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# FCC SAR Test Report

**Report No.** : SA120621C20  
**Applicant** : HTC Corporation  
**Address** : No. 23, Xinghua Rd., Taoyuan City, Taiwan  
**Product** : Smartphone  
**FCC ID** : NM8PL83200  
**Brand** : HTC  
**Model No.** : PL83200  
**Standards** : FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1991 / IEEE 1528:2003  
FCC OET Bulletin 65 Supplement C (Edition 01-01)  
KDB 248227 D01 v01r02 / KDB 648474 D01 v01r05 / KDB 941225 D01 v02  
KDB 941225 D03 v01 / KDB 941225 D05 v01 / KDB 941225 D06 v01  
**Date of Testing** : Aug. 13, 2012 ~ Oct. 22, 2012

**CERTIFICATION:** The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch - Taiwan HwaYa Lab**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agencies.

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## Release Control Record

Issue No.	Reason for Change	Date Issued
R01	Original release	Oct. 24, 2012

### 1. Summary of Maximum SAR Value

Mode / Band	Test Position	SAR-1g (W/kg)
GSM850	Head	0.072
	Body Worn (1 cm Gap)	0.304
	Hotspot Mode (1 cm Gap)	0.371
GSM1900	Head	0.052
	Body Worn (1 cm Gap)	0.381
	Hotspot Mode (1 cm Gap)	0.517
WCDMA Band II	Head	0.187
	Body Worn (1 cm Gap)	0.499
	Hotspot Mode (1 cm Gap)	0.516
WCDMA Band V	Head	0.062
	Body Worn (1 cm Gap)	0.15
	Hotspot Mode (1 cm Gap)	0.196
CDMA2000 BC0	Head	0.182
	Body Worn (1 cm Gap)	0.313
	Hotspot Mode (1 cm Gap)	0.485
CDMA2000 BC1	Head	0.171
	Body Worn (1 cm Gap)	0.633
	Hotspot Mode (1 cm Gap)	0.655
LTE Band 13	Head	0.496
	Body Worn (1 cm Gap)	0.097
	Hotspot Mode (1 cm Gap)	0.263
WLAN 2.4GHz	Head	0.118
	Body Worn (1 cm Gap)	0.196
	Hotspot Mode (1 cm Gap)	0.138
WLAN 5GHz	Head	0.103
	Body Worn (1 cm Gap)	0.109
	Hotspot Mode (1 cm Gap)	0.114
Bluetooth	Head	N/A
	Body Worn (1 cm Gap)	N/A
	Hotspot Mode (1 cm Gap)	N/A

**Note:**

1. The SAR limit (**1.6 W/kg**) for general population/uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1991.
2. Since the Bluetooth maximum power is less than  $P_{Ref}$  and maximum SAR for others transmitter is less than 1.2 W/kg, SAR testing for Bluetooth is not required.

## 2. Description of Equipment Under Test

<b>EUT Type</b>	Smartphone
<b>FCC ID</b>	NM8PL83200
<b>Brand Name</b>	HTC
<b>Model Name</b>	PL83200
<b>IMEI Code</b>	990000657087161
<b>Tx Frequency Bands (Unit: MHz)</b>	GSM850 : 824.2 ~ 848.8 GSM1900 : 1850.2 ~ 1909.8 WCDMA Band II : 1852.4 ~ 1907.6 WCDMA Band V : 826.4 ~ 846.6 CDMA BC0 : 824.7 ~ 848.31 CDMA BC1 : 1851.25 ~ 1908.75 LTE Band 13 : 779.5 ~ 784.5 WLAN : 2412 ~ 2462, 5180 ~ 5240, 5260 ~ 5320, 5500 ~ 5700, 5745 ~ 5805 Bluetooth : 2402 ~ 2480
<b>Uplink Modulations</b>	GSM & GPRS : GMSK EDGE : 8PSK WCDMA : QPSK CDMA : QPSK LTE : QPSK, 16QAM 802.11b : DSSS 802.11a/g/n : OFDM Bluetooth : GFSK
<b>Maximum AVG Conducted Power (Unit: dBm)</b>	GSM850 : 33.68 GSM1900 : 30.70 WCDMA Band II : 24.14 WCDMA Band V : 24.10 CDMA BC0 : 24.47 CDMA BC1 : 24.60 LTE Band 13 : 25.28 802.11b : 18.48 802.11g : 13.28 802.11n HT20 (2.4GHz) : 12.16 802.11n HT40 (2.4GHz) : 12.48 802.11a : 13.77 802.11n HT20 (5GHz) : 13.24 802.11n HT40 (5GHz) : 13.48
<b>Antenna Type</b>	Fixed Internal Antenna
<b>EUT Stage</b>	Identical Prototype

**Note:**

1. The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.
2. This device does not support DTM capability.

### 3. SAR Measurement System

#### 3.1 Definition of Specific Absorption Rate (SAR)

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.

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 ( $\rho$ ). The equation description is as below:

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

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

SAR measurement can be related to the electrical field in the tissue by

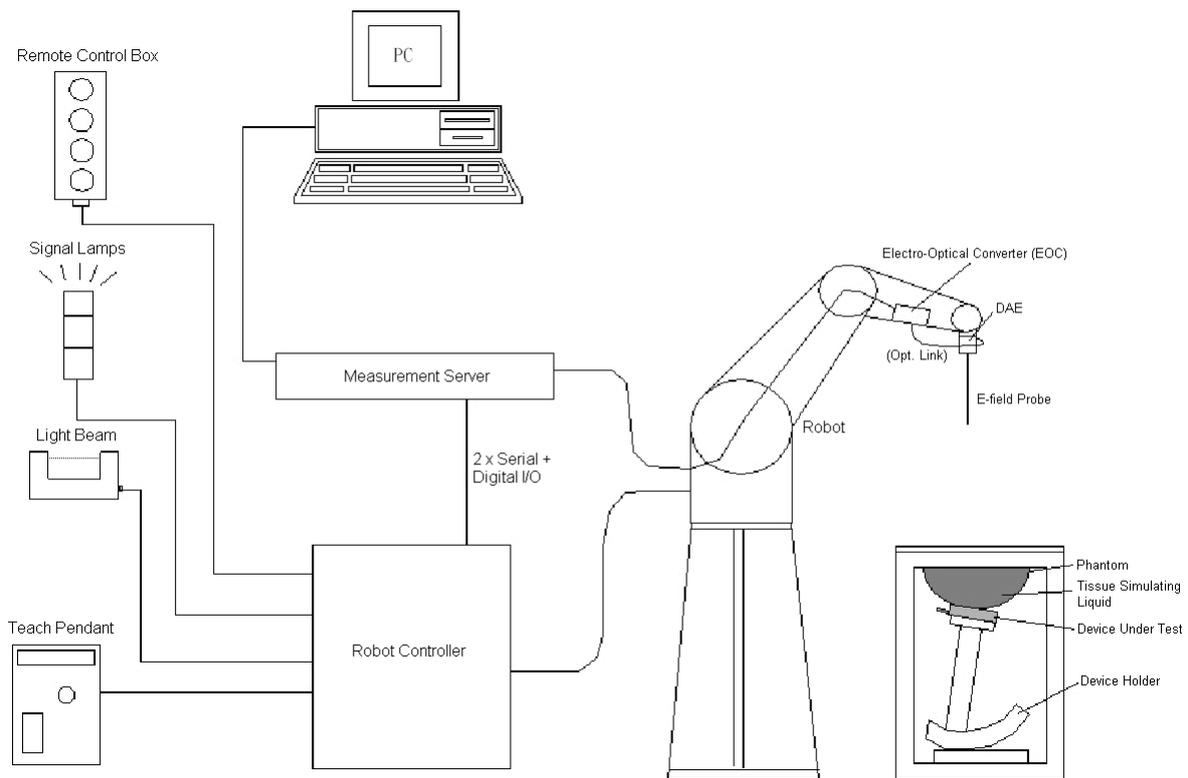
$$\text{SAR} = \frac{\sigma |E|^2}{\rho}$$

Where:  $\sigma$  is the conductivity of the tissue,  $\rho$  is the mass density of the tissue and E is the RMS electrical field strength.

#### 3.2 SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY4/5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC.

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**Fig-3.1 DASY System Setup**

### 3.2.1 Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability  $\pm 0.035$  mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



**Fig-3.2 DASY4**



**Fig-3.3 DASY5**

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## 3.2.2 Probes

The SAR measurement is conducted with the dosimetric probe. 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.

<b>Model</b>	EX3DV4	
<b>Construction</b>	Symmetrical 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 to 6 GHz Linearity: $\pm 0.2$ dB	
<b>Directivity</b>	$\pm 0.3$ dB in HSL (rotation around probe axis) $\pm 0.5$ dB in tissue material (rotation normal to probe axis)	
<b>Dynamic Range</b>	10 $\mu$ W/g to 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	

<b>Model</b>	ES3DV3	
<b>Construction</b>	Symmetrical 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 to 4 GHz Linearity: $\pm 0.2$ dB	
<b>Directivity</b>	$\pm 0.2$ dB in HSL (rotation around probe axis) $\pm 0.3$ dB in tissue material (rotation normal to probe axis)	
<b>Dynamic Range</b>	5 $\mu$ W/g to 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: 2.0 mm	

## 3.2.3 Data Acquisition Electronics (DAE)

<b>Model</b>	DAE3, DAE4	
<b>Construction</b>	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.	
<b>Measurement Range</b>	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)	
<b>Input Offset Voltage</b>	$< 5$ $\mu$ V (with auto zero)	
<b>Input Bias Current</b>	$< 50$ fA	
<b>Dimensions</b>	60 x 60 x 68 mm	

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## 3.2.4 Phantoms

<b>Model</b>	Twin SAM	
<b>Construction</b>	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.	
<b>Material</b>	Vinylester, glass fiber reinforced (VE-GF)	
<b>Shell Thickness</b>	2 ± 0.2 mm (6 ± 0.2 mm at ear point)	
<b>Dimensions</b>	Length: 1000 mm Width: 500 mm Height: adjustable feet	
<b>Filling Volume</b>	approx. 25 liters	

<b>Model</b>	ELI	
<b>Construction</b>	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
<b>Material</b>	Vinylester, glass fiber reinforced (VE-GF)	
<b>Shell Thickness</b>	2.0 ± 0.2 mm (bottom plate)	
<b>Dimensions</b>	Major axis: 600 mm Minor axis: 400 mm	
<b>Filling Volume</b>	approx. 30 liters	

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## 3.2.5 Device Holder

<b>Model</b>	Mounting Device	
<b>Construction</b>	In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).	
<b>Material</b>	POM	

<b>Model</b>	Laptop Extensions Kit	
<b>Construction</b>	Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner.	
<b>Material</b>	POM, Acrylic glass, Foam	

