SAR TEST REPORT

(WLAN)

REPORT NO.: SA110330C13
MODEL NO.: PG86300
FCC ID: NM8PG86300
RECEIVED: Mar. 30, 2011
TESTED: May 13, 2011
ISSUED: May 19, 2011

APPLICANT: HTC Corporation

ADDRESS: No. 23, Xinghua Rd., Taoyuan City, Taoyuan, 330 Taiwan

ISSUED BY: Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch

LAB ADDRESS: No. 47, 14th Ling, Chia Pau Tsuen, Lin Kou Hsiang, Taipei Hsien 244, Taiwan, R.O.C.

TEST LOCATION: No. 19, Hwa Ya 2nd Rd, Wen Hwa Tsuen, Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.

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Testing Laboratory
2021

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	NA	May 19, 2011

1. CERTIFICATION

PRODUCT:	Smart Phone
MODEL NO.:	PG86300
BRAND:	hTC
APPLICANT:	HTC Corporation
TESTED:	May 13, 2011
TEST SAMPLE:	Production Unit
STANDARDS:	**FCC Part 2 (Section 2.1093)**
	FCC OET Bulletin 65, Supplement C (01-01)
	RSS-102 Issue 4 (2010-03)

The above equipment (model: PG86300) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, 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.

PREPARED BY : Ivy Lin / Specialist , DATE: May 19, 2011

APPROVED BY : Gary Chang / Assistant Manager , DATE: May 19, 2011

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

<table>
<tr><td>EUT</td><td colspan="2">Smart Phone</td></tr>
<tr><td>MODEL NO.</td><td colspan="2">PG86300</td></tr>
<tr><td>FCC ID</td><td colspan="2">NM8PG86300</td></tr>
<tr><td>POWER SUPPLY</td><td colspan="2">3.7Vdc (Rechargeable lithium battery)
3.8Vdc (Rechargeable lithium battery)
5.0Vdc (Power adapter)
5.0Vdc (host equipment)</td></tr>
<tr><td>MODULATION TYPE</td><td colspan="2">CCK, DQPSK, DBPSK for DSSS
64QAM, 16QAM, QPSK, BPSK for OFDM</td></tr>
<tr><td>MODULATION TECHNOLOGY</td><td colspan="2">DSSS, OFDM</td></tr>
<tr><td>TRANSFER RATE</td><td colspan="2">802.11b:11.0/ 5.5/ 2.0/ 1.0Mbps
802.11g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps
802.11n (20MHz): up to 65.0Mbps</td></tr>
<tr><td>OPERATING FREQUENCY</td><td colspan="2">2412 ~ 2462MHz</td></tr>
<tr><td>NUMBER OF CHANNEL</td><td colspan="2">11</td></tr>
<tr><td rowspan="6">CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER</td><td>802.11b (PK Power)</td><td>802.11b (AV Power)</td></tr>
<tr><td>20.5dBm / Ch1: 2412MHz
20.9dBm / Ch6: 2437MHz
20.6dBm / Ch11: 2462MHz</td><td>18.1dBm / Ch1: 2412MHz
18.4dBm / Ch6: 2437MHz
18.1dBm / Ch11: 2462MHz</td></tr>
<tr><td>802.11g (PK Power)</td><td>802.11g (AV Power)</td></tr>
<tr><td>21.8dBm / Ch1: 2412MHz
22.3dBm / Ch6: 2437MHz
21.9dBm / Ch11: 2462MHz</td><td>13.4dBm / Ch1: 2412MHz
13.8dBm / Ch6: 2437MHz
13.5dBm / Ch11: 2462MHz</td></tr>
<tr><td>802.11n (20MHz) (PK Power)</td><td>802.11n (20MHz) (AV Power)</td></tr>
<tr><td>20.8dBm / Ch1: 2412MHz
21.2dBm / Ch6: 2437MHz
20.9dBm / Ch11: 2462MHz</td><td>12.2dBm / Ch1: 2412MHz
12.6dBm / Ch6: 2437MHz
12.4dBm / Ch11: 2462MHz</td></tr>
<tr><td rowspan="2">MAXIMUM SAR (1g)</td><td>Head</td><td>Body</td></tr>
<tr><td>0.446 mW/g</td><td>0.222mW/g</td></tr>
<tr><td>ANTENNA TYPE</td><td colspan="2">PIFA antenna with -0.5dBi gain</td></tr>
<tr><td>ANTENNA CONNECTOR</td><td colspan="2">NA</td></tr>
<tr><td>DATA CABLE</td><td colspan="2">NA</td></tr>
<tr><td>I/O PORTS</td><td colspan="2">Refer to user’s manual</td></tr>
<tr><td>ACCESSORY DEVICES</td><td colspan="2">Refer to note as below</td></tr>
</table>

NOTE:

1. The EUT is a Smart Phone. The test data are separated into following test reports:

	REFERENCE REPORT
SAR test report-247 (WLAN 802.11b/g/n)	SA110330C13
SAR test report-GSM / GPRS/ E-GPRS 850	SA110330C13-1
SAR test report- GSM / GPRS/ E-GPRS 1900	
SAR test report-WCDMA	
RF Exposure (For Bluetooth)	SA110330C13-2

2. The communicated functions of EUT listed as below:

		850MHz	1700MHz	1900MHz	
2G	**GSM**	√		√	**With 802.11b/g/n + Bluetooth + GPS**
	GPRS	√		√	
	E-GPRS	√		√	
3G	**WCDMA**		√		
	HSDPA		√		
	HSUPA		√		

3. The EUT has following accessories.

NO.	PRODUCT	BRAND	MODEL	DESCRIPTION
1	Power Adapter	hTC	TC X250 (X= U, B, E, C, A)	I/P: 100-240Vac, 200mA, 50-60Hz O/P: 5Vdc, 1A Manufacture: Emerson
2				I/P: 100-240Vac, 200mA, 50-60Hz O/P: 5Vdc, 1A Manufacture: Delta
3				I/P: 100-240Vac, 200mA, 50-60Hz O/P: 5Vdc, 1A Manufacture: Phihong
4	Battery	hTC	BG86100	Rating: 3.8Vdc, 1730mAh, 6.57Whr Manufacture: HT ENERGY
5				Rating: 3.7Vdc, 1730mAh, 6.40Whr Manufacture: HT ENERGY
6	USB cable	Chant Sincere Co., LTD (COXOC)	DC M410	1.30m non-shielded cable w/o core
7				1.27m non-shielded cable w/o core
8		Foxlink		1.25m non-shielded cable w/o core
9		MEC		1.27m non-shielded cable w/o core
10	Earphone cable	Merry	RC E160	1.23m non-shielded cable without core

4. The above EUT information was declared by 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 Issue 4 (2010-03)

IEEE 1528-2003

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

2.3 GENERAL INOFRMATION OF THE SAR SYSTEM

DASY4 (software 4.7 Build 80) 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 form the optical into digital electric signal of the DAE and transfers data to the PC.

EX3DV4 ISOTROPIC E-FIELD PROBE

CONSTRUCTION	Symmetrical design with triangular core Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.g., DGBE)
FREQUENCY	10 MHz > 6 GHz Linearity: ± 0.2 dB (30 MHz to 6 GHz)
DIRECTIVITY	± 0.3 dB in HSL (rotation around probe axis) ± 0.5 dB in tissue material (rotation normal to probe axis)
DYNAMIC RANGE	10 μW/g to > 100 mW/g Linearity: ± 0.2 dB (noise: typically < 1 μW/g)
DIMENSIONS	Overall length: 330 mm (Tip: 20 mm) Tip diameter: 2.5 mm (Body: 12 mm) Typical distance from probe tip to dipole centers: 1 mm
APPLICATION	High precision dosimetric measurements in any exposure scenario (e.g., very strong gradient fields). Only probe which enables compliance testing for frequencies up to 6 GHz with precision of better 30%.

NOTE

1. The Probe parameters have been calibrated by the SPEAG. Please reference “APPENDIX D” for the Calibration Certification Report.
2. For frequencies above 800MHz, calibration in a rectangular wave-guide is used, because wave-guide size is manageable.
3. For frequencies below 800MHz, 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, EN 62209-1 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.
SHELL THICKNESS	2 ± 0.2mm
FILLING VOLUME	Approx. 25liters
DIMENSIONS	Height: 810mm; Length: 1000mm; Width: 500mm

SYSTEM VALIDATION KITS:

CONSTRUCTION	Symmetrical dipole with l/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	2450MHz, 5800MHz
RETURN LOSS	> 20dB at specified validation position
POWER CAPABILITY	> 100W (f < 1GHz); > 40W (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 ε =3 and loss tangent δ =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.

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 200MOhm; the inputs are symmetrical and floating. Common mode rejection is above 80 dB.

2.4 TEST EQUIPMENT

FOR SAR MEASURENENT

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	SAM Phantom	S & P	QD000 P40 CA	TP-1202	NA	NA
2	Signal Generator	Agilent	E4438C	MY45092849	Dec. 01, 2010	Nov. 30, 2011
3	E-Field Probe	S & P	EX3DV4	3590	Feb. 25, 2011	Feb. 24, 2012
4	DAE	S & P	DAE 3	579	Sep. 20, 2010	Sep. 19, 2011
5	Robot Positioner	Staubli Unimation	NA	NA	NA	NA
6	Validation Dipole	S & P	D2450V2	716	Jan. 26, 2011	Jan. 25, 2012

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

FOR TISSUE PROPERTY

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	Network Analyzer	Agilent	E5071C	MY46104190	Apr. 15, 2011	Apr. 14, 2012
2	Dielectric Probe	Agilent	85070D	US01440176	NA	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 ±2.5% and ±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 ±2.5% (k=1). It can be substantially smaller if more accurate methods are applied.

2.5 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	$Norm_i$, 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:

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

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:

$$\text{E-fieldprobes: } E_i = \sqrt{\frac{V_1}{Norm_i \cdot ConvF}}$$

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

V_i	=compensated signal of channel I	(i = x, y, z)
$Norm_i$	=sensor sensitivity of channel i µV/(V/m)2 for E-field Probes	(i = x, y, z)
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):

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

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1'000}$$

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/cm3

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 1g and 10g 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 1g and 10g.

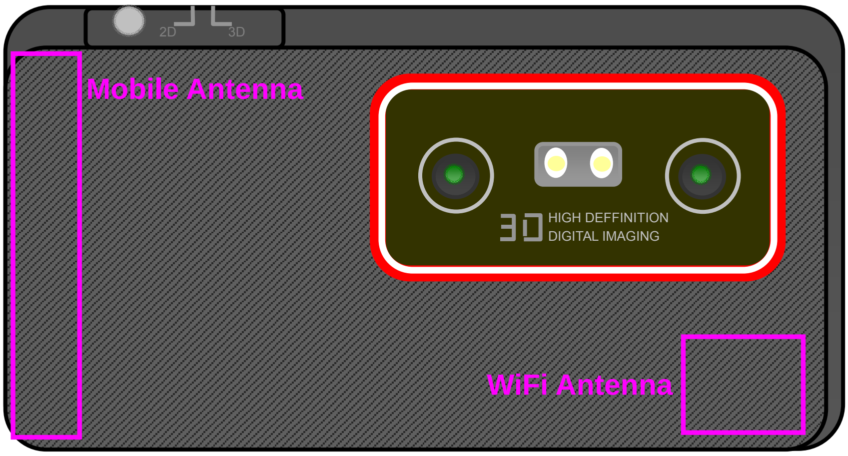
The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration 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.

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 the 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.

2.6 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

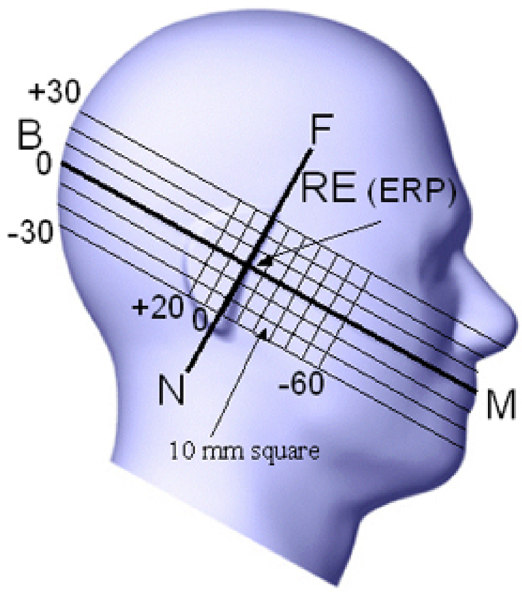
3. DESCRIPTION OF ANTENNA LOCATION



Note: The EUT size is 12.6cm *6.5cm*1.205cm > 9 cm * 5cm, therefore 10 mm is used to be test distance for body SAR evaluation.

4. DESCRIPTION OF TEST POSITION

4.1. DESCRIPTION OF TEST POSITION



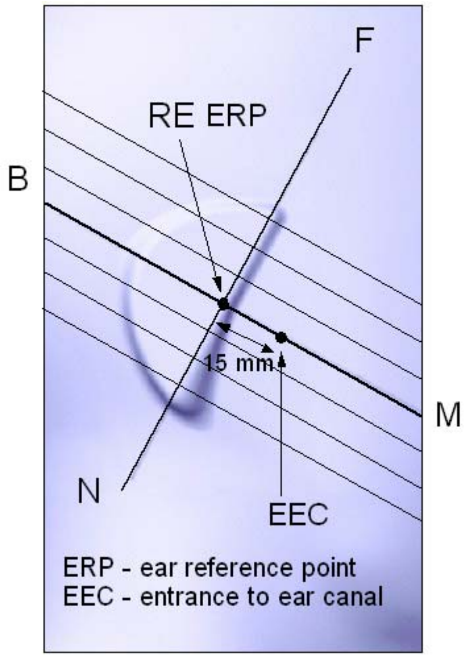


FIGURE 3.1

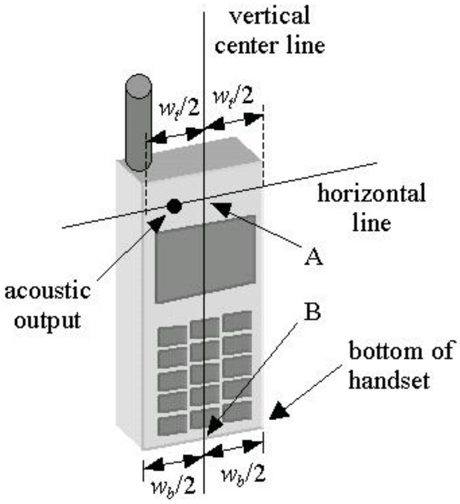


FIGURE 3.1a

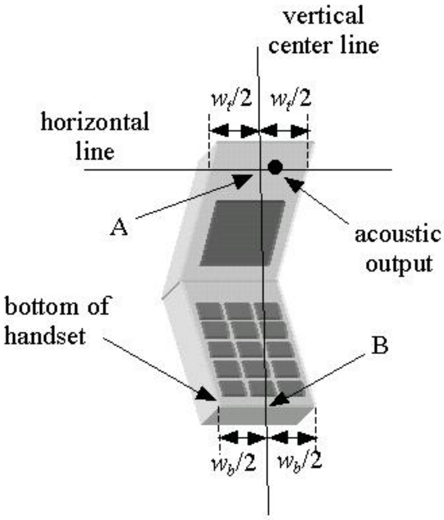
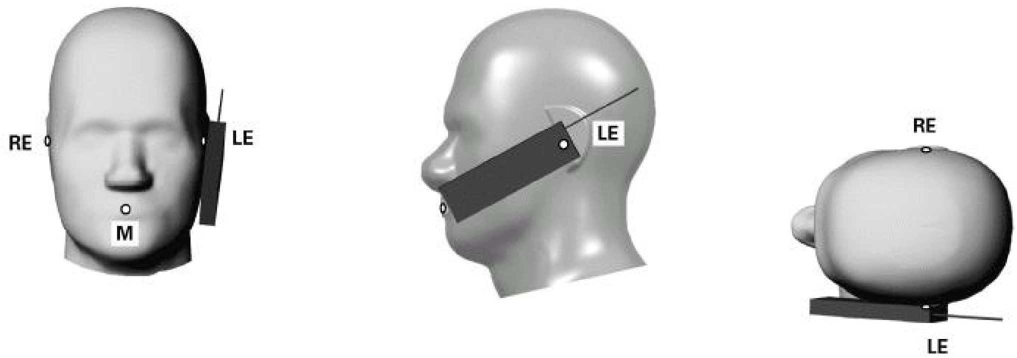


