



FCC SAR EVALUATION REPORT

For

AcrossTechs, LLC

13601 Preston Road, Suite W615, Dallas, TX 75240 USA

Product Name: GSM bar Phone

Model No. : 201401,C101A

Date of Receipt: 21st May. 2014

Date of Test: 21st ~23nd May. 2014

Issued Date: 23nd May. 2014

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Issue By

Shenzhen Sunway Communication CO.,LTD Testing Center
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Note: *The test results relate only to the samples tested. This report shall not be reproduced in full, without the written approval of SUNWAY Testing Center.*

**SAR Evaluation compliance**

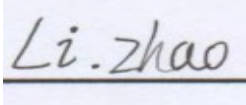
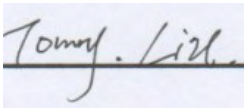
Product Name:	GSM bar phone
Brand Name:	AcrossTechs
Model Name:	201401,C101A
Applicant:	AcrossTechs, LLC
Address:	13601 Preston Road, Suite W615, Dallas, TX 75240 USA
Manufacturer:	Honsung International Industry Ltd.
Address:	2FL, East Wing, WanYuan Building, Shangbu Industry Park, Hongli Road, Futian District, Shenzhen, PRC
Applicable Standard:	IEEE Std. 1528-2013, FCC 47CFR § 2.1093 KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01r03 KDB 447498 D01 General RF Exposure Guidance v05r02
Test Result:	Max. SAR Report: Body (1g): 0.339W/kg Head(1g): 0.733W/kg
Performed Date:	21 st ~23 nd May. 2014
Test Engineer:	 26 th May. 2014
Reviewed By	 26 th May. 2014
Performed Location:	Shenzhen Sunway Communication CO.,LTD Testing Center 1/F,BuildingA, SDG Info Port, KefengRoad, Hi-Tech Park, Nanshan District,Shenzhen , Guangdong, China 518104 Tel: +86-755- 36615880 Fax: +86-755- 86525532



TABLE OF CONTENTS

1. General Information:	4
1.1 EUT Description:	4
1.2 Test Environment:	5
2. SAR Measurement System:	6
2.1 Dasy4 System Description:	6
3. System Components:	7
4. Tissue Simulating Liquid	9
4.1 The composition of the tissue simulating liquid:	9
4.2 Tissue Calibration Result:	9
4.3 Tissue Dielectric Parameters for Head and Body Phantoms:	9
5. SAR System Validation	11
5.1 Validation System:	11
5.2 Validation Dipoles:	11
5.3 Validation Result:	12
6. SAR Evaluation Procedures:	13
7. SAR Exposure Limits	14
8. Measurement Uncertainty:	15
9. Conducted Power Measurement:	17
10. Test photos and results:	18
10.1 DUT photos:	18
11. Equipment List:	26
Appendix A. System validation plots:	27
Appendix D. DAE Calibration Data:	59
Appendix E. Dipole Calibration Data:	64

**1. General Information:**

1.1 EUT Description:

EUT Information	
Product Name	GSM bar phone
Brand Name	AcrossTechs
Model Name	201401,C101A
Device Category	MobilePhone
Antenna Type	Integral Antenna
Headset	/
Battery	Type: Rechargeable lithium-ion battery 3.7V
Dimensions (L*W*H):	102mm (L)× 42mm (W)×14mm (H)
Weight:	0.078kg
Power Source:	DC 5.2V from adapter Rechargeable lithium-ion battery 3.7V
Normal Operation:	Head and Body-worn
Product Version:	end-product
GSM-2G	
Support Band	GSM850/PCS1900
Frequency Bands:	GSM 850: UL: 824-850 MHz DL: 869-894 MHz PCS 1900: UL: 1850-1910 MHz DL: 1930-1990 MHz
Release Version	R99
Type of modulation	GMSK for GSM
Antenna locations	GSM antenna is located on the top of the mobile phone (page 20)
Antenna Gain	1.2dBi for GSM 850 1.2dBi for PCS 1900
Max. Output Power (Conducted)	
GSM850:	32.31 dBm
PCS1900:	30.45 dBm



1.2 Test Environment:

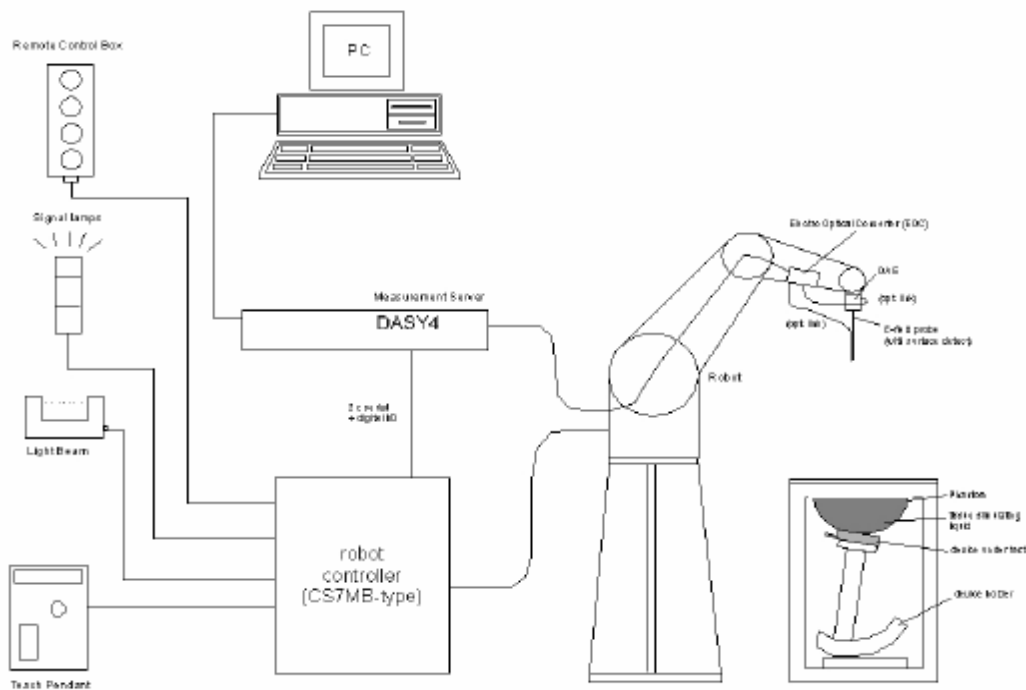
Ambient conditions in the SAR laboratory:

Items	Required	Actual
Temperature (°C)	18-25	21~23
Humidity (%RH)	30-70	50~65



2. SAR Measurement System:

2.1 Dasy4 System Description:



The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot with controller, teach pendant and software. An arm extension for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc.
- The Electro-optical converter (EOC) performs the conversion between optical and electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
- A computer operating Windows 2000 or Windows XP.
- DASY4 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
- The SAM twin phantom enabling testing left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- Validation dipole kits allowing to validate the proper functioning of the system.



3. System Components:

➤ DAsY4 Measurement Server:



Calibration: No calibration required.

The DASY4 measurement server is based on a PC/104 CPU board with a 166MHz low-power pentium, 32MB chipdisk and 64MB RAM. The necessary circuits for communication with either the DAE4 (or DAE3) electronic box as well as the 16-bit AD-converter system for optical detection and digital I/O interface are contained on the DASY4 I/O-board, which is directly connected to the PC/104 bus of the CPU board.

➤ DATA Acquisition Electronics (DAE):



Calibration: Recommended once a year

The data acquisition electronics consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock.

➤ Dosimetric Probes:



Calibration: Recommended once a year

Model: ES3DV3,
Frequency: 10MHz to 3G, Linearity: ± 0.2 dB,
Dynamic Range: 10 μ W/g to 100 mW/g
Directivity:
 ± 0.3 dB in HSL (rotation around probe axis)
 ± 0.5 dB in tissue material (rotation normal to probe axis)

These probes are specially designed and calibrated for use in liquids with high permittivities. They should not be used in air, since the spherical isotropy in air is poor (± 2 dB). The dosimetric probes have special calibrations in various liquids at different frequencies.



➤ Light Beam unit:



Calibration: No calibration required.

The light beam switch allows automatic "tooling" of the probe. During the process, the actual position of the probe tip with respect to the robot arm is measured, as well as the probe length and the horizontal probe offset. The software then corrects all movements, such that the robot coordinates are valid for the probe tip. The repeatability of this process is better than 0.1 mm.

➤ SAM Twin Phantom:



The SAM twin phantom is a fiberglass shell phantom with 2mm shell thickness (except the ear region where shell thickness increases to 6mm). It has three measurement areas:

- Left hand
- Right hand
- Flat phantom

The bottom plate contains three pair of bolts for locking the device holder. The device holder positions are adjusted to the standard measurement positions in the three sections. A white cover is provided to tap the phantom during off-periods to prevent water evaporation and changes in the liquid parameters. On the phantom top, three reference markers are provided to identify the phantom position with respect to the robot.

➤ Device Holder for SAM Twin Phantom:



The DASY device holder is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the 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.

The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon_r=3$ and loss tangent $\tan \delta=0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered



4. Tissue Simulating Liquid

4.1 The composition of the tissue simulating liquid:

INGREDIENT (% Weight)	835MHz Head	835MHz Body	1900MHz Head	1900MHz Body
Water	40.45	52.4	54.9	40.4
Salt	1.525	1.52	0.18	0.5
Sugar	57.6	45.0	0.00	58.0
HEC	0.40	1.0	0.00	1.0
Preventol	0.10	0.1	0.00	0.1
DGBE	0.00	0	44.92	0

4.2 Tissue Calibration Result:

Dielectric Probe Kit: Speag DAK 3.5mm probe -S/N:1038

Head Tissue Simulate Measurement:

Frequency (MHz)	Description	Dielectric Parameters		Tissue Temp. (°C)	Date
		ϵ_r	σ [s/m]		
835MHz	Reference	$41.50 \pm 5\%$ (39.425~43.574)	$0.90 \pm 5\%$ (0.9215~1.0185)	N/A	2014.05.21
	Measurement	42.27	0.91	22.1	
1900MHz	Reference	$40 \pm 5\%$ (38~42)	$1.40 \pm 5\%$ (1.33~1.47)	N/A	2014.05.21
	Measurement	39.27	1.42	21.8	

Body Tissue Simulate Measurement:

Frequency (MHz)	Description	Dielectric Parameters		Tissue Temp. (°C)	Date
		ϵ_r	σ [s/m]		
835MHz	Reference	$55.2 \pm 5\%$ (52.45~57.96)	$0.97 \pm 5\%$ (0.93~1.01)	N/A	2014.05.21
	Measurement	54.73	0.98	22.5	
1900MHz	Reference	$53.3 \pm 5\%$ (50.64~55.96)	$1.52 \pm 5\%$ (1.45~1.59)	N/A	2014.05.21
	Measurement	52.45	1.54	22.5	

**4.3 Tissue Dielectric Parameters for Head and Body Phantoms:**

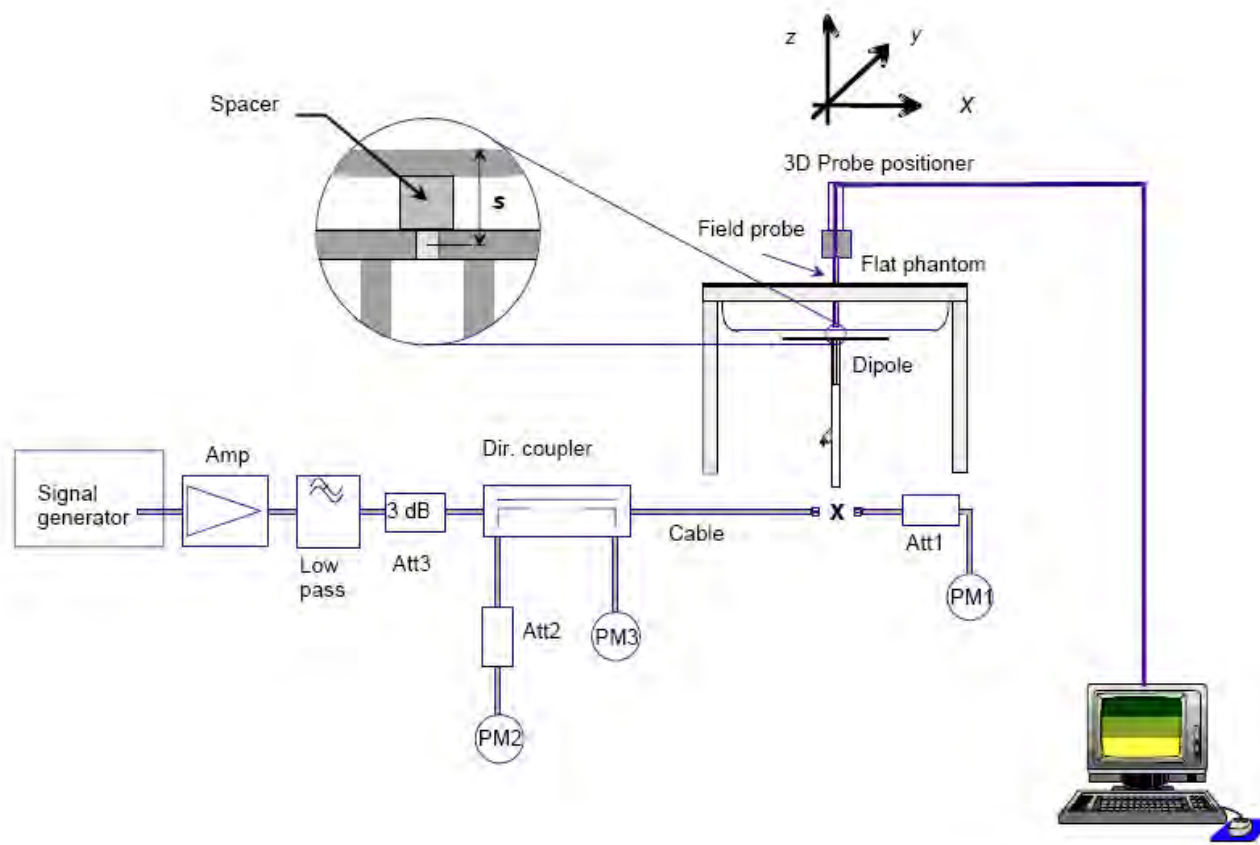
The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table

Target Frequency (MHz)	Head		Body	
	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. SAR System Validation

5.1 Validation System:



5.2 Validation Dipoles:

The dipoles used is based on the IEEE-1528/EN62209-1 standard, and is complied with mechanical and electrical specifications in line with the requirements of both IEEE-1528/EN62209-1 and FCC Supplement C. the table below provides details for the mechanical and electrical specifications for the dipoles

Frequency	L(mm)	H(mm)	D(mm)
835MHz	161	89.8	3.6
1900MHz	68	39.5	3.6



5.3 Validation Result:

System performance check for Head at 835MHz,1900MHz

Validation Dipole: D835V2-SN:4d154

Frequency (MHz)	Description	SAR(1g) W/Kg	SAR(10g) W/Kg	Tissue Temp. (°C)	Date
835MHz	Reference	$9.51 \pm 10\%$ (8.56~10.46)	$6.17 \pm 10\%$ (5.56~6.78)	N/A	2014.05.21
	Validation	10.04	6.56	22.5	

Validation Dipole: D1900V2-SN:5d142

1900MHz	Reference	$40.2 \pm 10\%$ (36.18~44.22)	$21 \pm 10\%$ (18.9~23.1)	N/A	2014.05.21
	Validation	42.0	21.44	22.5	

System performance check for Body at 835MHz,1900MHz

Validation Dipole: D835V2-SN:4d154

Frequency (MHz)	Description	SAR(1g) W/Kg	SAR(10g) W/Kg	Tissue Temp. (°C)	Date
835MHz	Reference	$9.51 \pm 10\%$ (8.56~10.46)	$6.23 \pm 10\%$ (5.61~6.85)	N/A	2014.05.21
	Validation	9.68	6.24	22.5	

Validation Dipole: D1900V2-SN:5d142

1900MHz	Reference	$40.8 \pm 10\%$ (36.72~44.88)	$21.8 \pm 10\%$ (19.62~23.98)	N/A	2014.05.21
	Validation	42.40	21.60	22.5	

Note: Note: All system validation SAR values are measured at 24dBm and normalized to 1W forward power.



