

SAR TEST REPORT (WLAN)

REPORT NO.: SA110303C19A-1

MODEL NO.: SC900, M1000

FCC ID: TQ2-SC900PDT-BWG

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TESTED: Aug. 21, 2011 ~ Dec. 28, 2011

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RELEASE CONTROL RECORD

ISSUE NO.	REASON FOR CHANGE	DATE ISSUED
Original release	NA	Jan. 02, 2012

1. CERTIFICATION

PRODUCT: Portable Data Terminal
MODEL NO.: SC900, M1000
FCC ID: TQ2-SC900PDT-BWG
BRAND: SCC
APPLICANT: Shin Chuan Computer Co., Ltd.
TESTED: Aug. 21, 2011 ~ Dec. 28, 2011
STANDARDS: **FCC Part 2 (Section 2.1093)**
FCC OET Bulletin 65 Supplement C (01-01)
IEEE 1528-2003

The above equipment has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's SAR characteristics under the conditions specified in this report.

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2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

EUT	Portable Data Terminal
MODEL NO.	SC900, M1000
FCC ID	TQ2-SC900PDT-BWG
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b: 11.0/ 5.5/ 2.0/ 1.0Mbps 802.11g: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps 802.11a: 54.0/ 48.0/ 36.0/ 24.0/ 18.0/ 12.0/ 9.0/ 6.0Mbps
OPERATING FREQUENCY	2.4GHz: 2412 ~ 2462 MHz 5.0GHz: 5180 ~ 5320 MHz, 5500 ~ 5700 MHz, 5745 ~ 5825 MHz
ANTENNA TYPE	Fixed Internal Antenna
ACCESSORY DEVICES	Refer to Note as below

NOTE:

1. The model M1000 is serial model of SC900. The difference between them is M1000 has earphone port and SC900 has USB port and the others are the same.
2. The EUT provides one completed transmitter and one receiver.

MODULATION MODE	TX FUNCTION
802.11b	1TX
802.11g	1TX
802.11a	1TX

3. The EUT were powered by the following adapters, battery & accessories:

NO.	PRODUCT	BRAND	MODEL	DESCRIPTION
1	Power Adapter	Powertron Electronics Corp.	PA1008-050SI100	I/P: 100-240Vac, 50-60Hz, 0.3A O/P: 5Vdc, 1A 5W Max.
2	Battery	ETI CA	NA	Rating: 3.7Vdc, 1840mAh, 6.8Whr

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

2.2 SUMMARY OF PEAK SAR RESULTS

Model: SC900		
Band	Position	SAR _{1g} (W/kg)
802.11a/b/g	Body with holster (0 cm)	0.243
	Body without holster (1.5 cm)	0.139
Bluetooth	Body with holster (0 cm)	N/A
	Body without holster (1.5 cm)	N/A

Model: M1000		
Band	Position	SAR _{1g} (W/kg)
802.11a/b/g	Body with holster (0 cm)	0.178
	Body without holster (1.5 cm)	0.048
Bluetooth	Body with holster (0 cm)	N/A
	Body without holster (1.5 cm)	N/A

2.3 TEST CONFIGURATION

For WLAN SAR testing, WLAN engineering testing software installed on the DUT can provide continuous transmitting RF signal. This RF signal utilized in SAR measurement has almost 100% duty cycle and its crest factor is 1.

2.4 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 2 (2.1093)

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

IEEE 1528-2003

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

2.5 GENERAL INFORMATION OF THE SAR SYSTEM

DASY4/5 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 DASY4/5 software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC.

EX3DV4 ISOTROPIC E-FIELD PROBE

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

NOTE

1. The Probe parameters have been calibrated by the SPEAG. Please reference "APPENDIX D" for the Calibration Certification Report.

TWIN SAM V4.0

CONSTRUCTION

The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, EN 62209-1 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.

SHELL THICKNESS

$2 \pm 0.2\text{mm}$

FILLING VOLUME

Approx. 25liters

DIMENSIONS

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

SYSTEM VALIDATION KITS:

CONSTRUCTION

Symmetrical dipole with 1/4 balun enables measurement of feedpoint impedance with NWA matched for use near flat phantoms filled with brain simulating solutions. Includes distance holder and tripod adaptor

CALIBRATION

Calibrated SAR value for specified position and input power at the flat phantom in brain simulating solutions

FREQUENCY

2450MHz, 5800MHz

RETURN LOSS

> 20dB at specified validation position

POWER CAPABILITY

> 100W ($f < 1\text{GHz}$); > 40W ($f > 1\text{GHz}$)

OPTIONS

Dipoles for other frequencies or solutions and other calibration conditions upon request

DEVICE HOLDER FOR SAM TWIN PHANTOM

CONSTRUCTION

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

DATA ACQUISITION ELECTRONICS

CONSTRUCTION

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

2.6 TEST EQUIPMENT

FOR SAR MEASUREMENT

NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
E-Field Probe	S & P	EX3DV4	3590	Feb. 25, 2011	Feb. 24, 2012
E-Field Probe	S & P	EX3DV4	3650	Jan. 24, 2011	Jan. 23, 2012
DAE	S & P	DAE3	579	Sep. 20, 2010	Sep. 19, 2011
DAE	S & P	DAE4	861	Aug. 29, 2011	Aug. 28, 2012
DAE	S & P	DAE4	1277	Jul. 29, 2011	Jul. 28, 2012
Validation Dipole	S & P	D2450V2	716	Jan. 26, 2011	Jan. 25, 2012
Validation Dipole	S & P	D5GHzV2	1019	Jan. 25, 2011	Jan. 24, 2012

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

FOR TISSUE PROPERTY

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	Network Analyzer	Agilent	E8358A	US41480538	Dec. 30, 2010	Dec. 29, 2011
2	Dielectric Probe	Agilent	85070D	US01440176	NA	NA

NOTE:

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

2.7 GENERAL DESCRIPTION OF THE SPATIAL PEAK SAR EVALUATION

The DASY4/5 post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the micro-volt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	Norm _i , a _{i0} , a _{i1} , a _{i2}
	- Conversion factor	ConvF _i
	- Diode compression point	dcp _i
Device parameters:	- Frequency	F
	- Crest factor	Cf
Media parameters:	- Conductivity	ζ
	- Density	ρ

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

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

V _i	=compensated signal of channel i	(i = x, y, z)
U _i	=input signal of channel i	(i = x, y, z)
Cf	=crest factor of exciting field	(DASY parameter)
dcp _i	=diode compression point	(DASY parameter)

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

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

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

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

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

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

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

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

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

Note that the density is set to 1, to account for actual head tissue density rather than the density of the tissue simulating liquid. The entire evaluation of the spatial peak values is performed within the Post-processing engine (SEMCAD). The system always gives the maximum values for the 1g and 10g cubes. The algorithm to find the cube with highest averaged SAR is divided into the following stages:

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

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

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 5x5x7 points with step size 8, 8 and 5 mm for 300 MHz to 3 GHz, and 7x7x9 points with step size 4, 4 and 2.5 mm for 3 GHz to 6 GHz. The routines are verified and optimized for the grid dimensions used in these cube measurements. The first procedure is an extrapolation (incl. boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid. In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

2.8 DESCRIPTION OF SUPPORT UNITS

The EUT has been tested as an independent unit.

3. DESCRIPTION OF TEST POSITION

3.1. BODY-WORN CONFIGURATION

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

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

If the device supports WiFi hotspot function, the body SAR will test under 1 cm for the surfaces/slide edges where a transmitting antenna is within 2.5 cm from the edge.

4. RECIPES FOR TISSUE SIMULATING LIQUIDS

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

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

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

THE RECIPES FOR 2450MHz SIMULATING LIQUID TABLE

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

THE RECIPES FOR 5GHz SIMULATING LIQUID TABLE

INGREDIENT	HEAD SIMULATING LIQUID (HSL-5GHz)	MUSCLE SIMULATING LIQUID (MSL-5GHz)
Water	65.5	78.6
Triton X-100	17.3	10.7
Diethylenglycol Monohexylether	17.2	10.7
Dielectric Parameters at 22°C	f= 5200MHz $\epsilon = 36.0 \pm 5\%$ $\zeta = 4.66 \pm 5\%$ S/m	f= 5200MHz $\epsilon = 49.0 \pm 5\%$ $\zeta = 5.30 \pm 5\%$ S/m
	f= 5500MHz $\epsilon = 35.6 \pm 5\%$ $\zeta = 4.96 \pm 5\%$ S/m	f= 5500MHz $\epsilon = 48.6 \pm 5\%$ $\zeta = 5.65 \pm 5\%$ S/m
	f= 5800MHz $\epsilon = 35.3 \pm 5\%$ $\zeta = 5.27 \pm 5\%$ S/m	f= 5800MHz $\epsilon = 48.2 \pm 5\%$ $\zeta = 6.00 \pm 5\%$ S/m

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

1. Turn Network Analyzer on and allow at least 30min. warm up.
2. Mount dielectric probe kit so that interconnecting cable to Network Analyzer will not be moved during measurements or calibration.
3. Pour de-ionized water and measure water temperature ($\pm 1^\circ$).
4. Set water temperature in Agilent-Software (Calibration Setup).
5. Perform calibration.
6. Validate calibration with dielectric material of known properties (e.g. polished ceramic slab with $>8\text{mm}$ thickness $\epsilon' = 10.0$, $\epsilon'' = 0.0$). If measured parameters do not fit within tolerance, repeat calibration (± 0.2 for ϵ' : ± 0.1 for ϵ'').
7. Conductivity can be calculated from ϵ'' by $\zeta = \omega \epsilon_0 \epsilon'' = \epsilon'' f [\text{GHz}] / 18$.
8. Measure liquid shortly after calibration. Repeat calibration every hour.
9. Stir the liquid to be measured. Take a sample ($\sim 50\text{ml}$) with a syringe from the center of the liquid container.
10. Pour the liquid into a small glass flask. Hold the syringe at the bottom of the flask to avoid air bubbles.
11. Put the dielectric probe in the glass flask. Check that there are no air bubbles in front of the opening in the dielectric probe kit.
12. Perform measurements.
13. Adjust medium parameters in DASY5 for the frequencies necessary for the measurements („Setup Config“, select medium (e.g. Brain 900MHz) and press „Option“-button.
14. Select the current medium for the frequency of the validation (e.g. Setup Medium Brain 900MHz).

