FCC SAR Test Report

Report No.	:	**SA120402C01**
Applicant	:	**HTC Corporation**
Address	:	**23, Xinghua Rd., Taoyuan 330, Taiwan, R.O.C.**
Product	:	**Smart Phone**
FCC ID	:	**NM8PJ83110**
Brand	:	**HTC**
Model No.	:	**PJ83110**
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 D06 v01**
Date of Testing	:	**Apr. 05, 2012 ~ Apr. 20, 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.

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Testing Laboratory
2021

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Release Control Record

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

1. Summary of Maximum SAR Value

Mode / Band	Test Position	SAR-1g (W/kg)
GSM850	Head	0.638
	Body Worn (1 cm Gap)	0.698
	Hotspot Mode (1 cm Gap)	0.917
GSM1900	Head	0.601
	Body Worn (1 cm Gap)	1.01
	Hotspot Mode (1 cm Gap)	1.02
WCDMA Band II	Head	0.591
	Body Worn (1 cm Gap)	0.928
	Hotspot Mode (1 cm Gap)	1.07
WLAN 2.4GHz	Head	0.253
	Body Worn (1 cm Gap)	0.077
	Hotspot Mode (1 cm Gap)	0.091
WLAN 5GHz	Head	0.074
	Body Worn (1 cm Gap)	0.063
	Hotspot Mode (1 cm Gap)	0.033
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}, SAR testing for Bluetooth is not required.

2. Description of Equipment Under Test

EUT Type	Smart Phone
FCC ID	NM8PJ83110
Brand Name	HTC
Model Name	PJ83110
Tx Frequency Bands (Unit: MHz)	GSM850 : 824 ~ 849 GSM1900 : 1850 ~ 1910 WCDMA Band II : 1850 ~ 1910 WLAN : 2400 ~ 2483.5, 5150 ~ 5350, 5470 ~ 5725, 5725 ~ 5825 Bluetooth : 2400 ~ 2483.5
Uplink Modulations	GSM & GPRS : GMSK EDGE : 8PSK WCDMA : QPSK 802.11b : DSSS 802.11a/g/n : OFDM Bluetooth : GFSK
Maximum AVG Conducted Power (Unit: dBm)	GSM850 : 33.36 GSM1900 : 30.61 WCDMA Band II : 23.26 802.11b : 18.35 802.11g : 12.71 802.11n HT20 (2.4GHz) : 12.33 802.11a : 13.50 802.11n HT20 (5GHz) : 10.50 802.11n HT40 (5GHz) : 10.49 Bluetooth : 8.61
Antenna Type	Fixed Internal Antenna
EUT Stage	Production Unit

Note:

1. This device does not support DTM (Dual Transfer Mode) capability.
2. 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:

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

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

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

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

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.

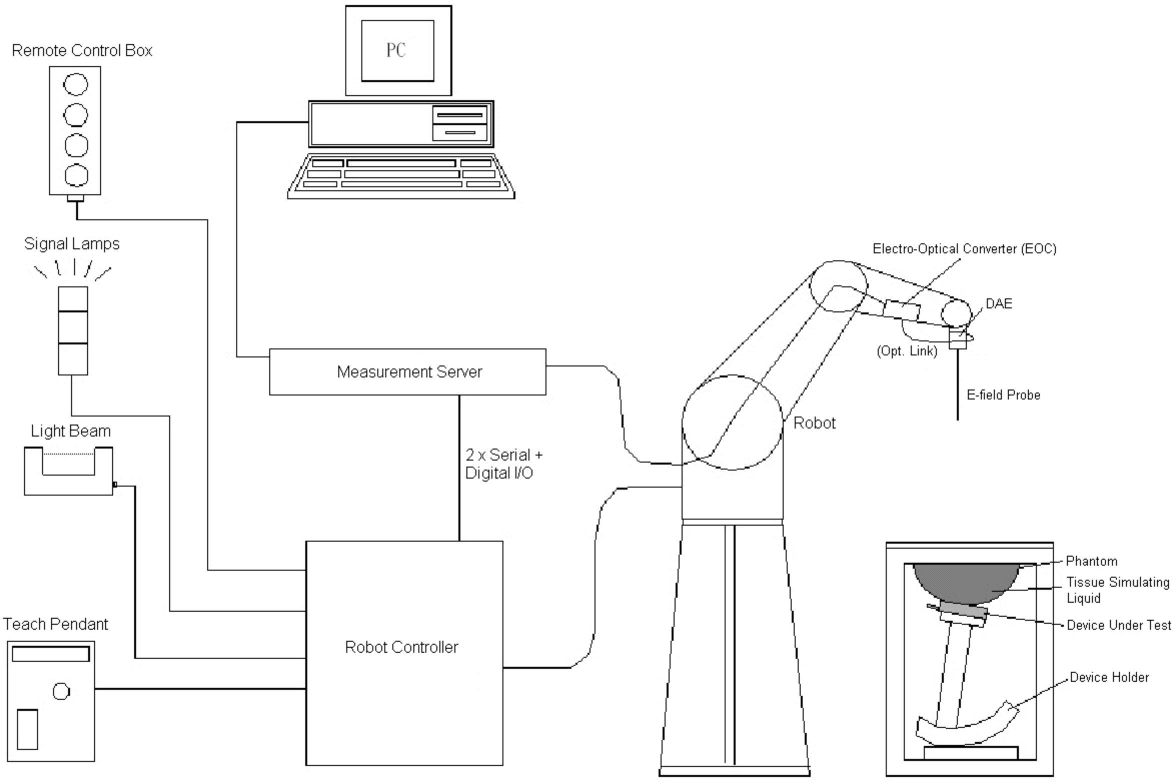


Fig-3.1 DASY System Setup

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

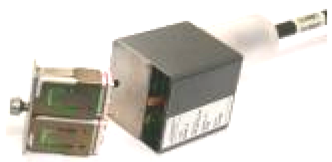
The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

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.

