FCC SAR Test Report

Report No.	:	**SA121012C09**
Applicant	:	**Kyocera Communications, Inc.**
Address	:	**8611 Balboa Avenue, San Diego, CA 92123**
Product	:	**PDA Phone**
FCC ID	:	**V65E6710**
Brand	:	**Kyocera**
Model No.	:	**E6710**
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 D05 v01 / KDB 941225 D06 v01**
Date of Testing	:	**Oct. 23, 2012 ~ Dec. 04, 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.

Prepared By : Evonne Liu
Evonne Liu / Specialist

Approved By : Roy Wu
Roy Wu / Manager

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TAF Testing Laboratory 2021

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Release Control Record

Issue No.	Reason for Change	Date Issued
R01	Original release	Dec. 17, 2012

1. Summary of Maximum SAR Value

Mode / Band	Test Position	SAR-1g (W/kg)
CDMA2000 BC0	Head	0.477
	Body Worn (1 cm Gap)	0.541
	Hotspot Mode (1 cm Gap)	0.554
CDMA2000 BC1	Head	0.772
	Body Worn (1 cm Gap)	0.445
	Hotspot Mode (1 cm Gap)	0.47
CDMA2000 BC10	Head	0.666
	Body Worn (1 cm Gap)	0.653
	Hotspot Mode (1 cm Gap)	0.738
LTE Band 25	Head	0.938
	Body Worn (1 cm Gap)	0.725
	Hotspot Mode (1 cm Gap)	0.843
WLAN 2.4GHz	Head	0.151
	Body Worn (1 cm Gap)	0.076
	Hotspot Mode (1 cm Gap)	0.082
Bluetooth	Head	N/A
	Body Worn (1 cm Gap)	N/A
	Hotspot Mode (1 cm Gap)	N/A
Multi-band SAR	Head	1.07
	Body Worn (1 cm Gap)	Not Required
	Hotspot Mode (1 cm Gap)	Not Required

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	PDA Phone
FCC ID	V65E6710
Brand Name	Kyocera
Model Name	E6710
HW Version	0101
SW Version	0401NS
Tx Frequency Bands (Unit: MHz)	CDMA BC0 : 824.7 ~ 848.31 CDMA BC1 : 1851.25 ~ 1908.75 CDMA BC10 : 817.9 ~ 823.1 LTE Band 25 : 1852.5 ~ 1912.5 WLAN : 2412 ~ 2462 Bluetooth : 2402 ~ 2480
Uplink Modulations	CDMA : QPSK LTE : QPSK, 16QAM 802.11b : DSSS 802.11g/n : OFDM Bluetooth : GFSK
Maximum AVG Conducted Power (Unit: dBm)	CDMA BC0 : 24.71 CDMA BC1 : 24.58 CDMA BC10 : 24.71 LTE Band 25 : 23.75 802.11b : 16.36 802.11g : 14.30 802.11n HT20 : 14.41 Bluetooth : 1.34
Antenna Type	Fixed Internal Antenna
EUT Stage	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.

List of Accessory:

Battery	**Brand Name**	Kyocera
	Model Name	SCP-51LBPS
	Power Rating	3.8Vdc, 2500mAh
	Type	Li-ion
Earphone	**Brand Name**	GALIENELECTRON
	Model Name	HF-KYO-2D-01
	Signal Line Type	1.4 meter non-shielded cable without ferrite core

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.

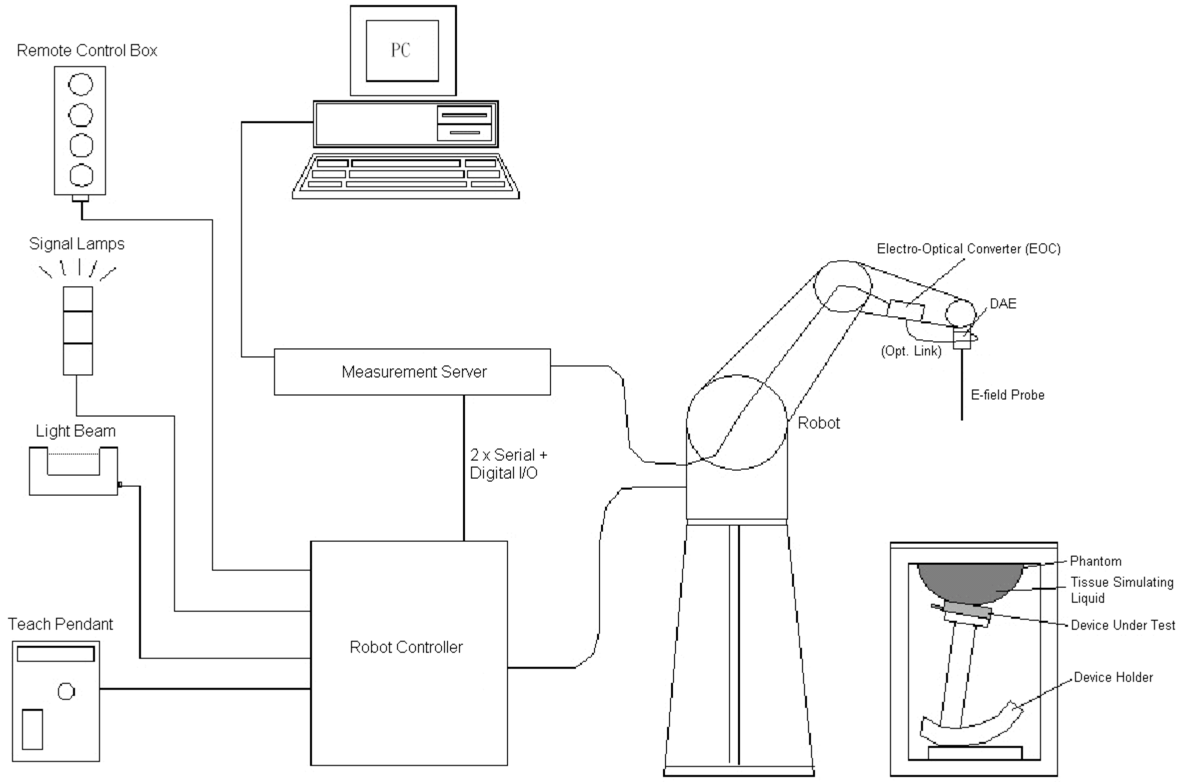


Fig-3.1 DASY System Setup

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**

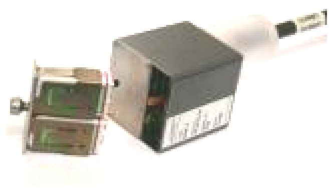
3.2.2 Probes

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.

