FCC SAR Test Report

Report No.	:	**SA120427C12**
Applicant	:	**Lenovo (Shanghai) Electronics Technology Co., Ltd.**
Address	:	**No. 68 Building, 199 Fenju Road, Wei Gao Qiao FTZ, Shanghai, China**
Product	:	**Tablet PC**
FCC ID	:	**O57WESTLAKE3G**
Brand	:	**Lenovo**
Model No.	:	**60012, 2258, IdeaTab S2110A-XXXX (X can be 0-9, A-Z, a-z or blank)**
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 447498 D01 v04 / KDB 616217 D03 v01** **KDB 941225 D01 v02 / KDB 941225 D03 v01**
Date of Testing	:	**May 11, 2012 ~ Jul. 12, 2012**

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

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Approved By : Roy Wu / Manager

Testing Laboratory
2021

Table of Contents

Release Control Record

Issue No.	Reason for Change	Date Issued
R01	Original release	Jun. 21, 2012
R02	Since there is one screw near to WLAN portion may not be locked in WLAN SAR testing. We lock the screw tightly and verify worst WLAN SAR.	Jul. 17, 2012

1. Summary of Maximum SAR Value

Mode / Band	Test Position	SAR-1g (W/kg)
GSM850	Body	0.795
GSM1900	Body	0.747
WCDMA Band II	Body	1.2
WCDMA Band V	Body	1.09
WLAN 2.4GHz	Body	1.05
Bluetooth	Body	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 60/f, the SAR testing for Bluetooth is not required.

2. Description of Equipment Under Test

EUT Type	Tablet PC
FCC ID	O57WESTLAKE3G
Brand Name	Lenovo
Model Name	60012, 2258, IdeaTab S2110A-XXXX (X can be 0-9, A-Z, a-z or blank)
Tx Frequency Bands (Unit: MHz)	GSM850 : 824 ~ 849 GSM1900 : 1850 ~ 1910 WCDMA Band II : 1850 ~ 1910 WCDMA Band V : 824 ~ 849 WLAN : 2400 ~ 2483.5 Bluetooth : 2400 ~ 2483.5
Uplink Modulations	GPRS : GMSK EDGE : 8PSK WCDMA : QPSK 802.11b : DSSS 802.11g/n : OFDM Bluetooth : GFSK
Maximum AVG Conducted Power (Unit: dBm)	GSM850 : 32.10 GSM1900 : 29.23 WCDMA Band II : 23.76 WCDMA Band V : 23.55 802.11b : 14.12 802.11g : 12.35 802.11n HT20 : 12.26
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:

AC Adapter 1	Brand Name	lenovo
	Model Name	AD83650
	Power Rating	I/P:100-240Vac, 50-60Hz, 0.3A; O/P: 5.2Vdc, 2A
AC Adapter 2	Brand Name	lenovo
	Model Name	ADP-10AW B
	Power Rating	I/P:100-240Vac, 50-60Hz, 0.4A; O/P: 5.2Vdc, 2A
AC Adapter 3	Brand Name	lenovo
	Model Name	ADP-10AW C
	Power Rating	I/P:100-240Vac, 50-60Hz, 0.4A; O/P: 5.2Vdc, 2A
AC Adapter 4	Brand Name	lenovo
	Model Name	ADP-10AW D
	Power Rating	I/P:100-240Vac, 50-60Hz, 0.4A; O/P: 5.2Vdc, 2A
AC Adapter 5	Brand Name	lenovo
	Model Name	ADP-10AW H
	Power Rating	I/P:100-240Vac, 50-60Hz, 0.4A; O/P: 5.2Vdc, 2A
Battery	Brand Name	lenovo
	Model Name	L11C2P32
	Power Rating	3.7Vdc, 6340mAh
	Type	Li-ion
USB Cable	Brand Name	COPARTNER TECH CORP
	Model Name	S00-445
	Signal Line Type	1.0 meter shielded cable without ferrite core
LCD Panel	Brand Name	LGD
	Model Name	LP101WX2-SLA1
Front Camera	Brand Name	Sunny
	Model Name	P1M02B-0JG
Rear Camera	Brand Name	Sunny
	Model Name	P5V08C-0JG
Docking	Brand Name	lenovo
	Model Name	S2DK10

3. SAR Measurement System

3.1 Definition of Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

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

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

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

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.

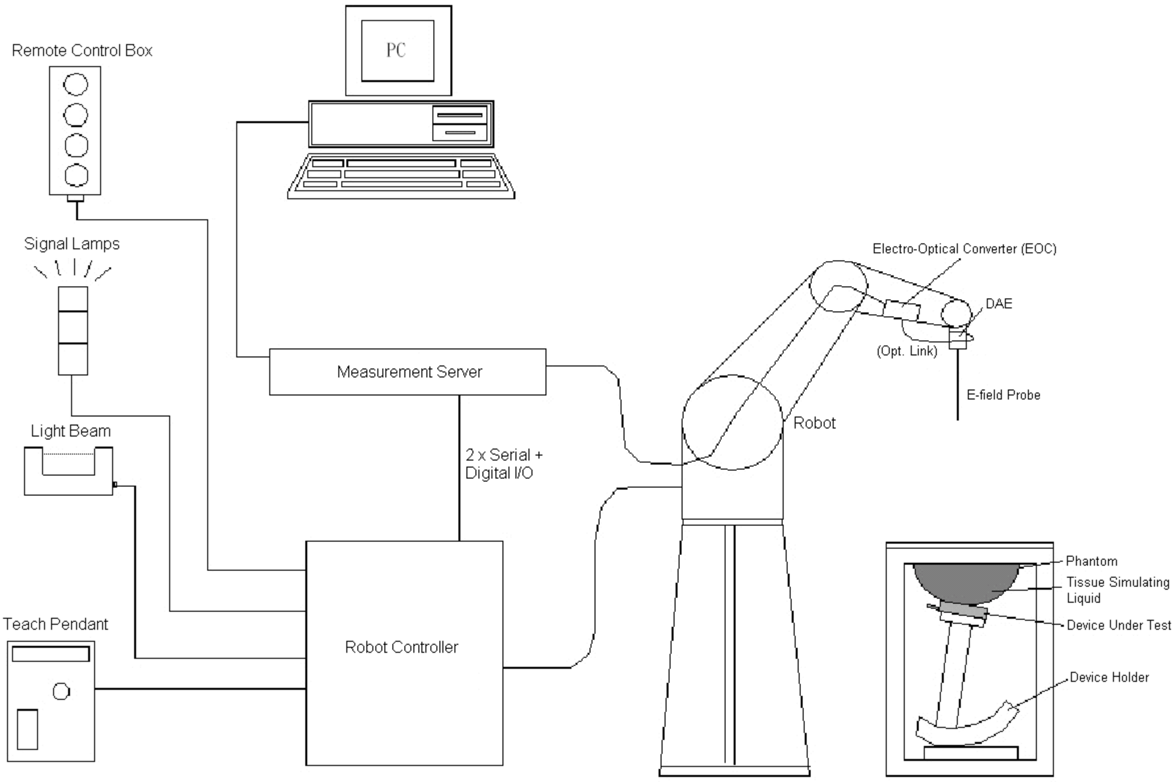


Fig-3.1 DASY System Setup

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.

