

# FCC SAR Test Report

APPLICANT : HMD Global Oy  
EQUIPMENT : Smart Phone  
BRAND NAME : Nokia  
MODEL NAME : TA-1055  
FCC ID : 2AJOTTA-1055  
STANDARD : FCC 47 CFR Part 2 (2.1093)  
ANSI/IEEE C95.1-1992  
IEEE 1528-2013

We, SPORTON INTERNATIONAL 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 INC., the test report shall not be reproduced except in full.



Reviewed by: Eric Huang / Manager



Approved by: Jones Tsai / Manager



## **SPORTON INTERNATIONAL INC.**

No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.)



## **Table of Contents**

<b>1. Statement of Compliance .....</b>	<b>4</b>
<b>2. Administration Data .....</b>	<b>5</b>
<b>3. Guidance Applied.....</b>	<b>5</b>
<b>4. Equipment Under Test (EUT) Information.....</b>	<b>6</b>
4.1 General Information .....	6
4.2 General LTE SAR Test and Reporting Considerations.....	7
<b>5. RF Exposure Limits.....</b>	<b>8</b>
5.1 Uncontrolled Environment.....	8
5.2 Controlled Environment.....	8
<b>6. Specific Absorption Rate (SAR).....</b>	<b>9</b>
6.1 Introduction .....	9
6.2 SAR Definition.....	9
<b>7. System Description and Setup .....</b>	<b>10</b>
7.1 E-Field Probe .....	11
7.2 Data Acquisition Electronics (DAE) .....	11
7.3 Phantom.....	12
7.4 Device Holder.....	13
<b>8. Measurement Procedures .....</b>	<b>14</b>
8.1 Spatial Peak SAR Evaluation.....	14
8.2 Power Reference Measurement.....	15
8.3 Area Scan .....	15
8.4 Zoom Scan.....	16
8.5 Volume Scan Procedures.....	16
8.6 Power Drift Monitoring.....	16
<b>9. Test Equipment List.....</b>	<b>17</b>
<b>10. System Verification .....</b>	<b>18</b>
10.1 Tissue Simulating Liquids.....	18
10.2 Tissue Verification .....	19
10.3 System Performance Check Results.....	20
<b>11. RF Exposure Positions .....</b>	<b>22</b>
11.1 Ear and handset reference point .....	22
11.2 Definition of the cheek position.....	23
11.3 Definition of the tilt position.....	24
11.4 Body Worn Accessory .....	24
11.5 Extremity Exposure .....	25
11.6 Wireless Router.....	25
<b>12. Conducted RF Output Power (Unit: dBm).....</b>	<b>26</b>
<b>13. Antenna Location .....</b>	<b>53</b>
<b>14. SAR Test Results .....</b>	<b>54</b>
14.1 Head SAR .....	56
14.2 Hotspot SAR .....	58
14.3 Product Specific SAR.....	61
14.4 Body Worn Accessory SAR.....	63
14.5 Repeated SAR Measurement .....	65
<b>15. Simultaneous Transmission Analysis.....</b>	<b>66</b>
15.1 Head Exposure Conditions .....	67
15.2 Hotspot Exposure Conditions.....	68
15.3 Product Specific Conditions .....	70
15.4 Body-Worn Accessory Exposure Conditions .....	71
<b>16. Uncertainty Assessment .....</b>	<b>72</b>
<b>17. References.....</b>	<b>75</b>
<b>Appendix A. Plots of System Performance Check</b>	
<b>Appendix B. Plots of High SAR Measurement</b>	
<b>Appendix C. DASY Calibration Certificate</b>	
<b>Appendix D. Test Setup Photos</b>	



## Revision History

REPORT NO.	VERSION	DESCRIPTION	ISSUED DATE
FA7D0706-01	Rev. 01	Initial issue of report	Mar. 23, 2018

## 1. Statement of Compliance

The maximum results of Specific Absorption Rate (SAR) found during testing for HMD Global Oy, Smart Phone, TA-1055, are as follows.

Equipment Class	Frequency Band	Highest SAR Summary				Highest Simultaneous Transmission 1g SAR (W/kg)
		Head (Separation 0mm)	Body-worn (Separation 15mm)	Hotspot (Separation 10mm)	Product Specific (Separation 0mm)	
		1g SAR (W/kg)			10g SAR (W/kg)	
Licensed	GSM850	0.17	0.16	0.25		1.18
	GSM1900	0.08	0.62	1.11	3.51	
	WCDMA II	0.18	0.59	0.95	3.89	
	WCDMA V	0.22	0.21	0.32		
	LTE Band 5	0.20	0.23	0.27		
	LTE Band 7	0.12	0.51	1.18	2.73	
	LTE Band 38	0.10	0.40	1.16	2.32	
	LTE Band 41	0.09	0.46	1.03	2.72	
DTS	2.4GHz WLAN	0.68	0.09	0.19		1.18
NII	5GHz WLAN	0.51	0.03	0.08	0.51	1.18
DSS	Bluetooth	0.02				1.18
Date of Testing:		2018/3/14 ~ 2018/3/19				

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, 4.0 W/kg for Product Specific 10g 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

Sporton Lab is accredited to ISO 17025 by Taiwan Accreditation Foundation (TAF code: 1190) and the FCC designation No. TW1190 under the FCC 2.948(e) by Mutual Recognition Agreement (MRA) in FCC test.

Testing Laboratory	
Test Site	SPORTON INTERNATIONAL INC.
Test Site Location	No.52, Hwa Ya 1st Rd., Hwa Ya Technology Park, Kwei-Shan District, Taoyuan City, Taiwan (R.O.C.) TEL: +886-3-327-3456 FAX: +886-3-328-4978

Applicant	
Company Name	HMD Global Oy
Address	Karaportti 2, 02610 Espoo, Finland

Manufacturer	
Company Name	HMD Global Oy
Address	Karaportti 2, 02610 Espoo, Finland

## 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 941225 D01 3G SAR Procedures v03r01
- FCC KDB 941225 D05 SAR for LTE Devices v02r05
- FCC KDB 941225 D05A Rel.10 LTE SAR Test Guidance v01r02
- FCC KDB 941225 D06 Hotspot Mode SAR v02r01

## **4. Equipment Under Test (EUT) Information**

### **4.1 General Information**

<b>Product Feature &amp; Specification</b>	
<b>Equipment Name</b>	Smart Phone
<b>Brand Name</b>	Nokia
<b>Model Name</b>	TA-1055
<b>FCC ID</b>	2AJOTTA-1055
<b>IMEI Code</b>	358545080000484
<b>Wireless Technology and Frequency Range</b>	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 LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz WLAN 2.4GHz Band: 2412 MHz ~ 2462 MHz WLAN 5.2GHz Band: 5180 MHz ~ 5240 MHz WLAN 5.3GHz Band: 5260 MHz ~ 5320 MHz WLAN 5.5GHz Band: 5500 MHz ~ 5700 MHz WLAN 5.8GHz Band: 5745 MHz ~ 5825 MHz Bluetooth: 2402 MHz ~ 2480 MHz NFC : 13.56 MHz
<b>Mode</b>	GSM/GPRS/EGPRS RMC/AMR 12.2Kbps HSDPA HSUPA DC-HSDPA LTE: QPSK, 16QAM, 64QAM WLAN 2.4GHz : 802.11b/g/n HT20/HT40 WLAN 5GHz : 802.11a/n/ac HT20/HT40/VHT20/VHT40/VHT80 Bluetooth BR/EDR/LE NFC:ASK
<b>HW Version</b>	2.1.5
<b>SW Version</b>	000C_1_190
<b>GSM / (E)GPRS Transfer mode</b>	Class B – EUT cannot support Packet Switched and Circuit Switched Network simultaneously but can automatically switch between Packet and Circuit Switched Network.
<b>EUT Stage</b>	Identical Prototype
<b>Remark:</b> 1. This device WLAN 2.4GHz / 5.2GHz / 5.8GHz supports Hotspot operation and Bluetooth support tethering applications. 2. When hotspot mode is enabled, power reduction will be activated to limit the maximum power of GSM1900, WCDMA B2 and LTE B7 / B38 / B41.	

## 4.2 General LTE SAR Test and Reporting Considerations

Summarized necessary items addressed in KDB 941225 D05 v02r05								
FCC ID	2AJOTTA-1055							
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 LTE Band 38: 2572.5 MHz ~ 2617.5 MHz LTE Band 41: 2498.5 MHz ~ 2687.5 MHz							
Channel Bandwidth	LTE Band 5: 1.4MHz, 3MHz, 5MHz, 10MHz LTE Band 7: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 38: 5MHz, 10MHz, 15MHz, 20MHz LTE Band 41: 5MHz, 10MHz, 15MHz, 20MHz							
uplink modulations used	QPSK / 16QAM / 64QAM							
LTE Voice / Data requirements	Voice and Data							
LTE MPR permanently built-in by design	Table 6.2.3-1: Maximum Power Reduction (MPR) for Power Class 1, 2 and 3							
	Modulation	Channel bandwidth / Transmission bandwidth (N <sub>RB</sub> )						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
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	Yes, when operating in hotspot mode that LTE B7 / B38 / B41 power reduction applied to satisfy SAR compliance.							
LTE Carrier Aggregation Combinations	Intra-Band possible combinations and power verification please referred to section 12.							
LTE Carrier Aggregation Additional Information	This device supports maximum of 2 carriers in the downlink. Additional following LTE Release features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WiFi Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.							
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
LTE Band 38								
	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	37775	2572.5	37800	2575	37825	2577.5	37850	2580
M	38000	2595	38000	2595	38000	2595	38000	2595
H	38225	2617.5	38200	2615	38175	2612.5	38150	2610
LTE Band 41								
	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	39675	2498.5	39700	2501	39725	2503.5	39750	2506
L	40148	2545.8	40160	2547	40173	2548.3	40185	2549.5
M	40620	2593	40620	2593	40620	2593	40620	2593
H	41093	2640.3	41080	2639	41068	2637.8	41055	2636.5
H	41565	2687.5	41540	2685	41515	2682.5	41490	2680

## **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

1. 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:

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

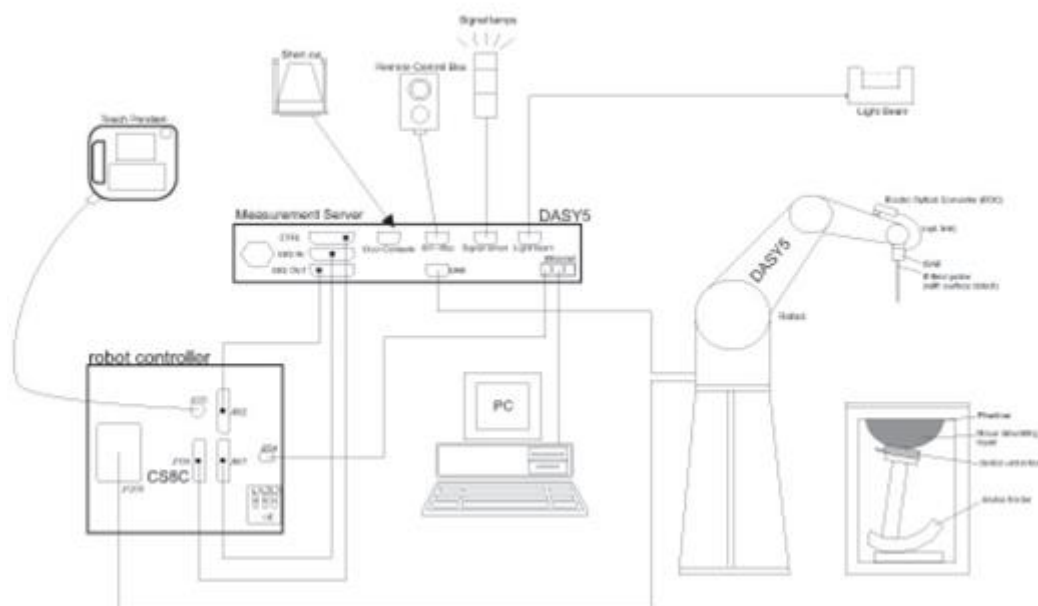
SAR is expressed in units of Watts per kilogram (W/kg)

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

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>

<b>Construction</b>	Symmetric design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
<b>Frequency</b>	10 MHz – 4 GHz; Linearity: $\pm 0.2$ dB (30 MHz – 4 GHz)	
<b>Directivity</b>	$\pm 0.2$ dB in TSL (rotation around probe axis) $\pm 0.3$ dB in TSL (rotation normal to probe axis)	
<b>Dynamic Range</b>	5 $\mu$ W/g – >100 mW/g; Linearity: $\pm 0.2$ dB	
<b>Dimensions</b>	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>

<b>Construction</b>	Symmetric design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)	
<b>Frequency</b>	10 MHz – >6 GHz Linearity: $\pm 0.2$ dB (30 MHz – 6 GHz)	
<b>Directivity</b>	$\pm 0.3$ dB in TSL (rotation around probe axis) $\pm 0.5$ dB in TSL (rotation normal to probe axis)	
<b>Dynamic Range</b>	10 $\mu$ W/g – >100 mW/g Linearity: $\pm 0.2$ dB (noise: typically <1 $\mu$ W/g)	
<b>Dimensions</b>	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.



**Fig 5.1 Photo of DAE**


### **7.3 Phantom**

#### **<SAM Twin Phantom>**

<b>Shell Thickness</b>	2 ± 0.2 mm; Center ear point: 6 ± 0.2 mm	
<b>Filling Volume</b>	Approx. 25 liters	
<b>Dimensions</b>	Length: 1000 mm; Width: 500 mm; Height: adjustable feet	
<b>Measurement Areas</b>	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>**

<b>Shell Thickness</b>	2 ± 0.2 mm (sagging: <1%)	
<b>Filling Volume</b>	Approx. 30 liters	
<b>Dimensions</b>	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 from 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.

	$\leq 3$ GHz	$> 3$ GHz
Maximum distance from closest measurement point (geometric center of probe sensors) to phantom surface	$5 \pm 1$ 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	$30^\circ \pm 1^\circ$	$20^\circ \pm 1^\circ$
Maximum area scan spatial resolution: $\Delta x_{Area}$ , $\Delta y_{Area}$	$\leq 2$ GHz: $\leq 15$ mm $2 - 3$ GHz: $\leq 12$ mm	$3 - 4$ GHz: $\leq 12$ mm $4 - 6$ GHz: $\leq 10$ 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 $\leq$ 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 to 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 whose 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.

			$\leq 3$ GHz	$> 3$ GHz
Maximum zoom scan spatial resolution: $\Delta x_{\text{Zoom}}, \Delta y_{\text{Zoom}}$			$\leq 2$ GHz: $\leq 8$ mm 2 – 3 GHz: $\leq 5$ mm*	3 – 4 GHz: $\leq 5$ mm* 4 – 6 GHz: $\leq 4$ mm*
Maximum zoom scan spatial resolution, normal to phantom surface	uniform grid: $\Delta z_{\text{Zoom}}(n)$		$\leq 5$ mm	3 – 4 GHz: $\leq 4$ mm 4 – 5 GHz: $\leq 3$ mm 5 – 6 GHz: $\leq 2$ mm
	graded grid	$\Delta z_{\text{Zoom}}(1)$ : between 1 <sup>st</sup> two points closest to phantom surface	$\leq 4$ mm	3 – 4 GHz: $\leq 3$ mm 4 – 5 GHz: $\leq 2.5$ mm 5 – 6 GHz: $\leq 2$ mm
		$\Delta z_{\text{Zoom}}(n>1)$ : between subsequent points	$\leq 1.5 \cdot \Delta z_{\text{Zoom}}(n-1)$	
Minimum zoom scan volume	x, y, z		$\geq 30$ mm	3 – 4 GHz: $\geq 28$ mm 4 – 5 GHz: $\geq 25$ mm 5 – 6 GHz: $\geq 22$ mm
Note: $\delta$ 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 $\leq 1.4$ W/kg, $\leq 8$ mm, $\leq 7$ mm and $\leq 5$ 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 to 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	499	Mar. 21, 2017	Mar. 20, 2018
SPEAG	1900MHz System Validation Kit	D1900V2	5d041	Sep. 28, 2017	Sep. 27, 2018
SPEAG	2450MHz System Validation Kit	D2450V2	736	Sep. 18, 2017	Sep. 17, 2018
SPEAG	2600MHz System Validation Kit	D2600V2	1008	Sep. 18, 2017	Sep. 17, 2018
SPEAG	5GHz System Validation Kit	D5GHzV2	1171	Jul. 18, 2017	Jul. 17, 2018
SPEAG	Data Acquisition Electronics	DAE4	1424	Jan. 18, 2018	Jan. 17, 2019
SPEAG	Data Acquisition Electronics	DAE3	495	May. 22, 2017	May. 21, 2018
SPEAG	Data Acquisition Electronics	DAE4	778	May. 22, 2017	May. 21, 2018
SPEAG	Data Acquisition Electronics	DAE4	854	May. 02, 2017	May. 01, 2018
SPEAG	Dosimetric E-Field Probe	EX3DV4	3976	Jan. 23, 2018	Jan. 22, 2019
SPEAG	Dosimetric E-Field Probe	EX3DV4	3925	May. 24, 2017	May. 23, 2018
SPEAG	Dosimetric E-Field Probe	ES3DV3	3270	Sep. 25, 2017	Sep. 24, 2018
SPEAG	Dosimetric E-Field Probe	EX3DV4	7306	Jul. 24, 2017	Jul. 23, 2018
Gencom	Thermometer	TE1	TM685-1	Mar. 21, 2017	Mar. 20, 2018
Gencom	Thermometer	TE1	TM685-2	Mar. 21, 2017	Mar. 20, 2018
TECPEL	Thermometer	UL-A03	TM225-1	Mar. 21, 2017	Mar. 20, 2018
TECPEL	Thermometer	UL-A03	TM225-2	Mar. 21, 2017	Mar. 20, 2018
Anritsu	Radio Communication Analyzer	MT8821C	6201341950	Apr. 20, 2017	Apr. 19, 2018
Agilent	Wireless Communication Test Set	E5515C	MY50266977	May. 30, 2017	May. 29, 2018
R&S	BT Base Station	CBT	100815	Feb. 05, 2018	Feb. 04, 2019
SPEAG	Device Holder	N/A	N/A	N/A	N/A
R&S	Signal Generator	SMA100A	101091	Jul. 06, 2017	Jul. 05, 2018
Agilent	ENA Network Analyzer	E5071C	MY46104758	Aug. 24, 2017	Aug. 23, 2018
SPEAG	Dielectric Probe Kit	DAK-3.5	1126	Sep. 26, 2017	Sep. 25, 2018
LINE SEIKI	Digital Thermometer	LKMelectronic	DTM3000SPEZIAL	Sep. 06, 2017	Sep. 05, 2018
Anritsu	Power Meter	ML2495A	1419002	May. 15, 2017	May. 14, 2018
Anritsu	Power Sensor	MA2411B	1339124	May. 15, 2017	May. 14, 2018
Anritsu	Power Meter	ML2495A	1218006	Oct. 06, 2017	Oct. 05, 2018
Anritsu	Power Sensor	MA2411B	1207363	Oct. 06, 2017	Oct. 05, 2018
Agilent	Spectrum Analyzer	E4408B	MY44211028	Aug. 23, 2017	Aug. 22, 2018
Anritsu	Spectrum Analyzer	MS2830A	6201396378	Jun. 26, 2017	Jun. 25, 2018
Mini-Circuits	Power Amplifier	ZVE-8G+	D120604	Mar. 12, 2018	Mar. 11, 2019
Mini-Circuits	Power Amplifier	ZHL-42W+	QA1344002	Mar. 12, 2018	Mar. 11, 2019
ATM	Dual Directional Coupler	C122H-10	P610410z-02	Note 1	
Woken	Attenuator 1	WK0602-XX	N/A	Note 1	
PE	Attenuator 2	PE7005-10	N/A	Note 1	
PE	Attenuator 3	PE7005- 3	N/A	Note 1	

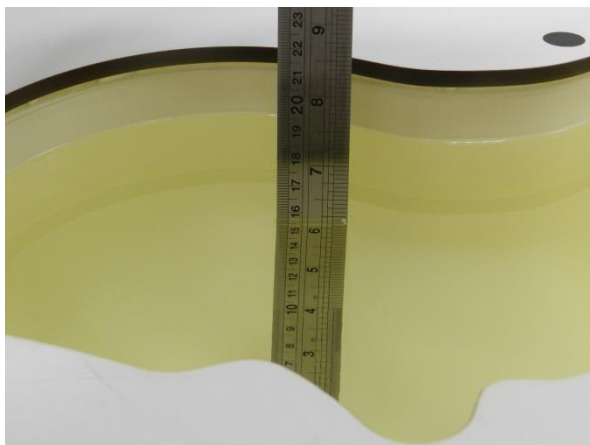
**General Note:**

1. 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 source.