6. SAR Evaluation Procedures:

The procedure for assessing the average SAR value consists of the following steps:

➤ Power Reference Measurement

The Power Reference Measurement and Power Drift Measurement jobs are useful jobs for monitoring the power drift of the device under test in the batch process. Both jobs measure the field at a specified reference position, at a selectable distance from the phantom surface. The reference position can be either the selected section's grid reference point or a user point in this section. The reference job projects the selected point onto the phantom surface, orients the probe perpendicularly to the surface, and approaches the surface using the selected detection method.

➤ Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values, before doing a finer measurement around the hot spot. The sophisticated interpolation routines implemented in DASY4 software can find the maximum locations even in relatively coarse grids. The scanning area is defined by an editable grid. This grid is anchored at the grid reference point of the selected section in the phantom. When the Area Scan's property sheet is brought-up, grid settings can be edited by a user.

➤ Zoom Scan

Zoom Scans are used to assess the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan measures 7 x 7 x 7 points (5mmx5mmx5mm) within a cube whose base faces are centered on the maxima found in a preceding area scan job within the same procedure.

➤ Power Drift Measurement

The Power Drift Measurement job measures the field at the same location as the most recent power reference measurement job within the same procedure, and with the same settings. The Power Drift Measurement gives the field difference in dB from the reading conducted within the last Power Reference Measurement.

**7. SAR Exposure Limits**

SAR assessments have been made in line with the requirements of IEEE-15288,FCC Supplement C ,and comply with ANSI/IEEE C95.1-1992"Uncontrolled Environments" limits.

Limits for General Population/Uncontrolled Exposure (W/kg)

Type Exposure	Uncontrolled Environment Limit
Spatial Peak SAR (1g cube tissue for brain or body)	1.60W/kg
Spatial Peak SAR (whole body)	0.08W/kg
Spatial Peak SAR (10g for hands,feet,ankles and wrist)	4.00W/kg

Note: Occupational/Uncontrolled Environments are defined as locations where there is exposure that may be incurred by people who are aware of the potential for exposure,(i.e. as a result of employment or occupation)



8. Measurement Uncertainty:

Measurement uncertainty for 300 MHz to 3 GHz averaged over 1 gram / 10 gram.

NO	Source	Uncert. ai (%)	Prob. Dist.	Div. k	ci (1g)	ci (10g)	Stand. Uncert. ui (1g)	Stand. Uncert. ui (10g)	V _{eff}
1	Repeat	0.04	N	1	1	1	0.04	0.04	9
Instrument									
2	Probe calibration	7	N	2	1	1	3.5	3.5	∞
3	Axial isotropy	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	∞
4	Hemispherical isotropy	9.6	R	$\sqrt{3}$	0.7	0.7	3.9	3.9	∞
5	Boundary effect	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
6	Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	∞
7	Detection limits	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞
8	Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
9	Response time	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	∞
10	Integration time	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	∞
11	Ambient noise	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
12	Ambient reflections	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	∞
13	Probe positioner mech. restrictions	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	∞
14	Probe positioning with respect to phantom shell	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	∞
15	Max.SAR evaluation	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	∞



Test sample related									
16	Device positioning	3.8	N	1	1	1	3.8	3.8	99
17	Device holder	5.1	N	1	1	1	5.1	5.1	5
18	Drift of output power	5.0	R	√3	1	1	2.9	2.9	∞
Phantom and set-up									
19	Phantom uncertainty	4.0	R	√3	1	1	2.3	2.3	∞
20	Liquid conductivity (target)	5.0	R	√3	0.64	0.43	1.8	1.2	∞
21	Liquid conductivity (meas)	2.5	N	1	0.64	0.43	1.6	1.2	∞
22	Liquid Permittivity (target)	5.0	R	√3	0.6	0.49	1.7	1.5	∞
23	Liquid Permittivity (meas)	2.5	N	1	0.6	0.49	1.5	1.2	∞
Combined standard			RSS	$U_c = \sqrt{\sum_{i=1}^n C_i^2 U_i^2}$			12.2%	11.9%	236
Expanded uncertainty (P=95%)		$U = k U_c$,k=2					24.4%	23.8%	

**9. Conducted Power Measurement:**

Band	Channel	Frequency (MHz)	Avg.Burst Power(dBm)	Duty Cycle Factor(dB)	Frame Power (dBm)
Maximum Power <SIM 1>					
GSM850	CH128	824.20	32.31	-9.03	23.28
	CH190	836.60	32.28	-9.03	23.25
	CH251	848.80	32.25	-9.03	23.22
PCS1900	Ch512	1850.20	30.45	-9.03	21.522
	CH661	1880.00	30.31	-9.03	21.28
	CH810	1909.80	30.37	-9.03	21.34
Maximum Power <SIM 2>					
GSM850	CH128	824.20	32.13	-9.03	23.10
	CH190	836.60	32.03	-9.03	23.00
	CH251	848.80	32.14	-9.03	23.11
PCS1900	Ch512	1850.20	30.21	-9.03	21.18
	CH661	1880.00	30.16	-9.03	21.13
	CH810	1909.80	30.19	-9.03	21.16

Band	Channel	Frequency (MHz)	Avg.Burst Power(dBm)	Duty Cycle Factor(dB)	Frame Power (dBm)
Maximum Power					
Bluetooth	CH1	2402	-3.60	-9.03	-12.63
	CH40	2441	-8.09	-9.03	-17.12
	CH79	2480	-8.34	-9.03	-17.37

Note: When The conducted power of Bluetooth is $\leq 10\text{dBm}$, the simultaneous transmission SAR evaluation is not required.



10. Test photos and results:

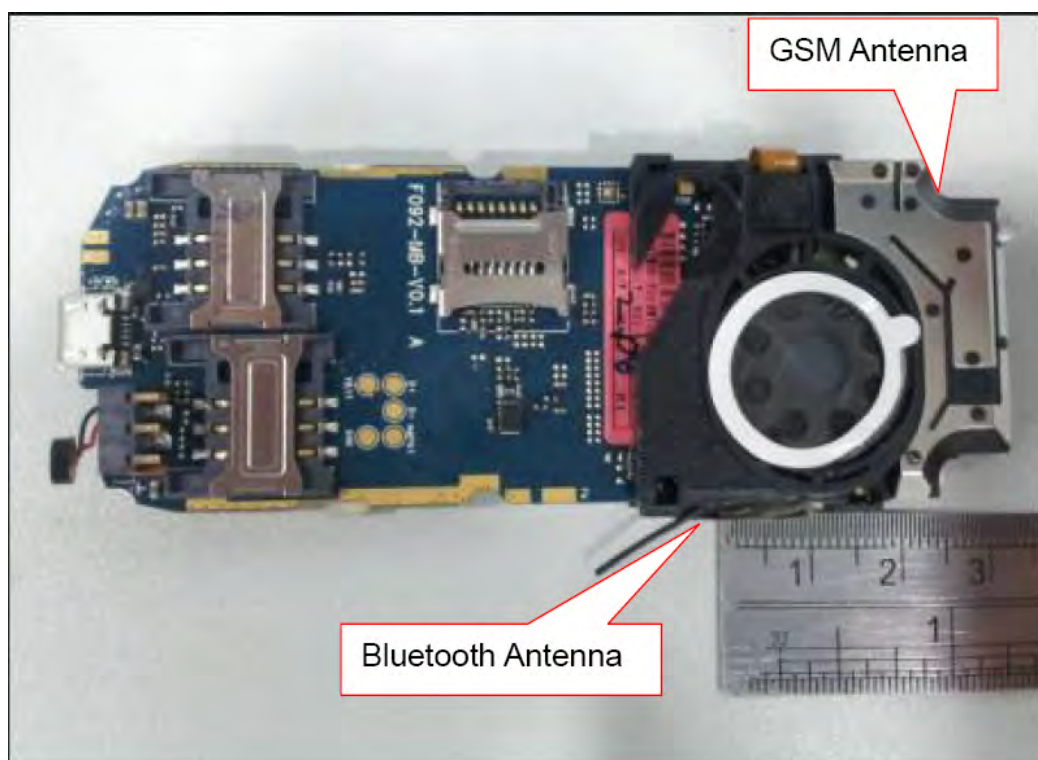
10.1 DUT photos:



Front side



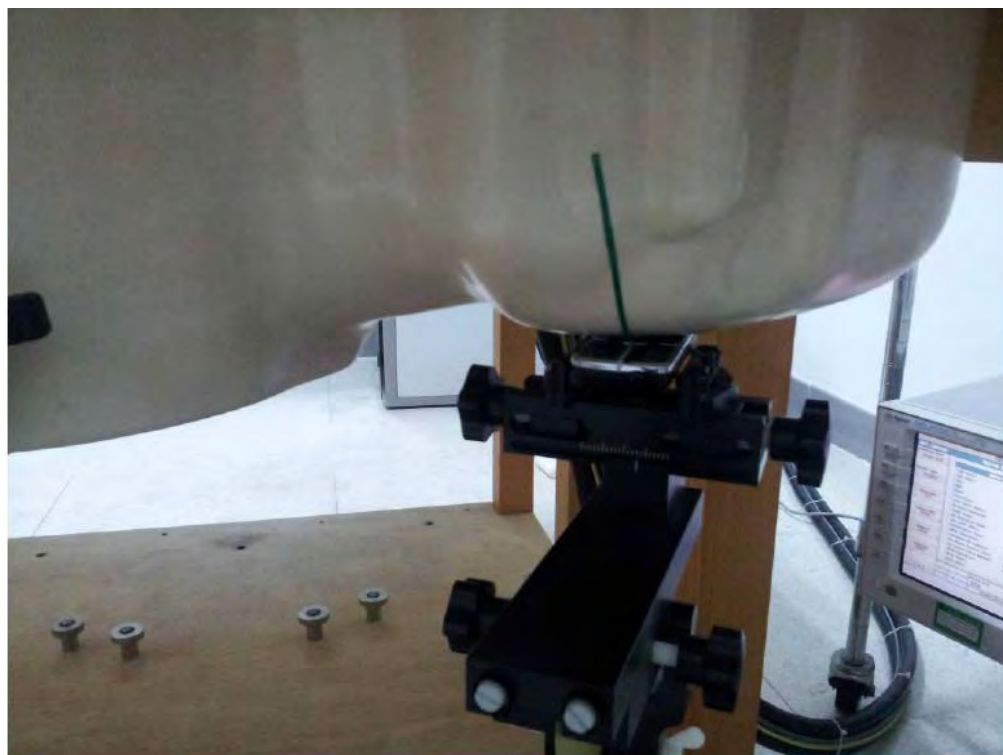
Back side



Antenna Location



10.2 Setup photos:



Left Touch Cheek



Left Tilt(15°)



