FCC SAR Test Report

Report No.	:	**SA121023C07A**
Applicant	:	**BandRich Inc.**
Address	:	**6F., No. 71, Zhouzi St., Neihu Dist., Taipei City 11493, Taiwan (R.O.C.)**
Product	:	**LTE/EVDO Mobile Router**
FCC ID	:	**UZI-30P58**
Brand	:	**BandLuxe**
Model No.	:	**P530**
Standards	:	**FCC 47 CFR Part 2 (2.1093) / IEEE C95.1:1992 / IEEE 1528:2003** **FCC OET Bulletin 65 Supplement C (Edition 01-01)** **KDB 248227 D01 v01r02 / KDB 447498 D01 v05r01 / KDB 941225 D01 v02** **KDB 941225 D05 v02r02 / KDB 941225 D06 v01r01**
Date of Testing	:	**Jul. 10, 2013 ~ Jul. 11, 2013**

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.

Prepared By : Evonne Liu

Evonne Liu / Specialist

Approved By : Roy Wu

Roy Wu / Manager

Testing Laboratory
2021

Table of Contents

Release Control Record

Issue No.	Reason for Change	Date Issued
R01	Initial release	Jul. 23, 2013

1. Summary of Maximum SAR Value

Equipment Class	Mode	Highest Reported Body SAR_{1g} (0.5 cm Gap) (W/kg)
PCB	CDMA BC0	0.12
	CDMA BC1	1.13
	CDMA BC15	0.83
	LTE 2	0.72
	LTE 4	0.62
	LTE 5	0.10
	LTE 12	0.69
	LTE 17	0.66
	LTE 25	0.67
DTS	2.4G WLAN	0.90
Highest Simultaneous Transmission SAR		Body (W/kg)
PCB+DTS		1.59

Note:

1. The SAR limit **(Head & Body: SAR_{1g} 1.6 W/kg)** for general population / uncontrolled exposure is specified in FCC 47 CFR part 2 (2.1093) and ANSI/IEEE C95.1-1992.

2. Description of Equipment Under Test

EUT Type	LTE/EVDO Mobile Router
FCC ID	UZI-30P58
Brand Name	BandLuxe
Model Name	P530
HW Version	V01
SW Version	QC_2_00012644_2_001_0032
Tx Frequency Bands (Unit: MHz)	CDMA BC0 : 824.7 ~ 848.31 CDMA BC1 : 1851.25 ~ 1908.75 CDMA BC15 : 1711.25 ~ 1753.75 LTE Band 2 : 1852.5 ~ 1907.5 LTE Band 4 : 1712.5 ~ 1752.5 LTE Band 5 : 826.5 ~ 846.5 LTE Band 12 : 701.5 ~ 713.5 LTE Band 17 : 706.5 ~ 713.5 LTE Band 25 : 1852.5 ~ 1912.5 WLAN : 2412 ~ 2462
Uplink Modulations	CDMA : QPSK LTE : QPSK, 16QAM 802.11b : DSSS 802.11g/n : OFDM
Maximum Tune-up Conducted Power (Unit: dBm)	CDMA BC0 : 25.0 CDMA BC1 : 24.5 CDMA BC15 : 23.5 LTE Band 2 : 22.9 LTE Band 4 : 22.6 LTE Band 5 : 22.6 LTE Band 12 : 22.5 LTE Band 17 : 22.5 LTE Band 25 : 22.8 WLAN 2.4G : 14.1
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**	PHIHONG
	Model Name	PSA05A-050Q
	Power Rating	I/P:100-240Vac, 50-60Hz, 0.2A; O/P: 5Vdc, 1A
	DC Power Cord Type	1 meter shielded cable without ferrite core
Battery	**Model Name**	GT-2200
	Power Rating	3.7Vdc, 8.14WH
	Type	Li-ion

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:

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

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

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

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

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

3.2 SPEAG DASY System

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

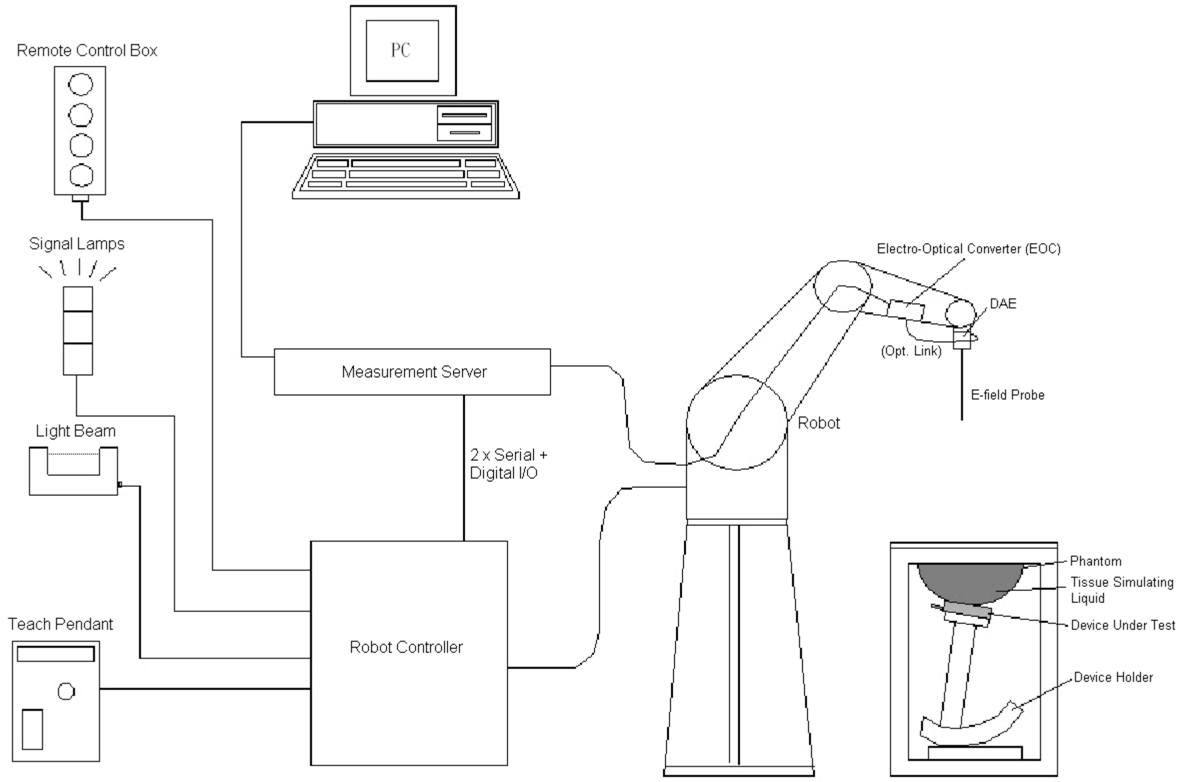


Fig-3.1 DASY System Setup

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.

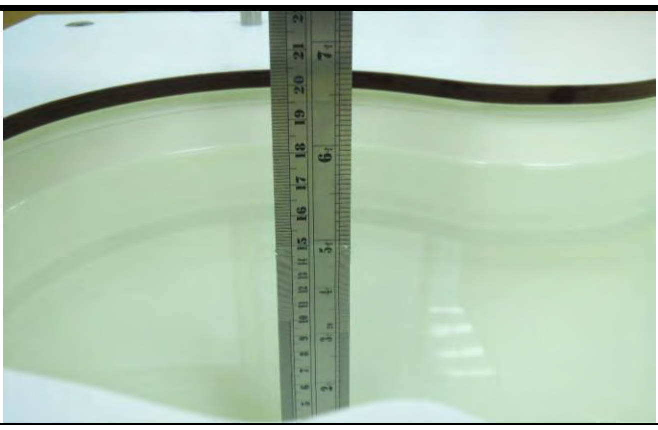
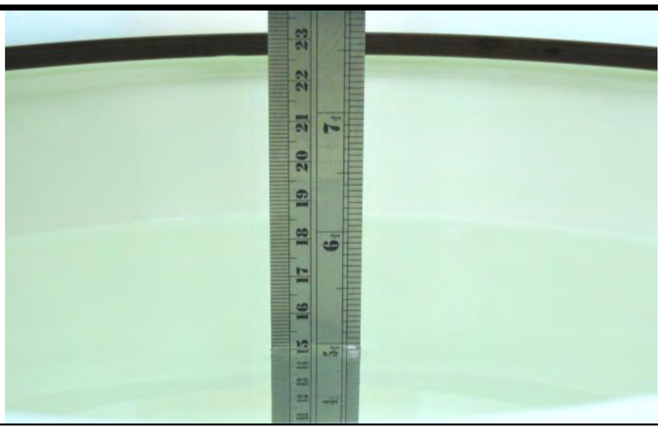



Photo of Liquid Height for Head Position	**Photo of Liquid Height for Body Position**

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				
750	41.9	39.8 ~ 44.0	0.89	0.85 ~ 0.93
835	41.5	39.4 ~ 43.6	0.90	0.86 ~ 0.95
900	41.5	39.4 ~ 43.6	0.97	0.92 ~ 1.02
1450	40.5	38.5 ~ 42.5	1.20	1.14 ~ 1.26
1640	40.3	38.3 ~ 42.3	1.29	1.23 ~ 1.35
1750	40.1	38.1 ~ 42.1	1.37	1.30 ~ 1.44
1800	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
1900	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2000	40.0	38.0 ~ 42.0	1.40	1.33 ~ 1.47
2300	39.5	37.5 ~ 41.5	1.67	1.59 ~ 1.75
2450	39.2	37.2 ~ 41.2	1.80	1.71 ~ 1.89
2600	39.0	37.1 ~ 41.0	1.96	1.86 ~ 2.06
3500	37.9	36.0 ~ 39.8	2.91	2.76 ~ 3.06
5200	36.0	34.2 ~ 37.8	4.66	4.43 ~ 4.89
5300	35.9	34.1 ~ 37.7	4.76	4.52 ~ 5.00
5500	35.6	33.8 ~ 37.4	4.96	4.71 ~ 5.21
5600	35.5	33.7 ~ 37.3	5.07	4.82 ~ 5.32
5800	35.3	33.5 ~ 37.1	5.27	5.01 ~ 5.53
For Body				
750	55.5	52.7 ~ 58.3	0.96	0.91 ~ 1.01
835	55.2	52.4 ~ 58.0	0.97	0.92 ~ 1.02
900	55.0	52.3 ~ 57.8	1.05	1.00 ~ 1.10
1450	54.0	51.3 ~ 56.7	1.30	1.24 ~ 1.37
1640	53.8	51.1 ~ 56.5	1.40	1.33 ~ 1.47
1750	53.4	50.7 ~ 56.1	1.49	1.42 ~ 1.56
1800	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
1900	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
2000	53.3	50.6 ~ 56.0	1.52	1.44 ~ 1.60
2300	52.9	50.3 ~ 55.5	1.81	1.72 ~ 1.90
2450	52.7	50.1 ~ 55.3	1.95	1.85 ~ 2.05
2600	52.5	49.9 ~ 55.1	2.16	2.05 ~ 2.27
3500	51.3	48.7 ~ 53.9	3.31	3.14 ~ 3.48
5200	49.0	46.6 ~ 51.5	5.30	5.04 ~ 5.57
5300	48.9	46.5 ~ 51.3	5.42	5.15 ~ 5.69
5500	48.6	46.2 ~ 51.0	5.65	5.37 ~ 5.93
5600	48.5	46.1 ~ 50.9	5.77	5.48 ~ 6.06
5800	48.2	45.8 ~ 50.6	6.00	5.70 ~ 6.30

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
H750	0.2	-	0.2	1.5	56.0	-	42.1	-
H835	0.2	-	0.2	1.5	57.0	-	41.1	-
H900	0.2	-	0.2	1.4	58.0	-	40.2	-
H1450	-	43.3	-	0.6	-	-	56.1	-
H1640	-	45.8	-	0.5	-	-	53.7	-
H1750	-	47.0	-	0.4	-	-	52.6	-
H1800	-	44.5	-	0.3	-	-	55.2	-
H1900	-	44.5	-	0.2	-	-	55.3	-
H2000	-	44.5	-	0.1	-	-	55.4	-
H2300	-	44.9	-	0.1	-	-	55.0	-
H2450	-	45.0	-	0.1	-	-	54.9	-
H2600	-	45.1	-	0.1	-	-	54.8	-
H3500	-	8.0	-	0.2	-	20.0	71.8	-
H5G	-	-	-	-	-	17.2	65.5	17.3
B750	0.2	-	0.2	0.8	48.8	-	50.0	-
B835	0.2	-	0.2	0.9	48.5	-	50.2	-
B900	0.2	-	0.2	0.9	48.2	-	50.5	-
B1450	-	34.0	-	0.3	-	-	65.7	-
B1640	-	32.5	-	0.3	-	-	67.2	-
B1750	-	31.0	-	0.2	-	-	68.8	-
B1800	-	29.5	-	0.4	-	-	70.1	-
B1900	-	29.5	-	0.3	-	-	70.2	-
B2000	-	30.0	-	0.2	-	-	69.8	-
B2300	-	31.0	-	0.1	-	-	68.9	-
B2450	-	31.4	-	0.1	-	-	68.5	-
B2600	-	31.8	-	0.1	-	-	68.1	-
B3500	-	28.8	-	0.1	-	-	71.1	-
B5G	-	-	-	-	-	10.7	78.6	10.7

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.

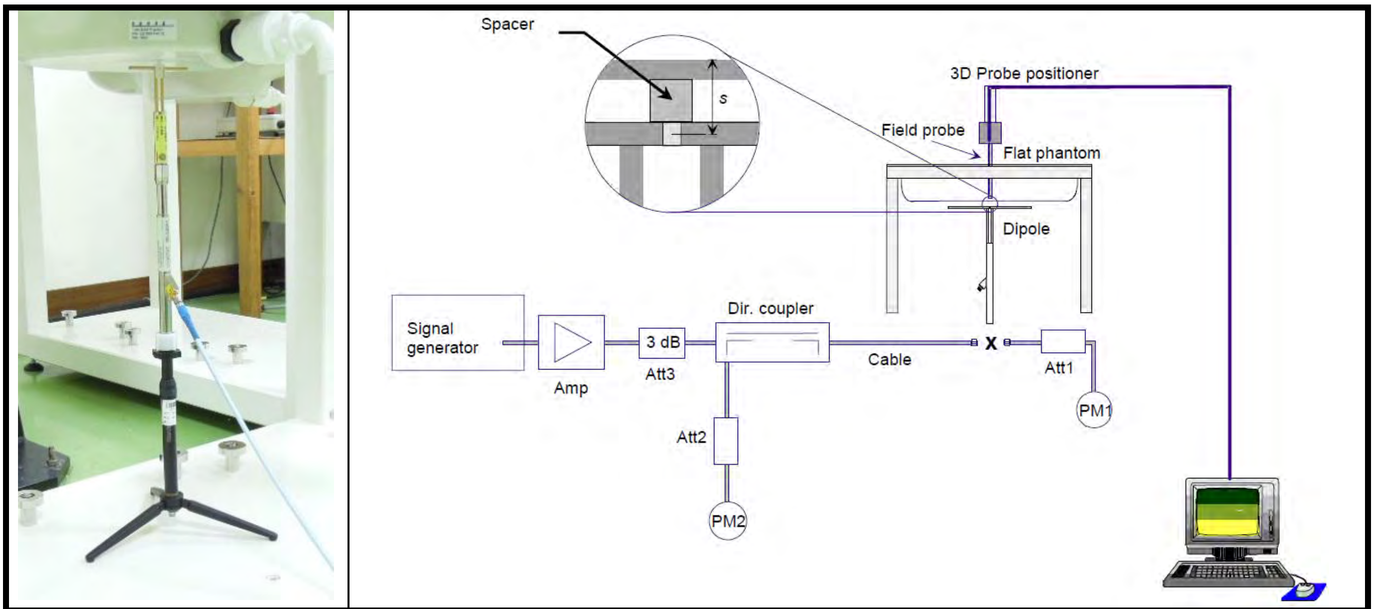


Fig-3.4 System Verification Setup

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 is performed around the highest E-field value to determine the averaged SAR-distribution over 10 g. According to KDB 865664 D01 v01r01, the resolution for Area and Zoom scan is specified in the table below.

Items	<= 2 GHz	2-3 GHz	3-4 GHz	4-5 GHz	5-6 GHz
Area Scan (Δx, Δy)	<= 15 mm	<= 12 mm	<= 12 mm	<= 10 mm	<= 10 mm
Zoom Scan (Δx, Δy)	<= 8 mm	<= 5 mm	<= 5 mm	<= 4 mm	<= 4 mm
Zoom Scan (Δz)	<= 5 mm	<= 5 mm	<= 4 mm	<= 3 mm	<= 2 mm
Zoom Scan Volume	>= 30 mm	>= 30 mm	>= 28 mm	>= 25 mm	>= 22 mm

Note:

When zoom scan is required and report SAR is <= 1.4 W/kg, the zoom scan resolution of Δx / Δy (2-3GHz: <= 8 mm, 3-4GHz: <= 7 mm, 4-6GHz: <= 5 mm) may be applied.

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

The EUT is a data transmitter device that contains one WWAN transmitters (CDMA2000/LTE). Confirming the LTE transmitter follows 3GPP standards, is category 3, BW 5/10/15/20 MHz (LTE Band 2/4/25), BW 5/10 MHz (LTE Band 5/12/17), supports QPSK / 16QAM modulations, and supports data transmission only. Tested per 3GPP 36.521 maximum transmit procedures for both QPSK / 16QAM.

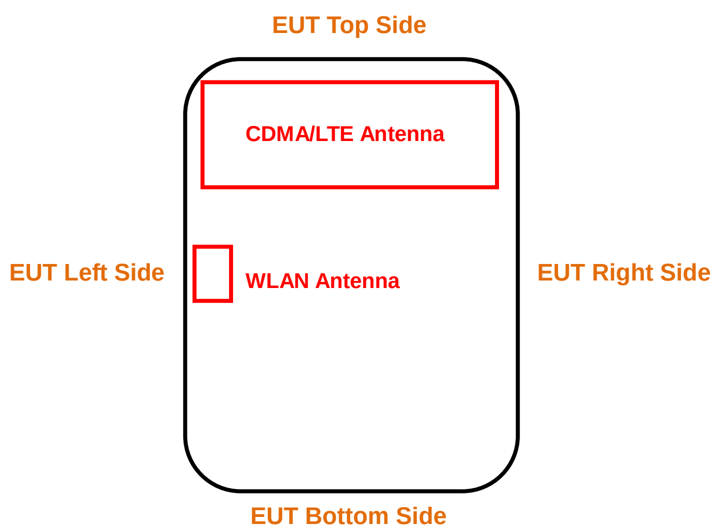
LTE Maximum Power Reduction in accordance with 3GPP 36.101: Power Reduction in accordance to 3GPP is active all times during LTE operation.

Modulation	Channel Bandwidth / RB Configurations				LTE MPR Setting (dB)
	BW 5 MHz	BW 10 MHz	BW 15 MHz	BW 20 MHz	
QPSK	> 8	> 12	> 16	> 18	1
16QAM	<= 8	<= 12	<= 16	<= 18	1
16QAM	> 8	> 12	> 16	> 18	2

Note: MPR is according to the standard and implemented in the circuit (mandatory).

In addition, the device is compliant with A-MPR requirements defined in 36.101 section 6.2.4 that may be required to meet 3GPP Adjacent Channel Leakage Ratio ("ACLR") requirements. A-MPR was disabled for all FCC compliance testing.

<Antenna Location>



<EUT Front View>

The separation distance for antenna to edge:

Antenna	To Top Side (mm)	To Bottom Side (mm)	To Left Side (mm)	To Right Side (mm)
WWAN	3	60	3	3
WLAN	35.9	42.66	4.67	46.9

The simultaneous transmission possibilities are listed as below.

Simultaneous TX Combination	Configuration	Head (Voice / VoIP)	Body Worn (Voice / VoIP)	Hotspot (Data)
1	CDMA2000 BC0 (Data) + WLAN (Data)	No	No	Yes
2	CDMA2000 BC1 (Data) + WLAN (Data)	No	No	Yes
3	CDMA2000 BC15 (Data) + WLAN (Data)	No	No	Yes
4	LTE 2 (Data) + WLAN (Data)	No	No	Yes
5	LTE 4 (Data) + WLAN (Data)	No	No	Yes
6	LTE 5 (Data) + WLAN (Data)	No	No	Yes
7	LTE 12 (Data) + WLAN (Data)	No	No	Yes
8	LTE 17 (Data) + WLAN (Data)	No	No	Yes
9	LTE 25 (Data) + WLAN (Data)	No	No	Yes

For WWAN SAR testing, the EUT was linked and controlled by base station emulator (Agilent E5515C for CDMA, and Anritsu MT8820C for LTE). 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.

For CDMA, SAR is tested under EVDO Rev.0 mode using Reverse Data Channel rate of 153.6 kbps in subtype 0/1 Physical Layer Configurations, and the power control set “All Up Bits”. SAR for EVDO Rev.A is not required since its power is less than EVDO Rev.0. SAR for 1xRTT is not required since its power is less than 1/4 dB higher than EVDO Rev.0. The steps for system simulator (Agilent E5515C) setup are as below.

1. Set the Sector ID
2. Set the Protocol Release
3. Set the Cell Band and connecting Channel
4. Set the RTAP Rate
5. Set the power control
6. Press “Start Data Connection” button

For LTE, set the related parameters of operating band, channel bandwidth, uplink channel number, modulation type, and RB in base station simulator. When the EUT has registered and communicated to base station simulator, set the simulator to make EUT transmitting the maximum radiated power. The steps for system simulator (Anritsu MT8820C) setup are as below.

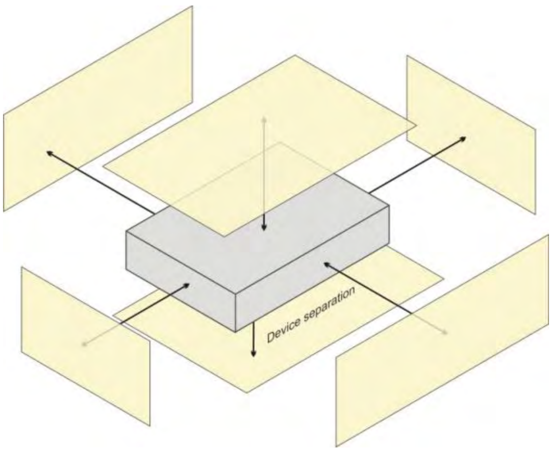
1. Press the “Std” button to select “LTE 22.20S” function
2. Choose the “Screen Select” item to “Fundamental Measurement”
3. Enter the “Common” item
4. Set the Operating Band
5. Set the Channel Bandwidth
6. Set the UL Channel & Frequency
7. Set the Modulation
8. Set the RB number and RB shift
9. Press “Start Call” button when EUT register to the system simulator
10. Set the TX-1 Max. Power to make the EUT transmit maximum output power

For WLAN SAR testing, the EUT has installed WLAN engineering testing software which can provide continuous transmitting RF signal. According to KDB 248227 D01, WLAN SAR should tested at the lowest data rate, and testing at higher data rate is not required when the maximum average output power is less than 1/4 dB higher than those measured at the lowest data rate. Since the WLAN power at lowest data rate has highest output power, WLAN SAR for this device was performed at the lowest data rate as set in 1 Mbps for 802.11b. This RF signal utilized in SAR measurement has almost 100% duty cycle, and the duty factor is 1 during WLAN SAR testing.

4.2 EUT Testing Position

4.2.1 Hotspot Mode Exposure conditions

For handsets that support hotspot mode operations, with wireless router capabilities and various web browsing functions, the relevant hand and body exposure conditions are tested according to the hotspot SAR procedures in KDB 941225 D06. A test separation distance of 10 mm is required between the phantom and all surfaces and edges with a transmitting antenna located within 25 mm from that surface or edge. When the form factor of a handset is smaller than 9 cm x 5 cm, a test separation distance of 5 mm (instead of 10 mm) is required for testing hotspot mode. When the separation distance required for body-worn accessory testing is larger than or equal to that tested for hotspot mode, in the same wireless mode and for the same surface of the phone, the hotspot mode SAR data may be used to support body-worn accessory SAR compliance for that particular configuration (surface).



Based on the antenna location shown on section 4.1 of this report, the SAR testing required for hotspot mode is listed as below.

Antenna	Front Face	Rear Face	Top Side	Bottom Side	Left Side	Right Side
WWAN	V	V	V		V	V
WLAN	V	V			V	

4.3 Tissue Verification

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

Test Date	Tissue Type	Frequency (MHz)	Liquid Temp. (℃)	Measured Conductivity (σ)	Measured Permittivity (ε_r)	Target Conductivity (σ)	Target Permittivity (ε_r)	Conductivity Deviation (%)	Permittivity Deviation (%)
Jul. 11, 2013	Body	750	20.5	0.974	55.974	0.96	55.5	1.46	0.85
Jul. 11, 2013	Body	835	20.5	0.979	55.854	0.97	55.2	0.93	1.18
Jul. 11, 2013	Body	1750	20.5	1.488	52.158	1.49	53.4	-0.13	-2.33
Jul. 10, 2013	Body	1900	20.5	1.543	52.865	1.52	53.3	1.51	-0.82
Jul. 11, 2013	Body	2450	20.5	1.985	51.431	1.95	52.7	1.79	-2.41

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 Validation

The SAR measurement system was validated according to procedures in KDB 865664 D01 v01r01. The validation status in tabulated summary is as below.

Test Date	Probe S/N	Calibration Point		Measured Conductivity (σ)	Measured Permittivity (ε_r)	Validation for CW			Validation for Modulation		
						Sensitivity Range	Probe Linearity	Probe Isotropy	Modulation Type	Duty Factor	PAR
Jul. 11, 2013	3590	Body	750	0.974	55.974	Pass	Pass	Pass	N/A	N/A	N/A
Jul. 11, 2013	3864	Body	835	0.979	55.854	Pass	Pass	Pass	N/A	N/A	N/A
Jul. 11, 2013	3864	Body	1750	1.488	52.158	Pass	Pass	Pass	N/A	N/A	N/A
Jul. 10, 2013	3864	Body	1900	1.543	52.865	Pass	Pass	Pass	N/A	N/A	N/A
Jul. 11, 2013	3650	Body	2450	1.985	51.431	Pass	Pass	Pass	OFDM	N/A	Pass

4.5 System Verification

The measuring result for system verification is tabulated as below.

Test Date	Mode	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
Jul. 11, 2013	Body	750	8.81	2.21	8.84	0.34	1013	3590	861
Jul. 11, 2013	Body	835	9.69	2.48	9.92	2.37	4d121	3864	360
Jul. 11, 2013	Body	1750	37.20	9.39	37.56	0.97	1055	3864	360
Jul. 10, 2013	Body	1900	41.00	9.68	38.72	-5.56	5d036	3864	360
Jul. 11, 2013	Body	2450	49.60	12.3	49.20	-0.81	737	3650	1277

Note:

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

4.6 Maximum Output Power

4.6.1 Maximum Conducted Power

The maximum conducted power (Unit: dBm) including tune-up tolerance is shown as below.

