Test Plan for Wireless Device Over-the-Air Performance

CTIA 01.01 Test Scope, Requirements, and Applicability

Version 8.0.0

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Use Instructions

All testing shall be performed in a CTIA Certification Authorized Test Lab and shall be initiated through one of the following methods:

1. By submitting a PTCRB or IoT Network Certified device certification request at https://certify.ptcrb.com/

2. By submitting an OTA Test Plan use request at https://certify.ctiacertification.org/

CTIA Certification LLC
1400 16th Street, NW
Suite 600
Washington, DC 20036

1.202.785.0081

programs@ctiacertification.org

ctiacertification.org/test-plans/

Acknowledgements

Company, Representative	Company, Representative
7 Layers: Clive Bax, Dominik Mente, Eleazar Zuniga	**MCL Technology Limited:** Phil Chadwick, Camelia Gabriel
Anritsu Co.: Alex Nixon	**Microsoft:** Kevin Li
Apple: Diego Hernandez, Swapnil Jain, Ning Liu, Alejandro Marquez, Kevin Z. Navares, Harneet Oberoi, Taeho Park, Sravya Pendyala, Vijay Ramakrishnan, Indranil Sen, Wisuit Sinsathitchai, Istvan Szini, Junhong Zhang	**Motorola Mobility:** Tyler Brown, David Bush, Eric Krenz, Philip Makotyn, Edwin Mendivil, Paul Moller, Andrew Pavacic, Paul Peterson, Jim Philips, Roger Scheer, Carl Seaberg, Istvan Szini
AT&T: Ron Borsato, Jan Chaffee, Dave Chapman, Virgilio Corral, Steve Harbin, Carl Martin, Darwin Parra, Ryan Pirkl, Scott Prather	**MultiTech Systems:** Terry Boe, Tom Hofstede
Azimuth Systems: Eric Ely, John Griesing, Thorkild Hansen, Charles Wright	**MVG:** John Estrada, Sebastien Gaymay, Nicolas Gross, Per Iversen, Kim Rutkowski, Alessandro Scannavini
Beijing HWA-TECH: Tuyuan Cheng	**National Institute of Standards and Technology:** Joop Aan Den Toorn, Maria Becker, Walter T.C. Burger, Jos Dortmans, Chris L. Holloway, Robert D. Horansky, Anouk Hubrechsen, Robert Jones, Ansgar T. Kirk, Thomas Meurs, Vincent Neylon, Carnot Nogueira, Ryan J. Pirkl, Kate A. Remley, Haider A. Shah, Stefan van de Beek, Chih-Ming Wang
Blackberry: Perry Jarmuszewski, Xin Jin, Yihong Qi, Qingmai Zhou	**NextNav, LLC:** Waldemar Kunysz, Subbu Meiyappan, Cristina Seibert, Bill Shvodian
Bluetest: Sara Catteau, Per-Simon Kildal, Susanne Schilliger Kildal, John Kvarnstrand, Christian Lötbäck Patané, Charlie Orlenius, Derek Skousen	**Nokia Corp.:** Bob Alexander, Randy Leenerts, Kevin Li, Pertti Makikyro, Miia Nurkkala, Hugh Shapter, Jesse Torres
Bureau Veritas: Clive Bax, Yi-Che Chen, Dayan Gao, Eddie Parsons, Fred Yang	**Paul Moller Consulting:** Paul Moller
CETECOM, Inc.: Lothar Schmidt, Thomas Tam	**Qualcomm, Inc.:** Greg Breit, Vince Butsumyo, Pat Connor, Thom Erickson, Dennis Feenaghty, Paul Guckian, Sri Kasturi, Ernie Ozaki, Ali Tassoudji, Allen Tran
CTTL: Xudong An, Justin Liu, Zheng Liu, Can Sun, Siyang Sun, Shawn Wu	**Rohde & Schwarz:** Anes Belkacem, Jose M. Fortes, Christoph Gagern, Thorsten Hertel, Adam Tankielun
Dell: Johnny Gutierrez, Justin Harbour, Keith Hendrickson, Elvis Yen	**Rogers:** Jean-Yves Bernard
Dish Network: Jussi Kuusisto	**Samsung:** Ingmar Dippe, Chirag Panchal
Element Materials Technology: Nik Bankov, Ron Borsato, Baron Chan, Luis Magana, Matt Smith, Andrea Zaworski	**Schmid & Partner Engineering AG:** Parisa Fallahi, Ioannis Koufogiannis, Erdem Ofli, Fereshteh Rouholahnejad
EMITE: Miguel Ángel García Fernández, Miguel Mora-Andreu, David A. Sánchez-Hernández	**Schmidt Consulting:** Lothar Schmidt
ETS-Lindgren: Faris Alhorr, Garth D'Abreu, Michael Foegelle, Jun Luo, Edwin Mendivil	**SGS:** Jason Bartosch, Chris Hiesberger, Peter Liao

Company, Representative	Company, Representative
General Test System: Kefeng Liu, Yihong Qi, Wei Yu	**Siemens ICM, LLC:** Milton de Leon, Peter Nevermann
Google, LLC: Karthikbabu Adappa Laxmi, Kevin Li	**Sony Mobile Communications, Inc.:** Ken Bednasz, Thomas Bolin, Pierre Chery, George Daniel, Beny Dong, Gerry Hayes, Matt Isley, Jim Sponsler, Scott Vance, Jun Wang
Hewlett-Packard: Jim Cottrell, Isaac Lagnado, Glenn Meyer, Tim Neill	**Spirent Communications:** Hakan Alparsan, Ron Borsato, William Chan, Doug Reed, Alfonso Rodriguez-Herrera, Jukka-Pekka Nuutinen
The Howland Company: Jamie Huff, Carl Sirles	**Sporton:** Lorien Chang, Jerry Fu, Alexander Ho, Ace Liu, Will Ni, Elvis Yen
IndexSAR Ltd.: David Riley	**Sprint:** Chris Hiesberger, Drew Liszewski
Intel: Jagjit Singh Ahsta,Xavier Carreño, Anatoliy Ioffe, Mikael Bergholz Knudsen, Günter Krenz, Tommy Nielsen, Hassan Yaghoobi, Boyan Yanakiev	**TMC:** Justin Liu, Can Sun
Intertek: Kevin Colaco, Bill Henning	**T-Mobile:** Adeel Ahmad, Uday Dodla, John Fessler, Michael Hart, Chris Hiesberger, David Holmes, Drew Liszewski, Fermin Romero, Alex Tkatch
IT'IS Foundation: Niels Kuster	**UL Verification Services:** Mike Heckrotte
Keysight Technologies: Satish Dhanasekaran, Steve Duffy, Aki Hekkala, Lassi Hentila, Thorsten Hertel, Ya Jing, Hongwei Kong, Karthikesh Raju, Moray Rumney, Xu Zhao	**Verizon Wireless:** David Binczewski, Ron Borsato, Lou LaMedica, Wayne Wilson, Andrew Youtz
Kyocera: Doug Dunn	**vivo**: Benny Dong
Lenovo: Jim Salembier	**Wireless Research Center of North Carolina:** Scott Vance

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Section 1 Introduction

1.1 Purpose

The purpose of this test plan is to define the CTIA Certification program test requirements for performing Radiated RF Power and Receiver Performance measurements on wireless devices.

This document is written in a normative context, but all or portions of the text may be considered normative or informative based on the certification body that incorporates this test plan.

Normative	Mandatory aspect for CTIA Certification testing
Informative	Optional testing/condition that is not part of CTIA Certification testing

1.2 Scope

This test plan defines general requirements for equipment configurations, laboratory techniques, test methodologies, and evaluation criteria that must be met in order to ensure the accurate, repeatable, and uniform testing of wireless devices to ensure that they meet CTIA Certification standards. This test plan also defines a portion of the requirements that a laboratory must satisfy to qualify for and maintain Authorized Testing Laboratory (ATL) status (complete ATL requirements may be found at https://ctiacertification.org/test-labs/).

This test plan provides high-level test procedures and basic test equipment configuration information but does not include detailed test instructions by which to execute certification testing. Such documentation and procedures must be presented by the test lab as part of the ATL authorization process and subsequently maintained and employed by the ATL to remain authorized to perform certification testing.

This test plan consists of a suite of documents; see Section 1.7.

These Documents use terms for the 3GPP Radio Access Technologies (RATs) that sometimes differ from those used by the Standards Body themselves. While readers of these documents may fully understand that the terms mean the same thing, we offer this cross reference to avoid any confusion.

This version includes all RAT references currently used in the CTIA OTA Test Plan.

CTIA OTA Nomenclature	PTCRB Nomenclature
GSM	GERAN
GPRS	
EGPRS	
UMTS (WCDMA)	UTRA
LTE	E-UTRA
NR	NR

This document specifies all the test requirements except carrier aggregation and dual-connectivity band combinations which are based on operator priorities and are further defined in *CTIA 01.02* [1]. All normative reporting tables are included in *CTIA 01.03* [2]. Some informative reporting tables are included in *CTIA 01.04* [4]. Details of various wireless technologies are described in *CTIA 01.50* [10], *CTIA 01.51* [11] and *CTIA 01.52* [12] which are applicable to multiple test methodologies. Additional normative requirements are described in *CTIA 01.70* [13], *CTIA 01.71* [14], *CTIA 01.72* [15] and *CTIA 01.73* [16] which are applicable to multiple test methodologies. Informative content is described in *CTIA 01.90* [17].

1.3 Scope of Test Methods

This test plan includes several test methodologies, and, in some cases, multiple test methodologies may be used to perform certain tests. Note that the SISO, Reverberation Chamber Test Methodology is informative.

Table 1.3 1 shows the 3GPP wireless technologies supported by each of the different test methodologies. Table 1.3-2 shows the location based wireless technologies supported by each of the different test methodologies. Table 1.3-3 shows the non-3GPP wireless technologies supported by each of the different test methodologies. Table 1.3-4 shows the device types supported by each of the different test methodologies. Table 1.3-5 shows the tests supported by each of the different test methodologies.

Table 1.3-1 Support of 3GPP Wireless Technologies by Test Methodology

	SISO, Anechoic Chamber	SISO, Reverberation Chamber	SISO, Millimeter Wave	MIMO, Multi-Probe Anechoic Chamber	MIMO, Radiated Two Stage
GSM	Yes	Yes	No	No	No
GPRS	Yes	Yes	No	No	No
EGPRS	Yes	Yes	No	No	No
UMTS	Yes	Yes	No	No	No
LTE	Yes	Yes	No	Yes	Yes
LTE 2DL CA	Yes	No	No	No	No
LTE 3DL CA	Yes	No	No	No	No
LTE LAA	Yes	No	No	No	No
LTE Category M1	Yes	Yes	No	No	No
LTE Category NB1	Yes	Yes	No	No	No
NR FR1 SA	Yes	No	No	No	No
NR FR1 EN-DC	Yes	No	No	No	No
NR FR2 EN-DC	No	No	Yes	No	No
NR FR1 SA 2DL CA	Yes	No	No	No	No
NR FR1 SA 3DL CA	Yes	No	No	No	No

	SISO, Anechoic Chamber	SISO, Reverberation Chamber	SISO, Millimeter Wave	MIMO, Multi-Probe Anechoic Chamber	MIMO, Radiated Two Stage
NR FR1 SA 2UL CA	Yes	No	No	No	No
NR FR1 RedCap	Yes	No	No	No	No

Table 1.3-2 Support of Location Based Wireless Technologies by Test Methodology

	SISO, Anechoic Chamber	SISO, Reverberation Chamber	SISO, Millimeter Wave	MIMO, Multi-Probe Anechoic Chamber	MIMO, Radiated Two Stage
A-GPS L1	Yes	No	No	No	No
A-GPS L5	Yes	No	No	No	No
A-GALILEO E1	Yes	No	No	No	No
A-GALILEO E5A	Yes	No	No	No	No
MBS	Yes	No	No	No	No
Stand Alone (SA) GPS L1	Yes	No	No	No	No

Table 1.3-3 Support of Non-3GPP Wireless Technologies by Test Methodology

	SISO, Anechoic Chamber	SISO, Reverberation Chamber	SISO, Millimeter Wave	MIMO, Multi-Probe Anechoic Chamber	MIMO, Radiated Two Stage
Bluetooth® BR	Yes	No	No	No	No
Bluetooth LE	Yes	No	No	No	No
Zigbee	Yes	No	No	No	No

Table 1.3-4 Support of Device Types by Test Methodology

	SISO, Anechoic Chamber	SISO, Reverberation Chamber	SISO, Millimeter Wave	MIMO, Multi-Probe Anechoic Chamber	MIMO, Radiated Two Stage
Hand-Held Device	Yes	No	Yes[1]	Yes	Yes
Wrist-Worn Device	Yes	Yes	No	No	No

	SISO, Anechoic Chamber	SISO, Reverberation Chamber	SISO, Millimeter Wave	MIMO, Multi-Probe Anechoic Chamber	MIMO, Radiated Two Stage
Chest-Worn Device	Yes	Yes	No	No	No
Ankle-Worn Device	Yes	Yes	No	No	No
IoT devices fitting within Notebook-sized test volume[2]	Yes	Yes[3]	No	No	No
Tablets	Yes	No	Yes[1]	Yes	Yes
Notebooks	Yes	No	No	No	No
IoT devices larger than Notebook-sized test volume[2]	No	Yes[3]	No	No	No

Note 1: Devices must fit within the 30 cm quiet zone. Devices must meet the requirement of having antenna arrays with a radiating aperture less than 5 cm. Measurement grids and measurement uncertainties for DUTs with antenna apertures greater than 5 cm have not been defined yet and can therefore not be certified using this test plan.

Note 2: The Notebook-sized test volume is defined in *CTIA 01.73* [16] Section 5.4.

Note 3: Only IoT devices that do not require partial surface radiated quantities may be tested using the reverberation chamber test method.

Table 1.3-5 Tests Supported by Test Methodology

	SISO, Anechoic Chamber	SISO, Reverberation Chamber	SISO, Millimeter Wave	MIMO, Multi-Probe Anechoic Chamber	MIMO, Radiated Two Stage
Total Radiated Power (TRP)	Yes	Yes	No	No	No
Near Horizon Partial Radiated Power (NHPRP)	Yes	No	No	No	No
Relative power on intermediate channels	Yes	No	No	No	No
Total Isotropic Sensitivity (TIS) or Combined Total Isotropic Sensitivity (C-TIS)	Yes	Yes	No	No	No
Near Horizon Partial Isotropic Sensitivity (NHPIS)	Yes	No	No	No	No
Partial Isotropic GPS Sensitivity (PIGS)	Yes	No	No	No	No
Upper Hemisphere Isotropic Sensitivity (UHIS)	Yes	No	No	No	No
Average 3D C/N_0	Yes	No	No	No	No

	SISO, Anechoic Chamber	SISO, Reverberation Chamber	SISO, Millimeter Wave	MIMO, Multi-Probe Anechoic Chamber	MIMO, Radiated Two Stage
Partial Integrated GPS (PIG) 3D C/N_0	Yes	No	No	No	No
Upper Hemisphere (UH) 3D C/N_0	Yes	No	No	No	No
Relative sensitivity on intermediate channels	Yes	Yes	No	No	No
Intermediate Channel Degradation to Location Based Wireless Technologies	Yes	No	No	No	No
LAA Un-Licensed Degradation (LUD) Test	Yes	No	No	No	No
Cellular desensitization due to simultaneous operation of 802.11n radios	Yes	No	No	No	No
Maximum Output Power - EIRP (MOP-EIRP)	No	No	Yes	No	No
Maximum Output Power - TRP (MOP-TRP)	No	No	Yes	No	No
Maximum Output Power -spherical coverage (MOP-spherical coverage)	No	No	Yes	No	No
REFSENS - EIS	No	No	Yes	No	No
REFSENS - spherical coverage	No	No	Yes	No	No
MIMO average radiated SIR sensitivity (MARSS)	No	No	No	Yes	Yes

1.3.1 SISO Test Methodologies for Wireless Technologies below 6 GHz

Good radiated performance is critical to the effective operation of a wireless device in today's networks. As devices become smaller, radiated performance can often become compromised. For example, achieving an efficient antenna in a small size and over multiple frequency bands is a difficult task. A comprehensive and accurate characterization of radiated performance will enable carriers and manufacturers to determine how well wireless devices will work within the constraints of a specific cellular network design.

Generally, peak Effective Isotropic Radiated Power (EIRP) is not a good indication of wireless performance in the field. For example, if the radiation pattern of the Device Under Test's (DUT) antenna system is highly directive, the peak EIRP would be high (since the antenna gain is high in one direction), but coverage would be poor in other directions. In a cellular environment it is best to maximize the spatial coverage of the antenna system so that the user does not have to point the antenna in one particular direction to get good call performance. Further, the human body (e.g. head, hand, and forearm) can alter

the shape and peak value of the DUT radiation pattern. Losses due to the body can vary significantly with frequency, device size, and antenna design implemented. From a field performance perspective, measurement of the average EIRP on a body model is more meaningful than measurement of peak EIRP in free-space conditions. This test plan requires average spherical effective isotropic radiated power (termed Total Radiated Power or TRP) to be measured.

Receiver performance, or Effective Isotropic Sensitivity (EIS) is as important to the overall system performance as transmitter performance. The downlink receive path is integral to the quality of the device's operation. Poor receiver radiated performance will cause the user of the subscriber unit to hear a low-quality voice signal. This can also cause the subscriber unit to lose the base station signal resulting in abrupt termination of the call. This test plan requires average spherical effective radiated receiver sensitivity (termed, in the general sense, Total Isotropic Sensitivity or TIS) to be measured. A frequent cause of poor sensitivity on a single channel, or a small number of channels, is due to receiver in-band noise, or spurious signals from the transmitter itself being radiated back into the receiver. The receiver sensitivity will be measured with the transmitter set to the maximum power output allowed by the particular DUT and technology combination.

For all air interfaces and devices, TIS shall be measured with all receivers active. This measurement method and result is referred to as Combined Total Isotropic Sensitivity, or C-TIS. The C-TIS test is agnostic to whether the device under test actually has only one or multiple receivers; all that matters is that the receivers are all active during the test. The performance metrics (pass/fail criteria) are given in terms of C-TIS for all device types. Different categories of devices, having differing performance expectations based on e.g., number of receivers, may be defined, each having its own appropriate pass/fail criteria expressed in terms of C-TIS.

1.3.1.1 Applicability of SISO, Anechoic Chamber Test Methodology

CTIA 01.20 [5] is used to measure total radiated quantities (e.g. TRP and TIS including Fast TIS, where applicable), partial radiated quantities (e.g. near horizon partial radiated power (NHPRP), near horizon partial isotropic sensitivity (NHPIS), partial isotropic GPS sensitivity (PIGS), upper hemisphere isotropic sensitivity (UHIS)), relative sensitivity on intermediate channels, relative power on intermediate channels, intermediate channel degradation for location based wireless technologies, and LAA (License-Assisted Access) Un-Licensed Degradation (LUD) test. Wireless protocols in New Radio Frequency Range 1 (NR FR1) or below 6 GHz are supported in this test plan. Wireless protocols operating in New Radio Frequency Range 2 (NR FR2), or the millimeter wave frequency range are not supported in this test plan. Most device types are supported by this test methodology except for devices larger than the Notebook-sized test volume defined in *CTIA 01.73* [16] Section 5.4. This test methodology also covers testing of cellular desensitization due to simultaneous operation of 802.11 radios in Integrated Devices.

1.3.1.2 Applicability of SISO, Reverberation Chamber Test Methodology (Informative)

The SISO, Reverberation Chamber Test Methodology is used to measure total radiated quantities (e.g. TRP and TIS including Fast TIS, where applicable), and relative sensitivity on intermediate channels. This test method does not cover any of the partial surface quantities such as NHPRP and NHPIS. This test plan only covers the following 3GPP wireless technologies below 6 GHz: GSM, GPRS, EGPRS, UMTS, LTE, LTE Category NB1 and LTE Category M1. The test method does not cover LTE carrier aggregation nor location based wireless technology testing at this time. Wireless protocols operating in FR2, or the millimeter wave frequency range are not supported in this test plan. Many device types are supported by this test methodology including large form factor devices that are larger than the Notebook-sized test volume defined in *CTIA 01.73* [16] Section 5.4. This test method only supports a limited selection of phantoms including the forearm phantom.

1.3.1.3 Fast TIS Test Methodologies for Wireless Technologies below 6 GHz

Due to the proliferation of narrowband IoT devices, bands, and testing time associated with these protocols, certain devices may be tested using the Fast TIS testing method. For this category of

measurements, one or more of the following measurement techniques may be utilized: device-reported RSS values; theta-dependent phi point reduction; single or multi-point offset methods in anechoic chambers, and continuous-mode stirring in reverberation chambers.

Fast TIS testing is limited to:

1. LTE Category M1/M2, and Category NB1.
2. IoT devices which
    a. utilize a single RX antenna and a single receiver per supported WWAN band(s), and
    b. do not support real-time voice communications for human body-worn devices.

Examples of devices that meet the above criteria include:

- Utility, parking meter, or other sensor-centric devices using LTE Cat-NB1
- Ankle, arm, chest, or wrist-worn devices using LTE Cat-M1 that do not support voice calling
- Pet tracking devices using LTE Cat-M1 or NB1 regardless of whether or not they support real-time audio.

Employing these Fast TIS time-saving techniques generally increases measurement uncertainty. In order to ensure that the additional allowed uncertainty is providing the expected measurement time benefits, a maximum test time for a reference device is prescribed. Labs must demonstrate ability to meet test time and uncertainty requirements during an audit or certification in order to utilize a Fast TIS method. Actual test time for test objects may vary and exceed this time in some cases due to device instability, device pattern characteristics, or battery limitations. Maximum test times for reference devices are given in Table 1.3.1.3-1.

Table 1.3.1.3-1: Test Time Limits for Fast TIS for Applicable Protocols

Protocol	Maximum Test Time Per Channel (Minutes)
LTE Category M1/M2	20
Category NB1	20

1.3.2 SISO, Millimeter Wave Test Methodology

A notable difference in devices operating in FR2 compared to devices operating in FR1 is the ability of the devices that support FR2 to support antenna beam forming. Consequently, this test method measures the following transmit characteristics: Maximum Output Power (MOP) – EIRP, MOP – TRP, and MOP – spherical coverage. This test method measures the following receive characteristics: REFSENS (Reference Sensitivity power level) – EIS, and REFSENS – spherical coverage.

1.3.2.1 Applicability of SISO, Millimeter Wave Test Methodology

CTIA 01.22 [7] is used to measure radiated performance of wireless devices supporting NR FR2 in the EN-DC (E-UTRAN New Radio – Dual Connectivity) mode (using the LTE network).

1.3.3 MIMO Test Methodologies

Downlink 2x2 MIMO allows LTE wireless devices with MIMO spatial multiplexing receiver implementations to support data rates almost twice as high as the data rates available from a 2x1 MISO (Multiple Input Single Output) downlink. This higher data rate is possible through the use of spatial multiplexing, where the device's serving network simultaneously transmits two independent, spatially-diverse data streams to the wireless device. In order to realize the full benefit of spatial multiplexing, the wireless device must be able to differentiate between the two downlink data streams. In order to assess radiated downlink 2x2 MIMO performance, this test methodology creates a standardized spatial channel within the test zone, with characteristics similar to real-world radio environments. Currently, the test system creates the SCME (Spatial Channel Model Extended) Urban Macro propagation channel. However, any spatial channel model can be created within the test zone should future industry demands require the use of alternative models.

The test system used to create a spatial radio channel is thoroughly described in *CTIA 01.40* [8]. In addition to describing the creation of a spatial radio environment, *CTIA 01.40* [8] also describes a means by which the Signal to Interference Ratio (SIR) can be controlled. The control of SIR is very important, as it allows labs to evaluate the wireless device's spatial multiplexing performance under operating conditions the device will experience in actual networks. SIR control also allows labs to render a performance metric which can be used as a benchmark for each device's spatial multiplexing performance in actual wireless networks.

This test method is intended to determine the average MIMO receiver performance of a DUT for a given usage case and RF environmental condition. The test evaluates the DUT in a range of typical orientations for a given usage case and then determines a single figure of merit for that model and usage case combination. The MIMO Average Radiated SIR Sensitivity (MARSS) orientation dependent performance should not be thought of as a radiation pattern, since at each orientation of the DUT, signals from multiple directions are received simultaneously and combined by the antennas and radio receivers in whatever manner the DUT supports. There is no single direction around the DUT for which a given measurement defines the receiver performance in that direction. Instead, the MARSS orientation dependent information simply reflects the receiver performance for a given DUT orientation relative to the origin coordinates of the simulated RF environment in which it is being tested. The selection of orientations to be tested are intended to reflect a uniform distribution of the most common range of orientations such that no additional weighting is required to determine average performance.

1.3.3.1 Applicability of MIMO, Multi-Probe Anechoic Chamber Test Methodology

CTIA 01.40 [8] is used to test wireless devices capable of supporting LTE 2x2 downlink MIMO.

1.3.3.2 Applicability of MIMO, Radiated Two Stage Test Methodology

CTIA 01.41 [9] is an alternative method to the MIMO, Multi-Probe Anechoic Chamber Test Methodology.

1.4 DUT and Accessories—The Wireless Device

All DUTs submitted to an ATL for radiated performance testing shall be representative of typical production units and will be able to comply with the regulatory requirements of the countries in which the device is targeted to be sold. At the manufacturer's discretion, one or multiple DUTs may be submitted. All DUTs shall be provided to a single ATL responsible for OTA testing of the device, known as the "primary" ATL. The primary ATL may distribute the DUT(s) to labs acting as a subcontractor to the primary ATL.

The primary ATL and its subcontractors shall ensure that all of the requirements listed below are met:

- All DUTs shall be capable of supporting all applicable radiated performance test cases.

- If conducted measurements are required to be made for a given protocol, they shall be performed on the DUT and documented for each DUT for each of the test frequencies, bands, and protocols utilized.

- When multiple samples are provided, the DUT shall be randomly selected from among the submitted samples such that a single DUT will be employed for tests within a:
    - Test Methodology (e.g., SISO, Anechoic Chamber or MIMO, Multi-Probe Anechoic Chamber)
    - Radio Mode (e.g., 3GPP Wireless Technology, Non-3GPP Wireless Technology, Location Based Wireless Technology)
    - Band
    - Test Type (e.g., TRP, or TIS)
    - Test Condition (e.g., FS (free space), BHHL (beside head and hand left) or BHHR (beside head and hand right))

    Example: If a manufacturer provides four sample devices to the ATL (Device A, B, C and D) and the lab randomly selects Device C for execution of *CTIA 01.20* [5] for BHHR testing for TIS in UMTS Band II, then all radiated performance tests associated with this test method, test condition, test type, band and cellular radio mode must be executed with Device C only. In this example, BHHL testing for TIS using *CTIA 01.20* [5] in UMTS Band II could be executed with a different randomly-selected sample device. BHHR testing for TIS using *CTIA 01.20* [5] in UMTS Band V could be executed using yet another randomly-selected sample device, etc.

- The test report shall unambiguously state which sample and test system was used for each test in order to comply with the traceability requirements of ISO/IEC 17025:2017.

- One or more authorized test systems may be utilized.

- For devices supporting an eSIM, the eSIM shall be configured with the 3GPP test eSIM profile to enable connections to communication testers.

- For devices which support a time-averaging algorithm to control RF output in real-time for the purpose of RF exposure compliance or for other reasons, the manufacturer is required to provide a mechanism for the test lab to disable the algorithm, so that during OTA testing, the DUT can consistently operate at maximum power level for the corresponding usage mode under test. For MIMO OTA testing, the time-averaging algorithm shall be disabled so that the DUT can consistently operate at the power level required for MIMO OTA testing.

- The sample devices for A-GNSS (Assisted Global Navigation Satellite System) OTA for LTE shall be prepared by the manufacturer to ensure compatibility with the test procedure herein which utilizes the Open Mobile Alliance (OMA) Secure User Plane (SUPL) 2.0 protocol. Specifically, the manufacturer shall:
    - Install the SUPL certificate(s) for the corresponding LTE A-GNSS test equipment used at the “primary” ATL and at any labs acting as a subcontractor to the primary ATL. Ideally, the manufacturer should install the SUPL certificates for all LTE A-GNSS test equipment manufacturers referenced on the authorized equipment list.
    - Provide a mechanism (application, hidden menu, support tool, etc.) that allows the ATL to specify the SUPL server address and port or have this information pre-set on the device for the corresponding LTE A-GNSS test equipment used at the “primary” ATL and at any labs acting as a subcontractor to the primary ATL.

- Alternatively, the manufacturer shall provide tools and detailed instructions that allow the ATLs to install the SUPL certificates and set the SUPL server and ports themselves on any of the provided sample devices for A-GNSS OTA for LTE.

- Units for test shall be supplied with all required peripherals and accessories, including the standard battery and charger as supplied with the unit. For protocols requiring conducted measurements and where an RF port is available on the DUT, a calibrated RF adapter cable terminating in a common SMA or “type N” connector shall be supplied for conducted measurements. The associated RF insertion loss for that cable connection shall be included.

- Testing shall be performed solely with the standard battery (if field replaceable) or internal battery, i.e., no charging cable or accessory cable shall be utilized during the testing, unless explicitly permitted or required elsewhere in the suite of test plans (see Section 1.7), e.g., devices requiring external power supply to operate.

1.4.1 Additional Requirements for SISO, Anechoic Chamber Test Methodology

For tests that employ relative measurements, such as single point offset test (SPOT) for carrier aggregation (CA), a different chamber and sample may be used regardless of which was used for the original test. Both the Test Configuration A and Test Configuration B tests which make up the SPOT shall be performed in the same OTA chamber using the peak position and polarization from the original (full) radiated test, regardless of which chamber the original radiated test was performed in. The delta between Test Configuration A and Test Configuration B shall be applied to the original (full) radiated test as specified in *CTIA 01.20* [5]. If the laboratory chooses to utilize this option, the measurement uncertainty for the alternate procedure shall be updated to reflect any differences in chamber equipment or setup.

1.4.2 Additional Requirements for SISO, Millimeter Wave Test Methodology

No samples for conducted testing are required for this test method. The DUT’s antennas shall not be configured or enabled/disabled in a manner that is contrary to the normal operation of the DUT. The DUT can, however, also be pre-configured by disabling UL TX diversity schemes similar to what 3GPP is currently mandating for conformance testing (see *3GPP TS 38.521-2* [18].)

1.4.3 Additional Requirements for MIMO, Test Methodologies

The manufacturer shall not indicate support for any operating band where the MIMO antenna system is not completely contained within the validated spatial correlation sphere as defined in Section 2.3.3 of *CTIA 01.40* [8]. If the DUT supports more than 2 antennas, then the DUT shall be tested in the antenna configuration used for normal device operation. The DUT’s antennas shall not be configured or enabled/disabled in a manner that is contrary to the normal operation of the DUT.

1.5 Wireless Device Documentation

All documentation and accessories associated with the installation and operation of the DUT shall be supplied. This includes, at a minimum:

- User guides or manuals
- Programming instructions
- Installation guides or manuals
- Service manuals, including manual control of DUT from Test Interface Unit and/or keypad
- All Base Station Simulator settings required to register the DUT and establish a call

- Manufacturer declaration of primary mechanical mode of operation, i.e., portrait slide open, fold open, or other mechanical configuration
- Manufacturer declaration of all mechanical use modes that are representative use cases
- Manufacturer declaration if the DUT supports a time-averaging algorithm to control RF output power in real-time for the purpose of RF exposure compliance or for other reasons.
- For Wrist-Worn Devices:
    - Declaration of the wristband to be used during the testing. The wristband to be used shall be the wristband packaged with the end product. If wristbands are provided separately, the wristband selection shall be based on the expected worst-case wristband.
    - Declaration of the housing material to be used during the test based on the expected worst-case material.
    - Declaration of the single arm orientation (WL (wrist left) or WR (wrist right)) to be used for test, based on the expected worst-case orientation and based on input from target operators.
- For chest-worn devices:
    - For chest-worn devices that are configured to make E911 calls or restricted to call certain phone numbers, instructions shall be provided for these devices to ensure that accidental calls to E911 are avoided.
- For ankle-worn devices:
    - Declaration of the ankle-band to be used during the testing. The ankle-band to be used shall be the ankle-band packaged with the end product. If ankle-bands are provided separately, the ankle-band selection shall be based on the expected worst-case ankle-band.
    - Declaration of the housing material to be used during the test based on the expected worst-case material.
    - In general, ankle-worn devices can be worn in the same position on the ankle in two orientations. For example, if a device had a single button on the side of the device, the device could be worn on the ankle with the button pointing upwards or downwards. The manufacturer shall declare the orientation of the device for test 1) based on the recommended use guidelines, or 2) based on the expected worst-case orientation and input from target operators.

In addition to the documentation, the manufacturer shall provide contact information including telephone number and e-mail address of an individual responsible for providing technical and operational assistance.

1.5.1 Additional Documentation for SISO Test Methodologies for Wireless Technologies Below 6 GHz

- List of all antennas used for SISO sub-6 GHz OTA testing as supplied by the manufacturer:
    - Each antenna shall be labelled with a letter, starting with the letter “A”. These antenna labels are used in *CTIA 01.03* [3] Table RA.1-2.
    - Each unique antenna feed shall be associated with a unique label
    - These labels shall be used by the ATL when completing the reporting tables described in *CTIA 01.03* [3] Section RA.

- Table RA.1-2 in *CTIA 01.03* [3] as completed by the manufacturer:
    - Declaration of all bands and protocols supported by each antenna, and to which transceiver functions the antenna are connected (transmitter, primary receiver, secondary receiver)
    - Declaration of all antenna, band and protocol combinations that are activated dynamically for RX functionality
    - Declaration of which antennas are dynamically tuned in such a way that offset - tests (see *CTIA 01.20* [5]) cannot be used when offset tests are being considered for use.)
    - Declaration of the baseline antenna receiver combination (switch state) to be used as a baseline for testing devices supporting RX antenna switching (see Section 2.1.5.2). Declaration of which switch states require testing according to Section 2.1.5.2.

- Instructions for enabling testing of devices supporting antenna switching (see Section 2.1.5).

- Instructions for which channel(s) to test A-GPS L1 with LTE Band 12 (see *CTIA 01.51* [11]*).*

- Manufacturer to report the targeted operators in order for the CA and DC testing to be determined according to the operator priority list (see *CTIA 01.02* [2]).

- When submitting a device for LTE A-GNSS testing, the device manufacturer shall include a declaration statement that identifies one of the options specified in Section 2.1.8.1.2 to define the testing to be performed by the test lab.

- When submitting an LTE Category M1 device for A-GNSS testing, the device manufacturer shall include a declaration statement that identifies one of the options specified in Section 2.1.8.1.2 to define the testing to be performed by the test lab.

    - In cases where multiple antennas integrated in the DUT radiate coherently and have an effective radiating aperture greater than what is assumed in this test plan, the device manufacturer shall inform the test lab of this fact, and the test lab will include that information in the test report. See Section 2 of *CTIA 01.73* [16] for more details.

1.5.2 Additional Documentation for SISO, Millimeter Wave Test Methodology

To allow for test time reduction with the beam peak search measurements, the manufacturer is allowed to declare that the beam peak at the mid test frequency range is applicable for the remaining (low, high) test frequency ranges. Beam peak search results cannot be re-used across different bands.

Device manufacturers may use their knowledge of the antenna locations within the device to declare zones of the DUT with the intent that those areas are not covered or blocked by DUT mounting fixtures in order to minimize their impact on measured device performance in free space. ATLs shall collaborate with the manufacturer to try to meet the provided guidance.

A vendor declaration is necessary in case the gray-box positioning approach is used, where a declared positioning reference point is aligned with the center of the quiet zone as described in Section 4.1 of *CTIA 01.71* [14]. The sample vendor declaration for the gray-box approach is highlighted in Table 1.5.2-1 and relies on the declaration of a reference point and the minimum quiet zone required to contain all active antennas.

Table 1.5.2-1 Sample Vendor Declaration for Gray-Box Approach

Band	Positioning Reference Point: Offset (*X*/*Y*/*Z*) from Geometric Center of DUT	Min. QZ Required to Contain All Active Antennas Within the Quiet Zone
n258		
n260		
n261		
Note: The only available QZ sizes are 30 cm and 40 cm in diameter as defined in Section 2.1.3 of *CTIA 01.22* [7].		

Laptops and FWAs shall be scanned for beam peak searches and spherical coverage test cases by default in both hemispheres. As an alternative, OEMs are allowed to declare only one hemisphere to be tested. This vendor declaration shall specify the DUT test condition (Alignment Option and DUT Orientation) as shown in Table 1.5.2-2.

Table 1.5.2-2 Sample Vendor Declaration to Test Single Hemisphere for Laptops or FWAs.

Band	Alignment Option (Note 1)	DUT Orientation (Note 2)
n258		
n260		
n261		
Note 1: For FWAs, the available alignment options are #1, #4, and #5, while for laptops, the available alignment options are #1 and #6. The alignment options are defined in Section 4.1 of *CTIA 01.71* [14] Note 2: Either DUT Orientation 1 or DUT Orientation 2 shall be selected.		

The vendor shall submit a declaration of the primary mechanical mode as referenced in this test plan to the ATL.

To allow test time reduction for 3D scans, e.g., beam peak searches, spherical coverage and TRP test cases, the manufacturer is allowed to declare that the integrated antenna arrays for PC3 devices are based on an alternate worst-case 4x2 or 6x2 configuration and thus apply relaxed measurement grids for testing. A sample vendor declaration is highlighted in Table 1.5.2-3.

Table 1.5.2-3: Sample vendor declaration to declare alternate PC3 worst case antenna array configuration.

Band	Intent	Comments
n258	n258 PC3 measurement grids can be relaxed based on 4x2 worst case antenna array configuration	Note 1

Band	Intent	Comments
n260	n260 PC3 measurement grids can be relaxed based on 4x2 worst case antenna array configuration	Note 1
n261	n261 PC3 measurement grids can be relaxed based on 4x2 worst case antenna array configuration	Note 1
n258	n258 PC3 measurement grids can be relaxed based on 6x2 worst case antenna array configuration	Note 2
n260	n260 PC3 measurement grids can be relaxed based on 6x2 worst case antenna array configuration	Note 2
n261	n261 PC3 measurement grids can be relaxed based on 6x2 worst case antenna array configuration	Note 2
Note 1: The fine PC3 measurement grids based on the 8x2 worst case configuration shall be applied by default unless the device manufacturer explicitly declares that all antenna arrays with M x N ($M \geq N$) comply with $M \leq 4$ and $N \leq 2$ for each band. Note 2: The fine PC3 measurement grids based on the 8x2 worst case configuration shall be applied by default unless the device manufacturer explicitly declares that all antenna arrays with M x N ($M \geq N$) comply with $4<M\leq 6$ and $N\leq 2$ for each band.		

1.5.3 Additional Documentation for MIMO, Test Methodologies

Wireless devices submitted to an ATL for MIMO performance evaluation shall include information concerning the antenna placement for each band in which MIMO is supported by the DUT. The specific information required is described in Section 2.3.3 of *CTIA 01.40* [8]. In addition, the number of devices receive antennas for each band to be tested shall be included in the information submitted to an ATL for MIMO performance evaluation.

1.6 Acronyms and Definition

Acronym/Term	Definition
A-GNSS	Assisted Global Navigation Satellite System
AL	Ankle Left
ATL	Authorized Test Lab
BER	Bit Error Rate
BLER	Block Error Rate
BH	Beside Head
BHHL	Beside Head and Hand Left Side

Acronym/Term	Definition
BHHR	Beside Head and Hand Right Side
BHL	Beside Head Left
BHR	Beside Head Right
Bluetooth BR	Bluetooth Basic Rate
Bluetooth LE	Bluetooth Low Energy
C-TIS	Combined Total Isotropic Sensitivity
CA	Carrier Aggregation
CAT-M1	Category M1
CAT-NB1	Category NB1
CC	Component Carrier
CCDF	Complementary Cumulative Distribution Function
ChW	Chest Worn
DC	Dual Connectivity
DL	Downlink
DML	Data Mode Landscape
DMP	Data Mode Portrait
DMSU	Data Mode Screen-Up
DUT	Device Under Test
EGPRS	Enhanced General Packet Radio Service
EIRP	Effective Isotropic Radiated Power
EIS	Effective Isotropic Sensitivity
EN-DC	E-UTRAN New Radio – Dual Connectivity
eSIM	Embedded Subscriber Identity Module
FCC	Federal Communications Commission
FER	Frame Error Rate
FR1	Frequency Range 1
FR2	Frequency Range 2

Acronym/Term	Definition
FS	Free Space
GPRS	General Packet Radio Service
GSM	Global System for Mobiles
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HL	Hand Left
HR	Hand Right
IoT	Internet of Things
LTE	Long Term Evolution
LAA	License Assisted Access
LUD	LTE LAA Un-Licensed Degradation Test
MARSS	MIMO Average Radiated SIR Sensitivity
MBS	Metropolitan Beacon System
MCG	Master Cell Group
MIMO	Multiple Input Multiple Output
MOP	Maximum Output Power
NHPIS	Near Horizon Partial Isotropic Sensitivty
NHPRP	Near Horizon Partial Radiated Power
NR	New Radio
OEM	Original Equipment Manufacturer
OMA	Open Mobile Alliance
OTA	Over-the-Air
PCC	Primary Component Carrier
PCMCIA	Personal Computer Memory Card International Association
PDA	Personal Digital Assistant
PER	Packet Error Rate
PIG	Partial Integrated GPS

Acronym/Term	Definition
PIGS	Partial Isotropic GPS Sensitivity
PTCRB	PCS Type Certification Review Board
RB	Resource Block
RedCap	Reduced Capability
RF	Radio Frequency
RSS	Receive Signal Strength
RX	Receive
SA	Stand Alone
SCC	Secondary Component Carrier
SCG	Secondary Cell Group
SCME	Spatial Channel Model Extended
SCS	Subcarrier spacing
SIR	Signal to Interference Ratio
SISO	Single Input Single Output
SPOT	Single Point Offset Test
SUPL	Secure User Plane
TIS	Total Isotropic Radiation
TRP	Total Radiated Power
TX	Transmit
UE	User Equipment
UHIS	Upper Hemisphere Isotropic Sensitivity
UL	Uplink
UMTS	Universal Mobile Telecommunications System
USB	Universal Serial Bus
VoIP	Voice over IP
VoLTE	Voice over LTE
WL	Wrist-worn Left

Acronym/Term	Definition
WR	Wrist-worn Right
WWAN	Wireless Wide Area Network

1.7 Document References

This test plan is composed of a suite of the following documents:

Document Number, *Document Name*
[1] CTIA 01.01, *Test Scope, Requirements, and Applicability*
[2] CTIA 01.02, *Operator Priority List*
[3] CTIA 01.03, *Normative Reporting Table*
[4] CTIA 01.04, *Informative Reporting Tables*
[5] CTIA 01.20, *Test Methodology, SISO (Single Input Single Output), Anechoic Chamber*
[6] CTIA 01.21, *Test Methodology, SISO, Reverberation Chamber (Informative)*
[7] CTIA 01.22, *Test Methodology, SISO, Millimeter Wave*
[8] CTIA 01.40, *Test Methodology, MIMO (Multiple Input Multiple Output), Static Channel Model, Multi-Probe Anechoic Chamber*
[9] CTIA 01.41, *Test Methodology, MIMO, Radiated Two Stage*
[10] CTIA 01.50, *Wireless Technology, 3GPP Radio Access Technologies*
[11] CTIA 01.51, *Wireless Technology, Location Based Technologies*
[12] CTIA 01.52, *Wireless Technology, Non-3GPP Radio Access Technologies*
[13] CTIA 01.70, *Measurement Uncertainty*
[14] CTIA 01.71, *Device Setup and Positioning Guidelines*
[15] CTIA 01.72, *Near-Field Phantoms*
[16] CTIA 01.73, *Supporting Procedures*
[17] CTIA 01.90, *Informative Reference Material*

The following additional documents are referenced in this test plan:

Document Number, ***Document Name***
[18] 3GPP TS 38.521-2, *User Equipment (UE) Conformance Specification, Radio Transmission and Reception; Part 2: Range 2 Standalone.*
[19] CTIA Certification and Wi-Fi Alliance*, Test Plan for RF Performance Evaluation of Wi-Fi Mobile Converged Devices*, 2020.
[20] 3GPP TS 45.005, GSM/EDGE Radio transmission and reception

Section 2 Test Requirements

2.1 SISO Test Methodologies for Wireless Technologies below 6 GHz

This section outlines test requirements for devices supporting wireless technologies below 6 GHz.

Products supporting multiple air-interface technologies shall be tested in accordance with all relevant test procedures for the following metrics, as applicable:

- Total Radiated Power (TRP)
- Near-Horizon Partial Radiated Power considered over ±45 degrees ($NHPRP_{\pm 45}$)
- Near-Horizon Partial Radiated Power considered over ±30 degrees ($NHPRP_{\pm 30}$)
- Relative power on intermediate channels
- Total Isotropic Sensitivity (TIS)
- Near-Horizon Partial Isotropic Sensitivity considered over ±45 degrees ($NHPIS_{\pm 45}$)
- Near-Horizon Partial Isotropic Sensitivity considered over ±30 degrees ($NHPIS_{\pm 30}$)
- Partial Isotropic GPS Sensitivity (PIGS)
- Upper Hemisphere Isotropic Sensitivity (UHIS)
- Relative sensitivity on intermediate channels
- Intermediate channel degradation to location based wireless technologies
- LTE LAA Un-Licensed Degradation (LUD) Test
- Cellular desensitization due to simultaneous operation of 802.11n radios

Devices shall be tested with the applicable phantoms as defined below.

In general, all supported normative bands below 6 GHz will be tested with exceptions defined in this section.

2.1.1 Definitions

2.1.1.1 Device Definitions

Ankle-Worn Device- A device that is typically worn on the user's ankle. This device category includes ankle monitors.

Chest-Worn Device- A device that is typically worn on the user's chest. This device category includes personal emergency response devices.

Hand-Held Device- A device that is typically used in the user's hand. This device category includes mobile phones and smart phones.

Integrated Device- A device that embeds a Module. Notebook computers and Tablets are special categories of Integrated Devices and are additionally defined below.

Integration Component- A device that meets the definition of an Integrated Device but is intended to be completely self-contained and incorporated “into” or “part of” a “host device” without any electrical interaction with the host device.

Module- A finished WWAN radio device that does not directly connect to a host via a standardized external interface such as PCMCIA, RS-232, USB, PCIExpress when using an External Interface, etc.

Notebook- A portable personal computer combining the computer, keyboard and display in one form factor. Typically, the keyboard is built into the base and the display is hinged along the back edge of the base. A convertible Notebook is a form factor that enables configuration as a Notebook or as a Tablet.

Tablet- A portable personal computer combining the computer and display in a single form factor resembling a writing slate. User input is typically accomplished via a touchscreen or stylus pen.

USB Modem- A modem that plugs into the USB port of a computer. Its primary use case is while directly connected to the computer without the need for additional cabling.

Wrist-Worn Device- A device that is worn on the user’s wrist. This device class includes smartwatches.

2.1.1.2 Use Case Definitions

FS = Free Space

BH = Beside Head (Head Phantom Only)

BHL = Beside Head Left Side (Head Phantom Only)

BHR = Beside Head Right Side (Head Phantom Only)

HL = Hand Left (Hand Phantom Only)

HR = Hand Right (Hand Phantom Only)

BHHL = Beside Head and Hand Left Side (Head and Hand Phantom)

BHHR = Beside Head and Hand Right Side (Head and Hand Phantom)

WL = Wrist-Worn Left (Forearm Phantom)

WR = Wrist-Worn Right (Forearm Phantom)

ChW = Chest Worn (Chest Phantom)

AL = Ankle-Worn Left (Ankle Phantom)

2.1.1.3 Other Definitions

Target Operator- An operator is considered a “target operator” for a device if either of the following criteria is satisfied:

- The device is sold through the operator's supply chain (e.g. operator store, operator online website, etc.). ***Note:*** *The device may also be sold through other outlets in addition to the operator's supply chain; and/or*

- The device is expected to access an operator's network where that operator requires OTA testing before the device is allowed to access the operator's network. ***Note:*** *An operator may waive off some aspects of OTA testing or OTA testing in its entirety, in which case this clause does not apply.*

If neither of these criteria is satisfied, then the device is considered to have no “target operator”.

2.1.1.4 Definition of Test IDs

Most test requirements in Section 2.1 are summarized in tables. These test requirements are assigned unique Test IDs which are defined in Table 2.1.1.4-1.

Table 2.1.1.4-1 Definition of Test IDs

AA	B	C	D	E
all = all devices	1 = all cellular protocols	If B = 1, then index C is skipped	0 = N/A for location based technologies	Index for test ID
BH = beside head and hand	2 = 2G cellular protocols	if B = 2, then index for 2G cellular protocol. 1 = GSM 2 = GPRS 3 = EGPRS	1 = all location based technologies	
H = hand only	3 = 3G cellular protocols	if B = 3, then index for 3G cellular protocol. 1 = UMTS	2 = A-GPS L1	
FSH = free space for hand-held device	4 = 4G cellular protocols	if B = 4, then index for 4G cellular protocol. 1 = LTE (single carrier) 2 = LTE CA 3 = LTE LAA	3 = A-Galileo E1	
W = wrist-worn	5 = 5G cellular protocols	if B = 5, then index for 5G cellular protocol. 1 = NR FR1 SA (single carrier) 2 = NR FR1 EN-DC 3 = NR FR1 SA CA 4 = NR FR1 SA UL CA 5 = NR FR1 RedCap	4 = A-GPS L5	
C = chest-worn			5 = A-Galileo E5A	
A = ankle-worn				
NT = notebook and tablet				
intB = Integrated devices that are body worn				
intN = Integrated devices that are not body worn				

2.1.2 Devices Tested with a Phantom

Phantoms are defined in *CTIA 01.72* [15]. Device setup and positioning guidelines, including the use of phantoms, are defined in *CTIA 01.71* [14].

2.1.2.1 Hand-Held Devices

2.1.2.1.1 Hand Phantom Selection

If available (based on the DUT dimensions and form factor), an appropriate standard hand phantom shall be employed when testing the “Talk Mode” (head-and-hand, voice call) and “Data Mode” (hand-only, browsing).

Figure 2.1.2.1.1-1 illustrates a flowchart for selecting the appropriate hand phantom for a given DUT. If the device exceeds 72 mm but does not exceed 92 mm in width, then the “Wide Grip” shall be used for testing both “Talk Mode” and “Data Mode”. If the device width is between 56 mm and 72 mm (inclusive), then the “PDA Grip” shall be used for both modes. If the device is less than 56 mm in width, then “data” (hand-only) mode will be tested in the “Narrow Data Grip”, and the hand phantom used for testing “Talk Mode” (against the head) is determined by form factor: monoblock and closed slide/rotator DUTs use the “Monoblock Grip”, while fold and open slide/rotator DUTs use the “Fold Grip”.

Devices not fitting the aforementioned criteria (e.g., devices wider than 92 mm, those held in a landscape orientation or with two hands) are not required to be tested with a hand phantom under this test method at this time.

Network operators or other customers may request additional testing with non-standard hand phantoms. In such cases, standard fixturing and positioning is to be observed to the extent possible, and the additional data can be included and marked as supplemental in the test report.

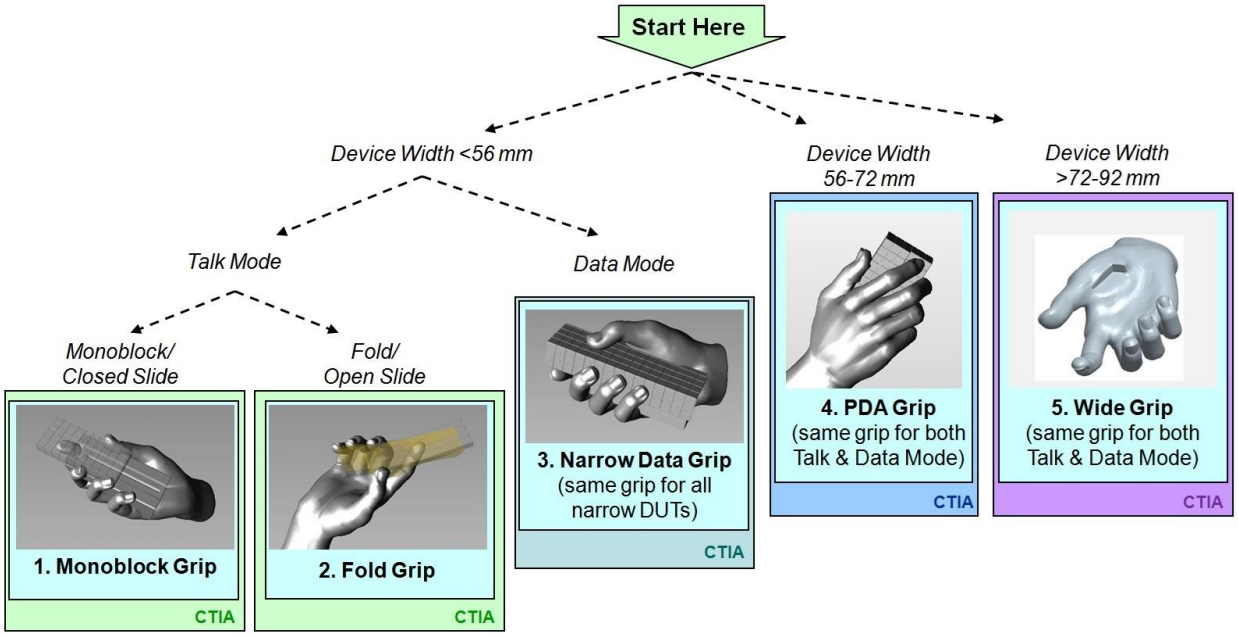

Figure 2.1.2.1.1-1 Choosing the Correct Hand Phantom

2.1.2.1.2 Beside Head and Hand Testing

In general, testing against the head (e.g., BHHR and BHHL) is required for devices supporting usage against the head, unless otherwise noted below.