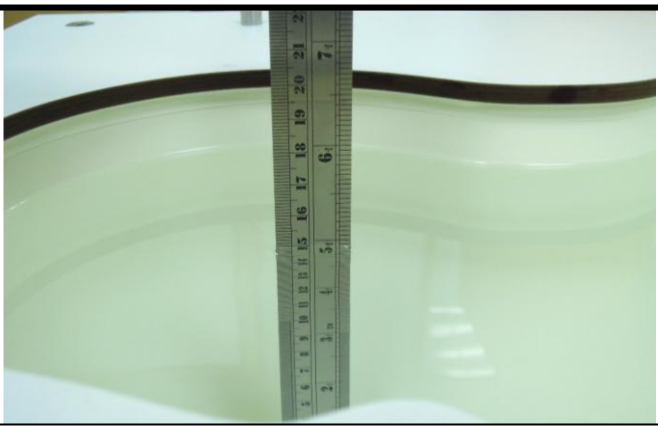
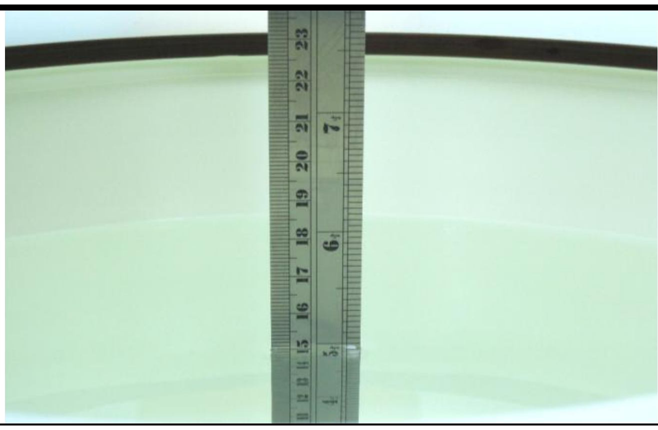
	

Photo of Liquid Height for Head Position	**Photo of Liquid Height for Body Position**

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				
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
900	41.5	39.4 ~ 43.6	0.97	0.92 ~ 1.02
1450	40.5	38.5 ~ 42.5	1.20	1.14 ~ 1.26
1640	40.3	38.3 ~ 42.3	1.29	1.23 ~ 1.35
1750	40.1	38.1 ~ 42.1	1.37	1.30 ~ 1.44
1800	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
1900	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2000	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2300	39.5	37.5 ~ 41.5	1.67	1.59 ~ 1.75
2450	39.2	37.2 ~ 41.2	1.80	1.71 ~ 1.89
2600	39.0	37.1 ~ 41.0	1.96	1.86 ~ 2.06
3500	37.9	36.0 ~ 39.8	2.91	2.76 ~ 3.06
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
For Body				
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
900	55.0	52.3 ~ 57.8	1.05	1.00 ~ 1.10
1450	54.0	51.3 ~ 56.7	1.30	1.24 ~ 1.37
1640	53.8	51.1 ~ 56.5	1.40	1.33 ~ 1.47
1750	53.4	50.7 ~ 56.1	1.49	1.42 ~ 1.56
1800	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
1900	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
2000	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
2300	52.9	50.3 ~ 55.5	1.81	1.72 ~ 1.90
2450	52.7	50.1 ~ 55.3	1.95	1.85 ~ 2.05
2600	52.5	49.9 ~ 55.1	2.16	2.05 ~ 2.27
3500	51.3	48.7 ~ 53.9	3.31	3.14 ~ 3.48
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	-
H900	0.2	-	0.2	1.4	58.0	-	40.2	-
H1450	-	43.3	-	0.6	-	-	56.1	-
H1640	-	45.8	-	0.5	-	-	53.7	-
H1750	-	47.0	-	0.4	-	-	52.6	-
H1800	-	44.5	-	0.3	-	-	55.2	-
H1900	-	44.5	-	0.2	-	-	55.3	-
H2000	-	44.5	-	0.1	-	-	55.4	-
H2300	-	44.9	-	0.1	-	-	55.0	-
H2450	-	45.0	-	0.1	-	-	54.9	-
H2600	-	45.1	-	0.1	-	-	54.8	-
H3500	-	8.0	-	0.2	-	20.0	71.8	-
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	-
B900	0.2	-	0.2	0.9	48.2	-	50.5	-
B1450	-	34.0	-	0.3	-	-	65.7	-
B1640	-	32.5	-	0.3	-	-	67.2	-
B1750	-	31.0	-	0.2	-	-	68.8	-
B1800	-	29.5	-	0.4	-	-	70.1	-
B1900	-	29.5	-	0.3	-	-	70.2	-
B2000	-	30.0	-	0.2	-	-	69.8	-
B2300	-	31.0	-	0.1	-	-	68.9	-
B2450	-	31.4	-	0.1	-	-	68.5	-
B2600	-	31.8	-	0.1	-	-	68.1	-
B3500	-	28.8	-	0.1	-	-	71.1	-
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.

