

SAR TEST REPORT

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MODEL NO.: NP01LM

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1. CERTIFICATION

PRODUCT: USB Wireless LAN unit
MODEL: NP01LM
BRAND: NEC
APPLICANT: Alpha Networks Inc.
TESTED: Jun. 06 ~ Jun. 08, 2007
TEST SAMPLE: MASS-PRODUCTION
STANDARDS: **FCC Part 2 (Section 2.1093), RSS-102**
FCC OET Bulletin 65, Supplement C (01-01)
IEEE 1528-2003

The above equipment (Model: NP01LM) have been tested by **Advance Data Technology Corporation**, 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 EMC characteristics under the conditions specified in this report.

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TECHNICAL
ACCEPTANCE : Stanely Hsu , **DATE:** Jun. 14, 2007
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Gary Chang / Supervisor

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	USB Wireless LAN unit
MODEL NO.	NP01LM
FCC ID	RRK-NECNP01LM
POWER SUPPLY	5Vdc from host equipment
CLASSIFICATION	Portable device, production unit
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
RADIO TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b: 11/5.5/2/1Mbps 802.11g: 54/48/36/24/18/12/9/6Mbps 802.11a: 54/48/36/24/18/12/9/6Mbps
FREQUENCY RANGE	802.11b & 802.11g: 2.412 ~ 2.462GHz 802.11a: 5.150 ~ 5.350GHz , 5.470 ~ 5.850GHz
NUMBER OF CHANNEL	802.11b & 802.11g: 11 802.11a: 14
CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER	802.11b: 81.470mW / 2412.0MHz for channel 1 81.658mW / 2437.0MHz for channel 6 80.910mW / 2462.0MHz for channel 11
	802.11g: 78.343mW / 2412.0MHz for channel 1 79.433mW / 2437.0MHz for channel 6 77.268mW / 2462.0MHz for channel 11
	802.11a: 30.832mW / 5180MHz for channel 36 28.379mW / 5240MHz for channel 48 29.107mW / 5260MHz for channel 52 28.119mW / 5320MHz for channel 64 29.648mW / 5500MHz for channel 100 29.174mW / 5520MHz for channel 104 28.708mW / 5580MHz for channel 116 28.184mW / 5600MHz for channel 120 27.606mW / 5620MHz for channel 124 26.669mW / 5680MHz for channel 136 26.303mW / 5700MHz for channel 140 26.915mW / 5745MHz for channel 149 26.607mW / 5785MHz for channel 157 26.792mW / 5825MHz for channel 165
AVERAGE SAR (1g)	0.942W/kg (802.11b) 0.533W/kg (802.11g) 0.538W/kg (802.11a)

ANTENNA TYPE	For 2.4GHz Multilayer Chip Antenna with 0dBi For 5.0GHz Multilayer Chip Antenna with 2dBi
DATA CABLE	NA
I/O PORTS	USB
ASSOCIATED DEVICES	NA

NOTE:

1. The EUT operates in both the 5GHz and 2.4GHz Bands and compatibility with 802.11a and 802.11b, 802.11g technology.
2. The above EUT information was declared by the manufacturer and for more detailed features description, please refer to the manufacturer's specifications or User's Manual.

2.2 GENERAL DESCRIPTION OF APPLIED STANDARDS

According to the specifications of the manufacturer, this product must comply with the requirements of the following standards:

FCC Part 2 (2.1093)

FCC OET Bulletin 65, Supplement C (01- 01)

RSS-102

IEEE 1528-2003

All test items have been performed and recorded as per the above standards.

2.3 GENERAL INFORMATION OF THE SAR SYSTEM

DASY4 (software 4.7 Build 53) 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 software defined. The DASY4 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.

ET3DV6 ISOTROPIC E-FIELD PROBE (FREQUENCY BAND < 3GHz)

CONSTRUCTION	Symmetrical design with triangular core. Built-in optical fiber for surface detection system. Built-in shielding against static charges. PEEK enclosure material (resistant to organic solvents, e.g., glycolether).
FREQUENCY	10 MHz to 3 GHz; Linearity: ± 0.2 dB (30 MHz to 3 GHz)
DYNAMIC RANGE	5 μ W/g to > 100 mW/g; Linearity: ± 0.2 dB
OPTICAL SURFACE DETECTION	± 0.2 mm repeatability in air and clear liquids over diffuse reflecting surfaces
DIMENSIONS	Overall length: 330 mm (Tip Length: 16 mm) Tip diameter: 6.8 mm (Body diameter: 12 mm) Distance from probe tip to dipole centers: 2.7 mm
APPLICATION	General dosimetric measurements up to 3 GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary phantoms (ET3DV6)



EX3DV3 ISOTROPIC E-FIELD PROBE (FREQUENCY BAND 5 ~ 6GHz)

DIMENSIONS	Overall length: 330 mm (Tip Length: 20 mm) Tip diameter: 2.5 mm (Body diameter: 12 mm) Distance from probe tip to dipole centers: 1.0 mm
APPLICATION	General dosimetric measurements range 5 ~ 6 GHz. Fast automatic scanning in arbitrary phantoms (EX3DV3)

NOTE

1. The Probe parameters have been calibrated by the SPEAG. Please reference "APPENDIX D" for the Calibration Certification Report.
2. For frequencies above 800 MHz, calibration in a rectangular wave-guide is used, because wave-guide size is manageable.
3. For frequencies below 800 MHz, temperature transfer calibration is used because the wave-guide size becomes relatively large.

TWIN SAM V4.0

CONSTRUCTION	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, CENELEC 50361 and IEC 62209. 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 manually teaching three points with the robot.
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SHELL THICKNESS 2 ± 0.2 mm

FILLING VOLUME Approx. 25 liters

DIMENSIONS Height: 810 mm; Length: 1000 mm; Width: 500 mm

SYSTEM VALIDATION KITS:

CONSTRUCTION	Symmetrical dipole with 1/4 balun enables measurement of feedpoint impedance with NWA matched for use near flat phantoms filled with brain simulating solutions. Includes distance holder and tripod adaptor
CALIBRATION	Calibrated SAR value for specified position and input power at the flat phantom in brain simulating solutions

FREQUENCY	2450 , 5200, 5800 MHz
RETURN LOSS	> 20 dB at specified validation position
POWER CAPABILITY	> 100 W (f < 1GHz); > 40 W (f > 1GHz)
OPTIONS	Dipoles for other frequencies or solutions and other calibration conditions upon request

DEVICE HOLDER FOR SAM TWIN PHANTOM

CONSTRUCTION	The device holder for the mobile phone device is designed to cope with different positions given in the standard. It has two scales for the device rotation (with respect to the body axis) and the device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles. The holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered. The device holder for the portable device makes up of the polyethylene foam. The dielectric parameters of material close to the dielectric parameters of the air.
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DATA ACQUISITION ELECTRONICS

CONSTRUCTION	The data acquisition electronics (DAE3) consists of a highly sensitive electrometer grade preamplifier with auto-zeroing, a channel and gain-switching multiplex, a fast 16 bit AD converter and a command decoder and control logic unit. Transmission to the measurement server is accomplished through an optical downlink for data and status information as well as an optical uplink for commands and the clock. The mechanical probe is mounting device includes two different sensor systems for frontal and sideways probe contacts. They are used for mechanical surface detection and probe collision detection. The input impedance of the DAE3 box is 200MΩm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.
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2.4 GENERAL DESCRIPTION OF THE SPATIAL PEAK SAR EVALUATION

The DASY4 post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the micro-volt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$\text{Norm}_i, a_{i0}, a_{i1}, a_{i2}$
	- Conversion factor	ConvF_i
	- Diode compression point	dcp_i
Device parameters:	- Frequency	F
	- Crest factor	Cf
Media parameters:	- Conductivity	σ
	- Density	ρ

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics. If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot \frac{cf}{dcp_i}$$

V_i	=compensated signal of channel i	(i = x, y, z)
U_i	=input signal of channel i	(i = x, y, z)
Cf	=crest factor of exciting field	(DASY parameter)
dcp_i	=diode compression point	(DASY parameter)

From the compensated input signals the primary field data for each channel can be evaluated:

$$\text{E-field probes: } E_i = \sqrt{\frac{V_i}{\text{Norm}_i \cdot \text{ConvF}}}$$

$$\text{H-field probes: } H_i = \sqrt{V_i} \cdot \frac{a_{i0} + a_{i1}f + a_{i2}f^2}{f}$$

V_i	=compensated signal of channel i	(i = x, y, z)
Norm_i	=sensor sensitivity of channel i $\mu\text{V}/(\text{V/m})^2$ for (i = x, y, z)	E-field Probes
ConvF	= sensitivity enhancement in solution	
a_{ij}	= sensor sensitivity factors for H-field probes	
f	= carrier frequency [GHz]	
E_i	= electric field strength of channel i in V/m	
H_i	= magnetic field strength of channel i in A/m	

The RSS value of the field components gives the total field strength (Hermitian magnitude):

$$E_{\text{tot}} = \sqrt{E_x^2 + E_y^2 + E_z^2}$$

The primary field data are used to calculate the derived field units.

$$\text{SAR} = E_{\text{tot}}^2 \cdot \frac{s}{r \cdot 1'000}$$

SAR	= local specific absorption rate in mW/g
E_{tot}	= total field strength in V/m
σ	= conductivity in [mho/m] or [Siemens/m]
ρ	= equivalent tissue density in g/cm ³

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid. 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 1 g and 10 g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

1. The extraction of the measured data (grid and values) from the Zoom Scan
2. The calculation of the SAR value at every measurement point based on all stored data (A/D values and measurement parameters)
3. The generation of a high-resolution mesh within the measured volume
4. The interpolation of all measured values from the measurement grid to the high-resolution grid
5. The extrapolation of the entire 3-D field distribution to the phantom surface over the distance from sensor to surface
6. The calculation of the averaged SAR within masses of 1 g and 10 g.

The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration file. The software always knows exactly how far away the measured point is from the surface. As the probe cannot directly measure at the surface, the values between the deepest measured point and the surface must be extrapolated. The angle between the probe axis and the surface normal line is less than 30 degree.

In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within -2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). 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 5mm.

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7 x 7 x 7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30 x 30 x 30mm contains about 30g of tissue. The first procedure is an extrapolation (incl. boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid (42875 points). In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

3. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	Compaq	N800C	470048-515	FCC DoC Approved
2	NOTEBOOK	Dell	PP01L	TW-09C748-12800-16M-5064	FCC DoC Approved

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA
2	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

4. DESCRIPTION OF TEST MODES AND CONFIGURATIONS

4.1. DESCRIPTION OF ANTENNA LOCATION



4.2. DESCRIPTION OF ASSESSMENT POSITION

The following test configurations have been applied in this test report:

	
A: NOTEBOOK MODEL: N800C The bottom of the EUT face to the phantom with 10mm-separation distance.	B: NOTEBOOK MODEL: PP01L The edge of the EUT face to the phantom with 11mm-separation distance.

NOTE: The bottom of the notebook contacts the bottom of the flat phantom with 0mm-separation distance.

4.3. DESCRIPTION OF TEST MODE

TEST MODE	COMMUNICATION	MODULATION	ASSESSMENT POSTITION	TESTED CHANNEL
1	802.11b	DBPSK	A	L, M, H
2	802.11g	BPSK	A	L, M, H
3	802.11b	DBPSK	B	L, M, H
4	802.11g	BPSK	B	L, M, H
5	802.11a	BPSK	A	36, 48, 52, 64, 100, 104, 116, 120, 124, 136, 140, 149, 157, 165
6	802.11a	BPSK	B	

4.4. SUMMARY OF TEST RESULTS

COMMUNICATION MODE	802.11b	802.11g	802.11b	802.11g
TEST MODE	1	2	3	4
MEASURED VALUE OF 1g SAR (W/kg)				
CHANNEL	ASSESSMENT POSTITION			
LOW	0.633	0.463	0.593	0.328
MIDDLE	0.816	0.512	0.575	0.327
HIGH	0.942	0.533	0.597	0.326

NOTE: The worst value has been marked by boldface.

COMMUNICATION MODE	802.11a	802.11a
TEST MODE	5	6
MEASURED VALUE OF 1g SAR (W/kg)		
CHANNEL	ASSESSMENT POSTITION	ASSESSMENT POSTITION
36	0.430	0.239
48	0.531	0.317
52	0.526	0.357
64	0.538	0.275
100	0.283	0.148
104	0.237	0.119
116	0.310	0.163
120	0.275	0.158
124	0.292	0.168
136	0.260	0.143
140	0.209	0.131
149	0.063	0.044
157	0.062	0.041
165	0.062	0.053

NOTE: The worst value has been marked by boldface.

5. TEST RESULTS

5.1 TEST PROCEDURES

Use the software to control the EUT channel and transmission power. Then record the conducted power before the testing. Place the EUT to the specific test location. After the testing, must writing down the conducted power of the EUT into the report. The SAR value was calculated via the 3D spline interpolation algorithm that has been implemented in the software of DASY4 SAR measurement system manufactured and calibrated by SPEAG. According to the IEEE 1528 standards, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

- Power reference measurement
- Verification of the power reference measurement
- Area scan
- Zoom scan
- Power reference measurement

The area scan was performed for the highest spatial SAR location. The zoom scan with 30mm x 30mm x 30mm volume was performed for SAR value averaged over 1g and 10g spatial volumes.

In the zoom scan, the distance between the measurement point at the probe sensor location (geometric center behind the probe tip) and the phantom surface is 4.0 mm and maintained at a constant distance of ± 1.0 mm during a zoom scan to determine peak SAR locations. The distance is 4mm between the first measurement point and the bottom surface of the phantom. The secondary measurement point to the bottom surface of the phantom is with 9mm separation distance. The cube size is 7 x 7 x 7 points consist of 343 points and the grid space is 5mm.

The measurement time is 0.5 s at each point of the zoom scan. The probe boundary effect compensation shall be applied during the SAR test. Because of the tip of the probe to the Phantom surface separated distances are longer than half a tip probe diameter.

In the area scan, the separation distance is 4mm between the each measurement point and the phantom surface. The scan size shall be included the transmission portion of the EUT. The measurement time is the same as the zoom scan. At last the reference power drift shall be less than $\pm 5\%$.

5.2 MEASURED SAR RESULTS

2.4GHz

ENVIRONMENTAL CONDITION		Air Temperature : 23.6°C, Liquid Temperature : 22.4°C Humidity : 63%RH					
TESTED BY		Sam Onn			DATE		Jun. 06, 2007
CHAN.	FREQ. (MHz)	TEST MODE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST			
1	2412.000 (Low)	DBPSK	81.470	79.250	-2.730	1	0.633
6	2437.000 (Mid.)	DBPSK	81.658	78.886	-3.390	1	0.816
11	2462.000 (High)	DBPSK	80.910	79.068	-2.280	1	0.942
1	2412.000 (Low)	BPSK	78.343	76.033	-2.950	2	0.463
6	2437.000 (Mid.)	BPSK	79.433	76.913	-3.170	2	0.512
11	2462.000 (High)	BPSK	77.268	75.162	-2.730	2	0.533

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over 1g, **1.6 W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

ENVIRONMENTAL CONDITION		Air Temperature : 23.6°C, Liquid Temperature : 22.4°C Humidity : 63%RH					
TESTED BY		Sam Onn			DATE		Jun. 06, 2007
CHAN.	FREQ. (MHz)	TEST MODE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST			
1	2412.000 (Low)	DBPSK	81.470	79.616	-2.280	3	0.593
6	2437.000 (Mid.)	DBPSK	81.658	79.433	-2.730	3	0.575
11	2462.000 (High)	DBPSK	80.910	78.886	-2.500	3	0.597
1	2412.000 (Low)	BPSK	78.343	75.858	-3.170	4	0.328
6	2437.000 (Mid.)	BPSK	79.433	77.268	-2.730	4	0.327
11	2462.000 (High)	BPSK	77.268	74.817	-3.170	4	0.326

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over 1g, **1.6 W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

5GHz

ENVIRONMENTAL CONDITION		Air Temperature : 23.4°C, Liquid Temperature : 22.3°C Humidity : 64%RH					
TESTED BY		Sam Onn			DATE		Jun. 07, 2007
CHAN.	FREQ. (MHz)	TEST MODE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST			
36	5180.000	BPSK	30.832	29.978	-2.770	5	0.430
48	5240.000	BPSK	28.379	27.460	-3.240	5	0.531
52	5260.000	BPSK	29.107	28.373	-2.520	5	0.526
64	5320.000	BPSK	28.119	27.265	-3.040	5	0.538
100	5500.000	BPSK	29.648	28.940	-2.390	5	0.283
104	5520.000	BPSK	29.174	28.392	-2.680	5	0.237
116	5580.000	BPSK	28.708	27.663	-3.640	5	0.310
120	5600.000	BPSK	28.184	27.460	-2.570	5	0.275
124	5620.000	BPSK	27.606	26.860	-2.700	5	0.292
136	5680.000	BPSK	26.669	25.912	-2.840	5	0.260
140	5700.000	BPSK	26.303	25.604	-2.660	5	0.209
149	5745.000	BPSK	26.915	25.924	-3.680	5	0.063
157	5785.000	BPSK	26.607	25.829	-2.930	5	0.062
165	5825.000	BPSK	26.792	25.930	-3.220	5	0.062

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over 1g, **1.6 W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

ENVIRONMENTAL CONDITION			Air Temperature : 23.4°C, Liquid Temperature : 22.3°C Humidity : 64%RH				
TESTED BY			Sam Onn		DATE		Jun. 07, 2007
CHAN.	FREQ. (MHz)	TEST MODE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST			
36	5180.000	BPSK	30.832	29.874	-3.110	6	0.239
48	5240.000	BPSK	28.379	27.340	-3.660	6	0.317
52	5260.000	BPSK	29.107	28.301	-2.770	6	0.357
64	5320.000	BPSK	28.119	27.202	-3.260	6	0.275
100	5500.000	BPSK	29.648	28.973	-2.280	6	0.148
104	5520.000	BPSK	29.174	28.366	-2.770	6	0.119
116	5580.000	BPSK	28.708	27.874	-2.900	6	0.163
120	5600.000	BPSK	28.184	27.555	-2.230	6	0.158

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over 1g, **1.6 W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

ENVIRONMENTAL CONDITION			Air Temperature : 23.4°C, Liquid Temperature : 22.3°C Humidity : 64%RH				
TESTED BY			Sam Onn		DATE		Jun. 08, 2007
CHAN.	FREQ. (MHz)	TEST MODE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST			
124	5620.000	BPSK	27.606	26.835	-2.790	6	0.168
136	5680.000	BPSK	26.669	25.942	-2.730	6	0.143
140	5700.000	BPSK	26.303	25.692	-2.320	6	0.131
149	5745.000	BPSK	26.915	25.954	-3.570	6	0.044
157	5785.000	BPSK	26.607	25.834	-2.900	6	0.041
165	5825.000	BPSK	26.792	25.882	-3.390	6	0.053

NOTE:

1. Test configuration of each mode is described in section 3.
2. In this testing, the limit for General Population Spatial Peak averaged over 1g, **1.6 W/kg**, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.

5.3 SAR LIMITS

HUMAN EXPOSURE	SAR (W/kg)	
	(General Population / Uncontrolled Exposure Environment)	(Occupational / controlled Exposure Environment)
Spatial Average (whole body)	0.08	0.4
Spatial Peak (averaged over 1 g)	1.6	8.0
Spatial Peak (hands / wrists / feet / ankles averaged over 10 g)	4.0	20.0

NOTE:

1. This limits accord to 47 CFR 2.1093 – Safety Limit.
2. The EUT property been complied with the partial body exposure limit under the general population environment.

5.4 RECIPES FOR TISSUE SIMULATING LIQUIDS

For the measurement of the field distribution inside the SAM phantom, the phantom must be filled with 25 liters of tissue simulation liquid.

The following ingredients are used :

- **WATER-** Deionized water (pure H₂O), resistivity $\geq 16 \text{ M}$ - as basis for the liquid
- **SUGAR-** Refined sugar in crystals, as available in food shops - to reduce relative permittivity
- **SALT-** Pure NaCl - to increase conductivity
- **CELLULOSE-** Hydroxyethyl-cellulose, medium viscosity (75-125 mPa.s, 2% in water, 20°C),
CAS # 54290 - to increase viscosity and to keep sugar in solution
- **PRESERVATIVE-** Preventol D-7 Bayer AG, D-51368 Leverkusen, CAS # 55965-84-9 - to prevent the spread of bacteria and molds
- **DGMBE-** Diethylenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS # 112-34-5 - to reduce relative permittivity

THE RECIPES FOR 2450MHz SIMULATING LIQUID TABLE

INGREDIENT	HEAD SIMULATING LIQUID 2450MHz (HSL-2450)	MUSCLE SIMULATING LIQUID 2450MHz (MSL-2450)
Water	45%	69.83%
DGMBE	55%	30.17%
Salt	NA	NA
Dielectric Parameters at 22°C	f= 2450MHz $\epsilon = 39.2 \pm 5\%$ $\sigma = 1.80 \pm 5\% \text{ S/m}$	f= 2450MHz $\epsilon = 52.7 \pm 5\%$ $\sigma = 1.95 \pm 5\% \text{ S/m}$

THE INFORMATION FOR 5GHz SIMULATING LIQUID

The 5GHz liquids was purchased from SPEAG.

Body liquid model: HSL 5800, P/N: SL AAH 5800 AA

Head liquid model: M 5800, P/N: SL AAM 580 AD

5GHz liquids contain the following ingredients:

Water 64 - 78%

Mineral Oil 11 - 18%

Emulsifiers 9 - 15%

Additives and Salt 2 - 3%

Testing the liquids using the Agilent Network Analyzer E8358A and Agilent Dielectric Probe Kit 85070D. The testing procedure is following as

1. Turn Network Analyzer on and allow at least 30 min. warm up.
2. Mount dielectric probe kit so that interconnecting cable to Network Analyzer will not be moved during measurements or calibration.
3. Pour de-ionized water and measure water temperature ($\pm 1^\circ$).
4. Set water temperature in Agilent-Software (Calibration Setup).
5. Perform calibration.
6. Validate calibration with dielectric material of known properties (e.g. polished ceramic slab with >8mm thickness $\epsilon' = 10.0$, $\epsilon'' = 0.0$). If measured parameters do not fit within tolerance, repeat calibration (± 0.2 for ϵ' : ± 0.1 for ϵ'').
7. Conductivity can be calculated from ϵ'' by $\sigma = \omega \epsilon_0 \epsilon'' = \epsilon'' f [\text{GHz}] / 18$.
8. Measure liquid shortly after calibration. Repeat calibration every hour.
9. Stir the liquid to be measured. Take a sample (~50ml) with a syringe from the center of the liquid container.
10. Pour the liquid into a small glass flask. Hold the syringe at the bottom of the flask to avoid air bubbles.
11. Put the dielectric probe in the glass flask. Check that there are no air bubbles in front of the opening in the dielectric probe kit.
12. Perform measurements.
13. Adjust medium parameters in DASY4 for the frequencies necessary for the measurements ('Setup Config', select medium (e.g. Brain 900 MHz) and press 'Option'-button.
14. Select the current medium for the frequency of the validation (e.g. Setup Medium Brain 900 MHz).

FOR 2.4GHz BAND SIMULATING LIQUID

LIQUID TYPE		HSL-2450		MSL-2450	
SIMULATING LIQUID TEMP.		NA		22.4	
TEST DATE		NA		Jun. 06, 2007	
TESTED BY		NA		Sam Onn	
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	STANDARD VALUE	MEASUREMENT VALUE
2412	Permittivity (ϵ)	NA	NA	52.80	54.10
2437		NA	NA	52.70	54.00
2450		NA	NA	52.70	54.00
2462		NA	NA	52.70	54.00
2412	Conductivity (σ) S/m	NA	NA	1.91	1.97
2437		NA	NA	1.94	2.01
2450		NA	NA	1.95	2.03
2462		NA	NA	1.97	2.04
Dielectric Parameters Required at 22°C		f= 2450MHz ε= 39.2 ± 5% σ= 1.80 ± 5% S/m		f= 2450MHz ε= 52.7 ± 5% σ= 1.95 ± 5% S/m	

FOR 5.0GHz BAND SIMULATING LIQUID

BAND (5.150 ~ 5.350GHz)

LIQUID TYPE		HSL-5200		MSL-5200	
SIMULATING LIQUID TEMP.		NA		22.3	
TEST DATE		NA		Jun. 07, 2007	
TESTED BY		NA		Sam Onn	
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	STANDARD VALUE	MEASUREMENT VALUE
5180	Permittivity (ϵ)	NA	NA	49.00	50.40
5200		NA	NA	49.00	50.30
5240		NA	NA	49.00	50.30
5260		NA	NA	48.90	50.20
5320		NA	NA	48.90	50.10
5180	Conductivity (σ) S/m	NA	NA	5.28	5.30
5200		NA	NA	5.30	5.33
5240		NA	NA	5.35	5.39
5260		NA	NA	5.37	5.42
5320		NA	NA	5.44	5.51
Dielectric Parameters Required at 21°C					

BAND (5.470 ~ 5.850GHz)

LIQUID TYPE		HSL-5800		MSL-5800	
SIMULATING LIQUID TEMP.		NA		22.3	
TEST DATE		NA		Jun. 07, 2007	
TESTED BY		NA		Sam Onn	
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	STANDARD VALUE	MEASUREMENT VALUE
5500	Permittivity (ϵ)	NA	NA	48.60	49.80
5520		NA	NA	48.60	49.70
5580		NA	NA	48.50	49.60
5600		NA	NA	48.50	49.50
5620		NA	NA	48.40	49.50
5680		NA	NA	48.40	49.40
5700		NA	NA	48.30	49.40
5745		NA	NA	48.30	49.30
5785		NA	NA	48.20	49.20
5800		NA	NA	48.20	49.20
5825		NA	NA	48.20	49.10
5500		Conductivity (σ) S/m	NA	NA	5.65
5520	NA		NA	5.67	5.80
5580	NA		NA	5.74	5.89
5600	NA		NA	5.77	5.92
5620	NA		NA	5.79	5.95
5680	NA		NA	5.86	6.05
5700	NA		NA	5.88	6.08
5745	NA		NA	5.94	6.15
5785	NA		NA	5.98	6.21
5800	NA		NA	6.00	6.23
5825	NA		NA	6.03	6.27
Dielectric Parameters Required at 21°C					

5.5 TEST EQUIPMENT FOR TISSUE PROPERTY

ITEM	NAME	BAND	TYPE	SERIES NO.	CALIBRATED UNTIL
1	Network Analyzer	Agilent	E8358A	US41480538	Nov. 06, 2007
2	Dielectric Probe	Agilent	85070D	US01440176	NA

NOTE:

1. Before starting, all test equipment shall be warmed up for 30min.
2. The tolerance ($k=1$) specified by Agilent for general dielectric measurements, deriving from inaccuracies in the calibration data, analyzer drift, and random errors, are usually $\pm 2.5\%$ and $\pm 5\%$ for measured permittivity and conductivity, respectively. However, the tolerances for the conductivity is smaller for material with large loss tangents, i.e., less than $\pm 2.5\%$ ($k=1$). It can be substantially smaller if more accurate methods are applied.

6. SYSTEM VALIDATION

The system validation was performed in the flat phantom with equipment listed in the following table. Since the SAR value is calculated from the measured electric field, dielectric constant and conductivity of the body tissue, and the SAR is proportional to the square of the electric field. So, the SAR value will be also proportional to the RF power input to the system validation dipole under the same test environment. In our system validation test, 250mW RF input power was used.

6.1 TEST EQUIPMENT

ITEM	NAME	BAND	TYPE	SERIES NO.	CALIBRATED UNTIL
1	SAM Phantom	S & P	QD000 P40 CA	PT-1150	NA
2	Signal Generator	Anritsu	68247B	984703	May 18, 2008
3	E-Field Probe	Speaq	EX3DV6	3504	Nov. 22, 2007
4	E-Field Probe	Speaq	ET3DV6	1790	Nov. 22, 2007
5	DAE	Speaq	DAE3 V1	510	Sep. 06, 2007
6	Robot Positioner	Staubli Unimation	NA	NA	NA
7	Validation Dipole	Speaq	D2450V2	716	Aug. 20, 2007
8	Validation Dipole	Speaq	D5GHzV2	1019	Jul. 11, 2007
9	Power Meter	Agilent	E4416A	GB41291763	May 27, 2008
10	Peak and Average Power Sensor	Agilent	E9327A	US40441181	May 27, 2008

NOTE: Before starting the measurement, all test equipment shall be warmed up for 30min.

6.2 TEST PROCEDURE

Before the system performance check, we need only to tell the system which components (probe, medium, and device) are used for the system performance check; the system will take care of all parameters. The dipole must be placed beneath the flat section of the SAM Twin Phantom with the correct distance holder in place. The distance holder should touch the phantom surface with a light pressure at the reference marking (little cross) and be oriented parallel to the long side of the phantom. Accurate positioning is not necessary, since the system will search for the peak SAR location, except that the dipole arms should be parallel to the surface. The device holder for mobile phones can be left in place but should be rotated away from the dipole.

1. The "Power Reference Measurement" and "Power Drift Measurement" jobs are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the amplifier output power. If it is too high (above ± 0.1 dB), the system performance check should be repeated; some amplifiers have very high drift during warm-up. A stable amplifier gives drift results in the DASY system below ± 0.02 dB.
2. The "Surface Check" job tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1 mm). In that case it is better to abort the system performance check and stir the liquid. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within $\pm 30^\circ$.) However, varying breaking indices of different liquid compositions might also influence the distance. If the indicated difference varies from the actual setting, the probe parameter "optical surface

3. The "Area Scan" job measures the SAR above the dipole on a plane parallel to the surface. It is used to locate the approximate location of the peak SAR. The proposed scan uses large grid spacing for faster measurement; due to the symmetric field, the peak detection is reliable. If a finer graphic is desired, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result.
4. The "Zoom Scan" job measures the field in a volume around the peak SAR value assessed in the previous "Area Scan" job (for more information see the application note on SAR evaluation).

About the validation dipole positioning uncertainty, the constant and low loss dielectric spacer is used to establish the correct distance between the top surface of the dipole and the bottom surface of the phantom, the error component introduced by the uncertainty of the distance between the liquid (i.e., phantom shell) and the validation dipole in the DASY4 system is less than $\pm 0.1\text{mm}$.

$$SAR_{\text{tolerance}} [\%] = 100 \times \left(\frac{(a + d)^2}{a^2} - 1 \right)$$

As the closest distance is 10mm, the resulting tolerance $SAR_{\text{tolerance}} [\%]$ is $< 2\%$.

6.3 VALIDATION RESULTS

2450MHz SYSTEM VALIDATION TEST IN THE MUSCLE SIMULATING LIQUID					
TEST FREQUENCY (MHz)	REQUIRED SAR (mW/g)	MEASURED SAR (mW/g)	DEVIATION (%)	SEPARATION DISTANCE	TEST DATE
MSL2450	13.40 (1g)	13.40	0	10mm	Jun. 06, 2007
MSL5200	19.10 (1g)	20.00	4.71	10mm	Jun. 07, 2007
MSL5500	18.90 (1g)	19.60	3.70	10mm	Jun. 07, 2007
MSL5800	17.60 (1g)	18.60	5.68	10mm	Jun. 07, 2007
TESTED BY	Sam Onn				

NOTE: Please see Appendix for the photo of system validation test.

6.4 SYSTEM VALIDATION UNCERTAINTIES

In the table below, the system validation uncertainty with respect to the analytically assessed SAR value of a dipole source as given in the IEEE 1528 standard is given. This uncertainty is smaller than the expected uncertainty for mobile phone measurements due to the simplified setup and the symmetric field distribution.

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C _i)		Standard Uncertainty (±%)		(v _i)
				(1g)	(10g)	(1g)	(10g)	
Measurement System								
Probe Calibration	4.8	Normal	1	1	1	4.8	4.8	∞
Axial Isotropy	4.7	Rectangular	√3	1	1	2.7	2.7	∞
Hemispherical Isotropy	0	Rectangular	√3	1	1	0	0	∞
Boundary effect	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Linearity	4.7	Rectangular	√3	1	1	2.7	2.7	∞
System Detection Limit	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Readout Electronics	1.0	Normal	1	1	1	1.0	1.0	∞
Response Time	0	Rectangular	√3	1	1	0	0	∞
Integration Time	0	Rectangular	√3	1	1	0	0	∞
RF Ambient Conditions	3.0	Rectangular	√3	1	1	1.7	1.7	∞
Probe Positioner	0.4	Rectangular	√3	1	1	0.2	0.2	∞
Probe positioning	2.9	Rectangular	√3	1	1	1.7	1.7	∞
Algorithms for Max. SAR Evaluation	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Dipole								
Dipole Axis to Liquid Distance	2.0	Rectangular	√3	1	1	1.2	1.2	∞
Input power and SAR drift measurement	4.7	Rectangular	√3	1	1	2.7	2.7	∞
Phantom and Tissue Parameters								
Phantom Uncertainty	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5.0	Rectangular	√3	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	2.5	Normal	1	0.64	0.43	1.6	1.1	∞
Liquid Permittivity (target)	5.0	Rectangular	√3	0.6	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	2.5	Normal	1	0.6	0.49	1.5	1.2	∞
Combined Standard Uncertainty						8.4	8.1	∞
Coverage Factor for 95%						kp=2		
Expanded Uncertainty (K=2)						16.8	16.2	

NOTE: About the system validation uncertainty assessment, please reference the section 7.

