FCC SAR Test Report

Report No.	:	**SA120508C07**
Applicant	:	**HTC Corporation**
Address	:	**No. 23, Xinghua Rd., Taoyuan City, Taiwan**
Product	:	**Smartphone**
FCC ID	:	**NM8PL01200**
Brand	:	**HTC**
Model No.	:	**PL01200**
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 D06 v01**
Date of Testing	:	**May 28, 2012 ~ Jun. 01, 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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Testing Laboratory 2021

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Release Control Record

Issue No.	Reason for Change	Date Issued
R01	Original release	Jun. 14, 2012

1. Summary of Maximum SAR Value

Mode / Band	Test Position	SAR-1g (W/kg)
CDMA2000 BC0	Head	0.314
	Body Worn (1.0 cm Gap)	0.365
	Hotspot Mode (1.0 cm Gap)	0.436
CDMA2000 BC1	Head	1.14
	Body Worn (1.0 cm Gap)	0.365
	Hotspot Mode (1.0 cm Gap)	0.436
CDMA2000 BC15	Head	0.609
	Body Worn (1.0 cm Gap)	0.344
	Hotspot Mode (1.0 cm Gap)	0.383
WLAN 2.4GHz	Head	0.336
	Body Worn (1.0 cm Gap)	0.172
	Hotspot Mode (1.0 cm Gap)	0.201
Bluetooth	Head	N/A
	Body Worn (1.0 cm Gap)	N/A
	Hotspot Mode (1.0 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 maximum output power of Bluetooth is less than $2P_{Ref}$ (13.8 dBm) and the closest separation distance of WWAN and Bluetooth antennas is larger than 5 cm, SAR testing for Bluetooth is not required.

2. Description of Equipment Under Test

EUT Type	Smartphone
FCC ID	NM8PL01200
Brand Name	HTC
Model Name	PL01200
Tx Frequency Bands (Unit: MHz)	CDMA BC0 : 824 ~ 849 CDMA BC1 : 1850 ~ 1910 CDMA BC15 : 1710 ~ 1755 WLAN : 2400 ~ 2483.5 Bluetooth : 2400 ~ 2483.5
Uplink Modulations	CDMA : QPSK 802.11b : DSSS 802.11g/n : OFDM Bluetooth : GFSK
Maximum AVG Conducted Power (Unit: dBm)	CDMA BC0 : 24.95 CDMA BC1 : 24.80 CDMA BC15 : 24.95 802.11b : 18.45 802.11g : 13.44 802.11n HT20 : 12.45
Antenna Type	Fixed Internal Antenna
EUT Stage	Production Unit

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.

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 (ρ). The equation description is as below:

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

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

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

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

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

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 form the optical into digital electric signal of the DAE and transfers data to the PC.

