FCC SAR TEST REPORT

Report No.:	SET2013-05837
Product Name:	GALAPAD9
Model No.:	GALAPAD9
FCC ID:	Y3GGALAPAD9G3
Applicant:	Galaxy Microsystems Ltd.
Address:	Room 1101-1103, 11/F, Enterprise Square Two, 3 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong
Issued by:	CCIC-SET
Lab Location:	Electronic Testing Building, Shahe Road，Xili, Nanshan District, Shenzhen, 518055, P. R. China
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Test Report

Product Name	GALAPAD9
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Applicant	Galaxy Microsystems Ltd.
Applicant Address	Room 1101-1103, 11/F, Enterprise Square Two, 3 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong
Manufacturer	Galaxy Microsystems Ltd.
Manufacturer Address	Room 1101-1103, 11/F, Enterprise Square Two, 3 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong
Test Standards	**47CFR § 2.1093-** Radiofrequency Radiation Exposure Evaluation: Portable Devices; **FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01):** Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; **ANSI C95.1–1999:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz; **IEEE 1528–2003:** Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices: Experimental Techniques;
Test Result	**Pass**
Tested by	2013-10-16 Signature, Date
Reviewed by	2013-10-16 Signature, Date
Approved by	2013-10-16 Signature, Date

Contents

1. GENERAL CONDITIONS

1.1 This report only refers to the item that has undergone the test.

1.2 This report standalone does not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities.

1.3 This document is only valid if complete; no partial reproduction can be made without written approval of CCIC-SET.

1.4 This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of CCIC-SET. and the Accreditation Bodies, if it applies.

2. Administrative Date

2.1. Identification of the Responsible Testing Laboratory

Company Name:	CCIC-SET
Department:	EMC & RF Department
Address:	Electronic Testing Building, Shahe Road, Nanshan District, Shenzhen, P. R. China
Telephone:	+86-755-26628676
Fax:	+86-755-26627238
Responsible Test Lab Managers:	Mr. Wu Li'an

2.2. Identification of the Responsible Testing Location(s)

Company Name:	CCIC-SET
Address:	Electronic Testing Building, Shahe Road, Nanshan District, Shenzhen, P. R. China

2.3. Organization Item

CCIC-SET Report No.:	SET2013-05837
CCIC-SET Project Leader:	Mr. Li Sixiong
CCIC-SET Responsible for accreditation scope:	Mr. Wu Li'an
Start of Testing:	2013-09-22
End of Testing:	2013-09-22

2.4. Identification of Applicant

Company Name:	Galaxy Microsystems Ltd.
Address:	Room 1101-1103, 11/F, Enterprise Square Two, 3 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong

2.5. Identification of Manufacture

Company Name:	Galaxy Microsystems Ltd.
Address:	Room 1101-1103, 11/F, Enterprise Square Two, 3 Sheung Yuet Road, Kowloon Bay, Kowloon, Hong Kong

Notes: This data is based on the information by the applicant.

3. Equipment Under Test (EUT)

3.1. Identification of the Equipment under Test

Sample Name: GALAPAD9

Type Name: GALAPAD9

General description:	Support band	Wi-Fi 2.4 GHz
	Test band	Wi-Fi 2.4 GHz
	Development Stage	Identical Prototype
	Accessories	Power Supply
	Battery type	SR3275105-1S2P
	Battery specification	6000mAh/3.7V
	Antenna type	IFA Antenna
	Operation mode	802.11b, 802.11g, 802.11n-20MHz, 802.11n-40MHz
	Modulation mode	DSSS, OFDM

NOTE:

a. The EUT is a model of GALAPAD9, it could support 802.11b, 802.11g, 802.11n-20MHz, 802.11n-40MHz.

b. Since the EUT didn't support voice function, only support data function, the tests were carried out against body.

c. Please refer to Appendix C for the photographs of the EUT. For a more detailed features description about the EUT, please refer to User's Manual.

4 Specific Absorption Rate (SAR)

4.1 Introduction

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.

4.2 SAR Definition

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 (). The equation description is as below:

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

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

SAR measurement can be either related to the temperature elevation in tissue by

$$\mathrm{SAR} = C\frac{\delta T}{\delta t}$$

where C is the specific head capacity, δT is the temperature rise and δt the exposure duration, or related to the electrical field in the tissue by

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

where σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the rms electrical field strength.

However for evaluating SAR of low power transmitter, electrical field measurement is typically applied.

4.3 Phantoms

The phantom used for all tests i.e. for both system checks and device testing, was the twin-headed "SAM Phantom", manufactured by SATIMO. The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region, where shell thickness increases to 6mm).

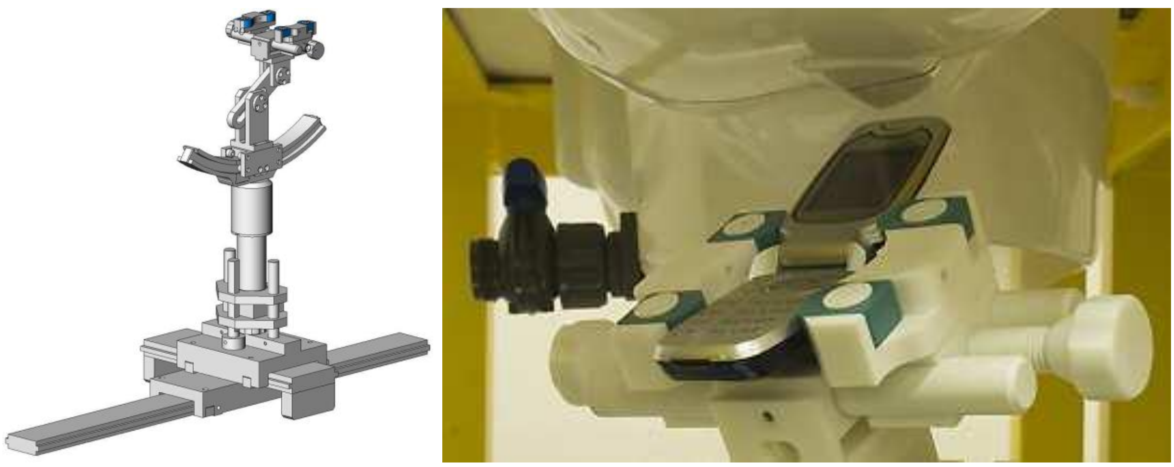
System checking was performed using the flat section, whilst Head SAR tests used the left and right head profile sections. Body SAR testing also used the flat section between the head profiles.

SAM Twin Phantom

4.4 Device Holder

The device was placed in the device holder (illustrated below) that is supplied by SATIMO as an integral part of the COMOSAR test system.

The device holder is designed to cope with the different positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles.



Device holder

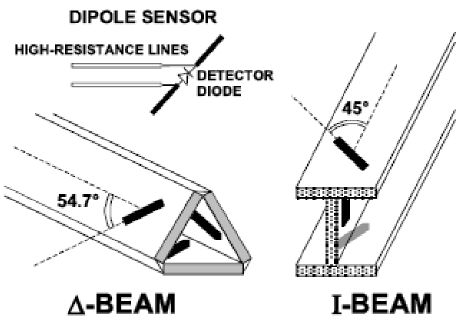
4.5 Probe Specification

Construction	Symmetrical design with triangular core Interleaved sensors Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
Calibration	ISO/IEC 17025 calibration service available.
Frequency	700 MHz to 3 GHz; Linearity: ± 0.5 dB (700 MHz to 3 GHz)
Directivity	± 0.25 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
Dynamic Range	1.5 µW/g to 100 mW/g; Linearity: ± 0.5 dB
Dimensions	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 5 mm (Body: 8 mm) Distance from probe tip to dipole centers: <2.7 mm
Application	General dosimetry up to 3 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones
Compatibility	COMOSAR

Isotropic E-Field Probe

The isotropic E-Field probe has been fully calibrated and assessed for isotropicity, and boundary effect within a controlled environment. Depending on the frequency for which the probe is calibrated the method utilized for calibration will change.

The E-Field probe utilizes a triangular sensor arrangement as detailed in the diagram below:



5 OPERATIONAL CONDITIONS DURING TEST

5.1 Schematic Test Configuration

During SAR test, EUT is in Traffic Mode (Channel Allocated) at Normal Voltage Condition. A communication link is set up with a System Simulator (SS) by air link, and a call is established.

The EUT shall use its internal transmitter. The antenna(s), battery and accessories shall be those specified by the manufacturer. The EUT battery must be fully charged and checked periodically during the test to ascertain uniform power output.

The power level results listed in the following table:

Table 1: Maximum Conducted Transmitting Power

Test Mode	Channel	Frequency (MHz)	Measured Output Peak Power (dBm)	Tune up Power in tolerance (dBm)	Scaled Factory
802.11b	1	2412	15.11	15±1	1.227
	6	2437	15.42	15±1	1.148
	11	2462	15.24	15±1	1.197
802.11g	1	2412	14.42	14±1	1.143
	6	2437	14.52	14±1	1.117
	11	2462	14.30	14±1	1.175
802.11n-20MHz	1	2412	13.41	13±1	1.146
	6	2437	13.66	13±1	1.081
	11	2462	13.45	13±1	1.135
802.11n-40MHz	3	2422	11.96	12±1	1.271
	6	2437	11.27	12±1	1.489
	9	2452	11.65	12±1	1.365

5.2 SAR Measurement System

The SAR measurement system being used is the COMOSAR test system, the system is controlled remotely from a PC, which contains the software to control the robot and data acquisition equipment. The software also displays the data obtained from test scans.

In operation, the system first does an area (2D) scan at a fixed depth within the liquid from the inside wall of the phantom. When the maximum SAR point has been found, the system will then carry out a 3D scan centred at that point to determine volume averaged SAR level.

5.2.1 Tissue Dielectric Parameters for Head and Body Phantoms

The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table. These head parameters are derived from planar layer models simulating the highest expected SAR for the dielectric properties and tissue thickness Power drifts in a human head. Other head and body tissue parameters that have not been specified in P1528 are derived from the tissue dielectric parameters computed from the 4-Cole-Cole equations described in extrapolated according to the head parameters specified in P1528.

Table 2: Recommended Dielectric Performance of Tissue

Ingredients (% by weight)	Frequency (MHz)									
	450		835		915		1900		2450	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56.0	54.9	40.4	62.7	73.2
Salt (Nacl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.5	0.5	0.04
Sugar	56.32	46.78	56.0	45.0	56.5	41.76	0.0	58.0	0.0	0.0
HEC	0.98	0.52	1.0	1.0	1.0	1.21	0.0	1.0	0.0	0.0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0.0	0.1	0.0	0.0
Triton x-100	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	36.8	0.0
DGBE	0.0	0.0	0.0	0.0	0.0	0.0	44.92	0.0	0.0	26.7
Dielectric Constant	43.42	58.0	42.54	56.1	42.0	56.8	39.9	54.0	39.8	52.5
Conductivity (s/m)	0.85	0.83	0.91	0.95	1.0	1.07	1.42	1.45	1.88	1.78

Table 3 Recommended Tissue Dielectric Parameters

Frequency (MHz)	Head Tissue		Body Tissue	
	ε_r	σ(S/m)	ε_r	σ(S/m)
150	52.3	0.76	61.9	0.80
300	45.3	0.87	58.2	0.92
450	43.5	0.87	56.7	0.94
835	41.5	0.90	55.2	0.97
900	41.5	0.97	55.0	1.05
915	41.5	0.98	55.0	1.06
1450	40.5	1.20	54.0	1.30
1610	40.3	1.29	53.8	1.40
1800-2000	40.0	1.40	53.3	1.52
2450	39.2	1.80	52.7	1.95
3000	38.5	2.40	52.0	2.73
5800	35.3	5.27	48.2	6.00

5.2.2 Simulant liquids

For body-worn measurements, the EUT was tested against flat phantom representing the user body. The EUT was put on in the belt holder. Simulant liquids that are used for testing at frequencies of Wi-Fi 2.4GHz, which are made mainly of sugar, salt and water solutions may be left in the phantoms.

Table 4: Dielectric Performance of Body Tissue Simulating Liquid

Temperature: 23.2°C; Humidity: 64%			
/	Frequency	Permittivity ε	Conductivity σ (S/m)
Target value	2450	52.7	1.95
Validation value (September 22th, 2013)	2450	52.69	1.93

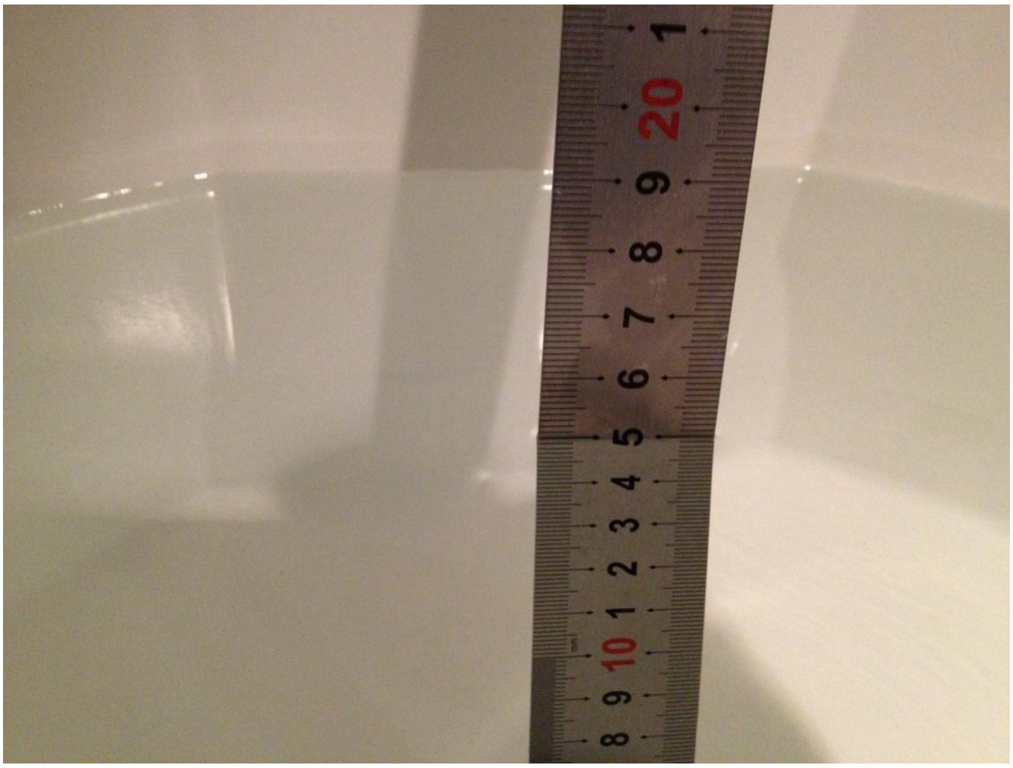


Fig. 1 Configuration of body tissue

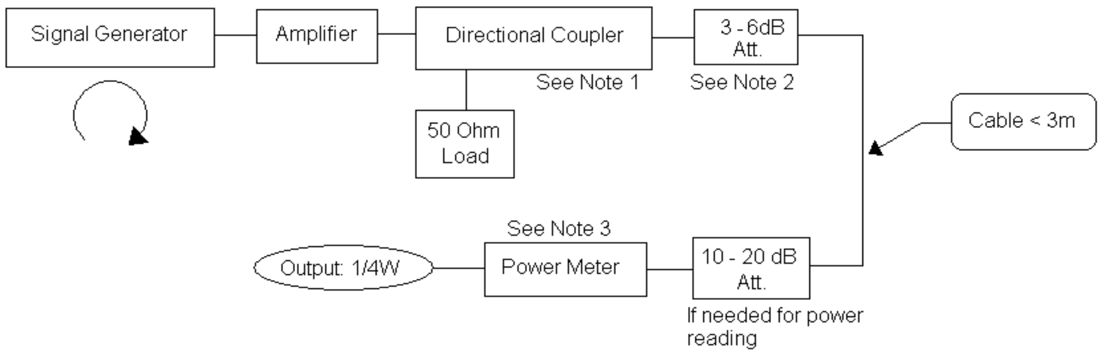
5.2.3 Equipments and results of validation testing

