

FCC SAR Test Report

APPLICANT : Huawei Technologies Co., Ltd.
EQUIPMENT : smart phone
BRAND NAME : HUAWEI
MODEL NAME : MRD-LX1N
FCC ID : QISMRD-LX1N
STANDARD : FCC 47 CFR Part 2 (2.1093)
ANSI/IEEE C95.1-1992
IEEE 1528-2013

We, Sporton International (Kunshan) Inc, would like to declare that the tested sample has been evaluated in accordance with the procedures and had been in compliance with the applicable technical standards.

The test results in this report apply exclusively to the tested model / sample. Without written approval of Sporton International (Kunshan) Inc., the test report shall not be reproduced except in full.



Approved by: Mark Qu / Manager

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Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA8N3012-01	Rev. 01	Initial issue of report	Dec. 27, 2018



1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for Huawei Technologies Co., Ltd., smart phone, MRD-LX1N, are as follows.

Highest 1g SAR Summary						
Equipment Class	Frequency Band		Head (Separation 0mm)	Hotspot (Separation 10mm)	Body-worn (Separation 15mm)	Highest Simultaneous Transmission 1g SAR (W/kg)
			1g SAR (W/kg)			
Licensed	GSM	GSM850	0.25	0.36	0.36	1.24
		GSM1900	0.39	0.20	0.20	
	WCDMA	Band V	0.34	0.47	0.47	
		Band II	0.66	0.33	0.42	
	LTE	Band 5	0.30	0.44	0.43	
		Band 7	0.48	0.28	0.30	
DTS	WLAN	2.4GHz WLAN	0.58	0.30	0.14	1.24
DSS	Bluetooth	2.4GHz Bluetooth	0.15		<0.10	0.81
Date of Testing:			2018/12/3~2018/12/25			

This device is in compliance with Specific Absorption Rate (SAR) for general population/uncontrolled exposure limits (1.6 W/kg for Partial-Body 1g SAR) specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992, and had been tested in accordance with the measurement methods and procedures specified in IEEE 1528-2013 and FCC KDB publications.



2. Administration Data

Testing Laboratory	
Test Site	Sporton International (Kunshan) Inc.
Test Site Location	No. 1098, Pengxi North Road, Kunshan Economic Development Zone, Jiangsu Province 215335, China TEL : 86-512-57900158 FAX : 86-512-57900958

Applicant	
Company Name	Huawei Technologies Co., Ltd.
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

Manufacturer	
Company Name	Huawei Technologies Co., Ltd.
Address	Administration Building, Headquarters of Huawei Technologies Co., Ltd., Bantian, Longgang District, Shenzhen, 518129, P.R.C

3. Guidance Applied

The Specific Absorption Rate (SAR) testing specification, method, and procedure for this device is in accordance with the following standards:

- FCC 47 CFR Part 2 (2.1093)
- ANSI/IEEE C95.1-1992
- IEEE 1528-2013
- FCC KDB 865664 D01 SAR Measurement 100 MHz to 6 GHz v01r04
- FCC KDB 865664 D02 SAR Reporting v01r02
- FCC KDB 447498 D01 General RF Exposure Guidance v06
- FCC KDB 648474 D04 SAR Evaluation Considerations for Wireless Handsets v01r03
- FCC KDB 248227 D01 802.11 Wi-Fi SAR v02r02
- FCC KDB 616217 D04 SAR for laptop and tablets v01r02
- FCC KDB 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

4. Equipment Under Test (EUT) Information

4.1 General Information

Product Feature & Specification			
Equipment Name	smart phone		
Brand Name	HUAWEI		
Model Name	MRD-LX1N		
FCC ID	QISMRD-LX1N		
IMEI Code		Test Sample for MRD-LX1	Test Sample for MRD-LX1N
	With battery 1	SIM1: 865037040015998 SIM2: 865037040022499	SIM1: 866945040025057 SIM2: 866945040030214
	With battery 2	SIM1: 865037040015790 SIM2: 865037040022291	SIM1: 866945040028259 SIM2: 866945040033416
	With battery 3	SIM1: 865037040016491 SIM2: 865037040022994	SIM1: 866945040025297 SIM2: 866945040030453
Wireless Technology and Frequency Range	GSM850: 824.2 MHz ~ 848.8 MHz GSM1900: 1850.2 MHz ~ 1909.8 MHz WCDMA Band II: 1852.4 MHz ~ 1907.6 MHz WCDMA Band V: 826.4 MHz ~ 846.6 MHz LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz		
Mode	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA HSPA+ (16QAM uplink) LTE: QPSK, 16QAM WLAN 2.4GHz 802.11b/g/n HT20/HT40 Bluetooth BR/EDR/LE NFC:ASK		
HW Version	HL1JATM		
SW Version	5.0.1.57(SP1C900E64R1P3)		
GSM / (E)GPRS Transfer mode	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.		
Remark:			
<ol style="list-style-type: none"> This device supports VoIP in WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation. This device 2.4GHz WLAN support hotspot operation. This device does not support DTM operation and supports GRPS/EGRPS mode up to multi-slot class 12. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of all WWAN Bands. The device employs proximity sensors that detect the presence of the user's body at the back and bottom side faces of the device. When back or bottom side is detected, all WWAN Bands reduced power will be active. When the phone is in talking mode and receiver worked, then power reduction will be implemented immediately at WLAN2.4GHz. The device has two SIM slots and supports dual SIM dual standby. The WWAN radio transmission will be enabled by either one SIM at a time (single active). After pre-scan two SIM cards power, we found test result of the SIM1 was the worse, so we chose SIM1 slot to perform all tests, SIM2 only verified the worst case of SIM1 for each position. There are three batteries which with the same capacity, they are only with different suppliers. We only chose battery 1 for full test, and battery 2/3 only verified the worst case of battery 1 for each position. This application re-uses data collected on a similar device. The subject device of this application is electrically identical to the reference device (Model: MRD-LX1, FCC ID: QISMRD-LX1) for the portions of the circuitry corresponding to the data being re-used. The difference is MDR-LX1 without NFC function and MRD-LX1N with NFC function. So spot check for the worst cases of the referenced test report FA8N3012 for ensuring that SAR measurement for both device are almost the same, so the referenced SAR value can represent this application. 			

4.2 Specification of Accessory

Battery NO.	Manufacture	Description
1	HuaweiTechnologies Co., Ltd. (Manufacturer: SCUD)	Battery Model: HB405979ECW Rated capacity: 2920mAh Nominal Voltage:  +3.82V
2	HuaweiTechnologies Co., Ltd. (Manufacturer: Sunwoda)	
3	HuaweiTechnologies Co., Ltd. (Manufacturer: Desay)	

Headset NO.	Manufacture	Model
1	Jiangxi Lianchuang Hongsheng Electronic Co. ,LTD.	MEND1532B528A02
2	Boluo County Quancheng Electronic Co.,ltd.	1293-3283-3.5MM-322

4.3 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05																																																															
FCC ID	QISM RD-LX1N																																																														
Equipment Name	smart phone																																																														
Operating Frequency Range of each LTE transmission band	LTE Band 5: 824.7 MHz ~ 848.3 MHz LTE Band 7: 2502.5 MHz ~ 2567.5 MHz																																																														
Channel Bandwidth	LTE Band 5: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz																																																														
Uplink Modulations Used	QPSK, 16QAM																																																														
LTE Voice / Data requirements	Voice and Data																																																														
LTE Release Version	R10, Cat4																																																														
CA Support	Not Supported																																																														
LTE MPR permanently built-in by design	<p align="center">Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3</p> <table border="1"> <thead> <tr> <th rowspan="2">Modulation</th> <th colspan="6">Channel bandwidth / Transmission bandwidth (N_{RB})</th> <th rowspan="2">MPR (dB)</th> </tr> <tr> <th>1.4 MHz</th> <th>3.0 MHz</th> <th>5 MHz</th> <th>10 MHz</th> <th>15 MHz</th> <th>20 MHz</th> </tr> </thead> <tbody> <tr> <td>QPSK</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 1</td> </tr> <tr> <td>16 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>≤ 5</td> <td>≤ 4</td> <td>≤ 8</td> <td>≤ 12</td> <td>≤ 16</td> <td>≤ 18</td> <td>≤ 2</td> </tr> <tr> <td>64 QAM</td> <td>> 5</td> <td>> 4</td> <td>> 8</td> <td>> 12</td> <td>> 16</td> <td>> 18</td> <td>≤ 3</td> </tr> <tr> <td>256 QAM</td> <td colspan="6" style="text-align: center;">≥ 1</td> <td>≤ 5</td> </tr> </tbody> </table>	Modulation	Channel bandwidth / Transmission bandwidth (N _{RB})						MPR (dB)	1.4 MHz	3.0 MHz	5 MHz	10 MHz	15 MHz	20 MHz	QPSK	> 5	> 4	> 8	> 12	> 16	> 18	≤ 1	16 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 1	16 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 2	64 QAM	≤ 5	≤ 4	≤ 8	≤ 12	≤ 16	≤ 18	≤ 2	64 QAM	> 5	> 4	> 8	> 12	> 16	> 18	≤ 3	256 QAM	≥ 1						≤ 5
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256 QAM	≥ 1						≤ 5																																																								
LTE A-MPR	In the base station simulator configuration, Network Setting value is set to NS_01 to disable A-MPR during SAR testing and the LTE SAR tests was transmitting on all TTI frames (Maximum TTI)																																																														
Spectrum plots for RB configuration	A properly configured base station simulator was used for the SAR and power measurement; therefore, spectrum plots for each RB allocation and offset configuration are not included in the SAR report.																																																														
Power reduction applied to satisfy SAR compliance	<p>Yes</p> <ol style="list-style-type: none"> When hotspot mode is enabled, power reduction will be activated to limit the maximum power of LTE band 5/7. The device employs proximity sensors that detect the presence of the user's body at the back and bottom faces of the device. When back or bottom side condition is detected, LTE band 5/7 reduced power will be active. 																																																														

Transmission (H, M, L) channel numbers and frequencies in each LTE band								
LTE Band 5								
	Bandwidth 1.4 MHz		Bandwidth 3 MHz		Bandwidth 5 MHz		Bandwidth 10 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20407	824.7	20415	825.5	20425	826.5	20450	829
M	20525	836.5	20525	836.5	20525	836.5	20525	836.5
H	20643	848.3	20635	847.5	20625	846.5	20600	844
LTE Band 7								
	Bandwidth 5 MHz		Bandwidth 10 MHz		Bandwidth 15 MHz		Bandwidth 20 MHz	
	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)	Ch. #	Freq. (MHz)
L	20775	2502.5	20800	2505	20825	2507.5	20850	2510
M	21100	2535	21100	2535	21100	2535	21100	2535
H	21425	2567.5	21400	2565	21375	2562.5	21350	2560



5. RF Exposure Limits

5.1 Uncontrolled Environment

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

5.2 Controlled Environment

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are applicable to situations in which persons are exposed as a consequence of their employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. The 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.

Limits for Occupational/Controlled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.4	8.0	20.0

Limits for General Population/Uncontrolled Exposure (W/kg)

Whole-Body	Partial-Body	Hands, Wrists, Feet and Ankles
0.08	1.6	4.0

Whole-Body SAR is averaged over the entire body, partial-body SAR is averaged over any 1gram of tissue defined as a tissue volume in the shape of a cube. SAR for hands, wrists, feet and ankles is averaged over any 10 grams of tissue defined as a tissue volume in the shape of a cube.

6. Specific Absorption Rate (SAR)

6.1 Introduction

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

6.2 SAR Definition

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

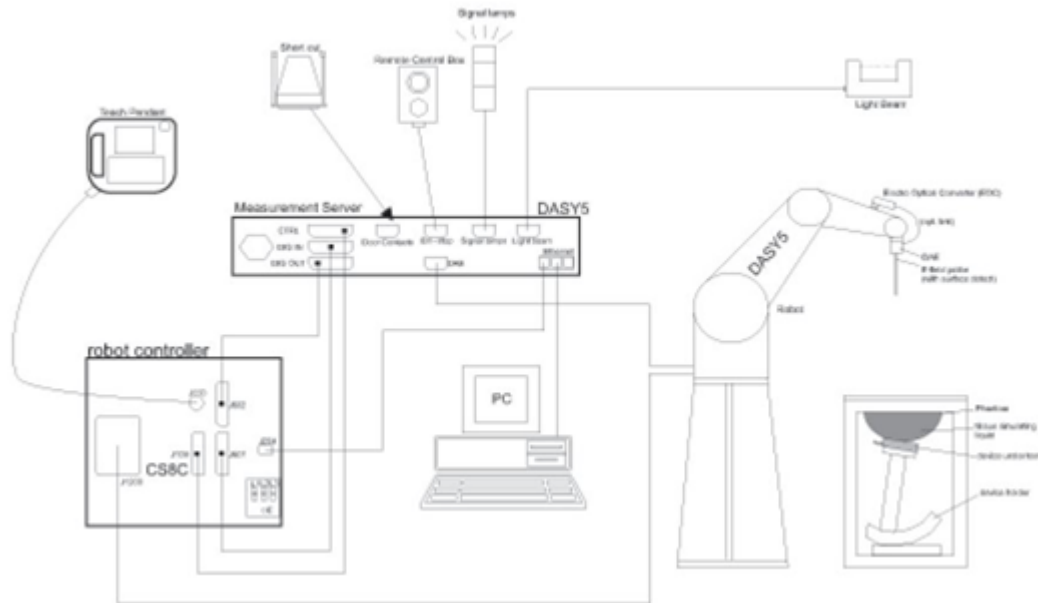
SAR is expressed in units of Watts per kilogram (W/kg)

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

7. System Description and Setup

The DASY system used for performing compliance tests consists of the following items:




- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- An isotropic Field probe optimized and calibrated for the targeted measurement.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.
- The Electro-optical converter (EOC) performs the conversion from optical to electrical signals for the digital communication to the DAE. To use optical surface detection, a special version of the EOC is required. The EOC signal is transmitted to the measurement server.
- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- The Light Beam used is for probe alignment. This improves the (absolute) accuracy of the probe positioning.
- A computer running WinXP or Win7 and the DASY5 software.
- Remote control and teach pendant as well as additional circuitry for robot safety such as warning lamps, etc.
- The phantom, the device holder and other accessories according to the targeted measurement.


7.1 E-Field Probe

The SAR measurement is conducted with the dosimetric probe (manufactured by SPEAG). The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency. This probe has a built in optical surface detection system to prevent from collision with phantom.

<ES3DV3 Probe>

Construction	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – 4 GHz; Linearity: ± 0.2 dB (30 MHz – 4 GHz)	
Directivity	± 0.2 dB in TSL (rotation around probe axis) ± 0.3 dB in TSL (rotation normal to probe axis)	
Dynamic Range	5 μ W/g – >100 mW/g; Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 3.9 mm (body: 12 mm) Distance from probe tip to dipole centers: 3.0 mm	

<EX3DV4 Probe>

Construction	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
Frequency	10 MHz – >6 GHz Linearity: ± 0.2 dB (30 MHz – 6 GHz)	
Directivity	± 0.3 dB in TSL (rotation around probe axis) ± 0.5 dB in TSL (rotation normal to probe axis)	
Dynamic Range	10 μ W/g – >100 mW/g Linearity: ± 0.2 dB (noise: typically <1 μ W/g)	
Dimensions	Overall length: 337 mm (tip: 20 mm) Tip diameter: 2.5 mm (body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

7.2 Data Acquisition Electronics (DAE)

The data acquisition electronics (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 measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.


The input impedance of the DAE is 200 MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.



Photo of DAE


7.3 Phantom

<SAM Twin Phantom>

Shell Thickness	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
Measurement Areas	Left Hand, Right Hand, Flat Phantom	

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

<ELI Phantom>

Shell Thickness	2 ± 0.2 mm (sagging: <1%)	
Filling Volume	Approx. 30 liters	
Dimensions	Major ellipse axis: 600 mm Minor axis: 400 mm	

The ELI phantom is intended for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI4 is fully compatible with standard and all known tissue simulating liquids.

7.4 Device Holder

<Mounting Device for Hand-Held Transmitter>

In combination with the Twin SAM V5.0/V5.0c or ELI phantoms, the Mounting Device for Hand-Held Transmitters enables rotation of the mounted transmitter device to specified spherical coordinates. At the heads, the rotation axis is at the ear opening. Transmitter devices can be easily and accurately positioned according to IEC 62209-1, IEEE 1528, FCC, or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat). And upgrade kit to Mounting Device to enable easy mounting of wider devices like big smart-phones, e-books, small tablets, etc. It holds devices with width up to 140 mm.



Mounting Device for Hand-Held Transmitters



Mounting Device Adaptor for Wide-Phones

<Mounting Device for Laptops and other Body-Worn Transmitters>

The extension is lightweight and made of POM, acrylic glass and foam. It fits easily on the upper part of the mounting device in place of the phone positioned. The extension is fully compatible with the SAM Twin and ELI phantoms.



Mounting Device for Laptops

8. Measurement Procedures

The measurement procedures are as follows:

<Conducted power measurement>

- (a) For WWAN power measurement, use base station simulator to configure EUT WWAN transmission in conducted connection with RF cable, at maximum power in each supported wireless interface and frequency band.
- (b) Read the WWAN RF power level from the base station simulator.
- (c) For WLAN/BT power measurement, use engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power in each supported wireless interface and frequency band
- (d) Connect EUT RF port through RF cable to the power meter, and measure WLAN/BT output power

<SAR measurement>

- (a) Use base station simulator to configure EUT WWAN transmission in radiated connection, and engineering software to configure EUT WLAN/BT continuously transmission, at maximum RF power, in the highest power channel.
- (b) Place the EUT in the positions as Appendix D demonstrates.
- (c) Set scan area, grid size and other setting on the DASY software.
- (d) Measure SAR results for the highest power channel on each testing position.
- (e) Find out the largest SAR result on these testing positions of each band
- (f) Measure SAR results for other channels in worst SAR testing position if the reported SAR of highest power channel is larger than 0.8 W/kg

According to the test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

8.1 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values form the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

8.2 Power Reference Measurement

The Power Reference Measurement and Power Drift Measurements are for monitoring the power drift of the device under test in the batch process. The minimum distance of probe sensors to surface determines the closest measurement point to phantom surface. This distance cannot be smaller than the distance of sensor calibration points to probe tip as defined in the probe properties.

8.3 Area Scan

The area scan is used as a fast scan in two dimensions to find the area of high field values, before doing a fine measurement around the hot spot. The sophisticated interpolation routines implemented in DASY software can find the maximum found in the scanned area, within a range of the global maximum. The range (in dB0 is specified in the standards for compliance testing. For example, a 2 dB range is required in IEEE standard 1528 and IEC 62209 standards, whereby 3 dB is a requirement when compliance is assessed in accordance with the ARIB standard (Japan), if only one zoom scan follows the area scan, then only the absolute maximum will be taken as reference. For cases where multiple maximums are detected, the number of zoom scans has to be increased accordingly.

Area scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

	≤ 3 GHz	> 3 GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	5 ± 1 mm	$\frac{1}{2} \cdot \delta \cdot \ln(2) \pm 0.5$ mm
Maximum probe angle from probe axis to phantom surface normal at the measurement location	30° ± 1°	20° ± 1°
Maximum area scan spatial resolution: Δx_{Area} , Δy_{Area}	≤ 2 GHz: ≤ 15 mm 2 – 3 GHz: ≤ 12 mm	3 – 4 GHz: ≤ 12 mm 4 – 6 GHz: ≤ 10 mm
	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.	

8.4 Zoom Scan

Zoom scans are used assess the peak spatial SAR values within a cubic averaging volume containing 1 gram and 10 gram of simulated tissue. The zoom scan measures points (refer to table below) within a cube shoes base faces are centered on the maxima found in a preceding area scan job within the same procedure. When the measurement is done, the zoom scan evaluates the averaged SAR for 1 gram and 10 gram and displays these values next to the job's label.

Zoom scan parameters extracted from FCC KDB 865664 D01v01r04 SAR measurement 100 MHz to 6 GHz.

		≤ 3 GHz	> 3 GHz
Maximum zoom scan spatial resolution: $\Delta x_{Zoom}, \Delta y_{Zoom}$		≤ 2 GHz: ≤ 8 mm 2 – 3 GHz: ≤ 5 mm*	3 – 4 GHz: ≤ 5 mm* 4 – 6 GHz: ≤ 4 mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{Zoom}(n)$	≤ 5 mm	3 – 4 GHz: ≤ 4 mm 4 – 5 GHz: ≤ 3 mm 5 – 6 GHz: ≤ 2 mm
	graded grid	$\Delta z_{Zoom}(1)$: between 1 st two points closest to phantom surface	≤ 4 mm 3 – 4 GHz: ≤ 3 mm 4 – 5 GHz: ≤ 2.5 mm 5 – 6 GHz: ≤ 2 mm
		$\Delta z_{Zoom}(n>1)$: between subsequent points	$\leq 1.5 \cdot \Delta z_{Zoom}(n-1)$
Minimum zoom scan volume	x, y, z	≥ 30 mm	3 – 4 GHz: ≥ 28 mm 4 – 5 GHz: ≥ 25 mm 5 – 6 GHz: ≥ 22 mm
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 <i>reported</i> SAR from the <i>area scan based 1-g SAR estimation</i> 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.			