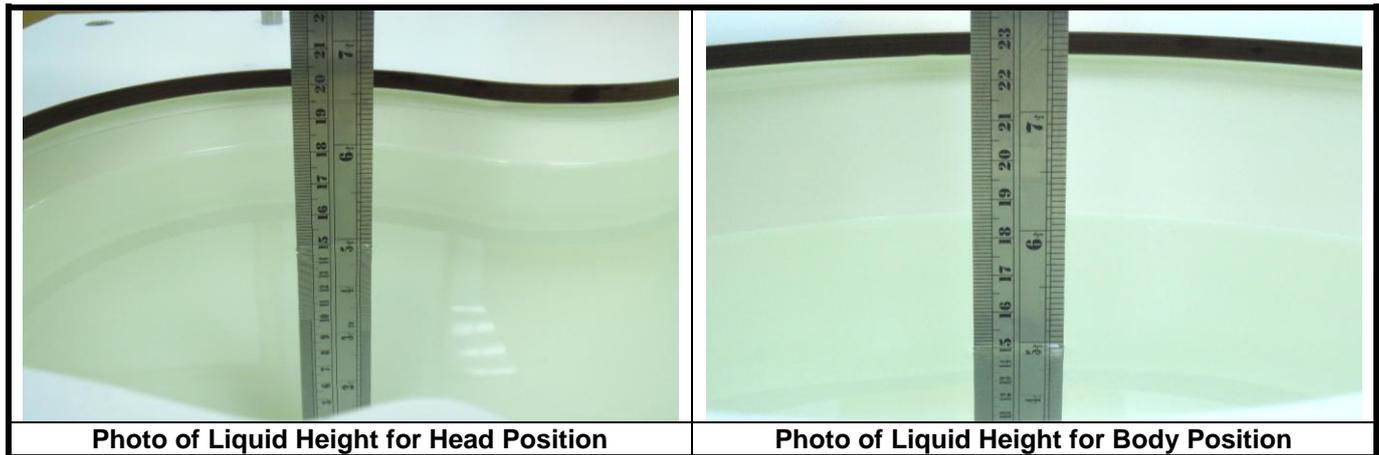
## 3.2.6 System Validation Dipoles

<b>Model</b>	D-Serial	
<b>Construction</b>	Symmetrical dipole with 1/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.	
<b>Frequency</b>	750 MHz to 5800 MHz	
<b>Return Loss</b>	> 20 dB	
<b>Power Capability</b>	> 100 W (f < 1GHz), > 40 W (f > 1GHz)	

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### 3.2.7 Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. 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. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in Table-3.1.



The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528 and FCC OET 65 Supplement C Appendix C. For the body tissue simulating liquids, the dielectric properties are defined in FCC OET 65 Supplement C Appendix C. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

**Table-3.1 Targets of Tissue Simulating Liquid**

Frequency (MHz)	Target Permittivity	Range of $\pm 5\%$	Target Conductivity	Range of $\pm 5\%$
<b>For Head</b>				
750	41.9	39.8 ~ 44.0	0.89	0.85 ~ 0.93
835	41.5	39.4 ~ 43.6	0.90	0.86 ~ 0.95
1900	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2450	39.2	37.2 ~ 41.2	1.80	1.71 ~ 1.89
5200	36.0	34.2 ~ 37.8	4.66	4.43 ~ 4.89
5300	35.9	34.1 ~ 37.7	4.76	4.52 ~ 5.00
5500	35.6	33.8 ~ 37.4	4.96	4.71 ~ 5.21
5600	35.5	33.7 ~ 37.3	5.07	4.82 ~ 5.32
5800	35.3	33.5 ~ 37.1	5.27	5.01 ~ 5.53
<b>For Body</b>				
750	55.5	52.7 ~ 58.3	0.96	0.91 ~ 1.01
835	55.2	52.4 ~ 58.0	0.97	0.92 ~ 1.02
1900	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
2450	52.7	50.1 ~ 55.3	1.95	1.85 ~ 2.05
5200	49.0	46.6 ~ 51.5	5.30	5.04 ~ 5.57
5300	48.9	46.5 ~ 51.3	5.42	5.15 ~ 5.69
5500	48.6	46.2 ~ 51.0	5.65	5.37 ~ 5.93
5600	48.5	46.1 ~ 50.9	5.77	5.48 ~ 6.06
5800	48.2	45.8 ~ 50.6	6.00	5.70 ~ 6.30



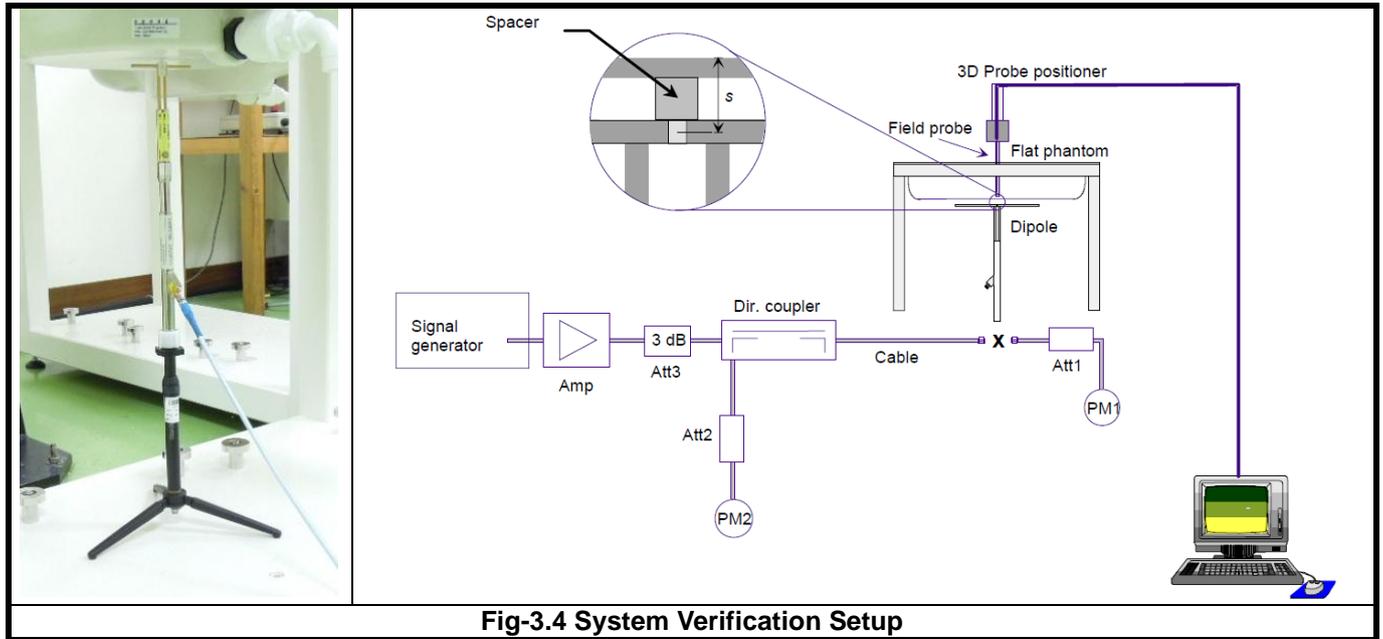
The following table gives the recipes for tissue simulating liquids.

**Table-3.2 Recipes of Tissue Simulating Liquid**

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
H750	0.2	-	0.2	1.5	56.0	-	42.1	-
H835	0.2	-	0.2	1.5	57.0	-	41.1	-
H1900	-	44.5	-	0.2	-	-	55.3	-
H2450	-	45.0	-	0.1	-	-	54.9	-
H5G	-	-	-	-	-	17.2	65.5	17.3
B750	0.2	-	0.2	0.8	48.8	-	50.0	-
B835	0.2	-	0.2	0.9	48.5	-	50.2	-
B1900	-	29.5	-	0.3	-	-	70.2	-
B2450	-	31.4	-	0.1	-	-	68.5	-
B5G	-	-	-	-	-	10.7	78.6	10.7

### 3.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.



**Fig-3.4 System Verification Setup**

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The power meter PM1 measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.

### **3.4 SAR Measurement Procedure**

According to the SAR 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

The SAR measurement procedures for each of test conditions are as follows:

- (a) Make EUT to transmit maximum output power
- (b) Measure conducted output power through RF cable
- (c) Place the EUT in the specific position of phantom
- (d) Perform SAR testing steps on the DASY system
- (e) Record the SAR value

#### **3.4.1 Area & Zoom Scan Procedure**

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for below 3 GHz, and 7x7x9 points with step size 4, 4 and 2.5 mm for above 5 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

#### **3.4.2 Volume Scan Procedure**

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

#### **3.4.3 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 drift more than 5%, the SAR will be retested.

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### 3.4.4 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

### 3.4.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

## 4. SAR Measurement Evaluation

### 4.1 EUT Configuration and Setting

The EUT is a voice/data transmitter device that contains two WWAN transmitters (one is for GSM / WCDMA / CDMA2000, and the other is for LTE). Confirming the LTE transmitter follows 3GPP standards, is category 3, BW 5/10 MHz, band 13, supports QPSK / 16QAM modulations, and supports data transmission only. Tested per 3GPP 36.521 maximum transmit procedures for both QPSK / 16QAM.

**LTE Maximum Power Reduction in accordance with 3GPP 36.101:** Power Reduction in accordance to 3GPP is active all times during LTE operation.

Modulation	Channel bandwidth / Transmission bandwidth configuration (RB)		3GPP Requirement (dB)	LTE MPR Setting (dB)
	BW 5 MHz	BW 10 MHz		
QPSK	> 8	> 12	<= 1	1
16QAM	<= 8	<= 12	<= 1	1
16QAM	> 8	> 12	<= 2	2

**Note:** MPR is according to the standard and implemented in the circuit (mandatory).

In addition, the device is compliant with A-MPR requirements defined in 36.101 section 6.2.4 that may be required to meet 3GPP Adjacent Channel Leakage Ratio (“ACLR”) requirements. A-MPR was disabled for all FCC compliance testing.

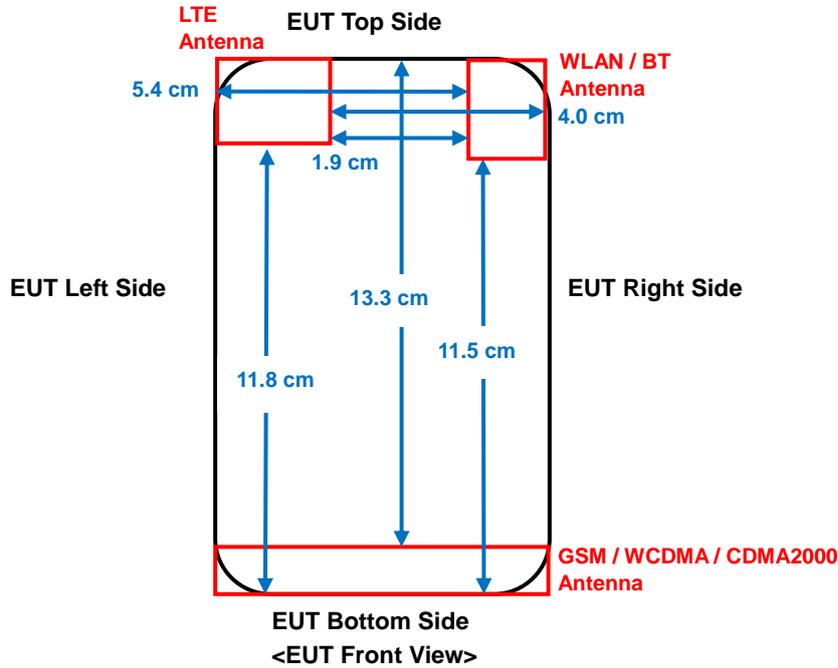
This device has two WWAN antennas and one WLAN/BT antenna design. The capabilities of antenna are shown as below. The EUT adopts so-called Circuit Switch Fallback (CSFB) approach. The definition of CSFB is when using LTE to download data and a voice call coming, this scenario (CSFB) will drop the LTE connection then switching link to voice path (GSM) smoothly. In other words, it is impossible to transmit simultaneously under GSM/WCDMA and LTE network at the same time. Since only one WWAN wireless technology (GSM/WCDMA and LTE) can be used at the same time, LTE band 13 cannot transmit simultaneously with GSM850/1900, and WCDMA Band V/II. The details please refer to the operational description document.