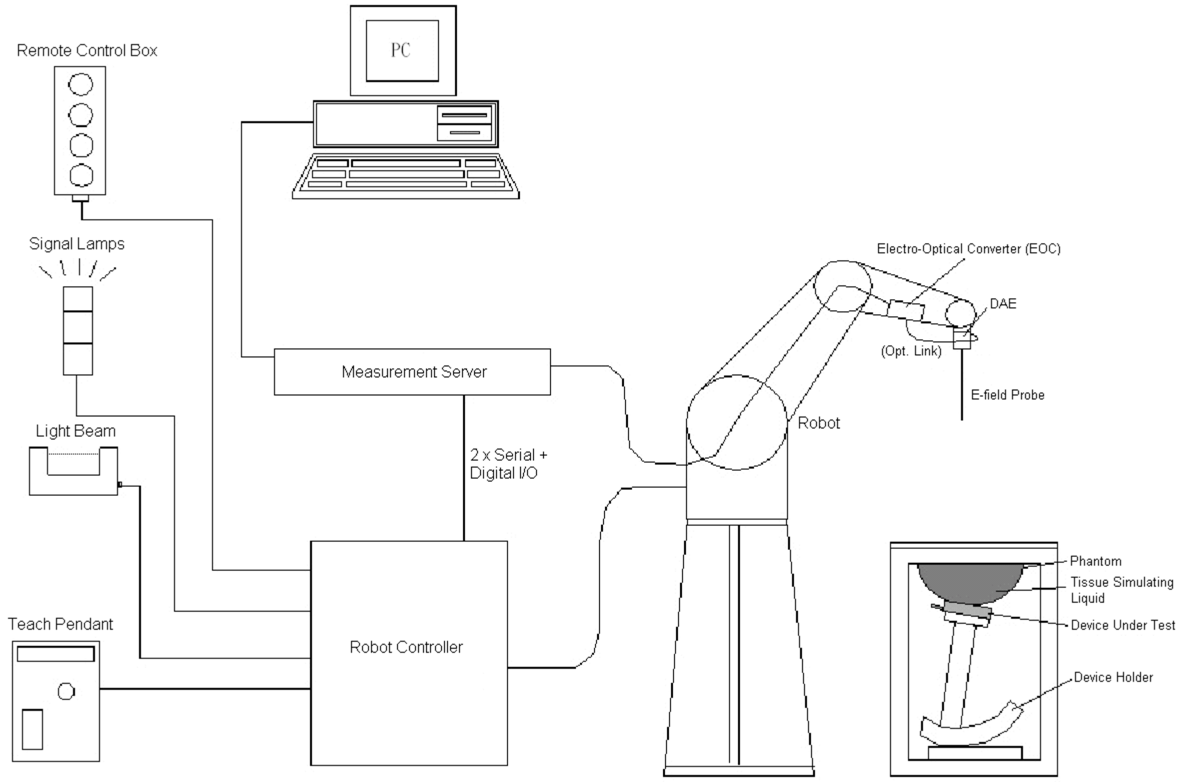


Fig-3.1 DASY System Setup

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 ±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

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.

Model	EX3DV4	
Construction	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).	
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 µW/g to 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 µW/g)	
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	

Model	ES3DV3	
Construction	Symmetrical design with triangular core. Interleaved sensors. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).	
Frequency	10 MHz to 4 GHz Linearity: ± 0.2 dB	
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	5 µW/g to 100 mW/g Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm	

3.2.3 Data Acquisition Electronics (DAE)

Model	DAE3, DAE4	
Construction	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.	
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)	
Input Offset Voltage	< 5µV (with auto zero)	
Input Bias Current	< 50 fA	
Dimensions	60 x 60 x 68 mm	

3.2.4 Phantoms

Model	Twin SAM
Construction	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.
Material	Vinylester, glass fiber reinforced (VE-GF)
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)
Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet
Filling Volume	approx. 25 liters

Model	ELI
Construction	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.
Material	Vinylester, glass fiber reinforced (VE-GF)
Shell Thickness	2.0 ± 0.2 mm (bottom plate)
Dimensions	Major axis: 600 mm Minor axis: 400 mm
Filling Volume	approx. 30 liters

3.2.5 Device Holder

Model	Mounting Device	
Construction	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).	
Material	POM	

Model	Laptop Extensions Kit	
Construction	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.	
Material	POM, Acrylic glass, Foam	

3.2.6 System Validation Dipoles

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

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.

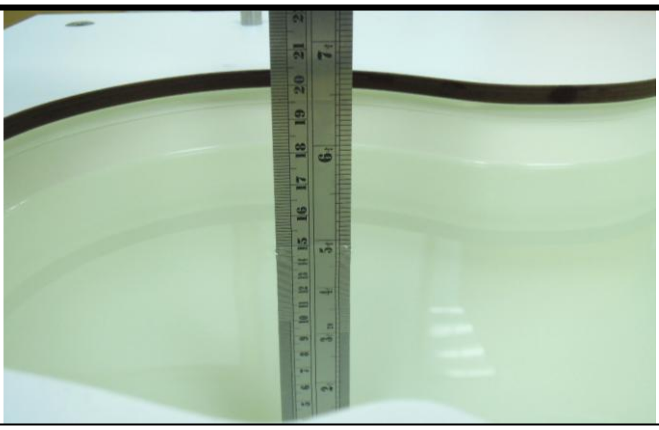
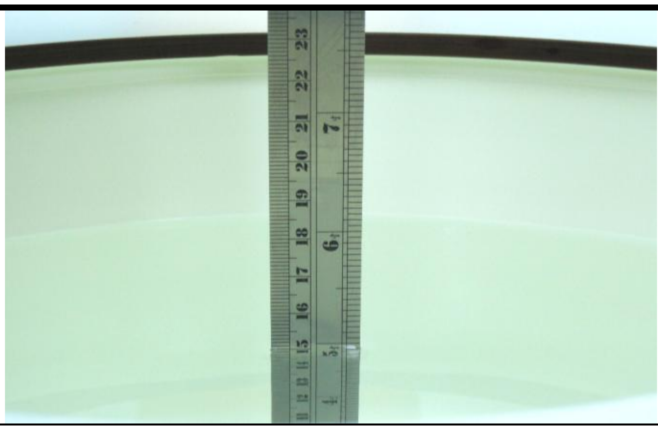
	

