FCC SAR EVALUATION REPORT

For

SANHO ELECTRONICS TECHNOLOGY CO.,LTD.

1/F, BLOCK 1, #1177 LINGYUN ROAD, NINGBO,CHINA

Product Name: Wireless Portable Storage Device

Model No. :iUSBport Mini

Date of Receipt:1 7 thJuly., 2013

Date of Test: 22thJuly., 2013

Issued Date:7thAug. 2013

Report No.:TS20130723003

Report Version:V1.0

Issue By

Shenzhen Sunway Communication CO.,LTD Testing Center

Building 9, Changxing High-tech Industrial Park, Wan'an Road, Shajing Town,

Bao'an District, Shenzhen 518104, P.R.China

SAR Evaluation compliance

Product Name:	Wireless Portable Storage Device
Brand Name:	Hyper Drive
Model Name:	iUSBport Mini
Applicant:	SANHO ELECTRONICS TECHNOLOGY CO.,LTD.
Address:	1/F, BLOCK 1, #1177 LINGYUN ROAD, NINGBO,CHINA
Manufacturer:	SANHO ELECTRONICS TECHNOLOGY CO.,LTD.
Address:	1/F, BLOCK 1, #1177 LINGYUN ROAD, NINGBO,CHINA
Applicable Standard and Test Guidance:	FCC Oet65 Supplement C, June 2001 KDB 447498 D01 General RF Exposure Guidance v05 KDB 447498 D02 SAR Procedures for Dongle Xmtr v02 KDB 941225 D01 SAR test for 3G devices v02 KDB 865664 D01 SAR measurement 100 MHz to 6 GHz v01 KDB 248227 D01 SAR measurement Procedures for 802.11 a/b/g Transmitters v01r02
Test Result:	Max. SAR Measurement (1g) 1g body Tissue: 0.103 mW/g
Performed Date:	22thJuly. 2013-7th Aug. 2013
Test Engineer:	Li Zhao
Reviewed By	Tony Liu
Performed Location:	Shenzhen Sunway Communication CO.,LTD Testing Center Address:Building 9, Changxing High-tech Industrial Park, Wan’an Road, Shajing Town, Bao’an District, Shenzhen 518104, P.R.China Tel: +86-755- 81773388 Fax: +86-755- 81773335

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1. General Information:

1.1 EUT Description:

EUT Information	
Product Name	Wireless Portable Storage Device
Brand Name	Hyper Drive
Model Name	iUSBport Mini
Hardware Version	2013/4/18
Software Version	V12
Device Category	Portable
Antenna Type	Fixed Internal Antenna
Battery	Type:Li-ion Polymer Battery 3.7V 950mAh
Dimensions (L*W*H):	92.5cm (L)× 45.5cm (W)× 1.5cm (H)
Weight:	50g
Power Source:	Battery 3.7V or DC 5V form PC
Normal Operation:	Body Worn

WIFI	
Wi-Fi Frequency	802.11b/802.11g/802.11n(HT20):2412MHz~2462MHz 802.11n(HT40): 2422MHz~2452MHz
Type of modulation	802.11b:Direct Sequence Spread Spectrum(DSSS) 802.11g/802.11n(HT20)/802.11n(HT40): Orthogonal Frequency Division Multiplexing (OFDM)
Data Rate	802.11b: 1/2/5.5/11 Mbps
	802.11g: 6/9/12/18/24/36/48/54 Mbps
	802.11n: up to 150 Mbps
Antenna Gain	0dBi

Max. Output Power(Conducted)	
802.11b	18.68dBm
802.11g	15.57dBm
802.11n-HT20	15.41dBm
802.11n-HT40	14.36dBm

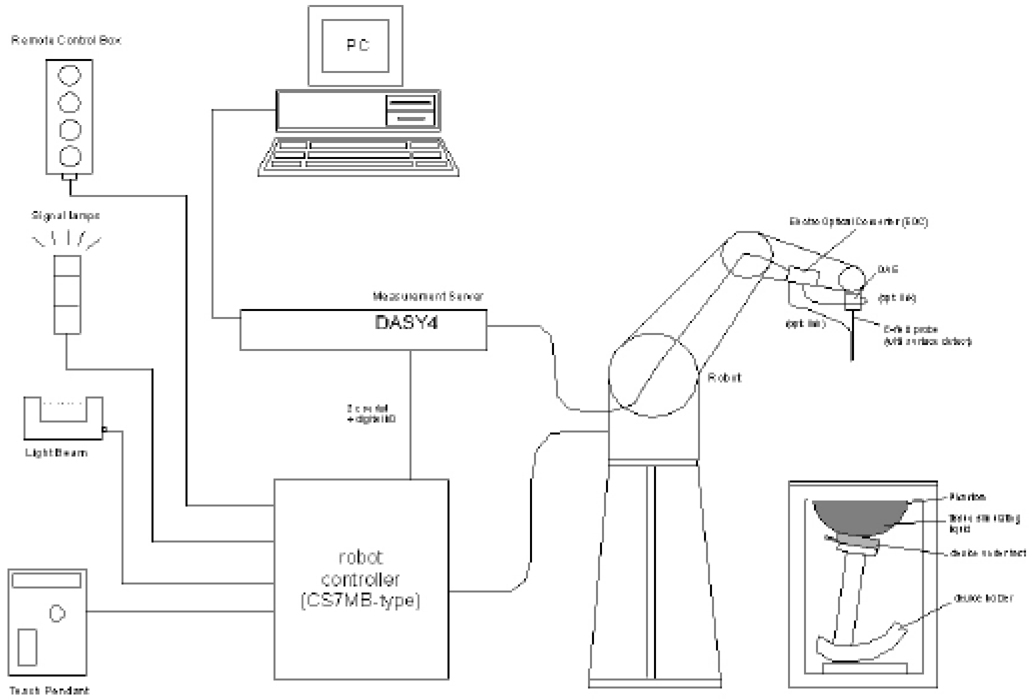
1.2 Test Environment:

Ambient conditions in the SAR laboratory:

Items	Required	Actual
Temperature (℃)	20-25	22~23
Humidity (%RH)	400-70	55~65

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

3. System Components:

- DAsY4 Measurement Server:

Calibration: No calibration required.

The DASY4 measurement server is based on aPC/104 CPU board with a 166MHz low-powerpentium, 32MB chipdisk and 64MB RAM. Thenecessary circuits for communication with eitherthe DAE4 (or DAE3) electronic box as well asthe 16-bit AD-converter system for optical detectionand digital I/O interface are contained on theDASY4 I/O-board, which is directly connected tothe PC/104 bus of the CPU board.

- DATA Acquisition Electronics (DAE):

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

Calibration: Recommended once a year

- Dosimetric Probes:

Model: EX3DV4,
Frequency: 10MHz to 6G, Linearity:±0.2dB,
Dynamic Range: 10 μW/g to100 mW/g
Directivity:
± 0.3 dB in HSL (rotation around probe axis)
± 0.5 dB in tissue material (rotation normal to probe axis)

Application: High Precision dosimetric measurements in any exposure scenario (e.g.,very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6GHz with precision of better 30%.

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 with2mm shell thickness (except the ear region where shellthickness increases to 6mm). It has three measurementareas:

• Left hand
• Right hand
• Flat phantom

The bottom plate contains three pair of bolts for locking the device holder. The deviceholder 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 waterevaporation and changes in the liquid parameters. On the phantom top, three referencemarkers 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 hastwo scales for the device rotation (with respect to the body axis) and the device inclination (withrespect to the line between the ear reference points). The rotation centers for both scales is theear reference point (ERP). Thus the device needs no repositioning when changing theangles.

The DASY device holder has been made out of low-loss POM material having the following dielectricparameters: relative permittivity "=3 and loss tangent _=0.02. The amount of dielectricmaterial has been reduced in the closest vicinity of the device, since measurements have suggestedthat 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)	2450MHz Body
Water	73.2
Salt	0.04
Sugar	0.00
HEC	0.00
Preventol	0.00
DGBE	26.7

4.2 Tissue Calibration Result:

Body Tissue Simulate Measurement:

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

Frequency (MHz)	Description	Dielectric Parameters		Tissue Temp Humidity
		ε_r	σ [s/m]	
2450MHz	Reference	52.7±5% (50.12~55.38)	1.95±5% (1.86~2.04)	N/A
	Measurement 2013-07-22	52.20	1.93	21.8℃,64%RH
	Measurement 2013-07-22	52.30	1.97	22.5℃,57%RH

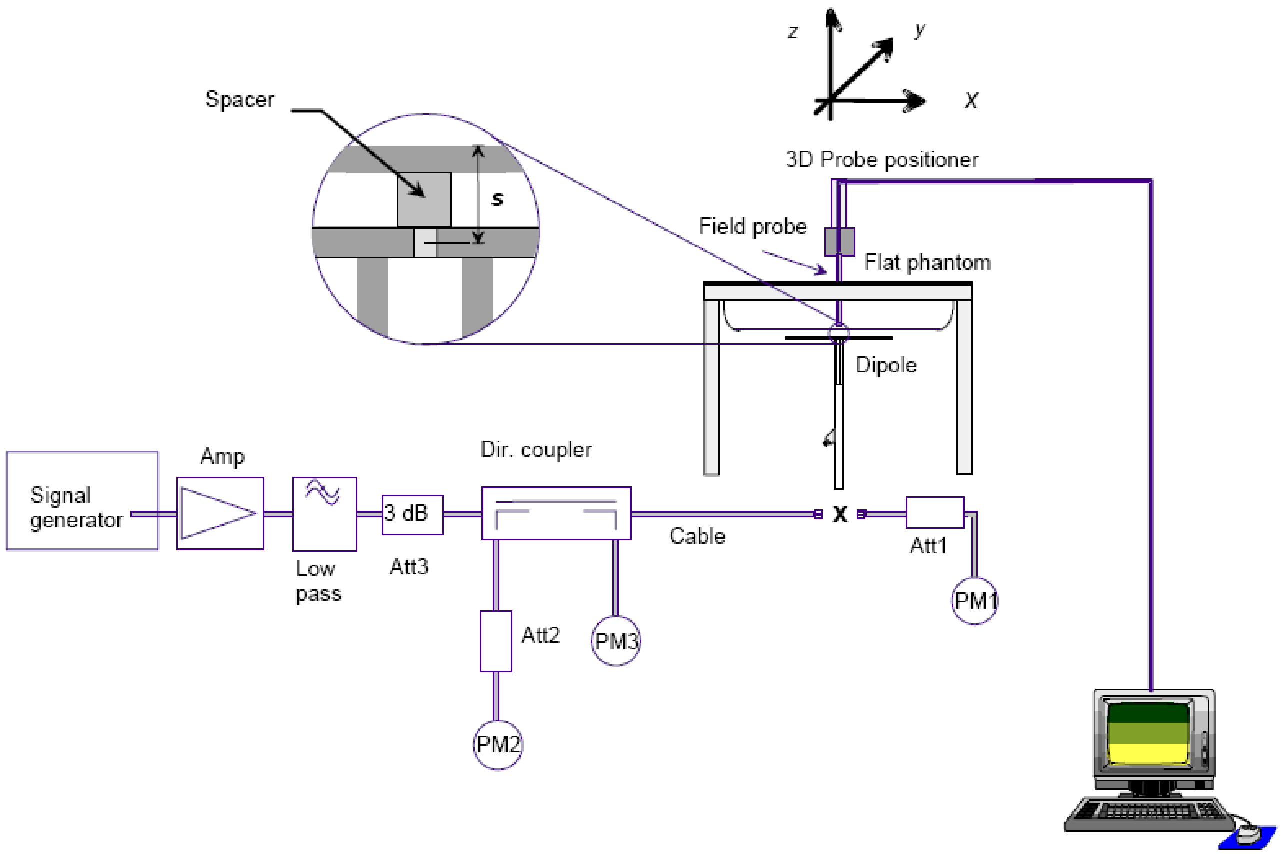
4.3 Tissue Dielectric Parameters for Head and Body Phantoms:

The tissue dielectric parameters recommended by the IEEE SCC-34/SC-2 in P1528have been incorporated in the following table:

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

5. SAR System Validation

5.1 Validation System:



5.2 Validation Dipoles:

The dipoles used is based on the IEEE-1528 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)
2450MHz	51.5	30.4	3.6

5.3 Validation Result:

System performance check at 2450MHz Validation Dipole: D2450V2-SN:884						
Frequency (MHz)	Description	SAR(1g) mW/g		SAR(10g) mW/g		Tissue Temp Humidity
		24dBm	Normalized to 1W	24dBm	Normalized to 1W	
2450MHz	Reference	12.8±10% (11.52~ 14.08)	50.3±10% (45.27~ 55.33)	5.98±10% (5.39~ 6.57)	23.7±10% (21.33~ 26.07)	N/A
	Validation 2013-07-22	12.2	48.8	5.68	22.72	21.8℃, 64%RH
	Validation 2013-07-22	12.5	50	5.72	22.88	22.5℃, 57%RH
Note: All system validation SAR values are measured at 24dBm 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 routinesimplemented 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 pointof the selected section in the phantom. When the Area Scan’s property sheet is brought-up, gridsettings 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 powerreference measurement job within the same procedure, and with the same settings. The PowerDrift Measurement gives the field difference in dB from the reading conducted within the last PowerReference 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
Instrument									
2	Probe calibration	7	N	2	1	1	3.5	3.5	∞
3	Axial isotropy	4.7	R		0.7	0.7	1.9	1.9	∞
4	Hemispherical isotropy	9.6	R		0.7	0.7	3.9	3.9	∞
5	Boundary effect	1.0	R		1	1	0.6	0.6	∞
6	Linearity	4.7	R		1	1	2.7	2.7	∞
7	Detection limits	1.0	R		1	1	0.6	0.6	∞
8	Readout electronics	0.3	N	1	1	1	0.3	0.3	∞
	Response time	0.8	R		1	1	0.5	0.5	∞
	Integration time	2.6	R		1	1	1.5	1.5	∞
	Ambient noise	3.0	R		1	1	1.7	1.7	∞
9	Ambient reflections	3.0	R		1	1	1.7	1.7	∞
10	Probe positioner mech. restrictions	0.4	R		1	1	0.2	0.2	∞
11	Probe positioning with respect to phantom shell	2.9	R		1	1	1.7	1.7	∞

12	Max.SAR evaluation	1.0	R		1	1	0.6	0.6	∞
Test sample related									
13	Device positioning	3.8	N	1	1	1	3.8	3.8	99
14	Device holder	5.1	N	1	1	1	5.1	5.1	5
15	Drift of output power	5.0	R		1	1	2.9	2.9	∞
Phantom and set-up									
16	Phantom uncertainty	4.0	R		1	1	2.3	2.3	∞
17	Liquid conductivity (target)	5.0	R		0.64	0.43	1.8	1.2	∞
18	Liquid conductivity (meas)	2.5	N	1	0.64	0.43	1.6	1.2	∞
19	Liquid Permittivity (target)	5.0	R		0.6	0.49	1.7	1.5	∞
20	Liquid Permittivity (meas)	2.5	N	1	0.6	0.49	1.5	1.2	∞
Combined standard			RSS	$U_C = \sqrt{\sum_{i=1}^{n} C_i^2 U_i^2}$			12.2%	11.9%	236
Expanded uncertainty (P=95%)		$U = k U_C$,k=2					24.4%	23.8%	

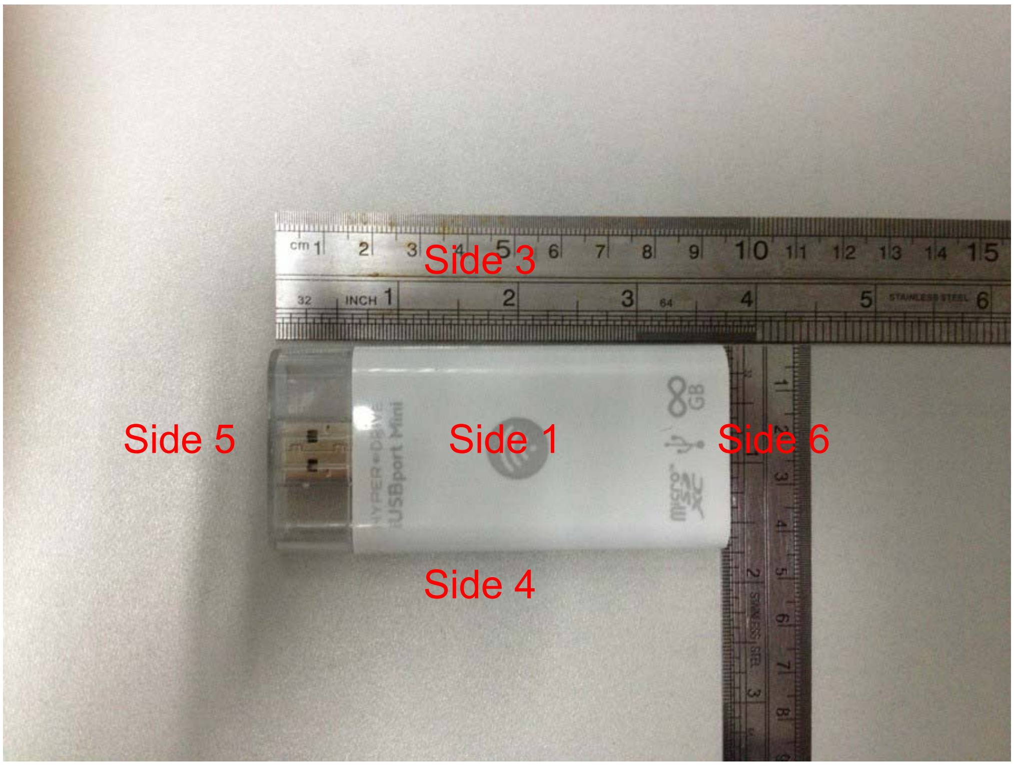
9. Conducted Power Measurement:

Band	Channel	Frequency (MHz)	Peak Power (dBm)
802.11b	CH01	2412	18.68
	CH06	2437	18.67
	CH11	2462	18.59
802.11g	CH01	2412	15.57
	CH06	2437	15.37
	CH11	2462	15.43
802.11n (20MHz)	CH01	2422	15.37
	CH06	2437	15.41
	CH11	2452	15.38
802.11n (40MHz)	CH01	2422	14.27
	CH06	2437	14.38
	CH11	2452	14.23

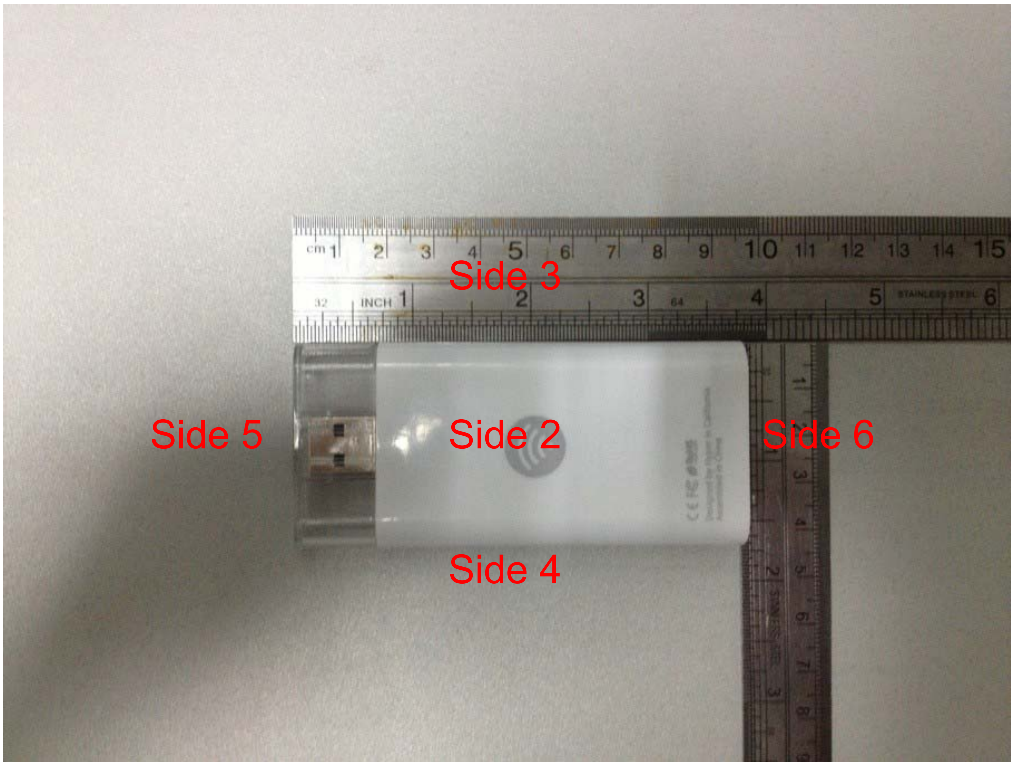
Note: According to the output value listed above.SAR is not require for 802.11g/nchannels when the maximum average output. Power is less than that measured on the corresponding 802.11b channel01.