Table 5: Important equipments :

Equipment description	Manufacturer/Model	Identification No.
SAR Probe	SATIMO	SN_0913_EP169
Phantom	SATIMO	SN_0913_SAM97
Liquid	SATIMO	-
Dipole	SATIMO-SID2450	SN_0913_DIP2G450-220
Vector Network Analyzer	Rohde & Schwarz - ZVB8	1145.1010.08
Amplifier	Nucletudes	143060
Power Meter	Rohde & Schwarz - NRVS	1020.1809.02
Multimeter	Keithley - 2000	4014020

Prior to the assessment, the system validation kit was used to test whether the system was operating within its specifications of ±10%. The validation results are tabulated below. And also the corresponding SAR plot is attached as well in the SAR plots files.

The following procedure, recommended for performing validation tests using box phantoms is based on the procedures described in the draft IEEE standard P1528. Setup according to the setup diagram below :



With the SG and Amp and with directional coupler in place, set up the source signal at the relevant frequency and use a power meter to measure the power at the end of the SMA cable that you intend to connect to the balanced dipole. Adjust the SG to make this, say, 0.25W (24 dBm). If this level is too high to read directly with the power meter sensor, insert a calibrated attenuator (e.g. 10 or 20 dB) and make a suitable correction to the power meter reading.

Note 1: In this method, the directional coupler is used for monitoring rather than setting the exact feed power level. If, however, the directional coupler is used for power measurement, you should check the frequency range and power rating of the coupler and measure the coupling factor (referred to output) at the test frequency using a VNA.

Note 2: Remember that the use of a 3dB attenuator (as shown in Figure 8.1 of P1528) means that you need an RF amplifier of 2 times greater power for the same feed power. The other issue is the cable length. You might get up to 1dB of loss per meter of cable, so the cable length after the coupler needs to be quite short.

Note 3: For the validation testing done using CW signals, most power meters are suitable. However, if you are measuring the output of a modulated signal from either a signal generator or a handset, you must ensure that the power meter correctly reads the modulated signals.

The measured 1-gram averaged SAR values of the device against the head and body were provided in Table 6. The humidity and ambient temperature of test facility were 64% and 23.2°C respectively. The phantom was full of the body tissue simulating liquid while testing against the body-worn measurement. The EUT was supplied with full-charged battery for each measurement.

For the body-worn measurement, the EUT was directly against the phantom, and the EUT was tested at the lowest, middle and highest frequencies in the transmit band.

Table 6: Liquid Verification Results (Body)

Frequency	Duty cycle	Target value（W/kg）		Test value（W/kg）	
		10g	1g	10g	1g
2450MHz (September 22th, 2013)	1:1	23.96	51.99	23.88	52.88

*Note: The target value referred to the calibration report of the dipole, and all SAR values are normalized to 1W forward power.

5.2.4 SAR measurement procedure

The SAR test against the head phantom was carried out as follow:

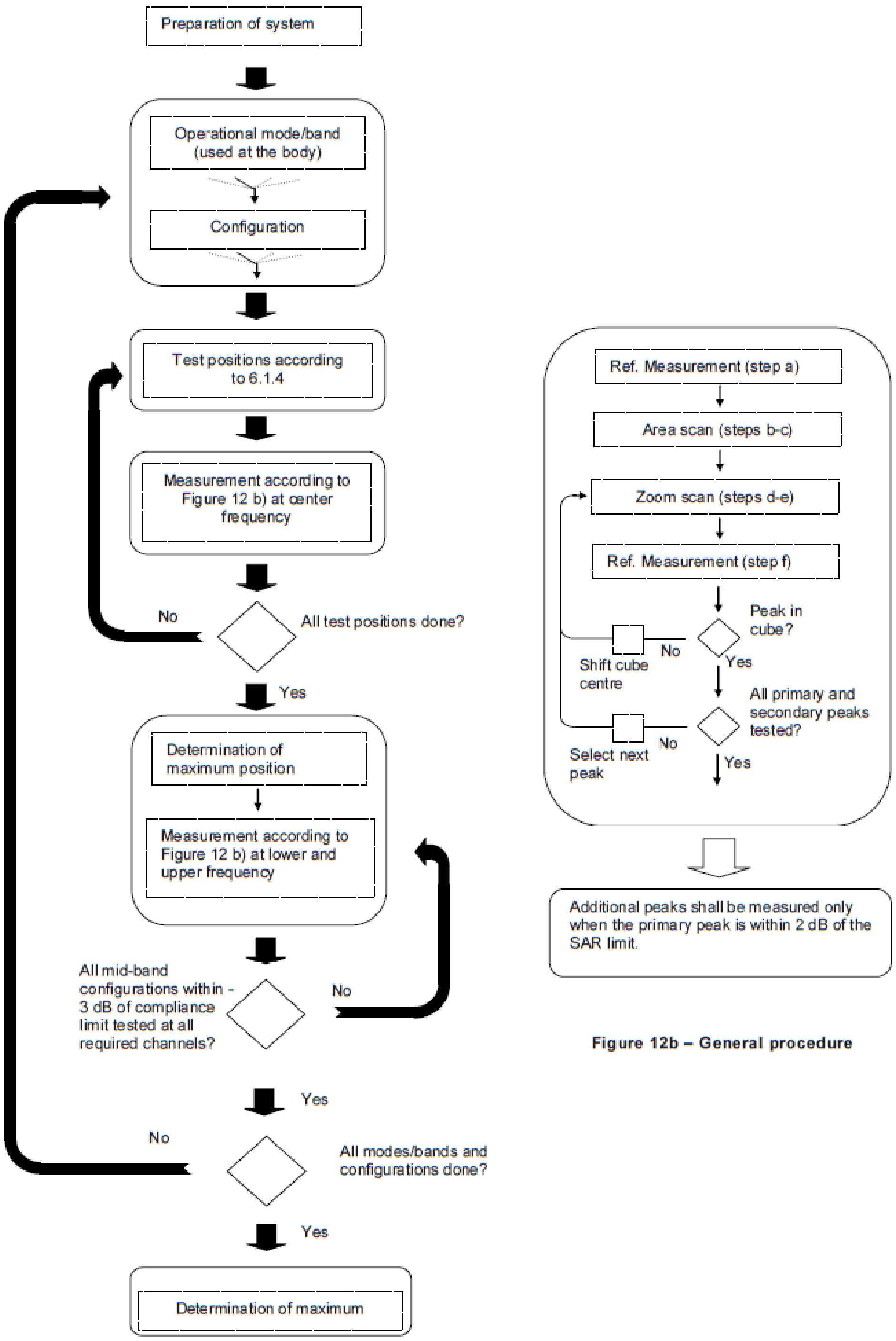


Figure 12b – General procedure

The SAR test against the body-worn was carried out as follow:

The EUT was controlled to operate in 802.11b mode in channel 6 with the maximum output power.

After an area scan has been done at a fixed distance of 8mm from the surface of the phantom on the source side, a 3D scan is set up around the location of the maximum spot SAR. First, a point within the scan area is visited by the probe and a SAR reading taken at the start of testing. At the end of testing, the probe is returned to the same point and a second reading is taken. Comparison between these start and end readings enables the power drift during measurement to be assessed.

The same procedure should be also executed for 802.11b mode in channel 1 and 11.

Above is the scanning procedure flow chart and table from the IEEEp1528 standard. This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behaviour are tested.

5.2.5 Antennas position and test position

There's only one antenna (Wi-Fi antenna) inside the EUT, and it is the transmitting source. The following pictures showed position of the antenna:

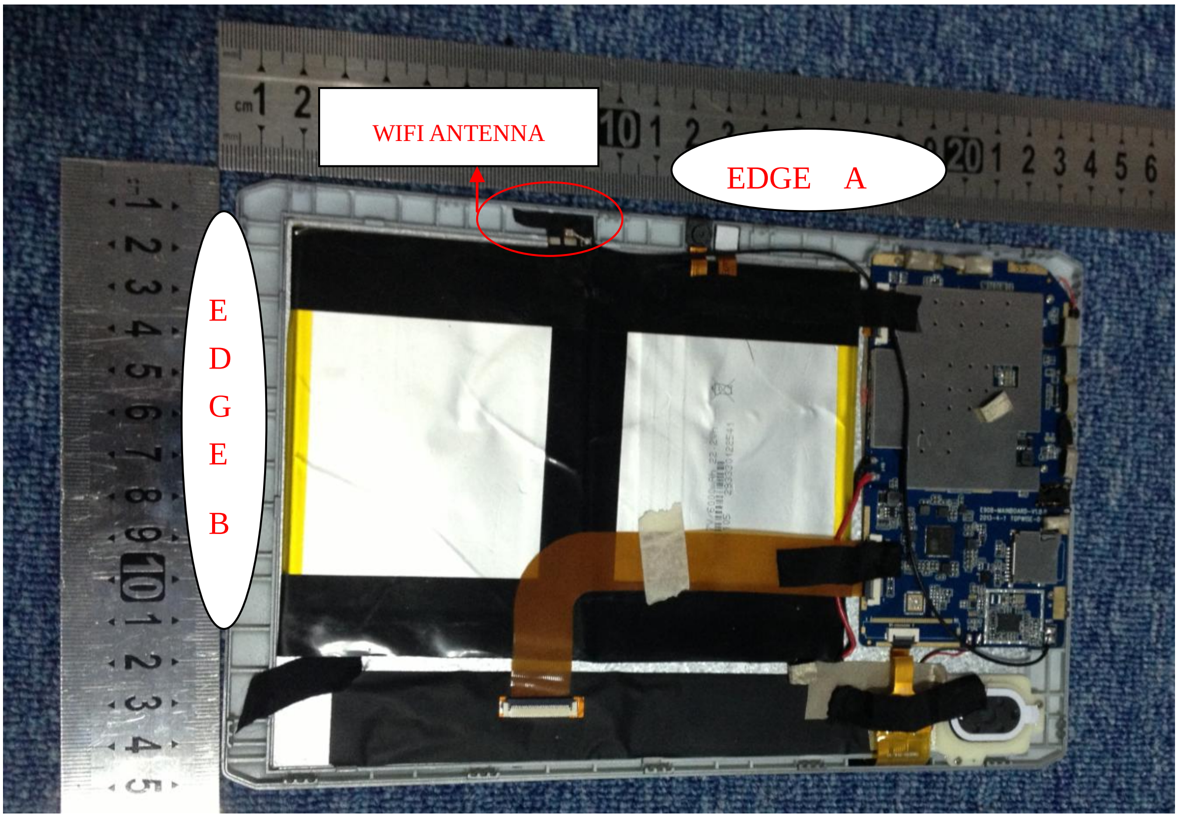


Fig. 3 Position of antenna

Since the EUT does not support hotspot, the tests should be executed under the following positions according to KDB 616217 and KDB447498:

a. Display Upward (the display directly against the phantom);
b. Back Upward (the back directly against the phantom);
c. Edge A (the side of Edge A directly against the phantom);
d. Edge B (the side of Edge B directly against the phantom);

6 CHARACTERISTICS OF THE TEST

6.1 Applicable Limit Regulations

It specifies the maximum exposure limit of **1.6 W/kg** as averaged over any 1 gram of tissue for portable devices being used within 20 cm of the user in the uncontrolled environment.

6.2 Applicable Measurement Standards

47CFR §2.1093- Radiofrequency Radiation Exposure Evaluation: Portable Devices;

FCC OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01): Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields;

ANSI C95.1–1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz;

7 LABORATORY ENVIRONMENT

Table 7: The Ambient Conditions during SAR Test

Temperature	Min. = 22 °C, Max. = 25 °C
Atmospheric pressure	Min.=86 kPa, Max.=106 kPa
Relative humidity	Min. = 30%, Max. = 60%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

8 TEST RESULTS

8.1 Summary of Measurement Results

According the description above, the measurements against the body phantom were executed on the 802.11b mode.

Table 8: SAR Values of WIFI 802.11b

Temperature: 22.0~23.0°C, humidity: 52~60%.				
Test Mode	Test Position	SAR(W/Kg), 1.6 (1g average)		
		Channel		
		1	6	11
802.11b	Back Upward	/	0.190	/
	Display Upward	/	0.122	/
	Edge A	0.342	0.438	0.363
	Edge B	/	0.003	/

Table 9: Scaled SAR Values of 802.11b for tablet platform

Temperature: 22.0~23.0°C, humidity: 52~60%.				
Test Mode	Test Position	SAR(W/Kg), 1.6 (1g average)		
		Channel		
		1	6	11
802.11b	Back Upward	/	0.218	/
	Display Upward	/	0.140	/
	Edge A	0.420	0.503	0.435
	Edge B	/	0.003	/

Note: The SAR test shall be performed at the middle channel.If the SAR measured is at least 3.0 dB lower than the SAR limit (<0.8W/kg),testing at the other channels is optional.

