HCT Co., Ltd.
74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Tel. +82 31 634 6300 Fax. +82 31 645 6401

SAR TEST REPORT

Applicant Name: **SAMSUNG Electronics Co., Ltd.** 129, Samsung-ro, Yeongtong-gu, Suwon-Si, Gyeonggi-do, 16677 Rep. of Korea	**Date of Issue:** Mar. 19, 2021 **Test Report No.:** HCT-SR-2103-FC001-R1 **Test Site: HCT CO., LTD.**

FCC ID: **A3LSMM022G**

Equipment Type:	**Mobile Phone**
Application Type	**Certification**
FCC Rule Part(s):	**CFR §2.1093**
Model Name:	**SM-M022G/DS**
Date of Test:	**Feb. 22. 2021~ Mar. 15. 2021**

This device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in FCC KDB procedures and had been tested in accordance with the measurement procedures specified in FCC KDB procedures.

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.

Tested By

Jung-Hun, Park
Test Engineer
SAR Team
Certification Division

Reviewed By

Yun-jeang, Heo
Technical Manager
SAR Team
Certification Division

REVISION HISTORY

The revision history for this test report is shown in table.

Revision No.	Date of Issue	Description
0	Mar. 17, 2021	Initial Release
1	Mar. 19, 2021	Revied page 9

This test results were applied only to the test methods required by the standard.

The above Test Report is not related to the accredited test result by (KS Q) ISO/IEC 17025 and KOLAS(Korea Laboratory Accreditation Scheme), which signed the ILAC-MRA.

Table of Contents

1. Test Regulations

The tests documented in this report were performed in accordance with FCC CFR § 2.1093, IEEE 1528-2013, ANSI C63.26-2015 the following FCC Published RF exposure KDB procedures:

- FCC KDB Publication 941225 D01 3G SAR Procedures v03r01
- FCC KDB Publication 941225 D06 Hot Spot SAR v02r01
- FCC KDB Publication 941225 D05 SAR for LTE Devices v02r05
- FCC KDB Publication 941225 D05A LTE Rel.10 KDB Inquiry sheet v01r02
- FCC KDB Publication 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB Publication 447498 D01 General SAR Guidance v06
- FCC KDB Publication 648474 D04 Handset SAR v01r03
- FCC KDB Publication 616217 D04 v01r02 (Proximity Sensor)
- FCC KDB Publication 865664 D01 SAR measurement 100 MHz to 6 GHz v01r04
- FCC KDB Publication 865664 D02 SAR Reporting v01r02
- FCC KDB Publication 690783 D01 SAR Listings on Grants v01r03
- FCC KDB Publication 971168 D01 Power Meas License Digital Systems v03r01

In Addition to the above, the following information was used.

- October 2013 TCB Workshop Notes (GPRS testing criteria)
- April 2015 TCB Workshop Notes (Simultaneous transmission summation clarified)
- October 2016 TCB Workshop Notes (Bluetooth Duty Factor)

2. Test Location

2.1 Test Laboratory

Company Name	HCT Co., Ltd.
Address	74, Seoicheon-ro 578beon-gil, Majang-myeon, Icheon-si, Gyeonggi-do, 17383 KOREA
Telephone	031-645-6300
Fax.	031-645-6401

2.2 Test Facilities

Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

Korea	National Radio Research Agency (Designation No. KR0032)
	KOLAS (Testing No. KT197)

3. Information of the EUT

3.1 General Information of the EUT

Model Name	SM-M022G/DS
Equipment Type	Mobile Phone
FCC ID	A3LSMM022G
Application Type	Certification
Applicant	SAMSUNG Electronics Co., Ltd.

3.2 Attestation of test result of device under test

The Highest Reported SAR Results						
Band	Tx. Frequency	Equipment Class	Reported SAR (W/kg)			
			1g Head	1g Body-Worn	1g Hotspot	10g Extremity
GSM/GPRS/EDGE 850	824.2 ㎒ ~ 848.8 ㎒	TNE	0.25	0.38	0.73	N/A
UMTS 850	826.4 ㎒ ~ 846.6 ㎒	TNE	0.27	0.34	0.61	N/A
LTE Band 5 (Cell)	824.7 ㎒ ~ 848.3 ㎒	TNE	0.31	0.40	0.70	N/A
LTE TDD Band 41	2 498.5 ㎒ ~ 2 687.5 ㎒	TNE	1.30	0.59	1.08	1.26
802.11b	2 412 ㎒ ~ 2 472 ㎒	DTS	0.29	0.13	0.31	N/A
Bluetooth	2 402 ㎒ ~ 2 480 ㎒	DSS	0.21	<0.10	<0.10	N/A
Simultaneous SAR per KDB 690783 D01v01r03			1.590	0.714	1.391	N/A
Date(s) of Tests:	02/22/2021 ~ 03/15/2021					

4. Device Under Test Description

4.1 DUT specification

Device Wireless specification overview		
Band & Mode	**Operating Mode**	**Tx Frequency**
GSM850	Voice / Data	824.2 ㎒ ~ 848.8 ㎒
UMTS 850	Voice / Data	826.4 ㎒ ~ 846.6 ㎒
LTE Band 5 (Cell)	Voice / Data	824.7 ㎒~ 848.3 ㎒
LTE TDD Band 41	Voice / Data	2 498.5 ㎒ ~ 2 687.5 ㎒
2.4 ㎓ WLAN	Voice / Data	2 412 ㎒ ~ 2 472 ㎒
Bluetooth / LE 5.0	Data	2 402 ㎒ ~ 2 480 ㎒
Device Serial Numbers	**Mode**	**Serial Number**
	GSM 850, UMTS B5, LTE B5	TLM0312H
	2.4GHz WLAN /BT	TLM0296H
	LTE B41	TLM0312H, TLM0296H
	The manufacturer has confirmed that the devices tested have the same physical, mechanical and thermal characteristics are within operational tolerances expected for production units.	

4.2 Power Reduction for SAR

This device utilizes power reduction mechanisms for LTE B41 for SAR compliance under hotspot conditions and under some conditions when the device is being used in close proximity to the user's hand. All hotspot SAR evaluations for this device were performed at the maximum allowed output power when Hotspot is enabled. FCC KDB Publication 616217 D04v01r02 Sec.6 was used as a guideline for selection SAR test distances for device when being used in phablet use conditions.

This device uses an independent fixed level power reduction mechanism for WLAN modes and LTE B41 during held-to-ear scenarios. Per FCC Guidance, the held-to-ear exposure conditions were evaluated at reduced power according to the head SAR Positions described in IEEE1528-2013. Detailed descriptions of the power reduction mechanism are included in the operational description.

.

4.3 Nominal and Maximum Output Power Specifications

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB publication 447498 D01v06.

4.3.1 Maximum Output Power

Mode / Band		Voice	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 Tx Slot	1 Tx Slot	2 Tx Slot	3 Tx Slot	4 Tx Slot	1 Tx Slot	2 Tx Slot	3 Tx Slot	4 Tx Slot
GSM/GPRS/EDGE 850	Maximum	34.0	34.0	33.0	31.5	30.5	29.0	27.5	25.5	24.5
	Nominal	33.0	33.0	32.0	30.5	29.5	28.0	26.5	24.5	23.5

Mode / Band		Modulated Average (dBm)			
		3GPP UMTS	3GPP HSDPA	3GPP HSUPA	DC-HSDPA
UMTS Band 5 (850 ㎒)	Maximum	25.5	24.5	23.0	24.5
	Nominal	24.5	23.5	22.0	23.5

Mode / Band		Modulated Average (dBm)
		Max
LTE Band 5	Maximum	25.3
	Nominal	24.3
LTE TDD Band 41	Maximum	22.2
	Nominal	21.2

4.3.2 LTE Reduced Power

- RCV On Mode / Hotspot Mode / Earjack / Grip Sensor on

Mode / Band		Modulated Average (dBm)		
		Hotspot Mode/ Earjack	Grip Sensor on	RCV on Mode
LTE TDD Band 41	Maximum	17.5	20.3	19.1
	Nominal	16.5	19.3	18.1

4.3.3 Maximum 2.4 ㎓ WIFI output power

Mode	Band	SISO				
		a	b	g	n	ac
WLAN 802.11b/g/n	2.4GHz		17 (12CH : 7) (13CH : 7)	16 (12CH : 7) (13CH : 7)	16 (11CH : 15) (12CH : 7) (13CH : 7)	

(Upper Tolerance: target -1.5dB ~ +1.0 dB)

4.3.4 Reduced WLAN Power – receiver Active

Mode	Band	SISO				
		a	b	g	n	ac
WLAN 802.11b/g/n	2.4GHz		13 (12CH : 7) (13CH : 7)	13 (12CH : 7) (13CH : 7)	13 (12CH : 7) (13CH : 7)	

(Upper Tolerance: target -1.5dB ~ +1.0 dB)

4.3.5 Maximum Bluetooth Power

Mode / Band		Modulated Average (dBm)
Bluetooth 1Mbps	Maximum	12.5
	Nominal	11.5
DH5	Maximum	12.5
	Nominal	11.5
2-DH5	Maximum	10.5
	Nominal	9.5
3-DH5	Maximum	10.5
	Nominal	9.5
Bluetooth LE	Maximum	9.0
	Nominal	8.0

(Tolerance target: Upper +1.0dB, Lower -1.5dB)

4.4 LTE Information

Item.			Description				
Frequency Range		LTE Band 5 (Cell)	824.7 ㎒ ~ 848.3 ㎒				
		LTE TDD Band 41	2 498.5 ㎒ ~ 2 687.5 ㎒				
Channel Bandwidths		LTE Band 5 (Cell)	1.4 ㎒, 3 ㎒, 5 ㎒, 10 ㎒				
		LTE TDD Band 41	5 ㎒, 10 ㎒, 15 ㎒, 20 ㎒				
Ch. No.& Freq.(㎒)		Low	Mid			High	
LTE Band 5 (Cell)	1.4 ㎒	824.7 (20407)	836.5 (20525)			848.3 (20643)	
	3 ㎒	825.5 (20415)	836.5 (20525)			847.5 (20635)	
	5 ㎒	826.5 (20425)	836.5 (20525)			846.5 (20625)	
	10 ㎒	829.0 (20450)	836.5 (20525)			844.0 (20600)	
LTE TDD Band 41	5 ㎒	2 506.0(39750)	2 549.5(40185)	2 593.0(40620)	2 636.5(41055)	2 680.0(41490)	
	10 ㎒	2 506.0(39750)	2 549.5(40185)	2 593.0(40620)	2 636.5(41055)	2 680.0(41490)	
	15 ㎒	2 506.0(39750)	2 549.5(40185)	2 593.0(40620)	2 636.5(41055)	2 680.0(41490)	
	20 ㎒	2 506.0(39750)	2 549.5(40185)	2 593.0(40620)	2 636.5(41055)	2 680.0(41490)	

UE Category	LTE Rel. 11, DL: Category 4, UL: Category 5
Modulations Supported in UL	QPSK, 16QAM, 64QAM
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3	Yes
A-MPR disabled for SAR Testing.	Yes
LTE Carrier Aggregation	This device dose not supports Up-Link/ down link Carrier aggregation.in US.
LTE Release information	This device does not support full CA features on 3GPP Release 10 All other uplink communications are identical to te release 8 specifications. The following LTE Release 10 Features are not supported: Up link / down link carrier aggregation, Relay, Hetnet, Enhanced elCl, MDH, cross-carrier Scheduling, Enhanced SC-FDMA.

4.5 DUT Antenna Locations

The overall dimensions of this device are > 9 X 5 cm. A diagram showing device antenna can be found in SAR_setup_photos. Since the diagonal dimension of this device is > 160 mm and < 200 mm, it is considered a “phablet”.

This model allows users to exchange data or media files with other Bluetooth enabled devices using Bluetooth, which means they can connect to other Bluetooth enabled devices via Bluetooth tethering. Therefore, SAR test was performed for additional simultaneous transmissions.
Head and Bluetooth Tethering SAR were evaluated for BT BR tethering applications.

Mode	Ant	Rear	Front	Left	Right	Bottom	Top
GSM/GPRS/EDGE 850	Main #1	Yes	Yes	Yes	Yes	Yes	No
UMTS 850	Main #1	Yes	Yes	Yes	Yes	Yes	No
LTE Band 5 (Cell)	Main #1	Yes	Yes	Yes	Yes	Yes	No
LTE TDD Band 41	Main #2	Yes	Yes	Yes	No	No	Yes
2.4 ㎓ WLAN	BT/WIFI	Yes	Yes	Yes	No	No	Yes
Bluetooth	BT/WIFI	Yes	Yes	Yes	No	No	Yes

Particular EUT edges were not required to be evaluated for Bluetooth Tethering and Hotspot SAR if the edges were > 25 mm from the transmitting antenna according to FCC KDB 941225 D06v02r01 on page 2.
The distance between the transmit antennas and the edges of the device are included in the filing.
- Note: All test configurations are based on front view position.

4.6 SAR Summation Scenario

According to FCC KDB 447498 D01v06, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the EUT are shown below paths and are mode in same rectangle to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.

Simultaneous transmission paths

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB 447498 D01v06.

Simultaneous Transmission Scenarios				
Applicable Combination	Head	Body-Worn	Hotspot	Extremity
GSM Voice + 2.4 GHz WiFi	Yes	Yes	N/A	Yes
GSM Voice + Bluetooth	Yes^	Yes	N/A	Yes
GSMGPRS/EDGE +2.4 GHz WiFi	N/A	N/A	Yes	Yes
GSMGPRS/EDGE + Bluetooth	N/A	N/A	Yes^	Yes
UMTS + 2.4 GHz WiFi	Yes	Yes	Yes	Yes
UMTS + Bluetooth	Yes^	Yes	Yes^	Yes
LTE + 2.4 GHz WiFi	Yes*	Yes	Yes	Yes
LTE+ Bluetooth	Yes^	Yes	Yes^	Yes

Note:
1. Bluetooth Antenna and WLAN antenna cannot transmit simultaneously
2. The device does not support licensed bands simultaneously transmitting.
3. UMTS +WLAN scenario also represents the UMTS Voice/DATA + WLAN hotspot scenario.
4. VoIP dosn't supported in GPRS/EDGE
5. The highest reported SAR for each exposure condition is used for SAR summation purpose.
6. Wi-Fi Hotspot is supported for 2.4 GHz
7. This device supports Bluetooth tethering. ^ BluetoothTetheringis considered.
8. * Pre-installed VOIP applications areconsidered
9. This device supports VoLTE/VoWiFi

4.7 SAR Test Considerations

4.7.1 WiFi

WiFi Hotspot SAR test and combinations are considered only 2.4 GHz for SAR with respected to wireless router configurations according to FCC KDB 941225 D06v02r01.

Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.
. Phablet SAR was not evaluated for 2.4 GHz WIFI and 2.4 GHz Bluetooth operations since wireless router 1g SAR was < 1.2 W/kg.

4.7.2 Licensed Transmitter(s)

GSM/GPRS/EDGE DTM is not supported for US bands. Therefore, the GSM Voice modes in this report do not transmit simultaneously with GPRS/EDGE Data.

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.

Per FCC KDB 648474 D04v01r03, this device is considered a “Phablet” since the diagonal dimension is greater than 160 mm and less than 200 mm. Therefore, extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR >1.2 W/kg. When hotspot mode applies, 10g SAR required only for the surfaces and edges with hotspot mode scaled to the maximum output power (including tolerance) is 1g SAR > 1.2 W/kg.

This Device supports 64QAM on the uplink for LTE Operations. Conducted powers for 64QAM uplink configurations were measured per section 5.1 of FCC KDB 941225 D05v02r05. SAR was not required for 64QAM sins the highest maximum output power for 64QAM is ≤ 0.5dB higher than the same configuration in QPSK and the reported SAR for QPSK configuration is ≤1.45 W/Kg, per section 5.2.4 for FCC KDB941225 D05v02r05.

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01v03r01.
Per FCC KDB 941225 D01v03r01, 12.2 kbps RMC is the primary mode and HSPA (HSUPA/HSDPA with RMC) is the secondary mode.
Per FCC KDB 941225 D01v03r01, The SAR test exclusion is applied to the secondary mode by the following equation.

$$Adjusted\ SAR = Highest\ Reported\ SAR\ x\ \frac{Secondary\ Max\ tune - up\ (mW)}{Primary\ Max\ tune\ tune - up(mW)} \leq 1.2\ \mathrm{W/kg}.$$

Based on the highest Reported SAR, the secondary mode is not required.

5. Introduction

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices.

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. 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York 10017. The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring 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 National Council on Radiation Protection and Measurements (NCRP) in Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814. 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.

SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative of the incremental electromagnetic energy (d*W*) absorbed by (dissipated in) an incremental mass (d*m*) contained in a volume element (d*V*) of a given density (*r*). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body.