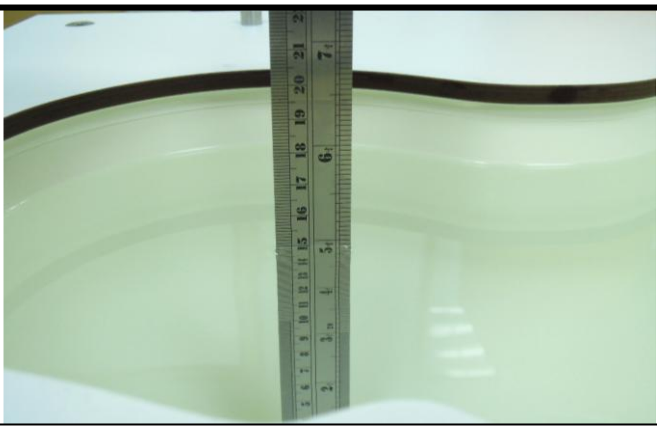


Photo of Liquid Height for Head Position

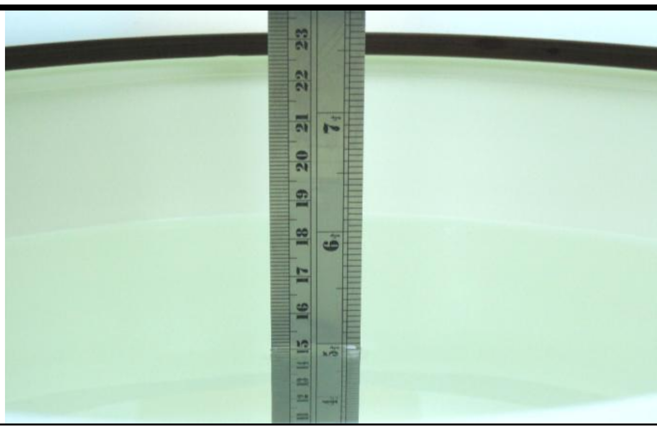


Photo of Liquid Height for Body Position

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 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
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.

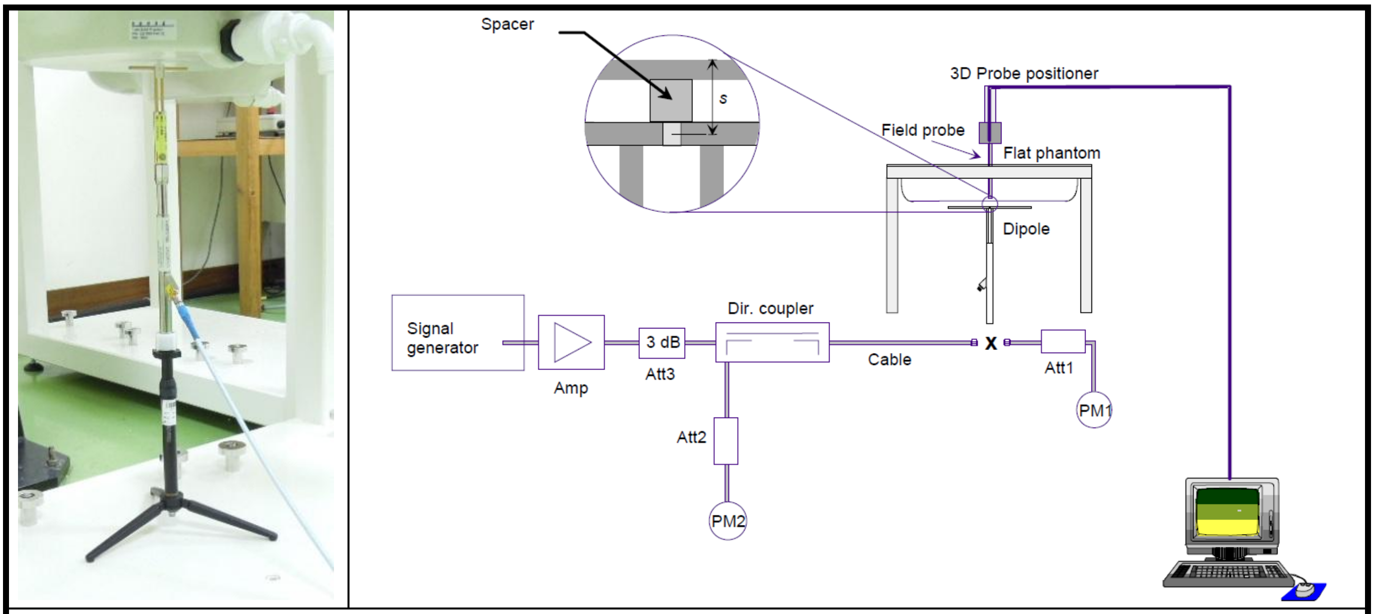


Fig-3.4 System Verification Setup

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

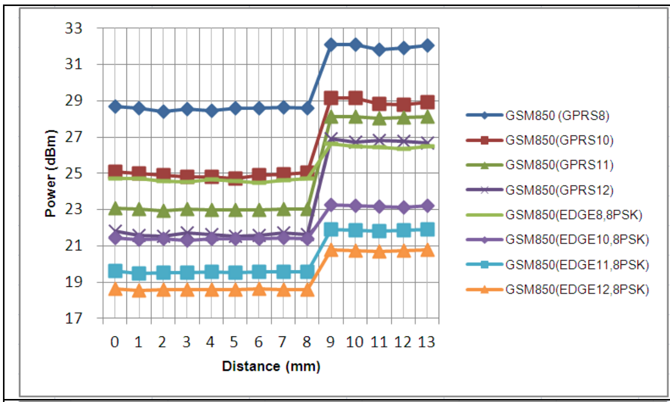
In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

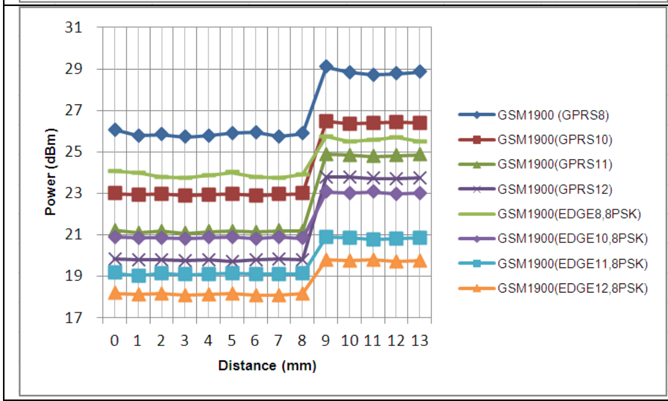
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty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