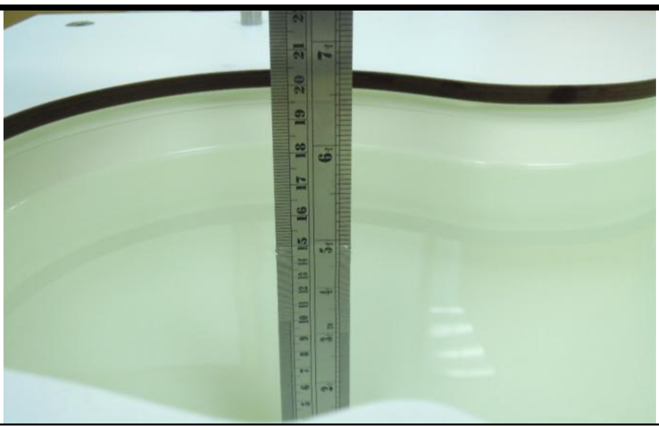


Photo of Liquid Height for Head Position

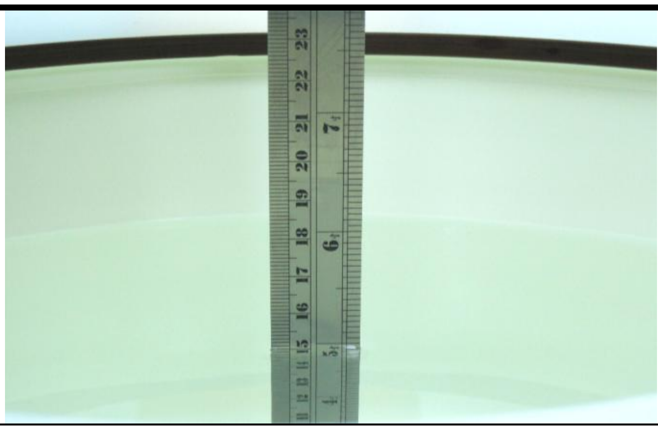


Photo of Liquid Height for Body Position

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		
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
		For Body		
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

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	-
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	-
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.

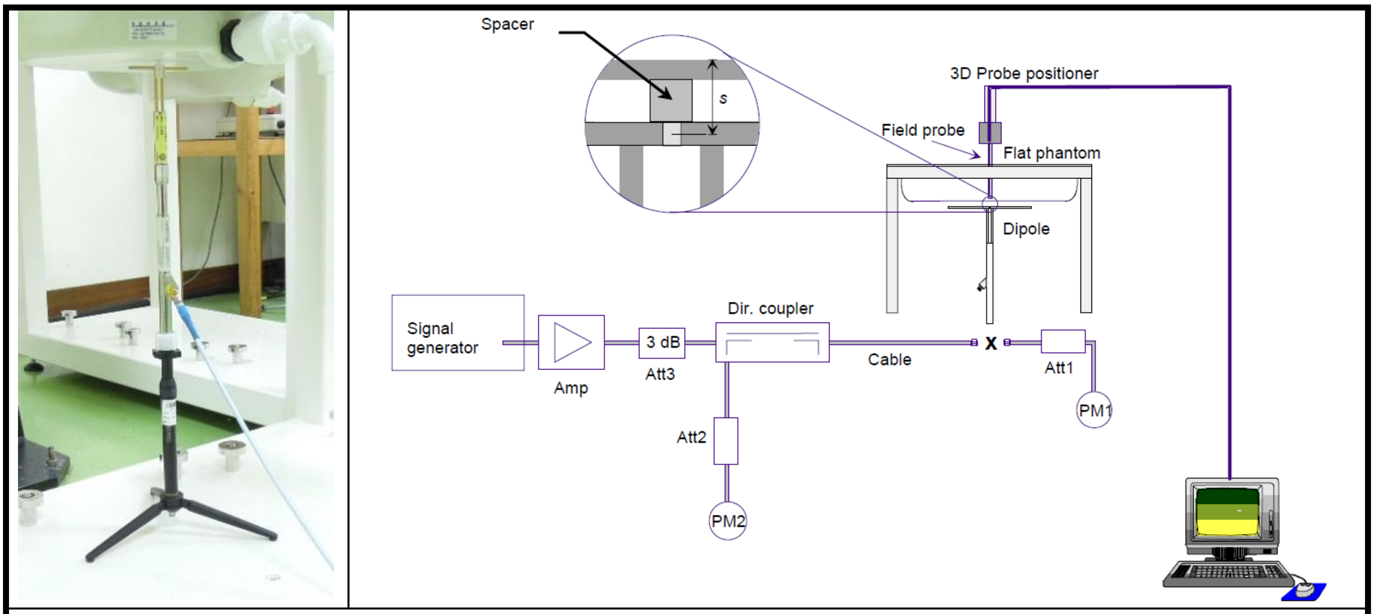


Fig-3.4 System Verification Setup

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

The EUT is a voice/data transmitter device that contains two WWAN transmitters (one is for CDMA2000, and the other is for LTE). Confirming the LTE transmitter follows 3GPP standards, is category 3, BW 5/10 MHz, band 25, 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

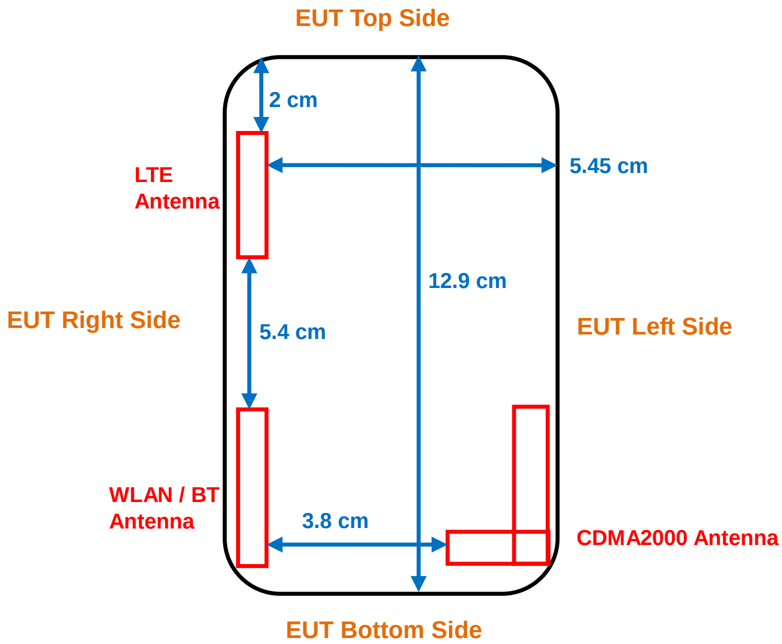
Note: MPR is according to the standard and implemented in the circuit (mandatory).

