DAT-PL-162/04-01

TESTING
No. L0570

TEST REPORT

REPORT NUMBER: I11GC9100-FCC-SAR-1

ON

Type of Equipment: Tablet PC
Type of Designation: VS14359
Manufacturer: ViewSonic Corporation

ACCORDING TO

FCC Part 2.1093: Radiofrequency radiation exposure evaluation: portable devices, Oct-1-2009
FCC OET Bulletin 65 Supplement C (Edition 01-01): Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions

China Telecommunication Technology Labs.

Month date, year
Sep 22, 2011

Signature

He Guili
Director

FCC ID: GSS-VS14359
Report Date: 2011-09-22

Test Firm Name: China Telecommunication Technology Labs
Registration Number: 840587

Statement

The measurements shown in this report were made in accordance with the procedures described on test pages. All reported tests were carried out on a sample equipment to demonstrate limited compliance with FCC CFR 47 Part 2.1093. The sample tested was found to comply with the requirements defined in the applied rules.

Table of Contents

1. General Information

1.1 Notes

All reported tests were carried out on a sample equipment to demonstrate limited compliance with the requirements of FCC CFR 47 Part 2.1093.

The test results of this test report relate exclusively to the item(s) tested as specified in section 2.

The following deviations from, additions to, or exclusions from the test specifications have been made. See Annex G.

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1.2 Testers

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Date: 2011-09-22

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1.3 Testing Laboratory information

1.3.1 Location

Name:	China Telecommunication Technology Labs.
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1.3.2 Details of accreditation status

Accredited by:	DATech Deutsche Akkreditierungsstelle Technik in der TGA GmbH（German Accreditation Body for Technology in the TGA）
Lab number:	DA7130
DAR Registration number:	DAT-PL-162/04-01
Accredited by:	CNAS (China National Accreditation Service for Conformity Assessment)
Registration number:	CNAS L0570
Standard:	ISO/IEC 17025:2005

1.3.3 Test location, where different from section 1.3.1

Name:	------
Address:	------

1.4 Details of applicant or manufacturer

1.4.1 Applicant

Name:	ViewSonic Corporation
Address:	381 Brea Canyon Road, Walnut, CA 91789, USA
Country:	American
Telephone:	886 2 29645672
Fax:	886 2 89132117
Contact:	Lisa
Telephone:	--
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1.4.2 Manufacturer (if different from applicant in section 1.4.1)

Name:	--
Address:	--

1.4.3 Manufactory (if different from applicant in section 1.4.1)

Name:	--
Address:	--

2 Test Item

2.1 General Information

Manufacturer: ViewSonic Corporation
Name: Tablet PC
Model Number: VS14359
IMEI Number: --
Serial Number: SAR2
Production Status: Product
Receipt date of test item: 2011-08-31

2.2 Outline of EUT

EUT is a electronic paper book supporting 802.11 b/g/n and Bluetooth functions.

2.3 Modifications Incorporated in EUT

The EUT has not been modified from what is described by the brand name and unique type identification stated above.

2.4 Equipment Configuration

Equipment configuration list:

Item	Generic Description	Manufacturer	Type	Serial No.	Remarks
A	Tablet PC	ViewSonic Corporation	VS14359	--	None
B	Adaptor	PHIHONG Electronic Co., LTD	PSAA10R-050	--	None
C	battery	McNair New Power Co.,Ltd	MLP3575103	--	None
		M-POWER TECHNOLOGY Co.LTD	S11ND028A	--	Backup(1)

Note 1: The battery of model MLP3575103 is used for SAR measurement in the test, and the model S11ND028A is a backup. They have the same design and same capacity, i.e., the capacity of the two batteries are both: Minimum: 3200mAh 11.84Wh, Nominal: 3300mAh 12.21Wh, and only with the exception of different brand names and manufacturers.

Cables:

Item	Cable Type	Manufacturer	Length	Shield	Quantity	Remarks
1	DC cable on Adapter	--	150cm	--	--	None

2.5 Other Information

Version of hardware and software:

HW Version: --

SW Version: --

2.6 EUT Photographs

See internal and external photo of Annex A and B.

2.7 References

IEEE Std 1528-2003 IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques

OET Bulletin No. 65, Supplement C (2001): Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields

FCC KDB Publication 248227 D01 SAR Measurement Procedures for 802.11 a/b/g Transmitters

FCC KDB Publication 616217 D03 SAR Evaluation Considerations for Laptop/Notebook/Netbook and Tablet Computers v01

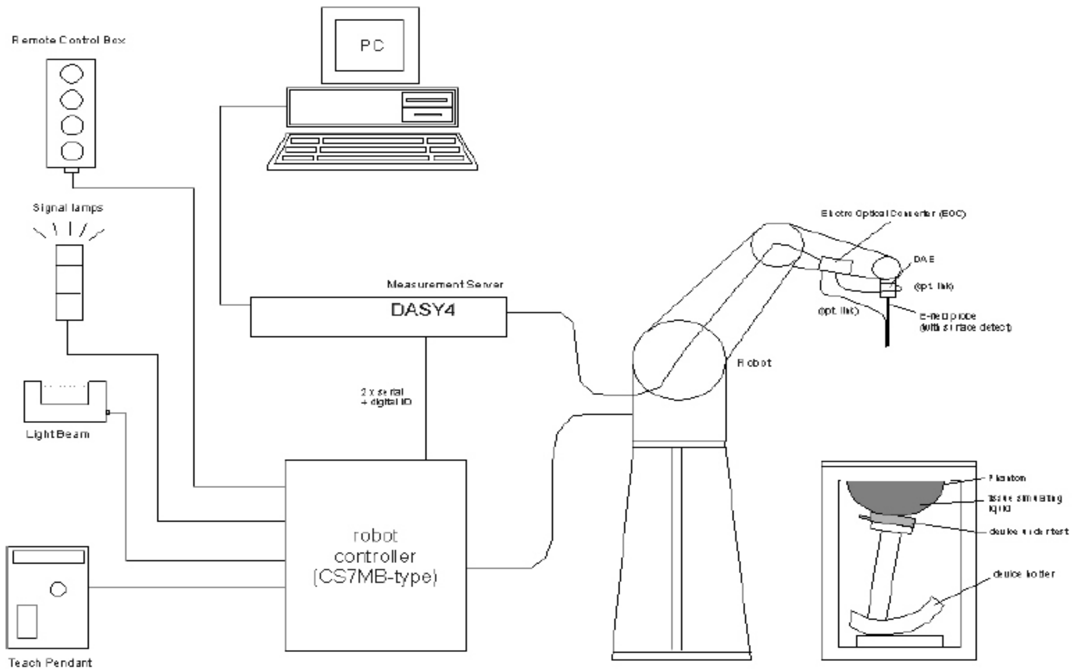
FCC KDB Publication 447498 D01 Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies v04

3 Measurement Systems

3.1 SAR Measurement Systems Setup

All measurements were performed using the automated near-field scanning system, DASY5, from Schmid & Partner Engineering AG (SPEAG). The system is based on a high precision industrial robot which positions the probes with a positional repeatability of better than 0.02mm. Special E- and H-field probes have been developed for measurements close to material discontinuity, the sensors of which are directly loaded with a Schottky diode and connected via highly resistive lines (length =300mm) to the data acquisition unit.

A cell controller system containing the power supply, robot controller, teach pendant (Joystick) and remote control, is used to drive the robot motors. The PC consists of the Micron Pentium III 800 MHz computer with Windows 2000 system and SAR Measurement Software DASY5, A/D interface card, monitor, mouse, and keyboard. The Stäubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc., which is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical signal to digital electric signal of the DAE and transfers data to the PC plug-in card.



Demonstration of measurement system setup

The DAE4 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built-in VME-bus computer.

3.2 E-field Probe

3.2.1 E-field Probe Description

The SAR measurements were conducted with the dosimetric probe ES3DV3 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation. The probe has been calibrated according to the standard procedure with an accuracy of better than ±10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB.

Items	Specification
Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System Built-in shielding against static charges PEEK enclosure material(resistant to organic solvents, e.g., glycol)
Calibration	In air from 10 MHz to 2.5 GHz In brain and muscle simulating tissue at frequencies of 450MHz, 900MHz and 1.8GHz (accuracy±8%) Calibration for other liquids and frequencies upon request
Frequency	l 0 MHz to > 6 GHz; Linearity: ±0.2 dB (30 MHz to 3 GHz)
Directivity	±0.2 dB in brain tissue (rotation around probe axis) ±0.4 dB in brain tissue (rotation normal probe axis)
Dynamic Range	5u W/g to > 100mW/g; Linearity: ±0.2dB
Surface Detection	±0.2 mm repeatability in air and clear liquids over diffuse reflecting surface
Dimensions	Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diameter: 6.8mm Distance from probe tip to dipole centers: 2.7mm
Application	General dosimetry up to 3GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms

3.2.2 E-field Probe Calibration

The Annex C is the copy of the calibration certificate of the used probes.

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The free-space E-field measured in the medium correlates to temperature increase in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$SAR = C\frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

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

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m^3).

3.3 Phantom

The ELI flat phantom is constructed of Vinylester, glass fiber reinforced (VE-GF) shell integrated in a wooden table. It enables compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. A cover prevents the evaporation of the liquid. Reference markings on the Phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points in the robot.

Specifications:

Shell Thickness: 2.0 ± 0.2 mm (bottom plate)

Filling Volume: Approx. 30 liters

Dimensions: Major axis: 600 mm, Minor axis: 400 mm

Liquid depth when testing: at least 150 mm

ELI phantom

3.4 Device Holder

In combination with the Generic Twin Phantom V3.0, the Mounting Device (POM) enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation points is the ear opening. The devices can be easily, accurately, and repeat ably positioned according to the FCC and CENELEC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom etc).

Mounting device

For the convenience of the SAR testing of notebook, laptop, tablet and so on, Laptop Extensions Kit is used. It is 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. The extension is fully compatible with the Twin-SAM, ELI4 and SAM v6.0 Phantoms.

Laptop Extensions Kit

4 Test Results

4.1 Operational Condition

Specifications FCC OET 65C (01-01)
Date of Tests 2011-09-22
Operation Mode TX at the highest output peak power level
Method of measurement: FCC OET 65C (01-01)

4.2 Test Equipment Used

ITEM	TYPE	S/N	CALIBRATION DATE	DUE DATE
probe	ES3DV3	3158	2011-06-16	2012-06-15
DAE	DAE4	797	2011-06-21	2012-06-20
D2450V2	dipole	803	2011-06-22	2012-06-21
Power Meter	E4417A	GB41050460	2010-05-25	2012-05-20
Signal Generator	MG3694B	102917	2011-01-29	2012-01-28
Power Sensor	E9327A	US40440198	2011-07-27	2012-07-27
Power Sensor	E9327A	US40440326	2011-07-27	2012-07-27
Power Amplifier	150W1000	150W1000	NA	NA
Attenuator	20dB	836471/003	NA	NA
Attenuator	20dB	836471/004	NA	NA
Attenuator	2	BL1250	NA	NA
Attenuator	2	BK774	NA	NA
Dual directional coupler	4242-20	04200	NA	NA
Probe kit	85070E	3G-S-00139	NA	NA
Network Analyzer	8753ES	MY40002093	2011-05-31	2012-05-31
EMC Analyzer	E7405A	US41160321	2011-08-29	2012-08-28

4.3 Applicable Limit Regulations

Item	Limit Level
Local Specific Absorption Rate (SAR) (1g)	1.6W/kg

4.4 Test Results

The EUT complies.

