FCC SAR TEST REPORT

Report No.:	SAR2013-007
Product Name:	MID
Model No.:	StarTab 715
Brand Name:	Touch+
FCC ID:	Q7Q-T017
Applicant:	Shenzhen Skyworth Wireless Technology Co., Ltd.
Address:	Unit A, Rm 3A01,Skyworth Building, Gaoxin Ave 1S., Nanshan District, Shenzhen, China
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......................: MID

Model No. ....: StarTab 715

Brand Name.........................: Touch+

FCC ID..................................: Q7Q- T017

Applicant...............................: Shenzhen Skyworth Wireless Technology Co., Ltd.

Applicant Address...............: Unit A, Rm 3A01,Skyworth Building, Gaoxin Ave 1S., Nanshan District, Shenzhen, China

Manufacturer.......................: Shenzhen Skyworth Wireless Technology Co., Ltd.

Manufacturer Address..........: Skyworth Industrial Park, Tangtou Village, Shiyan Town, Baoan District, Shenzhen, Guangdong, China

Rating..................................: 5Vdc 2000mA(Charger) or 3.7V 4000mAh (Battery)

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 ....: Jan 12, 2013
Signature, Date

Reviewed by.......................: Jan 12, 2013
Signature, Date

Approved by.......................: Jan 12, 2013
Signature, Date

Contents

This Test Report consists of the following Annexes:

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 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

Organization Item

CCIC-SET Report No.:	SAR2013-007
CCIC-SET Project Leader:	Mr. Li Sixiong
CCIC-SET Responsible for accreditation scope:	Mr. Wu Li'an
Start of Testing:	2013-01-11
End of Testing:	2013-01-11

Identification of Applicant

Company Name:	Shenzhen Skyworth Wireless Technology Co., Ltd.
Address:	Unit A, Rm 3A01,Skyworth Building, Gaoxin Ave 1S., Nanshan District, Shenzhen, China

2.3. Identification of Manufacture

Company Name:	Shenzhen Skyworth Wireless Technology Co., Ltd.
Address:	Skyworth Industrial Park, Tangtou Village, Shiyan Town, Baoan District, Shenzhen, Guangdong, China

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:	MID	
Type Name:	StarTab 715	
Brand Name:	Touch+	
General description:	Test frequency	Wi-Fi 2.4 GHz
	Development Stage	Identical Prototype
	Accessories	Power Supply
	Battery type	WD4356156P
	Battery specification	4000mAh 3.7V
	Antenna type	FPG Antenna
	Operation mode	802.11b/g/n
	Modulation mode	DSSS(802.11b), OFDM(802.11g, 802.11n-20MHz, 802.11n-40MHz)
	Max. Power(EIRP)	0.08995Watt(Wi-Fi 2.4GHz)

NOTE:

a. The EUT is a model of MID operating in Wi-Fi 2.4 GHz band. It support 802.11b, 802.11g, 802.11n-20MHz and 802.11n-40MHz. Since the EUT does not support speech function, the tests were carried out only against body mounting measurement.

b. 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:

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

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

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

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

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

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

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 SPEAG. 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 SPEAG as an integral part of the DASY system.

The DASY 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 supplied by SPEAG

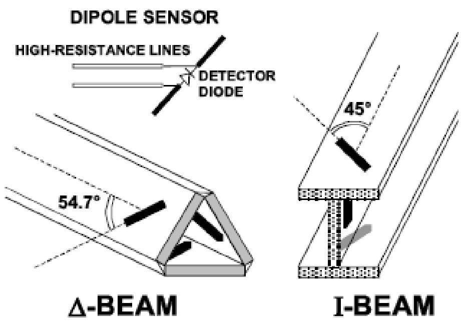
4.5 Probe Specification

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	10 MHz to 4 GHz; Linearity: ± 0.2 dB (30 MHz to 4 GHz)
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)
Dynamic Range	5 μW/g to > 100 mW/g; Linearity: ± 0.2 dB
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm
Application	General dosimetry up to 4 GHz Dosimetry in strong gradient fields Compliance tests of mobile phones
Compatibility	DASY3, DASY4, DASY52 SAR and higher, EASY4/MRI

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 PC was used to control the operation of the PAD.

The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 1, 6 and 11 for 802.11b, 802.11g and 802.11n-20MHz respectively, or 3, 6 and 9 for 802.11n-40MHz. The EUT is commanded to operate at maximum transmitting power.

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.

5.2 SAR Measurement System

The SAR measurement system being used is the DASY4 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 1: 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 2 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

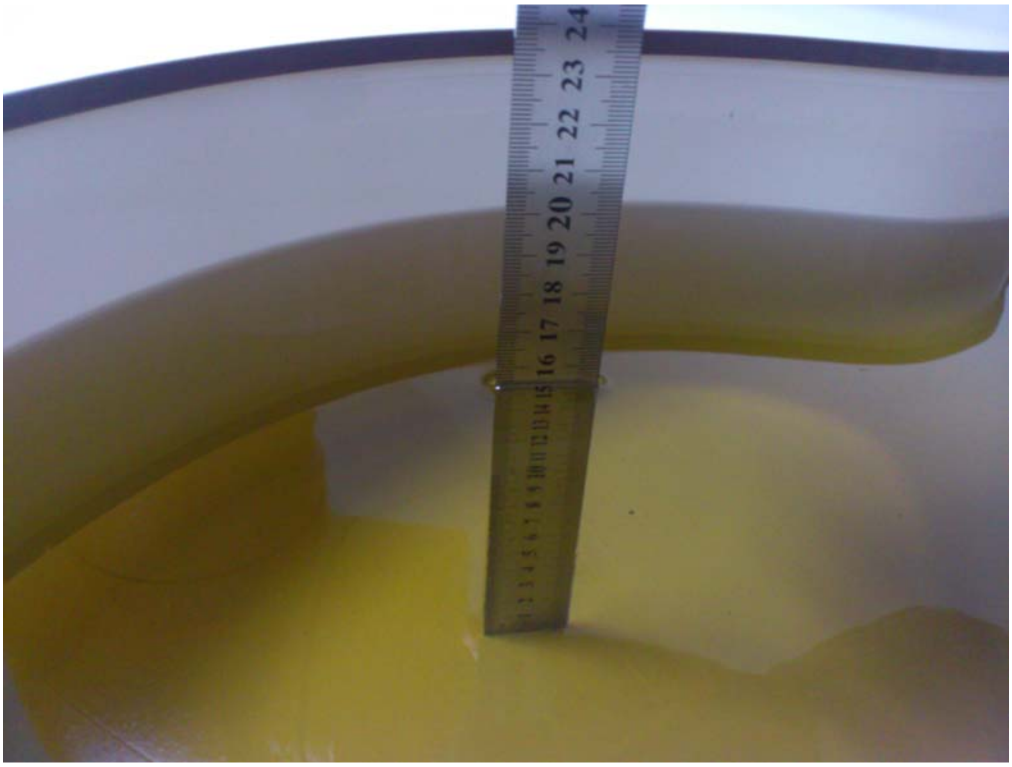
5.2.2 Simulant liquids

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 2450MHz, which are made mainly of sugar, salt and water solutions may be left in the phantoms.

Table 3: Dielectric Performance of Body Tissue Simulating Liquid

Temperature: 20.0°C~20.3°C; Humidity: 46%~49% RH; Time: 8:30~12:30;			
/	Frequency	Permittivity ε	Conductivity σ (S/m)
Target value	2450MHz	52.7	1.95
Validation value (January 11, 2013)	2450MHz	51.88	1.94

The depth of the body tissue was 15.1 cm as the following photo.



Configuration of body tissue

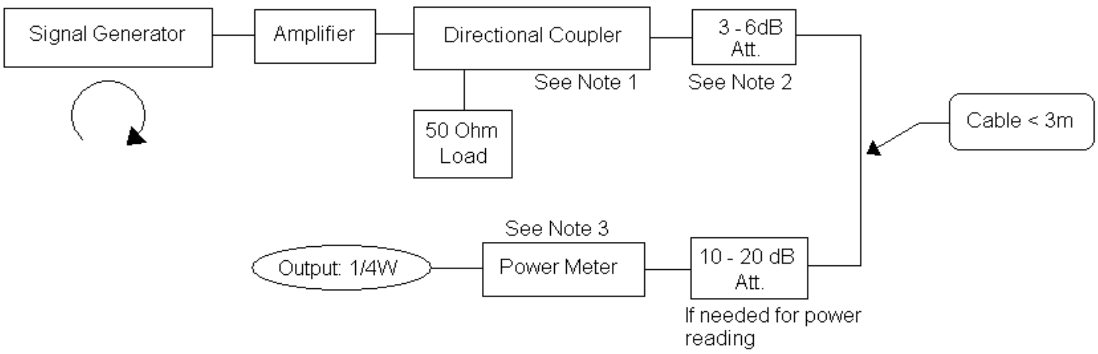
5.2.3 Equipments and results of validation testing

Important equipments :

Name	Type and specification
System Simulator	E5515C
DAE	DAE4
Reference dipole	ES3DV3

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 body is provided in Tables 4. The humidity and ambient temperature of test facility were 49% and 20.0°C respectively. The body phantom were full of the body tissue simulating liquid. The EUT was supplied with full-charged battery for each measurement.

For body-worn measurements, the EUT was tested at the lowest, middle and highest frequencies in the transmit band.