## **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 ( $\sigma$ )	Permittivity ( $\epsilon_r$ )
For Head								
750	41.1	57.0	0.2	1.4	0.2	0	0.89	41.9
835	40.3	57.9	0.2	1.4	0.2	0	0.90	41.5
900	40.3	57.9	0.2	1.4	0.2	0	0.97	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								
750	51.7	47.2	0	0.9	0.1	0	0.96	55.5
835	50.8	48.2	0	0.9	0.1	0	0.97	55.2
900	50.8	48.2	0	0.9	0.1	0	1.05	55.0
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

### Simulating Liquid for 5GHz, Manufactured by SPEAG

Ingredients	(% by weight)
Water	64~78%
Mineral oil	11~18%
Emulsifiers	9~15%
Additives and Salt	2~3%

### <Tissue Dielectric Parameter Check Results>

Frequency (MHz)	Tissue Type	Liquid Temp. (°C)	Conductivity ( $\sigma$ )	Permittivity ( $\epsilon_r$ )	Conductivity Target ( $\sigma$ )	Permittivity Target ( $\epsilon_r$ )	Delta ( $\sigma$ ) (%)	Delta ( $\epsilon_r$ ) (%)	Limit (%)	Date
835	HSL	22.5	0.878	42.057	0.90	41.50	-2.44	1.34	±5	2018/3/14
835	HSL	22.5	0.891	41.355	0.90	41.50	-1.00	-0.35	±5	2018/3/17
835	MSL	22.1	0.965	56.263	0.97	55.20	-0.52	1.93	±5	2018/3/14
1900	HSL	22.3	1.417	40.819	1.40	40.00	1.21	2.05	±5	2018/3/14
1900	HSL	22.4	1.422	40.745	1.40	40.00	1.57	1.86	±5	2018/3/15
1900	MSL	22.4	1.554	51.750	1.52	53.30	2.24	-2.91	±5	2018/3/14
1900	MSL	22.3	1.561	54.028	1.52	53.30	2.70	1.37	±5	2018/3/17
2450	HSL	22.6	1.812	38.922	1.80	39.20	0.67	-0.71	±5	2018/3/19
2450	MSL	22.5	2.008	52.991	1.95	52.70	2.97	0.55	±5	2018/3/19
2600	HSL	22.1	1.950	38.157	1.96	39.00	-0.51	-2.16	±5	2018/3/14
2600	MSL	22.7	2.197	53.248	2.16	52.50	1.71	1.42	±5	2018/3/15
2600	MSL	22.6	2.214	52.699	2.16	52.50	2.50	0.38	±5	2018/3/17
2600	MSL	22.6	2.080	51.719	2.16	52.50	-3.70	-1.49	±5	2018/3/17
2600	MSL	22.6	2.080	51.719	2.16	52.50	-3.70	-1.49	±5	2018/3/17
5250	HSL	22.6	4.682	37.109	4.71	35.95	-0.59	3.22	±5	2018/3/19
5250	MSL	22.5	5.478	47.666	5.36	48.95	2.20	-2.62	±5	2018/3/19
5600	HSL	22.6	5.032	36.604	5.07	35.50	-0.75	3.11	±5	2018/3/19
5600	MSL	22.5	5.938	47.113	5.77	48.50	2.91	-2.86	±5	2018/3/19
5750	HSL	22.6	5.208	36.445	5.22	35.35	-0.23	3.10	±5	2018/3/19
5750	MSL	22.5	6.137	46.839	5.94	48.28	3.32	-2.98	±5	2018/3/19

### 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 (%)
2018/3/14	835	HSL	250	D835V2-499	EX3DV4 - SN7306	DAE4 Sn854	2.38	9.45	9.52	0.74
2018/3/17	835	HSL	250	D835V2-499	EX3DV4 - SN3976	DAE3 Sn495	2.29	9.45	9.16	-3.07
2018/3/14	835	MSL	250	D835V2-499	EX3DV4 - SN3925	DAE4 Sn1424	2.46	9.67	9.84	1.76
2018/3/14	1900	HSL	250	D1900V2-5d041	EX3DV4 - SN3925	DAE4 Sn1424	9.52	40.50	38.08	-5.98
2018/3/15	1900	HSL	250	D1900V2-5d041	EX3DV4 - SN7306	DAE4 Sn854	10.30	40.50	41.2	1.73
2018/3/14	1900	MSL	250	D1900V2-5d041	EX3DV4 - SN3925	DAE4 Sn1424	10.20	40.70	40.8	0.25
2018/3/17	1900	MSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn778	10.20	40.70	40.8	0.25
2018/3/19	2450	HSL	250	D2450V2-736	EX3DV4 - SN3925	DAE4 Sn1424	12.50	52.40	50	-4.58
2018/3/19	2450	MSL	250	D2450V2-736	ES3DV3 - SN3270	DAE4 Sn778	11.90	50.80	47.6	-6.30
2018/3/14	2600	HSL	250	D2600V2-1008	EX3DV4 - SN3925	DAE4 Sn1424	13.20	56.80	52.8	-7.04
2018/3/15	2600	MSL	250	D2600V2-1008	EX3DV4 - SN3976	DAE3 Sn495	13.80	55.00	55.2	0.36
2018/3/17	2600	MSL	250	D2600V2-1008	EX3DV4 - SN7306	DAE4 Sn854	14.30	55.00	57.2	4.00
2018/3/17	2600	MSL	250	D2600V2-1008	ES3DV3 - SN3270	DAE4 Sn778	13.30	55.00	53.2	-3.27
2018/3/17	2600	MSL	250	D2600V2-1008	EX3DV4 - SN3976	DAE3 Sn495	13.10	55.00	52.4	-4.73
2018/3/19	5250	HSL	100	D5GHzV2-1171	EX3DV4 - SN3925	DAE4 Sn1424	8.02	81.20	80.2	-1.23
2018/3/19	5250	MSL	100	D5GHzV2-1171	EX3DV4 - SN3925	DAE4 Sn1424	7.82	78.10	78.2	0.13
2018/3/19	5600	HSL	100	D5GHzV2-1171	EX3DV4 - SN3925	DAE4 Sn1424	9.21	84.90	92.1	8.48
2018/3/19	5600	MSL	100	D5GHzV2-1171	EX3DV4 - SN3925	DAE4 Sn1424	8.31	81.00	83.1	2.59
2018/3/19	5750	HSL	100	D5GHzV2-1171	EX3DV4 - SN3925	DAE4 Sn1424	7.88	82.20	78.8	-4.14
2018/3/19	5750	MSL	100	D5GHzV2-1171	EX3DV4 - SN3925	DAE4 Sn1424	8.17	78.70	81.7	3.81

Date	Frequency (MHz)	Tissue Type	Input Power (mW)	Dipole S/N	Probe S/N	DAE S/N	Measured 10g SAR (W/kg) <sup>2</sup>	Targeted 10g SAR (W/kg) <sup>3</sup>	Normalized 10g SAR (W/kg) <sup>4</sup>	Deviation (%) <sup>2</sup>
2018/3/14	1900	MSL	250	D1900V2-5d041	EX3DV4 - SN3925	DAE4 Sn1424	5.33	21.40	21.32	-0.37
2018/3/17	1900	MSL	250	D1900V2-5d041	ES3DV3 - SN3270	DAE4 Sn778	5.30	21.40	21.2	-0.93
2018/3/15	2600	MSL	250	D2600V2-1008	EX3DV4 - SN3976	DAE3 Sn495	6.22	24.50	24.88	1.55
2018/3/17	2600	MSL	250	D2600V2-1008	EX3DV4 - SN7306	DAE4 Sn854	6.39	24.50	25.56	4.33
2018/3/17	2600	MSL	250	D2600V2-1008	EX3DV4 - SN3976	DAE3 Sn495	5.89	24.50	23.56	-3.84
2018/3/19	5250	MSL	100	D5GHzV2-1171	EX3DV4 - SN3925	DAE4 Sn1424	2.14	21.80	21.4	-1.83
2018/3/19	5600	MSL	100	D5GHzV2-1171	EX3DV4 - SN3925	DAE4 Sn1424	2.27	22.80	22.7	-0.44

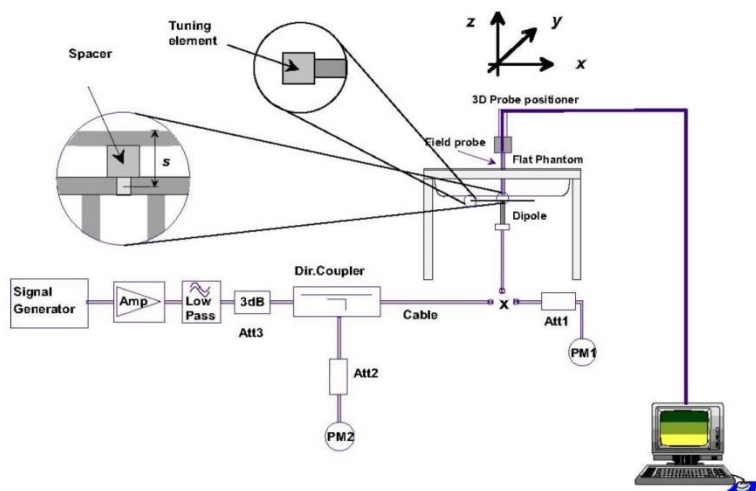


Fig 8.3.1 System Performance Check Setup



Fig 8.3.2 Setup Photo

## 11. RF Exposure Positions

### 11.1 Ear and handset reference point

Figure 9.1.1 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 9.1.2. 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 9.1.3). 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 9.1.2. The ear truncation is introduced to preclude the ear lobe from interfering with handset tilt, which could lead to unstable positioning at the cheek.

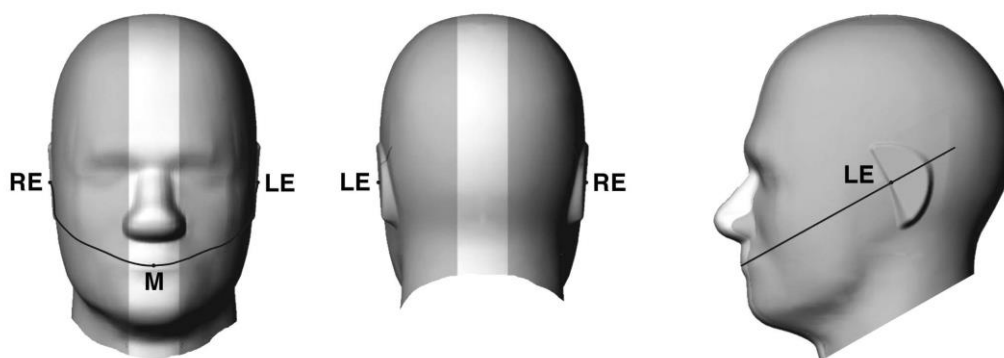


Fig 9.1.1 Front, back, and side views of SAM twin phantom

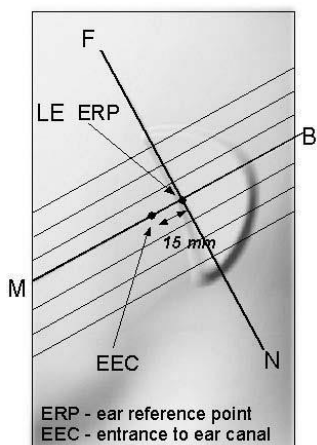


Fig 9.1.2 Close-up side view of phantom showing the ear region.

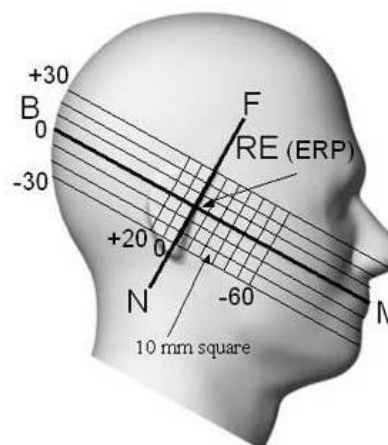


Fig 9.1.3 Side view of the phantom showing relevant markings and seven cross-sectional plane locations

## 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 9.2.1 and Figure 9.2.2), 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 9.2.1). 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 9.2.2), 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 9.2.3), 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 9.2.3. The actual rotation angles should be documented in the test report.

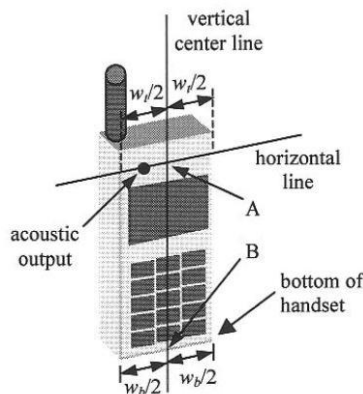


Fig 9.2.1 Handset vertical and horizontal reference lines—"fixed case"

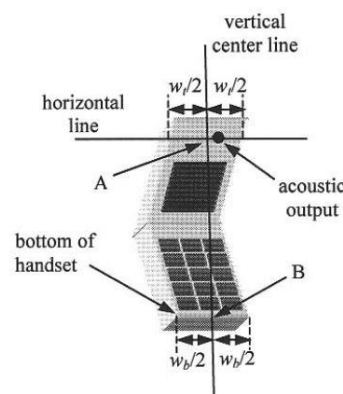


Fig 9.2.2 Handset vertical and horizontal reference lines—"clam-shell case"

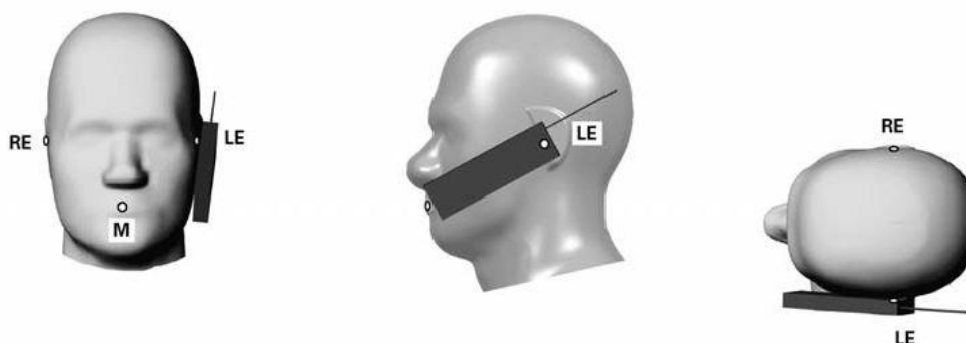
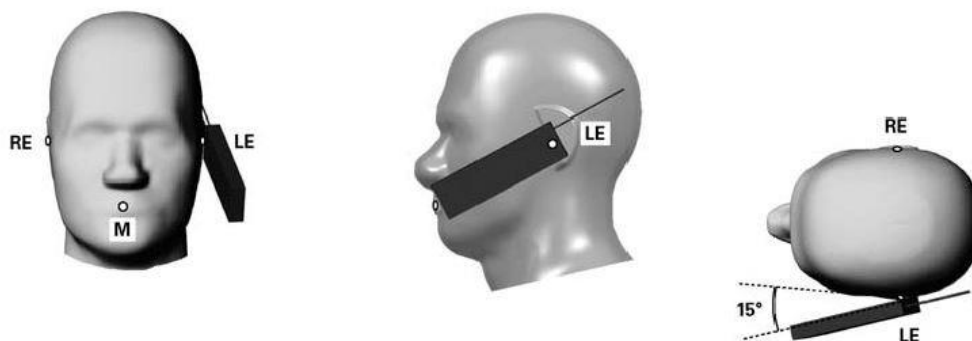


Fig 9.2.3 cheek or touch position. The reference points for the right ear (RE), left ear (LE), and mouth (M), which establish the Reference Plane for handset positioning, are indicated.



### 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 9.3.1. 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

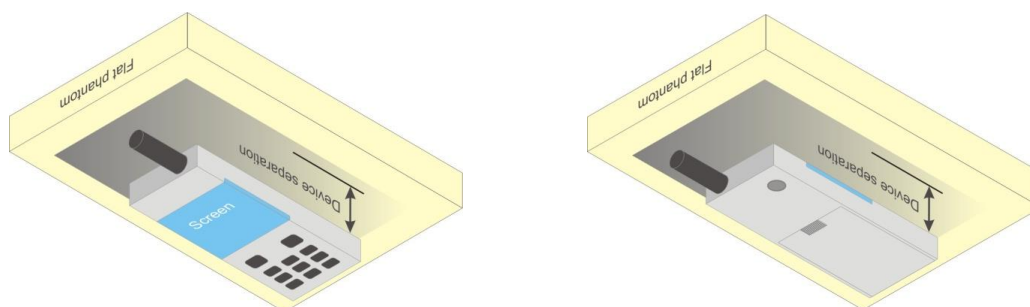


**Fig 9.3.1 Tilt position.** The reference points for the right ear (RE), left ear (LE), and mouth (M), which define the Reference Plane for handset positioning, are indicated.

### 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 9.4). 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  $> 1.2 \text{ W/kg}$ , the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a handset 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 test with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.



**Fig 9.4 Body Worn Position**





### **11.5 Extremity Exposure**

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, According to KDB648474 D04v01r03, the following phablet procedures should be applied to evaluate SAR compliance for each applicable wireless modes and frequency band. Devices marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance

1. The normally required head and body-worn accessory SAR test procedures for handsets, including hotspot mode, must be applied.
2. The UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna located at  $\leq 25$  mm from that surface or edge, in direct contact with a flat phantom, for 10-g extremity SAR according to the body-equivalent tissue dielectric parameters in KDB 865664 to address interactive hand use exposure conditions.<sup>6</sup> The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g extremity SAR is required only for the surfaces and edges with hotspot mode 1-g reported SAR > 1.2 W/kg.

### **11.6 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 x 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. 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, the GPRS (1Tx slots) for GSM850 and GPRS (4Tx slots) for GSM1900 are considered as the primary mode.
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 is implemented in GSM1900 band, for hotspot mode SAR testing EUT was set in reduced power mode and GPRS 4Tx slot due to its highest frame-average power.

### <Default Power Mode>

GSM850	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	TX Channel	128	189		128	189	251	
Frequency (MHz)		824.2	836.4		824.2	836.4	848.8	
GSM 1 Tx slot		32.94	33.13	33.27	33.50	23.94	24.13	24.27
GPRS 1 Tx slot		32.95	33.14	33.28	33.50	23.95	24.14	24.28
GPRS 2 Tx slots		28.42	28.72	28.92	29.50	22.42	22.72	22.92
GPRS 3 Tx slots		27.31	27.25	27.42	28.50	23.05	22.99	23.16
GPRS 4 Tx slots		26.77	26.94	26.87	27.00	23.77	23.94	23.87
EDGE 1 Tx slot		25.32	25.39	25.49	27.00	16.32	16.39	16.49
EDGE 2 Tx slots		24.19	24.27	24.36	26.00	18.19	18.27	18.36
EDGE 3 Tx slots		23.09	23.15	23.41	25.00	18.83	18.89	19.15
EDGE 4 Tx slots		21.07	21.14	21.17	23.00	18.07	18.14	18.17

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	TX Channel	512	661		512	661	810	
Frequency (MHz)		1850.2	1880		1850.2	1880	1909.8	
GSM 1 Tx slot		29.41	29.37	29.54	30.50	20.41	20.37	20.54
GPRS 1 Tx slot		29.42	29.39	29.56	30.50	20.42	20.39	20.56
GPRS 2 Tx slots		27.64	27.68	27.69	28.50	21.64	21.68	21.69
GPRS 3 Tx slots		26.44	26.45	26.47	27.50	22.18	22.19	22.21
GPRS 4 Tx slots		25.23	25.27	25.26	26.50	22.23	22.27	22.26
EDGE 1 Tx slot		24.66	24.69	24.78	26.00	15.66	15.69	15.78
EDGE 2 Tx slots		23.68	23.78	23.71	25.00	17.68	17.78	17.71
EDGE 3 Tx slots		22.78	22.59	22.85	24.00	18.52	18.33	18.59
EDGE 4 Tx slots		21.53	21.55	21.63	23.00	18.53	18.55	18.63

### <Reduced Power Mode>

GSM1900	Burst Average Power (dBm)			Tune-up Limit (dBm)	Frame-Average Power (dBm)			Tune-up Limit (dBm)
	TX Channel	512	661		512	661	810	
Frequency (MHz)		1850.2	1880		1850.2	1880	1909.8	
GSM 1 Tx slot		28.41	28.40	28.42	28.50	19.41	19.40	19.42
GPRS 1 Tx slot		28.42	28.41	28.45	28.50	19.42	19.41	19.45
GPRS 2 Tx slots		24.95	25.00	25.03	25.50	18.95	19.00	19.03
GPRS 3 Tx slots		23.87	23.88	23.96	24.50	19.61	19.62	19.70
GPRS 4 Tx slots		22.80	22.84	22.86	23.50	19.80	19.84	19.86
EDGE 1 Tx slot		24.19	24.21	24.31	25.00	15.19	15.21	15.31
EDGE 2 Tx slots		23.39	23.18	23.26	24.00	17.39	17.18	17.26
EDGE 3 Tx slots		22.15	22.18	22.18	23.00	17.89	17.92	17.92
EDGE 4 Tx slots		21.69	21.71	21.79	22.00	18.69	18.71	18.79

**<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 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 ( $\beta_c$  and  $\beta_d$ ) 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:  $\beta$  values for transmitter characteristics tests with HS-DPCCH**

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{hs}$ (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,  $\Delta_{ACK}$  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 DPDCCH, 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  $\beta_c/\beta_d$  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 ( $\beta_c$  and  $\beta_d$ ) 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:  $\beta$  values for transmitter characteristics tests with HS-DPCCH and E-DCH**

Sub-test	$\beta_c$	$\beta_d$	$\beta_d$ (SF)	$\beta_c/\beta_d$	$\beta_{HS}$ (Note 1)	$\beta_{ec}$	$\beta_{ed}$ (Note 4) (Note 5)	$\beta_{ed}$ (SF)	$\beta_{ed}$ (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	209/25	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	$\beta_{ed1}$ : 47/15 $\beta_{ed2}$ : 47/15	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,  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 30/15$  with  $\beta_{hs} = 30/15 * \beta_c$ . For sub-test 5,  $\Delta_{ACK}$ ,  $\Delta_{NACK}$  and  $\Delta_{CQI} = 5/15$  with  $\beta_{hs} = 5/15 * \beta_c$ .

Note 2: CM = 1 for  $\beta_d/\beta_c = 12/15$ ,  $\beta_{hs}/\beta_c = 24/15$ . 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  $\beta_c/\beta_d$  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:  $\beta_{ed}$  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**

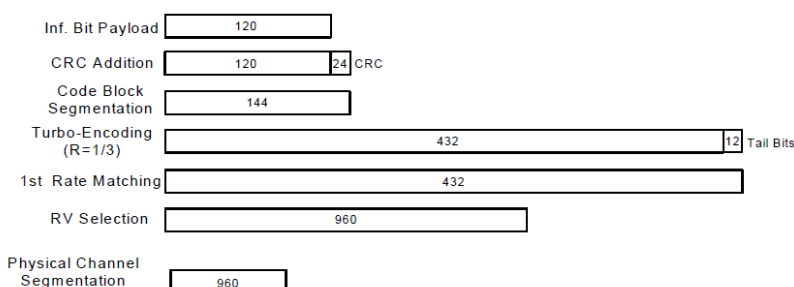
**DC-HSDPA 3GPP release 8 Setup Configuration:**

- 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 ( $\beta_c$  and  $\beta_d$ ) 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 Cycle 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**



**<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 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 to RMC12.2Kbps and the adjusted SAR is  $\leq 1.2$  W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than  $\frac{1}{4}$  dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.