8.5 Volume Scan Procedures

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

8.6 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASY measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drifts more than 5%, the SAR will be retested.



9. Test Equipment List

Manufacturer	Name of Equipment	Type/Model	Serial Number	Calibration	
				Last Cal.	Due Date
SPEAG	835MHz System Validation Kit	D835V2	4d151	2018/3/26	2019/3/25
SPEAG	1900MHz System Validation Kit	D1900V2	5d170	2018/3/25	2019/3/24
SPEAG	2450MHz System Validation Kit	D2450V2	908	2018/3/22	2019/3/21
SPEAG	2600MHz System Validation Kit	D2600V2	1061	2017/12/7	2018/12/6
SPEAG	2600MHz System Validation Kit	D2600V2	1061	2018/12/7	2019/12/6
SPEAG	Data Acquisition Electronics	DAE4	1358	2018/4/19	2019/4/18
SPEAG	Data Acquisition Electronics	DAE4	1279	2018/10/22	2019/10/21
SPEAG	Data Acquisition Electronics	DAE4	1338	2018/12/3	2019/12/2
SPEAG	Data Acquisition Electronics	DAE4	1210	2018/5/28	2019/5/27
SPEAG	Dosimetric E-Field Probe	ES3DV3	3293	2018/10/25	2019/10/24
SPEAG	Dosimetric E-Field Probe	EX3DV4	3857	2018/5/31	2019/5/30
SPEAG	Dosimetric E-Field Probe	EX3DV4	3843	2018/9/27	2019/9/26
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1754	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1839	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1503	NCR	NCR
SPEAG	ELI4 Phantom	QD 0VA 001 BB	TP-1842	NCR	NCR
SPEAG	SAM Twin Phantom	QD 000 P40 CB	TP-1697	NCR	NCR
SPEAG	Phone Positioner	N/A	N/A	NCR	NCR
Anritsu	Radio communication analyzer	MT8820C	6201563900	2018/1/26	2019/1/25
Agilent	Wireless Communication Test Set	E5515C	MY52102706	2018/4/17	2019/4/16
Agilent	ENA Series Network Analyzer	E5071C	MY46111157	2018/4/17	2019/4/16
SPEAG	Dielectric Probe Kit	DAK-3.5	1144	2018/1/9	2019/1/8
Anritsu	Vector Signal Generator	MG3710A	6201682672	2018/2/6	2019/2/5
R&S	Power Meter	NRVD	102081	2018/8/20	2019/8/19
R&S	Power Sensor	NRV-Z5	100538	2018/8/20	2019/8/19
R&S	Power Sensor	NRV-Z5	100539	2018/8/20	2019/8/19
R&S	CBT BLUETOOTH TESTER	CBT	101246	2018/1/26	2019/1/25
EXA	Spectrum Analyzer	FSV7	101742	2018/1/19	2019/1/18
Testo	Hygrometer	608-H1	1241332126	2018/8/21	2019/8/20
FLUKE	DIGITAC THERMOMETER	51II	97240029	2018/8/8	2019/8/7
ARRA	Power Divider	A3200-2	N/A		Note
MCL	Attenuation1	BW-S10W5+	N/A		Note
MCL	Attenuation2	BW-S10W5+	N/A		Note
MCL	Attenuation3	BW-S10W5+	N/A		Note
Agilent	Dual Directional Coupler	778D	20500		Note
Agilent	Dual Directional Coupler	11691D	MY48151020		Note
BONN	POWER AMPLIFIER	BLMA 0830-3	087193A		Note
BONN	POWER AMPLIFIER	BLMA 2060-2	087193B		Note

Note:

Prior to system verification and validation, the path loss from the signal generator to the system check source and the power meter, which includes the amplifier, cable, attenuator and directional coupler, was measured by the network analyzer. The reading of the power meter was offset by the path loss difference between the path to the power meter and the path to the system check source to monitor the actual power level fed to the system check.

10. System Verification

10.1 Tissue Simulating Liquids

For the measurement of the field distribution inside the SAM phantom with DASY, the phantom must be filled with around 25 liters of homogeneous body tissue simulating liquid. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.1. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm, which is shown in Fig. 10.2.

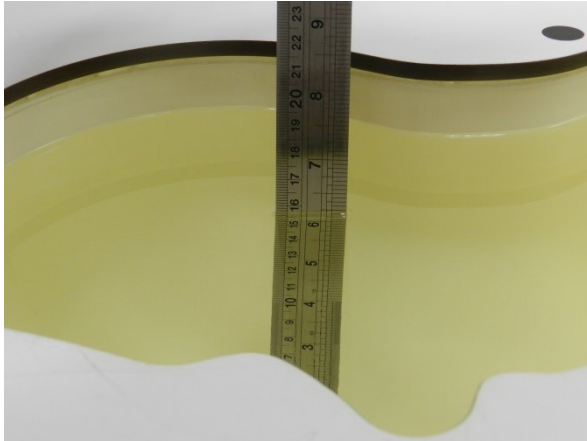


Fig 10.1 Photo of Liquid Height for Head SAR

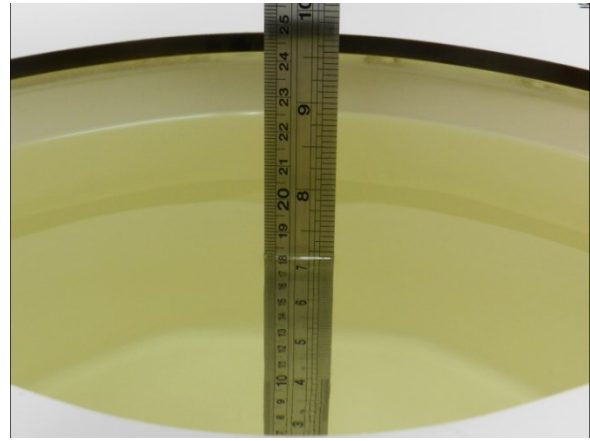


Fig 10.2 Photo of Liquid Height for Body SAR

10.2 Tissue Verification

The following tissue formulations are provided for reference only as some of the parameters have not been thoroughly verified. The composition of ingredients may be modified accordingly to achieve the desired target tissue parameters required for routine SAR evaluation.

Frequency (MHz)	Water (%)	Sugar (%)	Cellulose (%)	Salt (%)	Preventol (%)	DGBE (%)	Conductivity (σ)	Permittivity (ϵ_r)
For Head								
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
1800, 1900, 2000	55.2	0	0	0.3	0	44.5	1.40	40.0
2450	55.0	0	0	0	0	45.0	1.80	39.2
2600	54.8	0	0	0.1	0	45.1	1.96	39.0
For Body								
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
1800, 1900, 2000	70.2	0	0	0.4	0	29.4	1.52	53.3
2450	68.6	0	0	0	0	31.4	1.95	52.7
2600	68.1	0	0	0.1	0	31.8	2.16	52.5

<Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
835	Head	22.7	0.908	42.255	0.90	41.50	0.89	1.82	±5	2018/12/3
1900	Head	22.7	1.428	41.108	1.40	40.00	2.00	2.77	±5	2018/12/3
2450	Head	22.6	1.864	38.667	1.80	39.20	3.56	-1.36	±5	2018/12/4
2450	Head	22.8	1.841	38.234	1.80	39.20	2.28	-2.46	±5	2018/12/20
2600	Head	22.8	2.040	37.884	1.96	39.00	4.08	-2.86	±5	2018/12/4
835	Body	22.9	1.007	54.328	0.97	55.20	3.81	-1.58	±5	2018/12/3
1900	Body	22.7	1.526	51.581	1.52	53.30	0.39	-3.23	±5	2018/12/3
2450	Body	22.7	2.005	53.300	1.95	52.70	2.82	1.14	±5	2018/12/5
2450	Body	22.8	2.004	53.295	1.95	52.70	2.77	1.13	±5	2018/12/20
2600	Body	22.8	2.207	52.750	2.16	52.50	2.18	0.48	±5	2018/12/5

<Spot Check Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Conductivity Target (σ)	Permittivity Target (ϵ_r)	Delta (σ) (%)	Delta (ϵ_r) (%)	Limit (%)	Date
835	Head	22.8	0.898	41.000	0.90	41.50	-0.22	-1.20	±5	2018/12/25
1900	Head	22.8	1.424	38.799	1.40	40.00	1.71	-3.00	±5	2018/12/25
2450	Head	22.7	1.867	38.486	1.80	39.20	3.72	-1.82	±5	2018/12/25
2600	Head	22.8	2.012	37.658	1.96	39.00	2.65	-3.44	±5	2018/12/25
835	Body	22.6	0.978	54.493	0.97	55.20	0.82	-1.28	±5	2018/12/24
1900	Body	22.7	1.547	51.779	1.52	53.30	1.78	-2.85	±5	2018/12/24
2450	Body	22.8	2.011	52.237	1.95	52.70	3.13	-0.88	±5	2018/12/24
2600	Body	22.8	2.186	50.820	2.16	52.50	1.20	-3.20	±5	2018/12/24

10.3 System Performance Check Results

Comparing to the original SAR value provided by SPEAG, the verification data should be within its specification of 10 %. Below table shows the target SAR and measured SAR after normalized to 1W input power. The table below indicates the system performance check can meet the variation criterion and the plots can be referred to Appendix A of this report.

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2018/12/3	835	Head	250	4d151	3293	1358	2.31	9.66	9.24	-4.35
2018/12/3	1900	Head	250	5d170	3293	1358	9.36	39.90	37.44	-6.17
2018/12/4	2450	Head	250	908	3857	1279	13.40	51.80	53.60	3.47
2018/12/20	2450	Head	250	908	3857	1279	13.30	51.80	53.20	2.70
2018/12/4	2600	Head	250	1061	3293	1358	14.10	58.20	56.40	-3.09
2018/12/3	835	Body	250	4d151	3857	1279	2.37	9.58	9.48	-1.04
2018/12/3	1900	Body	250	5d170	3857	1279	9.60	40.70	38.40	-5.65
2018/12/5	2450	Body	250	908	3857	1279	13.10	50.70	52.40	3.35
2018/12/20	2450	Body	250	908	3857	1279	13.20	50.70	52.8	4.14
2018/12/5	2600	Body	250	1061	3857	1279	13.60	56.40	54.40	-3.55

<Spot Check>

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 1g SAR (W/kg)	Targeted 1g SAR (W/kg)	Normalized 1g SAR (W/kg)	Deviation (%)
2018/12/25	835	Head	250	4d151	3843	1338	2.34	9.66	9.36	-3.11
2018/12/25	1900	Head	250	5d170	3843	1338	9.23	39.90	36.92	-7.47
2018/12/25	2450	Head	250	908	3843	1338	12.90	51.80	51.60	-0.39
2018/12/25	2600	Head	250	1061	3843	1338	13.30	57.70	53.20	-7.80
2018/12/24	835	Body	250	4d151	3857	1210	2.30	9.58	9.20	-3.97
2018/12/24	1900	Body	250	5d170	3857	1210	9.73	40.70	38.92	-4.37
2018/12/24	2450	Body	250	908	3857	1210	13.40	50.70	53.60	5.72
2018/12/24	2600	Body	250	1061	3857	1210	14.20	54.20	56.80	4.80

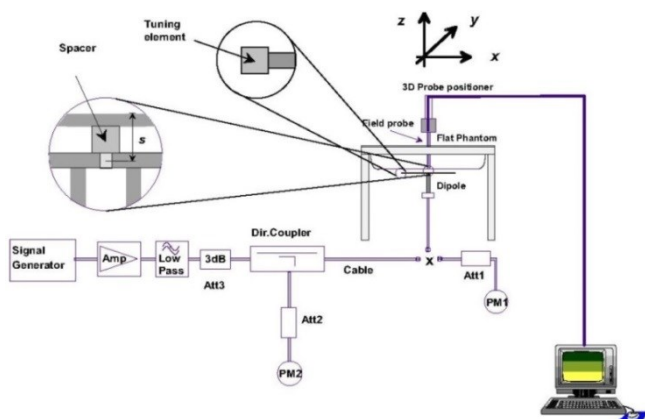


Fig 10.3.1 System Performance Check Setup

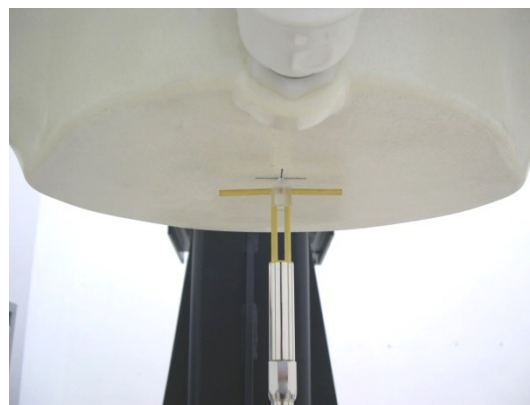


Fig 10.3.2 Setup Photo

11. RF Exposure Positions

11.1 Ear and handset reference point

Figure 11.1.1 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 15 mm along the B-M (back-mouth) line behind the entrance-to-ear-canal (EEC) point, as shown in Figure 11.1.2 The Reference Plane is defined as passing through the two ear reference points and point M. The line N-F (neck-front), also called the reference pivoting line, is normal to the Reference Plane and perpendicular to both a line passing through RE and LE and the B-M line (see Figure 11.1.3). Both N-F and B-M lines should be marked on the exterior of the phantom shell to facilitate handset positioning. Posterior to the N-F line the ear shape is a flat surface with 6 mm thickness at each ERP, and forward of the N-F line the ear is truncated, as illustrated in Figure 11.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

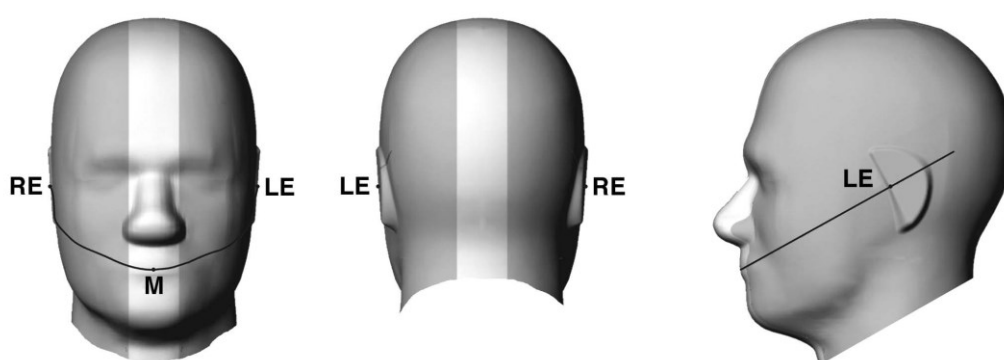


Fig 11.1.1 Front, back, and side views of SAM twin phantom

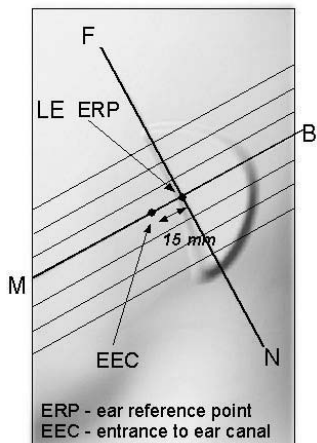


Fig 11.1.2 Close-up side view of phantom showing the ear region.

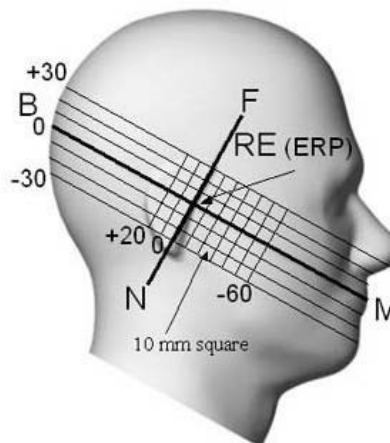


Fig 11.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

11.2 Definition of the cheek position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. Define two imaginary lines on the handset—the vertical centerline and the horizontal line. The vertical centerline passes through two points on the front side of the handset—the midpoint of the width w_t of the handset at the level of the acoustic output (point A in Figure 11.2.1 and Figure 11.2.2), and the midpoint of the width w_b of the bottom of the handset (point B). The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output (see Figure 11.2.1). The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset (see Figure 11.2.2), especially for clamshell handsets, handsets with flip covers, and other irregularly-shaped handsets.
3. Position the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 11.2.3), such that the plane defined by the vertical centerline and the horizontal line of the handset is approximately parallel to the sagittal plane of the phantom.
4. Translate the handset towards the phantom along the line passing through RE and LE until handset point A touches the pinna at the ERP.
5. While maintaining the handset in this plane, rotate it around the LE-RE line until the vertical centerline is in the plane normal to the plane containing B-M and N-F lines, i.e., the Reference Plane.
6. Rotate the handset around the vertical centerline until the handset (horizontal line) is parallel to the N-F line.
7. While maintaining the vertical centerline in the Reference Plane, keeping point A on the line passing through RE and LE, and maintaining the handset contact with the pinna, rotate the handset about the N-F line until any point on the handset is in contact with a phantom point below the pinna on the cheek. See Figure 11.2.3. The actual rotation angles should be documented in the test report.

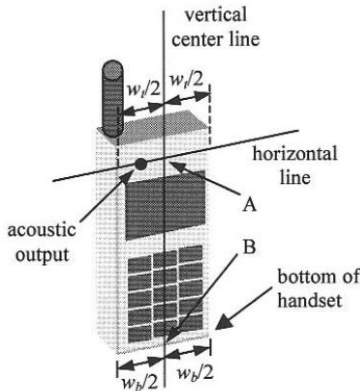


Fig 11.2.1 Handset vertical and horizontal reference lines—“fixed case”

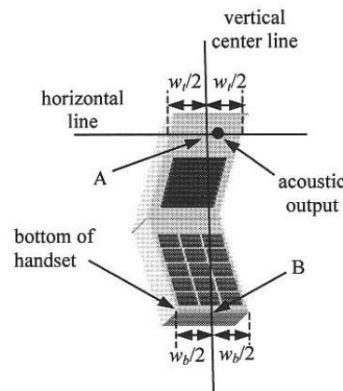


Fig 11.2.2 Handset vertical and horizontal reference lines—“clam-shell case”

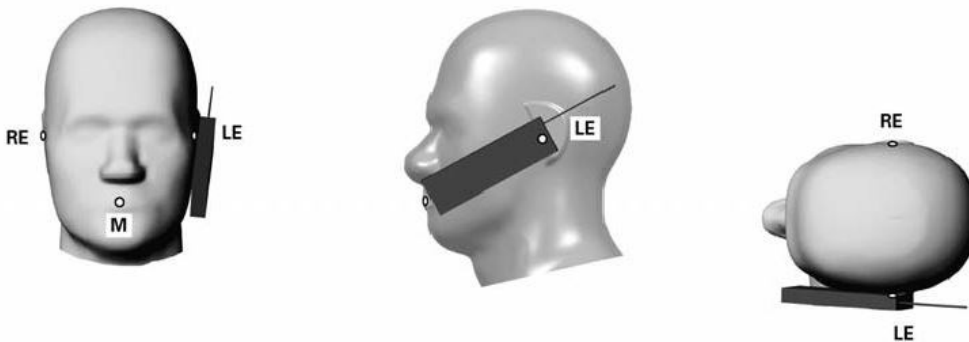


Fig 11.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.

11.3 Definition of the tilt position

1. Ready the handset for talk operation, if necessary. For example, for handsets with a cover piece (flip cover), open the cover. If the handset can transmit with the cover closed, both configurations must be tested.
2. While maintaining the orientation of the handset, move the handset away from the pinna along the line passing through RE and LE far enough to allow a rotation of the handset away from the cheek by 15°.
3. Rotate the handset around the horizontal line by 15°.
4. While maintaining the orientation of the handset, move the handset towards the phantom on the line passing through RE and LE until any part of the handset touches the ear. The tilt position is obtained when the contact point is on the pinna. See Figure 11.3.1. If contact occurs at any location other than the pinna, e.g., the antenna at the back of the phantom head, the angle of the handset should be reduced. In this case, the tilt position is obtained if any point on the handset is in contact with the pinna and a second point

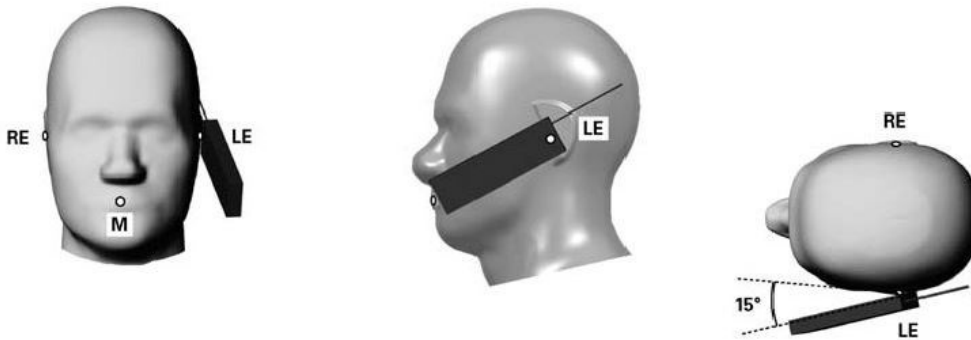


Fig 11.3.1 Tilt position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

11.4 Body Worn Accessory

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 11.4). Per KDB648474 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 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for 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.