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.

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.

<Antenna Location>



<EUT Rear View>

According to KDB 941225 D06, this device supports WiFi hotspot capability and its overall device length and width are larger than 9 cm x 5 cm, so hotspot SAR was tested under 10 mm for the surfaces / edges where a transmitting antenna is within 25 mm from the surface / edge. Since the SAR is required for antenna located within 2.5 cm from edge, SAR testing for each antenna is listed as below.

CDMA Antenna : Front Face, Rear Face, Left Side, Bottom Side
LTE Antenna : Front Face, Rear Face, Right Side, Top Side
WLAN / BT Antenna : Front Face, Rear Face, Right Side, Bottom Side

The simultaneous transmission possibilities are listed as below.

Simultaneous TX Combination	Configuration	Head (Voice / VoIP)	Body Worn (Voice / VoIP)	Hotspot (Data)
1	CDMA2000 BC0 (Voice / Data) + WLAN / BT (Data)	Yes	Yes	Yes
2	CDMA2000 BC1 (Voice / Data) + WLAN / BT (Data)	Yes	Yes	Yes
3	CDMA2000 BC10 (Voice / Data) + WLAN / BT (Data)	Yes	Yes	Yes
4	LTE 25 (Data) + WLAN / BT (Data)	Yes	Yes	Yes
5	CDMA2000 BC0 (Voice) + LTE 25 (Data) + WLAN / BT (Data)	Yes	Yes	Yes
6	CDMA2000 BC1 (Voice) + LTE 25 (Data) + WLAN / BT (Data)	Yes	Yes	Yes
7	CDMA2000 BC10 (Voice) + LTE 25 (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.

For WWAN SAR testing, the EUT was linked and controlled by base station emulator (Agilent E5515C). 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 CDMA, SAR is tested under 1xRTT mode using RC3 with the EUT configured to transmit at full rate using Loopback Service Option SO55 on head position, and RC3 with the EUT configured using TDSO/SO32, to transmit at full rate on FCH with all other code channels disabled on body position. SAR for RC1 is not required when the maximum power is less than 1/4 dB higher than RC3. SAR for multiple code channels (FCH+SCH_n) is not required when the maximum power is less than 1/4 dB higher than that measured with FCH only. SAR for EVDO Rev.0 is not required when the maximum power is less than 1/4 dB higher than RC3 (1xRTT). SAR for EVDO Rev.A is not required when the maximum power is less than Rev.0 or less than 1/4 dB higher than RC3. The steps for system simulator (Agilent E5515C) setup are as below.

1. Set the System ID and Network ID
2. Set the Cell Band and connecting Channel
3. Set the power control to All Up Bits
4. Press “Originate Call” button

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. According to KDB 248227 D01, WLAN SAR should tested at the lowest data rate, and testing at higher data rate is not required when the maximum average output power is less than 1/4 dB higher than those measured at the lowest data rate. Since the WLAN power at lowest data rate has highest output power, WLAN SAR for this device was performed at the lowest data rate as set in 1 Mbps for 802.11b. This RF signal utilized in SAR measurement has almost 100% duty cycle, and the duty factor is 1 during WLAN SAR testing.

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.

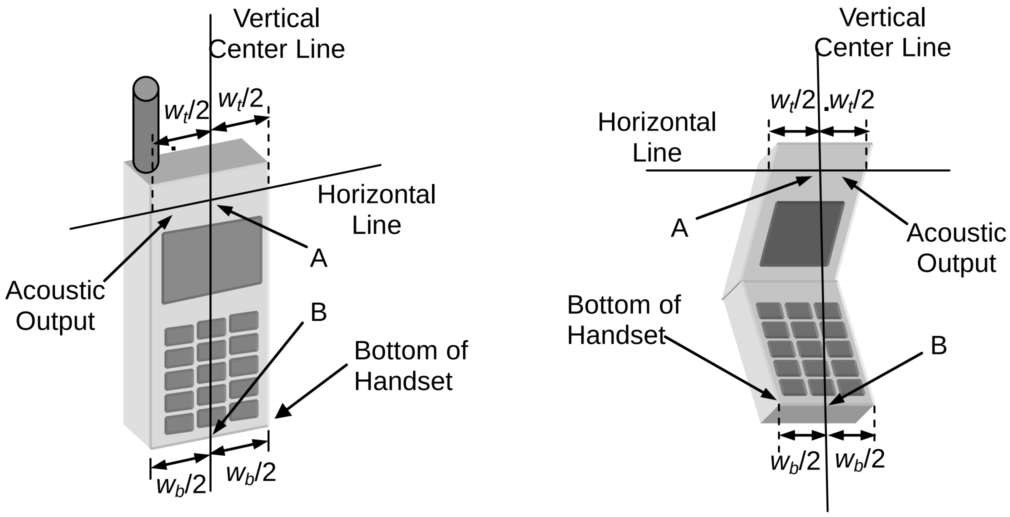


Fig-4.1 Illustration for Handset Vertical and Horizontal Reference Lines

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).

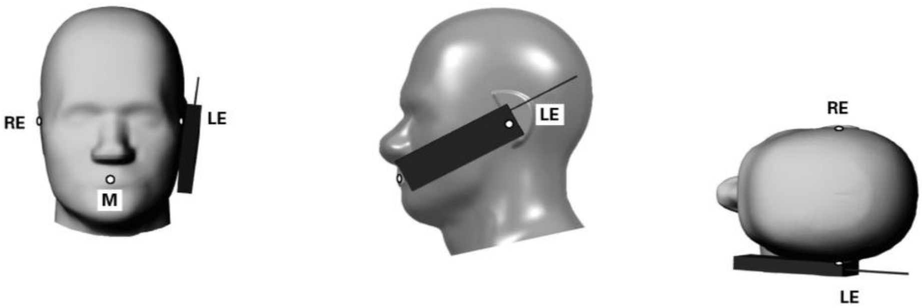


Fig-4.2 Illustration for Cheek Position

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).