**<Default Power Mode>**

Band		WCDMA II			Tune-up Limit (dBm)	WCDMA 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	21.57	21.41	21.50	22.00	22.16	22.21	22.40	24.00
3GPP Rel 99	RMC 12.2Kbps	21.59	21.42	21.55	22.00	22.18	22.22	22.42	24.00
3GPP Rel 6	HSDPA Subtest-1	20.59	20.39	20.48	21.00	21.23	21.24	21.40	23.00
3GPP Rel 6	HSDPA Subtest-2	20.14	19.93	20.03	21.00	21.03	21.08	21.15	23.00
3GPP Rel 6	HSDPA Subtest-3	20.15	19.94	20.01	20.50	20.73	20.78	20.97	22.50
3GPP Rel 6	HSDPA Subtest-4	20.15	19.95	20.03	20.50	20.73	20.80	20.97	22.50
3GPP Rel 8	DC-HSDPA Subtest-1	20.59	20.40	20.51	21.00	21.16	21.23	21.41	23.00
3GPP Rel 8	DC-HSDPA Subtest-2	20.66	20.38	20.49	21.00	21.17	21.22	21.38	23.00
3GPP Rel 8	DC-HSDPA Subtest-3	20.07	19.89	20.00	20.50	20.66	20.70	20.91	22.50
3GPP Rel 8	DC-HSDPA Subtest-4	20.08	19.89	19.99	20.50	20.66	20.70	20.90	22.50
3GPP Rel 6	HSUPA Subtest-1	20.58	20.39	20.49	21.00	21.16	21.22	21.40	22.00
3GPP Rel 6	HSUPA Subtest-2	18.58	18.43	18.52	19.00	19.20	19.26	19.45	20.00
3GPP Rel 6	HSUPA Subtest-3	19.60	19.41	19.50	20.00	20.18	20.25	20.41	21.00
3GPP Rel 6	HSUPA Subtest-4	18.59	18.39	18.49	19.00	19.20	19.23	19.44	20.00
3GPP Rel 6	HSUPA Subtest-5	20.57	20.40	20.50	21.00	21.19	21.22	21.40	22.00

**<Reduced Power Mode>**

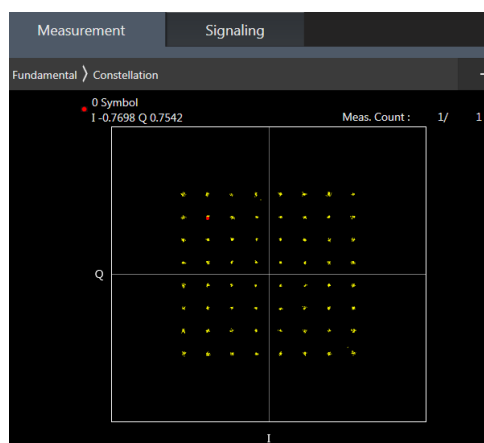
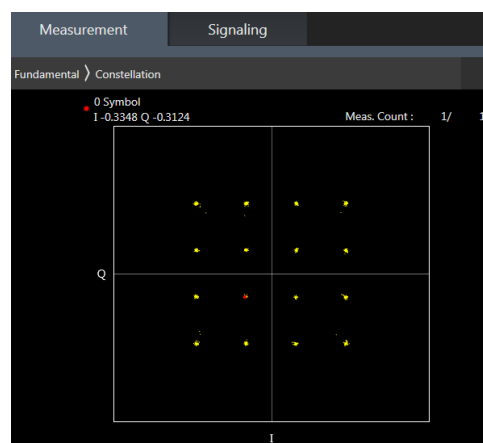
Band		WCDMA II			Tune-up Limit (dBm)
TX Channel		9262	9400	9538	
Rx Channel		9662	9800	9938	
Frequency (MHz)		1852.4	1880	1907.6	
3GPP Rel 99	AMR 12.2Kbps	17.83	17.65	17.80	18.50
3GPP Rel 99	RMC 12.2Kbps	17.85	17.69	17.81	18.50
3GPP Rel 6	HSDPA Subtest-1	16.88	16.71	16.81	17.50
3GPP Rel 6	HSDPA Subtest-2	16.90	16.73	16.82	17.50
3GPP Rel 6	HSDPA Subtest-3	16.42	16.22	16.33	17.00
3GPP Rel 6	HSDPA Subtest-4	16.40	16.22	16.32	17.00
3GPP Rel 8	DC-HSDPA Subtest-1	16.86	16.70	16.79	17.50
3GPP Rel 8	DC-HSDPA Subtest-2	16.89	16.71	16.80	17.50
3GPP Rel 8	DC-HSDPA Subtest-3	16.40	16.20	16.30	17.00
3GPP Rel 8	DC-HSDPA Subtest-4	16.38	16.21	16.31	17.00
3GPP Rel 6	HSUPA Subtest-1	15.87	15.71	15.85	17.50
3GPP Rel 6	HSUPA Subtest-2	15.20	15.15	15.05	15.50
3GPP Rel 6	HSUPA Subtest-3	15.87	15.71	15.75	16.50
3GPP Rel 6	HSUPA Subtest-4	15.19	15.14	15.09	15.50
3GPP Rel 6	HSUPA Subtest-5	16.89	16.75	16.85	17.50



# <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  $\leq 0.8$  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  $\leq 1.45$  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  $\leq 1.45$  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 64 QAM and 16 QAM 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 64QAM and 16QAM signal modulation are correct.


**64QAM**

**16QAM**

**<Default 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	23.69	23.75	23.95	24	0
10	QPSK	1	25	23.67	23.73	23.92		
10	QPSK	1	49	23.61	23.84	23.88		
10	QPSK	25	0	22.74	22.89	22.99	23	1
10	QPSK	25	12	22.71	22.85	22.98		
10	QPSK	25	25	22.67	22.86	22.93		
10	QPSK	50	0	22.69	22.83	22.97	23	1
10	16QAM	1	0	22.94	23.00	22.94		
10	16QAM	1	25	22.92	22.95	22.93		
10	16QAM	1	49	22.93	22.97	22.96	22	2
10	16QAM	25	0	21.61	21.83	21.96		
10	16QAM	25	12	21.72	21.82	21.97		
10	16QAM	25	25	21.67	21.87	21.99	22	2
10	16QAM	50	0	21.71	21.81	21.98		
10	64QAM	1	0	21.79	21.94	21.91		
10	64QAM	1	25	21.87	21.98	21.92	22	2
10	64QAM	1	49	21.85	21.93	21.95		
10	64QAM	25	0	20.62	20.83	20.97		
10	64QAM	25	12	20.73	20.84	20.98	21	3
10	64QAM	25	25	20.67	20.89	20.92		
10	64QAM	50	0	20.71	20.84	20.95		
Channel				20425	20525	20625	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				826.5	836.5	846.5		
5	QPSK	1	0	23.70	23.86	23.90	24	0
5	QPSK	1	12	23.67	23.89	23.89		
5	QPSK	1	24	23.75	23.84	23.86		
5	QPSK	12	0	22.74	22.92	22.93	23	1
5	QPSK	12	7	22.76	22.94	22.97		
5	QPSK	12	13	22.80	22.91	23.00		
5	QPSK	25	0	22.75	22.95	22.95	23	1
5	16QAM	1	0	22.97	22.91	22.90		
5	16QAM	1	12	22.94	22.94	22.91		
5	16QAM	1	24	22.95	22.93	22.98	22	2
5	16QAM	12	0	21.74	21.91	21.94		
5	16QAM	12	7	21.80	21.93	21.88		
5	16QAM	12	13	21.84	22.00	21.82	22	2
5	16QAM	25	0	21.72	21.88	21.86		
5	64QAM	1	0	21.96	21.94	21.97		
5	64QAM	1	12	21.89	21.93	21.92	22	2
5	64QAM	1	24	21.91	21.97	21.94		
5	64QAM	12	0	20.75	20.94	20.96		
5	64QAM	12	7	20.77	20.98	20.99	21	3
5	64QAM	12	13	20.79	20.94	20.96		
5	64QAM	25	0	20.71	20.90	21.00		





# FCC SAR Test Report

Report No. : FA7D0706-01

Channel				20415	20525	20635	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				825.5	836.5	847.5		
3	QPSK	1	0	23.55	23.74	23.89	24	0
3	QPSK	1	8	23.56	23.73	23.85		
3	QPSK	1	14	23.54	23.84	23.80		
3	QPSK	8	0	22.62	22.80	22.92	23	1
3	QPSK	8	4	22.66	22.83	22.93		
3	QPSK	8	7	22.61	22.79	22.94		
3	QPSK	15	0	22.64	22.78	22.96		
3	16QAM	1	0	22.90	23.00	22.93	23	1
3	16QAM	1	8	22.97	22.92	22.94		
3	16QAM	1	14	22.94	22.94	22.87		
3	16QAM	8	0	21.70	21.74	21.75	22	2
3	16QAM	8	4	21.72	21.76	21.78		
3	16QAM	8	7	21.66	21.72	21.75		
3	16QAM	15	0	21.65	21.71	21.72		
3	64QAM	1	0	21.74	21.79	21.87	22	2
3	64QAM	1	8	21.75	21.80	21.85		
3	64QAM	1	14	21.72	21.94	21.80		
3	64QAM	8	0	20.68	20.71	20.72	21	3
3	64QAM	8	4	20.69	20.74	20.77		
3	64QAM	8	7	20.66	20.71	20.72		
3	64QAM	15	0	20.62	20.70	20.73		
Channel				20407	20525	20643	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				824.7	836.5	848.3		
1.4	QPSK	1	0	23.51	23.64	23.87	24	0
1.4	QPSK	1	3	23.59	23.70	23.82		
1.4	QPSK	1	5	23.50	23.63	23.77		
1.4	QPSK	3	0	23.56	23.73	23.83		
1.4	QPSK	3	1	23.59	23.76	23.88		
1.4	QPSK	3	3	23.56	23.70	23.84		
1.4	QPSK	6	0	22.55	22.72	22.82	23	1
1.4	16QAM	1	0	22.84	22.92	23.03	23	1
1.4	16QAM	1	3	22.91	23.00	23.07		
1.4	16QAM	1	5	22.88	22.90	23.00		
1.4	16QAM	3	0	22.60	22.71	22.85		
1.4	16QAM	3	1	22.63	22.78	22.89		
1.4	16QAM	3	3	22.59	22.72	22.81		
1.4	16QAM	6	0	21.63	21.79	21.88	22	2
1.4	64QAM	1	0	21.69	21.84	21.97	22	2
1.4	64QAM	1	3	21.75	21.91	21.95		
1.4	64QAM	1	5	21.61	21.84	21.99		
1.4	64QAM	3	0	21.66	21.85	21.96		
1.4	64QAM	3	1	21.73	21.86	21.91		
1.4	64QAM	3	3	21.71	21.84	21.97		
1.4	64QAM	6	0	20.56	20.73	20.80	21	3



**<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	22.88	22.67	22.74	23	0
20	QPSK	1	49	22.73	22.62	22.67		
20	QPSK	1	99	22.71	22.65	22.69		
20	QPSK	50	0	21.74	21.72	21.70	22	1
20	QPSK	50	24	21.80	21.69	21.75		
20	QPSK	50	50	21.73	21.66	21.69		
20	QPSK	100	0	21.80	21.67	21.71	22	1
20	16QAM	1	0	21.92	21.75	21.92		
20	16QAM	1	49	21.98	21.82	21.92		
20	16QAM	1	99	21.93	21.93	21.90	21	2
20	16QAM	50	0	20.77	20.73	20.65		
20	16QAM	50	24	20.84	20.70	20.75		
20	16QAM	50	50	20.75	20.66	20.69	21	2
20	16QAM	100	0	20.80	20.69	20.70		
20	64QAM	1	0	20.91	20.76	20.84		
20	64QAM	1	49	20.93	20.80	20.88	21	2
20	64QAM	1	99	20.89	20.89	20.88		
20	64QAM	50	0	19.75	19.70	19.65		
20	64QAM	50	24	19.80	19.71	19.72	20	3
20	64QAM	50	50	19.77	19.66	19.69		
20	64QAM	100	0	19.77	19.68	19.74		
Channel				20825	21100	21375		
Frequency (MHz)				2507.5	2535	2562.5		
15	QPSK	1	0	22.68	22.56	22.58	23	0
15	QPSK	1	37	22.66	22.58	22.51		
15	QPSK	1	74	22.69	22.67	22.65		
15	QPSK	36	0	21.83	21.64	21.67	22	1
15	QPSK	36	20	21.77	21.73	21.65		
15	QPSK	36	39	21.80	21.72	21.68		
15	QPSK	75	0	21.76	21.68	21.62	22	1
15	16QAM	1	0	21.98	21.81	21.86		
15	16QAM	1	37	22.00	21.84	21.81		
15	16QAM	1	74	21.94	21.98	21.93	21	2
15	16QAM	36	0	20.86	20.63	20.68		
15	16QAM	36	20	20.84	20.70	20.67		
15	16QAM	36	39	20.80	20.75	20.66	21	2
15	16QAM	75	0	20.78	20.69	20.62		
15	64QAM	1	0	20.95	20.80	20.81		
15	64QAM	1	37	20.89	20.79	20.75	21	2
15	64QAM	1	74	20.89	20.86	20.89		
15	64QAM	36	0	19.85	19.66	19.69		
15	64QAM	36	20	19.83	19.73	19.66	20	3
15	64QAM	36	39	19.81	19.76	19.71		
15	64QAM	75	0	19.77	19.67	19.62		



Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	22.79	22.64	22.67	23	0
10	QPSK	1	25	22.70	22.60	22.59		
10	QPSK	1	49	22.80	22.61	22.71		
10	QPSK	25	0	21.80	21.62	21.59	22	1
10	QPSK	25	12	21.78	21.67	21.65		
10	QPSK	25	25	21.78	21.70	21.67		
10	QPSK	50	0	21.74	21.65	21.62		
10	16QAM	1	0	21.97	21.82	21.88	22	1
10	16QAM	1	25	21.96	21.82	21.81		
10	16QAM	1	49	21.93	21.87	21.89		
10	16QAM	25	0	20.80	20.61	20.57	21	2
10	16QAM	25	12	20.76	20.70	20.66		
10	16QAM	25	25	20.77	20.70	20.66		
10	16QAM	50	0	20.77	20.66	20.63		
10	64QAM	1	0	20.94	20.81	20.80	21	2
10	64QAM	1	25	20.87	20.77	20.75		
10	64QAM	1	49	20.94	20.77	20.82		
10	64QAM	25	0	19.84	19.63	19.59	20	3
10	64QAM	25	12	19.77	19.68	19.65		
10	64QAM	25	25	19.76	19.70	19.66		
10	64QAM	50	0	19.75	19.67	19.65		
Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	22.82	22.60	22.64	23	0
5	QPSK	1	12	22.84	22.65	22.59		
5	QPSK	1	24	22.75	22.68	22.66		
5	QPSK	12	0	21.81	21.61	21.60	22	1
5	QPSK	12	7	21.87	21.65	21.66		
5	QPSK	12	13	21.87	21.67	21.65		
5	QPSK	25	0	21.83	21.66	21.62		
5	16QAM	1	0	21.95	21.78	21.75	22	1
5	16QAM	1	12	21.92	21.87	21.82		
5	16QAM	1	24	21.97	21.87	21.83		
5	16QAM	12	0	20.81	20.62	20.61	21	2
5	16QAM	12	7	20.89	20.70	20.66		
5	16QAM	12	13	20.87	20.69	20.67		
5	16QAM	25	0	20.82	20.65	20.62		
5	64QAM	1	0	20.93	20.74	20.71	21	2
5	64QAM	1	12	20.97	20.77	20.76		
5	64QAM	1	24	20.92	20.81	20.78		
5	64QAM	12	0	19.85	19.65	19.66	20	3
5	64QAM	12	7	19.90	19.72	19.71		
5	64QAM	12	13	19.89	19.72	19.70		
5	64QAM	25	0	19.85	19.63	19.62		

**<Reduced Power Mode>**
**<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	19.33	19.17	19.21	20	0
20	QPSK	1	49	19.25	19.11	19.16		
20	QPSK	1	99	19.25	19.16	19.20		
20	QPSK	50	0	18.28	18.24	18.22	19	1
20	QPSK	50	24	18.34	18.25	18.30		
20	QPSK	50	50	18.28	18.19	18.25		
20	QPSK	100	0	18.35	18.18	18.25	19	1
20	16QAM	1	0	18.66	18.45	18.47		
20	16QAM	1	49	18.67	18.42	18.52		
20	16QAM	1	99	18.64	18.56	18.59	18	2
20	16QAM	50	0	17.30	17.25	17.22		
20	16QAM	50	24	17.36	17.24	17.29		
20	16QAM	50	50	17.29	17.18	17.24	18	2
20	16QAM	100	0	17.34	17.18	17.24		
20	64QAM	1	0	17.48	17.29	17.32		
20	64QAM	1	49	17.44	17.26	17.36	18	2
20	64QAM	1	99	17.45	17.32	17.38		
20	64QAM	50	0	16.29	16.25	16.21	17	3
20	64QAM	50	24	16.33	16.25	16.29		
20	64QAM	50	50	16.26	16.19	16.27		
20	64QAM	100	0	16.32	16.20	16.27		
Channel				20825	21100	21375		
Frequency (MHz)				2507.5	2535	2562.5	Tune-up limit (dBm)	MPR (dB)
15	QPSK	1	0	19.29	19.15	19.12	20	0
15	QPSK	1	37	19.29	19.10	19.12		
15	QPSK	1	74	19.27	19.16	19.25		
15	QPSK	36	0	18.38	18.15	18.22	19	1
15	QPSK	36	20	18.35	18.23	18.25		
15	QPSK	36	39	18.35	18.26	18.25		
15	QPSK	75	0	18.31	18.22	18.22	19	1
15	16QAM	1	0	18.67	18.48	18.43		
15	16QAM	1	37	18.60	18.42	18.46		
15	16QAM	1	74	18.64	18.51	18.59	18	2
15	16QAM	36	0	17.42	17.16	17.24		
15	16QAM	36	20	17.33	17.21	17.24		
15	16QAM	36	39	17.34	17.27	17.24	18	2
15	16QAM	75	0	17.34	17.21	17.21		
15	64QAM	1	0	17.55	17.37	17.33		
15	64QAM	1	37	17.45	17.29	17.34	18	2
15	64QAM	1	74	17.48	17.38	17.44		
15	64QAM	36	0	16.40	16.19	16.25		
15	64QAM	36	20	16.34	16.23	16.26	17	3
15	64QAM	36	39	16.35	16.29	16.28		
15	64QAM	75	0	16.32	16.20	16.20		



# FCC SAR Test Report

Report No. : FA7D0706-01

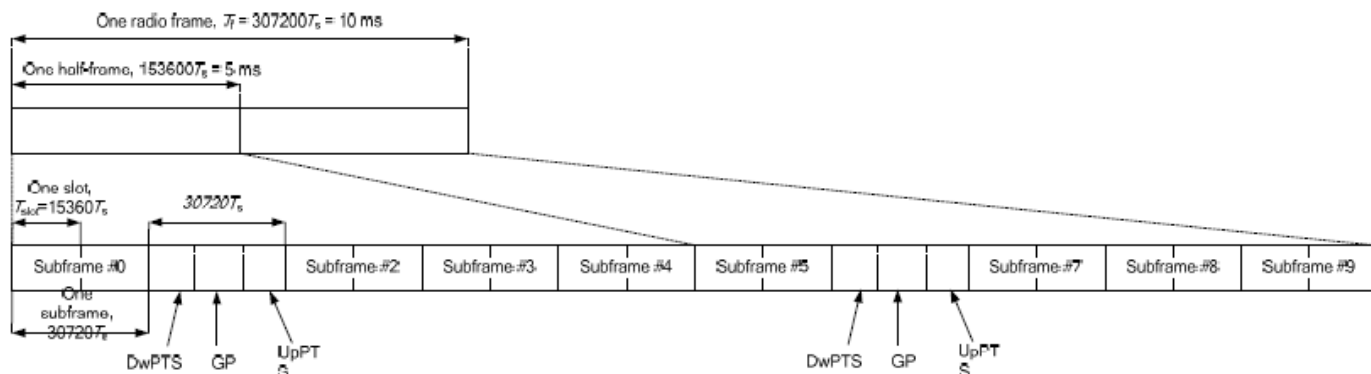
Channel				20800	21100	21400	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2505	2535	2565		
10	QPSK	1	0	19.24	19.05	19.02	20	0
10	QPSK	1	25	19.30	19.09	19.22		
10	QPSK	1	49	19.26	19.14	19.27		
10	QPSK	25	0	18.28	18.14	18.25	19	1
10	QPSK	25	12	18.45	18.26	18.21		
10	QPSK	25	25	18.29	18.28	18.34		
10	QPSK	50	0	18.41	18.19	18.19		
10	16QAM	1	0	18.67	18.53	18.44	19	1
10	16QAM	1	25	18.56	18.42	18.53		
10	16QAM	1	49	18.61	18.58	18.49		
10	16QAM	25	0	17.49	17.15	17.30	18	2
10	16QAM	25	12	17.42	17.28	17.27		
10	16QAM	25	25	17.41	17.32	17.24		
10	16QAM	50	0	17.28	17.12	17.21		
10	64QAM	1	0	17.52	17.44	17.25	18	2
10	64QAM	1	25	17.50	17.24	17.26		
10	64QAM	1	49	17.46	17.46	17.42		
10	64QAM	25	0	16.34	16.22	16.24	17	3
10	64QAM	25	12	16.29	16.13	16.31		
10	64QAM	25	25	16.38	16.23	16.24		
10	64QAM	50	0	16.30	16.28	16.13		
Channel				20775	21100	21425	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2502.5	2535	2567.5		
5	QPSK	1	0	19.27	19.04	19.11	20	0
5	QPSK	1	12	19.31	19.10	19.14		
5	QPSK	1	24	19.25	19.14	19.16		
5	QPSK	12	0	18.34	18.13	18.19	19	1
5	QPSK	12	7	18.40	18.21	18.21		
5	QPSK	12	13	18.38	18.19	18.25		
5	QPSK	25	0	18.37	18.18	18.22		
5	16QAM	1	0	18.66	18.34	18.39	19	1
5	16QAM	1	12	18.67	18.39	18.48		
5	16QAM	1	24	18.60	18.44	18.47		
5	16QAM	12	0	17.34	17.12	17.20	18	2
5	16QAM	12	7	17.42	17.22	17.24		
5	16QAM	12	13	17.41	17.21	17.21		
5	16QAM	25	0	17.37	17.16	17.22		
5	64QAM	1	0	17.45	17.22	17.29	18	2
5	64QAM	1	12	17.53	17.27	17.31		
5	64QAM	1	24	17.40	17.29	17.32		
5	64QAM	12	0	16.37	16.18	16.23	17	3
5	64QAM	12	7	16.43	16.23	16.30		
5	64QAM	12	13	16.41	16.24	16.29		
5	64QAM	25	0	16.34	16.16	16.20		

### <TDD LTE SAR Measurement>

TDD LTE configuration setup for SAR measurement

SAR was tested with a fixed periodic duty factor according to the highest transmission duty factor implemented for the device and supported by 3GPP.

