



ELEMENT MATERIALS TECHNOLOGY

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SAR EVALUATION REPORT

Applicant Name:

Physio-Control, Inc.
11811 Willows Road NE PO Box 97006,
Redmond, WA 98073

Date of Testing:

01/22/24 - 01/23/24

Test Site/Location:

Element, Columbia, MD, USA

Document Serial No.:

1M2401240006-R1

FCC ID:

CZO23L4N1

APPLICANT:

PHYSIO-CONTROL, INC.

DUT Type:

Portable Defibrillator (With Modem)

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model(s):

LP35 Monitor/Defibrillator (With Modem)

Equipment Class	Band & Mode	Operating Modes	Tx Frequency	SAR
				1g Body (W/kg)
PCB	LTE Band 71	Data	665.5 - 695.5 MHz	0.42
PCB	LTE Band 12	Data	699.7 - 715.3 MHz	0.31
PCB	LTE Band 13	Data	779.5 - 784.5 MHz	0.27
PCB	LTE Band 14	Data	790.5 - 795.5 MHz	0.28
PCB	LTE Band 5	Data	824.7 - 848.3 MHz	0.23
PCB	LTE Band 66	Data	1710.7 - 1779.3 MHz	0.25
PCB	LTE Band 4	Data	1710.7 - 1754.3 MHz	N/A
PCB	LTE Band 2	Data	1850.7 - 1909.3 MHz	0.68

Note: This revised Test Report (S/N: 1M2401240006-R1) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.6 of this report; for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

RJ Ortanez
Executive Vice President



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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
UMTS 850	Data	826.40 - 846.60 MHz
UMTS 1750	Data	1712.4 - 1752.6 MHz
UMTS 1900	Data	1852.4 - 1907.6 MHz
LTE Band 71	Data	665.5 - 695.5 MHz
LTE Band 12	Data	699.7 - 715.3 MHz
LTE Band 13	Data	779.5 - 784.5 MHz
LTE Band 14	Data	790.5 - 795.5 MHz
LTE Band 5	Data	824.7 - 848.3 MHz
LTE Band 66	Data	1710.7 - 1779.3 MHz
LTE Band 4	Data	1710.7 - 1754.3 MHz
LTE Band 2	Data	1850.7 - 1909.3 MHz
2.4 GHz WIFI	Data	2412 - 2472 MHz
5 GHz WIFI	Data	U-NII-1: 5180 - 5240 MHz U-NII-2A: 5260 - 5320 MHz U-NII-2C: 5500 - 5720 MHz U-NII-3: 5745 - 5825 MHz
2.4 GHz Bluetooth	Data	2402 - 2480 MHz

Note: Full UMTS, 2.4 GHz WLAN, 5 GHz WLAN, and Bluetooth testing are not included in this report. For full information about those modes, including full evaluation results, please refer to Test Report SN PHYS1087.5.

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1.2 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D04v01.

1.2.1 Licensed Output Power

Mode / Band		Modulated Average Output Power (in dBm)
LTE FDD Band 71	Max allowed power	23.5
	Nominal	23.0
LTE FDD Band 12	Max allowed power	23.5
	Nominal	23.0
LTE FDD Band 13	Max allowed power	23.5
	Nominal	23.0
LTE FDD Band 14	Max allowed power	23.5
	Nominal	23.0
LTE FDD Band 5	Max allowed power	23.5
	Nominal	23.0
LTE FDD Band 66	Max allowed power	23.5
	Nominal	23.0
LTE FDD Band 4	Max allowed power	23.5
	Nominal	23.0
LTE FDD Band 2	Max allowed power	23.5
	Nominal	23.0

The maximum rated power for LTE is listed in the table above. Per the manufacturer there is an additional power reduction implemented in the product firmware of 0.5 dB to mitigate disconnection due to the cellular modem overheating. Only maximum rated power was used for testing and data in this report.

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1.3 Location of Transmit Antenna



Photo 1-1
Entire DUT View



Photo 1-2
View of Cell Modem Inside Left Bag

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Photo 1-4
View of Cell Modem in Isolation

A SAM phantom was used for testing this device. The cellular modem of the DUT is smaller than the SAM Flat Phantom section, and the radiating structure within the cellular modem is smaller than the modem. The cellular modem and its radiating structure are also smaller than the full DUT. Furthermore, the area scans fully capture the SAR distributions. Test setup photos can be seen in Appendix F including the outer housing of the cellular modem for testing.

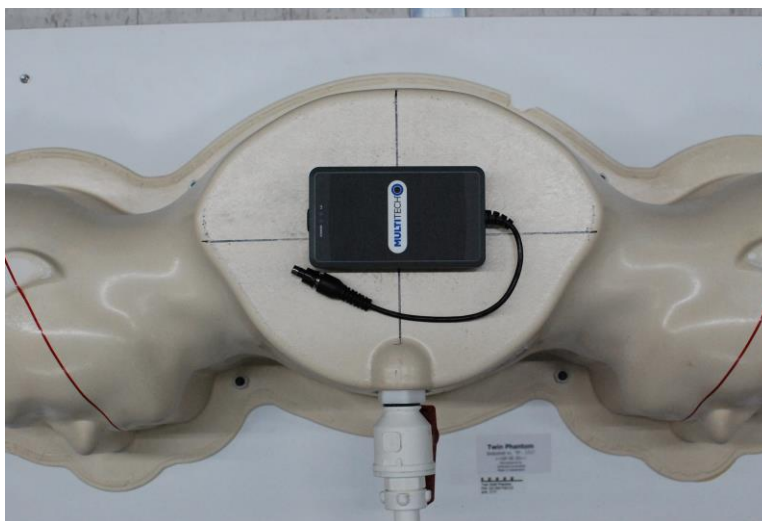


Photo 1-5
Cellular Modem Size Comparison with SAM Flat Phantom

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**Table 1-1
Device Edges/Sides for SAR Testing**

Technology	DUT Orientation					
	Back	Front	Top	Bottom	Right	Left
LTE Band 71	0 mm	0 mm	0 mm ³	Reduced ⁴	Reduced ¹	0 mm
LTE Band 12	0 mm	0 mm	0 mm ³	Reduced ⁴	Reduced ¹	0 mm
LTE Band 13	0 mm	0 mm	0 mm ³	Reduced ⁴	Reduced ¹	0 mm
LTE Band 14	0 mm	0 mm	0 mm ³	Reduced ⁴	Reduced ¹	0 mm
LTE Band 5	0 mm	0 mm	0 mm ³	Reduced ⁴	Reduced ¹	0 mm
LTE Band 4	Reduced ²	Reduced ²	Reduced ²	Reduced ²	Reduced ²	Reduced ²
LTE Band 66	0 mm	0 mm	0 mm ³	Reduced ⁴	Reduced ¹	0 mm
LTE Band 2	0 mm	0 mm	0 mm ³	Reduced ⁴	Reduced ¹	0 mm

1: Reduced due to meeting standalone SAR Test Exclusion.

2: When the supported frequency range of an LTE Band falls completely within an LTE band with a larger transmission frequency range, both LTE bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both LTE bands share the same transmission path and signal characteristics, SAR was only assessed for the band with the larger transmission frequency range.

3: In the field, the DUT will have a non-metallic handle present on the top orientation around which a user can wrap a hand. This presents a non-standard form factor for testing. The handle has been removed to facilitate testing. This presents a worst-case exposure condition with regards to separation distance. In the field, extremities can be 0 mm away from the top side of the device, but the body will be a minimum of 63.9 mm away due to the handle size. For the purpose of testing, the top orientation is being tested against body exposure limits at a distance of 0 mm.