6.1 SYSTEM VALIDATION UNCERTAINTIES (FOR 5.0GHz)

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C _i)		Standard Uncertainty (±%)		(v _i)
				(1g)	(10g)	(1g)	(10g)	
Measurement System								
Probe Calibration	6.6	Normal	1	1	1	4.8	6.6	∞
Axial Isotropy	4.7	Rectangular	√3	1	1	2.7	2.7	∞
Hemispherical Isotropy	0.0	Rectangular	√3	1	1	0.0	0.0	∞
Boundary effect	2.0	Rectangular	√3	1	1	1.2	1.2	∞
Linearity	4.7	Rectangular	√3	1	1	2.7	2.7	∞
System Detection Limit	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Readout Electronics	1.0	Normal	1	1	1	1.0	1.0	∞
Response Time	0.0	Rectangular	√3	1	1	0.0	0.0	∞
Integration Time	0.0	Rectangular	√3	1	1	0.0	0.0	∞
RF Ambient Conditions	3.0	Rectangular	√3	1	1	1.7	1.7	∞
Probe Positioner	0.8	Rectangular	√3	1	1	0.5	0.5	∞
Probe positioning	5.7	Normal	1	1	1	5.7	5.7	∞
Algorithms for Max. SAR Evaluation	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Dipole								
Dipole Axis to Liquid Distance	2.0	Rectangular	√3	1	1	1.2	1.2	∞
Input power and SAR drift measurement	4.7	Rectangular	√3	1	1	2.7	2.7	∞
Phantom and Tissue Parameters								
Phantom Uncertainty	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5.0	Rectangular	√3	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	2.5	Normal	1	0.64	0.43	1.6	1.1	∞
Liquid Permittivity (target)	5.0	Rectangular	√3	0.60	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	2.5	Normal	1	0.60	0.49	1.5	1.2	∞
Combined Standard Uncertainty						11.3	11.1	∞
Coverage Factor for 95%						kp=2		
Expanded Uncertainty (K=2)						22.6	22.1	

Table 6.1

NOTE: 1. Table 6.1 Uncertainty of the system performance check in the 5-6GHz range. Probe calibration error reflects uncertainty of the EX3DV3 probe conversion factor at Calibration Frequency.
2. About the system validation uncertainty assessment, please reference the section 7.

7. MEASUREMENT SAR PROCEDURE UNCERTAINTIES

The assessment of spatial peak SAR of the hand handheld devices is according to IEEE 1528. All testing situation shall be met below these requirements.

- The system is used by an experienced engineer who follows the manual and the guidelines taught during the training provided by SPEAG.
- The probe has been calibrated within the requested period and the stated uncertainty for the relevant frequency bands does not exceed 4.8% ($k=1$).
- The validation dipole has been calibrated within the requested period and the system performance check has been successful.
- The DAE unit has been calibrated within the within the requested period.
- The minimum distance between the probe sensor and inner phantom shell is selected to be between 4 and 5mm.
- The operational mode of the DUT is CW, CDMA, FDMA or TDMA (GSM, DCS, PCS, IS136 and PDC) and the measurement/integration time per point is >500 ms.
- The dielectric parameters of the liquid have been assessed using Agilent 85070D dielectric probe kit or a more accurate method.
- The dielectric parameters are within 5% of the target values.
- The DUT has been positioned as described in section 3.

7.1. PROBE CALIBRATION UNCERTAINTY

SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN50361, IEC 62209, etc.) under ISO17025. The uncertainties are stated on the calibration certificate. For the most relevant frequency bands, these values do not exceed 4.8% ($k=1$). If evaluations of other bands are performed for which the uncertainty exceeds these values, the uncertainty tables given in the summary have to be revised accordingly.

7.2. ISOTROPY UNCERTAINTY

The axial isotropy tolerance accounts for probe rotation around its axis while the hemispherical isotropy error includes all probe orientations and field polarizations. These parameters are assessed by SPEAG during initial calibration. In 2001, SPEAG further tightened its quality controls and warrants that the maximal deviation from axial isotropy is ± 0.20 dB, while the maximum deviation of hemispherical isotropy is ± 0.40 dB, corresponding to $\pm 4.7\%$ and $\pm 9.6\%$, respectively. A weighting factor of c_p equal to 0.5 can be applied, since the axis of the probe deviates less than 30 degrees from the normal surface orientation.

7.3. BOUNDARY EFFECT UNCERTAINTY

The effect can be estimated according to the following error approximation formula

$$SAR_{tolerance} [\%] = SAR_{be} [\%] \times \frac{(d_{be} + d_{step})^2}{2d_{step}} \frac{e^{-\frac{d_{be}}{\delta/2}}}{d/2}$$

$$d_{be} + d_{step} < 10mm$$

The parameter d_{be} is the distance in mm between the surface and the closest measurement point used in the averaging process; d_{step} is the separation distance in mm between the first and second measurement points; δ is the minimum penetration depth in mm within the head tissue equivalent liquids (i.e., $\delta = 13.95$ mm at 3GHz); SAR_{be} is the deviation between the measured SAR value at the distance d_{be} from the boundary and the wave-guide analytical value SAR_{ref} . DASY4 applies a boundary effect compensation algorithm according to IEEE 1528, which is possible since the axis of the probe never deviates more than 30 degrees from the normal surface orientation. $SAR_{be} [\%]$ is assessed during the calibration process and SPEAG warrants that the uncertainty at distances larger than 4mm is always less than 1%. In summary, the worst case boundary effect SAR tolerance [%] for scanning distances larger than 4mm is $< \pm 0.8\%$.

7.4. PROBE LINEARITY UNCERTAINTY

Field probe linearity uncertainty includes errors from the assessment and compensation of the diode compression effects for CW and pulsed signals with known duty cycles. This error is assessed using the procedure described in IEEE 1528. For SPEAG field probes, the measured difference between CW and pulsed signals, with pulse frequencies between 10 Hz and 1 kHz and duty cycles between 1 and 100, is $< \pm 0.20$ dB ($< \pm 4.7\%$).

7.5. READOUT ELECTRONICS UNCERTAINTY

All uncertainties related to the probe readout electronics (DAE unit), including the gain and linearity of the instrumentation amplifier, its loading effect on the probe, and accuracy of the signal conversion algorithm, have been assessed accordingly to IEEE 1528. The combination (root-sum-square RSS method) of these components results in an overall maximum error of $\pm 1.0\%$.

7.6. RESPONSE TIME UNCERTAINTY

The time response of the field probes is assessed by exposing the probe to a well-controlled electric field producing SAR larger than 2.0 W/kg at the tissue medium surface. The signal response time is evaluated as the time required by the system to reach 90% of the expected final value after an on/of switch of the power source. Analytically, it can be expressed as:

$$SAR_{tolerance} [\%] = 100 \times \left(\frac{T_m}{T_m + te^{-T_m/t}} - 1 \right)$$

where T_m is 500 ms, i.e., the time between measurement samples, and τ the time constant. The response time τ of SPEAG's probes is < 5 ms. In the current implementation, DASY4 waits longer than 100 ms after having reached the grid point before starting a measurement, i.e., the response time uncertainty is negligible.

7.7. INTEGRATION TIME UNCERTAINTY

If the device under test does not emit a CW signal, the integration time applied to measure the electric field at a specific point may introduce additional uncertainties due to the discretization and can be assessed as follows

$$SAR_{tolerance} [\%] = 100 \times \sum_{all sub-frames} \frac{t_{frame}}{t_{integration}} \frac{slot_{idle}}{slot_{total}}$$

The tolerances for the different systems are given in Table 7.1, whereby the worst-case $SAR_{tolerance}$ is 2.6%.

System	$SAR_{tolerance} \%$
CW	0
CDMA*	0
WCDMA*	0
FDMA	0
IS-136	2.6
PDC	2.6
GSM/DCS/PCS	1.7
DECT	1.9
Worst-Case	2.6

TABLE 7.1

7.8. PROBE POSITIONER MECHANICAL TOLERANCE

The mechanical tolerance of the field probe positioner can introduce probe positioning uncertainties. The resulting SAR uncertainty is assessed by comparing the SAR obtained according to the specifications of the probe positioner with respect to the actual position defined by the geometric center of the probe sensors. The tolerance is determined as:

$$SAR_{tolerance}[\%] = 100 \times \frac{d_{ph}}{d/2}$$

The specified repeatability of the RX robot family used in DASY4 systems is $\pm 25 \mu\text{m}$. The absolute accuracy for short distance movements is better than $\pm 0.1\text{mm}$, i.e., the $SAR_{tolerance}[\%]$ is better than 1.5% (rectangular).

7.9. PROBE POSITIONING

The probe positioning procedures affect the tolerance of the separation distance between the probe tip and the phantom surface as:

$$SAR_{tolerance}[\%] = 100 \times \frac{d_{ph}}{d/2}$$

where d_{ph} is the maximum deviation of the distance between the probe tip and the phantom surface. The optical surface detection has a precision of better than 0.2 mm, resulting in an $SAR_{tolerance}[\%]$ of <2.9% (rectangular distribution). Since the mechanical detection provides better accuracy, 2.9% is a worst-case figure for DASY4 system.

7.10. PHANTOM UNCERTAINTY

The SAR measurement uncertainty due to SPEAG phantom shell production tolerances has been evaluated using

$$SAR_{tolerance}[\%] \cong 100 \times \frac{2d}{a}, \quad d \ll a$$

For a maximum deviation d of the inner and outer shell of the phantom from that specified in the CAD file of ± 0.2 mm, and a 10mm spacing a between source and tissue liquid, the calculated phantom uncertainty is $\pm 4.0\%$.

7.11. DASY4 UNCERTAINTY BUDGET (FOR 2.4GHz)

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C _i)		Standard Uncertainty (±%)		(v _i)
				(1g)	(10g)	(1g)	(10g)	
Measurement Equipment								
Probe Calibration	4.8	Normal	1	1	1	4.8	4.8	∞
Axial Isotropy	4.7	Rectangular	√3	1	1	1.9	1.9	∞
Hemispherical Isotropy	9.6	Rectangular	√3	1	1	3.9	3.9	∞
Boundary effect	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Linearity	4.7	Rectangular	√3	1	1	2.7	2.7	∞
System Detection Limit	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Readout Electronics	1.0	Normal	1	1	1	1.0	1.0	∞
Response Time	0.8	Normal	1	1	1	0.8	0.8	∞
Integration Time	2.6	Normal	1	1	1	2.6	2.6	∞
Noise	0.0	Normal	1	0	0	0	0	∞
Mechanical Constraints								
Scanning System	0.4	Rectangular	√3	1	1	0.2	0.2	∞
Phantom Shell	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Probe Positioning	2.9	Rectangular	√3	1	1	1.7	1.7	∞
Device Positioning	2.9	Normal	1	1	1	2.9	2.9	875
Physical Parameters								
Liquid Conductivity (target)	5.0	Rectangular	√3	0.7	0.5	2	1.4	∞
Liquid Conductivity (measurement)	4.3	Rectangular	√3	0.7	0.5	1.7	1.2	∞
Liquid Permittivity (target)	5.0	Rectangular	√3	0.6	0.5	1.7	1.4	∞
Liquid Permittivity (measurement)	4.3	Rectangular	√3	0.6	0.5	1.5	1.2	∞
Power Drift	5	Rectangular	√3	1	1	2.9	2.9	∞
RF Ambient Conditions	3.0	Rectangular	√3	1	1	1.7	1.7	∞
Post-Processing								
Extrapolation and Integration	1	Rectangular	√3	1	1	0.6	0.6	∞
Combined Standard Uncertainty						9.9	9.7	
Coverage Factor for 95%						kp=2		
Expanded Uncertainty (K=2)						19.9	19.3	

TABLE 7.2

The table 7.2: Worst-Case uncertainty budget for DASY4 assessed according to IEEE 1528. The budget is valid for the frequency range 300MHz ~ 3GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

7.12.DASY4 UNCERTAINTY BUDGET (FOR 5 ~ 6GHz)

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C _i)		Standard Uncertainty (±%)		(v _i)
				(1g)	(10g)	(1g)	(10g)	
Measurement System								
Probe Calibration	6.8	Normal	1	1	1	6.8	6.8	∞
Axial Isotropy	4.7	Rectangular	√3	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	9.6	Rectangular	√3	0.7	0.7	3.9	3.9	∞
Boundary effect	2.0	Rectangular	√3	1	1	1.2	1.2	∞
Linearity	4.7	Rectangular	√3	1	1	2.7	2.7	∞
System Detection Limit	1.0	Rectangular	√3	1	1	0.6	0.6	∞
Readout Electronics	1.0	Normal	1	1	1	1.0	1.0	∞
Response Time	0.8	Rectangular	√3	1	1	0.5	0.5	∞
Integration Time	2.6	Rectangular	√3	1	1	1.5	1.5	∞
RF Ambient Conditions	3.0	Rectangular	√3	1	1	1.7	1.7	∞
Probe Positioner	0.8	Rectangular	√3	1	1	0.5	0.5	∞
Probe positioning	5.7	Normal	1	1	1	5.7	5.7	∞
Algorithms for Max. SAR Evaluation	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Test EUT Related								
Device Positioning	2.9	Normal	1	1	1	2.9	2.9	145
Device Holder	3.6	Normal	1	1	1	3.6	3.6	5
Power Drift	5.0	Rectangular	√3	1	1	2.9	2.9	∞
Phantom and Tissue Parameters								
Phantom Uncertainty	4.0	Rectangular	√3	1	1	2.3	2.3	∞
Liquid Conductivity (target)	5.0	Rectangular	√3	0.64	0.43	1.8	1.2	∞
Liquid Conductivity (measurement)	2.5	Normal	1	0.64	0.43	1.6	1.1	∞
Liquid Permittivity (target)	5.0	Rectangular	√3	0.60	0.49	1.7	1.4	∞
Liquid Permittivity (measurement)	2.5	Normal	1	0.60	0.49	1.5	1.2	∞
Combined Standard Uncertainty						12.8	12.7	330
Expanded STD Uncertainty						25.7	25.3	

TABLE 7.3

The table 7.3: Worst-Case uncertainty budget for DASY4 valid for the frequency range 5 ~ 6 GHz. Probe calibration error reflects uncertainty of the narrow-bandwidth EX3DV3 probe conversion factor (±50 MHz).

8. INFORMATION ON THE TESTING LABORATORIES

We, ADT Corp., were founded in 1988 to provide our best service in EMC, Radio, Telecom and Safety consultation. Our laboratories are accredited and approved by the following approval agencies according to ISO/IEC 17025.

USA	FCC, UL, A2LA
Germany	TUV Rheinland
Japan	VCCI
Norway	NEMKO
Canada	INDUSTRY CANADA , CSA
R.O.C.	CNLA, BSMI, NCC
Netherlands	Telefication
Singapore	PSB , GOST-ASIA(MOU)
Russia	CERTIS(MOU)

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site:

www.adt.com.tw/index.5/phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3185050

Web Site: www.adt.com.tw

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

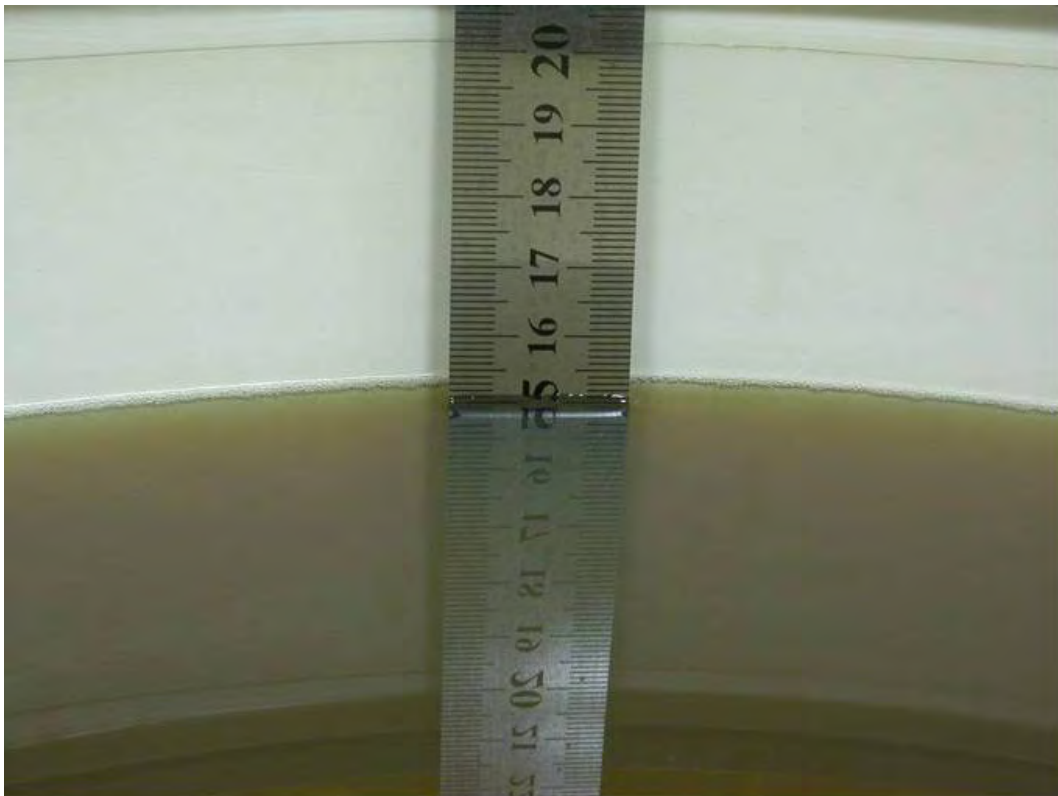
APPENDIX A: TEST DATA

Liquid Level Photo

MSL 2450MHz D=150mm



MSL 5800MHz D=151mm



Date/Time: 2007/6/6 11:02:57

Test Laboratory: Advance Data Technology

N800C-11b-Ch1-Mode 1

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2412 MHz

Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK

Medium: MSL2450 Medium parameters used: $f = 2412 \text{ MHz}$; $\sigma = 1.97 \text{ mho/m}$; $\epsilon_r = 54.1$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Low Channel 1/Area Scan (5x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.693 mW/g

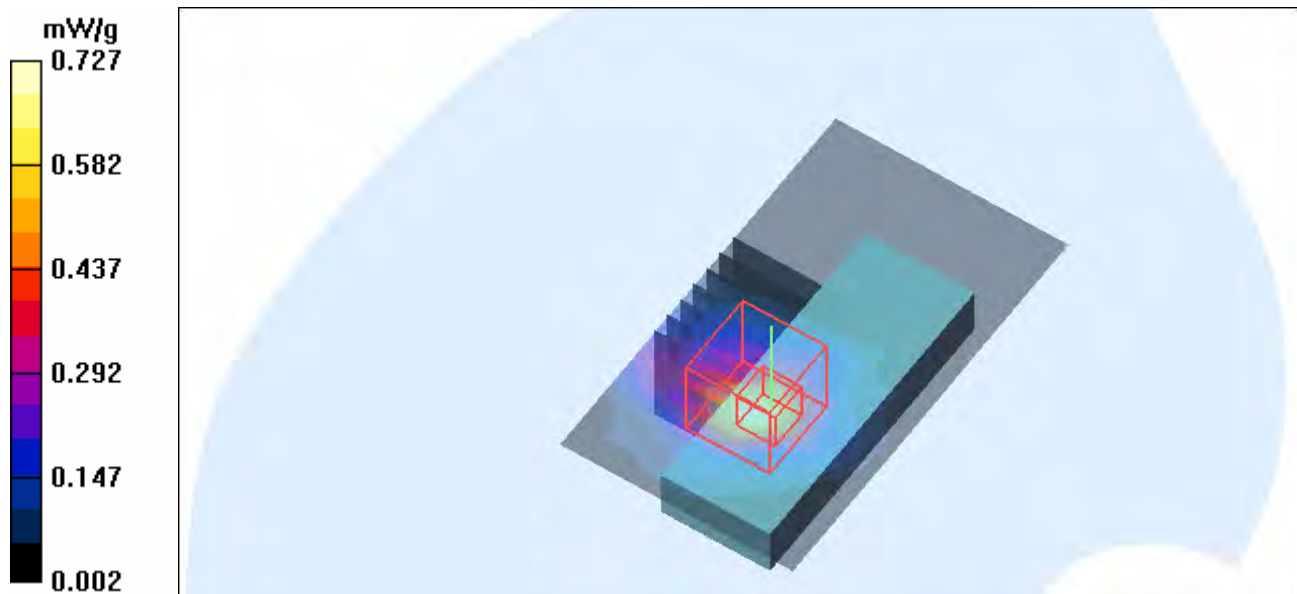
Low Channel 1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 19.3 V/m

Peak SAR (extrapolated) = 1.57 W/kg

SAR(1 g) = 0.633 mW/g; SAR(10 g) = 0.294 mW/g

Maximum value of SAR (measured) = 0.727 mW/g



Date/Time: 2007/6/6 11:27:09

Test Laboratory: Advance Data Technology

N800C-11b-Ch6-Mode 1

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2437 MHz

Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK

Medium: MSL2450 Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 2.01 \text{ mho/m}$; $\epsilon_r = 54$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 6/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.840 mW/g

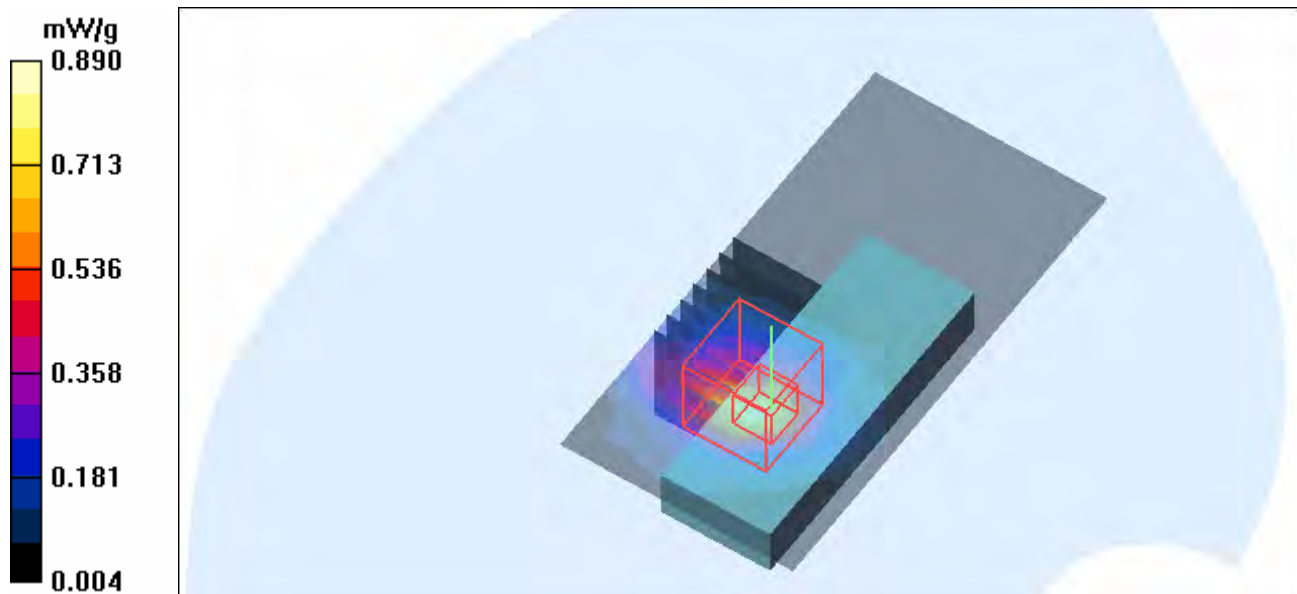
Mid Channel 6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 21.2 V/m

Peak SAR (extrapolated) = 2.16 W/kg

SAR(1 g) = 0.816 mW/g; SAR(10 g) = 0.363 mW/g

Maximum value of SAR (measured) = 0.890 mW/g



Date/Time: 2007/6/6 11:43:25

Test Laboratory: Advance Data Technology

N800C-11b-Ch11-Mode 1

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2462 MHz

Communication System: 802.11b ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK

Medium: MSL2450 Medium parameters used: $f = 2462 \text{ MHz}$; $\sigma = 2.04 \text{ mho/m}$; $\epsilon_r = 54$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

High Channel 11/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.978 mW/g

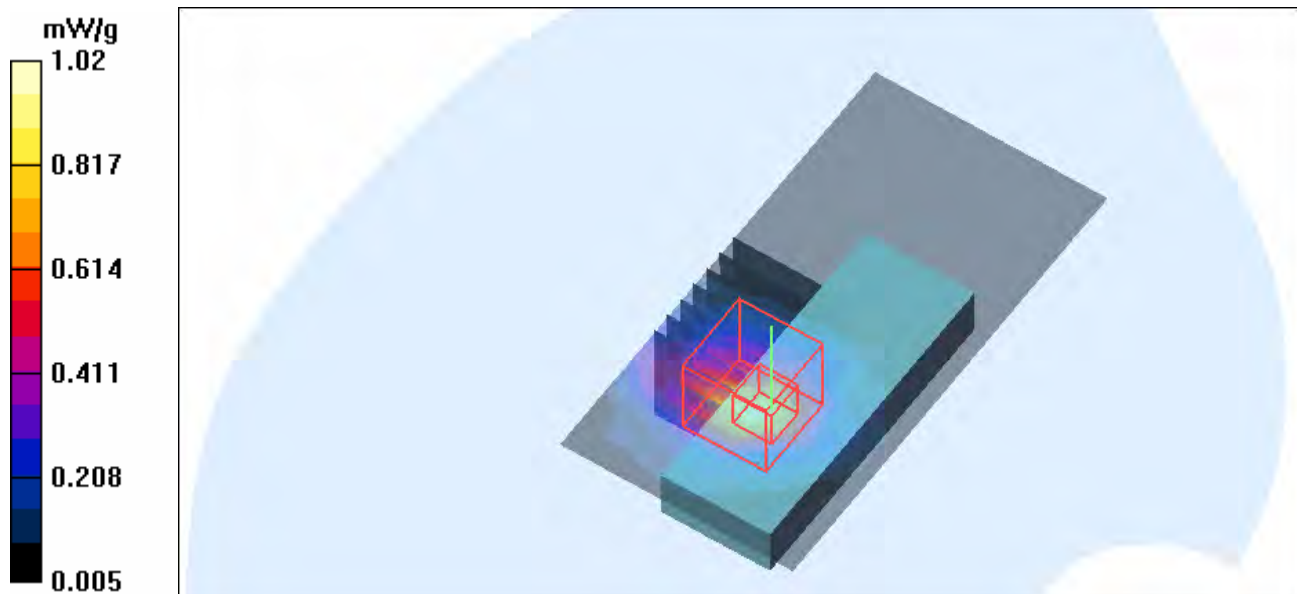
High Channel 11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

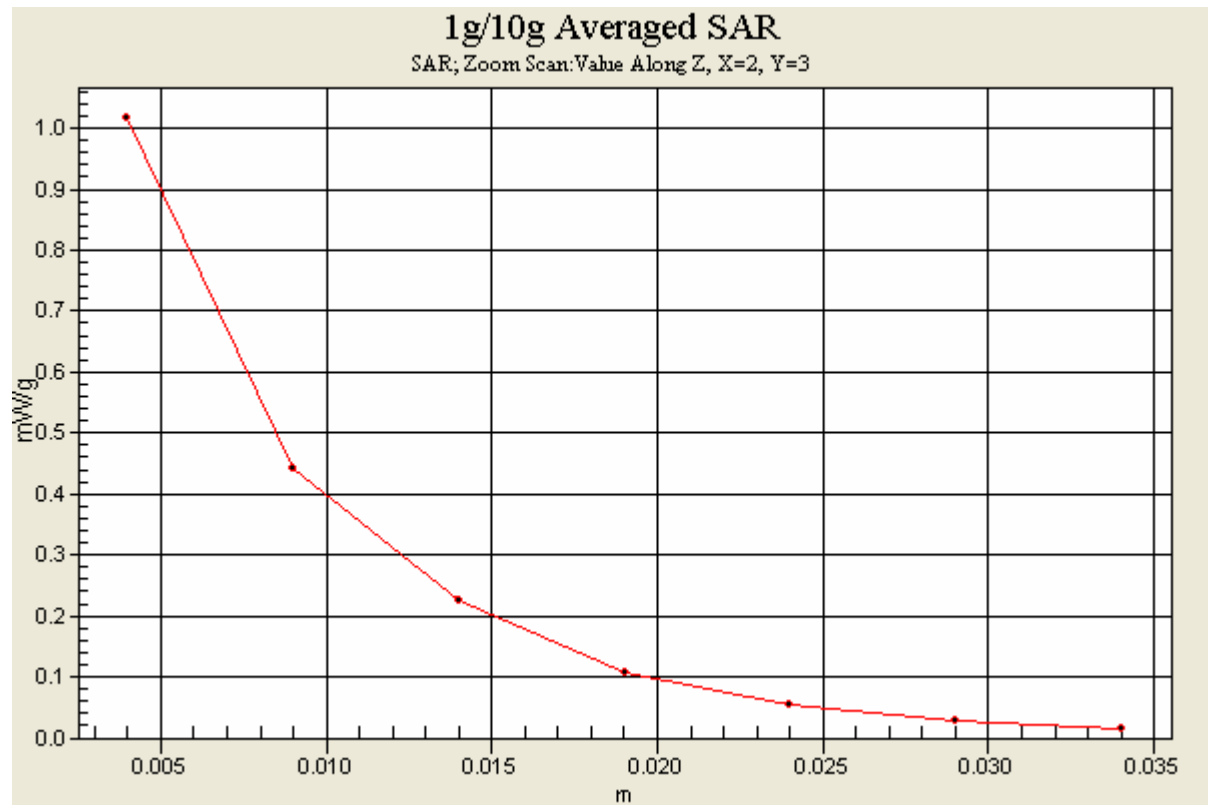
Reference Value = 22.7 V/m

Peak SAR (extrapolated) = 2.51 W/kg

SAR(1 g) = 0.942 mW/g; SAR(10 g) = 0.422 mW/g

Maximum value of SAR (measured) = 1.02 mW/g





Date/Time: 2007/6/6 12:59:33

Test Laboratory: Advance Data Technology

N800C-11g-Ch1-Mode 2

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2412 MHz

Communication System: 802.11g ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2412 \text{ MHz}$; $\sigma = 1.97 \text{ mho/m}$; $\epsilon_r = 54.1$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Low Channel 1/Area Scan (5x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

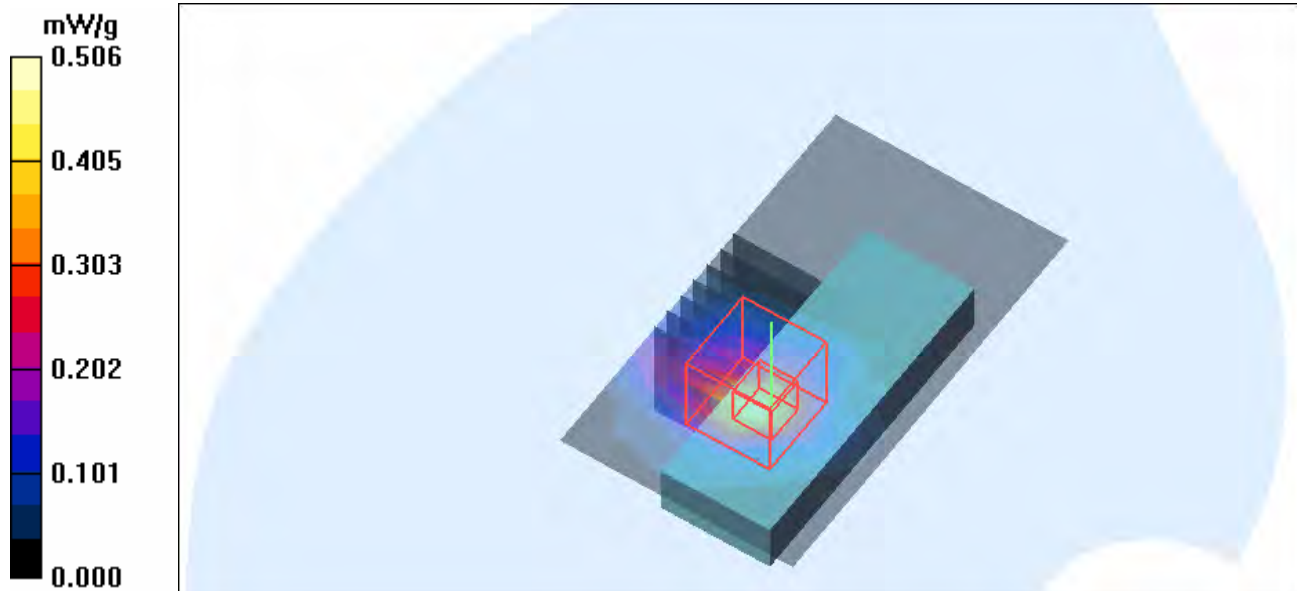
Maximum value of SAR (measured) = 0.506 mW/g

Low Channel 1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 16.9 V/m

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.463 mW/g; SAR(10 g) = 0.205 mW/g



Date/Time: 2007/6/6 01:15:33

Test Laboratory: Advance Data Technology

N800C-11g-Ch6-Mode 2

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2437 MHz

Communication System: 802.11g ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 2.01 \text{ mho/m}$; $\epsilon_r = 54$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 6/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.527 mW/g