FIGURE 3.1b

4.1.1 TOUCH/CHEEK TEST POSITION

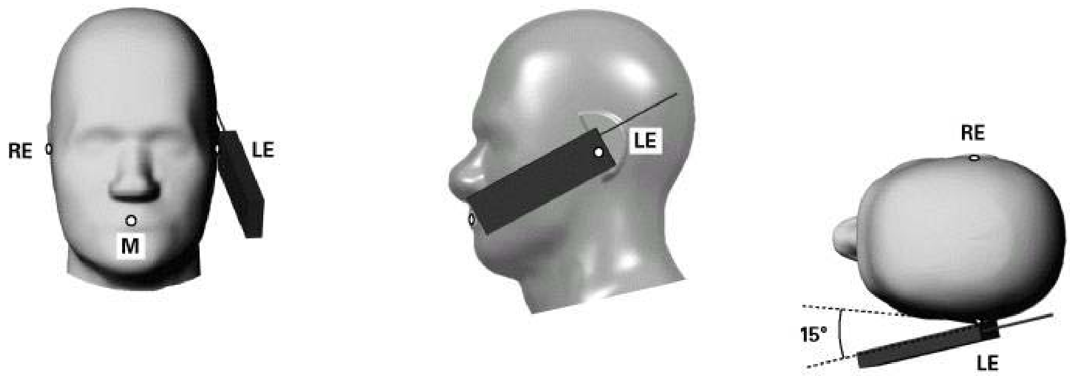
The head position in Figure 3.1, the ear reference points ERP are 15mm above entrance to ear canal along the B-M line. The line N-F (Neck-Front) is perpendicular to the B-M (Back Mouth) line. The handset device in Figure 3.1a and 3.1b,The vertical centerline pass through two points on the front side of handset: the midpoint of the width wt of the handset at the level of the acoustic output (point A) and the midpoint of the width Wb of the bottom of the handset (point B). The vertical centerline is perpendicular to the horizontal line and pass through the center of the acoustic output. The point A touches the ERP and the vertical centerline of the handset is parallel to the B-M line. While maintaining the point A contact with the ear(ERP), rotate the handset about the line NF until any point on handset is in contact with the cheek of the phantom



TOUCH/CHEEK POSITION FIGURE

4.1.2 TILT TEST POSITION

Adjust the device in the cheek position. While maintaining a point of the handset contact in the ear, move the bottom of the handset away from the mouth by an angle of 15 degrees.



TILT POSITION FIGURE

4.1.3 BODY-WORN CONFIGURATION

The handset device attached the belt clip or the holster. The keypad face of the handset is against with the bottom of the flat phantom face and the bottom of the keypad face contact to the bottom of the flat phantom.

When multiple accessories that do not contain metallic components are supplied with the device, the device may be tested with only the accessory that dictates the closest spacing to the body. When multiple accessories that contain metallic components are supplied with the device, the device must be tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component (e.g., the same metallic belt-clip used with different holsters with no other metallic components), only accessory that dictates the closest spacing to the body must be tested.

5. RECIPES FOR TISSUE SIMULATING LIQUIDS

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

The following is a short description of some typical ingredients used in the Simulating Liquids ：

• **WATER-**	Deionized water (pure H20), resistivity _16 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 (75-125mPa.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℃	f= 2450MHz ε= 39.2 ± 5% σ= 1.80 ± 5% S/m	f= 2450MHz ε= 52.7 ± 5% σ= 1.95 ± 5% 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 30min. 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 (±1°).
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 ε'=10.0, ε''=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 $\sigma = \omega\, \varepsilon_0\, \varepsilon'' = \varepsilon''\, f\,[\mathrm{GHz}] / 18$.
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 900MHz) and press ‘Option’-button.
14. Select the current medium for the frequency of the validation (e.g. Setup Medium Brain 900MHz).

TISSUE TYPE		HEAD		
LIQUID TYPE		HSL-2450		
SIMULATING LIQUID TEMP.		21.7		
TEST DATE		May 13, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
2437	Permitivity (ε)	39.22	40.83	4.11
2450		39.20	40.68	3.78
2437	Conductivity (σ) S/m	1.79	1.82	1.68
2450		1.80	1.86	3.33

TISSUE TYPE		BODY		
LIQUID TYPE		MSL-2450		
SIMULATING LIQUID TEMP.		21.1		
TEST DATE		May 13, 2011		
TESTED BY		Morrison Huang		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
2437	Permitivity (ε)	52.72	54.04	2.50
2450		52.70	53.92	2.31
2437	Conductivity (σ) S/m	1.94	1.95	0.52
2450		1.95	1.98	1.54

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 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 ±0.02dB.

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 ±0.1mm). In that case it is better to abort the system performance check and stir the liquid.

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 ±0.1mm.

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

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

6.2 VALIDATION RESULTS

SYSTEM VALIDATION TEST OF SIMULATING LIQUID					
FREQUENCY (MHz)	**REQUIRED SAR (mW/g)**	**MEASURED SAR (mW/g)**	**DEVIATION (%)**	**SEPARATION DISTANCE**	**TESTED DATE**
HSL 2450	13.60 (1g)	12.9	-5.15	10mm	May 13, 2011
MSL 2450	13.40 (1g)	12.5	-6.72	10mm	May 13, 2011
TESTED BY	Morrison Huang				

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

6.3 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	5.50	Normal	1	1	1	5.50	5.50	∞
Axial Isotropy	0.25	Rectangular	$\sqrt{3}$	0.7	0.7	0.10	0.10	∞
Hemispherical Isotropy	1.30	Rectangular	$\sqrt{3}$	0.7	0.7	0.53	0.53	∞
Boundary effects	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	0.30	Rectangular	$\sqrt{3}$	1	1	0.17	0.17	∞
System Detection Limits	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	0.30	Normal	1	1	1	0.30	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	1	0.46	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1	1.50	1.50	∞
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	9
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	9
Probe Positioner	0.40	Rectangular	$\sqrt{3}$	1	1	0.23	0.23	∞
Probe Positioning	2.90	Rectangular	$\sqrt{3}$	1	1	1.67	1.67	∞
Max. SAR Eval.	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Test sample related								
Sample positioning	1.90	Normal	1	1	1	1.90	1.90	4
Device holder uncertainty	2.80	Normal	1	1	1	2.80	2.80	4
Output power variation-SAR drift measurement	4.50	Rectangular	$\sqrt{3}$	1	1	2.60	2.60	1
Dipole Related								
Dipole Axis to Liquid Distance	1.60	Rectangular	$\sqrt{3}$	1	1	0.92	0.92	4
Input Power Drift	0.90	Rectangular	$\sqrt{3}$	1	1	0.52	0.52	1
Phantom and Tissue parameters								
Phantom Uncertainty	4.00	Rectangular	$\sqrt{3}$	1	1	2.31	2.31	∞
Liquid Conductivity (target)	5.00	Rectangular	$\sqrt{3}$	0.64	0.43	1.85	1.24	∞
Liquid Conductivity (measurement)	3.33	Normal	1	0.64	0.43	2.13	1.43	9
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	4.11	Normal	1	0.6	0.49	2.47	2.01	9
Combined Standard Uncertainty						**9.20**	**8.79**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**18.40**	**17.58**	

7. TEST RESULTS

7.1 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 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 3mm and maintained at a constant distance of ±0.5mm during a zoom scan to determine peak SAR locations. The distance is 2mm between the first measurement point and the bottom surface of the phantom.

The measurement time is 0.5s 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 2mm 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 ±5%.

7.2 DESCRIPTION OF TEST CONDITION

TEST DATE	TEMPERATURE(°C)		HUMIDITY(%RH)	TESTED BY
	AIMBENT	LIQUID		
May 13, 2011	22.7	21.7	58	Morrison Huang
May 13, 2011	22.3	21.1	59	Morrison Huang

7.3 MEASURED SAR RESULTS

HEAD POSITION					
		RIGHT		LEFT	
CHAN.	FREQ. (MHz)	CHEEK	TILT	CHEEK	TILT
802.11b		Battery (Manufacture: HT ENERGY, Rating: 3.8Vdc)			
6	2437 (Mid.)	**0.446**	0.336	0.390	0.291
802.11b		Battery (Manufacture: HT ENERGY, Rating: 3.7Vdc)			
6	2437 (Mid.)	**0.446**	0.321	0.349	0.301

BODY POSITION						
Distance between EUT and phantom is 10mm						
CHAN.	FREQ. (MHz)	Bottom	Front	Right edge	Left edge	Tip
802.11b		Battery (Manufacture: HT ENERGY, Rating: 3.8Vdc)				
6	2437 (Mid.)	0.199	0.074	0.017	0.081	0.148
802.11b		Battery (Manufacture: HT ENERGY, Rating: 3.7Vdc)				
6	2437 (Mid.)	**0.222**	0.057	0.014	0.088	0.178

NOTE:

1. In this testing, the limit for General Population Spatial Peak averaged over 1g, **1.6 W/kg**, is applied.
2. Please see the Appendix A for the data.
3. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.
4. Temperature of Liquid is 22±1˚C
5. SAR is not required for 802.11g/ 11n (20MHz) channels when the maximum average output power is less than ¼ dB higher than that measured on the corresponding 802.11b channels.

7.4 POWER DRIFT TABLE

Test Mode	Configuration	Test Position	Communication Mode	Test Channel	Test Frequency (MHz)	Power (dBm)		Power Drift (%)
						Begin	After	
1	HT ENERGY Battery (3.8Vdc), without headset	Right Head Cheek	802.11b	6	2437	18.4	18.2	-4.50
2		Right Head Tilt				18.4	18.3	-2.28
3		Left Head Cheek				18.4	18.3	-2.28
4		Left Head Tilt				18.4	18.3	-2.28
5	HT ENERGY Battery (3.7Vdc), without headset	Right Head Cheek	802.11b	6	2437	18.4	18.3	-2.28
6		Right Head Tilt				18.4	18.2	-4.50
7		Left Head Cheek				18.4	18.3	-2.28
8		Left Head Tilt				18.4	18.3	-2.28
9	HT ENERGY Battery (3.8Vdc), with headset	Bottom 10mm	802.11b	6	2437	18.4	18.3	-2.28
10	HT ENERGY Battery (3.7Vdc), with headset					18.4	18.3	-2.28
11	HT ENERGY Battery (3.8Vdc), with headset	Front 10mm	802.11b	6	2437	18.4	18.3	-2.28
12	HT ENERGY Battery (3.7Vdc), with headset					18.4	18.3	-2.28
13	HT ENERGY Battery (3.8Vdc), with headset	Right edge 10mm	802.11b	6	2437	18.4	18.3	-2.28
14	HT ENERGY Battery (3.7Vdc), with headset					18.4	18.3	-2.28
15	HT ENERGY Battery (3.8Vdc), with headset	Left edge 10mm	802.11b	6	2437	18.4	18.3	-2.28
16	HT ENERGY Battery (3.7Vdc), with headset					18.4	18.3	-2.28
17	HT ENERGY Battery (3.8Vdc), with headset	Tip 10mm	802.11b	6	2437	18.4	18.2	-4.50
18	HT ENERGY Battery (3.7Vdc), with headset					18.4	18.3	-2.28

7.5 NO SIMULTANEOUS SAR JUSTIFICATION

The device has mobile (GSM / WCDMA), Wi-Fi and Bluetooth function.
850 and 1900MHz band can not be used at the same time. GSM and WCDMA can not transmit simultaneously. Wi-Fi and Bluetooth use same antenna but both functions will not active in the same time since time-sharing technology is used.

SAR evaluation for Transmitter

Since the output power > 60/f(GHz), SAR is necessary for mobile and Wi-Fi function
The max output power of Bluetooth is 1.4mW < 24 mW (2.P_{Ref}) and antenna separation between mobile and Bluetooth is 10.15 cm > 5 cm. Therefore, SAR evaluation is not necessary.
.

Hot spot function

DTM is supported for the device. Hot spot function supports simultaneous transmission mode as below

Configuration	GSM voice	GSM data	WCDMA	WIFI	BT
1	X	O	X	O	O
2	O	O	X	O	O
3	X	X	O	O	O

Antenna separation distance (cm)

	Mobile	Wi-Fi	Bluetooth
Mobile		10.15	10.15
Wi-Fi	10.15		0
Bluetooth	10.15	0	

Note: Wi-Fi and Bluetooth use same antenna but can not work at the same time.

Sum of max SAR value for simultaneous transmission (Unit: W/kg)

Head position

Battery	Frequency band (MHz)	Test configuration		GSM+GPRS	Wi-Fi	Sum of MAX SAR value of each band
3.8Vdc	850	Right	Cheek	1.110	0.446	1.556
		Right	Tilt	0.697	0.336	1.033
		Left	Cheek	1.208	0.390	1.598
		Left	Tilt	0.599	0.291	0.890
3.8Vdc	1900	Right	Cheek	1.146	0.446	1.592
		Right	Tilt	0.700	0.336	1.036
		Left	Cheek	1.077	0.390	1.467
		Left	Tilt	0.944	0.291	1.235
3.7Vdc	850	Right	Cheek	1.146	0.446	1.592
		Right	Tilt	0.750	0.321	1.071
		Left	Cheek	1.204	0.349	1.553
		Left	Tilt	0.591	0.301	0.892
3.7Vdc	1900	Right	Cheek	1.135	0.446	1.581
		Right	Tilt	0.745	0.321	1.066
		Left	Cheek	1.171	0.349	1.520
		Left	Tilt	0.899	0.301	1.200

Battery	Frequency band (MHz)	Test configuration		WCDMA	Wi-Fi	Sum of MAX SAR value of each band
3.8Vdc	1700	Right	Cheek	0.552	0.446	0.998
		Right	Tilt	0.318	0.336	0.654
		Left	Cheek	0.388	0.39	0.778
		Left	Tilt	0.369	0.291	0.66
3.7Vdc	1700	Right	Cheek	0.527	0.446	0.973
		Right	Tilt	0.314	0.321	0.635
		Left	Cheek	0.507	0.349	0.856
		Left	Tilt	0.354	0.301	0.655

Sum of max SAR value for all test configurations is < 1.6 W/kg, simultaneous transmission SAR is not required for head position

Body position

Battery	Frequency band (MHz)	Test side	GSM	Wi-Fi	Sum of MAX SAR value of each band
3.8Vdc	850	Back	0.956	0.199	1.155
	1900		1.147	0.199	1.346
3.7Vdc	850		0.858	0.222	1.080
	1900		1.104	0.222	1.326

Battery	Frequency band (MHz)	Test side	WCDMA	Wi-Fi	Sum of MAX SAR value of each band
3.8Vdc	1700	Back	0.839	0.199	1.038
3.7Vdc	1700		0.856	0.222	1.078

Sum of max SAR value for all test configurations is < 1.6 W/kg, simultaneous transmission SAR is not required for body position

Conclusion

Distance between simultaneous transmitting antennas is > 5cm and max sum of SAR value is <1.6 W / kg. Accordingly, simultaneous Transmission SAR is not required for this device.