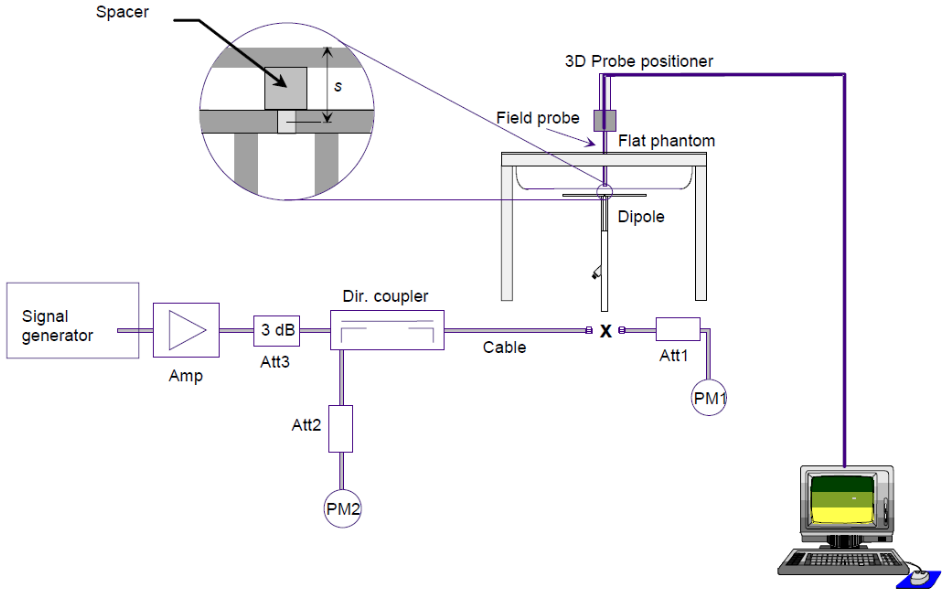


Fig-3.4 System Verification Setup

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.

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

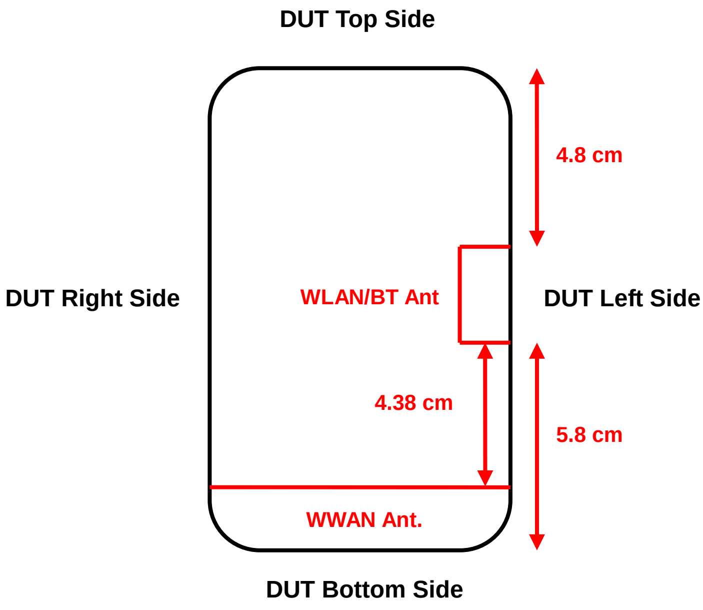
For WWAN SAR testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator 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. According to KDB 248227, the data rates for WLAN SAR testing were set in 1 Mbps for 802.11b, 6 Mbps for 802.11g/a, and MCS0 for 802.11n due to the highest RF output power.

The simultaneous transmission possibilities are listed as below.

Simultaneous Tx Combination	Configuration	Head (Voice / VoIP)	Body Worn (Voice / VoIP)	Hotspot (Data)
1	GSM850 (GSM/GPRS/EDGE) + WLAN/BT	V	V	V
2	GSM1900 (GSM/GPRS/EDGE) + WLAN/BT	V	V	V
3	WCDMA Band II (Voice/Data) + WLAN/BT	V	V	V

<Antenna Capabilities>



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

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**, 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.

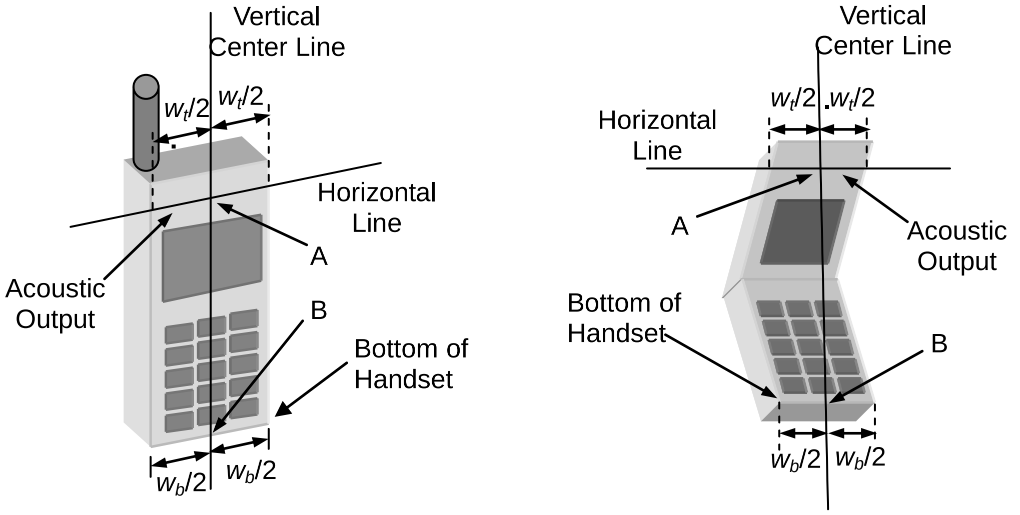


Fig-4.1 Illustration for Handset Vertical and Horizontal Reference Lines

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).

