



## **FCC SAR EVALUATION REPORT**

For

**MADETRONICS SAS**

Diagonal 54 Sur No. 24A - 55 Interior 24 Apto. 401 Bogota, Colombia

**Product Name:** GSM Mobile Phone

**Model No. :** mini5130

**FCC ID:** 2ACIBMINI5130

**Date of Receipt:** 21 May 2014

**Date of Test:** 21 ~25 May 2014

**Issued Date:** 25 May 2014

**Report No.:** TS201405030001

**Report Version:** V1.0

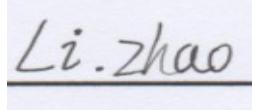
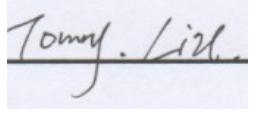
**Issue By**

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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 Mobile Phone
Brand Name:	MADETRONICS
Model Name:	mini5130
Applicant:	MADETRONICS SAS
Address:	Diagonal 54 Sur No. 24A - 55 Interior 24 Apto. 401 Bogota, Colombia
Manufacturer:	Shenzhen Leed Electronic Co.,LTD
Address:	Room 29A1, Block A, Zhonghangbeiyuan Building, Zhenhua Road, Futian District Shenzhen China
Applicable Standard:	IEEE Std. 1528-2013, FCC 47 CFR§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 Measurement Body (1g): 0.630 W/kg Head(1g): 0.576W/kg
Performed Date:	21 ~25 May 2014
Test Engineer:	 25 <sup>th</sup> May 2014
Reviewed By	 25 May 2014
Performed Location:	Shenzhen Sunway Communication CO.,LTD Testing Center 1/F, Building A, SDG Info Port, Kefeng Road, Hi-Tech Park, Nanshan District, Shenzhen, Guangdong, China 518104 Tel: +86-755- 36615880 Fax: +86-755- 86525532



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**1. General Information:****1.1 EUT Description:**

<b>EUT Information</b>	
Product Name	GSM Mobile Phone
Brand Name	MADETRONICS
Model Name	mini5130
Device Category	MobilePhone
Antenna Type	Integral Antenna
Headset	mini5130
Battery	Type: Rechargeable lithium-ion battery 3.7V
Dimensions (L*W*H):	90mm (L)× 37mm (W)×14mm (H)
Weight:	-
Power Source:	Rechargeable lithium-ion battery 3.7V
Normal Operation:	Head and Body-worn



<b>GSM-2G</b>	
Support Band	GSM850/PCS1900
GPRS Type	N/A
GPRS Class	N/A
Frequency Bands:	GSM 850: UL: 824-850 MHz DL: 869-894 MHz PCS 1900: UL: 1710-1785 MHz DL: 1805-1880 MHz
Release Version	R99
Type of modulation	GMSK for GSM/GPRS
Antenna Gain	1.2dBi for GSM 850 1.2dBi for DCS 1900

<b>Max. Output Power (Conducted)</b>	
GSM850:	32.32 dBm
PCS1900:	30.51 dBm

## 1.2 Test Environment:

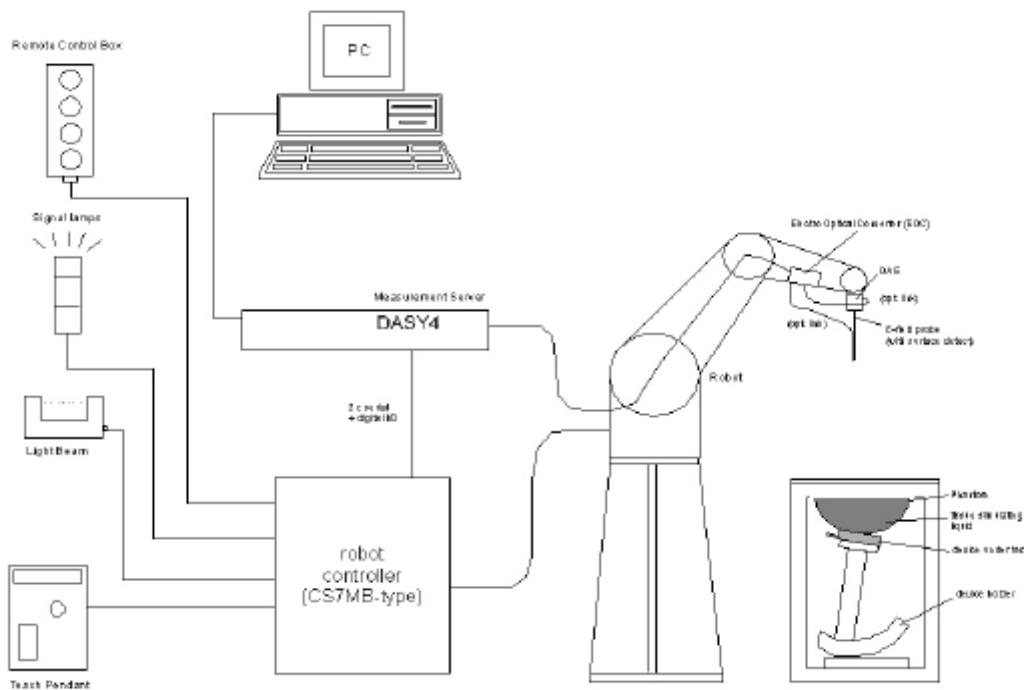
Ambient conditions in the SAR laboratory:

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.

- DATA Acquisition Electronics (DAE):



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.

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.

Calibration: Recommended once a year

- Dosimetric Probes:



Model: ES3DV3,

Frequency: 10MHz to 3G, Linearity:  $\pm 0.2\text{dB}$ ,

Dynamic Range: 10  $\mu\text{W/g}$  to 100 mW/g

Directivity:

$\pm 0.3\text{ dB}$  in HSL (rotation around probe axis)

$\pm 0.5\text{ dB}$  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 ( $\pm 2\text{ dB}$ ). The dosimetric probes have special calibrations in various liquids at different frequencies.

Calibration: Recommended once a year



➤ 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
<b>Water</b>	40.45	52.4	54.9	40.4
<b>Salt</b>	1.45	1.4	0.18	0.5
<b>Sugar</b>	57.6	45.0	0.00	58.0
<b>HEC</b>	0.40	1.0	0.00	1.0
<b>Preventol</b>	0.10	0.1	0.00	0.1
<b>DGBE</b>	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
		$\epsilon_r$	$\sigma[\text{s/m}]$		
835MHz	Reference	41.50±5% (39.425~43.574)	0.90±5% (0.9215~1.0185)	N/A	2014.05.22
	Measurement	42.07	0.91	22.1	
1900MHz	Reference	40±5% (38~42)	1.40±5% (1.33~1.47)	N/A	2014.05.22
	Measurement	39.33	1.42	21.8	
Body Tissue Simulate Measurement:					
Frequency (MHz)	Description	Dielectric Parameters		Tissue Temp. (°C)	Date
		$\epsilon_r$	$\sigma[\text{s/m}]$		
835MHz	Reference	55.2±5% (52.45~57.96)	0.97±5% (0.93~1.01)	N/A	2014.05.23
	Measurement	53.42	0.98	22.5	
1900MHz	Reference	53.3±5% (50.64~55.96)	1.52±5% (1.45~1.59)	N/A	2014.05.23
	Measurement	52.35	1.54	22.5	



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

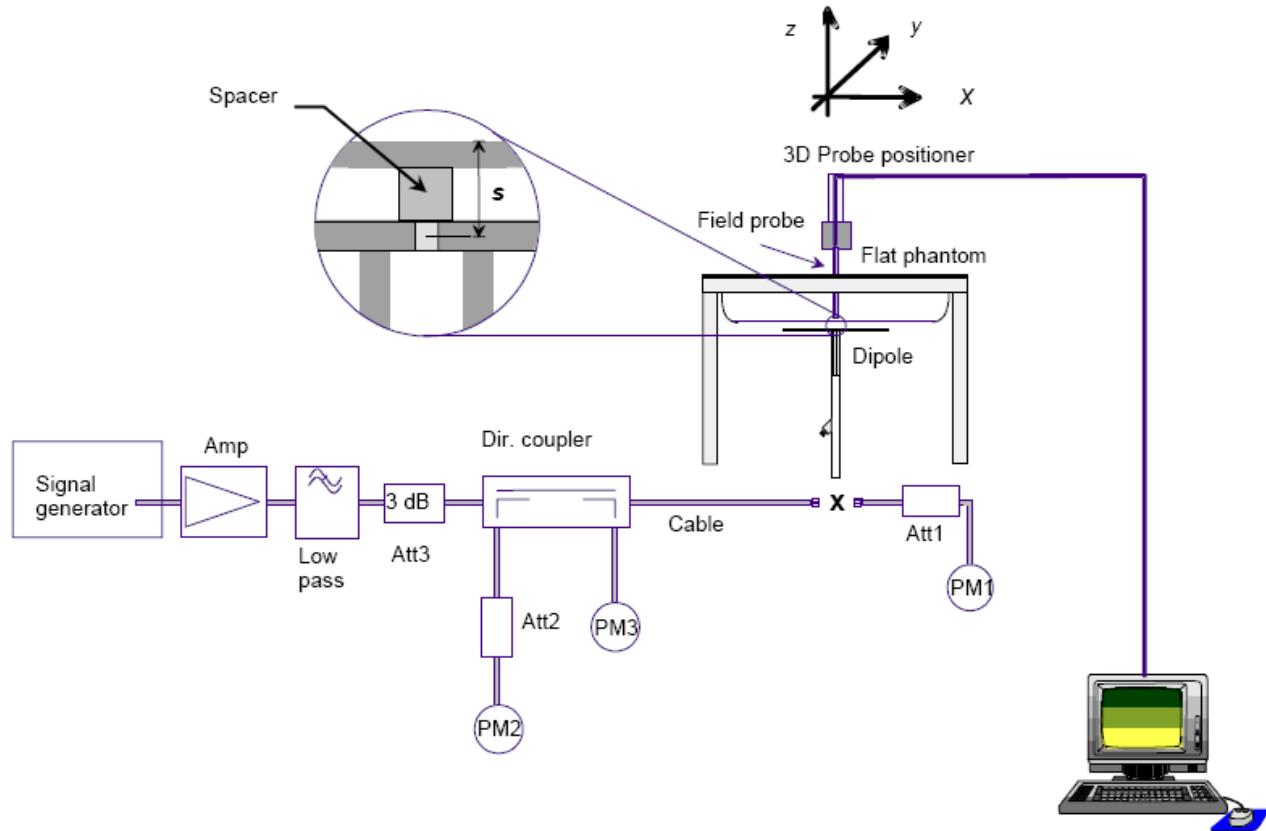
The head tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528 have been incorporated in the following table

Target Frequency (MHz)	Head		Body	
	$\epsilon_r$	$\sigma$ [s/m]	$\epsilon_r$	$\sigma$ [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±10% (8.56~10.46)	6.17±10% (5.56~6.78)	N/A	2014.05.22	
	Validation	10.04	6.56	22.5		
Validation Dipole: D1900V2-SN:						
1900MHz	Reference	40.2±10% (36.18~44.22)	21±10% (18.9~23.1)	N/A	2014.05.22	
	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±10% (8.56~10.46)	6.23±10% (5.61~6.85)	N/A	2014.05.22	
	Validation	9.68	6.24	22.5		
Validation Dipole: D1900V2-SN:5d142						
1900MHz	Reference	40.8±10% (36.72~44.88)	21.8±10% (19.62~23.98)	N/A	2014.05.23	
	Validation	42.40	21.60	22.5		
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:**

NO	Source	Uncert. ai (%)	Prob. Dist.	Div. k	ci (1g)	ci (10g)	Stand. Uncert. ui (1g)	Stand. Uncert. ui (10g)	Veff
1	Repeat	0.04	N	1	1	1	0.04	0.04	9
<b>Instrument</b>									
2	Probe calibration	7	N	2	1	1	3.5	3.5	$\infty$
3	Axial isotropy	4.7	R	$\sqrt{3}$	0.7	0.7	1.9	1.9	$\infty$
4	Hemispherical isotropy	9.6	R	$\sqrt{3}$	0.7	0.7	3.9	3.9	$\infty$
5	Boundary effect	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
6	Linearity	4.7	R	$\sqrt{3}$	1	1	2.7	2.7	$\infty$
7	Detection limits	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
8	Readout electronics	0.3	N	1	1	1	0.3	0.3	$\infty$
9	Response time	0.8	R	$\sqrt{3}$	1	1	0.5	0.5	$\infty$
10	Integration time	2.6	R	$\sqrt{3}$	1	1	1.5	1.5	$\infty$
11	Ambient noise	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	$\infty$
12	Ambient reflections	3.0	R	$\sqrt{3}$	1	1	1.7	1.7	$\infty$
13	Probe positioner mech. restrictions	0.4	R	$\sqrt{3}$	1	1	0.2	0.2	$\infty$
14	Probe positioning with respect to phantom shell	2.9	R	$\sqrt{3}$	1	1	1.7	1.7	$\infty$
15	Max.SAR evaluation	1.0	R	$\sqrt{3}$	1	1	0.6	0.6	$\infty$
<b>Test sample related</b>									
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	$\sqrt{3}$	1	1	2.9	2.9	$\infty$
Phantom and set-up									
19	Phantom uncertainty	4.0	R	$\sqrt{3}$	1	1	2.3	2.3	$\infty$
20	Liquid conductivity (target)	5.0	R	$\sqrt{3}$	0.64	0.43	1.8	1.2	$\infty$
21	Liquid conductivity (meas)	2.5	N	1	0.64	0.43	1.6	1.2	$\infty$
22	Liquid Permittivity (target)	5.0	R	$\sqrt{3}$	0.6	0.49	1.7	1.5	$\infty$
23	Liquid Permittivity (meas)	2.5	N	1	0.6	0.49	1.5	1.2	$\infty$
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	32.32	-9.03	23.29
	CH190	836.60	32.28	-9.03	23.25
	CH251	848.80	32.31	-9.03	23.28
PCS1900	Ch512	1850.20	30.51	-9.03	21.48
	CH661	1880.00	30.47	-9.03	21.44
	CH810	1909.80	30.49	-9.03	21.46
Maximum Power <SIM 2>					
GSM850	CH128	824.20	32.32	-9.03	23.29
	CH190	836.60	32.28	-9.03	23.25
	CH251	848.80	32.31	-9.03	23.28
PCS1900	Ch512	1850.20	30.51	-9.03	21.48
	CH661	1880.00	30.47	-9.03	21.44
	CH810	1909.80	30.49	-9.03	21.46