Note:

All measurements are traceable to national standards.

4.5 Test Setup and Procedures

4.5.1 Test distance

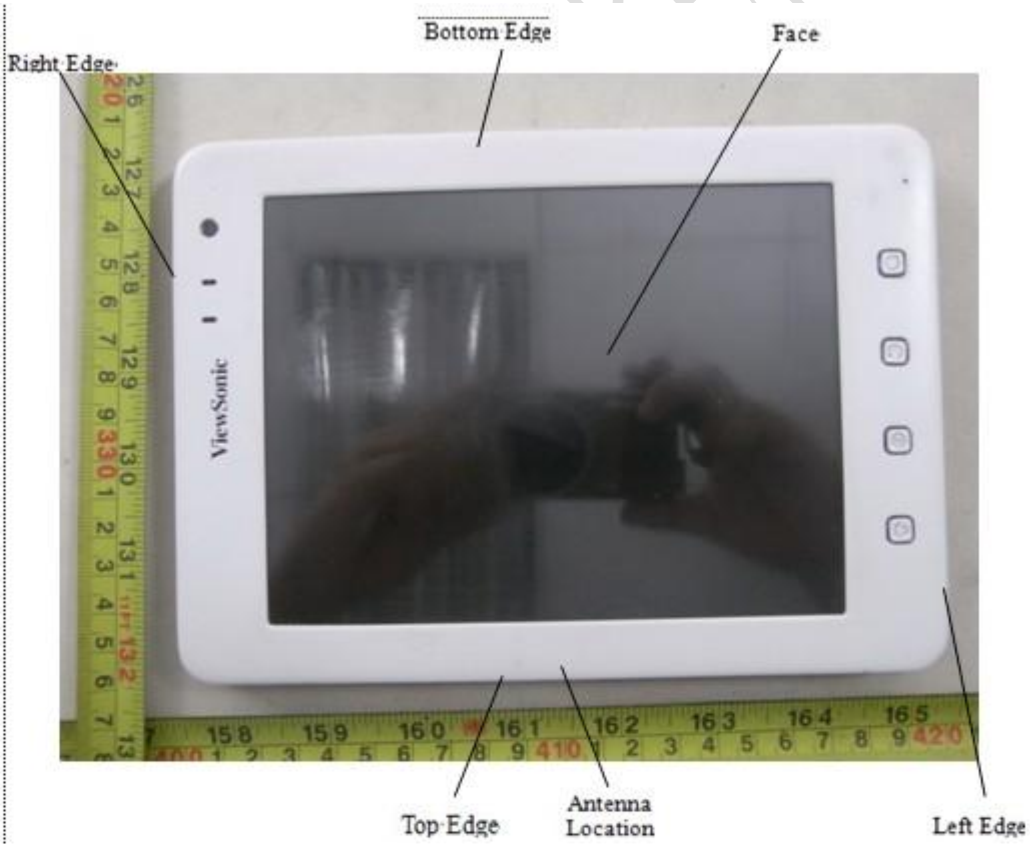
The edge of the EUT towards and directed tightly to touch the bottom of the flat phantom.

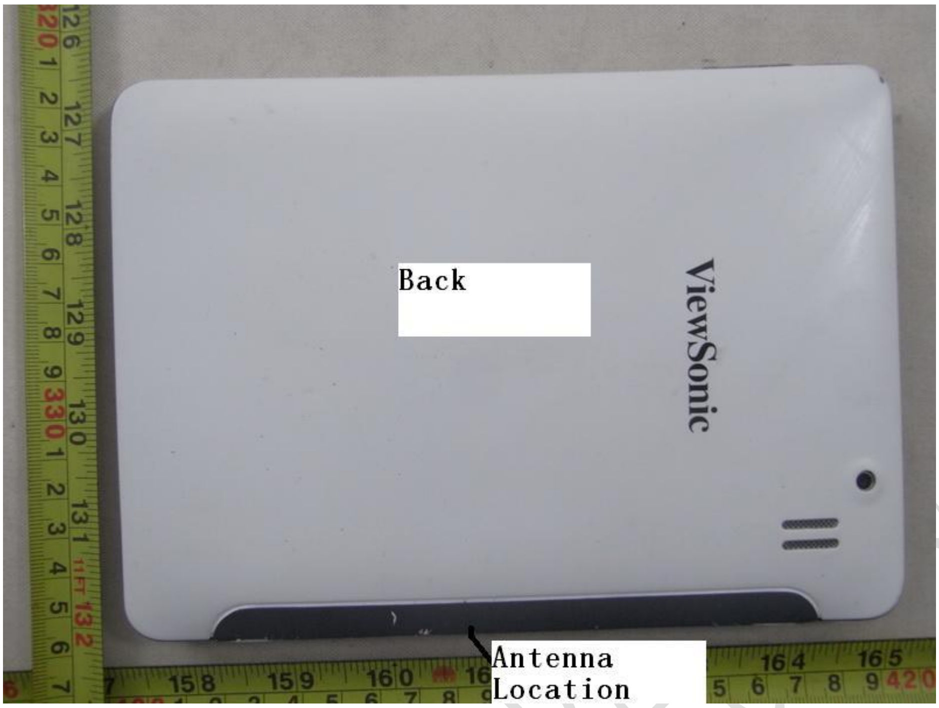
4.5.2 Duty Factor and Crest Factor

The crest factor is 1.

4.5.3 Test position definition

The six edges, face, back, top, bottom, left and right edge, are defined as the following pictures.





4.5.4 Antenna position and Test positions Selection

According to FCC KDB 447498 4) ii) (2) SAR is required only for the edge with the most conservative exposure condition. So the SAR tests for the Bottom edge, left edge and right edge are not performed.

4.5.5 General body mode measurement procedures

Generally, for body mode, the evaluation was performed according to the following procedure:

Step 1: The SAR value at a fixed location above the center point flat phantom was measured and was used as a reference value for assessing the power drift.

Step 2: The SAR distribution at the exposed side of the body was measured at a distance of 4 mm from the inner surface of the shell. The area covered the entire dimension of the EUT and the horizontal grid spacing was 15 mm x 15 mm. Based on these data, the area of the maximum absorption was determined by interpolation.

Step 3: Around this point, a volume of 30 mm x 30 mm x 30 mm was assessed by measuring 7 x 7 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

a. The data at the surface were extrapolated, since the center of the dipoles is 2.7 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2 mm. The extrapolation was based on the least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

b. The maximum interpolated value was searched with a straightforward algorithm. Around this maximum the SAR values averaged over the spatial volumes (1g or 10g) were computed using the 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot"-condition (in x ~ y and z-directions). The volume was integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were interpolated to calculate the average.

c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Step 4: Re-measurement the SAR value at the same location as in Step 1. If the value changed by more than 5%, the evaluation should be repeated.

4.6 Test Environment and Liquid Information

4.6.1 Test Environment

Date:	Liquid Temperature (℃)	Ambient Temperature (℃)	Ambient Humidity (%)
	18~~25	18~~25	30~~70
2011-09-22	20.4	20.2	53.3

4.6.2 Liquid Recipes

INGREDIENTS	TISSUE TYPE
	MSL2450
Water	68.64% weight percent
DGBE	31.37% weight percent
Sugar	0
Salt	0
Cellulose	0
Preventol	0

4.6.3 Liquid Parameters

Tissue Type	Type	Dielectric Parameters		Date
		permittivity	conductivity	
MSL2450 At 2450MHz	Target	52.7	1.95	2011-09-22
	±5% window	50.06~55.34	1.85~2.05	
	Measured	50.83	2.04	

4.7 System Validation Check

Validation Method:

The setup of system validation check or performance check is demonstrated as figure 5. The amplifier, low pass filter and attenuators are optional. The dipole shall be positioned and centered below the phantom, paralleling to the longest side of the phantom. A low loss and low dielectric constant spacer on the dipole may be used to guarantee the correct distance between the dipole top surface and the phantom bottom surface.

The separation d, which is defined as the distance from the liquid bottom surface to the dipole's central axis at location of the feed-point, should be as following: for less than 1000 MHz dipole, d = 15 mm, and for more than 1000 MHz dipole, d = 10 mm, and this can be obtained using two different size spacer. The dipole arms shall be parallel to the flat phantom surface.

First the power meter PM1 is connected to the cable and it measures the forward power at the location of the dipole connector (X). The signal generator is adjusted for the desired forward power at the dipole connector (taking into account the (Att1) value) and the power meter PM2 is read at that level. Then after connecting the cable to the dipole, the signal generator is readjusted for the same reading at the power meter PM2.

The system validation check procedures are the same as all measurement procedures used for compliance tests. A complete 1 g averaged SAR measurement is performed using the flat part of the phantom. The reference dipole input power is adjusted to produce a 1 g averaged SAR value falling in the range of 0.4 – 10 mW/g. The 1 g averaged SAR is measured using corresponding dipole. Then the results are normalized to 1 W forward input power and compared with the reference SAR values.

