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FCC SAR Test Report

Report No. : SA120412C30
Applicant : Getac Technology Corporation
Address : 5F., Building A, No. 209, Sec. 1, Nangang Rd., Nangang Dist, Taipei City 11568, Taiwan, R.O.C.
Product : Tablet PC
FCC ID : QYLG0BI3K
Brand : Getac
Model No. : E110
Standards : FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1991 / IEEE 1528:2003
FCC OET Bulletin 65 Supplement C (Edition 01-01)
KDB 447498 D01 v04 / KDB 616217 D03 v01 / KDB 941225 D01 v02
KDB 941225 D03 v01
Date of Testing : May 08, 2012 ~ May 26, 2012

CERTIFICATION: The above equipment have been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch - Taiwan HwaYa Lab**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report. It should not be reproduced except in full, without the written approval of our laboratory. The client should not use it to claim product certification, approval, or endorsement by TAF or any government agencies.

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Release Control Record

Issue No.	Reason for Change	Date Issued
R01	Original release	Jun. 22, 2012



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1. Summary of Maximum SAR Value

Mode / Band	Test Position	SAR-1g (W/kg)
GSM850	Body (0 cm Gap)	1.27
GSM1900	Body (0 cm Gap)	0.485
WCDMA Band II	Body (0 cm Gap)	0.585
WCDMA Band V	Body (0 cm Gap)	1.04
CDMA2000 BC0	Body (0 cm Gap)	0.957
CDMA2000 BC1	Body (0 cm Gap)	0.451

Note:

1. The SAR limit (**1.6 W/kg**) for general population/uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1991.



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2. Description of Equipment Under Test

EUT Type	Tablet PC
FCC ID	QYLGOBI3K
Brand Name	Getac
Model Name	E110
Tx Frequency Bands (Unit: MHz)	GSM850 : 824 ~ 849 GSM1900 : 1850 ~ 1910 WCDMA Band II : 1850 ~ 1910 WCDMA Band V : 824 ~ 849 CDMA BC0 : 824 ~ 849 CDMA BC1 : 1850 ~ 1910
Uplink Modulations	GPRS : GMSK EDGE : 8PSK WCDMA : QPSK CDMA : QPSK
Maximum AVG Conducted Power (Unit: dBm)	GSM850 : 31.25 GSM1900 : 29.86 WCDMA Band II : 24.05 WCDMA Band V : 24.01 CDMA BC0 : 24.10 CDMA BC1 : 24.34
Antenna Type	Retractable Antenna
EUT Stage	Identical Prototype

Note:

- The above EUT information is declared by manufacturer and for more detailed features description please refers to the manufacturer's specifications or User's Manual.

List of Accessory:

AC Adapter	Brand Name	Delta
	Model Name	ADP-65WH BB
	Power Rating	I/P:100-240Vac, 50-60Hz, 1.5A; O/P: 19Vdc, 3.42A
	DC Power Cord Type	1.7 meter non-shielded cable with ferrite core
Battery	Brand Name	GETAC
	Model Name	BP2S2P2050
	Power Rating	7.2Vdc, 4100mAh
	Type	Li-ion
RFID Module	Brand Name	Jogtek
	Model Name	TM-001
GPS Module	Brand Name	GlobalSat
	Model Name	EB-5318
BT Module	Brand Name	CastleNet
	Model Name	BTC08R800
WLAN Module	Brand Name	Intel
	Model Name	Advanced-N 6205
WWAN Module	Brand Name	Sierra
	Model Name	Gobi3000



3. SAR Measurement System

3.1 Definition of Specific Absorption Rate (SAR)

SAR is related to the rate at which energy is absorbed per unit mass in an object exposed to a radio field. The SAR distribution in a biological body is complicated and is usually carried out by experimental techniques or numerical modeling. The standard recommends limits for two tiers of groups, occupational/controlled and general population/uncontrolled, based on a person's awareness and ability to exercise control over his or her exposure. In general, occupational/controlled exposure limits are higher than the limits for general population/uncontrolled.

The SAR definition is the time derivative (rate) of the incremental energy (dW) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dv) of a given density (ρ). The equation description is as below:

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

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

SAR measurement can be related to the electrical field in the tissue by

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

Where: σ is the conductivity of the tissue, ρ is the mass density of the tissue and E is the RMS electrical field strength.

3.2 SPEAG DASY System

DASY system consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY4/5 software defined. The DASY software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC.

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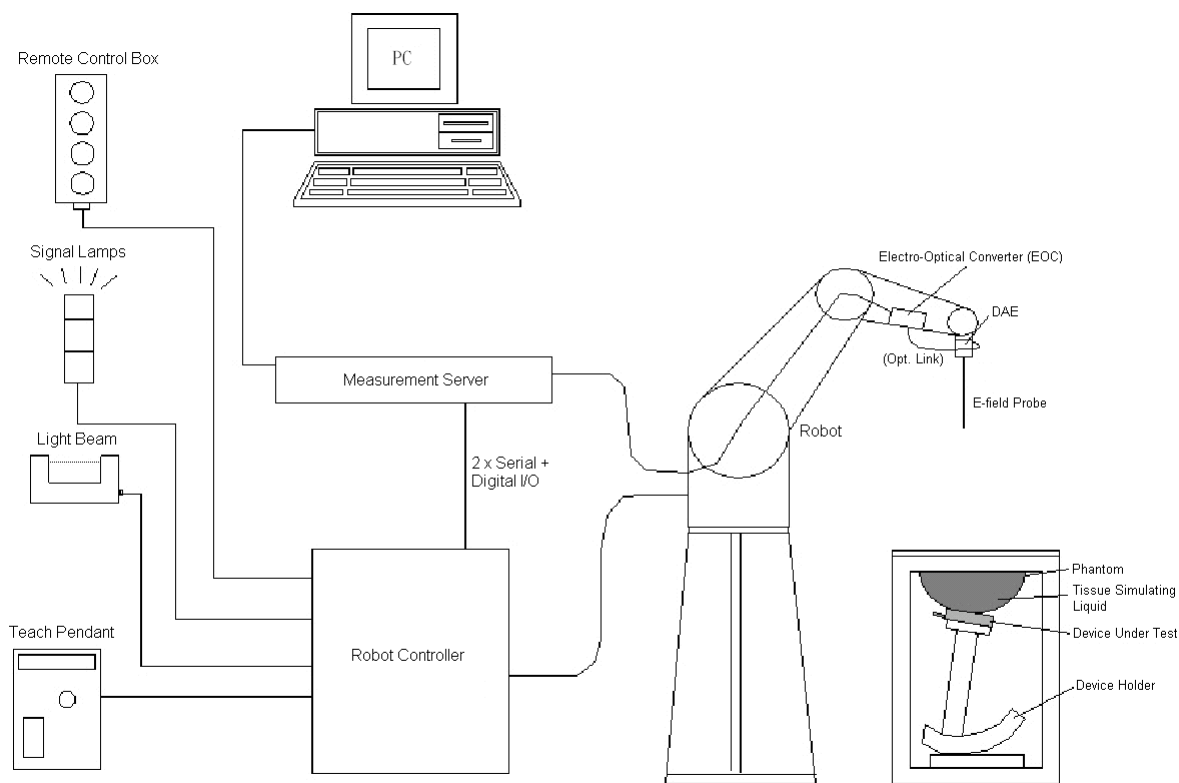


Fig-3.1 DASY System Setup

3.2.1 Robot

The DASY system uses the high precision robots from Stäubli SA (France). For the 6-axis controller system, the robot controller version (DASY4: CS7MB; DASY5: CS8c) from Stäubli is used. The Stäubli robot series have many features that are important for our application:

- High precision (repeatability ± 0.035 mm)
- High reliability (industrial design)
- Jerk-free straight movements
- Low ELF interference (the closed metallic construction shields against motor control fields)



Fig-3.2 DASY4



Fig-3.3 DASY5

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3.2.2 Probes

The SAR measurement is conducted with the dosimetric probe. The probe is specially designed and calibrated for use in liquid with high permittivity. The dosimetric probe has special calibration in liquid at different frequency.

Model	EX3DV4	
Construction	Symmetrical design with triangular core. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).	
Frequency	10 MHz to 6 GHz Linearity: ± 0.2 dB	
Directivity	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	10 μ W/g to 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μ W/g)	
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm	


Model	ES3DV3	
Construction	Symmetrical design with triangular core. Interleaved sensors. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., DGBE).	
Frequency	10 MHz to 4 GHz Linearity: ± 0.2 dB	
Directivity	± 0.2 dB in HSL (rotation around probe axis) ± 0.3 dB in tissue material (rotation normal to probe axis)	
Dynamic Range	5 μ W/g to 100 mW/g Linearity: ± 0.2 dB	
Dimensions	Overall length: 337 mm (Tip: 20 mm) Tip diameter: 3.9 mm (Body: 12 mm) Distance from probe tip to dipole centers: 2.0 mm	


3.2.3 Data Acquisition Electronics (DAE)

Model	DAE3, DAE4	
Construction	Signal amplifier, multiplexer, A/D converter and control logic. Serial optical link for communication with DASY4/5 embedded system (fully remote controlled). Two step probe touch detector for mechanical surface detection and emergency robot stop.	
Measurement Range	-100 to +300 mV (16 bit resolution and two range settings: 4mV, 400mV)	
Input Offset Voltage	$< 5\mu$ V (with auto zero)	
Input Bias Current	< 50 fA	
Dimensions	60 x 60 x 68 mm	

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3.2.4 Phantoms


Model	Twin SAM	
Construction	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528 and IEC 62209-1. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by teaching three points with the robot.	
Material	Vinylester, glass fiber reinforced (VE-GF)	
Shell Thickness	2 ± 0.2 mm (6 ± 0.2 mm at ear point)	
Dimensions	Length: 1000 mm Width: 500 mm Height: adjustable feet	
Filling Volume	approx. 25 liters	

Model	ELI	
Construction	Phantom for compliance testing of handheld and body-mounted wireless devices in the frequency range of 30 MHz to 6 GHz. ELI is fully compatible with the IEC 62209-2 standard and all known tissue simulating liquids. ELI has been optimized regarding its performance and can be integrated into our standard phantom tables. A cover prevents evaporation of the liquid. Reference markings on the phantom allow installation of the complete setup, including all predefined phantom positions and measurement grids, by teaching three points. The phantom is compatible with all SPEAG dosimetric probes and dipoles.	
Material	Vinylester, glass fiber reinforced (VE-GF)	
Shell Thickness	2.0 ± 0.2 mm (bottom plate)	
Dimensions	Major axis: 600 mm Minor axis: 400 mm	
Filling Volume	approx. 30 liters	


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3.2.5 Device Holder

Model	Mounting Device	
Construction	In combination with the Twin SAM Phantom or ELI4, the Mounting Device enables the rotation of the mounted transmitter device in spherical coordinates. Rotation point is the ear opening point. Transmitter devices can be easily and accurately positioned according to IEC, IEEE, FCC or other specifications. The device holder can be locked for positioning at different phantom sections (left head, right head, flat).	
Material	POM	

Model	Laptop Extensions Kit	
Construction	Simple but effective and easy-to-use extension for Mounting Device that facilitates the testing of larger devices according to IEC 62209-2 (e.g., laptops, cameras, etc.). It is lightweight and fits easily on the upper part of the Mounting Device in place of the phone positioner.	
Material	POM, Acrylic glass, Foam	

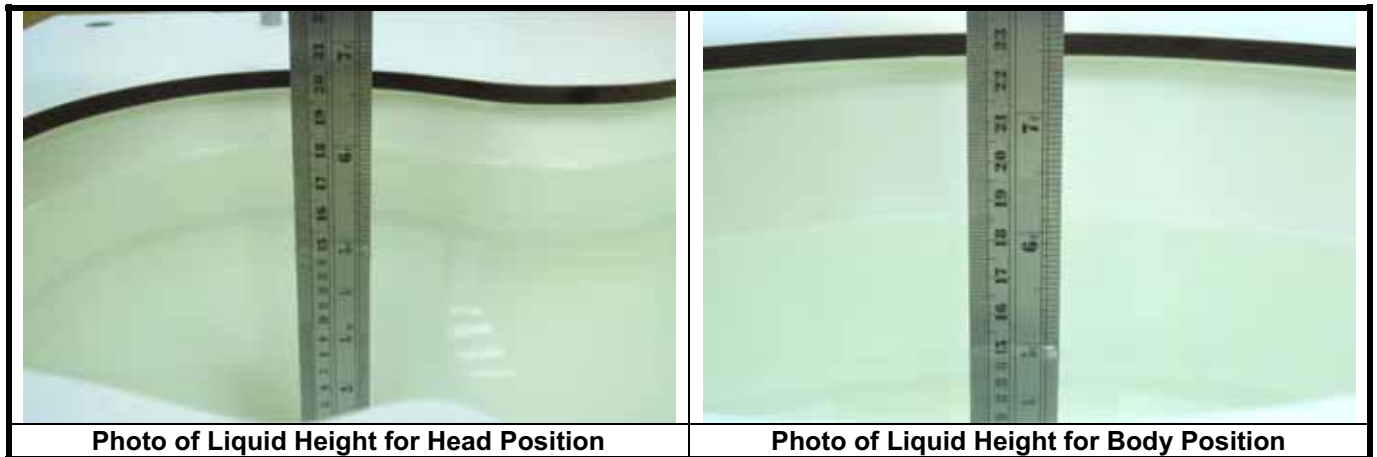
3.2.6 System Validation Dipoles

Model	D-Serial	
Construction	Symmetrical dipole with 1/4 balun. Enables measurement of feed point impedance with NWA. Matched for use near flat phantoms filled with tissue simulating solutions.	
Frequency	750 MHz to 5800 MHz	
Return Loss	> 20 dB	
Power Capability	> 100 W (f < 1GHz), > 40 W (f > 1GHz)	

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3.2.7 Tissue Simulating Liquids

For SAR measurement of the field distribution inside the phantom, the phantom must be filled with homogeneous tissue simulating liquid to a depth of at least 15 cm. For head SAR testing, the liquid height from the ear reference point (ERP) of the phantom to the liquid top surface is larger than 15 cm. For body SAR testing, the liquid height from the center of the flat phantom to the liquid top surface is larger than 15 cm. The nominal dielectric values of the tissue simulating liquids in the phantom and the tolerance of 5% are listed in Table-3.1.



The dielectric properties of the head tissue simulating liquids are defined in IEEE 1528 and FCC OET 65 Supplement C Appendix C. For the body tissue simulating liquids, the dielectric properties are defined in FCC OET 65 Supplement C Appendix C. The dielectric properties of the tissue simulating liquids were verified prior to the SAR evaluation using an Agilent 85070D Dielectric Probe Kit and an Agilent Network Analyzer.

Table-3.1 Targets of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Range of $\pm 5\%$	Target Conductivity	Range of $\pm 5\%$
For Body				
835	55.2	52.4 ~ 58.0	0.97	0.92 ~ 1.02
1900	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60

The following table gives the recipes for tissue simulating liquids.

Table-3.2 Recipes of Tissue Simulating Liquid

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
B835	0.2	-	0.2	0.9	48.5	-	50.2	-
B1900	-	29.5	-	0.3	-	-	70.2	-

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3.3 SAR System Verification

The system check verifies that the system operates within its specifications. It is performed daily or before every SAR measurement. The system check uses normal SAR measurements in the flat section of the phantom with a matched dipole at a specified distance. The system verification setup is shown as below.

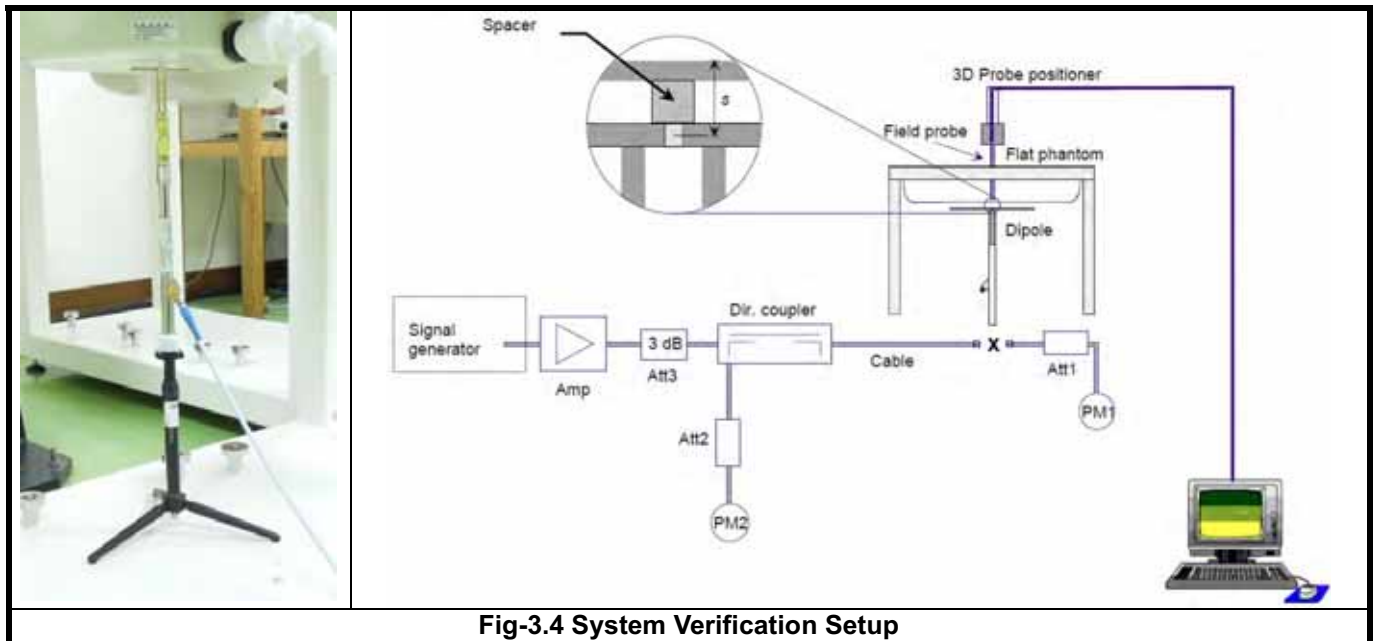


Fig-3.4 System Verification Setup

The validation dipole is placed beneath the flat phantom with the specific spacer in place. The distance spacer is touch the phantom surface with a light pressure at the reference marking and be oriented parallel to the long side of the phantom. The power meter PM1 measures the forward power at the location of the system check dipole connector. The signal generator is adjusted for the desired forward power (250 mW is used for 700 MHz to 3 GHz, 100 mW is used for 3.5 GHz to 6 GHz) at the dipole connector and the power meter PM2 is read at that level. After connecting the cable to the dipole, the signal generator is readjusted for the same reading at power meter PM2.

After system check testing, the SAR result will be normalized to 1W forward input power and compared with the reference SAR value derived from validation dipole certificate report. The deviation of system check should be within 10 %.



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3.4 SAR Measurement Procedure

According to the SAR test standard, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- (a) Power reference measurement
- (b) Area scan
- (c) Zoom scan
- (d) Power drift measurement

The SAR measurement procedures for each of test conditions are as follows:

- (a) Make EUT to transmit maximum output power
- (b) Measure conducted output power through RF cable
- (c) Place the EUT in the specific position of phantom
- (d) Perform SAR testing steps on the DASYS system
- (e) Record the SAR value

3.4.1 Area & Zoom Scan Procedure

First Area Scan is used to locate the approximate location(s) of the local peak SAR value(s). The measurement grid within an Area Scan is defined by the grid extent, grid step size and grid offset. Next, in order to determine the EM field distribution in a three-dimensional spatial extension, Zoom Scan is required. The Zoom Scan measures 5x5x7 points with step size 8, 8 and 5 mm for below 3 GHz, and 7x7x9 points with step size 4, 4 and 2.5 mm for above 5 GHz. The Zoom Scan is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g.

3.4.2 Volume Scan Procedure

The volume scan is used for assess overlapping SAR distributions for antennas transmitting in different frequency bands. It is equivalent to an oversized zoom scan used in standalone measurements. The measurement volume will be used to enclose all the simultaneous transmitting antennas. For antennas transmitting simultaneously in different frequency bands, the volume scan is measured separately in each frequency band. In order to sum correctly to compute the 1g aggregate SAR, the EUT remain in the same test position for all measurements and all volume scan use the same spatial resolution and grid spacing. When all volume scan were completed, the software, SEMCAD postprocessor can combine and subsequently superpose these measurement data to calculating the multiband SAR.

3.4.3 Power Drift Monitoring

All SAR testing is under the EUT install full charged battery and transmit maximum output power. In DASYS measurement software, the power reference measurement and power drift measurement procedures are used for monitoring the power drift of EUT during SAR test. Both these procedures measure the field at a specified reference position before and after the SAR testing. The software will calculate the field difference in dB. If the power drift more than 5%, the SAR will be retested.



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3.4.4 Spatial Peak SAR Evaluation

The procedure for spatial peak SAR evaluation has been implemented according to the test standard. It can be conducted for 1g and 10g, as well as for user-specific masses. The DASY software includes all numerical procedures necessary to evaluate the spatial peak SAR value.

The base for the evaluation is a "cube" measurement. The measured volume must include the 1g and 10g cubes with the highest averaged SAR values. For that purpose, the center of the measured volume is aligned to the interpolated peak SAR value of a previously performed area scan.

The entire evaluation of the spatial peak values is performed within the post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

- (a) Extraction of the measured data (grid and values) from the Zoom Scan
- (b) Calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
- (c) Generation of a high-resolution mesh within the measured volume
- (d) Interpolation of all measured values from the measurement grid to the high-resolution grid
- (e) Extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
- (f) Calculation of the averaged SAR within masses of 1g and 10g

3.4.5 SAR Averaged Methods

In DASY, the interpolation and extrapolation are both based on the modified Quadratic Shepard's method. The interpolation scheme combines a least-square fitted function method and a weighted average method which are the two basic types of computational interpolation and approximation.

Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5 mm.

4. SAR Measurement Evaluation

4.1 EUT Configuration and Setting

For WWAN SAR testing, the EUT was linked and controlled by base station emulator. Communication between the EUT and the emulator was established by air link. The distance between the EUT and the communicating antenna of the emulator is larger than 50 cm and the output power radiated from the emulator antenna is at least 30 dB smaller than the output power of EUT. The EUT was set from the emulator to radiate maximum output power during SAR testing.

4.2 EUT Testing Position

According to KDB 447498, SAR testing is required for edges with a transmitting antenna within 5 cm from that surface or edge. Based on the antenna location shown on appendix D, the EUT was tested in some positions as **Rear Face**, **Secondary Portrait** and **Secondary Landscape**. In these positions, the separation distance between EUT and phantom is 0 cm.

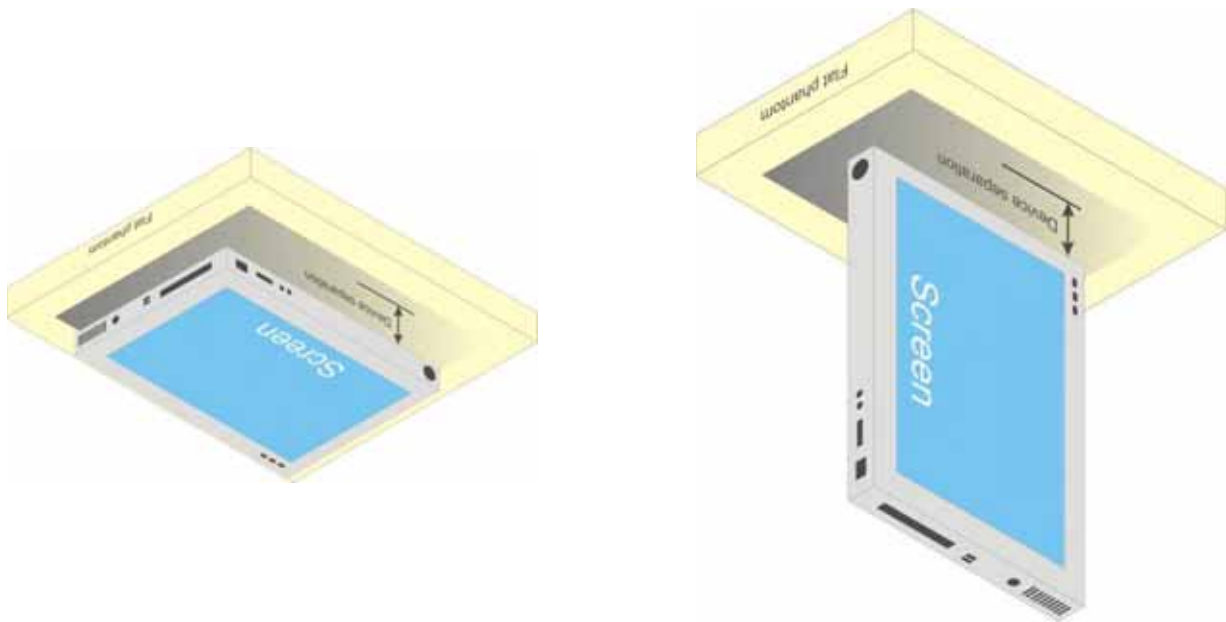


Fig-4.1 Illustration for Tablet Setup



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4.3 Tissue Verification

The measuring results for tissue simulating liquid are shown as below.

Tissue Type	Frequency (MHz)	Liquid Temp. (°C)	Measured Conductivity (σ)	Measured Permittivity (ϵ_r)	Target Conductivity (σ)	Target Permittivity (ϵ_r)	Conductivity Deviation (%)	Permittivity Deviation (%)	Test Date
B835	835	20.5	0.996	56.383	0.97	55.2	2.68	2.14	May 09, 2012
B835	835	20.4	0.992	55.615	0.97	55.2	2.27	0.75	May 11, 2012
B835	835	20.7	0.995	56.10	0.97	55.2	2.58	1.63	May 21, 2012
B835	835	20.9	0.991	55.768	0.97	55.2	2.16	1.03	May 25, 2012
B1900	1900	20.8	1.563	54.687	1.52	53.3	2.83	2.60	May 08, 2012
B1900	1900	20.9	1.55	53.982	1.52	53.3	1.97	1.28	May 26, 2012

Note:

The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within $\pm 5\%$ of the target values. Liquid temperature during the SAR testing must be within $\pm 2^\circ\text{C}$.

4.4 System Verification

The measuring results for system check are shown as below.

Test Date	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
May 09, 2012	835	9.65	2.45	9.80	1.55	4d092	3650	1277
May 11, 2012	835	9.65	2.43	9.72	0.73	4d092	3590	861
May 21, 2012	835	9.65	2.44	9.76	1.14	4d092	3590	861
May 25, 2012	835	9.65	2.57	10.28	6.53	4d092	3650	1277
May 08, 2012	1900	38.90	10.40	41.60	6.94	5d036	3650	1277
May 26, 2012	1900	38.90	10.20	40.80	4.88	5d036	3650	1277

Note:

Comparing to the reference SAR value provided by SPEAG, the validation data should be within its specification of 10 %. The result indicates the system check can meet the variation criterion and the plots can be referred to Appendix A of this report.



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4.5 Conducted Power Results

The measuring conducted power (Unit: dBm) are shown as below.

Band	GSM850			GSM1900		
Channel	128	189	251	512	661	810
Frequency (MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
Maximum Burst-Averaged Output Power						
GPRS 8 (GMSK, 1 slot)	31.21	31.12	31.25	29.50	29.58	29.86
GPRS 10 (GMSK, 2 slot)	31.10	31.02	31.16	29.40	29.47	29.79
EDGE 8 (8PSK, 1 slot)	24.84	24.85	24.85	25.62	25.49	25.62
EDGE 10 (8PSK, 2 slot)	24.76	24.77	24.77	25.49	25.37	25.50
Maximum Frame-Averaged Output Power						
GPRS 8 (GMSK, 1 slot)	22.21	22.12	22.25	20.50	20.58	20.86
GPRS 10 (GMSK, 2 slot)	25.10	25.02	25.16	23.40	23.47	23.79
EDGE 8 (8PSK, 1 slot)	15.84	15.85	15.85	16.62	16.49	16.62
EDGE 10 (8PSK, 2 slot)	18.76	18.77	18.77	19.49	19.37	19.50

Note: Body SAR testing for GPRS/EDGE was performed on the maximum frame-averaged power mode.

Band	WCDMA Band II			WCDMA Band V		
Channel	9262	9400	9538	4132	4182	4233
Frequency (MHz)	1852.4	1880.0	1907.6	826.4	836.4	846.6
RMC 12.2K	24.05	23.96	23.64	23.93	23.92	24.01
HSDPA Subtest-1	23.44	23.58	23.46	22.95	23.08	23.30
HSDPA Subtest-2	23.46	23.48	23.46	22.94	22.99	23.11
HSDPA Subtest-3	23.01	22.99	22.62	22.62	22.63	22.70
HSDPA Subtest-4	22.88	22.77	22.60	22.51	22.49	22.47
HSUPA Subtest-1	22.71	22.76	23.07	22.65	22.74	23.07
HSUPA Subtest-2	22.08	21.92	22.04	21.50	21.73	21.68
HSUPA Subtest-3	22.05	22.08	21.66	21.54	21.66	21.66
HSUPA Subtest-4	22.15	22.16	22.03	21.92	21.99	21.86
HSUPA Subtest-5	23.18	23.17	23.06	23.22	23.01	23.28

Note: Body SAR testing was performed on RMC 12.2K. SAR for HSPA is not required because its maximum power is less than 1/4 dB higher than RMC 12.2K power.

