SAR TEST REPORT

REPORT NO.: SA991116C07B

MODEL NO.: WIXUBB-116

FCC ID: MXF-WIXUBB-116

RECEIVED: Jun. 23, 2011

TESTED: Aug. 29 ~ Sep. 02, 2011

ISSUED: Sep. 21, 2011

APPLICANT: Gemtek Technology Co., Ltd.

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

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Testing Laboratory
2021

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	N/A	Sep. 21, 2011

1. CERTIFICATION

PRODUCT:	WiMAX USB Dongle
MODEL NO.:	WIXUBB-116
BRAND:	Gemtek
APPLICANT:	Gemtek Technology Co., Ltd.
TESTED:	Aug. 29 ~ Sep. 02, 2011
STANDARDS:	**FCC Part 2 (Section 2.1093)**
	FCC OET Bulletin 65, Supplement C (01-01)
	IEEE 1528-2003
	RSS-102 Issue 4 (2010-03)

The above equipment 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 SAR characteristics under the conditions specified in this report.

PREPARED BY : Polly Chien / Specialist , **DATE :** Sep. 21, 2011

APPROVED BY : Gary Chang / Technical Manager , **DATE :** Sep. 21, 2011

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

EUT	WiMAX USB Dongle
MODEL NO.	WIXUBB-116
FCC ID	MXF-WIXUBB-116
MODULATION TYPE	UL: QPSK1/2, QPSK 3/4, 16QAM1/2, 16QAM 3/4 DL: QPSK1/2, QPSK 3/4, 16QAM1/2, 16QAM 3/4, 64QAM1/2, 64QAM2/3, 64QAM3/4, 64QAM5/6
MODULATION TECHNOLOGY	S-OFDMA
MULTIPLE ACCESS METHOD	TDMA
DUPLEX METHOD	TDD
OPERATING RANGE	2498.5 MHz ~ 2687.5 MHz
CHANNEL BANDWIDTH	5MHz, 10MHz
MAX. SAR (1g)	1.156 W/kg
ANTENNA TYPE	Fixed Internal Antenna

1. The EUT can supports different UL / DL ratio, max transmit ratio is up to 18 (UL): 29 (DL). After pretesting of output power and spurious emission, 18 (UL): 29 (DL) was found to be worst case and was selected for the final test configuration.

Modulation	Coding Rate	Frequency (MHz)	Main Antenna			Aux Antenna		
			Peak Power	Average Power	PAPR	Peak Power	Average Power	PAPR
QPSK (BW 5MHz)	1/2	2498.5	31.71	23.72	7.99	31.42	23.88	7.54
		2593.0	31.85	23.87	7.98	31.57	23.97	7.60
		2687.5	31.58	23.82	7.76	31.43	23.93	7.50
	3/4	2498.5	31.39	23.64	7.75	31.59	23.70	7.89
		2593.0	31.47	23.71	7.76	31.73	23.81	7.92
		2687.5	31.39	23.63	7.76	31.48	23.82	7.66
16QAM (BW 5MHz)	1/2	2498.5	31.03	22.32	8.71	30.85	22.47	8.38
		2593.0	31.09	22.36	8.73	30.87	22.42	8.45
		2687.5	30.91	22.30	8.61	31.03	22.42	8.61
	3/4	2498.5	30.79	22.31	8.48	31.38	22.40	8.98
		2593.0	31.54	22.35	9.19	31.08	22.37	8.71
		2687.5	31.39	22.30	9.09	30.97	22.35	8.62
QPSK (BW 10MHz)	1/2	2501.0	31.31	23.87	7.44	31.59	23.95	7.64
		2593.0	31.71	23.89	7.82	31.49	23.97	7.52
		2685.0	31.46	23.85	7.61	31.56	23.95	7.61
	3/4	2501.0	31.25	23.64	7.61	31.71	23.76	7.95
		2593.0	31.48	23.74	7.74	31.90	23.80	8.10
		2685.0	31.52	23.74	7.78	31.51	23.83	7.68
16QAM (BW 10MHz)	1/2	2501.0	31.12	22.42	8.70	30.89	22.46	8.43
		2593.0	31.05	22.44	8.61	31.25	22.47	8.78
		2685.0	31.11	22.45	8.66	31.19	22.47	8.72
	3/4	2501.0	31.09	22.37	8.72	31.33	22.39	8.94
		2593.0	31.44	22.35	9.09	31.27	22.38	8.89
		2685.0	31.38	22.33	9.05	31.34	22.34	9.00

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

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 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 to > 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	15 cm deep from the ERP
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	2600MHz
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 C	TP 1485	NA	NA
2	Signal Generator	Agilent	E8257C	MY43320668	Dec. 27, 2010	Dec. 26, 2011
3	E-Field Probe	S & P	EX3DV4	3590	Feb. 25, 2011	Feb. 24, 2012
4	E-Field Probe	S & P	EX3DV4	3650	Jan. 24, 2011	Jan. 23, 2012
5	DAE	S & P	DAE3	510	Oct. 04, 2010	Oct. 03, 2011
6	DAE	S & P	DAE3	579	Sep. 20, 2010	Sep. 19, 2011
7	Robot Positioner	Staubli Unimation	NA	NA	NA	NA
8	Validation Dipole	S & P	D2600V2	1003	Jan. 27, 2011	Jan. 26, 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	E8358A	US41480539	Dec. 30, 2010	Dec. 29, 2011
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 DASY52 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.

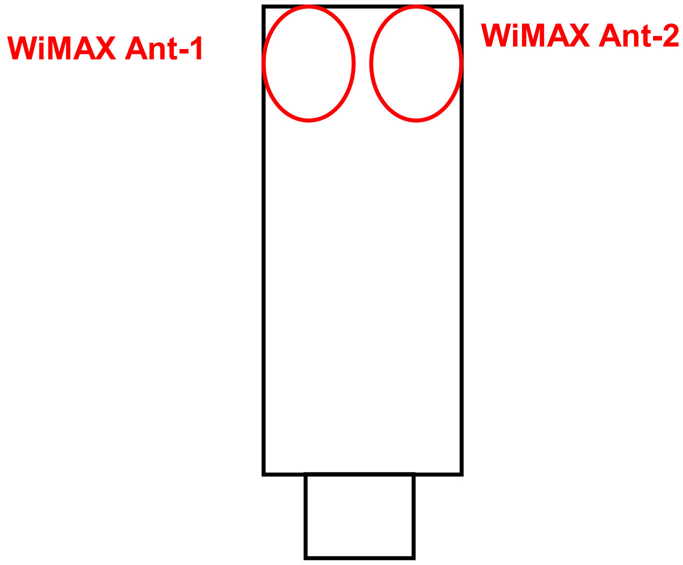
The probe is calibrated at the center of the dipole sensors that is located 1 to 2.7mm away from the probe tip. During measurements, the probe stops shortly above the phantom surface, depending on the probe and the surface detecting system. Both distances are included as parameters in the probe configuration 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 5 x 5 x 7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 32 x 32 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.

3. DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

4. DESCRIPTION OF ANTENNA LOCATION



5. RECIPES FOR TISSUE SIMULATING LIQUIDS

For the measurement of the field distribution inside the SAM phantom, the phantom must be filled with tissue simulation liquid to a depth of 15 cm

The following ingredients are used：

- **WATER-** Deionized water (pure H20), resistivity _16 M - as basis for the liquid
- **DGMBE-** Diethylenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS # 112-34-5 - to reduce relative permittivity

THE RECIPES FOR 2600MHz SIMULATING LIQUID TABLE

Ingredient	Muscle Simulating Liquid 2600MHz (MSL-2600)
Water	69.83%
DGMBE	30.17%
Salt	NA
Dielectric Parameters at 22℃	f= 2600MHz ε= 52.5 ± 5% σ= 2.16 ± 5% S/m

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 $\sigma = \omega \varepsilon_0 \varepsilon'' = \varepsilon'' f$ [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 DASY52 for the frequencies necessary for the measurements.
14. Select the current medium for the frequency of the validation.

FOR SIMULATING LIQUID

Frequency (MHz)	Liquid Type	Liquid Temp. (℃)	Conductivity (σ)	Permittivity (εr)	Date
2600	Body	21.9	2.17	53.8	Aug. 29, 2011
2600	Body	21.2	2.268	53.823	Aug. 31, 2011
2600	Body	21.4	2.209	51.123	Sep. 02, 2011

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 DASY52 system is less than ±0.1mm.

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

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

6.2. VALIDATION RESULTS

Date	Frequency (MHz)	Targeted SAR (W/kg)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
Aug. 29, 2011	2600	58.10	14.50	58.00	-0.17
Aug. 31, 2011	2600	58.10	15.50	62.00	6.71
Sep. 02, 2011	2600	58.10	15.10	60.40	3.96

NOTE:

1. Comparing to the original SAR value provided by SPEAG, the validation data should be within its specification of 10 %. Above table shows the target SAR and measured SAR after normalized to 1W input power.

2. 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	3.04	Rectangular	$\sqrt{3}$	1	1	1.75	1.75	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)	2.48	Normal	1	0.64	0.43	1.59	1.07	9
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	3.50	Normal	1	0.6	0.49	2.10	1.72	9
Combined Standard Uncertainty						**9.15**	**8.84**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**18.31**	**17.67**	

7. 802.16e/WiMax DEVICE AND SYSTEM OPERATING PARAMETERS

Description	Parameter		Comment
FCC ID	MXF- WIXUBB-116		Identify all related FCC ID
Radio Service	Part 27 Subpart M		Rule parts
Transmit Frequency Range (MHz)	5MHz BW : 2498.5 MHz to 2687.5 MHz 10MHz BW : 2501.0 MHz to 2685.0 MHz		System parameter
System/Channel Bandwidth (MHz)	5 MHz	10 MHz	System parameter
System Profile	Revision 1.7.0		Defined by WiMAX Forum
Modulation Schemes	QPSK, 16QAM		Identify all applicable UL modulations
Sampling Factor	28/25		System parameter
Sampling Frequency (MHz)	5.6 MHz	11.2 MHz	(F_S)
Sample Time (ns)	178.57 ns	89.29 ns	($1/F_S$)
FFT Size (N_{FFT})	512	1024	(N_{FFT})
Sub-Carrier Spacing (kHz)	10.94 kHz		(Δf)
Useful Symbol Time (μs)	91.4286 μs		($T_b=1/\Delta f$)
Guard Time (μs)	11.4286 μs		(T_g=Tb/cp); cp = cyclic prefix
OFDMA Symbol Time (μs)	102.857 μs		($T_S=T_b+T_g$)
Frame Size (ms)	5 ms		System parameter
TTG + RTG (μs or number of symbols)	165.72 μs		Idle time, system parameter
Number of DL OFDMA Symbols per Frame	29		Identify the allowed & maximum symbols, including both traffic & control symbols
Number of UL OFDMA Symbols per Frame	18		
DL:UL Symbol Ratios	29:18		For determining UL duty factor
Power Class (dBm)	Power Class 2, 24.0 dBm		Identify power class and tolerance
Wave1 / Wave2	Wave2: Two antennas for Tx/Rx diversity. ANT1 and ANT2 cannot transmit simultaneously.		Describe antenna diversity info and MIMO requirements separately
UL Zone Types (FUSC, PUSC, OFUSC, OPUSC, AMC, TUSC1, TUSC2)	PUSC mode only for current FW.		Describe separately the symbol and sub-carrier/sub-channel structures applicable to each zone type
Maximum Number of UL Sub-Carriers	420	840	Identify the allowed and tested / to be tested parameters; include separate explanations on the types of control symbols and how the power levels are determined
Measured UL Burst Maximum Average Conducted Power	23.97 dBm		
UL Control Symbol Configuration	3 PUSC symbols (used for ranging, CQICH and ACK/NACK)		
UL Control Symbol Maximum Conducted Average Power	73.88 mW	35.88 mW	
UL Burst Peak-to-Average (Conducted) Power Ratio (PAPR)	PAPR is between 7.44 ~ 9.19 dB		Identify the expected range and measured/tested PAR; explain separately the methods used / to be used to address SAR probe calibration and measurement error issues
Frame Averaged UL Transmission Duty Factor (%)	18/48 * 100 % = 37.5 %		Show calculations separately and explain how the applicable CF (*crest factor*) used / to be use in the SAR measurements is derived and how the control symbols are accounted for

8. WIMAX/802.16e DEVICE SPECIFICATION

8.1. WIMAX ZONE TYPES

The device and its system are both transmitting using only PUSC zone type. This enables multiple users to transmit simultaneously within the system. FUSC, AMC and other zone types are not used by the test device for uplink transmission. The maximum DL:UL symbol ratio can be determined according to the PUSC requirements. The system transmit an odd number of symbols using DL-PUSC consisting of even multiples of traffics and control symbols plus one symbol for the preamble. Multiples of three symbols are transmitted by the device using UL-PUSC. The OFDMA symbol time allows up to 48 downlink and uplink symbols in each 5 ms frame. TTG and RTG are also included in each frame as DL/UL transmission gaps; therefore, the system can only allow 47 or less symbols per frame

8.2. POWER MEASUREMENT

Set the transmitter under transmission condition continuously at specific mode with maximum output.

The power meter was used to read the response of the power sensor. Record the power level and PK to AV ratio. The maximum conducted output power is measured for the uplink burst at DL:UL ratio=**29:18** that is measured for the uplink bursts through triggering and gating.

The measured results are as below table:

Modulation	Coding Rate	Frequency (MHz)	Main Antenna			Aux Antenna		
			Peak Power	Average Power	PAPR	Peak Power	Average Power	PAPR
QPSK (BW 5MHz)	1/2	**2498.5**	31.71	23.72	7.99	31.42	23.88	7.54
		2593.0	31.85	23.87	7.98	31.57	23.97	7.60
		2687.5	31.58	23.82	7.76	31.43	23.93	7.50
	3/4	**2498.5**	31.39	23.64	7.75	31.59	23.70	7.89
		2593.0	31.47	23.71	7.76	31.73	23.81	7.92
		2687.5	31.39	23.63	7.76	31.48	23.82	7.66
16QAM (BW 5MHz)	1/2	**2498.5**	31.03	22.32	8.71	30.85	22.47	8.38
		2593.0	31.09	22.36	8.73	30.87	22.42	8.45
		2687.5	30.91	22.30	8.61	31.03	22.42	8.61
	3/4	**2498.5**	30.79	22.31	8.48	31.38	22.40	8.98
		2593.0	31.54	22.35	9.19	31.08	22.37	8.71
		2687.5	31.39	22.30	9.09	30.97	22.35	8.62
QPSK (BW 10MHz)	1/2	**2501.0**	31.31	23.87	7.44	31.59	23.95	7.64
		2593.0	31.71	23.89	7.82	31.49	23.97	7.52
		2685.0	31.46	23.85	7.61	31.56	23.95	7.61
	3/4	**2501.0**	31.25	23.64	7.61	31.71	23.76	7.95
		2593.0	31.48	23.74	7.74	31.90	23.80	8.10
		2685.0	31.52	23.74	7.78	31.51	23.83	7.68
16QAM (BW 10MHz)	1/2	**2501.0**	31.12	22.42	8.70	30.89	22.46	8.43
		2593.0	31.05	22.44	8.61	31.25	22.47	8.78
		2685.0	31.11	22.45	8.66	31.19	22.47	8.72
	3/4	**2501.0**	31.09	22.37	8.72	31.33	22.39	8.94
		2593.0	31.44	22.35	9.09	31.27	22.38	8.89
		2685.0	31.38	22.33	9.05	31.34	22.34	9.00

8.3. DUTY FACTOR

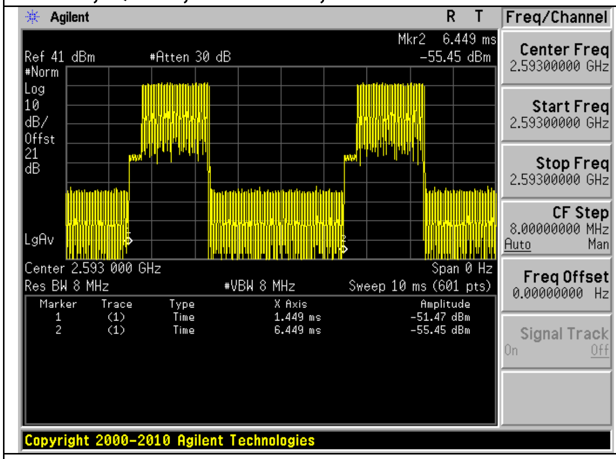
Theoretical duty cycle is

UL Data Symbols x Symbol Time / Frame Size
= 15 x 102.857 us / 5000 us
= 30.86 %

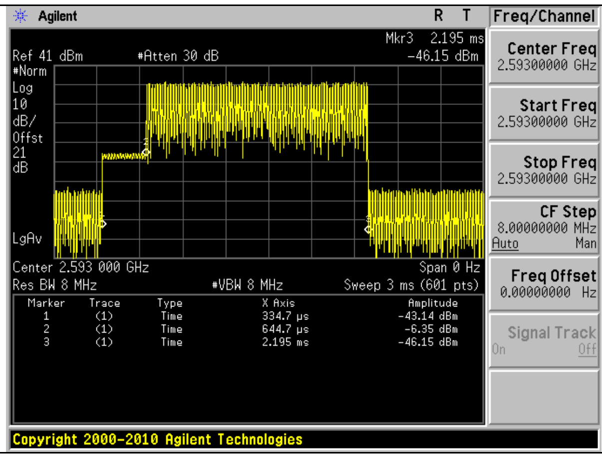
Crest Factor = 1 / Duty Cycle = 3.24
This cf was used for SAR evaluation.

The WiMAX time domain waveform used for SAR testing is shown as below.

PUSC, QPSK, BW 5MHz, 2593.0 MHz

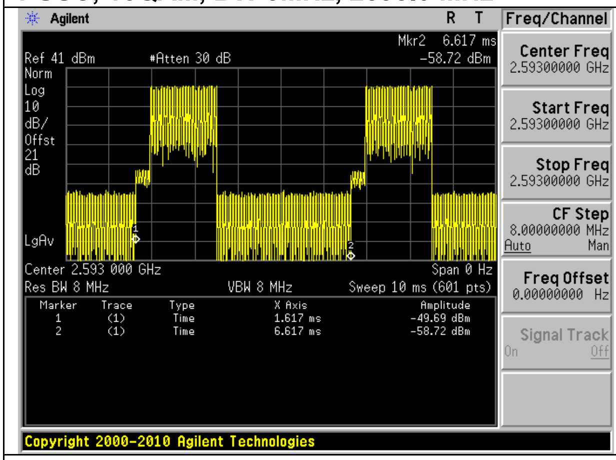


Frame Length
= Mark 2 – Mark 1
= 6.449 ms – 1.449 ms = 5 ms

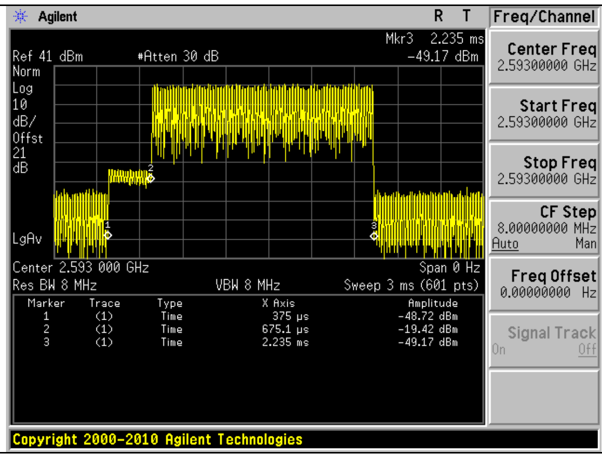


Control Symbol (3 symbols)
= Mark 2 – Mark 1 = 644.7 us – 334.7 us = 310 us
UL Data Symbols (15 symbols)
= Mark 3 – Mark 2 = 2.195 ms – 644.7 us = 1.5503 ms
Duty Cycle
= 15 data symbols UL time / Frame Length x 100%
= 1.5503 / 5 x 100% = 31.0 %

PUSC, 16QAM, BW 5MHz, 2593.0 MHz

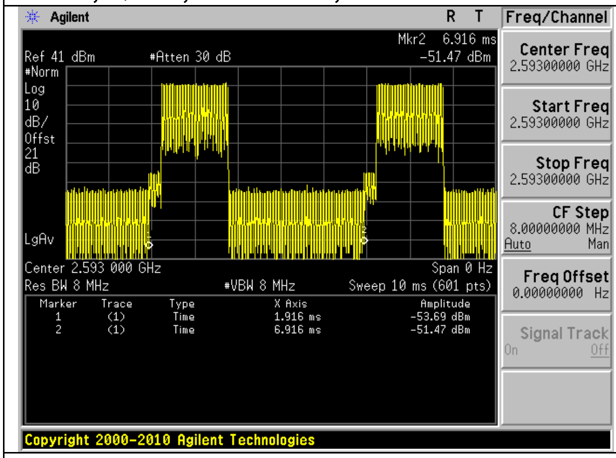


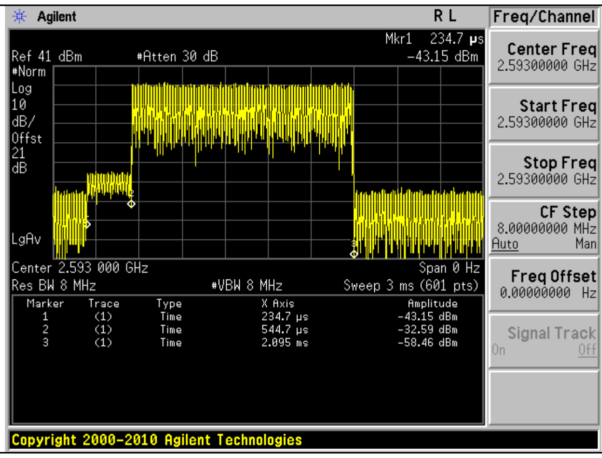
Frame Length
= Mark 2 – Mark 1
= 6.617 ms – 1.617 ms = 5 ms



Control Symbol (3 symbols)
= Mark 2 – Mark 1 = 675.1 us – 375 us = 300.1 us
UL Data Symbols (15 symbols)
= Mark 3 – Mark 2 = 2.235 ms – 675.1 us = 1.5599 ms
Duty Cycle
= 15 data symbols UL time / Frame Length x 100%
= 1.5599 / 5 x 100% = 31.2 %

PUSC, QPSK, BW 10MHz, 2593.0 MHz

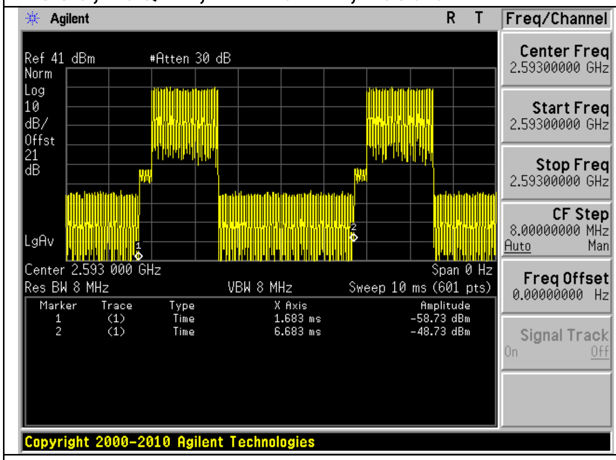


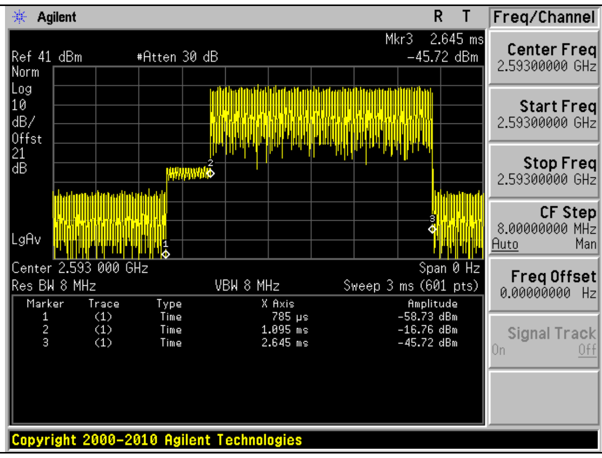


Frame Length
= Mark 2 – Mark 1
= 6.916 ms – 1.916 ms = 5 ms

Control Symbol (3 symbols)
= Mark 2 – Mark 1 = 544.7 us – 234.7 us = 310 us
UL Data Symbols (15 symbols)
= Mark 3 – Mark 2 = 2.095 ms – 544.7 us = 1.5503 ms
Duty Cycle
= 15 data symbols UL time / Frame Length x 100%
= 1.5503 / 5 x 100% = 31.0 %

PUSC, 16QAM, BW 10MHz, 2593.0 MHz





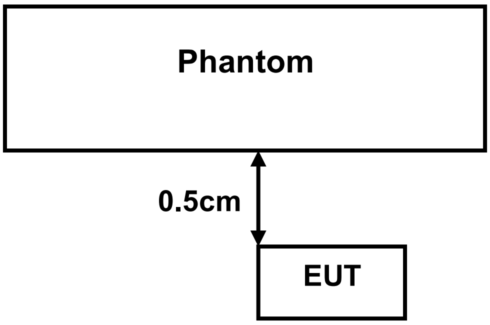
Frame Length
= Mark 2 – Mark 1
= 6.683 ms – 1.683 ms = 5 ms

Control Symbol (3 symbols)
= Mark 2 – Mark 1 = 1.095 ms – 785 us = 310 us
UL Data Symbols (15 symbols)
= Mark 3 – Mark 2 = 2.645 ms – 1.095 ms = 1.55 ms
Duty Cycle
= 15 data symbols UL time / Frame Length x 100%
= 1.55 / 5 x 100% = 31.0 %

9. TEST SETUP

Test setup

The test set-up is shown in the following picture. The WiMAX dongle (DUT) is connected to the notebook computer. MTK Test tool is provided by client. This tool can control EUT to transmit at specific channel bandwidth, modulation type, coding rate, power level and frequency without signal generator.



Test Signal detail

The WIXUBB-116 is 2.5 GHz WiMAX transceiver in a USB dongle configuration which supports 1Tx (Tx Switching Diversity) and 2Rx for this device. Its uplink is capable of both 10 MHz and 5 MHz bandwidths.

PUSC zone type

For the 10 MHz bandwidth, it has 35 sub-channels structured from 1024 subcarriers per OFDMA symbol and each sub-channel is spanned over 3 OFDMA symbols and consists of 72 subcarriers including 48 data and 24 pilot subcarriers. For each symbol, there are 184 guard subcarriers, leaving 840 available subcarriers for transmission. For the 5 MHz bandwidth, it contains 17 sub-channels using 512 subcarriers including 104 guard subcarriers per symbol and leaving 408 available subcarriers for transmission.