4: Device is used on tabletop-type surfaces, which means the human body cannot be exposed on the bottom orientation.

5: This report pertains only to the LTE licensed transmitter for the device. Please refer to Test Report SN PHYS1087.5 for UMTS, WLAN/BT test results.

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1.4 Simultaneous Transmission Capabilities

The EUT does not have simultaneous transmission capability

1.5 Miscellaneous SAR Test Considerations

Licensed Transmitter(s)

LTE SAR for the higher modulations and lower bandwidths were not tested since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05v02r05.

This device supports LTE capabilities with overlapping transmission frequency ranges. When the supported frequency range of an LTE Band falls completely within an LTE band with a larger transmission frequency range, both LTE bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both LTE bands share the same transmission path and signal characteristics, SAR was only assessed for the band with the larger transmission frequency range.

1.6 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D05v02r05,(4G)
- FCC KDB Publication 447498 D04v01 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)

1.7 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 9.

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2 LTE INFORMATION

LTE Information					
Frequency Range of each LTE transmission band	LTE Band 71: 665.5 - 695.5 MHz				
	LTE Band 12: 699.7 - 715.3 MHz				
	LTE Band 13: 779.5 - 784.5 MHz				
	LTE Band 14: 790.5 - 795.5 MHz				
	LTE Band 5: 824.7 - 848.3 MHz				
	LTE Band 66: 1710.7 - 1779.3 MHz				
	LTE Band 4: 1710.7 - 1754.3 MHz				
	LTE Band 2: 1850.7 - 1909.3 MHz				
Channel Bandwidths	LTE Band 71: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 13: 5 MHz, 10 MHz				
	LTE Band 14: 5 MHz, 10 MHz				
	LTE Band 5: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 66: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 4: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 2: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High	High
LTE Band 71: 5 MHz	665.5 (133147)		680.5 (133297)		695.5 (133447)
LTE Band 71: 10 MHz	668 (133172)		680.5 (133297)		693 (133422)
LTE Band 71: 15 MHz	670.5 (133197)		680.5 (133297)		690.5 (133397)
LTE Band 71: 20 MHz	673 (133222)		680.5 (133297)		688 (133372)
LTE Band 12: 1.4 MHz	699.7 (23017)		707.5 (23095)		715.3 (23173)
LTE Band 12: 3 MHz	700.5 (23025)		707.5 (23095)		714.5 (23165)
LTE Band 12: 5 MHz	701.5 (23035)		707.5 (23095)		713.5 (23155)
LTE Band 12: 10 MHz	704 (23060)		707.5 (23095)		711 (23130)
LTE Band 13: 5 MHz	779.5 (23205)		782 (23230)		784.5 (23255)
LTE Band 13: 10 MHz	(N/A)		782 (23230)		(N/A)
LTE Band 14: 5 MHz	790.5 (23305)		793 (23330)		795.5 (23355)
LTE Band 14: 10 MHz	(N/A)		793 (23330)		(N/A)
LTE Band 5: 1.4 MHz	824.7 (20407)		836.5 (20525)		848.3 (20643)
LTE Band 5: 3 MHz	825.5 (20415)		836.5 (20525)		847.5 (20635)
LTE Band 5: 5 MHz	826.5 (20425)		836.5 (20525)		846.5 (20625)
LTE Band 5: 10 MHz	829 (20450)		836.5 (20525)		844 (20600)
LTE Band 66: 1.4 MHz	1710.7 (131979)		1745 (132322)		1779.3 (132665)
LTE Band 66: 3 MHz	1711.5 (131987)		1745 (132322)		1778.5 (132657)
LTE Band 66: 5 MHz	1712.5 (131997)		1745 (132322)		1777.5 (132647)
LTE Band 66: 10 MHz	1715 (132022)		1745 (132322)		1775 (132622)
LTE Band 66: 15 MHz	1717.5 (132047)		1745 (132322)		1772.5 (132597)
LTE Band 66: 20 MHz	1720 (132072)		1745 (132322)		1770 (132572)
LTE Band 4: 1.4 MHz	1710.7 (19957)		1732.5 (20175)		1754.3 (20393)
LTE Band 4: 3 MHz	1711.5 (19965)		1732.5 (20175)		1753.5 (20385)
LTE Band 4: 5 MHz	1712.5 (19975)		1732.5 (20175)		1752.5 (20375)
LTE Band 4: 10 MHz	1715 (20000)		1732.5 (20175)		1750 (20350)
LTE Band 4: 15 MHz	1717.5 (20025)		1732.5 (20175)		1747.5 (20325)
LTE Band 4: 20 MHz	1720 (20050)		1732.5 (20175)		1745 (20300)
LTE Band 2: 1.4 MHz	1850.7 (18607)		1880 (18900)		1909.3 (19193)
LTE Band 2: 3 MHz	1851.5 (18615)		1880 (18900)		1908.5 (19185)
LTE Band 2: 5 MHz	1852.5 (18625)		1880 (18900)		1907.5 (19175)
LTE Band 2: 10 MHz	1855 (18650)		1880 (18900)		1905 (19150)
LTE Band 2: 15 MHz	1857.5 (18675)		1880 (18900)		1902.5 (19125)
LTE Band 2: 20 MHz	1860 (18700)		1880 (18900)		1900 (19100)
UE Category	4				
Modulations Supported in UL	QPSK, 16 QAM				
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3-6.2.5? (manufacturer attestation to be provided)	YES				
A-MPR (Additional MPR) disabled for SAR Testing?	YES				

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3 INTRODUCTION

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

3.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 3-1).

Equation 3-1
SAR Mathematical Equation

$$SAR = \frac{d}{dt} \left(\frac{dU}{dm} \right) = \frac{d}{dt} \left(\frac{dU}{\rho dv} \right)$$

SAR is expressed in units of Watts per Kilogram (W/kg).

$$SAR = \frac{\sigma \cdot E^2}{\rho}$$

where:

- σ = conductivity of the tissue-simulating material (S/m)
- ρ = mass density of the tissue-simulating material (kg/m³)
- E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

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4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
 - a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
 - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
 - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

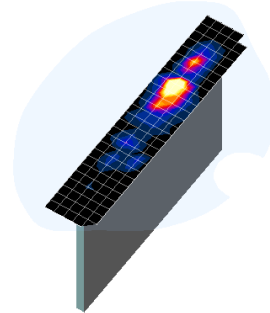


Figure 4-1
Sample SAR Area Scan

Table 4-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

Frequency	Maximum Area Scan Resolution (mm) ($\Delta x_{\text{area}}, \Delta y_{\text{area}}$)	Maximum Zoom Scan Resolution (mm) ($\Delta x_{\text{zoomTV}}, \Delta y_{\text{zoom}}$)	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
				$\Delta z_{\text{zoom}}(n)$	$\Delta z_{\text{zoom}}(1)^*$	
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≤ 4	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5* $\Delta z_{\text{zoom}}(n-1)$	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

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5 RF EXPOSURE LIMITS

5.1 Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

5.2 Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 5-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <i>General Population</i> (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT <i>Occupational</i> (W/kg) or (mW/g)
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR Hands, Feet, Ankle, Wrists, etc.	4.0	20

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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6 FCC MEASUREMENT PROCEDURES

Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

6.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D04v01, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

6.2 Procedures Used to Establish RF Signal for SAR

The device is placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test are evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device is tested throughout the SAR test at maximum output power, the SAR measurement system measures a “point SAR” at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. If the power drift deviates by more than 5%, the SAR test and drift measurements are repeated.

6.3 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r04 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

6.3.1 Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

6.3.2 MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

6.3.3 A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

6.3.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

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- a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
 - i. The required channel and offset combination with the highest maximum output power is required for SAR.
 - ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
 - iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
- b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
- c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
- d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to $\frac{1}{2}$ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is < 1.45 W/kg.