FOR SIMULATING LIQUID

Frequency (MHz)	Liquid Type	Liquid Temp. (°C)	Conductivity (σ)	Permittivity (ϵ_r)	Target σ / Deviation (%)	Target ϵ_r / Deviation (%)	Test Date
2450	Body	23.6	2.00	51.2	1.95 / -2.5	52.7 / 2.9	Aug. 21, 2011
2450	Body	21.2	2.02	53.886	1.95 / -3.5	52.7 / -2.2	Sep. 02, 2011
5200	Body	21.3	5.174	48.005	5.3 / -2.38	49 / -2.03	Dec. 26, 2011
5500	Body	21.3	5.67	47.86	5.65 / 0.35	48.6 / -1.52	Dec. 26, 2011
5800	Body	21.3	6.269	47.17	6 / 4.48	48.2 / -2.14	Dec. 26, 2011
2450	Body	21.3	1.92	53.118	1.95 / 1.6	52.7 / -0.8	Sep. 07, 2011
2450	Body	21.2	2.02	54.0	1.95 / -3.5	52.7 / -2.4	Sep. 09, 2011
5200	Body	21.1	5.162	48.492	5.3 / -2.60	49 / -1.04	Dec. 28, 2011
5500	Body	21.1	5.587	47.93	5.65 / -1.12	48.6 / -1.38	Dec. 28, 2011
5800	Body	21.1	5.976	47.158	6 / -0.40	48.2 / -2.16	Dec. 28, 2011

5. SYSTEM VALIDATION

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

5.1. TEST PROCEDURE

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

1. The "Power Reference Measurement" and "Power Drift Measurement" jobs are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the amplifier output power. If it is too high (above ± 0.1 dB), the system performance check should be repeated; some amplifiers have very high drift during warm-up. A stable amplifier gives drift results in the DASY system below ± 0.02 dB.
2. The "Surface Check" job tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1 mm). In that case it is better to abort the system performance check and stir the liquid.

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

About the validation dipole positioning uncertainty, the constant and low loss dielectric spacer is used to establish the correct distance between the top surface of the dipole and the bottom surface of the phantom, the error component introduced by the uncertainty of the distance between the liquid (i.e., phantom shell) and the validation dipole in the DASY5 system is less than ± 0.1 mm.

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

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

5.2. VALIDATION RESULTS

Date	Frequency (MHz)	Targeted SAR (W/kg)	Measured SAR (W/kg)	Normalized SAR (W/kg)	Deviation (%)
Aug. 21, 2011	2450	53.30	13.10	52.40	-1.69
Sep. 02, 2011	2450	53.30	14.10	56.40	5.82
Dec. 26, 2011	5200	77.10	8.28	82.80	7.39
Dec. 26, 2011	5500	82.40	8.66	86.60	5.10
Dec. 26, 2011	5800	73.40	7.36	73.60	0.27
Sep. 07, 2011	2450	53.30	12.30	49.20	-7.69
Sep. 09, 2011	2450	53.30	13.30	53.20	-0.19
Dec. 28, 2011	5200	77.10	8.03	80.30	4.15
Dec. 28, 2011	5500	82.40	7.85	78.50	-4.73
Dec. 28, 2011	5800	73.40	7.79	77.90	6.13

NOTE:

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

2. Please see Appendix for the photo of system validation test.

5.3. SYSTEM VALIDATION UNCERTAINTIES

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

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C _i)		Standard Uncertainty (±%)		(v _i)
				(1g)	(10g)	(1g)	(10g)	
Measurement System								
Probe Calibration	6.55	Normal	1	1	1	6.55	6.55	∞
Axial Isotropy	0.25	Rectangular	√3	0.7	0.7	0.10	0.10	∞
Hemispherical Isotropy	1.30	Rectangular	√3	0.7	0.7	0.53	0.53	∞
Boundary effects	1.00	Rectangular	√3	1	1	0.58	0.58	∞
Linearity	0.30	Rectangular	√3	1	1	0.17	0.17	∞
System Detection Limits	1.00	Rectangular	√3	1	1	0.58	0.58	∞
Readout Electronics	0.30	Normal	1	1	1	0.30	0.30	∞
Response Time	0.80	Rectangular	√3	1	1	0.46	0.46	∞
Integration Time	2.60	Rectangular	√3	1	1	1.50	1.50	∞
RF Ambient Noise	3.00	Rectangular	√3	1	1	1.73	1.73	9
RF Ambient Reflections	3.00	Rectangular	√3	1	1	1.73	1.73	9
Probe Positioner	0.40	Rectangular	√3	1	1	0.23	0.23	∞
Probe Positioning	2.90	Rectangular	√3	1	1	1.67	1.67	∞
Max. SAR Eval.	1.00	Rectangular	√3	1	1	0.58	0.58	∞
Test sample related								
Sample positioning	1.90	Normal	1	1	1	1.90	1.90	4
Device holder uncertainty	2.80	Normal	1	1	1	2.80	2.80	4
Output power variation-SAR drift measurement	4.50	Rectangular	√3	1	1	2.60	2.60	1
Dipole Related								
Dipole Axis to Liquid Distance	1.60	Rectangular	√3	1	1	0.92	0.92	4
Input Power Drift	3.04	Rectangular	√3	1	1	1.75	1.75	1
Phantom and Tissue parameters								
Phantom Uncertainty	4.00	Rectangular	√3	1	1	2.31	2.31	∞
Liquid Conductivity (target)	5.00	Rectangular	√3	0.64	0.43	1.85	1.24	∞
Liquid Conductivity (measurement)	3.50	Normal	1	0.64	0.43	2.24	1.51	9
Liquid Permittivity (target)	5.00	Rectangular	√3	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	3.39	Normal	1	0.6	0.49	2.03	1.66	9
Combined Standard Uncertainty						9.93	9.57	
Coverage Factor for 95%						Kp=2		
Expanded Uncertainty (K=2)						19.87	19.15	

6. TEST RESULTS

6.1. TEST PROCEDURES

Use the software to control the EUT channel and transmission power. Then record the conducted power before the testing. Place the EUT to the specific test location. After the testing, must writing down the conducted power of the EUT into the report. The SAR value was calculated via the 3D spline interpolation algorithm that has been implemented in the software of DASY5 SAR measurement system manufactured and calibrated by SPEAG. According to the IEEE 1528 standards, the recommended procedure for assessing the peak spatial-average SAR value consists of the following steps:

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

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

In the zoom scan, the distance between the measurement point at the probe sensor location (geometric center behind the probe tip) and the phantom surface is 3mm and maintained at a constant distance of $\pm 0.5\text{mm}$ during a zoom scan to determine peak SAR locations. The distance is 2mm between the first measurement point and the bottom surface of the phantom.

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

In the area scan, the separation distance is 2mm between the each measurement point and the phantom surface. The scan size shall be included the transmission portion of the EUT. The measurement time is the same as the zoom scan. At last the reference power drift shall be less than $\pm 5\%$.