10. Test photos and results:

10.1 DUT photos:



Front side



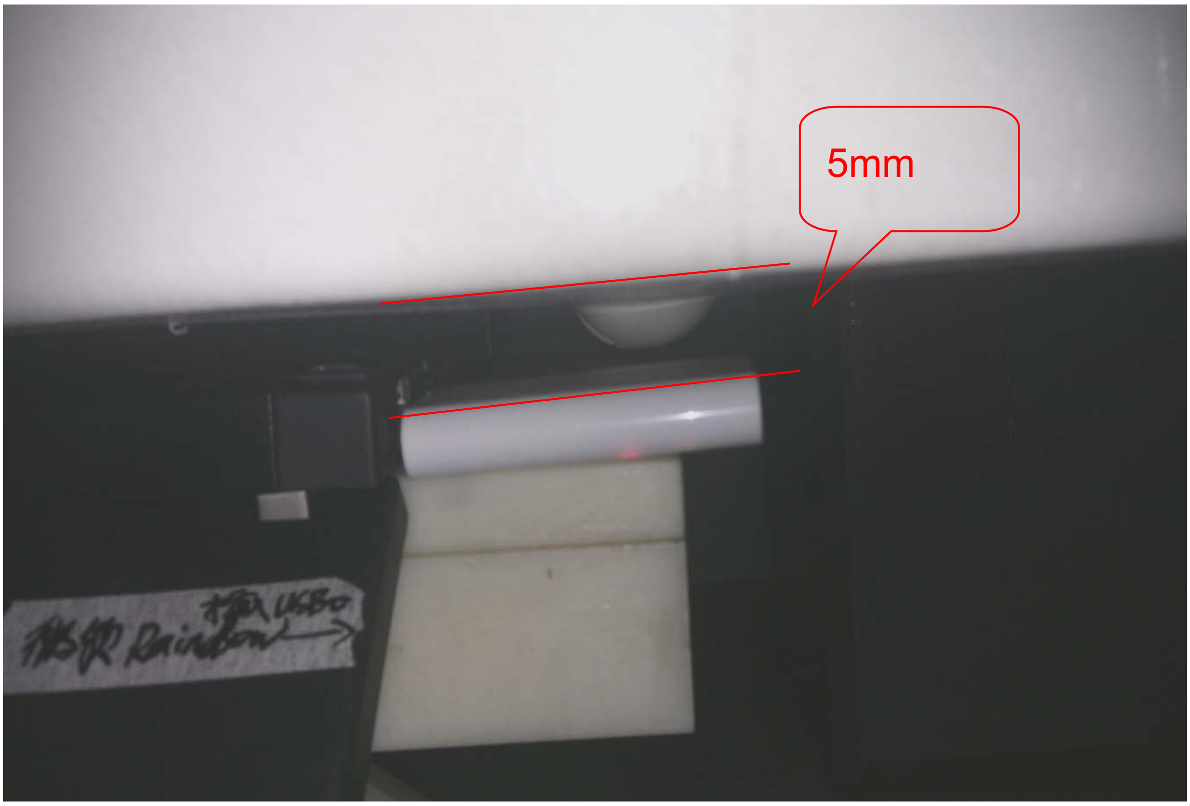
Back side

Horizontal USB Port used for test side1&2

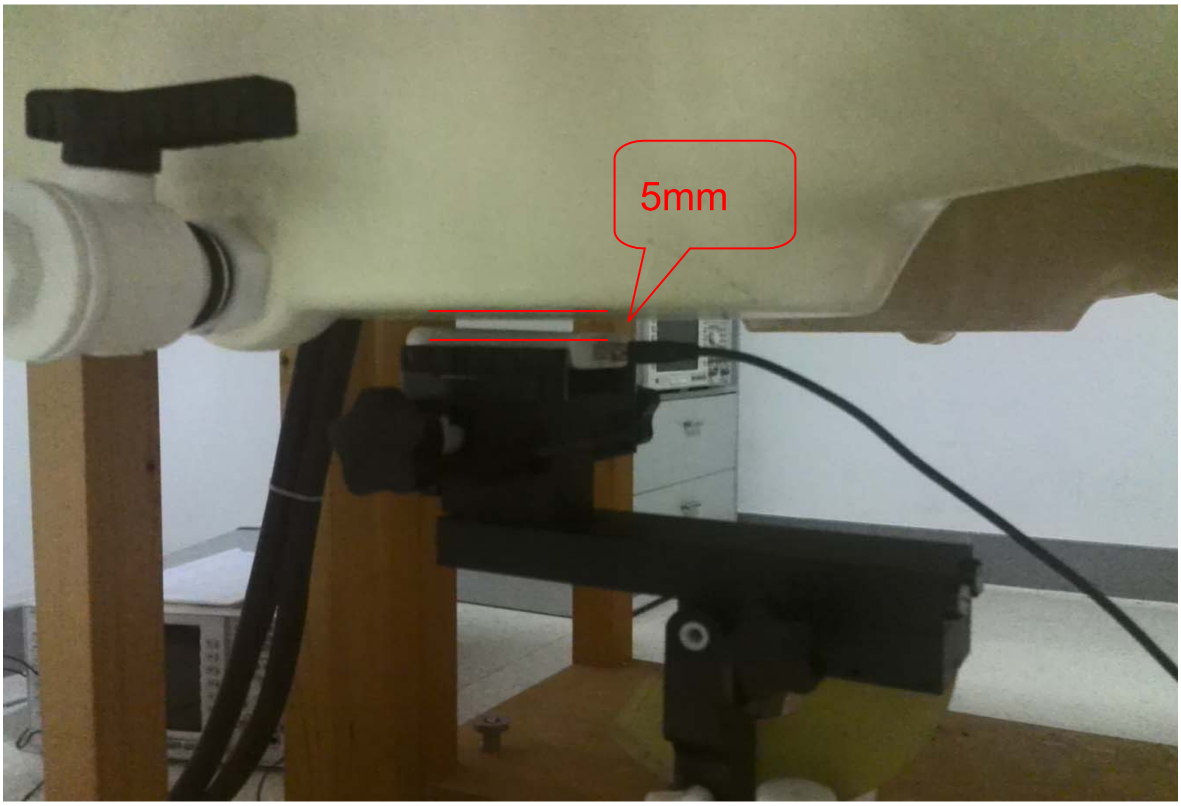
Vertical USB Port used for test side 3&4

To Edge	Distance
Side 1	2mm
Side 2	10mm
Side 3	7mm
Side 4	30mm
Side 6	21mm
Software	TR537xQA
Transmit power	18dBm
Test Laptop	ThinkPad T61

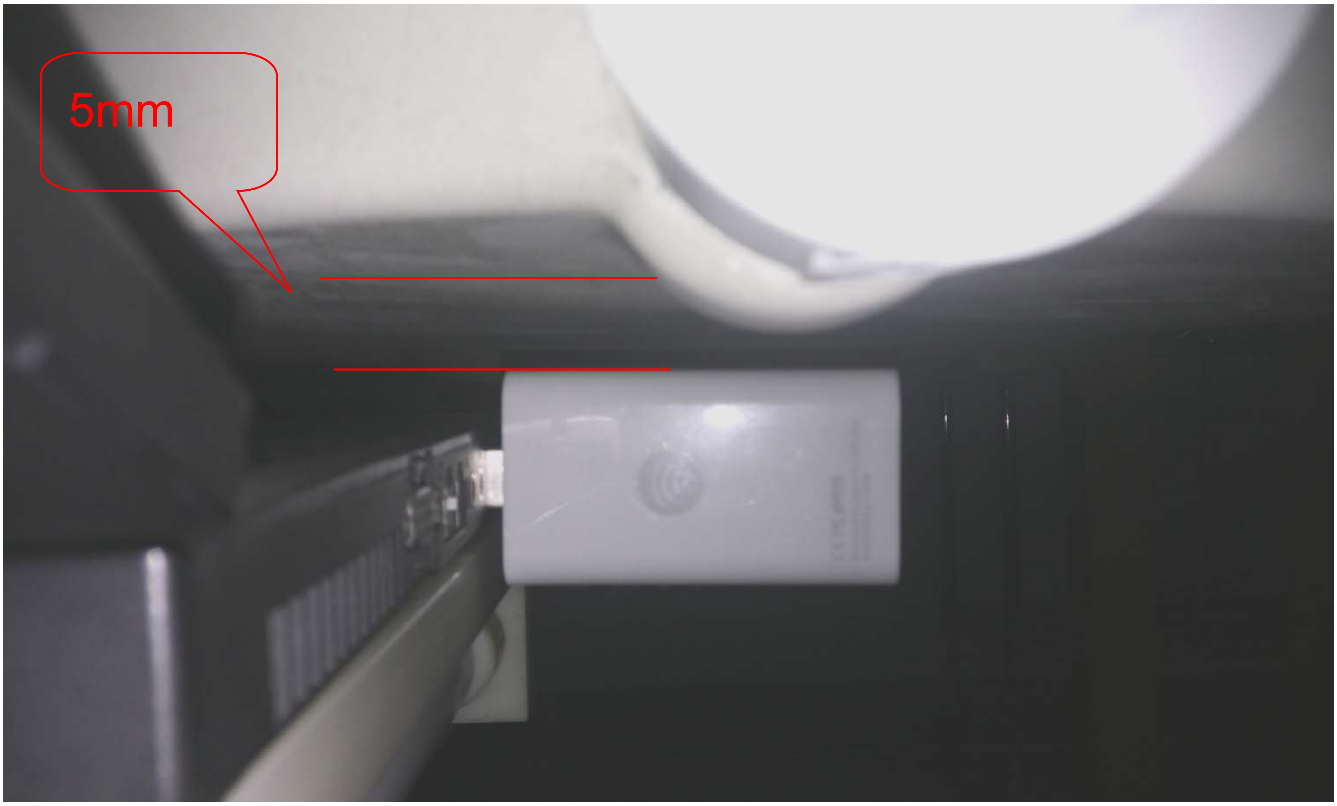
10.2 Setup photos:



Side 2

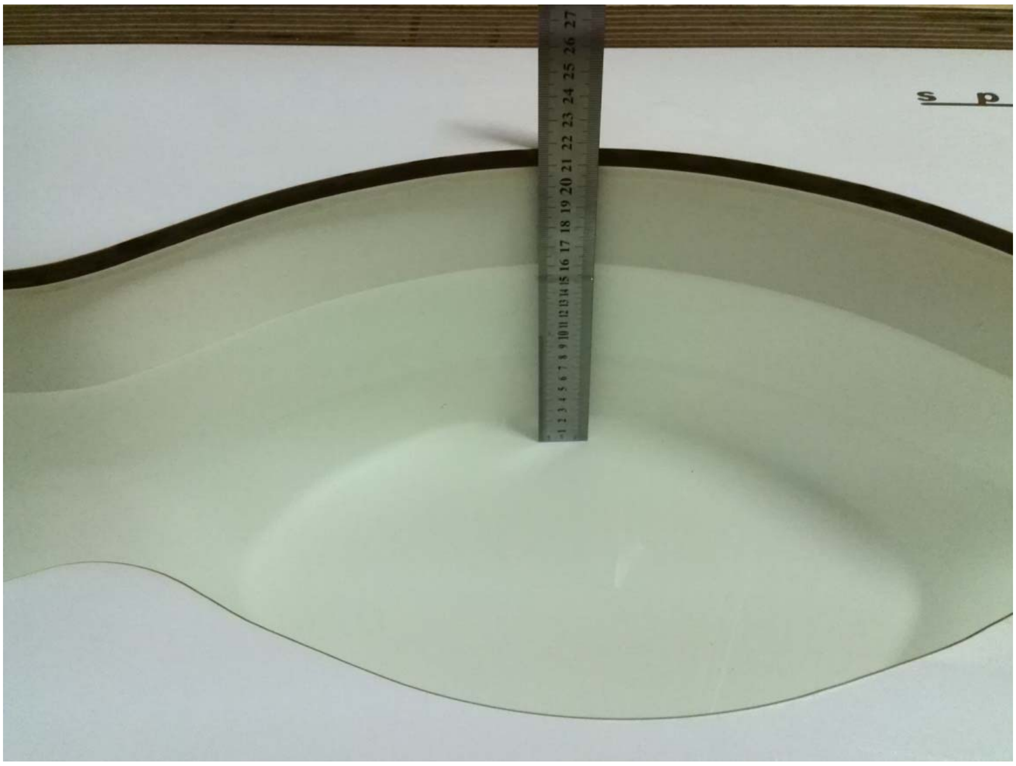


Side 1 (connect to PC with USB cable less than 12 inch)



Side 3

Side 4



Liquid depth (15cm)

10.3 SAR result summary:

Body (0mm between DUT and Phantom)

Test Case of Body					Result(mW/g) 1g Average	Power Drift <±0.2dB	Data Slot
Band	Test Position	Separation	Channel	Liquid			
802.11b	Side 1	5mm	CH1	Body	**0.095**	-0.013	Plot 1
		5mm	CH6		0.084	0.109	Plot 2
		5mm	CH11		0.091	0.17	Plot 3
	Side 2	5mm	CH1		0.025	-0.17	Plot 4
	Side 3	5mm	CH1		0.007	0.173	Plot 5
	Side 4	5mm	CH1		0.005	0.186	Plot 6

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

10.4 Scale SAR result:

The device’s power specific is 18±1dBm,so the target power is 19dBm.
Scale Factor=Target Power/Measurement Power
Scale SAR=Measurement SAR*Scale Factor

Mode	Channel/ Position	Measurement Power	Target Power	Scale Factor	Measurement SAR	Scale SAR
802.b	CH1/ Side 1	73.79mw (18.68dBm)	79.43mw (19dBm)	1.08	0.095 mw/g	0.103mw/g
	CH6/ Side 1	73.62mw (18.67dBm)		1.08	0.084 mw/g	0.090mw/g
	CH11/ Side 1	72.28mw (18.59dBm)		1.10	0.091 mw/g	0.100mw/g
	CH1/ Side 2	73.79mw (18.68dBm)		1.08	0.025 mw/g	0.027mw/g
	CH1/ Side 3	73.79mw (18.68dBm)		1.08	0.007 mw/g	0.008mw/g
	CH1/ Side 4	73.79mw (18.68dBm)		1.08	0.005 mw/g	0.006mw/g

Note:1 The SAR test shall be performaed at the high , middle and low frequency channels of each operation mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0dB (<0.8 mw/g) lower than the SAR limit,testing at the high and low channels is optional.

2. Middle and Higher frequencies were measured at the worst case.
3. SAR is not required for 802.11g/n channels when the maximum average output power is less than 0.25dB higher than that measure on the corresponding 802.11b channels.

Above all, the max SAR value is 0.103 mw/g.

11. Equipment List:

NO.	Instrument	Manufacture	Model	S/N	Cal. Date	Cal. Due Date
1	E-field Probe	Speag	EX3DV4	3753	Jan 16th 2013	Jan 17th 2014
2	Dielectric Probe Kit	Speag	DAK 3.5mm Probe	1038	N/A	N/A
3	Network analyzer	Agilent	E5071C	MY46213515	22nd Mar. 2013	22nd Mar. 2014
4	DAE	Speag	DAE4	914	Jan 16th 2013	Jan 17th 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	Signal Generator	Agilent	E4438C	MY49072279	Dec 26th 2012	Dec 26th 2013
9	Amplifier	Mini-circult	ZHL-42W	QA098002	N/A	N/A
10	Power Meter	Agilent	N1419A	MY50001563	Dec 26th 2012	Dec 26th 2013
11	Power Sensor	Agilent	N8481H	MY51020010	Dec 26th 2012	Dec 26th 2013
12	Directional Coupler	Agilent	778D	MY48220607	Dec 26th 2012	Dec 26th 2013
13	Dipole 2450MHz	Speag	D2450V2	884	Feb 29th 2012	Feb 29th 2014

Appendix A. System validation plots:

Date/Time: 7/22/2013 09:02:53 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

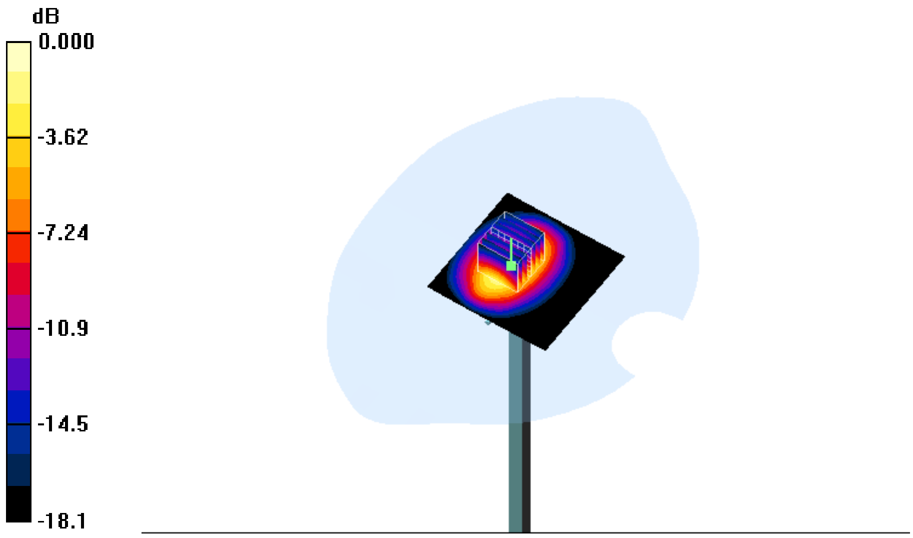
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884
Program Name: System Performance Check at 2450 MHz

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.93 mho/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(6.90, 6.90, 6.90); Calibrated: 1/17/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 1/16/2013
- 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=15mm, dy=15mm
Maximum value of SAR (interpolated) = 12.8 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 81.2 V/m; Power Drift = 0.127dB
Peak SAR (extrapolated) = 23.4 W/kg
SAR(1 g) = 12.2 mW/g; SAR(10 g) = 5.68 mW/g
Maximum value of SAR (measured) = 13.6 mW/g



0 dB = 9.93mW/g

Date/Time:7/22/2013 08:34:27 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

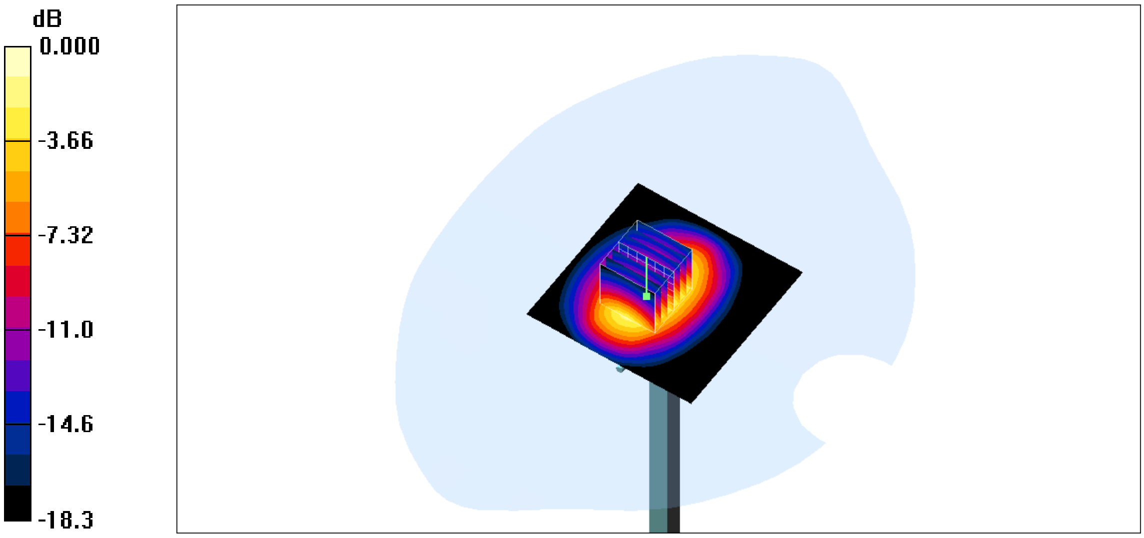
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884
Program Name: System Performance Checkat 2450 MHz