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

Figure 1. SAR Mathematical Equation
SAR is expressed in units of Watts per Kilogram (W/kg)

Where:
= conductivity of the tissue-simulant material (S/m)
= mass density of the tissue-simulant material (kg/m^3)
= 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 relations 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. Description of test equipment

6.1 SAR MEASUREMENT SETUP

These measurements are performed using the DASY4 automated dosimetric assessment system. It is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland. It consists of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Figure.2).

A cell controller system contains the power supply, robot controller, teach pendant (Joystick), and remote control, is used to drive the robot motors. The PC with Windows XP or Windows 7 is working with SAR Measurement system DASY4 & DASY5, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

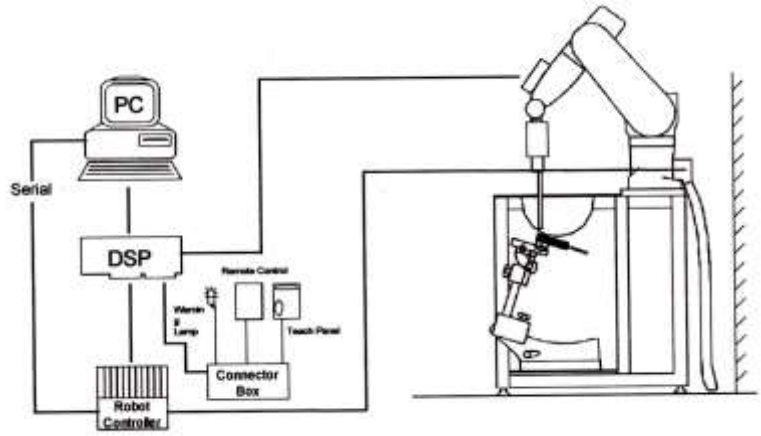


Figure 2. HCT SAR Lab. Test Measurement Set-up

The DAE consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail in.

7. SAR 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 more than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the DUT's head and body area and the horizontal grid resolution was depending on the FCC KDB 865664 D01v01r04 table 4-1 & IEEE 1528-2013.

2. Based on step, the area of the maximum absorption was determined by sophisticated interpolations routines implemented in DASY software. When an Area Scan has measured all reachable point. DASY system computes the field maximal found in the scanned are, within a range of the maximum. SAR at this fixed point was measured and used as a reference value.

3. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB 865664 D01v01r04 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 (reference from the DASY manual.)

   a. The data at the surface were extrapolated, since the center of the dipoles is no more than 2.7 mm away from the tip of the probe (it is different from the probe type) and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

   b. The maximum interpolated value was searched with a straight-forward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1 g or 10 g) were computed using the 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 integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

   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. If the value changed by more than 5 %, the SAR evaluation and drift measurements were repeated.

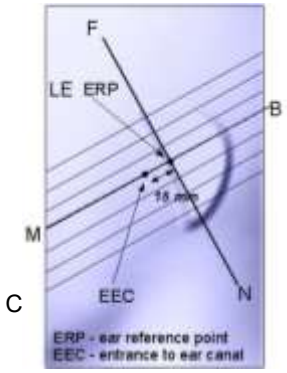
Area scan and zoom scan resolution setting follow KDB 865664 D01v01r04 quoted below.

<table>
<tr><td colspan="3"></td><td>≤ 3 GHz</td><td>> 3 GHz</td></tr>
<tr><td colspan="3">Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface</td><td>5±1 mm</td><td>$^1/_2 \cdot \delta \cdot \ln(2) \pm 0.5$ mm</td></tr>
<tr><td colspan="3">Maximum probe angle from probe axis to phantom surface
normal at the measurement location</td><td>30°±1°</td><td>20°±1°</td></tr>
<tr><td colspan="3" rowspan="2">Maximum area scan Spatial resolution: Δx_{Area}, Δy_{Area}</td><td>≤ 2 GHz: ≤15 mm
2-3 GHz: ≤12 mm</td><td>3-4 GHz: ≤12 mm
4-6 GHz: ≤10 mm</td></tr>
<tr><td colspan="2">When the x or y dimension of the test device, in the measurement plane orientation, is smaller than the above, the measurement resolution must be ≤ the corresponding x or y dimension of the test device with at least one measurement point on the test device.</td></tr>
<tr><td colspan="3">Maximum zoom scan Spatial resolution: Δx_{zoom}, Δy_{zoom}</td><td>≤ 2 GHz: ≤8mm
2-3 GHz: ≤5mm*</td><td>3-4 GHz: ≤5 mm*
4-6 GHz: ≤4 mm*</td></tr>
<tr><td rowspan="3">Maximum zoom scan Spatial resolution normal to phantom surface</td><td colspan="2">uniform grid: $\Delta z_{zoom}(n)$</td><td>≤ 5 mm</td><td>3-4 GHz: ≤4 mm
4-5 GHz: ≤3 mm
5-6 GHz: ≤2 mm</td></tr>
<tr><td rowspan="2">graded grid</td><td>$\Delta z_{zoom}(1)$: between 1 st two Points closest to phantom surface</td><td>≤ 4 mm</td><td>3-4 GHz: ≤3 mm
4-5 GHz: ≤2.5 mm
5-6 GHz: ≤2 mm</td></tr>
<tr><td>$\Delta z_{zoom}(n>1)$: between subsequent Points</td><td colspan="2">$\leq 1.5 \cdot \Delta z_{zoom}(n-1)$</td></tr>
<tr><td>Minimum zoom scan volume</td><td colspan="2">x, y, z</td><td>≥ 30 mm</td><td>3-4 GHz: ≥28 mm
4-5 GHz: ≥25 mm
5-6 GHz: ≥22 mm</td></tr>
<tr><td colspan="5">Note: δ is the penetration depth of a plane-wave at normal incidence to the tissue medium; see draft standard IEEE P1528-2011 for details.
* When zoom scan is required and the reported SAR from the area scan based 1-g SAR estimation procedures of KDB 447498 is ≤ 1.4 W/kg, ≤ 8 mm, ≤ 7 mm and ≤ 5 mm zoom scan resolution may be applied, respectively, for 2 GHz to 3 GHz, 3 GHz to 4 GHz and 4 GHz to 6 GHz.</td></tr>
</table>

8. Description of Test Position

8.1 EAR REFERENCE POINT

Figure 8-2 shows the front, back and side views of the SAM phantom. The center-of-mouth reference point is labeled “M”, the left ear reference point (ERP) is marked “LE”, and the right ERP is marked “RE.” Each ERP is on the B-M (back-mouth) line located 15 mm behind the entrance-to-ear-canal (EEC) point, as shown in Figure 6-1. The Reference Plane is defined as passing through the two ear reference point and point M. The line N-F (Neck-Front), also called the Reference Pivoting Line, is not perpendicular to the reference plane (See Figure 5-1), Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning.



8.2 HANDSET REFERENCE POINTS

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The device under test was placed in a normal operating position with the acoustic output located along the “vertical centerline” on the front of the device aligned to the “ear reference point”(see Figure 8-3). The acoustic output was than located at the same level as the center of the ear reference point. The device under test was positioned so that the “vertical centerline” was bisecting the front surface of the handset at its top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.

Figure 8-2
Front, back and side views of SAM Twin Phantom

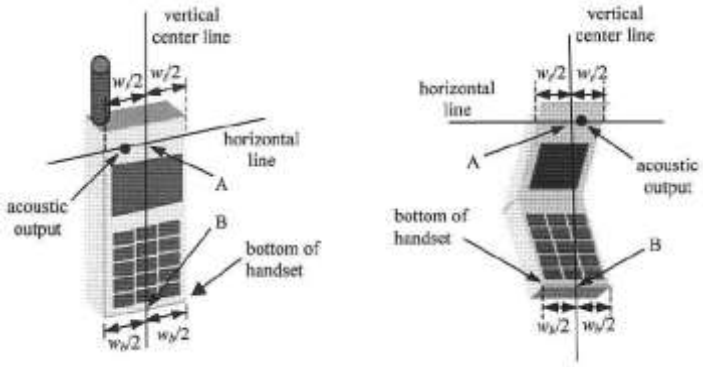


Figure 6-3. Handset vertical and horizontal reference lines

8.3 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameter; relative permittivity ε=3 and loss tangent σ =0.02.

8.4 Position for cheek

Figure 6.4. shows cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

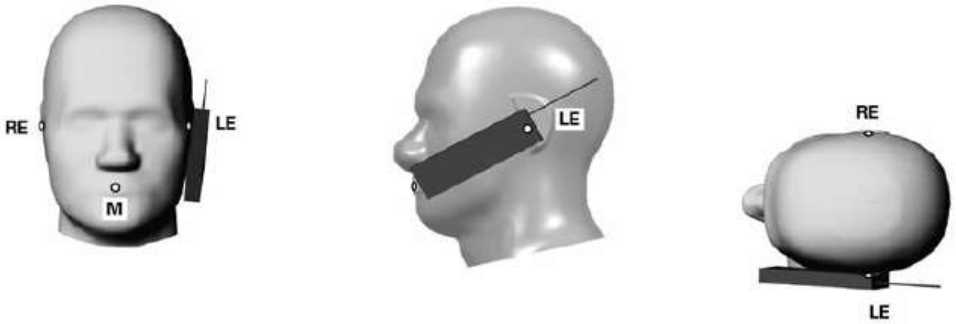


Figure 8.4 Cheek/ Touch position of the wireless device

8.5 Definition of the “tilted” position

Figure 6.5. shows tilted position. Place the device in the cheek position. Then while maintaining the orientation of the device, retract the device parallel to the reference plane far enough away from the phantom to enable a rotation of the device by 15°.

Figure 8.5. Tilt 15°position of the wireless device

8.6 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-dips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-6). Per FCC KDB Publication 648474 D04v01r03 Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in Body-worn accessories. The Body-worn accessory procedures in FCC KDB Publication 447498 D01v06 should be used to test for Body-worn accessory SAR compliance, without a headset connected to it.. When the reported SAR for a body- worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

Figure 8-6
Sample Body-Worn Diagram

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-dip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

8.7 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02r01 where SAR test considerations for handsets (L x W≥9cmx5 cm) are based on *a* composite test separation distance of 10 mm from the front back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the Body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some Body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 publication procedures. The Portable Hotspot feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

8.8 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions: i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1-g body and 10-g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D01v06 should be applied to determine SAR test requirements.

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear. the phablets procedures outlined in KDB Publication 648474 D04 v01r03 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worm accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna ≤25 mm from that surface or edge, in direct contact with the phantom, for 10-g SAR. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g SAR is required only for the surfaces and edges with hotspot mode scaled to the maximum output power (including tolerance) is 1-g SAR > 1.2 W/kg.

8.9 Additional Test Positions due to Proximity Conditions

This device uses a sensor to reduce output powers in extremity (hand-held) use conditions.

When the sensor detects a user is touching the device on or near to the antenna the device reduces the maximum allowed output power However, the proximity sensor is not active when the device is moved beyond the sensor triggering distance and the maximum output power is no longer limited. Therefore, an additional exposure condition is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a non-reduced output power level.

FCC KDB 616217 D04 v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device at these additional exposure conditions. The smallest separation distance determined by the sensor triggering and sensor coverage for each applicable edge, minus 1 mm. was used as the test separation distance for SAR testing. Sensor triggering distance summary data is included in below table.

Wireless technologies	Position	§6.2 Triggering Distance	§6.3 Coverage	§6.4 Tilt Angle	Worst case distance for Phablet SAR
Main #2 (LTE TDD B41)	Rear	15	N/A	N/A	14
	Left	13	N/A	N/A	12

8.10 Bluetooth tethering Configurations

Per May 2017 TCBC Workshop documents When Bluetooth tethering applies ,simultaneous transmission SAR needs consideration.

This model allows users to exchange data or media files with other Bluetooth enabled devices using Bluetooth, which means they can connect to other Bluetooth enabled devices via Bluetooth tethering.
Therefore, SAR test was performed for additional simultaneous transmissions.
Head and Bluetooth tethering SAR were evaluated for BT BR tethering applications.

9. RF Exposure Limits

HUMAN EXPOSURE	UNCONTROLLED ENVIRONMENT General Population (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT Occupational (W/kg) or (mW/g)
SPATIAL PEAK SAR * (Partial Body)	1.6	8.0
SPATIAL AVERAGE SAR ** (Whole Body)	0.08	0.4
SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist)	4.0	20.0

NOTES:

* The Spatial Peak value of the SAR averaged over any 1 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

** The Spatial Average value of the SAR averaged over the whole-body.

*** The Spatial Peak value of the SAR averaged over any 10 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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 mad 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.

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.

10. FCC SAR General Measurement Procedures

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

10.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, 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.

10.2 3G SAR Test Reduction Procedure

10.2.1 GSM, GPRS AND EDGE

The following procedures may be considered for each frequency band to determine SAR test reduction for devices operating in GSM/GPRS/EDGE modes to demonstrate RF exposure compliance. GSM voice mode transmits with 1 time-slot. GPRS and EDGE may transmit up to 4 time slots in the 8 time-slot frame according to the multi-slot class implemented in a device.

10.2.2 SAR Test Reduction

In FCC KDB 941225 D01v03r01, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is ≤ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is ≤ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.
SAR test reduction for GPRS and EDGE modes is determined by the source-based time-averaged output power specified for production units, including tune-up tolerance. The data mode with highest specified time-averaged output power should be tested for SAR compliance in the applicable exposure conditions. For modes with the same specified maximum output power and tolerance, the higher number time-slot configuration should be tested

10.2.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB 941225 D01v03r01-3G SAR Measurement Procedures.
The handset was placed into a simulated call using a base station simulator in a shielded chamber. Such test signals offer a consistent means for testing SAR and are recommended for evaluation SAR measurements were taken with a fully charged battery. In order to verify that the device was tested and maintained at full power, this was configured with the base station simulator. The SAR measurement Software calculates a reference point at the start and end of the test to Cheek for power drifts. If conducted Power deviations of more than 5 % occurred, the tests were repeated.

10.3 SAR Measurement Conditions for UMTS

10.3.1 Output Power Verification

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in sec. 5.2 of 3GPP TS 34.121, using the appropriate RMC with TPC (transmit power control) set to all “1s” or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

10.3.2 Body SAR measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all “1s”. the 3G SAR test reduction procedure is applied to other spreading codes and multiple DPDCHn configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using and applicable RMC configuration with the corresponding spreading code or DPDCHn, for the highest reported SAR configuration in 12.2 kbps RMC.

10.3.3 SAR Measurements with Rel. 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSDPA is measured using and FRC with H-SET 1 in Sub-test and a 12.2 kbps RMC without HSDPA. Handsets with both HSDPA and HSUPA are tested according to release 6 HSPA test procedures. 8.4.5 SAR Measurement with Rel.6 HSUPA The 3G SAR test Reduction Procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, Using H-Set 1 and QPSK for FRC and a 12.2kbps RMC configured in Test Loop Mode 1 and Power Control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

10.3.4 SAR Measurements with Rel. 6 HSUPA

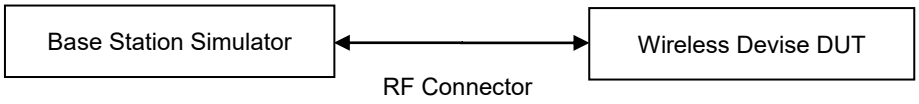
The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA.

10.3.5 DC-HSDPA

SAR is required for Rel.8 DC-HSDPA when SAR is required for Rel.5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in table C.8.1.12 of 3GPP TS34.121-1 to determine SAR test reduction. Primary and secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

DC-HSDPA Configurations

- 3GPP specification TS 34.121-1 Release 8. was used for used for DC-HSDPA guidance.
- H-set 12(QPSK)was conformed to be used during DC-HSDPA measurements.



10.4 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r05 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluation 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).

10.4.1 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.

10.4.2 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.

10.4.3 A-MPR

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

10.4.4 Required RB Size and RB offsets for SAR testing

According to FCC KDB 941225 D05v02r05

a. Per sec 4.2.1, 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 Sec 4.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Sec 4.2.1.
c. Per Sec. 4.2.3, 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 Sec. 4.2.4 and 4.3, SAR test for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sec. 4.2.1 through 4.2.3 is less than or equal to 1/2 dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is < 1.45 W/Kg.

10.4.5 LTE(TDD) Considerations

According to KDB 941225 D05v02r05, for Time-Division Duplex (TDD) systems, SAR must be tested using a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by the defined 3GPP LTE TDD configurations.
SAR was tested with the highest transmission duty factor (63.33 %) using Uplink-downlink configuration 0 and Special subframe configuration 6. LTE TDD Band 41 supports 3GPP TS 36.211 section 4.2 for Type 2 Frame and Table 4.2-2 for uplink-downlink configurations and Table 4.2-1 for Special sub frame configurations.