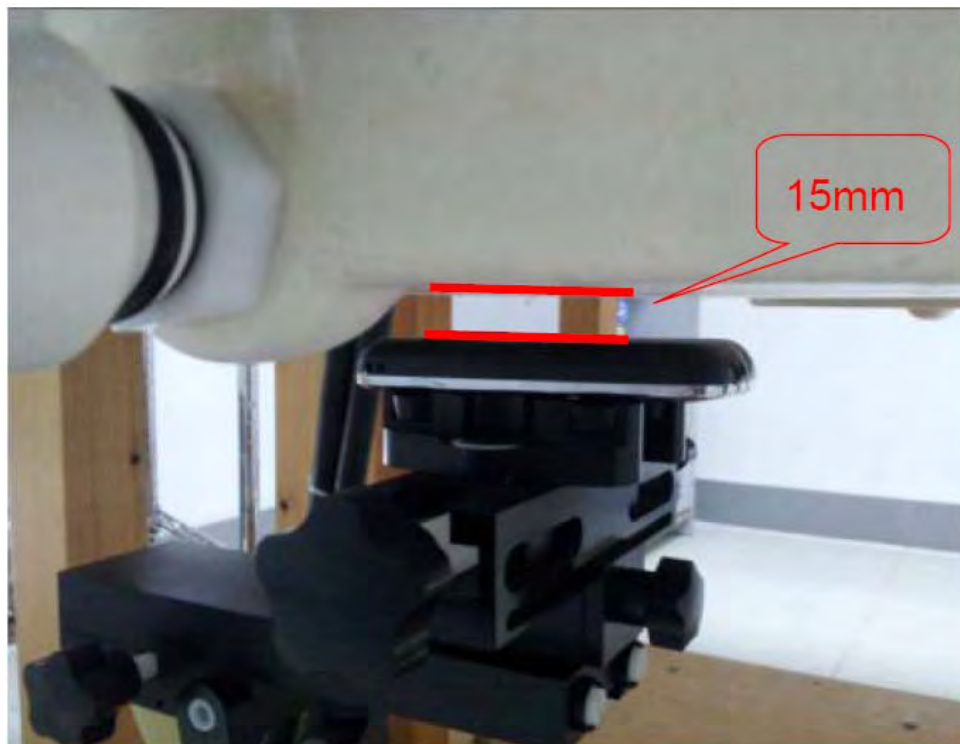
Right Touch Cheek



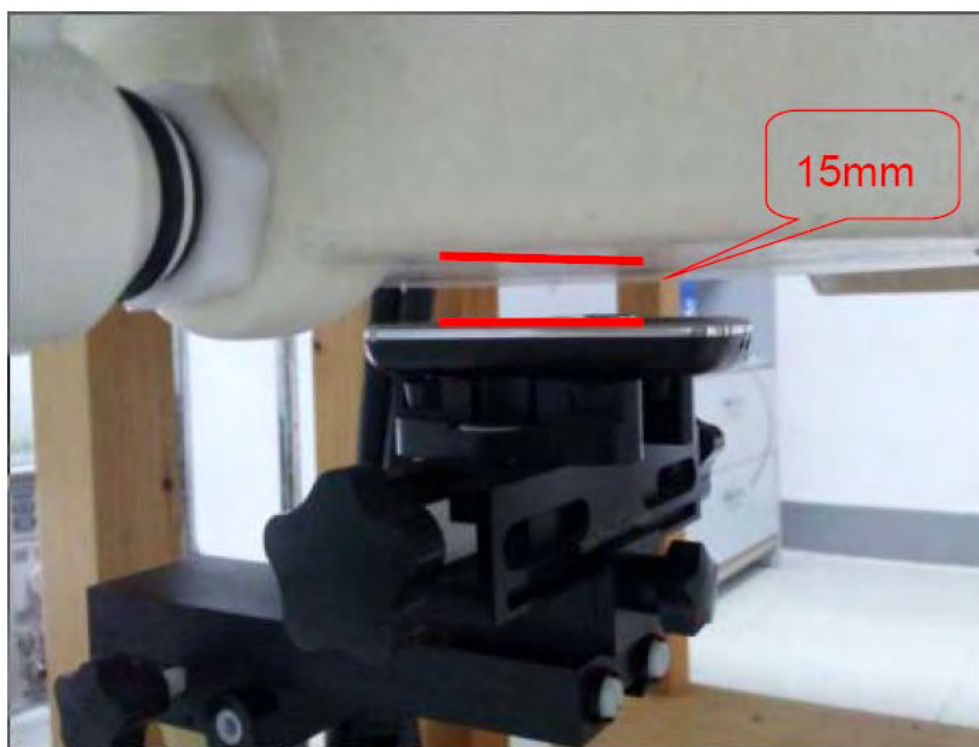
Right Tilt(15°)



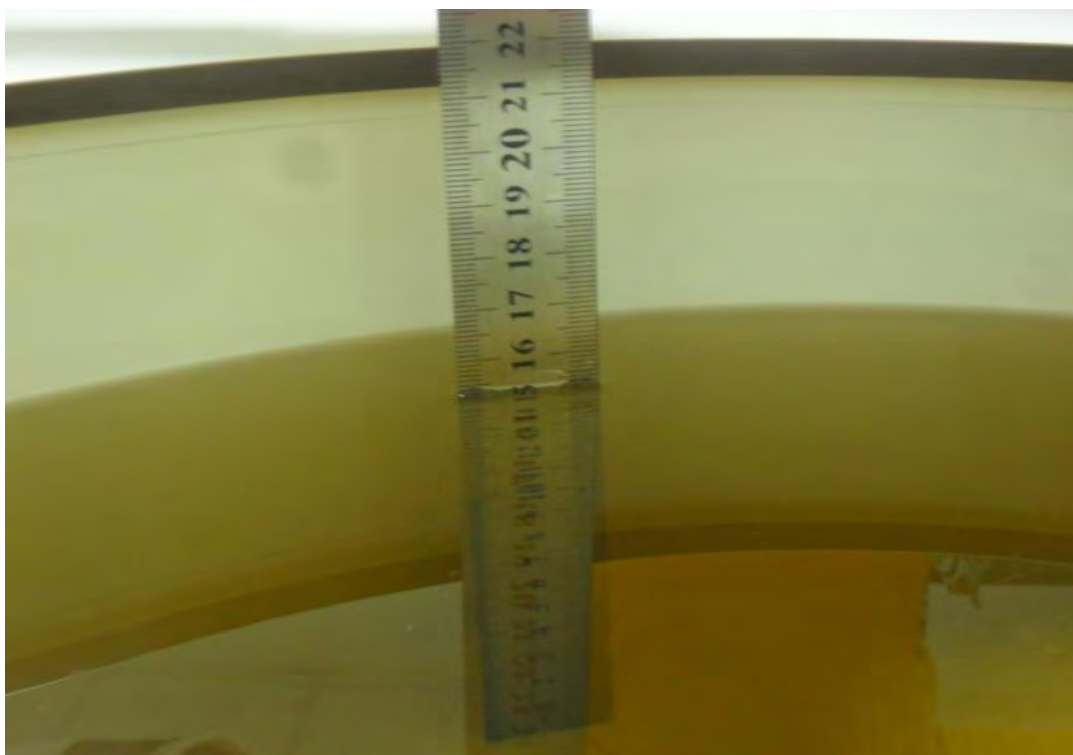
Body:



Body Worn



Body Front



Liquid depth (15cm)



10.3 SAR result summary:

The device's power specific is $32.6 \pm 1\text{dBm}$ for GSM 850, $30.0 \pm 1\text{dBm}$ for GSM 1900, so the target power is 33.6dBm for GSM 850, 31dBm for GSM 1900.

Scale Factor=Target Power/Measurement Power

Scale SAR=Measurement SAR*Scale Factor

Head

Test Case of Head			Meas. Power (dBm)	Target Power (dBm)	Factor	Meas. SAR (W/kg) 1g Avg.	Scale SAR (W/kg)	Power Drift <±0.2 dB	Data Slot
Band	Test Position	CH							
SIM1,Liquid: Head									
GSM 850	Right Cheek	CH190	32.28	33.6	1.49	0.438	0.654	-0.051	Plot 1
	Right Tilt	CH190	32.28	33.6	1.49	0.218	0.325	-0.032	Plot 2
	Left Tilt	CH190	32.28	33.6	1.49	0.251	0.375	0.019	Plot 3
	Left Cheek	CH190	32.28	33.6	1.49	0.428	0.639	-0.089	Plot 4
SIM2,Liquid: Head									
GSM 850	Right Cheek	CH190	32.28	33.6	1.49	0.408	0.609	-0.015	Plot 5
SIM1,Liquid: Head									
GSM 1900	Right Cheek	CH661	30.31	31	1.25	0.468	0.586	-0.024	Plot 6
	Right Tilt	CH661	30.31	31	1.25	0.403	0.505	0.052	Plot 7
	Left Tilt	CH661	30.31	31	1.25	0.533	0.668	0.078	Plot 8
	Left Cheek	CH661	30.31	31	1.25	0.585	0.733	0.018	Plot 9
SIM2,Liquid: Head									
GSM 1900	Left Tilt	CH661	30.31	31	1.25	0.538	0.674	-0.030	Plot 10



Body

Test Case of Head			Meas. Power (dBm)	Target Power (dBm)	Fact or	Meas. SAR (W/kg) 1g Avg.	Scale SAR (W/kg)	Power Drift <±0.2 dB	Data Slot
Band	Test Position	CH							
SIM1 Liquid: Body, Separator: 15mm									
GSM 850	Front	CH190	32.28	33.6	1.49	0.133	0.199	-0.066	Plot 11
	Worn	CH190	32.28	33.6	1.49	0.139	0.208	-0.104	Plot 12
GSM 1900	Front	CH661	30.31	31	1.25	0.167	0.209	-0.010	Plot 13
	Worn	CH661	30.31	31	1.25	0.271	0.339	-0.016	Plot 14

Note:

- When the 1g SAR is ≤ 0.8 W/kg, testing for low and high channel is optional.
- When The conducted power of Bluetooth is ≤ 10 dBm, the simultaneous transmission SAR evaluation is not required.

**11. Equipment List:**

NO.	Instrument	Manufacture	Model	S/N	Cal. Date	Cal. Due Date
1	Communication Tester	Agilent	E5515C	MY50267264	Dec 27 th 2013	Dec 27 th 2014
2	E-field Probe	Speag	ES3DV3	3028	August 5 th 2013	August 4 th 2014
3	Dielectric Probe Kit	Speag	DAK 3.5mm Probe	1038	N/A	N/A
4	DAE	Speag	DAE4	689	July 20 th 2013	July 19 th 2014
5	SAM TWIN phantom	Speag	SAM	1360/1432	N/A	N/A
6	Robot	Stabuli	TX60L	N/A	N/A	N/A
7	Device Holder	Speag	SD000H01HA	N/A	N/A	N/A
8	Vector Network	Agilent	E5071C	MY46107615	Jan 6 th 2014	Jan 7 th 2015
9	Signal Generator	Agilent	E4438C	MY49072279	Nov 27 th 2013	Nov 27 th 2014
10	Amplifier	Mini-circuit	ZHL-42W	QA098002	N/A	N/A
11	Power Meter	Agilent	N1419A	MY50001563	Nov 27 th 2013	Nov 27 th 2014
12	Power Sensor	Agilent	N8481H	MY51020010	Nov 27 th 2013	Nov 27 th 2014
13	Directional Coupler	Agilent	772D	MY46151275	Nov 27 th 2013	Nov 27 th 2014
14	Directional Coupler	Agilent	778D	MY48220607	Nov 27 th 2013	Nov 27 th 2014
15	Dipole 835MHz	Speag	D835V2	4d154	Jun 6 th 2013	Jun 6 th 2015
16	Dipole 1900MHz	Speag	D1900V2	5d142	Jun 10 th 2013	Jun 10 th 2015



Appendix A. System validation plots:

DUT: Dipole 835MHz; Type: D835V2; Serial: D835V2 - SN:4d154

Program Name: System Performance Check Head at 835 MHz

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.91 \text{ mho/m}$; $\epsilon_r = 42.27$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/5/2013

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn689; Calibrated: 7/20/2013

- Phantom: SAM with TP1432; Type: SAM

- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 2.59 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

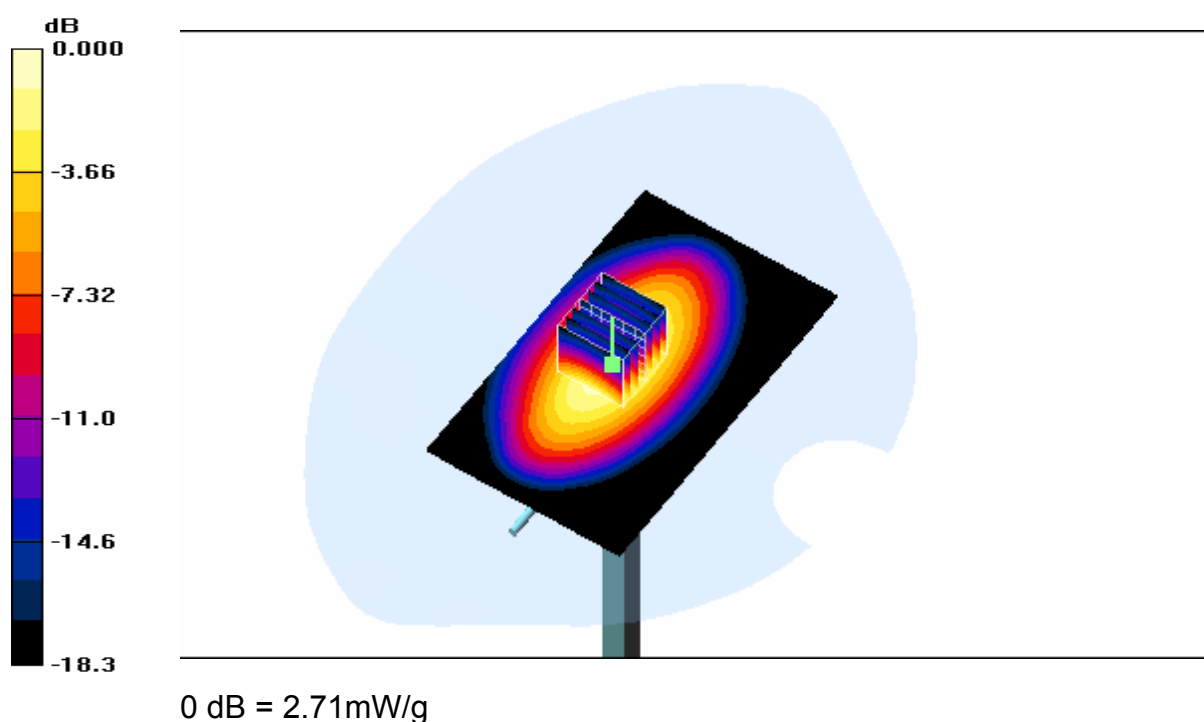
dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.7 V/m; Power Drift = -0.078dB

Peak SAR (extrapolated) = 3.8 W/kg

SAR(1 g) = 2.51 mW/g; SAR(10 g) = 1.64 mW/g

Maximum value of SAR (measured) = 2.71 mW/g





DUT: Dipole 835MHz; Type: D835V2; Serial: D835V2 - SN:4d154

Program Name: System Performance Check Body at 835 MHz

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.98 \text{ mho/m}$; $\epsilon_r = 54.73$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.28, 6.28, 6.28); Calibrated: 8/5/2013

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn689; Calibrated: 7/20/2013

- Phantom: SAM with TP1432; Type: SAM

- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin=250mW/Area Scan (61x61x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 2.49 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid:

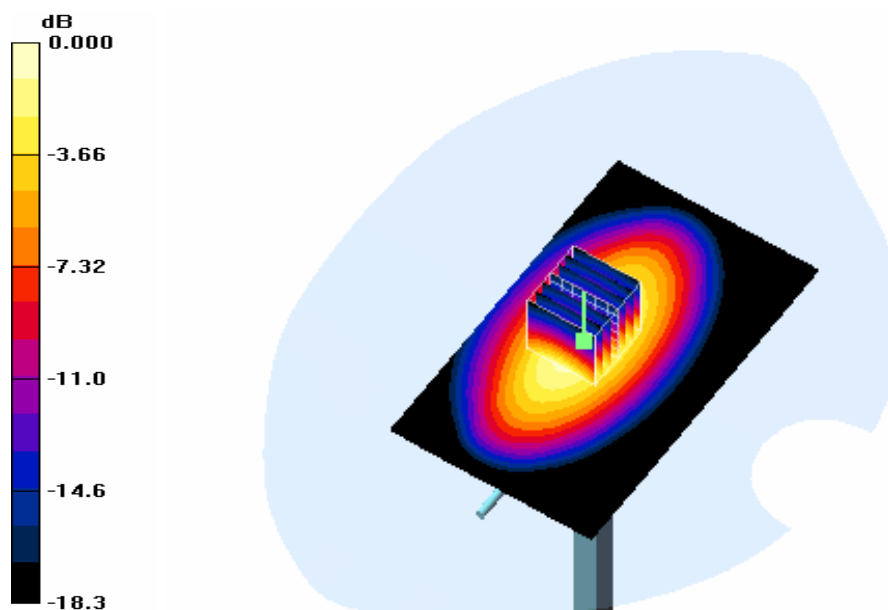
$dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 52.1 V/m ; Power Drift = -0.027dB