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.97 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(6.90, 6.90, 6.90); Calibrated: 1/17/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 1/16/2013
- 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=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14 mW/g

d=15mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 84.1 V/m; Power Drift = 0.029dB
Peak SAR (extrapolated) = 25.6 W/kg
SAR(1 g) = 12.5 mW/g; SAR(10 g) = 5.72 mW/g
Maximum value of SAR (measured) = 14.3 mW/g



0 dB = 14.4mW/g

Appendix B. SAR Test plots:

Plot 1: Date/Time: 7/22/2013 11:05:54 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

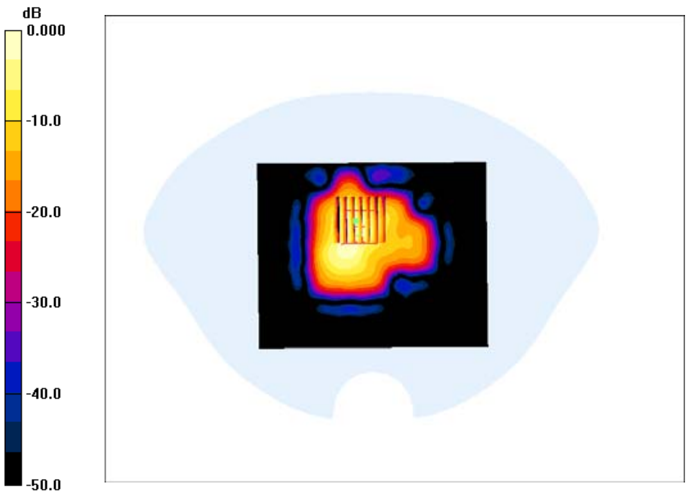
DUT: iUSBport Mini; Type: Table; Serial: Not Specified
Program Name: G7CS

Communication System: 802.11; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.93 mho/m; εr = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

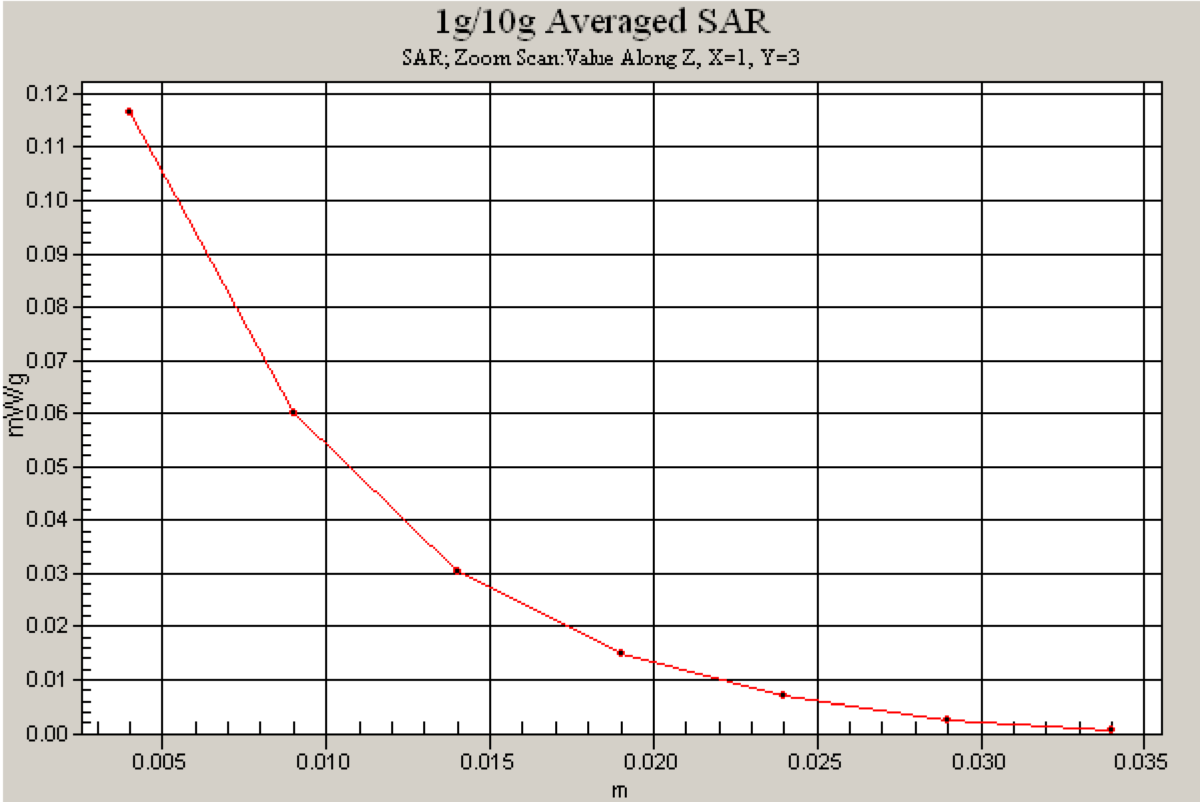
DASY4 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(6.90, 6.90, 6.90); Calibrated: 1/17/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 1/16/2013
- Phantom: SAM with TP1360; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Side 1/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.090 mW/g

Side 1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.50 V/m; Power Drift = -0.013 dB
Peak SAR (extrapolated) = 0.216 W/kg
SAR(1 g) = 0.095 mW/g; SAR(10 g) = 0.037 mW/g
Maximum value of SAR (measured) = 0.117 mW/g



0 dB = 0.117mW/g


1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=1, Y=3
0.12
0.11
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
mW/g
0.005
0.010
0.015
0.020
0.025
0.030
0.035
m

Plot 2: Date/Time:7/22/2013 11:26:27 PM

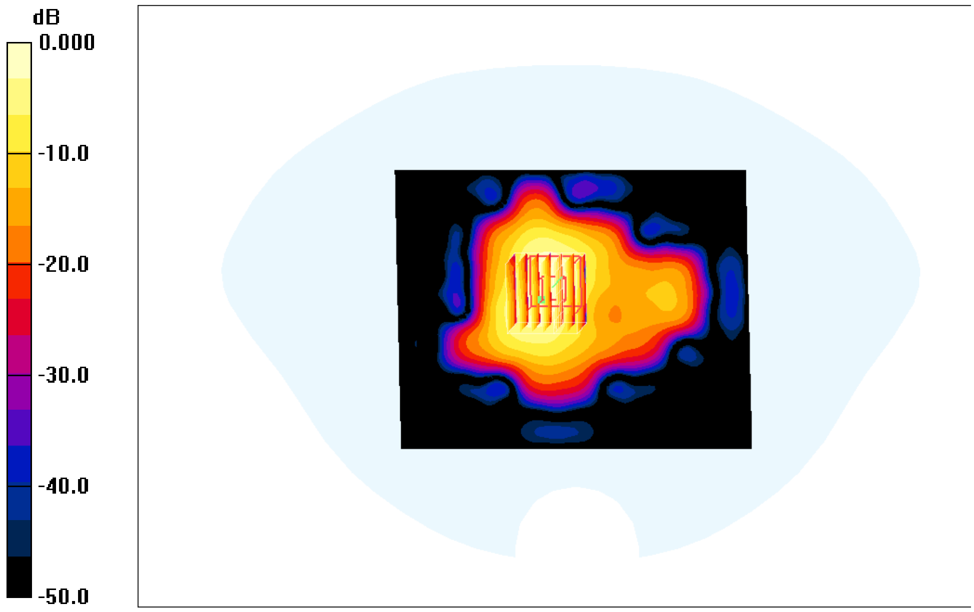
Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

DUT: iUSBport Mini; Type: Table; Serial: Not Specified
Program Name: G7CS

Communication System: 802.11; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.97 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(6.90, 6.90, 6.90); Calibrated: 6/18/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 6/11/2013
- Phantom: SAM with TP1360; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Side 1-2/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.132 mW/g
Side 1-2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.22 V/m; Power Drift = 0.109 dB
Peak SAR (extrapolated) = 0.326 W/kg
SAR(1 g) = 0.084 mW/g; SAR(10 g) = 0.041 mW/g
Maximum value of SAR (measured) = 0.110 mW/g



0 dB = 0.110mW/g

Plot 3: Date/Time:7/22/2013 11:54:09 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

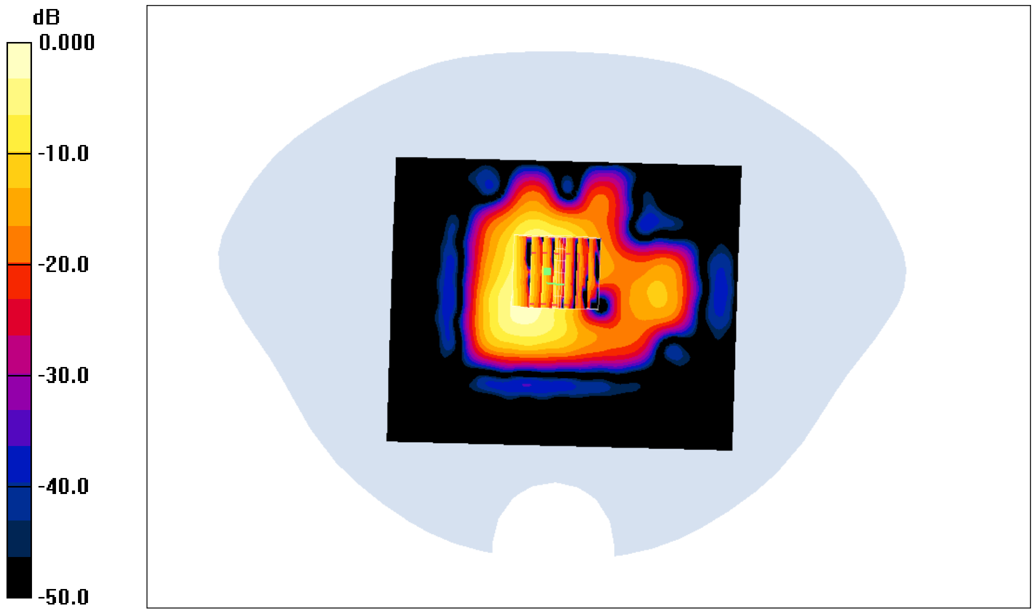
DUT: iUSBport Mini; Type: Table; Serial: Not Specified
Program Name: G7CS