Table 4.2-1: Configuration of special subframe (lengths of DwPTS/GP/UpPTS)

Special subframe configuration	Normal cyclic prefix in downlink			Extended cyclic prefix in downlink		
	DwPTS	UpPTS		DwPTS	UpPTS	
		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink		Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
0	$6592 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$	$7680 \cdot T_s$	$2192 \cdot T_s$	$2560 \cdot T_s$
1	$19760 \cdot T_s$			$20480 \cdot T_s$		
2	$21952 \cdot T_s$			$23040 \cdot T_s$		
3	$24144 \cdot T_s$			$25600 \cdot T_s$		
4	$26336 \cdot T_s$			$7680 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$
5	$6592 \cdot T_s$	$4384 \cdot T_s$	$5120 \cdot T_s$	$20480 \cdot T_s$		
6	$19760 \cdot T_s$			$23040 \cdot T_s$		
7	$21952 \cdot T_s$			$12800 \cdot T_s$		
8	$24144 \cdot T_s$			-	-	-
9	$13168 \cdot T_s$			-	-	-

Calculated Duty Cycle – Extended cyclic prefix in uplink x (T_s) x no of S + no of U

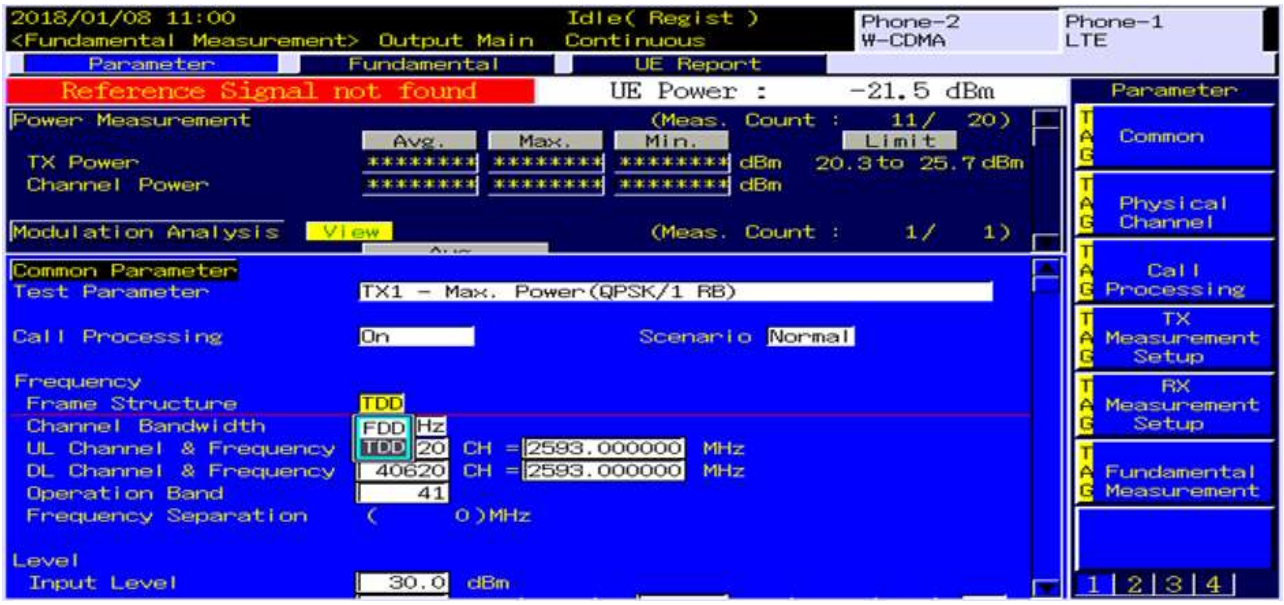
Table 4.2-2: Uplink-downlink configurations.

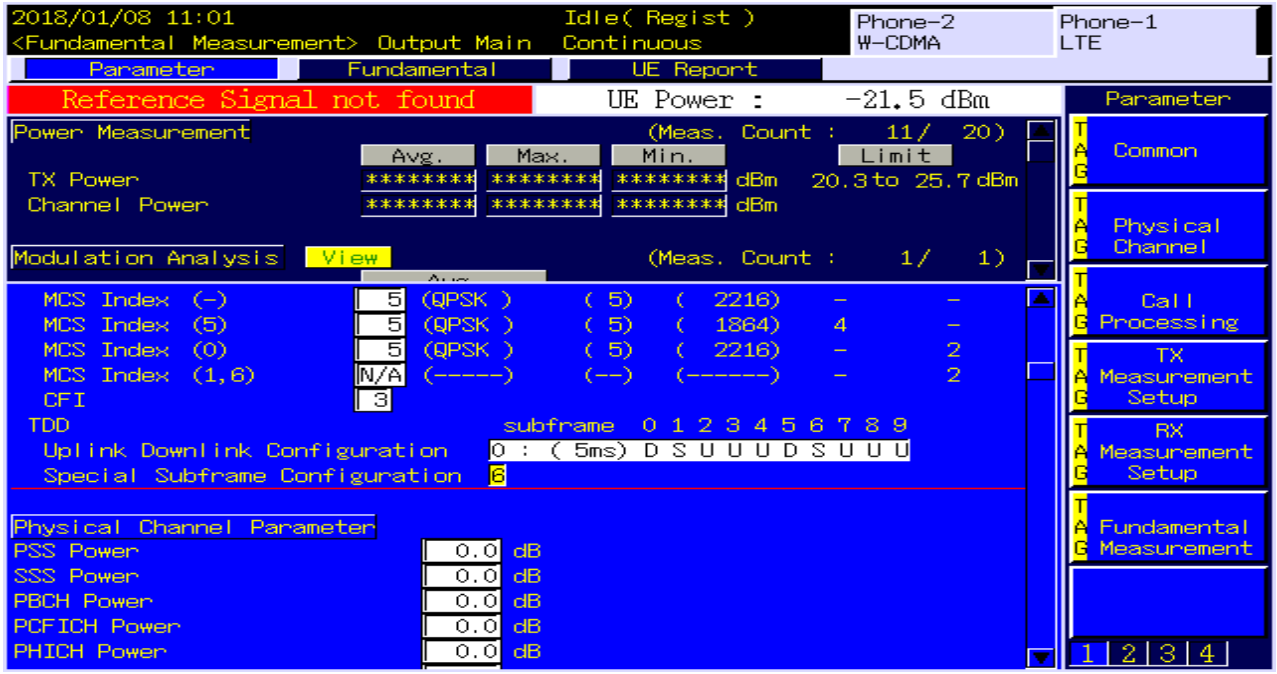
Uplink-downlink configuration	Downlink-to-Uplink Switch-point periodicity	Subframe number									
		0	1	2	3	4	5	6	7	8	9
0	5 ms	D	S	U	U	U	D	S	U	U	U
1	5 ms	D	S	U	U	D	D	S	U	U	D
2	5 ms	D	S	U	D	D	D	S	U	D	D
3	10 ms	D	S	U	U	U	D	D	D	D	D
4	10 ms	D	S	U	U	D	D	D	D	D	D
5	10 ms	D	S	U	D	D	D	D	D	D	D
6	5 ms	D	S	U	U	U	D	S	U	U	D

Example for calculated Duty Cycle for Uplink-Downlink Configuration 0:
Calculated Duty Cycle = (5120 x (1/(15000 x 2048)) x 2 + 0.006)/0.01 = 63.33 %
Where
T_s = 1/(15000 x 2048) seconds

10.4.7 The Call Box Setup for LTE(TDD)

When you Want to Test for LTE TDD, Please Change Frame Structure TDD and TDD Uplink Downlink Configuration 0 and Special Subframe Configuration 6.





10.5 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

10.5.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters.
A periodic duty factor is required for current generation SAR system to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92-96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

10.5.2 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating nest to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g SAR and ≤ 1.0 W/kg for 10g SAR, no additional testing for the remaining test position is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg for 1g SAR and ≤ 2.0 W/kg for 10g SAR or all test positions are measured.

10.5.3 2.4 ㎓ SAR test Requirements

SAR is measured for 2.4 ㎓ 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:
1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS is that exposure configuration.
2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 ㎓ 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 ㎓ band, the Initial Test Configuration Procedures should be followed.

10.5.4 OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 GHz, when the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate and lowest order 802.11 g/n mode.

10.5.5 Initial Test Configuration Procedure

For OFDM, in both 2.4 GHz, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, and lowest data rate. If the average RF output powers of the highest identical transmission modes are within 0.25 dB of each other, mid channel of the transmission mode with highest average RF output power is the initial test channel. Otherwise, the channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements.

10.5.6 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position on procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg for 1g SAR and ≤ 3.0 W/kg for 10g SAR, no additional SAR tests for the subsequent test configurations are required.

11. Output Power Specifications

This device operates using the following maximum output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB publication 447498 D01v06.

Licensed bands

Test Description	Test Procedure Used
Conducted Output Power	- KDB 971168 D01 v03r01 - Section 5.2.4 - ANSI C63.26-2015 - Section 5.2.1 & 5.2.4.2

Test Overview

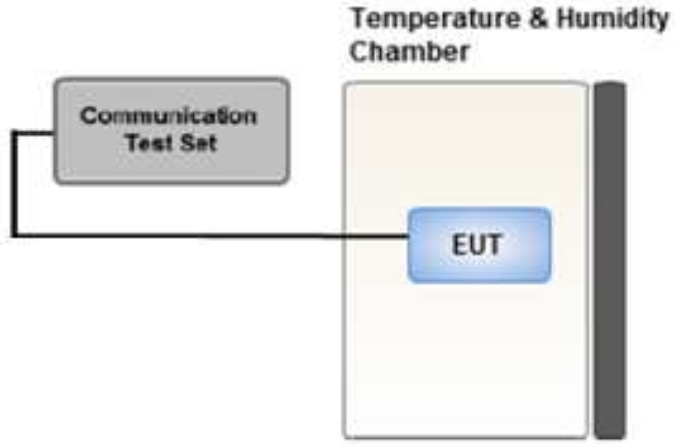
According to ANSI C63.26-2015 Section 5.2.1 when measuring the maximum RF output power from such devices, control over the EUT must be provided either through special test software (provided by manufacturer specifically for compliance testing, but not accessible by an end user) or through use of a base station emulator, communications test set, call box, or similar instrumentation that is capable of establishing a communications link with the EUT to enable control over variable parameters (e.g., output power, OBW, etc.).

In some cases, these instruments also include basic digital spectrum analyzer and/or power meter capabilities that can be utilized to measure the RF output power if the specified detectors and requirements can be realized and the measurement functions have been calibrated.

Test Procedure

1. The RF port of the EUT was connected to the Communication Tester via an RF cable.
2. Conducted average power was measured using a calibrated Radio Communication Tester.

Test setup



11.1 GSM

11.1.1 GSM Maximum Conducted Output Power

Mode / Band		Voice	GPRS(GMSK) Data – CS1(dBm)				EDGE Data (dBm)			
		GSM	GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot	EDGE 1 TX Slot	EDGE 2 TX Slot	EDGE 3 TX Slot	EDGE 4 TX Slot
Maximum		34.0	34.0	33.0	31.5	30.5	29.0	27.5	25.5	24.5
Nominal		33.0	33.0	32.0	30.5	29.5	28.0	26.5	24.5	23.5
GSM 850	128	32.60	32.61	31.92	30.23	29.25	26.93	25.84	23.88	22.72
	190	32.56	32.53	31.82	30.05	29.07	27.08	26.04	24.06	22.86
	251	32.49	32.48	31.75	29.91	28.88	26.87	25.76	23.78	22.68

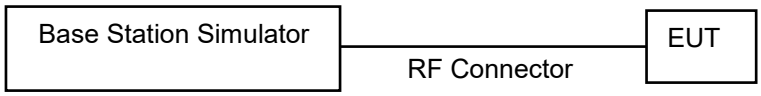
GSM Conducted output powers (Burst-Average)

Mode / Band		Voice	GPRS(GMSK) Data – CS1(dBm)				EDGE Data (dBm)			
		GSM	GPRS 1 TX Slot	GPRS 2 TX Slot	GPRS 3 TX Slot	GPRS 4 TX Slot	EDGE 1 TX Slot	EDGE 2 TX Slot	EDGE 3 TX Slot	EDGE 4 TX Slot
Maximum		24.97	24.97	26.98	27.24	27.49	19.97	21.48	21.24	21.49
Nominal		23.97	23.97	25.98	26.24	26.49	18.97	20.48	20.24	20.49
GSM 850	128	23.57	23.58	25.90	25.97	26.24	17.90	19.82	19.62	19.71
	190	23.53	23.50	25.80	25.79	26.06	18.05	20.02	19.80	19.85
	251	23.46	23.45	25.73	25.65	25.87	17.84	19.74	19.52	19.67

GSM Conducted output powers (Frame-Average)

Note:
Time slot average factor is as follows:
1 Tx slot = 9.03 dB, Frame-Average output power = Burst-Average output power – 9.03 dB
2 Tx slot = 6.02 dB, Frame-Average output power = Burst-Average output power – 6.02 dB
3 Tx slot = 4.26 dB, Frame-Average output power = Burst-Average output power – 4.26 dB
4 Tx slot = 3.01 dB, Frame-Average output power = Burst-Average output power – 3.01 dB

GSM Class : B
GSM voice: Head SAR , Body worn SAR
GPRS/EDGE Multi-slots 33 : Hotspot SAR with GPRS/EDGE
Multi-slot Class 33 with CS 1 (GMSK)



11.2 UMTS

HSPA+
This DUT is only capable of QPSK HSPA+ in uplink. Therefore, the RF conducted power is not measured according to 941225 D01v03r01 3G SAR.

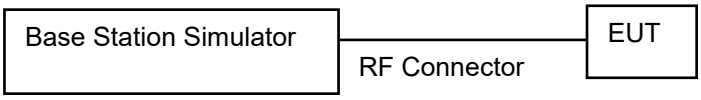
11.2.1 UMTS Maximum Conducted Output Power

UMTS Band 5 Maximum Conducted Output Power

3GPP Release Version	Mode	3GPP 34.121	UMTS Band 5 [dBm]			3GPP MPR
		Subtest	UL 4132 DL 4357	UL 4183 DL 4408	UL 4233 DL 4458	
99	UMTS	12.2 kbps RMC	24.64	24.60	24.58	-
99		12.2 kbps AMR	24.49	24.59	24.57	-
5	HSDPA	Subtest 1	23.54	23.47	23.53	0
5		Subtest 2	23.36	23.46	23.45	0
5		Subtest 3	22.93	22.90	22.94	0.5
5		Subtest 4	22.82	22.98	22.93	0.5
6	HSUPA	Subtest 1	21.37	21.40	21.38	0
6		Subtest 2	21.33	21.41	21.43	2
6		Subtest 3	22.34	22.40	22.41	1
6		Subtest 4	20.89	20.92	20.99	2
6		Subtest 5	21.85	21.34	21.37	0
8	DC-HSDPA	Subtest 1	23.05	23.09	23.20	0
8		Subtest 2	23.00	23.10	23.17	0
8		Subtest 3	22.46	22.58	22.68	0.5
8		Subtest 4	22.44	22.57	22.65	0.5

UMTS Average Conducted output powers

DC-HSDPA Configurations
- 3GPP specification TS 34.121-1 Release 8. was used for used for DC-HSDPA guidance.
- H-set 12(QPSK)was conformed to be used during DC-HSDPA measurements.



11.3 LTE Maximum Output Power

LTE B5 at 20 ㎒ Bandwidth does not support three non-overlapping channels. Per KDB 941225 D05v02r05, when a device supports overlapping channel assignment in a channel bandwidth configuration, the mid channel of the group of overlapping channels should be selected for testing.