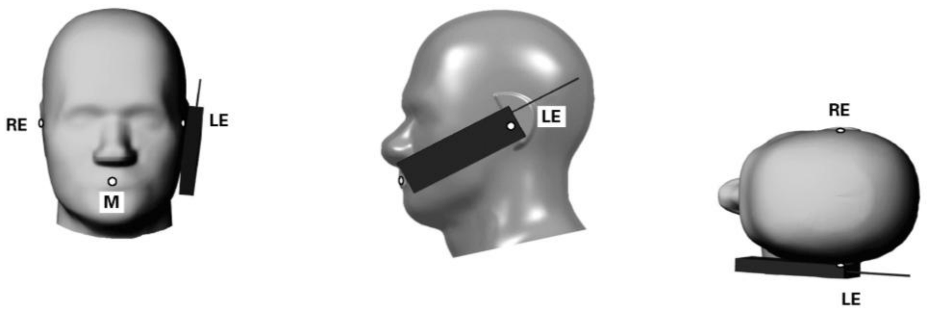


Fig-4.2 Illustration for Cheek Position

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).

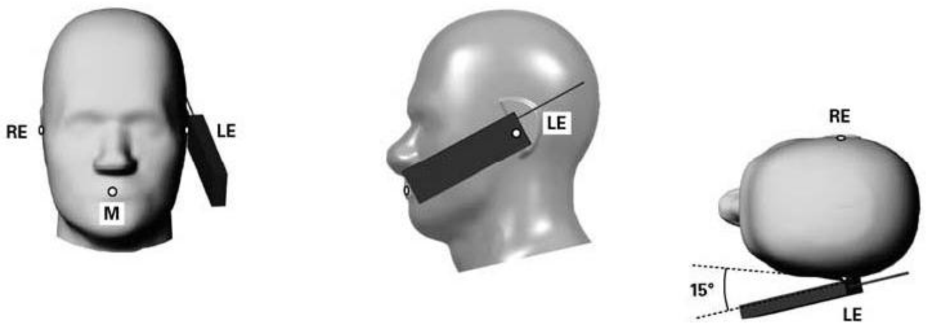


Fig-4.3 Illustration for Tilted Position

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 cm.