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7 RF CONDUCTED POWERS

7.1 LTE Conducted Powers

Note: Per FCC KDB Publication 941225 D05v02r05, LTE SAR for the lower bandwidths was not required for testing since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg.

Note: Some bands do not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

7.1.1 LTE Band 71

Table 7-1
LTE Band 71 Measured Conducted Powers- 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			133297 (680.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.20	0	0
	1	50	23.31		0
	1	99	23.23		0
	50	0	22.32	0-1	1
	50	25	22.41		1
	50	50	22.33		1
	100	0	22.38		1
16QAM	1	0	22.34	0-1	1
	1	50	22.43		1
	1	99	22.23		1
	50	0	21.50	0-2	2
	50	25	21.36		2
	50	50	21.47		2
	100	0	21.43		2

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Table 7-2
LTE Band 71 Measured Conducted Powers- 15 MHz Bandwidth

LTE Band 71 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			133297 (680.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.23	0	0
	1	36	23.32		0
	1	74	23.24		0
	36	0	22.46	0-1	1
	36	18	22.44		1
	36	37	22.50		1
	75	0	22.42		1
16QAM	1	0	22.50	0-1	1
	1	36	22.41		1
	1	74	22.33		1
	36	0	21.41	0-2	2
	36	18	21.47		2
	36	37	21.34		2
	75	0	21.49		2

Table 7-3
LTE Band 71 Measured Conducted Powers- 10 MHz Bandwidth

LTE Band 71 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			133172 (668.0 MHz)	133297 (680.5 MHz)	133422 (693.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.26	23.35	23.28	0	0
	1	25	23.33	23.31	23.25		0
	1	49	23.35	23.25	23.34		0
	25	0	22.43	22.47	22.43	0-1	1
	25	12	22.44	22.44	22.45		1
	25	25	22.39	22.41	22.32		1
16QAM	50	0	22.34	22.46	22.35	0-1	1
	1	0	22.43	22.31	22.35		1
	1	25	22.50	22.42	22.22		1
	1	49	22.35	22.44	22.43	0-2	1
	25	0	21.49	21.48	21.41		2
	25	12	21.42	21.47	21.50		2
	25	25	21.37	21.35	21.43		2
	50	0	21.49	21.47	21.47		2

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Table 7-4
LTE Band 71 Measured Conducted Powers- 5 MHz Bandwidth

LTE Band 71 Measured Conducted Powers- 5 MHz Bandwidth							
LTE Band 71 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			133147 (665.5 MHz)	133297 (680.5 MHz)	133447 (695.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.13	23.27	23.22	0	0
	1	12	23.25	23.26	23.33		0
	1	24	23.08	23.15	23.19		0
	12	0	22.49	22.42	22.45	0-1	1
	12	6	22.48	22.35	22.43		1
	12	13	22.50	22.41	22.42		1
16QAM	25	0	22.41	22.39	22.41	0-1	1
	1	0	22.44	22.08	22.22		1
	1	12	22.44	22.05	22.40		1
	1	24	22.23	21.97	22.13	0-2	1
	12	0	21.42	21.47	21.44		2
	12	6	21.44	21.43	21.50		2
	12	13	21.46	21.43	21.48		2
	25	0	21.44	21.49	21.50		2

7.1.2 LTE Band 12

Table 7-5
LTE Band 12 Measured Conducted Powers - 10 MHz Bandwidth

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23095 (707.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	22.93	0	0
	1	25	23.27		0
	1	49	23.12		0
	25	0	22.21	0-1	1
	25	12	22.18		1
	25	25	22.19		1
	50	0	22.20		1
16QAM	1	0	22.21	0-1	1
	1	25	22.18		1
	1	49	22.20		1
	25	0	21.23	0-2	2
	25	12	21.25		2
	25	25	21.30		2
	50	0	21.33		2

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Table 7-6
LTE Band 12 Measured Conducted Powers - 5 MHz Bandwidth

LTE Band 12 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23035 (701.5 MHz)	23095 (707.5 MHz)	23155 (713.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.20	23.19	23.25	0	0
	1	12	22.94	23.22	23.31		0
	1	24	23.22	23.15	23.04		0
	12	0	22.22	22.23	22.23	0-1	1
	12	6	22.27	22.32	22.30		1
	12	13	22.26	22.29	22.21		1
	25	0	22.17	22.33	22.27		1
16QAM	1	0	22.11	22.28	22.31	0-1	1
	1	12	22.35	22.28	22.22		1
	1	24	22.21	21.92	21.88		1
	12	0	21.15	21.50	21.44	0-2	2
	12	6	21.25	21.43	21.25		2
	12	13	21.24	21.22	21.08		2
	25	0	21.05	21.43	21.24		2

Table 7-7
LTE Band 12 Measured Conducted Powers - 3 MHz Bandwidth

LTE Band 12 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23025 (700.5 MHz)	23095 (707.5 MHz)	23165 (714.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.91	23.32	23.30	0	0
	1	7	23.12	23.28	23.33		0
	1	14	23.22	23.29	23.21		0
	8	0	22.10	22.32	22.22	0-1	1
	8	4	22.22	22.33	22.28		1
	8	7	22.31	22.37	22.17		1
	15	0	22.18	22.31	22.26		1
16QAM	1	0	22.03	22.38	22.35	0-1	1
	1	7	22.35	22.39	22.37		1
	1	14	22.20	22.25	22.10		1
	8	0	21.17	21.21	21.32	0-2	2
	8	4	21.39	21.24	21.20		2
	8	7	21.30	21.30	21.08		2
	15	0	21.11	21.38	21.11		2

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Table 7-8
LTE Band 12 Measured Conducted Powers – 1.4 MHz Bandwidth

LTE Band 12 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23017 (699.7 MHz)	23095 (707.5 MHz)	23173 (715.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.12	23.21	23.23	0	0
	1	2	23.08	23.30	23.28		0
	1	5	23.11	23.28	23.21		0
	3	0	23.07	23.22	23.22		0
	3	2	23.16	23.18	23.26		0
	3	3	23.10	23.30	23.18		0
	6	0	22.16	22.30	22.12	0-1	1
16QAM	1	0	22.02	22.23	22.25	0-1	1
	1	2	22.13	22.35	22.36		1
	1	5	22.22	22.34	22.17		1
	3	0	21.88	22.08	22.35		1
	3	2	21.86	22.30	22.19		1
	3	3	21.88	22.31	22.18		1
	6	0	21.04	21.22	21.49	0-2	2

7.1.3 LTE Band 13

Table 7-9
LTE Band 13 Measured Conducted Powers - 10 MHz Bandwidth

LTE Band 13 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	22.99	0	0
	1	25	23.22		0
	1	49	23.29		0
	25	0	22.43	0-1	1
	25	12	22.48		1
	25	25	22.50		1
	50	0	22.39		1
16QAM	1	0	22.27	0-1	1
	1	25	22.41		1
	1	49	22.40		1
	25	0	21.35	0-2	2
	25	12	21.42		2
	25	25	21.38		2
	50	0	21.34		2

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Table 7-10
LTE Band 13 Measured Conducted Powers - 5 MHz Bandwidth

LTE Band 13 5 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.26	0	0
	1	12	23.31		0
	1	24	23.24		0
	12	0	22.49	0-1	1
	12	6	22.35		1
	12	13	22.38		1
	25	0	22.50		1
16QAM	1	0	22.02	0-1	1
	1	12	22.16		1
	1	24	22.34		1
	12	0	21.34	0-2	2
	12	6	21.39		2
	12	13	21.44		2
	25	0	21.45		2