The control channels may occupy up to 5 slots during normal operation. A slot is a sub-channel with the duration of 3 symbols. There are a total of 35 (17) slots in the 10 MHz (5 MHz) channel configuration. The maximum power for each control symbol has been determined to be 35.88 (5/35 of 251.19 mW) for 10MHz and 73.88 (5/17 of 251.19 mW) for 5MHz. A maximum of two simultaneous CQICH reports are possible, which can occupy up to 2 slots. A maximum of three slots can be used for HARQ ACK/NAK by the five possible DL HARQ bursts in the previous DL frame. The 5 ACK/NAK bits each occupies ½ a slot. These 5 slots correspond to 5/35 (5/17) of the total number of uplink slots. When the device is transmitting at its maximum rated power of 24 dBm (251.19 mW), the output power for these control channels is 35.88 (5/35 of 251.19 mW) for 10MHz and 73.88 (5/17 of 251.19 mW) for 5MHz. Due to the limitation of the test mode software which cannot control the device to output typical control symbols (3 symbols with 5 slots occupied). The EUT was programmed to output full power at 24 dBm per symbol and this represents the max worst case power which a transmitted symbol can get (no mater it is data symbol or control symbol, the 24 dBm is the max output power that this device can output).

The up-link sub-frame is triggered by an Allocation Start Time contained in the information of UL-MAP. This information specifies the starting times of the Uplink and Downlink frames. In any UL sub-frame, the duty factor and bandwidth information is used to ensure optimal system operation. In the real usage, the data burst power will be adjusted according to the signal strength of the communication. In this way, by using the test mode arrangement we are transmitting at a worst case RF level.

The test mode instructs the mobile station to transmit for 18 symbols in the UL data zone. This UL transmission is repeated every 5 milliseconds. The TX power of the mobile station is set to maximum power.

The testing was done at DL:UL symbol ratio, 29:18 as this is the maximum achievable ratio for the product. The 18 indicates the number of uplink symbols. Inside the uplink, 15 of the symbols are used for data, and 3 of the symbols are used for sending control information to the network. During the testing, the control symbols contained no information, so did not contribute to the total energy transmitted. To compensate for the maximum energy which may presented in the 3 control symbols, following scheme is used for the up scaling.

<Scaling Factor for 5MHz BW>
This device is power class 2 device and the maximum power tolerance is 24.0 dBm.
The maximum rated output power of 5M BW is 24.0 dBm (251.19 mW).
Maximum power in 5M control traffic is 73.88 mW (5/17 of 251.19 mW).
Scaling Factor = (3 * 73.88 + 15 * 251.19) / (15 * max. measured power of the channel tested)
= 3989.49 / (15 * max. measured power of the channel tested)

<Scaling Factor for 10MHz BW>
This device is power class 2 device and the maximum power tolerance is 24.0 dBm.
The maximum rated output power of 10M BW is 24.0 dBm (251.19 mW).
Maximum power in 10M control traffic is 35.88 mW (5/35 of 251.19 mW).
Scaling Factor = (3 * 35.88 + 15 * 251.19) / (15 * max. measured power of the channel tested)
= 3875.49 / (15 * max. measured power of the channel tested)

Modulation	Coding Rate	Frequency (MHz)	Main Antenna			Aux Antenna		
			Average Power (dBm)	Average Power (mW)	Scaling Factor	Average Power (dBm)	Average Power (mW)	Scaling Factor
QPSK (BW 5MHz)	1/2	2498.5	23.72	235.50	1.13	23.88	244.34	1.09
		2593.0	23.87	243.78	1.09	23.97	249.46	1.07
		2687.5	23.82	240.99	1.10	23.93	247.17	1.08
	3/4	2498.5	23.64	231.21	1.15	23.70	234.42	1.13
		2593.0	23.71	234.96	1.13	23.81	240.44	1.11
		2687.5	23.63	230.67	1.15	23.82	240.99	1.10
16QAM (BW 5MHz)	1/2	2498.5	22.32	170.61	1.56	22.47	176.60	1.51
		2593.0	22.36	172.19	1.54	22.42	174.58	1.52
		2687.5	22.30	169.82	1.57	22.42	174.58	1.52
	3/4	2498.5	22.31	170.22	1.56	22.40	173.78	1.53
		2593.0	22.35	171.79	1.55	22.37	172.58	1.54
		2687.5	22.30	169.82	1.57	22.35	171.79	1.55
QPSK (BW 10MHz)	1/2	2501.0	23.87	243.78	1.06	23.95	248.31	1.04
		2593.0	23.89	244.91	1.05	23.97	249.46	1.04
		2685.0	23.85	242.66	1.06	23.95	248.31	1.04
	3/4	2501.0	23.64	231.21	1.12	23.76	237.68	1.09
		2593.0	23.74	236.59	1.09	23.80	239.88	1.08
		2685.0	23.74	236.59	1.09	23.83	241.55	1.07
16QAM (BW 10MHz)	1/2	2501.0	22.42	174.58	1.48	22.46	176.20	1.47
		2593.0	22.44	175.39	1.47	22.47	176.60	1.46
		2685.0	22.45	175.79	1.47	22.47	176.60	1.46
	3/4	2501.0	22.37	172.58	1.50	22.39	173.38	1.49
		2593.0	22.35	171.79	1.50	22.38	172.98	1.49
		2685.0	22.33	171.00	1.51	22.34	171.40	1.51

10. TEST RESULTS

10.1. 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 DASY 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 secondary measurement point to the bottom surface of the phantom is with 7mm separation distance. The cube size is 5 x 5 x 7 points consists of 343 points and the grid space is 5mm.

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%.

10.2. MEASURED SAR RESULTS

Plot No.	BW	Mode	Test Position	Separation Distance (cm)	Channel	Ant Status	SAR_{1g} (W/kg)	Scaling Factor	Scaled 1g SAR
1	5M	QPSK1/2	Horizontal Up	0.5	1	1	0.84	1.09	0.916
2	5M	QPSK1/2	Horizontal Down	0.5	1	1	0.726	1.09	0.791
3	5M	QPSK1/2	Vertical Front	0.5	1	1	0.827	1.09	0.901
4	5M	QPSK1/2	Vertical Back	0.5	1	1	0.157	1.09	0.171
5	5M	QPSK1/2	Tip Mode	0.5	1	1	0.677	1.09	0.738
15	5M	QPSK1/2	Horizontal Up	0.5	0	1	0.417	1.13	0.471
16	5M	QPSK1/2	Horizontal Up	0.5	2	1	0.953	1.10	1.048
29	5M	QPSK1/2	Vertical Front	0.5	0	1	0.805	1.13	0.910
30	5M	QPSK1/2	Vertical Front	0.5	2	1	0.980	1.10	1.078
37	5M	16QAM1/2	Vertical Front	0.5	2	1	0.691	1.57	1.085
17	5M	QPSK1/2	Horizontal Up	0.5	1	2	0.538	1.07	0.576
18	5M	QPSK1/2	Horizontal Down	0.5	1	2	0.471	1.07	0.504
19	5M	QPSK1/2	Vertical Front	0.5	1	2	0.086	1.07	0.092
20	5M	QPSK1/2	Vertical Back	0.5	1	2	1.08	1.07	**1.156**
21	5M	QPSK1/2	Tip Mode	0.5	1	2	0.725	1.07	0.776
31	5M	QPSK1/2	Vertical Back	0.5	0	2	0.801	1.09	0.873
32	5M	QPSK1/2	Vertical Back	0.5	2	2	0.915	1.08	0.988
7	5M	16QAM1/2	Vertical Back	0.5	1	2	0.707	1.52	1.075
8	10M	QPSK1/2	Horizontal Up	0.5	1	1	0.925	1.05	0.971
9	10M	QPSK1/2	Horizontal Down	0.5	1	1	0.651	1.05	0.684
10	10M	QPSK1/2	Vertical Front	0.5	1	1	0.805	1.05	0.845
11	10M	QPSK1/2	Vertical Back	0.5	1	1	0.168	1.05	0.176
12	10M	QPSK1/2	Tip Mode	0.5	1	1	0.657	1.05	0.690
22	10M	QPSK1/2	Horizontal Up	0.5	0	1	0.345	1.06	0.366
23	10M	QPSK1/2	Horizontal Up	0.5	2	1	0.915	1.06	0.970
33	10M	QPSK1/2	Vertical Front	0.5	0	1	0.703	1.06	0.745
34	10M	QPSK1/2	Vertical Front	0.5	2	1	0.896	1.06	0.950
38	10M	16QAM1/2	Horizontal Up	0.5	1	1	0.715	1.47	1.051
13	10M	QPSK1/2	Horizontal Up	0.5	1	2	0.6	1.04	0.624
24	10M	QPSK1/2	Horizontal Down	0.5	1	2	0.658	1.04	0.684
25	10M	QPSK1/2	Vertical Front	0.5	1	2	0.079	1.04	0.082
26	10M	QPSK1/2	Vertical Back	0.5	1	2	1.07	1.04	1.113
27	10M	QPSK1/2	Tip Mode	0.5	1	2	0.707	1.04	0.735
35	10M	QPSK1/2	Vertical Back	0.5	0	2	0.658	1.04	0.684
36	10M	QPSK1/2	Vertical Back	0.5	2	2	0.931	1.04	0.968
28	10M	16QAM1/2	Vertical Back	0.5	1	2	0.647	1.46	0.945

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. Use the lowest coding rate for each modulation is mentioned on TCB workshop April, 2010 RF Exposure Procedures Update. Therefore only coding rate 1/2 is tested

11. SAR LIMITS

HUMAN EXPOSURE	SAR (W/kg)	
	(GENERAL POPULATION / UNCONTROLLED EXPOSURE ENVIRONMENT)	(OCCUPATIONAL / CONTROLLED EXPOSURE ENVIRONMENT)
Spatial Average (whole body)	0.08	0.4
Spatial Peak (averaged over 1 g)	**1.6**	8.0
Spatial Peak (hands / wrists / feet / ankles averaged over 10 g)	4.0	20.0

NOTE:

1. This limits accord to 47 CFR 2.1093 – Safety Limit.

12. SAR ERROR CONSIDERATION

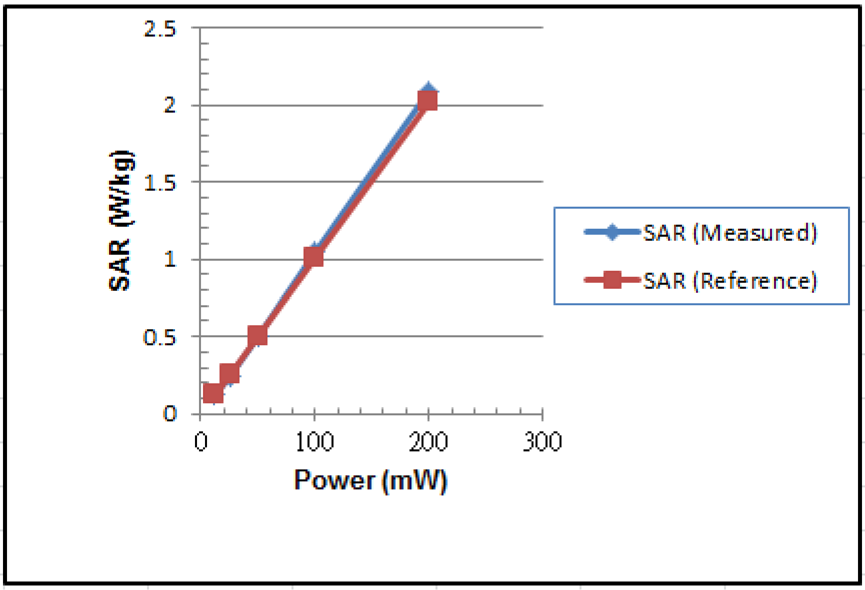
In order to estimate the measurement error due to PAR issues, the configuration with the highest SAR in each channel bandwidth and frequency band is measured at various power level. Test conditions are as below

Test position:	Vertical Back
Test distance:	5mm
TX antenna:	Antenna 2
Test frequency:	2593MHz for 5MHz bandwidth
Modulation:	QPSK 1/2

By tuning different power on this EUT and measuring the relative SAR to verify the high PAR of OFDM/OFDMA is as below:

5MHz / QPSK 1/2

Power (mW)	12.5	25	50	100	200
Point SAR	0.1261	0.2447	0.5043	1.045	2.092
Linear line	0.1261	0.2522	0.5044	1.0088	2.0176
Deviation(%)	0.00%	-2.97%	-0.02%	3.59%	3.69%



13. 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

Email:service.adt@tw.bureauveritas.com
Web Site: www.adt.com.tw

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

---END---

Date: 2011/8/29

System Check_MSL2600_110829

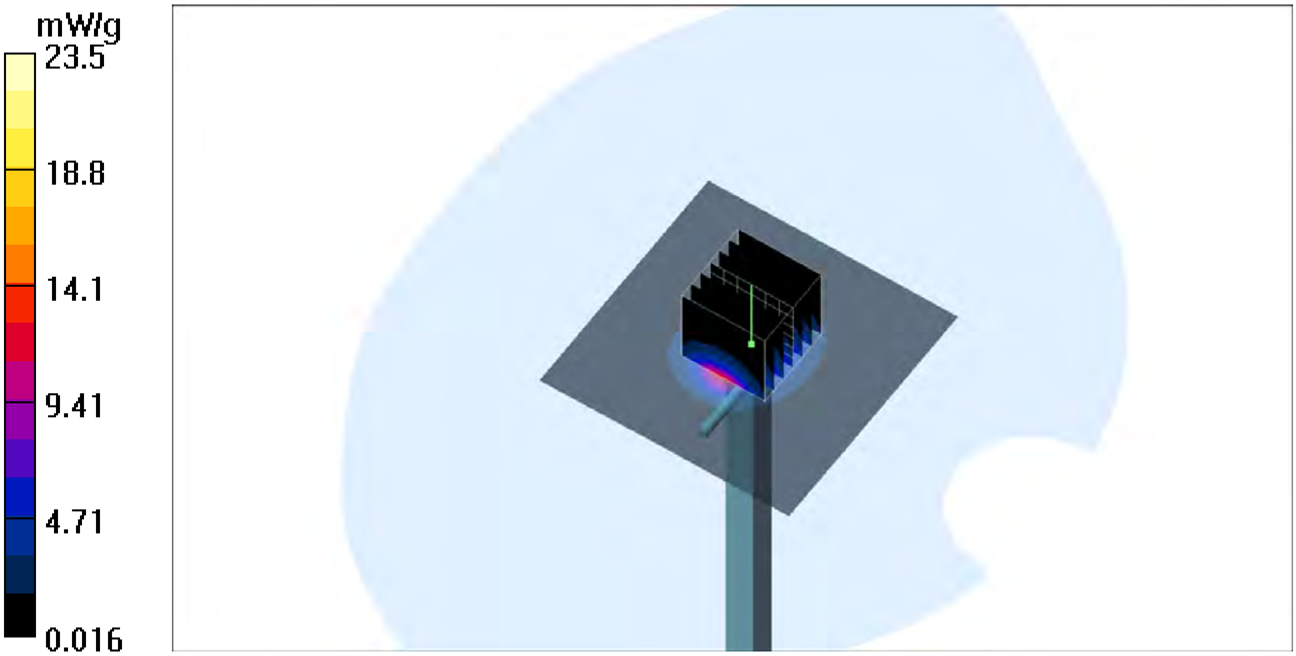
DUT: Dipole 2600 MHz D2600V2

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: MSL2600_0829 Medium parameters used: f = 2600 MHz; σ = 2.17 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：21.9 ℃

DASY4 Configuration:
- Probe: EX3DV4 - SN3590; ConvF(7.78, 7.78, 7.78); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2010/10/4
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 23.5 mW/g

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.2 V/m; Power Drift = -0.049 dB
Peak SAR (extrapolated) = 32.3 W/kg
SAR(1 g) = 14.5 mW/g; SAR(10 g) = 6.26 mW/g
Maximum value of SAR (measured) = 23.0 mW/g



System Check_MSL2600_110831

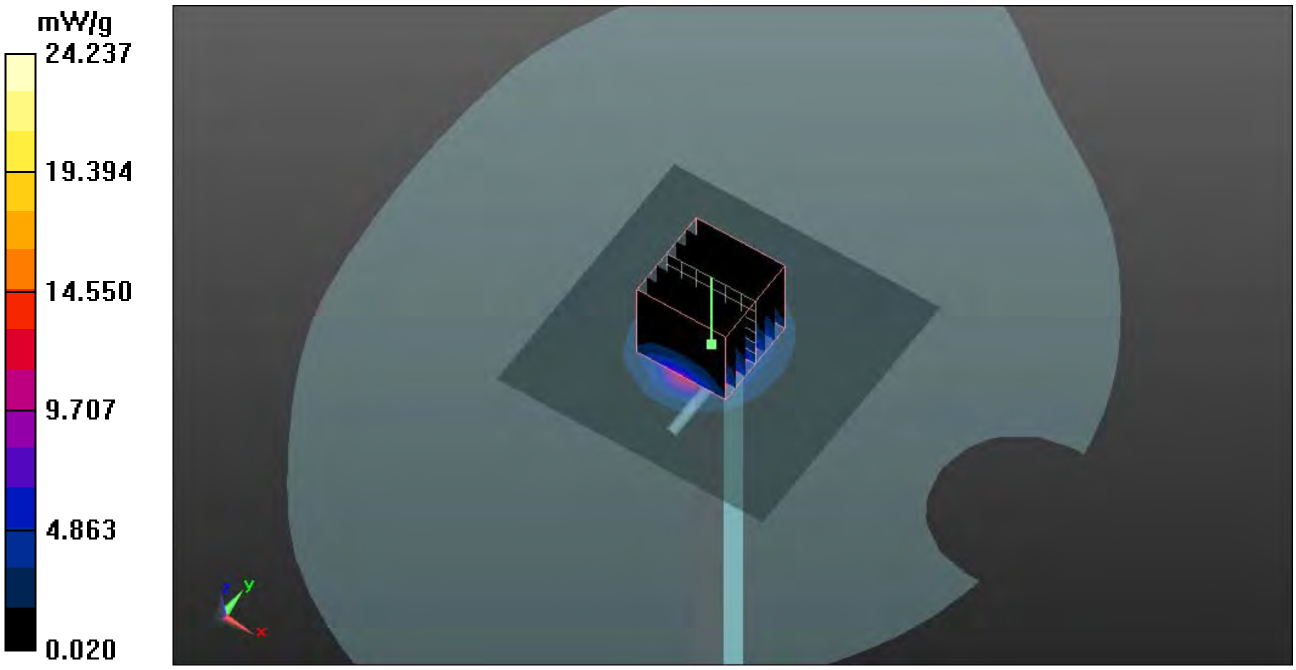
DUT: Dipole 2600 MHz

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: MSL2600_0831 Medium parameters used: f = 2600 MHz; σ = 2.268 mho/m; ε_r = 53.823; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃；Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: 1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Pin=250 mW, dist=2.0mm /Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 24.237 mW/g

Pin=250 mW, dist=2.0mm /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.3 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 35.876 W/kg
SAR(1 g) = 15.5 mW/g; SAR(10 g) = 6.73 mW/g
Maximum value of SAR (measured) = 17.766 mW/g



System Check_MSL2600_110902

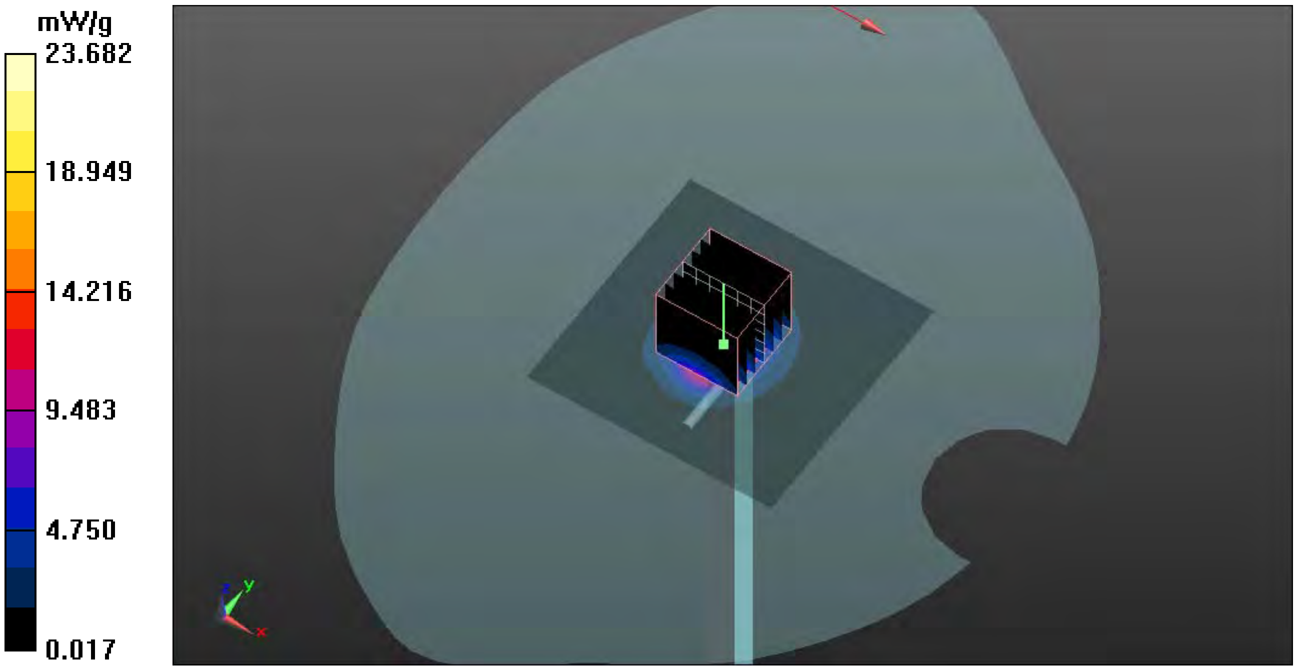
DUT: Dipole 2600 MHz

Communication System: CW; Frequency: 2600 MHz;Duty Cycle: 1:1
Medium: MSL2600_0902 Medium parameters used: f = 2600 MHz; σ = 2.209 mho/m; ε_r = 51.123; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Pin=250 mW, dist=2.0mm /Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 23.682 mW/g

Pin=250 mW, dist=2.0mm /Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.0 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 35.101 W/kg
SAR(1 g) = 15.1 mW/g; SAR(10 g) = 6.54 mW/g
Maximum value of SAR (measured) = 17.355 mW/g



Date: 2011/8/29

P01 WiMax2600_5MHz_QPSK1-2_Horizontal Up_Ch1_Ant1

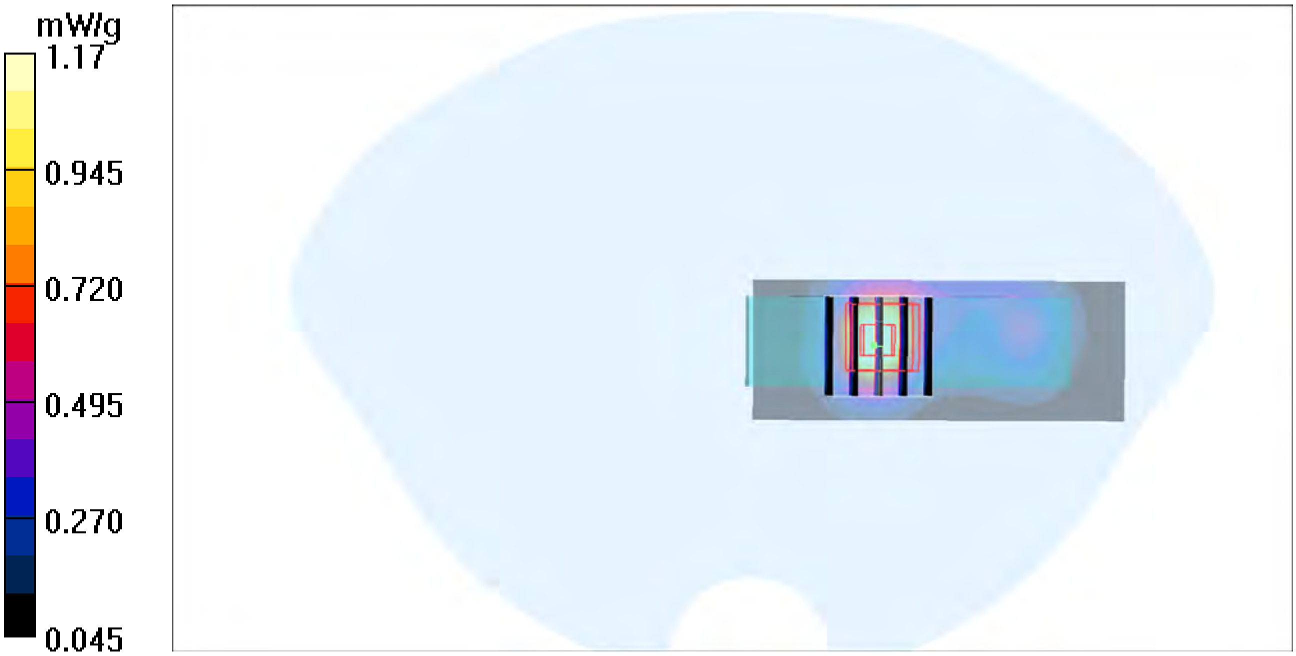
DUT: 110721C39

Communication System: Wimax_2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.24
Medium: MSL2600_0829 Medium parameters used: f = 2593 MHz; σ = 2.16 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：21.9 ℃

DASY4 Configuration:
- Probe: EX3DV4 - SN3590; ConvF(7.78, 7.78, 7.78); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2010/10/4
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.41 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.85 V/m; Power Drift = 0.126 dB
Peak SAR (extrapolated) = 1.58 W/kg
SAR(1 g) = 0.840 mW/g; SAR(10 g) = 0.434 mW/g
Maximum value of SAR (measured) = 1.17 mW/g