Mode	CDMA BC0	CDMA BC1	CDMA BC15
1xRTT	24.5	23.5	23.5
1xEVDO Rev.0	25.0	24.5	23.5
1xEVDO Rev.A	25.0	24.5	23.5

Mode	LTE 2	LTE 4
QPSK / 16QAM	22.9	22.6

Mode	LTE 5	LTE 12
QPSK / 16QAM	22.6	22.5

Mode	LTE 17	LTE 25
QPSK / 16QAM	22.5	22.8

Mode	2.4G WLAN
802.11b	14.1
802.11g	12.1
802.11n HT20	10.3

4.6.2 Measured Conducted Power Result

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

Band	CDMA BC0			CDMA BC1		
Channel	1013	384	777	25	600	1175
Frequency (MHz)	824.70	836.52	848.31	1851.25	1880.00	1908.75
1xRTT RC1+SO55	24.36	24.21	24.05	22.83	23.07	22.66
1xRTT RC3+SO55	24.35	24.20	24.04	22.84	23.08	22.67
1xRTT RC3+SO32 (FCH)	24.37	24.22	24.06	22.85	23.09	22.68
1xRTT RC3+SO32 (SCH)	24.22	24.07	23.91	22.84	23.08	22.67
1xEVDO Rev.0 RTAP 153.6	**24.79**	24.64	24.48	23.91	**24.15**	23.74
1xEVDO Rev.A RETAP 4096	24.65	24.50	24.34	23.83	24.07	23.66

Band	CDMA BC15		
Channel	25	425	875
Frequency (MHz)	1711.25	1731.25	1753.75
1xRTT RC1+SO55	22.37	22.30	23.24
1xRTT RC3+SO55	22.38	22.31	23.25
1xRTT RC3+SO32 (FCH)	22.34	22.27	23.21
1xRTT RC3+SO32 (SCH)	22.36	22.29	23.23
1xEVDO Rev.0 RTAP 153.6	22.40	22.33	**23.27**
1xEVDO Rev.A RETAP 4096	22.32	22.25	23.19

Band / BW	Modulation	RB Size	RB Offset	Low CH 18625 Frequency 1852.5 MHz	Mid CH 18900 Frequency 1880.0 MHz	High CH 19175 Frequency 1907.5 MHz	3PGG MPR (dB)
2 / 5M	QPSK	1	0	**22.76**	22.63	22.62	0
		1	12	22.76	22.63	22.62	0
		1	24	22.66	22.53	22.52	0
		12	0	21.61	21.48	21.47	1
		12	6	21.61	21.48	21.47	1
		12	13	**21.62**	21.49	21.48	1
		25	0	21.48	21.35	21.34	1
	16QAM	1	0	21.55	21.42	21.41	1
		1	12	**21.73**	21.60	21.59	1
		1	24	21.58	21.45	21.44	1
		12	0	20.60	20.47	20.46	2
		12	6	20.61	20.48	20.47	2
		12	13	**20.63**	20.50	20.49	2
		25	0	20.48	20.35	20.34	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 18650 Frequency 1855.0 MHz	Mid CH 18900 Frequency 1880.0 MHz	High CH 19150 Frequency 1905.0 MHz	3PGG MPR (dB)
2 / 10M	QPSK	1	0	22.76	22.59	22.55	0
		1	24	**22.77**	22.60	22.56	0
		1	49	22.69	22.52	22.48	0
		25	0	**21.58**	21.41	21.37	1
		25	12	21.57	21.40	21.36	1
		25	25	21.55	21.38	21.34	1
		50	0	21.38	21.21	21.17	1
	16QAM	1	0	21.62	21.45	21.41	1
		1	24	**21.74**	21.57	21.53	1
		1	49	21.63	21.46	21.42	1
		25	0	**20.58**	20.41	20.37	2
		25	12	20.55	20.38	20.34	2
		25	25	20.40	20.23	20.19	2
		50	0	20.38	20.21	20.17	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 18675 Frequency 1857.5 MHz	Mid CH 18900 Frequency 1880.0 MHz	High CH 19125 Frequency 1902.5 MHz	3PGG MPR (dB)
2 / 15M	QPSK	1	0	22.70	22.58	22.48	0
		1	37	**22.83**	22.71	22.61	0
		1	74	22.64	22.52	22.42	0
		36	0	**21.43**	21.31	21.21	1
		36	19	21.42	21.30	21.20	1
		36	39	21.40	21.28	21.18	1
		75	0	21.36	21.24	21.14	1
	16QAM	1	0	21.51	21.39	21.29	1
		1	37	**21.76**	21.64	21.54	1
		1	74	21.60	21.48	21.38	1
		36	0	**20.39**	20.27	20.17	2
		36	19	20.24	20.12	20.02	2
		36	39	20.29	20.17	20.07	2
		75	0	20.28	20.16	20.06	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 18700 Frequency 1860.0 MHz	Mid CH 18900 Frequency 1880.0 MHz	High CH 19100 Frequency 1900.0 MHz	3PGG MPR (dB)
2 / 20M	QPSK	1	0	22.77	22.65	22.63	0
		1	50	**22.85**	22.73	22.71	0
		1	99	22.70	22.58	22.56	0
		50	0	**21.51**	21.39	21.37	1
		50	25	21.46	21.34	21.32	1
		50	50	21.45	21.33	21.31	1
		100	0	21.49	21.37	21.35	1
	16QAM	1	0	21.68	21.56	21.54	1
		1	50	**21.79**	21.67	21.65	1
		1	99	21.64	21.52	21.50	1
		50	0	**20.51**	20.39	20.37	2
		50	25	20.46	20.34	20.32	2
		50	50	20.47	20.35	20.33	2
		100	0	20.46	20.34	20.32	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 19975 Frequency 1712.5 MHz	Mid CH 20175 Frequency 1732.5 MHz	High CH 20375 Frequency 1752.5 MHz	3PGG MPR (dB)
4 / 5M	QPSK	1	0	**22.52**	22.23	22.50	0
		1	12	22.36	22.07	22.34	0
		1	24	22.36	22.07	22.34	0
		12	0	**21.31**	21.02	21.29	1
		12	6	21.20	20.91	21.18	1
		12	13	21.15	20.86	21.13	1
		25	0	21.12	20.83	21.10	1
	16QAM	1	0	21.48	21.19	21.46	1
		1	12	**21.51**	21.22	21.49	1
		1	24	21.39	21.10	21.37	1
		12	0	**20.52**	20.23	20.50	2
		12	6	20.40	20.11	20.38	2
		12	13	20.34	20.05	20.32	2
		25	0	20.35	20.06	20.33	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 20000 Frequency 1715.0 MHz	Mid CH 20175 Frequency 1732.5 MHz	High CH 20350 Frequency 1750.0 MHz	3PGG MPR (dB)
4 / 10M	QPSK	1	0	22.28	22.02	22.43	0
		1	24	22.39	22.13	**22.54**	0
		1	49	22.17	21.91	22.32	0
		25	0	21.14	20.88	21.29	1
		25	12	21.17	20.91	**21.32**	1
		25	25	21.08	20.82	21.23	1
		50	0	21.03	20.77	21.18	1
	16QAM	1	0	21.14	20.88	21.29	1
		1	24	21.38	21.12	**21.53**	1
		1	49	21.10	20.84	21.25	1
		25	0	20.11	19.85	**20.26**	2
		25	12	20.06	19.80	20.21	2
		25	25	19.98	19.72	20.13	2
		50	0	19.92	19.66	20.07	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 20025 Frequency 1717.5 MHz	Mid CH 20175 Frequency 1732.5 MHz	High CH 20325 Frequency 1747.5 MHz	3PGG MPR (dB)
4 / 15M	QPSK	1	0	**22.57**	22.18	22.50	0
		1	37	22.30	21.91	22.23	0
		1	74	22.01	21.62	21.94	0
		36	0	**21.19**	20.80	21.12	1
		36	19	21.06	20.67	20.99	1
		36	39	21.00	20.61	20.93	1
		75	0	21.05	20.66	20.98	1
	16QAM	1	0	**21.55**	21.03	21.37	1
		1	37	21.48	20.96	21.30	1
		1	74	21.47	20.95	21.29	1
		36	0	**20.49**	19.97	20.31	2
		36	19	20.32	19.80	20.14	2
		36	39	20.20	19.68	20.02	2
		75	0	20.28	19.76	20.10	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 20050 Frequency 1720.0 MHz	Mid CH 20175 Frequency 1732.5 MHz	High CH 20300 Frequency 1745.0 MHz	3PGG MPR (dB)
4 / 20M	QPSK	1	0	**22.60**	22.45	22.41	0
		1	50	22.46	22.31	22.27	0
		1	99	22.27	22.12	22.08	0
		50	0	**21.16**	21.01	20.97	1
		50	25	21.00	20.85	20.81	1
		50	50	20.88	20.73	20.69	1
		100	0	21.08	20.93	20.89	1
	16QAM	1	0	**21.58**	21.43	21.39	1
		1	50	21.53	21.38	21.34	1
		1	99	21.32	21.17	21.13	1
		50	0	**20.22**	20.07	20.03	2
		50	25	19.91	19.76	19.72	2
		50	50	19.83	19.68	19.64	2
		100	0	19.96	19.81	19.77	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 20425 Frequency 826.5 MHz	Mid CH 20525 Frequency 836.5 MHz	High CH 20625 Frequency 846.5 MHz	3PGG MPR (dB)
5 / 5M	QPSK	1	0	22.35	22.14	22.20	0
		1	12	**22.50**	22.12	22.33	0
		1	24	22.14	22.06	22.09	0
		12	0	21.30	21.02	21.17	1
		12	6	**21.33**	21.02	21.20	1
		12	13	21.16	21.11	21.13	1
		25	0	21.32	21.03	21.22	1
	16QAM	1	0	21.35	21.14	21.20	1
		1	12	**21.50**	21.12	21.33	1
		1	24	21.14	21.06	21.09	1
		12	0	20.30	20.02	20.17	2
		12	6	**20.33**	20.02	20.20	2
		12	13	20.16	20.11	20.13	2
		25	0	20.32	20.03	20.22	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 20450 Frequency 829.0 MHz	Mid CH 20525 Frequency 836.5 MHz	High CH 20600 Frequency 844.0 MHz	3PGG MPR (dB)
5 / 10M	QPSK	1	0	22.37	22.16	22.22	0
		1	24	**22.52**	22.14	22.35	0
		1	49	22.16	22.08	22.11	0
		25	0	21.32	21.04	21.19	1
		25	12	**21.35**	21.04	21.22	1
		25	25	21.18	21.13	21.15	1
		50	0	21.31	21.02	21.21	1
	16QAM	1	0	21.37	21.16	21.22	1
		1	24	**21.52**	21.14	21.35	1
		1	49	21.16	21.08	21.11	1
		25	0	20.32	20.04	20.19	2
		25	12	**20.35**	20.04	20.22	2
		25	25	20.18	20.13	20.15	2
		50	0	20.31	20.02	20.21	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 23035 Frequency 701.5 MHz	Mid CH 23095 Frequency 707.5 MHz	High CH 23155 Frequency 713.5 MHz	3PGG MPR (dB)
12 / 5M	QPSK	1	0	22.44	**22.47**	22.39	0
		1	12	22.43	22.46	22.38	0
		1	24	22.37	22.40	22.32	0
		12	0	21.16	21.19	21.11	1
		12	6	21.21	**21.24**	21.16	1
		12	13	21.18	21.21	21.13	1
		25	0	20.93	20.96	20.88	1
	16QAM	1	0	21.10	21.13	21.05	1
		1	12	21.20	**21.23**	21.15	1
		1	24	21.10	21.13	21.05	1
		12	0	20.17	**20.20**	20.12	2
		12	6	20.08	20.11	20.03	2
		12	13	20.06	20.09	20.01	2
		25	0	19.90	19.93	19.85	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 23060 Frequency 704.0 MHz	Mid CH 23095 Frequency 707.5 MHz	High CH 23130 Frequency 711.0 MHz	3PGG MPR (dB)
12 / 10M	QPSK	1	0	22.36	22.15	22.28	0
		1	24	**22.50**	22.29	22.42	0
		1	49	22.32	22.11	22.24	0
		25	0	**20.95**	20.74	20.87	1
		25	12	20.93	20.72	20.85	1
		25	25	20.87	20.66	20.79	1
		50	0	20.72	20.51	20.64	1
	16QAM	1	0	21.11	20.90	21.03	1
		1	24	**21.28**	21.07	21.20	1
		1	49	21.06	20.85	20.98	1
		25	0	19.87	19.66	19.79	2
		25	12	**19.96**	19.75	19.88	2
		25	25	19.90	19.69	19.82	2
		50	0	19.75	19.54	19.67	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 23755 Frequency 706.5 MHz	Mid CH 23790 Frequency 710.0 MHz	High CH 23825 Frequency 713.5 MHz	3PGG MPR (dB)
17 / 5M	QPSK	1	0	**22.42**	22.00	22.20	0
		1	12	22.26	21.84	22.04	0
		1	24	22.15	21.73	21.93	0
		12	0	20.98	20.56	20.76	1
		12	6	**21.01**	20.59	20.79	1
		12	13	20.98	20.56	20.76	1
		25	0	20.98	20.56	20.76	1
	16QAM	1	0	21.38	20.96	20.74	1
		1	12	**21.44**	21.02	20.80	1
		1	24	21.29	20.87	20.65	1
		12	0	**20.26**	19.84	19.62	2
		12	6	20.21	19.79	19.57	2
		12	13	20.18	19.76	19.54	2
		25	0	20.08	19.66	19.54	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 23780 Frequency 709.0 MHz	Mid CH 23790 Frequency 710.0 MHz	High CH 23800 Frequency 711.0 MHz	3PGG MPR (dB)
17 / 10M	QPSK	1	0	**22.50**	22.37	22.29	0
		1	24	22.32	22.24	22.11	0
		1	49	22.35	22.11	22.14	0
		25	0	20.97	**21.47**	20.76	1
		25	12	20.96	21.36	20.75	1
		25	25	20.98	21.23	20.77	1
		50	0	20.77	21.10	20.56	1
	16QAM	1	0	21.06	**21.46**	20.85	1
		1	24	21.24	21.33	21.03	1
		1	49	21.13	21.20	20.92	1
		25	0	**20.37**	20.24	20.16	2
		25	12	20.25	20.12	20.04	2
		25	25	20.26	20.13	20.05	2
		50	0	20.05	19.92	19.84	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 26065 Frequency 1852.5 MHz	Mid CH 26365 Frequency 1882.5 MHz	High CH 26665 Frequency 1912.5 MHz	3PGG MPR (dB)
25 / 5M	QPSK	1	0	**22.73**	22.61	22.37	0
		1	12	22.66	22.54	22.30	0
		1	24	22.45	22.33	22.09	0
		12	0	**21.48**	21.36	21.12	1
		12	6	21.47	21.35	21.11	1
		12	13	21.40	21.28	21.04	1
		25	0	21.31	21.19	20.95	1
	16QAM	1	0	**21.55**	21.43	21.19	1
		1	12	21.50	21.38	21.14	1
		1	24	21.37	21.25	21.01	1
		12	0	20.51	20.39	20.15	2
		12	6	**20.54**	20.42	20.18	2
		12	13	20.44	20.32	20.08	2
		25	0	20.31	20.19	19.95	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 26090 Frequency 1855.0 MHz	Mid CH 26365 Frequency 1882.5 MHz	High CH 26640 Frequency 1910.0 MHz	3PGG MPR (dB)
25 / 10M	QPSK	1	0	**22.75**	22.57	22.50	0
		1	24	22.69	22.51	22.44	0
		1	49	22.60	22.42	22.35	0
		25	0	21.41	21.23	21.16	1
		25	12	**21.44**	21.26	21.19	1
		25	25	21.38	21.20	21.13	1
		50	0	21.30	21.12	21.05	1
	16QAM	1	0	**21.59**	21.41	21.34	1
		1	24	21.49	21.31	21.24	1
		1	49	21.41	21.23	21.16	1
		25	0	20.38	20.20	20.13	2
		25	12	**20.42**	20.24	20.17	2
		25	25	20.40	20.22	20.15	2
		50	0	20.32	20.14	20.07	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 26115 Frequency 1857.5 MHz	Mid CH 26365 Frequency 1882.5 MHz	High CH 26615 Frequency 1907.5 MHz	3PGG MPR (dB)
25 / 15M	QPSK	1	0	**22.76**	22.60	22.45	0
		1	37	22.76	22.60	22.45	0
		1	74	22.72	22.56	22.41	0
		36	0	21.48	21.32	21.17	1
		36	19	**21.56**	21.40	21.25	1
		36	39	21.44	21.28	21.13	1
		75	0	21.33	21.17	21.02	1
	16QAM	1	0	21.58	21.42	21.27	1
		1	37	**21.62**	21.46	21.31	1
		1	74	21.45	21.29	21.14	1
		36	0	20.41	20.25	20.10	2
		36	19	20.38	20.22	20.07	2
		36	39	**20.44**	20.28	20.13	2
		75	0	20.37	20.21	20.06	2

Band / BW	Modulation	RB Size	RB Offset	Low CH 26140 Frequency 1860.0 MHz	Mid CH 26365 Frequency 1882.5 MHz	High CH 26590 Frequency 1905.0 MHz	3PGG MPR (dB)
25 / 20M	QPSK	1	0	22.72	22.67	22.63	0
		1	50	**22.79**	22.74	22.70	0
		1	99	22.64	22.59	22.55	0
		50	0	21.47	21.42	21.38	1
		50	25	21.47	21.42	21.38	1
		50	50	**21.51**	21.46	21.42	1
		100	0	21.53	21.48	21.44	1
	16QAM	1	0	21.61	21.56	21.52	1
		1	50	**21.74**	21.69	21.65	1
		1	99	21.62	21.57	21.53	1
		50	0	**20.48**	20.43	20.39	2
		50	25	20.47	20.42	20.38	2
		50	50	20.46	20.41	20.37	2
		100	0	20.44	20.39	20.35	2

<WLAN 2.4G>

Mode	802.11b		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	13.97	13.96	**14.09**
Mode	802.11g		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	11.94	11.93	**12.01**
Mode	802.11n (HT20)		
Channel / Frequency (MHz)	1 (2412)	6 (2437)	11 (2462)
Average Power	10.20	**10.22**	10.04

4.7 SAR Testing Results

4.7.1 SAR Results for Body (Separation Distance is 0.5 cm Gap)

Plot No.	Band	Mode	Test Position	Ch.	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
01	CDMA BC0	RTAP 153.6	Front Face	1013	25.0	24.79	1.05	-0.02	0.112	**0.12**
	CDMA BC0	RTAP 153.6	Rear Face	1013	25.0	24.79	1.05	-0.01	0.056	0.06
	CDMA BC0	RTAP 153.6	Left Side	1013	25.0	24.79	1.05	-0.16	0.027	0.03
	CDMA BC0	RTAP 153.6	Right Side	1013	25.0	24.79	1.05	0.15	0.034	0.04
	CDMA BC0	RTAP 153.6	Top Side	1013	25.0	24.79	1.05	-0.17	0.031	0.03
	CDMA BC1	RTAP 153.6	Front Face	600	24.5	24.15	1.08	0.07	0.415	0.45
	CDMA BC1	RTAP 153.6	Rear Face	600	24.5	24.15	1.08	0.01	0.93	1.01
	CDMA BC1	RTAP 153.6	Left Side	600	24.5	24.15	1.08	0.05	0.304	0.33
	CDMA BC1	RTAP 153.6	Right Side	600	24.5	24.15	1.08	-0.01	0.307	0.33
	CDMA BC1	RTAP 153.6	Top Side	600	24.5	24.15	1.08	0.15	0.125	0.14
02	CDMA BC1	RTAP 153.6	Rear Face	25	24.5	23.91	1.15	0.00	0.985	**1.13**
	CDMA BC1	RTAP 153.6	Rear Face	1175	24.5	23.74	1.19	-0.09	0.711	0.85
	CDMA BC1	RTAP 153.6	Rear Face	25	24.5	23.91	1.15	0.03	0.956	1.10
	CDMA BC15	RTAP 153.6	Front Face	875	23.5	23.27	1.05	0.03	0.453	0.48
03	CDMA BC15	RTAP 153.6	Rear Face	875	23.5	23.27	1.05	-0.03	0.783	**0.83**
	CDMA BC15	RTAP 153.6	Left Side	875	23.5	23.27	1.05	0.00	0.348	0.37
	CDMA BC15	RTAP 153.6	Right Side	875	23.5	23.27	1.05	-0.01	0.246	0.26
	CDMA BC15	RTAP 153.6	Top Side	875	23.5	23.27	1.05	0.12	0.099	0.10
	CDMA BC15	RTAP 153.6	Rear Face	25	23.5	22.40	1.29	-0.02	0.512	0.66
	CDMA BC15	RTAP 153.6	Rear Face	425	23.5	22.33	1.31	-0.10	0.535	0.70
	802.11b	-	Front Face	11	14.1	14.09	1.00	0.05	0.839	0.84
	802.11b	-	Rear Face	11	14.1	14.09	1.00	0.01	0.338	0.34
	802.11b	-	Left Side	11	14.1	14.09	1.00	-0.08	0.668	0.67
10	802.11b	-	Front Face	1	14.1	13.97	1.03	0.05	0.869	**0.90**
	802.11b	-	Front Face	6	14.1	13.96	1.03	0.04	0.808	0.83
	802.11b	-	Front Face	1	14.1	13.97	1.03	-0.01	0.842	0.87

Note:

1. SAR is performed on the highest power channel. When the reported SAR value of highest power channel is <= 0.8 W/kg, SAR testing for optional channel is not required.
2. According to KDB 248227, when the extrapolated maximum peak SAR for the maximum output power channel is <= 1.6 W/kg and the 1g averaged SAR is <= 0.8 W/kg, WLAN SAR testing for other channels is not required.
3. SAR testing for 802.11g/n is not required when its maximum power is less than 1/4 dB higher than 802.11b.

Plot No.	Band	Mode	Test Position	Ch.	RB#	RB Offset	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
	LTE 2	QPSK_20M	Front Face	18700	1	50	22.9	22.85	1.01	-0.15	0.527	0.53
04	LTE 2	QPSK_20M	Rear Face	18700	1	50	22.9	22.85	1.01	-0.07	0.713	**0.72**
	LTE 2	QPSK_20M	Left Side	18700	1	50	22.9	22.85	1.01	-0.13	0.282	0.29
	LTE 2	QPSK_20M	Right Side	18700	1	50	22.9	22.85	1.01	-0.18	0.292	0.30
	LTE 2	QPSK_20M	Top Side	18700	1	50	22.9	22.85	1.01	0.14	0.104	0.11
	LTE 2	QPSK_20M	Front Face	18700	50	0	21.9	21.51	1.09	-0.02	0.401	0.44
	LTE 2	QPSK_20M	Rear Face	18700	50	0	21.9	21.51	1.09	0.00	0.564	0.62
	LTE 2	QPSK_20M	Left Side	18700	50	0	21.9	21.51	1.09	0.06	0.223	0.24
	LTE 2	QPSK_20M	Right Side	18700	50	0	21.9	21.51	1.09	0.07	0.238	0.26
	LTE 2	QPSK_20M	Top Side	18700	50	0	21.9	21.51	1.09	0.11	0.084	0.09
	LTE 4	QPSK_20M	Front Face	20050	1	0	22.6	22.60	1.00	0.03	0.5	0.50
05	LTE 4	QPSK_20M	Rear Face	20050	1	0	22.6	22.60	1.00	-0.19	0.622	**0.62**
	LTE 4	QPSK_20M	Left Side	20050	1	0	22.6	22.60	1.00	-0.03	0.321	0.32
	LTE 4	QPSK_20M	Right Side	20050	1	0	22.6	22.60	1.00	-0.03	0.194	0.19
	LTE 4	QPSK_20M	Top Side	20050	1	0	22.6	22.60	1.00	-0.02	0.098	0.10
	LTE 4	QPSK_20M	Front Face	20050	50	0	21.6	21.16	1.11	0.17	0.342	0.38
	LTE 4	QPSK_20M	Rear Face	20050	50	0	21.6	21.16	1.11	-0.10	0.436	0.48
	LTE 4	QPSK_20M	Left Side	20050	50	0	21.6	21.16	1.11	0.06	0.187	0.21
	LTE 4	QPSK_20M	Right Side	20050	50	0	21.6	21.16	1.11	0.17	0.138	0.15
	LTE 4	QPSK_20M	Top Side	20050	50	0	21.6	21.16	1.11	0.05	0.069	0.08
06	LTE 5	QPSK_10M	Front Face	20450	1	24	22.6	22.52	1.02	-0.14	0.101	**0.10**
	LTE 5	QPSK_10M	Rear Face	20450	1	24	22.6	22.52	1.02	0.01	0.049	0.05
	LTE 5	QPSK_10M	Left Side	20450	1	24	22.6	22.52	1.02	0.00	0.026	0.03
	LTE 5	QPSK_10M	Right Side	20450	1	24	22.6	22.52	1.02	-0.05	0.035	0.04
	LTE 5	QPSK_10M	Top Side	20450	1	24	22.6	22.52	1.02	-0.18	0.031	0.03
	LTE 5	QPSK_10M	Front Face	20450	25	12	21.6	21.35	1.06	-0.05	0.074	0.08
	LTE 5	QPSK_10M	Rear Face	20450	25	12	21.6	21.35	1.06	-0.04	0.036	0.04
	LTE 5	QPSK_10M	Left Side	20450	25	12	21.6	21.35	1.06	0.10	0.019	0.02
	LTE 5	QPSK_10M	Right Side	20450	25	12	21.6	21.35	1.06	0.12	0.025	0.03
	LTE 5	QPSK_10M	Top Side	20450	25	12	21.6	21.35	1.06	-0.15	0.022	0.02

Note:

1. According to KDB 941225, LTE SAR testing for remaining RB offset configurations and required test channels is not required when the reported SAR of highest power 1RB configuration is less than 0.8 W/kg.
2. According to KDB 941225, LTE SAR testing for remaining RB offset configurations and required test channels is not required when the reported SAR of highest power 50% RB configuration is less than 0.8 W/kg.
3. According to KDB 941225, LTE SAR testing for 100% RB is not required when the maximum power of 100% RB is less than the maximum power of 1RB and 50% RB, and the highest reported SAR for 1RB and 50% RB is less than 0.8 W/kg.
4. According to KDB 941225, LTE SAR testing for 16QAM is not required when the maximum power of 16QAM is less 1/2 dB higher than QPSK, and the highest reported SAR of QPSK is less than 1.45 W/kg.
5. According to KDB 941225, LTE SAR testing for smaller channel bandwidth is not required when the maximum power of smaller channel bandwidth is less 1/2 dB higher than largest channel bandwidth, and the highest reported SAR of largest channel bandwidth is less than 1.45 W/kg.

Plot No.	Band	Mode	Test Position	Ch.	RB#	RB Offset	Max. Tune-up Power (dBm)	Measured Conducted Power (dBm)	Scaling Factor	Power Drift (dB)	Measured SAR-1g (W/kg)	Scaled SAR-1g (W/kg)
07	LTE 12	QPSK_10M	Front Face	23060	1	24	22.5	22.50	1.00	-0.10	0.689	0.69
	LTE 12	QPSK_10M	Rear Face	23060	1	24	22.5	22.50	1.00	-0.04	0.242	0.24
	LTE 12	QPSK_10M	Left Side	23060	1	24	22.5	22.50	1.00	-0.08	0.147	0.15
	LTE 12	QPSK_10M	Right Side	23060	1	24	22.5	22.50	1.00	-0.14	0.43	0.43
	LTE 12	QPSK_10M	Top Side	23060	1	24	22.5	22.50	1.00	-0.12	0.086	0.09
	LTE 12	QPSK_10M	Front Face	23060	25	0	21.5	20.95	1.14	-0.05	0.511	0.58
	LTE 12	QPSK_10M	Rear Face	23060	25	0	21.5	20.95	1.14	-0.01	0.181	0.21
	LTE 12	QPSK_10M	Left Side	23060	25	0	21.5	20.95	1.14	-0.06	0.079	0.09
	LTE 12	QPSK_10M	Right Side	23060	25	0	21.5	20.95	1.14	-0.19	0.296	0.34
	LTE 12	QPSK_10M	Top Side	23060	25	0	21.5	20.95	1.14	-0.17	0.068	0.08
08	LTE 17	QPSK_10M	Front Face	23780	1	0	22.5	22.50	1.00	-0.07	0.662	0.66
	LTE 17	QPSK_10M	Rear Face	23780	1	0	22.5	22.50	1.00	0.04	0.216	0.22
	LTE 17	QPSK_10M	Left Side	23780	1	0	22.5	22.50	1.00	0.08	0.108	0.11
	LTE 17	QPSK_10M	Right Side	23780	1	0	22.5	22.50	1.00	-0.05	0.396	0.40
	LTE 17	QPSK_10M	Top Side	23780	1	0	22.5	22.50	1.00	-0.07	0.083	0.08
	LTE 17	QPSK_10M	Front Face	23790	25	0	21.5	21.47	1.01	-0.06	0.465	0.47
	LTE 17	QPSK_10M	Rear Face	23790	25	0	21.5	21.47	1.01	0.01	0.146	0.15
	LTE 17	QPSK_10M	Left Side	23790	25	0	21.5	21.47	1.01	0.06	0.072	0.07
	LTE 17	QPSK_10M	Right Side	23790	25	0	21.5	21.47	1.01	-0.06	0.286	0.29
	LTE 17	QPSK_10M	Top Side	23790	25	0	21.5	21.47	1.01	0.04	0.053	0.05
	LTE 25	QPSK_20M	Front Face	26140	1	50	22.8	22.79	1.00	0.02	0.535	0.54
09	LTE 25	QPSK_20M	Rear Face	26140	1	50	22.8	22.79	1.00	-0.04	0.673	0.67
	LTE 25	QPSK_20M	Left Side	26140	1	50	22.8	22.79	1.00	-0.07	0.279	0.28
	LTE 25	QPSK_20M	Right Side	26140	1	50	22.8	22.79	1.00	-0.04	0.289	0.29
	LTE 25	QPSK_20M	Top Side	26140	1	50	22.8	22.79	1.00	0.12	0.108	0.11
	LTE 25	QPSK_20M	Front Face	26140	50	50	21.8	21.51	1.07	-0.06	0.38	0.41
	LTE 25	QPSK_20M	Rear Face	26140	50	50	21.8	21.51	1.07	0.01	0.5	0.53
	LTE 25	QPSK_20M	Left Side	26140	50	50	21.8	21.51	1.07	0.04	0.198	0.21
	LTE 25	QPSK_20M	Right Side	26140	50	50	21.8	21.51	1.07	-0.16	0.22	0.24
	LTE 25	QPSK_20M	Top Side	26140	50	50	21.8	21.51	1.07	0.01	0.079	0.08

Note:

1. According to KDB 941225, LTE SAR testing for remaining RB offset configurations and required test channels is not required when the reported SAR of highest power 1RB configuration is less than 0.8 W/kg.
2. According to KDB 941225, LTE SAR testing for remaining RB offset configurations and required test channels is not required when the reported SAR of highest power 50% RB configuration is less than 0.8 W/kg.
3. According to KDB 941225, LTE SAR testing for 100% RB is not required when the maximum power of 100% RB is less than the maximum power of 1RB and 50% RB, and the highest reported SAR for 1RB and 50% RB is less than 0.8 W/kg.
4. According to KDB 941225, LTE SAR testing for 16QAM is not required when the maximum power of 16QAM is less 1/2 dB higher than QPSK, and the highest reported SAR of QPSK is less than 1.45 W/kg.
5. According to KDB 941225, LTE SAR testing for smaller channel bandwidth is not required when the maximum power of smaller channel bandwidth is less 1/2 dB higher than largest channel bandwidth, and the highest reported SAR of largest channel bandwidth is less than 1.45 W/kg.

