FCC SAR Test Report

Report No.	:	**SA120628C18**
Applicant	:	**CT Asia**
Address	:	**Unit 01, 15/F, Seaview Centre,139-141 Hoi bun road, Kwun Tong, Kowloon, Hongkong**
Product	:	**GSM mobile**
FCC ID	:	**YHLBLUCLICKPUS**
Brand	:	**Blu**
Model No.	:	**Click Plus**
Standards	:	**FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1991 / IEEE 1528:2003** **FCC OET Bulletin 65 Supplement C (Edition 01-01)** **KDB 648474 D01 v01r05**
Date of Testing	:	**Jun. 29, 2012 ~ Jul. 02, 2012**

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

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ilac-MRA

TAF
Testing Laboratory
2021

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Release Control Record

Issue No.	Reason for Change	Date Issued
R01	Original release	Jul. 16, 2012

1. Summary of Maximum SAR Value

Mode / Band	Test Position	SAR-1g (W/kg)
GSM850	Head	1.16
	Body Worn (1.5 cm Gap)	0.279
GSM1900	Head	0.388
	Body Worn (1.5 cm Gap)	0.131

Note:

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

2. Description of Equipment Under Test

EUT Type	GSM mobile
FCC ID	YHLBLUCLICKPUS
Brand Name	Blu
Model Name	Click Plus
Tx Frequency Bands (Unit: MHz)	GSM850 : 824 ~ 849 GSM1900 : 1850 ~ 1910
Uplink Modulations	GSM : GMSK
Maximum AVG Conducted Power (Unit: dBm)	GSM850 : 32.35 GSM1900 : 28.66
Antenna Type	Fixed Internal Antenna
EUT Stage	Identical Prototype

Note:

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

List of Accessory:

AC Adapter	**Brand Name**	BLU
	Model Name	US300507
	Power Rating	I/P:100-240Vac, 150mA; O/P: 5Vdc, 500mA
Battery	**Brand Name**	BLU
	Model Name	N5C60T
	Power Rating	3.7Vdc, 600mAh
	Type	Li-ion
USB Cable	**Brand Name**	BLU
	Model Name	NA
	Signal Line Type	0.93 meter non-shielded cable without core
Earphone	**Brand Name**	BLU
	Model Name	NA
	Signal Line Type	1.29 meter non-shielded cable without core

3. SAR Measurement System

3.1 Definition of Specific Absorption Rate (SAR)

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

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

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

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

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

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

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

3.2 SPEAG DASY System

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

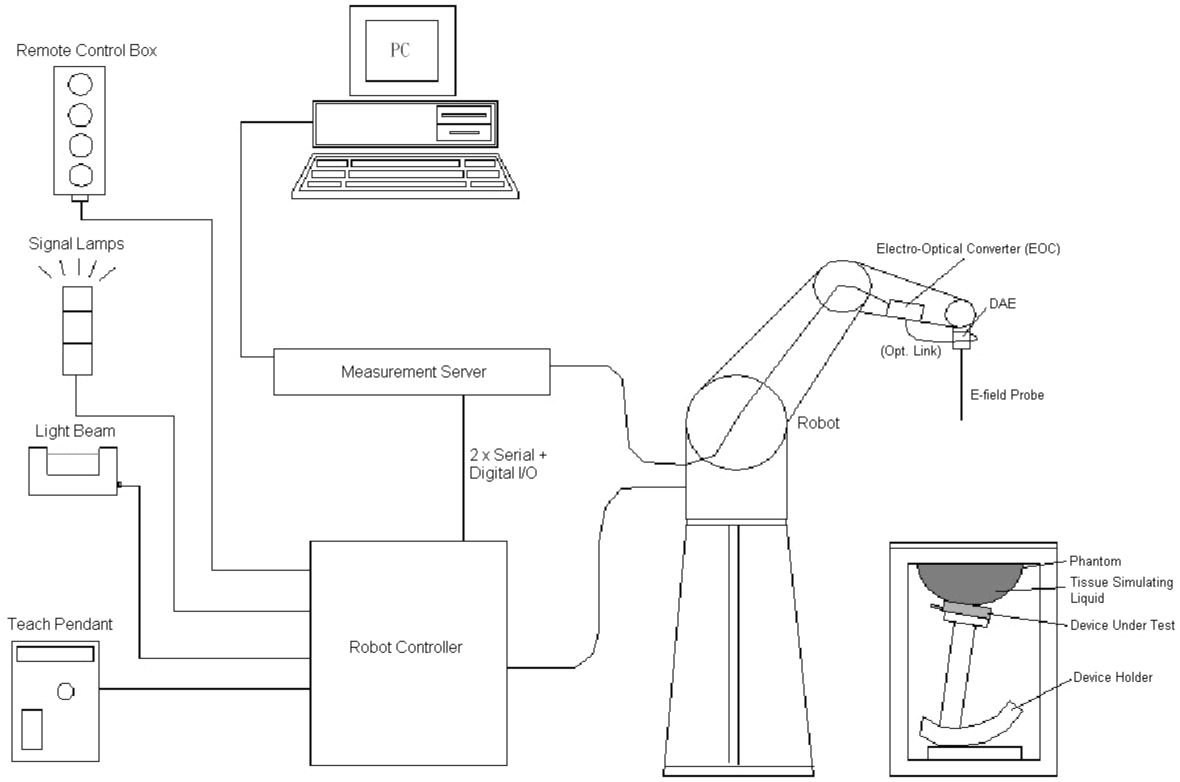

Fig-3.1 DASY System Setup

3.2.1 Robot

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

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

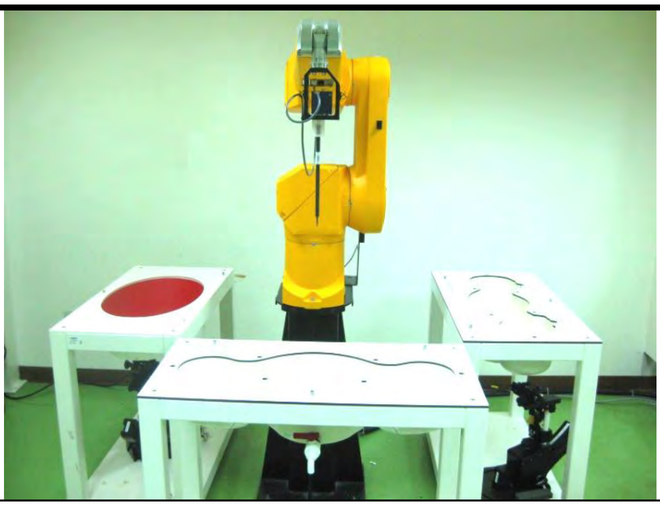

Fig-3.2 DASY4

Fig-3.3 DASY5

3.2.2 Probes

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

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

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

3.2.3 Data Acquisition Electronics (DAE)

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

3.2.4 Phantoms

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

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

3.2.5 Device Holder

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

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

3.2.6 System Validation Dipoles

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

3.2.7 Tissue Simulating Liquids

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

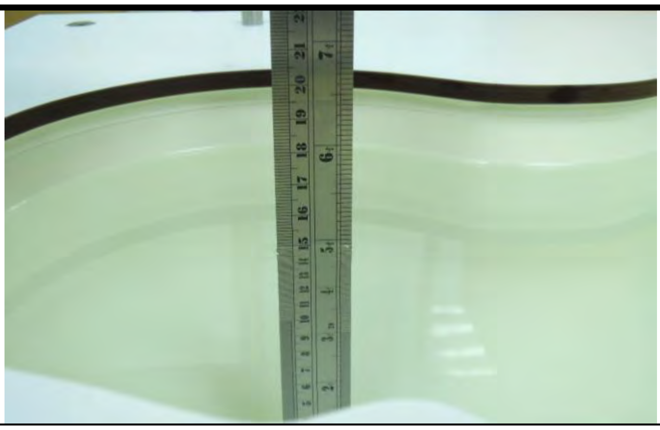

Photo of Liquid Height for Head Position

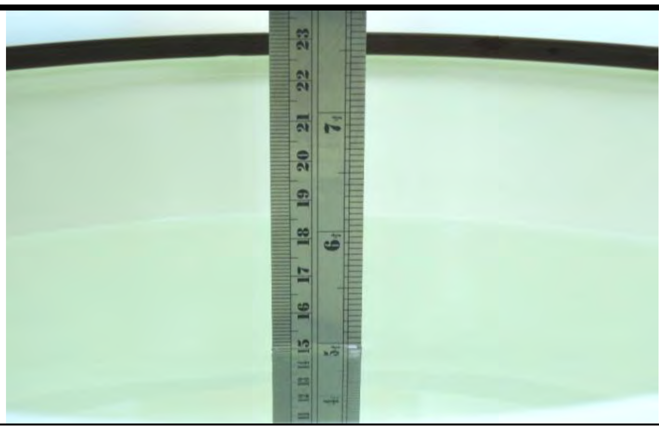

Photo of Liquid Height for Body Position

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

Table-3.1 Targets of Tissue Simulating Liquid

Frequency (MHz)	Target Permittivity	Range of ±5%	Target Conductivity	Range of ±5%
		For Head		
835	41.5	39.4 ~ 43.6	0.90	0.86 ~ 0.95
1900	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
		For Body		
835	55.2	52.4 ~ 58.0	0.97	0.92 ~ 1.02
1900	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60

The following table gives the recipes for tissue simulating liquids.

Table-3.2 Recipes of Tissue Simulating Liquid

Tissue Type	Bactericide	DGBE	HEC	NaCl	Sucrose	Triton X-100	Water	Diethylene Glycol Mono-hexylether
H835	0.2	-	0.2	1.5	57.0	-	41.1	-
H1900	-	44.5	-	0.2	-	-	55.3	-
B835	0.2	-	0.2	0.9	48.5	-	50.2	-
B1900	-	29.5	-	0.3	-	-	70.2	-

3.3 SAR System Verification

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

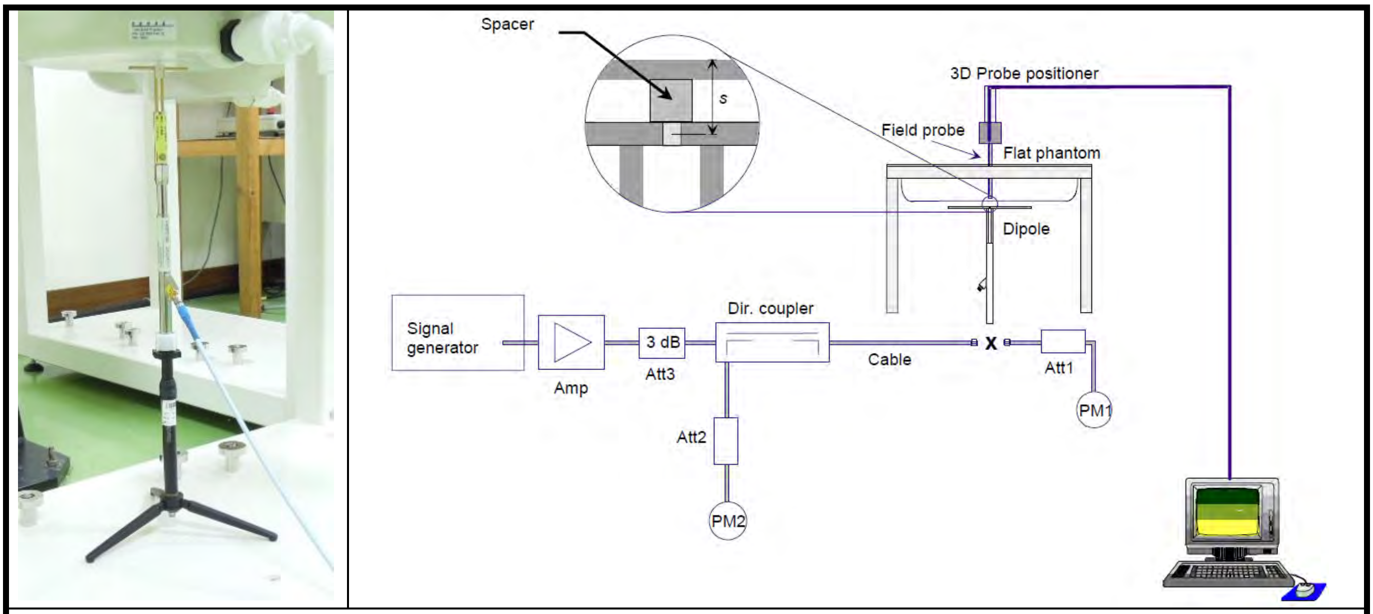

Fig-3.4 System Verification Setup

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

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

3.4 SAR Measurement Procedure

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

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

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

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

3.4.1 Area & Zoom Scan Procedure

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

3.4.2 Volume Scan Procedure

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

3.4.3 Power Drift Monitoring

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

3.4.4 Spatial Peak SAR Evaluation

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

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

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

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

3.4.5 SAR Averaged Methods

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

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

4. SAR Measurement Evaluation

4.1 EUT Configuration and Setting

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

4.2 EUT Testing Position

This EUT was tested in **Right Cheek**, **Right Tilted**, **Left Cheek**, **Left Tilted**, **Front Face of EUT with phantom 1.5 cm gap**, and **Rear Face of EUT with phantom 1.5 cm gap** positions as illustrated below:

1. Define two imaginary lines on the handset

(a) The vertical centerline passes through two points on the front side of the handset - the midpoint of the width w_t of the handset at the level of the acoustic output, and the midpoint of the width w_b of the bottom of the handset.

(b) The horizontal line is perpendicular to the vertical centerline and passes through the center of the acoustic output. The horizontal line is also tangential to the face of the handset at point A.

(c) The two lines intersect at point A. Note that for many handsets, point A coincides with the center of the acoustic output; however, the acoustic output may be located elsewhere on the horizontal line. Also note that the vertical centerline is not necessarily parallel to the front face of the handset, especially for clamshell handsets, handsets with flip covers, and other irregularly shaped handsets.

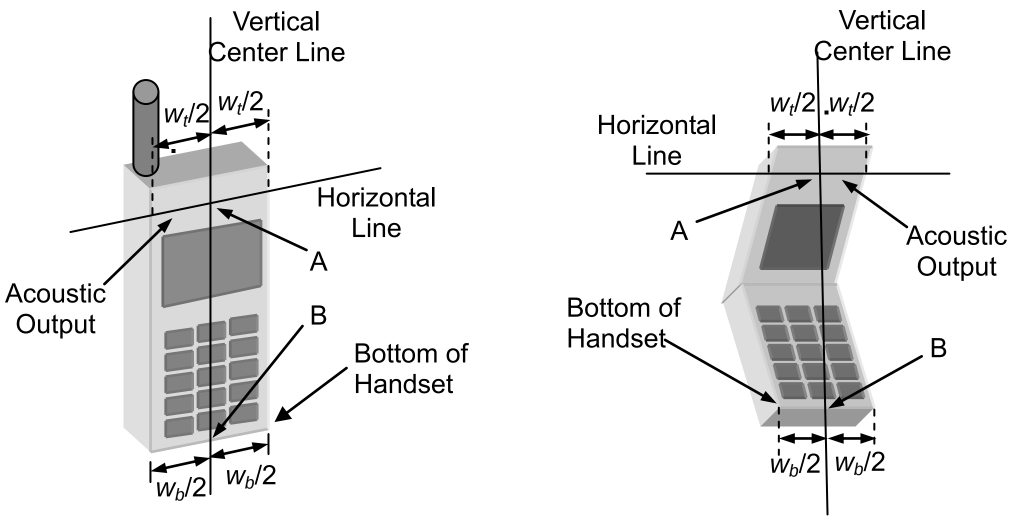

Fig-4.1 Illustration for Handset Vertical and Horizontal Reference Lines

2. Cheek Position

(a) To position the device with the vertical center line of the body of the device and the horizontal line crossing the center piece in a plane parallel to the sagittal plane of the phantom. While maintaining the device in this plane, align the vertical center line with the reference plane containing the three ear and mouth reference point (M: Mouth, RE: Right Ear, and LE: Left Ear) and align the center of the ear piece with the line RE-LE.

(b) To move the device towards the phantom with the ear piece aligned with the line LE-RE until the phone touched the ear. While maintaining the device in the reference plane and maintaining the phone contact with the ear, move the bottom of the phone until any point on the front side is in contact with the cheek of the phantom or until contact with the ear is lost (see Fig-4.2).

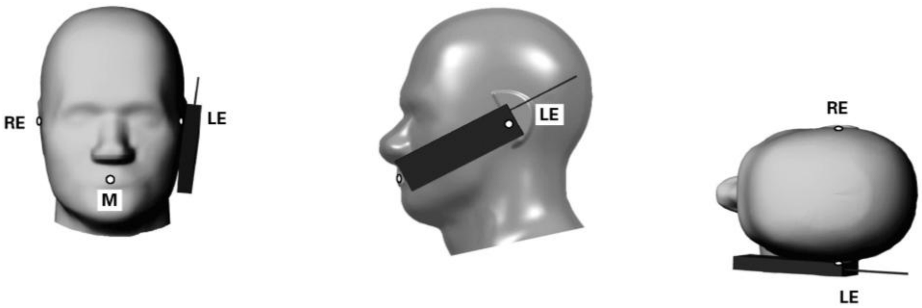

Fig-4.2 Illustration for Cheek Position

3. Tilted Position

(a) To position the device in the "cheek" position described above.

(b) While maintaining the device the reference plane described above and pivoting against the ear, moves it outward away from the mouth by an angle of 15 degrees or until contact with the ear is lost (see Fig-4.3).

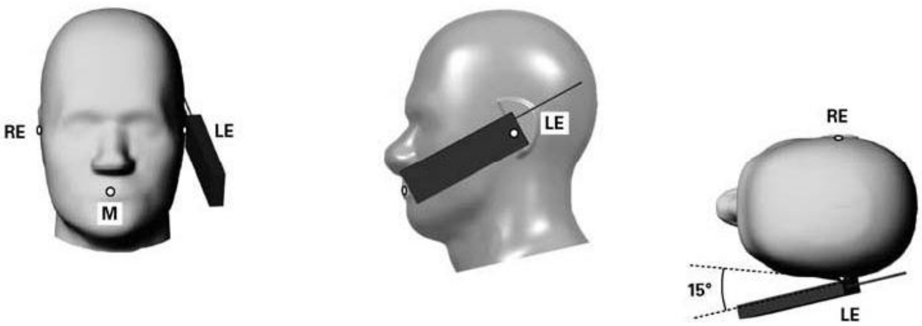

Fig-4.3 Illustration for Tilted Position

4. **Body Worn Position**
(a) To position the EUT parallel to the phantom surface.
(b) To adjust the EUT parallel to the flat phantom.
(c) To adjust the distance between the EUT surface and the flat phantom to 1.5 cm.

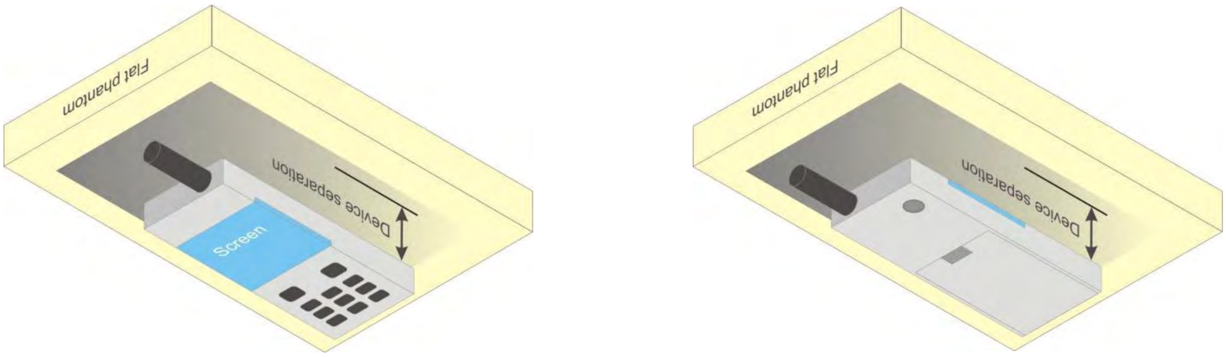

Fig-4.4 Illustration for Body Worn Position

4.3 Tissue Verification

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

Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)	Test Date
H835	835	21.5	0.897	42.846	0.90	41.5	-0.33	3.24	Jun. 29, 2012
B835	835	20.5	0.992	55.437	0.97	55.2	2.27	0.43	Jun. 29, 2012
B835	835	20.9	0.991	55.349	0.97	55.2	2.16	0.27	Jul. 02, 2012
H1900	1900	20.9	1.409	40.781	1.40	40.0	0.64	1.95	Jun. 29, 2012
B1900	1900	20.4	1.554	54.479	1.52	52.3	2.24	4.17	Jun. 29, 2012

Note:
The dielectric properties of the tissue simulating liquid must be measured within 24 hours before the SAR testing and within ±5% of the target values. Liquid temperature during the SAR testing must be within ±2 ℃.

4.4 System Verification

The measuring results for system check are shown as below.