P02 WiMax2600_5MHz_QPSK1-2_Horizontal Down_Ch1_Ant1

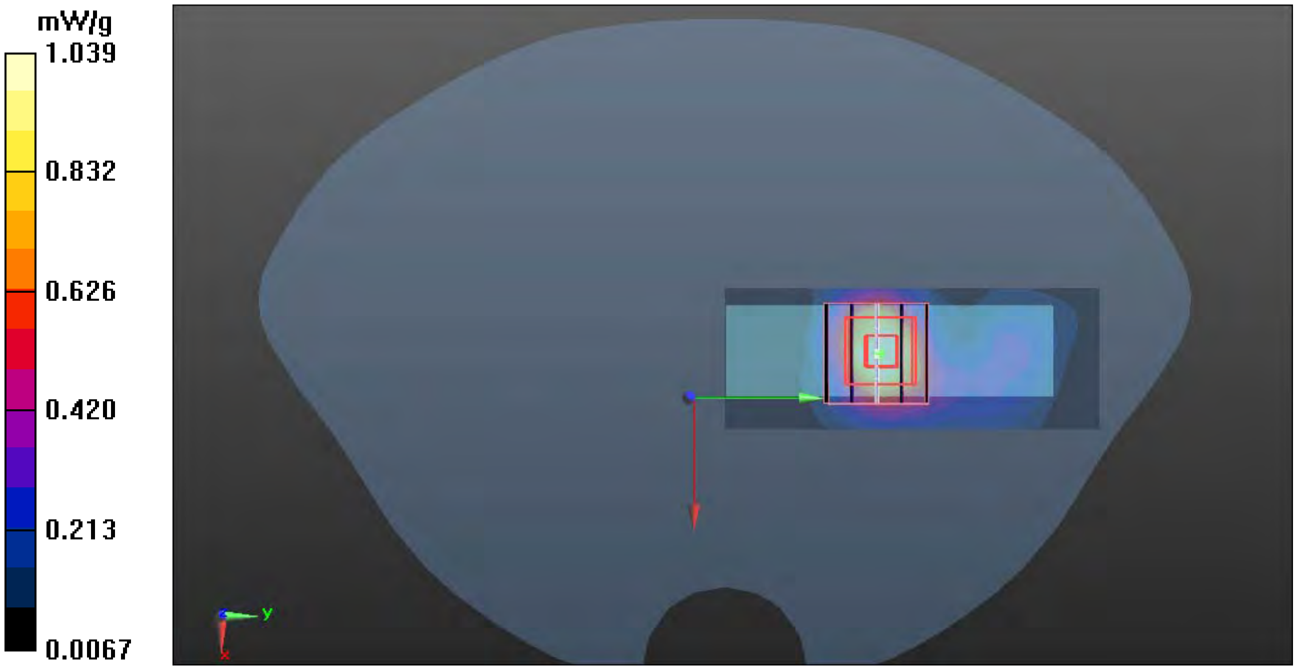
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: 1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.230 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.442 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 1.394 W/kg
SAR(1 g) = 0.726 mW/g; SAR(10 g) = 0.368 mW/g
Maximum value of SAR (measured) = 1.039 mW/g



P03 WiMax2600_5MHz_QPSK1-2_Vertical Front_Ch1_Ant1

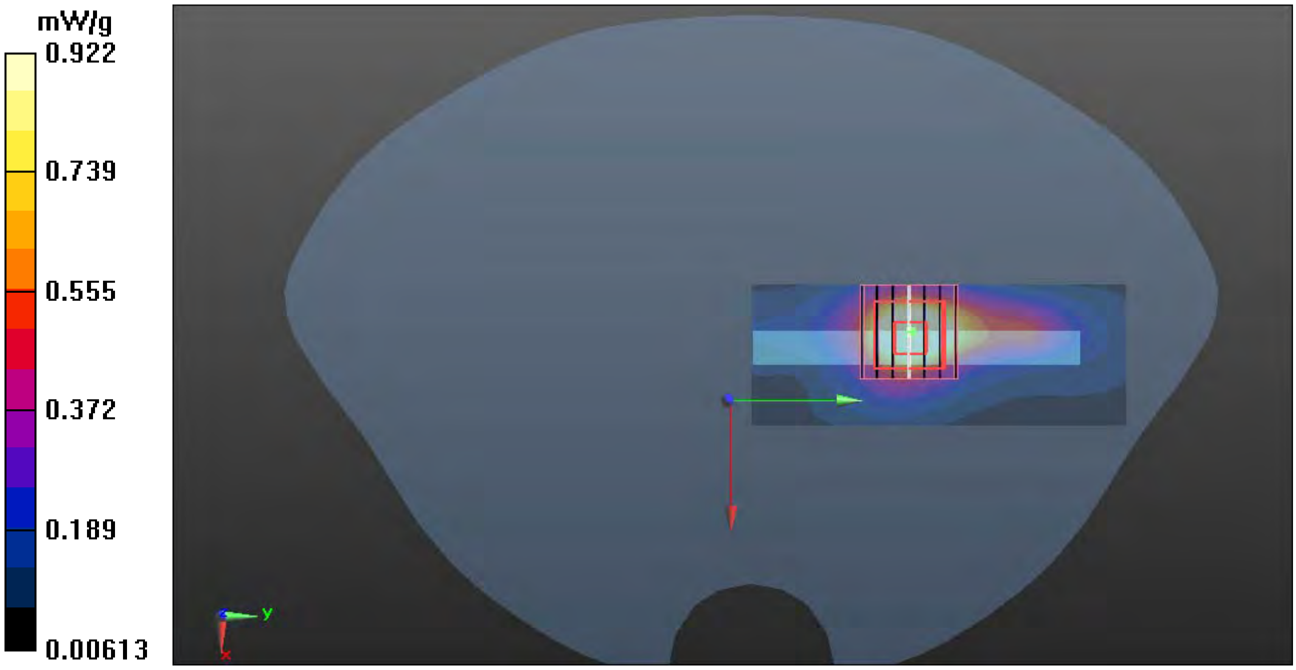
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.254 mW/g

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.784 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.686 W/kg
SAR(1 g) = 0.827 mW/g; SAR(10 g) = 0.393 mW/g
Maximum value of SAR (measured) = 0.922 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab   Date: 2011/8/31

P04 WiMax2600_5MHz_QPSK1-2_Vertical Back_Ch1_Ant1

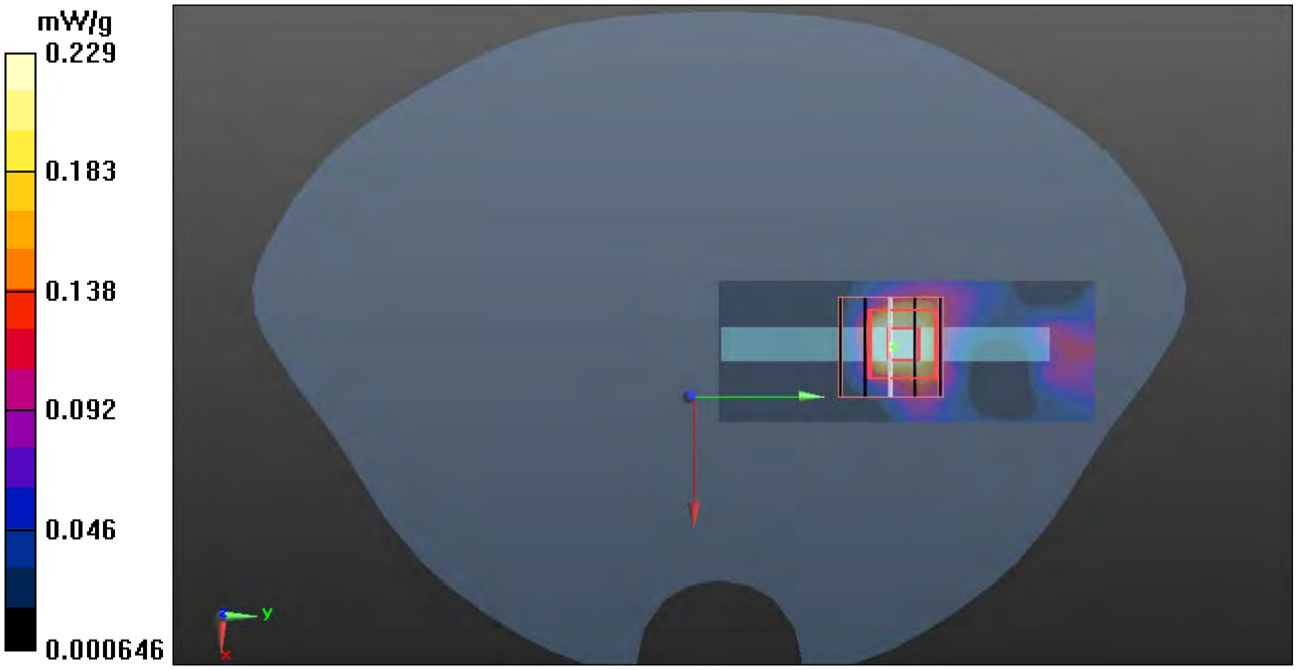
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.308 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.486 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.295 W/kg
SAR(1 g) = 0.157 mW/g; SAR(10 g) = 0.069 mW/g
Maximum value of SAR (measured) = 0.229 mW/g



P05 WiMax2600_5MHz_QPSK1-2_Tip_Ch1_Ant1

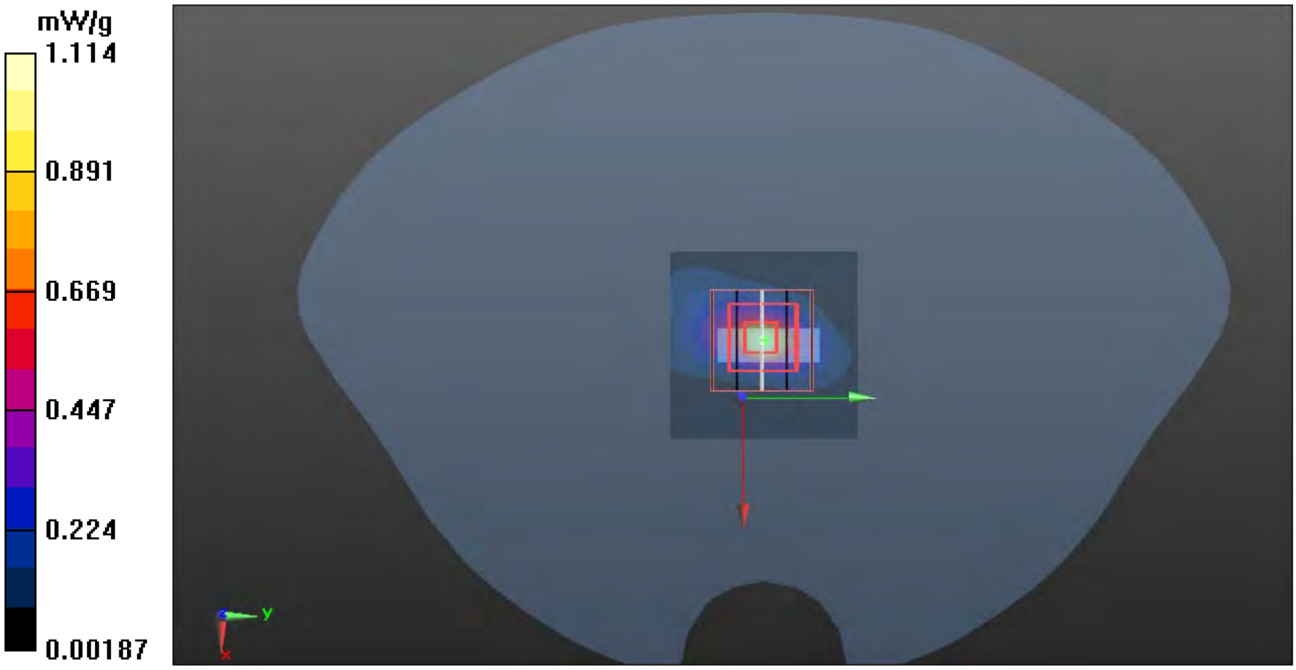
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.080 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.598 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.541 W/kg
SAR(1 g) = 0.677 mW/g; SAR(10 g) = 0.274 mW/g
Maximum value of SAR (measured) = 1.114 mW/g



P15 WiMax2600_5MHz_QPSK1-2_Horizontal Up_Ch0_Ant1

DUT: 110723C17

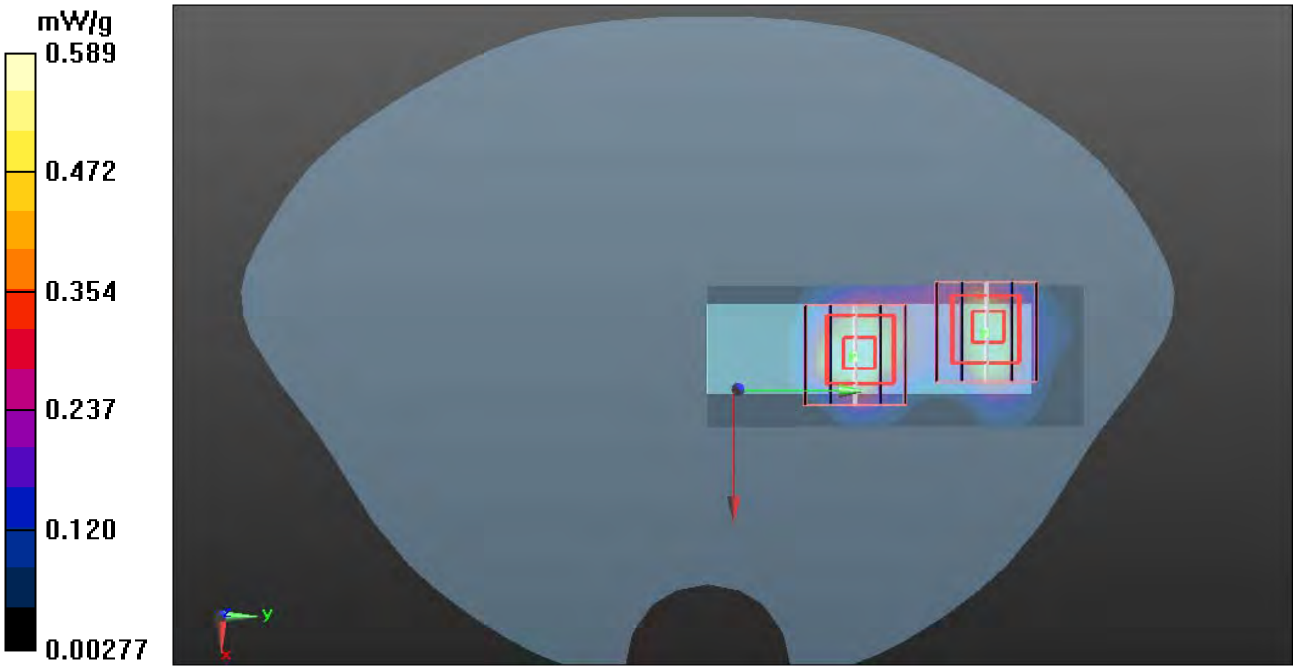
Communication System: WiMAX 2.6GHz 5M; Frequency: 2498.5 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2498.5 MHz; σ = 2.047 mho/m; ε_r = 54.007; ρ = 1000 kg/m^3
Ambient Temperature：22.5 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.05, 7.05, 7.05); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: 1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch0/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.783 mW/g

Ch0/Zoom Scan (5x5x7)/Cube 0: Measurement grid:
dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.551 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.784 W/kg
SAR(1 g) = 0.417 mW/g; SAR(10 g) = 0.213 mW/g
Maximum value of SAR (measured) = 0.589 mW/g

Ch/Zoom Scan (5x5x7)/Cube 1: Measurement grid:
dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.551 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.751 W/kg
SAR(1 g) = 0.373 mW/g; SAR(10 g) = 0.184 mW/g
Maximum value of SAR (measured) = 0.551 mW/g


mW/g
0.589
0.472
0.354
0.237
0.120
0.00277
y
x

P16 WiMax2600_5MHz_QPSK1-2_Horizontal Up_Ch2_Ant1

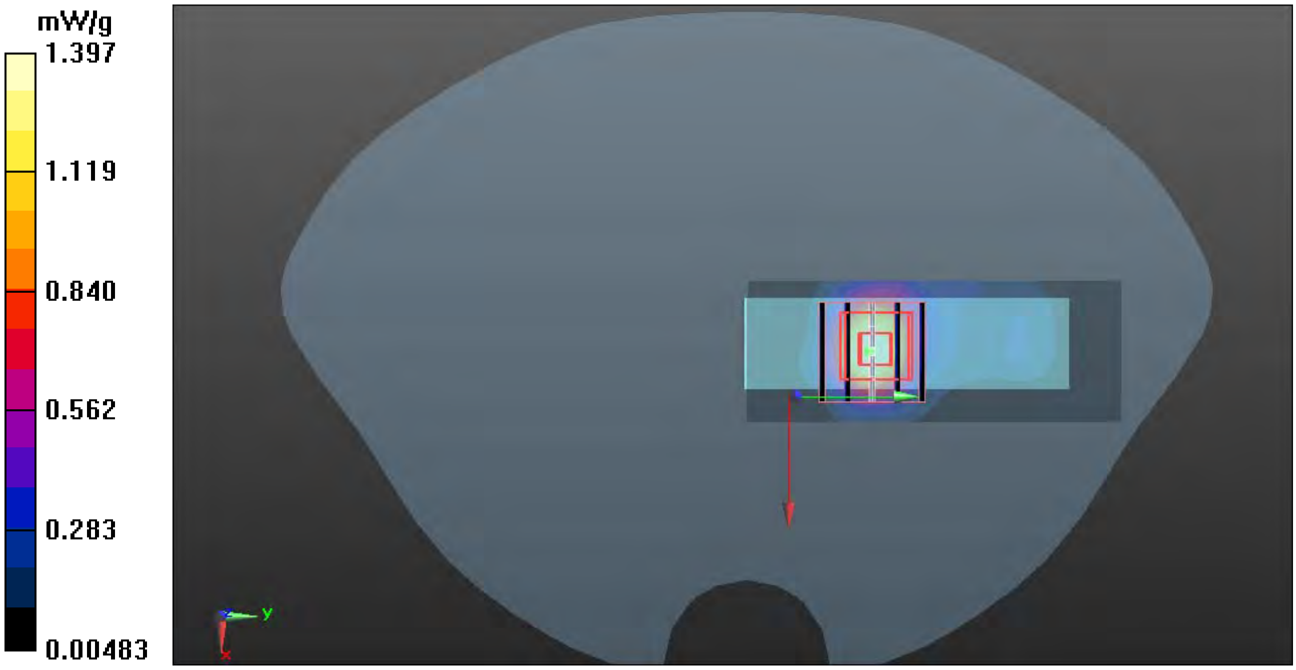
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2687.5 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used : f = 2687.5 MHz; σ = 2.212 mho/m; ε_r = 53.559; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: 1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch2/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.584 mW/g

Ch2/Zoom Scan (5x5x7)/Cube 0: Measurement grid:
dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.185 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 1.941 W/kg
SAR(1 g) = 0.953 mW/g; SAR(10 g) = 0.457 mW/g
Maximum value of SAR (measured) = 1.397 mW/g



P29 WiMax2600_5MHz_QPSK1-2_Vertical Front_Ch0_Ant1

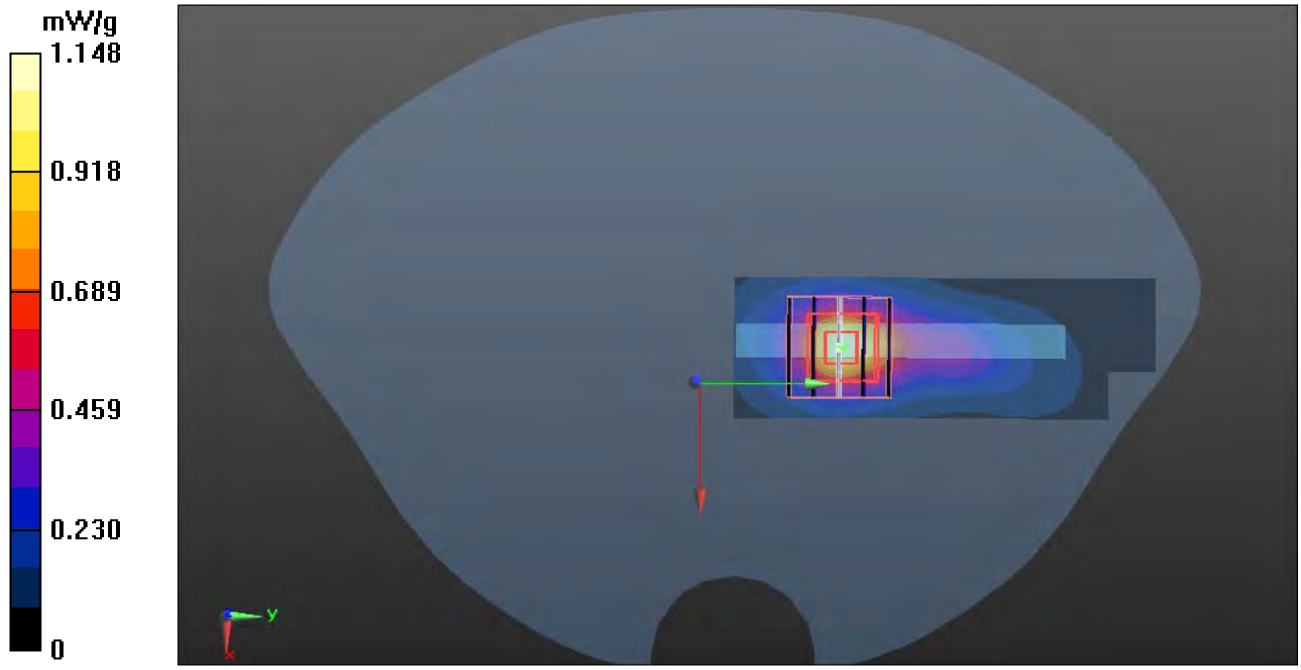
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2498.5 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used: f = 2498.5 MHz; σ = 2.045 mho/m; ε_r = 51.33; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.05, 7.05, 7.05); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch0/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.148 mW/g

Ch0/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.512 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.582 W/kg
SAR(1 g) = 0.805 mW/g; SAR(10 g) = 0.398 mW/g
Maximum value of SAR (measured) = 1.197 mW/g



P30 WiMax2600_5MHz_QPSK1-2_Vertical Front_Ch2_Ant1

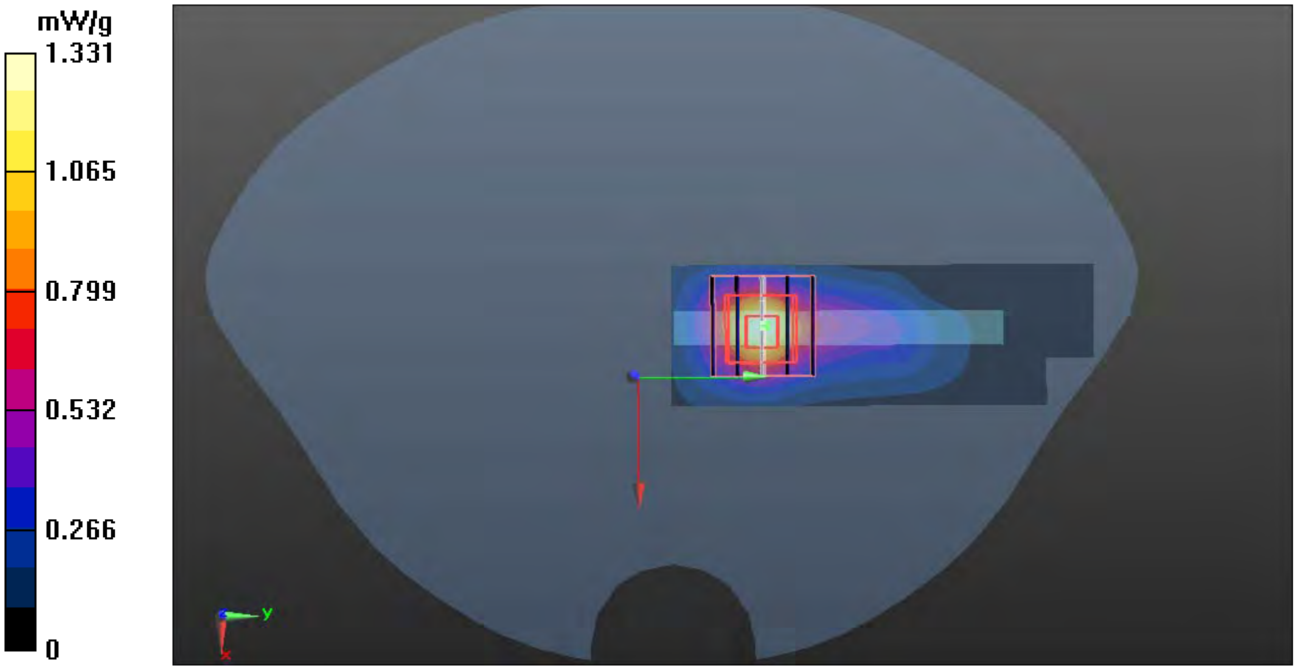
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2687.5 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used : f = 2687.5 MHz; σ = 2.256 mho/m; ε_r = 50.859; ρ = 1000 kg/m^3
Ambient Temperature：22.9 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch2/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.331 mW/g

Ch2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.161 V/m; Power Drift = 0.0089 dB
Peak SAR (extrapolated) = 2.043 W/kg
SAR(1 g) = 0.980 mW/g; SAR(10 g) = 0.459 mW/g
Maximum value of SAR (measured) = 1.473 mW/g