11.3.1 LTE Maximum Conducted Power

[LTE Band 5 Conducted Power]

LTE Band 5 _ 1.4 ㎒ Bandwidth

Bandwidth	Modulation	RB Size	RB Offset	Max. Average Power [dBm]			MPR Allowed Per 3GPP [dB]	MPR [dB]
				20407 Ch. 824.7 ㎒	20525 Ch. 836.5 ㎒	20643 Ch. 848.3 ㎒		
1.4 ㎒	QPSK	1	0	23.68	23.80	23.90	0	0
		1	3	23.75	23.92	24.00	0	0
		1	5	23.44	23.77	23.88	0	0
		3	0	23.71	23.84	23.98	0	0
		3	1	23.69	23.90	23.94	0	0
		3	3	23.69	23.85	23.94	0	0
		6	0	22.55	22.92	22.96	0-1	1
	16QAM	1	0	23.17	22.83	22.81	0-1	1
		1	3	23.37	22.99	23.00	0-1	1
		1	5	23.03	22.83	22.85	0-1	1
		3	0	22.91	22.73	22.99	0-1	1
		3	1	22.85	22.80	23.00	0-1	1
		3	3	22.84	22.77	23.04	0-1	1
		6	0	22.00	21.91	21.94	0-2	2
	64QAM	1	0	22.21	21.84	22.10	0-2	2
		1	3	22.28	21.95	22.30	0-2	2
		1	5	22.20	21.89	22.15	0-2	2
		3	0	22.18	21.89	22.11	0-2	2
		3	1	22.15	22.03	22.12	0-2	2
		3	3	22.16	21.94	22.16	0-2	2
		6	0	21.03	21.02	21.02	0-3	3

LTE Band 5 _ 3 ㎒ Bandwidth

Bandwidth	Modulation	RB Size	RB Offset	Max. Average Power [dBm]			MPR Allowed Per 3GPP [dB]	MPR [dB]
				20415 Ch. 825.5 ㎒	20525 Ch. 836.5 ㎒	20635 Ch. 847.5 ㎒		
3 ㎒	QPSK	1	0	24.02	23.90	23.91	0	0
		1	7	24.13	24.16	24.03	0	0
		1	14	23.93	23.84	23.91	0	0
		8	0	22.97	22.96	22.91	0-1	1
		8	3	23.02	22.91	22.94	0-1	1
		8	7	22.94	22.88	22.95	0-1	1
		15	0	22.97	22.93	23.01	0-1	1
	16QAM	1	0	23.27	23.06	23.47	0-1	1
		1	7	23.46	23.31	23.64	0-1	1
		1	14	23.41	23.02	23.48	0-1	1
		8	0	22.11	21.99	22.01	0-2	2
		8	3	22.10	21.93	22.02	0-2	2
		8	7	22.09	21.90	22.03	0-2	2
		15	0	22.05	21.87	22.04	0-2	2
	64QAM	1	0	22.32	21.94	21.72	0-2	2
		1	7	22.42	22.15	21.92	0-2	2
		1	14	22.29	21.89	21.81	0-2	2
		8	0	21.12	20.95	21.17	0-3	3
		8	3	21.12	20.98	21.16	0-3	3
		8	7	21.09	20.91	21.18	0-3	3
		15	0	21.07	20.84	21.11	0-3	3

LTE Band 5 _ 5 ㎒ Bandwidth

Bandwidth	Modulation	RB Size	RB Offset	Max. Average Power [dBm]			MPR Allowed Per 3GPP [dB]	MPR [dB]
				20425 Ch. 826.5 ㎒	20525 Ch. 836.5 ㎒	20625 Ch. 846.5 ㎒		
5 ㎒	QPSK	1	0	23.94	23.83	23.75	0	0
		1	12	24.19	24.07	24.00	0	0
		1	24	23.89	23.77	23.81	0	0
		12	0	22.96	22.88	22.93	0-1	1
		12	6	23.00	22.92	22.94	0-1	1
		12	11	23.03	22.90	23.00	0-1	1
		25	0	22.99	22.92	22.97	0-1	1
	16QAM	1	0	23.26	22.97	23.24	0-1	1
		1	12	23.54	23.16	23.53	0-1	1
		1	24	23.24	22.87	23.36	0-1	1
		12	0	21.95	21.94	21.94	0-2	2
		12	6	22.02	22.02	22.00	0-2	2
		12	11	22.03	21.95	22.06	0-2	2
		25	0	21.97	21.97	21.96	0-2	2
	64QAM	1	0	22.27	22.06	21.89	0-2	2
		1	12	22.43	22.27	22.19	0-2	2
		1	24	22.17	21.94	22.03	0-2	2
		12	0	21.05	21.08	21.02	0-3	3
		12	6	21.11	21.11	21.08	0-3	3
		12	11	21.11	21.08	21.12	0-3	3
		25	0	21.03	20.90	21.05	0-3	3

LTE Band 5 _ 10 ㎒ Bandwidth

Bandwidth	Modulation	RB Size	RB Offset	Max. Average Power [dBm] 20525 Ch. 836.5 ㎒	MPR Allowed Per 3GPP [dB]	MPR [dB]
10 ㎒	QPSK	1	0	23.83	0	0
		1	24	23.90	0	0
		1	49	23.74	0	0
		25	0	22.94	0-1	1
		25	12	22.96	0-1	1
		25	24	22.93	0-1	1
		50	0	23.07	0-1	1
	16QAM	1	0	22.87	0-1	1
		1	24	23.01	0-1	1
		1	49	22.90	0-1	1
		25	0	21.88	0-2	2
		25	12	21.93	0-2	2
		25	24	21.88	0-2	2
		50	0	21.92	0-2	2
	64QAM	1	0	21.90	0-2	2
		1	24	22.03	0-2	2
		1	49	21.82	0-2	2
		25	0	20.95	0-3	3
		25	12	20.97	0-3	3
		25	24	20.95	0-3	3
		50	0	20.98	0-3	3

[LTE TDD Band 41 Conducted Power]

LTE Band 41 _ 5 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
5 ㎒	QPSK	1	0	21.08	21.54	21.11	21.16	21.78	0	0
		1	12	21.29	21.65	21.26	21.32	21.95	0	0
		1	24	21.12	21.46	21.07	21.05	21.84	0	0
		12	0	20.22	20.60	20.17	20.18	20.99	0-1	1
		12	6	20.28	20.63	20.22	20.29	21.04	0-1	1
		12	11	20.30	20.62	20.20	20.24	21.03	0-1	1
		25	0	20.20	20.62	20.17	20.24	20.99	0-1	1
	16QAM	1	0	20.12	20.62	20.22	20.17	20.92	0-1	1
		1	12	20.40	20.76	20.37	20.34	21.06	0-1	1
		1	24	20.27	20.54	20.18	20.16	20.94	0-1	1
		12	0	19.13	19.60	19.12	19.13	19.96	0-2	2
		12	6	19.25	19.63	19.20	19.16	20.02	0-2	2
		12	11	19.24	19.60	19.15	19.15	19.96	0-2	2
		25	0	19.21	19.60	19.17	19.15	20.00	0-2	2
	64QAM	1	0	18.78	19.31	18.84	18.75	19.56	0-2	2
		1	12	19.03	19.44	19.00	18.98	19.76	0-2	2
		1	24	18.90	19.22	18.75	18.79	19.57	0-2	2
		12	0	18.18	18.69	18.20	18.21	19.01	0-3	3
		12	6	18.29	18.76	18.31	18.33	19.07	0-3	3
		12	11	18.27	18.70	18.23	18.24	19.03	0-3	3
		25	0	18.23	18.71	18.21	18.28	19.02	0-3	3

LTE Band 41 _ 10 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
10 ㎒	QPSK	1	0	21.13	21.61	21.22	21.08	21.91	0	0
		1	24	21.32	21.68	21.22	21.24	22.02	0	0
		1	49	21.37	21.46	21.12	21.38	21.95	0	0
		25	0	20.21	20.59	20.19	20.09	20.96	0-1	1
		25	12	20.28	20.61	20.24	20.33	20.96	0-1	1
		25	24	20.37	20.59	20.15	20.39	20.99	0-1	1
		50	0	20.24	20.56	20.20	20.16	20.95	0-1	1
	16QAM	1	0	20.22	20.64	20.32	20.41	20.96	0-1	1
		1	24	20.44	20.76	20.36	20.49	21.08	0-1	1
		1	49	20.44	20.58	20.17	20.44	21.00	0-1	1
		25	0	19.14	19.59	19.20	19.34	19.98	0-2	2
		25	12	19.25	19.68	19.24	19.34	19.97	0-2	2
		25	24	19.39	19.61	19.20	19.44	19.94	0-2	2
		50	0	19.25	19.67	19.16	19.41	20.00	0-2	2
	64QAM	1	0	18.88	19.39	18.91	18.73	19.61	0-2	2
		1	24	19.02	19.42	19.00	19.07	19.70	0-2	2
		1	49	19.11	19.18	18.85	18.97	19.68	0-2	2
		25	0	18.20	18.68	18.27	18.13	19.03	0-3	3
		25	12	18.36	18.72	18.27	18.20	18.99	0-3	3
		25	24	18.46	18.69	18.19	18.24	19.00	0-3	3
		50	0	18.29	18.66	18.20	18.15	18.97	0-3	3

LTE Band 41 _ 15 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
15 ㎒	QPSK	1	0	21.05	21.53	21.09	21.15	21.75	0	0
		1	36	21.40	21.55	21.21	21.32	21.95	0	0
		1	74	21.34	21.26	20.95	21.10	21.83	0	0
		36	0	20.22	20.59	20.17	20.12	20.92	0-1	1
		36	18	20.40	20.57	20.19	20.17	20.96	0-1	1
		36	39	20.45	20.49	20.13	20.20	20.97	0-1	1
		75	0	20.32	20.54	20.17	20.09	20.88	0-1	1
	16QAM	1	0	20.15	20.66	20.20	20.07	20.82	0-1	1
		1	36	20.48	20.72	20.35	20.26	21.03	0-1	1
		1	74	20.49	20.37	20.11	20.15	20.87	0-1	1
		36	0	19.18	19.54	19.14	19.06	19.90	0-2	2
		36	18	19.35	19.57	19.15	19.11	19.94	0-2	2
		36	39	19.45	19.47	19.08	19.15	19.90	0-2	2
		75	0	19.36	19.55	19.15	19.08	19.89	0-2	2
	64QAM	1	0	18.85	19.26	18.76	18.64	19.46	0-2	2
		1	36	19.08	19.33	18.89	18.88	19.68	0-2	2
		1	74	19.12	18.96	18.70	18.76	19.50	0-2	2
		36	0	18.20	18.63	18.14	18.10	18.94	0-3	3
		36	18	18.35	18.62	18.21	18.15	18.96	0-3	3
		36	39	18.48	18.50	18.17	18.24	18.86	0-3	3
		75	0	18.33	18.63	18.17	18.12	18.84	0-3	3

LTE Band 41 _ 20 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
20 ㎒	QPSK	1	0	20.87	21.36	20.88	20.73	21.57	0	0
		1	49	21.51	21.56	21.24	21.12	21.97	0	0
		1	99	21.27	21.01	20.74	21.08	21.56	0	0
		50	0	20.25	20.56	20.19	20.19	20.79	0-1	1
		50	25	20.39	20.50	20.16	20.26	20.81	0-1	1
		50	49	20.62	20.48	20.10	20.34	20.82	0-1	1
		100	0	20.42	20.58	20.18	20.30	20.87	0-1	1
	16QAM	1	0	19.94	20.47	20.00	20.07	20.63	0-1	1
		1	49	20.58	20.68	20.35	20.48	21.05	0-1	1
		1	99	20.37	20.13	19.91	20.15	20.68	0-1	1
		50	0	19.24	19.57	19.24	19.23	19.87	0-2	2
		50	25	19.42	19.50	19.16	19.26	19.89	0-2	2
		50	49	19.65	19.51	19.12	19.33	19.81	0-2	2
		100	0	19.43	19.55	19.16	19.33	19.87	0-2	2
	64QAM	1	0	18.52	19.10	18.60	18.48	19.28	0-2	2
		1	49	19.20	19.29	18.93	19.07	19.69	0-2	2
		1	99	18.99	18.75	18.50	18.74	19.31	0-2	2
		50	0	18.25	18.59	18.18	17.99	18.86	0-3	3
		50	25	18.41	18.53	18.17	18.04	18.88	0-3	3
		50	49	18.63	18.49	18.14	18.12	18.81	0-3	3
		100	0	18.44	18.56	18.15	18.09	18.87	0-3	3

Note; LTE Band 41 has 5 required test channels per FCC KDB 447498 D01v06.

11.3.2 LTE Reduced Conducted Power (Hotspot activated, Earjack)

[LTE TDD Band 41 Conducted Power_ Hotspot activated, Earjack]

LTE Band 41 _ 5 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
5 ㎒	QPSK	1	0	16.67	17.03	16.64	16.46	17.04	0	0
		1	12	16.96	17.37	16.84	16.63	17.24	0	0
		1	24	16.81	16.93	16.63	16.54	17.12	0	0
		12	0	16.71	17.07	16.71	16.49	17.10	0-1	0
		12	6	16.85	17.10	16.80	16.59	17.22	0-1	0
		12	11	16.89	17.15	16.74	16.60	17.19	0-1	0
		25	0	16.85	17.10	16.79	16.54	17.20	0-1	0
	16QAM	1	0	16.75	17.09	16.72	16.56	17.07	0-1	0
		1	12	16.99	17.22	16.87	16.75	17.30	0-1	0
		1	24	16.83	17.00	16.71	16.59	17.12	0-1	0
		12	0	16.65	16.97	16.61	16.39	17.05	0-2	0
		12	6	16.76	17.08	16.72	16.50	17.10	0-2	0
		12	11	16.74	17.02	16.65	16.52	17.09	0-2	0
		25	0	16.69	17.09	16.66	16.48	17.07	0-2	0
	64QAM	1	0	16.24	16.70	16.34	16.07	16.74	0-2	0
		1	12	16.54	16.74	16.48	16.31	16.90	0-2	0
		1	24	16.38	16.63	16.31	16.10	16.63	0-2	0
		12	0	16.66	17.03	16.63	16.47	17.10	0-3	0
		12	6	16.83	17.13	16.74	16.51	17.16	0-3	0
		12	11	16.82	17.07	16.69	16.56	17.14	0-3	0
		25	0	16.76	17.06	16.68	16.51	17.10	0-3	0

LTE Band 41 _ 10 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
10 ㎒	QPSK	1	0	16.67	17.06	16.68	16.58	17.14	0	0
		1	24	16.97	17.10	16.76	16.70	17.26	0	0
		1	49	16.94	16.92	16.63	16.62	17.21	0	0
		25	0	16.72	17.04	16.76	16.59	17.20	0-1	0
		25	12	16.85	17.10	16.75	16.63	17.18	0-1	0
		25	24	16.92	17.12	16.81	16.65	17.17	0-1	0
		50	0	16.79	17.09	16.73	16.52	17.17	0-1	0
	16QAM	1	0	16.77	17.16	16.80	16.59	17.26	0-1	0
		1	24	17.00	17.16	16.84	16.72	17.29	0-1	0
		1	49	16.97	16.93	16.67	16.60	17.21	0-1	0
		25	0	16.62	16.94	16.66	16.52	17.15	0-2	0
		25	12	16.76	16.99	16.64	16.60	17.18	0-2	0
		25	24	16.83	16.90	16.62	16.52	17.11	0-2	0
		50	0	16.75	16.99	16.62	16.49	17.11	0-2	0
	64QAM	1	0	16.26	16.68	16.31	16.12	16.83	0-2	0
		1	24	16.53	16.70	16.40	16.26	16.90	0-2	0
		1	49	16.49	16.52	16.26	16.23	16.74	0-2	0
		25	0	16.68	16.97	16.61	16.50	17.15	0-3	0
		25	12	16.81	16.98	16.65	16.56	17.18	0-3	0
		25	24	16.86	16.97	16.64	16.55	17.13	0-3	0
		50	0	16.69	16.94	16.62	16.44	17.14	0-3	0

LTE Band 41 _ 15 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
15 ㎒	QPSK	1	0	16.52	16.93	16.57	16.53	17.01	0	0
		1	36	16.93	17.00	16.74	16.69	17.22	0	0
		1	74	16.95	16.72	16.47	16.59	17.11	0	0
		36	0	16.73	16.96	16.70	16.58	17.15	0-1	0
		36	18	16.84	16.99	16.70	16.67	17.18	0-1	0
		36	39	16.98	16.94	16.65	16.66	17.15	0-1	0
		75	0	16.84	16.98	16.59	16.53	17.09	0-1	0
	16QAM	1	0	16.64	17.05	16.66	16.52	17.08	0-1	0
		1	36	16.98	17.10	16.76	16.72	17.28	0-1	0
		1	74	16.93	16.77	16.50	16.59	17.30	0-1	0
		36	0	16.62	16.91	16.57	16.44	17.02	0-2	0
		36	18	16.72	16.93	16.60	16.55	17.15	0-2	0
		36	39	16.89	16.81	16.55	16.51	17.05	0-2	0
		75	0	16.77	16.90	16.52	16.50	17.06	0-2	0
	64QAM	1	0	16.17	16.61	16.20	16.06	16.62	0-2	0
		1	36	16.54	16.66	16.34	16.30	16.86	0-2	0
		1	74	16.54	16.32	16.12	16.15	16.66	0-2	0
		36	0	16.64	16.92	16.60	16.46	16.98	0-3	0
		36	18	16.69	16.91	16.57	16.52	17.12	0-3	0
		36	39	16.88	16.83	16.55	16.47	17.07	0-3	0
		75	0	16.77	16.88	16.51	16.45	17.00	0-3	0

LTE Band 41 _ 20 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
20 ㎒	QPSK	1	0	16.39	16.78	16.34	16.21	16.67	0	0
		1	49	16.94	16.99	16.65	16.59	17.12	0	0
		1	99	16.79	16.37	16.23	16.25	16.81	0	0
		50	0	16.66	16.91	16.58	16.35	16.97	0-1	0
		50	25	16.86	16.90	16.57	16.45	17.02	0-1	0
		50	49	17.06	16.88	16.55	16.52	17.04	0-1	0
		100	0	16.88	16.98	16.61	16.47	17.03	0-1	0
	16QAM	1	0	16.41	16.82	16.39	16.23	16.74	0-1	0
		1	49	17.00	17.06	16.73	16.59	17.19	0-1	0
		1	99	16.79	16.50	16.31	16.26	16.88	0-1	0
		50	0	16.70	16.86	16.55	16.35	16.97	0-2	0
		50	25	16.85	16.83	16.52	16.39	17.00	0-2	0
		50	49	16.99	16.85	16.47	16.45	17.02	0-2	0
		100	0	16.83	16.88	16.52	16.42	17.00	0-2	0
	64QAM	1	0	15.96	16.40	15.97	15.79	16.31	0-2	0
		1	49	16.55	16.63	16.31	16.15	16.79	0-2	0
		1	99	16.42	16.04	15.86	15.83	16.42	0-2	0
		50	0	16.63	16.84	16.54	16.32	16.90	0-3	0
		50	25	16.80	16.78	16.53	16.29	16.96	0-3	0
		50	49	16.99	16.81	16.45	16.38	16.98	0-3	0
		100	0	16.80	16.83	16.52	16.38	16.98	0-3	0

Note; LTE Band 41 has 5 required test channels per FCC KDB 447498 D01v06.