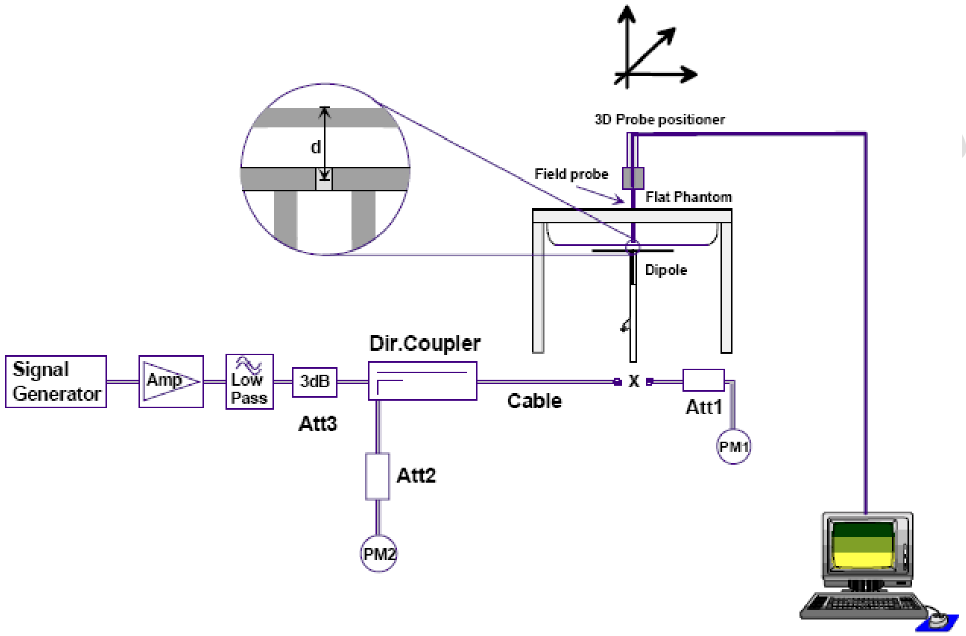


Figure 5 Illustration of system validation test setup

Validation Results

Date:	Frequency (MHz)	Tissue Type	Input Power(mw)	Targeted (SAR1g)	Measured (SAR1g)	Deviation (%)
2011-09-22	2450	Body	125	50.8mW/g	52.0mW/g	2.4

4.8 Maximum Output Power stand-alone test determination

According to FCC OET 65c, maximum output power shall be measured before and after each SAR test. The test setup and method are described as following.

Test setup

The output power measurement test setup is demonstrated as figure 6.

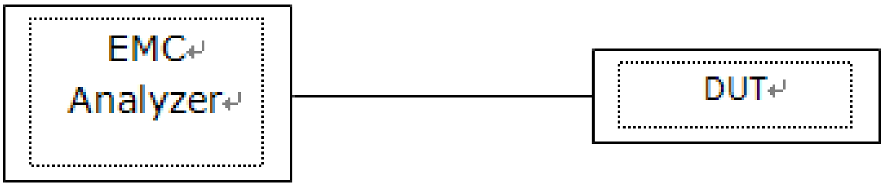


Figure 6 Demonstration of power measurement

(1) Wifi power values

	CHANNEL	设置值	PEAK POWER
B	1	17	18.82
	6	17	18.59
	11	18	18.98
G	1	15	19.38
	6	15	19.4
	11	15	19.11
N20	1	13	18.46
	6	14	19.29
	11	15	19.09

	CHANNEL	设置值	avg POWER
B	1	17	15.5
	6	17	15.45
	11	18	15.54
G	1	15	13.42
	6	15	13.32
	11	15	13.04
N20	1	13	12.16
	6	14	12.38
	11	15	12.4

Power unit: dBm

From above tables, according to FCC KDB Publication 248227 D01, only 802.11b modes are necessary to be tested for SAR as the average powers of 802.11g/n modes are lower than those of 802.11b.

(2) Bluetooth power values

BT	FREQUENCY	POWER
1M	2402	1.79
	2441	1.71
	2480	0.74
3M	2402	1.83
	2441	1.78
	2480	1.05

Power unit: dBm

According to FCC KDB Publication 447498 D01, if the power is less than threshold value, 60/f(GHz) mW, the transmitter is exempted for SAR test. For Bluetooth, the threshold is 24.5mW, i.e., 13.9dBm. From above table, the Bluetooth transmitter's power is less than the threshold, so it is exempt for SAR test.

4.9 Simultaneous test determination

According to the applicant's description, the two systems, wifi and Bluetooth use the same antenna, and they can not transmit simultaneously, so the simultaneous transmission SAR test is not necessary.

4.10 Test Data

Note: The edge of the EUT towards and directed tightly to touch the bottom of the flat phantom.

802.11b, 1Mbps, body

Test configuration	SAR_{1g} [W/kg] / Power Drift [dB]		
	Channel 1 [low] 2412 MHz	Channel 6 [Mid] 2437 MHz	Channel 11 [high] 2464 MHz
Face	-- / --	0.046 / 0	-- / --
Back	-- / --	0.038 / -0.31	-- / --
Top	0.056 / 0.37	0.047 / 0.10	0.051 / 0.38
Bottom	-- / --	-- / --	-- / --
Left	-- / --	-- / --	-- / --
Right	-- / --	-- / --	-- / --

4.11 Measurement uncertainty

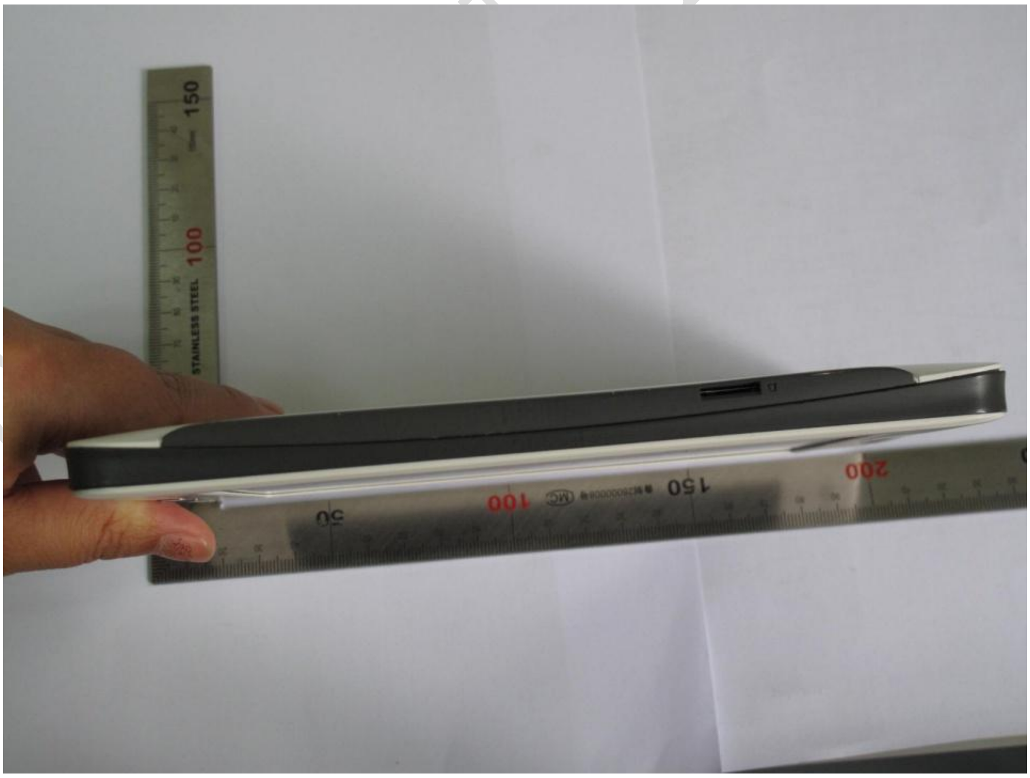
ERROR SOURCE	Uncertainty value (%)	Probability distribution	Divisor	c_i (1g)	Standard Uncertainty (%)
Measurement equipment					
Probe calibration	5.9	Normal	1	1	5.9
Probe axial isotropy	4.7	Rectangular	$\sqrt{3}$	0.7	1.9
Probe hemispherical isotropy	9.6	Rectangular	$\sqrt{3}$	0.7	3.9
Probe linearity	4.7	Rectangular	$\sqrt{3}$	1	2.7
Detection limits	0.25	Rectangular	$\sqrt{3}$	1	0.6
Boundary effect	0.8	Rectangular	$\sqrt{3}$	1	0.6
Measurement device	0.3	Normal	1	1	0.3
Response time	0.0	Normal	1	1	0
Noise	0.0	Normal	1	1	0
Integration time	1.7	Normal	1	1	2.6
Mechanical constraints					
Scanning system	1.5	Rectangular	$\sqrt{3}$	1	0.2
Positioning of the probe	2.9	Normal	1	1	2.9
Phantom shell	4.0	Rectangular	$\sqrt{3}$	1	2.3
Positioning of the dipole	2.0	Normal	1	1	2.0
Positioning of the phone	2.9	Normal	1	1	2.9
Device holder disturbance	3.6	Normal	1	1	3.6
Physical parameters					
Liquid conductivity (deviation from target)	5.0	Rectangular	$\sqrt{3}$	0.5	1.4
Liquid conductivity (measurement error)	4.3	Rectangular	$\sqrt{3}$	0.5	1.2
Liquid permittivity (deviation from target)	5.0	Rectangular	$\sqrt{3}$	0.5	1.4
Liquid permittivity (measurement error)	4.3	Rectangular	$\sqrt{3}$	0.5	1.2
Drifts in output power of the phone, probe, temperature and humidity	5.0	Rectangular	$\sqrt{3}$	1	2.9
Environment disturbance	3.0	Rectangular	$\sqrt{3}$	1	1.7
Post-processing					
SAR interpolation and extrapolation	0.6	Rectangular	$\sqrt{3}$	1	0.6
Maximum SAR evaluation	1.0	Rectangular	$\sqrt{3}$		0.6
Combined standard uncertainty	$u_c = \sqrt{\sum_{i=1}^{m} c_i^2 \cdot u_i^2}$ =11.08%				
Expanded uncertainty （confidence interval of 95％）	Normal $u_e = 1.96 u_c$ =21.7%				