4.7.2 SAR Measurement Variability

According to KDB 865664 D01 v01r01, SAR measurement variability was assessed for each frequency band, which is determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media are required for SAR measurements in a frequency band, the variability measurement procedures should be applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. Alternatively, if the highest measured SAR for both head and body tissue-equivalent media are ≤ 1.45 W/kg and the ratio of these highest SAR values, i.e., largest divided by smallest value, is ≤ 1.10, the highest SAR configuration for either head or body tissue-equivalent medium may be used to perform the repeated measurement. These additional measurements are repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device should be returned to ambient conditions (normal room temperature) with the battery fully charged before it is re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR repeated measurement procedure:

1. When the highest measured SAR is < 0.80 W/kg, repeated measurement is not required.
2. When the highest measured SAR is >= 0.80 W/kg, repeat that measurement once.
3. If the ratio of largest to smallest SAR for the original and first repeated measurements is > 1.20, or when the original or repeated measurement is >= 1.45 W/kg, perform a second repeated measurement.
4. If the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20, and the original, first or second repeated measurement is >= 1.5 W/kg, perform a third repeated measurement.

Band	Mode	Test Position	Ch.	Original Measured SAR-1g (W/kg)	1st Repeated SAR-1g (W/kg)	L/S Ratio	2nd Repeated SAR-1g (W/kg)	L/S Ratio	3rd Repeated SAR-1g (W/kg)	L/S Ratio
CDMA BC1	RTAP 153.6	Rear Face	25	0.985	0.956	1.03	N/A	N/A	N/A	N/A
802.11b	-	Front Face	1	0.869	0.842	1.03	N/A	N/A	N/A	N/A

4.7.3 Simultaneous Multi-band Transmission Evaluation

<Estimated SAR Calculation>

According to KDB 447498 D01, when standalone SAR test exclusion applies to an antenna that transmits simultaneously with other antennas, the standalone SAR was estimated according to following formula to result in substantially conservative SAR values of <= 0.4 W/kg to determine simultaneous transmission SAR test exclusion.

$$\text{Estimated SAR} = \frac{\text{Max. Tune up Power}_{(\text{mW})}}{\text{Min. Test Separation Distance}_{(\text{mm})}} \times \frac{\sqrt{f_{(\text{GHz})}}}{7.5}$$

If the minimum test separation distance is < 5 mm, a distance of 5 mm is used for estimated SAR calculation. When the test separation distance is > 50 mm, the 0.4 W/kg is used for SAR-1g.

Mode / Band	Frequency (GHz)	Max. Tune-up Power (dBm)	Test Position	Separation Distance (mm)	Estimated SAR (W/kg)
CDMA BC0	0.848	25.0	Body	10	0.4
CDMA BC1	1.908	24.5	Body	10	0.4
CDMA BC15	1.753	23.5	Body	10	0.4
LTE 2	1.909	22.9	Body	10	0.4
LTE 4	1.754	22.6	Body	10	0.4
LTE 5	0.848	22.6	Body	10	0.4
LTE 12	0.715	22.5	Body	10	0.4
LTE 17	0.713	22.5	Body	10	0.4
LTE 25	1.914	22.8	Body	10	0.4
WLAN (DTS)	2.462	14.1	Body	10	0.4

Note:

1. The separation distance is determined from the outer housing of the EUT to the user.
2. When standalone SAR testing is not required, an estimated SAR can be applied to determine simultaneous transmission SAR test exclusion.

<SAR Summation Analysis>

Simultaneous transmission SAR test exclusion is determined for each operating configuration and exposure condition according to the reported standalone SAR of each applicable simultaneous transmitting antenna. When the sum of SAR_{1g} of all simultaneously transmitting antennas in an operating mode and exposure condition combination is within the SAR limit (SAR_{1g} 1.6 W/kg), the simultaneous transmission SAR is not required. When the sum of SAR_{1g} is greater than the SAR limit (SAR_{1g} 1.6 W/kg), SAR test exclusion is determined by the SPLSR.

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR Analysis
1	CDMA BC0 + WLAN	Body	Front Face	0.12	0.90	1.02	Σ SAR < 1.6, Not required
			Rear Face	0.06	0.34	0.40	Σ SAR < 1.6, Not required
			Left Side	0.03	0.67	0.70	Σ SAR < 1.6, Not required
			Right Side	0.04	0.4 (Estimated SAR)	0.44	Σ SAR < 1.6, Not required
			Top Side	0.03	0.4 (Estimated SAR)	0.43	Σ SAR < 1.6, Not required
			Bottom Side	0.4 (Estimated SAR)	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required
2	CDMA BC1 + WLAN	Body	Front Face	0.45	0.90	1.35	Σ SAR < 1.6, Not required
			Rear Face	1.13	0.34	1.47	Σ SAR < 1.6, Not required
			Left Side	0.33	0.67	1.00	Σ SAR < 1.6, Not required
			Right Side	0.33	0.4 (Estimated SAR)	0.73	Σ SAR < 1.6, Not required
			Top Side	0.14	0.4 (Estimated SAR)	0.54	Σ SAR < 1.6, Not required
			Bottom Side	0.4 (Estimated SAR)	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required
3	CDMA BC15 + WLAN	Body	Front Face	0.48	0.90	1.38	Σ SAR < 1.6, Not required
			Rear Face	0.83	0.34	1.17	Σ SAR < 1.6, Not required
			Left Side	0.37	0.67	1.04	Σ SAR < 1.6, Not required
			Right Side	0.26	0.4 (Estimated SAR)	0.66	Σ SAR < 1.6, Not required
			Top Side	0.10	0.4 (Estimated SAR)	0.50	Σ SAR < 1.6, Not required
			Bottom Side	0.4 (Estimated SAR)	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required
4	LTE 2 + WLAN	Body	Front Face	0.53	0.90	1.43	Σ SAR < 1.6, Not required
			Rear Face	0.72	0.34	1.06	Σ SAR < 1.6, Not required
			Left Side	0.29	0.67	0.96	Σ SAR < 1.6, Not required
			Right Side	0.30	0.4 (Estimated SAR)	0.70	Σ SAR < 1.6, Not required
			Top Side	0.11	0.4 (Estimated SAR)	0.51	Σ SAR < 1.6, Not required
			Bottom Side	0.4 (Estimated SAR)	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required

No.	Conditions (SAR1 + SAR2)	Exposure Condition	Test Position	Max. SAR1	Max. SAR2	SAR Summation	SPLSR Analysis
5	**LTE 4 + WLAN**	Body	Front Face	0.50	0.90	1.40	Σ SAR < 1.6, Not required
			Rear Face	0.62	0.34	0.96	Σ SAR < 1.6, Not required
			Left Side	0.32	0.67	0.99	Σ SAR < 1.6, Not required
			Right Side	0.19	0.4 (Estimated SAR)	0.59	Σ SAR < 1.6, Not required
			Top Side	0.10	0.4 (Estimated SAR)	0.50	Σ SAR < 1.6, Not required
			Bottom Side	0.4 (Estimated SAR)	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required
6	**LTE 5 + WLAN**	Body	Front Face	0.10	0.90	1.00	Σ SAR < 1.6, Not required
			Rear Face	0.05	0.34	0.39	Σ SAR < 1.6, Not required
			Left Side	0.03	0.67	0.70	Σ SAR < 1.6, Not required
			Right Side	0.04	0.4 (Estimated SAR)	0.44	Σ SAR < 1.6, Not required
			Top Side	0.03	0.4 (Estimated SAR)	0.43	Σ SAR < 1.6, Not required
			Bottom Side	0.4 (Estimated SAR)	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required
7	**LTE 12 + WLAN**	Body	Front Face	0.69	0.90	1.59	Σ SAR < 1.6, Not required
			Rear Face	0.24	0.34	0.58	Σ SAR < 1.6, Not required
			Left Side	0.15	0.67	0.82	Σ SAR < 1.6, Not required
			Right Side	0.43	0.4 (Estimated SAR)	0.83	Σ SAR < 1.6, Not required
			Top Side	0.09	0.4 (Estimated SAR)	0.49	Σ SAR < 1.6, Not required
			Bottom Side	0.4 (Estimated SAR)	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required
8	**LTE 17 + WLAN**	Body	Front Face	0.66	0.90	1.56	Σ SAR < 1.6, Not required
			Rear Face	0.22	0.34	0.56	Σ SAR < 1.6, Not required
			Left Side	0.11	0.67	0.78	Σ SAR < 1.6, Not required
			Right Side	0.40	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required
			Top Side	0.08	0.4 (Estimated SAR)	0.48	Σ SAR < 1.6, Not required
			Bottom Side	0.4 (Estimated SAR)	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required
9	**LTE 25 + WLAN**	Body	Front Face	0.54	0.90	1.44	Σ SAR < 1.6, Not required
			Rear Face	0.67	0.34	1.01	Σ SAR < 1.6, Not required
			Left Side	0.28	0.67	0.95	Σ SAR < 1.6, Not required
			Right Side	0.29	0.4 (Estimated SAR)	0.69	Σ SAR < 1.6, Not required
			Top Side	0.11	0.4 (Estimated SAR)	0.51	Σ SAR < 1.6, Not required
			Bottom Side	0.4 (Estimated SAR)	0.4 (Estimated SAR)	0.80	Σ SAR < 1.6, Not required

Test Engineer： Mars Chang, and Enzo Chang

5. Calibration of Test Equipment

Equipment	Manufacturer	Model	SN	Cal. Date	Cal. Interval
System Validation Kit	SPEAG	D750V3	1013	Apr. 25, 2013	Annual
System Validation Kit	SPEAG	D835V2	4d121	Apr. 25, 2013	Annual
System Validation Kit	SPEAG	D1750V2	1055	Aug. 23, 2012	Annual
System Validation Kit	SPEAG	D1900V2	5d036	Jan. 21, 2013	Annual
System Validation Kit	SPEAG	D2450V2	737	Jan. 21, 2013	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3590	Feb. 20, 2013	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3650	Apr. 30, 2013	Annual
Dosimetric E-Field Probe	SPEAG	EX3DV4	3864	Jul. 19, 2012	Annual
Data Acquisition Electronics	SPEAG	DAE3	360	Jan. 30, 2013	Annual
Data Acquisition Electronics	SPEAG	DAE4	861	Mar. 19, 2013	Annual
Data Acquisition Electronics	SPEAG	DAE4	1277	Jul. 19, 2012	Annual
SAM Phantom	SPEAG	QD000P40CD	TP-1652	N/A	N/A
SAM Phantom	SPEAG	QD000P40CD	TP-1654	N/A	N/A
ELI Phantom	SPEAG	QDOVA002AA	1206	N/A	N/A
Radio Communication Tester	Agilent	E5515C	MY50266628	Nov. 22, 2012	Biennial
Radio Communication Analyzer	Anritsu	MT8820C	6201010284	Aug. 18, 2012	Biennial
ENA Series Network Analyzer	Agilent	E5071C	MY46214281	Jun. 10, 2013	Annual
MXG Analog Signal Generator	Agilent	N5181A	MY50143868	Jun. 06, 2013	Annual
Power Meter	Anritsu	ML2495A	1218009	Jun. 11, 2013	Annual
Power Sensor	Anritsu	MA2411B	1207252	Jun. 11, 2013	Annual
EXA Spectrum Analyzer	Agilent	N9010A	MY52100136	Jun. 26, 2013	Annual
Dielectric Probe Kit	Agilent	85070D	E2-020018	May 13, 2013	Annual
Thermometer	YFE	YF-160A	110600361	Feb. 20, 2013	Annual
Directional Coupler	Woken	0110A05602O-10	11122702	Apr. 18, 2013	Annual
Power Amplifier	AR	5S1G4	0339656	Apr. 18, 2013	Annual
Attenuator	Woken	00800A1G01L-03	N/A	Apr. 18, 2013	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.

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.
Tel: 886-3-318-3232
Fax: 886-3-327-0892

Taiwan LinKo EMC/RF Lab:
Add: No. 47, 14th Ling, Chia Pau Vil., Linkou Dist., New Taipei City 244, Taiwan, R.O.C.
Tel: 886-2-2605-2180
Fax: 886-2-2605-1924

Taiwan HsinChu EMC/RF Lab:
Add: No. 81-1, Lu Liao Keng, 9th Ling, Wu Lung Vil., Chiung Lin Township, Hsinchu County 307, Taiwan, R.O.C.
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.

---END---

Appendix A. SAR Plots of System Verification

The plots for system verification with largest deviation for each SAR system combination are shown as follows.

Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab   Date: 2013/07/11

System Check_B750_130711

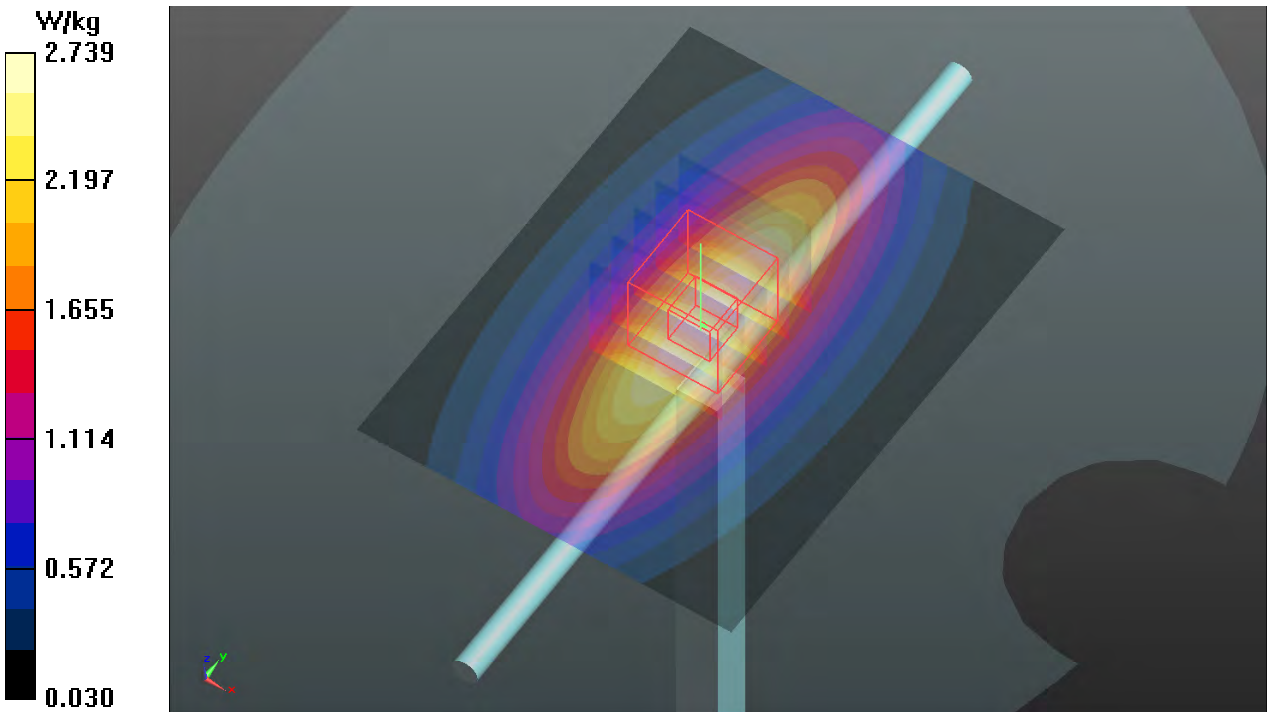
DUT: Dipole 750 MHz; Type: D750V3; SN: 1013

Communication System: CW; Frequency: 750 MHz;Duty Cycle: 1:1
Medium: B750_0711 Medium parameters used: f = 750 MHz; σ = 0.974 S/m; ε_r = 55.974; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3590; ConvF(10.6, 10.6, 10.6); Calibrated: 2013/02/20;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2013/03/19
- Phantom: SAM Phantom_Front; Type: SAM V4.0; Serial: TP 1654
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Pin=250mW/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 2.74 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 53.668 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 3.23 W/kg
SAR(1 g) = 2.21 W/kg; SAR(10 g) = 1.49 W/kg
Maximum value of SAR (measured) = 2.77 W/kg



System Check_B835_130711

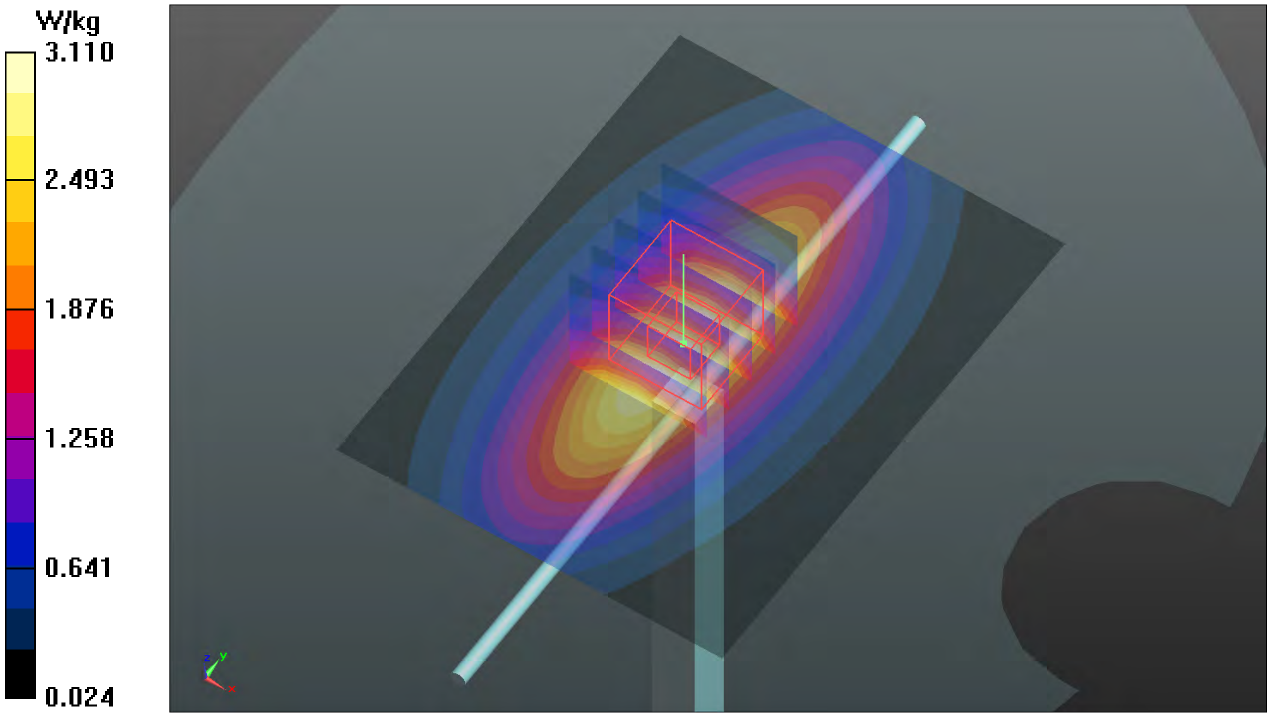
DUT: Dipole 835 MHz; Type: D835V2; SN: 4d121

Communication System: CW; Frequency: 835 MHz;Duty Cycle: 1:1
Medium: B835_0711 Medium parameters used: f = 835 MHz; σ = 0.979 S/m; ε_r = 55.854; ρ = 1000 kg/m^3
Ambient Temperature：21.5 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(9.94, 9.94, 9.94); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Front; Type: SAM V4.0; Serial: TP 1654
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Pin=250mW/Area Scan (61x81x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 3.11 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 56.795 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 3.68 W/kg
SAR(1 g) = 2.48 W/kg; SAR(10 g) = 1.64 W/kg
Maximum value of SAR (measured) = 3.14 W/kg



System Check_B1750_130711

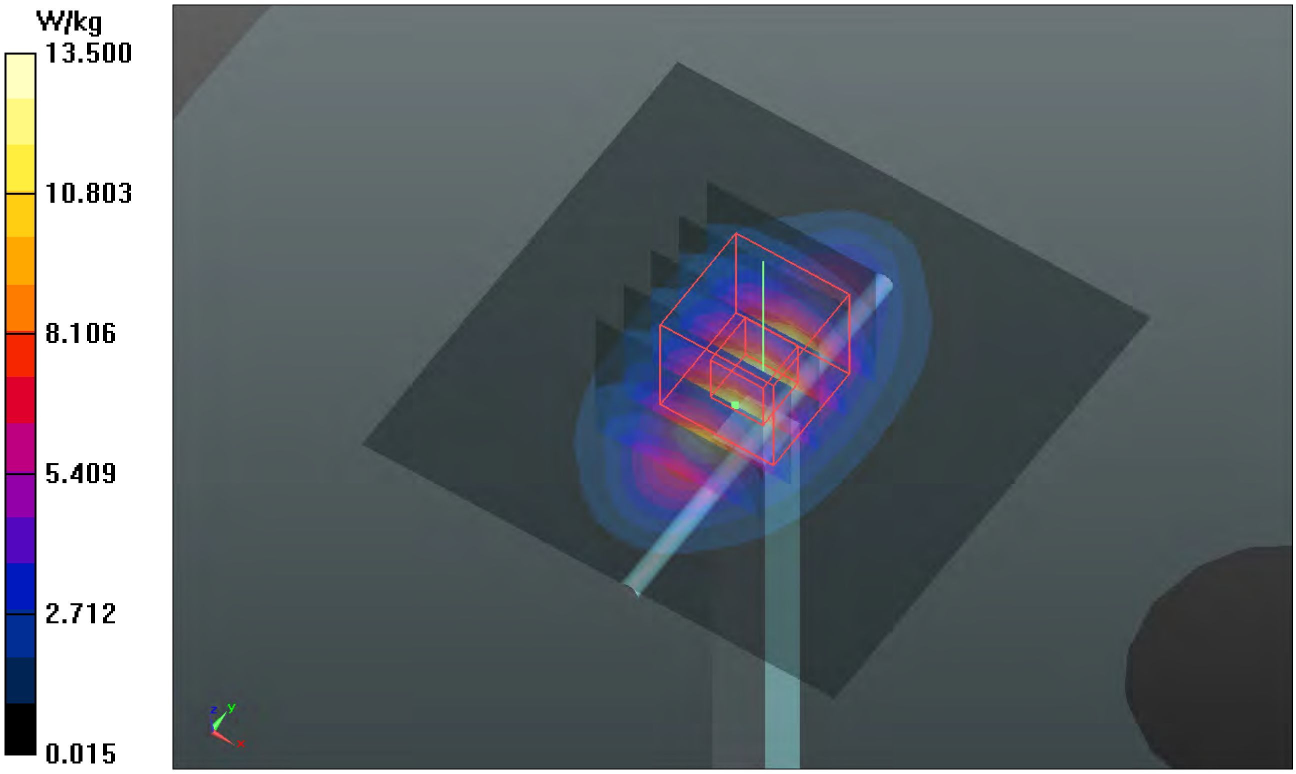
DUT: Dipole 1750 MHz; Type: D1750V2; SN: 1055

Communication System: CW; Frequency: 1750 MHz;Duty Cycle: 1:1
Medium: B1750_0711 Medium parameters used: f = 1750 MHz; σ = 1.488 S/m; ε_r = 52.158; ρ = 1000 kg/m^3
Ambient Temperature：21.5 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(8.45, 8.45, 8.45); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 13.5 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 96.537 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 16.3 W/kg
SAR(1 g) = 9.39 W/kg; SAR(10 g) = 5.05 W/kg
Maximum value of SAR (measured) = 13.2 W/kg



System Check_B1900_130710

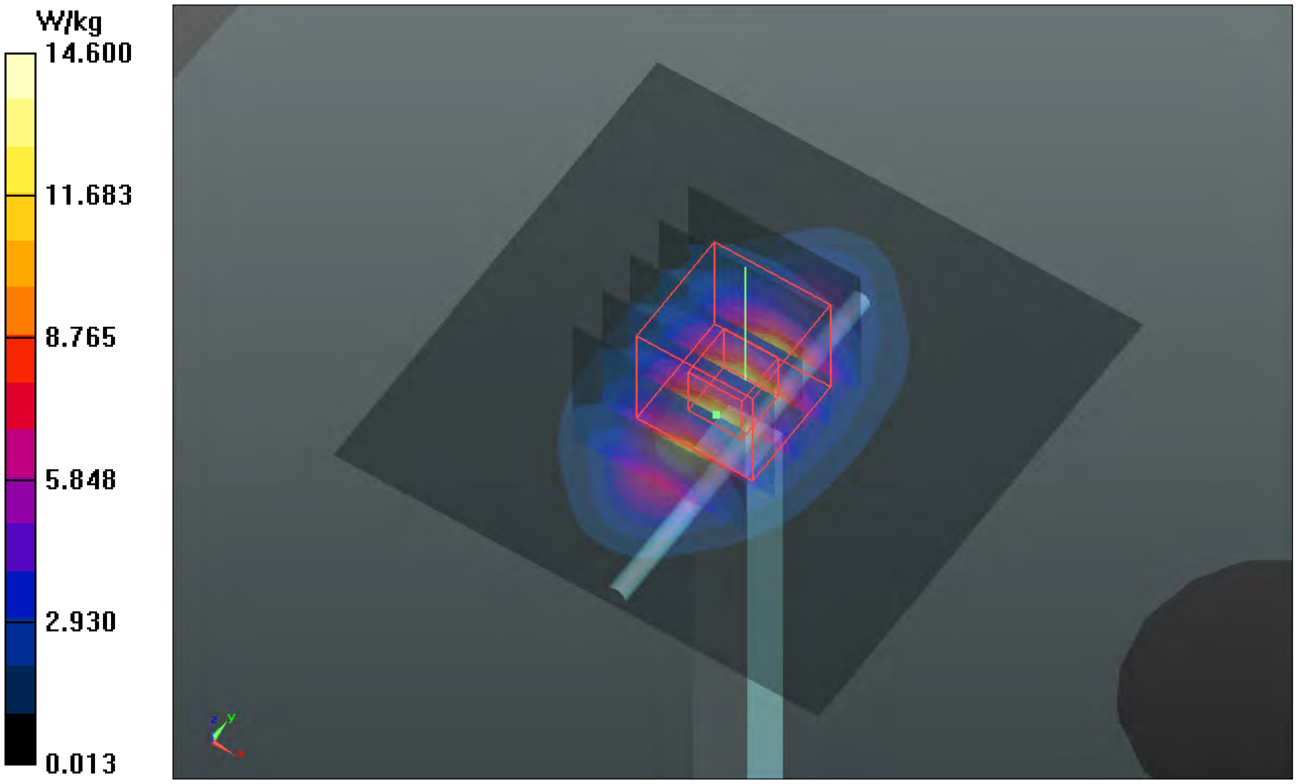
DUT: Dipole 1900 MHz; Type: D1900V2; SN: 5d036

Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: B1900_0710 Medium parameters used: f = 1900 MHz; σ = 1.543 S/m; ε_r = 52.865; ρ = 1000 kg/m^3
Ambient Temperature：21.5 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(7.88, 7.88, 7.88); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Pin=250mW/Area Scan (61x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 14.6 W/kg

Pin=250mW/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 96.733 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 17.4 W/kg
SAR(1 g) = 9.68 W/kg; SAR(10 g) = 5.03 W/kg
Maximum value of SAR (measured) = 13.6 W/kg



System Check_B2450_130711

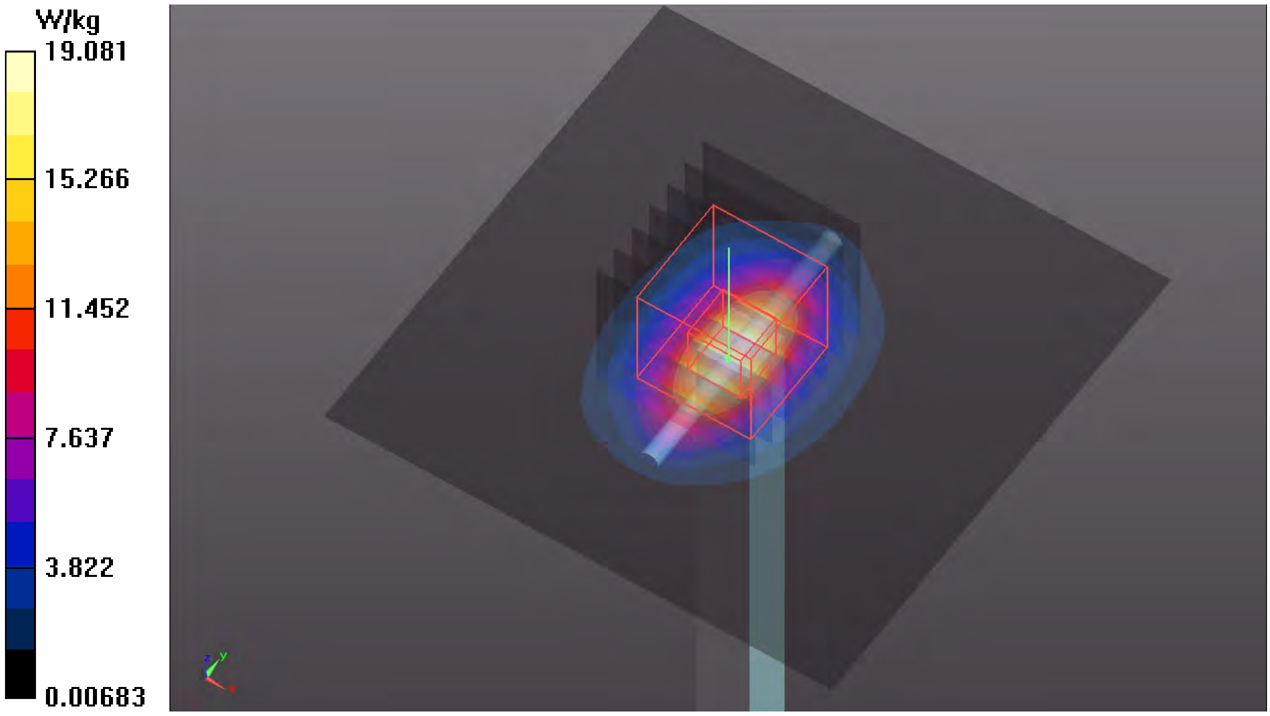
DUT: Dipole 2450 MHz; Type: D2450V2; SN: 737

Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: B2450_0711 Medium parameters used: f = 2450 MHz; σ = 1.985 S/m; ε_r = 51.431; ρ = 1000 kg/m^3
Ambient Temperature：21.8 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.09, 7.09, 7.09); Calibrated: 2013/04/30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2012/07/19
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: TP:1206
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

Pin=250mW/Area Scan (81x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 19.1 W/kg

Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 97.093 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 25.6 W/kg
SAR(1 g) = 12.3 W/kg; SAR(10 g) = 5.68 W/kg
Maximum value of SAR (measured) = 18.8 W/kg



Appendix B. SAR Plots of SAR Measurement

The SAR plots for highest measured SAR in each exposure configuration, wireless mode and frequency band combination, and measured SAR > 1.5 W/kg are shown as follows.

Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2013/07/11

P01 CDMA2000 BC0_RTAP 153.6_Front Face_0.5cm_Ch1013

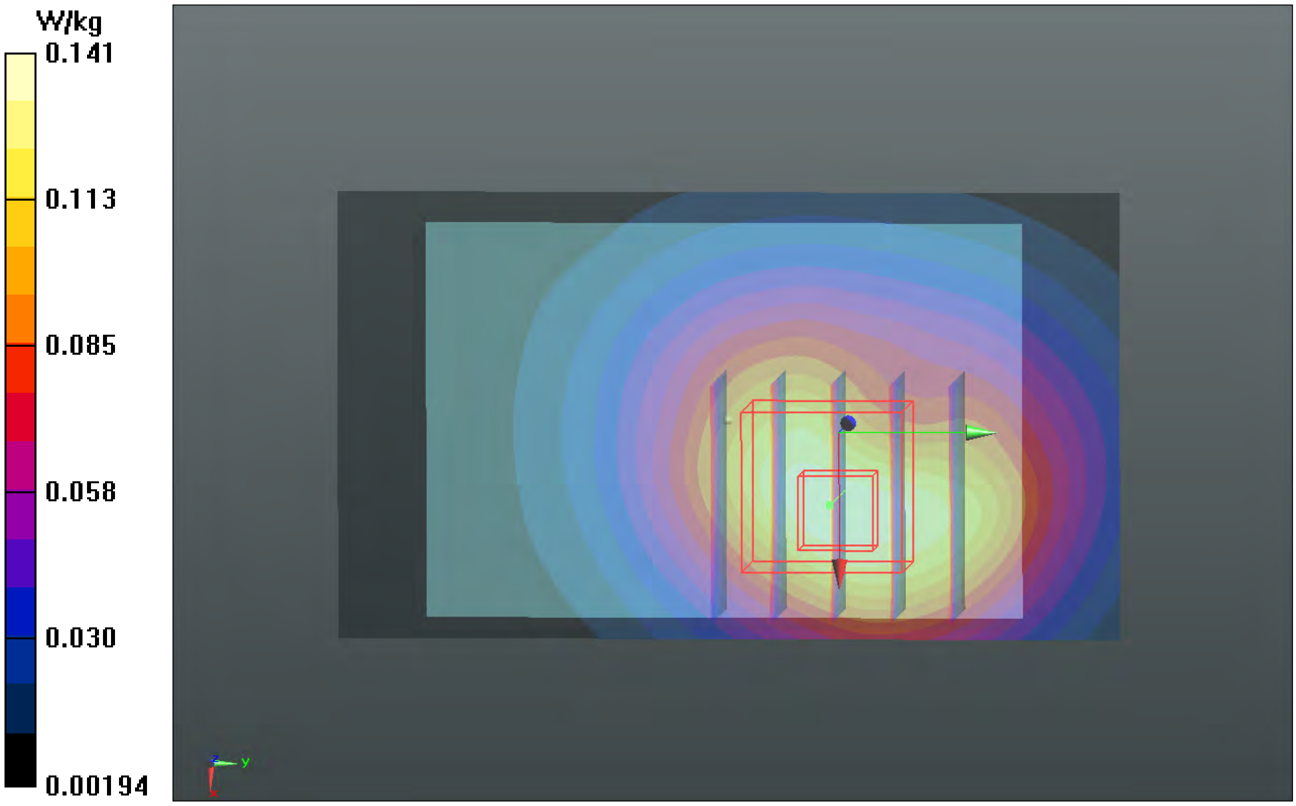
DUT: 130627C12

Communication System: CDMA2000; Frequency: 824.7 MHz;Duty Cycle: 1:1
Medium: B835_0711 Medium parameters used: f = 825 MHz; σ = 0.97 S/m; ε_r = 55.949; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(9.94, 9.94, 9.94); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Front; Type: SAM V4.0; Serial: TP 1654
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (41x71x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.141 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.904 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.181 W/kg
SAR(1 g) = 0.112 W/kg; SAR(10 g) = 0.070 W/kg
Maximum value of SAR (measured) = 0.146 W/kg



P02 CDMA2000 BC1_RTAP 153.6_Rear Face _0.5cm_Ch25

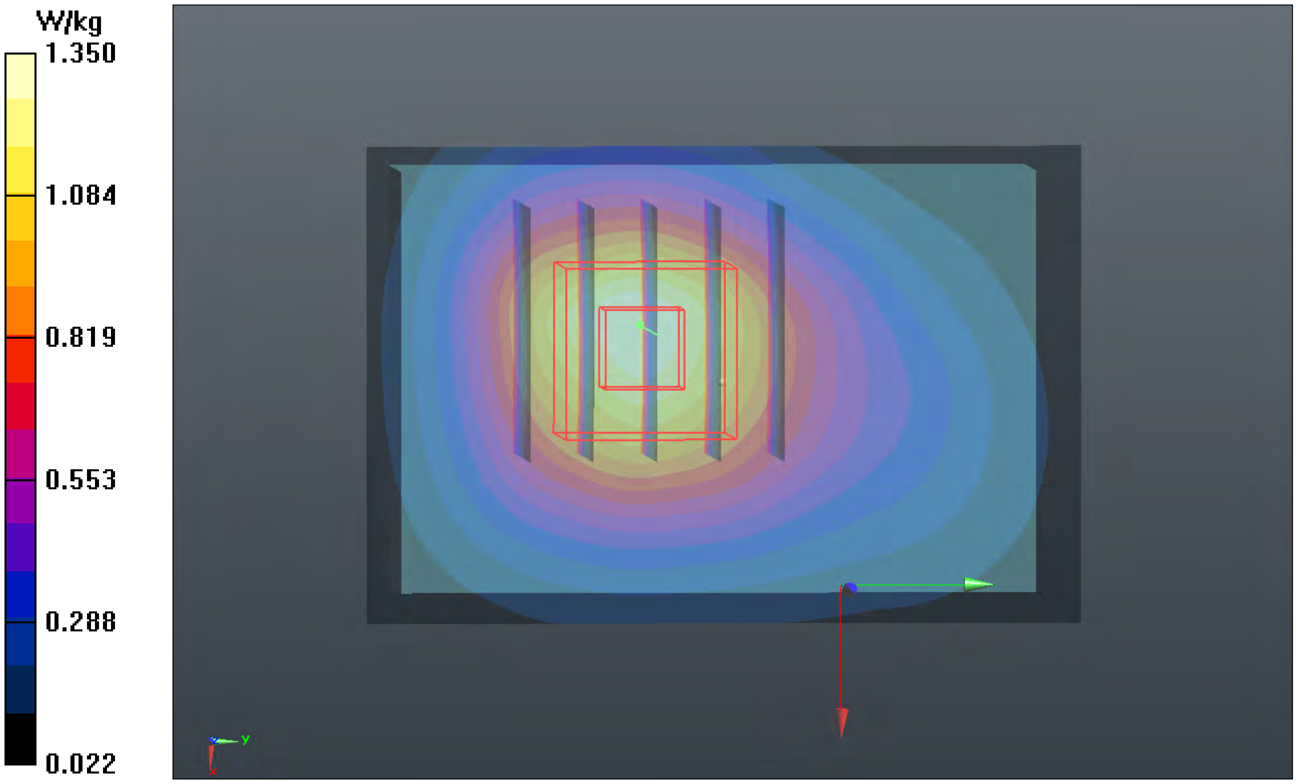
DUT: 130627C12

Communication System: CDMA2000; Frequency: 1851.25 MHz;Duty Cycle: 1:1
Medium: B1900_0710 Medium parameters used: f = 1851.25 MHz; σ = 1.479 S/m; ε_r = 53.063; ρ = 1000 kg/m^3
Ambient Temperature：21.5 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(7.88, 7.88, 7.88); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.35 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.943 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.46 W/kg
SAR(1 g) = 0.985 W/kg; SAR(10 g) = 0.615 W/kg
Maximum value of SAR (measured) = 1.23 W/kg



P03 CDMA2000 BC15_RTAP 153.6_Rear Face_0.5cm_Ch875

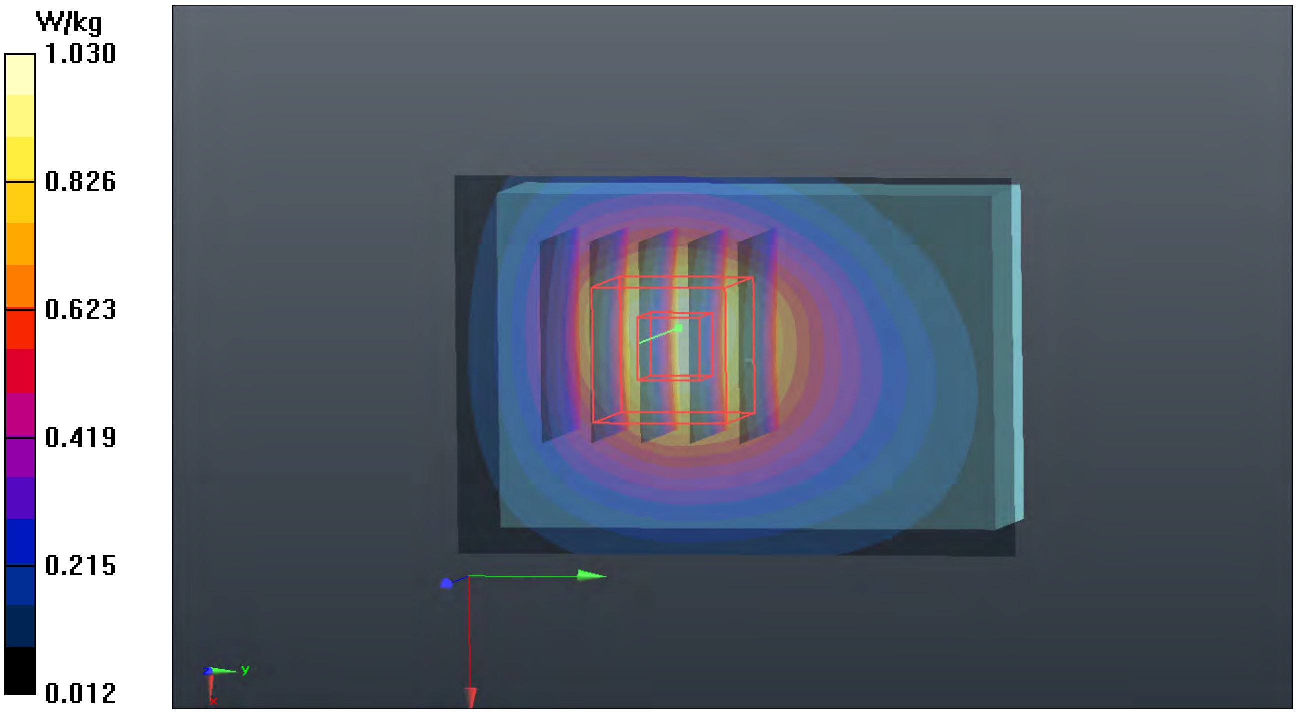
DUT: 130627C12

Communication System: CDMA2000; Frequency: 1753.75 MHz;Duty Cycle: 1:1
Medium: B1750_0711 Medium parameters used: f = 1754 MHz; σ = 1.493 S/m; ε_r = 52.148; ρ = 1000 kg/m^3
Ambient Temperature：21.5 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(8.45, 8.45, 8.45); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 1.03 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.746 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.783 W/kg; SAR(10 g) = 0.499 W/kg
Maximum value of SAR (measured) = 0.964 W/kg



P04 LTE 2_QPSK_20M_Rear Face_0.5cm_Ch18700_1 RB_50 Offset

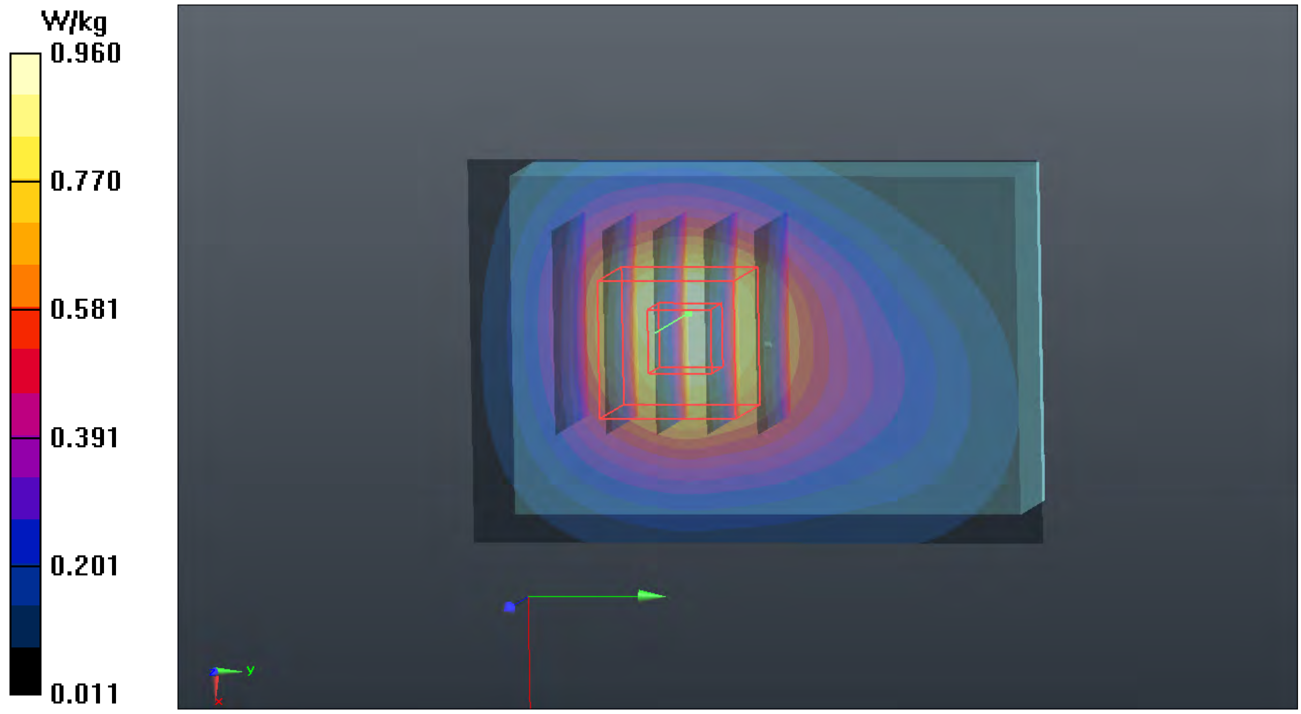
DUT: 130627C12

Communication System: LTE 2; Frequency: 1860 MHz;Duty Cycle: 1:1
Medium: B1900_0710 Medium parameters used: f = 1860 MHz; σ = 1.49 S/m; ε_r = 53.023; ρ = 1000 kg/m^3
Ambient Temperature：21.5 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(7.88, 7.88, 7.88); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.960 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.211 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.06 W/kg
SAR(1 g) = 0.713 W/kg; SAR(10 g) = 0.442 W/kg
Maximum value of SAR (measured) = 0.892 W/kg



P05 LTE 4_QPSK_20M_Rear Face_0.5cm_Ch20050_1 RB_0 Offset

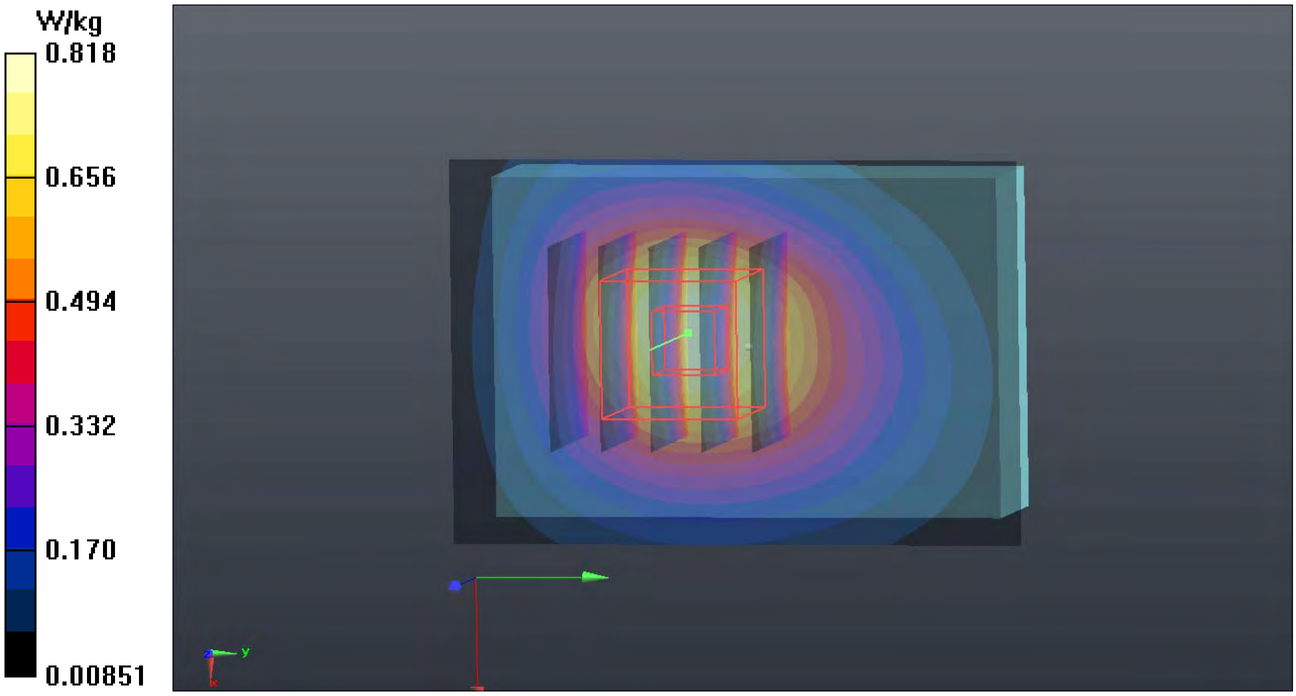
DUT: 130627C12

Communication System: LTE 4; Frequency: 1720 MHz;Duty Cycle: 1:1
Medium: B1750_0711 Medium parameters used: f = 1720 MHz; σ = 1.454 S/m; ε_r = 52.291; ρ = 1000 kg/m^3
Ambient Temperature：21.5 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(8.45, 8.45, 8.45); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.818 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.166 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 0.882 W/kg
SAR(1 g) = 0.622 W/kg; SAR(10 g) = 0.398 W/kg
Maximum value of SAR (measured) = 0.767 W/kg



P06 LTE 5_QPSK_10M_Front Face_0.5cm_Ch20450_1 RB_24 Offset

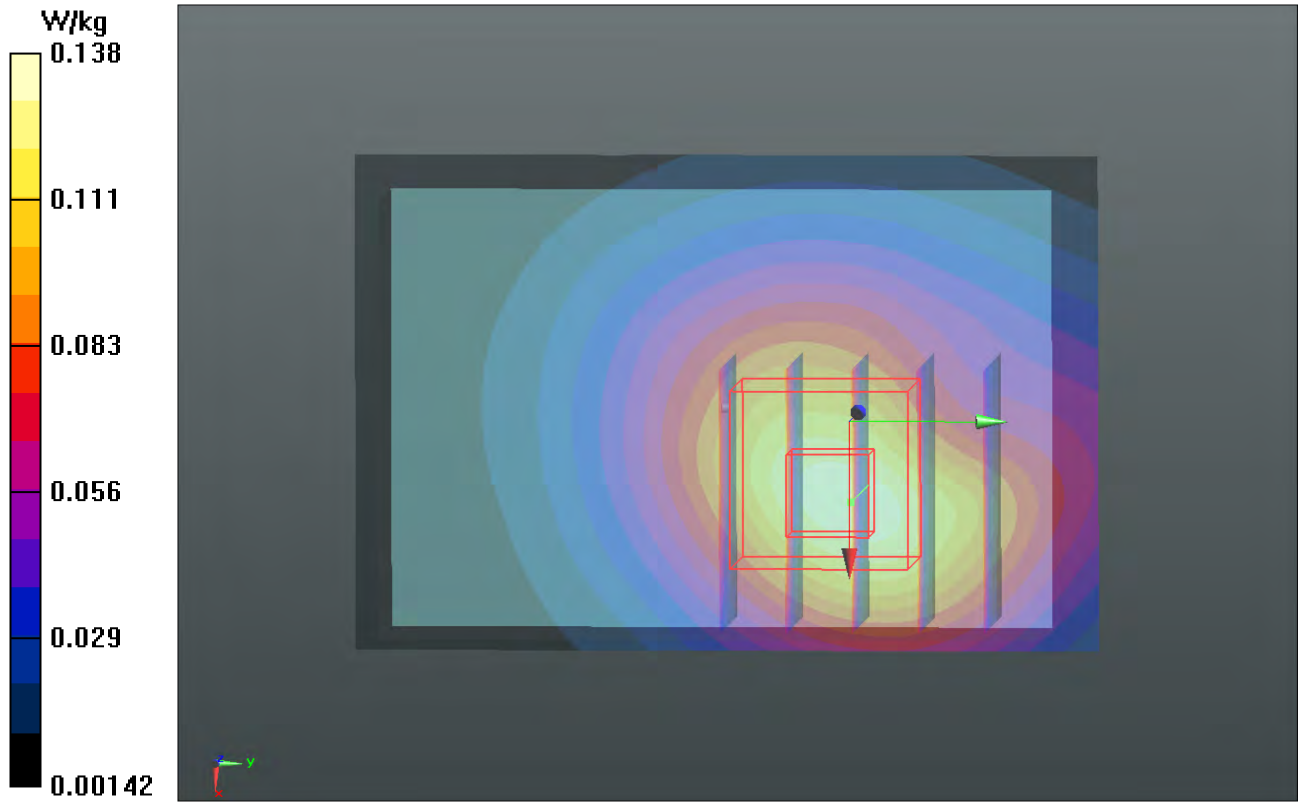
DUT: 130627C12

Communication System: LTE 5; Frequency: 829 MHz;Duty Cycle: 1:1
Medium: B835_0711 Medium parameters used: f = 829 MHz; σ = 0.973 S/m; ε_r = 55.913; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(9.94, 9.94, 9.94); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Front; Type: SAM V4.0; Serial: TP 1654
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.138 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.902 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 0.160 W/kg
SAR(1 g) = 0.101 W/kg; SAR(10 g) = 0.064 W/kg
Maximum value of SAR (measured) = 0.132 W/kg



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab Date: 2013/07/11

P07 LTE 12_QPSK_10M_Front Face_0.5cm_Ch23060_1 RB_24 Offset

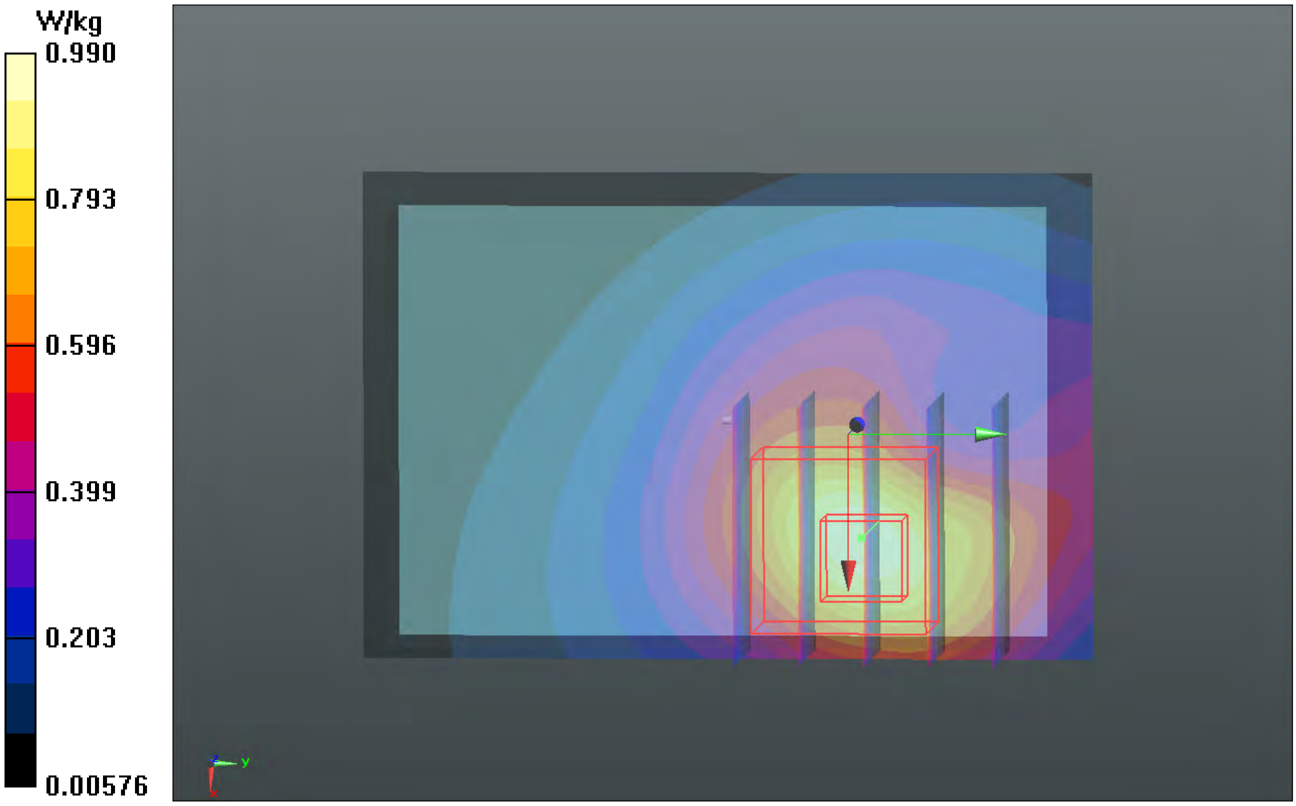
DUT: 130627C12

Communication System: LTE 12; Frequency: 704 MHz;Duty Cycle: 1:1
Medium: B750_0711 Medium parameters used: f = 704 MHz; σ = 0.934 S/m; ε_r = 56.337; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3590; ConvF(10.6, 10.6, 10.6); Calibrated: 2013/02/20;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2013/03/19
- Phantom: SAM Phantom_Front; Type: SAM V4.0; Serial: TP 1654
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.990 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.743 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.689 W/kg; SAR(10 g) = 0.398 W/kg
Maximum value of SAR (measured) = 0.937 W/kg