Date: 2011/8/29

P17 WiMax2600_5MHz_QPSK1-2_Horizontal Up_Ch1_Ant2

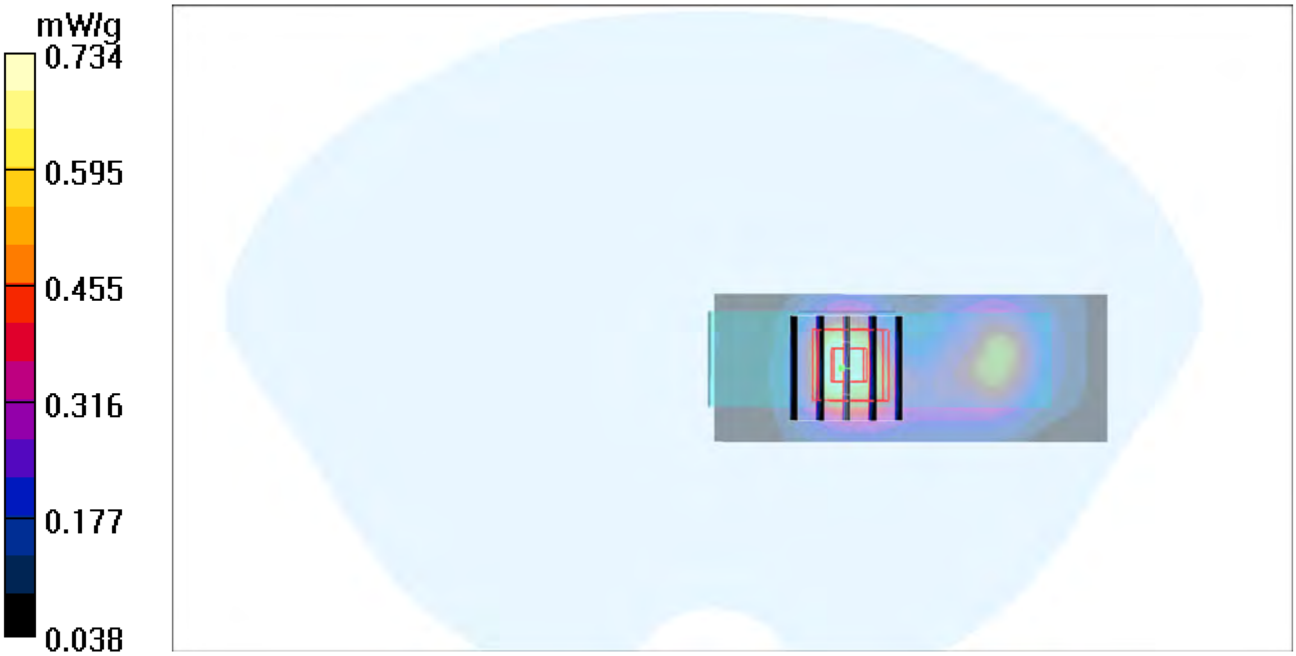
DUT: 110721C39

Communication System: Wimax_2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.24
Medium: MSL2600_0829 Medium parameters used: f = 2593 MHz; σ = 2.16 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：22.0 ℃

DASY4 Configuration:
- Probe: EX3DV4 - SN3590; ConvF(7.78, 7.78, 7.78); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2010/10/4
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.961 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.50 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.974 W/kg
SAR(1 g) = 0.538 mW/g; SAR(10 g) = 0.288 mW/g
Maximum value of SAR (measured) = 0.734 mW/g



P18 WiMax2600_5MHz_QPSK1-2_Horizontal Down_Ch1_Ant2

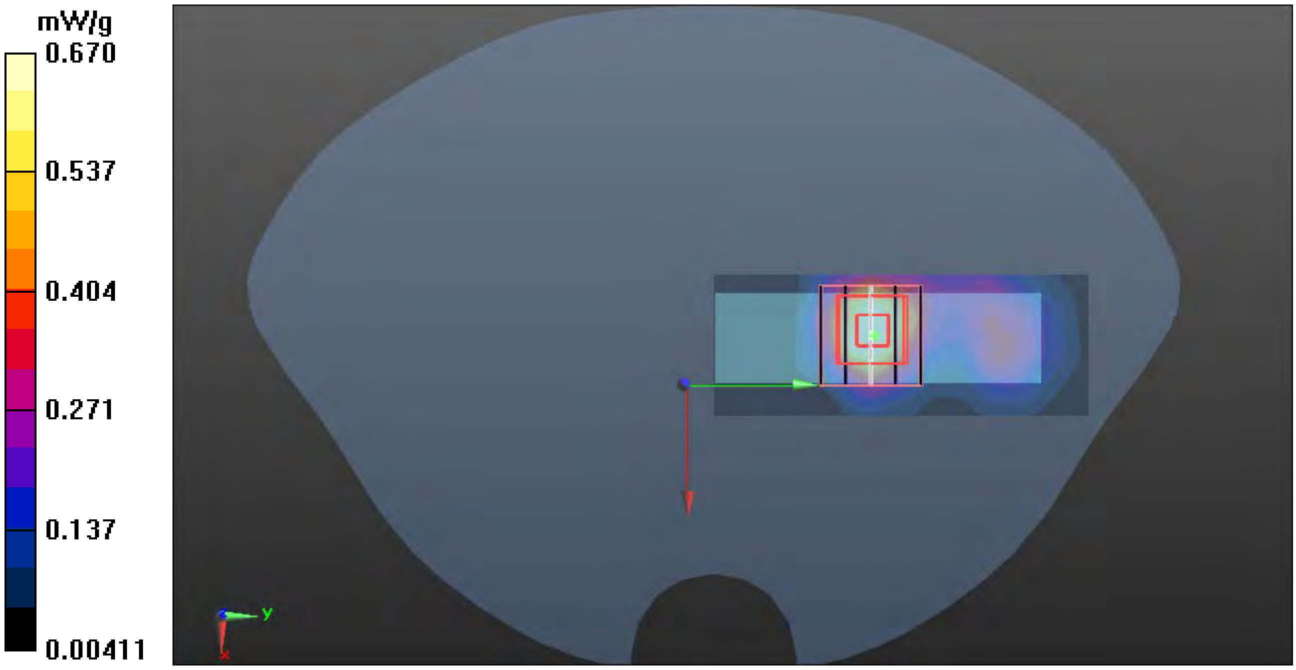
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: 1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.776 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.980 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.908 W/kg
SAR(1 g) = 0.471 mW/g; SAR(10 g) = 0.242 mW/g
Maximum value of SAR (measured) = 0.670 mW/g



P19 WiMax2600_5MHz_QPSK1-2_Vertical Front_Ch1_Ant2

DUT: 110723C17

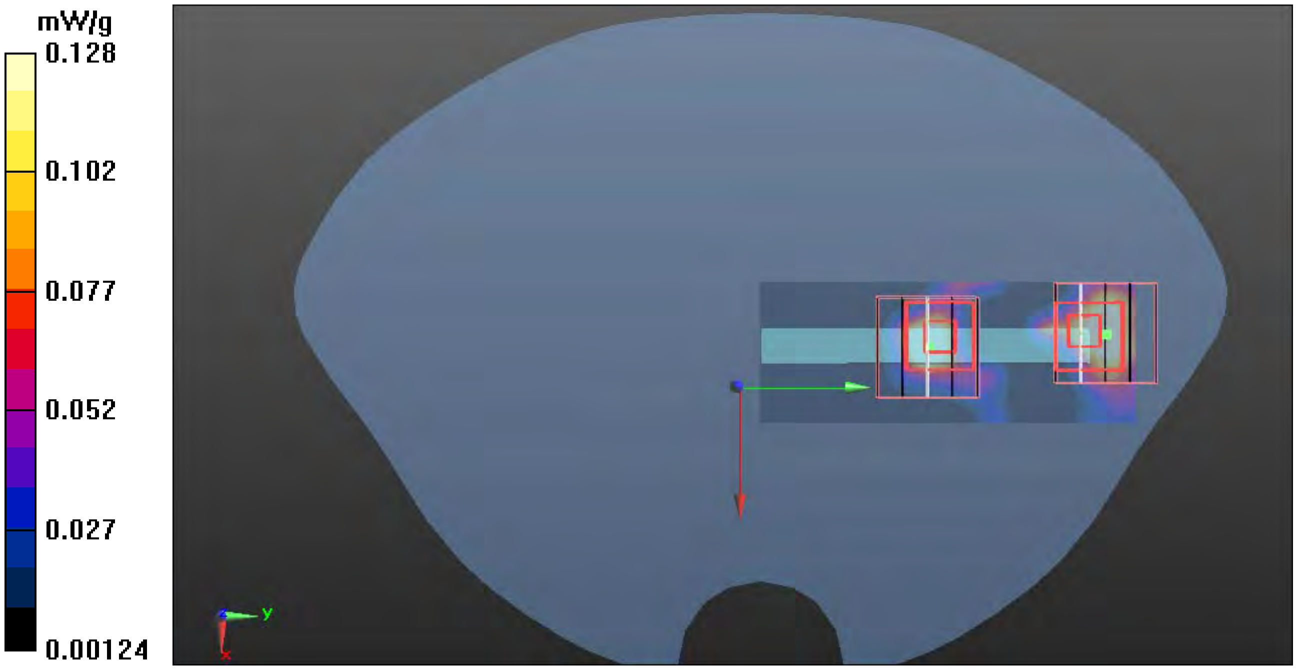
Communication System: WiMAX 2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.204 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.664 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.154 W/kg
SAR(1 g) = 0.086 mW/g; SAR(10 g) = 0.034 mW/g
Maximum value of SAR (measured) = 0.128 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.664 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.153 W/kg
SAR(1 g) = 0.068 mW/g; SAR(10 g) = 0.024 mW/g
Maximum value of SAR (measured) = 0.098 mW/g



mW/g
0.128
0.102
0.077
0.052
0.027
0.00124
y
x

P20 WiMax2600_5MHz_QPSK1-2_Vertical Back_Ch1_Ant2

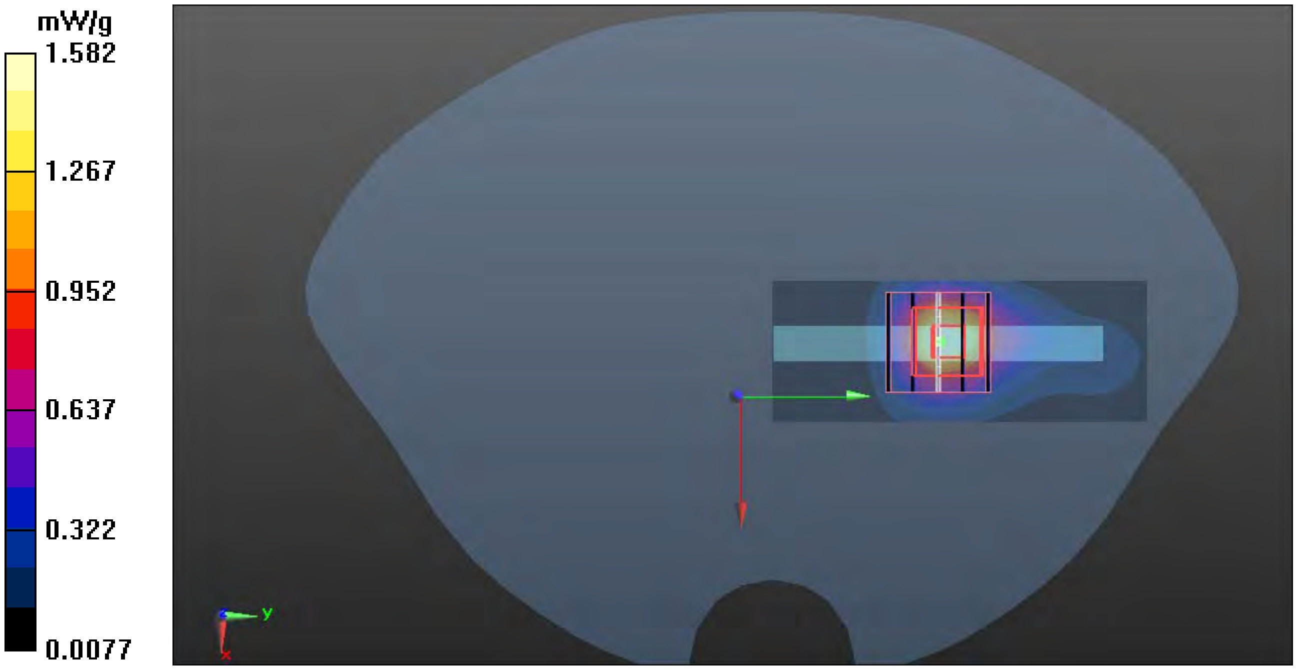
DUT: 110723C17

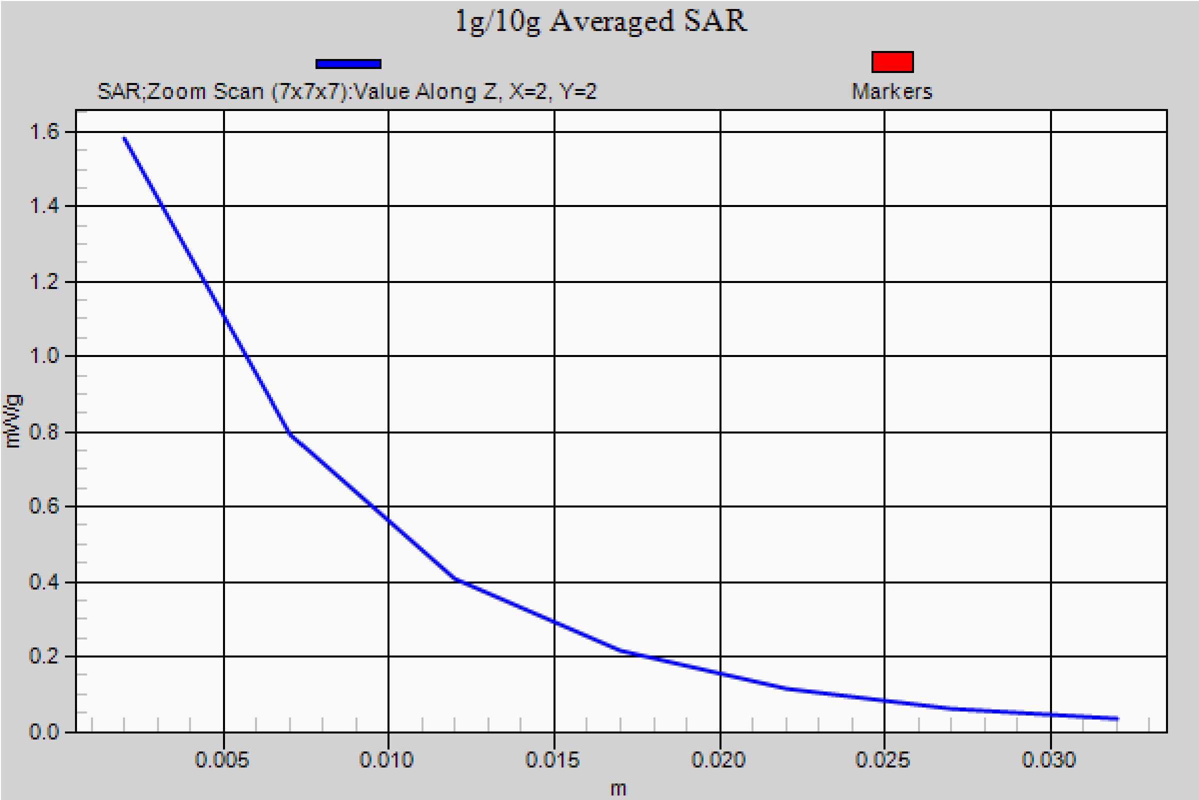
Communication System: WiMAX 2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.674 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.971 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 2.192 W/kg
SAR(1 g) = 1.08 mW/g; SAR(10 g) = 0.522 mW/g
Maximum value of SAR (measured) = 1.582 mW/g




1g/10g Averaged SAR
SAR;Zoom Scan (7x7x7):Value Along Z, X=2, Y=2
Markers
mW/g
1.6
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.005
0.010
0.015
0.020
0.025
0.030
m

P21 WiMax2600_5MHz_QPSK1-2_Tip_Ch1_Ant2

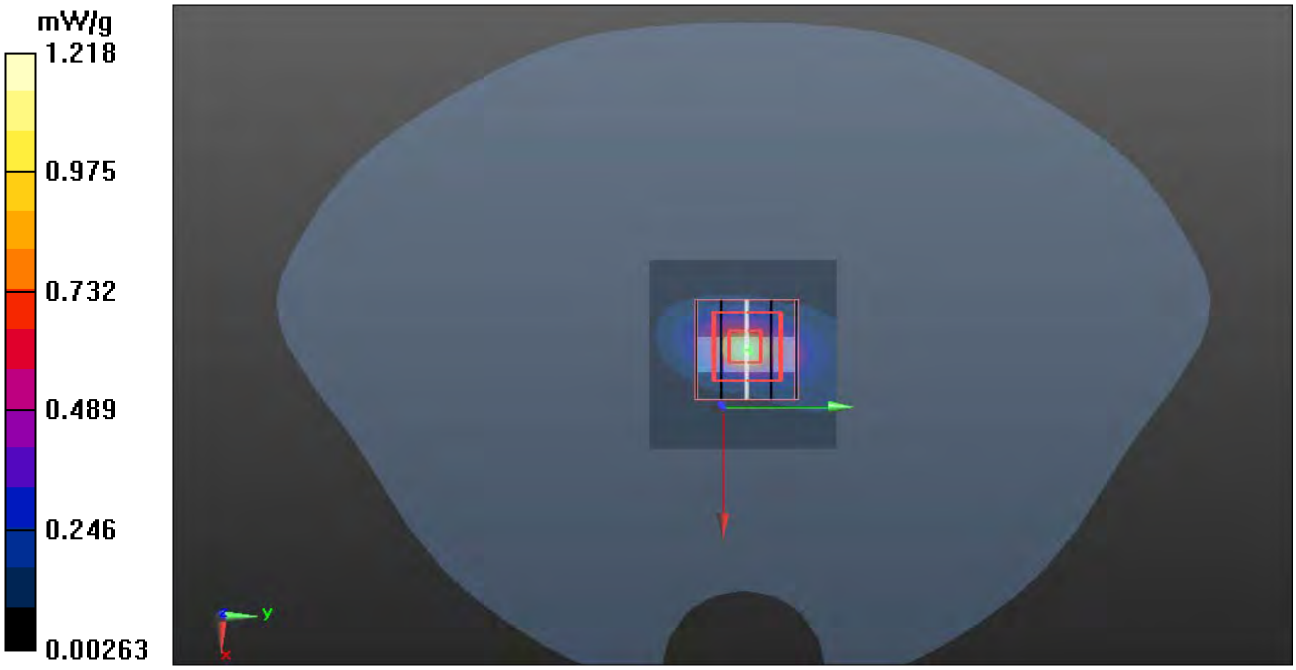
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.140 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.278 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 1.662 W/kg
SAR(1 g) = 0.725 mW/g; SAR(10 g) = 0.292 mW/g
Maximum value of SAR (measured) = 1.218 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab　　　　　　　　　　　　　Date: 2011/9/2

P31 WiMax2600_5MHz_QPSK1-2_Vertical Back_Ch0_Ant2

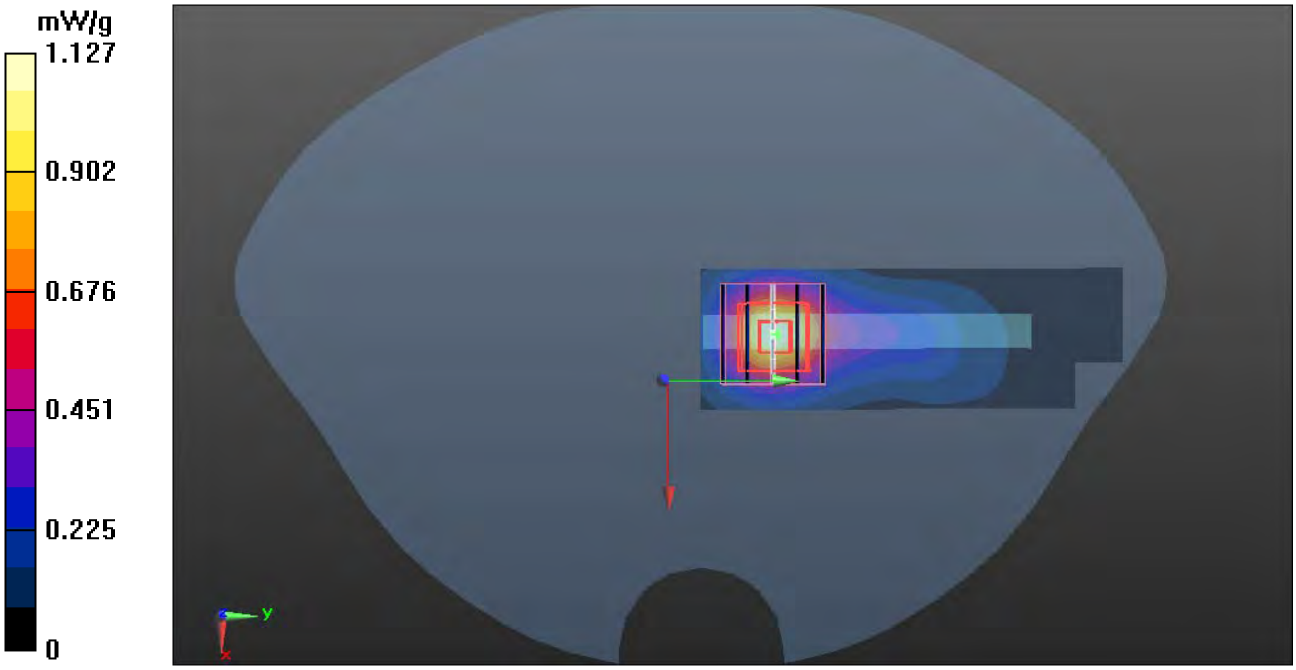
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2498.5 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used: f = 2498.5 MHz; σ = 2.045 mho/m; ε_r = 51.33; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.05, 7.05, 7.05); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch0/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.127 mW/g

Ch0/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.623 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 1.532 W/kg
SAR(1 g) = 0.801 mW/g; SAR(10 g) = 0.401 mW/g
Maximum value of SAR (measured) = 1.170 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2011/9/2

P32 WiMax2600_5MHz_QPSK1-2_Vertical Back_Ch2_Ant2

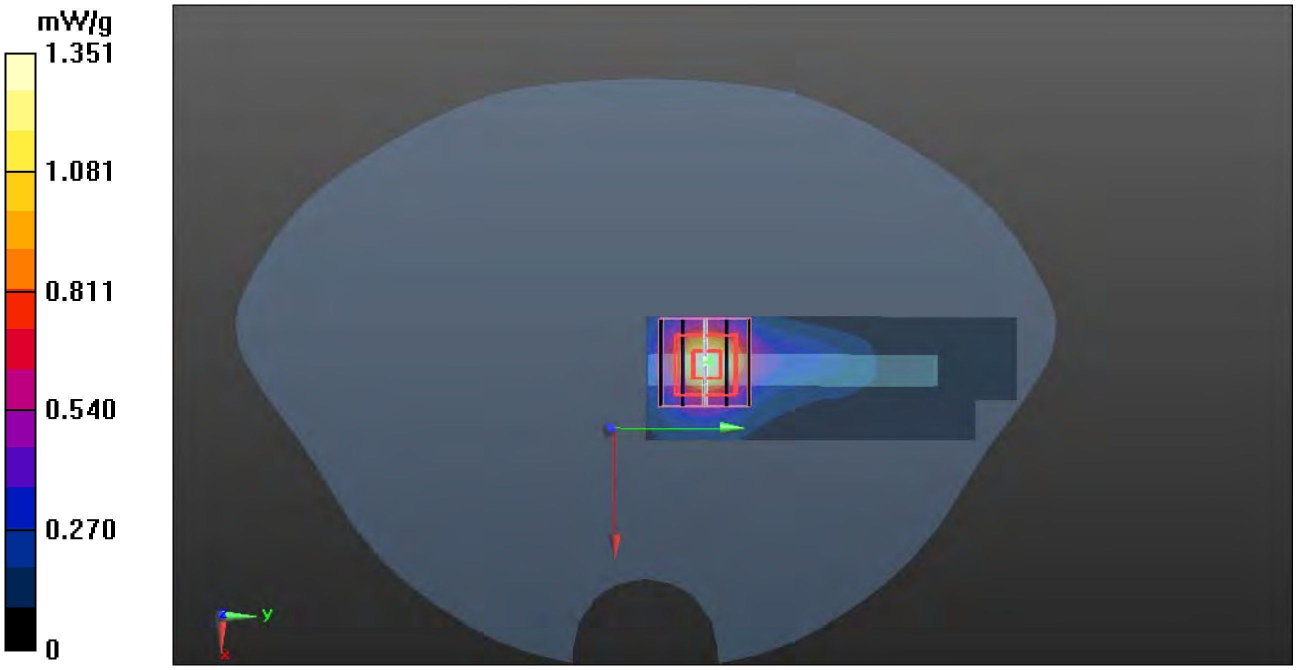
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2687.5 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used : f = 2687.5 MHz; σ = 2.256 mho/m; ε_r = 50.859; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch2/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.351 mW/g

Ch2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.650 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.850 W/kg
SAR(1 g) = 0.915 mW/g; SAR(10 g) = 0.443 mW/g
Maximum value of SAR (measured) = 1.362 mW/g



P37 WiMax2600_5MHz_16QAM1-2_Vertical Front_Ch2_Ant1

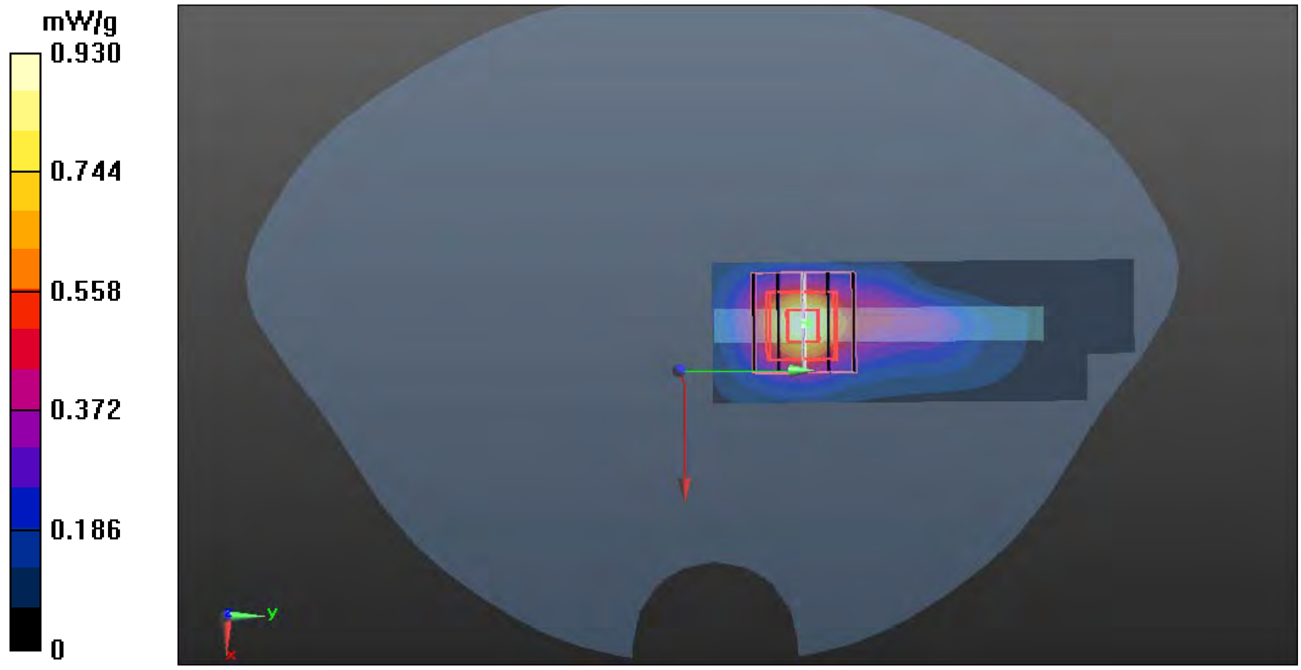
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2687.5 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used : f = 2687.5 MHz; σ = 2.256 mho/m; ε_r = 50.859; ρ = 1000 kg/m^3
Ambient Temperature：22.6 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch2/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.930 mW/g