Band	Channel	Frequency (MHz)	Avg.Burst Power(dBm)	Duty Cycle Factor(dB)	Frame Power (dBm)
Maximum Power <SIM 1>					
GPRS850 1slot	CH128	824.20	28.62	-9.03	19.59
	CH190	836.60	28.73	-9.03	19.70
	CH251	848.80	28.65	-9.03	19.62
GPRS850 2slots	CH128	824.20	25.18	-6.02	19.16
	CH190	836.60	25.43	-6.02	19.41
	CH251	848.80	25.72	-6.02	19.70
GPRS850 3slots	CH128	824.20	24.16	-4.26	19.90
	CH190	836.60	24.18	-4.26	19.92
	CH251	848.80	24.23	-4.26	19.97
GPRS850 4slots	CH128	824.20	23.12	-3.01	20.11
	CH190	836.60	23.21	-3.01	20.20
	CH251	848.80	23.04	-3.01	20.03
GPRS1900 1slot	Ch512	1850.20	28.83	-9.03	19.80
	CH661	1880.00	28.71	-9.03	19.68
	CH810	1909.80	28.97	-9.03	19.94
GPRS1900 2slots	Ch512	1850.20	25.61	-6.02	19.59
	CH661	1880.00	25.41	-6.02	19.39
	CH810	1909.80	25.32	-6.02	19.30
GPRS1900 3slots	Ch512	1850.20	24.04	-4.26	19.78
	CH661	1880.00	24.31	-4.26	20.05
	CH810	1909.80	24.12	-4.26	19.86
GPRS1900 4slots	Ch512	1850.20	23.03	-3.01	20.02
	CH661	1880.00	22.98	-3.01	19.97
	CH810	1909.80	23.01	-3.01	20.00



## 10. Test photos and results:

### 10.1 DUT photos:



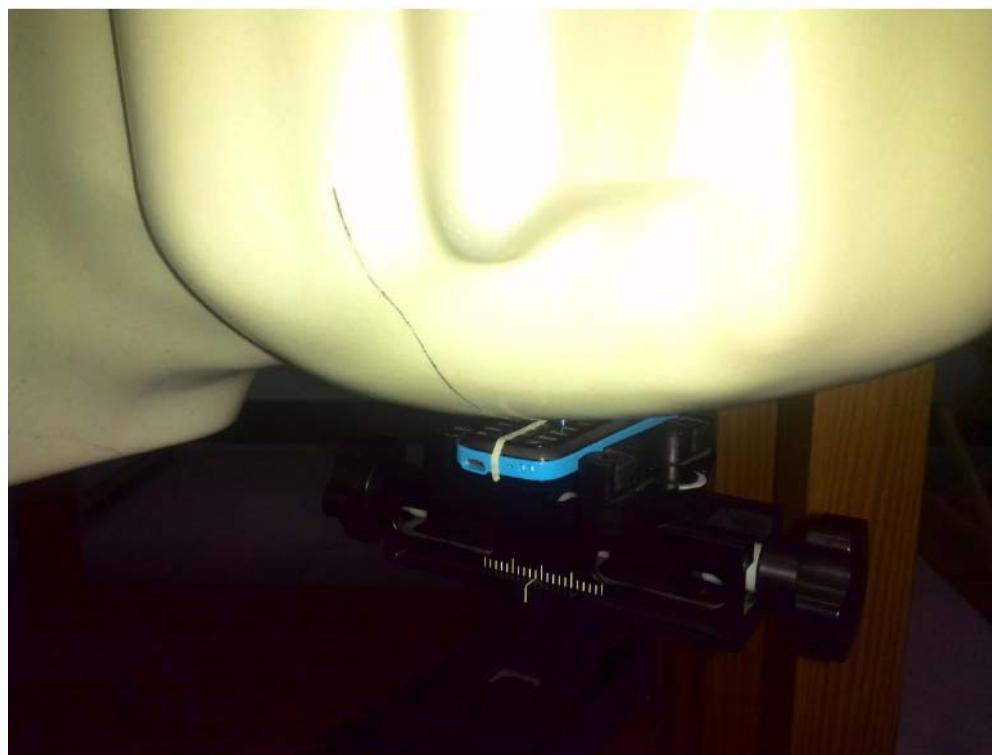
Front side



Back side



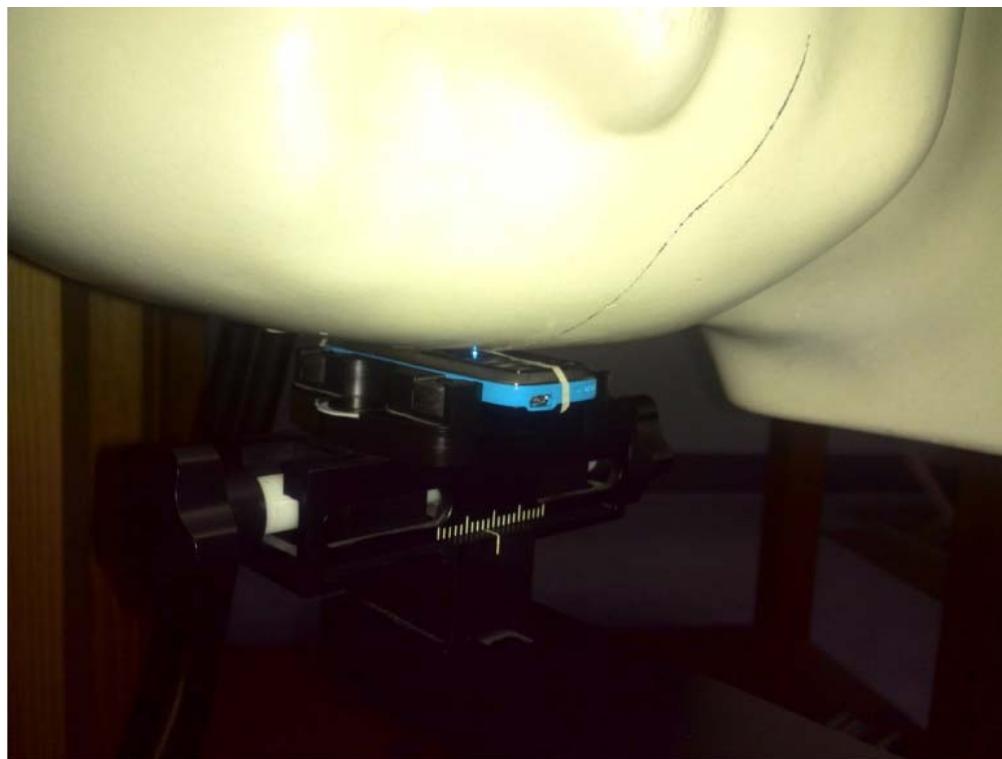
10.2 Setup photos:



Left Touch Cheek



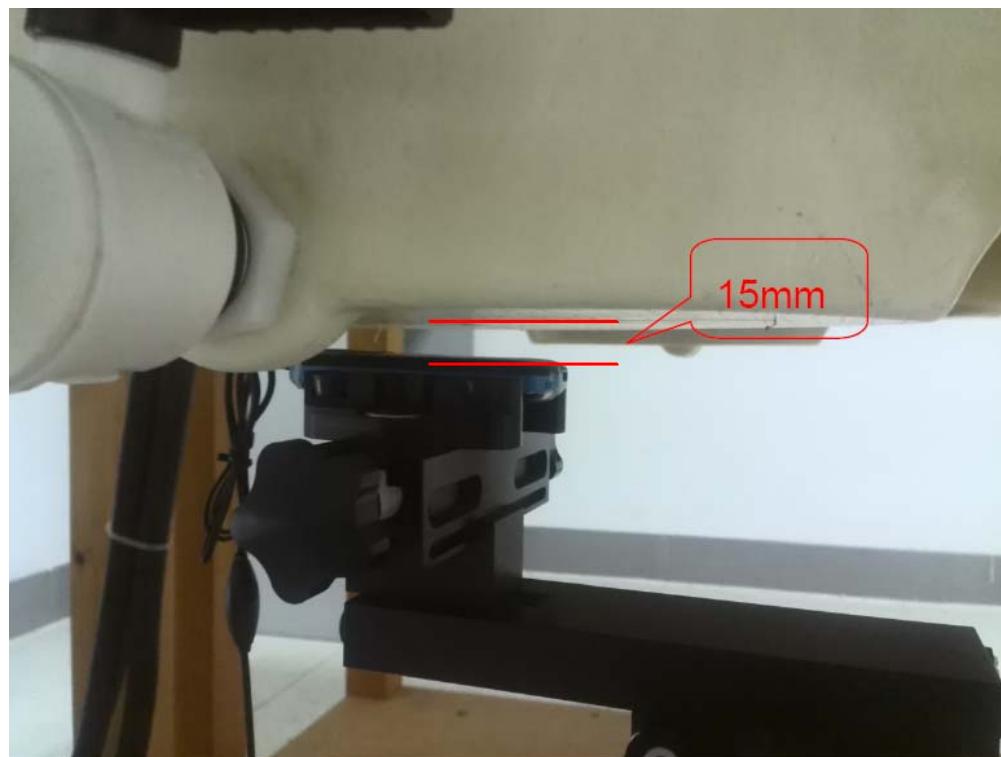
Left Tilt( $15^\circ$ )



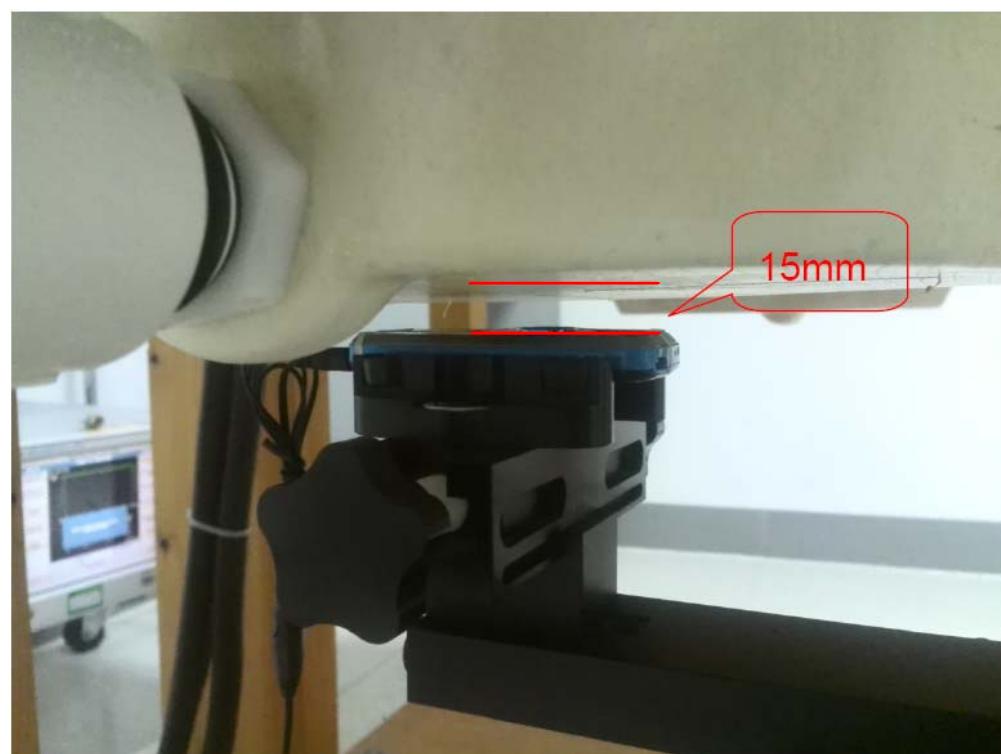
Right Touch Cheek



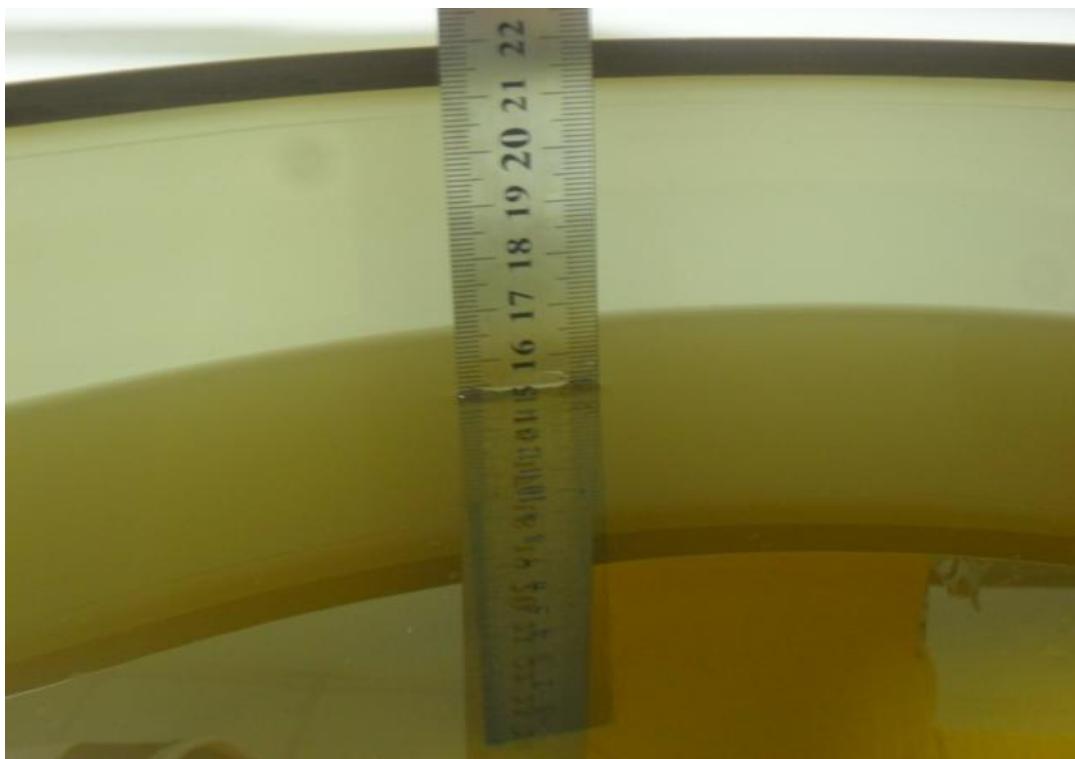
Right Tilt(15°)