Band	CDMA BC0			CDMA BC1		
Channel	1013	384	777	25	600	1175
Frequency (MHz)	824.70	836.52	848.31	1851.25	1880.00	1908.75
1xRTT RC1+SO55	23.93	23.85	23.74	24.06	24.00	23.75
1xRTT RC3+SO55	23.91	23.83	23.76	24.02	23.96	23.72
RC3+SO32(FCH)	23.90	23.83	23.75	24.11	23.97	23.73
RC3+SO32(SCH)	23.92	23.84	23.77	24.09	23.09	23.73
1xEVDO Rev.0 RTAP 153.6	24.10	23.98	23.90	24.34	24.27	23.91
1xEVDO Rev.A RETAP 4096	24.09	24.05	24.01	24.30	24.29	24.07

Note: Body SAR testing was performed on EVDO Rev.0. SAR for EVDO Rev.A is not required because its maximum power is less than the EVDO Rev.0 power. SAR for 1xRTT is also not required because its maximum power is less than 1/4 dB higher than EVDO Rev.0 power.



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4.6 SAR Testing Results

4.6.1 SAR Results for Body

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	Antenna Status	SAR-1g (W/kg)
26	GSM850	GPRS 10	Rear Face	0	251	Retracted	0.0000555
27	GSM850	GPRS 10	Rear Face	0	251	Extended	1.2
28	GSM850	GPRS 10	Secondary Portrait	0	251	Extended	0.633
29	GSM850	GPRS 10	Secondary Landscape	0	251	Retracted	0.00032
30	GSM850	GPRS 10	Rear Face	0	128	Extended	1.27
31	GSM850	GPRS 10	Rear Face	0	189	Extended	1.25
7	GSM1900	GPRS 10	Rear Face	0	810	Retracted	0.00354
8	GSM1900	GPRS 10	Rear Face	0	810	Extended	0.485
9	GSM1900	GPRS 10	Secondary Portrait	0	810	Extended	0.133
10	GSM1900	GPRS 10	Secondary Landscape	0	810	Retracted	0.029
13	WCDMA II	RMC12.2K	Rear Face	0	9262	Retracted	0.016
14	WCDMA II	RMC12.2K	Rear Face	0	9262	Extended	0.585
15	WCDMA II	RMC12.2K	Secondary Portrait	0	9262	Extended	0.26
16	WCDMA II	RMC12.2K	Secondary Landscape	0	9262	Retracted	0.144
19	WCDMA V	RMC12.2K	Rear Face	0	4233	Retracted	0.00108
20	WCDMA V	RMC12.2K	Rear Face	0	4233	Extended	0.999
21	WCDMA V	RMC12.2K	Secondary Portrait	0	4233	Extended	0.538
22	WCDMA V	RMC12.2K	Secondary Landscape	0	4233	Retracted	0.00192
23	WCDMA V	RMC12.2K	Rear Face	0	4132	Extended	1.02
24	WCDMA V	RMC12.2K	Rear Face	0	4182	Extended	1.04
32	CDMA2000 BC0	RTAP 153.6	Rear Face	0	1013	Retracted	N/A
33	CDMA2000 BC0	RTAP 153.6	Rear Face	0	1013	Extended	0.957
34	CDMA2000 BC0	RTAP 153.6	Secondary Portrait	0	1013	Extended	0.456
36	CDMA2000 BC0	RTAP 153.6	Secondary Landscape	0	1013	Retracted	0.00875
37	CDMA2000 BC0	RTAP 153.6	Rear Face	0	384	Extended	0.841
38	CDMA2000 BC0	RTAP 153.6	Rear Face	0	777	Extended	0.835
39	CDMA2000 BC1	RTAP 153.6	Rear Face	0	25	Retracted	0.026
40	CDMA2000 BC1	RTAP 153.6	Rear Face	0	25	Extended	0.451
41	CDMA2000 BC1	RTAP 153.6	Secondary Portrait	0	25	Extended	0.081
43	CDMA2000 BC1	RTAP 153.6	Secondary Landscape	0	25	Retracted	0.055

Note:

1. The "N/A" means there is no SAR value or the SAR is too low to be measured.
2. Since the WWAN antenna is expected to use on extended position and there is no antenna performance when the antenna on retracted position, the SAR testing for antenna retracted position is verified on Rear Face mode and Secondary Portrait mode is tested on antenna extended position only.

Test Engineer : Eli Hsu, Match Tsui, and Morrison Huang



5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Kit	SPEAG	D835V2	4d092	Jun. 22, 2011	Annual
System Validation Kit	SPEAG	D1900V2	5d036	Jan. 26, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3590	Feb. 23, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3650	Oct. 26, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	861	Aug. 29, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE4	1277	Jul. 29, 2011	Annual
ELI Phantom	SPEAG	QDOVA001B	TP-1043	N/A	N/A
Radio Communication Tester	Agilent	E5515C	MY50266628	Sep. 26, 2011	Biennial
ENA Series Network Analyzer	Agilent	E5071C	MY46214281	May 14, 2012	Annual
MXG Analog Signal Generator	Agilent	N5181A	MY50143868	May 06, 2012	Annual
Power Meter	Anritsu	ML2495A	1218009	May 07, 2012	Annual
Power Sensor	Anritsu	MA2411B	1207252	May 07, 2012	Annual
EXA Spectrum Analyzer	Agilent	N9010A	MY52100136	Apr. 23, 2012	Annual
Dielectric Probe Kit	Agilent	85070D	N/A	N/A	N/A
Thermometer	YFE	YF-160A	110600361	Feb. 21, 2012	Annual



6. Measurement Uncertainty

Error Description	Uncertainty Value (±%)	Probability Distribution	Divisor	C _i (1g)	Standard Uncertainty (1g)	V _i
Measurement System						
Probe Calibration	6.0	Normal	1	1	± 6.0 %	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	± 1.9 %	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	± 3.9 %	∞
Boundary Effects	1.0	Rectangular	√3	1	± 0.6 %	∞
Linearity	4.7	Rectangular	√3	1	± 2.7 %	∞
System Detection Limits	1.0	Rectangular	√3	1	± 0.6 %	∞
Readout Electronics	0.6	Normal	1	1	± 0.6 %	∞
Response Time	0.0	Rectangular	√3	1	± 0.0 %	∞
Integration Time	1.7	Rectangular	√3	1	± 1.0 %	∞
RF Ambient Noise	3.0	Rectangular	√3	1	± 1.7 %	∞
RF Ambient Reflections	3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	0.5	Rectangular	√3	1	± 0.3 %	∞
Probe Positioning	2.9	Rectangular	√3	1	± 1.7 %	∞
Max. SAR Eval.	2.3	Rectangular	√3	1	± 1.3 %	∞
Test Sample Related						
Device Positioning	3.9	Normal	1	1	± 3.9 %	31
Device Holder	2.7	Normal	1	1	± 2.7 %	19
Power Drift	5.0	Rectangular	√3	1	± 2.9 %	∞
Phantom and Setup						
Phantom Uncertainty	4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid Conductivity (Target)	5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid Conductivity (Meas.)	5.0	Normal	1	0.64	± 3.2 %	29
Liquid Permittivity (Target)	5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid Permittivity (Meas.)	5.0	Normal	1	0.6	± 3.0 %	29
Combined Standard Uncertainty					± 11.7 %	
Expanded Uncertainty (K=2)					± 23.4 %	

Uncertainty budget for frequency range 300 MHz to 3 GHz



7. Information on the Testing Laboratories

We, Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch, were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved according to ISO/IEC 17025.

Copies of accreditation and authorization certificates of our laboratories obtained from approval agencies can be downloaded from our web site. If you have any comments, please feel free to contact us at the following:

Taiwan HwaYa EMC/RF/Safety/Telecom Lab:

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Web Site: www.adt.com.tw

The road map of all our labs can be found in our web site also.

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Appendix A. SAR Plots of System Verification

The plots for system verification are shown as follows.

System Check_B835_120509

DUT: Dipole 835 MHz; Type: D835V2; SN: 4d092

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

Medium: B835_0509 Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.996 \text{ mho/m}$; $\epsilon_r = 56.383$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Pin=250mW/Area Scan (61x121x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 3.10 mW/g

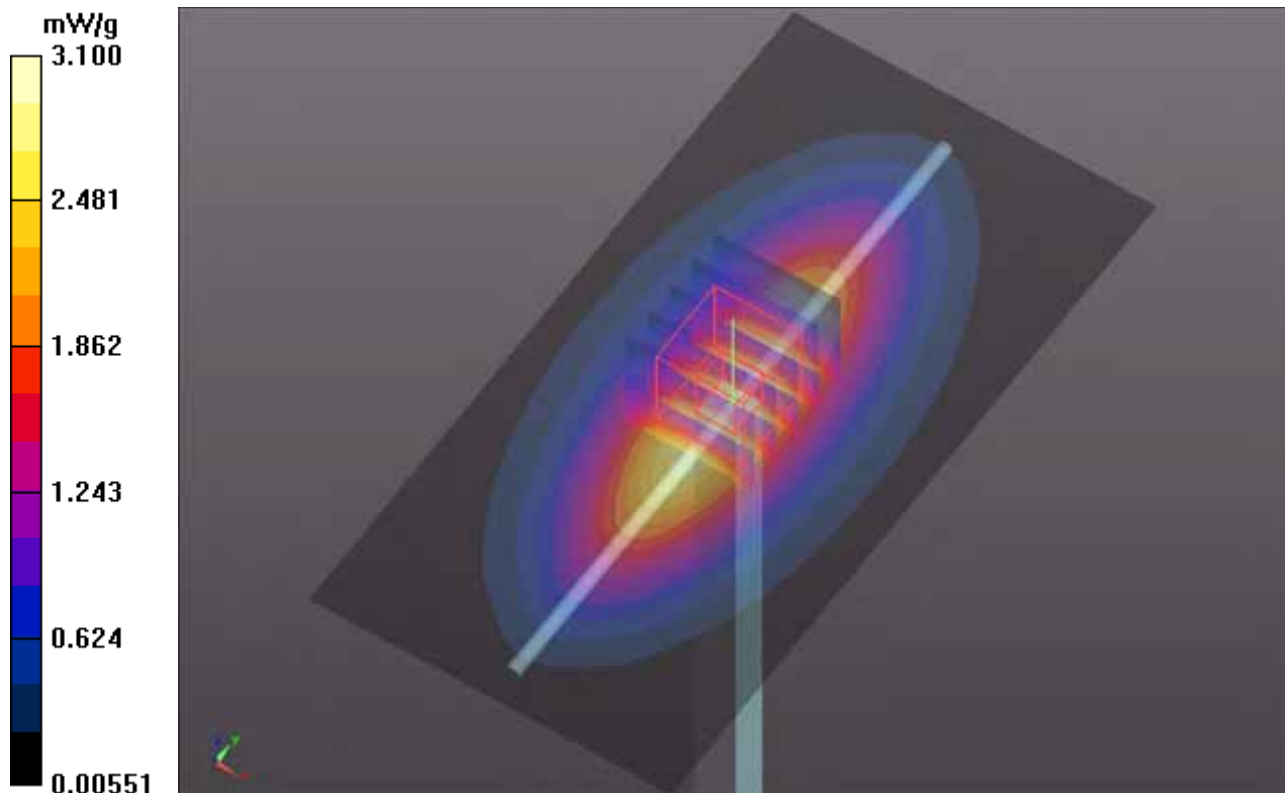
Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 54.025 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.602 mW/g

SAR(1 g) = 2.45 mW/g; SAR(10 g) = 1.62 mW/g

Maximum value of SAR (measured) = 3.09 mW/g



System Check_B835_120511

DUT: Dipole 835 MHz; Type: D835V2; SN: 4d092

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

Medium: B835_0511 Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.992 \text{ mho/m}$; $\epsilon_r = 55.615$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 21.9 °C ; Liquid Temperature : 20.4 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

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

Maximum value of SAR (interpolated) = 3.08 mW/g

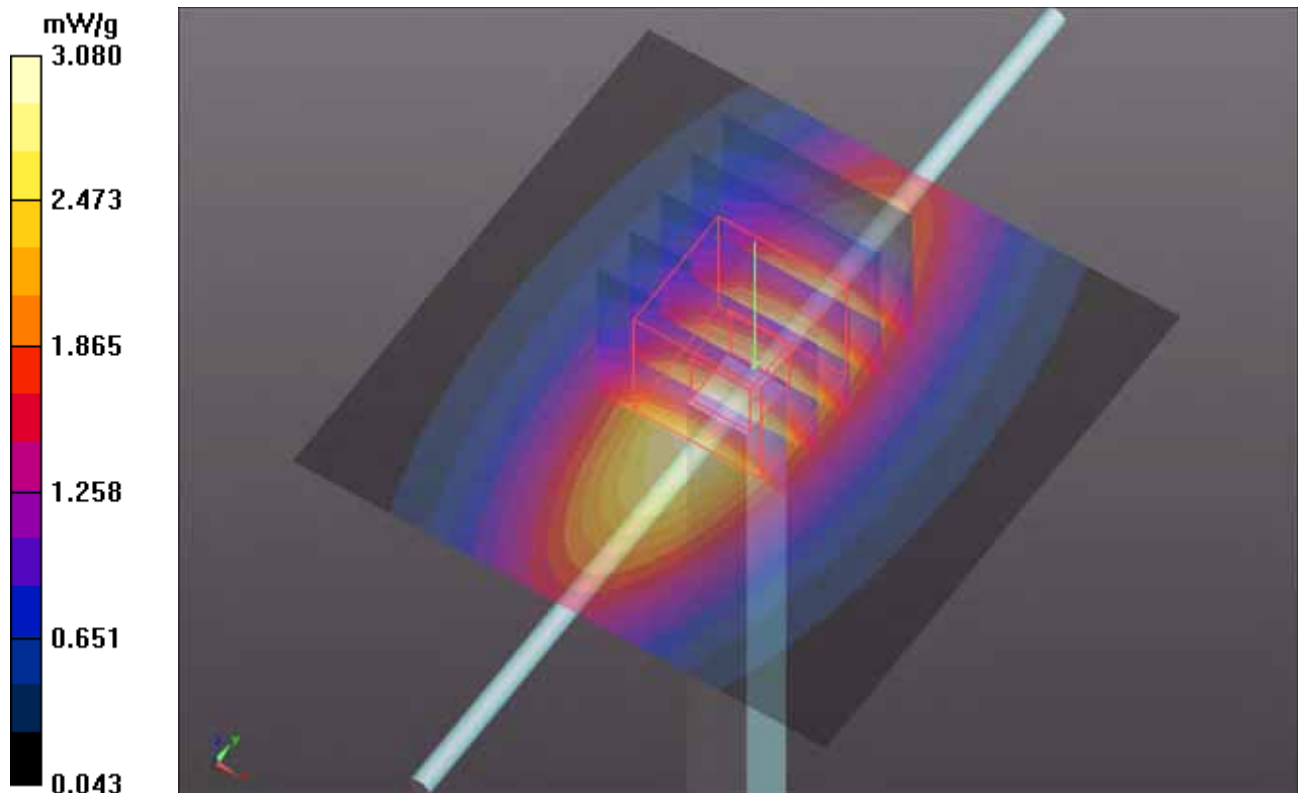
Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 53.793 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.621 mW/g

SAR(1 g) = 2.43 mW/g; SAR(10 g) = 1.6 mW/g

Maximum value of SAR (measured) = 3.06 mW/g



System Check_B835_120521

DUT: Dipole 835 MHz; Type: D835V2; SN: 4d092

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

Medium: B835_0521 Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.995 \text{ mho/m}$; $\epsilon_r = 56.1$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.7 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

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

Maximum value of SAR (interpolated) = 3.09 mW/g

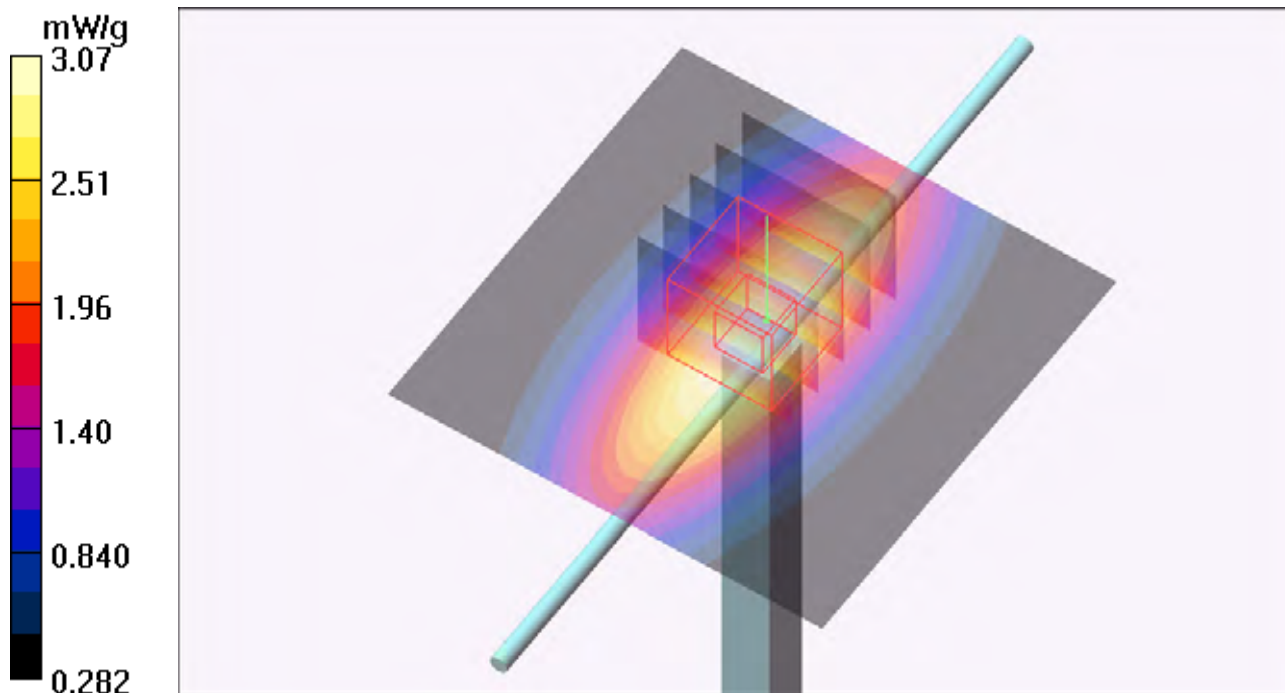
Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 53.8 V/m; Power Drift = -0.018 dB

Peak SAR (extrapolated) = 3.63 W/kg

SAR(1 g) = 2.44 mW/g; SAR(10 g) = 1.61 mW/g

Maximum value of SAR (measured) = 3.07 mW/g



System Check_B835_120525

DUT: Dipole 835 MHz; Type: D835V2; SN: 4d092

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

Medium: B835_0525 Medium parameters used: $f = 835$ MHz; $\sigma = 0.991$ mho/m; $\epsilon_r = 55.768$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C ; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Pin=250mW/Area Scan (61x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 3.24 mW/g

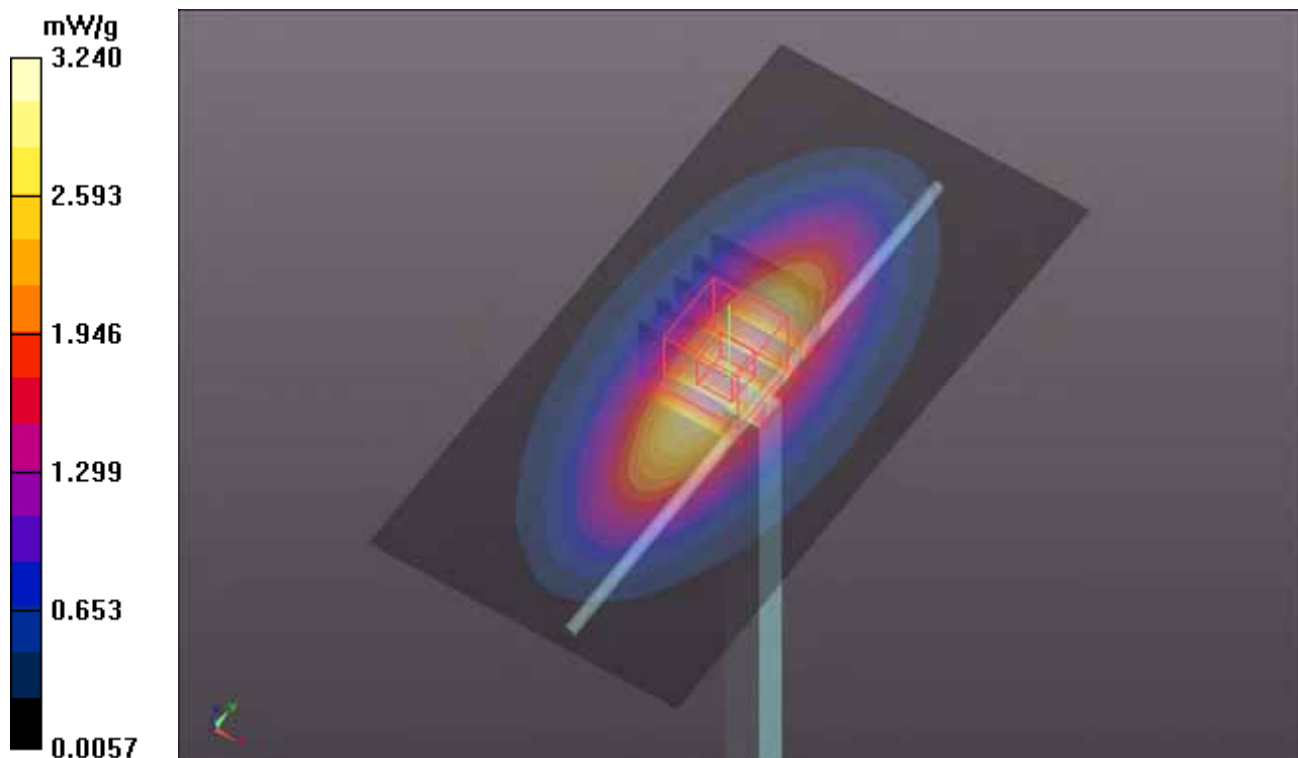
Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 55.517 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.774 mW/g

SAR(1 g) = 2.57 mW/g; SAR(10 g) = 1.7 mW/g

Maximum value of SAR (measured) = 3.24 mW/g



System Check_B1900_120508

DUT: Dipole 1900 MHz; Type: D1900V2; SN: 5d036

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

Medium: B1900_0508 Medium parameters used: $f = 1900$ MHz; $\sigma = 1.563$ mho/m; $\epsilon_r = 54.687$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.6 °C; Liquid Temperature : 20.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

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

Maximum value of SAR (interpolated) = 15.2 mW/g

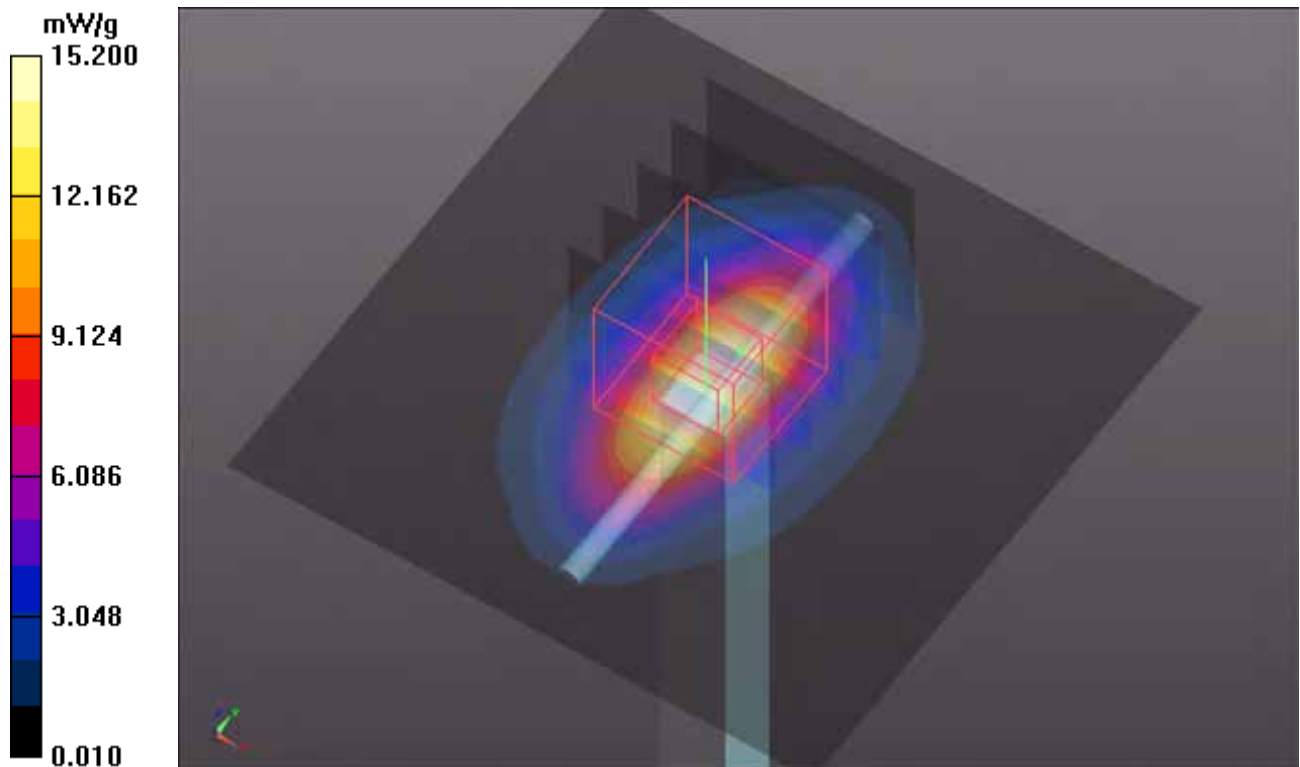
Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 99.006 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 18.930 mW/g

SAR(1 g) = 10.4 mW/g; SAR(10 g) = 5.36 mW/g

Maximum value of SAR (measured) = 14.9 mW/g



System Check_B1900_120526

DUT: Dipole 1900 MHz; Type: D1900V2; SN: 5d036

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

Medium: B1900_0526 Medium parameters used: $f = 1900$ MHz; $\sigma = 1.55$ mho/m; $\epsilon_r = 53.982$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

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

Maximum value of SAR (interpolated) = 15.0 mW/g

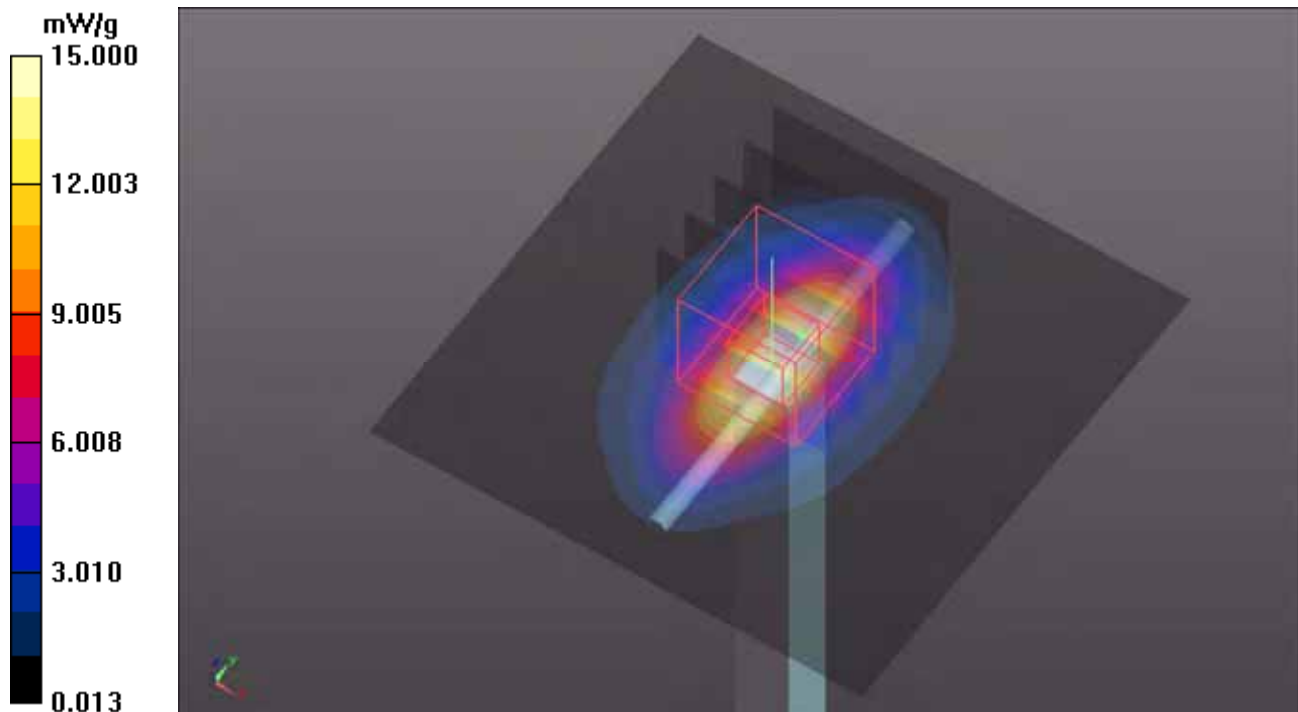
Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 99.376 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 18.583 mW/g

SAR(1 g) = 10.2 mW/g; SAR(10 g) = 5.27 mW/g

Maximum value of SAR (measured) = 14.7 mW/g





Appendix B. SAR Plots of SAR Measurement

The plots for SAR measurement are shown as follows.