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-chip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

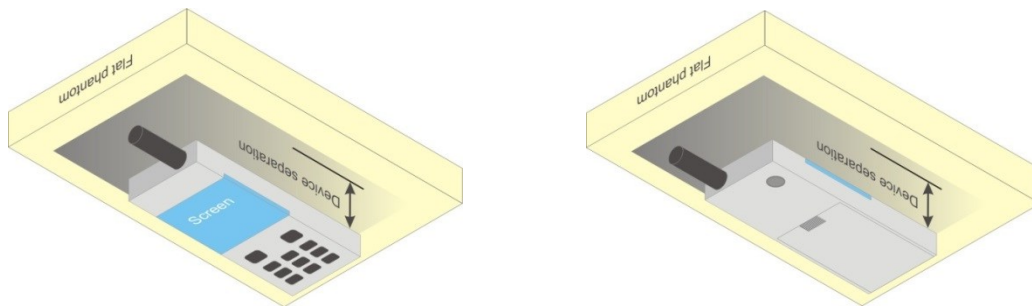


Fig 11.4 Body Worn Position

11.5 Wireless Router

Some battery-operated handsets have the capability to transmit and receive user through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v02r01 where SAR test considerations for handsets ($L \times W \geq 9$ cm \times 5 cm) are based on a composite test separation distance of 10mm from the front, back and edges of the device containing transmitting antennas within 2.5cm 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.

12. Audio Receiver Detection Mechanism

This mobile phone device supports the receiver detection mechanism. The main purpose is to minimize triggering associated with power reduction scenarios by receiver detection mechanisms and provide enhanced user experience.

This device uses the receiver to indicate whether the user is making a call in head scenario or not. The selection between head and body power levels is based on the receiver detection mechanism. It can determine proximity to head or body and set the relevant power level for WiFi antenna accordingly.

Audio receiver detection mechanism clarifications:

1) When there is a voice call (including VOIP) and the modem chip detects that the Headset is unconnected and speaker is off, then the receiver is triggered and it is considered as Held to ear scenario (Head). The power level A is applied.

2) When there is a voice call, but the headset is connected or speaker mode is on, the receiver will not work. It is considered as other scenarios (Body etc.). The power level B is applied.

3) When there is data service only (No voice call, including VOIP), the receiver will not work too. It is considered as other scenarios (Body etc.). The power level B is applied.

WWAN antenna + WiFi antenna simultaneous transmission			
Band/Mode	Power Reduction Level Amount (dB)		
	2G&3G&4G Antenna(Voice) + WiFi on	VO-WiFi(Voice) + WiFi on	Other scenarios
WiFi 2.4GHz	4.0	4.0	0

The SAR test plan is as below:

- For head SAR test of WiFi antenna, standalone head SAR should be evaluated with audio receiver on and use reduced power (power level A).
- For body SAR test of WiFi antenna standalone Body should be evaluated with full power (power level B).

13. General Information for Proximity Sensor

The following tables summarize the key power reduction information of 2G/3G/4G main antenna. The detailed full power and reduced conducted power measurement results are provided in this report.

Band	Sensor Trigger Distance	Capacitive sensor on+ Receiver off	Hotspot on + capacitive sensor off	Other conditions
		Power reduction(dB)	Power reduction(dB)	
GSM850	Back side: 19 mm	1	1	0
	Bottom side: 13 mm			
GSM1900	Back side: 19 mm	2	2	0
	Bottom side: 13 mm			
WCDMA Band II	Back side: 19 mm	3	3	0
	Bottom side: 13 mm			
WCDMA Band V	Back side: 19 mm	1	1	0
	Bottom side: 13 mm			
LTE Band 5	Back side: 19 mm	1	1	0
	Bottom side: 13 mm			
LTE Band 7	Back side: 19 mm	4	4	0
	Bottom side: 13 mm			

Note:

- 1) Since the capacitive proximity sensor triggering distance for the Back is 19mm, a conservative distance of Back 18mm was required for additional SAR test at maximum power level with sensor off. So for back side of body-worn , we verified 18mm full power SAR.
- 2) About Bottom side, though proximity sensor triggering distance is 13mm, but for this test report, we only performed head/hotspot/body-worn SAR testing, when hotspot mode, bottom side will implanted hotspot power level. So no need to consider verify bottom SAR with 12mm distance.
- 3) SAR tests with proximity sensor power reduction are only required for the sides of frequency bands in the table above. For the other sides or other frequency bands of the device, SAR is still tested at the maximum power level with sensor off.

13.1 Proximity sensor triggering distances(Per KDB616217§6.2)

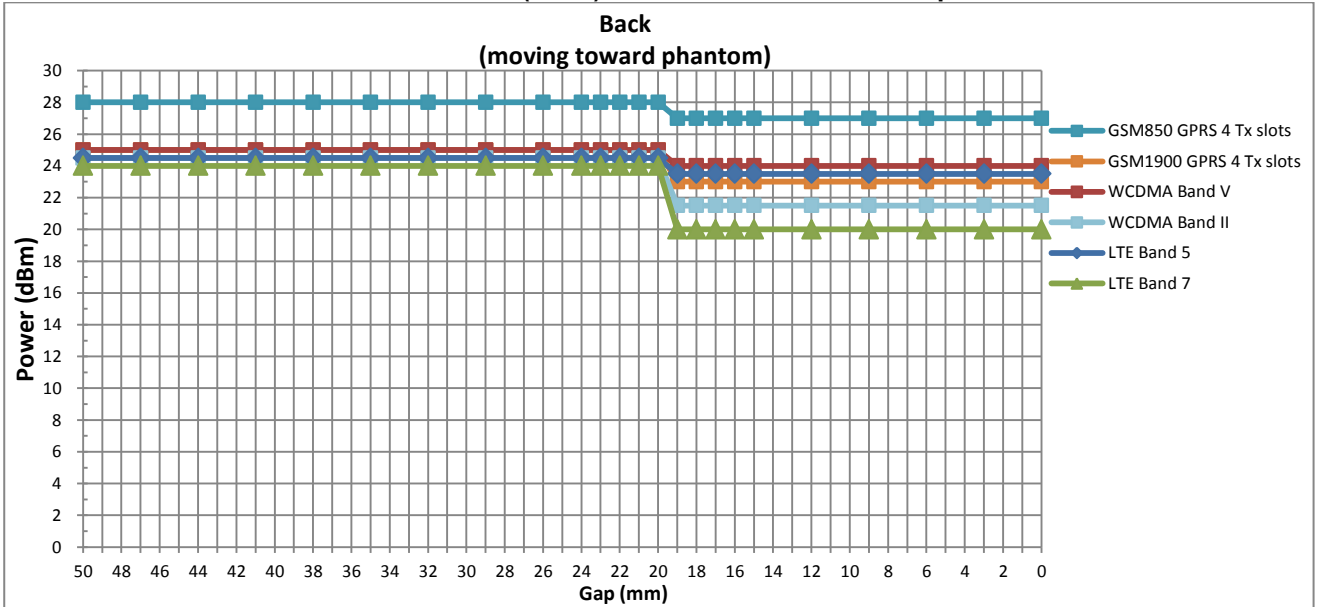
The proximity sensor triggering distances for back side and bottom side of the device is as the following table. To ensure all production units are compliant, the smallest separation distance determined by the sensor triggering minus 1 mm, must be used as the test separation distance for SAR testing.



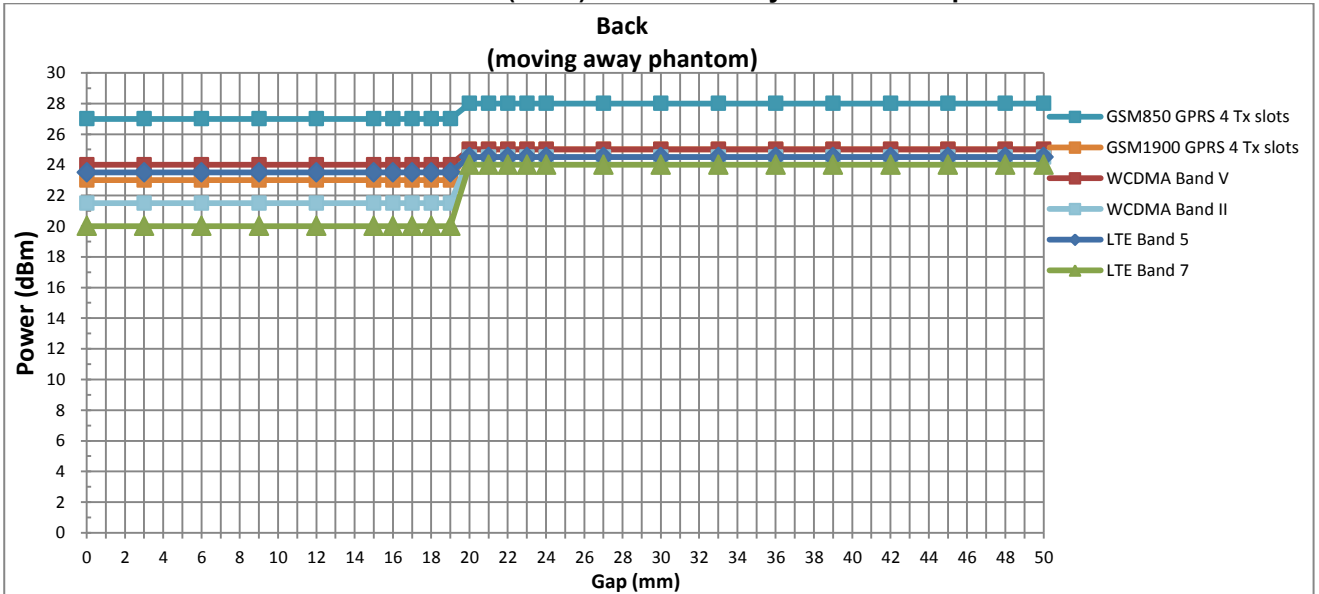
Table: Summary of Trigger Distances

Band(MHz)	Trigger distance-Back Side		Trigger distance-Bottom Side	
	Moving toward phantom	Moving away from phantom	Moving toward phantom	Moving away from phantom
GSM850	19	19	13	13
GSM1900	19	19	13	13
WCDMA Band II	19	19	13	13
WCDMA Band V	19	19	13	13
LTE Band 5	19	19	13	13
LTE Band 7	19	19	13	13

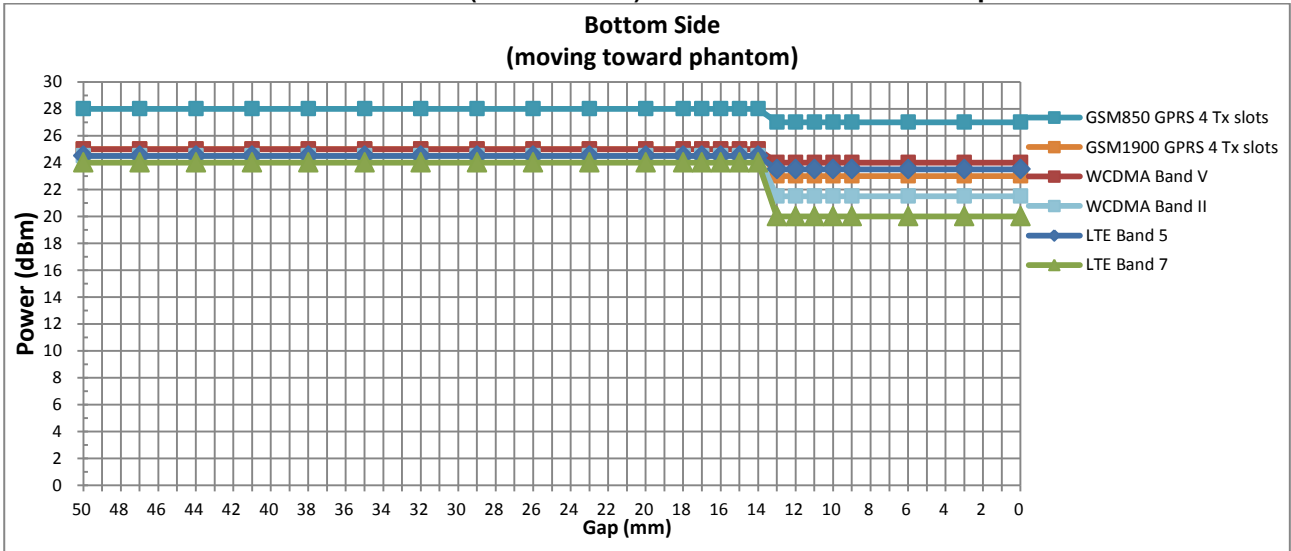
<The DUT (Back) is moved towards the flat phantom>



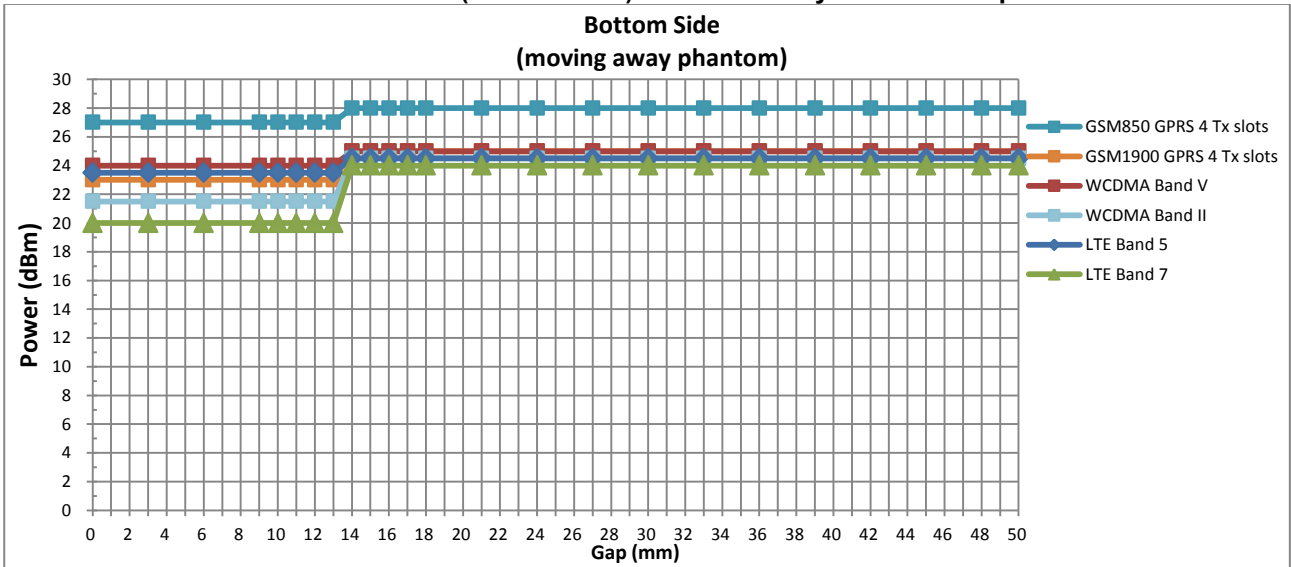
<The DUT (Back) is moved away from the flat phantom>



<The DUT (Bottom Side) is moved towards the flat phantom>



<The DUT (Bottom Side) is moved away from the flat phantom>



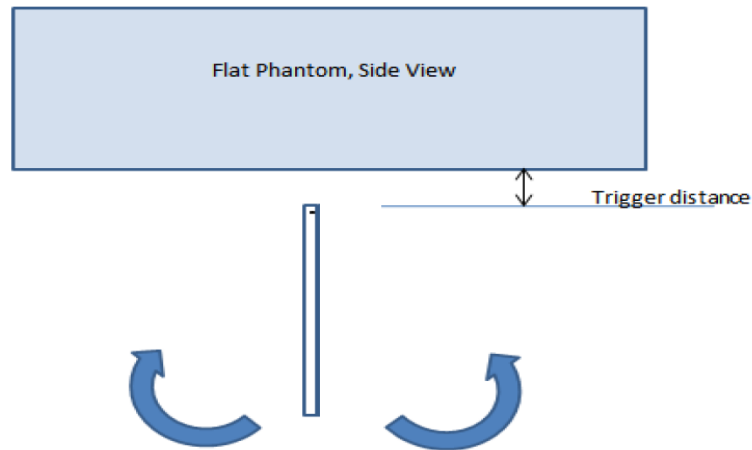
Conclusion: It can be ensured that the proximity sensor can be valid triggered for the body exposure condition (GSM850/1900, WCDMA Band II/V, LTE Band 5/7 with Main Antenna).

13.2 Proximity Sensor Triggering Coverage (KDB 616217 D04 section 6.3)

The proximity sensor and main antenna use same metallic electrode, so there is no spatial offset.

13.3 Tilt angle influences to proximity sensor triggering(Per KDB616217 §6.4)

The DUT was positioned directly below the flat phantom at the minimum measured trigger distance with Bottom side parallel to the base of the flat phantom for each band. The EUT was rotated about Bottom side for angles up to +/- 45°. If the output power increased during the rotation the DUT was moved 1mm toward the phantom and the rotation repeated. This procedure was repeated until the power remained reduced for all angles up to +/- 45°.



Proximity Sensor Coverage Assesment(Bottom Side)

Table: Summary of device Tilt Angle Influence to Proximity Sensor Triggering (Bottom side)

Main ant Band(MHz)	Minimum trigger distance at which power reduction was maintained over ±45°	Power Reduction Status											
		-45°	-35°	-25°	-15°	-5°	0°	5°	15°	25°	35°	45°	
GSM850	13mm	on	on	on	on	on	on	on	on	on	on	on	on
GSM1900	13mm	on	on	on	on	on	on	on	on	on	on	on	on
WCDMA Band II	13mm	on	on	on	on	on	on	on	on	on	on	on	on
WCDMA Band V	13mm	on	on	on	on	on	on	on	on	on	on	on	on
LTE Band 5	13mm	on	on	on	on	on	on	on	on	on	on	on	on
LTE Band 7	13mm	on	on	on	on	on	on	on	on	on	on	on	on

Conclusion: As is shown from the validation data, it can be ensured that the proximity sensor can be valid triggered for the DUT tilt coverage exposure condition.

Summary SAR test Plan for Proximity sensor power reduction:

1. Since the capacitive proximity sensor triggering distance for the Back is 19mm, a conservative distance of Back 18mm was required for additional SAR test at maximum power level with sensor off. So for back side of body-worn, we verified 18mm full power SAR.
2. About Bottom side, though proximity sensor triggering distance is 13mm, but for this test report, we only performed head/hotspot/body-worn SAR testing, when hotspot mode, bottom side will implanted hotspot power level. So no need to consider verify bottom SAR with 12mm distance.
3. SAR tests with proximity sensor power reduction are only required for the sides of frequency bands in the table above. For the other sides or other frequency bands of the device, SAR is still tested at the maximum power level with sensor off.

14. Country Code Detection Mechanism

General description:

This device uses the mobile country code (MCC) to indicate whether the users in CE countries or FCC countries. The selection between CE countries and FCC countries power levels is based on the country code detection mechanism. It can determine the countries where users are and set the relevant power level for WiFi antennas accordingly.

Summary of country code detection mechanism

Antenna	MCC OF CE COUNTRY (CE standard)	MCC OF FCC COUNTRY (FCC standard)
WiFi 2.4GHz Ant	Power Level A3	Power Level B3

- 1) For WIFI bands, the router also has MCC information so the device can distinguish different countries.
- 2) The following power table is used for MCC of CE countries for WiFi2.4GHz.
- 3) About FCC countries, MCC of FCC countries, the power level for WiFi2.4GHz is listed on page 63 and page 64.
- 4) For this device, WIFI 2.4G 12CH and 13 CH can not be used in FCC countries.

Conducted Power of WiFi 2.4G for CE (MCC of CE countries, Power Level A3)

Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)
			Max.	1Mbps
802.11b	1	2412	18.50	18.13
	7	2442	18.50	18.33
	13	2472	18.50	18.29
Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)
			Max.	6Mbps
802.11g	1	2412	18.00	17.69
	7	2442	18.00	17.92
	13	2472	18.00	17.72
Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)
			Max.	MCS0
802.11n HT20	1	2412	17.50	17.08
	7	2442	17.50	17.46
	13	2472	17.50	17.15
Mode	Channel	Frequency (MHz)	Tune-up	Average Power (dBm)
			Max.	MCS0
802.11n HT40	3	2422	15.00	14.88
	7	2442	15.00	14.69
	11	2462	15.00	14.65

Summary SAR test Plan:

Antenna	MCC OF CE COUNTRY (CE standard)	MCC OF FCC COUNTRY (FCC standard)
WiFi 2.4GHz	Power Level A3	Power Level B3

Based on the summary table of countries detection mechanism above, we plan to perform the SAR test as below:

For conducted power test, both the full power level and reduced power level will be tested by setting different MCC to validate that the country code detection mechanism works.