7.6 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: This limits accord to 47 CFR 2.1093 – Safety Limit.

8. INFORMATION ON THE TESTING LABORATORIES

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

Copies of accreditation 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.

---END---

APPENDIX A: TEST DATA

Product Name: Smart Phone ; Model Number: PG86300

Liquid Level Photo

Tissue 2450MHz D=150mm

Date/Time: 2011/5/13 07:03:44

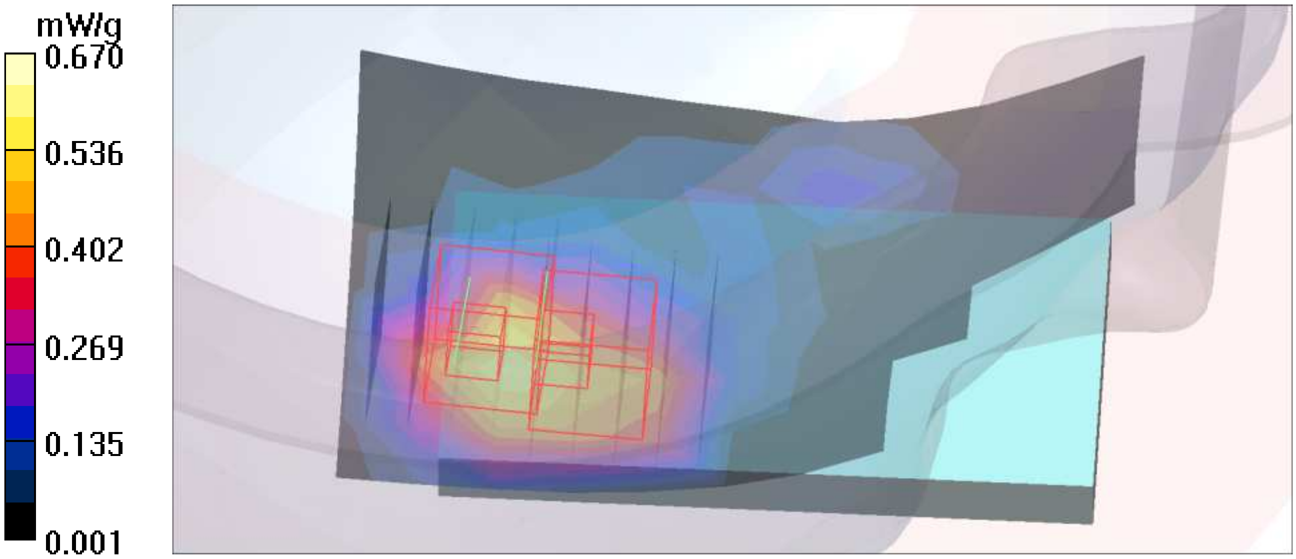
M01-Right Head-Cheek-11b-Ch6 / Bat-HT Energy 3.8VDC

Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used : f = 2437 MHz; σ = 1.82 mho/m; ε_r = 40.83; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Cheek ; Modulation type: DBPSK

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.73, 7.73, 7.73); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Middle/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.590 mW/g
Touch position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.1 V/m; Power Drift = -0.131 dB
Peak SAR (extrapolated) = 0.987 W/kg
SAR(1 g) = 0.446 mW/g; SAR(10 g) = 0.226 mW/g
Maximum value of SAR (measured) = 0.670 mW/g
Touch position - Middle/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.1 V/m; Power Drift = -0.131 dB
Peak SAR (extrapolated) = 0.940 W/kg
SAR(1 g) = 0.372 mW/g; SAR(10 g) = 0.193 mW/g
Maximum value of SAR (measured) = 0.666 mW/g



Date/Time: 2011/5/13 07:32:34

M02-Right Head-Tilt-11b-Ch6 / Bat-HT Energy 3.8VDC

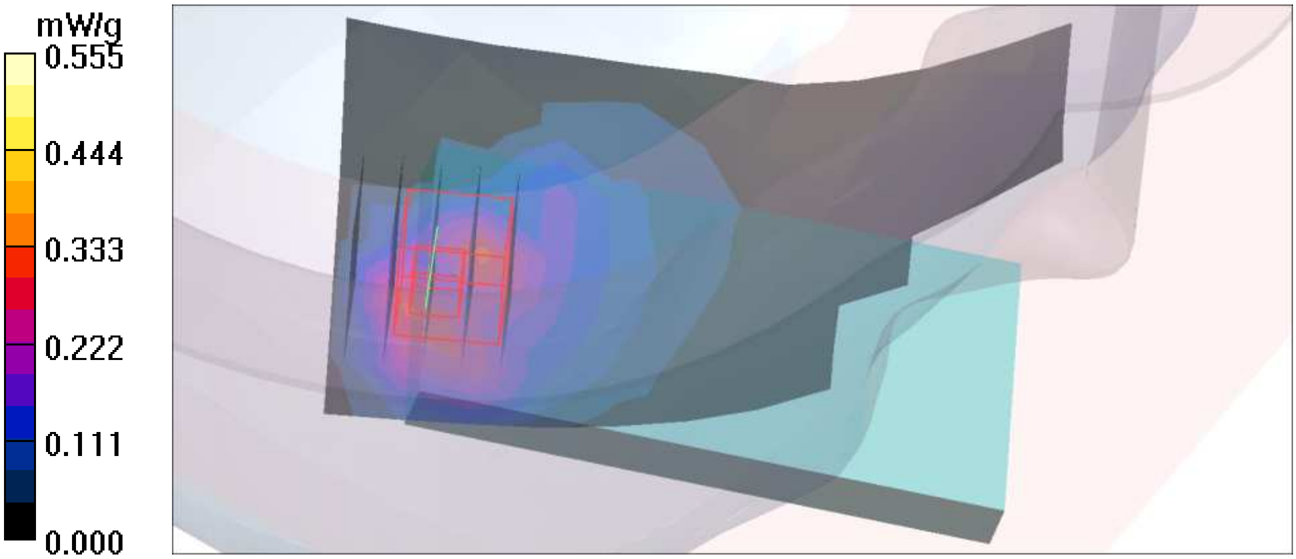
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used : f = 2437 MHz; σ = 1.82 mho/m; ε_r = 40.83; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Tilt ; Modulation type: DBPSK

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.73, 7.73, 7.73); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt position - Middle/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.315 mW/g

Tilt position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.7 V/m; Power Drift = 0.104 dB
Peak SAR (extrapolated) = 0.737 W/kg
SAR(1 g) = 0.336 mW/g; SAR(10 g) = 0.150 mW/g
Maximum value of SAR (measured) = 0.555 mW/g



Date/Time: 2011/5/13 08:10:11

M03-Left Head-Cheek-11b-Ch6 / Bat-HT Energy 3.8VDC

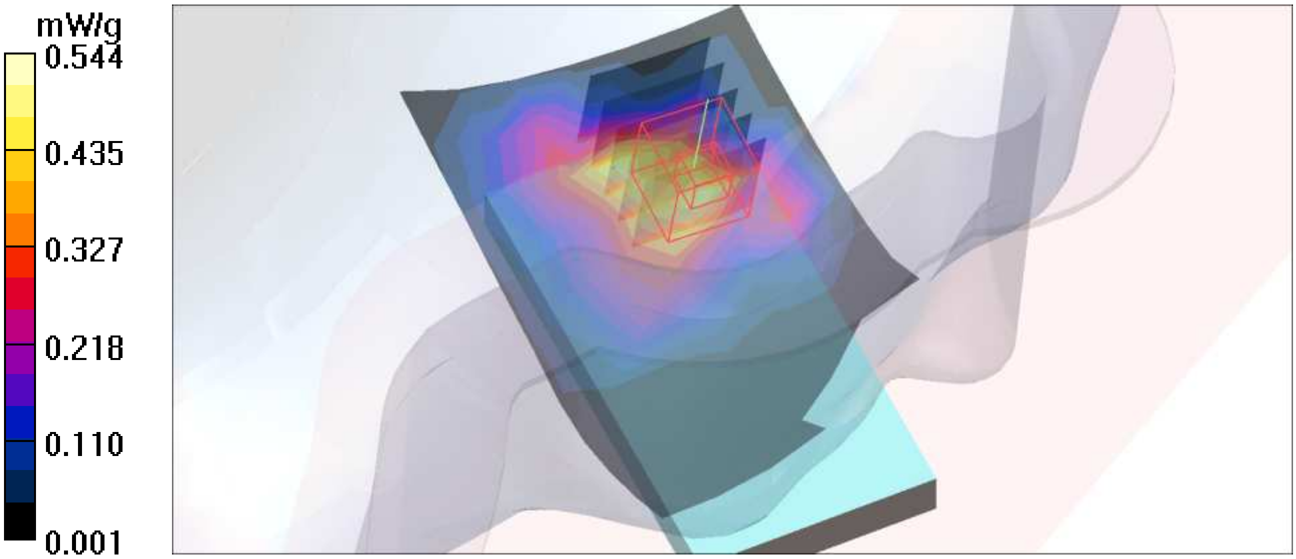
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used : f = 2437 MHz; σ = 1.82 mho/m; ε_r = 40.83; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: DBPSK

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.73, 7.73, 7.73); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Middle/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.481 mW/g

Touch position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.1 V/m; Power Drift = -0.129 dB
Peak SAR (extrapolated) = 0.734 W/kg
SAR(1 g) = 0.390 mW/g; SAR(10 g) = 0.200 mW/g
Maximum value of SAR (measured) = 0.544 mW/g



Date/Time: 2011/5/13 08:27:02

M04-Left Head-Tilt-11b-Ch6 / Bat-HT Energy 3.8VDC

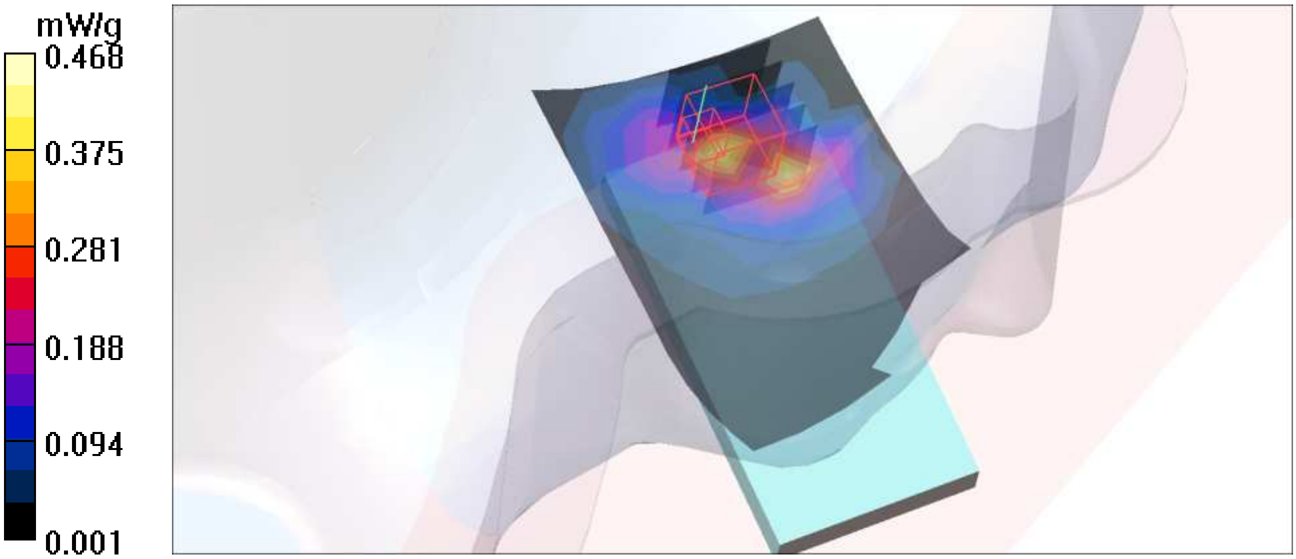
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used : f = 2437 MHz; σ = 1.82 mho/m; ε_r = 40.83; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Tilt ; Modulation type: DBPSK

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.73, 7.73, 7.73); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt position - Middle/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.399 mW/g

Tilt position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.2 V/m; Power Drift = -0.096 dB
Peak SAR (extrapolated) = 0.635 W/kg
SAR(1 g) = 0.291 mW/g; SAR(10 g) = 0.133 mW/g
Maximum value of SAR (measured) = 0.468 mW/g



Date/Time: 2011/5/13 08:46:42

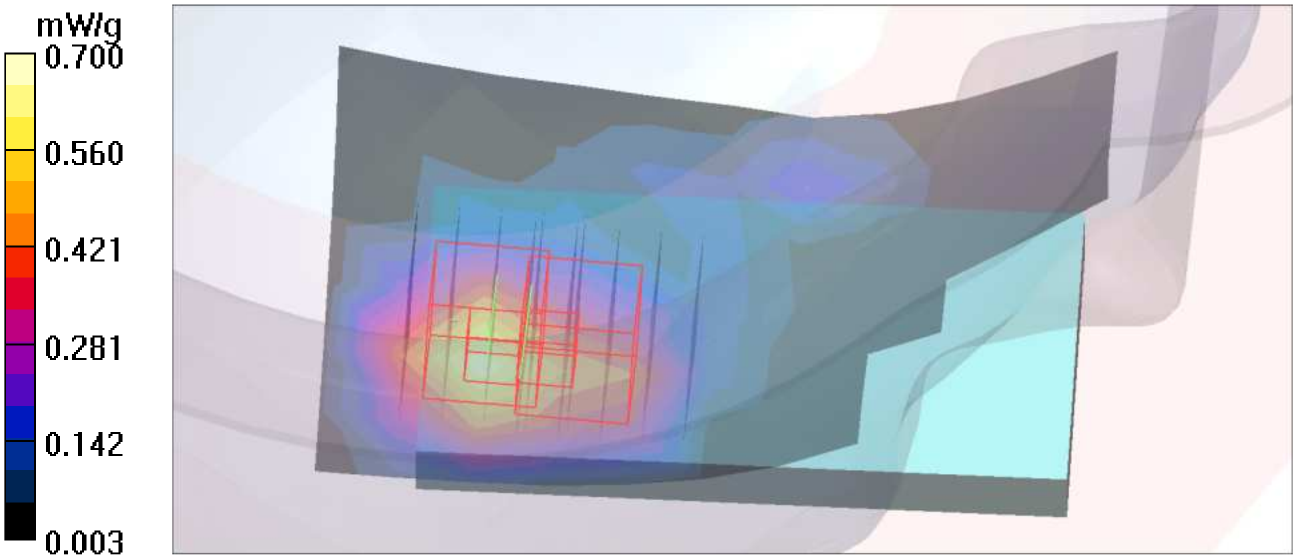
M05-Right Head-Cheek-11b-Ch6 / Bat-HT Energy 3.7VDC

Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used : f = 2437 MHz; σ = 1.82 mho/m; ε_r = 40.83; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Cheek ; Modulation type: DBPSK

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.73, 7.73, 7.73); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Middle/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.657 mW/g
Touch position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.4 V/m; Power Drift = -0.037 dB
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.446 mW/g; SAR(10 g) = 0.225 mW/g
Maximum value of SAR (measured) = 0.700 mW/g
Touch position - Middle/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.4 V/m; Power Drift = -0.037 dB
Peak SAR (extrapolated) = 0.890 W/kg
SAR(1 g) = 0.349 mW/g; SAR(10 g) = 0.183 mW/g
Maximum value of SAR (measured) = 0.615 mW/g



Date/Time: 2011/5/13 09:06:58

M06-Right Head-Tilt-11b-Ch6 / Bat-HT Energy 3.7VDC

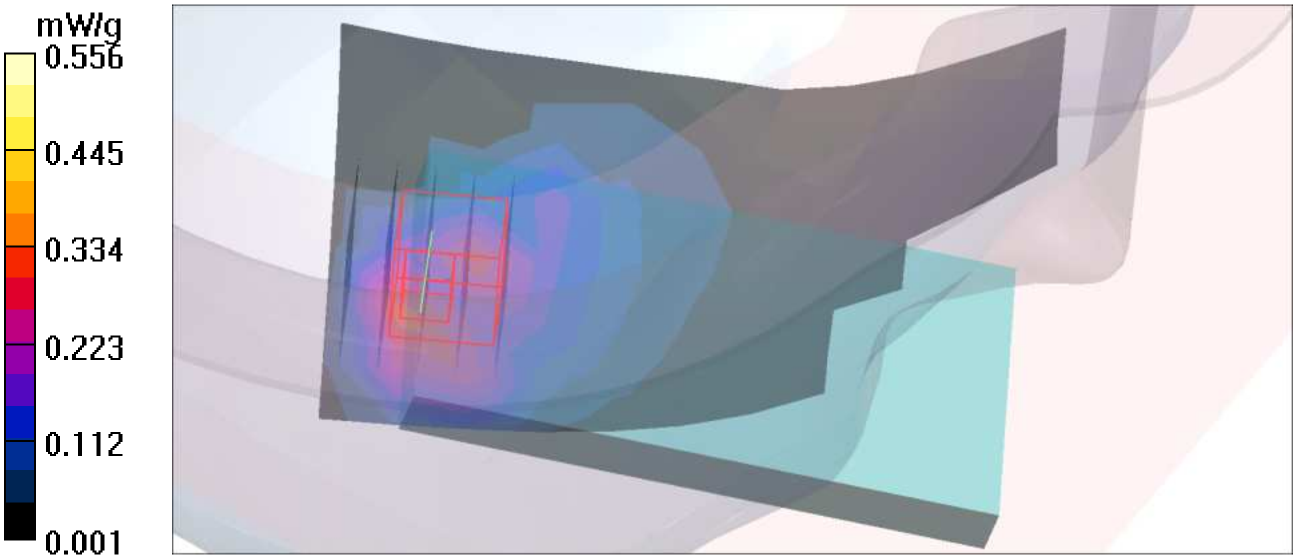
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used : f = 2437 MHz; σ = 1.82 mho/m; ε_r = 40.83; ρ = 1000 kg/m^3
Phantom section: Right Section ; DUT test position : Tilt ; Modulation type: DBPSK

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.73, 7.73, 7.73); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt position - Middle/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.324 mW/g

Tilt position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.1 V/m; Power Drift = 0.167 dB
Peak SAR (extrapolated) = 0.725 W/kg
SAR(1 g) = 0.321 mW/g; SAR(10 g) = 0.142 mW/g
Maximum value of SAR (measured) = 0.556 mW/g



Date/Time: 2011/5/13 09:26:21

M07-Left Head-Cheek-11b-Ch6 / Bat-HT Energy 3.7VDC

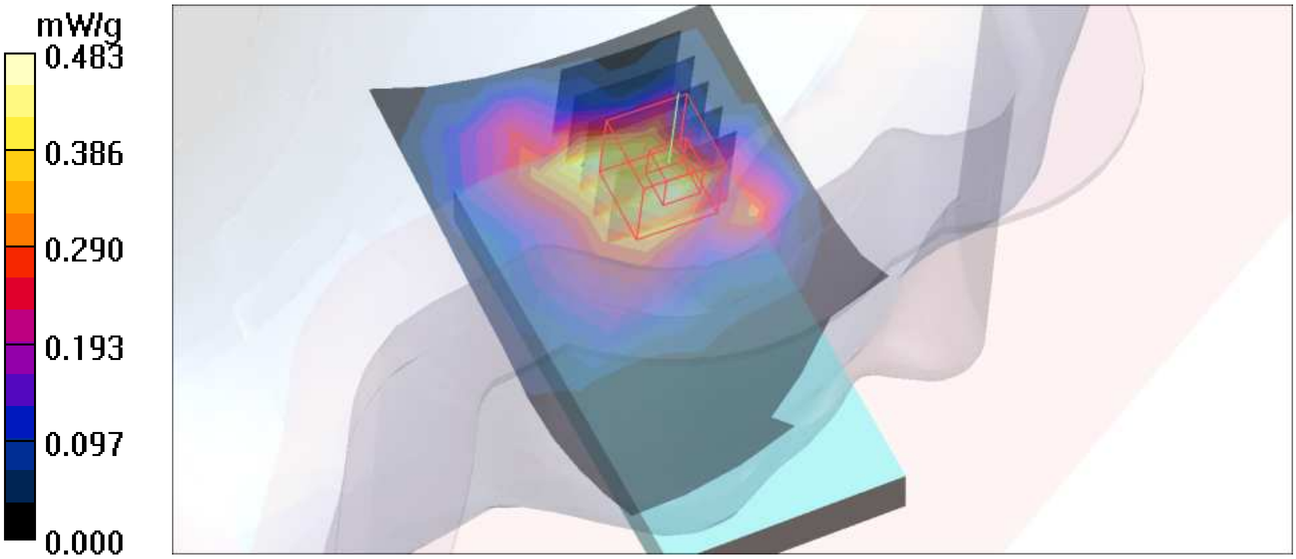
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used : f = 2437 MHz; σ = 1.82 mho/m; ε_r = 40.83; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Cheek ; Modulation type: DBPSK

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.73, 7.73, 7.73); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Touch position - Middle/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.460 mW/g

Touch position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.9 V/m; Power Drift = -0.146 dB
Peak SAR (extrapolated) = 0.703 W/kg
SAR(1 g) = 0.349 mW/g; SAR(10 g) = 0.174 mW/g
Maximum value of SAR (measured) = 0.483 mW/g



Date/Time: 2011/5/13 09:42:43

M08-Left Head-Tilt-11b-Ch6 / Bat-HT Energy 3.7VDC

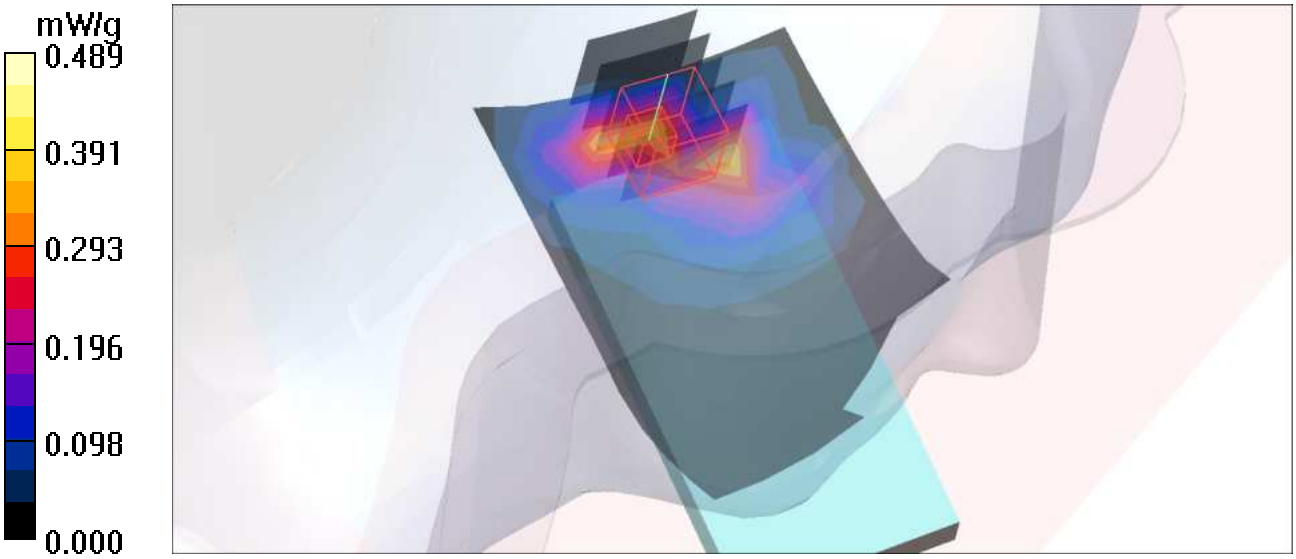
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1
Medium: HSL2450 Medium parameters used : f = 2437 MHz; σ = 1.82 mho/m; ε_r = 40.83; ρ = 1000 kg/m^3
Phantom section: Left Section ; DUT test position : Tilt ; Modulation type: DBPSK

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.73, 7.73, 7.73); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Tilt position - Middle/Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.353 mW/g

Tilt position - Middle/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.5 V/m; Power Drift = -0.063 dB
Peak SAR (extrapolated) = 0.653 W/kg
SAR(1 g) = 0.301 mW/g; SAR(10 g) = 0.137 mW/g
Maximum value of SAR (measured) = 0.489 mW/g



Date/Time: 2011/5/13 11:50:51

M09-Bottom-11b-Ch6 / Bat-HT Energy 3.8VDC

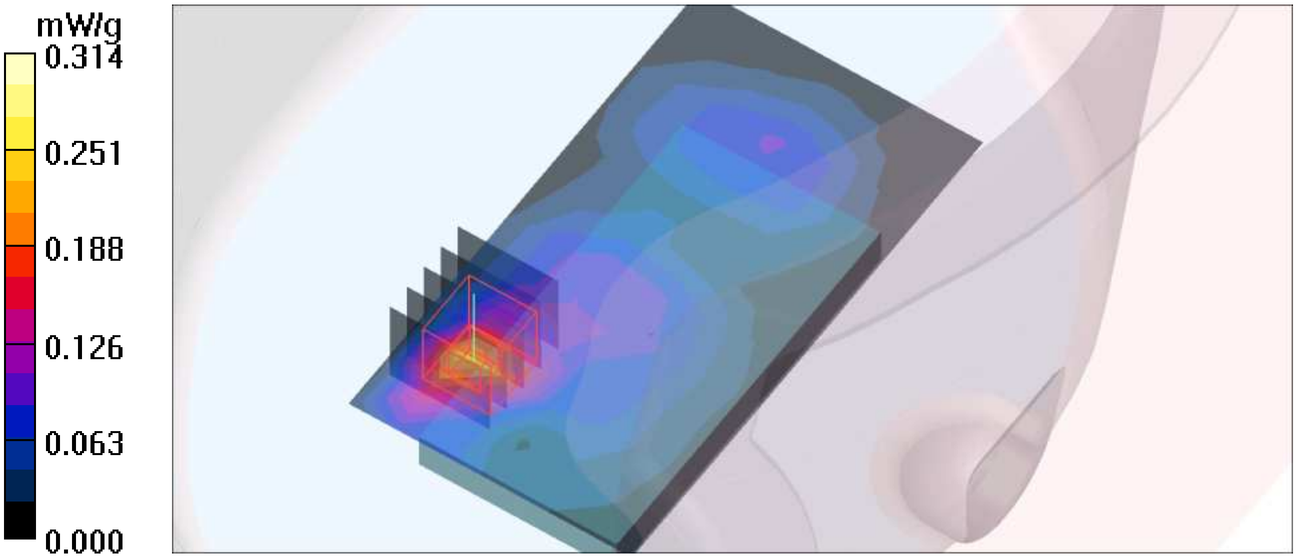
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.248 mW/g

Body Position - Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.98 V/m; Power Drift = 0.034 dB
Peak SAR (extrapolated) = 0.445 W/kg
SAR(1 g) = 0.199 mW/g; SAR(10 g) = 0.088 mW/g
Maximum value of SAR (measured) = 0.314 mW/g



Date/Time: 2011/5/13 13:04:40

M10-Bottom-11b-Ch6 / Bat-HT Energy 3.7VDC

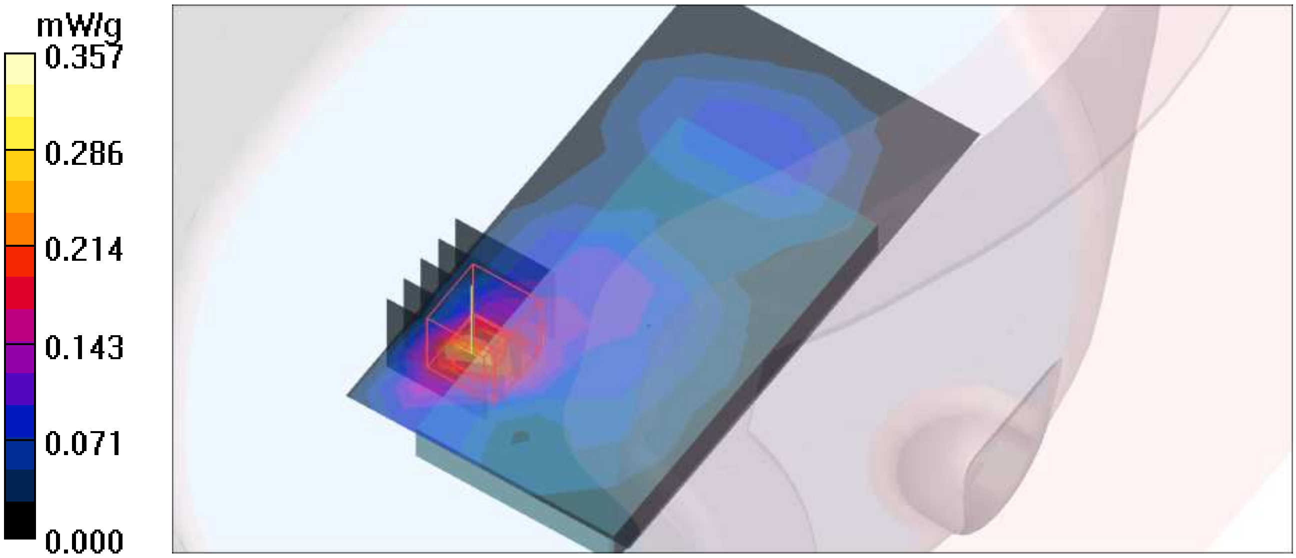
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.252 mW/g