8.2 Conclusion

Localized Specific Absorption Rate (SAR) of this portable wireless device has been measured in all cases requested by the relevant standards cited in Clause 5.2 of this report. Maximum localized SAR is **below** exposure limits specified in the relevant standards.

9 Measurement Uncertainty

No.	Uncertainty Component	Type	Uncertainty Value (%)	Probability Distribution	k	ci	Standard Uncertainty (%) ui(%)	Degree of freedom Veff or vi
	Measurement System							
1	—Probe Calibration	B	7	N	$\sqrt{3}$	1	3.5	∞
2	—Axial isotropy	B	4.7	R	$\sqrt{3}$	0.5	4.3	∞
3	—Hemispherical Isotropy	B	9.4	R	$\sqrt{3}$	0.5	4.3	∞
4	—Boundary Effect	B	11.0	R	$\sqrt{3}$	1	6.4	∞
5	—Linearity	B	4.7	R	$\sqrt{3}$	1	2.7	∞
6	—System Detection Limits	B	1.0	R	$\sqrt{3}$	1	0.6	∞
7	—Readout Electronics	B	1.0	N	$\sqrt{3}$	1	1.00	∞
8	—Response Time	B	0.00	R	$\sqrt{3}$	1	0.00	∞
9	—Integration Time	B	0.00	R	$\sqrt{3}$	1	0.00	∞
10	—RF Ambient Conditions	B	3.0	R	$\sqrt{3}$	1	1.73	∞
11	—Probe Position Mechanical tolerance	B	0.4	R	$\sqrt{3}$	1	0.2	∞
12	—Probe Position with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1.7	∞
13	—Extrapolation, Interpolation and Integration Algorithms for Max. SAR evaluation	B	3.9	R	$\sqrt{3}$	1	2.3	∞

	Uncertainties of the DUT							
14	—Position of the DUT	A	4.8	N	$\sqrt{3}$	1	4.8	5
15	—Holder of the DUT	A	7.1	N	$\sqrt{3}$	1	7.1	5
16	—Output Power Variation –SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	∞
	Phantom and Tissue Parameters							
17	—Phantom Uncertainty(shape and thickness tolerances)	B	1.0	R	$\sqrt{3}$	1	0.6	∞
18	—Liquid Conductivity Target –tolerance	B	5.0	R	$\sqrt{3}$	0.6	1.7	∞
19	—Liquid Conductivity –measurement Uncertainty)	B	0.23	N	$\sqrt{3}$	1	0.23	9
20	—Liquid Permittivity Target tolerance	B	5.0	R	$\sqrt{3}$	0.6	1.7	∞
21	—Liquid Permittivity –measurement uncertainty	B	0.46	N	$\sqrt{3}$	1	0.46	∞
Combined Standard Uncertainty				RSS			12.92	44.15
Expanded uncertainty (Confidence interval of 95 %)				K=2			25.84	

10 MAIN TEST INSTRUMENTS

No	EQUIPMENT	TYPE	Series No.	Due Date
1	System Simulator	E5515C	GB 47200710	2014/02/23
2	SAR Probe	SATIMO	SN_0913_EP169	2014/04/04
3	Dipole	SID900	SN_0913_DIP0G900-215	2014/04/04
4	Dipole	SID1800	SN_0913_DIP1G800-216	2014/04/04
5	Dipole	SID1900	SN_0913_ DIP1G900-218	2014/04/04
6	Dipole	SID2450	SN_0913_DIP2G450-220	2014/04/04
7	Vector Network Analyzer	ZVB8	A0802530	2014/06/13
8	Signal Generator	SMR27	A0304219	2014/06/10
9	Amplifier	Nucletudes	143060	2014/04/04
10	Power Meter	NRVS	A0802531	2014/06/10
11	Power Sensor	NRV-Z4	100069	2014/06/10
12	Multimeter	Keithley-2000	4014020	2014/01/29
13	Device Holder	MSH80	SN 09/13 MSH80	2014/04/04
14	SAM Phantom	SAM97	SN 09/13 SAM97	2014/04/04

ANNEX A

of

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

CONFORMANCE TEST REPORT FOR

HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

SET2013-05837

GALAPAD

Type Name: GALAPAD9

Accreditation Certificate

This Annex consists of 2 pages

Date of Report: 2013-10-16

China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L1659)

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

Building 28/29, Shigudong, Xili Industrial Area, Xili Street,

Nanshan District, Shenzhen, Guangdong, China

is accredited to ISO/IEC 17025:2005 General Requirements for the Competence of Testing and Calibration Laboratories(CNAS-CL01 Accreditation Criteria for the Competence of Testing and Calibration Laboratories) for the competence of testing and calibration.

The scope of accreditation is detailed in the attached appendices bearing the same registration number as above. The appendices form an integral part of this certificate.

Date of Issue：2012-09-29

Date of Expiry：2015-09-28

Date of Initial Accreditation：1999-08-03

Date of Update： 2012-09-29

Signed on behalf of China National Accreditation Service for Conformity Assessment

China National Accreditation Service for Conformity Assessment (CNAS) is authorized by Certification and Accreditation Administration of the People's Republic of China (CNCA) to operate the national accreditation schemes for conformity assessment. CNAS is the signatory to International Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (ILAC MRA) and Asia Pacific Laboratory Accreditation Cooperation Multilateral Recognition Arrangement (APLAC MRA).

No.CNAS AL 2 0005210

ANNEX B

of

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

CONFORMANCE TEST REPORT FOR

HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

SET2013-05837

Galaxy Microsystems Ltd.

GALAPAD

Type Name: GALAPAD9

Hardware Version： 1.0

Software Version： 4.2

Typical Test Layout

This Annex consists of 3 pages

Date of Report: 2013-10-16

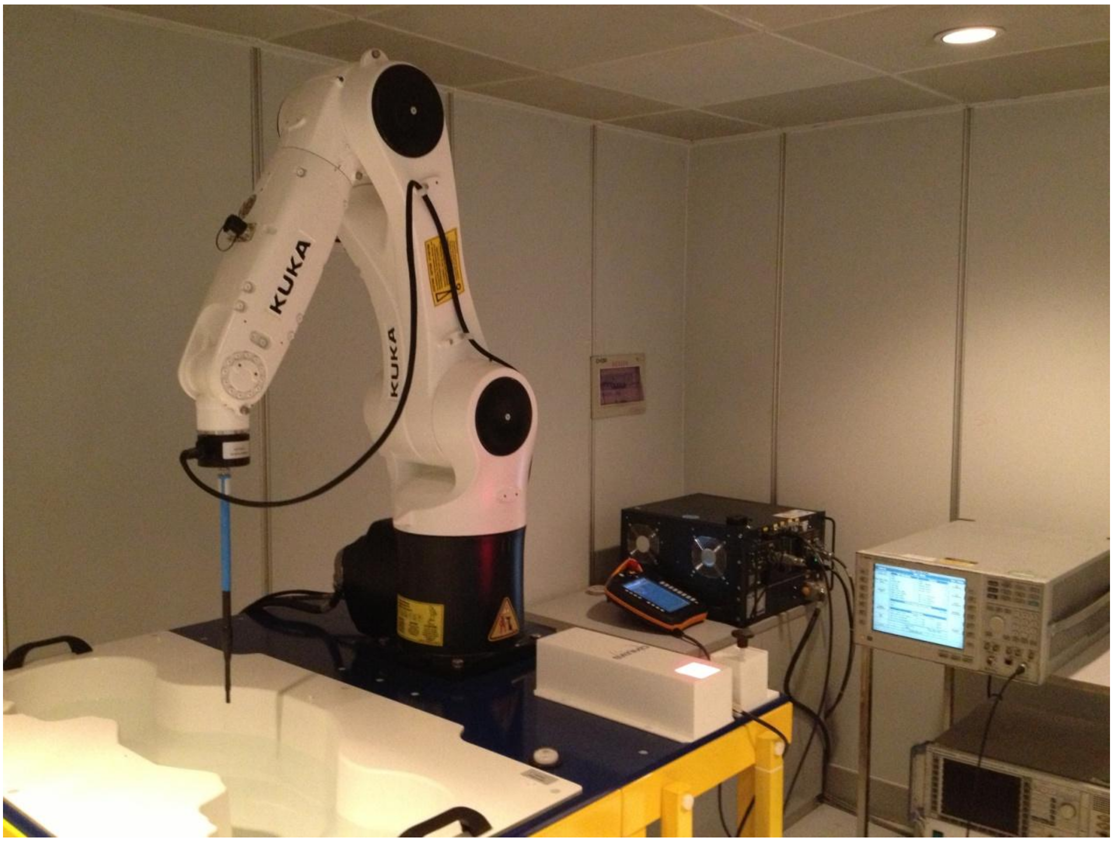


Fig.1 COMO SAR Test System

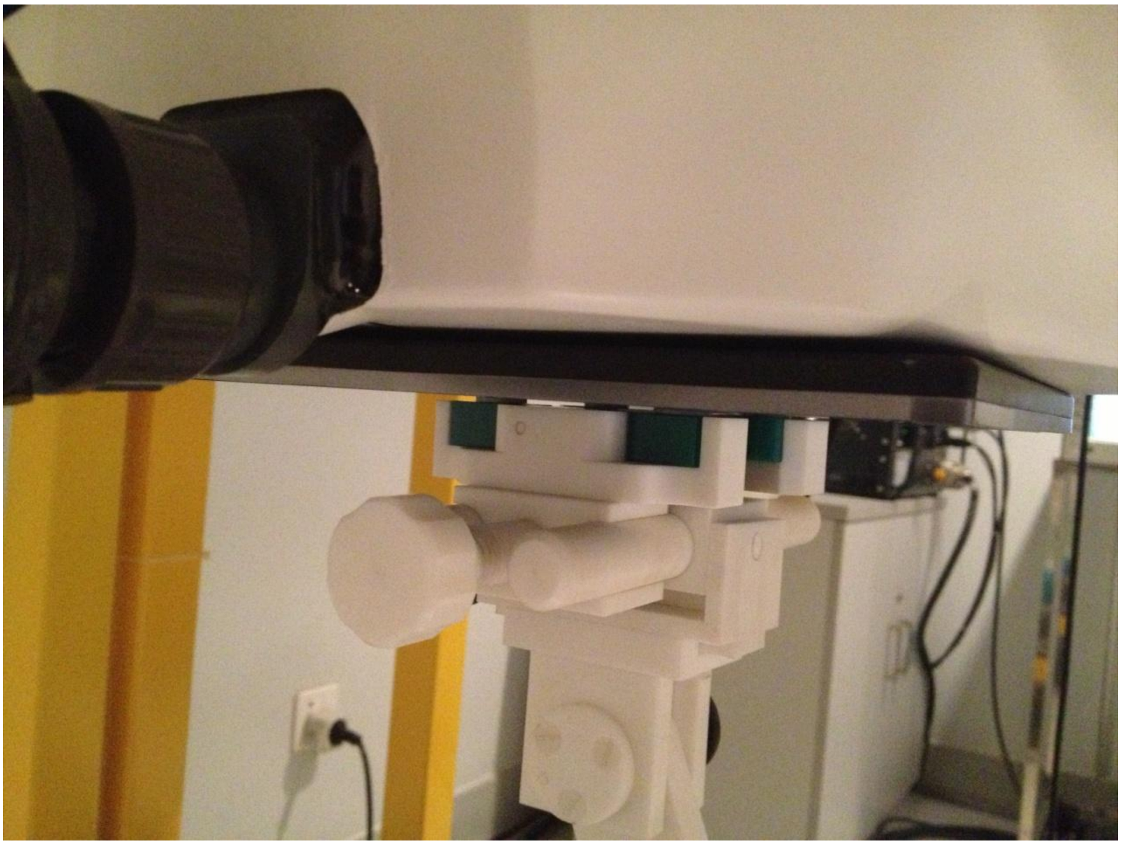


Fig.2 Back Upward

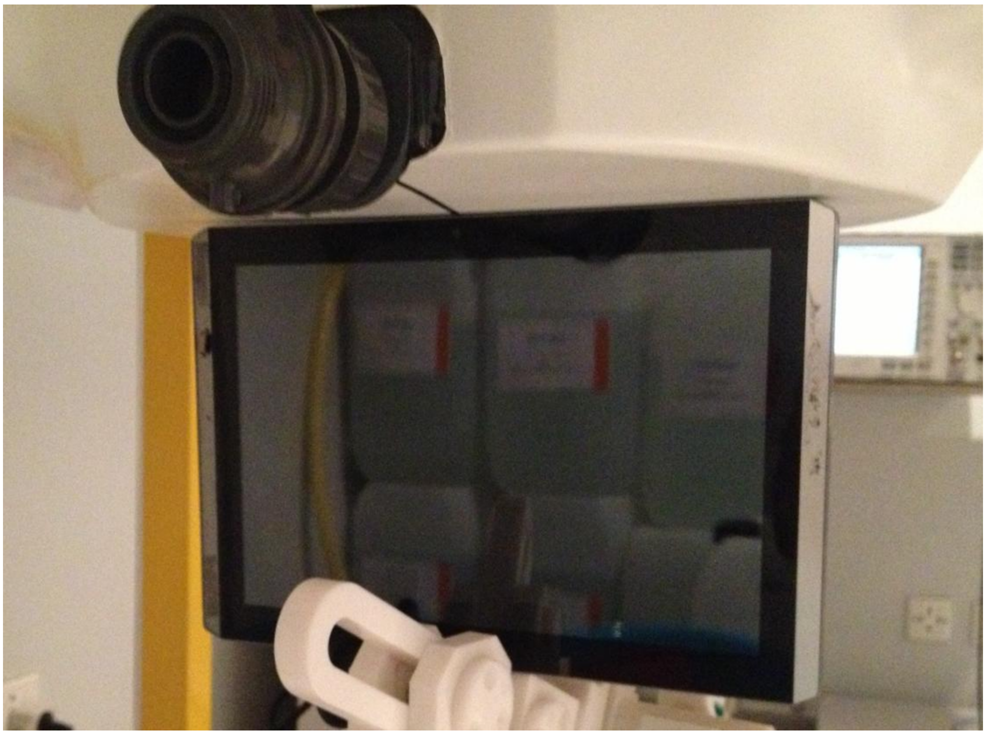


Fig.3 Edge A Upward

Fig.4 Edge B Upward

ANNEX C

of

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

CONFORMANCE TEST REPORT FOR

HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

SET2013-05837

Galaxy Microsystems Ltd.