Different measurement results may be obtained between positioning the DUT on the left or right ear of the head phantom. As a result, this test method requires the measurement of performance against both ears for the head and hand phantom tests. In the interest of managing the overall test time, head phantom only tests are no longer required.

Table 2.1.2.1.2-1 list the rules that determine which types of devices will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.2.1.2-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1.

Table 2.1.2.1.2-1 Test Requirements for Beside Head and Head Testing

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
BH1.0-1	all	N/A	The relative sensitivity test on intermediate channels and relative power test on intermediate channels will be performed on the right side head and hand phantom (BHHR) test configurations for 3GPP wireless technologies.
BH1.1-1	all	all	Testing against the head (BHHR and BHHL) is required for all cellular protocols that support voice (e.g., VoIP, VoLTE or VoNR) as manufactured against the head, unless otherwise noted. Testing against the head is not required for any cellular protocol that does not support voice against the head. Head phantom only tests are no longer required.
BH1.1-2	all	all	Intermediate Channel Degradation testing for Location Based Technologies (e.g., A-GNSS and MBS) shall be tested in the right side head and hand phantom (BHHR) configurations.
BH1.1-3	all	all	If a device has multiple mechanical modes in which to make a voice call, each mechanical mode representative of end use, where the receiver is placed on the ear, shall be tested (e.g., a portrait slide phone shall be tested in both slide open and slide closed positions, a side slide phone shall be tested only in the slide closed position, a fold phone shall be tested only in the open position). Device mechanical modes that are not representative of end use do not need to be tested in head and hand phantom conditions. The vendor shall submit to the ATL a declaration of the primary mechanical mode as referenced in this test plan. The ATL shall use the primary mechanical mode when applying the pass/fail limits. Testing in non-primary mechanical modes is only required on the middle channel (e.g. low and high-channel testing is not required). Note that for relative sensitivity on intermediate channel testing and relative power on intermediate channel testing of non-primary mechanical modes, the middle channel is used as the reference channel for all intermediate channel tests because TIS/TRP is not tested at the other reference channels.
BH1.1-4	all	all	Devices that exceed the maximum dimensions specified for the hand phantom test conditions defined in this test plan do not need to be tested in the head and hand phantom test conditions.
BH1.1-5	all	all	Perform OTA testing with the DUT antenna extended and retracted, as applicable.
BH2.1.0-1	GSM	N/A	For GSM, TRP and TIS testing across the entire band is required for BHHR. BHHL testing is not required.
BH2.1.0-2	GSM	N/A	GSM relative sensitivity tests on intermediate channels are not required for GSM devices that support voice operation against the head.
BH2.1.0-3	GSM	N/A	For GSM devices that support voice operation against the head that meet the following conditions, GSM OTA testing may be reduced. o The device supports LTE, and is fully tested (all applicable use cases) in the equivalent LTE band (including bands with wider frequency coverage, e.g. LTE 2 or 25 for GSM 1900) as GSM.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			o Each TX antenna for GSM is the same as a TX antenna that was fully tested for LTE. o Each RX antenna for GSM is the same as a RX antenna that was fully tested for LTE. Under these conditions, the GSM TRP/TIS testing may be reduced as follows: o Test GSM TRP/TIS in low, mid and high channels only in FS, except for non-primary mechanical modes where only the middle channel is tested in FS. GSM TRP/TIS is not required for BHHR and BHHL
BH2.1.2-1	GSM	A-GPS L1	Void. Replaced by all2.1.2-1.
BH2.2.0-1	GPRS	N/A	Head-adjacent TRP/TIS testing is only required for a GPRS band if the DUT supports usage against the head in this mode (e.g. VoIP) and GSM is not supported in the same band.
BH2.2.0-2	GPRS	N/A	GPRS OTA (TRP/TIS/relative sensitivity on intermediate channels) testing is not required for GSM devices that support voice operation against the head in the same band.
BH2.3.0-1	EGPRS	N/A	Head-adjacent TRP/TIS testing is only required for a EGPRS band if the DUT supports usage against the head in this mode (e.g. VoIP) and GSM is not supported in the same band.
BH2.3.0-2	EGPRS	N/A	EGPRS OTA (TRP/TIS/relative sensitivity on intermediate channels) testing is not required for GSM devices that support voice operation against the head in the same band.
BH3.1.0-1	UMTS	N/A	For UMTS, TRP and TIS testing across the entire band is required for BHHR. BHHL testing is not required.
BH3.1.0-2	UMTS	N/A	UMTS OTA testing may be reduced for devices which meet the following criteria: o The device supports LTE and is fully tested (all applicable use cases) in the equivalent LTE band as UMTS. o Each TX antenna for UMTS is the same as a TX antenna that was fully tested for LTE. o Each RX antenna for UMTS is the same as a RX antenna that was fully tested for LTE. Under these conditions, UMTS OTA testing may be reduced as follows: o Relative sensitivity testing on intermediate channels for UMTS is not required (BHHR).
BH3.1.2-1	UMTS	A-GPS L1	Void. Replaced by all3.1.2-1.
BH4.1.0-1	LTE (single carrier)	N/A	For LTE, TRP and TIS testing across the entire band is required for BHHR. For LTE, only mid-channel testing is required for BHHL for TRP and TIS (i.e., no low/high channel testing is required for BHHL unless requested by the manufacturer).
BH4.1.0-2	LTE (single carrier)	N/A	LTE OTA testing may be reduced for devices which meet the following criteria: o The device supports NR FR1 SA and is fully tested for NR FR1 SA OTA (all applicable use cases) in the NR band equivalent to the LTE band. o Each TX antenna for LTE is the same as a TX antenna that was fully tested for NR FR1 SA.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			o Each RX antenna for LTE is the same as a RX antenna that was fully tested for NR FR1 SA. Under these conditions, LTE OTA testing may be reduced as follows: o Test LTE TRP/TIS (low, mid, high channel) for the BHHR use case. LTE TRP/TIS is not required for BHHL use case. o Relative sensitivity testing on intermediate channels for LTE is not required (BHHR). o For the purposes of determining what other test reductions are allowed, each TX antenna and RX antenna for LTE that meets this test reduction is considered to be fully tested for LTE for BHHR and BHHL.
BH4.1.2-1	LTE (single carrier)	A-GPS L1	Void. Replaced by all4.1.2-1.
BH4.1.2-2	LTE (single carrier)	A-GPS L1	For A-GPS L1 with LTE testing on devices which do not support dynamically tuned GPS antennas, choose any reference band (except Band 13 / Band 14) as per *CTIA 01.51* [11] section 2.5.4.1 and measure all the orientations (i.e. BHHR and BHHL). The worst-case orientation between BHHR and BHHL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands. Band 13 and Band 14 requires testing on both BHHR and BHHL for all transmitters as applicable.
BH4.1.3-1	LTE (single carrier)	A-Galileo E1	Void. Replaced by all4.1.3-1.
BH4.1.3-2	LTE (single carrier)	A-Galileo E1	For A-Galileo E1 with LTE testing on devices which do not support dynamically tuned GPS antennas, choose any reference band (except Band 13 / Band 14) as per *CTIA 01.51* [11] section 2.5.4.1 and measure all the orientations (i.e. BHHR and BHHL). The worst-case orientation between BHHR and BHHL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands. Band 13 and Band 14 requires testing on both BHHR and BHHL for all transmitters as applicable.
BH4.1.4-1	LTE (single carrier)	A-GPS L5	Void. Replaced by all4.1.4-1.
BH4.1.4-2	LTE (single carrier)	A-GPS L5	For A-GPS L5 with LTE testing on devices which do not support dynamically tuned GPS antennas, choose any reference band as per *CTIA 01.51* [11] section 2.5.4.1 and measure all the orientations (i.e. BHHR and BHHL). The worst-case orientation between BHHR and BHHL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands.
BH4.1.5-1	LTE (single carrier)	A-Galileo E5A	For A-Galileo E5A with LTE testing on devices which do not support dynamically tuned GPS antennas, choose any reference band (except Band 13 / Band 14) as per CTIA 01.51 [11] section 2.5.4.1 and measure all the orientations (i.e. BHHR and BHHL). The worst-case orientation between BHHR and BHHL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands. Band 13 and Band 14 requires testing on both BHHR and BHHL for all transmitters as applicable.
BH4.2.0-1	LTE CA	N/A	Head-adjacent testing is not required in LTE carrier aggregation mode (LTE CA).
BH4.3.0-1	LTE LAA	N/A	Head-adjacent testing is not required in LTE carrier aggregation mode (LTE LAA).

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
BH5.1.0-1	NR FR1 SA (single carrier)	N/A	Head-adjacent TRP/TIS testing is only required for NR FR1 SA if the DUT supports usage against the head in this mode (e.g. VoIP).
BH5.1.0-2	NR FR1 SA (single carrier)	N/A	For NR FR1 SA, TRP and TIS testing across the entire band is required for BHHR. For NR FR1 SA, only mid-channel testing is required for BHHL for TRP and TIS (i.e., no low/high channel testing is required for BHHL unless requested by the manufacturer).
BH5.1.2-1	NR FR1 SA (single carrier)	A-GPS L1	Void. Replaced by all5.1.2-1.
BH5.1.2-2	NR FR1 SA (single carrier)	A-GPS L1	For A-GPS L1 with NR FR1 SA testing on devices which do not support dynamically tuned GPS L1 antennas, choose any reference band (except Band n14) as per *CTIA 01.51* [11] section 2.5.7.1 and measure all the orientations (i.e. BHHR and BHHL). The worst-case orientation between BHHR and BHHL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands. Band n14 requires testing on both BHHR and BHHL for all transmitters as applicable.
BH5.1.3-1	NR FR1 SA (single carrier)	A-Galileo E1	Void. Replaced by all5.1.3-1.
BH5.1.3-2	NR FR1 SA (single carrier)	A-Galileo E1	For A-Galileo E1 with NR FR1 SA testing on devices which do not support dynamically tuned Galileo E1 antennas, choose any reference band (except Band n14) as per *CTIA 01.51* [11] section 2.5.7.1 and measure all the orientations (i.e. BHHR and BHHL). The worst-case orientation between BHHR and BHHL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands. Band n14 requires testing on both BHHR and BHHL for all transmitters as applicable.
BH5.1.4-1	NR FR1 SA (single carrier)	A-GPS L5	Void. Replaced by all5.1.4-1.
BH5.1.4-2	NR FR1 SA (single carrier)	A-GPS L5	For A-GPS L5 with NR FR1 SA testing on devices which do not support dynamically tuned GPS L5 antennas, choose any reference band as per *CTIA 01.51* [11] section 2.5.7.1 and measure all the orientations (i.e. BHHR and BHHL). The worst-case orientation between BHHR and BHHL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands.
BH5.2.0-1	NR FR1 EN-DC	N/A	Relative sensitivity tests on intermediate channels are not required for NR FR1 EN-DC.
BH5.2.1-1	NR FR1 EN-DC	all	Head-adjacent testing is not required in NR FR1 EN-DC.
BH5.3.1-1	NR FR1 SA CA	all	Head-adjacent testing is not required in NR FR1 SA CA.
BH5.4.1-1	NR FR1 SA UL CA	all	Head-adjacent testing is not required in NR FR1 SA UL CA.

Table 2.1.2.1.2-3 lists which test IDs apply to the various test cases associated with beside head and hand testing.

Table 2.1.2.1.2-3 Test IDs Applying to Various Test Cases for Beside Head and Hand Testing

3GPP Protocol	Location Based Protocol	BHHL TRP	BHHL TIS	BHHR TRP	BHHR TIS	BHHR REL. Sense.	BHHR REL. Power	Inter. Channel Degrad. BHHR
all	N/A					BH1.0-1	BH1.0-1	
all	all	BH1.1-1, BH1.1-3, BH1.1-4, BH1.1-5	BH1.1-1, BH1.1-3, BH1.1-4, BH1.1-5	BH1.1-1, BH1.1-3, BH1.1-4, BH1.1-5	BH1.1-1, BH1.1-3, BH1.1-4, BH1.1-5	BH1.1-4, BH1.1-5	BH1.1-4, BH1.1-5	BH1.1-2, BH1.1-4, BH1.1-5
GSM	N/A	BH2.1.0-1, BH2.1.0-3	BH2.1.0-1, BH2.1.0-3	BH2.1.0-1, BH2.1.0-3	BH2.1.0-1, BH2.1.0-3			
GSM	A-GPS L1							
GPRS	N/A	BH2.2.0-1, BH2.2.0-2	BH2.2.0-1, BH2.2.0-2	BH2.2.0-1, BH2.2.0-2	BH2.2.0-1, BH2.2.0-2	BH2.2.0-2	BH2.2.0-2	
EGPRS	N/A	BH2.3.0-1, BH2.3.0-2	BH2.3.0-1, BH2.3.0-2	BH2.3.0-1, BH2.3.0-2	BH2.3.0-1, BH2.3.0-2	BH2.3.0-2	BH2.3.0-2	
UMTS	N/A	BH3.1.0-1, BH3.1.0-2	BH3.1.0-1, BH3.1.0-2	BH3.1.0-1, BH3.1.0-2	BH3.1.0-1, BH3.1.0-2	BH3.1.0-2		
UMTS	A-GPS L1							
LTE (single carrier)	N/A	BH4.1.0-1, BH4.1.0-2	BH4.1.0-1, BH4.1.0-2	BH4.1.0-1, BH4.1.0-2	BH4.1.0-1, BH4.1.0-2	BH4.1.0-2		
LTE (single carrier)	A-GPS L1		BH4.1.2-2		BH4.1.2-2			
LTE (single carrier)	A-Galileo E1		BH4.1.3-2		BH4.1.3-2			
LTE (single carrier)	A-GPS L5		BH4.1.4-2		BH4.1.4-2			
LTE (single carrier)	A-Galileo E5A		BH4.1.5-1		BH4.1.5-1			
LTE CA	N/A	BH4.2.0-1	BH4.2.0-1	BH4.2.0-1	BH4.2.0-1	BH4.2.0-1	BH4.2.0-1	BH4.2.0-1
LTE LAA	N/A	BH4.3.0-1	BH4.3.0-1	BH4.3.0-1	BH4.3.0-1	BH4.3.0-1	BH4.3.0-1	BH4.3.0-1
NR FR1 SA (single carrier)	N/A	BH5.1.0-1, BH5.1.0-2	BH5.1.0-1, BH5.1.0-2	BH5.1.0-1, BH5.1.0-2	BH5.1.0-1, BH5.1.0-2			
NR FR1 SA (single carrier)	A-GPS L1		BH5.1.2-2		BH5.1.2-2			

3GPP Protocol	Location Based Protocol	BHHL TRP	BHHL TIS	BHHR TRP	BHHR TIS	BHHR REL. Sense.	BHHR REL. Power	Inter. Channel Degrad. BHHR
NR FR1 SA (single carrier)	A-Galileo E1		BH5.1.3-2		BH5.1.3-2			
NR FR1 SA (single carrier)	A-GPS L5		BH5.1.4-2		BH5.1.4-2			
NR FR1 SA (single carrier)	A-Galileo E5A							
NR FR1 EN-DC	N/A					BH5.2.0-1		
NR FR1 EN-DC	all	BH5.2.1-1	BH5.2.1-1	BH5.2.1-1	BH5.2.1-1	BH5.2.1-1	BH5.2.1-1	BH5.2.1-1
NR FR1 EN-DC	A-GPS L1							
NR FR1 EN-DC	A-Galileo E1							
NR FR1 EN-DC	A-GPS L5							
NR FR1 EN-DC	A- Galileo E5A							
NR FR1 SA CA	N/A							
NR FR1 SA CA	all	BH5.3.1-1	BH5.3.1-1	BH5.3.1-1	BH5.3.1-1	BH5.3.1-1	BH5.3.1-1	BH5.3.1-1
NR FR1 SA UL CA	N/A							
NR FR1 SA UL CA	all	BH5.4.1-1	BH5.4.1-1	BH5.4.1-1	BH5.4.1-1	BH5.4.1-1	BH5.4.1-1	BH5.4.1-1

2.1.2.1.3 Hand Only Testing

Table 2.1.2.1.3-1 list the rules that determine which types of devices will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.2.1.3-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1.

Table 2.1.2.1.3-1 Test Requirements for Hand Only Testing

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
H1.0-1	all	N/A	Relative sensitivity tests and relative power tests on intermediate channels in the hand phantom are not required.
H1.1-1	all	all	Testing in the hand (e.g. HR and HL) is required, unless other noted.
H1.1-2	all	all	In the hand phantom test conditions, all cellular radio modes capable of voice and data operation shall be tested for all the mechanical modes representative of end use.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
H1.1-3	all	all	If a device has multiple mechanical modes in which it can be held in the hand for data usage scenarios where the display is visible to the end user, each mechanical mode representative of end use shall be tested. Device mechanical modes that are not representative of end use in the hand for data usage scenarios, do not need to be tested in the hand phantom test conditions. The vendor shall submit to the ATL a declaration of the primary mechanical mode as referenced in this test plan. The ATL shall use the primary mechanical mode when applying the pass/fail limits. Testing in non-primary mechanical modes is only required on the middle channel (e.g. low- and high-channel testing is not required). Note that for relative sensitivity on intermediate channel testing and relative power on intermediate channel testing of non-primary mechanical modes, the middle channel is used as the reference channel for all intermediate channel tests because TIS/TRP is not tested at the other reference channels.
H1.1-4	all	all	Devices that exceed the maximum dimensions specified for the hand phantom test conditions defined in this test plan do not need to be tested in the hand phantom test conditions.
H1.1-5	all	all	Intermediate Channel Degradation testing for A-GNSS shall be tested in HR.
H1.1-6	all	all	Perform OTA testing with the DUT antenna extended and retracted, as applicable.
H2.1.0-1	GSM	N/A	GSM TRP/TIS testing for HR/HL is not required for GSM devices that support voice operation against the head.
H2.1.2-1	GSM	A-GPS L1	Void. Replaced by all2.1.2-1.
H2.2.0-1	GPRS	N/A	GPRS TRP/TIS testing for HR/HL is not required for GSM devices that support voice operation against the head.
H2.3.0-1	EGPRS	N/A	EGPRS TRP/TIS testing for HR/HL is not required for GSM devices that support voice operation against the head.
H3.1.0-1	UMTS	N/A	For devices that support voice operation against the head, UMTS TRP and TIS testing across the entire band is required for HL. For UMTS, HR testing is not required.
H3.1.0-3	UMTS	N/A	UMTS OTA testing may be reduced for devices which meet the following criteria: o The device supports LTE and is fully tested (all applicable use cases) in the equivalent LTE band as UMTS. o Each TX antenna for UMTS is the same as a TX antenna that was fully tested for LTE. o Each RX antenna for UMTS is the same as a RX antenna that was fully tested for LTE. Under these conditions, the UMTS OTA testing may be reduced as follows: o UMTS OTA (TRP/TIS) testing in HR and HL is not required.
H3.1.2-1	UMTS	A-GPS L1	Void. Replaced by all3.1.2-1.
H4.1.0-1	LTE (single carrier)	N/A	For devices that support both LTE operation against the head (e.g., VoIP) and LTE carrier aggregation, hand-only testing is required in LTE single carrier mode for these devices.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
H4.1.0-2	LTE (single carrier)	N/A	LTE OTA testing may be reduced for devices which meet the following criteria: o The device supports NR FR1 SA and is fully tested (all applicable use cases) in the NR band equivalent to the LTE band. o Each TX antenna for LTE is the same as a TX antenna that was fully tested for NR FR1 SA. o Each RX antenna for LTE is the same as a RX antenna that was fully tested for NR FR1 SA. Under these conditions, the LTE OTA testing may be reduced as follows: o LTE TRP/TIS testing in HR and HL is not required. o For the purposes of determining what other test reductions are allowed, each TX antenna and RX antenna for LTE that meets this test reduction is considered to be fully tested for LTE for HR and HL.
H4.1.2-1	LTE (single carrier)	A-GPS L1	Void. Replaced by all4.1.2-1.
H4.1.2-2	LTE (single carrier)	A-GPS L1	A-GPS L1 with LTE OTA testing may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-GPS L1 with NR FR1 EN-DC and is tested for A-GPS L1 with NR FR1 EN-DC TIS (HR, HL) with the NR band equivalent to the LTE band. o The device supports A-GPS L1 with LTE and is tested for A-GPS L1 with LTE intermediate channel degradation (HR) with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-GPS L1 with LTE is the same RX antenna that was fully tested for A-GPS L1 with NR FR1 EN-DC. Under these conditions, A-GPS L1 with LTE OTA testing may be reduced as follows: o A-GPS L1 with LTE TIS testing is not required (HR, HL). o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L1 with LTE that meets this test reduction is considered to be fully tested for A-GPS L1 with LTE for HR and HL.
H4.1.2-3	LTE (single carrier)	A-GPS L1	For A-GPS L1 with LTE testing on devices which do not support dynamically tuned GPS L1 antennas, choose any reference band (except Band 13 / Band 14) as per *CTIA 01.51* [11] Section 2.5.4.1 and measure all the orientations i.e. HR and HL. The worst-case orientation between HR and HL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands. Band 13 and Band 14 requires testing on both HR and HL for all transmitters as applicable.
H4.1.3-1	LTE (single carrier)	A-Galileo E1	Void. Replaced by all4.1.3-1.
H4.1.3-2	LTE (single carrier)	A-Galileo E1	A-Galileo E1 with LTE OTA testing may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-Galileo E1 with NR FR1 EN-DC and is tested for A-Galileo E1 with NR FR1 EN-DC TIS (HR, HL) with the NR band equivalent to the LTE band. o The device supports A-Galileo E1 with LTE and is tested for A-Galileo E1 with LTE intermediate channel degradation (HR) with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-Galileo E1 with LTE is the same RX antenna that was fully tested for A-Galileo E1 with NR FR1 EN-DC. Under these conditions, A-Galileo E1 with LTE OTA testing may be reduced as follows:

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			o A-Galileo E1 with LTE TIS testing is not required (HR, HL). o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E1 with LTE that meets this test reduction is considered to be fully tested for A-Galileo E1 with LTE for HR and HL.
H4.1.3-3	LTE (single carrier)	A-Galileo E1	For A-Galileo E1 with LTE testing on devices which do not support dynamically tuned Galileo E1 antennas, choose any reference band (except Band 13 / Band 14) as per *CTIA 01.51* [11] Section 2.5.4.1 and measure all the orientations i.e. HR and HL. The worst-case orientation between HR and HL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands. Band 13 and Band 14 requires testing on both HR and HL for all transmitters as applicable.
H4.1.4-1	LTE (single carrier)	A-GPS L5	Void. Replaced by all4.1.4-1.
H4.1.4-2	LTE (single carrier)	A-GPS L5	A-GPS L5 with LTE OTA testing may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-GPS L5 with NR FR1 EN-DC and is tested for A-GPS L5 with NR FR1 EN-DC 3D C/N_0 (HR, HL) with the NR band equivalent to the LTE band. o The device supports A-GPS L5 with LTE and is tested for A-GPS L5 with LTE intermediate channel degradation (HR) with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-GPS L5 with LTE is the same RX antenna that was fully tested for A-GPS L5 with NR FR1 EN-DC. Under these conditions, A-GPS L5 with LTE OTA testing may be reduced as follows: o A-GPS L5 with LTE 3D C/N0 testing is not required (HR, HL). o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L5 with LTE that meets this test reduction is considered to be fully tested for A-GPS L5 with LTE for HR and HL.
H4.1.4-3	LTE (single carrier)	A-GPS L5	For A-GPS L5 with LTE testing on devices which do not support dynamically tuned GPS antennas, choose any reference band as per *CTIA 01.51* [11] Section 2.5.4.1 and measure all the orientations i.e. HR and HL. The worst-case orientation between HR and HL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands.
H4.2.0-1	LTE CA	N/A	For devices that support both LTE operation against the head (e.g., VoIP) and LTE carrier aggregation, hand-only testing is required in LTE carrier aggregation mode for these devices. Per Table 2.1.2.1.3-2, full TRP and TIS testing across the entire band is required for HL; and only mid-channel testing is required for HR for TRP and TIS (i.e., no low/high channel testing is required for HR unless requested by the manufacturer).
H5.1.0-1	NR FR1 SA (single carrier)	N/A	For devices that support voice operation against the head (e.g., VoNR), NR FR1 SA TRP and TIS testing across the entire band is required for HL. For NR FR1 SA, only mid-channel testing is required for HR for TRP and TIS (i.e., no low/high channel testing is required for HR unless requested by the manufacturer).
H5.1.2-1	NR FR1 SA (single carrier)	A-GPS L1	Void. Replaced by all5.1.2-1.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
H5.1.2-2	NR FR1 SA (single carrier)	A-GPS L1	For A-GPS L1 with NR FR1 SA testing on devices which do not support dynamically tuned GPS L1 antennas, choose any reference band (except Band n14) as per CTIA 01.51 [11] section 2.5.7.1 and measure all the orientations (i.e. HR and HL). The worst-case orientation between HR and HL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands. Band n14 requires testing on both HR and HL for all transmitters as applicable.
H5.1.3-1	NR FR1 SA (single carrier)	A-Galileo E1	Void. Replaced by all5.1.3-1.
H5.1.3-2	NR FR1 SA (single carrier)	A-Galileo E1	For A-Galileo E1 with NR FR1 SA testing on devices which do not support dynamically tuned Galileo E1 antennas, choose any reference band (except Band n14) as per CTIA 01.51 [11] section 2.5.7.1 and measure all the orientations (i.e. HR and HL). The worst-case orientation between HR and HL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands. Band n14 requires testing on both HR and HL for all transmitters as applicable.
H5.1.4-1	NR FR1 SA (single carrier)	A-GPS L5	Void. Replaced by all5.1.4-1.
H5.1.4-2	NR FR1 SA (single carrier)	A-GPS L5	For A-GPS L5 with NR FR1 SA testing on devices which do not support dynamically tuned GPS L5 antennas, choose any reference band as per CTIA 01.51 [11] section 2.5.7.1 and measure all the orientations (i.e. HR and HL). The worst-case orientation between HR and HL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands.
H5.1.5-1	NR FR1 SA (single carrier)	A-Galileo E5A	For A-Galileo E5A with NR FR1 SA testing on devices which do not support dynamically tuned GPS L5 antennas, choose any reference band as per CTIA 01.51 [11] section 2.5.7.1 and measure all the orientations (i.e. HR and HL). The worst-case orientation between HR and HL shall be tested based on the measured data and the selected orientation shall be used to perform testing on the rest of the supported bands.
H5.2.0-2	NR FR1 EN-DC	N/A	For devices that support both LTE operation against the head (e.g., VoLTE) and NR FR1 EN-DC mode, hand-only testing is required in NR FR1 EN-DC mode. Per Table 2.1.2.1.3-4 below, full TRP and TIS testing across the entire band is required for HL; and only mid-channel testing is required for HR for TRP and TIS (i.e., no low/high channel testing is required for HR unless requested by the manufacturer).
H5.2.2-1	NR FR1 EN-DC	A-GPS L1	A-GPS L1 with NR FR1 EN-DC TIS testing is limited to HR and HL.
H5.2.2-2	NR FR1 EN-DC	A-GPS L1	Void. Replaced by all5.2.2-1.
H5.2.2-3	NR FR1 EN-DC	A-GPS L1	Void. Replaced by all5.2.2-2.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
H5.2.2-4	NR FR1 EN-DC	A-GPS L1	Void. Replaced by all5.2.2-3.
H5.2.3-1	NR FR1 EN-DC	A-Galileo E1	A-GALILEO E1 with NR FR1 EN-DC TIS testing is limited to HR and HL.
H5.2.3-2	NR FR1 EN-DC	A-Galileo E1	Void. Replaced by all5.2.3-1.
H5.2.3-3	NR FR1 EN-DC	A-Galileo E1	Void. Replaced by all5.2.3-2.
H5.2.3-4	NR FR1 EN-DC	A-Galileo E1	Void. Replaced by all5.2.3-3.
H5.2.3-5	NR FR1 EN-DC	A-Galileo E1	Void. Replaced by all5.2.3-4.
H5.2.4-1	NR FR1 EN-DC	A-GPS L5	A-GPS L5 with NR FR1 EN-DC 3D C/N0 testing is limited to HR and HL.
H5.2.4-2	NR FR1 EN-DC	A-GPS L5	Void. Replaced by all5.2.4-1.
H5.2.4-3	NR FR1 EN-DC	A-GPS L5	Void. Replaced by all5.2.4-2.
H5.2.4-4	NR FR1 EN-DC	A-GPS L5	Void. Replaced by all5.2.4-3.
H5.2.4-5	NR FR1 EN-DC	A-GPS L5	Void. Replaced by all5.2.4-4.
H5.2.5-1	NR FR1 EN-DC	A-Galileo E5A	A-Galileo E5A with NR FR1 EN-DC TIS testing is limited to HR and HL.
H5.3.0-1	NR FR1 SA CA	N/A	For devices that support both NR FR1 SA operation against the head (e.g., VoNR) and NR FR1 SA carrier aggregation, hand-only testing is required in NR FR1 SA DL carrier aggregation mode for these devices. Per Table 2.1.2.1.3-3 below, for NR FR1 SA DL CA, full TRP and TIS testing across the entire band is required for HL; and only mid-channel testing is required for HR

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			for TRP and TIS (i.e., no low/high channel testing is required for HR unless requested by the manufacturer).
H5.4.0-1	NR FR1 SA UL CA	N/A	Hand-only testing for NR FR1 SA UL CA is not required.

Table 2.1.2.1.3-2 LTE CA Test Reduction Table

PCC Test Channel[1]	HL		HR	
	TRP	TIS	TRP	TIS
Low Channel	PCC	PCC/SCC(s)[1,2]	Optional[3]	Optional[3]
Mid Channel	PCC	PCC/SCC(s)[1,2]	PCC[4]	PCC/SCC(s)[1,2,5]
High Channel	PCC	PCC/SCC(s)[1,2]	Optional[3]	Optional[3]

Note 1: PCC and SCC test channels are per Table 4.2.1-1, Table 4.2.2-1, Table 4.3.1-1, and Table 4.3.2-1 in *CTIA 01.50* [10]

Note 2: Testing is required on the PCC and all SCC's unless indicated otherwise in Section 2.1.7.3

Note 3: Not required unless requested by the manufacturer.

Note 4: For bands which only support one channel (e.g., bands 13, 30, the mid-channel TRP test point for HR shall be the TRP test point with the mid-channel uplink RB allocation.

Note 5: For bands which only support one channel (e.g., bands 13, 30), the mid-channel TIS test point for HR shall be the TIS test point where the SCC/SCC1 is mid-band.

Table 2.1.2.1.3-3 NR FR1 SA DL CA Test Reduction Table

PCC Test Channel[1]	HL		HR	
	TRP	TIS	TRP	TIS
Low Channel	PCC	PCC/SCC(s)[1,2]	Optional[3]	Optional[3]
Mid Channel	PCC	PCC/SCC(s)[1,2]	PCC	PCC/SCC(s)[1,2]
High Channel	PCC	PCC/SCC(s)[1,2]	Optional[3]	Optional[3]

Note 1: PCC and SCC test channels are per Table 5.1.3.1-1, Table 5.1.3.2-1, Table 5.1.4.1-1, and Table 5.1.4.2-1 in *CTIA 01.50* [10]

Note 2: Testing is required on the PCC and all SCC's unless indicated otherwise in *CTIA 01.70* [13]

Note 3: Not required unless requested by the manufacturer.

Table 2.1.2.1.3-4 NR FR1 EN-DC Test Reduction Table

Test Channel[1]	HL		HR	
	TRP	TIS	TRP	TIS
Low Channel	LTE PCell NR PSCell	LTE PCell/SCell(s)[1,2] NR PSCell/SCell(s)[1,2]	Optional[3]	Optional[3]
Mid Channel	LTE PCell NR PSCell	LTE PCell/SCell(s)[1,2] NR PSCell/SCell(s)[1,2]	LTE PCell NR PSCell	LTE PCell/SCell(s)[1,2] NR PSCell/SCell(s)[1,2]
High Channel	LTE PCell NR PSCell	LTE PCell/SCell(s)[1,2] NR PSCell/SCell(s)[1,2]	Optional[3]	Optional[3]

Note 1: PCell, PSCell, and SCell test channels are per Table 5.1.2.1-1 and Table 5.1.2.2.1-1 in *CTIA 01.50* [10]

Note 2: Testing is required on the LTE PCell and all LTE SCell's unless indicated otherwise in *CTIA 01.70* [13]. Testing is required on the NR PSCell and all NR SCell's unless indicated otherwise in *CTIA 01.70* [13].

Note 3: Not required unless requested by the manufacturer.

Table 2.1.2.1.3-5 lists which test IDs apply to the various test cases associated with devices supporting data usage in the hand.

Table 2.1.2.1.3-5 Test IDs Applying to Various Test Cases for Hand Only Testing

3GPP Protocol	Location Based Protocol	HL TRP	HL TIS or HL 3D C/N_0	HR TRP	HR TIS or HR 3D C/N_0	HL/HR Rel. Sense.	HL/HR Rel. Power	Inter. Channel Degrad. HR
all	N/A					H1.0-1	H1.0-1	
all	all	H1.1-1, H1.1-2, H1.1-3, H1.1-4, H1.1-6	H1.1-1, H1.1-2, H1.1-3, H1.1-4, H1.1-6	H1.1-1, H1.1-2, H1.1-3, H1.1-4, H1.1-6	H1.1-1, H1.1-2, H1.1-3, H1.1-4, H1.1-6			H1.1-1, H1.1-2, H1.1-3, H1.1-4, H1.1-5, H1.1-6
GSM	N/A	H2.1.0-1	H2.1.0-1	H2.1.0-1	H2.1.0-1			
GSM	A-GPS L1							
GPRS	N/A	H2.2.0-1	H2.2.0-1	H2.2.0-1	H2.2.0-1			
EGPRS	N/A	H2.3.0-1	H2.3.0-1	H2.3.0-1	H2.3.0-1			
UMTS	N/A	H3.1.0-1, H3.1.0-2	H3.1.0-1, H3.1.0-2	H3.1.0-1, H3.1.0-2	H3.1.0-1, H3.1.0-2			
UMTS	A-GPS L1							
LTE (single carrier)	N/A	H4.1.0-1, H4.1.0-2	H4.1.0-1, H4.1.0-2	H4.1.0-1, H4.1.0-2	H4.1.0-1, H4.1.0-2			
LTE (single carrier)	A-GPS L1		H4.1.2-2, H4.1.2-3		H4.1.2-2, H4.1.2-3			
LTE (single carrier)	A-Galileo E1		H4.1.3-2, H4.1.3-3		H4.1.3-2, H4.1.3-3			
LTE (single carrier)	A-GPS L5		H5.1.4-2, H5.1.4-3		H5.1.4-2, H5.1.4-3			
LTE (single carrier)	A-Galileo E5A							
LTE CA	N/A	H4.2.0-1	H4.2.0-1	H4.2.0-1	H4.2.0-1			
LTE LAA	N/A							

LTE Category M1	N/A							
LTE Category NB1	N/A							
NR FR1 SA (single carrier)	N/A	H5.1.0-1	H5.1.0-1	H5.1.0-1	H5.1.0-1			
NR FR1 SA (single carrier)	A-GPS L1		H5.1.2-2		H5.1.2-2			
NR FR1 SA (single carrier)	A-Galileo E1		H5.1.3-2		H5.1.3-2			
NR FR1 SA (single carrier)	A-GPS L5		H5.1.4-2		H5.1.4-2			
NR FR1 SA (single carrier)	A-Galileo E5A		H5.1.5-1		H5.1.5-1			
NR FR1 EN-DC	N/A	H5.2.0-1	H5.2.0-1	H5.2.0-1	H5.2.0-1			
NR FR1 EN-DC	A-GPS L1		H5.2.2-1		H5.2.2-1			
NR FR1 EN-DC	A-Galileo E1		H5.2.3-1		H5.2.3-1			
NR FR1 EN-DC	A-GPS L5		H5.2.4-1		H5.2.4-1			
NR FR1 EN-DC	A-Galileo E5A		H5.2.5-1		H5.2.5-1			
NR FR1 SA CA	N/A	H5.3.0-1	H5.3.0-1	H5.3.0-1	H5.3.0-1			
NR FR1 SA UL CA	N/A	H5.4.0-1	H5.4.0-1	H5.4.0-1	H5.4.0-1	H5.4.0-1	H5.4.0-1	H5.4.0-1

2.1.2.1.4 Free Space Testing for Hand-Held Devices

In general, testing in free space is required for hand-held devices, unless otherwise noted below.

Table 2.1.2.1.4-1 list the rules that determine which types of devices will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.2.1.4-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1.

Table 2.1.2.1.4-1 Test IDs Applying to Various Test Cases for Free Space Testing for Hand-Held Devices

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
FSH1.0-1	all	N/A	Testing in free space is required for all cellular protocols that support 1) voice (e.g., VoIP or VoLTE) as manufactured against the head and 2) data operation, unless otherwise noted.
FSH1.0-2	all	N/A	The relative sensitivity test on intermediate channels and relative power test on intermediate channels will be performed in the free space (FS) test configuration for 3GPP wireless technologies.
FSH1.0-3	all	N/A	If a device has multiple mechanical modes in which to use data, each mechanical mode representative of end use, shall be tested in free space (e.g., a portrait slide phone shall be tested in both slide open and slide closed positions, a fold phone shall be tested only in the open position). Device mechanical modes that are not representative of end use do not need to be tested in free-space test conditions. The vendor shall submit to the ATL a declaration of the primary mechanical mode as referenced in this test plan. The ATL shall use the primary mechanical mode when applying the pass/fail limits. Testing in non-primary mechanical modes is only required on the middle channel (e.g. low and high-channel testing is not required). Note that for relative sensitivity on intermediate channel testing and relative power on intermediate channel testing of non-primary mechanical modes, the middle channel is used as the reference channel for all intermediate channel tests because TIS/TRP is not tested at the other reference channels.
FSH1.1-1	all	all	Location based wireless protocol OTA testing is not required in the free-space test conditions for devices tested against the head.
FSH1.1-2	all	all	Perform OTA testing with the DUT antenna extended and retracted, as applicable.
FSH2.1.0-1	GSM	N/A	For GSM, TRP and TIS testing across the entire band is required for FS.
FSH2.1.0-2	GSM	N/A	For GSM devices that support voice operation against the head that meet the following conditions, GSM OTA testing may be reduced. o The device supports LTE, and is fully tested (all applicable use cases) in the equivalent LTE band (including bands with wider frequency coverage, e.g. LTE 2 or 25 for GSM 1900) as GSM. o Each TX antenna for GSM is the same as a TX antenna that was fully tested for LTE. o Each RX antenna for GSM is the same as a RX antenna that was fully tested for LTE. Under these conditions, the GSM TRP/TIS testing may be reduced as follows: o Test GSM TRP/TIS in low, mid and high channels in FS, except for non-primary mechanical modes where only the middle channel is tested in FS.
FSH2.1.0-3	GSM	N/A	Relative sensitivity tests on intermediate channels in free space are not required for GSM for devices that support voice operation against the head.
FSH2.2.0-1	GPRS	N/A	GPRS OTA (TRP/TIS/relative sensitivity on intermediate channels) testing is not required for GSM devices that support voice operation against the head in the same band.
FSH2.3.0-1	EGPRS	N/A	EGPRS OTA (TRP/TIS/relative sensitivity on intermediate channels) testing is not required for GSM devices that support voice operation against the head in the same band.
FSH3.1.0-1	UMTS	N/A	For UMTS, TRP and TIS testing across the entire band is required for FS.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
FSH3.1.0-2	UMTS	N/A	UMTS OTA testing may be reduced for devices which meet the following criteria: o The device supports LTE and is fully tested (all applicable use cases) in the equivalent LTE band as UMTS. o Each TX antenna for UMTS is the same as a TX antenna that was fully tested for LTE. o Each RX antenna for UMTS is the same as a RX antenna that was fully tested for LTE. Under these conditions, UMTS OTA testing may be reduced as follows: o UMTS TRP/TIS is not required for FS use case. o Relative sensitivity testing on intermediate channels for UMTS is not required (FS).
FSH4.1.0-1	LTE (single carrier)	N/A	For LTE, TRP and TIS testing across the entire band is required for FS.
FSH4.1.0-2	LTE (single carrier)	N/A	LTE OTA testing may be reduced for devices which meet the following criteria: o The device supports NR FR1 SA and is fully tested for NR FR1 SA OTA (all applicable use cases) in the NR band equivalent to the LTE band. o Each TX antenna for LTE is the same as a TX antenna that was fully tested for NR FR1 SA. o Each RX antenna for LTE is the same as a RX antenna that was fully tested for NR FR1 SA. Under these conditions, LTE OTA testing may be reduced as follows: o LTE TRP/TIS is not required for the FS use case. o Relative sensitivity testing on intermediate channels for LTE is not required (FS). o For the purposes of determining what other test reductions are allowed, each TX antenna and RX antenna for LTE that meets this test reduction is considered to be fully tested for LTE for FS.
FSH5.1.0-1	NR FR1 SA (single carrier)	N/A	For NR FR1 SA, TRP and TIS testing across the entire band is required for FS.
FSH5.2.0-1	NR FR1 EN-DC	N/A	Relative sensitivity tests on intermediate channels are not required for NR FR1 EN-DC.

Table 2.1.2.1.4-2 lists which test IDs apply to the various test cases for free space testing for hand-held devices.

Table 2.1.2.1.4-2 Test IDs Applying to Various Test Cases for Free Space Testing for Hand-Held Devices

3GPP Protocol	Location Based Protocol	FS TRP	FS TIS	FS Rel. Sense.	FS Rel. Power
all	N/A	FSH1.0-1, FSH1.0-3	FSH1.0-1, FSH1.0-3	FSH1.0-2	FSH1.0-2
all	all	FSH1.1-2	FSH1.1-1, FSH1.1-2	FSH1.1-2	FSH1.1-2
GSM	N/A	FSH2.1.0-1, FSH2.1.0-2	FSH2.1.0-1, FSH2.1.0-2	FSH2.1.0-3	
GSM	A-GPS L1				

3GPP Protocol	Location Based Protocol	FS TRP	FS TIS	FS Rel. Sense.	FS Rel. Power
GPRS	N/A	FSH2.2.0-1	FSH2.2.0-1		
EGPRS	N/A	FSH2.3.0-1	FSH2.3.0-1		
UMTS	N/A	FSH3.1.0-1, FSH3.1.0-2	FSH3.1.0-1, FSH3.1.0-2	FSH3.1.0-2	
UMTS	A-GPS L1				
LTE (single carrier)	N/A	FSH4.1.0-1, FSH4.1.0-2	FSH4.1.0-1, FSH4.1.0-2	FSH4.1.0-2	
LTE (single carrier)	A-GPS L1				
LTE (single carrier)	A-Galileo E1				
LTE (single carrier)	A-GPS L5				
LTE CA	N/A				
LTE LAA	N/A				
NR FR1 SA (single carrier)	N/A	FSH5.1.0-1	FSH5.1.0-1		
NR FR1 SA (single carrier)	A-GPS L1				
NR FR1 SA (single carrier)	A-Galileo E1				
NR FR1 SA (single carrier)	A-GPS L5				
NR FR1 EN-DC	N/A			FSH5.2.0-1	
NR FR1 EN-DC	A-GPS L1				
NR FR1 EN-DC	A-Galileo E1				
NR FR1 EN-DC	A-GPS L5				
NR FR1 SA CA	N/A				
NR FR1 SA UL CA	N/A				

2.1.2.2 Wrist-Worn Devices

Table 2.1.2.2-1 list the rules that determine which types of devices will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.2.2-1 have the format AAB.C.D-E and are defined in Table 2.1.2.1.2-1.

Table 2.1.2.2-1 Test Requirements for Wrist-Worn Devices

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
W1.0-1	all	N/A	Testing in non-primary mechanical modes is only required on the middle channel (e.g. low and high-channel testing is not required). Note that for relative sensitivity on intermediate channel testing and relative power on intermediate channel testing of non-primary mechanical modes, the middle channel is used as the reference channel for all intermediate channel tests because TIS/TRP is not tested at the other reference channels.
W1.1-1	all	all	Wrist-Worn Devices shall only be tested in the wrist worn configuration using the Forearm Phantom and not in the free space condition.
W1.1-2	all	all	Perform OTA testing with the DUT antenna extended and retracted, as applicable.
W1.1-3	all	all	The manufacturer shall declare the wristband to be used during the testing. The wristband to be used shall be the wristband packaged with the end product. If wristbands are provided separately, the wristband selection shall be based on the expected worst-case wristband.
W1.1-4	all	all	The manufacturer shall declare the housing material to be used during the test based on the expected worst-case material.
W1.1-5	all	all	If a device has multiple mechanical modes in which it can be used, each mechanical mode representative of end use shall be tested. Device mechanical modes that are not representative of end use while worn on the wrist, do not need to be tested in the forearm phantom test conditions. The vendor shall submit to the ATL a declaration of the primary mechanical mode as referenced in this test plan. The ATL shall use the primary mechanical mode when applying the pass/fail limits.
W1.1-6	all	all	The manufacturer shall declare the single arm orientation (WL or WR) for test, based on the expected worst-case orientation and based on input from target operators.
W1.1-7	all	all	It is not necessary to measure nor report the following quantities for Wrist-Worn Devices: NHPRP, NHPIS, UHIS, nor PIGS, primarily because the orientation of the Wrist-Worn Device varies so much in normal usage that these partial quantities don't have much bearing on the user experience. Note that while UHIS measurements are not required, measurements at the peak in the upper hemisphere pattern will still be used instead of the peak in the entire pattern in order to avoid complicating the test implementation.
W2.1.0-1	GSM	N/A	GSM OTA testing of wrist-worn devices is not required.
W2.1.2-1	GSM	A-GPS L1	A-GPS L1 with GSM OTA testing of wrist-worn devices is not required.
W2.2.0-1	GPRS	N/A	GPRS OTA testing of wrist-worn devices is not required.
W2.3.0-1	EGPRS	N/A	EGPRS OTA testing of wrist-worn devices is not required.
W3.1.0-1	UMTS	N/A	UMTS OTA testing of wrist-worn devices is not required.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
W3.1.2-1	UMTS	A-GPS L1	A-GPS L1 with UMTS testing of wrist-worn devices is not required.
W4.1.0-1	LTE (single carrier)	N/A	LTE OTA testing of wrist-worn devices is required on the forearm.
W4.1.2-1	LTE (single carrier)	A-GPS L1	A-GPS L1 with LTE OTA testing of wrist-worn devices is required on the forearm.
W4.1.3-1	LTE (single carrier)	A-Galileo E1	A-Galileo E1 with LTE OTA testing of wrist-worn devices is required on the forearm.
W4.1.4-1	LTE (single carrier)	A-GPS L5	A-GPS L5 with LTE OTA testing of wrist-worn devices is required on the forearm.
W4.1.5-1	LTE (single carrier)	A-Galileo E5A	A-Galileo E5A with LTE OTA testing of wrist-worn devices is required on the forearm.
W4.2.0-1	LTE CA	N/A	LTE CA OTA testing of wrist-worn devices is not required.
W4.3.0-1	LTE LAA	N/A	LTE LAA OTA testing of wrist-worn devices is not required.
W4.4.0-1	LTE Category M1	N/A	LTE Category M1 OTA testing of wrist-worn devices is required on the forearm.
W4.5.0-1	LTE Category NB1	N/A	LTE Category NB1 OTA testing of wrist-worn devices is required on the forearm.
W5.1.0-1	NR FR1 SA (single carrier)	N/A	NR FR1 SA OTA testing of wrist-worn devices is required on the forearm.
W5.1.2-1	NR FR1 SA (single carrier)	A-GPS L1	A-GPS L1 with NR FR1 SA OTA testing of wrist-worn devices is required on the forearm.
W5.1.3-1	NR FR1 SA (single carrier)	A-Galileo E1	A-Galileo E1 with NR FR1 SA OTA testing of wrist-worn devices is required on the forearm.
W5.1.4-1	NR FR1 SA (single carrier)	A-GPS L5	A-GPS L5 with NR FR1 SA OTA testing of wrist-worn devices is required on the forearm.
W5.1.5-1	NR FR1 SA (single carrier)	A-Galileo E5A	A-Galileo E5A with NR FR1 SA OTA testing of wrist-worn devices is required on the forearm.
W5.2.1-1	NR FR1 EN-DC	all	NR FR1 EN-DC OTA testing of wrist-worn devices is not required.
W5.3.1-1	NR FR1 SA CA	all	NR FR1 SA CA OTA testing of wrist-worn devices is not required.
W5.4.1-1	NR FR1 SA UL CA	all	NR FR1 SA UL CA OTA testing of wrist-worn devices is not required.

Table 2.1.2.2-2 lists which test IDs apply to the various test cases associated with wrist-worn devices.

Table 2.1.2.2-2 Test IDs Applying to Various Test Cases for Wrist-Worn Devices

3GPP Protocol	Location Based Protocol	WL/WR TRP	WL/WR TIS	WL/WR Rel. Sense.	WL/WR Rel. Power	Inter. Channel Degrad. WL/WR
all	N/A	W1.0-1	W1.0-1			
all	all	W1.1-1, W1.1-2, W1.1-3, W1.1-4, W1.1-5, W1.1-6, W1.1-7	W1.1-1, W1.1-2, W1.1-3, W1.1-4, W1.1-5, W1.1-6, W1.1-7	W1.1-1, W1.1-2, W1.1-3, W1.1-4, W1.1-5, W1.1-6, W1.1-7	W1.1-1, W1.1-2, W1.1-3, W1.1-4, W1.1-5, W1.1-6, W1.1-7	W1.1-1, W1.1-2, W1.1-3, W1.1-4, W1.1-5, W1.1-6, W1.1-7
GSM	N/A	W2.1.0-1	W2.1.0-1	W2.1.0-1	W2.1.0-1	
GSM	A-GPS L1					W2.1.2-1
GPRS	N/A	W2.2.0-1	W2.2.0-1	W2.2.0-1	W2.2.0-1	
EGPRS	N/A	W2.3.0-1	W2.3.0-1	W2.3.0-1	W2.3.0-1	
UMTS	N/A	W3.1.0-1	W3.1.0-1	W3.1.0-1	W3.1.0-1	
UMTS	A-GPS L1					W3.1.2-1
LTE (single carrier)	N/A	W4.1.0-1	W4.1.0-1	W4.1.0-1	W4.1.0-1	
LTE (single carrier)	A-GPS L1		W4.1.2-1			W4.1.2-1
LTE (single carrier)	A-Galileo E1		W4.1.3-1			W4.1.3-1
LTE (single carrier)	A-GPS L5		W4.1.4-1			W4.1.4-1
LTE (single carrier)	A-Galileo E5A		W4.1.5-1			W4.1.5-1
LTE CA	N/A	W4.2.0-1	W4.2.0-1	W4.2.0-1	W4.2.0-1	
LTE LAA	N/A	W4.3.0-1	W4.3.0-1	W4.3.0-1	W4.3.0-1	
LTE Category M1	N/A	W4.4.0-1	W4.4.0-1			
LTE Category NB1	N/A	W4.5.0-1	W4.5.0-1			
NR FR1 SA (single carrier)	N/A	W5.1.0-1	W5.1.0-1	W5.1.0-1	W5.1.0-1	
NR FR1 SA (single carrier)	A-GPS L1		W5.1.2-1			W5.1.2-1
NR FR1 SA (single carrier)	A-Galileo E1		W5.1.3-1			W5.1.3-1

3GPP Protocol	Location Based Protocol	WL/WR TRP	WL/WR TIS	WL/WR Rel. Sense.	WL/WR Rel. Power	Inter. Channel Degrad. WL/WR
NR FR1 SA (single carrier)	A-GPS L5		W5.1.4-1			W5.1.4-1
NR FR1 SA (single carrier)	A-Galileo E5A		W5.1.5-1			W5.1.5-1
NR FR1 EN-DC	N/A					
NR FR1 EN-DC	all	W5.2.1-1	W5.2.1-1	W5.2.1-1	W5.2.1-1	W5.2.1-1
NR FR1 SA CA	N/A					
NR FR1 SA CA	all	W5.3.1-1	W5.3.1-1	W5.3.1-1	W5.3.1-1	W5.3.1-1
NR FR1 SA UL CA	N/A					
NR FR1 SA UL CA	all	W5.4.1-1	W5.4.1-1	W5.4.1-1	W5.4.1-1	W5.4.1-1

2.1.2.3 Chest-Worn Devices

Some Chest-Worn Devices are configured to make E911 calls or restricted to call certain phone numbers. These devices will in general need to be and may be modified prior to OTA testing to enable making a connection with a communication tester. Instructions shall be provided for these devices to ensure that accidental calls to E911 are avoided.