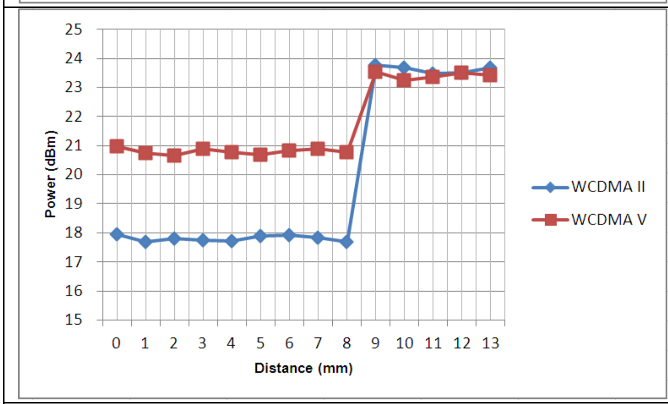
4. SAR Measurement Evaluation

4.1 EUT Configuration and Setting

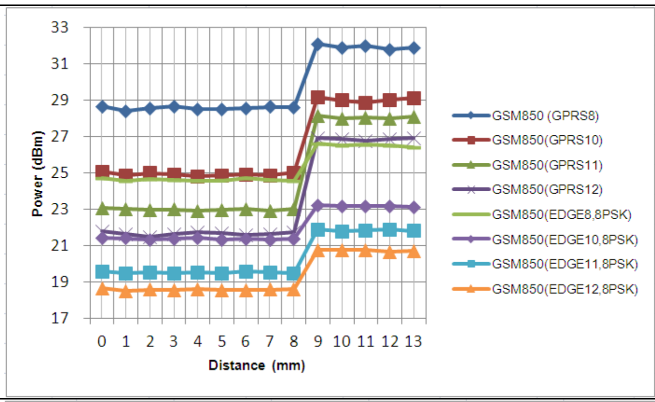
The device is tablet PC which supports WWAN, WLAN, Bluetooth and wireless hotspot capabilities. This tablet PC can be used for four display orientations. It is designed with a proximity sensor which can trigger/not trigger power reduction for WWAN on EUT Rear Face and Secondary Landscape orientations. The other RF capabilities (WLAN and BT) have no power reduction. The power vs distance plots for EUT Rear Face and Secondary Landscape edge are shown as below.

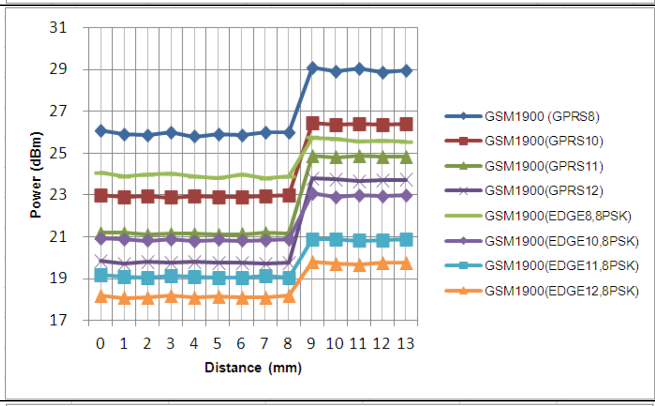


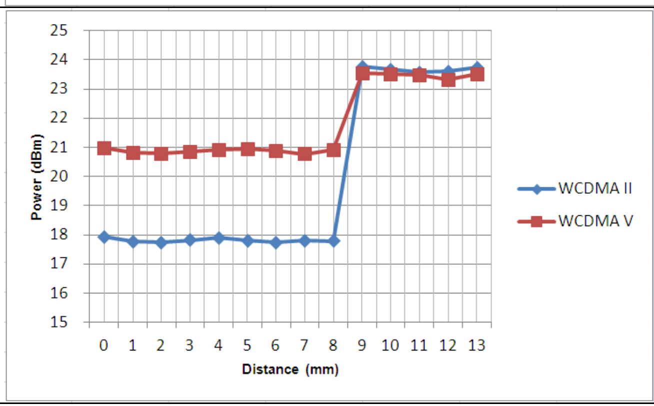




Power vs Distance for EUT Rear Face







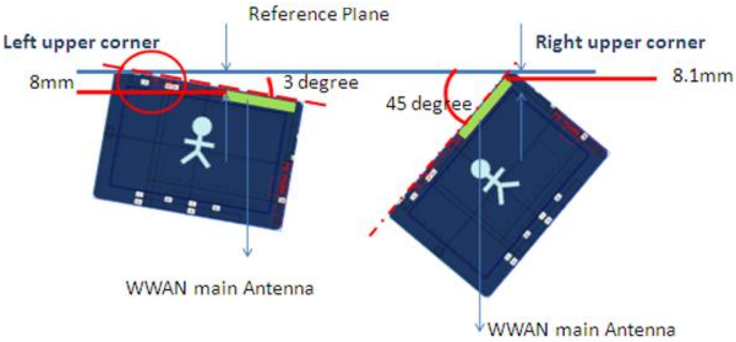
Power vs Distance for Secondary Landscape Edge

Based on the separation distance for the sensor triggered / not triggered, we test SAR with power reduction at 0 mm, and test SAR without power reduction at 7 mm for EUT Rear Face and Secondary Landscape edge.

Since the sensing coverage does not cover the right / left edge contour and the power will resume to normal full power while this tablet is tilted to certain angle, we tilt the tablet and test SAR on the angle with the sensor not triggered. The angle of proximity sensor triggered / not triggered at the corner of Top Left and Top Right is listed as below. Based on the angle, we test SAR without power reduction at 3° for Top Edge/Left Corner, and 45° for Top Edge/Right Corner.

Angle of Top Edge/Left Corner	0° ~ 2°	3°	4°	5°
Proximity Sensor Status	Triggered	Triggered	Not Triggered	Not Triggered

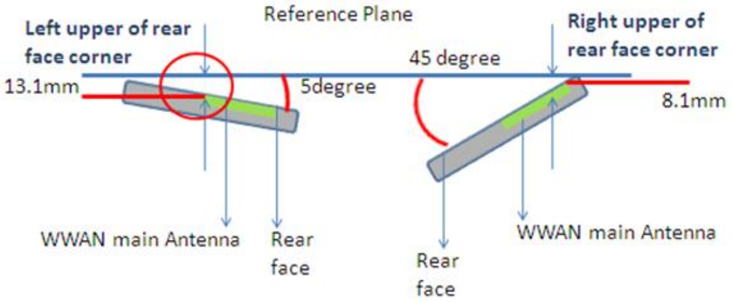
Angle of Top Edge/Right Corner	0° ~ 44°	45°	46°	47°
Proximity Sensor Status	Triggered	Triggered	Not Triggered	Not Triggered



The angle of proximity sensor triggered / not triggered at the corner of EUT Rear Face of Top Left and Top Right is listed as below. Based on the angle, we test SAR without power reduction at 5° for Top Edge/Left Rear Corner, and 45° for Top Edge/Right Rear Corner.