Test Date	Tissue Type	Frequency (MHz)	1W Target SAR-1g (W/kg)	Measured SAR-1g (W/kg)	Normalized to 1W SAR-1g (W/kg)	Deviation (%)	Dipole S/N	Probe S/N	DAE S/N
Jun. 29, 2012	Head	835	9.46	2.39	9.56	1.06	4d021	3650	1277
Jun. 29, 2012	Body	835	9.60	2.41	9.64	0.42	4d021	3820	579
Jul. 02, 2012	Body	835	9.60	2.40	9.60	0.00	4d021	3650	1277
Jun. 29, 2012	Head	1900	38.90	9.60	38.40	-1.29	5d036	3650	1277
Jun. 29, 2012	Body	1900	38.90	9.98	39.92	2.62	5d036	3820	579

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

4.5 Conducted Power Results

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

Band	GSM850			GSM1900		
Channel	128	189	251	512	661	810
Frequency (MHz)	824.2	836.4	848.8	1850.2	1880.0	1909.8
Maximum Burst-Averaged Output Power						
GSM (GMSK, 1 slot)	32.10	32.35	32.08	28.55	28.54	28.66

4.6 SAR Testing Results

4.6.1 SAR Results for Head

Plot No.	Band	Mode	Test Position	Channel	SAR-1g (W/kg)
1	GSM850	GSM	Right Cheek	189	0.809
2	GSM850	GSM	Right Tilted	189	0.413
3	GSM850	GSM	Left Cheek	189	0.794
4	GSM850	GSM	Left Tilted	189	0.433
13	GSM850	GSM	Right Cheek	128	0.562
14	GSM850	GSM	Right Cheek	251	**1.16**
7	GSM1900	GSM	Right Cheek	810	**0.388**
8	GSM1900	GSM	Right Tilted	810	0.321
9	GSM1900	GSM	Left Cheek	810	0.378
10	GSM1900	GSM	Left Tilted	810	0.287

4.6.2 SAR Results for Body

Plot No.	Band	Mode	Test Position	Separation Distance (cm)	Channel	SAR-1g (W/kg)
15	GSM850	GSM	Front Face	1.5	189	0.123
6	GSM850	GSM	Rear Face	1.5	189	**0.279**
11	GSM1900	GSM	Front Face	1.5	810	0.055
12	GSM1900	GSM	Rear Face	1.5	810	**0.131**

Test Engineer： Morrison Huang

5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Kit	SPEAG	D835V2	4d021	Apr. 20, 2012	Annual
System Validation Kit	SPEAG	D1900V2	5d036	Jan. 26, 2012	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3650	Oct. 26, 2011	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3820	Dec. 16, 2011	Annual
Data Acquisition Electronics	SPEAG	DAE3	579	Apr. 27, 2012	Annual
Data Acquisition Electronics	SPEAG	DAE4	1277	Jul. 29, 2011	Annual
SAM Phantom	SPEAG	QD000P40CD	TP-1652	N/A	N/A
SAM Phantom	SPEAG	QD000P40CD	TP-1654	N/A	N/A
SAM Phantom	SPEAG	QD000P40CD	TP-1653	N/A	N/A
ELI Phantom	SPEAG	QDOVA001B	TP-1043	N/A	N/A
Radio Communication Tester	Agilent	E5515C	MY50266628	Sep. 26, 2011	Biennial
ENA Series Network Analyzer	Agilent	E5071C	MY46214281	May 14, 2012	Annual
MXG Analog Signal Generator	Agilent	N5181A	MY50143868	May 06, 2012	Annual
Power Meter	Anritsu	ML2495A	1218009	May 07, 2012	Annual
Power Sensor	Anritsu	MA2411B	1207252	May 07, 2012	Annual
EXA Spectrum Analyzer	Agilent	N9010A	MY52100136	Apr. 23, 2012	Annual
Dielectric Probe Kit	Agilent	85070D	E2-020018	May 14, 2012	Annual
Thermometer	YFE	YF-160A	110600361	Feb. 21, 2012	Annual
Directional Coupler	Woken	0110A05602O-10	11122702	Apr. 19, 2012	Annual
Power Amplifier	AR	5S1G4	0339656	Apr. 23, 2012	Annual
Power Amplifier	Mini-Circuit	ZVE-8G	001000422	Apr. 23, 2012	Annual
Attenuator	Woken	00800A1G01L-03	N/A	Apr. 19, 2012	Annual

6. Measurement Uncertainty

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

Uncertainty budget for frequency range 300 MHz to 3 GHz

7. Information on the Testing Laboratories

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

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

Taiwan HwaYa EMC/RF/Safety/Telecom Lab:
Add: No. 19, Hwa Ya 2nd Rd, Wen Hwa Vil., Kwei Shan Hsiang, Taoyuan Hsien 333, Taiwan, R.O.C.
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Fax: 886-3-327-0892

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Fax: 886-2-2605-1924

Taiwan HsinChu EMC/RF Lab:
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Tel: 886-3-593-5343
Fax: 886-3-593-5342

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

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

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Appendix A. SAR Plots of System Verification

The plots for system verification are shown as follows.

Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab   Date: 2012/06/29

System Check_H835_120629

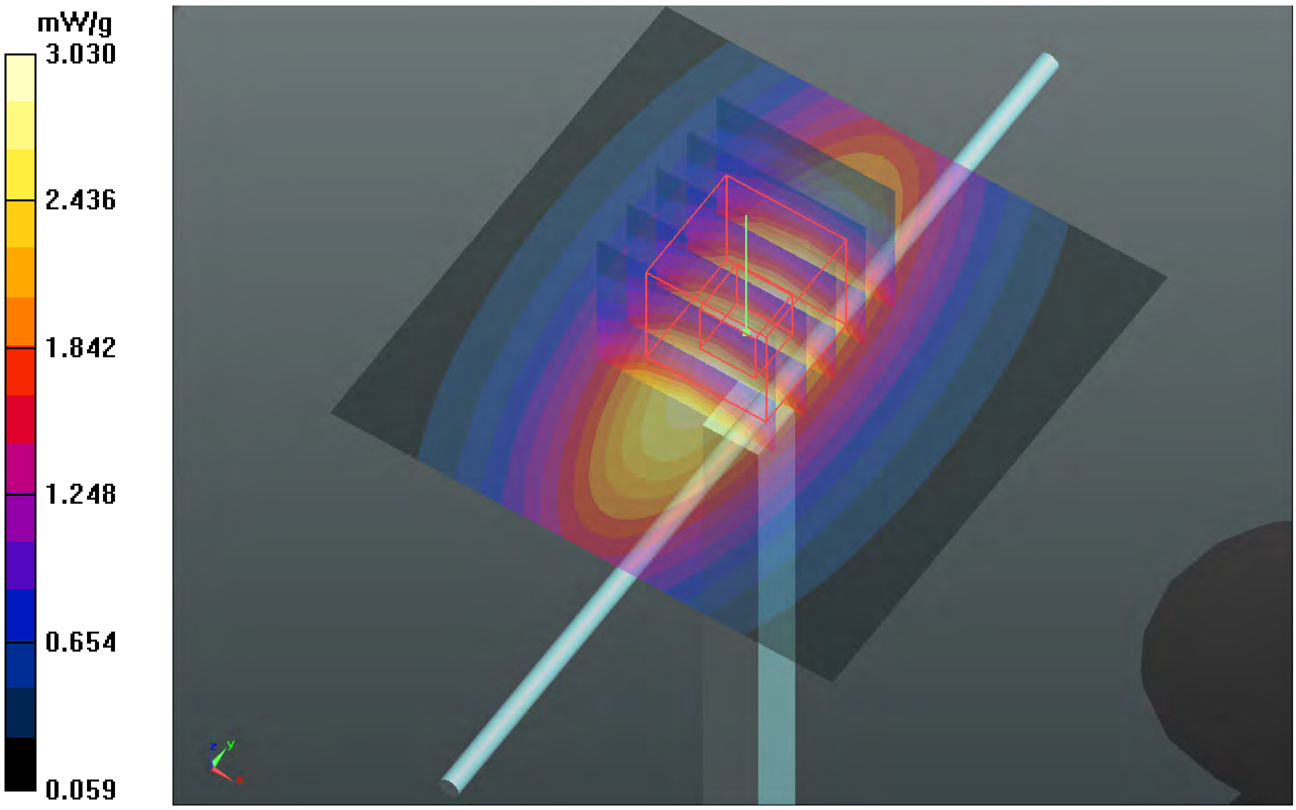
DUT: Dipole 835 MHz; Type: D835V2; SN: 4d021

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: H835_0629 Medium parameters used: f = 835 MHz; σ = 0.897 mho/m; ε_r = 42.846; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(8.87, 8.87, 8.87); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.03 mW/g

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 56.144 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.512 mW/g
SAR(1 g) = 2.39 mW/g; SAR(10 g) = 1.58 mW/g
Maximum value of SAR (measured) = 3.02 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2012/06/29

System Check_B835_120629

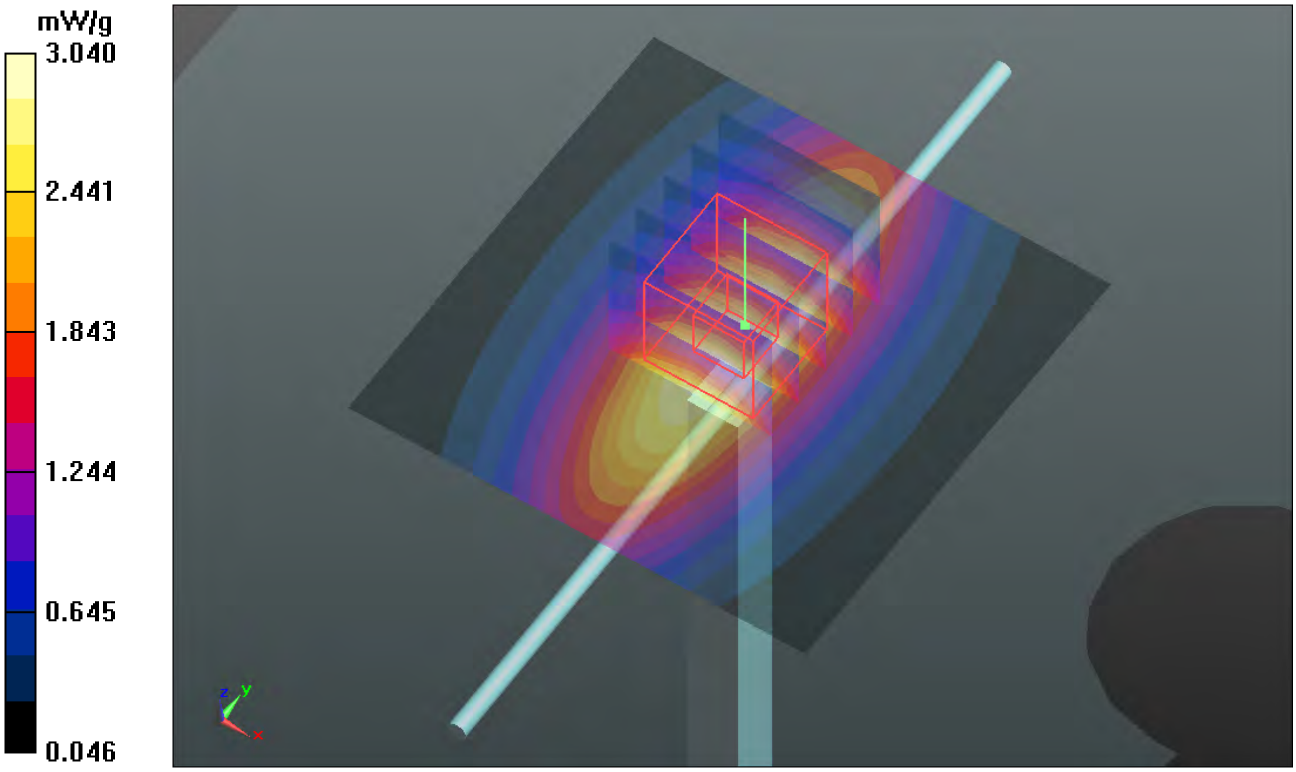
DUT: Dipole 835 MHz; Type: D835V2; SN: 4d021

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: B850_0629 Medium parameters used: f = 835 MHz; σ = 0.992 mho/m; ε_r = 55.437; ρ = 1000 kg/m^3
Ambient Temperature：21.7 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3820; ConvF(9.24, 9.24, 9.24); Calibrated: 2011/12/16;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2012/04/27
- Phantom: SAM Phantom_Front; Type: SAM V4.0; Serial: TP 1654
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.04 mW/g

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.561 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.527 mW/g
SAR(1 g) = 2.41 mW/g; SAR(10 g) = 1.59 mW/g
Maximum value of SAR (measured) = 3.03 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2012/07/02

System Check_B835_120702

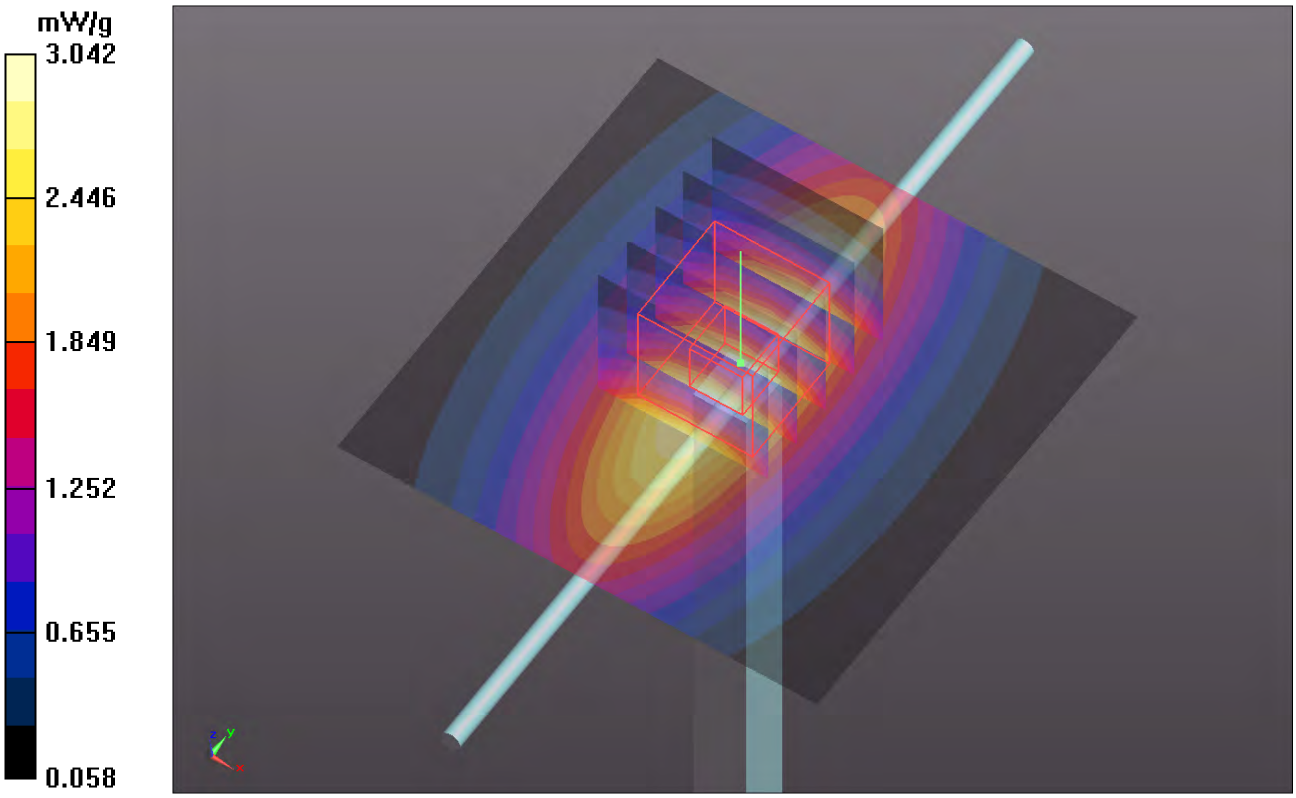
DUT: Dipole 835 MHz; Type: D835V2; SN: 4d021

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: B835_0702 Medium parameters used: f = 835 MHz; σ = 0.991 mho/m; ε_r = 55.349; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃；Liquid Temperature：20.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 3.04 mW/g

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.398 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.555 mW/g
SAR(1 g) = 2.4 mW/g; SAR(10 g) = 1.58 mW/g
Maximum value of SAR (measured) = 3.05 mW/g



System Check_H1900_120629

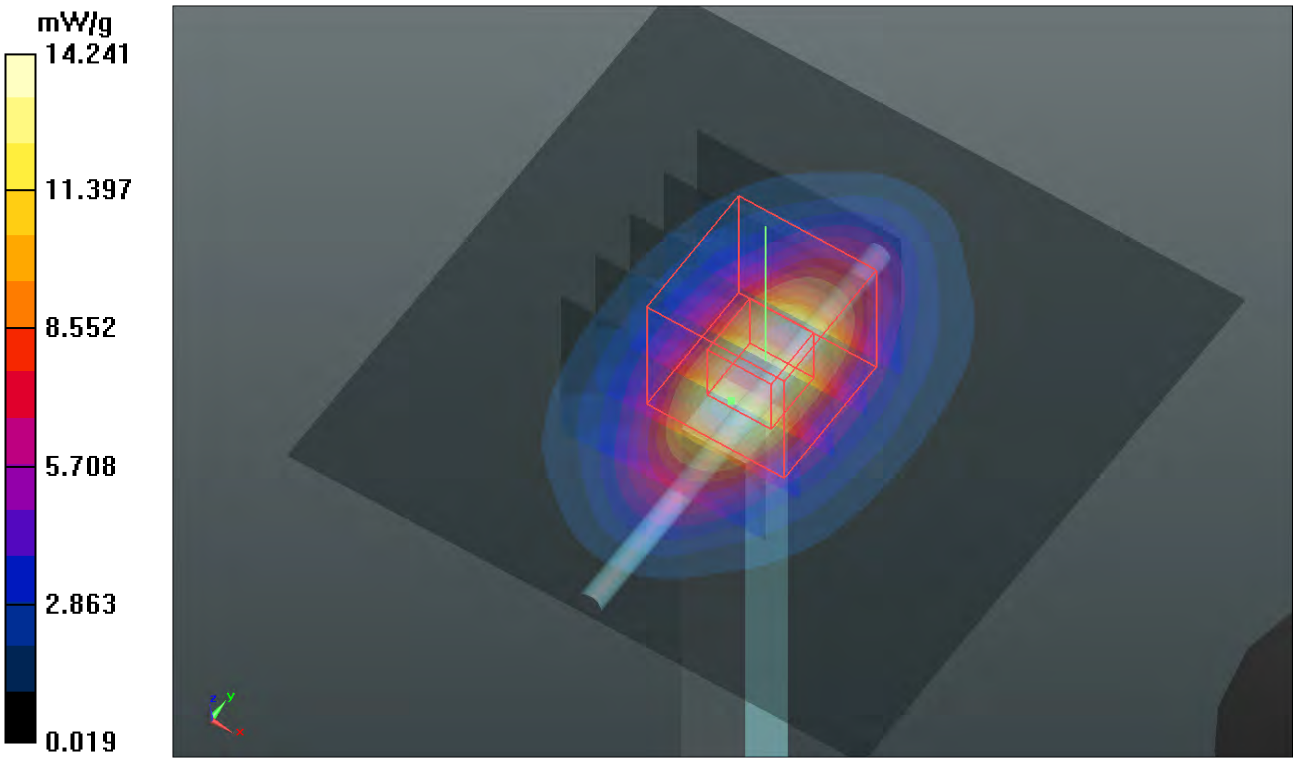
DUT: Dipole 1900 MHz; Type: D1900V2; SN: 5d036

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: H1900_0629 Medium parameters used: f = 1900 MHz; σ = 1.409 mho/m; ε_r = 40.781; ρ = 1000 kg/m^3
Ambient Temperature：21.9 ℃; Liquid Temperature：20.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.4, 7.4, 7.4); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.2 mW/g

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 100.9 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 18.291 mW/g
SAR(1 g) = 9.6 mW/g; SAR(10 g) = 4.93 mW/g
Maximum value of SAR (measured) = 13.9 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2012/06/29

System Check_B1900_120629

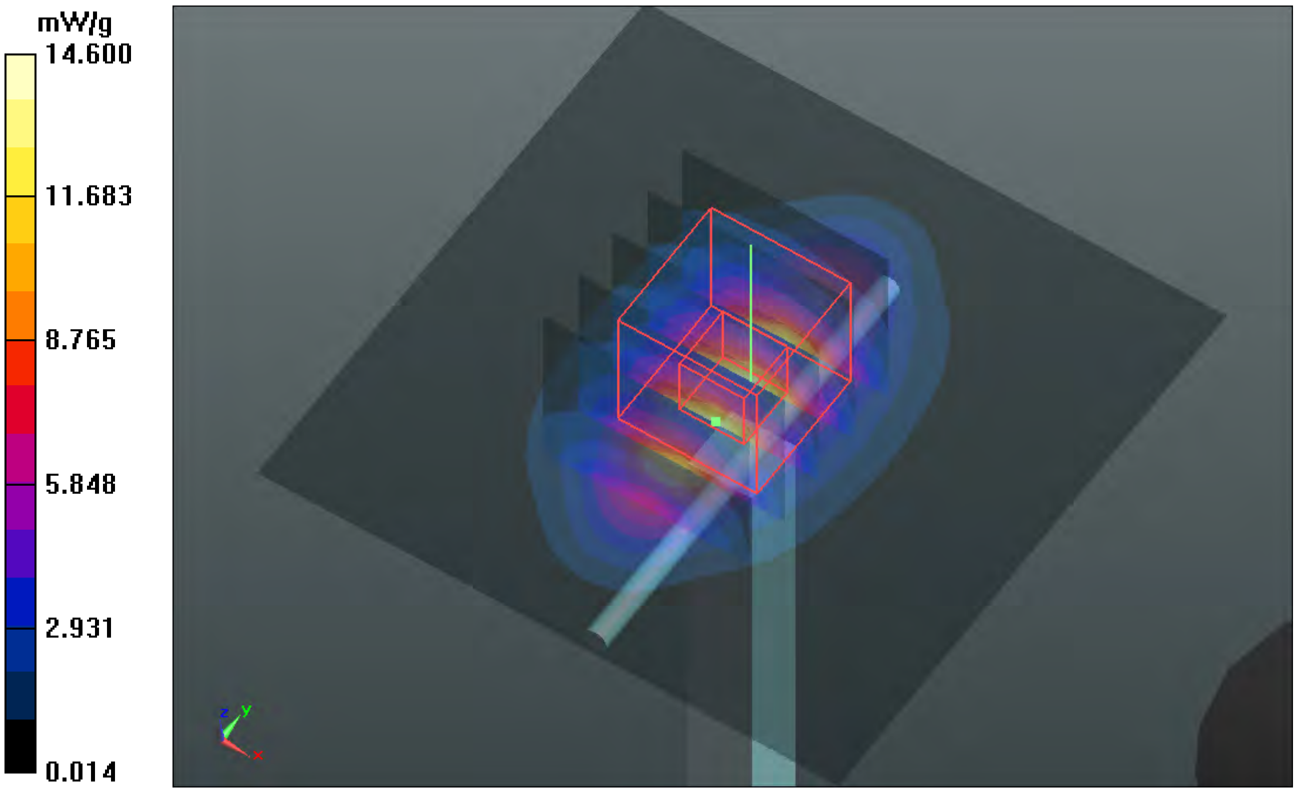
DUT: Dipole 1900 MHz; Type: D1900V2; SN: 5d036

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: B1900_0629 Medium parameters used: f = 1900 MHz; σ = 1.554 mho/m; ε_r = 54.479; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃; Liquid Temperature：20.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3820; ConvF(8.04, 8.04, 8.04); Calibrated: 2011/12/16;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2012/04/27
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (interpolated) = 14.6 mW/g

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 97.823 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 17.799 mW/g
SAR(1 g) = 9.98 mW/g; SAR(10 g) = 5.2 mW/g
Maximum value of SAR (measured) = 14.1 mW/g



Appendix B. SAR Plots of SAR Measurement

The plots for SAR measurement are shown as follows.

Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2012/06/29

P01 GSM850_Right Cheek_Ch189

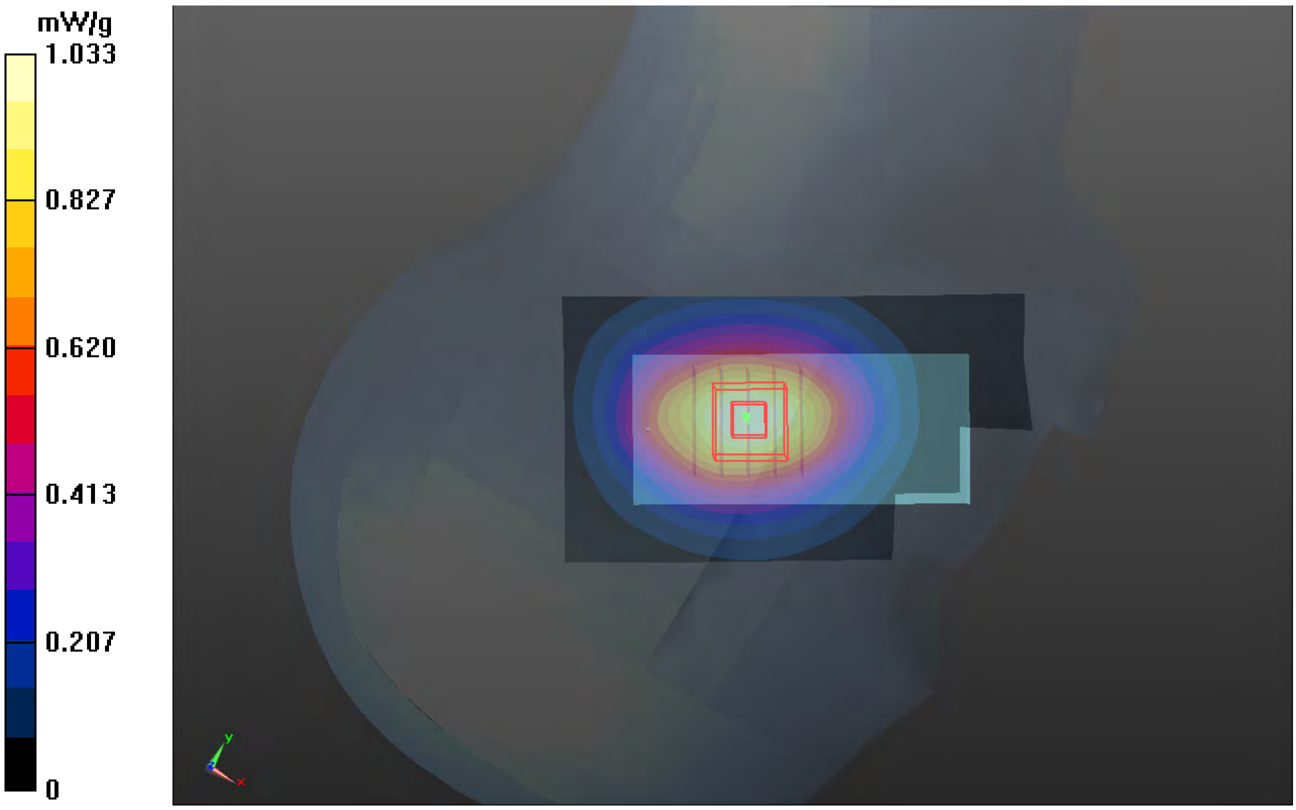
DUT: 120628C18

Communication System: GSM; Frequency: 836.4 MHz;Duty Cycle: 1:8.30042
Medium: H835_0629 Medium parameters used: f = 836.4 MHz; σ = 0.898 mho/m; ε_r = 42.829; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(8.87, 8.87, 8.87); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch189/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 1.03 mW/g

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.982 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.092 mW/g
SAR(1 g) = 0.809 mW/g; SAR(10 g) = 0.556 mW/g
Maximum value of SAR (measured) = 0.970 mW/g



P02 GSM850_Right Tilted_Ch189

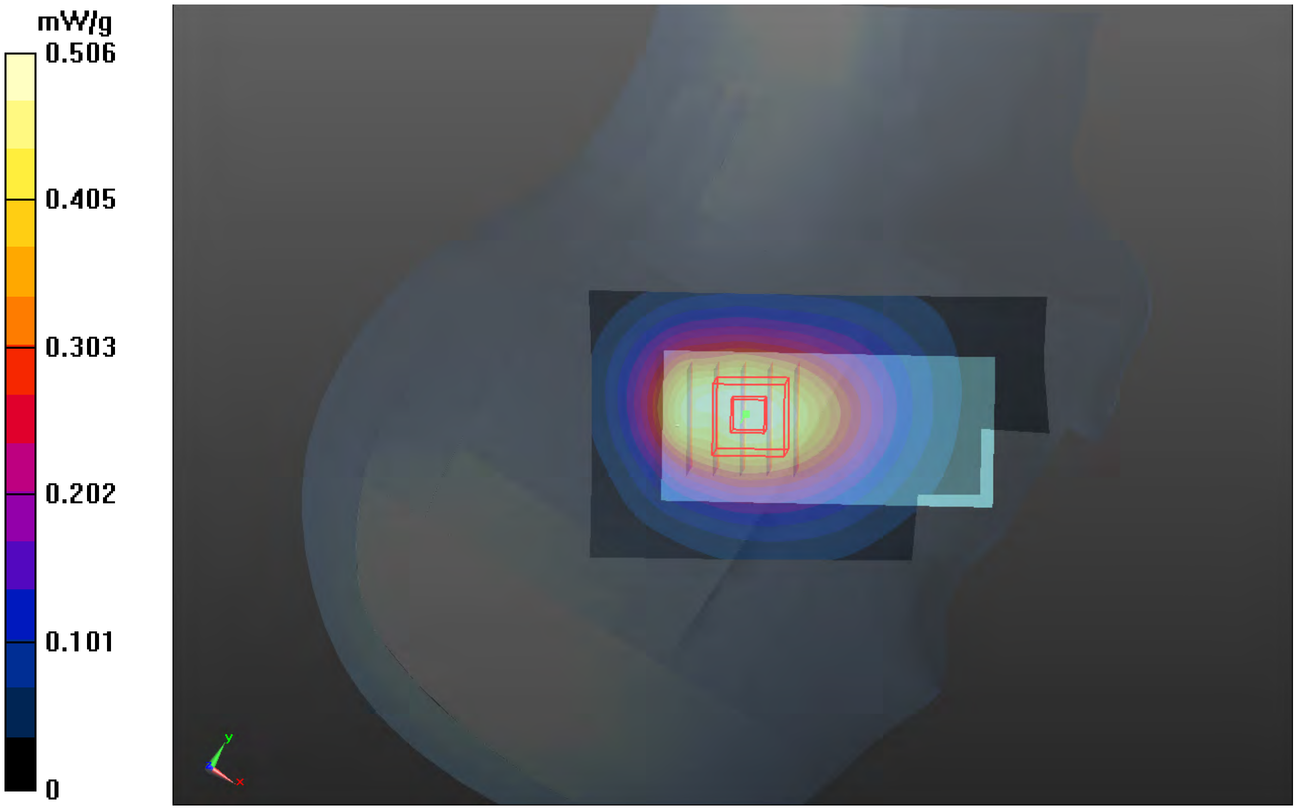
DUT: 120628C18

Communication System: GSM; Frequency: 836.4 MHz;Duty Cycle: 1:8.30042
Medium: H835_0629 Medium parameters used: f = 836.4 MHz; σ = 0.898 mho/m; ε_r = 42.829; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(8.87, 8.87, 8.87); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch189/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.506 mW/g

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.407 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.559 mW/g
SAR(1 g) = 0.413 mW/g; SAR(10 g) = 0.288 mW/g
Maximum value of SAR (measured) = 0.496 mW/g



P03 GSM850_Left Cheek_Ch189

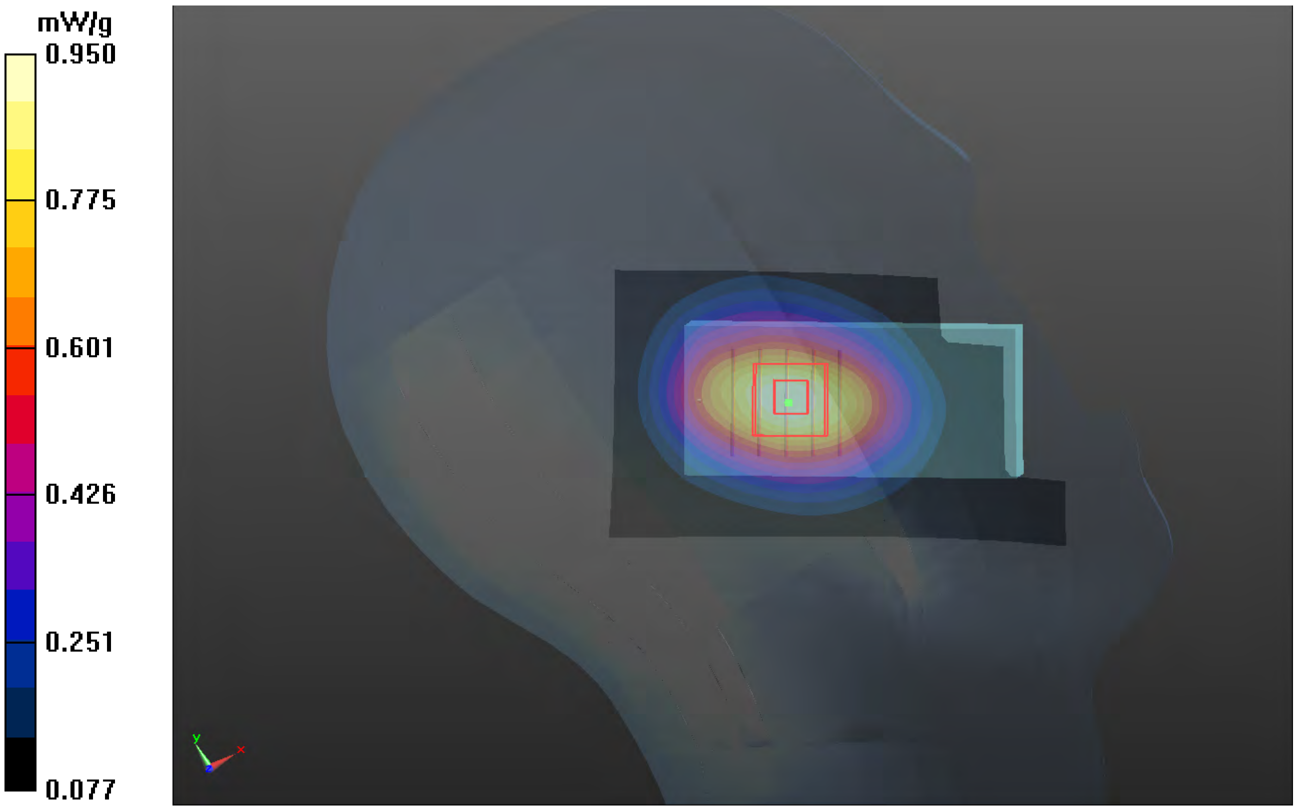
DUT: 120628C18

Communication System: GSM; Frequency: 836.4 MHz;Duty Cycle: 1:8.30042
Medium: H835_0629 Medium parameters used: f = 836.4 MHz; σ = 0.898 mho/m; ε_r = 42.829; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(8.87, 8.87, 8.87); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch189/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.953 mW/g

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.968 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 1.091 mW/g
SAR(1 g) = 0.794 mW/g; SAR(10 g) = 0.541 mW/g
Maximum value of SAR (measured) = 0.950 mW/g



P04 GSM850_Left Tilted_Ch189

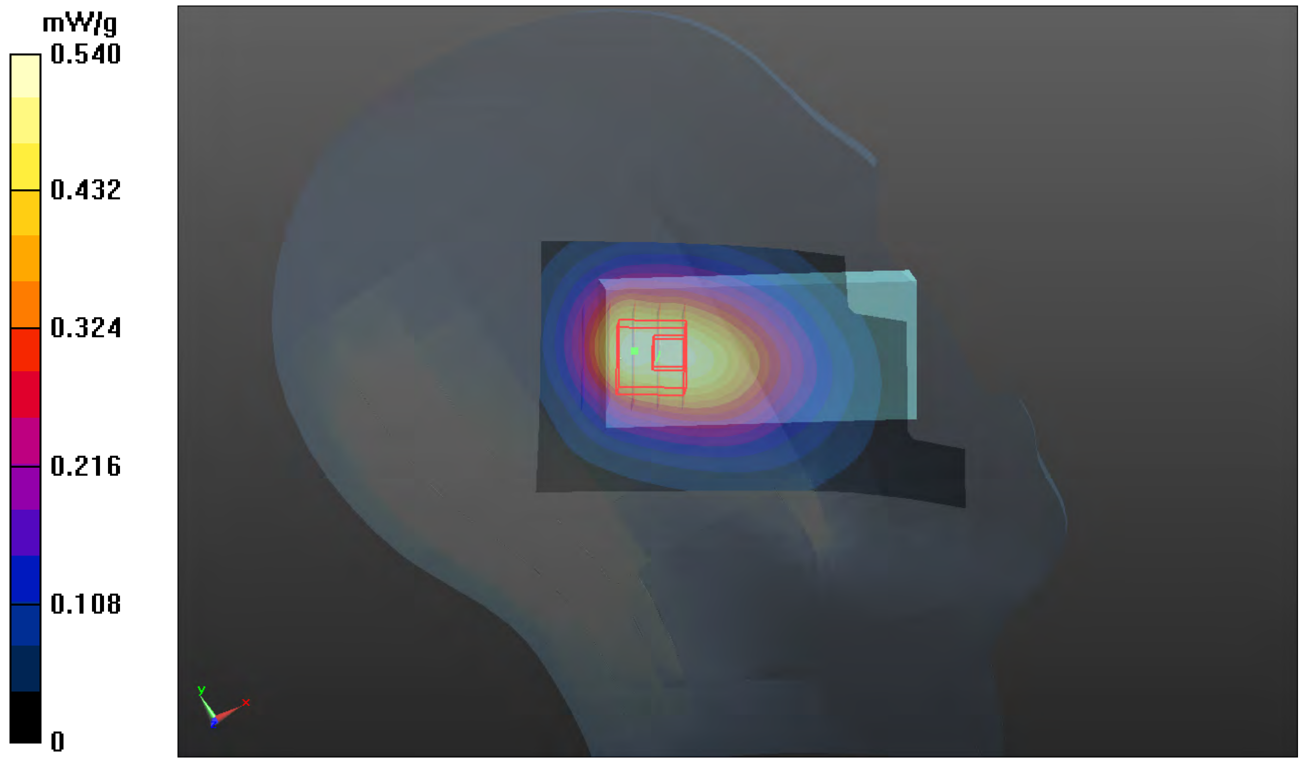
DUT: 120628C18

Communication System: GSM; Frequency: 836.4 MHz;Duty Cycle: 1:8.30042
Medium: H835_0629 Medium parameters used: f = 836.4 MHz; σ = 0.898 mho/m; ε_r = 42.829; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(8.87, 8.87, 8.87); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch189/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.540 mW/g

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.063 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.606 mW/g
SAR(1 g) = 0.433 mW/g; SAR(10 g) = 0.287 mW/g
Maximum value of SAR (measured) = 0.524 mW/g



P13 GSM850_Right Cheek_Ch128

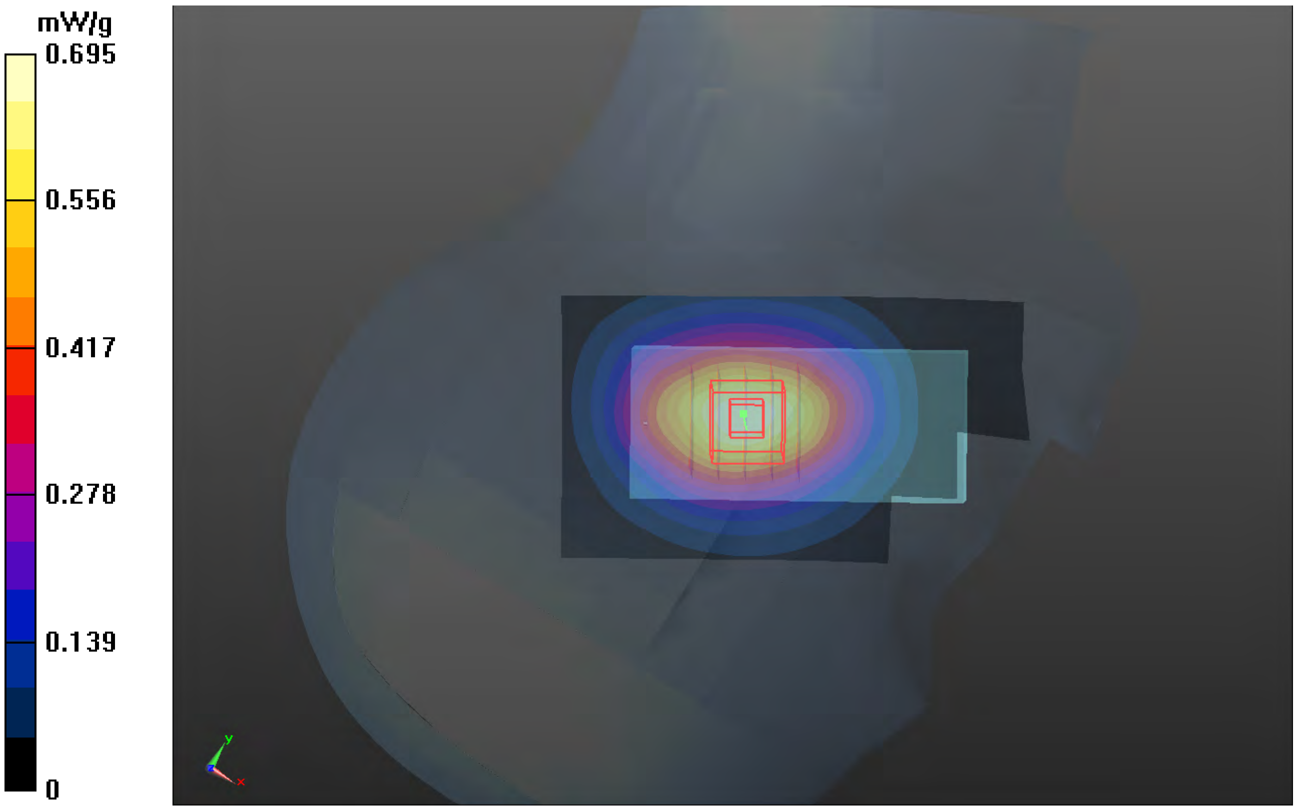
DUT: 120628C18

Communication System: GSM; Frequency: 824.2 MHz;Duty Cycle: 1:8.30042
Medium: H835_0629 Medium parameters used: f = 824.2 MHz; σ = 0.887 mho/m; ε_r = 42.987; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(8.87, 8.87, 8.87); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch128/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.695 mW/g