Photo of Liquid Height for Head Position	**Photo of Liquid Height for Body Position**

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 ±5%	Target Conductivity	Range of ±5%
For Head				
835	41.5	39.4 ~ 43.6	0.90	0.86 ~ 0.95
1750	40.1	38.1 ~ 42.1	1.37	1.30 ~ 1.44
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
For Body				
835	55.2	52.4 ~ 58.0	0.97	0.92 ~ 1.02
1750	53.4	50.7 ~ 56.1	1.49	1.42 ~ 1.56
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

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
H835	0.2	-	0.2	1.5	57.0	-	41.1	-
H1750	-	47.0	-	0.4	-	-	52.6	-
H1900	-	44.5	-	0.2	-	-	55.3	-
H2450	-	45.0	-	0.1	-	-	54.9	-
B835	0.2	-	0.2	0.9	48.5	-	50.2	-
B1750	-	31.0	-	0.2	-	-	68.8	-
B1900	-	29.5	-	0.3	-	-	70.2	-
B2450	-	31.4	-	0.1	-	-	68.5	-

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.

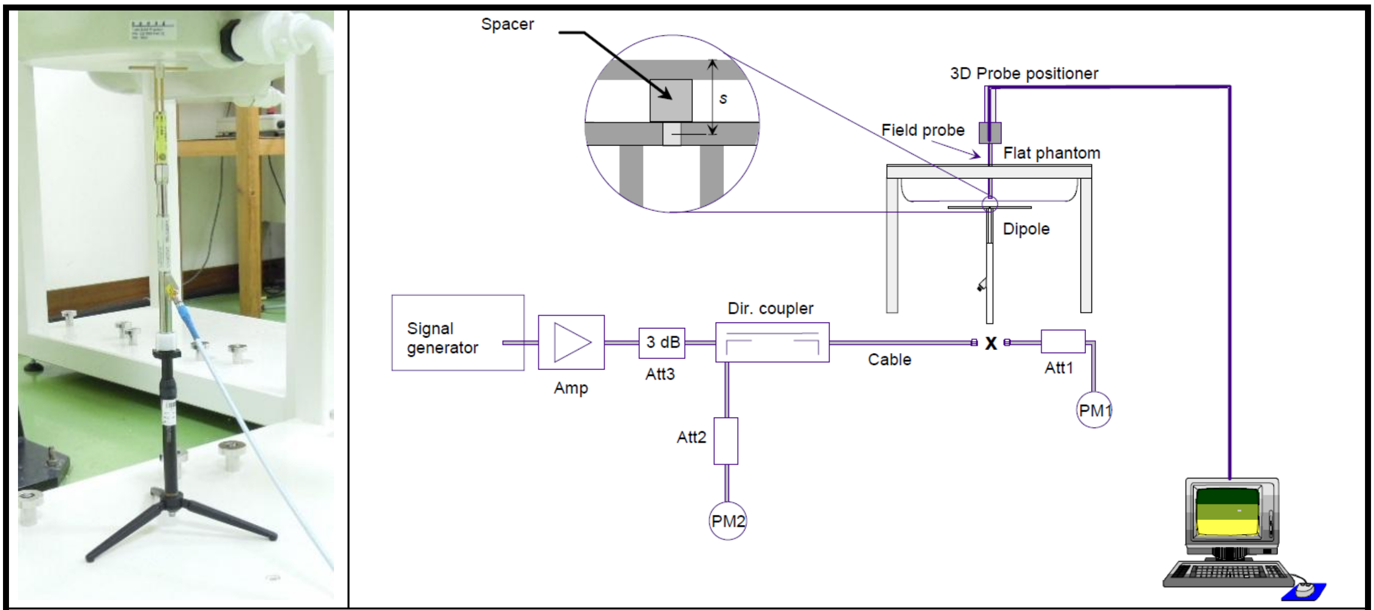


Fig-3.4 System Verification Setup

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.