Body Worn with Headset



Body Front With Headset



Liquid depth (15cm)



## 10.3 SAR result summary:

Scale Factor=Target Power/Measurement Power

Scale SAR=Measurement SAR\*Scale Factor

Head

Test Case of Head			Meas. Power (dBm)	Target Power (dBm)	Fact or	Meas. SAR (W/kg) 1g Avg.	Scale SAR (W/kg)	Power Drift $\leq \pm 0.2$ dB	Data Slot
Band	Test Position	CH							
<b>SIM1,Liquid: Head</b>									
GSM 850	Right Cheek	CH190	32.18	33.0	1.21	0.476	0.576	-0.108	Plot 1
	Right Tilt	CH190	32.18	33.0	1.21	0.203	0.246	0.131	Plot 2
	Left Tilt	CH190	32.18	33.0	1.21	0.220	0.266	-0.136	Plot 3
	Left Cheek	CH190	32.18	33.0	1.21	0.421	0.509	-0.176	Plot 4
<b>SIM2,Liquid: Head</b>									
GSM 850	Right Cheek	CH190	32.18	33.0	1.21	0.473	0.572	-0.180	Plot 5
<b>SIM1,Liquid: Head</b>									
GSM 1900	Right Cheek	CH661	30.24	31	1.19	0.211	0.251	-0.108	Plot 6
	Right Tilt	CH661	30.24	31	1.19	0.237	0.282	0.024	Plot 7
	Left Tilt	CH661	30.24	31	1.19	0.300	0.357	0.011	Plot 8
	Left Cheek	CH661	30.24	31	1.19	0.232	0.276	-0.138	Plot 9
<b>SIM2,Liquid: Head</b>									
GSM 1900	Left Tilt	CH661	30.24	31	1.19	0.300	0.357	-0.045	Plot 10

Note: When the 1g SAR is  $\leq 0.8$  W/kg, testing for low and high channel is optional.



Body (15mm between DUT and Flat Phantom)

Test Case of Head			Meas. Power (dBm)	Target Power (dBm)	Fact or	Meas. SAR (W/kg) 1g Avg.	Scale SAR (W/kg)	Power Drift $<\pm 0.2$ dB	Data Slot
Band	Test Position	CH							

**SIM1,Liquid: Body, Separator: 15mm**

GSM 850	Worn With Headset	CH190	32.18	33.0	1.21	0.201	0.243	-0.483	Plot 11
	Front With Headset	CH190	32.18	33.0	1.21	0.512	0.630	-0.260	Plot 12
GSM 1900	Worn With Headset	CH661	30.24	31	1.19	0.385	0.458	-0.001	Plot 13
	Front With Headset	CH661	30.24	31	1.19	0.091	0.108	-0.053	Plot 14

Note: When the 1g SAR is  $\leq 0.8$  W/kg, testing for low and high channel is optional.

**11. Equipment List:**

NO.	Instrument	Manufacture	Model	S/N	Cal. Date	Cal. Due Date
1	Communication Tester	Agilent	E5515C	MY50267264	Dec 27 <sup>th</sup> 2013	Dec 27 <sup>th</sup> 2014
2	E-field Probe	Speag	ES3DV3	3028	August 5 <sup>th</sup> 2013	August 4 <sup>th</sup> 2014
3	Dielectric Probe Kit	Speag	DAK 3.5mm Probe	1038	N/A	N/A
4	DAE	Speag	DAE4	689	July 20 <sup>th</sup> 2013	July 19 <sup>th</sup> 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 <sup>th</sup> 2014	Jan 7 <sup>th</sup> 2015
9	Signal Generator	Agilent	E4438C	MY49072279	Nov 27 <sup>th</sup> 2013	Nov 27 <sup>th</sup> 2014
10	Amplifier	Mini-circult	ZHL-42W	QA098002	N/A	N/A
11	Power Meter	Agilent	N1419A	MY50001563	Nov 27 <sup>th</sup> 2013	Nov 27 <sup>th</sup> 2014
12	Power Sensor	Agilent	N8481H	MY51020010	Nov 27 <sup>th</sup> 2013	Nov 27 <sup>th</sup> 2014
13	Directional Coupler	Agilent	772D	MY46151275	Nov 27 <sup>th</sup> 2013	Nov 27 <sup>th</sup> 2014
14	Directional Coupler	Agilent	778D	MY48220607	Nov 27 <sup>th</sup> 2013	Nov 27 <sup>th</sup> 2014
15	Dipole 835MHz	Speag	D835V2	4d154	Jun 6 <sup>th</sup> 2013	Jun 6 <sup>th</sup> 2015
16	Dipole 1900MHz	Speag	D1900V2	5d142	Jun 10 <sup>th</sup> 2013	Jun 10 <sup>th</sup> 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(4.08, 4.08, 4.08); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

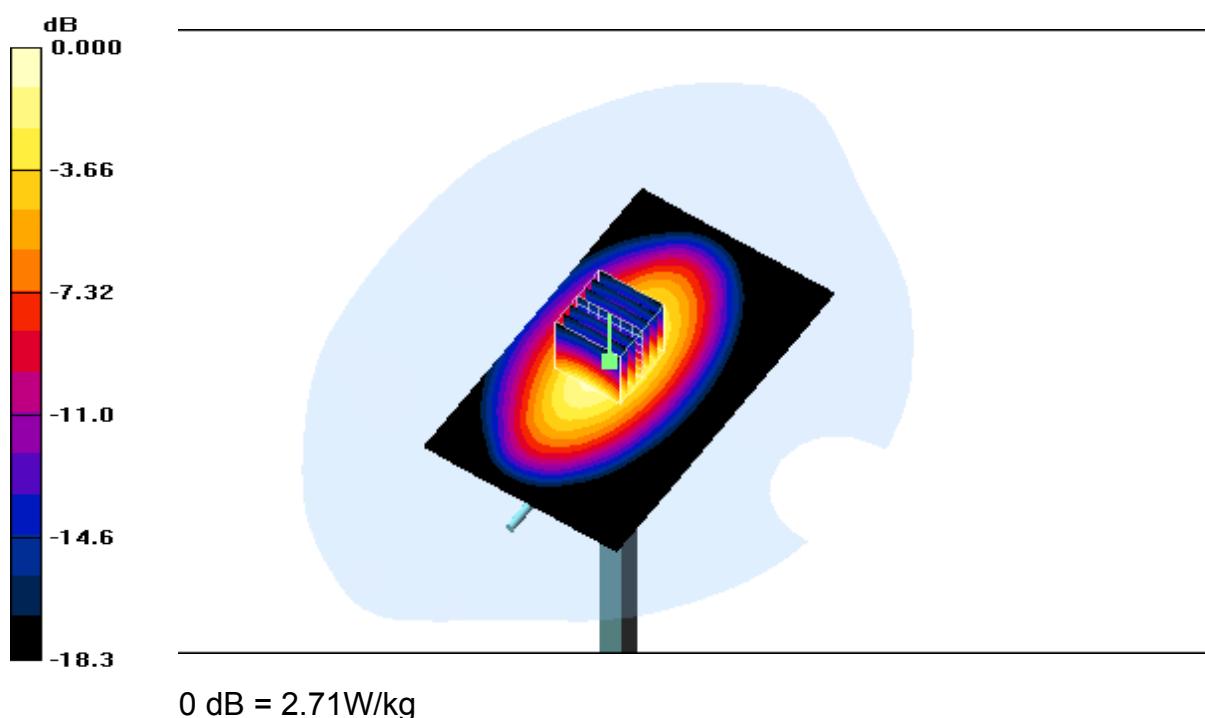
**d=10mm, Pin=250mW/Area Scan (61x61x1):** Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 2.59 W/kg**d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid:  
dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 3.8 W/kg

**SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.64 W/kg**

Maximum value of SAR (measured) = 2.71 W/kg





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(4.08, 4.08, 4.08); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- 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) = 2.49 W/kg

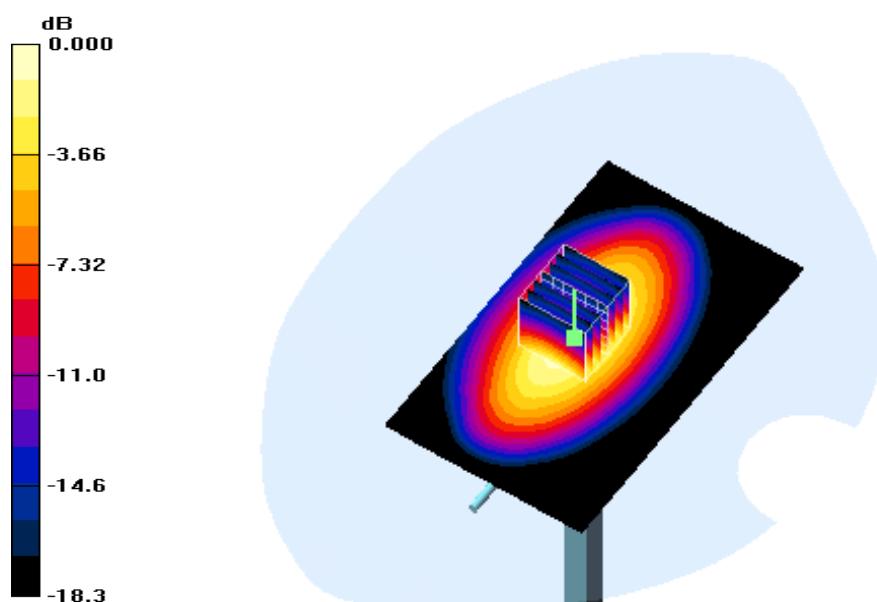
**d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid:  
dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 3.68 W/kg

**SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.56 W/kg**

Maximum value of SAR (measured) = 2.61 W/kg



0 dB = 2.61W/kg



**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:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.42 \text{ mho/m}$ ;  $\epsilon_r = 39.27$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(4.08, 4.08, 4.08); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**d=15mm, Pin=250mW/Area Scan (61x101x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 11.1 W/kg

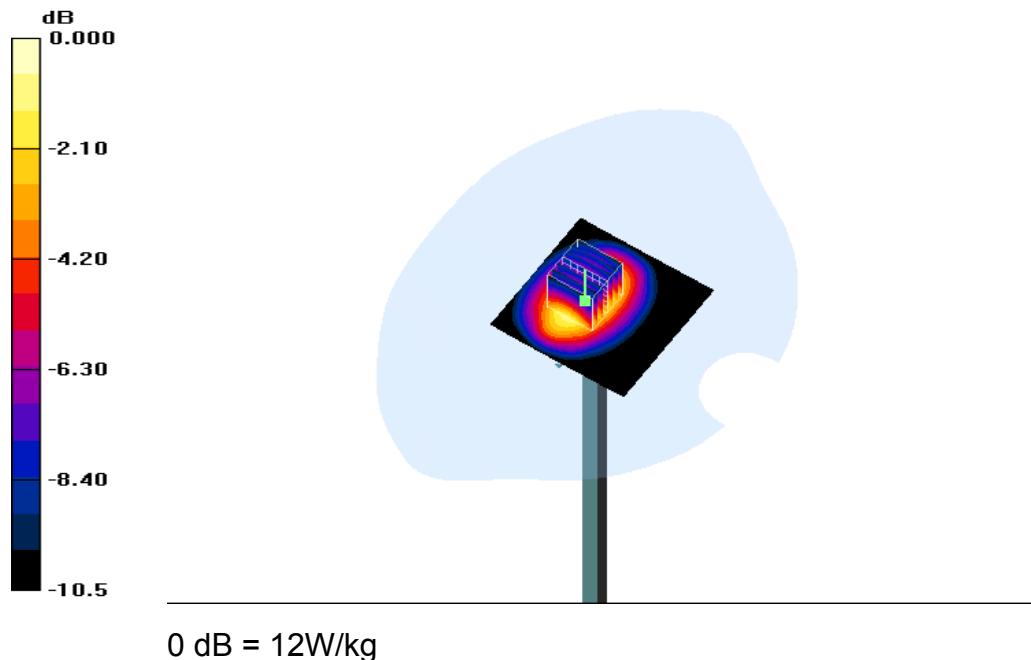
**d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

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

Peak SAR (extrapolated) = 20 W/kg

**SAR(1 g) = 10.5 W/kg; SAR(10 g) = 5.36 W/kg**

Maximum value of SAR (measured) = 12 W/kg





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:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.54 \text{ mho/m}$ ;  $\epsilon_r = 52.45$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(4.08, 4.08, 4.08); Calibrated: 8/5/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**d=15mm, Pin=250mW/Area Scan (61x101x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 12 W/kg

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

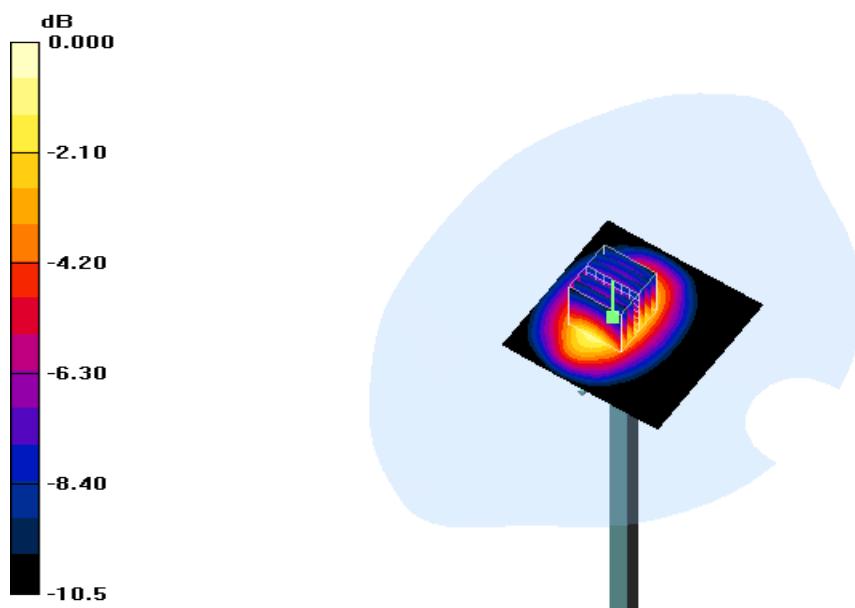
$dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