Table 4: Liquid Verification Results

Frequency	Duty cycle	Target value（1g）	Test value（1g）
2450MHz (8:30, January 11, 2013)	1:1	52.4 W/kg	51.92 W/kg（Body）

*Note: All SAR values are normalized to 1W forward power.

Climate condition during system evaluation

5.2.4 SAR measurement procedure

The SAR test was carried out as follow:

The EUT was controlled to operate in 802.11b mode in channel 1 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.

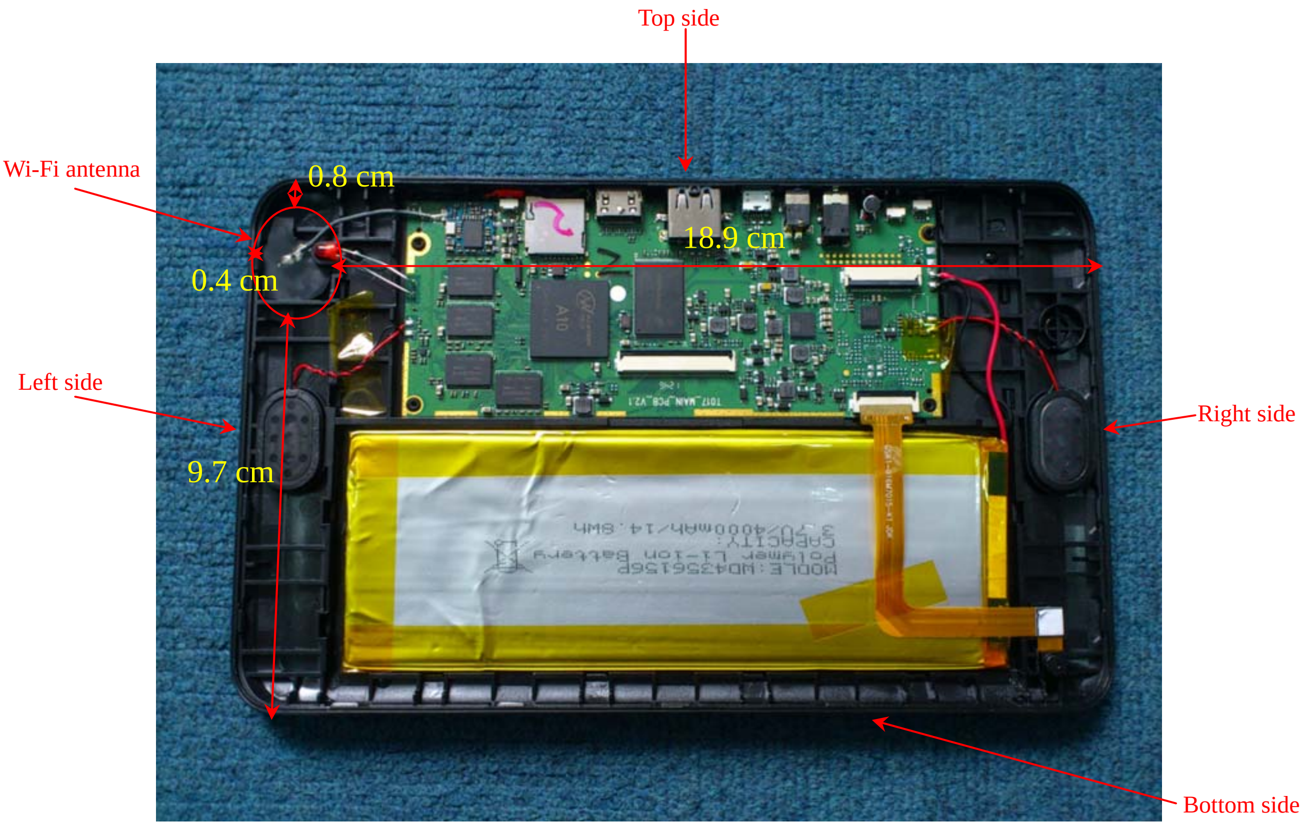
Above is the scanning procedure flow chart and table from the IEEEp1528 standard. This is the procedure for which all compliant testing should be carried out to ensure that all variations of the device position and transmission behaviour are tested.

The same procedure should be also executed for 802.11b in channel 6 and 11, and the mode 802.11g, 802.11n-20MHz and 802.11n-40MHz in bottom channel, middle channel and top channel, respectively.

5.2.5 Transmitting antenna information

There’s only one antenna (Wi-Fi antenna) inside the EUT, and it is the transmitting source. The following pictures showed the diagonal dimension (23cm>20cm) of the EUT and position of the antenna:

Diagonal dimension of the display



Position of the antennas

The EUT should be tested under the following positions according to KDB 616217 and KDB447498:

(1) Back side: the back side of the EUT towards and contacted to the phantom.

(2) Left side: the left side of the EUT towards and contacted to the phantom.

(3) Top side: the bottom side of the EUT towards and contacted to the phantom.

(4) Bottom side: SAR test was not required.

Because the distance between WLAN antenna and this side was 9.7cm,maximum output power 17.04dBm<26.71dBm(496mW),according KDB447498 Appendix B SAR test exclusion power thresholds.

(5) Right Side: SAR test was not required.

Because the distance between WLAN antenna and this side was 18.9cm, maximum output power 17.04dBm<31.44dBm(1396mW),according KDB447498 Appendix B SAR test exclusion power thresholds.

(6). Front Side: SAR test was not required.

(7). The 4/5/6 positions are not the most conservative antenna - to – user distance at edge mode. According to KDB 447498 4) ii) (2) –SAR is required only the edge with the most conservative exposure conditions, No SAR)

6 CHARACTERISTICS OF THE TEST

6.1 Applicable Limit Regulations

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;

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

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.

It specifies the measurement method for demonstration of compliance with the SAR limits for such equipments.

7 LABORATORY ENVIRONMENT

Table 5: The Ambient Conditions during SAR Test

Temperature	Min. = 15 °C**,** Max. = 30 °C
Relative humidity	Min. = 30%, Max. = 70%
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

The power level results listed in the following table 6 has referred to the RF report FCC2012-8706R.

Table 6: RF Output Peak Power Values

Test Mode	Channel	Frequency (MHz)	Measured Output Peak Power (dBm)
802.11b	1	2412	17.04
	6	2437	16.09
	11	2462	16.26
802.11g	1	2412	15.94
	6	2437	15.41
	11	2462	15.27
802.11n-20MHz	3	2422	14.74
	6	2437	14.76
	9	2452	14.81
802.11n-40MHz	3	2422	15.29
	6	2437	15.42
	9	2452	15.58

Since the 802.11b operating mode resulted in the maximum RF output power, the SAR measurement was executed only at this operating mode. The following table showed the SAR measurement results at 802.11b operating mode, according to the worst-case of each channel.

Table 7: SAR Values (802.11b), Measured against the body.

Temperature: 20.1°C, humidity: 46%.		
Limit of SAR (W/kg)	1.6 (1 g Average)	
Test Case	Measurement Result (W/kg)	
	1g Average (W/kg)	Power level (dBm)
Back side, Bottom frequency	0.567	17.04
Left side, Bottom frequency	0.622	
Top side, Bottom frequency	0.582	
Back side, Middle frequency	0.560	16.09
Left side, Middle frequency	0.636	
Top side, Middle frequency	0.532	
Back side, Top frequency	0.542	16.26
Left side, Top frequency	0.596	
Top side, Top frequency	0.478	

8.3 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	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	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	3	1	4.8	5
15	—Holder of the DUT	A	7.1	N	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	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	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	2013-06-11
2	DAE	DAE4	1315	2013/02/27
3	E-Field probe	ES3DV3	3292	2013/02/24
4	System Validation Dipole D2450V2	D2450V2	884	2013/02/29

ANNEX A

of

CCIC-SET

CONFORMANCE TEST REPORT FOR

HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

SAR2013-007

Shenzhen Skyworth Wireless Technology Co., Ltd.

MID

Type Name: StarTab 715

Hardware Version: V2.1

Software Version: StarTab715_HW.V2.1_V2.0G_20121205

TEST LAYOUT

This Annex consists of 2 pages

Date of Report: 2013-01-11

Fig.1 SAR Test System Layout

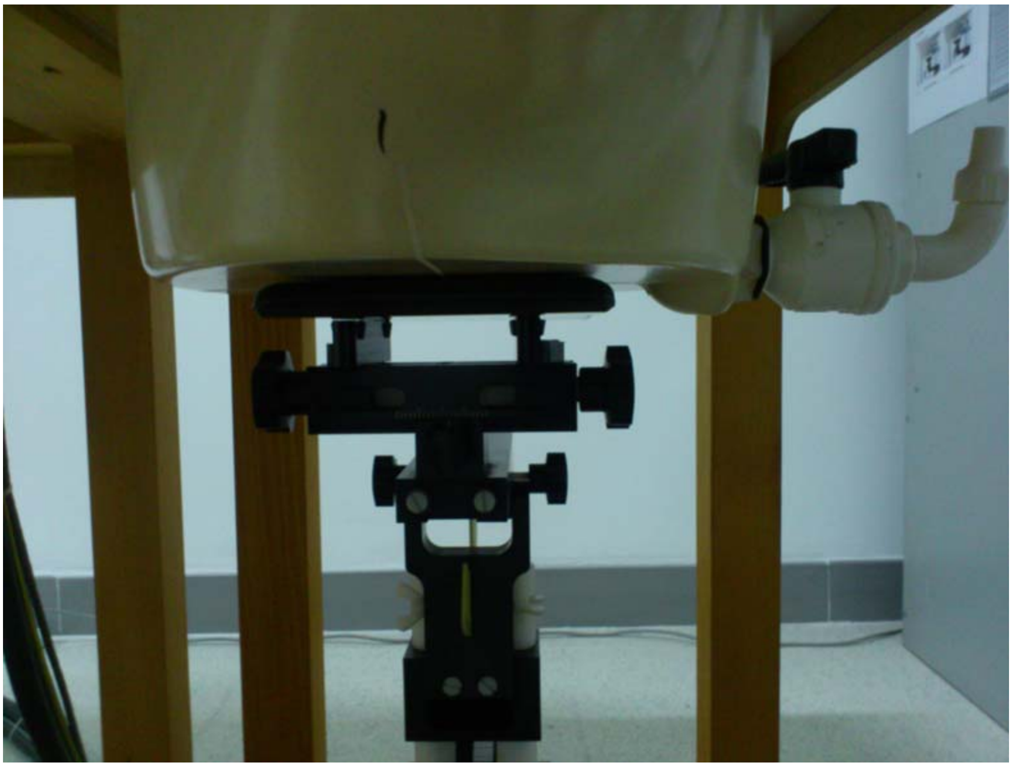


Fig.2 Body Position (Back side)