Body Position - Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.22 V/m; Power Drift = 0.099 dB
Peak SAR (extrapolated) = 0.510 W/kg
SAR(1 g) = 0.222 mW/g; SAR(10 g) = 0.097 mW/g
Maximum value of SAR (measured) = 0.357 mW/g



Date/Time: 2011/5/13 12:20:26

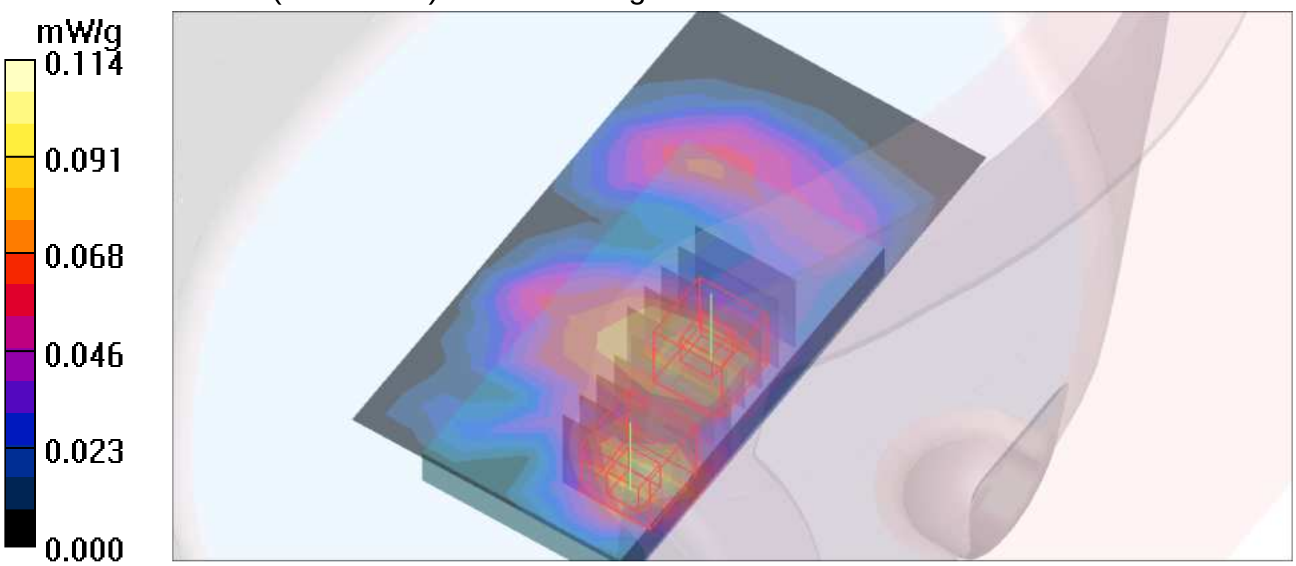
M11-Front-11b-Ch6 / Bat-HT Energy 3.8VDC

Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The front side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.101 mW/g
Body Position - Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.04 V/m; Power Drift = -0.169 dB
Peak SAR (extrapolated) = 0.160 W/kg
SAR(1 g) = 0.074 mW/g; SAR(10 g) = 0.035 mW/g
Maximum value of SAR (measured) = 0.114 mW/g
Body Position - Mid/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.04 V/m; Power Drift = -0.169 dB
Peak SAR (extrapolated) = 0.174 W/kg
SAR(1 g) = 0.074 mW/g; SAR(10 g) = 0.035 mW/g
Maximum value of SAR (measured) = 0.088 mW/g



Date/Time: 2011/5/13 12:44:07

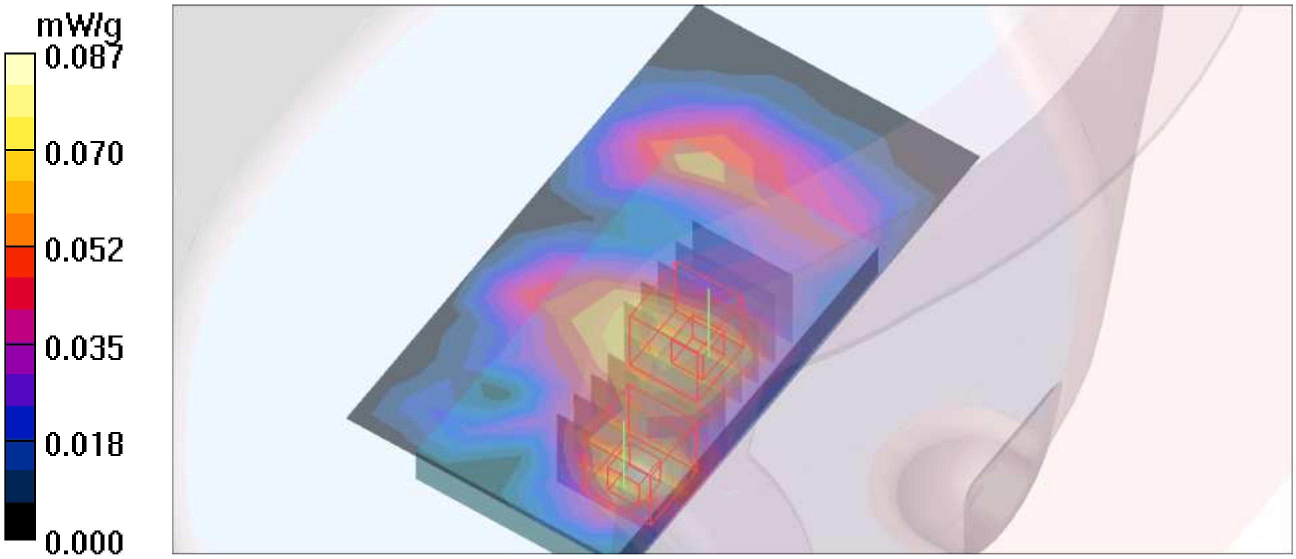
M12-Front-11b-Ch6 / Bat-HT Energy 3.7VDC

Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The front side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.087 mW/g
Body Position - Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.64 V/m; Power Drift = 0.117 dB
Peak SAR (extrapolated) = 0.124 W/kg
SAR(1 g) = 0.057 mW/g; SAR(10 g) = 0.026 mW/g
Maximum value of SAR (measured) = 0.086 mW/g
Body Position - Mid/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.64 V/m; Power Drift = 0.117 dB
Peak SAR (extrapolated) = 0.105 W/kg
SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.024 mW/g
Maximum value of SAR (measured) = 0.079 mW/g



Date/Time: 2011/5/13 14:22:24

M13-Right edge-11b-Ch6 / Bat-HT Energy 3.8VDC

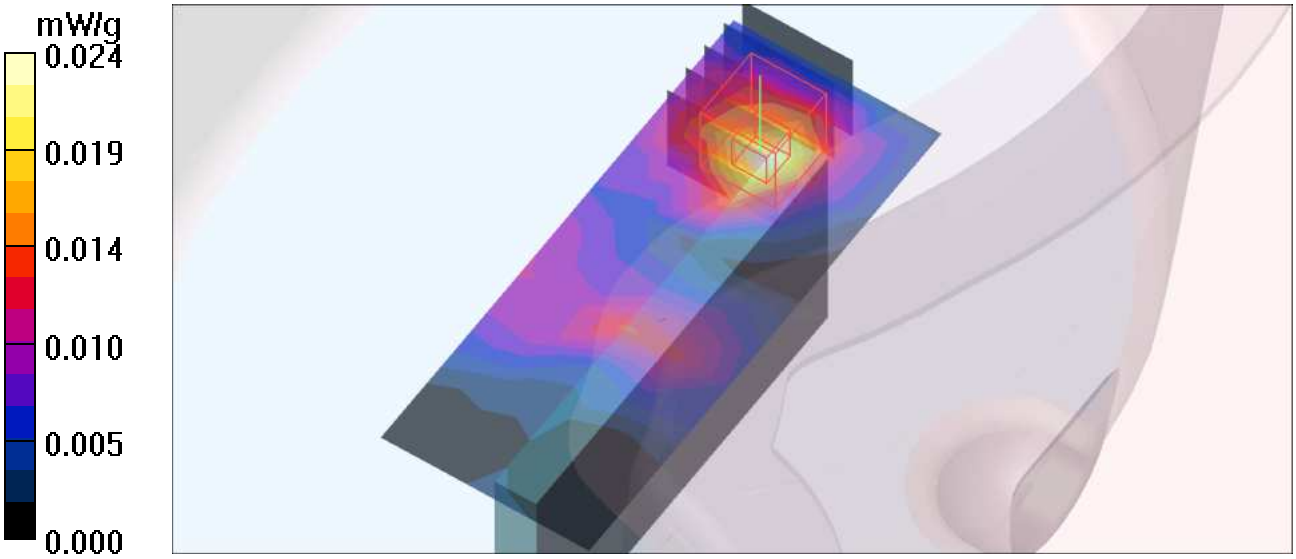
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The right edge side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.024 mW/g

Body Position - Mid/Zoom Scan(5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.75 V/m; Power Drift = 0.034 dB
Peak SAR (extrapolated) = 0.032 W/kg
SAR(1 g) = 0.017 mW/g; SAR(10 g) = 0.00871 mW/g



Date/Time: 2011/5/13 14:03:59

M14-Right edge-11b-Ch6 / Bat-HT Energy 3.7VDC

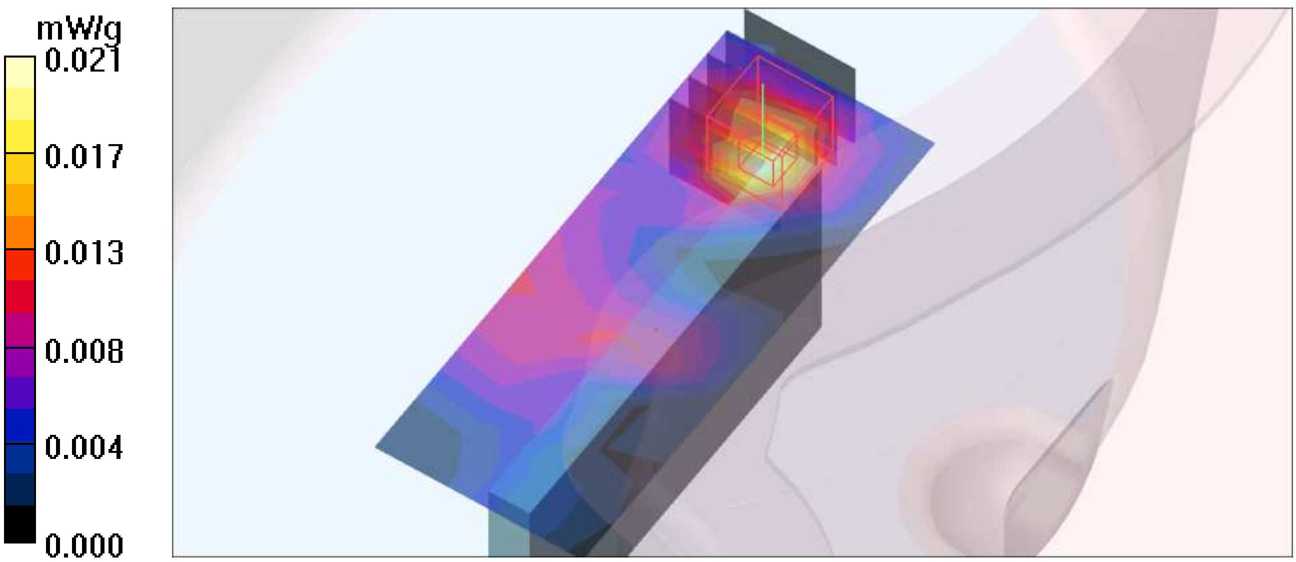
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The right edge side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.021 mW/g

Body Position - Mid/Zoom Scan(5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.52 V/m; Power Drift = 0.012 dB
Peak SAR (extrapolated) = 0.026 W/kg
SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00708 mW/g
Maximum value of SAR (measured) = 0.020 mW/g



Date/Time: 2011/5/13 14:36:41

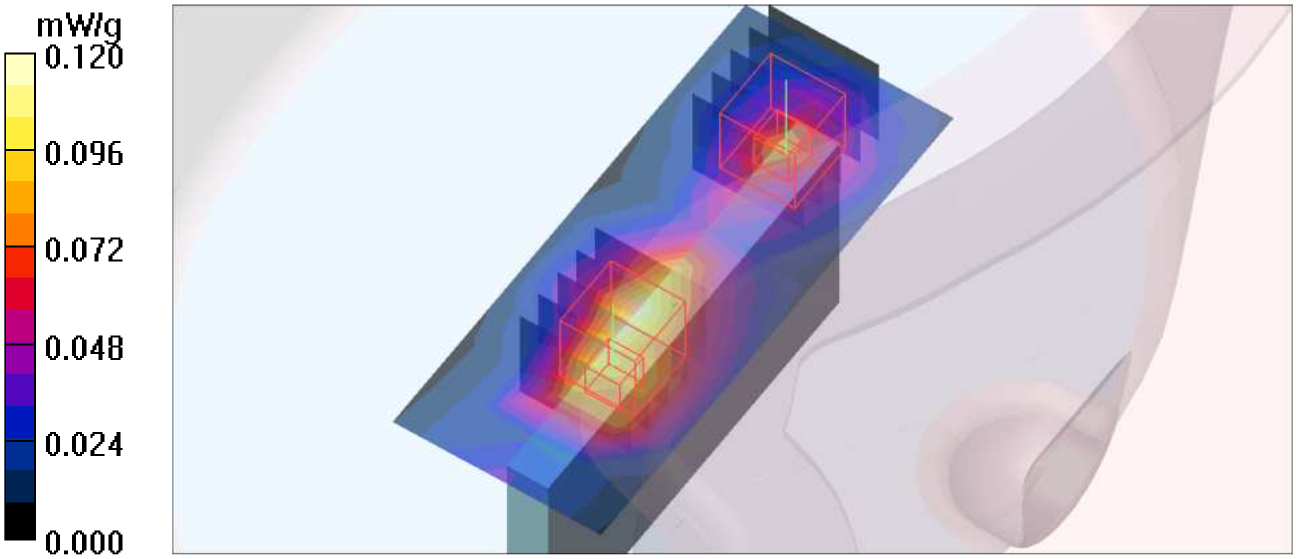
M15-Left edge-11b-Ch6 / Bat-HT Energy 3.8VDC

Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The left edge side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.115 mW/g
Body Position - Mid/Zoom Scan(5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.69 V/m; Power Drift = -0.018 dB
Peak SAR (extrapolated) = 0.163 W/kg
SAR(1 g) = 0.081 mW/g; SAR(10 g) = 0.042 mW/g
Maximum value of SAR (measured) = 0.120 mW/g
Body Position - Mid/Zoom Scan(5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.69 V/m; Power Drift = -0.018 dB
Peak SAR (extrapolated) = 0.112 W/kg
SAR(1 g) = 0.057 mW/g; SAR(10 g) = 0.030 mW/g
Maximum value of SAR (measured) = 0.084 mW/g