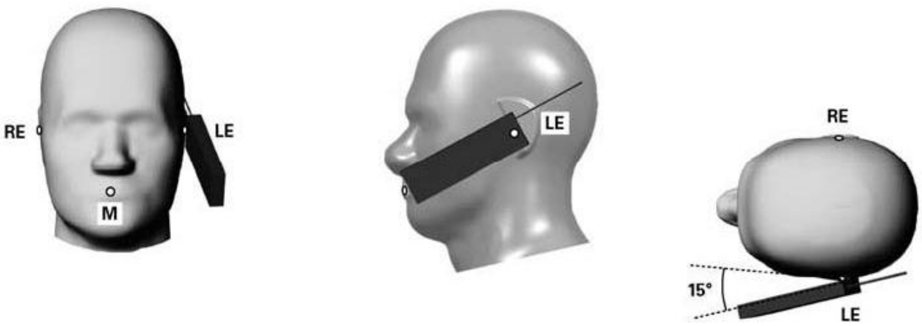


Fig-4.3 Illustration for Tilted Position

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.

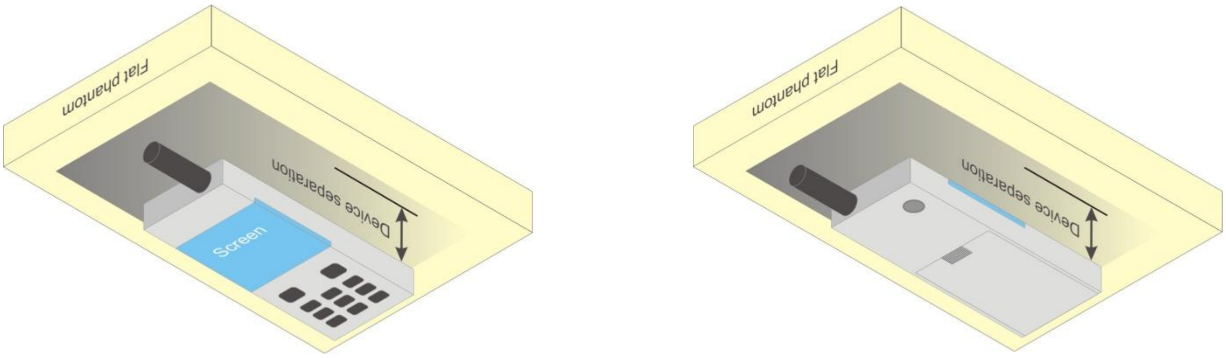


Fig-4.4 Illustration for Body Worn Position

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	20.5	0.896	42.43	0.90	41.5	-0.44	2.24	Dec. 01, 2012
H835	835	20.6	0.906	42.387	0.90	41.5	0.67	2.14	Dec. 02, 2012
H835	835	20.4	0.897	41.95	0.90	41.5	-0.33	1.08	Dec. 04, 2012
H1900	1900	20.7	1.422	40.423	1.40	40.0	1.57	1.06	Dec. 02, 2012
H1900	1900	21.0	1.412	40.293	1.40	40.0	0.86	0.73	Dec. 03, 2012
H1900	1900	20.2	1.426	40.405	1.40	40.0	1.86	1.01	Dec. 04, 2012
H2450	2450	20.9	1.865	40.834	1.80	39.2	3.61	4.17	Dec. 03, 2012
H2450	2450	20.6	1.87	40.258	1.80	39.2	3.89	2.70	Dec. 04, 2012
B835	835	20.9	0.98	55.90	0.97	55.2	1.03	1.27	Oct. 23, 2012
B1900	1900	20.7	1.54	52.80	1.52	53.3	1.32	-0.94	Oct. 23, 2012
B1900	1900	20.3	1.545	51.143	1.52	53.3	1.64	-4.05	Oct. 31, 2012
B2450	2450	20.5	2.03	53.00	1.95	52.7	4.10	0.57	Oct. 27, 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	Type	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
Dec. 01, 2012	Head	835	9.46	2.48	9.92	4.86	4d021	3801	1277
Dec. 02, 2012	Head	835	9.46	2.43	9.72	2.75	4d021	3650	579
Dec. 04, 2012	Head	835	9.46	2.35	9.40	-0.63	4d021	3864	579
Dec. 02, 2012	Head	1900	38.90	9.58	38.32	-1.49	5d036	3650	579
Dec. 03, 2012	Head	1900	38.90	9.51	38.04	-2.21	5d036	3864	861
Dec. 04, 2012	Head	1900	38.90	9.42	37.68	-3.14	5d036	3864	579
Dec. 03, 2012	Head	2450	52.90	13.6	54.40	2.84	737	3864	861
Dec. 04, 2012	Head	2450	52.90	13.5	54.00	2.08	737	3864	579
Oct. 23, 2012	Body	835	9.60	2.4	9.60	0.00	4d021	3578	1277
Oct. 23, 2012	Body	1900	38.90	10.2	40.80	4.88	5d036	3578	1277
Oct. 31, 2012	Body	1900	38.90	9.29	37.16	-4.47	5d036	3590	861
Oct. 27, 2012	Body	2450	50.00	12.9	51.60	3.20	737	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.

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	24.44	24.65	24.56	24.40	24.39	24.52
1xRTT RC3+SO55	24.52	**24.71**	24.60	24.48	24.48	**24.58**
1xRTT RC3+SO32 (FCH)	24.46	24.62	24.49	24.35	24.42	24.51
1xRTT RC3+SO32 (SCH)	24.39	24.57	24.42	24.37	24.50	24.52
1xEVDO Rev.0 RTAP 153.6	24.43	24.48	24.32	24.34	24.37	24.41
1xEVDO Rev.A RETAP 4096	24.39	24.41	24.30	24.30	24.33	24.39

Band	**CDMA BC10**		
Channel	**476**	**580**	**684**
Frequency (MHz)	**817.9**	**820.5**	**823.1**
1xRTT RC1+SO55	24.52	24.64	24.68
1xRTT RC3+SO55	24.55	24.68	**24.71**
1xRTT RC3+SO32 (FCH)	24.52	24.61	24.67
1xRTT RC3+SO32 (SCH)	24.49	24.58	24.65
1xEVDO Rev.0 RTAP 153.6	24.46	24.64	24.67
1xEVDO Rev.A RETAP 4096	24.42	24.62	24.65

Band	**802.11b**			**802.11g**		
Channel	**1**	**6**	**11**	**1**	**6**	**11**
Frequency (MHz)	**2412**	**2437**	**2462**	**2412**	**2437**	**2462**
Average Power	**16.36**	16.17	16.02	13.01	**14.30**	13.52

Band	**802.11n (HT20)**		
Channel	**1**	**6**	**11**
Frequency (MHz)	**2412**	**2437**	**2462**
Average Power	13.07	**14.41**	13.63