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

Peak SAR (extrapolated) = 19.7 W/kg

**SAR(1 g) = 10.6 W/kg; SAR(10 g) = 5.4 W/kg**

Maximum value of SAR (measured) = 12 W/kg



**Appendix B. SAR Test plots:**

Plot 1: Date/Time: 5/22/2014 8:56:22 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 837 \text{ MHz}$ ;  $\sigma = 0.892 \text{ mho/m}$ ;  $\epsilon_r = 41.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/1/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- 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) = 0.526 W/kg

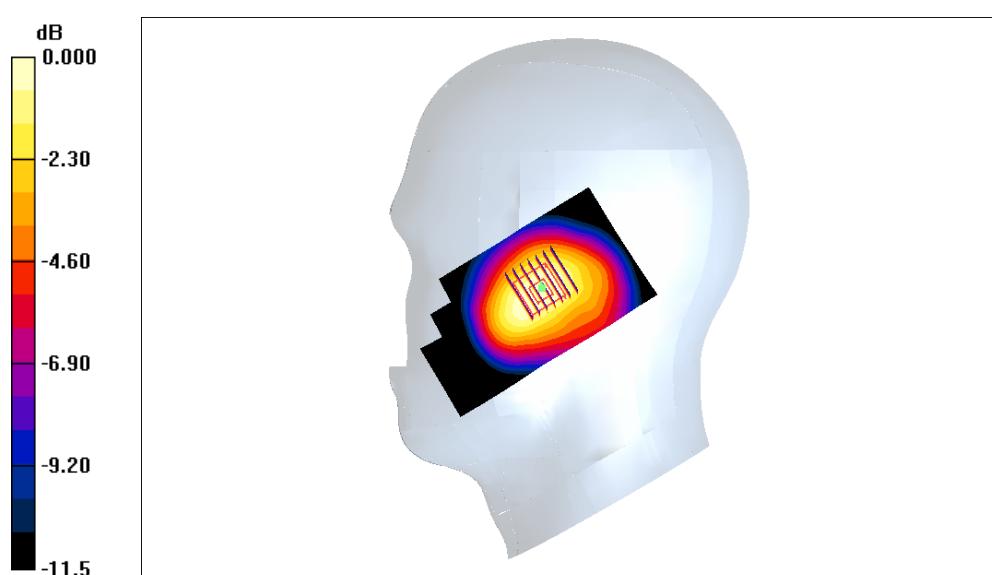
**Right touch/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 17.1 V/m; Power Drift = -0.108 dB

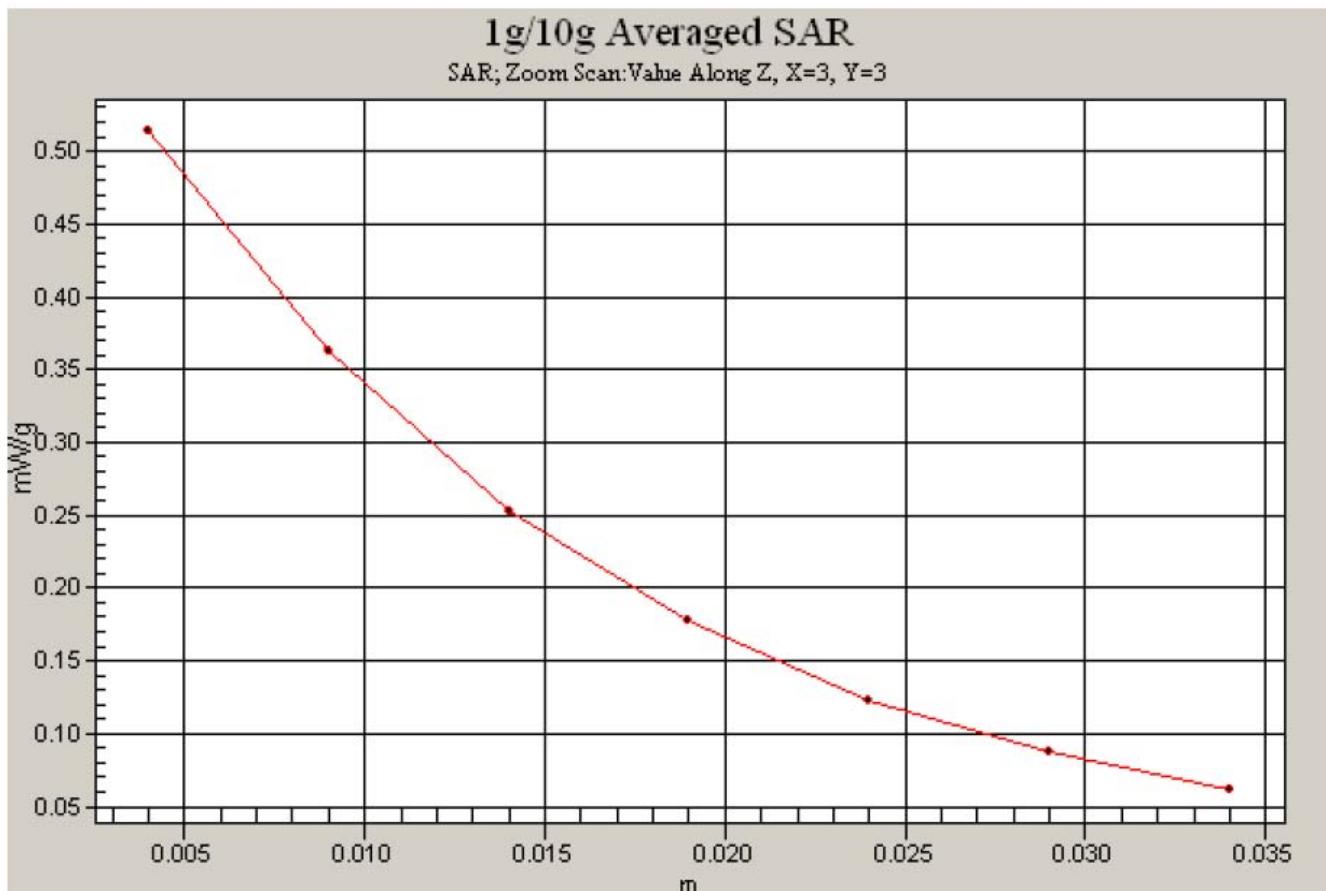
Peak SAR (extrapolated) = 0.668 W/kg

**SAR(1 g) = 0.476 W/kg; SAR(10 g) = 0.317 W/kg**

Maximum value of SAR (measured) = 0.513 W/kg



0 dB = 0.513W/kg Right touch Section, Liquid: Head





Plot 2: Date/Time: 5/22/2014 9:15:58 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number  
Program Name: MADETRONICS mini5130**

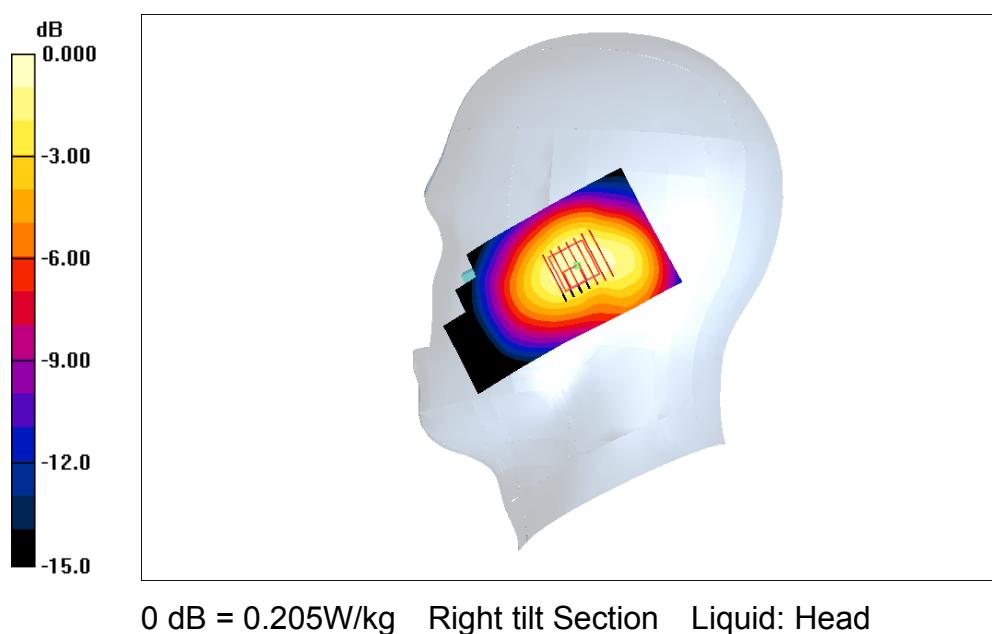
Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 837 \text{ MHz}$ ;  $\sigma = 0.892 \text{ mho/m}$ ;  $\epsilon_r = 41.5$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/1/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- 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) = 0.220 W/kg

**Right tilt/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 12.5 V/m; Power Drift = 0.131 dB  
Peak SAR (extrapolated) = 0.419 W/kg  
**SAR(1 g) = 0.203 W/kg; SAR(10 g) = 0.130 W/kg**  
Maximum value of SAR (measured) = 0.205 W/kg





Plot 3: Date/Time: 5/22/2014 10:40:35 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number  
Program Name: MADETRONICS mini5130**

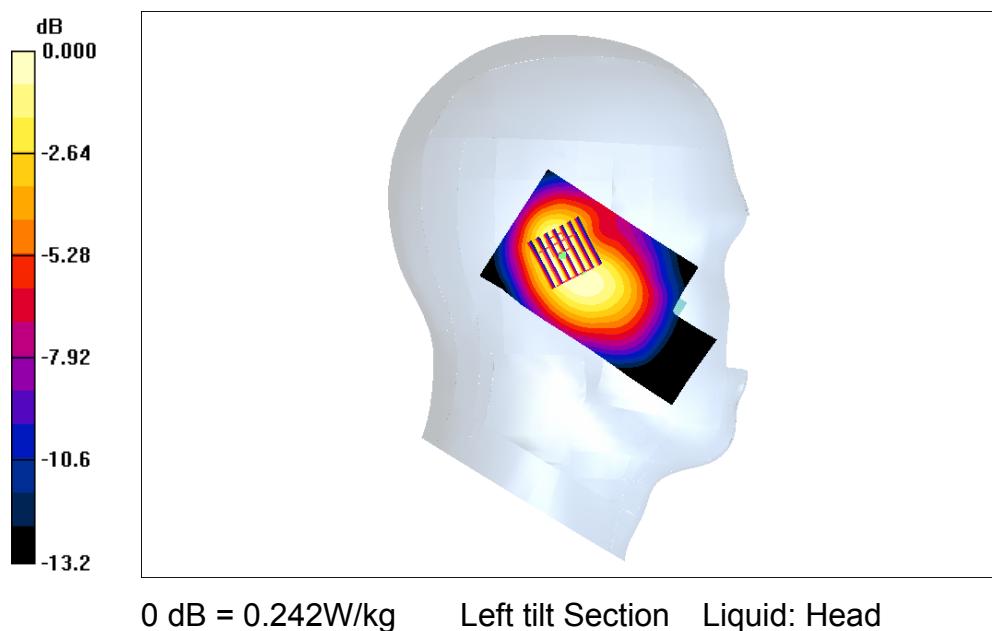
Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 837 \text{ MHz}$ ;  $\sigma = 0.892 \text{ mho/m}$ ;  $\epsilon_r = 41.5$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/1/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Left tilt/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.252 W/kg

**Left tilt/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 16.2 V/m; Power Drift = -0.136 dB  
Peak SAR (extrapolated) = 0.386 W/kg  
**SAR(1 g) = 0.220 W/kg; SAR(10 g) = 0.138 W/kg**  
Maximum value of SAR (measured) = 0.242 W/kg





Plot 4: Date/Time: 5/22/2014 10:58:50 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 837 \text{ MHz}$ ;  $\sigma = 0.892 \text{ mho/m}$ ;  $\epsilon_r = 41.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/1/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- 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) = 0.454 W/kg

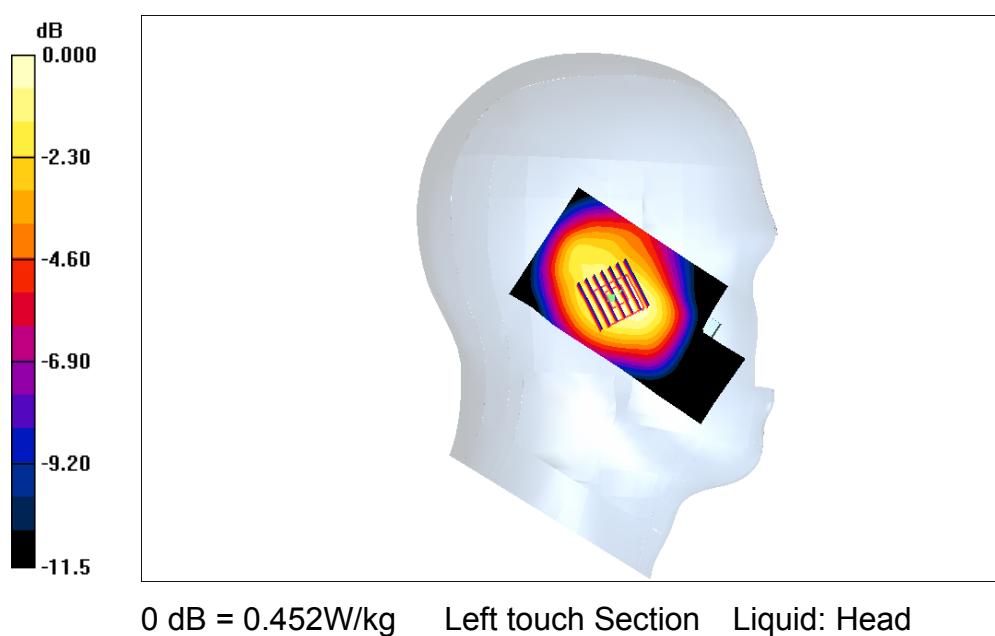
**Left touch/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 19.1 V/m; Power Drift = -0.176 dB