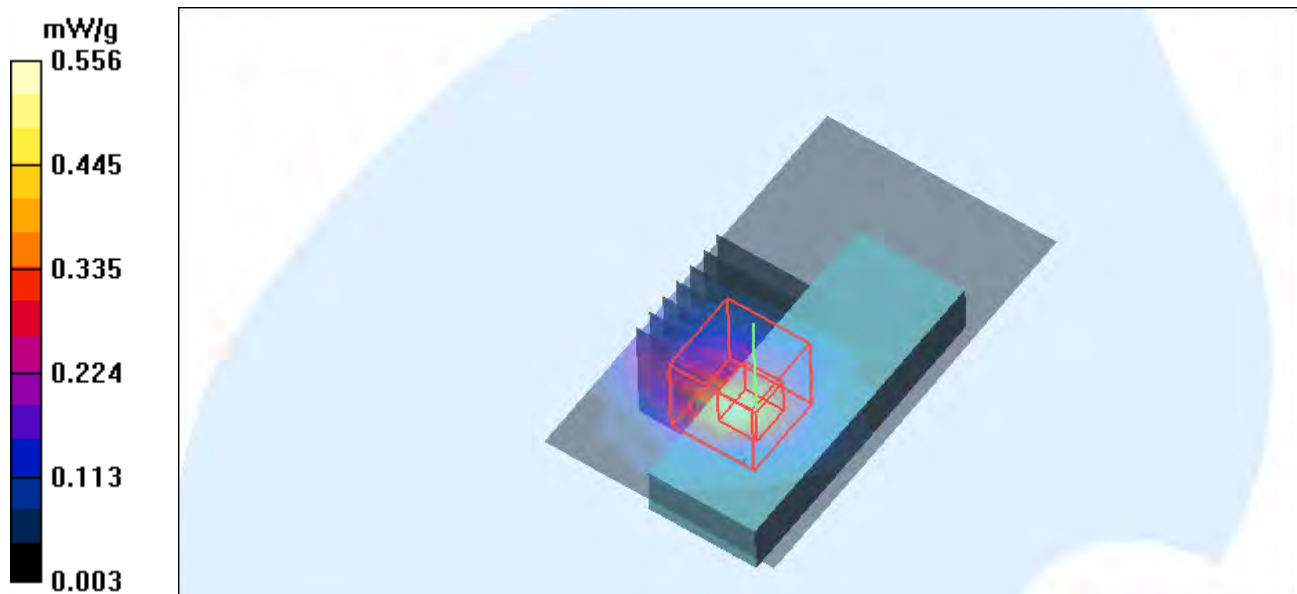
Mid Channel 6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 16.8 V/m

Peak SAR (extrapolated) = 1.36 W/kg

SAR(1 g) = 0.512 mW/g; SAR(10 g) = 0.226 mW/g

Maximum value of SAR (measured) = 0.556 mW/g



Test Laboratory: Advance Data Technology

N800C-11g-Ch11-Mode 2

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2462 MHz

Communication System: 802.11g ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2462 \text{ MHz}$; $\sigma = 2.04 \text{ mho/m}$; $\epsilon_r = 54$; $\rho = 1000 \text{ kg/m}^3$; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

High Channel 11/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.550 mW/g

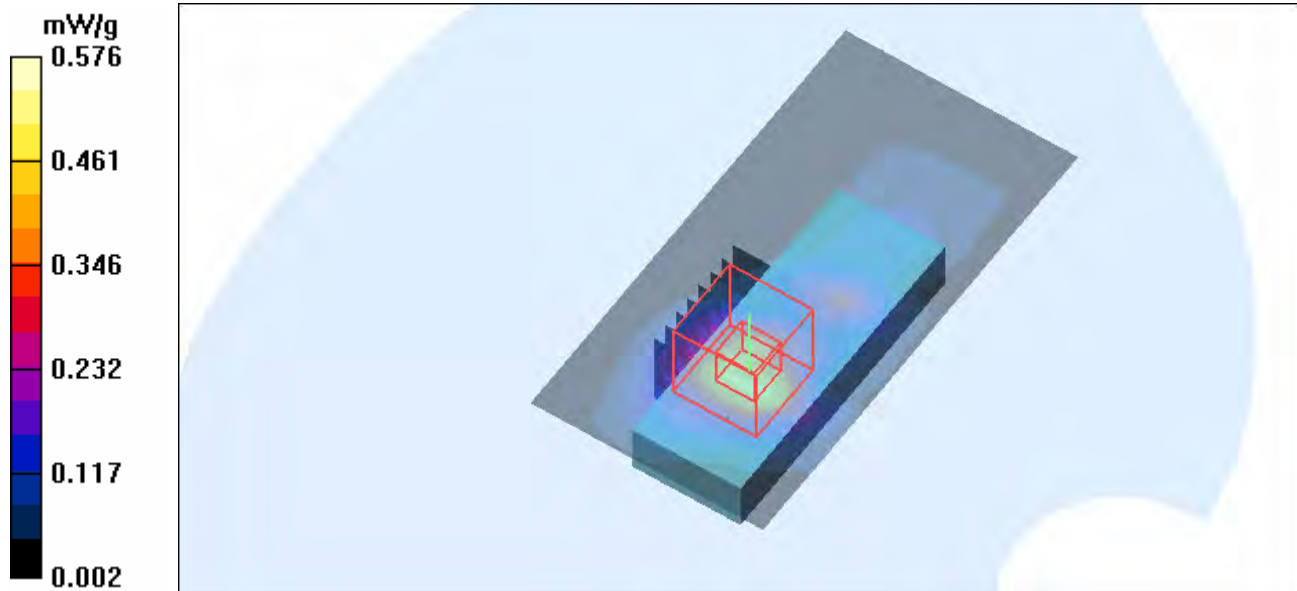
High Channel 11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 17.1 V/m

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.533 mW/g; SAR(10 g) = 0.237 mW/g

Maximum value of SAR (measured) = 0.576 mW/g



Date/Time: 2007/6/6 04:03:25

Test Laboratory: Advance Data Technology

C600-11b-Ch1-Mode 3

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2412 MHz

Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK

Medium: MSL2450 Medium parameters used: $f = 2412 \text{ MHz}$; $\sigma = 1.97 \text{ mho/m}$; $\epsilon_r = 54.1$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Low Channel 1/Area Scan (5x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.580 mW/g

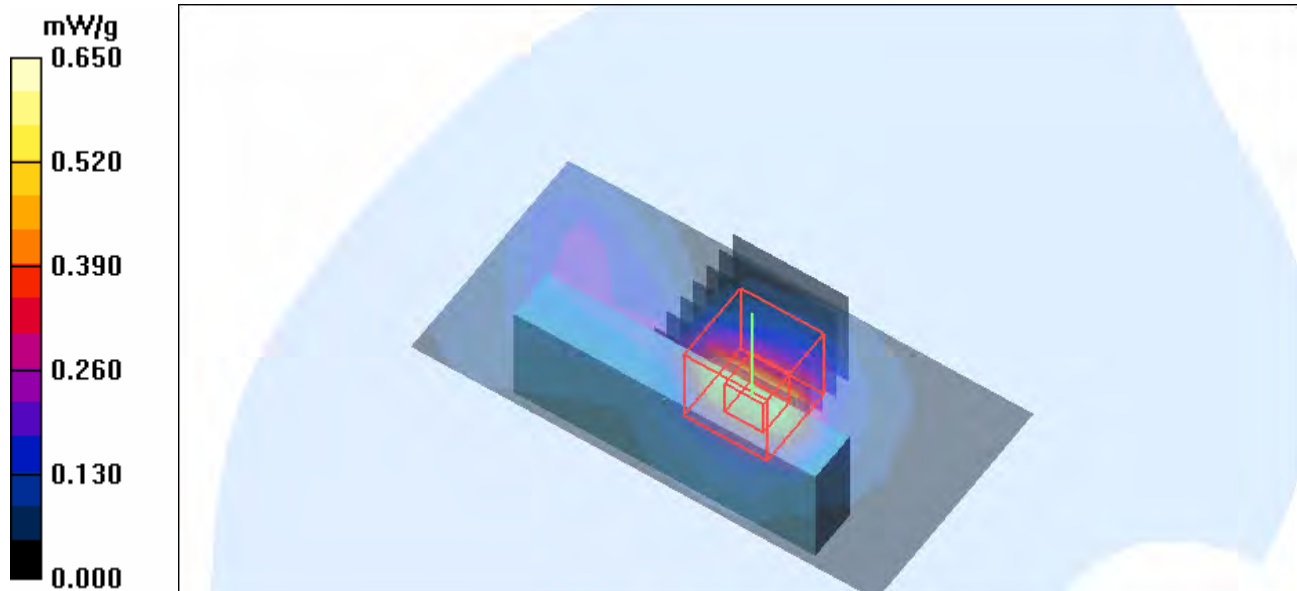
Low Channel 1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 17.6 V/m

Peak SAR (extrapolated) = 1.37 W/kg

SAR(1 g) = 0.593 mW/g; SAR(10 g) = 0.282 mW/g

Maximum value of SAR (measured) = 0.650 mW/g



Date/Time: 2007/6/6 04:23:44

Test Laboratory: Advance Data Technology

C600-11b-Ch6-Mode 3

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2437 MHz

Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK

Medium: MSL2450 Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 2.01 \text{ mho/m}$; $\epsilon_r = 54$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 6/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.529 mW/g

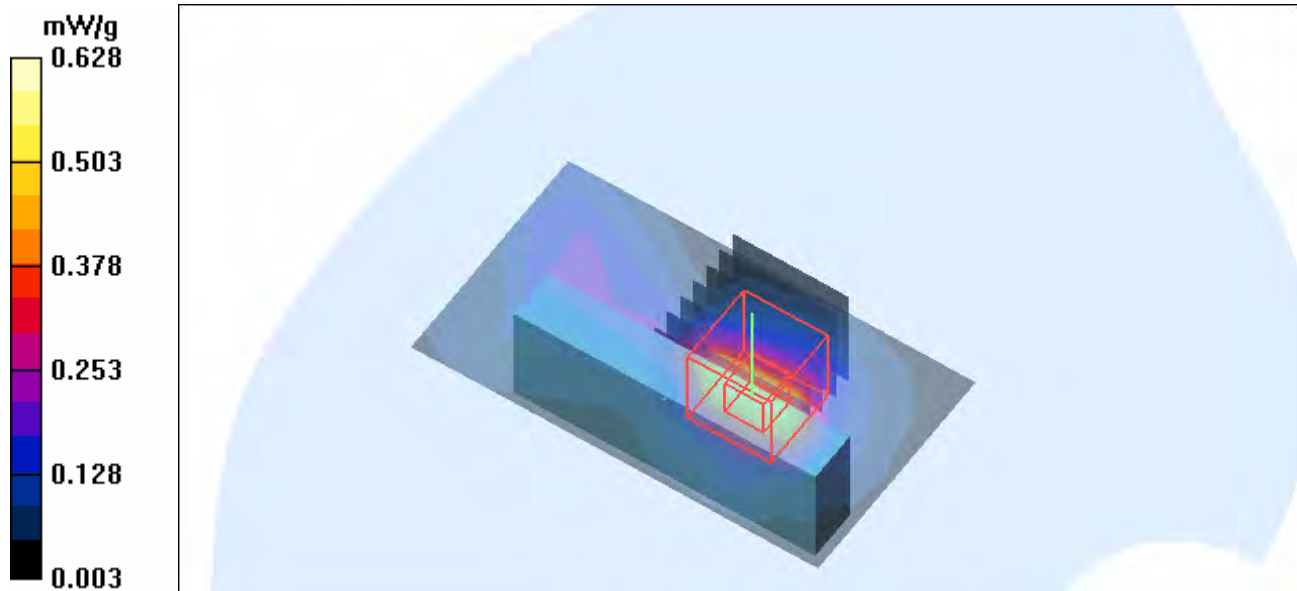
Mid Channel 6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 17.3 V/m

Peak SAR (extrapolated) = 1.35 W/kg

SAR(1 g) = 0.575 mW/g; SAR(10 g) = 0.268 mW/g

Maximum value of SAR (measured) = 0.628 mW/g



Date/Time: 2007/6/6 04:39:57

Test Laboratory: Advance Data Technology

C600-11b-Ch11-Mode 3

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2462 MHz

Communication System: 802.11b ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK

Medium: MSL2450 Medium parameters used: $f = 2462 \text{ MHz}$; $\sigma = 2.04 \text{ mho/m}$; $\epsilon_r = 54$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

High Channel 11/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.607 mW/g

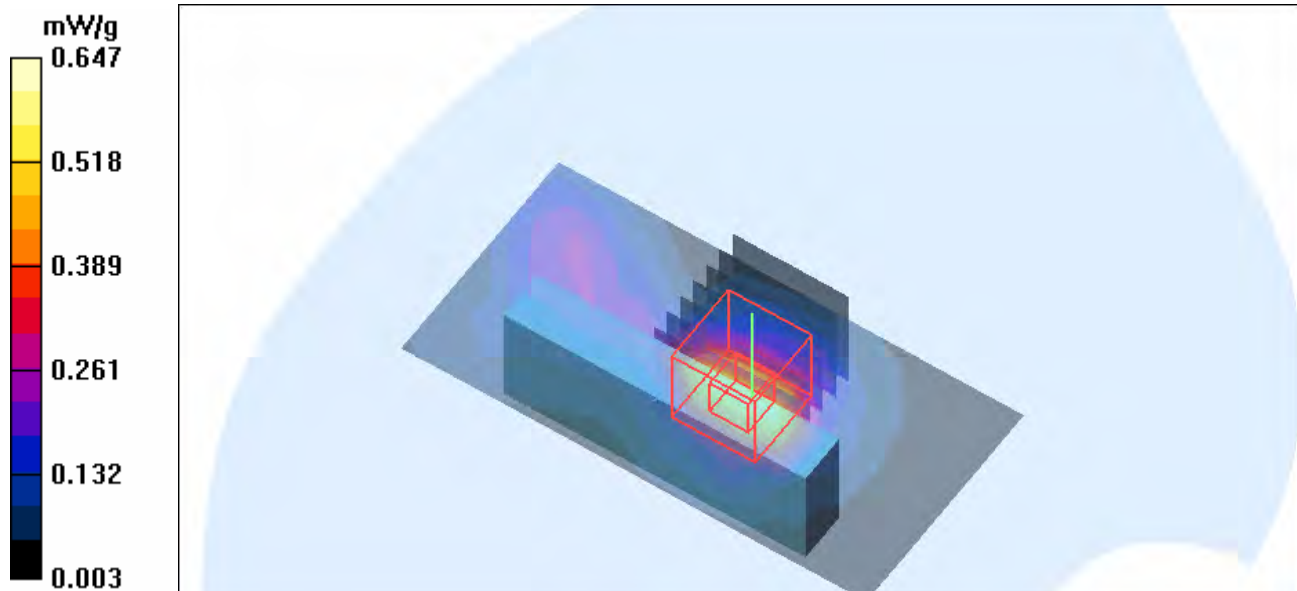
High Channel 11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 18.0 V/m

Peak SAR (extrapolated) = 1.41 W/kg

SAR(1 g) = 0.597 mW/g; SAR(10 g) = 0.277 mW/g

Maximum value of SAR (measured) = 0.647 mW/g



Date/Time: 2007/6/6 04:58:44

Test Laboratory: Advance Data Technology

C600-11g-Ch1-Mode 4

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2412 MHz

Communication System: 802.11g ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2412 \text{ MHz}$; $\sigma = 1.97 \text{ mho/m}$; $\epsilon_r = 54.1$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Low Channel 1/Area Scan (5x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.326 mW/g

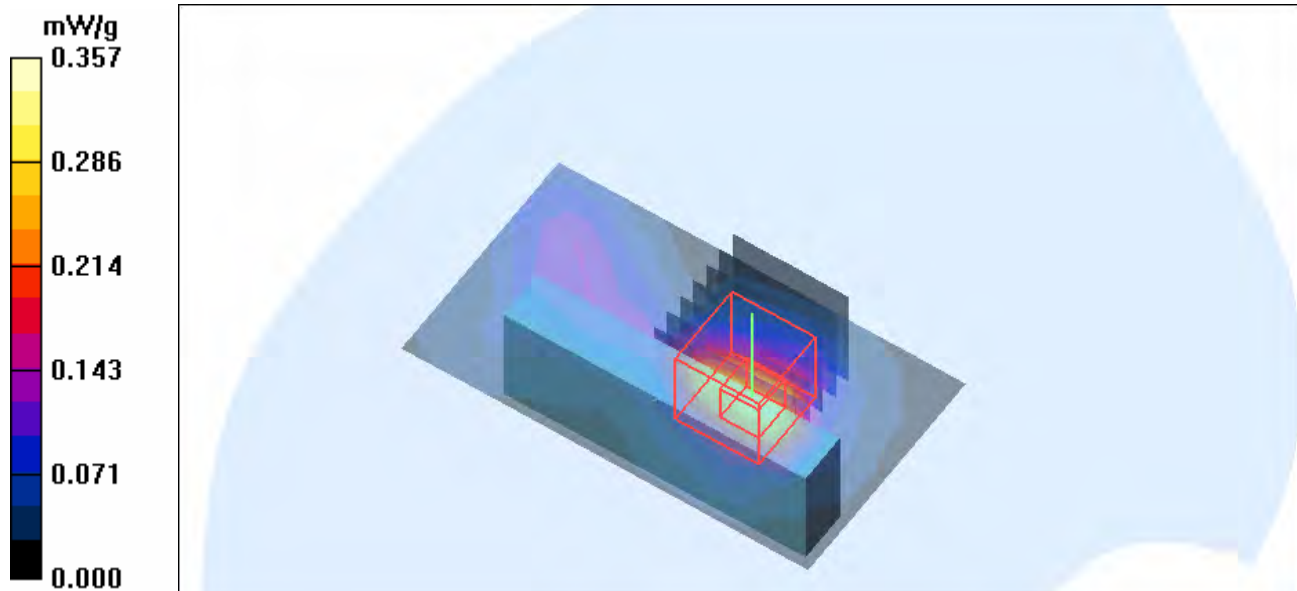
Low Channel 1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 13.4 V/m

Peak SAR (extrapolated) = 0.811 W/kg

SAR(1 g) = 0.328 mW/g; SAR(10 g) = 0.156 mW/g

Maximum value of SAR (measured) = 0.357 mW/g



Date/Time: 2007/6/6 05:20:43

Test Laboratory: Advance Data Technology

C600-11g-Ch6-Mode 4

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2437 MHz

Communication System: 802.11g ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2437 \text{ MHz}$; $\sigma = 2.01 \text{ mho/m}$; $\epsilon_r = 54$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 6/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.321 mW/g

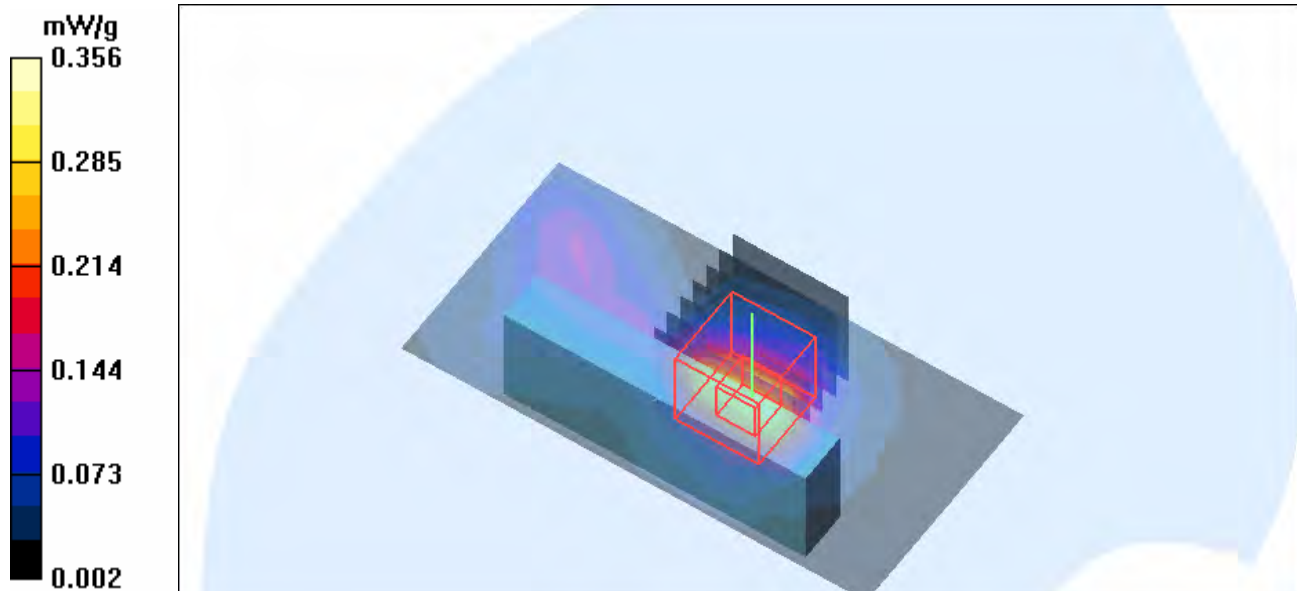
Mid Channel 6/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 13.2 V/m

Peak SAR (extrapolated) = 0.765 W/kg

SAR(1 g) = 0.327 mW/g; SAR(10 g) = 0.154 mW/g

Maximum value of SAR (measured) = 0.356 mW/g



Date/Time: 2007/6/6 05:38:13

Test Laboratory: Advance Data Technology

C600-11g-Ch11-Mode 4

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 2462 MHz

Communication System: 802.11g ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2462 \text{ MHz}$; $\sigma = 2.04 \text{ mho/m}$; $\epsilon_r = 54$; $\rho = 1000$

kg/m^3 ; Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : External Antenna ; Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

High Channel 11/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

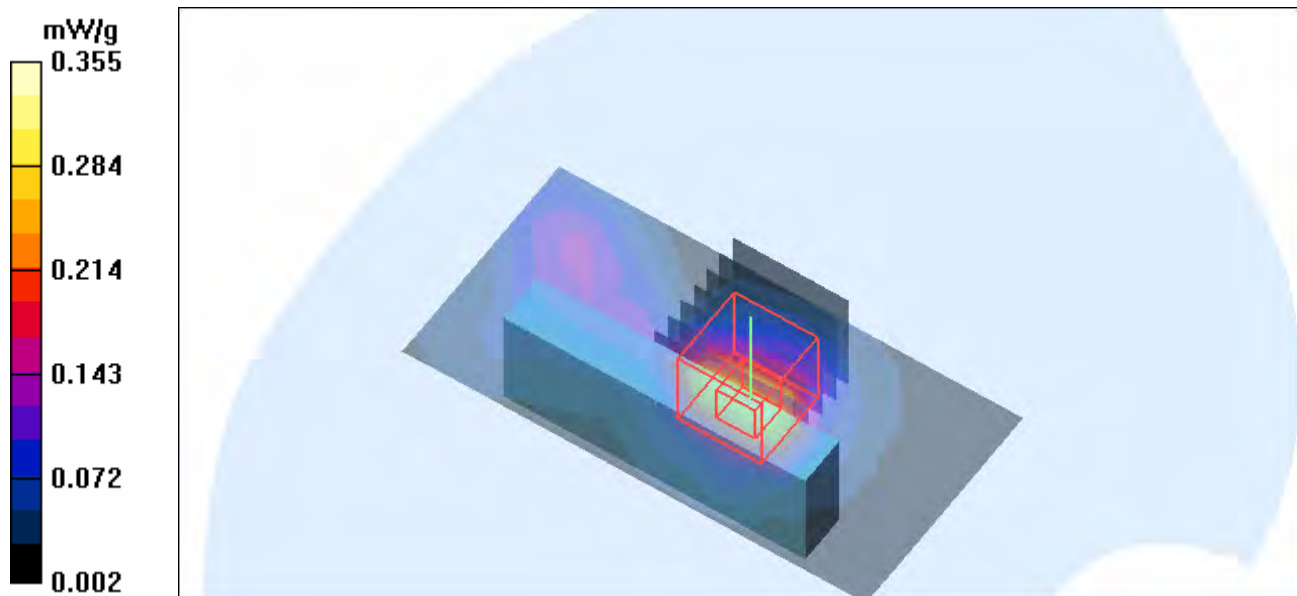
High Channel 11/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 13.0 V/m

Peak SAR (extrapolated) = 0.765 W/kg

SAR(1 g) = 0.326 mW/g; SAR(10 g) = 0.154 mW/g

Maximum value of SAR (measured) = 0.355 mW/g



Date/Time: 2007/6/7 11:37:11

Test Laboratory: Advance Data Technology

N800C -11a-Ch36-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5180 MHz

Communication System: 802.11a ; Frequency: 5180 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5180 \text{ MHz}$; $\sigma = 5.3 \text{ mho/m}$; $\epsilon_r = 50.4$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.42, 4.42, 4.42) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 36/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.651 mW/g

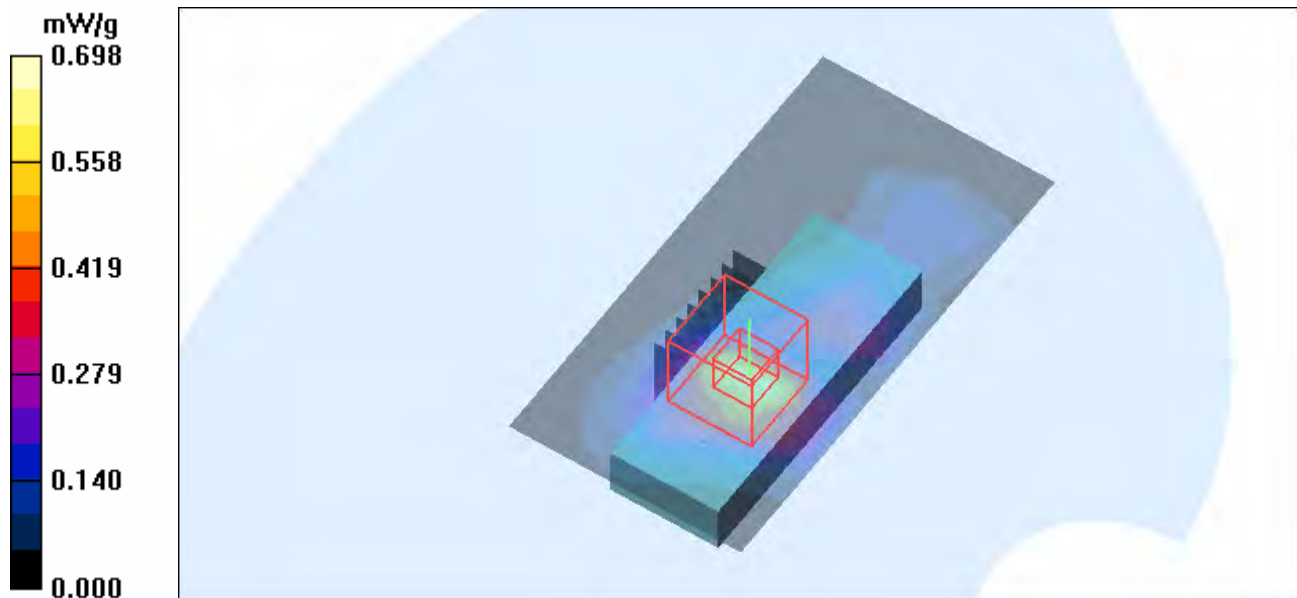
Channel 36/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 7.08 V/m

Peak SAR (extrapolated) = 2.12 W/kg

SAR(1 g) = 0.430 mW/g; SAR(10 g) = 0.134 mW/g

Maximum value of SAR (measured) = 0.698 mW/g



Date/Time: 2007/6/7 12:07:15

Test Laboratory: Advance Data Technology

N800C -11a-Ch48-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5240 MHz

Communication System: 802.11a ; Frequency: 5240 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5240 \text{ MHz}$; $\sigma = 5.39 \text{ mho/m}$; $\epsilon_r = 50.3$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Multilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.42, 4.42, 4.42) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 48/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.833 mW/g

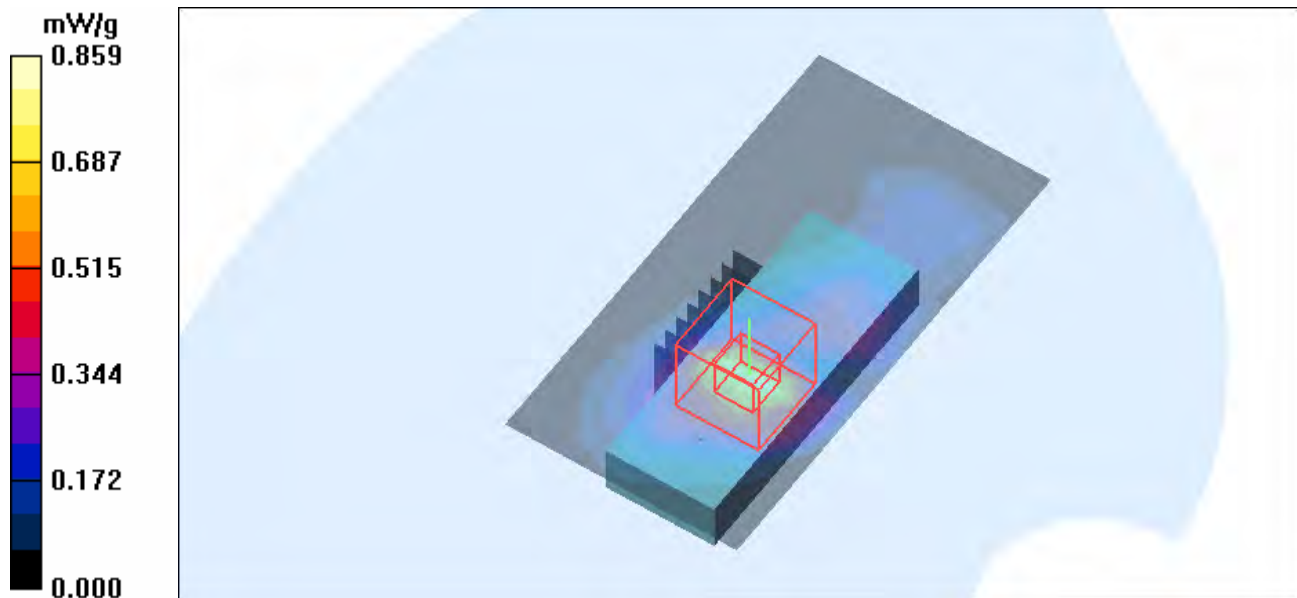
Channel 48/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 7.62 V/m

Peak SAR (extrapolated) = 1.96 W/kg

SAR(1 g) = 0.531 mW/g; SAR(10 g) = 0.194 mW/g

Maximum value of SAR (measured) = 0.859 mW/g



Date/Time: 2007/6/7 12:37:19

Test Laboratory: Advance Data Technology

N800C -11a-Ch52-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5260 MHz

Communication System: 802.11a ; Frequency: 5260 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5260 \text{ MHz}$; $\sigma = 5.42 \text{ mho/m}$; $\epsilon_r = 50.2$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Multilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.05, 4.05, 4.05) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 52/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.840 mW/g

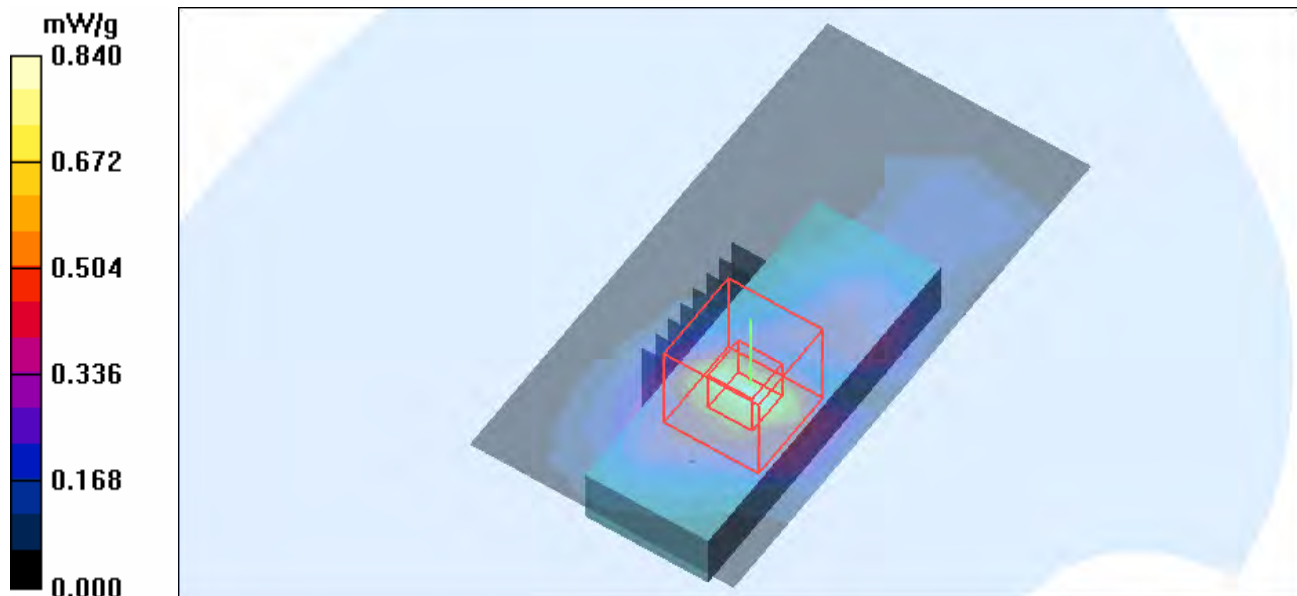
Channel 52/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 7.40 V/m