GALAPAD

Type Name: GALAPAD9

Hardware Version： **1.0**

Software Version： **4.2**

Sample Photographs

This Annex consists of 3 pages

Date of Report: 2013-10-16

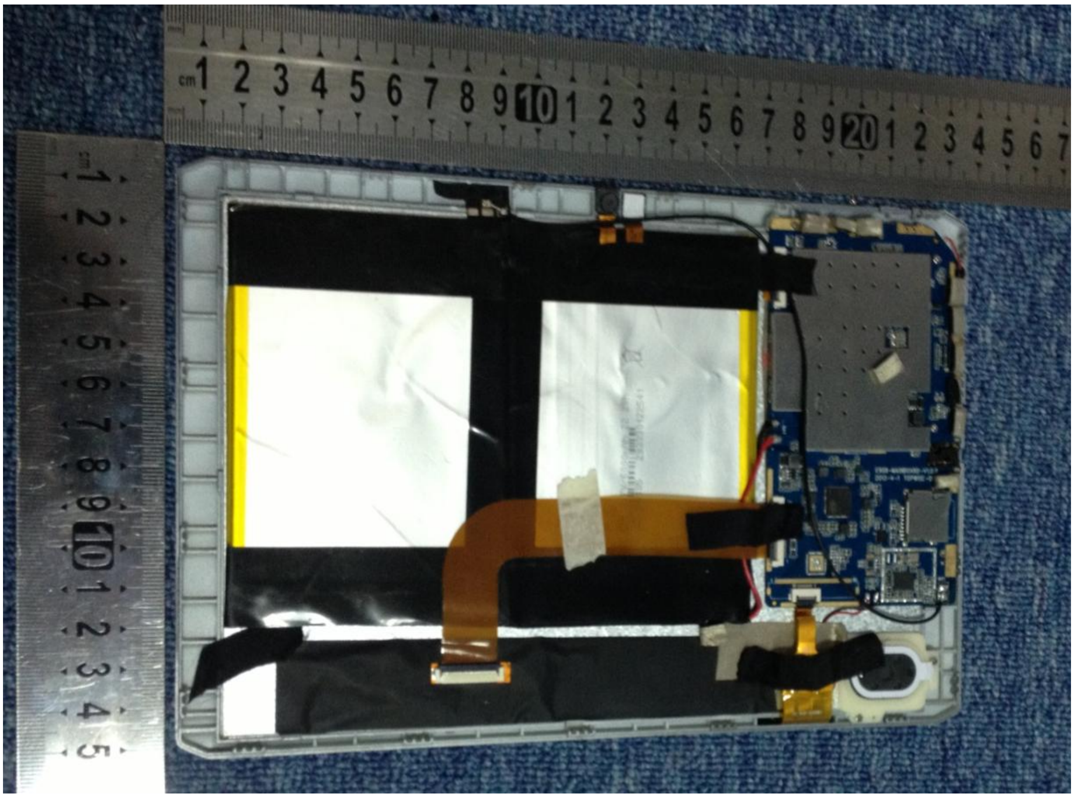
Photograph of the Equipment under Test

1. Appearance

Appearance and size (obverse)

Appearance and size (reverse)

2. Inside



ANNEX D

of

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

CONFORMANCE TEST REPORT FOR

HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

SET2013-05837

Galaxy Microsystems Ltd.

GALAPAD

Type Name: GALAPAD9

Hardware Version：1.0

Software Version：4.2

System Performance Check Data

This Annex consists of 21 pages

Date of Report：2013-10-16

System Performance Check (Body, 2450MHz)

Type: Phone measurement (Complete)

Area scan resolution: dx=8mm,dy=8mm

Zoom scan resolution: dx=8mm, dy=8mm, dz=5mm

Date of measurement: 22/9/2013

Measurement duration: 12 minutes 55 seconds

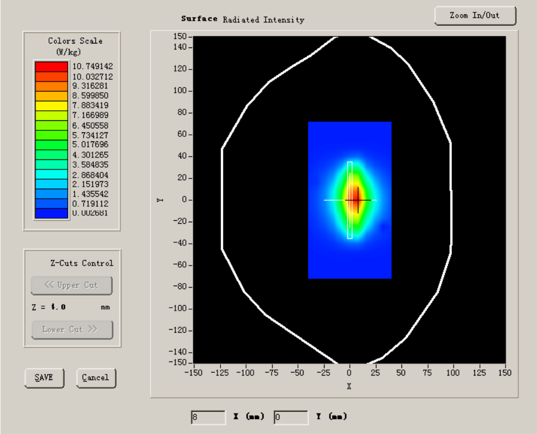
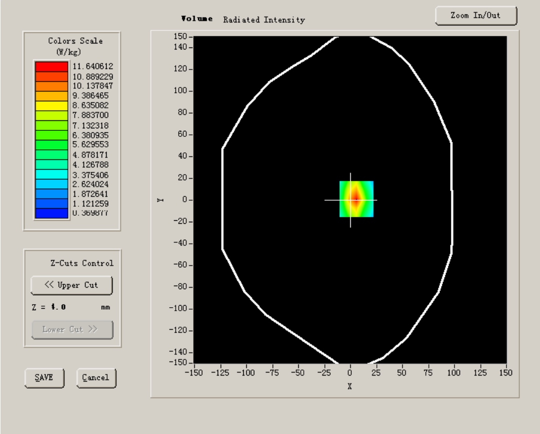
A. Experimental conditions.

Phantom File	surf_sam_plan.txt
Phantom	Validation plane
Device Position	
Band	2450MHz
Channels	
Signal	CW

B. SAR Measurement Results

Band SAR

Frequency (MHz)	2450.000000
Relative permittivity (real part)	52.689490
Relative permittivity	12.991650
Conductivity (S/m)	1.928476
Power Drift (%)	1.080000
Ambient Temperature:	23.2 ℃
Liquid Temperature:	22.8 ℃
ConvF:	4.90
Crest factor:	1:1

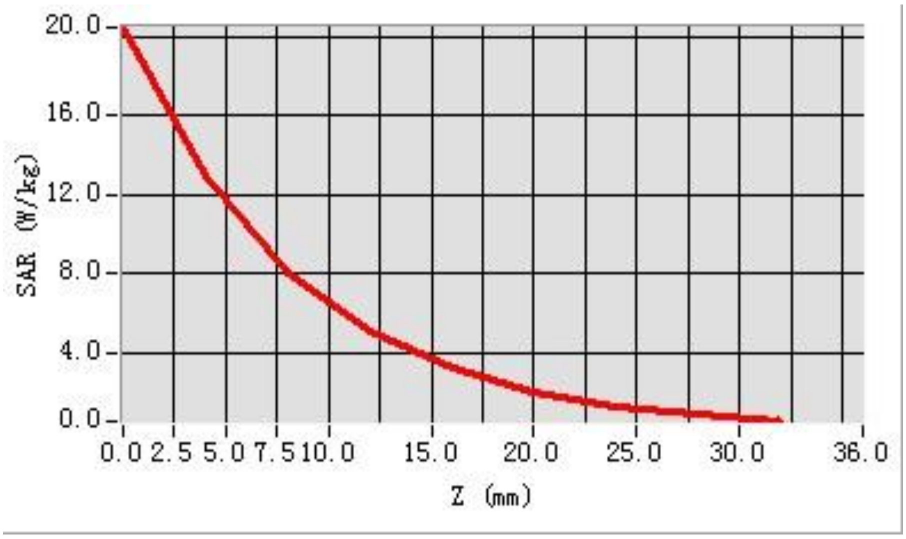
SURFACE SAR	VOLUME SAR
	

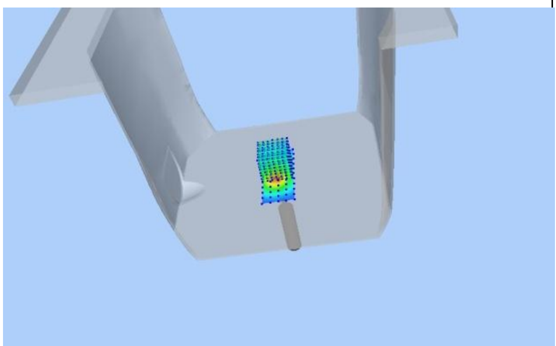
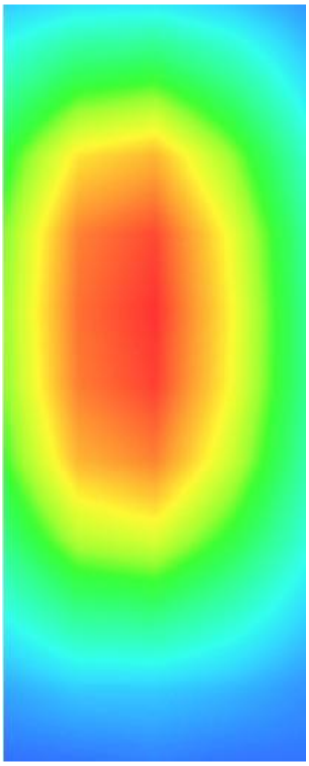
Maximum location: X=7.00, Y=1.00

SAR 10g (W/Kg)	5.968765
SAR 1g (W/Kg)	13.218766

Z Axis Scan

Z (mm)	0.00	4.00	9.00	14.00	19.00
SAR (W/Kg)	20.3260	13.2188	6.8642	3.9921	1.9833



3D sceen shot	Hot spot position
	

MEASUREMENT 1

Type: Phone measurement (Very fast, 11 points in the volume)

Date of measurement: 22/9/2013

Measurement duration: 7 minutes 16 seconds

Mobile Phone IMEI number: --

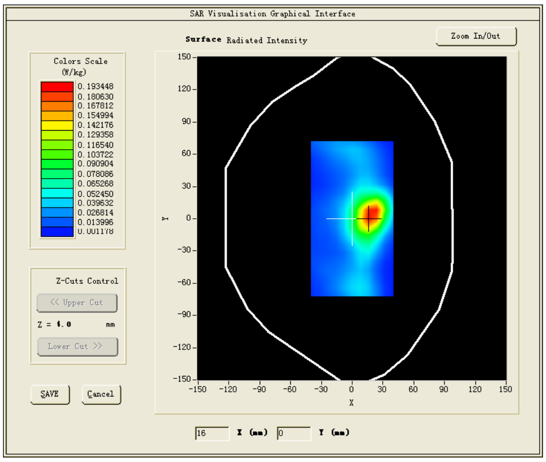
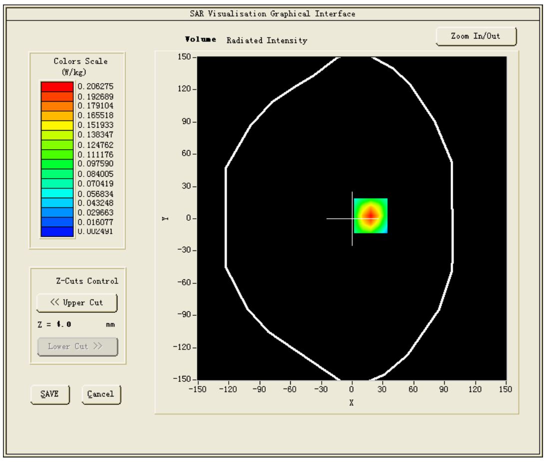
A. Experimental conditions.

Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	Middle
Signal	IEEE802.b (Crest factor: 1.0)

B. SAR Measurement Results

Middle Band SAR (Channel 6):

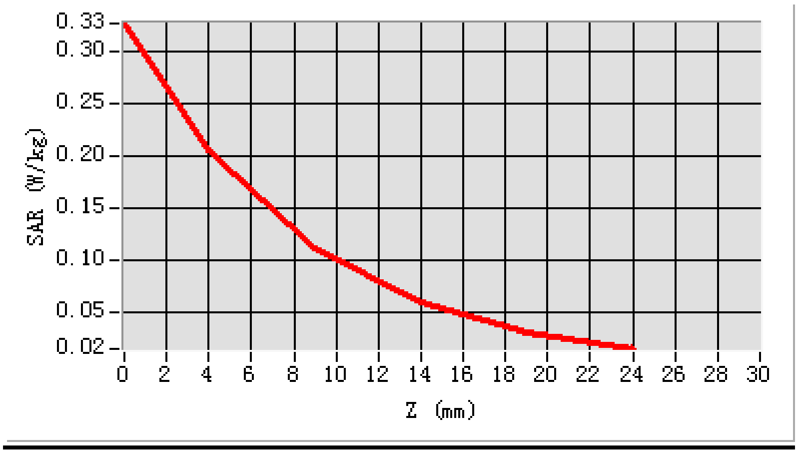
Frequency (MHz)	2437.000000
Relative permittivity (real part)	52.717335
Relative permittivity (imaginary	14.311222
Conductivity (S/m)	1.937580
Variation (%)	-2.480000
ConvF:	4.90

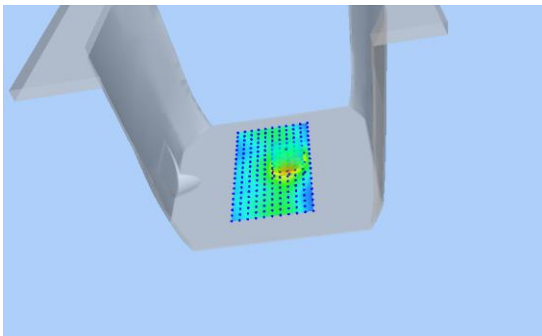
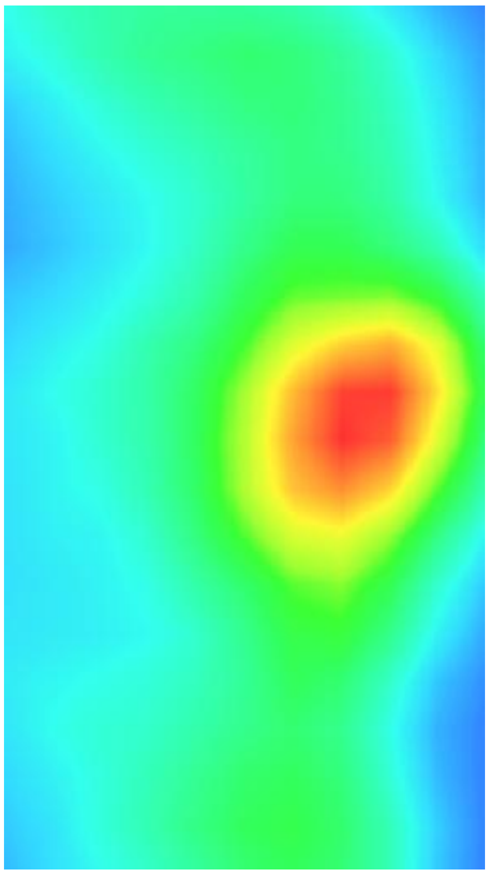
SURFACE SAR	VOLUME SAR
	