Peak SAR (extrapolated) = 0.647 W/kg

**SAR(1 g) = 0.421 W/kg; SAR(10 g) = 0.278 W/kg**

Maximum value of SAR (measured) = 0.452 W/kg





Plot 5: Date/Time: 5/23/2014 2:45:00 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 837 \text{ MHz}$ ;  $\sigma = 0.892 \text{ mho/m}$ ;  $\epsilon_r = 41.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.26, 6.26, 6.26); Calibrated: 8/1/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Right touchSIM2/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.543 W/kg

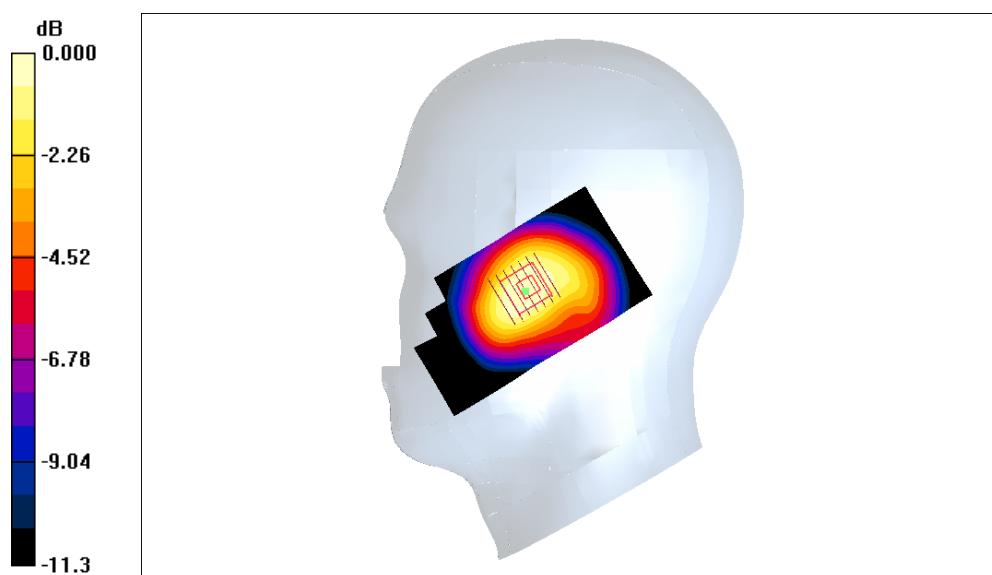
**Right touchSIM2/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 18.2 V/m; Power Drift = -0.180 dB

Peak SAR (extrapolated) = 0.653 W/kg

**SAR(1 g) = 0.473 W/kg; SAR(10 g) = 0.317 W/kg**

Maximum value of SAR (measured) = 0.506 W/kg



0 dB = 0.506W/kg   Right touch Section   Liquid: Head



Plot 6: Date/Time: 5/22/2014 6:07:12 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.4 \text{ mho/m}$ ;  $\epsilon_r = 40.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/1/2013
- 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

**Right touch/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.218 W/kg

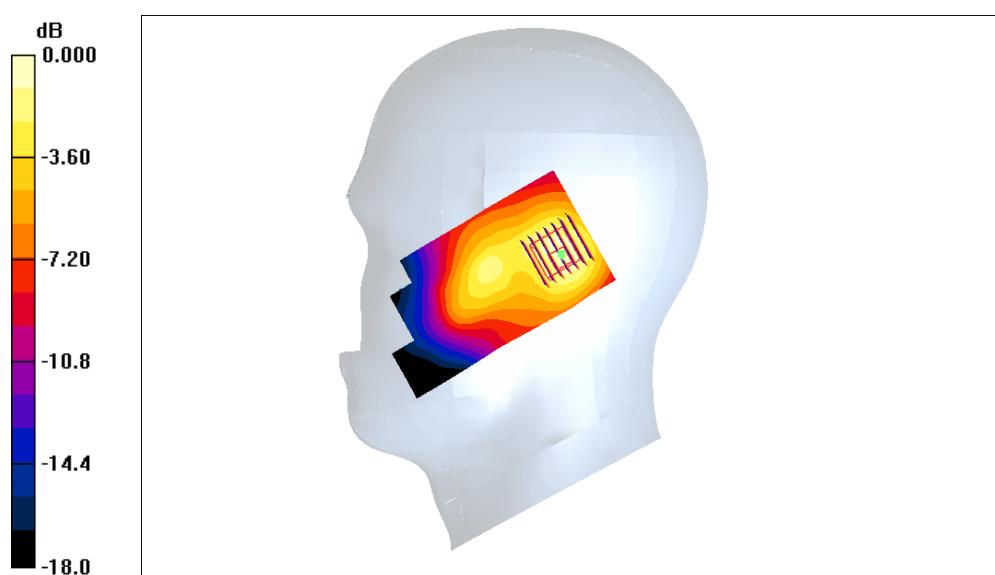
**Right touch/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 12.9 V/m; Power Drift = -0.108 dB

Peak SAR (extrapolated) = 0.420 W/kg

**SAR(1 g) = 0.211 W/kg; SAR(10 g) = 0.115 W/kg**

Maximum value of SAR (measured) = 0.233 W/kg



0 dB = 0.233W/kg Right touch Section Liquid: Head



Plot 7: Date/Time: 5/22/2014 5:41:37 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.4 \text{ mho/m}$ ;  $\epsilon_r = 40.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/1/2013
- 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

**Right tilt/Area Scan (51x91x1):** Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.247 W/kg

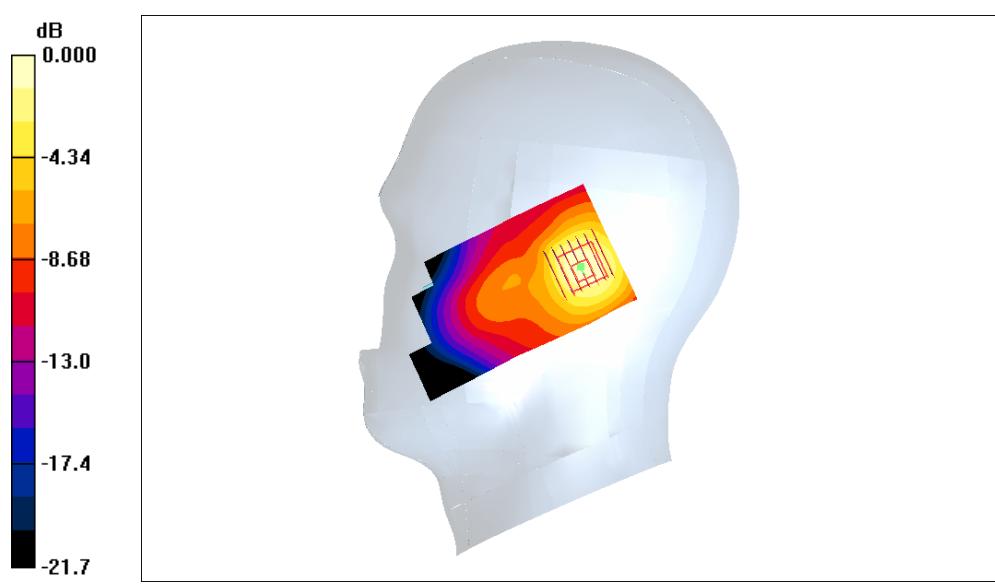
**Right tilt/Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.3 V/m; Power Drift = 0.024 dB

Peak SAR (extrapolated) = 0.469 W/kg

**SAR(1 g) = 0.237 W/kg; SAR(10 g) = 0.127 W/kg**

Maximum value of SAR (measured) = 0.266 W/kg



0 dB = 0.266W/kg   Right tilt Section   Liquid: Head



Plot 8: Date/Time: 5/22/2014 5:21:14 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.4 \text{ mho/m}$ ;  $\epsilon_r = 40.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/1/2013
- 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

**Left tilt/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.324 W/kg

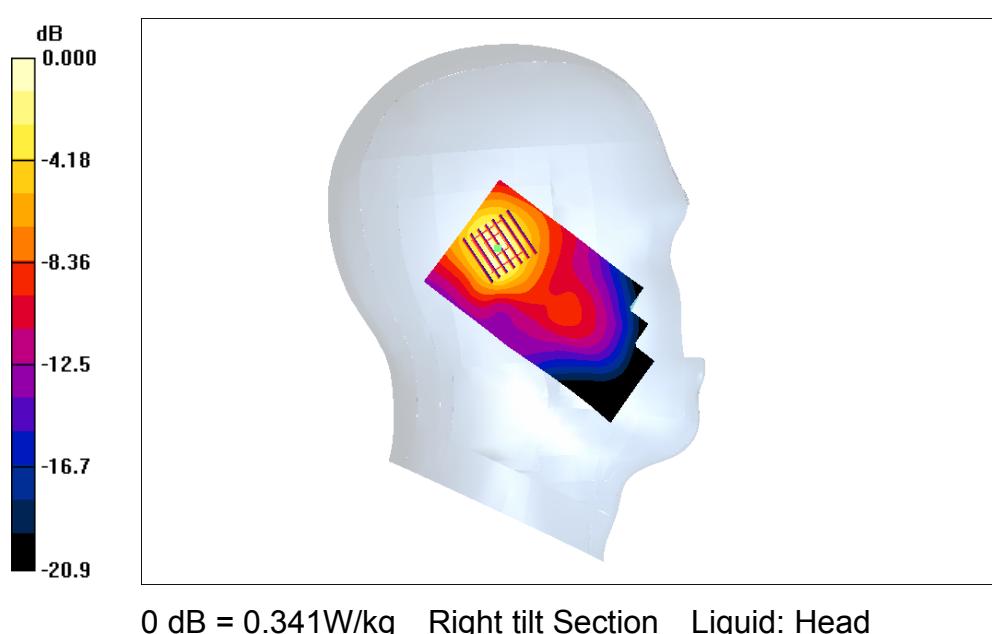
**Left tilt/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 14.7 V/m; Power Drift = 0.011 dB

Peak SAR (extrapolated) = 0.597 W/kg

**SAR(1 g) = 0.300 W/kg; SAR(10 g) = 0.148 W/kg**

Maximum value of SAR (measured) = 0.341 W/kg





Plot 9: Date/Time: 5/22/2014 5:02:49 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.4 \text{ mho/m}$ ;  $\epsilon_r = 40.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/1/2013
- 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

**Left touch/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.240 W/kg

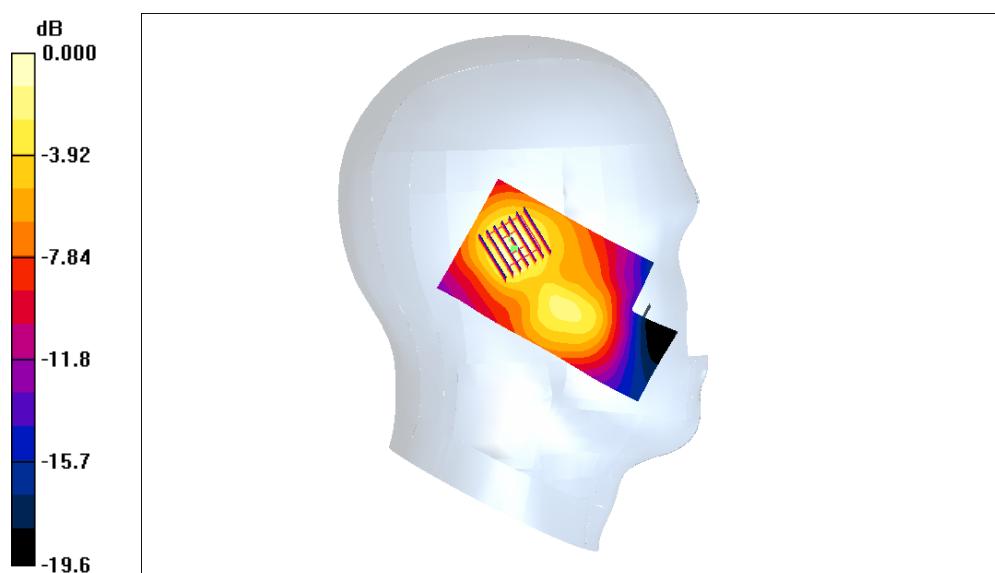
**Left touch/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 12.8 V/m; Power Drift = -0.138 dB

Peak SAR (extrapolated) = 0.442 W/kg

**SAR(1 g) = 0.232 W/kg; SAR(10 g) = 0.118 W/kg**

Maximum value of SAR (measured) = 0.260 W/kg



0 dB = 0.260W/kg   Left touch Section   Liquid: Head



Plot 10: Date/Time: 5/22/2014 8:27:23 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.4 \text{ mho/m}$ ;  $\epsilon_r = 40.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(5.21, 5.21, 5.21); Calibrated: 8/1/2013
- 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