Table 2.1.2.3-1 list the rules that determine which types of devices will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.2.3-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1.

Table 2.1.2.3-1 Test Requirements for Chest-Worn Devices

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
C1.0-1	all	N/A	Testing in non-primary mechanical modes is only required on the middle channel (e.g. low and high-channel testing is not required). Note that for relative sensitivity on intermediate channel testing and relative power on intermediate channel testing of non-primary mechanical modes, the middle channel is used as the reference channel for all intermediate channel tests because TIS/TRP is not tested at the other reference channels.
C1.1-1	all	all	Chest-Worn Devices shall only be tested in the chest worn configuration using the Chest Phantom and not in the free space condition.
C1.1-2	all	all	The manufacturer shall declare the housing material to be used during the test based on the expected worst-case material.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
C1.1-3	all	all	If a device has multiple mechanical modes in which it can be used, each mechanical mode representative of end use shall be tested. Device mechanical modes that are not representative of end use while worn on the chest, do not need to be tested in the chest phantom test conditions. The vendor shall submit to the ATL a declaration of the primary mechanical mode as referenced in this test plan. The ATL shall use the primary mechanical mode when applying the pass/fail limits.
C1.1-4	all	all	Only a single Chest-Worn (ChW) orientation shall be tested. The chest-worn device is tested in one position on the chest phantom, which shall be centered on the chest phantom. Some chest-worn devices can be worn in the same position on the chest in multiple orientations and/or multiple positions on the chest. The manufacturer shall declare the orientation and position of the device on the chest phantom for test 1) based on the recommended use guidelines when a single orientation and position are identified, or 2) based on the expected worst-case orientation/position within the recommended or reasonable use case guidelines and input from target operators.
C1.1-5	all	all	It is not necessary to measure nor report the following quantities for chest-worn devices: NHPRP, NHPIS, UHIS, nor PIGS, because 1) the orientation of the chest-worn device can vary which impacts the interpretation of these partial quantities and 2) not requiring these partial quantities enables the use of reverberation chambers. Note that while UHIS measurements are not required, measurements at the peak in the upper hemisphere pattern will still be used instead of the peak in the entire pattern in order to avoid complicating the test implementation.
C2.1.0-1	GSM	N/A	GSM OTA testing of chest-worn devices is not required.
C2.1.2-1	GSM	A-GPS L1	A-GPS L1 with GSM OTA testing of chest-worn devices is not required.
C2.2.0-1	GPRS	N/A	GPRS OTA testing of chest-worn devices is not required.
C2.3.0-1	EGPRS	N/A	EGPRS OTA testing of chest-worn devices is not required.
C3.1.0-1	UMTS	N/A	UMTS OTA testing of chest-worn devices is not required.
C3.1.2-1	UMTS	A-GPS L1	A-GPS L1 with UMTS testing of chest-worn devices is not required.
C4.1.0-1	LTE (single carrier)	N/A	LTE OTA testing of chest-worn devices is required on the chest.
C4.1.2-1	LTE (single carrier)	A-GPS L1	A-GPS L1 with LTE OTA testing of chest-worn devices is required on the chest.
C4.1.3-1	LTE (single carrier)	A-Galileo E1	A-Galileo E1 with LTE OTA testing of chest-worn devices is required on the chest.
C4.1.4-1	LTE (single carrier)	A-GPS L5	A-GPS L5 with LTE OTA testing of chest-worn devices is required on the chest.
C4.1.5-1	LTE (single carrier)	A-Galileo E5A	A-Galileo E5A with LTE OTA testing of chest-worn devices is required on the chest.
C4.2.0-1	LTE CA	N/A	LTE CA OTA testing of chest-worn devices is not required.
C4.3.0-1	LTE LAA	N/A	LTE LAA OTA testing of chest-worn devices is not required.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
C4.4.0-1	LTE Category M1	N/A	LTE Category M1 OTA testing of chest-worn devices is required on the chest.
C4.5.0-1	LTE Category NB1	N/A	LTE Category NB1 OTA testing of chest-worn devices is required on the chest.
C5.1.0-1	NR FR1 SA (single carrier)	N/A	NR FR1 SA OTA testing of chest-worn devices is required on the chest.
C5.1.2-1	NR FR1 SA (single carrier)	A-GPS L1	A-GPS L1 with NR FR1 SA OTA testing of chest-worn devices is required on the chest.
C5.1.3-1	NR FR1 SA (single carrier)	A-Galileo E1	A-Galileo E1 with NR FR1 SA OTA testing of chest-worn devices is required on the chest.
C5.1.4-1	NR FR1 SA (single carrier)	A-GPS L5	A-GPS L5 with NR FR1 SA OTA testing of chest-worn devices is required on the chest.
C5.1.4-1	NR FR1 SA (single carrier)	A-Galileo E5A	A-Galileo E5A with NR FR1 SA OTA testing of chest-worn devices is required on the chest.
C5.2.1-1	NR FR1 EN-DC	all	NR FR1 EN-DC OTA testing of chest-worn devices is not required.
C5.3.1-1	NR FR1 SA CA	all	NR FR1 SA CA OTA testing of chest-worn devices is not required.
C5.4.1-1	NR FR1 SA UL CA	all	NR FR1 SA UL CA OTA testing of chest-worn devices is not required.

Table 2.1.2.3-2 lists which test IDs apply to the various test cases associated with chest-worn devices.

Table 2.1.2.3-2 Test IDs Applying to Various Test Cases for Chest-Worn Devices

3GPP Protocol	Location Based Protocol	CHW TRP	CHW TIS	CHW Rel. Sense.	CHW Rel. Power	Inter. Channel Degrad. CHW
all	N/A	C1.0-1	C1.0-1			
all	all	C1.1-1, C1.1-2, C1.1-3, C1.1-4, C1.1-5	C1.1-1, C1.1-2, C1.1-3, C1.1-4, C1.1-5	C1.1-1, C1.1-2, C1.1-3, C1.1-4, C1.1-5	C1.1-1, C1.1-2, C1.1-3, C1.1-4, C1.1-5	C1.1-1, C1.1-2, C1.1-3, C1.1-4, C1.1-5
GSM	N/A	C2.1.0-1	C2.1.0-1	C2.1.0-1	C2.1.0-1	
GSM	A-GPS L1					C2.1.2-1

3GPP Protocol	Location Based Protocol	CHW TRP	CHW TIS	CHW Rel. Sense.	CHW Rel. Power	Inter. Channel Degrad. CHW
GPRS	N/A	C2.2.0-1	C2.2.0-1	C2.2.0-1	C2.2.0-1	
EGPRS	N/A	C2.3.0-1	C2.3.0-1	C2.3.0-1	C2.3.0-1	
UMTS	N/A	C3.1.0-1	C3.1.0-1	C3.1.0-1	C3.1.0-1	
UMTS	A-GPS L1					C3.1.2-1
LTE (single carrier)	N/A	C4.1.0-1	C4.1.0-1	C4.1.0-1	C4.1.0-1	
LTE (single carrier)	A-GPS L1		C4.1.2-1			C4.1.2-1
LTE (single carrier)	A-Galileo E1		C4.1.3-1			C4.1.3-1
LTE (single carrier)	A-GPS L5		C4.1.4-1			C4.1.4-1
LTE (single carrier)	A-Galileo E5A		C4.1.5-1			C4.1.5-1
LTE CA	N/A	C4.2.0-1	C4.2.0-1	C4.2.0-1	C4.2.0-1	
LTE LAA	N/A	C4.3.0-1	C4.3.0-1	C4.3.0-1	C4.3.0-1	
LTE Category M1	N/A	C4.4.0-1	C4.4.0-1			
LTE Category NB1	N/A	C4.5.0-1	C4.5.0-1			
NR FR1 SA (single carrier)	N/A	C5.1.0-1	C5.1.0-1	C5.1.0-1	C5.1.0-1	
NR FR1 SA (single carrier)	A-GPS L1		C5.1.2-1			C5.1.2-1
NR FR1 SA (single carrier)	A-Galileo E1		C5.1.3-1			C5.1.3-1
NR FR1 SA (single carrier)	A-GPS L5		C5.1.4-1			C5.1.4-1
NR FR1 SA (single carrier)	A-Galileo E5A		C5.1.5-1			C5.1.5-1
NR FR1 EN-DC	N/A					
NR FR1 EN-DC	all	C5.2.1-1	C5.2.1-1	C5.2.1-1	C5.2.1-1	C5.2.1-1

3GPP Protocol	Location Based Protocol	CHW TRP	CHW TIS	CHW Rel. Sense.	CHW Rel. Power	Inter. Channel Degrad. CHW
NR FR1 SA CA	N/A					
NR FR1 SA CA	all	C5.3.1-1	C5.3.1-1	C5.3.1-1	C5.3.1-1	C5.3.1-1
NR FR1 SA UL CA	N/A					
NR FR1 SA UL CA	all	C5.4.1-1	C5.4.1-1	C5.4.1-1	C5.4.1-1	C5.4.1-1

2.1.2.4 Integrated Devices that Are Body-Worn

Table 2.1.2.4-1 lists the rules that determine how integrated devices that are body-worn will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.2.4-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1.

Table 2.1.2.4-1 Test Requirements for Integrated Devices that Are Body Worn

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
intB1.1-1	all	all	Integrated Devices and Integration Components shall be tested in a free space configuration per Section 2.1.3, unless specific phantom testing is defined such as body worn.
intB1.1-2	all	all	Integration Components are commonly integrated into clothing and in cases where an Integration Component is intended to be used with clothing then no free space testing is required if body worn testing is performed. An Integration Component should be tested in a “host device” declared by the manufacturer as being one of the most common “host devices”.
intB1.1-3	all	all	OTA testing shall be performed with the applicable body phantoms as defined in this test plan. In addition, network operators, or other customers may request testing with non-standardized body phantoms when standardized body phantoms are not applicable or not defined. In such cases, standard fixturing and positioning shall be observed to the extent possible, and the data shall be included and marked as supplemental in the test report. When non-standardized body phantoms are used, the test requirements in Section 2.1.3 shall be followed except that testing shall be done with the applicable body phantom.
intB1.1-4	all	all	Certain devices support usage in more than one physical configuration. Each configuration may produce different radiated performance due to possible changes in antenna orientation. Consequently, such devices may require testing in more than one configuration. At a minimum, the device shall be tested in the manufacturer's recommended configuration(s).
intB1.1-5	all	all	Some retractable antennas used for Integrated Devices are functional only in the extended position. In such cases, the device shall only be tested with the antenna in the manufacturer's recommended configuration.
intB1.1-6	all	all	Embedded data Modules commonly support multiple protocols or air interfaces (e.g., GPRS/ EGPRS/UMTS) within the same frequency band. In cases where particular modes are not relevant to the intended use of the DUT, it is allowable to test only a subset of the supported protocols. The device manufacturer shall specify the intended use cases (e.g., test mode, data rate, channel set up).

Table 2.1.2.4-2 lists which test IDs apply to the various test cases associated with integrated devices that are body worn.

Table 2.1.2.4-2 Test IDs Applying to Various Test Cases for Integrated Devices that Are Body Worn

3GPP Protocol	Location Based Protocol	FS TRP	FS TIS	FS Rel. Sense.	FS Rel. Power	Inter. Channel Degrad. FS	Body Worn TRP	Body Worn TIS	Body Worn Rel. Sense.	Body Worn Rel. Power	Inter. Channel Degrad. Body Worn
all	N/A										
all	all	intB1.1-1, intB1.1-2, intB1.1-4, intB1.1-5	intB1.1-1, intB1.1-2, intB1.1-4, intB1.1-5	intB1.1-1, intB1.1-2, intB1.1-4, intB1.1-5	intB1.1-1, intB1.1-2, intB1.1-4, intB1.1-5	intB1.1-1, intB1.1-2, intB1.1-4, intB1.1-5	intB1.1-2, intB1.1-3, intB1.1-4, intB1.1-5	intB1.1-2, intB1.1-3, intB1.1-4, intB1.1-5	intB1.1-2, intB1.1-3, intB1.1-4, intB1.1-5	intB1.1-2, intB1.1-3, intB1.1-4, intB1.1-5	intB1.1-2, intB1.1-3, intB1.1-4, intB1.1-5
GSM	N/A										
GSM	A-GPS L1										
GPRS	N/A										
EGPRS	N/A										
UMTS	N/A										
UMTS	A-GPS L1										
LTE (single carrier)	N/A										
LTE (single carrier)	A-GPS L1										
LTE (single carrier)	A-Galileo E1										
LTE (single carrier)	A-GPS L5										
LTE (single carrier)	A-Galileo E5A										
LTE CA	N/A										
LTE LAA	N/A										
LTE Category M1	N/A										

3GPP Protocol	Location Based Protocol	FS TRP	FS TIS	FS Rel. Sense.	FS Rel. Power	Inter. Channel Degrad. FS	Body Worn TRP	Body Worn TIS	Body Worn Rel. Sense.	Body Worn Rel. Power	Inter. Channel Degrad. Body Worn
LTE Category NB1	N/A										
NR FR1 SA (single carrier)	N/A										
NR FR1 SA (single carrier)	A-GPS L1										
NR FR1 SA (single carrier)	A-Galileo E1										
NR FR1 SA (single carrier)	A-GPS L5										
NR FR1 SA (single carrier)	A-Galileo E5A										
NR FR1 EN-DC	N/A										
NR FR1 EN-DC	A-GPS L1										
NR FR1 EN-DC	A-Galileo E1										
NR FR1 EN-DC	A-GPS L5										
NR FR1 EN-DC	A-Galileo E5A										
NR FR1 SA CA	N/A										
NR FR1 SA UL CA	N/A										

Note that these guidelines shall not preclude using the alternative single-point and multi-point offset test procedures for TIS and TRP described in *CTIA 01.20* [5]. For example, in the event that the manufacturer and operator agree that voice-mode results are not required for certification, the ATL may nevertheless opt to measure TIS and TRP in a voice mode to take advantage of the test time optimization provided by those alternative procedures. The manufacturer should be aware that certain protocols not required by the operator for certification may nonetheless be needed by the ATL and should be enabled on the device submitted for testing.

2.1.2.4.1 Testing of Cellular Desensitization due to Simultaneous Operation of 802.11 Radios for Integrated Devices

Integrated devices that are not required to complete testing per the *CTIA Certification-Wi-Fi Alliance Test Plan for RF Performance Evaluation of Wi-Fi Mobile Converged Devices* [19] shall perform testing of cellular desense due to simultaneous operation of 802.11 radios per Section 4.9 in *CTIA 01.20* [5]. The cellular desense testing is limited to single carrier cellular radio modes (e.g. GSM, GPRS, EGPRS, UMTS, LTE single carrier, LTE Cat-M1, LTE Cat-NB1, NR FR1 SA single carrier, NR FR1 RedCap). The test method is not applicable for CA/DC modes. For devices where the 802.11 radio will never operate during communication over 3GPP wireless technologies, this test is not required. For example, devices which may camp on the cellular network while operating the 802.11 radio shall perform this test, even if the device rarely transmits on both radios concurrently. This test does not measure the impact of cellular communication on the 802.11 wireless interface.

2.1.2.5 Ankle-Worn Devices

Table 2.1.2.5-1 list the rules that determine which types of devices will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.2.5-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1.

Table 2.1.2.5-1 Test Requirements for Ankle-Worn Devices

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
A1.0-1	all	N/A	Testing in non-primary mechanical modes is only required on the middle channel (e.g. low and high-channel testing is not required). Note that for relative sensitivity on intermediate channel testing and relative power on intermediate channel testing of non-primary mechanical modes, the middle channel is used as the reference channel for all intermediate channel tests because TIS/TRP is not tested at the other reference channels.
A1.1-1	all	all	Ankle-Worn Devices shall only be tested in the ankle worn configuration using the Ankle Phantom and not in the free space condition.
A1.1-2	all	all	The manufacturer shall declare the ankle-band to be used during the testing. The ankle-band to be used shall be the ankle-band packaged with the end product. If ankle-bands are provided separately, the ankle-band selection shall be based on the expected worst-case ankleband.
A1.1-3	all	all	The manufacturer shall declare the housing material to be used during the test based on the expected worst-case material.
A1.1-4	all	all	If a device has multiple mechanical modes in which it can be used, each mechanical mode representative of end use shall be tested. Device mechanical modes that are not representative of end use while worn on the ankle, do not need to be tested in the ankle phantom test conditions. The vendor shall submit to the ATL a declaration of the primary mechanical mode as referenced in this test plan. The ATL shall use the primary mechanical mode when applying the pass/fail limits.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
A1.1-5	all	all	Only a single ankle orientation (AL) shall be tested. The ankle-worn device is tested and mounted only on the left side of the (left) ankle phantom, as ankle-worn devices are typically worn on the outer side of the ankle. In general, ankle-worn devices can be worn in the same position on the ankle in two orientations. For example, if a device had a single button on the side of the device, the device could be worn on the ankle with the button pointing upwards or downwards. The manufacturer shall declare the orientation of the device for test 1) based on the recommended use guidelines, or 2) based on the expected worst-case orientation and input from target operators. Relative sensitivity on intermediate channel testing shall be performed on the single device orientation declared by the manufacturer.
A1.1-6	all	all	It is not necessary to measure nor report the following quantities for ankle-worn devices: NHPRP, NHPIS, UHIS, nor PIGS, because 1) the orientation of the ankle-worn device can vary which impacts the interpretation of these partial quantities and 2) not requiring these partial quantities enables the use of reverberation chambers. Note that while UHIS measurements are not required, measurements at the peak in the upper hemisphere pattern will still be used instead of the peak in the entire pattern in order to avoid complicating the test implementation.
A2.1.0-1	GSM	N/A	GSM OTA testing of ankle-worn devices is not required.
A2.1.2-1	GSM	A-GPS L1	A-GPS L1 with GSM OTA testing of ankle-worn devices is not required.
A2.2.0-1	GPRS	N/A	GPRS OTA testing of ankle-worn devices is not required.
A2.3.0-1	EGPRS	N/A	EGPRS OTA testing of ankle-worn devices is not required.
A3.1.0-1	UMTS	N/A	UMTS OTA testing of ankle-worn devices is not required.
A3.1.2-1	UMTS	A-GPS L1	A-GPS L1 with UMTS testing of ankle-worn devices is not required.
A4.1.0-1	LTE (single carrier)	N/A	LTE OTA testing of ankle-worn devices is required on the ankle.
A4.1.2-1	LTE (single carrier)	A-GPS L1	A-GPS L1 with LTE OTA testing of ankle-worn devices is required on the ankle.
A4.1.3-1	LTE (single carrier)	A-Galileo E1	A-Galileo E1 with LTE OTA testing of ankle-worn devices is required on the ankle.
A4.1.4-1	LTE (single carrier)	A-GPS L5	A-GPS L5 with LTE OTA testing of ankle-worn devices is required on the ankle.
A4.1.5-1	LTE (single carrier)	A-Galileo E5A	A-Galileo E5A with LTE OTA testing of ankle-worn devices is required on the ankle.
A4.2.0-1	LTE CA	N/A	LTE CA OTA testing of ankle-worn devices is not required.
A4.3.0-1	LTE LAA	N/A	LTE LAA OTA testing of ankle-worn devices is not required.
A4.4.0-1	LTE Category M1	N/A	LTE Category M1 OTA testing of ankle-worn devices is required on the ankle.
A4.5.0-1	LTE Category NB1	N/A	LTE Category NB1 OTA testing of ankle-worn devices is required on the ankle.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
A5.1.0-1	NR FR1 SA (single carrier)	N/A	NR FR1 SA OTA testing of ankle-worn devices is required on the ankle.
A5.1.2-1	NR FR1 SA (single carrier)	A-GPS L1	A-GPS L1 with NR FR1 SA OTA testing of ankle-worn devices is required on the ankle.
A5.1.3-1	NR FR1 SA (single carrier)	A-Galileo E1	A-Galileo E1 with NR FR1 SA OTA testing of ankle-worn devices is required on the ankle.
A5.1.4-1	NR FR1 SA (single carrier)	A-GPS L5	A-GPS L5 with NR FR1 SA OTA testing of ankle-worn devices is required on the ankle.
A5.1.5-1	NR FR1 SA (single carrier)	A-Galileo E5A	A-Galileo E5A with NR FR1 SA OTA testing of ankle-worn devices is required on the ankle.
A5.2.1-1	NR FR1 EN-DC	all	NR FR1 EN-DC OTA testing of ankle-worn devices is not required.
A5.3.1-1	NR FR1 SA CA	all	NR FR1 SA CA OTA testing of ankle-worn devices is not required.
A5.4.1-1	NR FR1 SA UL CA	all	NR FR1 SA UL CA OTA testing of ankle-worn devices is not required.

Table 2.1.2.5-2 lists which test IDs apply to the various test cases associated with ankle-worn devices.

Table 2.1.2.5-2 Test IDs Applying to Various Test Cases for Ankle-Worn Devices

3GPP Protocol	Location Based Protocol	WL/WR TRP	WL/WR TIS	WL/WR Rel. Sense.	WL/WR Rel. Power	Inter. Channel Degrad. WL/WR
all	N/A	A1.0-1	A1.0-1			
all	all	A1.1-1, A1.1-2, A1.1-3, A1.1-4, A1.1-5, A1.1-6	A1.1-1, A1.1-2, A1.1-3, A1.1-4, A1.1-5, A1.1-6	A1.1-1, A1.1-2, A1.1-3, A1.1-4, A1.1-5, A1.1-6	A1.1-1, A1.1-2, A1.1-3, A1.1-4, A1.1-5, A1.1-6	A1.1-1, A1.1-2, A1.1-3, A1.1-4, A1.1-5, A1.1-6
GSM	N/A	A2.1.0-1	A2.1.0-1	A2.1.0-1	A2.1.0-1	
GSM	A-GPS L1					A2.1.2-1
GPRS	N/A	A2.2.0-1	A2.2.0-1	A2.2.0-1	A2.2.0-1	
EGPRS	N/A	A2.3.0-1	A2.3.0-1	A2.3.0-1	A2.3.0-1	
UMTS	N/A	A3.1.0-1	A3.1.0-1	A3.1.0-1	A3.1.0-1	

3GPP Protocol	Location Based Protocol	WL/WR TRP	WL/WR TIS	WL/WR Rel. Sense.	WL/WR Rel. Power	Inter. Channel Degrad. WL/WR
UMTS	A-GPS L1					A3.1.2-1
LTE (single carrier)	N/A	A4.1.0-1	A4.1.0-1	A4.1.0-1	A4.1.0-1	
LTE (single carrier)	A-GPS L1		A4.1.2-1			A4.1.2-1
LTE (single carrier)	A-Galileo E1		A4.1.3-1			A4.1.3-1
LTE (single carrier)	A-GPS L5		A4.1.4-1			A4.1.4-1
LTE (single carrier)	A-Galileo E5A		A4.1.5-1			A4.1.5-1
LTE CA	N/A	A4.2.0-1	A4.2.0-1	A4.2.0-1	A4.2.0-1	
LTE LAA	N/A	A4.3.0-1	A4.3.0-1	A4.3.0-1	A4.3.0-1	
LTE Category M1	N/A	A4.4.0-1	A4.4.0-1			
LTE Category NB1	N/A	A4.5.0-1	A4.5.0-1			
NR FR1 SA (single carrier)	N/A	A5.1.0-1	A5.1.0-1	A5.1.0-1	A5.1.0-1	
NR FR1 SA (single carrier)	A-GPS L1		A5.1.2-1			A5.1.2-1
NR FR1 SA (single carrier)	A-Galileo E1		A5.1.3-1			A5.1.3-1
NR FR1 SA (single carrier)	A-GPS L5		A5.1.4-1			A5.1.4-1
NR FR1 SA (single carrier)	A-Galileo E5A		A5.1.5-1			A5.1.5-1
NR FR1 EN-DC	N/A					
NR FR1 EN-DC	all	A5.2.1-1	A5.2.1-1	A5.2.1-1	A5.2.1-1	A5.2.1-1
NR FR1 SA CA	N/A					
NR FR1 SA CA	all	A5.3.1-1	A5.3.1-1	A5.3.1-1	A5.3.1-1	A5.3.1-1
NR FR1 SA UL CA	N/A					

3GPP Protocol	Location Based Protocol	WL/WR TRP	WL/WR TIS	WL/WR Rel. Sense.	WL/WR Rel. Power	Inter. Channel Degrad. WL/WR
NR FR1 SA UL CA	all	A5.4.1-1	A5.4.1-1	A5.4.1-1	A5.4.1-1	A5.4.1-1

2.1.3 Devices Tested without a Phantom

Device setup and positioning guidelines are defined in *CTIA 01.71* [14].

Radiated performance testing of devices not covered by Section 2.1.2 is limited to free-space only. The applicability of free-space testing is summarized by Table 2.1.3-1 and Table 2.1.3-2.

Table 2.1.3-1 Data-Only Integrated Device Radiated Test Applicability

Data-Only Integrated Device (No Circuit-Switched Voice or VOLTE Support)	Applicable Notes
Integrated, Non-Removable Antenna	See Notes 1, 2, 3, 4 and 5
Removable Antenna Physically Attached to Device	See Notes 1, 2, 3, 4 and 5
Removable Antenna Connected to Device via Transmission line less than 20 cm	See Notes 1, 2, 3, 4 and 5

Table 2.1.3-2 Circuit-Switched Voice or VOLTE-Capable Integrated Device Radiated Test Applicability

Circuit-Switched Voice or Volte-Capable Integrated Device	Applicable Notes
Integrated, Non-Removable Antenna	See Notes 1, 2 and 4
Removable Antenna Physically Attached to Device	See Notes 1, 2 and 4
Removable Antenna Connected to Device via Transmission line less than 20 cm	See Notes 1, 2 and 4

Note 1: Devices larger than the Notebook-sized test volume defined in *CTIA 01.73* [16] Section 5.4 and heavy devices that cannot be placed in an OTA chamber are excluded. Devices larger than the Notebook-sized test volume may be tested in suitable reverberation chambers as long as they still meet the size criteria for the reverberation chamber.

Note 2: Some devices include sensors which reduce the transmitter's RF output power when in close proximity to the user. TRP measurements of any device that includes user proximity RF power reduction shall be made when the proximity sensor is not activated (e.g. device is operating at full RF output power). The PTCRB lab shall also measure the device's RF output power when the proximity sensor is activated. This measurement may be made using either conducted or radiated techniques, and the lab shall document the proximity sensor's RF power reduction in dB.

Note 3: WWAN radiated performance testing of data-only devices (no support for voice nor VoLTE) shall be executed on every normative band supported. In addition, radiated performance testing of data-only devices shall be executed for every cellular radio mode supported according to Table 2.1.3-3 below.

Note 4: A-GNSS OTA testing is required in the free-space configurations as specified in Section 2.1.3. Also, the vendor shall submit to the ATL a declaration of the primary mechanical mode as referenced in this test plan. The ATL shall use the primary mechanical mode when applying the pass/fail limits.

Note 5: Simple IoT devices meet the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. Relative sensitivity on intermediate channel tests and relative power on intermediate channel tests shall be performed on simple IoT devices. However, the relative sensitivity intermediate channel test results will be informative and not used for failing a device.

Table 2.1.3-3 Cellular Radio Mode Test Requirements for Data-Only Devices

Cellular Radio Modes Supported By DUT	Cellular Radio Modes Subject To Radiated Performance Testing
GPRS, EGPRS, UMTS, LTE (not VoLTE-capable), NR FR1	LTE, NR FR1
EGPRS, UMTS, LTE (not VoLTE-capable), NR FR1	LTE, NR FR1
UMTS, LTE (not VoLTE-capable), NR FR1	LTE, NR FR1
GPRS, UMTS, LTE (not VoLTE-capable), NR FR1	LTE, NR FR1
GPRS, EGPRS, UMTS, LTE (not VoLTE-capable)	UMTS, LTE
EGPRS, UMTS, LTE (not VoLTE-capable)	UMTS, LTE
UMTS, LTE (not VoLTE-capable)	UMTS, LTE
GPRS, UMTS, LTE (not VoLTE-capable)	UMTS, LTE
GPRS, EGPRS, UMTS	EGPRS, UMTS
EGPRS, LTE (not VoLTE-capable), NR FR1	LTE, NR FR1
EGPRS, LTE (not VoLTE-capable)	EGPRS, LTE
EGPRS, UMTS	EGPRS, UMTS
GPRS, EGPRS	GPRS, EGPRS

For Table 2.1.3-3, LTE includes LTE single carrier, LTE CA, LTE LAA, LTE Category M1, and LTE NB-IoT; and NR FR1 includes NR FR1 SA single carrier, NR FR1 SA CA, NR FR1 SA UL CA and NR FR1 EN-DC. If the cellular radio modes in the left column are supported by the DUT, then the testing listed in the right column is required and all test reductions (across cellular radio modes) described in this document apply.

2.1.3.1 Large IoT Devices (Informative)

OTA testing of large IoT devices is limited to TRP and TIS for GSM, GPRS, EGPRS, UMTS and LTE. Large IoT devices are defined as being larger than the Notebook sized test volume defined in *CTIA 01.73*

[16] Section 5.4. Near horizon quantities do not need to measured, and relative sensitivity on intermediate channels and relative power on intermediate channels do not need be tested.

2.1.3.2 Notebook and Tablet Devices

Table 2.1.3.2-1 lists the rules that determine how notebooks and tablets with embedded modules will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.3.2-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1.

Table 2.1.3.2-1 Test Requirements for Notebook and Tablet Devices

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
NT1.1-1	all	all	Certain devices support usage in more than one physical configuration, such as convertible Notebooks. Each configuration may produce different radiated performance due to possible changes in antenna performance and self-interference. Consequently, such devices may require testing in more than one configuration. At a minimum, the device shall be tested in the manufacturer's recommended configuration(s).
NT1.1-2	all	all	Some retractable antennas used for embedded Notebooks and Tablets are functional only in the extended position. In such cases, the device shall only be tested with the antenna in the manufacturer's recommended configuration.
NT1.1-3	all	all	Embedded WWAN data modules commonly support multiple protocols or air interfaces (e.g. GPRS/ EGPRS/UMTS) within the same frequency band. In cases where particular modes are not relevant to the intended use of the DUT, it is allowable to test only a subset of the supported protocols. The device manufacturer shall specify the intended use cases.
NT1.1-4	all	all	Since Notebooks and Tablets are not body-worn devices and they are not recommended for use placed directly on the lap, the DUT shall be tested in a Free Space configuration per Section 2.1.3.

Table 2.1.3.2-2 lists which test IDs apply to the various test cases associated with Notebook and Tablet devices.

Table 2.1.3.2-2 Test IDs Applying to Various Test Cases for Notebook and Tablet Devices

3GPP Protocol	Location Based Protocol	FS TRP	FS TIS	FS Rel. Sense.	FS Rel. Power	Inter. Channel Degrad. FS
all	N/A					
all	all	NT1.1-1, NT1.1-2, NT1.1-3, NT1.1-4	NT1.1-1, NT1.1-2, NT1.1-3, NT1.1-4	NT1.1-1, NT1.1-2, NT1.1-3, NT1.1-4	NT1.1-1, NT1.1-2, NT1.1-3, NT1.1-4	NT1.1-1, NT1.1-2, NT1.1-3, NT1.1-4
GSM	N/A					
GSM	A-GPS L1					
GPRS	N/A					

3GPP Protocol	Location Based Protocol	FS TRP	FS TIS	FS Rel. Sense.	FS Rel. Power	Inter. Channel Degrad. FS
EGPRS	N/A					
UMTS	N/A					
UMTS	A-GPS L1					
LTE (single carrier)	N/A					
LTE (single carrier)	A-GPS L1					
LTE (single carrier)	A-Galileo E1					
LTE (single carrier)	A-GPS L5					
LTE (single carrier)	A-Galileo E5A					
LTE CA	N/A					
LTE LAA	N/A					
LTE Category M1	N/A					
LTE Category NB1	N/A					
NR FR1 SA (single carrier)	N/A					
NR FR1 SA (single carrier)	A-GPS L1					
NR FR1 SA (single carrier)	A-Galileo E1					
NR FR1 SA (single carrier)	A-GPS L5					
NR FR1 SA (single carrier)	A-Galileo E5A					
NR FR1 EN-DC	N/A					
NR FR1 EN-DC	A-GPS L1					
NR FR1 EN-DC	A-Galileo E1					

3GPP Protocol	Location Based Protocol	FS TRP	FS TIS	FS Rel. Sense.	FS Rel. Power	Inter. Channel Degrad. FS
NR FR1 EN-DC	A-GPS L5					
NR FR1 EN-DC	A-Galileo E5A					
NR FR1 SA CA	N/A					
NR FR1 SA UL CA	N/A					

Note that these guidelines shall not preclude using the alternative single-point and multi-point offset test procedures for TIS and TRP described in *CTIA 01.02* [2].For example, in the event that the manufacturer and operator agree that voice-mode results are not required for certification, the ATL may nevertheless opt to measure TIS and TRP in a voice mode to take advantage of the test time optimization provided by those alternative procedures. The manufacturer should be aware that certain protocols not required by the operator for certification may nonetheless be needed by the ATL and should be available on the device submitted for testing.

2.1.3.3 Integrated Devices that Are Not Body-Worn

Table 2.1.3.3-1 lists the rules that determine how integrated devices that are not body-worn with embedded WWAN radio modules will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.3.3-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1.

Table 2.1.3.3-1 Test Requirements for Integrated Devices that Are Not Body Worn

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
intN1.1-1	all	all	Integrated Devices and Integration Components that are not body-worn shall be tested in a Free Space configuration per Section 2.1.3.
intN1.1-2	all	all	Certain devices support usage in more than one physical configuration, such as an Integrated Device placed on a wall or on a desk in normal operating mode (vertical and horizontal plane). Each configuration may produce different radiated performance due to possible changes in antenna orientation (e.g., horizontal and vertical polarization measurements could change). Consequently, such devices may require testing in more than one configuration. At a minimum, the device shall be tested in the manufacturer's recommended configuration(s).
intN1.1-3	all	all	Some retractable antennas used for Integrated Devices are functional only in the extended position. In such cases, the device shall only be tested with the antenna in the manufacturer's recommended configuration.
intN1.1-4	all	all	Embedded data Modules commonly support multiple protocols or air interfaces (e.g., GPRS/ EGPRS/UMTS) within the same frequency band. In cases where particular modes are not relevant to the intended use of the DUT, it is allowable to test only a subset of the supported protocols. The device manufacturer shall specify the intended use cases (e.g., test mode, data rate, channel set up).

Table 2.1.3.3-2 lists which test IDs apply to the various test cases associated with integrated devices that are not body worn.

Table 2.1.3.3-2 Test IDs Applying to Various Test Cases for Integrated Devices that Are Not Body Worn

3GPP Protocol	Location Based Protocol	FS TRP	FS TIS	FS Rel. Sense.	FS Rel. Power	Inter. Channel Degrad. FS
all	N/A					
all	all	intN1.1-1, intN1.1-2, intN1.1-3, intN1.1-4	intN1.1-1, intN1.1-2, intN1.1-3, intN1.1-4	intN1.1-1, intN1.1-2, intN1.1-3, intN1.1-4	intN1.1-1, intN1.1-2, intN1.1-3, intN1.1-4	intN1.1-1, intN1.1-2, intN1.1-3, intN1.1-4
GSM	N/A					
GSM	A-GPS L1					
GPRS	N/A					
EGPRS	N/A					
UMTS	N/A					
UMTS	A-GPS L1					
LTE (single carrier)	N/A					
LTE (single carrier)	A-GPS L1					
LTE (single carrier)	A-Galileo E1					
LTE (single carrier)	A-GPS L5					
LTE (single carrier)	A-Galileo E5A					
LTE CA	N/A					
LTE LAA	N/A					
LTE Category M1	N/A					
LTE Category NB1	N/A					
NR FR1 SA (single carrier)	N/A					

3GPP Protocol	Location Based Protocol	FS TRP	FS TIS	FS Rel. Sense.	FS Rel. Power	Inter. Channel Degrad. FS
NR FR1 SA (single carrier)	A-GPS L1					
NR FR1 SA (single carrier)	A-Galileo E1					
NR FR1 SA (single carrier)	A-GPS L5					
NR FR1 SA (single carrier)	A-Galileo E5A					
NR FR1 EN-DC	N/A					
NR FR1 EN-DC	A-GPS L1					
NR FR1 EN-DC	A-Galileo E1					
NR FR1 EN-DC	A-GPS L5					
NR FR1 EN-DC	A-Galileo E5A					
NR FR1 SA CA	N/A					
NR FR1 SA UL CA	N/A					

An Integration Component should be tested in a “host device” declared by the manufacturer as being one of the most common “host device”.

Note that these guidelines shall not preclude using the alternative single-point and multi-point offset test procedures for TIS and TRP described in *CTIA 01.20* [5]. For example, in the event that the manufacturer and operator agree that voice-mode results are not required for certification, the ATL may nevertheless opt to measure TIS and TRP in a voice mode to take advantage of the test time optimization provided by those alternative procedures. The manufacturer should be aware that certain protocols not required by the operator for certification may nonetheless be needed by the ATL and should be enabled on the device submitted for testing.

2.1.3.3.1 Testing of Cellular Desensitization due to Simultaneous Operation of 802.11 Radios for Integrated Devices

Integrated Devices that are not required to complete testing per the *CTIA Certification-Wi-Fi Alliance Test Plan for RF Performance Evaluation of Wi-Fi Mobile Converged Devices* [19] shall perform testing of cellular desense due to simultaneous operation of 802.11 radios per Section 4.9 in *CTIA 01.20* [5]. The cellular desense testing is limited to single carrier cellular radio modes (e.g. GSM, GPRS, EGPRS, UMTS, LTE single carrier, LTE Cat-M1, LTE Cat-NB1, NR FR1 SA single carrier, NR FR1 RedCap). The test method is not applicable for CA/DC modes. For devices where the 802.11 radio will never operate during communication over 3GPP wireless technologies, this test is not required. For example, devices which may camp on the cellular network while operating the 802.11 radio shall perform this test, even if the device rarely transmits on both radios concurrently. This test does not measure the impact of cellular communication on the 802.11 wireless interface.

2.1.4 Devices Not Requiring Testing

This section applies to following types of devices:

- Integrated Devices without a defined antenna.
- Integrated Devices with a removable antenna that is connected to the device through an RF transmission line (such as a coaxial cable) greater than 20 cm in length and not physically attached to the host device. The no-testing-required justification document noted above shall include a vendor-provided list of recommended external antennas. The vendor shall also include this list in the product user manual.
- Modules
- PCMCIA cards and PCIExpress when using External Interface
- USB Modems
- Variants or re-branded devices having no altered RF performance from their parent device

Note: *The vendor shall consult with the operator(s) to which it intends to sell the device to determine whether operator-specific testing may be required. If no testing is conducted, the lab shall provide a detailed justification document stating that the device falls into one or more of the categories listed above*.

2.1.5 Devices Supporting Antenna Switching

2.1.5.1 Transmit Performance Testing of Devices Containing Multiple TX Antennas

2.1.5.1.1 Devices where the Active TX Antenna Could Switch during the Execution of the Test Cases

These are devices where the choice of which TX antenna is active is not a function of the use case of the device. Instead, TX antenna selection is made according to other parameters such as, but not limited to base station control, user control, RX signal level or other means that originate external to the device. Such a device may switch from one TX antenna to another but requires specific inputs from an external control source to do so. At this time, devices of this type must measure TRP for each TX antenna individually and the measured values shall be reported accordingly in the Test Report. Devices supporting TX switched diversity are in this device category as well.

1. The manufacturer shall provide either:

    a. Equipment and/or software which will allow the test lab to control which TX antenna is used. Or,

    b. Otherwise identical test devices which are pre-configured for each TX antenna selection.

2. The device manufacturer shall indicate which frequency bands and air interfaces support TX antenna switching in Table RA.1-2 in *CTIA 01.03* [3].

The antenna with better TRP will be used to determine the pass/fail compliance. The better antenna between the two transmitting antennas is always identified as the primary antenna, and the weaker antenna is the secondary antenna.

2.1.5.1.2 Devices where the Active TX Antenna Does Not Switch during the Execution of the Test Cases

These are devices where the choice of which TX antenna is active is a function of the proximity to the user's hand, head or body, or nearby object and is usually determined by sensors contained within the device. Such a device will switch from one TX antenna to another based on the inputs it receives from its

own self-contained sensors. The sensors may detect proximity of human tissue (hand, head or body) or may detect proximity of external objects (tables, seats, etc.). In such a device, it is required that the choice of TX antenna of the device remains the same during the TRP test. Below are listed the basic requirements and conditions for two testing mode options, autonomous and non-autonomous defined for FS, BHHL, BHHR, HR, and HL test cases.

1. Autonomous Mode

    a. If the manufacturer chooses, the device is allowed to operate in a fully autonomous mode where it actively chooses the TX antenna depending on the test case during the TRP test.

2. Non-Autonomous Mode

    a. The device manufacturer shall supply a “truth table” that clearly identifies which TX antenna will be used for all of the test cases (FS, BHHL, BHHR, HL, HR). The truth table shall be consistent with the software control algorithms activated in the commercial device.

    b. In addition, the manufacturer shall provide either:

        i. Equipment and/or software which will allow the test lab to control which TX antenna is used for each test case, per the truth table. Or,

        ii. Otherwise identical test devices which are pre-configured for the TX antenna selections per the truth table.

    c. The device is allowed to change the TX antenna that it uses at different RF frequencies within the same band, or when different TX power levels are chosen, or when a different air interface is chosen, or other manufacturer declared conditions, as long as this is clearly indicated in the truth table and is consistent with the SW control algorithms activated in the commercial device.

2.1.5.2 Receiver Performance Testing of Devices with Antenna Switching

This section deals with devices that may switch one or more receivers between more than one antenna. The most common current application of such a scheme is in incidental support of TX Switched Diversity, wherein the transmit path is switched dynamically between different antennas, in order to optimize TX performance vs. hand presence or other time-variant impairment factors.

A common implementation for such a scheme is to switch the RF front-end path between a main and a diversity antenna, and a main transceiver port and diversity receiver port of the radio. Consequently, when the switch is toggled to direct the transmitter (main transceiver port) to one or the other antenna, the receivers are incidentally also swapped between the two antennas. In most implementations, both receivers remain active for either switch state; that is, the device continuously operates as a diversity receiver. In this case, assuming modern receiver technology like max-ratio-combining is implemented in the device and the receivers have equal conducted performance, the Combined TIS of the device would not change regardless of the switch state (to an ideal first order). In practice, with receiver impairments like transmit desensitization affecting each receiver to a different degree, the C-TIS values of the two switch states may diverge.

There are of course many other hypothetical scenarios whereby antennas may be switched between receivers. For example, there may be cases where there is only one receiver and multiple antennas are switched to it (classically known as Antenna Switched RX Diversity, but could conceivably result from a TX Switched Diversity scheme where the device only has one receiver for the band/mode in question). In a most general case, a diversity device may have N receivers that are always active, and M >= N antennas that are mapped to those receivers at any point in time.

In general, the C-TIS value should be measured for each available switch state that is applicable to the use case under test, to ensure the full range of TIS performance possible in the field is characterized.

Exceptions for test time reduction are made where applicable, for example if the manufacturer affirms that C-TIS (at maximum transmit power) is invariant across switch states. In cases where the TX antenna is not uniquely defined based on the which antennas are used in the C-TIS measurement, the device manufacturer shall supply a "truth table" that clearly identifies which TX antenna shall be used for each of the C-TIS test cases (e.g., FS, BHHL, BHHR, HL, HR). The truth table shall be consistent with the software control algorithms activated in the commercial device. For example, in the situation where 1) the TX can switch between antennas A and B, 2) antennas A and B are used for RX for both TX switch states, and 3) the C-TIS is the same for both TX switch states, then the device manufacturer shall specify which antenna will be used for TX.

For test time reduction, note that a single-point offset measurement can be used to characterize C-TIS for one cellular radio mode based on the fully measured C-TIS of another cellular radio mode only if the same antenna/receiver combination (switch state) is applied in both cellular radio modes.

Test reports shall be based on the existing reporting tables and also include the receiver/antenna and transmitter/antenna combination used.

2.1.5.2.1 Devices Where the Receiver Could Switch to a Different RX Antenna During the Execution of the Test Cases

These are devices where the choice of which RX antenna is connected to a receiver is either:

- Not a function of the use case of the device, e.g., the decision is made according to other parameters such as, but not limited to base station control, user control, RX signal level or other means that originate external to the device, or

- A function of both the use case of the device and parameters that are not a function of the use case of the device, e.g., the decision depends on both body (head, hand) loading as well as the RX signal level.

Such a device may change the connection of a receiver from one RX antenna to another antenna, but requires specific inputs from an external control source to do so. At this time, devices of this type must measure C-TIS for each antenna/receiver combination that produces a unique value as follows:

1. For the given device use case (i.e., FS, BHHR/BHHL, HR/HL), band, and cellular radio mode wherein the device supports RX antenna switching, measure C-TIS (including relative sensitivity on intermediate channel testing) for the baseline antenna/receiver combination (switch state) as declared by the device manufacturer. The pass/fail criteria shall apply to this test case.
2. For the additional antenna/receiver combinations (switch states) supported in the band and cellular radio mode:
    a. if the device manufacturer declares that the free space C-TIS in step 1 differs by more than 1 dB from the free space C-TIS that would be obtained in the additional antenna/receiver combination in question: Results for additional antenna configurations shall be reported using duplicate tables with each table labeled to identify the antenna configuration tested.

       Measure the free space C-TIS for the additional antenna/receiver combination (switch state). No pass/fail criteria shall be applied to this test case.

    b. Otherwise, no additional testing is needed.
3. If step 2 doesn't apply, then no additional C-TIS testing is required for any additional receiver/antenna combinations.

The manufacturer shall provide either:

- Equipment and/or software which will allow the test lab to control which RX switch state is used. Or,
- Otherwise identical test devices which are pre-configured for each RX switch state selection.

The device manufacturer shall indicate which frequency bands and cellular radio mode support RX antenna switching in Table RA.1-2 in *CTIA 01.03* [3] and specify the baseline antenna/receiver combination (switch state) to be tested first in the procedure above.

2.1.5.2.2 Devices Where the Receiver Does Not Switch to a Different Antenna During the Execution of the Test Cases

These are devices where the choice of which RX antenna is active is a function of the proximity to the user's hand, head or body, or nearby object and is usually determined by sensors contained within the device. Such a device will switch from one RX antenna to another based on the inputs it receives from its own self-contained sensors. The sensors may detect proximity of human tissue (hand, head or body) or may detect proximity of external objects (tables, seats, etc.). In such a device, it is required that the choice of RX antenna of the device remains the same during the C-TIS testing of the receiver/antenna combination (switch state) under test. Below are listed the basic requirements and conditions for two testing mode options, autonomous and non-autonomous defined for FS, BHHL, BHHR, HR, and HL test cases.

1. Autonomous Mode
    a. If the manufacturer chooses, the device is allowed to operate in a fully autonomous mode where it actively chooses the receiver antenna combination depending on the test case during the C-TIS test.
2. Non-Autonomous Mode
    a. The device manufacturer shall supply a “truth table” that clearly identifies which receiver-antenna combination will be used during C-TIS testing for all of the test cases (FS, BHHL, BHHR, HL, HR).
    b. In addition, the manufacturer shall provide either:
        i. Equipment and/or software which will allow the test lab to control which receiver-antenna combination is used for each test case, per the truth table. Or
        ii. Otherwise identical test devices which are pre-configured for the receiver-antenna selections per the truth table.
    c. The device is allowed to change the receiver-antenna combination that it uses at different RF frequencies within the same band, or when different TX power levels are chosen, or when a different air interface is chosen, or other manufacturer declared conditions, as long as this is clearly indicated in the truth table.

2.1.6 Requirements on Partial Surface Radiated Quantities

Most DUTs subject to OTA performance testing are required to report both average radiated quantities (TRP and TIS) and partial surface radiated quantities (e.g., NHPRP, NHPIS, UHIS, and PIGS). While this level of detail is appropriate for many DUTs, some DUTs could benefit from a reduction in test time if only one of these measurements was required. The determination of which DUTs require partial surface radiated measurements is defined according to the requirements in Table 2.1.6-1 below:

This requirement applies to all 3GPP FR1 wireless technologies.

Table 2.1.6-1: DUTs Requiring Average vs. Partial Surface Radiated Performance Evaluation

DUT Type	Partial Surface Radiated Measurements Required for These Use Cases	Applicable Test Methods	Notes
Handsets; Smartphones	BHHR, BHHL, HR, HL	SISO, Anechoic Chamber	Near horizon measurements needed for BHH and hand only because actual usage matches the OTA test position. Wireless links to base stations are often in directions near the horizon for these use cases. Wireless links to satellites will still be in the upward direction (UHIS, PIGS).
Notebooks; Wireless Access Points; IoT devices where OTA performance in the near horizon is important except large devices (e.g. fixed outdoor installations)	FS	SISO, Anechoic Chamber	Near horizon measurements needed for FS because actual usage matches the OTA test position. Wireless links to base stations are often in directions near the horizon for these use cases. Wireless links to satellites will still be in the upward direction (UHIS, PIGS).
Large IoT devices	None	SISO, Reverberation Chamber	Partial surface quantity measurements are not required because the reverberation chamber is currently the only methodology for testing large IoT devices.
Tablets; Wrist-Worn Devices; Chest-worn devices, Ankle-worn devices, IoT devices not defined elsewhere in this table	None	SISO, Anechoic Chamber; SISO, Reverberation Chamber	Partial surface quantity measurements are not needed because either 1) multiple orientations are used (not fixed) or 2) devices are installed indoors (not outdoors) where multi-path makes near horizon performance less important.

2.1.7 Test Requirements That Are 3GPP FR1 Wireless Technology Specific

In general, all supported 3GPP FR1 Wireless Technology protocols and bands shall be tested, unless otherwise specified within this document. In general, all channels specified in *CTIA 01.50* [10] for applicable protocols and bands shall be tested, unless otherwise specified within this document. In general, the relative sensitivity or TIS of all the intermediate channels specified in *CTIA 01.50* [10] for applicable protocols and bands shall be tested, unless otherwise specified within this document. In the case of fully measured TIS, the same limit as that channel's reference channel shall be applied with a 3 dB margin as per the intermediate channel test procedure. Regardless of test method, intermediate channel results shall be reported as PASS/FAIL.

Relative power on intermediate channel testing is not required unless otherwise specified in this section. Table 2.1.7-1 provides a generic summary of the OTA test requirements for 3GPP FR1 wireless technologies by device type. Test requirements listed elsewhere in the section will supersede this table.

Table 2.1.7-1 Generic Test Requirements by Device Type for 3GPP FR1 Wireless Technologies

DUT Type	Use Case	Comment	TRP	NHPRP	TIS	NHPIS	Relative Sensitivity on Intermediate Channels	Relative Power on Intermediate Channels
Hand-Held Devices	FS		Yes	No	Yes	No	Yes	Yes
	HR	If the device supports data usage in the hand	Yes	Yes	Yes	Yes	No	No
	HL		Yes	Yes	Yes	Yes	No	No
	BHHR	If the device supports voice calls against the head	Yes	Yes	Yes	Yes	Yes	Yes
	BHHL		Yes	Yes	Yes	Yes	No	No
Notebooks; Wireless Access Points; IoT devices where OTA performance in the near horizon is important except large devices (e.g. fixed outdoor installations)	FS		Yes	Yes	Yes	Yes	Yes	Yes
Large IoT devices	FS		Yes	No	Yes	No	No	No
Tablets; IoT devices not defined elsewhere in this table	FS		Yes	No	Yes	No	Yes	Yes
Wrist-Worn Devices	WR or WL	Side with worse OTA performance	Yes	No	Yes	No	Yes	Yes
Chest-Worn Devices	ChW		Yes	No	Yes	No	Yes	Yes
Ankle-Worn Devices	AL		Yes	No	Yes	No	Yes	Yes

2.1.7.1 UMTS

This section is intentionally left empty.

2.1.7.2 LTE Single Carrier

If the device supports LTE Band 25 and LTE Band 2, then testing is only required to be completed in LTE Band 25. If the device supports LTE Band 26 and LTE Band 5, then testing is only required to be completed in LTE Band 26. If the device supports LTE Band 66 and LTE Band 4, then testing is only required to be completed in LTE Band 66.
These test reductions also apply to A-GNSS.

2.1.7.3 LTE CA and LAA

The LTE CA/LAA band combination shall always list the PCC first, and then all SCCs will be listed in ascending order.

When submitting a device for CA and LAA testing, the device manufacturer shall declare the target operator(s) for the device, and the LTE CA and LAA testing shall be limited as described in this section.

The operator CA and LAA priority list is included in *CTIA 01.02* [2].

If the device supports both CA_66A-xA and CA_4A-xA (where x is the band number of the SCC), then testing is only required in CA_66A-xA. Similarly, if the device supports both CA_xA-66A and CA_xA-4A (where x is the band number of the PCC), then testing is only required in CA_xA-66A.

DUTs incapable of supporting the aggregated channel BW associated with the CA or LAA CA modes specified in *CTIA 01.50* [10] do not need to be tested.

Relative sensitivity on intermediate channel testing is not required for LTE LAA and LTE CA.