Maximum location: X=18.00, Y=3.00

SAR 10g (W/Kg)	0.094969
SAR 1g (W/Kg)	0.189778

Z axis scan



3D screen shot	Hot spot position
	

MEASUREMENT 2

Type: Phone measurement (Very fast, 11 points in the volume)

Date of measurement: 22/9/2013

Measurement duration: 7 minutes 14 seconds

Mobile Phone IMEI number: --

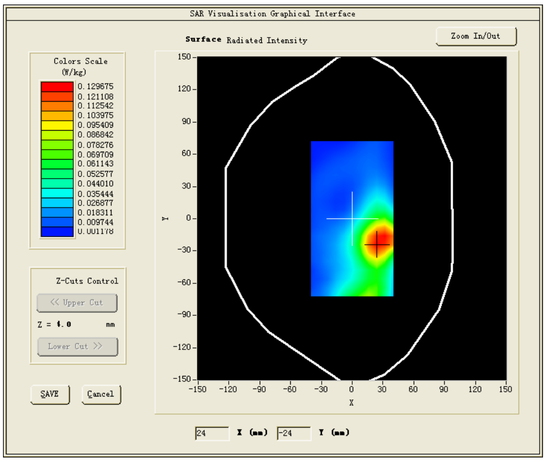
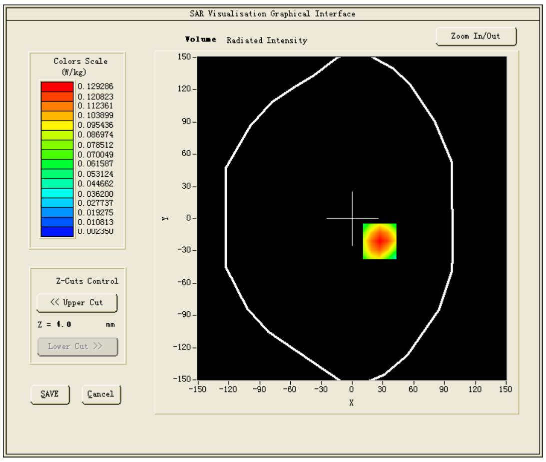
A. Experimental conditions.

Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	Middle
Signal	IEEE802.b (Crest factor: 1.0)

B. SAR Measurement Results

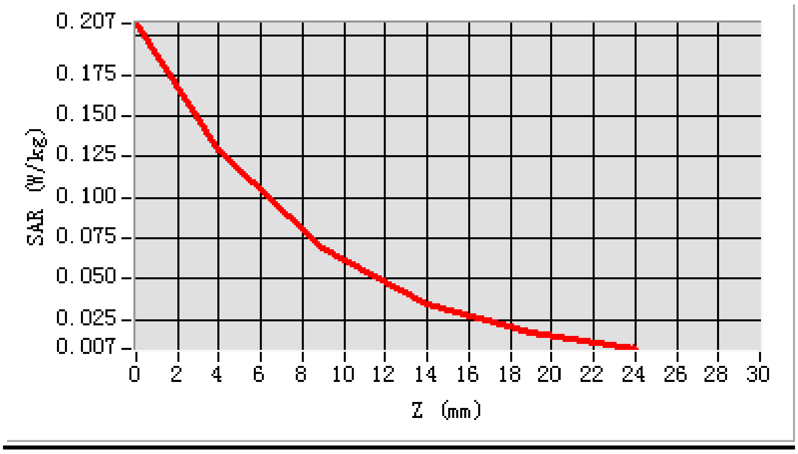
Middle Band SAR (Channel 6):

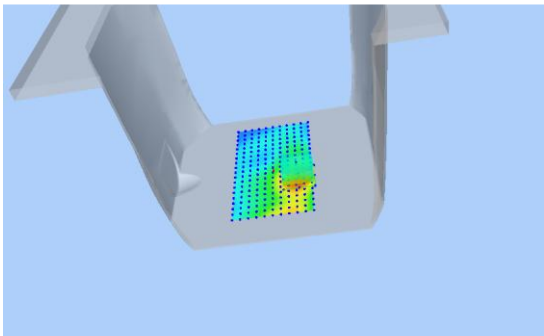
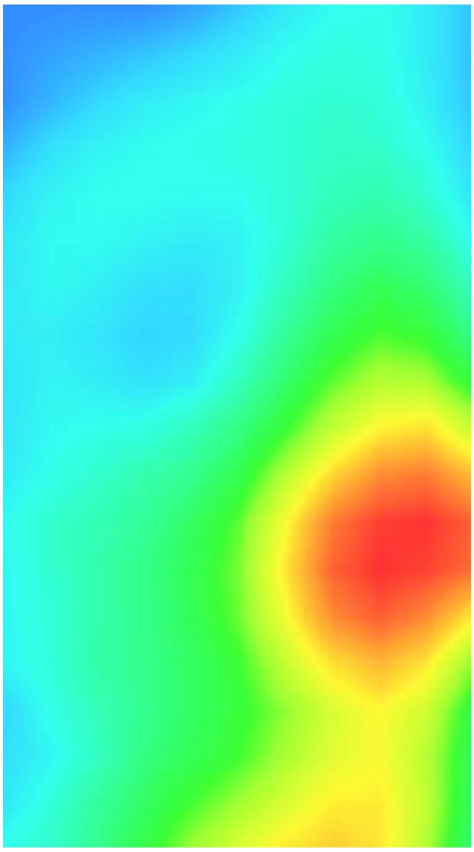
Frequency (MHz)	2437.000000
Relative permittivity (real part)	52.717335
Relative permittivity	14.311222
Conductivity (S/m)	1.937580
Variation (%)	-1.500000
ConvF:	4.90

SURFACE SAR	VOLUME SAR
	

Maximum location: X=27.00, Y=-21.00

SAR 10g (W/Kg)	0.065283
SAR 1g (W/Kg)	0.122048

Z axis scan


3D screen shot	Hot spot position
	

MEASUREMENT 3

Type: Phone measurement (Very fast, 11 points in the volume)

Date of measurement: 22/9/2013

Measurement duration: 7 minutes 45 seconds

Mobile Phone IMEI number: --

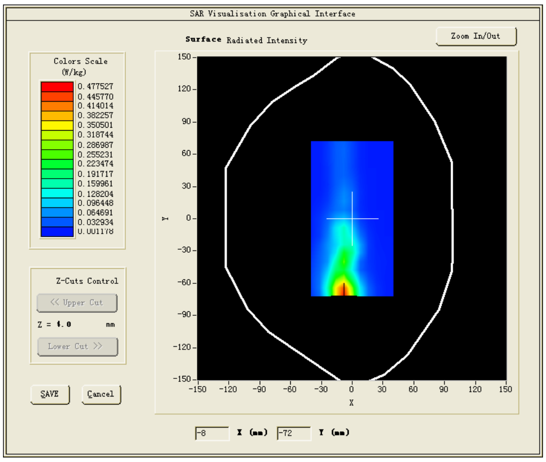
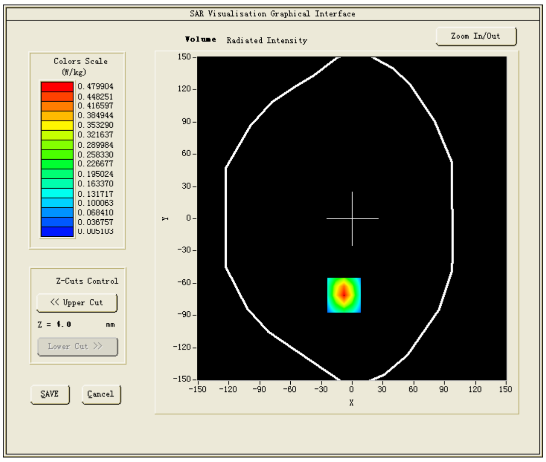
A. Experimental conditions.

Area Scan	surf_sam_plan.txt
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	Middle
Signal	IEEE802.b (Crest factor: 1.0)

B. SAR Measurement Results

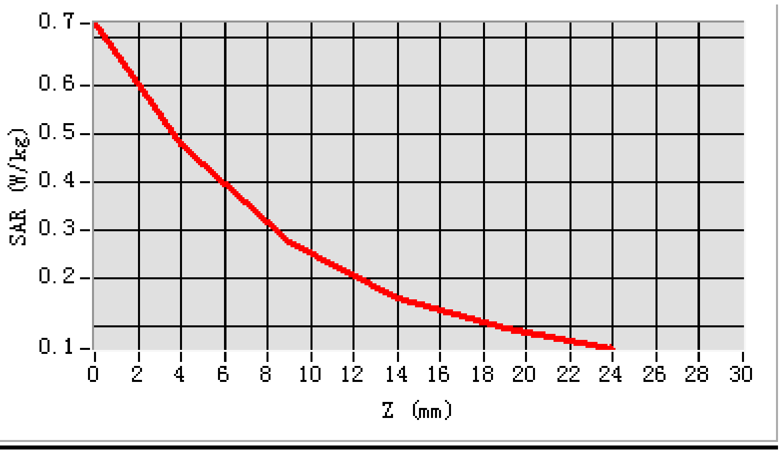
Middle Band SAR (Channel 6):

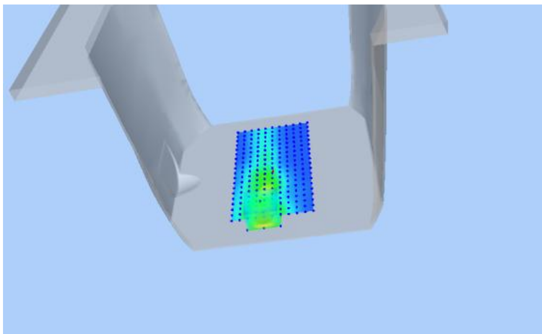
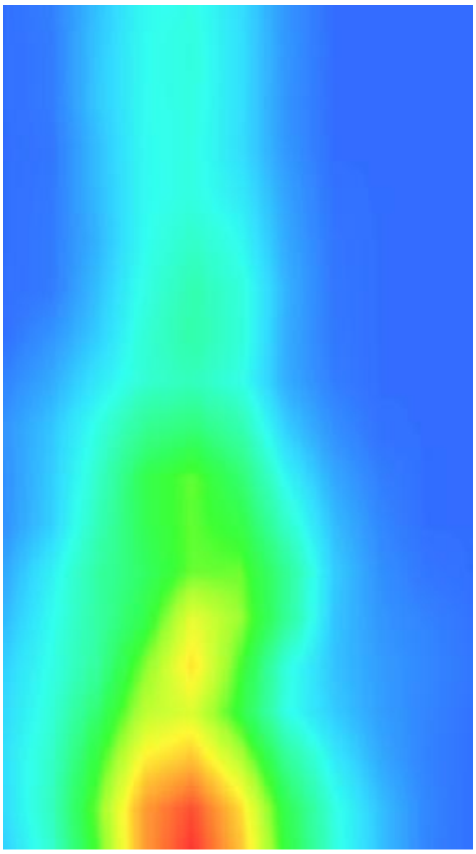
Frequency (MHz)	2437.000000
Relative permittivity (real part)	52.717335
Relative permittivity (imaginary	14.311222
Conductivity (S/m)	1.937580
Variation (%)	-0.320000
ConvF:	4.90

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-8.00, Y=-71.00

SAR 10g (W/Kg)	0.220775
SAR 1g (W/Kg)	0.437589

Z axis scan


3D screen shot	Hot spot position
	

MEASUREMENT 4

Type: Phone measurement (Very fast, 27 points in the volume)

Date of measurement: 22/9/2013

Measurement duration: 5 minutes 22 seconds

Mobile Phone IMEI number: --

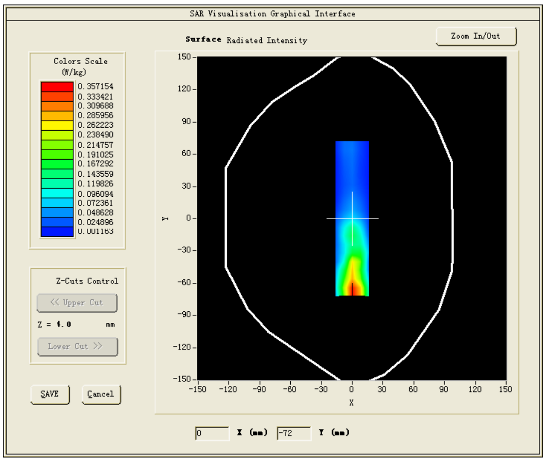
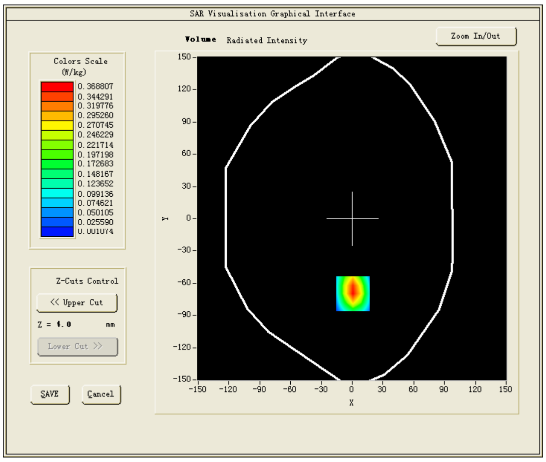
A. Experimental conditions.