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 form the measurement grid to the high-resolution grid
(e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
(f) Calculation of the averaged SAR within masses of 1g and 10g

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

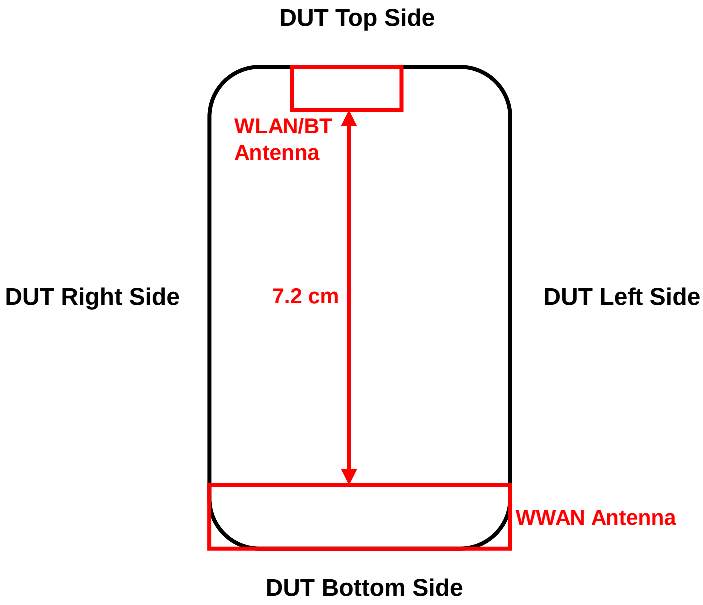
For WWAN SAR testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator 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.

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 due to the highest RF output power.

The simultaneous transmission possibilities are listed as below.

Simultaneous Tx Combination	Configuration	Head (Voice)	Body Worn (Voice)	Hotspot (Data)
1	CDMA2000 BC0 + WLAN/BT	V	V	V
2	CDMA2000 BC1 + WLAN/BT	V	V	V
3	CDMA2000 BC15 + WLAN/BT	V	V	V

<Antenna Location>



<EUT Rear View>

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.

WWAN Ant.: Front Face, Rear Face, Left Side, Right Side, Bottom Side
WLAN Ant.: Front Face, Rear Face, Left Side, Right Side, Top Side

4.2 EUT Testing Position

This EUT was tested in **Right Cheek**, **Right Tilted**, **Left Cheek**, **Left Tilted**, **Front Face, Rear Face, Left Side, Right 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.

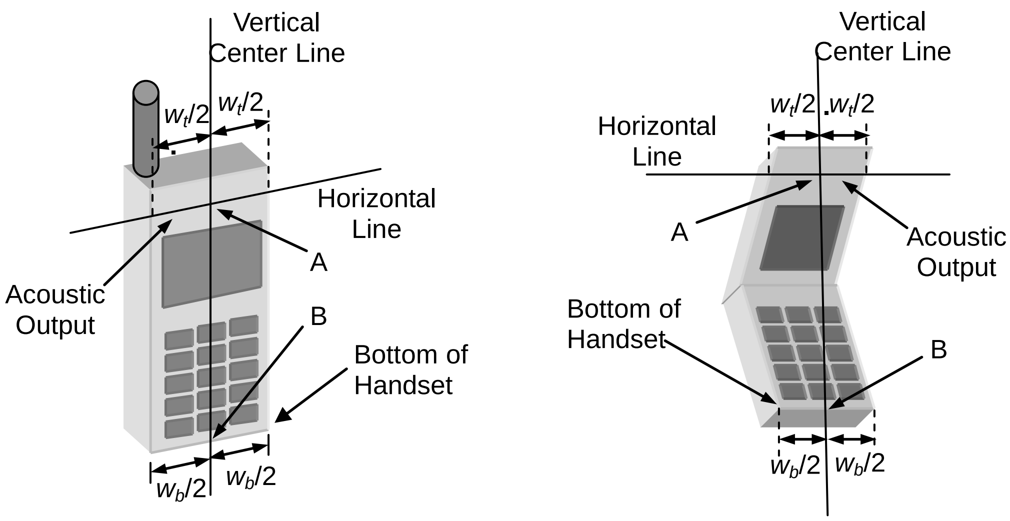


Fig-4.1 Illustration for Handset Vertical and Horizontal Reference Lines

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).

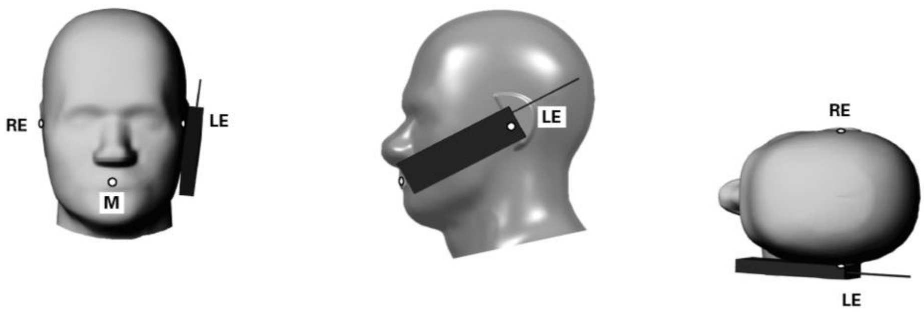


Fig-4.2 Illustration for Cheek Position

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).