LTE Band 25									
BW	Modulation	CH	Frequency (MHz)	RB	RB Offset	Target Power	MPR	Expected Power	Measured Power
5 MHz	QPSK	26065	1852.5	1	0	23.9	0	23.9	23.57
		26365	1882.5	1	0	23.9	0	23.9	**23.74**
		26665	1912.5	1	0	23.9	0	23.9	23.23
		26065	1852.5	1	24	23.9	0	23.9	23.35
		26365	1882.5	1	24	23.9	0	23.9	23.62
		26665	1912.5	1	24	23.9	0	23.9	23.20
		26065	1852.5	12	6	23.9	1	22.9	22.35
		26365	1882.5	12	6	23.9	1	22.9	22.69
		26665	1912.5	12	6	23.9	1	22.9	22.18
		26065	1852.5	25	0	23.9	1	22.9	22.43
		26365	1882.5	25	0	23.9	1	22.9	22.58
		26665	1912.5	25	0	23.9	1	22.9	22.13
	16QAM	26065	1852.5	1	0	23.9	1	22.9	22.64
		26365	1882.5	1	0	23.9	1	22.9	**22.76**
		26665	1912.5	1	0	23.9	1	22.9	22.27
		26065	1852.5	1	24	23.9	1	22.9	22.43
		26365	1882.5	1	24	23.9	1	22.9	22.69
		26665	1912.5	1	24	23.9	1	22.9	22.24
		26065	1852.5	12	6	23.9	2	21.9	21.53
		26365	1882.5	12	6	23.9	2	21.9	21.71
		26665	1912.5	12	6	23.9	2	21.9	21.29
		26065	1852.5	25	0	23.9	2	21.9	21.48
		26365	1882.5	25	0	23.9	2	21.9	21.63
		26665	1912.5	25	0	23.9	2	21.9	21.22
10 MHz	QPSK	20690	1855	1	0	23.9	0	23.9	23.55
		26365	1882.5	1	0	23.9	0	23.9	**23.75**
		26640	1910	1	0	23.9	0	23.9	23.46
		20690	1855	1	49	23.9	0	23.9	23.49
		26365	1882.5	1	49	23.9	0	23.9	23.72
		26640	1910	1	49	23.9	0	23.9	23.30
		20690	1855	25	12	23.9	1	22.9	22.35
		26365	1882.5	25	12	23.9	1	22.9	22.60
		26640	1910	25	12	23.9	1	22.9	22.32
		20690	1855	50	0	23.9	1	22.9	22.39
		26365	1882.5	50	0	23.9	1	22.9	22.54
		26640	1910	50	0	23.9	1	22.9	22.18
	16QAM	20690	1855	1	0	23.9	1	22.9	22.58
		26365	1882.5	1	0	23.9	1	22.9	**22.80**
		26640	1910	1	0	23.9	1	22.9	22.49
		20690	1855	1	49	23.9	1	22.9	22.75
		26365	1882.5	1	49	23.9	1	22.9	22.79
		26640	1910	1	49	23.9	1	22.9	22.27
		20690	1855	25	12	23.9	2	21.9	21.53
		26365	1882.5	25	12	23.9	2	21.9	21.69
		26640	1910	25	12	23.9	2	21.9	21.34
		20690	1855	50	0	23.9	2	21.9	21.44
		26365	1882.5	50	0	23.9	2	21.9	21.63
		26640	1910	50	0	23.9	2	21.9	21.27

4.6 SAR Testing Results

4.6.1 SAR Results for Head

Plot No.	Band	Mode	Test Position	Channel	Power Drift (dB)	SAR-1g (W/kg)
001	CDMA BC0	RC3+SO55	Right Cheek	384	0.06	0.321
002	CDMA BC0	RC3+SO55	Right Tilted	384	0.16	0.199
003	CDMA BC0	RC3+SO55	Left Cheek	384	0.01	**0.477**
004	CDMA BC0	RC3+SO55	Left Tilted	384	-0.12	0.23
101	CDMA BC1	RC3+SO55	Right Cheek	1175	-0.11	0.364
102	CDMA BC1	RC3+SO55	Right Tilted	1175	0.01	0.234
103	CDMA BC1	RC3+SO55	Left Cheek	1175	-0.07	**0.772**
104	CDMA BC1	RC3+SO55	Left Tilted	1175	0.10	0.238
201	CDMA BC10	RC3+SO55	Right Cheek	684	-0.03	0.424
202	CDMA BC10	RC3+SO55	Right Tilted	684	-0.01	0.261
203	CDMA BC10	RC3+SO55	Left Cheek	684	-0.10	**0.666**
204	CDMA BC10	RC3+SO55	Left Tilted	684	0.01	0.34
401	802.11b	-	Right Cheek	1	-0.15	0.14
402	802.11b	-	Right Tilted	1	0.151	0.034
403	802.11b	-	Left Cheek	1	0.065	**0.151**
404	802.11b	-	Left Tilted	1	0.13	0.045

Plot No.	Band	Mode	Test Position	Channel	RB#	RB Offset	Power Drift (dB)	SAR-1g (W/kg)
301	LTE 25	QPSK_10M	Right Cheek	26365	25	12	-0.02	0.461
302	LTE 25	QPSK_10M	Right Cheek	26365	1	0	-0.01	0.609
303	LTE 25	QPSK_10M	Right Cheek	26365	1	49	-0.05	0.601
304	LTE 25	QPSK_10M	Right Tilted	26365	25	12	-0.08	0.454
305	LTE 25	QPSK_10M	Right Tilted	26365	1	0	-0.05	0.602
306	LTE 25	QPSK_10M	Right Tilted	26365	1	49	-0.05	0.587
307	LTE 25	QPSK_10M	Left Cheek	26365	25	12	-0.18	0.7
309	LTE 25	QPSK_10M	Left Cheek	26365	1	0	-0.10	**0.938**
308	LTE 25	QPSK_10M	Left Cheek	26365	1	49	-0.05	0.887
310	LTE 25	QPSK_10M	Left Tilted	26365	25	12	-0.05	0.463
311	LTE 25	QPSK_10M	Left Tilted	26365	1	0	-0.07	0.626
312	LTE 25	QPSK_10M	Left Tilted	26365	1	49	-0.05	0.594
313	LTE 25	16QAM_10M	Right Cheek	26365	25	12	-0.01	0.372
314	LTE 25	16QAM_10M	Right Cheek	26365	1	0	-0.04	0.483
315	LTE 25	16QAM_10M	Right Cheek	26365	1	49	-0.06	0.473
316	LTE 25	16QAM_10M	Right Tilted	26365	25	12	-0.02	0.371
317	LTE 25	16QAM_10M	Right Tilted	26365	1	0	0.03	0.477
318	LTE 25	16QAM_10M	Right Tilted	26365	1	49	0.05	0.472
319	LTE 25	16QAM_10M	Left Cheek	26365	25	12	-0.01	0.573
320	LTE 25	16QAM_10M	Left Cheek	26365	1	0	-0.10	0.749
321	LTE 25	16QAM_10M	Left Cheek	26365	1	49	-0.04	0.735
322	LTE 25	16QAM_10M	Left Tilted	26365	25	12	-0.08	0.383
323	LTE 25	16QAM_10M	Left Tilted	26365	1	0	0.02	0.497
324	LTE 25	16QAM_10M	Left Tilted	26365	1	49	0.07	0.488