Annex A EUT External Photos

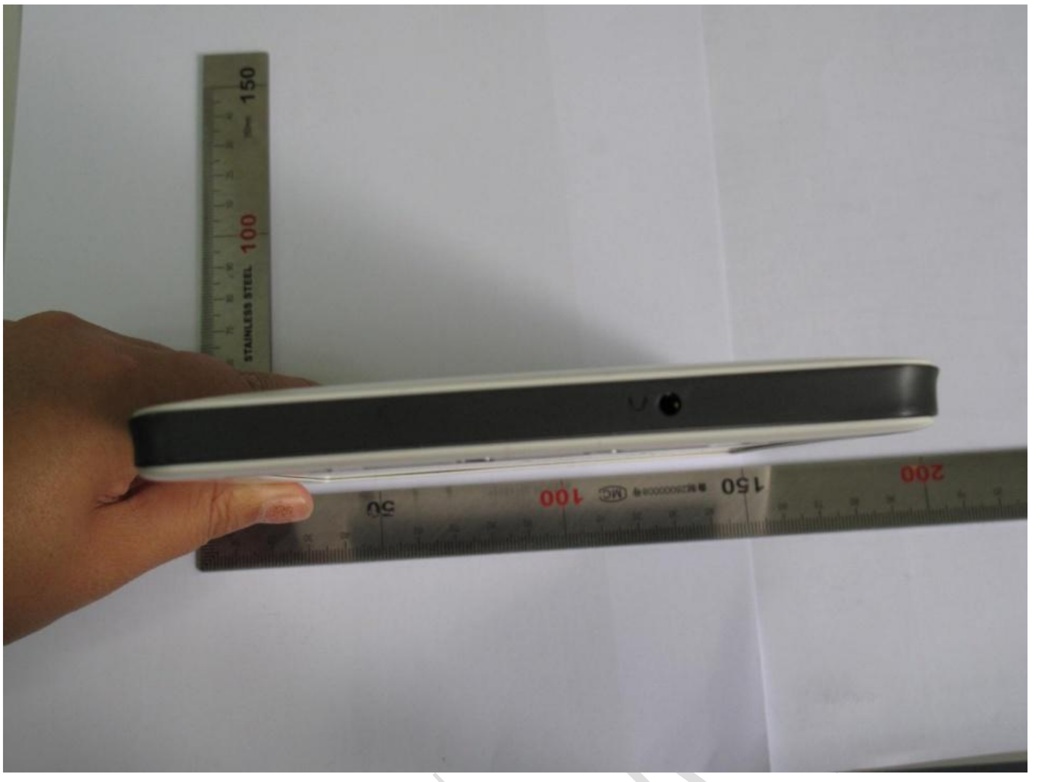
Face

Back

Bottom



Top



Left

Right

Adapter and cable

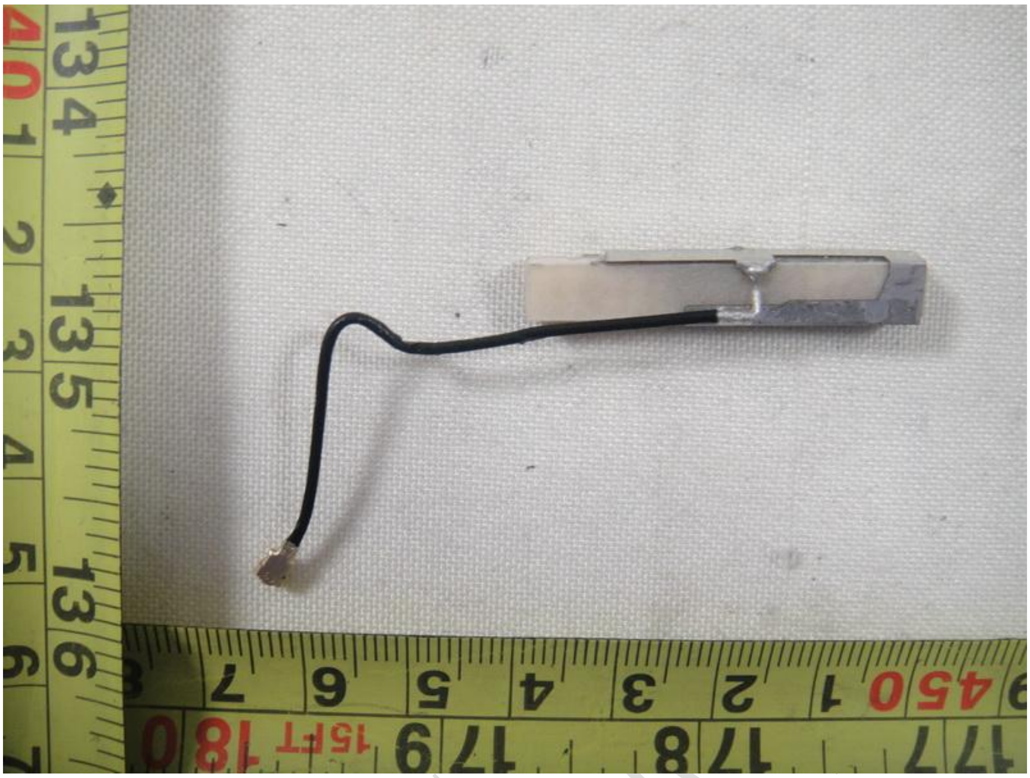
Adapter

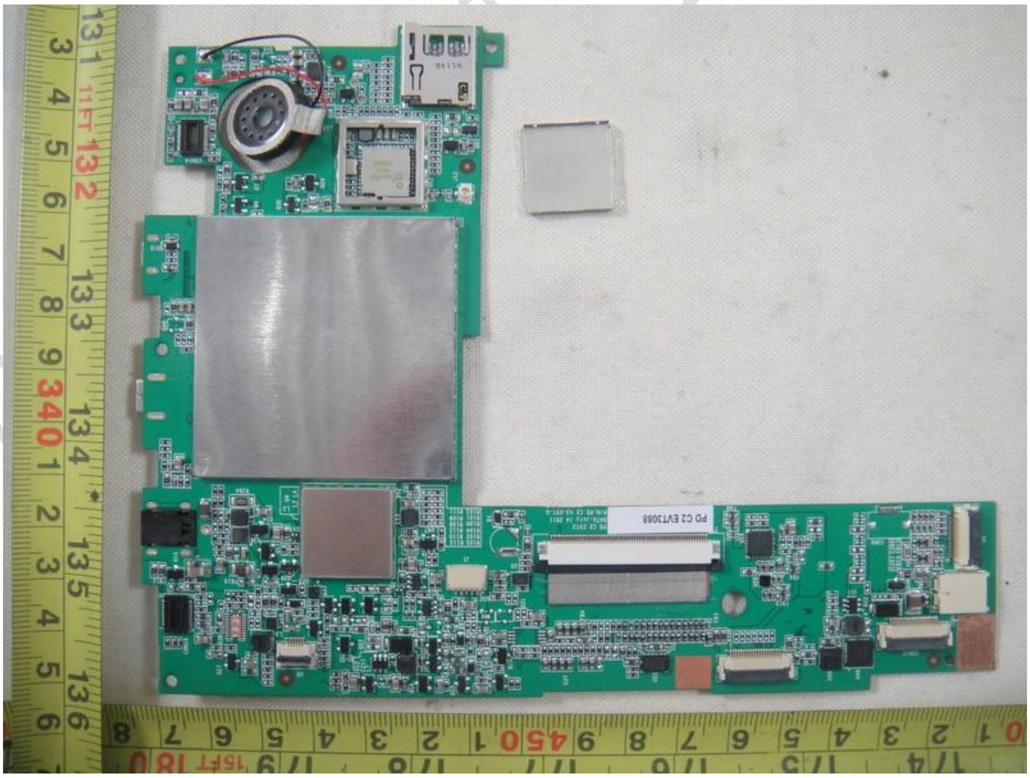
Annex B EUT Internal Photos

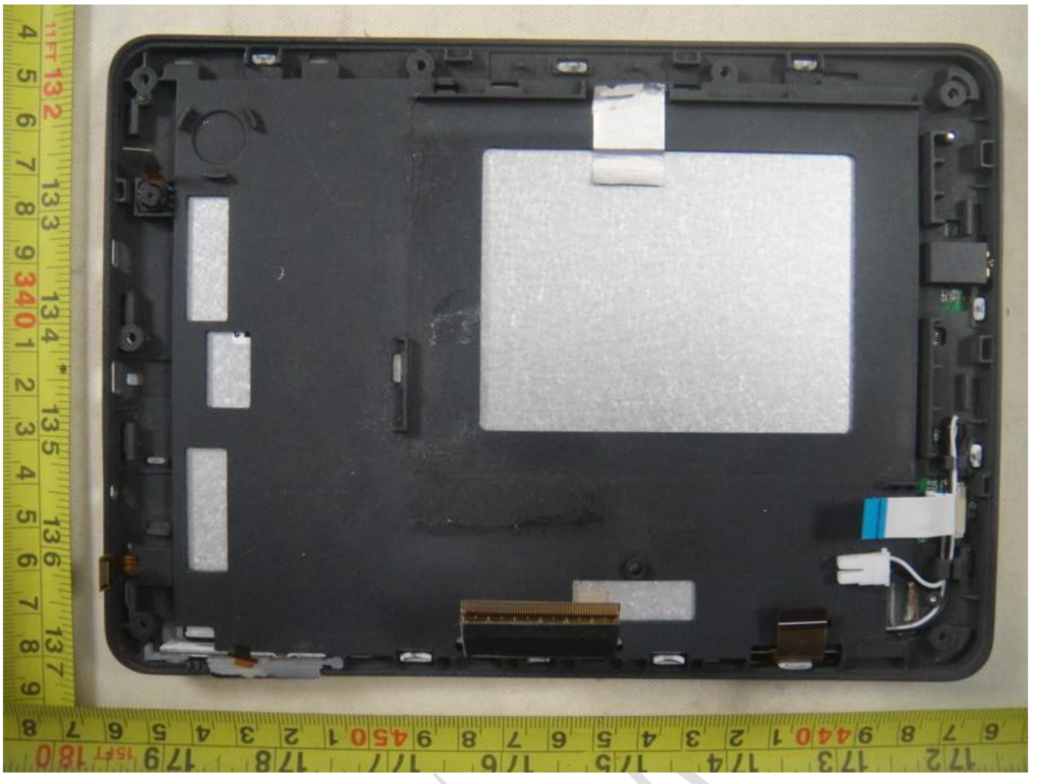
Battery (Model: MLP3575103, which is used for SAR measurement in this report)

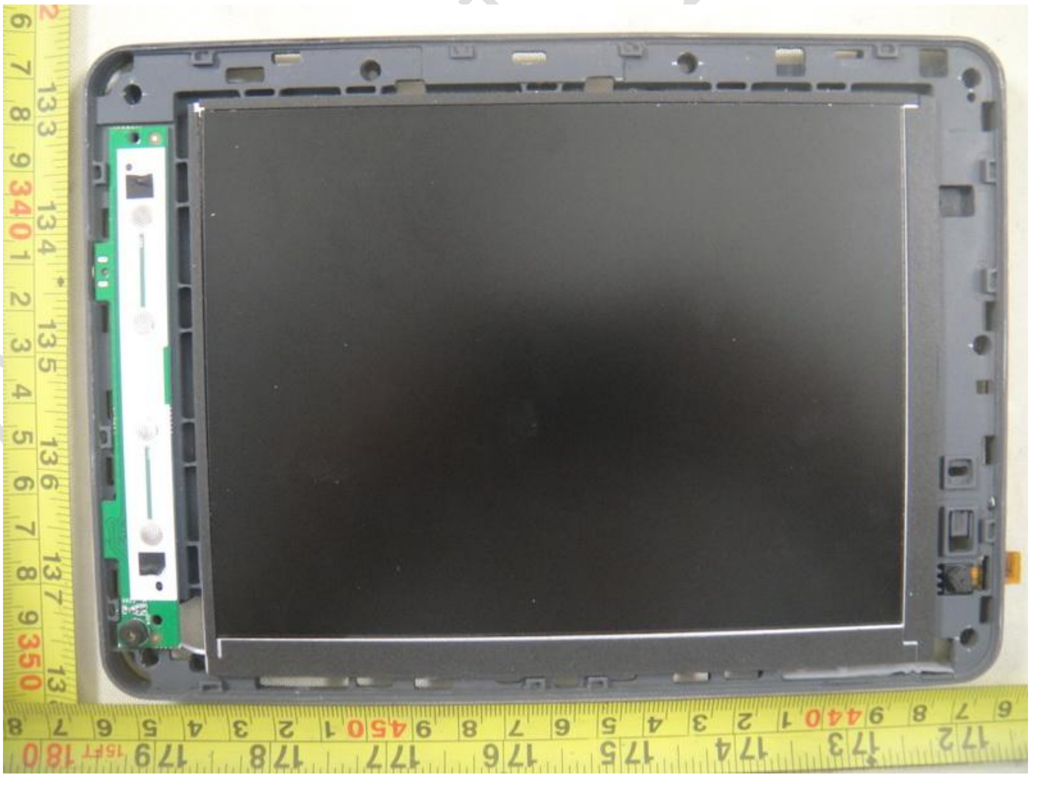
Backup battery (model: S11ND028A)