Area Scan	dx=8mm dy=8mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	Low
Signal	IEEE802.b (Crest factor: 1.0)

B. SAR Measurement Results

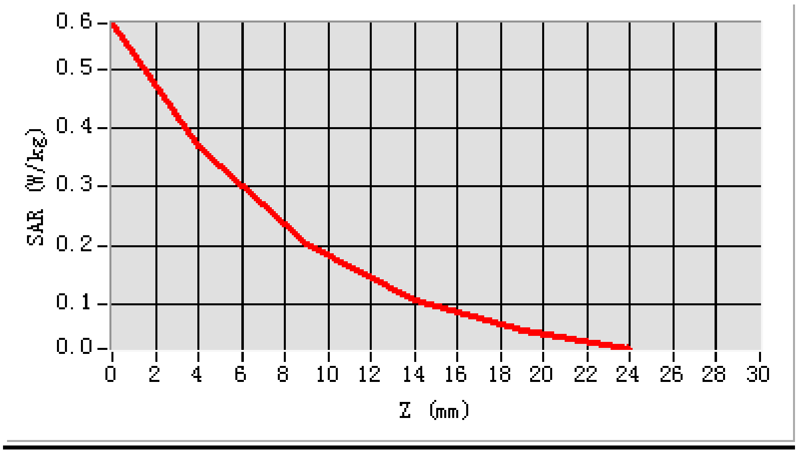
Lower Band SAR (Channel 1):

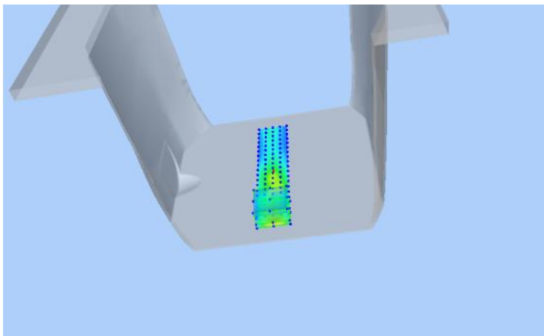
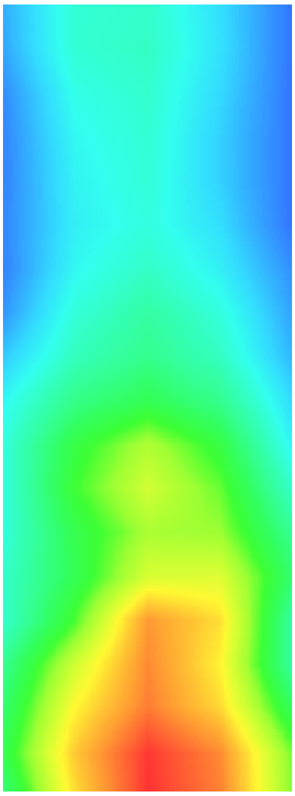
Frequency (MHz)	2412.000000
Relative permittivity (real	52.750668
Relative permittivity	14.275111
Conductivity (S/m)	1.912865
Variation (%)	-1.620000
ConvF:	4.90

SURFACE SAR	VOLUME SAR
	

Maximum location: X=1.00, Y=-70.00

SAR 10g (W/Kg)	0.164156
SAR 1g (W/Kg)	0.341522

Z axis scan


3D screen shot	**Hot spot position**
	

MEASUREMENT 5

Type: Phone measurement (Very fast, 27 points in the volume)

Date of measurement: 22/9/2013

Measurement duration: 5 minutes 21 seconds

Mobile Phone IMEI number: --

A. Experimental conditions.

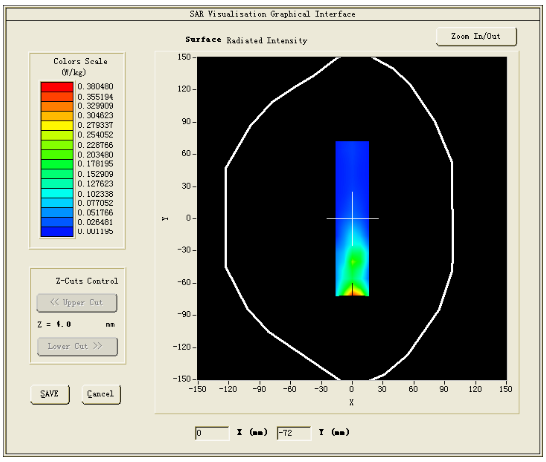
Area Scan	dx=8mm dy=8mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	High
Signal	IEEE802.b (Crest factor: 1.0)

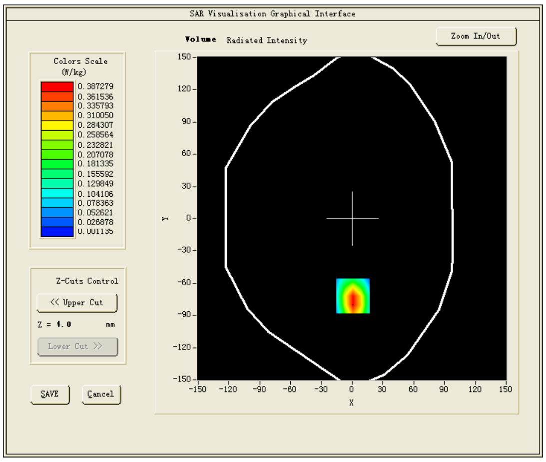
B. SAR Measurement Results

Higher Band SAR (Channel 11):

Frequency (MHz)	2462.000000
Relative permittivity (real	52.684727
Relative permittivity	14.374727
Conductivity (S/m)	1.966143
Variation (%)	-0.950000
ConvF:	4.90

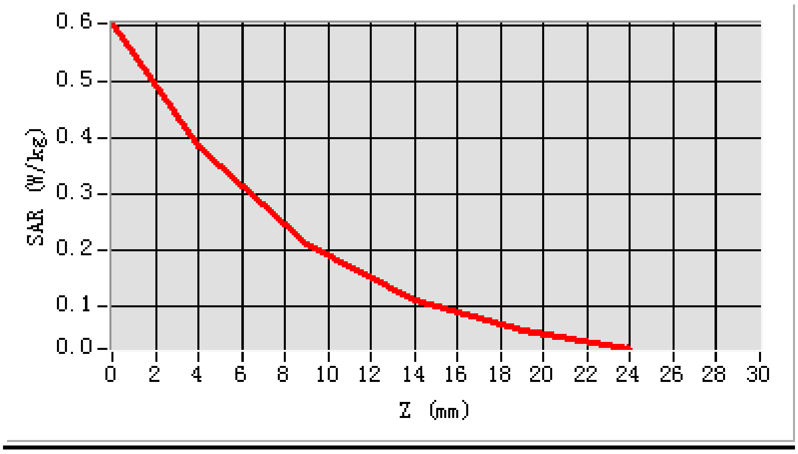
SURFACE SAR	VOLUME SAR

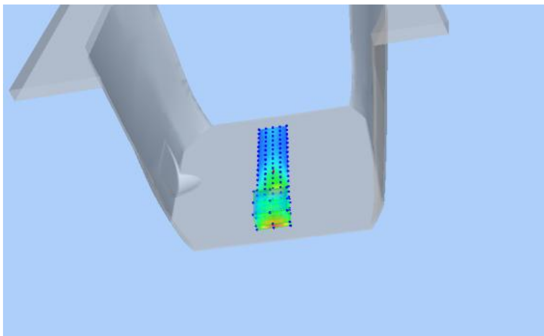
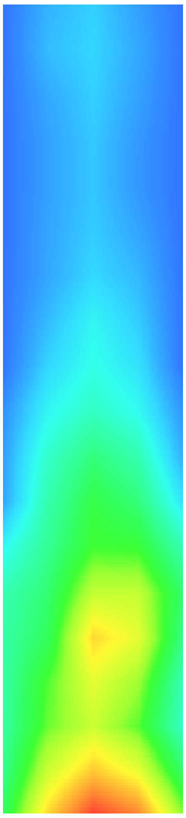




Maximum location: X=1.00, Y=-72.00

SAR 10g (W/Kg)	0.179660
SAR 1g (W/Kg)	0.362879

Z axis scan


3D screen shot	Hot spot position
	

MEASUREMENT 6

Type: Phone measurement (Very fast, 27 points in the volume)

Date of measurement: 22/9/2013

Measurement duration: 5 minutes 8 seconds

Mobile Phone IMEI number: --

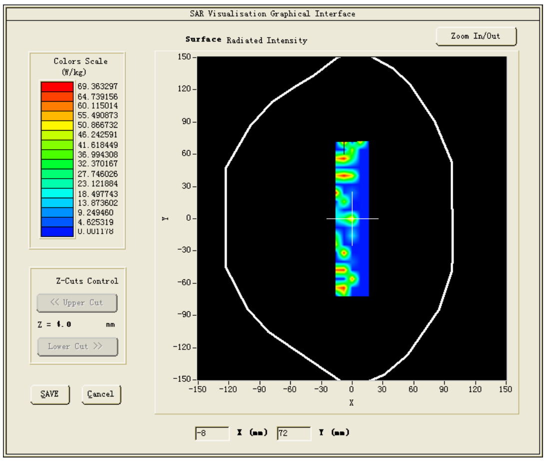
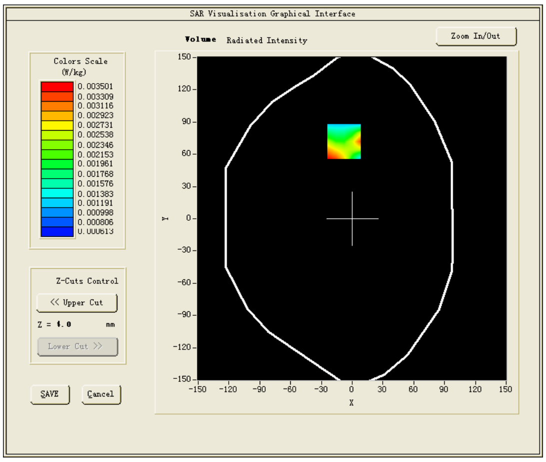
A. Experimental conditions.

Area Scan	dx=8mm dy=8mm
ZoomScan	5x5x7,dx=8mm dy=8mm dz=5mm,Very fast
Phantom	Validation plane
Device Position	Body
Band	IEEE 802.11b ISM
Channels	Middle
Signal	IEEE802.b (Crest factor: 1.0)

B. SAR Measurement Results

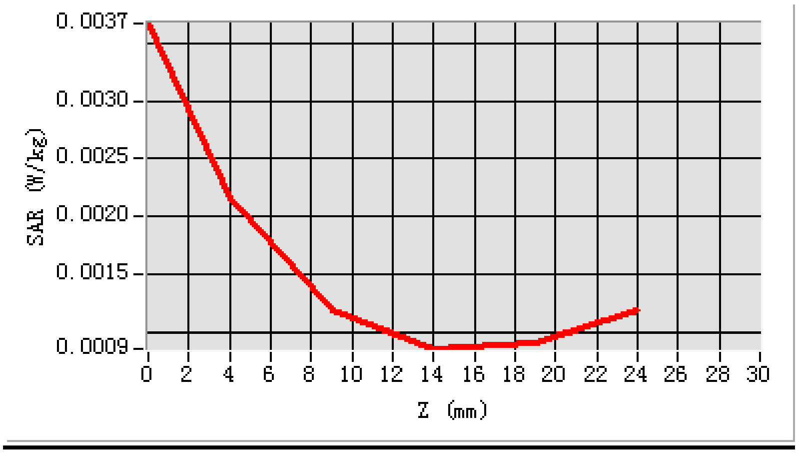
Middle Band SAR (Channel 6):

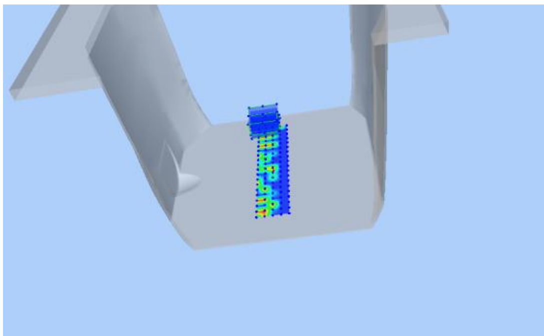
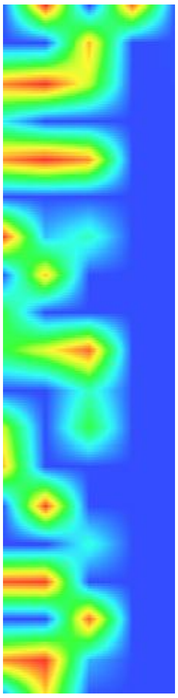
Frequency (MHz)	2437.000000
Relative permittivity (real part)	52.717335
Relative permittivity (imaginary	14.311222
Conductivity (S/m)	1.937580
Variation (%)	--
ConvF:	4.90

SURFACE SAR	VOLUME SAR
	

Maximum location: X=-8.00, Y=72.00

SAR 10g (W/Kg)	0.001721
SAR 1g (W/Kg)	0.003050

Z axis scan


3D screen shot	Hot spot position
	

ANNEX E

of

CCIC Southern Electronic Product Testing (Shenzhen) Co., Ltd.

CONFORMANCE TEST REPORT FOR

HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

SET2013-05837

Galaxy Microsystems Ltd.

GALAPAD

Type Name: GALAPAD9

Hardware Version： **1.0**

Software Version： **4.2**

Calibration Certificate of Probe and Dipoles

This Annex consists of 22 pages

Date of Report：2013-10-16

Probe Calibration Ceriticate

COMOSAR E-Field Probe Calibration Report

Ref : ACR.96.2.13.SATU.A

CCIC SOUTHERN ELECTRONIC PRODUCT TESTING (SHENZHEN) CO.,LTD

ELECTRONIC TESTING BUILDING,SHAHE ROAD, XILI. TOWN SHENZHEN,P.R.CHINA

SATIMO COMOSAR DOSIMETRIC E-FIELD PROBE

SERIAL NO.: SN 09/13 EP169

Calibrated at SATIMO US

2105 Barrett Park Dr. - Kennesaw, GA 30144

ACCREDITED

Calibration CERT #2246.02

04/05/13

Summary:

This document presents the method and results from an accredited COMOSAR Dosimetric E-Field Probe calibration performed in SATIMO USA using the CALISAR / CALIBAIR test bench, for use with a SATIMO COMOSAR system only. All calibration results are traceable to national metrology institutions.