6.2. MEASURED CONDUCTED POWER OF DUT

Band	802.11b			802.11g		
Channel	1	6	11	1	6	11
Frequency (MHz)	2412	2437	2462	2412	2437	2462
Average Power	16.40	16.10	16.00	15.80	16.50	15.90

Band	802.11a						
Channel	36	40	44	48	52	56	60
Frequency (MHz)	5180	5200	5220	5240	5260	5280	5300
Average Power	12.00	10.20	11.40	11.50	11.40	11.60	11.70

Band	802.11a						
Channel	64	100	104	108	112	116	132
Frequency (MHz)	5320	5500	5520	5540	5560	5580	5660
Average Power	11.60	11.70	12.00	11.80	11.90	12.50	12.10

Band	802.11a						
Channel	136	140	149	153	157	161	165
Frequency (MHz)	5680	5700	5745	5765	5785	5805	5825
Average Power	12.40	12.30	12.70	13.00	13.50	13.20	13.40

Band	Bluetooth			-		
Channel	0	39	78	-	-	-
Frequency (MHz)	2402	2441	2480	-	-	-
Power	-2.6	-2.5	-2.8	-	-	-

Unit: dBm

6.3. MEASURED SAR RESULTS

<Body SAR: Body Worn Mode with holster>

Model: SC900

Plot No.	Band	Test Position	Separation Distance (cm)	Channel	SAR _{1g} (W/kg)
1	802.11b	Rear Face	0	1	0.191
2	802.11b	Front Face	0	1	0.023
3	802.11a	Rear Face	0	36	0.194
4	802.11a	Front Face	0	36	0.00638
5	802.11a	Rear Face	0	60	0.203
6	802.11a	Front Face	0	60	0.00406
7	802.11a	Rear Face	0	116	0.243
8	802.11a	Front Face	0	116	0.012
9	802.11a	Rear Face	0	157	0.239
10	802.11a	Front Face	0	157	0.019

Model: M1000

Plot No.	Band	Test Position	Separation Distance (cm)	Channel	SAR _{1g} (W/kg)
31	802.11b	Rear Face	0	1	0.178
32	802.11a	Rear Face	0	36	0.034
33	802.11a	Rear Face	0	60	0.065
34	802.11a	Rear Face	0	116	0.014
35	802.11a	Rear Face	0	157	0.028

<Body SAR: Body Worn Mode without holster>

Model: SC900

Plot No.	Band	Test Position	Separation Distance (cm)	Channel	SAR _{1g} (W/kg)
11	802.11b	Rear Face	1.5	1	0.035
12	802.11b	Front Face	1.5	1	n/a
13	802.11a	Rear Face	1.5	36	0.08
14	802.11a	Front Face	1.5	36	0.00443
15	802.11a	Rear Face	1.5	60	0.098
16	802.11a	Front Face	1.5	60	0.0044
17	802.11a	Rear Face	1.5	116	0.139
18	802.11a	Front Face	1.5	116	0.00496
19	802.11a	Rear Face	1.5	157	0.121
20	802.11a	Front Face	1.5	157	0.011

Note: The "n/a" shown in above table means the SAR is too low and DASy cannot take any SAR value.

Model: M1000

Plot No.	Band	Test Position	Separation Distance (cm)	Channel	SAR _{1g} (W/kg)
36	802.11b	Rear Face	1.5	1	0.048
37	802.11a	Rear Face	1.5	36	0.015
38	802.11a	Rear Face	1.5	60	0.026
39	802.11a	Rear Face	1.5	116	0.00414
40	802.11a	Rear Face	1.5	157	0.00402

Note:

1. The details of WWAN standalone SAR result can be referred to BVADT SAR report number SA110303C19A issued Jan. 02, 2012.
2. Since the maximum power of Bluetooth is less than 60/f, the SAR testing for Bluetooth was not required.

6.4. SIMULTANEOUS TRANSMISSION EVALUATION

Position	Holster	GSM 850	GSM 1900	802.11a/b/g	Max. SAR Summation
Front Face	With	0.492	0.270	0.023	0.515
Rear Face	With	0.578	0.415	0.243	0.821
Front Face	Without	0.350	0.093	0.011	0.361
Rear Face	Without	0.179	0.083	0.139	0.318

Summary:

According to KDB 648474, the simultaneous transmission SAR for WWAN and WLAN was not required, because the SAR summation is less than 1.6 W/kg. The simultaneous transmission SAR for WWAN and BT was not required, because the closest separation distance of these antennas is larger than 2.5 cm and the output power of Bluetooth is less than P_{Ref} (10.8 dBm). The BT standalone SAR and simultaneous transmission SAR for WLAN and BT were not required, because the closest separation distance of these antennas is larger than 2.5 cm and the output power of Bluetooth is less than P_{Ref} (10.8 dBm).

6.5. SAR LIMITS

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

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

7. INFORMATION ON THE TESTING LABORATORIES

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

Copies of accreditation certificates of our laboratories obtained from approval agencies can be downloaded from our web site: www.adt.com.tw/index.5.phtml. If you have any comments, please feel free to contact us at the following:

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3185050

Email: service.adt@tw.bureauveritas.com

Web Site: www.adt.com.tw

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

---END---

Date: 2011/8/21

Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab

System Check_MSL2450_110821

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

Communication System: CW2450; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2450$ MHz; $\sigma = 2$ mho/m; $\epsilon_r = 51.2$; $\rho = 1000$ kg/m³

Air Temperature: 24.6 deg C; Liquid Temperature: 23.6 deg C

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/7/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Pin=250mW/Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 15.2 mW/g

Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

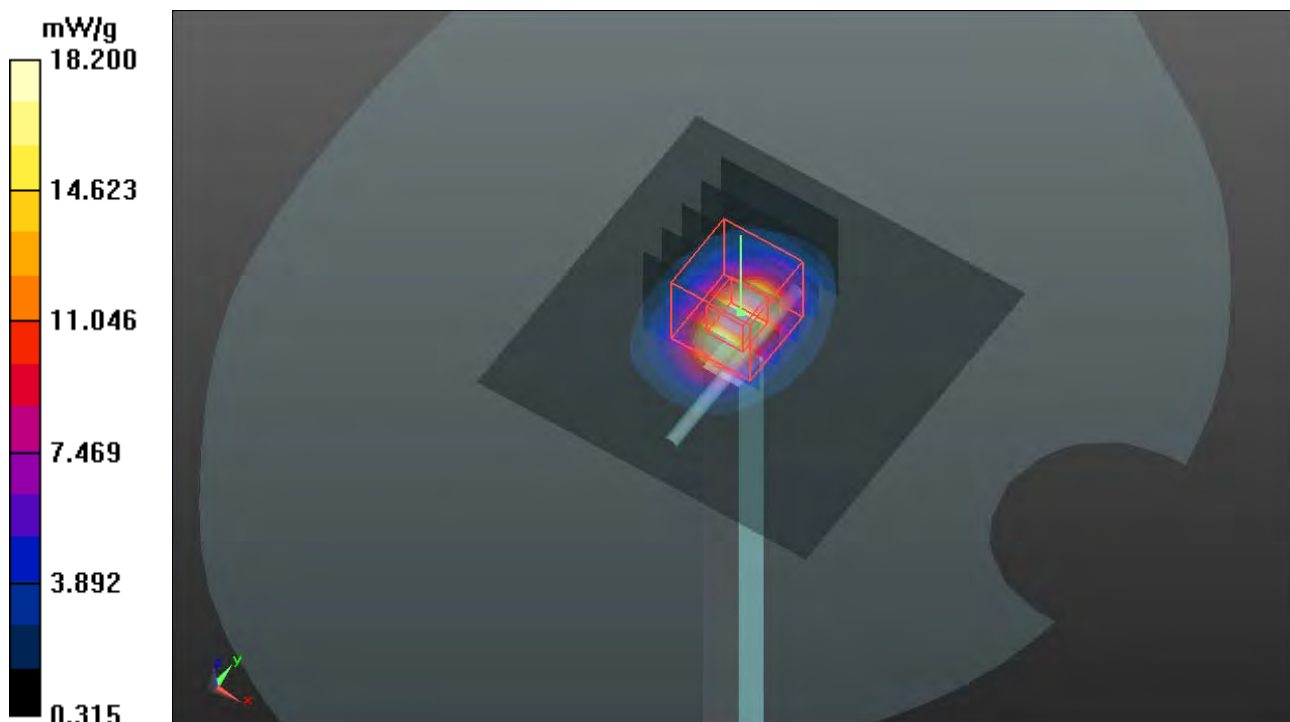
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.8 V/m; Power Drift = -0.049 dB

Peak SAR (extrapolated) = 25.8 W/kg

SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.15 mW/g

Maximum value of SAR (measured) = 18.2 mW/g



System Check_MSL2450_110902**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 716**

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

Medium: MSL2450_0902 Medium parameters used: $f = 2450$ MHz; $\sigma = 2.02$ mho/m; $\epsilon_r = 53.886$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.4 °C; Liquid Temperature : 21.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2/25/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 7/29/2011
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Pin=250mW/Area Scan (61x61x1): Measurement grid:

dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 23.220 mW/g

Pin=250mW/Zoom Scan (7x7x7)/Cube 0:

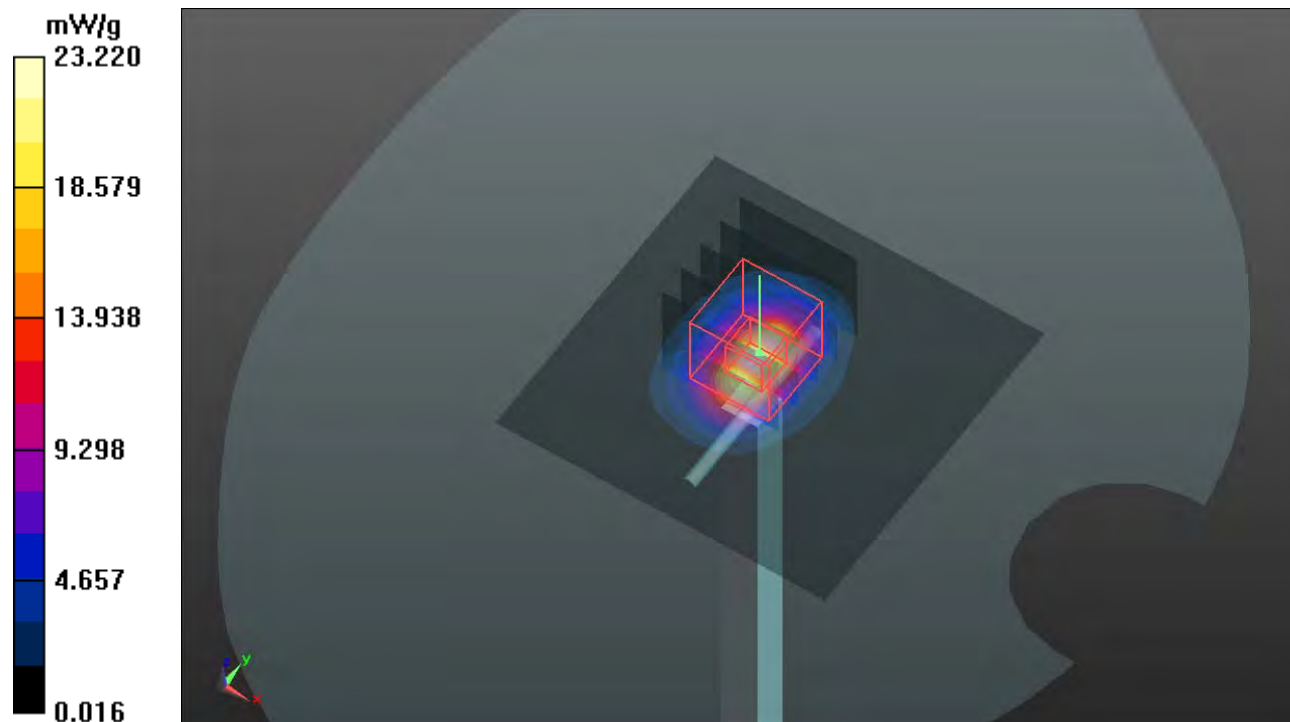
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.7 V/m; Power Drift = -0.0027 dB

Peak SAR (extrapolated) = 30.059 W/kg

SAR(1 g) = 14.1 mW/g; SAR(10 g) = 6.37 mW/g

Maximum value of SAR (measured) = 21.852 mW/g



System Check_B5200_111226**DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1019**

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5200$ MHz; $\sigma = 5.174$ mho/m; $\epsilon_r = 48.005$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.81, 4.81, 4.81); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

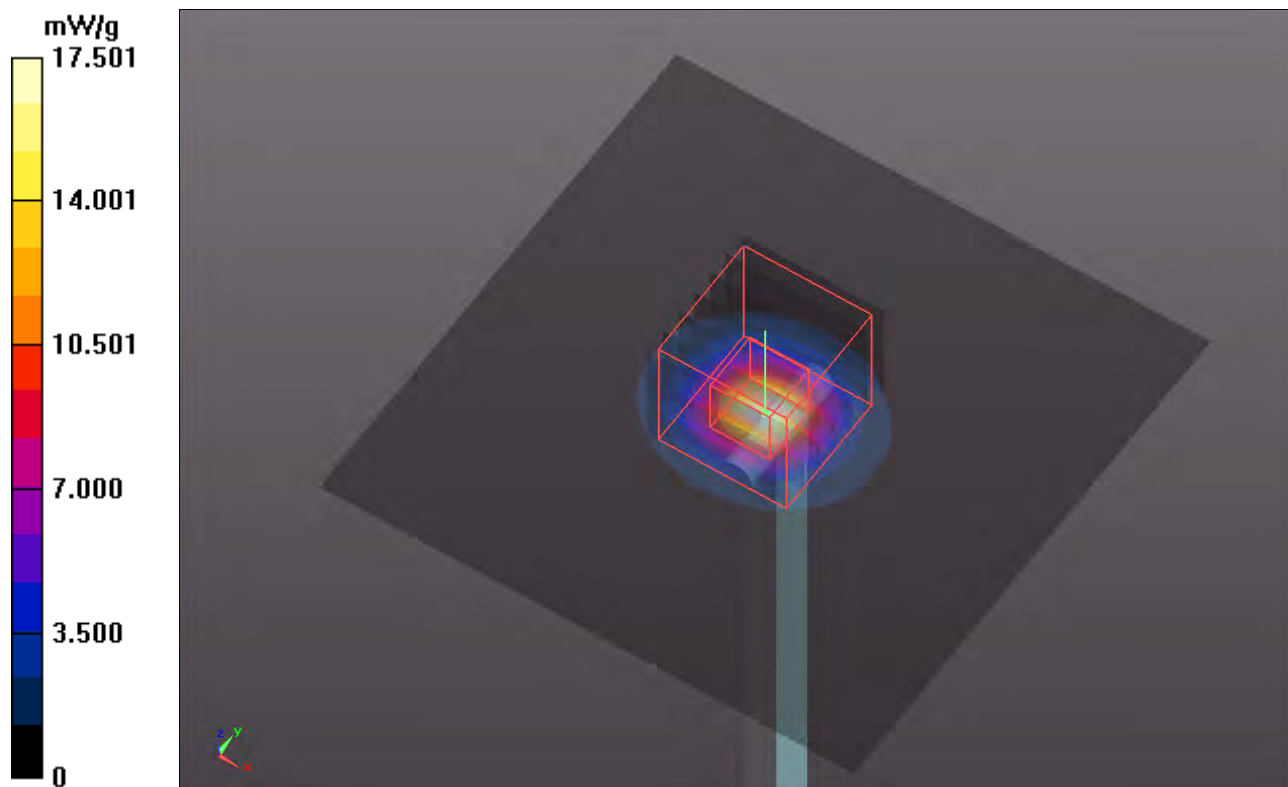
Pin=100mW, f=5200 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 17.586 mW/g**Pin=100mW, f=5200 MHz/Zoom Scan (7x7x9)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 64.894 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 31.548 W/kg

SAR(1 g) = 8.28 mW/g; SAR(10 g) = 2.34 mW/g

Maximum value of SAR (measured) = 17.501 mW/g



System Check_B5500_111226**DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1019**

Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5500$ MHz; $\sigma = 5.67$ mho/m; $\epsilon_r = 47.86$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.32, 4.32, 4.32); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

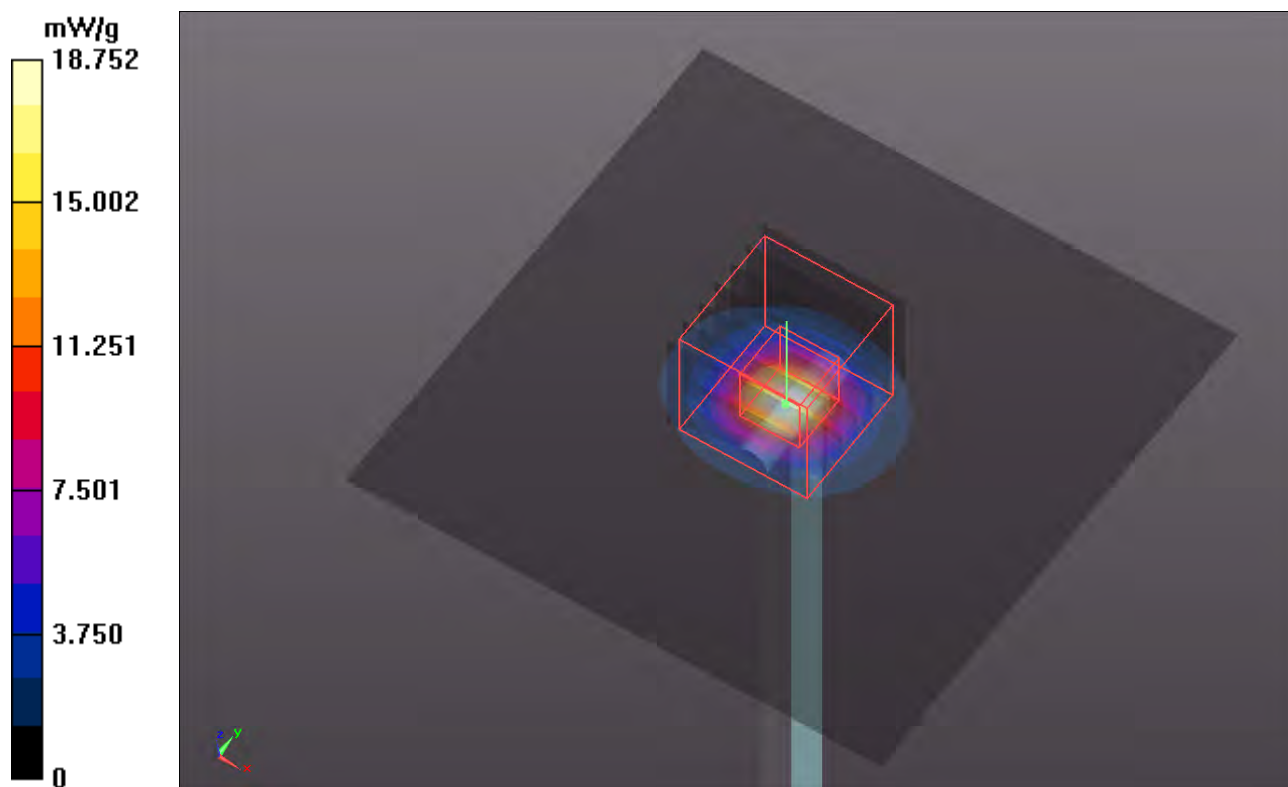
Pin=100mW, f=5500 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 18.945 mW/g**Pin=100mW, f=5500 MHz/Zoom Scan (7x7x9)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 62.070 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 35.081 W/kg