P26 GSM850_GPRS10_Rear Face_0cm_Ch251_Ant In

DUT: 120412C30

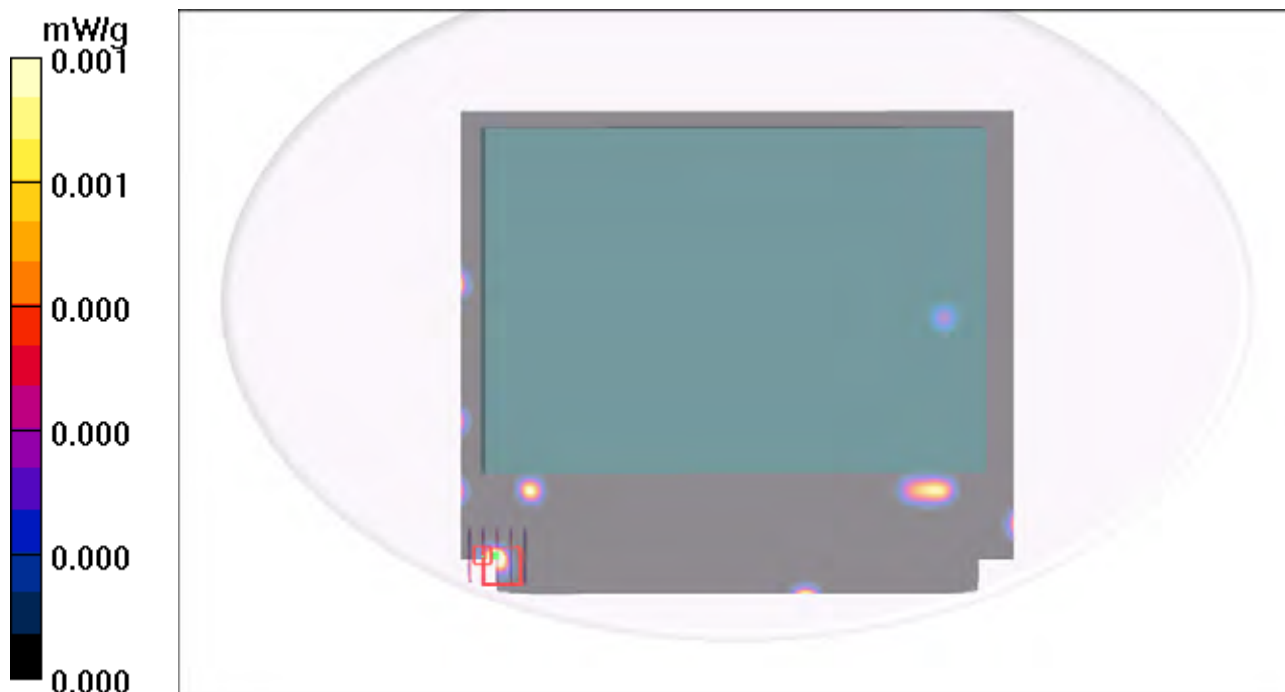
Communication System: GSM850 GPRS10; Frequency: 848.8 MHz; Duty Cycle: 1:4
Medium: B835_0521 Medium parameters used: $f = 849$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 55.9$; $\rho = 1000$ kg/m³
Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.7 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch251/Area Scan (141x161x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.001 mW/g

Ch251/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0.515 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.001 W/kg
SAR(1 g) = 5.55e-005 mW/g; SAR(10 g) = 1.15e-005 mW/g
Maximum value of SAR (measured) = 0.001 mW/g



P27 GSM850_GPRS10_Rear Face_0cm_Ch251_Ant Out

DUT: 120412C30

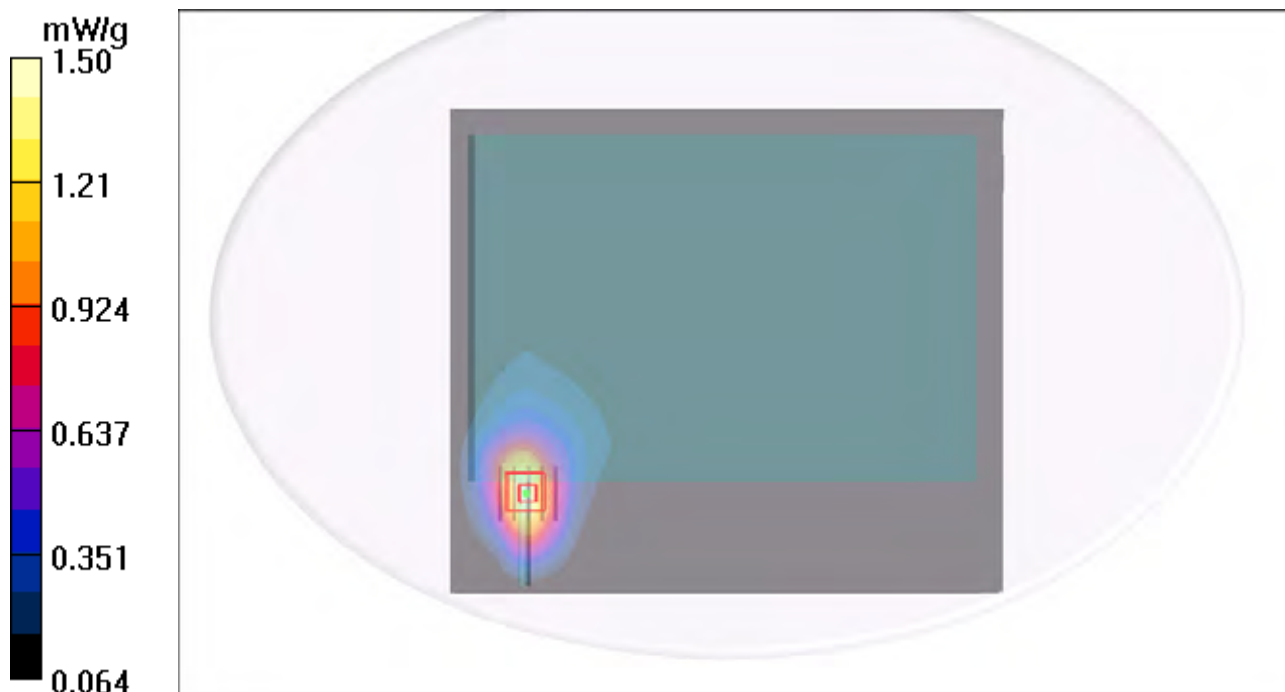
Communication System: GSM850 GPRS10; Frequency: 848.8 MHz; Duty Cycle: 1:4
Medium: B835_0521 Medium parameters used: $f = 849$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 55.9$; $\rho = 1000$ kg/m³
Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.7 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch251/Area Scan (141x161x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 1.43 mW/g

Ch251/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.10 V/m; Power Drift = 0.165 dB
Peak SAR (extrapolated) = 1.74 W/kg
SAR(1 g) = 1.2 mW/g; SAR(10 g) = 0.794 mW/g
Maximum value of SAR (measured) = 1.50 mW/g



P28 GSM850_GPRS10_Secondary Portrait_0cm_Ch251_Ant Out

DUT: 120412C30

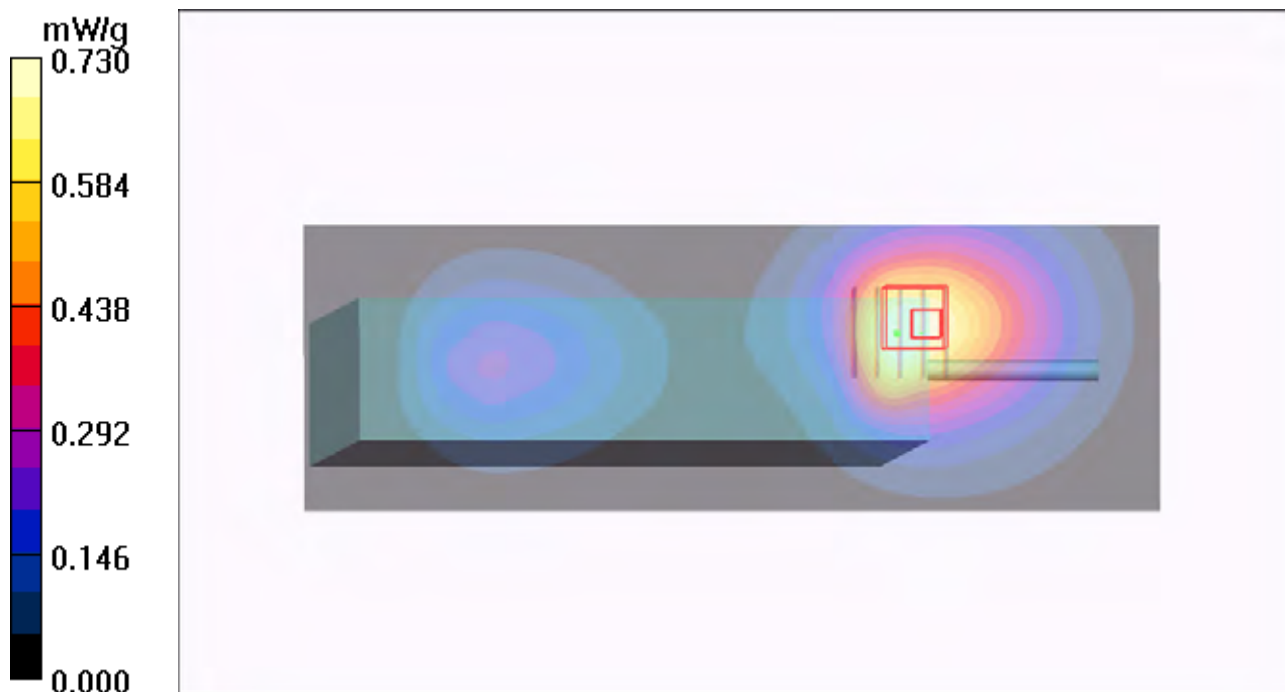
Communication System: GSM850 GPRS10; Frequency: 848.8 MHz; Duty Cycle: 1:4
Medium: B835_0521 Medium parameters used: $f = 849$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 55.9$; $\rho = 1000$ kg/m³
Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.7 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch251/Area Scan (51x151x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.749 mW/g

Ch251/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.74 V/m; Power Drift = 0.037 dB
Peak SAR (extrapolated) = 0.925 W/kg
SAR(1 g) = 0.633 mW/g; SAR(10 g) = 0.417 mW/g
Maximum value of SAR (measured) = 0.730 mW/g



P29 GSM850_GPRS10_Secondary Landscape_0cm_Ch251_Ant In

DUT: 120412C30

Communication System: GSM850 GPRS10; Frequency: 848.8 MHz; Duty Cycle: 1:4

Medium: B835_0521 Medium parameters used: $f = 849$ MHz; $\sigma = 1.01$ mho/m; $\epsilon_r = 55.9$; $\rho = 1000$

kg/m³

Ambient Temperature : 21.5 °C; Liquid Temperature : 20.7 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch251/Area Scan (71x201x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.020 mW/g

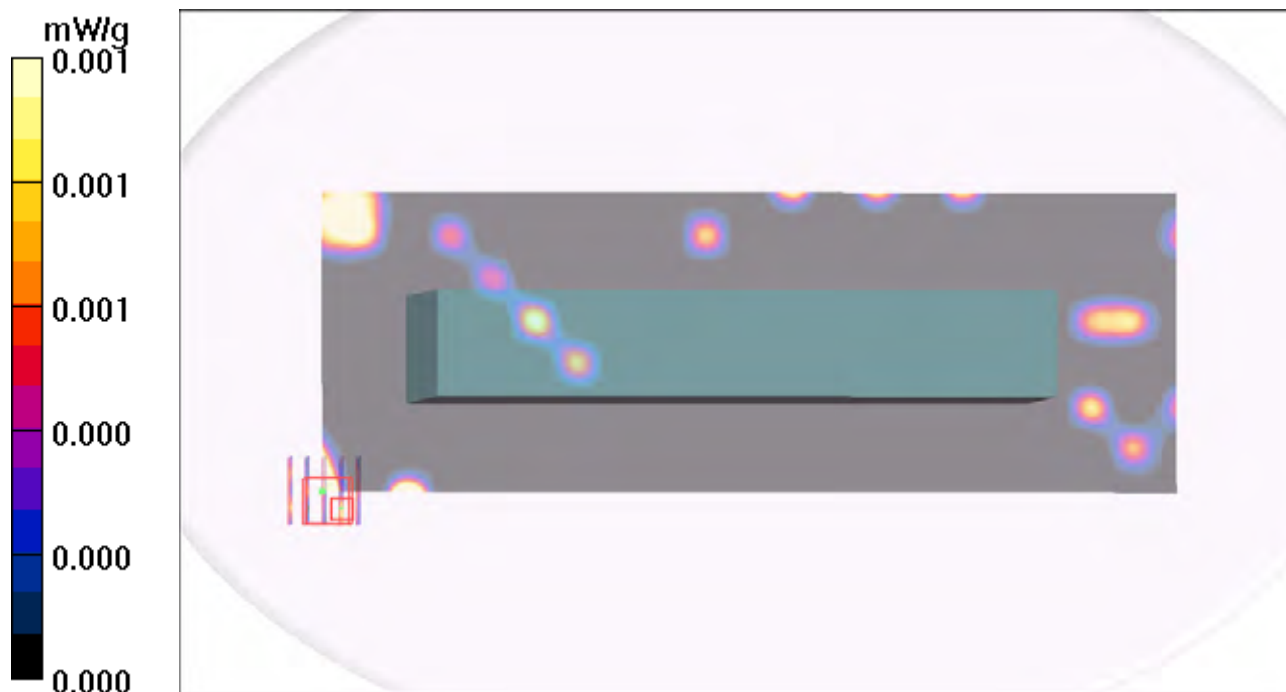
Ch251/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.487 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.001 W/kg

SAR(1 g) = 0.00032 mW/g; SAR(10 g) = 7.14e-005 mW/g

Maximum value of SAR (measured) = 0.001 mW/g



P30 GSM850_GPRS10_Rear Face_0cm_Ch128_Ant Out

DUT: 120412C30

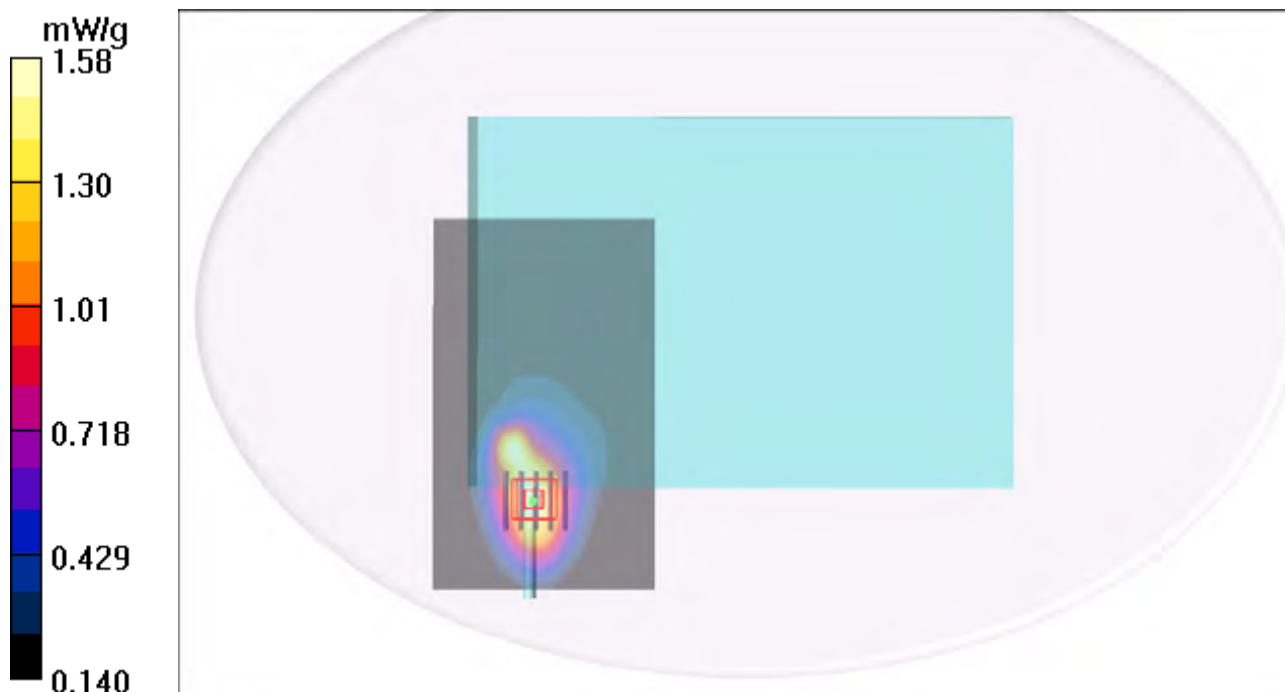
Communication System: GSM850 GPRS10; Frequency: 824.2 MHz; Duty Cycle: 1:4
Medium: B835_0521 Medium parameters used : $f = 824.2$ MHz; $\sigma = 0.985$ mho/m; $\epsilon_r = 56.2$; $\rho = 1000$ kg/m³
Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.7 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

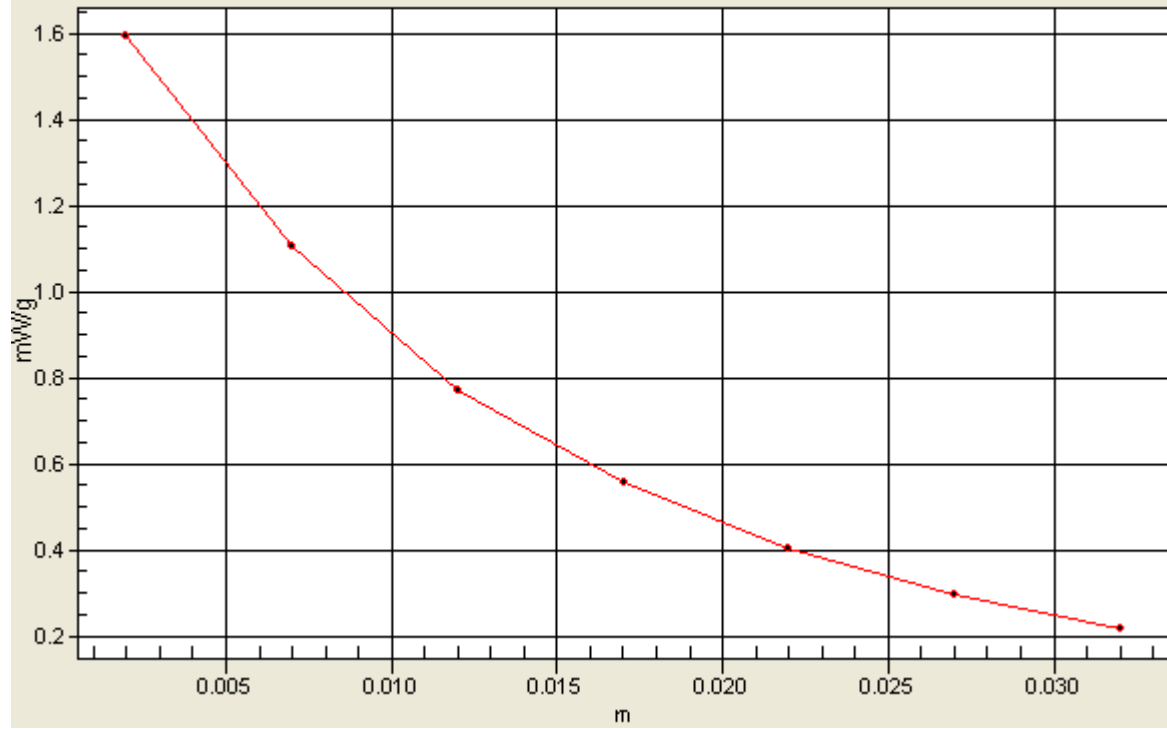
Ch128/Area Scan (101x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 1.62 mW/g

Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.53 V/m; Power Drift = -0.059 dB
Peak SAR (extrapolated) = 1.86 W/kg
SAR(1 g) = 1.27 mW/g; SAR(10 g) = 0.848 mW/g
Maximum value of SAR (measured) = 1.58 mW/g



1g/10g Averaged SAR

SAR; Zoom Scan: Value Along Z, X=2, Y=2



P31 GSM850_GPRS10_Rear Face_0cm_Ch189_Ant Out

DUT: 120412C30

Communication System: GSM850 GPRS10; Frequency: 836.4 MHz; Duty Cycle: 1:4
Medium: B835_0521 Medium parameters used : $f = 836.4$ MHz; $\sigma = 0.996$ mho/m; $\epsilon_r = 56.1$; $\rho = 1000$ kg/m³
Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.7 °C

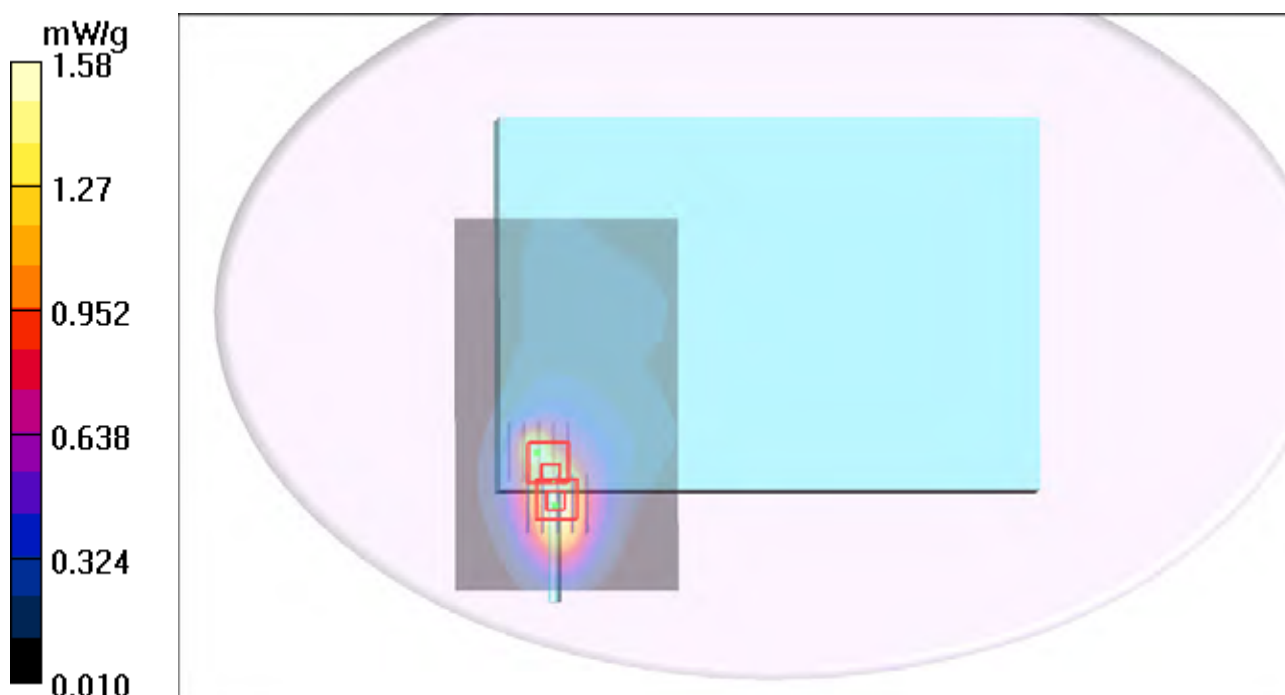
DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch189/Area Scan (101x61x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 1.61 mW/g

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.23 V/m; Power Drift = 0.100 dB
Peak SAR (extrapolated) = 1.81 W/kg
SAR(1 g) = 1.25 mW/g; SAR(10 g) = 0.837 mW/g
Maximum value of SAR (measured) = 1.58 mW/g

Ch189/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.23 V/m; Power Drift = 0.100 dB
Peak SAR (extrapolated) = 1.74 W/kg
SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.680 mW/g
Maximum value of SAR (measured) = 1.48 mW/g



P07 GSM1900_GPRS 10_Rear Face_0cm_Ch810_Ant In

DUT: 120412C30

Communication System: PRS10; Frequency: 1909.8 MHz; Duty Cycle: 1:4.00037

Medium: B1900_0508 Medium parameters used: $f = 1910$ MHz; $\sigma = 1.573$ mho/m; $\epsilon_r = 54.676$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.6 °C; Liquid Temperature : 20.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (131x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.0176 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.338 V/m; Power Drift = 0.079 dB

Peak SAR (extrapolated) = 0.0061 mW/g

SAR(1 g) = 0.00354 mW/g; SAR(10 g) = 0.0026 mW/g

Maximum value of SAR (measured) = 0.00597 mW/g

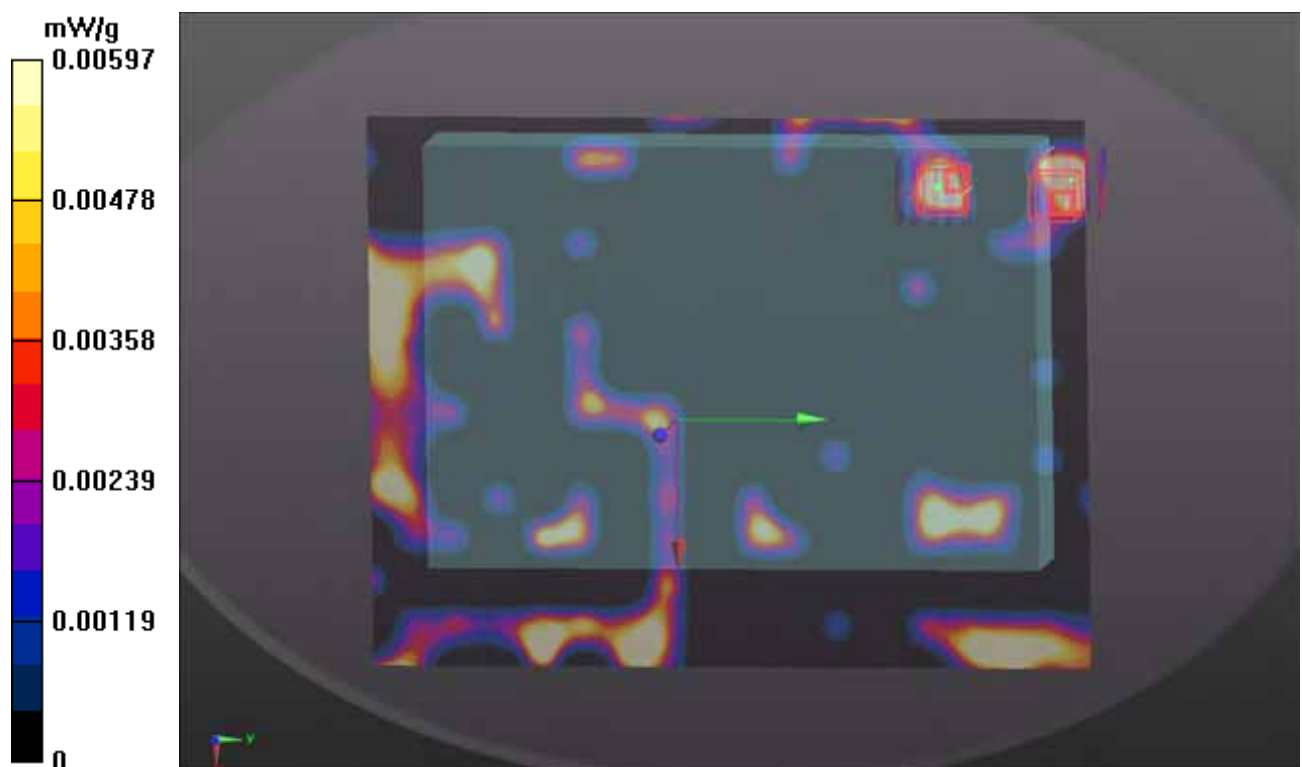
Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.338 V/m; Power Drift = 0.079 dB

Peak SAR (extrapolated) = 0.00677 mW/g

SAR(1 g) = 0.00313 mW/g; SAR(10 g) = 0.00181 mW/g

Maximum value of SAR (measured) = 0.00599 mW/g



P08 GSM1900_GPRS 10_Rear Face_0cm_Ch810_Ant Out

DUT: 120412C30

Communication System: PRS10; Frequency: 1909.8 MHz; Duty Cycle: 1:4.00037

Medium: B1900_0508 Medium parameters used: $f = 1910$ MHz; $\sigma = 1.573$ mho/m; $\epsilon_r = 54.676$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.3 °C ; Liquid Temperature : 21.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (151x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.579 mW/g

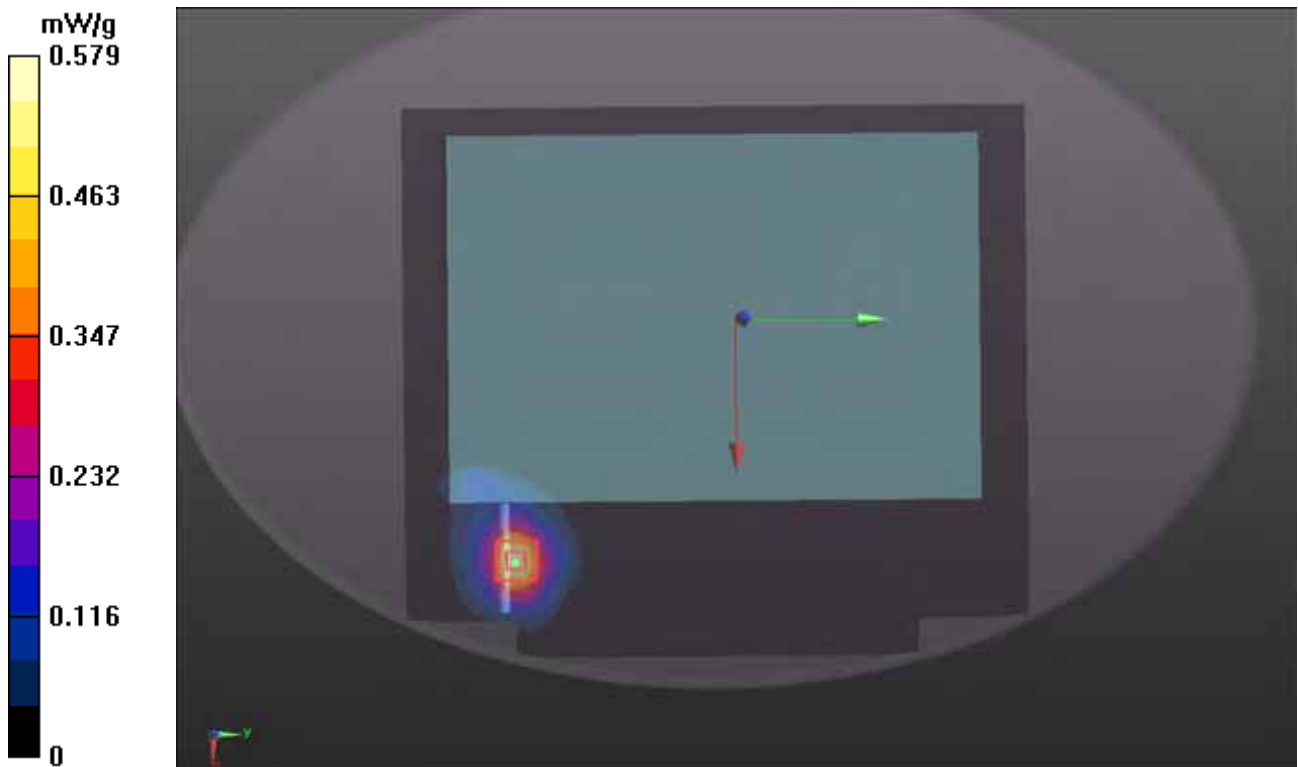
Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.516 V/m; Power Drift = 0.118 dB