Communication System: 802.11; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2462 MHz; σ = 1.97 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(6.90, 6.90, 6.90); Calibrated: 6/18/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn905; Calibrated: 6/11/2013
- Phantom: SAM with TP1360; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Side 1-3/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.094 mW/g

Side 1-3/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.00 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 0.236 W/kg
SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.041 mW/g
Maximum value of SAR (measured) = 0.101 mW/g



0 dB = 0.101mW/g

Plot 4: Date/Time: 7/22/2013 9:25:45 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

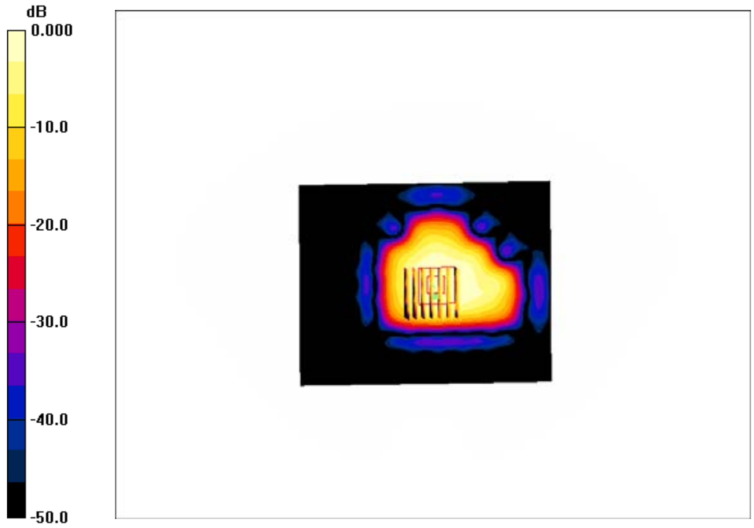
DUT: iUSBport Mini; Type: Table; Serial: Not Specified
Program Name: G7CS

Communication System: 802.11; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.93 mho/m; εr = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(6.90, 6.90, 6.90); Calibrated: 1/17/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 1/16/2013
- Phantom: SAM with TP1360; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Side 2/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.033 mW/g

Side 2/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.83 V/m; Power Drift = -0.170 dB
Peak SAR (extrapolated) = 0.047 W/kg
SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.013 mW/g
Maximum value of SAR (measured) = 0.027 mW/g



0 dB = 0.027mW/g

Plot 5: Date/Time: 7/22/2013 10:01:04 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

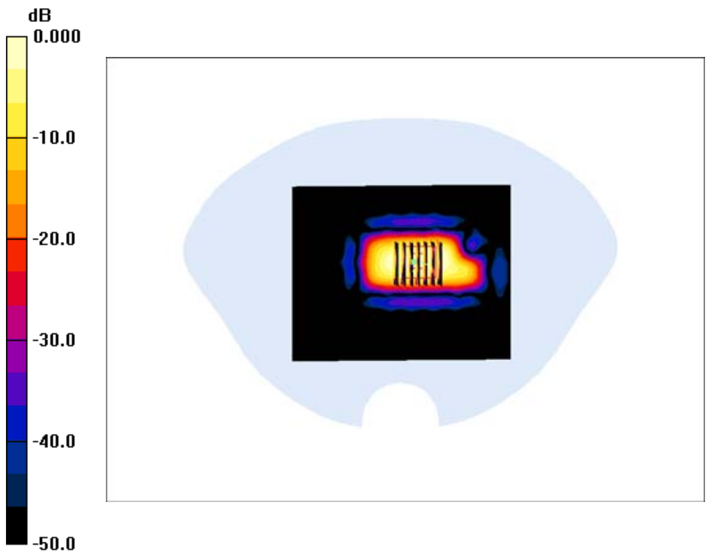
DUT: iUSBport Mini; Type: Table; Serial: Not Specified
Program Name: G7CS

Communication System: 802.11; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.93 mho/m; εr = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(6.90, 6.90, 6.90); Calibrated: 1/17/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 1/16/2013
- Phantom: SAM with TP1360; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Side 3/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.020 mW/g

Side 3/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.64 V/m; Power Drift = 0.173 dB
Peak SAR (extrapolated) = 0.014 W/kg
SAR(1 g) = 0.00721 mW/g; SAR(10 g) = 0.00308 mW/g
Maximum value of SAR (measured) = 0.009 mW/g



0 dB = 0.009mW/g

Plot 6: Date/Time: 7/22/2013 10:28:32 PM

Test Laboratory: SUNWAY COMMUNICATION CO.,LTD.

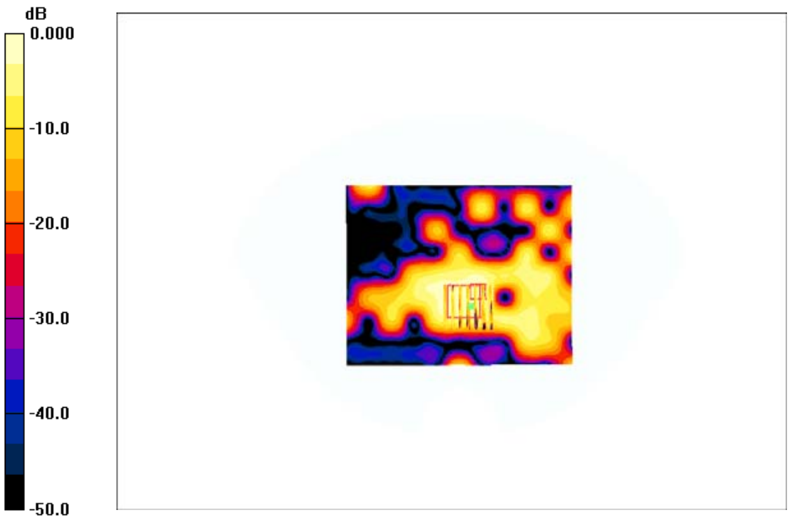
DUT: iUSBport Mini; Type: Table; Serial: Not Specified
Program Name: G7CS

Communication System: 802.11; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2412 MHz; σ = 1.93 mho/m; εr = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV4 - SN3753; ConvF(6.90, 6.90, 6.90); Calibrated: 1/17/2013
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn914; Calibrated: 1/16/2013
- Phantom: SAM with TP1360; Type: SAM;
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

Side 4/Area Scan (81x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.007 mW/g

Side 4/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 1.08 V/m; Power Drift = 0.186 dB
Peak SAR (extrapolated) = 0.010 W/kg
SAR(1 g) = 0.00472 mW/g; SAR(10 g) = 0.00194 mW/g
Maximum value of SAR (measured) = 0.006 mW/g



0 dB = 0.006mW/g

Appendix C. Probe Calibration Data:

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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 **Auden** Certificate No: **EX3-3753_Jan13**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3753

Calibration procedure(s): QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4
Calibration procedure for dosimetric E-field probes

Calibration date: January 17, 2013

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: January 17, 2013

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

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

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

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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3753

Manufactured: March 16, 2010
Calibrated: January 17, 2013

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3753

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.47	0.31	0.45	± 10.1 %
DCP (mV)[B]	101.8	102.3	102.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	163.7	±3.5 %
		Y	0.0	0.0	1.0		168.5	
		Z	0.0	0.0	1.0		159.9	

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

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3753

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	9.46	9.46	9.46	0.45	0.83	± 12.0 %
835	41.5	0.90	8.95	8.95	8.95	0.26	1.19	± 12.0 %
1750	40.1	1.37	7.86	7.86	7.86	0.52	0.79	± 12.0 %
1900	40.0	1.40	7.63	7.63	7.63	0.54	0.73	± 12.0 %
2000	40.0	1.40	7.50	7.50	7.50	0.53	0.77	± 12.0 %
2450	39.2	1.80	6.86	6.86	6.86	0.44	0.80	± 12.0 %
5200	36.0	4.66	4.65	4.65	4.65	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.48	4.48	4.48	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.46	4.46	4.46	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.51	4.51	4.51	0.35	1.80	± 13.1 %
5800	35.3	5.27	4.36	4.36	4.36	0.45	1.80	± 13.1 %

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

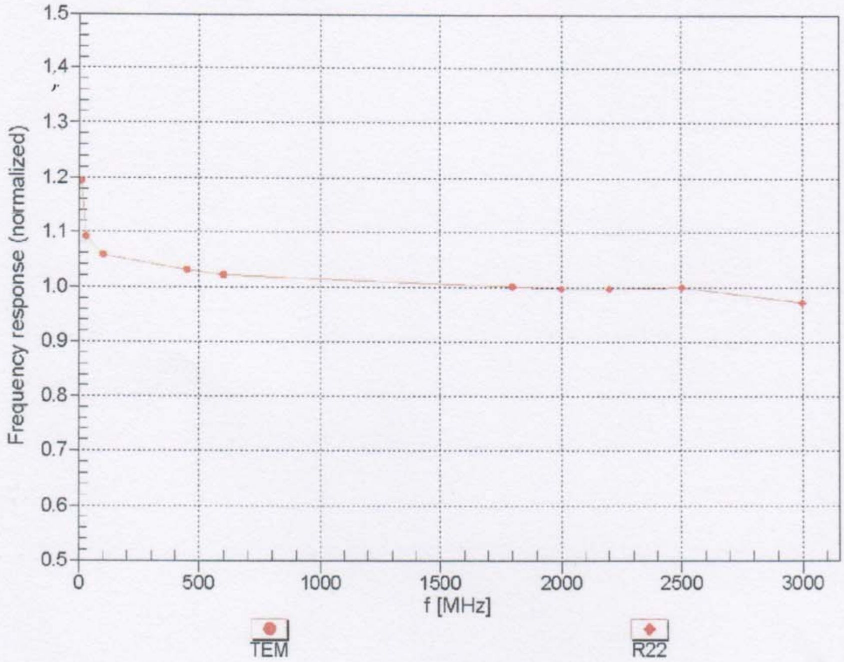
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3753