11.3.3 LTE Reduced Conducted Power(Grip Sensor on)

[LTE TDD Band 41 Conducted Power _ Grip Sensor on]

LTE Band 41 _ 5 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
5 ㎒	QPSK	1	0	19.11	19.27	19.13	19.05	19.96	0	0
		1	12	19.35	19.45	19.29	19.18	20.09	0	0
		1	24	19.22	19.15	19.10	18.98	19.96	0	0
		12	0	19.14	19.34	19.09	19.08	20.06	0-1	0
		12	6	19.21	19.41	18.93	19.14	20.11	0-1	0
		12	11	19.25	19.41	19.21	19.17	20.11	0-1	0
		25	0	19.30	19.40	18.94	19.16	20.05	0-1	0
	16QAM	1	0	19.22	19.37	19.20	19.08	20.03	0-1	0
		1	12	19.44	19.58	19.38	19.39	20.17	0-1	0
		1	24	19.34	19.31	18.91	19.36	20.02	0-1	0
		12	0	19.11	19.26	18.85	19.29	20.06	0-2	0
		12	6	19.25	19.33	19.22	19.33	20.02	0-2	0
		12	11	19.29	19.29	19.18	19.34	20.00	0-2	0
		25	0	19.24	19.30	19.16	19.36	20.04	0-2	0
	64QAM	1	0	18.78	19.00	18.81	18.90	19.59	0-2	0
		1	12	19.05	19.18	18.97	19.09	19.78	0-2	0
		1	24	18.89	18.91	18.74	18.96	19.62	0-2	0
		12	0	19.20	19.34	19.17	19.37	20.09	0-3	0
		12	6	19.36	19.41	19.29	19.40	20.11	0-3	0
		12	11	19.33	19.39	19.24	19.39	20.08	0-3	0
		25	0	19.26	19.35	19.25	19.37	20.07	0-3	0

LTE Band 41 _ 10 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
10 ㎒	QPSK	1	0	18.99	19.51	19.03	19.03	20.01	0	0
		1	24	19.26	19.52	19.13	19.24	20.13	0	0
		1	49	19.23	19.35	18.98	19.15	20.02	0	0
		25	0	19.06	19.48	19.02	19.13	20.11	0-1	0
		25	12	19.15	19.49	19.06	19.24	20.13	0-1	0
		25	24	19.24	19.45	19.07	19.20	20.08	0-1	0
		50	0	19.12	19.41	19.04	19.11	20.03	0-1	0
	16QAM	1	0	18.98	19.57	19.15	19.33	20.07	0-1	0
		1	24	19.32	19.53	19.20	19.52	20.22	0-1	0
		1	49	19.50	19.35	19.07	19.44	20.13	0-1	0
		25	0	19.08	19.41	19.05	19.37	20.05	0-2	0
		25	12	19.35	19.44	19.06	19.42	20.08	0-2	0
		25	24	19.46	19.41	18.99	19.43	20.07	0-2	0
		50	0	19.37	19.43	19.02	19.39	20.05	0-2	0
	64QAM	1	0	18.93	19.15	18.73	18.94	19.67	0-2	0
		1	24	19.17	19.13	18.77	19.11	19.81	0-2	0
		1	49	19.00	18.97	18.65	19.07	19.71	0-2	0
		25	0	19.32	19.44	19.11	19.40	20.10	0-3	0
		25	12	19.44	19.44	19.10	19.42	20.08	0-3	0
		25	24	19.55	19.44	19.04	19.46	20.06	0-3	0
		50	0	19.34	19.41	19.01	19.36	20.02	0-3	0

LTE Band 41 _ 15 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
15 ㎒	QPSK	1	0	19.01	19.49	19.05	19.13	19.84	0	0
		1	36	19.40	19.57	19.15	19.25	20.11	0	0
		1	74	19.39	19.22	18.97	19.08	19.93	0	0
		36	0	19.18	19.51	19.13	19.15	20.06	0-1	0
		36	18	19.32	19.53	19.17	19.18	20.08	0-1	0
		36	39	19.44	19.42	19.11	19.17	20.07	0-1	0
		75	0	19.33	19.41	19.07	19.13	20.03	0-1	0
	16QAM	1	0	19.06	19.57	19.10	19.00	19.94	0-1	0
		1	36	19.45	19.59	19.20	19.45	20.12	0-1	0
		1	74	19.42	19.31	18.98	19.43	20.05	0-1	0
		36	0	19.14	19.45	19.09	19.29	19.96	0-2	0
		36	18	19.25	19.46	19.07	19.38	20.01	0-2	0
		36	39	19.33	19.34	18.99	19.39	19.98	0-2	0
		75	0	19.27	19.41	19.06	19.38	20.03	0-2	0
	64QAM	1	0	18.63	19.14	18.69	18.89	19.54	0-2	0
		1	36	18.99	19.18	18.81	19.11	19.69	0-2	0
		1	74	19.03	18.91	18.58	18.98	19.65	0-2	0
		36	0	19.16	19.46	19.11	19.34	19.97	0-3	0
		36	18	19.22	19.46	19.04	19.38	20.02	0-3	0
		36	39	19.38	19.37	19.01	19.42	20.01	0-3	0
		75	0	19.27	19.39	19.03	19.32	20.00	0-3	0

LTE Band 41 _ 20 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
20 ㎒	QPSK	1	0	18.87	19.30	18.86	19.11	19.64	0	0
		1	49	19.52	19.57	19.20	19.17	20.10	0	0
		1	99	19.29	18.99	18.75	19.15	19.76	0	0
		50	0	19.20	19.46	19.16	19.03	19.98	0-1	0
		50	25	19.36	19.42	19.11	19.31	19.96	0-1	0
		50	49	19.61	19.52	19.05	19.40	20.00	0-1	0
		100	0	19.43	19.49	19.16	19.19	19.98	0-1	0
	16QAM	1	0	18.92	19.41	18.96	19.13	19.71	0-1	0
		1	49	19.54	19.73	19.32	19.54	20.18	0-1	0
		1	99	19.35	19.12	18.80	19.22	19.83	0-1	0
		50	0	19.17	19.47	19.17	19.33	19.92	0-2	0
		50	25	19.37	19.45	19.11	19.29	19.96	0-2	0
		50	49	19.61	19.48	19.08	19.41	19.96	0-2	0
		100	0	19.40	19.48	19.11	19.38	19.95	0-2	0
	64QAM	1	0	18.45	19.03	18.53	18.75	19.30	0-2	0
		1	49	19.12	19.31	18.90	19.14	19.75	0-2	0
		1	99	18.93	18.67	18.42	18.85	19.43	0-2	0
		50	0	19.13	19.45	19.14	19.29	19.94	0-3	0
		50	25	19.35	19.42	19.11	19.28	19.96	0-3	0
		50	49	19.56	19.45	19.05	19.38	19.92	0-3	0
		100	0	19.32	19.46	19.06	19.38	19.96	0-3	0

Note; LTE Band 41 has 5 required test channels per FCC KDB 447498 D01v06.

11.3.4 LTE Reduced Conducted Power (Receiver ON)

[LTE TDD Band 41 Conducted Power_Receiver ON]

LTE Band 41 _ 5 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
5 ㎒	QPSK	1	0	18.11	18.53	18.16	18.29	18.86	0	0
		1	12	18.54	18.71	18.32	18.40	18.98	0	0
		1	24	18.25	18.46	18.09	18.28	18.84	0	0
		12	0	18.15	18.59	18.16	18.27	18.88	0-1	0
		12	6	18.26	18.65	18.23	18.37	18.95	0-1	0
		12	11	18.30	18.64	18.19	18.39	18.94	0-1	0
		25	0	18.28	18.62	18.21	18.30	18.98	0-1	0
	16QAM	1	0	18.20	18.63	18.26	18.26	18.87	0-1	0
		1	12	18.48	18.73	18.39	18.50	19.01	0-1	0
		1	24	18.31	18.54	18.18	18.34	18.89	0-1	0
		12	0	18.13	18.51	18.13	18.23	18.87	0-2	0
		12	6	18.25	18.61	18.19	18.30	18.88	0-2	0
		12	11	18.27	18.56	18.13	18.28	18.86	0-2	0
		25	0	18.25	18.56	18.20	18.28	18.87	0-2	0
	64QAM	1	0	17.80	18.24	17.82	17.97	18.48	0-2	0
		1	12	18.05	18.33	17.96	18.10	18.59	0-2	0
		1	24	17.87	18.13	17.80	17.98	18.46	0-2	0
		12	0	18.17	18.62	18.14	18.29	18.89	0-3	0
		12	6	18.28	18.70	18.33	18.37	18.93	0-3	0
		12	11	18.32	18.64	18.20	18.36	18.91	0-3	0
		25	0	18.28	18.65	18.26	18.32	18.88	0-3	0

LTE Band 41 _ 10 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
10 ㎒	QPSK	1	0	18.22	18.66	18.31	18.32	18.88	0	0
		1	24	18.48	18.71	18.33	18.49	19.01	0	0
		1	49	18.47	18.51	18.18	18.43	18.92	0	0
		25	0	18.31	18.58	18.24	18.34	19.00	0-1	0
		25	12	18.38	18.63	18.28	18.40	18.98	0-1	0
		25	24	18.46	18.58	18.22	18.38	18.97	0-1	0
		50	0	18.34	18.57	18.21	18.31	18.93	0-1	0
	16QAM	1	0	18.26	18.71	18.34	18.19	18.87	0-1	0
		1	24	18.53	18.76	18.43	18.50	19.05	0-1	0
		1	49	18.49	18.60	18.29	18.41	18.91	0-1	0
		25	0	18.20	18.60	18.26	18.29	18.94	0-2	0
		25	12	18.35	18.61	18.25	18.43	18.95	0-2	0
		25	24	18.39	18.58	18.23	18.35	18.87	0-2	0
		50	0	18.41	18.58	18.23	18.31	18.93	0-2	0
	64QAM	1	0	17.84	18.31	17.94	17.74	18.49	0-2	0
		1	24	18.11	18.37	18.00	18.08	18.66	0-2	0
		1	49	18.11	18.17	17.88	17.96	18.52	0-2	0
		25	0	18.24	18.63	18.28	18.33	18.94	0-3	0
		25	12	18.40	18.63	18.29	18.47	18.97	0-3	0
		25	24	18.47	18.61	18.23	18.38	18.96	0-3	0
		50	0	18.27	18.59	18.24	18.29	18.89	0-3	0

LTE Band 41 _ 15 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
15 ㎒	QPSK	1	0	18.21	18.63	18.18	18.32	18.76	0	0
		1	36	18.62	18.69	18.34	18.46	18.96	0	0
		1	74	18.53	18.40	18.09	18.34	18.85	0	0
		36	0	18.31	18.66	18.31	18.36	18.84	0-1	0
		36	18	18.47	18.71	18.30	18.39	18.94	0-1	0
		36	39	18.58	18.55	18.22	18.39	18.92	0-1	0
		75	0	18.45	18.60	18.23	18.38	18.86	0-1	0
	16QAM	1	0	18.30	18.70	18.29	18.27	18.80	0-1	0
		1	36	18.63	18.78	18.42	18.47	18.99	0-1	0
		1	74	18.60	18.47	18.18	18.43	18.85	0-1	0
		36	0	18.31	18.64	18.25	18.31	18.85	0-2	0
		36	18	18.43	18.68	18.19	18.35	18.90	0-2	0
		36	39	18.54	18.52	18.22	18.32	18.90	0-2	0
		75	0	18.48	18.62	18.26	18.29	18.85	0-2	0
	64QAM	1	0	17.86	18.34	17.90	17.83	18.38	0-2	0
		1	36	18.22	18.39	18.02	18.09	18.65	0-2	0
		1	74	18.20	18.09	17.76	18.07	18.44	0-2	0
		36	0	18.27	18.68	18.27	18.27	18.84	0-3	0
		36	18	18.43	18.68	18.23	18.29	18.94	0-3	0
		36	39	18.53	18.56	18.23	18.32	18.89	0-3	0
		75	0	18.49	18.63	18.21	18.30	18.83	0-3	0

LTE Band 41 _ 20 ㎒ Bandwidth

Band width	Modulation	RB Size	RB Offset	Max. Average Power [dBm]					MPR Allowed Per 3GPP [dB]	MPR [dB]
				39750 Ch. 2506.0 ㎒	40185 Ch. 2549.5 ㎒	40620 Ch. 2593.0 ㎒	41055 Ch. 2636.5 ㎒	41490 Ch. 2680.0 ㎒		
20 ㎒	QPSK	1	0	18.08	18.53	18.10	18.18	18.59	0	0
		1	49	18.76	18.75	18.41	18.54	19.05	0	0
		1	99	18.44	18.19	17.94	18.16	18.74	0	0
		50	0	18.41	18.65	18.39	18.31	18.87	0-1	0
		50	25	18.59	18.67	18.26	18.30	18.87	0-1	0
		50	49	18.79	18.65	18.26	18.41	18.91	0-1	0
		100	0	18.56	18.66	18.32	18.36	18.90	0-1	0
	16QAM	1	0	18.14	18.62	18.15	18.09	18.54	0-1	0
		1	49	18.76	18.83	18.50	18.52	19.08	0-1	0
		1	99	18.53	18.29	18.03	18.18	18.69	0-1	0
		50	0	18.38	18.70	18.34	18.29	18.81	0-2	0
		50	25	18.58	18.66	18.27	18.33	18.89	0-2	0
		50	49	18.82	18.68	18.28	18.39	18.88	0-2	0
		100	0	18.59	18.70	18.32	18.34	18.91	0-2	0
	64QAM	1	0	17.72	18.24	17.75	17.73	18.16	0-2	0
		1	49	18.30	18.47	18.10	18.10	18.62	0-2	0
		1	99	18.16	17.91	17.65	17.78	18.27	0-2	0
		50	0	18.41	18.68	18.36	18.22	18.80	0-3	0
		50	25	18.56	18.66	18.25	18.27	18.84	0-3	0
		50	49	18.82	18.64	18.28	18.35	18.82	0-3	0
		100	0	18.57	18.68	18.31	18.35	18.86	0-3	0

Note; LTE Band 41 has 5 required test channels per FCC KDB 447498 D01v06.

11.4 WIFI Conducted Power measurement method

Un-Licensed bands (DTS Band)

Test Description	Test Procedure Used
Conducted Output Power	- KDB 558074 v05 - Section 8.3.2.3 - ANSI 63.10-2013 - Section 11.9.2.3

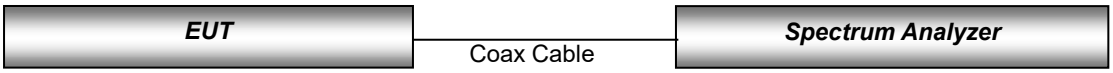
Test Procedure
1. Measure the duty cycle.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Un-Licensed bands (NII Band)

Test Description	Test Procedure Used
Conducted Output Power	- KDB 789033 D02 v02r01 - Section E.3.a

Test Procedure
1. Measure the duty cycle.
2. Measure the average power of the transmitter. This measurement is an average over both the on and off periods of the transmitter.
3. Add 10 log (1/x), where x is the duty cycle, to the measured power in order to compute the average power during the actual transmission times.