SAR(1 g) = 8.66 mW/g; SAR(10 g) = 2.4 mW/g

Maximum value of SAR (measured) = 18.752 mW/g



System Check_B5800_111226**DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1019**

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5800$ MHz; $\sigma = 6.269$ mho/m; $\epsilon_r = 47.17$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.55, 4.55, 4.55); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

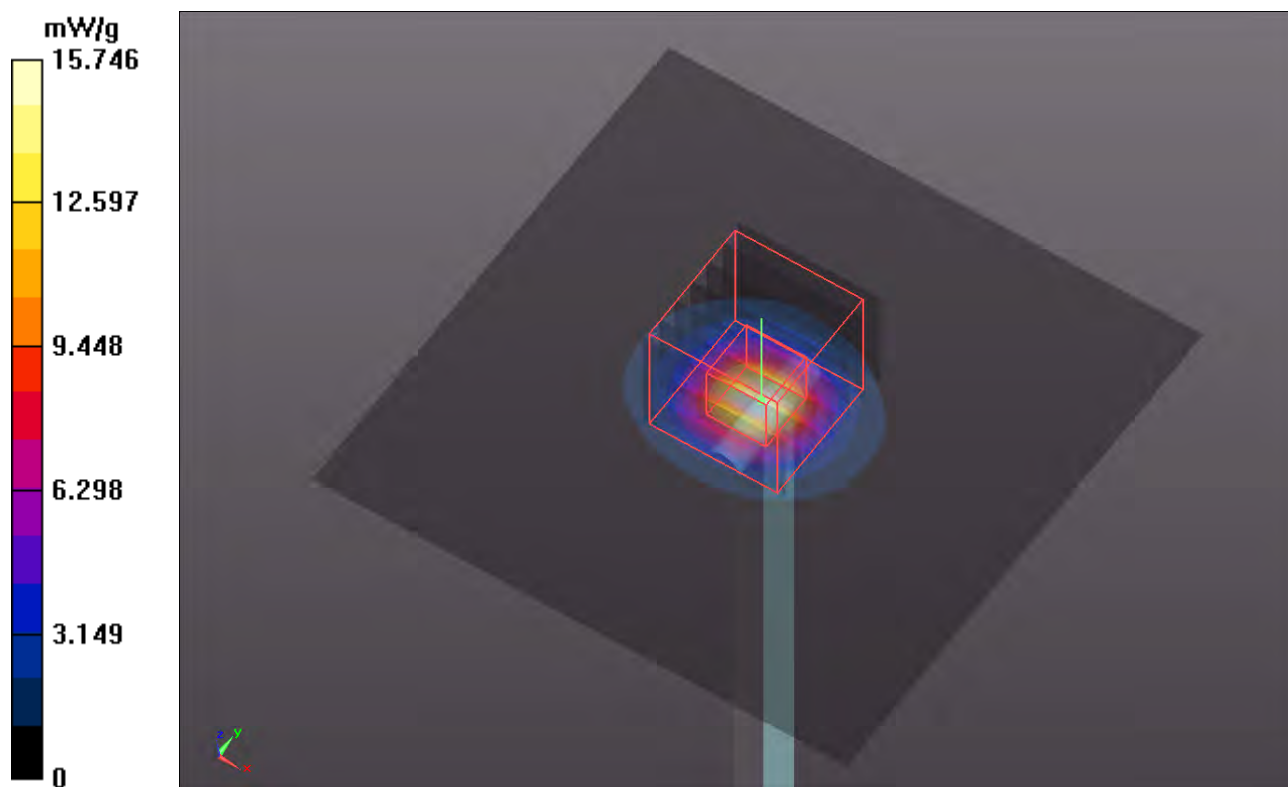
Pin=100mW, f=5800 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 15.961 mW/g**Pin=100mW, f=5800 MHz/Zoom Scan (7x7x9)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 55.192 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 30.808 W/kg

SAR(1 g) = 7.36 mW/g; SAR(10 g) = 2.07 mW/g

Maximum value of SAR (measured) = 15.746 mW/g



System Check_MSL2450_110907**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 716**

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

Medium: MSL2450_110907 Medium parameters used: $f = 2450$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 53.118$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.05, 7.05, 7.05); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/7/29
- Phantom: ELI 4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Pin=250 mW, dist=2.0mm (EX-Probe)/Area Scan (61x61x1): Measurement grid:

dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 18.959 mW/g

Pin=250 mW, dist=2.0mm (EX-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid:

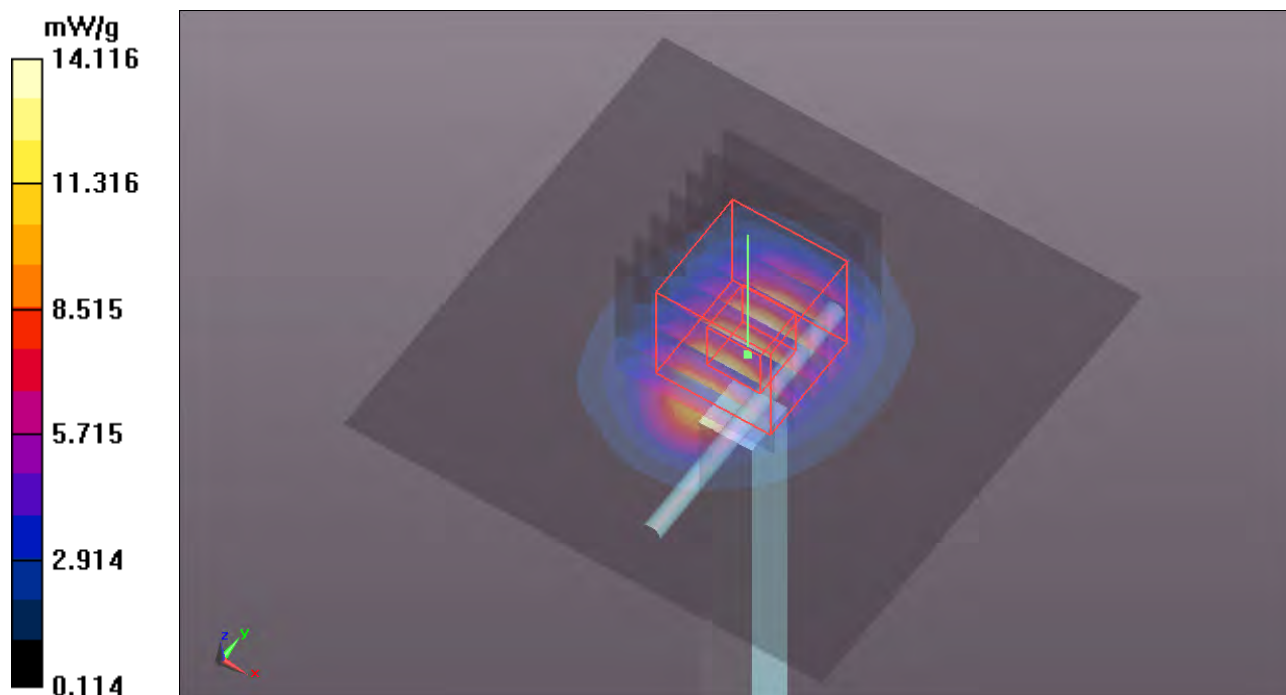
dx=5mm, dy=5mm, dz=5mm

Reference Value = 78.643 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 25.186 W/kg

SAR(1 g) = 12.3 mW/g; SAR(10 g) = 5.71 mW/g

Maximum value of SAR (measured) = 14.116 mW/g



System Check_MSL2450_110909**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 716**

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

Medium: MSL2450_0909 Medium parameters used: $f = 2450$ MHz; $\sigma = 2.02$ mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.4 °C; Liquid Temperature : 21.2 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.05, 7.05, 7.05); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/7/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY52, V52.6 Build 2; Postprocessing SW: SEMCAD, V1.8 Build 186

Pin=250mW/Area Scan (61x61x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 21.4 mW/g