A simultaneous CDMA 1xRTT voice and LTE data connection is referred to as “SVLTE”. The transmitters are independent in respect to the RF chains as each transmitter has dedicated RF circuitry (PA and RF filtering) and a unique transmit antenna. The device also contains an additional antenna associated with receiver diversity or unlicensed transmitters. The LTE Uplink MIMO configuration is 1x2 (1 Uplink antenna and 2 Downlink antennas).

Although the RF circuits are independent for both transmitters, the chipset solution incorporated SVLTE implementation does include electrical connections between the voice and data transmitters such that the device can coordinate the transmit power of both transmitters. That said the transmitters operate independently in the sense that they independently support voice or data connection without interaction between the modems or signaling from the WWAN network.

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## <Antenna Location>



This device supports WiFi hotspot function, so body SAR was tested under 1 cm for the surfaces / slide edges where a transmitting antenna is within 2.5 cm from the edge. Since the SAR is required for antenna located within 2.5 cm from edge, SAR testing for each antenna is listed as below.

**GSM / WCDMA / CDMA Antenna :** Front Face, Rear Face, Left Side, Right Side, Bottom Side

**LTE Antenna :** Front Face, Rear Face, Left Side, Top Side

**WLAN / BT Antenna :** Front Face, Rear Face, Right Side, Top Side

The simultaneous transmission possibilities are listed as below.

Simultaneous TX Combination	Configuration	Head (Voice / VoIP)	Body Worn (Voice / VoIP)	Hotspot (Data)
1	GSM850 (Voice / Data) + WLAN / BT (Data)	Yes	Yes	Yes
2	GSM1900 (Voice / Data) + WLAN / BT (Data)	Yes	Yes	Yes
3	WCDMA V (Voice / Data) + WLAN / BT (Data)	Yes	Yes	Yes
4	WCDMA II (Voice / Data) + WLAN / BT (Data)	Yes	Yes	Yes
5	CDMA2000 BC0 (Voice / Data) + WLAN / BT (Data)	Yes	Yes	Yes
6	CDMA2000 BC1 (Voice / Data) + WLAN / BT (Data)	Yes	Yes	Yes
7	LTE 13 (Data) + WLAN / BT (Data)	Yes	Yes	Yes
8	CDMA2000 BC0 (Voice) + LTE 13 (Data) + WLAN / BT (Data)	Yes	Yes	Yes
9	CDMA2000 BC1 (Voice) + LTE 13 (Data) + WLAN / BT (Data)	Yes	Yes	Yes

**Note :** In the SVLTE mode, CDMA 1xRTT and LTE can transmit at maximum power level simultaneously.

The WLAN and BT cannot transmit simultaneously, so there is no co-location test requirement for WLAN and BT.

## FCC SAR Test Report

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For WWAN SAR testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

The EUT is communicated with base station simulator (Agilent E5515C is used for GSM/WCDMA/CDMA2000, and Anritsu MT8820C is used for LTE) by air link. During SAR testing, the base station simulator is set to make the EUT to radiate maximum output power.

For GSM850, the power control level is set to 5. For GPRS850 (GMSK, CS1), the power control level is set to 5. For EDGE850 (GMSK: MCS1, 8PSK:MCS9), the power control level is set to 8. For GSM1900, the power control level is set to 0. For GPRS1900 (GMSK, CS1), the power control level is set to 0. For EDGE1900 (GMSK: MCS1, 8PSK:MCS9), the power control level is set to 2. Head SAR is tested under GSM link mode. Body SAR is tested under maximum source-based time-average power mode of GPRS/EDGE.

For WCDMA, head and body SAR is tested under 12.2k RMC mode with power control set all up bits. SAR for AMR is not required since its power is less than 1/4 dB higher than RMC. SAR for HSDPA/HSUPA is not required since its power is less than 1/4 dB higher than RMC without HSDPA/HSUPA.

For CDMA, SAR is tested under EVDO Rev.0 mode using Reverse Data Channel rate of 153.6 kbps in subtype 0/1 Physical Layer Configurations, and the power control set "All Up Bits". SAR for EVDO Rev.A is not required since its power is less than EVDO Rev.0. SAR for 1xRTT is not required since its power is less than 1/4 dB higher than EVDO Rev.0. The steps for system simulator (Agilent E5515C) setup are as below.

1. Set the Sector ID
2. Set the Protocol Release
3. Set the Cell Band and connecting Channel
4. Set the RTAP Rate
5. Set the power control
6. Press "Start Data Connection" button



## FCC SAR Test Report

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For LTE, set the related parameters of operating band, channel bandwidth, uplink channel number, modulation type, and RB in base station simulator. When the EUT has registered and communicated to base station simulator, set the simulator to make EUT transmitting the maximum radiated power. The steps for system simulator (Anritsu MT8820C) setup are as below.

1. Press the "Std" button to select "LTE 22.20S" function
2. Choose the "Screen Select" item to "Fundamental Measurement"
3. Enter the "Common" item
4. Set the Operating Band
5. Set the Channel Bandwidth
6. Set the UL Channel & Frequency
7. Set the Modulation
8. Set the RB number and RB shift
9. Press "Start Call" button when EUT register to the system simulator
10. Set the TX-1 Max. Power to make the EUT transmit maximum output power

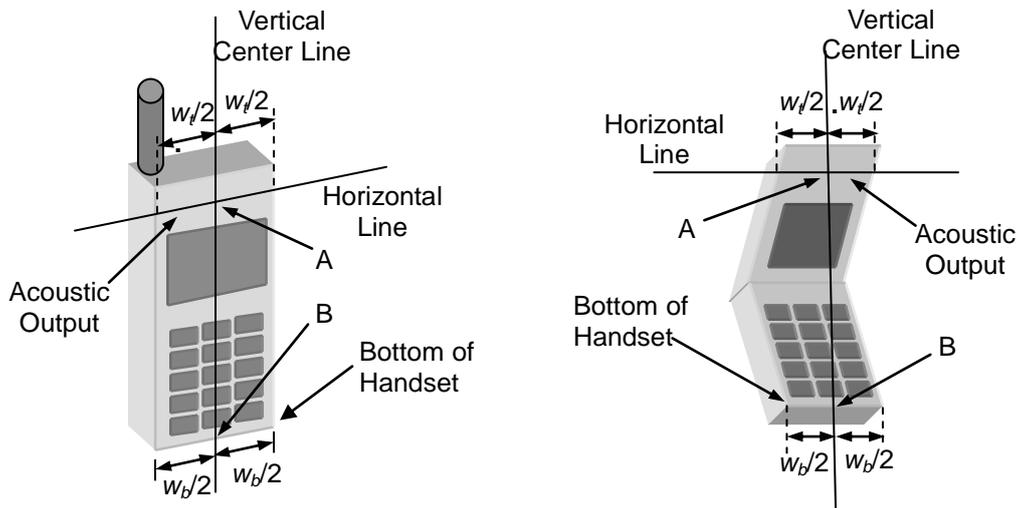
For WLAN SAR testing, the EUT has installed WLAN engineering testing software which can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100% duty cycle. The data rates for WLAN SAR testing were set in 1 Mbps for 802.11b, 6 Mbps for 802.11a and MCS0 for 802.11n HT40 due to the highest RF output power.

## 4.2 EUT Testing Position

This EUT was tested in **Right Cheek, Right Tilted, Left Cheek, Left Tilted, Front Face, Rear Face, Right Side, Left Side, Top Side** and **Bottom Side** positions as illustrated below:

### 1. Define two imaginary lines on the handset

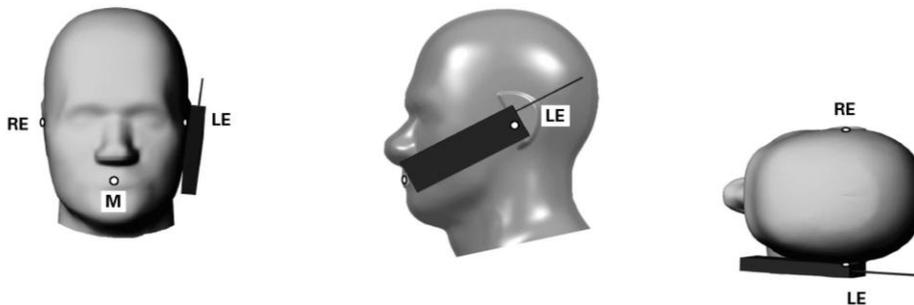
- (a) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width  $w_t$  of the handset at the level of the acoustic output, and the midpoint of the width  $w_b$  of the bottom of the handset.
- (b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.
- (c) 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, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.



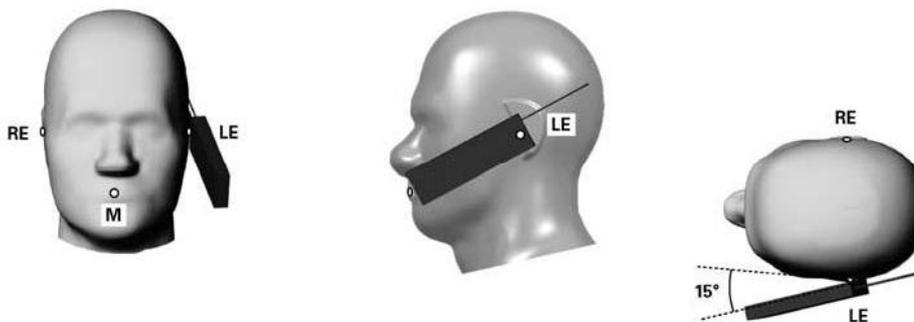
**Fig-4.1 Illustration for Handset Vertical and Horizontal Reference Lines**

**2. Cheek Position**

- (a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.
- (b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig-4.2).