- 3GPP TS 36.211 section 4.2 for Type 2 Frame Structure and Table 4.2-2 for uplink-downlink configurations
- "special subframe S" contains both uplink and downlink transmissions, it has been taken into consideration to determine the transmission duty factor according to the worst case uplink and downlink cyclic prefix requirements for UpPTS
- Establishing connections with base station simulators ensure a consistent means for testing SAR and recommended for evaluating SAR. The Anritsu MT8820C (firmware: #22.52#004) was used for LTE output power measurements and SAR testing.



**Figure 4.2-1: Frame structure type 2 (for 5 ms switch-point periodicity).**

**Table 4.2-2: Uplink-downlink configurations.**

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

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

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

Special subframe (30720·T <sub>s</sub> ): Normal cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
Uplink duty factor in one special subframe	0~4	7.13%	8.33%
	5~9	14.3%	16.7%

Special subframe(30720·T <sub>s</sub> ): Extended cyclic prefix in downlink (UpPTS)			
	Special subframe configuration	Normal cyclic prefix in uplink	Extended cyclic prefix in uplink
Uplink duty factor in one special subframe	0~3	7.13%	8.33%
	4~7	14.3%	16.7%

The highest duty factor is resulted from:

- Uplink-downlink configuration: 0. In a half-frame consisted of 5 subframes, uplink operation is in 3 uplink subframes and 1 special subframe.
- special subframe configuration: 5-9 for normal cyclic prefix in downlink, 4-7 for extended cyclic prefix in downlink
- for special subframe with extended cyclic prefix in uplink, the total uplink duty factor in one half-frame is:  
 $(3+0.167)/5 = 63.3\%$
- for special subframe with normal cyclic prefix in uplink, the total uplink duty factor in one half-frame is:  
 $(3+0.143)/5 = 62.9\%$
- For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix  $63.3\%/62.9\% = 1.006$  is applied to scale-up the measured SAR result. The scaled TDD LTE SAR = measured SAR (W/kg)\* Tune-up Scaling Factor\* scaling factor for extended cyclic prefix.

**<Default Power Mode>**
**<LTE Band 38>**

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				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	23.69	23.42	23.21	24	0
20	QPSK	1	49	23.58	23.43	23.14		
20	QPSK	1	99	23.57	23.27	22.95		
20	QPSK	50	0	22.69	22.44	22.21	23	1
20	QPSK	50	24	22.68	22.50	22.09		
20	QPSK	50	50	22.54	22.34	22.03		
20	QPSK	100	0	22.60	22.48	22.15	23	1
20	16QAM	1	0	22.70	22.52	22.29		
20	16QAM	1	49	22.62	22.51	22.17		
20	16QAM	1	99	22.59	22.28	22.04	22	2
20	16QAM	50	0	21.69	21.43	21.24		
20	16QAM	50	24	21.75	21.54	21.10		
20	16QAM	50	50	21.55	21.34	21.06	22	2
20	16QAM	100	0	21.62	21.50	21.17		
20	64QAM	1	0	21.50	21.23	20.98		
20	64QAM	1	49	21.34	21.22	20.84	22	2
20	64QAM	1	99	21.32	21.01	20.70		
20	64QAM	50	0	20.66	20.42	20.20	21	3
20	64QAM	50	24	20.71	20.50	20.09		
20	64QAM	50	50	20.54	20.32	20.01		
20	64QAM	100	0	20.59	20.48	20.16		
Channel				37825	38000	38175		
Frequency (MHz)				2577.5	2595	2612.5	Tune-up limit (dBm)	MPR (dB)
15	QPSK	1	0	23.55	23.36	23.07	24	0
15	QPSK	1	37	23.46	23.30	22.95		
15	QPSK	1	74	23.52	23.24	22.89		
15	QPSK	36	0	22.54	22.36	22.06	23	1
15	QPSK	36	20	22.62	22.42	22.02		
15	QPSK	36	39	22.54	22.35	21.96		
15	QPSK	75	0	22.59	22.38	22.01	23	1
15	16QAM	1	0	22.65	22.46	22.18		
15	16QAM	1	37	22.58	22.41	22.07		
15	16QAM	1	74	22.59	22.33	22.00	22	2
15	16QAM	36	0	21.52	21.31	21.01		
15	16QAM	36	20	21.57	21.37	20.99		
15	16QAM	36	39	21.47	21.29	20.90	22	2
15	16QAM	75	0	21.62	21.40	21.04		
15	64QAM	1	0	21.42	21.20	20.88		
15	64QAM	1	37	21.35	21.11	20.80	22	2
15	64QAM	1	74	21.37	21.06	20.65		
15	64QAM	36	0	20.50	20.32	20.00		
15	64QAM	36	20	20.58	20.38	20.00	21	3
15	64QAM	36	39	20.50	20.29	19.90		
15	64QAM	75	0	20.59	20.39	20.00		





Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	23.64	23.32	22.94	24	0
10	QPSK	1	25	23.51	23.37	22.91		
10	QPSK	1	49	23.51	23.25	22.91		
10	QPSK	25	0	22.60	22.38	21.99	23	1
10	QPSK	25	12	22.58	22.41	21.94		
10	QPSK	25	25	22.62	22.35	21.96		
10	QPSK	50	0	22.53	22.38	21.89	23	1
10	16QAM	1	0	22.65	22.37	22.03		
10	16QAM	1	25	22.55	22.40	22.00		
10	16QAM	1	49	22.53	22.29	21.95	22	2
10	16QAM	25	0	21.62	21.36	20.99		
10	16QAM	25	12	21.59	21.42	20.95		
10	16QAM	25	25	21.58	21.28	20.94	22	2
10	16QAM	50	0	21.57	21.39	20.96		
10	64QAM	1	0	21.45	21.13	20.70		
10	64QAM	1	25	21.33	21.15	20.66	22	2
10	64QAM	1	49	21.32	21.03	20.58		
10	64QAM	25	0	20.64	20.37	19.98		
10	64QAM	25	12	20.61	20.43	19.98	21	3
10	64QAM	25	25	20.61	20.35	19.99		
10	64QAM	50	0	20.56	20.38	19.95		
Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	23.61	23.37	22.89	24	0
5	QPSK	1	12	23.63	23.35	22.90		
5	QPSK	1	24	23.52	23.28	22.85		
5	QPSK	12	0	22.58	22.33	21.88	23	1
5	QPSK	12	7	22.66	22.38	21.94		
5	QPSK	12	13	22.59	22.31	21.87		
5	QPSK	25	0	22.61	22.36	21.95	23	1
5	16QAM	1	0	22.61	22.35	21.89		
5	16QAM	1	12	22.70	22.43	22.00		
5	16QAM	1	24	22.57	22.36	21.94	22	2
5	16QAM	12	0	21.55	21.35	20.90		
5	16QAM	12	7	21.63	21.42	20.92		
5	16QAM	12	13	21.55	21.28	20.86	22	2
5	16QAM	25	0	21.61	21.39	20.92		
5	64QAM	1	0	21.40	21.09	20.60		
5	64QAM	1	12	21.45	21.14	20.62	22	2
5	64QAM	1	24	21.37	21.08	20.61		
5	64QAM	12	0	20.60	20.36	19.90		
5	64QAM	12	7	20.66	20.40	19.96	21	3
5	64QAM	12	13	20.57	20.28	19.86		
5	64QAM	25	0	20.63	20.37	19.92		



**<LTE Band 41>**

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				39750	40185	40620	41055	41490		
Frequency (MHz)				2506	2549.5	2593	2636.5	2680		
20	QPSK	1	0	23.63	23.44	23.39	23.07	22.89	24	0
20	QPSK	1	49	23.56	23.43	23.38	22.98	22.84		
20	QPSK	1	99	23.58	23.43	23.37	23.02	22.88		
20	QPSK	50	0	22.68	22.48	22.38	22.06	21.89	23	1
20	QPSK	50	24	22.67	22.47	22.37	21.99	21.88		
20	QPSK	50	50	22.60	22.47	22.32	22.04	21.80		
20	QPSK	100	0	22.61	22.46	22.35	22.09	21.88	23	1
20	16QAM	1	0	22.61	22.52	22.43	22.09	21.88		
20	16QAM	1	49	22.64	22.55	22.58	22.00	21.94		
20	16QAM	1	99	22.66	22.53	22.47	22.02	21.96	22	2
20	16QAM	50	0	21.64	21.50	21.34	21.11	20.84		
20	16QAM	50	24	21.69	21.50	21.43	21.05	20.91		
20	16QAM	50	50	21.60	21.49	21.32	21.10	20.84	22	2
20	16QAM	100	0	21.59	21.48	21.39	21.12	20.88		
20	64QAM	1	0	21.41	21.18	21.09	20.88	20.70		
20	64QAM	1	49	21.37	21.11	21.09	20.89	20.69	22	2
20	64QAM	1	99	21.41	21.20	21.14	20.88	20.72		
20	64QAM	50	0	20.61	20.45	20.31	20.04	19.80		
20	64QAM	50	24	20.65	20.43	20.37	20.02	19.85	21	3
20	64QAM	50	50	20.62	20.49	20.30	20.06	19.84		
20	64QAM	100	0	20.60	20.45	20.39	20.12	19.89		
Channel				39725	40173	40620	41068	41515	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2503.5	2548.3	2593	2637.8	2682.5		
15	QPSK	1	0	23.45	23.35	23.20	22.87	22.70	24	0
15	QPSK	1	37	23.47	23.28	23.17	22.81	22.68		
15	QPSK	1	74	23.50	23.29	23.27	22.91	22.80		
15	QPSK	36	0	22.53	22.40	22.27	22.01	21.83	23	1
15	QPSK	36	20	22.59	22.42	22.30	21.96	21.79		
15	QPSK	36	39	22.51	22.43	22.28	22.02	21.81		
15	QPSK	75	0	22.56	22.39	22.34	21.93	21.73	23	1
15	16QAM	1	0	22.58	22.58	22.33	22.01	21.80		
15	16QAM	1	37	22.68	22.62	22.46	21.96	21.84		
15	16QAM	1	74	22.64	22.54	22.40	21.99	21.97	22	2
15	16QAM	36	0	21.52	21.40	21.20	20.98	20.76		
15	16QAM	36	20	21.58	21.36	21.26	20.94	20.79		
15	16QAM	36	39	21.44	21.36	21.21	20.96	20.78	22	2
15	16QAM	75	0	21.60	21.40	21.32	20.97	20.76		
15	64QAM	1	0	21.39	21.16	21.02	20.76	20.62		
15	64QAM	1	37	21.44	21.10	21.08	20.82	20.61	22	2
15	64QAM	1	74	21.39	21.13	21.15	20.77	20.76		
15	64QAM	36	0	20.51	20.34	20.20	19.96	19.77		
15	64QAM	36	20	20.56	20.35	20.30	19.96	19.75	21	3
15	64QAM	36	39	20.48	20.36	20.24	19.98	19.79		
15	64QAM	75	0	20.58	20.34	20.32	19.93	19.76		



Channel				39700	40160	40620	41080	41540	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2501	2547	2593	2639	2685		
10	QPSK	1	0	23.56	23.40	23.24	23.02	22.87	24	0
10	QPSK	1	25	23.54	23.35	23.29	22.99	22.80		
10	QPSK	1	49	23.59	23.41	23.28	23.04	22.93		
10	QPSK	25	0	22.50	22.35	22.31	21.94	21.77	23	1
10	QPSK	25	12	22.56	22.34	22.30	21.96	21.80		
10	QPSK	25	25	22.58	22.40	22.27	22.01	21.89		
10	QPSK	50	0	22.53	22.30	22.28	21.96	21.78	23	1
10	16QAM	1	0	22.62	22.52	22.34	22.02	21.95		
10	16QAM	1	25	22.63	22.42	22.42	21.93	21.89		
10	16QAM	1	49	22.66	22.46	22.34	21.88	21.92	22	2
10	16QAM	25	0	21.54	21.45	21.29	20.90	20.76		
10	16QAM	25	12	21.58	21.37	21.31	20.97	20.84		
10	16QAM	25	25	21.57	21.31	21.21	20.98	20.81	22	2
10	16QAM	50	0	21.56	21.32	21.36	20.98	20.87		
10	64QAM	1	0	21.43	21.17	21.09	20.88	20.76		
10	64QAM	1	25	21.43	21.04	21.09	20.78	20.63	22	2
10	64QAM	1	49	21.48	21.15	21.12	20.83	20.77		
10	64QAM	25	0	20.54	20.39	20.28	19.96	19.80		
10	64QAM	25	12	20.60	20.42	20.38	20.04	19.85	21	3
10	64QAM	25	25	20.59	20.35	20.27	20.05	19.86		
10	64QAM	50	0	20.53	20.30	20.30	19.95	19.81		
Channel				39675	40148	40620	41093	41565	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2498.5	2545.8	2593	2640.30	2687.5		
5	QPSK	1	0	23.55	23.41	23.21	22.97	22.83	24	0
5	QPSK	1	12	23.57	23.28	23.27	22.93	22.85		
5	QPSK	1	24	23.59	23.33	23.20	22.92	22.84		
5	QPSK	12	0	22.49	22.32	22.26	21.94	21.80	23	1
5	QPSK	12	7	22.52	22.35	22.32	21.97	21.85		
5	QPSK	12	13	22.54	22.39	22.28	21.99	21.88		
5	QPSK	25	0	22.51	22.27	22.27	21.96	21.87	23	1
5	16QAM	1	0	22.53	22.45	22.33	21.92	21.89		
5	16QAM	1	12	22.64	22.43	22.52	22.04	21.93		
5	16QAM	1	24	22.61	22.57	22.35	21.94	21.97	22	2
5	16QAM	12	0	21.47	21.39	21.27	20.92	20.82		
5	16QAM	12	7	21.56	21.37	21.31	20.95	20.85		
5	16QAM	12	13	21.53	21.35	21.28	20.97	20.85	22	2
5	16QAM	25	0	21.51	21.35	21.27	20.95	20.80		
5	64QAM	1	0	21.34	21.16	21.08	20.82	20.68		
5	64QAM	1	12	21.37	21.07	21.17	20.87	20.75	22	2
5	64QAM	1	24	21.40	21.21	21.03	20.84	20.76		
5	64QAM	12	0	20.49	20.37	20.27	19.93	19.80		
5	64QAM	12	7	20.57	20.36	20.30	19.99	19.84	21	3
5	64QAM	12	13	20.51	20.31	20.30	19.96	19.81		
5	64QAM	25	0	20.53	20.31	20.30	19.99	19.82		



**<Reduced Power Mode>**

**<LTE Band 38>**

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				37850	38000	38150		
Frequency (MHz)				2580	2595	2610		
20	QPSK	1	0	21.61	21.41	21.18	22.5	0
20	QPSK	1	49	21.44	21.36	21.09		
20	QPSK	1	99	21.47	21.17	20.90		
20	QPSK	50	0	20.66	20.43	20.23	21.5	1
20	QPSK	50	24	20.63	20.42	20.09		
20	QPSK	50	50	20.47	20.26	20.02		
20	QPSK	100	0	20.52	20.39	20.19	21.5	1
20	16QAM	1	0	20.67	20.43	20.38		
20	16QAM	1	49	20.56	20.46	20.27		
20	16QAM	1	99	20.55	20.25	20.08	20.5	2
20	16QAM	50	0	19.57	19.36	19.25		
20	16QAM	50	24	19.65	19.46	19.14		
20	16QAM	50	50	19.49	19.27	19.07	20.5	2
20	16QAM	100	0	19.50	19.41	19.20		
20	64QAM	1	0	19.34	19.13	19.04		
20	64QAM	1	49	19.21	19.12	18.89	20.5	2
20	64QAM	1	99	19.24	18.92	18.69		
20	64QAM	50	0	18.55	18.34	18.23	19.5	3
20	64QAM	50	24	18.60	18.42	18.10		
20	64QAM	50	50	18.48	18.30	18.05		
20	64QAM	100	0	18.52	18.44	18.22		
Channel				37825	38000	38175	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2577.5	2595	2612.5		
15	QPSK	1	0	21.60	21.39	21.25	22.5	0
15	QPSK	1	37	21.43	21.36	21.13		
15	QPSK	1	74	21.50	21.31	21.01		
15	QPSK	36	0	20.45	20.36	20.14	21.5	1
15	QPSK	36	20	20.51	20.41	20.12		
15	QPSK	36	39	20.43	20.36	20.05		
15	QPSK	75	0	20.50	20.41	20.10	21.5	1
15	16QAM	1	0	20.56	20.46	20.28		
15	16QAM	1	37	20.57	20.44	20.18		
15	16QAM	1	74	20.62	20.32	20.12	20.5	2
15	16QAM	36	0	19.50	19.32	19.12		
15	16QAM	36	20	19.57	19.39	19.09		
15	16QAM	36	39	19.49	19.32	19.00	20.5	2
15	16QAM	75	0	19.60	19.44	19.10		
15	64QAM	1	0	19.32	19.17	19.00		
15	64QAM	1	37	19.33	19.13	18.83	19.5	3
15	64QAM	1	74	19.35	19.07	18.70		
15	64QAM	36	0	18.51	18.33	18.15		
15	64QAM	36	20	18.59	18.41	18.10	19.5	3
15	64QAM	36	39	18.52	18.32	18.03		
15	64QAM	75	0	18.56	18.42	18.09		



Channel				37800	38000	38200	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2575	2595	2615		
10	QPSK	1	0	21.58	21.32	21.27	22.5	0
10	QPSK	1	25	21.48	21.43	21.19		
10	QPSK	1	49	21.57	21.27	20.93		
10	QPSK	25	0	20.41	20.41	20.06	21.5	1
10	QPSK	25	12	20.59	20.50	20.13		
10	QPSK	25	25	20.42	20.26	20.06		
10	QPSK	50	0	20.48	20.37	20.02	21.5	1
10	16QAM	1	0	20.60	20.45	20.24		
10	16QAM	1	25	20.65	20.40	20.11		
10	16QAM	1	49	20.58	20.37	20.14	20.5	2
10	16QAM	25	0	19.44	19.39	19.15		
10	16QAM	25	12	19.50	19.43	19.02		
10	16QAM	25	25	19.46	19.28	19.05	20.5	2
10	16QAM	50	0	19.66	19.41	19.16		
10	64QAM	1	0	19.27	19.22	19.10		
10	64QAM	1	25	19.39	19.18	18.75	20.5	2
10	64QAM	1	49	19.26	19.02	18.69		
10	64QAM	25	0	18.51	18.41	18.24		
10	64QAM	25	12	18.59	18.42	18.03	19.5	3
10	64QAM	25	25	18.42	18.24	18.12		
10	64QAM	50	0	18.63	18.52	18.04		
Channel				37775	38000	38225	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2572.5	2595	2617.5		
5	QPSK	1	0	21.57	21.34	21.29	22.5	0
5	QPSK	1	12	21.52	21.44	21.03		
5	QPSK	1	24	21.47	21.34	21.09		
5	QPSK	12	0	20.52	20.46	20.23	21.5	1
5	QPSK	12	7	20.61	20.47	20.18		
5	QPSK	12	13	20.37	20.26	20.10		
5	QPSK	25	0	20.51	20.47	20.06	21.5	1
5	16QAM	1	0	20.57	20.38	20.23		
5	16QAM	1	12	20.66	20.44	20.27		
5	16QAM	1	24	20.71	20.37	20.10	20.5	2
5	16QAM	12	0	19.43	19.30	19.06		
5	16QAM	12	7	19.55	19.33	19.13		
5	16QAM	12	13	19.40	19.38	18.97	20.5	2
5	16QAM	25	0	19.64	19.52	19.13		
5	64QAM	1	0	19.32	19.25	19.03		
5	64QAM	1	12	19.38	19.04	18.77	20.5	2
5	64QAM	1	24	19.40	19.06	18.77		
5	64QAM	12	0	18.60	18.43	18.16		
5	64QAM	12	7	18.59	18.44	18.12	19.5	3
5	64QAM	12	13	18.44	18.39	18.01		
5	64QAM	25	0	18.47	18.41	18.02		