Fig.3 Body Position (Top side)

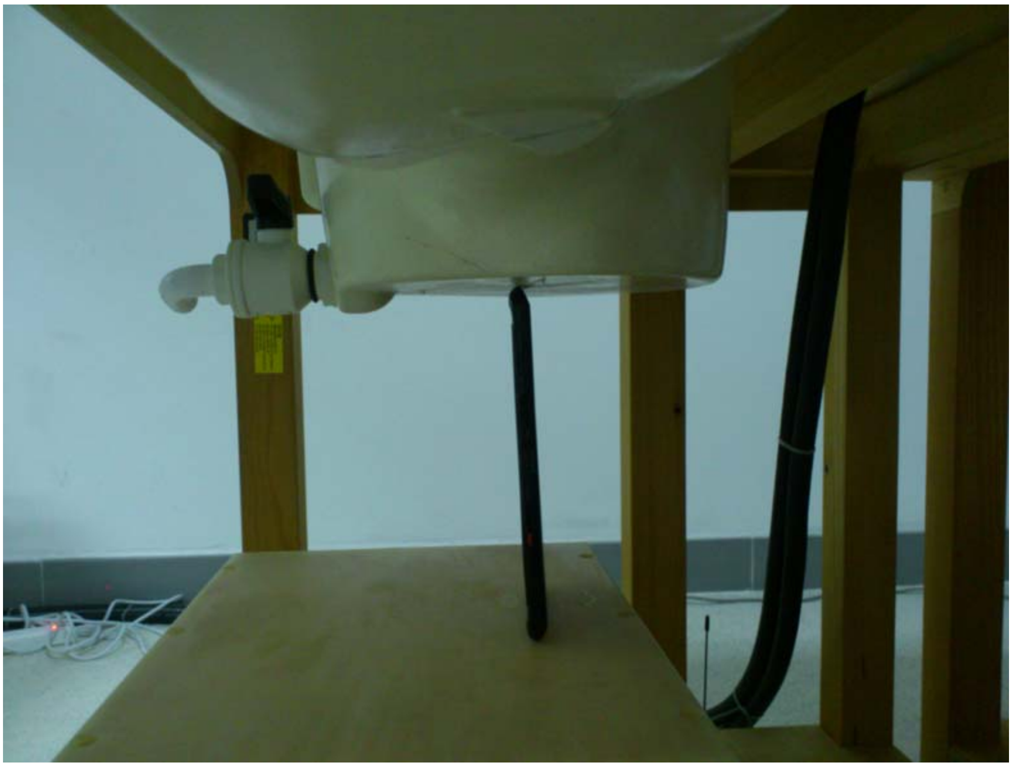


Fig.4 Body Position (Left side)

ANNEX B

of

CCIC-SET

CONFORMANCE TEST REPORT FOR

HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

SAR2013-007

MID

Type Name: StarTab 715

Hardware Version: V2.1

Software Version: StarTab715_HW.V2.1_V2.0G_20121205

Sample Photographs

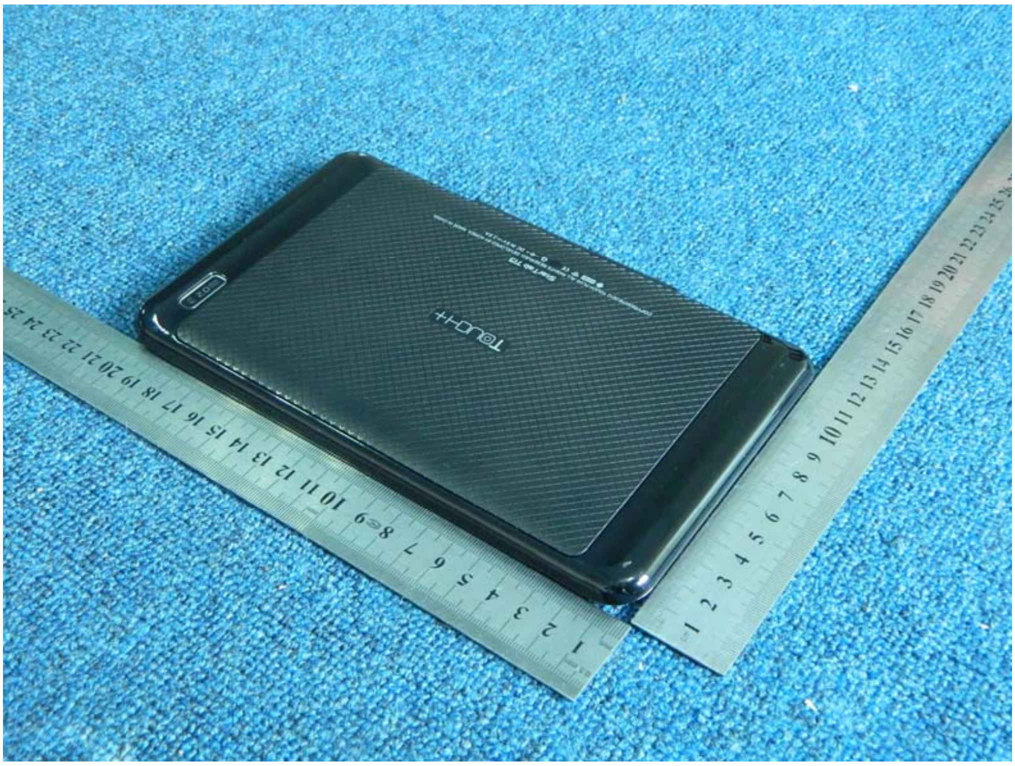
This Annex consists of 4 pages

Date of Report: 2013-01-11

1. Photograph of the Equipment under Test

1.1. Appearance

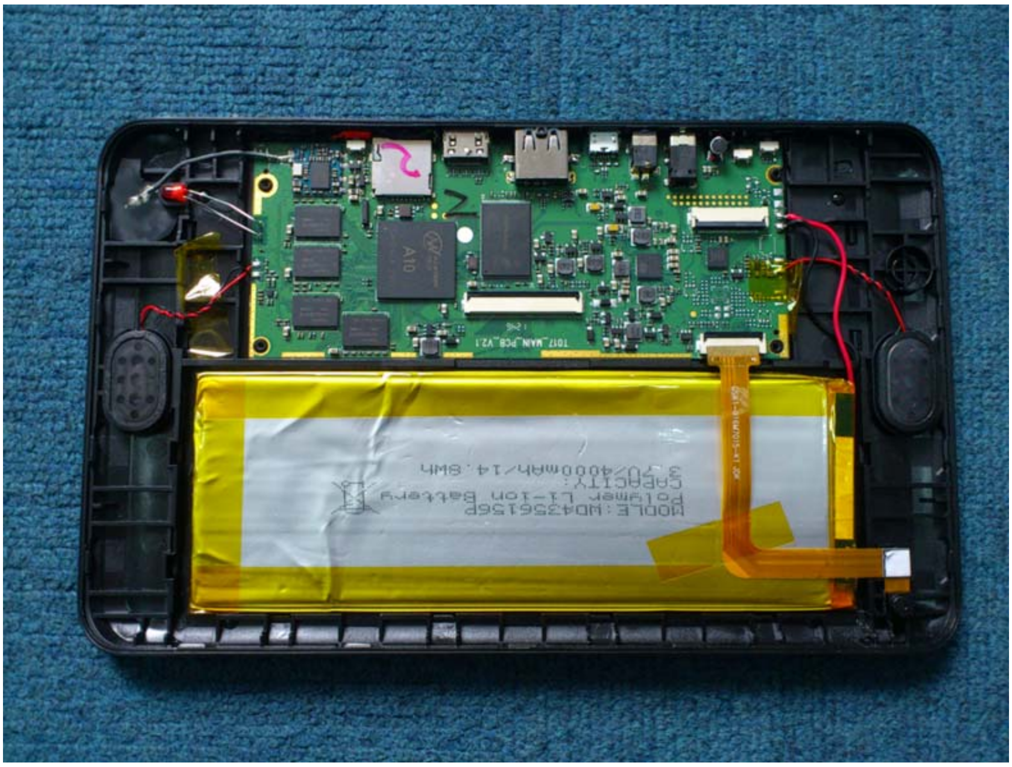
Appearance and size (obverse)