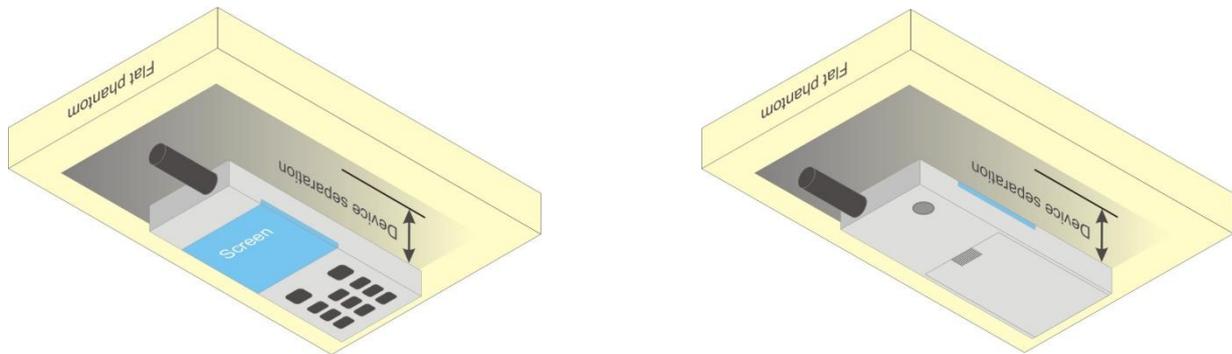

**Fig-4.2 Illustration for Cheek Position**
**3. Tilted Position**

- (a) To position the device in the "cheek" position described above.
- (b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig-4.3).


**Fig-4.3 Illustration for Tilted Position**

**4. Body Worn Position**

- (a) To position the EUT parallel to the phantom surface.
- (b) To adjust the EUT parallel to the flat phantom.
- (c) To adjust the distance between the EUT surface and the flat phantom to 1.0 cm.

**Fig-4.4 Illustration for Body Worn Position**



# FCC SAR Test Report

## 4.3 Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

Tissue Type	Frequency (MHz)	Liquid Temp. (°C)	Measured Conductivity ( $\sigma$ )	Measured Permittivity ( $\epsilon_r$ )	Target Conductivity ( $\sigma$ )	Target Permittivity ( $\epsilon_r$ )	Conductivity Deviation (%)	Permittivity Deviation (%)	Test Date
H750	750	21.5	0.896	40.30	0.89	41.9	0.67	-3.82	Aug. 14, 2012
H750	750	20.5	0.892	41.542	0.89	41.9	0.22	-0.85	Oct. 22, 2012
H835	835	21.5	0.913	42.50	0.90	41.5	1.44	2.41	Aug. 14, 2012
H835	835	20.6	0.913	42.52	0.90	41.5	1.44	2.46	Aug. 16, 2012
H1900	1900	21.7	1.430	39.70	1.40	40.0	2.14	-0.75	Aug. 13, 2012
H1900	1900	20.3	1.441	39.728	1.40	40.0	2.93	-0.68	Aug. 16, 2012
H2450	2450	20.3	1.777	40.205	1.80	39.2	-1.28	2.56	Aug. 17, 2012
H5G	5200	20.7	4.700	37.081	4.66	36.0	0.86	3.00	Aug. 17, 2012
H5G	5500	20.7	5.082	36.452	4.96	35.6	2.46	2.39	Aug. 17, 2012
H5G	5800	20.7	5.44	35.757	5.27	35.3	3.23	1.29	Aug. 17, 2012
H5G	5800	20.5	5.10	35.479	5.27	35.3	-3.23	0.51	Oct. 18, 2012
B750	750	21.4	0.966	55.257	0.96	55.5	0.63	-0.44	Aug. 14, 2012
B750	750	20.7	0.966	55.30	0.96	55.5	0.63	-0.36	Aug. 22, 2012
B750	750	20.3	0.967	55.261	0.96	55.5	0.73	-0.43	Aug. 23, 2012
B750	750	20.6	0.969	55.50	0.96	55.5	0.94	0.00	Oct. 22, 2012
B835	835	21.0	0.978	55.648	0.97	55.2	0.82	0.81	Aug. 14, 2012
B835	835	21.0	0.980	55.935	0.97	55.2	1.03	1.33	Aug. 15, 2012
B1900	1900	21.5	1.543	52.865	1.52	53.3	1.51	-0.82	Aug. 15, 2012
B1900	1900	21.5	1.543	52.865	1.52	53.3	1.51	-0.82	Aug. 15, 2012
B2450	2450	20.6	2.025	53.072	1.95	52.7	3.85	0.71	Aug. 20, 2012
B2450	2450	20.6	2.010	52.98	1.95	52.7	3.08	0.53	Aug. 21, 2012
B5G	5200	20.6	5.218	49.463	5.30	49.0	-1.55	0.94	Aug. 18, 2012
B5G	5500	20.6	5.667	48.98	5.65	48.6	0.30	0.78	Aug. 18, 2012
B5G	5500	20.7	5.710	48.53	5.65	48.6	1.06	-0.14	Aug. 19, 2012
B5G	5800	20.7	6.125	47.779	6.00	48.2	2.08	-0.87	Aug. 19, 2012
B5G	5800	21.1	6.118	47.772	6.00	48.2	1.97	-0.89	Oct. 20, 2012

### Note:

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within  $\pm 5\%$  of the target values. Liquid temperature during the SAR testing must be within  $\pm 2$  °C.



# FCC SAR Test Report

## 4.4 System Verification

The measuring results for system check are shown as below.

Test Date	Mode	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Aug. 14, 2012	Head	750	8.44	2.26	9.04	7.11	1013	3650	910
Oct. 22, 2012	Head	750	8.44	2.19	8.76	3.79	1013	3864	579
Aug. 14, 2012	Head	835	9.46	2.41	9.64	1.90	4d021	3650	910
Aug. 16, 2012	Head	835	9.46	2.36	9.44	-0.21	4d021	3864	910
Aug. 13, 2012	Head	1900	38.90	9.92	39.68	2.01	5d036	3650	910
Aug. 16, 2012	Head	1900	38.90	9.48	37.92	-2.52	5d036	3864	910
Aug. 17, 2012	Head	2450	52.90	13.10	52.40	-0.95	737	3590	579
Aug. 17, 2012	Head	5200	79.60	7.46	74.60	-6.28	1018	3590	579
Aug. 17, 2012	Head	5500	84.70	8.56	85.60	1.06	1018	3590	579
Aug. 17, 2012	Head	5800	78.60	8.04	80.40	2.29	1018	3590	579
Oct. 18, 2012	Head	5800	78.60	7.90	79.00	0.51	1018	3820	910
Aug. 14, 2012	Body	750	8.76	2.31	9.24	5.48	1013	3590	579
Aug. 22, 2012	Body	750	8.76	2.15	8.60	-1.83	1013	3590	579
Aug. 23, 2012	Body	750	8.76	2.31	9.24	5.48	1013	3650	910
Oct. 22, 2012	Body	750	8.76	2.25	9.00	2.74	1013	3820	910
Aug. 14, 2012	Body	835	9.60	2.34	9.36	-2.50	4d021	3590	579
Aug. 15, 2012	Body	835	9.60	2.46	9.84	2.50	4d021	3864	910
Aug. 15, 2012	Body	1900	38.90	9.36	37.44	-3.75	5d036	3590	579
Aug. 15, 2012	Body	1900	38.90	9.48	37.92	-2.52	5d036	3864	910
Aug. 20, 2012	Body	2450	50.00	12.9	51.60	3.20	737	3650	910
Aug. 21, 2012	Body	2450	50.00	12.6	50.40	0.80	737	3650	910
Aug. 18, 2012	Body	5200	72.70	6.96	69.60	-4.26	1018	3590	579
Aug. 18, 2012	Body	5500	78.30	7.63	76.30	-2.55	1018	3590	579
Aug. 19, 2012	Body	5500	78.30	7.49	74.90	-4.34	1018	3650	910
Aug. 19, 2012	Body	5800	73.40	6.82	68.20	-7.08	1018	3650	910
Oct. 20, 2012	Body	5800	73.40	7.92	79.20	7.90	1018	3578	1277

**Note:**

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.

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## 4.5 Conducted Power Results

The measuring conducted power (Unit: dBm) are shown as below.

Band Channel	GSM850			GSM1900		
	128	189	251	512	661	810
Frequency (MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
<b>Maximum Burst-Averaged Output Power</b>						
GSM (GMSK, 1 Uplink)	33.68	33.11	33.20	30.65	30.70	30.47
GPRS 8 (GMSK, 1 Uplink)	33.63	33.06	33.15	30.64	30.69	30.46
GPRS 10 (GMSK, 2 Uplink)	32.34	31.77	31.86	30.00	30.05	29.82
GPRS 11 (GMSK, 3 Uplink)	31.16	30.59	30.68	29.25	29.30	29.06
GPRS 12 (GMSK, 4 Uplink)	29.17	28.60	28.69	27.95	28.00	27.77
EDGE 8 (GMSK, 1 Uplink)	33.52	32.95	33.04	30.45	30.50	30.27
EDGE 10 (GMSK, 2 Uplink)	32.32	31.75	31.84	29.67	29.72	29.49
EDGE 11 (GMSK, 3 Uplink)	31.12	30.55	30.64	29.24	29.29	29.06
EDGE 12 (GMSK, 4 Uplink)	29.12	28.55	28.64	27.80	27.85	27.62
EDGE 8 (8PSK, 1 Uplink)	26.23	25.66	25.75	26.07	26.12	25.89
EDGE 10 (8PSK, 2 Uplink)	25.94	25.37	25.46	25.84	25.89	25.66
EDGE 11 (8PSK, 3 Uplink)	25.73	25.16	25.25	25.13	25.18	24.95
EDGE 12 (8PSK, 4 Uplink)	24.06	23.49	23.58	23.95	24.00	23.77
<b>Maximum Frame-Averaged Output Power</b>						
GSM (GMSK, 1 Uplink)	24.68	24.11	24.20	21.65	21.70	21.47
GPRS 8 (GMSK, 1 Uplink)	24.63	24.06	24.15	21.64	21.69	21.46
GPRS 10 (GMSK, 2 Uplink)	26.34	25.77	25.86	24.00	24.05	23.82
GPRS 11 (GMSK, 3 Uplink)	<b>26.90</b>	26.33	26.42	24.99	<b>25.04</b>	24.80
GPRS 12 (GMSK, 4 Uplink)	26.17	25.60	25.69	24.95	25.00	24.77
EDGE 8 (GMSK, 1 Uplink)	24.52	23.95	24.04	21.45	21.50	21.27
EDGE 10 (GMSK, 2 Uplink)	26.32	25.75	25.84	23.67	23.72	23.49
EDGE 11 (GMSK, 3 Uplink)	26.86	26.29	26.38	24.98	25.03	24.80
EDGE 12 (GMSK, 4 Uplink)	26.12	25.55	25.64	24.80	24.85	24.62
EDGE 8 (8PSK, 1 Uplink)	17.23	16.66	16.75	17.07	17.12	16.89
EDGE 10 (8PSK, 2 Uplink)	19.94	19.37	19.46	19.84	19.89	19.66
EDGE 11 (8PSK, 3 Uplink)	21.47	20.90	20.99	20.87	20.92	20.69
EDGE 12 (8PSK, 4 Uplink)	21.06	20.49	20.58	20.95	21.00	20.77

### Note:

- SAR testing for GSM/GPRS/EDGE was performed on the maximum frame-averaged power mode.
- The frame-averaged power is linearly scaled the maximum burst-averaged power based on time slots. The calculated methods are shown as below:

Frame-averaged power = Burst-averaged power (1 Uplink) – 9 dBm  
 Frame-averaged power = Burst averaged power (2 Uplink) – 6 dBm  
 Frame-averaged power = Burst averaged power (3 Uplink) – 2.67 dBm  
 Frame-averaged power = Burst averaged power (4 Uplink) – 3 dBm



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A D T

Band	WCDMA Band II			WCDMA Band V		
Channel	9262	9400	9538	4132	4182	4233
Frequency (MHz)	1852.4	1880.0	1907.6	826.4	836.4	846.6
RMC 12.2K	23.78	24.14	23.73	24.10	23.81	23.87
HSDPA Subtest-1	22.31	22.67	22.26	22.60	22.31	22.37
HSDPA Subtest-2	22.26	22.62	22.21	22.55	22.26	22.32
HSDPA Subtest-3	22.32	22.68	22.27	22.63	22.34	22.40
HSDPA Subtest-4	22.33	22.69	22.28	22.54	22.25	22.31
HSUPA Subtest-1	22.25	22.61	22.20	22.40	22.11	22.17
HSUPA Subtest-2	20.77	21.13	20.72	21.01	20.72	20.78
HSUPA Subtest-3	21.50	21.86	21.45	21.66	21.37	21.43
HSUPA Subtest-4	22.07	22.43	22.02	22.18	21.89	21.95
HSUPA Subtest-5	22.97	23.33	22.92	23.11	22.82	22.88

Band	CDMA2000 BC0			CDMA2000 BC1		
Channel	1013	384	777	25	600	1175
Frequency (MHz)	824.70	836.52	848.31	1851.25	1880.00	1908.75
1xRTT RC1+SO55	24.29	24.35	24.32	24.52	24.57	24.34
1xRTT RC3+SO55	24.38	24.47	24.44	24.55	24.60	24.37
1xRTT RC3+SO32 (FCH)	24.34	24.43	24.40	24.53	24.58	24.35
1xRTT RC3+SO32 (SCH)	24.33	24.42	24.39	24.49	24.54	24.31
1xEVDO Rev.0 RTAP 153.6	24.23	24.32	24.29	24.45	24.50	24.32
1xEVDO Rev.A RETAP 4096	24.22	24.31	24.28	24.40	24.45	24.27

Band	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Average Power	17.90	18.30	18.48	12.69	13.13	13.28

Band	802.11n (HT20)			802.11n (HT40)		
Channel	1	6	11	3	6	9
Frequency (MHz)	2412	2437	2462	2422	2437	2452
Average Power	11.77	12.16	12.15	12.01	12.29	12.48



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Band	802.11a							
Channel	36	40	44	48	52	56	60	64
Frequency (MHz)	5180	5200	5220	5240	5260	5280	5300	5320
Average Power	13.77	13.74	13.63	13.51	13.41	13.22	13.08	12.95

Band	802.11a							
Channel	100	104	108	112	116	132	136	140
Frequency (MHz)	5500	5520	5540	5560	5580	5660	5680	5700
Average Power	13.58	13.36	13.16	13.01	12.86	12.36	13.34	12.26

Band	802.11a							
Channel	149	153	157	161	-	-	-	-
Frequency (MHz)	5745	5765	5785	5805	-	-	-	-
Average Power	13.11	13.07	13.00	12.89	-	-	-	-

Band	802.11n (HT20)							
Channel	36	40	44	48	52	56	60	64
Frequency (MHz)	5180	5200	5220	5240	5260	5280	5300	5320
Average Power	13.22	13.24	13.11	12.93	12.88	12.70	12.51	12.40

Band	802.11n (HT20)							
Channel	100	104	108	112	116	132	136	140
Frequency (MHz)	5500	5520	5540	5560	5580	5660	5680	5700
Average Power	13.18	13.00	12.87	12.63	12.43	12.79	12.69	12.63

Band	802.11n (HT20)							
Channel	149	153	157	161	-	-	-	-
Frequency (MHz)	5745	5765	5785	5805	-	-	-	-
Average Power	13.09	13.05	12.98	12.84	-	-	-	-

Band	802.11n (HT40)							
Channel	38	46	54	62	102	134	151	159
Frequency (MHz)	5190	5230	5270	5310	5510	5670	5755	5795
Average Power	13.48	13.37	13.08	12.80	13.31	12.20	13.27	13.29



# FCC SAR Test Report

A D T

LTE Band 13									
BW	Modulation	CH	Frequency (MHz)	RB	RB Offset	Target Power	MPR	Expected Power	Measured Power
5 MHz	QPSK	23205	779.5	1	0	25.3	0	25.3	25.13
		23230	782	1	0	25.3	0	25.3	25.24
		23255	784.5	1	0	25.3	0	25.3	25.25
		23205	779.5	1	24	25.3	0	25.3	25.11
		23230	782	1	24	25.3	0	25.3	25.22
		23255	784.5	1	24	25.3	0	25.3	25.23
		23205	779.5	12	6	25.3	1	24.3	24.02
		23230	782	12	6	25.3	1	24.3	24.13
		23255	784.5	12	6	25.3	1	24.3	24.14
		23205	779.5	25	0	25.3	1	24.3	23.88
	23230	782	25	0	25.3	1	24.3	23.99	
	23255	784.5	25	0	25.3	1	24.3	24.00	
	16QAM	23205	779.5	1	0	25.3	1	24.3	24.14
		23230	782	1	0	25.3	1	24.3	24.25
		23255	784.5	1	0	25.3	1	24.3	24.26
		23205	779.5	1	24	25.3	1	24.3	24.07
		23230	782	1	24	25.3	1	24.3	24.18
		23255	784.5	1	24	25.3	1	24.3	24.19
		23205	779.5	12	6	25.3	2	23.3	22.95
		23230	782	12	6	25.3	2	23.3	23.06
23255		784.5	12	6	25.3	2	23.3	23.07	
23205		779.5	25	0	25.3	2	23.3	22.78	
23230	782	25	0	25.3	2	23.3	22.89		
23255	784.5	25	0	25.3	2	23.3	22.90		
10 MHz	QPSK	23230	782	1	0	25.3	0	25.3	25.28
		23230	782	1	49	25.3	0	25.3	25.26
		23230	782	25	12	25.3	1	24.3	24.17
		23230	782	50	0	25.3	1	24.3	24.03
	16QAM	23230	782	1	0	25.3	1	24.3	24.29
		23230	782	1	49	25.3	1	24.3	24.22
		23230	782	25	12	25.3	2	23.3	23.10
		23230	782	50	0	25.3	2	23.3	22.93

# FCC SAR Test Report

## 4.6 SAR Testing Results

### 4.6.1 SAR Results for Head

Plot No.	Band	Mode	Test Position	Channel	SAR-1g (W/kg)
3	GSM850	GPRS11	Right Cheek	128	<b>0.072</b>
4	GSM850	GPRS11	Right Tilted	128	0.036
5	GSM850	GPRS11	Left Cheek	128	0.071
6	GSM850	GPRS11	Left Tilted	128	0.047
9	GSM1900	GPRS11	Right Cheek	661	0.035
10	GSM1900	GPRS11	Right Tilted	661	0.029
11	GSM1900	GPRS11	Left Cheek	661	<b>0.052</b>
12	GSM1900	GPRS11	Left Tilted	661	0.023
21	WCDMA II	RMC12.2K	Right Cheek	9400	0.17
22	WCDMA II	RMC12.2K	Right Tilted	9400	0.121
23	WCDMA II	RMC12.2K	Left Cheek	9400	<b>0.187</b>
24	WCDMA II	RMC12.2K	Left Tilted	9400	0.101
15	WCDMA V	RMC12.2K	Right Cheek	4132	<b>0.062</b>
16	WCDMA V	RMC12.2K	Right Tilted	4132	0.032
17	WCDMA V	RMC12.2K	Left Cheek	4132	0.061
18	WCDMA V	RMC12.2K	Left Tilted	4132	0.043
302	CDMA2000 BC0	RC3+SO55	Right Cheek	384	<b>0.182</b>
303	CDMA2000 BC0	RC3+SO55	Right Tilted	384	0.059
304	CDMA2000 BC0	RC3+SO55	Left Cheek	384	0.175
305	CDMA2000 BC0	RC3+SO55	Left Tilted	384	0.059
329	CDMA2000 BC1	RC3+SO55	Right Cheek	600	<b>0.171</b>
309	CDMA2000 BC1	RC3+SO55	Right Tilted	600	0.09
310	CDMA2000 BC1	RC3+SO55	Left Cheek	600	0.155
311	CDMA2000 BC1	RC3+SO55	Left Tilted	600	0.047
15	802.11b	-	Right Cheek	11	0.102
2	802.11b	-	Right Tilted	11	0.094
3	802.11b	-	Left Cheek	11	<b>0.118</b>
4	802.11b	-	Left Tilted	11	0.1
5	802.11a	-	Right Cheek	36	0.00798
6	802.11a	-	Right Tilted	36	0.011
7	802.11a	-	Left Cheek	36	0.027
8	802.11a	-	Left Tilted	36	0.018
9	802.11a	-	Right Cheek	52	0.01
10	802.11a	-	Right Tilted	52	0.012
11	802.11a	-	Left Cheek	52	0.023
12	802.11a	-	Left Tilted	52	0.000269
16	802.11a	-	Right Cheek	100	0.0011
17	802.11a	-	Right Tilted	100	0.027
18	802.11a	-	Left Cheek	100	0.058
19	802.11a	-	Left Tilted	100	0.054
140	802.11a	-	Right Cheek	149	0.0048
141	802.11a	-	Right Tilted	149	0.0049
138	802.11a	-	Left Cheek	149	0.072
139	802.11a	-	Left Tilted	149	0.078
101	802.11n	HT40	Right Cheek	159	0.049
102	802.11n	HT40	Right Tilted	159	0.05
103	802.11n	HT40	Left Cheek	159	<b>0.103</b>
104	802.11n	HT40	Left Tilted	159	0.086