Date/Time: 2011/5/13 15:22:37

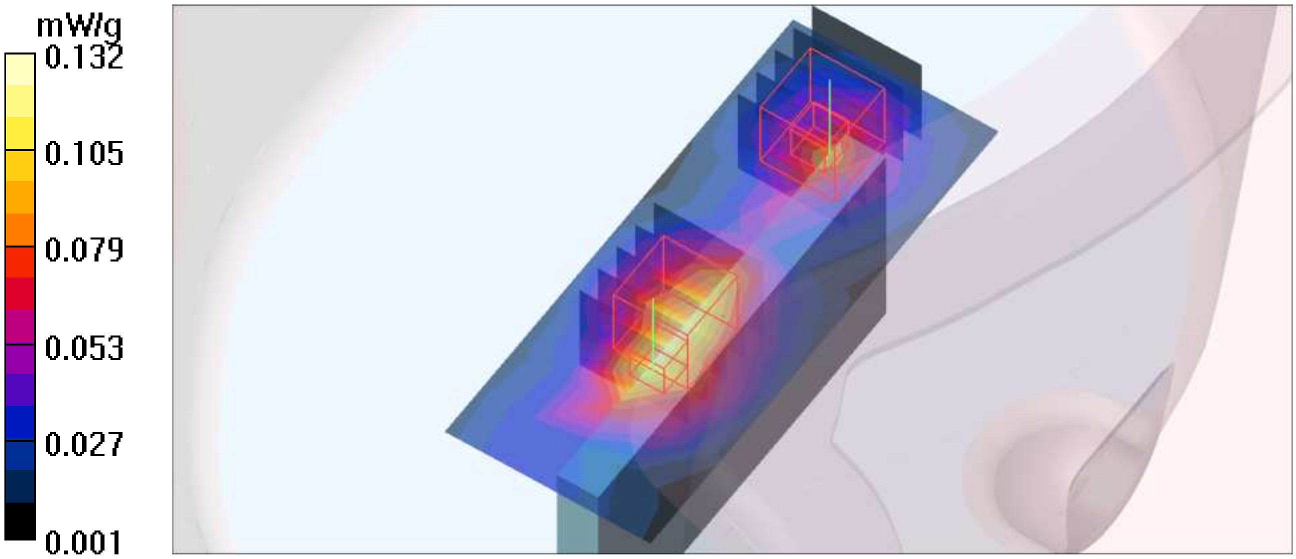
M16-Left edge-11b-Ch6 / Bat-HT Energy 3.7VDC

Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The left edge side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (5x11x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.121 mW/g
Body Position - Mid/Zoom Scan(5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.13 V/m; Power Drift = -0.057 dB
Peak SAR (extrapolated) = 0.177 W/kg
SAR(1 g) = 0.088 mW/g; SAR(10 g) = 0.046 mW/g
Maximum value of SAR (measured) = 0.132 mW/g
Body Position - Mid/Zoom Scan(5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.13 V/m; Power Drift = -0.057 dB
Peak SAR (extrapolated) = 0.117 W/kg
SAR(1 g) = 0.061 mW/g; SAR(10 g) = 0.031 mW/g
Maximum value of SAR (measured) = 0.085 mW/g



Date/Time: 2011/5/13 16:39:47

M17-Tip-11b-Ch6 / Bat-HT Energy 3.8VDC

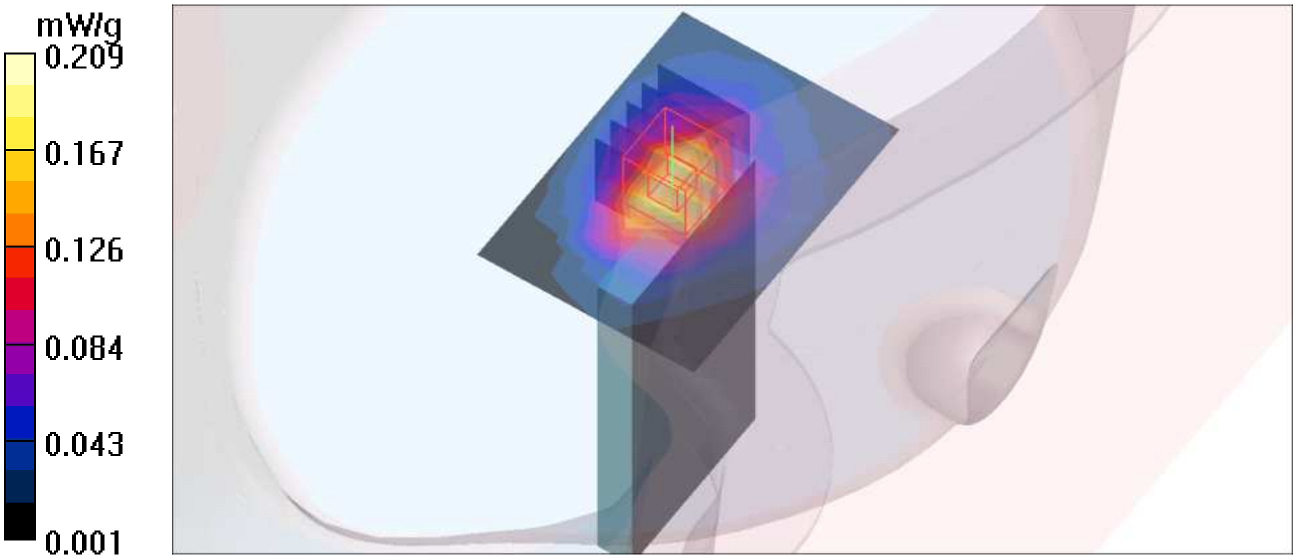
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type:DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The tip side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (6x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.187 mW/g

Body Position - Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.4 V/m; Power Drift = 0.124 dB
Peak SAR (extrapolated) = 0.271 W/kg
SAR(1 g) = 0.148 mW/g; SAR(10 g) = 0.080 mW/g
Maximum value of SAR (measured) = 0.209 mW/g



Date/Time: 2011/5/13 15:46:24

M18-Tip-11b-Ch6 / Bat-HT Energy 3.7VDC

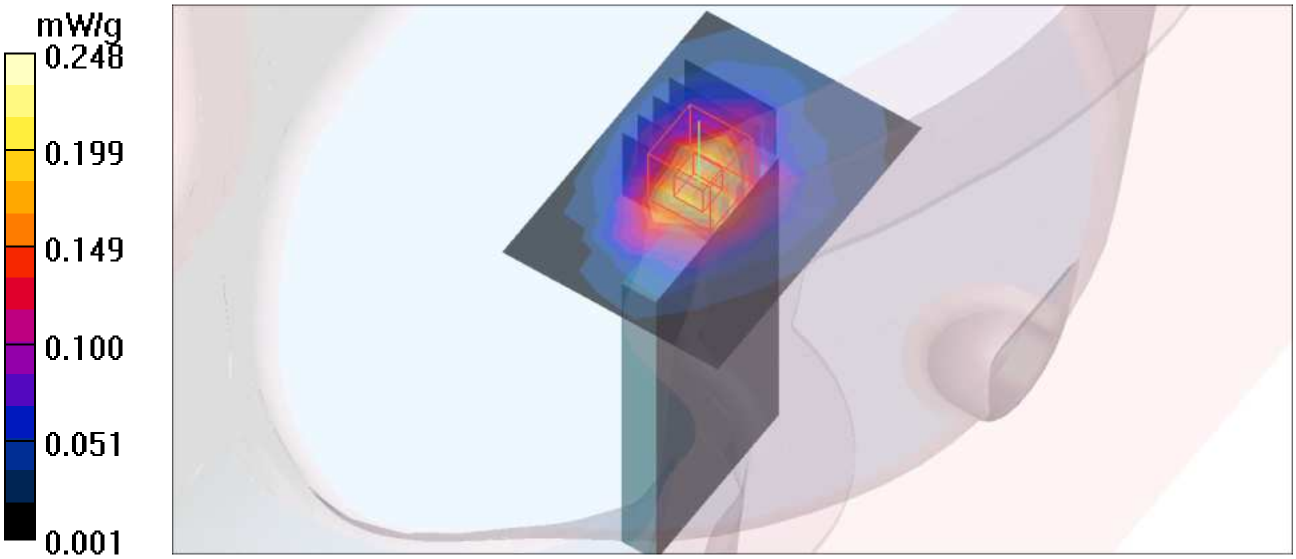
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 54.04; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The tip side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Body Position - Mid/Area Scan (6x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.224 mW/g

Body Position - Mid/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.4 V/m; Power Drift = 0.032 dB
Peak SAR (extrapolated) = 0.323 W/kg
SAR(1 g) = 0.178 mW/g; SAR(10 g) = 0.096 mW/g
Maximum value of SAR (measured) = 0.248 mW/g



Date/Time: 2011/5/13 03:51:54

SystemPerformanceCheck-D2450V2-HSL2450MHz

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

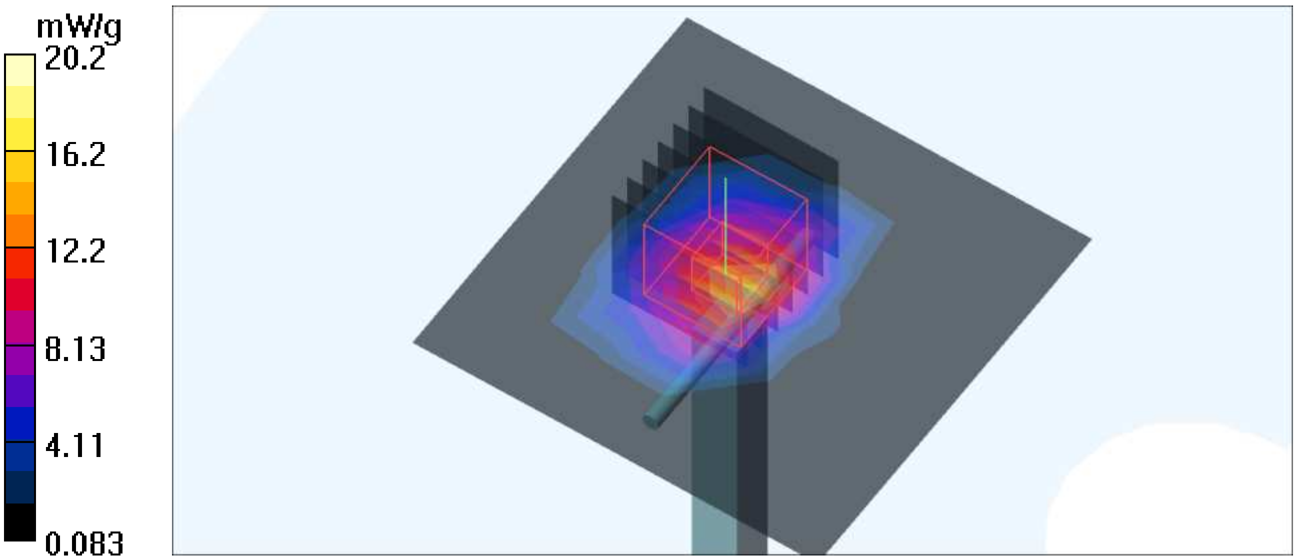
Communication System: CW ; Frequency: 2450 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: HSL2450;Medium parameters used: f = 2450 MHz; σ = 1.86 mho/m; ε_r = 40.68; ρ = 1000 kg/m^3 ; Liquid level : 150 mm
Phantom section: Flat Section ; Separation distance : 10 mm (The feet point of the dipole to the Phantom)Air temp. : 22.7 degrees ; Liquid temp. : 21.7 degrees

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.73, 7.73, 7.73); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 15.8 mW/g

d=10mm, Pin=250mW/Zoom Scan(7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.6 V/m; Power Drift = 0.039 dB
Peak SAR (extrapolated) = 28.0 W/kg
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 5.97 mW/g
Maximum value of SAR (measured) = 20.2 mW/g



Date/Time: 2011/5/13 10:36:03

SystemPerformanceCheck-D2450V2-MSL2450MHz

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

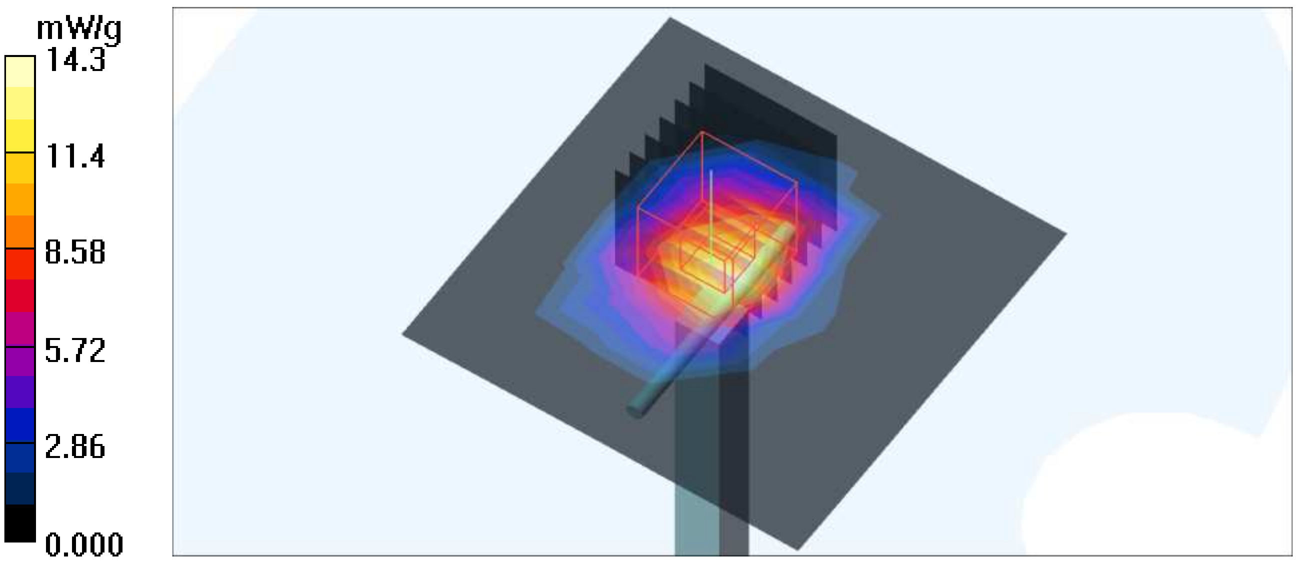
Communication System: CW ; Frequency: 2450 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL2450;Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 53.92; ρ = 1000 kg/m^3 ; Liquid level : 150 mm
Phantom section: Flat Section ; Separation distance : 10 mm (The feet point of the dipole to the Phantom)Air temp. : 22.3 degrees ; Liquid temp. : 21.1 degrees

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Twin Phantom V4.0; Type: QD 000 P40 CA; Serial: TP-1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