Angle of Top Edge/Left Rear Corner	0° ~ 4°	5°	6°	7°
Proximity Sensor Status	Triggered	Triggered	Not Triggered	Not Triggered

Angle of Top Edge/Right Rear Corner	0° ~ 44°	45°	46°	47°
Proximity Sensor Status	Triggered	Triggered	Not Triggered	Not Triggered



The simultaneous transmission possibilities are listed as below.

Simultaneous Tx Combination	RF Configuration
1	GSM850 (Data) + WLAN 2.4G (Data)
2	GSM1900 (Data) + WLAN 2.4G (Data)
3	WCDMA Band II (Data) + WLAN 2.4G (Data)
4	WCDMA Band V (Data) + WLAN 2.4G (Data)
5	GSM850 (Data) + BT (Data)
6	GSM1900 (Data) + BT (Data)
7	WCDMA Band II (Data) + BT (Data)
8	WCDMA Band V (Data) + BT (Data)

Note: This device does not support voice communication capability.

The power reduction is depends on the proximity sensor input. For a steady SAR test, the power reduction can be enabled manually by RF tool program “adb.exe” during SAR testing. After executing the RF tool program, the power reduction can be enabled by below command.
echo 50 > /sys/class/gpio/export
echo “out” > /sys/class/gpio/gpio50/direction
echo 1 > /sys/class/gpio/gpio50/value

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 DUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

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

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

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

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

4.2 EUT Testing Position

The proximity sensor is only active for GSM850/1900 and WCDMA Band II/V on EUT Rear Face and Secondary Landscape edge. According to KDB 447498, the SAR is required for antenna located within 5 cm from edge. Based on the antenna location shown on Appendix D of this report, SAR testing condition for each antenna is listed as below.

Mode	Testing Position	Power Reduction	Separation Distance (mm)	SAR Testing
GSM 850 / 1900	Rear Face	Yes	0	Yes
	Rear Face	No	7	Yes
	Primary Portrait	No	0	Yes
	Secondary Portrait	No	0	No
	Primary Landscape	No	0	No
	Secondary Landscape	Yes	0	Yes
	Secondary Landscape	No	7	Yes
WCDMA Band II / V	Rear Face	Yes	0	Yes
	Rear Face	No	7	Yes
	Primary Portrait	No	0	Yes
	Secondary Portrait	No	0	No
	Primary Landscape	No	0	No
	Secondary Landscape	Yes	0	Yes
	Secondary Landscape	No	7	Yes
WLAN 2.4G	Rear Face	No	0	Yes
	Primary Portrait	No	0	No
	Secondary Portrait	No	0	No
	Primary Landscape	No	0	No
	Secondary Landscape	No	0	Yes

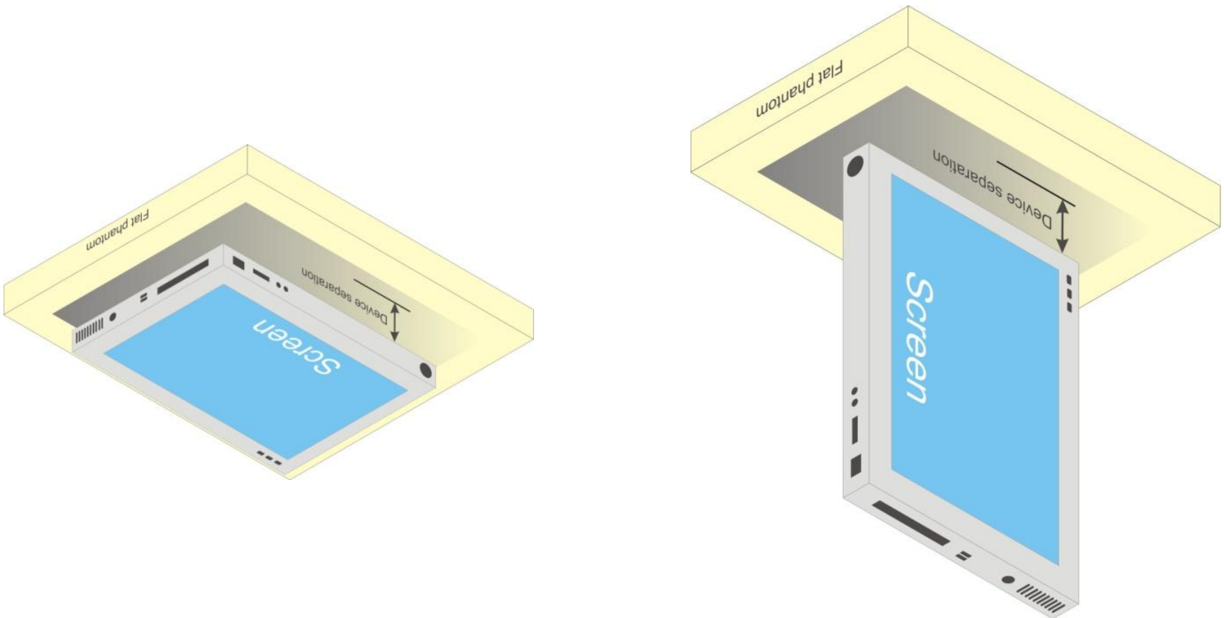


Fig-4.1 Illustration for Tablet Setup

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
B835	835	20.5	0.991	55.768	0.97	55.2	2.16	1.03	May 31, 2012
B835	835	20.5	0.993	57.127	0.97	55.2	2.37	3.49	Jun. 05, 2012
B835	835	20.8	0.991	55.349	0.97	55.2	2.16	0.27	Jun. 20, 2012
B1900	1900	20.8	1.55	54.30	1.52	53.3	1.97	1.88	May 30, 2012
B1900	1900	20.6	1.539	54.827	1.52	53.3	1.25	2.86	May 31, 2012
B1900	1900	20.8	1.552	53.953	1.52	53.3	2.11	1.23	Jun. 06, 2012
B1900	1900	21.1	1.563	54.687	1.52	53.3	2.83	2.60	Jun. 20, 2012
B2450	2450	20.8	1.971	51.743	1.95	52.7	1.08	-1.82	May 11, 2012
B2450	2450	20.5	2.026	52.96	1.95	52.7	3.90	0.49	Jul. 12, 2012

Note:

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

4.4 System Verification

The measuring results for system check are shown as below.