Test setup



11.4.1 IEEE 802.11 (2.4 GHz) Maximum Conducted Power

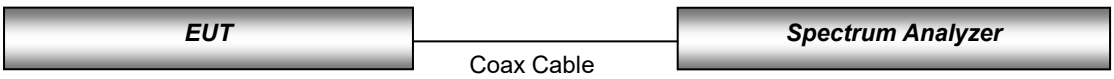
Mode	Frequency [㎒]	Channel	IEEE 802.11 (2.4 ㎓) Average RF Conducted Power [dBm]
802.11b	2 412	1	16.94
	2 437	6	17.34
	2 462	11	16.89
802.11g	2 412	1	16.02
	2 437	6	16.20
	2 462	11	16.02
802.11n (HT20)	2 412	1	16.05
	2 437	6	16.17
	2 462	11	16.02

11.4.2 IEEE 802.11 (2.4 GHz) Reduced Conducted Power

Mode	Frequency [㎒]	Channel	IEEE 802.11 (2.4 ㎓) Conducted Power [dBm]
802.11b	2 412	1	13.15
	2 437	6	13.19
	2 462	11	12.82
802.11g	2 412	1	13.11
	2 437	6	13.26
	2 462	11	13.03
802.11n (HT20)	2 412	1	13.13
	2 437	6	13.27
	2 462	11	13.02

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:
▪ Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
▪ For transmission mode with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
▪ For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
▪ For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured.

Test Configuration



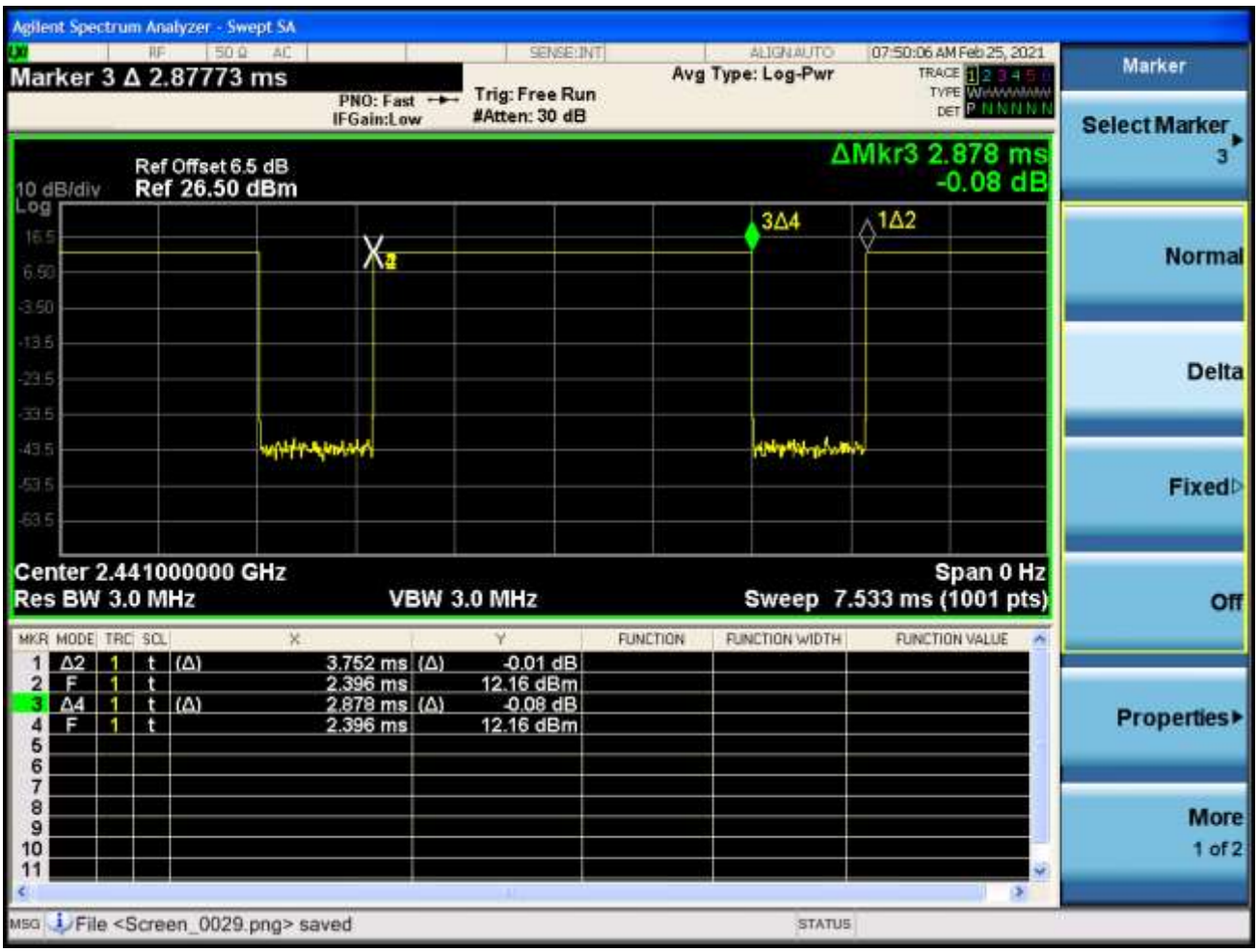
11.5 Bluetooth

11.5.1 Bluetooth Maximum Conducted Power

The Burst averaged-conducted power

Mode	Channel	Bluetooth Power [dBm]
DH5	0	12.31
	39	12.48
	78	12.24
2-DH5	0	9.52
	39	9.87
	78	9.56
3-DH5	0	9.52
	39	9.87
	78	9.57

Per October 2016 TCB Workshop Notes:
When call box and Bluetooth protocol are used for Bluetooth SAR measurement, time-domain plot is required to identify duty factor for supporting the test setup and result.
Bluetooth duty cycle was measured using Bluetooth tester equipment (CBT / R&S) with Bluetooth DH5 mode.



Bluetooth

Duty Cycle

= (BT-On time /BT-Full time) =(2.878/3.752) = 0.767 (DH5)

Duty factor= 1/Duty cycle : 1.304

12. System Verification

12.1 Tissue Verification

The body simulating material is calibrated by HCT using the DAKS 3.5 to determine the conductivity and permittivity.

Table for Head Tissue Verification									
Date of Tests	Tissue Temp. (°C)	Tissue Type	Freq. (㎒)	Measured Conductivity σ (S/m)	Measured Dielectric Constant, ε	Target Conductivity σ (S/m)	Target Dielectric Constant, ε	% dev σ	% dev ε
02/22/2021	22.2	835H	820	0.873	42.132	0.899	41.577	-2.89	1.33
			835	0.890	41.886	0.900	41.500	-1.11	0.93
			850	0.902	41.728	0.916	41.500	-1.53	0.55
03/02/2021	20.9	835H	820	0.871	42.140	0.899	41.577	-3.11	1.35
			835	0.888	41.913	0.900	41.500	-1.33	1.00
			850	0.904	41.825	0.916	41.500	-1.31	0.78
03/02/2021	20.4	2450H	2400	1.754	40.171	1.756	39.290	-0.11	2.24
			2450	1.812	40.036	1.800	39.200	0.67	2.13
			2500	1.866	39.880	1.855	39.140	0.59	1.89
03/03/2021	18.2	2600H	2500	1.899	40.632	1.855	39.140	2.37	3.81
			2600	2.005	40.154	1.964	39.010	2.09	2.93
			2690	2.104	39.967	2.062	38.894	2.04	2.76
03/04/2021	20.8	2600H	2500	1.900	40.620	1.855	39.140	2.43	3.78
			2600	2.009	40.160	1.964	39.010	2.29	2.95
			2690	2.099	39.935	2.062	38.894	1.79	2.68
03/12/2021	21.5	2600H	2500	1.893	40.623	1.855	39.140	2.05	3.79
			2600	2.004	40.242	1.964	39.010	2.04	3.16
			2690	2.109	39.956	2.062	38.894	2.28	2.73
03/15/2021	21.9	2600H	2500	1.854	40.120	1.855	39.140	-0.05	2.50
			2600	1.966	39.687	1.964	39.010	0.10	1.74
			2690	2.073	39.401	2.062	38.894	0.53	1.30

12.2 System Verification

Input Power: 50 mW

Freq. [MHz]	Date	Probe (S/N)	Dipole (S/N)	Liquid	Amb. Temp. [°C]	Liquid Temp. [°C]	1 W Target SAR_{1g} (SPEAG) [W/kg]	50mW Measured SAR_{1g} [W/kg]	1 W Normalized SAR_{1g} [W/kg]	Deviation [%]	Limit [%]
835	02/22/2021	3903	4d165	Head	22.4	22.2	9.56	0.469	9.38	- 1.88	± 10
835	03/02/2021	3903		Head	21.1	20.9	9.56	0.467	9.34	- 2.30	± 10
2 450	03/02/2021	7622	1049	Head	20.6	20.4	51.4	2.73	54.6	+ 6.23	± 10
2 600	03/03/2021	3903	1015	Head	18.4	18.2	56.7	2.82	56.4	- 0.53	± 10
2 600	03/04/2021	7622		Head	21.0	20.8	56.7	2.83	56.6	- 0.18	± 10
2 600	03/12/2021	7622		Head	21.7	21.5	56.7	2.98	59.6	+ 5.11	± 10

System Verification Results – Extremity SAR

Input Power: 50 mW

Freq.	Date	Probe (S/N)	Dipole (S/N)	Liquid	Amb. Temp.	Liquid Temp.	1 W Target SAR_{10g} (SPEAG)	50mW Measured SAR_{10g}	1 W Normalized SAR_{10g}	Deviation	Limit
[MHz]					[°C]	[°C]	[W/kg]	[W/kg]	[W/kg]	[%]	[%]
2 600	03/15/2021	7622	1015	Head	22.1	21.9	25.4	1.2	24	- 5.51	± 10

12.3 System Verification Procedure

SAR measurement was prior to assessment, the system is verified to the ± 10 % of the specifications at each frequency band by using the system verification kit. (Graphic Plots Attached)
- Cabling the system, using the verification kit equipment.
- Generate about 50 ㎽ Input level from the signal generator to the Dipole Antenna.
- Dipole antenna was placed below the flat phantom.
- The measured one-gram SAR at the surface of the phantom above the dipole feed-point should be within 10 % of the target reference value.
- The results are normalized to 1 W input power.

Note;
SAR Verification was performed according to the FCC KDB 865664 D01v01r04.

13. SAR Test Data Summary

13.1 SAR Measurement Results

GSM 850 Head SAR											
Frequency		Mode	Tune-Up Limit	Meas. Power	Power Drift	Test Position	Duty Cycle	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(dB)	(dB)	(dB)			(W/kg)		(W/kg)	
836.6	190	GSM	34.0	32.56	-0.17	Left Cheek	1:8.3	0.136	1.393	0.189	-
836.6	190	GSM	34.0	32.56	-0.07	Left Tilt	1:8.3	0.074	1.393	0.103	-
836.6	190	GSM	34.0	32.56	0.15	Right Cheek	1:8.3	0.178	1.393	**0.248**	1
836.6	190	GSM	34.0	32.56	-0.03	Right Tilt	1:8.3	0.086	1.393	0.120	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg Averaged over 1 gram					

UMTS 850 Head SAR											
Frequency		Mode	Tune-Up Limit	Meas. Power	Power Drift	Test Position	Duty Cycle	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(dB)	(dB)	(dB)			(W/kg)		**(W/kg)**	
836.6	4183	RMC	25.5	24.60	-0.19	Left Cheek	1:1	0.167	1.230	0.205	-
836.6	4183	RMC	25.5	24.60	-0.05	Left Tilt	1:1	0.098	1.230	0.121	-
836.6	4183	RMC	25.5	24.60	-0.01	Right Cheek	1:1	0.223	1.230	**0.274**	2
836.6	4183	RMC	25.5	24.60	-0.12	Right Tilt	1:1	0.107	1.230	0.132	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg (mW/g) Averaged over 1 gram					

LTE Band 5 Head SAR

Frequency		Mode	Band width	Tune-Up Limit	Meas. Power	Power Drift	Test Position	MPR	RB Size	RB offset	Duty Cycle	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(MHz)	(dBm)	(dBm)	(dB)		(dB)				(W/kg)		(W/kg)	
836.5	20525	QPSK	10	25.3	23.90	-0.07	Left Cheek	0	1	24	1:1	0.173	1.380	0.239	-
836.5	20525	QPSK	10	24.3	22.96	0.17	Left Cheek	1	25	12	1:1	0.142	1.361	0.193	-
836.5	20525	QPSK	10	25.3	23.90	-0.17	Left Tilt	0	1	24	1:1	0.106	1.380	0.146	-
836.5	20525	QPSK	10	24.3	22.96	0.01	Left Tilt	1	25	12	1:1	0.087	1.361	0.118	-
836.5	20525	QPSK	10	25.3	23.90	-0.12	Right Cheek	0	1	24	1:1	0.227	1.380	**0.313**	3
836.5	20525	QPSK	10	24.3	22.96	-0.01	Right Cheek	1	25	12	1:1	0.180	1.361	0.245	-
836.5	20525	QPSK	10	25.3	23.90	0.01	Right Tilt	0	1	24	1:1	0.117	1.380	0.162	-
836.5	20525	QPSK	10	24.3	22.96	0.08	Right Tilt	1	25	12	1:1	0.091	1.361	0.124	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							Head 1.6 W/kg Averaged over 1 gram								

LTE TDD Band 41 Head SAR

Frequency		Mode	Band width	Tune-Up Limit	Meas. Power	Power Drift	Test Position	MPR	RB Size	RB offset	Duty Cycle	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(MHz)	(dBm)	(dBm)	(dB)		(dB)				(W/kg)		(W/kg)	
2 680.0	41490	QPSK	20	19.1	19.05	-0.04	Left Cheek	0	1	49	1:1.58	0.266	1.012	0.269	
2 680.0	41490	QPSK	20	19.1	18.91	0.14	Left Cheek	0	50	49	1:1.58	0.259	1.045	0.271	-
2 680.0	41490	QPSK	20	19.1	19.05	0.16	Left Tilt	0	1	49	1:1.58	0.157	1.012	0.159	-
2 680.0	41490	QPSK	20	19.1	18.91	-0.14	Left Tilt	0	50	49	1:1.58	0.159	1.045	0.166	-
2 506.0	39750	QPSK	20	19.1	18.76	0.13	Right Cheek	0	1	49	1:1.58	0.759	1.081	0.821	-
2 549.5	40185	QPSK	20	19.1	18.75	-0.16	Right Cheek	0	1	49	1:1.58	1.04	1.084	1.127	-
2 593.0	40620	QPSK	20	19.1	18.41	-0.08	Right Cheek	0	1	49	1:1.58	1.11	1.172	**1.301**	4
2 636.5	41055	QPSK	20	19.1	18.54	0.11	Right Cheek	0	1	49	1:1.58	0.923	1.138	1.050	-
2 680.0	41490	QPSK	20	19.1	19.05	0.14	Right Cheek	0	1	49	1:1.58	0.920	1.012	0.931	-
2 506.0	39750	QPSK	20	19.1	18.79	-0.13	Right Cheek	0	50	49	1:1.58	0.807	1.074	0.867	-
2 549.5	40185	QPSK	20	19.1	18.67	0.16	Right Cheek	0	50	25	1:1.58	**1.15**	1.104	1.270	5
2 593.0	40620	QPSK	20	19.1	18.39	0.04	Right Cheek	0	50	0	1:1.58	1.1	1.178	1.295	-
2 636.5	41055	QPSK	20	19.1	18.41	0.12	Right Cheek	0	50	49	1:1.58	0.909	1.172	1.066	-
2 680.0	41490	QPSK	20	19.1	18.91	0.11	Right Cheek	0	50	49	1:1.58	0.884	1.045	0.924	-
2 680.0	41490	QPSK	20	19.1	18.90	-0.10	Right Cheek	0	100	0	1:1.58	0.905	1.047	0.948	-
2 680.0	41490	QPSK	20	19.1	19.05	0.04	Right Tilt	0	1	49	1:1.58	0.326	1.012	0.330	-
2 680.0	41490	QPSK	20	19.1	18.91	-0.13	Right Tilt	0	50	49	1:1.58	0.317	1.045	0.331	-
2 549.5	40185	QPSK	20	19.1	18.67	0.11	Right Cheek	0	50	25	1:1.58	1.14	1.104	1.259	*
2 593.0	40620	QPSK	20	19.1	18.41	0.10	Right Cheek	0	1	49	1:1.58	1.1	1.172	1.289	**
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							Head 1.6 W/kg Averaged over 1 gram								

Note: * Data entry indicate Variability measurement.
** Data entry indicate Device holder perturbation measurement.