# FCC SAR Test Report

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Plot No.	Band	Mode	Test Position	Channel	RB	Offset	SAR-1g (W/kg)
201	LTE 13	QPSK, BW 10M	Right Cheek	23230	25	12	0.388
205	LTE 13	QPSK, BW 10M	Right Cheek	23230	1	0	<b>0.496</b>
209	LTE 13	QPSK, BW 10M	Right Cheek	23230	1	49	0.406
202	LTE 13	QPSK, BW 10M	Right Tilted	23230	25	12	0.366
206	LTE 13	QPSK, BW 10M	Right Tilted	23230	1	0	0.453
210	LTE 13	QPSK, BW 10M	Right Tilted	23230	1	49	0.38
203	LTE 13	QPSK, BW 10M	Left Cheek	23230	25	12	0.264
207	LTE 13	QPSK, BW 10M	Left Cheek	23230	1	0	0.329
211	LTE 13	QPSK, BW 10M	Left Cheek	23230	1	49	0.273
204	LTE 13	QPSK, BW 10M	Left Tilted	23230	25	12	0.216
208	LTE 13	QPSK, BW 10M	Left Tilted	23230	1	0	0.273
212	LTE 13	QPSK, BW 10M	Left Tilted	23230	1	49	0.229
213	LTE 13	16QAM, BW 10M	Right Cheek	23230	25	12	0.309
214	LTE 13	16QAM, BW 10M	Right Cheek	23230	1	0	0.382
215	LTE 13	16QAM, BW 10M	Right Cheek	23230	1	49	0.324
271	LTE 13	16QAM, BW 10M	Right Tilted	23230	25	12	0.297
272	LTE 13	16QAM, BW 10M	Right Tilted	23230	1	0	0.362
273	LTE 13	16QAM, BW 10M	Right Tilted	23230	1	49	0.3
274	LTE 13	16QAM, BW 10M	Left Cheek	23230	25	12	0.185
275	LTE 13	16QAM, BW 10M	Left Cheek	23230	1	0	0.231
276	LTE 13	16QAM, BW 10M	Left Cheek	23230	1	49	0.189
277	LTE 13	16QAM, BW 10M	Left Tilted	23230	25	12	0.168
278	LTE 13	16QAM, BW 10M	Left Tilted	23230	1	0	0.203
279	LTE 13	16QAM, BW 10M	Left Tilted	23230	1	49	0.16

## Note:

1. SAR is performed on the highest power channel. When the SAR value of highest power channel is less than 0.8 W/kg, SAR testing for optional channel is not required.
2. Since GPRS/EDGE and WLAN of this device supports VOIP capability through 3<sup>rd</sup> party apps software, we have evaluated data mode for head SAR.
3. According to KDB 941225 D03, the SAR testing for GSM/GPRS/EDGE modes was performed on the maximum source-based time-averaged output power mode.
4. According to KDB 941225, the LTE SAR testing for 100% RB is not required since the maximum SAR of 50% RB is less than 1.45 W/kg.
5. According to KDB 941225, the LTE SAR testing was performed on largest channel bandwidth, and SAR for other channel bandwidths is not required since the maximum power of smaller channel bandwidth is within 1/2 dB higher or lower of measured for the largest channel bandwidth and maximum SAR of largest channel bandwidth is less than 1.45 W/kg.
6. SAR testing for 802.11g/n is not required because its maximum power is less than 1/4 dB higher than 802.11b.
7. SAR testing for WLAN 5G is performed on the maximum power mode.

# FCC SAR Test Report

## 4.6.2 SAR Results for Body

### <Body Worn Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	SAR-1g (W/kg)
30	GSM850	GPRS11	Front Face	1	128	0.126
31	GSM850	GPRS11	Rear Face	1	128	<b>0.304</b>
37	GSM1900	GPRS11	Front Face	1	661	0.379
38	GSM1900	GPRS11	Rear Face	1	661	<b>0.381</b>
53	WCMDA II	RMC12.2K	Front Face	1	9400	0.257
54	WCMDA II	RMC12.2K	Rear Face	1	9400	<b>0.499</b>
46	WCMDA V	RMC12.2K	Front Face	1	4132	0.056
47	WCMDA V	RMC12.2K	Rear Face	1	4132	<b>0.15</b>
318	CDMA2000 BC0	RC3+SO32	Front Face	1	384	0.123
319	CDMA2000 BC0	RC3+SO32	Rear Face	1	384	<b>0.313</b>
326	CDMA2000 BC1	RC3+SO32	Front Face	1	600	0.34
327	CDMA2000 BC1	RC3+SO32	Rear Face	1	600	<b>0.633</b>
109	802.11b	-	Front Face	1	11	0.053
110	802.11b	-	Rear Face	1	11	<b>0.196</b>
116	802.11a	-	Front Face	1	36	0.00832
129	802.11a	-	Rear Face	1	36	0.014
118	802.11a	-	Front Face	1	52	0.00895
119	802.11a	-	Rear Face	1	52	0.023
120	802.11a	-	Front Face	1	100	0.017
121	802.11a	-	Rear Face	1	100	0.04
152	802.11a	-	Front Face	1	149	0.03
153	802.11a	-	Rear Face	1	149	0.066
126	802.11n	HT40	Front Face	1	159	0.047
127	802.11n	HT40	Rear Face	1	159	<b>0.109</b>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	RB	Offset	SAR-1g (W/kg)
236	LTE 13	QPSK, BW 10M	Front Face	1	23230	25	12	0.056
238	LTE 13	QPSK, BW 10M	Front Face	1	23230	1	0	0.068
240	LTE 13	QPSK, BW 10M	Front Face	1	23230	1	49	0.062
237	LTE 13	QPSK, BW 10M	Rear Face	1	23230	25	12	0.08
239	LTE 13	QPSK, BW 10M	Rear Face	1	23230	1	0	<b>0.097</b>
241	LTE 13	QPSK, BW 10M	Rear Face	1	23230	1	49	0.09
280	LTE 13	16QAM, BW 10M	Front Face	1	23230	25	12	0.034
281	LTE 13	16QAM, BW 10M	Front Face	1	23230	1	0	0.043
282	LTE 13	16QAM, BW 10M	Front Face	1	23230	1	49	0.039
242	LTE 13	16QAM, BW 10M	Rear Face	1	23230	25	12	0.079
243	LTE 13	16QAM, BW 10M	Rear Face	1	23230	1	0	0.096
244	LTE 13	16QAM, BW 10M	Rear Face	1	23230	1	49	0.087

**Note:**

1. SAR is performed on the highest power channel. When the SAR value of highest power channel is less than 0.8 W/kg, SAR testing for optional channel is not required.
2. According to KDB 941225, the SAR testing for 100% RB is not required since the maximum SAR of 50% RB is less than 1.45 W/kg.
3. According to KDB 941225, the SAR testing was performed on largest channel bandwidth, and SAR for other channel bandwidths is not required since the maximum power of smaller channel bandwidth is within 1/2 dB higher or lower of measured for the largest channel bandwidth and maximum SAR of largest channel bandwidth is less than 1.45 W/kg.
4. Since GPRS/EDGE, WCDMA and WLAN of this device supports VOIP capability through 3<sup>rd</sup> party apps software, we have evaluated data mode for body worn mode.
5. SAR testing for 802.11g/n is not required because its maximum power is less than 1/4 dB higher than 802.11b.
6. SAR testing for WLAN 5G is performed on the maximum power mode.



# FCC SAR Test Report

## <Hotspot Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	SAR-1g (W/kg)
25	GSM850	GPRS11	Front Face	1	128	0.166
26	GSM850	GPRS11	Rear Face	1	128	<b>0.371</b>
27	GSM850	GPRS11	Left Side	1	128	0.119
28	GSM850	GPRS11	Right Side	1	128	0.155
29	GSM850	GPRS11	Bottom Side	1	128	0.092
32	GSM1900	GPRS11	Front Face	1	661	0.327
33	GSM1900	GPRS11	Rear Face	1	661	<b>0.517</b>
34	GSM1900	GPRS11	Left Side	1	661	0.07
35	GSM1900	GPRS11	Right Side	1	661	0.034
36	GSM1900	GPRS11	Bottom Side	1	661	0.33
48	WCMDA II	RMC12.2K	Front Face	1	9400	0.299
49	WCMDA II	RMC12.2K	Rear Face	1	9400	<b>0.516</b>
50	WCMDA II	RMC12.2K	Left Side	1	9400	0.078
51	WCMDA II	RMC12.2K	Right Side	1	9400	0.044
52	WCMDA II	RMC12.2K	Bottom Side	1	9400	0.334
41	WCMDA V	RMC12.2K	Front Face	1	4132	0.065
42	WCMDA V	RMC12.2K	Rear Face	1	4132	<b>0.196</b>
43	WCMDA V	RMC12.2K	Left Side	1	4132	0.054
44	WCMDA V	RMC12.2K	Right Side	1	4132	0.077
45	WCMDA V	RMC12.2K	Bottom Side	1	4132	0.045
312	CDMA2000 BC0	RC3+SO32	Front Face	1	384	0.205
313	CDMA2000 BC0	RC3+SO32	Rear Face	1	384	<b>0.485</b>
314	CDMA2000 BC0	RC3+SO32	Left Side	1	384	0.21
315	CDMA2000 BC0	RC3+SO32	Right Side	1	384	0.256
317	CDMA2000 BC0	RC3+SO32	Bottom Side	1	384	0.059
320	CDMA2000 BC1	RC3+SO32	Front Face	1	600	0.337
321	CDMA2000 BC1	RC3+SO32	Rear Face	1	600	<b>0.655</b>
322	CDMA2000 BC1	RC3+SO32	Left Side	1	600	0.112
323	CDMA2000 BC1	RC3+SO32	Right Side	1	600	0.096
325	CDMA2000 BC1	RC3+SO32	Bottom Side	1	600	0.441
105	802.11b	-	Front Face	1	11	0.054
106	802.11b	-	Rear Face	1	11	<b>0.138</b>
107	802.11b	-	Right Side	1	11	0.07
108	802.11b	-	Top Side	1	11	0.097
112	802.11a	-	Front Face	1	36	0.0087
113	802.11a	-	Rear Face	1	36	0.024
114	802.11a	-	Right Side	1	36	0.015
115	802.11a	-	Top Side	1	36	0.035
148	802.11a	-	Front Face	1	149	0.024
149	802.11a	-	Rear Face	1	149	0.071
150	802.11a	-	Right Side	1	149	0.041
151	802.11a	-	Top Side	1	149	0.049
122	802.11n	HT40	Front Face	1	159	0.03
123	802.11n	HT40	Rear Face	1	159	0.086
124	802.11n	HT40	Right Side	1	159	0.096
125	802.11n	HT40	Top Side	1	159	<b>0.114</b>



## FCC SAR Test Report

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	RB	Offset	SAR-1g (W/kg)
216	LTE 13	QPSK, BW 10M	Front Face	1	23230	25	12	0.093
222	LTE 13	QPSK, BW 10M	Front Face	1	23230	1	0	0.114
228	LTE 13	QPSK, BW 10M	Front Face	1	23230	1	49	0.099
217	LTE 13	QPSK, BW 10M	Rear Face	1	23230	25	12	0.169
223	LTE 13	QPSK, BW 10M	Rear Face	1	23230	1	0	0.219
229	LTE 13	QPSK, BW 10M	Rear Face	1	23230	1	49	0.183
333	LTE 13	QPSK, BW 10M	Left Side	1	23230	25	12	0.222
334	LTE 13	QPSK, BW 10M	Left Side	1	23230	1	0	<b>0.263</b>
335	LTE 13	QPSK, BW 10M	Left Side	1	23230	1	49	0.23
220	LTE 13	QPSK, BW 10M	Top Side	1	23230	25	12	0.162
226	LTE 13	QPSK, BW 10M	Top Side	1	23230	1	0	0.169
232	LTE 13	QPSK, BW 10M	Top Side	1	23230	1	49	0.181
283	LTE 13	16QAM, BW 10M	Front Face	1	23230	25	12	0.106
284	LTE 13	16QAM, BW 10M	Front Face	1	23230	1	0	0.128
285	LTE 13	16QAM, BW 10M	Front Face	1	23230	1	49	0.113
286	LTE 13	16QAM, BW 10M	Rear Face	1	23230	25	12	0.144
234	LTE 13	16QAM, BW 10M	Rear Face	1	23230	1	0	0.176
287	LTE 13	16QAM, BW 10M	Rear Face	1	23230	1	49	0.157
336	LTE 13	16QAM, BW 10M	Left Side	1	23230	25	12	0.184
337	LTE 13	16QAM, BW 10M	Left Side	1	23230	1	0	0.224
338	LTE 13	16QAM, BW 10M	Left Side	1	23230	1	49	0.199
288	LTE 13	16QAM, BW 10M	Top Side	1	23230	25	12	0.134
289	LTE 13	16QAM, BW 10M	Top Side	1	23230	1	0	0.162
290	LTE 13	16QAM, BW 10M	Top Side	1	23230	1	49	0.143