Peak SAR (extrapolated) = 1.66 W/kg

SAR(1 g) = 0.526 mW/g; SAR(10 g) = 0.190 mW/g

Maximum value of SAR (measured) = 0.831 mW/g



Date/Time: 2007/6/7 13:06:55

Test Laboratory: Advance Data Technology

N800C -11a-Ch64-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5320 MHz

Communication System: 802.11a ; Frequency: 5320 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5320 \text{ MHz}$; $\sigma = 5.51 \text{ mho/m}$; $\epsilon_r = 50.1$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Multilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.05, 4.05, 4.05) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 64/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.848 mW/g

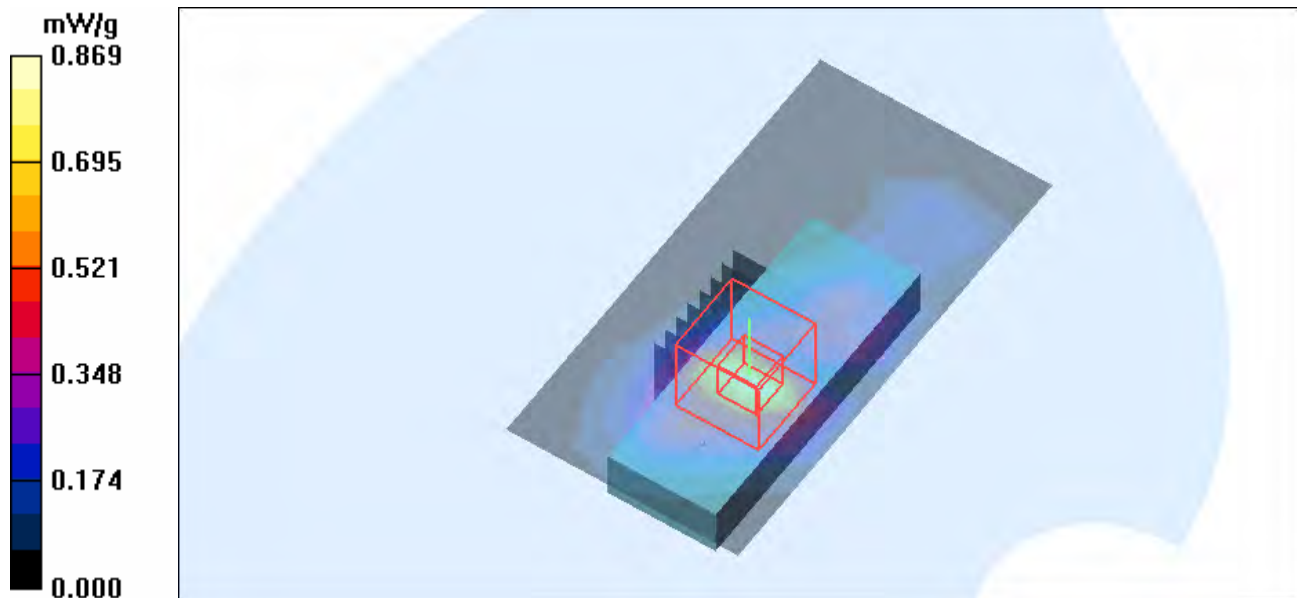
Channel 64/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

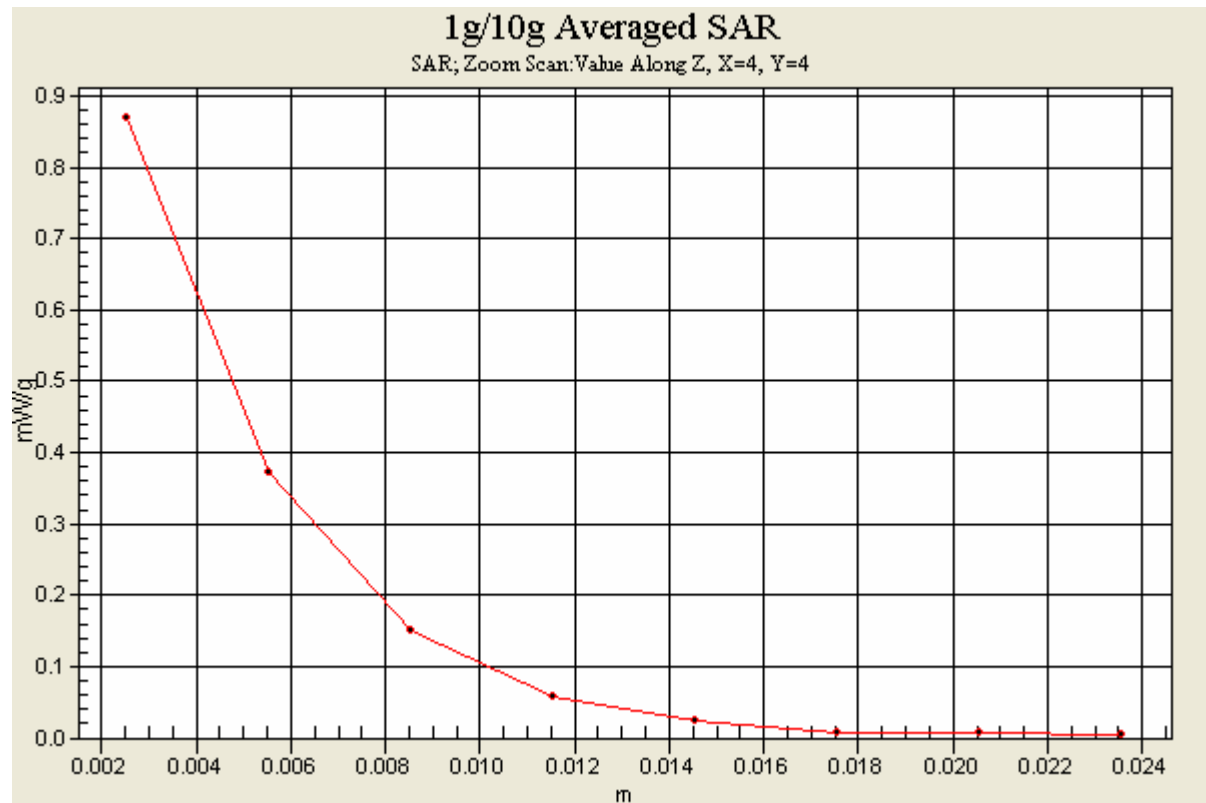
Reference Value = 7.19 V/m

Peak SAR (extrapolated) = 1.79 W/kg

SAR(1 g) = 0.538 mW/g; SAR(10 g) = 0.193 mW/g

Maximum value of SAR (measured) = 0.869 mW/g





Date/Time: 2007/6/7 13:37:07

Test Laboratory: Advance Data Technology

N800C -11a-Ch100-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5500 MHz

Communication System: 802.11a ; Frequency: 5500 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5500$ MHz; $\sigma = 5.78$ mho/m; $\epsilon_r = 49.8$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.09, 4.09, 4.09) ; Calibrated: 2006/11/23

- Sensor-Surface: 2.5mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7

- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202

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

Channel 100/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.439 mW/g

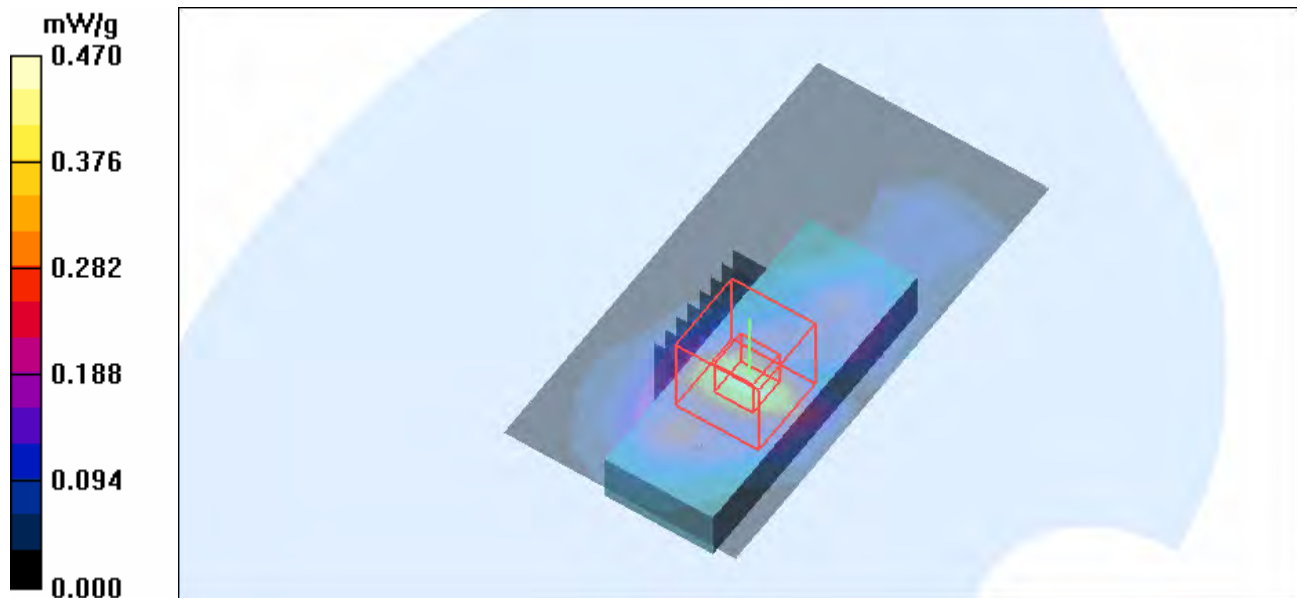
Channel 100/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 4.81 V/m

Peak SAR (extrapolated) = 0.991 W/kg

SAR(1 g) = 0.283 mW/g; SAR(10 g) = 0.095 mW/g

Maximum value of SAR (measured) = 0.470 mW/g



Date/Time: 2007/6/7 14:08:34

Test Laboratory: Advance Data Technology

N800C -11a-Ch104-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5520 MHz

Communication System: 802.11a ; Frequency: 5520 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5520 \text{ MHz}$; $\sigma = 5.8 \text{ mho/m}$; $\epsilon_r = 49.7$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 104/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.396 mW/g

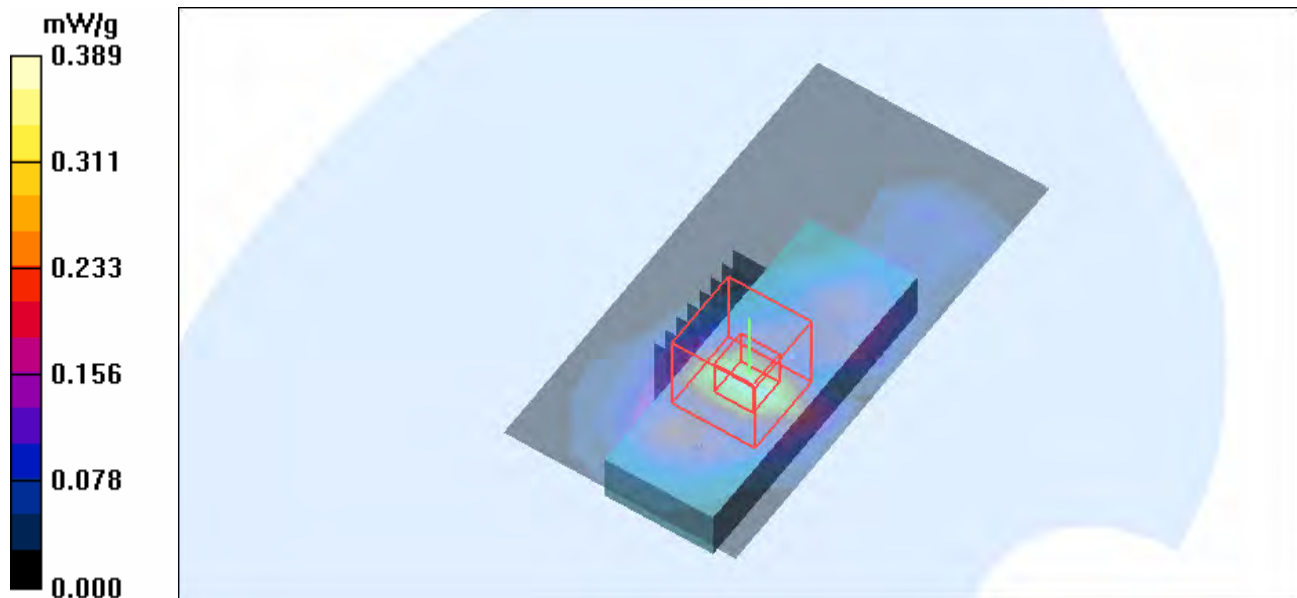
Channel 104/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 4.84 V/m

Peak SAR (extrapolated) = 0.849 W/kg

SAR(1 g) = 0.237 mW/g; SAR(10 g) = 0.079 mW/g

Maximum value of SAR (measured) = 0.389 mW/g



Date/Time: 2007/6/7 14:37:15

Test Laboratory: Advance Data Technology

N800C -11a-Ch116-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5580 MHz

Communication System: 802.11a ; Frequency: 5580 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5580 \text{ MHz}$; $\sigma = 5.89 \text{ mho/m}$; $\epsilon_r = 49.6$; $\rho = 1000 \text{ kg/m}^3$; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 116/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.502 mW/g

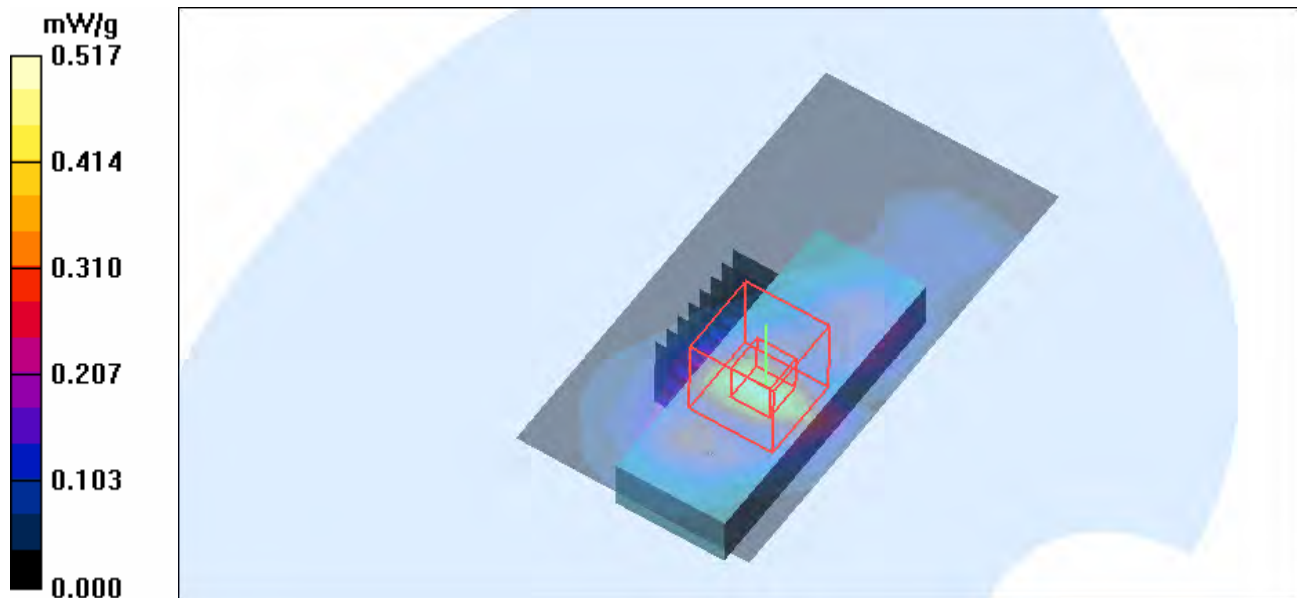
Channel 116/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 5.00 V/m

Peak SAR (extrapolated) = 1.12 W/kg

SAR(1 g) = 0.310 mW/g; SAR(10 g) = 0.106 mW/g

Maximum value of SAR (measured) = 0.517 mW/g



Date/Time: 2007/6/7 15:05:25

Test Laboratory: Advance Data Technology

N800C -11a-Ch120-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5600 MHz

Communication System: 802.11a ; Frequency: 5600 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5600$ MHz; $\sigma = 5.92$ mho/m; $\epsilon_r = 49.5$; $\rho = 1000$

kg/m³ ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 120/Area Scan (7x13x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (measured) = 0.434 mW/g

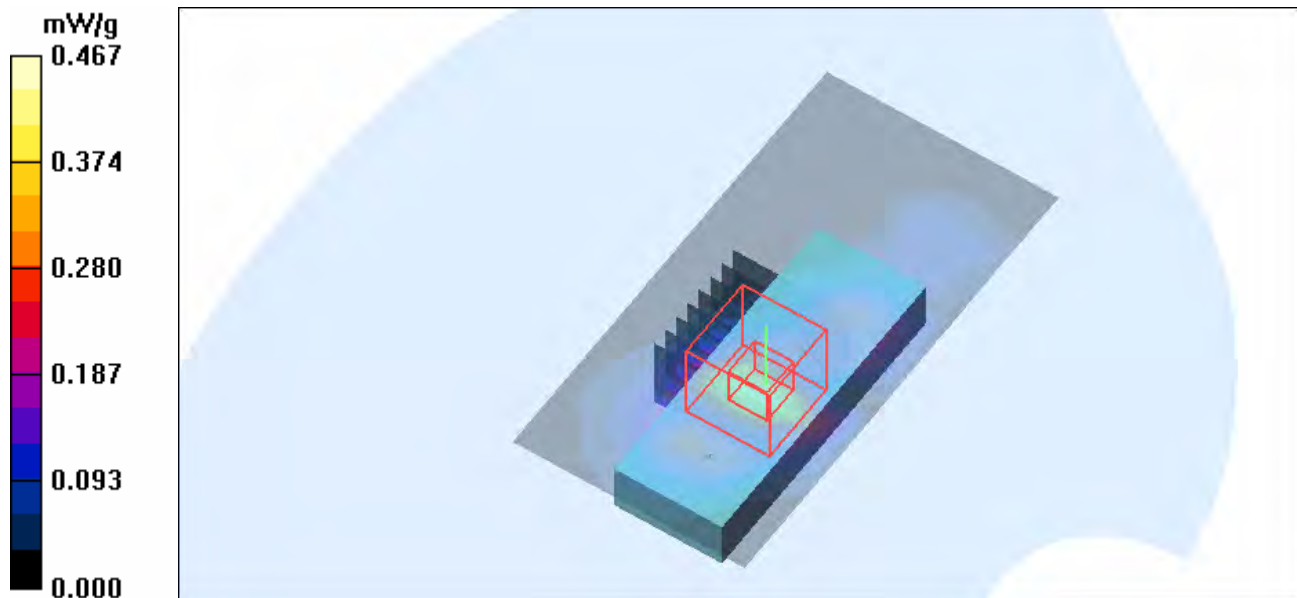
Channel 120/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 4.61 V/m

Peak SAR (extrapolated) = 1.06 W/kg

SAR(1 g) = 0.275 mW/g; SAR(10 g) = 0.087 mW/g

Maximum value of SAR (measured) = 0.467 mW/g



Date/Time: 2007/6/7 15:35:26

Test Laboratory: Advance Data Technology

N800C -11a-Ch124-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5620 MHz

Communication System: 802.11a ; Frequency: 5620 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL5800 Medium parameters used: $f = 5620 \text{ MHz}$; $\sigma = 5.95 \text{ mho/m}$; $\epsilon_r = 49.5$; $\rho = 1000 \text{ kg/m}^3$; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 124/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.452 mW/g

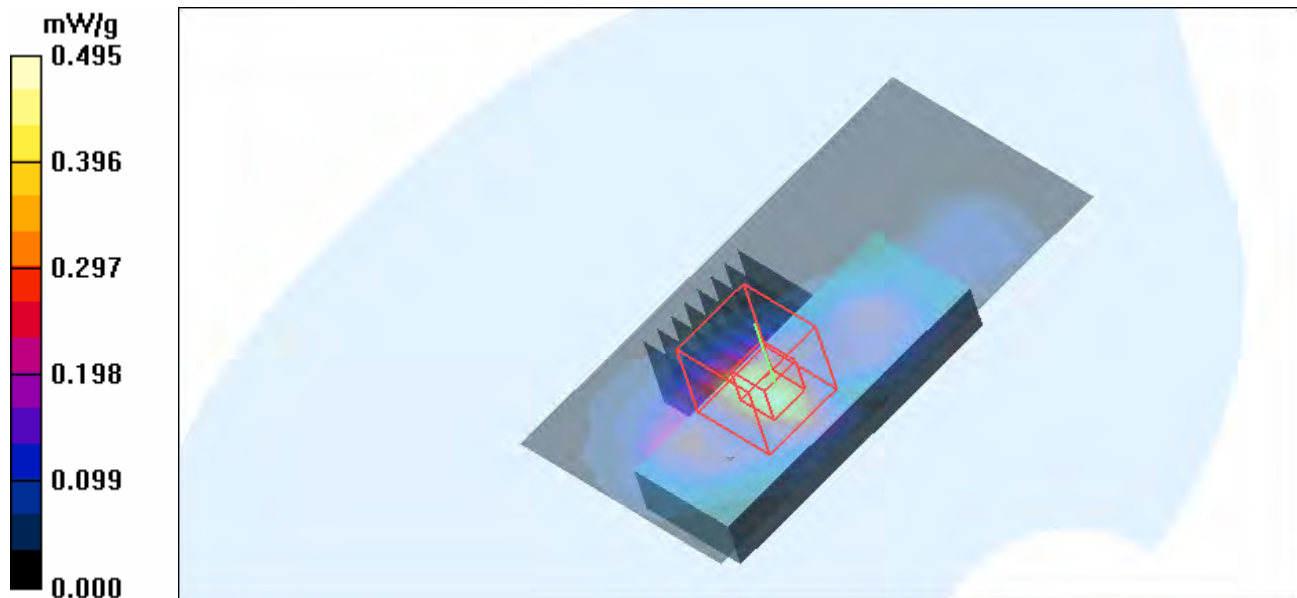
Channel 124/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 4.59 V/m

Peak SAR (extrapolated) = 1.09 W/kg

SAR(1 g) = 0.292 mW/g; SAR(10 g) = 0.094 mW/g

Maximum value of SAR (measured) = 0.495 mW/g



Date/Time: 2007/6/7 16:04:45

Test Laboratory: Advance Data Technology

N800C -11a-Ch136-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5680 MHz

Communication System: 802.11a ; Frequency: 5680 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5680 \text{ MHz}$; $\sigma = 6.05 \text{ mho/m}$; $\epsilon_r = 49.4$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 136/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.364 mW/g

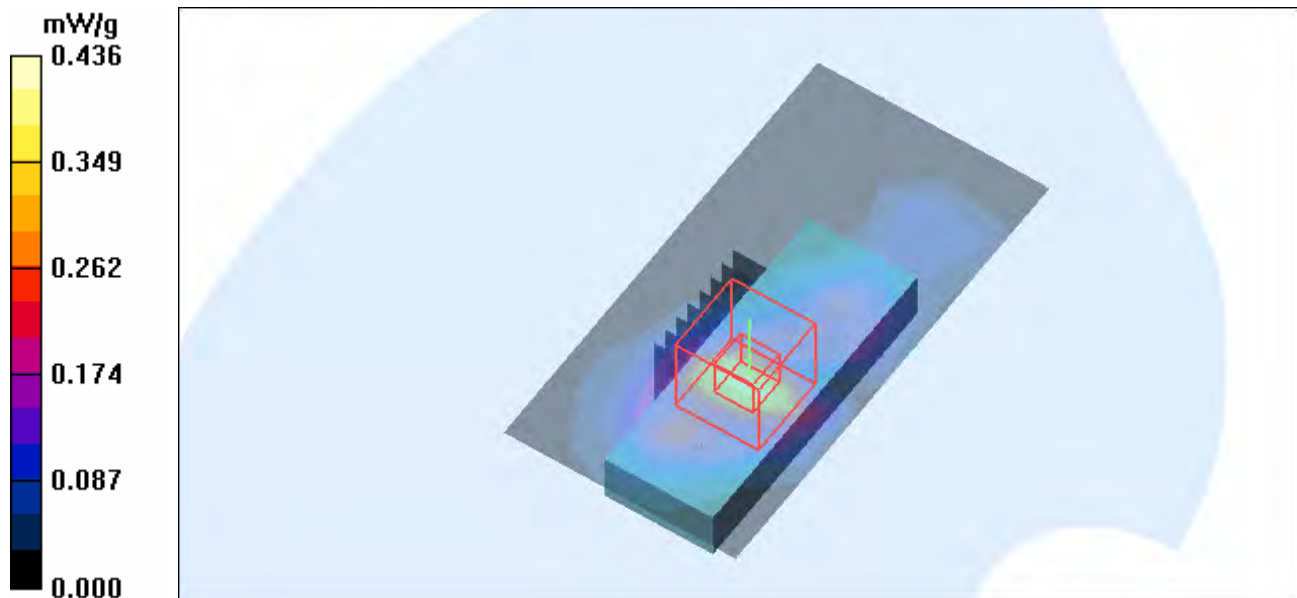
Channel 136/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 4.04 V/m

Peak SAR (extrapolated) = 0.993 W/kg

SAR(1 g) = 0.260 mW/g; SAR(10 g) = 0.087 mW/g

Maximum value of SAR (measured) = 0.436 mW/g



Date/Time: 2007/6/7 16:58:39

Test Laboratory: Advance Data Technology

N800C -11a-Ch140-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5700 MHz

Communication System: 802.11a ; Frequency: 5700 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5700 \text{ MHz}$; $\sigma = 6.08 \text{ mho/m}$; $\epsilon_r = 49.4$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Multilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 140/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.554 mW/g

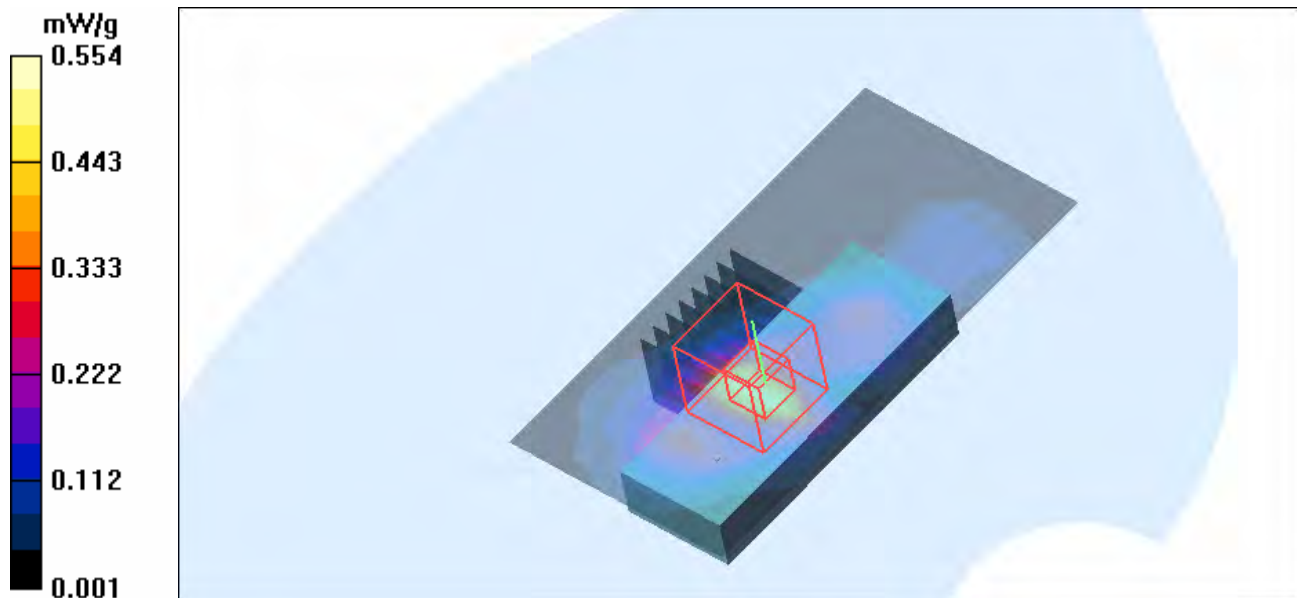
Channel 140/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 5.73 V/m

Peak SAR (extrapolated) = 0.803 W/kg

SAR(1 g) = 0.209 mW/g; SAR(10 g) = 0.067 mW/g

Maximum value of SAR (measured) = 0.364 mW/g



Date/Time: 2007/6/7 17:28:04

Test Laboratory: Advance Data Technology

N800C -11a-Ch149-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5745 MHz

Communication System: 802.11a ; Frequency: 5745 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5745 \text{ MHz}$; $\sigma = 6.15 \text{ mho/m}$; $\epsilon_r = 49.3$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 149/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

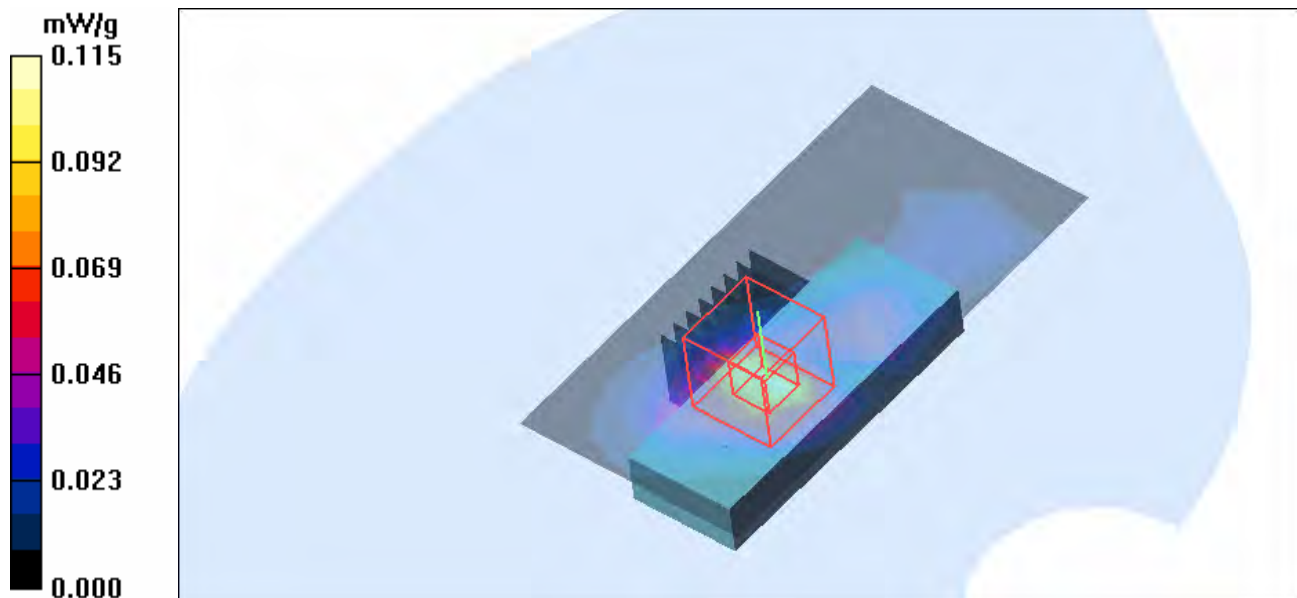
Channel 149/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 2.14 V/m

Peak SAR (extrapolated) = 0.250 W/kg

SAR(1 g) = 0.063 mW/g; SAR(10 g) = 0.020 mW/g

Maximum value of SAR (measured) = 0.115 mW/g



Date/Time: 2007/6/7 17:55:41

Test Laboratory: Advance Data Technology

N800C -11a-Ch157-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5785 MHz

Communication System: 802.11a ; Frequency: 5785 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5785 \text{ MHz}$; $\sigma = 6.21 \text{ mho/m}$; $\epsilon_r = 49.2$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Multilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23

- Sensor-Surface: 2.5mm (Mechanical Surface Detection)

- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7

- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202

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

Channel 157/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.105 mW/g

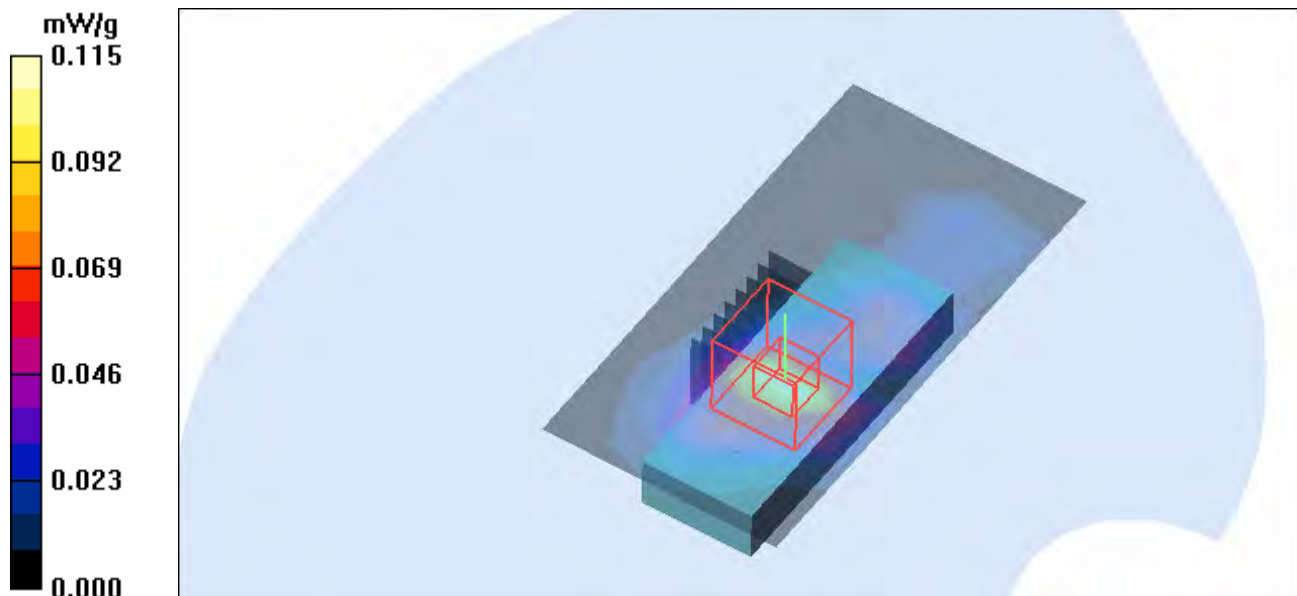
Channel 157/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 2.48 V/m