Test Date	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
May 31, 2012	835	9.60	2.41	9.64	0.42	4d021	3650	1277
Jun. 05, 2012	835	9.60	2.45	9.80	2.08	4d021	3650	1277
Jun. 20, 2012	835	9.60	2.39	9.56	-0.42	4d021	3650	1277
May 30, 2012	1900	38.90	9.50	38.00	-2.31	5d036	3590	861
May 31, 2012	1900	38.90	9.72	38.88	-0.05	5d036	3650	1277
Jun. 06, 2012	1900	38.90	10.30	41.20	5.91	5d036	3650	1277
Jun. 20, 2012	1900	38.90	9.94	39.76	2.21	5d036	3650	1277
May 11, 2012	2450	50.00	12.40	49.60	-0.80	737	3650	1277
Jul. 12, 2012	2450	50.00	11.60	46.40	-7.20	737	3820	579

Note:

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

4.5 Conducted Power Results

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

Band	GSM850 (P-Sensor Not Triggered)			Power Reduction (dB)	GSM850 (P-Sensor Triggered)		
Channel	128	189	251		128	189	251
Frequency (MHz)	824.2	836.4	848.8		824.2	836.4	848.8
Maximum Burst-Averaged Output Power							
GPRS 8 (GMSK, 1 Uplink)	32.10	31.89	31.75	**3.5**	28.69	28.59	28.39
GPRS 10 (GMSK, 2 Uplink)	29.17	29.12	29.05	**4.0**	25.08	25.06	24.79
GPRS 11 (GMSK, 3 Uplink)	28.13	28.00	27.80	**5.0**	23.06	22.98	22.97
GPRS 12 (GMSK, 4 Uplink)	26.93	26.86	26.60	**5.0**	21.79	21.71	21.65
EDGE 8 (GMSK, 1 Uplink)	32.09	31.92	31.78	**3.5**	28.56	28.47	28.28
EDGE 10 (GMSK, 2 Uplink)	29.31	29.13	29.03	**4.0**	25.11	25.07	24.78
EDGE 11 (GMSK, 3 Uplink)	28.12	27.96	27.76	**5.0**	23.01	22.91	22.68
EDGE 12 (GMSK, 4 Uplink)	26.74	26.72	26.56	**5.0**	21.81	21.67	21.65
EDGE 8 (8PSK, 1 Uplink)	26.61	26.53	26.45	**2.0**	24.73	24.67	24.61
EDGE 10 (8PSK, 2 Uplink)	23.25	23.21	23.17	**2.0**	21.44	21.41	21.36
EDGE 11 (8PSK, 3 Uplink)	21.90	21.85	21.79	**2.0**	19.60	19.46	19.44
EDGE 12 (8PSK, 4 Uplink)	20.78	20.58	20.52	**2.0**	18.65	18.57	18.53
Maximum Frame-Averaged Output Power							
GPRS 8 (GMSK, 1 Uplink)	23.10	22.89	22.75	**3.5**	**19.69**	19.59	19.39
GPRS 10 (GMSK, 2 Uplink)	23.17	23.12	23.05	**4.0**	19.08	19.06	18.79
GPRS 11 (GMSK, 3 Uplink)	23.87	23.74	23.54	**5.0**	18.80	18.72	18.71
GPRS 12 (GMSK, 4 Uplink)	**23.93**	23.86	23.60	**5.0**	18.79	18.71	18.65
EDGE 8 (GMSK, 1 Uplink)	23.09	22.92	22.78	**3.5**	19.56	19.47	19.28
EDGE 10 (GMSK, 2 Uplink)	23.31	23.13	23.03	**4.0**	19.11	19.07	18.78
EDGE 11 (GMSK, 3 Uplink)	23.86	23.70	23.50	**5.0**	18.75	18.65	18.42
EDGE 12 (GMSK, 4 Uplink)	23.74	23.72	23.56	**5.0**	18.81	18.67	18.65
EDGE 8 (8PSK, 1 Uplink)	17.61	17.53	17.45	**2.0**	15.73	15.67	15.61
EDGE 10 (8PSK, 2 Uplink)	17.25	17.21	17.17	**2.0**	15.44	15.41	15.36
EDGE 11 (8PSK, 3 Uplink)	17.64	17.59	17.53	**2.0**	15.34	15.20	15.18
EDGE 12 (8PSK, 4 Uplink)	17.78	17.58	17.52	**2.0**	15.65	15.57	15.53

Note:

1. The configuration of time slot for GPRS/EDGE is listed as below

Multi-slot Class	Maximum Uplink Slot	Maximum Downlink Slot	Total Timeslots
8	1	4	5
10	2	4	5
11	3	4	5
12	4	4	5

2. Body SAR testing for GPRS/EDGE was performed on the maximum frame-averaged power mode.

Band	GSM1900 (P-Sensor Not Triggered)			Power Reduction (dB)	GSM1900 (P-Sensor Triggered)		
Channel	512	661	810		512	661	810
Frequency (MHz)	1850.2	1880.0	1909.8		1850.2	1880.0	1909.8
Maximum Burst-Averaged Output Power							
GPRS 8 (GMSK, 1 Uplink)	29.23	29.07	29.02	**3.5**	26.08	25.90	25.88
GPRS 10 (GMSK, 2 Uplink)	26.46	26.40	26.20	**3.5**	22.99	22.82	22.80
GPRS 11 (GMSK, 3 Uplink)	24.89	24.70	24.62	**3.5**	21.21	21.15	21.05
GPRS 12 (GMSK, 4 Uplink)	23.79	23.71	23.65	**3.5**	19.84	19.75	19.66
EDGE 8 (GMSK, 1 Uplink)	29.10	29.18	29.07	**3.5**	25.89	25.75	25.77
EDGE 10 (GMSK, 2 Uplink)	26.55	26.37	26.19	**3.5**	22.85	22.68	22.67
EDGE 11 (GMSK, 3 Uplink)	25.01	24.78	24.71	**3.5**	21.05	20.99	20.91
EDGE 12 (GMSK, 4 Uplink)	23.70	23.58	23.45	**3.5**	19.69	19.63	19.53
EDGE 8 (8PSK, 1 Uplink)	25.75	25.68	25.60	**2.0**	24.06	24.02	23.95
EDGE 10 (8PSK, 2 Uplink)	23.07	23.00	22.91	**2.0**	20.91	20.97	20.78
EDGE 11 (8PSK, 3 Uplink)	20.90	20.85	20.70	**2.0**	19.16	18.97	18.96
EDGE 12 (8PSK, 4 Uplink)	19.79	19.71	19.66	**2.0**	18.19	18.07	18.03
Maximum Frame-Averaged Output Power							
GPRS 8 (GMSK, 1 Uplink)	20.23	20.07	20.02	**3.5**	**17.08**	16.90	16.88
GPRS 10 (GMSK, 2 Uplink)	20.46	20.40	20.20	**3.5**	16.99	16.82	16.80
GPRS 11 (GMSK, 3 Uplink)	20.63	20.44	20.36	**3.5**	16.95	16.89	16.79
GPRS 12 (GMSK, 4 Uplink)	**20.79**	20.71	20.65	**3.5**	16.84	16.75	16.66
EDGE 8 (GMSK, 1 Uplink)	20.10	20.18	20.07	**3.5**	16.89	16.75	16.77
EDGE 10 (GMSK, 2 Uplink)	20.55	20.37	20.19	**3.5**	16.85	16.68	16.67
EDGE 11 (GMSK, 3 Uplink)	20.75	20.52	20.45	**3.5**	16.79	16.73	16.65
EDGE 12 (GMSK, 4 Uplink)	20.70	20.58	20.45	**3.5**	16.69	16.63	16.53
EDGE 8 (8PSK, 1 Uplink)	16.75	16.68	16.60	**2.0**	15.06	15.02	14.95
EDGE 10 (8PSK, 2 Uplink)	17.07	17.00	16.91	**2.0**	14.91	14.97	14.78
EDGE 11 (8PSK, 3 Uplink)	16.64	16.59	16.44	**2.0**	14.90	14.71	14.70
EDGE 12 (8PSK, 4 Uplink)	16.79	16.71	16.66	**2.0**	15.19	15.07	15.03