Peak SAR (extrapolated) = 3.68 W/kg

SAR(1 g) = 2.42 mW/g ; SAR(10 g) = 1.56 mW/g

Maximum value of SAR (measured) = 2.61 mW/g



0 dB = 2.61 mW/g



DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d142

Program Name: System Performance Check Head at 1900 MHz

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.27$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21,5.21,5.21); Calibrated:8/5/2013

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn689; Calibrated: 7/20/2013

- Phantom: SAM with TP1432; Type: SAM

- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=15mm, Pin=250mW/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 11.1 mW/g

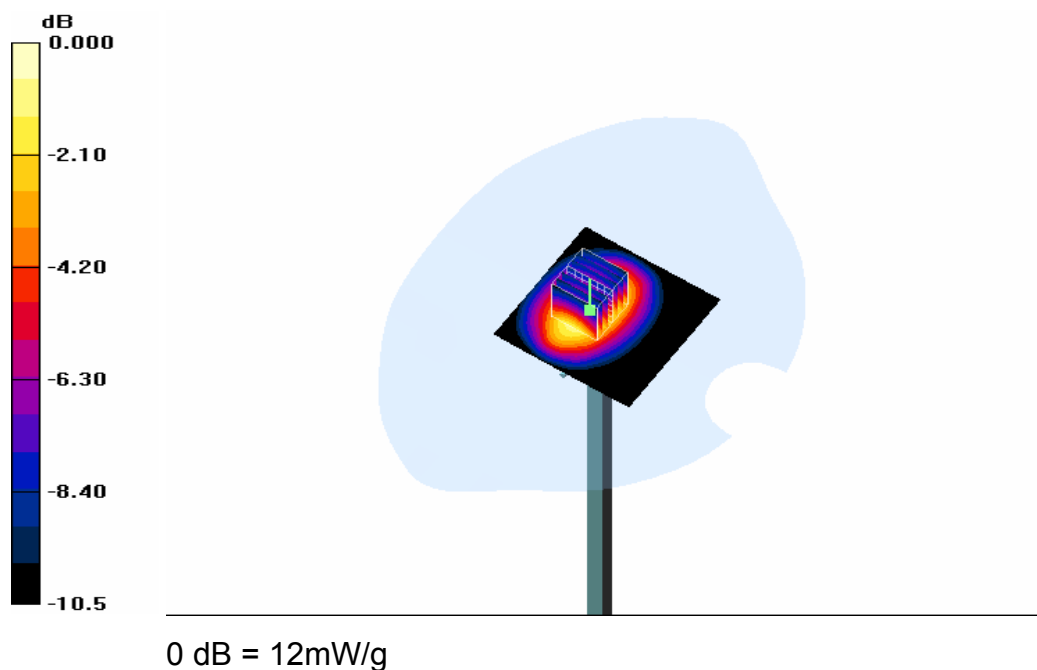
d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.8 V/m; Power Drift = -0.099dB

Peak SAR (extrapolated) = 20 W/kg

SAR(1 g) = 10.5 mW/g; SAR(10 g) = 5.36 mW/g

Maximum value of SAR (measured) = 12 mW/g





DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d142

Program Name: System Performance Check Body at 1900 MHz

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 52.45$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(4.96,4.96,4.96); Calibrated:8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=15mm, Pin=250mW/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 12 mW/g

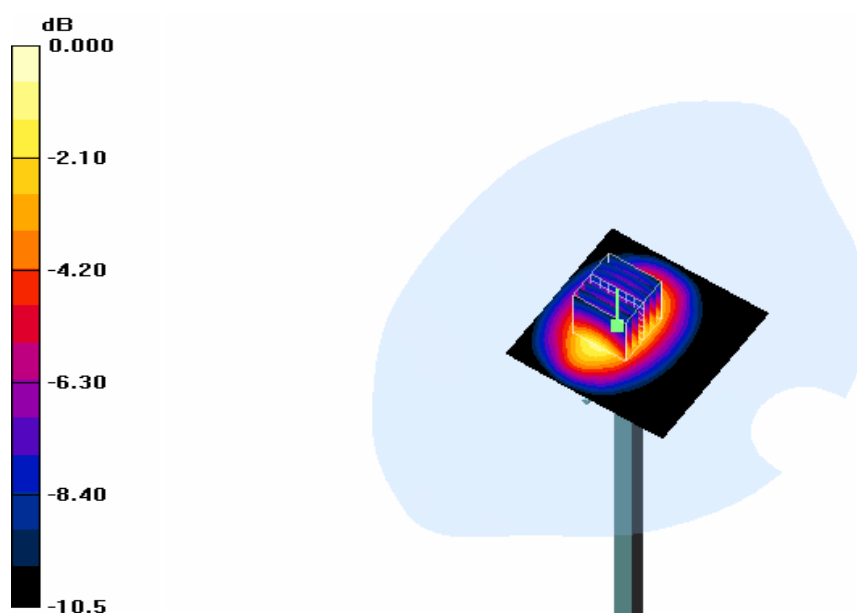
d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.6 V/m; Power Drift = 0.025dB

Peak SAR (extrapolated) = 19.7 W/kg

SAR(1 g) = 10.6 mW/g; SAR(10 g) = 5.4 mW/g

Maximum value of SAR (measured) = 12 mW/g



0 dB = 12mW/g



Appendix B. SAR Test plots:

Plot 1: 5/21/2014 4:11:55 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 836.6 \text{ MHz}$; $\sigma = 0.91 \text{ mho/m}$; $\epsilon_r = 42.27$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/5/2013
 - Sensor-Surface: 4mm (Mechanical Surface Detection)
 - Electronics: DAE4 Sn689; Calibrated: 7/20/2013
 - Phantom: SAM with TP1432; Type: SAM
 - Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172
- right touch/Area Scan (51x91x1):** Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.445 mW/g

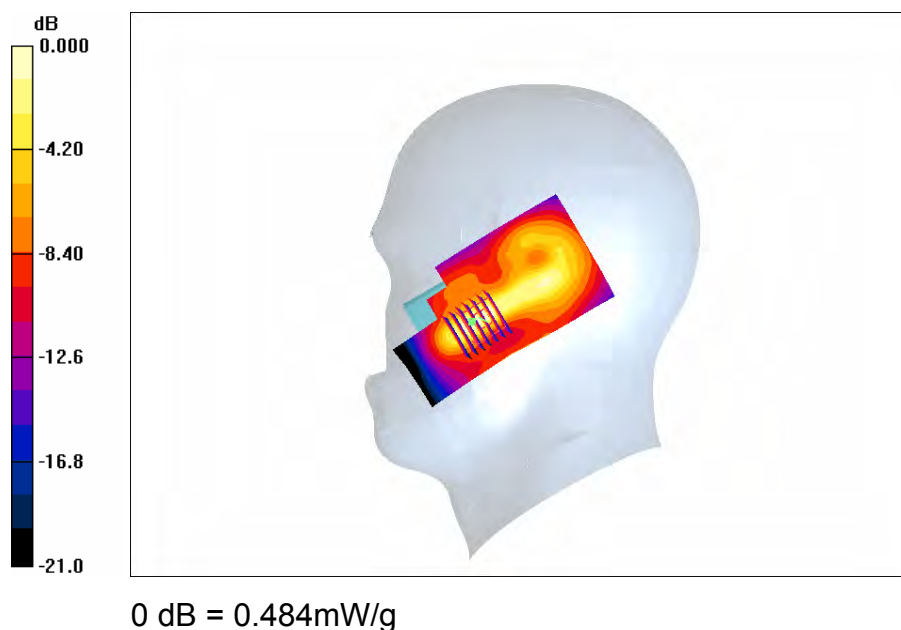
right touch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 18.2 V/m; Power Drift = -0.051 dB

Peak SAR (extrapolated) = 0.948 W/kg

SAR(1 g) = 0.438 mW/g; SAR(10 g) = 0.197 mW/g

Maximum value of SAR (measured) = 0.484 mW/g





Plot 2: Date/Time: 5/21/2014 4:45:04 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

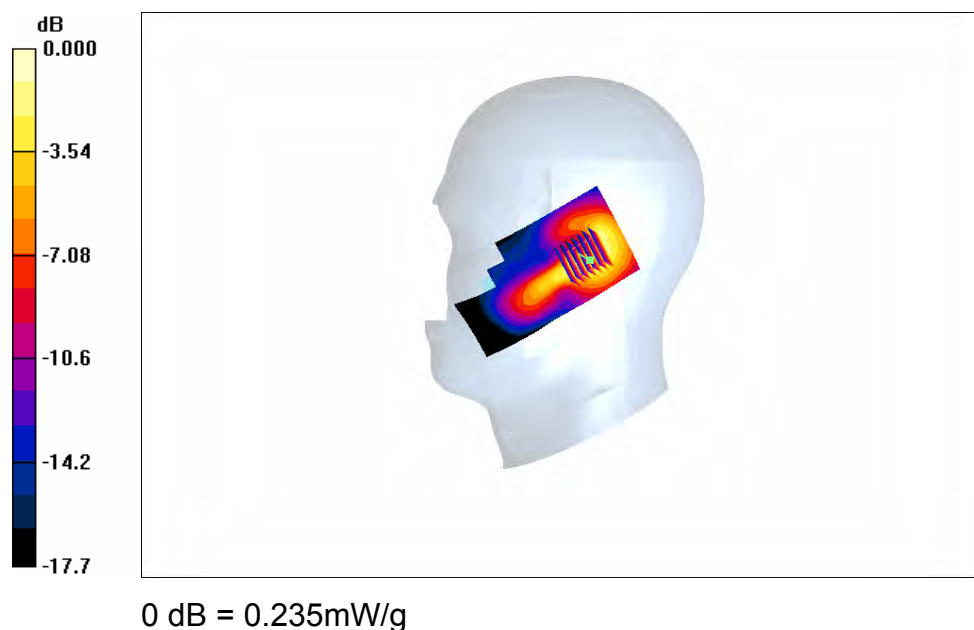
Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 836.6 \text{ MHz}$; $\sigma = 0.91 \text{ mho/m}$; $\epsilon_r = 42.27$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

right tilt/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.236 mW/g

right tilt/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
Reference Value = 14.7 V/m; Power Drift = -0.032 dB
Peak SAR (extrapolated) = 0.614 W/kg
SAR(1 g) = 0.218 mW/g; SAR(10 g) = 0.107 mW/g
Maximum value of SAR (measured) = 0.235 mW/g





Plot 3: Date/Time: 5/21/2014 5:22:00 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 836.6$ MHz; $\sigma = 0.91$ mho/m; $\epsilon_r = 42.27$; $\rho = 1000$ kg/m³
Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

left tilt/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.242 mW/g

left tilt/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.1 V/m; Power Drift = 0.019 dB
Peak SAR (extrapolated) = 0.648 W/kg
SAR(1 g) = 0.251 mW/g; SAR(10 g) = 0.119 mW/g
Maximum value of SAR (measured) = 0.272 mW/g





Plot 4: Date/Time: 5/21/2014 5:45:55 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

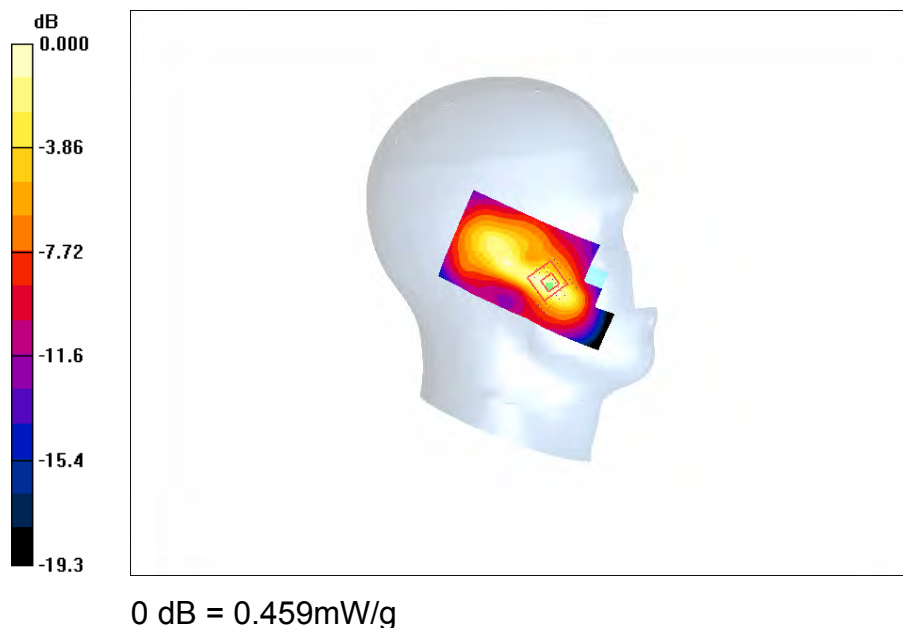
Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 836.6 \text{ MHz}$; $\sigma = 0.91 \text{ mho/m}$; $\epsilon_r = 42.27$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

left touch/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.427 mW/g

left touch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
Reference Value = 16.8 V/m ; Power Drift = -0.089 dB
Peak SAR (extrapolated) = 0.908 W/kg
SAR(1 g) = 0.428 mW/g ; SAR(10 g) = 0.194 mW/g
Maximum value of SAR (measured) = 0.459 mW/g





Plot 5: 5/21/2014 6:20:57 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 836.6 \text{ MHz}$; $\sigma = 0.91 \text{ mho/m}$; $\epsilon_r = 42.27$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

right touch -SIM2 2/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.422 mW/g