DTS Head SAR

Frequency		Mode	Band width	Data Rate	Tune-Up Limit	Meas. Power	Power Drift	Test Position	Duty Cycle	Area Scan Peak SAR	Meas. SAR	Scaling Factor	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(MHz)	(Mbps)	(dBm)	(dBm)	(dB)			(W/kg)	(W/kg)		(Duty)	(W/kg)	
2 437	6	802.11b	20	1	14.0	13.19		Left Cheek	98.9	0.29					-
2 437	6	802.11b	20	1	14.0	13.19		Left Tilt	98.9	0.322					-
2 437	6	802.11b	20	1	14.0	13.19	-0.10	Right Cheek	98.9	0.427	0.237	1.205	1.011	**0.289**	6
2 437	6	802.11b	20	1	14.0	13.19		Right Tilt	98.9	0.412					-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population								Head 1.6 W/kg Averaged over 1 gram							

DSS Head SAR

Frequency		Mode	Tune-Up Limit	Meas. Power	Power Drift	Test Position	Meas. SAR	Scaling Factor	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(dBm)	(dBm)	(dB)		(W/kg)		(Duty)	(W/kg)	
2 441	39	Bluetooth DH5	12.5	12.48	-0.09	Left Cheek	0.119	1.005	1.304	0.156	-
2 441	39	Bluetooth DH5	12.5	12.48	-0.15	Left Tilt	0.149	1.005	1.304	0.195	-
2 441	39	Bluetooth DH5	12.5	12.48	-0.17	Right Cheek	0.159	1.005	1.304	**0.208**	7
2 441	39	Bluetooth DH5	12.5	12.48	0.13	Right Tilt	0.133	1.005	1.304	0.174	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Head 1.6 W/kg (mW/g) Averaged over 1 gram					

13.2 Body-worn SAR Measurement Results

GSM/ UMTS Body-Worn SAR													
Frequency		Mode		Tune-Up Limit	Meas. Power	Power Drift	Test Position	Duty Cycle	Distance	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.			(dB)	(dB)	(dB)			(mm)	(W/kg)		(W/kg)	
836.6	190	GSM 850 Voice		34.0	32.56	0.01	Rear	1:8.3	15	0.270	1.393	**0.376**	8
836.6	190	GSM 850 Voice		34.0	32.56	-0.06	Front	1:8.3	15	0.213	1.393	0.297	-
836.6	4183	UMTS 850	RMC	25.5	24.60	-0.02	Rear	1:1	15	0.273	1.230	**0.336**	9
836.6	4183	UMTS 850	RMC	25.5	24.60	-0.07	Front	1:1	15	0.210	1.230	0.258	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							Body 1.6 W/kg Averaged over 1 gram						

LTE Body-Worn SAR															
Frequency		Mode	Band width	Tune-Up Limit	Meas. Power	Power Drift	Test Position	MPR	RB Size	RB offset	Duty Cycle	Distance	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(MHz)	(dBm)	(dBm)	(dB)		(dB)				(mm)	(W/kg)		(W/kg)	
836.5	20525	LTE 5 QPSK	10	25.3	23.90	-0.01	Rear	0	1	24	1:1	15	0.290	1.380	**0.400**	10
836.5	20525		10	24.3	22.96	0.03	Rear	1	25	12	1:1	15	0.233	1.361	0.317	-
836.5	20525		10	25.3	23.90	-0.01	Front	0	1	24	1:1	15	0.224	1.380	0.309	-
836.5	20525		10	24.3	22.96	-0.01	Front	1	25	12	1:1	15	0.181	1.361	0.246	-
2 680.0	41490	LTE 41 QPSK	20	22.2	21.97	-0.14	Rear	0	1	49	1:1.58	15	0.558	1.054	**0.588**	11
2 680.0	41490		20	21.2	20.82	0.10	Rear	1	50	49	1:1.58	15	0.478	1.091	0.522	-
2 680.0	41490		20	22.2	21.97	-0.01	Front	0	1	49	1:1.58	15	0.159	1.054	0.168	-
2 680.0	41490		20	21.2	20.82	0.10	Front	1	50	49	1:1.58	15	0.128	1.091	0.140	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							Body 1.6 W/kg Averaged over 1 gram									

DTS Body-Worn SAR																
Frequency		Mode	Band width (㎒)	Data Rate (Mbps)	Tune-Up Limit (dBm)	Meas. Power (dBm)	Power Drift (dB)	Test Position	Duty Cycle	Distance (mm)	Area Scan Peak SAR (W/kg)	Meas. SAR (W/kg)	Scaling Factor	Scaling Factor (Duty)	Scaled SAR (W/kg)	Plot No.
㎒	Ch.															
2 437	6	802.11b	20	1	18.0	17.34	-0.14	Rear	98.9	15	0.200	0.107	1.164	1.011	**0.126**	12
2 437	6	802.11b	20	1	18.0	17.34		Front	98.9	15	0.128					-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population								Body 1.6 W/kg Averaged over 1 gram								

DSS Body-Worn SAR												
Frequency		Mode	Tune-Up Limit	Meas. Power	Power Drift	Test Position	Distance	Meas. SAR	Scaling Factor	Scaling Factor	Scaled SAR	Plot No.
㎒	Ch.		(dBm)	(dBm)	(dB)		(mm)	(W/kg)		(Duty)	(W/kg)	
2 441	39	Bluetooth DH5	12.5	12.48	0.01	Rear	15	0.022	1.005	1.304	**0.029**	13
2 441	39	Bluetooth DH5	12.5	12.48	-0.16	Front	15	0.00672	1.005	1.304	0.009	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Body 1.6 W/kg (mW/g) Averaged over 1 gram						

13.3 Hotspot SAR Measurement Results

GSM 850 Hotspot SAR												
Frequency		Mode	Tune-Up Limit	Meas. Power	Power Drift	Test Position	Duty Cycle	Distance	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(dB)	(dB)	(dB)			(mm)	(W/kg)		(W/kg)	
836.6	190	GPRS 4Tx	30.5	29.07	-0.05	Rear	1:2.07	10	0.525	1.390	**0.730**	14
836.6	190	GPRS 4Tx	30.5	29.07	-0.04	Front	1:2.07	10	0.336	1.390	0.467	-
836.6	190	GPRS 4Tx	30.5	29.07	-0.05	Left	1:2.07	10	0.275	1.390	0.382	-
836.6	190	GPRS 4Tx	30.5	29.07	0.03	Right	1:2.07	10	0.386	1.390	0.537	-
836.6	190	GPRS 4Tx	30.5	29.07	-0.05	Bottom	1:2.07	10	0.105	1.390	0.146	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Body 1.6 W/kg Averaged over 1 gram						

UMTS 850 Hotspot SAR												
Frequency		Mode	Tune-Up Limit	Meas. Power	Power Drift	Test Position	Duty Cycle	Distance	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(dB)	(dB)	(dB)			(mm)	(W/kg)		(W/kg)	
836.6	4183	RMC	25.5	24.60	0.03	Rear	1:1	10	0.499	1.230	**0.614**	15
836.6	4183	RMC	25.5	24.60	-0.02	Front	1:1	10	0.212	1.230	0.261	-
836.6	4183	RMC	25.5	24.60	0.02	Left	1:1	10	0.151	1.230	0.186	-
836.6	4183	RMC	25.5	24.60	-0.04	Right	1:1	10	0.299	1.230	0.368	-
836.6	4183	RMC	25.5	24.60	0.18	Bottom	1:1	10	0.110	1.230	0.135	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Body 1.6 W/kg Averaged over 1 gram						

LTE Band 5 Hotspot SAR																
Frequency		Mode	Band width	Tune-Up Limit	Meas. Power	Power Drift	Test Position	MPR	RB Size	RB offset	Duty Cycle	Distance	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(MHz)	(dBm)	(dBm)	(dB)		(dB)				(mm)	(W/kg)		(W/kg)	
836.5	20525	QPSK	10	25.3	23.90	0.04	Rear	0	1	24	1:1	10	0.504	1.380	**0.696**	16
836.5	20525	QPSK	10	24.3	22.96	-0.01	Rear	1	25	12	1:1	10	0.404	1.361	0.550	-
836.5	20525	QPSK	10	25.3	23.90	-0.08	Front	0	1	24	1:1	10	0.219	1.380	0.302	-
836.5	20525	QPSK	10	24.3	22.96	-0.03	Front	1	25	12	1:1	10	0.173	1.361	0.236	-
836.5	20525	QPSK	10	25.3	23.90	-0.12	Left	0	1	24	1:1	10	0.158	1.380	0.218	-
836.5	20525	QPSK	10	24.3	22.96	0.01	Left	1	25	12	1:1	10	0.127	1.361	0.173	-
836.5	20525	QPSK	10	25.3	23.90	-0.04	Right	0	1	24	1:1	10	0.268	1.380	0.370	-
836.5	20525	QPSK	10	24.3	22.96	-0.05	Right	1	25	12	1:1	10	0.216	1.361	0.294	-
836.5	20525	QPSK	10	25.3	23.90	0.18	Bottom	0	1	24	1:1	10	0.111	1.380	0.153	-
836.5	20525	QPSK	10	24.3	22.96	0.19	Bottom	1	25	12	1:1	10	0.088	1.361	0.120	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							Body 1.6 W/kg Averaged over 1 gram									

LTE TDD Band 41 Hotspot SAR																
Frequency		Mode	Band width	Tune-Up Limit	Meas. Power	Power Drift	Test Position	MPR	RB Size	RB offset	Duty Cycle	Distance	Meas. SAR	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(MHz)	(dBm)	(dBm)	(dB)		(dB)				(mm)	(W/kg)		(W/kg)	
2 506.0	39750	QPSK	20	17.5	16.94	-0.17	Rear	0	1	49	1:1.58	10	0.675	1.138	0.768	-
2 549.5	40185	QPSK	20	17.5	16.99	0.18	Rear	0	1	49	1:1.58	10	**0.917**	1.125	1.031	17
2 593.0	40620	QPSK	20	17.5	16.65	0.01	Rear	0	1	49	1:1.58	10	0.870	1.216	1.058	-
2 636.5	41055	QPSK	20	17.5	16.59	-0.01	Rear	0	1	49	1:1.58	10	0.676	1.233	0.834	-
2 680.0	41490	QPSK	20	17.5	17.12	0.13	Rear	0	1	49	1:1.58	10	0.580	1.091	0.633	-
2 506.0	39750	QPSK	20	17.5	17.06	0.11	Rear	0	50	49	1:1.58	10	0.749	1.107	0.829	-
2 549.5	40185	QPSK	20	17.5	16.91	0.17	Rear	0	50	0	1:1.58	10	0.914	1.146	1.047	-
2 593.0	40620	QPSK	20	17.5	16.58	0.01	Rear	0	50	0	1:1.58	10	0.877	1.236	**1.084**	18
2 636.5	41055	QPSK	20	17.5	16.52	-0.01	Rear	0	50	49	1:1.58	10	0.652	1.253	0.817	-
2 680.0	41490	QPSK	20	17.5	17.04	0.14	Rear	0	50	49	1:1.58	10	0.574	1.112	0.638	-
2 680.0	41490	QPSK	20	17.5	17.03	-0.14	Rear	0	100	0	1:1.58	10	0.549	1.114	0.612	
2 680.0	41490	QPSK	20	17.5	17.12	0.01	Front	0	1	49	1:1.58	10	0.102	1.091	0.111	-
2 506.0	39750	QPSK	20	17.5	17.06	0.01	Front	0	50	49	1:1.58	10	0.084	1.107	0.093	-
2 506.0	39750	QPSK	20	17.5	16.94	0.13	Left	0	1	49	1:1.58	10	0.448	1.138	0.510	-
2 549.5	40185	QPSK	20	17.5	16.99	-0.19	Left	0	1	49	1:1.58	10	0.733	1.125	0.824	-
2 593.0	40620	QPSK	20	17.5	16.65	0.14	Left	0	1	49	1:1.58	10	0.822	1.216	1.000	-
2 636.5	41055	QPSK	20	17.5	16.59	-0.15	Left	0	1	49	1:1.58	10	0.705	1.233	0.869	-
2 680.0	41490	QPSK	20	17.5	17.12	0.16	Left	0	1	49	1:1.58	10	0.698	1.091	0.762	-
2 506.0	39750	QPSK	20	17.5	17.06	-0.08	Left	0	50	49	1:1.58	10	0.511	1.107	0.565	-
2 680.0	41490	QPSK	20	17.5	17.03	0.17	Left	0	100	0	1:1.58	10	0.677	1.114	0.754	-
2 680.0	41490	QPSK	20	17.5	17.12	0.01	Top	0	1	49	1:1.58	10	0.072	1.091	0.079	-
2 506.0	39750	QPSK	20	17.5	17.06	-0.19	Top	0	50	49	1:1.58	10	0.052	1.107	0.058	-
2 549.5	40185	QPSK	20	17.5	16.99	0.18	Rear	0	1	49	1:1.58	10	0.904	1.125	1.017	*
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population							Body 1.6 W/kg Averaged over 1 gram									

Note: * Data entry indicate Variability measurement.

DTS Hotspot SAR																
Frequency		Mode	Band width (MHz)	Data Rate (Mbps)	Tune-Up Limit (dBm)	Meas. Power (dBm)	Power Drift (dB)	Test Position	Duty Cycle	Distance (mm)	Area Scan Peak SAR (W/kg)	Meas. SAR (W/kg)	Scaling Factor	Scaling Factor (Duty)	Reported SAR (W/kg)	Plot No.
MHz	Ch.															
2 437	6	802.11b	20	1	18.0	17.34	-0.14	Rear	98.9	10	0.459	0.261	1.164	1.011	**0.307**	19
2 437	6	802.11b	20	1	18.0	17.34		Front	98.9	10	0.273					-
2 437	6	802.11b	20	1	18.0	17.34		Left	98.9	10	0.209					-
2 437	6	802.11b	20	1	18.0	17.34		Top	98.9	10	0.419					-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population								Body 1.6 W/kg Averaged over 1 gram								

Note: In the worst case of the UNII-3 band, SAR Measurement were performed.

DSS Tethering SAR												
Frequency		Mode	Tune-Up Limit	Meas. Power	Power Drift	Test Position	Distance	Meas. SAR	Scaling Factor	Scaling Factor	Scaled SAR	Plot No.
MHz	Ch.		(dBm)	(dBm)	(dB)		(mm)	(W/kg)		(Duty)	(W/kg)	
2 441	39	Bluetooth DH5	12.5	12.48	0.01	Rear	10	0.062	1.005	1.304	**0.081**	20
2 441	39	Bluetooth DH5	12.5	12.48	-0.18	Front	10	0.035	1.005	1.304	0.046	-
2 441	39	Bluetooth DH5	12.5	12.48	-0.17	Left	10	0.033	1.005	1.304	0.043	-
2 441	39	Bluetooth DH5	12.5	12.48	0.12	Top	10	0.059	1.005	1.304	0.077	-
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population						Body 1.6 W/kg (mW/g) Averaged over 1 gram						

13.4 Phablet SAR Measurement Considerations

Per FCC KDB 648474 D04v01r03, this device is considered a “Phablet” since the diagonal dimension is greater than 160 mm and less than 200 mm. Therefore, extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR >1.2 W/kg. When hotspot mode applies, 10g SAR required only for the surfaces and edges with hotspot mode scaled to the maximum output power (including tolerance) is 1g SAR > 1.2 W/kg.

13.5 Phablet SAR Measurement Results

LTE TDD Band 41 Phablet SAR 10g																	
Frequency		Mode	Band Width	Tune-Up Limit (dB)	Meas. Power (dB)	Power Drift (dB)	Test Position	Sensor	MPR (dB)	RB Size	RB Offset	Duty Cycle	Distance (mm)	10g Meas. SAR (W/kg)	Scaling Factor	10g Scaled SAR (W/kg)	Plot No.
MHz	Ch.																
2 680.0	41490	QPSK	20	22.2	21.97	-0.19	Rear	OFF	0	1	49	1:1.58	14	0.273	1.054	0.288	-
2 680.0	41490	QPSK	20	21.2	20.82	0.18	Rear	OFF	1	50	49	1:1.58	14	0.212	1.091	0.231	-
2 680.0	41490	QPSK	20	22.2	21.97	-0.13	Left	OFF	0	1	49	1:1.58	12	0.494	1.054	0.521	-
2 680.0	41490	QPSK	20	21.2	20.82	0.07	Left	OFF	1	50	49	1:1.58	12	0.382	1.091	0.417	-
2 680.0	41490	QPSK	20	22.2	21.97	0.01	Front	N/A	0	1	49	1:1.58	0	1.05	1.054	1.107	-
2 680.0	41490	QPSK	20	21.2	20.82	0.01	Front	N/A	1	50	49	1:1.58	0	0.820	1.091	0.895	-
2 680.0	41490	QPSK	20	22.2	21.97	-0.17	Top	N/A	0	1	49	1:1.58	0	0.521	1.054	0.549	-
2 680.0	41490	QPSK	20	21.2	20.82	-0.01	Top	N/A	1	50	49	1:1.58	0	0.416	1.091	0.454	-
2 680.0	41490	QPSK	20	20.3	20.10	-0.15	Rear	ON	0	1	49	1:1.58	0	1.12	1.047	1.173	-
2 680.0	41490	QPSK	20	20.3	20.00	-0.01	Rear	ON	0	50	49	1:1.58	0	1.1	1.072	1.179	-
2 680.0	41490	QPSK	20	20.3	20.10	-0.19	Left	ON	0	1	49	1:1.58	0	**1.19**	1.047	1.246	21
2 680.0	41490	QPSK	20	20.3	20.00	-0.11	Left	ON	0	50	49	1:1.58	0	1.18	1.072	**1.264**	22
ANSI/ IEEE C95.1 - 2005 – Safety Limit Spatial Peak Uncontrolled Exposure/ General Population								Hand 4.0 W/kg Averaged over 10 gram									

13.6 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, FCC KDB Procedure.
2. Batteries are fully charged at the beginning of the SAR measurements. A standard battery was used for all SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. 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.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB 447498 D01v06.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 15 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB 648474 D04v01r03, SAR was evaluated without a headset connected to the device. Since the standalone reported SAR was 1.2 W/kg, no additional SAR evaluation using a headset cable were required.
8. Per KDB 648474 D04v01r03, this device is considered a “Phablet” since the diagonal dimension is > 160 mm and < 200 mm. When hotspot mode applies, extremity SAR is required only for the surfaces and edges with hotspot mode scaled to the maximum output power (with tolerance) is 1 g SAR > 1.2 W/kg.
9. Per FCC KDB 865664 D01v01r04, variability SAR measurement were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg for 1g SAR and >2 for 10g SAR Please see Section 15 for variability analysis.
10. This device utilizes power reduction for some wireless mode and technologies, as outlined in sec. 4 The maximum output power allowed for each transmitter and exposure condition was evaluated for SAR compliance based on expected use conditions and simultaneous scenarios.
11. During SAR testing for the Hotspot conditions per KDB 941225 D06v02r01, the actual portable hotspot operation (with actual simultaneous transmission of a transmitter with WiFi) was not activated.