2.1.7.3.1 LTE CA TRP Test Requirements

Full TRP testing is required in the 2 DL and 3 DL CA combinations identified as “Non-essential, high priority” combinations by the operator CA priority lists (see *CTIA 01.02* [2]) for all of the target operators for the UE under test. Single point offset testing shall not be used for “Non-essential, high priority” combinations.

No additional TRP testing is required for any CA combinations not identified as “Non-essential, high priority”.

2.1.7.3.2 LTE CA TIS Test Requirements

Full TIS testing of the SCC is required for any CA combinations with known self-desensitization issues that are identified as “Essential” in the operator CA priority lists (see *CTIA 01.02* [2]) and are supported on the device (no TIS testing of the PCC is required). Single point offset testing shall not be used for CA combinations with known self-desensitization issues that are identified as “Essential” in the operator CA priority lists.

Full TIS testing of the SCC is required for any CA combinations with known self-desensitization issues that are identified as “Essential Conditional” (no testing of the PCC is required). However, CA combinations that are identified as “Essential Conditional” may be tested as part of a higher order, non-essential CA combination that includes the corresponding LTE PCC and SCC combination. Single point offset testing shall not be used for CA combinations with known self-desensitization issues that are identified as “Essential Conditional” in the operator CA priority lists.

TIS testing (PCC and all SCC’s) is required in the 2 DL and 3 DL CA combinations identified as “Non-essential, high priority” combinations by the operator CA priority lists for all of the target operators for the UE under test. Single point offset testing may be used for ”Non-essential, high priority” combinations unless a higher order, non-essential combination is used to test an “Essential Conditional” combination. When testing an “Essential Conditional” combination as part of a “Non-essential, high priority” combination, full TIS testing is required for the SCC that corresponds to the “Essential Conditional” combination (single point offset testing may be used for TIS testing of any other CC’s).. If a single point offset test results in a TIS value that deviates more than 3 dB from the TIS of the fully tested reference, then a full TIS measurement is required.

No additional TIS testing is required for any CA combinations not identified as “Essential”, “Essential Conditional”, or “Non-essential, high priority”.

2.1.7.3.3 LTE LAA TIS Test and LAA un-Licensed Degradation Test Requirements (Informative)

Full TIS testing is required on Band 46 for one 2 CC LAA combination as defined by the logic in Figure 2.1.7.3.3-1.

Band 46 radiated sensitivity performance for all other 2 CC and 3 CC LAA combinations that are identified by the operator LAA priority lists for all of the target operators for the UE under test shall be evaluated using the LAA Un-Licensed Degradation Test defined in *CTIA 01.50* [10].

No additional Band 46 TIS testing is required.

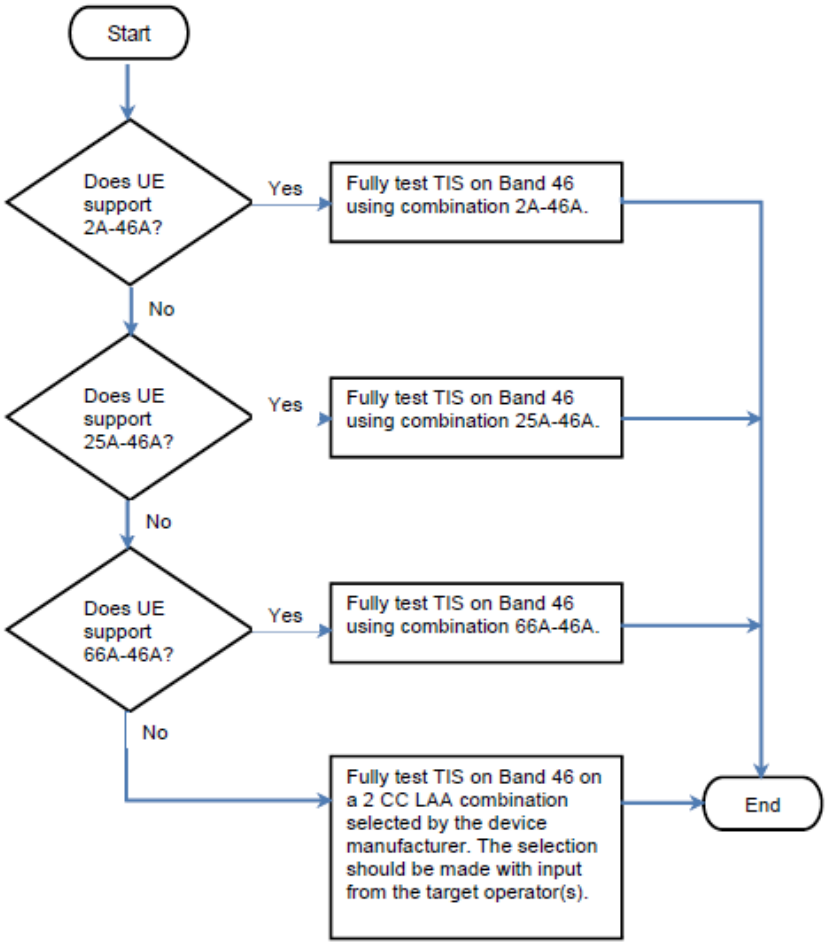

Figure 2.1.7.3.3-1 Logic for Determining the LAA Combination Used for Full TIS Testing of Band 46

2.1.7.3.4 Test Reduction When NR FR1 DL CA or NR FR1 EN-DC Is Supported

For devices that support LTE CA and either NR FR1 SA DL CA or NR FR1 EN-DC, LTE CA testing may be reduced when the LTE CA combination overlaps with an equivalent 5G NR FR1 SA DL CA or 5G NR FR1 EN-DC combination as described below:

If for a supported LTE CA combination on the Operator Priority List, ALL of the following are true:

a) There is a fully tested (based on device type) FR1 SA DL CA combination with the LTE equivalent NR FR1 SA bands. The total number of CC's is the same between the LTE

CA combination and the FR1 SA DL CA combination. Each CC in the LTE CA combination maps to one and only one CC in the FR1 SA DL CA combination

b) The LTE PCC and SCC bands are the same as the equivalent NR FR1 SA PCC and SCC bands.

c) For the PCC, each TX antenna for LTE is the same as a TX antenna that was fully tested (based on device type) for the PCC in the equivalent NR FR1 SA DL d) CA combination. For devices that support TX antenna switching, the TX antenna switch state is the same between the LTE PCC in the LTE CA combination and the PCC in the equivalent NR FR1 SA DL CA combination.

d) For the individual PCC and SCC(s), each RX antenna for LTE is the same as a RX antenna that was fully tested (based on device type) for the corresponding CC in the equivalent NR FR1 SA DL CA combination. The RX antenna topology (i.e. 2 RX, 4 RX, 8 RX) is the same for each CC in the LTE CA combination and the corresponding CC in the equivalent NR FR1 SA DL CA combination.

e) Per device manufacturer declaration, the antenna tuning state is the same for each CC in the LTE CA combination and the corresponding CC in the equivalent NR FR1 SA DL CA combination.

Then LTE CA testing may be omitted for the given combination.

Else if all of the criteria above (i.e. a, b, c, d, e) are met except the device supports TX antenna switching, and a TX antenna switch state for the LTE PCC in the LTE CA combination is not fully tested for the PCC in the equivalent NR FR1 SA DL CA combination:

Then full testing of the LTE CA combination for the un-tested TX antenna switch state(s) is required. No other LTE CA testing is required for the given combination.

Else if for a supported LTE CA combination on the Operator Priority List, if ALL of the following are true:

f) There is a fully tested (based on device type) FR1 EN-DC combination with the same bands (LTE and equivalent NR FR1 bands) as the LTE CA combination. The total number of CC's is the same between the LTE CA combination and the FR1 EN-DC combination. Each CC in the LTE CA combination maps to one and only one CC in the FR1 EN-DC combination.

g) The LTE PCC is the same between the LTE CA combination and the FR1 EN-DC combination, or the NR PSCell in the FR1 EN-DC combination is the NR equivalent band for the LTE PCC in the LTE CA combination.

h) For the LTE PCC in the LTE CA combination, each TX antenna is the same as a TX antenna that was fully tested (based on device type) for the corresponding CC (LTE PCC or NR PSCell) in the FR1 EN-DC combination. For devices that support TX antenna switching, the TX antenna switch state is the same between the LTE PCC in the LTE CA combination and the corresponding CC (LTE PCC or NR PSCell) in the FR1 EN-DC combination.

i) For the individual LTE PCC and SCC(s) in the LTE CA combination, each RX antenna is the same as a RX antenna that was fully tested (based on device type) for the corresponding CC in the FR1 EN-DC combination. The RX antenna topology (i.e. 2 RX, 4 RX, 8 RX) is the same for each CC in the LTE CA combination and the corresponding CC in the FR1 EN-DC combination.

j) Per device manufacturer declaration, the antenna tuning state is the same for each CC in the LTE CA combination and the corresponding CC in the FR1 EN-DC combination.

Then LTE CA testing may be omitted for the given LTE CA combination with the following exception: If the LTE CA combination is either an “essential” or an “essential conditional” combination per the Operator Priority List, the C-TIS testing prescribed by the “essential” and “essential conditional” sections of the Operator Priority List is still required, but a single point offset test using the pattern measurement from the EN-DC C-TIS testing may be used.

Else if all of the criteria above (i.e. f, g, h, i, j) are met except the device supports TX antenna switching, and a TX antenna switch state for the LTE PCC in the LTE CA combination is not fully tested for the corresponding CC (LTE PCC or NR PSCell) in the FR1 EN-DC combination:

Then full testing of the LTE CA combination for the un-tested TX antenna switch state(s) is required. No other LTE CA testing is required for the given combination. If the LTE CA combination is either an “essential” or an “essential conditional” combination per the Operator Priority List, the C-TIS testing prescribed by the “essential” and “essential conditional” sections of the Operator Priority List is still required for all TX antenna switch states, but a single point offset test using the pattern measurement from the EN-DC C-TIS testing may be used.

Else full testing of the LTE CA combination is required.

2.1.7.4 LTE Category M1 and Category NB1

Relative sensitivity on intermediate channel testing is not required for LTE Category M1 and LTE Category NB1. If the device supports LTE Category M1 Band 26 and LTE Category M1 Band 5, then testing is only required to be completed in LTE Category M1 Band 26. If the device supports LTE Category NB1 Band 25 and LTE Category NB1 Band 2, then testing is only required to be completed in LTE Category NB1 Band 25. If the device supports LTE Category NB1 Band 26 and LTE Category NB1 Band 5, then testing is only required to be completed in LTE Category NB1 Band 26. If the device supports LTE Category NB1 Band 66 and LTE Category NB1 Band 4, then testing is only required to be completed in LTE Category NB1 Band 66.

LTE Category M1 and LTE Category NB1 device vendors should consult the target operator(s) prior to device submission. If LTE Category M1 and/or LTE Category NB1 TRP and TIS testing is required by the target operator(s), the device vendor shall provide specific information concerning the frequency bands, cellular radio mode and mechanical use cases to be evaluated when submitting the device for testing.

If the LTE Category M1 and/or LTE Category NB1 device is not targeted for a specific operator(s), then perform testing as follows:

- If LTE Category M1 is supported, then TRP/TIS testing shall be executed in all supported bands included in the list below:
    - Band 4
    - Band 5
    - Band 12
    - Band 13

  Note: If LTE Category M1 and LTE Category NB1 are both supported in one or more bands, then LTE Category M1 testing is the only cellular radio mode required in the supported bands.

- If LTE Category NB1 is supported, then TRP/TIS testing shall be executed in all supported bands included in the list below unless otherwise noted:

- Band 4
- Band 5
- Band 12
- Band 13
- Band 66

Note: If Bands 4 and 66 are supported in LTE Category NB1, then testing shall be executed in Band 66; Band 4 testing is not required in this case.

2.1.7.5 NR FR1 SA Single Carrier

If the device supports NR Band n25 and NR Band n2, then testing is only required to be completed in NR Band n25. If the device supports NR Band n26 and NR Band n5, then testing is only required to be completed in NR Band n26.

Relative sensitivity on intermediate channel testing is required for NR FR1 SA single carrier.

Relative power on intermediate channel testing is required for wide frequency bands in NR FR1 SA single carrier as defined in *CTIA 01.51* [11] Section 5.1.1.1.1.

2.1.7.6 NR FR1 EN-DC (1-2 LTE Carriers with 1 NR Carrier)

When submitting a device for NR FR1 EN-DC testing, the device manufacturer shall declare the target operator(s) for the device, and the NR FR1 EN-DC testing shall be limited as described in this section.

Test all NR FR1 EN-DC combinations per the Operator Priority List. The operator NR FR1 EN-DC priority list is included in *CTIA 01.02* [2].

When submitting a device for NR FR1 EN-DC testing, the device manufacturer shall declare the target operator(s) for the device, and the NR FR1 EN-DC testing shall be limited as described in the operator priority list included in *CTIA 01.02* [2].
The PTCRB Variant ID is used to uniquely identify settings associated with a particular combination of bands in NR FR1 EN-DC. The PTCRB Variant ID defines 1) the MCG/SCG and PCC/SCC, 2) bandwidths of each CC in the band combination, and 3) the SCS for NR bands.

Relative sensitivity and relative power on intermediate channel testing is not required for NR FR1 EN-DC.

2.1.7.6.1 NR FR1 EN-DC TRP Test Requirements

Full TRP testing is required for the NR FR1 EN-DC combinations identified as “Non-essential, high priority” combinations by the operator NR FR1 EN-DC priority lists (see *CTIA 01.02* [2]) for all of the target operators for the UE under test. Single point offset testing shall not be used for “Non-essential, high priority” combinations.

No additional TRP testing is required for any NR FR1 EN-DC combinations not identified as “Non-essential, high priority”.

2.1.7.6.2 NR FR1 EN-DC TIS Test Requirements

Full TIS testing of the LTE PCell and the NR PSCell is required for any NR FR1 EN-DC combinations with known self-desensitization issues that are identified as “Essential” in the operator NR FR1 EN-DC priority lists (see *CTIA 01.02* [2]) and are supported on the device. Single point offset testing shall not be used for NR FR1 EN-DC combinations with known self-desensitization issues that are identified as “Essential” in the operator NR FR1 EN-DC priority lists.

Full TIS testing of the LTE PCell and the NR PSCell is required for any NR FR1 EN-DC combinations with known self-desensitization issues that are identified as “Essential Conditional”. However, NR FR1 EN-DC combinations that are identified as “Essential Conditional” may be tested as part of a higher order, non-essential FR1 EN-DC combination that includes the corresponding LTE PCell and NR PSCell combination. Single point offset testing shall not be used for NR FR1 EN-DC combinations with known self-desensitization issues that are identified as “Essential Conditional” in the operator NR FR1 EN-DC priority lists.

TIS testing of all LTE and NR CC’s is required for the NR FR1 EN-DC combinations identified as “Non-essential, high priority” combinations by the operator NR FR1 EN-DC priority lists for all of the target operators for the UE under test. Single point offset testing may be used for “Non-essential, high priority” combinations unless a higher order, non-essential NR FR1 EN-DC combination is used to test an “Essential Conditional” combination. When testing an “Essential Conditional” combination as part of a non-essential NR FR1 EN-DC combination, full TIS testing is required for the LTE PCell and NR PSCell that correspond to the “Essential Conditional” combination (single point offset testing may be used for TIS testing of any other CC’s). If a single point offset test results in a TIS value that deviates more than 3 dB from the TIS of the fully tested reference, then a full TIS measurement is required.

No additional TIS testing is required for any NR FR1 EN-DC combinations not identified as “Essential”, “Essential Conditional”, or “Non-essential, high priority”.

2.1.7.7 NR FR1 SA DL CA (Single UL Carrier)

When submitting a device for CA testing, the device manufacturer shall declare the target operator(s) for the device, and the NR FR1 SA DL CA (single UL carrier) testing shall be limited as described in this section.

The operator CA priority list is included in *CTIA 01.02* [2].

DUTs incapable of supporting the aggregated channel BW associated with the NR FR1 SA DL CA modes specified in *CTIA 01.50* [10] do not need to be tested.

Relative sensitivity on intermediate channel and relative power testing is not required for NR FR1 SA DL CA.

2.1.7.7.1 NR FR1 SA DL CA TRP Test Requirements

Full TRP testing is required in the 2 DL and 3 DL CA combinations identified as “Non-essential, high priority combinations” by the operator CA priority lists (see *CTIA 01.02* [2]) for all of the target operators for the UE under test. Single point offset testing shall not be used for “Non-essential, high priority” combinations.

No additional TRP testing is required for any DL CA combinations not identified as “Non-essential, high priority”.

2.1.7.7.2 NR FR1 SA DL CA TIS Test Requirements

Full TIS testing of the SCC is required for any DL CA combinations with known self-desensitization issues that are identified as “Essential” in the operator CA priority lists (see *CTIA 01.02* [2]) and are supported on the device (no TIS testing of the PCC is required). Single point offset testing shall not be used for DL CA combinations with known self-desensitization issues that are identified as “Essential” in the operator CA priority lists.

Full TIS testing of the SCC is required for any DL CA combinations with known self-desensitization issues that are identified as “Essential Conditional” (no TIS testing of the PCC is required). However, DL CA combinations that are identified as “Essential Conditional” may be tested as part of a higher order, non-essential DL CA combination that includes the corresponding NR PCC and SCC combination. Single

point offset testing shall not be used for DL CA combinations with known self-desensitization issues that are identified as “Essential Conditional” in the operator CA priority lists.

TIS testing (PCC and all SCC's) is required in the 2 DL and 3 DL CA combinations identified as “Non-essential, high priority” combinations by the operator CA priority lists for all of the target operators for the UE under test. Single point offset testing may be used for “Non-essential, high priority” combinations unless a higher order, non-essential combination is used to test an “Essential Conditional” combination. When testing an “Essential Conditional” combination as part of a “Non-essential, high priority” combination, full TIS testing is required for the SCC that corresponds to the “Essential Conditional” combination (single point offset testing may be used for TIS testing of any other CC’s). If a single point offset test results in a TIS value that deviates more than 3 dB from the TIS of the fully tested reference, then a full TIS measurement is required.

No additional TIS testing is required for any DL CA combinations not identified as “Essential”, “Essential Conditional”, or “Non-essential, high priority”.

2.1.7.8 NR FR1 SA UL CA (with 2 or 3 DL CA)

OTA testing for NR FR1 SA UL CA is limited to NR FR1 SA two/three downlink carrier aggregation with two inter band uplink carrier aggregation where the uplink carriers generate self-interference to one or more of the downlink carriers.

When submitting a device for CA testing, the device manufacturer shall declare the target operator(s) for the device, and the NR FR1 SA UL CA desense testing shall be limited as described in this section.

The operator CA priority list is included in *CTIA 01.02* [2].

DUTs incapable of supporting the aggregated channel BW associated with the NR FR1 SA CA modes specified in *CTIA 01.50* [10] do not need to be tested.

If the device supports TX antenna switching for a given combination under test, the device manufacturer shall declare the TX antenna switch state that results in the worst case desense to the victim channel, and only testing of this worst case TX antenna switch state is required.

Relative sensitivity on intermediate channel and relative power testing is not required for NR FR1 SA UL CA.

2.1.7.8.1 NR FR1 SA UL CA TRP Test Requirements

Full TRP testing is required for both the PCC and the UL SCC in the 2 UL CA desense combinations identified as “Non-essential, high priority combinations” by the operator CA priority lists (see *CTIA 01.02* [2]) for all of the target operators for the UE under test. Single point offset testing shall not be used for “Non-essential, high priority” combinations.

2.1.7.8.2 NR FR1 SA UL CA TIS Test Requirements

TIS testing of the victim CC (either PCC, SCC/SCC1, or SCC2) is required in the 2 UL CA desense combinations identified as “Non-essential, high priority” combinations by the operator CA priority lists for all of the target operators for the UE under test. Single point offset testing shall not be used.

2.1.7.9 NR FR1 RedCap

If the device supports NR Band n25 and NR Band n2, then testing is only required to be completed in NR Band n25. If the device supports NR Band n26 and NR Band n5, then testing is only required to be completed in NR Band n26.

Relative sensitivity on intermediate channel testing is required for NR FR1 RedCap.

Relative power on intermediate channel testing is required for wide frequency bands in NR FR1 Recap as defined in CTIA 01.51 [11] Section 5.1.6.1.1.

2.1.7.10 Summary of 3GPP FR1 Wireless Technology Specific Test Requirements

Table 2.1.7.10-1 lists the rules that determine how devices that support 3GPP FR1 wireless technologies will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.7.10-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1. Some requirements will have more details elsewhere in Section 2.1.7 and some requirements will only be in Table 2.1.7.10-1.

Table 2.1.7.10-1 Test Requirements for Devices that Support 3GPP FR1 Wireless Technologies

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
all1.0-1	all	N/A	Relative power on intermediate channel testing is not required except for wide frequency bands in NR FR1 SA single carrier as defined in *CTIA 01.51* [11] Section 5.1.1.1.1.
all4.1.1-1	LTE (single carrier)	all	If the device supports LTE Band 25 and LTE Band 2, then testing is only required to be completed with LTE Band 25. If the device supports LTE Band 26 and LTE Band 5, then testing is only required to be completed with LTE Band 26. If the device supports LTE Band 66 and LTE Band 4, then testing is only required to be completed with LTE Band 66.
all4.2.0-1	LTE CA	N/A	If the device supports both CA_66A-xA and CA_4A-xA (where x is the band number of the SCC), then testing is only required in CA_66A-xA. Similarly, if the device supports both CA_xA-66A and CA_xA-4A (where x is the band number of the PCC), then testing is only required in CA_xA-66A.
all4.2.0-2	LTE CA	N/A	DUTs incapable of supporting the aggregated channel BW associated with the CA or LAA CA modes specified in *CTIA 01.50* [10] do not need to be tested.
all4.2.0-3	LTE CA	N/A	Relative sensitivity on intermediate channel testing is not required for LTE LAA and LTE CA.
all4.2.0-4	LTE CA	N/A	Full TRP testing is required in the 2 DL and 3 DL CA combinations identified as “Non-essential, high priority” combinations by the operator CA priority lists (see *CTIA 01.02* [2]) for all of the target operators for the UE under test. Single point offset testing shall not be used for “Non-essential, high priority” combinations.
all4.2.0-5	LTE CA	N/A	No additional TRP testing is required for any CA combinations not identified as “Non-essential, high priority”.
all4.2.0-6	LTE CA	N/A	Full TIS testing of the SCC is required for any CA combinations with known self-desensitization issues that are identified as “Essential” in the operator CA priority lists (see *CTIA 01.02* [2]) and are supported on the device (no TIS testing of the PCC is required). Single point offset testing shall not be used for CA combinations with known self-desensitization issues that are identified as “Essential” in the operator CA priority lists.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
all4.2.0-7	LTE CA	N/A	Full TIS testing of the SCC is required for any CA combinations with known self-desensitization issues that are identified as “Essential Conditional” (no testing of the PCC is required). However, CA combinations that are identified as “Essential Conditional” may be tested as part of a higher order, non-essential CA combination that includes the corresponding LTE PCC and SCC combination. Single point offset testing shall not be used for CA combinations with known self-desensitization issues that are identified as “Essential Conditional” in the operator CA priority lists.
all4.2.0-8	LTE CA	N/A	TIS testing (PCC and all SCC's) is required in the 2 DL and 3 DL CA combinations identified as “Non-essential, high priority” combinations by the operator CA priority lists for all the target operators for the UE under test. Single point offset testing may be used for ”Non-essential, high priority” combinations unless a higher order, non-essential combination is used to test an “Essential Conditional” combination. When testing an “Essential Conditional” combination as part of a “Non-essential, high priority” combination, full TIS testing is required for the SCC that corresponds to the “Essential Conditional” combination (single point offset testing may be used for TIS testing of any other CC’s).. If a single point offset test results in a TIS value that deviates more than 3 dB from the TIS of the fully tested reference, then a full TIS measurement is required.
all4.2.0-9	LTE CA	N/A	No additional TIS testing is required for any CA combinations not identified as “Essential”, “Essential Conditional”, or “Non-essential, high priority”.
all4.2.0-10	LTE CA	N/A	For devices that support both NR FR1 EN-DC and LTE CA, LTE CA testing may be reduced when the LTE CA combination overlaps with an equivalent NR FR1 EN-DC combination as described in Section 2.1.7.6.3.
all4.2.0-11	LTE CA	N/A	For devices that support both NR FR1 SA DL CA and LTE CA, LTE CA testing may be reduced when the LTE CA combination overlaps with an equivalent 5G NR FR1 SA DL CA or 5G NR FR1 EN-DC combination as described in Section 2.1.7.7.3.
all4.3.0-1	LTE Category M1	N/A	Relative sensitivity on intermediate channel testing is not required for LTE Category M1.
all4.3.0-2	LTE Category M1	N/A	If the device supports LTE Category M1 Band 26 and LTE Category M1 Band 5, then testing is only required to be completed in LTE Category M1 Band 26.
all4.3.0-3	LTE Category M1	N/A	See Section 2.1.7.4 for which LTE Category M1 bands require testing.
all4.4.0-1	LTE Category NB1	N/A	Relative sensitivity on intermediate channel testing is not required for LTE Category NB1.
all4.4.0-2	LTE Category NB1	N/A	If the device supports LTE Category NB1 Band 25 and LTE Category NB1 Band 2, then testing is only required to be completed in LTE Category NB1 Band 25. If the device supports LTE Category NB1 Band 26 and LTE Category NB1 Band 5, then testing is only required to be completed in LTE Category NB1 Band 26. If the device supports LTE Category NB1 Band 66 and LTE Category NB1 Band 4, then testing is only required to be completed in LTE Category NB1 Band 66.
all4.4.0-3	LTE Category NB1	N/A	See Section 2.1.7.4 for which LTE Category NB1 bands require testing.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
all5.1.0-1	NR FR1 SA (single carrier)	N/A	Relative sensitivity on intermediate channel testing is required for NR FR1 SA single carrier.
all5.1.0-2	NR FR1 SA (single carrier)	N/A	Relative power on intermediate channel testing is required for wide frequency bands in NR FR1 SA single carrier as defined in *CTIA 01.51* [11] Section 5.1.1.1.1.
all5.1.1-1	NR FR1 SA (single carrier)	all	If the device supports NR Band n25 and NR Band n2, then testing is only required to be completed in NR Band n25. If the device supports NR Band n26 and NR Band n5, then testing is only required to be completed in NR Band n26.
all5.2.0-1	NR FR1 EN-DC	N/A	When submitting a device for NR FR1 EN-DC testing, the device manufacturer shall declare the target operator(s) for the device, and the NR FR1 EN-DC testing shall be limited as described in the operator priority list included in *CTIA 01.02* [2].
all5.2.0-2	NR FR1 EN-DC	N/A	Relative sensitivity and relative power on intermediate channel testing is not required for NR FR1 EN-DC.
all5.2.0-3	NR FR1 EN-DC	N/A	Full TRP testing is required for the NR FR1 EN-DC combinations identified as “Non-essential, high priority” combinations by the operator NR FR1 EN-DC priority lists (see *CTIA 01.02* [2]) for all of the target operators for the UE under test. Single point offset testing shall not be used for “Non-essential, high priority” combinations.
all5.2.0-4	NR FR1 EN-DC	N/A	No additional TRP testing is required for any NR FR1 EN-DC combinations not identified as “Non-essential, high priority”.
all5.2.0-5	NR FR1 EN-DC	N/A	Full TIS testing of the LTE PCell and the NR PSCell is required for any NR FR1 EN-DC combinations with known self-desensitization issues that are identified as “Essential” in the operator NR FR1 EN-DC priority lists (see *CTIA 01.02* [2]) and are supported on the device. Single point offset testing shall not be used for NR FR1 EN-DC combinations with known self-desensitization issues that are identified as “Essential” in the operator NR FR1 EN-DC priority lists.
all5.2.0-6	NR FR1 EN-DC	N/A	Full TIS testing of the LTE PCell and the NR PSCell is required for any NR FR1 EN-DC combinations with known self-desensitization issues that are identified as “Essential Conditional”. However, NR FR1 EN-DC combinations that are identified as “Essential Conditional” may be tested as part of a higher order, non-essential FR1 EN-DC combination that includes the corresponding LTE PCell and NR PSCell combination. Single point offset testing shall not be used for NR FR1 EN-DC combinations with known self-desensitization issues that are identified as “Essential Conditional” in the operator NR FR1 EN-DC priority lists.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
all5.2.0-7	NR FR1 EN-DC	N/A	TIS testing of all LTE and NR CC's is required for the NR FR1 EN-DC combinations identified as "Non-essential, high priority" combinations by the operator NR FR1 EN-DC priority lists for all of the target operators for the UE under test. Single point offset testing may be used for "Non-essential, high priority" combinations unless a higher order, non-essential NR FR1 EN-DC combination is used to test an "Essential Conditional" combination. When testing an "Essential Conditional" combination as part of a non-essential NR FR1 EN-DC combination, full TIS testing is required for the LTE PCell and NR PSCell that correspond to the "Essential Conditional" combination (single point offset testing may be used for TIS testing of any other CC's). If a single point offset test results in a TIS value that deviates more than 3 dB from the TIS of the fully tested reference, then a full TIS measurement is required.
all5.2.0-8	NR FR1 EN-DC	N/A	No additional TIS testing is required for any NR FR1 EN-DC combinations not identified as "Essential", "Essential Conditional", or "Non-essential, high priority".
all5.3.0-1	NR FR1 SA CA	N/A	DUTs incapable of supporting the aggregated channel BW associated with the NR FR1 SA DL CA modes specified in *CTIA 01.50* [10] do not need to be tested.
all5.3.0-2	NR FR1 SA CA	N/A	Relative sensitivity and relative power on intermediate channel testing is not required for NR FR1 SA DL CA.
all5.3.0-3	NR FR1 SA CA	N/A	Full TRP testing is required in the 2 DL and 3 DL CA combinations identified as "Non-essential, high priority combinations" by the operator CA priority lists (see *CTIA 01.02* [2]) for all of the target operators for the UE under test. Single point offset testing shall not be used for "Non-essential, high priority" combinations.
all5.3.0-4	NR FR1 SA CA	N/A	No additional TRP testing is required for any DL CA combinations not identified as "Non-essential, high priority".
all5.3.0-5	NR FR1 SA CA	N/A	Full TIS testing of the SCC is required for any DL CA combinations with known self-desensitization issues that are identified as "Essential" in the operator CA priority lists (see *CTIA 01.02* [2]) and are supported on the device (no TIS testing of the PCC is required). Single point offset testing shall not be used for DL CA combinations with known self-desensitization issues that are identified as "Essential" in the operator CA priority lists.
all5.3.0-6	NR FR1 SA CA	N/A	Full TIS testing of the SCC is required for any DL CA combinations with known self-desensitization issues that are identified as "Essential Conditional" (no TIS testing of the PCC is required). However, DL CA combinations that are identified as "Essential Conditional" may be tested as part of a higher order, non-essential DL CA combination that includes the corresponding NR PCC and SCC combination. Single point offset testing shall not be used for DL CA combinations with known self-desensitization issues that are identified as "Essential Conditional" in the operator CA priority lists.
all5.3.0-7	NR FR1 SA CA	N/A	TIS testing (PCC and all SCC's) is required in the 2 DL and 3 DL CA combinations identified as "Non-essential, high priority" combinations by the operator CA priority lists for all of the target operators for the UE under test. Single point offset testing may be used for "Non-essential, high priority" combinations unless a higher order, non-essential combination is used to test an "Essential Conditional" combination. When testing an "Essential Conditional" combination as part of a "Non-essential, high priority" combination, full TIS testing is required for the SCC that corresponds to the "Essential Conditional" combination (single point offset testing may be used for TIS testing of any other CC's). If a single point offset test results in a TIS value that deviates more than 3 dB from the TIS of the fully tested reference, then a full TIS measurement is required.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
all5.3.0-8	NR FR1 SA CA	N/A	No additional TIS testing is required for any DL CA combinations not identified as “Essential”, “Essential Conditional”, or “Non-essential, high priority”.
all5.4.0-1	NR FR1 SA UL CA	N/A	DUTs incapable of supporting the aggregated channel BW associated with the NR FR1 SA CA modes specified in *CTIA 01.50* [10] do not need to be tested.
all5.4.0-2	NR FR1 SA UL CA	N/A	Relative sensitivity and relative power on intermediate channel testing is not required for NR FR1 SA UL CA.
all5.4.0-3	NR FR1 SA UL CA	N/A	If the device supports TX antenna switching for a given combination under test, the device manufacturer shall declare the TX antenna switch state that results in the worst case desense to the victim channel, and only testing of this worst case TX antenna switch state is required.
all5.4.0-4	NR FR1 SA UL CA	N/A	Full TRP testing is required for both the PCC and the UL SCC in the 2 UL CA desense combinations identified as “Non-essential, high priority combinations” by the operator CA priority lists (see *CTIA 01.02* [2]) for all of the target operators for the UE under test. Single point offset testing shall not be used for “Non-essential, high priority” combinations.
all5.4.0-5	NR FR1 SA UL CA	N/A	TIS testing of the victim CC (either PCC, SCC/SCC1, or SCC2) is required in the 2 UL CA desense combinations identified as “Non-essential, high priority” combinations by the operator CA priority lists for all of the target operators for the UE under test. Single point offset testing shall not be used.
all5.4.0-6	NR FR1 SA UL CA	N/A	No additional TIS testing is required beyond “non-essential, high priority” combinations.
all5.5.0-1	NR FR1 SA (single carrier)	N/A	Relative sensitivity on intermediate channel testing is required for NR FR1 RedCap.
all5.5.0-2	NR FR1 SA (single carrier)	N/A	Relative power on intermediate channel testing is required for wide frequency bands in NR FR1 Recap as defined in *CTIA 01.51* [11] Section 5.1.6.1.1.
All5.5.1-1	NR FR1 RedCap	all	If the device supports NR Band n25 and NR Band n2, then testing is only required to be completed in NR Band n25. If the device supports NR Band n26 and NR Band n5, then testing is only required to be completed in NR Band n26.

Table 2.1.7.10-2 lists which test IDs apply to the various test cases associated with devices that support 3GPP FR1 wireless technologies.

Table 2.1.7.10-2 Test IDs Applying to Various Test Cases for Devices that Support 3GPP FR1 Wireless Technologies

3GPP Protocol	Location Based Protocol	TRP for Applicable Use Cases	TIS for Applicable Use Cases	Rel. Sense for Applicable Use Cases	Rel. Power for Applicable Use Cases	Inter. Channel Degrad. for Applicable Use Cases
all	N/A				all1.0-1	
all	all					
GSM	N/A					
GPRS	N/A					
EGPRS	N/A					
UMTS	N/A					
LTE (single carrier)	all	all4.1.1-1	all4.1.1-1	all4.1.1-1	all4.1.1-1	all4.1.1-1
LTE CA	N/A	all4.2.0-1, all4.2.0-2, all4.2.0-4, all4.2.0-5, all4.2.0-10, all4.2.0-11	all4.2.0-1, all4.2.0-2, all4.2.0-6, all4.2.0-7, all4.2.0-8, all4.2.0-9, all4.2.0-10, all4.2.0-11	all4.2.0-3	all4.2.0-3	
LTE LAA	N/A	all4.2.0-2	all4.2.0-2	all4.2.0-3	all4.2.0-3	
LTE Category M1	N/A	all4.3.0-1, all4.3.0-2	all4.3.0-1, all4.3.0-2	all4.3.0-1		all4.3.0-1, all4.3.0-2
LTE Category NB1	N/A	all4.4.0-2, all4.4.0-3	all4.4.0-2, all4.4.0-3	all4.4.0-1		
NR FR1 SA (single carrier)	N/A			all5.1.0-1	all5.1.0-2	
NR FR1 SA (single carrier)	all	all5.1.1-1	all5.1.1-1	all5.1.1-1	all5.1.1-1	all5.1.1-1
NR FR1 EN-DC	N/A	all5.2.0-1, all5.2.0-3, all5.2.0-4	all5.2.0-1, all5.2.0-5, all5.2.0-6, all5.2.0-7, all5.2.0-8	all5.2.0-2	all5.2.0-2	
NR FR1 SA CA	N/A	all5.3.0-1, all5.3.0-3, all5.3.0-4	all5.3.0-1, all5.3.0-5, all5.3.0-6, all5.3.0-7, all5.3.0-8	all5.3.0-2	all5.3.0-2	

3GPP Protocol	Location Based Protocol	TRP for Applicable Use Cases	TIS for Applicable Use Cases	Rel. Sense for Applicable Use Cases	Rel. Power for Applicable Use Cases	Inter. Channel Degrad. for Applicable Use Cases
NR FR1 SA UL CA	N/A	all5.4.0-1, all5.4.0-4	all5.4.0-1, all5.4.0-5, all5.4.0-6	all5.4.0-2, all5.4.0-3	all5.4.0-2	
NR FR1 RedCap	N/A			all5.1.0-1	all5.1.0-2	
NR FR1 RedCap	all	all5.1.1-1	all5.1.1-1	all5.1.1-1	all5.1.1-1	all5.1.1-1

2.1.8 Test Requirements That Are Location Based Wireless Technologies Specific

2.1.8.1 Generic A-GNSS Test Requirements

A-GNSS devices shall be tested for A-GPS L1, A-GPS L5, A-GALILEO E1 and A-GALILEO E5A if applicable.

The test applies to both UE-based and UE-assisted A-GNSS devices. If both UE-based and UE-assisted A-GNSS are supported by a device, then both modes will be tested unless otherwise specified.

If a device supports both UE-based and UE-assisted GNSS methods, then the radiated A-GNSS intermediate channel degradation measurement will be limited to UE-assisted A-GNSS. In this case, the radiated A-GNSS intermediate channel degradation results will apply to both UE-assisted and UE-based A-GNSS.

More specific test requirements listed elsewhere in this document will supersede the tables in this section. Table 2.1.8.1-1 provides a generic summary of the OTA test requirements for A-GNSS by device type.

Table 2.1.8.1-1 Generic Test Requirements by Device Type for A-GNSS

DUT Type	Use Case	Comment	TIS / Average 3D C/N_0	UHIS / UH 3D C/N_0	PIGS / PIG 3D C/N_0	Intermediate Channel Degradation to A-GNSS
Hand-Held Devices	FS		No	No	No	No
	HR	If the device supports data usage in the hand	Yes	Yes	Yes	Yes
	HL		Yes	Yes	Yes	No
	BHHR	If the device supports voice calls against the head	Yes	Yes	Yes	Yes
	BHHL		Yes	Yes	Yes	No

DUT Type	Use Case	Comment	TIS / Average 3D C/N_0	UHIS / UH 3D C/N_0	PIGS / PIG 3D C/N_0	Intermediate Channel Degradation to A-GNSS
Notebooks; Wireless Access Points; IoT devices where OTA performance in the near horizon is important except large devices (e.g. fixed outdoor installations)	FS		Yes	Yes	Yes	Yes
Large IoT devices	FS		No	No	No	No
Tablets; IoT devices not defined elsewhere in this table	FS		Yes	No	No	Yes
Wrist-Worn Devices	WR or WL	Side with worse OTA performance	Yes	No	No	Yes
Chest-Worn Devices	Ch		Yes	No	No	Yes
Ankle-Worn Devices	AL	Left side only	Yes	No	No	Yes

Table 2.1.8.1-2 provides a summary of the OTA test requirements for A-GNSS when different cellular protocols are used for assistance.

Table 2.1.8.1-2 A-GNSS Test Requirements When Different Cellular Protocols Are Used for Assistance

	Control Plane		User Plane			
			RRLP		LPP	
	UE-Based	UE-Assisted	UE-Based	UE-Assisted	UE-Based	UE-Assisted
GSM	Required If Supported	Required If Supported	Not Supported	Not Supported	Not Supported	Not Supported
UMTS	Required If Supported	Required If Supported	Not Supported	Not Supported	Not Supported	Not Supported
LTE	Required[1,2]	Required[1,2]	Not Required	Required[1,3]	Not Required	Required[1,3]
NR FR1 EN-DC	Required[1,2]	Required[1,2]	Not Required	Required[1,3]	Not Required	Required[1,3]
NR FR1 SA	Required[1,2]	Required[1,2]	Not Required	Not Required	Not Required	Required[1,3]

Note 1: A-GNSS testing is only required in either User Plane or Control Plane and the positioning procedure used for test shall be selected by the manufacturer. The selection should be made with input from the target operators. In the absence of operator input, then User Plane Positioning procedures should be used.

Note 2: When utilizing Control Plane Positioning procedures, the test applies to both UE-based and UE-assisted A-GNSS devices. If both UE-based and UE-assisted A-GNSS is supported by a device, then both modes will be tested.

Note 3: If user plane testing is selected, then either RRLP or LPP positioning protocol may be used during the test.

Table 2.1.8.1-3 Test Requirements for Different Cellular Protocols Used for Assistance for Different GNSS Services

	A-GPS L1	A-GPS L5	A-GALILEO E1	A-GALILEO E5A
GSM	Required	Not Required	Not Required	Not Required
UMTS	Required	Not Required	Not Required	Not Required
LTE	Required	Required	Required	Required
NR FR1 EN-DC	Required	Required	Required	Required
NR FR1 SA	Required	Required	Required	Required

2.1.8.1.1 UMTS

A-GNSS testing of UMTS 2100/1700 is not required.

2.1.8.1.2 LTE

2.1.8.1.3 VOID

2.1.8.1.4 NR FR1 SA

In general, TIS and 3D C/N0 testing of A-GNSS with band n77 will be limited to sub-ranges R1 and R3. In general, ICD testing will be required all n77 sub-ranges.

2.1.8.1.5 NR FR1 EN-DC (1 LTE Carrier with 1 NR Carrier)

In general, TIS and 3D C/N0 testing of A-GNSS with band n77 will be limited to sub-ranges R1 and R3. In cases where the GNSS band can be a victim of an IMD product when any sub-range of n77 is transmitting, then those sub-ranges (e.g. R1, R2, R3, R4) may require testing. In general, ICD testing will be required all n77 sub-ranges. Note that there are no EN-DC combinations using n77 sub-range R3 or R4 at this time.

2.1.8.2 A-GPS L1 Test Requirements

2.1.8.2.1 LTE

2.1.8.2.2 VOID

2.1.8.2.3 NR FR1 EN-DC (1 LTE Carrier with 1 NR Carrier)

When submitting a device for A-GPS L1 with NR FR1 EN-DC OTA testing, the device manufacturer shall declare the target operator(s) for the device, and the A-GPS L1 with NR FR1 EN-DC OTA testing shall be limited as described in the operator priority list included in *CTIA 01.02* [2].

2.1.8.3 A-GPS L5 Test Requirements
The same positioning procedures and positioning protocol shall be used when testing A-GPS L5 as was used for reference mode testing in A-GPS L1.

2.1.8.4 A-GALILEO E1 Test Requirements
The same positioning procedures and positioning protocol shall be used when testing A-GALILEO E1 as was used for reference mode testing in A-GPS L1.

2.1.8.4.1 LTE

2.1.8.5 VOID

2.1.8.6 A-GALILEO E5A Test Requirements

The same positioning procedures and positioning protocol shall be used when testing A- GALILEO E5A as was used for reference mode testing in A-GPS L1.

2.1.8.7 Summary of Location Based Wireless Technology Specific Test Requirements

Table 2.1.8.7-1 lists the rules that determine how devices that support location based wireless technologies will be tested for which mechanical modes, which test conditions, which cellular radio modes and which channels. The test IDs in Table 2.1.8.7-1 have the format AAB.C.D-E and are defined in Table 2.1.1.4-1. Some requirements will have more details elsewhere in Section 2.1.8 and some requirements will only be in Table 2.1.8.7-1.

Table 2.1.8.7-1 Test Requirements for Devices that Support Location Based Wireless Technologies

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
all1.1-1	all	all	A-GNSS devices shall be tested for A-GPS L1, A-GPS L5, A-GALILEO E1 and A-GALILEO E5A if applicable.
all1.1-2	all	all	If both UE-based and UE-assisted A-GNSS are supported by a device, then both modes will be tested unless otherwise specified.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
all1.1-3	all	all	If a device supports both UE-based and UE-assisted GNSS methods, then the radiated A-GNSS intermediate channel degradation measurement will be limited to UE-assisted A-GNSS. In this case, the radiated A-GNSS intermediate channel degradation results will apply to both UE-assisted and UE-based A-GNSS.
all2.1.2-1	GSM	A-GPS L1	For GSM devices that meet the following conditions, A-GPS L1 with GSM OTA testing may be reduced. o The device supports an equivalent LTE band (including bands with wider frequency coverage, e.g. LTE 2 or 25 for GSM 1900). o Each TX antenna for GSM is the same as a TX antenna for LTE. o Each GNSS RX antenna for A-GPS L1 with GSM is the same RX antenna that was fully tested for A-GPS L1 with LTE. Under these conditions, the A-GPS L1 with GSM OTA testing may be reduced as follows: o A-GPS L1 with GSM TIS testing is not required. A-GPS L1 with GSM intermediate channel degradation testing is not required.
all2.1.3-1	GSM	A-Galileo E1	A-Galileo E1 OTA with GSM testing is not required.
all2.1.4-1	GSM	A-GPS L5	A-GPS L5 OTA with GSM testing is not required.
all3.1.1-1	UMTS	all	A-GNSS testing of UMTS 2100/1700 is not required.
all3.1.2-1	UMTS	A-GPS L1	A-GPS L1 with UMTS OTA testing may be reduced for devices which meet the following criteria: o The device supports A-GPS L1 with LTE and is fully tested (all applicable use cases) with the equivalent LTE band as UMTS. o Each TX antenna for UMTS is the same as a TX antenna that was fully tested for LTE. o Each GNSS RX antenna for A-GPS L1 with UMTS is the same RX antenna that was fully tested for A-GPS L1 with LTE Under these conditions, A-GPS L1 with UMTS OTA testing may be reduced as follows: o A-GPS L1 with UMTS TIS testing is not required. A-GPS L1 with UMTS intermediate channel degradation testing is not required.
all3.1.3-1	UMTS	A-Galileo E1	A-Galileo E1 OTA with UMTS testing is not required.
all3.1.4-1	UMTS	A-GPS L5	A-GPS L5 OTA with UMTS testing is not required.
all4.1.2-1	LTE (single carrier)	A-GPS L1	For devices that support transmitter antenna switching, the sensitivity search in Band 13 and Band 14 and the calculation of TIS, UHIS, and PIGS shall be performed with the transmitter connected to each transmit antenna independently. TIS, UHIS, and PIGS results shall be provided for both transmit antennas. Results shall pass for both transmit antennas or the test for Band 13/Band 14 shall be failed.
all4.1.2-2	LTE (single carrier)	A-GPS L1	A-GPS L1 with LTE OTA testing may be reduced for devices which meet the following criteria: o The device supports A-GPS L1 and is fully tested for A-GPS L1 with NR FR1 SA TIS with the NR band equivalent to the LTE band. o The device supports A-GPS L1 with LTE and is fully tested for A-GPS L1 with LTE intermediate channel degradation with the LTE band equivalent to the NR FR1 SA band. o Each TX antenna for LTE is the same TX antenna for NR FR1 SA for the equivalent band.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			o Each GNSS RX antenna for A-GPS L1 with LTE is the same RX antenna for A-GPS L1 with NR FR1 SA. Under these conditions, A-GPS L1 with LTE OTA testing may be reduced as follows: o A-GPS L1 with LTE TIS testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L1 with LTE that meets this test reduction is considered to be fully tested for A-GPS L1 with LTE.
all4.1.2-3	LTE (single carrier)	A-GPS L1	A-GPS L1 with LTE OTA testing may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-GPS L1 with NR FR1 EN-DC and is tested for A-GPS L1 with NR FR1 EN-DC TIS with the NR band equivalent to the LTE band. o The device supports A-GPS L1 with LTE and is tested for A-GPS L1 with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-GPS L1 with LTE is the same RX antenna that was fully tested for A-GPS L1 with NR FR1 EN-DC. Under these conditions, A-GPS L1 with LTE OTA testing may be reduced as follows: o A-GPS L1 with LTE TIS testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L1 with LTE that meets this test reduction is considered to be fully tested for A-GPS L1 with LTE.
all4.1.3-1	LTE (single carrier)	A-Galileo E1	For devices that support transmitter antenna switching, the sensitivity search in Band 13 and Band 14 and the calculation of TIS, UHIS, and PIGS shall be performed with the transmitter connected to each transmit antenna independently. TIS, UHIS, and PIGS results shall be provided for both transmit antennas. Results shall pass for both transmit antennas or the test for Band 13/Band 14 shall be failed.
all4.1.3-2	LTE (single carrier)	A-Galileo E1	A-Galileo E1 with LTE OTA testing may be reduced for devices which meet the following criteria: o The device supports A-Galileo E1 and is fully tested for A-Galileo E1 with NR FR1 SA TIS with the NR band equivalent to the LTE band. o The device supports A-Galileo E1 with LTE and is fully tested for A-Galileo E1 with LTE intermediate channel degradation with the LTE band equivalent to the NR FR1 SA band. o Each TX antenna for LTE is the same TX antenna for NR FR1 SA for the equivalent band. o Each GNSS RX antenna for A-Galileo E1 with LTE is the same RX antenna for A-Galileo E1 with NR FR1 SA. Under these conditions, A-Galileo E1 with LTE OTA testing may be reduced as follows: o A-Galileo E1 with LTE TIS testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E1 with LTE that meets this test reduction is considered to be fully tested for A-Galileo E1 with LTE.
all4.1.3-3	LTE (single carrier)	A-Galileo E1	A-Galileo E1 with LTE OTA testing may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-Galileo E1 with NR FR1 EN-DC and is tested for A-Galileo E1 with NR FR1 EN-DC TIS with the NR band equivalent to the LTE band. o The device supports A-Galileo E1 with LTE and is tested for A-Galileo E1 with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			for the equivalent band. o Each GNSS RX antenna for A-Galileo E1 with LTE is the same RX antenna that was fully tested for A-Galileo E1 with NR FR1 EN-DC. Under these conditions, A-Galileo E1 with LTE OTA testing may be reduced as follows: o A-Galileo E1 with LTE TIS testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E1 with LTE that meets this test reduction is considered to be fully tested for A-Galileo E1 with LTE.
all4.1.4-1	LTE (single carrier)	A-GPS L5	A-GPS L5 with LTE OTA testing may be reduced for devices which meet the following criteria: o The device supports A-GPS L5 and is fully tested for A-GPS L5 with NR FR1 SA 3D C/N0 with the NR band equivalent to the LTE band. o The device supports A-GPS L5 with LTE and is fully tested for A-GPS L5 with LTE intermediate channel degradation with the LTE band equivalent to the NR FR1 SA band. o Each TX antenna for LTE is the same TX antenna for NR FR1 SA for the equivalent band. o Each GNSS RX antenna for A-GPS L5 with LTE is the same RX antenna for A-GPS L5 with NR FR1 SA. Under these conditions, A-GPS L5 with LTE OTA testing may be reduced as follows: o A-GPS L5 with LTE 3D C/N0 testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L5 with LTE that meets this test reduction is considered to be fully tested for A-GPS L5 with LTE.
all4.1.4-2	LTE (single carrier)	A-GPS L5	A-GPS L5 with LTE OTA testing may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-GPS L5 with NR FR1 EN-DC and is tested for A-GPS L5 with NR FR1 EN-DC C/N0 with the NR band equivalent to the LTE band. o The device supports A-GPS L5 with LTE and is tested for A-GPS L5 with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-GPS L5 with LTE is the same RX antenna that was fully tested for A-GPS L5 with NR FR1 EN-DC. Under these conditions, A-GPS L5 with LTE OTA testing may be reduced as follows: o A-GPS L5 with LTE C/N0 testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L5 with LTE that meets this test reduction is considered to be fully tested for A-GPS L5 with LTE.
all4.1.5-1	LTE (single carrier)	A-Galileo E5A	A-Galileo E5A with LTE OTA testing may be reduced for devices which meet the following criteria: o The device supports A-Galileo E5A and is fully tested for A-Galileo E5A with NR FR1 SA 3D C/N0 with the NR band equivalent to the LTE band. o The device supports A-Galileo E5A with LTE and is fully tested for A-Galileo E5A with LTE intermediate channel degradation with the LTE band equivalent to the NR FR1 SA band. o Each TX antenna for LTE is the same TX antenna for NR FR1 SA for the equivalent band. o Each GNSS RX antenna for A-Galileo E5A with LTE is the same RX antenna for A-Galileo E5A with NR FR1 SA. Under these conditions, A-Galileo E5A with LTE OTA testing may be reduced as follows: o A-Galileo E5A with LTE 3D C/N0 testing is not required. o For the purposes of determining what other test reductions are allowed, each