Ch128/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.325 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.767 mW/g
SAR(1 g) = 0.562 mW/g; SAR(10 g) = 0.385 mW/g
Maximum value of SAR (measured) = 0.680 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2012/06/29

P14 GSM850_Right Cheek_Ch251

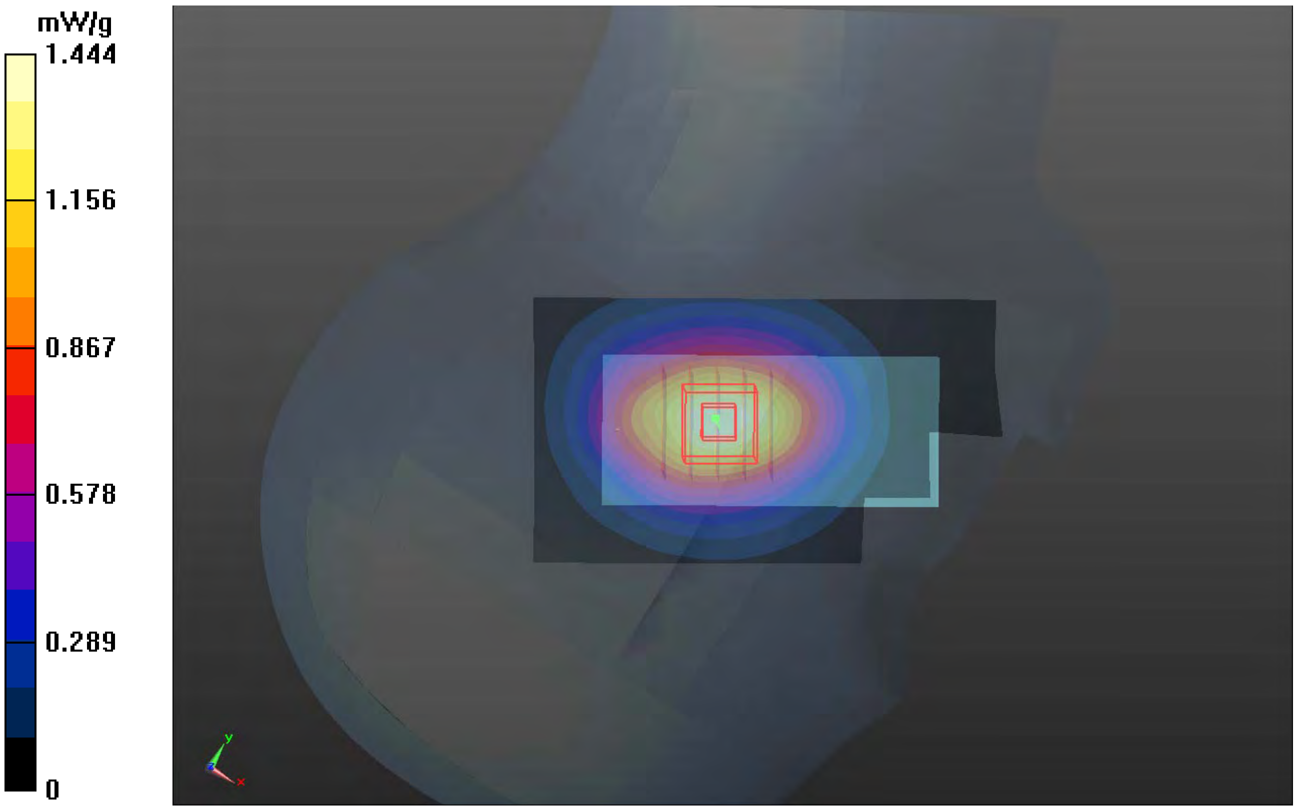
DUT: 120628C18

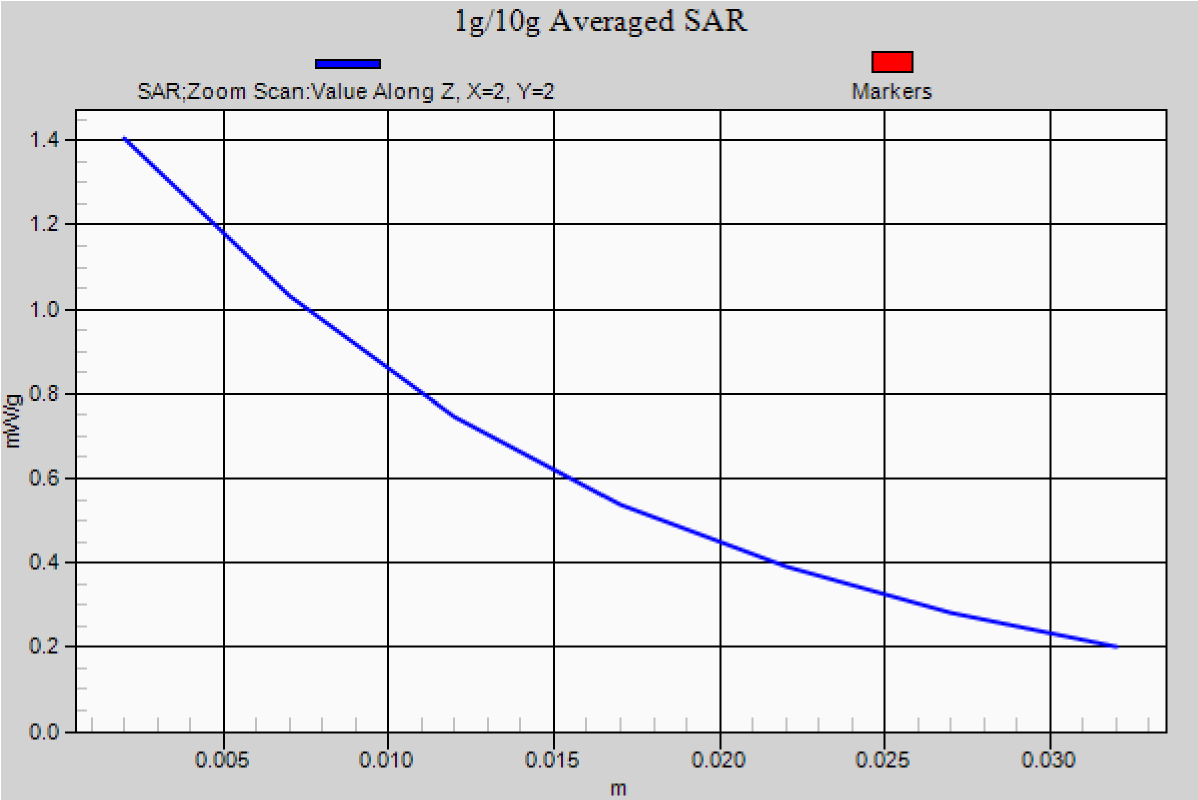
Communication System: GSM; Frequency: 848.8 MHz;Duty Cycle: 1:8.30042
Medium: H835_0629 Medium parameters used: f = 849 MHz; σ = 0.91 mho/m; ε_r = 42.661; ρ = 1000 kg/m^3
Ambient Temperature：22.4 ℃; Liquid Temperature：21.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(8.87, 8.87, 8.87); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch251/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 1.44 mW/g

Ch251/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.511 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.587 mW/g
SAR(1 g) = 1.16 mW/g; SAR(10 g) = 0.793 mW/g
Maximum value of SAR (measured) = 1.40 mW/g




1g/10g Averaged SAR
SAR;Zoom Scan:Value Along Z, X=2, Y=2
Markers
mW/g
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

P07 GSM1900_Right Cheek_Ch810

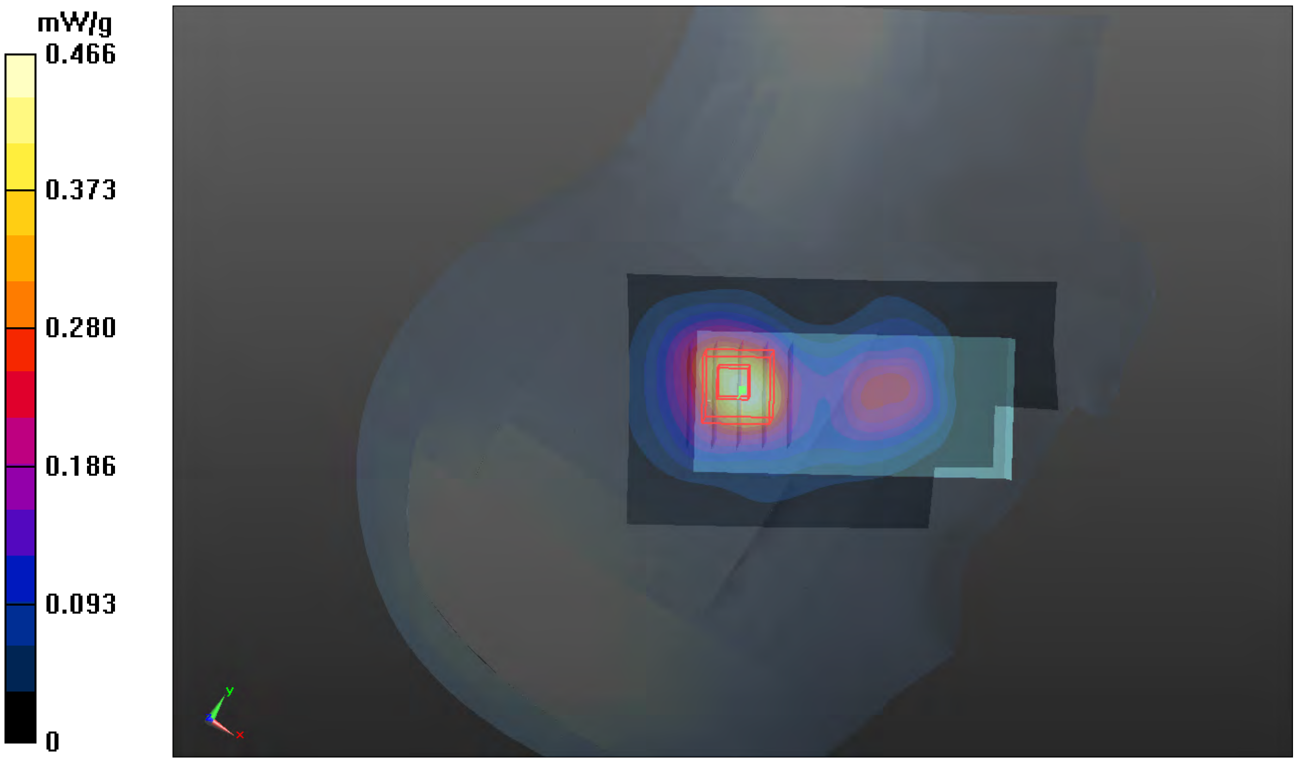
DUT: 120628C18

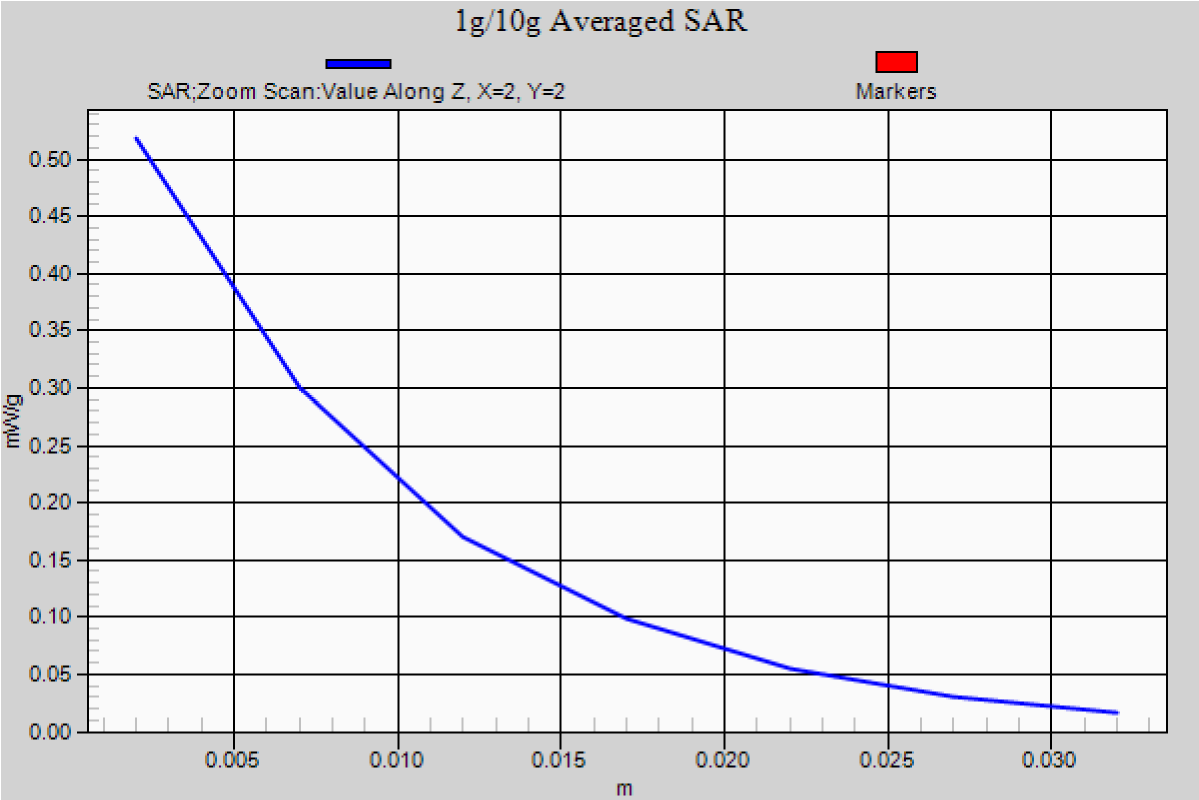
Communication System: GSM; Frequency: 1909.8 MHz;Duty Cycle: 1:8.30042
Medium: H1900_0629 Medium parameters used: f = 1910 MHz; σ = 1.416 mho/m; ε_r = 40.788; ρ = 1000 kg/m^3
Ambient Temperature：21.9 ℃; Liquid Temperature：20.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.4, 7.4, 7.4); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.466 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.000 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.716 mW/g
SAR(1 g) = 0.388 mW/g; SAR(10 g) = 0.199 mW/g
Maximum value of SAR (measured) = 0.518 mW/g




1g/10g Averaged SAR
SAR;Zoom Scan:Value Along Z, X=2, Y=2
Markers
mW/g
0.50
0.45
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.005
0.010
0.015
0.020
0.025
0.030
m

P08 GSM1900_Right Tilted_Ch810

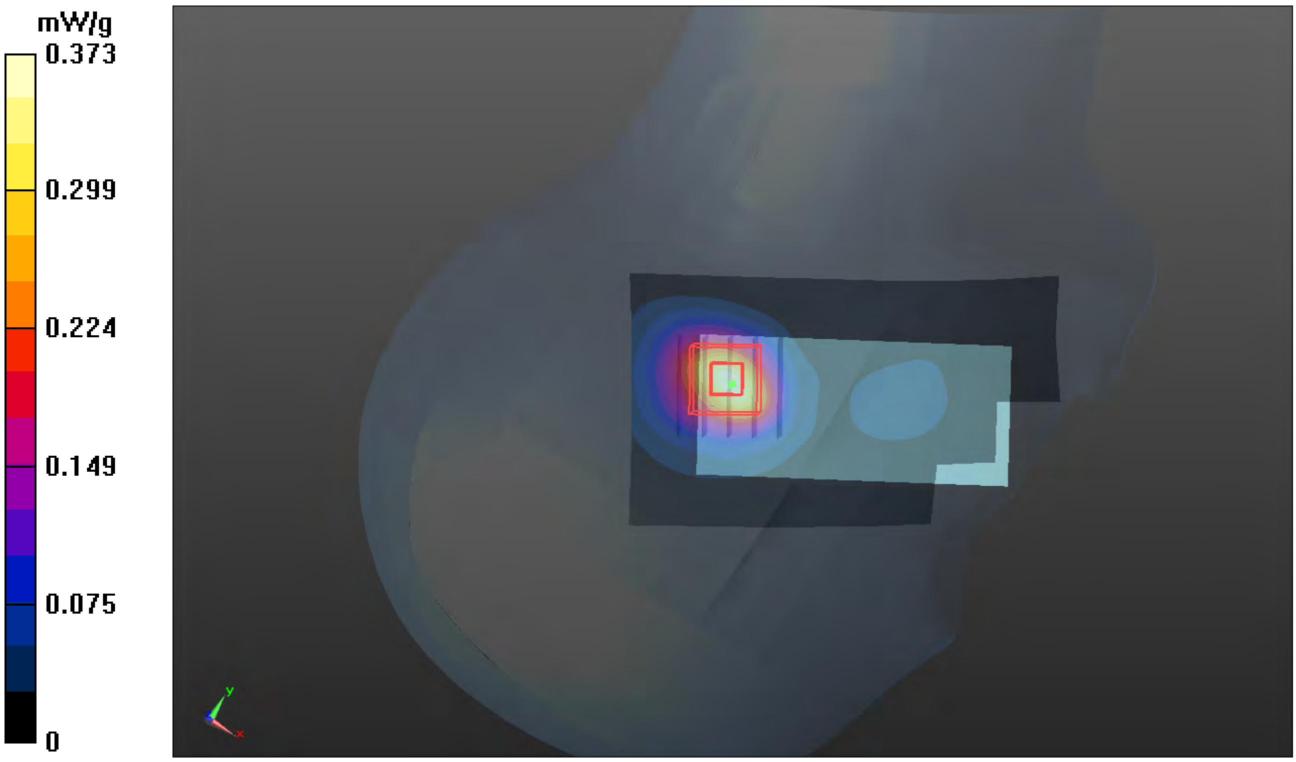
DUT: 120628C18

Communication System: GSM; Frequency: 1909.8 MHz;Duty Cycle: 1:8.30042
Medium: H1900_0629 Medium parameters used: f = 1910 MHz; σ = 1.416 mho/m; ε_r = 40.788; ρ = 1000 kg/m^3
Ambient Temperature：21.9 ℃; Liquid Temperature：20.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.4, 7.4, 7.4); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.373 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.021 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.602 mW/g
SAR(1 g) = 0.321 mW/g; SAR(10 g) = 0.158 mW/g
Maximum value of SAR (measured) = 0.451 mW/g