GSM/GPRS Test Notes:

1. This EUT’S GSM and GPRS device class is B.
2. This device does not support GPRS VOIP .
3. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
4. Justification for reduced test configurations per KDB 941225 D01v03r01: The source-based time-averaged output power was evaluated for all multi-slot operations. The multi-slot configuration with the highest frame averaged output power including tolerance was evaluated for SAR.
5. Per FCC KDB 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is 1/2 dB, instead of the middle channel, the highest output power channel must be used.

UMTS Notes:

1. The 12.2 kbps RMC mode is the primary mode per KDB 941225 D01v03r01.
2. UMTS SAR was tested under RMC 12.2 kbps with HSPA inactive per KDB publication 941225 D01v03r01. AMR and HSPA SAR was not required per the 3G Test Reduction Procedure in KDB Publication 941225 D01v03r01.
3. Per FCC KDB 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the channel highest output power channel was used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Consideration for LTE Devices in FCC KDB 941225 D05v02r05.
2. According to FCC KDB 941225 D05v02r05:
   When the reported SAR is 0.8 W/kg, testing of the 100% RB allocation and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the 1RB, 50%RB and 100%RB allocation with highest output power for that channel.
   Only one channel, and as reported SAR values for 1RB allocation and 50%RB allocation were less than 1.45 W/Kg only the highest power RB offset for each allocation was required.
3. 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 target MPR is indicated alongside the SAR results.
4. When Power reduction is applied, MPR is 0.
5. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator.
6. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) LTE TDD Band 41 SAR measured at the highest output power channel for each test configuration is 0.6 W/kg then testing at the other channels is not required for such test configurations.
7. TDD LTE B41 was tested using UL-DL configuration 0 with 6 UL sub frames and 2S sub frames using extended cyclic prefix only and special sub frame configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Sec. 4, the duty factor using extended cyclic prefix is 0.633(cf=1.58).
8. :Start with the largest channel bandwidth and measure SAR for QPSK with 1 RB, and 50% RB allocation, using the RB offset and required test channel combination with the highest maximum output power among RB offsets at the upper edge, middle and lower edge of each required test channel. When the reported SAR is >0.8 W/kg, testing for other Channels is performed at the highest output power level for 1RB, and 50% RB configuration for that channel. Testing for 100% RB configuration is performed at the highest output power level for 100% RB configuration across the Low, Mid and High Channel when the highest reported SAR for 1 RB and 50% RB are >0.8 W/kg, testing for the remaining required channels is not needed because the reported SAR for 100% RB Allocation <1.45 W/kg. Testing for 16-QAM modulation is not required because the reported SAR for QPSK is <1.45 W/kg and its output power is not more than 0.5 dB higher than that a QPSK. Testing for the other channel bandwidths is not required because the reported SAR for the highest channel bandwidth is <1.45 W/kg and its output power is not more than 0.5 dB higher than that of the highest channel bandwidth.

WLAN Notes:

1. For held-to-ear and hotspot operations, the initial test position procedures were applied. For initial test position, the highest extrapolated peak SAR will be used. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g SAR and ≤ 1.0 W/kg for 10g SAR, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR results is ≤ 0.8 W/kg for 1g SAR and ≤ 2.0 W/kg for 10g SAR or all test position are measured.
2. Per KDB 2482227 D01v02r02 justification for test configurations of 2.4 GHz WiFi Single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11 g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR.
3. When the maximum reported 1g averaged SAR is ≤ 0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg or all test channels were measured.
4. The device was configured to transmit continuously at the required data rated, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated WLAN test reports.

Bluetooth Notes:

1. Bluetooth SAR was measured with the device connected to a call box with hopping disabled with DH5 operation and Tx Tests mode type. Per October 2016 TCBC Workshop Notes, the reported SAR was scaled to 100% transmission duty factor to determine compliance. Please see sec.11 for the time-domain plot and calculation for duty factor of the device.
2. Head and Bluetooth tethering SAR were evaluated for BT BR tethering applications.

14. Simultaneous SAR Analysis

14.1 Head SAR Simultaneous Transmission Analysis.

Simultaneous Transmission Summation Scenario with 2.4 GHz WLAN				
Exposure condition	Band	WWAN SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	∑ 1-g SAR (W/kg)
Head SAR	GSM 850	0.248	0.289	0.537
	UMTS 850	0.274	0.289	0.563
	LTE Band 5	0.313	0.289	0.602
	LTE Band 41	1.301	0.289	1.590

Simultaneous Transmission Summation Scenario with Bluetooth				
Exposure condition	Band	WWAN SAR (W/kg)	Bluetooth SAR (W/kg)	∑ 1-g SAR (W/kg)
Head SAR	GSM 850	0.248	0.208	0.456
	UMTS 850	0.274	0.208	0.482
	LTE Band 5	0.313	0.208	0.521
	LTE Band 41	1.301	0.208	1.509

14.2 Body-Worn SAR Simultaneous Transmission Analysis.

Simultaneous Transmission Summation Scenario with 2.4 GHz WLAN					
Exposure condition	Distance (mm)	Band	WWAN SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	∑ 1-g SAR (W/kg)
Body-worn	15	GSM 850	0.376	0.126	0.502
		UMTS 850	0.336	0.126	0.462
		LTE Band 5	0.400	0.126	0.526
		LTE Band 41	0.588	0.126	0.714

Simultaneous Transmission Summation Scenario with Bluetooth					
Exposure condition	Distance (mm)	Band	WWAN SAR (W/kg)	Bluetooth SAR (W/kg)	∑ 1-g SAR (W/kg)
Body-worn	15	GSM 850	0.376	0.029	0.405
		UMTS 850	0.336	0.029	0.365
		LTE Band 5	0.400	0.029	0.429
		LTE Band 41	0.588	0.029	0.617

14.3 Hotspot SAR Simultaneous Transmission Analysis.

Simultaneous Transmission Scenario with 2.4G WLAN					
Exposure condition	Distance (mm)	Band	WWAN SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	∑ 1-g SAR (W/kg)
Hotspot	10	GSM 850	0.730	0.307	1.037
		UMTS 850	0.614	0.307	0.921
		LTE Band 5	0.696	0.307	1.003
		LTE Band 41	1.084	0.307	1.391

Simultaneous Transmission Summation Scenario with Bluetooth					
Exposure condition	Distance (mm)	Band	WWAN SAR (W/kg)	Bluetooth SAR (W/kg)	∑ 1-g SAR (W/kg)
Hotspot	10	GSM 850	0.730	0.081	0.811
		UMTS 850	0.614	0.081	0.695
		LTE Band 5	0.696	0.081	0.777
		LTE Band 41	1.084	0.081	1.165

14.4 Simultaneous Transmission Conclusion

The above numerical summed SAR Results are sufficient to determine that simultaneous transmission cases will not exceed the SAR Limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE1528-2013.

15. SAR Measurement Variability and Uncertainty

In accordance with KDB procedure 865664 D01v01r04 SAR measurement 100 ㎒ to 6 ㎓, SAR additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement variability was assessed using the following procedures for each frequency band:

1) Repeated measurement is not required when the original highest measured SAR is < 0.80 W/kg for 1g SAR or < 2.0 W/kg for 10g SAR; steps 2) through 4) do not apply.

2) When the original highest measured 1g SAR is ≥ 0.80 W/kg or 10g SAR ≥ 2.0W/kg, repeat that measurement once.

3) Perform a second repeated measurement only if the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20 or when the original or repeated measurement is ≥ 1.45 W/kg for 1g SAR or ≥ 3.625 W/kg for 10g SAR (~ 10% from the 1-g SAR limit).

4) Perform a third repeated measurement only if the original, first or second repeated measurement is ≥1.5 W/kg for 1g SAR or ≥3.75 W/kg for 10g SAR and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.

Head SAR measurement variability Results

Frequency		Mode/Band	Configuration	Measured SAR (W/kg)	Repeated SAR (W/kg)	SAR Ratio
㎒	Channel					
2 549.5	40185	LTE Band 41	Right Cheek	1.15	1.14	1.01

Hotspot SAR measurement variability Results

Frequency		Mode/Band	Configuration	Measured SAR (W/kg)	Repeated SAR (W/kg)	SAR Ratio
㎒	Channel					
2 549.5	40185	LTE Band 41	Rear	0.917	0.904	1.01

16. Device Holder Perturbation Verification.

In accordance with published DUT Holder Perturbations in Oct.2016 TCB Workshop.
When Highest reported SAR is over 1.2 W/kg, Holder Perturbation Verification is required for each antenna, using the highest configuration among all applicable frequency bands.

Frequency		Mode/Band	Configuration	Highest Reported SAR		Deviation (%)
				(without Device Holder)	(with Device Holder)	
MHz	Channel			(W/kg)	(W/kg)	
2 593.0	40620	LTE Band 41	Right Cheek	1.301	1.289	1.01

16. SAR Test Equipment

Manufacturer	Type / Model	S/N	Calib. Date	Calib.Interval	Calib.Due
SPEAG	SAM Phantom	-	N/A	N/A	N/A
HP	SAR System Control PC	-	N/A	N/A	N/A
Staubli	CS8Cspeag-TX90	F13/ 5R4XF1/ C/ 01	N/A	N/A	N/A
Staubli	CS8Cspeag-TX90	F11/5K3RA1/C/01	N/A	N/A	N/A
Staubli	CS8Cspeag-TX90	F/20/0018446/C/001	N/A	N/A	N/A
Staubli	TX90 XLspeag	F13/ 5R4XF1/ A/ 01	N/A	N/A	N/A
Staubli	TX90 XLspeag	F11/5K3RA1/A/01	N/A	N/A	N/A
Staubli	TX60 Xlspeag	F/20/0018446/A/001	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	S-1338 1332	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	S-1203 0309	N/A	N/A	N/A
Staubli	Teach Pendant (Joystick)	D21142608A	N/A	N/A	N/A
SPEAG	DAE4	869	09/28/2020	Annual	09/28/2021
SPEAG	DAE4	648	05/25/2020	Annual	05/25/2021
SPEAG	E-Field Probe EX3DV4	7622	11/06/2020	Annual	11/06/2021
SPEAG	E-Field Probe EX3DV4	3903	03/25/2020	Annual	03/25/2021
SPEAG	Dipole D835V2	4d165	07/28/2020	Annual	07/28/2021
SPEAG	Dipole D2450V2	1049	08/26/2020	Annual	08/26/2021
SPEAG	Dipole D2600V2	1015	08/26/2020	Annual	08/26/2021
Agilent	Power Meter E4419B	MY41291386	10/23/2020	Annual	10/23/2021
Agilent	Power Meter N1911A	MY45101406	08/31/2020	Annual	08/31/2021
Agilent	Power Sensor 8481A	SG1091286	10/05/2020	Annual	10/05/2021
Agilent	Power Sensor 8481A	MY41090873	10/05/2020	Annual	10/05/2021
Agilent	Power Sensor N1921A	MY55220026	08/31/2020	Annual	08/31/2021
SPEAG	DAKS 3.5	1038	03/24/2020	Annual	03/24/2021
H.P	Network Analyzer /8753ES	JP39240221	01/11/2021	Annual	01/11/2022
Agilent	WIRELESS COMMUNICATION E5515C	MY48360252	08/06/2020	Annual	08/06/2021
Agilent	WIRELESS COMMUNICATION E5515C	GB44051865	06/01/2020	Annual	06/01/2021
Agilent	Signal Generator N5182A	MY47070230	05/06/2020	Annual	05/06/2021
Agilent	11636B/Power Divider	58698	02/28/2020	Annual	02/28/2021
Agilent	11636B/Power Divider	58698	02/26/2021	Annual	02/26/2022
TESTO	175-H1/Thermometer	40332651310	01/26/2021	Annual	01/26/2022
TESTO	175-H1/Thermometer	40331949309	01/26/2021	Annual	01/26/2022
TESTO	175-H1/Thermometer	44606559906	01/26/2021	Annual	01/26/2022
EMPOWER	RF Power Amplifier	1084	07/01/2020	Annual	07/01/2021
MICRO LAB	LP Filter / LA-15N	10453	10/05/2020	Annual	10/05/2021
MICRO LAB	LP Filter / LA-30N	-	10/05/2020	Annual	10/05/2021
MICRO LAB	LP Filter / LA-60N	32011	10/05/2020	Annual	10/05/2021
Agilent	Attenuator (3dB) 8693B	MY39260298	09/18/2020	Annual	09/18/2021
HP	Attenuator (20dB) 8493C	09271	09/18/2020	Annual	09/18/2021
Agilent	Directional Bridge	3140A03878	06/08/2020	Annual	06/08/2021
Agilent	MXA Signal Analyzer N9020A	MY50510407	10/23/2020	Annual	10/23/2021
HP	Dual Directional Coupler	16072	10/05/2020	Annual	10/05/2021
Anritsu	Radio Communication Tester MT8820C	6200695605	05/06/2020	Annual	05/06/2021
Anritsu	Radio Communication Tester MT8820C	6200628628	09/18/2020	Annual	09/18/2021
Anritsu	Radio Communication Tester MT8821C	6201502997	08/06/2020	Annual	08/06/2021
R&S	Bluetooth CBT	100272	03/02/2020	Annual	03/02/2021
R&S	Bluetooth CBT	100272	02/26/2021	Annual	02/26/2022

* The E-field probe was calibrated by SPEAG, by the waveguide technique procedure. Dipole Verification measurement is performed by HCT Lab. before each test. The brain/body simulating material is calibrated by HCT using the DAKS 3.5 to determine the conductivity and permittivity (dielectric constant) of the brain/body-equivalent material.

17. Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the ANSI/ IEEE C95.1 - 2005.

These measurements were taken to simulate the RF effects 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 abortion and distribution of electromagnetic energy in the body are very complex phenomena the 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.

18. References

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radio frequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1 - 2005 , American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300 kHz to 300 ㎓, New York: IEEE, Sept. 1992

[3] ANSI/IEEE C 95.1 - 2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 ㎓, New York: IEEE, 2006

[4 ANSI/IEEE C95.3 - 2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: December 2002.

[5] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2013, IEEE Recommended Practice or Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body from Wireless Communications Devices

[6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for Radio Frequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 120-124.

[9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Head Modeling at 900 ㎒, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300 ㎒, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectro magnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computer mathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10 kHz-300 ㎓, Jan. 1995.

[19] Prof. Dr. Niels Kuster, ETH, EidgenØssische Technische Hoschschule Zòrich, Dosimetric Evaluation of the Cellular Phone.

[20] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation and procedures – Part 1:Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 ㎒ to 3 ㎓), July. 2016..

[21] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices – Human models, instrumentation, and procedures – Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 ㎒ to 6 ㎓) Mar. 2010.

[22] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radio Communication Apparatus (All Frequency Band) Issue 5, March 2015.

[23] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Rage from 3 kHz – 300 ㎓, 2009

[24] FCC SAR Test procedures for 2G-3G Devices, Mobile Hotspot and UMPC Device KDB 941225 D01.

[25] SAR Measurement Guidance for IEEE 802.11 transmitters, KDB 248227 D01v02r02

[26] SAR Evaluation of Handsets with Multiple Transmitters and Antennas KDB 648474 D03, D04.

[27] SAR Evaluation for Laptop, Notebook, Netbook and Tablet computers KDB 616217 D04.

[28] SAR Measurement and Reporting Requirements for 100 ㎒ – 6 ㎓, KDB 865664 D01, D02.

[29] FCC General RF Exposure Guidance and SAR procedures for Dongles, KDB 447498 D01,D02.