For FCC SAR test:

Standalone FCC SAR of Wifi 2.4G is evaluated at Power Level B3 (FCC mobile country code)

15. Conducted RF Output Power (Unit: dBm)

<GSM Conducted Power>

1. Per KDB 447498 D01v06, the maximum output power channel is used for SAR testing and for further SAR test reduction.
2. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The 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. Therefore, GSM voice for GSM850/GSM1900 is chose to perform head SAR, GPRS 4Tx slots for GSM850/GSM1900 are considered as the primary mode for body SAR.
3. Other configurations of GSM / GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq \frac{1}{4}$ dB higher than the primary mode, SAR measurement is not required for the secondary mode.
4. Power reduction which is triggered by hotspot mode/p-sensor on are implemented in GSM850/1900 band, for SAR testing EUT was set in reduced power mode and GPRS 4 Tx slots due to its highest frame-average power.

<Full Power Mode>

GSM850 Tx Channel	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	128	189	251		128	189	251	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM 1 Tx slot	33.06	33.05	32.98	34.00	24.06	24.05	23.98	25.00
GPRS 1 Tx slot	33.05	33.04	33.00	34.00	24.05	24.04	24.00	25.00
GPRS 2 Tx slots	30.08	30.07	30.01	31.00	24.08	24.07	24.01	25.00
GPRS 3 Tx slots	28.33	28.32	28.26	29.20	24.07	24.06	24.00	24.94
GPRS 4 Tx slots	27.00	26.98	26.90	28.00	24.00	23.98	23.90	25.00
EDGE 1 Tx slot	27.00	27.11	27.23	28.00	18.00	18.11	18.23	19.00
EDGE 2 Tx slots	23.76	23.92	24.02	25.00	17.76	17.92	18.02	19.00
EDGE 3 Tx slots	21.77	21.87	21.94	23.20	17.51	17.61	17.68	18.94
EDGE 4 Tx slots	20.47	20.62	20.61	22.00	17.47	17.62	17.61	19.00
GSM1900								
	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	29.80	29.68	29.57	31.00	20.80	20.68	20.57	22.00
GPRS 1 Tx slot	29.79	29.70	29.58	31.00	20.79	20.70	20.58	22.00
GPRS 2 Tx slots	27.01	26.87	26.74	28.00	21.01	20.87	20.74	22.00
GPRS 3 Tx slots	25.20	25.07	24.95	26.20	20.94	20.81	20.69	21.94
GPRS 4 Tx slots	23.75	23.73	23.65	25.00	20.75	20.73	20.65	22.00
EDGE 1 Tx slot	25.78	25.68	25.63	27.00	16.78	16.68	16.63	18.00
EDGE 2 Tx slots	22.68	22.57	22.55	24.00	16.68	16.57	16.55	18.00
EDGE 3 Tx slots	20.80	20.71	20.67	22.20	16.54	16.45	16.41	17.94
EDGE 4 Tx slots	19.35	19.23	19.15	21.00	16.35	16.23	16.15	18.00

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.

The calculated method are shown as below:

Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB

Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB

Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB

Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<Reduced Power Mode for P-Sensor On>

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	Tx Channel	128	189		251	128	189	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GSM 1 Tx slot	32.05	32.02	31.92	33.00	23.05	23.02	22.92	24.00
GPRS 1 Tx slot	32.04	32.01	31.90	33.00	23.04	23.01	22.90	24.00
GPRS 2 Tx slots	29.00	28.97	28.88	30.00	23.00	22.97	22.88	24.00
GPRS 3 Tx slots	27.58	27.54	27.44	28.20	23.32	23.28	23.18	23.94
GPRS 4 Tx slots	26.05	26.01	25.93	27.00	23.05	23.01	22.93	24.00
EDGE 1 Tx slot	26.92	27.12	27.22	28.00	17.92	18.12	18.22	19.00
EDGE 2 Tx slots	23.70	23.88	24.01	25.00	17.70	17.88	18.01	19.00
EDGE 3 Tx slots	21.66	21.78	21.92	23.20	17.40	17.52	17.66	18.94
EDGE 4 Tx slots	20.37	20.47	20.51	22.00	17.37	17.47	17.51	19.00
GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GSM 1 Tx slot	27.83	27.84	27.89	29.00	18.83	18.84	18.89	20.00
GPRS 1 Tx slot	27.82	27.83	27.88	29.00	18.82	18.83	18.88	20.00
GPRS 2 Tx slots	24.82	24.87	24.96	26.00	18.82	18.87	18.96	20.00
GPRS 3 Tx slots	23.32	23.41	23.54	24.20	19.06	19.15	19.28	19.94
GPRS 4 Tx slots	21.87	21.84	21.80	23.00	18.87	18.84	18.80	20.00
EDGE 1 Tx slot	25.93	25.87	26.09	27.00	16.93	16.87	17.09	18.00
EDGE 2 Tx slots	22.82	22.81	22.91	24.00	16.82	16.81	16.91	18.00
EDGE 3 Tx slots	20.93	20.92	21.03	22.20	16.67	16.66	16.77	17.94
EDGE 4 Tx slots	19.41	19.39	19.58	21.00	16.41	16.39	16.58	18.00

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.

The calculated method are shown as below:

- Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB
- Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB
- Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB
- Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<Reduced Power Mode for Hotspot On>

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	Tx Channel	128	189		251	128	189	
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8	
GPRS 1 Tx slot	32.13	32.08	31.99	33.00	23.13	23.08	22.99	24.00
GPRS 2 Tx slots	29.01	28.96	28.89	30.00	23.01	22.96	22.89	24.00
GPRS 3 Tx slots	27.59	27.54	27.45	28.20	23.33	23.28	23.19	23.94
GPRS 4 Tx slots	26.06	26.01	25.95	27.00	23.06	23.01	22.95	24.00
EDGE 1 Tx slot	26.97	27.05	27.15	28.00	17.97	18.05	18.15	19.00
EDGE 2 Tx slots	23.68	23.87	24.01	25.00	17.68	17.87	18.01	19.00
EDGE 3 Tx slots	21.70	21.90	21.97	23.20	17.44	17.64	17.71	18.94
EDGE 4 Tx slots	20.36	20.51	20.75	22.00	17.36	17.51	17.75	19.00
GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
Tx Channel	512	661	810		512	661	810	
Frequency (MHz)	1850.2	1880	1909.8		1850.2	1880	1909.8	
GPRS 1 Tx slot	27.93	27.93	27.99	29.00	18.93	18.93	18.99	20.00
GPRS 2 Tx slots	24.94	24.99	25.07	26.00	18.94	18.99	19.07	20.00
GPRS 3 Tx slots	23.40	23.49	23.64	24.20	19.14	19.23	19.38	19.94
GPRS 4 Tx slots	22.15	22.09	22.12	23.00	19.15	19.09	19.12	20.00
EDGE 1 Tx slot	25.94	25.93	26.14	27.00	16.94	16.93	17.14	18.00
EDGE 2 Tx slots	22.82	22.87	22.97	24.00	16.82	16.87	16.97	18.00
EDGE 3 Tx slots	20.97	20.99	21.13	22.20	16.71	16.73	16.87	17.94
EDGE 4 Tx slots	19.72	19.43	19.67	21.00	16.72	16.43	16.67	18.00

Remark: The frame-averaged power is linearly scaled the maximum burst averaged power over 8 time slots.

The calculated method are shown as below:

Frame-averaged power = Maximum burst averaged power (1 Tx Slot) - 9 dB

Frame-averaged power = Maximum burst averaged power (2 Tx Slots) - 6 dB

Frame-averaged power = Maximum burst averaged power (3 Tx Slots) - 4.26 dB

Frame-averaged power = Maximum burst averaged power (4 Tx Slots) - 3 dB

<WCDMA Conducted Power>

1. The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification.
2. The procedures in KDB 941225 D01v03r01 are applied for 3GPP Rel. 6 HSPA to configure the device in the required sub-test mode(s) to determine SAR test exclusion.
3. For HSPA+ devices supporting 16 QAM in the uplink, power measurements procedure is according to the configurations in Table C.11.1.4 of 3GPP TS 34.121-1.
4. For DC-HSDPA, the device was configured according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1, with the primary and the secondary serving HS-DSCH Cell enabled during the power measurement.

A summary of these settings are illustrated below:

HSDPA Setup Configuration:

- a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting:
 - i. Set Gain Factors (β_c and β_d) and parameters were set according to each
 - ii. Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
 - iii. Set RMC 12.2Kbps + HSDPA mode.
 - iv. Set Cell Power = -86 dBm
 - v. Set HS-DSCH Configuration Type to FRC (H-set 1, QPSK)
 - vi. Select HSDPA Uplink Parameters
 - vii. Set Delta ACK, Delta NACK and Delta CQI = 8
 - viii. Set Ack-Nack Repetition Factor to 3
 - ix. Set CQI Feedback Cycle (k) to 4 ms
 - x. Set CQI Repetition Factor to 2
 - xi. Power Ctrl Mode = All Up bits
- d. The transmitted maximum output power was recorded.

Table C.10.1.4: β values for transmitter characteristics tests with HS-DPCCH

Sub-test	β_c	β_d	β_d (SF)	β_d/β_d	β_{hs} (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: $\Delta_{ACK}, \Delta_{NACK}$ and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta_{CQI} = 24/15$ with $\beta_{hs} = 24/15 * \beta_c$.

Note 3: CM = 1 for $\beta_c/\beta_d = 12/15, \beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Note 4: For subtest 2 the β_c/β_d ratio of 12/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 11/15$ and $\beta_d = 15/15$.

Setup Configuration

HSUPA Setup Configuration:

- a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting * :
 - i. Call Configs = 5.2B, 5.9B, 5.10B, and 5.13.2B with QPSK
 - ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.3, quoted from the TS 34.121
 - iii. Set Cell Power = -86 dBm
 - iv. Set Channel Type = 12.2k + HSPA
 - v. Set UE Target Power
 - vi. Power Ctrl Mode= Alternating bits
 - vii. Set and observe the E-TFCI
 - viii. Confirm that E-TFCI is equal to the target E-TFCI of 75 for sub-test 1, and other subtest's E-TFCI
- d. The transmitted maximum output power was recorded.

Table C.11.1.3: β values for transmitter characteristics tests with HS-DPCCH and E-DCH

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note 1)	β_{ec}	β_{ed} (Note 4) (Note 5)	β_{ed} (SF)	β_{ed} (Codes)	CM (dB) (Note 2)	MPR (dB) (Note 2) (Note 6)	AG Index (Note 5)	E-TFCI
1	11/15 (Note 3)	15/15 (Note 3)	64	11/15 (Note 3)	22/15	209/225	1309/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	β_{ed1} : 47/15 β_{ed2} : 47/15	4 4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15	0	-	-	5/15	5/15	47/15	4	1	1.0	0.0	12	67

- Note 1: For sub-test 1 to 4, Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 30/15$ with $\beta_{hs} = 30/15 * \beta_c$. For sub-test 5, Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 5/15$ with $\beta_{hs} = 5/15 * \beta_c$.
- Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
- Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signalled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.
- Note 4: In case of testing by UE using E-DPDCH Physical Layer category 1, Sub-test 3 is omitted according to TS25.306 Table 5.1g.
- Note 5: β_{ed} can not be set directly; it is set by Absolute Grant Value.
- Note 6: For subtests 2, 3 and 4, UE may perform E-DPDCH power scaling at max power which could results in slightly smaller MPR values.

Setup Configuration

DC-HSDPA 3GPP release 8 Setup Configuration:

- a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration below
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting:
 - i. Set RMC 12.2Kbps + HSDPA mode.
 - ii. Set Cell Power = -25 dBm
 - iii. Set HS-DSCH Configuration Type to FRC (H-set 12, QPSK)
 - iv. Select HSDPA Uplink Parameters
 - v. Set Gain Factors (β_c and β_d) and parameters were set according to each Specific sub-test in the following table, C10.1.4, quoted from the TS 34.121
 - a). Subtest 1: $\beta_c/\beta_d=2/15$
 - b). Subtest 2: $\beta_c/\beta_d=12/15$
 - c). Subtest 3: $\beta_c/\beta_d=15/8$
 - d). Subtest 4: $\beta_c/\beta_d=15/4$
 - vi. Set Delta ACK, Delta NACK and Delta CQI = 8
 - vii. Set Ack-Nack Repetition Factor to 3
 - viii. Set CQI Feedback Cycle (k) to 4 ms
 - ix. Set CQI Repetition Factor to 2
 - x. Power Ctrl Mode = All Up bits
- d. The transmitted maximum output power was recorded.

The following tests were conducted according to the test requirements outlines in 3GPP TS 34.121 specification. A summary of these settings are illustrated below:

C.8.1.12 Fixed Reference Channel Definition H-Set 12

Table C.8.1.12: Fixed Reference Channel H-Set 12

Parameter	Unit	Value
Nominal Avg. Inf. Bit Rate	kbps	60
Inter-TTI Distance	TTI's	1
Number of HARQ Processes	Processes	6
Information Bit Payload (N_{INF})	Bits	120
Number Code Blocks	Blocks	1
Binary Channel Bits Per TTI	Bits	960
Total Available SML's in UE	SML's	19200
Number of SML's per HARQ Proc.	SML's	3200
Coding Rate		0.15
Number of Physical Channel Codes	Codes	1
Modulation		QPSK
Note 1: The RMC is intended to be used for DC-HSDPA mode and both cells shall transmit with identical parameters as listed in the table. Note 2: Maximum number of transmission is limited to 1, i.e., retransmission is not allowed. The redundancy and constellation version 0 shall be used.		

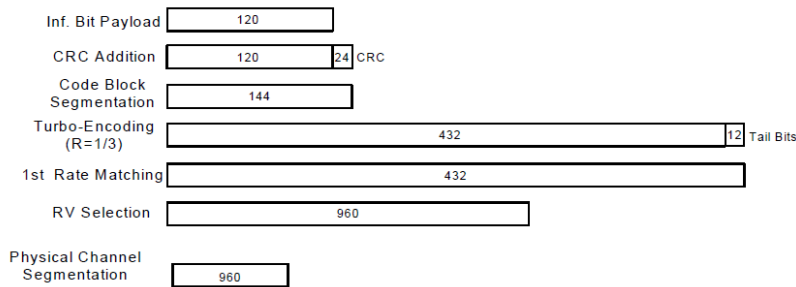


Figure C.8.19: Coding rate for Fixed reference Channel H-Set 12 (QPSK)

Setup Configuration

HSPA+ 3GPP release 7 (uplink category 7) 16QAM, Setup Configuration:

- a. The EUT was connected to Base Station Agilent E5515C referred to the Setup Configuration.
- b. The RF path losses were compensated into the measurements.
- c. A call was established between EUT and Base Station with following setting * :
 - i. Call Configs = 5.2E:HSPA+:UL with 16QAM
 - ii. Set the Gain Factors (β_c and β_d) and parameters (AG Index) were set according to each specific sub-test in the following table, C11.1.4, quoted from the TS 34.121-1 s5.2E
 - iii. Set Channel Parmes
 - iv. Set Cell Power = -86 dBm
 - v. Set Channel Type = HSPA
 - vi. Set UE Target Power =21 dBm
 - vii. Power Ctrl Mode= All Up Bits
 - viii. Set Manual Uplink DPCH Bc/Bd = Manual
 - ix. Set Manual Uplink DPCH Bc and Bd=15,15(for 34.121-1 v8.10.0 table C11.1.4 sub-test 1)
 - x. Set HSPA Conn DL Channel Levels
 - xi. Set HS-SCCH Configs
 - xii. Set RB Test Mode Setup
 - xiii. Set Common HSUPA Parameters
 - xiv. Set Serving Grant
 - xv. Confirm that E-TFCI is equal to the target E-TFCI of 105 for sub-test 1, and other subtest's E-TFCI
- d. The transmitted maximum output power was recorded.

Table C.11.1.4: β values for transmitter characteristics tests with HS-DPCCH and E-DCH with 16QAM

Sub-test	β_c (Note3)	β_d	β_{HS} (Note1)	β_{ec}	β_{ed} (2xSF2) (Note 4)	β_{ed} (2xSF4) (Note 4)	CM (dB) (Note 2)	MPR (dB) (Note 2)	AG Index (Note 4)	E-TFCI (Note 5)	E-TFCI (boost)
1	1	0	30/15	30/15	β_{ed1} : 30/15 β_{ed2} : 30/15	β_{ed3} : 24/15 β_{ed4} : 24/15	3.5	2.5	14	105	105

Note 1: $\Delta_{ACK}, \Delta_{NACK}$ and $\Delta_{CQI} = 30/15$ with $\beta_{HS} = 30/15 * \beta_c$.

Note 2: CM = 3.5 and the MPR is based on the relative CM difference, MPR = MAX(CM-1,0).

Note 3: DPDCH is not configured, therefore the β_c is set to 1 and $\beta_d = 0$ by default.

Note 4: β_{ed} can not be set directly; it is set by Absolute Grant Value.

Note 5: All the sub-tests require the UE to transmit 2SF2+2SF4 16QAM EDCH and they apply for UE using E-DPDCH category 7. E-DCH TTI is set to 2ms TTI and E-DCH table index = 2. To support these E-DCH configurations DPDCH is not allocated. The UE is signaled to use the extrapolation algorithm.

Setup Configuration

<WCDMA Conducted Power>
General Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA / HSPA+ is $\leq \frac{1}{4}$ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA / HSPA+ to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA / DC-HSDPA / HSPA+) are less than $\frac{1}{4}$ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+.

<Full Power Mode>

Band		WCDMA Band II			Tune-up Limit (dBm)	WCDMA Band V			Tune-up Limit (dBm)
Tx Channel		9262	9400	9538		4132	4182	4233	
Rx Channel		9662	9800	9938		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		826.4	836.4	846.6	
3GPP Rel 99	AMR 12.2Kbps	23.42	23.56	23.74	24.50	24.00	24.02	24.00	25.00
3GPP Rel 99	RMC 12.2Kbps	23.43	23.57	23.76	24.50	24.01	24.04	24.02	25.00
3GPP Rel 6	HSDPA Subtest-1	22.84	22.79	22.81	24.00	23.02	23.03	22.96	24.50
3GPP Rel 6	HSDPA Subtest-2	22.70	22.70	22.78	24.00	22.98	23.01	22.93	24.50
3GPP Rel 6	HSDPA Subtest-3	22.26	22.17	22.28	23.50	22.46	22.40	22.37	24.00
3GPP Rel 6	HSDPA Subtest-4	22.27	22.16	22.31	23.50	22.49	22.46	22.40	24.00
3GPP Rel 8	DC-HSDPA Subtest-1	22.67	22.73	22.68	24.00	22.98	22.89	22.78	24.50
3GPP Rel 8	DC-HSDPA Subtest-2	22.65	22.71	22.65	24.00	22.96	22.80	22.76	24.50
3GPP Rel 8	DC-HSDPA Subtest-3	22.20	22.16	22.20	23.50	22.34	22.30	22.19	24.00
3GPP Rel 8	DC-HSDPA Subtest-4	22.18	22.12	22.12	23.50	22.30	22.28	22.16	24.00
3GPP Rel 6	HSUPA Subtest-1	20.84	20.85	20.89	22.00	21.06	21.05	21.06	23.00
3GPP Rel 6	HSUPA Subtest-2	20.87	20.81	20.92	22.00	21.01	21.10	21.03	23.00
3GPP Rel 6	HSUPA Subtest-3	21.81	21.81	21.90	23.00	22.18	22.05	22.04	24.00
3GPP Rel 6	HSUPA Subtest-4	20.39	20.28	20.38	21.50	20.59	20.52	20.53	22.50
3GPP Rel 6	HSUPA Subtest-5	21.80	21.80	21.80	23.00	22.20	22.10	22.30	24.00
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	21.00	20.83	20.90	22.00	20.90	21.20	21.17	23.00