P09 GSM1900_Left Cheek_Ch810

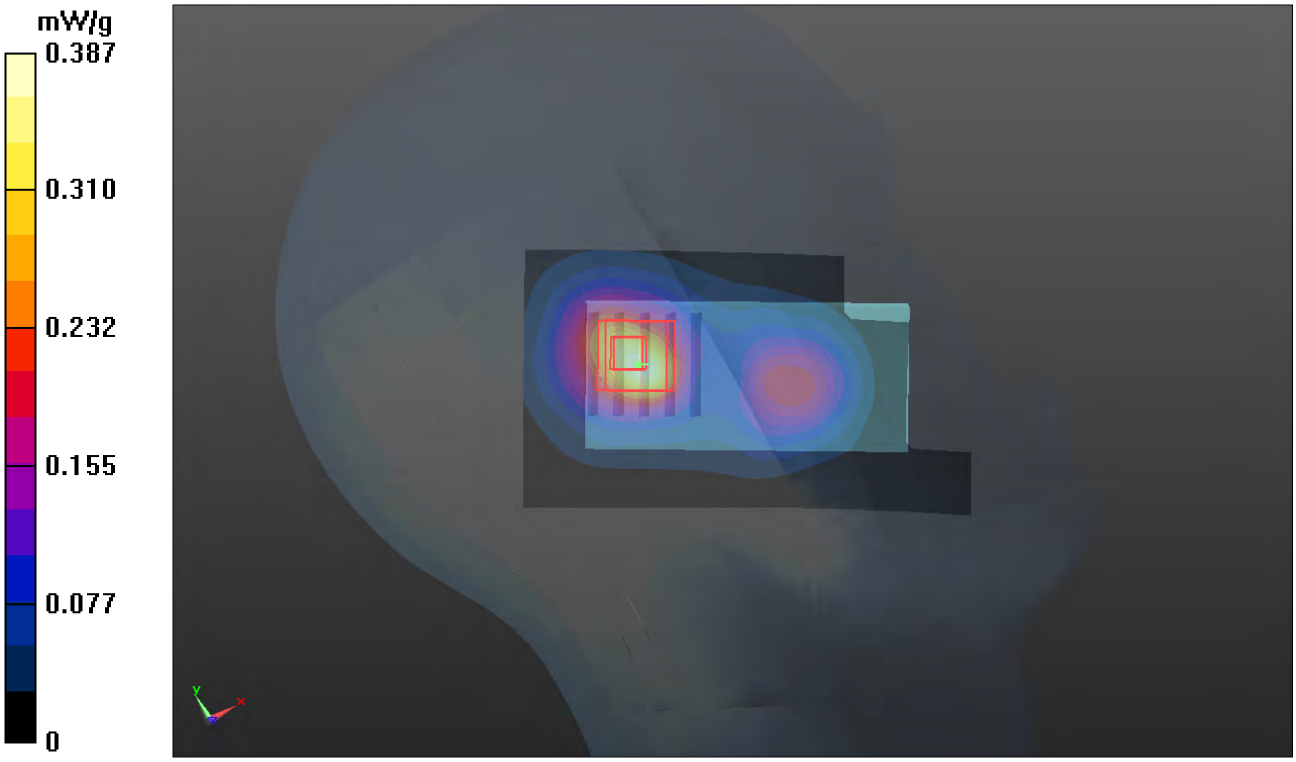
DUT: 120628C18

Communication System: GSM; Frequency: 1909.8 MHz;Duty Cycle: 1:8.30042
Medium: H1900_0629 Medium parameters used: f = 1910 MHz; σ = 1.416 mho/m; ε_r = 40.788; ρ = 1000 kg/m^3
Ambient Temperature：21.9 ℃; Liquid Temperature：20.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.4, 7.4, 7.4); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.387 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.456 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.730 mW/g
SAR(1 g) = 0.378 mW/g; SAR(10 g) = 0.184 mW/g
Maximum value of SAR (measured) = 0.493 mW/g



P10 GSM1900_Left Tilted_Ch810

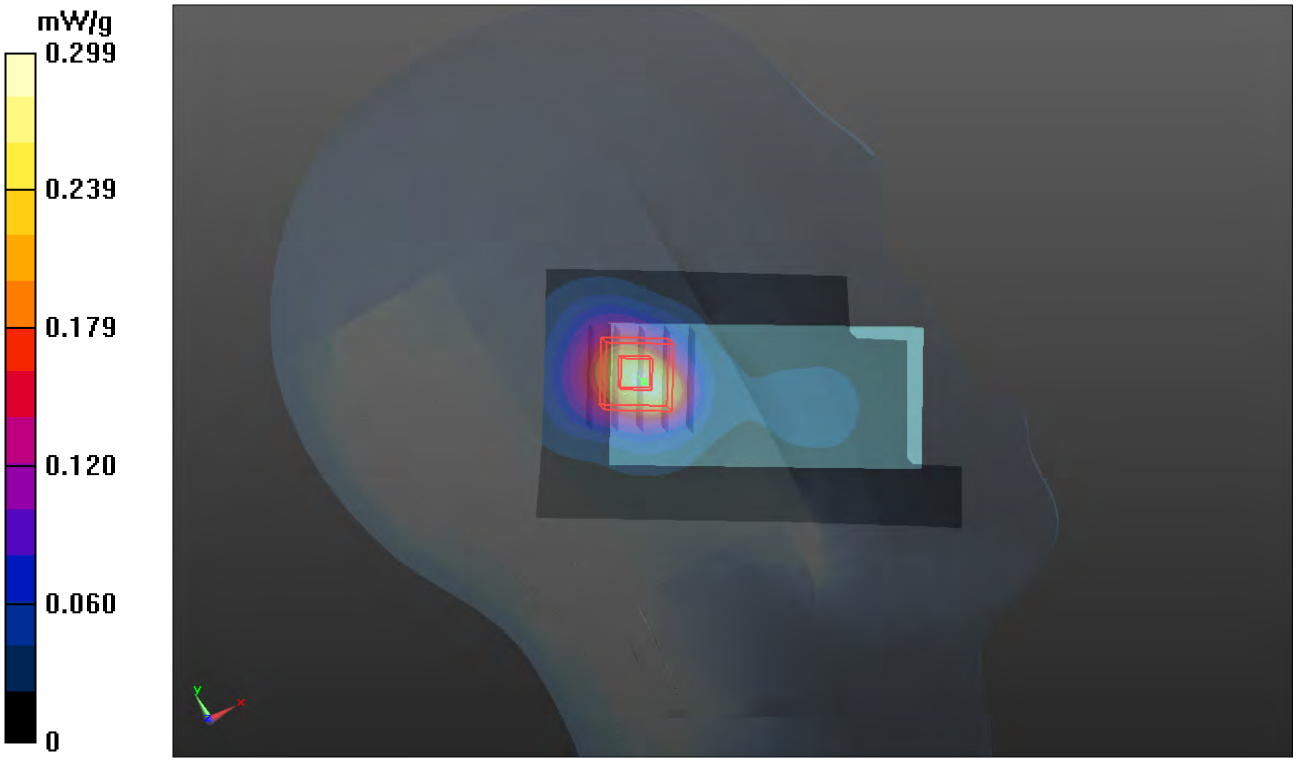
DUT: 120628C18

Communication System: GSM; Frequency: 1909.8 MHz;Duty Cycle: 1:8.30042
Medium: H1900_0629 Medium parameters used: f = 1910 MHz; σ = 1.416 mho/m; ε_r = 40.788; ρ = 1000 kg/m^3
Ambient Temperature：21.9 ℃; Liquid Temperature：20.9 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.4, 7.4, 7.4); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.299 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.583 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.550 mW/g
SAR(1 g) = 0.287 mW/g; SAR(10 g) = 0.137 mW/g
Maximum value of SAR (measured) = 0.390 mW/g



P15 GSM835_Front Face_1.5cm_Ch189_Earphone

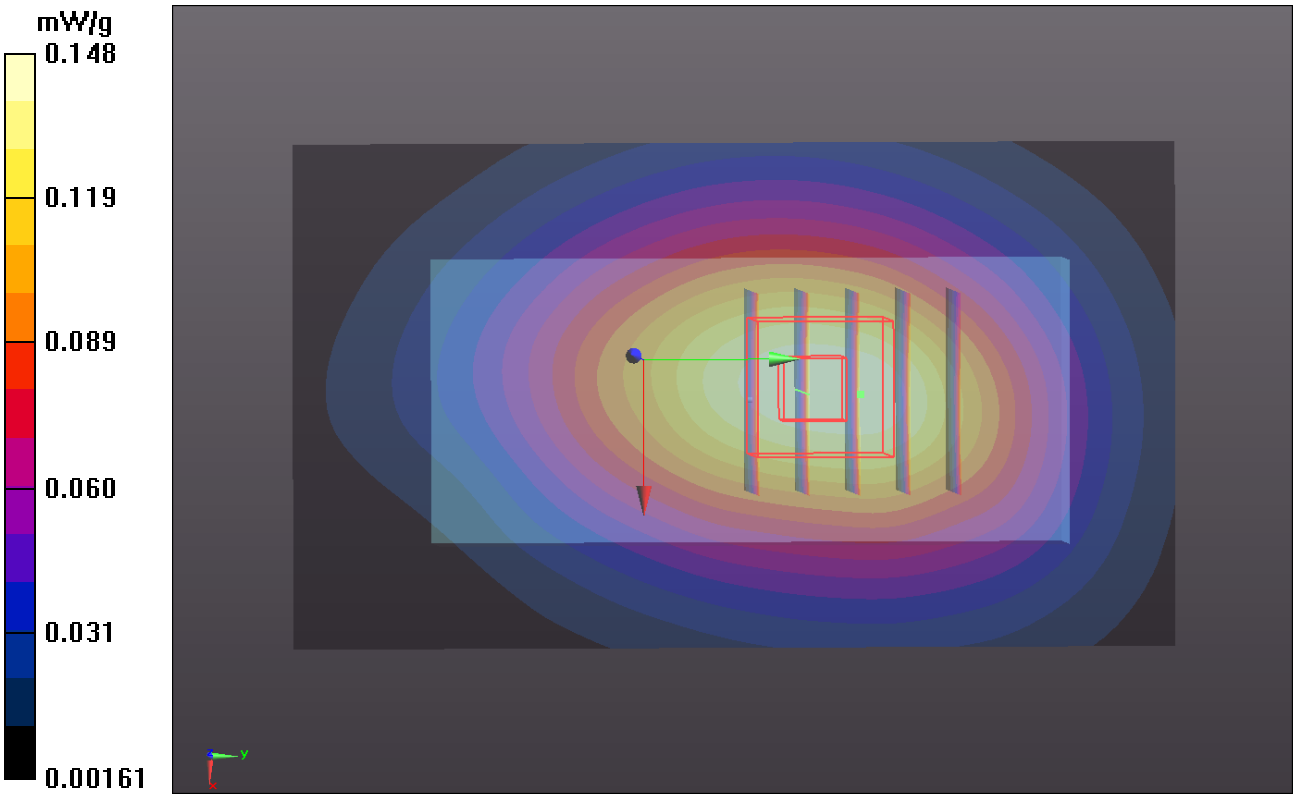
DUT: 120628C18

Communication System: GSM; Frequency: 836.4 MHz;Duty Cycle: 1:8.30042
Medium: B835_0702 Medium parameters used : f = 836.4 MHz; σ = 0.992 mho/m; ε_r = 55.331; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃; Liquid Temperature：20.2 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(9.12, 9.12, 9.12); Calibrated: 2011/10/26;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/07/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch189/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.148 mW/g

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.052 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.168 mW/g
SAR(1 g) = 0.123 mW/g; SAR(10 g) = 0.086 mW/g
Maximum value of SAR (measured) = 0.148 mW/g



P06 GSM850_Rear Face_1.5cm_Ch189_Earphone

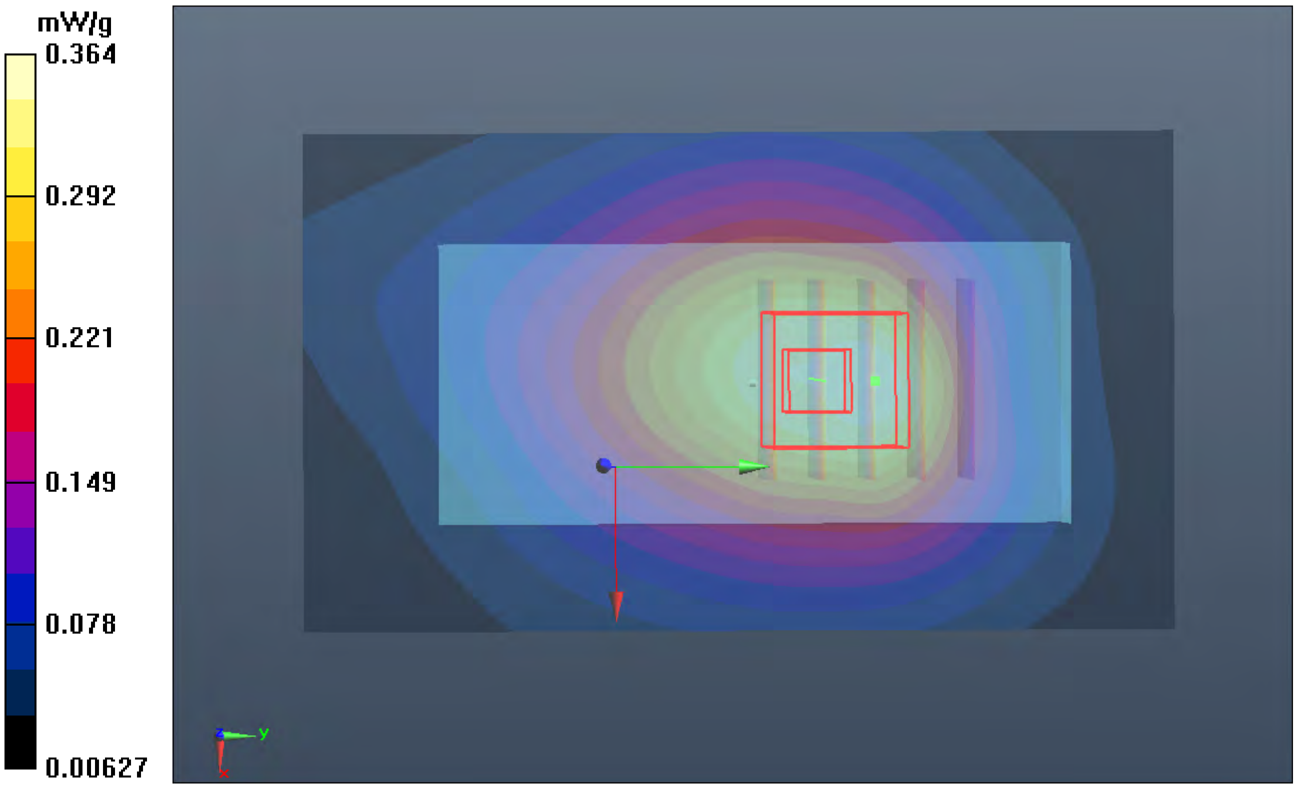
DUT: 120628C18

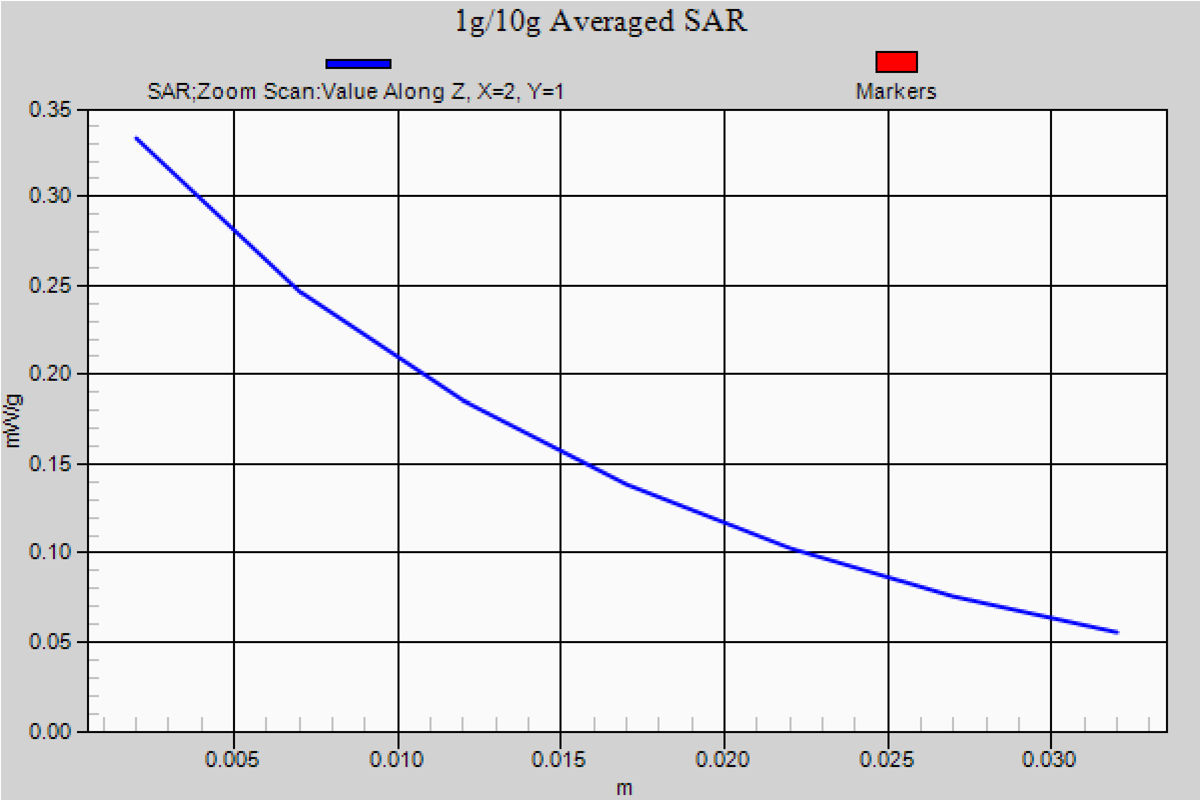
Communication System: GSM; Frequency: 836.4 MHz;Duty Cycle: 1:8.30042
Medium: B835_0629 Medium parameters used: f = 836.4 MHz; σ = 0.993 mho/m; ε_r = 55.417; ρ = 1000 kg/m^3
Ambient Temperature：21.7 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3820; ConvF(9.24, 9.24, 9.24); Calibrated: 2011/12/16;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2012/04/27
- Phantom: SAM Phantom_Front; Type: SAM V4.0; Serial: TP 1654
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch189/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.364 mW/g

Ch189/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.637 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.377 mW/g
SAR(1 g) = 0.279 mW/g; SAR(10 g) = 0.196 mW/g
Maximum value of SAR (measured) = 0.333 mW/g




1g/10g Averaged SAR
SAR;Zoom Scan:Value Along Z, X=2, Y=1
Markers
mW/g
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
0.005
0.010
0.015
0.020
0.025
0.030
m

P11 GSM1900_Front Face_1.5cm_Ch810_Earphone

DUT: 120628C18

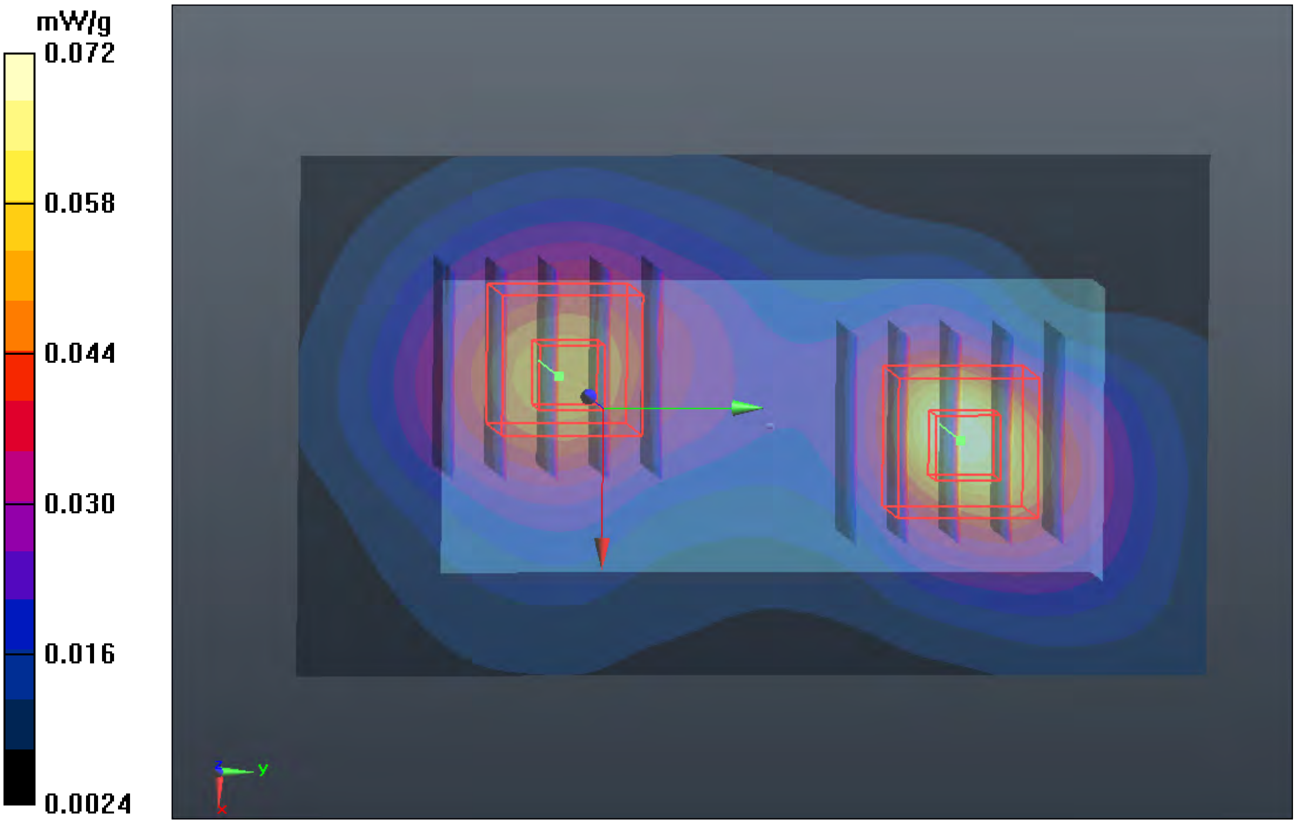
Communication System: GSM; Frequency: 1909.8 MHz;Duty Cycle: 1:8.30042
Medium: B1900_0629 Medium parameters used: f = 1910 MHz; σ = 1.565 mho/m; ε_r = 54.452; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃; Liquid Temperature：20.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3820; ConvF(8.04, 8.04, 8.04); Calibrated: 2011/12/16;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2012/04/27
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.0715 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.044 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.095 mW/g
SAR(1 g) = 0.055 mW/g; SAR(10 g) = 0.029 mW/g
Maximum value of SAR (measured) = 0.0759 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.044 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.059 mW/g
SAR(1 g) = 0.037 mW/g; SAR(10 g) = 0.022 mW/g
Maximum value of SAR (measured) = 0.0503 mW/g