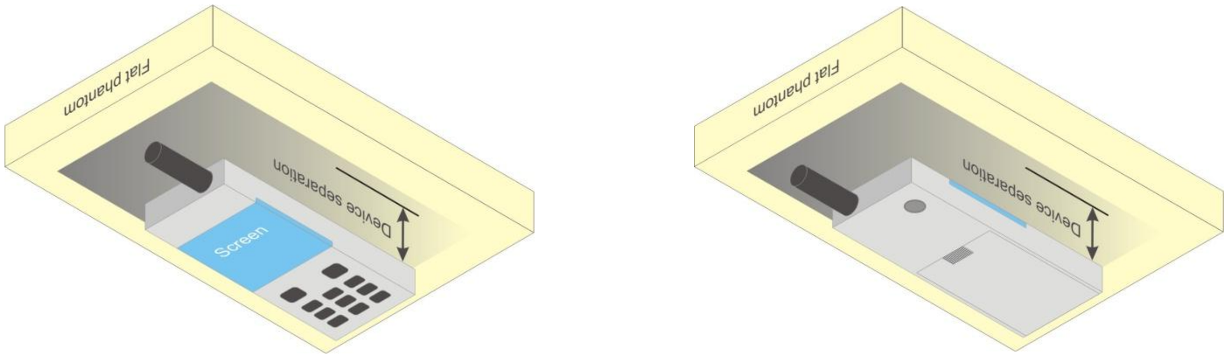


Fig-4.4 Illustration for Body Worn Position

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	21.2	0.886	42.111	0.90	41.5	-1.56	1.47	Apr. 07, 2012
H835	835	20.7	0.887	42.085	0.90	41.5	-2.56	-3.41	Apr. 20, 2012
B835	835	20.5	0.988	54.796	0.97	55.2	1.86	-0.73	Apr. 12, 2012
B835	835	20.7	0.988	54.796	0.97	55.2	1.86	-0.73	Apr. 20, 2012
H1900	1900	20.7	1.436	40.996	1.40	40.0	2.57	2.49	Apr. 07, 2012
H1900	1900	20.8	1.442	40.609	1.40	40.0	2.86	1.50	Apr. 20, 2012
B1900	1900	20.8	1.548	52.953	1.52	53.3	1.84	-0.65	Apr. 08, 2012
B1900	1900	20.8	1.533	53.731	1.52	53.3	0.86	0.81	Apr. 11, 2012
B1900	1900	20.8	1.545	53.003	1.52	53.3	1.64	-0.56	Apr. 20, 2012
H2450	2450	20.8	1.811	37.4	1.80	39.2	0.61	-4.59	Apr. 18, 2012
B2450	2450	20.9	1.975	50.958	1.95	52.7	1.28	-3.31	Apr. 18, 2012
H5G	5200	21.1	4.535	36.821	4.66	36.0	-2.68	2.28	Apr. 05, 2012
H5G	5200	20.7	4.642	36.132	4.66	36.0	-0.39	0.37	Apr. 18, 2012
B5G	5200	20.8	5.24	51.1	5.30	49.0	-1.13	4.29	Apr. 10, 2012
B5G	5200	20.8	5.182	51.045	5.30	49.0	-2.23	4.17	Apr. 19, 2012
H5G	5500	21.1	4.872	36.29	4.96	35.6	-1.77	1.94	Apr. 05, 2012
H5G	5500	20.7	5.007	35.63	4.96	35.6	0.95	0.08	Apr. 18, 2012
B5G	5500	20.8	5.75	50.6	5.65	48.6	1.77	4.12	Apr. 10, 2012
B5G	5500	20.8	5.69	50.618	5.65	48.6	0.71	4.15	Apr. 19, 2012
H5G	5800	21.1	5.206	35.773	5.27	35.3	-1.21	1.34	Apr. 05, 2012
H5G	5800	20.7	5.354	35.061	5.27	35.3	1.59	-0.68	Apr. 18, 2012
B5G	5800	20.8	6.23	49.9	6.00	48.2	3.83	3.53	Apr. 10, 2012
B5G	5800	20.8	6.155	49.875	6.00	48.2	2.58	3.48	Apr. 19, 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
Apr. 07, 2012	835	9.52	2.40	9.60	0.84	4d092	3650	1277
Apr. 20, 2012	835	9.52	2.39	9.56	0.42	4d092	3650	1277
Apr. 12, 2012	835	9.65	2.20	8.80	-8.81	4d092	3800	905
Apr. 20, 2012	835	9.65	2.57	10.28	6.53	4d092	3650	1277
Apr. 07, 2012	1900	38.90	9.78	39.12	0.57	5d036	3650	1277
Apr. 20, 2012	1900	38.90	10.40	41.60	6.94	5d036	3650	1277
Apr. 08, 2012	1900	38.90	10.30	41.20	5.91	5d036	3650	1277
Apr. 11, 2012	1900	38.90	10.20	40.80	4.88	5d036	3800	905
Apr. 20, 2012	1900	38.90	10.00	40.00	2.83	5d036	3650	1277
Apr. 18, 2012	2450	52.90	13.40	53.60	1.32	737	3590	861
Apr. 18, 2012	2450	50.00	11.70	46.80	-6.40	737	3590	861
Apr. 05, 2012	5200	79.60	7.52	75.20	-5.53	1018	3590	861
Apr. 18, 2012	5200	79.60	8.19	81.90	2.89	1018	3590	861
Apr. 10, 2012	5200	72.70	7.20	72.00	-0.96	1018	3650	1277
Apr. 19, 2012	5200	72.70	6.75	67.50	-7.15	1018	3590	861
Apr. 05, 2012	5500	84.70	8.21	82.10	-3.07	1018	3590	861
Apr. 18, 2012	5500	84.70	8.43	84.30	-0.47	1018	3590	861
Apr. 10, 2012	5500	78.30	8.23	82.30	5.11	1018	3650	1277
Apr. 19, 2012	5500	78.30	7.47	74.70	-4.60	1018	3590	861
Apr. 05, 2012	5800	78.60	7.83	78.30	-0.38	1018	3590	861
Apr. 18, 2012	5800	78.60	7.72	77.20	-1.78	1018	3590	861
Apr. 10, 2012	5800	73.40	7.04	70.40	-4.09	1018	3650	1277
Apr. 19, 2012	5800	73.40	7.65	76.50	4.22	1018	3590	861

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	GSM850			GSM1900		
Channel	128	189	251	512	661	810
Frequency (MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
Maximum Burst-Averaged Output Power						
GSM (GMSK, 1 slot)	33.36	33.01	33.11	30.55	30.27	30.61
GPRS 8 (GMSK, 1 slot)	33.35	32.98	33.18	30.51	30.16	30.52
GPRS 10 (GMSK, 2 slot)	30.39	30.17	30.07	29.57	29.54	29.59
EDGE 8 (8PSK, 1 slot)	26.59	26.51	26.47	26.28	26.23	26.15
EDGE 10 (8PSK, 2 slot)	26.74	26.68	26.60	26.40	26.30	26.21
Maximum Frame-Averaged Output Power						
GSM (GMSK, 1 slot)	24.36	24.01	24.11	21.55	21.27	21.61
GPRS 8 (GMSK, 1 slot)	24.35	23.98	24.18	21.51	21.16	21.52
GPRS 10 (GMSK, 2 slot)	24.39	24.17	24.07	23.57	23.54	23.59
EDGE 8 (8PSK, 1 slot)	17.59	17.51	17.47	17.28	17.23	17.15
EDGE 10 (8PSK, 2 slot)	20.74	20.68	20.60	20.40	20.30	20.21

Note: VOIP and body SAR testing for GSM/GPRS/EDGE was performed on the maximum frame-averaged power mode.

Band	WCDMA Band II			-		
Channel	9262	9400	9538	-	-	-
Frequency (MHz)	1852.4	1880.0	1907.6	-	-	-
RMC 12.2K	23.12	23.26	23.13	-	-	-
HSDPA Subtest-1	22.37	22.62	22.56	-	-	-
HSDPA Subtest-2	22.35	22.62	22.57	-	-	-
HSDPA Subtest-3	21.53	21.72	21.69	-	-	-
HSDPA Subtest-4	21.55	21.75	21.65	-	-	-
HSUPA Subtest-1	21.72	22.28	22.07	-	-	-
HSUPA Subtest-2	19.14	18.90	19.15	-	-	-
HSUPA Subtest-3	20.22	20.27	20.25	-	-	-
HSUPA Subtest-4	19.12	19.06	19.17	-	-	-
HSUPA Subtest-5	22.31	22.47	22.42	-	-	-

Band	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Average Power	18.15	18.35	18.14	12.60	12.71	12.63

Band	802.11n (HT20)			-		
Channel	1	6	11	-	-	-
Frequency (MHz)	2412	2437	2462	-	-	-
Average Power	12.12	12.33	12.22	-	-	-