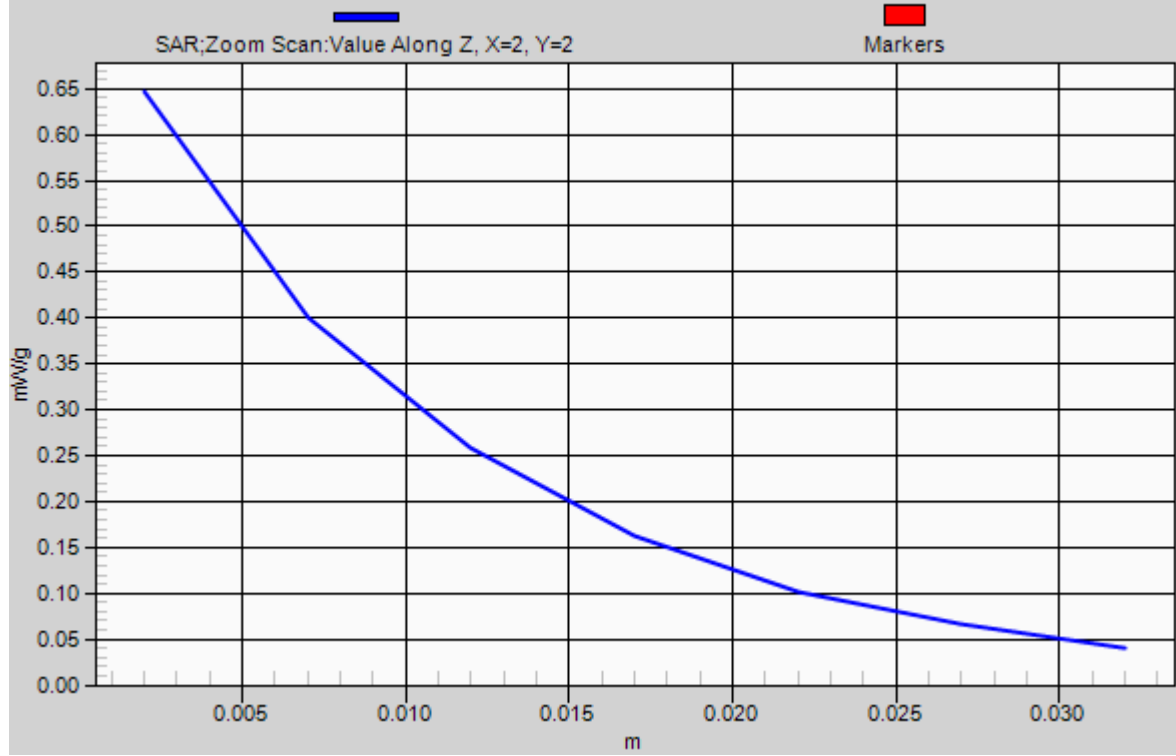
Peak SAR (extrapolated) = 0.791 mW/g

SAR(1 g) = 0.485 mW/g; SAR(10 g) = 0.281 mW/g

Maximum value of SAR (measured) = 0.646 mW/g



1g/10g Averaged SAR



P09 GSM1900_GPRS 10_Secondary Portrait_0cm_Ch810_Ant Out

DUT: 120412C30

Communication System: PRS10; Frequency: 1909.8 MHz; Duty Cycle: 1:4.00037

Medium: B1900_0508 Medium parameters used: $f = 1910$ MHz; $\sigma = 1.573$ mho/m; $\epsilon_r = 54.676$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.6 °C; Liquid Temperature : 20.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (81x161x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.201 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.703 V/m; Power Drift = 0.131 dB

Peak SAR (extrapolated) = 0.286 mW/g

SAR(1 g) = 0.133 mW/g; SAR(10 g) = 0.085 mW/g

Maximum value of SAR (measured) = 0.198 mW/g

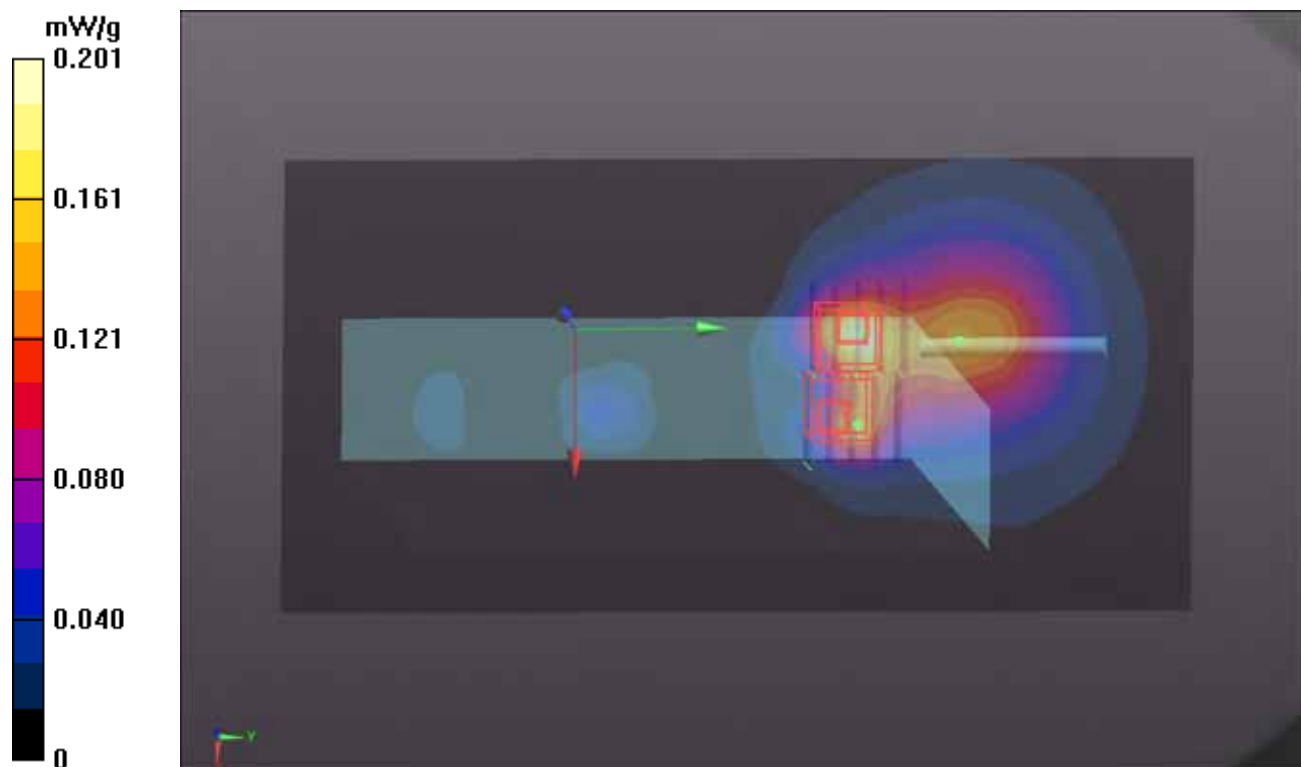
Ch810/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.703 V/m; Power Drift = 0.131 dB

Peak SAR (extrapolated) = 0.212 mW/g

SAR(1 g) = 0.122 mW/g; SAR(10 g) = 0.068 mW/g

Maximum value of SAR (measured) = 0.173 mW/g



P10 GSM1900_GPRS 10_Secondary Landscape_0cm_Ch810_Ant In

DUT: 120412C30

Communication System: PRS10; Frequency: 1909.8 MHz; Duty Cycle: 1:4.00037

Medium: B1900_0508 Medium parameters used: $f = 1910$ MHz; $\sigma = 1.573$ mho/m; $\epsilon_r = 54.676$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.4 °C ; Liquid Temperature : 20.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (81x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.0697 mW/g

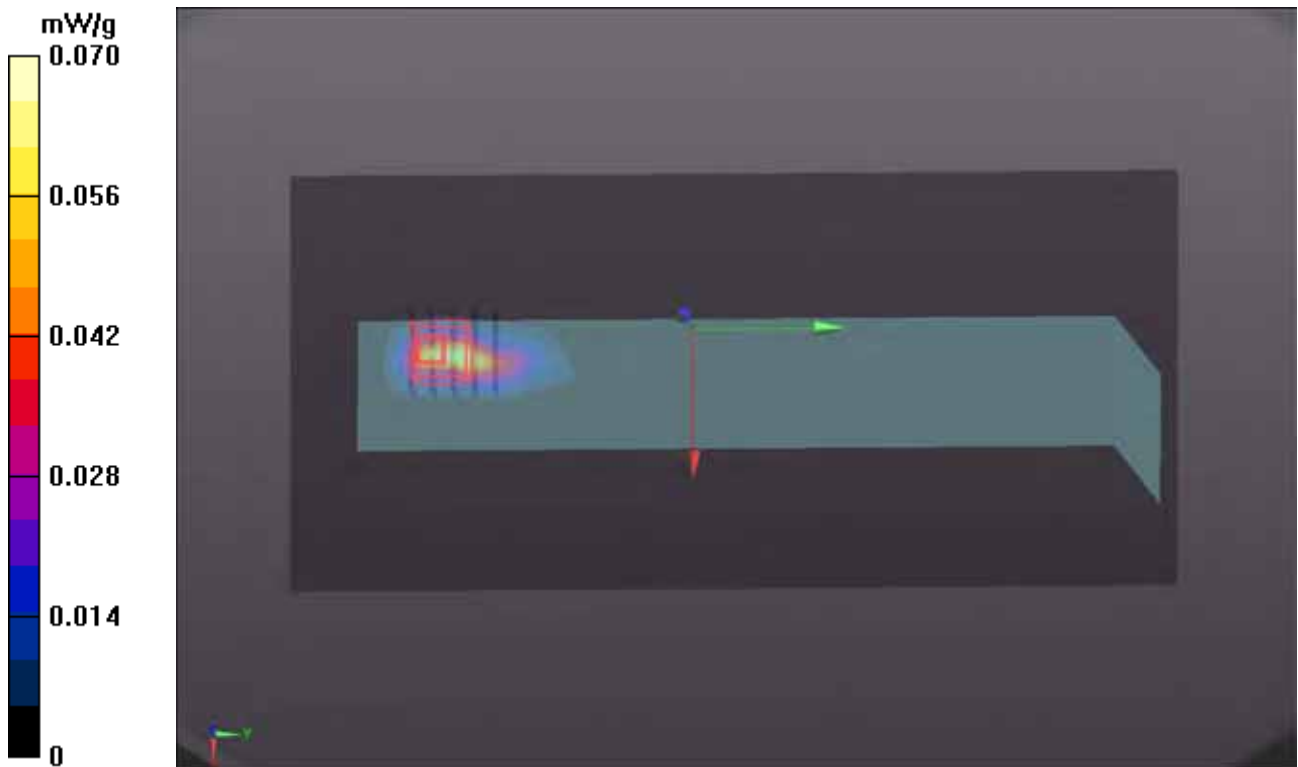
Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.410 V/m; Power Drift = 0.126 dB

Peak SAR (extrapolated) = 0.052 mW/g

SAR(1 g) = 0.029 mW/g; SAR(10 g) = 0.012 mW/g

Maximum value of SAR (measured) = 0.0407 mW/g



P19 WCDMA V_RMC12.2K_Rear Face_0cm_Ch4233_Ant In

DUT: 120412C30

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: B835_0511 Medium parameters used: $f = 847$ MHz; $\sigma = 1.004$ mho/m; $\epsilon_r = 55.49$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.9 °C ; Liquid Temperature : 20.4 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch4233/Area Scan (131x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.0126 mW/g

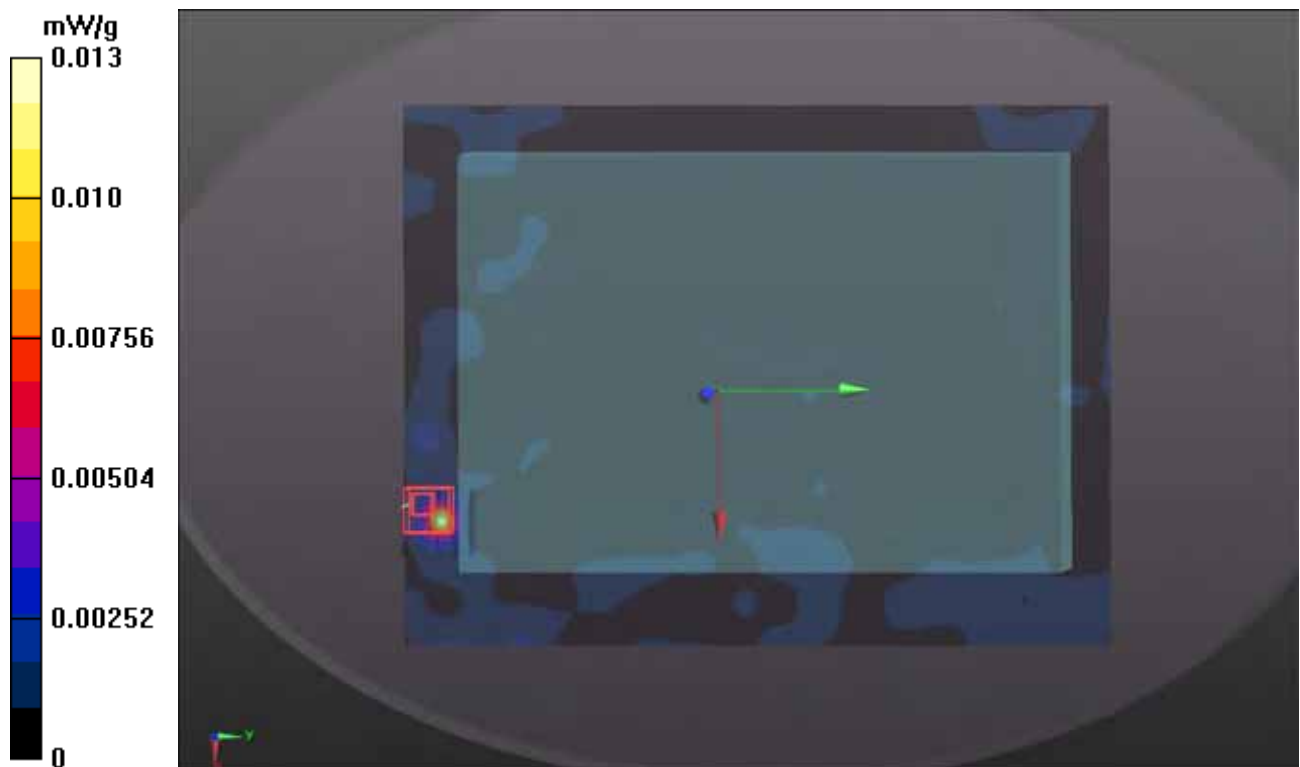
Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.00491 mW/g

SAR(1 g) = 0.00108 mW/g; SAR(10 g) = 0.00039 mW/g

Maximum value of SAR (measured) = 0.00262 mW/g



P20 WCDMA V_RMC12.2K_Rear Face_0cm_Ch4233_Ant Out

DUT: 120412C30

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: B835_0509 Medium parameters used: $f = 847$ MHz; $\sigma = 1.008$ mho/m; $\epsilon_r = 56.249$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch4233/Area Scan (151x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 1.43 mW/g

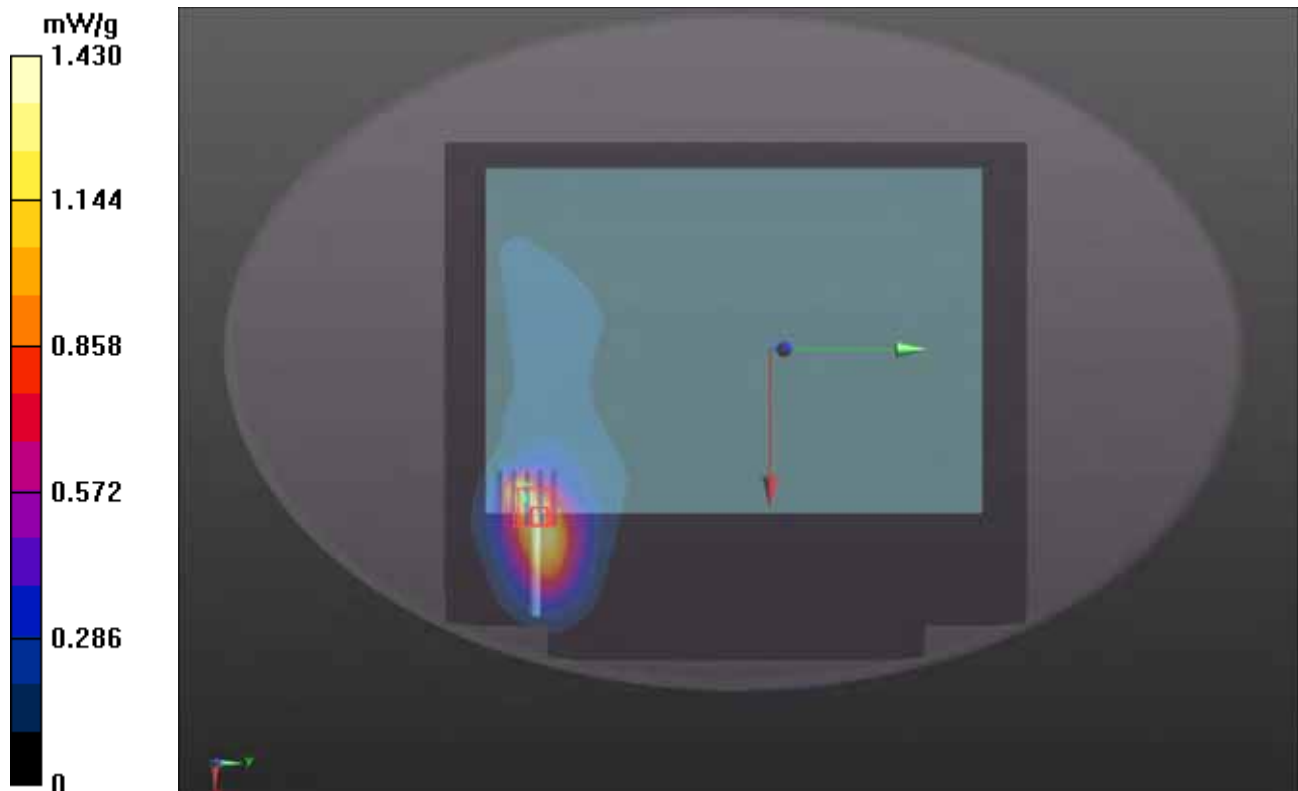
Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.634 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 2.102 mW/g

SAR(1 g) = 0.999 mW/g; SAR(10 g) = 0.645 mW/g

Maximum value of SAR (measured) = 1.47 mW/g



P21 WCDMA V_RMC12.2K_Secondary Portrait_0cm_Ch4233_Ant Out

DUT: 120412C30

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: B835_0511 Medium parameters used: $f = 847$ MHz; $\sigma = 1.004$ mho/m; $\epsilon_r = 55.49$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.9 °C; Liquid Temperature : 20.4 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch4233/Area Scan (81x161x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.672 mW/g

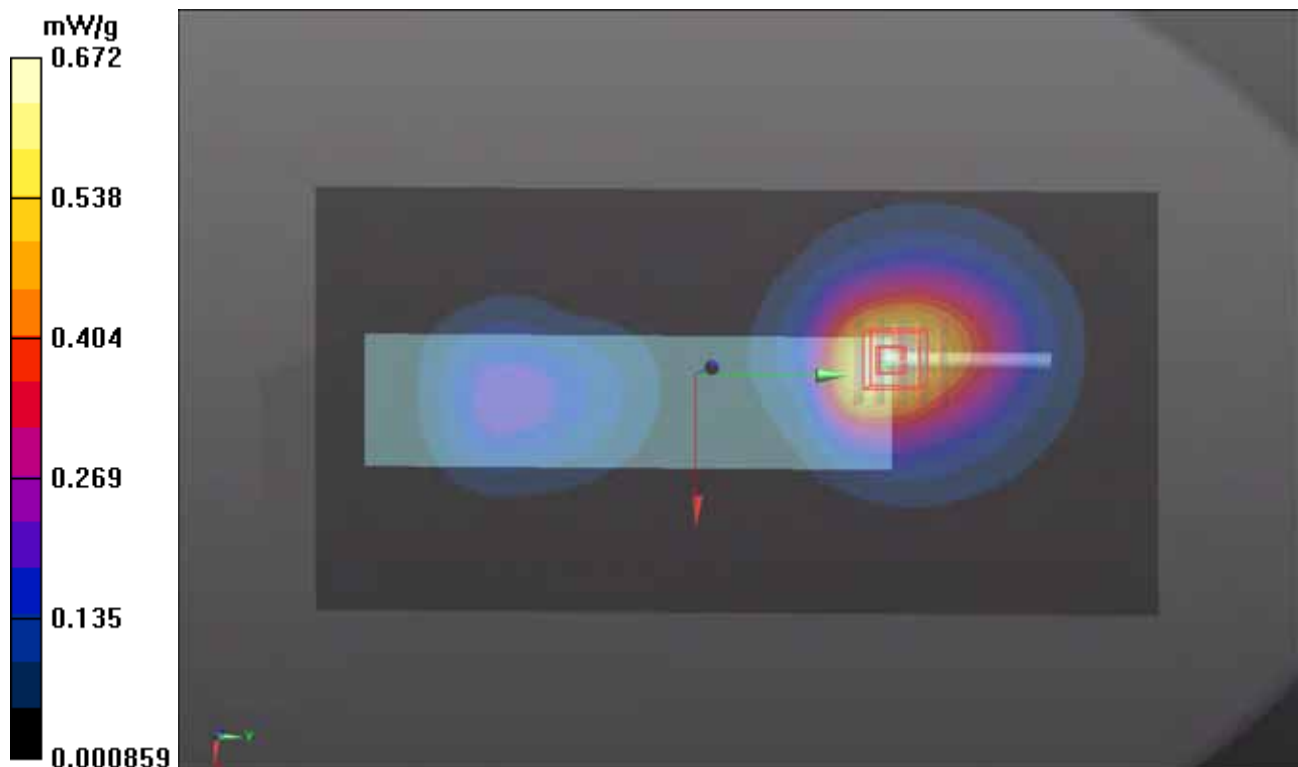
Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 9.243 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 0.754 mW/g

SAR(1 g) = 0.538 mW/g; SAR(10 g) = 0.378 mW/g

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



P22 WCDMA V_RMC12.2K_Secondary Landscape_0cm_Ch4233_Ant In

DUT: 120412C30

Communication System: WCDMA; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: B835_0511 Medium parameters used: $f = 847$ MHz; $\sigma = 1.004$ mho/m; $\epsilon_r = 55.49$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.9 °C; Liquid Temperature : 20.4 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(10.47, 10.47, 10.47); Calibrated: 2012/02/23;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch4233/Area Scan (81x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.00412 mW/g

Ch4233/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.208 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.00713 mW/g

SAR(1 g) = 0.00192 mW/g; SAR(10 g) = 0.000583 mW/g

Maximum value of SAR (measured) = 0.00637 mW/g

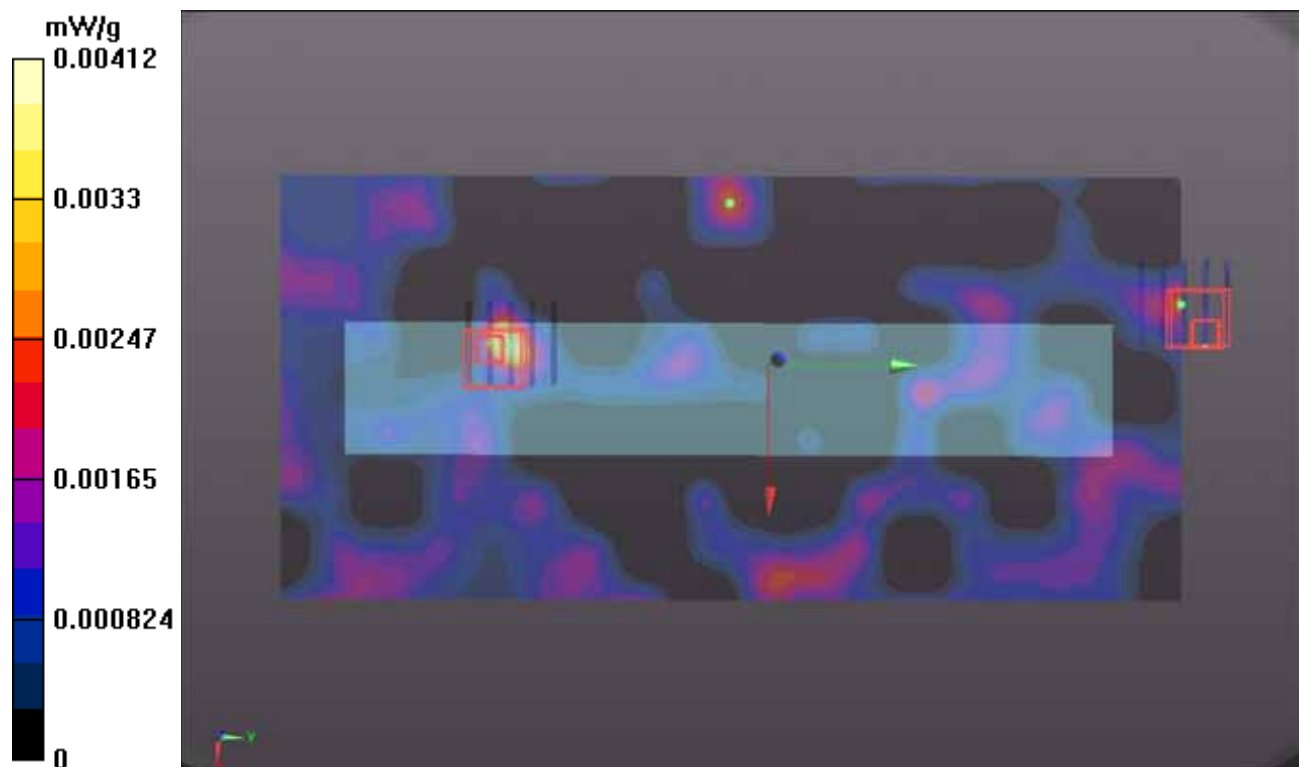
Ch4233/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.208 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.00276 mW/g

SAR(1 g) = 0.000407 mW/g; SAR(10 g) = 0.000161 mW/g

Maximum value of SAR (measured) = 0.00153 mW/g



P23 WCDMA V_RMC12.2K_Rear Face_0cm_Ch4132_Ant Out

DUT: 120412C30

Communication System: WCDMA; Frequency: 826.4 MHz; Duty Cycle: 1:1

Medium: B835_0509 Medium parameters used: $f = 826.4$ MHz; $\sigma = 0.988$ mho/m; $\epsilon_r = 56.479$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch4132/Area Scan (131x61x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 1.47 mW/g