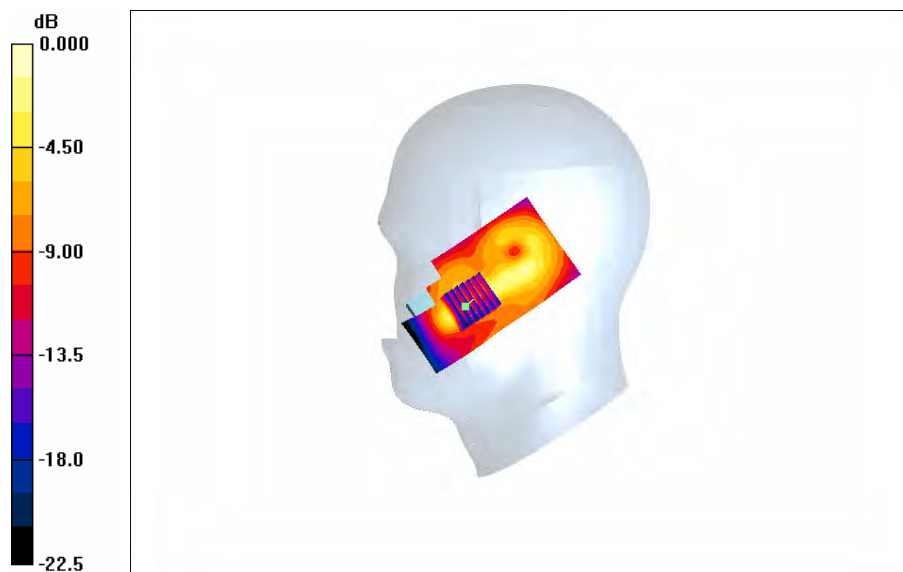
right touch -SIM2 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$,
 $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 16.9 V/m ; Power Drift = -0.015 dB

Peak SAR (extrapolated) = 0.904 W/kg

SAR(1 g) = 0.408 mW/g ; SAR(10 g) = 0.180 mW/g

Maximum value of SAR (measured) = 0.455 mW/g



0 dB = 0.455 mW/g



Plot 6: Date/Time: 5/21/2014 6:43:35 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.27$; $\rho = 1000$ kg/m³
Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1360; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

right touch/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.538 mW/g

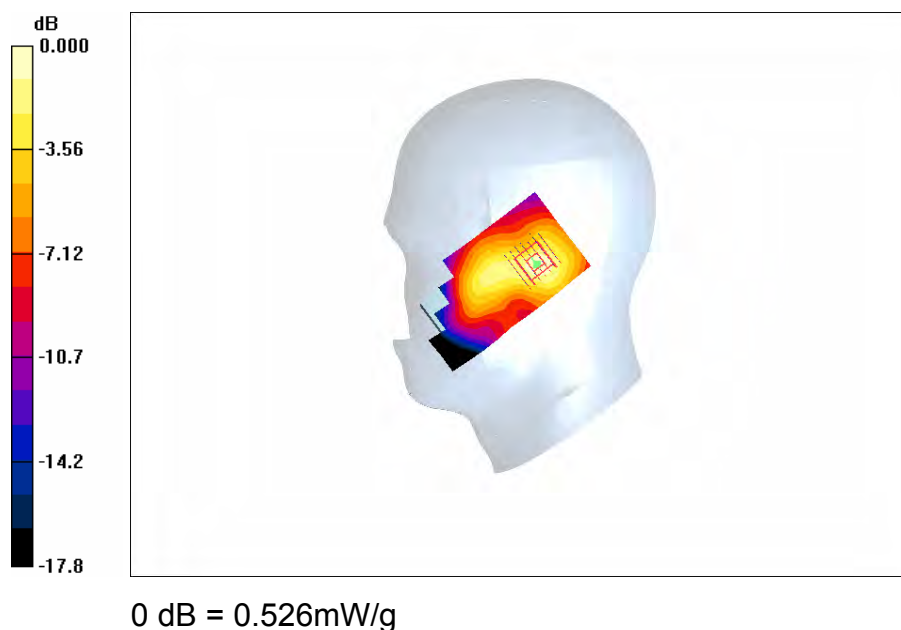
right touch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 17.1 V/m; Power Drift = -0.024 dB

Peak SAR (extrapolated) = 0.696 W/kg

SAR(1 g) = 0.468 mW/g; SAR(10 g) = 0.267 mW/g

Maximum value of SAR (measured) = 0.526 mW/g





Plot 7: Date/Time: 5/21/2014 7:10:14 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

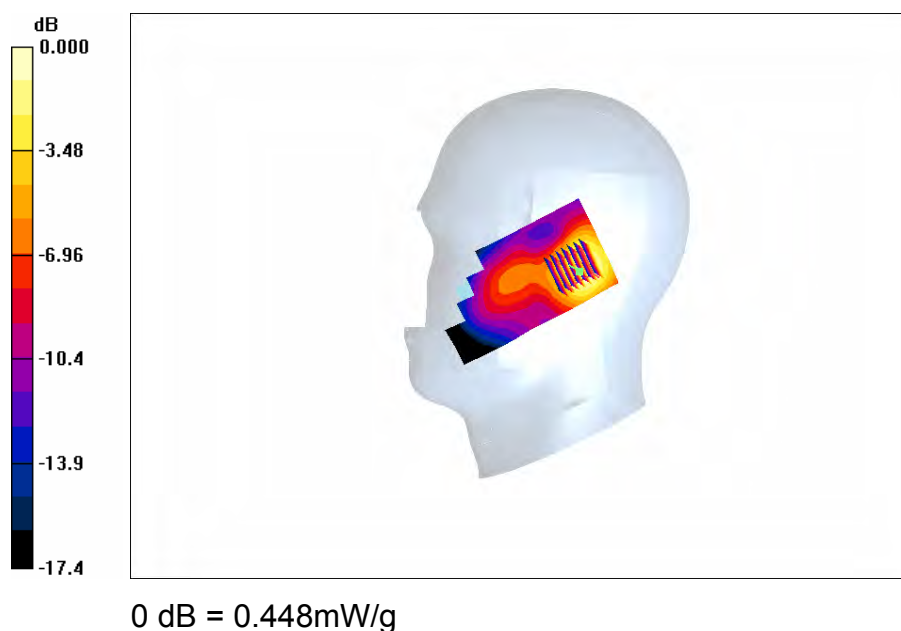
Communication System: GSM 1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.27$; $\rho = 1000$ kg/m³
Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1360; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

right tilt/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.444 mW/g

right tilt/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.0 V/m; Power Drift = 0.052 dB
Peak SAR (extrapolated) = 0.617 W/kg
SAR(1 g) = 0.403 mW/g; SAR(10 g) = 0.232 mW/g
Maximum value of SAR (measured) = 0.448 mW/g





Plot 8: Date/Time: 5/21/2014 7:08:24 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

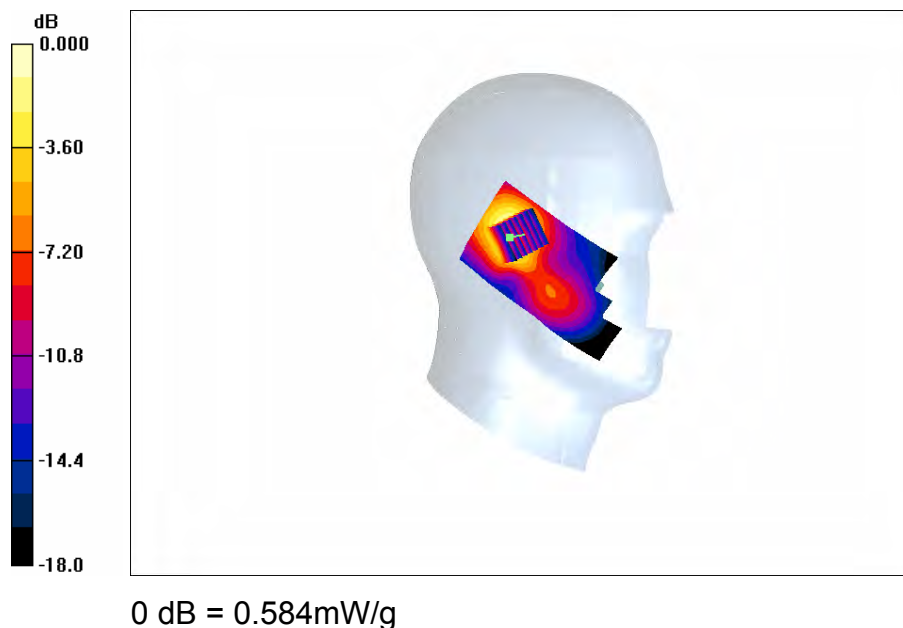
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.27$; $\rho = 1000$ kg/m³
Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1360; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

left tilt/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.611 mW/g

left tilt/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.0 V/m; Power Drift = 0.078 dB
Peak SAR (extrapolated) = 0.913 W/kg
SAR(1 g) = 0.533 mW/g; SAR(10 g) = 0.296 mW/g
Maximum value of SAR (measured) = 0.584 mW/g





Plot 9: Date/Time: 5/21/2014 7:34:07 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

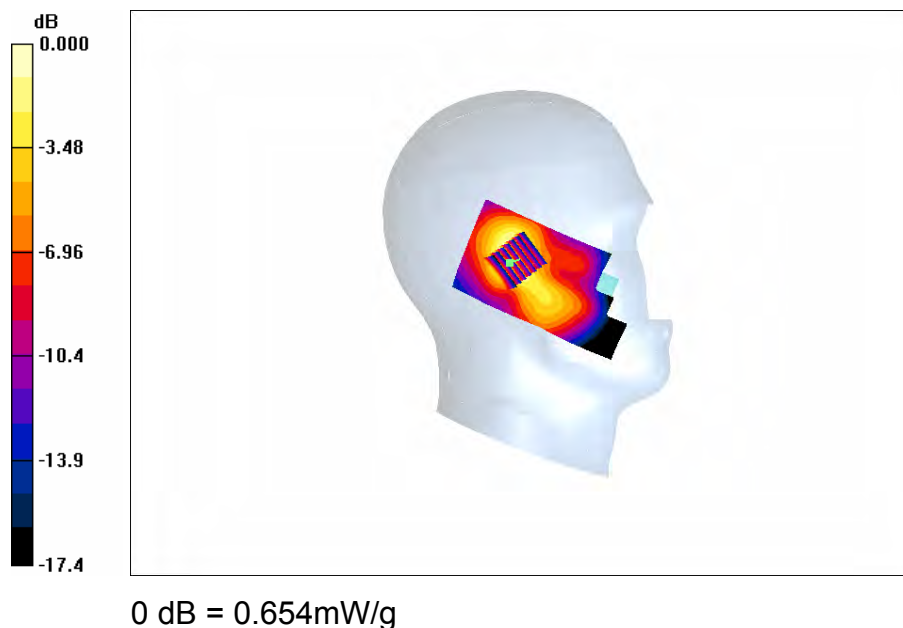
Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.42 \text{ mho/m}$; $\epsilon_r = 39.27$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section

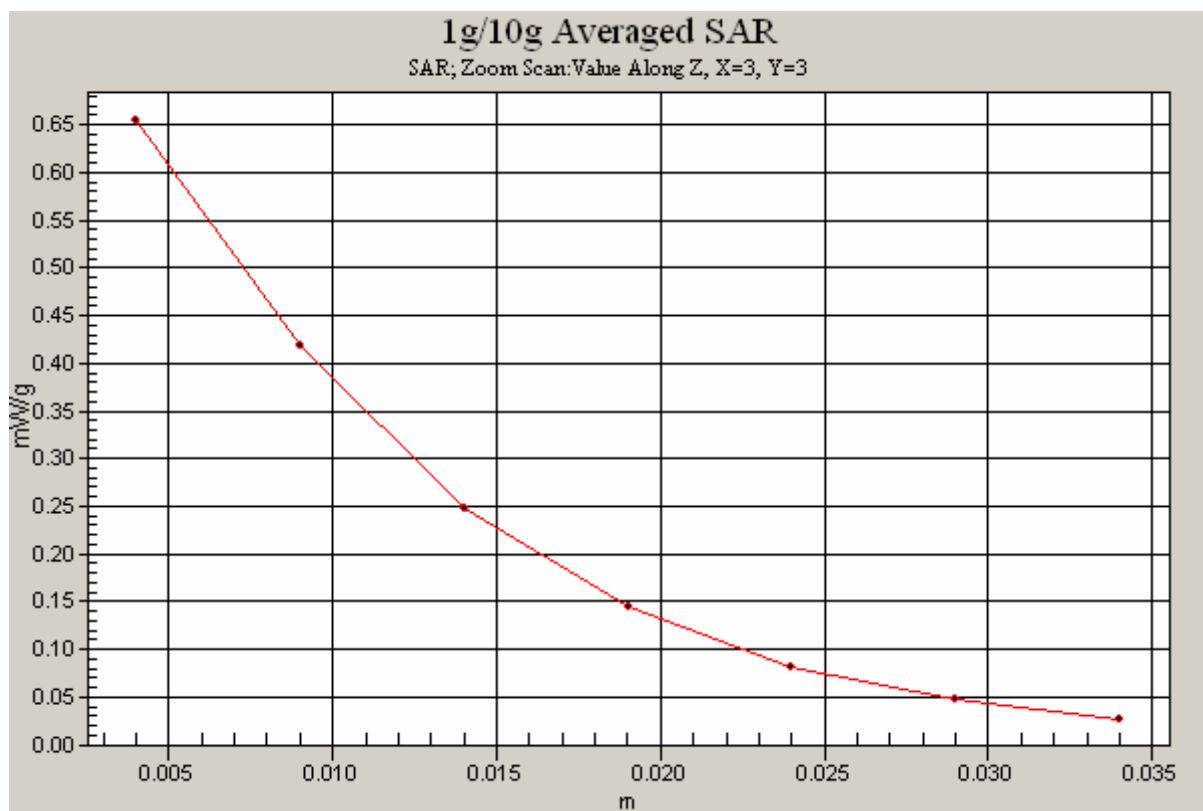
DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1360; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

left touch/Area Scan (51x91x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.707 mW/g

left touch/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
Reference Value = 16.4 V/m; Power Drift = 0.018 dB
Peak SAR (extrapolated) = 0.896 W/kg
SAR(1 g) = 0.585 mW/g; SAR(10 g) = 0.336 mW/g
Maximum value of SAR (measured) = 0.654 mW/g







Plot 10: Date/Time: 5/21/2014 7:57:28 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -

Program Name: Across Techs

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium parameters used: $f = 1880$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.27$; $\rho = 1000$ kg/m³

Phantom section: Left Section DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/5/2013

- Sensor-Surface: 4mm (Mechanical Surface Detection)

- Electronics: DAE4 Sn689; Calibrated: 7/20/2013

- Phantom: SAM with TP1360; Type: SAM

- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

left tilt -SIM2/Area Scan (51x91x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.654 mW/g