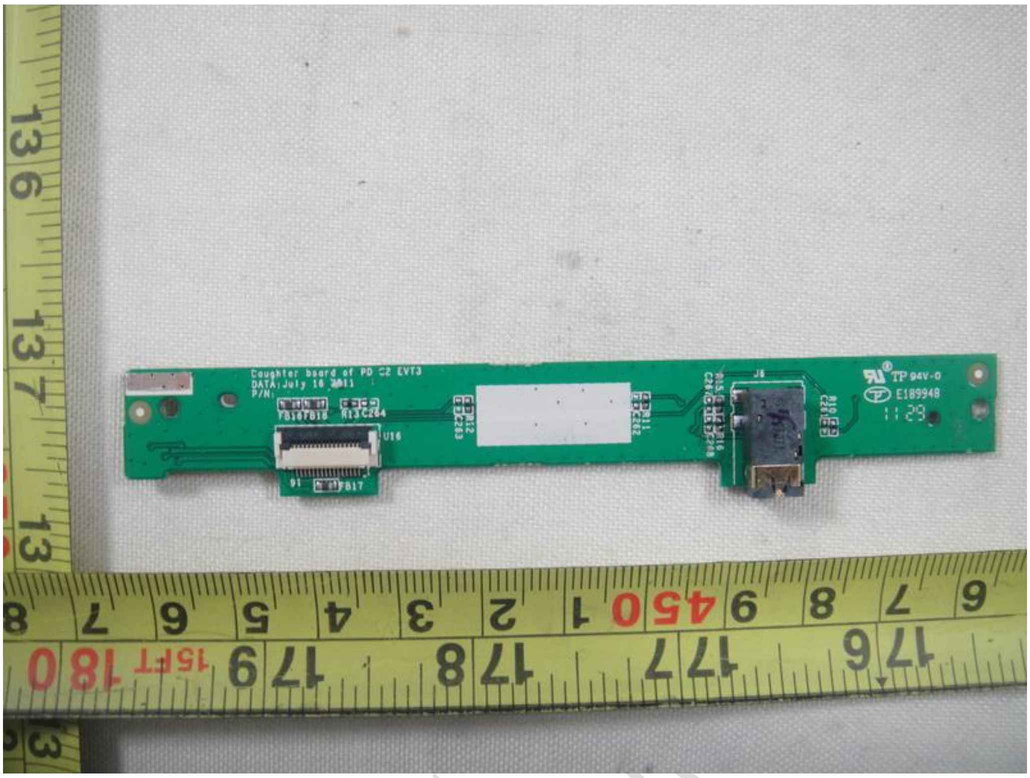
The product declared the battery (S11ND028A) was the backup for battery (MLP3575103) by other manufacture, with the same design and components.

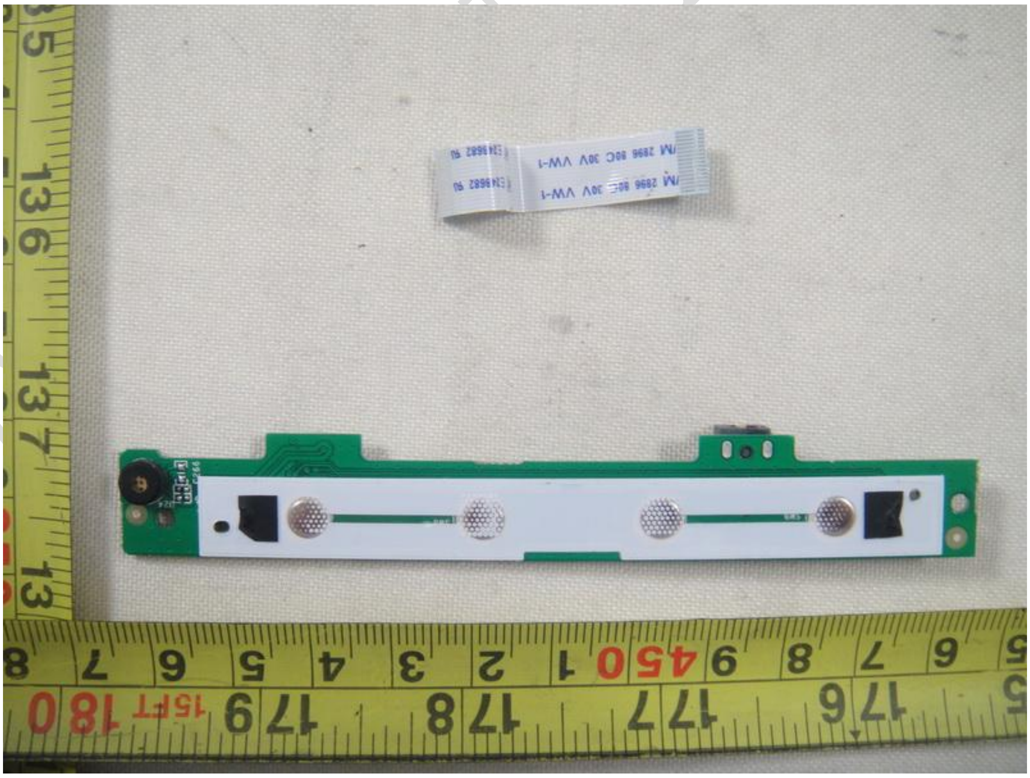






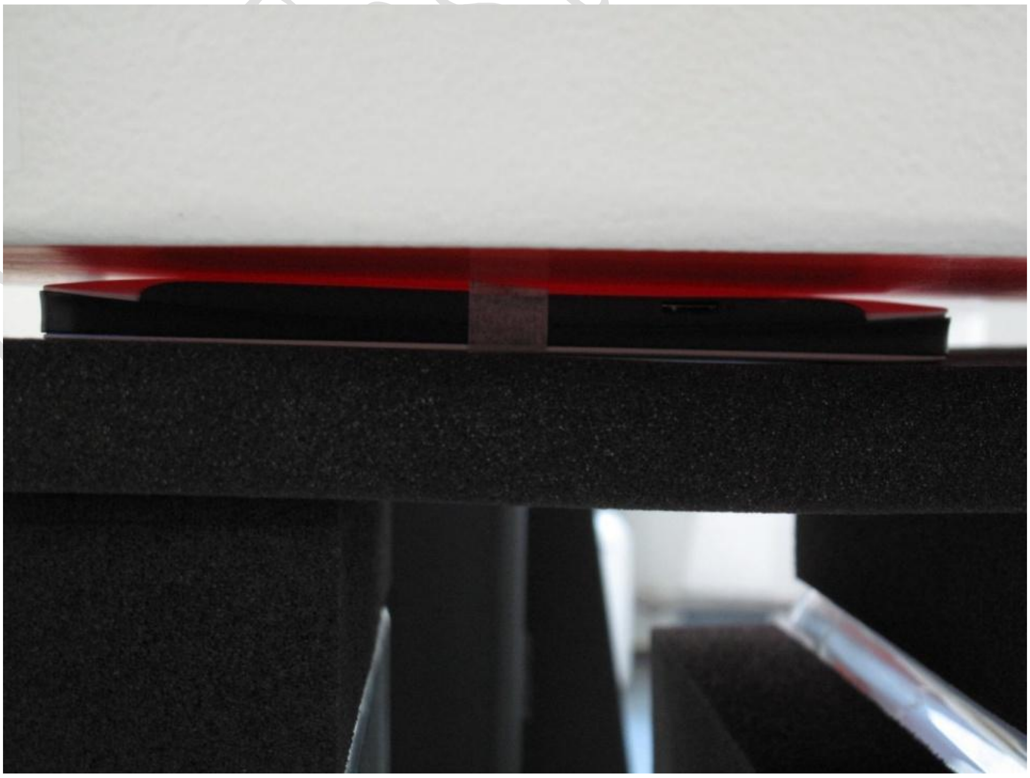






Annex C EUT Test Setup Photos

Picture 1 Face to Phantom



Picture 2 Back to Phantom

Picture 3 Top to Phantom

Annex D Graphical Measurement Results

Date/Time: 2011-9-22 8:05:56, Date/Time: 2011-9-22 8:12:11

FCC_Body_Face_802.11b_Middle

DUT: VISONIC; Type: VISONIC; Serial: --

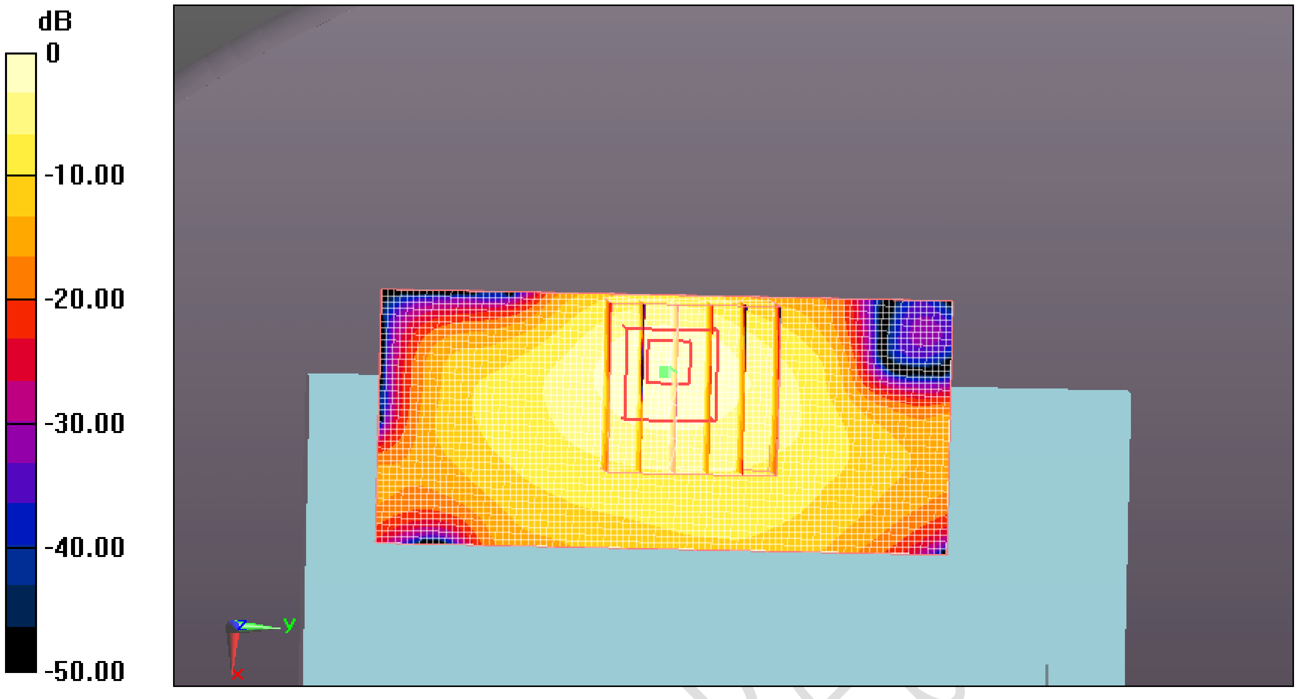
Communication System: 802.11b/g; Communication System Band: WLAN2.4G;
Frequency: 2437 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2437 MHz; σ = 2.028 mho/m; ε_r = 50.805; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3158; ConvF(4.37, 4.37, 4.37); Calibrated: 2011-6-16
    - Modulation Compensation: - -
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn797; Calibrated: 2011-6-21
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Configuration/802.11b_Face_Mid/Area Scan (41x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.054 mW/g