**<LTE Band 41>**

BW [MHz]	Modulation	RB Size	RB Offset	Power Low Ch. / Freq.	Power Low Middle Ch. / Freq.	Power Middle Ch. / Freq.	Power High Middle Ch. / Freq.	Power High Ch. / Freq.	Tune-up limit (dBm)	MPR (dB)
Channel				39750	40185	40620	41055	41490		
Frequency (MHz)				2506	2549.5	2593	2636.5	2680		
20	QPSK	1	0	20.44	20.26	20.22	20.08	19.83	21.5	0
20	QPSK	1	49	20.43	20.31	20.33	20.01	19.88		
20	QPSK	1	99	20.64	20.33	20.37	20.14	19.98		
20	QPSK	50	0	19.55	19.44	19.26	19.09	18.92	20.5	1
20	QPSK	50	24	19.63	19.54	19.36	19.16	19.01		
20	QPSK	50	50	19.53	19.45	19.26	19.14	18.88		
20	QPSK	100	0	19.52	19.38	19.33	19.17	18.98	20.5	1
20	16QAM	1	0	19.64	19.44	19.36	19.09	18.92		
20	16QAM	1	49	19.50	19.55	19.37	19.03	18.93		
20	16QAM	1	99	19.61	19.43	19.38	19.08	19.03	19.5	2
20	16QAM	50	0	18.57	18.45	18.26	18.12	17.94		
20	16QAM	50	24	18.61	18.41	18.37	18.09	18.02		
20	16QAM	50	50	18.57	18.47	18.30	18.17	17.91	19.5	2
20	16QAM	100	0	18.52	18.38	18.33	18.20	18.01		
20	64QAM	1	0	18.15	18.04	17.99	17.83	17.60	19.5	2
20	64QAM	1	49	18.22	18.08	17.97	17.75	17.60		
20	64QAM	1	99	18.23	18.07	18.06	17.82	17.65		
20	64QAM	50	0	17.53	17.46	17.27	17.08	16.93	18.5	3
20	64QAM	50	24	17.63	17.43	17.33	17.06	17.00		
20	64QAM	50	50	17.52	17.47	17.29	17.15	16.89		
20	64QAM	100	0	17.50	17.43	17.34	17.19	16.98		
Channel				39725	40173	40620	41068	41515	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2503.5	2548.3	2593	2637.8	2682.5		
15	QPSK	1	0	20.48	20.58	20.35	20.18	19.98	21.5	0
15	QPSK	1	37	20.49	20.63	20.32	20.29	20.00		
15	QPSK	1	74	20.58	20.63	20.34	20.31	20.05		
15	QPSK	36	0	19.65	19.59	19.38	19.22	19.06	20.5	1
15	QPSK	36	20	19.63	19.68	19.40	19.32	19.07		
15	QPSK	36	39	19.64	19.63	19.44	19.24	19.14		
15	QPSK	75	0	19.59	19.67	19.37	19.32	19.02	20.5	1
15	16QAM	1	0	19.68	19.69	19.42	19.32	19.03		
15	16QAM	1	37	19.63	19.78	19.37	19.34	19.05		
15	16QAM	1	74	19.79	19.75	19.39	19.34	19.11	19.5	2
15	16QAM	36	0	18.66	18.60	18.39	18.22	18.04		
15	16QAM	36	20	18.59	18.67	18.35	18.30	18.03		
15	16QAM	36	39	18.58	18.57	18.38	18.20	18.05	19.5	2
15	16QAM	75	0	18.59	18.70	18.42	18.33	18.07		
15	64QAM	1	0	18.37	18.33	18.06	17.99	17.77		
15	64QAM	1	37	18.31	18.41	18.13	18.02	17.77	19.5	2
15	64QAM	1	74	18.47	18.32	18.07	18.11	17.84		
15	64QAM	36	0	17.62	17.61	17.40	17.21	17.06		
15	64QAM	36	20	17.57	17.67	17.36	17.31	17.05	18.5	3
15	64QAM	36	39	17.60	17.59	17.38	17.19	17.10		
15	64QAM	75	0	17.60	17.67	17.35	17.30	17.06		



# FCC SAR Test Report

Report No. : FA7D0706-01

Channel				39700	40160	40620	41080	41540	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2501	2547	2593	2639	2685		
10	QPSK	1	0	20.46	20.55	20.38	20.19	20.07	21.5	0
10	QPSK	1	25	20.44	20.61	20.35	20.28	20.01		
10	QPSK	1	49	20.64	20.63	20.29	20.36	20.03		
10	QPSK	25	0	19.64	19.64	19.34	19.31	19.10	20.5	1
10	QPSK	25	12	19.68	19.66	19.30	19.42	19.11		
10	QPSK	25	25	19.61	19.54	19.41	19.20	19.10		
10	QPSK	50	0	19.54	19.59	19.39	19.29	19.02	20.5	1
10	16QAM	1	0	19.60	19.63	19.44	19.32	19.02		
10	16QAM	1	25	19.61	19.75	19.40	19.27	19.12		
10	16QAM	1	49	19.89	19.82	19.37	19.26	19.15	19.5	2
10	16QAM	25	0	18.65	18.52	18.36	18.27	18.14		
10	16QAM	25	12	18.63	18.69	18.40	18.22	18.11		
10	16QAM	25	25	18.58	18.62	18.34	18.22	18.11	19.5	2
10	16QAM	50	0	18.65	18.64	18.45	18.37	18.13		
10	64QAM	1	0	18.29	18.43	18.05	18.07	17.83	19.5	2
10	64QAM	1	25	18.39	18.32	18.18	18.10	17.81		
10	64QAM	1	49	18.46	18.32	18.17	18.19	17.89		
10	64QAM	25	0	17.70	17.64	17.36	17.24	17.12	18.5	3
10	64QAM	25	12	17.47	17.73	17.40	17.37	17.10		
10	64QAM	25	25	17.70	17.63	17.39	17.12	17.10		
10	64QAM	50	0	17.52	17.61	17.41	17.40	17.15	18.5	3
10	64QAM	50	0	17.52	17.61	17.41	17.40	17.15		
Channel				39675	40148	40620	41093	41565	Tune-up limit (dBm)	MPR (dB)
Frequency (MHz)				2498.5	2545.8	2593	2640.30	2687.5		
5	QPSK	1	0	20.39	20.54	20.33	20.17	19.98	21.5	0
5	QPSK	1	12	20.41	20.53	20.30	20.22	19.93		
5	QPSK	1	24	20.63	20.54	20.29	20.28	20.07		
5	QPSK	12	0	19.67	19.64	19.32	19.21	19.05	20.5	1
5	QPSK	12	7	19.67	19.75	19.37	19.33	19.03		
5	QPSK	12	13	19.73	19.63	19.43	19.30	19.17		
5	QPSK	25	0	19.62	19.66	19.29	19.29	18.98	20.5	1
5	16QAM	1	0	19.64	19.77	19.47	19.26	18.99		
5	16QAM	1	12	19.73	19.79	19.35	19.35	18.96		
5	16QAM	1	24	19.87	19.71	19.42	19.31	19.07	19.5	2
5	16QAM	12	0	18.68	18.55	18.37	18.18	17.95		
5	16QAM	12	7	18.54	18.60	18.32	18.35	17.98		
5	16QAM	12	13	18.65	18.50	18.35	18.22	18.13	19.5	2
5	16QAM	25	0	18.61	18.66	18.38	18.40	18.09		
5	64QAM	1	0	18.40	18.40	18.03	17.94	17.87		
5	64QAM	1	12	18.32	18.37	18.23	18.02	17.87	19.5	2
5	64QAM	1	24	18.44	18.29	18.01	18.05	17.89		
5	64QAM	12	0	17.60	17.61	17.39	17.25	17.12		
5	64QAM	12	7	17.52	17.61	17.27	17.40	16.99	18.5	3
5	64QAM	12	13	17.53	17.55	17.32	17.10	17.17		
5	64QAM	25	0	17.69	17.61	17.41	17.36	17.10		



**<LTE Carrier Aggregation>**
**General Note:**

- i. This device supports Carrier Aggregation on downlink for intra band, uplink CA is not supported. For the device supports bands and bandwidths and configurations are provided as follow table was according to 3GPP.

Band	Intra-Band Contiguous
Band 7	7C
Band 38	38C

**<Power verification when LTE Carrier Aggregation Active>**
**General Note:**

- i. According to KDB941225 D05A v01r02, Uplink maximum output power measurement with downlink carrier aggregation active should be measured, using the highest output channel measured without downlink carrier aggregation, to confirm that uplink maximum output power with downlink carrier aggregation active remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output measured without downlink carrier aggregation active.
- ii. Uplink maximum output power with downlink carrier aggregation active does not show more than ¼ dB higher than the maximum output power without downlink carrier aggregation active, therefore SAR evaluation with downlink carrier aggregation active can be excluded.
- iii. The device supports downlink two carrier aggregation. For power measurement were control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
- iv. Selected highest measured power when downlink carrier aggregation is inactive for conducted power comparison with downlink carrier aggregation is active, to confirm that when downlink carrier aggregation is active uplink maximum output power remains within the specified tune-up tolerance limits and not more than ¼ dB higher than the maximum output power measured when downlink carrier aggregation inactive.
- v. FFor Intra-band, contiguous CA, the downlink channels selected to perform the uplink power measurement must satisfy 3GPP channel spacing (5.4.1A of 3GPP TS 36.521 or equivalent) and channel bandwidth (5.4.2A) requirements.

$$\text{Nominal channel spacing} = \left\lceil \frac{BW_{\text{Channel}(1)} + BW_{\text{Channel}(2)} - 0.1|BW_{\text{Channel}(1)} - BW_{\text{Channel}(2)}|}{0.6} \right\rceil 0.3 \text{ [MHz]}$$

Configure		PCC							SCC				Power	
		LTE Band	BW (MHz)	UL Freq. (MHz)	UL Channel	Mod.	UL# RB	UL RB Offset	LTE Band	BW (MHz)	DL Freq. (MHz)	DL Channel	With CA Tx.Power (dBm)	W/O CA Tx.Power (dBm)
Intra-Band	Contiguous	7	20	2510	20850	QPSK	1	0	7	20	2649.80	3048	22.88	22.81
		38	20	2580	37850	QPSK	1	0	38	20	2599.80	38048	23.69	23.64

**<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  $\leq 0.4$  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  $\leq 0.8$  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  $\leq 1.2$  W/kg or all required channels are tested.

**<2.4GHz WLAN>**

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
2.4GHz WLAN	802.11b 1Mbps	1	2412	17.90	18.00	100.00
		6	2437	17.95	18.00	
		11	2462	17.60	18.00	
	802.11g 6Mbps	1	2412	15.73	16.00	94.78
		6	2437	15.93	16.00	
		11	2462	15.66	16.00	
	802.11n-HT20 MCS0	1	2412	13.75	14.00	94.40
		6	2437	13.90	14.00	
		11	2462	13.97	14.00	
	802.11n-HT40 MCS0	3	2422	13.81	14.00	89.92
		6	2437	13.98	14.00	
		9	2452	13.76	14.00	

**<5GHz WLAN>**

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.2GHz WLAN	802.11a 6Mbps	36	5180	13.85	14.00	95.49
		40	5200	13.84	14.00	
		44	5220	13.83	14.00	
		48	5240	13.77	14.00	
	802.11n-HT20 MCS0	36	5180	12.74	13.00	95.16
		40	5200	12.73	13.00	
		44	5220	12.72	13.00	
		48	5240	12.60	13.00	
	802.11n-HT40 MCS0	38	5190	12.93	13.00	92.03
		46	5230	12.90	13.00	
	802.11ac-VHT20 MCS0	36	5180	10.97	11.00	94.40
		40	5200	10.96	11.00	
		44	5220	10.95	11.00	
		48	5240	10.80	11.00	
	802.11ac-VHT40 MCS0	38	5190	10.87	11.00	91.34
		46	5230	10.83	11.00	
	802.11ac-VHT80 MCS0	42	5210	10.97	11.00	85.08

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.3GHz WLAN	802.11a 6Mbps	52	5260	13.78	14.00	95.49
		56	5280	13.79	14.00	
		60	5300	13.80	14.00	
		64	5320	13.81	14.00	
	802.11n-HT20 MCS0	52	5260	12.54	13.00	95.16
		56	5280	12.60	13.00	
		60	5300	12.69	13.00	
		64	5320	12.70	13.00	
	802.11n-HT40 MCS0	54	5270	12.71	13.00	92.03
		62	5310	12.81	13.00	
	802.11ac-VHT20 MCS0	52	5260	10.75	11.00	94.40
		56	5280	10.77	11.00	
		60	5300	10.89	11.00	
		64	5320	10.91	11.00	
	802.11ac-VHT40 MCS0	54	5270	10.59	11.00	91.34
		62	5310	10.66	11.00	
	802.11ac-VHT80 MCS0	58	5290	10.75	11.00	85.08

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.5GHz WLAN	802.11a 6Mbps	100	5500	13.75	14.00	95.49
		116	5580	13.60	14.00	
		124	5620	13.59	14.00	
		132	5660	13.56	14.00	
		140	5700	13.55	14.00	
	802.11n-HT20 MCS0	100	5500	12.94	13.00	95.16
		116	5580	12.76	13.00	
		124	5620	12.75	13.00	
		132	5660	12.74	13.00	
		140	5700	12.73	13.00	
	802.11n-HT40 MCS0	102	5510	12.66	13.00	92.03
		110	5550	12.63	13.00	
		126	5630	12.55	13.00	
		134	5670	12.53	13.00	
	802.11ac-VHT20 MCS0	100	5500	10.67	11.00	94.40
		116	5580	10.65	11.00	
		124	5620	10.63	11.00	
		132	5660	10.62	11.00	
		140	5700	10.60	11.00	
	802.11ac-VHT40 MCS0	102	5510	10.99	11.00	91.34
		110	5550	10.60	11.00	
		126	5630	10.59	11.00	
		134	5670	10.58	11.00	
	802.11ac-VHT80 MCS0	106	5530	10.72	11.00	85.08
		122	5610	10.70	11.00	

	Mode	Channel	Frequency (MHz)	Average power (dBm)	Tune-Up Limit	Duty Cycle %
5.8GHz WLAN	802.11a 6Mbps	149	5745	13.99	14.00	95.49
		157	5785	13.95	14.00	
		165	5825	13.76	14.00	
	802.11n-HT20 MCS0	149	5745	12.97	13.00	95.16
		157	5785	12.85	13.00	
		165	5825	12.62	13.00	
	802.11n-HT40 MCS0	151	5755	12.92	13.00	92.03
		159	5795	12.89	13.00	
	802.11ac-VHT20 MCS0	149	5745	10.97	11.00	94.40
		157	5785	10.93	11.00	
		165	5825	10.60	11.00	
	802.11ac-VHT40 MCS0	151	5755	10.90	11.00	91.34
		159	5795	10.81	11.00	
	802.11ac-VHT80 MCS0	155	5775	10.96	11.00	85.08

**<2.4GHz Bluetooth>**
**General Note:**

- For 2.4GHz Bluetooth Head SAR testing was selected 1Mbps due to its highest average power and duty cycle is 77.13% considered in SAR testing.

Mode	Channel	Frequency (MHz)	Average power (dBm)		
			1Mbps	2Mbps	3Mbps
BR / EDR	CH 00	2402	10.40	8.52	8.58
	CH 39	2441	11.04	8.41	8.47
	CH 78	2480	10.49	8.47	8.52
Tune-up Limit			11.50	9.50	9.50

Mode	Channel	Frequency (MHz)	Average power (dBm)	
			1Mbps	2Mbps
LE	CH 00	2402	0.33	0.31
	CH 19	2440	1.00	1.03
	CH 39	2480	1.13	1.18
Tune-up Limit			1.50	1.50

**<Bluetooth Exclusions Applied>**
**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

**1. For Hotspot exclusion:**

Per KDB 447498 D01v06, when the test separation distance is 10 mm to determine SAR test exclusion. The test exclusion threshold is 2.23 which is ≤ 3, SAR testing is not required.

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
11.5	10	2.48	2.23

**2. For Body-worn exclusion:**

Per KDB 447498 D01v06, when the test separation distance is 15 mm to determine SAR test exclusion. The test exclusion threshold is 1.48 which is ≤ 3, SAR testing is not required.

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
11.5	15	2.48	1.48

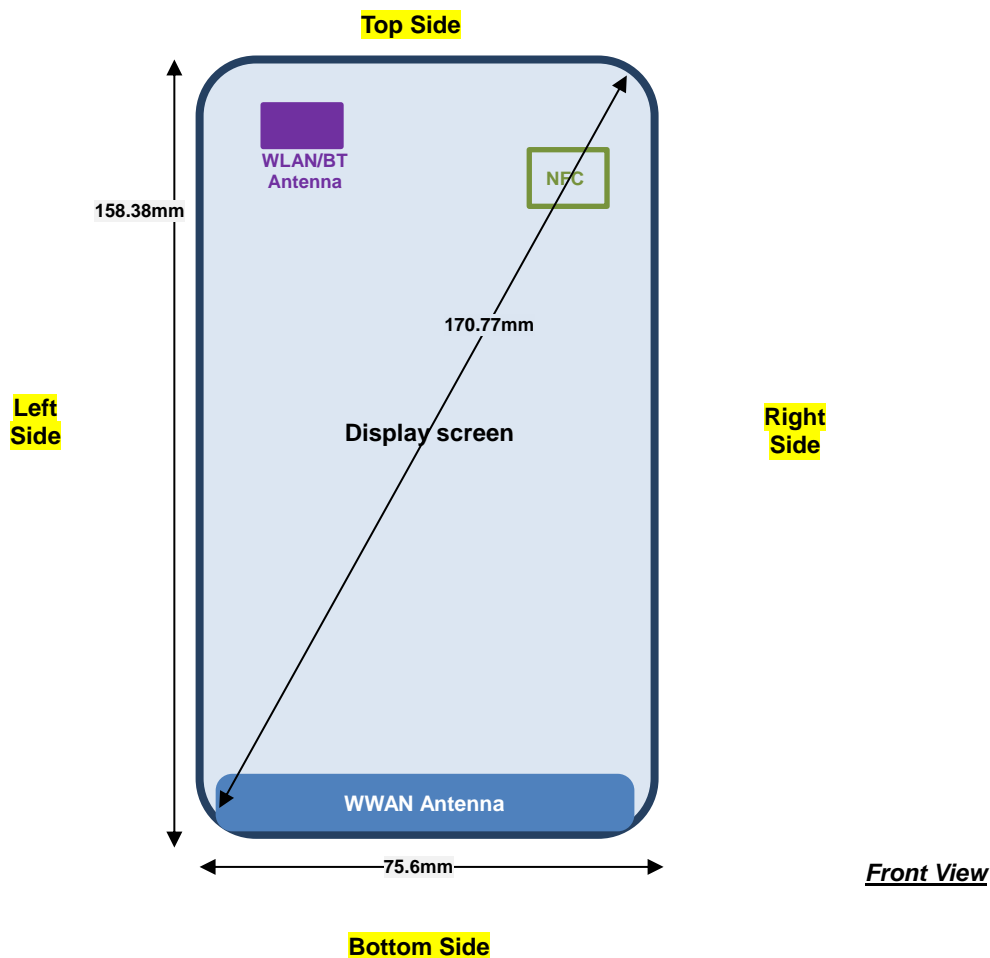
**3. For Product Specific exclusion:**

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 4.45 which is ≤ 7.5, SAR testing is not required.

Bluetooth Max Power (dBm)	Separation Distance (mm)	Frequency (GHz)	exclusion thresholds
11.5	5	2.48	4.45

# **13. Antenna Location**

<Mobile Phone>



Distance of the Antenna to the EUT surface/edge						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	≤ 25mm	≤ 25mm	>25mm	≤ 25mm	≤ 25mm	≤ 25mm
BT&WLAN	≤ 25mm	≤ 25mm	≤ 25mm	>25mm	>25mm	≤ 25mm

Positions for SAR tests; Hotspot mode						
Antennas	Back	Front	Top Side	Bottom Side	Right Side	Left Side
WWAN Main	Yes	Yes	No	Yes	Yes	Yes
BT&WLAN	Yes	Yes	Yes	No	No	Yes

**General Note:**

- Referring to KDB 941225 D06 v02r01, when the overall device length and width are ≥ 9cm\*5cm, the test distance is 10 mm. SAR must be measured for all sides and surfaces with a transmitting antenna located within 25mm from that surface or edge.

## 14. SAR Test Results

### General Note:

- Per KDB 447498 D01v06, the reported SAR is the measured SAR value adjusted for maximum tune-up tolerance.
  - 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.
  - 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)"
  - For WWAN/Bluetooth: Reported SAR(W/kg)= Measured SAR(W/kg)\*Tune-up Scaling Factor
  - For WLAN: Reported SAR(W/kg)= Measured SAR(W/kg)\* Duty Cycle scaling factor \* Tune-up scaling factor
  - For TDD LTE SAR measurement, the duty cycle 1:1.59 (62.9 %) was used perform testing and considering the theoretical duty cycle of 63.3% for extended cyclic prefix in the uplink, and the theoretical duty cycle of 62.9% for normal cyclic prefix in uplink, a scaling factor of extended cyclic prefix  $63.3\%/62.9\% = 1.006$  is applied to scale-up the measured SAR result.  
The Reported TDD LTE SAR = measured SAR (W/kg)\* Tune-up Scaling Factor\* scaling factor for extended cyclic prefix.
- 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:
  - $\leq 0.8$  W/kg or  $2.0$  W/kg, for 1-g or 10-g respectively, when the transmission band is  $\leq 100$  MHz
  - $\leq 0.6$  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
  - $\leq 0.4$  W/kg or  $1.0$  W/kg, for 1-g or 10-g respectively, when the transmission band is  $\geq 200$  MHz
- Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is  $\geq 0.8$ W/kg.
- When hotspot mode is enabled, power reduction will be activated to limit the maximum power of GSM1900, WCDMA B2 and LTE B7 / B38 / B41.
- Per KDB 648474 D04v01r03, when the reported SAR for a body-worn accessory measured without a headset connected to the handset is  $\leq 1.2$  W/kg, SAR testing with a headset connected to the handset is not required.
- Per KDB 648474 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 5.3GHz / 5.5GHz WLAN product specific SAR is necessary too, due to an overall diagonal dimension is  $> 16$ cm.

### GSM Note:

- 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, the GPRS (1Tx slots) for GSM850 and GPRS (4Tx slots) for GSM1900 are considered as the primary mode.
- 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.
- Power reduction which is triggered by hotspot mode is implemented in GSM1900 band, for hotspot mode SAR testing EUT was set in reduced power mode and GPRS 4 Tx slot due to its highest frame-average power.

### UMTS Note:

- Per KDB 941225 D01v03r01, for SAR testing is measured using a 12.2 kbps RMC with TPC bits configured to all "1's".
- 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 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 to RMC12.2Kbps and the adjusted SAR is  $\leq 1.2$  W/kg, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA, and according to the following RF output power, the output power results of the secondary modes (HSUPA, HSDPA, DC-HSDPA) are less than  $\frac{1}{4}$  dB higher than the primary modes; therefore, SAR measurement is not required for HSDPA / HSUPA / DC-HSDPA.