Peak SAR (extrapolated) = 0.256 W/kg

SAR(1 g) = 0.062 mW/g; SAR(10 g) = 0.021 mW/g

Maximum value of SAR (measured) = 0.115 mW/g



Date/Time: 2007/6/7 18:32:31

Test Laboratory: Advance Data Technology

N800C -11a-Ch165-Mode 5

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5825 MHz

Communication System: 802.11a ; Frequency: 5825 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5825 \text{ MHz}$; $\sigma = 6.27 \text{ mho/m}$; $\epsilon_r = 49.1$; $\rho = 1000 \text{ kg/m}^3$; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The lateral side of the EUT to the Phantom)

Antenna type : Multilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Channel 165/Area Scan (7x13x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (measured) = 0.108 mW/g

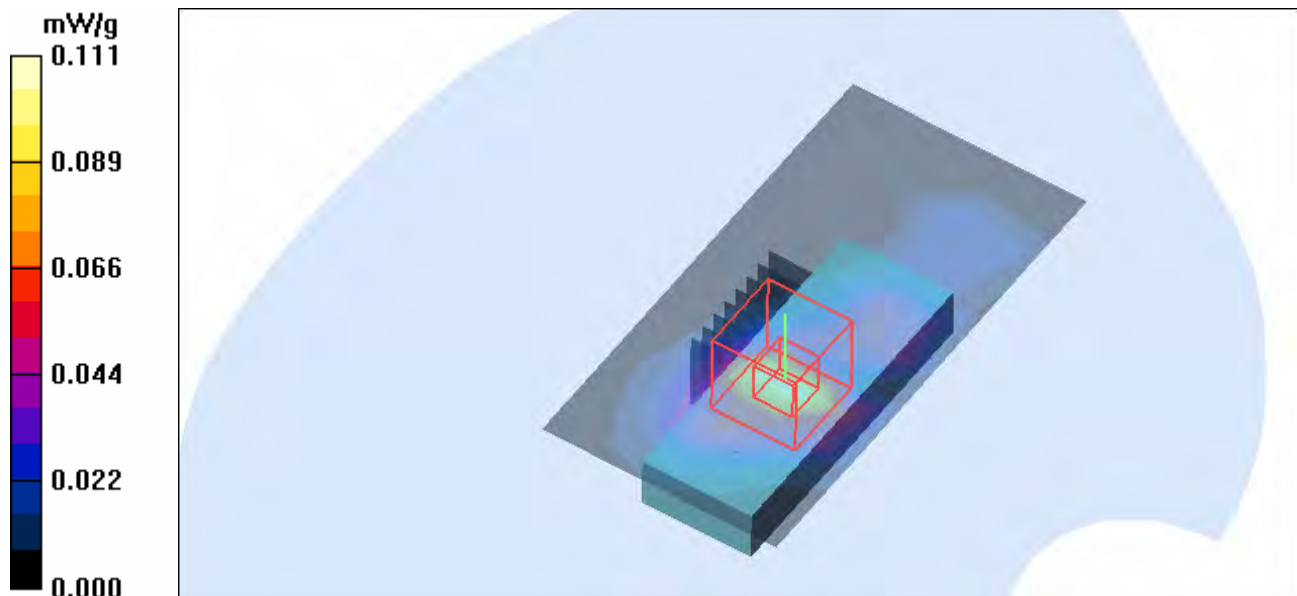
Channel 165/Zoom Scan (8x8x8)/Cube 0: Measurement grid: $dx=4.3\text{mm}$, $dy=4.3\text{mm}$, $dz=3\text{mm}$

Reference Value = 2.36 V/m

Peak SAR (extrapolated) = 0.247 W/kg

SAR(1 g) = 0.062 mW/g; SAR(10 g) = 0.021 mW/g

Maximum value of SAR (measured) = 0.111 mW/g



Date/Time: 2007/6/7 19:35:40

Test Laboratory: Advance Data Technology

C600 -11a-Ch36-Mode 6

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5180 MHz

Communication System: 802.11a ; Frequency: 5180 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5180 \text{ MHz}$; $\sigma = 5.3 \text{ mho/m}$; $\epsilon_r = 50.4$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.42, 4.42, 4.42) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Low Channel 36/Area Scan (5x8x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.202 mW/g

Low Channel 36/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 6.06 V/m

Peak SAR (extrapolated) = 0.944 W/kg

SAR(1 g) = 0.239 mW/g; SAR(10 g) = 0.078 mW/g

Maximum value of SAR (measured) = 0.253 mW/g

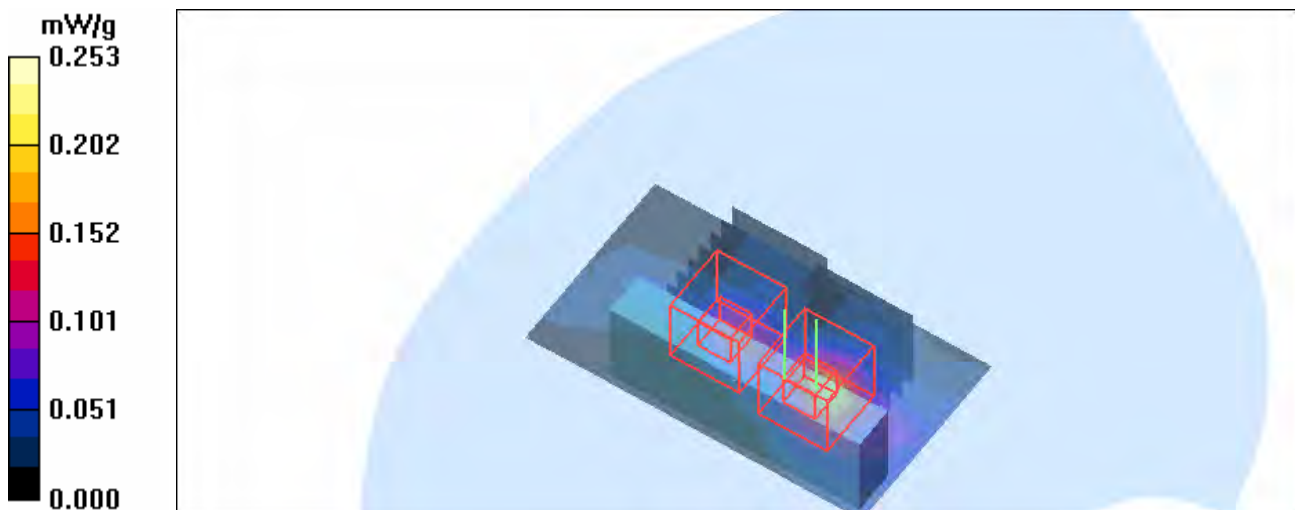
Low Channel 36/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 6.06 V/m

Peak SAR (extrapolated) = 1.14 W/kg

SAR(1 g) = 0.136 mW/g; SAR(10 g) = 0.041 mW/g

Maximum value of SAR (measured) = 0.175 mW/g



Date/Time: 2007/6/7 20:13:39

Test Laboratory: Advance Data Technology

C600 -11a-Ch48-Mode 6

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5240 MHz

Communication System: 802.11a ; Frequency: 5240 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5240 \text{ MHz}$; $\sigma = 5.39 \text{ mho/m}$; $\epsilon_r = 50.3$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.42, 4.42, 4.42) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 48/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.229 mW/g

Mid Channel 48/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 6.69 V/m

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 0.317 mW/g; SAR(10 g) = 0.101 mW/g

Maximum value of SAR (measured) = 0.299 mW/g

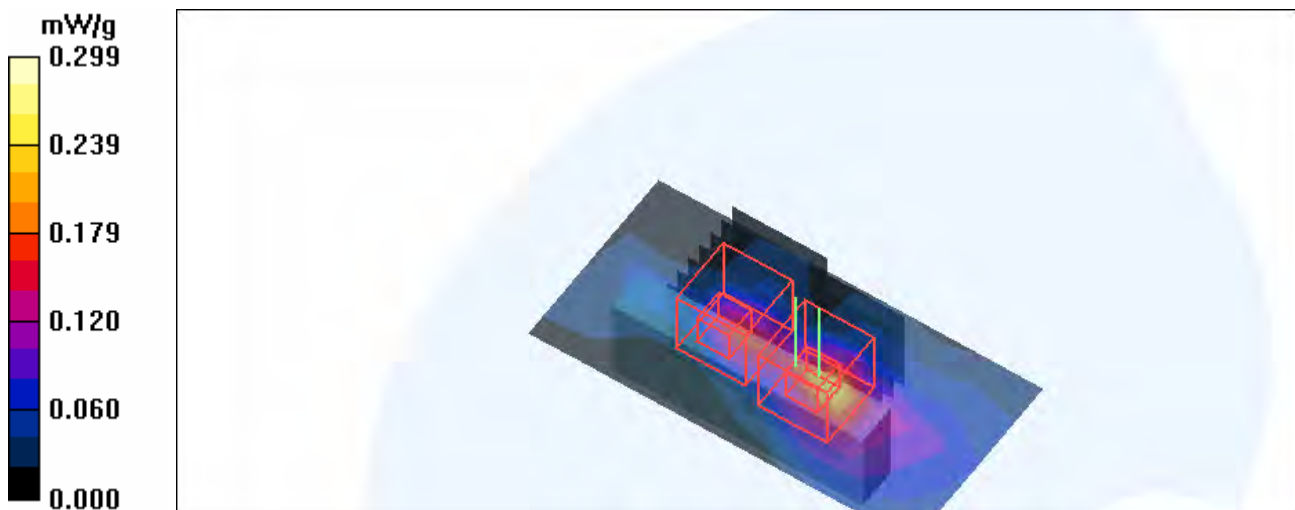
Mid Channel 48/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 6.69 V/m

Peak SAR (extrapolated) = 0.550 W/kg

SAR(1 g) = 0.151 mW/g; SAR(10 g) = 0.046 mW/g

Maximum value of SAR (measured) = 0.233 mW/g



Date/Time: 2007/6/7 20:52:40

Test Laboratory: Advance Data Technology

C600 -11a-Ch52-Mode 6

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5260 MHz

Communication System: 802.11a ; Frequency: 5260 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5260 \text{ MHz}$; $\sigma = 5.42 \text{ mho/m}$; $\epsilon_r = 50.2$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.05, 4.05, 4.05) ; Calibrated: 2006/11/23

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

- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7

- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202

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

Mid Channel 52/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.193 mW/g

Mid Channel 52/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.98 V/m

Peak SAR (extrapolated) = 1.85 W/kg

SAR(1 g) = 0.357 mW/g; SAR(10 g) = 0.114 mW/g

Maximum value of SAR (measured) = 0.313 mW/g

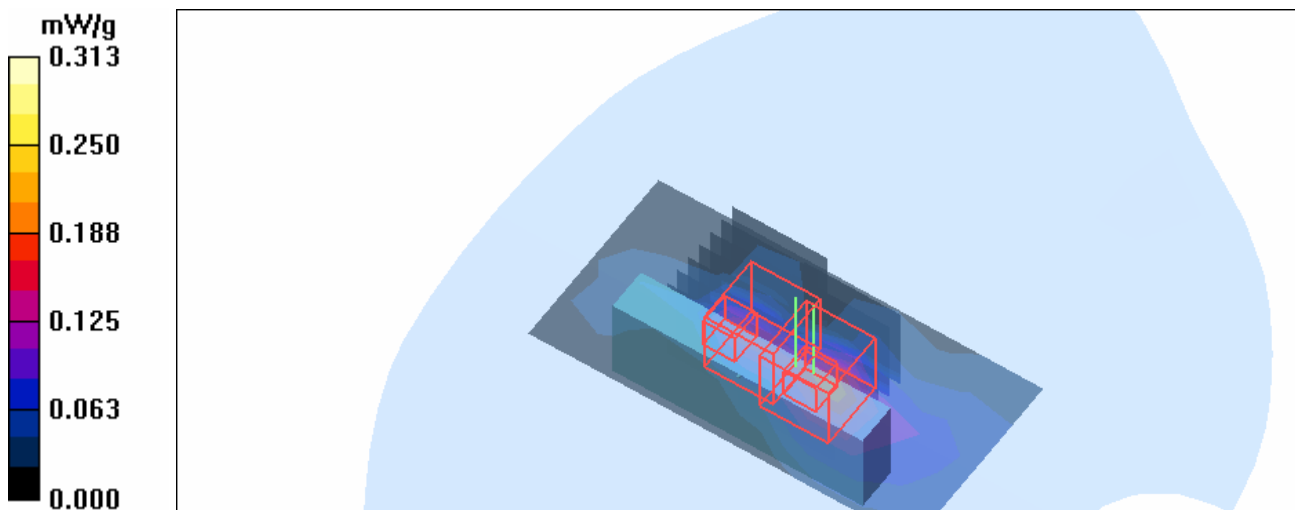
Mid Channel 52/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.98 V/m

Peak SAR (extrapolated) = 0.699 W/kg

SAR(1 g) = 0.141 mW/g; SAR(10 g) = 0.042 mW/g

Maximum value of SAR (measured) = 0.233 mW/g



Date/Time: 2007/6/7 21:32:46

Test Laboratory: Advance Data Technology

C600 -11a-Ch64-Mode 6

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5320 MHz

Communication System: 802.11a ; Frequency: 5320 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5320 \text{ MHz}$; $\sigma = 5.51 \text{ mho/m}$; $\epsilon_r = 50.1$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.05, 4.05, 4.05) ; Calibrated: 2006/11/23

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

- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7

- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202

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

Mid Channel 64/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Mid Channel 64/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.34 V/m

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.275 mW/g; SAR(10 g) = 0.083 mW/g

Maximum value of SAR (measured) = 0.274 mW/g

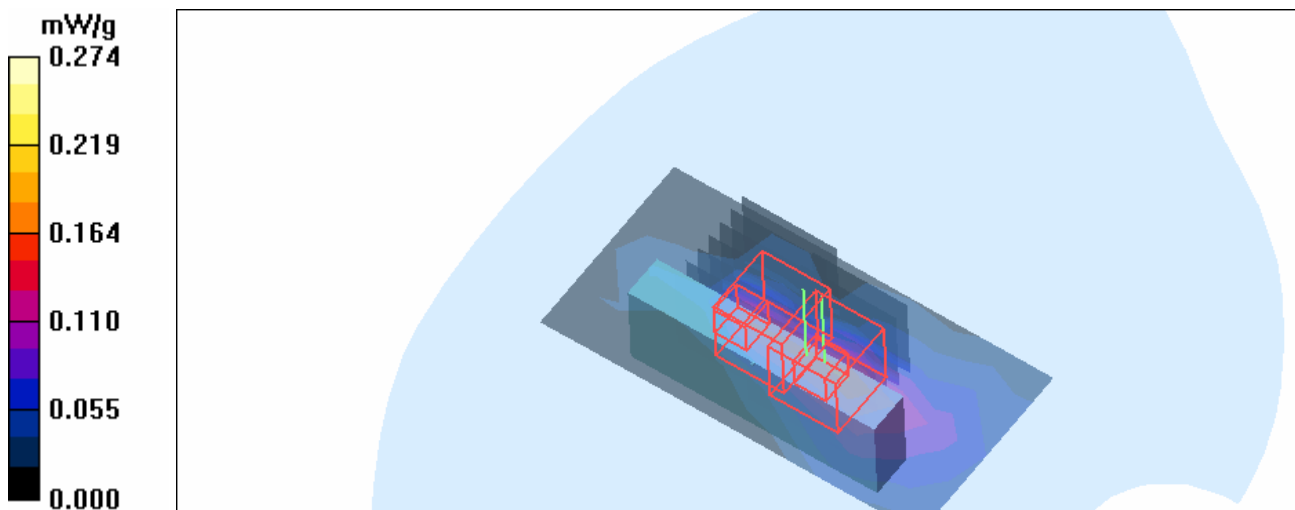
Mid Channel 64/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 5.34 V/m

Peak SAR (extrapolated) = 0.684 W/kg

SAR(1 g) = 0.143 mW/g; SAR(10 g) = 0.039 mW/g

Maximum value of SAR (measured) = 0.227 mW/g



Date/Time: 2007/6/7 22:12:47

Test Laboratory: Advance Data Technology

C600 -11a-Ch100-Mode 6

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5500 MHz

Communication System: 802.11a ; Frequency: 5500 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5500 \text{ MHz}$; $\sigma = 5.78 \text{ mho/m}$; $\epsilon_r = 49.8$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.09, 4.09, 4.09) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 100/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.141 mW/g

Mid Channel 100/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.65 V/m

Peak SAR (extrapolated) = 0.435 W/kg

SAR(1 g) = 0.148 mW/g; SAR(10 g) = 0.047 mW/g

Maximum value of SAR (measured) = 0.178 mW/g

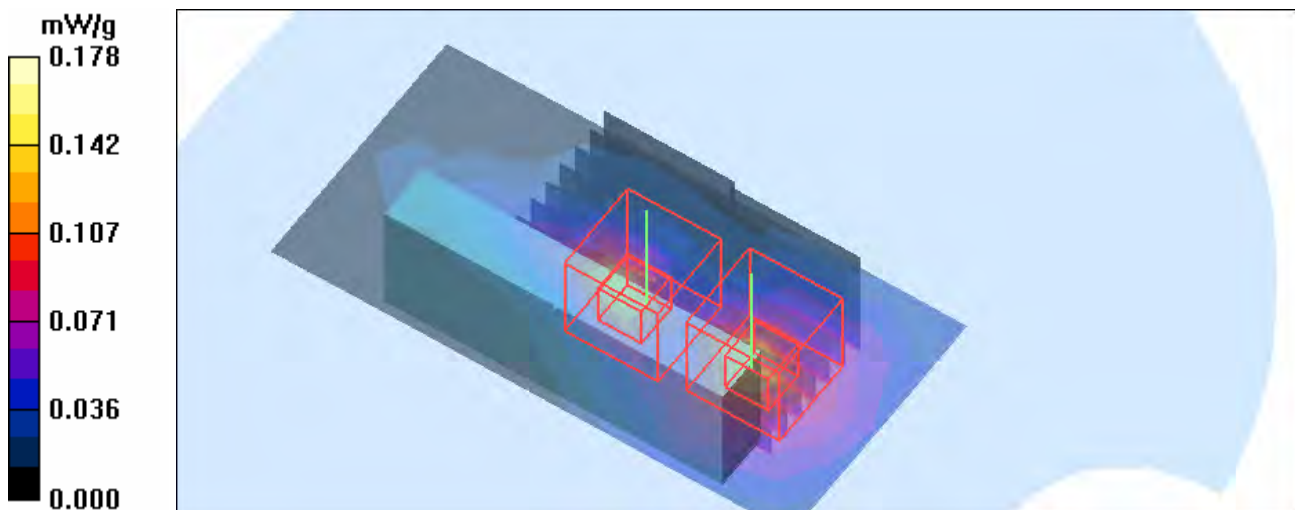
Mid Channel 100/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.65 V/m

Peak SAR (extrapolated) = 0.546 W/kg

SAR(1 g) = 0.133 mW/g; SAR(10 g) = 0.051 mW/g

Maximum value of SAR (measured) = 0.137 mW/g



Date/Time: 2007/6/7 22:12:29

Test Laboratory: Advance Data Technology

C600 -11a-Ch104-Mode 6

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5520 MHz

Communication System: 802.11a ; Frequency: 5520 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5520 \text{ MHz}$; $\sigma = 5.8 \text{ mho/m}$; $\epsilon_r = 49.7$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 104/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.124 mW/g

Mid Channel 104/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 2.97 V/m

Peak SAR (extrapolated) = 0.341 W/kg

SAR(1 g) = 0.119 mW/g; SAR(10 g) = 0.038 mW/g

Maximum value of SAR (measured) = 0.141 mW/g

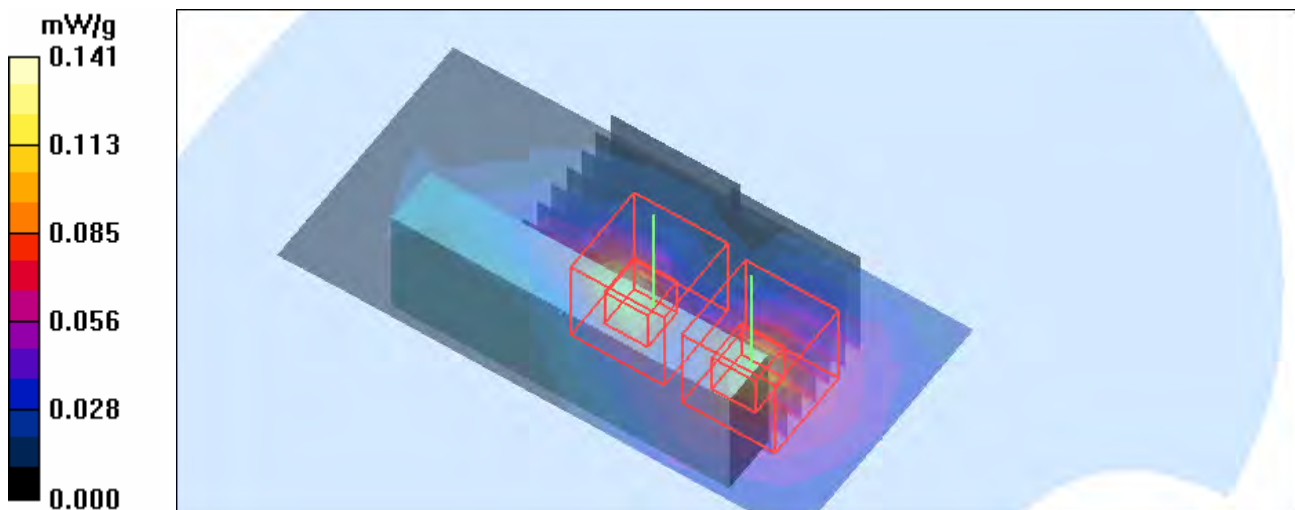
Mid Channel 104/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 2.97 V/m

Peak SAR (extrapolated) = 0.283 W/kg

SAR(1 g) = 0.101 mW/g; SAR(10 g) = 0.040 mW/g

Maximum value of SAR (measured) = 0.114 mW/g



Date/Time: 2007/6/7 22:53:07

Test Laboratory: Advance Data Technology

C600 -11a-Ch116-Mode 6

DUT: USB Wireless LAN unit ; Type: NP01LM ; Test Frequency: 5580 MHz

Communication System: 802.11a ; Frequency: 5580 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5580 \text{ MHz}$; $\sigma = 5.89 \text{ mho/m}$; $\epsilon_r = 49.6$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 116/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.191 mW/g

Mid Channel 116/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.23 V/m

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.163 mW/g; SAR(10 g) = 0.054 mW/g

Maximum value of SAR (measured) = 0.215 mW/g

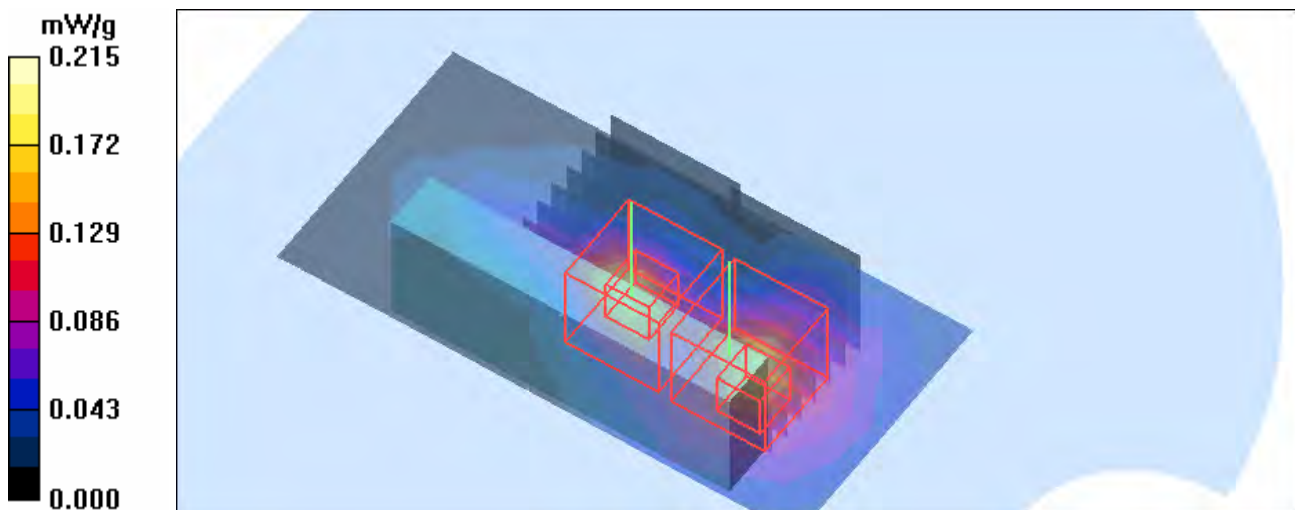
Mid Channel 116/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.23 V/m

Peak SAR (extrapolated) = 0.725 W/kg

SAR(1 g) = 0.152 mW/g; SAR(10 g) = 0.060 mW/g

Maximum value of SAR (measured) = 0.172 mW/g



Date/Time: 2007/6/7 23:32:37

Test Laboratory: Advance Data Technology

C600 -11a-Ch120-Mode 6

DUT: Wireless USB Adapter ; Type: NP01LM ; Test Frequency: 5600 MHz

Communication System: 802.11a ; Frequency: 5600 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5600$ MHz; $\sigma = 5.92$ mho/m; $\epsilon_r = 49.5$; $\rho = 1000$

kg/m³ ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid. Channel 120/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm

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

Mid. Channel 120/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.87 V/m

Peak SAR (extrapolated) = 0.477 W/kg

SAR(1 g) = 0.158 mW/g; SAR(10 g) = 0.052 mW/g

Maximum value of SAR (measured) = 0.186 mW/g

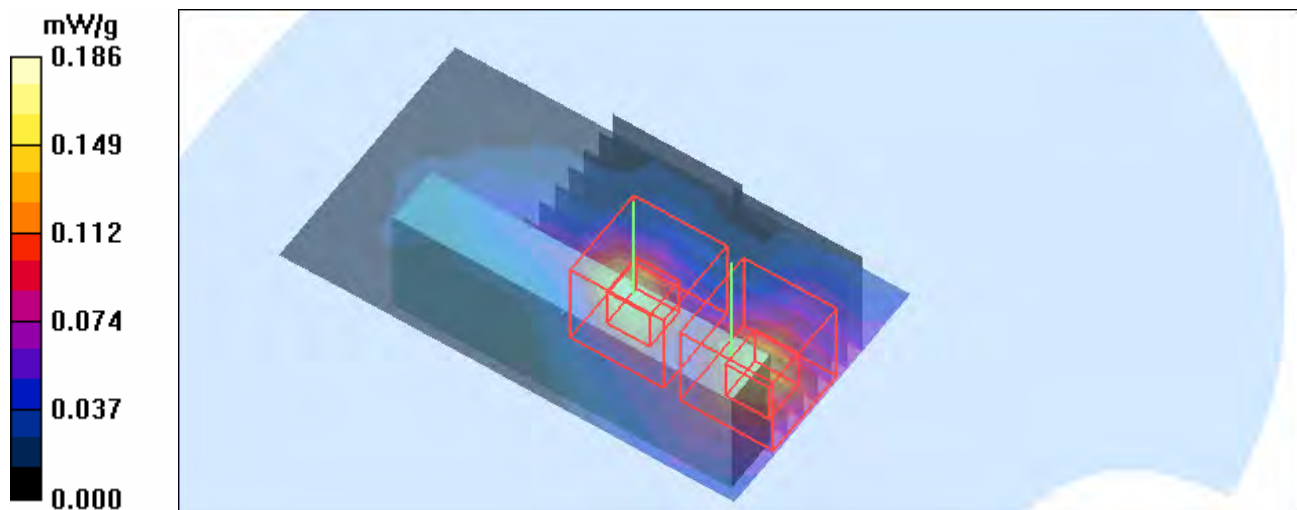
Mid. Channel 120/Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 3.87 V/m

Peak SAR (extrapolated) = 0.759 W/kg

SAR(1 g) = 0.152 mW/g; SAR(10 g) = 0.054 mW/g

Maximum value of SAR (measured) = 0.154 mW/g



Date/Time: 2007/6/8 00:11:05

Test Laboratory: Advance Data Technology

C600 -11a-Ch124-Mode 6

DUT: Wireless USB Adapter ; Type: NP01LM ; Test Frequency: 5620 MHz

Communication System: 802.11a ; Frequency: 5620 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5620 \text{ MHz}$; $\sigma = 5.95 \text{ mho/m}$; $\epsilon_r = 49.5$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 124/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.186 mW/g

Mid Channel 124/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.04 V/m

Peak SAR (extrapolated) = 0.513 W/kg

SAR(1 g) = 0.168 mW/g; SAR(10 g) = 0.054 mW/g

Maximum value of SAR (measured) = 0.208 mW/g

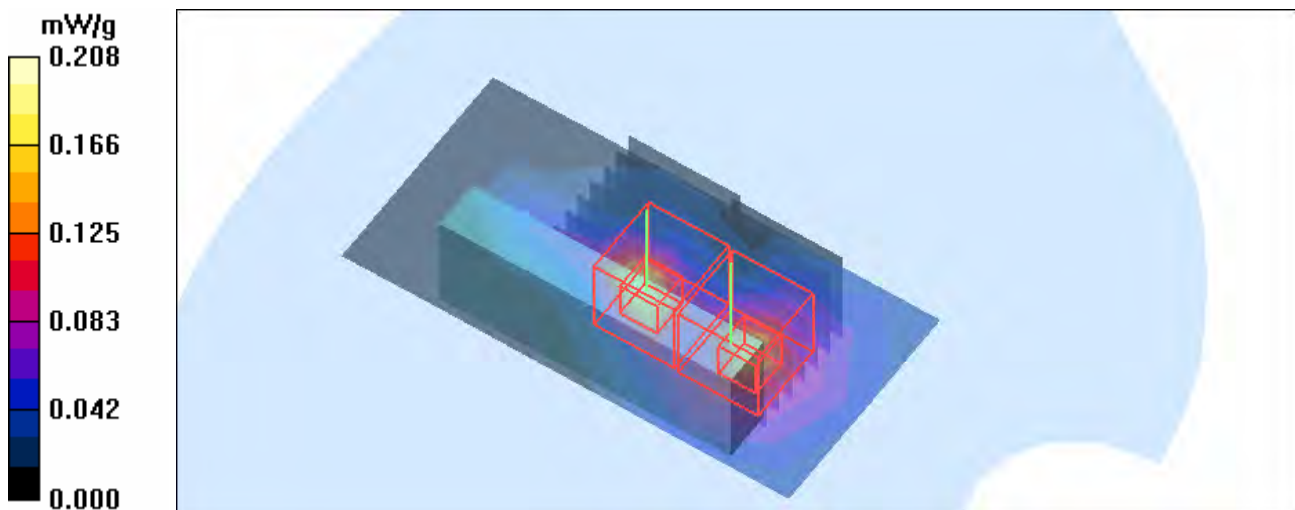
Mid Channel 124/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 4.04 V/m

Peak SAR (extrapolated) = 0.478 W/kg

SAR(1 g) = 0.110 mW/g; SAR(10 g) = 0.047 mW/g

Maximum value of SAR (measured) = 0.160 mW/g



Date/Time: 2007/6/8 00:53:58

Test Laboratory: Advance Data Technology

C600 -11a-Ch136-Mode 6

DUT: Wireless USB Adapter ; Type: NP01LM ; Test Frequency: 5680 MHz

Communication System: 802.11a ; Frequency: 5680 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5680 \text{ MHz}$; $\sigma = 6.05 \text{ mho/m}$; $\epsilon_r = 49.4$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23