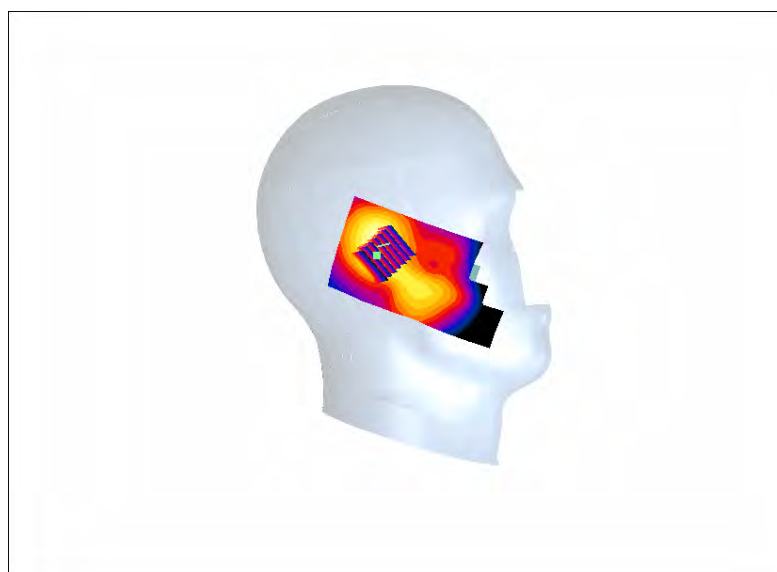
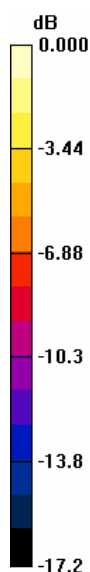
left tilt -SIM2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 19.2 V/m; Power Drift = -0.030 dB

Peak SAR (extrapolated) = 0.865 W/kg

SAR(1 g) = 0.538 mW/g; SAR(10 g) = 0.309 mW/g

Maximum value of SAR (measured) = 0.593 mW/g



0 dB = 0.593mW/g



Plot 11 Date/Time: 5/21/2014 8:16:19 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

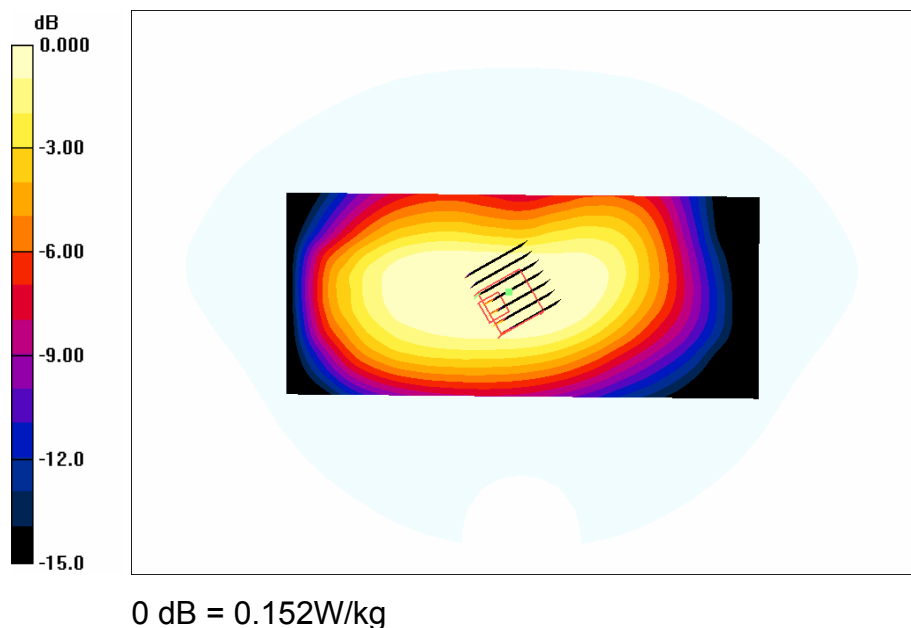
Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:2
Medium parameters used: $f = 836.6$ MHz; $\sigma = 0.98$ mho/m; $\epsilon_r = 54.73$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.28, 6.28, 6.28); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Front/Area Scan (61x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.152 W/kg

Front /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.9 V/m; Power Drift = -0.055 dB
Peak SAR (extrapolated) = 0.494 W/kg
SAR(1 g) = 0.133 W/kg; SAR(10 g) = 0.061 W/kg
Maximum value of SAR (measured) = 0.152 W/kg





Plot 12 Date/Time: 5/21/2014 8:35:22 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

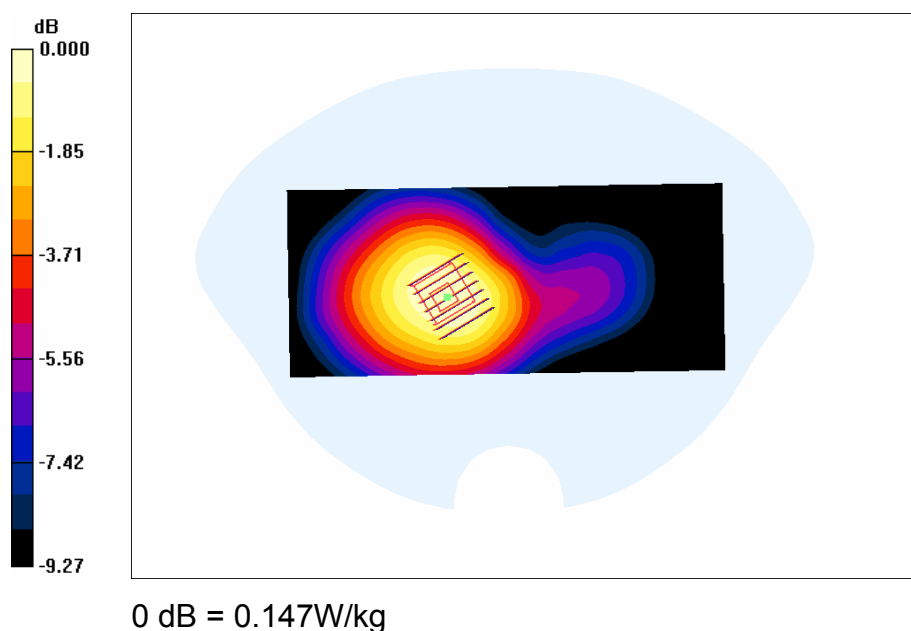
Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 836.6 \text{ MHz}$; $\sigma = 0.98 \text{ mho/m}$; $\epsilon_r = 54.73$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.28, 6.28, 6.28); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Worn /Area Scan (61x141x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.152 W/kg

Worn /Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
Reference Value = 9.34 V/m ; Power Drift = -0.104 dB
Peak SAR (extrapolated) = 0.185 W/kg
SAR(1 g) = 0.139 W/kg ; SAR(10 g) = 0.101 W/kg
Maximum value of SAR (measured) = 0.147 W/kg





Plot 13 Date/Time: 5/21/2014 8:54:12 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

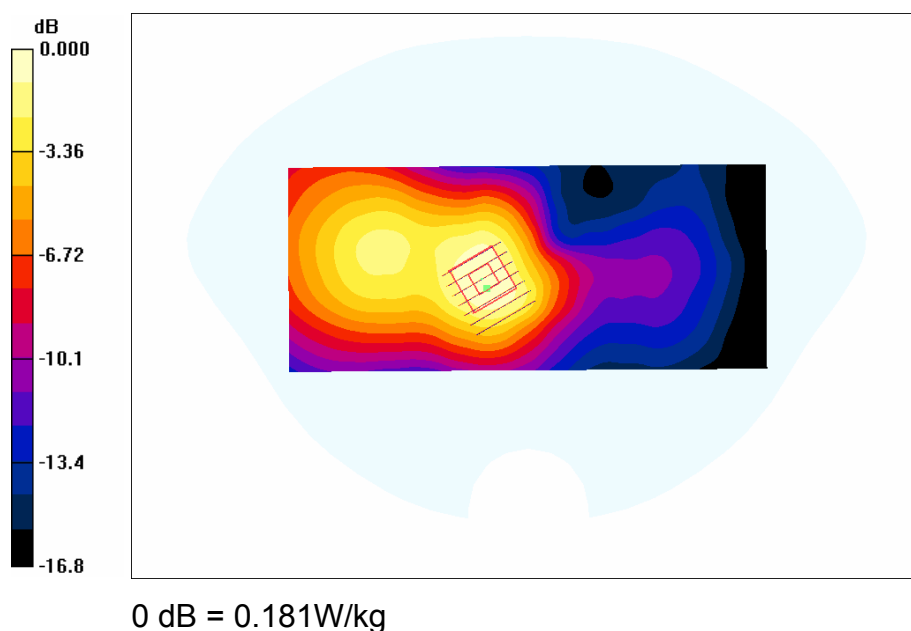
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8
Medium parameters used: $f = 1880$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 52.45$; $\rho = 1000$ kg/m³
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(4.96, 4.96, 4.96); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1360; Type: SAM
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Front/Area Scan (61x141x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.184 W/kg

Front /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.25 V/m; Power Drift = -0.010 dB
Peak SAR (extrapolated) = 0.260 W/kg
SAR(1 g) = 0.167 W/kg; SAR(10 g) = 0.099 W/kg
Maximum value of SAR (measured) = 0.181 W/kg





Plot 14 Date/Time: 5/21/2014 9:18:10 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: AcrossTechs; Type: SI PIN; Serial: -
Program Name: Across Techs

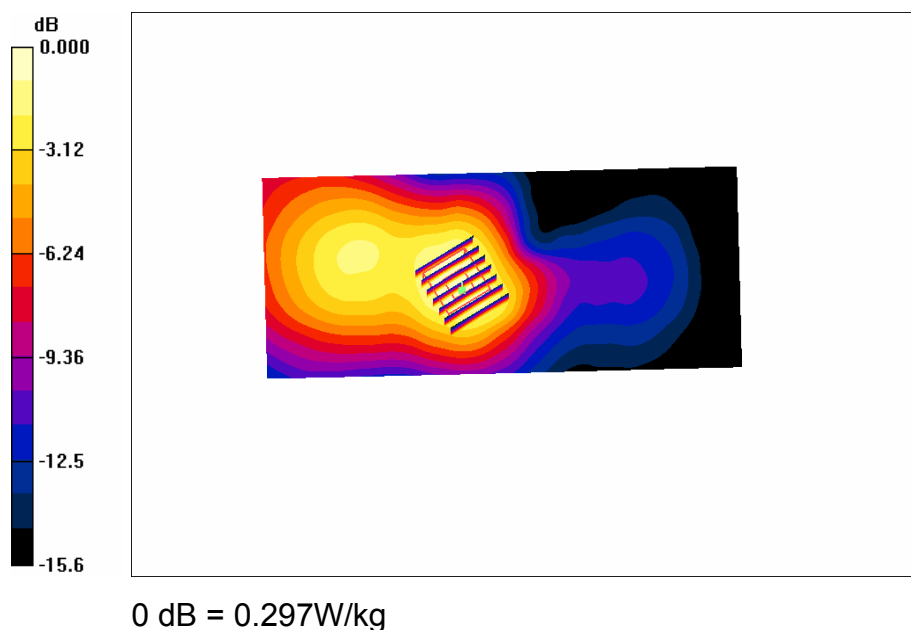
Communication System: GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:4
Medium parameters used: $f = 1880 \text{ MHz}$; $\sigma = 1.54 \text{ mho/m}$; $\epsilon_r = 52.45$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(4.96, 4.96, 4.96); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1360; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Worn/Area Scan (61x141x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Maximum value of SAR (interpolated) = 0.299 W/kg

Worn/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
Reference Value = 10.5 V/m ; Power Drift = -0.016 dB
Peak SAR (extrapolated) = 0.421 W/kg
SAR(1 g) = 0.271 W/kg ; SAR(10 g) = 0.160 W/kg
Maximum value of SAR (measured) = 0.297 W/kg





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Client **Sunway**Certificate No: **J13-2-2186****CALIBRATION CERTIFICATE**Object **ES3DV3 - SN:3028**Calibration Procedure(s) **TMC-OS-E-02-195**
Calibration Procedures for Dosimetric E-field ProbesCalibration date: **August 5, 2013**

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(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRP2	101919	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101547	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Power sensor NRP-Z91	101548	01-Jul-13 (TMC, No.JW13-044)	Jun-14
Reference10dBAttenuator	BT0520	12-Dec-12(TMC,No.JZ12-867)	Dec-14
Reference20dBAttenuator	BT0267	12-Dec-12(TMC,No.JZ12-866)	Dec-14
Reference Probe EX3DV4	SN 3846	20-Dec-12(SPEAG,No.EX3-3846_Dec12)	Dec-13
DAE4	SN 777	22-Feb-13 (SPEAG, DAE4-777_Feb13)	Feb -14
Secondary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
SignalGeneratorMG3700A	6201052605	01-Jul-13 (TMC, No.JW13-045)	Jun-14
Network Analyzer E5071C	MY46110673	15-Feb-13 (TMC, No.JZ13-781)	Feb-14

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Xiao Li	Deputy Director of the laboratory	

Issued: August 7, 2013

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



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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A,B,C,D	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 $\theta=0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

- 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
- 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 300MHz to 3GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta=0$ ($f \leq 900\text{MHz}$ in TEM-cell; $f > 1800\text{MHz}$: waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E^2 -field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,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.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep (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.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,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 $f \leq 800\text{MHz}$) and inside waveguide using analytical field distributions based on power measurements for $f > 800\text{MHz}$. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty valued are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,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 $\pm 50\text{MHz}$ to $\pm 100\text{MHz}$.
- 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.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).



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Probe ES3DV3

SN: 3028

Calibrated: August 5, 2013

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)



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DASY – Parameters of Probe: ES3DV3 - SN: 3028**Basic Calibration Parameters**

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm($\mu V/(V/m)^2$) ^A	1.06	1.17	1.14	±10.8%
DCP(mV) ^B	105.6	104.6	98.9	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB· μV	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	193.3	±6.7%
		Y	0.0	0.0	1.0		205.8	
		Z	0.0	0.0	1.0		198.3	

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 Norm X, Y, Z do not affect the E²-field uncertainty inside TSL (see Page 5 and Page 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.



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DASY – Parameters of Probe: ES3DV3 - SN: 3028

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)
850	41.5	0.92	6.26	6.26	6.26	0.27	1.90	± 12%
900	41.5	0.97	6.28	6.28	6.28	0.26	1.88	± 12%
1750	40.1	1.37	5.62	5.62	5.62	0.27	3.08	± 12%
1900	40.0	1.40	5.21	5.21	5.21	0.28	3.03	± 12%
2000	40.0	1.40	5.14	5.14	5.14	0.27	2.99	± 12%
2450	39.2	1.80	4.84	4.84	4.84	0.46	1.72	± 12%

^C Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.



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DASY – Parameters of Probe: ES3DV3 - SN: 3028

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)
850	55.2	0.99	6.28	6.28	6.28	0.30	1.91	± 12%
900	55.0	1.05	6.29	6.29	6.29	0.37	1.61	± 12%
1750	53.4	1.49	5.15	5.15	5.15	0.30	2.92	± 12%
1900	53.3	1.52	4.96	4.96	4.96	0.29	2.93	± 12%
2000	53.3	1.52	4.99	4.99	4.99	0.29	2.86	± 12%
2450	52.7	1.95	4.36	4.36	4.36	0.52	1.71	± 12%

^C Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

^F At frequency below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ±10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.