Band	802.11a							
Channel	36	40	44	48	52	56	60	64
Frequency (MHz)	5180	5200	5220	5240	5260	5280	5300	5320
Average Power	13.50	13.01	13.17	13.06	13.03	12.70	12.74	13.38

Band	802.11a							
Channel	100	104	108	112	116	132	136	140
Frequency (MHz)	5500	5520	5540	5560	5580	5660	5680	5700
Average Power	12.69	13.11	13.06	12.93	12.67	12.88	12.79	13.34

Band	802.11a							
Channel	149	153	157	161	-	-	-	-
Frequency (MHz)	5745	5765	5785	5805	-	-	-	-
Average Power	12.55	12.71	12.80	12.93	-	-	-	-

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	10.41	10.21	10.02	9.85	9.93	9.68	9.64	10.50

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	9.99	9.89	10.12	10.20	9.71	9.71	9.73	10.43

Band	802.11n (HT20)							
Channel	149	153	157	161	-	-	-	-
Frequency (MHz)	5745	5765	5785	5805	-	-	-	-
Average Power	9.59	9.66	9.81	10.01	-	-	-	-

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	10.30	10.01	9.61	9.72	9.72	10.49	9.87	9.98

4.6 SAR Testing Results

4.6.1 SAR Results for Head

Plot No.	Band	Mode	Test Position	Channel	EUT Sample	SAR-1g (W/kg)
1	GSM850	GSM	Right Cheek	128	1	0.55
2	GSM850	GSM	Right Tilted	128	1	0.346
3	GSM850	GSM	Left Cheek	128	1	0.534
4	GSM850	GSM	Left Tilted	128	1	0.349
5	GSM850	GPRS10 (VOIP)	Right Cheek	128	1	**0.638**
61	GSM850	GPRS10 (VOIP)	Right Cheek	128	2	0.551
7	GSM1900	GSM	Right Cheek	810	1	0.302
8	GSM1900	GSM	Right Tilted	810	1	0.114
9	GSM1900	GSM	Left Cheek	810	1	0.331
10	GSM1900	GSM	Left Tilted	810	1	0.148
11	GSM1900	GPRS10 (VOIP)	Left Cheek	810	1	**0.601**
62	GSM1900	GPRS10 (VOIP)	Left Cheek	810	2	0.446
13	WCDMA II	RMC12.2K	Right Cheek	9400	1	0.44
14	WCDMA II	RMC12.2K	Right Tilted	9400	1	0.168
15	WCDMA II	RMC12.2K	Left Cheek	9400	1	**0.591**
16	WCDMA II	RMC12.2K	Left Tilted	9400	1	0.272
63	WCDMA II	RMC12.2K	Left Cheek	9400	2	0.464
301	802.11b	-	Right Cheek	6	1	0.144
302	802.11b	-	Right Tilted	6	1	0.038
303	802.11b	-	Left Cheek	6	1	**0.253**
304	802.11b	-	Left Tilted	6	1	0.031
365	802.11b	-	Left Cheek	6	2	0.246
318	802.11a	-	Right Cheek	36	1	0.00581
319	802.11a	-	Right Tilted	36	1	0.00106
320	802.11a	-	Left Cheek	36	1	**0.074**
321	802.11a	-	Left Tilted	36	1	0.00405
369	802.11a	-	Left Cheek	36	2	0.019
323	802.11a	-	Right Cheek	64	1	0.039
324	802.11a	-	Right Tilted	64	1	0.00593
325	802.11a	-	Left Cheek	64	1	**0.064**
326	802.11a	-	Left Tilted	64	1	0.00366
370	802.11a	-	Left Cheek	64	2	0.024
328	802.11a	-	Right Cheek	140	1	**0.033**
329	802.11a	-	Right Tilted	140	1	0.00363
330	802.11a	-	Left Cheek	140	1	0.00637
331	802.11a	-	Left Tilted	140	1	0.0044
371	802.11a	-	Right Cheek	140	2	0.015
313	802.11a	-	Right Cheek	161	1	N/A
314	802.11a	-	Right Tilted	161	1	0.00116
315	802.11a	-	Left Cheek	161	1	0.00113
316	802.11a	-	Left Tilted	161	1	**0.00863**
368	802.11a	-	Left Tilted	161	2	0.00247

Note:

1. Since GPRS/EDGE, WCDMA and WLAN of this device supports VOIP capability through 3rd party apps software, we have evaluated data mode for head SAR.
2. According to KDB 248227, the SAR testing for 802.11g/n is not required since the maximum power of 802.11g/n is less 1/4 dB higher than maximum power of 802.11b.
3. According to KDB 248227, the SAR testing for 802.11n is not required since the maximum power of 802.11n is less 1/4 dB higher than maximum power of 802.11a.