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

- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7

- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202

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

Mid Channel 136/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.169 mW/g

Mid Channel 136/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.84 V/m

Peak SAR (extrapolated) = 0.425 W/kg

SAR(1 g) = 0.143 mW/g; SAR(10 g) = 0.047 mW/g

Maximum value of SAR (measured) = 0.176 mW/g

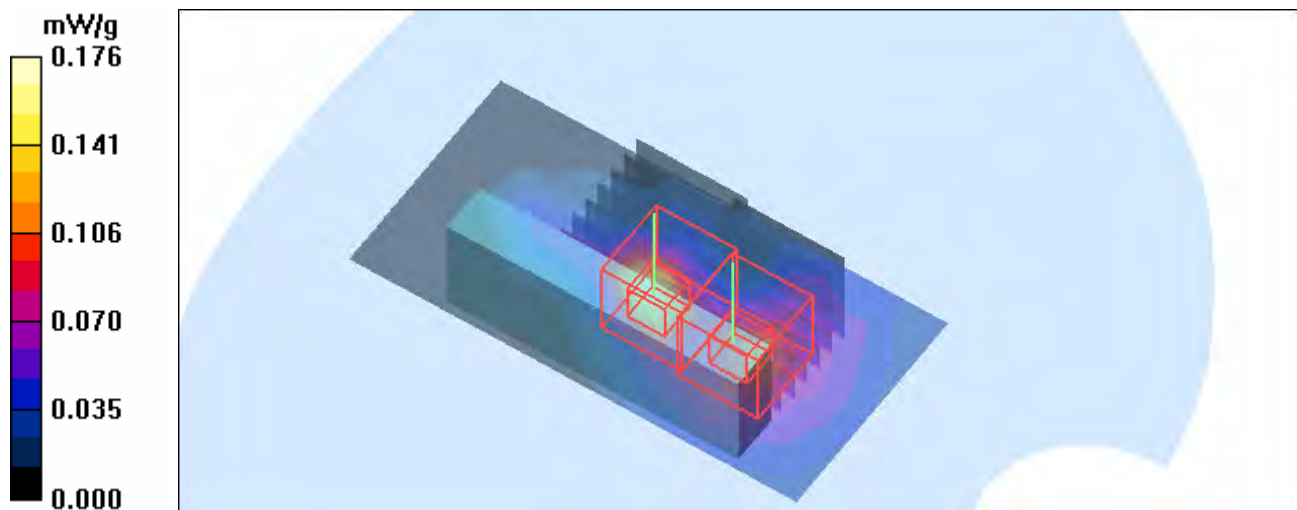
Mid Channel 136/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.84 V/m

Peak SAR (extrapolated) = 0.320 W/kg

SAR(1 g) = 0.116 mW/g; SAR(10 g) = 0.046 mW/g

Maximum value of SAR (measured) = 0.134 mW/g



Date/Time: 2007/6/8 01:34:46

Test Laboratory: Advance Data Technology

C600 -11a-Ch140-Mode 6

DUT: Wireless USB Adapter ; Type: NP01LM ; Test Frequency: 5700 MHz

Communication System: 802.11a ; Frequency: 5700 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5700 \text{ MHz}$; $\sigma = 6.08 \text{ mho/m}$; $\epsilon_r = 49.4$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 140/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.147 mW/g

Mid Channel 140/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.58 V/m

Peak SAR (extrapolated) = 0.397 W/kg

SAR(1 g) = 0.131 mW/g; SAR(10 g) = 0.043 mW/g

Maximum value of SAR (measured) = 0.156 mW/g

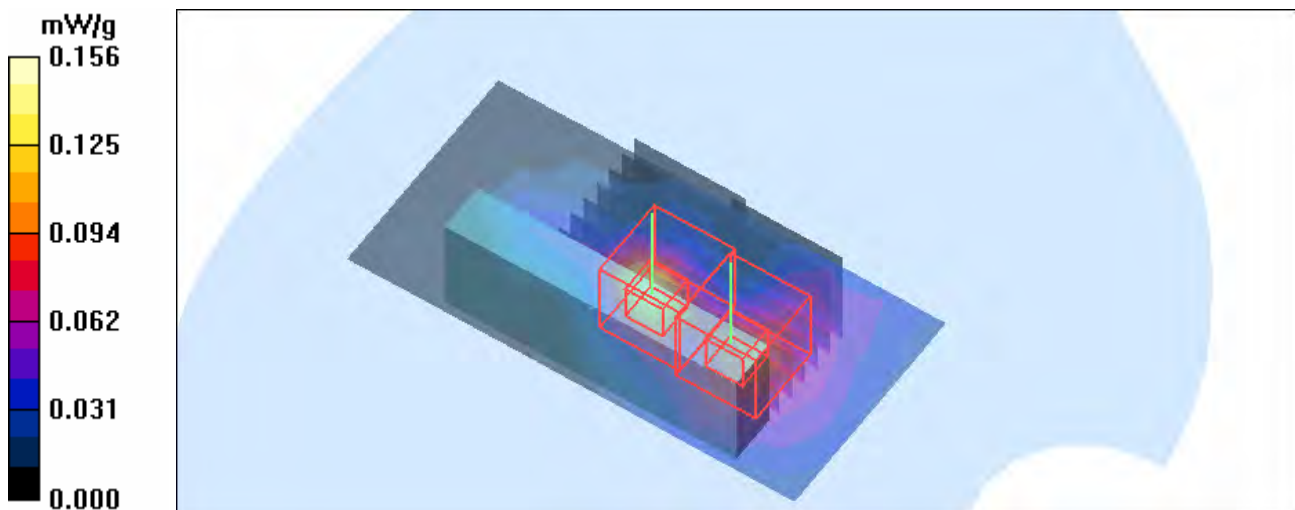
Mid Channel 140/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.58 V/m

Peak SAR (extrapolated) = 0.275 W/kg

SAR(1 g) = 0.099 mW/g; SAR(10 g) = 0.040 mW/g

Maximum value of SAR (measured) = 0.115 mW/g



Date/Time: 2007/6/8 02:12:02

Test Laboratory: Advance Data Technology

C600 -11a-Ch149-Mode 6

DUT: Wireless USB Adapter ; Type: NP01LM ; Test Frequency: 5745 MHz

Communication System: 802.11a ; Frequency: 5745 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5745 \text{ MHz}$; $\sigma = 6.15 \text{ mho/m}$; $\epsilon_r = 49.3$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

Mid Channel 149/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.044 mW/g

Mid Channel 149/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 1.95 V/m

Peak SAR (extrapolated) = 0.173 W/kg

SAR(1 g) = 0.044 mW/g; SAR(10 g) = 0.015 mW/g

Maximum value of SAR (measured) = 0.047 mW/g

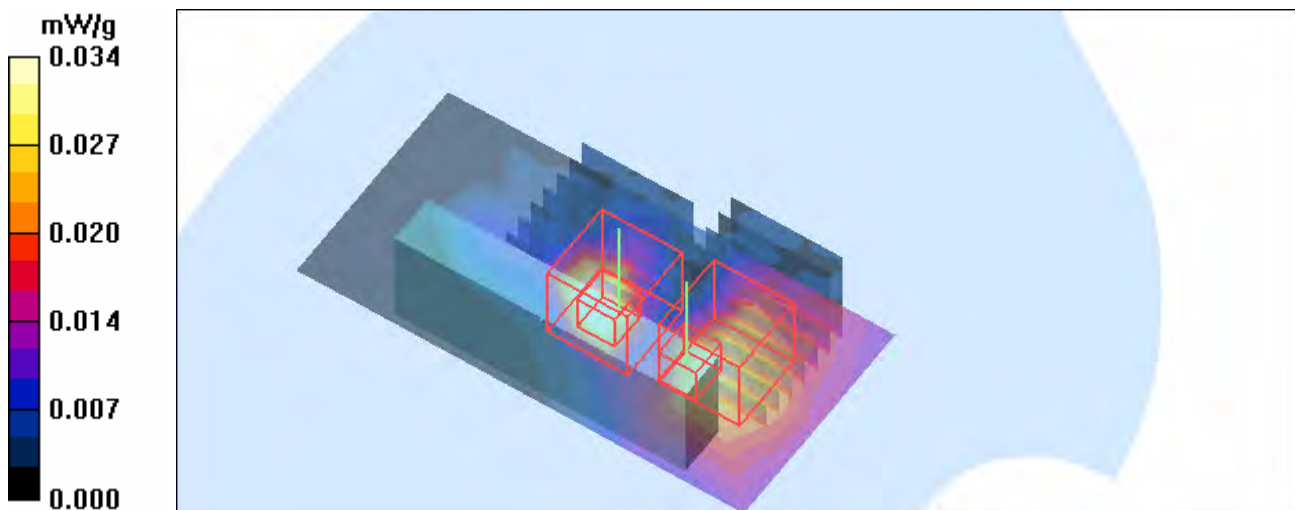
Mid Channel 149/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 1.95 V/m

Peak SAR (extrapolated) = 0.178 W/kg

SAR(1 g) = 0.038 mW/g; SAR(10 g) = 0.015 mW/g

Maximum value of SAR (measured) = 0.034 mW/g



Date/Time: 2007/6/8 02:53:20

Test Laboratory: Advance Data Technology

C600 -11a-Ch157-Mode 6

DUT: Wireless USB Adapter ; Type: NP01LM ; Test Frequency: 5785 MHz

Communication System: 802.11a ; Frequency: 5785 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5785 \text{ MHz}$; $\sigma = 6.21 \text{ mho/m}$; $\epsilon_r = 49.2$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23

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

- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7

- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202

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

Mid Channel 157/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.039 mW/g

Mid Channel 157/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 1.35 V/m

Peak SAR (extrapolated) = 0.187 W/kg

SAR(1 g) = 0.041 mW/g; SAR(10 g) = 0.018 mW/g

Maximum value of SAR (measured) = 0.037 mW/g

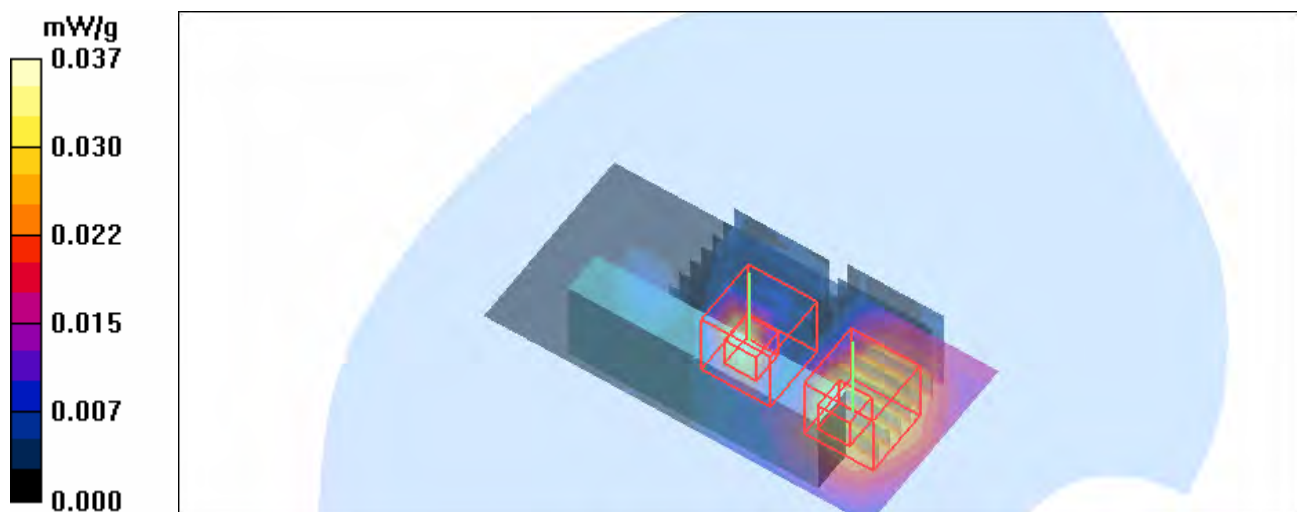
Mid Channel 157/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 1.35 V/m

Peak SAR (extrapolated) = 0.131 W/kg

SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.0082 mW/g

Maximum value of SAR (measured) = 0.036 mW/g



Date/Time: 2007/6/8 03:31:21

Test Laboratory: Advance Data Technology

C600 -11a-Ch165-Mode 6

DUT: Wireless USB Adapter ; Type: NP01LM ; Test Frequency: 5825 MHz

Communication System: 802.11a ; Frequency: 5825 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL5800 Medium parameters used: $f = 5825 \text{ MHz}$; $\sigma = 6.27 \text{ mho/m}$; $\epsilon_r = 49.1$; $\rho = 1000$

kg/m^3 ; Liquid level : 151 mm

Phantom section: Flat Section ; Separation distance : 11 mm (The lateral side of the EUT to the Phantom)

Antenna type : Mutilayer Chip Antenna ; Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2006/9/7
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53 ; Postprocessing SW: SEMCAD, V1.8 Build 172

High Channel 165/Area Scan (5x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Maximum value of SAR (measured) = 0.053 mW/g

High Channel 165/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 0.867 V/m; Power Drift = 3.20 dB

Peak SAR (extrapolated) = 0.186 W/kg

SAR(1 g) = 0.053 mW/g; SAR(10 g) = 0.022 mW/g

Maximum value of SAR (measured) = 0.056 mW/g

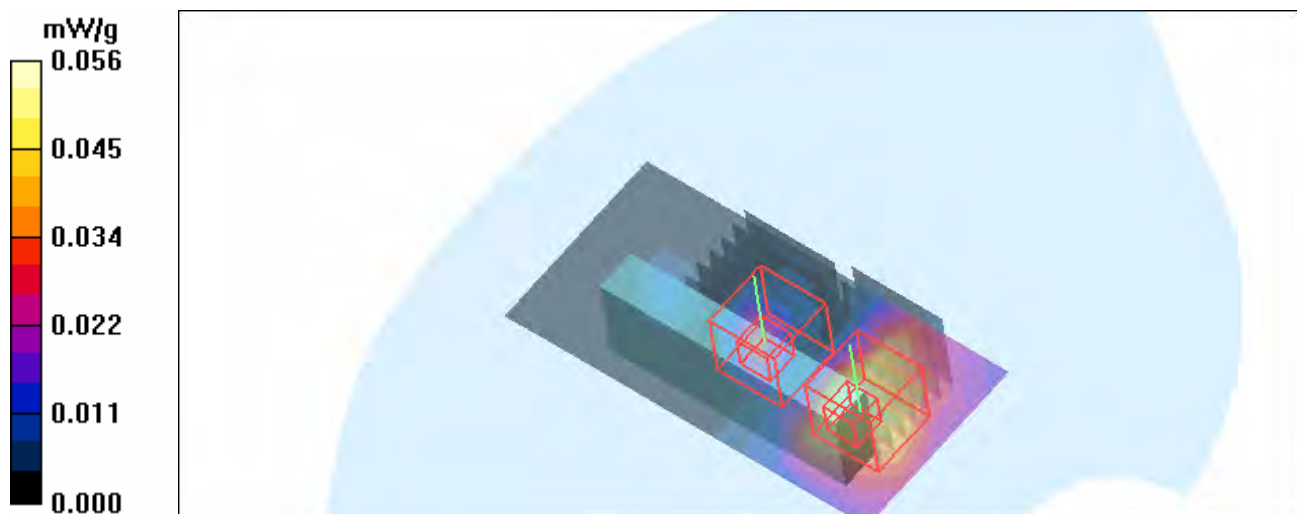
Mid Channel 165/Zoom Scan (7x7x7)/Cube 1: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 0.854 V/m

Peak SAR (extrapolated) = 0.119 W/kg

SAR(1 g) = 0.028 mW/g; SAR(10 g) = 0.0062 mW/g

Maximum value of SAR (measured) = 0.031 mW/g



Date/Time: 2007/6/6 09:29:19

Test Laboratory: Advance Data Technology

System Validation Check-MSL 2450MHz

DUT: Dipole 2450 MHz ; Type: D2450V2 ; Serial: 716 ; Test Frequency: 2450 MHz

Communication System: CW ; Frequency: 2450 MHz; Duty Cycle: 1:1; Modulation type: CW

Medium: MSL2450; Medium parameters used: $f = 2450$ MHz; $\sigma = 2.03$ mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³ ;

Liquid level : 150 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom) Air temp. : 23.6 degrees ; Liquid temp. : 22.4 degrees

DASY4 Configuration:

- Probe: ET3DV6 - SN1790 ; ConvF(4.35, 4.35, 4.35) ; Calibrated: 2006/11/23
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2006/9/7
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

d=10mm, Pin=250mW/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm

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

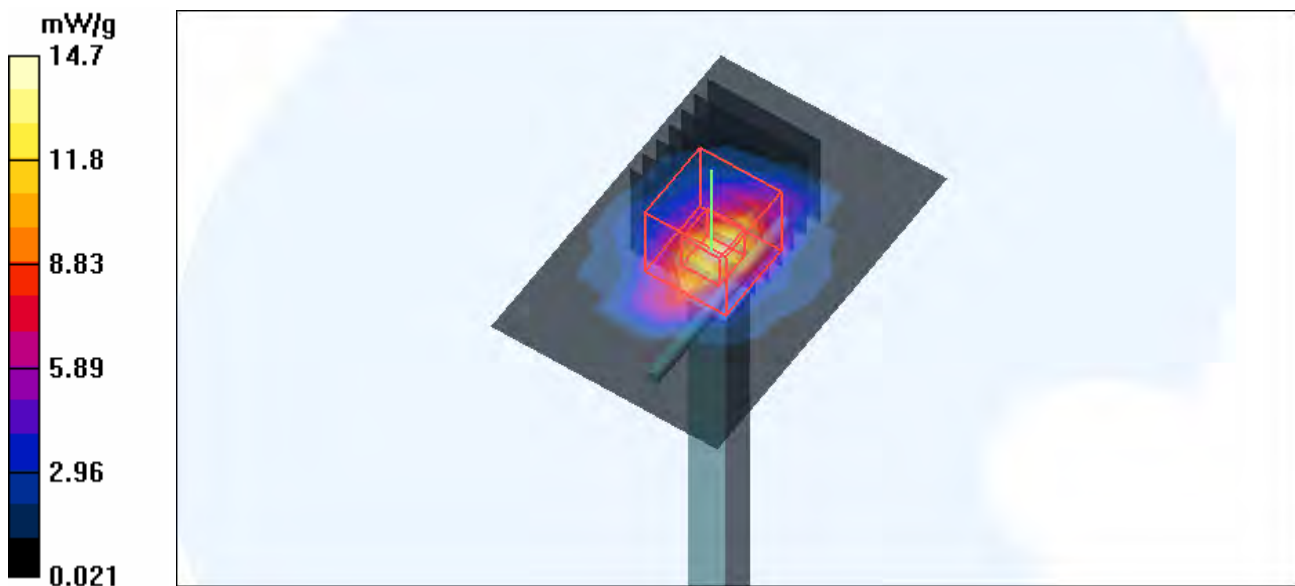
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 88.4 V/m; Power Drift = -0.102 dB

Peak SAR (extrapolated) = 31.2 W/kg

SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.1 mW/g

Maximum value of SAR (measured) = 14.6 mW/g



Date/Time: 2007/6/7 09:40:08

Test Laboratory: Advance Data Technology

System Validation Check-MSL 5GHz

DUT: Dipole 5 GHz ; Type: D5GHzV2 ; Serial: 1019 ; Test Frequency: 5200 MHz

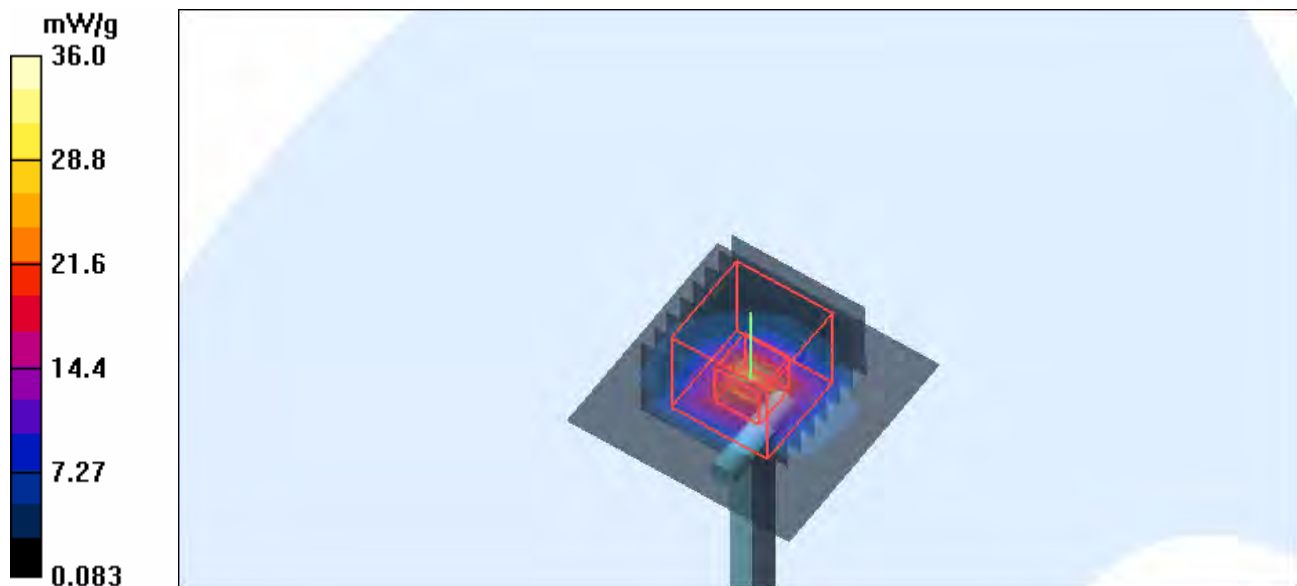
Communication System: CW ; Frequency: 5200 MHz; Duty Cycle: 1:1; Modulation type: CW
 Medium: MSL5800; Medium parameters used: $f = 5200$ MHz; $\sigma = 5.33$ mho/m; $\epsilon_r = 50.3$; $\rho = 1000$ kg/m³ ; Liquid level : 151 mm
 Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom) Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.42, 4.42, 4.42) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2006/9/7
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

f=5200, d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (measured) = 36.0 mW/g

f=5200, d=10mm, Pin=250mW/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
 Reference Value = 80.1 V/m; Power Drift = -0.043 dB
 Peak SAR (extrapolated) = 84.7 W/kg
SAR(1 g) = 20 mW/g; SAR(10 g) = 5.54 mW/g
 Maximum value of SAR (measured) = 34.1 mW/g



Date/Time: 2007/6/7 10:23:12

Test Laboratory: Advance Data Technology

System Validation Check-MSL 5GHz

DUT: Dipole 5 GHz ; Type: D5GHzV2 ; Serial: 1019 ; Test Frequency: 5500 MHz

Communication System: CW ; Frequency: 5500 MHz; Duty Cycle: 1:1; Modulation type: CW
 Medium: MSL5800; Medium parameters used: $f = 5500$ MHz; $\sigma = 5.78$ mho/m; $\epsilon_r = 49.8$; $\rho = 1000$ kg/m³ ; Liquid level : 151 mm
 Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom) Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.09, 4.09, 4.09) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2006/9/7
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

f=5500, d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (measured) = 35.4 mW/g

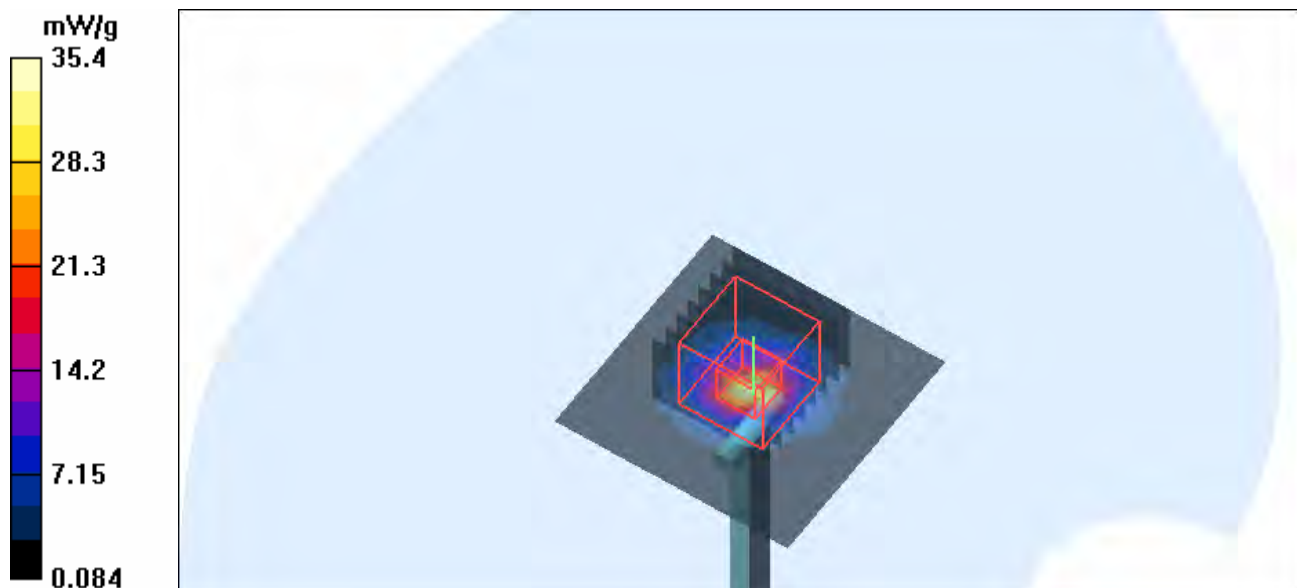
f=5500, d=10mm, Pin=250mW/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 82.1 V/m; Power Drift = 0.039 dB

Peak SAR (extrapolated) = 80.7 W/kg

SAR(1 g) = 19.6 mW/g; SAR(10 g) = 5.46 mW/g

Maximum value of SAR (measured) = 33.6 mW/g



Date/Time: 2007/6/7 10:58:50

Test Laboratory: Advance Data Technology

System Validation Check-MSL 5GHz

DUT: Dipole 5 GHz ; Type: D5GHzV2 ; Serial: 1019 ; Test Frequency: 5800 MHz

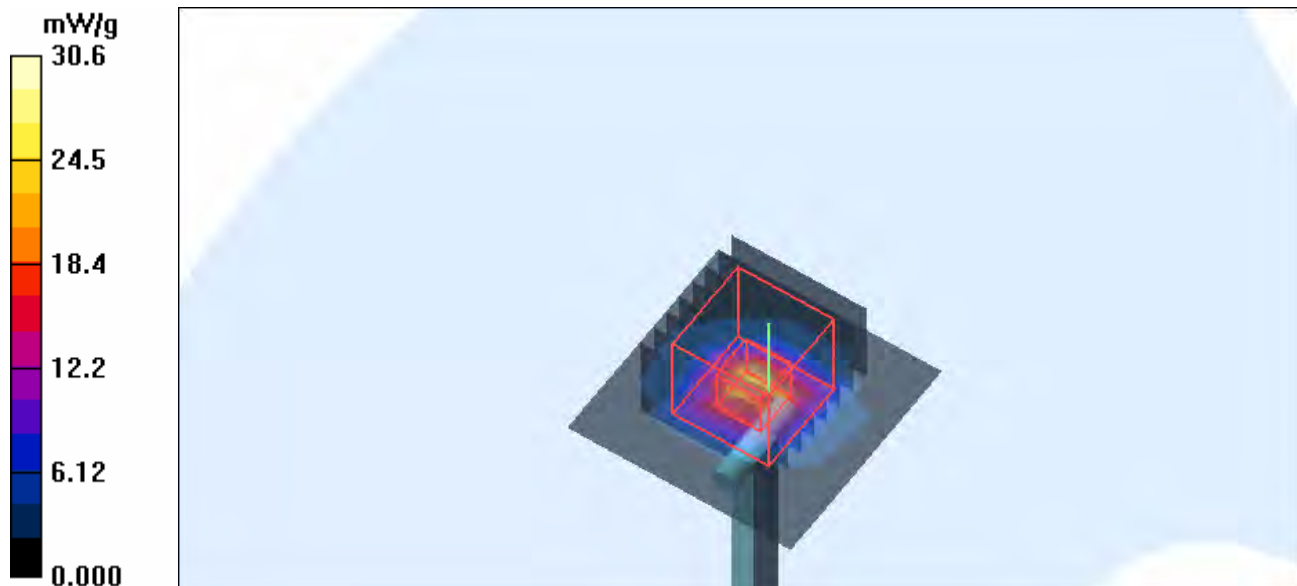
Communication System: CW ; Frequency: 5800 MHz; Duty Cycle: 1:1; Modulation type: CW
 Medium: MSL5800; Medium parameters used: $f = 5800$ MHz; $\sigma = 6.23$ mho/m; $\epsilon_r = 49.2$; $\rho = 1000$ kg/m³ ; Liquid level : 151 mm
 Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom) Air temp. : 23.4 degrees ; Liquid temp. : 22.3 degrees

DASY4 Configuration:

- Probe: EX3DV3 - SN3504 ; ConvF(4.24, 4.24, 4.24) ; Calibrated: 2006/11/23
- Sensor-Surface: 2.5mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2006/9/7
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 53; Postprocessing SW: SEMCAD, V1.8 Build 172

f=5800, d=10mm, Pin=250mW/Area Scan (6x6x1): Measurement grid: dx=10mm, dy=10mm
 Maximum value of SAR (measured) = 22.3 mW/g

f=5800, d=10mm, Pin=250mW/Zoom Scan (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
 Reference Value = 75.9 V/m; Power Drift = 0.020 dB
 Peak SAR (extrapolated) = 86.1 W/kg
SAR(1 g) = 18.6 mW/g; SAR(10 g) = 5.13 mW/g
 Maximum value of SAR (measured) = 30.6 mW/g



APPENDIX B: ADT SAR MEASUREMENT SYSTEM



APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION





APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION

D1: SAM PHANTOM

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 CA
Series No	TP-1150 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

The series production process used allows the limitation to test of first articles. Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series units (called samples).

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

- [1] CENELEC EN 50361
- [2] IEEE P1528-200x draft 6.5
- [3] IEC PT 62209 draft 0.9

(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date 28.02.2002

Signature / Stamp

F. Bombault

**Schmid & Partner
Engineering AG**

Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

Volker Kofe



D2: DOSIMETRIC E-FIELD PROBE



Accredited by the Swiss Federal Office of Metrology and Accreditation
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 **ADT (Auden)**

Certificate No. **ET3-1790_Nov06**

CALIBRATION CERTIFICATE

Object

ET3DV6 - SN-1790

Calibration procedure(s)

**QA CAL-01 v5
Calibration procedure for dosimetric E-field probes**

Calibration date:

November 23, 2006

Condition of the calibrated item

In Tolerance

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: November 23, 2006

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



Accredited by the Swiss Federal Office of Metrology and Accreditation
 The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

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 effect the E^2 -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * *frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep (no uncertainty required). DCP does not depend on frequency nor media.
- 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 ET3DV6

SN:1790

Manufactured:	May 28, 2003
Last calibrated:	December 20, 2004
Recalibrated:	November 23, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: ET3DV6 SN:1790

Sensitivity in Free Space^A

Diode Compression^B

NormX	2.04 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	91 mV
NormY	2.10 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	93 mV
NormZ	1.84 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	98 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL **900 MHz** **Typical SAR gradient: 5 % per mm**

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	9.2	4.9
SAR _{be} [%]	With Correction Algorithm	0.1	0.2

TSL **1750 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		3.7 mm	4.7 mm
SAR _{be} [%]	Without Correction Algorithm	12.6	8.4
SAR _{be} [%]	With Correction Algorithm	0.5	0.0

Sensor Offset

Probe Tip to Sensor Center **2.7 mm**

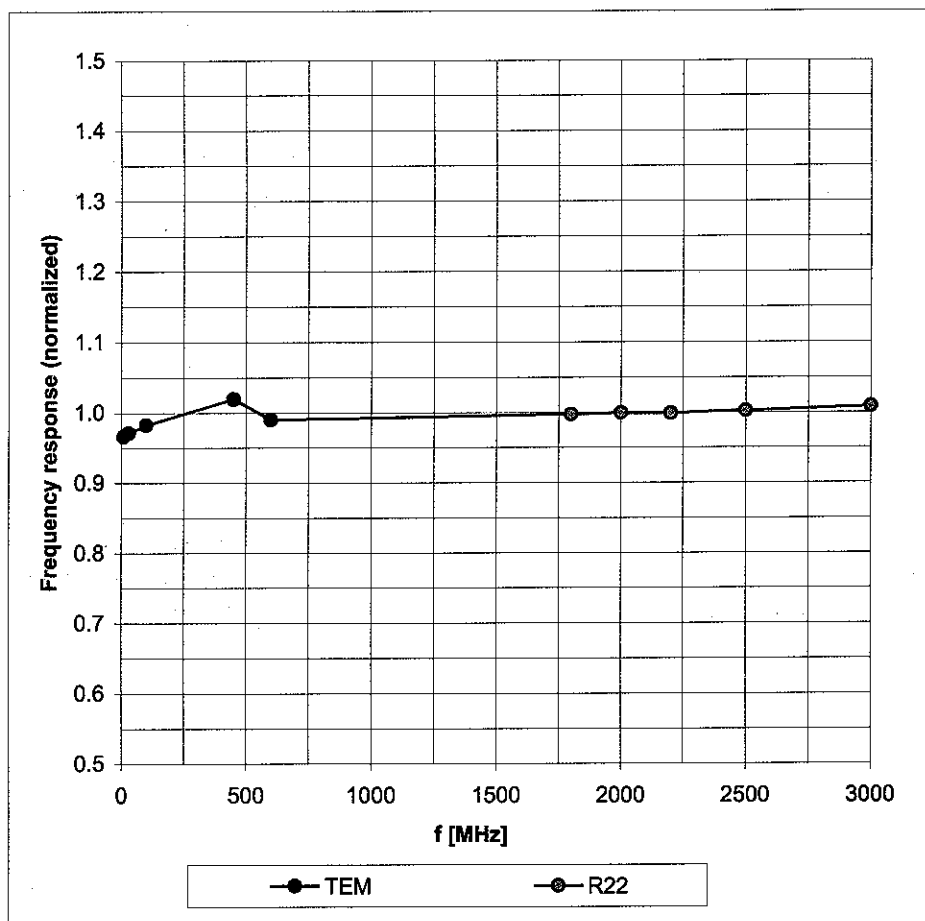
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

^B Numerical linearization parameter: uncertainty not required.