7.1.4 LTE Band 14

Table 7-11
LTE Band 14 Measured Conducted Powers - 10 MHz Bandwidth

LTE Band 14 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23330 (793.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.31	0	0
	1	25	23.22		0
	1	49	23.33		0
	25	0	22.42	0-1	1
	25	12	22.41		1
	25	25	22.40		1
	50	0	22.33		1
16QAM	1	0	22.38	0-1	1
	1	25	22.45		1
	1	49	22.41		1
	25	0	21.49	0-2	2
	25	12	21.28		2
	25	25	21.38		2
	50	0	21.44		2

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Table 7-12
LTE Band 14 Measured Conducted Powers - 5 MHz Bandwidth

LTE Band 14 5 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23330 (793.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.27	0	0
	1	12	23.24		0
	1	24	23.05		0
	12	0	22.42	0-1	1
	12	6	22.40		1
	12	13	22.35		1
	25	0	22.27		1
16QAM	1	0	22.42	0-1	1
	1	12	22.37		1
	1	24	22.10		1
	12	0	21.33	0-2	2
	12	6	21.35		2
	12	13	21.37		2
	25	0	21.41		2

7.1.5 LTE Band 5

Table 7-13
LTE Band 5 Measured Conducted Powers - 10 MHz Bandwidth

LTE Band 5 (Cell) 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20525 (836.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.42	0	0
	1	25	23.38		0
	1	49	23.40		0
	25	0	22.38	0-1	1
	25	12	22.31		1
	25	25	22.40		1
	50	0	22.32		1
16QAM	1	0	22.28	0-1	1
	1	25	22.42		1
	1	49	22.50		1
	25	0	21.33	0-2	2
	25	12	21.42		2
	25	25	21.38		2
	50	0	21.15		2

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Table 7-14
LTE Band 5 Measured Conducted Powers - 5 MHz Bandwidth

LTE Band 5 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20425 (826.5 MHz)	20525 (836.5 MHz)	20625 (846.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.35	23.21	23.30	0	0
	1	12	23.33	23.30	23.22		0
	1	24	23.28	23.11	23.28		0
	12	0	22.50	22.08	22.22	0-1	1
	12	6	22.46	22.24	22.23		1
	12	13	22.50	22.30	22.27		1
	25	0	22.42	22.10	22.30		1
16QAM	1	0	22.32	21.82	22.44	0-1	1
	1	12	22.38	22.12	21.99		1
	1	24	22.05	22.19	21.91		1
	12	0	21.43	21.13	21.33	0-2	2
	12	6	21.05	21.16	21.11		2
	12	13	21.41	21.25	21.25		2
	25	0	21.43	21.26	21.19		2

Table 7-15
LTE Band 5 Measured Conducted Powers - 3 MHz Bandwidth

LTE Band 5 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20415 (825.5 MHz)	20525 (836.5 MHz)	20635 (847.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.32	23.12	23.24	0	0
	1	7	23.26	23.32	23.35		0
	1	14	23.34	23.21	23.30		0
	8	0	22.50	22.10	22.41	0-1	1
	8	4	22.43	22.18	22.50		1
	8	7	22.44	22.26	22.45		1
	15	0	22.49	22.14	22.42		1
16QAM	1	0	22.42	22.12	22.41	0-1	1
	1	7	22.48	22.32	22.10		1
	1	14	22.42	22.42	22.32		1
	8	0	21.42	21.21	21.44	0-2	2
	8	4	21.42	21.26	21.43		2
	8	7	21.50	21.31	21.42		2
	15	0	21.44	21.11	21.46		2

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Table 7-16
LTE Band 5 Measured Conducted Powers – 1.4 MHz Bandwidth

LTE Band 5 (Cell) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20407 (824.7 MHz)	20525 (836.5 MHz)	20643 (848.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.31	23.20	23.28	0	0
	1	2	23.15	23.23	23.31		0
	1	5	23.30	23.28	23.29		0
	3	0	23.26	23.21	23.18		0
	3	2	23.25	23.25	23.26		0
	3	3	23.14	23.32	23.28		0
	6	0	22.41	22.27	22.43	0-1	1
16QAM	1	0	22.41	22.23	22.42	0-1	1
	1	2	22.46	22.42	22.41		1
	1	5	22.40	22.48	22.37		1
	3	0	22.48	22.42	22.46		1
	3	2	22.43	22.29	22.45		1
	3	3	22.45	22.25	22.42		1
	6	0	21.41	21.36	21.50	0-2	2

7.1.6 LTE Band 66

Table 7-17
LTE Band 66 Measured Conducted Powers – 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	21.70	22.35	21.64	0	0
	1	50	21.88	22.21	21.62		0
	1	99	21.73	22.42	21.67		0
	50	0	20.71	21.13	20.63	0-1	1
	50	25	20.62	21.00	20.68		1
	50	50	20.63	20.91	20.58		1
	100	0	20.72	20.80	20.54		1
16QAM	1	0	20.50	20.52	20.50	0-1	1
	1	50	20.58	20.88	20.58		1
	1	99	20.52	20.60	20.62		1
	50	0	19.66	19.82	19.58	0-2	2
	50	25	19.62	19.88	19.52		2
	50	50	19.59	19.77	19.69		2
	100	0	19.50	19.81	19.57		2

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Table 7-18
LTE Band 66 Measured Conducted Powers – 15 MHz Bandwidth

LTE Band 66 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132047 (1717.5 MHz)	132322 (1745.0 MHz)	132597 (1772.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	21.91	21.92	21.97	0	0
	1	36	21.87	22.17	21.70		0
	1	74	21.63	22.10	21.68		0
	36	0	20.84	20.98	20.77	0-1	1
	36	18	20.85	20.89	20.61		1
	36	37	20.63	20.82	20.63		1
	75	0	20.84	20.86	20.59		1
16QAM	1	0	20.60	20.96	20.94	0-1	1
	1	36	20.68	21.13	21.00		1
	1	74	20.73	21.09	20.87		1
	36	0	19.77	19.95	19.73	0-2	2
	36	18	19.74	19.97	19.60		2
	36	37	19.68	19.80	19.59		2
	75	0	19.61	19.62	19.70		2

Table 7-19
LTE Band 66 Measured Conducted Powers – 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132022 (1715.0 MHz)	132322 (1745.0 MHz)	132622 (1775.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.01	22.03	21.86	0	0
	1	25	21.92	21.90	21.83		0
	1	49	21.84	22.08	21.58		0
	25	0	20.85	20.98	20.71	0-1	1
	25	12	20.91	20.89	20.73		1
	25	25	20.87	20.77	20.59		1
	50	0	20.80	20.80	20.68		1
16QAM	1	0	20.84	20.55	20.70	0-1	1
	1	25	20.95	20.80	20.97		1
	1	49	20.79	20.72	20.67		1
	25	0	19.74	19.75	19.58	0-2	2
	25	12	19.76	19.83	19.51		2
	25	25	19.88	19.73	19.50		2
	50	0	19.77	19.61	19.53		2

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Table 7-20
LTE Band 66 Measured Conducted Powers – 5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131997 (1712.5 MHz)	132322 (1745.0 MHz)	132647 (1777.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	21.74	21.88	21.73	0	0
	1	12	21.87	21.92	21.70		0
	1	24	21.68	21.94	21.72		0
	12	0	20.64	20.72	20.60	0-1	1
	12	6	20.79	20.79	20.62		1
	12	13	20.62	20.83	20.54		1
	25	0	20.77	20.66	20.54		1
16QAM	1	0	20.66	20.69	20.62	0-1	1
	1	12	20.86	20.65	20.53		1
	1	24	20.70	20.51	20.50		1
	12	0	19.82	19.55	19.63	0-2	2
	12	6	19.68	19.61	19.57		2
	12	13	19.60	19.58	19.62		2
	25	0	19.89	19.70	19.59		2