4. The SAR value for some test positions is too low to be measured. Therefore, only "N/A" was presented in the table.

4.6.2 SAR Results for Body

<Body Worn Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	EUT Sample	SAR-1g (W/kg)
26	GSM850	GPRS10 (VOIP)	Front Face	1	128	1	0.648
27	GSM850	GPRS10 (VOIP)	Rear Face	1	128	1	**0.698**
67	GSM850	GPRS10 (VOIP)	Rear Face	1	128	2	0.671
39	GSM1900	GPRS10 (VOIP)	Front Face	1	810	1	**1.01**
40	GSM1900	GPRS10 (VOIP)	Rear Face	1	810	1	0.791
41	GSM1900	GPRS10 (VOIP)	Front Face	1	512	1	0.906
42	GSM1900	GPRS10 (VOIP)	Front Face	1	661	1	0.928
71	GSM1900	GPRS10 (VOIP)	Front Face	1	810	2	0.946
72	GSM1900	GPRS10 (VOIP)	Front Face	1	512	2	0.921
73	GSM1900	GPRS10 (VOIP)	Front Face	1	661	2	0.859
52	WCDMA II	RMC12.2K	Front Face	1	9400	1	0.894
53	WCDMA II	RMC12.2K	Rear Face	1	9400	1	0.907
54	WCDMA II	RMC12.2K	Front Face	1	9262	1	**0.928**
55	WCDMA II	RMC12.2K	Front Face	1	9538	1	0.848
59	WCDMA II	RMC12.2K	Rear Face	1	9262	1	0.806
60	WCDMA II	RMC12.2K	Rear Face	1	9538	1	0.823
77	WCDMA II	RMC12.2K	Front Face	1	9262	2	0.682
311	802.11b	-	Front Face	1	6	1	0.039
312	802.11b	-	Rear Face	1	6	1	**0.077**
367	802.11b	-	Rear Face	1	6	2	0.071
347	802.11a	-	Front Face	1	36	1	0.029
348	802.11a	-	Rear Face	1	36	1	**0.046**
375	802.11a	-	Rear Face	1	36	2	0.013
355	802.11a	-	Front Face	1	64	1	0.03
356	802.11a	-	Rear Face	1	64	1	**0.063**
377	802.11a	-	Rear Face	1	64	2	0.016
363	802.11a	-	Front Face	1	140	1	0.027
364	802.11a	-	Rear Face	1	140	1	**0.034**
379	802.11a	-	Rear Face	1	140	2	0.02
339	802.11a	-	Front Face	1	161	1	**0.041**
340	802.11a	-	Rear Face	1	161	1	0.026
373	802.11a	-	Front Face	1	161	2	0.014

Note:

1. Since GPRS/EDGE, WCDMA and WLAN of this device supports VOIP capability through 3rd party apps software, we have evaluated data mode for body worn mode.
2. According to KDB 248227, the SAR testing for 802.11g/n is not required since the maximum power of 802.11g/n is less 1/4 dB higher than maximum power of 802.11b.
3. According to KDB 248227, the SAR testing for 802.11n is not required since the maximum power of 802.11n is less 1/4 dB higher than maximum power of 802.11a.

<Hotspot Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	EUT Sample	SAR-1g (W/kg)
18	GSM850	GPRS10	Front Face	1	128	1	0.659
19	GSM850	GPRS10	Rear Face	1	128	1	0.896
20	GSM850	GPRS10	Bottom Side	1	128	1	0.14
21	GSM850	GPRS10	Left Side	1	128	1	0.614
22	GSM850	GPRS10	Right Side	1	128	1	0.619
23	GSM850	GPRS10	Rear Face	1	189	1	**0.917**
24	GSM850	GPRS10	Rear Face	1	251	1	0.823
64	GSM850	GPRS10	Rear Face	1	189	2	0.892
65	GSM850	GPRS10	Rear Face	1	128	2	0.864
66	GSM850	GPRS10	Rear Face	1	251	2	0.767
31	GSM1900	GPRS10	Front Face	1	810	1	**1.02**
32	GSM1900	GPRS10	Rear Face	1	810	1	0.81
33	GSM1900	GPRS10	Bottom Side	1	810	1	0.857
34	GSM1900	GPRS10	Left Side	1	810	1	0.153
35	GSM1900	GPRS10	Right Side	1	810	1	0.16
44	GSM1900	GPRS10	Front Face	1	512	1	0.899
45	GSM1900	GPRS10	Front Face	1	661	1	0.929
36	GSM1900	GPRS10	Rear Face	1	512	1	0.62
37	GSM1900	GPRS10	Rear Face	1	661	1	0.687
46	GSM1900	GPRS10	Bottom Side	1	512	1	0.757
47	GSM1900	GPRS10	Bottom Side	1	661	1	0.837
68	GSM1900	GPRS10	Front Face	1	810	2	0.948
69	GSM1900	GPRS10	Front Face	1	512	2	0.84
70	GSM1900	GPRS10	Front Face	1	661	2	0.808
44	WCDMA II	RMC12.2K	Front Face	1	9400	1	0.904
45	WCDMA II	RMC12.2K	Rear Face	1	9400	1	0.776
46	WCDMA II	RMC12.2K	Bottom Side	1	9400	1	1.06
47	WCDMA II	RMC12.2K	Left Side	1	9400	1	0.166
48	WCDMA II	RMC12.2K	Right Side	1	9400	1	0.181
49	WCDMA II	RMC12.2K	Front Face	1	9262	1	0.908
50	WCDMA II	RMC12.2K	Front Face	1	9538	1	0.87
57	WCDMA II	RMC12.2K	Bottom Side	1	9262	1	**1.07**
58	WCDMA II	RMC12.2K	Bottom Side	1	9538	1	1.05
74	WCDMA II	RMC12.2K	Bottom Side	1	9262	2	0.927
75	WCDMA II	RMC12.2K	Bottom Side	1	9400	2	0.96
76	WCDMA II	RMC12.2K	Bottom Side	1	9538	2	0.924