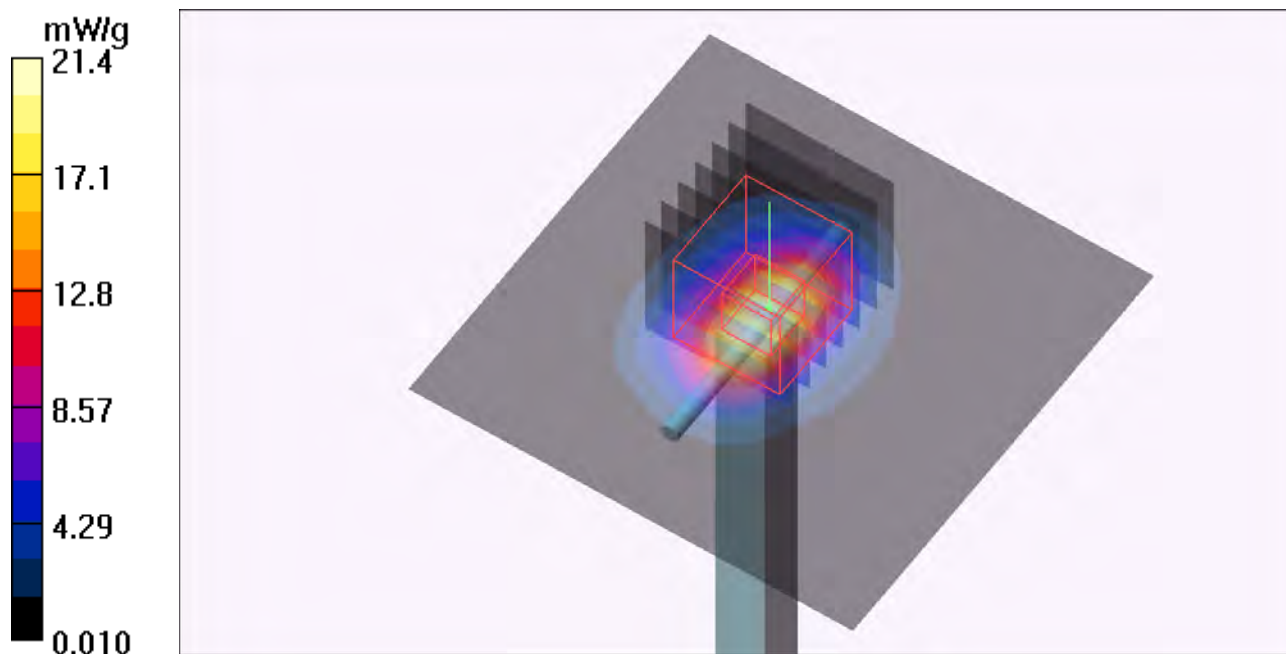
Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.5 V/m; Power Drift = -0.165 dB

Peak SAR (extrapolated) = 29.1 W/kg

SAR(1 g) = 13.3 mW/g; SAR(10 g) = 5.91 mW/g

Maximum value of SAR (measured) = 20.9 mW/g



System Check_B5200_111228**DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1019**

Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used: $f = 5200$ MHz; $\sigma = 5.162$ mho/m; $\epsilon_r = 48.492$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C; Liquid Temperature : 21.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.81, 4.81, 4.81); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

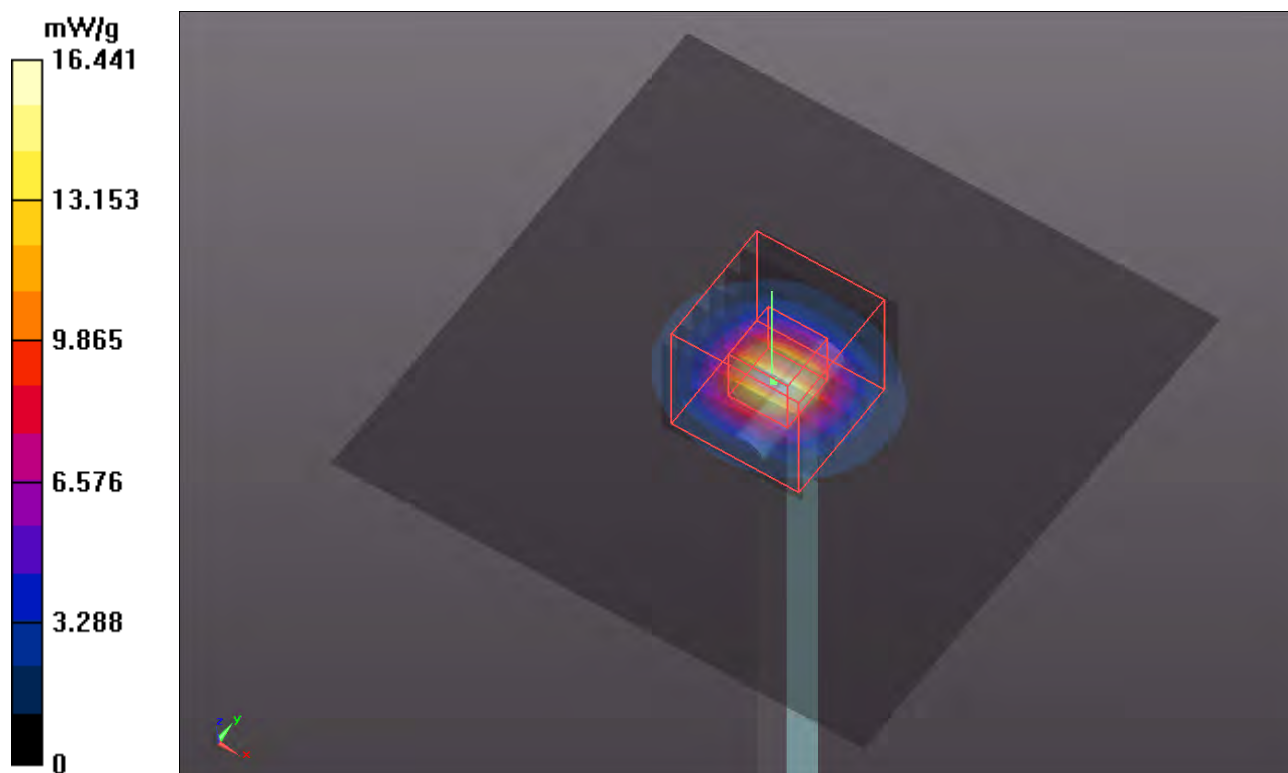
Pin=100mW, f=5200 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 16.905 mW/g**Pin=100mW, f=5200 MHz/Zoom Scan (7x7x9)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 61.904 V/m; Power Drift = 0.00031 dB

Peak SAR (extrapolated) = 28.4310

SAR(1 g) = 8.03 mW/g; SAR(10 g) = 2.21 mW/g

Maximum value of SAR (measured) = 16.441 mW/g



System Check_B5500_111228**DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1019**

Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used: $f = 5500$ MHz; $\sigma = 5.587$ mho/m; $\epsilon_r = 47.93$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C; Liquid Temperature : 21.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.32, 4.32, 4.32); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

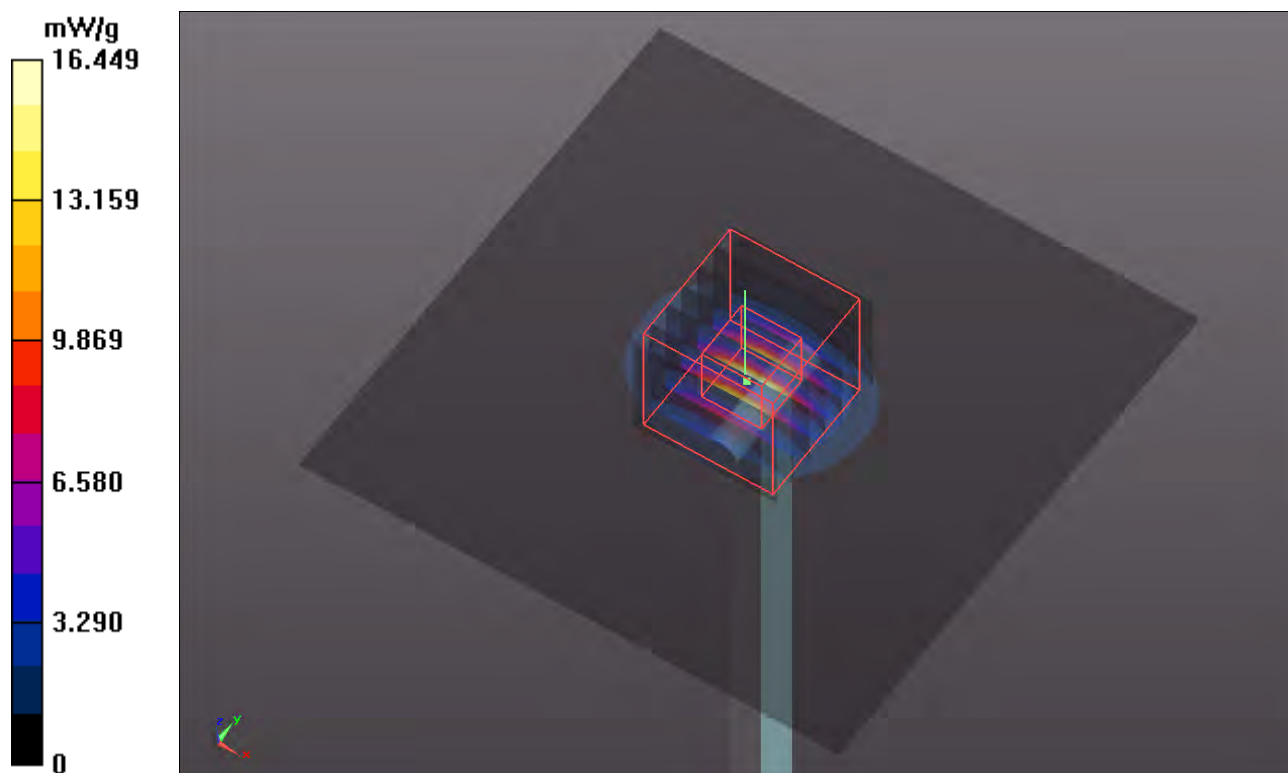
Pin=100mW, f=5500 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 16.721 mW/g**Pin=100mW, f=5500 MHz/Zoom Scan (7x7x9)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 59.698 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 29.6210