Ch2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.401 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 1.427 W/kg
SAR(1 g) = 0.691 mW/g; SAR(10 g) = 0.329 mW/g
Maximum value of SAR (measured) = 1.044 mW/g



P07 WiMax2600_5MHz_16QAM1-2_Vertical Back_Ch1_Ant2

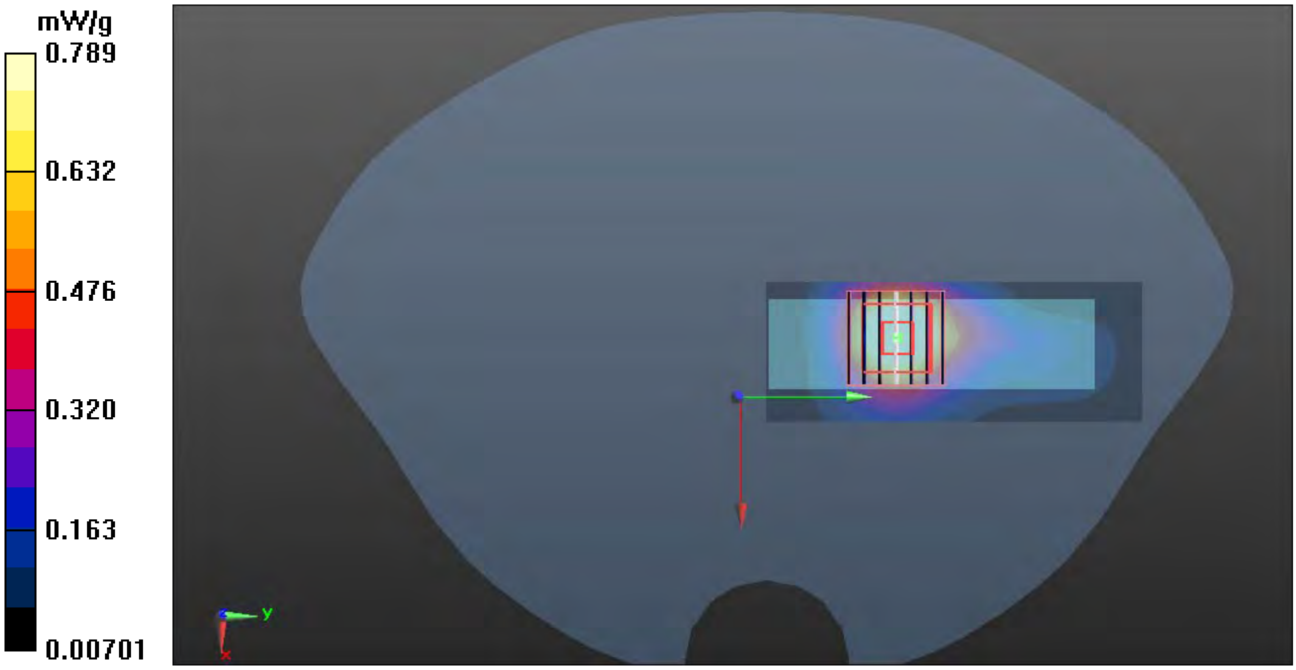
DUT: 110723C17

Communication System: WiMAX 2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection), Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.002 mW/g

Ch1/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.651 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 1.342 W/kg
SAR(1 g) = 0.707 mW/g; SAR(10 g) = 0.361 mW/g
Maximum value of SAR (measured) = 0.789 mW/g



Date: 2011/8/29

P08 WiMax2600_10MHz_QPSK1-2_Horizontal Up_Ch1_Ant1

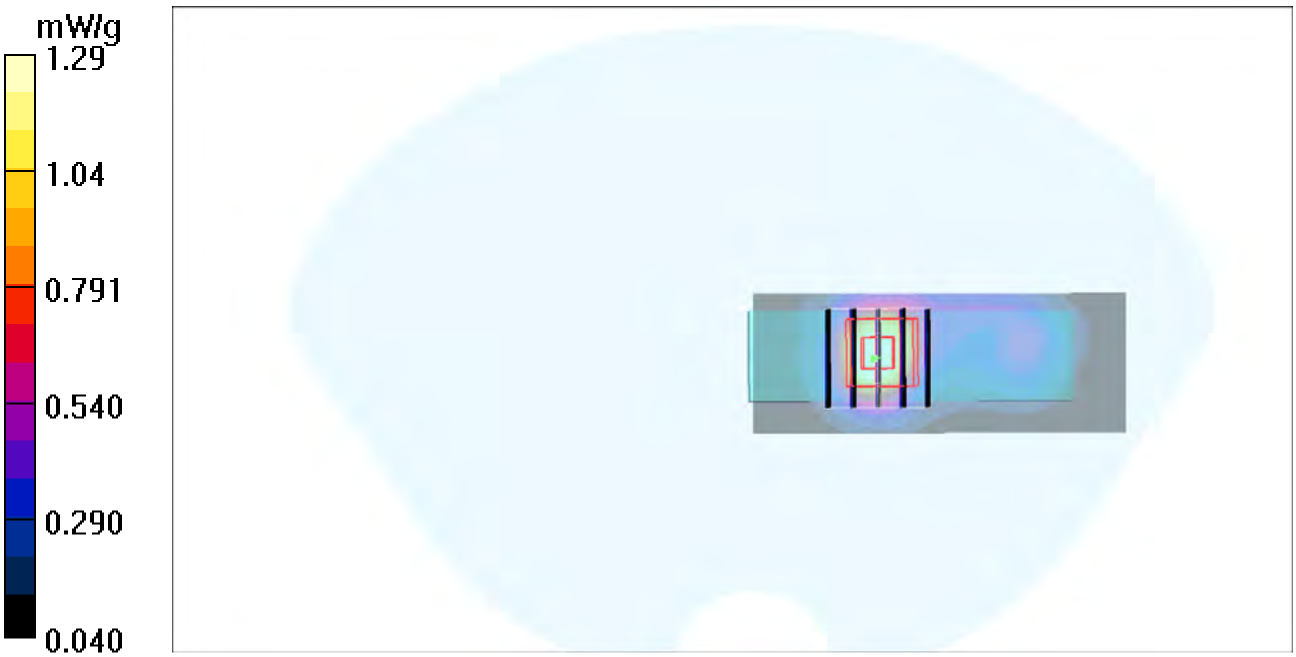
DUT: 110721C39

Communication System: Wimax_2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.24
Medium: MSL2600_0829 Medium parameters used: f = 2593 MHz; σ = 2.16 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：21.9 ℃

DASY4 Configuration:
- Probe: EX3DV4 - SN3590; ConvF(7.78, 7.78, 7.78); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2010/10/4
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.57 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.02 V/m; Power Drift = -0.150 dB
Peak SAR (extrapolated) = 1.75 W/kg
SAR(1 g) = 0.925 mW/g; SAR(10 g) = 0.478 mW/g
Maximum value of SAR (measured) = 1.29 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2011/8/31

P09 WiMax2600_10MHz_QPSK1-2_Horizontal Down_Ch1_Ant1

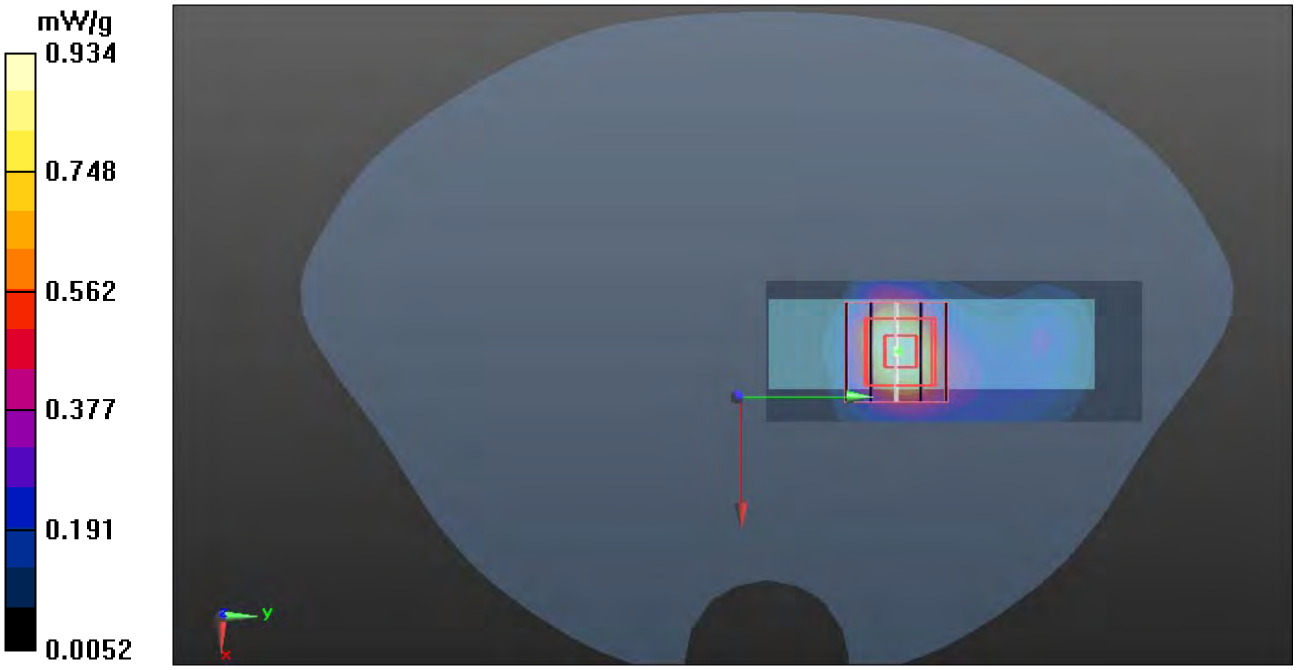
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: 1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.061 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.371 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 1.251 W/kg
SAR(1 g) = 0.651 mW/g; SAR(10 g) = 0.331 mW/g
Maximum value of SAR (measured) = 0.934 mW/g



P10 WiMax2600_10MHz_QPSK1-2_Vertical Front_Ch1_Ant1

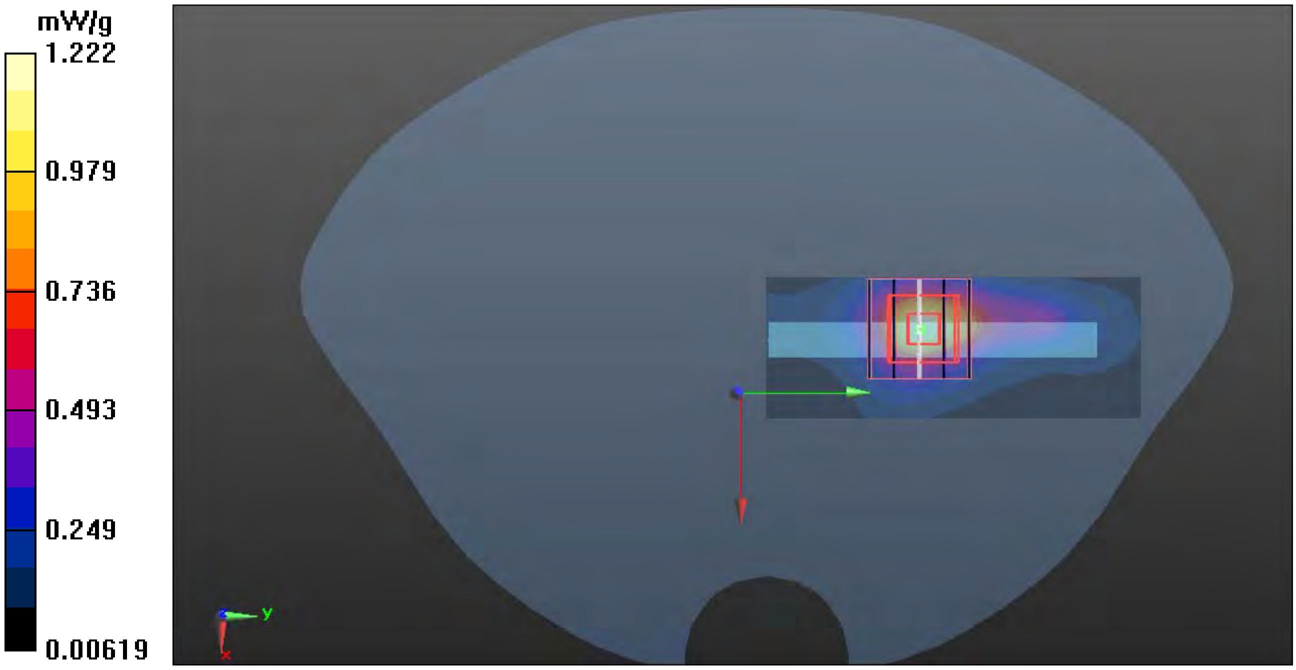
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.235 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.715 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.661 W/kg
SAR(1 g) = 0.805 mW/g; SAR(10 g) = 0.386 mW/g
Maximum value of SAR (measured) = 1.222 mW/g



P11 WiMax2600_10MHz_QPSK1-2_Vertical Back_Ch1_Ant1

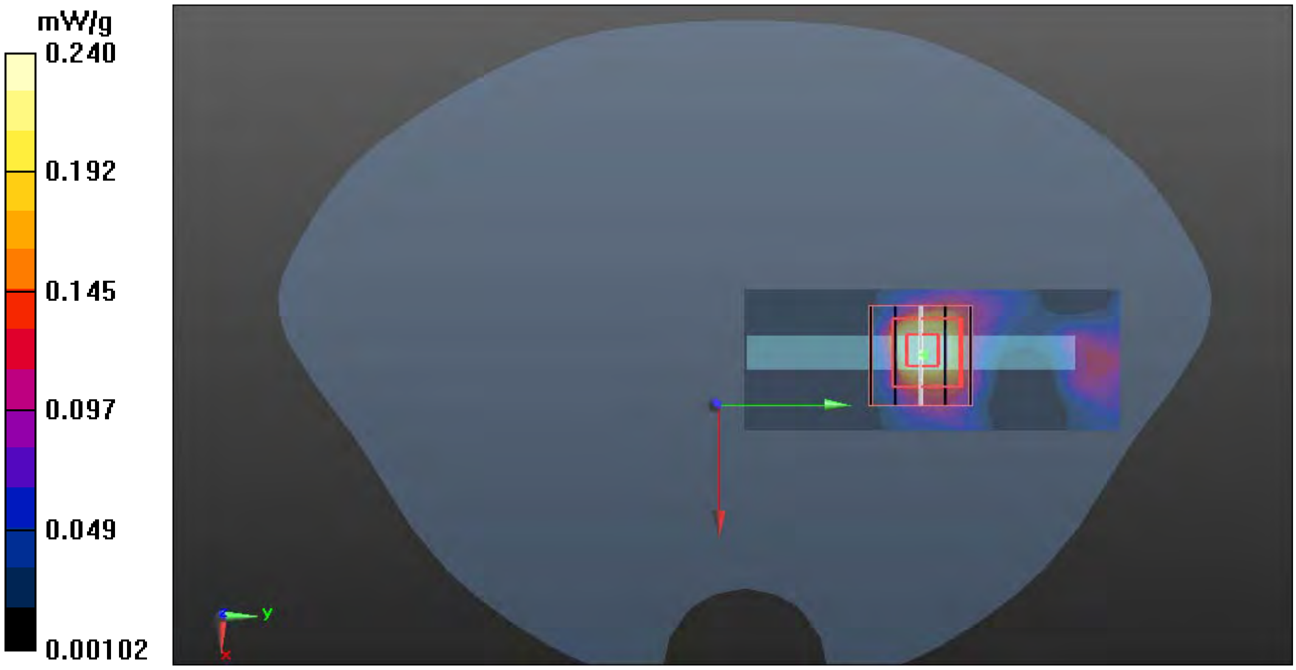
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.280 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.674 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.327 W/kg
SAR(1 g) = 0.168 mW/g; SAR(10 g) = 0.071 mW/g
Maximum value of SAR (measured) = 0.240 mW/g



P12 WiMax2600_10MHz_QPSK1-2_Tip_Ch1_Ant1

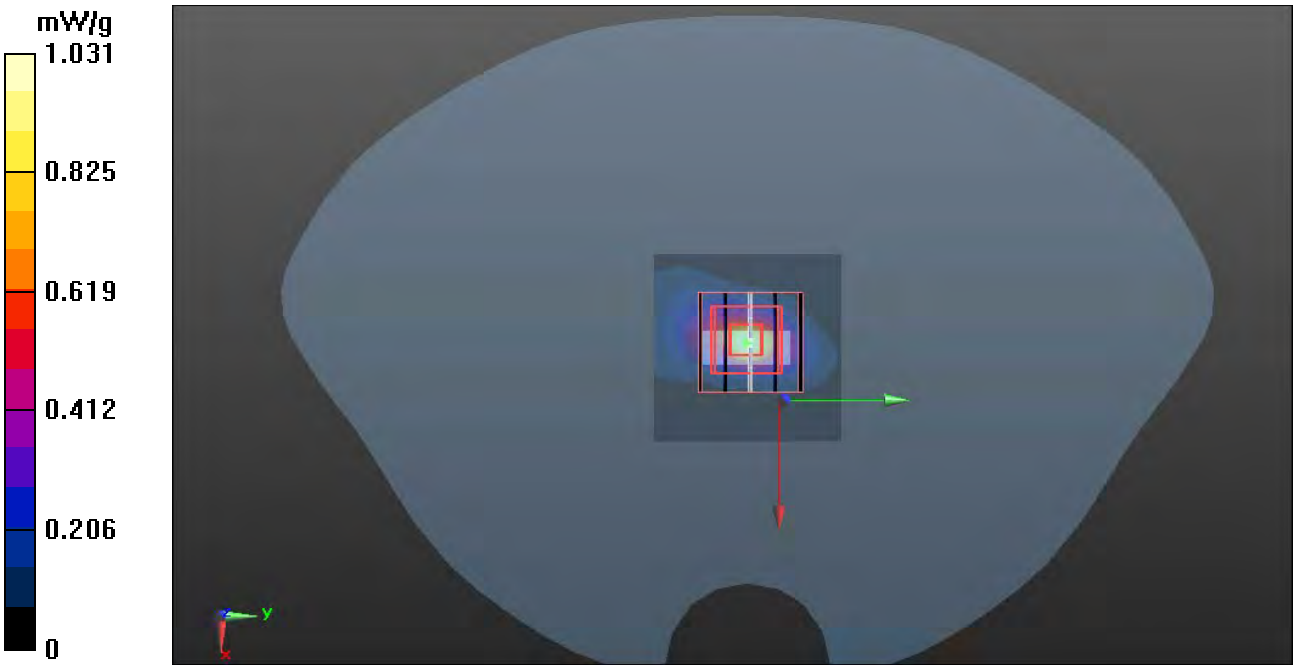
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.031 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.154 V/m; Power Drift = 0.15 dB
Peak SAR (extrapolated) = 1.487 W/kg
SAR(1 g) = 0.657 mW/g; SAR(10 g) = 0.269 mW/g
Maximum value of SAR (measured) = 1.101 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2011/8/31

P22 WiMax2600_10MHz_QPSK1-2_Horizontal Up_Ch0_Ant1

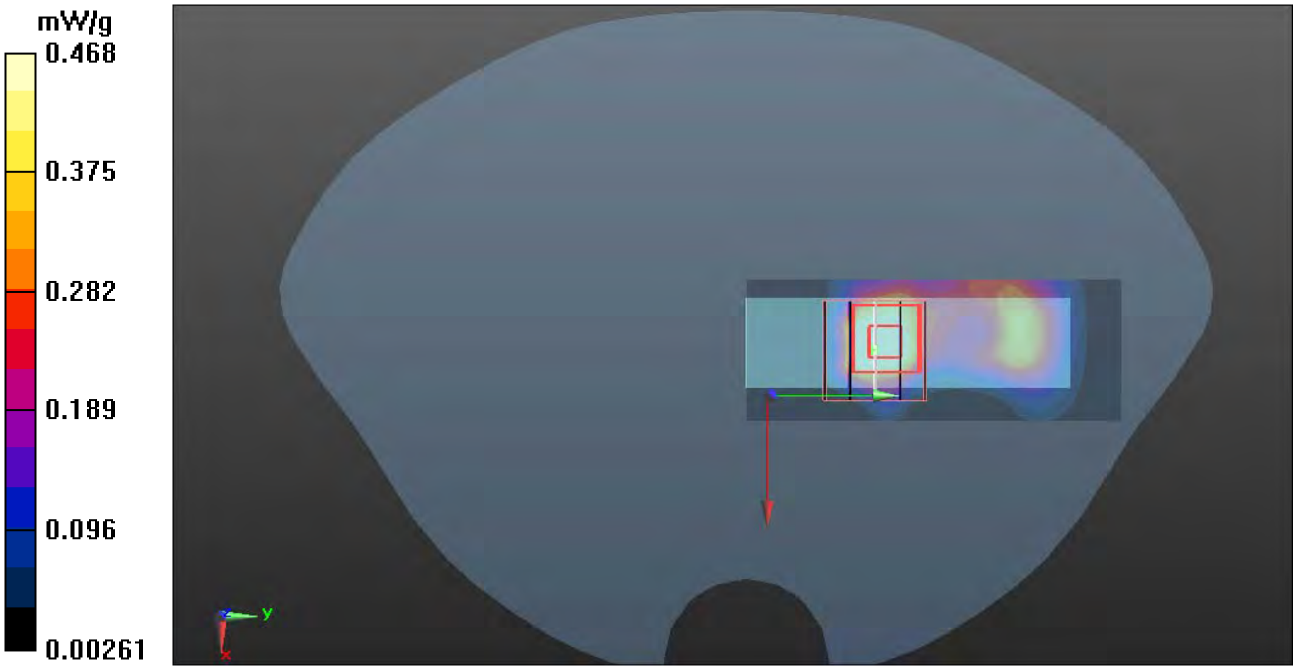
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2501 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2501 MHz; σ = 2.057 mho/m; ε_r = 54.009; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: 1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch0/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.730 mW/g

Ch0/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.093 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.644 W/kg
SAR(1 g) = 0.345 mW/g; SAR(10 g) = 0.179 mW/g
Maximum value of SAR (measured) = 0.468 mW/g



P23 WiMax2600_10MHz_QPSK1-2_Horizontal Up_Ch2_Ant1

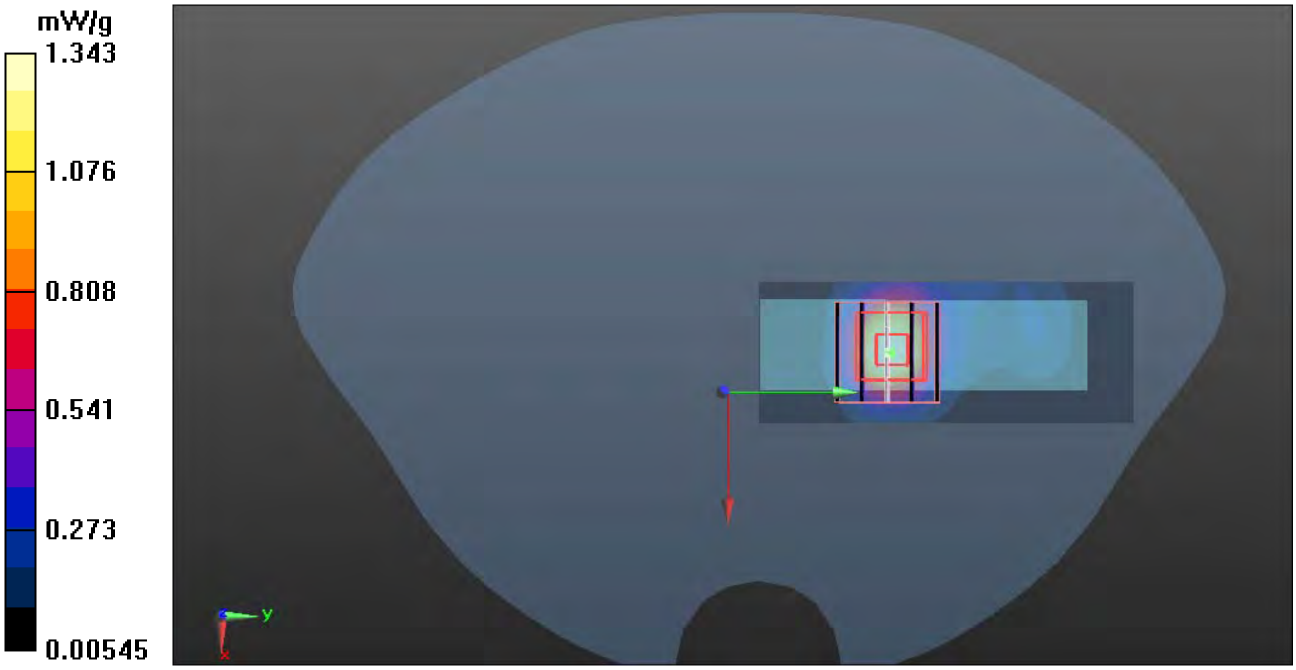
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2685 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2685 MHz; σ = 2.208 mho/m; ε_r = 53.56; ρ = 1000 kg/m^3
Ambient Temperature：22.5 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: 1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch2/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.528 mW/g

Ch2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.603 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 1.854 W/kg
SAR(1 g) = 0.915 mW/g; SAR(10 g) = 0.441 mW/g
Maximum value of SAR (measured) = 1.343 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2011/9/2