**Left tilt 2-SIM2/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.320 W/kg

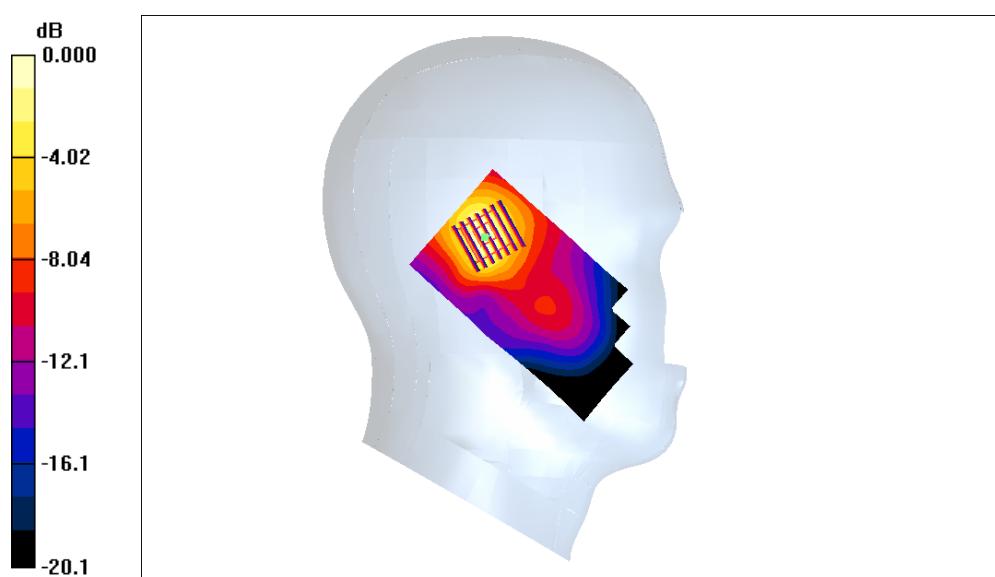
**Left tilt 2-SIM2/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 14.7 V/m; Power Drift = -0.045 dB

Peak SAR (extrapolated) = 0.601 W/kg

**SAR(1 g) = 0.300 W/kg; SAR(10 g) = 0.147 W/kg**

Maximum value of SAR (measured) = 0.340 W/kg



0 dB = 0.340W/kg   Left tilt Section   Liquid: Head



Plot 11: Date/Time: 5/23/2014 4:32:20 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 837 \text{ MHz}$ ;  $\sigma = 0.992 \text{ mho/m}$ ;  $\epsilon_r = 55.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.28, 6.28, 6.28); Calibrated: 8/1/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Worn With HS/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.231 W/kg

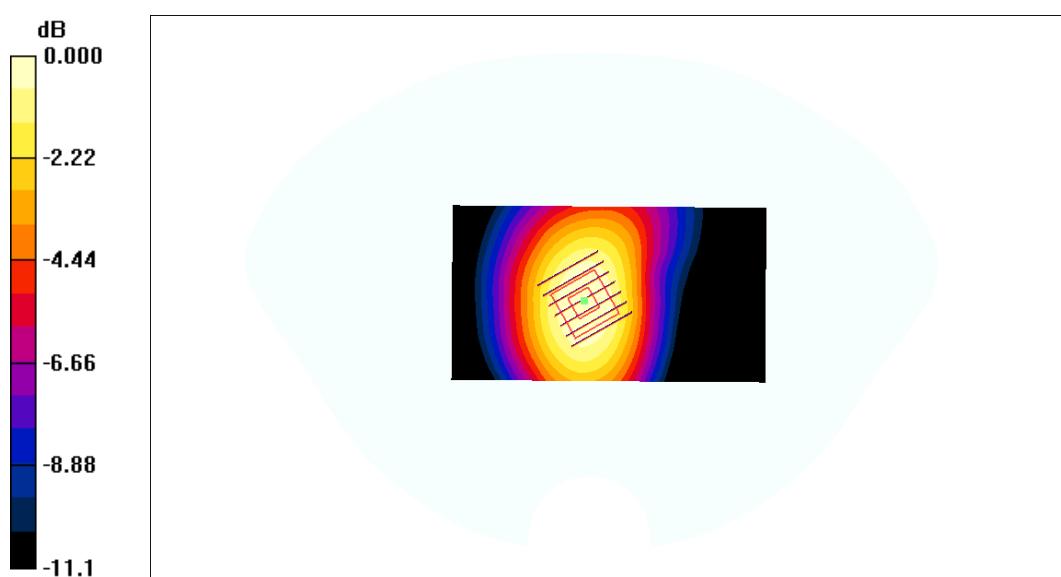
**Worn With HS/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 15.9 V/m; Power Drift = -0.483 dB

Peak SAR (extrapolated) = 0.278 W/kg

**SAR(1 g) = 0.201 W/kg; SAR(10 g) = 0.136 W/kg**

Maximum value of SAR (measured) = 0.216 W/kg



0 dB = 0.216W/kg   Flat Section   Liquid: Body



Plot 12: Date/Time: 5/23/2014 4:50:17 AM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

Communication System: GSM 850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used:  $f = 837 \text{ MHz}$ ;  $\sigma = 0.992 \text{ mho/m}$ ;  $\epsilon_r = 55.5$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(6.28, 6.28, 6.28); Calibrated: 8/1/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn689; Calibrated: 7/20/2013
- Phantom: SAM with TP1432; Type: SAM; Serial: Not Specified
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

**Front With HS/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.583 W/kg

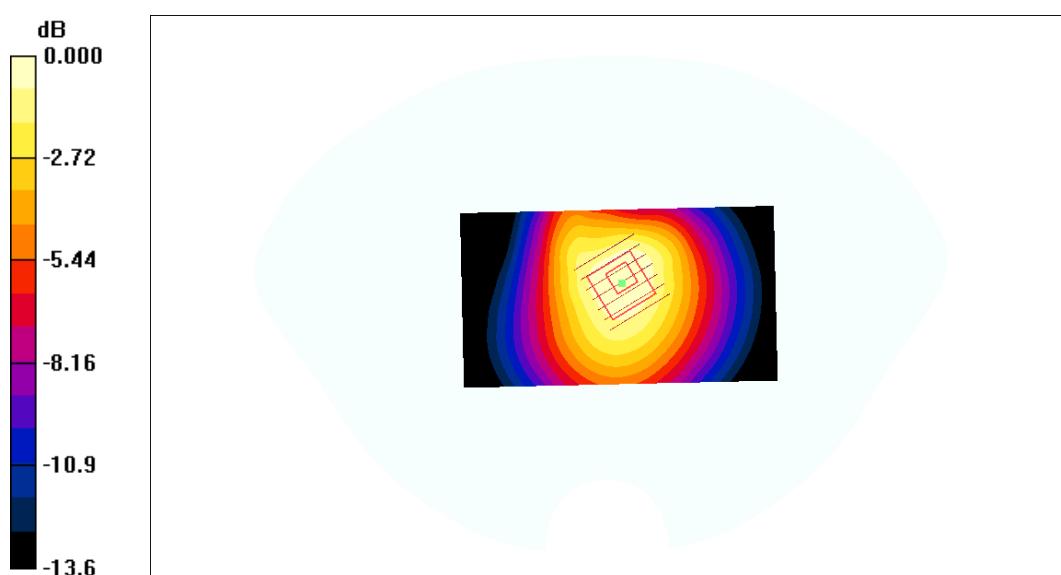
**Front With HS/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 22.3 V/m; Power Drift = -0.260 dB

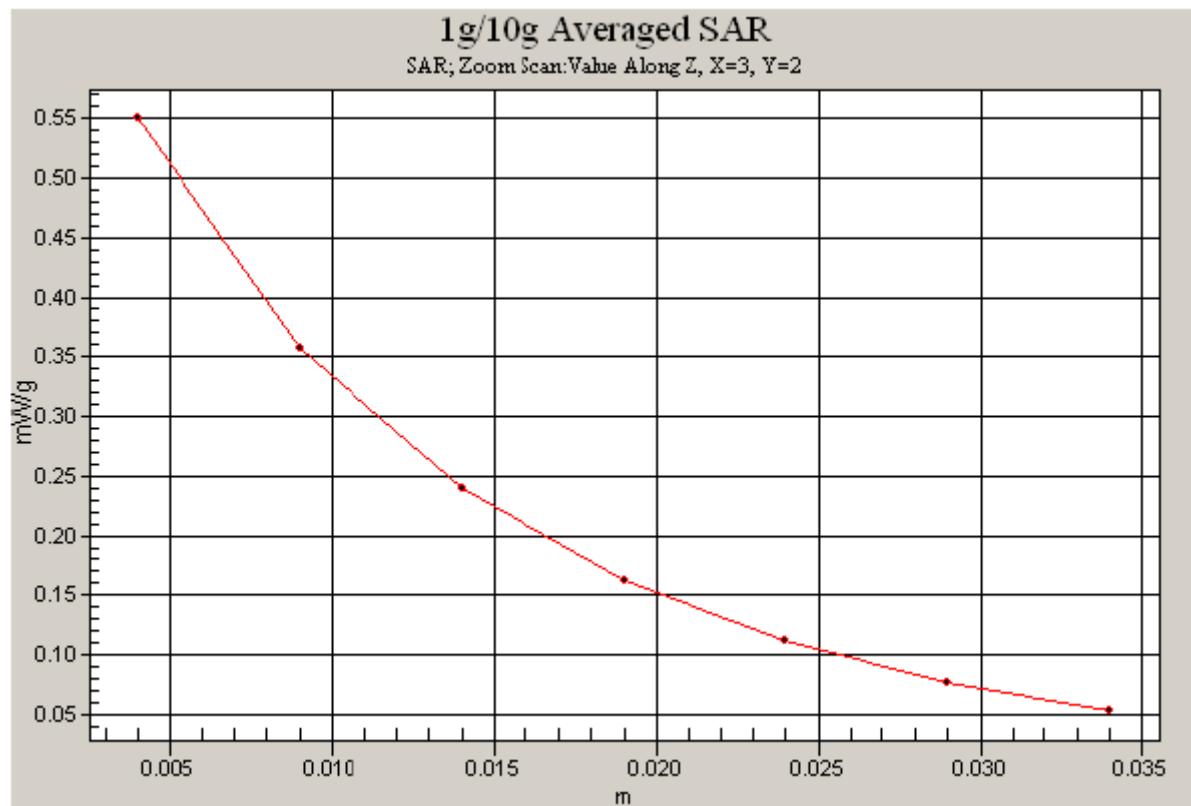
Peak SAR (extrapolated) = 0.775 W/kg

**SAR(1 g) = 0.512 W/kg; SAR(10 g) = 0.335 W/kg**

Maximum value of SAR (measured) = 0.550 W/kg



0 dB = 0.550W/kg Flat Section Liquid: Body





Plot 13: Date/Time: 5/23/2014 3:23:09 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number  
Program Name: MADETRONICS mini5130**

Communication System: GSM 1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3  
Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.54 \text{ mho/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(4.96, 4.96, 4.96); Calibrated: 8/1/2013
- 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 With HS/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.397 W/kg

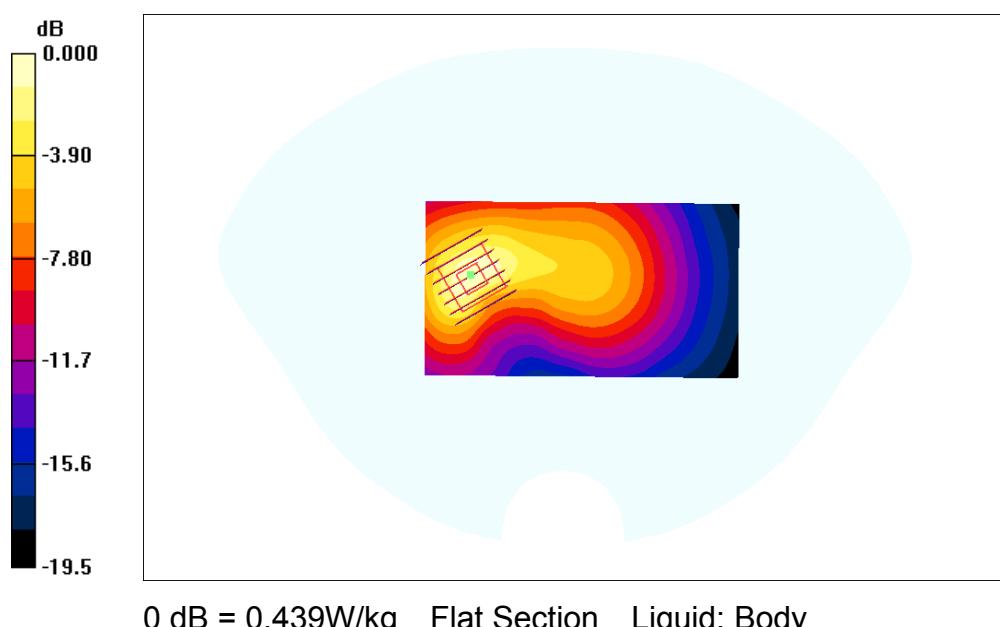
**Worn With HS/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 10.1 V/m; Power Drift = -0.001 dB

Peak SAR (extrapolated) = 0.654 W/kg

**SAR(1 g) = 0.385 W/kg; SAR(10 g) = 0.198 W/kg**

Maximum value of SAR (measured) = 0.439 W/kg





Plot 14: Date/Time: 5/23/2014 2:50:17 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

**DUT: MADETRONICS mini5130; Type: SI PIN; Serial: IMEI Number**

**Program Name: MADETRONICS mini5130**

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

Medium parameters used:  $f = 1880 \text{ MHz}$ ;  $\sigma = 1.54 \text{ mho/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

DASY4 Configuration:

- Probe: ES3DV3 - SN3028; ConvF(4.96, 4.96, 4.96); Calibrated: 8/1/2013
- 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

**Front With HS/Area Scan (51x91x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.101 W/kg

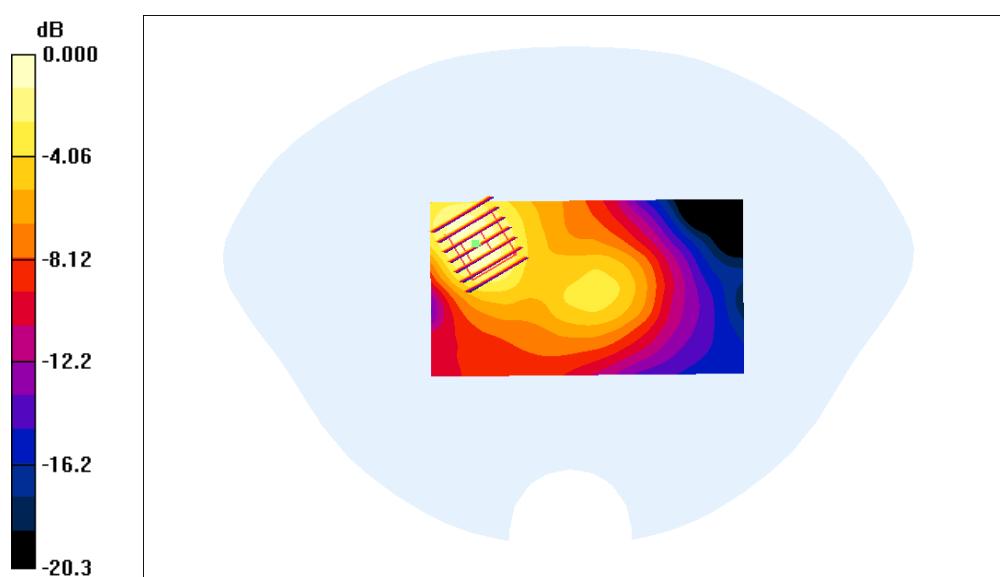
**Front With HS/Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 5.74 V/m; Power Drift = -0.053 dB