4.6.2 SAR Results for Body

<Body Worn Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	Power Drift (dB)	SAR-1g (W/kg)
009	CDMA BC0	RC3+SO32	Front Face	1	384	-0.038	0.273
010	CDMA BC0	RC3+SO32	Rear Face	1	384	0.006	**0.541**
109	CDMA BC1	RC3+SO32	Front Face	1	1175	0.077	0.319
110	CDMA BC1	RC3+SO32	Rear Face	1	1175	-0.063	**0.445**
209	CDMA BC10	RC3+SO32	Front Face	1	684	-0.033	0.302
210	CDMA BC10	RC3+SO32	Rear Face	1	684	-0.132	**0.653**
409	802.11b	-	Front Face	1	1	0.083	**0.076**
410	802.11b	-	Rear Face	1	1	-0.057	0.07

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	RB#	RB Offset	Power Drift (dB)	SAR-1g (W/kg)
349	LTE 25	QPSK_10M	Front Face	1	26365	25	12	-0.10	0.26
350	LTE 25	QPSK_10M	Front Face	1	26365	1	0	0.05	0.352
351	LTE 25	QPSK_10M	Front Face	1	26365	1	49	-0.02	0.333
352	LTE 25	QPSK_10M	Rear Face	1	26365	25	12	-0.09	0.603
353	LTE 25	QPSK_10M	Rear Face	1	26365	1	0	-0.05	**0.725**
354	LTE 25	QPSK_10M	Rear Face	1	26365	1	49	0.06	0.656
355	LTE 25	16QAM_10M	Front Face	1	26365	25	12	-0.12	0.213
356	LTE 25	16QAM_10M	Front Face	1	26365	1	0	0.07	0.27
357	LTE 25	16QAM_10M	Front Face	1	26365	1	49	0.05	0.259
358	LTE 25	16QAM_10M	Rear Face	1	26365	25	12	-0.06	0.445
359	LTE 25	16QAM_10M	Rear Face	1	26365	1	0	0.01	0.571
360	LTE 25	16QAM_10M	Rear Face	1	26365	1	49	0.05	0.566

<Hotspot Mode>

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	Power Drift (dB)	SAR-1g (W/kg)
005	CDMA BC0	RC3+SO32	Front Face	1	384	0.005	0.343
006	CDMA BC0	RC3+SO32	Rear Face	1	384	0.011	**0.554**
007	CDMA BC0	RC3+SO32	Left Side	1	384	-0.033	0.318
008	CDMA BC0	RC3+SO32	Bottom Side	1	384	0.033	0.144
105	CDMA BC1	RC3+SO32	Front Face	1	1175	-0.041	0.306
106	CDMA BC1	RC3+SO32	Rear Face	1	1175	-0.095	0.463
107	CDMA BC1	RC3+SO32	Left Side	1	1175	-0.086	**0.47**
108	CDMA BC1	RC3+SO32	Right Side	1	1175	-0.105	0.062
205	CDMA BC10	RC3+SO32	Front Face	1	684	-0.008	0.396
206	CDMA BC10	RC3+SO32	Rear Face	1	684	-0.05	**0.738**
207	CDMA BC10	RC3+SO32	Left Side	1	684	0.026	0.388
208	CDMA BC10	RC3+SO32	Bottom Side	1	684	-0.047	0.168
405	802.11b	-	Front Face	1	1	-0.048	**0.082**
406	802.11b	-	Rear Face	1	1	0.003	0.067
407	802.11b	-	Right Side	1	1	-0.092	0.065
408	802.11b	-	Bottom Side	1	1	-0.015	0.055

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	RB#	RB Offset	Power Drift (dB)	SAR-1g (W/kg)
325	LTE 25	QPSK_10M	Front Face	1	26365	25	12	-0.003	0.267
326	LTE 25	QPSK_10M	Front Face	1	26365	1	0	-0.098	0.366
327	LTE 25	QPSK_10M	Front Face	1	26365	1	49	-0.1	0.345
328	LTE 25	QPSK_10M	Rear Face	1	26365	25	12	0.024	0.642
329	LTE 25	QPSK_10M	Rear Face	1	26365	1	0	0.023	**0.843**
330	LTE 25	QPSK_10M	Rear Face	1	26365	1	49	0.006	0.815
331	LTE 25	QPSK_10M	Right Side	1	26365	25	12	-0.026	0.251
332	LTE 25	QPSK_10M	Right Side	1	26365	1	0	-0.016	0.336
333	LTE 25	QPSK_10M	Right Side	1	26365	1	49	-0.021	0.324
334	LTE 25	QPSK_10M	Top Side	1	26365	25	12	-0.063	0.067
335	LTE 25	QPSK_10M	Top Side	1	26365	1	0	0.012	0.091
336	LTE 25	QPSK_10M	Top Side	1	26365	1	49	0.114	0.087
337	LTE 25	16QAM_10M	Front Face	1	26365	25	12	-0.02	0.222
338	LTE 25	16QAM_10M	Front Face	1	26365	1	0	-0.06	0.296
339	LTE 25	16QAM_10M	Front Face	1	26365	1	49	0.08	0.284
340	LTE 25	16QAM_10M	Rear Face	1	26365	25	12	-0.123	0.563
341	LTE 25	16QAM_10M	Rear Face	1	26365	1	0	-0.025	0.71
342	LTE 25	16QAM_10M	Rear Face	1	26365	1	49	0.036	0.699
343	LTE 25	16QAM_10M	Right Side	1	26365	25	12	0.04	0.215
344	LTE 25	16QAM_10M	Right Side	1	26365	1	0	-0.002	0.279
345	LTE 25	16QAM_10M	Right Side	1	26365	1	49	0.12	0.271
346	LTE 25	16QAM_10M	Top Side	1	26365	25	12	0.03	0.054
347	LTE 25	16QAM_10M	Top Side	1	26365	1	0	0.00	0.069
348	LTE 25	16QAM_10M	Top Side	1	26365	1	49	0.06	0.067

Note:

1. Since EVDO, LTE and WLAN of this device supports VOIP capability through 3rd party apps software, we have evaluated data mode for head SAR.
2. 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.
3. According to KDB 941225, the head SAR testing for EVDO is not required since the maximum power is less than 1xRTT.
4. According to KDB 941225, the SAR testing for EVDO REV.A is not required since the maximum power is less than EVDO REV.0.
5. 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.
6. 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.
7. SAR testing for 802.11g/n is not required because its maximum power is less than 1/4 dB higher than 802.11b.