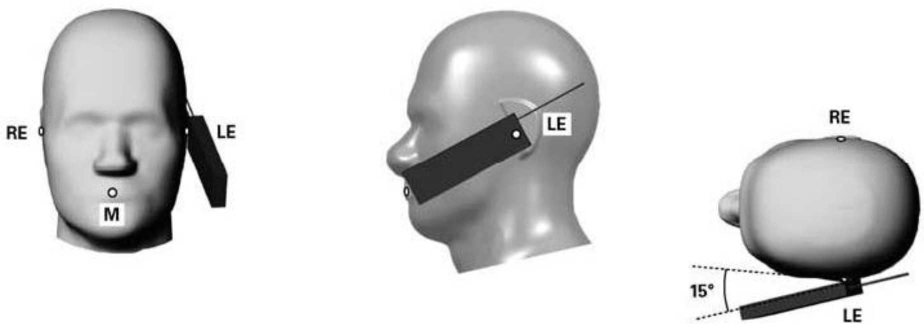


Fig-4.3 Illustration for Tilted Position

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.

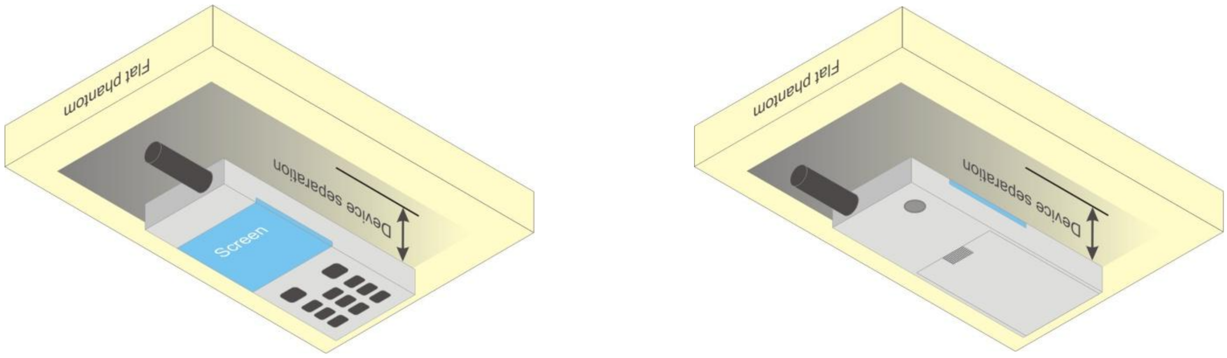


Fig-4.4 Illustration for Body Worn Position

4.3 Tissue Verification

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

Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)	Test Date
H835	835	20.7	0.893	41.64	0.90	41.5	-0.78	0.34	May 28, 2012
B835	835	20.5	0.992	55.575	0.97	55.2	2.27	0.68	May 29, 2012
B835	835	20.5	0.994	55.999	0.97	55.2	2.47	1.45	Jun. 01, 2012
H1750	1750	20.7	1.357	40.639	1.37	40.1	-0.95	1.34	May 29, 2012
B1750	1750	20.8	1.531	52.593	1.49	53.4	2.75	-1.51	May 29, 2012
B1750	1750	20.7	1.526	54.358	1.49	53.4	2.42	1.79	Jun. 01, 2012
H1900	1900	20.7	1.409	40.842	1.40	40.0	0.64	2.11	May 28, 2012
B1900	1900	20.8	1.564	54.848	1.52	53.3	2.89	2.90	May 29, 2012
B1900	1900	20.7	1.554	54.282	1.52	53.3	2.24	1.84	Jun. 01, 2012
H2450	2450	20.8	1.843	38.054	1.80	39.2	2.39	-2.92	May 31, 2012
B2450	2450	20.6	2.016	52.949	1.95	52.7	3.38	0.47	May 30, 2012
B2450	2450	20.7	2.026	52.80	1.95	52.7	3.90	0.19	Jun. 01, 2012

Note:

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ±5% of the target values. Liquid temperature during the SAR testing must be within ±2 ℃.

4.4 System Verification

The measuring results for system check are shown as below.