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme LUC	Product Manager	4/5/2013	
Checked by :	Jérôme LUC	Product Manager	4/5/2013	
Approved by :	Kim RUTKOWSKI	Quality Manager	4/5/2013	

	Customer Name
Distribution :	Shenzhen EMC-united Co., Ltd

Issue	*Date*	*Modifications*
A	4/5/2013	Initial release

TABLE OF CONTENTS

1 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR DOSIMETRIC E FIELD PROBE
Manufacturer	Satimo
Model	SSE5
Serial Number	SN 09/13 EP169
Product Condition (new / used)	new
Frequency Range of Probe	0.7 GHz-3GHz
Resistance of Three Dipoles at Connector	Dipole 1: R1=0.223 MΩ Dipole 2: R2=0.233 MΩ Dipole 3: R3=0.222 MΩ

A yearly calibration interval is recommended.

2 PRODUCT DESCRIPTION

2.1 GENERAL INFORMATION

Satimo's COMOSAR E field Probes are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards.

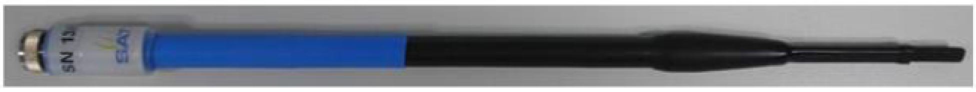


Figure 1 – *Satimo COMOSAR Dosimetric E field Dipole*

Probe Length	330 mm
Length of Individual Dipoles	4.5 mm
Maximum external diameter	8 mm
Probe Tip External Diameter	5 mm
Distance between dipoles / probe extremity	2.7 mm

3 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards provide recommended practices for the probe calibrations, including the performance characteristics of interest and methods by which to assess their affect. All calibrations / measurements performed meet the fore mentioned standards.

3.1 LINEARITY

The evaluation of the linearity was done in free space using the waveguide, performing a power sweep to cover the SAR range 0.01W/kg to 100W/kg.

3.2 SENSITIVITY

The sensitivity factors of the three dipoles were determined using a two step calibration method (air and tissue simulating liquid) using waveguides as outlined in the standards.

3.3 LOWER DETECTION LIMIT

The lower detection limit was assessed using the same measurement set up as used for the linearity measurement. The required lower detection limit is 10 mW/kg.

3.4 ISOTROPY

The axial isotropy was evaluated by exposing the probe to a reference wave from a standard dipole with the dipole mounted under the flat phantom in the test configuration suggested for system validations and checks. The probe was rotated along its main axis from 0 - 360 degrees in 15 degree steps. The hemispherical isotropy is determined by inserting the probe in a thin plastic box filled with tissue-equivalent liquid, with the plastic box illuminated with the fields from a half wave dipole. The dipole is rotated about its axis (0°–180°) in 15° increments. At each step the probe is rotated about its axis (0°–360°).

3.5 BOUNDARY EFFECT

The boundary effect is defined as the deviation between the SAR measured data and the expected exponential decay in the liquid when the probe is oriented normal to the interface. To evaluate this effect, the liquid filled flat phantom is exposed to fields from either a reference dipole or waveguide. With the probe normal to the phantom surface, the peak spatial average SAR is measured and compared to the analytical value at the surface.

4 MEASUREMENT UNCERTAINTY

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty associated with an E-field probe calibration using the waveguide technique. All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

Uncertainty analysis of the probe calibration in waveguide					
ERROR SOURCES	**Uncertainty value (%)**	**Probability Distribution**	**Divisor**	**ci**	**Standard Uncertainty (%)**
Incident or forward power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Reflected power	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Liquid conductivity	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Liquid permittivity	4.00%	Rectangular	$\sqrt{3}$	1	2.309%
Field homogeneity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%
Field probe positioning	5.00%	Rectangular	$\sqrt{3}$	1	2.887%
Field probe linearity	3.00%	Rectangular	$\sqrt{3}$	1	1.732%

Combined standard uncertainty					5.831%
Expanded uncertainty 95 % confidence level k = 2					12%

5 CALIBRATION MEASUREMENT RESULTS

Calibration Parameters	
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

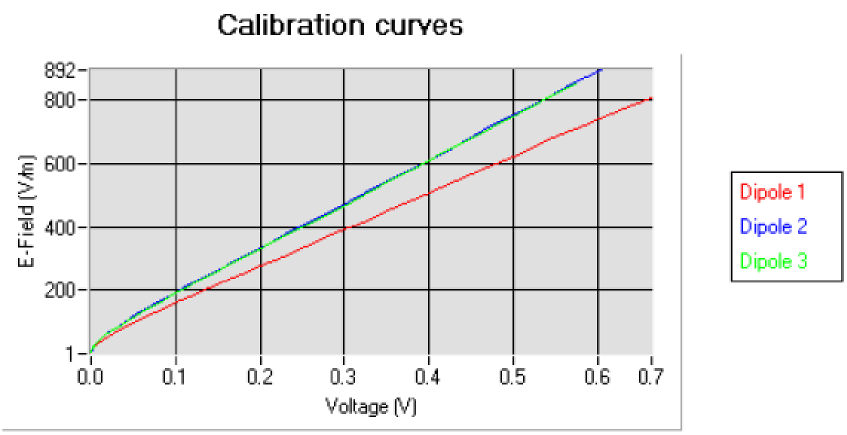
5.1 SENSITIVITY IN AIR

Normx dipole 1 ($\mu V/(V/m)^2$)	Normy dipole 2 ($\mu V/(V/m)^2$)	Normz dipole 3 ($\mu V/(V/m)^2$)
7.21	6.08	5.72

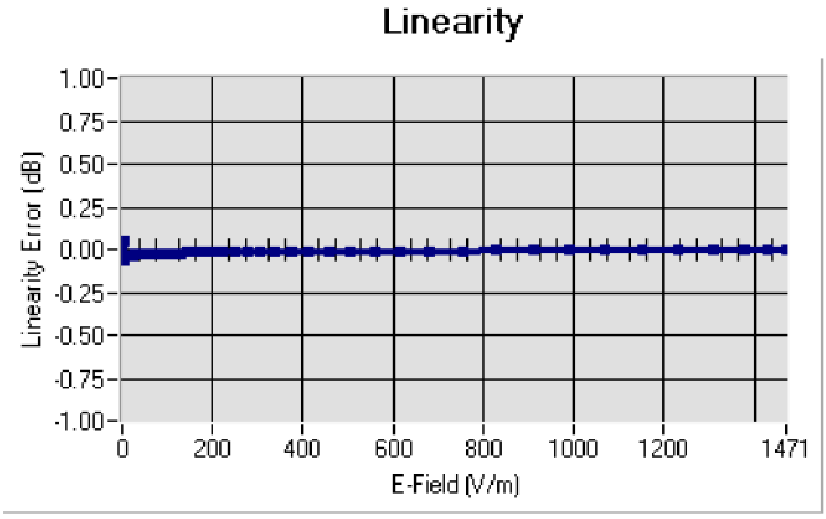
DCP dipole 1 (mV)	DCP dipole 2 (mV)	DCP dipole 3 (mV)
93	93	90

Calibration curves ei=f(V) (i=1,2,3) allow to obtain H-field value using the formula:

$$E = \sqrt{E_1^2 + E_2^2 + E_3^2}$$



5.2 LINEARITY



Linearity:+/-1.42% (+/-0.06dB)

5.3 SENSITIVITY IN LIQUID

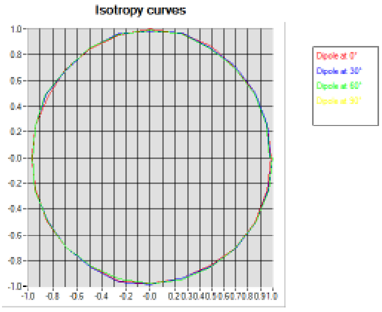
Liquid	Frequency (MHz +/- 100MHz)	Permittivity	Epsilon (S/m)	ConvF
HL850	835	42.56	0.88	5.52
BL850	835	55.26	0.96	5.67
HL900	900	41.79	0.96	5.19
BL900	900	55.98	1.04	5.32
HL1800	1750	40.17	1.38	4.79
BL1800	1750	52.05	1.48	4.95
HL1900	1880	39.80	1.43	5.48
BL1900	1880	52.55	1.50	5.64
HL2000	1950	38.93	1.44	4.82
BL2000	1950	53.12	1.51	5.01
HL2450	2450	38.64	1.82	4.80
BL2450	2450	52.02	1.94	4.90

LOWER DETECTION LIMIT: 9mW/kg

5.4 ISOTROPY

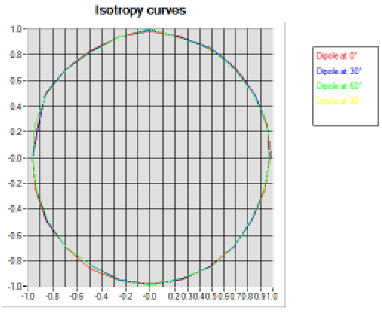
HL900 MHz

- Axial isotropy: 0.04 dB
- Hemispherical isotropy: 0.05 dB

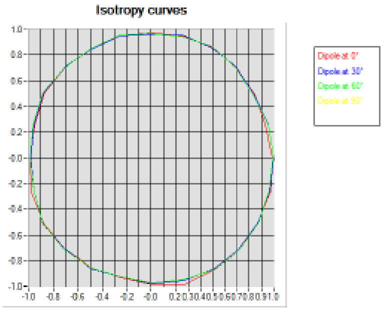


HL1800 MHz

- Axial isotropy: 0.05 dB
- Hemispherical isotropy: 0.07 dB



HL2450 MHz
- Axial isotropy: 0.06 dB
- Hemispherical isotropy: 0.09 dB



6 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
Flat Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Reference Probe	Satimo	EP 94 SN 37/08	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Multimeter	Keithley 2000	1188656	11/2010	11/2013
Signal Generator	Agilent E4438C	MY49070581	12/2010	12/2013
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	11/2010	11/2013
Power Sensor	HP ECP-E26A	US37181460	11/2010	11/2013
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Waveguide	Mega Industries	069Y7-158-13-712	Validated. No cal required.	Validated. No cal required.
Waveguide Transition	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Waveguide Termination	Mega Industries	069Y7-158-13-701	Validated. No cal required.	Validated. No cal required.
Temperature / Humidity Sensor	Control Company	11-661-9	3/2012	3/2014

SID2450 Dipole Calibration Ceriticate

SAR Reference Dipole Calibration Report

Ref : ACR.96.8.13.SATU.A

CCIC SOUTHERN ELECTRONIC PRODUCT TESTING (SHENZHEN) CO.,LTD

ELECTRONIC TESTING BUILDING,SHAHE ROAD, XILI TOWN SHENZHEN,P.R.CHINA

SATIMO COMOSAR REFERENCE DIPOLE

FREQUENCY: 2450 MHZ

Calibrated at SATIMO US

2105 Barrett Park Dr. - Kennesaw, GA 30144

ACCREDITED

Calibration CERT #2246.02

04/05/13

Summary:

This document presents the method and results from an accredited SAR reference dipole calibration performed in SATIMO USA using the COMOSAR test bench. All calibration results are traceable to national metrology institutions.

	Name	*Function*	*Date*	*Signature*
Prepared by :	Jérôme LUC	Product Manager	4/5/2013	
Checked by :	Jérôme LUC	Product Manager	4/5/2013	
Approved by :	Kim RUTKOWSKI	Quality Manager	4/5/2013	Kim Rutkowski

	Customer Name
Distribution :	Shenzhen EMC-united Co., Ltd

Issue	*Date*	*Modifications*
A	4/5/2013	Initial release

TABLE OF CONTENTS

1 INTRODUCTION

This document contains a summary of the requirements set forth by the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards for reference dipoles used for SAR measurement system validations and the measurements that were performed to verify that the product complies with the fore mentioned standards.

2 DEVICE UNDER TEST

Device Under Test	
Device Type	COMOSAR 2450 MHz REFERENCE DIPOLE
Manufacturer	Satimo
Model	SID2450
Serial Number	SN 09/13 DIP2G450-220
Product Condition (new / used)	new

A yearly calibration interval is recommended.

3 PRODUCT DESCRIPTION

3.1 GENERAL INFORMATION

Satimo's COMOSAR Validation Dipoles are built in accordance to the IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards. The product is designed for use with the COMOSAR test bench only.

Figure 1 – *Satimo COMOSAR Validation Dipole*

4 MEASUREMENT METHOD

The IEEE 1528, OET 65 Bulletin C and CEI/IEC 62209 standards provide requirements for reference dipoles used for system validation measurements. The following measurements were performed to verify that the product complies with the fore mentioned standards.

4.1 RETURN LOSS REQUIREMENTS

The dipole used for SAR system validation measurements and checks must have a return loss of -20 dB or better. The return loss measurement shall be performed against a liquid filled flat phantom, with the phantom constucted as outlined in the fore mentioned standards.

4.2 MECHANICAL REQUIREMENTS

The IEEE Std. 1528 and CEI/IEC 62209 standards specify the mechanical components and dimensions of the validation dipoles, with the dimensions frequency and phantom shell thickness dependent. The COMOSAR test bench employs a 2 mm phantom shell thickness therefore the dipoles sold for use with the COMOSAR test bench comply with the requirements set forth for a 2 mm phantom shell thickness.

5 MEASUREMENT UNCERTAINTY

All uncertainties listed below represent an expanded uncertainty expressed at approximately the 95% confidence level using a coverage factor of k=2, traceable to the Internationally Accepted Guides to Measurement Uncertainty.

5.1 RETURN LOSS

The following uncertainties apply to the return loss measurement:

Frequency band	Expanded Uncertainty on Return Loss
400-6000MHz	0.1 dB

5.2 DIMENSION MEASUREMENT

The following uncertainties apply to the dimension measurements:

Length (mm)	Expanded Uncertainty on Length
3 - 300	0.05 mm

5.3 VALIDATION MEASUREMENT

The guidelines outlined in the IEEE 1528, OET 65 Bulletin C, CENELEC EN50361 and CEI/IEC 62209 standards were followed to generate the measurement uncertainty for validation measurements.