P33 WiMax2600_10MHz_QPSK1-2_Vertical Front_Ch0_Ant1

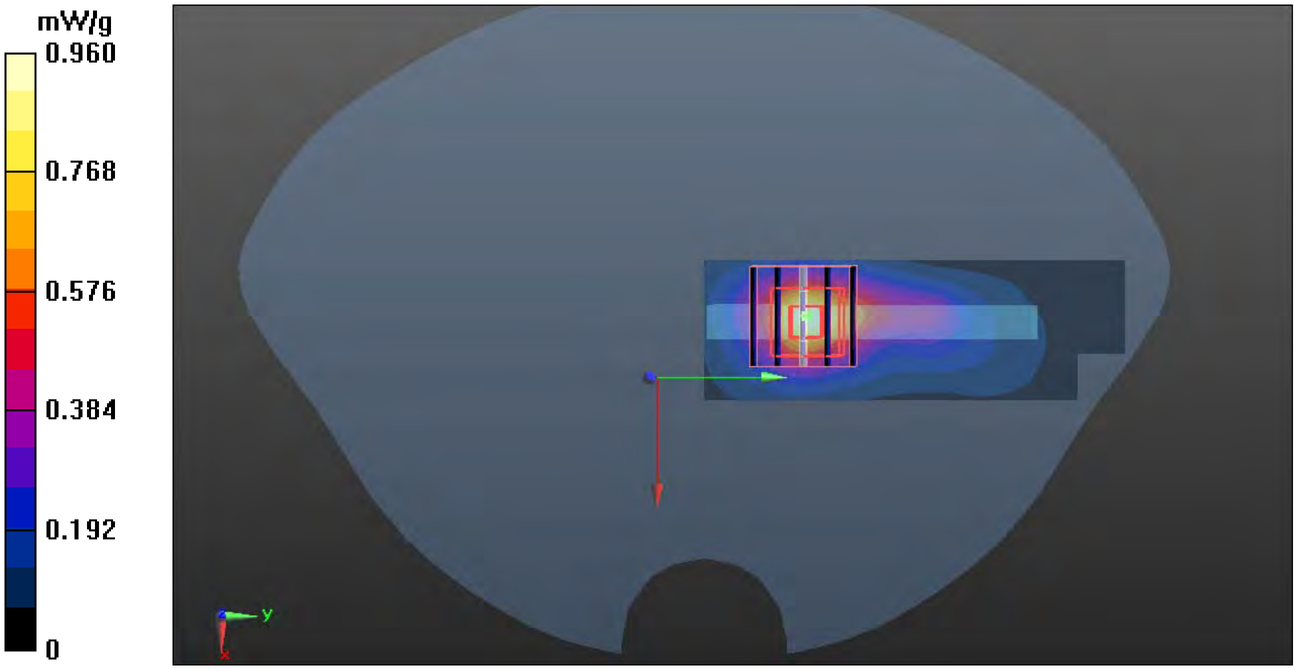
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2501 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used: f = 2501 MHz; σ = 2.099 mho/m; ε_r = 51.309; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch0/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.960 mW/g

Ch0/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.366 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.374 W/kg
SAR(1 g) = 0.703 mW/g; SAR(10 g) = 0.348 mW/g
Maximum value of SAR (measured) = 1.019 mW/g



P34 WiMax2600_10MHz_QPSK1-2_Vertical Front_Ch2_Ant1

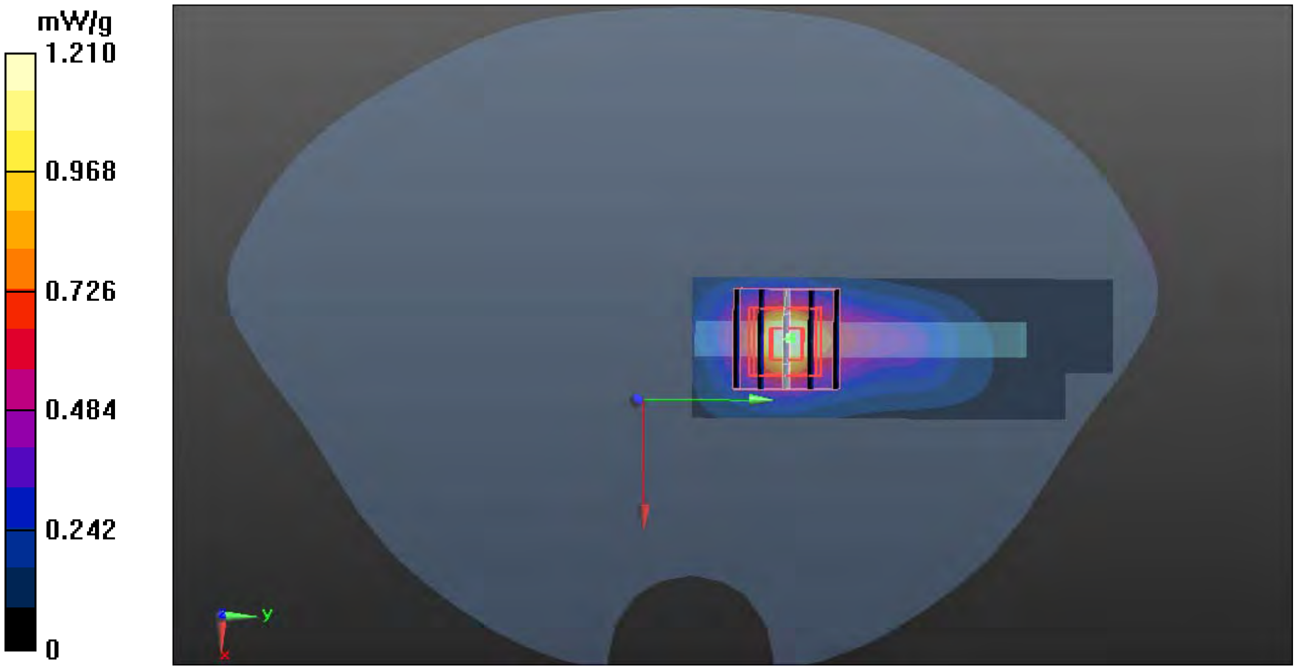
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2685 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used: f = 2685 MHz; σ = 2.253 mho/m; ε_r = 50.86; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch2/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.210 mW/g

Ch2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.408 V/m; Power Drift = 0.0068 dB
Peak SAR (extrapolated) = 1.878 W/kg
SAR(1 g) = 0.896 mW/g; SAR(10 g) = 0.419 mW/g
Maximum value of SAR (measured) = 1.352 mW/g



Date: 2011/8/29

P13 WiMax2600_10MHz_QPSK1-2_Horizontal Up_Ch1_Ant2

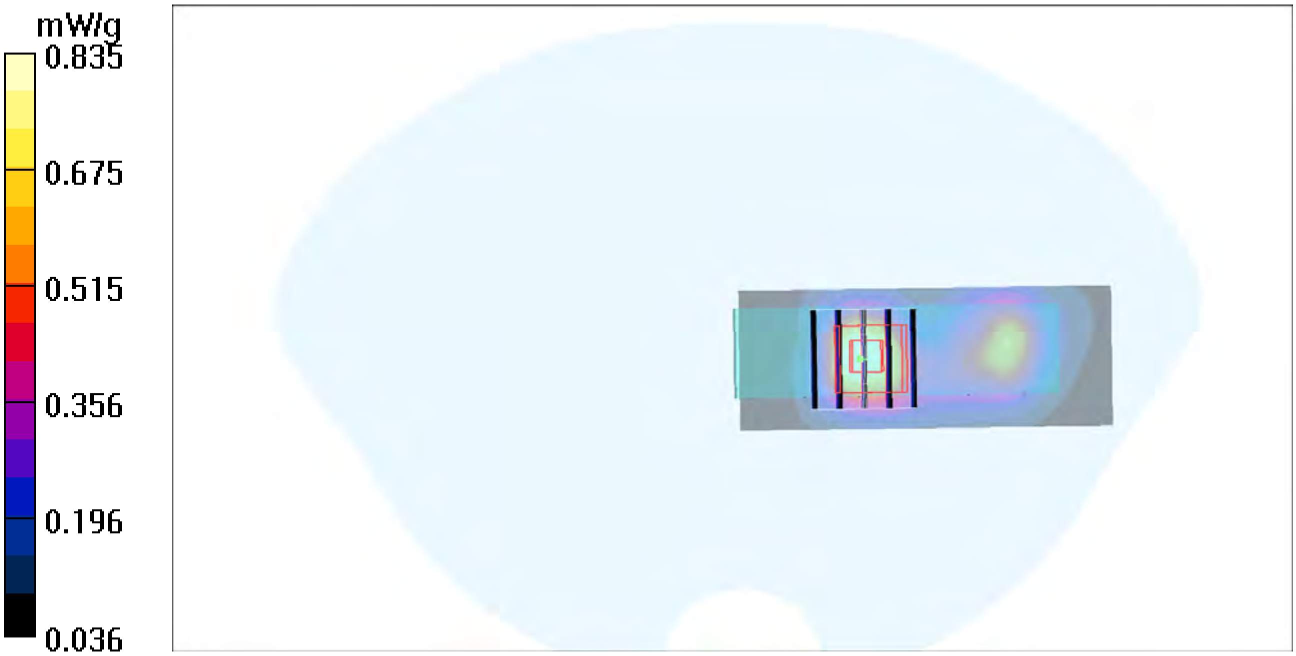
DUT: 110721C39

Communication System: Wimax_2.6GHz 5M; Frequency: 2593 MHz;Duty Cycle: 1:3.24
Medium: MSL2600_0829 Medium parameters used: f = 2593 MHz; σ = 2.16 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Ambient Temperature：22.8 ℃; Liquid Temperature：21.9 ℃

DASY4 Configuration:
- Probe: EX3DV4 - SN3590; ConvF(7.78, 7.78, 7.78); Calibrated: 2011/2/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2010/10/4
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.07 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.93 V/m; Power Drift = 0.040 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.600 mW/g; SAR(10 g) = 0.314 mW/g
Maximum value of SAR (measured) = 0.835 mW/g



P24 WiMax2600_10MHz_QPSK1-2_Horizontal Down_Ch1_Ant2

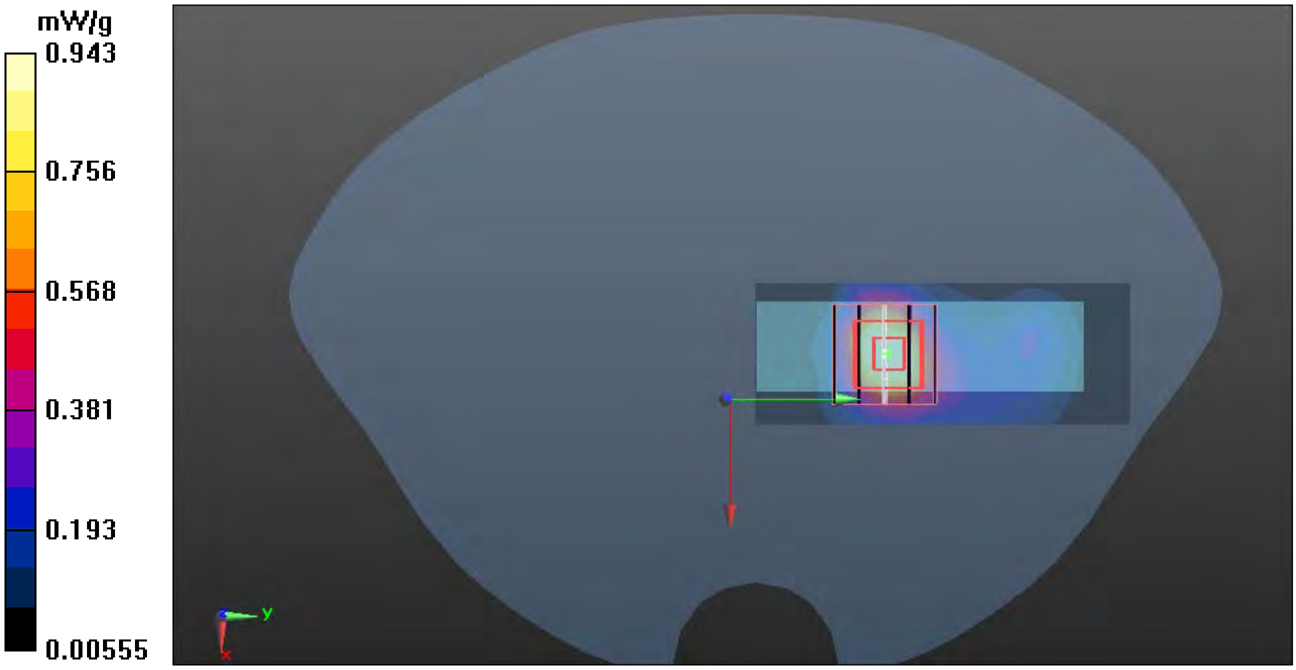
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: 1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.065 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.329 V/m; Power Drift = 0.0025 dB
Peak SAR (extrapolated) = 1.264 W/kg
SAR(1 g) = 0.658 mW/g; SAR(10 g) = 0.334 mW/g
Maximum value of SAR (measured) = 0.943 mW/g



P25 WiMax2600_10MHz_QPSK1-2_Vertical Front_Ch1_Ant2

DUT: 110723C17

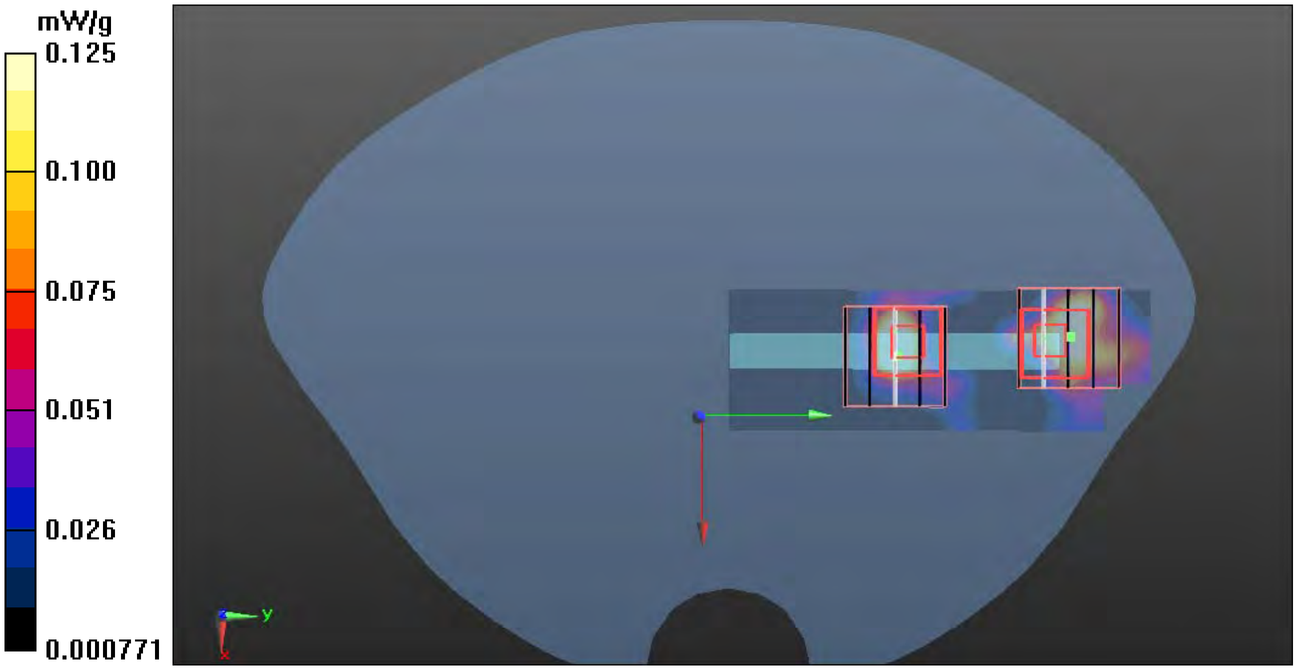
Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.176 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.626 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 0.133 W/kg
SAR(1 g) = 0.079 mW/g; SAR(10 g) = 0.031 mW/g
Maximum value of SAR (measured) = 0.125 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.626 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 0.160 W/kg
SAR(1 g) = 0.066 mW/g; SAR(10 g) = 0.022 mW/g
Maximum value of SAR (measured) = 0.096 mW/g


mW/g
0.125
0.100
0.075
0.051
0.026
0.000771
y
x

P26 WiMax2600_10MHz_QPSK1-2_Vertical Back_Ch1_Ant2

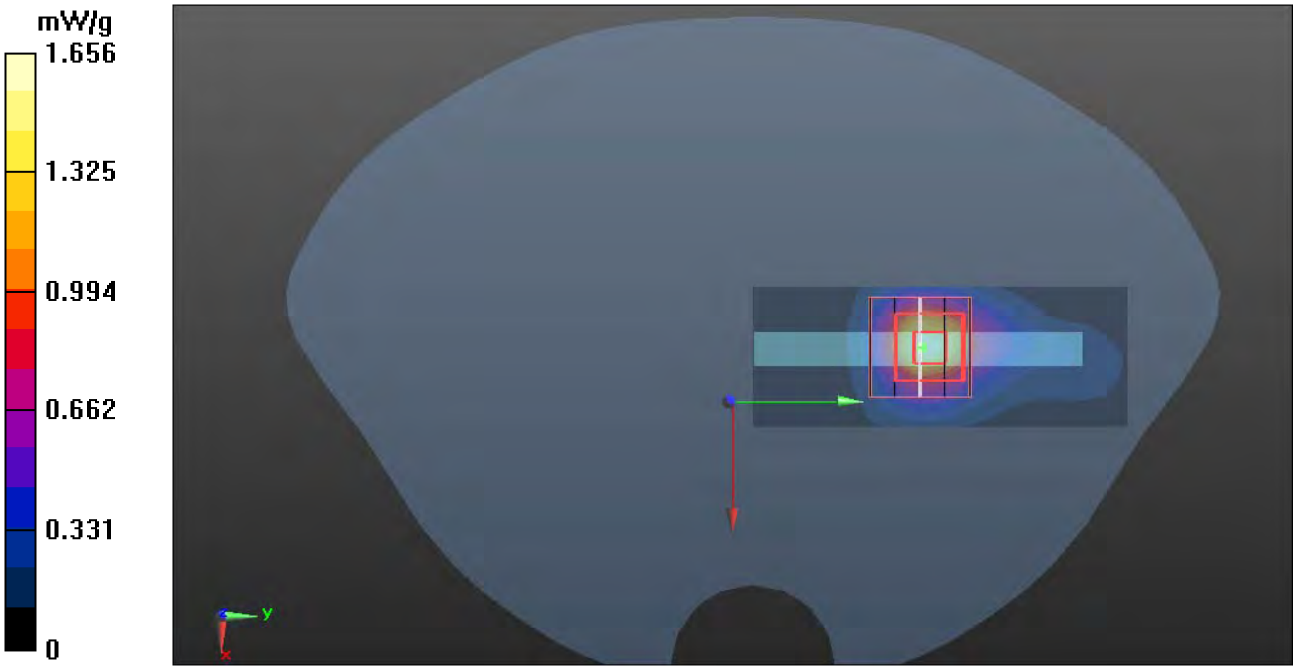
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.3 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.656 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.536 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 2.176 W/kg
SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.512 mW/g
Maximum value of SAR (measured) = 1.561 mW/g



P27 WiMax2600_10MHz_QPSK1-2_Tip_Ch2593_Ant2

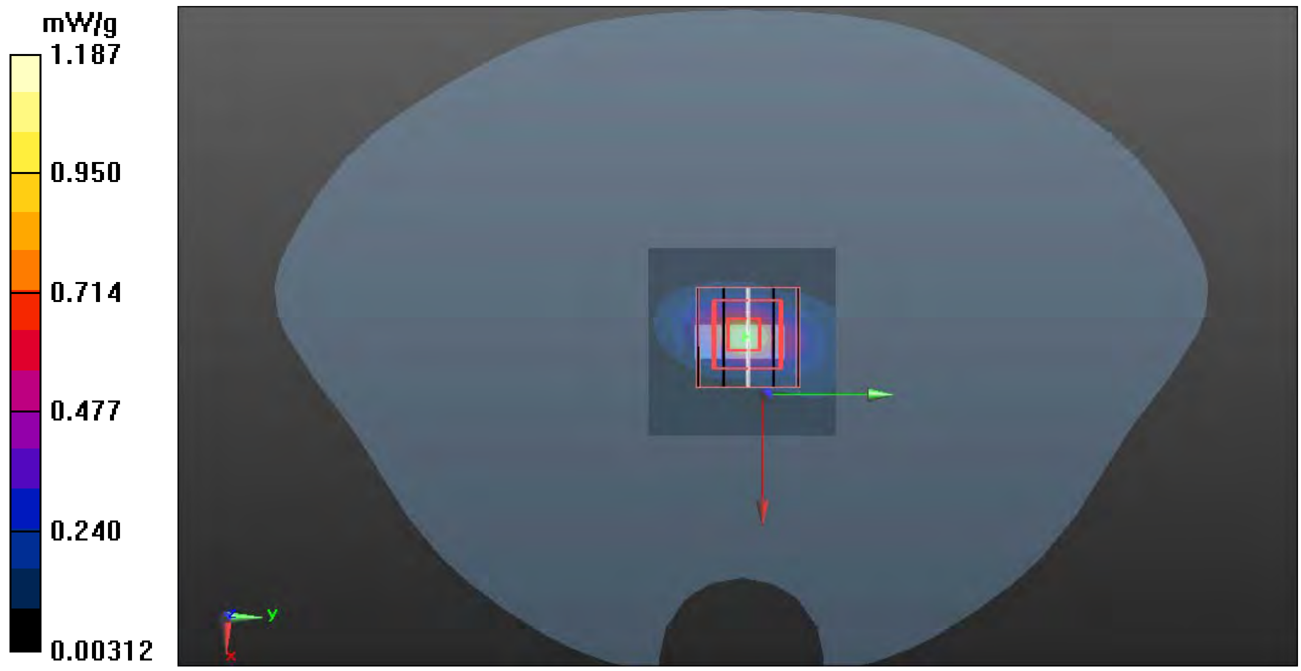
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (41x41x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.106 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.839 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 1.622 W/kg
SAR(1 g) = 0.707 mW/g; SAR(10 g) = 0.286 mW/g
Maximum value of SAR (measured) = 1.187 mW/g



P35 WiMax2600_10MHz_QPSK1-2_Vertical Back_Ch0_Ant2

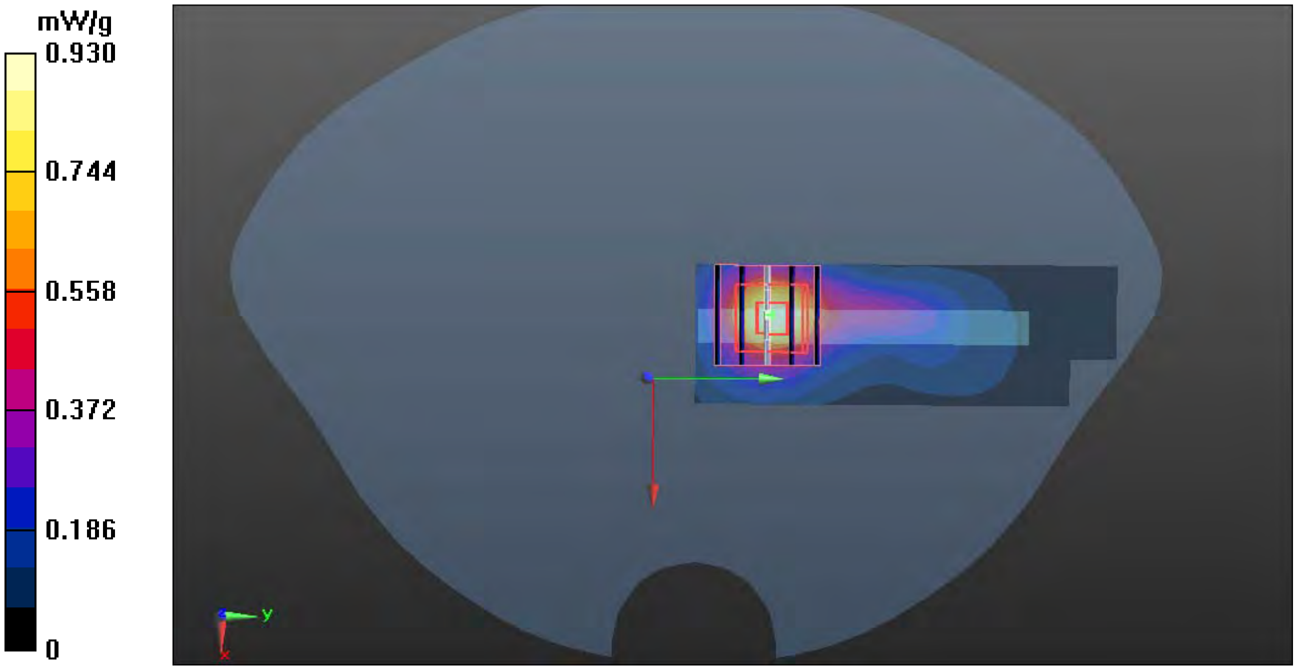
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2501 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used: f = 2501 MHz; σ = 2.099 mho/m; ε_r = 51.309; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch0/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 0.930 mW/g

Ch0/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.842 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.242 W/kg
SAR(1 g) = 0.658 mW/g; SAR(10 g) = 0.338 mW/g
Maximum value of SAR (measured) = 0.946 mW/g



P36 WiMax2600_10MHz_QPSK1-2_Vertical Back_Ch2_Ant2

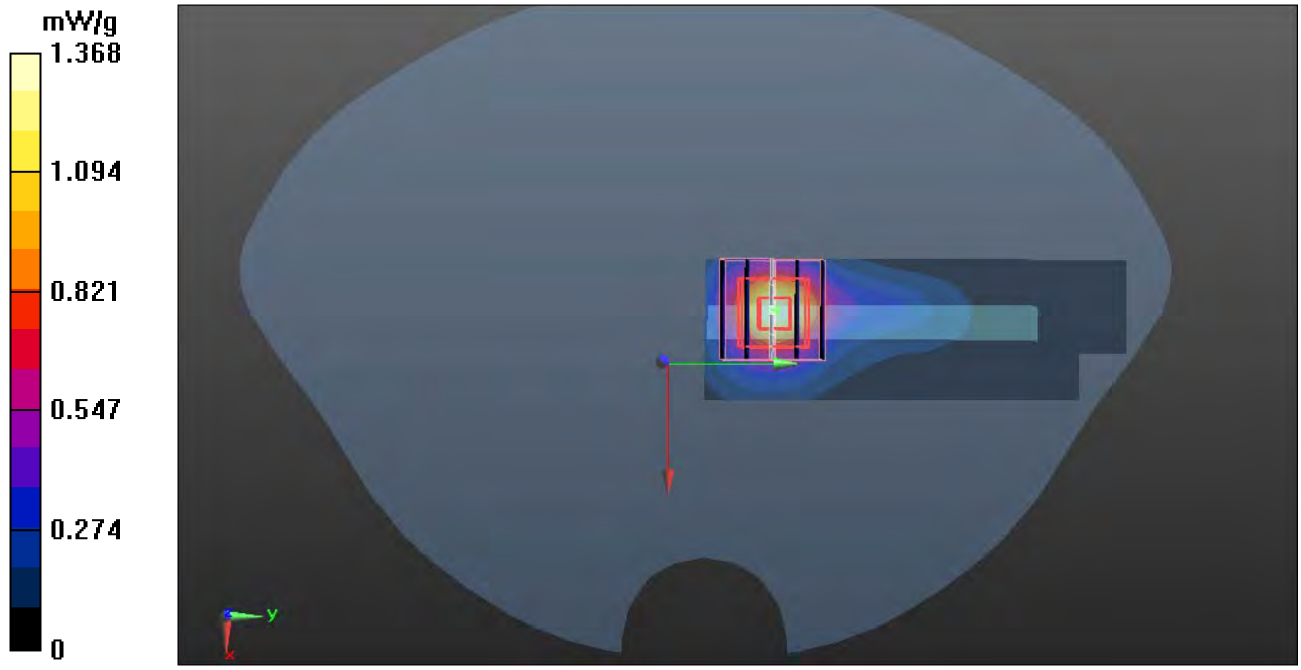
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2685 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used: f = 2685 MHz; σ = 2.253 mho/m; ε_r = 50.86; ρ = 1000 kg/m^3
Ambient Temperature：22.6 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch2/Area Scan (31x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.368 mW/g