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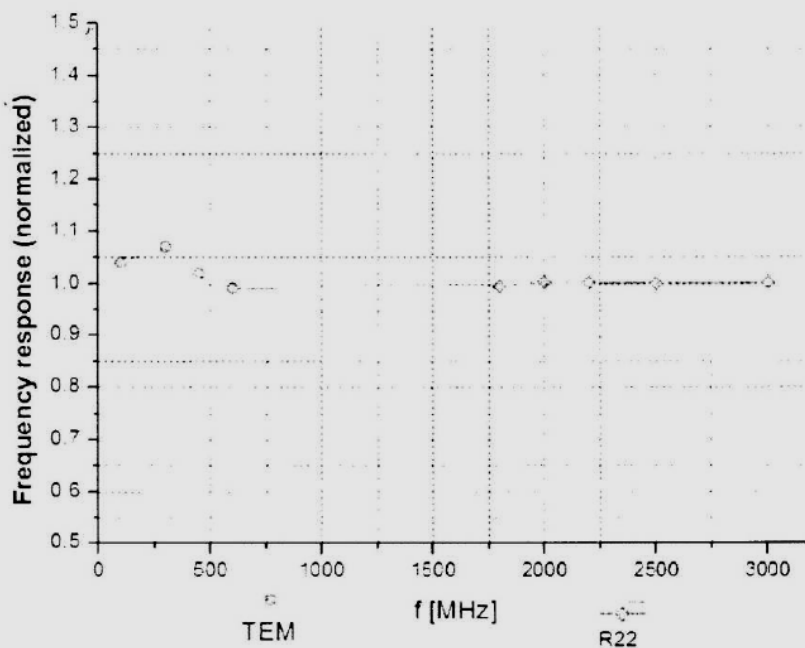
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Frequency Response of E-Field (TEM-Cell: ifi110 EXX, Waveguide: R22)



Uncertainty of Frequency Response of E-field: $\pm 7.5\%$ ($k=2$)



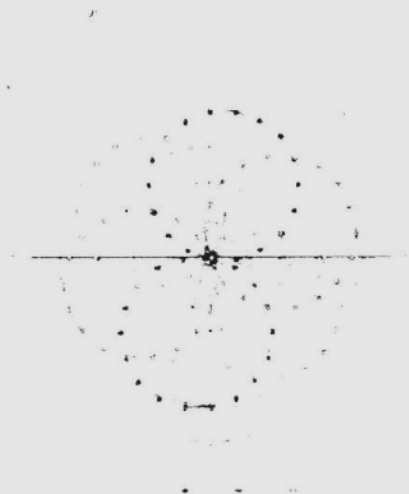
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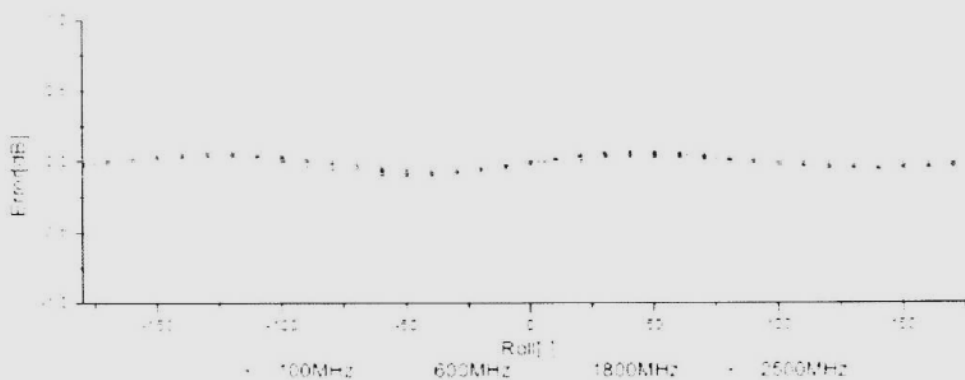
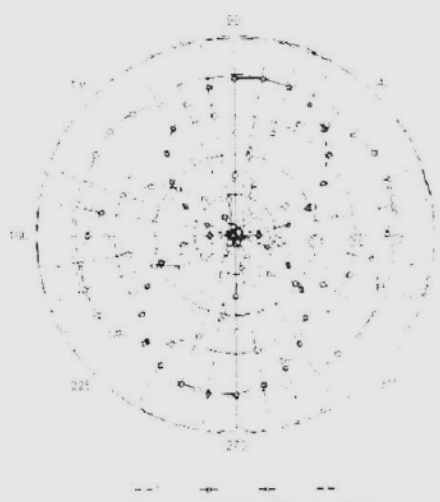
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Receiving Pattern (Φ), $\theta=0^\circ$

f=600 MHz, TEM



f=1800 MHz, R22



Uncertainty of Axial Isotropy Assessment: $\pm 0.9\%$ (k=2)



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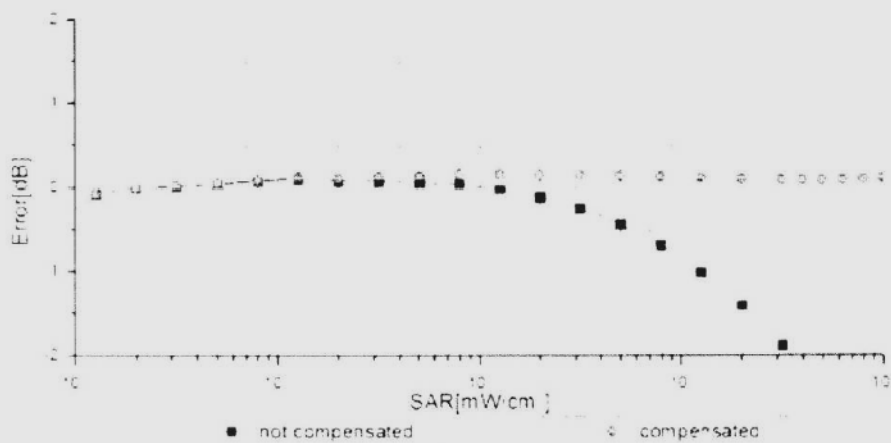
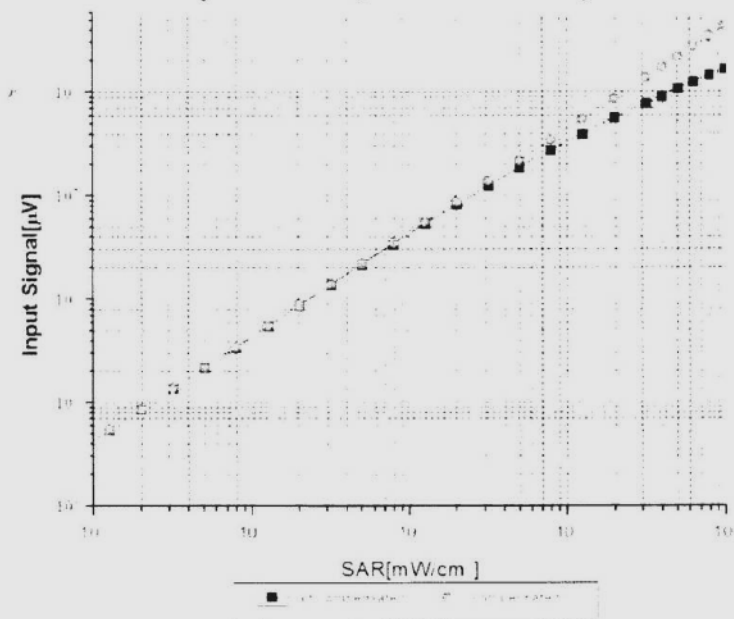
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Dynamic Range f(SAR_{head}) (TEM cell, $f = 900$ MHz)



Uncertainty of Linearity Assessment: $\pm 0.9\%$ ($k=2$)



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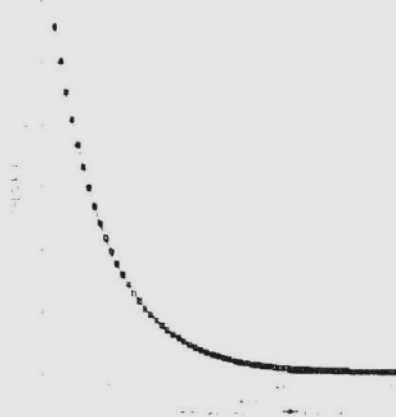
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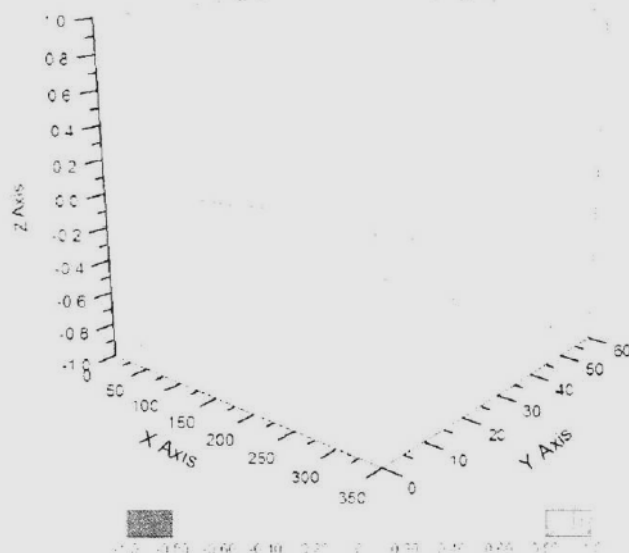
Conversion Factor Assessment

f=900 MHz, WGLS R9(H_convF)

f=2450 MHz, WGLS R26(H_convF)



Deviation from Isotropy in Liquid



Uncertainty of Spherical Isotropy Assessment: $\pm 2.8\%$ (K=2)



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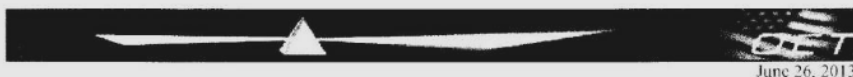
E-mail: Info@emcetc.com

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DASY - Parameters of Probe: ES3DV3 - SN: 3028

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	54.7
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disable
Probe Overall Length	337mm
Probe Body Diameter	10mm
Tip Length	10mm
Tip Diameter	4mm
Probe Tip to Sensor X Calibration Point	2mm
Probe Tip to Sensor Y Calibration Point	2mm
Probe Tip to Sensor Z Calibration Point	2mm
Recommended Measurement Distance from Surface	3mm

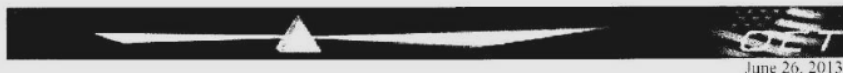


June 26, 2013

Acceptable Conditions for SAR Measurements Using Probes and Dipoles Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to Support FCC Equipment Certification

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MITT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

- 1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
- 2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
 - a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
 - i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
 - ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
 - b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
 - c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
 - d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
 - e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
 - f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.



June 26, 2013

- 3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
 - a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC, SPEAG and FCC agreements to remain valid.
 - b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
 - c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
 - d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
- 4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
- 5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.

**Appendix D. DAE Calibration Data:**

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Client : **Sunway**Certificate No: **J13-2-2187****CALIBRATION CERTIFICATE**

Object DAE4 - SN: 689

Calibration Procedure(s) TMC-OS-E-01-198
Calibration Procedure for the Data Acquisition Electronics (DAEx)

Calibration date: July 20, 2013

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(Calibrated by, Certificate No.)	Scheduled Calibration
-------------------	------	--	-----------------------

Documenting Process Calibrator 753	1971018	01-July-13 (TMC, No:JW13-049)	July-14
---------------------------------------	---------	-------------------------------	---------

	Name	Function	Signature
Calibrated by:	Zhao Jing	SAR Test Engineer	
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Xiao Li	Deputy Director of the laboratory	

Issued: August 5, 2013

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Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504
E-mail: [Http://www.emcite.com](http://www.emcite.com)

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 report provide only calibration results for DAE, it does not contain other performance test results.



in Collaboration with
s p e a g
CALIBRATION LABORATORY

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E-mail: Http://www.emcete.com

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 μ V, full range = -100...+300 mV

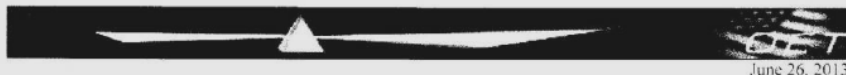
Low Range: 1LSB = 61nV, full range = -1.....+3mV

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

Calibration Factors	X	Y	Z
High Range	404.270 $\pm$ 0.15% (k=2)	404.187 $\pm$ 0.15% (k=2)	404.856 $\pm$ 0.15% (k=2)
Low Range	3.95764 $\pm$ 0.7% (k=2)	3.97509 $\pm$ 0.7% (k=2)	3.99031 $\pm$ 0.7% (k=2)

Connector Angle

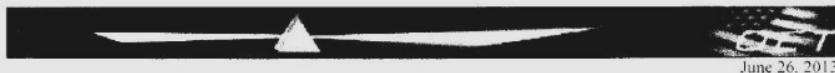
Connector Angle to be used in DASY system	87.5° $\pm$ 1 °
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Acceptable Conditions for SAR Measurements Using Probes and Dipoles Calibrated under the SPEAG-TMC Dual-Logo Calibration Program to Support FCC Equipment Certification

The acceptable conditions for SAR measurements using probes, dipoles and DAEs calibrated by TMC (*Telecommunication Metrology Center of MITT in Beijing, China*), under the Dual-Logo Calibration Certificate program and quality assurance (QA) protocols established between SPEAG (*Schmid & Partner Engineering AG, Switzerland*) and TMC, to support FCC (*U.S. Federal Communications Commission*) equipment certification are defined and described in the following.