Note:

1. The configuration of time slot for GPRS/EDGE is listed as below

Multi-slot Class	Maximum Uplink Slot	Maximum Downlink Slot	Total Timeslots
8	1	4	5
10	2	4	5
11	3	4	5
12	4	4	5

2. Body SAR testing for GPRS/EDGE was performed on the maximum frame-averaged power mode.

Band	WCDMA II (P-Sensor Not Triggered)			Power Reduction (dB)	WCDMA II (P-Sensor Triggered)		
Channel	9262	9400	9538		9262	9400	9538
Frequency (MHz)	1852.4	1880.0	1907.6		1852.4	1880.0	1907.6
RMC 12.2K	23.40	23.76	23.00	6.5	16.51	17.04	16.25
HSDPA Subtest-1	23.14	23.65	22.90	6.5	16.54	17.00	16.29
HSDPA Subtest-2	23.52	23.71	23.09	6.5	16.76	16.91	16.37
HSDPA Subtest-3	23.10	23.18	22.69	6.5	16.43	16.49	15.84
HSDPA Subtest-4	23.08	23.10	22.63	6.5	16.41	16.43	15.86
HSUPA Subtest-1	23.30	23.44	23.24	6.5	16.66	16.73	16.53
HSUPA Subtest-2	21.65	21.95	21.58	6.5	15.48	15.85	14.94
HSUPA Subtest-3	21.86	21.79	21.65	6.5	15.58	15.49	15.22
HSUPA Subtest-4	21.81	21.99	21.79	6.5	15.65	15.66	15.31
HSUPA Subtest-5	23.46	23.39	23.26	6.5	16.90	16.99	16.56

Band	WCDMA V (P-Sensor Not Triggered)			Power Reduction (dB)	WCDMA V (P-Sensor Triggered)		
Channel	4132	4182	4233		4132	4182	4233
Frequency (MHz)	826.4	836.4	846.6		826.4	836.4	846.6
RMC 12.2K	23.53	23.49	23.55	2.5	20.94	20.84	20.97
HSDPA Subtest-1	23.02	23.00	23.41	2.5	20.93	20.90	20.94
HSDPA Subtest-2	23.44	23.43	23.50	2.5	20.94	20.91	20.95
HSDPA Subtest-3	22.97	22.95	23.01	2.5	20.43	20.41	20.56
HSDPA Subtest-4	22.94	22.95	23.08	2.5	20.50	20.45	20.53
HSUPA Subtest-1	23.10	22.98	23.30	2.5	20.13	20.08	20.33
HSUPA Subtest-2	21.57	21.45	21.93	2.5	19.30	19.11	19.42
HSUPA Subtest-3	21.72	21.74	21.76	2.5	18.89	18.87	19.01
HSUPA Subtest-4	21.90	21.74	21.91	2.5	19.31	19.23	19.45
HSUPA Subtest-5	23.44	23.32	23.50	2.5	20.54	20.52	20.56

Band	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Average Power	14.06	14.12	13.97	12.02	12.03	12.35

Band	802.11n (HT20)			-		
Channel	1	6	11	-	-	-
Frequency (MHz)	2412	2437	2462	-	-	-
Average Power	12.05	12.16	12.26	-	-	-

Note : Power reduction is not implemented on WLAN.

4.6 SAR Testing Results

4.6.1 SAR Results for Body

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	P-Sensor Status	Burst Averaged Power	Frame Averaged Power	Power Reduction (dB)	SAR-1g (W/kg)	Power Drift (dB)
01	GSM850	GPRS 8	Rear Face	0	128	Triggered	28.69	19.69	3.5	**0.795**	0.01
02	GSM850	GPRS 8	Secondary Landscape	0	128	Triggered	28.69	19.69	3.5	0.406	-0.1
03	GSM850	GPRS 12	Rear Face	0.7	128	Not Triggered	26.93	23.93	w/o	0.481	-0.132
04	GSM850	GPRS 12	Rear Face (Top Edge/Right Rear Corner at 45°)	0	128	Not Triggered	26.93	23.93	w/o	0.236	-0.17
05	GSM850	GPRS 12	Rear Face (Top Edge/Left Rear Corner at 5°)	0	128	Not Triggered	26.93	23.93	w/o	0.495	-0.04
06	GSM850	GPRS 12	Primary Portrait	0	128	Not Triggered	26.93	23.93	w/o	0.099	0.13
07	GSM850	GPRS 12	Secondary Landscape	0.7	128	Not Triggered	26.93	23.93	w/o	0.317	0.05
08	GSM850	GPRS 12	Secondary Landscape (Top Edge/Right Corner at 45°)	0	128	Not Triggered	26.93	23.93	w/o	0.101	-0.15
09	GSM850	GPRS 12	Secondary Landscape (Top Edge/Left Corner at 3°)	0	128	Not Triggered	26.93	23.93	w/o	0.525	-0.05
21	GSM1900	GPRS 8	Rear Face	0	512	Triggered	26.08	17.08	3.5	**0.747**	0.147
22	GSM1900	GPRS 8	Secondary Landscape	0	512	Triggered	26.08	17.08	3.5	0.489	0.091
23	GSM1900	GPRS 12	Rear Face	0.7	512	Not Triggered	23.79	20.79	w/o	0.451	-0.11
24	GSM1900	GPRS 12	Rear Face (Top Edge/Right Rear Corner at 45°)	0	512	Not Triggered	23.79	20.79	w/o	0.164	0.00
25	GSM1900	GPRS 12	Rear Face (Top Edge/Left Rear Corner at 5°)	0	512	Not Triggered	23.79	20.79	w/o	0.206	0.04
26	GSM1900	GPRS 12	Primary Portrait	0	512	Not Triggered	23.79	20.79	w/o	0.244	-0.105
27	GSM1900	GPRS 12	Secondary Landscape	0.7	512	Not Triggered	23.79	20.79	w/o	0.429	-0.117
28	GSM1900	GPRS 12	Secondary Landscape (Top Edge/Right Corner at 45°)	0	512	Not Triggered	23.79	20.79	w/o	0.044	-0.12
29	GSM1900	GPRS 12	Secondary Landscape (Top Edge/Left Corner at 3°)	0	512	Not Triggered	23.79	20.79	w/o	0.232	0.17