P08 LTE 17_QPSK_10M_Front Face_0.5cm_Ch23780_1 RB_0 Offset

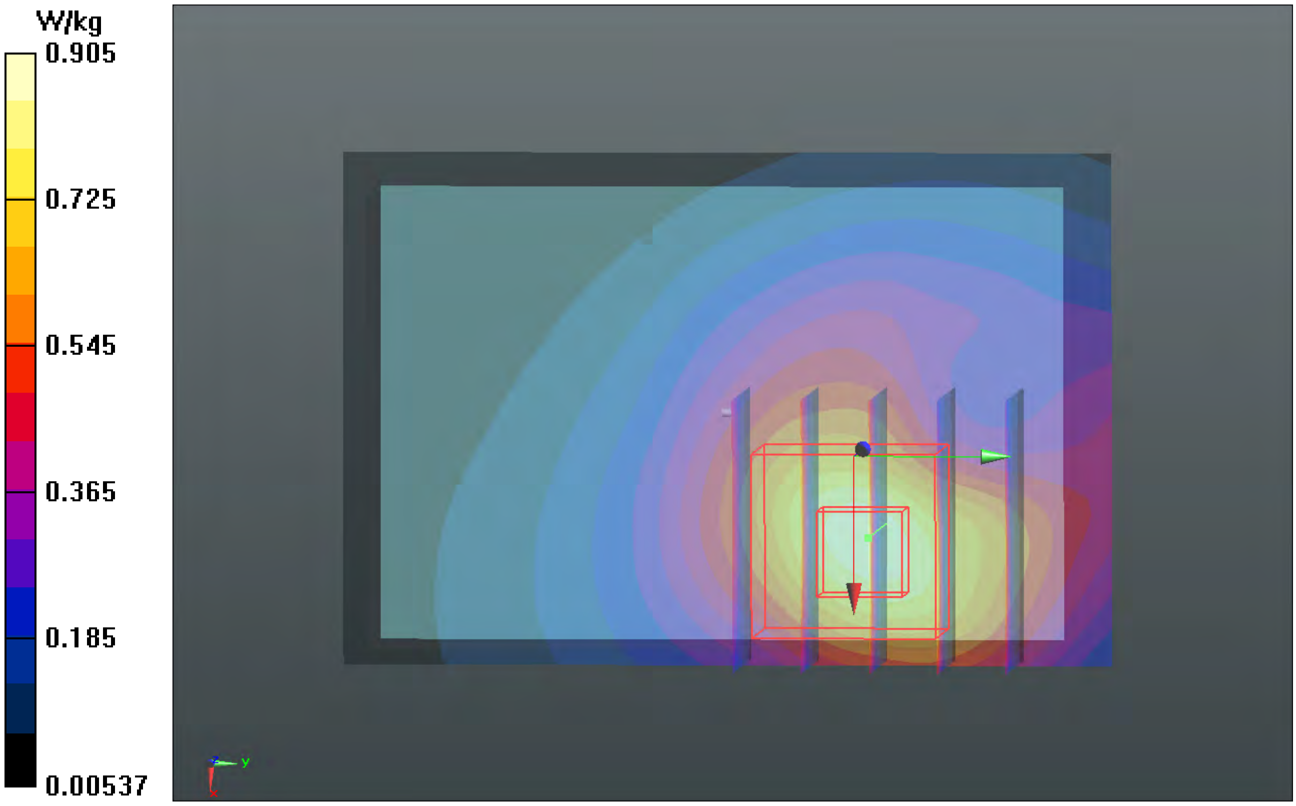
DUT: 130627C12

Communication System: LTE 17; Frequency: 709 MHz;Duty Cycle: 1:1
Medium: B750_0711 Medium parameters used: f = 709 MHz; σ = 0.939 S/m; ε_r = 56.295; ρ = 1000 kg/m^3
Ambient Temperature：21.4 ℃；Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3590; ConvF(10.6, 10.6, 10.6); Calibrated: 2013/02/20;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2013/03/19
- Phantom: SAM Phantom_Front; Type: SAM V4.0; Serial: TP 1654
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.905 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.782 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.662 W/kg; SAR(10 g) = 0.384 W/kg
Maximum value of SAR (measured) = 0.904 W/kg



P09 LTE 25_QPSK_20M_Rear Face_0.5cm_Ch26140_1 RB_50 Offset

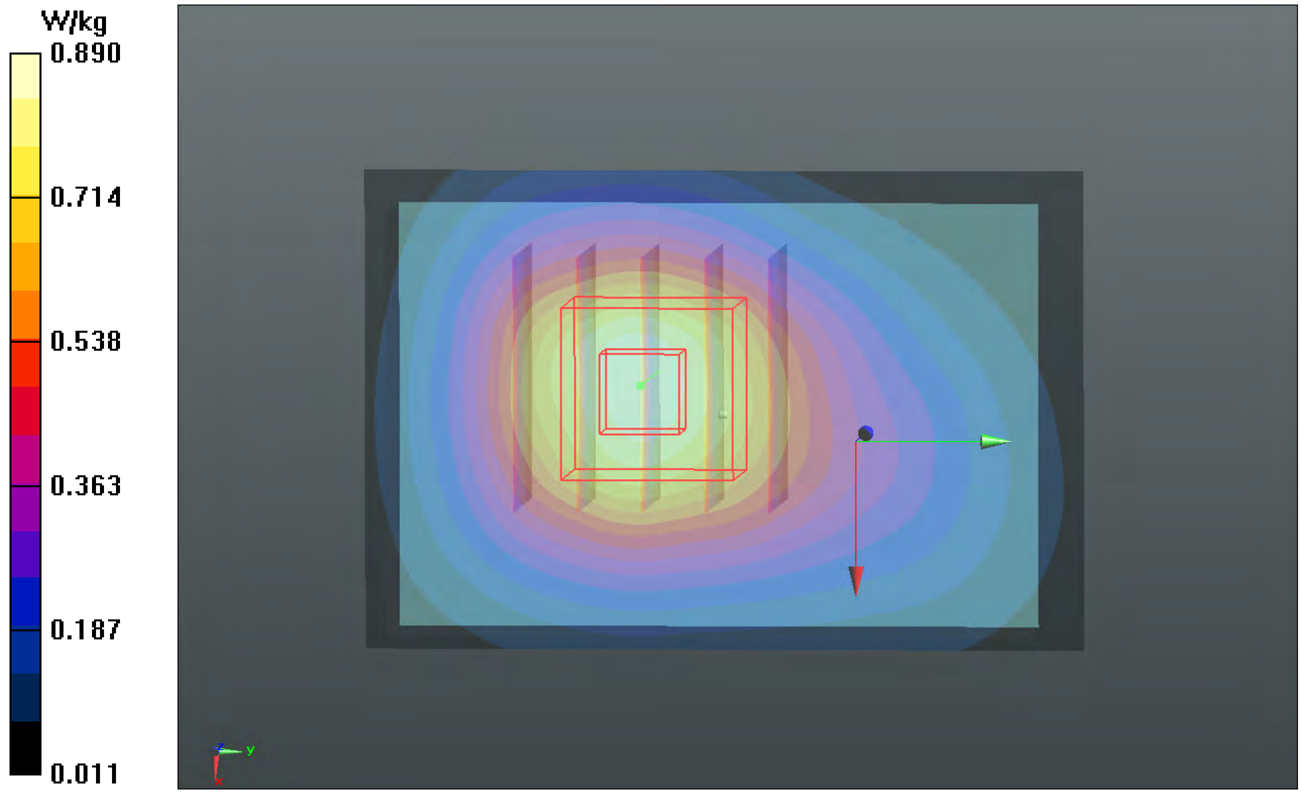
DUT: 130627C12

Communication System: LTE 25; Frequency: 1860 MHz;Duty Cycle: 1:1
Medium: B1900_0710 Medium parameters used: f = 1860 MHz; σ = 1.49 S/m; ε_r = 53.023; ρ = 1000 kg/m^3
Ambient Temperature：21.5 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3864; ConvF(7.88, 7.88, 7.88); Calibrated: 2012/07/19;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn360; Calibrated: 2013/01/30
- Phantom: SAM Phantom_Left; Type: SAM V4.0; Serial: TP 1652
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (41x61x1): Interpolated grid: dx=1.500 mm, dy=1.500 mm
Maximum value of SAR (interpolated) = 0.890 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.620 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.997 W/kg
SAR(1 g) = 0.673 W/kg; SAR(10 g) = 0.418 W/kg
Maximum value of SAR (measured) = 0.843 W/kg



P10 802.11b_Front Face_0.5cm_Ch1

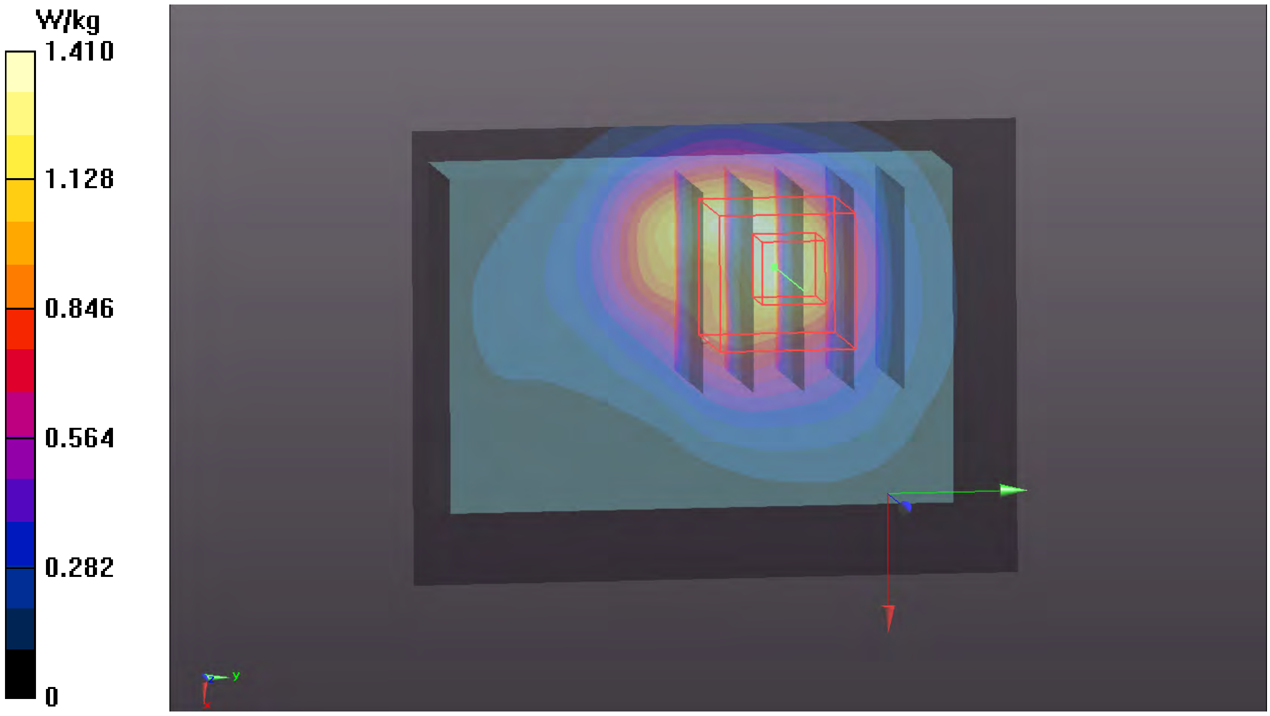
DUT: 130627C12

Communication System: WLAN_2.4G; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium: B2450_0711 Medium parameters used: f = 2412 MHz; σ = 1.932 S/m; ε_r = 51.578; ρ = 1000 kg/m^3
Ambient Temperature：21.2 ℃; Liquid Temperature：20.5 ℃

DASY5 Configuration:
- Probe: EX3DV4 - SN3650; ConvF(7.09, 7.09, 7.09); Calibrated: 2013/04/30;
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2012/07/19
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: TP:1206
- Measurement SW: DASY52, Version 52.8 (4); SEMCAD X Version 14.6.8 (7028)

- Area Scan (61x81x1): Interpolated grid: dx=1.200 mm, dy=1.200 mm
Maximum value of SAR (interpolated) = 1.41 W/kg

- Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.940 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.80 W/kg
SAR(1 g) = 0.869 W/kg; SAR(10 g) = 0.447 W/kg
Maximum value of SAR (measured) = 1.32 W/kg



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**
S **Servizio svizzero di taratura**
Swiss Calibration Service

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

Accreditation No.: SCS 108

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

Certificate No: D750V3-1013_Apr13

CALIBRATION CERTIFICATE

Object	D750V3 - SN: 1013
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 25, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 909	11-Sep-12 (No. DAE4-909_Sep12)	Sep-13

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-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 26, 2013

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	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.0 ± 6 %	0.92 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	2.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.66 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.66 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.1 ± 6 %	0.98 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	2.25 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.81 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.82 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.5 Ω - 0.7 jΩ
Return Loss	- 29.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8 Ω - 2.8 jΩ
Return Loss	- 30.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.036 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	March 22, 2010

DASY5 Validation Report for Head TSL

Date: 25.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1013

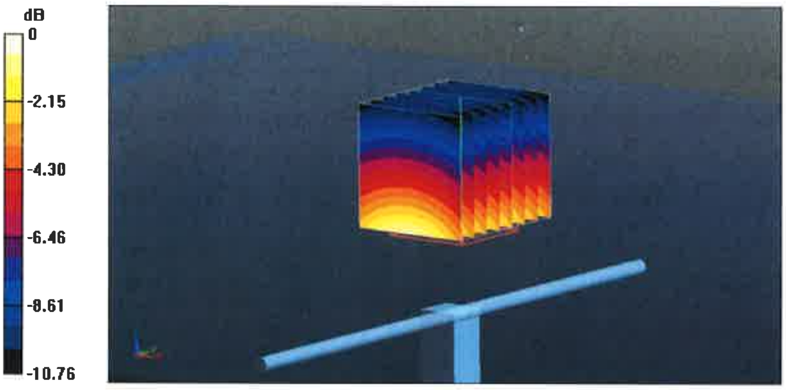
Communication System: UID 0 – CW, Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.92$ S/m; $\varepsilon_r = 41$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.28, 6.28, 6.28); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

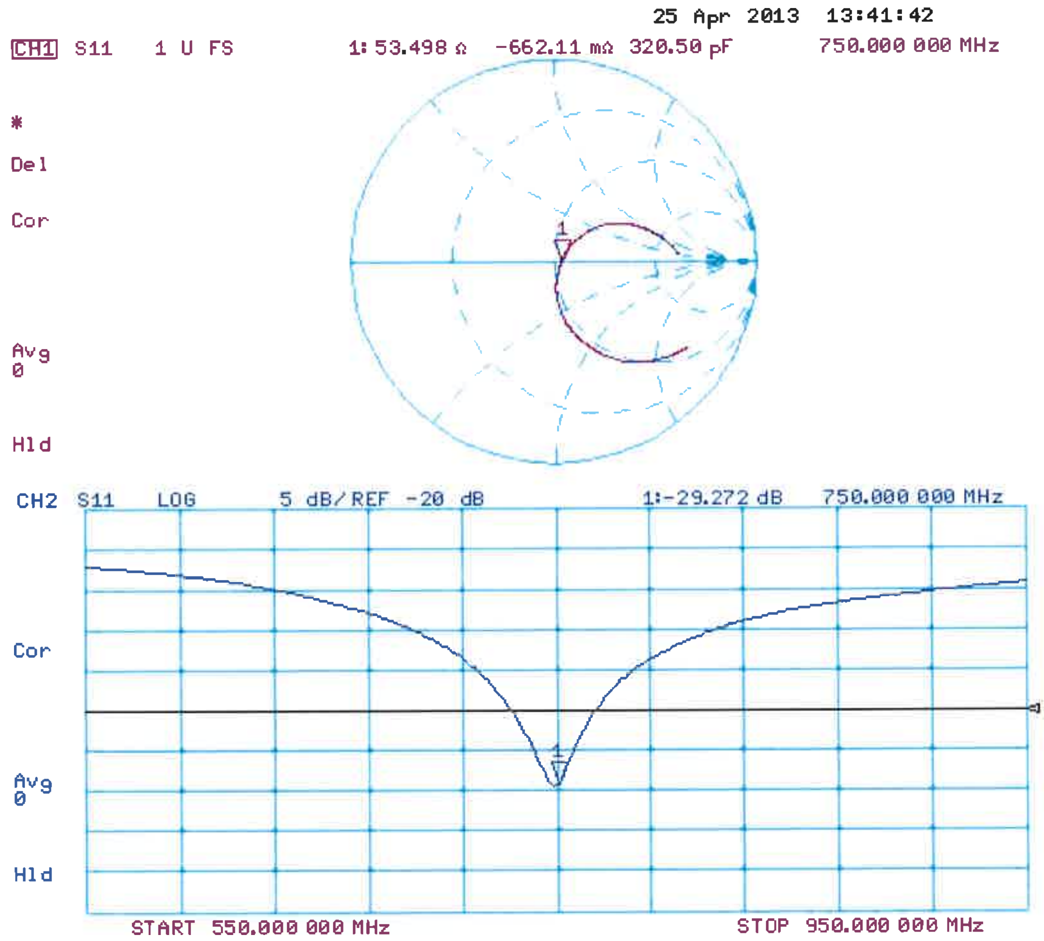
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x8x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.217 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.44 W/kg
SAR(1 g) = 2.23 W/kg; SAR(10 g) = 1.45 W/kg
Maximum value of SAR (measured) = 2.60 W/kg



0 dB = 2.60 W/kg = 4.15 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 25.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1013

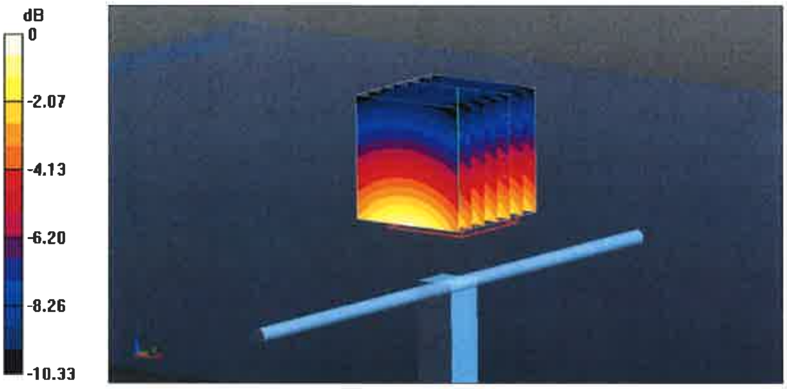
Communication System: UID 0 - CW Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.98$ S/m; $\varepsilon_r = 54.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.11, 6.11, 6.11); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

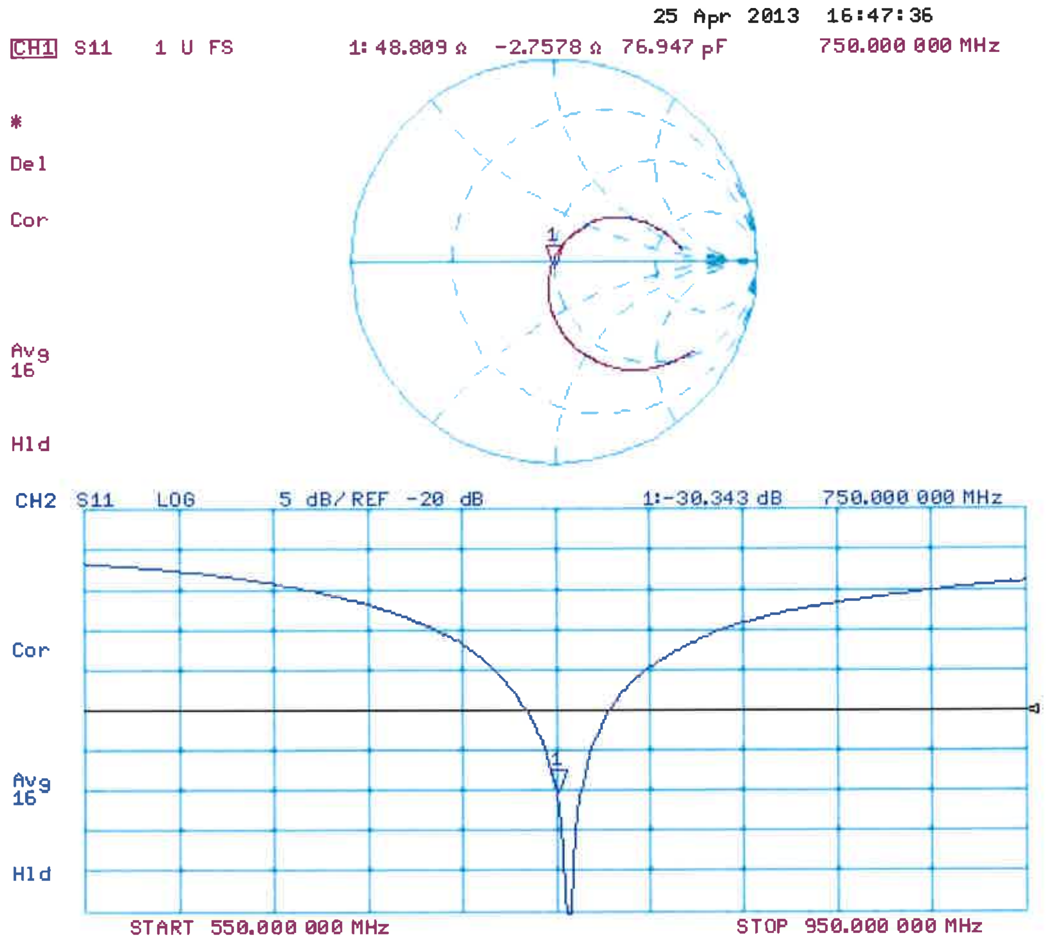
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.330 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.32 W/kg
SAR(1 g) = 2.25 W/kg; SAR(10 g) = 1.48 W/kg
Maximum value of SAR (measured) = 2.62 W/kg



0 dB = 2.62 W/kg = 4.18 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: SCS 108

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

Certificate No: D835V2-4d121_Apr13

CALIBRATION CERTIFICATE

Object	D835V2 - SN: 4d121
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 25, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 909	11-Sep-12 (No. DAE4-909_Sep12)	Sep-13

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-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 26, 2013

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	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	0.94 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	2.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.68 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.30 W/kg ± 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	54.0 ± 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	2.51 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.69 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.38 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.4 Ω - 2.1 jΩ
Return Loss	- 30.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 3.8 jΩ
Return Loss	- 26.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.395 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	June 29, 2010

DASY5 Validation Report for Head TSL

Date: 25.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d121

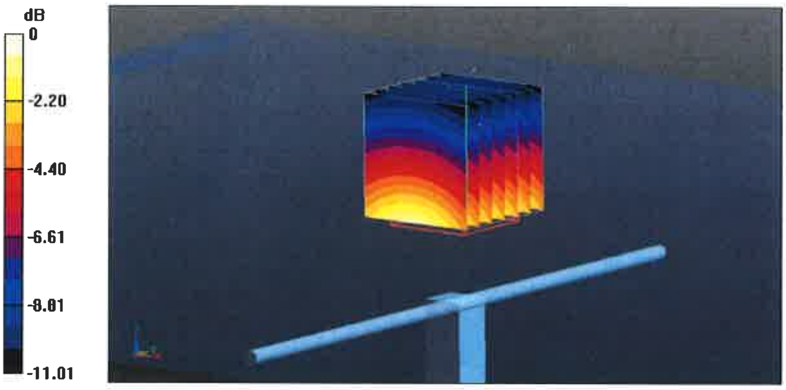
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

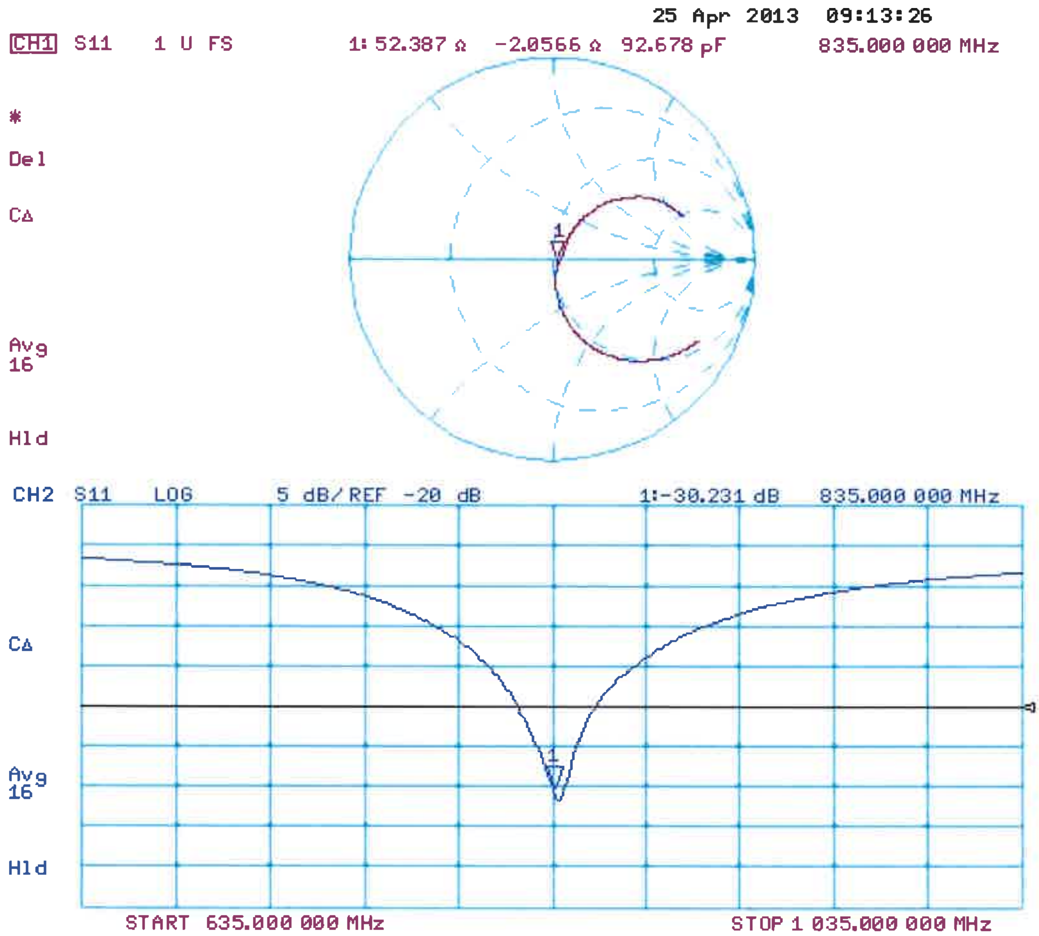
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.380 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.86 W/kg
SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.62 W/kg
Maximum value of SAR (measured) = 2.94 W/kg



0 dB = 2.94 W/kg = 4.68 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 24.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d121

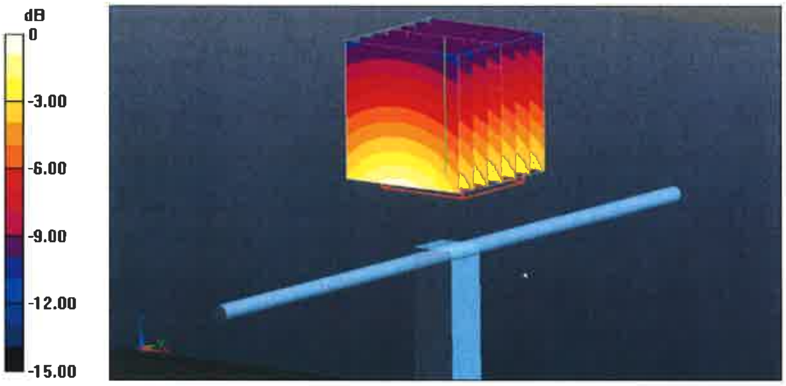
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

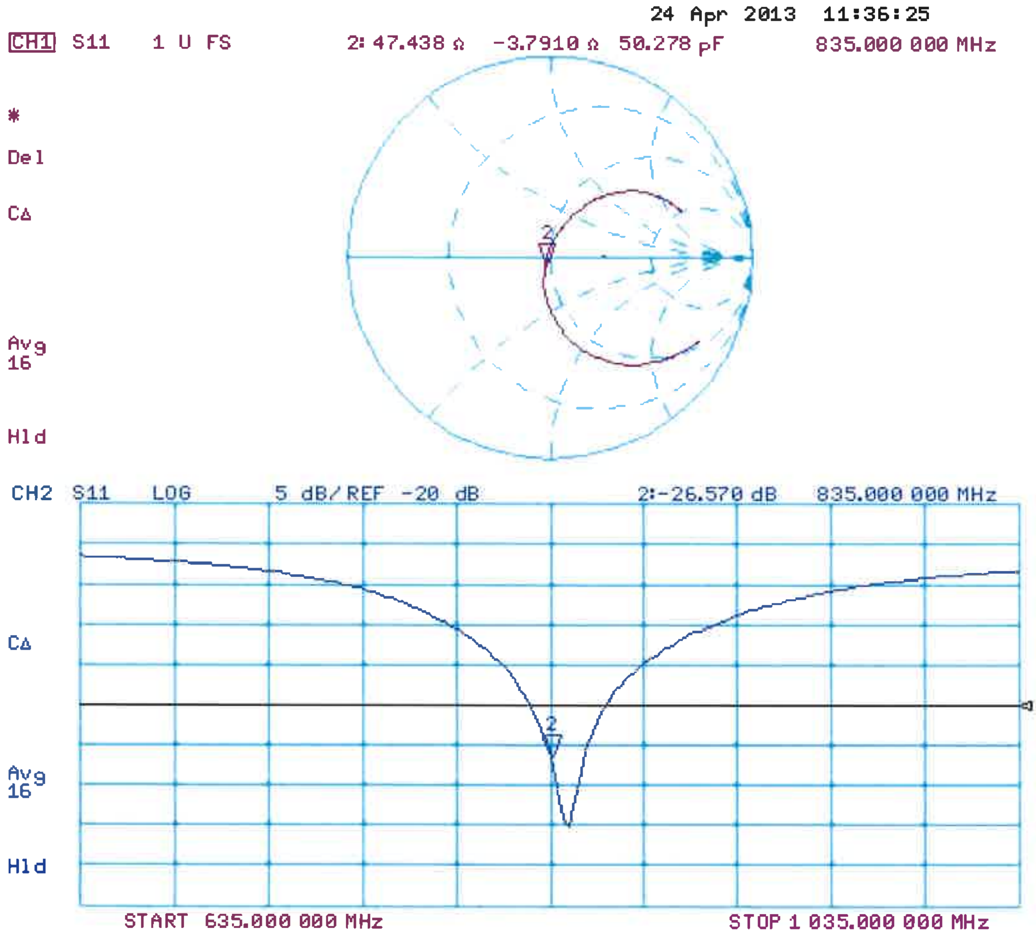
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.573 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.72 W/kg
SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.64 W/kg
Maximum value of SAR (measured) = 2.93 W/kg