P12 GSM1900_Rear Face_1.5cm_Ch810_Earphone

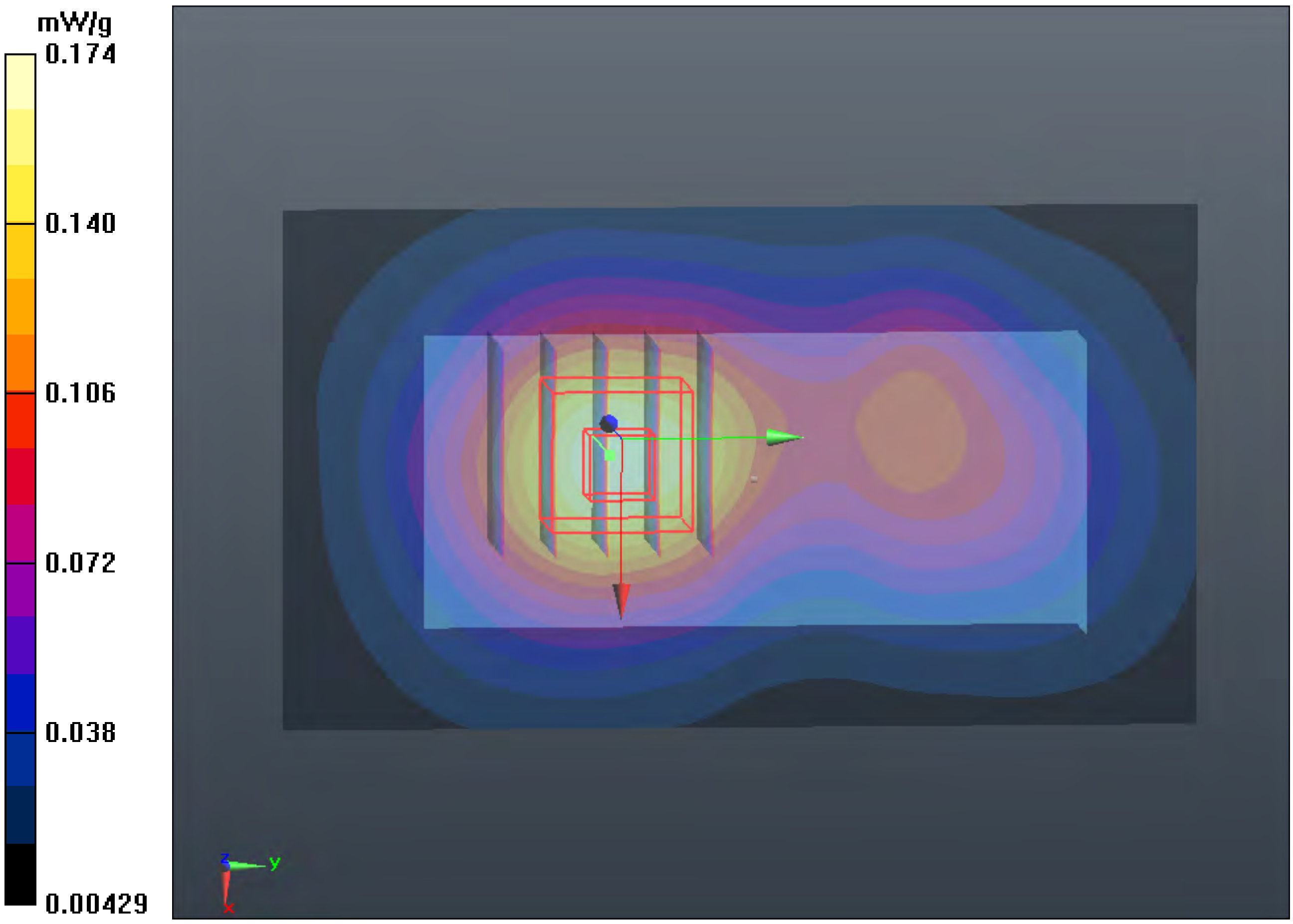
DUT: 120628C18

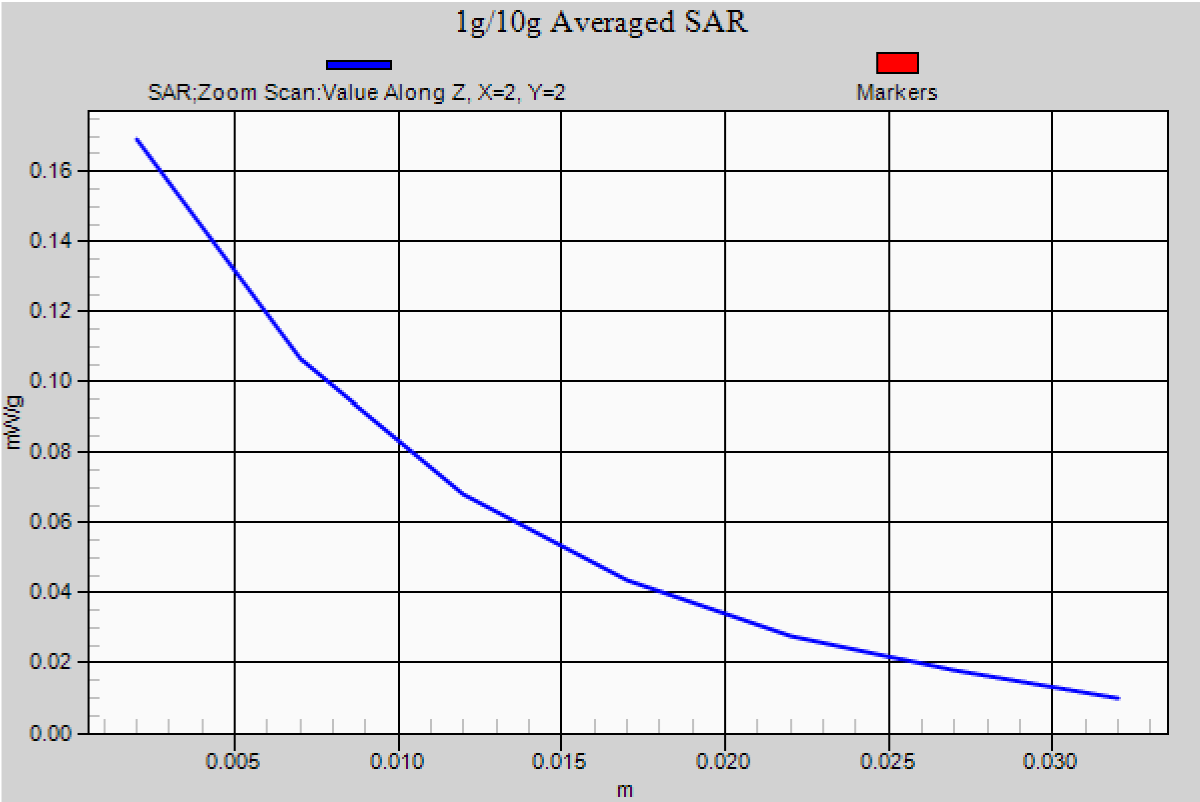
Communication System: GSM; Frequency: 1909.8 MHz;Duty Cycle: 1:8.30042
Medium: B1900_0629 Medium parameters used: f = 1910 MHz; σ = 1.565 mho/m; ε_r = 54.452; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃; Liquid Temperature：20.4 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3820; ConvF(8.04, 8.04, 8.04); Calibrated: 2011/12/16;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn579; Calibrated: 2012/04/27
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Ch810/Area Scan (41x71x1): Measurement grid: dx=20mm, dy=20mm
Maximum value of SAR (interpolated) = 0.174 mW/g

Ch810/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.941 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.206 mW/g
SAR(1 g) = 0.131 mW/g; SAR(10 g) = 0.081 mW/g
Maximum value of SAR (measured) = 0.169 mW/g




1g/10g Averaged SAR
SAR;Zoom Scan:Value Along Z, X=2, Y=2
Markers
mW/g
0.16
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.005
0.010
0.015
0.020
0.025
0.030
m

Appendix C. Calibration Certificate for Probe and Dipole

The SPEAG calibration certificates are shown as follows.

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

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

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

Accreditation No.: SCS 108

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

Certificate No: D835V2-4d021_Apr12

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d021
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 20, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	05-Oct-11 (No. 217-01451)	Oct-12
Power sensor HP 8481A	US37292783	05-Oct-11 (No. 217-01451)	Oct-12
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.2 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	30-Dec-11 (No. ES3-3205_Dec11)	Dec-12
DAE4	SN: 601	04-Jul-11 (No. DAE4-601_Jul11)	Jul-12

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

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

Issued: April 20, 2012

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.

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%.

Measurement Conditions

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

DASY Version	DASY5	V52.8.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.1 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.37 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**9.46 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**6.19 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.5 ± 6 %	1.01 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.48 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**9.60 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.63 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**6.35 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.0 Ω - 2.1 jΩ
Return Loss	- 30.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.7 Ω - 3.5 jΩ
Return Loss	- 27.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.392 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	April 22, 2004

DASY5 Validation Report for Head TSL

Date: 20.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d021

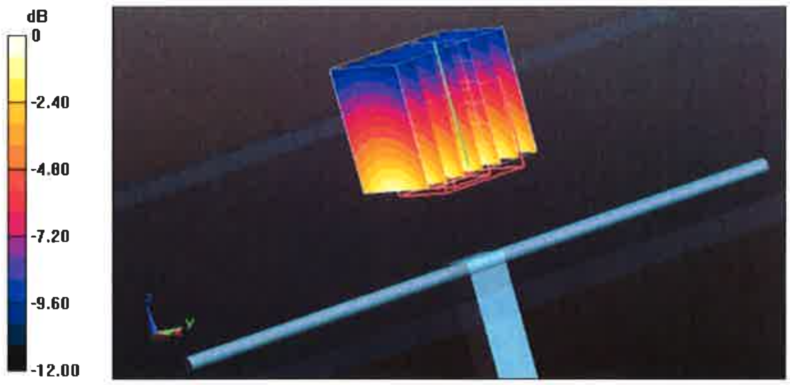
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.9 mho/m; ε_r = 41.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.07, 6.07, 6.07); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

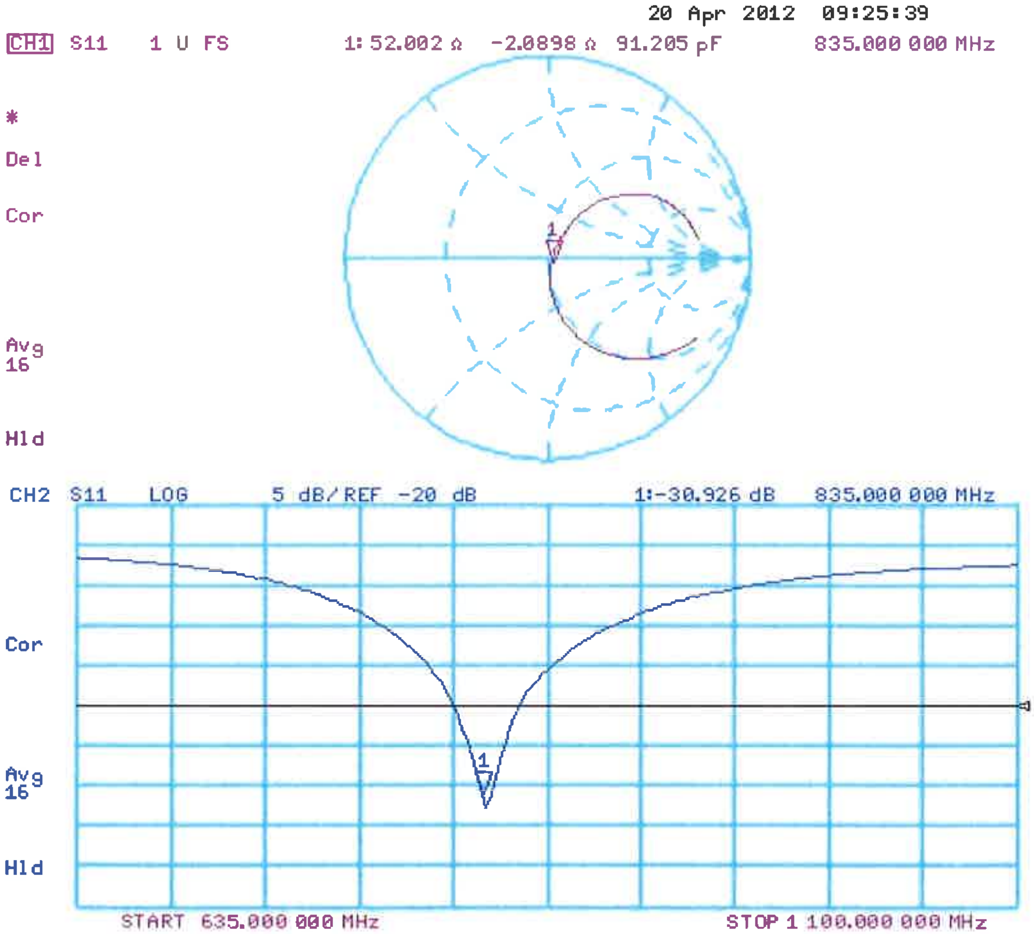
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.325 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.488 mW/g
SAR(1 g) = 2.37 mW/g; SAR(10 g) = 1.55 mW/g
Maximum value of SAR (measured) = 2.76 mW/g



0 dB = 2.76 mW/g = 8.82 dB mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.04.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d021

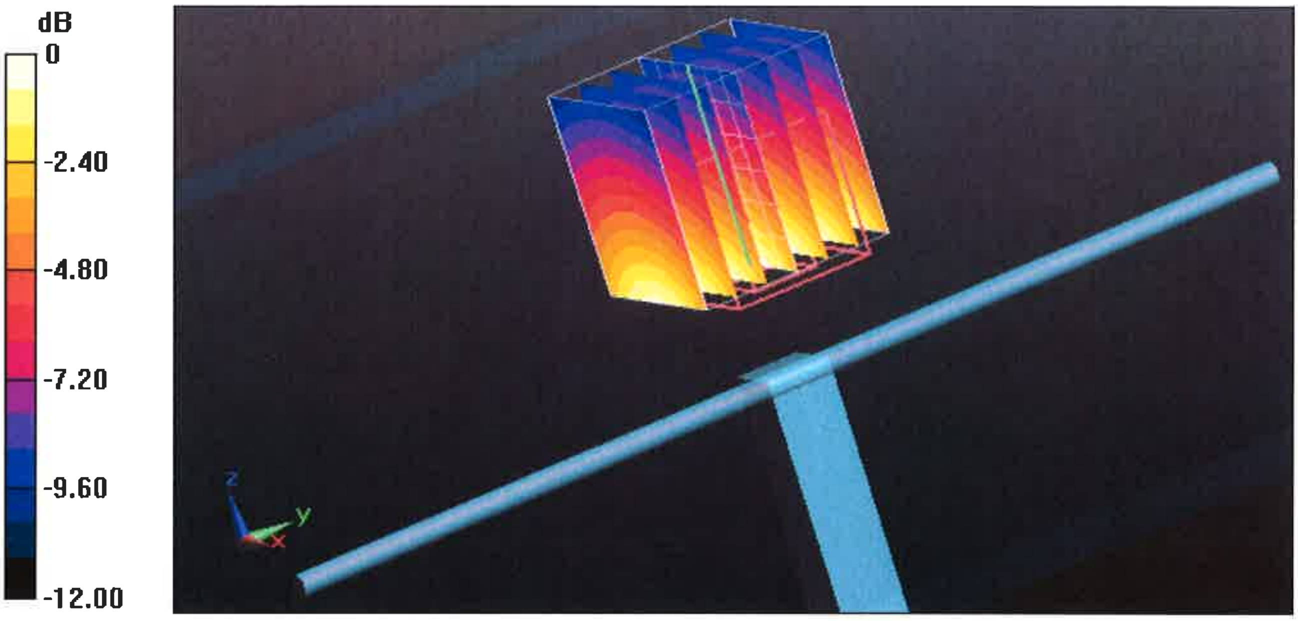
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 mho/m; ε_r = 54.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.02, 6.02, 6.02); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.1(838); SEMCAD X 14.6.5(6469)

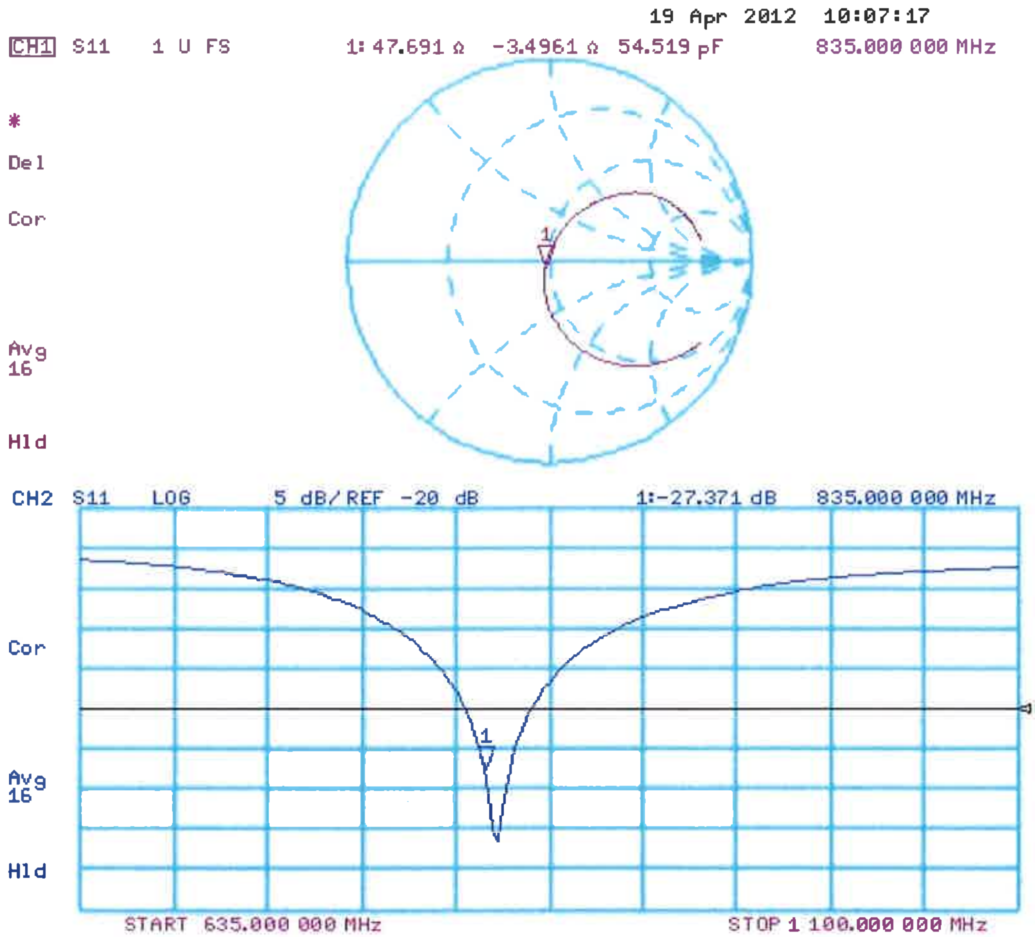
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.287 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.590 mW/g
SAR(1 g) = 2.48 mW/g; SAR(10 g) = 1.63 mW/g
Maximum value of SAR (measured) = 2.88 mW/g



0 dB = 2.88 mW/g = 9.19 dB mW/g

Impedance Measurement Plot for Body TSL



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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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C Service suisse d'étalonnage
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Accreditation No.: **SCS 108**

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

Certificate No: **D1900V2-5d036_Jan12**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d036
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 26, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

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

Issued: January 26, 2012

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.65 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**38.9 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.05 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**20.3 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 6 %	1.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.74 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**38.9 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.10 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.4 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

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

Antenna Parameters with Body TSL

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

General Antenna Parameters and Design

Electrical Delay (one direction)	1.195 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 08, 2003

DASY5 Validation Report for Head TSL

Date: 26.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

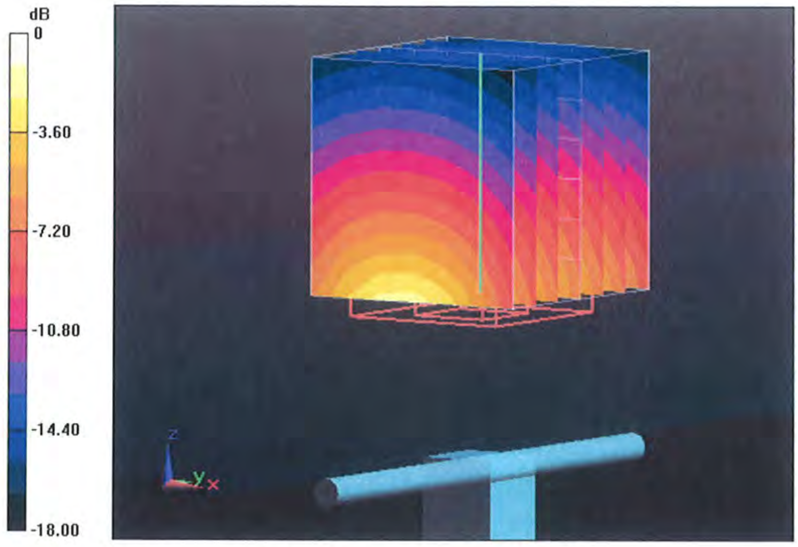
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma = 1.39$ mho/m; $\varepsilon_r = 40.8$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