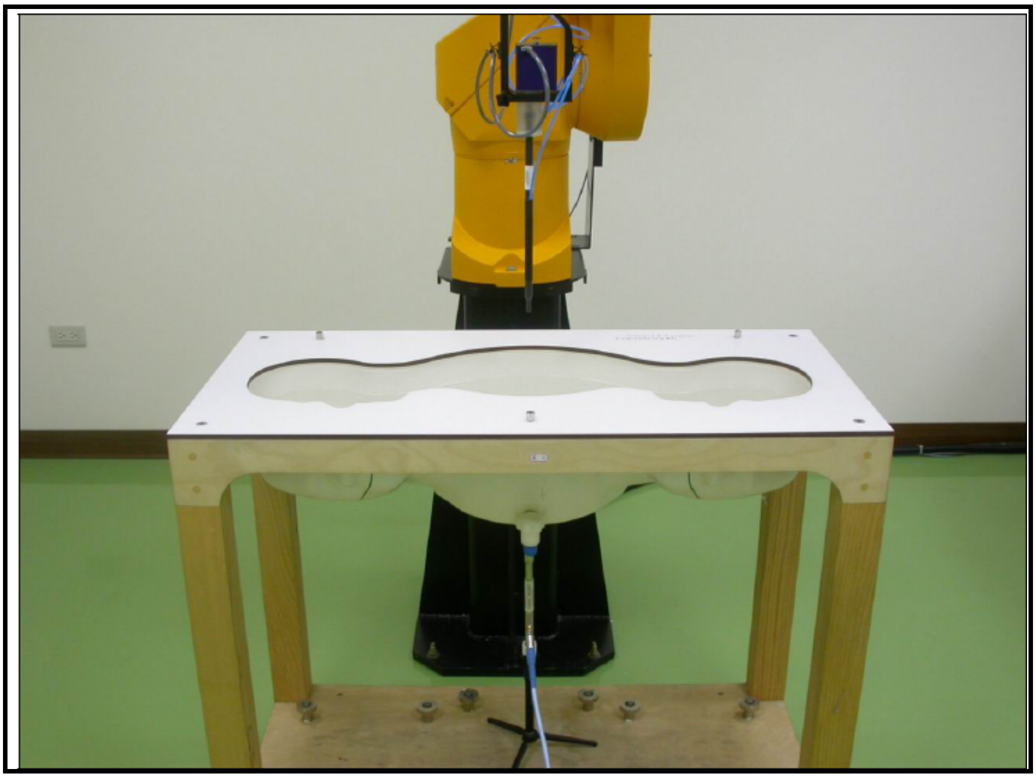
d=10mm, Pin=250mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 14.3 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.9 V/m; Power Drift = 0.006 dB
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 12.5 mW/g; SAR(10 g) = 5.78 mW/g
Maximum value of SAR (measured) = 19.4 mW/g



APPENDIX B: BV 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

Schmid & Partner
Engineering AG
Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

F. Bomholt

D2: DOSIMETRIC E-FIELD PROBE

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

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

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

Accreditation No.: SCS 108

Client **BV ADT (Auden)**

Certificate No: **EX3-3590_Feb11**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3590

Calibration procedure(s): QA CAL-01.v7, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v3
Calibration procedure for dosimetric E-field probes

Calibration date: February 25, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	01-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 654	23-Apr-10 (No. DAE4-654_Apr10)	Apr-11
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

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

Issued: February 25, 2011

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3590

Manufactured: March 23, 2009
Calibrated: February 25, 2011

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.51	0.48	0.51	± 10.1 %
DCP (mV)[B]	94.6	95.5	92.8	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	119.0	±2.7 %
			Y	0.00	0.00	1.00	141.4	
			Z	0.00	0.00	1.00	115.0	

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

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	41.5	0.90	10.21	10.21	10.21	0.56	0.68	± 12.0 %
1640	40.3	1.29	9.25	9.25	9.25	0.68	0.60	± 12.0 %
1750	40.1	1.37	9.03	9.03	9.03	0.79	0.58	± 12.0 %
1950	40.0	1.40	8.45	8.45	8.45	0.55	0.66	± 12.0 %
2300	39.5	1.67	8.14	8.14	8.14	0.40	0.80	± 12.0 %
2450	39.2	1.80	7.73	7.73	7.73	0.29	1.00	± 12.0 %
2600	39.0	1.96	7.53	7.53	7.53	0.28	1.06	± 12.0 %
3500	37.9	2.91	7.55	7.55	7.55	0.36	1.03	± 13.1 %
5200	36.0	4.66	5.51	5.51	5.51	0.30	1.80	± 13.1 %
5300	35.9	4.76	5.17	5.17	5.17	0.30	1.80	± 13.1 %
5500	35.6	4.96	5.00	5.00	5.00	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.52	4.52	4.52	0.50	1.80	± 13.1 %
5800	35.3	5.27	4.53	4.53	4.53	0.50	1.80	± 13.1 %

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

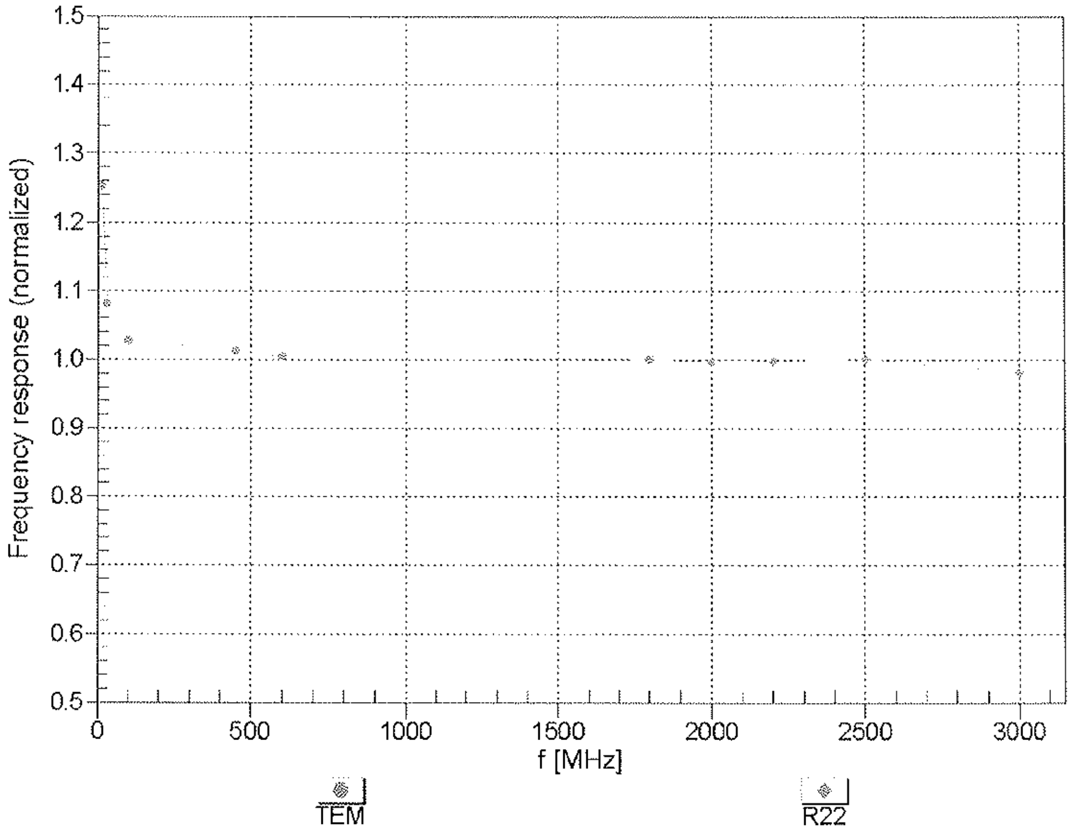
DASY/EASY - Parameters of Probe: EX3DV4- SN:3590

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	55.2	0.97	10.32	10.32	10.32	0.38	0.82	± 12.0 %
1640	53.8	1.40	9.72	9.72	9.72	0.51	0.79	± 12.0 %
1750	53.4	1.49	8.77	8.77	8.77	0.37	0.92	± 12.0 %
1950	53.3	1.52	8.49	8.49	8.49	0.60	0.67	± 12.0 %
2300	52.9	1.81	8.08	8.08	8.08	0.30	1.00	± 12.0 %
2450	52.7	1.95	7.91	7.91	7.91	0.42	0.82	± 12.0 %
2600	52.5	2.16	7.78	7.78	7.78	0.25	1.17	± 12.0 %
3500	51.3	3.31	7.14	7.14	7.14	0.43	0.96	± 13.1 %
5200	49.0	5.30	4.81	4.81	4.81	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.56	4.56	4.56	0.50	1.90	± 13.1 %
5500	48.6	5.65	4.32	4.32	4.32	0.50	1.90	± 13.1 %
5600	48.5	5.77	4.01	4.01	4.01	0.60	1.90	± 13.1 %
5800	48.2	6.00	4.55	4.55	4.55	0.50	1.90	± 13.1 %

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

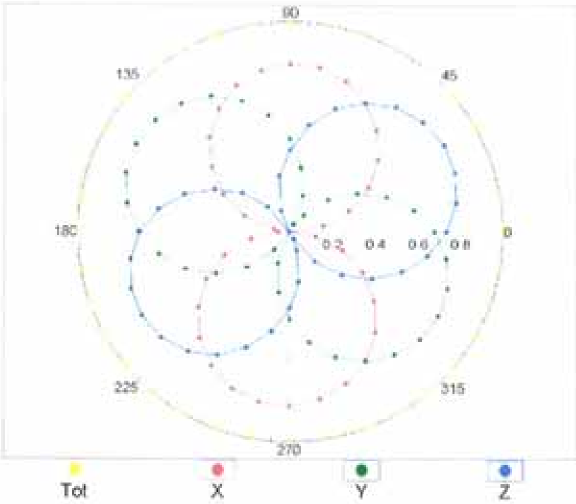
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



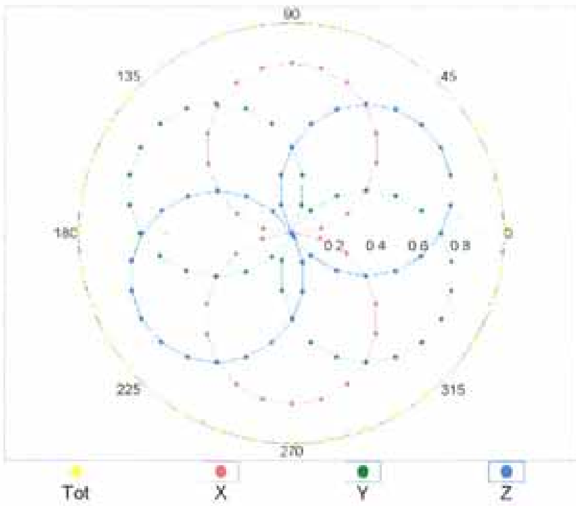
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

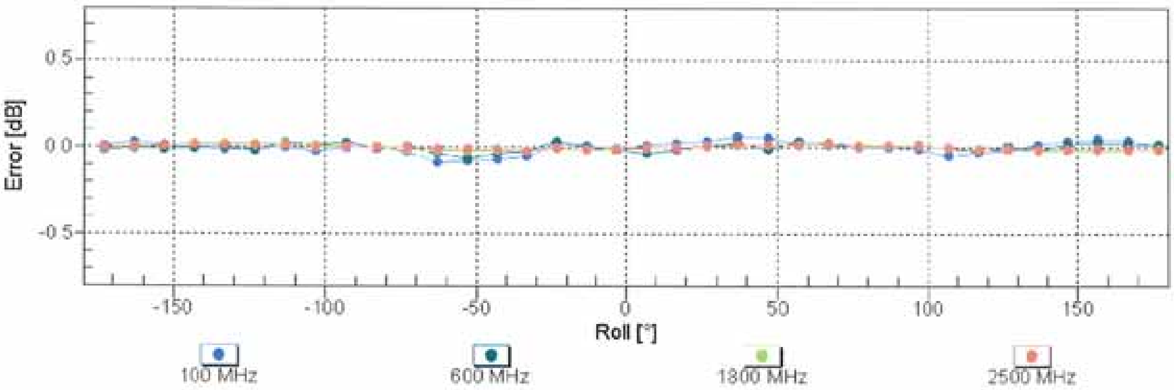
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



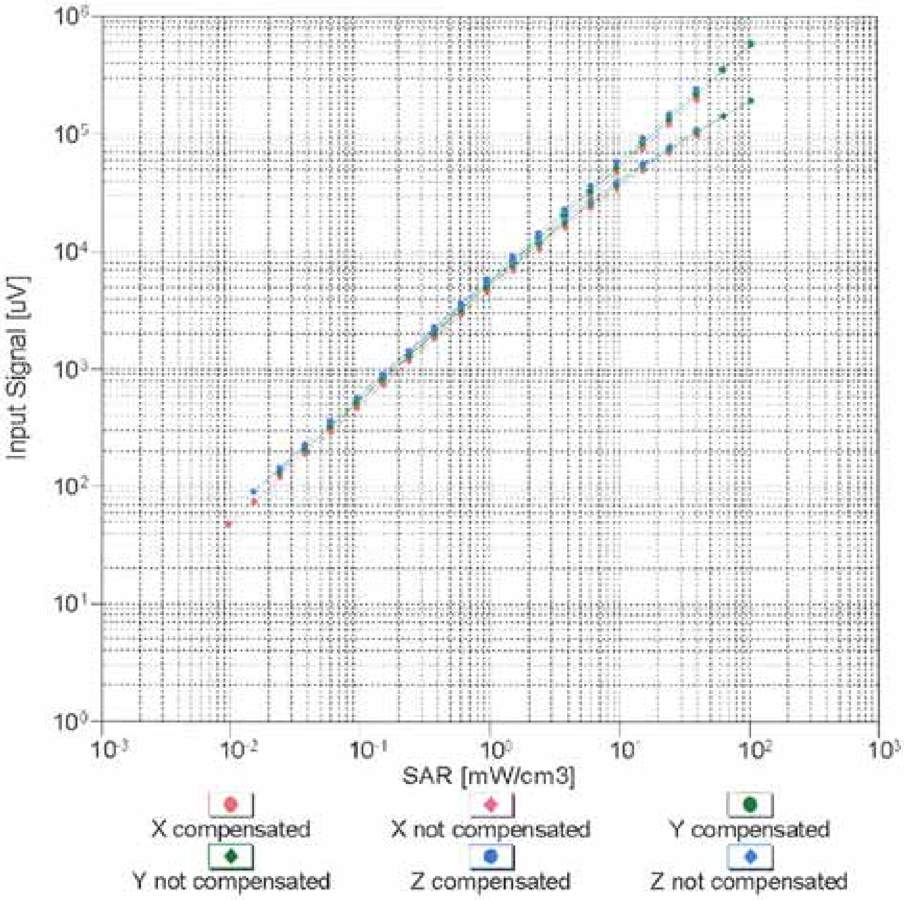
f=1800 MHz,R22

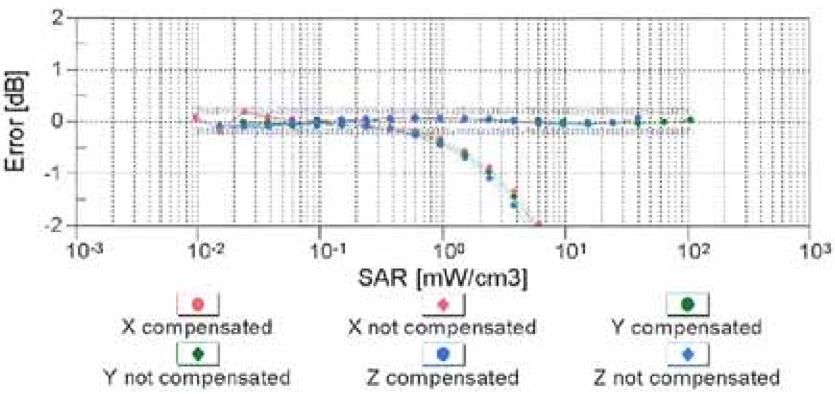




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

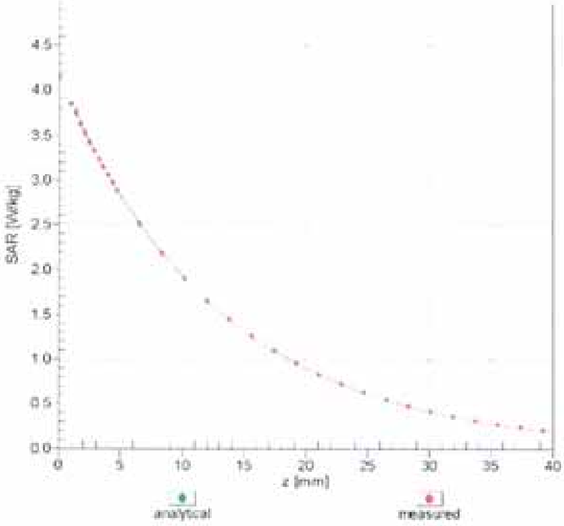




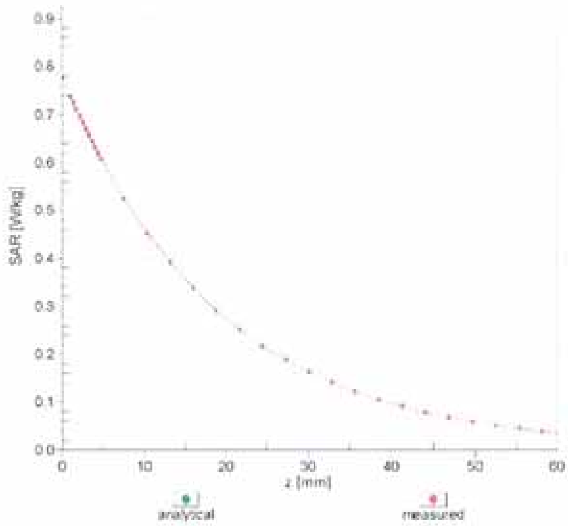
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 1750 MHz,WGLS R22 (H_convF)