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			GNSS RX antenna for A-Galileo E5A with LTE that meets this test reduction is considered to be fully tested for A-Galileo E5A with LTE.
all4.1.5-2	LTE (single carrier)	A-Galileo E5A	A-Galileo E5A with LTE OTA testing may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-Galileo E5A with NR FR1 EN-DC and is tested for A-Galileo E5A with NR FR1 EN-DC C/N0 with the NR band equivalent to the LTE band. o The device supports A-Galileo E5A with LTE and is tested for A-Galileo E5A with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-Galileo E5A with LTE is the same RX antenna that was fully tested for A-Galileo E5A with NR FR1 EN-DC. Under these conditions, A-Galileo E5A with LTE OTA testing may be reduced as follows: o A-Galileo E5A with LTE C/N0 testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E5A with LTE that meets this test reduction is considered to be fully tested for A-Galileo E5A with LTE.
all5.1.2-1	NR FR1 SA (single carrier)	A-GPS L1	A-GPS L1 with NR FR1 SA OTA testing may be reduced for devices which meet the following criteria: o The device supports A-GPS L1 with NR FR1 SA and is fully tested for A-GPS L1 with NR FR1 SA TIS with the NR band equivalent to the LTE band. o The device supports A-GPS L1 with LTE and is fully tested for A-GPS L1 with LTE intermediate channel degradation with the LTE band equivalent to the NR FR1 SA band. o Each TX antenna for LTE is the same TX antenna for NR FR1 SA for the equivalent band. o Each GNSS RX antenna for A-GPS L1 with LTE is the same RX antenna for A-GPS L1 with NR FR1 SA. Under these conditions, A-GPS L1 with NR FR1 SA OTA testing may be reduced as follows: o A-GPS L1 with NR FR1 SA intermediate channel degradation testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L1 with NR FR1 SA that meets this test reduction is considered to be fully tested for A-GPS L1 with NR FR1 SA.
all5.1.3-1	NR FR1 SA (single carrier)	A-Galileo E1	A-Galileo E1 with NR FR1 SA OTA testing may be reduced for devices which meet the following criteria: o The device supports A-Galileo E1 with NR FR1 SA and is fully tested for A-Galileo E1 with NR FR1 SA TIS with the NR band equivalent to the LTE band. o The device supports A-Galileo E1 with LTE and is fully tested for A-Galileo E1 with LTE intermediate channel degradation with the LTE band equivalent to the NR FR1 SA band. o Each TX antenna for LTE is the same TX antenna for NR FR1 SA for the equivalent band. o Each GNSS RX antenna for A-Galileo E1 with LTE is the same RX antenna for A-Galileo E1 with NR FR1 SA. Under these conditions, A-Galileo E1 with NR FR1 SA OTA testing may be reduced as follows: o A-Galileo E1 with NR FR1 SA intermediate channel degradation testing is not required.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E1 with NR FR1 SA that meets this test reduction is considered to be fully tested for A-Galileo E1 with NR FR1 SA.
all5.1.4-1	NR FR1 SA (single carrier)	A-GPS L5	A-GPS L5 with NR FR1 SA OTA testing may be reduced for devices which meet the following criteria: o The device supports A-GPS L5 with NR FR1 SA and is fully tested for A-GPS L5 with NR FR1 SA 3D C/N0 with the NR band equivalent to the LTE band. o The device supports A-GPS L5 with LTE and is fully tested for A-GPS L5 with LTE intermediate channel degradation with the LTE band equivalent to the NR FR1 SA band. o Each TX antenna for LTE is the same TX antenna for NR FR1 SA for the equivalent band. o Each GNSS RX antenna for A-GPS L5 with LTE is the same RX antenna for A-GPS L5 with NR FR1 SA. Under these conditions, A-GPS L5 with NR FR1 SA OTA testing may be reduced as follows: o A-GPS L5 with NR FR1 SA intermediate channel degradation testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L5 with NR FR1 SA that meets this test reduction is considered to be fully tested for A-GPS L5 with NR FR1 SA.
all5.1.5-1	NR FR1 SA (single carrier)	A-Galileo E5A	A-Galileo E5A with NR FR1 SA OTA testing may be reduced for devices which meet the following criteria: o The device supports A-Galileo E5A with NR FR1 SA and is fully tested for A-Galileo E5A with NR FR1 SA 3D C/N0 with the NR band equivalent to the LTE band. o The device supports A-Galileo E5A with LTE and is fully tested for A-Galileo E5A with LTE intermediate channel degradation with the LTE band equivalent to the NR FR1 SA band. o Each TX antenna for LTE is the same TX antenna for NR FR1 SA for the equivalent band. o Each GNSS RX antenna for A-Galileo E5A with LTE is the same RX antenna for A-Galileo E5A with NR FR1 SA. Under these conditions, A-Galileo E5A with NR FR1 SA OTA testing may be reduced as follows: o A-Galileo E5A with NR FR1 SA intermediate channel degradation testing is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E5A with NR FR1 SA that meets this test reduction is considered to be fully tested for A-Galileo E5A with NR FR1 SA.
all5.2.2-1	NR FR1 EN-DC	A-GPS L1	A-GPS L1 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-GPS L1 with LTE and is fully tested for A-GPS L1 with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each GNSS RX antenna for A-GPS L1 with LTE is the same RX antenna that was fully tested for A-GPS L1 with NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. Under these conditions, A-GPS L1 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced as follows: o A-GPS L1 with NR FR1 EN-DC intermediate channel degradation testing for the first test with NR only at maximum TX power is not required. o For the purposes of determining what other test reductions are allowed, each

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			GNSS RX antenna for A-GPS L1 with NR FR1 EN-DC that meets this test reduction is considered to be fully tested for A-GPS L1 with NR FR1 EN-DC for the first test with NR only at maximum TX power.
all5.2.2-2	NR FR1 EN-DC	A-GPS L1	A-GPS L1 with NR FR1 EN-DC OTA testing for the second test with LTE and NR at maximum balanced TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-GPS L1 with LTE and is fully tested for A-GPS L1 with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each GNSS RX antenna for A-GPS L1 with LTE is the same RX antenna that was fully tested for A-GPS L1 with NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o The NR FR1 EN-DC band combination does not have a known IMD interference to A-GPS L1 or A-Galileo E1 Under these conditions, A-GPS L1 with NR FR1 EN-DC OTA testing for the second test with LTE and NR at maximum balanced TX power may be reduced as follows: o A-GPS L1 with NR FR1 EN-DC intermediate channel degradation testing for the second test with LTE and NR at maximum balanced TX power is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L1 with NR FR1 EN-DC that meets this test reduction is considered to be fully tested for A-GPS L1 with NR FR1 EN-DC for the second test with LTE and NR at maximum balanced TX power.
all5.2.2-3	NR FR1 EN-DC	A-GPS L1	A-GPS L1 OTA with NR FR1 EN-DC testing may be reduced for devices which meet the following criteria: o The device supports NR FR1 SA and NR FR1 EN-DC for the same NR band. o The device supports A-GPS L1 with NR FR1 SA is fully tested for A-GPS L1 with NR FR1 SA with the same NR band used in NR FR1 EN-DC. o Each TX antenna for NR FR1 SA is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-GPS L1 with NR FR1 EN-DC is the same RX antenna that is fully tested for A-GPS L1 with NR FR1 SA. Under these conditions, A-GPS L1 with NR FR1 EN-DC OTA testing may be reduced as follows: o A-GPS L1 with NR FR1 EN-DC TIS testing is not required for the first test with NR only at maximum power. o A-GPS L1 with NR FR1 EN-DC intermediate channel degradation testing is not required for the first test with NR only at maximum power. o A-GPS L1 with NR FR1 EN-DC TIS testing and intermediate channel degradation testing for the second test with maximum NR-LTE balanced power is not required for non-IMD bands.
all5.2.2-4	NR FR1 EN-DC	A-GPS L1	A-GPS L1 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports more than one EN-DC band combination with same NR band Under these conditions, A-GPS L1 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced as follows: o Only one EN-DC band combination is required for A-GPS L1 with NR FR1 EN-DC intermediate channel degradation testing for the first test with NR only at maximum TX power.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
all5.2.3-1	NR FR1 EN-DC	A-Galileo E1	A-Galileo E1 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-Galileo E1 with LTE and is fully tested for A-Galileo E1 with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each GNSS RX antenna for A-Galileo E1 with LTE is the same RX antenna that was fully tested for A-Galileo E1 with NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. Under these conditions, A-Galileo E1 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced as follows: o A-Galileo E1 with NR FR1 EN-DC intermediate channel degradation testing for the first test with NR only at maximum TX power is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E1 with NR FR1 EN-DC that meets this test reduction is considered to be fully tested for A-Galileo E1 with NR FR1 EN-DC for the first test with NR only at maximum TX power.
all5.2.3-2	NR FR1 EN-DC	A-Galileo E1	A-Galileo E1 with NR FR1 EN-DC OTA testing for the second test with LTE and NR at maximum balanced TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-Galileo E1 with LTE and is tested for A-Galileo E1 with LTE intermediate channel degradation (HR) with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each GNSS RX antenna for A-Galileo E1 with LTE is the same RX antenna that was fully tested for A-Galileo E1 with NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o The NR FR1 EN-DC band combination does not have a known IMD interference to A-GPS L1 or A-Galileo E1 Under these conditions, A-Galileo E1 with NR FR1 EN-DC OTA testing for the second test with LTE and NR at maximum balanced TX power may be reduced as follows: o A-Galileo E1 with NR FR1 EN-DC intermediate channel degradation testing for the second test with LTE and NR at maximum balanced TX power is not required (HR). o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E1 with NR FR1 EN-DC that meets this test reduction is considered to be fully tested for A-Galileo E1 with NR FR1 EN-DC for the second test with LTE and NR at maximum balanced TX power for HR and HL.
H5.2.3-3	NR FR1 EN-DC	A-Galileo E1	A-Galileo E1 OTA with NR FR1 EN-DC testing may be reduced for devices which meet the following criteria: o The device supports NR FR1 SA and NR FR1 EN-DC for the same NR band. o The device supports A-Galileo E1 with NR FR1 SA is fully tested for A-Galileo E1 with NR FR1 SA with the same NR band used in NR FR1 EN-DC. o Each TX antenna for NR FR1 SA is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-Galileo E1 with NR FR1 EN-DC is the same RX antenna that is fully tested for A-Galileo E1 with NR FR1 SA. Under these conditions, A-Galileo E1 with NR FR1 EN-DC OTA testing may be reduced as follows: o A-Galileo E1 with NR FR1 EN-DC TIS testing is not required for the first test with NR only at maximum power. o A-Galileo E1 with NR FR1 EN-DC intermediate channel degradation testing is not required for the first test with NR only at maximum power. o A-Galileo E1 with NR FR1 EN-DC TIS testing and intermediate channel

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			degradation testing for the second test with maximum NR-LTE balanced power is not required for non-IMD bands.
all5.2.3-4	NR FR1 EN-DC	A-Galileo E1	A-Galileo E1 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports more than one EN-DC band combination with same NR band Under these conditions, A-Galileo E1 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced as follows: o Only one EN-DC band combination is required for A-Galileo E1 with NR FR1 EN-DC intermediate channel degradation testing for the first test with NR only at maximum TX power.
all5.2.4-1	NR FR1 EN-DC	A-GPS L5	A-GPS L5 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-GPS L5 with LTE and is fully tested for A-GPS L5 with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each GNSS RX antenna for A-GPS L5 with LTE is the same RX antenna that was fully tested for A-GPS L5 with NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. Under these conditions, A-GPS L5 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced as follows: o A-GPS L5 with NR FR1 EN-DC intermediate channel degradation testing for the first test with NR only at maximum TX power is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L5 with NR FR1 EN-DC that meets this test reduction is considered to be fully tested for A-GPS L5 with NR FR1 EN-DC for the first test with NR only at maximum TX power.
all5.2.4-2	NR FR1 EN-DC	A-GPS L5	A-GPS L5 with NR FR1 EN-DC OTA testing for the second test with LTE and NR at maximum balanced TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-GPS L5 with LTE and is fully tested for A-GPS L5 with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each GNSS RX antenna for A-GPS L5 with LTE is the same RX antenna that was fully tested for A-GPS L5 with NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o The NR FR1 EN-DC band combination does not have a known IMD interference to A-GPS L1 or A-GPS L5 Under these conditions, A-GPS L5 with NR FR1 EN-DC OTA testing for the second test with LTE and NR at maximum balanced TX power may be reduced as follows: o A-GPS L5 with NR FR1 EN-DC intermediate channel degradation testing for the second test with LTE and NR at maximum balanced TX power is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-GPS L5 with NR FR1 EN-DC that meets this test reduction is considered to be fully tested for A-GPS L5 with NR FR1 EN-DC for the second test with LTE and NR at maximum balanced TX power.

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
all5.2.4-3	NR FR1 EN-DC	A-GPS L5	A-GPS L5 OTA with NR FR1 EN-DC testing may be reduced for devices which meet the following criteria: o The device supports NR FR1 SA and NR FR1 EN-DC for the same NR band. o The device supports A-GPS L5 with NR FR1 SA is fully tested for A-GPS L5 with NR FR1 SA with the same NR band used in NR FR1 EN-DC. o Each TX antenna for NR FR1 SA is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-GPS L5 with NR FR1 EN-DC is the same RX antenna that is fully tested for A-GPS L5 with NR FR1 SA. Under these conditions, A-GPS L5 with NR FR1 EN-DC OTA testing may be reduced as follows: o A-GPS L5 with NR FR1 EN-DC 3D C/N0 testing is not required for the first test with NR only at maximum power. o A-GPS L5 with NR FR1 EN-DC intermediate channel degradation testing is not required for the first test with NR only at maximum power. o A-GPS L5 with NR FR1 EN-DC 3D C/N0 testing and intermediate channel degradation testing for the second test with maximum NR-LTE balanced power is not required for non-IMD bands.
all5.2.4-4	NR FR1 EN-DC	A-GPS L5	A-GPS L5 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports more than one EN-DC band combination with same NR band Under these conditions, A-GPS L5 with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced as follows: o Only one EN-DC band combination is required for A-GPS L5 with NR FR1 EN-DC intermediate channel degradation testing for the first test with NR only at maximum TX power.
all5.2.5-1	NR FR1 EN-DC	A-Galileo E5A	A-Galileo E5A with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-Galileo E5A with LTE and is fully tested for A-Galileo E5A with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each GNSS RX antenna for A-Galileo E5A with LTE is the same RX antenna that was fully tested for A-Galileo E5A with NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. Under these conditions, A-Galileo E5A with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced as follows: o A-Galileo E5A with NR FR1 EN-DC intermediate channel degradation testing for the first test with NR only at maximum TX power is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E5A with NR FR1 EN-DC that meets this test reduction is considered to be fully tested for A-Galileo E5A with NR FR1 EN-DC for the first test with NR only at maximum TX power.
all5.2.5-2	NR FR1 EN-DC	A-Galileo E5A	A-Galileo E5A with NR FR1 EN-DC OTA testing for the second test with LTE and NR at maximum balanced TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports A-Galileo E5A with LTE and is fully tested for A-Galileo E5A with LTE intermediate channel degradation with the LTE band equivalent to the NR band used in NR FR1 EN-DC. o Each GNSS RX antenna for A-Galileo E5A with LTE is the same RX antenna that was fully tested for A-Galileo E5A with NR FR1 EN-DC. o Each TX antenna for LTE is the same TX antenna for NR used in NR FR1 EN-DC

Test Req. ID	3GPP Protocol	Location Based Protocol	Test Requirement
			for the equivalent band. o The NR FR1 EN-DC band combination does not have a known IMD interference to A-GPS L5 or A-Galileo E5A Under these conditions, A-Galileo E5A with NR FR1 EN-DC OTA testing for the second test with LTE and NR at maximum balanced TX power may be reduced as follows: o A-Galileo E5A with NR FR1 EN-DC intermediate channel degradation testing for the second test with LTE and NR at maximum balanced TX power is not required. o For the purposes of determining what other test reductions are allowed, each GNSS RX antenna for A-Galileo E5A with NR FR1 EN-DC that meets this test reduction is considered to be fully tested for A-Galileo E5A with NR FR1 EN-DC for the second test with LTE and NR at maximum balanced TX power.
all5.2.5-3	NR FR1 EN-DC	A-Galileo E5A	A-Galileo E5A OTA with NR FR1 EN-DC testing may be reduced for devices which meet the following criteria: o The device supports NR FR1 SA and NR FR1 EN-DC for the same NR band. o The device supports A-Galileo E5A with NR FR1 SA is fully tested for A-Galileo E5A with NR FR1 SA with the same NR band used in NR FR1 EN-DC. o Each TX antenna for NR FR1 SA is the same TX antenna for NR used in NR FR1 EN-DC for the equivalent band. o Each GNSS RX antenna for A-Galileo E5A with NR FR1 EN-DC is the same RX antenna that is fully tested for A-Galileo E5A with NR FR1 SA. Under these conditions, A-Galileo E5A with NR FR1 EN-DC OTA testing may be reduced as follows: o A-Galileo E5A with NR FR1 EN-DC 3D C/N0 testing is not required for the first test with NR only at maximum power. o A-Galileo E5A with NR FR1 EN-DC intermediate channel degradation testing is not required for the first test with NR only at maximum power. o A-Galileo E5A with NR FR1 EN-DC 3D C/N0 testing and intermediate channel degradation testing for the second test with maximum NR-LTE balanced power is not required for non-IMD bands.
all5.2.5-4	NR FR1 EN-DC	A-Galileo E5A	A-Galileo E5A with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced for devices which meet the following criteria: o The device does not support NR FR1 SA but does support NR FR1 EN-DC. o The device supports more than one EN-DC band combination with same NR band Under these conditions, A-Galileo E5A with NR FR1 EN-DC OTA testing for the first test with NR only at maximum TX power may be reduced as follows: o Only one EN-DC band combination is required for A-Galileo E5A with NR FR1 EN-DC intermediate channel degradation testing for the first test with NR only at maximum TX power.

Table 2.1.8.7-2 lists which test IDs apply to the various test cases associated with devices that support location based wireless technologies.

Table 2.1.8.7-2 Test IDs Applying to Various Test Cases for Devices that Support Location based Wireless Technologies

3GPP Protocol	Location Based Protocol	TIS For Applicable Use Cases	Inter. Channel Degrad. For Applicable Use Cases
all	all	all1.1-1, all1.1-2	all1.1-1, all1.1-2, all1.1-3
GSM	A-GPS L1	all2.1.2-1	all2.1.2-1

3GPP Protocol	Location Based Protocol	TIS For Applicable Use Cases	Inter. Channel Degrad. For Applicable Use Cases
GSM	A-Galileo E1	all2.1.3-1	all2.1.3-1
GSM	A-GPS L5	all2.1.4-1	all2.1.4-1
UMTS	all	all3.1.1-1	all3.1.1-1
UMTS	A-GPS L1	all3.1.2.-1	all3.1.2.-1
UMTS	A-Galileo E1	all3.1.3-1	all3.1.3-1
UMTS	A-GPS L5	all3.1.4-1	all3.1.4-1
LTE (single carrier)	all		
LTE (single carrier)	A-GPS L1	all4.1.2-1, all4.1.2-2, all4.1.2-3	all4.1.2-1
LTE (single carrier)	A-Galileo E1	all4.1.3-1, all4.1.3-2, all4.1.3-3	all4.1.3-1
LTE (single carrier)	A-GPS L5	all4.1.4-1, all4.1.4-2	
LTE (single carrier)	A-Galileo E5A	All4.1.5-1, all4.1.5-2	
NR FR1 SA (single carrier)	all		
NR FR1 SA (single carrier)	A-GPS L1		all5.1.2-1
NR FR1 SA (single carrier)	A-Galileo E1		all5.1.3-1
NR FR1 SA (single carrier)	A-GPS L5		all5.1.4-1
NR FR1 SA (single carrier)	A-Galileo E5A	all5.1.5-1	
NR FR1 EN-DC	all		
NR FR1 EN-DC	A-GPS L1	all5.2.2-3	all5.2.2-1, all5.2.2-2, all5.2.2-3, all5.2.2-4
NR FR1 EN-DC	A-Galileo E1	all5.2.3-3	all5.2.3-1, all5.2.3-2, all5.2.3-3, all5.2.3-4
NR FR1 EN-DC	A-GPS L5	all5.2.4-3	all5.2.4-1, all5.2.4-2, all5.2.4-3, all5.2.4-4
NR FR1 EN-DC	A-Galileo E5A	all5.2.5-3	all5.2.5-1, all5.2.5-2, all5.2.5-3, all5.2.5-4
NR FR1 SA UL CA	all		
NR FR1 SA UL CA	A-GPS L1		
NR FR1 SA UL CA	A-Galileo E1		

3GPP Protocol	Location Based Protocol	TIS For Applicable Use Cases	Inter. Channel Degrad. For Applicable Use Cases
NR FR1 SA UL CA	A-GPS L5		
NR FR1 SA UL CA	A-Galileo E5A		

2.1.9 IoT vs. Non-IoT Devices and Measurement Grids

TRP and TIS testing of IoT devices may use the coarser measurement grids as defined in Tables 3.1-2 and 4.1-1 of *CTIA 01.20* [5]. TRP and TIS testing of non-IoT devices shall not use the coarser measurement grids.

PTCRB defines an IoT device as “a device whose main function is to allow objects to be accessed, sensed, and/or controlled remotely across existing mobile network infrastructures”. Given the PTCRB definition for an IoT device, the term “non-IoT device” shall include (but is not necessarily limited to) all of the following device types:

- Hand held devices
- Devices that support operation against the head
- Tablets
- Laptops
- Devices that support WiFi access point functionality
- Fixed wireless broadband access devices
- Body worn wearable devices
- LTE capable data devices that are LTE category 4 or higher
- 5G NR capable devices

2.2 SISO, Millimeter Wave Test Methodology

Devices supporting NR FR2 EN-DC shall complete the following tests:

- Maximum output power - EIRP
- Maximum output power - TRP
- Maximum output power -spherical coverage
- REFSENS – EIS
- REFSENS - spherical coverage

All supported normative FR2 bands shall be tested.

Certification testing is currently only required for PC3 devices.

Device mechanical modes that are not representative of end use do not need to be tested. The ATL shall use the primary mechanical mode to test low, mid, and high frequency ranges and use these results when applying the pass/fail limits (if applicable). Testing in non-primary mechanical modes is only required in the low and high frequency ranges; mid frequency range testing is not required.

The following percentiles are the spherical coverage testing requirements when testing is performed over the full sphere (default):

- For PC3 devices, the spherical coverage CDF/CCDF percentile shall be 50%

When only a single hemisphere shall be tested (based on an optional vendor declaration), see Section 1.5.2, the following percentiles are the spherical coverage testing requirements:

- For laptops (PC3), the spherical coverage CDF/CCDF percentile shall be 50% and 20%

If the vendor declares that only a single hemisphere shall be tested, see Section 1.5.2, the spherical coverage test cases and beam peak searches shall not be performed over the full sphere.

The spherical coverage testing requirements are summarized in Table 2.2 1.

Table 2.2 1: Overview of Spherical Coverage Testing Requirements

UE Type/Device Type	Spherical Coverage CDF/CCDF Testing Requirements	
	Full Sphere (Default)	Single Hemisphere (Optional)
PC3 (general)	50%	N/A
PC3 (laptops)	50%	50% & 20%
Note: When an optional vendor declaration to test a single hemisphere only is provided, testing over the full sphere shall not be performed.		

2.2.1 Devices Tested with a Phantom

For future study.

2.2.2 Devices Tested without a Phantom

Testing shall be performed in free space.

2.3 MIMO Test Methodologies

Devices supporting MIMO in LTE shall complete the MIMO average radiated SIR sensitivity (MARSS) performance tests. All supported normative LTE bands shall be tested considering the test reduction below.

If the device supports both Band 2 and Band 25, then testing is only required in Band 25. If the device supports both Band 4 and Band 66, then testing is only required in Band 66. If the device supports both Band 5 and Band 26, then testing is only required in Band 26.

Testing is not required in any band where the maximum antenna spacing is greater than one wavelength. For LTE 4 RX devices where the antenna separation of any two antennas exceeds one wavelength, 2x2 MIMO testing is not required for that band.

2.3.1 Devices Tested with a Phantom

For future study.

2.3.2 Devices Tested without a Phantom

MIMO OTA performance testing of Hand-Held Devices and Tablets in free-space shall be performed in Date Mode Portrait (DMP) and Data Mode Landscape (DML) - Right Tilt for all normative operating bands. Testing in DML - Left Tilt and Date Mode Screen-Up (DMSU) shall be limited to all normative operating bands below 1 GHz. The MIMO OTA performance assessment of Notebooks is not currently normative.

Section 3 Temporary Test Requirements

All test requirements included in the section are intended to be temporary in nature and supersede existing requirements in this test plan where applicable.

3.1 SISO Test Methodologies for Wireless Technologies below 6 GHz

3.1.1 LTE Relative Sensitivity on Intermediate Channels Test

Until such time that OTA limits are added for LTE TIS, the relative sensitivity on intermediate channels testing process shall be modified to report the EIS for the applicable use cases, (e.g. $FS\ EIS_{(IC)}$, $BHHR\ EIS_{(IC)}$, $WL/WR\ EIS_{(IC)}$, $ChW\ EIS_{(IC)}$ and $AL\ EIS_{(IC)}$), at each LTE Intermediate Channel test channel (including the reference test channels) as defined in *CTIA 01.50* [10]. $X\ EIS_{(IC)}$, is equivalent to X $EIS_{(peak)}$, where X is the appropriate use case, for the reference channels. Please refer to the relative sensitivity testing process in *CTIA 01.20* [5] for a general definition of $EIS_{(peak)}$. The same position and polarization shall be used for the intermediate channels as used for the corresponding reference channels. If the optional full TIS method was used at an intermediate channel, the EIS value obtained from the full TIS measurement associated with the peak position and polarization for the closest reference channel shall be reported. The results shall be reported using the following template, Table 3.1.1-1. The full TIS results at the intermediate channels may be included as additional data and marked as supplemental in the test report.

Table 3.1.1-1 LTE Relative Sensitivity on Intermediate Channels

Band	Channel Bandwidth (MHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$(dBm)[1]
2	10	650	1935			
2	10	740	1944			
2	10	820	1952			
2	10	900	1960			
2	10	980	1968			
2	10	1060	1976			
2	10	1150	1985			
4	10	2000	2115			
4	10	2090	2124			
4	10	2175	2132.5			
4	10	2260	2141			
4	10	2350	2150			

Band	Channel Bandwidth (MHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$(dBm)[1]
12	5	5035	731.5			
12	5	5065	734.5			
12	5	5095	737.5			
12	5	5125	740.5			
12	5	5155	743.5			
25	5	8065	1932.5			
25	5	8105	1936.5			
25	5	8145	1940.5			
25	5	8185	1944.5			
25	5	8225	1948.5			
25	5	8265	1952.5			
25	5	8305	1956.5			
25	5	8345	1960.5			
25	5	8365	1962.5			
25	5	8385	1964.5			
25	5	8425	1968.5			
25	5	8465	1972.5			
25	5	8505	1976.5			
25	5	8545	1980.5			
25	5	8585	1984.5			
25	5	8625	1988.5			
25	5	8665	1992.5			
26	5	8715	861.5			
26	5	8755	865.5			
26	5	8795	869.5			

Band	Channel Bandwidth (MHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$(dBm)[1]
26	5	8835	873.5			
26	5	8865	876.5			
26	5	8895	879.5			
26	5	8935	883.5			
26	5	8975	887.5			
26	5	9015	891.5			
7	20	2850	2630			
7	20	2975	2642.5			
7	20	3100	2655			
7	20	3225	2667.5			
7	20	3350	2680			
41	20	39750	2506			
41	20	39930	2524			
41	20	40110	2542			
41	20	40280	2559			
41	20	40450	2576			
41	20	40620	2593			
41	20	40790	2610			
41	20	40960	2627			
41	20	41130	2644			
41	20	41310	2662			
41	20	41490	2680			
48	10	55290	3555			
48	10	55380	3564			
48	10	55470	3573			

Band	Channel Bandwidth (MHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$(dBm)[1]
48	10	55560	3582			
48	10	55650	3591			
48	10	55740	3600			
48	10	55830	3609			
48	10	55910	3617			
48	10	55990	3625			
48	10	56070	3633			
48	10	56150	3641			
48	10	56240	3650			
48	10	56330	3659			
48	10	56420	3668			
48	10	56510	3677			
48	10	56600	3686			
48	10	56690	3695			
66	10	66486	2115			
66	10	66566	2123			
66	10	66636	2130			
66	10	66706	2137			
66	10	66786	2145			
66	10	66866	2153			
66	10	66936	2160			
66	10	67006	2167			
66	10	67086	2175			
71	10	68636	622			
71	10	68706	629			

Band	Channel Bandwidth (MHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$(dBm)[1]
71	10	68761	634.5			
71	10	68816	640			
71	10	68886	647			
Note 1: Update this header to the applicable use case.						

3.1.2 Waiver for n77 Canada Testing

This section is no longer needed as testing of sub-bands of n77 for Canada have become normative.

3.1.3 NR FR1 SA Relative Sensitivity on Intermediate Channels Test

Until such time that OTA limits are added for NR FR1 SA, the relative sensitivity on intermediate channels testing process shall be modified to report for the applicable use cases, (e.g. $FS\ EIS_{(IC)}$, $BHHR\ EIS_{(IC)}$, $WL/WR\ EIS_{(IC)}$, $ChW\ EIS_{(IC)}$ and $AL\ EIS_{(IC)}$), at each NR FR1 SA Intermediate Channel test channel (including the reference test channels) as defined in *CTIA 01.50* [10]. $X\ EIS_{(IC)}$, is equivalent to $X\ EIS_{(peak)}$, where X is the appropriate use case, for the reference channels. Please refer to the relative sensitivity testing process in *CTIA 01.20* [5] for a general definition of $EIS_{(peak)}$. The same position and polarization shall be used for the intermediate channels as used for the corresponding reference channels. If the optional full TIS method was used at an intermediate channel, the EIS value obtained from the full TIS measurement associated with the peak position and polarization for the closest reference channel shall be reported. The results shall be reported using the following template, Table 3.1.3-1. The full TIS results at the intermediate channels may be included as additional data and marked as supplemental in the test report.

Table 3.1.3-1 NR FR1 SA Relative Sensitivity on Intermediate Channels

3GPP Config. Identifier	CC BW (MHz)	SCS (kHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$ (dBm)[1]
n2	10	15	387000	1935			
			388400	1942			
			389800	1949			
			391200	1956			
			392000	1960			

3GPP Config. Identifier	CC BW (MHz)	SCS (kHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$ (dBm)[1]
			392800	1964			
			394200	1971			
			395600	1978			
			397000	1985			
n25	10	15	387000	1935			
			388400	1942			
			389800	1949			
			391200	1956			
			392500	1962.5			
			393800	1969			
			395200	1976			
			396600	1983			
			398000	1990			
n26	10	15	172800	864			
			174200	871			
			175300	876.5			
			176400	882			
			177800	889			
n41	20	30	501204	2506.02			
			504204	2521.02			
			507204	2536.02			
			510198	2550.99			
			513198	2565.99			
			516198	2580.99			

3GPP Config. Identifier	CC BW (MHz)	SCS (kHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$ (dBm)[1]
			518998	2592.99			
			520998	2604.99			
			523998	2619.99			
			526998	2634.99			
			529998	2649.99			
			532998	2664.99			
			535998	2679.99			
n48	20	30	637334	3560.01			
			638500	3577.5			
			639500	3592.5			
			640500	3607.5			
			641666	3624.99			
			642834	3642.51			
			643834	3657.51			
			644834	3672.51			
			646000	3690			
n66	10	15	423000	2115			
			424600	2123			
			426000	2130			
			427400	2137			
			429000	2145			
			430600	2153			
			432000	2160			
			433400	2167			

3GPP Config. Identifier	CC BW (MHz)	SCS (kHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$ (dBm)[1]
			435000	2175			
n71	10	15	124400	622			
			125800	629			
			126900	634.5			
			128000	640			
			129400	647			
n77 (R1)	20	30	647334	3710.01			
			648500	3727.5			
			649500	3742.5			
			650500	3757.5			
			651666	3774.99			
			652834	3792.51			
			653834	3807.51			
			654834	3822.51			
			656000	3840			
			657166	3857.49			
			658166	3872.49			
			659166	3887.49			
			660334	3905.01			
			661500	3922.5			
			662500	3937.5			
			663500	3952.5			
			664666	3969.99			
n77	20	30	630668	3460.02			

3GPP Config. Identifier	CC BW (MHz)	SCS (kHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$ (dBm)[1]
(R2)			631534	3473.01			
			632400	3486			
			633334	3500.01			
			634266	3513.99			
			635134	3527.01			
			636000	3540			
n77 (R3)	20	30	630668	3460.02			
			631668	3475.02			
			632668	3490.02			
			633668	3505.02			
			634668	3520.02			
			635668	3535.02			
			636668	3550.02			
			637668	3565.02			
			638668	3580.02			
			639668	3595.02			
			640668	3610.02			
			641668	3625.02			
			642666	3639.99			
n77 (R4)	20	30	644000	3660			
			645000	3675			
			646000	3690			
			647000	3705			
			648066	3720.99			

3GPP Config. Identifier	CC BW (MHz)	SCS (kHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$ (dBm)[1]
			649166	3737.49			
			650166	3752.49			
			651166	3767.49			
			652166	3782.49			
			653232	3798.48			
			654334	3815.01			
			655334	3830.01			
			656334	3845.01			
			657334	3860.01			
			658400	3876			
			659500	3892.5			
			660500	3907.5			
			661500	3922.5			
			662500	3937.5			
			663566	3953.49			
			664666	3969.99			
n78	20	30	620668	3310.02			
			621668	3325.02			
			622668	3340.02			
			623668	3355.02			
			624668	3370.02			
			625668	3385.02			
			626668	3400.02			
			627668	3415.02			

3GPP Config. Identifier	CC BW (MHz)	SCS (kHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$ (dBm)[1]
			628668	3430.02			
			629668	3445.02			
			630668	3460.02			
			631668	3475.02			
			632666	3489.99			
			633666	3504.99			
			634666	3519.99			
			635666	3534.99			
			636666	3549.99			
			637666	3564.99			
			638666	3579.99			
			639666	3594.99			
			640666	3609.99			
			641666	3624.99			
			642666	3639.99			
			643666	3654.99			
			644666	3669.99			
			645666	3684.99			
			646666	3699.99			
			647666	3714.99			
			648666	3729.99			
			649666	3744.99			
			650666	3759.99			
			651666	3774.99			

3GPP Config. Identifier	CC BW (MHz)	SCS (kHz)	Channel	Frequency (MHz)	FS $EIS_{(IC)}$ (dBm)	BHHR $EIS_{(IC)}$ (dBm)	WR/WL $EIS_{(IC)}$ or ChW $EIS_{(IC)}$ or AL $EIS_{(IC)}$ (dBm)[1]
			652666	3789.99			
Note 1: Update this header to the applicable use case.							

3.1.4 Modification to Broadband Power Mode Measurement Requirements for NR FR1 TRP Testing

The updates for the channel bandwidths and RB allocations for NR FR1 TRP testing in *CTIA 01.50* [10] require a modification to the broadband power mode measurement requirements in *CTIA 01.73* [16]. The broadband power mode measurement requirements in *CTIA 01.73* [16] Table 9.13-1 is modified to use the measurement settings in Table 3.1.4-1.

Table 3.1.4-1 Broadband Power Mode Measurement Requirements

Channel BW (MHz)	SCS [kHz]	N_{RB}	RB Allocation	RB Start	Frequency Offset (MHz)	f_{span} (MHz)[1]	$f_{Gaussian}$ (MHz)	$f_{flat\ top}$ (MHz)[1]
5	15	25	12	6	-0.09	2.4	8	3
10	15	52	12	6	-2.52	2.4	8	3
				20	0.0			
				34	+2.52			
20	30	51	9	4	-6.12	3.6	12	4.5
				21	0.0			
				38	+6.12			
f_{RBW}			30 kHz					
T_{dwell} or T_{sweep}			100 ms					
$T_{short\ dwell}$ or $T_{short\ sweep}$			20 ms					
P_{flat}			70%					

3.1.5 NR FR1 SA A-GNSS Testing: General

The A-GNSS radiated receiver sensitivity measurements will be performed for the NR bands, channel numbers, and the allocations specified in Section 2.5.7.1 in *CTIA 01.51* [11] except that for NR band n14, the settings in Table 3.1.5-1 are used instead of the settings in Table 2.5.7.1-2 in *CTIA 01.51* [11].

Table 3.1.5-1 A-GNSS Radiated Receiver Sensitivity Test Channel Settings for NR band n14

3GPP Config. Identifier	CC BW (MHz)	SCS (kHz)	NR DL Channel	RX Frequency (MHz) [center of RX channel bandwidth]	NR UL RB Allocation	NR DL RB Allocation
n14	10	15	152600	763	12@0	52@0
			152600	763	1@2	52@0

3.1.6 Use of Legacy Measurement Grids for Certain Devices

The following device classes shall use the legacy measurement grids:

- Hand held devices
- Devices that support operation against the head
- Tablets
- Laptops
- Devices that support Wi-Fi access point functionality
- Fixed wireless broadband access devices
- Body worn wearable devices
- LTE capable data devices that are LTE category 4 or higher.
- 5G NR capable devices

TRP and TIS testing of these devices shall use the measurements grids defined in Table 3.1.6-1 and Table 3.1.6-2 below. For these devices, Table 3.1.6-1 and Table 3.1.6-2 replace Tables 3.1-2 and 4.1-1 of *CTIA 01.20* [5], respectively. For TIS testing of these devices, Table 3.1.6-3 and Table 3.1.6-4 below replace Tables 2.20.1-2 and 2.21.1-1 of *CTIA 01.70* [13], respectively.

Table 3.1.6-1: Applicability of TRP Measurement Grids for Devices Requiring the Use of Legacy Measurement Grids

Applicability Condition	Measurement Grid Step Size $\Delta\theta$ [°]	Unique Number of Measurement Points with Constant Angular Step Size, Section 3.1.1 of *CTIA 01.90* [9] $\Delta\theta=\Delta\phi$ [°]	Unique Number of Measurement Points with Theta Dependent Phi Optimization, Section 2.7 and Section 3.1.2 of *CTIA 01.90* [9]
Below 3 GHz and Device Size ≤ 30 cm	15	266	182
Below 3 GHz and Device Size > 30 cm	15	266	182
Above 3 GHz	15	266	182

Table 3.1.6-2: Applicability of TIS Measurement Grids for Devices Requiring the Use of Legacy Measurement Grids

Applicability Condition	Measurement Grid Step Size Δθ [°]	Unique Number of Measurement Points with Constant Angular Step Size, Section 3.1.1 of *CTIA 01.90* [9] Δθ=Δϕ [°]	Unique Number of Measurement Points with Theta Dependent Phi Optimization, Section 2.7 and Section 3.1.2 of *CTIA 01.90* [9]
Below 3 GHz and Device Size ≤ 30 cm	30	62	46
Below 3 GHz and Device Size > 30 cm	30	62	46
Above 3 GHz	30	62	46

Table 3.1.6-3: Uncertainty Contributions and Step Sizes for Devices Requiring the Use of Legacy Measurement Grids

Applicability Condition	Δθ=Δϕ [°]	Step Size [dB]	Standard Uncertainty Contribution [dB]
Below 3 GHz and Device Size ≤ 30 cm	30	0.5	0.14
Below 3 GHz and Device Size > 30 cm	30	0.5	0.14
Above 3 GHz	30	0.5	0.14

Table 3.1.6-4: Uncertainty Contributions and Step Sizes for Devices Requiring the Use of Legacy Measurement Grids

Applicability Condition	Δθ [°]	Standard Uncertainty Contribution [dB]
Below 3 GHz and Device Size ≤ 30 cm	30	0.23
Below 3 GHz and Device Size > 30 cm	30	0.23
Above 3 GHz	30	0.23
Note: The uncertainty distribution shall be assumed to be actual		

Testing of devices not covered by this section may use the measurement grids as defined in Tables 3.1-2 and 4.1-1 of *CTIA 01.20* [5].

3.1.7 LTE Broadband Power Mode Measurement Requirements

The following clarifications and changes are necessary in Section 9.10 of *CTIA 01.73* [16].

The following text replaces the first paragraph of Section 9.10 of CTIA 01.73 [16]. *The text in the second paragraph of Section 9.10 of* CTIA 01.73 [16] *remains as is.*

LTE uses SC-FDMA to produce a digital spread spectrum where specific sub-channels may be used or unused depending on the configuration information provided by the eNodeB base station. Thus, the

occupied bandwidth is configurable by the number of specified resource blocks (RBs) independent of the actual channel bandwidth, allowing multiple UEs to share one channel.
The sub-channel bandwidth ($fspan$) should be calculated as follows:

Equation 3.1.7-1

$$f_{span}(kHz) = 180(kHz) * N(RB) * (10/9)$$

Where the quantity (10/9) is the adjustment factor to ensure that the span is adequate to capture the power contribution from the band edges in the final integrated channel power measurement. Accordingly, the current TRP requirements specify sub-channel bandwidths of 18 RBs or 3.6 MHz for 20 MHz channels, 16 RBs or 3.2 MHz for 15 MHz channels, 12 RBs or 2.4 MHz for 10 MHz channels, 8 RBs or 1.6 MHz for 5 MHz channels, respectively. While there are a number of different power control options for LTE, the test plan expects maximum power to be produced by sending the “up” command constantly. After a few hundred milliseconds, the device will be at maximum power.

The following text replaces the third paragraph of Section 9.10 and Table 9.10-1 of CTIA 01.73 [16]. *All other text below the table remains as is.*

For the purposes of characterizing antenna performance, the resulting power may be measured with either the total power (CTIA 01.73 [16] Section 9.4) or integrated channel power (CTIA 01.73 [16] Section 9.5) methods using the parameters in Table 3.1.7-1, centered on the occupied bandwidth defined by the resource block allocation. A stable trace is defined as all points within ±0.5 dB of the midpoint value. In either case, the required frequency offsets specified in Table 3.1.7-1 may be determined generally as $[\text{RBStart} + (\text{RBAllocation} - \text{Total RBs})/2] * 0.18\ \text{MHz}$.

Table 3.1.7-1 Broadband Power Mode Measurement Requirements

Channel BW (MHz)	Total RBs	RB Allocation	RB Start	Frequency Offset (MHz)	f_{span} (MHz)[1]	$f_{Gaussian}$ (MHz)	$f_{flat\ top}$ (MHz)[1]
5	25	8	0	-1.53	1.6	4	2
			8	-0.09			
			17	+1.53			
10	50	12	0	-3.42	2.4	8	3
			19	0.0			
			38	+3.42			
15	75	16	0	-5.31	3.2	9	4
			29	-0.09			
			59	+5.31			
20	100	18	0	-7.38	3.6	12	4.5
			41	0.0			
			82	+7.38			
f_{RBW}			30 kHz				
T_{dwell} or T_{sweep}			100 ms				

$T_{short\ dwell}\ or\ T_{short\ sweep}$	20 ms
P_{flat}	70%
Note 1: The Sub-channel BW may be reconsidered in future versions as number of RBs may not be appropriate.	

3.2 SISO, Millimeter Wave Test Methodology

3.2.1 Use of Charging Cables

The use of charging cables is permitted for the RX beam peak search only with a corresponding vendor declaration as follows (which augments the vendor declarations described in Section 1.5.2)

For beam peak search tests performed with a charging cable as described in Section 4 of *CTIA 01.22* [7], device manufacturers shall declare

- Their intent regarding which bands and channels shall utilize a charging cable

- The zones of the DUT with the intent that those areas are not covered or blocked by the charging cable and cable routing fixtures to minimize their impact on measured device performance. ATLs shall collaborate with the manufacturer to try to meet the provided guidance.

- Based on this allowance, the following clarifications are necessary in *CTIA 01.22* [7] (unless otherwise noted, the following text should be appended at the end of the respective sections):Section 3: The DUT shall not be tested with a charging cable for any band and channel for TX testing.

- Section 4: The DUT may be tested with a charging cable for any band and channel if declared by the vendor and proper cable routing instructions are provided. The corresponding vendor declaration is listed in Section 1.5.2 of *CTIA 01.01* [1] The following applicability rules shall be considered when a charging cable is used:

  - The charging cable can only be used for the RX beam peak search procedure, i.e., the charging cable shall not be used for the test cases REFSENS – EIS (Section 4.2), and REFSENS – Spherical Coverage (Section 4.3).

  - The $EIS_{100\%\text{-}CCDF}$ result from the beam peak search procedure, performed with the charging cable, shall be within 1.5 dB of the peak EIS result from test case REFSENS – EIS (Section 4.2), performed without charging cable, for each band and channel tested with the charging cable. If the absolute difference is not within the 1.5 dB limit, the RX beam peak search and all applicable test cases shall be repeated without the charging cable for given band and channel.

- Section 4.2: If a charging cable was used for the RX beam peak search, it is recommended to follow the test sequences as outlined below:

  1. Perform RX beam peak search procedure with the charging cable while following the guidelines of the vendor declaration outlined in Section 1.5.2 of *CTIA 01.01* [1].

  2. Following the RX beam peak search, Section 4.1/Step 1, remove the charging cable with as few changes to the device and test setup as possible.

  3. Perform the REFSENS – EIS test immediately after the conclusion of the RX beam peak search, Step 1, and the removal of the charging cable, Step 2.

4. Determine the absolute difference between the $EIS_{100\%-CCDF}$ result from the beam peak search, performed with the charging cable (Step 1), and the peak EIS result, performed without the charging cable (Step 3).

- Section 4.3: The sentence in the third paragraph should have the following clarification (underlined): The $\mathrm{EIS}_{target\%-\mathrm{CCDF}}$ is obtained from the Complementary Cumulative Distribution Function (CCDF) computed from the EIS_{avg} measurements for all grid points collected during the RX beam peak search in Section 4.1. <u>if the DUT was tested with the standard battery, i.e., without the charging cable, see Section 4.</u>

3.3 MIMO Test Methodologies

There are no additional, temporary test requirements for these test methodologies at this time.

Section 4 Test Criteria

4.1 Test Criteria for SISO Test Method for 3GPP FR1 Wireless Technologies

The TRP and TIS criteria are protocol specific and specified in this section.

The criteria for the relative sensitivity on intermediate channels are defined as follows:

- When full TIS measurements are performed on intermediate channels, the intermediate channel passes if the full TIS result is better than 1) the TIS limit or 2) the TIS result at either of the neighboring reference channels plus 1 dB. The full TIS results at the intermediate channels may be included as additional data and marked as supplemental in the test report.
- When the single point sensitivity measurements are performed on intermediate channels, the intermediate channel passes if the single point sensitivity passes the standard sensitivity threshold at a reference downlink signal power. The reference downlink signal power is defined as the EIS of the nearest reference TIS measurement increased by 3 dB plus the M1 dB. M1 is defined as the larger of 0 dB or the amount the TIS exceeds the target. Full details of how the perform the relative sensitivity on intermediate channels can be found in *CTIA 01.20* [5].

4.1.1 GSM

4.1.1.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The limits in Table 4.1.1.1-1 are recommended.

Table 4.1.1.1-1 GSM Minimum TRP Level (in dBm) Recommended Limits for the Primary Mechanical Mode[1]

Band	Device Held Up to Head for Voice (Yes/No)	Device Power Class	Device Width (mm)[2]	FS	BHHL and BHHR	HL and HR[3]
GSM 850	Yes[4]	2	≤72	32	TBD	N/A
		2	>72	32	TBD	N/A
		3	≤72	30	TBD	N/A
		3	>72	30	TBD	N/A
		4	≤72	26	TBD	N/A
		4	>72	26	TBD	N/A
		5	≤72	22	TBD	N/A
		5	>72	22	TBD	N/A

Band	Device Held Up to Head for Voice (Yes/No)	Device Power Class	Device Width (mm)[2]	FS	BHHL and BHHR	HL and HR[3]
	No[5]	2	All	32	N/A	N/A
		3	All	30	N/A	N/A
		4	All	26	N/A	N/A
		5	All	22	N/A	N/A
GSM 1900	Yes[4]	1	≤72	24.5	TBD	N/A
		1	>72	24.5	TBD	N/A
		2	≤72	18.5	TBD	N/A
		2	>72	18.5	TBD	N/A
		3	≤72	27.5	TBD	N/A
		3	>72	27.5	TBD	N/A
	No[5]	1	All	24.5	N/A	N/A
		2	All	18.5	N/A	N/A
		3	All	27.5	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: GSM HL and HR tests are optional and are currently not a requirement of this Test Plan but may be used for single and multiple offset point reference tests including GPRS/EGPRS.

Note 4: “Yes” applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 5: “No” would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

Note: Device Power shall comply with the power levels specified in the relevant industry standard(s).

4.1.1.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The limits in Table 4.1.1.2-1 are recommended. However, they shall be used to determine the mandatory pass/fail limits for the relative sensitivity on intermediate channel tests.

Relative sensitivity on intermediate channels test results shall be provided in a file format specified in Section 5. The reported RF level that produces a 2.44% RBER for each channel shall be less than the level determined in *CTIA 01.50* [10].

Table 4.1.1.2-1 GSM Maximum C-TIS Level (in dBm) Recommended Limits for the Primary Mechanical Mode[1]

Band	Device Held Up to Head for Voice (Yes/No)	Device Power Class	Device Width (mm)[2]	FS	BHHL and BHHR	HL and HR[3]
GSM 850	Yes[4]	2	≤72	-99	TBD	N/A
			>72	-99	TBD	N/A
		3	≤72	-99	TBD	N/A
			>72	-99	TBD	N/A
		4	≤72	-99	TBD	N/A
			>72	-99	TBD	N/A
		5	≤72	-99	TBD	N/A
			>72	-99	TBD	N/A
	No[5]	2	All	-99	N/A	N/A
		3	All	-99	N/A	N/A
		4	All	-99	N/A	N/A
		5	All	-99	N/A	N/A
GSM 1900	Yes[4]	1	≤72	-101.5	TBD	N/A
			>72	-101.5	TBD	N/A
		2	≤72	-101.5	TBD	N/A
			>72	-101.5	TBD	N/A
		3	≤72	-101.5	TBD	N/A
			>72	-101.5	TBD	N/A
	No[5]	1	All	-101.5	N/A	N/A
		2	All	-101.5	N/A	N/A
		3	All	-101.5	N/A	N/A

Band	Device Held Up to Head for Voice (Yes/No)	Device Power Class	Device Width (mm)[2]	FS	BHHL and BHHR	HL and HR[3]
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor). Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB. Note 3: GSM HL and HR tests are optional and are currently not a requirement of this Test Plan, but may be used for single and multiple offset point reference tests including GPRS/EGPRS. Note 4: "Yes" applies if the device supports voice operation in the talk position against the head in any cellular radio mode. Note 5: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.						

4.1.2 GPRS

4.1.2.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The limits in Table 4.1.2.1-1 are recommended.

Table 4.1.2.1-1 GPRS Minimum TRP Level (in dBm) Recommended Limits for the Primary Mechanical Mode[1 2]

Band	Device Held Up to Head for Voice (Yes/ No)	Device Power Class	Device Width (mm)[3]	FS	BHHL and BHHR	HL and HR
GPRS 850	Yes[4]	2	≤72	32	TBD	TBD
		2	>72	32	TBD	TBD
		3	≤72	30	TBD	TBD
		3	>72	30	TBD	TBD
		4	≤72	26	TBD	TBD
		4	>72	26	TBD	TBD
		5	≤72	22	TBD	TBD
		5	>72	22	TBD	TBD
	No[5]	2	All	32	N/A	N/A
		3	All	30	N/A	N/A
		4	All	26	N/A	N/A

Band	Device Held Up to Head for Voice (Yes/ No)	Device Power Class	Device Width (mm)[3]	FS	BHHL and BHHR	HL and HR
		5	All	22	N/A	N/A
GPRS 1900	Yes[4]	1	≤72	24.5	TBD	TBD
		1	>72	24.5	TBD	TBD
		2	≤72	18.5	TBD	TBD
		2	>72	18.5	TBD	TBD
		3	≤72	27.5	TBD	TBD
		3	>72	27.5	TBD	TBD
	No[5]	1	All	24.5	N/A	N/A
		2	All	18.5	N/A	N/A
		3	All	27.5	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: The associated TRP value is based on measurements made with one uplink slot. Devices tested using two uplink time slots are allowed a TRP reduction of 3 dB, devices tested using three uplink slots are allowed a TRP reduction of up to 4.8 dB and devices tested using four uplink slots are allowed a TRP reduction of up to 6 dB. These allowances for uplink slot counts greater than one are based on an DUT capable of meeting the minimum TRP performance in single slot operation. This allowance is in alignment with *3GPP TS 45.005* [20], Section 4.1.1, Table 4.1-5.

Note 3: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 4: "Yes" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 5: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

Note: Device Power shall comply with the power levels specified in the relevant industry standard(s).

4.1.2.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The limits in Table 4.1.2.2-1 are recommended. However, they shall be used to determine the mandatory pass/fail limits for the intermediate channel desensitization tests.

Relative sensitivity on intermediate channels test results shall be provided in a file format specified in Section 5. The reported RF level that produces a 10% BLER for each channel shall be less than the level determined in *CTIA 01.50* [10].