- 1) The agreement established between SPEAG and TMC is only applicable to calibration services performed by TMC where its clients (companies and divisions of such companies) are headquartered in the Greater China Region, including Taiwan and Hong Kong. This agreement is subject to renewal at the end of each calendar year between SPEAG and TMC. TMC shall inform the FCC of any changes or early termination to the agreement.
- 2) Only a subset of the calibration services specified in the SPEAG-TMC agreement, while it remains valid, are applicable to SAR measurements performed using such equipment for supporting FCC equipment certification. These are identified in the following.
 - a) Calibration of dosimetric (SAR) probes EX3DVx, ET3DVx and ES3DVx.
 - i) Free-space E-field and H-field probes, including those used for HAC (hearing aid compatibility) evaluation, temperature probes, other probes or equipment not identified in this document, when calibrated by TMC, are excluded and cannot be used for measurements to support FCC equipment certification.
 - ii) Signal specific and bundled probe calibrations based on PMR (probe modulation response) characteristics are handled according to the requirements of KDB 865664; that is, "Until standardized procedures are available to make such determination, the applicability of a signal specific probe calibration for testing specific wireless modes and technologies is determined on a case-by-case basis through KDB inquiries, including SAR system verification requirements."
 - b) Calibration of SAR system validation dipoles, excluding HAC dipoles.
 - c) Calibration of data acquisition electronics DAE3Vx, DAE4Vx and DAEasyVx.
 - d) For FCC equipment certification purposes, the frequency range of SAR probe and dipole calibrations is limited to 700 MHz - 6 GHz and provided it is supported by the equipment identified in the TMC QA protocol (a separate attachment to this document).
 - e) The identical system and equipment setup, measurement configurations, hardware, evaluation algorithms, calibration and QA protocols, including the format of calibration certificates and reports used by SPEAG shall be applied by TMC.
 - f) The calibrated items are only applicable to SPEAG DASY 4 and DASY 5 or higher version systems.



- 3) The SPEAG-TMC agreement includes specific protocols identified in the following to ensure the quality of calibration services provided by TMC under this SPEAG-TMC Dual-Logo calibration agreement are equivalent to the calibration services provided by SPEAG. TMC shall, upon request, provide copies of documentation to the FCC to substantiate program implementation.
 - a) The Inter-laboratory Calibration Evaluation (ILCE) stated in the TMC QA protocol shall be performed between SPEAG and TMC at least once every 12 months. The ILCE acceptance criteria defined in the TMC QA protocol shall be satisfied for the TMC, SPEAG and FCC agreements to remain valid.
 - b) Check of Calibration Certificate (CCC) shall be performed by SPEAG for all calibrations performed by TMC. Written confirmation from SPEAG is required for TMC to issue calibration certificates under the SPEAG-TMC Dual-Logo calibration program. Quarterly reports for all calibrations performed by TMC under the program are also issued by SPEAG.
 - c) The calibration equipment and measurement system used by TMC shall be verified before each calibration service according to the specific reference SAR probes, dipoles, and DAE calibrated by SPEAG. The results shall be reproducible and within the defined acceptance criteria specified in the TMC QA protocol before each actual calibration can commence. TMC shall maintain records of the measurement and calibration system verification results for all calibrations.
 - d) Quality Check of Calibration (QCC) certificates shall be performed by SPEAG at least once every 12 months. SPEAG shall visit TMC facilities to verify the laboratory, equipment, applied procedures and plausibility of randomly selected certificates.
- 4) A copy of this document, to be updated annually, shall be provided to TMC clients that accept calibration services according to the SPEAG-TMC Dual-Logo calibration program, which should be presented to a TCB (*Telecommunication Certification Body*), to facilitate FCC equipment approval.
- 5) TMC shall address any questions raised by its clients or TCBs relating to the SPEAG-TMC Dual-Logo calibration program and inform the FCC and SPEAG of any critical issues.

Change Note: Revised on June 26 to clarify the applicability of PMR and Bundled probe calibrations according to the requirements of KDB 865664.



Appendix E. Dipole Calibration Data:

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



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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 **CCIS (Auden)**

Certificate No: **D835V2-4d154_Jun13**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d154**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **June 06, 2013**

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

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-12)	In house check: Oct-13

Calibrated by:

Approved by:

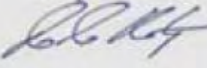
Name
Leif Klysner

Katja Pokovic

Function
Laboratory Technician

Technical Manager

Signature



Issued: June 6, 2013

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

Certificate No: D835V2-4d154_Jun13

Page 1 of 8



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S Swiss Calibration Service

Accreditation No.: SCS 108

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

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:

- 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
- 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
- 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:

- 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.

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%.

**Measurement Conditions**

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

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.4 $\pm$ 6 %	0.94 mho/m $\pm$ 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	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.51 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.17 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.5 $\pm$ 6 %	1.00 mho/m $\pm$ 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	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.51 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.23 W/kg $\pm$ 16.5 % (k=2)

**Appendix****Antenna Parameters with Head TSL**

Impedance, transformed to feed point	52.4 Ω - 2.8 j Ω
Return Loss	- 28.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.2 Ω - 4.5 j Ω
Return Loss	- 26.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.432 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	December 28, 2012



DASY5 Validation Report for Head TSL

Date: 06.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d154

Communication System: UID 0 - CW ; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.94 \text{ S/m}$; $\epsilon_r = 40.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

Dipole Calibration for Head Tissue/Pin=250 mW, $d=15\text{mm}$ /Zoom Scan (7x7x7)/Cube 0:

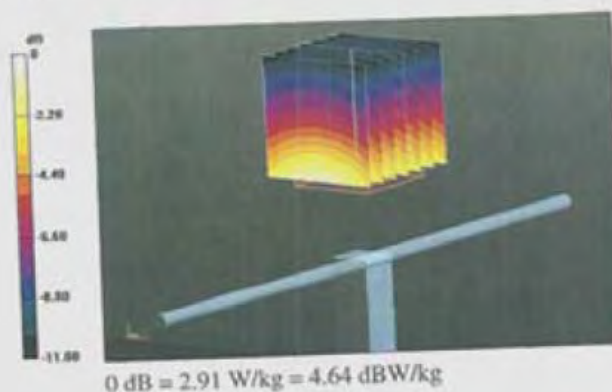
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 57.316 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.76 W/kg

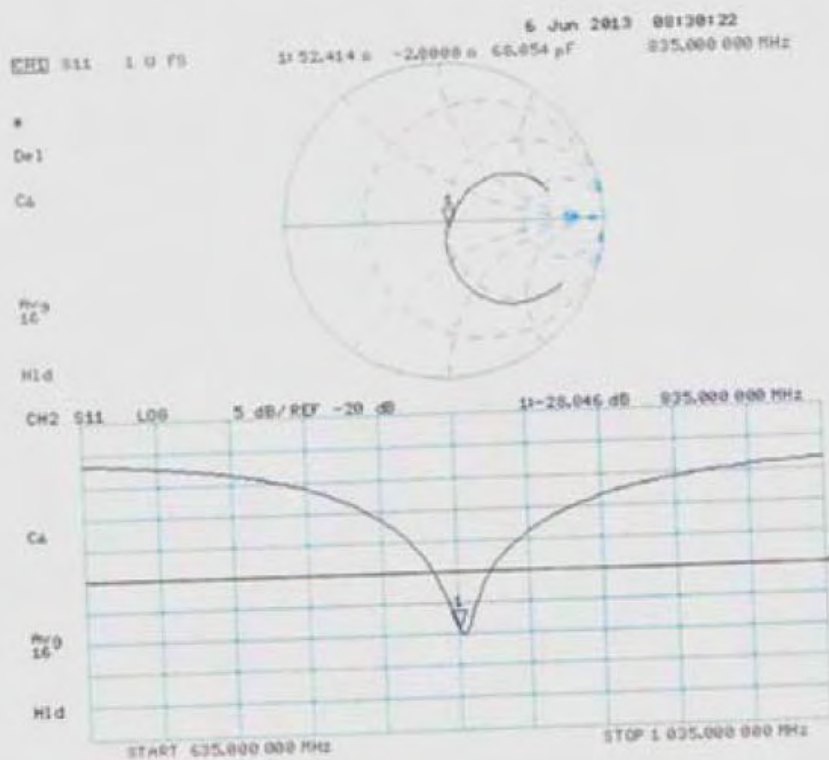
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.59 W/kg

Maximum value of SAR (measured) = 2.91 W/kg





Impedance Measurement Plot for Head TSL





DASY5 Validation Report for Body TSL

Date: 05.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d154

Communication System: UID 0 - CW ; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 54.5$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

Dipole Calibration for Body Tissue/Pin=250 mW, $d=15\text{mm}$ /Zoom Scan (7x7x7)/Cube 0:

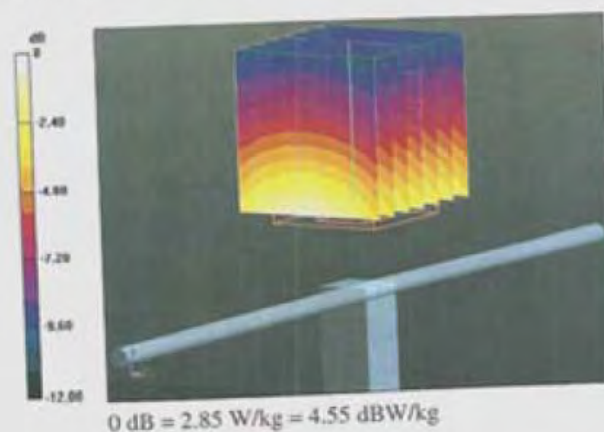
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.428 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.58 W/kg

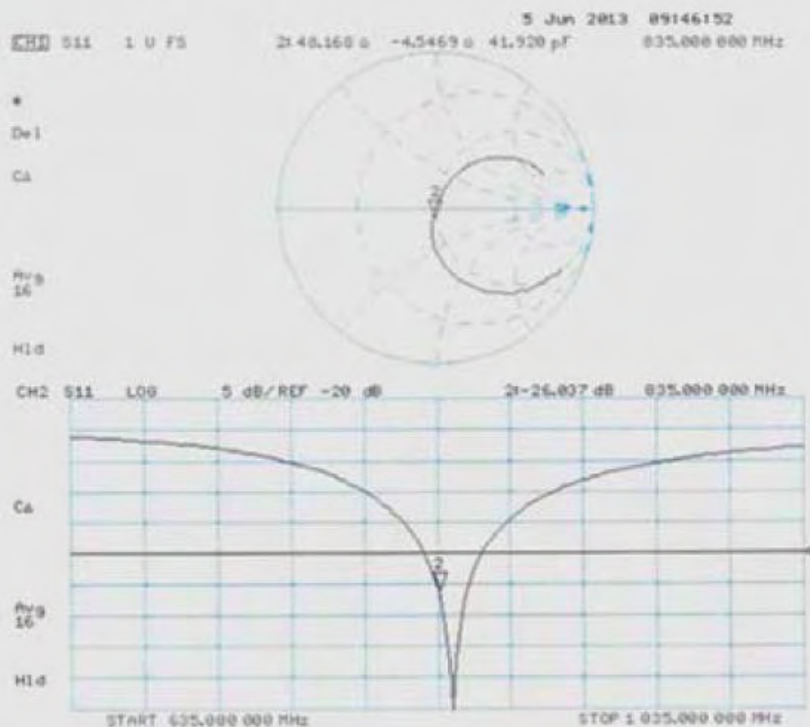
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.59 W/kg

Maximum value of SAR (measured) = 2.85 W/kg





Impedance Measurement Plot for Body TSL





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Accreditation No.: SCS 108

Client **Auden**

Certificate No: D1900V2-5d142_Jun13

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d142**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **June 10, 2013**

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
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-12)	In house check: Oct-13

Calibrated by: **Name**
Jeton Kastrati **Function**
Laboratory Technician

Approved by: **Katja Pokovic** **Technical Manager**

Signature

Issued: June 11, 2013

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



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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**

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:

- 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
- 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
- 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:

- 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.

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%.

**Measurement Conditions**

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.3 $\pm$ 6 %	1.34 mho/m $\pm$ 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	9.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.2 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.0 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.7 $\pm$ 6 %	1.50 mho/m $\pm$ 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	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.8 W/kg $\pm$ 16.5 % (k=2)

**Appendix****Antenna Parameters with Head TSL**

Impedance, transformed to feed point	$52.8 \Omega + 5.8 j\Omega$
Return Loss	- 24.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.0 \Omega + 6.2 j\Omega$
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 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	March 11, 2011



DASY5 Validation Report for Head TSL

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d142

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.34$ S/m; $\epsilon_r = 39.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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 = 95.950 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.83 W/kg; SAR(10 g) = 5.18 W/kg

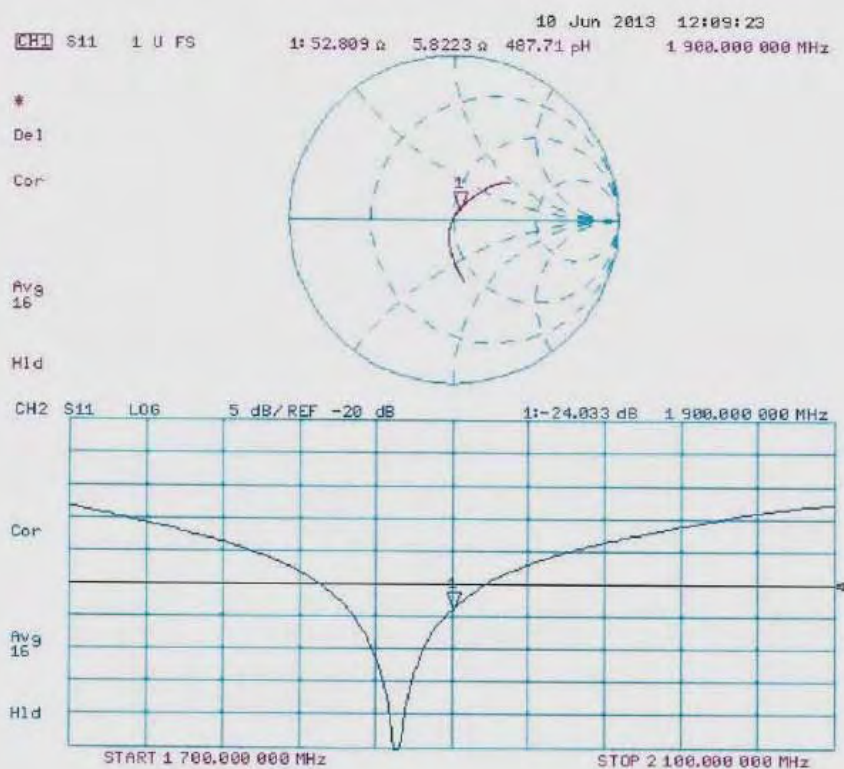
Maximum value of SAR (measured) = 12.3 W/kg



0 dB = 12.3 W/kg = 10.90 dBW/kg



Impedance Measurement Plot for Head TSL





DASY5 Validation Report for Body TSL

Date: 10.06.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d142

Communication System: UID 0 - CW ; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.5$ S/m; $\epsilon_r = 53.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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 = 95.950 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 17.4 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.41 W/kg

Maximum value of SAR (measured) = 12.8 W/kg



0 dB = 12.8 W/kg = 11.07 dBW/kg



Impedance Measurement Plot for Body TSL