SAR(1 g) = 7.85 mW/g; SAR(10 g) = 2.12 mW/g

Maximum value of SAR (measured) = 16.449 mW/g



System Check_B5800_111228**DUT: Dipole 5 GHz; Type: D5GHzV2; SN: 1019**

Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used: $f = 5800$ MHz; $\sigma = 5.976$ mho/m; $\epsilon_r = 47.158$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C ; Liquid Temperature : 21.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.55, 4.55, 4.55); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

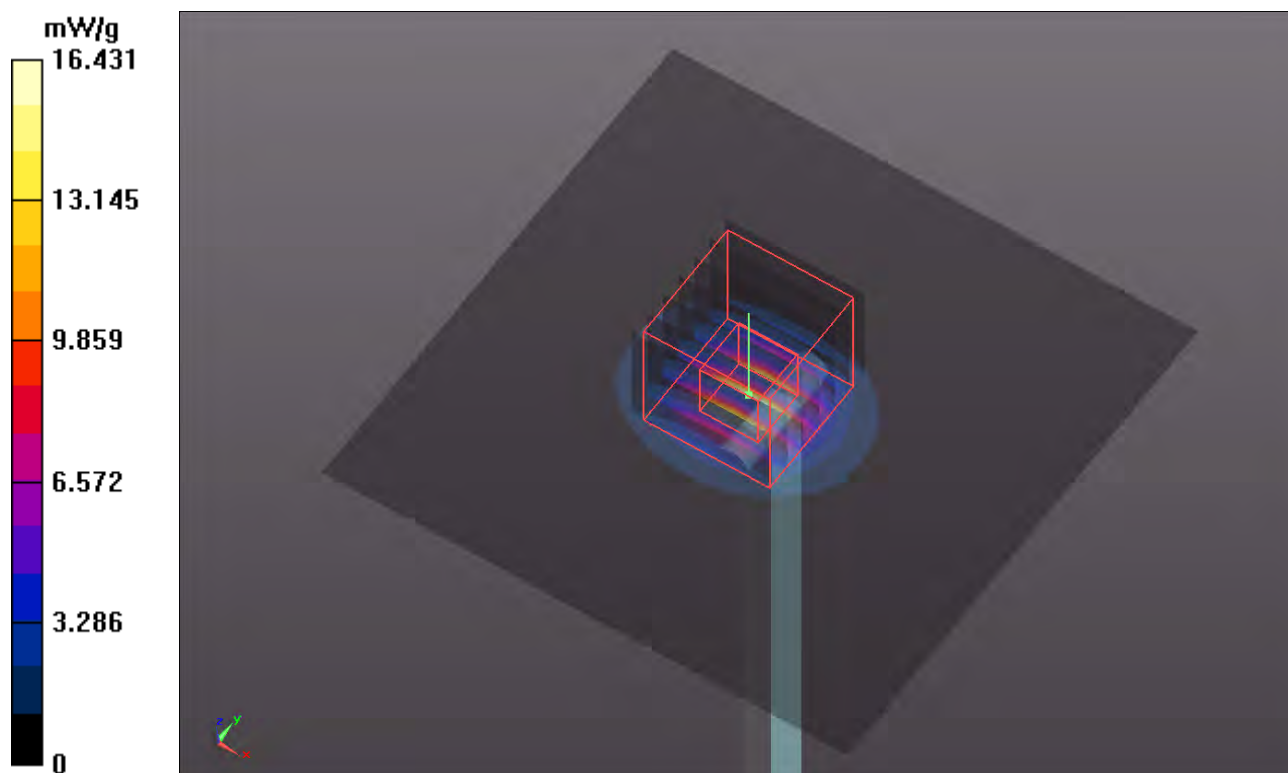
Pin=100mW, f=5800 MHz/Area Scan (91x91x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 16.288 mW/g**Pin=100mW, f=5800 MHz/Zoom Scan (7x7x9)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 57.241 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 31.2260

SAR(1 g) = 7.79 mW/g; SAR(10 g) = 2.25 mW/g

Maximum value of SAR (measured) = 16.431 mW/g



Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab

P01 802.11b_Rear Face_0cm_Ch1

DUT: 110420C35

Communication System: IEEE 802.11b WLAN; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2412$ MHz; $\sigma = 1.95$ mho/m; $\epsilon_r = 51.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Air Temperature: 24.6 deg C; Liquid Temperature: 23.6 deg C

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/7/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1/Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm

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

Ch1/Zoom Scan (7x7x9)/Cube 0:

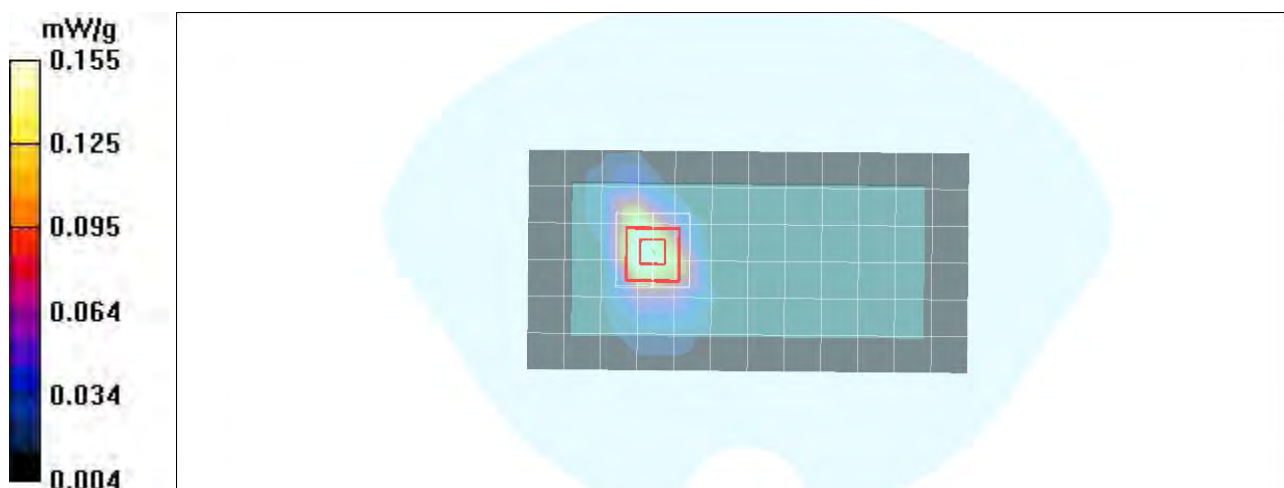
Measurement grid: dx=5mm, dy=5mm, dz=3mm