**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  $\leq 0.8$  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  $\leq 1.45$  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  $\leq 1.45$  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  $\leq 1.2$  W/kg.
2. Per KDB 248227 D01v02r02, U-NII-1 SAR testing is not required when the U-NII-2A band highest reported SAR for a test configuration is  $\leq 1.2$  W/kg, SAR is not required for U-NII-1 band.
3. 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  $\leq 0.8$  W/kg or all required test position are tested.
4. 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  $\leq 1.2$  W/kg or all required channels are tested.
5. During SAR testing the WLAN transmission was verified using a spectrum analyzer.

## 14.1 Head SAR

### <GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	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	GSM850	GPRS (1 Tx slot)	Right Cheek	0mm	251	848.8	33.28	33.50	1.052	-0.06	0.161	0.169
	GSM850	GPRS (1 Tx slot)	Right Tilted	0mm	251	848.8	33.28	33.50	1.052	-0.05	0.082	0.086
	GSM850	GPRS (1 Tx slot)	Left Cheek	0mm	251	848.8	33.28	33.50	1.052	-0.04	0.141	0.148
	GSM850	GPRS (1 Tx slot)	Left Tilted	0mm	251	848.8	33.28	33.50	1.052	-0.04	0.071	0.075
02	GSM1900	GPRS (4 Tx slots)	Right Cheek	0mm	661	1880	25.27	26.50	1.327	0.18	0.059	0.078
	GSM1900	GPRS (4 Tx slots)	Right Tilted	0mm	661	1880	25.27	26.50	1.327	0.04	0.011	0.015
	GSM1900	GPRS (4 Tx slots)	Left Cheek	0mm	661	1880	25.27	26.50	1.327	0.18	0.030	0.040
	GSM1900	GPRS (4 Tx slots)	Left Tilted	0mm	661	1880	25.27	26.50	1.327	0.18	0.024	0.032

### <WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	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	WCDMA II	RMC 12.2Kbps	Right Cheek	0mm	9262	1852.4	21.59	22.00	1.099	0.04	0.160	0.176
	WCDMA II	RMC 12.2Kbps	Right Tilted	0mm	9262	1852.4	21.59	22.00	1.099	0.12	0.078	0.086
	WCDMA II	RMC 12.2Kbps	Left Cheek	0mm	9262	1852.4	21.59	22.00	1.099	0.1	0.120	0.132
	WCDMA II	RMC 12.2Kbps	Left Tilted	0mm	9262	1852.4	21.59	22.00	1.099	-0.07	0.077	0.085
04	WCDMA V	RMC 12.2Kbps	Right Cheek	0mm	4233	846.6	22.42	24.00	1.439	0	0.153	0.220
	WCDMA V	RMC 12.2Kbps	Right Tilted	0mm	4233	846.6	22.42	24.00	1.439	-0.02	0.059	0.085
	WCDMA V	RMC 12.2Kbps	Left Cheek	0mm	4233	846.6	22.42	24.00	1.439	0.04	0.127	0.183
	WCDMA V	RMC 12.2Kbps	Left Tilted	0mm	4233	846.6	22.42	24.00	1.439	-0.03	0.063	0.091

### <FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	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	LTE Band 5	10M	QPSK	1	49	Right Cheek	0mm	20525	836.5	23.84	24.00	1.038	-0.12	0.193	0.200
	LTE Band 5	10M	QPSK	25	0	Right Cheek	0mm	20525	836.5	22.89	23.00	1.026	0.04	0.168	0.172
	LTE Band 5	10M	QPSK	1	49	Right Tilted	0mm	20525	836.5	23.84	24.00	1.038	0.01	0.089	0.092
	LTE Band 5	10M	QPSK	25	0	Right Tilted	0mm	20525	836.5	22.89	23.00	1.026	0.04	0.079	0.081
	LTE Band 5	10M	QPSK	1	49	Left Cheek	0mm	20525	836.5	23.84	24.00	1.038	0.14	0.158	0.164
	LTE Band 5	10M	QPSK	25	0	Left Cheek	0mm	20525	836.5	22.89	23.00	1.026	-0.13	0.140	0.144
	LTE Band 5	10M	QPSK	1	49	Left Tilted	0mm	20525	836.5	23.84	24.00	1.038	0.09	0.083	0.086
	LTE Band 5	10M	QPSK	25	0	Left Tilted	0mm	20525	836.5	22.89	23.00	1.026	-0.09	0.071	0.073
06	LTE Band 7	20M	QPSK	1	0	Right Cheek	0mm	20850	2510	22.88	23.00	1.028	-0.14	0.117	0.120
	LTE Band 7	20M	QPSK	50	24	Right Cheek	0mm	20850	2510	21.80	22.00	1.047	0.17	0.092	0.096
	LTE Band 7	20M	QPSK	1	0	Right Tilted	0mm	20850	2510	22.88	23.00	1.028	0.03	0.033	0.034
	LTE Band 7	20M	QPSK	50	24	Right Tilted	0mm	20850	2510	21.80	22.00	1.047	-0.14	0.028	0.029
	LTE Band 7	20M	QPSK	1	0	Left Cheek	0mm	20850	2510	22.88	23.00	1.028	0.11	0.089	0.091
	LTE Band 7	20M	QPSK	50	24	Left Cheek	0mm	20850	2510	21.80	22.00	1.047	-0.09	0.067	0.070
	LTE Band 7	20M	QPSK	1	0	Left Tilted	0mm	20850	2510	22.88	23.00	1.028	-0.14	0.039	0.040
	LTE Band 7	20M	QPSK	50	24	Left Tilted	0mm	20850	2510	21.80	22.00	1.047	0.03	0.029	0.030

**<TDD LTE SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	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)
07	LTE Band 38	20M	QPSK	1	0	Right Cheek	0mm	37850	2580	23.69	24.00	1.074	62.9	1.006	0.19	0.089	0.096
	LTE Band 38	20M	QPSK	50	0	Right Cheek	0mm	37850	2580	22.69	23.00	1.074	62.9	1.006	0.08	0.069	0.075
	LTE Band 38	20M	QPSK	1	0	Right Tilted	0mm	37850	2580	23.69	24.00	1.074	62.9	1.006	-0.01	0.016	0.017
	LTE Band 38	20M	QPSK	50	0	Right Tilted	0mm	37850	2580	22.69	23.00	1.074	62.9	1.006	0.16	0.011	0.012
	LTE Band 38	20M	QPSK	1	0	Left Cheek	0mm	37850	2580	23.69	24.00	1.074	62.9	1.006	-0.13	0.041	0.044
	LTE Band 38	20M	QPSK	50	0	Left Cheek	0mm	37850	2580	22.69	23.00	1.074	62.9	1.006	-0.09	0.030	0.032
	LTE Band 38	20M	QPSK	1	0	Left Tilted	0mm	37850	2580	23.69	24.00	1.074	62.9	1.006	-0.04	0.014	0.015
	LTE Band 38	20M	QPSK	50	0	Left Tilted	0mm	37850	2580	22.69	23.00	1.074	62.9	1.006	-0.18	0.010	0.010
08	LTE Band 41	20M	QPSK	1	0	Right Cheek	0mm	39750	2506	23.63	24.00	1.089	62.9	1.006	0.17	0.078	0.085
	LTE Band 41	20M	QPSK	50	0	Right Cheek	0mm	39750	2506	22.68	23.00	1.076	62.9	1.006	0.03	0.058	0.063
	LTE Band 41	20M	QPSK	1	0	Right Tilted	0mm	39750	2506	23.63	24.00	1.089	62.9	1.006	-0.12	0.014	0.015
	LTE Band 41	20M	QPSK	50	0	Right Tilted	0mm	39750	2506	22.68	23.00	1.076	62.9	1.006	0.16	0.012	0.013
	LTE Band 41	20M	QPSK	1	0	Left Cheek	0mm	39750	2506	23.63	24.00	1.089	62.9	1.006	-0.19	0.037	0.041
	LTE Band 41	20M	QPSK	50	0	Left Cheek	0mm	39750	2506	22.68	23.00	1.076	62.9	1.006	-0.15	0.029	0.031
	LTE Band 41	20M	QPSK	1	0	Left Tilted	0mm	39750	2506	23.63	24.00	1.089	62.9	1.006	0.07	0.016	0.018
	LTE Band 41	20M	QPSK	50	0	Left Tilted	0mm	39750	2506	22.68	23.00	1.076	62.9	1.006	0.12	0.013	0.014

**<WLAN SAR>**

Plot No.	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)
09	WLAN2.4GHz	802.11b 1Mbps	Right Cheek	0mm	6	2437	17.95	18.00	1.012	100	1.000	0.16	0.671	0.679
	WLAN2.4GHz	802.11b 1Mbps	Right Tilted	0mm	6	2437	17.95	18.00	1.012	100	1.000	0.18	0.496	0.502
	WLAN2.4GHz	802.11b 1Mbps	Left Cheek	0mm	6	2437	17.95	18.00	1.012	100	1.000	0.08	0.268	0.271
	WLAN2.4GHz	802.11b 1Mbps	Left Tilted	0mm	6	2437	17.95	18.00	1.012	100	1.000	0.03	0.246	0.249
10	WLAN5GHz	802.11a 6Mbps	Right Cheek	0mm	64	5320	13.81	14.00	1.045	95.49	1.047	0.08	0.462	0.505
	WLAN5GHz	802.11a 6Mbps	Right Tilted	0mm	64	5320	13.81	14.00	1.045	95.49	1.047	0.01	0.353	0.386
	WLAN5GHz	802.11a 6Mbps	Left Cheek	0mm	64	5320	13.81	14.00	1.045	95.49	1.047	-0.12	0.199	0.218
	WLAN5GHz	802.11a 6Mbps	Left Tilted	0mm	64	5320	13.81	14.00	1.045	95.49	1.047	0.07	0.180	0.197
11	WLAN5GHz	802.11a 6Mbps	Right Cheek	0mm	100	5500	13.75	14.00	1.059	95.49	1.047	-0.09	0.356	0.395
	WLAN5GHz	802.11a 6Mbps	Right Tilted	0mm	100	5500	13.75	14.00	1.059	95.49	1.047	0.02	0.305	0.338
	WLAN5GHz	802.11a 6Mbps	Left Cheek	0mm	100	5500	13.75	14.00	1.059	95.49	1.047	-0.06	0.254	0.282
	WLAN5GHz	802.11a 6Mbps	Left Tilted	0mm	100	5500	13.75	14.00	1.059	95.49	1.047	-0.02	0.167	0.185
	WLAN5GHz	802.11a 6Mbps	Right Cheek	0mm	149	5745	13.99	14.00	1.002	95.49	1.047	-0.15	0.259	0.272
12	WLAN5GHz	802.11a 6Mbps	Right Tilted	0mm	149	5745	13.99	14.00	1.002	95.49	1.047	0.16	0.305	0.320
	WLAN5GHz	802.11a 6Mbps	Left Cheek	0mm	149	5745	13.99	14.00	1.002	95.49	1.047	0.14	0.185	0.194
	WLAN5GHz	802.11a 6Mbps	Left Tilted	0mm	149	5745	13.99	14.00	1.002	95.49	1.047	-0.06	0.174	0.183

**<Bluetooth SAR>**

Plot No.	Band	Mode	Test Position	Gap (mm)	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	Bluetooth	1Mbps	Right Cheek	0mm	39	2441	11.04	11.50	1.112	0.06	0.016	0.018
	Bluetooth	1Mbps	Right Tilted	0mm	39	2441	11.04	11.50	1.112	0.01	0.012	0.013
	Bluetooth	1Mbps	Left Cheek	0mm	39	2441	11.04	11.50	1.112	0.13	0.004	0.004
	Bluetooth	1Mbps	Left Tilted	0mm	39	2441	11.04	11.50	1.112	-0.17	0.005	0.005



## 14.2 Hotspot SAR

### <GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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)
	GSM850	GPRS (1 Tx slot)	Front	10mm	OFF	251	848.8	33.28	33.50	1.052	-0.04	0.186	0.196
14	GSM850	GPRS (1 Tx slot)	Back	10mm	OFF	251	848.8	33.28	33.50	1.052	-0.02	0.239	0.251
	GSM850	GPRS (1 Tx slot)	Left Side	10mm	OFF	251	848.8	33.28	33.50	1.052	-0.04	0.080	0.084
	GSM850	GPRS (1 Tx slot)	Right Side	10mm	OFF	251	848.8	33.28	33.50	1.052	-0.01	0.159	0.167
	GSM850	GPRS (1 Tx slot)	Bottom Side	10mm	OFF	251	848.8	33.28	33.50	1.052	0.12	0.136	0.143
	GSM1900	GPRS (4 Tx slots)	Front	10mm	ON	810	1909.8	22.86	23.50	1.159	0.06	0.586	0.679
	GSM1900	GPRS (4 Tx slots)	Back	10mm	ON	810	1909.8	22.86	23.50	1.159	0.05	0.570	0.661
	GSM1900	GPRS (4 Tx slots)	Left Side	10mm	ON	810	1909.8	22.86	23.50	1.159	-0.01	0.082	0.095
	GSM1900	GPRS (4 Tx slots)	Right Side	10mm	ON	810	1909.8	22.86	23.50	1.159	0.07	0.036	0.042
15	GSM1900	GPRS (4 Tx slots)	Bottom Side	10mm	ON	810	1909.8	22.86	23.50	1.159	-0.05	0.958	1.110
	GSM1900	GPRS (4 Tx slots)	Bottom Side	10mm	ON	512	1850.2	22.80	23.50	1.175	0.07	0.594	0.698
	GSM1900	GPRS (4 Tx slots)	Bottom Side	10mm	ON	661	1880	22.84	23.50	1.164	0.04	0.770	0.896

### <WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	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)
	WCDMA II	RMC 12.2Kbps	Front	10mm	ON	9262	1852.4	17.85	18.50	1.161	0.02	0.463	0.538
	WCDMA II	RMC 12.2Kbps	Back	10mm	ON	9262	1852.4	17.85	18.50	1.161	0.01	0.467	0.542
	WCDMA II	RMC 12.2Kbps	Left Side	10mm	ON	9262	1852.4	17.85	18.50	1.161	-0.08	0.082	0.095
	WCDMA II	RMC 12.2Kbps	Right Side	10mm	ON	9262	1852.4	17.85	18.50	1.161	-0.06	0.049	0.057
	WCDMA II	RMC 12.2Kbps	Bottom Side	10mm	ON	9262	1852.4	17.85	18.50	1.161	0.09	0.795	0.923
	WCDMA II	RMC 12.2Kbps	Bottom Side	10mm	ON	9400	1880	17.69	18.50	1.205	-0.14	0.785	0.946
16	WCDMA II	RMC 12.2Kbps	Bottom Side	10mm	ON	9538	1907.6	17.81	18.50	1.172	-0.11	0.814	0.954
	WCDMA V	RMC 12.2Kbps	Front	10mm	OFF	4233	846.6	22.42	24.00	1.439	0.02	0.179	0.258
17	WCDMA V	RMC 12.2Kbps	Back	10mm	OFF	4233	846.6	22.42	24.00	1.439	-0.06	0.219	0.315
	WCDMA V	RMC 12.2Kbps	Left Side	10mm	OFF	4233	846.6	22.42	24.00	1.439	0.03	0.091	0.131
	WCDMA V	RMC 12.2Kbps	Right Side	10mm	OFF	4233	846.6	22.42	24.00	1.439	0.03	0.161	0.232
	WCDMA V	RMC 12.2Kbps	Bottom Side	10mm	OFF	4233	846.6	22.42	24.00	1.439	0.07	0.134	0.193



**<FDD LTE SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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	LTE Band 5	10M	QPSK	1	49	Front	10mm	OFF	20525	836.5	23.84	24.00	1.038	0.06	0.221	0.229
	LTE Band 5	10M	QPSK	25	0	Front	10mm	OFF	20525	836.5	22.89	23.00	1.026	0.03	0.194	0.199
	LTE Band 5	10M	QPSK	1	49	Back	10mm	OFF	20525	836.5	23.84	24.00	1.038	0	0.257	0.267
	LTE Band 5	10M	QPSK	25	0	Back	10mm	OFF	20525	836.5	22.89	23.00	1.026	0.01	0.236	0.242
	LTE Band 5	10M	QPSK	1	49	Left Side	10mm	OFF	20525	836.5	23.84	24.00	1.038	0.01	0.122	0.127
	LTE Band 5	10M	QPSK	25	0	Left Side	10mm	OFF	20525	836.5	22.89	23.00	1.026	-0.1	0.104	0.107
	LTE Band 5	10M	QPSK	1	49	Right Side	10mm	OFF	20525	836.5	23.84	24.00	1.038	0.02	0.162	0.168
	LTE Band 5	10M	QPSK	25	0	Right Side	10mm	OFF	20525	836.5	22.89	23.00	1.026	-0.01	0.140	0.144
	LTE Band 5	10M	QPSK	1	49	Bottom Side	10mm	OFF	20525	836.5	23.84	24.00	1.038	-0.02	0.165	0.171
	LTE Band 5	10M	QPSK	25	0	Bottom Side	10mm	OFF	20525	836.5	22.89	23.00	1.026	0.06	0.148	0.152
	LTE Band 7	20M	QPSK	1	0	Front	10mm	ON	20850	2510	19.33	20.00	1.167	-0.01	0.550	0.642
	LTE Band 7	20M	QPSK	50	24	Front	10mm	ON	20850	2510	18.34	19.00	1.164	-0.01	0.430	0.501
	LTE Band 7	20M	QPSK	1	0	Back	10mm	ON	20850	2510	19.33	20.00	1.167	-0.02	0.546	0.637
	LTE Band 7	20M	QPSK	50	24	Back	10mm	ON	20850	2510	18.34	19.00	1.164	-0.02	0.424	0.494
	LTE Band 7	20M	QPSK	1	0	Left Side	10mm	ON	20850	2510	19.33	20.00	1.167	-0.12	0.045	0.053
	LTE Band 7	20M	QPSK	50	24	Left Side	10mm	ON	20850	2510	18.34	19.00	1.164	-0.03	0.038	0.044
	LTE Band 7	20M	QPSK	1	0	Right Side	10mm	ON	20850	2510	19.33	20.00	1.167	-0.05	0.073	0.085
	LTE Band 7	20M	QPSK	50	24	Right Side	10mm	ON	20850	2510	18.34	19.00	1.164	-0.04	0.058	0.068
19	LTE Band 7	20M	QPSK	1	0	Bottom Side	10mm	ON	20850	2510	19.33	20.00	1.167	-0.04	1.010	1.178
	LTE Band 7	20M	QPSK	1	0	Bottom Side	10mm	ON	21100	2535	19.17	20.00	1.211	-0.06	0.970	1.174
	LTE Band 7	20M	QPSK	1	0	Bottom Side	10mm	ON	21350	2560	19.21	20.00	1.199	-0.06	0.967	1.160
	LTE Band 7	20M	QPSK	50	24	Bottom Side	10mm	ON	20850	2510	18.34	19.00	1.164	-0.04	0.822	0.957
	LTE Band 7	20M	QPSK	50	24	Bottom Side	10mm	ON	21100	2535	18.25	19.00	1.189	-0.04	0.765	0.909
	LTE Band 7	20M	QPSK	50	24	Bottom Side	10mm	ON	21350	2560	18.30	19.00	1.175	0.01	0.779	0.915
	LTE Band 7	20M	QPSK	100	0	Bottom Side	10mm	ON	20850	2510	18.35	19.00	1.161	-0.02	0.819	0.951