Table 7-21
LTE Band 66 Measured Conducted Powers – 3 MHz Bandwidth

LTE Band 66 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131987 (1711.5 MHz)	132322 (1745.0 MHz)	132657 (1778.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	21.83	22.20	21.82	0	0
	1	7	21.99	22.11	22.03		0
	1	14	21.88	21.92	21.88		0
	8	0	20.83	20.88	20.80	0-1	1
	8	4	20.77	20.86	20.62		1
	8	7	20.69	20.79	20.68		1
	15	0	20.62	20.85	20.60		1
16QAM	1	0	20.85	20.95	20.80	0-1	1
	1	7	20.90	21.29	20.69		1
	1	14	20.87	20.84	20.50		1
	8	0	19.82	19.94	19.60	0-2	2
	8	4	19.78	19.90	19.51		2
	8	7	19.87	19.81	19.50		2
	15	0	19.73	19.62	19.60		2

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Table 7-22
LTE Band 66 Measured Conducted Powers – 1.4 MHz Bandwidth

LTE Band 66 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131979 (1710.7 MHz)	132322 (1745.0 MHz)	132665 (1779.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	21.81	21.96	21.88	0	0
	1	2	21.86	22.00	21.71		0
	1	5	21.78	21.92	21.68		0
	3	0	21.77	21.74	21.70		0
	3	2	21.74	21.88	21.77		0
	3	3	21.73	21.80	21.62	0	
	6	0	20.73	20.76	20.60	0-1	1
16QAM	1	0	20.61	20.87	20.62	0-1	1
	1	2	20.68	21.04	20.57		1
	1	5	20.72	21.05	20.61		1
	3	0	20.53	20.91	20.64		1
	3	2	20.51	20.88	20.58		1
	3	3	20.52	20.87	20.55	1	
	6	0	19.61	19.81	19.51	0-2	2

7.1.7 LTE Band 2

Table 7-23
LTE Band 2 Measured Conducted Powers - 20 MHz Bandwidth

LTE Band 2 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18700 (1860.0 MHz)	18900 (1880.0 MHz)	19100 (1900.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.75	22.68	22.74	0	0
	1	50	22.68	22.90	22.86		0
	1	99	22.72	22.57	23.12		0
	50	0	21.70	21.55	21.86	0-1	1
	50	25	21.70	21.66	21.87		1
	50	50	21.55	21.46	21.99		1
	100	0	21.50	21.54	21.91		1
16QAM	1	0	21.36	21.20	21.42	0-1	1
	1	50	21.55	21.44	22.00		1
	1	99	21.25	21.22	21.55		1
	50	0	20.62	20.51	20.90	0-2	2
	50	25	20.67	20.42	20.89		2
	50	50	20.48	20.45	20.75		2
	100	0	20.61	20.47	20.85		2

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Table 7-24
LTE Band 2 Measured Conducted Powers - 15 MHz Bandwidth

LTE Band 2 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18675 (1857.5 MHz)	18900 (1880.0 MHz)	19125 (1902.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.98	22.61	22.94	0	0
	1	36	22.77	22.58	23.01		0
	1	74	22.62	22.67	23.02		0
	36	0	21.99	21.34	22.09	0-1	1
	36	18	21.87	21.39	22.18		1
	36	37	21.77	21.43	22.22		1
	75	0	21.76	21.50	22.15		1
16QAM	1	0	22.07	21.43	22.33	0-1	1
	1	36	21.81	21.40	22.32		1
	1	74	21.64	21.20	22.40		1
	36	0	20.85	20.46	21.09	0-2	2
	36	18	20.82	20.42	21.10		2
	36	37	20.86	20.52	21.20		2
	75	0	20.82	20.45	21.05		2

Table 7-25
LTE Band 2 Measured Conducted Powers - 10 MHz Bandwidth

LTE Band 2 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18650 (1855.0 MHz)	18900 (1880.0 MHz)	19150 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.99	22.61	22.99	0	0
	1	25	23.01	22.67	23.01		0
	1	49	23.02	22.82	22.98		0
	25	0	22.08	21.51	22.10	0-1	1
	25	12	22.01	21.45	22.13		1
	25	25	21.95	21.51	22.15		1
	50	0	21.97	21.58	22.20		1
16QAM	1	0	21.80	21.45	22.12	0-1	1
	1	25	21.71	21.72	22.15		1
	1	49	21.48	21.66	22.31		1
	25	0	20.97	20.61	21.19	0-2	2
	25	12	21.01	20.52	21.18		2
	25	25	20.88	20.50	21.22		2
	50	0	20.93	20.52	21.30		2

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Table 7-26
LTE Band 2 Measured Conducted Powers - 5 MHz Bandwidth

LTE Band 2 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18625 (1852.5 MHz)	18900 (1880.0 MHz)	19175 (1907.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.82	22.50	23.01	0	0
	1	12	22.86	22.61	23.02		0
	1	24	23.01	22.42	23.01		0
	12	0	22.06	21.61	22.31	0-1	1
	12	6	21.98	21.45	22.21		1
	12	13	21.99	21.63	22.12		1
	25	0	22.06	21.49	22.24		1
16QAM	1	0	22.06	21.32	22.18	0-1	1
	1	12	22.02	21.17	22.09		1
	1	24	21.99	21.14	21.68		1
	12	0	21.04	20.68	21.02	0-2	2
	12	6	21.09	20.42	21.20		2
	12	13	21.02	20.30	21.07		2
	25	0	21.01	20.60	21.12		2

Table 7-27
LTE Band 2 Measured Conducted Powers - 3 MHz Bandwidth

LTE Band 2 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18615 (1851.5 MHz)	18900 (1880.0 MHz)	19185 (1908.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.01	22.42	23.02	0	0
	1	7	23.09	22.61	22.99		0
	1	14	23.02	22.51	23.05		0
	8	0	22.15	21.52	22.28	0-1	1
	8	4	22.05	21.49	22.19		1
	8	7	22.00	21.52	22.11		1
	15	0	22.03	21.49	22.15		1
16QAM	1	0	22.00	21.56	22.42	0-1	1
	1	7	22.28	21.51	22.41		1
	1	14	22.15	21.35	22.15		1
	8	0	21.14	20.55	21.22	0-2	2
	8	4	21.07	20.65	21.33		2
	8	7	21.16	20.62	21.30		2
	15	0	21.29	20.70	21.15		2

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Table 7-28
LTE Band 2 Measured Conducted Powers – 1.4 MHz Bandwidth

LTE Band 2 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18607 (1850.7 MHz)	18900 (1880.0 MHz)	19193 (1909.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.85	22.72	23.09	0	0
	1	2	23.02	22.92	22.99		0
	1	5	22.99	22.93	23.00		0
	3	0	22.94	22.55	23.04		0
	3	2	22.99	22.62	23.06		0
	3	3	22.92	22.63	23.02		0
	6	0	21.99	21.48	22.10	0-1	1
16QAM	1	0	22.01	21.89	22.21	0-1	1
	1	2	22.10	21.88	22.18		1
	1	5	22.05	21.91	22.09		1
	3	0	21.99	21.51	22.22		1
	3	2	21.88	21.59	22.34		1
	3	3	21.92	21.62	22.15		1
	6	0	21.00	20.55	21.21	0-2	2