<Reduced Power Mode for P-Sensor On>

Band		WCDMA Band II			Tune-up Limit (dBm)	WCDMA Band V			Tune-up Limit (dBm)
Tx Channel		9262	9400	9538		4132	4182	4233	
Rx Channel		9662	9800	9938		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		826.4	836.4	846.6	
3GPP Rel 99	AMR 12.2Kbps	21.03	21.18	21.08	21.50	23.23	23.23	23.18	24.00
3GPP Rel 99	RMC 12.2Kbps	21.05	21.19	21.10	21.50	23.23	23.24	23.20	24.00
3GPP Rel 6	HSDPA Subtest-1	20.14	20.21	20.17	21.00	22.08	22.19	22.10	23.50
3GPP Rel 6	HSDPA Subtest-2	20.06	20.10	20.08	21.00	22.05	22.04	21.96	23.50
3GPP Rel 6	HSDPA Subtest-3	19.56	19.63	19.53	20.50	21.59	21.52	21.51	23.00
3GPP Rel 6	HSDPA Subtest-4	19.55	19.59	19.53	20.50	21.54	21.48	21.46	23.00
3GPP Rel 8	DC-HSDPA Subtest-1	20.09	20.16	20.13	21.00	22.02	22.13	22.09	23.50
3GPP Rel 8	DC-HSDPA Subtest-2	20.01	20.07	20.02	21.00	21.98	22.09	21.89	23.50
3GPP Rel 8	DC-HSDPA Subtest-3	19.45	19.56	19.44	20.50	21.45	21.48	21.42	23.00
3GPP Rel 8	DC-HSDPA Subtest-4	19.43	19.45	19.39	20.50	21.41	21.42	21.34	23.00
3GPP Rel 6	HSUPA Subtest-1	18.12	18.26	18.24	19.00	20.21	20.19	20.19	22.00
3GPP Rel 6	HSUPA Subtest-2	18.13	18.28	18.19	19.00	20.14	20.19	20.11	22.00
3GPP Rel 6	HSUPA Subtest-3	19.16	19.25	19.22	20.00	21.14	21.12	21.06	23.00
3GPP Rel 6	HSUPA Subtest-4	17.62	17.74	17.73	18.50	19.66	19.65	19.63	21.50
3GPP Rel 6	HSUPA Subtest-5	19.10	19.20	19.10	20.00	21.10	21.10	21.00	23.00
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	18.16	18.23	18.24	19.00	19.12	19.09	19.11	22.00

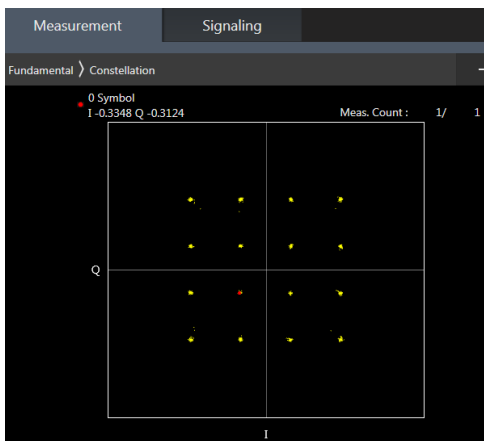
<Reduced Power Mode for Hotspot On>

Band		WCDMA Band II			Tune-up Limit (dBm)	WCDMA Band V			Tune-up Limit (dBm)
Tx Channel		9262	9400	9538		4132	4182	4233	
Rx Channel		9662	9800	9938		4357	4407	4458	
Frequency (MHz)		1852.4	1880	1907.6		826.4	836.4	846.6	
3GPP Rel 99	RMC 12.2Kbps	21.02	21.18	21.10	21.50	23.18	23.20	23.04	24.00
3GPP Rel 6	HSDPA Subtest-1	20.11	20.24	20.20	21.00	22.07	22.06	21.95	23.50
3GPP Rel 6	HSDPA Subtest-2	19.98	20.18	20.08	21.00	22.00	21.91	21.86	23.50
3GPP Rel 6	HSDPA Subtest-3	19.56	19.69	19.59	20.50	21.50	21.37	21.33	23.00
3GPP Rel 6	HSDPA Subtest-4	19.57	19.70	19.57	20.50	21.44	21.39	21.34	23.00
3GPP Rel 8	DC-HSDPA Subtest-1	20.09	20.21	20.17	21.00	22.02	22.03	21.94	23.50
3GPP Rel 8	DC-HSDPA Subtest-2	19.96	20.13	20.02	21.00	21.97	21.92	21.89	23.50
3GPP Rel 8	DC-HSDPA Subtest-3	19.52	19.56	19.53	20.50	21.46	21.33	21.29	23.00
3GPP Rel 8	DC-HSDPA Subtest-4	19.48	19.49	19.47	20.50	21.42	21.31	21.28	23.00
3GPP Rel 6	HSUPA Subtest-1	18.16	18.26	18.23	19.00	20.10	20.10	20.00	22.00
3GPP Rel 6	HSUPA Subtest-2	18.14	18.22	18.19	19.00	20.00	20.09	19.98	22.00
3GPP Rel 6	HSUPA Subtest-3	19.20	19.29	19.18	20.00	21.03	21.07	20.94	23.00
3GPP Rel 6	HSUPA Subtest-4	17.62	17.79	17.65	18.50	19.50	19.60	19.53	21.50
3GPP Rel 6	HSUPA Subtest-5	19.10	19.20	19.20	20.00	21.00	21.00	20.90	23.00
3GPP Rel 7	HSPA+ (16QAM) Subtest-1	18.12	18.23	18.21	19.00	20.03	20.12	20.08	22.00

<LTE Conducted Power>

General Note:

1. Anritsu MT8820C base station simulator was used to setup the connection with EUT; the frequency band, channel bandwidth, RB allocation configuration, modulation type are set in the base station simulator to configure EUT transmitting at maximum power and at different configurations which are requested to be reported to FCC, for conducted power measurement and SAR testing.
2. Per KDB 941225 D05v02r05, when a properly configured base station simulator is used for the SAR and power measurements, spectrum plots for each RB allocation and offset configuration is not required.
3. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
4. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
5. Per KDB 941225 D05v02r05, for QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
6. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
7. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
8. For LTE B5 the maximum 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 middle channel of the group of overlapping channels should be selected for testing.
9. According to 2017 TCB workshop, for 16QAM should be verified by checking the signal constellation with a call box to avoid incorrect maximum power levels due to MPR and other requirements associated with signal modulation, and the following figure is taken from the "Fundamental Measurement >> Modulation Analysis >> constellation" mode of the device connect to the MT8821C base station, therefore, the device 16QAM signal modulation are correct.



16QAM



<Full Power Mode>

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	23.06	23.02	23.01	24.5	0
10	QPSK	1	25	23.22	23.15	23.12		
10	QPSK	1	49	23.03	23.00	23.02		
10	QPSK	25	0	22.15	22.12	22.17	23.5	1
10	QPSK	25	12	22.16	22.09	22.08		
10	QPSK	25	25	22.21	22.09	22.07		
10	QPSK	50	0	22.18	22.08	22.11	23.5	1
10	16QAM	1	0	22.39	22.43	22.30		
10	16QAM	1	25	22.50	22.44	22.43		
10	16QAM	1	49	22.37	22.30	22.37	22.5	2
10	16QAM	25	0	21.17	21.13	21.20		
10	16QAM	25	12	21.17	21.12	21.11		
10	16QAM	25	25	21.22	21.11	21.11	22.5	2
10	16QAM	50	0	21.19	21.12	21.15		



Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.96	22.90	22.86	24.5	0
5	QPSK	1	12	23.21	23.17	23.17		
5	QPSK	1	24	22.95	22.89	22.92		
5	QPSK	12	0	22.13	22.06	22.02	23.5	1
5	QPSK	12	7	22.17	22.09	22.05		
5	QPSK	12	13	22.15	22.07	22.10		
5	QPSK	25	0	22.13	22.04	22.00		
5	16QAM	1	0	22.27	22.25	22.21	23.5	1
5	16QAM	1	12	22.46	22.53	22.46		
5	16QAM	1	24	22.31	22.21	22.26		
5	16QAM	12	0	21.12	21.08	21.05	22.5	2
5	16QAM	12	7	21.19	21.10	21.09		
5	16QAM	12	13	21.15	21.10	21.10		
5	16QAM	25	0	21.14	21.07	21.07		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	23.08	23.03	22.98	24.5	0
3	QPSK	1	8	23.07	23.00	22.99		
3	QPSK	1	14	23.09	22.98	23.01		
3	QPSK	8	0	22.15	22.05	22.07	23.5	1
3	QPSK	8	4	22.18	22.09	22.11		
3	QPSK	8	7	22.15	22.05	22.05		
3	QPSK	15	0	22.13	22.06	22.07		
3	16QAM	1	0	22.40	22.36	22.37	23.5	1
3	16QAM	1	8	22.37	22.36	22.33		
3	16QAM	1	14	22.40	22.35	22.35		
3	16QAM	8	0	21.20	21.16	21.19	22.5	2
3	16QAM	8	4	21.19	21.18	21.23		
3	16QAM	8	7	21.19	21.11	21.14		
3	16QAM	15	0	21.12	21.09	21.14		



Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	23.01	22.97	22.94	24.5	0
1.4	QPSK	1	3	23.12	23.13	23.10		
1.4	QPSK	1	5	23.04	22.99	22.97		
1.4	QPSK	3	0	23.12	23.06	23.08		
1.4	QPSK	3	1	23.17	23.13	23.09		
1.4	QPSK	3	3	23.11	23.10	23.09		
1.4	QPSK	6	0	22.14	22.07	22.07	23.5	1
1.4	16QAM	1	0	22.32	22.26	22.26	23.5	1
1.4	16QAM	1	3	22.47	22.41	22.38		
1.4	16QAM	1	5	22.31	22.28	22.26		
1.4	16QAM	3	0	22.16	22.06	22.09		
1.4	16QAM	3	1	22.22	22.14	22.13		
1.4	16QAM	3	3	22.15	22.10	22.06		
1.4	16QAM	6	0	21.21	21.15	21.19	22.5	2



<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	22.51	22.51	22.70	24	0
20	QPSK	1	49	22.93	22.95	23.20		
20	QPSK	1	99	22.63	22.75	22.80		
20	QPSK	50	0	21.85	21.90	22.02	23	1
20	QPSK	50	24	21.88	21.96	22.15		
20	QPSK	50	50	22.02	22.01	22.23		
20	16QAM	1	0	21.73	21.84	22.00	23	1
20	16QAM	1	49	22.25	22.20	22.43		
20	16QAM	1	99	21.99	22.02	22.04		
20	16QAM	50	0	20.89	20.92	21.08	22	2
20	16QAM	50	24	20.94	20.98	21.18		
20	16QAM	50	50	21.08	21.01	21.25		
20	16QAM	100	0	20.99	20.94	21.16		



Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	22.68	22.76	22.89	24	0
15	QPSK	1	37	22.95	23.00	23.18		
15	QPSK	1	74	22.80	22.87	23.00		
15	QPSK	36	0	21.90	21.92	22.09	23	1
15	QPSK	36	20	21.88	22.01	22.16		
15	QPSK	36	39	22.00	22.00	22.18		
15	QPSK	75	0	21.94	21.97	22.15	23	1
15	16QAM	1	0	21.93	22.04	22.19		
15	16QAM	1	37	22.25	22.28	22.46		
15	16QAM	1	74	22.14	22.15	22.25	22	2
15	16QAM	36	0	20.91	20.93	21.11		
15	16QAM	36	20	20.92	21.00	21.18		
15	16QAM	36	39	21.00	21.00	21.19	22	2
15	16QAM	75	0	20.96	20.99	21.18		
Channel				20800	21100	21400		
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	22.76	22.84	23.02	24	0
10	QPSK	1	25	22.85	22.96	23.13		
10	QPSK	1	49	22.87	22.95	23.06		
10	QPSK	25	0	21.91	21.94	22.12	23	1
10	QPSK	25	12	21.85	21.96	22.13		
10	QPSK	25	25	21.88	21.98	22.16		
10	QPSK	50	0	21.93	22.00	22.15	23	1
10	16QAM	1	0	22.00	22.07	22.32		
10	16QAM	1	25	22.14	22.20	22.38		
10	16QAM	1	49	22.15	22.18	22.31	22	2
10	16QAM	25	0	20.94	20.97	21.15		
10	16QAM	25	12	20.90	20.99	21.18		
10	16QAM	25	25	20.95	20.97	21.21	22	2
10	16QAM	50	0	20.96	21.02	21.20		



Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	22.68	22.75	22.92	24	0
5	QPSK	1	12	22.98	23.02	23.18		
5	QPSK	1	24	22.67	22.80	22.95		
5	QPSK	12	0	21.83	21.92	22.10	23	1
5	QPSK	12	7	21.86	21.95	22.16		
5	QPSK	12	13	21.84	21.97	22.15		
5	QPSK	25	0	21.84	21.95	22.09		
5	16QAM	1	0	21.94	22.00	22.19	23	1
5	16QAM	1	12	22.14	22.25	22.46		
5	16QAM	1	24	21.96	22.05	22.18		
5	16QAM	12	0	20.85	20.91	21.10	22	2
5	16QAM	12	7	20.91	20.98	21.19		
5	16QAM	12	13	20.87	21.00	21.16		
5	16QAM	25	0	20.88	20.97	21.14		



<Reduced Power Mode for P-Sensor On>

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600	23.5	0
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.21	22.18	22.17	23.5	0
10	QPSK	1	25	22.33	22.32	22.27		
10	QPSK	1	49	22.20	22.17	22.21		
10	QPSK	25	0	22.30	22.28	22.31	23.5	0
10	QPSK	25	12	22.29	22.28	22.22		
10	QPSK	25	25	22.34	22.24	22.23		
10	QPSK	50	0	22.32	22.26	22.29	23.5	0
10	16QAM	1	0	22.22	22.23	22.17		
10	16QAM	1	25	22.46	22.42	22.41		
10	16QAM	1	49	22.32	22.32	22.36	22.5	1
10	16QAM	25	0	21.30	21.29	21.35		
10	16QAM	25	12	21.31	21.29	21.25		
10	16QAM	25	25	21.34	21.26	21.28		
10	16QAM	50	0	21.34	21.28	21.32		



Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.17	22.09	22.06	23.5	0
5	QPSK	1	12	22.35	22.34	22.30		
5	QPSK	1	24	22.13	22.05	22.11		
5	QPSK	12	0	22.31	22.22	22.19	23.5	0
5	QPSK	12	7	22.32	22.25	22.24		
5	QPSK	12	13	22.31	22.24	22.28		
5	QPSK	25	0	22.28	22.20	22.18	23.5	0
5	16QAM	1	0	22.41	22.44	22.35		
5	16QAM	1	12	22.38	22.32	22.31		
5	16QAM	1	24	22.46	22.35	22.38	22.5	1
5	16QAM	12	0	21.27	21.25	21.22		
5	16QAM	12	7	21.30	21.26	21.28		
5	16QAM	12	13	21.30	21.29	21.27	22.5	1
5	16QAM	25	0	21.28	21.22	21.21		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.25	22.16	22.16	23.5	0
3	QPSK	1	8	22.23	22.18	22.16		
3	QPSK	1	14	22.24	22.16	22.19		
3	QPSK	8	0	22.28	22.20	22.21	23.5	0
3	QPSK	8	4	22.28	22.25	22.25		
3	QPSK	8	7	22.26	22.20	22.21		
3	QPSK	15	0	22.26	22.21	22.23	23.5	0
3	16QAM	1	0	22.35	22.29	22.28		
3	16QAM	1	8	22.31	22.28	22.31		
3	16QAM	1	14	22.34	22.23	22.31	22.5	1
3	16QAM	8	0	21.34	21.31	21.30		
3	16QAM	8	4	21.35	21.32	21.34		
3	16QAM	8	7	21.32	21.27	21.31	22.5	1
3	16QAM	15	0	21.30	21.26	21.24		



Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.14	22.10	22.09	23.5	0
1.4	QPSK	1	3	22.28	22.22	22.25		
1.4	QPSK	1	5	22.18	22.11	22.12		
1.4	QPSK	3	0	22.25	22.20	22.23		
1.4	QPSK	3	1	22.32	22.30	22.26		
1.4	QPSK	3	3	22.27	22.20	22.23		
1.4	QPSK	6	0	22.26	22.21	22.24	23.5	0
1.4	16QAM	1	0	22.42	22.40	22.41	23.5	0
1.4	16QAM	1	3	22.56	22.54	22.57		
1.4	16QAM	1	5	22.47	22.40	22.44		
1.4	16QAM	3	0	22.24	22.21	22.24		
1.4	16QAM	3	1	22.30	22.27	22.30		
1.4	16QAM	3	3	22.26	22.21	22.21		
1.4	16QAM	6	0	21.35	21.32	21.35	22.5	1



<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	18.81	18.79	18.80	20	0
20	QPSK	1	49	19.21	19.14	19.22		
20	QPSK	1	99	18.88	18.88	18.87		
20	QPSK	50	0	19.17	19.07	19.10	20	0
20	QPSK	50	24	19.15	19.16	19.22		
20	QPSK	50	50	19.25	19.14	19.31		
20	QPSK	100	0	19.22	19.09	19.22	20	0
20	16QAM	1	0	19.12	19.13	19.17		
20	16QAM	1	49	19.60	19.48	19.61		
20	16QAM	1	99	19.24	19.19	19.19	20	0
20	16QAM	50	0	19.17	19.05	19.16		
20	16QAM	50	24	19.18	19.16	19.25		
20	16QAM	50	50	19.25	19.13	19.35	20	0
20	16QAM	100	0	19.21	19.09	19.26		



Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	18.98	18.99	19.00	20	0
15	QPSK	1	37	19.22	19.22	19.32		
15	QPSK	1	74	19.07	19.02	19.02		
15	QPSK	36	0	19.15	19.11	19.15	20	0
15	QPSK	36	20	19.16	19.17	19.26		
15	QPSK	36	39	19.17	19.12	19.21		
15	QPSK	75	0	19.16	19.13	19.19	20	0
15	16QAM	1	0	19.33	19.35	19.35		
15	16QAM	1	37	19.54	19.52	19.70		
15	16QAM	1	74	19.41	19.37	19.39	20	0
15	16QAM	36	0	19.16	19.08	19.16		
15	16QAM	36	20	19.16	19.17	19.24		
15	16QAM	36	39	19.17	19.13	19.20	20	0
15	16QAM	75	0	19.18	19.10	19.24		
Channel				20800	21100	21400		
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	19.05	19.05	19.11	20	0
10	QPSK	1	25	19.13	19.15	19.23		
10	QPSK	1	49	19.12	19.11	19.09		
10	QPSK	25	0	19.15	19.09	19.11	20	0
10	QPSK	25	12	19.11	19.13	19.18		
10	QPSK	25	25	19.11	19.13	19.22		
10	QPSK	50	0	19.16	19.14	19.19	20	0
10	16QAM	1	0	19.42	19.39	19.49		
10	16QAM	1	25	19.49	19.45	19.58		
10	16QAM	1	49	19.45	19.43	19.43	20	0
10	16QAM	25	0	19.15	19.07	19.14		
10	16QAM	25	12	19.15	19.12	19.22		
10	16QAM	25	25	19.14	19.15	19.25	20	0
10	16QAM	50	0	19.15	19.13	19.21		



Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	18.97	18.92	18.98	20	0
5	QPSK	1	12	19.20	19.16	19.18		
5	QPSK	1	24	18.93	18.94	18.97		
5	QPSK	12	0	19.04	19.03	19.11	20	0
5	QPSK	12	7	19.11	19.11	19.18		
5	QPSK	12	13	19.07	19.10	19.14		
5	QPSK	25	0	19.07	19.08	19.10	20	0
5	16QAM	1	0	19.30	19.29	19.35		
5	16QAM	1	12	19.58	19.51	19.56		
5	16QAM	1	24	19.26	19.26	19.31	20	0
5	16QAM	12	0	19.07	19.02	19.11		
5	16QAM	12	7	19.14	19.10	19.20		
5	16QAM	12	13	19.10	19.12	19.17	20	0
5	16QAM	25	0	19.09	19.07	19.14		



<Reduced Power Mode for Hotspot On>

<LTE Band 5>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20450	20525	20600		
Frequency (MHz)				829	836.5	844		
10	QPSK	1	0	22.27	22.25	22.22	23.5	0
10	QPSK	1	25	22.33	22.39	22.30		
10	QPSK	1	49	22.24	22.18	22.24		
10	QPSK	25	0	22.33	22.31	22.36	23.5	0
10	QPSK	25	12	22.33	22.28	22.26		
10	QPSK	25	25	22.36	22.37	22.28		
10	QPSK	50	0	22.35	22.27	22.31	23.5	0
10	16QAM	1	0	22.45	22.36	22.48		
10	16QAM	1	25	22.48	22.44	22.46		
10	16QAM	1	49	22.50	22.41	22.43	22.5	1
10	16QAM	25	0	21.36	21.40	21.37		
10	16QAM	25	12	21.34	21.33	21.28		
10	16QAM	25	25	21.40	21.33	21.30		
10	16QAM	50	0	21.35	21.31	21.33		



Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	22.18	22.13	22.08	23.5	0
5	QPSK	1	12	22.43	22.37	22.31		
5	QPSK	1	24	22.15	22.06	22.11		
5	QPSK	12	0	22.29	22.25	22.21	23.5	0
5	QPSK	12	7	22.36	22.26	22.24		
5	QPSK	12	13	22.30	22.28	22.27		
5	QPSK	25	0	22.28	22.23	22.18	23.5	0
5	16QAM	1	0	22.49	22.45	22.33		
5	16QAM	1	12	22.50	22.40	22.45		
5	16QAM	1	24	22.49	22.38	22.39	22.5	1
5	16QAM	12	0	21.32	21.26	21.22		
5	16QAM	12	7	21.34	21.29	21.27		
5	16QAM	12	13	21.31	21.29	21.30	22.5	1
5	16QAM	25	0	21.31	21.26	21.23		
Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	22.27	22.23	22.18	23.5	0
3	QPSK	1	8	22.25	22.21	22.16		
3	QPSK	1	14	22.24	22.18	22.18		
3	QPSK	8	0	22.29	22.23	22.22	23.5	0
3	QPSK	8	4	22.30	22.28	22.29		
3	QPSK	8	7	22.28	22.24	22.23		
3	QPSK	15	0	22.29	22.24	22.23	23.5	0
3	16QAM	1	0	22.47	22.50	22.49		
3	16QAM	1	8	22.38	22.50	22.41		
3	16QAM	1	14	22.48	22.46	22.50	22.5	1
3	16QAM	8	0	21.34	21.32	21.33		
3	16QAM	8	4	21.35	21.34	21.37		
3	16QAM	8	7	21.36	21.30	21.32	22.5	1
3	16QAM	15	0	21.29	21.28	21.31		



Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	22.18	22.11	22.12	23.5	0
1.4	QPSK	1	3	22.31	22.26	22.26		
1.4	QPSK	1	5	22.20	22.14	22.14		
1.4	QPSK	3	0	22.31	22.23	22.23		
1.4	QPSK	3	1	22.34	22.31	22.30		
1.4	QPSK	3	3	22.30	22.25	22.22		
1.4	QPSK	6	0	22.32	22.22	22.26	23.5	0
1.4	16QAM	1	0	22.44	22.41	22.43	23.5	0
1.4	16QAM	1	3	22.45	22.40	22.40		
1.4	16QAM	1	5	22.50	22.44	22.44		
1.4	16QAM	3	0	22.26	22.23	22.23		
1.4	16QAM	3	1	22.34	22.31	22.29		
1.4	16QAM	3	3	22.31	22.25	22.21		
1.4	16QAM	6	0	21.37	21.33	21.35	22.5	1



<LTE Band 7>

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				20850	21100	21350		
Frequency (MHz)				2510	2535	2560		
20	QPSK	1	0	18.75	18.73	18.72	20	0
20	QPSK	1	49	19.17	19.08	19.20		
20	QPSK	1	99	18.83	18.85	18.79		
20	QPSK	50	0	19.07	19.05	19.07	20	0
20	QPSK	50	24	19.10	19.12	19.20		
20	QPSK	50	50	19.16	19.09	19.27		
20	QPSK	100	0	19.15	19.05	19.18	20	0
20	16QAM	1	0	19.09	19.08	19.15		
20	16QAM	1	49	19.50	19.48	19.57		
20	16QAM	1	99	19.18	19.17	19.16	20	0
20	16QAM	50	0	19.12	19.03	19.11		
20	16QAM	50	24	19.14	19.13	19.22		
20	16QAM	50	50	19.17	19.11	19.31	20	0
20	16QAM	100	0	19.16	19.03	19.20		



Channel				20825	21100	21375	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	18.72	18.81	18.95	20	0
15	QPSK	1	37	18.98	19.05	19.22		
15	QPSK	1	74	18.83	18.90	19.00		
15	QPSK	36	0	18.89	18.96	19.10	20	0
15	QPSK	36	20	18.91	19.04	19.18		
15	QPSK	36	39	18.96	18.99	19.16		
15	QPSK	75	0	18.94	19.00	19.15	20	0
15	16QAM	1	0	19.06	19.17	19.26		
15	16QAM	1	37	19.32	19.43	19.60		
15	16QAM	1	74	19.20	19.25	19.33	20	0
15	16QAM	36	0	18.89	18.91	19.09		
15	16QAM	36	20	18.90	19.01	19.20		
15	16QAM	36	39	18.95	18.98	19.16	20	0
15	16QAM	75	0	18.95	18.98	19.16		
15	16QAM	75	0	18.95	18.98	19.16		
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	18.81	18.89	19.03	20	0
10	QPSK	1	25	18.89	18.99	19.13		
10	QPSK	1	49	18.90	18.99	19.06		
10	QPSK	25	0	18.89	18.93	19.08	20	0
10	QPSK	25	12	18.88	18.98	19.15		
10	QPSK	25	25	18.87	18.98	19.14		
10	QPSK	50	0	18.90	19.00	19.14	20	0
10	16QAM	1	0	19.15	19.21	19.39		
10	16QAM	1	25	19.26	19.31	19.50		
10	16QAM	1	49	19.19	19.29	19.42	20	0
10	16QAM	25	0	18.92	18.95	19.09		
10	16QAM	25	12	18.91	18.97	19.17		
10	16QAM	25	25	18.90	18.99	19.17	20	0
10	16QAM	50	0	18.93	19.01	19.17		



Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	18.74	18.78	18.96	20	0
5	QPSK	1	12	18.97	19.07	19.23		
5	QPSK	1	24	18.71	18.82	18.96		
5	QPSK	12	0	18.81	18.90	19.09	20	0
5	QPSK	12	7	18.87	18.97	19.16		
5	QPSK	12	13	18.84	18.98	19.12		
5	QPSK	25	0	18.83	18.94	19.09	20	0
5	16QAM	1	0	19.07	19.13	19.30		
5	16QAM	1	12	19.33	19.40	19.58		
5	16QAM	1	24	19.08	19.18	19.33	20	0
5	16QAM	12	0	18.83	18.90	19.09		
5	16QAM	12	7	18.92	19.00	19.17		
5	16QAM	12	13	18.87	19.01	19.16	20	0
5	16QAM	25	0	18.84	18.96	19.12		

<WLAN Conducted Power>

General Note:

1. Per KDB 248227 D01v02r02, SAR test reduction is determined according to 802.11 transmission mode configurations and certain exposure conditions with multiple test positions. In the 2.4 GHz band, separate SAR procedures are applied to DSSS and OFDM configurations to simplify DSSS test requirements. For OFDM, in both 2.4 and 5 GHz bands, an initial test configuration must be determined for each standalone and aggregated frequency band, according to the transmission mode configuration with the highest maximum output power specified for production units to perform SAR measurements. If the same highest maximum output power applies to different combinations of channel bandwidths, modulations and data rates, additional procedures are applied to determine which test configurations require SAR measurement. When applicable, an initial test position may be applied to reduce the number of SAR measurements required for next to the ear, UMPC mini-tablet or hotspot mode configurations with multiple test positions.
2. For 2.4 GHz 802.11b DSSS, either the initial test position procedure for multiple exposure test positions or the DSSS procedure for fixed exposure position is applied; these are mutually exclusive. For 2.4 GHz and 5 GHz OFDM configurations, the initial test configuration is applied to measure SAR using either the initial test position procedure for multiple exposure test position configurations or the initial test configuration procedures for fixed exposure test conditions. Based on the reported SAR of the measured configurations and maximum output power of the transmission mode configurations that are not included in the initial test configuration, the subsequent test configuration and initial test position procedures are applied to determine if SAR measurements are required for the remaining OFDM transmission configurations. In general, the number of test channels that require SAR measurement is minimized based on maximum output power measured for the test sample(s).
3. For OFDM transmission configurations in the 2.4 GHz and 5 GHz bands, When the same maximum power is specified for multiple transmission modes in a frequency band, the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order 802.11a/g/n/ac mode is used for SAR measurement, on the highest measured output power channel for each frequency band.
4. DSSS and OFDM configurations are considered separately according to the required SAR procedures. SAR is measured in the initial test position using the 802.11 transmission mode configuration required by the DSSS procedure or initial test configuration and subsequent test configuration(s) according to the OFDM procedures.18 The initial test position procedure is described in the following:
 - a. When the reported SAR of the initial test position is ≤ 0.4 W/kg, further SAR measurement is not required for the other test positions in that exposure configuration and 802.11 transmission mode combinations within the frequency band or aggregated band.
 - b. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
 - c. For all positions/configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions/configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.



<Full Power Mode>

<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	18.20	18.50	100.00
		6	2437	18.46	18.50	
		11	2462	18.16	18.50	
	802.11g 6Mbps	1	2412	13.68	14.50	96.97
		2	2417	17.87	18.00	
		6	2437	17.59	18.00	
		10	2437	17.79	18.00	
		11	2462	13.67	14.50	
	802.11n-HT20 MCS0	1	2412	13.62	14.50	96.76
		2	2417	17.42	17.50	
		6	2437	17.06	17.50	
		10	2437	17.33	17.50	
		11	2462	13.66	14.50	
	802.11n-HT40 MCS0	3	2422	13.61	14.50	93.73
		4	2427	14.92	15.00	
		6	2437	14.87	15.00	
8		2447	14.81	15.00		
9		2452	13.92	14.50		



<Reduced Power Mode for Receiver On>

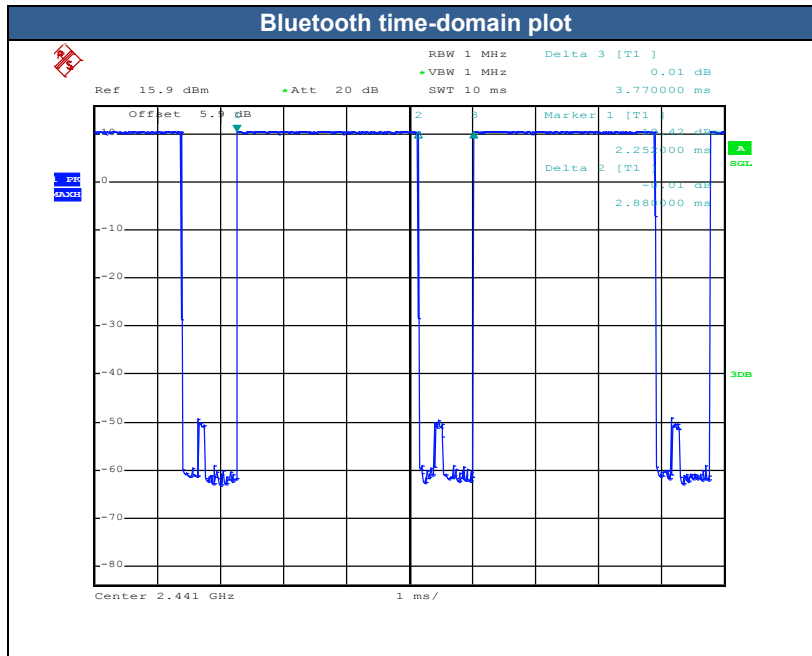
<2.4GHz WLAN>

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	14.25	14.50	100.00
		6	2437	14.19	14.50	
		11	2462	14.29	14.50	
	802.11g 6Mbps	1	2412	14.39	14.50	96.97
		6	2437	14.44	14.50	
		11	2462	14.19	14.50	
	802.11n-HT20 MCS0	1	2412	14.45	14.50	96.76
		6	2437	14.47	14.50	
		11	2462	14.35	14.50	
	802.11n-HT40 MCS0	3	2422	14.33	14.50	93.73
		6	2437	14.21	14.50	
		9	2452	14.36	14.50	

<2.4GHz Bluetooth>

General Note:

1. For 2.4GHz Bluetooth SAR testing was selected 1Mbps, due to its highest average power.
2. The Bluetooth duty cycle is 76.39 % as following figure, according to 2016 Oct. TCB workshop for Bluetooth SAR scaling need further consideration and the theoretical duty cycle is 83.3%, therefore the actual duty cycle will be scaled up to the theoretical value of Bluetooth reported SAR calculation.



Mode	Channel	Frequency (MHz)	Average power (dBm)		
			DH5	2DH5	3DH5
BR/EDR	CH 00	2402	9.85	7.81	7.21
	CH 39	2441	9.94	7.74	7.62
	CH 78	2480	10.37	8.10	8.00
Tune-up limit (dBm)			11.00	9.00	9.00

Mode	Channel	Frequency (MHz)	Average power (dBm)
			GFSK
BLE	CH 00	2402	-2.99
	CH 19	2440	-2.03
	CH 39	2480	-2.29
Tune-up Limit			1.00



16. Bluetooth Exclusions Applied for Product Specific 10g SAR

Mode Band	Max Average power(dBm)	
	BR/EDR	LE
2.4GHz Bluetooth	11.00	1.00

Note:

- Per KDB 447498 D01v06, the 1-g and 10-g SAR test exclusion thresholds for 100 MHz to 6 GHz at *test separation distances* ≤ 50 mm are determined by:

$$[(\text{max. power of channel, including tune-up tolerance, mW}) / (\text{min. test separation distance, mm})] \cdot [\sqrt{f(\text{GHz})}] \leq 3.0$$
for 1-g SAR and ≤ 7.5 for 10-g extremity SAR
 - f(GHz) is the RF channel transmit frequency in GHz
 - Power and distance are rounded to the nearest mW and mm before calculation
 - The result is rounded to one decimal place for comparison

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	Exclusion Thresholds
11.00	0	2.48	0.2

Note:

Per KDB 447498 D01v06, when the minimum test separation distance is < 5 mm, a distance of 5 mm is applied to determine SAR test exclusion. The test exclusion threshold is 0.2 which is ≤ 7.5, Product Specific 10g SAR testing is not required.



17. Antenna Location

The detail antenna location information please refers to appendix E submitted separately.



18. SAR Test Results

General Note:

1. Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
 - a. Tune-up scaling Factor = tune-up limit power (mW) / EUT RF power (mW), where tune-up limit is the maximum rated power among all production units.
 - b. For SAR testing of WLAN signal with non-100% duty cycle, the measured SAR is scaled-up by the duty cycle scaling factor which is equal to "1/(duty cycle)"
 - c. For WWAN: Reported SAR(W/kg)= Measured SAR(W/kg)*Tune-up Scaling Factor
 - d. For BT/WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)* Duty Cycle scaling factor * Tune-up scaling factor
2. Per KDB 447498 D01v06, for each exposure position, testing of other required channels within the operating mode of a frequency band is not required when the *reported* 1-g or 10-g SAR for the mid-band or highest output power channel is:
 - ≤ 0.8 W/kg or 2.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≤ 100 MHz
 - ≤ 0.6 W/kg or 1.5 W/kg, for 1-g or 10-g respectively, when the transmission band is between 100 MHz and 200 MHz
 - ≤ 0.4 W/kg or 1.0 W/kg, for 1-g or 10-g respectively, when the transmission band is ≥ 200 MHz
3. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required when the measured SAR is ≥ 0.8 W/kg.
4. Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is ≤ 1.2 W/kg, SAR testing with a headset connected to the handset is not required.
5. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of all WWAN Bands.
6. The device employs proximity sensors that detect the presence of the user's body at the back and bottom side faces of the device. When back or bottom side is detected, all WWAN Bands reduced power will be active.
7. When the phone is in talking mode and receiver worked, then power reduction will be implemented immediately at WLAN2.4GHz.
8. Per KDB648474 D04v01r03, for smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm, when hotspot mode applies, 10-g product specific SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg, however, when power reduction applies to hotspot mode the measured SAR must be scaled to the maximum output power, including tolerance, allowed for phablet modes to compare with the 1.2 W/kg SAR test reduction threshold, for this device, hotspot mode reported SAR and the maximum output power scaled SAR are all less than 1.2 W/kg, therefore product specific SAR is not necessary.
9. The device has two SIM slots and supports dual SIM dual standby. The WWAN radio transmission will be enabled by either one SIM at a time (single active). After pre-scan two SIM cards power, we found test result of the SIM1 was the worse, so we chose SIM1 slot to perform all tests, SIM2 only verified the worst case of SIM1 for each position.
10. There are three batteries which with the same capacity, they are only with different suppliers. We only chose battery 1 for full test, and battery 2/3 only verified the worst case of battery 1 for each position.

GSM Note:

1. Per KDB 941225 D01v03r01, for SAR test reduction for GSM / GPRS / EDGE modes is determined by the source-based time-averaged output power including tune-up tolerance. The 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. Therefore, GSM voice for GSM850/GSM1900 is chose to perform head SAR, GPRS 4Tx slots for GSM850/GSM1900 are considered as the primary mode for body SAR.
2. Other configurations of GSM / GPRS / EDGE are considered as secondary modes. The 3G SAR test reduction procedure is applied, when the maximum output power and tune-up tolerance specified for production units in a secondary mode is $\leq 1/4$ dB higher than the primary mode, SAR measurement is not required for the secondary mode.
3. Power reduction which is triggered by hotspot mode/p-sensor on are implemented in GSM850/1900 band, for SAR testing EUT was set in reduced power mode and GPRS 4Tx slots due to its highest frame-average power.

WCDMA Note:

1. Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
2. Per KDB 941225 D01v03r01, RMC 12.2kbps setting is used to evaluate SAR. The maximum output power and tune-up tolerance specified for production units in HSDPA / HSUPA / DC-HSDPA / HSPA+ is $\leq \frac{1}{4}$ dB higher than RMC 12.2Kbps or when the highest reported SAR of the RMC12.2Kbps is scaled by the ratio of specified maximum output power and tune-up tolerance of HSDPA / HSUPA / DC-HSDPA / HSPA+ to RMC12.2Kbps and the adjusted SAR is ≤ 1.2 W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+, and according to the following RF output power, the output power results of the secondary modes (HSDPA / HSUPA / DC-HSDPA / HSPA+) are less than $\frac{1}{4}$ dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA / HSPA+.

LTE Note:

1. Per KDB 941225 D05v02r05, start with the largest channel bandwidth and measure SAR for QPSK with 1 RB allocation, using the RB offset and required test channel combination with the highest maximum output power for RB offsets at the upper edge, middle and lower edge of each required test channel.
2. Per KDB 941225 D05v02r05, 50% RB allocation for QPSK SAR testing follows 1RB QPSK allocation procedure.
3. Per KDB 941225 D05v02r05, For QPSK with 100% RB allocation, SAR is not required when the highest maximum output power for 100 % RB allocation is less than the highest maximum output power in 50% and 1 RB allocations and the highest reported SAR for 1 RB and 50% RB allocation are ≤ 0.8 W/kg. Otherwise, SAR is measured for the highest output power channel; and if the reported SAR is > 1.45 W/kg, the remaining required test channels must also be tested.
4. Per KDB 941225 D05v02r05, 16QAM output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, 16QAM SAR testing is not required.
5. Per KDB 941225 D05v02r05, smaller bandwidth output power for each RB allocation configuration is $>$ not $\frac{1}{2}$ dB higher than the same configuration in the largest supported bandwidth, and the reported SAR for the largest supported bandwidth is ≤ 1.45 W/kg; Per KDB 941225 D05v02r05, smaller bandwidth SAR testing is not required.
6. For LTE B5 the maximum 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 middle channel of the group of overlapping channels should be selected for testing.

WLAN Note:

1. Per KDB 248227 D01v02r02, for 2.4GHz 802.11g/n SAR testing is not required when the highest reported SAR for DSSS is adjusted by the ratio of OFDM to DSSS specified maximum output power and the adjusted SAR is ≤ 1.2 W/kg.
2. When the reported SAR of the test position is > 0.4 W/kg, SAR is repeated for the 802.11 transmission mode configuration tested in the initial test position to measure the subsequent next closet/smallest test separation distance and maximum coupling test position on the highest maximum output power channel, until the report SAR is ≤ 0.8 W/kg or all required test position are tested.
3. For all positions / configurations, when the reported SAR is > 0.8 W/kg, SAR is measured for these test positions / configurations on the subsequent next highest measured output power channel(s) until the reported SAR is ≤ 1.2 W/kg or all required channels are tested.
4. During SAR testing the WLAN transmission was verified using a spectrum analyzer.