## &lt;TDD LTE SAR&gt;

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Power Reduction	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)
	LTE Band 38	20M	QPSK	1	0	Front	10mm	ON	37850	2580	21.61	22.50	1.227	62.9	1.006	-0.1	0.431	0.532
	LTE Band 38	20M	QPSK	50	0	Front	10mm	ON	37850	2580	20.66	21.50	1.213	62.9	1.006	-0.06	0.339	0.414
	LTE Band 38	20M	QPSK	1	0	Back	10mm	ON	37850	2580	21.61	22.50	1.227	62.9	1.006	0.01	0.408	0.504
	LTE Band 38	20M	QPSK	50	0	Back	10mm	ON	37850	2580	20.66	21.50	1.213	62.9	1.006	-0.07	0.321	0.392
	LTE Band 38	20M	QPSK	1	0	Left Side	10mm	ON	37850	2580	21.61	22.50	1.227	62.9	1.006	0.03	0.087	0.107
	LTE Band 38	20M	QPSK	50	0	Left Side	10mm	ON	37850	2580	20.66	21.50	1.213	62.9	1.006	-0.16	0.072	0.088
	LTE Band 38	20M	QPSK	1	0	Right Side	10mm	ON	37850	2580	21.61	22.50	1.227	62.9	1.006	-0.11	0.095	0.117
	LTE Band 38	20M	QPSK	50	0	Right Side	10mm	ON	37850	2580	20.66	21.50	1.213	62.9	1.006	-0.11	0.076	0.093
20	LTE Band 38	20M	QPSK	1	0	Bottom Side	10mm	ON	37850	2580	21.61	22.50	1.227	62.9	1.006	0.01	0.941	1.162
	LTE Band 38	20M	QPSK	1	0	Bottom Side	10mm	ON	38000	2595	21.41	22.50	1.285	62.9	1.006	0.01	0.894	1.156
	LTE Band 38	20M	QPSK	1	0	Bottom Side	10mm	ON	38150	2610	21.18	22.50	1.355	62.9	1.006	0.03	0.823	1.122
	LTE Band 38	20M	QPSK	50	0	Bottom Side	10mm	ON	37850	2580	20.66	21.50	1.213	62.9	1.006	0.02	0.731	0.892
	LTE Band 38	20M	QPSK	50	0	Bottom Side	10mm	ON	38000	2595	20.43	21.50	1.279	62.9	1.006	-0.04	0.696	0.896
	LTE Band 38	20M	QPSK	50	0	Bottom Side	10mm	ON	38150	2610	20.23	21.50	1.340	62.9	1.006	-0.11	0.678	0.914
	LTE Band 38	20M	QPSK	100	0	Bottom Side	10mm	ON	37850	2580	20.52	21.50	1.253	62.9	1.006	-0.01	0.686	0.865
	LTE Band 41	20M	QPSK	1	99	Front	10mm	ON	39750	2506	20.64	21.50	1.219	62.9	1.006	-0.06	0.361	0.443
	LTE Band 41	20M	QPSK	50	24	Front	10mm	ON	39750	2506	19.63	20.50	1.222	62.9	1.006	-0.04	0.322	0.396
	LTE Band 41	20M	QPSK	1	99	Back	10mm	ON	39750	2506	20.64	21.50	1.219	62.9	1.006	0.11	0.403	0.494
	LTE Band 41	20M	QPSK	50	24	Back	10mm	ON	39750	2506	19.63	20.50	1.222	62.9	1.006	-0.19	0.321	0.395
	LTE Band 41	20M	QPSK	1	99	Left Side	10mm	ON	39750	2506	20.64	21.50	1.219	62.9	1.006	0.07	0.035	0.043
	LTE Band 41	20M	QPSK	50	24	Left Side	10mm	ON	39750	2506	19.63	20.50	1.222	62.9	1.006	0.12	0.025	0.031
	LTE Band 41	20M	QPSK	1	99	Right Side	10mm	ON	39750	2506	20.64	21.50	1.219	62.9	1.006	-0.08	0.047	0.058
	LTE Band 41	20M	QPSK	50	24	Right Side	10mm	ON	39750	2506	19.63	20.50	1.222	62.9	1.006	-0.06	0.041	0.050
21	LTE Band 41	20M	QPSK	1	99	Bottom Side	10mm	ON	39750	2506	20.64	21.50	1.219	62.9	1.006	0.12	0.836	1.025
	LTE Band 41	20M	QPSK	1	99	Bottom Side	10mm	ON	40185	2549.5	20.33	21.50	1.309	62.9	1.006	0.13	0.608	0.801
	LTE Band 41	20M	QPSK	1	99	Bottom Side	10mm	ON	40620	2593	20.37	21.50	1.297	62.9	1.006	0.11	0.608	0.793
	LTE Band 41	20M	QPSK	1	99	Bottom Side	10mm	ON	41055	2636.5	20.14	21.50	1.368	62.9	1.006	0.11	0.664	0.914
	LTE Band 41	20M	QPSK	1	99	Bottom Side	10mm	ON	41490	2680	19.98	21.50	1.419	62.9	1.006	-0.14	0.634	0.905
	LTE Band 41	20M	QPSK	50	24	Bottom Side	10mm	ON	39750	2506	19.63	20.50	1.222	62.9	1.006	0.11	0.574	0.706
	LTE Band 41	20M	QPSK	50	24	Bottom Side	10mm	ON	40185	2549.5	19.54	20.50	1.247	62.9	1.006	0.12	0.505	0.634
	LTE Band 41	20M	QPSK	50	24	Bottom Side	10mm	ON	40620	2593	19.36	20.50	1.300	62.9	1.006	-0.02	0.600	0.785
	LTE Band 41	20M	QPSK	50	24	Bottom Side	10mm	ON	41055	2636.5	19.16	20.50	1.361	62.9	1.006	-0.05	0.570	0.781
	LTE Band 41	20M	QPSK	50	24	Bottom Side	10mm	ON	41490	2680	19.01	20.50	1.409	62.9	1.006	-0.13	0.548	0.777
	LTE Band 41	20M	QPSK	100	0	Bottom Side	10mm	ON	39750	2506	19.52	20.50	1.253	62.9	1.006	-0.14	0.635	0.801

## &lt;WLAN SAR&gt;

Plot No.	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)
	WLAN2.4GHz	802.11b 1Mbps	Front	10mm	6	2437	17.95	18.00	1.012	100	1.000	-0.07	0.133	0.135
22	WLAN2.4GHz	802.11b 1Mbps	Back	10mm	6	2437	17.95	18.00	1.012	100	1.000	-0.06	0.192	0.194
	WLAN2.4GHz	802.11b 1Mbps	Left Side	10mm	6	2437	17.95	18.00	1.012	100	1.000	-0.03	0.118	0.119
	WLAN2.4GHz	802.11b 1Mbps	Top Side	10mm	6	2437	17.95	18.00	1.012	100	1.000	0.13	0.071	0.072
23	WLAN5GHz	802.11a 6Mbps	Front	10mm	36	5180	13.85	14.00	1.035	95.49	1.047	-0.11	0.070	0.076
	WLAN5GHz	802.11a 6Mbps	Back	10mm	36	5180	13.85	14.00	1.035	95.49	1.047	-0.15	0.016	0.017
	WLAN5GHz	802.11a 6Mbps	Left Side	10mm	36	5180	13.85	14.00	1.035	95.49	1.047	0.06	0.026	0.028
	WLAN5GHz	802.11a 6Mbps	Top Side	10mm	36	5180	13.85	14.00	1.035	95.49	1.047	0.09	0.025	0.027
24	WLAN5GHz	802.11a 6Mbps	Front	10mm	149	5745	13.99	14.00	1.002	95.49	1.047	0.15	0.045	0.047
	WLAN5GHz	802.11a 6Mbps	Back	10mm	149	5745	13.99	14.00	1.002	95.49	1.047	0.16	0.005	0.006
	WLAN5GHz	802.11a 6Mbps	Left Side	10mm	149	5745	13.99	14.00	1.002	95.49	1.047	0.02	0.012	0.013
	WLAN5GHz	802.11a 6Mbps	Top Side	10mm	149	5745	13.99	14.00	1.002	95.49	1.047	0.08	0.010	0.010



**14.3 Product Specific SAR****<GSM SAR>**

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	GSM1900	GPRS (4 Tx slots)	Front	0mm	810	1909.8	25.26	26.50	1.330	0.16	2.540	3.379
	GSM1900	GPRS (4 Tx slots)	Front	0mm	661	1880	25.27	26.50	1.327	0.1	2.530	3.358
	GSM1900	GPRS (4 Tx slots)	Front	0mm	512	1850.2	25.23	26.50	1.340	0.16	2.320	3.108
	GSM1900	GPRS (4 Tx slots)	Back	0mm	810	1909.8	25.26	26.50	1.330	0.19	2.440	3.246
	GSM1900	GPRS (4 Tx slots)	Back	0mm	661	1880	25.27	26.50	1.327	0.16	2.520	3.345
	GSM1900	GPRS (4 Tx slots)	Back	0mm	512	1850.2	25.23	26.50	1.340	0.11	2.300	3.081
	GSM1900	GPRS (4 Tx slots)	Bottom Side	0mm	810	1909.8	25.26	26.50	1.330	-0.14	2.110	2.807
	GSM1900	GPRS (4 Tx slots)	Bottom Side	0mm	661	1880	25.27	26.50	1.327	-0.13	2.210	2.934
25	GSM1900	GPRS (4 Tx slots)	Bottom Side	0mm	512	1850.2	25.23	26.50	1.340	-0.13	2.620	3.510

**<WCDMA SAR>**

Plot No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
26	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	9262	1852.4	21.59	22.00	1.099	-0.17	3.540	3.890
	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	9538	1907.6	21.55	22.00	1.109	-0.16	3.280	3.638
	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	9400	1880	21.42	22.00	1.143	-0.16	3.270	3.737

**<FDD LTE SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	LTE Band 7	20M	QPSK	1	0	Bottom Side	0mm	20850	2510	22.88	23.00	1.028	-0.14	2.440	2.508
	LTE Band 7	20M	QPSK	1	0	Bottom Side	0mm	21100	2535	22.67	23.00	1.079	-0.16	2.430	2.622
27	LTE Band 7	20M	QPSK	1	0	Bottom Side	0mm	21350	2560	22.74	23.00	1.062	-0.14	2.570	2.729



**<TDD LTE SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	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 10g SAR (W/kg)	Reported 10g SAR (W/kg)
	LTE Band 38	20M	QPSK	1	0	Bottom Side	0mm	37850	2580	23.69	24.00	1.074	62.9	1.006	-0.05	1.960	2.118
	LTE Band 38	20M	QPSK	1	0	Bottom Side	0mm	38000	2595	23.42	24.00	1.143	62.9	1.006	-0.08	1.970	2.265
28	LTE Band 38	20M	QPSK	1	0	Bottom Side	0mm	38150	2610	23.21	24.00	1.199	62.9	1.006	0.11	1.920	2.317
	LTE Band 41	20M	QPSK	1	99	Bottom Side	0mm	39750	2506	23.58	24.00	1.102	62.9	1.006	-0.17	2.360	2.615
	LTE Band 41	20M	QPSK	1	99	Bottom Side	0mm	40185	2549.5	23.43	24.00	1.140	62.9	1.006	-0.09	1.920	2.202
	LTE Band 41	20M	QPSK	1	99	Bottom Side	0mm	40620	2593	23.37	24.00	1.156	62.9	1.006	-0.11	2.140	2.489
	LTE Band 41	20M	QPSK	1	99	Bottom Side	0mm	41055	2636.5	23.02	24.00	1.253	62.9	1.006	-0.14	2.130	2.685
29	LTE Band 41	20M	QPSK	1	99	Bottom Side	0mm	41490	2680	22.88	24.00	1.294	62.9	1.006	-0.16	2.090	2.721

**<WLAN SAR>**

Plot No.	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 10g SAR (W/kg)	Reported 10g SAR (W/kg)
30	WLAN5GHz	802.11a 6Mbps	Front	0mm	64	5320	13.81	14.00	1.045	95.49	1.047	0.02	0.470	0.514
	WLAN5GHz	802.11a 6Mbps	Back	0mm	64	5320	13.81	14.00	1.045	95.49	1.047	0.05	0.034	0.037
	WLAN5GHz	802.11a 6Mbps	Left Side	0mm	64	5320	13.81	14.00	1.045	95.49	1.047	-0.01	0.093	0.102
	WLAN5GHz	802.11a 6Mbps	Top Side	0mm	64	5320	13.81	14.00	1.045	95.49	1.047	-0.11	0.035	0.038
31	WLAN5GHz	802.11a 6Mbps	Front	0mm	100	5500	13.75	14.00	1.059	95.49	1.047	0.13	0.173	0.192
	WLAN5GHz	802.11a 6Mbps	Back	0mm	100	5500	13.75	14.00	1.059	95.49	1.047	-0.11	0.053	0.059
	WLAN5GHz	802.11a 6Mbps	Left Side	0mm	100	5500	13.75	14.00	1.059	95.49	1.047	-0.02	0.039	0.043
	WLAN5GHz	802.11a 6Mbps	Top Side	0mm	100	5500	13.75	14.00	1.059	95.49	1.047	-0.02	0.025	0.028

# 14.4 Body Worn Accessory SAR

## <GSM SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	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)
	GSM850	GPRS (1 Tx slot)	Front	15mm	251	848.8	33.28	33.50	1.052	0.03	0.143	0.150
32	GSM850	GPRS (1 Tx slot)	Back	15mm	251	848.8	33.28	33.50	1.052	0.04	0.149	0.157
	GSM1900	GPRS (4 Tx slots)	Front	15mm	661	1880	25.27	26.50	1.327	-0.04	0.454	0.603
33	GSM1900	GPRS (4 Tx slots)	Back	15mm	661	1880	25.27	26.50	1.327	-0.01	0.467	0.620

## <WCDMA SAR>

Plot No.	Band	Mode	Test Position	Gap (mm)	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)
	WCDMA II	RMC 12.2Kbps	Front	15mm	9262	1852.4	21.59	22.00	1.099	-0.07	0.521	0.573
34	WCDMA II	RMC 12.2Kbps	Back	15mm	9262	1852.4	21.59	22.00	1.099	0	0.536	0.589
	WCDMA V	RMC 12.2Kbps	Front	15mm	4233	846.6	22.42	24.00	1.439	-0.03	0.142	0.204
35	WCDMA V	RMC 12.2Kbps	Back	15mm	4233	846.6	22.42	24.00	1.439	-0.07	0.148	0.213

## <FDD LTE SAR>

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	Test Position	Gap (mm)	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)
	LTE Band 5	10M	QPSK	1	49	Front	15mm	20525	836.5	23.84	24.00	1.038	0.01	0.198	0.205
	LTE Band 5	10M	QPSK	25	0	Front	15mm	20525	836.5	22.89	23.00	1.026	0.05	0.180	0.185
36	LTE Band 5	10M	QPSK	1	49	Back	15mm	20525	836.5	23.84	24.00	1.038	0.01	0.223	0.231
	LTE Band 5	10M	QPSK	25	0	Back	15mm	20525	836.5	22.89	23.00	1.026	0.06	0.201	0.206
37	LTE Band 7	20M	QPSK	1	0	Front	15mm	20850	2510	22.88	23.00	1.028	-0.02	0.497	0.511
	LTE Band 7	20M	QPSK	50	24	Front	15mm	20850	2510	21.80	22.00	1.047	-0.04	0.394	0.413
	LTE Band 7	20M	QPSK	1	0	Back	15mm	20850	2510	22.88	23.00	1.028	-0.01	0.477	0.490
	LTE Band 7	20M	QPSK	50	24	Back	15mm	20850	2510	21.80	22.00	1.047	0	0.377	0.395

**<TDD LTE SAR>**

Plot No.	Band	BW (MHz)	Modulation	RB Size	RB offset	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)
38	LTE Band 38	20M	QPSK	1	0	Front	15mm	37850	2580	23.69	24.00	1.074	62.9	1.006	-0.14	0.373	0.403
	LTE Band 38	20M	QPSK	50	0	Front	15mm	37850	2580	22.69	23.00	1.074	62.9	1.006	-0.11	0.302	0.326
	LTE Band 38	20M	QPSK	1	0	Back	15mm	37850	2580	23.69	24.00	1.074	62.9	1.006	-0.11	0.369	0.399
	LTE Band 38	20M	QPSK	50	0	Back	15mm	37850	2580	22.69	23.00	1.074	62.9	1.006	-0.07	0.296	0.320
39	LTE Band 41	20M	QPSK	1	0	Front	15mm	39750	2506	23.63	24.00	1.089	62.9	1.006	0.09	0.422	0.462
	LTE Band 41	20M	QPSK	50	0	Front	15mm	39750	2506	22.68	23.00	1.076	62.9	1.006	0.17	0.346	0.375
	LTE Band 41	20M	QPSK	1	0	Back	15mm	39750	2506	23.63	24.00	1.089	62.9	1.006	-0.04	0.419	0.459
	LTE Band 41	20M	QPSK	50	0	Back	15mm	39750	2506	22.68	23.00	1.076	62.9	1.006	0.06	0.341	0.369

**<WLAN SAR>**

Plot No.	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)
	WLAN2.4GHz	802.11b 1Mbps	Front	15mm	6	2437	17.95	18.00	1.012	100	1.000	-0.1	0.071	0.072
40	WLAN2.4GHz	802.11b 1Mbps	Back	15mm	6	2437	17.95	18.00	1.012	100	1.000	-0.12	0.088	0.089
41	WLAN5GHz	802.11a 6Mbps	Front	15mm	64	5320	13.81	14.00	1.045	95.49	1.047	0.03	0.026	0.028
	WLAN5GHz	802.11a 6Mbps	Back	15mm	64	5320	13.81	14.00	1.045	95.49	1.047	0.13	0.008	0.009
42	WLAN5GHz	802.11a 6Mbps	Front	15mm	100	5500	13.75	14.00	1.059	95.49	1.047	0.09	0.018	0.020
	WLAN5GHz	802.11a 6Mbps	Back	15mm	100	5500	13.75	14.00	1.059	95.49	1.047	0.13	0.008	0.009
43	WLAN5GHz	802.11a 6Mbps	Front	15mm	149	5745	13.99	14.00	1.002	95.49	1.047	-0.09	0.022	0.023
	WLAN5GHz	802.11a 6Mbps	Back	15mm	149	5745	13.99	14.00	1.002	95.49	1.047	0.16	0.004	0.004

**14.5 Repeated SAR Measurement**

No.	Band	Mode	Test Position	Gap (mm)	Power Reduction	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 1g SAR (W/kg)	Ratio	Reported 1g SAR (W/kg)
1st	GSM1900	GPRS (4 Tx slots)	Bottom Side	10mm	ON	810	1909.8	22.86	23.50	1.159	-0.05	0.958		1.110
2nd	GSM1900	GPRS (4 Tx slots)	Bottom Side	10mm	ON	810	1909.8	22.86	23.50	1.159	-0.05	0.947	1.01	1.097
1st	LTE Band 7	20M_QPSK_1_0	Bottom Side	10mm	ON	20850	2510	19.33	20.00	1.167	-0.04	1.010		1.178
2nd	LTE Band 7	20M_QPSK_1_0	Bottom Side	10mm	ON	20850	2510	19.33	20.00	1.167	0.13	0.999	1.01	1.166

No.	Band	Mode	Test Position	Gap (mm)	Ch.	Freq. (MHz)	Average Power (dBm)	Tune-Up Limit (dBm)	Tune-up Scaling Factor	Power Drift (dB)	Measured 10g SAR (W/kg)	Ratio	Reported 10g SAR (W/kg)
1st	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	9262	1852.4	21.59	22.00	1.099	-0.17	3.540		3.890
2nd	WCDMA II	RMC 12.2Kbps	Bottom Side	0mm	9262	1852.4	21.59	22.00	1.099	-0.07	3.460	1.02	3.803
1st	LTE Band 7	20M_QPSK_1_0	Bottom Side	0mm	21350	2560	22.74	23.00	1.062	-0.14	2.570		2.729
2nd	LTE Band 7	20M_QPSK_1_0	Bottom Side	0mm	21350	2560	22.74	23.00	1.062	-0.01	2.510	1.02	2.665

**General Note:**

1. Per KDB 865664 D01v01r04, for each frequency band, repeated SAR measurement is required only when the measured SAR is  $\geq 0.8$ W/kg.
2. Per KDB 865664 D01v01r04, if the ratio among the repeated measurement is  $\leq 1.2$  and the measured SAR  $< 1.45$ W/kg, only one repeated measurement is required.
3. Per KDB 865664 D01v01r04, if the extremity repeated SAR is necessary, the same procedures should be adapted for measurements according to extremity and occupational exposure limits by applying a factor of 2.5 for extremity exposure and a factor of 5 for occupational exposure to the corresponding SAR thresholds.
4. The ratio is the difference in percentage between original and repeated *measured* SAR.
5. All measurement SAR result is scaled-up to account for tune-up tolerance and is compliant.

## 15. Simultaneous Transmission Analysis

NO.	Simultaneous Transmission Configurations	Portable Handset			
		Head	Body-worn	Hotspot	Product Specific
1.	GSM Voice + WLAN2.4GHz	Yes	Yes		Yes
2.	GPRS/EDGE + WLAN2.4GHz	Yes	Yes	Yes	Yes
3.	WCDMA + WLAN2.4GHz	Yes	Yes	Yes	Yes
4.	LTE + WLAN2.4GHz	Yes	Yes	Yes	Yes
5.	GSM Voice + Bluetooth	Yes	Yes		Yes
6.	GPRS/EDGE + Bluetooth	Yes	Yes	Yes	Yes
7.	WCDMA+ Bluetooth	Yes	Yes	Yes	Yes
8.	LTE + Bluetooth	Yes	Yes	Yes	Yes
9.	GSM Voice + WLAN5GHz	Yes	Yes		Yes
10.	GPRS/EDGE + WLAN5GHz	Yes	Yes	Yes	Yes
11.	WCDMA + WLAN5GHz	Yes	Yes	Yes	Yes
12.	LTE + WLAN5GHz	Yes	Yes	Yes	Yes

**General Note:**

- This device WLAN 2.4GHz / 5.2GHz / 5.8GHz supports Hotspot operation and Bluetooth support tethering applications.
- WLAN and Bluetooth share the same antenna, and cannot transmit simultaneously.
- All licensed modes share the same antenna part and cannot transmit simultaneously.
- EUT will choose either WLAN 2.4GHz or WLAN 5GHz according to the network signal condition; therefore, 2.4GHz WLAN and 5GHz WLAN will not operate simultaneously at any moment.
- The Scaled SAR summation is calculated based on the same configuration and test position.
- Per KDB 447498 D01v06, simultaneous transmission SAR is compliant if,
  - Scalar SAR summation < 1.6W/kg.
  - $SPLSR = (SAR1 + SAR2)^{1.5} / (\min. \text{ separation distance, mm})$ , 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.
  - If  $SPLSR \leq 0.04$ , simultaneously transmission SAR measurement is not necessary.
  - Simultaneously transmission SAR measurement, and the reported multi-band SAR < 1.6W/kg.
- For simultaneous transmission analysis, Bluetooth SAR is estimated per KDB 447498 D01v06 based on the formula below.
  - $(\max. \text{ power of channel, including tune-up tolerance, mW}) / (\min. \text{ test separation distance, mm}) \cdot [\sqrt{f(\text{GHz})} / x] \text{ W/kg}$  for test separation distances  $\leq 50 \text{ mm}$ ; where  $x = 7.5$  for 1-g SAR, and  $x = 18.75$  for 10-g SAR.
  - When the minimum separation distance is < 5mm, the distance is used 5mm to determine SAR test exclusion.
  - 0.4 W/kg for 1-g SAR and 1.0 W/kg for 10-g SAR, when the test separation distances is > 50 mm.