Ch2/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.583 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 1.873 W/kg
SAR(1 g) = 0.931 mW/g; SAR(10 g) = 0.451 mW/g
Maximum value of SAR (measured) = 1.381 mW/g



P38 WiMax2600_10MHz_16QAM1-2_Horizontal Up_Ch1_Ant1

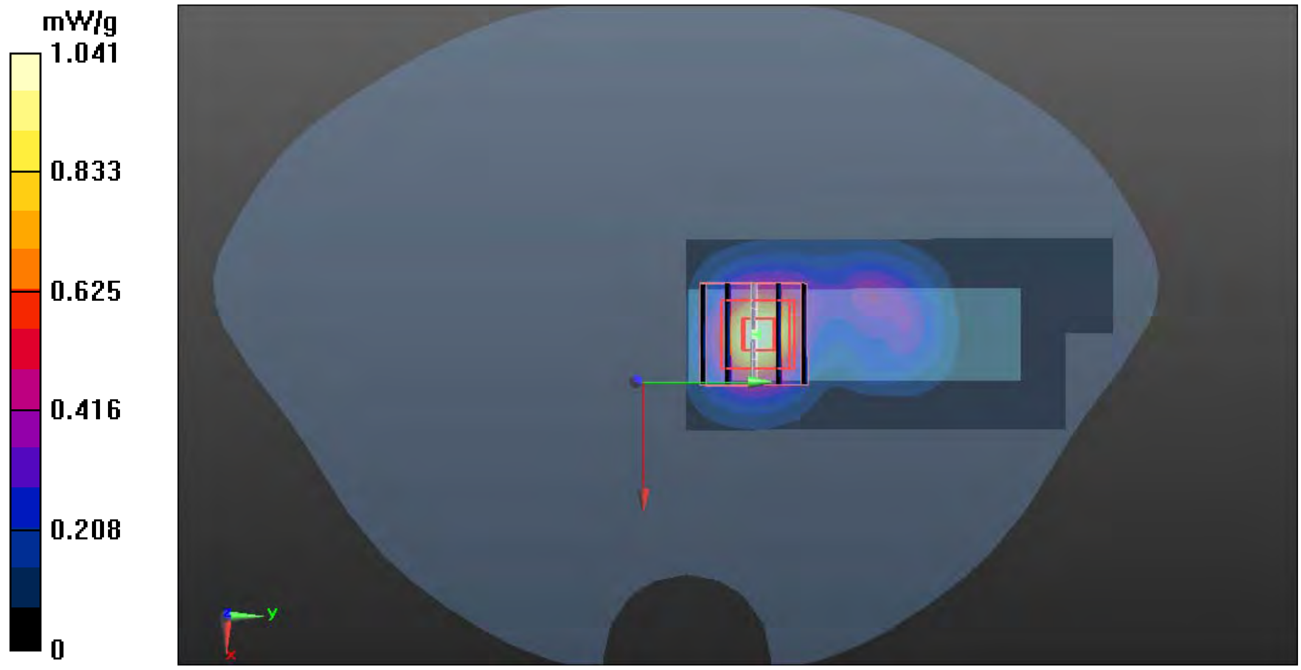
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0902 Medium parameters used: f = 2593 MHz; σ = 2.2 mho/m; ε_r = 51.105; ρ = 1000 kg/m^3
Ambient Temperature：22.7 ℃; Liquid Temperature：21.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Front; Type: SAM; Serial: TP-1485
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (41x101x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.041 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.176 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.351 W/kg
SAR(1 g) = 0.715 mW/g; SAR(10 g) = 0.360 mW/g
Maximum value of SAR (measured) = 1.011 mW/g



P28 WiMax2600_10MHz_16QAM1-2_Vertical Back_Ch1_Ant2

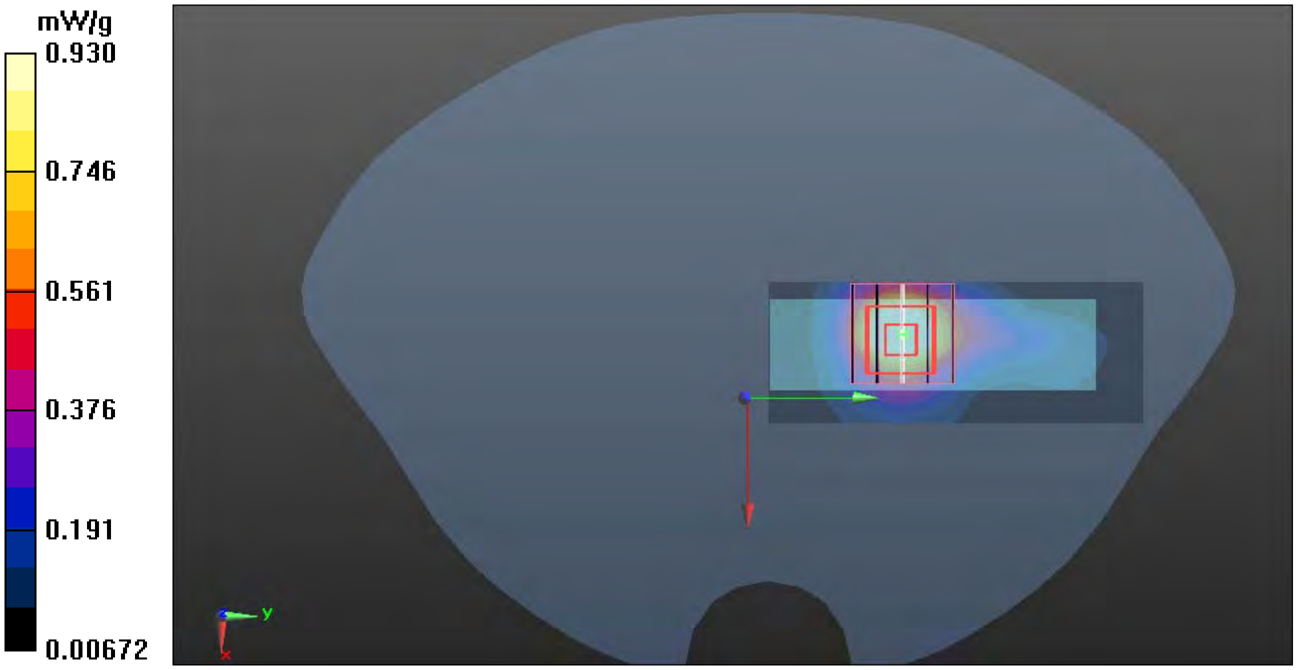
DUT: 110723C17

Communication System: WiMAX 2.6GHz 10M; Frequency: 2593 MHz;Duty Cycle: 1:3.23966
Medium: MSL2600_0831 Medium parameters used: f = 2593 MHz; σ = 2.157 mho/m; ε_r = 53.805; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(6.92, 6.92, 6.92); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2010/9/20
- Phantom: SAM Phantom_Left; Type: SAM; Serial: TP-1202
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

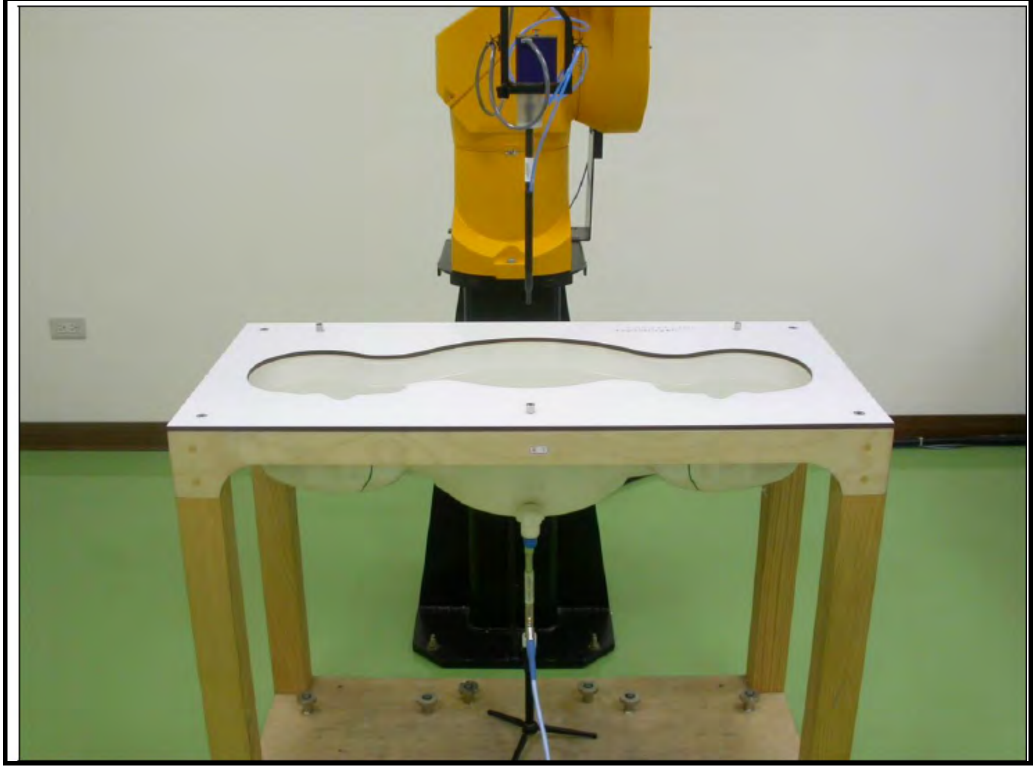
Ch1/Area Scan (31x81x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 1.131 mW/g

Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.282 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.251 W/kg
SAR(1 g) = 0.647 mW/g; SAR(10 g) = 0.329 mW/g
Maximum value of SAR (measured) = 0.930 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

F. Bomholt

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

Volcaire Kotz

Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 1 245 9700, Fax +41 1 245 9779
info@speag.com, http://www.speag.com

Certificate of Conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 C
Series No	TP-1150 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zürich 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 items (called samples) or are tested at each item.

Test	Requirement	Details	Units tested
Dimensions	Compliant with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness of shell	Compliant with the requirements according to the standards	2mm +/- 0.2mm in flat and specific areas of head section	First article, Samples, TP-1314 ff.
Material thickness at ERP	Compliant with the requirements according to the standards	6mm +/- 0.2mm at ERP	First article, All items
Material parameters	Dielectric parameters for required frequencies	300 MHz – 6 GHz: Relative permittivity < 5, Loss tangent < 0.05	Material samples
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe technical Note for material compatibility.	DEGMBE based simulating liquids	Pre-series, First article, Material samples
Sagging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with tissue simulating liquid.	< 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below	Prototypes, Sample testing

Standards
[1] CENELEC EN 50361
[2] IEEE Std 1528-2003
[3] IEC 62209 Part I
[4] FCC OET Bulletin 65, Supplement C, Edition 01-01
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

Conformity
Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standards [1] to [4].

Date 07.07.2005

Signature / Stamp

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

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.

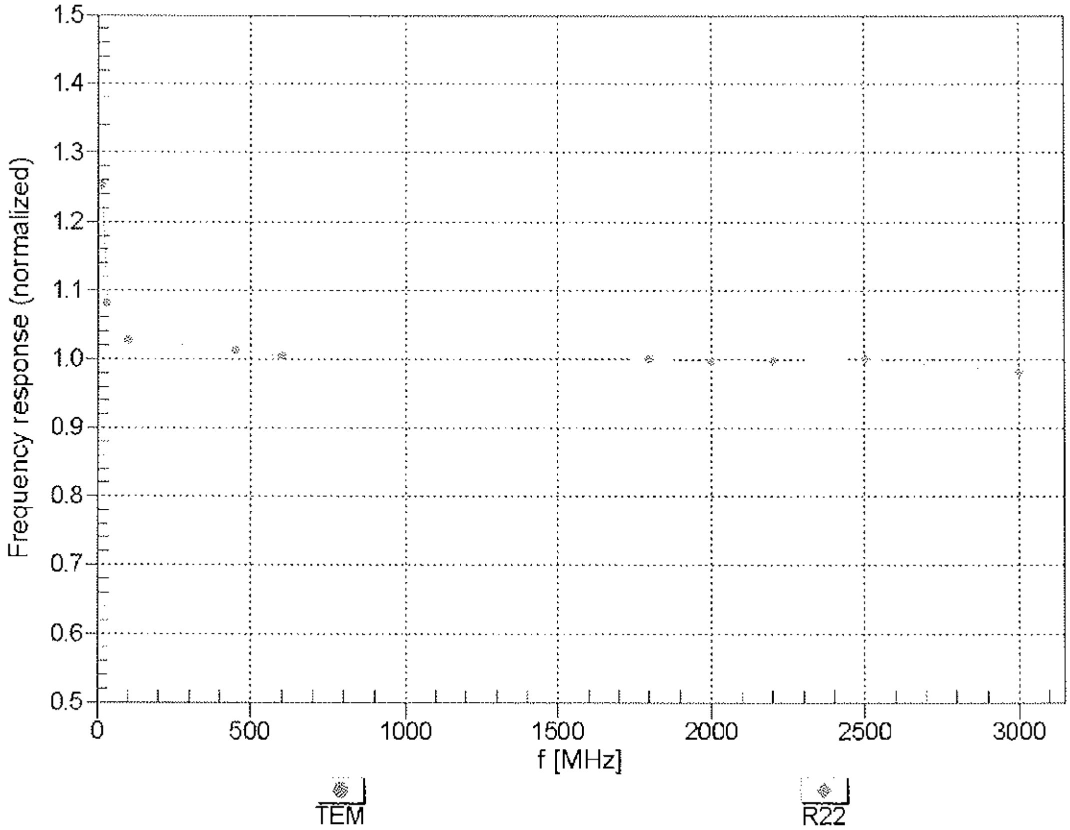
DASY/EASY - Parameters of Probe: EX3DV4- SN:3590

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.

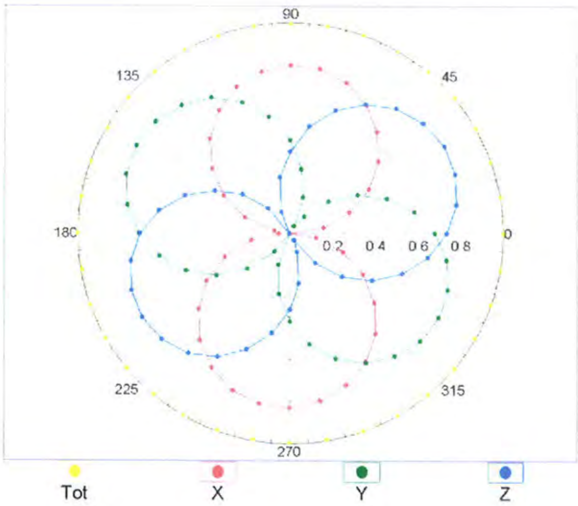
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



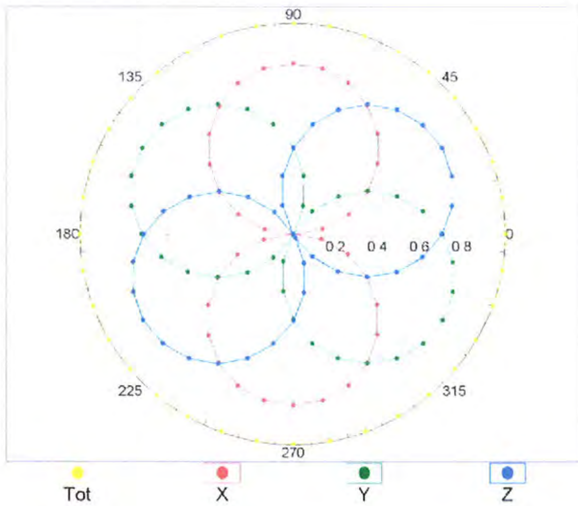
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

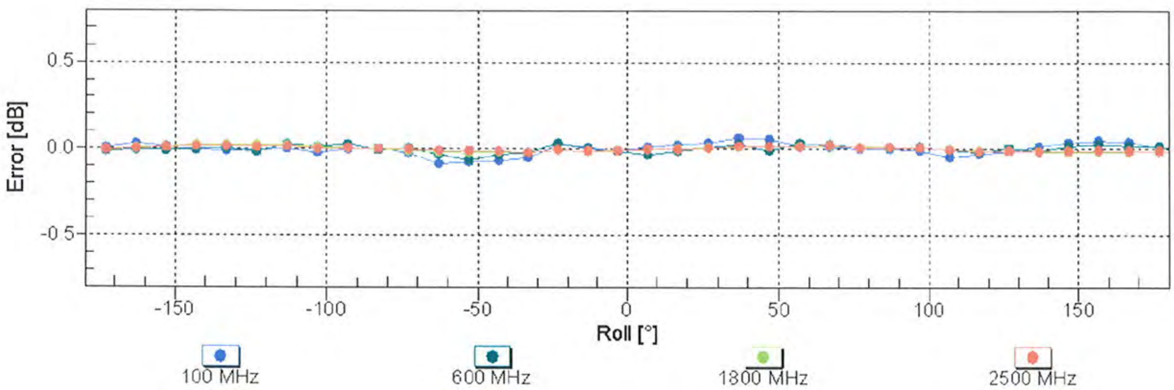
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

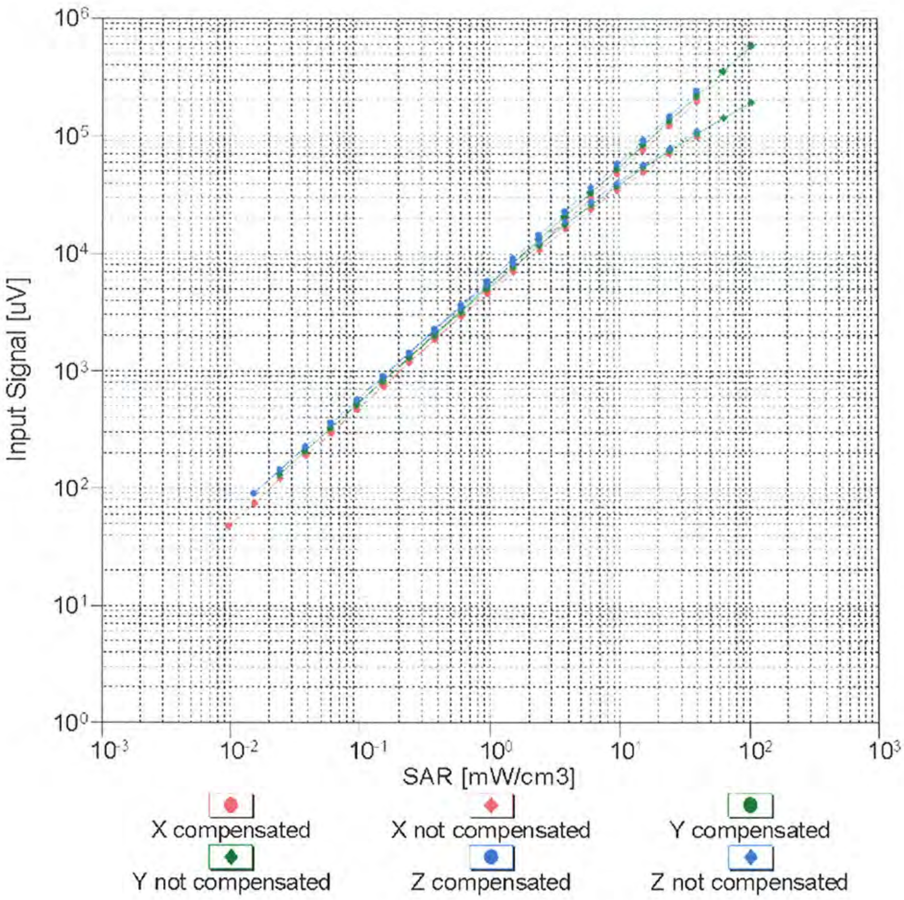


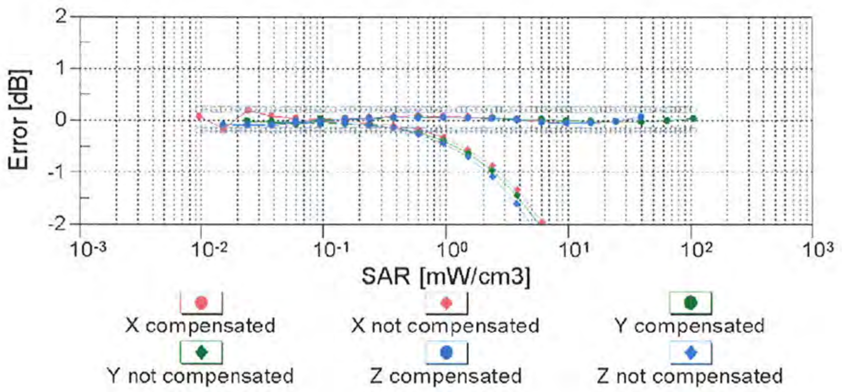


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

(TEM cell , f = 900 MHz)

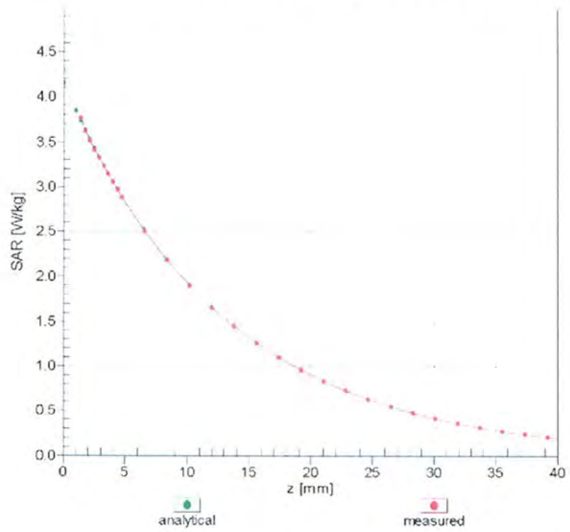




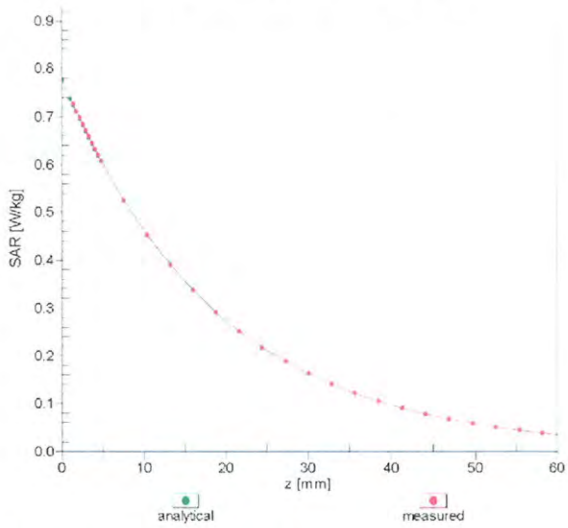
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 1750 MHz,WGLS R22 (H_convF)

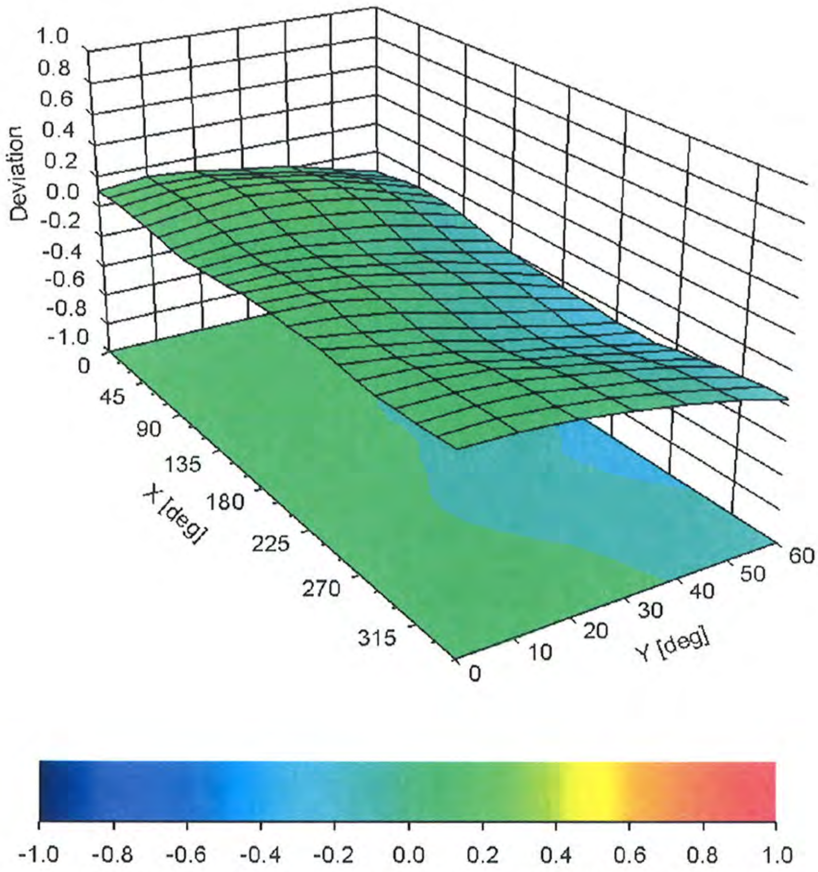


f = 835 MHz,WGLS R9 (H_convF)