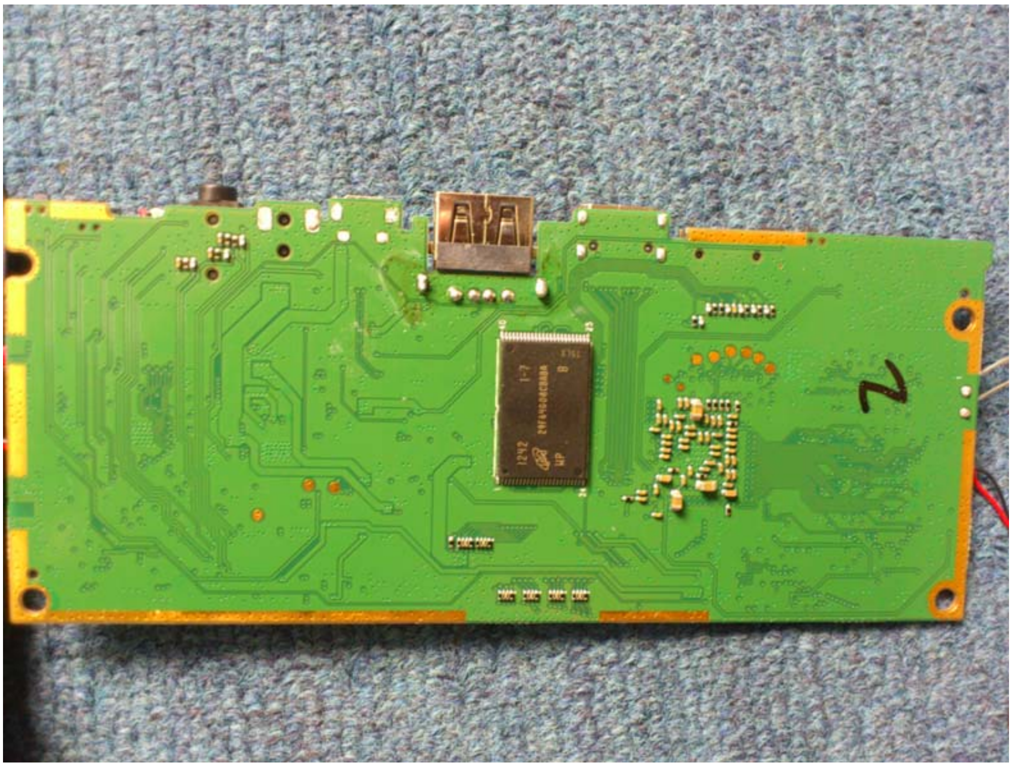
Appearance and size (reverse)

Appearance and ports (Side)

1.2 Inside



Structure



Mainboard (obverse)

ANNEX C

of

CCIC-SET

CONFORMANCE TEST REPORT FOR

HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

SAR2013-007

MID

Type Name: StarTab 715

Hardware Version： **V2.1**

Software Version： **StarTab715_HW.V2.1_V2.0G_20121205**

System Performance Check Data

This Annex consists of 11 pages

Date of Report：2013-01-11

System Performance Check (Wi-Fi, Jan 11st, 2013)

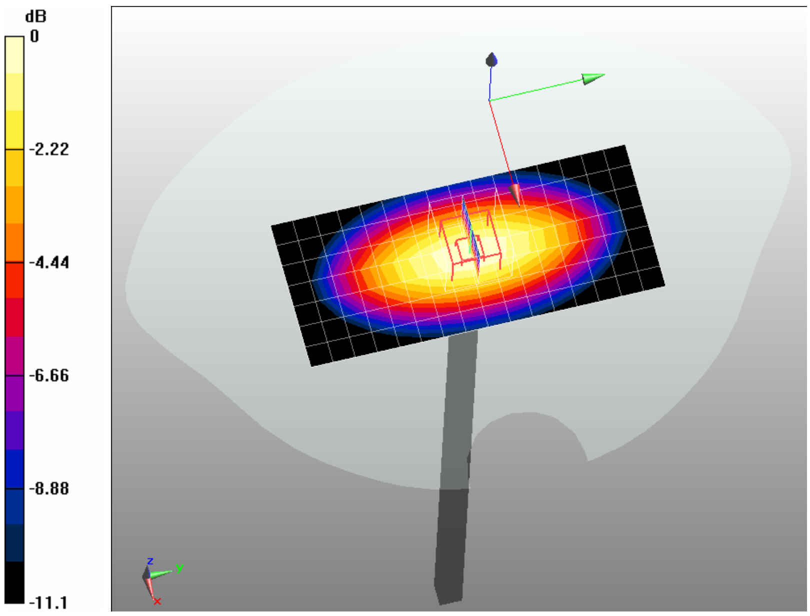
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:xxx
Program Name: System Performance Check at 2450 MHz

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.942 mho/m; εr = 51.88; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

d=15mm, Pin=250mW/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.08 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 89.6 V/m; Power Drift = -0.123 dB
Peak SAR (extrapolated) = 15.73 W/kg
SAR(1 g) = 12.98 mW/g; SAR(10 g) = 3.29 mW/g
Maximum value of SAR (measured) = 13.76 mW/g



0 dB = 13.76mW/g

802.11b at 11Mbps (Back side, Bottom channel)

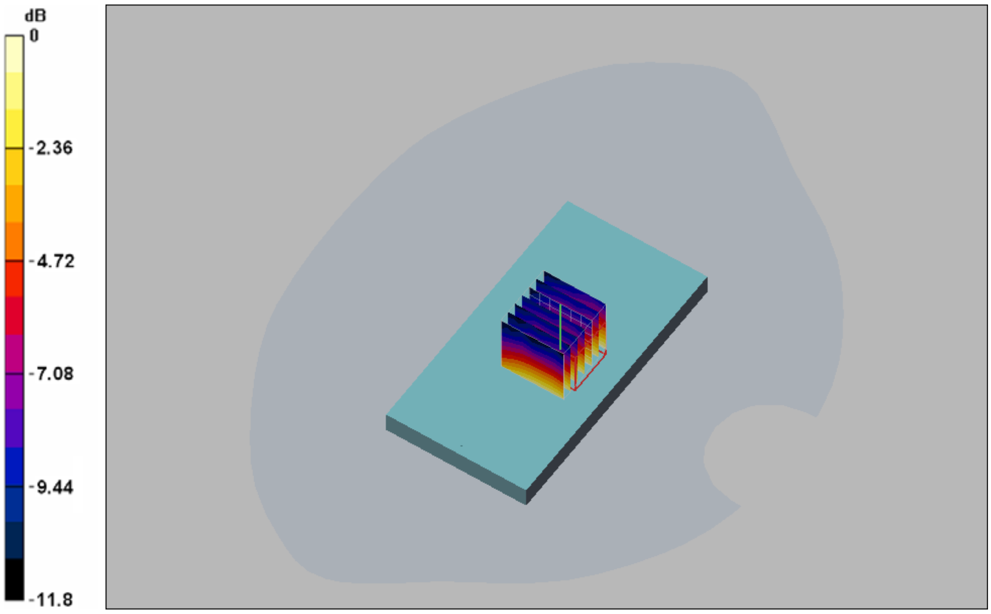
DUT: Tablet; Type: Sample; Serial: Not Specified

Communication System: CW; Frequency: 2412 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2412 MHz; σ = 1.933 mho/m; εr = 52.49; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0. 762 mW/g
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.218 V/m; Power Drift = -0.034 dB
Peak SAR (extrapolated) = 0.688 mW/g
SAR(1 g) = 0.567 mW/g; SAR(10 g) = 0.292 mW/g

Maximum value of SAR (measured) = 0.676 mW/g



0 dB = 0.676mW/g

802.11b at 11Mbps (Left side, Bottom channel)

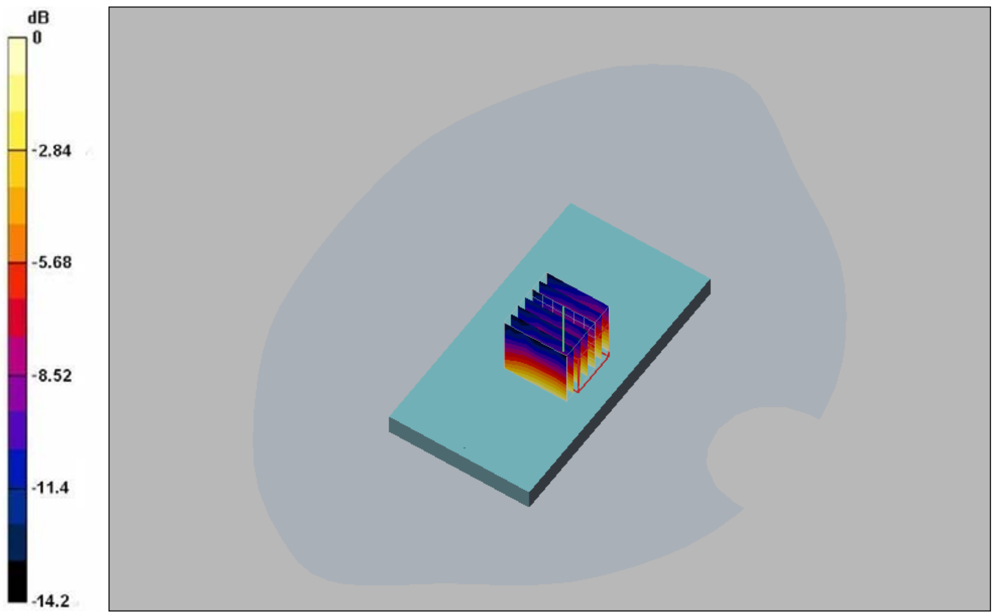
DUT: Tablet; Type: Sample; Serial: Not Specified