0 dB = 2.93 W/kg = 4.67 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: SCS 108

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

Certificate No: D1750V2-1055_Aug12

CALIBRATION CERTIFICATE

Object	D1750V2 - SN: 1055
Calibration procedure(s)	QA CAL-05.v8 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 23, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

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: August 23, 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	V52.8.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.0 ± 6 %	1.34 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	8.89 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**36.0 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.77 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**19.2 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	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.2 ± 6 %	1.47 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	9.28 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**37.2 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.01 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.1 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.6 Ω + 1.3 jΩ
Return Loss	- 37.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.2 Ω + 1.8 jΩ
Return Loss	- 27.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.222 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	February 19, 2010

DASY5 Validation Report for Head TSL

Date: 23.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1055

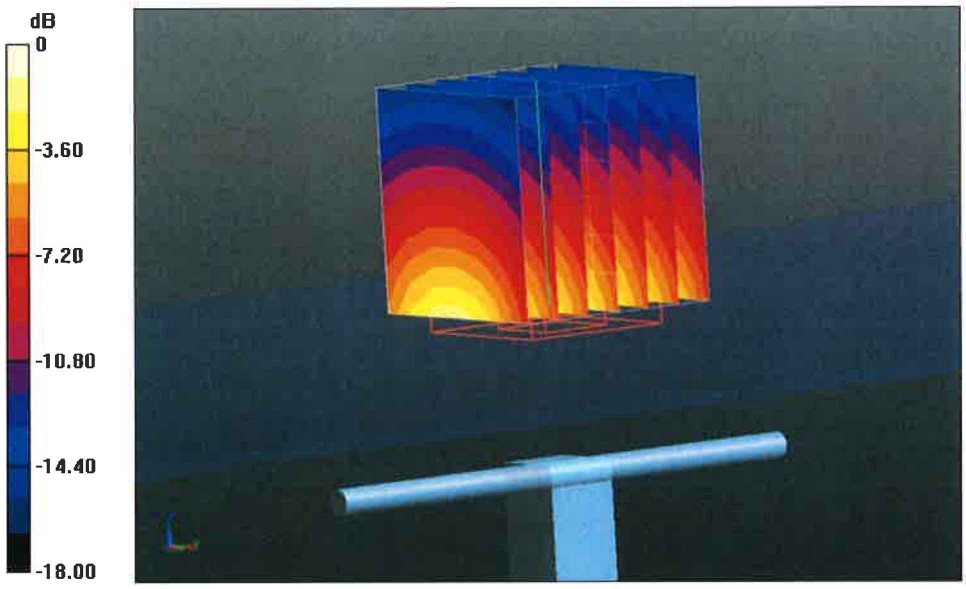
Communication System: CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.34 mho/m; ε_r = 40; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.22, 5.22, 5.22); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

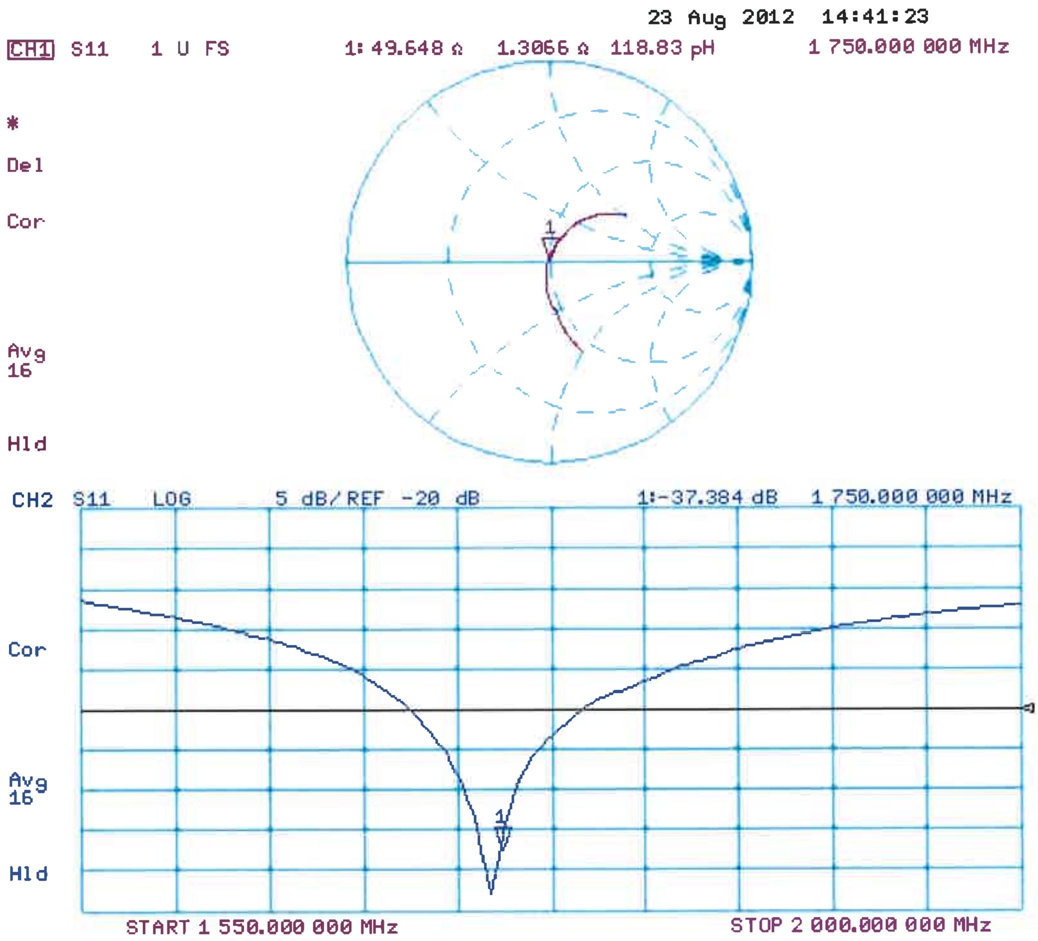
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.389 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 15.719 mW/g
SAR(1 g) = 8.89 mW/g; SAR(10 g) = 4.77 mW/g
Maximum value of SAR (measured) = 11.0 W/kg



0 dB = 11.0 W/kg = 20.83 dB W/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.08.2012

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN: 1055

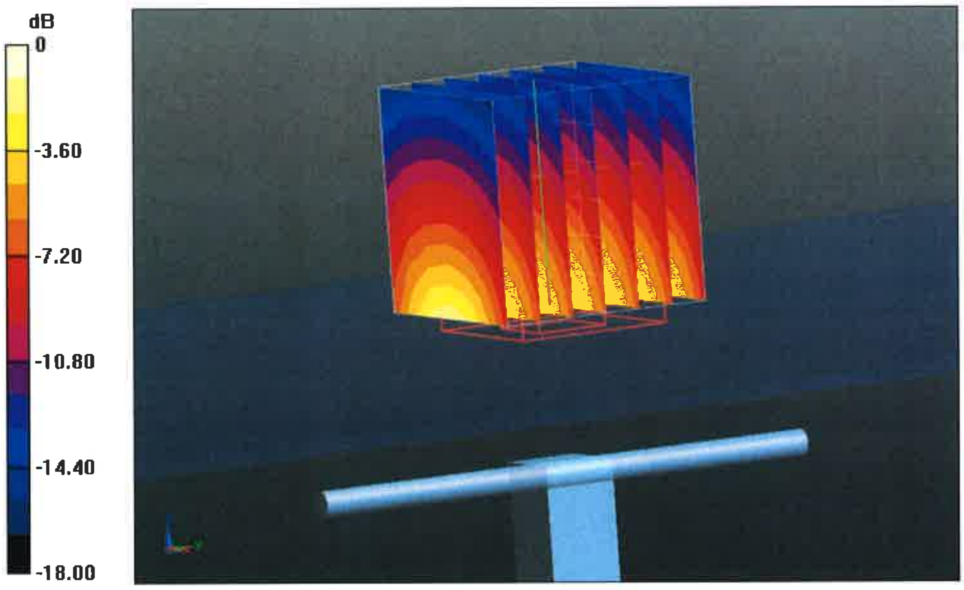
Communication System: CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma = 1.47$ mho/m; $\varepsilon_r = 52.2$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.85, 4.85, 4.85); Calibrated: 30.12.2011;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.2(969); SEMCAD X 14.6.6(6824)

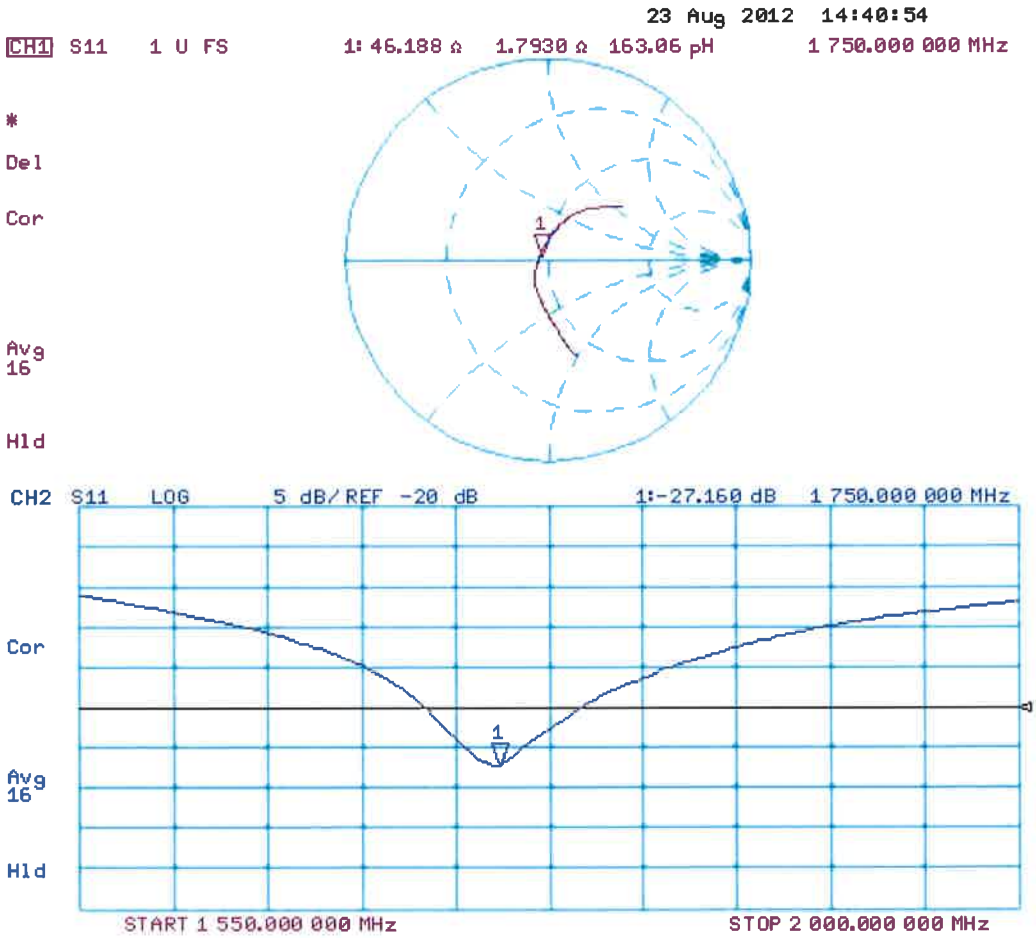
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 92.389 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 15.904 mW/g
SAR(1 g) = 9.28 mW/g; SAR(10 g) = 5.01 mW/g
Maximum value of SAR (measured) = 11.5 W/kg



0 dB = 11.5 W/kg = 21.21 dB W/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: SCS 108

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

Certificate No: D1900V2-5d036_Jan13

CALIBRATION CERTIFICATE

Object	D1900V2 - SN: 5d036
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 21, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

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-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Israe El-Naouq	Laboratory Technician	Israe El-Naouq
Approved by:	Fin Bomholt	Deputy Technical Manager	F. Bomholt

Issued: January 22, 2013

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	V52.8.5
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	39.4 ± 6 %	1.38 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	10.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.3 W/kg ± 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	52.2 ± 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	10.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**41.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.6 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.1 Ω + 5.0 jΩ
Return Loss	- 26.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.5 Ω + 5.2 jΩ
Return Loss	- 24.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 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: 21.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

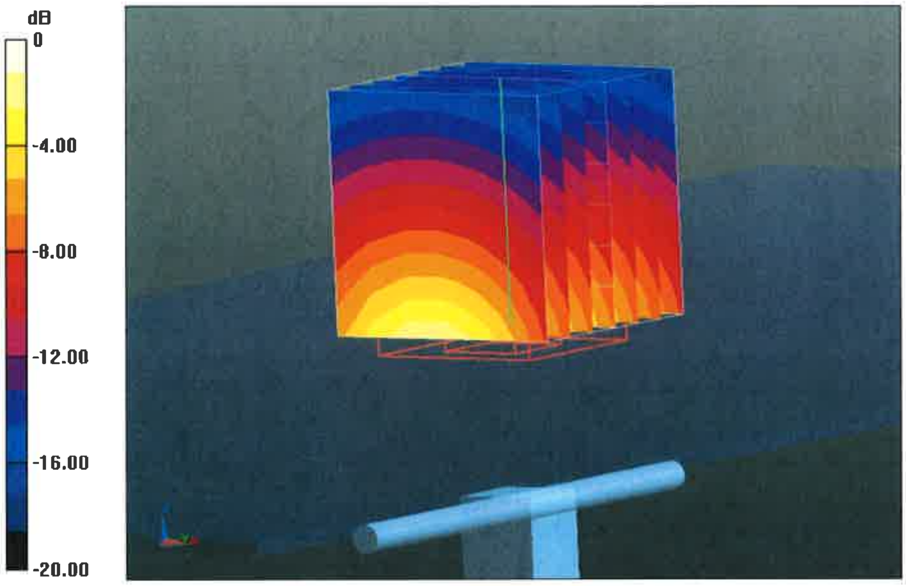
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

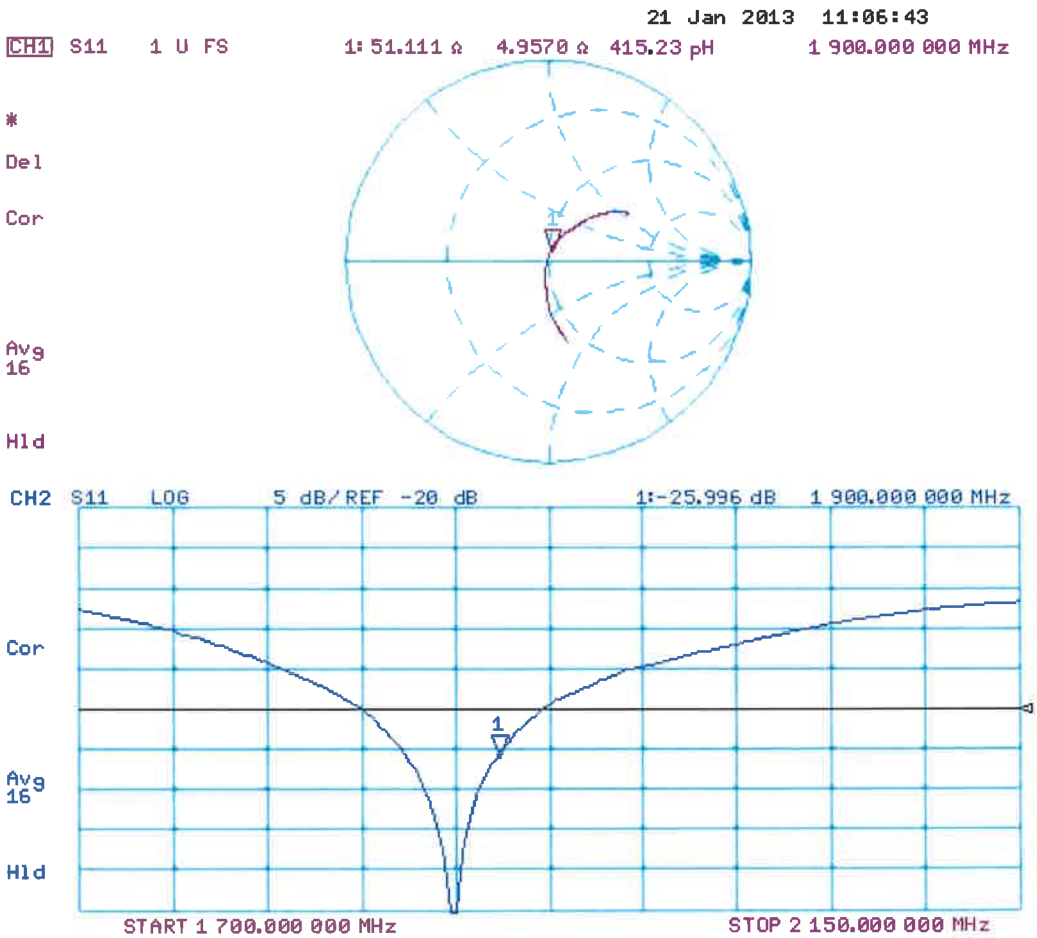
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.363 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.31 W/kg
Maximum value of SAR (measured) = 12.6 W/kg



0 dB = 12.6 W/kg = 11.00 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

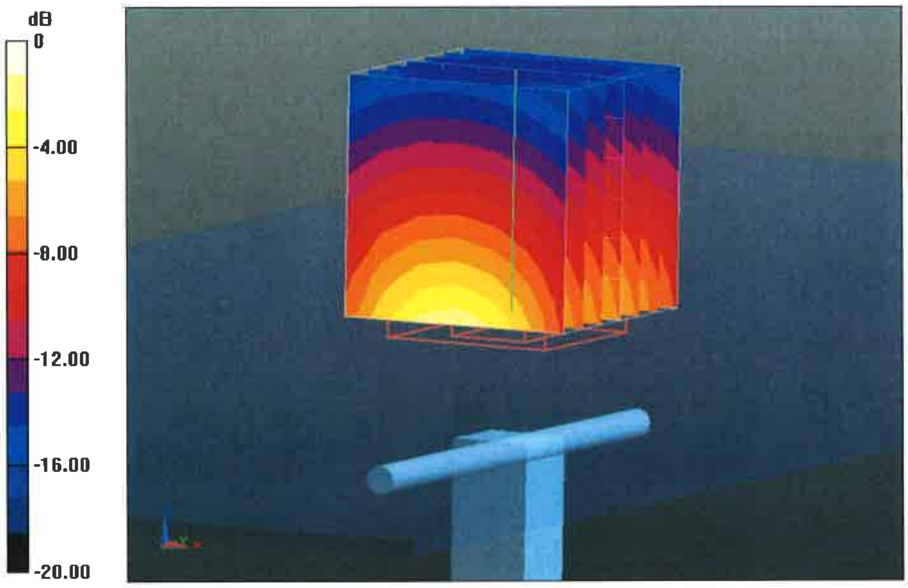
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma = 1.52$ S/m; $\varepsilon_r = 52.2$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

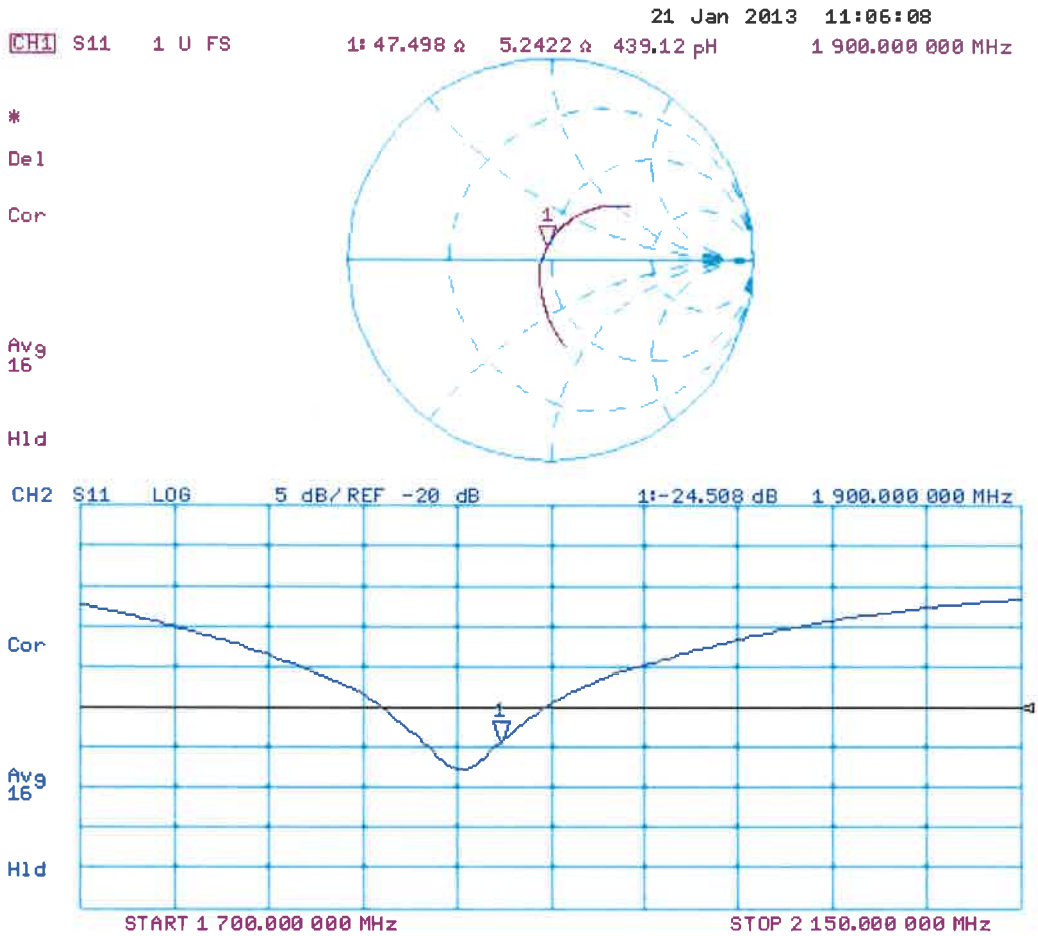
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.692 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.42 W/kg
Maximum value of SAR (measured) = 13.0 W/kg



0 dB = 13.0 W/kg = 11.14 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: SCS 108

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

Certificate No: D2450V2-737_Jan13

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 737
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 21, 2013

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	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

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-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	Leif Klysner
Approved by:	Fin Bomholt	Deputy Technical Manager	F. Bomholt

Issued: January 21, 2013

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	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	1.85 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	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.4 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.5 ± 6 %	2.01 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	12.7 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**49.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.86 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.1 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.4 Ω + 3.7 jΩ
Return Loss	- 26.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.1 Ω + 5.3 jΩ
Return Loss	- 25.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.161 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	August 26, 2003

DASY5 Validation Report for Head TSL

Date: 21.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 737

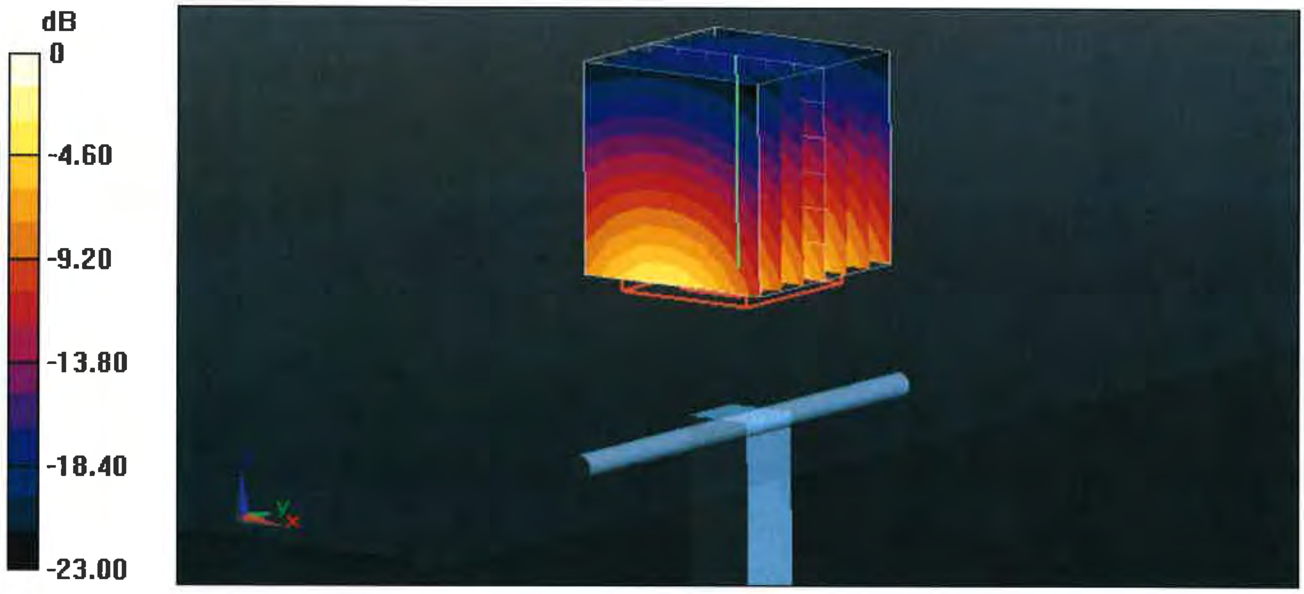
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.52, 4.52, 4.52); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

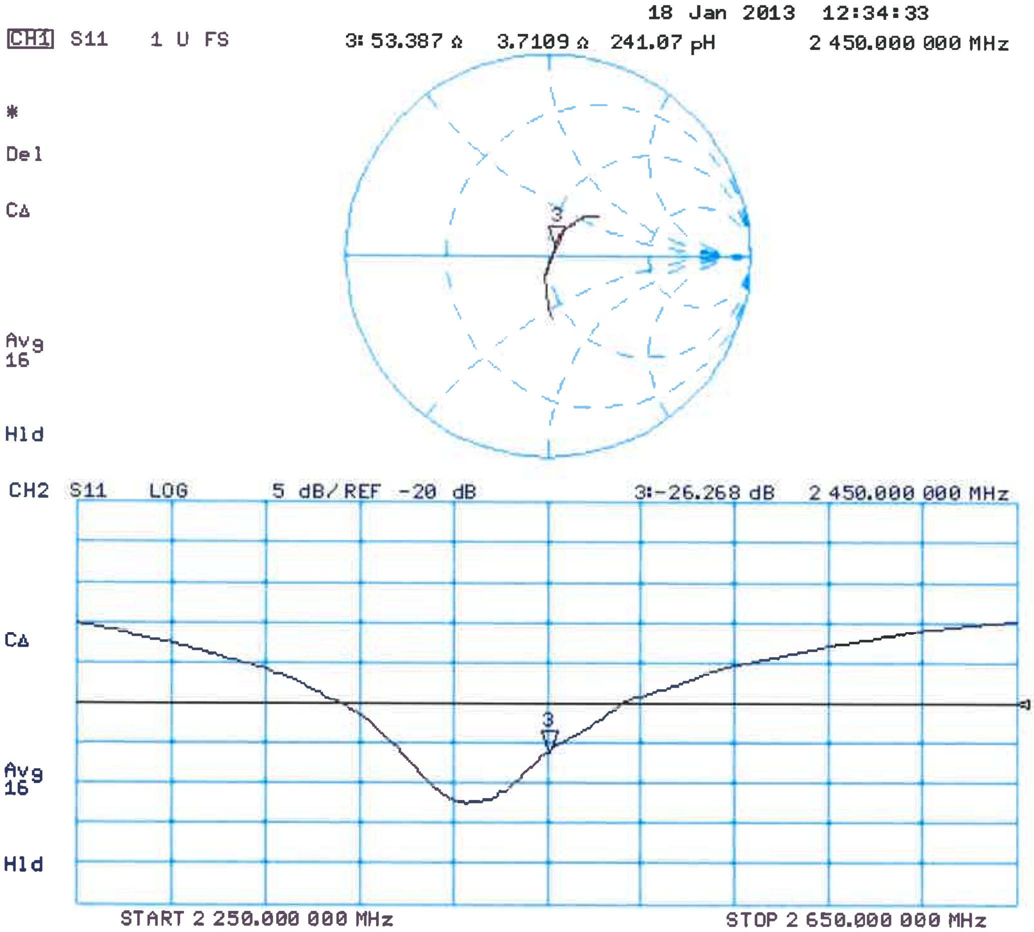
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.892 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 28.0 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.17 W/kg
Maximum value of SAR (measured) = 17.2 W/kg