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	P-Sensor Status	Output Power	Power Reduction (dB)	SAR-1g (W/kg)	Power Drift (dB)
61	WCDMA II	RMC12.2K	Rear Face	0	9400	Triggered	17.04	6.5	1.15	0.12
63	WCDMA II	RMC12.2K	Rear Face	0	9262	Triggered	16.51	6.5	0.884	0.133
64	WCDMA II	RMC12.2K	Rear Face	0	9538	Triggered	16.25	6.5	0.903	0.169
62	WCDMA II	RMC12.2K	Secondary Landscape	0	9400	Triggered	17.04	6.5	0.773	0.175
65	WCDMA II	RMC12.2K	Rear Face	0.7	9400	Not Triggered	23.76	w/o	**1.2**	-0.08
74	WCDMA II	RMC12.2K	Rear Face	0.7	9262	Not Triggered	23.40	w/o	1.01	-0.07
75	WCDMA II	RMC12.2K	Rear Face	0.7	9538	Not Triggered	23.00	w/o	0.91	0.05
66	WCDMA II	RMC12.2K	Rear Face (Top Edge/Right Rear Corner at 45°)	0	9400	Not Triggered	23.76	w/o	0.806	-0.16
68	WCDMA II	RMC12.2K	Rear Face (Top Edge/Right Rear Corner at 45°)	0	9262	Not Triggered	23.40	w/o	0.632	-0.17
69	WCDMA II	RMC12.2K	Rear Face (Top Edge/Right Rear Corner at 45°)	0	9538	Not Triggered	23.00	w/o	0.577	0.1
67	WCDMA II	RMC12.2K	Rear Face (Top Edge/Left Rear Corner at 5°)	0	9400	Not Triggered	23.76	w/o	0.626	-0.131
70	WCDMA II	RMC12.2K	Primary Portrait	0	9400	Not Triggered	23.76	w/o	0.586	0.132
71	WCDMA II	RMC12.2K	Secondary Landscape	0.7	9400	Not Triggered	23.76	w/o	0.815	0.119
76	WCDMA II	RMC12.2K	Secondary Landscape	0.7	9262	Not Triggered	23.40	w/o	0.62	-0.00
77	WCDMA II	RMC12.2K	Secondary Landscape	0.7	9538	Not Triggered	23.00	w/o	0.678	-0.09
72	WCDMA II	RMC12.2K	Secondary Landscape (Top Edge/Right Corner at 45°)	0	9400	Not Triggered	23.76	w/o	0.128	-0.15
73	WCDMA II	RMC12.2K	Secondary Landscape (Top Edge/Left Corner at 3°)	0	9400	Not Triggered	23.76	w/o	0.831	0.03
78	WCDMA II	RMC12.2K	Secondary Landscape (Top Edge/Left Corner at 3°)	0	9262	Not Triggered	23.40	w/o	0.648	-0.05
79	WCDMA II	RMC12.2K	Secondary Landscape (Top Edge/Left Corner at 3°)	0	9538	Not Triggered	23.00	w/o	0.691	-0.16
41	WCDMA V	RMC12.2K	Rear Face	0	4132	Triggered	20.94	2.5	0.891	0.06
43	WCDMA V	RMC12.2K	Rear Face	0	4182	Triggered	20.84	2.5	1.07	0.16
44	WCDMA V	RMC12.2K	Rear Face	0	4233	Triggered	20.97	2.5	**1.09**	0.11
42	WCDMA V	RMC12.2K	Secondary Landscape	0	4132	Triggered	20.94	2.5	0.504	-0.02
45	WCDMA V	RMC12.2K	Rear Face	0.7	4233	Not Triggered	23.55	w/o	0.56	0.11
46	WCDMA V	RMC12.2K	Rear Face (Top Edge/Right Rear Corner at 45°)	0	4233	Not Triggered	23.55	w/o	0.313	-0.03
47	WCDMA V	RMC12.2K	Rear Face (Top Edge/Left Rear Corner at 5°)	0	4233	Not Triggered	23.55	w/o	0.398	0.05
48	WCDMA V	RMC12.2K	Primary Portrait	0	4233	Not Triggered	23.55	w/o	0.174	0.1
49	WCDMA V	RMC12.2K	Secondary Landscape	0.7	4233	Not Triggered	23.55	w/o	0.373	0.03
50	WCDMA V	RMC12.2K	Secondary Landscape (Top Edge/Right Corner at 45°)	0	4233	Not Triggered	23.55	w/o	0.141	-0.11
51	WCDMA V	RMC12.2K	Secondary Landscape (Top Edge/Left Corner at 3°)	0	4233	Not Triggered	23.55	w/o	0.639	-0.12

Plot No.	Band	Test Position	Separation Distance (cm)	Channel	P-Sensor Status	Output Power	Power Reduction (dB)	SAR-1g (W/kg)	Power Drift (dB)
90	802.11b	Rear Face	0	6	N/A	14.12	N/A	**1.05**	-0.16
91	802.11b	Rear Face	0	1	N/A	14.06	N/A	0.894	-0.08
92	802.11b	Rear Face	0	11	N/A	13.97	N/A	0.868	0.01
82	802.11b	Secondary Landscape	0	6	N/A	14.12	N/A	0.713	-0.072

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.