Bluetooth Max Power	Exposure Position	Hotspot	Body-worn
	Test separation	10 mm	15 mm
11.5 dBm	Estimated 1g SAR (W/kg)	0.297 W/kg	0.198 W/kg

Bluetooth Max Power	Exposure Position	Product Specific
	Test separation	0 mm
11.5 dBm	Estimated 10g SAR (W/kg)	0.237 W/kg

**15.1 Head Exposure Conditions**

WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth			
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)			
GSM	GSM850	Right Cheek	0.169	0.679	0.505	0.018	<b>0.848</b>	<b>0.674</b>	<b>0.187</b>
		Right Tilted	0.086	0.502	0.386	0.013	<b>0.588</b>	<b>0.472</b>	<b>0.099</b>
		Left Cheek	0.148	0.271	0.282	0.004	<b>0.419</b>	<b>0.430</b>	<b>0.152</b>
		Left Tilted	0.075	0.249	0.197	0.005	<b>0.324</b>	<b>0.272</b>	<b>0.080</b>
	GSM1900	Right Cheek	0.078	0.679	0.505	0.018	<b>0.757</b>	<b>0.583</b>	<b>0.096</b>
		Right Tilted	0.015	0.502	0.386	0.013	<b>0.517</b>	<b>0.401</b>	<b>0.028</b>
		Left Cheek	0.040	0.271	0.282	0.004	<b>0.311</b>	<b>0.322</b>	<b>0.044</b>
		Left Tilted	0.032	0.249	0.197	0.005	<b>0.281</b>	<b>0.229</b>	<b>0.037</b>
WCDMA	WCDMA II	Right Cheek	0.176	0.679	0.505	0.018	<b>0.855</b>	<b>0.681</b>	<b>0.194</b>
		Right Tilted	0.086	0.502	0.386	0.013	<b>0.588</b>	<b>0.472</b>	<b>0.099</b>
		Left Cheek	0.132	0.271	0.282	0.004	<b>0.403</b>	<b>0.414</b>	<b>0.136</b>
		Left Tilted	0.085	0.249	0.197	0.005	<b>0.334</b>	<b>0.282</b>	<b>0.090</b>
	WCDMA V	Right Cheek	0.220	0.679	0.505	0.018	<b>0.899</b>	<b>0.725</b>	<b>0.238</b>
		Right Tilted	0.085	0.502	0.386	0.013	<b>0.587</b>	<b>0.471</b>	<b>0.098</b>
		Left Cheek	0.183	0.271	0.282	0.004	<b>0.454</b>	<b>0.465</b>	<b>0.187</b>
		Left Tilted	0.091	0.249	0.197	0.005	<b>0.340</b>	<b>0.288</b>	<b>0.096</b>
LTE	LTE Band 5	Right Cheek	0.200	0.679	0.505	0.018	<b>0.879</b>	<b>0.705</b>	<b>0.218</b>
		Right Tilted	0.092	0.502	0.386	0.013	<b>0.594</b>	<b>0.478</b>	<b>0.105</b>
		Left Cheek	0.164	0.271	0.282	0.004	<b>0.435</b>	<b>0.446</b>	<b>0.168</b>
		Left Tilted	0.086	0.249	0.197	0.005	<b>0.335</b>	<b>0.283</b>	<b>0.091</b>
	LTE Band 7	Right Cheek	0.120	0.679	0.505	0.018	<b>0.799</b>	<b>0.625</b>	<b>0.138</b>
		Right Tilted	0.034	0.502	0.386	0.013	<b>0.536</b>	<b>0.420</b>	<b>0.047</b>
		Left Cheek	0.091	0.271	0.282	0.004	<b>0.362</b>	<b>0.373</b>	<b>0.095</b>
		Left Tilted	0.040	0.249	0.197	0.005	<b>0.289</b>	<b>0.237</b>	<b>0.045</b>
	LTE Band 38	Right Cheek	0.096	0.679	0.505	0.018	<b>0.775</b>	<b>0.601</b>	<b>0.114</b>
		Right Tilted	0.017	0.502	0.386	0.013	<b>0.519</b>	<b>0.403</b>	<b>0.030</b>
		Left Cheek	0.044	0.271	0.282	0.004	<b>0.315</b>	<b>0.326</b>	<b>0.048</b>
		Left Tilted	0.015	0.249	0.197	0.005	<b>0.264</b>	<b>0.212</b>	<b>0.020</b>
	LTE Band 41	Right Cheek	0.085	0.679	0.505	0.018	<b>0.764</b>	<b>0.590</b>	<b>0.103</b>
		Right Tilted	0.015	0.502	0.386	0.013	<b>0.517</b>	<b>0.401</b>	<b>0.028</b>
		Left Cheek	0.041	0.271	0.282	0.004	<b>0.312</b>	<b>0.323</b>	<b>0.045</b>
		Left Tilted	0.018	0.249	0.197	0.005	<b>0.267</b>	<b>0.215</b>	<b>0.023</b>

**15.2 Hotspot Exposure Conditions**

WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth			
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)			
GSM	GSM850	Front	0.196	0.135	0.076	0.297	<b>0.331</b>	<b>0.272</b>	<b>0.493</b>
		Back	0.251	0.194	0.017	0.297	<b>0.445</b>	<b>0.268</b>	<b>0.548</b>
		Left side	0.084	0.119	0.028	0.297	<b>0.203</b>	<b>0.112</b>	<b>0.381</b>
		Right side	0.167				<b>0.167</b>	<b>0.167</b>	<b>0.167</b>
		Top side		0.072	0.027	0.297	<b>0.072</b>	<b>0.027</b>	<b>0.297</b>
		Bottom side	0.143				<b>0.143</b>	<b>0.143</b>	<b>0.143</b>
	GSM1900	Front	0.679	0.135	0.076	0.297	<b>0.814</b>	<b>0.755</b>	<b>0.976</b>
		Back	0.661	0.194	0.017	0.297	<b>0.855</b>	<b>0.678</b>	<b>0.958</b>
		Left side	0.095	0.119	0.028	0.297	<b>0.214</b>	<b>0.123</b>	<b>0.392</b>
		Right side	0.042				<b>0.042</b>	<b>0.042</b>	<b>0.042</b>
		Top side		0.072	0.027	0.297	<b>0.072</b>	<b>0.027</b>	<b>0.297</b>
		Bottom side	1.110				<b>1.110</b>	<b>1.110</b>	<b>1.110</b>
WCDMA	WCDMA II	Front	0.538	0.135	0.076	0.297	<b>0.673</b>	<b>0.614</b>	<b>0.835</b>
		Back	0.542	0.194	0.017	0.297	<b>0.736</b>	<b>0.559</b>	<b>0.839</b>
		Left side	0.095	0.119	0.028	0.297	<b>0.214</b>	<b>0.123</b>	<b>0.392</b>
		Right side	0.057				<b>0.057</b>	<b>0.057</b>	<b>0.057</b>
		Top side		0.072	0.027	0.297	<b>0.072</b>	<b>0.027</b>	<b>0.297</b>
		Bottom side	0.954				<b>0.954</b>	<b>0.954</b>	<b>0.954</b>
	WCDMA V	Front	0.258	0.135	0.076	0.297	<b>0.393</b>	<b>0.334</b>	<b>0.555</b>
		Back	0.315	0.194	0.017	0.297	<b>0.509</b>	<b>0.332</b>	<b>0.612</b>
		Left side	0.131	0.119	0.028	0.297	<b>0.250</b>	<b>0.159</b>	<b>0.428</b>
		Right side	0.232				<b>0.232</b>	<b>0.232</b>	<b>0.232</b>
		Top side		0.072	0.027	0.297	<b>0.072</b>	<b>0.027</b>	<b>0.297</b>
		Bottom side	0.193				<b>0.193</b>	<b>0.193</b>	<b>0.193</b>



WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth			
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)			
LTE	LTE Band 5	Front	0.229	0.135	0.076	0.297	<b>0.364</b>	<b>0.305</b>	<b>0.526</b>
		Back	0.267	0.194	0.017	0.297	<b>0.461</b>	<b>0.284</b>	<b>0.564</b>
		Left side	0.127	0.119	0.028	0.297	<b>0.246</b>	<b>0.155</b>	<b>0.424</b>
		Right side	0.168				<b>0.168</b>	<b>0.168</b>	<b>0.168</b>
		Top side		0.072	0.027	0.297	<b>0.072</b>	<b>0.027</b>	<b>0.297</b>
		Bottom side	0.171				<b>0.171</b>	<b>0.171</b>	<b>0.171</b>
	LTE Band 7	Front	0.642	0.135	0.076	0.297	<b>0.777</b>	<b>0.718</b>	<b>0.939</b>
		Back	0.637	0.194	0.017	0.297	<b>0.831</b>	<b>0.654</b>	<b>0.934</b>
		Left side	0.053	0.119	0.028	0.297	<b>0.172</b>	<b>0.081</b>	<b>0.350</b>
		Right side	0.085				<b>0.085</b>	<b>0.085</b>	<b>0.085</b>
		Top side		0.072	0.027	0.297	<b>0.072</b>	<b>0.027</b>	<b>0.297</b>
		Bottom side	1.178				<b>1.178</b>	<b>1.178</b>	<b>1.178</b>
	LTE Band 38	Front	0.532	0.135	0.076	0.297	<b>0.667</b>	<b>0.608</b>	<b>0.829</b>
		Back	0.504	0.194	0.017	0.297	<b>0.698</b>	<b>0.521</b>	<b>0.801</b>
		Left side	0.107	0.119	0.028	0.297	<b>0.226</b>	<b>0.135</b>	<b>0.404</b>
		Right side	0.117				<b>0.117</b>	<b>0.117</b>	<b>0.117</b>
		Top side		0.072	0.027	0.297	<b>0.072</b>	<b>0.027</b>	<b>0.297</b>
		Bottom side	1.162				<b>1.162</b>	<b>1.162</b>	<b>1.162</b>
	LTE Band 41	Front	0.443	0.135	0.076	0.297	<b>0.578</b>	<b>0.519</b>	<b>0.740</b>
		Back	0.494	0.194	0.017	0.297	<b>0.688</b>	<b>0.511</b>	<b>0.791</b>
		Left side	0.043	0.119	0.028	0.297	<b>0.162</b>	<b>0.071</b>	<b>0.340</b>
		Right side	0.058				<b>0.058</b>	<b>0.058</b>	<b>0.058</b>
		Top side		0.072	0.027	0.297	<b>0.072</b>	<b>0.027</b>	<b>0.297</b>
		Bottom side	1.025				<b>1.025</b>	<b>1.025</b>	<b>1.025</b>



**15.3 Product Specific Conditions**

WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 10g SAR (W/kg)	1+3 Summed 10g SAR (W/kg)	1+4 Summed 10g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth			
			10g SAR (W/kg)	10g SAR (W/kg)	10g SAR (W/kg)	Estimated 10g SAR (W/kg)			
GSM	GSM1900	Front	3.379		0.514	0.237	3.379	3.893	3.616
		Back	3.345		0.059	0.237	3.345	3.404	3.582
		Left side			0.102	0.237		0.102	0.237
		Right side							
		Top side			0.038	0.237		0.038	0.237
		Bottom side	3.510				3.510	3.510	3.510
WCDMA	WCDMA II	Front			0.514	0.237		0.514	0.237
		Back			0.059	0.237		0.059	0.237
		Left side			0.102	0.237		0.102	0.237
		Right side							
		Top side			0.038	0.237		0.038	0.237
		Bottom side	3.890				3.890	3.890	3.890
LTE	LTE Band 7	Front			0.514	0.237		0.514	0.237
		Back			0.059	0.237		0.059	0.237
		Left side			0.102	0.237		0.102	0.237
		Right side							
		Top side			0.038	0.237		0.038	0.237
		Bottom side	2.729				2.729	2.729	2.729
	LTE Band 38	Front			0.514	0.237		0.514	0.237
		Back			0.059	0.237		0.059	0.237
		Left side			0.102	0.237		0.102	0.237
		Right side							
		Top side			0.038	0.237		0.038	0.237
		Bottom side	2.317				2.317	2.317	2.317
	LTE Band 41	Front			0.514	0.237		0.514	0.237
		Back			0.059	0.237		0.059	0.237
		Left side			0.102	0.237		0.102	0.237
		Right side							
		Top side			0.038	0.237		0.038	0.237
		Bottom side	2.721				2.721	2.721	2.721

**15.4 Body-Worn Accessory Exposure Conditions**

WWAN Band		Exposure Position	1	2	3	4	1+2 Summed 1g SAR (W/kg)	1+3 Summed 1g SAR (W/kg)	1+4 Summed 1g SAR (W/kg)
			WWAN	2.4GHz WLAN	5GHz WLAN	Bluetooth			
			1g SAR (W/kg)	1g SAR (W/kg)	1g SAR (W/kg)	Estimated 1g SAR (W/kg)			
GSM	GSM850	Front	0.150	0.072	0.028	0.198	<b>0.222</b>	<b>0.178</b>	<b>0.348</b>
		Back	0.157	0.089	0.009	0.198	<b>0.246</b>	<b>0.166</b>	<b>0.355</b>
	GSM1900	Front	0.603	0.072	0.028	0.198	<b>0.675</b>	<b>0.631</b>	<b>0.801</b>
		Back	0.620	0.089	0.009	0.198	<b>0.709</b>	<b>0.629</b>	<b>0.818</b>
WCDMA	WCDMA II	Front	0.573	0.072	0.028	0.198	<b>0.645</b>	<b>0.601</b>	<b>0.771</b>
		Back	0.589	0.089	0.009	0.198	<b>0.678</b>	<b>0.598</b>	<b>0.787</b>
	WCDMA V	Front	0.204	0.072	0.028	0.198	<b>0.276</b>	<b>0.232</b>	<b>0.402</b>
		Back	0.213	0.089	0.009	0.198	<b>0.302</b>	<b>0.222</b>	<b>0.411</b>
LTE	LTE Band 5	Front	0.205	0.072	0.028	0.198	<b>0.277</b>	<b>0.233</b>	<b>0.403</b>
		Back	0.231	0.089	0.009	0.198	<b>0.320</b>	<b>0.240</b>	<b>0.429</b>
	LTE Band 7	Front	0.511	0.072	0.028	0.198	<b>0.583</b>	<b>0.539</b>	<b>0.709</b>
		Back	0.490	0.089	0.009	0.198	<b>0.579</b>	<b>0.499</b>	<b>0.688</b>
	LTE Band 38	Front	0.403	0.072	0.028	0.198	<b>0.475</b>	<b>0.431</b>	<b>0.601</b>
		Back	0.399	0.089	0.009	0.198	<b>0.488</b>	<b>0.408</b>	<b>0.597</b>
	LTE Band 41	Front	0.462	0.072	0.028	0.198	<b>0.534</b>	<b>0.490</b>	<b>0.660</b>
		Back	0.459	0.089	0.009	0.198	<b>0.548</b>	<b>0.468</b>	<b>0.657</b>

**Test Engineer :** James Chen Jay Jian White Huang Wilson Lin Poa Pan Jacky Chen and Kurt Liu

## 16. Uncertainty Assessment

The component of uncertainty may generally be categorized according to the methods used to evaluate them. The evaluation of uncertainty by the statistical analysis of a series of observations is termed a Type A evaluation of uncertainty. The evaluation of uncertainty by means other than the statistical analysis of a series of observation is termed a Type B evaluation of uncertainty. Each component of uncertainty, however evaluated, is represented by an estimated standard deviation, termed standard uncertainty, which is determined by the positive square root of the estimated variance.

A Type A evaluation of standard uncertainty may be based on any valid statistical method for treating data. This includes calculating the standard deviation of the mean of a series of independent observations; using the method of least squares to fit a curve to the data in order to estimate the parameter of the curve and their standard deviations; or carrying out an analysis of variance in order to identify and quantify random effects in certain kinds of measurement.

A type B evaluation of standard uncertainty is typically based on scientific judgment using all of the relevant information available. These may include previous measurement data, experience, and knowledge of the behavior and properties of relevant materials and instruments, manufacture's specification, data provided in calibration reports and uncertainties assigned to reference data taken from handbooks. Broadly speaking, the uncertainty is either obtained from an outdoor source or obtained from an assumed distribution, such as the normal distribution, rectangular or triangular distributions indicated in table below.

Uncertainty Distributions	Normal	Rectangular	Triangular	U-Shape
Multi-plying Factor <sup>(a)</sup>	1/ $\kappa$ <sup>(b)</sup>	1/ $\sqrt{3}$	1/ $\sqrt{6}$	1/ $\sqrt{2}$

(a) standard uncertainty is determined as the product of the multiplying factor and the estimated range of variations in the measured quantity

(b)  $\kappa$  is the coverage factor

**Table 16.1. Standard Uncertainty for Assumed Distribution**

The combined standard uncertainty of the measurement result represents the estimated standard deviation of the result. It is obtained by combining the individual standard uncertainties of both Type A and Type B evaluation using the usual "root-sum-squares" (RSS) methods of combining standard deviations by taking the positive square root of the estimated variances.

Expanded uncertainty is a measure of uncertainty that defines an interval about the measurement result within which the measured value is confidently believed to lie. It is obtained by multiplying the combined standard uncertainty by a coverage factor. Typically, the coverage factor ranges from 2 to 3. Using a coverage factor allows the true value of a measured quantity to be specified with a defined probability within the specified uncertainty range. For purpose of this document, a coverage factor two is used, which corresponds to confidence interval of about 95 %. The DASY uncertainty Budget is shown in the following tables.

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
<b>Measurement System</b>							
Probe Calibration	6.00	N	1	1	1	6.0	6.0
Axial Isotropy	4.70	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.60	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	1.00	R	1.732	1	1	0.6	0.6
Linearity	4.70	R	1.732	1	1	2.7	2.7
System Detection Limits	1.00	R	1.732	1	1	0.6	0.6
Modulation Response	4.68	R	1.732	1	1	2.7	2.7
Readout Electronics	0.30	N	1	1	1	0.3	0.3
Response Time	0.00	R	1.732	1	1	0.0	0.0
Integration Time	2.60	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.00	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.00	R	1.732	1	1	1.7	1.7
Probe Positioner	0.40	R	1.732	1	1	0.2	0.2
Probe Positioning	2.90	R	1.732	1	1	1.7	1.7
Max. SAR Eval.	2.00	R	1.732	1	1	1.2	1.2
<b>Test Sample Related</b>							
Device Positioning	3.03	N	1	1	1	3.0	3.0
Device Holder	3.60	N	1	1	1	3.6	3.6
Power Drift	5.00	R	1.732	1	1	2.9	2.9
Power Scaling	0.00	R	1.732	1	1	0.0	0.0
<b>Phantom and Setup</b>							
Phantom Uncertainty	6.10	R	1.732	1	1	3.5	3.5
SAR correction	0.00	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.03	N	1	0.78	0.71	0.0	0.0
Liquid Conductivity (target)	5.00	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.50	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.68	R	1.732	0.78	0.71	1.7	1.5
Liquid Permittivity Repeatability	0.02	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.00	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.50	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.84	R	1.732	0.23	0.26	0.1	0.1
<b>Combined Std. Uncertainty</b>						<b>11.6%</b>	<b>11.6%</b>
<b>Coverage Factor for 95 %</b>						<b>K=2</b>	<b>K=2</b>
<b>Expanded STD Uncertainty</b>						<b>23.2%</b>	<b>23.1%</b>

**Table 16.2. Uncertainty Budget for frequency range 300 MHz to 3 GHz**

Error Description	Uncertainty Value (±%)	Probability	Divisor	(Ci) 1g	(Ci) 10g	Standard Uncertainty (1g) (±%)	Standard Uncertainty (10g) (±%)
<b>Measurement System</b>							
Probe Calibration	6.55	N	1	1	1	6.6	6.6
Axial Isotropy	4.70	R	1.732	0.7	0.7	1.9	1.9
Hemispherical Isotropy	9.60	R	1.732	0.7	0.7	3.9	3.9
Boundary Effects	2.00	R	1.732	1	1	1.2	1.2
Linearity	4.70	R	1.732	1	1	2.7	2.7
System Detection Limits	1.00	R	1.732	1	1	0.6	0.6
Modulation Response	4.68	R	1.732	1	1	2.7	2.7
Readout Electronics	0.30	N	1	1	1	0.3	0.3
Response Time	0.00	R	1.732	1	1	0.0	0.0
Integration Time	2.60	R	1.732	1	1	1.5	1.5
RF Ambient Noise	3.00	R	1.732	1	1	1.7	1.7
RF Ambient Reflections	3.00	R	1.732	1	1	1.7	1.7
Probe Positioner	0.40	R	1.732	1	1	0.2	0.2
Probe Positioning	6.70	R	1.732	1	1	3.9	3.9
Max. SAR Eval.	4.00	R	1.732	1	1	2.3	2.3
<b>Test Sample Related</b>							
Device Positioning	3.03	N	1	1	1	3.0	3.0
Device Holder	3.60	N	1	1	1	3.6	3.6
Power Drift	5.00	R	1.732	1	1	2.9	2.9
Power Scaling	0.00	R	1.732	1	1	0.0	0.0
<b>Phantom and Setup</b>							
Phantom Uncertainty	6.60	R	1.732	1	1	3.8	3.8
SAR correction	0.00	R	1.732	1	0.84	0.0	0.0
Liquid Conductivity Repeatability	0.03	N	1	0.78	0.71	0.0	0.0
Liquid Conductivity (target)	5.00	R	1.732	0.78	0.71	2.3	2.0
Liquid Conductivity (mea.)	2.50	R	1.732	0.78	0.71	1.1	1.0
Temp. unc. - Conductivity	3.68	R	1.732	0.78	0.71	1.7	1.5
Liquid Permittivity Repeatability	0.02	N	1	0.23	0.26	0.0	0.0
Liquid Permittivity (target)	5.00	R	1.732	0.23	0.26	0.7	0.8
Liquid Permittivity (mea.)	2.50	R	1.732	0.23	0.26	0.3	0.4
Temp. unc. - Permittivity	0.84	R	1.732	0.23	0.26	0.1	0.1
<b>Combined Std. Uncertainty</b>						<b>12.7%</b>	<b>12.6%</b>
<b>Coverage Factor for 95 %</b>						<b>K=2</b>	<b>K=2</b>
<b>Expanded STD Uncertainty</b>						<b>25.4%</b>	<b>25.3%</b>

**Table 16.3. Uncertainty Budget for frequency range 3 GHz to 6 GHz**

## **17. 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 248227 D01 v02r02, "SAR Guidance for IEEE 802.11 (WiFi) Transmitters", Oct 2015.
- [6] FCC KDB 447498 D01 v06, "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies", Oct 2015
- [7] FCC KDB 648474 D04 v01r03, "SAR Evaluation Considerations for Wireless Handsets", Oct 2015.
- [8] FCC KDB 941225 D01 v03r01, "3G SAR MEAUREMENT PROCEDURES", Oct 2015
- [9] FCC KDB 941225 D05 v02r05, "SAR Evaluation Considerations for LTE Devices", Dec 2015
- [10] FCC KDB 941225 D05A v01r02, "Rel. 10 LTE SAR Test Guidance and KDB Inquiries", Oct 2015
- [11] FCC KDB 941225 D06 v02r01, "SAR Evaluation Procedures for Portable Devices with Wireless Router Capabilities", Oct 2015.
- [12] FCC KDB 865664 D01 v01r04, "SAR Measurement Requirements for 100 MHz to 6 GHz", Aug 2015.
- [13] FCC KDB 865664 D02 v01r02, "RF Exposure Compliance Reporting and Documentation Considerations" Oct 2015.