Plot No.	Band	Test Position	Separation Distance (cm)	Channel	EUT Sample	SAR-1g (W/kg)
305	802.11b	Front Face	1	6	1	0.04
306	802.11b	Rear Face	1	6	1	0.08
307	802.11b	Left Side	1	6	1	**0.091**
366	802.11b	Left Side	1	6	2	0.073
341	802.11a	Front Face	1	36	1	0.00257
342	802.11a	Rear Face	1	36	1	**0.02**
343	802.11a	Left Side	1	36	1	N/A
374	802.11a	Rear Face	1	36	2	0.016
349	802.11a	Front Face	1	64	1	0.00344
350	802.11a	Rear Face	1	64	1	**0.033**
351	802.11a	Left Side	1	64	1	0.029
376	802.11a	Rear Face	1	64	2	0.019
357	802.11a	Front Face	1	140	1	0.00232
358	802.11a	Rear Face	1	140	1	**0.024**
359	802.11a	Left Side	1	140	1	0.018
378	802.11a	Rear Face	1	140	2	0.021
333	802.11a	Front Face	1	161	1	**0.00822**
334	802.11a	Rear Face	1	161	1	0.0000173
335	802.11a	Left Side	1	161	1	N/A
372	802.11a	Front Face	1	161	2	0.00512

Note:

1. According to KDB 248227, the SAR testing for 802.11g/n is not required since the maximum power of 802.11g/n is less 1/4 dB higher than maximum power of 802.11b.
2. According to KDB 248227, the SAR testing for 802.11n is not required since the maximum power of 802.11n is less 1/4 dB higher than maximum power of 802.11a.
3. The SAR value for some test positions is too low to be measured. Therefore, only “N/A” was presented in the table.

Test Engineer： Eli Hsu, Match Tsui, and Sam Onn

4.6.3 Simultaneous Multi-band Transmission Evaluation

<Simultaneous Transmission Configuration 1>

Position (Head)	GSM850 (Voice / VOIP)	802.11a/b/g/n (Data)	Max. SAR Summation
Right Cheek	0.638	0.144	0.782
Right Tilted	0.346	0.038	0.384
Left Cheek	0.534	0.253	0.787
Left Tilted	0.349	0.031	0.38
Position (Body Worn)	**GSM850 (Voice / VOIP)**	**802.11a/b/g/n (Data)**	**Max. SAR Summation**
Front Face	0.648	0.041	0.689
Rear Face	0.698	0.077	0.775
Position (Hotspot)	**GSM850 (Data)**	**802.11a/b/g/n (Data)**	**Max. SAR Summation**
Front Face	0.659	0.04	0.699
Rear Face	0.917	0.08	0.997
Left Side	0.614	0.091	0.705
Right Side	0.619	0	0.619
Top Side	0	0	0
Bottom Side	0.14	0	0.14

<Simultaneous Transmission Configuration 2>

Position (Head)	GSM1900 (Voice / VOIP)	802.11a/b/g/n (Data)	Max. SAR Summation
Right Cheek	0.302	0.144	0.446
Right Tilted	0.114	0.038	0.152
Left Cheek	0.601	0.253	0.854
Left Tilted	0.148	0.031	0.179
Position (Body Worn)	**GSM1900 (Voice / VOIP)**	**802.11a/b/g/n (Data)**	**Max. SAR Summation**
Front Face	1.01	0.041	1.051
Rear Face	0.791	0.077	0.868
Position (Hotspot)	**GSM1900 (Data)**	**802.11a/b/g/n (Data)**	**Max. SAR Summation**
Front Face	1.02	0.04	1.06
Rear Face	0.81	0.08	0.89
Left Side	0.153	0.091	0.244
Right Side	0.16	0	0.16
Top Side	0	0	0
Bottom Side	0.857	0	0.857

<Simultaneous Transmission Configuration 3>

Position (Head)	WCDMA Band II (Voice / VOIP)	802.11a/b/g/n (Data)	Max. SAR Summation
Right Cheek	0.44	0.144	0.584
Right Tilted	0.168	0.038	0.206
Left Cheek	0.591	0.253	0.844
Left Tilted	0.272	0.031	0.303
Position (Body Worn)	**WCDMA Band II (Voice / VOIP)**	**802.11a/b/g/n (Data)**	**Max. SAR Summation**
Front Face	0.928	0.041	0.969
Rear Face	0.907	0.077	0.984
Position (Hotspot)	**WCDMA Band II (Data)**	**802.11a/b/g/n (Data)**	**Max. SAR Summation**
Front Face	0.908	0.04	0.948
Rear Face	0.776	0.08	0.856
Left Side	0.166	0.091	0.257
Right Side	0.181	0	0.181
Top Side	0	0	0
Bottom Side	1.07	0	1.07

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 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. 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	4d092	Jun. 22, 2011	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	3590	Feb. 23, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3650	Oct. 26, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	861	Aug. 29, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	905	Jun. 24, 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-1485	N/A	N/A
SAM Phantom	SPEAG	QD000P40CD	TP-1202	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	MY46107999	Mar. 24, 2012	Annual
Signal Generator	Agilent	E8257C	MY43320668	Dec. 20, 2011	Annual
Power Meter	Anritsu	ML2487A	6K00001571	May 25, 2011	Annual
Power Sensor	Anritsu	MA2491A	030954	May 25, 2011	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	0.6	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 %	∞
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

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)	Vi
Measurement System						
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 %	∞
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 %	30
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid Permittivity (Meas.)	5.0	Normal	1	0.6	± 3.0 %	30
Combined Standard Uncertainty					± 13.4 %	
Expanded Uncertainty (K=2)					**± 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.

Copies of accreditation and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site. 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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Appendix A. SAR Plots of System Verification

The plots for system verification are shown as follows.

Appendix B. SAR Plots of SAR Measurement

The plots for SAR measurement are shown as follows.

Appendix C. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.

Appendix D. Photographs of EUT and Setup