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4.6.2 Simultaneous Multi-band Transmission Evaluation

No.	Conditions	Position	Gap (cm)	Max. WWAN SAR	Max. WLAN SAR	SAR Summation	SPLSR
1	GSM850 + WLAN	Rear Face	0	0.795	1.05	**1.845**	0.172
		Rear Face	0.7	0.481	0	0.481	-
		Primary Portrait	0	0.099	0	0.099	-
		Secondary Portrait	0	0	0	0	-
		Primary Landscape	0	0	0	0	-
		Secondary Landscape	0	0.406	0.713	1.119	-
		Secondary Landscape	0.7	0.317	0	0.317	-
2	GSM1900 + WLAN	Rear Face	0	0.747	1.05	**1.797**	0.169
		Rear Face	0.7	0.451	0	0.451	-
		Primary Portrait	0	0.244	0	0.244	-
		Secondary Portrait	0	0	0	0	-
		Primary Landscape	0	0	0	0	-
		Secondary Landscape	0	0.489	0.713	1.202	-
		Secondary Landscape	0.7	0.429	0	0.429	-
3	WCDMA II + WLAN	Rear Face	0	1.15	1.05	**2.2**	0.215
		Rear Face	0.7	1.2	0	1.2	-
		Primary Portrait	0	0.586	0	0.586	-
		Secondary Portrait	0	0	0	0	-
		Primary Landscape	0	0	0	0	-
		Secondary Landscape	0	0.773	0.713	1.486	-
		Secondary Landscape	0.7	0.815	0	0.815	-
4	WCDMA V + WLAN	Rear Face	0	1.09	1.05	**2.14**	0.127
		Rear Face	0.7	0.56	0	0.56	-
		Primary Portrait	0	0.174	0	0.174	-
		Secondary Portrait	0	0	0	0	-
		Primary Landscape	0	0	0	0	-
		Secondary Landscape	0	0.504	0.713	1.217	-
		Secondary Landscape	0.7	0.373	0	0.373	-

Note:

1. The maximum SAR summation is calculated based on the same configuration and test position.
2. The calculation of SPLSR 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 = $\mathrm{Sqrt}[(X_1 - X_2)^2 + (Y_1 - Y_2)^2 + (Z_1 - Z_2)^2]$
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.

The calculation of SPLSR for (GSM850 + WLAN, Rear Face) is as below:
Coordinate of Peak SAR Location (X, Y, Z) :
GSM850 Cube 0 (-7.36, -11.08, -17.85), Cube 1 (-7.84, -4.6, -17.87)
WLAN (-7.8, 5.4, -17.83)
Peak Location Spacing = Cube0-WLAN: 16.5 cm, Cube1-WLAN: 10 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.795 + 1.05) / 16.5 = 0.112, (0.795 + 1.05) / 10 = 0.172

The calculation of SPLSR for (GSM1900 + WLAN, Rear Face) is as below:
Coordinate of Peak SAR Location (X, Y, Z) :
GSM1900 (-8.11, -5.24, -17.83)
WLAN (-7.8, 5.4, -17.83)
Peak Location Spacing = 10.6 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (0.747 + 1.05) / 10.6 = 0.169

The calculation of SPLSR for (WCDMA II + WLAN, Rear Face) is as below:
Coordinate of Peak SAR Location (X, Y, Z) :
WCDMA II (-8.12, -4.84, -17.82)
WLAN (-7.8, 5.4, -17.83)
Peak Location Spacing = 10.2 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.15 + 1.05) / 10.2 = 0.215

The calculation of SPLSR for (WCDMA V + WLAN, Rear Face) is as below:
Coordinate of Peak SAR Location (X, Y, Z) :
WCDMA V (-7.2, -11.4, -17.79)
WLAN (-7.8, 5.4, -17.83)
Peak Location Spacing = 16.8 cm
SPLSR (SAR to Peak Location Spacing Ratio) = (1.09 + 1.05) / 16.8 = 0.127

Summary:

According to KDB 447498, the simultaneous transmission SAR for WWAN and WLAN was not required because the SAR summation is less than 1.6 W/kg or SPLSR is less than 0.3. The Bluetooth standalone SAR and simultaneous transmission SAR for WWAN and Bluetooth were not required, because the output power of Bluetooth is less than 60/f. The WLAN and Bluetooth cannot transmit simultaneously, so there is no co-location test requirement for WLAN and Bluetooth.

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	3820	Dec. 16, 2011	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	DAE3	579	Apr. 27, 2012	Annual
Data Acquisition Electronics	SPEAG	DAE4	861	Aug. 29, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	1277	Jul. 29, 2011	Annual
ELI Phantom	SPEAG	QDOVA001B	TP-1039	N/A	N/A
ELI Phantom	SPEAG	QDOVA001B	TP-1043	N/A	N/A
Radio Communication Tester	Agilent	E5515C	MY50266628	Sep. 26, 2011	Biennial
ENA Series Network Analyzer	Agilent	E5071C	MY46214281	May 14, 2012	Annual
MXG Analog Signal Generator	Agilent	N5181A	MY50143868	May 06, 2012	Annual
Power Meter	Anritsu	ML2495A	1218009	May 07, 2012	Annual
Power Sensor	Anritsu	MA2411B	1207252	May 07, 2012	Annual
EXA Spectrum Analyzer	Agilent	N9010A	MY52100136	Apr. 23, 2012	Annual
Dielectric Probe Kit	Agilent	85070D	N/A	N/A	N/A
Thermometer	YFE	YF-160A	110600361	Feb. 21, 2012	Annual

6. Measurement Uncertainty

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	Ci (1g)	Standard Uncertainty (1g)	Vi
Measurement System						
Probe Calibration	6.0	Normal	1	1	± 6.0 %	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %	∞
Boundary Effects	1.0	Rectangular	√3	1	± 0.6 %	∞
Linearity	4.7	Rectangular	√3	1	± 2.7 %	∞
System Detection Limits	1.0	Rectangular	√3	1	± 0.6 %	∞
Readout Electronics	0.3	Normal	1	1	± 0.3 %	∞
Response Time	0.8	Rectangular	√3	1	± 0.5 %	∞
Integration Time	2.6	Rectangular	√3	1	± 1.5 %	∞
RF Ambient Noise	3.0	Rectangular	√3	1	± 1.7 %	∞
RF Ambient Reflections	3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	0.4	Rectangular	√3	1	± 0.2 %	∞
Probe Positioning	2.9	Rectangular	√3	1	± 1.7 %	∞
Max. SAR Eval.	1.0	Rectangular	√3	1	± 0.6 %	∞
Test Sample Related						
Device Positioning	3.9	Normal	1	1	± 3.9 %	31
Device Holder	2.7	Normal	1	1	± 2.7 %	19
Power Drift	5.0	Rectangular	√3	1	± 2.9 %	∞
Phantom and Setup						
Phantom Uncertainty	4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid Conductivity (Meas.)	5.0	Normal	1	0.64	± 3.2 %	∞
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid Permittivity (Meas.)	5.0	Normal	1	0.6	± 3.0 %	∞
Combined Standard Uncertainty					± 11.7 %	
Expanded Uncertainty (K=2)					**± 23.4 %**	

Uncertainty budget for frequency range 300 MHz to 3 GHz

7. Information on the Testing Laboratories

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

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

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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