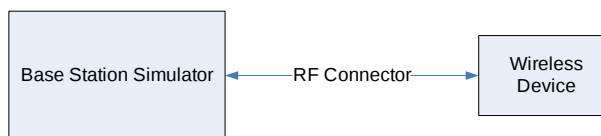


Figure 7-1
Power Measurement Setup

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8 SYSTEM VERIFICATION

8.1 Tissue Verification

Table 8-1
Measured Head Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
01/23/2024	750 Head	21.0	680	0.853	42.455	0.888	42.305	-3.94%	0.35%
			695	0.858	42.410	0.889	42.227	-3.49%	0.43%
			700	0.860	42.395	0.889	42.201	-3.26%	0.46%
			710	0.863	42.359	0.890	42.149	-3.03%	0.50%
			725	0.868	42.303	0.891	42.071	-2.58%	0.55%
			750	0.877	42.233	0.894	41.942	-1.90%	0.69%
			770	0.883	42.192	0.895	41.838	-1.34%	0.85%
			785	0.888	42.150	0.896	41.760	-0.89%	0.93%
01/23/2024	835 Head	21.0	800	0.894	42.099	0.897	41.682	-0.33%	1.00%
			815	0.900	42.044	0.898	41.594	0.22%	1.08%
			820	0.901	42.027	0.899	41.578	0.22%	1.08%
			835	0.907	41.983	0.900	41.500	0.78%	1.16%
01/22/2024	1750 Head	19.0	850	0.913	41.947	0.916	41.500	-0.33%	1.08%
			1700	1.288	39.653	1.343	40.145	-4.10%	-1.23%
			1705	1.291	39.645	1.345	40.141	-4.01%	-1.24%
			1710	1.294	39.638	1.348	40.136	-4.01%	-1.24%
			1720	1.300	39.620	1.354	40.126	-3.99%	-1.26%
			1745	1.313	39.581	1.368	40.087	-4.02%	-1.26%
			1750	1.316	39.573	1.371	40.079	-4.01%	-1.26%
01/22/2024	1900 Head	19.0	1770	1.326	39.541	1.383	40.047	-4.12%	-1.26%
			1790	1.335	39.509	1.394	40.016	-4.23%	-1.27%
			1850	1.361	39.229	1.400	40.000	-2.79%	-1.93%
			1860	1.366	39.225	1.400	40.000	-2.43%	-1.94%
			1880	1.378	39.208	1.400	40.000	-1.57%	-1.98%
			1900	1.389	39.183	1.400	40.000	-0.79%	-2.04%
			1905	1.393	39.175	1.400	40.000	-0.50%	-2.06%
			1910	1.396	39.168	1.400	40.000	-0.29%	-2.08%
			1920	1.403	39.151	1.400	40.000	0.21%	-2.12%

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2. The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

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8.2 Test System Verification

Prior to SAR assessment, the system is verified to $\pm 10\%$ of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in SAR System Validation Appendix.

Table 8-2
System Verification Results – Head

SAR System	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp. (C)	Liquid Temp. (C)	Input Power (W)	Source SN	Probe SN	DAE	Measured SAR 1g (W/kg)	1W Target SAR 1g (W/kg)	1W Normalized SAR 1g (W/kg)	Deviation 1g (%)	Measured SAR 10g (W/kg)	1W Target SAR 10g (W/kg)	1W Normalized SAR 10g (W/kg)	Deviation 10g (%)
E	750	HEAD	01/23/2024	22.9	21.0	0.20	1054	7406	1677	1.630	8.520	8.150	-4.34%	1.070	5.600	5.350	-4.46%
E	835	HEAD	01/23/2024	22.9	21.0	0.20	4d133	7406	1677	1.960	9.760	9.800	0.41%	1.280	6.370	6.400	0.47%
E	1750	HEAD	01/22/2024	20.3	19.1	0.10	1008	7406	1677	3.530	37.400	35.300	-5.61%	1.880	19.600	18.800	-4.08%
E	1900	HEAD	01/22/2024	20.3	19.1	0.10	5d149	7406	1677	3.950	40.500	39.500	-2.47%	2.050	21.200	20.500	-3.30%

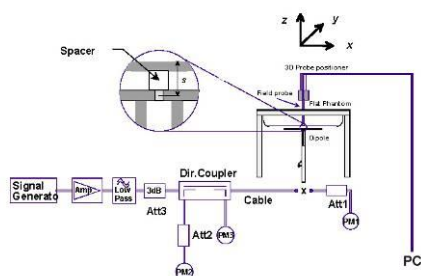


Figure 8-1
System Verification Setup Diagram



Figure 8-2
System Verification Setup Photo

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9 SAR DATA SUMMARY

9.1 LTE Band 71 Standalone SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)	(W/kg)			
680.50	133297	Mid	LTE Band 71	20	23.5	23.31	0.08	0	20256587	QPSK	1	50	0 mm	back	1:1	0.397	1.045	0.415	0.289	0.302	A1
680.50	133297	Mid	LTE Band 71	20	22.5	22.41	0.10	1	20256587	QPSK	50	25	0 mm	back	1:1	0.306	1.021	0.312	0.220	0.225	
680.50	133297	Mid	LTE Band 71	20	23.5	23.31	0.12	0	20256587	QPSK	1	50	0 mm	front	1:1	0.003	1.045	0.003	0.002	0.002	
680.50	133297	Mid	LTE Band 71	20	22.5	22.41	0.12	1	20256587	QPSK	50	25	0 mm	front	1:1	0.004	1.021	0.004	0.003	0.003	
680.50	133297	Mid	LTE Band 71	20	23.5	23.31	0.00	0	20256587	QPSK	1	50	0 mm	top	1:1	0.015	1.045	0.016	0.011	0.011	
680.50	133297	Mid	LTE Band 71	20	22.5	22.41	0.05	1	20256587	QPSK	50	25	0 mm	top	1:1	0.011	1.021	0.011	0.008	0.008	
680.50	133297	Mid	LTE Band 71	20	23.5	23.31	0.03	0	20256587	QPSK	1	50	0 mm	left	1:1	0.085	1.045	0.089	0.060	4.490	
680.50	133297	Mid	LTE Band 71	20	22.5	22.41	0.12	1	20256587	QPSK	50	25	0 mm	left	1:1	0.038	1.021	0.039	0.027	0.028	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body													
Spatial Peak								1.6 W/kg (mW/g)													
Uncontrolled Exposure/General Population								averaged over 1 gram													

9.2 LTE Band 12 Standalone SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)	(W/kg)			
707.50	23095	Mid	LTE Band 12	10	23.5	23.27	-0.16	0	20256587	QPSK	1	25	0 mm	back	1:1	0.296	1.054	0.312	0.210	0.221	A2
707.50	23095	Mid	LTE Band 12	10	22.5	22.21	0.09	1	20256587	QPSK	25	0	0 mm	back	1:1	0.255	1.069	0.273	0.161	0.172	
707.50	23095	Mid	LTE Band 12	10	23.5	23.27	0.01	0	20256587	QPSK	1	25	0 mm	front	1:1	0.006	1.054	0.006	0.004	0.004	
707.50	23095	Mid	LTE Band 12	10	22.5	22.21	-0.14	1	20256587	QPSK	25	0	0 mm	front	1:1	0.004	1.069	0.004	0.003	0.003	
707.50	23095	Mid	LTE Band 12	10	23.5	23.27	0.13	0	20256587	QPSK	1	25	0 mm	top	1:1	0.011	1.054	0.012	0.008	0.008	
707.50	23095	Mid	LTE Band 12	10	22.5	22.21	-0.10	1	20256587	QPSK	25	0	0 mm	top	1:1	0.009	1.069	0.010	0.006	0.006	
707.50	23095	Mid	LTE Band 12	10	23.5	23.27	0.00	0	20256587	QPSK	1	25	0 mm	left	1:1	0.035	1.054	0.037	0.026	0.027	
707.50	23095	Mid	LTE Band 12	10	22.5	22.21	-0.16	1	20256587	QPSK	25	0	0 mm	left	1:1	0.026	1.069	0.028	0.019	0.020	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body													
Spatial Peak								1.6 W/kg (mW/g)													
Uncontrolled Exposure/General Population								averaged over 1 gram													