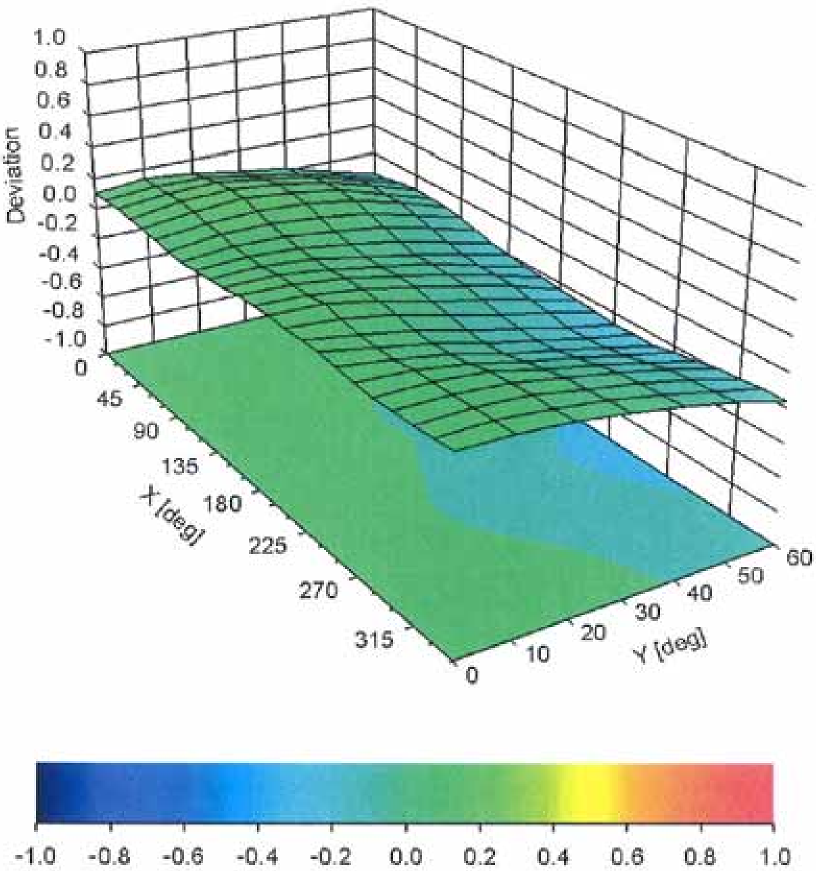


f = 835 MHz,WGLS R9 (H_convF)



Deviation from Isotropy in Air

Error (ϕ, ϑ), f = 900 MHz



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

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

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	Not applicable
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	2 mm

D3: DAE

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

IMPORTANT NOTICE

USAGE OF THE DAE 3

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

Battery Exchange: The battery cover of the DAE3 unit is connected to a fragile 3-pin battery connector. Customer is responsible to apply outmost caution not to bend or damage the connector when changing batteries.

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

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

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

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

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

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

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

Schmid & Partner Engineering

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

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

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

Accreditation No.: SCS 108

Client **BV-ADT (Auden)**

Certificate No: DAE3-579_Sep10

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 579
Calibration procedure(s)	QA CAL-06.v22 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	September 20, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	1-Oct-09 (No: 9055)	Oct-10
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	07-Jun-10 (in house check)	In house check: Jun-11

	Name	Function	Signature
Calibrated by:	Dominique Steffen	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: September 20, 2010

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

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

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

Calibration Factors	X	Y	Z
High Range	404.327 ± 0.1% (k=2)	404.379 ± 0.1% (k=2)	404.160 ± 0.1% (k=2)
Low Range	3.98675 ± 0.7% (k=2)	3.99301 ± 0.7% (k=2)	3.94834 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	358.0 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200003.9	0.96	0.00
Channel X	+ Input	20003.19	3.09	0.02
Channel X	- Input	-19994.55	4.75	-0.02
Channel Y	+ Input	199992.4	-0.09	-0.00
Channel Y	+ Input	19999.51	0.41	0.00
Channel Y	- Input	-19997.22	3.18	-0.02
Channel Z	+ Input	200002.0	0.91	0.00
Channel Z	+ Input	20001.93	2.03	0.01
Channel Z	- Input	-19997.58	2.82	-0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.0	0.02	0.00
Channel X	+ Input	199.82	0.12	0.06
Channel X	- Input	-200.46	-0.56	0.28
Channel Y	+ Input	2000.3	0.47	0.02
Channel Y	+ Input	199.12	-0.78	-0.39
Channel Y	- Input	-201.36	-1.16	0.58
Channel Z	+ Input	1999.9	-0.07	-0.00
Channel Z	+ Input	199.18	-0.72	-0.36
Channel Z	- Input	-201.47	-1.47	0.73

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	7.07	5.75
	- 200	-4.60	-6.25
Channel Y	200	9.48	9.62
	- 200	-10.39	-10.96
Channel Z	200	8.79	8.42
	- 200	-9.64	-9.80

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	-	0.03	0.35
Channel Y	200	1.14	-	2.31
Channel Z	200	2.01	0.80	-

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	16343	16314
Channel Y	16194	16427
Channel Z	15816	16265

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	-0.70	-1.94	0.80	0.49
Channel Y	-1.55	-2.12	-0.66	0.27
Channel Z	0.57	-0.11	5.61	0.62

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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

D4: SYSTEM VALIDATION DIPOLE

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

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

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

Accreditation No.: **SCS 108**

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

Certificate No: **D2450V2-716_Jan11**

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 716
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
Calibration date:	January 26, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe ES3DV3	SN: 3205	30-Apr-10 (No. ES3-3205_Apr10)	Apr-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Dimce Iliev	Laboratory Technician	D. Iliev
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: January 27, 2011

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.6
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 ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	1.74 mho/m ± 6 %
Head TSL temperature during test	(20.5 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.6 mW / g
SAR normalized	normalized to 1W	54.4 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**54.8 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.37 mW / g
SAR normalized	normalized to 1W	25.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**25.5 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.5 ± 6 %	1.96 mho/m ± 6 %
Body TSL temperature during test	(20.8 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (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	normalized to 1W	**53.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.22 mW / g
SAR normalized	normalized to 1W	24.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.8 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.0 Ω + 2.1 jΩ
Return Loss	- 25.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.1 Ω + 4.4 jΩ
Return Loss	- 27.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.143 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

DASY5 Validation Report for Head TSL

Date/Time: 24.01.2011 13:05:38

Test Laboratory: SPEAG, Zurich, Switzerland

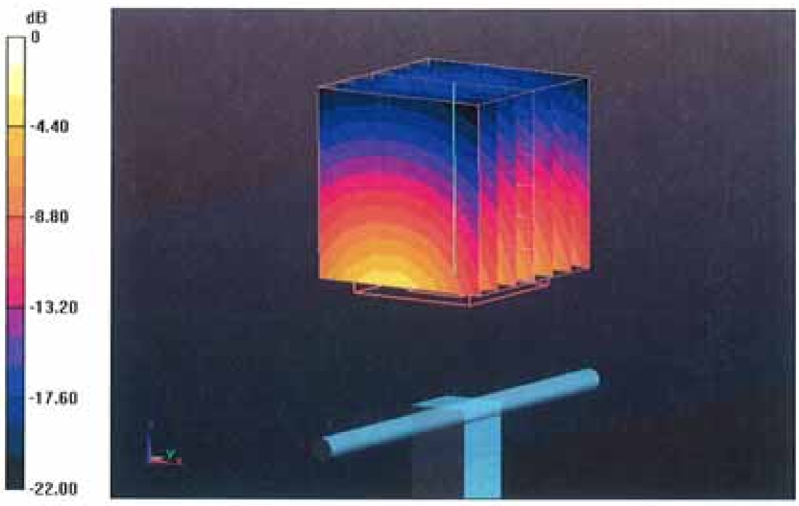
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:716

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.75 mho/m; ε_r = 38.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

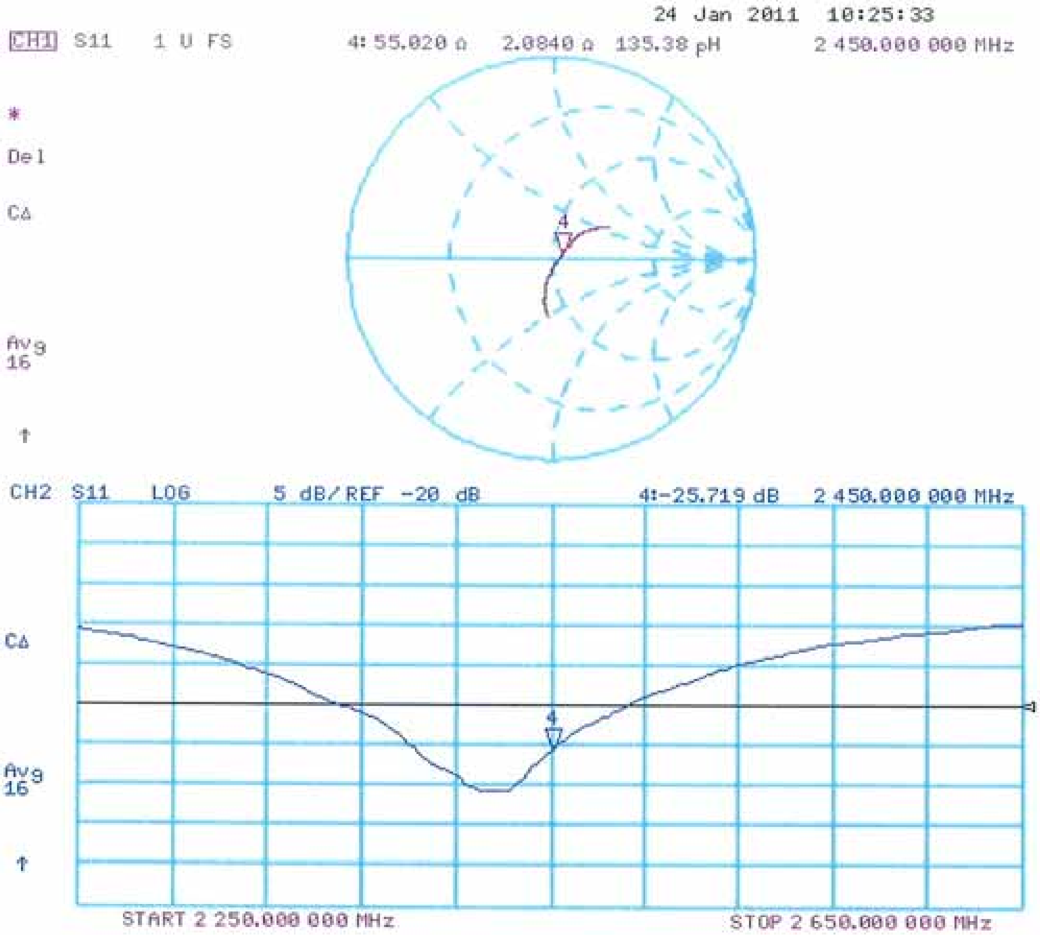
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.2 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 27.976 W/kg
SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.37 mW/g
Maximum value of SAR (measured) = 17.366 mW/g



0 dB = 17.370mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 26.01.2011 13:56:41

Test Laboratory: SPEAG, Zurich, Switzerland

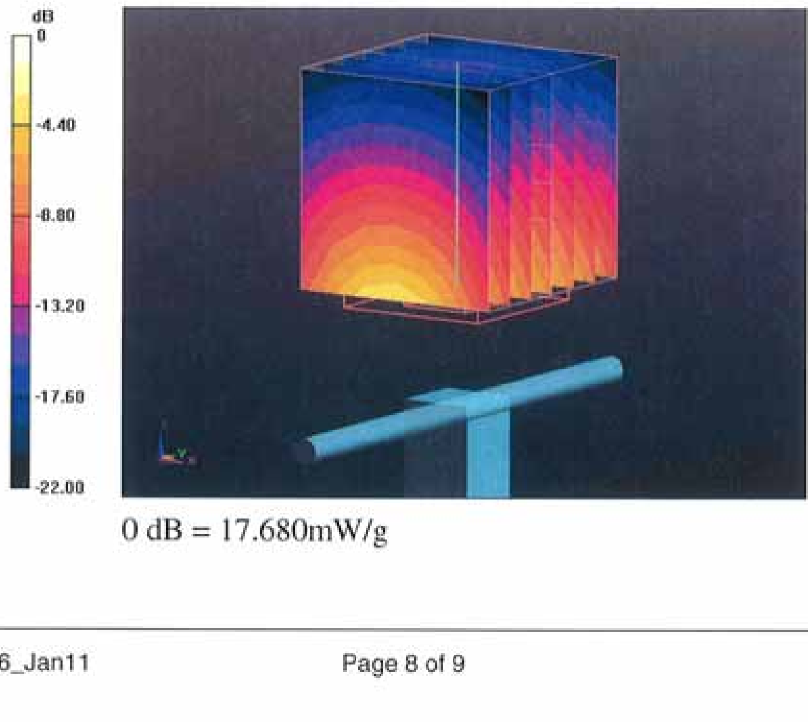
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:716

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 2450 MHz; σ = 1.97 mho/m; ε_r = 52.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 30.04.2010
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.445 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 28.276 W/kg
SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.22 mW/g
Maximum value of SAR (measured) = 17.680 mW/g



0 dB = 17.680mW/g

Impedance Measurement Plot for Body TSL