Communication System: CW; Frequency: 2412 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2412 MHz; σ = 1.933 mho/m; εr = 52.49; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.824 mW/g
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.328 V/m; Power Drift = -0.042 dB
Peak SAR (extrapolated) = 0.866 mW/g
SAR(1 g) = 0.622 mW/g; SAR(10 g) = 0.332 mW/g

Maximum value of SAR (measured) = 0.778 mW/g



0 dB = 0.778mW/g

802.11b at 11Mbps (Top side, Bottom channel)

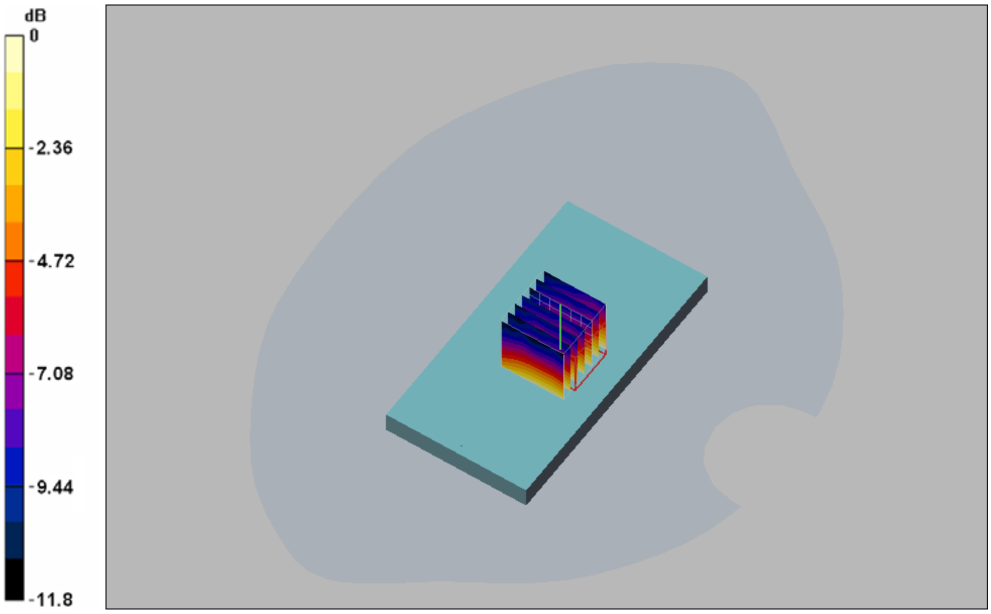
DUT: Tablet; Type: Sample; Serial: Not Specified

Communication System: CW; Frequency: 2412 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2412 MHz; σ = 1.933 mho/m; εr = 52.49; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.742 mW/g
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.308 V/m; Power Drift = 0.014 dB
Peak SAR (extrapolated) = 0.698 mW/g
SAR(1 g) = 0.582 mW/g; SAR(10 g) = 0.302 mW/g

Maximum value of SAR (measured) = 0.645 mW/g



0 dB = 0.645mW/g

802.11b at 11Mbps (Back side, Middle channel)

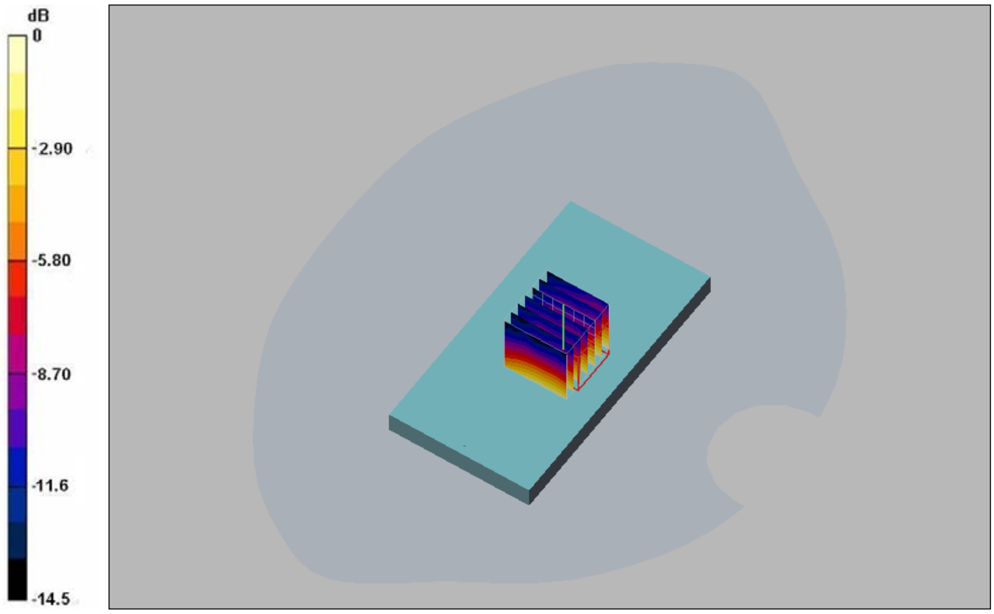
DUT: Tablet; Type: Sample; Serial: Not Specified

Communication System: CW; Frequency: 2437 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2437 MHz; σ = 1.940 mho/m; εr = 52.86; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.722 mW/g
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.322 V/m; Power Drift = -0.066 dB
Peak SAR (extrapolated) = 0.688 mW/g
SAR(1 g) = 0.560 mW/g; SAR(10 g) = 0.288 mW/g

Maximum value of SAR (measured) = 0.676 mW/g



0 dB = 0.676mW/g

802.11b at 11Mbps (Left side, Middle channel)

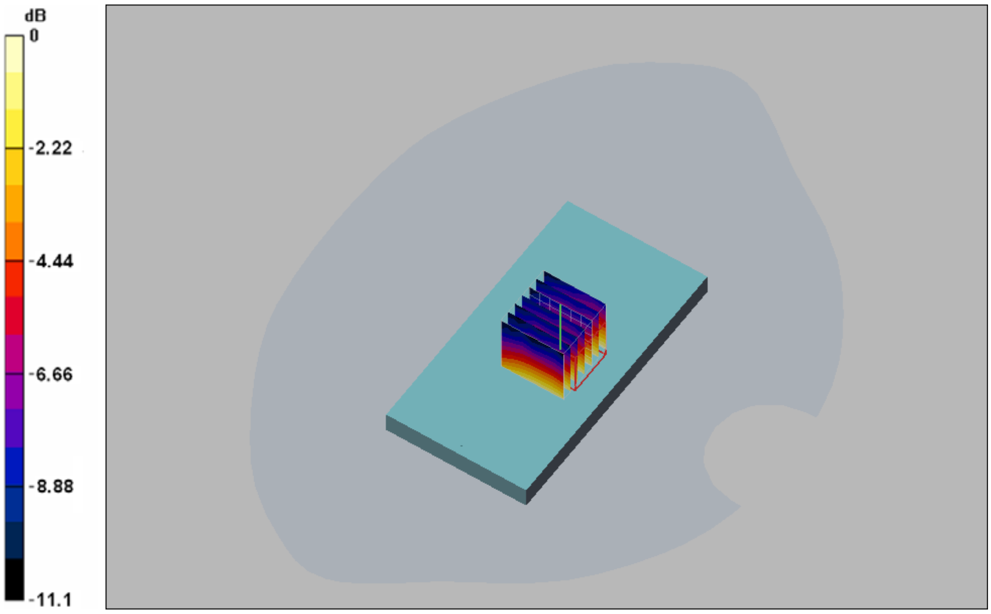
DUT: Tablet; Type: Sample; Serial: Not Specified

Communication System: CW; Frequency: 2437 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2437 MHz; σ = 1.940 mho/m; εr = 52.86; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.838 mW/g
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.978 V/m; Power Drift = -0.076 dB
Peak SAR (extrapolated) = 0.784 mW/g
SAR(1 g) = 0.636 mW/g; SAR(10 g) = 0.329 mW/g

Maximum value of SAR (measured) = 0.712 mW/g



0 dB = 0.712mW/g

802.11b at 11Mbps (Top side, Middle channel)

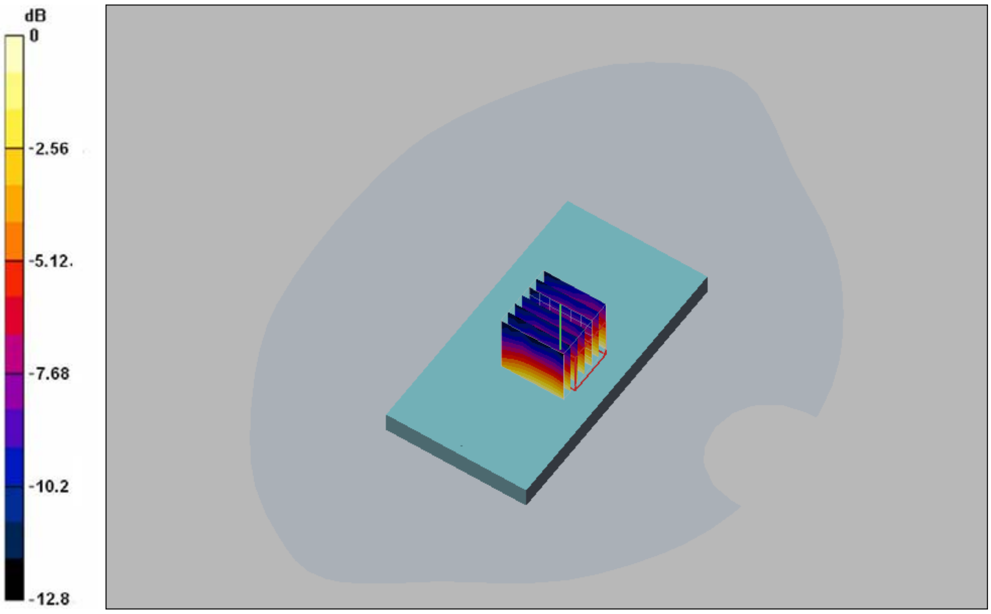
DUT: Tablet; Type: Sample; Serial: Not Specified