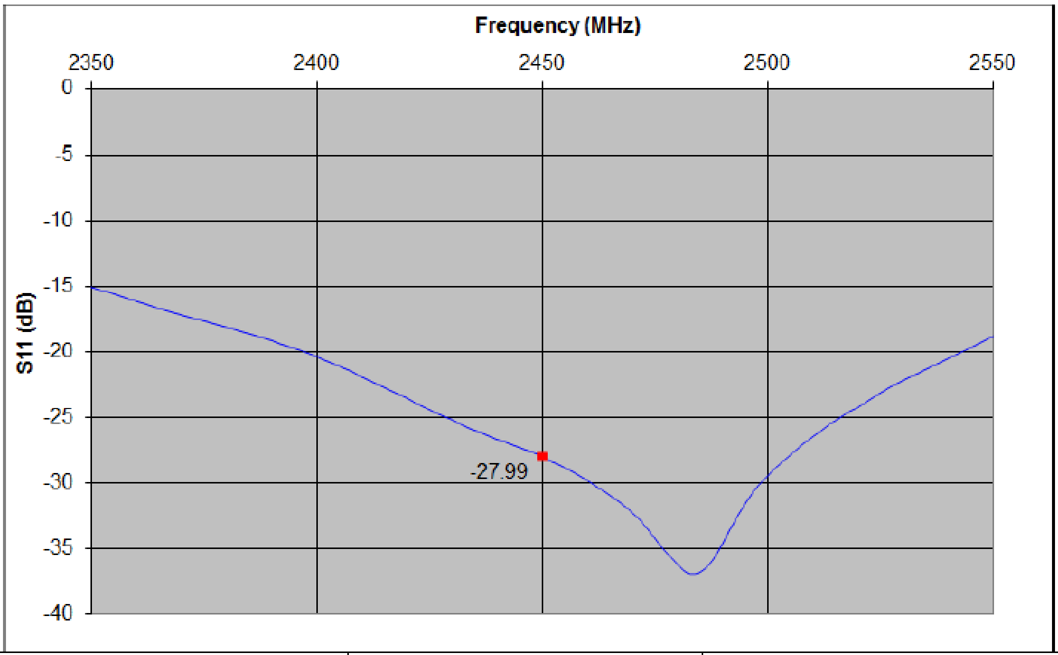
Scan Volume	Expanded Uncertainty
1 g	16.19 %
10 g	15.86 %

SAR REFERENCE DIPOLE CALIBRATION REPORT

Ref: ACR.96.8.13.SATU.A

6 CALIBRATION MEASUREMENT RESULTS

6.1 RETURN LOSS



Frequency (MHz)	Return Loss (dB)	Requirement (dB)
2450	-27.99	-20

6.2 MECHANICAL DIMENSIONS

Frequency MHz	L mm		h mm		d mm	
	required	measured	required	measured	required	measured
300	420.0 ±1 %.		250.0 ±1 %.		6.35 ±1 %.	
450	290.0 ±1 %.		166.7 ±1 %.		6.35 ±1 %.	
750	176.0 ±1 %.		100.0 ±1 %.		6.35 ±1 %.	
835	161.0 ±1 %.		89.8 ±1 %.		3.6 ±1 %.	
900	149.0 ±1 %.		83.3 ±1 %.		3.6 ±1 %.	
1450	89.1 ±1 %.		51.7 ±1 %.		3.6 ±1 %.	
1500	80.5 ±1 %.		50.0 ±1 %.		3.6 ±1 %.	
1640	79.0 ±1 %.		45.7 ±1 %.		3.6 ±1 %.	
1750	75.2 ±1 %.		42.9 ±1 %.		3.6 ±1 %.	
1800	72.0 ±1 %.		41.7 ±1 %.		3.6 ±1 %.	
1900	68.0 ±1 %.		39.5 ±1 %.		3.6 ±1 %.	
1950	66.3 ±1 %.		38.5 ±1 %.		3.6 ±1 %.	
2000	64.5 ±1 %.		37.5 ±1 %.		3.6 ±1 %.	
2100	61.0 ±1 %.		35.7 ±1 %.		3.6 ±1 %.	

2300	55.5 ±1 %.		32.6 ±1 %.		3.6 ±1 %.	
2450	51.5 ±1 %.	PASS	30.4 ±1 %.	PASS	3.6 ±1 %.	PASS
2600	48.5 ±1 %.		28.8 ±1 %.		3.6 ±1 %.	
3000	41.5 ±1 %.		25.0 ±1 %.		3.6 ±1 %.	
3500	37.0±1 %.		26.4 ±1 %.		3.6 ±1 %.	
3700	34.7±1 %.		26.4 ±1 %.		3.6 ±1 %.	

7 VALIDATION MEASUREMENT

The IEEE Std. 1528, OET 65 Bulletin C and CEI/IEC 62209 standards state that the system validation measurements must be performed using a reference dipole meeting the fore mentioned return loss and mechanical dimension requirements. The validation measurement must be performed against a liquid filled flat phantom, with the phantom constructed as outlined in the fore mentioned standards. Per the standards, the dipole shall be positioned below the bottom of the phantom, with the dipole length centered and parallel to the longest dimension of the flat phantom, with the top surface of the dipole at the described distance from the bottom surface of the phantom.

7.1 MEASUREMENT CONDITION

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 38.6 sigma : 1.82
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

7.2 HEAD LIQUID MEASUREMENT

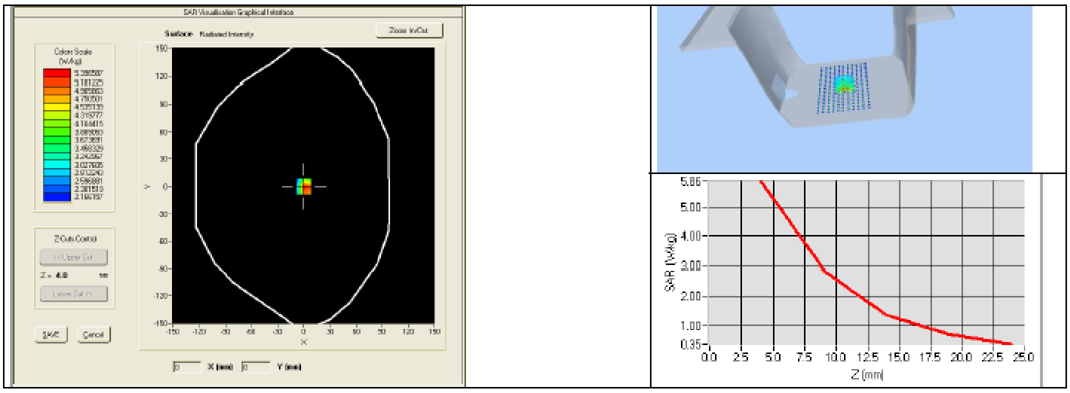
Frequency MHz	Relative permittivity (ε_r')		Conductivity (σ) S/m	
	required	measured	required	measured
300	45.3 ±5 %		0.87 ±5 %	
450	43.5 ±5 %		0.87 ±5 %	
750	41.9 ±5 %		0.89 ±5 %	
835	41.5 ±5 %		0.90 ±5 %	
900	41.5 ±5 %		0.97 ±5 %	
1450	40.5 ±5 %		1.20 ±5 %	
1500	40.4 ±5 %		1.23 ±5 %	
1640	40.2 ±5 %		1.31 ±5 %	
1750	40.1 ±5 %		1.37 ±5 %	
1800	40.0 ±5 %		1.40 ±5 %	
1900	40.0 ±5 %		1.40 ±5 %	
1950	40.0 ±5 %		1.40 ±5 %	

2000	40.0 ±5 %		1.40 ±5 %	
2100	39.8 ±5 %		1.49 ±5 %	
2300	39.5 ±5 %		1.67 ±5 %	
2450	39.2 ±5 %	PASS	1.80 ±5 %	PASS
2600	39.0 ±5 %		1.96 ±5 %	
3000	38.5 ±5 %		2.40 ±5 %	
3500	37.9 ±5 %		2.91 ±5 %	

7.3 MEASUREMENT RESULT

The IEEE Std. 1528 and CEI/IEC 62209 standards state that the system validation measurements should produce the SAR values shown below (for phantom thickness of 2 mm), within the uncertainty for the system validation. All SAR values are normalized to 1 W forward power. In bracket, the measured SAR is given with the used input power.

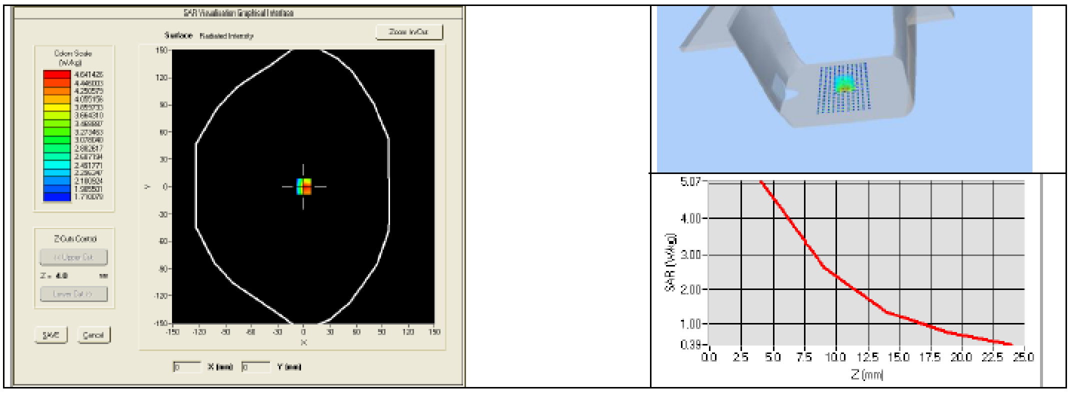
Frequency MHz	1 g SAR (W/kg/W)		10 g SAR (W/kg/W)	
	required	measured	required	measured
300	2.85		1.94	
450	4.58		3.06	
750	8.49		5.55	
835	9.56		6.22	
900	10.9		6.99	
1450	29		16	
1500	30.5		16.8	
1640	34.2		18.4	
1750	36.4		19.3	
1800	38.4		20.1	
1900	39.7		20.5	
1950	40.5		20.9	
2000	41.1		21.1	
2100	43.6		21.9	
2300	48.7		23.3	
2450	52.4	53.33 (5.33)	24	24.23 (2.42)
2600	55.3		24.6	
3000	63.8		25.7	
3500	67.1		25	



7.4 BODY MEASUREMENT RESULT

Software	OPENSAR V4
Phantom	SN 20/09 SAM71
Probe	SN 18/11 EPG122
Liquid	Head Liquid Values: eps' : 52.0 sigma : 1.94
Distance between dipole center and liquid	10.0 mm
Area scan resolution	dx=8mm/dy=8mm
Zoon Scan Resolution	dx=8mm/dy=8m/dz=5mm
Frequency	2450 MHz
Input power	20 dBm
Liquid Temperature	21 °C
Lab Temperature	21 °C
Lab Humidity	45 %

Frequency MHz	1 g SAR (W/kg/W)	10 g SAR (W/kg/W)
	measured	measured
2450	51.99 (5.20)	23.96 (2.40)



8 LIST OF EQUIPMENT

Equipment Summary Sheet				
Equipment Description	**Manufacturer / Model**	**Identification No.**	**Current Calibration Date**	**Next Calibration Date**
SAM Phantom	Satimo	SN-20/09-SAM71	Validated. No cal required.	Validated. No cal required.
COMOSAR Test Bench	Version 3	NA	Validated. No cal required.	Validated. No cal required.
Network Analyzer	Rhode & Schwarz ZVA	SN100132	02/2013	02/2016
Calipers	Carrera	CALIPER-01	12/2010	12/2013
Reference Probe	Satimo	EPG122 SN 18/11	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Multimeter	Keithley 2000	1188656	11/2010	11/2013
Signal Generator	Agilent E4438C	MY49070581	12/2010	12/2013
Amplifier	Aethercomm	SN 046	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Power Meter	HP E4418A	US38261498	11/2010	11/2013
Power Sensor	HP ECP-E26A	US37181460	11/2010	11/2013
Directional Coupler	Narda 4216-20	01386	Characterized prior to test. No cal required.	Characterized prior to test. No cal required.
Temperature and Humidity Sensor	Control Company	11-661-9	3/2012	3/2014

Calibration Certificate of Keithley 2000 Multimeter

KEITHLEY
A Tektronix Company

A Greater Measure of Confidence

TRACEABLE CALIBRATION
2000, 4014020
Cal Date: 30-JAN-2013
Cal Due: Lab: Kei
KEITHLEY

KEITHLEY INSTRUMENTS, INC • 28775 AURORA RD, CLEVELAND, OHIO - USA • 440-248-0400 • Fax: 440-248-6168 • 1-888-KEITHLEY • www.keithley.com

Calibration Facility: This product was calibrated for Keithley Instruments by
Tektronix (China) Co. Ltd., 1227 Chuan Qiao Road, Pudong New District, Shanghai, China 201206

Calibration Certificate

Certificate No: PCXPTG6FZX	Revision: 00	
Manufacturer: Keithley	Model: 2000	Serial No: 4014020
Description: Multimeter, 6 1/2 digit	Temperature: 23.0 °C	Humidity: 46 %
Calibration Date: 30-JAN-2013	Date Placed In Service: __________*	Due Date: __________*

* Optional customer entry fields: The due date may be established by adding the Keithley recommended cal interval stated in the product manual to the "Date placed in service"

Initial Condition: Not applicable, new product **Final Condition:** In Tolerance

- Keithley Instruments, Inc. certifies that the above instrument meets its published measurement specifications.
- This instrument has been calibrated using measurement standards traceable to the International System of Units (SI) through the PRC National Institute of Metrology (NIM), or other National Metrology Institutes (such as NIST, NPL, PTB, etc.).
- The policies and procedures used for the calibration of this product are based upon ANSI/NCSL Z540.1-1994 (R2002).
- The quality system used by the calibration facility is ISO 9001 registered.
- This calibration is a direct comparison of the unit under test to the listed reference standards and did not involve any sampling plans to complete. No allowance has been made for the instability of the test device due to use, time, etc. Such allowances would be made by the customer as needed.
- This calibration certificate shall not be reproduced, except in full, without the written approval of Keithley Instruments, Inc.

Calibration Procedure Used: MANIFEST:Product_Dmm_KeithleyDMM_Full VERSION:107

Calibration Standards Used:

Manufacturer/Model	Model Description	ID Number	Due Date
Fluke 5720A	Calibrator	KI10138	18-Nov-2013
Fluke 5725A	Power Amplifier	KI5554	09-Jan-2014
Keithley 3390	Function/Arbitrary Waveform Gen	KI10261	16-Nov-2013

Issued By: [signature] **Certified By:** Lin Qing Zhu

Quality Director: Cui, Hu Wa **Date Issued:** 30-JAN-2013

2000 4014020 Page 1 of 1 PA-1061A

———End of the Report———