18.1 Head SAR

<GSM SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	1	GSM850	GSM Voice	Right Cheek	Full	128	824.2	33.06	34.00	1.242	0.04	0.135	0.168
	1	1	GSM850	GSM Voice	Right Tilted	Full	128	824.2	33.06	34.00	1.242	0.05	0.079	0.098
#01	1	1	GSM850	GSM Voice	Left Cheek	Full	128	824.2	33.06	34.00	1.242	0.03	0.146	0.181
	1	1	GSM850	GSM Voice	Left Tilted	Full	128	824.2	33.06	34.00	1.242	0.01	0.078	0.097
	2	1	GSM850	GSM Voice	Left Cheek	Full	128	824.2	33.06	34.00	1.242	0.06	0.142	0.176
	1	2	GSM850	GSM Voice	Left Cheek	Full	128	824.2	33.06	34.00	1.242	0.01	0.124	0.154
	1	3	GSM850	GSM Voice	Left Cheek	Full	128	824.2	33.06	34.00	1.242	0.04	0.144	0.179
	1	1	GSM1900	GSM Voice	Right Cheek	Full	512	1850.2	29.80	31.00	1.318	-0.01	0.158	0.208
	1	1	GSM1900	GSM Voice	Right Tilted	Full	512	1850.2	29.80	31.00	1.318	-0.01	0.120	0.158
	1	1	GSM1900	GSM Voice	Left Cheek	Full	512	1850.2	29.80	31.00	1.318	-0.02	0.230	0.303
	1	1	GSM1900	GSM Voice	Left Tilted	Full	512	1850.2	29.80	31.00	1.318	0.02	0.104	0.137
	2	1	GSM1900	GSM Voice	Left Cheek	Full	512	1850.2	29.80	31.00	1.318	0.05	0.225	0.297
	1	2	GSM1900	GSM Voice	Left Cheek	Full	512	1850.2	29.80	31.00	1.318	0.01	0.243	0.320
#02	1	3	GSM1900	GSM Voice	Left Cheek	Full	512	1850.2	29.80	31.00	1.318	-0.05	0.298	0.393

<WCDMA SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	1	WCDMA Band V	RMC 12.2Kbps	Right Cheek	Full	4182	836.4	24.04	25.00	1.247	0.08	0.215	0.268
	1	1	WCDMA Band V	RMC 12.2Kbps	Right Tilted	Full	4182	836.4	24.04	25.00	1.247	0.01	0.139	0.173
	1	1	WCDMA Band V	RMC 12.2Kbps	Left Cheek	Full	4182	836.4	24.04	25.00	1.247	0.05	0.238	0.297
	1	1	WCDMA Band V	RMC 12.2Kbps	Left Tilted	Full	4182	836.4	24.04	25.00	1.247	0.02	0.131	0.163
	2	1	WCDMA Band V	RMC 12.2Kbps	Left Cheek	Full	4182	836.4	24.04	25.00	1.247	-0.02	0.237	0.296
#03	1	2	WCDMA Band V	RMC 12.2Kbps	Left Cheek	Full	4182	836.4	24.04	25.00	1.247	-0.05	0.253	0.316
	1	3	WCDMA Band V	RMC 12.2Kbps	Left Cheek	Full	4182	836.4	24.04	25.00	1.247	0.03	0.251	0.313
	1	1	WCDMA Band II	RMC 12.2Kbps	Right Cheek	Full	9538	1907.6	23.76	24.50	1.186	-0.04	0.296	0.351
	1	1	WCDMA Band II	RMC 12.2Kbps	Right Tilted	Full	9538	1907.6	23.76	24.50	1.186	0.06	0.206	0.244
	1	1	WCDMA Band II	RMC 12.2Kbps	Left Cheek	Full	9538	1907.6	23.76	24.50	1.186	0.01	0.442	0.524
	1	1	WCDMA Band II	RMC 12.2Kbps	Left Tilted	Full	9538	1907.6	23.76	24.50	1.186	0.03	0.227	0.269
	2	1	WCDMA Band II	RMC 12.2Kbps	Left Cheek	Full	9538	1907.6	23.76	24.50	1.186	-0.03	0.442	0.524
	2	2	WCDMA Band II	RMC 12.2Kbps	Left Cheek	Full	9538	1907.6	23.76	24.50	1.186	0.02	0.439	0.521
#04	2	3	WCDMA Band II	RMC 12.2Kbps	Left Cheek	Full	9538	1907.6	23.76	24.50	1.186	-0.01	0.524	0.621



<LTE SAR>

Plot No.	SIM	Battery	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	1	LTE Band 5	10M	QPSK	1	25	Right Cheek	Full	20525	836.5	23.15	24.50	1.365	0.07	0.181	0.247
	1	1	LTE Band 5	10M	QPSK	25	25	Right Cheek	Full	20525	836.5	22.09	23.50	1.384	0.03	0.141	0.195
	1	1	LTE Band 5	10M	QPSK	1	25	Right Tilted	Full	20525	836.5	23.15	24.50	1.365	-0.05	0.110	0.150
	1	1	LTE Band 5	10M	QPSK	25	25	Right Tilted	Full	20525	836.5	22.09	23.50	1.384	0.09	0.088	0.122
	1	1	LTE Band 5	10M	QPSK	1	25	Left Cheek	Full	20525	836.5	23.15	24.50	1.365	0.04	0.201	0.274
	1	1	LTE Band 5	10M	QPSK	25	25	Left Cheek	Full	20525	836.5	22.09	23.50	1.384	0.06	0.154	0.213
	1	1	LTE Band 5	10M	QPSK	1	25	Left Tilted	Full	20525	836.5	23.15	24.50	1.365	-0.02	0.114	0.156
	1	1	LTE Band 5	10M	QPSK	25	25	Left Tilted	Full	20525	836.5	22.09	23.50	1.384	0.07	0.087	0.121
	2	1	LTE Band 5	10M	QPSK	1	25	Left Cheek	Full	20525	836.5	23.15	24.50	1.365	0.06	0.198	0.270
#05	1	2	LTE Band 5	10M	QPSK	1	25	Left Cheek	Full	20525	836.5	23.15	24.50	1.365	0.04	0.213	0.291
	1	3	LTE Band 5	10M	QPSK	1	25	Left Cheek	Full	20525	836.5	23.15	24.50	1.365	0.02	0.211	0.288
	1	1	LTE Band 7	20M	QPSK	1	49	Right Cheek	Full	21350	2560	23.20	24.00	1.202	0.04	0.392	0.471
	1	1	LTE Band 7	20M	QPSK	50	50	Right Cheek	Full	21350	2560	22.23	23.00	1.194	0.01	0.312	0.373
	1	1	LTE Band 7	20M	QPSK	1	49	Right Tilted	Full	21350	2560	23.20	24.00	1.202	0.02	0.225	0.271
	1	1	LTE Band 7	20M	QPSK	50	50	Right Tilted	Full	21350	2560	22.23	23.00	1.194	0.05	0.175	0.209
	1	1	LTE Band 7	20M	QPSK	1	49	Left Cheek	Full	21350	2560	23.20	24.00	1.202	0.05	0.234	0.281
	1	1	LTE Band 7	20M	QPSK	50	50	Left Cheek	Full	21350	2560	22.23	23.00	1.194	0.05	0.192	0.229
	1	1	LTE Band 7	20M	QPSK	1	49	Left Tilted	Full	21350	2560	23.20	24.00	1.202	0.04	0.257	0.309
	1	1	LTE Band 7	20M	QPSK	50	50	Left Tilted	Full	21350	2560	22.23	23.00	1.194	0.02	0.192	0.229
#06	2	1	LTE Band 7	20M	QPSK	1	49	Right Cheek	Full	21350	2560	23.20	24.00	1.202	0.01	0.396	0.476
	2	2	LTE Band 7	20M	QPSK	1	49	Right Cheek	Full	21350	2560	23.20	24.00	1.202	-0.06	0.336	0.404
	2	3	LTE Band 7	20M	QPSK	1	49	Right Cheek	Full	21350	2560	23.20	24.00	1.202	-0.05	0.287	0.345

<WLAN 2.4GHz SAR>

Plot No.	Battery	Band	Mode	Test Position	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	Receiver On	11	2462	14.29	14.50	1.050	100	1.000		0.338		
	1	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	Receiver On	11	2462	14.29	14.50	1.050	100	1.000		0.402		
	1	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Receiver On	11	2462	14.29	14.50	1.050	100	1.000	-0.05	0.788	0.409	0.429
	1	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	Receiver On	11	2462	14.29	14.50	1.050	100	1.000	0.02	0.803	0.397	0.417
	2	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Receiver On	11	2462	14.29	14.50	1.050	100	1.000	-0.14		0.392	0.411
#07	3	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Receiver On	11	2462	14.29	14.50	1.050	100	1.000	-0.02		0.488	0.512

<Bluetooth SAR>

Plot No.	Battery	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	Bluetooth	1Mbps	Right Cheek	78	2480	10.37	11.00	1.156	76.39	1.090	-0.02	0.043	0.055
	1	Bluetooth	1Mbps	Right Tilted	78	2480	10.37	11.00	1.156	76.39	1.090	-0.05	0.044	0.056
	1	Bluetooth	1Mbps	Left Cheek	78	2480	10.37	11.00	1.156	76.39	1.090	0.07	0.076	0.096
	1	Bluetooth	1Mbps	Left Tilted	78	2480	10.37	11.00	1.156	76.39	1.090	-0.02	0.070	0.088
	2	Bluetooth	1Mbps	Left Cheek	78	2480	10.37	11.00	1.156	76.39	1.090	0.03	0.080	0.100
#08	3	Bluetooth	1Mbps	Left Cheek	78	2480	10.37	11.00	1.156	76.39	1.090	0.01	0.114	0.144



18.2 Hotspot SAR

<GSM SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	1	GSM850	GPRS 4 Tx slots	Front	10	Hotspot On	128	824.2	26.06	27.00	1.242	-0.09	0.131	0.163
	1	1	GSM850	GPRS 4 Tx slots	Back	10	Hotspot On	128	824.2	26.06	27.00	1.242	0.03	0.268	0.333
	1	1	GSM850	GPRS 4 Tx slots	Left Side	10	Hotspot On	128	824.2	26.06	27.00	1.242	0.05	0.197	0.245
	1	1	GSM850	GPRS 4 Tx slots	Right Side	10	Hotspot On	128	824.2	26.06	27.00	1.242	0.02	0.187	0.232
	1	1	GSM850	GPRS 4 Tx slots	Bottom Side	10	Hotspot On	128	824.2	26.06	27.00	1.242	0.02	0.028	0.035
	2	1	GSM850	GPRS 4 Tx slots	Back	10	Hotspot On	128	824.2	26.06	27.00	1.242	0.04	0.263	0.327
#09	1	2	GSM850	GPRS 4 Tx slots	Back	10	Hotspot On	128	824.2	26.06	27.00	1.242	-0.15	0.289	0.359
	1	3	GSM850	GPRS 4 Tx slots	Back	10	Hotspot On	128	824.2	26.06	27.00	1.242	-0.02	0.286	0.355
	1	1	GSM1900	GPRS 4 Tx slots	Front	10	Hotspot On	512	1850.2	22.15	23.00	1.216	-0.07	0.119	0.145
	1	1	GSM1900	GPRS 4 Tx slots	Back	10	Hotspot On	512	1850.2	22.15	23.00	1.216	-0.05	0.163	0.198
	1	1	GSM1900	GPRS 4 Tx slots	Left Side	10	Hotspot On	512	1850.2	22.15	23.00	1.216	0.02	0.107	0.130
	1	1	GSM1900	GPRS 4 Tx slots	Right Side	10	Hotspot On	512	1850.2	22.15	23.00	1.216	0.03	0.051	0.063
	1	1	GSM1900	GPRS 4 Tx slots	Bottom Side	10	Hotspot On	512	1850.2	22.15	23.00	1.216	0.02	0.143	0.174
	2	1	GSM1900	GPRS 4 Tx slots	Back	10	Hotspot On	512	1850.2	22.15	23.00	1.216	-0.09	0.154	0.187
#10	1	2	GSM1900	GPRS 4 Tx slots	Back	10	Hotspot On	512	1850.2	22.15	23.00	1.216	-0.14	0.164	0.199
	1	3	GSM1900	GPRS 4 Tx slots	Back	10	Hotspot On	512	1850.2	22.15	23.00	1.216	-0.12	0.160	0.195

<WCDMA SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	1	WCDMA Band V	RMC 12.2Kbps	Front	10	Hotspot On	4182	836.4	23.20	24.00	1.202	0.02	0.193	0.232
	1	1	WCDMA Band V	RMC 12.2Kbps	Back	10	Hotspot On	4182	836.4	23.20	24.00	1.202	0.01	0.371	0.446
	1	1	WCDMA Band V	RMC 12.2Kbps	Left Side	10	Hotspot On	4182	836.4	23.20	24.00	1.202	-0.05	0.268	0.322
	1	1	WCDMA Band V	RMC 12.2Kbps	Right Side	10	Hotspot On	4182	836.4	23.20	24.00	1.202	0.02	0.261	0.314
	1	1	WCDMA Band V	RMC 12.2Kbps	Bottom Side	10	Hotspot On	4182	836.4	23.20	24.00	1.202	-0.14	0.049	0.059
	2	1	WCDMA Band V	RMC 12.2Kbps	Back	10	Hotspot On	4182	836.4	23.20	24.00	1.202	-0.1	0.367	0.441
#11	1	2	WCDMA Band V	RMC 12.2Kbps	Back	10	Hotspot On	4182	836.4	23.20	24.00	1.202	-0.13	0.392	0.471
	1	3	WCDMA Band V	RMC 12.2Kbps	Back	10	Hotspot On	4182	836.4	23.20	24.00	1.202	0.02	0.355	0.427
	1	1	WCDMA Band II	RMC 12.2Kbps	Front	10	Hotspot On	9400	1880	21.18	21.50	1.076	-0.1	0.257	0.277
#12	1	1	WCDMA Band II	RMC 12.2Kbps	Back	10	Hotspot On	9400	1880	21.18	21.50	1.076	0.09	0.310	0.334
	1	1	WCDMA Band II	RMC 12.2Kbps	Left Side	10	Hotspot On	9400	1880	21.18	21.50	1.076	0.02	0.243	0.262
	1	1	WCDMA Band II	RMC 12.2Kbps	Right Side	10	Hotspot On	9400	1880	21.18	21.50	1.076	0.02	0.105	0.113
	1	1	WCDMA Band II	RMC 12.2Kbps	Bottom Side	10	Hotspot On	9400	1880	21.18	21.50	1.076	-0.18	0.193	0.208
	2	1	WCDMA Band II	RMC 12.2Kbps	Back	10	Hotspot On	9400	1880	21.18	21.50	1.076	-0.07	0.295	0.318
	1	2	WCDMA Band II	RMC 12.2Kbps	Back	10	Hotspot On	9400	1880	21.18	21.50	1.076	-0.07	0.284	0.306
	1	3	WCDMA Band II	RMC 12.2Kbps	Back	10	Hotspot On	9400	1880	21.18	21.50	1.076	-0.08	0.296	0.319



<LTE SAR>

Plot No.	SIM	Battery	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	1	LTE Band 5	10M	QPSK	1	25	Front	10	Hotspot On	20525	836.5	22.39	23.50	1.291	-0.01	0.147	0.190
	1	1	LTE Band 5	10M	QPSK	25	25	Front	10	Hotspot On	20525	836.5	22.37	23.50	1.297	-0.01	0.158	0.205
	1	1	LTE Band 5	10M	QPSK	1	25	Back	10	Hotspot On	20525	836.5	22.39	23.50	1.291	-0.06	0.306	0.395
	1	1	LTE Band 5	10M	QPSK	25	25	Back	10	Hotspot On	20525	836.5	22.37	23.50	1.297	-0.01	0.303	0.393
	1	1	LTE Band 5	10M	QPSK	1	25	Left Side	10	Hotspot On	20525	836.5	22.39	23.50	1.291	-0.06	0.226	0.292
	1	1	LTE Band 5	10M	QPSK	25	25	Left Side	10	Hotspot On	20525	836.5	22.37	23.50	1.297	-0.01	0.228	0.296
	1	1	LTE Band 5	10M	QPSK	1	25	Right Side	10	Hotspot On	20525	836.5	22.39	23.50	1.291	-0.14	0.213	0.275
	1	1	LTE Band 5	10M	QPSK	25	25	Right Side	10	Hotspot On	20525	836.5	22.37	23.50	1.297	-0.03	0.214	0.278
	1	1	LTE Band 5	10M	QPSK	1	25	Bottom Side	10	Hotspot On	20525	836.5	22.39	23.50	1.291	-0.01	0.041	0.053
	1	1	LTE Band 5	10M	QPSK	25	25	Bottom Side	10	Hotspot On	20525	836.5	22.37	23.50	1.297	0.02	0.043	0.055
	2	1	LTE Band 5	10M	QPSK	1	25	Back	10	Hotspot On	20525	836.5	22.39	23.50	1.291	0.02	0.311	0.402
#13	2	2	LTE Band 5	10M	QPSK	1	25	Back	10	Hotspot On	20525	836.5	22.39	23.50	1.291	-0.11	0.339	0.438
	2	3	LTE Band 5	10M	QPSK	1	25	Back	10	Hotspot On	20525	836.5	22.39	23.50	1.291	-0.02	0.334	0.431
	1	1	LTE Band 7	20M	QPSK	1	49	Front	10	Hotspot On	21350	2560	19.20	20.00	1.202	-0.12	0.157	0.189
	1	1	LTE Band 7	20M	QPSK	50	50	Front	10	Hotspot On	21350	2560	19.27	20.00	1.183	-0.07	0.159	0.188
	1	1	LTE Band 7	20M	QPSK	1	49	Back	10	Hotspot On	21350	2560	19.20	20.00	1.202	-0.06	0.214	0.257
	1	1	LTE Band 7	20M	QPSK	50	50	Back	10	Hotspot On	21350	2560	19.27	20.00	1.183	-0.07	0.223	0.264
	1	1	LTE Band 7	20M	QPSK	1	49	Left Side	10	Hotspot On	21350	2560	19.20	20.00	1.202	-0.05	0.077	0.093
	1	1	LTE Band 7	20M	QPSK	50	50	Left Side	10	Hotspot On	21350	2560	19.27	20.00	1.183	-0.14	0.073	0.086
	1	1	LTE Band 7	20M	QPSK	1	49	Right Side	10	Hotspot On	21350	2560	19.20	20.00	1.202	-0.17	0.100	0.120
	1	1	LTE Band 7	20M	QPSK	50	50	Right Side	10	Hotspot On	21350	2560	19.27	20.00	1.183	-0.18	0.102	0.121
	1	1	LTE Band 7	20M	QPSK	1	49	Bottom Side	10	Hotspot On	21350	2560	19.20	20.00	1.202	-0.12	0.228	0.274
#14	1	1	LTE Band 7	20M	QPSK	50	50	Bottom Side	10	Hotspot On	21350	2560	19.27	20.00	1.183	-0.15	0.235	0.278
	2	1	LTE Band 7	20M	QPSK	50	50	Bottom Side	10	Hotspot On	21350	2560	19.27	20.00	1.183	-0.13	0.232	0.274
	1	2	LTE Band 7	20M	QPSK	50	50	Bottom Side	10	Hotspot On	21350	2560	19.27	20.00	1.183	-0.02	0.209	0.247
	1	3	LTE Band 7	20M	QPSK	50	50	Bottom Side	10	Hotspot On	21350	2560	19.27	20.00	1.183	-0.13	0.230	0.272



<WLAN 2.4GHz SAR>

Plot No.	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	WLAN2.4GHz	802.11b 1Mbps	Front	10	Full	6	2437	18.46	18.50	1.009	100	1.000		0.329		
	1	WLAN2.4GHz	802.11b 1Mbps	Back	10	Full	6	2437	18.46	18.50	1.009	100	1.000	-0.08	0.481	0.280	0.283
	1	WLAN2.4GHz	802.11b 1Mbps	Right Side	10	Full	6	2437	18.46	18.50	1.009	100	1.000		0.223		
	1	WLAN2.4GHz	802.11b 1Mbps	Top Side	10	Full	6	2437	18.46	18.50	1.009	100	1.000		0.419		
	2	WLAN2.4GHz	802.11b 1Mbps	Back	10	Full	6	2437	18.46	18.50	1.009	100	1.000	-0.12		0.259	0.261
#15	3	WLAN2.4GHz	802.11b 1Mbps	Back	10	Full	6	2437	18.46	18.50	1.009	100	1.000	-0.14		0.292	0.295

18.3 Body Worn Accessory SAR

<GSM SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	1	GSM850	GPRS 4 Tx slots	Front	15	Full	128	824.2	27.00	28.00	1.259	-0.12	0.164	0.206
	1	1	GSM850	GPRS 4 Tx slots	Back	15	P-Sensor On	128	824.2	26.05	27.00	1.245	-0.07	0.238	0.296
	2	1	GSM850	GPRS 4 Tx slots	Back	15	P-Sensor On	128	824.2	26.05	27.00	1.245	0.1	0.235	0.292
	1	2	GSM850	GPRS 4 Tx slots	Back	15	P-Sensor On	128	824.2	26.05	27.00	1.245	0.01	0.257	0.320
	1	3	GSM850	GPRS 4 Tx slots	Back	15	P-Sensor On	128	824.2	26.05	27.00	1.245	-0.03	0.262	0.326
#16	1	3	GSM850	GPRS 4 Tx slots	Back	18	P-Sensor Off	128	824.2	27.00	28.00	1.259	-0.03	0.275	0.346
	1	1	GSM1900	GPRS 4 Tx slots	Front	15	Full	512	1850.2	23.75	25.00	1.334	-0.1	0.142	0.189
	1	1	GSM1900	GPRS 4 Tx slots	Back	15	P-Sensor On	512	1850.2	21.87	23.00	1.297	-0.04	0.086	0.112
	1	1	GSM1900	GPRS 4 Tx slots	Back	18	P-Sensor Off	512	1850.2	23.75	25.00	1.334	0.01	0.101	0.135
	2	1	GSM1900	GPRS 4 Tx slots	Front	15	Full	512	1850.2	23.75	25.00	1.334	-0.11	0.143	0.191
	2	2	GSM1900	GPRS 4 Tx slots	Front	15	Full	512	1850.2	23.75	25.00	1.334	-0.17	0.139	0.185
#17	2	3	GSM1900	GPRS 4 Tx slots	Front	15	Full	512	1850.2	23.75	25.00	1.334	-0.16	0.153	0.204