**Note:**

- SAR is performed on the highest power channel. When the SAR value of highest power channel is less than 0.8 W/kg, SAR testing for optional channel is not required.
- According to KDB 941225, the SAR testing for 1xEVDO REV.A is not required since the maximum power is less than 1xEVDO REV.0.
- According to KDB 941225, the LTE SAR testing for 100% RB is not required since the maximum SAR of 50% RB is less than 1.45 W/kg.
- According to KDB 941225, the LTE SAR testing was performed on largest channel bandwidth, and SAR for other channel bandwidths is not required since the maximum power of smaller channel bandwidth is within 1/2 dB higher or lower of measured for the largest channel bandwidth and maximum SAR of largest channel bandwidth is less than 1.45 W/kg.
- SAR testing for 802.11g/n is not required because its maximum power is less than 1/4 dB higher than 802.11b.
- Only WLAN 5G band 1 and 4 (5.15~5.25 and 5.725~5.85 GHz) support wireless hotspot mode.
- SAR testing for WLAN 5G is performed on the maximum power mode.

**Test Engineer** : Morrison Huang, and Match Tsui

**FCC SAR Test Report**
**4.6.3 Simultaneous Multi-band Transmission Evaluation**

No.	Conditions (SAR1 + SAR2)	Mode	Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR
1	GSM850 + WLAN 2.4G	Head	Right Cheek	0.072	0.102	0.174	-
			Right Tilted	0.036	0.094	0.13	-
			Left Cheek	0.071	0.118	0.189	-
			Left Tilted	0.047	0.1	0.147	-
		Body-Worn	Front Face	0.126	0.053	0.179	-
			Rear Face	0.304	0.196	0.5	-
		Hotspot	Front Face	0.166	0.054	0.22	-
			Rear Face	0.371	0.138	0.509	-
			Left Side	0.119	0	0.119	-
			Right Side	0.155	0.07	0.225	-
			Top Side	0	0.097	0.097	-
			Bottom Side	0.092	0	0.092	-
	GSM850 + WLAN 5G	Head	Right Cheek	0.072	0.049	0.121	-
			Right Tilted	0.036	0.05	0.086	-
			Left Cheek	0.071	0.103	0.174	-
			Left Tilted	0.047	0.086	0.133	-
		Body-Worn	Front Face	0.126	0.047	0.173	-
			Rear Face	0.304	0.109	0.413	-
		Hotspot	Front Face	0.166	0.03	0.196	-
			Rear Face	0.371	0.086	0.457	-
Left Side			0.119	0	0.119	-	
Right Side			0.155	0.096	0.251	-	
Top Side			0	0.114	0.114	-	
Bottom Side			0.092	0	0.092	-	
2	GSM1900 + WLAN 2.4G	Head	Right Cheek	0.035	0.102	0.137	-
			Right Tilted	0.029	0.094	0.123	-
			Left Cheek	0.052	0.118	0.17	-
			Left Tilted	0.023	0.1	0.123	-
		Body-Worn	Front Face	0.379	0.053	0.432	-
			Rear Face	0.381	0.196	0.577	-
		Hotspot	Front Face	0.327	0.054	0.381	-
			Rear Face	0.517	0.138	0.655	-
			Left Side	0.07	0	0.07	-
			Right Side	0.034	0.07	0.104	-
			Top Side	0	0.097	0.097	-
			Bottom Side	0.33	0	0.33	-
	GSM1900 + WLAN 5G	Head	Right Cheek	0.035	0.049	0.084	-
			Right Tilted	0.029	0.05	0.079	-
			Left Cheek	0.052	0.103	0.155	-
			Left Tilted	0.023	0.086	0.109	-
		Body-Worn	Front Face	0.379	0.047	0.426	-
			Rear Face	0.381	0.109	0.49	-
		Hotspot	Front Face	0.327	0.03	0.357	-
			Rear Face	0.517	0.086	0.603	-
Left Side	0.07		0	0.07	-		
Right Side	0.034		0.096	0.13	-		
Top Side	0	0.114	0.114	-			
Bottom Side	0.33	0	0.33	-			



# FCC SAR Test Report

No.	Conditions (SAR1 + SAR2)	Mode	Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR
3	WCDMA II + WLAN 2.4G	Head	Right Cheek	0.17	0.102	0.272	-
			Right Tilted	0.121	0.094	0.215	-
			Left Cheek	0.187	0.118	0.305	-
			Left Tilted	0.101	0.1	0.201	-
		Body-Worn	Front Face	0.257	0.053	0.31	-
			Rear Face	0.499	0.196	0.695	-
		Hotspot	Front Face	0.299	0.054	0.353	-
			Rear Face	0.516	0.138	0.654	-
			Left Side	0.078	0	0.078	-
			Right Side	0.044	0.07	0.114	-
			Top Side	0	0.097	0.097	-
			Bottom Side	0.334	0	0.334	-
	WCDMA II + WLAN 5G	Head	Right Cheek	0.17	0.049	0.219	-
			Right Tilted	0.121	0.05	0.171	-
			Left Cheek	0.187	0.103	0.29	-
			Left Tilted	0.101	0.086	0.187	-
		Body-Worn	Front Face	0.257	0.047	0.304	-
			Rear Face	0.499	0.109	0.608	-
		Hotspot	Front Face	0.299	0.03	0.329	-
			Rear Face	0.516	0.086	0.602	-
Left Side			0.078	0	0.078	-	
Right Side			0.044	0.096	0.14	-	
Top Side			0	0.114	0.114	-	
Bottom Side			0.334	0	0.334	-	
4	WCDMA V + WLAN 2.4G	Head	Right Cheek	0.062	0.102	0.164	-
			Right Tilted	0.032	0.094	0.126	-
			Left Cheek	0.061	0.118	0.179	-
			Left Tilted	0.043	0.1	0.143	-
		Body-Worn	Front Face	0.056	0.053	0.109	-
			Rear Face	0.15	0.196	0.346	-
		Hotspot	Front Face	0.065	0.054	0.119	-
			Rear Face	0.196	0.138	0.334	-
			Left Side	0.054	0	0.054	-
			Right Side	0.077	0.07	0.147	-
			Top Side	0	0.097	0.097	-
			Bottom Side	0.045	0	0.045	-
	WCDMA V + WLAN 5G	Head	Right Cheek	0.062	0.049	0.111	-
			Right Tilted	0.032	0.05	0.082	-
			Left Cheek	0.061	0.103	0.164	-
			Left Tilted	0.043	0.086	0.129	-
		Body-Worn	Front Face	0.056	0.047	0.103	-
			Rear Face	0.15	0.109	0.259	-
		Hotspot	Front Face	0.065	0.03	0.095	-
			Rear Face	0.196	0.086	0.282	-
Left Side	0.054		0	0.054	-		
Right Side	0.077		0.096	0.173	-		
Top Side	0	0.114	0.114	-			
Bottom Side	0.045	0	0.045	-			



# FCC SAR Test Report

No.	Conditions (SAR1 + SAR2)	Mode	Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR
5	CDMA2000 BC0 + WLAN 2.4G	Head	Right Cheek	0.182	0.102	0.284	-
			Right Tilted	0.059	0.094	0.153	-
			Left Cheek	0.175	0.118	0.293	-
			Left Tilted	0.059	0.1	0.159	-
		Body-Worn	Front Face	0.123	0.053	0.176	-
			Rear Face	0.313	0.196	0.509	-
		Hotspot	Front Face	0.205	0.054	0.259	-
			Rear Face	0.485	0.138	0.623	-
			Left Side	0.21	0	0.21	-
			Right Side	0.256	0.07	0.326	-
			Top Side	0	0.097	0.097	-
			Bottom Side	0.059	0	0.059	-
	CDMA2000 BC0 + WLAN 5G	Head	Right Cheek	0.182	0.049	0.231	-
			Right Tilted	0.059	0.05	0.109	-
			Left Cheek	0.175	0.103	0.278	-
			Left Tilted	0.059	0.086	0.145	-
		Body-Worn	Front Face	0.123	0.047	0.17	-
			Rear Face	0.313	0.109	0.422	-
		Hotspot	Front Face	0.205	0.03	0.235	-
			Rear Face	0.485	0.086	0.571	-
Left Side			0.21	0	0.21	-	
Right Side			0.256	0.096	0.352	-	
Top Side			0	0.114	0.114	-	
Bottom Side			0.059	0	0.059	-	
6	CDMA2000 BC1 + WLAN 2.4G	Head	Right Cheek	0.171	0.102	0.273	-
			Right Tilted	0.09	0.094	0.184	-
			Left Cheek	0.155	0.118	0.273	-
			Left Tilted	0.047	0.1	0.147	-
		Body-Worn	Front Face	0.34	0.053	0.393	-
			Rear Face	0.633	0.196	0.829	-
		Hotspot	Front Face	0.337	0.054	0.391	-
			Rear Face	0.655	0.138	0.793	-
			Left Side	0.112	0	0.112	-
			Right Side	0.096	0.07	0.166	-
			Top Side	0	0.097	0.097	-
			Bottom Side	0.441	0	0.441	-
	CDMA2000 BC1 + WLAN 5G	Head	Right Cheek	0.171	0.049	0.22	-
			Right Tilted	0.09	0.05	0.14	-
			Left Cheek	0.155	0.103	0.258	-
			Left Tilted	0.047	0.086	0.133	-
		Body-Worn	Front Face	0.34	0.047	0.387	-
			Rear Face	0.633	0.109	0.742	-
		Hotspot	Front Face	0.337	0.03	0.367	-
			Rear Face	0.655	0.086	0.741	-
Left Side	0.112		0	0.112	-		
Right Side	0.096		0.096	0.192	-		
Top Side	0	0.114	0.114	-			
Bottom Side	0.441	0	0.441	-			