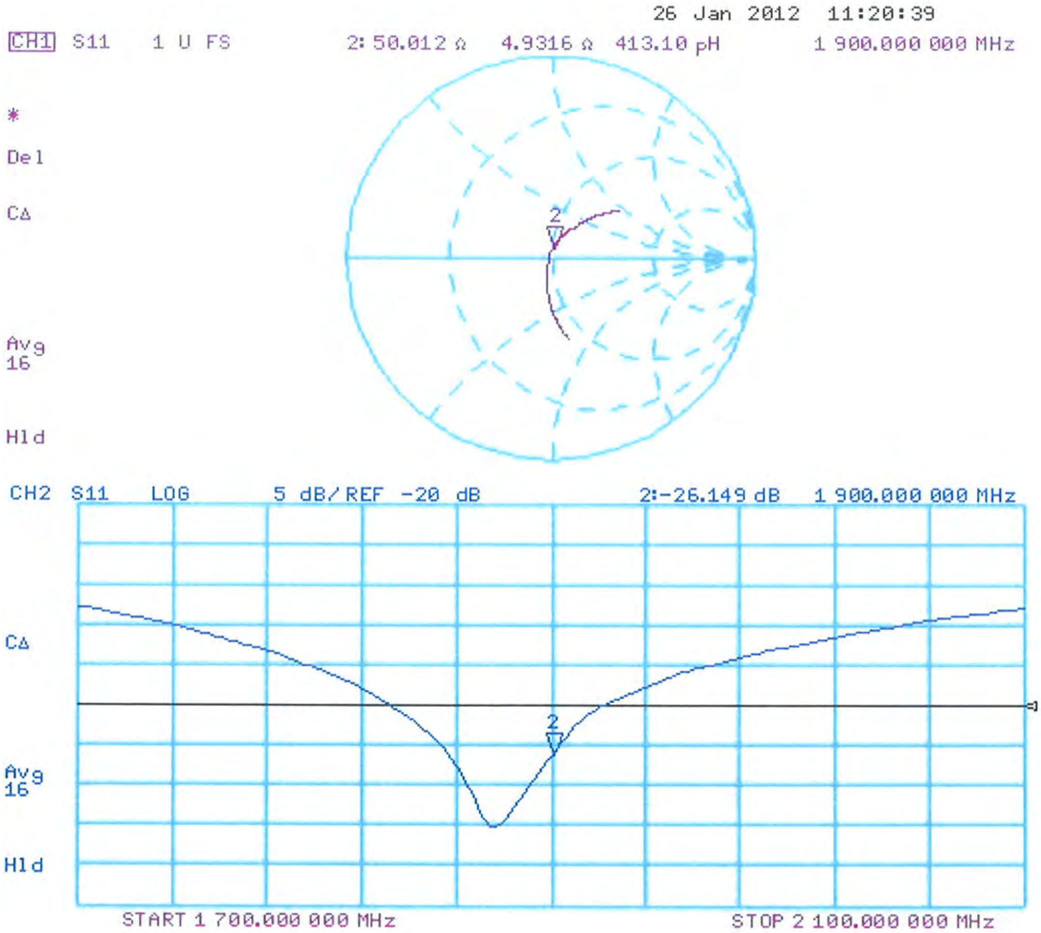
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.850 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 17.7040
SAR(1 g) = 9.65 mW/g; SAR(10 g) = 5.05 mW/g
Maximum value of SAR (measured) = 12.055 mW/g



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 26.01.2012

Test Laboratory: SPEAG, Zurich, Switzerland

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

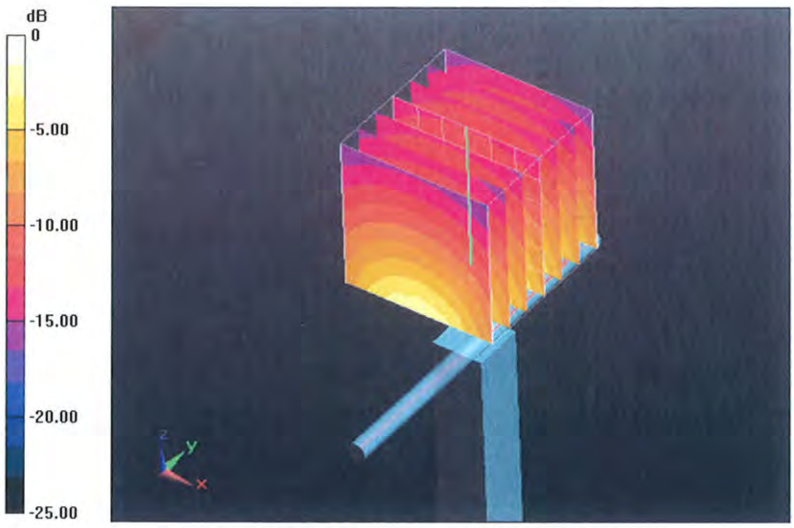
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.52 mho/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.62, 4.62, 4.62); Calibrated: 30.12.2011
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.07.2011
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.0(692); SEMCAD X 14.6.4(4989)

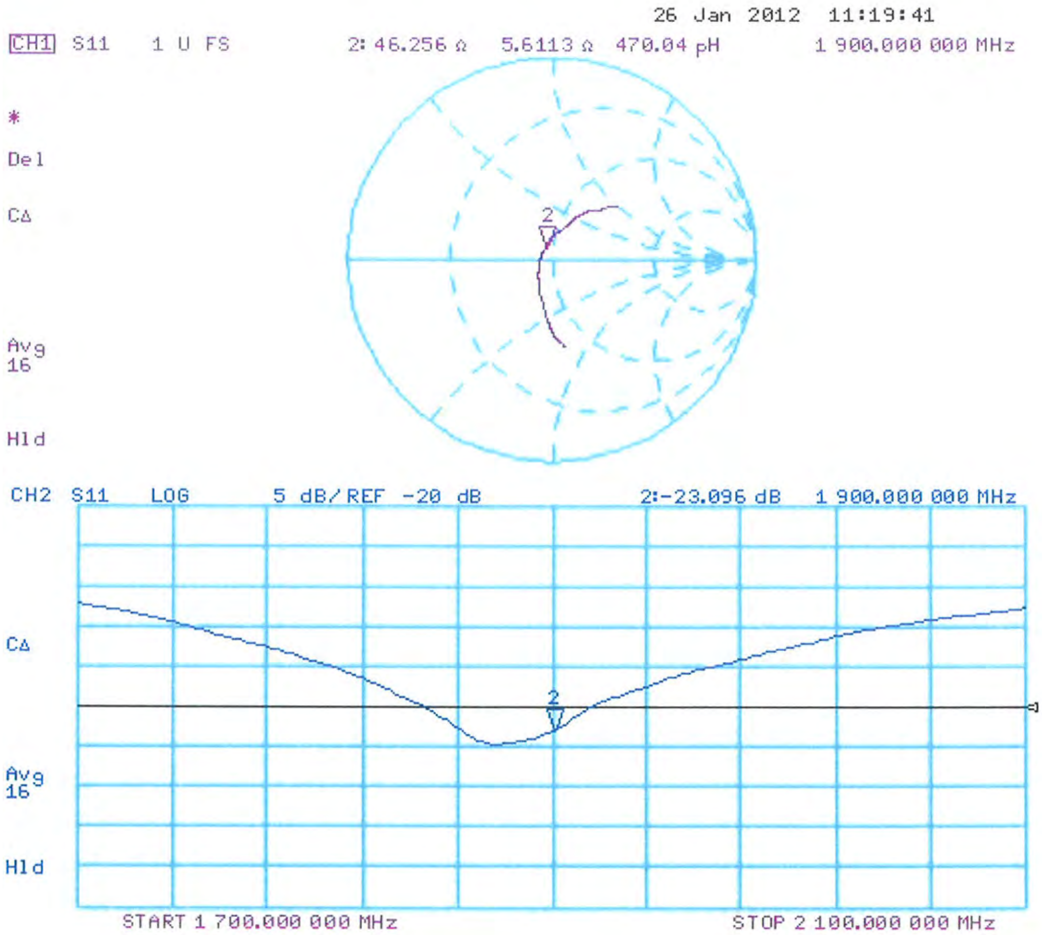
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.423 V/m; Power Drift = -0.0044 dB
Peak SAR (extrapolated) = 17.2700
SAR(1 g) = 9.74 mW/g; SAR(10 g) = 5.1 mW/g
Maximum value of SAR (measured) = 12.419 mW/g



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

Impedance Measurement Plot for Body TSL



359.

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Accreditation No.: SCS 108

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

Certificate No: **EX3-3650_Oct11**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3650

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

Calibration date: October 26, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: October 27, 2011

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

Calibration Laboratory of
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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., $\vartheta = 0$ 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 $\vartheta = 0$ ($f \leq 900$ 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, 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 $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *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
Calibrated: October 26, 2011

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

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

Basic Calibration Parameters

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

Modulation Calibration Parameters

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

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

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	9.20	9.20	9.20	0.79	0.69	± 12.0 %
835	41.5	0.90	8.87	8.87	8.87	0.79	0.69	± 12.0 %
1450	40.5	1.20	8.32	8.32	8.32	0.79	0.65	± 12.0 %
1750	40.1	1.37	7.92	7.92	7.92	0.70	0.63	± 12.0 %
1950	40.0	1.40	7.40	7.40	7.40	0.79	0.54	± 12.0 %
2450	39.2	1.80	6.80	6.80	6.80	0.59	0.62	± 12.0 %
2600	39.0	1.96	6.68	6.68	6.68	0.50	0.74	± 12.0 %
5200	36.0	4.66	5.05	5.05	5.05	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.71	4.71	4.71	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.56	4.56	4.56	0.45	1.80	± 13.1 %
5600	35.5	5.07	4.42	4.42	4.42	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.30	4.30	4.30	0.50	1.80	± 13.1 %

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

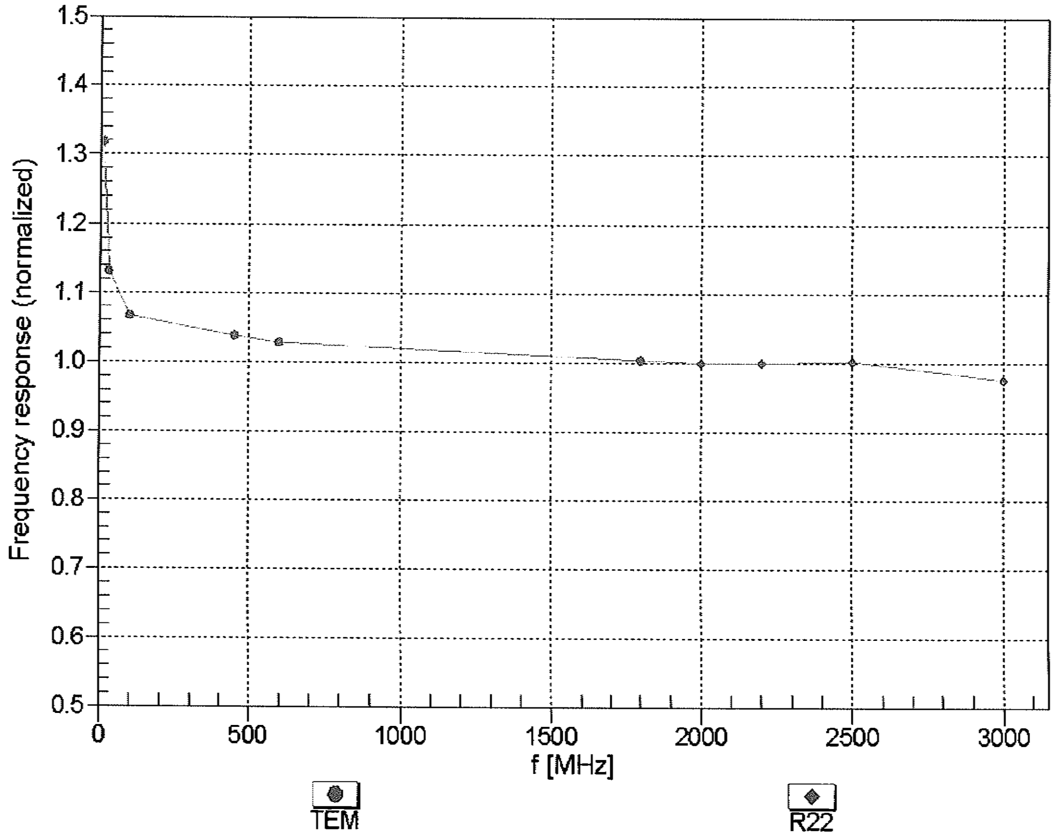
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3650

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	9.21	9.21	9.21	0.78	0.69	± 12.0 %
835	55.2	0.97	9.12	9.12	9.12	0.79	0.67	± 12.0 %
1450	54.0	1.30	8.09	8.09	8.09	0.79	0.63	± 12.0 %
1750	53.4	1.49	7.49	7.49	7.49	0.79	0.64	± 12.0 %
1950	53.3	1.52	7.46	7.46	7.46	0.79	0.65	± 12.0 %
2450	52.7	1.95	6.89	6.89	6.89	0.79	0.60	± 12.0 %
2600	52.5	2.16	6.79	6.79	6.79	0.72	0.58	± 12.0 %
5200	49.0	5.30	4.28	4.28	4.28	0.50	1.95	± 13.1 %
5300	48.9	5.42	4.11	4.11	4.11	0.50	1.95	± 13.1 %
5500	48.6	5.65	3.73	3.73	3.73	0.60	1.95	± 13.1 %
5600	48.5	5.77	3.57	3.57	3.57	0.60	1.95	± 13.1 %
5800	48.2	6.00	3.81	3.81	3.81	0.60	1.95	± 13.1 %

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

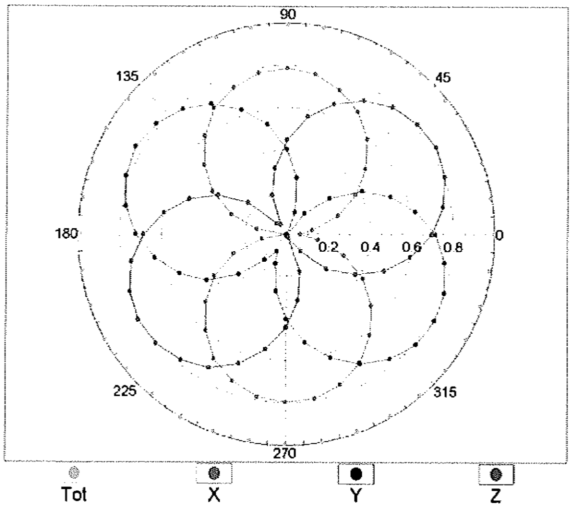
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



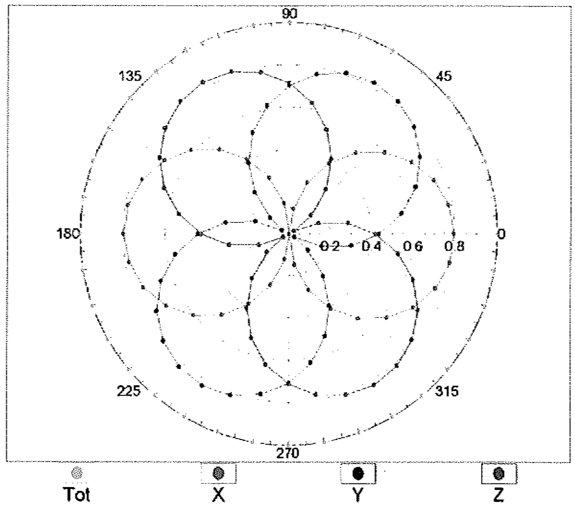
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

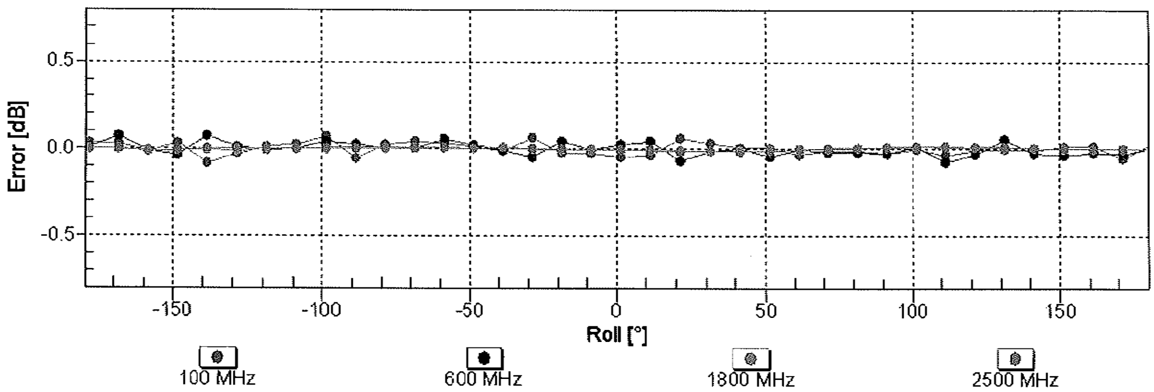
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



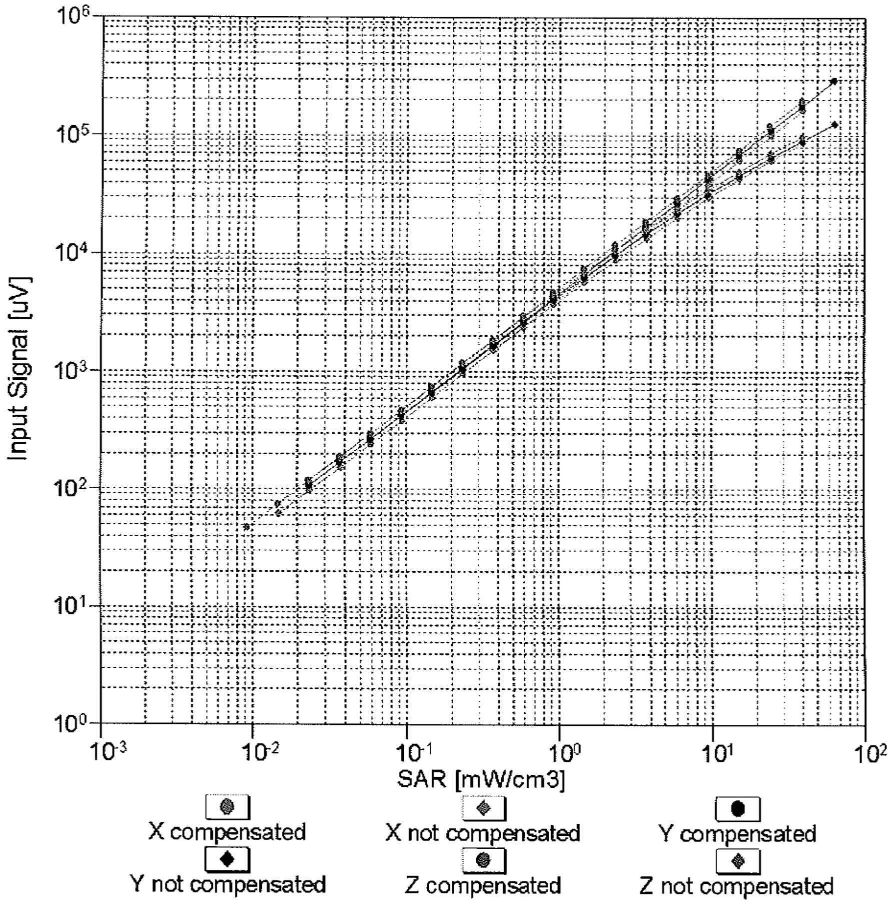
f=1800 MHz,R22

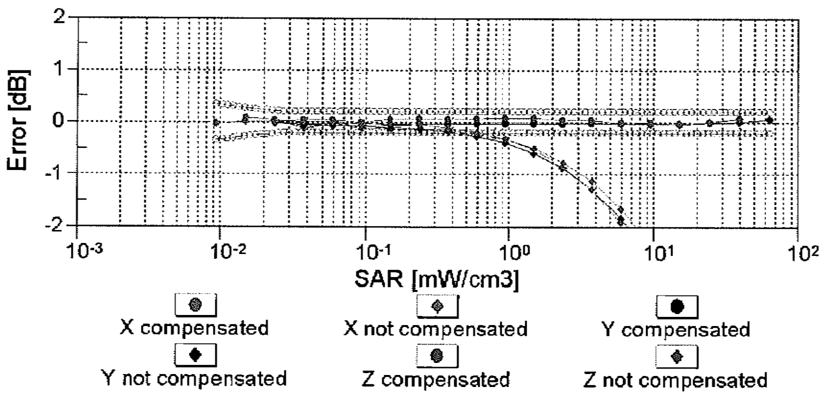




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

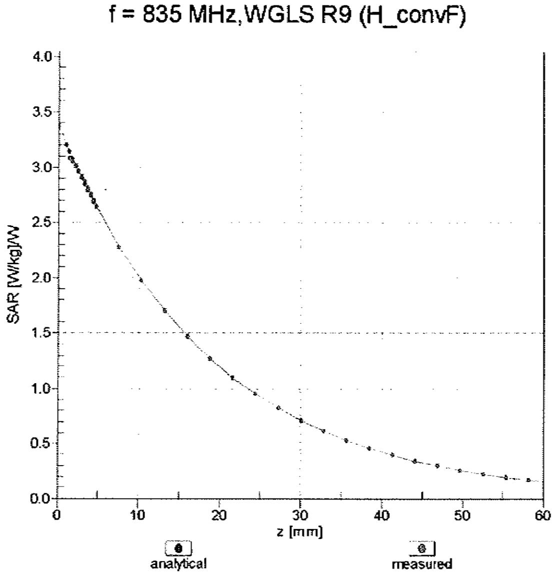
Dynamic Range f(SAR_{head})
(TEM cell , f = 900 MHz)