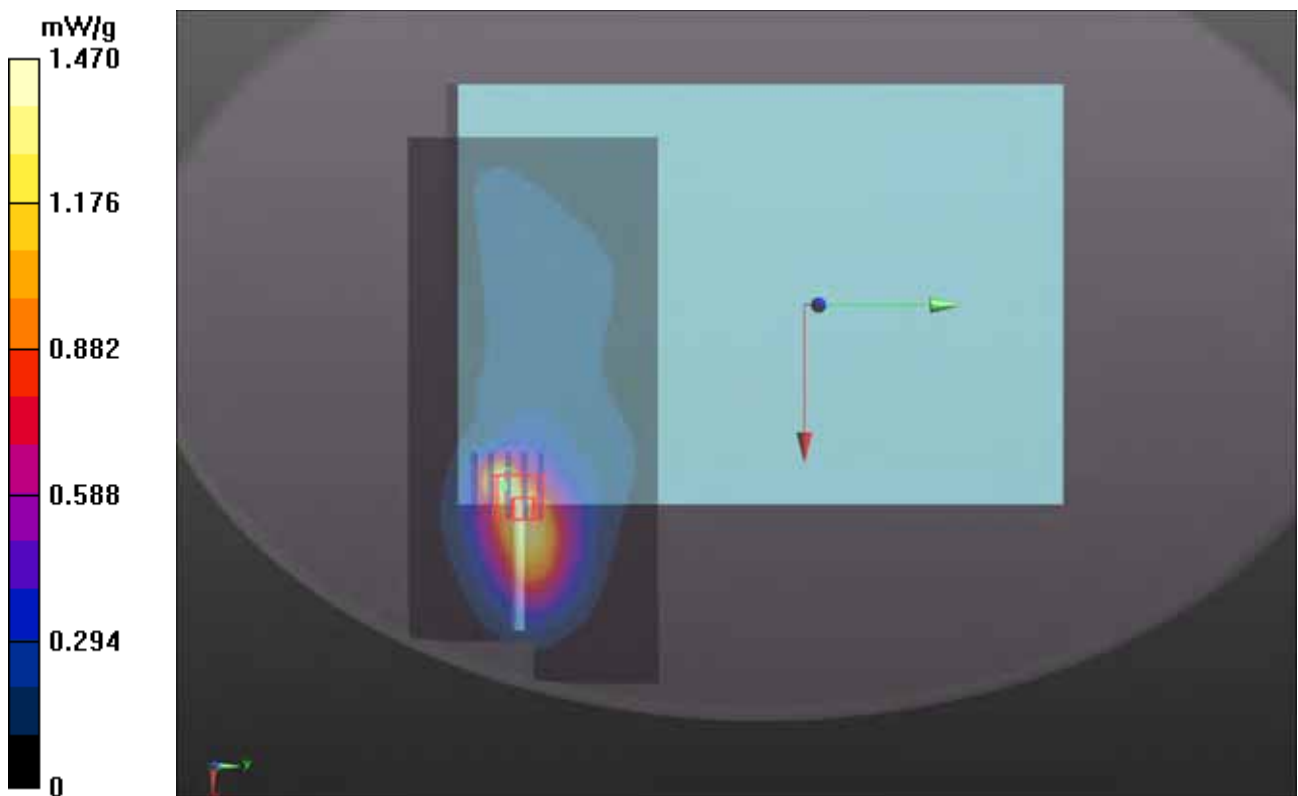
Ch4132/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 6.072 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 2.275 mW/g

SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.663 mW/g

Maximum value of SAR (measured) = 1.52 mW/g



P24 WCDMA V_RMC12.2K_Rear Face_0cm_Ch4182_Ant Out

DUT: 120412C30

Communication System: WCDMA; Frequency: 836.4 MHz; Duty Cycle: 1:1

Medium: B835_0509 Medium parameters used: $f = 836.4$ MHz; $\sigma = 0.998$ mho/m; $\epsilon_r = 56.367$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.5 °C ; Liquid Temperature : 20.5 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch4182/Area Scan (131x61x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 1.48 mW/g

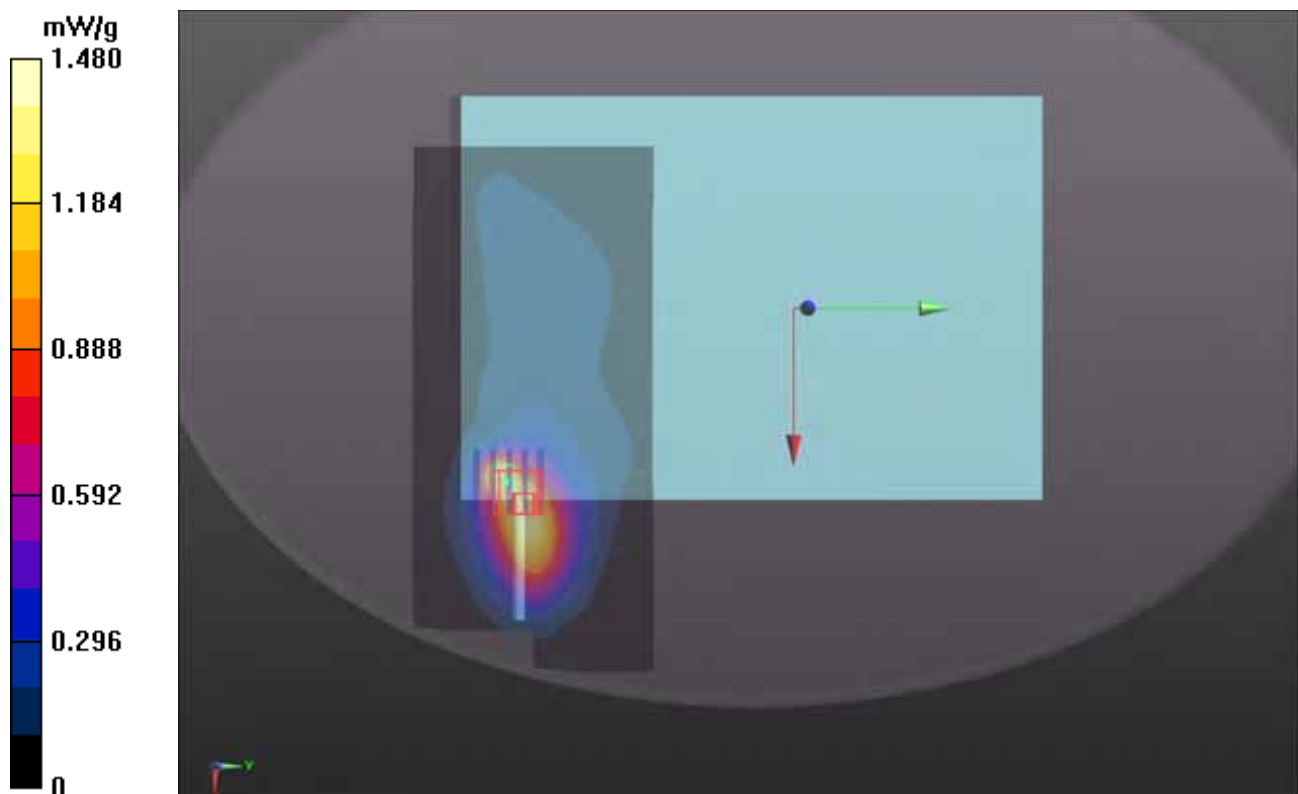
Ch4182/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

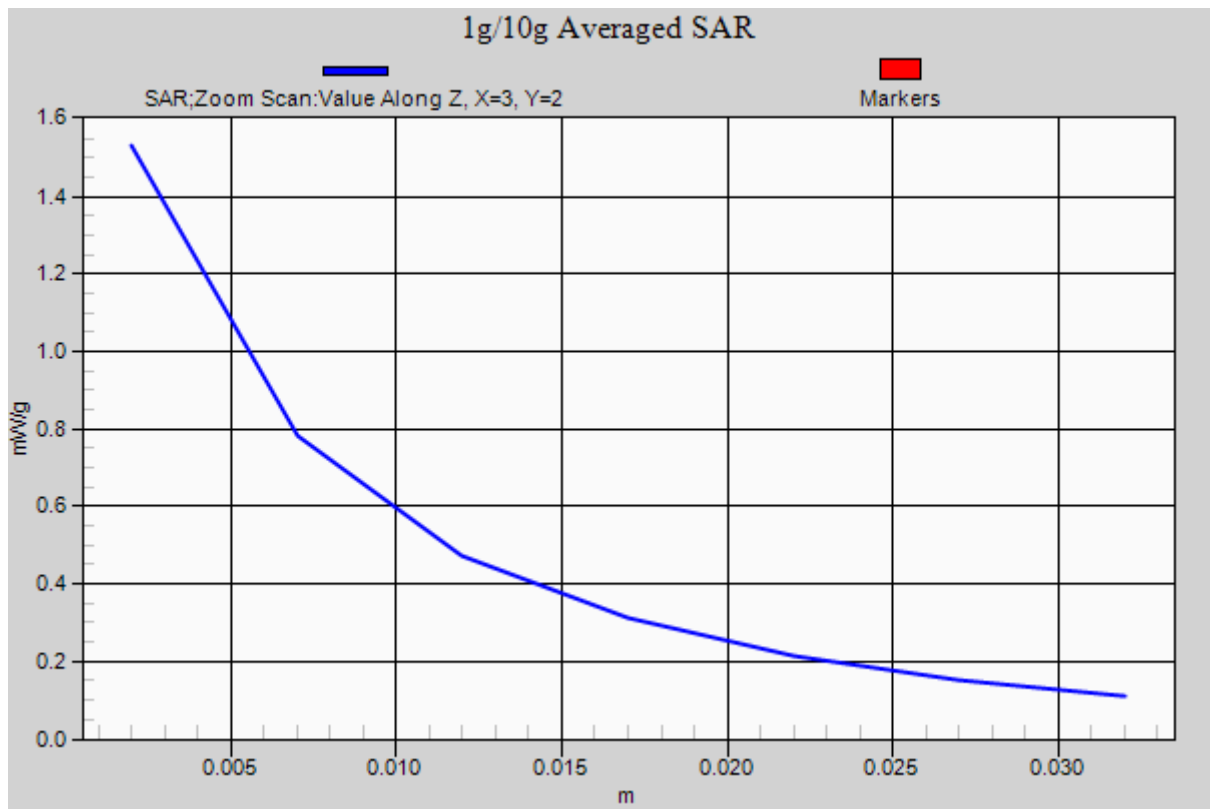
Reference Value = 6.157 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 2.301 mW/g

SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.672 mW/g

Maximum value of SAR (measured) = 1.54 mW/g





P13 WCDMA II_RMC12.2K_Rear Face_0cm_Ch9262_Ant In

DUT: 120412C30

Communication System: WCDMA; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: B1900_0508 Medium parameters used: $f = 1852.4$ MHz; $\sigma = 1.507$ mho/m; $\epsilon_r = 54.839$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.6 °C ; Liquid Temperature : 20.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch9262/Area Scan (131x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.0376 mW/g

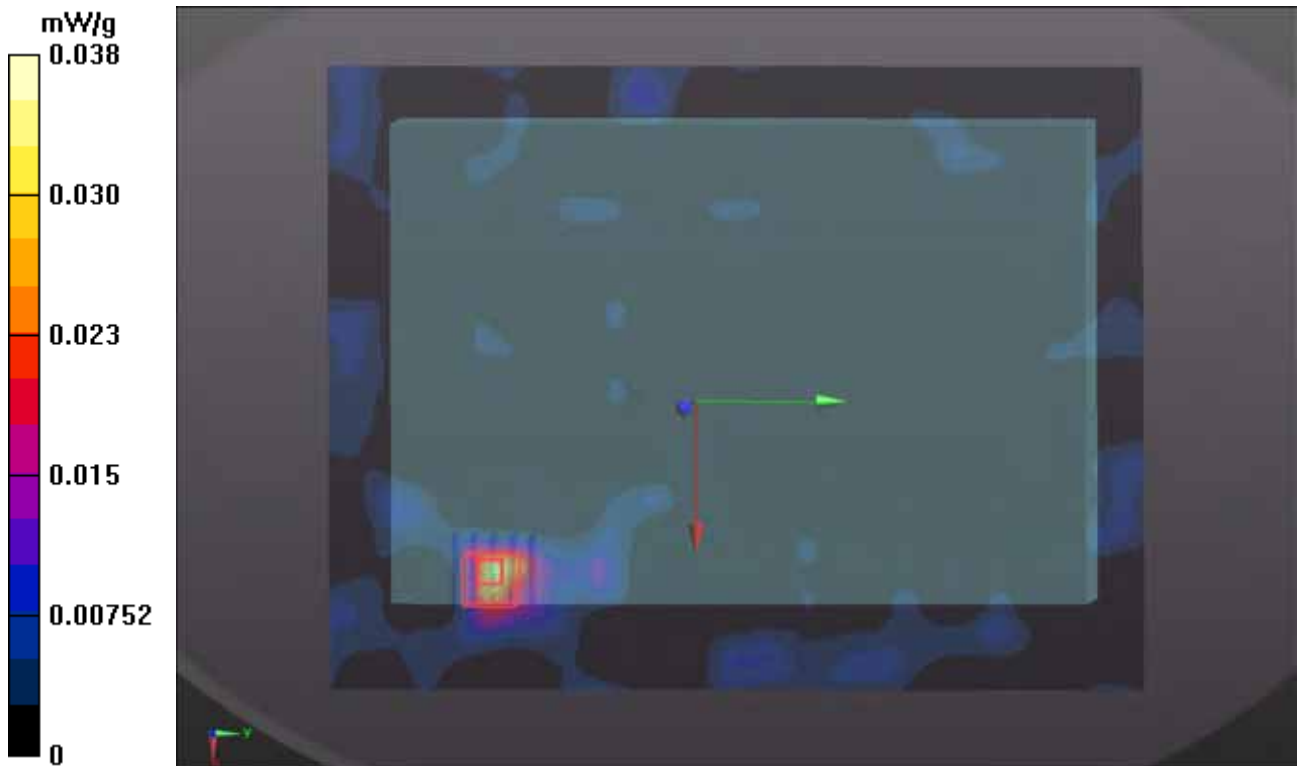
Ch9262/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.182 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.025 mW/g

SAR(1 g) = 0.016 mW/g; SAR(10 g) = 0.01 mW/g

Maximum value of SAR (measured) = 0.0198 mW/g



P14 WCDMA II_RMC12.2K_Rear Face_0cm_Ch9262_Ant Out

DUT: 120412C30

Communication System: WCDMA; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: B1900_0508 Medium parameters used: $f = 1852.4$ MHz; $\sigma = 1.507$ mho/m; ϵ_r

$= 54.839$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.6 °C; Liquid Temperature : 20.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch9262/Area Scan (151x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.819 mW/g

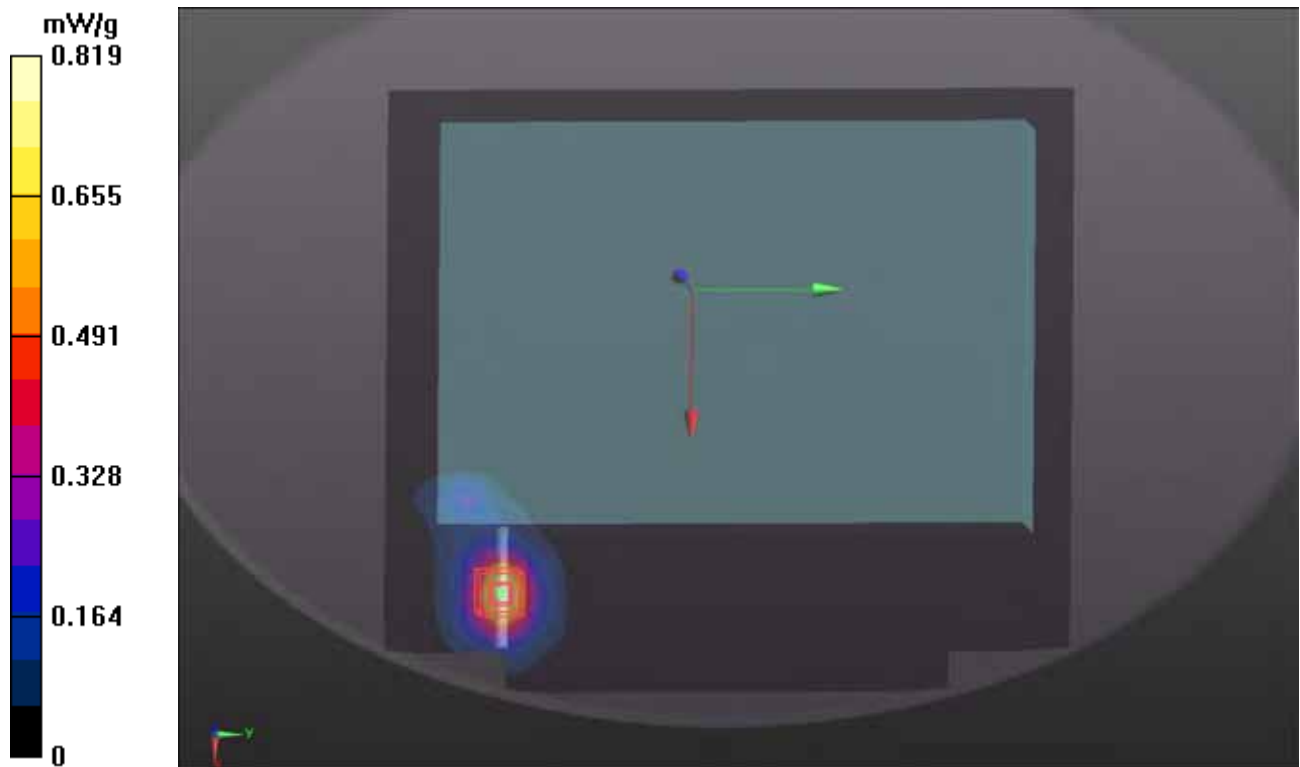
Ch9262/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.376 V/m; Power Drift = 0.074 dB

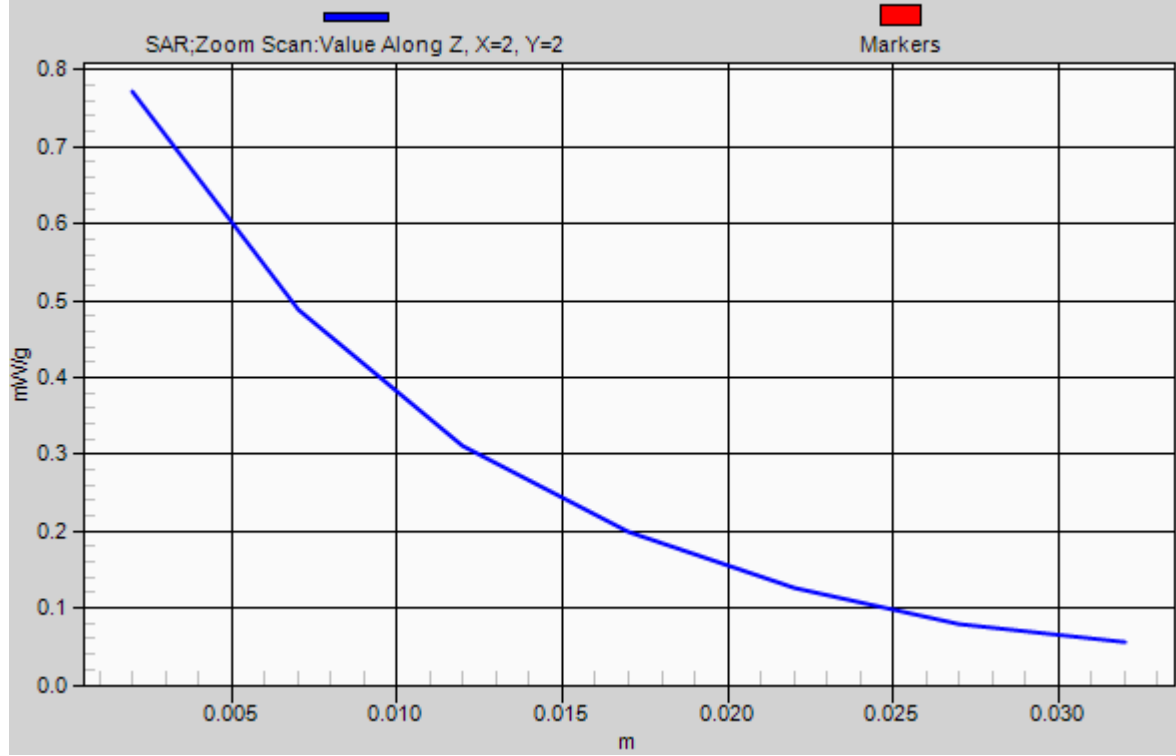
Peak SAR (extrapolated) = 0.929 mW/g

SAR(1 g) = 0.585 mW/g; SAR(10 g) = 0.341 mW/g

Maximum value of SAR (measured) = 0.772 mW/g



1g/10g Averaged SAR



P15 WCDMA II_RMC12.2K_Secondary Portrait_0cm_Ch9262_Ant Out

DUT: 120412C30

Communication System: WCDMA; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: B1900_0508 Medium parameters used: $f = 1852.4$ MHz; $\sigma = 1.507$ mho/m; ϵ_r

$= 54.839$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.6 °C; Liquid Temperature : 20.8 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch9262/Area Scan (81x161x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.320 mW/g

Ch9262/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.668 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.442 mW/g

SAR(1 g) = 0.260 mW/g; SAR(10 g) = 0.147 mW/g

Maximum value of SAR (measured) = 0.354 mW/g

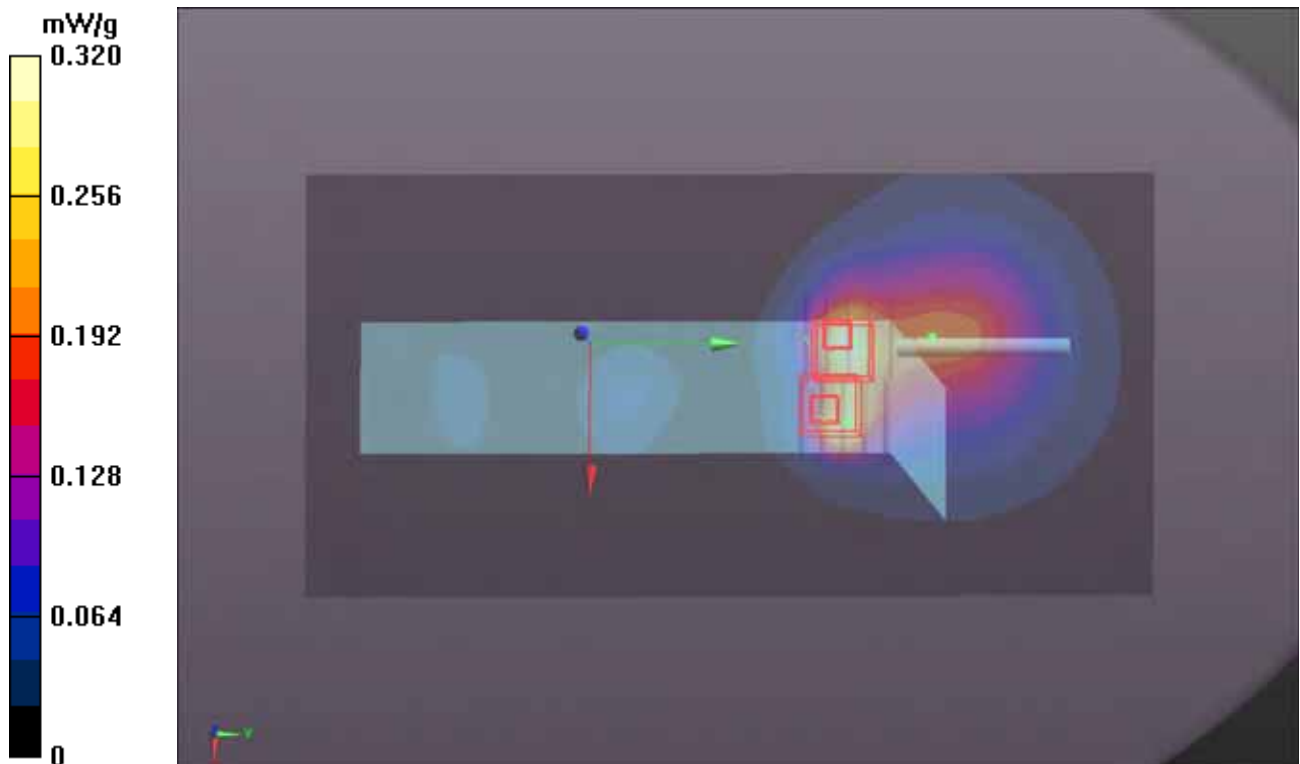
Ch9262/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.668 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.386 mW/g

SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.135 mW/g

Maximum value of SAR (measured) = 0.283 mW/g



P16 WCDMA II_RMC12.2K_Secondary Landscape_0cm_Ch9262_Ant In

DUT: 120412C30

Communication System: WCDMA; Frequency: 1852.4 MHz; Duty Cycle: 1:1

Medium: B1900_0508 Medium parameters used: $f = 1852.4$ MHz; $\sigma = 1.507$ mho/m; ϵ_r

$= 54.839$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.4 °C ; Liquid Temperature : 22.6 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch9262/Area Scan (81x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.209 mW/g

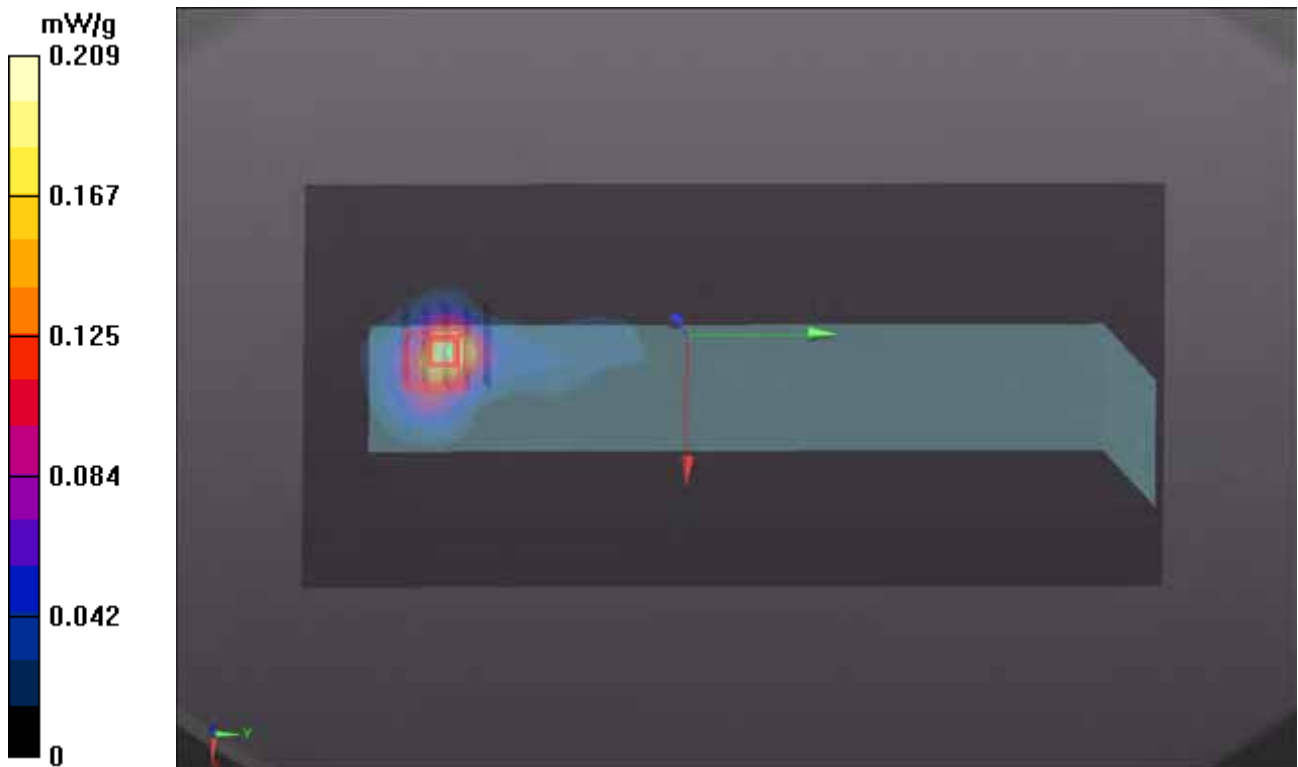
Ch9262/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 2.287 V/m; Power Drift = -0.071 dB

Peak SAR (extrapolated) = 0.320 mW/g

SAR(1 g) = 0.144 mW/g; SAR(10 g) = 0.069 mW/g

Maximum value of SAR (measured) = 0.244 mW/g



P33 CDMA2000 BC0_RTAP153.6_Rear Face_0cm_Ch1013_Ant Out

DUT: 120412C30

Communication System: CDMA2000; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium: B835_0525 Medium parameters used: $f = 825 \text{ MHz}$; $\sigma = 0.982 \text{ mho/m}$; $\epsilon_r = 55.871$; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : 21.7 °C ; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch1013/Area Scan (151x171x1): Measurement grid: $dx=20\text{mm}$, $dy=20\text{mm}$

Maximum value of SAR (interpolated) = 1.17 mW/g

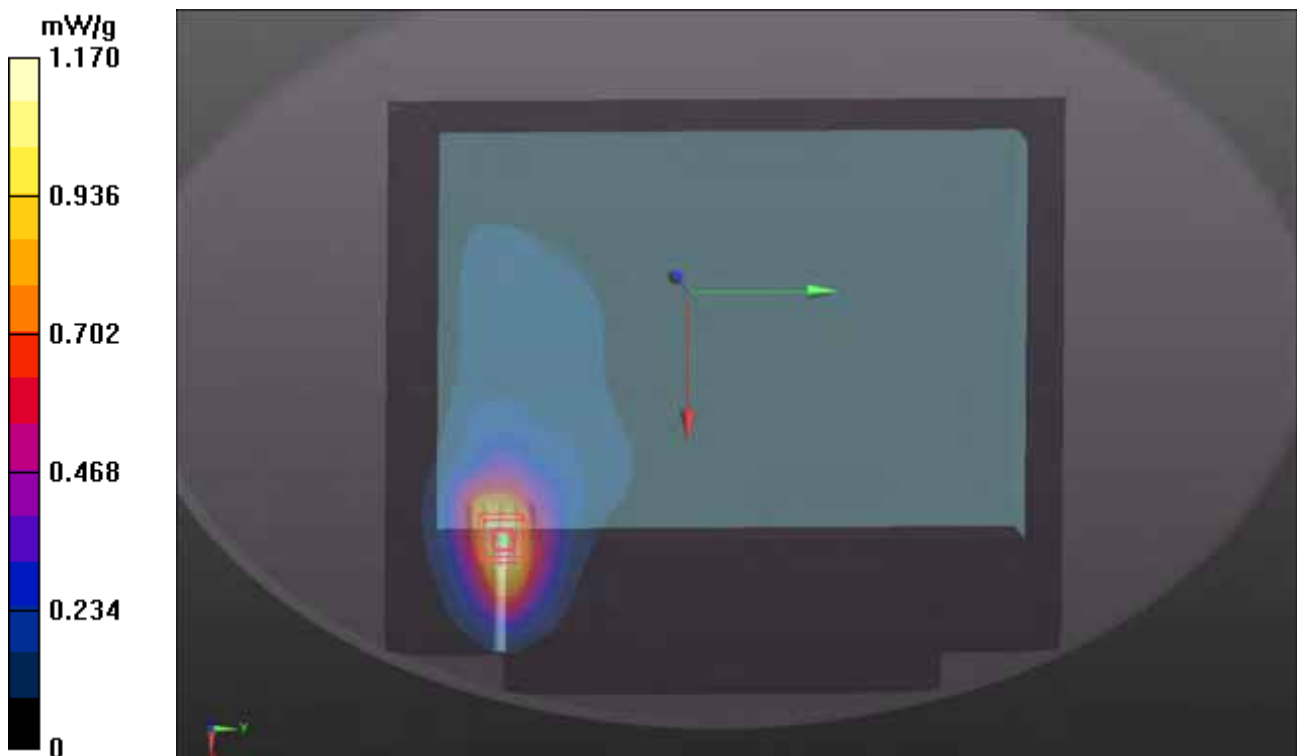
Ch1013/Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.854 V/m; Power Drift = 0.128 dB