9.3 LTE Band 13 Standalone SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)	(W/kg)			
782.00	23230	Mid	LTE Band 13	10	23.5	23.29	0.04	0	20256587	QPSK	1	49	0 mm	back	1:1	0.252	1.050	0.265	0.178	0.187	A3
782.00	23230	Mid	LTE Band 13	10	22.5	22.50	-0.06	1	20256587	QPSK	25	25	0 mm	back	1:1	0.204	1.000	0.204	0.145	0.145	
782.00	23230	Mid	LTE Band 13	10	23.5	23.29	0.00	0	20256587	QPSK	1	49	0 mm	front	1:1	0.004	1.050	0.004	0.002	0.002	
782.00	23230	Mid	LTE Band 13	10	22.5	22.50	-0.10	1	20256587	QPSK	25	25	0 mm	front	1:1	0.003	1.000	0.003	0.003	0.003	
782.00	23230	Mid	LTE Band 13	10	23.5	23.29	-0.16	0	20256587	QPSK	1	49	0 mm	top	1:1	0.016	1.050	0.017	0.012	0.013	
782.00	23230	Mid	LTE Band 13	10	22.5	22.50	-0.12	1	20256587	QPSK	25	25	0 mm	top	1:1	0.011	1.000	0.011	0.008	0.008	
782.00	23230	Mid	LTE Band 13	10	23.5	23.29	-0.19	0	20256587	QPSK	1	49	0 mm	left	1:1	0.017	1.050	0.018	0.012	0.013	
782.00	23230	Mid	LTE Band 13	10	22.5	22.50	-0.12	1	20256587	QPSK	25	25	0 mm	left	1:1	0.014	1.000	0.014	0.011	0.011	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body													
Spatial Peak								1.6 W/kg (mW/g)													
Uncontrolled Exposure/General Population								averaged over 1 gram													

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9.4 LTE Band 14 Standalone SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	(W/kg)	(W/kg)	
793.00	23330	Mid	LTE Band 14	10	23.5	23.33	0.04	0	20256587	QPSK	1	49	0 mm	back	1:1	0.267	1.040	0.278	0.189	0.197	A4
793.00	23330	Mid	LTE Band 14	10	22.5	22.42	0.07	1	20256587	QPSK	25	0	0 mm	back	1:1	0.200	1.019	0.204	0.143	0.146	
793.00	23330	Mid	LTE Band 14	10	23.5	23.33	-0.09	0	20256587	QPSK	1	49	0 mm	front	1:1	0.005	1.040	0.005	0.004	0.004	
793.00	23330	Mid	LTE Band 14	10	22.5	22.42	0.00	1	20256587	QPSK	25	0	0 mm	front	1:1	0.004	1.019	0.004	0.003	0.003	
793.00	23330	Mid	LTE Band 14	10	23.5	23.33	-0.19	0	20256587	QPSK	1	49	0 mm	top	1:1	0.011	1.040	0.011	0.008	0.008	
793.00	23330	Mid	LTE Band 14	10	22.5	22.42	0.12	1	20256587	QPSK	25	0	0 mm	top	1:1	0.006	1.019	0.006	0.005	0.005	
793.00	23330	Mid	LTE Band 14	10	23.5	23.33	0.13	0	20256587	QPSK	1	49	0 mm	left	1:1	0.024	1.040	0.025	0.018	0.019	
793.00	23330	Mid	LTE Band 14	10	22.5	22.42	-0.09	1	20256587	QPSK	25	0	0 mm	left	1:1	0.019	1.019	0.019	0.014	0.014	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body													
Spatial Peak								1.6 W/kg (mW/g)													
Uncontrolled Exposure/General Population								averaged over 1 gram													

9.5 LTE Band 5 Standalone SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)	(W/kg)	(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.42	-0.06	0	20256587	QPSK	1	0	0 mm	back	1:1	0.228	1.019	0.232	0.166	0.169	A5
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.40	-0.16	1	20256587	QPSK	25	25	0 mm	back	1:1	0.180	1.023	0.184	0.132	0.135	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.42	0.08	0	20256587	QPSK	1	0	0 mm	front	1:1	0.009	1.019	0.009	0.006	0.006	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.40	-0.05	1	20256587	QPSK	25	25	0 mm	front	1:1	0.007	1.023	0.007	0.005	0.005	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.42	0.03	0	20256587	QPSK	1	0	0 mm	top	1:1	0.021	1.019	0.021	0.014	0.014	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.40	0.05	1	20256587	QPSK	25	25	0 mm	top	1:1	0.018	1.023	0.018	0.012	0.012	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.42	-0.14	0	20256587	QPSK	1	0	0 mm	left	1:1	0.063	1.019	0.064	0.044	0.045	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.40	-0.06	1	20256587	QPSK	25	25	0 mm	left	1:1	0.055	1.023	0.056	0.038	0.039	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body													
Spatial Peak								1.6 W/kg (mW/g)													
Uncontrolled Exposure/General Population								averaged over 1 gram													

9.6 LTE Band 66 Standalone SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)	(W/kg)			
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	21.88	0.06	0	20256587	QPSK	1	50	0 mm	back	1:1	0.109	1.452	0.158	0.069	0.100	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.5	22.42	0.09	0	20256587	QPSK	1	99	0 mm	back	1:1	0.122	1.282	0.156	0.076	0.097	
1770.00	132572	High	LTE Band 66 (AWS)	20	23.5	21.67	0.15	0	20256587	QPSK	1	99	0 mm	back	1:1	0.163	1.524	0.248	0.098	0.149	A6
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	20.71	-0.09	1	20256587	QPSK	50	0	0 mm	back	1:1	0.084	1.510	0.127	0.052	0.079	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	22.5	21.13	0.05	1	20256587	QPSK	50	0	0 mm	back	1:1	0.094	1.371	0.129	0.059	0.081	
1770.00	132572	High	LTE Band 66 (AWS)	20	22.5	20.68	0.00	1	20256587	QPSK	50	25	0 mm	back	1:1	0.108	1.521	0.164	0.066	0.100	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.5	22.42	-0.17	0	20256587	QPSK	1	99	0 mm	front	1:1	0.009	1.282	0.012	0.006	0.008	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	22.5	21.13	0.13	1	20256587	QPSK	50	0	0 mm	front	1:1	0.007	1.371	0.010	0.005	0.007	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.5	22.42	-0.08	0	20256587	QPSK	1	99	0 mm	top	1:1	0.022	1.282	0.028	0.014	0.018	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	22.5	21.13	-0.12	1	20256587	QPSK	50	0	0 mm	top	1:1	0.017	1.371	0.023	0.011	0.015	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.5	22.42	-0.01	0	20256587	QPSK	1	99	0 mm	left	1:1	0.024	1.282	0.031	0.016	0.021	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	22.5	21.13	0.03	1	20256587	QPSK	50	0	0 mm	left	1:1	0.019	1.371	0.026	0.013	0.018	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body													
Spatial Peak								1.6 W/kg (mW/g)													
Uncontrolled Exposure/General Population								averaged over 1 gram													