Table 4.1.2.2-1 GPRS Maximum C-TIS Level (in dBm) Recommended Limits for the Primary Mechanical Mode[1]

Band	Device Held Up to Head for Voice (Yes/No)	Device Power Class	Device Width (mm)[2]	FS	BHHL and BHHR	HL and HR
GPRS 850	Yes[3]	2	≤72	-99	TBD	TBD
		2	>72	-99	TBD	TBD
		3	≤72	-99	TBD	TBD
		3	>72	-99	TBD	TBD
		4	≤72	-99	TBD	TBD
		4	>72	-99	TBD	TBD
		5	≤72	-99	TBD	TBD
		5	>72	-99	TBD	TBD
	No[4]	2	All	-99	N/A	N/A
		3	All	-99	N/A	N/A
		4	All	-99	N/A	N/A
		5	All	-99	N/A	N/A
GPRS 1900	Yes[3]	1	≤72	-101.5	TBD	TBD
		1	>72	-101.5	TBD	TBD
		2	≤72	-101.5	TBD	TBD
		2	>72	-101.5	TBD	TBD
		3	≤72	-101.5	TBD	TBD
		3	>72	-101.5	TBD	TBD
	No[4]	1	All	-101.5	N/A	N/A
		2	All	-101.5	N/A	N/A
		3	All	-101.5	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.3 EGPRS

4.1.3.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The limits in Table 4.1.3.1-1 are recommended.

Table 4.1.3.1-1 EGPRS Minimum TRP Level (in dBm) Recommended Limits for the Primary Mechanical Mode[1] [2]

Band	Device Held Up to Head for Voice (Yes/No)	Device Power Class	Device Width (mm)[3]	FS	BHHL and BHHR	HL and HR
EGPRS 850	Yes[4]	E1	≤72	26	TBD	TBD
		E1	>72	26	TBD	TBD
		E2	≤72	20	TBD	TBD
		E2	>72	20	TBD	TBD
		E3	≤72	16	TBD	TBD
		E3	>72	16	TBD	TBD
	No[5]	E1	All	26	N/A	N/A
		E2	All	20	N/A	N/A
		E3	All	16	N/A	N/A
EGPRS 1900	Yes[4]	E1	≤72	24.5	TBD	TBD
		E1	>72	24.5	TBD	TBD
		E2	≤72	20.5	TBD	TBD
		E2	>72	20.5	TBD	TBD
		E3	≤72	16.5	TBD	TBD
		E3	>72	16.5	TBD	TBD
	No[5]	E1	All	24.5	N/A	N/A
		E2	All	20.5	N/A	N/A
		E3	All	16.5	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: The associated TRP value is based on measurements made with one or two uplink slots. Devices tested using three uplink slots are allowed a TRP reduction of up to 1.8 dB and devices tested using four uplink slots are allowed a TRP reduction of up to 3 dB. These allowances for uplink slot counts greater than two are based on an DUT capable of meeting the minimum TRP performance in single or dual-slot operation.

Note 3: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 4: "Yes" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 5: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

Note: Device Power shall comply with the power levels specified in the relevant industry standard(s).

4.1.3.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The limits in Table 4.1.3.2-1 are recommended. However, they shall be used to determine the mandatory pass/fail limits for the intermediate channel desensitization tests.

Relative sensitivity on intermediate channels test results shall be provided in a file format specified in Section 5. The reported RF level that produces a 10% BLER for each channel shall be less than the level determined in *CTIA 01.50* [10].

Table 4.1.3.2-1 EGPRS Maximum C-TIS Level (in dBm) Recommended Limits for the Primary Mechanical Mode[1]

Band	Device Held Up to Head for Voice (Yes/No)	Device Power Class	Device Width (mm)[2]	FS	BHHL and BHHR	HL and HR
EGPRS 850	Yes[3]	E1	≤72	-94	TBD	TBD
		E1	>72	-94	TBD	TBD
		E2	≤72	-94	TBD	TBD
		E2	>72	-94	TBD	TBD
		E3	≤72	-94	TBD	TBD
		E3	>72	-94	TBD	TBD
	No[4]	E1	All	-94	N/A	N/A
		E2	All	-94	N/A	N/A
		E3	All	-94	N/A	N/A
EGPRS 1900	Yes[3]	E1	≤72	-97	TBD	TBD
		E1	>72	-97	TBD	TBD
		E2	≤72	-97	TBD	TBD
		E2	>72	-97	TBD	TBD
		E3	≤72	-97	TBD	TBD
		E3	>72	-97	TBD	TBD
	No[4]	E1	All	-97	N/A	N/A
		E2	All	-97	N/A	N/A
		E3	All	-97	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.4 UMTS (WCDMA)

4.1.4.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The limits in Table 4.1.4.1-1 are recommended.

Table 4.1.4.1-1 UMTS Minimum TRP Level (in dBm) Recommended Limits for the Primary Mechanical Mode[1]

Band	Device Held Up to Head for Voice (Yes/No)	Device Power Class	Device Width (mm)[2]	FS	BHHL and BHHR	HL and HR
UMTS 850	Yes[3]	3	≤72	17	TBD	TBD
		3	>72	17	TBD	TBD
		4	≤72	14	TBD	TBD
		4	>72	14	TBD	TBD
	No[4]	3	All	17	N/A	N/A
		4	All	14	N/A	N/A
UMTS 1900	Yes[3]	3	≤72	18.5	TBD	TBD
		3	>72	18.5	TBD	TBD
		4	≤72	15.5	TBD	TBD
		4	>72	15.5	TBD	TBD
	No[4]	3	All	18.5	N/A	N/A
		4	All	15.5	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

Note: Device Power shall comply with the power levels specified in the relevant industry standard(s).

4.1.4.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) across all channels measured with the DUT in primary

mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The limits in Table 4.1.4.2-1 are recommended. However, they shall be used to determine the mandatory pass/fail limits for the intermediate channel desensitization tests.

Relative sensitivity on intermediate channels test results shall be provided in a file format equivalent to that specified in Section 5. The reported RF level that produces a 1.2% BER for each channel shall be less than the level determined in *CTIA 01.50* [10].

Table 4.1.4.2-1 UMTS Maximum C-TIS Level (in dBm) Recommended Limits for the Primary Mechanical Mode[1]

Band	Device Held Up to Head for Voice (Yes/No)	Device Power Class	Device Width (mm)[2]	FS	BHHL and BHHR	HL and HR
UMTS 850	Yes[3]	3	≤72	-100	TBD	TBD
		3	>72	-100	TBD	TBD
		4	≤72	-100	TBD	TBD
		4	>72	-100	TBD	TBD
	No[4]	3	All	-100	N/A	N/A
		4	All	-100	N/A	N/A
UMTS 1900	Yes[3]	3	≤72	-102	TBD	TBD
		3	>72	-102	TBD	TBD
		4	≤72	-102	TBD	TBD
		4	>72	-102	TBD	TBD
	No[4]	3	All	-102	N/A	N/A
		4	All	-102	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.5 LTE Single Carrier

4.1.5.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space, head/hand configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations, across all channels and RB allocations measured with the DUT in

primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The TRP value for each LTE band shall meet the limits in Table 4.1.5.1-1. The limits for simple IoT devices in Table 4.1.5.1-1 are recommended.

Table 4.1.5.1-1 LTE Minimum TRP Level (in dBm) Requirements for the Primary Mechanical Mode[1]

Band	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
LTE Band 71	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	16	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 12	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	16	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 17	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	16	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A

Band	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
LTE Band 13	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	16	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 14	Held to head for voice[3]	1	≤72	N/A	N/A	N/A	TBD
			>72	N/A	N/A	N/A	TBD
		3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	1	All	N/A	N/A	N/A	N/A
		3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	1	All	N/A	N/A	N/A	N/A
		3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	1	All	N/A	N/A	N/A	N/A
		3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	1	All	N/A	N/A	N/A	N/A
		3	All	16	N/A	N/A	N/A
	Other[8]	1	All	TBD	N/A	N/A	N/A
		3	All	TBD	N/A	N/A	N/A
LTE Band 26	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A

Band	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
	Simple IoT Devices[7]	3	All	16	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 5	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	16	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 70	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	18	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 2	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	18	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 25	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A

Band	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	18	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 4	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	18	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 66	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	18	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 30	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	18	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 7	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD

Band	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	18	N/A	N/A	N/A
	Other[8]	3	All	TBD	N/A	N/A	N/A
LTE Band 41	Held to head for voice[3]	2	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	2	All	N/A	TBD	N/A	N/A
		3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	2	All	N/A	TBD	N/A	N/A
		3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	2	All	N/A	TBD	N/A	N/A
		3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	2	All	TBD	N/A	N/A	N/A
		3	All	18	N/A	N/A	N/A
	Other[8]	2	All	TBD	N/A	N/A	N/A
		3	All	TBD	N/A	N/A	N/A
LTE Band 48	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
	Chest worn[5]	3	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	3	All	18	N/A	N/A	N/A

Band	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
	Other[8]	3	All	TBD	N/A	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Held to head for voice" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: "Wrist worn" applies to devices that are worn on the wrist, e.g., smartwatches.

Note 5: "Chest worn" applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 6: "Ankle worn" applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 7: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 8: Applicable to any device not meeting the criteria for Note 3, through Note 7.

4.1.5.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space, head/hand configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

Relative sensitivity on intermediate channels test results shall be provided in a file format equivalent to that specified in Section 5.

The C-TIS value for each LTE band shall meet the limits in Table 4.1.5.2-1. The limits for simple IoT devices in Table 4.1.5.2-1 are recommended.

Table 4.1.5.2-1 LTE Maximum C-TIS Level (in dBm) Requirements for the Primary Mechanical Mode[1, 2]

Band	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
LTE Band 71	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A

Band	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
	Simple IoT Devices[7]	All	-87	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 12	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-90	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 13	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-87	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 14	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-87	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A

Band	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
LTE Band 26	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-90.5	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 5	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-88	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 70	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-90.2	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 2	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A

Band	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-90	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 25	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-91.5	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 4	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-92	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 66	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A

Band	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
	Simple IoT Devices[7]	All	-91.5	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 30	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-91	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 7	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-87	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A
LTE Band 41	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-87	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A

Band	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
LTE Band 48	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
		>72	TBD	N/A	TBD	TBD
	Wrist worn[4]	All	N/A	TBD	N/A	N/A
	Chest worn[5]	All	N/A	TBD	N/A	N/A
	Ankle worn[6]	All	N/A	TBD	N/A	N/A
	Simple IoT Devices[7]	All	-91	N/A	N/A	N/A
	Other[8]	All	TBD	N/A	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Held to head for voice" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: "Wrist worn" would be applicable to devices that are worn on the wrist, e.g., smartwatches.

Note 5: "Chest worn" applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 6: "Ankle worn" applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 7: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 8: Applicable to any device not meeting the criteria for Note 3 through Note 7.

4.1.6 LTE Two Downlink Carrier Aggregation (Single Uplink Carrier)

The number and type of measurements required to support TRP and TIS performance evaluation shall be determined based on the CA specific test requirements for carrier aggregation testing as described in Section 2.1.7.3.

4.1.6.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The TRP value for each applicable LTE 2 DL band combination shall meet the limits in Table 4.1.6.1-1.

Table 4.1.6.1-1 LTE Carrier Aggregation Mode (2 Downlink Carriers, 1 Uplink Carrier) TRP Criteria Table for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_2A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-29A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	No[4]	All	TBD	N/A
CA_2A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-29A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_5A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5B	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-4A	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_25A-25A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_25A-26A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	No[4]	All	TBD	N/A
CA_25A-41A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_26A-25A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_26A-41A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-29A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_30A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_41A-25A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_41A-26A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_41C	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_41A-41A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_48A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_48A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_48A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_48A-66A	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-29A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66C	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	No[4]	All	TBD	N/A
CA_66A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_70C	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.6.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels. When applicable, the receiver performance in all applicable CA band combinations shall be measured once with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

C-TIS shall meet the limits for the PCC and the SCC as shown in Table 4.1.6.2-1.

Table 4.1.6.2-1 LTE Maximum C-TIS Level Requirements for PCC and SCC In Carrier Aggregation Mode (2 Downlink Carriers, 1 Uplink Carrier) for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_2A-2A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_2A-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-29A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-29A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_5A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5B	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-4A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_13A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_25A-25A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_25A-26A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_25A-41A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_26A-25A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_26A-41A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-29A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_41A-25A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_41A-26A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_41C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_41A-41A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_48A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_48A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_48A-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_48A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-29A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_66A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_70C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor). Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB. Note 3: Different limits for different channel combinations may be needed since the desensitization effects will be channel dependent. Note 4: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode. Note 5: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.					

4.1.7 LTE Three Downlink Carrier Aggregation (Single Uplink Carrier)

The number and type of measurements required to support TRP and TIS performance evaluation shall be determined based on the CA specific test requirements for carrier aggregation testing as described in Section 2.1.7.3.

4.1.7.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

TRP shall meet the limits as shown in Table 4.1.7.1-1 below.

Table 4.1.7.1-1 LTE Carrier Aggregation Mode (3 Downlink Carriers, 1 Uplink Carrier) TRP Criteria Table for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_2A-2A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-2A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-2A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_2A-2A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-2A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-4A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-4A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-4A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-4A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-5A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-5A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-5A-66A	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-12A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-12A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-13A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-13A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-29A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-48A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-66C	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_2A-66A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	No[4]	All	TBD	N/A
CA_4A-2A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-2A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-2A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-2A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-4A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-4A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-4A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-5A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_4A-12A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_4A-29A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-2A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-2A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-2A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-2A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-2A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-4A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-4A-30A	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-5A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-29A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-30A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-48A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-66C	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_5A-66A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-2A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-2A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	No[4]	All	TBD	N/A
CA_12A-2A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-2A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-4A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-4A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-29A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-30A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-66C	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_12A-66A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_13A-2A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-2A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-2A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-2A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-4A-4A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-48A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-66C	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_13A-66A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_25A-41C	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-2A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-2A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-2A-29A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-4A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-4A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-4A-29A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-5A-29A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-5A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	No[4]	All	TBD	N/A
CA_30A-12A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-29A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-66C	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_30A-66A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_41D	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_48A-2A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_48A-2A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_48A-2A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_48A-5A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_48A-13A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-2A-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-2A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-2A-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-2A-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-2A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66C-2A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-2A-66A	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-5A-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-5A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-5A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66C-5A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-5A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-12A-29A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-12A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66C-12A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
	No[4]	All	TBD	N/A
CA_66A-12A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-13A-48A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66C-13A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-13A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-29A-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66C-29A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-29A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66C-30A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A

Carrier Aggregation Combination	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_66A-30A-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66D	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66C-66A	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A
CA_66A-66C	Yes[3]	≤72	TBD	TBD
	Yes[3]	>72	TBD	TBD
	No[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Yes” applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 4: “No” would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.7.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels. When applicable, the receiver performance in all applicable CA band combinations shall be measured once with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

C-TIS shall meet the limits for the PCC, SCC1, and SCC2 as shown in Table 4.1.7.2-1 below.

Table 4.1.7.2-1 LTE Maximum C-TIS Level Requirements for PCC, SCC1, and SCC2 in Carrier Aggregation Mode (3 Downlink Carriers, 1 Uplink Carrier) for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_2A-2A-4A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-2A-5A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-2A-12A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-2A-13A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-2A-66A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-4A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-4A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-4A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-4A-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-5A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-5A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-5A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-12A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-12A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-13A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-13A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-29A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-48A-66A	PCC		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-66C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-66A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_4A-2A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-2A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-2A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
CA_4A-2A-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-4A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-4A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-4A-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-5A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-12A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-29A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-2A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-2A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-2A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-2A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-2A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-4A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-4A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-5A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-29A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-30A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-48A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-66C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-66A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-2A-2A	PCC		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-2A-4A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-2A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_12A-2A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-4A-4A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-4A-30A[3]	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
CA_12A-29A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-30A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-66C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_12A-66A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-2A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-2A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-2A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-2A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-4A-4A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-48A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-66C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-66A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_25A-41C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-2A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-2A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-2A-29A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-4A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-4A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-4A-29A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-5A-29A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-5A-66A	PCC		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-12A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-29A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_30A-66C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-66A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_41D	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
CA_48A-2A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_48A-2A-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_48A-2A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_48A-5A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_48A-13A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-2A-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-2A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-2A-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-2A-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-2A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66C-2A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-2A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-5A-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-5A-48A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66C-5A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-5A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-12A-29A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-12A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66C-12A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-12A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-13A-48A	PCC		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66C-13A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-13A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_66A-29A-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66C-29A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-29A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
CA_66C-30A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-30A-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66D	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66C-66A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-66C	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: Different limits for different channel combinations may be needed since the desensitization effects will be channel dependent.

Note 4: “Yes” applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 5: “No” would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.8 LTE LAA Downlink Carrier Aggregation

4.1.8.1 TIS Criteria

Results shall be reported for the Band 46 radiated sensitivity as specified in Section 5. Results shall include cases where Band 46 TIS is fully measured for a given downlink LTE LAA carrier aggregation combination and where Band 46 radiated sensitivity is evaluated using the LAA un-licensed degradation test for a given downlink LTE LAA carrier aggregation combination. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels defined in Table 4.1.8.1-1 and Table 4.1.8.1-2. When applicable, the Band 46 receiver performance in all LTE LAA CA band combinations shall be measured once with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

Table 4.1.8.1-1 LTE LAA Maximum C-TIS Level for all Antennas (in dBm) Requirements for PCC and SCC in Carrier Aggregation Mode (2 Downlink Carriers, 1 Uplink Carrier) for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_2A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
CA_12A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_13A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_25A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_26A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-46A	PCC		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_41A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: Different limits for different channel combinations may be needed since the desensitization effects will be channel dependent.

Note 4: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 5: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

Table 4.1.8.1-2 LTE LAA Maximum C-TIS Level for All Antennas (in dBm) Requirements for PCC, SCC1, and SCC2 in Carrier Aggregation Mode (3 Downlink Carriers, 1 Uplink Carrier) for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_2A-4A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-5A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-12A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-13A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-29A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_2A-66A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-5A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-12A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_4A-13A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1		≤72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head for Voice (Yes/No)	Device Width (mm)^2	Free Space	HL and HR
		Yes[4]	>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_5A-12A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_30A-12A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_41C-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-5A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-12A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-13A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD

Carrier Aggregation Combination	PCC/SCC	Device Held Up To Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
CA_66A-66A-46A	PCC	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC1	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A
	SCC2	Yes[4]	≤72	TBD	TBD
			>72	TBD	TBD
		No[5]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: Different limits for different channel combinations may be needed since the desensitization effects will be channel dependent.

Note 4: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 5: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.9 LTE Category M1

4.1.9.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations, across all channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

TRP shall meet the limits as shown in Table 4.1.9.1-1 below. The limits for simple IoT devices in Table 4.1.9.1-1 are recommended.

Table 4.1.9.1-1 LTE Category M1 Minimum TRP Level (in dBm) Requirements for the Primary Mechanical Mode[1]

Band	Use Case Supported	Power Class	FS	WL/WR or ChW or AL
LTE Band 71	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 12	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 13	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD

Band	Use Case Supported	Power Class	FS	WL/WR or ChW or AL
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 26	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 5	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 2	Wrist Worn[2]	3	N/A	TBD

Band	Use Case Supported	Power Class	FS	WL/WR or ChW or AL
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	18	N/A
		5	15	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 4	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	18	N/A
		5	15	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 7	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	18	N/A
		5	15	N/A

Band	Use Case Supported	Power Class	FS	WL/WR or ChW or AL
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 41	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	18	N/A
		5	15	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Applicable to devices that are worn on the wrist, e.g. smartwatches.

Note 3: Applicable to devices that are worn on the chest, e.g. personal emergency response devices.

Note 4: Applicable to devices that are worn on the ankle, e.g. ankle monitors.

Note 5: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 6: Applicable to any devices that do not meet the criteria for Note 2 through Note 5.

4.1.9.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations, across all channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

TIS shall meet the limits as shown in Table 4.1.9.2-1 below. The limits for simple IoT devices in Table 4.1.9.2-1 are recommended.

Table 4.1.9.2-1 LTE Category M1 Maximum C-TIS Level (in dBm/1080 KHz) Requirements for the Primary Mechanical Mode[1]

Band	Use Case Supported	FS	WL/WR or ChW or AL
LTE Band 71	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-93.2	N/A
	Other[6]	TBD	N/A
LTE Band 12	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-93	N/A
	Other[6]	TBD	N/A
LTE Band 13	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-93	N/A
	Other[6]	TBD	N/A
LTE Band 26	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-94	N/A
	Other[6]	TBD	N/A
LTE Band 5	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-94.5	N/A
	Other[6]	TBD	N/A
LTE Band 4	Wrist Worn[2]	N/A	TBD

Band	Use Case Supported	FS	WL/WR or ChW or AL
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-98	N/A
	Other[6]	TBD	N/A
LTE Band 2	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-96	N/A
	Other[6]	TBD	N/A
LTE Band 7	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-96	N/A
	Other[6]	TBD	N/A
LTE Band 41	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-97	N/A
	Other[6]	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Applicable to devices that are worn on the wrist, e.g. smartwatches

Note 3: “Chest worn” applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 4: “Ankle worn” applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 5: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 6: Applicable to any devices that do not meet the criteria for Note 2 through Note 5.

4.1.10 LTE Category NB1

4.1.10.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations, across all relevant channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

TRP shall meet the limits as shown in Table 4.1.10.1-1 below. The limits for simple IoT devices in Table 4.1.10.1-1 are recommended.

Table 4.1.10.1-1 LTE Category NB1 Minimum TRP Level (dBm) for Stand-Alone (SA) Operation Using $\pi/4$ QPSK (15 KHZ Sub-Carrier Spacing) in the Primary Mechanical Mode[1]

Band	Use Case Supported	Power Class	FS	WL/WR or ChW or AL
LTE Band 71	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 12	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A

Band	Use Case Supported	Power Class	FS	WL/WR or ChW or AL
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 13	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 14	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 26	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD

Band	Use Case Supported	Power Class	FS	WL/WR or ChW or AL
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 5	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	16	N/A
		5	13	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 25	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	18	N/A
		5	15	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 2	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD

Band	Use Case Supported	Power Class	FS	WL/WR or ChW or AL
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	18	N/A
		5	15	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 4	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	18	N/A
		5	15	N/A
	Other[6]	3	TBD	N/A
		5	TBD	N/A
LTE Band 66	Wrist Worn[2]	3	N/A	TBD
		5	N/A	TBD
	Chest Worn[3]	3	N/A	TBD
		5	N/A	TBD
	Ankle Worn[4]	3	N/A	TBD
		5	N/A	TBD
	Simple IoT Devices[5]	3	18	N/A
		5	15	N/A
	Other[6]	3	TBD	N/A

Band	Use Case Supported	Power Class	FS	WL/WR or ChW or AL
		5	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Applicable to devices that are worn on the wrist, e.g. smartwatches

Note 3: "Chest worn" applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 4: "Ankle worn" applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 5: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 6: Applicable to any devices that do not meet the criteria for Note 2 through Note 5.

4.1.10.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations, across all relevant channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

TIS shall meet the limits as shown in Table 4.1.10.2-1 below. The limits for simple IoT devices in Table 4.1.10.2-1 are recommended.

Table 4.1.10.2-1 LTE Category NB1 Maximum TIS Level (dBm) for Stand-Alone (SA) Operation Using QPSK (15 kHz Sub-Carrier Spacing) in the Primary Mechanical Mode[1]

Band	Use Case Supported	FS	WL/WR or ChW or AL
LTE Band 71	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-101.2	N/A
	Other[6]	TBD	N/A
LTE Band 12	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-101.2	N/A
	Other[6]	TBD	N/A

Band	Use Case Supported	FS	WL/WR or ChW or AL
LTE Band 13	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-101.2	N/A
	Other[6]	TBD	N/A
LTE Band 14	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-101.2	N/A
	Other[6]	TBD	N/A
LTE Band 26	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-101.2	N/A
	Other[6]	TBD	N/A
LTE Band 5	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-101.2	N/A
	Other[6]	TBD	N/A
LTE Band 25	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-103.2	N/A
	Other[6]	TBD	N/A
LTE Band 2	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD

Band	Use Case Supported	FS	WL/WR or ChW or AL
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-103.2	N/A
	Other[6]	TBD	N/A
LTE Band 4	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-103.2	N/A
	Other[6]	TBD	N/A
LTE Band 66	Wrist Worn[2]	N/A	TBD
	Chest Worn[3]	N/A	TBD
	Ankle Worn[4]	N/A	TBD
	Simple IoT Devices[5]	-103.2	N/A
	Other[6]	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Applicable to devices that are worn on the wrist, e.g. smartwatches.

Note 3: “Chest worn” applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 4: “Ankle worn” applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 5: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 6: Applicable to any devices that do not meet the criteria for Note 2 through Note 5.

4.1.11 NR FR1 SA Single Carrier

4.1.11.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space, head/hand configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations, , across all channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The TRP value for each NR FR1 SA band shall meet the limits in Table 4.1.11.1-1.

Table 4.1.11.1-1 NR FR1 SA Minimum TRP Level (dBm) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
n2	1	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
n5	1	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
n12	1	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
n14	1	Held to head for voice[3]	1	≤72	N/A	N/A	N/A	N/A
				>72	N/A	N/A	N/A	N/A
			3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	1	All	N/A	N/A	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	1	All	N/A	N/A	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Ankle worn[46]	1	All	N/A	N/A	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	1	All	N/A	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A
		Other[8]	1	All	TBD	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A
n25	1	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
	2	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
n30	1	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
n41	1	Held to head for voice[3]	1.5	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
			2	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
			3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	1.5	All	TBD	N/A	N/A	N/A
			2	All	TBD	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A
		Other[8]	1.5	All	TBD	N/A	N/A	N/A
			2	All	TBD	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A
n48	1	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
n66	1	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
	2	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
	3	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Other[8]	3	All	TBD	N/A	N/A	N/A
n70	1	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
	2	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A
n71	1	Held to head for voice[3]	3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
n77 (all sub-ranges)	1	Held to head for voice[3]	1.5	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
			2	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
			3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	1.5	All	TBD	N/A	N/A	N/A
			2	All	TBD	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A
		Other[8]	1.5	All	TBD	N/A	N/A	N/A
			2	All	TBD	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A
n78	1		1.5	≤72	TBD	N/A	TBD	TBD

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Held to head for voice[3]		>72	TBD	N/A	TBD	TBD
			2	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
			3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	1.5	All	TBD	N/A	N/A	N/A
			2	All	TBD	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A
		Other[8]	1.5	All	TBD	N/A	N/A	N/A
			2	All	TBD	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A
	2	Held to head for voice[3]	1.5	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
			2	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
			3	≤72	TBD	N/A	TBD	TBD
				>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Chest worn[5]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Ankle worn[6]	1.5	All	N/A	N/A	N/A	N/A
			2	All	N/A	TBD	N/A	N/A
			3	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	1.5	All	TBD	N/A	N/A	N/A
			2	All	TBD	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A
		Other[8]	1.5	All	TBD	N/A	N/A	N/A
			2	All	TBD	N/A	N/A	N/A
			3	All	TBD	N/A	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Held to head for voice" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: "Wrist worn" applies to devices that are worn on the wrist, e.g., smartwatches.

Note 5: "Chest worn" applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 6: "Ankle worn" applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 7: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 8: Applicable to any device not meeting the criteria for Note 3 through Note 7.

4.1.11.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space, head/hand configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations, across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

Relative sensitivity on intermediate channels and relative power on intermediate channels test results shall be provided in a file format equivalent to that specified in Section 5.

The C-TIS value for each NR FR1 SA band shall meet the limits in Table 4.1.11.2-1.

Table 4.1.11.2-1 NR FR1 SA Maximum TIS Level (dBm) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
n2	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
n5	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
n12	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
n14	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Other[8]	All	TBD	N/A	N/A	N/A
n25	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
	2	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
n30	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
n41	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
n66	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
	2	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
	3		≤72	TBD	N/A	TBD	TBD

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Held to head for voice[3]	>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
n70	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
	2	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
n71	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
n77 (all sub-ranges)	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
n78	1	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A
	2	Held to head for voice[3]	≤72	TBD	N/A	TBD	TBD
			>72	TBD	N/A	TBD	TBD
		Wrist worn[4]	All	N/A	TBD	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	BHHL and BHHR	HL and HR
		Chest Worn[5]	All	N/A	TBD	N/A	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A	N/A
		Other[8]	All	TBD	N/A	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Held to head for voice” applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: “Wrist worn” applies to devices that are worn on the wrist, e.g., smartwatches.

Note 5: “Chest worn” applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 6: “Ankle worn” applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 7: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 8: Applicable to any device not meeting the criteria for Note 3 through Note 7

4.1.12 NR FR1 EN-DC (1 LTE Carrier with 1 NR Carrier)

4.1.12.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space, head/hand configurations, across all channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The TRP value for each NR FR1 EN-DC band shall meet the limits in Table 4.1.12.1-1.

Table 4.1.12.1-1 LTE Minimum TRP Level (dBm) for EN-DC in the Primary Mechanical Mode[1]

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
DC_2A_n5A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
				Other[4]	All	TBD	N/A
DC_2A_n66A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A_n71A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A_n77A	R1	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A_n77A	R2	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A_n78A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_5A_n66A	N/A	1	LTE Band 5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_5A_n78A	N/A	1	LTE Band 5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
		2	LTE Band 5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_7A_n78A	N/A	1	LTE Band 7	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	LTE Band 7	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_12A_n66A	N/A	1	LTE Band 12	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n2A	N/A	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n5A	N/A	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n66A	N/A	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n77A	R1	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n77A	R2	1			≤72	TBD	TBD

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
			LTE Band 13	Held to head for voice[3]	>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_48A_n5A	N/A	1	LTE Band 48	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n2A	N/A	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n5A	N/A	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n71A	N/A	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n77A	R1	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n77A	R2	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n78A	N/A	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
				Other[4]	All	TBD	N/A
DC_(n)71AA	N/A	1	LTE Band 71	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Held to head for voice" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: Applicable to any device not meeting the criteria for Note 3.

Table 4.1.12.1-2 NR FR1 Minimum TRP Level (dBm) for EN-DC in the Primary Mechanical Mode[1]

3GPP Config. Identifier	n77 Range ID	Var.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
DC_2A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A_n66A	N/A	1	NR n66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A_n71A	N/A	1	NR n71	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A_n77A	R1	1	NR n77 (R1)	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A

3GPP Config. Identifier	n77 Range ID	Var.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
DC_2A_n77A	R2	1	NR n77 (R2)	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A_n78A	N/A	1	NR n78	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n78	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_5A_n66A	N/A	1	NR n66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_5A_n78A	N/A	1	NR n78	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n78	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_7A_n78A	N/A	1	NR n78	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n78	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_12A_n66A	N/A	1	NR n66		≤72	TBD	TBD

3GPP Config. Identifier	n77 Range ID	Var.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
				Held to head for voice[3]	>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n2A	N/A	1	NR n2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n66A	N/A	1	NR n66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n77A	R1	1	NR n77 (R1)	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A_n77A	R2	1	NR n77 (R2)	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_48A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n2A	N/A	1	NR n2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD

3GPP Config. Identifier	n77 Range ID	Var.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
				Other[4]	All	TBD	N/A
DC_66A_n71A	N/A	1	NR n71	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n77A	R1	1	NR n77 (R1)	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n77A	R2	1	NR n77 (R2)	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_66A_n78A	N/A	1	NR n78	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n78	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_(n)71AA	N/A	1	NR n71	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Held to head for voice” applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: Applicable to any device not meeting the criteria for Note 3.

4.1.12.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space, head/hand configurations across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

Relative sensitivity on intermediate channels test results shall be provided in a file format equivalent to that specified in Section 5.

The C-TIS value for each NR FR1 EN-DC band shall meet the limits in Table 4.1.12.2-1.

Table 4.1.12.2-1 LTE Maximum C-TIS Level (dBm) for EN-DC in the Primary Mechanical Mode[1]

3GPP Config. Identifier	n77 Variant Range	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	WL and WR	HL and HR
DC_2A_n5A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_2A_n66A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_2A_n71A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_2A_n77A	R1	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_2A_n77A	R2	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_2A_n78A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A

3GPP Config. Identifier	n77 Variant Range	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	WL and WR	HL and HR
		2	LTE Band 2	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_5A_n66A	N/A	1	LTE Band 5	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_5A_n78A	N/A	1	LTE Band 5	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
		2	LTE Band 5	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_7A_n78A	N/A	1	LTE Band 7	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
		2	LTE Band 7	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_12A_n66A	N/A	1	LTE Band 12	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n2A	N/A	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n5A	N/A	1			≤72	TBD	N/A	TBD

3GPP Config. Identifier	n77 Variant Range	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	WL and WR	HL and HR
			LTE Band 13	Held to head for voice[3]	>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n66A	N/A	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n77A	R1	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n77A	R2	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_48A_n5A	N/A	1	LTE Band 48	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n2A	N/A	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n5A	N/A	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n71A	N/A	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n77A	R1	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD

3GPP Config. Identifier	n77 Variant Range	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	WL and WR	HL and HR
				Other[4]	All	TBD	N/A	N/A
DC_66A_n77A	R2	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n78A	N/A	1	LTE Band 66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
		2	LTE Band 66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_(n)71AA	N/A	1	LTE Band 71	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Held to head for voice" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: Applicable to any device not meeting the criteria for Note 3.

Table 4.1.12.2-2 NR FR1 Maximum C-TIS Level (dBm) for EN-DC in the Primary Mechanical Mode[1]

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	WL and WR	HL and HR
DC_2A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	WL and WR	HL and HR
DC_2A_n66A	N/A	1	NR n66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_2A_n71A	N/A	1	NR n71	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_2A_n77A	R1	1	NR n77 (R1)	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_2A_n77A	R2	1	NR n77 (R2)	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_2A_n78A	N/A	1	NR n78	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
		2	NR n78	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_5A_n66A	N/A	1	NR n66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_5A_n78A	N/A	1	NR n78	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
		2	NR n78		≤72	TBD	N/A	TBD

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	WL and WR	HL and HR
				Held to head for voice[3]	>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_7A_n78A	N/A	1	NR n78	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
		2	NR n78	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_12A_n66A	N/A	1	NR n66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n2A	N/A	1	NR n2	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n66A	N/A	1	NR n66	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n77A	R1	1	NR n77 (R1)	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_13A_n77A	R2	1	NR n77 (R2)	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	WL and WR	HL and HR
				Other[4]	All	TBD	N/A	N/A
DC_48A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n2A	N/A	1	NR n2	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n71A	N/A	1	NR n71	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n77A	R1	1	NR n77 (R1)	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n77A	R2	1	NR n77 (R2)	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
DC_66A_n78A	N/A	1	NR n78	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A
		2	NR n78	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	WL and WR	HL and HR
DC_(n)71AA	N/A	1	NR n71	Held to head for voice[3]	≤72	TBD	N/A	TBD
					>72	TBD	N/A	TBD
				Other[4]	All	TBD	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Held to head for voice" applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: Applicable to any device not meeting the criteria for Note 3.

4.1.13 Cellular Desensitization Due to Simultaneous Operation of 802.11 Radios for Integrated Devices

No pass/fail criteria exist for cellular desensitization due to simultaneous operation of 802.11 radios.

4.1.14 NR FR1 EN-DC (2 LTE Carriers with 1 NR Carrier)

4.1.14.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space, head/hand configurations, across all channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The TRP value for each NR FR1 EN-DC band shall meet the limits in Table 4.1.14.1-1 and Table 4.1.14.1-2.

Table 4.1.14.1-1 LTE Minimum TRP Level (dBm) for EN-DC (2 LTE Carriers, 1 NR Carrier) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
DC_2A-13A_n66A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
				Other[4]	All	TBD	N/A
DC_2A-66A_n5A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A-66A_n2A	N/A	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Held to head for voice” applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: Applicable to any device not meeting the criteria for Note 3.

Table 4.1.14.1-2 NR FR1 Minimum TRP Level (dBm) for EN-DC (2 LTE Carriers, 1 NR Carrier) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	n77 Range ID	Var.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
DC_2A-13A_n66A	N/A	1	NR n66		≤72	TBD	TBD

3GPP Config. Identifier	n77 Range ID	Var.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
				Held to head for voice[3]	>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A-66A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A-66A_n2A	N/A	1	NR n2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Held to head for voice” applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: Applicable to any device not meeting the criteria for Note 3.

4.1.14.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space, head/hand configurations across all channels measured with the DUT antenna extended and retracted.

Relative sensitivity on intermediate channels test results shall be provided in a file format equivalent to that specified in Section 5.

The C-TIS value for each NR FR1 EN-DC band shall meet the limits in Table 4.1.14.2-1 and Table 4.1.14.2-2.

Table 4.1.14.2-1 LTE Maximum C-TIS Level (dBm) for EN-DC (2 LTE Carriers, 1 NR Carrier) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
DC_2A-13A_n66A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
			LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
			LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A-66A_n5A	N/A	1	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
			LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	LTE Band 2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
				Other[4]	All	TBD	N/A
			LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A-66A_n2A	N/A	1	LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
			LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	LTE Band 13	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
			LTE Band 66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Held to head for voice” applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: Applicable to any device not meeting the criteria for Note 3.

Table 4.1.14.2-2 NR FR1 Maximum C-TIS Level (dBm) for EN-DC (2 LTE Carriers, 1 NR Carrier) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	n77 Range ID	VAR.	Band	Use Cases Supported	Device Width (mm)[2]	FS	HL and HR
DC_2A-13A_n66A	N/A	1	NR n66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n66	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_2A-66A_n5A	N/A	1	NR n5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n5	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
DC_13A-66A_n2A	N/A	1	NR n2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A
		2	NR n2	Held to head for voice[3]	≤72	TBD	TBD
					>72	TBD	TBD
				Other[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Held to head for voice” applies if the device supports voice operation in the talk position against the head in any cellular radio mode.

Note 4: Applicable to any device not meeting the criteria for Note 3.

4.1.15 NR FR1 SA Two Downlink Carrier Aggregation (Single Uplink Carrier)

The number and type of measurements required to support TRP and TIS performance evaluation shall be determined based on the DL CA specific test requirements for carrier aggregation testing as described in Section 2.1.7.7.

4.1.15.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The TRP value for each applicable NR FR1 SA 2 DL band combination shall meet the limits in Table 4.1.15.1-1.

Table 4.1.15.1-1 NR FR1 SA Carrier Aggregation Mode (2 Downlink Carriers, 1 Uplink Carrier) Minimum TRP Criteria Table for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_n2A-n5A	N/A	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A	N/A	2	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A	N/A	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A	N/A	2	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n66A	N/A	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A

Carrier Aggregation Combination	77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_n2A-n66A	N/A	2	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n77A	R1	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n77A	R1	2	n77 (R1)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n77A	R2	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n77A	R2	2	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A	N/A	1	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A	N/A	2	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n66A	N/A	1	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A

Carrier Aggregation Combination	77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_n5A-n66A	N/A	2	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n77A	R1	1	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n77A	R1	2	n77 (R1)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n77A	R2	1	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n77A	R2	2	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n66A	N/A	1	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n66A	N/A	2	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n77A	R1	1	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A

Carrier Aggregation Combination	77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_n48A-n77A	R1	2	n77 (R1)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n77A	R2	1	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n77A	R2	2	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n66A-n77A	R1	1	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n66A-n77A	R1	2	n77 (R1)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n66A-n77A	R2	1	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n66A-n77A	R2	2	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A

Carrier Aggregation Combination	77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor). Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB. Note 3: “Yes” applies if the device supports voice operation in the talk position against the head in LTE mode. Note 4: “No” would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.							

4.1.15.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels. When applicable, the receiver performance in all applicable CA band combinations shall be measured once with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

C-TIS shall meet the limits for the PCC and the SCC as shown in Table 4.1.15.2-1.

Table 4.1.15.2-1 NR FR1 SA Maximum C-TIS Level Requirements for PCC and SCC In Carrier Aggregation Mode (2 Downlink Carriers, 1 Uplink Carrier) for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_n2A-n5A	N/A	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A	N/A	2	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n48A	N/A	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n48A	N/A	2	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
CA_n2A-n66A	N/A	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n66A	N/A	2	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n77A	R1	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n77A	R1	2	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_n2A-n77A	R2	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n77A (R1)	R2	2	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n48A	N/A	1	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n48A	N/A	2	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n66A	N/A	1	PCC	n5	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n66A	N/A	2	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n77A	R1	1	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n77A	R1	2	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n77A	R2	1	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
			SCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n77A	R2	2	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n66A	N/A	1	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n66A	N/A	2	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n77A	R1	1	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
			SCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n77A	R1	2	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n77A	R2	1	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n77A	R2	2	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n66A-n77A	R1	1	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n77 (R1)	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n66A-n77A	R1	2	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n66A-n77A	R2	1	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n66A-n77A	R2	2	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.16 NR FR1 SA Three Downlink Carrier Aggregation (Single Uplink Carrier)

The number and type of measurements required to support TRP and TIS performance evaluation shall be determined based on the DL CA specific test requirements for carrier aggregation testing as described in Section 2.1.7.7.

4.1.16.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

TRP shall meet the limits as shown in Table 4.1.16.1-1 below.

Table 4.1.16.1-1 NR FR1 SA Carrier Aggregation Mode (3 Downlink Carriers, 1 Uplink Carrier) Minimum TRP Criteria Table for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_n2A-n5A-n48A	N/A	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n48A	N/A	2	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n48A	N/A	3	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n66A	N/A	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n66A	N/A	2	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_n2A-n5A-n66A	N/A	3	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R1	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R1	2	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R1	3	n77 (R1)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R2	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R2	2	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R2	3	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A-n66A	N/A	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A-n66A	N/A	2	n48	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A-n66A	N/A	3	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R1	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R1	2	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R1	3	n77 (R1)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R2	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R2	2	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R2	3	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	2	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	3	n77 (R1)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R2	1	n2	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R2	2	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R2	3	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A-n66A	N/A	1	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A-n66A	N/A	2	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A-n66A	N/A	3	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
CA_n5A-n48A-n77A	R1	1	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R1	2	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R1	3	n77 (R1)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R2	1	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R2	2	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R2	3	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	1	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	2	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	3	n77 (R1)	Yes[3]	≤72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R2	1	n5	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R2	2	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R2	3	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R1	1	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R1	2	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R1	3	n77 (R1)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R2	1	n48	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R2	2	n66	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC Band	Device Held to Head for Voice	Device Width (mm)[2]	Free Space	HL and HR
				No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R2	3	n77 (R2)	Yes[3]	≤72	TBD	TBD
				Yes[3]	>72	TBD	TBD
				No[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.16.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels. When applicable, the receiver performance in all applicable CA band combinations shall be measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

C-TIS shall meet the limits for the PCC, SCC1, and SCC2 as shown in Table 4.1.16.2-1 below.

Table 4.1.16.2-1 NR FR1 SA Maximum C-TIS Level Requirements for PCC, SCC1, and SCC2 in Carrier Aggregation Mode (3 Downlink Carriers, 1 Uplink Carrier) for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_n2A-n5A-n48A	N/A	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
CA_n2A-n5A-n48A	N/A	2	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n48A	N/A	3	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n66A	N/A	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n66A	N/A	2	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n66A	N/A	3	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R1	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R1	2	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R1	3	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R2	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R2	2	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n5A-n77A	R2	3	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n48A-n66A	N/A	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n48A-n66A	N/A	2	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n48A-n66A	N/A	3	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_n2A-n48A-n77A	R1	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R1	2	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R1	3	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R2	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R2	2	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n48A-n77A	R2	3	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
			SCC2	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	2	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	3	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R2	1	PCC	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R2	2	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R2	3	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
			SCC1	n2	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n48A-n66A	N/A	1	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n48A-n66A	N/A	2	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n48A-n66A	N/A	3	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R1	1	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R1	2	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
CA_n5A-n48A-n77A	R1	3	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R2	1	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R2	2	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
CA_n5A-n48A-n77A	R2	3	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	1	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	2	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	3	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R2	1	PCC	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R2	2	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R2	3	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n5	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R1	1	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R1	2	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R1	3	PCC	n77 (R1)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R2	1	PCC	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R2	2	PCC	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD

Carrier Aggregation Combination	n77 Range ID	VAR.	PCC/SCC	Band	Device Held Up To Head For Voice (Yes/No)	Device Width (mm)[2]	Free Space	HL and HR
					No[4]	All	TBD	N/A
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
CA_n48A-n66A-n77A	R2	3	PCC	n77 (R2)	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC1	n48	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A
			SCC2	n66	Yes[3]	≤72	TBD	TBD
						>72	TBD	TBD
					No[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.17 NR FR1 SA Uplink Carrier Aggregation (with 2-3 DL CA)

The number and type of measurements required to support TRP and TIS performance evaluation shall be determined based on the UL CA specific test requirements for carrier aggregation testing as described in Section 2.1.7.8.

4.1.17.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels and RB allocations measured with the

DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

The TRP value for each UL CA component carrier associated with the corresponding DL band combination shall meet the limits in Table 4.1.17.1-1 and Table 4.1.17.1-2.

Table 4.1.17.1-1 NR FR1 SA UL Carrier Aggregation Mode (2 Downlink Carriers, 2 Uplink Carriers) Minimum TRP Criteria Table for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	n77 Range ID	VAR.	UL PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_n2A-n66A	N/A	3	PCC NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
			SCC NR n66	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n2A-n77A	R1	3	PCC NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
			SCC NR n77 (R1)	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n5A-n66A	N/A	4	PCC NR n66	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
			SCC NR n5	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n66A-n77A	R1	3	PCC NR n66	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	UL PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
				No[4]	All	TBD	N/A
			SCC NR n77 (R1)	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

Table 4.1.17.1-2 NR FR1 SA UL Carrier Aggregation Mode (3 Downlink Carriers, 2 Uplink Carriers) Minimum TRP Criteria Table for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	n77 Range ID	VAR.	UL PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_n2A-n5A-n77A	R1	5	PCC NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
			SCC NR n77 (R1)	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	4	PCC NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
			SCC NR n66	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	UL PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_n2A-n66A-n77A	R1	5	PCC NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
			SCC NR n77 (R1)	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	7	PCC NR n66	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
			SCC NR n77 (R1)	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	5	PCC NR n5	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
			SCC NR n77 (R1)	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	6	PCC NR n66	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
			SCC NR n5	Yes[3]	72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	UL PCC/SCC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.17.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and hand only configurations (if applicable) across all applicable channels. When applicable, the receiver performance in all applicable CA band combinations shall be measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

C-TIS shall meet the limits for the victim component carrier as shown in Table 4.1.17.2-1 and Table 4.1.17.2-2.

Table 4.1.17.2-1 NR FR1 SA UL Carrier Aggregation Mode (2 Downlink Carriers, 2 Uplink Carriers) Maximum C-TIS Criteria Table for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	n77 Range ID	VAR.	DL VICTIM CC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_n2A-n66A	N/A	3	PCC NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n2A-n77A	R1	3	PCC NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n5A-n66A	N/A	4	SCC NR n5	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n66A-n77A	R1	3	PCC NR n66	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	DL VICTIM CC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
				No[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

Table 4.1.17.2-2 NR FR1 SA UL Carrier Aggregation Mode (3 Downlink Carriers, 2 Uplink Carriers) Maximum C-TIS Criteria Table for the Primary Mechanical Mode[1]

Carrier Aggregation Combination	n77 Range ID	VAR.	VICTIM CC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
CA_n2A-n5A-n77A	R1	5	PCC NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	4	PCC NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	5	SCC1 NR n66	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	7	PCC NR n66	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n2A-n66A-n77A	R1	7	SCC1 NR n2	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	5	SCC1		≤72	TBD	N/A

Carrier Aggregation Combination	n77 Range ID	VAR.	VICTIM CC	Device Held Up to Head for Voice (Yes/No)	Device Width (mm)2	Free Space	HL and HR
			NR n66	Yes[3]	>72	TBD	N/A
				No[4]	All	TBD	N/A
CA_n5A-n66A-n77A	R1	6	SCC1 NR n5	Yes[3]	≤72	TBD	N/A
					>72	TBD	N/A
				No[4]	All	TBD	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: "Yes" applies if the device supports voice operation in the talk position against the head in LTE mode.

Note 4: "No" would be applicable to data-centric devices that are not held up against the head, e.g., embedded laptop solutions.

4.1.18 NR FR1 RedCap

4.1.18.1 TRP Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space configurations, hand configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations, across all channels and RB allocations measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

Relative power on intermediate channels test results shall be provided in a file format equivalent to that specified in Section 5.

The TRP value for each NR FR1 RedCap band shall meet the limits in Table 4.1.18.1-1.

Table 4.1.18.1-1 NR FR1 RedCap Minimum TRP Level (dBm) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
n2	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Ankle worn[6]	3	All	N/A	TBD	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n5	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n12	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n14	1	Handheld[3]	3	≤72	N/A	N/A	N/A
				>72	N/A	N/A	N/A
		Wrist worn[4]	3	All	N/A	N/A	N/A
		Chest worn[5]	3	All	N/A	N/A	N/A
		Ankle worn[46]	3	All	N/A	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Simple IoT Devices[7]	3	All	N/A	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n25	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n30	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n41	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	N/A	N/A
		Chest worn[5]	3	All	N/A	N/A	N/A
		Ankle worn[6]	3	All	N/A	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n48	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n66	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n70	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Other[8]	3	All	TBD	N/A	N/A
n71	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	TBD	N/A
		Chest worn[5]	3	All	N/A	TBD	N/A
		Ankle worn[6]	3	All	N/A	TBD	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n77 (all sub-ranges)	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	N/A	N/A
		Chest worn[5]	3	All	N/A	N/A	N/A
		Ankle worn[6]	3	All	N/A	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A
		Other[8]	3	All	TBD	N/A	N/A
n78	1	Handheld[3]	3	≤72	TBD	N/A	TBD
				>72	TBD	N/A	TBD
		Wrist worn[4]	3	All	N/A	N/A	N/A
		Chest worn[5]	3	All	N/A	N/A	N/A
		Ankle worn[6]	3	All	N/A	N/A	N/A
		Simple IoT Devices[7]	3	All	TBD	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Power Class	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Other[8]	3	All	TBD	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Handheld” applies if the NR FR1 RedCap device supports handheld operation.

Note 4: “Wrist worn” applies to devices that are worn on the wrist, e.g., smartwatches.

Note 5: “Chest worn” applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 6: “Ankle worn” applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 7: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 8: Applicable to any device not meeting the criteria for Note 3 through Note 7.

4.1.18.2 TIS Criteria

Results shall be reported as specified in Section 5. Reports shall include results for applicable use cases, including free-space configurations, hand configurations, wrist-worn configurations, chest-worn configurations and/or ankle-worn configurations, across all channels measured with the DUT in primary mechanical mode with the DUT antenna extended and retracted (if applicable), and (if applicable) in non-primary mechanical modes as reference information.

Relative sensitivity on intermediate channels test results shall be provided in a file format equivalent to that specified in Section 5.

For NR FR1 FDD/TDD RedCap devices supporting single antenna operation in a particular operating band, the C-TIS value for each NR FR1 RedCap band shall meet the limits in Table 4.1.18.2-1. For NR FR1 FDD/TDD RedCap devices supporting dual antenna operation in a particular operating band, the C-TIS value for each NR FR1 RedCap band shall meet the limits in Table 4.1.18.2-2. For NR FR1 HD-FDD RedCap devices supporting single antenna operation in a particular operating band, the C-TIS value for each NR FR1 RedCap band shall meet the limits in Table 4.1.18.2-3. For NR FR1 HD-FDD RedCap devices supporting dual antenna operation in a particular operating band, the C-TIS value for each NR FR1 RedCap band shall meet the limits in Table 4.1.18.2-4.

Table 4.1.18.2-1 NR FR1 RedCap Single Antenna Maximum TIS Level (dBm) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
n2	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n5	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n12	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
n14	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n25	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n30	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n41	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n66	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n70	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n71	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n77 (all sub-ranges)	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n78	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Handheld” applies if the NR FR1 RedCap device supports handheld operation.

Note 4: “Wrist worn” applies to devices that are worn on the wrist, e.g., smartwatches.

Note 5: “Chest worn” applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 6: “Ankle worn” applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 7: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 8: Applicable to any device not meeting the criteria for Note 3 through Note 7.

Table 4.1.18.2-2 NR FR1 RedCap Dual Antenna Maximum TIS Level (dBm) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
n2	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n5	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n12	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n14	1	Handheld[3]	≤72	TBD	N/A	TBD

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n25	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n30	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n41	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n66	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n70	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n71	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n77 (all sub-ranges)	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n78	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Handheld” applies if the NR FR1 RedCap device supports handheld operation.

Note 4: “Wrist worn” applies to devices that are worn on the wrist, e.g., smartwatches.

Note 5: “Chest worn” applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 6: “Ankle worn” applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 7: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 8: Applicable to any device not meeting the criteria for Note 3 through Note 7.

Table 4.1.18.2-3 NR FR1 HD-FDD RedCap Single Antenna Maximum TIS Level (dBm) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
n2	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n5	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n12	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n14	1	Handheld[3]	≤72	TBD	N/A	TBD

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n25	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n30	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n41	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n66	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n70	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n71	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n77 (all sub-ranges)	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n78	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Handheld” applies if the NR FR1 RedCap device supports handheld operation.

Note 4: “Wrist worn” applies to devices that are worn on the wrist, e.g., smartwatches.

Note 5: “Chest worn” applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 6: “Ankle worn” applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 7: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 8: Applicable to any device not meeting the criteria for Note 3 through Note 7.