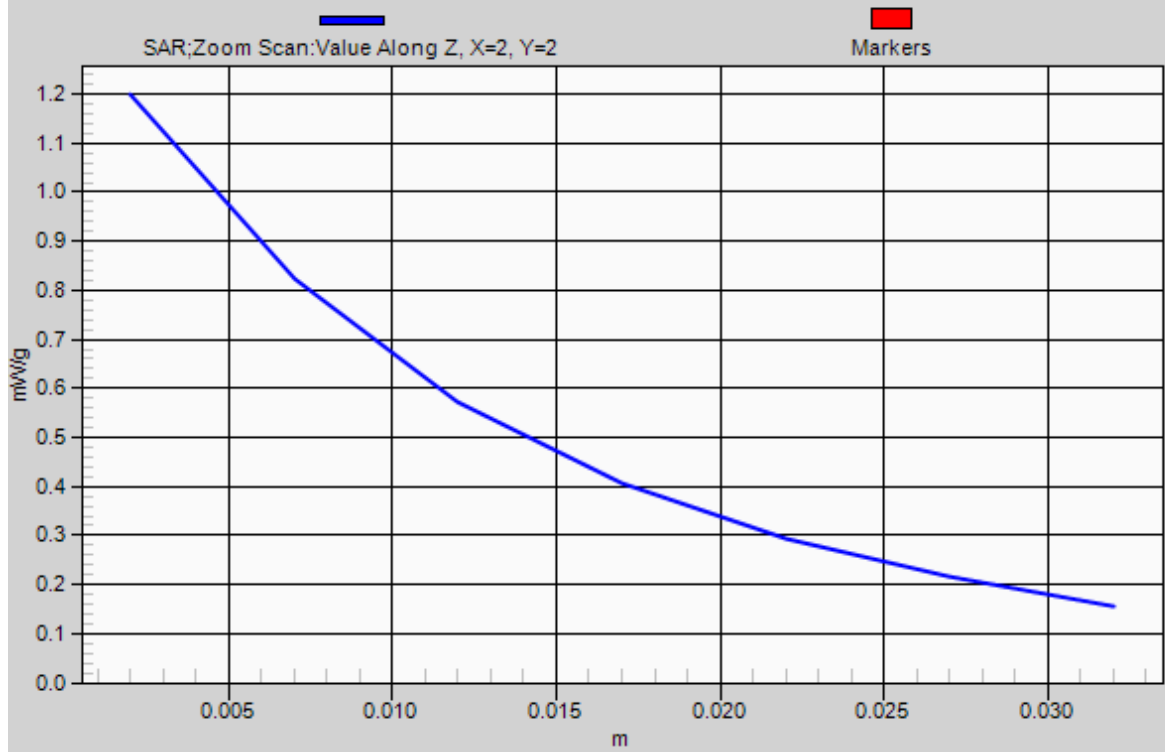
Peak SAR (extrapolated) = 1.395 mW/g

SAR(1 g) = 0.957 mW/g; SAR(10 g) = 0.635 mW/g

Maximum value of SAR (measured) = 1.20 mW/g



1g/10g Averaged SAR



P34 CDMA2000 BC0_RTAP153.6_Secondary Portrait_0cm_Ch1013_Ant Out

DUT: 120412C30

Communication System: CDMA2000; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium: B835_0525 Medium parameters used: $f = 825$ MHz; $\sigma = 0.982$ mho/m; $\epsilon_r = 55.871$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch1013/Area Scan (61x161x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.589 mW/g

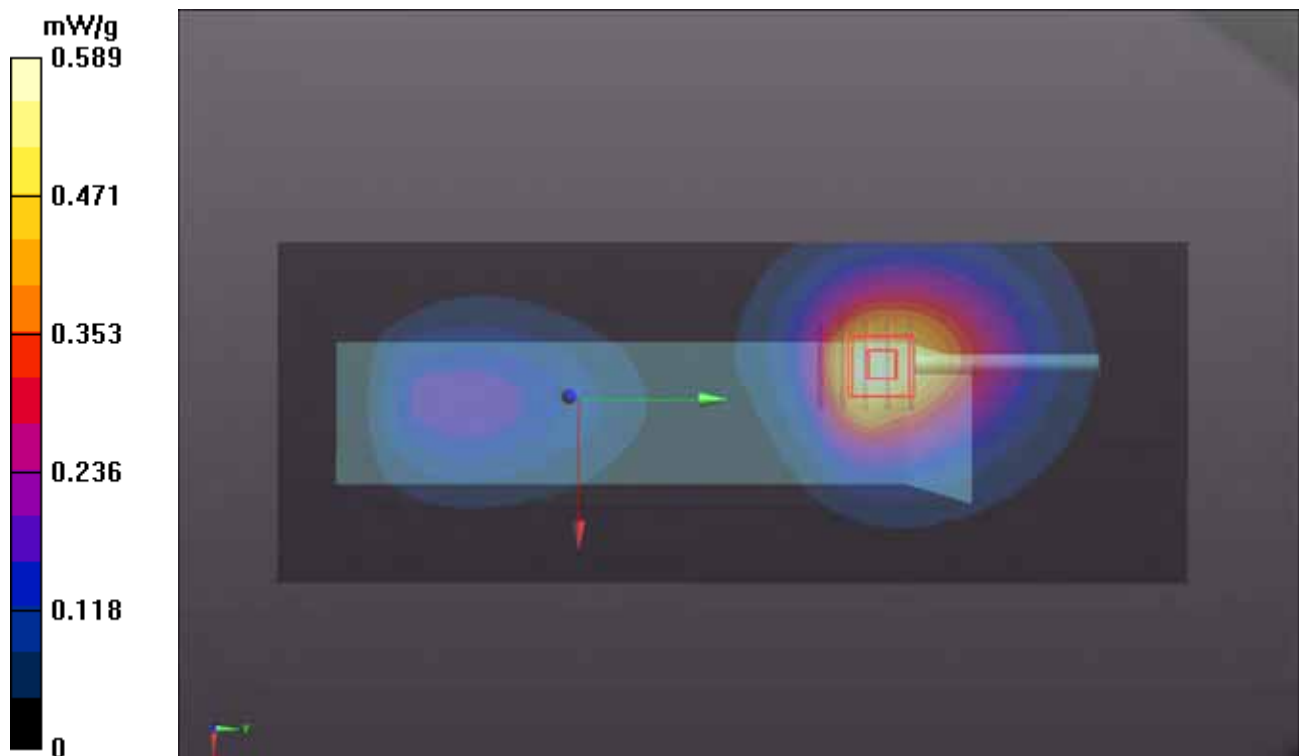
Ch1013/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 8.122 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.610 mW/g

SAR(1 g) = 0.456 mW/g; SAR(10 g) = 0.326 mW/g

Maximum value of SAR (measured) = 0.537 mW/g



P36 CDMA2000 BC0_RTAP153.6_Secondary Landscape_0cm_Ch1013_Ant In

DUT: 120412C30

Communication System: CDMA2000; Frequency: 824.7 MHz; Duty Cycle: 1:1

Medium: B835_0525 Medium parameters used: $f = 825$ MHz; $\sigma = 0.982$ mho/m; $\epsilon_r = 55.871$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch1013/Area Scan (61x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.0181 mW/g

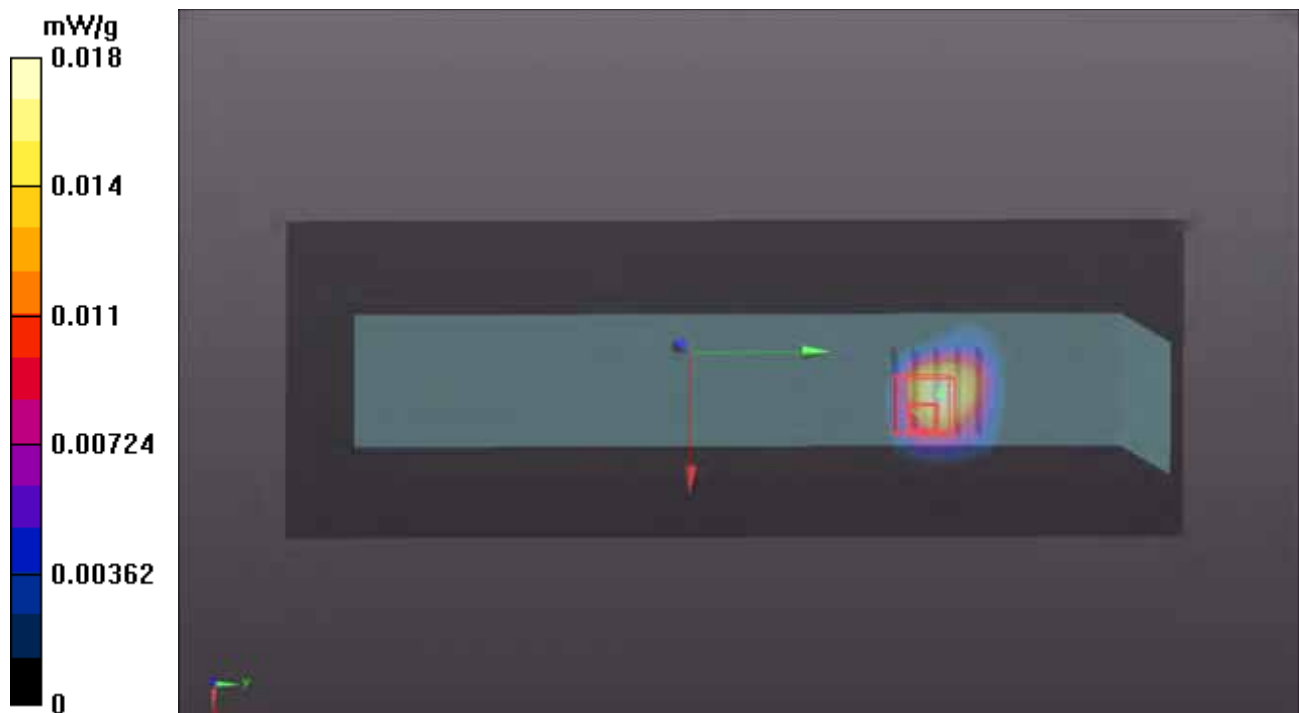
Ch1013/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0 V/m; Power Drift =0.11 dB

Peak SAR (extrapolated) = 0.036 mW/g

SAR(1 g) = 0.00875 mW/g; SAR(10 g) = 0.00314 mW/g

Maximum value of SAR (measured) = 0.0153 mW/g



P37 CDMA2000 BC0_RTAP153.6_Rear Face_0cm_Ch384_Ant Out

DUT: 120412C30

Communication System: CDMA2000; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: B835_0525 Medium parameters used: $f = 837$ MHz; $\sigma = 0.993$ mho/m; $\epsilon_r = 55.744$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C ; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch384/Area Scan (121x81x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 1.05 mW/g

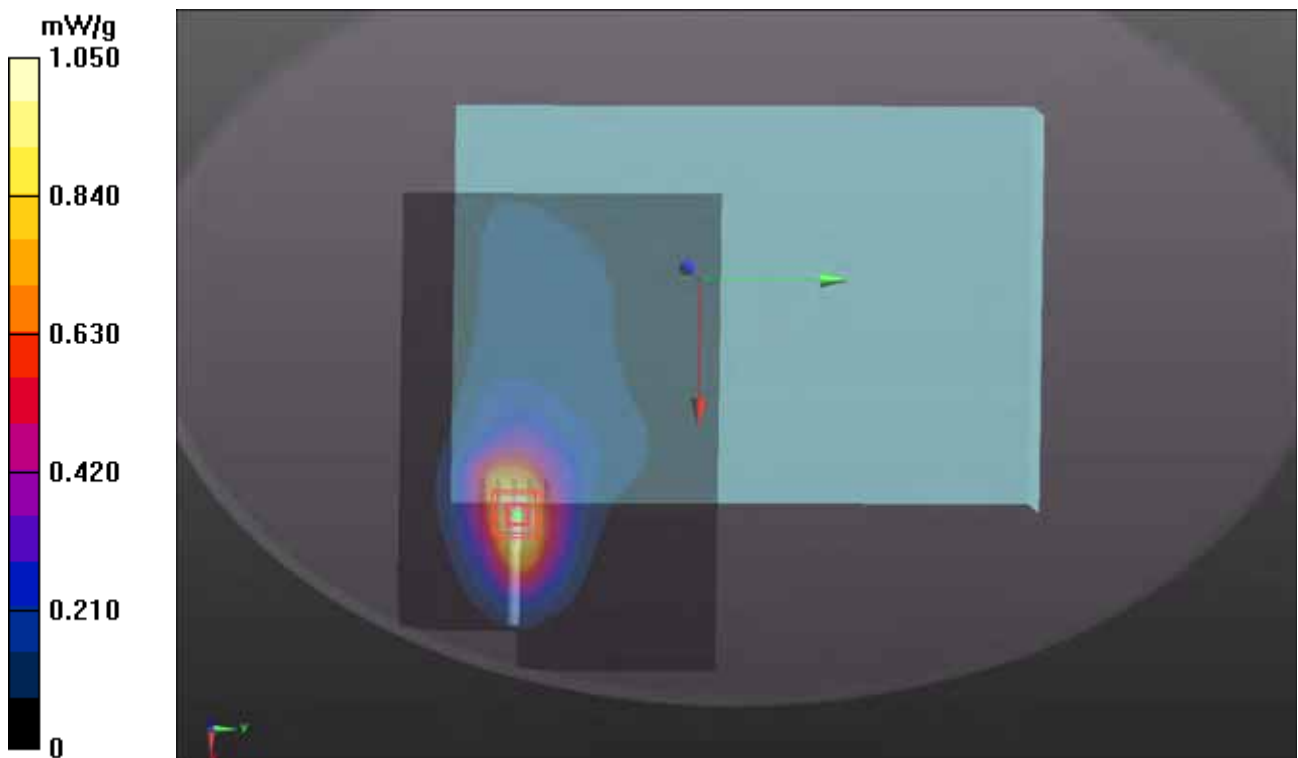
Ch384/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.593 V/m; Power Drift = 0.132 dB

Peak SAR (extrapolated) = 1.226 mW/g

SAR(1 g) = 0.841 mW/g; SAR(10 g) = 0.559 mW/g

Maximum value of SAR (measured) = 1.05 mW/g



P38 CDMA2000 BC0_RTAP153.6_Rear Face_0cm_Ch777_Ant Out

DUT: 120412C30

Communication System: CDMA2000; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: B835_0525 Medium parameters used: $f = 848.31$ MHz; $\sigma = 1.003$ mho/m; $\epsilon_r = 55.604$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C ; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch777/Area Scan (121x81x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 1.05 mW/g

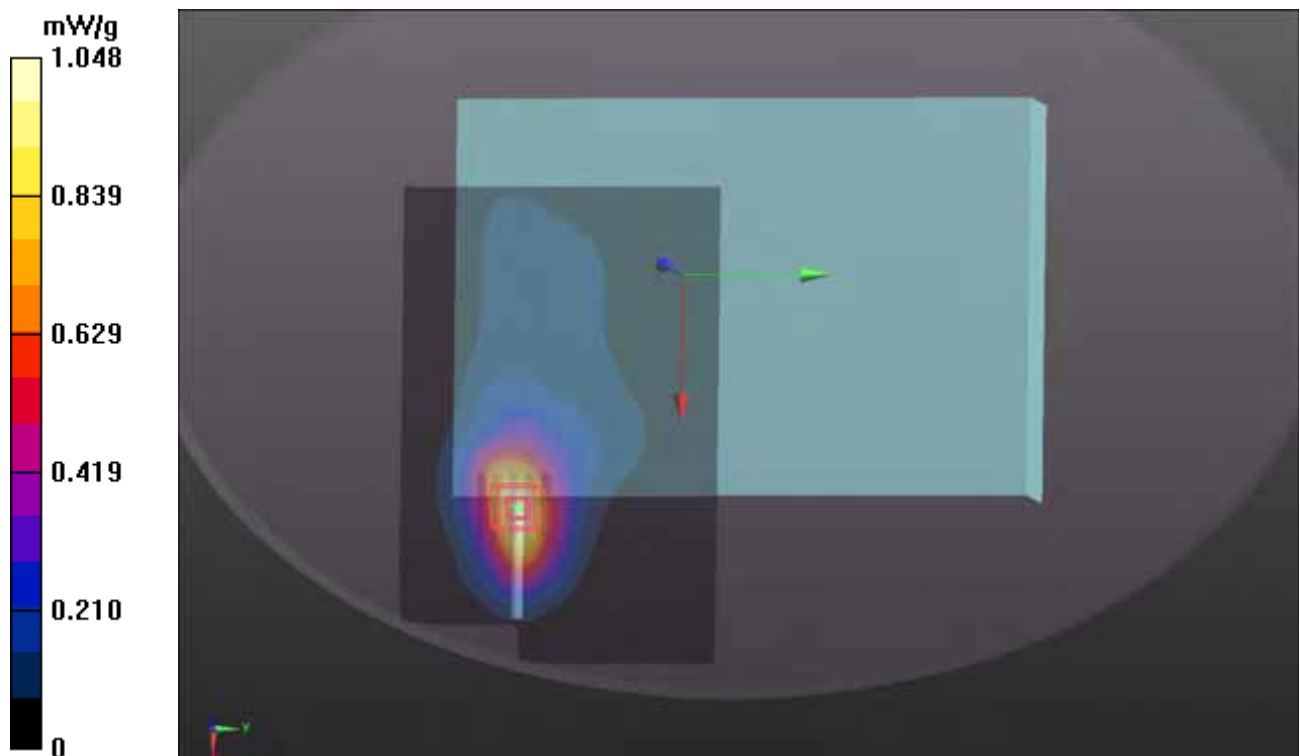
Ch777/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 5.442 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 1.222 mW/g

SAR(1 g) = 0.835 mW/g; SAR(10 g) = 0.553 mW/g

Maximum value of SAR (measured) = 1.05 mW/g



P39 CDMA2000 BC1_RTAP153.6_Rear Face_0cm_Ch25_Ant In

DUT: 120412C30

Communication System: CDMA2000; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium: B1900_0526 Medium parameters used: $f = 1851.25$ MHz; $\sigma = 1.494$ mho/m; $\epsilon_r = 54.146$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch25/Area Scan (121x161x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.0467 mW/g

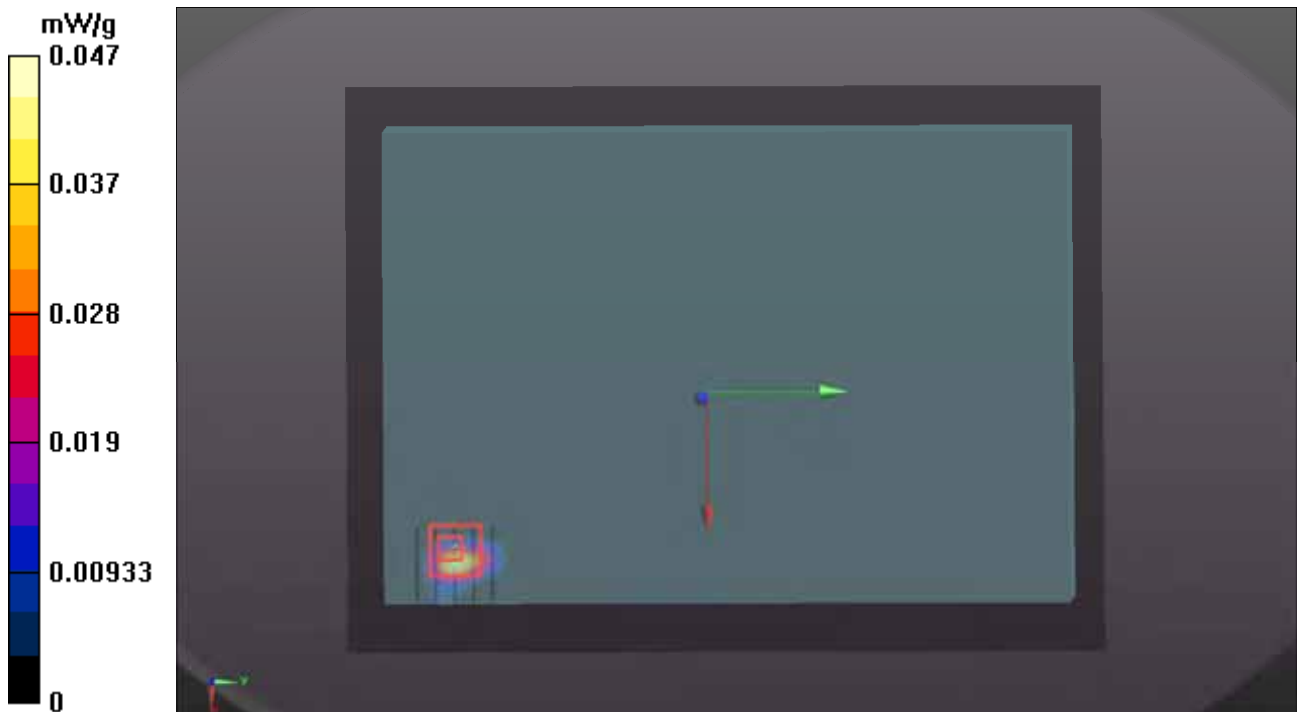
Ch25/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.041 mW/g

SAR(1 g) = 0.026 mW/g; SAR(10 g) = 0.013 mW/g

Maximum value of SAR (measured) = 0.0349 mW/g



P40 CDMA2000 BC1_RTAP153.6_Rear Face_0cm_Ch25_Ant Out

DUT: 120412C30

Communication System: CDMA2000; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium: B1900_0526 Medium parameters used: $f = 1851.25$ MHz; $\sigma = 1.494$ mho/m; $\epsilon_r = 54.146$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch25/Area Scan (151x171x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.643 mW/g

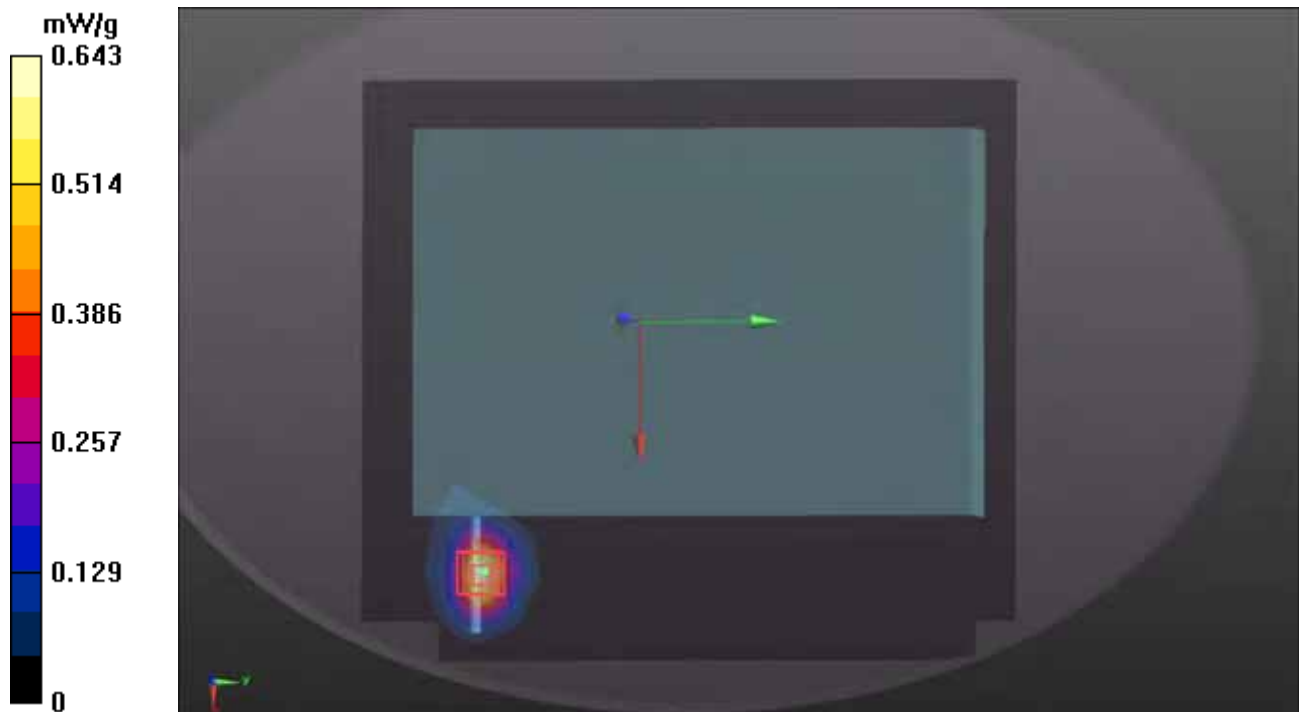
Ch25/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0 V/m; Power Drift = 0.10 dB

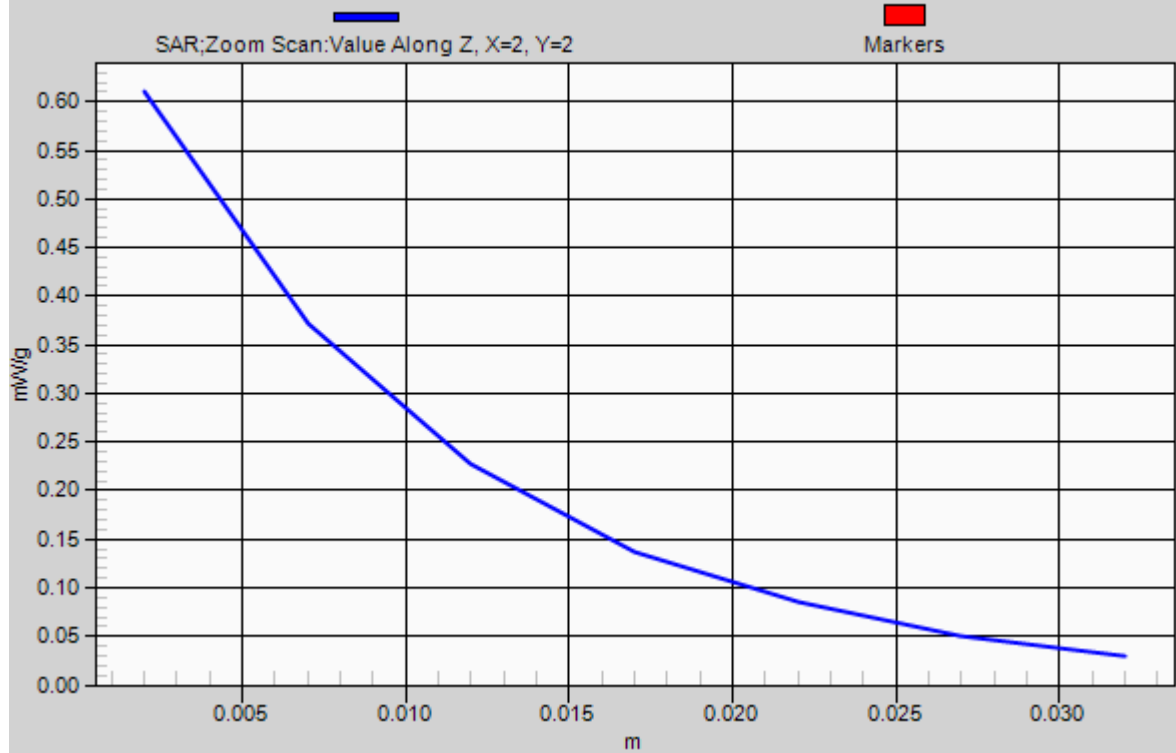
Peak SAR (extrapolated) = 0.748 mW/g

SAR(1 g) = 0.451 mW/g; SAR(10 g) = 0.251 mW/g

Maximum value of SAR (measured) = 0.610 mW/g



1g/10g Averaged SAR



P41 CDMA2000 BC1_RTAP153.6_Secondary Portrait_0cm_Ch25_Ant Out

DUT: 120412C30

Communication System: CDMA2000; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium: B1900_0526 Medium parameters used: $f = 1851.25$ MHz; $\sigma = 1.494$ mho/m; $\epsilon_r = 54.146$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch25/Area Scan (61x161x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.102 mW/g

Ch25/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.899 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.125 mW/g