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9.7 LTE Band 2 Standalone SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	SAR (10g)	Reported SAR (10g)	Plot	
MHz	Ch.														(W/kg)		(W/kg)	(W/kg)			
1860.00	18700	Low	LTE Band 2 (PCS)	20	23.5	22.75	0.18	0	20256587	QPSK	1	0	0 mm	back	1:1	0.291	1.189	0.346	0.177	0.210	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.5	22.90	0.07	0	20256587	QPSK	1	50	0 mm	back	1:1	0.328	1.148	0.377	0.198	0.227	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.5	23.12	0.12	0	20256587	QPSK	1	99	0 mm	back	1:1	0.621	1.091	0.678	0.377	0.411	A7
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	21.70	0.04	1	20256587	QPSK	50	0	0 mm	back	1:1	0.223	1.202	0.268	0.135	0.162	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.66	0.05	1	20256587	QPSK	50	25	0 mm	back	1:1	0.248	1.213	0.301	0.150	0.182	
1900.00	19100	High	LTE Band 2 (PCS)	20	22.5	21.99	-0.02	1	20256587	QPSK	50	50	0 mm	back	1:1	0.490	1.125	0.551	0.295	0.332	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.5	23.12	0.00	0	20256587	QPSK	1	99	0 mm	front	1:1	0.018	1.091	0.020	0.009	0.010	
1900.00	19100	High	LTE Band 2 (PCS)	20	22.5	21.99	0.12	1	20256587	QPSK	50	50	0 mm	front	1:1	0.011	1.125	0.012	0.006	0.007	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.5	23.12	0.00	0	20256587	QPSK	1	99	0 mm	top	1:1	0.089	1.091	0.097	0.047	0.051	
1900.00	19100	High	LTE Band 2 (PCS)	20	22.5	21.99	0.04	1	20256587	QPSK	50	50	0 mm	top	1:1	0.057	1.125	0.064	0.037	0.042	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.5	23.12	-0.01	0	20256587	QPSK	1	99	0 mm	left	1:1	0.042	1.091	0.046	0.026	0.028	
1900.00	19100	High	LTE Band 2 (PCS)	20	22.5	21.99	-0.12	1	20256587	QPSK	50	50	0 mm	left	1:1	0.029	1.125	0.033	0.018	0.020	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT																					
Spatial Peak																					
Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram													

9.8 SAR Test Notes

General Notes:

- The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D04v01.
- Batteries are fully charged at the beginning of the SAR measurements.
- Liquid tissue depth was at least 15.0 cm for all frequencies.
- The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
- SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D04v01.
- Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 10 for variability analysis.
- Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the 1g thresholds for the equivalent test cases.

LTE Notes:

- LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 6.3.4.
- MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
- A-MPR was disabled for all SAR tests by setting NS=01 and MCC=001 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

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10 SAR MEASUREMENT VARIABILITY

10.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, all measured 1 g SAR values were <0.8 W/kg and all measured 10 g SAR values were <2.0 W/kg. Therefore, no SAR measurement variability analysis was required.

10.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for 1g and <3.75 W/kg for 10g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

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11 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4404B	Spectrum Analyzer	N/A	N/A	N/A	MY45113242
Agilent	N5182A	MXG Vector Signal Generator	7/4/2023	Annual	7/4/2024	MY48180366
Agilent	8753ES	S-Parameter Vector Network Analyzer	6/2/2023	Annual	6/2/2024	MY40003841
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433973
Anritsu	MT8821C	Radio Communication Analyzer MT8821C	7/7/2023	Annual	7/7/2024	6262044715
Anritsu	MA24106A	USB Power Sensor	6/15/2023	Annual	6/15/2024	1827530
Anritsu	MA24106A	USB Power Sensor	4/21/2023	Annual	4/21/2024	1344554
Traceable	4040 90080-06	Therm./ Clock/ Humidity Monitor	5/11/2022	Biennial	5/11/2024	221514974
Control Company	4353	Long Stem Thermometer	9/15/2022	Biennial	9/15/2024	221767767
Mitutoyo	500-196-30	CD-6" ASX 6inch Digital Caliper	2/16/2022	Triennial	2/16/2025	A20238413
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	ZUDC10-83-S+	Directional Coupler	CBT	N/A	CBT	2050
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Huber + Suhner	74Z-0-0-21	Torque Wrench	11/29/2022	Biennial	11/29/2024	94722
Seekonk	TSF-100	Torque Wrench	6/30/2023	Annual	6/30/2024	47639-29
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/9/2023	Annual	2/9/2024	161617
SPEAG	DAK-3.5	Dielectric Assessment Kit	11/13/2023	Annual	11/13/2024	1277
SPEAG	MAIA	Modulation and Audio Interference Analyzer	N/A	N/A	N/A	1237
SPEAG	D750V3	750 MHz SAR Dipole	3/14/2022	Biennial	3/14/2024	1054
SPEAG	D835V2	835 MHz SAR Dipole	8/19/2021	Triennial	8/19/2024	4d133
SPEAG	D1765V2	1750 MHz SAR Dipole	5/14/2021	Triennial	5/14/2024	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	9/21/2021	Triennial	9/21/2024	5d149
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/10/2023	Annual	7/10/2024	1677
SPEAG	EX3DV4	SAR Probe	7/7/2023	Annual	7/7/2024	7406

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.

Note: All equipment was used solely within its respective calibration period.

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12 MEASUREMENT UNCERTAINTIES

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c _i 1gm	c _i 10 gms	1gm u _i (± %)	10gms u _i (± %)	v _i
Measurement System									
Probe Calibration	E.2.1	7	N	1	1	1	7.0	7.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	0.7	0.7	0.9	0.9	∞
Boundary Effect	E.2.3	2	R	1.732	1	1	1.2	1.2	∞
Linearity	E.2.4	0.3	N	1	1	1	0.3	0.3	∞
System Detection Limits	E.2.4	0.25	R	1.732	1	1	0.1	0.1	∞
Modulation Response	E.2.5	4.8	R	1.732	1	1	2.8	2.8	∞
Readout Electronics	E.2.6	0.3	N	1	1	1	0.3	0.3	∞
Response Time	E.2.7	0.8	R	1.732	1	1	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.732	1	1	1.5	1.5	∞
RF Ambient Conditions - Noise	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
RF Ambient Conditions - Reflections	E.6.1	3	R	1.732	1	1	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.8	R	1.732	1	1	0.5	0.5	∞
Probe Positioning w/ respect to Phantom	E.6.3	6.7	R	1.732	1	1	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	4	R	1.732	1	1	2.3	2.3	∞
Test Sample Related									
Test Sample Positioning	E.4.2	3.12	N	1	1	1	3.1	3.1	35
Device Holder Uncertainty	E.4.1	1.67	N	1	1	1	1.7	1.7	5
Output Power Variation - SAR drift measurement	E.2.9	5	R	1.732	1	1	2.9	2.9	∞
SAR Scaling	E.6.5	0	R	1.732	1	1	0.0	0.0	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	7.6	R	1.73	1.0	1.0	4.4	4.4	∞
Liquid Conductivity - measurement uncertainty	E.3.3	4.3	N	1	0.78	0.71	3.3	3.0	76
Liquid Permittivity - measurement uncertainty	E.3.3	4.2	N	1	0.23	0.26	1.0	1.1	75
Liquid Conductivity - Temperature Uncertainty	E.3.4	3.4	R	1.732	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Uncertainty	E.3.4	0.6	R	1.732	0.23	0.26	0.1	0.1	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Combined Standard Uncertainty (k=1)							RSS	12.2	12.0
Expanded Uncertainty (95% CONFIDENCE LEVEL)							k=2	24.4	24.0

The above measurement uncertainties are according to IEEE Std. 1528-2013

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13 CONCLUSION

13.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The results and statements relate only to the item(s) tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

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