Test Engineer：Morrison Huang, Isaac Liao, and Ulysses Liu

4.6.3 Simultaneous Multi-band Transmission Evaluation

No.	Conditions (SAR1 + SAR2)	Mode	Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR
1	CDMA BC0 + WLAN	Head	Right Cheek	0.321	0.14	0.461	-
			Right Tilted	0.199	0.034	0.233	-
			Left Cheek	0.477	0.151	0.628	-
			Left Tilted	0.23	0.045	0.275	-
		Body-Worn	Front Face	0.273	0.076	0.349	-
			Rear Face	0.541	0.07	0.611	-
		Hotspot	Front Face	0.343	0.082	0.425	-
			Rear Face	0.554	0.067	0.621	-
			Left Side	0.318	0	0.318	-
			Right Side	0	0.065	0.065	-
			Top Side	0	0	0	-
			Bottom Side	0.144	0.055	0.199	-
2	CDMA BC1 + WLAN	Head	Right Cheek	0.364	0.14	0.504	-
			Right Tilted	0.234	0.034	0.268	-
			Left Cheek	0.772	0.151	0.923	-
			Left Tilted	0.238	0.045	0.283	-
		Body-Worn	Front Face	0.319	0.076	0.395	-
			Rear Face	0.445	0.07	0.515	-
		Hotspot	Front Face	0.306	0.082	0.388	-
			Rear Face	0.463	0.067	0.53	-
			Left Side	0.47	0	0.47	-
			Right Side	0	0.065	0.065	-
			Top Side	0	0	0	-
			Bottom Side	0.062	0.055	0.117	-
3	CDMA BC10 + WLAN	Head	Right Cheek	0.424	0.14	0.564	-
			Right Tilted	0.261	0.034	0.295	-
			Left Cheek	0.666	0.151	0.817	-
			Left Tilted	0.34	0.045	0.385	-
		Body-Worn	Front Face	0.302	0.076	0.378	-
			Rear Face	0.653	0.07	0.723	-
		Hotspot	Front Face	0.396	0.082	0.478	-
			Rear Face	0.738	0.067	0.805	-
			Left Side	0.388	0	0.388	-
			Right Side	0	0.065	0.065	-
			Top Side	0	0	0	-
			Bottom Side	0.168	0.055	0.223	-
4	LTE 25 + WLAN	Head	Right Cheek	0.609	0.14	0.749	-
			Right Tilted	0.602	0.034	0.636	-
			Left Cheek	0.938	0.151	1.089	-
			Left Tilted	0.626	0.045	0.671	-
		Body-Worn	Front Face	0.352	0.076	0.428	-
			Rear Face	0.725	0.07	0.795	-
		Hotspot	Front Face	0.366	0.082	0.448	-
			Rear Face	0.843	0.067	0.91	-
			Left Side	0	0	0	-
			Right Side	0.336	0.065	0.401	-
			Top Side	0.091	0	0.091	-
			Bottom Side	0	0.055	0.055	-

No.	Conditions (SAR1 + SAR2 + SAR3)	Mode	Position	Max. SAR1	Max. SAR2	Max. SAR3	SAR Summation	SPLSR
5	CDMA BC0 + LTE 25 + WLAN	Head	Right Cheek	0.321	0.609	0.14	1.07	-
			Right Tilted	0.199	0.602	0.034	0.835	-
			Left Cheek	0.477	0.938	0.151	1.566	-
			Left Tilted	0.23	0.626	0.045	0.901	-
		Body-Worn	Front Face	0.273	0.352	0.076	0.701	-
			Rear Face	0.541	0.725	0.07	1.336	-
		Hotspot	Front Face	0.343	0.366	0.082	0.791	-
			Rear Face	0.554	0.843	0.067	1.464	-
			Left Side	0.318	0	0	0.318	-
			Right Side	0	0.336	0.065	0.401	-
			Top Side	0	0.091	0	0.091	-
			Bottom Side	0.144	0	0.055	0.199	-
6	CDMA BC1 + LTE 25 + WLAN	Head	Right Cheek	0.364	0.609	0.14	1.113	-
			Right Tilted	0.234	0.602	0.034	0.87	-
			Left Cheek	0.772	0.938	0.151	**1.861**	Analyzed as below
			Left Tilted	0.238	0.626	0.045	0.909	-
		Body-Worn	Front Face	0.319	0.352	0.076	0.747	-
			Rear Face	0.445	0.725	0.07	1.24	-
		Hotspot	Front Face	0.306	0.366	0.082	0.754	-
			Rear Face	0.463	0.843	0.067	1.373	-
			Left Side	0.47	0	0	0.47	-
			Right Side	0	0.336	0.065	0.401	-
			Top Side	0	0.091	0	0.091	-
			Bottom Side	0.062	0	0.055	0.117	-
7	CDMA BC10 + LTE 25 + WLAN	Head	Right Cheek	0.424	0.609	0.14	1.173	-
			Right Tilted	0.261	0.602	0.034	0.897	-
			Left Cheek	0.666	0.938	0.151	**1.755**	Analyzed as below
			Left Tilted	0.34	0.626	0.045	1.011	-
		Body-Worn	Front Face	0.302	0.352	0.076	0.73	-
			Rear Face	0.653	0.725	0.07	1.448	-
		Hotspot	Front Face	0.396	0.366	0.082	0.844	-
			Rear Face	0.738	0.843	0.067	**1.648**	Analyzed as below
			Left Side	0.388	0	0	0.388	-
			Right Side	0	0.336	0.065	0.401	-
			Top Side	0	0.091	0	0.091	-
			Bottom Side	0.168	0	0.055	0.223	-

Note:

1. The maximum SAR summation is calculated based on the same configuration and test position.
2. The calculation of SPLSR (SAR to Peak Location Spacing Ratio) is as follows.