Table 4.1.18.2-4 NR FR1 HD-FDD RedCap Dual Antenna Maximum TIS Level (dBm) in the Primary Mechanical Mode[1]

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
n2	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n5	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n12	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n14	1	Handheld[3]	≤72	TBD	N/A	TBD

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n25	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n30	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n41	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n66	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n70	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n71	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A

3GPP Config. Identifier	VAR.	Use Cases Supported	Device Width (mm)[2]	FS	WL/WR or ChW or AL	HL and HR
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n77 (all sub-ranges)	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A
n78	1	Handheld[3]	≤72	TBD	N/A	TBD
			>72	TBD	N/A	TBD
		Wrist worn[4]	All	N/A	TBD	N/A
		Chest Worn[5]	All	N/A	TBD	N/A
		Ankle Worn[6]	All	N/A	TBD	N/A
		Simple IoT Devices[7]	All	TBD	N/A	N/A
		Other[8]	All	TBD	N/A	N/A

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Note 3: “Handheld” applies if the NR FR1 RedCap device supports handheld operation.

Note 4: “Wrist worn” applies to devices that are worn on the wrist, e.g., smartwatches.

Note 5: “Chest worn” applies to devices that are worn on the chest, e.g. personal emergency response devices.

Note 6: “Ankle worn” applies to devices that are worn on the ankle, e.g. ankle monitors.

Note 7: Simple IoT devices meet all of the following criteria: 1) only support data, 2) are non-CA devices, 3) are 60mm or larger in size, and 4) are not wearable devices. The limits for Simple IoT devices are recommended.

Note 8: Applicable to any device not meeting the criteria for Note 3 through Note 7.

4.2 Test Criteria for SISO Test Method for Location Based Wireless Technologies

4.2.1 A-GPS L1

4.2.1.1 TIS, UHIS and PIGS and Intermediate Channel Degradation Test Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) or wrist-worn configurations (if applicable) across all channels measured with the DUT antenna extended and retracted.

A-GPS L1 intermediate channel degradation test results shall be provided in a file format equivalent to that specified in Section 5.

Table 4.2.1.1-1, Table 4.2.1.1-2 and Table 4.2.1.1-3 contain the pass/fail limits for A-GPS L1 for devices held to the head for voice, Integrated Devices and wrist-worn devices, respectively.

Table 4.2.1.1-1 A-GPS L1 Maximum TIS/UHIS/PIGS Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice[1]

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
GSM 850	N/A	Control Plane / UE-Based	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
GSM 1900	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
UMTS 850	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
UMTS 1900	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
GSM 850	N/A	Control Plane / UE-Assisted	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
GSM 1900	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
UMTS 850	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
UMTS 1900	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
LTE Band 71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
LTE Band 71	N/A	SUPL 2.0 / UE-Assisted	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor). Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.									

Table 4.2.1.1-2 A-GPS L1 Maximum TIS/UHIS/PIGS Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices[1]

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
GSM 850	N/A	Control Plane / UE-Based	TBD	TBD	TBD
GSM 1900	N/A		TBD	TBD	TBD
UMTS 850	N/A		TBD	TBD	TBD
UMTS 1900	N/A		TBD	TBD	TBD
LTE Band 71	N/A		TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
GSM 850	N/A	Control Plane / UE-Assisted	TBD	TBD	TBD
GSM 1900	N/A		TBD	TBD	TBD
UMTS 850	N/A		TBD	TBD	TBD
UMTS 1900	N/A		TBD	TBD	TBD
LTE Band 71	N/A		TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
LTE Band 71	N/A	SUPL 2.0 / UE-Assisted	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).					

Table 4.2.1.1-3 A-GPS L1 Maximum TIS Level (in dBm) Requirements for the Primary Mechanical Mode for Wrist-Worn Devices[1]

Band	Positioning Method	WL and WR
		TIS
LTE Band 71	Control Plane / UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD

Band	Positioning Method	WL and WR
		TIS
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane / UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD

Band	Positioning Method	WL and WR
		TIS
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0 / UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD

Band	Positioning Method	WL and WR
		TIS
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

Table 4.2.1.1-4 A-GPS L1 Maximum TIS Level (in dBm) Requirements for the Primary Mechanical Mode for Chest Worn Devices[1]

Band	Positioning Method	ChW
		TIS
LTE Band 71	Control Plane / UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD

Band	Positioning Method	ChW
		TIS
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane / UE-Assisted	TBD
LTE Band 12		TBD

Band	Positioning Method	ChW
		TIS
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD

Band	Positioning Method	ChW
		TIS
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0 / UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD

Band	Positioning Method	ChW
		TIS
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

Table 4.2.1.1-5 A-GPS L1 Maximum TIS Level (in dBm) Requirements for the Primary Mechanical Mode for Ankle-Worn Devices[1]

Band	Positioning Method	AL
		TIS
LTE Band 71	Control Plane / UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD

Band	Positioning Method	AL
		TIS
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane / UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD

Band	Positioning Method	AL
		TIS
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0 / UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD

Band	Positioning Method	AL
		TIS
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

4.2.2 A-GPS L5

4.2.2.1 Average 3D C/N_0 / UH 3D C/N_0 / PIG 3D C/N_0 and Intermediate Channel Degradation Test Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) or wrist-worn configurations (if applicable) across all channels measured with the DUT antenna extended and retracted.

A-GPS L5 intermediate channel degradation test results shall be provided in a file format equivalent to that specified in Section 5.

Table 4.2.2.1-1, Table 4.2.2.1-2 and Table 4.2.2.1-3 contain the pass/fail limits for A-GPS L5 for devices held to the head for voice, Integrated Devices and Wrist-Worn Devices, respectively.

Table 4.2.2.1-1 A-GPS L5 Minimum Average 3D C/N_0 / UH 3D C/N_0 / PIG 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice[1]

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
LTE Band 71	N/A	Control Plane / UE-Based	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_5A_n78A			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_(n)71AA			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 71	N/A	Control Plane/UE-Assisted	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_12A_n66A			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 71	N/A	SUPL 2.0/UE-Assisted	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_13A_n5A			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0	Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Table 4.2.2.1-2 A-GPS L5 Minimum Average 3D C/N_0 / UH 3D C/N_0 / PIG 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices[1]

Band	N77 Range ID	Positioning Method	FS		
			AVERAGE 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
LTE Band 71	N/A	Control Plane / UE-Based	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD

Band	N77 Range ID	Positioning Method	FS		
			AVERAGE 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD

Band	N77 Range ID	Positioning Method	FS		
			AVERAGE 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
LTE Band 71	N/A	Control Plane / UE-Assisted	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD

Band	N77 Range ID	Positioning Method	FS		
			AVERAGE 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD

Band	N77 Range ID	Positioning Method	FS		
			AVERAGE 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
LTE Band 71	N/A	SUPL 2.0 / UE-Assisted	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD

Band	N77 Range ID	Positioning Method	FS		
			AVERAGE 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD

Band	N77 Range ID	Positioning Method	FS		
			AVERAGE 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD

Band	N77 Range ID	Positioning Method	FS		
			AVERAGE 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).					

Table 4.2.2.1-3 A-GPS L5 Minimum Average 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Wrist-Worn Devices[1]

Band	Positioning Method	WL and WR
		Average 3D C/N_0
LTE Band 71	Control Plane/UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD

Band	Positioning Method	WL and WR Average 3D C/N_0
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD

Band	Positioning Method	WL and WR Average 3D C/N_0
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD

Band	Positioning Method	WL and WR Average 3D C/N_0
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

Table 4.2.2.1-4 A-GPS L5 Minimum Average 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Chest-Worn Devices[1]

Band	Positioning Method	CHW Average 3D C/N_0
LTE Band 71		TBD

Band	Positioning Method	CHW
		Average 3D C/N_0
LTE Band 12	Control Plane/UE-Based	TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD

Band	Positioning Method	CHW
		Average 3D C/N_0
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD

Band	Positioning Method	CHW
		Average 3D C/N_0
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD

Band	Positioning Method	CHW
		Average 3D C/N_0
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

Table 4.2.2.1-5 A-GPS L5 Minimum Average 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Ankle-Worn Devices[1]

Band	Positioning Method	AL
		Average 3D C/N_0
LTE Band 71	Control Plane/UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD

Band	Positioning Method	AL
		Average 3D C/N_0
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD

Band	Positioning Method	AL
		Average 3D C/N_0
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0/UE-Assisted	TBD

Band	Positioning Method	AL
		Average 3D C/N_0
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD

Band	Positioning Method	AL
		Average 3D C/N_0
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

4.2.3 A-GALILEO E1

4.2.3.1 TIS, UHIS and PIGS and Intermediate Channel Degradation Test Criteria

Results shall be reported as specified in Section 5. Reports shall include results for free-space and head/hand configurations (if applicable) or wrist-worn configurations (if applicable) across all channels measured with the DUT antenna extended and retracted.

A-GALILEO E1 intermediate channel degradation test results shall be provided in a file format equivalent to that specified in Section 5.

Table 4.2.3.1-1, Table 4.2.3.1-2 and Table 4.2.3.1-3 contain the pass/fail limits for A-GALILEO E1 for devices held to the head for voice, Integrated Devices and Wrist-Worn Devices, respectively.

Table 4.2.3.1-1 A-GALILEO E1 with Maximum TIS/UHIS/PIGS Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice[1]

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
LTE Band 71	N/A	Control Plane / UE-Based	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 71	N/A	Control Plane/UE-Assisted	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 71	N/A	SUPL 2.0/UE-Assisted	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				TIS	UHIS	PIGS	TIS	UHIS	PIGS
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Table 4.2.3.1-2 A-GALILEO E1 with Maximum TIS/UHIS/PIGS Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices[1]

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
LTE Band 71	N/A	Control Plane/UE-Based	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
LTE Band 71	N/A	Control Plane/UE-Assisted	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
LTE Band 71	N/A	SUPL 2.0/UE-Assisted	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			TIS	UHIS	PIGS
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).					

Table 4.2.3.1-3 A-GALILEO E1 with Maximum TIS Level (in dBm) Requirements for the Primary Mechanical Mode for Wrist-Worn Devices[1]

Band	Positioning Method	WL and WR
		TIS
LTE Band 71	Control Plane/UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD

Band	Positioning Method	WL and WR
		TIS
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD

Band	Positioning Method	WL and WR
		TIS
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD

Band	Positioning Method	WL and WR
		TIS
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

Table 4.2.3.1-4 A-GALILEO E1 with Maximum TIS Level (in dBm) Requirements for the Primary Mechanical Mode for Chest-Worn Devices[1]

Band	Positioning Method	ChW
		TIS
LTE Band 71	Control Plane/UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD

Band	Positioning Method	ChW
		TIS
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD

Band	Positioning Method	ChW
		TIS
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD

Band	Positioning Method	ChW
		TIS
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

Table 4.2.3.1-5 A-GALILEO E1 with Maximum TIS Level (in dBm) Requirements for the Primary Mechanical Mode for Ankle-Worn Devices[1]

Band	Positioning Method	AL
		TIS
LTE Band 71	Control Plane/UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD

Band	Positioning Method	AL
		TIS
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD

Band	Positioning Method	AL
		TIS
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD

Band	Positioning Method	AL
		TIS
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).

4.2.4 VOID

4.2.5 A-GALILEO E5A

4.2.5.1 Average 3D C/N_0 / UH 3D C/N_0 / PIG 3D C/N_0 and Intermediate Channel Degradation Test Criteria

Results shall be reported as specified in 0. Reports shall include results for free-space and head/hand configurations (if applicable) or wrist-worn configurations (if applicable) across all channels measured with the DUT antenna extended and retracted.

A- GALILEO E5A intermediate channel degradation test results shall be provided in a file format equivalent to that specified in 0.

Table 4.2.5.1-1, Table 4.2.5.1-2 and Table 4.2.5.1-3 contain the pass/fail limits for A- GALILEO E5A for devices held to the head for voice, Integrated Devices and Wrist-Worn Devices, respectively.

Table 4.2.5.1-1 A- GALILEO E5A Minimum Average 3D C/N_0 / UH 3D C/N_0 / PIG 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice[1]

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
LTE Band 71	N/A	Control Plane / UE-Based	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
NR FR1 EN-DC DC_66A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 71	N/A	Control Plane/UE-Assisted	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
NR FR1 EN-DC DC_66A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 71	N/A	SUPL 2.0/UE-Assisted	≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 13	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 4	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
LTE Band 66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 7	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
LTE Band 48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
NR FR1 EN-DC DC_5A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
NR FR1 EN-DC DC_66A_n77A	R2		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		≤72	N/A	N/A	N/A	TBD	TBD	TBD
			>72	N/A	N/A	N/A	TBD	TBD	TBD
NR FR1 SA n2	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n5	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n12	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n14	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n25	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n26	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n30	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n41	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n48	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n66	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	Device Width (mm)[2]	BHHL and BHHR			HL and HR		
				Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0	Average 3D C/N0	UH 3D C/N0	PIG 3D C/N0
NR FR1 SA n70	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n71	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R1		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n77	R3		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD
NR FR1 SA n78	N/A		≤72	TBD	TBD	TBD	TBD	TBD	TBD
			>72	TBD	TBD	TBD	TBD	TBD	TBD

Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically means antenna extended, fold or portrait slide open, but depends on form factor).

Note 2: Differences between requirements for devices wider and narrower than 72 mm reflect observed differences in OTA performance with different hand phantoms of up to 6 dB.

Table 4.2.5.1-2 A- GALILEO E5A Minimum Average 3D C/N_0 / UH 3D C/N_0 / PIG 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices[1]

Band	n77 Range ID	Positioning Method	FS		
			Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
LTE Band 71	N/A	Control Plane/UE-Based	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
LTE Band 71	N/A	Control Plane/UE-Assisted	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
LTE Band 71	N/A	SUPL 2.0/UE-Assisted	TBD	TBD	TBD
LTE Band 12	N/A		TBD	TBD	TBD
LTE Band 13	N/A		TBD	TBD	TBD
LTE Band 14	N/A		TBD	TBD	TBD
LTE Band 26	N/A		TBD	TBD	TBD
LTE Band 5	N/A		TBD	TBD	TBD
LTE Band 70	N/A		TBD	TBD	TBD
LTE Band 4	N/A		TBD	TBD	TBD
LTE Band 66	N/A		TBD	TBD	TBD
LTE Band 2	N/A		TBD	TBD	TBD
LTE Band 25	N/A		TBD	TBD	TBD
LTE Band 30	N/A		TBD	TBD	TBD
LTE Band 7	N/A		TBD	TBD	TBD
LTE Band 41	N/A		TBD	TBD	TBD
LTE Band 48	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n66A	N/A		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_2A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n77A	R2		TBD	TBD	TBD
NR FR1 EN-DC DC_2A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_5A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_7A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_12A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n66A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_13A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_48A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n2A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n5A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n71A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R1		TBD	TBD	TBD
NR FR1 EN-DC DC_66A_n77A	R2		TBD	TBD	TBD

Band	n77 Range ID	Positioning Method	FS		
			Average 3D C/N_0	UH 3D C/N_0	PIG 3D C/N_0
NR FR1 EN-DC DC_66A_n78A	N/A		TBD	TBD	TBD
NR FR1 EN-DC DC_(n)71AA	N/A		TBD	TBD	TBD
NR FR1 SA n2	N/A		TBD	TBD	TBD
NR FR1 SA n5	N/A		TBD	TBD	TBD
NR FR1 SA n12	N/A		TBD	TBD	TBD
NR FR1 SA n14	N/A		TBD	TBD	TBD
NR FR1 SA n25	N/A		TBD	TBD	TBD
NR FR1 SA n26	N/A		TBD	TBD	TBD
NR FR1 SA n30	N/A		TBD	TBD	TBD
NR FR1 SA n41	N/A		TBD	TBD	TBD
NR FR1 SA n48	N/A		TBD	TBD	TBD
NR FR1 SA n66	N/A		TBD	TBD	TBD
NR FR1 SA n70	N/A		TBD	TBD	TBD
NR FR1 SA n71	N/A		TBD	TBD	TBD
NR FR1 SA n77	R1		TBD	TBD	TBD
NR FR1 SA n77	R3		TBD	TBD	TBD
NR FR1 SA n78	N/A		TBD	TBD	TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).					

Table 4.2.5.1-3 A- GALILEO E5A Minimum Average 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Wrist-Worn Devices[1]

Band	Positioning Method	WL and WR
		Average 3D C/N_0
LTE Band 71	Control Plane / UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD

Band	Positioning Method	WL and WR
		Average 3D C/N_0
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71 (R1)		TBD
NR FR1 SA n71 (R3)		TBD
NR FR1 SA n77		TBD
NR FR1 SA n78		TBD

Band	Positioning Method	WL and WR
		Average 3D C/N_0
LTE Band 71	Control Plane / UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD

Band	Positioning Method	WL and WR
		Average 3D C/N_0
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0 / UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD

Band	Positioning Method	WL and WR
		Average 3D C/N_0
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

Table 4.2.5.1-4 A-GALILEO E5A with Minimum Average 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Chest-Worn Devices[1]

Band	Positioning Method	ChW
		Average 3D C/N_0
LTE Band 71	Control Plane/UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD

Band	Positioning Method	ChW Average 3D C/N_0
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD

Band	Positioning Method	ChW Average 3D C/N_0
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD

Band	Positioning Method	ChW Average 3D C/N_0
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

Table 4.2.5.1-5 A-GALILEO E5A with Minimum Average 3D C/N_0 Level (in dBm) Requirements for the Primary Mechanical Mode for Ankle-Worn Devices[1]

Band	Positioning Method	AL
		Average 3D C/N_0
LTE Band 71	Control Plane/UE-Based	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD

Band	Positioning Method	AL
		Average 3D C/N_0
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	Control Plane/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD

Band	Positioning Method	AL
		Average 3D C/N_0
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
LTE Band 71	SUPL 2.0/UE-Assisted	TBD
LTE Band 12		TBD
LTE Band 13		TBD
LTE Band 14		TBD
LTE Band 26		TBD
LTE Band 5		TBD
LTE Band 70		TBD
LTE Band 4		TBD
LTE Band 66		TBD
LTE Band 2		TBD
LTE Band 25		TBD
LTE Band 30		TBD
LTE Band 7		TBD
LTE Band 41		TBD
LTE Band 48		TBD
NR FR1 SA n2		TBD
NR FR1 SA n5		TBD
NR FR1 SA n12		TBD
NR FR1 SA n14		TBD
NR FR1 SA n25		TBD
NR FR1 SA n26		TBD

Band	Positioning Method	AL
		Average 3D C/N_0
NR FR1 SA n30		TBD
NR FR1 SA n41		TBD
NR FR1 SA n48		TBD
NR FR1 SA n66		TBD
NR FR1 SA n70		TBD
NR FR1 SA n71		TBD
NR FR1 SA n77 (R1)		TBD
NR FR1 SA n77 (R3)		TBD
NR FR1 SA n78		TBD
Note 1: Primary Mechanical Mode refers to device configured in preferred mode per manufacturer instructions (typically depends on form factor and OEM input).		

4.3 Test Criteria for SISO, Millimeter Wave Test Method

Limits for *CTIA 01.22* [7] are for future study.

4.4 Test Criteria for MIMO Test Methodologies

Limits for *CTIA 01.40* [8] and *CTIA 01.41* [9] are for future study.

Section 5 Reporting of Test Results

Test reports and files shall be provided as described in this section. Deliverables consist of a Range Reference Measurement data file and DUT Measurement data files (as described in this section) for each DUT characterized.

Data from the tests on every product shall be reported in the following ways:

1. A complete set of the measurement data for every test supplied electronically in a format that can be easily read (e.g., Excel, etc.).
2. A complete set of test report forms from the spreadsheet *CTIA 01.03* [3]. Test reports forms are in the spreadsheet *CTIA 01.04* [4] for informative tests.

Please note the following abbreviations are used in the tables in the spreadsheet *CTIA 01.03* [3] and *CTIA 01.04* [4].

FS = Free Space

BH = Beside Head (Head Phantom Only)

BHL = Beside Head Left Side (Head Phantom Only)

BHR = Beside Head Right Side (Head Phantom Only)

HL = Hand Left (Hand Phantom Only)

HR = Hand Right (Hand Phantom Only)

BHHL = Beside Head and Hand Left Side (Head and Hand Phantom)

BHHR = Beside Head and Hand Right Side (Head and Hand Phantom)

WL = Wrist-Worn Left (Forearm Phantom)

WR = Wrist-Worn Right (Forearm Phantom)

ChW = Chest-Worn (Chest Phantom)

AL = Ankle Left (Ankle Phantom)

5.1 Test Result Tables for SISO Test Methodologies for Wireless Technologies below 6 GHz

The list of reporting tables for SISO test methodologies for wireless technologies below 6 GHz is in “RA Content” in *CTIA 01.03* [3]. All reporting tables for SISO test methodologies for wireless technologies below 6 GHz start with “RA”.

1. A series of 3D plots based on Table RA.3-5, Table RA.4-7 to Table RA.4-9, Table RA.4-16 to Table RA.4-18, Table RA-4.59, Table RA-4.62 of the mid-channel cellular patterns, GPS L1 patterns, and GPS L5 patterns, as applicable, as seen from a representative viewing angle

2. The Summation Test Report (Table in RA.3, Tables in RA.4 and Table in RA.5) shall be included as a separate file and also be included at the beginning of the main test report submitted. When multiple test configurations and/or antennas are tested, then these tables shall be completed multiple times with the appropriate test configurations and antennas included in the table header.

The results of the calculations for expanded uncertainty for both TRP and TIS measurements shall be reported. The test performance requirements shall not be adjusted by the measurement uncertainty when determining compliance of the DUTs.

The tables include:

RA.1: General Reporting Tables

Table RA.1-1 Device Under Test (DUT) Information

Table RA.1-2 Bands and Protocols Supported by Each Antenna

Table RA.1-3 DUTs Used for Each Test

RA.2: Example DUT Tables

Table RA.2-1 Example DUT (Top)

Table RA.2-2 Example DUT (Bottom)

RA.3: Summary Reporting Tables for 3GPP Technologies

Table RA.3-1 Cellular Radio Mode OTA Summation Test Report for Devices Held to the Head for Voice

Table RA.3-2 Cellular Radio Mode OTA Summation Test Report for Integrated Devices

Table RA.3-3 Cellular Radio Mode OTA Summation Test Report for Wrist-Worn Devices

Table RA.3-4 Intermediate Channel Relative Sensitivity

Table RA.3-5 Summation Test Report Plot Matrix

Table RA.3-6 LTE Carrier Aggregation Mode (2 DL, 1 UL) TRP Summary Table for the Primary Mechanical Mode

Table RA.3-7 LTE Carrier Aggregation Mode (3 DL, 1 UL) TRP Summary Table for the Primary Mechanical Mode

Table RA.3-8 LTE Carrier Aggregation Mode (2 DL, 1 UL) TIS Summary Table for the Primary Mechanical Mode

Table RA.3-9 LTE Carrier Aggregation Mode (3 DL, 1 UL) TIS Summary Table for the Primary Mechanical Mode

Table RA.3-10 NR FR1 EN-DC (1CC LTE + 1CC NR) TRP Summary Table for the Primary Mechanical Mode

Table RA.3-11 NR FR1 EN-DC (1CC LTE + 1CC NR) C-TIS Summary Table for the Primary Mechanical Mode

Table RA.3-12 Intermediate Channel Relative Power

Table RA.3-13 NR FR1 SA Carrier Aggregation Mode (2 DL, 1 UL) TRP Summary Table for the Primary Mechanical Mode

Table RA.3-14 NR FR1 SA Carrier Aggregation Mode (3 DL, 1 UL) TRP Summary Table for the Primary Mechanical Mode

Table RA.3-15 NR FR1 SA Carrier Aggregation Mode (2 DL, 1 UL) TIS Summary Table for the Primary Mechanical Mode

Table RA.3-16 NR FR1 SA Carrier Aggregation Mode (3 DL, 1 UL) TIS Summary Table for the Primary Mechanical Mode

Table RA.3-17 NR FR1 EN-DC (2CC LTE + 1CC NR) TRP Summary Table for the Primary Mechanical Mode

Table RA.3-18 NR FR1 EN-DC (2CC LTE + 1CC NR) C-TIS Summary Table for the Primary Mechanical Mode

Table RA.3-19 NR FR1 SA UL CA Carrier Aggregation Mode (2 DL, 2 UL) Summary Table for the Primary Mechanical Mode

Table RA.3-20 NR FR1 SA UL CA Carrier Aggregation Mode (3 DL, 2 UL) Summary Table for the Primary Mechanical Mode

The reporting table for chest-worn devices can be created from the reporting table for integrated devices, Table RA.3-2, by changing "FS" headers to "ChW" headers within the table.

Table RA.3-21 Cellular Radio Mode OTA Summation Test Report for Chest-Worn Devices

The reporting table for ankle-worn devices can be created from the reporting table for wrist-worn devices, Table RA.3-3, by changing "WL" headers to "AL" headers within the table and removing the columns with "WR" headers.

Table RA.3-22 Cellular Radio Mode OTA Summation Test Report for Ankle-Worn Devices

For Table RA.3-1 to Table RA.3-3,Table RA.3-6 to Table RA.3-11 and Table RA.3-13 to Table RA.3-22, when multiple test configurations and/or antennas are tested, then these tables shall be completed multiple times with the appropriate test configurations and antennas included in the table header. In the case where a test case has been noted as "Re-use", there is no need to provide the corresponding test case result in the carrier aggregation result tables."

The reporting table for handheld only devices can be created from the reporting table for Devices Held to the Head for Voice, Table RA.3-1, by removing the columns with "BHHL" and "BHHR" headers within the table.

Table RA.3-23 Cellular Radio Mode OTA Summation Test Report for Handheld Only Devices

RA.4: Summary Reporting Tables for Location Based Wireless Technologies

Table RA.4-1 A-GPS L1 non-CA/DC Summation Test Report for Devices Held to the Head for Voice

Table RA.4-2 A-GPS L1 non-CA/DC Summation Test Report for Integrated Devices

Table RA.4-3 A-GPS L1 non-CA/DC Summation Test Report for Wrist-Worn Devices

Table RA.4-4 A-GPS L1 non-CA/DC Intermediate Channel Relative Sensitivity for Devices Held to the Head for Voice

Table RA.4-46 A-GALILEO E1 with NR FR1 EN-DC with NR & LTE at Balanced Max Power Summation Test Report for Reference Band for Devices Held to the Head for Voice (second test)

Table RA.4-47 A-GALILEO E1 with NR FR1 EN-DC with NR only at Max Power Summation Test Report for Reference Band for Integrated Devices (first test)

Table RA.4-48 A-GALILEO E1 with NR FR1 EN-DC with NR & LTE at Balanced Max Power Summation Test Report for Reference Band for Integrated Devices (second test)

Table RA.4-49 A-GALILEO E1 with NR FR1 EN-DC with NR only at Max Power Summation Test Report for Devices Held to the Head for Voice (first test)

Table RA.4-50 A-GALILEO E1 with NR FR1 EN-DC with NR & LTE at Balanced Max Power Summation Test Report for Devices Held to the Head for Voice (second test)

Table RA.4-51 A-GALILEO E1 with NR FR1 EN-DC with NR only at Max Power Summation Test Report for Integrated Devices (first test)

Table RA.4-52 A-GALILEO E1 with NR FR1 EN-DC with NR & LTE at Balanced Max Power Summation Test Report for Integrated Devices (second test)

Table RA.4-53 A-GALILEO E1 with NR FR1 EN-DC with NR only at Max Power Intermediate Channel Relative Sensitivity for Devices Held to the Head for Voice (first test)

Table RA.4-54 A-GALILEO E1 with NR FR1 EN-DC with NR & LTE at Balanced Max Power Intermediate Channel Relative Sensitivity for Devices Held to the Head for Voice (second test)

Table RA.4-55 A-GALILEO E1 with NR FR1 EN-DC with NR only at Max Power Intermediate Channel Relative Sensitivity for Integrated Devices (first test)

Table RA.4-56 A-GALILEO E1 with NR FR1 EN-DC with NR & LTE at Balanced Max Power Intermediate Channel Relative Sensitivity for Integrated Devices (second test)

The reporting tables for chest-worn devices can be created from the following reporting tables for wrist-worn devices (Table RA.4-3, Table RA.4-6, Table RA.4-9, Table RA.4-12, Table RA.4-15, Table RA.4-18, Table RA.4-21, Table RA.4-24 Table RA.4-27) by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.4-57 A-GPS L1 non-CA/DC Summation Test Report for Chest-Worn Devices

Table RA.4-58 A-GPS L1 non-CA/DC Intermediate Channel Relative Sensitivity for Chest-Worn Devices

Table RA.4-59 A-GPS L1 Summation Test Report Plot Matrix for Chest-Worn Devices

Table RA.4-60 A-GPS L5 non-CA/DC Summation Test Report for Chest-Worn Devices

Table RA.4-61 A-GPS L5 non-CA/DC Intermediate Channel Relative Sensitivity for Chest-Worn Devices

Table RA.4-62 A-GPS L5 Summation Test Report Plot Matrix for Chest-Worn Devices

Table RA.4-63 A-GALILEO E1 non-CA/DC Summation Test Report for the Reference Band for Chest-Worn Devices

Table RA.4-64 A-GALILEO E1 non-CA/DC Summation Test Report for Chest-Worn Devices

Table RA.4-65 A-GALILEO E1 non-CA/DC Intermediate Channel Relative Sensitivity for Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the following reporting tables for wrist-worn devices (Table RA.4-3, Table RA.4-6, Table RA.4-9, Table RA.4-12, Table RA.4-15, Table RA.4-18, Table RA.4-21, Table RA.4-24 Table RA.4-27) by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.4-66 A-GPS L1 non-CA/DC Summation Test Report for Ankle-Worn Devices

Table RA.4-67 A-GPS L1 non-CA/DC Intermediate Channel Relative Sensitivity for Ankle-Worn Devices

Table RA.4-68 A-GPS L1 Summation Test Report Plot Matrix for Ankle-Worn Devices

Table RA.4-69 A-GPS L5 non-CA/DC Summation Test Report for Ankle-Worn Devices

Table RA.4-70 A-GPS L5 non-CA/DC Intermediate Channel Relative Sensitivity for Ankle-Worn Devices

Table RA.4-71 A-GPS L5 Summation Test Report Plot Matrix for Ankle-Worn Devices

Table RA.4-72 A-GALILEO E1 non-CA/DC Summation Test Report for the Reference Band for Ankle-Worn Devices

Table RA.4-73 A-GALILEO E1 non-CA/DC Summation Test Report for Ankle-Worn Devices

Table RA.4-74 A-GALILEO E1 non-CA/DC Intermediate Channel Relative Sensitivity for Ankle-Worn Devices

Table RA.4-75 A-GALILEO E5A non-CA/DC Summation Test Report for Devices Held to the Head for Voice

Table RA.4-76 A-GALILEO E5A non-CA/DC Summation Test Report for Integrated Devices

Table RA.4-77 A-GALILEO E5A non-CA/DC Summation Test Report for Wrist-Worn Devices

The reporting table for chest-worn devices can be created from the following reporting table for wrist-worn devices, Table RA.4-77 by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.4-78 A-GALILEO E5A non-CA/DC Summation Test Report for Chest-Worn Devices

The reporting table for ankle-worn devices can be created from the following reporting table for wrist-worn devices Table RA.4-77, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.4-79 A-GALILEO E5A non-CA/DC Summation Test Report for Ankle-Worn Devices

Table RA.4-80 A-GALILEO E5A non-CA/DC Intermediate Channel Relative Sensitivity for Devices Held to the Head for Voice

Table RA.4-81 A-GALILEO E5A non-CA/DC Intermediate Channel Relative Sensitivity for Integrated Devices

Table RA.4-82 A-GALILEO E5A non-CA/DC Intermediate Channel Relative Sensitivity for Wrist-Worn Devices

The reporting table for chest-worn devices can be created from the following reporting table for wrist-worn devices, Table RA.4-82 by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.4-83 A-GALILEO E5A non-CA/DC Intermediate Channel Relative Sensitivity for Chest-Worn Devices

The reporting table for ankle-worn devices can be created from the following reporting table for wrist-worn devices, Table RA.4-82, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.4-84 A-GALILEO E5A non-CA/DC Intermediate Channel Relative Sensitivity for Ankle-Worn Devices

Table RA.4-85 A-GALILEO E5A Summation Test Report Plot Matrix for Devices Held to the Head for Voice

Table RA.4-86 A-GALILEO E5A Summation Test Report Plot Matrix for Integrated Devices

Table RA.4-87 A-GALILEO E5A Summation Test Report Plot Matrix for Wrist-Worn Devices

The reporting table for chest-worn devices can be created from the following reporting table for wrist-worn devices, Table RA.4-87 by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.4-88 A-GALILEO E5A Summation Test Report Plot Matrix for Chest-Worn Devices

The reporting table for ankle-worn devices can be created from the following reporting table for wrist-worn devices, Table RA.4-87, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.4-89 A-GALILEO E5A Summation Test Report Plot Matrix for Ankle-Worn Devices

Table RA.4-90 A-GALILEO E5A with NR FR1 EN-DC Summation Test Report for Devices Held to the Head for Voice

Table RA.4-91 A-GALILEO E5A with NR FR1 EN-DC Summation Test Report for Integrated Devices

Table RA.4-92 A-GALILEO E5A with NR FR1 EN-DC with NR only at Max Power Intermediate Channel Relative Sensitivity for Devices Held to the Head for Voice

Table RA.4-93 A-GALILEO E5A with NR FR1 EN-DC with NR & LTE at Balanced Max Power Intermediate Channel Relative Sensitivity for Devices Held to the Head for Voice

Table RA.4-94 A-GALILEO E5A with NR FR1 EN-DC with NR only at Max Power Intermediate Channel Relative Sensitivity for Integrated Devices (first test)

Table RA.4-95 A-GALILEO E5A with NR FR1 EN-DC with NR & LTE at Balanced Max Power Intermediate Channel Relative Sensitivity for Integrated Devices (second test)

RA.5: Machine Readable Report

Table RA.5-1 Machine Readable Report

The columns of Table RA.5-1 are defined as follows:

Column A; "ATL ID": Enter the ATL ID of the OTA lab which performed this test. This field is included to improve traceability of which OTA lab performed testing especially when OTA testing is outsourced to multiple OTA labs for a single device model.

Column B; "Technology": Align the available choices with the airlink technologies currently defined in this document using the same syntax. LTE Category NB1/M1/1bis is for single receiver. LTE Category 1 and higher is for two or more receivers. The technology of only the band under test is listed in this column.

Column C; "Test Metric": Align the enumerated values with the metrics currently defined in *CTIA 01.01* [1] using the same syntax. The example entries are TRP, TIS, C-TIS. TIS is used for single receiver technologies such as EGPRS, GPRS, GSM, LTE Cat 1bis, LTE Cat M1, and LTE Cat NB1. C-TIS is used for multiple receiver technologies such as LTE Category 1 and higher, as well as NR, and UMTS.

Column D; "Radio Band": Align the enumerated values with the bands currently defined in *CTIA 01.01* [1] using the same syntax. All possible bands for Cellular are listed. Roman numerals are used for UMTS bands. Regular numbers are used for LTE and NR Bands i.e. band xx is used for LTE Bands, and band with nXX is used for NR Bands.

Column E; "**Carrier Aggregation/Dual Connectivity (CADC)":** This field indicates when the test case pertains to 1) Carrier Aggregation (denoted "CA"), 2) Dual Connectivity (denoted "DC"), 3) no Carrier Aggregation and no Dual Connectivity (denoted "Single Carrier" for protocols that support CA or DC), or 4) Not Applicable (denoted "N/A") for protocols that don't support CA nor DC.

If this field equals "Single Carrier", then Column F "Single Carrier Test Channel Configuration ID" shall be populated and Columns G, H, I, J and K shall be marked "N/A".

If this field equals "LTE CA", then 1) Column G "LTE Carrier Aggregation Test Configuration" and Column K "Multiple Component Carrier Test Configuration ID" shall be populated, and 2) Columns F, H, I, and J shall be marked "N/A".

If this field equals "NR CA", then 1) Column H "NR CADC 3GPP Test Configuration", Column I "NR CADC Variant ID", Column J "UL CCs" and Column K "Multiple Component Carrier Test Configuration ID" shall be populated, and 2) Columns F, G shall be marked "N/A".

If this field equals "EN-DC", then 1) Column H "NR CADC 3GPP Test Configuration", Column I "NR CADC Variant ID", Column J "UL CCs" and Column K "Multiple Component Carrier Test Configuration ID" shall be populated, and 2) Columns F, G shall be marked "N/A".

NR-DC testing is not defined in current CTIA OTA Test Plan, but will be added in future test plan releases.

If this field equals “N/A”, then Column F “Single Carrier Test Channel Configuration ID” shall be populated and Columns G, H, I, J and K shall be marked “N/A”. For example, LTE Category NB1 shall be filled with “N/A” for Carrier Aggregation Column E.

Column F; “Single Carrier Test Channel Configuration ID”: The purpose of this enumerated field is to indicate what type of test will be executed. For example, this proposal includes entries such as “TRP_1DL-1UL_1”, where “TRP_1DL-1UL” indicates a SISO measurement with one downlink carrier and one uplink carrier. For example, the Test Channel Configuration IDs for NR FR1 SA Band n77 (R1) are _1, _2, _3, _4 and _5 which correspond to the lowest to highest channels.

Column G; “LTE Carrier Aggregation Test Configuration”: The purpose of this enumerated Column is to indicate which LTE CA combination is being tested. The LTE CA Test Configuration shall be selected from the CTIA Operator Priority List for OTA Test Plan. Note that the LTE CA configuration shall follow the *CTIA 01.01* [1] for LTE CA combinations. Note 1: ATL is required to fill the LTE Carrier Aggregation Test Configuration in Column G following the LTE CA format used in the *CTIA 01.01* [1]. The LTE Carrier Aggregation Test Configuration will eventually be covered by the 3GPP Test Configuration and Variant ID in a future test plan release. This column will be marked “Obsolete” at that time.

Column H; “NR CADC 3GPP Test Configuration”: This enumerated Column is used to indicate which 3GPP test configuration is being tested. The NR EN-DC or NR FR1 SA CA Test Configuration shall be selected from the CTIA Operator Priority List for the OTA Test Plan. The 3GPP test configurations are the 3GPP Test Identifiers in *3GPP 38.521-3* [18] and are defined in the CTIA OTA Test Plan. Note 2: ATL is required to fill the NR CADC 3GPP Test Configuration in Column H following the 3GPP Nomenclature. This enumerated Column will be renamed “3GPP Test Configuration” in a future test plan release, and will be used to cover LTE CA, NR EN-DC, NR DC, NR CA, etc.

Column I; “NR CADC Variant ID”: This enumerated Column is used to indicate which Variant ID is being tested. The Variant ID defines 1) the MCG/SCG and PCC/SCC, 2) bandwidths of each CC in the band combination, and 3) the SCS for NR bands. The Variant IDs used for OTA testing are defined in the CTIA OTA Test Plan. This enumerated Column will be renamed “Variant ID” in a future test plan release, and will be used to cover LTE CA, NR DC, etc. When the DUT supports “Single Uplink operation” then append an “S” to the Variant ID with no space between them.

Column J; “UL CCs”: This enumerated Column is used to indicate which CCs are used in the UL. The MCG/PCC is listed first. Remaining LTE CCs are then listed in ascending band order. Remaining NR CCs are then listed in ascending band order. Note 3: ATL is required to fill for NR EN-DC the UL CCs Configuration in Column J with MCG/PCC first, with the remaining LTE CCs in ascending order next, and then the remaining NR CCs in ascending order.

Column K; “Multiple Component Carrier Test Configuration ID”: This enumerated column is used to indicate which Component Carriers were used. This is the CADC equivalent of Column F. Naming entries in format of TRP/TIS_xDL_yUL_u-v, in which x denotes number of downlink carriers; y denotes number of uplink carriers; u denotes carrier under test; and v denotes channel under test. For LTE u denotes the carrier under test in the order of PCC, SCC1, SCC2 and so on. For NR EN-DC and NR SA CA u denotes the carrier under test in the order bands are listed in the 3GPP Test Configuration. For example for LTE, TRP_3DL_1UL_2-4 represents a TRP test case, where the channel configuration under test is the 4th channel configuration in SCC1 and it is a 3DL and 1UL CA combo case. For LTE, the channel configurations are defined in *CTIA 01.50* [10] in Table 4.2.1-1, Table 4.2.2-1, Table 4.3.1-1, Table 4.3.2-1, Table 4.4.1-1, and Table 4.4.1-2. For NR EN-DC, the channel configurations are defined in *CTIA 01.50* [10] in Table 5.1.2.1-1, and Table 5.1.2.2.1-1. For NR SA CA, the channel configurations are defined in *CTIA 01.50* [10] in Table 5.1.3.1-1, Table 5.1.3.2-1, Table 5.1.4.1-1, and Table 5.1.4.2-1.

Some relevant examples include:

In the case of narrow frequency bands (e.g. LTE Band 13), there is only one channel defined to be tested for the 3 channel configurations in the case of CA or DC. See the example from Table 5.1.2.2.1-1 in *CTIA 01.50* [10].

DC_13A_n2A	1	DC_13A_n2A	13	MCG / PCC	10	15	20	20	Inter-band EN-DC	No	5230	15 RB with RBstart=0	50 RB with RBstart=0	387000	50@2	52@0
			n2	SCG / PCC	10	15					5230	15 RB with RBstart=0	50 RB with RBstart=0	392000	50@2	52@0
											5230	15 RB with RBstart=0	50 RB with RBstart=0	397000	50@2	52@0

The testing for this band combination produces a total of 6 entries in this column corresponding to the 3 channel configuration, which are as follows:

C-TIS_2DL_2UL_1-1 → for LTE 13, Channel 5230 (mid channel)
C-TIS_2DL_2UL_2-1 → for n2, Channel 387000 (low channel)

C-TIS_2DL_2UL_1-2 → for LTE 13, Channel 5230 (mid channel)
C-TIS_2DL_2UL_2-2 → for n2, Channel 392000 (mid channel)

C-TIS_2DL_2UL_1-3 → for LTE 13, Channel 5230 (mid channel)
C-TIS_2DL_2UL_2-3 → for n2, Channel 397000 (high channel)

Another interesting case is for intra-band non-contiguous CA cases. The channel combinations for intra-band non-contiguous cannot follow a low-low, mid-mid, high-high structure since there will be an overlap between the channels for each carrier within the same band. See the example from Table 4.2.2-1 in *CTIA 01.50* [10] for CA_4A-4A:

CA_4A-4A[5]	4	4	10	10	2000	2175	50 RB with RBstart=0	50 RB with RBstart=0	50 RB with RBstart=0
					2175	2350	50 RB with RBstart=0	50 RB with RBstart=0	50 RB with RBstart=0
					2350	2000	50 RB with RBstart=0	50 RB with RBstart=0	50 RB with RBstart=0

In this case, the entries in Column K would be as follows:

C-TIS_2DL_1UL_1-1 → for LTE 4, Channel 2000 (low channel)
C-TIS_2DL_1UL_2-1 → for LTE 4, Channel 2175 (mid channel)

C-TIS_2DL_1UL_1-2 → for LTE 4, Channel 2175 (mid channel)
C-TIS_2DL_1UL_2-2 → for LTE 4, Channel 2350 (high channel)

C-TIS_2DL_1UL_1-3 → for LTE 4, Channel 2350 (high channel)
C-TIS_2DL_1UL_2-3 → for LTE 4, Channel 2000 (low channel)

Another interesting case is for intra-band contiguous EN-DC cases. See the example from Table 5.1.2.1-1 in *CTIA 01.50* [10] for DC_(n)71AA:

DC_(n)71AA	1	DC_(n)71AA	71	MCG / PCC	10	15	20	20	Intra-band EN-DC	No[4]	133272	12 RB with RBstart=19	N/A[2]	133600	25@12	N/A[2]
			n71	SCG / PCC	10	15					133197	12 RB with RBstart=19	N/A[2]	136100	25@12	N/A[2]
											133322	12 RB with RBstart=19	N/A[2]	138600	25@12	N/A[2]

In this case the entries in column K would be as follows:

TRP_2DL_2UL_1-1 → for LTE 71, Channel 133272 (next to low channel)
TRP_2DL_2UL_2-1 → for n71, Channel 133600 (low channel)

TRP_2DL_2UL_1-2 → for LTE 71, Channel 133197 (previous to mid channel)
TRP_2DL_2UL_2-2 → for n71, Channel 136100 (mid channel)

TRP_2DL_2UL_1-3 → for LTE 71, Channel 133322 (previous to high channel)
TRP_2DL_2UL_2-3 → for n71, Channel 138600 (high channel)

Column L; "UE Power Class": Align the available choices in this enumerated column with the Power Classes currently defined in *CTIA 01.01* [1] using the same syntax. Also, ensure that the power classes unique to NB-IoT are included. PC1-PC6 is for LTE technology, I-V is for UMTS technology, 1-5 is for GSM/GPRS technology, E1-E3 is for EGPRS technology, and 1-4 is for NR technology (includes also PC1.5).

Column M; "Number of Receive Antenna(s)": This enumerated Column can be used on a limited basis to indicate single receiver or multiple receivers. 1 is for single receiver. 2 is for two active receivers. 3 is for three active receivers. 4 is for four active receivers. 5, 6, 7, 8 is for 5, 6, 7, 8 active receivers, respectively. Note 4: The Machine Readable Report format only includes the baseline receive antenna switch state when switching is used with the DUT's receive antennas.

Column N; "Label of Transmit Antenna(s) Under Test": This enumerated column will be used to associate TRP with a specific antenna when transmit diversity is supported for a particular test case. When transmit diversity is not supported for a particular test case, then "N/A" shall be entered. Section 1.5 of the *CTIA 01.01* [1] defines antenna labels as 'Each antenna shall be labelled with a letter, starting with the letter "A" '. This same antenna label shall be used in the column when transmit diversity is supported for a particular test case. Note that these antenna labels are also used in Table RA.1-2 of the *CTIA 01.03* [3]. In test cases where multiple antennas are transmitting at the same time (e.g., PC1.5) then list each label for each antenna being measured separated with a plus sign (e.g., A+C).

Column O; "Radiated Test Configuration": This enumerated column will be used to associate a test configuration (e.g. free-space, HL/HR, BHHL/BHHR, WL/WR, ChW, AL, etc.) per record. This includes different types of hand phantom and head and hand phantom i.e. monoblock, fold, narrow data, PDA, wide. Note that for Chest Worn devices, differing test configurations apply based on whether a Manufacturer-approved Carry Accessory is required for proper DUT use. For example, ChW w/ spacer only; or ChW w/ accessory (or equivalent spacer).

Column P; "Parametric Test Result": This numeric column will be used to report the measurement value according to the metrics currently defined in CTIA 01.01 using the same syntax.

Column Q; "Binary Test Result": This binary column will be used to associate a pass/fail/info status with the test in that record assuming limits are eventually defined and published in *CTIA 01.01* [1].

Column R; "Comments": This will be the only free-form text field in the file. This Column can be used to refer to GPRS/EGPRS multi-slot class, test reduction such as single point offset test (SPOT), LAA Un-licensed Degradation (LUD), CA Test Reduction, TRPs for NR PC 1.5 devices with UL MIMO (ULFPTx Mode 1) or UL TxD, or other details.

Column S; "NR CADC n77 Range ID": This enumerated Column is used to indicate n77 sub-ranges (namely R1, R2, R3, R4) and limited to FR1 EN-DC or NR SA CA combinations. It should be used in conjunction with Column H, Column D and Column K.

If a SA CA combination has n77 CC's in different sub-ranges, for example, CA_n77(2A) with 1CC in R1 and 1CC in R2, it would use "R1-R2" to reflect in this column; the corresponding n77 CC under test would be reflected in Column D, for example, "n77 (R1)" or "n77 (R2)", and the corresponding test channels configuration should be following Column K.

If a SA CA combination has n77 CC's in same sub-range, for example, CA_n77(2A) with both CC's in R1, it would use "R1-R1" to reflect in this column; the corresponding n77 CC under test would be reflected in Column D, for example, "n77 (R1), and the corresponding test channels configuration should be following Column K.

For CA/DC cases which are not relevant, it would be filled with “N/A”.

RA.10: GSM Tables

Table RA.10-1 to Table RA.10-2 GSM Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.10-3 to Table RA.10-4 GSM Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.10-5 to Table RA.10-6 GSM Maximum C-TIS Level Requirements for the Primary Mechanical Mode

For GSM devices, only provide Table RA.10-3 to Table RA.10-4 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.10-1 to Table RA.10-2 for those bands requiring reporting TRP for 1 antenna.

RA.11: GPRS Tables

Table RA.11-1 to Table RA.11-2 GPRS Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.11-3 to Table RA.11-4 GPRS Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.11-5 to Table RA.11-6 GPRS Maximum C-TIS Level Requirements for the Primary Mechanical Mode

For GPRS devices, only provide Table RA.11-3 to Table RA.11-4 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.11-1 to Table RA.11-2 for those bands requiring reporting TRP for 1 antenna.

RA.12: EGPRS Tables

Table RA.12-1 to Table RA.12-2 EGPRS Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.12-3 to Table RA.12-4 EGPRS Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.12-5 to Table RA.12-6 EGPRS Maximum C-TIS Level Requirements for the Primary Mechanical Mode

For EGPRS devices, only provide Table RA.12-3 to Table RA.12-4 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.12-1 to Table RA.12-2 for those bands requiring reporting TRP for 1 antenna.

RA.13: UMTS Tables

Table RA.13-1 to Table RA.13-2 UMTS Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.13-3 to Table RA.13-4 UMTS Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.13-5 to Table RA.13-6 UMTS Maximum C-TIS Level Requirements for the Primary Mechanical Mode

For UMTS devices, only provide Table RA.13-3 to Table RA.13-4 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.13-1 to Table RA.13-2 for those bands requiring reporting TRP for 1 antenna.

RA.20: LTE Tables

Table RA.20-1 to Table RA.20-17 LTE Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.20-18 to Table RA.20-34 LTE Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.20-35 to Table RA.20-49 LTE Maximum C-TIS Level Requirements for the Primary Mechanical Mode

The reporting tables for chest-worn devices can be created from the reporting tables, Table RA.20-1 to Table RA.20-49, by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header. The additional columns for the other use cases that are not relevant may also be removed.

Table RA.20-50 to Table RA.20-66 LTE Minimum TRP Level Requirements for Primary Mechanical Mode for Chest-Worn Devices

Table RA.20-67 to Table RA.20-83 LTE Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas for Chest-Worn Devices

Table RA.20-84 to Table RA.20-98 LTE Maximum C-TIS Level Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the reporting tables, Table RA.20-1 to Table RA.20-49, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header. The additional columns for the other use cases that are not relevant may also be removed.

Table RA.20-99 to Table RA.20-115 LTE Minimum TRP Level Requirements for Primary Mechanical Mode for Ankle-Worn Devices

Table RA.20-116 to Table RA.20-132 LTE Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas for Ankle-Worn Devices

Table RA.20-133 to Table RA.20-147 LTE Maximum C-TIS Level Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

For LTE devices, only provide Table RA.20-18 to Table RA.20-34, Table RA.20-67 to Table RA.20-83, and Table RA20-116 to Table RA.20-132 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.20-1 to Table RA.20-17, Table RA.20-50 to Table RA.20-66 and Table RA.20-99 to Table RA.20-115 for those bands requiring reporting TRP for 1 antenna.

RA.21: LTE 2 DL CA Tables

Table RA.21-1 to Table RA.21-60 LTE Minimum TRP Level Requirements for the PCC IN 2 DL CA for Primary Mechanical Mode

Table RA.21-61 to Table RA.21-120 LTE Minimum TRP Level Requirements for the PCC IN 2 DL CA for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.21-121 to Table RA.21-240 LTE Maximum C-TIS Level Requirements for the PCC/SCC IN 2 DL CA for the Primary Mechanical Mode

For LTE devices supporting 2 DL CA, only provide Table RA.21-67 to Table RA.21-132 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.21-1 to Table RA.21-66 for those bands requiring reporting TRP for 1 antenna.

RA.22: LTE 3 DL CA Tables

Table RA.22-1 to Table RA.22-107 LTE Minimum TRP Level Requirements for the PCC IN 3 DL CA for Primary Mechanical Mode

Table RA.22-108 to Table RA.22-214 LTE Minimum TRP Level Requirements for the PCC IN 3 DL CA for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.22-215 to Table RA.22-535 LTE Maximum C-TIS Level Requirements for the PCC/SCC1/SCC2 IN 3 DL CA for the Primary Mechanical Mode

For LTE devices supporting 3 DL CA, only provide Table RA.22-108 to Table RA.22-214 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.22-1 to Table RA.22-107 for those bands requiring reporting TRP for 1 antenna.

RA.23: LAA 2 DL CA Tables

Table RA.23-1 to Table RA.23-3 LTE Band 46 Maximum C-TIS Level Requirements for the SCC IN 2 DL CA for the Primary Mechanical Mode

Table RA.23-4 to Table RA.23-13 LTE Band 46 LUD Requirements for the SCC IN 2 DL CA for the Primary Mechanical Mode

Band 46 TIS shall be fully measured for one supported LAA CA combination with 2 CC's and are reported using one of the tables from Table RA.23-1 to RA.23-3. For all other LAA 2 DL CA combinations that require testing, Band 46 EIS performance shall be evaluated using the LAA Un-Licensed Degradation (LUD) test and reported using tables from Table RA.23-4 to RA.23-13.