SAR(1 g) = 0.081 mW/g; SAR(10 g) = 0.051 mW/g

Maximum value of SAR (measured) = 0.104 mW/g

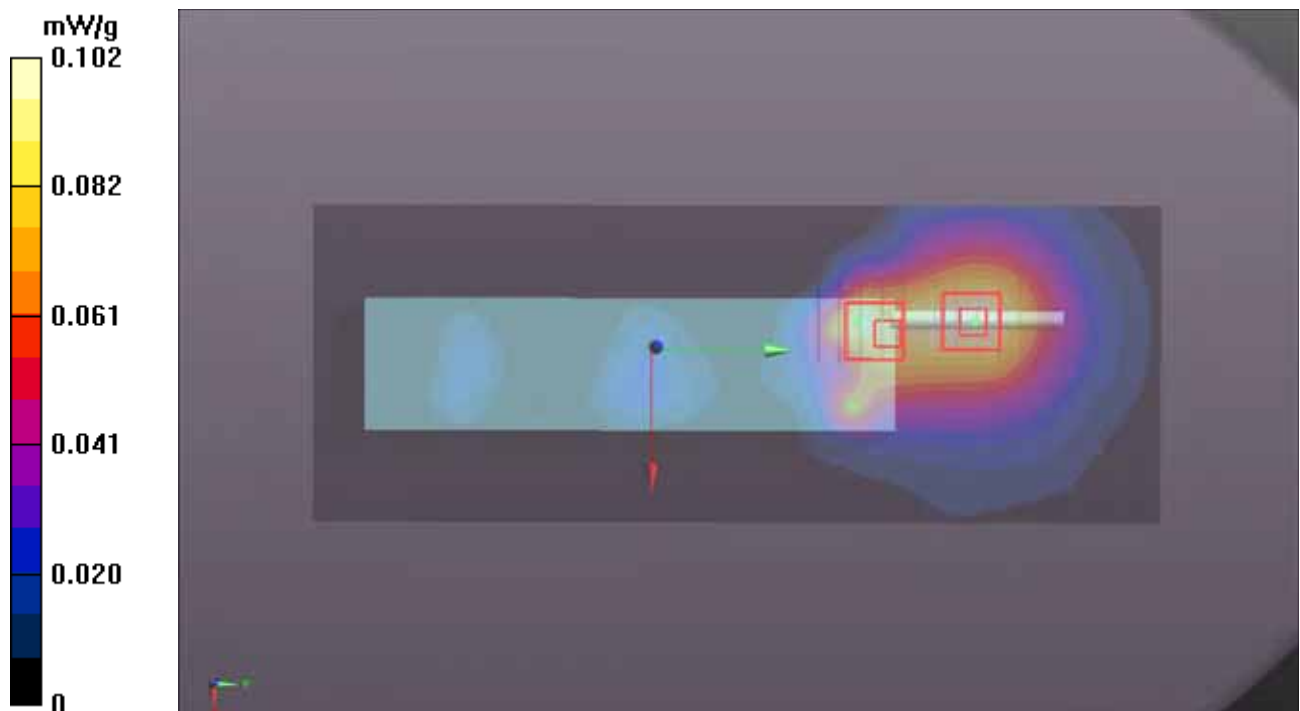
Ch25/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 3.899 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.112 mW/g

SAR(1 g) = 0.070 mW/g; SAR(10 g) = 0.042 mW/g

Maximum value of SAR (measured) = 0.0890 mW/g



P43 CDMA2000 BC1_RTAP153.6_Secondary Landscape_0cm_Ch25_Ant In

DUT: 120412C30

Communication System: CDMA2000; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium: B1900_0526 Medium parameters used: $f = 1851.25$ MHz; $\sigma = 1.494$ mho/m; $\epsilon_r = 54.146$; $\rho = 1000$ kg/m³

Ambient Temperature : 21.7 °C; Liquid Temperature : 20.9 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.46, 7.46, 7.46); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch25/Area Scan (61x161x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.155 mW/g

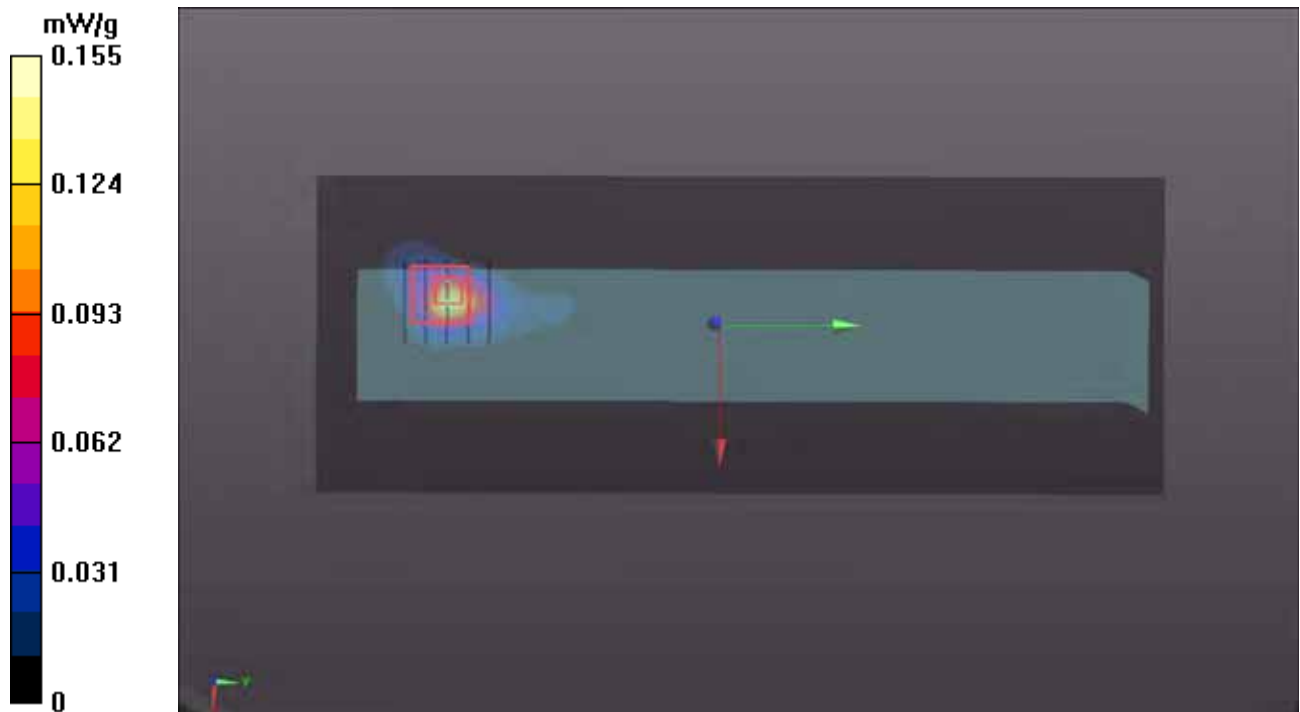
Ch25/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.323 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.111 mW/g

SAR(1 g) = 0.055 mW/g; SAR(10 g) = 0.028 mW/g

Maximum value of SAR (measured) = 0.0739 mW/g





Appendix C. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.



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: **D835V2-4d092_Jun11**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d092**

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

Calibration date: **June 22, 2011**

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	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Type-N mismatch combination	SN: 5047.2 / 06327	29-Mar-11 (No. 217-01371)	Apr-12
Reference Probe ES3DV3	SN: 3205	29-Apr-11 (No. ES3-3205_Apr11)	Apr-12
DAE4	SN: 601	8-Jun-11 (No. DAE4-601_Jun11)	Jun-12
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by: **Claudio Leubler** Name: Claudio Leubler Function: Laboratory Technician

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

Signature

Issued: June 22, 2011

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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.

Measurement Conditions

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

DASY Version	DASY5	V52.6.2
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	40.8 ± 6 %	0.89 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	2.37 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	9.52 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	6.22 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	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.1 ± 6 %	0.99 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	2.47 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	9.65 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	6.38 mW / g ± 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.2 Ω - 2.2 j Ω
Return Loss	- 30.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.2 Ω - 4.8 j Ω
Return Loss	- 25.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 ns
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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.

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	September 15, 2009

DASY5 Validation Report for Head TSL

Date: 22.06.2011

Test Laboratory: SPEAG, Zurich, Switzerland

D835_4d092_H_110622_CL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d092

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.89$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 08.06.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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

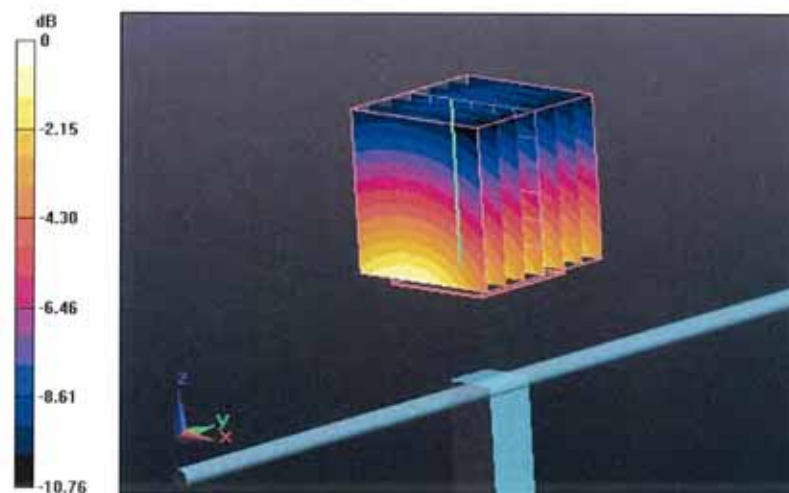
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.812 V/m; Power Drift = 0.0016 dB

Peak SAR (extrapolated) = 3.508 W/kg

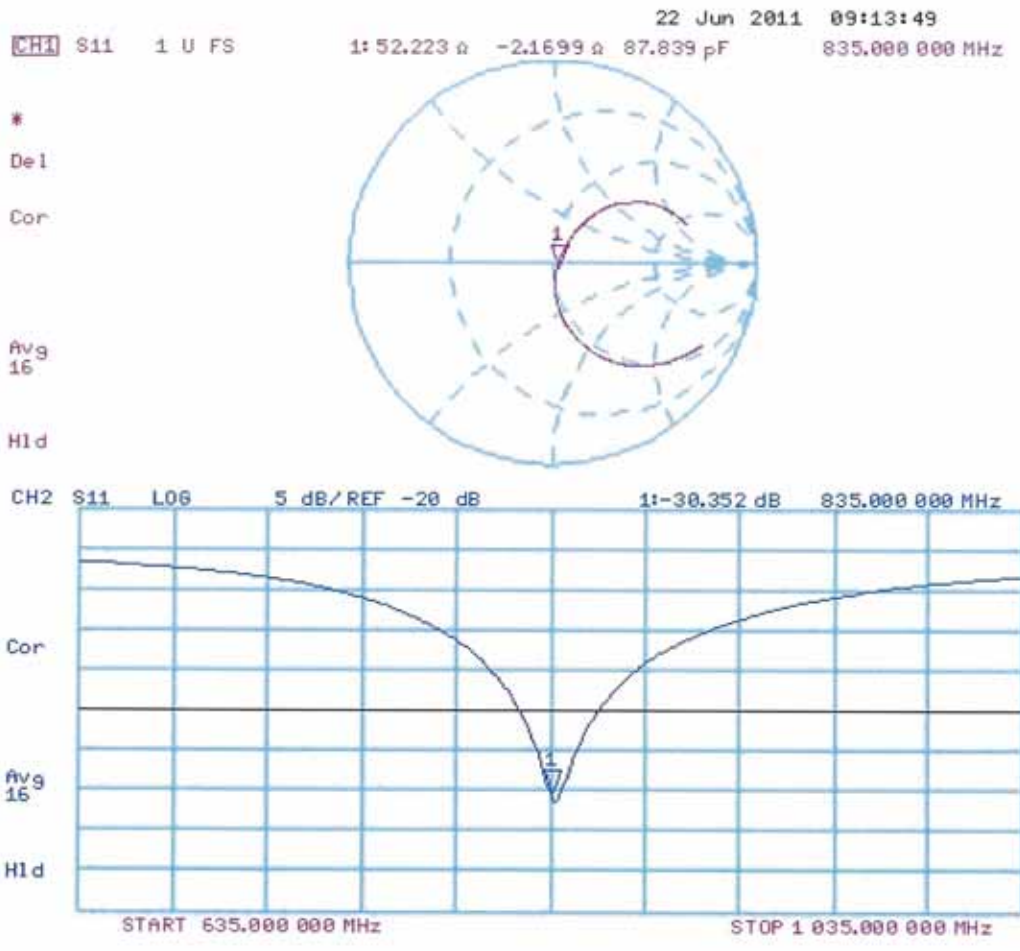
SAR(1 g) = 2.37 mW/g; SAR(10 g) = 1.55 mW/g

Maximum value of SAR (measured) = 2.748 mW/g



0 dB = 2.750mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.06.2011

Test Laboratory: SPEAG, Zurich, Switzerland

D835_4d092_M_110622_CL

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d092

Communication System: CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.99$ mho/m; $\epsilon_r = 53.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 29.04.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 08.06.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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

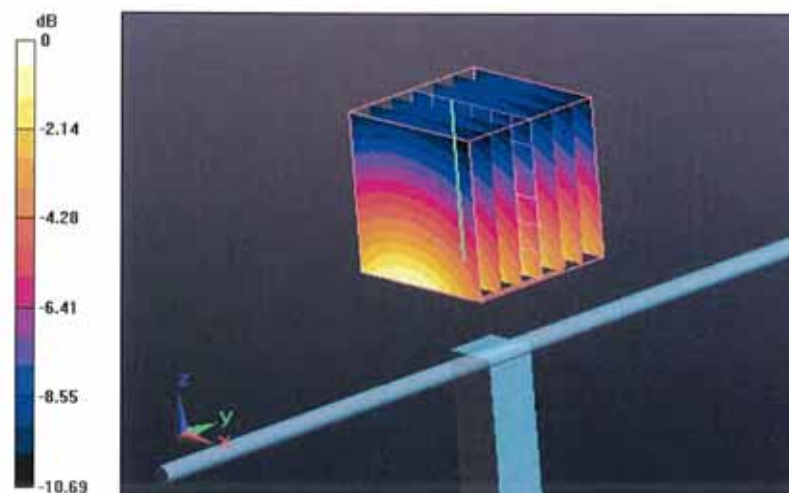
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.717 V/m; Power Drift = 0.07 dB

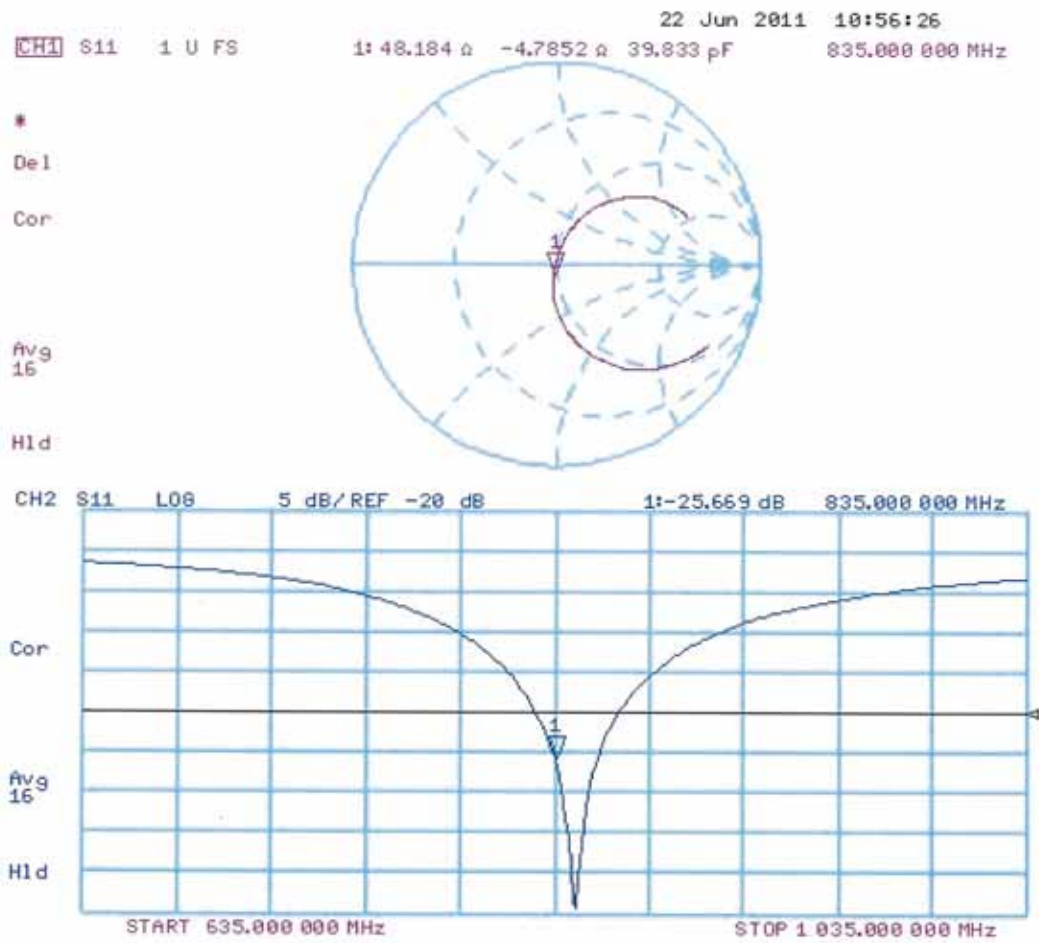
Peak SAR (extrapolated) = 3.594 W/kg

SAR(1 g) = 2.47 mW/g; SAR(10 g) = 1.62 mW/g

Maximum value of SAR (measured) = 2.864 mW/g



Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

Client **B.V.ADT (Auden)**

Certificate No: **D1900V2-5d036_Jan12**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d036**

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

Calibration date: **January 26, 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 $(22 \pm 3)^\circ\text{C}$ 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

Calibrated by:	Name Dimce Iliev	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature

Issued: January 26, 2012

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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	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	40.8 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.65 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	38.9 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.05 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	20.3 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.74 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	38.9 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.4 mW / g ± 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.0 Ω + 4.9 j Ω
Return Loss	- 26.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.3 Ω + 5.6 j Ω
Return Loss	- 23.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.195 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	May 08, 2003

DASY5 Validation Report for Head TSL

Date: 26.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d036

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ mho/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); 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 = 96.850 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 17.7040

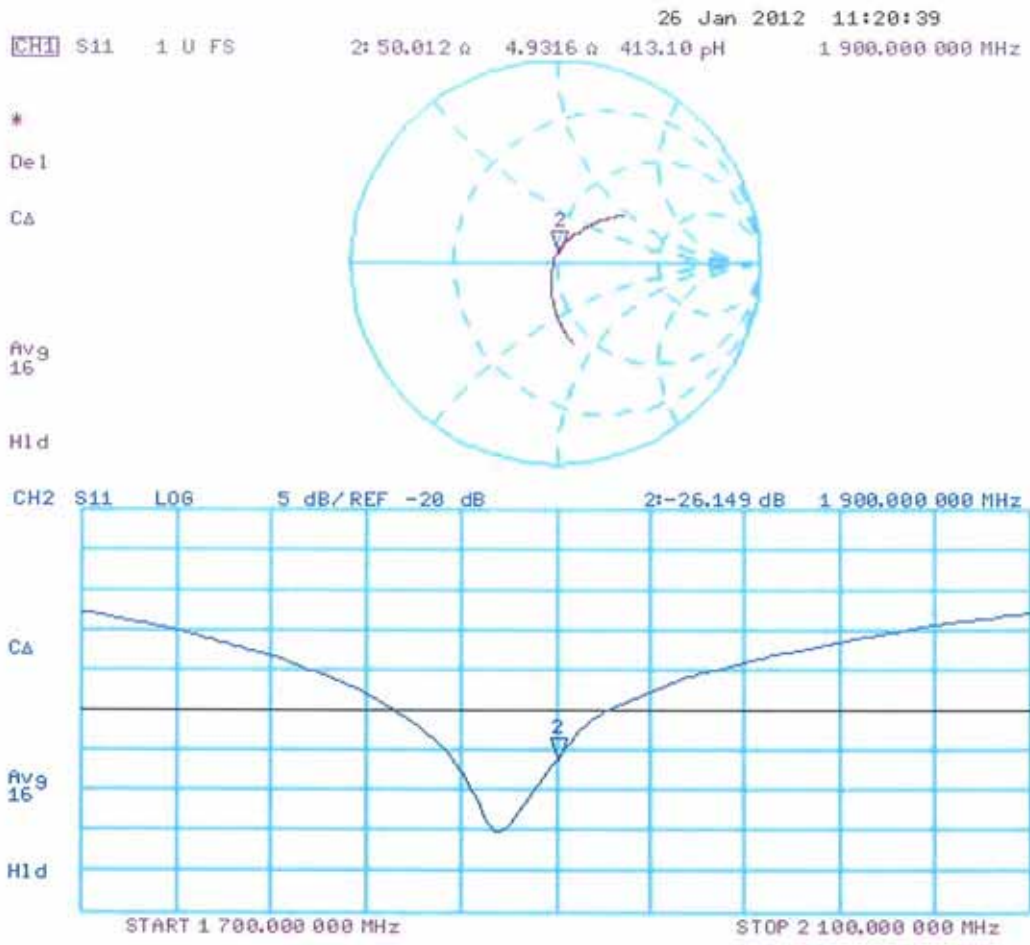
SAR(1 g) = 9.65 mW/g; SAR(10 g) = 5.05 mW/g

Maximum value of SAR (measured) = 12.055 mW/g



0 dB = 12.060mW/g = 21.63 dB mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 26.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d036

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.52$ mho/m; $\epsilon_r = 52.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

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

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); 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 = 94.423 V/m; Power Drift = -0.0044 dB

Peak SAR (extrapolated) = 17.2700

SAR(1 g) = 9.74 mW/g; SAR(10 g) = 5.1 mW/g

Maximum value of SAR (measured) = 12.419 mW/g



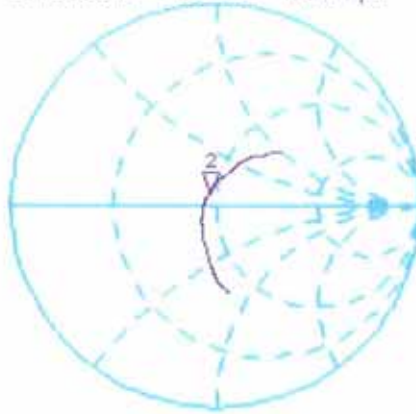
0 dB = 12.420mW/g = 21.88 dB mW/g

Impedance Measurement Plot for Body TSL

26 Jan 2012 11:19:41

CH1 S11 1 U FS 2: 46.256 Ω 5.6113 Ω 470.04 μH 1 900.000 000 MHz

*
De1
CA



avg
16

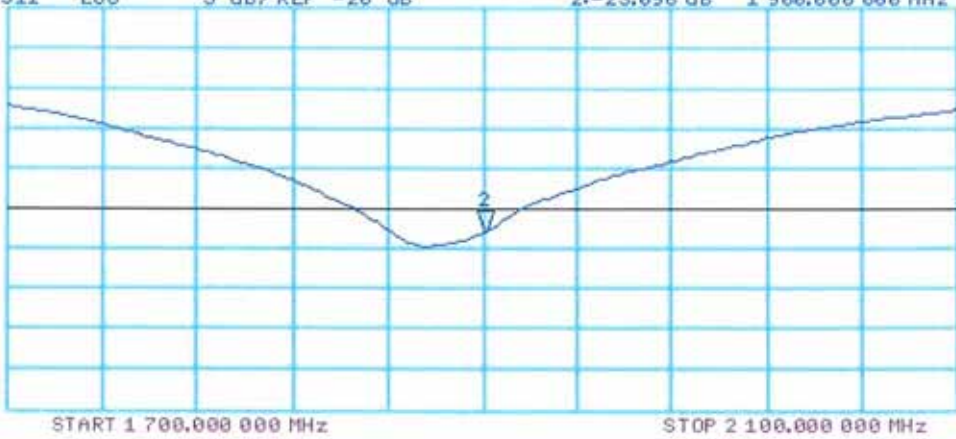
HI d

CH2 S11 L06 5 dB/REF -20 dB 2:-23.096 dB 1 900.000 000 MHz

CA

avg
16

HI d





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Accreditation No.: **SCS 108**

Client **B.V.ADT (Auden)**

Certificate No: **EX3-3590_Feb12**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3590**

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: **February 23, 2012**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
			Issued: February 23, 2012

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * *frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep 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
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ 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 NORM_{x,y,z} * *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 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:3590

Manufactured: March 23, 2009
Calibrated: February 23, 2012

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3590

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.48	0.48	0.50	$\pm 10.1 \%$
DCP (mV) ^B	96.3	97.6	94.0	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	106.2	$\pm 2.5 \%$
			Y	0.00	0.00	1.00	117.4	
			Z	0.00	0.00	1.00	109.0	

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:3590

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	10.62	10.62	10.62	0.43	0.80	± 12.0 %
835	41.5	0.90	10.14	10.14	10.14	0.18	1.26	± 12.0 %
900	41.5	0.97	10.11	10.11	10.11	0.44	0.75	± 12.0 %
1450	40.5	1.20	9.39	9.39	9.39	0.24	1.23	± 12.0 %
1640	40.3	1.29	9.18	9.18	9.18	0.80	0.56	± 12.0 %
1750	40.1	1.37	8.95	8.95	8.95	0.45	0.74	± 12.0 %
1810	40.0	1.40	8.79	8.79	8.79	0.66	0.61	± 12.0 %
1900	40.0	1.40	8.83	8.83	8.83	0.40	0.80	± 12.0 %
2000	40.0	1.40	8.65	8.65	8.65	0.49	0.70	± 12.0 %
2300	39.5	1.67	8.27	8.27	8.27	0.39	0.74	± 12.0 %
2450	39.2	1.80	7.88	7.88	7.88	0.35	0.83	± 12.0 %
2600	39.0	1.96	7.72	7.72	7.72	0.25	1.07	± 12.0 %
3500	37.9	2.91	7.77	7.77	7.77	0.33	1.11	± 13.1 %
5200	36.0	4.66	5.64	5.64	5.64	0.30	1.80	± 13.1 %
5300	35.9	4.76	5.32	5.32	5.32	0.30	1.80	± 13.1 %
5500	35.6	4.96	5.13	5.13	5.13	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.89	4.89	4.89	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.79	4.79	4.79	0.42	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:3590

Calibration Parameter Determined in Body Tissue Simulating Media

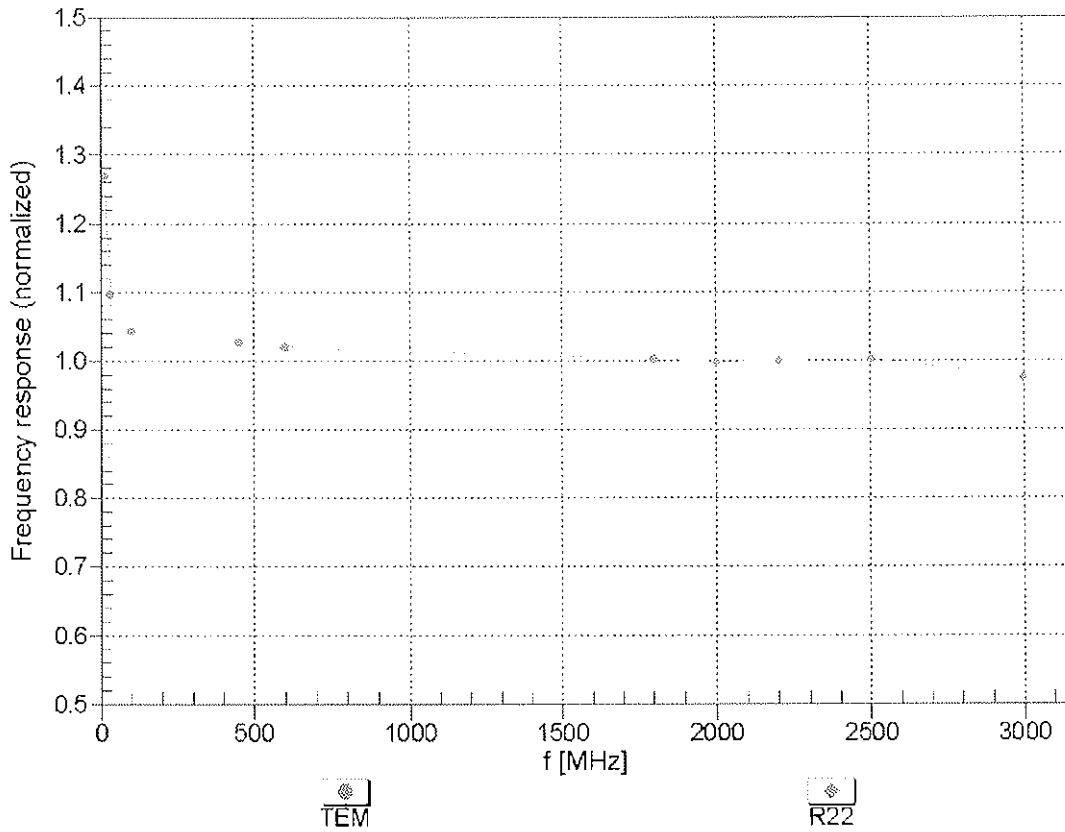
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	10.61	10.61	10.61	0.30	0.99	± 12.0 %
835	55.2	0.97	10.47	10.47	10.47	0.48	0.74	± 12.0 %
900	55.0	1.05	10.40	10.40	10.40	0.63	0.66	± 12.0 %
1450	54.0	1.30	9.45	9.45	9.45	0.17	1.66	± 12.0 %
1640	53.8	1.40	9.47	9.47	9.47	0.36	0.94	± 12.0 %
1750	53.4	1.49	8.64	8.64	8.64	0.28	0.99	± 12.0 %
1810	53.3	1.52	8.27	8.27	8.27	0.31	0.94	± 12.0 %
1900	53.3	1.52	8.07	8.07	8.07	0.33	0.94	± 12.0 %
2000	53.3	1.52	8.19	8.19	8.19	0.41	0.82	± 12.0 %
2300	52.9	1.81	8.00	8.00	8.00	0.70	0.64	± 12.0 %
2450	52.7	1.95	7.80	7.80	7.80	0.80	0.55	± 12.0 %
2600	52.5	2.16	7.57	7.57	7.57	0.65	0.50	± 12.0 %
3500	51.3	3.31	7.18	7.18	7.18	0.49	0.87	± 13.1 %
5200	49.0	5.30	4.89	4.89	4.89	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.81	4.81	4.81	0.48	1.90	± 13.1 %
5500	48.6	5.65	4.35	4.35	4.35	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.92	3.92	3.92	0.65	1.90	± 13.1 %
5800	48.2	6.00	4.54	4.54	4.54	0.50	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)