# FCC SAR Test Report

A D T

No.	Conditions (SAR1 + SAR2)	Mode	Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR
7	LTE 13 + WLAN 2.4G	Head	Right Cheek	0.496	0.102	0.598	-
			Right Tilted	0.453	0.094	0.547	-
			Left Cheek	0.329	0.118	0.447	-
			Left Tilted	0.273	0.1	0.373	-
		Body-Worn	Front Face	0.068	0.053	0.121	-
			Rear Face	0.097	0.196	0.293	-
		Hotspot	Front Face	0.128	0.054	0.182	-
			Rear Face	0.219	0.138	0.357	-
			Left Side	0.263	0	0.263	-
			Right Side	0	0.07	0.07	-
			Top Side	0.181	0.097	0.278	-
			Bottom Side	0	0	0	-
	LTE 13 + WLAN 5G	Head	Right Cheek	0.496	0.049	0.545	-
			Right Tilted	0.453	0.05	0.503	-
			Left Cheek	0.329	0.103	0.432	-
			Left Tilted	0.273	0.086	0.359	-
		Body-Worn	Front Face	0.068	0.047	0.115	-
			Rear Face	0.097	0.109	0.206	-
		Hotspot	Front Face	0.128	0.03	0.158	-
			Rear Face	0.219	0.086	0.305	-
Left Side			0.263	0	0.263	-	
Right Side			0	0.096	0.096	-	
Top Side			0.181	0.114	0.295	-	
Bottom Side			0	0	0	-	

**FCC SAR Test Report**

No.	Conditions (SAR1 + SAR2 + SAR3)	Mode	Position	Max. SAR1	Max. SAR2	Max. SAR3	SAR Summation	SPLSR
8	CDMA2000 BC0 + LTE 13 + WLAN 2.4G	Head	Right Cheek	0.182	0.496	0.102	0.78	-
			Right Tilted	0.059	0.453	0.094	0.606	-
			Left Cheek	0.175	0.329	0.118	0.622	-
			Left Tilted	0.059	0.273	0.1	0.432	-
		Body-Worn	Front Face	0.123	0.068	0.053	0.244	-
			Rear Face	0.313	0.097	0.196	0.606	-
			Front Face	0.205	0.128	0.054	0.387	-
			Rear Face	0.485	0.219	0.138	0.842	-
		Hotspot	Left Side	0.21	0.263	0	0.473	-
			Right Side	0.256	0	0.07	0.326	-
			Top Side	0	0.181	0.097	0.278	-
			Bottom Side	0.059	0	0	0.059	-
	CDMA2000 BC0 + LTE 13 + WLAN 5G	Head	Right Cheek	0.182	0.496	0.049	0.727	-
			Right Tilted	0.059	0.453	0.05	0.562	-
			Left Cheek	0.175	0.329	0.103	0.607	-
			Left Tilted	0.059	0.273	0.086	0.418	-
		Body-Worn	Front Face	0.123	0.068	0.047	0.238	-
			Rear Face	0.313	0.097	0.109	0.519	-
			Front Face	0.205	0.128	0.03	0.363	-
			Rear Face	0.485	0.219	0.086	0.79	-
Hotspot		Left Side	0.21	0.263	0	0.473	-	
		Right Side	0.256	0	0.096	0.352	-	
		Top Side	0	0.181	0.114	0.295	-	
		Bottom Side	0.059	0	0	0.059	-	
9	CDMA2000 BC1 + LTE 13 + WLAN 2.4G	Head	Right Cheek	0.171	0.496	0.102	0.769	-
			Right Tilted	0.09	0.453	0.094	0.637	-
			Left Cheek	0.155	0.329	0.118	0.602	-
			Left Tilted	0.047	0.273	0.1	0.42	-
		Body-Worn	Front Face	0.34	0.068	0.053	0.461	-
			Rear Face	0.633	0.097	0.196	0.926	-
			Front Face	0.337	0.128	0.054	0.519	-
			Rear Face	0.655	0.219	0.138	1.012	-
		Hotspot	Left Side	0.112	0.263	0	0.375	-
			Right Side	0.096	0	0.07	0.166	-
			Top Side	0	0.181	0.097	0.278	-
			Bottom Side	0.441	0	0	0.441	-
	CDMA2000 BC1 + LTE 13 + WLAN 5G	Head	Right Cheek	0.171	0.496	0.049	0.716	-
			Right Tilted	0.09	0.453	0.05	0.593	-
			Left Cheek	0.155	0.329	0.103	0.587	-
			Left Tilted	0.047	0.273	0.086	0.406	-
		Body-Worn	Front Face	0.34	0.068	0.047	0.455	-
			Rear Face	0.633	0.097	0.109	0.839	-
			Front Face	0.337	0.128	0.03	0.495	-
			Rear Face	0.655	0.219	0.086	0.96	-
Hotspot	Left Side	0.112	0.263	0	0.375	-		
	Right Side	0.096	0	0.096	0.192	-		
	Top Side	0	0.181	0.114	0.295	-		
	Bottom Side	0.441	0	0	0.441	-		

**Note:**

1. The maximum SAR summation is calculated based on the same configuration and test position.



## FCC SAR Test Report

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### Summary:

According to KDB 648474, the simultaneous transmission SAR for WWAN and WLAN was not required, because the SAR summation is less than 1.6 W/kg. The BT standalone SAR and WWAN/BT simultaneous transmission SAR were not required, because the maximum output power of Bluetooth is less than  $P_{Ref}$  (10.8 dBm) and the closest separation distance of these antennas is larger than 2.5 cm, and maximum WWAN SAR is less than 1.2 W/kg.



## 5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Kit	SPEAG	D750V3	1013	Apr. 25, 2012	Annual
System Validation Kit	SPEAG	D835V2	4d021	Apr. 20, 2012	Annual
System Validation Kit	SPEAG	D1900V2	5d036	Jan. 26, 2012	Annual
System Validation Kit	SPEAG	D2450V2	737	Jan. 24, 2012	Annual
System Validation Kit	SPEAG	D5GHzV2	1018	Jan. 18, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3578	Jun. 21, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3590	Feb. 23, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3650	Oct. 26, 2011	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3820	Dec. 16, 2011	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3864	Jul. 19, 2012	Annual
Data Acquisition Electronics	SPEAG	DAE3	579	Apr. 27, 2012	Annual
Data Acquisition Electronics	SPEAG	DAE4	910	Dec. 07, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	1277	Jul. 19, 2012	Annual
SAM Phantom	SPEAG	QD000P40CD	TP-1652	N/A	N/A
SAM Phantom	SPEAG	QD000P40CD	TP-1654	N/A	N/A
SAM Phantom	SPEAG	QD000P40CD	TP-1653	N/A	N/A
ELI Phantom	SPEAG	QDOVA001B	TP-1043	N/A	N/A
Radio Communication Tester	Agilent	E5515C	MY50266628	Sep. 26, 2011	Biennial
Radio Communication Analyzer	Anritsu	MT8820C	6201010284	Aug. 01, 2011	Biennial
ENA Series Network Analyzer	Agilent	E5071C	MY46214281	May 14, 2012	Annual
MXG Analog Signal Generator	Agilent	N5181A	MY50143868	May 06, 2012	Annual
Power Meter	Anritsu	ML2495A	1218009	May 07, 2012	Annual
Power Sensor	Anritsu	MA2411B	1207252	May 07, 2012	Annual
EXA Spectrum Analyzer	Agilent	N9010A	MY52100136	Apr. 23, 2012	Annual
Dielectric Probe Kit	Agilent	85070D	E2-020018	May 14, 2012	Annual
Thermometer	YFE	YF-160A	110600361	Feb. 21, 2012	Annual
Directional Coupler	Woken	0110A056020-10	11122702	Apr. 19, 2012	Annual
Power Amplifier	AR	5S1G4	0339656	Apr. 23, 2012	Annual
Power Amplifier	Mini-Circuit	ZVE-8G	001000422	Apr. 23, 2012	Annual
Attenuator	Woken	00800A1G01L-03	N/A	Apr. 19, 2012	Annual

## 6. Measurement Uncertainty

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)	Vi
<b>Measurement System</b>						
Probe Calibration	6.0	Normal	1	1	± 6.0 %	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %	∞
Boundary Effects	1.0	Rectangular	√3	1	± 0.6 %	∞
Linearity	4.7	Rectangular	√3	1	± 2.7 %	∞
System Detection Limits	1.0	Rectangular	√3	1	± 0.6 %	∞
Readout Electronics	0.6	Normal	1	1	± 0.6 %	∞
Response Time	0.0	Rectangular	√3	1	± 0.0 %	∞
Integration Time	1.7	Rectangular	√3	1	± 1.0 %	∞
RF Ambient Noise	3.0	Rectangular	√3	1	± 1.7 %	∞
RF Ambient Reflections	3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	0.5	Rectangular	√3	1	± 0.3 %	∞
Probe Positioning	2.9	Rectangular	√3	1	± 1.7 %	∞
Max. SAR Eval.	2.3	Rectangular	√3	1	± 1.3 %	∞
<b>Test Sample Related</b>						
Device Positioning	3.9	Normal	1	1	± 3.9 %	31
Device Holder	2.7	Normal	1	1	± 2.7 %	19
Power Drift	5.0	Rectangular	√3	1	± 2.9 %	∞
<b>Phantom and Setup</b>						
Phantom Uncertainty	4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid Conductivity (Meas.)	5.0	Normal	1	0.64	± 3.2 %	29
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid Permittivity (Meas.)	5.0	Normal	1	0.6	± 3.0 %	29
<b>Combined Standard Uncertainty</b>					± 11.7 %	
<b>Expanded Uncertainty (K=2)</b>					<b>± 23.4 %</b>	

Uncertainty budget for frequency range 300 MHz to 3 GHz



# FCC SAR Test Report

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Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)	Vi
<b>Measurement System</b>						
Probe Calibration	6.55	Normal	1	1	± 6.55 %	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %	∞
Boundary Effects	2.0	Rectangular	√3	1	± 1.2 %	∞
Linearity	4.7	Rectangular	√3	1	± 2.7 %	∞
System Detection Limits	1.0	Rectangular	√3	1	± 0.6 %	∞
Readout Electronics	0.3	Normal	1	1	± 0.3 %	∞
Response Time	0.8	Rectangular	√3	1	± 0.5 %	∞
Integration Time	2.6	Rectangular	√3	1	± 1.5 %	∞
RF Ambient Noise	3.0	Rectangular	√3	1	± 1.7 %	∞
RF Ambient Reflections	3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	0.8	Rectangular	√3	1	± 0.5 %	∞
Probe Positioning	9.9	Rectangular	√3	1	± 5.7 %	∞
Max. SAR Eval.	4.0	Rectangular	√3	1	± 2.3 %	∞
<b>Test Sample Related</b>						
Device Positioning	3.9	Normal	1	1	± 3.9 %	31
Device Holder	2.7	Normal	1	1	± 2.7 %	19
Power Drift	5.0	Rectangular	√3	1	± 2.9 %	∞
<b>Phantom and Setup</b>						
Phantom Uncertainty	4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid Conductivity (Meas.)	5.0	Normal	1	0.64	± 3.2 %	30
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid Permittivity (Meas.)	5.0	Normal	1	0.6	± 3.0 %	30
<b>Combined Standard Uncertainty</b>					± 13.4 %	
<b>Expanded Uncertainty (K=2)</b>					± 26.8 %	

## Uncertainty budget for frequency range 3 GHz to 6 GHz



## **7. Information on the Testing Laboratories**

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

If you have any comments, please feel free to contact us at the following:

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The road map of all our labs can be found in our web site also.

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