Test Date	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
May 28, 2012	835	9.46	2.39	9.56	1.06	4d021	3801	579
May 29, 2012	835	9.60	2.43	9.72	1.25	4d021	3801	579
Jun. 01, 2012	835	9.60	2.43	9.72	1.25	4d021	3801	579
May 29, 2012	1750	36.60	9.05	36.20	-1.09	1055	3801	579
May 29, 2012	1750	38.00	9.29	37.16	-2.21	1055	3801	579
Jun. 01, 2012	1750	38.00	9.42	37.68	-0.84	1055	3801	579
May 28, 2012	1900	38.90	9.60	38.40	-1.29	5d036	3801	579
May 29, 2012	1900	38.90	9.94	39.76	2.21	5d036	3801	579
Jun. 01, 2012	1900	38.90	10.30	41.20	5.91	5d036	3801	579
May 31, 2012	2450	52.90	13.40	53.60	1.32	737	3650	1277
May 30, 2012	2450	50.00	12.80	51.20	2.40	737	3650	1277
Jun. 01, 2012	2450	50.00	12.60	50.40	0.80	737	3801	579

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.

4.5 Conducted Power Results

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

Band	CDMA BC0			CDMA 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	24.88	24.73	24.73	24.73	24.71	24.70
1xRTT RC3+SO55	24.95	24.77	24.71	24.72	24.80	24.73
1xRTT RC3+SO32 (FCH)	24.88	24.76	24.74	24.72	24.76	24.74
1xRTT RC3+SO32 (SCH)	24.87	24.68	24.65	24.73	24.76	24.70
1xEVDO Rev.0 RTAP 153.6	24.94	24.75	24.74	24.78	24.78	24.77
1xEVDO Rev.A RETAP 4096	24.91	24.78	24.77	24.77	24.79	24.76

Band	CDMA BC15			-		
Channel	25	425	875	-	-	-
Frequency (MHz)	1711.25	1731.25	1753.75	-	-	-
1xRTT RC1+SO55	24.75	24.86	24.79	-	-	-
1xRTT RC3+SO55	24.68	24.95	24.80	-	-	-
1xRTT RC3+SO32 (FCH)	24.69	24.88	24.78	-	-	-
1xRTT RC3+SO32 (SCH)	24.63	24.84	24.77	-	-	-
1xEVDO Rev.0 RTAP 153.6	24.87	24.90	24.87	-	-	-
1xEVDO Rev.A RETAP 4096	24.80	24.92	24.90	-	-	-

Band	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Average Power	18.11	18.34	18.45	13.04	13.14	13.44

Band	802.11n (HT20)			-		
Channel	1	6	11	-	-	-
Frequency (MHz)	2412	2437	2462	-	-	-
Average Power	12.01	12.12	12.45	-	-	-

4.6 SAR Testing Results

4.6.1 SAR Results for Head

Plot No.	Band	Mode	Test Position	Channel	Battery	SAR-1g (W/kg)
1	CDMA BC0	RC3+SO55	Right Cheek	1013	1	0.262
2	CDMA BC0	RC3+SO55	Right Tilted	1013	1	0.178
3	CDMA BC0	RC3+SO55	Left Cheek	1013	1	**0.314**
4	CDMA BC0	RC3+SO55	Left Tilted	1013	1	0.185
7	CDMA BC0	RC3+SO55	Left Cheek	1013	2	0.283
8	CDMA BC1	RC3+SO55	Right Cheek	600	1	0.802
9	CDMA BC1	RC3+SO55	Right Tilted	600	1	1.1
10	CDMA BC1	RC3+SO55	Left Cheek	600	1	1.05
11	CDMA BC1	RC3+SO55	Left Tilted	600	1	**1.14**
12	CDMA BC1	RC3+SO55	Right Cheek	25	1	0.615
13	CDMA BC1	RC3+SO55	Right Cheek	1175	1	0.641
14	CDMA BC1	RC3+SO55	Right Tilted	25	1	0.991
15	CDMA BC1	RC3+SO55	Right Tilted	1175	1	0.752
16	CDMA BC1	RC3+SO55	Left Cheek	25	1	0.767
17	CDMA BC1	RC3+SO55	Left Cheek	1175	1	0.703
18	CDMA BC1	RC3+SO55	Left Tilted	25	1	1
19	CDMA BC1	RC3+SO55	Left Tilted	1175	1	0.835
20	CDMA BC1	RC3+SO55	Left Tilted	600	2	1.12
72	CDMA BC1	RC3+SO55	Left Tilted	25	2	0.973
73	CDMA BC1	RC3+SO55	Left Tilted	1175	2	0.812
21	CDMA BC15	RC3+SO55	Right Cheek	425	1	0.441
22	CDMA BC15	RC3+SO55	Right Tilted	425	1	**0.609**
23	CDMA BC15	RC3+SO55	Left Cheek	425	1	0.444
24	CDMA BC15	RC3+SO55	Left Tilted	425	1	0.553
27	CDMA BC15	RC3+SO55	Right Tilted	425	2	0.571
28	802.11b	-	Right Cheek	11	1	**0.336**
29	802.11b	-	Right Tilted	11	1	0.242
30	802.11b	-	Left Cheek	11	1	0.199
31	802.11b	-	Left Tilted	11	1	0.168
74	802.11b	-	Right Cheek	11	2	0.299