Communication System: CW; Frequency: 2437 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2437 MHz; σ = 1.940 mho/m; εr = 52.86; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.704 mW/g
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.982 V/m; Power Drift = -0.038 dB
Peak SAR (extrapolated) = 0.644 mW/g
SAR(1 g) = 0.532 mW/g; SAR(10 g) = 0.276 mW/g

Maximum value of SAR (measured) = 0.588 mW/g



0 dB = 0.588mW/g

802.11b at 11Mbps (Back side, Top channel)

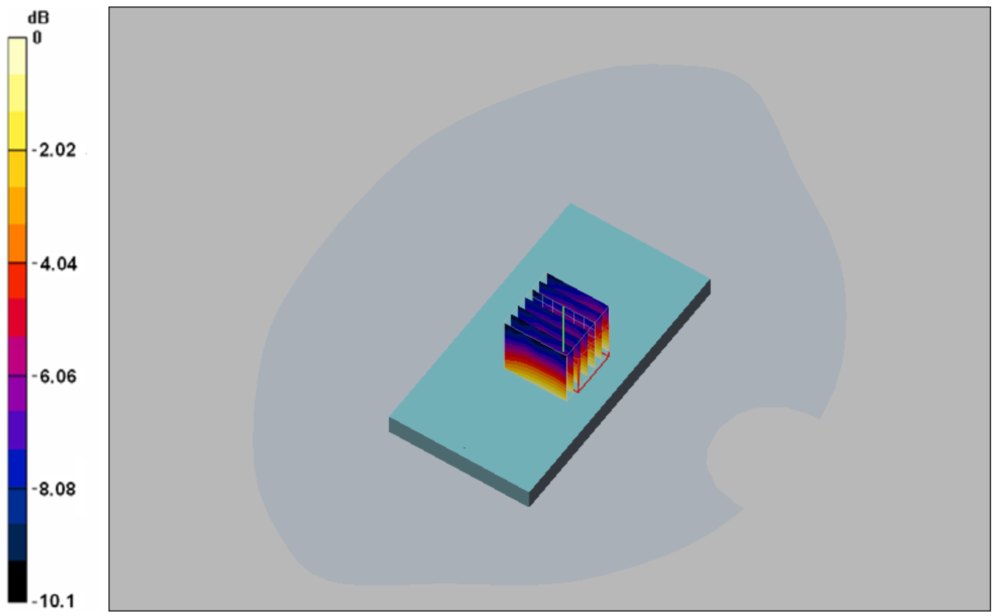
DUT: Tablet; Type: Sample; Serial: Not Specified

Communication System: CW; Frequency: 2462 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2462 MHz; σ = 1.951 mho/m; εr = 51.43; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.702 mW/g
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.562 V/m; Power Drift = -0.073 dB
Peak SAR (extrapolated) = 0.684 mW/g
SAR(1 g) = 0.542 mW/g; SAR(10 g) = 0.281 mW/g

Maximum value of SAR (measured) = 0.608 mW/g



0 dB = 0.608mW/g

802.11b at 11Mbps (Left side, Top channel)

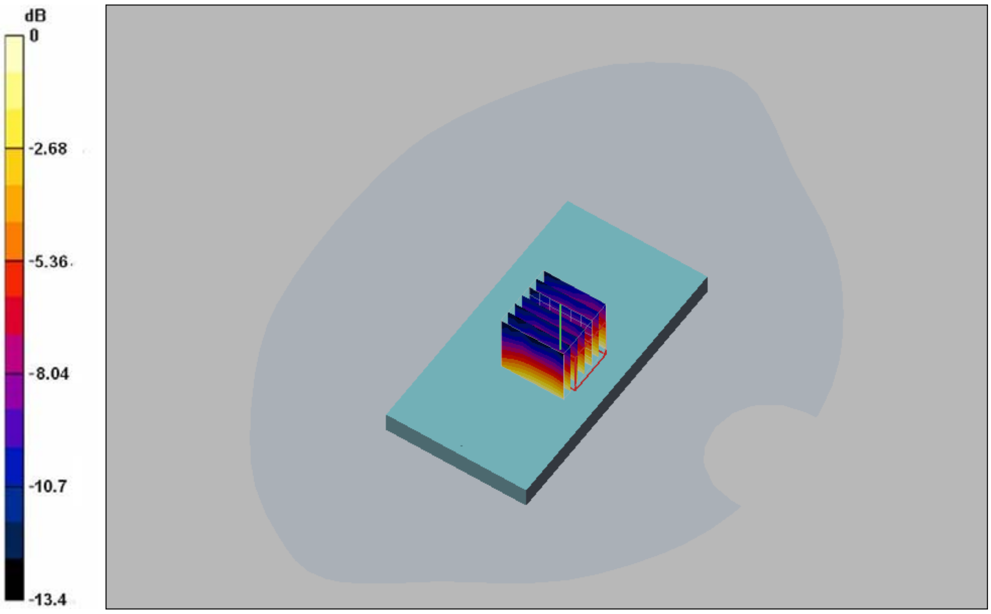
DUT: Tablet; Type: Sample; Serial: Not Specified

Communication System: CW; Frequency: 2462 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2462 MHz; σ = 1.951 mho/m; εr = 51.43; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.798 mW/g
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.056 V/m; Power Drift = -0.048 dB
Peak SAR (extrapolated) = 0.776 mW/g
SAR(1 g) = 0.596 mW/g; SAR(10 g) = 0.312 mW/g

Maximum value of SAR (measured) = 0.656 mW/g



0 dB = 0.656mW/g

802.11b at 11Mbps (Top side, Top channel)

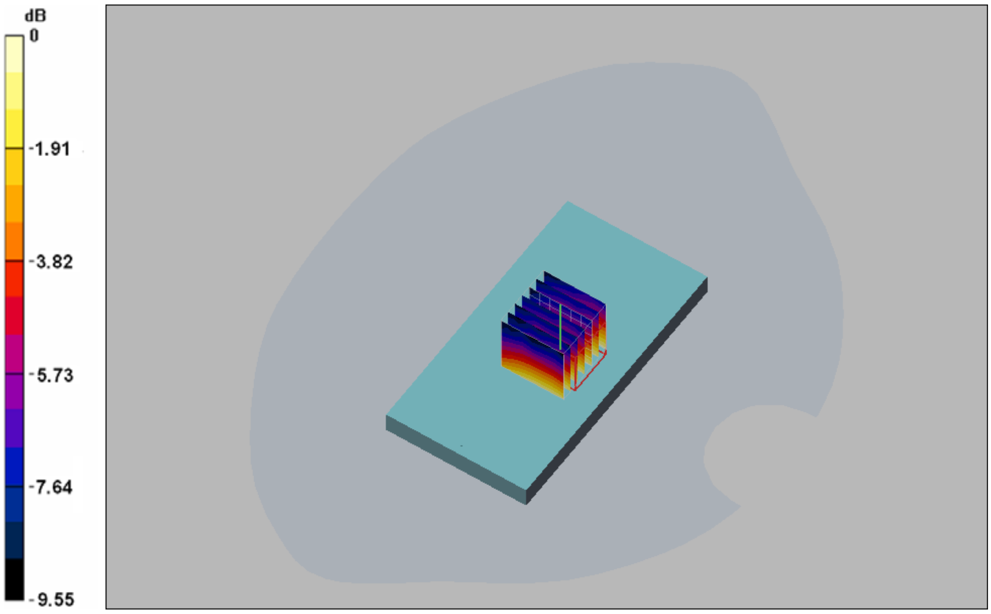
DUT: Tablet; Type: Sample; Serial: Not Specified

Communication System: CW; Frequency: 2462 MHz; Communication System PAR: 0 dB
Medium parameters used: f = 2462 MHz; σ = 1.951 mho/m; εr = 51.43; ρ = 1000 kg/m3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: ES3DV3 - SN3292; ConvF(4.25, 4.25, 4.25); Calibrated: 2/24/2012
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1315; Calibrated: 2/27/2012
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Post processing SW: SEMCAD, V1.8 Build 172

Unnamed procedure/Area Scan (61x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.624 mW/g
Unnamed procedure/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.048 V/m; Power Drift = -0.064 dB
Peak SAR (extrapolated) = 0.628 mW/g
SAR(1 g) = 0.478 mW/g; SAR(10 g) = 0.249 mW/g

Maximum value of SAR (measured) = 0.542 mW/g



0 dB = 0.542mW/g

ANNEX D

of

CCIC-SET

CONFORMANCE TEST REPORT FOR

HUMAN EXPOSURE TO ELECTROMAGNETIC FIELDS

SAR2013-007

MID

Type Name: StarTab 715

Hardware Version: V2.1

Software Version: StarTab715_HW.V2.1_V2.0G_20121205

Calibration Certificate of DAE and Probe

This Annex consists of 25 pages

Date of Report：2013-01-11

Probe Calibration Ceriticate

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
S 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 **CIQ SZ (Auden)**