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

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

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

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

Accreditation No.: **SCS 108**

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

Certificate No: **EX3-3650_Jan11**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3650

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

Calibration date: January 24, 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	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-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: 660	20-Apr-10 (No. DAE4-660_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:	Fin Bomholt	R&D Director	

Issued: January 25, 2011

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

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

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

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C	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 effect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *Ax,y,z; Bx,y,z; Cx,y,z, VRx,y,z: A, B, C* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 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:3650

Manufactured:	March 18, 2008
Last calibrated:	July 5, 2008
Recalibrated:	January 24, 2011

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.45	0.40	0.49	± 10.1%
DCP (mV)[B]	93.4	96.5	95.5	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	137.0	± 3.4 %
			Y	0.00	0.00	1.00	141.2	
			Z	0.00	0.00	1.00	144.7	

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 maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
750	± 50 / ± 100	41.9 ± 5%	0.89 ± 5%	9.46	9.46	9.46	0.43	0.72	± 11.0%
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	8.95	8.95	8.95	0.55	0.67	± 11.0%
1450	± 50 / ± 100	40.5 ± 5%	1.20 ± 5%	8.86	8.86	8.86	0.78	0.64	± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	8.17	8.17	8.17	0.75	0.60	± 11.0%
1950	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	7.57	7.57	7.57	0.57	0.66	± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.10	7.10	7.10	0.36	0.88	± 11.0%
2600	± 50 / ± 100	39.0 ± 5%	1.96 ± 5%	6.93	6.93	6.93	0.38	0.88	± 11.0%
5200	± 50 / ± 100	36.0 ± 5%	4.66 ± 5%	4.69	4.69	4.69	0.40	1.80	± 13.1%
5300	± 50 / ± 100	35.9 ± 5%	4.76 ± 5%	4.33	4.33	4.33	0.45	1.80	± 13.1%
5500	± 50 / ± 100	35.6 ± 5%	4.96 ± 5%	4.42	4.42	4.42	0.45	1.80	± 13.1%
5600	± 50 / ± 100	35.5 ± 5%	5.07 ± 5%	3.96	3.96	3.96	0.60	1.80	± 13.1%
5800	± 50 / ± 100	35.3 ± 5%	5.27 ± 5%	4.27	4.27	4.27	0.45	1.80	± 13.1%

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

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

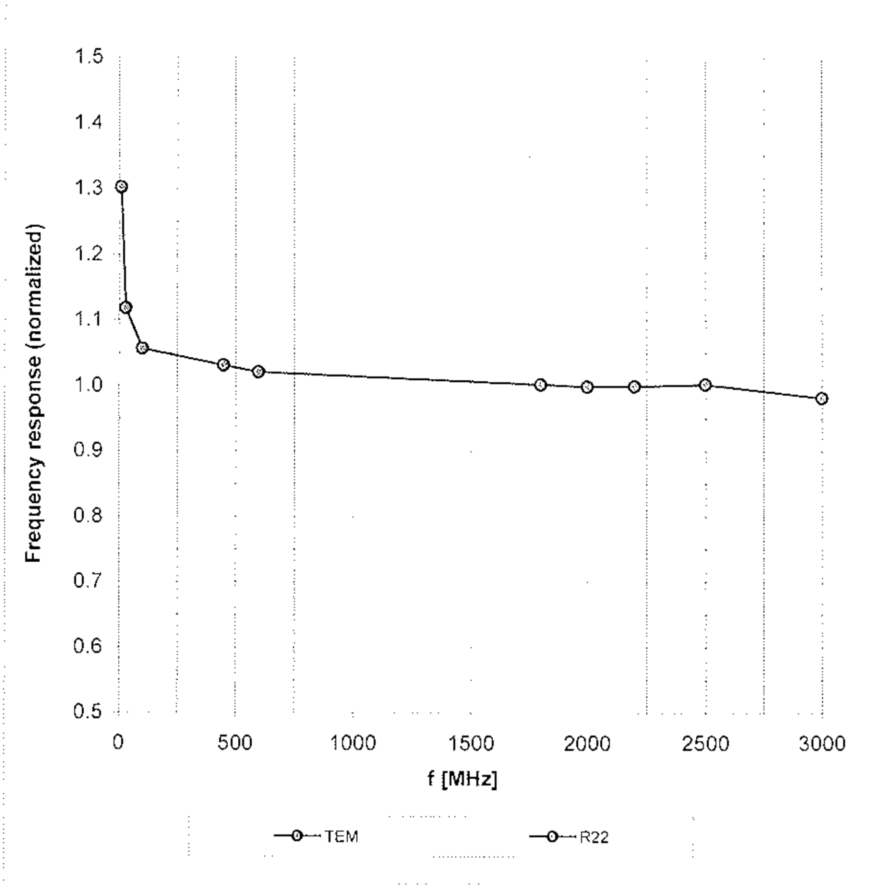
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
750	± 50 / ± 100	55.5 ± 5%	0.96 ± 5%	9.25	9.25	9.25	0.53	0.71	± 11.0%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	9.12	9.12	9.12	0.36	0.88	± 11.0%
1450	± 50 / ± 100	54.0 ± 5%	1.30 ± 5%	7.97	7.97	7.97	0.71	0.63	± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	7.46	7.46	7.46	0.78	0.61	± 11.0%
1950	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	7.52	7.52	7.52	0.79	0.59	± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	7.05	7.05	7.05	0.54	0.74	± 11.0%
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	6.92	6.92	6.92	0.45	0.80	± 11.0%
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	4.25	4.25	4.25	0.50	1.90	± 13.1%
5300	± 50 / ± 100	48.9 ± 5%	5.42 ± 5%	3.96	3.96	3.96	0.50	1.90	± 13.1%
5500	± 50 / ± 100	48.6 ± 5%	5.65 ± 5%	3.76	3.76	3.76	0.55	1.90	± 13.1%
5600	± 50 / ± 100	48.5 ± 5%	5.77 ± 5%	3.55	3.55	3.55	0.58	1.90	± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	3.86	3.86	3.86	0.60	1.90	± 13.1%

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

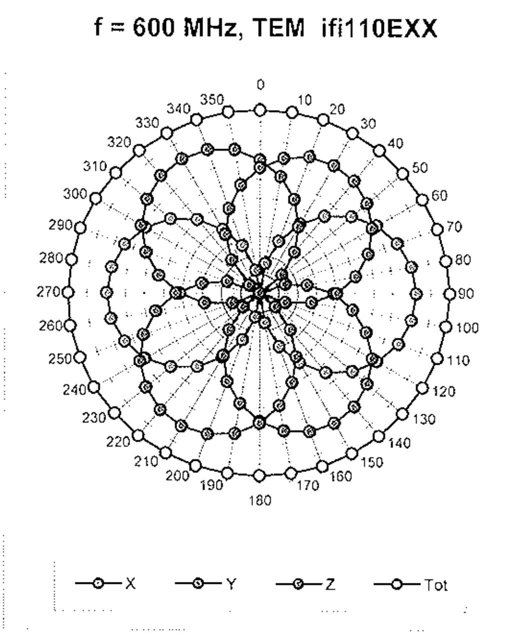
Frequency Response of E-Field

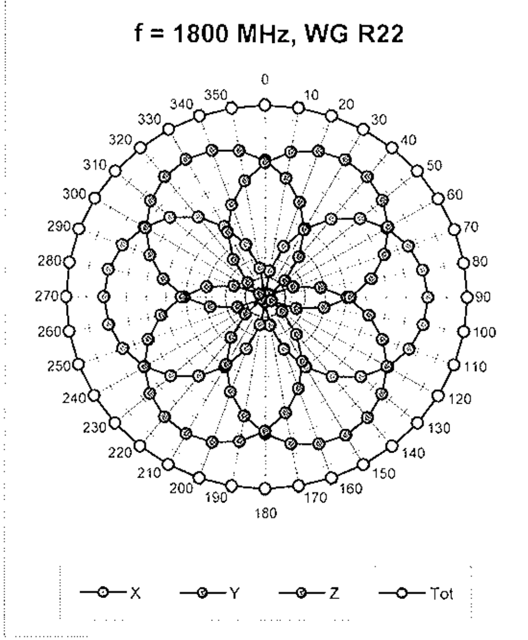
(TEM-Cell:ifi110 EXX, Waveguide: R22)

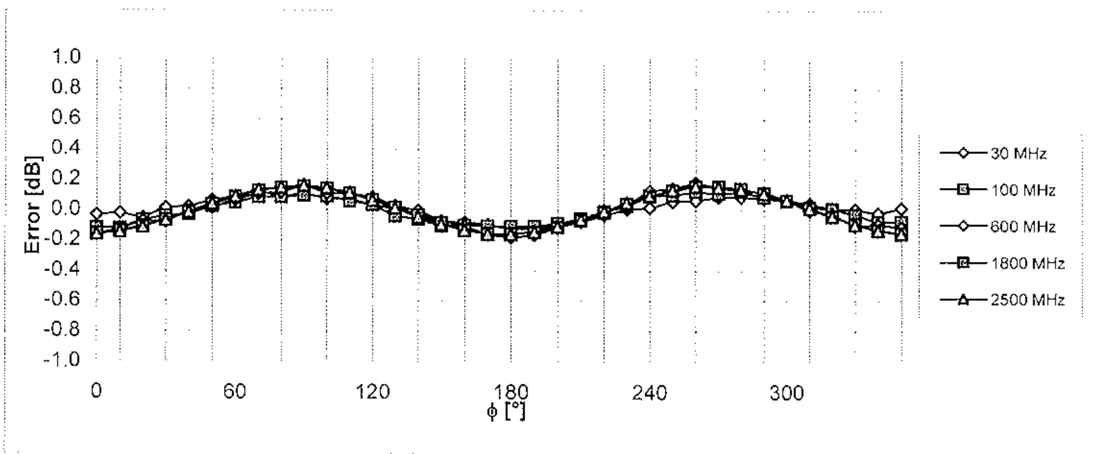


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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



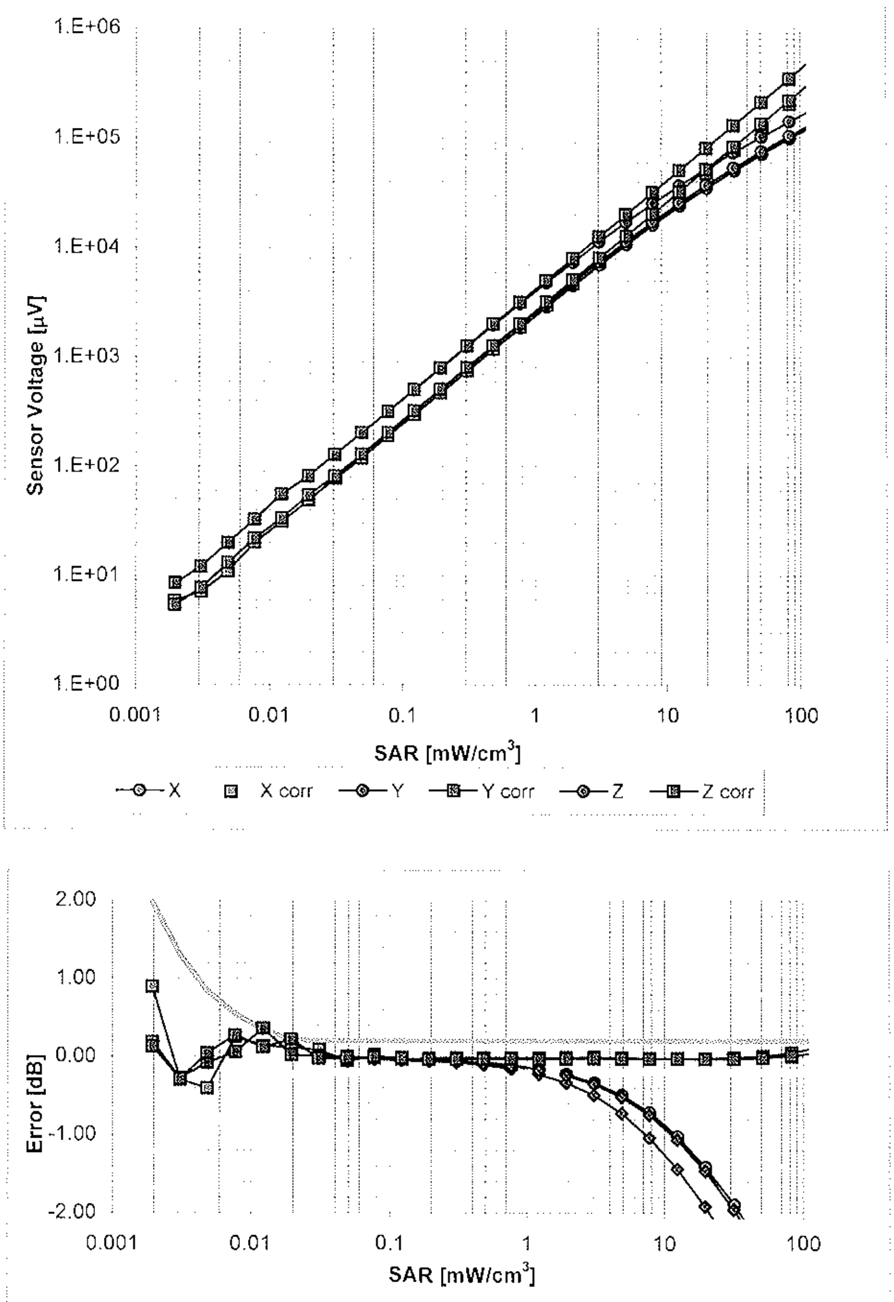




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

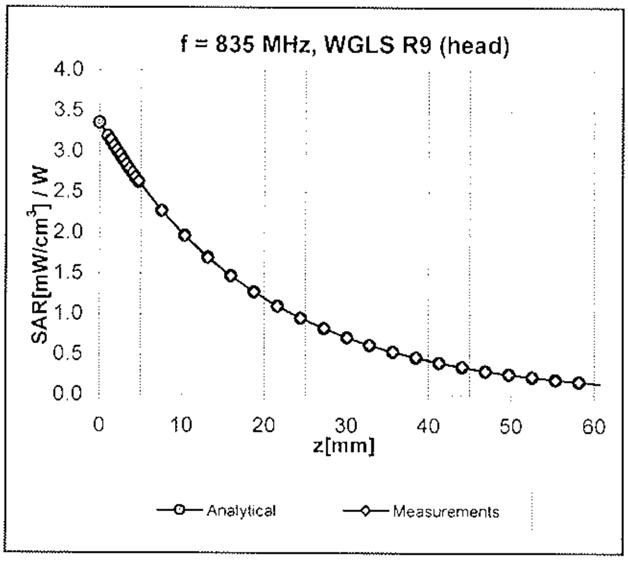
Dynamic Range f(SAR_{head})

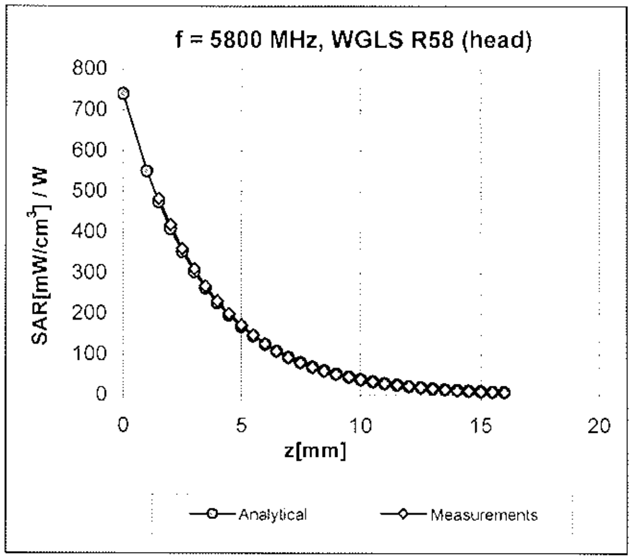
(TEM cell, f = 900 MHz)



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

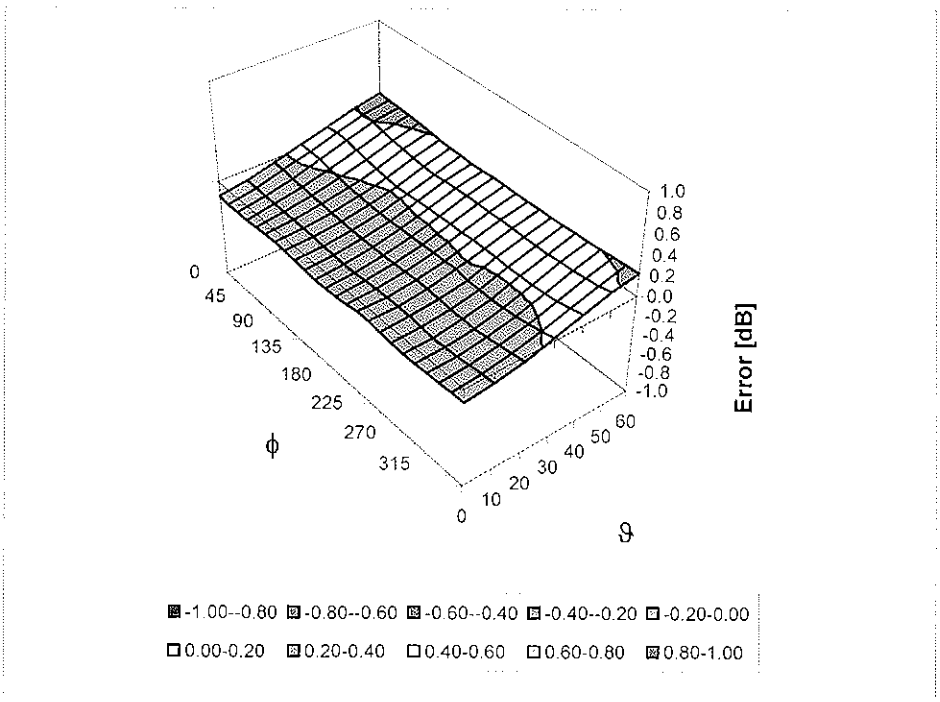
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

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

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Accreditation No.: SCS 108

Client **ADT (Auden)**

Certificate No: DAE3-510_Oct10

CALIBRATION CERTIFICATE

Object	DAE3 - SD 000 D03 AA - SN: 510
Calibration procedure(s)	QA CAL-06.v22 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	October 4, 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	28-Sep-10 (No:10376)	Sep-11
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: October 4, 2010

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	404.204 ± 0.1% (k=2)	404.261 ± 0.1% (k=2)	404.619 ± 0.1% (k=2)
Low Range	3.97841 ± 0.7% (k=2)	3.96431 ± 0.7% (k=2)	3.98318 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	280.0 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200002.6	1.33	0.00
Channel X	+ Input	20001.52	1.72	0.01
Channel X	- Input	-19997.99	1.81	-0.01
Channel Y	+ Input	200010.4	0.89	0.00
Channel Y	+ Input	20000.89	1.39	0.01
Channel Y	- Input	-19998.10	1.60	-0.01
Channel Z	+ Input	200007.2	-1.37	-0.00
Channel Z	+ Input	19998.21	-1.29	-0.01
Channel Z	- Input	-20001.73	-2.13	0.01

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	2000.1	0.23	0.01
Channel X	+ Input	200.27	0.27	0.13
Channel X	- Input	-199.76	0.04	-0.02
Channel Y	+ Input	2000.8	0.66	0.03
Channel Y	+ Input	199.56	-0.44	-0.22
Channel Y	- Input	-200.06	-0.16	0.08
Channel Z	+ Input	1999.4	-0.75	-0.04
Channel Z	+ Input	199.53	-0.57	-0.28
Channel Z	- Input	-201.06	-1.16	0.58

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	17.87	16.44
	- 200	-15.36	-17.11
Channel Y	200	14.99	14.97
	- 200	-16.63	-16.47
Channel Z	200	-8.65	-8.74
	- 200	7.23	7.63

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	-	4.37	-3.14
Channel Y	200	6.07	-	3.36
Channel Z	200	3.03	-0.24	-

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	15917	15639
Channel Y	16112	16210
Channel Z	16121	16322

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	0.61	0.06	2.59	0.30
Channel Y	1.72	-0.56	3.01	0.39
Channel Z	-1.94	-2.73	-0.59	0.30

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

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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

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

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Accreditation No.: SCS 108

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

Certificate No: D2600V2_1003_Jan11

CALIBRATION CERTIFICATE

Object	D2600V2 - SN: 1003
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits
Calibration date:	January 27, 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-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 27, 2011

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	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.9 ± 6 %	2.03 mho/m ± 6 %
Head TSL temperature during test	(21.5 ± 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	15.0 mW / g
SAR normalized	normalized to 1W	60.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**58.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.57 mW / g
SAR normalized	normalized to 1W	26.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**26.1 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	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.3 ± 6 %	2.10 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	14.4 mW / g
SAR normalized	normalized to 1W	57.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**58.1 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.41 mW / g
SAR normalized	normalized to 1W	25.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**25.7 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.5 Ω - 0.4 jΩ
Return Loss	- 44.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.2 Ω + 0.0 jΩ
Return Loss	- 28.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.147 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 23, 2006

DASY5 Validation Report for Head TSL

Date/Time: 27.01.2011 15:40:46

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1003

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: HSL BB1.9
Medium parameters used: f = 2600 MHz; σ = 2.04 mho/m; ε_r = 38.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

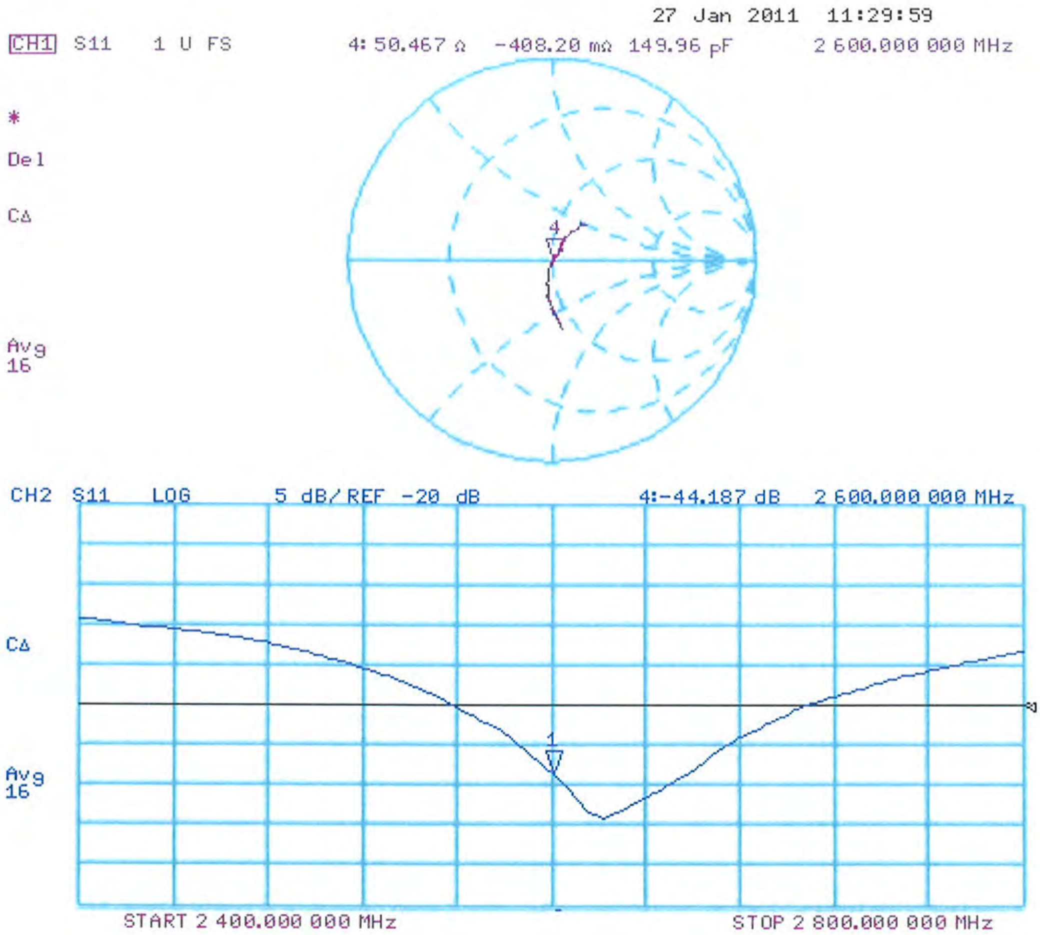
DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.47, 4.47, 4.47); 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 = 102.3 V/m; Power Drift = 0.00081 dB
Peak SAR (extrapolated) = 32.976 W/kg
SAR(1 g) = 15 mW/g; SAR(10 g) = 6.57 mW/g
Maximum value of SAR (measured) = 19.719 mW/g

0 dB = 19.720mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 05.01.2011 14:25:38

Test Laboratory: SPEAG, Zurich, Switzerland

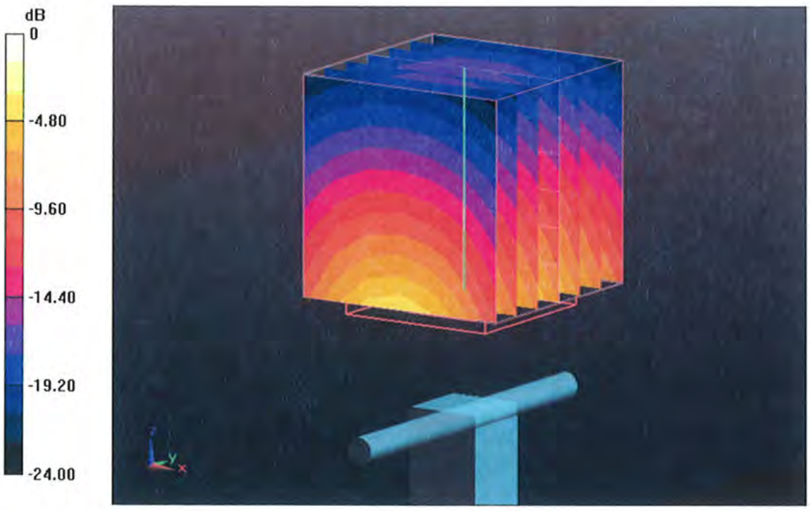
DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1003

Communication System: CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: MSL U12 BB
Medium parameters used: f = 2600 MHz; σ = 2.12 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.18, 4.18, 4.18); 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 = 97.717 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 31.466 W/kg
SAR(1 g) = 14.4 mW/g; SAR(10 g) = 6.41 mW/g
Maximum value of SAR (measured) = 19.133 mW/g



0 dB = 19.130mW/g

Impedance Measurement Plot for Body TSL