<SPLSR calculation procedure>

1) Use DASY software to open SAR data file with zoom scan results.
2) Export data file to SEMCAD using 'Field Data Export' function.
3) Search for highest SAR based on the imported measured/interpolated data and identify the X, Y, and Z coordinates. Per the SAR system manufacture, DASY stores the individual coordinates of each measurement point in the measurement file where the, center coordinate (x=0, y=0) is always the Grid Reference Point as set in DASY for a phantom section.
4) Calculate the peak SAR separation distances using the Pythagoras' theorem where
   Peak Location Separation = $\text{Sqrt}[(X_1 - X_2)^2 + (Y_1 - Y_2)^2 + (Z_1 - Z_2)^2]$
5) Calculate SPLSR = (SAR1 + SAR2) / Peak SAR separation distance.
6) The SPLSR calculation plots shown in test report are for reference only as the images were generated in a separate software program to add the antenna and arrow references. The distance information in the calculations below each plot is derived from the DASY SAR zoom scan data as specified in this procedure.

1. The calculation of SPLSR for (CDMA BC1 + LTE 25 + WLAN, Head-Left Cheek) is as below:

Coordinate of Peak SAR Location (X, Y, Z) & SAR Value:

SAR 1 : CDMA BC1 (6.77, 24.24, -17.23), 0.772

SAR 2 : LTE 25 (2.73, 32.44, -17.47), 0.938

SAR 3 : WLAN (7.31, 25.22, -17.22), 0.151

Peak Location Spacing for SAR1-SAR2 = 9.1 cm

Peak Location Spacing for SAR1-SAR3 = 1.1 cm

Peak Location Spacing for SAR2-SAR3 = 8.6 cm

SPLSR for SAR1-SAR2 = (0.772 + 0.938) / 9.1 = **0.187**

SPLSR for SAR1-SAR3 = (0.772 + 0.151) / 1.1 = **0.825**

SPLSR for SAR2-SAR3 = (0.938 + 0.151) / 8.6 = **0.127**

Since the SPLSR is larger than 0.3, volume scan is required and the testing result is as below.

Plot No.	Band	Mode	Test Position	Channel	RB	RB Offset	SAR-1g (W/kg)	Multi-Band SAR-1g (W/kg)
501	CDMA BC1	RC3+SO55	Left Cheek	1175	-	-	0.783	1.07
502	LTE 25	QPSK_10M		26365	1	0	0.959	
503	802.11b	-		1	-	-	0.095	

2. The calculation of SPLSR for (CDMA BC10 + LTE 25 + WLAN, Head-Left Cheek) is as below:

Coordinate of Peak SAR Location (X, Y, Z) & SAR Value:

SAR 1 : CDMA BC10 (6.25, 25, -17.44), 0.666

SAR 2 : LTE 25 (2.73, 32.44, -17.47), 0.938

SAR 3 : WLAN (7.31, 25.22, -17.22), 0.151

Peak Location Spacing for SAR1-SAR2 = 8.2 cm

Peak Location Spacing for SAR1-SAR3 = 1.1 cm

Peak Location Spacing for SAR2-SAR3 = 8.6 cm

SPLSR for SAR1-SAR2 = (0.666 + 0.938) / 8.2 = **0.195**

SPLSR for SAR1-SAR3 = (0.666 + 0.151) / 1.1 = **0.74**

SPLSR for SAR2-SAR3 = (0.938 + 0.151) / 8.6 = **0.127**

Since the SPLSR is larger than 0.3, volume scan is required and the testing result is as below.

Plot No.	Band	Mode	Test Position	Channel	RB	RB Offset	SAR-1g (W/kg)	Multi-Band SAR-1g (W/kg)
504	CDMA BC10	RC3+SO55	Left Cheek	684	-	-	0.645	1.04
502	LTE 25	QPSK_10M		26365	1	0	0.959	
503	802.11b	-		1	-	-	0.095	

3. The calculation of SPLSR for (CDMA BC10 + LTE 25 + WLAN, Hotspot-Rear Face) is as below:

Coordinate of Peak SAR Location (X, Y, Z) & SAR Value:

SAR 1 : CDMA BC10 (0.34, -3.64, -20.68), 0.738

SAR 2 : LTE 25 (-3.09, 2.44, -20.67), 0.843

SAR 3 : WLAN-Cube0 (-4.34, -2.84, -20.66), 0.067

SAR 3 : WLAN-Cube1 (-2.69, -5.6, -20.64), 0.057

Peak Location Spacing for SAR1-SAR2 = 7.0 cm

Peak Location Spacing for SAR1-SAR3 (Cube0) = 4.7 cm

Peak Location Spacing for SAR1-SAR3 (Cube1) = 3.6 cm

Peak Location Spacing for SAR2-SAR3 (Cube0) = 5.4 cm

Peak Location Spacing for SAR2-SAR3 (Cube1) = 8.1 cm

SPLSR for SAR1-SAR2 = (0.738 + 0.843) / 7.0 = **0.226**

SPLSR for SAR1-SAR3 (Cube0) = (0.738 + 0.067) / 4.7 = **0.17**

SPLSR for SAR1-SAR3 (Cube1) = (0.738 + 0.057) / 3.6 = **0.22**

SPLSR for SAR2-SAR3 (Cube0) = (0.843 + 0.067) / 5.4 = **0.168**

SPLSR for SAR2-SAR3 (Cube1) = (0.843 + 0.057) / 8.1 = **0.112**

The volume scan for this condition is not required because all calculated SPLSR are less than 0.3.

Bluetooth standalone SAR and WWAN/Bluetooth simultaneous transmission SAR are not required because Bluetooth maximum power is less than P_{Ref} and the separation distance between WWAN/Bluetooth antenna is large than 2.5 cm. WLAN and Bluetooth is 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	D1900V2	5d036	Jan. 26, 2012	Annual
System Validation Kit	SPEAG	D2450V2	737	Jan. 24, 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	3801	Jun. 22, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3650	Oct. 26, 2012	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	861	Aug. 23, 2012	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
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-1127	N/A	N/A
Radio Communication Tester	Agilent	E5515C	MY50260642	Nov. 02, 2012	Biennial
Radio Communication Analyzer	Anritsu	MT8820C	6201010284	Aug. 18, 2012	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	0110A05602O-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
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

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:

Taiwan HwaYa EMC/RF/Safety/Telecom Lab:
Add: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil., Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.
Tel: 886-3-318-3232
Fax: 886-3-327-0892

Taiwan LinKo EMC/RF Lab:
Add: No. 47, 14th Ling, Chia Pau Vil., Linkou Dist., New Taipei City 244, Taiwan, R.O.C.
Tel: 886-2-2605-2180
Fax: 886-2-2605-1924

Taiwan HsinChu EMC/RF Lab:
Add: No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Vil., Chiung Lin Township, Hsinchu County 307, Taiwan, R.O.C.
Tel: 886-3-593-5343
Fax: 886-3-593-5342

Email: service.adt@tw.bureauveritas.com
Web Site: www.adt.com.tw

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

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