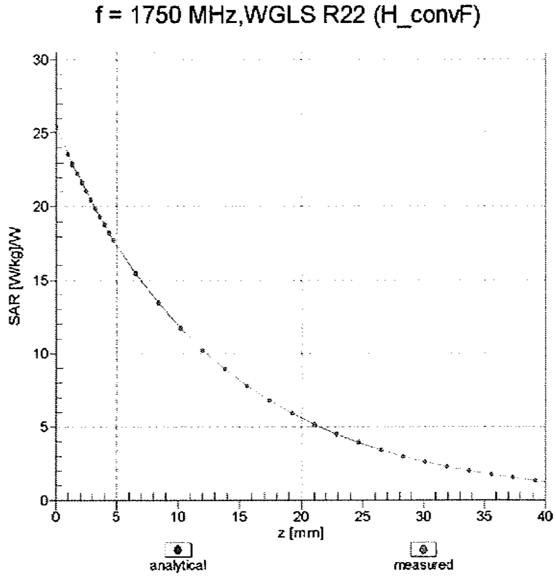




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

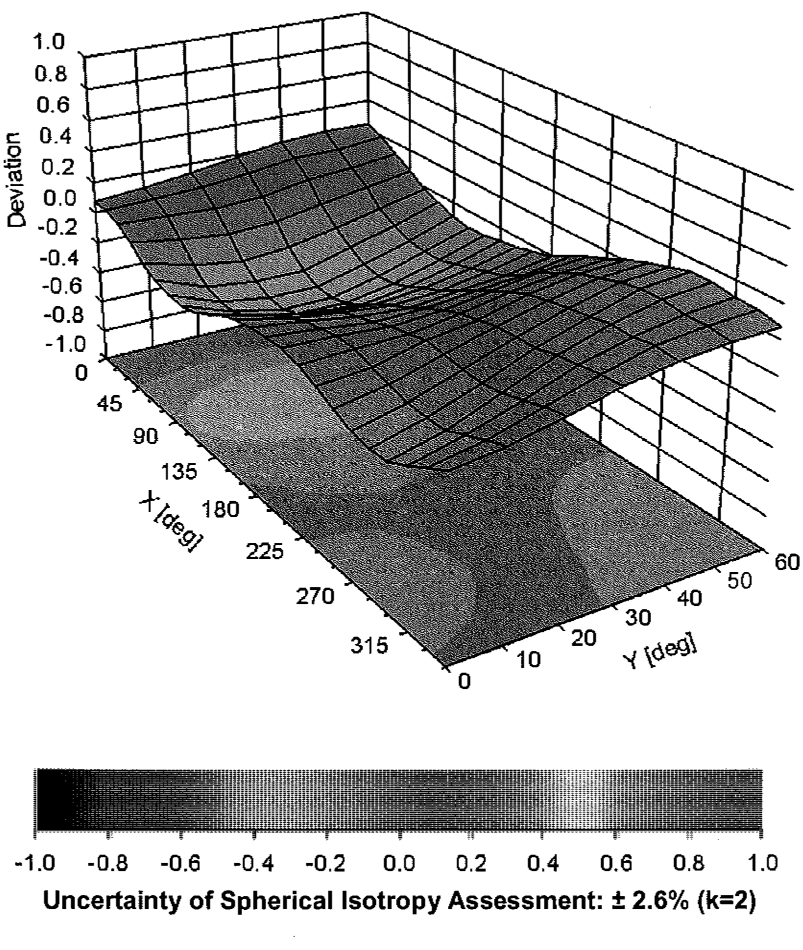
Conversion Factor Assessment





Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

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

Other Probe Parameters

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

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 **Auden**

Certificate No: EX3-3820_Dec11

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3820
Calibration procedure(s)	QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	December 16, 2011

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: December 16, 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., $\vartheta = 0$ 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 $\vartheta = 0$ (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, 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:3820

Manufactured: September 2, 2011
Calibrated: December 16, 2011

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.44	0.34	0.44	± 10.1 %
DCP (mV)[B]	100.1	102.1	98.5	

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	104.9	±2.5 %
			Y	0.00	0.00	1.00	125.4	
			Z	0.00	0.00	1.00	108.9	

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

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

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	9.05	9.05	9.05	0.18	1.29	± 12.0 %
1750	40.1	1.37	8.37	8.37	8.37	0.32	0.88	± 12.0 %
1900	40.0	1.40	8.02	8.02	8.02	0.31	0.91	± 12.0 %
2100	39.8	1.49	8.07	8.07	8.07	0.53	0.69	± 12.0 %
2450	39.2	1.80	7.17	7.17	7.17	0.29	0.99	± 12.0 %
5200	36.0	4.66	5.15	5.15	5.15	0.35	1.80	± 13.1 %
5300	35.9	4.76	4.93	4.93	4.93	0.35	1.80	± 13.1 %
5500	35.6	4.96	4.59	4.59	4.59	0.42	1.80	± 13.1 %
5600	35.5	5.07	4.53	4.53	4.53	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.44	4.44	4.44	0.45	1.80	± 13.1 %

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

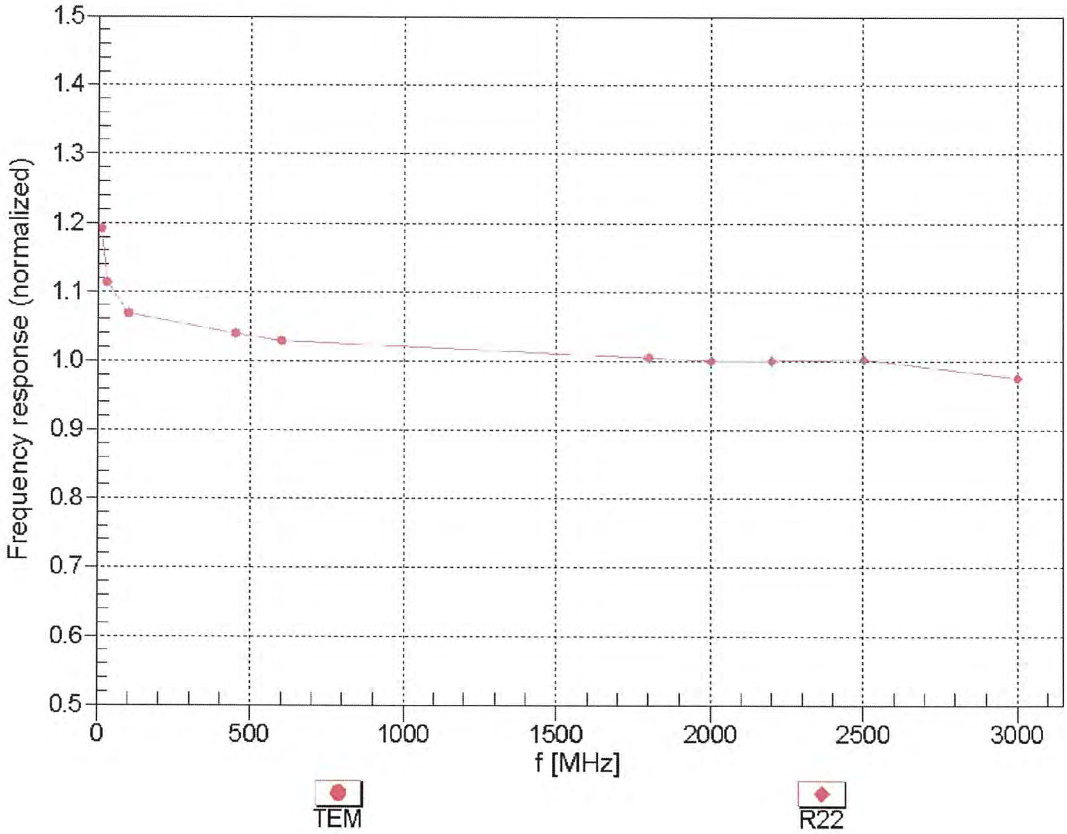
Calibration Parameter Determined in Body Tissue Simulating Media

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	9.24	9.24	9.24	0.36	0.88	± 12.0 %
1750	53.4	1.49	8.44	8.44	8.44	0.14	1.61	± 12.0 %
1900	53.3	1.52	8.04	8.04	8.04	0.13	1.87	± 12.0 %
2100	53.2	1.62	8.09	8.09	8.09	0.80	0.59	± 12.0 %
2450	52.7	1.95	7.34	7.34	7.34	0.79	0.50	± 12.0 %
5200	49.0	5.30	4.19	4.19	4.19	0.52	1.90	± 13.1 %
5300	48.9	5.42	4.00	4.00	4.00	0.52	1.90	± 13.1 %
5500	48.6	5.65	3.70	3.70	3.70	0.55	1.90	± 13.1 %
5600	48.5	5.77	3.43	3.43	3.43	0.60	1.90	± 13.1 %
5800	48.2	6.00	3.82	3.82	3.82	0.60	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.

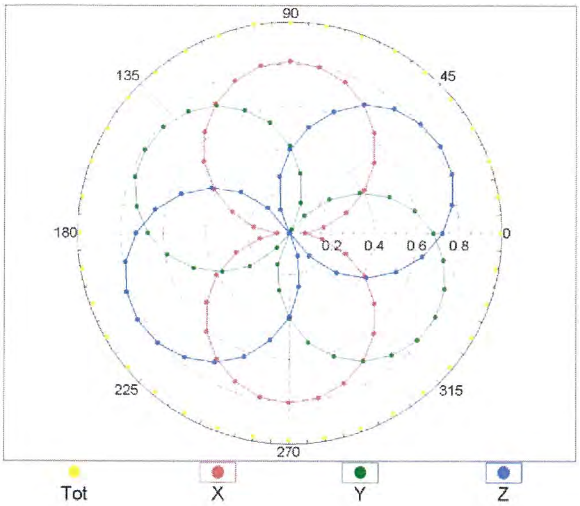
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



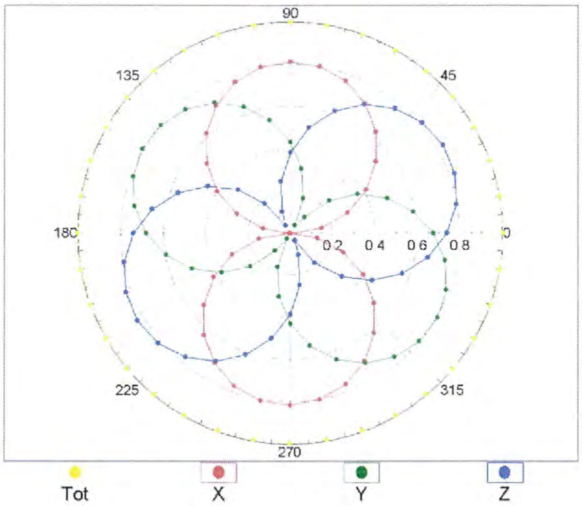
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

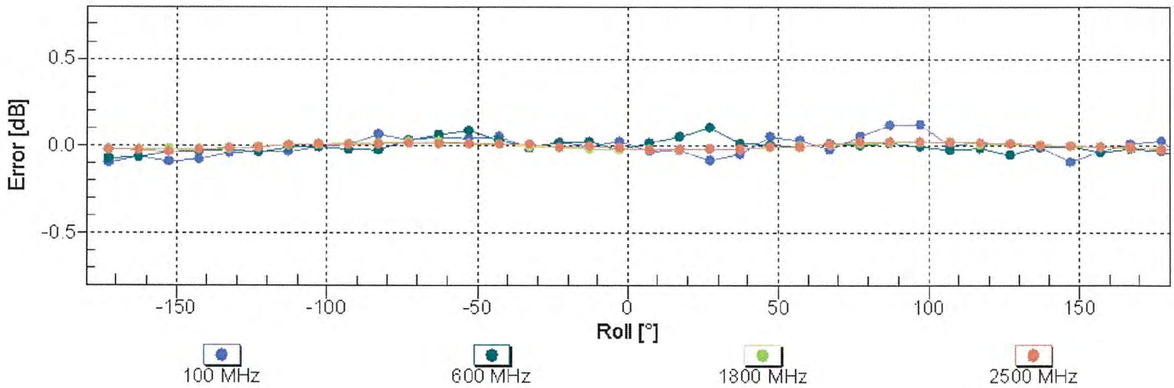
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



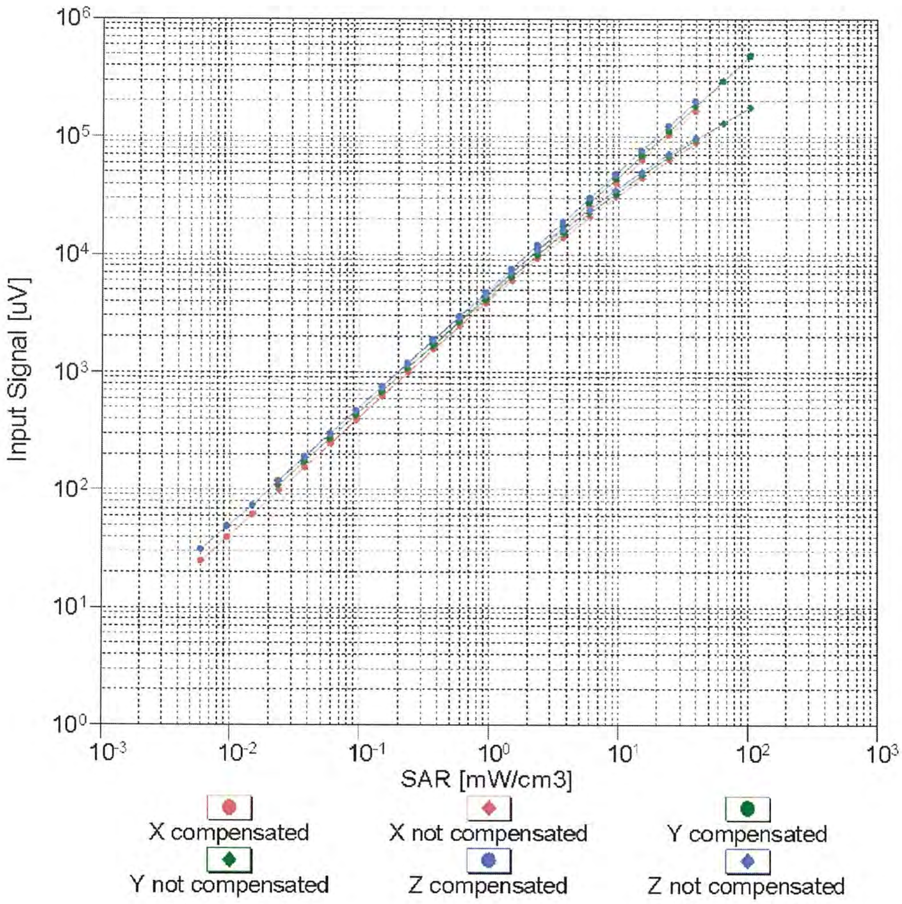
f=1800 MHz,R22

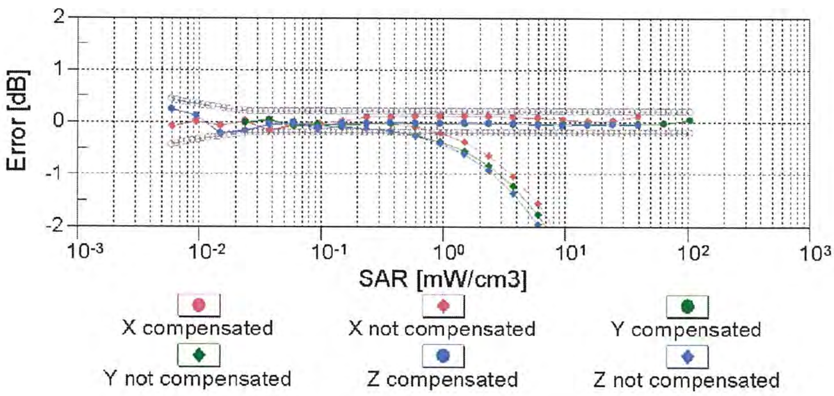




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

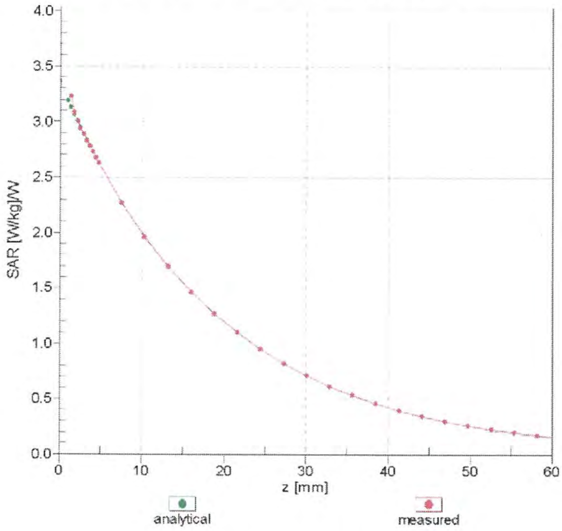




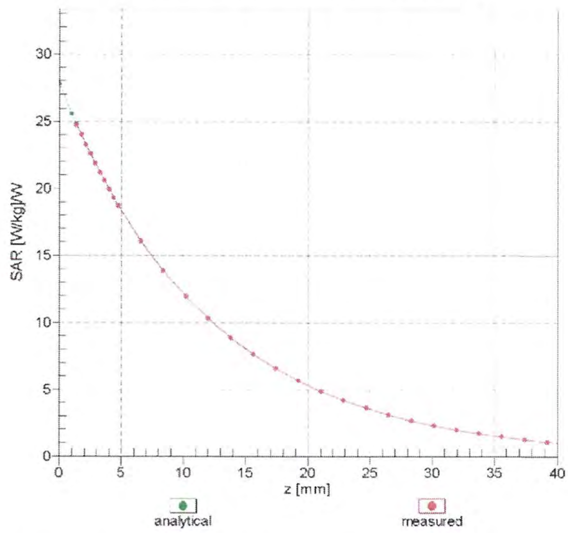
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

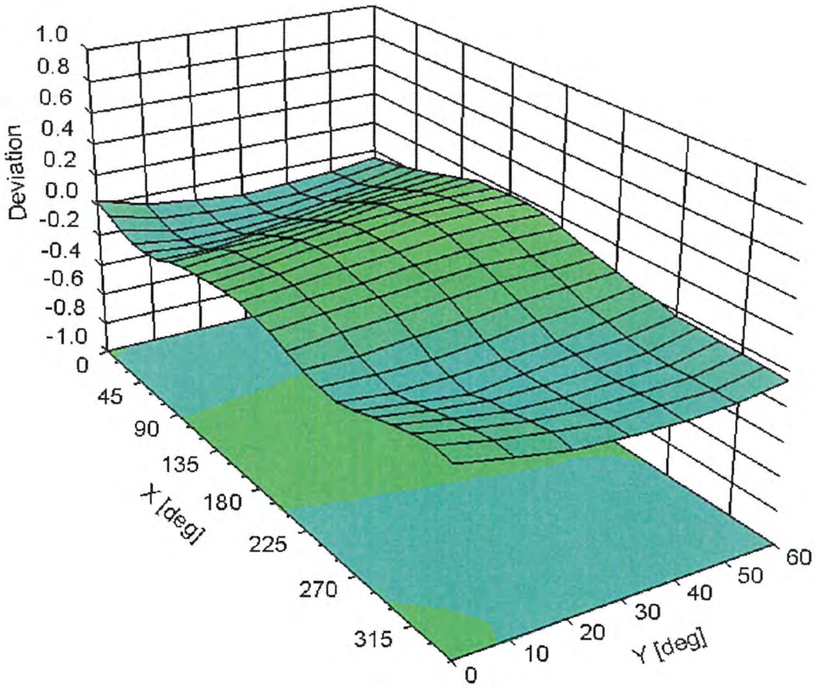


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3820

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

Appendix D. Photographs of EUT and Setup