Configuration/802.11b_Face_Mid/Zoom Scan (6x6x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0 dB
Peak SAR (extrapolated) = 0.101 W/kg
SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.052 mW/g



0 dB = 0.050mW/g

Date/Time: 2011-9-22 8:52:17, Date/Time: 2011-9-22 9:00:41

FCC_Body_Back_802.11b_Middle

DUT: VISONIC; Type: VISONIC; Serial: --

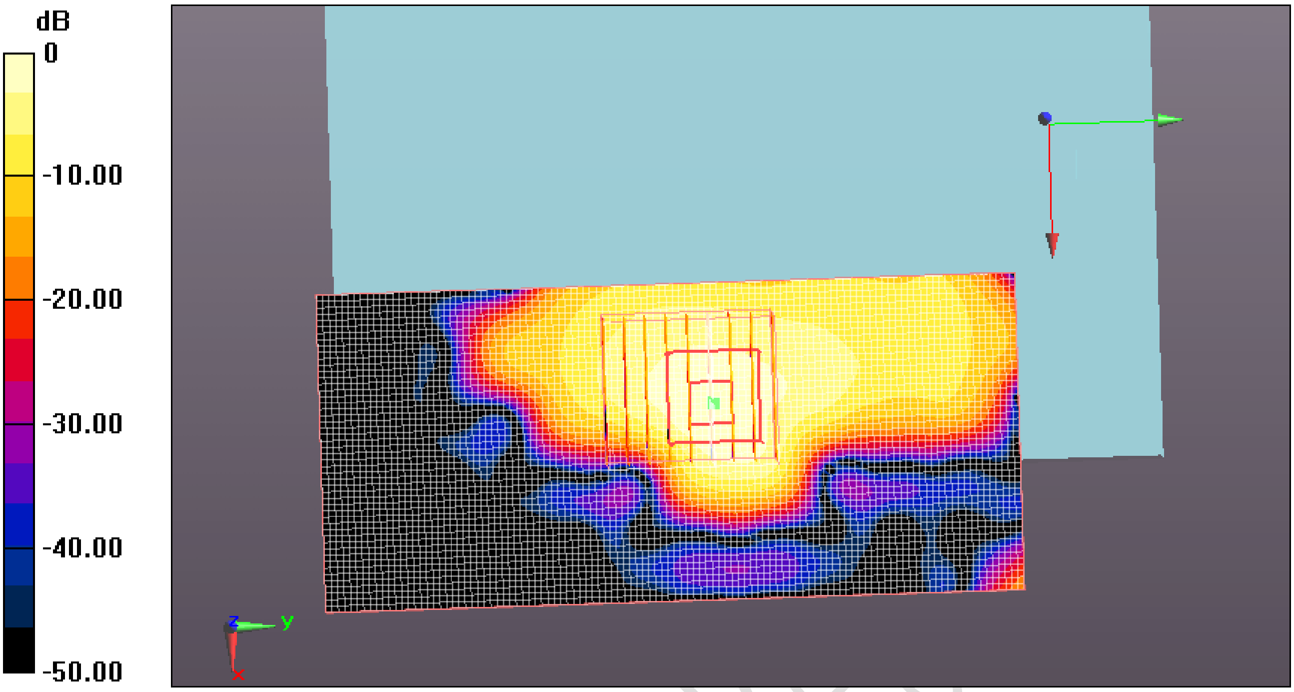
Communication System: 802.11b/g; Communication System Band: WLAN2.4G; Frequency: 2437 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2437 MHz; σ = 2.028 mho/m; ε_r = 50.805; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3158; ConvF(4.37, 4.37, 4.37); Calibrated: 2011-6-16
    - Modulation Compensation: - -
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn797; Calibrated: 2011-6-21
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Configuration/802.11b_Back_Mid 2/Area Scan (51x111x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.054 mW/g

Configuration/802.11b_Back_Mid 2/Zoom Scan (8x9x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.530 V/m; Power Drift = -0.31 dB
Peak SAR (extrapolated) = 0.088 W/kg
SAR(1 g) = 0.038 mW/g; SAR(10 g) = 0.016 mW/g
Maximum value of SAR (measured) = 0.044 mW/g



0 dB = 0.040mW/g

Date/Time: 2011-9-22 9:48:52, Date/Time: 2011-9-22 9:42:17

FCC_Body_TOP_802.11b_Low

DUT: VISONIC_TB; Type: VISONIC_TB; Serial: --

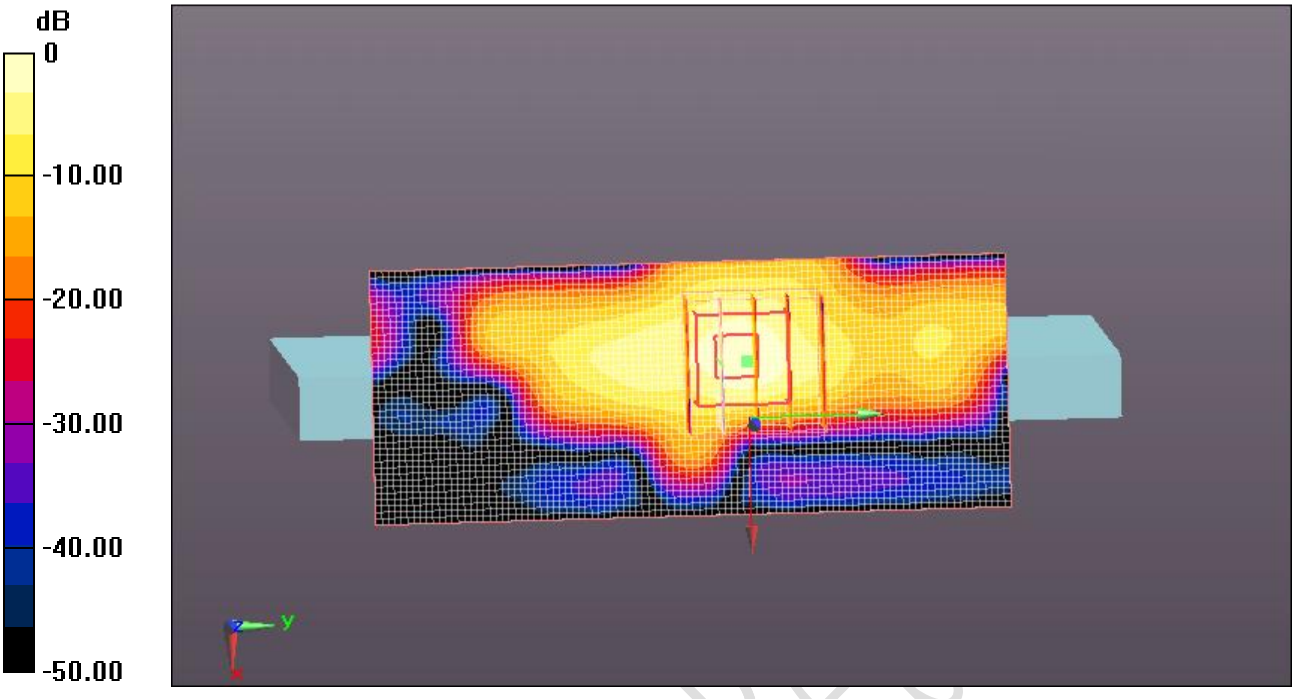
Communication System: 802.11b/g; Communication System Band: WLAN2.4G;
Frequency: 2412 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2412 MHz; σ = 1.983 mho/m; ε_r = 51.017; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3158; ConvF(4.37, 4.37, 4.37); Calibrated: 2011-6-16
  - Modulation Compensation: - -
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn797; Calibrated: 2011-6-21
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Configuration/802.11b_Top_Low/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.667 V/m; Power Drift = 0.37 dB
Peak SAR (extrapolated) = 0.143 W/kg
SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.021 mW/g
Maximum value of SAR (measured) = 0.069 mW/g

Configuration/802.11b_Top_Low/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.056 mW/g