Peak SAR (extrapolated) = 0.150 W/kg

**SAR(1 g) = 0.091 W/kg; SAR(10 g) = 0.051 W/kg**

Maximum value of SAR (measured) = 0.102 W/kg



0 dB = 0.102W/kg   Flat Section   Liquid: Body



## Appendix C. Probe Calibration Data:



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Client	Sunway	Certificate No:	
<b>CALIBRATION CERTIFICATE</b>			
Object	ES3DV3 - SN:3028		
Calibration Procedure(s)	TMC-OS-E-02-195 Calibration Procedures for Dosimetric E-field Probes		
Calibration 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( $22\pm3$ )°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
Calibrated by:	Name	Function	Signature
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
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,D	, modulation dependent linearization parameters
Polarization $\Phi$	$\Phi$ rotation around probe axis
Polarization $\theta$	$\theta$ 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:**

- 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 300MHz to 3GHz)", February 2005

**Methods Applied and Interpretation of Parameters:**

- $NORMx,y,z$ : Assessed for E-field polarization  $\theta=0$  ( $f \leq 900\text{MHz}$  in TEM-cell;  $f > 1800\text{MHz}$ : waveguide).  $NORMx,y,z$  are only intermediate values, i.e., the uncertainties of  $NORMx,y,z$  does not effect 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 (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  $f \leq 800\text{MHz}$ ) 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  $NORMx,y,z * ConvF$  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  $\pm 50\text{MHz}$  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  $NORMx$  (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( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	1.06	1.17	1.14	$\pm 10.8\%$
DCP(mV) <sup>B</sup>	105.6	104.6	98.9	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB/ $\mu\text{V}$	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	193.3	$\pm 6.7\%$
		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%.

<sup>A</sup> The uncertainties of Norm X, Y, Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 5 and Page 6).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> 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] <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	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%

<sup>C</sup> 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.

<sup>F</sup> At frequency below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) 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 ( $\epsilon$  and  $\sigma$ ) 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] <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	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%

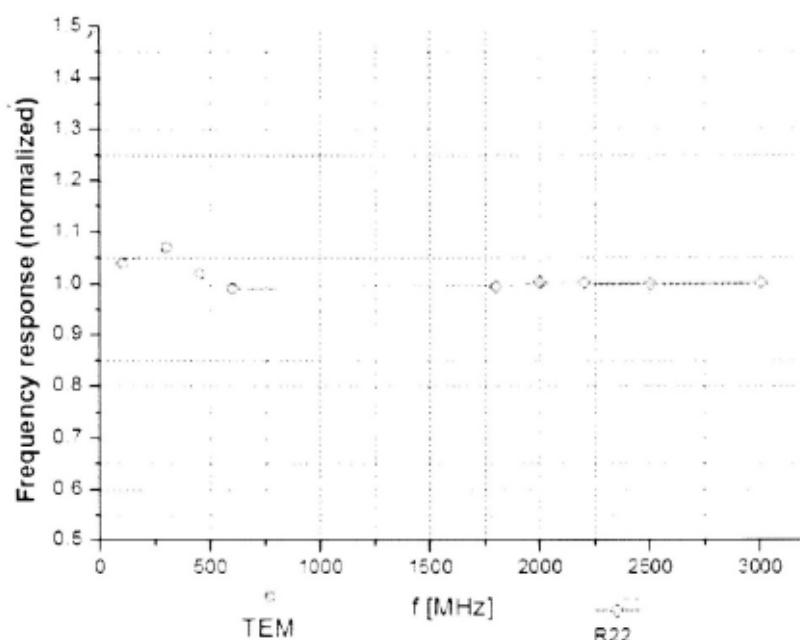
<sup>C</sup> Frequency validity of ±100MHz only applies for DASY v4.4 and higher (Page 2), else it is restricted to ±50MHz. The uncertainty is the RSS of ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequency below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) 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 ( $\epsilon$  and  $\sigma$ ) is restricted to ±5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.



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



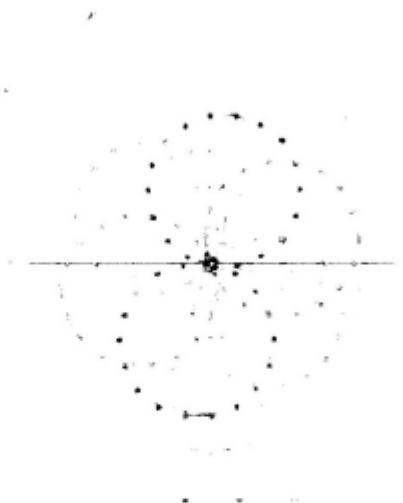
Uncertainty of Frequency Response of E-field:  $\pm 7.5\%$  ( $k=2$ )



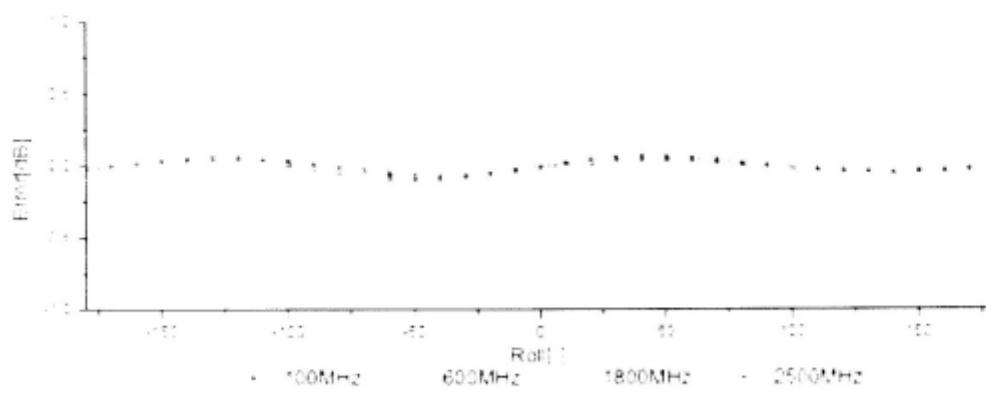
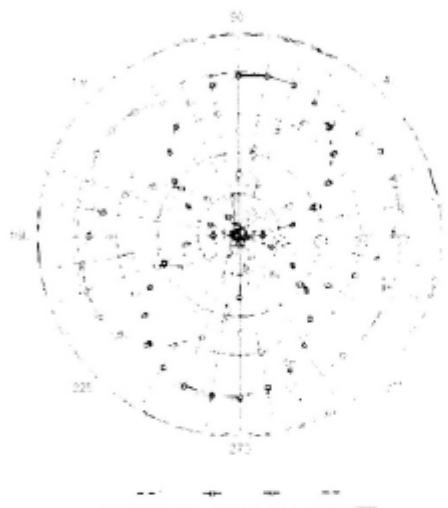
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### Receiving Pattern ( $\Phi$ ), $\theta=0^\circ$

f=600 MHz, TEM



f=1800 MHz, R22

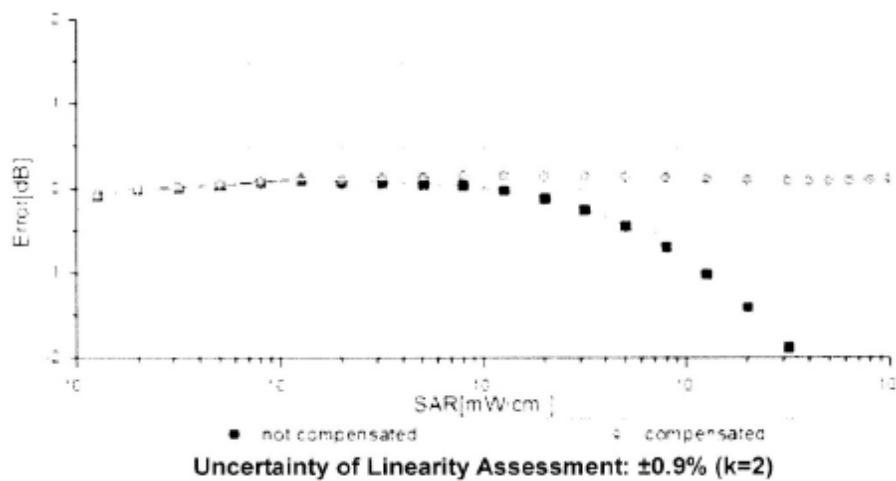
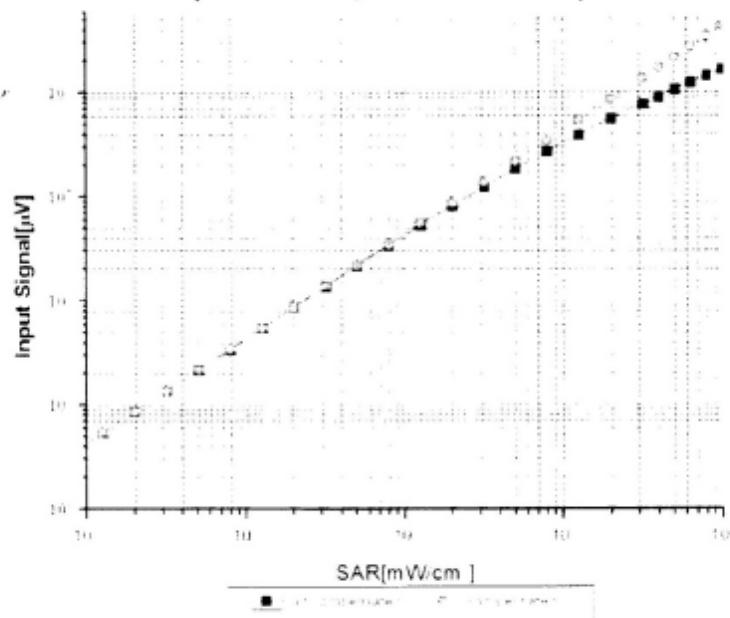


Uncertainty of Axial Isotropy Assessment:  $\pm 0.9\%$  (k=2)



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### Dynamic Range f(SAR<sub>head</sub>) (TEM cell, f = 900 MHz)

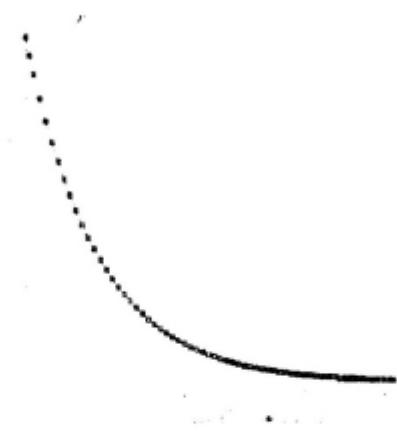




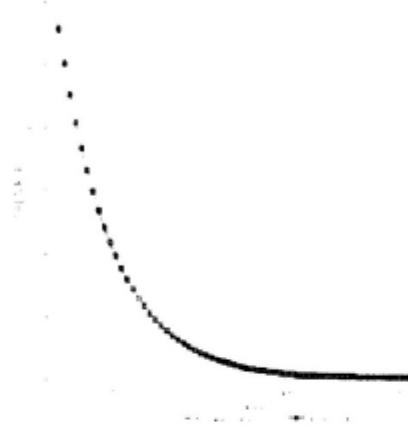
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## Conversion Factor Assessment

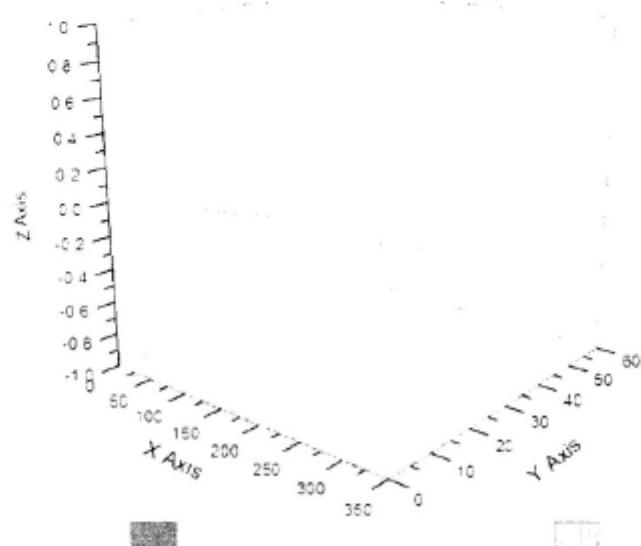
f=900 MHz, WGLS R9(H\_convF)



f=2450 MHz, WGLS R26(H\_convF)



## Deviation from Isotropy in Liquid



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

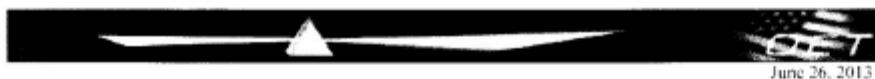


Add: No.52 Huguanbei Road, Haidian District, Beijing, 100191, China  
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504  
E-mail: Info@emcite.com Http://www.emcite.com

## 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

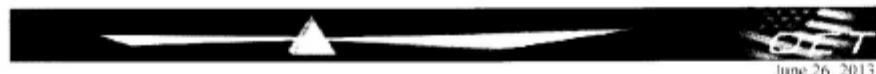


June 26, 2013

**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.



- 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.



# SHENZHEN SUNWAY COMMUNICATION CO.,LTD

Report NO.: TS201410503001

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## Appendix D. DAE Calibration Data:



In Collaboration with  
**s p e a g**  
CALIBRATION LABORATORY

Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China  
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504  
E-mail: <http://www.emcite.com>

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

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

Issued: August 5, 2013

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



Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China  
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504  
E-mail: <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.