Note:

1. According to KDB 941225, the SAR testing for RC1 is not required because the RC1 maximum power is less than 1/4 dB higher than RC3.
2. According to KDB 248227, the SAR testing for 802.11g/n is not required because the 802.11g/n maximum power is less 1/4 dB higher than 802.11b.

4.6.2 SAR Results for Body

<Body Worn Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	Battery	SAR-1g (W/kg)
39	CDMA BC0	RC3+SO32	Front Face	1	1013	1	0.151
40	CDMA BC0	RC3+SO32	Rear Face	1	1013	1	**0.365**
41	CDMA BC0	RC3+SO32	Rear Face	1	1013	2	0.357
49	CDMA BC1	RC3+SO32	Front Face	1	600	1	**0.365**
50	CDMA BC1	RC3+SO32	Rear Face	1	600	1	0.348
51	CDMA BC1	RC3+SO32	Rear Face	1	600	2	0.338
59	CDMA BC15	RC3+SO32	Front Face	1	425	1	0.206
60	CDMA BC15	RC3+SO32	Rear Face	1	425	1	**0.344**
61	CDMA BC15	RC3+SO32	Rear Face	1	425	2	0.342
69	802.11b	-	Front Face	1	11	1	0.034
70	802.11b	-	Rear Face	1	11	1	**0.172**
71	802.11b	-	Rear Face	1	11	2	0.157

<Hotspot Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	Battery	SAR-1g (W/kg)
32	CDMA BC0	RC3+SO32	Front Face	1	1013	1	0.199
33	CDMA BC0	RC3+SO32	Rear Face	1	1013	1	**0.436**
34	CDMA BC0	RC3+SO32	Left Side	1	1013	1	0.183
35	CDMA BC0	RC3+SO32	Right Side	1	1013	1	0.207
37	CDMA BC0	RC3+SO32	Bottom Side	1	1013	1	0.056
38	CDMA BC0	RC3+SO32	Rear Face	1	1013	2	0.425
42	CDMA BC1	RC3+SO32	Front Face	1	600	1	0.339
43	CDMA BC1	RC3+SO32	Rear Face	1	600	1	**0.436**
44	CDMA BC1	RC3+SO32	Left Side	1	600	1	0.075
45	CDMA BC1	RC3+SO32	Right Side	1	600	1	0.113
47	CDMA BC1	RC3+SO32	Bottom Side	1	600	1	0.142
48	CDMA BC1	RC3+SO32	Rear Face	1	600	2	0.356
52	CDMA BC15	RC3+SO32	Front Face	1	425	1	0.178
53	CDMA BC15	RC3+SO32	Rear Face	1	425	1	**0.383**
54	CDMA BC15	RC3+SO32	Left Side	1	425	1	0.059
55	CDMA BC15	RC3+SO32	Right Side	1	425	1	0.087
57	CDMA BC15	RC3+SO32	Bottom Side	1	425	1	0.141
58	CDMA BC15	RC3+SO32	Rear Face	1	425	2	0.339
62	802.11b	-	Front Face	1	11	1	0.049
63	802.11b	-	Rear Face	1	11	1	**0.201**
64	802.11b	-	Left Side	1	11	1	0.021
65	802.11b	-	Right Side	1	11	1	0.049
66	802.11b	-	Top Side	1	11	1	0.081
68	802.11b	-	Rear Face	1	11	2	0.177

Note:

1. According to KDB 941225, the SAR testing for EVDO is not required because the EVDO maximum power is less than 1/4 dB higher than 1xRTT.
2. According to KDB 248227, the SAR testing for 802.11g/n is not required because the 802.11g/n maximum power is less 1/4 dB higher than 802.11b.