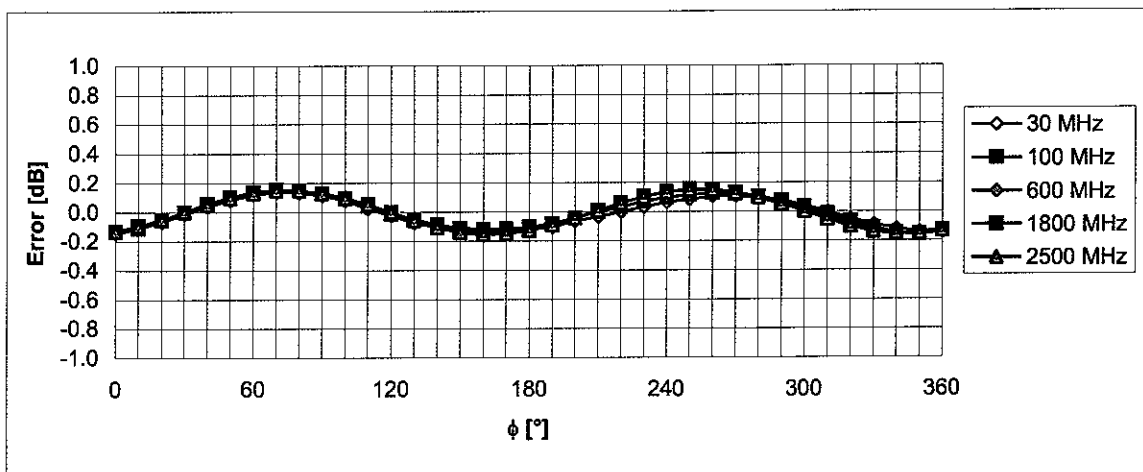
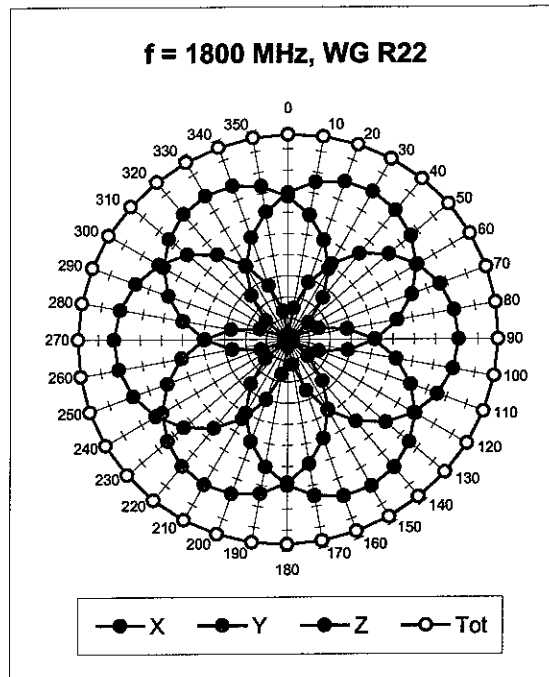
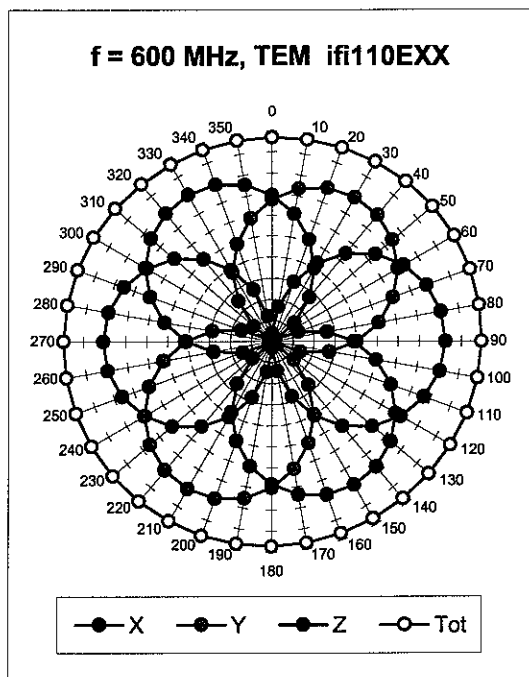
Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)



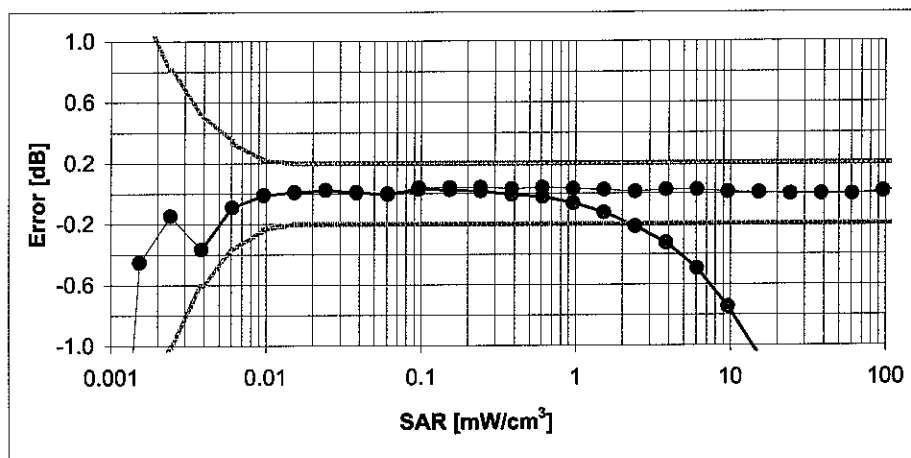
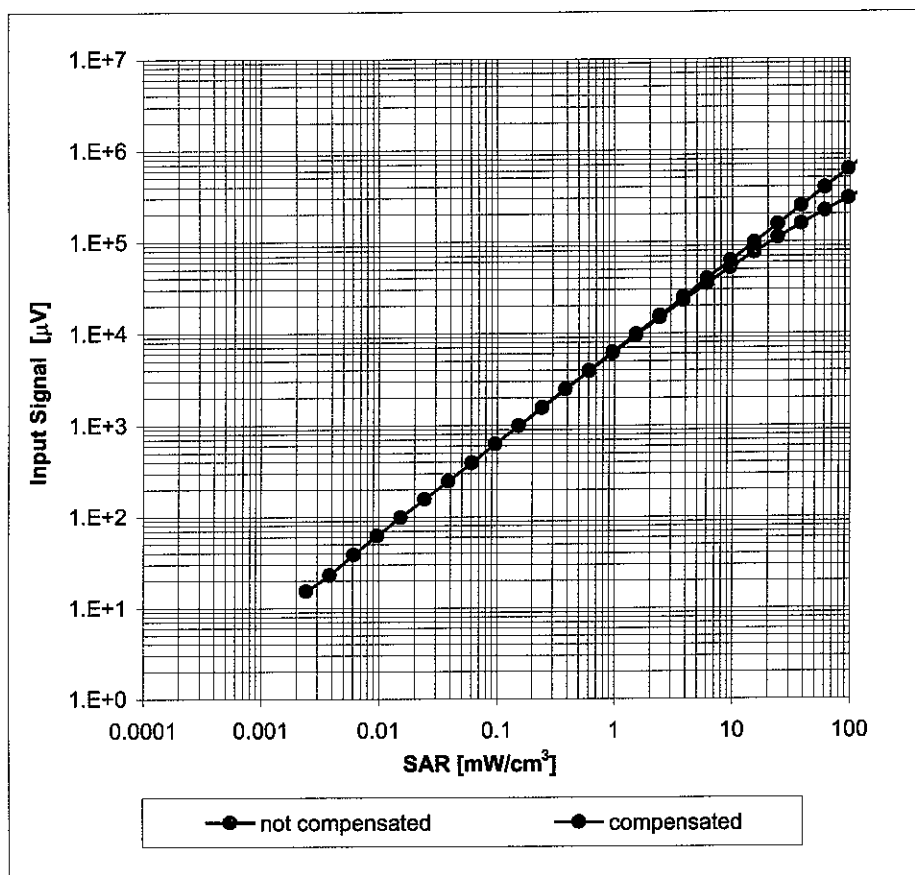
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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



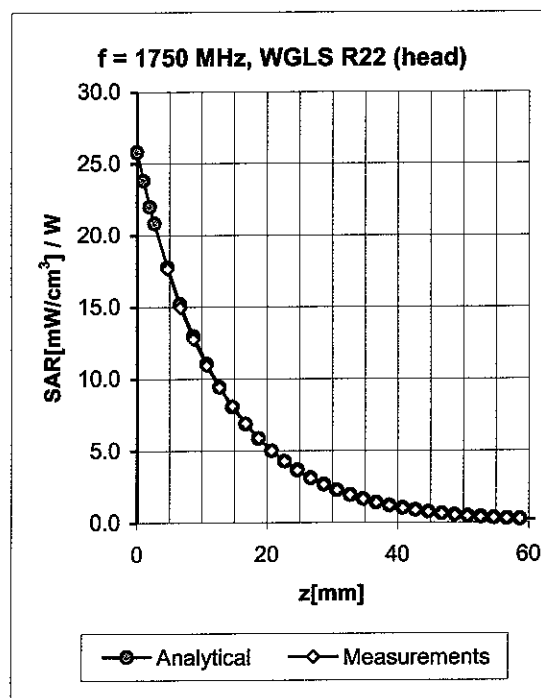
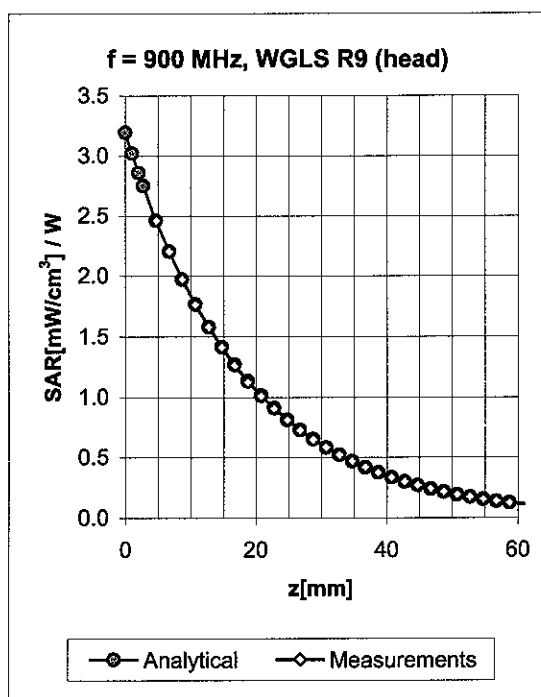
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$)



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

Conversion Factor Assessment

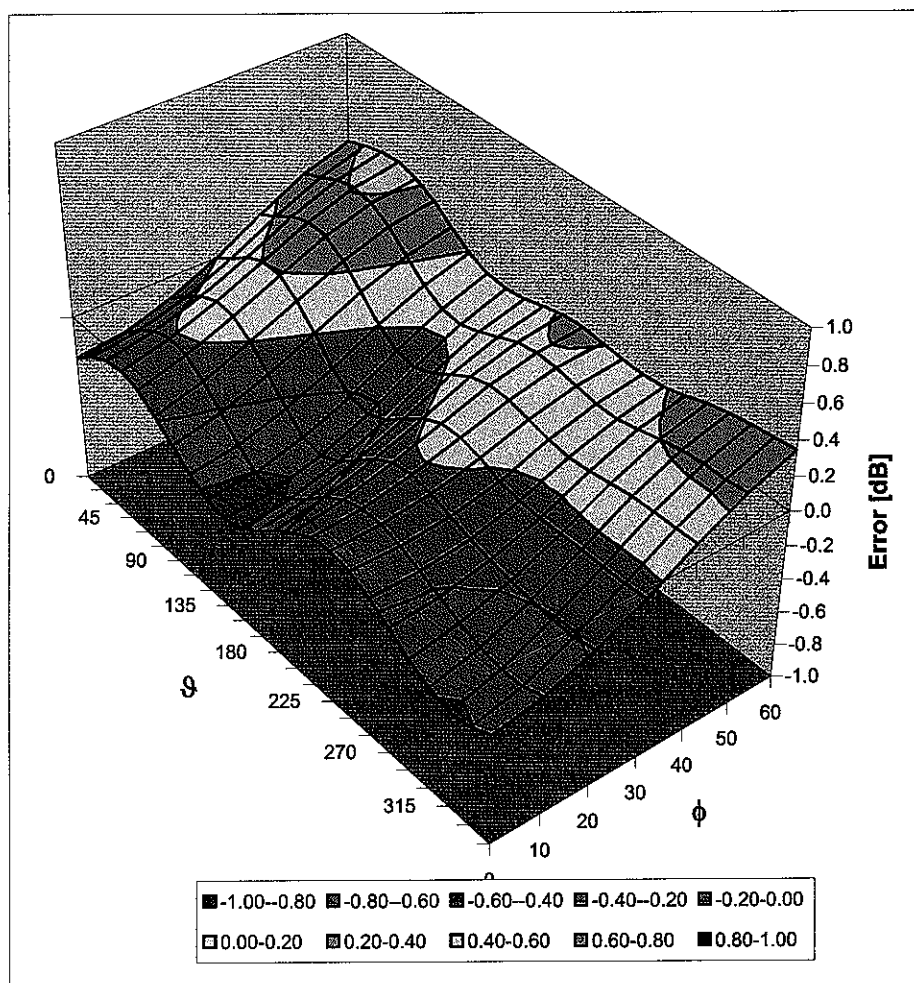


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.32	2.45	6.71 ± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.50	2.47	5.48 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.57	2.47	5.27 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.66	1.94	4.76 ± 11.8% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.32	2.78	6.35 ± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.55	2.76	4.85 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.70	2.39	4.59 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.64	1.81	4.35 ± 11.8% (k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL

Error (ϕ , θ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)



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Accreditation No.: **SCS 108**

Client **ADT (Auden)**

Certificate No. **EX3-3504_Nov06**

CALIBRATION CERTIFICATE

Object **EX3DV3 - SN:3504**

Calibration procedure(s) **QA CAL-01.v5 and QA CAL-14.v3
Calibration procedure for dosimetric E-field probes**

Calibration date: **November 23, 2006**

Condition of the calibrated item **In Tolerance**

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 3 dB Attenuator	SN: S5054 (3c)	10-Aug-06 (METAS, No. 217-00592)	Aug-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 30 dB Attenuator	SN: S5129 (30b)	10-Aug-06 (METAS, No. 217-00593)	Aug-07
Reference Probe ES3DV2	SN: 3013	2-Jan-06 (SPEAG, No. ES3-3013_Jan06)	Jan-07
DAE4	SN: 654	21-Jun-06 (SPEAG, No. DAE4-654_Jun06)	Jun-07

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585	18-Oct-01 (SPEAG, in house check Oct-06)	In house check: Oct-07

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	

Issued: November 23, 2006

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Accreditation No.: **SCS 108**

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
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
- CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001

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 effect 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 (no uncertainty required). DCP does not depend on frequency nor media.
- 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 EX3DV3

SN:3504

Manufactured:	December 15, 2003
Last calibrated:	March 23, 2005
Recalibrated:	November 23, 2006

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV3 SN:3504

Sensitivity in Free Space^A

Diode Compression^B

NormX	0.600 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	95 mV
NormY	0.600 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	95 mV
NormZ	0.630 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	95 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL 5200 MHz Typical SAR gradient: 25 % per mm

Sensor Center to Phantom Surface Distance		2.0 mm	3.0 mm
SAR _{be} [%]	Without Correction Algorithm	10.4	4.3
SAR _{be} [%]	With Correction Algorithm	0.0	0.0

TSL 5800 MHz Typical SAR gradient: 30 % per mm

Sensor Center to Phantom Surface Distance		2.0 mm	3.0 mm
SAR _{be} [%]	Without Correction Algorithm	8.4	2.3
SAR _{be} [%]	With Correction Algorithm	0.0	0.0

Sensor Offset

Probe Tip to Sensor Center **1.0 mm**

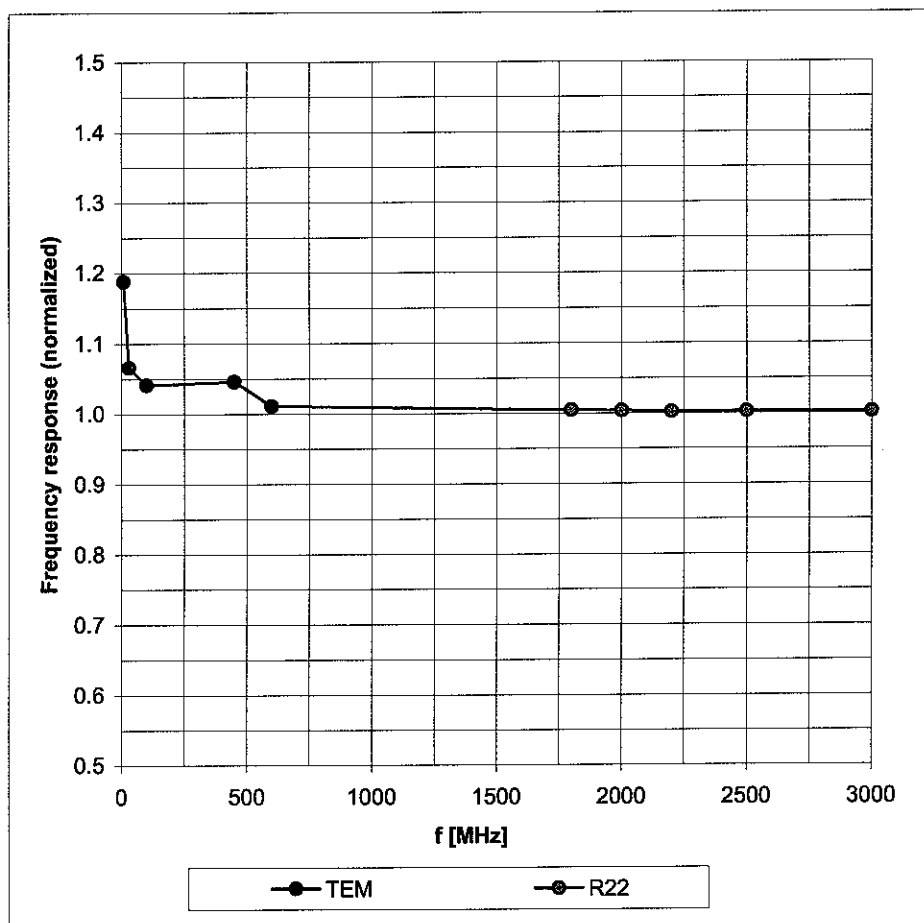
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

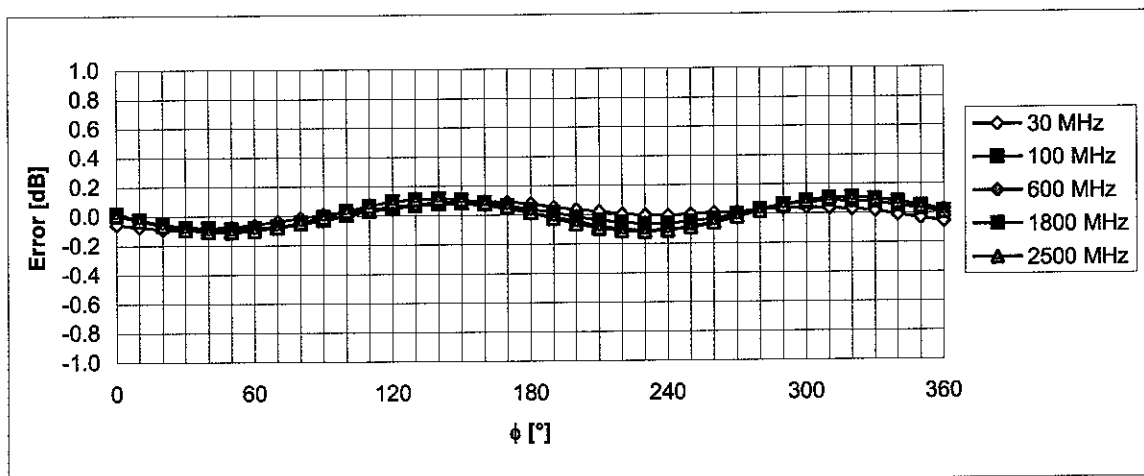
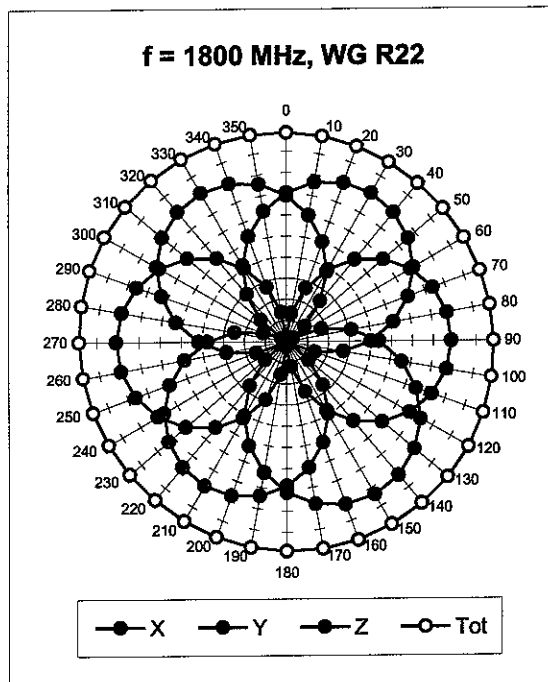
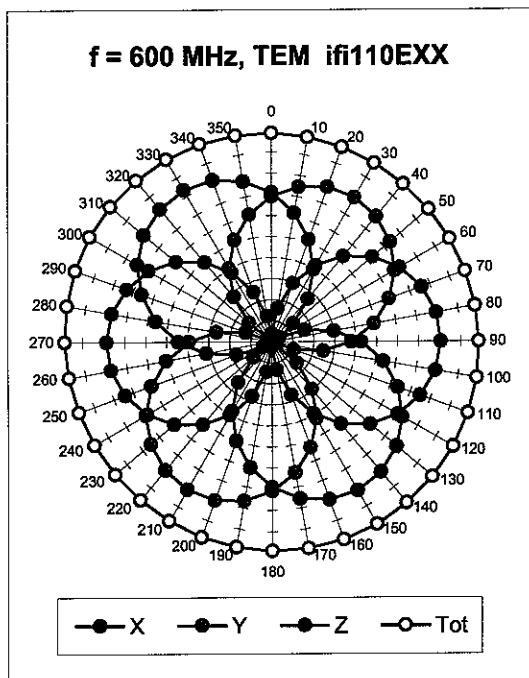
^B Numerical linearization parameter: uncertainty not required.

Frequency Response of E-Field

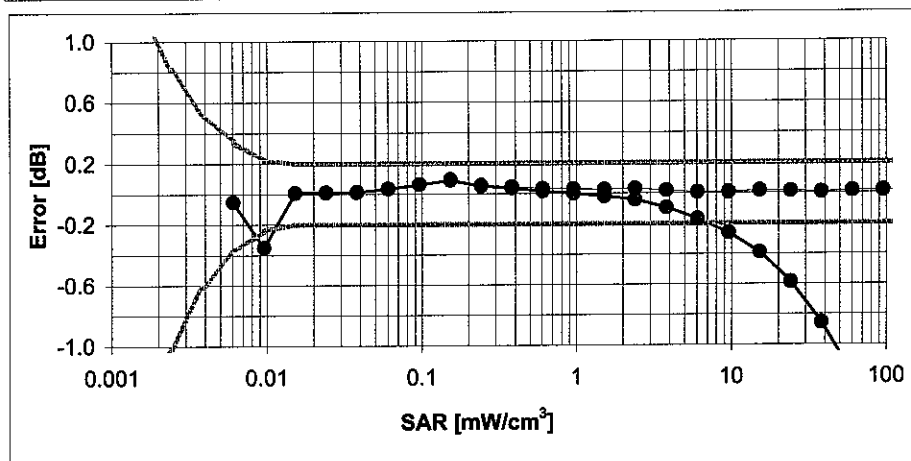
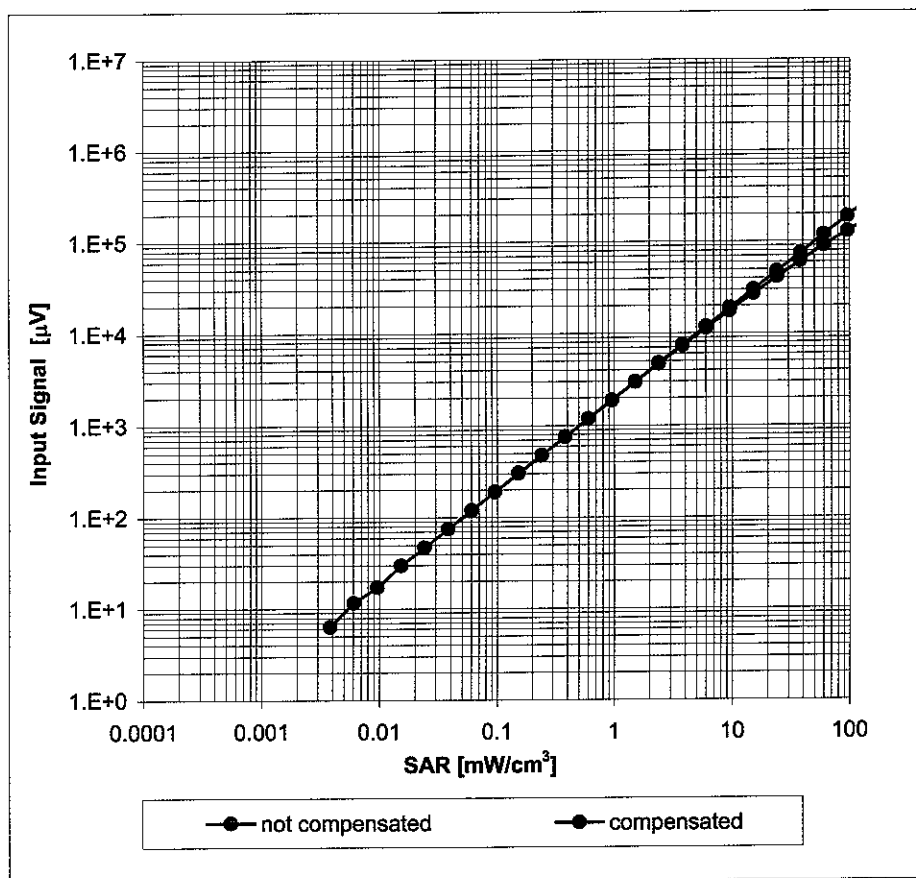
(TEM-Cell:ifi110 EXX, Waveguide: R22)



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

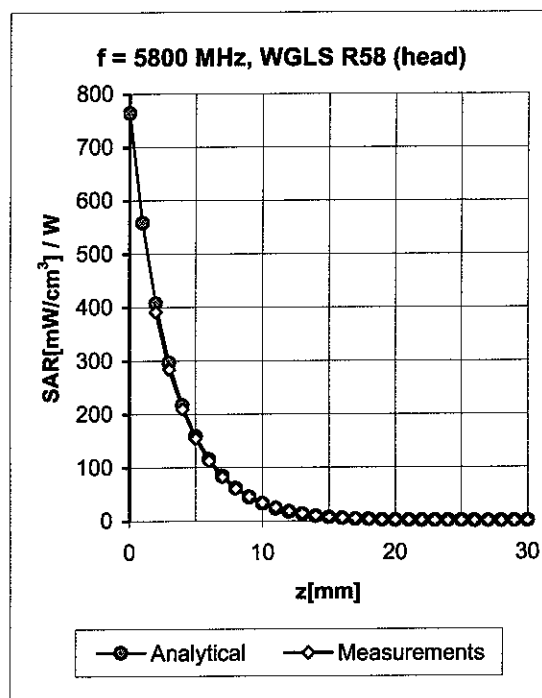
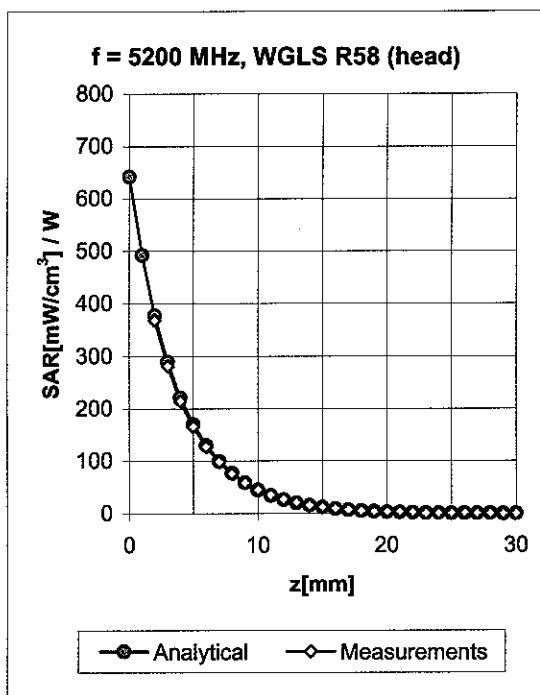
Receiving Pattern (ϕ), $\vartheta = 0^\circ$ Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$)



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

Conversion Factor Assessment

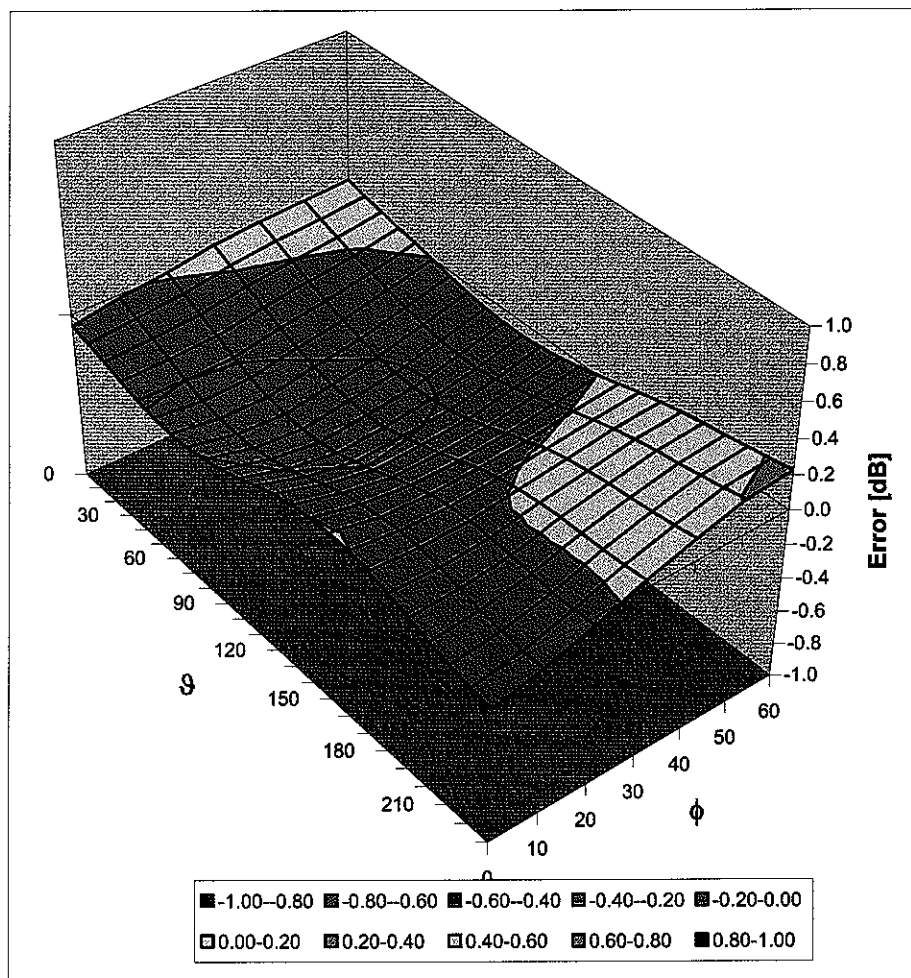


f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
4950	± 50 / ± 100	Head	36.3 ± 5%	4.40 ± 5%	0.32	1.75	5.46 ± 13.1% (k=2)
5200	± 50 / ± 100	Head	36.0 ± 5%	4.66 ± 5%	0.35	1.80	5.00 ± 13.1% (k=2)
5300	± 50 / ± 100	Head	35.9 ± 5%	4.76 ± 5%	0.35	1.80	4.78 ± 13.1% (k=2)
5500	± 50 / ± 100	Head	35.6 ± 5%	4.96 ± 5%	0.32	1.80	4.74 ± 13.1% (k=2)
5800	± 50 / ± 100	Head	35.3 ± 5%	5.27 ± 5%	0.35	1.78	4.58 ± 13.1% (k=2)
2300	± 50 / ± 100	Body	52.8 ± 5%	1.85 ± 5%	0.37	1.00	8.07 ± 11.8% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.33	1.00	7.83 ± 11.8% (k=2)
3500	± 50 / ± 100	Body	51.3 ± 5%	3.31 ± 5%	0.50	0.91	7.06 ± 13.1% (k=2)
4950	± 50 / ± 100	Body	49.4 ± 5%	5.01 ± 5%	0.38	1.70	4.68 ± 13.1% (k=2)
5200	± 50 / ± 100	Body	49.0 ± 5%	5.30 ± 5%	0.35	1.70	4.42 ± 13.1% (k=2)
5300	± 50 / ± 100	Body	48.5 ± 5%	5.42 ± 5%	0.37	1.65	4.05 ± 13.1% (k=2)
5500	± 50 / ± 100	Body	48.6 ± 5%	5.65 ± 5%	0.35	1.65	4.09 ± 13.1% (k=2)
5800	± 50 / ± 100	Body	48.2 ± 5%	6.00 ± 5%	0.35	1.65	4.24 ± 13.1% (k=2)