<WCDMA SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	1	WCDMA Band V	RMC 12.2Kbps	Front	15	Full	4182	836.4	24.04	25.00	1.247	0.02	0.192	0.239
	1	1	WCDMA Band V	RMC 12.2Kbps	Back	15	P-Sensor On	4182	836.4	23.24	24.00	1.191	0.06	0.321	0.382
	2	1	WCDMA Band V	RMC 12.2Kbps	Back	15	P-Sensor On	4182	836.4	23.24	24.00	1.191	0.03	0.323	0.385
	2	2	WCDMA Band V	RMC 12.2Kbps	Back	15	P-Sensor On	4182	836.4	23.24	24.00	1.191	0.07	0.351	0.418
	2	3	WCDMA Band V	RMC 12.2Kbps	Back	15	P-Sensor On	4182	836.4	23.24	24.00	1.191	-0.04	0.358	0.426
#18	2	3	WCDMA Band V	RMC 12.2Kbps	Back	18	P-Sensor Off	4182	836.4	24.04	25.00	1.247	-0.01	0.379	0.473
	1	1	WCDMA Band II	RMC 12.2Kbps	Front	15	Full	9538	1907.6	23.76	24.50	1.186	0.03	0.322	0.382
	1	1	WCDMA Band II	RMC 12.2Kbps	Back	15	P-Sensor On	9400	1880	21.19	21.50	1.074	-0.06	0.181	0.194
	1	1	WCDMA Band II	RMC 12.2Kbps	Back	18	P-Sensor Off	9538	1907.6	23.76	24.50	1.186	-0.02	0.209	0.248
	2	1	WCDMA Band II	RMC 12.2Kbps	Front	15	Full	9538	1907.6	23.76	24.50	1.186	-0.03	0.324	0.384
	2	2	WCDMA Band II	RMC 12.2Kbps	Front	15	Full	9538	1907.6	23.76	24.50	1.186	-0.08	0.307	0.364
#19	2	3	WCDMA Band II	RMC 12.2Kbps	Front	15	Full	9538	1907.6	23.76	24.50	1.186	-0.07	0.357	0.423



<LTE SAR>

Plot No.	SIM	Battery	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	1	LTE Band 5	10M	QPSK	1	25	Front	15	Full	20525	836.5	23.15	24.50	1.365	-0.04	0.104	0.142
	1	1	LTE Band 5	10M	QPSK	25	25	Front	15	Full	20525	836.5	22.09	23.50	1.384	0.03	0.082	0.113
	1	1	LTE Band 5	10M	QPSK	1	25	Back	15	P-Sensor On	20525	836.5	22.32	23.50	1.312	0.09	0.266	0.349
	1	1	LTE Band 5	10M	QPSK	25	25	Back	15	P-Sensor On	20525	836.5	22.24	23.50	1.337	0.04	0.260	0.348
	2	1	LTE Band 5	10M	QPSK	1	25	Back	15	P-Sensor On	20525	836.5	22.32	23.50	1.312	-0.12	0.270	0.354
	2	2	LTE Band 5	10M	QPSK	1	25	Back	15	P-Sensor On	20525	836.5	22.32	23.50	1.312	-0.07	0.295	0.387
	2	3	LTE Band 5	10M	QPSK	1	25	Back	15	P-Sensor On	20525	836.5	22.32	23.50	1.312	-0.03	0.290	0.381
#20	2	2	LTE Band 5	10M	QPSK	1	25	Back	18	P-Sensor Off	20525	836.5	23.15	24.50	1.365	0.02	0.312	0.426
	1	1	LTE Band 7	20M	QPSK	1	49	Front	15	Full	21350	2560	23.20	24.00	1.202	0.04	0.215	0.258
	1	1	LTE Band 7	20M	QPSK	50	50	Front	15	Full	21350	2560	22.23	23.00	1.194	-0.01	0.165	0.197
	1	1	LTE Band 7	20M	QPSK	1	49	Back	15	P-Sensor On	21350	2560	19.22	20.00	1.197	-0.01	0.115	0.138
	1	1	LTE Band 7	20M	QPSK	50	50	Back	15	P-Sensor On	21350	2560	19.31	20.00	1.172	-0.18	0.116	0.136
	1	1	LTE Band 7	20M	QPSK	1	49	Back	18	P-Sensor Off	21350	2560	23.20	24.00	1.202	-0.1	0.156	0.188
	2	1	LTE Band 7	20M	QPSK	1	49	Front	15	Full	21350	2560	23.20	24.00	1.202	-0.02	0.221	0.266
	2	2	LTE Band 7	20M	QPSK	1	49	Front	15	Full	21350	2560	23.20	24.00	1.202	-0.17	0.132	0.159
#21	2	3	LTE Band 7	20M	QPSK	1	49	Front	15	Full	21350	2560	23.20	24.00	1.202	-0.18	0.250	0.301

<WLAN 2.4GHz SAR>

Plot No.	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Max Area Scan SAR	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	WLAN2.4GHz	802.11b 1Mbps	Front	15	Full	6	2437	18.46	18.50	1.009	100	1.000		0.162		
	1	WLAN2.4GHz	802.11b 1Mbps	Back	15	Full	6	2437	18.46	18.50	1.009	100	1.000	-0.15	0.203	0.118	0.119
	2	WLAN2.4GHz	802.11b 1Mbps	Back	15	Full	6	2437	18.46	18.50	1.009	100	1.000	-0.12		0.115	0.116
#22	3	WLAN2.4GHz	802.11b 1Mbps	Back	15	Full	6	2437	18.46	18.50	1.009	100	1.000	0.05		0.134	0.135

<Bluetooth SAR>

Plot No.	Battery	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	1	Bluetooth	1Mbps	Front	15	78	2480	10.37	11.00	1.156	76.39	1.090	0.05	0.007	0.009
	1	Bluetooth	1Mbps	Back	15	78	2480	10.37	11.00	1.156	76.39	1.090	-0.07	0.008	0.010
	2	Bluetooth	1Mbps	Back	15	78	2480	10.37	11.00	1.156	76.39	1.090	0.01	0.005	0.006
#23	3	Bluetooth	1Mbps	Back	15	78	2480	10.37	11.00	1.156	76.39	1.090	0.06	0.00874	0.011



19. Spot Check Verification Data Section

1. This application re-uses data collected on a similar device. The subject device of this application is electrically identical to the reference device (Model: MRD-LX1, FCC ID: QISMRD-LX1) for the portions of the circuitry corresponding to the data being re-used. Spot check for the worst cases of the referenced test report FA8N3012 for ensuring that SAR measurement for both device are almost the same, so the referenced SAR value can represent this application.
2. In the table as below, all the deviation of SAR test results are compliant with uncertainty budget.

19.1 Head SAR

<GSM SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#01-1	1	1	GSM850	GSM Voice	Left Cheek	Full	128	824.2	33.06	34.00	1.242	-0.17	0.203	0.252
#02-1	1	3	GSM1900	GSM Voice	Left Cheek	Full	512	1850.2	29.80	31.00	1.318	0.08	0.234	0.308

<WCDMA SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#03-1	1	2	WCDMA Band V	RMC 12.2Kbps	Left Cheek	Full	4182	836.4	24.04	25.00	1.247	-0.05	0.276	0.344
#04-1	2	3	WCDMA Band II	RMC 12.2Kbps	Left Cheek	Full	9538	1907.6	23.76	24.50	1.186	-0.01	0.557	0.660

<LTE SAR>

Plot No.	SIM	Battery	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#05-1	1	2	LTE Band 5	10M	QPSK	1	25	Left Cheek	Full	20525	836.5	23.15	24.50	1.365	0.07	0.219	0.299
#06-1	2	1	LTE Band 7	20M	QPSK	1	49	Right Cheek	Full	21350	2560	23.20	24.00	1.202	0.08	0.190	0.228

<WLAN 2.4GHz SAR>

Plot No.	Battery	Band	Mode	Test Position	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#07-1	3	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	Receiver On	11	2462	14.29	14.50	1.050	100	1.000	0.06	0.553	0.580

<Bluetooth SAR>

Plot No.	Battery	Band	Mode	Test Position	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#08-1	3	Bluetooth	1Mbps	Left Cheek	78	2480	10.37	11.00	1.156	76.39	1.090	0.01	0.119	0.150

19.2 Hotspot SAR

<GSM SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#09-1	1	2	GSM850	GPRS 4 Tx slots	Back	10	Hotspot On	128	824.2	26.06	27.00	1.242	-0.07	0.253	0.314
#10-1	1	2	GSM1900	GPRS 4 Tx slots	Back	10	Hotspot On	512	1850.2	22.15	23.00	1.216	-0.04	0.149	0.181

<WCDMA SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#11-1	1	2	WCDMA Band V	RMC 12.2Kbps	Back	10	Hotspot On	4182	836.4	23.20	24.00	1.202	0.05	0.306	0.368
#12-1	1	1	WCDMA Band II	RMC 12.2Kbps	Back	10	Hotspot On	9400	1880	21.18	21.50	1.076	-0.04	0.296	0.319

<LTE SAR>

Plot No.	SIM	Battery	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#13-1	2	2	LTE Band 5	10M	QPSK	1	25	Back	10	Hotspot On	20525	836.5	22.39	23.50	1.291	0.07	0.254	0.328
#14-1	1	1	LTE Band 7	20M	QPSK	50	50	Bottom Side	10	Hotspot On	21350	2560	19.27	20.00	1.183	0.01	0.224	0.265

<WLAN 2.4GHz SAR>

Plot No.	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#15-1	3	WLAN2.4GHz	802.11b 1Mbps	Back	10	Full	6	2437	18.46	18.50	1.009	100	1.000	-0.12	0.213	0.215

19.3 Body Worn Accessory SAR

<GSM SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#16-1	1	3	GSM850	GPRS 4 Tx slots	Back	15	P-Sensor On	128	824.2	26.05	27.00	1.245	-0.07	0.288	0.358
	1	3	GSM850	GPRS 4 Tx slots	Back	18	P-Sensor Off	128	824.2	27.00	28.00	1.259	0.07	0.209	0.263
#17-1	2	3	GSM1900	GPRS 4 Tx slots	Front	15	Full	512	1850.2	23.75	25.00	1.334	0.04	0.127	0.169

<WCDMA SAR>

Plot No.	SIM	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#18-1	2	3	WCDMA Band V	RMC 12.2Kbps	Back	15	P-Sensor On	4182	836.4	23.24	24.00	1.191	0.03	0.349	0.416
	2	3	WCDMA Band V	RMC 12.2Kbps	Back	18	P-Sensor Off	4182	836.4	24.04	25.00	1.247	-0.02	0.311	0.388
#19-1	2	3	WCDMA Band II	RMC 12.2Kbps	Front	15	Full	9538	1907.6	23.76	24.50	1.186	0.02	0.354	0.420

<LTE SAR>

Plot No.	SIM	Battery	Band	BW (MHz)	Modulation	RB Size	RB Offset	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
	2	2	LTE Band 5	10M	QPSK	1	25	Back	15	P-Sensor On	20525	836.5	22.32	23.50	1.312	0.09	0.223	0.293
#20-1	2	2	LTE Band 5	10M	QPSK	1	25	Back	18	P-Sensor Off	20525	836.5	23.15	24.50	1.365	0.06	0.262	0.358
#21-1	2	3	LTE Band 7	20M	QPSK	1	49	Front	15	Full	21350	2560	23.20	24.00	1.202	-0.01	0.242	0.291

<WLAN 2.4GHz SAR>

Plot No.	Battery	Band	Mode	Test Position	Gap (mm)	Power Mode	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#22-1	3	WLAN2.4GHz	802.11b 1Mbps	Back	15	Full	6	2437	18.46	18.50	1.009	100	1.000	0.05	0.111	0.112

<Bluetooth SAR>

Plot No.	Battery	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Duty Cycle %	Duty Cycle Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Reported 1g SAR (W/kg)
#23-1	3	Bluetooth	1Mbps	Back	15	78	2480	10.37	11.00	1.156	76.39	1.090	0.01	0.00629	0.008

20. Simultaneous Transmission Analysis

No.	Simultaneous Transmission Configurations	Head	Body-worn	Hotspot
1.	GSM Voice + Bluetooth	Yes	Yes	
2.	GPRS/EDGE + Bluetooth		Yes	
3.	WCDMA + Bluetooth	Yes	Yes	
4.	LTE + Bluetooth	Yes	Yes	
5.	GSM Voice + WLAN2.4GHz	Yes	Yes	
6.	GPRS/EDGE + WLAN2.4GHz		Yes	Yes
7.	WCDMA + WLAN2.4GHz	Yes	Yes	Yes
8.	LTE + WLAN2.4GHz	Yes	Yes	Yes

General Note:

1. For simultaneously transmission SAR analysis, spot check SAR value and the referenced SAR value (Sporton Report Number FA8N3012), always choose the higher SAR to do co-located.
2. This device supports VoIP in WCDMA and LTE (e.g. for 3rd-party VoIP), LTE supports VoLTE operation.
3. EUT will choose each GSM, WCDMA and LTE according to the network signal condition; therefore, they will not operate simultaneously at any moment.
4. WLAN and Bluetooth share the same antenna so can't transmit simultaneously.
5. This device 2.4GHz WLAN support hotspot operation.
6. Chose the worst zoom scan SAR of WLAN correspondingly for co-located with WWAN analysis.
7. The reported SAR summation is calculated based on the same configuration and test position.
8. Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
 - i) 1g Scalar SAR summation < 1.6W/kg and 10g Scalar SAR summation < 4.0W/kg.
 - ii) $SPLSR = (SAR1 + SAR2)^{1.5} / (\text{min. separation distance, mm})$, and the peak separation distance is determined from the square root of $[(x1-x2)^2 + (y1-y2)^2 + (z1-z2)^2]$, where (x1, y1, z1) and (x2, y2, z2) are the coordinates of the extrapolated peak SAR locations in the zoom scan.
 - iii) If $SPLSR \leq 0.04$ for 1g SAR, $SPLSR \leq 0.10$ for 10g SAR simultaneously transmission SAR measurement is not necessary.
 - iv) Simultaneously transmission SAR measurement, and the reported multi-band 1g SAR < 1.6W/kg.



20.1 Head Exposure Conditions

WWAN Band		Exposure Position	1	2	3	1+2	1+3
			WWAN 1g SAR (W/kg)	2.4GHz WLAN 1g SAR (W/kg)	Bluetooth 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)
GSM	GSM850	Right Cheek	0.168	0.512	0.055	0.68	0.22
		Right Tilted	0.098	0.512	0.056	0.61	0.15
		Left Cheek	0.252	0.580	0.150	0.83	0.40
		Left Tilted	0.097	0.417	0.088	0.51	0.19
	GSM1900	Right Cheek	0.208	0.512	0.055	0.72	0.26
		Right Tilted	0.158	0.512	0.056	0.67	0.21
		Left Cheek	0.393	0.580	0.150	0.97	0.54
		Left Tilted	0.137	0.417	0.088	0.55	0.23
WCDMA	Band V	Right Cheek	0.268	0.512	0.055	0.78	0.32
		Right Tilted	0.173	0.512	0.056	0.69	0.23
		Left Cheek	0.344	0.580	0.150	0.92	0.49
		Left Tilted	0.163	0.417	0.088	0.58	0.25
	Band II	Right Cheek	0.351	0.512	0.055	0.86	0.41
		Right Tilted	0.244	0.512	0.056	0.76	0.30
		Left Cheek	0.660	0.580	0.150	1.24	0.81
		Left Tilted	0.269	0.417	0.088	0.69	0.36
LTE	Band 5	Right Cheek	0.247	0.512	0.055	0.76	0.30
		Right Tilted	0.150	0.512	0.056	0.66	0.21
		Left Cheek	0.299	0.580	0.150	0.88	0.45
		Left Tilted	0.156	0.417	0.088	0.57	0.24
	Band 7	Right Cheek	0.476	0.512	0.055	0.99	0.53
		Right Tilted	0.271	0.512	0.056	0.78	0.33
		Left Cheek	0.281	0.580	0.150	0.86	0.43
		Left Tilted	0.309	0.417	0.088	0.73	0.40



20.2 Hotspot Exposure Conditions

WWAN Band		Exposure Position	1	2	1+2		
			WWAN 1g SAR (W/kg)	2.4GHz WLAN 1g SAR (W/kg)	Summed 1g SAR (W/kg)		
GSM	GSM850	Front	0.163	0.295	0.46		
		Back	0.359	0.295	0.65		
		Left Side	0.245		0.25		
		Right Side	0.232	0.295	0.53		
		Top Side		0.295	0.30		
		Bottom Side	0.035		0.04		
	GSM1900	Front	0.145	0.295	0.44		
		Back	0.199	0.295	0.49		
		Left Side	0.130		0.13		
		Right Side	0.063	0.295	0.36		
		Top Side		0.295	0.30		
		Bottom Side	0.174		0.17		
		WCDMA	Band V	Front	0.232	0.295	0.53
				Back	0.471	0.295	0.77
Left Side	0.322				0.32		
Right Side	0.314			0.295	0.61		
Top Side				0.295	0.30		
Bottom Side	0.059				0.06		
Band II	Front		0.277	0.295	0.57		
	Back		0.334	0.295	0.63		
	Left Side		0.262		0.26		
	Right Side		0.113	0.295	0.41		
LTE	Band 5	Top Side		0.295	0.30		
		Bottom Side	0.053		0.05		
		Front	0.190	0.295	0.49		
		Back	0.438	0.295	0.73		
		Left Side	0.292		0.29		
		Right Side	0.275	0.295	0.57		
	Band 7	Top Side		0.295	0.30		
		Bottom Side	0.278		0.28		
		Front	0.189	0.295	0.48		
		Back	0.264	0.295	0.56		
		Left Side	0.093		0.09		
		Right Side	0.121	0.295	0.42		
		Top Side		0.295	0.30		
		Bottom Side					

20.3 Body-Worn Accessory Exposure Conditions

WWAN Band		Exposure Position	1	2	3	1+2	1+3
			WWAN 1g SAR (W/kg)	2.4GHz WLAN 1g SAR (W/kg)	Bluetooth 1g SAR (W/kg)	Summed 1g SAR (W/kg)	Summed 1g SAR (W/kg)
GSM	GSM850	Front	0.206	0.135	0.009	0.34	0.22
		Back	0.358	0.135	0.011	0.49	0.37
	GSM1900	Front	0.204	0.135	0.009	0.34	0.21
		Back	0.135	0.135	0.011	0.27	0.15
WCDMA	Band V	Front	0.239	0.135	0.009	0.37	0.25
		Back	0.473	0.135	0.011	0.61	0.48
	Band II	Front	0.423	0.135	0.009	0.56	0.43
		Back	0.248	0.135	0.011	0.38	0.26
LTE	Band 5	Front	0.142	0.135	0.009	0.28	0.15
		Back	0.426	0.135	0.011	0.56	0.44
	Band 7	Front	0.301	0.135	0.009	0.44	0.31
		Back	0.188	0.135	0.011	0.32	0.20

Note:

1. Always chose the highest SAR for WWAN whether it is 15mm SAR or full power verified distance 18mm SAR.
2. For WLAN/Bluetooth using 15mm body SAR to do co-located with WWAN verified distance 18mm SAR analysis is more conservatively.

Test Engineer: Nick Hu



21. Uncertainty Assessment

Pre KDB 865664 D01 SAR measurement 100MHz to 6GHz, when the highest measured 1-g SAR within a frequency band is < 1.5 W/kg and the measured 10-g SAR within a frequency band is < 3.75 W/kg. The expanded SAR measurement uncertainty must be $\leq 30\%$, for a confidence interval of $k = 2$. If these conditions are met, extensive SAR measurement uncertainty analysis described in IEEE Std 1528-2013 is not required in SAR reports submitted for equipment approval. For this device, the highest measured 1-g SAR is less 1.5W/kg and highest measured 10-g SAR is less 3.75W/kg. Therefore, the measurement uncertainty table is not required in this report.

22. References

- [1] FCC 47 CFR Part 2 “Frequency Allocations and Radio Treaty Matters; General Rules and Regulations”
- [2] ANSI/IEEE Std. C95.1-1992, “IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz”, September 1992
- [3] IEEE Std. 1528-2013, “IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques”, Sep 2013
- [4] SPEAG DASY System Handbook
- [5] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [6] FCC KDB 865664 D02 v01r02, “RF Exposure Compliance Reporting and Documentation Considerations” Oct 2015.
- [7] FCC KDB 447498 D01 v06, “Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies”, Oct 2015
- [8] FCC KDB 648474 D04 v01r03, “SAR Evaluation Considerations for Wireless Handsets”, Oct 2015.
- [9] FCC KDB 616217 D04 v01r02, “SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers”, Oct 2015
- [10] FCC KDB 248227 D01 v02r02, “SAR Guidance for IEEE 802.11 (WiFi) Transmitters”, Oct 2015.
- [11] FCC KDB 941225 D01 v03r01, “3G SAR MEAUREMENT PROCEDURES”, Oct 2015
- [12] FCC KDB 941225 D05 v02r05, “SAR Evaluation Considerations for LTE Devices”, Dec 2015
- [13] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.



Appendix A. Plots of System Performance Check

The plots are submitted separately.



Appendix B. Plots of High SAR Measurement

The plots submitted separately.



Appendix C. DASYS Calibration Certificate

The DASYS calibration certificates are submitted separately.



Appendix D. Test Setup Photos

The test setup photos are submitted separately.



Appendix E. Antenna Location

Antenna location is submitted separately.