0 dB = 17.2 W/kg = 12.36 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 18.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 737

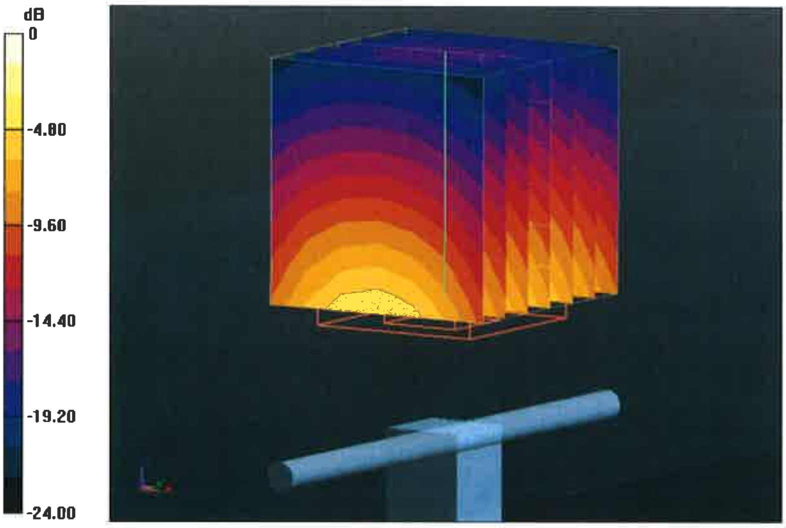
Communication System: CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.01 S/m; ε_r = 50.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.42, 4.42, 4.42); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

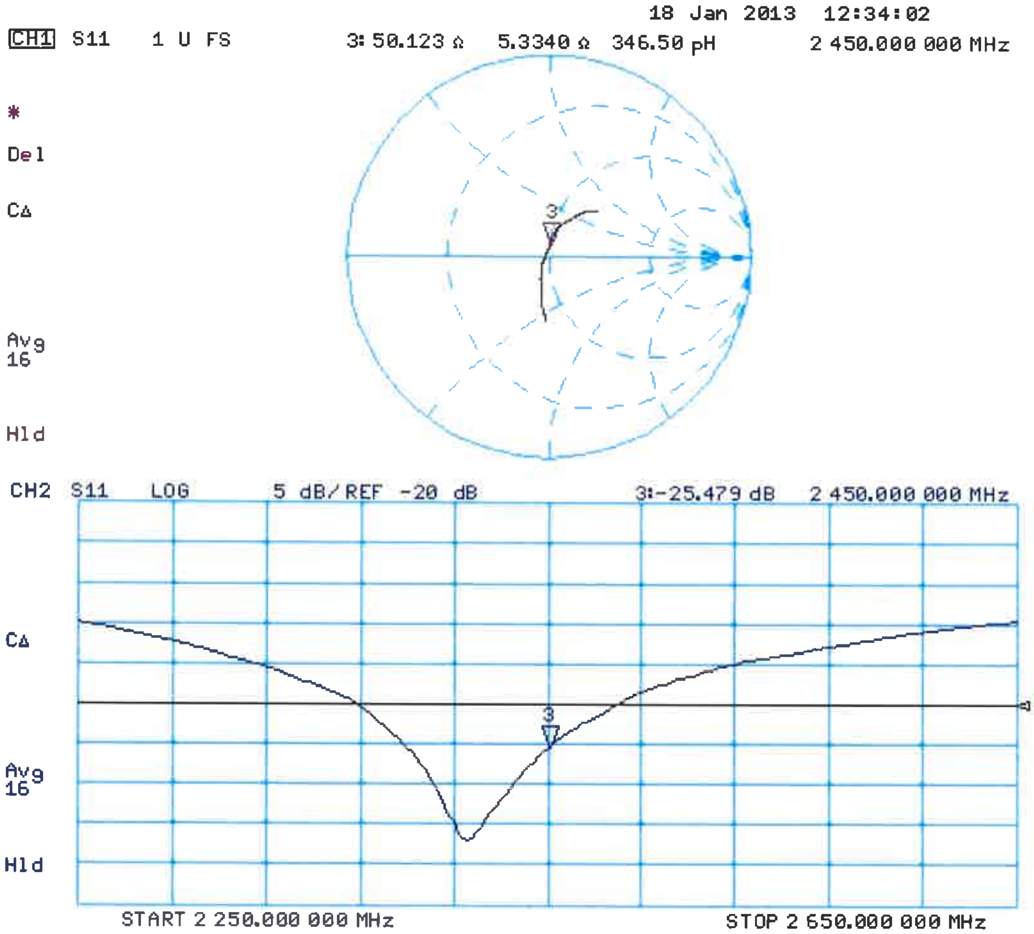
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.076 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 26.9 W/kg
SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.86 W/kg
Maximum value of SAR (measured) = 16.8 W/kg



0 dB = 16.8 W/kg = 12.25 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: SCS 108

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

Certificate No: EX3-3590_Feb13/3

CALIBRATION CERTIFICATE (Replacement of No: EX3-3590_Feb13/2)

Object	EX3DV4 - SN:3590
Calibration procedure(s)	QA CAL-01.v8, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	February 20, 2013

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	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-14
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-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 22, 2013

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

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

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

Accreditation No.: SCS 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	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; Dx,y,z; VRx,y,z: A, B, C, D* 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:3590

Manufactured: March 23, 2009
Calibrated: February 20, 2013

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

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

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.50	0.47	0.50	± 10.1 %
DCP (mV)[B]	94.4	97.2	92.1	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	122.9	±3.0 %
		Y	0.0	0.0	1.0		144.4	
		Z	0.0	0.0	1.0		120.3	

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

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

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

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	10.91	10.91	10.91	0.31	0.89	± 12.0 %
835	41.5	0.90	10.52	10.52	10.52	0.48	0.75	± 12.0 %
900	41.5	0.97	10.53	10.53	10.53	0.63	0.62	± 12.0 %
1450	40.5	1.20	9.08	9.08	9.08	0.17	1.62	± 12.0 %
1640	40.3	1.29	9.10	9.10	9.10	0.55	0.66	± 12.0 %
1750	40.1	1.37	8.89	8.89	8.89	0.54	0.67	± 12.0 %
1900	40.0	1.40	8.70	8.70	8.70	0.67	0.61	± 12.0 %
2000	40.0	1.40	8.67	8.67	8.67	0.73	0.59	± 12.0 %
2300	39.5	1.67	8.32	8.32	8.32	0.55	0.67	± 12.0 %
2450	39.2	1.80	7.88	7.88	7.88	0.46	0.74	± 12.0 %
2600	39.0	1.96	7.69	7.69	7.69	0.28	1.02	± 12.0 %
3500	37.9	2.91	7.75	7.75	7.75	0.57	0.81	± 13.1 %
5200	36.0	4.66	5.79	5.79	5.79	0.35	1.80	± 13.1 %
5300	35.9	4.76	5.61	5.61	5.61	0.32	1.80	± 13.1 %
5500	35.6	4.96	5.20	5.20	5.20	0.36	1.80	± 13.1 %
5600	35.5	5.07	5.05	5.05	5.05	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.92	4.92	4.92	0.35	1.80	± 13.1 %

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

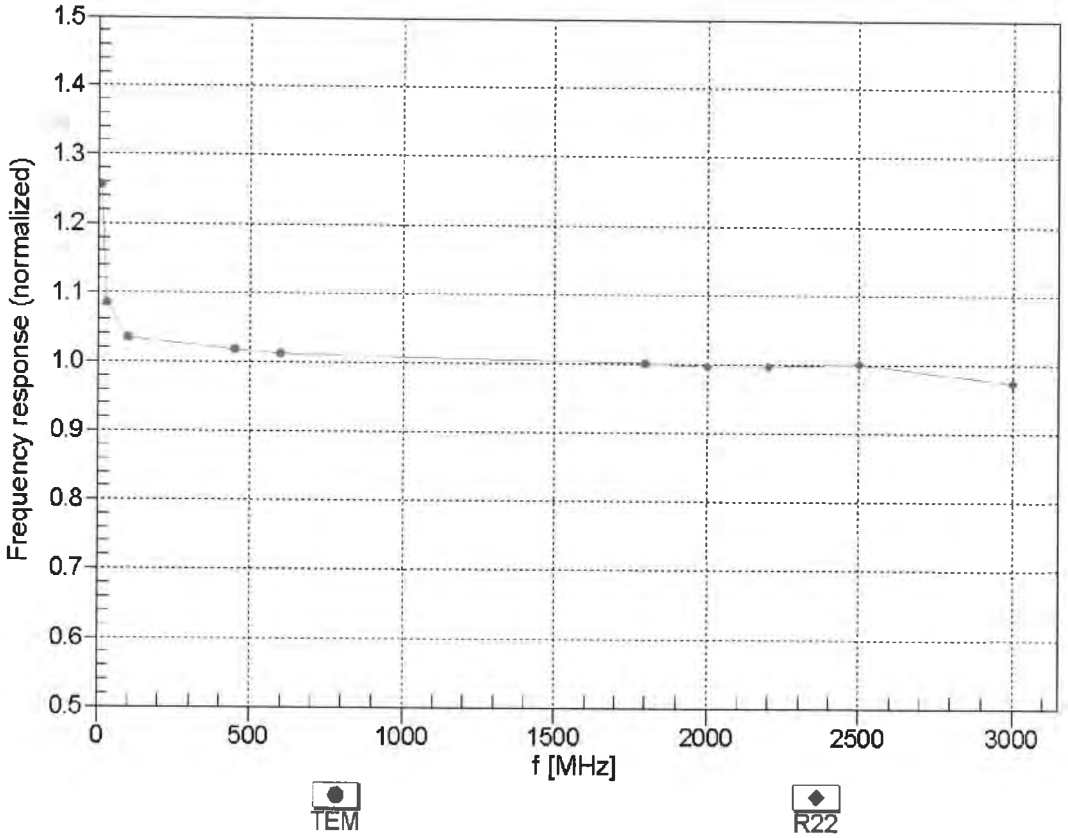
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3590

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	10.60	10.60	10.60	0.80	0.62	± 12.0 %
835	55.2	0.97	10.43	10.43	10.43	0.60	0.71	± 12.0 %
900	55.0	1.05	10.32	10.32	10.32	0.69	0.66	± 12.0 %
1450	54.0	1.30	9.03	9.03	9.03	0.76	0.55	± 12.0 %
1640	53.8	1.40	9.42	9.42	9.42	0.62	0.68	± 12.0 %
1750	53.4	1.49	8.63	8.63	8.63	0.44	0.82	± 12.0 %
1900	53.3	1.52	8.39	8.39	8.39	0.34	0.86	± 12.0 %
2000	53.3	1.52	8.55	8.55	8.55	0.32	0.87	± 12.0 %
2300	52.9	1.81	8.20	8.20	8.20	0.69	0.60	± 12.0 %
2450	52.7	1.95	8.08	8.08	8.08	0.76	0.57	± 12.0 %
2600	52.5	2.16	7.83	7.83	7.83	0.58	0.50	± 12.0 %
3500	51.3	3.31	7.38	7.38	7.38	0.55	0.88	± 13.1 %
5200	49.0	5.30	5.15	5.15	5.15	0.40	1.90	± 13.1 %
5300	48.9	5.42	4.94	4.94	4.94	0.40	1.90	± 13.1 %
5500	48.6	5.65	4.57	4.57	4.57	0.46	1.90	± 13.1 %
5600	48.5	5.77	4.46	4.46	4.46	0.40	1.90	± 13.1 %
5800	48.2	6.00	4.72	4.72	4.72	0.46	1.90	± 13.1 %

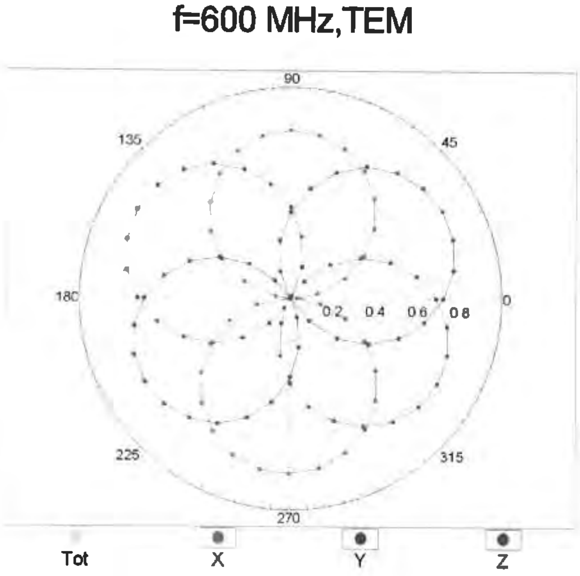
[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of 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.

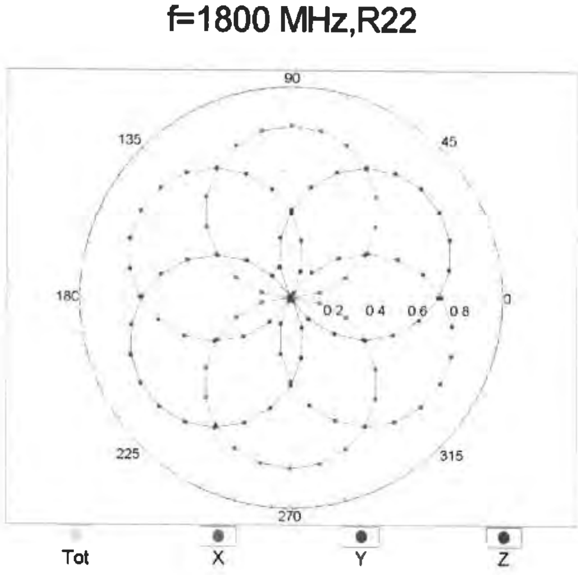
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)

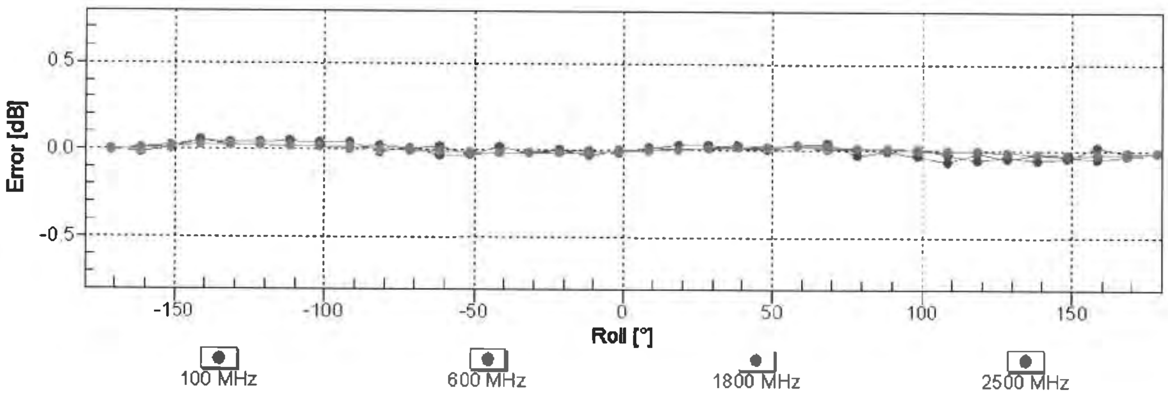


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

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

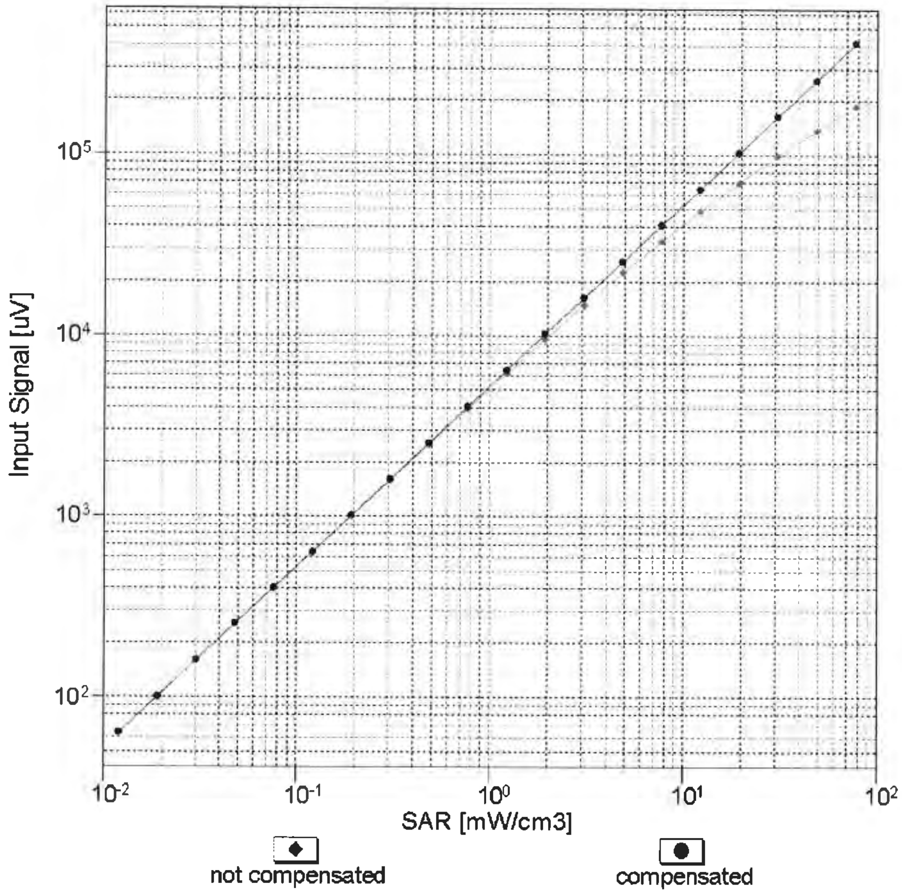


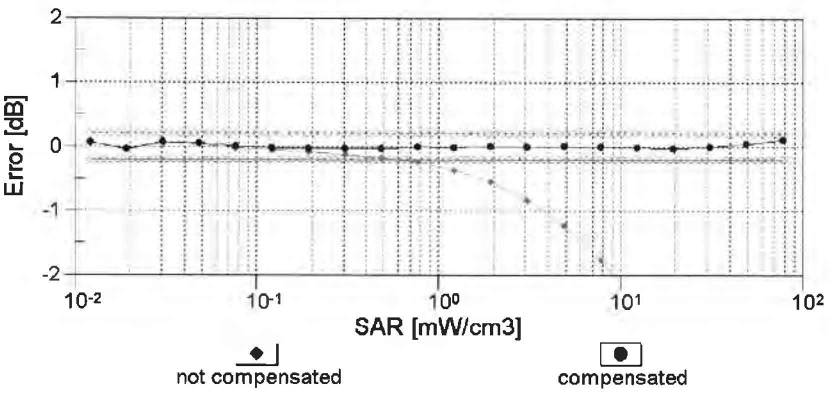




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

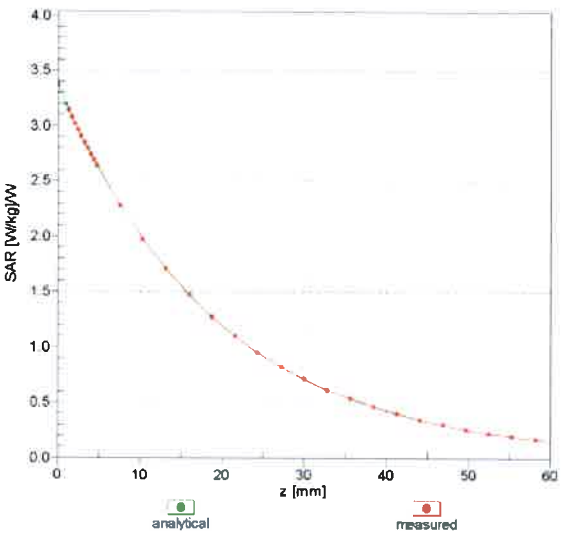




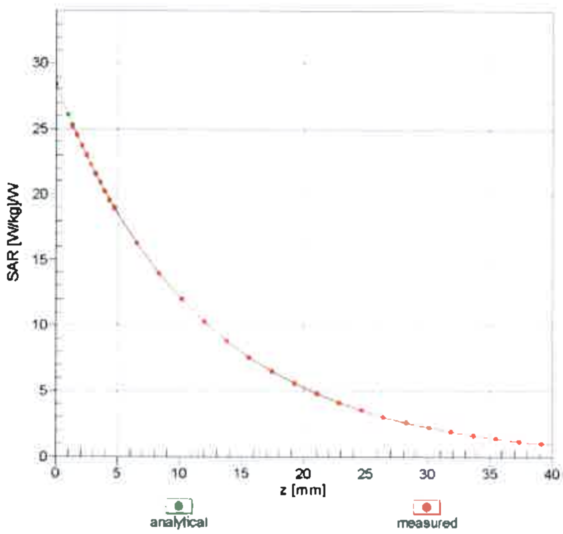
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

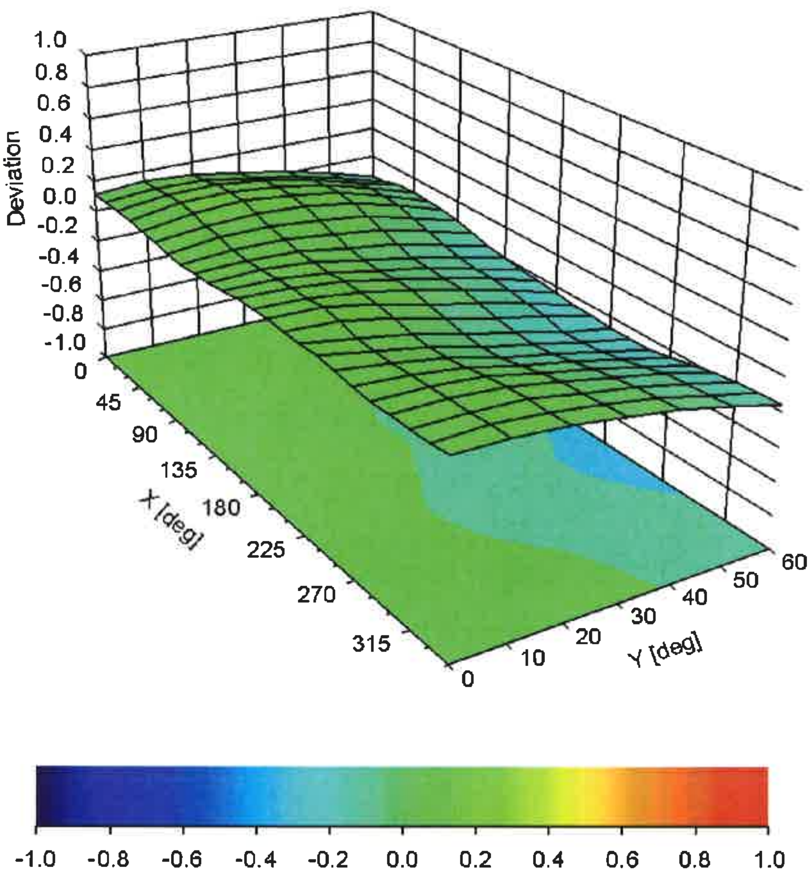


f = 1900 MHz,WGLS R22 (H_convF)



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:3590

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	38.4
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 **B.V. ADT (Auden)**

Certificate No: EX3-3650_Apr13

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: April 30, 2013

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	04-Apr-13 (No. 217-01733)	Apr-14
Power sensor E4412A	MY41498087	04-Apr-13 (No. 217-01733)	Apr-14
Reference 3 dB Attenuator	SN: S5054 (3c)	04-Apr-13 (No. 217-01737)	Apr-14
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-13 (No. 217-01735)	Apr-14
Reference 30 dB Attenuator	SN: S5129 (30b)	04-Apr-13 (No. 217-01738)	Apr-14
Reference Probe ES3DV2	SN: 3013	28-Dec-12 (No. ES3-3013_Dec12)	Dec-13
DAE4	SN: 660	31-Jan-13 (No. DAE4-660_Jan13)	Jan-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-15
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: May 1, 2013

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, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:3650

Manufactured:	March 18, 2008
Repaired:	April 22, 2013
Calibrated:	April 30, 2013

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]	0.39	0.37	0.40	± 10.1 %
DCP (mV)[B]	99.0	98.4	98.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB$\sqrt{\mu V}$	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	103.4	±3.5 %
		Y	0.0	0.0	1.0		132.3	
		Z	0.0	0.0	1.0		108.8	

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	9.69	9.69	9.69	0.41	0.87	± 12.0 %
835	41.5	0.90	9.37	9.37	9.37	0.66	0.67	± 12.0 %
900	41.5	0.97	9.22	9.22	9.22	0.46	0.72	± 12.0 %
1450	40.5	1.20	8.04	8.04	8.04	0.31	1.01	± 12.0 %
1640	40.3	1.29	8.07	8.07	8.07	0.40	0.80	± 12.0 %
1750	40.1	1.37	7.91	7.91	7.91	0.80	0.50	± 12.0 %
1900	40.0	1.40	7.73	7.73	7.73	0.35	0.88	± 12.0 %
2000	40.0	1.40	7.59	7.59	7.59	0.80	0.57	± 12.0 %
2300	39.5	1.67	7.34	7.34	7.34	0.67	0.62	± 12.0 %
2450	39.2	1.80	6.99	6.99	6.99	0.47	0.74	± 12.0 %
2600	39.0	1.96	6.85	6.85	6.85	0.48	0.78	± 12.0 %
3500	37.9	2.91	6.96	6.96	6.96	0.85	0.62	± 13.1 %
5200	36.0	4.66	5.20	5.20	5.20	0.35	1.80	± 13.1 %
5300	35.9	4.76	5.07	5.07	5.07	0.30	1.80	± 13.1 %
5600	35.5	5.07	4.57	4.57	4.57	0.40	1.80	± 13.1 %
5800	35.3	5.27	4.56	4.56	4.56	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.

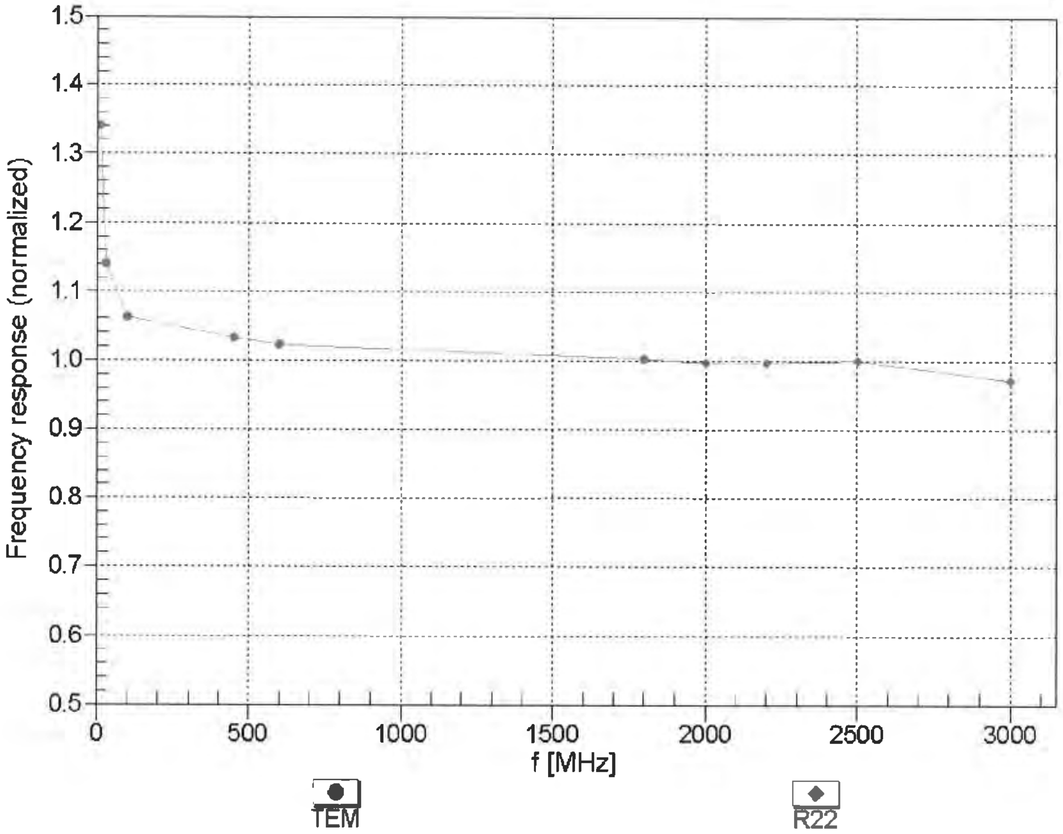
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3650

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	9.51	9.51	9.51	0.73	0.64	± 12.0 %
835	55.2	0.97	9.35	9.35	9.35	0.80	0.50	± 12.0 %
900	55.0	1.05	9.23	9.23	9.23	0.78	0.62	± 12.0 %
1450	54.0	1.30	8.40	8.40	8.40	0.80	0.50	± 12.0 %
1640	53.8	1.40	8.36	8.36	8.36	0.80	0.62	± 12.0 %
1750	53.4	1.49	7.57	7.57	7.57	0.74	0.66	± 12.0 %
1900	53.3	1.52	7.39	7.39	7.39	0.40	0.86	± 12.0 %
2000	53.3	1.52	7.57	7.57	7.57	0.51	0.77	± 12.0 %
2300	52.9	1.81	6.73	6.73	6.73	0.51	0.73	± 12.0 %
2450	52.7	1.95	7.09	7.09	7.09	0.80	0.50	± 12.0 %
2600	52.5	2.16	6.91	6.91	6.91	0.80	0.50	± 12.0 %
3500	51.3	3.31	6.58	6.58	6.58	0.38	1.16	± 13.1 %
5200	49.0	5.30	4.51	4.51	4.51	0.45	1.90	± 13.1 %
5300	48.9	5.42	4.31	4.31	4.31	0.45	1.90	± 13.1 %
5600	48.5	5.77	4.00	4.00	4.00	0.45	1.90	± 13.1 %
5800	48.2	6.00	4.21	4.21	4.21	0.55	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.