^c The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

Deviation from Isotropy in HSL

Error (ϕ , ϑ), $f = 900$ MHz



Uncertainty of Spherical Isotropy Assessment: $\pm 2.6\%$ ($k=2$)

D3: DAE



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Accreditation No.: **SCS 108**

Client **ADT (Auden)**

Certificate No: **DAE3-510_Sep06**

CALIBRATION CERTIFICATE

Object **DAE3 - SD 000 D03 AA - SN: 510**

Calibration procedure(s) **QA CAL-06.v12
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **September 07, 2006**

Condition of the calibrated item **In Tolerance**

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	7-Oct-05 (Sintrel, No.E-050073)	Oct-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1002	15-Jun-06 (SPEAG, in house check)	In house check Jun-07

	Name	Function	Signature
Calibrated by:	Daniel Steinacher	Technician	

Approved by:	Fin Bornholt	R&D Director
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Issued: September 7, 2006

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Accreditation No.: **SCS 108**

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

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

Calibration Factors	X	Y	Z
High Range	404.194 $\pm$ 0.1% (k=2)	404.254 $\pm$ 0.1% (k=2)	404.622 $\pm$ 0.1% (k=2)
Low Range	3.97522 $\pm$ 0.7% (k=2)	3.96545 $\pm$ 0.7% (k=2)	3.95957 $\pm$ 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	42 ° $\pm$ 1 °
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Appendix

1. DC Voltage Linearity

High Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	200000	200000.2	0.00
Channel X	+ Input	20000	20007.72	0.04
Channel X	- Input	20000	-19999.52	0.00
Channel Y	+ Input	200000	199999.5	0.00
Channel Y	+ Input	20000	20005.14	0.03
Channel Y	- Input	20000	-20000.72	0.00
Channel Z	+ Input	200000	200000.5	0.00
Channel Z	+ Input	20000	20006.06	0.03
Channel Z	- Input	20000	-20002.05	0.01

Low Range		Input (μV)	Reading (μV)	Error (%)
Channel X	+ Input	2000	1999.9	0.00
Channel X	+ Input	200	200.02	0.01
Channel X	- Input	200	-200.32	0.16
Channel Y	+ Input	2000	2000.0	0.00
Channel Y	+ Input	200	199.46	-0.27
Channel Y	- Input	200	-200.72	0.36
Channel Z	+ Input	2000	1999.9	0.00
Channel Z	+ Input	200	199.12	-0.44
Channel Z	- Input	200	-201.06	0.53

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	17.19	16.90
	- 200	-16.29	-16.91
Channel Y	200	14.52	14.16
	- 200	-15.49	-15.51
Channel Z	200	-8.86	-9.32
	- 200	7.79	7.80

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	1.86	-0.06
Channel Y	200	0.60	-	4.31
Channel Z	200	-2.51	-0.39	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15894	16343
Channel Y	16116	16300
Channel Z	16080	16129

5. Input Offset Measurement

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

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	0.39	-0.84	1.32	0.26
Channel Y	-1.02	-1.58	0.05	0.26
Channel Z	0.18	-0.50	1.13	0.28

6. Input Offset Current

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

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.2001	199.6
Channel Y	0.2001	198.3
Channel Z	0.2001	199.1

8. Low Battery Alarm Voltage (verified during pre test)

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

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	-0.01	-8	-9



D4: SYSTEM VALIDATION DIPOLE



Accredited by the Swiss Federal Office of Metrology and Accreditation
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 **ADT (Auden)**

Certificate No: **D5GHzV2-1019_Jul06**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1019**

Calibration procedure(s) **QA CAL-22.v1
Calibration procedure for dipole validation kits between 3-6 GHz**

Calibration date: **July 12, 2006**

Condition of the calibrated item **In Tolerance**

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41495277	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Power sensor E4412A	MY41498087	5-Apr-06 (METAS, No. 251-00557)	Apr-07
Reference 20 dB Attenuator	SN: S5086 (20b)	4-Apr-06 (METAS, No. 251-00558)	Apr-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	11-Aug-05 (METAS, No 251-00498)	Aug-06
Reference Probe EX3DV4	SN: 3503	19-Mar-05 (SPEAG, No. EX3-3503_Mar06)	Mar-07
DAE4	SN: 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	4-Aug-99 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov 06

Calibrated by: **Marcel Fehr** **Laboratory Technician** **Signature**

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

Issued: July 18, 2006

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) IEC Std 62209 Part 2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", Draft Version 0.9, December 2004
- b) 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:

- c) DASY4 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	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Area Scan resolution	dx, dy = 10 mm	
Zoom Scan Resolution	dx, dy = 4.3 mm, dz = 3 mm	
Frequency	4950 MHz $\pm$ 1 MHz 5200 MHz $\pm$ 1 MHz 5500 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 1 MHz	

Head TSL parameters at 4950 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.3	4.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	36.0 $\pm$ 6 %	4.27 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.4 $\pm$ 0.2) °C	---	---

SAR result with Head TSL at 4950 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	20.2 mW / g
SAR normalized	normalized to 1W	80.8 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	80.7 mW / g $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.80 mW / g
SAR normalized	normalized to 1W	23.2 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	23.1 mW / g $\pm$ 19.5 % (k=2)

¹ Correction to nominal TSL parameters according to c), chapter "SAR Sensitivities"

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.6 ± 6 %	4.53 mho/m ± 6 %
Head TSL temperature during test	(22.4 ± 0.2) °C	---	---

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	20.5 mW / g
SAR normalized	normalized to 1W	82.0 mW / g
SAR for nominal Head TSL parameters ²	normalized to 1W	81.8 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.83 mW / g
SAR normalized	normalized to 1W	23.3 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	23.2 mW / g ± 19.5 % (k=2)

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	4.80 mho/m ± 6 %
Head TSL temperature during test	(22.4 ± 0.2) °C	---	---

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	21.0 mW / g
SAR normalized	normalized to 1W	84.0 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	83.5 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.92 mW / g
SAR normalized	normalized to 1W	23.7 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	23.5 mW / g ± 19.5 % (k=2)

² Correction to nominal TSL parameters according to c), chapter "SAR Sensitivities"

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	5.09 mho/m ± 6 %
Head TSL temperature during test	(22.4 ± 0.2) °C	---	---

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	20.6 mW / g
SAR normalized	normalized to 1W	82.4 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	81.8 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.83 mW / g
SAR normalized	normalized to 1W	23.3 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	23.1 mW / g ± 19.5 % (k=2)

Body TSL parameters at 4950 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.4	5.01 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	4.80 mho/m ± 6 %
Body TSL temperature during test	(22.3 ± 0.2) °C	---	---

SAR result with Body TSL at 4950 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	condition	
SAR measured	250 mW input power	18.7 mW / g
SAR normalized	normalized to 1W	74.8 mW / g
SAR for nominal Body TSL parameters ¹	normalized to 1W	73.8 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.41 mW / g
SAR normalized	normalized to 1W	21.6 mW / g
SAR for nominal Body TSL parameters ¹	normalized to 1W	21.3 mW / g ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	5.09 mho/m ± 6 %
Body TSL temperature during test	(22.3 ± 0.2) °C	---	---

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	condition	
SAR measured	250 mW input power	19.1 mW / g
SAR normalized	normalized to 1W	76.4 mW / g
SAR for nominal Body TSL parameters ¹	normalized to 1W	75.3 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.42 mW / g
SAR normalized	normalized to 1W	21.7 mW / g
SAR for nominal Body TSL parameters ¹	normalized to 1W	21.3 mW / g ± 19.5 % (k=2)

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.56 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	5.52 mho/m ± 6 %
Body TSL temperature during test	(22.5 ± 0.2) °C	---	---

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	condition	
SAR measured	250 mW input power	18.9 mW / g
SAR normalized	normalized to 1W	75.6 mW / g
SAR for nominal Body TSL parameters ¹	normalized to 1W	74.3 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.35 mW / g
SAR normalized	normalized to 1W	21.4 mW / g
SAR for nominal Body TSL parameters ¹	normalized to 1W	21.1 mW / g ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	45.4 ± 6 %	5.87 mho/m ± 6 %
Body TSL temperature during test	(22.3 ± 0.2) °C	---	---

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	condition	
SAR measured	250 mW input power	17.6mW / g
SAR normalized	normalized to 1W	70.4 mW / g
SAR for nominal Body TSL parameters ¹	normalized to 1W	69.0 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.94 mW / g
SAR normalized	normalized to 1W	19.8 mW / g
SAR for nominal Body TSL parameters ¹	normalized to 1W	19.4 mW / g ± 19.5 % (k=2)

Appendix

Antenna Parameters with Head TSL at 4950 MHz

Impedance, transformed to feed point	$52.5\ \Omega - 13.8\ j\Omega$
Return Loss	-17.4 dB

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	$52.6\ \Omega - 8.2\ j\Omega$
Return Loss	-21.5 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	$51.3\ \Omega - 2.1\ j\Omega$
Return Loss	-32.2 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	$56.3\ \Omega + 1.7\ j\Omega$
Return Loss	-24.2 dB

Antenna Parameters with Body TSL at 4950 MHz

Impedance, transformed to feed point	$51.7\ \Omega - 12.3\ j\Omega$
Return Loss	-18.3 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	$52.3\ \Omega - 5.9\ j\Omega$
Return Loss	-24.1 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	$52.0\ \Omega - 0.2\ j\Omega$
Return Loss	-34.0 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	$58.1\ \Omega + 4.7\ j\Omega$
Return Loss	-21.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns
----------------------------------	----------

After long term use with 40 W 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	February 5, 2004

DASY4 Validation Report for Head TSL

Date/Time: 12.07.2006 14:31:10

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1019

Communication System: CW-5GHz; Frequency: 4950 MHz Frequency: 5200 MHz Frequency: 5500 MHz Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: HSL 5800 MHz;

Medium parameters used: $f = 4950$ MHz; $\sigma = 4.27$ mho/m; $\epsilon_r = 36$; $\rho = 1000$ kg/m³

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.53$ mho/m; $\epsilon_r = 35.6$; $\rho = 1000$ kg/m³

Medium parameters used: $f = 5500$ MHz; $\sigma = 4.8$ mho/m; $\epsilon_r = 35.1$; $\rho = 1000$ kg/m³

Medium parameters used: $f = 5800$ MHz; $\sigma = 5.09$ mho/m; $\epsilon_r = 34.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.96, 5.96, 5.96)ConvF(5.52, 5.52, 5.52)ConvF(5.18, 5.18, 5.18)ConvF(5.02, 5.02, 5.02); Calibrated: 18.03.2006
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

d=10mm, Pin=250mW, f=4950 MHz/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 44.2 mW/g

d=10mm, Pin=250mW, f=4950 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 82.4 V/m; Power Drift = 0.042 dB
Peak SAR (extrapolated) = 72.5 W/kg
SAR(1 g) = 20.2 mW/g; SAR(10 g) = 5.8 mW/g
Maximum value of SAR (measured) = 38.1 mW/g

d=10mm, Pin=250mW, f=5200 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 82.3 V/m; Power Drift = 0.057 dB
Peak SAR (extrapolated) = 76.0 W/kg
SAR(1 g) = 20.5 mW/g; SAR(10 g) = 5.83 mW/g
Maximum value of SAR (measured) = 39.5 mW/g

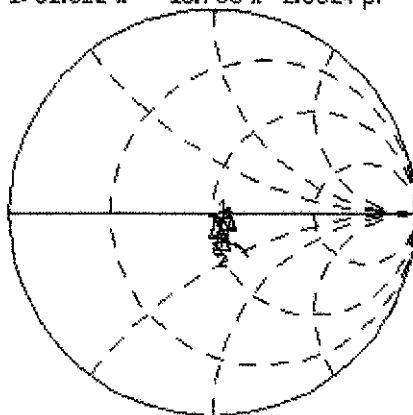
d=10mm, Pin=250mW, f=5500 MHz/Zoom Scan (8x8x8), dist=2mm 2 (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 81.0 V/m; Power Drift = 0.019 dB
Peak SAR (extrapolated) = 83.3 W/kg
SAR(1 g) = 21 mW/g; SAR(10 g) = 5.92 mW/g
Maximum value of SAR (measured) = 43.9 mW/g

d=10mm, Pin=250mW, f=5800 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm
Reference Value = 76.1 V/m; Power Drift = 0.069 dB
Peak SAR (extrapolated) = 84.8 W/kg
SAR(1 g) = 20.6 mW/g; SAR(10 g) = 5.83 mW/g
Maximum value of SAR (measured) = 43.8 mW/g

Impedance Measurement Plot for Head TSL

12 Jul 2006 11:27:35
CH1 S11 1 U FS 1: 52.512 Ω -13.785 Ω 2.3324 pF 4 950.000 000 MHz

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16
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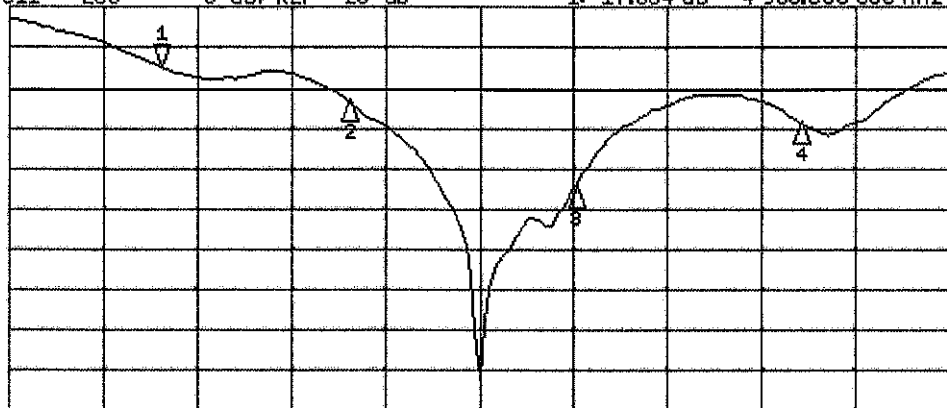


CH1 Markers

2: 52.627 Ω
-8.2246 Ω
5.20000 GHz
3: 51.330 Ω
-2.0898 Ω
5.50000 GHz
4: 56.293 Ω
1.7402 Ω
5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -17.354 dB 4 950.000 000 MHz

Cor
Avg
16
↑



CH2 Markers

2: -21.527 dB
5.20000 GHz
3: -32.226 dB
5.50000 GHz
4: -24.233 dB
5.80000 GHz

START 4 750.000 000 MHz

STOP 6 000.000 000 MHz

DASY4 Validation Report for Body TSL

Date/Time: 12.07.2006 19:51:15

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1019

Communication System: CW-5GHz; Frequency: 4950 MHzFrequency: 5200 MHzFrequency: 5500 MHzFrequency: 5800 MHz;Duty Cycle: 1:1

Medium: MSL U10 BB;

Medium parameters used: $f = 4950$ MHz; $\sigma = 4.76$ mho/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.07$ mho/m; $\epsilon_r = 46.8$; $\rho = 1000$ kg/m³

Medium parameters used: $f = 5500$ MHz; $\sigma = 5.48$ mho/m; $\epsilon_r = 46.3$; $\rho = 1000$ kg/m³

Medium parameters used: $f = 5800$ MHz; $\sigma = 5.84$ mho/m; $\epsilon_r = 45.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.14, 5.14, 5.14)ConvF(4.98, 4.98, 4.98)ConvF(4.67, 4.67, 4.67)ConvF(4.72, 4.72, 4.72); Calibrated: 18.03.2006
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; ;
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

d=10mm, Pin=250mW, f=4950 MHz/Area Scan 2 (61x61x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 38.8 mW/g

d=10mm, Pin=250mW, f=4950 MHz/Zoom Scan (8x8x8), dist=2mm 2 2 (8x8x8)/Cube 0: Measurement grid:

dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 82.6 V/m; Power Drift = 0.000 dB

Peak SAR (extrapolated) = 60.5 W/kg

SAR(1 g) = 18.7 mW/g; SAR(10 g) = 5.41 mW/g

Maximum value of SAR (measured) = 35.1 mW/g

d=10mm, Pin=250mW, f=5200 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 80.2 V/m; Power Drift = -0.090 dB

Peak SAR (extrapolated) = 66.5 W/kg

SAR(1 g) = 19.1 mW/g; SAR(10 g) = 5.42 mW/g

Maximum value of SAR (measured) = 37.6 mW/g

d=10mm, Pin=250mW, f=5500 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 76.2 V/m; Power Drift = -0.019 dB

Peak SAR (extrapolated) = 68.5 W/kg

SAR(1 g) = 18.9 mW/g; SAR(10 g) = 5.35 mW/g

Maximum value of SAR (measured) = 37.0 mW/g

d=10mm, Pin=250mW, f=5800 MHz/Zoom Scan (8x8x8), dist=2mm (8x8x8)/Cube 0: Measurement grid: dx=4.3mm, dy=4.3mm, dz=3mm

Reference Value = 70.4 V/m; Power Drift = 0.041 dB

Peak SAR (extrapolated) = 70.3 W/kg

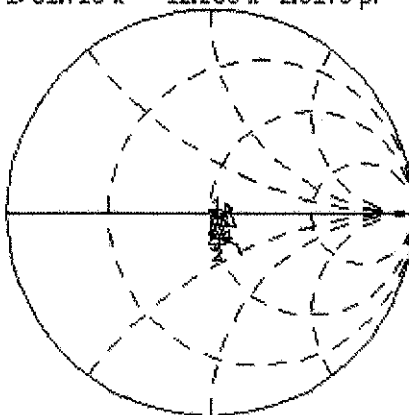
SAR(1 g) = 17.6 mW/g; SAR(10 g) = 4.94 mW/g

Maximum value of SAR (measured) = 34.7 mW/g

Impedance Measurement Plot for Body TSL

12 Jul 2006 11:29:36
CH1 S11 1 U FS 1: 51.713 Ω -12.283 Ω 2.6176 pF 4 950.000 000 MHz

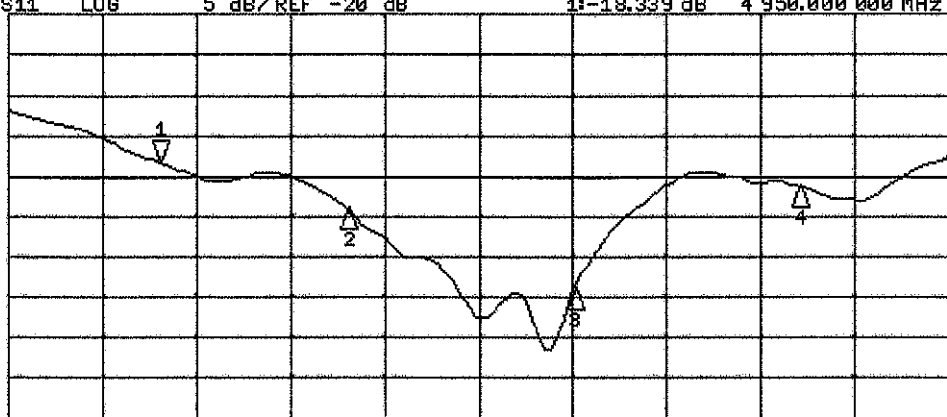
*
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CH1 Markers
2: 52.348 Ω
-5.9355 Ω
5.20000 GHz
3: 52.012 Ω
-199.22 m Ω
5.50000 GHz
4: 58.082 Ω
4.6602 Ω
5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -18.339 dB 4 950.000 000 MHz

Cor
Avg
16
↑



CH2 Markers
2: -24.117 dB
5.20000 GHz
3: -34.042 dB
5.50000 GHz
4: -21.287 dB
5.80000 GHz

START 4 750.000 000 MHz

STOP 6 000.000 000 MHz



Accredited by the Swiss Federal Office of Metrology and Accreditation
 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 **ADT (Auden)**

Certificate No: **D2450V2-716_Aug06**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 716**

Calibration procedure(s) **QA CAL-05.v6**
Calibration procedure for dipole validation kits

Calibration date: **August 21, 2006**

Condition of the calibrated item **In Tolerance**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Power sensor HP 8481A	US37292783	04-Oct-05 (METAS, No. 251-00516)	Oct-06
Reference 20 dB Attenuator	SN: 5086 (20g)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference 10 dB Attenuator	SN: 5047.2 (10r)	10-Aug-06 (METAS, No 217-00591)	Aug-07
Reference Probe ES3DV2	SN 3025	28-Oct-05 (SPEAG, No. ES3-3025_Oct05)	Oct-06
DAE4	SN 601	15-Dec-05 (SPEAG, No. DAE4-601_Dec05)	Dec-06
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (SPEAG, in house check Oct-05)	In house check: Oct-07
RF generator Agilent E4421B	MY41000675	11-May-05 (SPEAG, in house check Nov-05)	In house check: Nov-07
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (SPEAG, in house check Nov-05)	In house check: Nov-06

	Name	Function	Signature
Calibrated by:	Mike Meili	Laboratory Technician	<i>M. Meili</i>
Approved by:	Katja Pokovic	Technical Manager	<i>Katja Pokovic</i>

Issued: August 22, 2006

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



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The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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) CENELEC EN 50361, "Basic standard for the measurement of Specific Absorption Rate related to human exposure to electromagnetic fields from mobile phones (300 MHz - 3 GHz), July 2001
- 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 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	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.8 $\pm$ 6 %	1.80 mho/m $\pm$ 6 %
Head TSL temperature during test	(22.7 $\pm$ 0.2) °C	-----	-----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	250 mW input power	14.0 mW / g
SAR normalized	normalized to 1W	56.0 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	56.4 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.53 mW / g
SAR normalized	normalized to 1W	26.1 mW / g
SAR for nominal Head TSL parameters ¹	normalized to 1W	26.3 mW / g $\pm$ 16.5 % (k=2)

¹ Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.1 ± 6 %	1.97 mho/m ± 6 %
Body TSL temperature during test	(23.4 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.4 mW / g
SAR normalized	normalized to 1W	53.6 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	53.0 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.20 mW / g
SAR normalized	normalized to 1W	24.8 mW / g
SAR for nominal Body TSL parameters ²	normalized to 1W	24.6 mW / g ± 16.5 % (k=2)

² Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$54.2 \Omega + 1.9 j\Omega$
Return Loss	- 27.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$49.7 \Omega + 3.7 j\Omega$
Return Loss	- 28.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.147 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.

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 10, 2002

DASY4 Validation Report for Head TSL

Date/Time: 21.08.2006 14:39:00

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN716

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: HSL U10 BB_060425;

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.84$ mho/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025 (HF); ConvF(4.4, 4.4, 4.4); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

Pin = 250 mW; d = 10 mm 2/Zoom Scan (7x7x7)/Cube 0:

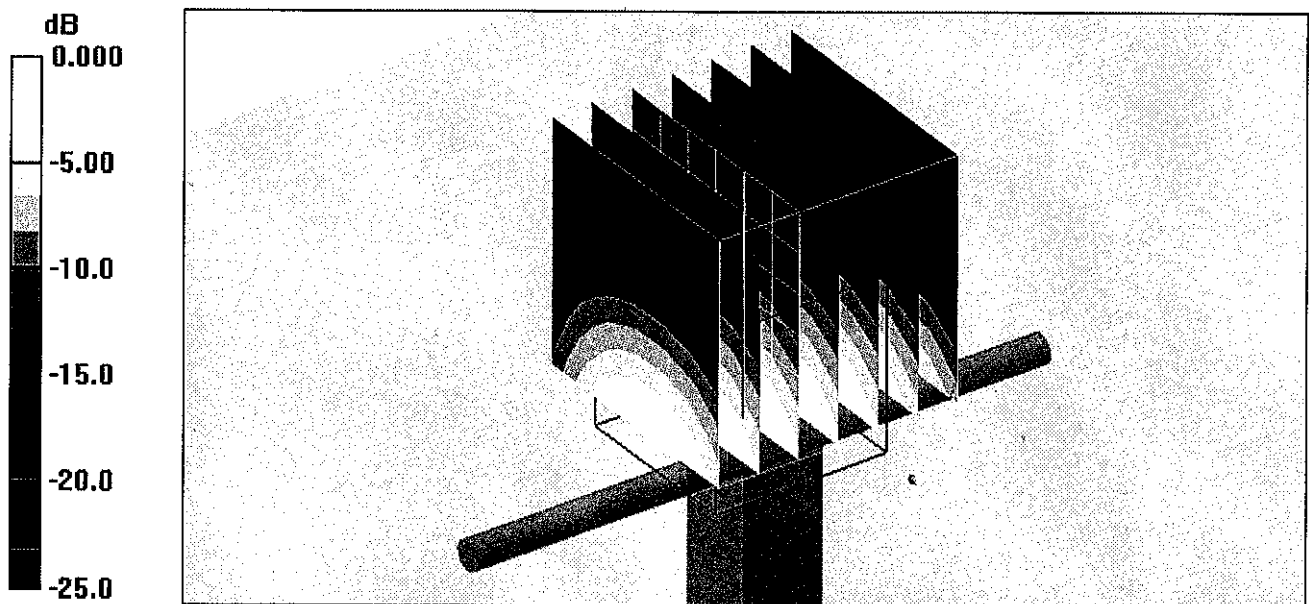
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 89.6 V/m; Power Drift = 0.022 dB

Peak SAR (extrapolated) = 28.9 W/kg

SAR(1 g) = 14 mW/g; SAR(10 g) = 6.53 mW/g

Maximum value of SAR (measured) = 15.5 mW/g

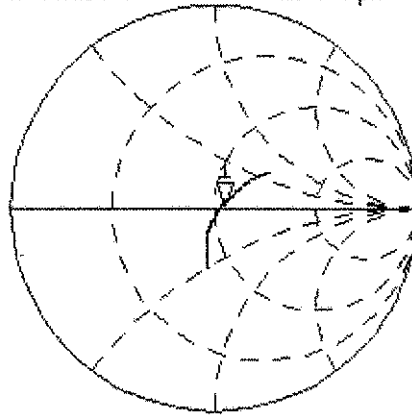


0 dB = 15.5mW/g

Impedance Measurement Plot for Head TSL

21 Aug 2006 10:09:29
CH1 S11 1 U FS 1: 54.230 Ω 1.9141 Ω 124.34 μH 2 450.000 000 MHz

*
Del
Cor

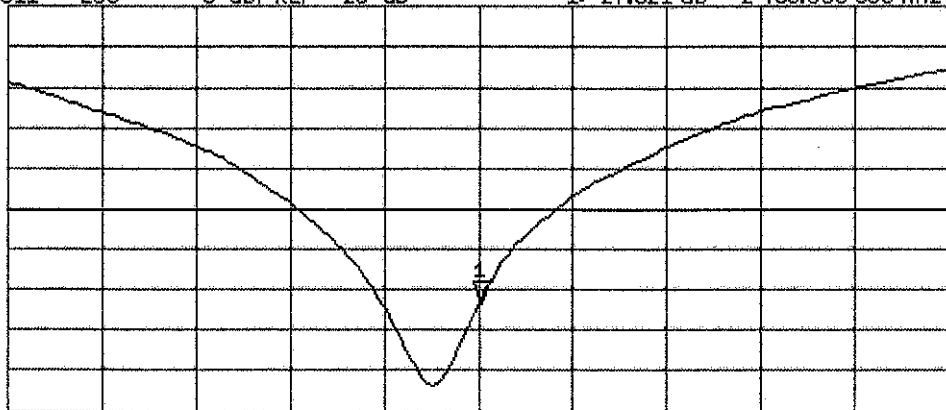


Avg
16

CH2 S11 LOG 3 dB/REF -20 dB 1: -27.021 dB 2 450.000 000 MHz

Cor

Avg
16



START 2 250.000 000 MHz

STOP 2 650.000 000 MHz

DASY4 Validation Report for Body TSL

Date/Time: 21.08.2006 16:08:52

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN716

Communication System: CW-2450; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: MSL U10;

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.96$ mho/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025 (HF); ConvF(4.06, 4.06, 4.06); Calibrated: 28.10.2005
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 15.12.2005
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 44; Postprocessing SW: SEMCAD, V1.8 Build 171

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

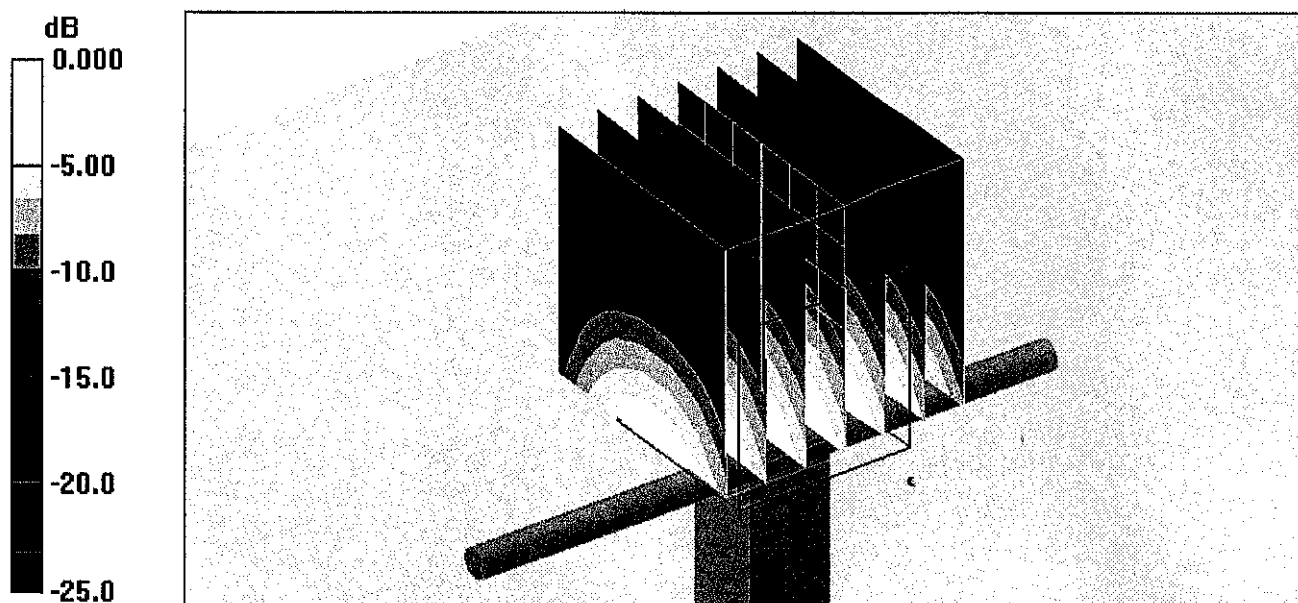
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 87.4 V/m; Power Drift = 0.018 dB

Peak SAR (extrapolated) = 28.8 W/kg

SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.2 mW/g

Maximum value of SAR (measured) = 14.8 mW/g



0 dB = 14.8mW/g

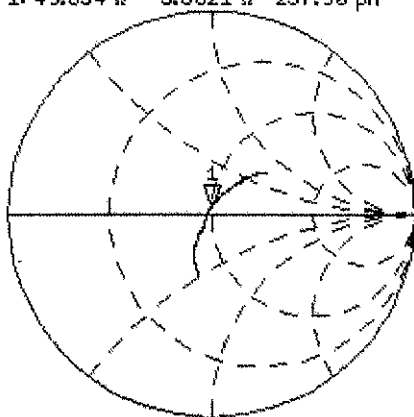
Impedance Measurement Plot for Body TSL

21 Aug 2006 10:10:19
CH1 S11 1 U FS 1: 49.654 Ω 3.6621 Ω 237.90 μ H 2 450.000 000 MHz

*
Del
Cor

Avg
16

↑

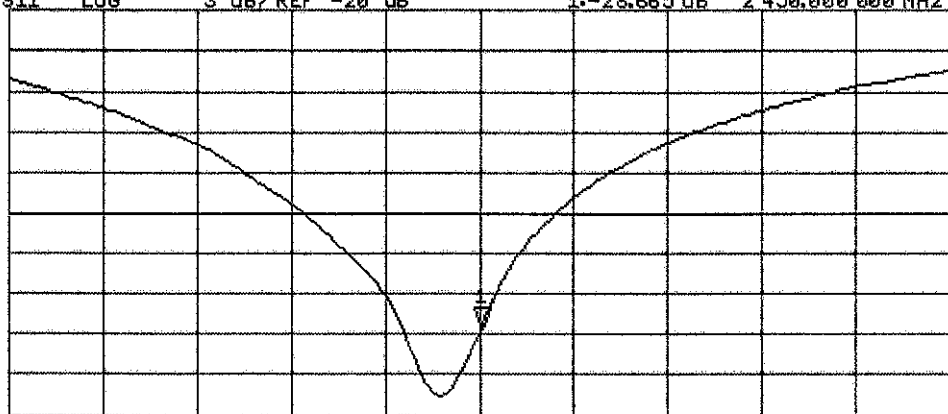


CH2 S11 LOG 3 dB/REF -20 dB 1: -28.665 dB 2 450.000 000 MHz

Cor

Avg
16

↑



START 2 250.000 000 MHz

STOP 2 650.000 000 MHz