0 dB = 0.060mW/g

Date/Time: 2011-9-22 8:34:11, Date/Time: 2011-9-22 8:40:46

FCC_Body_TOP_802.11b_Middle

DUT: VISONIC_TB; Type: VISONIC_TB; Serial: --

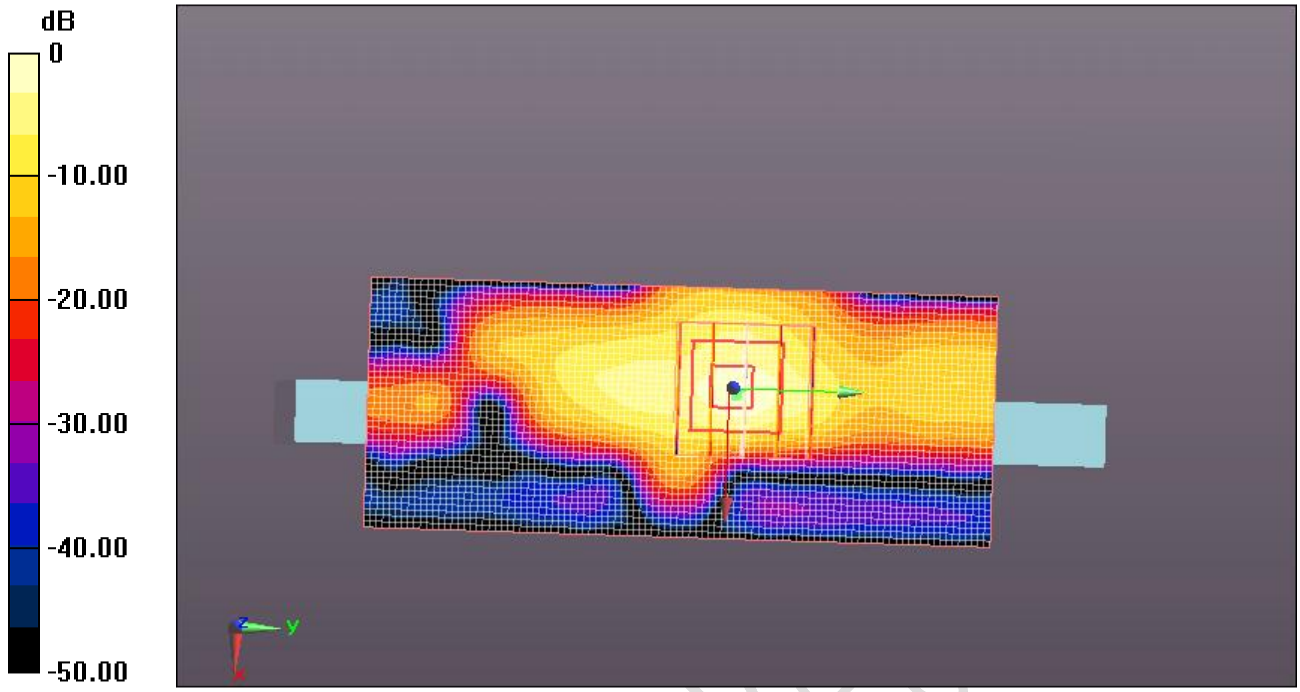
Communication System: 802.11b/g; Communication System Band: WLAN2.4G; Frequency: 2437 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2437 MHz; σ = 2.028 mho/m; ε_r = 50.805; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3158; ConvF(4.37, 4.37, 4.37); Calibrated: 2011-6-16
    - Modulation Compensation: - -
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn797; Calibrated: 2011-6-21
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Configuration/802.11b_Top_Mid/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.053 mW/g

Configuration/802.11b_Top_Mid/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.419 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.101 W/kg
SAR(1 g) = 0.047 mW/g; SAR(10 g) = 0.018 mW/g
Maximum value of SAR (measured) = 0.060 mW/g



0 dB = 0.060mW/g

Date/Time: 2011-9-22 9:24:09, Date/Time: 2011-9-22 9:17:35

FCC_Body_TOP_802.11b_High

DUT: VISONIC_TB; Type: VISONIC_TB; Serial: --

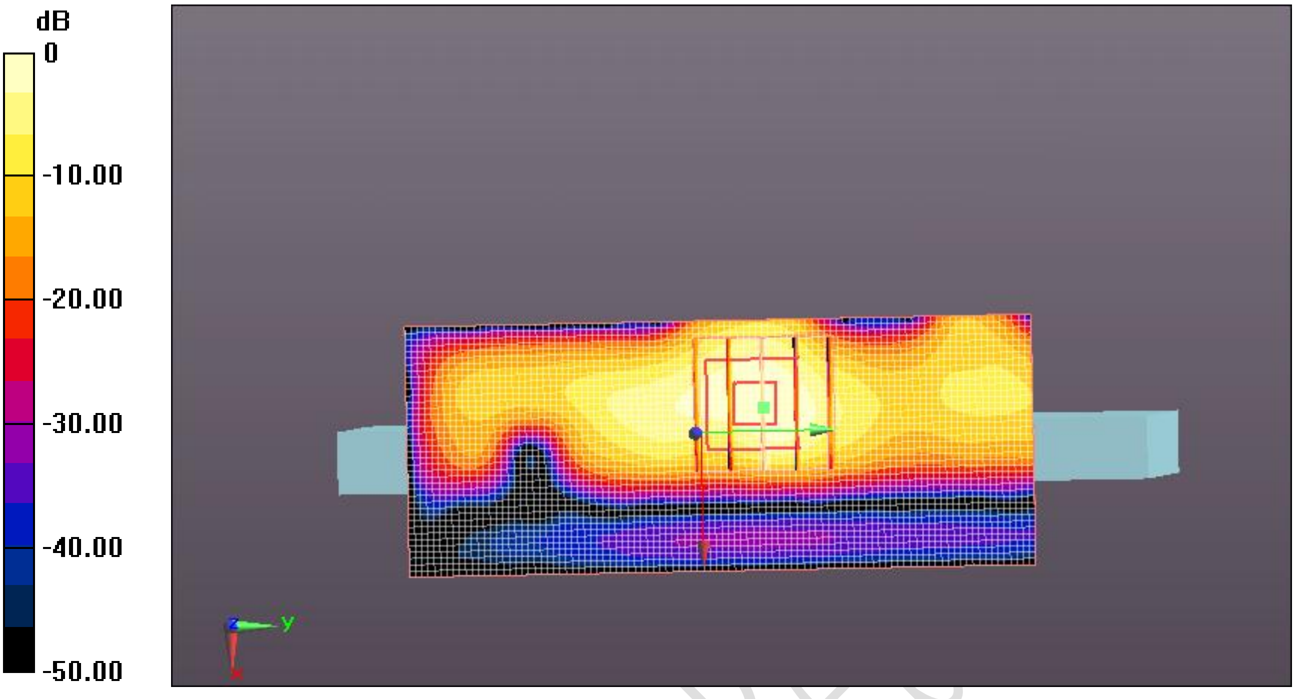
Communication System: 802.11b/g; Communication System Band: WLAN2.4G; Frequency: 2462 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2462 MHz; σ = 2.067 mho/m; ε_r = 50.824; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3158; ConvF(4.37, 4.37, 4.37); Calibrated: 2011-6-16
  - Modulation Compensation: - -
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn797; Calibrated: 2011-6-21
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Configuration/802.11b_Top_High/Zoom Scan (5x5x7)/Cube 0:
Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.486 V/m; Power Drift = 0.38 dB
Peak SAR (extrapolated) = 0.134 W/kg
SAR(1 g) = 0.051 mW/g; SAR(10 g) = 0.019 mW/g
Maximum value of SAR (measured) = 0.061 mW/g

Configuration/802.11b_Top_High/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.052 mW/g



0 dB = 0.050mW/g

Annex E System Performance Check Graphical Results

Date/Time: 2011-9-22 7:40:19, Date/Time: 2011-9-22 7:50:48

FCC_SystemPerformanceCheck-Body_D2450_21dBm

DUT: Dipole 2450 MHz D2450V2; Type: D2450V2; Serial: D2450V2 - SN:xxx

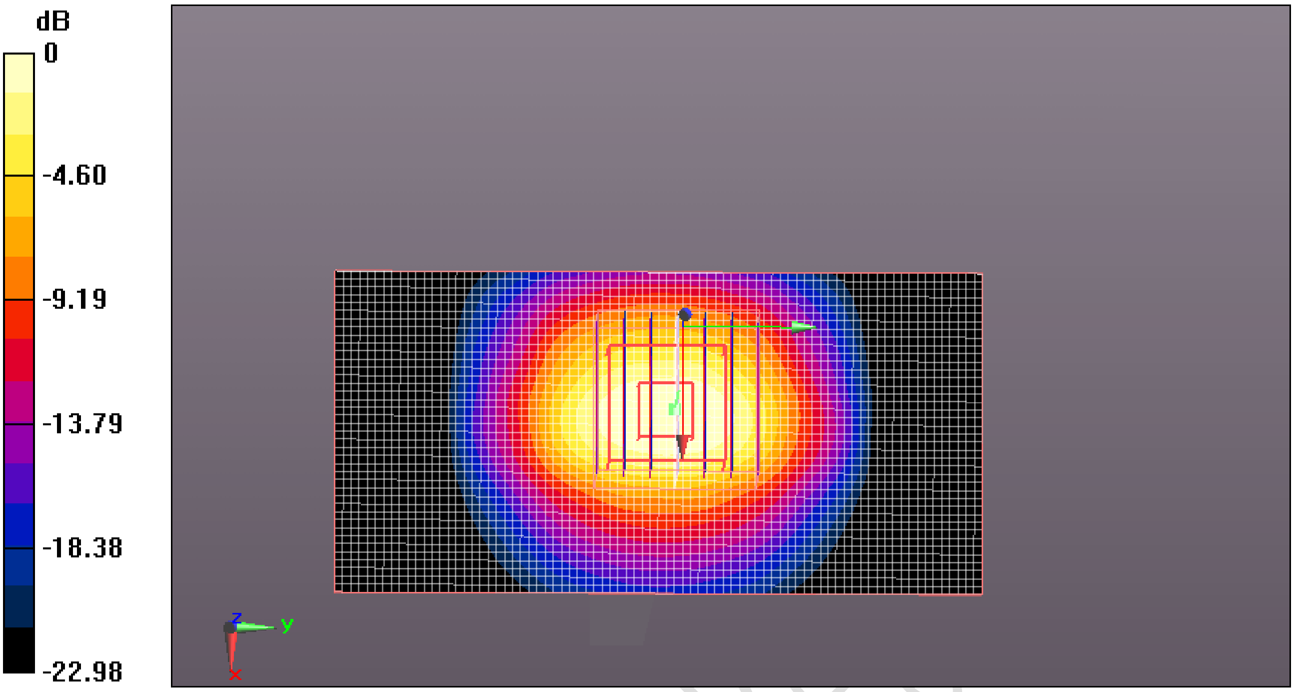
Communication System: CW; Communication System Band: - -; Frequency: 2450 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2450 MHz; σ = 2.043 mho/m; ε_r = 50.833; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3158; ConvF(4.37, 4.37, 4.37); Calibrated: 2011-6-16
  - Modulation Compensation: - -
- Sensor-Surface: 3.4mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn797; Calibrated: 2011-6-21
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: xxxx
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Configuration/d=10mm, Pin=21 dBm/Area Scan (41x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 8.110 mW/g

Configuration/d=10mm, Pin=21 dBm/Zoom Scan (7x7x7) (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.959 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 14.167 W/kg
SAR(1 g) = 6.5 mW/g; SAR(10 g) = 2.96 mW/g
Maximum value of SAR (measured) = 7.341 mW/g



0 dB = 7.340mW/g

Annex F Probes Calibration Certificates

The System Validation was conducted following the requirements of standard IEEE 1528: 2003 Clause 8.3.

The scanned copy of the calibration certificate of the probe used is as following.