Certificate No: **ES3-3292_Feb12**

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3292

Calibration procedure(s): QA CAL-01.v8, QA CAL-14.v7, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: February 24, 2012

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-11 (No. ES3-3013_Dec11)	Dec-12
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 Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 27, 2012

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

Certificate No: ES3-3292_Feb12 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:3292

Manufactured: July 6, 2010
Calibrated: February 24, 2012

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.81	0.90	1.18	± 10.1 %
DCP (mV)[B]	105.9	104.7	102.0	

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	117.3	±2.2 %
			Y	0.00	0.00	1.00	94.2	
			Z	0.00	0.00	1.00	108.2	

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:3292

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)
450	43.5	0.87	6.71	6.71	6.71	0.15	1.80	± 13.4 %
835	41.5	0.90	6.06	6.06	6.06	0.26	2.19	± 12.0 %
900	41.5	0.97	6.03	6.03	6.03	0.29	2.00	± 12.0 %
1810	40.0	1.40	5.25	5.25	5.25	0.80	1.17	± 12.0 %
1900	40.0	1.40	5.21	5.21	5.21	0.63	1.38	± 12.0 %
2100	39.8	1.49	5.15	5.15	5.15	0.80	1.20	± 12.0 %
2450	39.2	1.80	4.47	4.47	4.47	0.63	1.50	± 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.

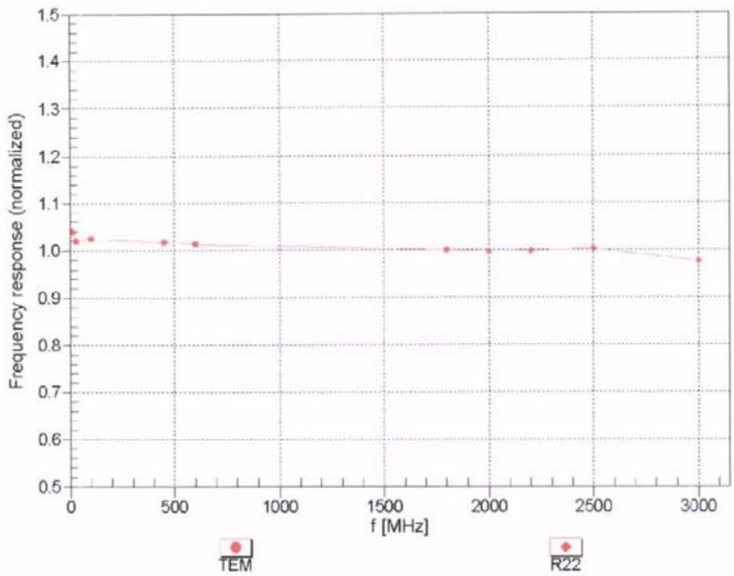
DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

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)
450	56.7	0.94	7.10	7.10	7.10	0.09	1.00	± 13.4 %
835	55.2	0.97	6.14	6.14	6.14	0.42	1.57	± 12.0 %
900	55.0	1.05	6.07	6.07	6.07	0.48	1.49	± 12.0 %
1810	53.3	1.52	4.86	4.86	4.86	0.62	1.42	± 12.0 %
1900	53.3	1.52	4.66	4.66	4.66	0.47	1.75	± 12.0 %
2100	53.2	1.62	4.76	4.76	4.76	0.70	1.39	± 12.0 %
2450	52.7	1.95	4.25	4.25	4.25	0.80	1.03	± 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.

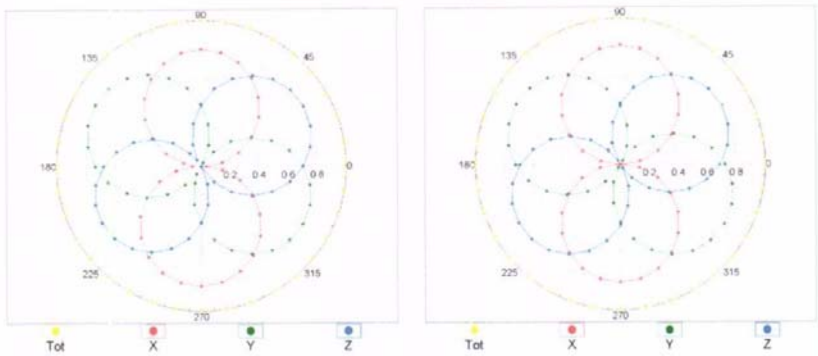
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)

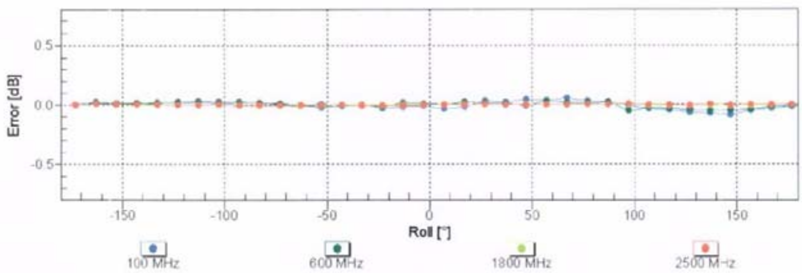


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), $\vartheta = 0°$

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

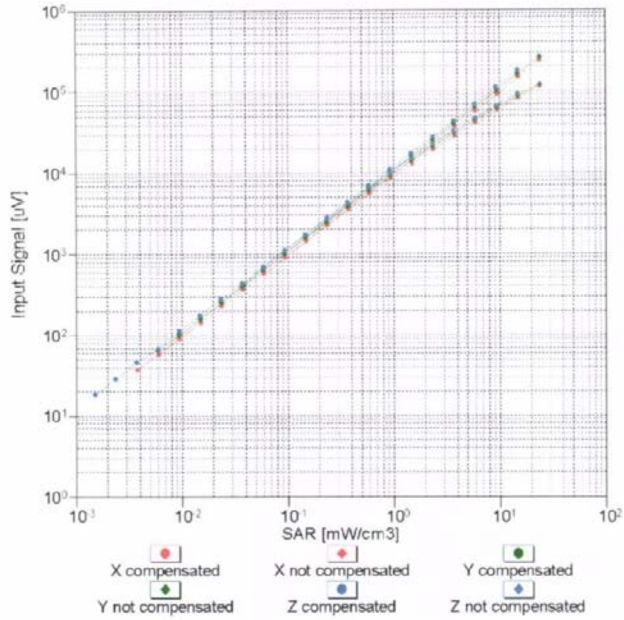


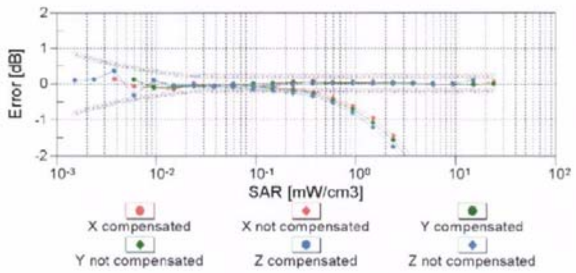


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell , f = 900 MHz)

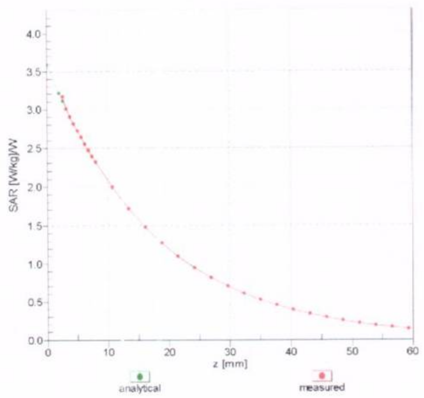


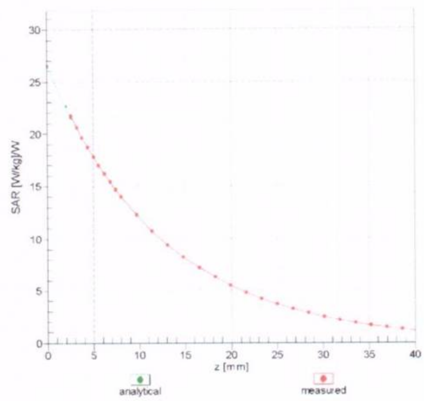


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ES3DV3– SN:3292 February 24, 2012

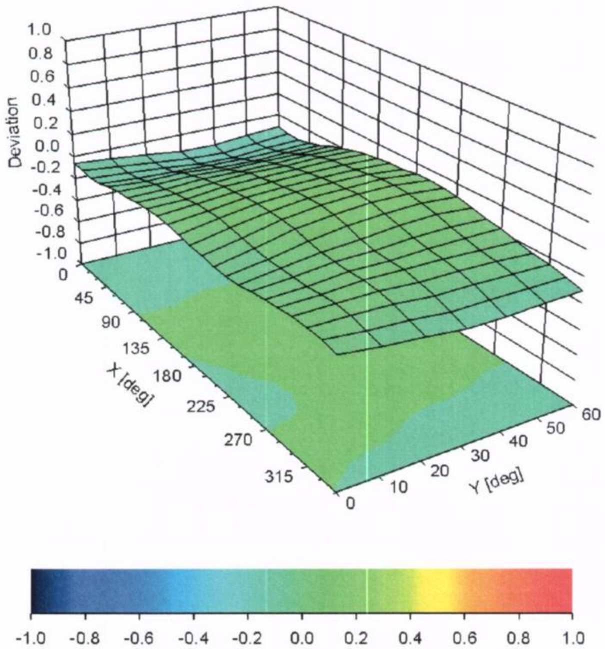
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