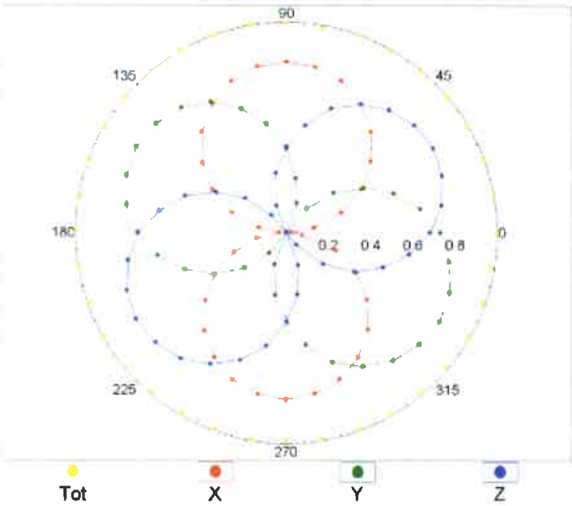
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



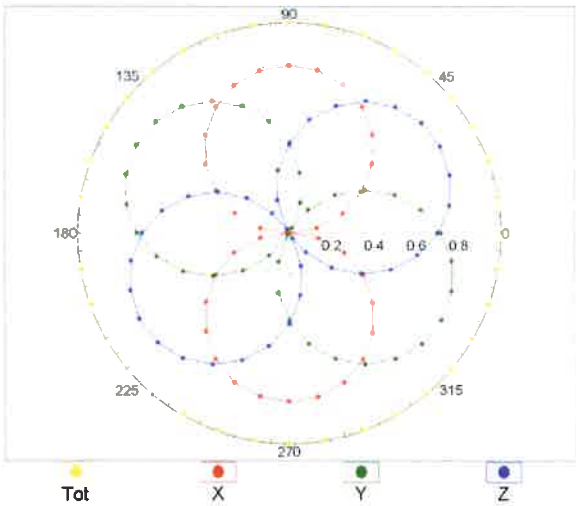
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

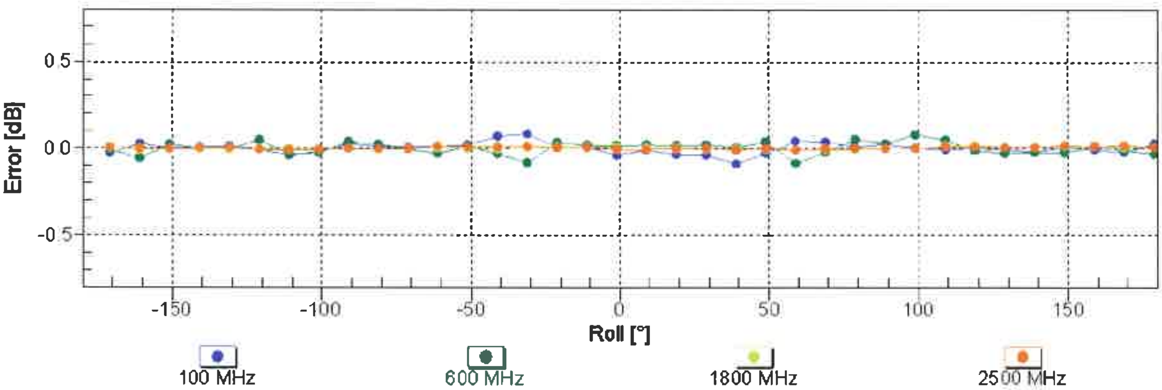
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



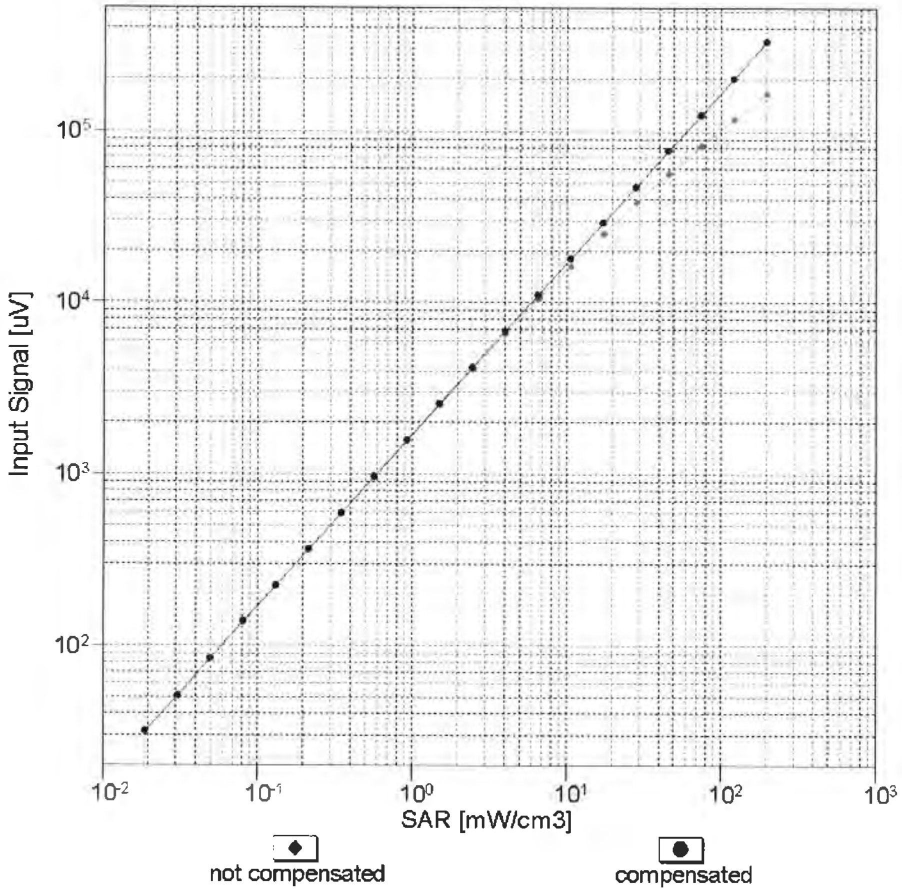
f=1800 MHz,R22

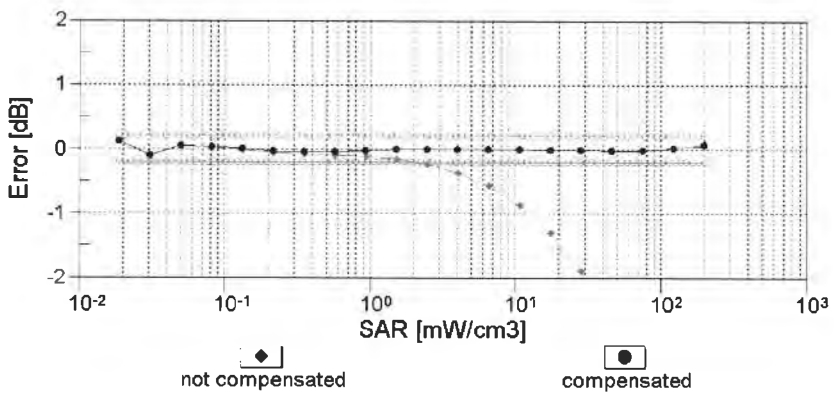




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

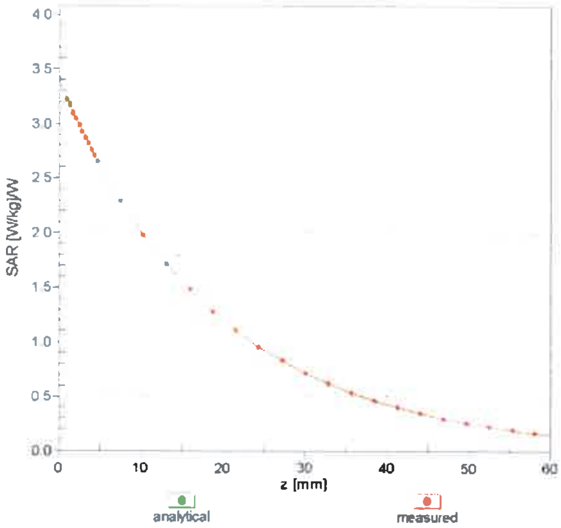




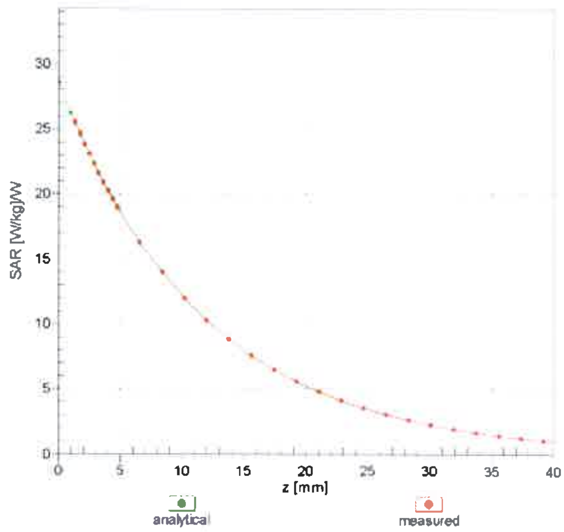
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

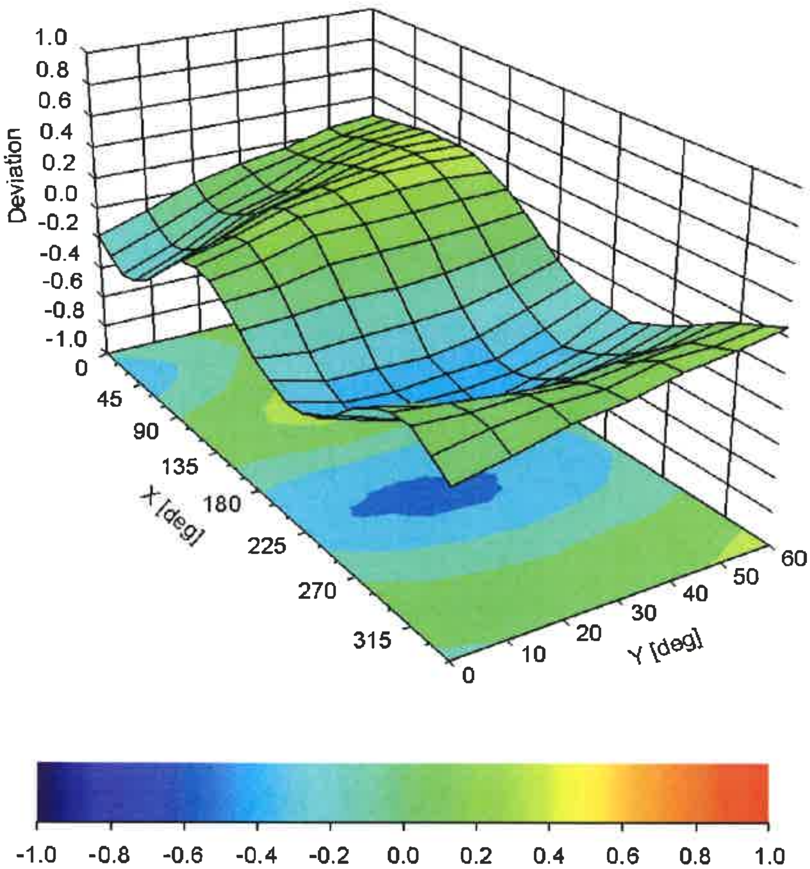


f = 1900 MHz,WGLS R22 (H_convF)



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:3650

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-21.1
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 **B.V. ADT (Auden)**

Certificate No: EX3-3864_Jul12

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3864
Calibration procedure(s)	QA CAL-01.v8, QA CAL-23.v4, QA CAL-25.v4 Calibration procedure for dosimetric E-field probes
Calibration date:	July 19, 2012

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	29-Mar-12 (No. 217-01508)	Apr-13
Power sensor E4412A	MY41498087	29-Mar-12 (No. 217-01508)	Apr-13
Reference 3 dB Attenuator	SN: S5054 (3c)	27-Mar-12 (No. 217-01531)	Apr-13
Reference 20 dB Attenuator	SN: S5086 (20b)	27-Mar-12 (No. 217-01529)	Apr-13
Reference 30 dB Attenuator	SN: S5129 (30b)	27-Mar-12 (No. 217-01532)	Apr-13
Reference Probe ES3DV2	SN: 3013	29-Dec-11 (No. ES3-3013_Dec11)	Dec-12
DAE4	SN: 660	20-Jun-12 (No. DAE4-660_Jun12)	Jun-13
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 Kastrat	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 20, 2012

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:3864

Manufactured: February 2, 2012
Calibrated: July 19, 2012

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3864

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.47	0.44	0.49	± 10.1 %
DCP (mV)[B]	97.6	98.0	97.9	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
0	CW	0.00	X	0.00	0.00	1.00	154.8	±4.1 %
			Y	0.00	0.00	1.00	146.9	
			Z	0.00	0.00	1.00	162.0	

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:3864

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	9.80	9.80	9.80	0.58	0.65	± 12.0 %
1750	40.1	1.37	8.56	8.56	8.56	0.43	0.82	± 12.0 %
1900	40.0	1.40	8.13	8.13	8.13	0.42	0.79	± 12.0 %
2450	39.2	1.80	7.28	7.28	7.28	0.43	0.80	± 12.0 %

[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.

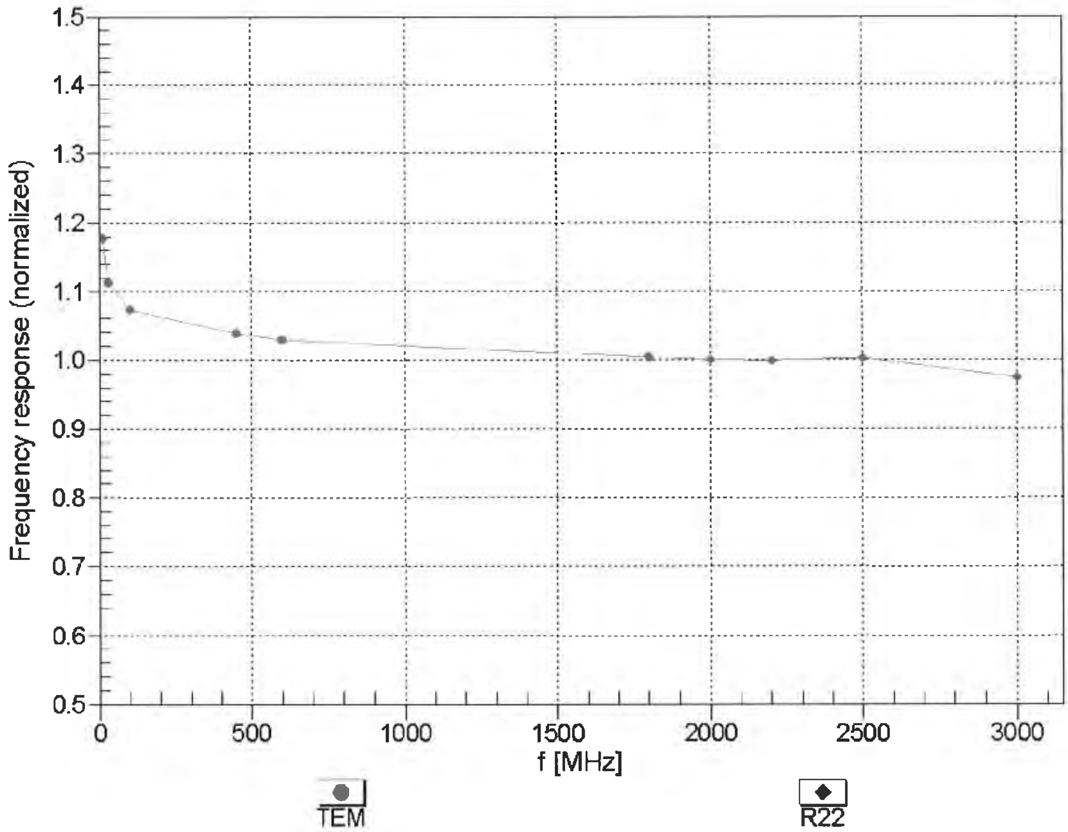
DASY/EASY - Parameters of Probe: EX3DV4 - SN:3864

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	9.94	9.94	9.94	0.58	0.72	± 12.0 %
1750	53.4	1.49	8.45	8.45	8.45	0.41	0.87	± 12.0 %
1900	53.3	1.52	7.88	7.88	7.88	0.48	0.77	± 12.0 %
2450	52.7	1.95	7.49	7.49	7.49	0.80	0.50	± 12.0 %

[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)

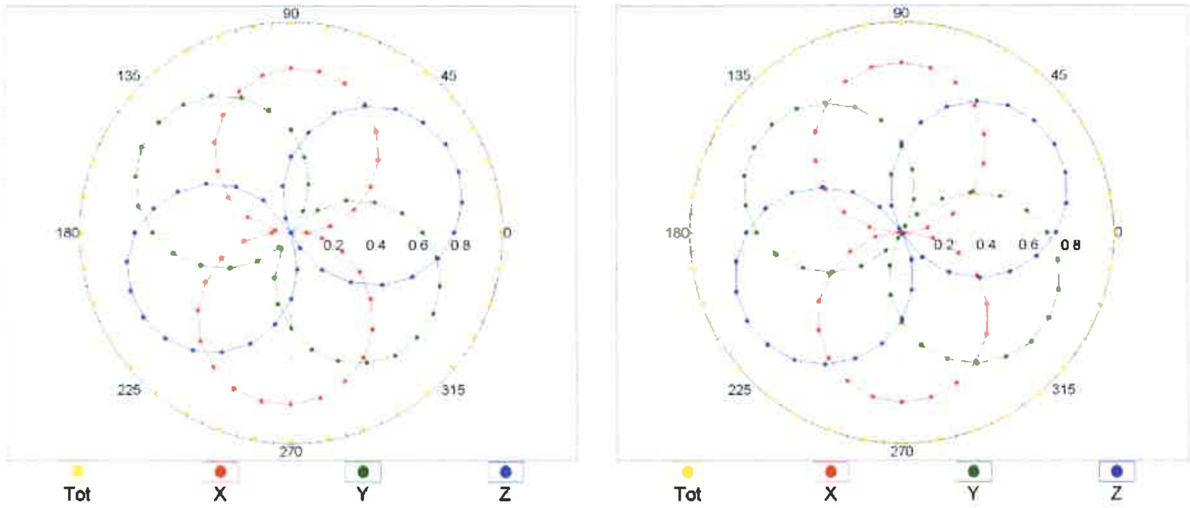


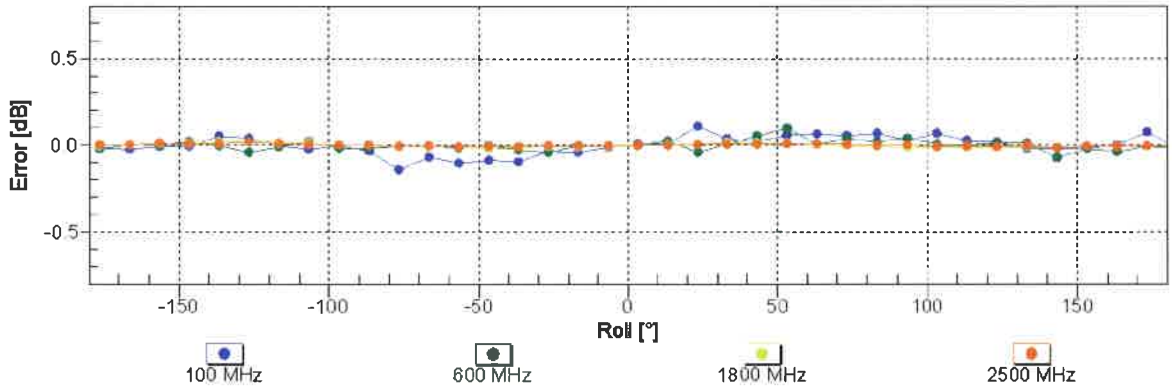
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM

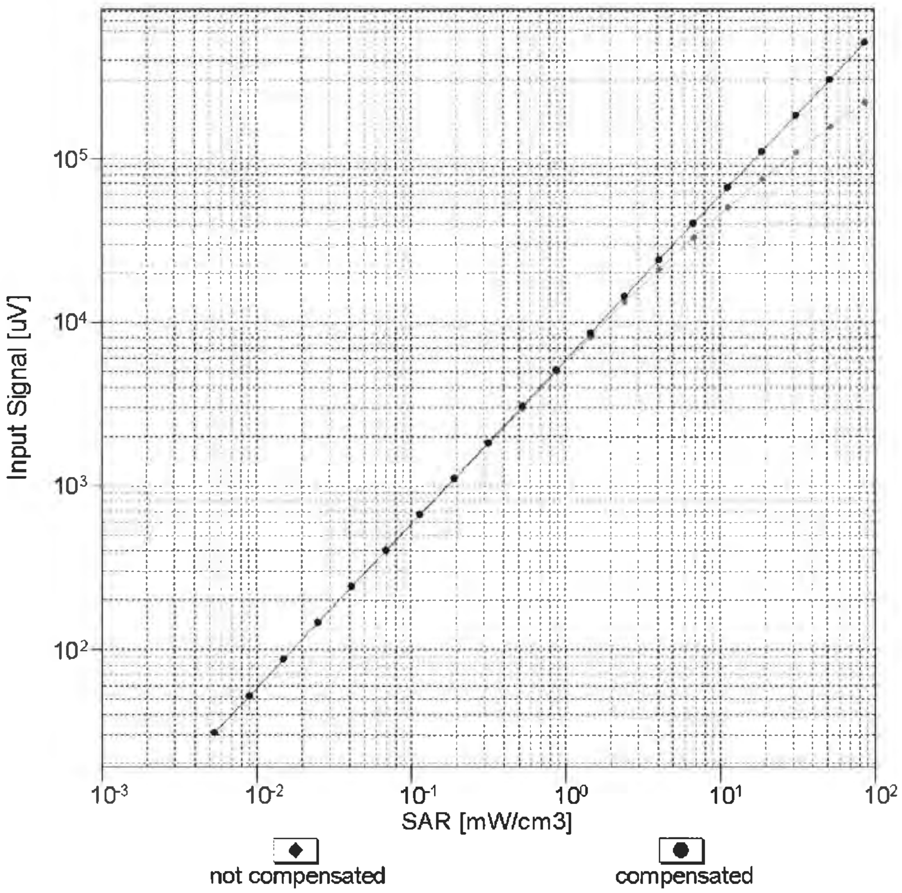
f=1800 MHz,R22

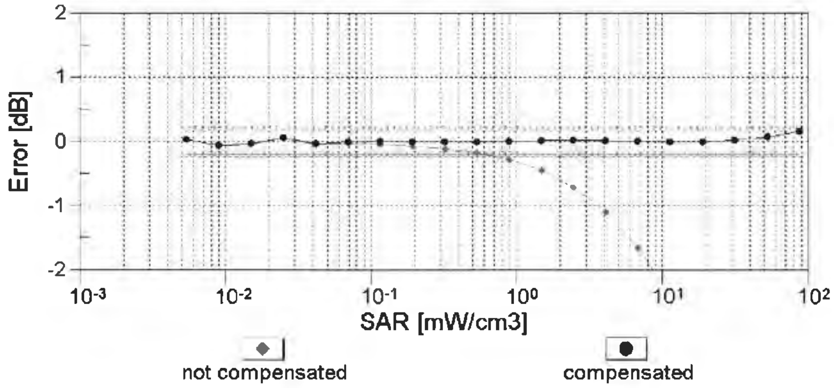




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

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

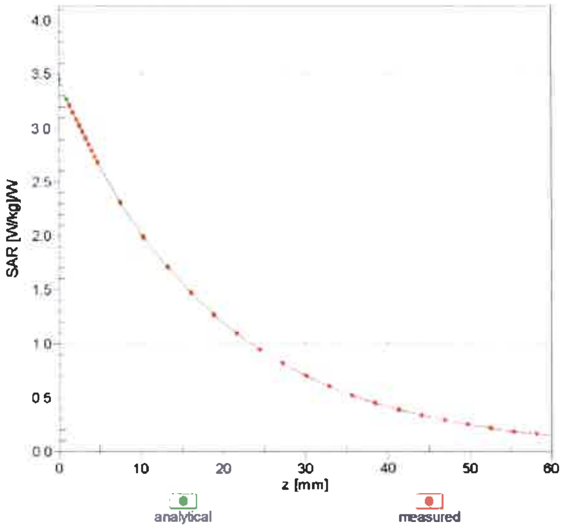




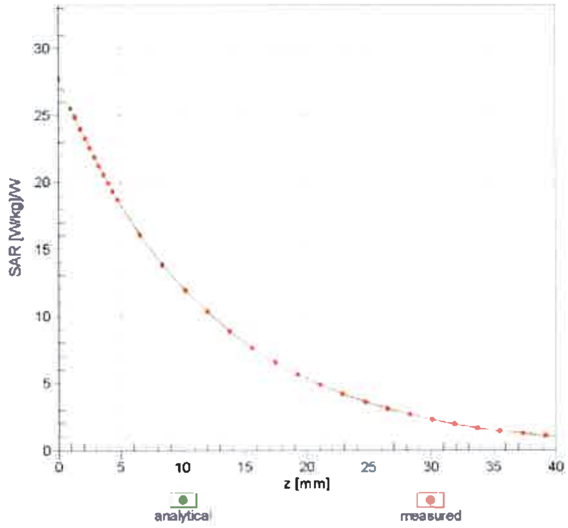
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

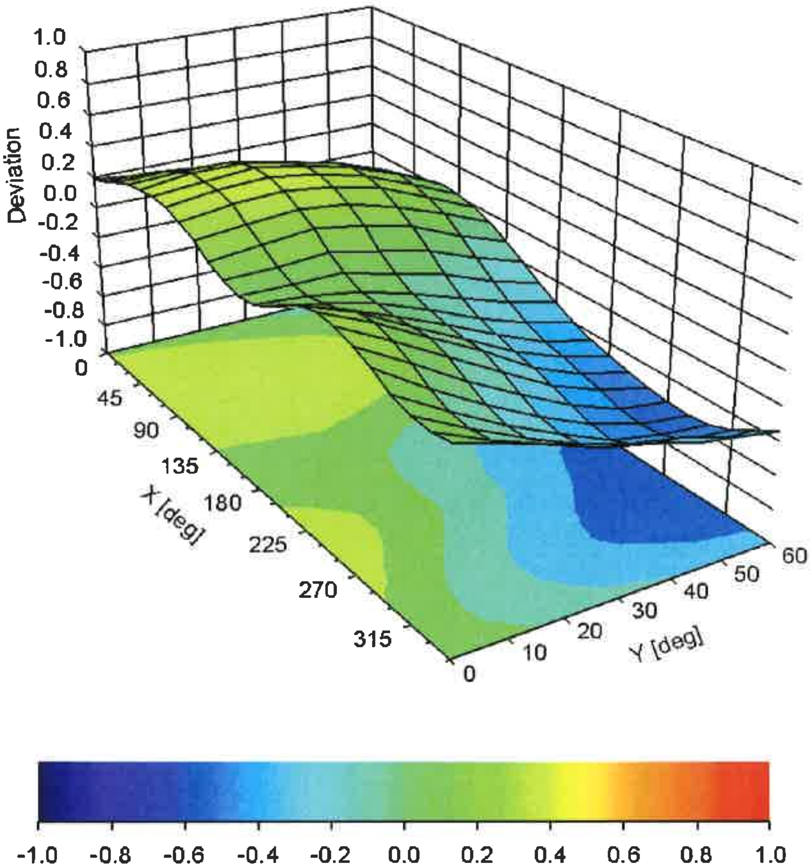


f = 1900 MHz,WGLS R22 (H_convF)



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:3864

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	63.3
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