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **CTTL (Auden)**

Certificate No: **ES3-3158_Jun11**

CALIBRATION CERTIFICATE

Object	ES3DV3 - SN:3158
Calibration procedure(s)	QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	June 16, 2011

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 16, 2011

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Certificate No: ES3-3158_Jun11 Page 1 of 11

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe ES3DV3

SN:3158

Manufactured: August 13, 2007
Calibrated: June 16, 2011

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3158

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.09	1.23	1.22	± 10.1 %
DCP (mV)[B]	104.2	98.6	99.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	103.8	±1.9 %
			Y	0.00	0.00	1.00	109.6	
			Z	0.00	0.00	1.00	105.7	

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 5 and 6).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3158

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	6.24	6.24	6.24	1.00	1.00	± 12.0 %
835	41.5	0.90	5.98	5.98	5.98	1.00	1.10	± 12.0 %
900	41.5	0.97	5.86	5.86	5.86	1.00	1.10	± 12.0 %
1750	40.1	1.37	5.24	5.24	5.24	0.88	1.20	± 12.0 %
1900	40.0	1.40	5.01	5.01	5.01	0.82	1.24	± 12.0 %
1950	40.0	1.40	4.88	4.88	4.88	0.89	1.19	± 12.0 %
2450	39.2	1.80	4.41	4.41	4.41	0.75	1.30	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

ES3DV3– SN:3158 June 16, 2011

DASY/EASY - Parameters of Probe: ES3DV3- SN:3158

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) C	Relative Permittivity F	Conductivity (S/m) F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	6.08	6.08	6.08	1.00	1.14	± 12.0 %
835	55.2	0.97	5.98	5.98	5.98	1.00	1.16	± 12.0 %
900	55.0	1.05	5.90	5.90	5.90	1.00	1.14	± 12.0 %
1750	53.4	1.49	5.13	5.13	5.13	0.81	1.38	± 12.0 %
1900	53.3	1.52	4.81	4.81	4.81	0.82	1.35	± 12.0 %
1950	53.3	1.52	4.90	4.90	4.90	0.71	1.44	± 12.0 %
2450	52.7	1.95	4.37	4.37	4.37	0.96	1.09	± 12.0 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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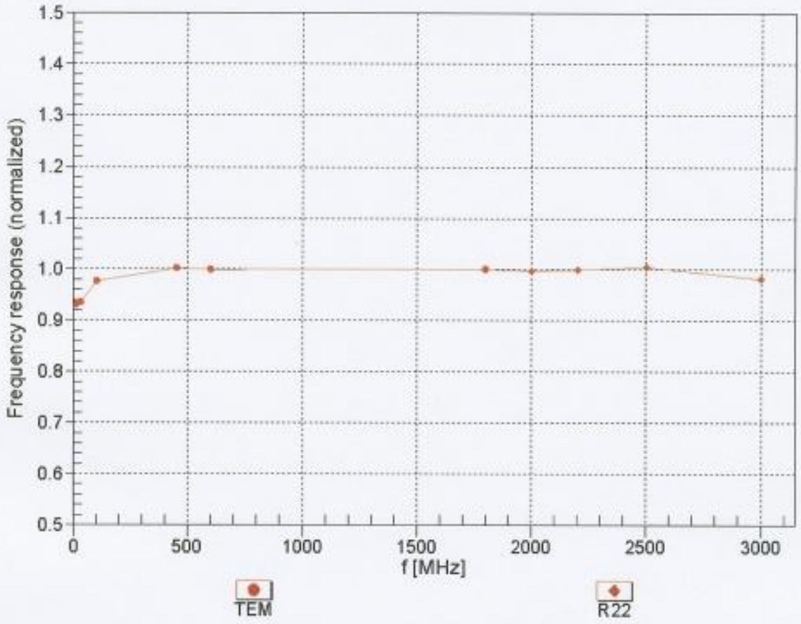
ES3DV3– SN:3158 June 16, 2011

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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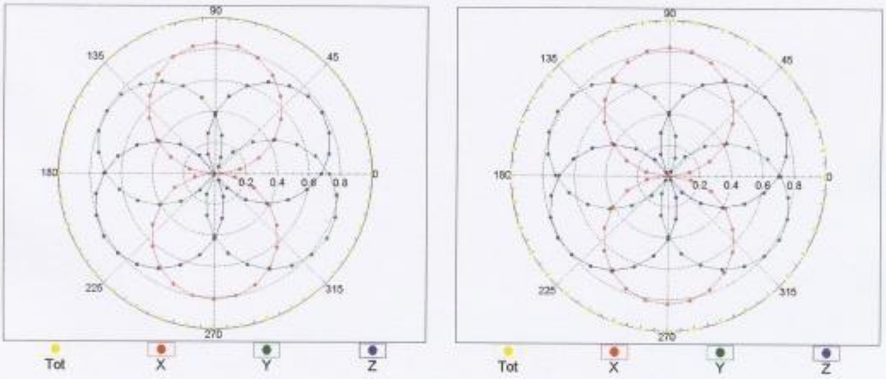
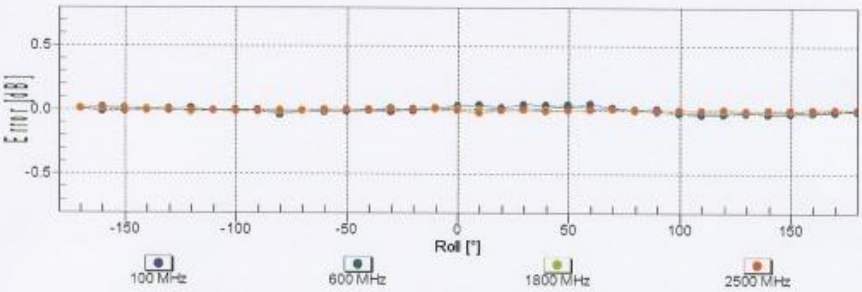
ES3DV3– SN:3158 June 16, 2011

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM f=1800 MHz,R22





Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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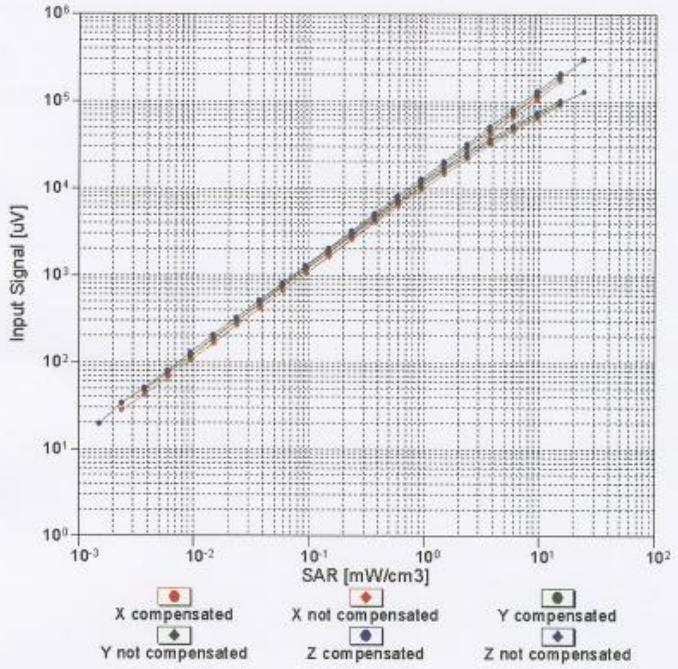
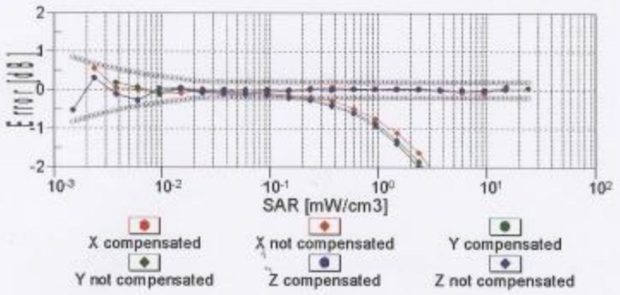
ES3DV3– SN:3158 June 16, 2011

Dynamic Range f(SAR_{head})

(TEM cell , f = 900 MHz)





Uncertainty of Linearity Assessment: ± 0.6% (k=2)

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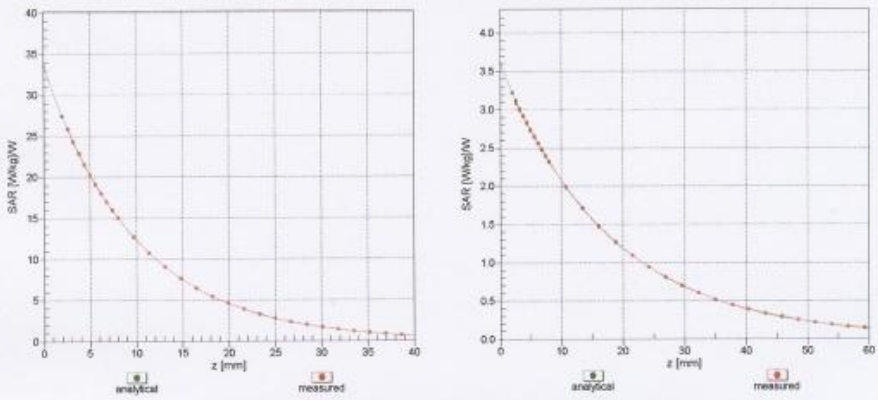
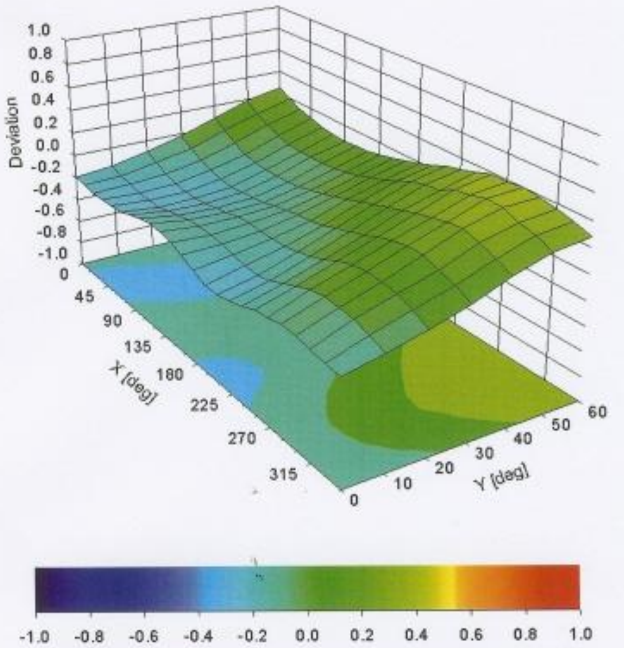
ES3DV3– SN:3158 June 16, 2011

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

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ES3DV3– SN:3158 June 16, 2011

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3158

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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Annex G Deviations from Prescribed Test Methods

No deviation from Prescribed Test Methods.

The End of this Report