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.25	9.25	9.25	0.54	0.75	± 12.0 %
835	55.2	0.97	9.05	9.05	9.05	0.68	0.68	± 12.0 %
1750	53.4	1.49	7.82	7.82	7.82	0.50	0.84	± 12.0 %
1900	53.3	1.52	7.33	7.33	7.33	0.31	1.01	± 12.0 %
2000	53.3	1.52	7.43	7.43	7.43	0.57	0.73	± 12.0 %
2300	52.9	1.81	7.07	7.07	7.07	0.74	0.64	± 12.0 %
2450	52.7	1.95	6.90	6.90	6.90	0.80	0.50	± 12.0 %
2600	52.5	2.16	6.66	6.66	6.66	0.80	0.50	± 12.0 %
3500	51.3	3.31	6.30	6.30	6.30	0.38	1.11	± 13.1 %
5200	49.0	5.30	4.38	4.38	4.38	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.13	4.13	4.13	0.50	1.90	± 13.1 %
5500	48.6	5.65	4.09	4.09	4.09	0.50	1.90	± 13.1 %
5600	48.5	5.77	4.10	4.10	4.10	0.45	1.90	± 13.1 %
5800	48.2	6.00	4.02	4.02	4.02	0.55	1.90	± 13.1 %

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

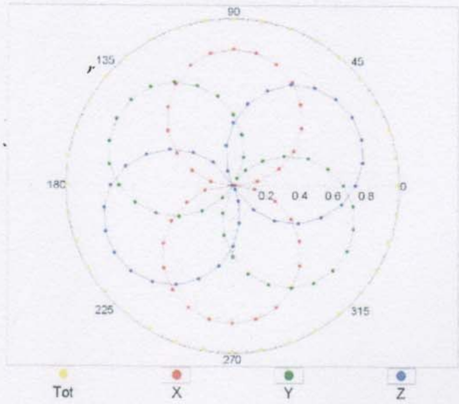
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



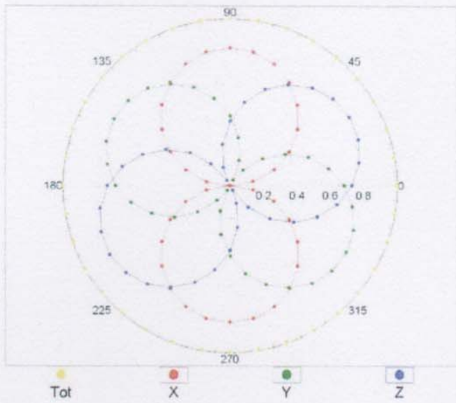
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

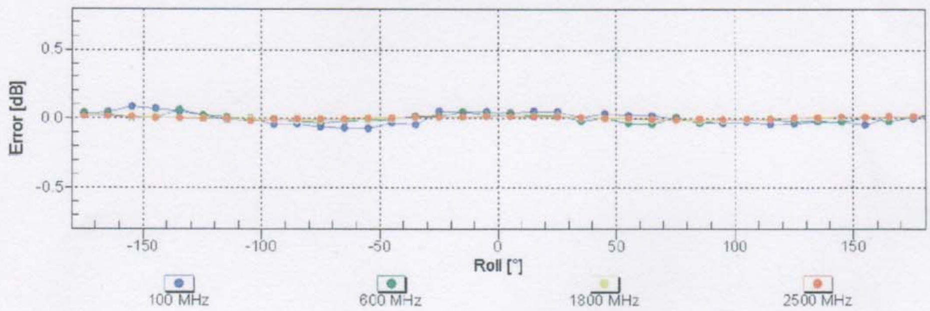
Receiving Pattern (ϕ), $\vartheta = 0°$

f=600 MHz,TEM



f=1800 MHz,R22

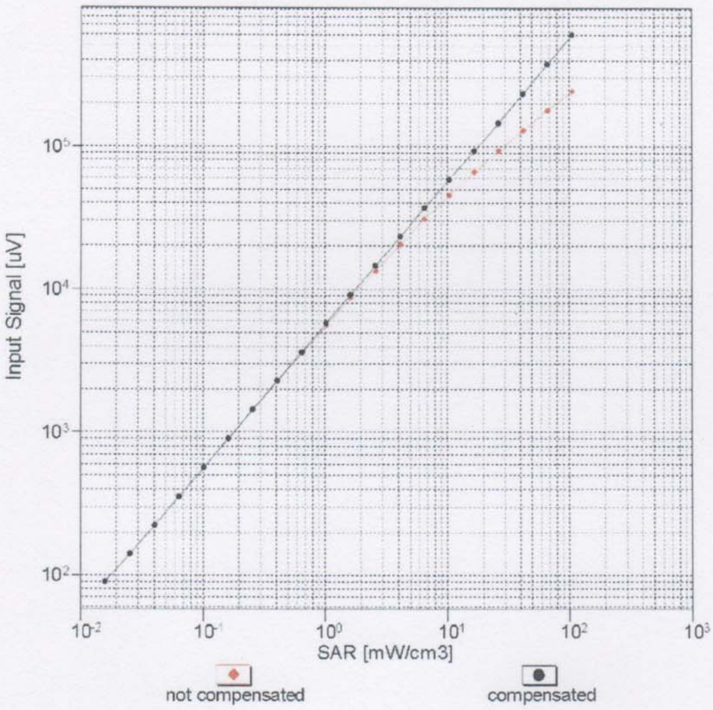


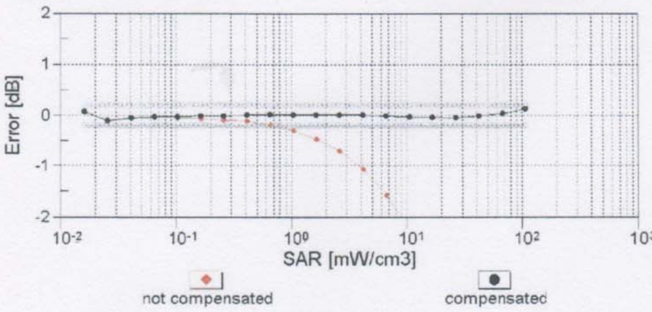


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell , f = 900 MHz)

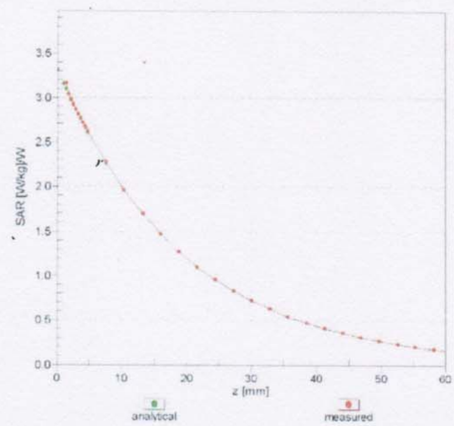




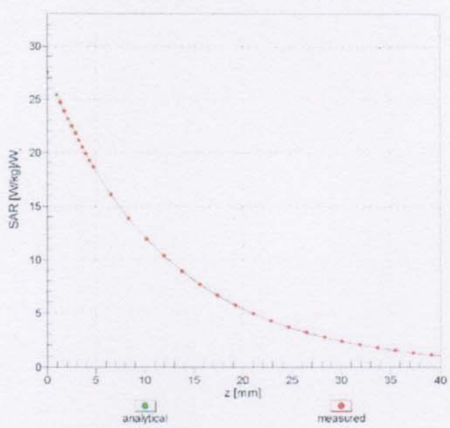
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

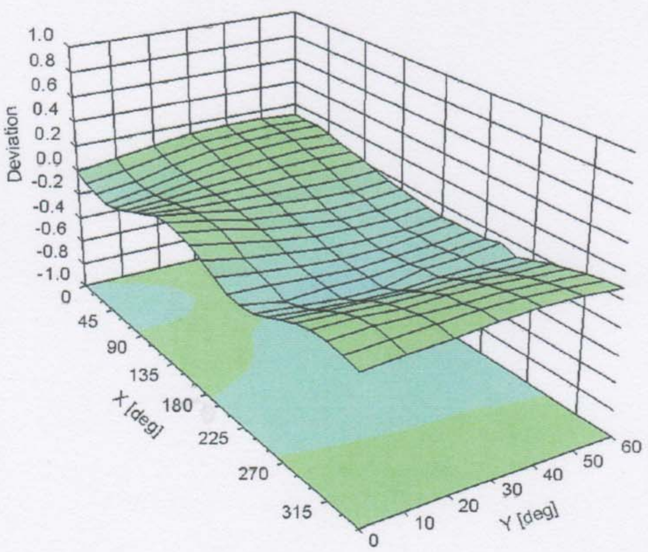


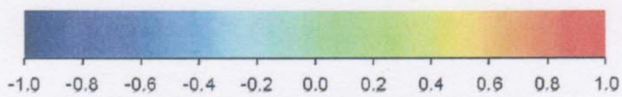
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3753

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	55.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

Appendix D. DAE Calibration Data:

Schmid & Partner Engineering AG
s p e a g
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

IMPORTANT NOTICE

USAGE OF THE DAE 4

The DAE unit is a delicate, high precision instrument and requires careful treatment by the user. There are no serviceable parts inside the DAE. Special attention shall be given to the following points:

Battery Exchange: The battery cover of the DAE4 unit is closed using a screw, over tightening the screw may cause the threads inside the DAE to wear out.

Shipping of the DAE: Before shipping the DAE to SPEAG for calibration, remove the batteries and pack the DAE in an antistatic bag. This antistatic bag shall then be packed into a larger box or container which protects the DAE from impacts during transportation. The package shall be marked to indicate that a fragile instrument is inside.

E-Stop Failures: Touch detection may be malfunctioning due to broken magnets in the E-stop. Rough handling of the E-stop may lead to damage of these magnets. Touch and collision errors are often caused by dust and dirt accumulated in the E-stop. To prevent E-stop failure, the customer shall always mount the probe to the DAE carefully and keep the DAE unit in a non-dusty environment if not used for measurements.