Certificate No: ES3-3292_Feb12 Page 10 of 11

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3292

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

D2450V2 Dipole Calibration Ceriticate

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **CIQ SZ (Auden)**

Certificate No: **D2450V2-884_Feb12**

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 884

Calibration procedure(s): QA CAL-05.v8
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: February 29, 2012

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 EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5086 (20g)	29-Mar-11 (No. 217-01368)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 29, 2012

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Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

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
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.9 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.7 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**53.9 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	concition	
SAR measured	250 mW input power	6.36 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**25.2 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.3 ± 6 %	2.02 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**50.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	concition	
SAR measured	250 mW input power	5.98 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.7 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω + 2.1 jΩ
Return Loss	- 27.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.7 Ω + 3.7 jΩ
Return Loss	- 28.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.159 ns

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 06, 2011

DASY5 Validation Report for Head TSL

Date: 29.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

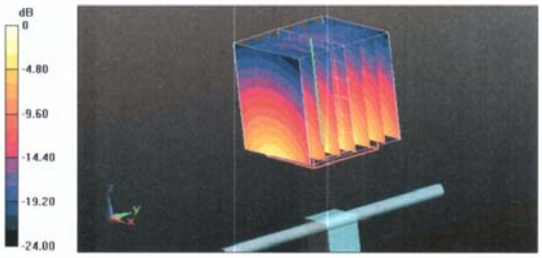
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

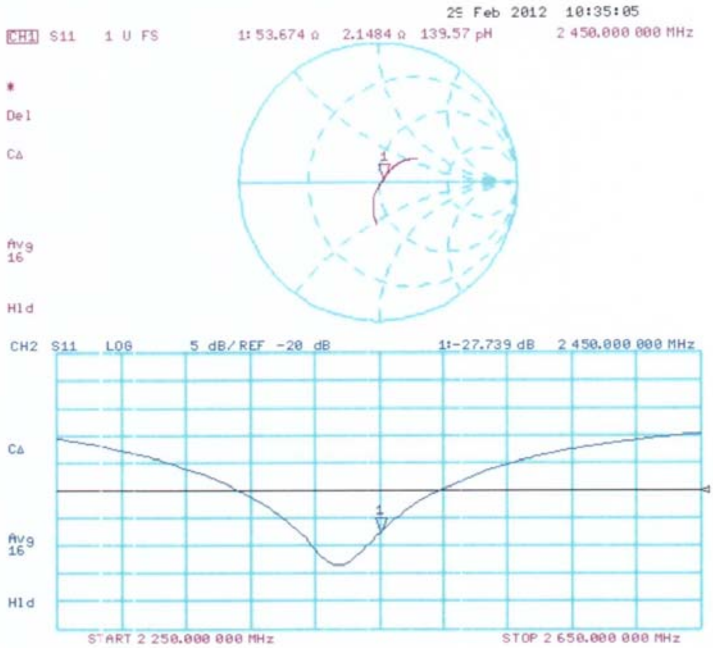
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.8 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 28.4450
SAR(1 g) = 13.7 mW/g; SAR(10 g) = 6.36 mW/g
Maximum value of SAR (measured) = 17.648 mW/g



0 dB = 17.650mW/g = 24.93 dB mW/g

Certificate No: D2450V2-884_Feb12 Page 5 of 8

Impedance Measurement Plot for Head TSL



Certificate No: D2450V2-884_Feb12 Page 6 of 8

DASY5 Validation Report for Body TSL

Date: 29.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

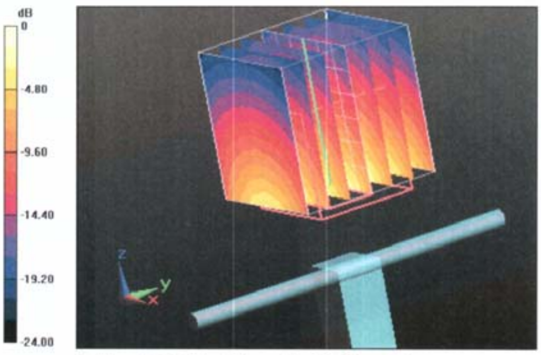
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884

Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

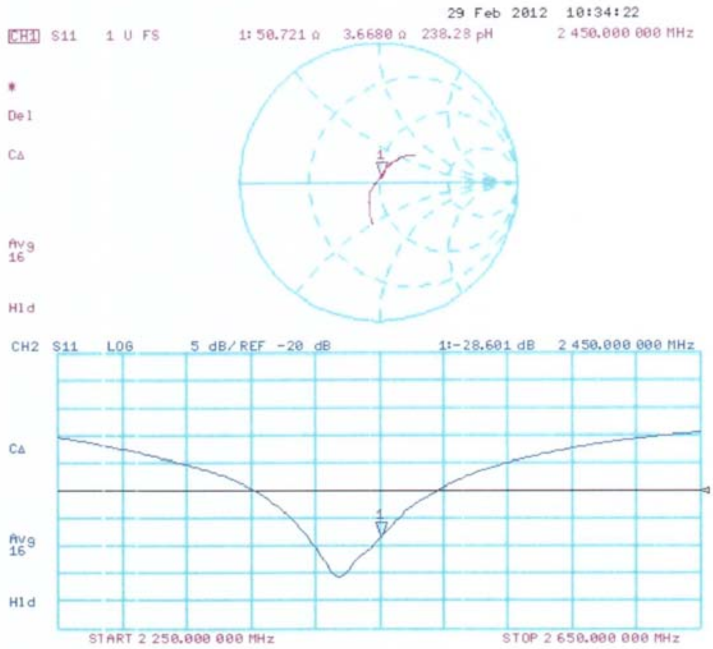
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.956 V/m; Power Drift = 0.0027 dB
Peak SAR (extrapolated) = 26.2360
SAR(1 g) = 12.8 mW/g; SAR(10 g) = 5.98 mW/g
Maximum value of SAR (measured) = 16.972 mW/g



0 dB = 16.970mW/g = 24.59 dB mW/g

Certificate No: D2450V2-884_Feb12 Page 7 of 8

Impedance Measurement Plot for Body TSL



Certificate No: D2450V2-884_Feb12 Page 8 of 8

DAE4 Calibration Ceriticate

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Accreditation No.: **SCS 108**

Client **CIQ SZ (Auden)**

Certificate No: **DAE4-1315_Feb12**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 1315
Calibration procedure(s)	QA CAL-06.v24 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	February 27, 2012

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
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-11 (No:11450)	Sep-12
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V2.1	SE UWS 053 AA 1001	05-Jan-12 (in house check)	In house check: Jan-13

	Name	Function	Signature
Calibrated by:	Andrea Guntli	Technician	[signature]
Approved by:	Fin Bomholt	R&D Director	i.V. [signature]

Issued: February 27, 2012

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Accreditation No.: **SCS 108**

Glossary

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* Typical value for information: DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal
High Range: 1LSB = 6.1μV , full range = -100...+300 mV
Low Range: 1LSB = 61nV , full range = -1.......+3mV
DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	405.194 ± 0.1% (k=2)	405.031 ± 0.1% (k=2)	405.006 ± 0.1% (k=2)
Low Range	4.00179 ± 0.7% (k=2)	3.99504 ± 0.7% (k=2)	4.00535 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	20.0 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199993.07	-0.46	-0.00
Channel X	+ Input	19998.21	0.29	0.00
Channel X	- Input	-19997.04	5.94	-0.03
Channel Y	+ Input	199992.78	-1.05	-0.00
Channel Y	+ Input	19995.99	-1.88	-0.01
Channel Y	- Input	-20001.41	1.50	-0.01
Channel Z	+ Input	199996.23	3.02	0.00
Channel Z	+ Input	19996.75	-0.72	-0.00
Channel Z	- Input	-20003.50	-0.24	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	1999.32	-1.73	-0.09
Channel X	+ Input	200.22	-1.03	-0.51
Channel X	- Input	-198.55	0.32	-0.16
Channel Y	+ Input	1997.53	-3.28	-0.16
Channel Y	+ Input	199.64	-1.21	-0.60
Channel Y	- Input	-199.77	-0.78	0.39
Channel Z	+ Input	1997.90	-2.04	-0.10
Channel Z	+ Input	199.23	-1.21	-0.61
Channel Z	- Input	-200.63	-1.12	0.56

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-1.10	-3.09
	- 200	4.35	3.23
Channel Y	200	-22.09	-22.46
	- 200	21.74	22.31
Channel Z	200	-4.46	-4.92
	- 200	3.65	2.86

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	-2.62	-3.29
Channel Y	200	6.73	-	-2.17
Channel Z	200	8.11	5.38	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16132	15682
Channel Y	16251	15151
Channel Z	15551	15659

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	1.32	0.22	2.38	0.46
Channel Y	-1.23	-2.04	-0.58	0.36
Channel Z	-1.89	-3.56	-1.12	0.39

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance (Typical values for information)

	Zeroing (kOhm)	Measuring (MOhm)
Channel X	200	200
Channel Y	200	200
Channel Z	200	200

8. Low Battery Alarm Voltage (Typical values for information)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (Typical values for information)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.01	+6	+14
Supply (- Vcc)	–0.01	-8	-9