Add: No.52 Huayuanbei Road, Haidian District, Beijing, 100191, China  
Tel: +86-10-62304633-2079 Fax: +86-10-62304633-2504  
E-mail: <http://www.cmcltc.com>

#### DC Voltage Measurement

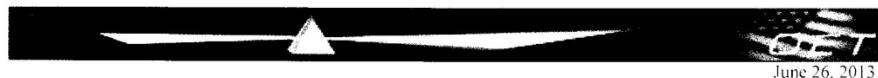
A/D - Converter Resolution nominal

High Range: 1LSB = 6.1 $\mu$ 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	$404.270 \pm 0.15\% \text{ (k=2)}$	$404.187 \pm 0.15\% \text{ (k=2)}$	$404.856 \pm 0.15\% \text{ (k=2)}$
Low Range	$3.95764 \pm 0.7\% \text{ (k=2)}$	$3.97509 \pm 0.7\% \text{ (k=2)}$	$3.99031 \pm 0.7\% \text{ (k=2)}$

#### Connector Angle

Connector Angle to be used in DASY system	$87.5^\circ \pm 1^\circ$
---	--------------------------

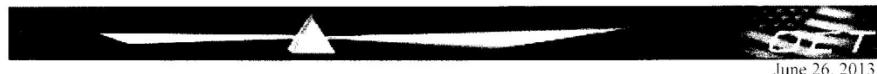


June 26, 2013

## 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.



- 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



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 Sunway

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 (IMTE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB97480704	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	US537390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by:

Name  
Leif KlynsnerFunction  
Laboratory TechnicianSignature  

Approved by:

Katja Pokovic

Technical Manager

Issued: June 6, 2013

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



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Report NO.: TS201410503001

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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

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 ± 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 ± 0.2) °C	40.4 ± 6 %	0.94 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	-----

**SAR result with Head TSL**

SAR averaged over 1 cm <sup>3</sup> (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 ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (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 ± 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 ± 0.2) °C	54.5 ± 6 %	1.00 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (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 ± 17.0 % (k=2)
SAR averaged over 10 cm <sup>3</sup> (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 ± 16.5 % (k=2)

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

Impedance, transformed to feed point	52.4 $\Omega$ - 2.8 $j\Omega$
Return Loss	- 28.8 dB

**Antenna Parameters with Body TSL**

Impedance, transformed to feed point	48.2 $\Omega$ - 4.5 $j\Omega$
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:  $f = 835$  MHz;  $\sigma = 0.94$  S/m;  $\epsilon_r = 40.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>  
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=15mm/Zoom Scan (7x7x7)/Cube 0:

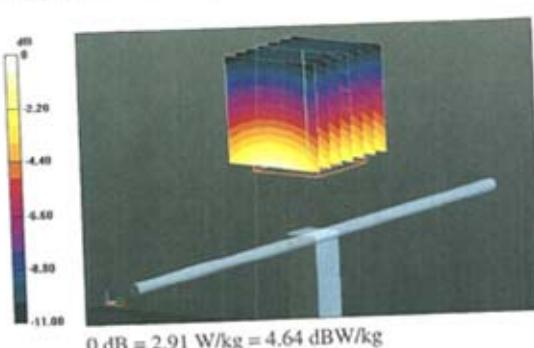
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

Peak SAR (extrapolated) = 3.76 W/kg

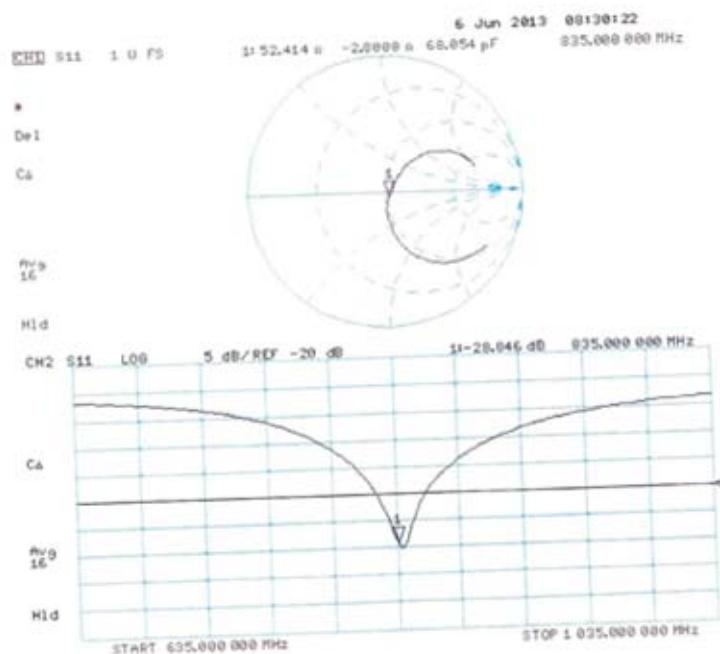
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.59 W/kg

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**

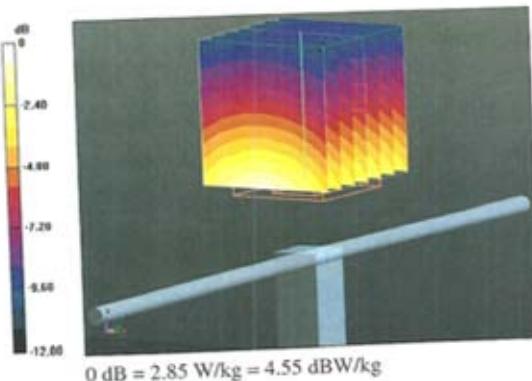
Communication System: UID 0 - CW ; Frequency: 835 MHz  
Medium parameters used:  $f = 835 \text{ MHz}$ ;  $\sigma = 1 \text{ S/m}$ ;  $\epsilon_r = 54.5$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section  
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

## 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)

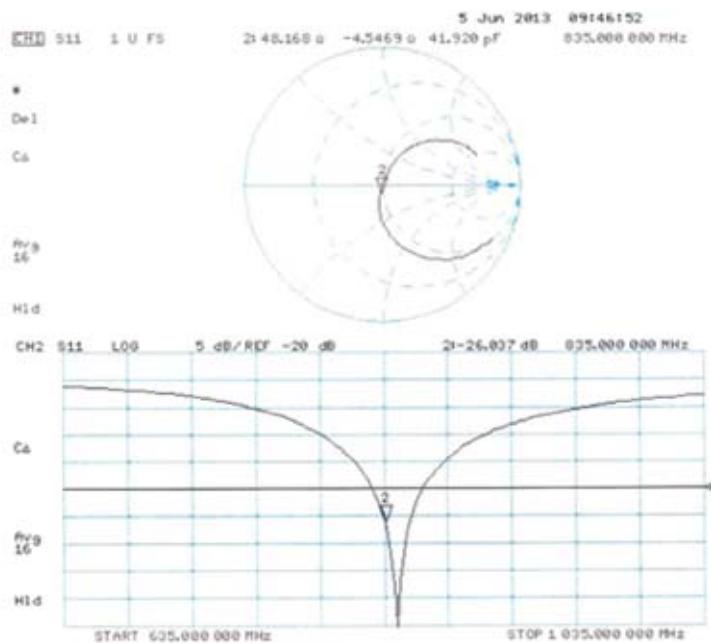
**Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:**

Measurement grid: dx=5mm, dy=5mm, dz=5mm  
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





# SHENZHEN SUNWAY COMMUNICATION CO., LTD

Report NO.: TS201410503001

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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 Sunway

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 ( $22 \pm 3$ )°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 Jelton Kastrati	Function Laboratory Technician	Signature 
Approved by:	Katja Pokovic	Technical Manager	

Issued: June 11, 2013

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



**Calibration Laboratory of**  
Schmid & Partner  
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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.

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 ± 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 ± 0.2) °C	39.3 ± 6 %	1.34 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

**SAR result with Head TSL**

SAR averaged over 1 cm <sup>3</sup> (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 ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (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 ± 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 ± 0.2) °C	53.7 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (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 ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (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 ± 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:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.34 \text{ S/m}$ ;  $\epsilon_r = 39.3$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(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:

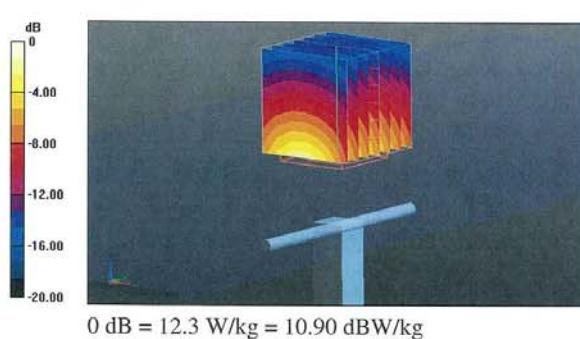
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 95.950 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 17.8 W/kg

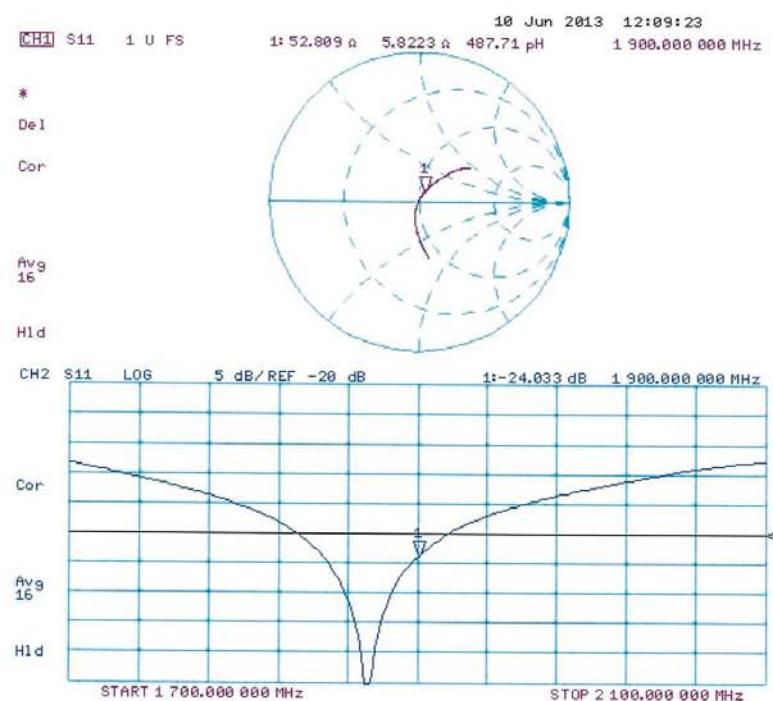
**SAR(1 g) = 9.83 W/kg; SAR(10 g) = 5.18 W/kg**

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





## 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:  $f = 1900 \text{ MHz}$ ;  $\sigma = 1.5 \text{ S/m}$ ;  $\epsilon_r = 53.7$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(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)

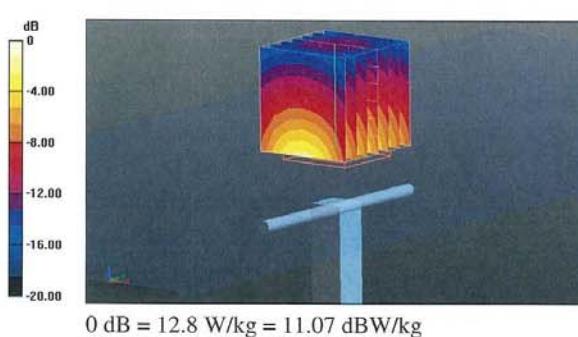
**Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 95.950 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 17.4 W/kg

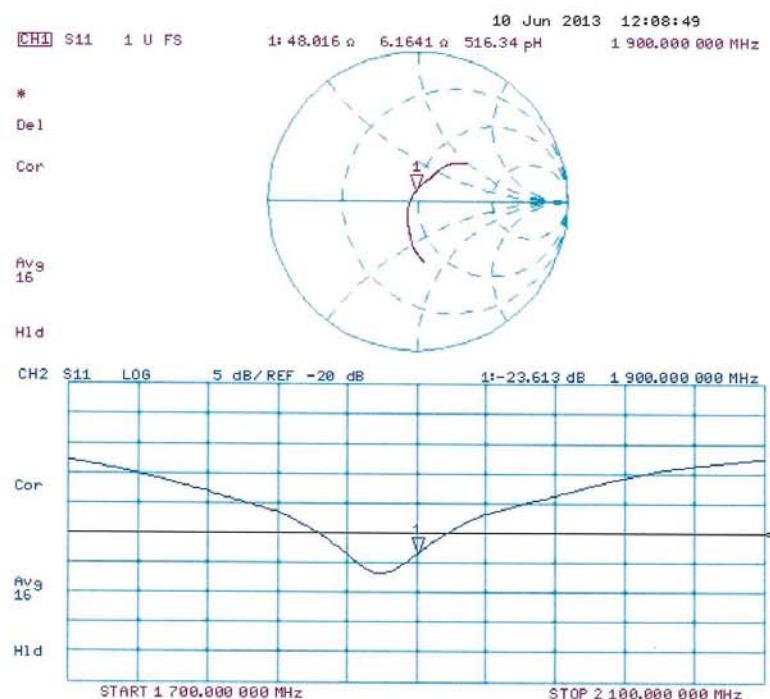
**SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.41 W/kg**

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





## Impedance Measurement Plot for Body TSL





**China National Accreditation Service for Conformity Assessment**

## **LABORATORY ACCREDITATION CERTIFICATE**

**(Registration No. CNAS L6487 )**

**Shenzhen Sunway Communication Co., Ltd. Testing Center**

1/F., Building A, SDG Info Port, Kefeng Road, Hi-Tech Park,  
Nanshan District, Shenzhen, Guangdong, China

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

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

Date of Issue: 2013-10-29

Date of Expiry: 2016-10-28

Date of Initial Accreditation: 2013-10-29

Date of Update: 2013-10-29

Signed on behalf of China National Accreditation Service  
for Conformity Assessment

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No.CNAS AL2

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\*\*\*\*\*END OF REPORT\*\*\*\*\*