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4.6.3 Simultaneous Multi-band Transmission Evaluation

<Simultaneous Transmission Configuration 1>

Position (Head)	CDMA BC0 (Voice)	802.11b/g/n (Data)	Max. SAR Summation	SPLSR
Right Cheek	0.262	0.336	0.598	-
Right Tilted	0.178	0.242	0.42	-
Left Cheek	0.314	0.199	0.513	-
Left Tilted	0.185	0.168	0.353	-
Position (Body Worn)	**CDMA BC0 (Voice)**	**802.11b/g/n (Data)**	**Max. SAR Summation**	**SPLSR**
Front Face	0.151	0.034	0.185	-
Rear Face	0.365	0.172	0.537	-
Position (Hotspot)	**CDMA BC0 (Data)**	**802.11b/g/n (Data)**	**Max. SAR Summation**	**SPLSR**
Front Face	0.199	0.049	0.248	-
Rear Face	0.436	0.201	0.637	-
Left Side	0.183	0.021	0.204	-
Right Side	0.207	0.049	0.256	-
Top Side	0	0.081	0.081	-
Bottom Side	0.056	0	0.056	-

<Simultaneous Transmission Configuration 2>

Position (Head)	CDMA BC1 (Voice)	802.11b/g/n (Data)	Max. SAR Summation	SPLSR
Right Cheek	0.802	0.336	1.138	-
Right Tilted	1.1	0.242	1.342	-
Left Cheek	1.05	0.199	1.249	-
Left Tilted	1.14	0.168	1.308	-
Position (Body Worn)	**CDMA BC1 (Voice)**	**802.11b/g/n (Data)**	**Max. SAR Summation**	**SPLSR**
Front Face	0.365	0.034	0.399	-
Rear Face	0.348	0.172	0.52	-
Position (Hotspot)	**CDMA BC1 (Data)**	**802.11b/g/n (Data)**	**Max. SAR Summation**	**SPLSR**
Front Face	0.339	0.049	0.388	-
Rear Face	0.436	0.201	0.637	-
Left Side	0.075	0.021	0.096	-
Right Side	0.113	0.049	0.162	-
Top Side	0	0.081	0.081	-
Bottom Side	0.142	0	0.142	-

<Simultaneous Transmission Configuration 3>

Position (Head)	CDMA BC15 (Voice)	802.11b/g/n (Data)	Max. SAR Summation	SPLSR
Right Cheek	0.441	0.336	0.777	-
Right Tilted	0.609	0.242	0.851	-
Left Cheek	0.444	0.199	0.643	-
Left Tilted	0.553	0.168	0.721	-
Position (Body Worn)	**CDMA BC15 (Voice)**	**802.11b/g/n (Data)**	**Max. SAR Summation**	**SPLSR**
Front Face	0.206	0.034	0.24	-
Rear Face	0.344	0.172	0.516	-
Position (Hotspot)	**CDMA BC15 (Data)**	**802.11b/g/n (Data)**	**Max. SAR Summation**	**SPLSR**
Front Face	0.178	0.049	0.227	-
Rear Face	0.383	0.201	0.584	-
Left Side	0.059	0.021	0.08	-
Right Side	0.087	0.049	0.136	-
Top Side	0	0.081	0.081	-
Bottom Side	0.141	0	0.141	-

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 simultaneous transmission SAR for WWAN and BT was not required, because the maximum output power of Bluetooth is less than $2P_{Ref}$ (13.8 dBm) and the closest separation distance of these antennas is larger than 5 cm. WLAN and BT share the same antenna, and they cannot transmit simultaneously.

5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Kit	SPEAG	D835V2	4d021	Apr. 20, 2012	Annual
System Validation Kit	SPEAG	D1750V2	1055	Aug. 09, 2011	Annual
System Validation Kit	SPEAG	D1900V2	5d036	Jan. 26, 2012	Annual
System Validation Kit	SPEAG	D2450V2	737	Jan. 24, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3650	Oct. 26, 2011	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3801	Jul. 11, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE3	579	Sep. 23, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	1277	Jul. 29, 2011	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
Radio Communication Tester	Agilent	E5515C	MY50266628	Sep. 26, 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	N/A	N/A	N/A
Thermometer	YFE	YF-160A	110600361	Feb. 21, 2012	Annual

6. Measurement Uncertainty

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)	Vi
Measurement System						
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	0.3	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	0.4	Rectangular	√3	1	± 0.2 %	∞
Probe Positioning	2.9	Rectangular	√3	1	± 1.7 %	∞
Max. SAR Eval.	1.0	Rectangular	√3	1	± 0.6 %	∞
Test Sample Related						
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 %	∞
Phantom and Setup						
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
Combined Standard Uncertainty					± 11.7 %	
Expanded Uncertainty (K=2)					**± 23.4 %**	

Uncertainty budget for frequency range 300 MHz to 3 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.

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

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