RA.24: LAA 3 DL CA Tables

Table RA.24-1 to Table RA.24-16 LTE Band 46 LUD Requirements for the SCC2 IN 3 DL CA for the Primary Mechanical Mode

RA.30: LTE Category M1 Tables

Table RA.30-1 to Table RA.30-9 LTE Category M1 Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.30-10 to Table RA.30-18 LTE CAT-M1 Maximum C-TIS Level Requirements for the Primary Mechanical Mode

The reporting tables for chest-worn devices can be created from the reporting tables, Table RA.30-1 to Table RA.30-18, by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.30-19 to Table RA.30-27 LTE Category M1 Minimum TRP Level Requirements for Primary Mechanical Mode for Chest-Worn Devices

Table RA.30-28 to Table RA.30-36 LTE CAT-M1 Maximum C-TIS Level Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the reporting tables, Table RA.30-1 to Table RA.30-18, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.30-37 to Table RA.30-45 LTE Category M1 Minimum TRP Level Requirements for Primary Mechanical Mode for Ankle-Worn Devices

Table RA.30-46 to Table RA.30-54 LTE CAT-M1 Maximum C-TIS Level Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

RA.35: LTE Category NB1 Tables

Table RA.35-1 to Table RA.35-11 LTE CAT-NB1 Stand-Alone Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.35-12 to Table RA.35-22 LTE CAT-NB1 Stand-Alone Maximum C-TIS Level Requirements for the Primary Mechanical Mode

The reporting tables for chest-worn devices can be created from the reporting tables, Table RA.35-1 to Table RA.35-12, by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.35-23 to Table RA.35-33 LTE CAT-NB1 Stand-Alone Minimum TRP Level Requirements for Primary Mechanical Mode for Chest-Worn Devices

Table RA.35-34 to Table RA.35-44 LTE CAT-NB1 Stand-Alone Maximum C-TIS Level Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the reporting tables, Table RA.35-1 to Table RA.35-12, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.35-45 to Table RA.35-55 LTE CAT-NB1 Stand-Alone Minimum TRP Level Requirements for Primary Mechanical Mode for Ankle-Worn Devices

Table RA.35-56 to Table RA.35-66 LTE CAT-NB1 Stand-Alone Maximum C-TIS Level Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

RA.40: NR FR1 SA Tables

Table RA.40-1 to Table RA.40-30 NR FR1 SA Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.40-31 to Table RA.40-60 NR FR1 SA Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.40-61 to Table RA.40-77 NR FR1 SA Maximum C-TIS Level Requirements for the Primary Mechanical Mode

The reporting tables for chest-worn devices can be created from the reporting tables, Table RA.40-1 to Table RA.40-77, by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.40-78 to Table RA.40-101 NR FR1 SA Minimum TRP Level Requirements for Primary Mechanical Mode for Chest-Worn Devices

Table RA.40-102 to Table RA.40-125 NR FR1 SA Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas for Chest-Worn Devices

Table RA.40-126 to Table RA.40-140 LTE Maximum C-TIS Level Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the reporting tables, Table RA.40-1 to Table RA.40-77, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.40-141 to Table RA.40-164 NR FR1 SA Minimum TRP Level Requirements for Primary Mechanical Mode for Ankle-Worn Devices

Table RA.40-165 to Table RA.40-188 NR FR1 SA Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas for Ankle-Worn Devices

Table RA.40-189 to Table RA.40-203 LTE Maximum C-TIS Level Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

For NR FR1 SA devices, only provide Table RA.40-31 to Table RA.40-60, Table RA.40-102 to Table RA.40-125 and Table RA.40-165 to Table RA.40-188 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.40-1 to Table RA.40-30, Table RA.78-64 to Table RA.40-101 and Table RA.40-141 to Table RA.40-164 for those bands requiring reporting TRP for 1 antenna.

RA.41: NR FR1 SA 2 DL CA Tables

Table RA.41-1 to Table RA.41-28 NR FR1 SA Minimum TRP Level Requirements for the PCC IN 2 DL CA for Primary Mechanical Mode

Table RA.41-29 to Table RA.41-56 NR FR1 SA Minimum TRP Level Requirements for the PCC IN 2 DL CA for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.41-57 to Table RA.41-112 NR FR1 SA Maximum C-TIS Level Requirements for the PCC/SCC IN 2 DL CA for the Primary Mechanical Mode

For NR FR1 SA devices supporting 2 DL CA, only provide Table RA.41-29 to Table RA.41-56 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.41-1 to Table RA.41-28 for those bands requiring reporting TRP for 1 antenna.

RA.42: NR FR1 SA 3 DL CA Tables

Table RA.42-1 to Table RA.42-48 NR FR1 SA Minimum TRP Level Requirements for the PCC IN 3 DL CA for Primary Mechanical Mode

Table RA.42-49 to Table RA.42-96 NR FR1 SA Minimum TRP Level Requirements for the PCC IN 3 DL CA for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.42-97 to Table RA.42-240 NR FR1 SA Maximum C-TIS Level Requirements for the PCC/SCC1/SCC2 IN 3 DL CA for the Primary Mechanical Mode

For NR FR1 SA devices supporting 3 DL CA, only provide Table RA.42-49 to Table RA.42-96 for those bands requiring reporting TRP for 2 antennas, and only provide Table RA.42-1 to Table RA.42-48 for those bands requiring reporting TRP for 1 antenna.

RA.43: NR FR1 SA 2 UL Inter-Band CA (2 DL CA) Tables

Table RA.43-1 to Table RA.43-8 NR FR1 SA Minimum TRP Level Requirements for the PCC and the UL SCC in 2 UL Inter-Band CA (2 DL CA) for Primary Mechanical Mode

Table RA.43-9 to Table RA.43-16 NR FR1 SA Minimum TRP Level Requirements for the PCC and the UL SCC in 2 UL Inter-Band CA (2 DL CA) for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.43-17 to Table RA.43-20 NR FR1 SA Maximum C-TIS Level Requirements for the Victim CC in 2 UL Inter-Band CA (2 DL CA) for the Primary Mechanical Mode

RA.44: NR FR1 SA 2 UL Inter-Band CA (3 DL CA) Tables

Table RA.44-1 to Table RA.44-14 NR FR1 SA Minimum TRP Level Requirements for the PCC and the UL SCC in 2 UL Inter-Band CA (3 DL CA) for Primary Mechanical Mode

Table RA.44-15 to Table RA.44-28 NR FR1 SA Minimum TRP Level Requirements for the PCC and the UL SCC in 2 UL Inter-Band CA (3 DL CA) for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.44-29 to Table RA.44-35 NR FR1 SA Maximum C-TIS Level Requirements for the Victim CC in 2 UL Inter-Band CA (3 DL CA) for the Primary Mechanical Mode

RA.50: NR FR1 EN-DC (1 CC LTE + 1CC NR) Tables

Table RA.50-1 to Table RA.50-46 NR FR1 EN-DC Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.50-47 to Table RA.50-92 NR FR1 EN-DC Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.50-93 to Table RA.50-138 NR FR1 EN-DC Maximum C-TIS Level Requirements for the Primary Mechanical Mode

RA.51: NR FR1 EN-DC Tables (2 CC LTE + 1 CC NR)

Table RA.51-1 to Table RA.51-12 NR FR1 EN-DC (2CC LTE + 1CC NR) Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.51-13 to Table RA.51-24 NR FR1 EN-DC (2CC LTE + 1CC NR) Minimum TRP Level Requirements for the Primary Mechanical Mode for the Primary and Secondary Antennas

Table RA.51-25 to Table RA.51-42 NR FR1 EN-DC (2CC LTE + 1CC NR) Maximum C-TIS Level Requirements for the Primary Mechanical Mode

RA.60: NR FR1 RedCap Tables

Table RA.60-1 to Table RA.60-17 NR FR1 RedCap Minimum TRP Level Requirements for Primary Mechanical Mode

Table RA.60-18 to Table RA.60-34 NR FR1 RedCap Single Antenna Maximum C-TIS Level Requirements for the Primary Mechanical Mode

Table RA.60-35 to Table RA.60-51 NR FR1 RedCap Dual Antenna Maximum C-TIS Level Requirements for the Primary Mechanical Mode

Table RA.60-52 to Table RA.60-68 NR FR1 HD-FDD RedCap Single Antenna Maximum C-TIS Level Requirements for the Primary Mechanical Mode

Table RA.60-69 to Table RA.60-85 NR FR1 HD-FDD RedCap Dual Antenna Maximum C-TIS Level Requirements for the Primary Mechanical Mode

The reporting tables for chest-worn devices can be created from the RA.60-1 to 85 reporting tables by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.60-86 to Table RA.60-102 NR FR1 RedCap Minimum TRP Level Requirements for Chest-Worn Devices

Table RA.60-103 to Table RA.60-119 NR FR1 RedCap Single Antenna Maximum C-TIS Level Requirements for the Chest-Worn Devices

Table RA.60-120 to Table RA.60-136 NR FR1 RedCap Dual Antenna Maximum C-TIS Level Requirements for the Chest-Worn Devices

Table RA.60-137 to Table RA.60-153 NR FR1 HD-FDD RedCap Single Antenna Maximum C-TIS Level Requirements for the Chest-Worn Devices

Table RA.60-154 to Table RA.60-170 NR FR1 HD-FDD RedCap Dual Antenna Maximum C-TIS Level Requirements for the Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the RA.60-1 to 85 reporting tables by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.60-171 to Table RA.60-187 NR FR1 RedCap Minimum TRP Level Requirements for Ankle-Worn Devices

Table RA.60-188 to Table RA.60-204 NR FR1 RedCap Single Antenna Maximum C-TIS Level Requirements for the Ankle-Worn Devices

Table RA.60-205 to Table RA.60-221 NR FR1 RedCap Dual Antenna Maximum C-TIS Level Requirements for the Ankle-Worn Devices

Table RA.60-222 to Table RA.60-238 NR FR1 HD-FDD RedCap Single Antenna Maximum C-TIS Level Requirements for the Ankle-Worn Devices

Table RA.60-239 to Table RA.60-255 NR FR1 HD-FDD RedCap Dual Antenna Maximum C-TIS Level Requirements for the Ankle-Worn Devices

RA.70: A-GPS L1 Tables

Table RA.70-1 A-GPS L1 with GSM/UMTS Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.70-2 A-GPS L1 with GSM/UMTS Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Integrated Devices

Table RA.70-3 A-GPS L1 with LTE Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.70-4 A-GPS L1 with LTE Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Integrated Devices

Table RA.70-5 A-GPS L1 with LTE Maximum TIS Level Requirements for the Primary Mechanical Mode for Wrist-Worn Devices

Table RA.70-6 Void

Table RA.70-7 Void

Table RA.70-8 Void

Table RA.70-9 A-GPS L1 with NR FR1 EN-DC with NR only at Max Power Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice (first test)

Table RA.70-10 A-GPS L1 with NR FR1 EN-DC with NR & LTE at Balanced Max Power Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice (second test)

Table RA.70-11 A-GPS L1 with NR FR1 EN-DC with NR only at Max Power Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Integrated Devices (first test)

Table RA.70-12 A-GPS L1 with NR FR1 EN-DC with NR & LTE at Balanced Max Power Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Integrated Devices (second test)

Table RA.70-13 A-GPS L1 with NR FR1 SA Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.70-14 A-GPS L1 with NR FR1 SA Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Integrated Devices

Table RA.70-15 A-GPS L1 with NR FR1 SA Maximum TIS Level Requirements for the Primary Mechanical Mode for Wrist-Worn Devices

The reporting tables for chest-worn devices can be created from the reporting tables for wrist-worn devices, Table RA.70-5 and Table RA.70-15, changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.70-16 A-GPS L1 with LTE Maximum TIS Level Requirements for the Primary Mechanical Mode for Chest-Worn Devices

Table RA.70-17 A-GPS L1 with NR FR1 SA Maximum TIS Level Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the reporting tables for wrist-worn devices, Table RA.70-5 and Table RA.70-15, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.70-18 A-GPS L1 with LTE Maximum TIS Level Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

Table RA.70-19 A-GPS L1 with NR FR1 SA Maximum TIS Level Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

RA.71: A-GPS L5 Tables

Table RA.71-1 A-GPS L5 with LTE Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.71-2 A-GPS L5 with LTE Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices

Table RA.71-3 A-GPS L5 with LTE Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Wrist-Worn Devices

Table RA.71-4 A-GPS L5 with NR FR1 EN-DC Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.71-5 A-GPS L5 with NR FR1 EN-DC Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices

Table RA.71-6 A-GPS L5 with NR FR1 SA Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.71-7 A-GPS L5 with NR FR1 SA Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices

Table RA.71-8 A-GPS L5 with NR FR1 SA Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Wrist-Worn Devices

The reporting tables for chest-worn devices can be created from the reporting tables for wrist-worn devices, Table RA.71-3 and Table RA.71-8, by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.71-9 A-GPS L5 with LTE Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Chest-Worn Devices

Table RA.71-10 A-GPS L5 with NR FR1 SA Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the reporting tables for wrist-worn devices, Table RA.71-3 and Table RA.71-8, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.71-11 A-GPS L5 with LTE Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

Table RA.71-12 A-GPS L5 with NR FR1 SA Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

RA.72: A-GALILEO E1 Tables

Table RA.72-1 A-GALILEO E1 with LTE Maximum TIS/UHIS/PIGS Level Requirements for the Reference Band for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.72-2 A-GALILEO E1 with LTE Maximum TIS/UHIS/PIGS Level Requirements for the Reference Band for the Primary Mechanical Mode for Integrated Devices

Table RA.72-3 A-GALILEO E1 with LTE Maximum TIS Level Requirements for the Reference Band for the Primary Mechanical Mode for Wrist-Worn Devices

Table RA.72-4 A-GALILEO E1 with NR FR1 EN-DC with NR only at Max Power Maximum TIS/UHIS/PIGS Level Requirements for the Reference Band for the Primary Mechanical Mode for Devices Held to the Head for Voice (first test)

Table RA.72-5 A-GALILEO E1 with NR FR1 EN-DC with NR & LTE at Max Balanced Maximum TIS/UHIS/PIGS Level Requirements for the Reference Band for the Primary Mechanical Mode for Devices Held to the Head for Voice (second test)

Table RA.72-6 A-GALILEO E1 with NR FR1 EN-DC with NR only at Max Power Maximum TIS/UHIS/PIGS Level Requirements for the Reference Band for the Primary Mechanical Mode for Integrated Devices (first test)

Table RA.72-7 A-GALILEO E1 with NR FR1 EN-DC with NR & LTE at Max Balanced Maximum TIS/UHIS/PIGS Level Requirements for the Reference Band for the Primary Mechanical Mode for Integrated Devices (second test)

Table RA.72-8 A-GALILEO E1 with NR FR1 SA Maximum TIS/UHIS/PIGS Level Requirements for the Reference Band for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.72-9 A-GALILEO E1 with NR FR1 SA Maximum TIS/UHIS/PIGS Level Requirements for the Reference Band for the Primary Mechanical Mode for Integrated Device

Table RA.72-10 A-GALILEO E1 with NR FR1 SA Maximum TIS Level Requirements for the Reference Band for the Primary Mechanical Mode for Wrist-Worn Devices

The reporting tables for chest-worn devices can be created from the reporting tables for wrist-worn devices, Table RA.72-3 and Table RA.72-10, by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.72-11 A-GALILEO E1 with LTE Maximum TIS Level Requirements for the Reference Band for the Primary Mechanical Mode for Chest-Worn Devices

Table RA.72-12 A-GALILEO E1 with NR FR1 SA Maximum TIS Level Requirements for the Reference Band for the Primary Mechanical Mode for Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the reporting tables for wrist-worn devices, Table RA.72-3 and Table RA.72-10, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.72-13 A-GALILEO E1 with LTE Maximum TIS/UHIS/PIGS Level Requirements for the Reference Band for the Primary Mechanical Mode for Ankle-Worn Devices

Table RA.72-14 A-GALILEO E1 with NR FR1 SA Maximum TIS Level Requirements for the Reference Band for the Primary Mechanical Mode for Ankle-Worn Devices

RA.73: A-GALILEO E5A Tables

Table RA.73-1 A-GALILEO E5A with LTE Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.73-2 A-GALILEO E5A with LTE Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices

Table RA.73-3 A-GALILEO E5A with LTE Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Wrist-Worn Devices

The reporting table for chest-worn devices can be created from the reporting table for wrist-worn devices, Table RA.73-3, by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.73-4 A-GALILEO E5A with LTE Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting table for ankle-worn devices can be created from the reporting table for wrist-worn devices, Table RA.73-3, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.73-5 A-GALILEO E5A with LTE Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

Table RA.73-6 A-GALILEO E5A with NR FR1 EN-DC Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.73-7 A-GALILEO E5A with NR FR1 EN-DC Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices

Table RA.73-8 A-GALILEO E5A with NR FR1 SA Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table RA.73-9 A-GALILEO E5A with NR FR1 SA Minimum Average 3D C/N0 / UH 3D C/N0 / PIG 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Integrated Devices

Table RA.73-10 A-GALILEO E5A with NR FR1 SA Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Wrist-Worn Devices

The reporting table for chest-worn devices can be created from the reporting table for wrist-worn devices, Table RA.73-10, by changing "WL or WR" headers to "ChW" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.73-11 A-GALILEO E5A with NR FR1 SA Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting table for ankle-worn devices can be created from the reporting table for wrist-worn devices, Table RA.73-10, by changing "WL or WR" headers to "AL" headers within each table and by removing the note associated with "WL or WR" header.

Table RA.73-12 A-GALILEO E5A with NR FR1 SA Minimum Average 3D C/N0 Level (in dBm) Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

RA 80: MBS Table

Table RA.80-1 VOID

RA.90 Cellular Desensitization Due to 802.11 Operation Tables

Table RA.90-1 Cellular Desensitization Test Results for 802.11 Operation (2.4 GHz Band) with Cellular Free-Space Limits

Table RA.90-2 Cellular Desensitization Test Results for 802.11 Operation (5 GHz Band) with Cellular Free-Space Limits

Table RA.90-3 Cellular Desensitization Test Results for 802.11 Operation (2.4 GHz Band) without Cellular Free-Space Limits

Table RA.90-4 Cellular Desensitization Test Results for 802.11 Operation (5 GHz Band) without Cellular Free-Space Limits

5.1.1 DUT Measurement Data Files

Spherical-scan pattern data shall be supplied in a format accessible (i.e., readable) for additional examination and computation as outlined in Table RA.2-1 and Table RA.2-2. The pattern data reported are Effective Isotropic Radiated Power (EIRP) for transmit tests and Effective Isotropic Sensitivity (EIS) for receive tests, as defined in *CTIA 01.90* [17]. Both EIRP and EIS quantities shall be reported in units of dBm. In case of RSS-based measurements, the pattern data shall also be reported as the raw RSS values. For example, report C/N_0 values for A-GPS, see *CTIA 01.51* [11]. Relative phase quantities shall be reported in radians. For each cellular radio mode and frequency band combination that the DUT supports, complete spherical pattern files shall be provided for the following transmit and receive tests, for each applicable channel, DUT configuration and test condition (3 different channels[1]) (N different DUT configurations[2], if applicable) (up to 5 different test conditions[3]).

Each transmit-test spherical-scan file shall contain measurements for 11 theta cuts, 24 phi cuts, and 2 polarizations. Based on samples measured every 15 degrees of rotation for each cut, 528 measurements are thus recorded in each transmit test file. Each receive-test spherical-scan file shall contain measurements for 5 theta cuts, 12 phi cuts, and 2 polarizations. Based on samples measured every 30 degrees of rotation for each cut, 120 measurements are recorded in each receive test file.

In cases where the spiral scan TRP method has been used, the raw data shall contain measurements for a minimum of 350 points of 2 polarizations (700 total measurement points). There shall be a maximum spacing between subsequent spirals of 15 degrees in theta in each polarization. Ideally, points shall be measured between theta=0 degrees and theta=180 degrees. In cases where the measurement system

[1] "Channel" refers to the appropriate frequency pair for transmit and receive.

[2] "DUT configuration" refers to antenna stowed or deployed, slide opened or closed, etc. for those DUTs that support multiple configurations.

[3] "Test conditions" are free-space, right hand only, right hand and head, etc. as specified in *CTIA 01.72* [15]

does not allow measurements at the poles, measurements shall be performed between at least theta=15 degrees and theta=165 degrees and additional measurement points shall be collected at the minimum and/or maximum theta values at no less than 6 phi values. The measurements near the extreme theta values are then used to interpolate the point values between the extreme values of the measurement system and the pole(s), e.g., 165-180 degrees. In the reported pattern data, all points shall be labeled as to whether they are a measured or interpolated. Alternatively, it shall be stated in the report which measurement range for theta the test system supports.

In cases where theta dependent phi optimization has been used for TRP measurements, each transmit-test spherical-scan file shall contain measurements for 11 theta, variable phi cuts and 2 polarizations. In addition, the theta and phi angles shall be recorded for every measurement. In cases where theta dependent phi optimization has been used for TIS measurements, each receive-test spherical-scan file shall contain measurements for 5 theta, variable phi cuts, and 2 polarizations. In addition, the theta and phi angles shall be recorded for every measurement.

In addition to the spherical pattern data, for each cellular radio mode and band that the DUT supports, a file showing the appropriate BER, BLER, FER, or PER outcome per channel for the additional intermediate-channel, single-point receive tests is also required. The contents and number of channels reported in the intermediate-channel receive-test file will vary depending on the cellular radio mode.

For RSS-based measurements, in addition, the data for the linearization (see *CTIA 01.20* [1]) and for the sensitivity search shall be supplied.

5.1.2 3-D Plots

Plots shall be submitted for each DUT reported. Plot EIRP in units of dBm. Plot the inverted EIS in units of dBm (-EIS).

5.1.3 Range Reference Measurement Data File

Files containing the path loss terms employed for the measurements shall be provided as part of the ATL authorization process. Tables in *CTIA 01.73* [16] illustrate the data file format for these files.

5.1.4 Photographs and Identification of Hand and Forearm Phantoms

Photographs of the configurations in which the DUT has been tested with hand or forearm phantoms, shall be included in the test report. Photographs of the configurations in which the DUT has been tested with the hand phantom mounted to the head phantom, shall be included in the test report.

In addition, the model and serial numbers of each hand or forearm phantom with which the DUT has been tested, shall also be included in the test report.

5.1.5 Testing of Cellular Desensitization due to Simultaneous Operation of 802.11 Radios for Integrated Devices

Cellular desensitization due to simultaneous operation of 802.11 radios shall be provided in a file format equivalent to that specified in Section 5. Separate reporting tables shall be created for each 802.11 interferer and labeled with the 802.11 interferer.

5.1.6 Informative Reporting Tables

The list of informative reporting tables for SISO test methodologies for wireless technologies below 6 GHz is in “IA Content” in *CTIA 01.04* [4]. All informative reporting tables for SISO test methodologies for wireless technologies below 6 GHz start with “IA”.

The tables include:

Table IA.20-10 A-GPS L1 non-CA/DC Summation Test Report for Devices Held to the Head for Voice

Table IA.20-11 A-GPS L1 non-CA/DC Summation Test Report for Integrated Devices

Table IA.20-12 A-GPS L1 non-CA/DC Summation Test Report for Wrist-Worn Devices

The reporting tables for chest-worn devices can be created from the following normative reporting tables for wrist-worn devices (Table RA.4-3, Table RA.4-6 and Table RA.4-9 in CTIA 01.03 [3]) 1) by adding one column to the right of the "Positioning Method" column and titling the new column "SIB".and 2) by changing “WL or WR” headers to “ChW” headers within each table and by removing the note associated with “WL or WR” header.

Table IA.20-13 A-GPS L1 with SIB non-CA/DC Summation Test Report for Chest-Worn Devices

Table IA.20-14 A-GPS L1 with SIB non-CA/DC Intermediate Channel Relative Sensitivity for Chest-Worn Devices

Table IA.20-15 A-GPS L1 with SIB non-CA/DC Summation Test Report Plot Matrix for Chest-Worn Devices

The reporting tables for ankle-worn devices can be created from the following normative reporting tables for wrist-worn devices (Table RA.4-3, Table RA.4-6 and Table RA.4-9 in CTIA 01.03 [3]) 1) by adding one column to the right of the "Positioning Method" column and titling the new column "SIB".and 2) by changing “WL or WR” headers to “AL” headers within each table and by removing the note associated with “WL or WR” header.

Table IA.20-16 A-GPS L1 with SIB non-CA/DC Summation Test Report for Ankle-Worn Devices

Table IA.20-17 A-GPS L1 with SIB non-CA/DC Intermediate Channel Relative Sensitivity for Ankle-Worn Devices

Table IA.20-18 A-GPS L1 with SIB non-CA/DC Summation Test Report Plot Matrix for Ankle-Worn Devices

The informative reporting tables, Table IA.20-19 to Table IA.20-20, include A-GPS L1 with LTE Category M1.

The reporting table for chest-worn devices can be created from the informative reporting table for wrist-worn devices, Table IA-12, by changing “WL or WR” headers to “ChW” headers within each table and by removing the note associated with “WL or WR” header.

Table IA.20-19 A-GPS L1 non-CA/DC Summation Test Report for Chest-Worn Devices

The reporting table for ankle-worn devices can be created from the informative reporting table for wrist-worn devices, Table IA-12, by changing “WL or WR” headers to “AL” headers within each table and by removing the note associated with “WL or WR” header.

Table IA.20-20 A-GPS L1 non-CA/DC Summation Test Report for Ankle-Worn Devices

IA.21 A-GPS L1 Tables

The informative reporting tables, Table IA.21-1 to Table IA.21-3, can be created from the normative reporting tables, Table RA.70-3 to Table RA.70-5, in CTIA 01.03 [3] by adding one column to the right of the "Positioning Method" column and titling the new column "SIB".

Table IA.21-1 A-GPS L1 with SIB with LTE Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table IA.21-2 A-GPS L1 with SIB with LTE Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Integrated Devices

Table IA.21-3 A-GPS L1 with SIB with LTE Maximum TIS Level Requirements for the Primary Mechanical Mode for Wrist-Worn Devices

The informative reporting tables, Table IA.21-4 to Table IA.21-6, can be created from the informative reporting tables, Table IA.21-7 to Table IA.21-9, in CTIA 01.04 [4] *by adding one column to the right of the "Positioning Method" column and titling the new column "SIB".*

Table IA.21-4 A-GPS L1 with SIB with LTE CAT-M1 Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table IA.21-5 A-GPS L1 with SIB with LTE CAT-M1 Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Integrated Devices

Table IA.21-6 A-GPS L1 with SIB with LTE CAT-M1 Maximum TIS Level Requirements for the Primary Mechanical Mode for Wrist-Worn Devices

Table IA.21-7 A-GPS L1 with LTE Cat-M1 Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Devices Held to the Head for Voice

Table IA.21-8 A-GPS L1 with LTE Cat-M1 Maximum TIS/UHIS/PIGS Level Requirements for the Primary Mechanical Mode for Integrated Devices

Table IA.21-9 A-GPS L1 with LTE Cat-M1 Maximum TIS Level Requirements for the Primary Mechanical Mode for Wrist-Worn Devices

The reporting table for A-GPS L1 with SIB with LTE for chest-worn devices can be created from the normative reporting table for wrist-worn devices, Table RA.70-5 in CTIA 01.03 [3]*, 1) by adding one column to the right of the "Positioning Method" column and titling the new column "SIB" and 2) by changing “WL or WR” headers to “ChW” headers within the table and by removing the note associated with “WL or WR” header.*

Table IA.21-10 A-GPS L1 with SIB with LTE Maximum TIS Level Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting table for A-GPS L1 with SIB with LTE CAT-M1 for chest-worn devices can be created from the informative reporting table for wrist-worn devices, Table IA.20-9, 1) by adding one column to the right of the "Positioning Method" column and titling the new column "SIB" and 2) by changing “WL or WR” headers to “ChW” headers within the table and by removing the note associated with “WL or WR” header.

Table IA.21-11 A-GPS L1 with SIB with LTE CAT-M1 Maximum TIS Level Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting table for A-GPS L1 with LTE CAT-M1 for chest-worn devices can be created from the informative reporting tables for wrist-worn devices, Table IA.21-9, by changing “WL or WR” headers to “ChW” headers within the table and by removing the note associated with “WL or WR” header.

Table IA.21-12 A-GPS L1 with LTE CAT-M1 Maximum TIS Level Requirements for the Primary Mechanical Mode for Chest-Worn Devices

The reporting table for A-GPS L1 with SIB with LTE for ankle-worn devices can be created from the normative reporting table for wrist-worn devices, Table RA.70-5 in CTIA 01.03 [3], 1) by adding one column to the right of the "Positioning Method" column and titling the new column "SIB" and 2) by changing “WL or WR” headers to “AL” headers within the table and by removing the note associated with “WL or WR” header.

Table IA.21-13 A-GPS L1 with SIB with LTE Maximum TIS Level Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

The reporting table for A-GPS L1 with SIB with LTE CAT-M1 for ankle-worn devices can be created from the informative reporting table for wrist-worn devices, Table IA.20-9, 1) by adding one column to the right of the "Positioning Method" column and titling the new column "SIB" and 2) by changing “WL or WR” headers to “AL” headers within the table and by removing the note associated with “WL or WR” header.

Table IA.21-14 A-GPS L1 with SIB with LTE CAT-M1 Maximum TIS Level Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

The reporting table for A-GPS L1 with LTE CAT-M1 for ankle-worn devices can be created from the informative reporting tables for wrist-worn devices, Table IA.21-9, by changing “WL or WR” headers to “AL” headers within the table and by removing the note associated with “WL or WR” header.

Table IA.21-15 A-GPS L1 with LTE CAT-M1 Maximum TIS Level Requirements for the Primary Mechanical Mode for Ankle-Worn Devices

IA.30 MBS Tables

Table IA.30-1 MBS Summation Test Report

Table IA.30-2 MBS Intermediate Channel Relative Sensitivity

Table IA.30-3 MBS Summation Test Report Plot Matrix

Table IA.30-4 MBS with LTE Maximum TIS/NHPIS±45/NHPIS±30 Level Requirements for the Reference Band for the Primary Mechanical Mode

5.2 Test Report Tables for SISO, Millimeter Wave Test Methodology

The list of reporting tables for SISO, Millimeter Wave Test Methodology is in “RB Content” in *CTIA 01.03* [3]. All reporting tables for SISO, Millimeter Wave Test Methodology start with “RB”.

The tables include:

RB.1: General Reporting Tables

Table RB.1-1 Device Under Test (DUT) Information

Table RB.1-2 Bands and Protocols Supported by DUT

Table RB.1-3 DUTs Used for Each Test

RB.2: TX Tests

Table RB.2-1 TX Beam Peak Search

Table RB.2-2 TX Beam Peak Summary

Table RB.2-3 MOP - EIRP Summary

Table RB.2-4 MOP - TRP Results

Table RB.2-5 MOP - TRP Summary

Table RB.2-6 MOP - Spherical Coverage Results

Table RB.2-7 MOP - Spherical Coverage CDF Results

Table RB.2-8 MOP - Spherical Coverage Summary

RB.3: RX Tests

Table RB.3-1 RX Beam Peak Search

Table RB.3-2 RX Beam Peak Summary

Table RB.3-3 REFSENS - EIS Summary

Table RB.3-4 REFSENS - Spherical Coverage Results

Table RB.3-5 REFSENS - Spherical Coverage CCDF Results

Table RB.3-6 REFSENS - Spherical Coverage 50% CCDF Results

5.2.1 Informative Reporting Tables

The list of informative reporting tables for SISO, Millimeter Wave Test Methodology is in “IB Content” in *CTIA 01.04* [4]. All informative reporting tables for SISO, Millimeter Wave Test Methodology start with “IB”.

There are currently no informative tables for SISO, Millimeter Wave Test Methodology.

5.3 Test Report Tables for MIMO Test Methodologies

The list of reporting tables for MIMO Test Methodologies is in “RC Content” in *CTIA 01.03* [3]. All reporting tables for MIMO Test Methodologies start with “RC”.

The tables include:

RC.1: General Reporting Tables

Table RC.1-1 Device Under Test (DUT) Information

Table RC.1-2 DUTs Used for Each Test

RC.2: MARSS Reporting Tables

Table RC.2-1 MARSS Measurement Data Table Format

5.3.1 Informative Reporting Tables

The list of informative reporting tables for MIMO Test Methodologies is in “IC Content” in *CTIA 01.04* [4]. All informative reporting tables for MIMO Test Methodologies start with “IC”.

There are currently no informative tables for MIMO Test Methodologies.

Appendix A Revision History

Date	Version	Description
February 2022	4.0.0	Initial release of the 4.0.0 suite of OTA documents
May 2022	4.0.1	Added first paragraph to Section 2.1.7.6. Added Section 2.1.8.2.3. Added clarification regarding EN-DC testing according to CTIA 01.02 on Section 2.1.7.6 and new section 2.1.8.2.3. Miscellaneous editorial fixes
November 2022	4.0.2	**Section 3:** Added Section 3.1.3 to modify UL RB Allocation for Band 14 A-GNSS testing. **Section 5:** Updated Column K definition (added last sentence) in 5.1.
December 2022	5.0.0	Section 1: • Added LTE Cat-M1 and LTE Cat-NB1 protocol support for reverberation chambers. • Updates to make A-GNSS testing with SIB8/SIB16 informative. • Added Fast TIS Test Methodologies for wireless technologies below 6 GHz. • Added relative power on intermediate channel testing. • Added ankle phantom as informative. • Clarified in Table 1.3-4 that the MIMO OTA test methods only apply to Hand-Held Devices and Tablets. Section 2: • Added test reductions in LTE when NR SA is supported. • Allowed use of reverberation chambers for LTE Category M1 and LTE Category NB1. • Updates to make A-GNSS testing with SIB8/SIB16 informative. • Added A-GPS L5 and A-GALILEO E1 testing with NR FR1 EN-DC. • Added A-GNSS (A-GPS L1, A-GPS L5 and A-GALILEO E1) with NR FR1 SA. • Removed testing LTE Band 17 and UMTS 1700/2100. Added test time reductions for A-GNSS OTA with LTE and NR. • Minor editorial clarifications and corrections. • Added relative power on intermediate channel testing. • Added intermediate channel testing for relative sensitivity for NR FR1 SA. • Reduced testing on data-only devices to the 2 most recent cellular radio modes. • Added ankle phantom as informative. Section 3: • Section 3.1.3 Modification to UL RB Allocation for Band 14 A-GNSS Testing in V4.0.x was removed and CTIA 01.51 was updated. • Section 3.1.4 NR FR1 SA Relative Sensitivity on Intermediate Channels Test was added. Section 4: • Updates to make A-GNSS testing with SIB8/SIB16 informative.

Date	Version	Description
		• Added A-GPS L5 and A-GALILEO E1 testing with NR FR1 EN-DC. • Added A-GNSS (A-GPS L1, A-GPS L5 and A-GALILEO E1) with NR FR1 SA. • Removed testing LTE Band 17 and UMTS 1700/2100. • Added new NR bands including: n12, n14, n26, n30, n48, n77 (n77 Canada added as informative). • Removed test limits for A-GPS L5 and A-GALILEO E1 with NR FR1 EN-DC for wrist-worn devices. • Added A-GALILEO E1 limit tables. • Added relative power on intermediate channel testing. Section 5: • Added sub-sections for informative reporting tables. • Added tables for A-GNSS (A-GPS L1, A-GPS L5 and A-GALILEO E1) with NR FR1 SA. • Added tables for A-GPS L5 and A-GALILEO E1 testing with NR FR1 EN-DC. • Corrected some table numbering in RA.71 and RA.72. • Added table for intermediate channel relative power. • Updated RA.5 Machine Readable Report, including identification of the type of hand phantom used in testing. • Updates to make A-GNSS testing with SIB8/SIB16 informative. • Added reporting tables in RA.40 for new NR FR1 SA bands.
March 2023	6.0.0	Section 1 • Added NR FR1 SA 2DL CA and NR FR1 SA 3DL CA as new 3GPP wireless technologies. • Added Fast TIS category of measurements for wireless technologies below 6 GHz. • Added new vendor declaration requirements for devices being tested with the SISO, Millimeter Wave Test Methodology. Section 2 • Rewrote the test requirements for devices supporting usage against the head. • Rewrote the test requirements for devices supporting data usage in the hand. • Added test requirements for NR FR1 SA CL CA and NR FR1 EN-DC. • Added test reduction for A-GPS L1, A-GPS L5 and A-Galileo E1with NR FR1 EN-DC under certain conditions. • Clarified cellular radio mode test requirements for data only devices. • Clarified receiver performance testing of devices with antenna switching. • Updated operator priority list requirements, including updating high-priority combinations to “Non-essential, high priority” combinations, removing secondary priority combinations and defining “Essential Conditional” combinations. • Added use of operator priority list for NR FR1 EN-DC testing. • Added allowance for reducing LTE CA OTA testing when NR FR1 EN-DC is OTA tested under specific conditions.

Date	Version	Description
		• Added use of operator priority list for NR FR1 DL CA. • Added allowance for reducing LTE CA OTA testing when NR FR1 SA CL CA is OTA tested under specific conditions. • Stated that SISO, Millimeter Wave certification testing is only required for PC3 devices. • Defined spherical coverage CDF/CCDF test requirements for SISO, Millimeter Wave testing. • MBS references were removed in clauses 2.1.2, 2.1.6 and 2.1.7. • Section 2.1.8.5 MBS Test Requirements was marked VOID in V6.0.0 since testing for MBS was moved from Normative to Informative. Section 3: • Section 3.1.2 Waiver for MBS OTA Testing was modified since testing for MBS was moved from Normative to Informative. Section 4 • Added TRP test criteria for band class 1 and 2 for some LTE bands. • Indicated that TIS performance is expected to be 3 dB lower for LTE Category 1bis devices. • Added TRP test criteria for band class 1, 1.5 and 2 for some NR FR1 SA bands. • Added OTA test criteria for several band combinations of NR FR1 EN-DC. • Added placeholder for NR FR1 EN-DC with 2 LTE carriers and 1 NR carrier. • Added NR FR1 SA 2DL CA. • Added NR FR1 SA 3DL CA. • Added placeholder for NR FR1 SA UL CA desense. • Section 4.2.4 MBS was marked VOID in V6.0.0 since testing for MBS was moved from Normative to Informative. Section 5 • Added references to tables for NR FR1 SA CA. • Modified definitions for RA.5: Machine Readable Report to indicate that NR FR1 SA CA will be added to the MRR in a future release. • MBS references were removed in Section 5.1. • List of reporting tables were updated to make MBS testing informative • Updated numbering for tables in RA.20, RA.40 and RA.50.
July 2023	4.0.3	**Section 1:** • In Section 1.2, added definitions of the CTIA OTA nomenclature and the PTCRB nomenclature for all 3GPP Radio Access Technologies. **Section 2:** • In Section 2.1.5.2, clarified C-TIS testing when TX antenna switching is supported. **Section 3:** • Added Section 3.1.4, Modification to Channel Bandwidths and RB Allocations for NR FR1 TRP and C-TIS Testing.

Date	Version	Description
		• Added Section 3.1.5, Modification to Channel Bandwidths and RB Allocations for NR FR1 EN-DC TRP and C-TIS Testing. Added Section 3.1.6, Modification to Broadband Power Mode Measurement Requirements for NR FR1 TRP Testing.
September 2023	6.0.1	**Section 1:** • In Section 1.2, added definitions of the CTIA OTA nomenclature and the PTCRB nomenclature for all 3GPP Radio Access Technologies. **Section 2:** • In Section 2.1.2.1.3, corrected some references to tables in CTIA 01.40 in Table 21.2.1.3-3. • In Section 2.1.8, References to LTE Category M1 were removed as normative testing of A-GNSS with LTE Category M1 is no longer required. **Section 3:** • Section for “Waiver for MBS OTA Testing” removed. • Added Section 3.1.5, Modification to Broadband Power Mode Measurement Requirements for NR FR1 TRP Testing. • Added Section 3.1.6, NR FR1 SA A-GNSS Testing: General **Section 5:** • Tables RA.70-6 through RA.70-8 were changed to Void as normative testing of A-GNSS with LTE Category M1 is no longer required. • The instructions for creating some of the Tables in IA.20 were clarified. Table IA.20-10 to Table IA.20-12 were added for A-GPS L1 with LTE Category M1. • The instructions for creating some of the Tables in IA.21 were clarified. Table IA.21-7 to Table IA.21-9 were added for A-GPS L1 with LTE Category M1.
December 2023	6.0.2	**Section 2:** • Clarified references to “PCIExpress” to “PCIExpress when using an External Interface”. **Section 3:** • Section 3.1.7 Use of Legacy Measurement Grids for Certain Devices was added. This section identifies which devices require the use of legacy measurement grids. **Section 5:** • Description of Column K “Multiple Component Carrier Test Configuration ID” of RA.5 Machine Readable Report updated to be more clear.
April 2024	7.0.0	**Section 1:** • Section 1.3 modified to make the SISO, Reverberation Chamber Test Methodology informative. • Table 1.3-4 updated to add Reverberation Chamber support for chest-worn and ankle-worn devices. • Section 1.3.1.2 updated to reflect that the informative Reverberation Chamber Test Methodology supports chest and ankle phantoms. • Updated documentation requirements in Section1.5 for chest-worn and anke-worn devices.

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		• Section 1.5.2 updated to require manufacturers to declare when PC3 devices can apply relaxed measurement grids. • Added Ankle Left acronym in Section 1.6. • Added NR FR1 SA 2UL CA to Table 1.3-1. • In Section 1.7, title of CTIA 01.21 changed to “Test Methodology, SISO, Reverberation Chamber (Informative)”. **Section 2:** • Section 2.1.2.1.2 split into 2 sections: Section 2.1.2.1.2 and Section 2.1.2.1.4. Section 2.1.2.1.2 covers beside head and hand testing. Section 2.1.2.1.4 covers free space testing for hand-held devices. • Updated Section 2.1.2.1.2 to include some new test reductions for beside head and hand testing • Section 2.1.2.1.3 renamed to Hand Only Testing. • Updated Section 2.1.2.1.3 to include some new test reductions for hand-only testing • Added requirement FSH2.1.0.3 to Table 2.1.2.1.4-1. • Updated Section 2.1.2.2 for better clarity and to include some new test reductions for wrist-worn devices. • In Section 2.1.2, test requirements BH5.4.0-1, H5.4.0-1, HS5.4.0-2 and W5.4.0-1 added for NR FR1 SA UL CA. • Updated Section 2.1.2.3 for chest-worn devices to be normative and reformatted all the test requirements into tables. • Updated Section 2.1.2.4 for ankle-worn devices to be normative and reformatted all the test requirements into tables. • Changed Section 2.1.3.1 Large IoT Devices to informative. • Updated Table 2.1.6-1 and Table 2.1.7-1 to include chest-worn and ankle-worn devices. • Title of Section 2.1.7.6 updated to include 1 or 2 LTE carriers. • In Section 2.1.7.6, clarified relative power in intermediate channel test requirements. • In Section 2.1.7.7, clarified relative power in intermediate channel test requirements. • In Section 2.1.7.8, clarified relative sensitivity and relative power on intermediate channel test requirements. • Section 2.1.7.8 added to cover NR FR1 SA UL CA.. • Section 2.1.7.6.3 Test Reduction for LTE CA and Section 2.1.7.7.3 Test Reduction for LTE CA were combined into, moved to and retitled as Section 2.1.7.3.4 Test Reduction when NR FR1 DL CA or NR FR1 EN-DC is Supported. • Added rows in Table 2.1.8.1-1 for chest-worn and ankle-worn devices. • Added Section 2.1.8.1.4 to clarify test requirements for n77 sub-ranges for NR FR1 SA. • Added Section 2.1.8.1.5 to clarify test requirements for n77 sub-ranges for NR FR1 EN-DC. **Section 3:** • Updated references to n77 as follows: ○ “n77 USA Range A” to “n77 (R1)”

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		○ “n77 USA Range B” to “n77 (R2)” ○ “n77 Canada” to “n77 (R3)” • Updated Section 3.1 to reference the additional test cases on the chest and ankle phantoms. • Section for “Waiver for MBS OTA Testing” removed. • Marked Section 3.1.2 Waiver for n77 Canada Testing as no longer required. • Updated Section 3.1.3 with intermediate channels for n77 (R3) and n77 (R4). **Section 4:** • Updated references to n77 as follows: ○ “n77 USA Range A” to “n77 (R1)” ○ “n77 USA Range B” to “n77 (R2)” ○ “n77 Canada” to “n77 (R3)” • Multiple tables for CA/DC updated to include an additional column with n77 Range ID information. • Section 4.1.5, Section 4.1.9, Section 4.1.10, Section 4.1.11, and Section 4.2 updated to reference the additional test cases on the chest and ankle phantoms. Content added to Section 4.1.14 to cover NR FR1 EN-DC with 2 LTE carriers and 1 NR carrier. • Content added to Section 4.1.17 to cover NR FR1 SA uplink carrier aggregation with 2-3 DL CA. • Updated Section 4.2 to include new NR FR1 EN-DC combinations. **Section 5:** • Added ChW and AL as normative test cases. • Added new tables for NR FR1 SA in Table RA.40 for new bands. • Added references to the following normative tables for chest-worn devices: Table RA.3-21, Tables RA.4-57 to RA.4-65, Tables RA.20-50 to RA.20-84, Tables RA.30-19 to RA.30-36, Tables RA.35-23 to RA.35-44, Tables RA.40-78 to RA.40-140, Tables RA.70-16 to RA.70-17, Tables RA.71-9 to RA.71-10, and Tables RA.72-11 to RA.72-12. • Added references to the following normative tables for ankle-worn devices: Table RA.3-22, Tables RA.4-66 to RA.4-74, Tables RA.20-99 to RA.20-147, Tables RA.30-37 to RA.30-54, Tables RA.35-45 to RA.35-66, Tables RA.40-141 to RA.40-203, Tables RA.70-18 to RA.70-19, Tables RA.71-11 to RA.71-12, and Tables RA.72-13 to RA.72-14. • Updated Table RA.5-1 to include AL test position. • Added references to the following informative tables for chest-worn devices: Tables IA.20-13 to IA.20-15, Table IA.20-11, and Tables IA.21-10 to IA.21-12. • Added references to the following informative tables for ankle-worn devices: Tables IA.20-16 to IA.20-18, Table IA.20-12, and Tables IA.21-13 to IA.21-15. • Updated references to Tables RA.3-10 and RA.3-11, and the RA.50 header to clarify that that these tables are for 1CC LTE and 1CC NR. • Added references to the following normative tables for NR FR1 EN-DC (2CC LTE + 1CC NR): Tables RA.3-17 to RA.3-18, and Table RA.51-1 to RA.51-42. • Added references to the following normative tables for NR FR1 SA UL CA: Tables RA.3-19 to RA.3-20, Tables RA.43-1 to RA.43-20, and Tables RA.44-1 to RA.44-35.

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September 2024	8.0.0	**Section 1:** • In Section 1.3, added NR FR1 RedCap to Table 1.3-1 and added A-GALILEO E5A to Table 1.3-2. • In Section 1.4, added clarification regarding testing with the standard battery. • In Section 1.5.2, added allowance to consider a 6x2 antenna array configuration when determine measurement grids. • In Section 1.6, added definition of RedCap. **Section 2:** • Added Section 2.1.1.4 Definition of Test IDs. Added some clarifications to the test IDs. Added NR FR1 RedCap and A-Galileo E5A. • Added and changed some test reductions (BH4.1.0-2, BH5.2.1-1, BH5.3.1-1, BH5.4.1-1) in Section 2.1.2.1.2 Beside Head and Hand Testing, and replaced some test reductions (BH2.1.2-1, BH3.1.2-1, BH4.1.2-1, BH4.1.3-1, BH4.1.4-1, BH5.1.2-1, BH5.1.3-1, BH5.1.4-1, BH5.2.0-2, BH5.2.2-1, BH5.2.3-1, BH5.2.4-1) with new requirements in Section 2.1.8.7 Summary of Location Based Wireless Technology Specific Test Requirements. • Added test requirement BH4.1.5-1 for A-Galileo E5A. • Added and changed some test reductions (H5.1.2-2, H5.1.3-2, H5.1.4-2) in Section 2.1.2.1.3 Hand Only Testing, and replaced some test reductions (H2.1.2-1, H3.1.2-1, H4.1.2-1, H4.1.3-1, H4.1.4-1, H5.1.2-1, H5.1.3-1, H5.1.4-1, H5.2.2-2, H5.2.2-3, H5.2.2-4, H5.2.3-2, H5.2.3-3, H5.2.3-4, H5.2.3-5, H5.2.4-2, H5.2.4-3, H5.2.4-4, H5.2.4-5) with new requirements in Section 2.1.8.7 Summary of Location Based Wireless Technology Specific Test Requirements. • Added test requirements H5.1.5-1 an H5.2.5-1 for A-Galileo E5A. • Modified test reduction FSH4.1.0-2 in Section 2.1.2.1.4 Free Space Testing for Hand-Held Devices. • Changed test requirement W5.2.1-1, W5.3.1-1, W5.4.1-1 and replaced W5.2.2-1, W5.2.3-1 and W5.2.4-1. • Added test requirements W4.1.5-1 and W5.1.5-1 for A-Galileo E5A. • Changed test requirement C5.2.1-1, C5.3.1-1, C5.4.1-1 and replaced C5.2.2-1, C5.2.3-1 and C5.2.4-1. • Added test requirements C4.1.5-1 and C5.1.5-1 for A-Galileo E5A. • Moved most requirements in Section 2.1.2.4 Integrated Devices that Are Body Worn into a table format. • In Section 2.1.2.4.1, added clarification that cellular desense testing is limited to single carrier modes and clarified when testing is required. • Section 2.1.2.4 Ankle-Worn Devices was moved to Section 2.1.2.5 in order to avoid renumbering the following sub-sections so that the sub-section numbering matches what is in Version 4.0.x. • Changed test requirement A5.2.1-1, A5.3.1-1, A5.4.1-1 and replaced A5.2.2-1, A5.2.3-1 and A5.2.4-1. • Added test requirements A4.1.5-1 and A5.1.5-1 for A-Galileo E5A. • Moved most requirements in Section 2.1.3.2 Notebook and Tablet Devices into a table format.

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		• Moved most requirements in Section 2.1.3.3 Integrated Devices that Are Not Body Worn into a table format. • In Section 2.1.3.3.1, added clarification that cellular desense testing is limited to single carrier modes and clarified when testing is required. • Added Section 2.1.7.9 for NR FR1 RedCap. • Added test requirements all5.5.0-1, all5.5.0-2 and all5.5.1-1 for NR FR1 RedCap. • Added Section 2.1.7.10 Summary of 3GPP FR1 Wireless Technology Specific Test Requirements. • Added A-Galileo E5A to Table 2.1.8.1-3. • Added Section 2.1.8.7 Summary of Location Based Wireless Technology Specific Test Requirements. Added test reductions (all2.1.2-1, all3.1.2-1, all4.1.2-2, all4.1.2-3, all4.1.3-2, all4.1.3-3, all4.1.4-1, all4.1.4-2, all5.1.2-1, all5.1.3-1, all5.1.4-1, all5.2.2-1, all5.2.2-2, all5.2.2-3, all5.2.2-4, all5.2.3-1, all5.2.3-2, all5.2.3-3, all5.2.3-4, all5.2.4-1, all5.2.4-2, all5.2.4-3, all5.2.4-4) in Section 2.1.8.7 Summary of Location Based Wireless Technology Specific Test Requirements. Some test requirements in Sections 2.1.8.x.x were moved into the table in Section 2.1.8.7 • Added Section 2.1.8.6 for A-Galileo E5A. • Added test requirements all4.1.5-1, all4.1.5-2, all5.1.5-1, all5.2.5-1, all5.2.5-2, all5.2.5-3, and all5.2.5-4 for A-Galileo E5A **Section 3:** • Added Section 3.1.7 LTE Broadband Power Mode Measurement Requirements. • Added Section 3.2.1 Use of Charging Cables. **Section 4:** • Added missing notes to the bottom of Table 4.1.12.1-1, Table 4.1.12.1-2, Table 4.1.12.2-1, and Table 4.1.12.2-2. • Corrected some n77 sub-ranges in Table 4.1.12.2-2 and Table 4.1.12.2-2. • Removed “Simple IoT” rows from Table 4.1.14.1-1, Table 4.1.14.1-2, Table 4.1.14.2-1 and Table 4.1.14.2-2. • Added missing notes to the bottom of Table 4.1.14.1-1 and Table 4.1.14.1-2. • Added Section 4.1.18 for NR FR1 RedCap. • Added missing notes to the bottom of Table 4.2.1.1-1, Table 4.2.1.1-2, Table 4.2.1.1.-3, Table 4.2.1.1-4, and Table 4.2.1.1-5. • Added missing note to the bottom of Table 4.2.2.1-4. • Added missing note to the bottom of Table 4.2.3.1-4. • Added Section 4.2.5 A-Galileo E5A. **Section 5:** • In Section 5.1, updated reporting requirements for 3D plots. • Added Table RA.3-23 Cellular Radio Mode OTA Summation Test Report for Handheld Only Devices. • Added Table RA.4-75 to Table RA.4-95 for A-GALILEO E5A. • Updated the explanation for Table RA.5-1 Machine Readable Report. • Added Table RA.60-1 to Table RA.60-239 for NR FR1 RedCap.

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		• Added Table RA.73-1 to Table RA.73-12 for A-GALILEO E5A.