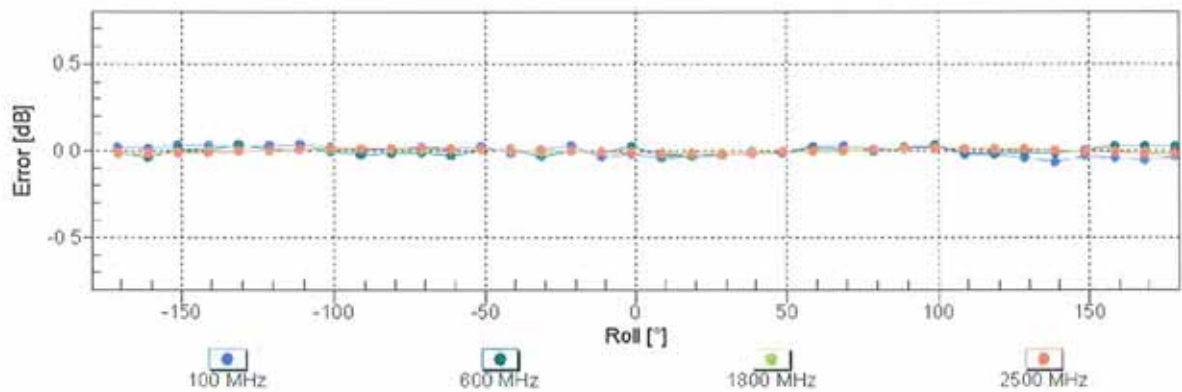
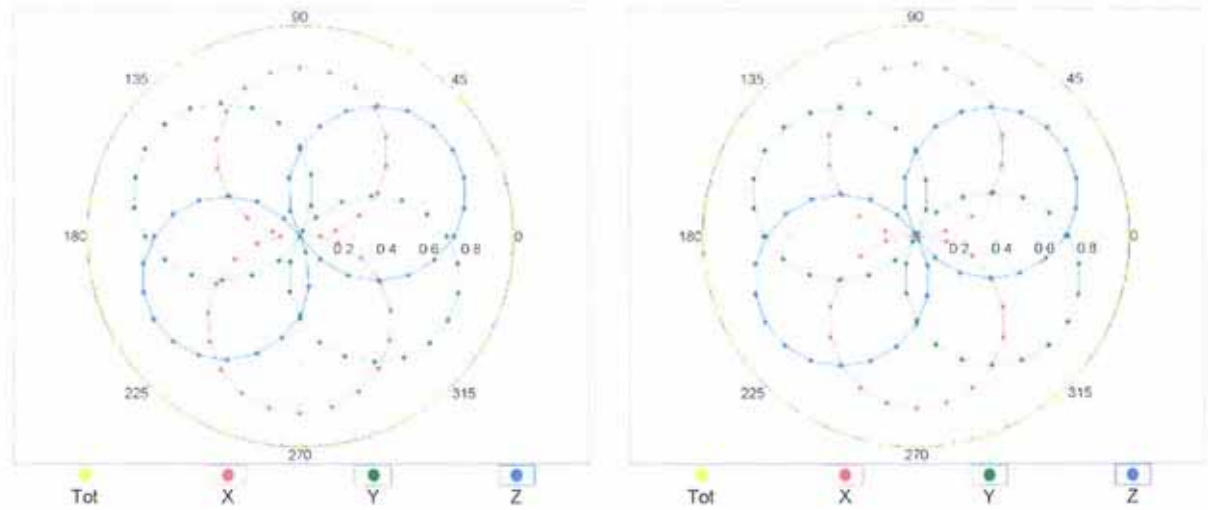


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$

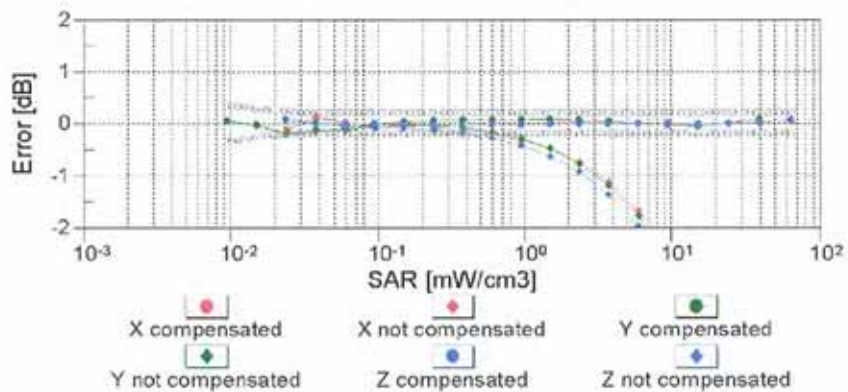
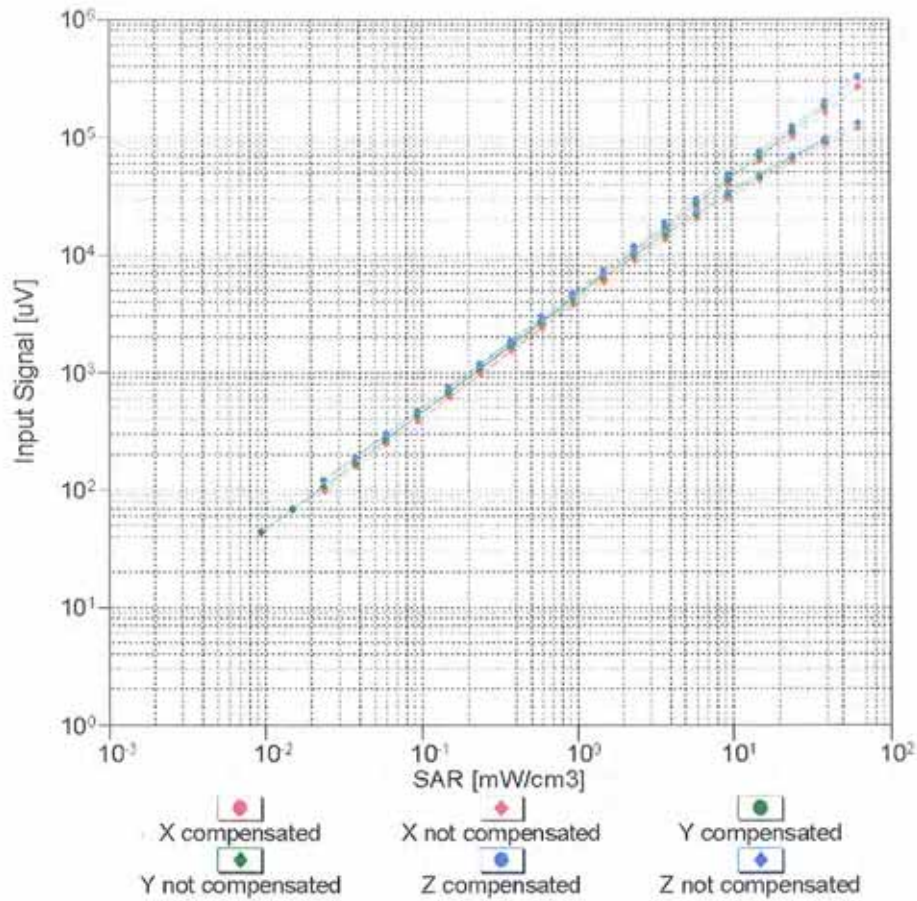
f=600 MHz,TEM

f=1800 MHz,R22



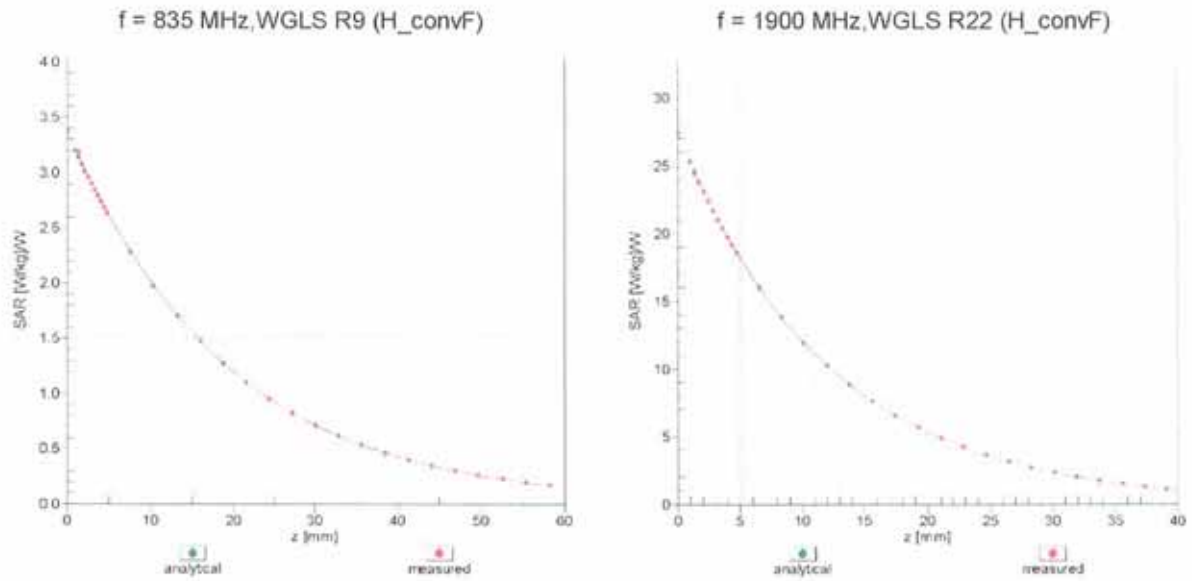
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

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

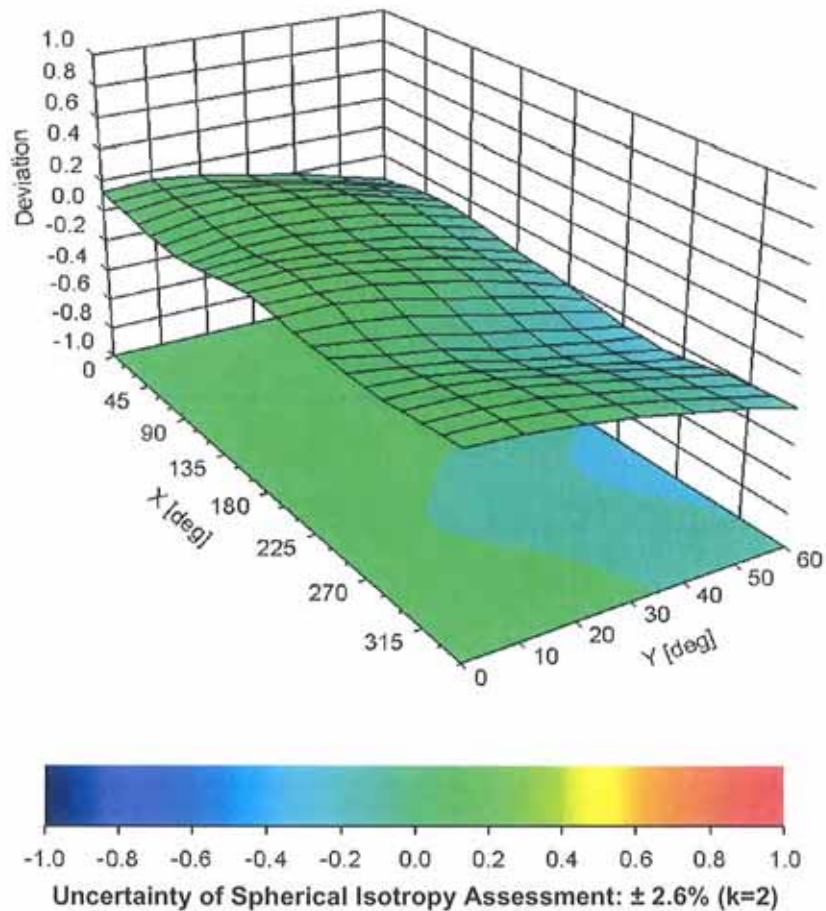


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ, ϑ), f = 900 MHz



DASY/EASY - Parameters of Probe: EX3DV4 - SN:3590

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	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

**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 **B.V. ADT (Auden)**

Certificate No: **EX3-3650_Oct11**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3650**

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: **October 26, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	31-Mar-11 (No. 217-01372)	Apr-12
Power sensor E4412A	MY41498087	31-Mar-11 (No. 217-01372)	Apr-12
Reference 3 dB Attenuator	SN: S5054 (3c)	29-Mar-11 (No. 217-01369)	Apr-12
Reference 20 dB Attenuator	SN: S5086 (20b)	29-Mar-11 (No. 217-01367)	Apr-12
Reference 30 dB Attenuator	SN: S5129 (30b)	29-Mar-11 (No. 217-01370)	Apr-12
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	3-May-11 (No. DAE4-654_May11)	May-12
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-11)	In house check: Apr-13
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-11)	In house check: Oct-12

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

Issued: October 27, 2011

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response** (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep 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
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,y,z}**: A, B, C are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ 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 NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 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:3650

Manufactured: March 18, 2008
Calibrated: October 26, 2011

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3650

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.36	0.37	0.46	$\pm 10.1 \%$
DCP (mV) ^B	98.5	94.0	98.2	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc ^E (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	94.9	$\pm 2.5 \%$
			Y	0.00	0.00	1.00	90.7	
			Z	0.00	0.00	1.00	114.0	

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:3650

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	9.20	9.20	9.20	0.79	0.69	± 12.0 %
835	41.5	0.90	8.87	8.87	8.87	0.79	0.69	± 12.0 %
1450	40.5	1.20	8.32	8.32	8.32	0.79	0.65	± 12.0 %
1750	40.1	1.37	7.92	7.92	7.92	0.70	0.63	± 12.0 %
1950	40.0	1.40	7.40	7.40	7.40	0.79	0.54	± 12.0 %
2450	39.2	1.80	6.80	6.80	6.80	0.59	0.62	± 12.0 %
2600	39.0	1.96	6.68	6.68	6.68	0.50	0.74	± 12.0 %
5200	36.0	4.66	5.05	5.05	5.05	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.71	4.71	4.71	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.56	4.56	4.56	0.45	1.80	± 13.1 %
5600	35.5	5.07	4.42	4.42	4.42	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.30	4.30	4.30	0.50	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:3650

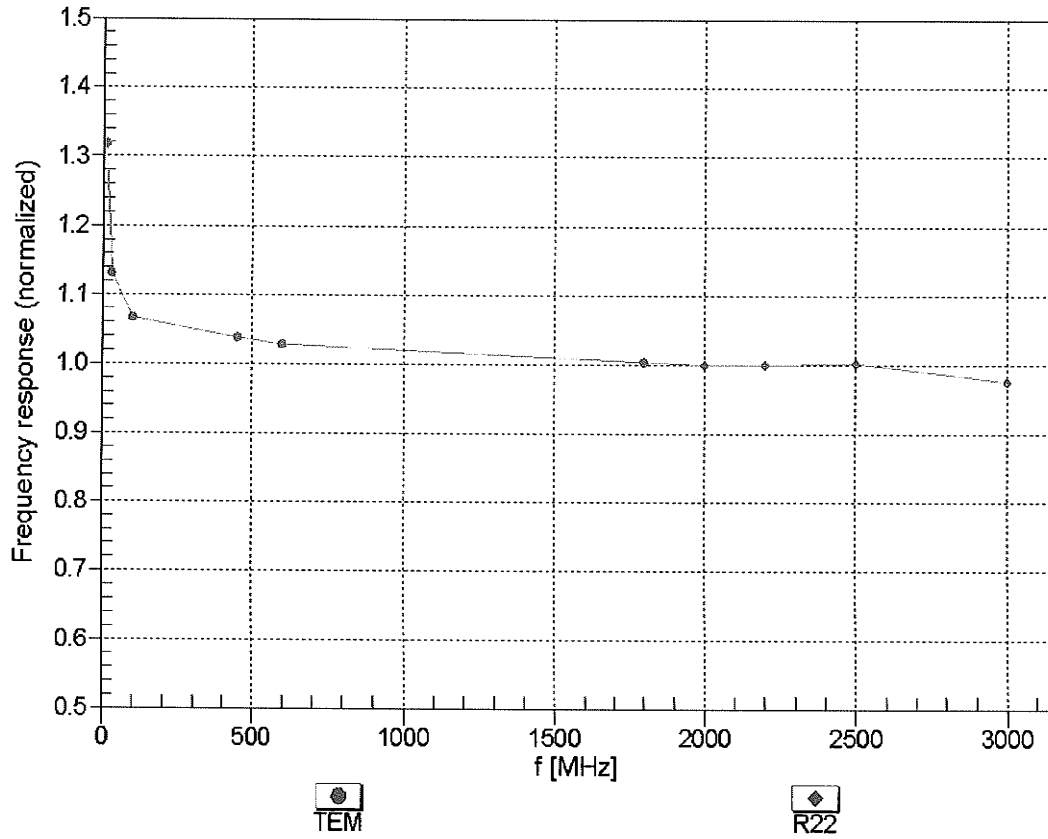
Calibration Parameter Determined in Body Tissue Simulating Media

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	9.21	9.21	9.21	0.78	0.69	± 12.0 %
835	55.2	0.97	9.12	9.12	9.12	0.79	0.67	± 12.0 %
1450	54.0	1.30	8.09	8.09	8.09	0.79	0.63	± 12.0 %
1750	53.4	1.49	7.49	7.49	7.49	0.79	0.64	± 12.0 %
1950	53.3	1.52	7.46	7.46	7.46	0.79	0.65	± 12.0 %
2450	52.7	1.95	6.89	6.89	6.89	0.79	0.60	± 12.0 %
2600	52.5	2.16	6.79	6.79	6.79	0.72	0.58	± 12.0 %
5200	49.0	5.30	4.28	4.28	4.28	0.50	1.95	± 13.1 %
5300	48.9	5.42	4.11	4.11	4.11	0.50	1.95	± 13.1 %
5500	48.6	5.65	3.73	3.73	3.73	0.60	1.95	± 13.1 %
5600	48.5	5.77	3.57	3.57	3.57	0.60	1.95	± 13.1 %
5800	48.2	6.00	3.81	3.81	3.81	0.60	1.95	± 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.

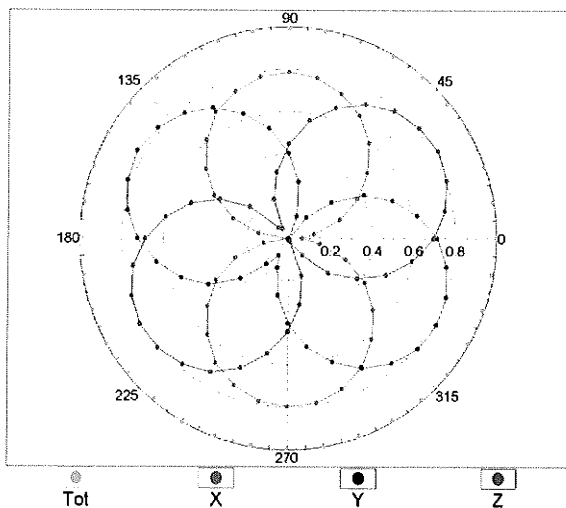
Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



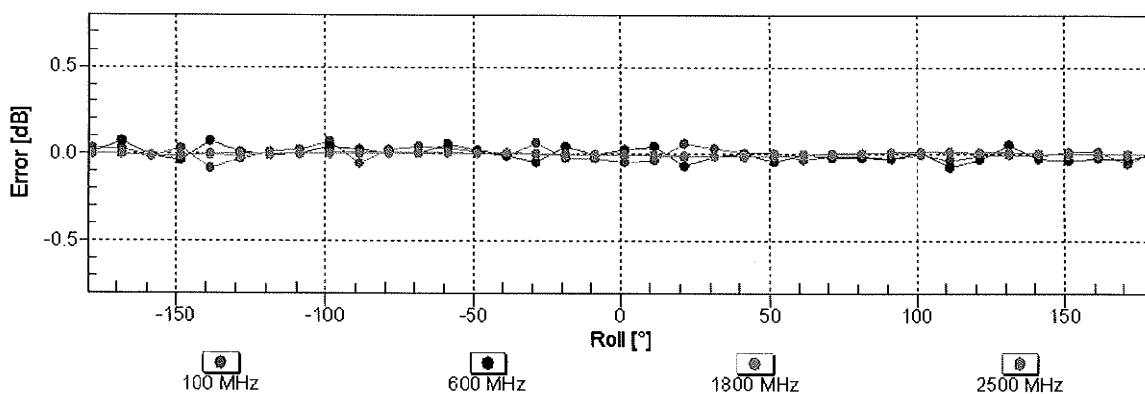
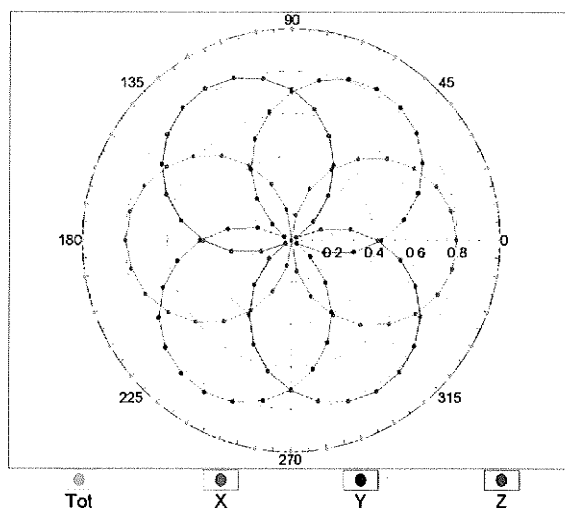
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

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

f=600 MHz, TEM

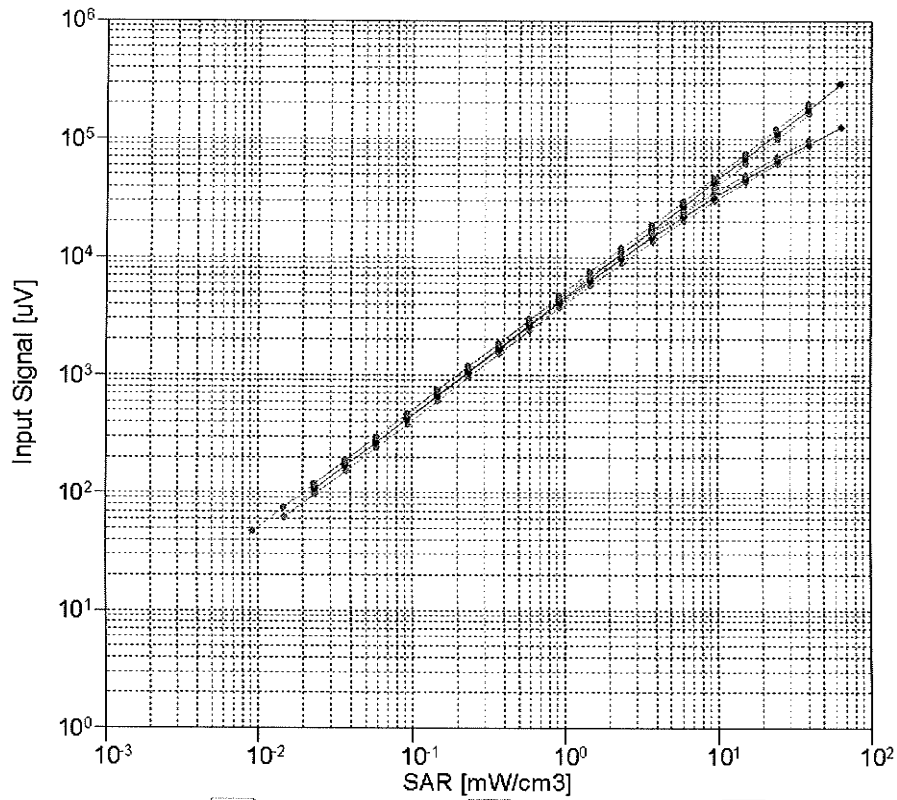


f=1800 MHz, R22

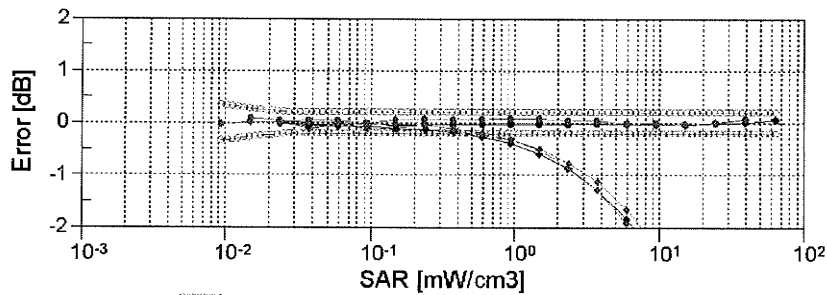


Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ (k=2)

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



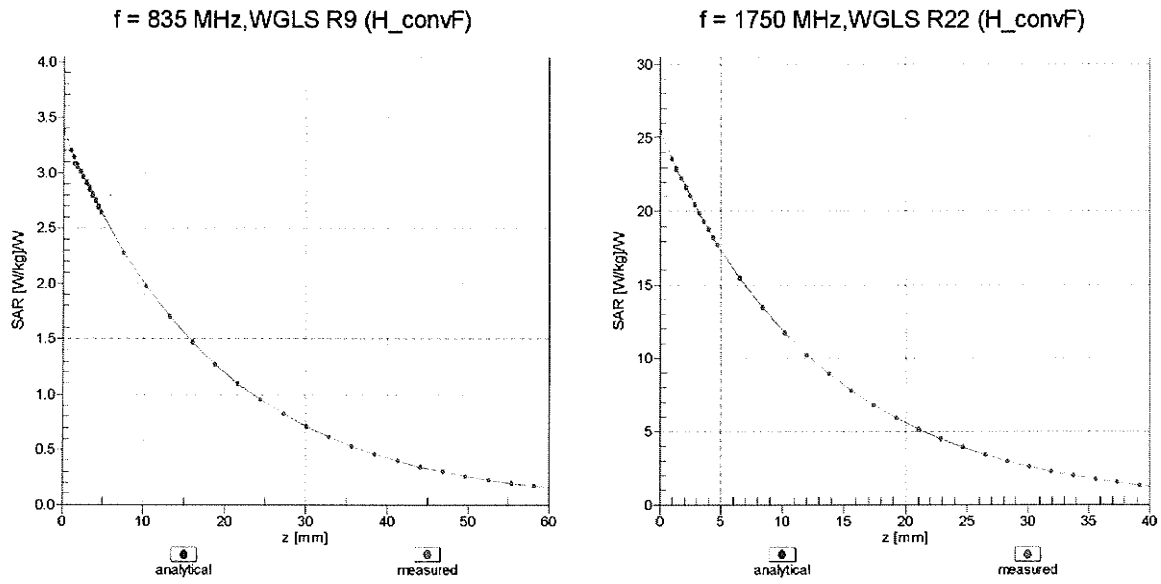
X compensated
X not compensated
Y compensated
Y not compensated
Z compensated
Z not compensated



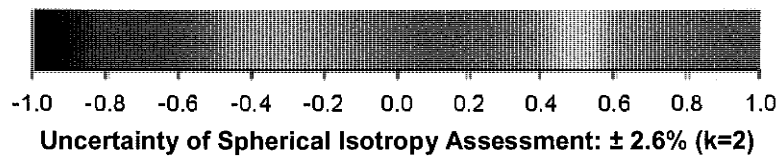
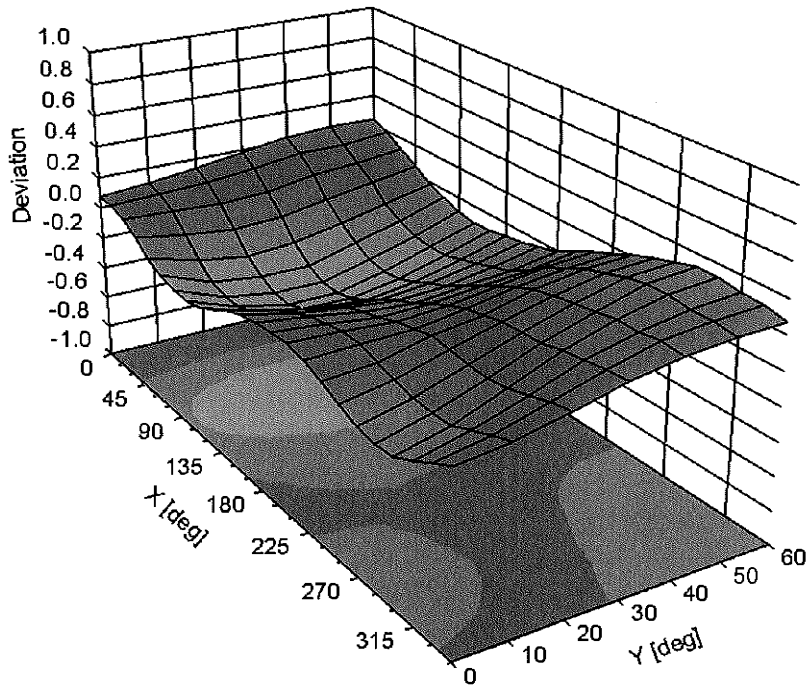
X compensated
X not compensated
Y compensated
Y not compensated
Z compensated
Z not compensated

Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ, θ), f = 900 MHz



DASY/EASY - Parameters of Probe: EX3DV4 - SN:3650

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	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



A D T

Appendix D. Photographs of EUT and Setup