Repair: Minor repairs are performed at no extra cost during the annual calibration. However, SPEAG reserves the right to charge for any repair especially if rough unprofessional handling caused the defect.

DASY Configuration Files: Since the exact values of the DAE input resistances, as measured during the calibration procedure of a DAE unit, are not used by the DASY software, a nominal value of 200 MOhm is given in the corresponding configuration file.

Important Note:
Warranty and calibration is void if the DAE unit is disassembled partly or fully by the Customer.

Important Note:
Never attempt to grease or oil the E-stop assembly. Cleaning and readjusting of the E-stop assembly is allowed by certified SPEAG personnel only and is part of the annual calibration procedure.

Important Note:
To prevent damage of the DAE probe connector pins, use great care when installing the probe to the DAE. Carefully connect the probe with the connector notch oriented in the mating position. Avoid any rotational movement of the probe body versus the DAE while turning the locking nut of the connector. The same care shall be used when disconnecting the probe from the DAE.

Schmid & Partner Engineering

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

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S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: **SCS 108**

Client **Auden**

Certificate No: **DAE4-914_Jan13**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BK - SN: 914
Calibration procedure(s)	QA CAL-06.v25 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	January 16, 2013

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	02-Oct-12 (No:12728)	Oct-13
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Auto DAE Calibration Unit	SE UWS 053 AA 1001	07-Jan-13 (in house check)	In house check: Jan-14
Calibrator Box V2.1	SE UMS 006 AA 1002	07-Jan-13 (in house check)	In house check: Jan-14

	Name	Function	Signature
Calibrated by:	R.Mayoraz	Technician	R. Mayoraz
Approved by:	Fin Bomholt	Deputy Technical Manager	i.V. B Reimer

Issued: January 16, 2013

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Accreditation No.: **SCS 108**

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100…+300 mV

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

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

Calibration Factors	X	Y	Z
High Range	404.483 ± 0.02% (k=2)	404.512 ± 0.02% (k=2)	403.776 ± 0.02% (k=2)
Low Range	3.99428 ± 1.55% (k=2)	3.95898 ± 1.55% (k=2)	3.99069 ± 1.55% (k=2)

Connector Angle

Connector Angle to be used in DASY system	64.5 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	199997.50	0.85	0.00
Channel X	+ Input	20000.46	-0.70	-0.00
Channel X	- Input	-19996.82	3.26	-0.02
Channel Y	+ Input	199997.69	1.21	0.00
Channel Y	+ Input	19998.41	-2.42	-0.01
Channel Y	- Input	-19999.41	0.94	-0.00
Channel Z	+ Input	199998.11	1.75	0.00
Channel Z	+ Input	19997.92	-2.91	-0.01
Channel Z	- Input	-20001.70	-1.39	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2002.88	1.67	0.08
Channel X	+ Input	202.88	1.20	0.60
Channel X	- Input	-197.40	0.75	-0.38
Channel Y	+ Input	2002.52	1.42	0.07
Channel Y	+ Input	201.32	-0.28	-0.14
Channel Y	- Input	-198.69	-0.34	0.17
Channel Z	+ Input	2002.08	0.86	0.04
Channel Z	+ Input	200.14	-1.60	-0.79
Channel Z	- Input	-199.43	-1.25	0.63

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-2.27	-4.05
	- 200	2.49	0.66
Channel Y	200	-5.76	-6.02
	- 200	4.62	4.34
Channel Z	200	-16.43	-16.40
	- 200	13.89	13.86

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	2.06	-4.57
Channel Y	200	8.40	-	2.96
Channel Z	200	10.03	5.78	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	16324	14835
Channel Y	15856	14739
Channel Z	16155	17075

5. Input Offset Measurement

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

Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.50	-0.88	1.54	0.48
Channel Y	0.66	-0.79	2.40	0.69
Channel Z	0.18	-0.65	1.77	0.53

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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

Appendix E. Dipole Calibration Data:

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

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Accreditation No.: **SCS 108**

Client: Sunway (Auden)

Certificate No: **D2450V2-884_Feb12**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 884
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 29, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

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

Issued: February 29, 2012

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

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

SAR result with Head TSL

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

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

Body TSL parameters

The following parameters and calculations were applied.

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

SAR result with Body TSL

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

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

Appendix

Antenna Parameters with Head TSL

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

Antenna Parameters with Body TSL

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

General Antenna Parameters and Design

Electrical Delay (one direction)	1.159 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 06, 2011

DASY5 Validation Report for Head TSL

Date: 29.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

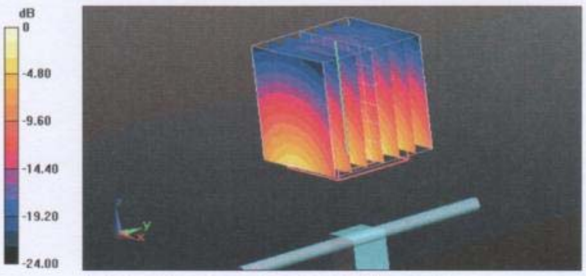
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884

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

DASY52 Configuration:

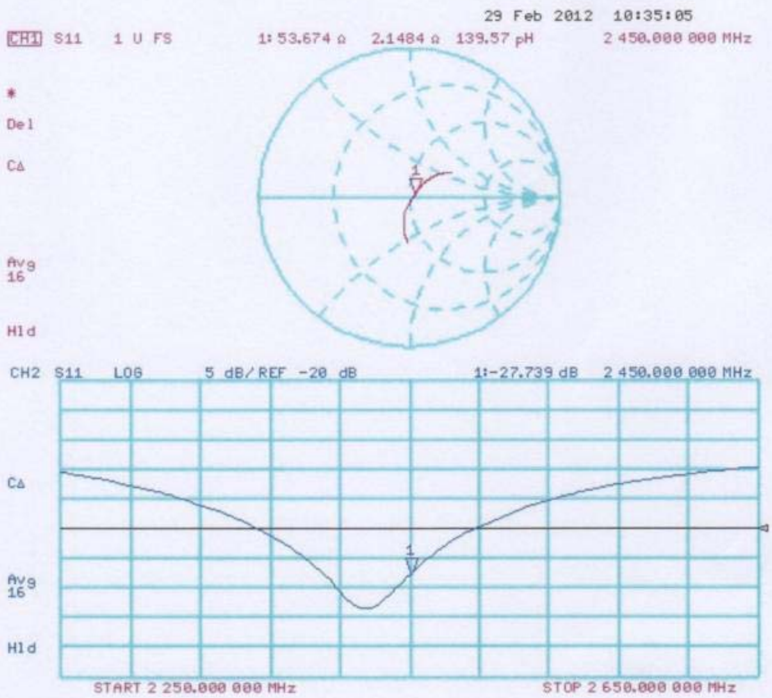
- Probe: ES3DV3 - SN3205; ConvF(4.45, 4.45, 4.45); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

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



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 29.02.2012

Test Laboratory: SPEAG, Zurich, Switzerland

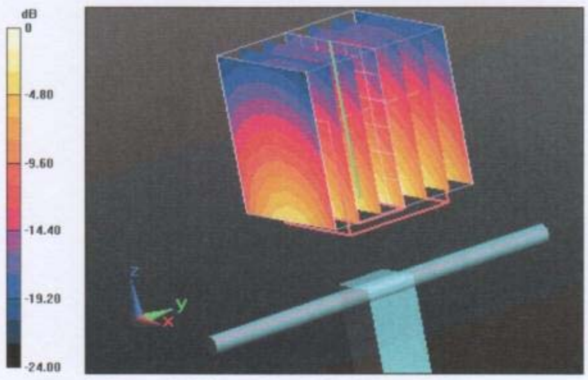
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 884

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

DASY52 Configuration:

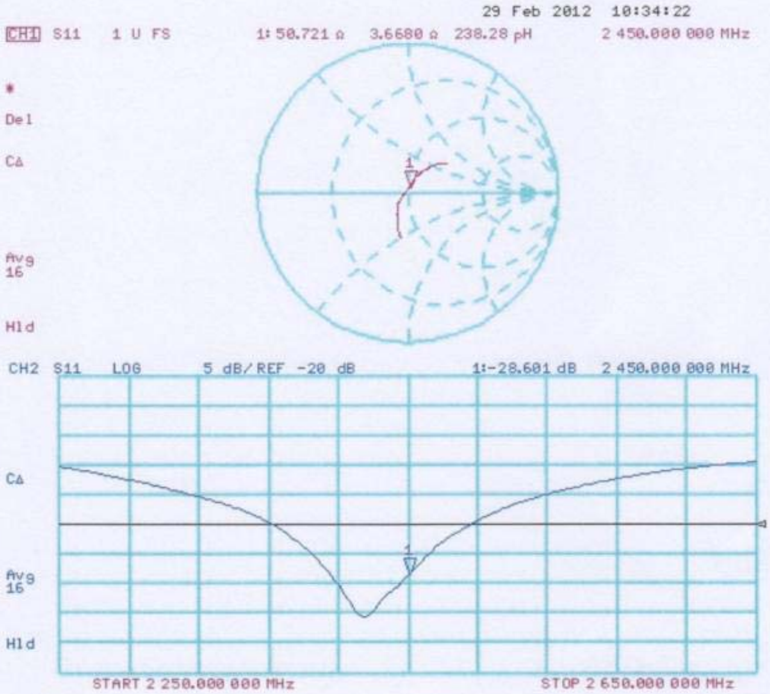
- Probe: ES3DV3 - SN3205; ConvF(4.26, 4.26, 4.26); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

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



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

Impedance Measurement Plot for Body TSL



China National Accreditation Service for Conformity Assessment

LABORATORY ACCREDITATION CERTIFICATE

(Registration No. CNAS L5718)

Shenzhen Sunway Communication Co., Ltd. Testing Center

Building 9, Changxing High-Tech Industrial Park, Wan'an Road, Shayi, Shajing, Bao'an 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： 2012-06-20
Date of Expiry： 2015-06-19
Date of Initial Accreditation： 2012-06-20
Date of Update： 2012-06-20

Signed on behalf of China National Accreditation Service for Conformity Assessment

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

No.CNAS AL 2 0004556

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