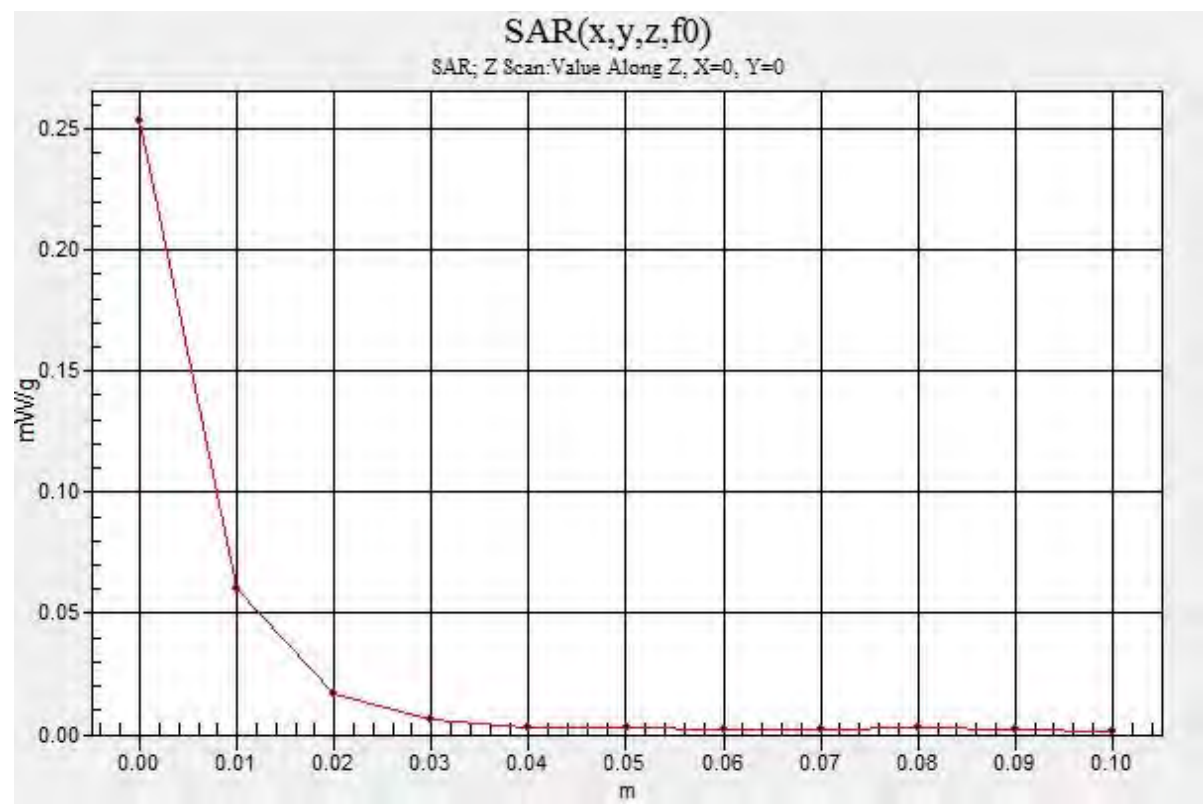
Reference Value = 1.68 V/m; Power Drift = -0.101 dB

Peak SAR (extrapolated) = 0.418 W/kg

SAR(1 g) = 0.191 mW/g; SAR(10 g) = 0.083 mW/g

Maximum value of SAR (measured) = 0.255 mW/g





Test Laboratory: Bureau Veritas ADT SAR/HAC Testing Lab

P02 802.11b_Front Face_0cm_Ch1

DUT: 110420C35

Communication System: IEEE 802.11b WLAN; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium parameters used: $f = 2412$ MHz; $\sigma = 1.95$ mho/m; $\epsilon_r = 51.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Air Temperature: 24.6 deg C; Liquid Temperature: 23.6 deg C

DASY4 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2011/2/25
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/7/29
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1/Area Scan (6x11x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (measured) = 0.005 mW/g

Ch1/Zoom Scan (7x7x9)/Cube 0:

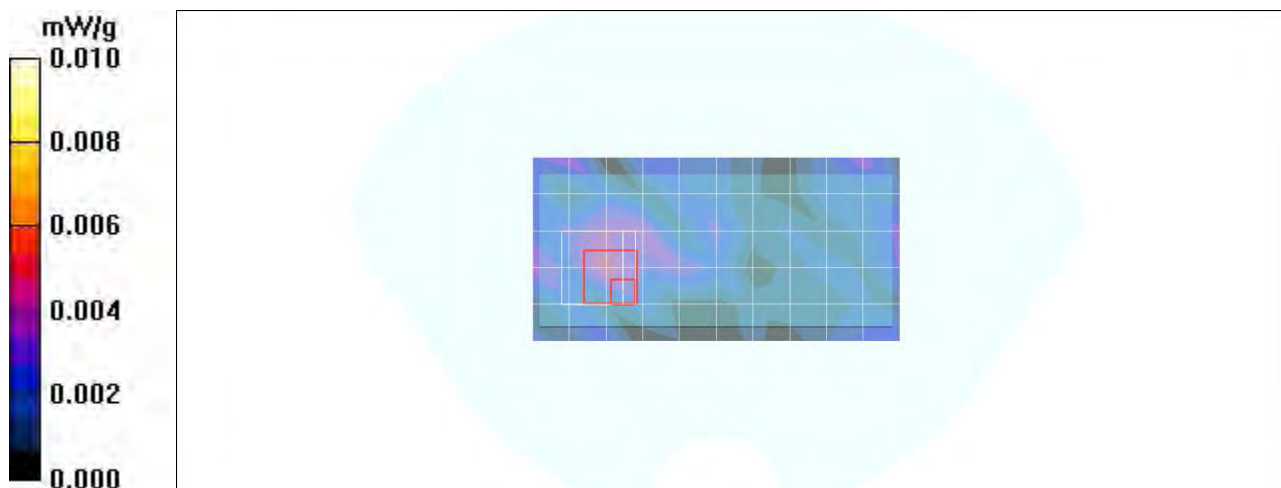
Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 0.868 V/m; Power Drift = -0.121 dB

Peak SAR (extrapolated) = 0.100 W/kg

SAR(1 g) = 0.023 mW/g; SAR(10 g) = 0.00497 mW/g

Maximum value of SAR (measured) = 0.100 mW/g



P03 802.11a_Rear Face _0cm_Ch36**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5180 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5180$ MHz; $\sigma = 5.162$ mho/m; $\epsilon_r = 48.034$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.81, 4.81, 4.81); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.6.4 (4989)

Ch36/Area Scan (141x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.335 mW/g

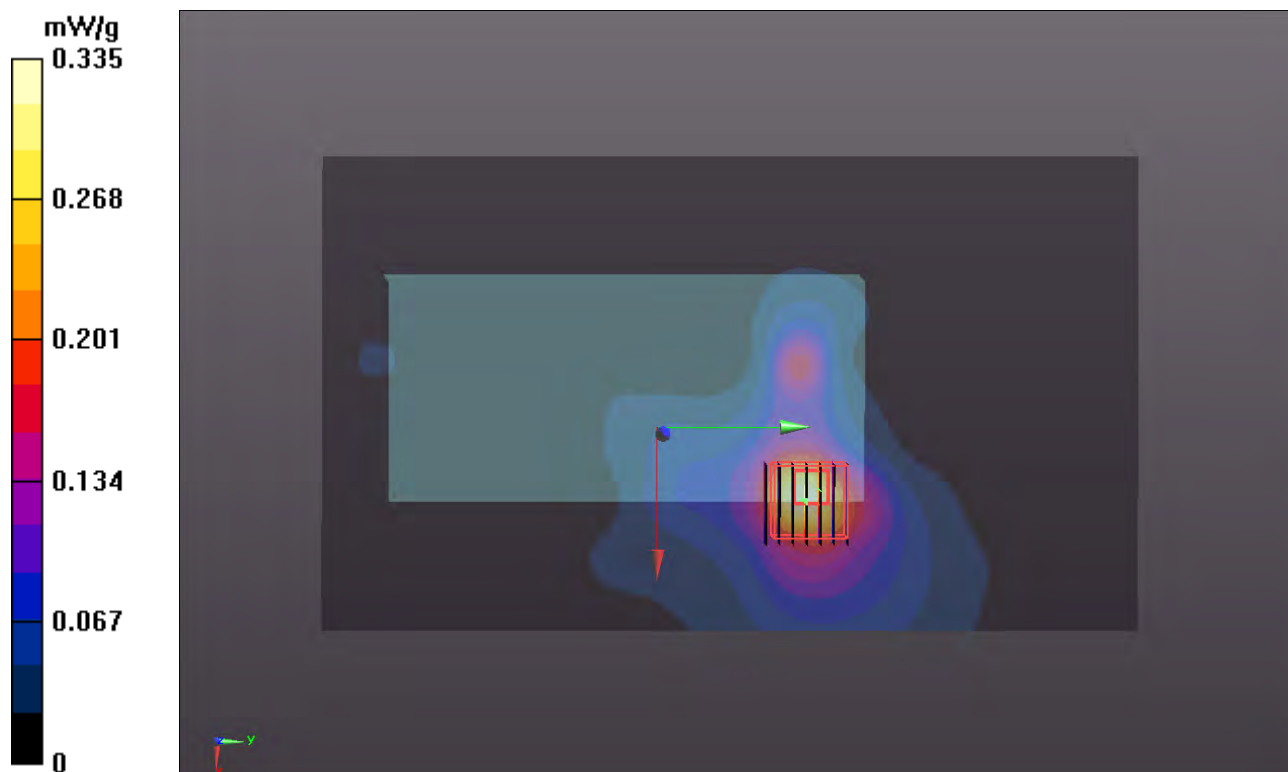
Ch36/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 1.923 V/m; Power Drift = -0.142 dB

Peak SAR (extrapolated) = 0.6500

SAR(1 g) = 0.194 mW/g; SAR(10 g) = 0.076 mW/g

Maximum value of SAR (measured) = 0.359 mW/g



P04 802.11a_Front Face_0cm_Ch36

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5180 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5180$ MHz; $\sigma = 5.162$ mho/m; $\epsilon_r = 48.034$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.81, 4.81, 4.81); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch36/Area Scan (161x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.027 mW/g

Ch36/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.210 V/m; Power Drift = -0.110 dB

Peak SAR (extrapolated) = 0.067 W/kg

SAR(1 g) = 0.00638 mW/g; SAR(10 g) = 0.0022 mW/g

Maximum value of SAR (measured) = 0.015 mW/g

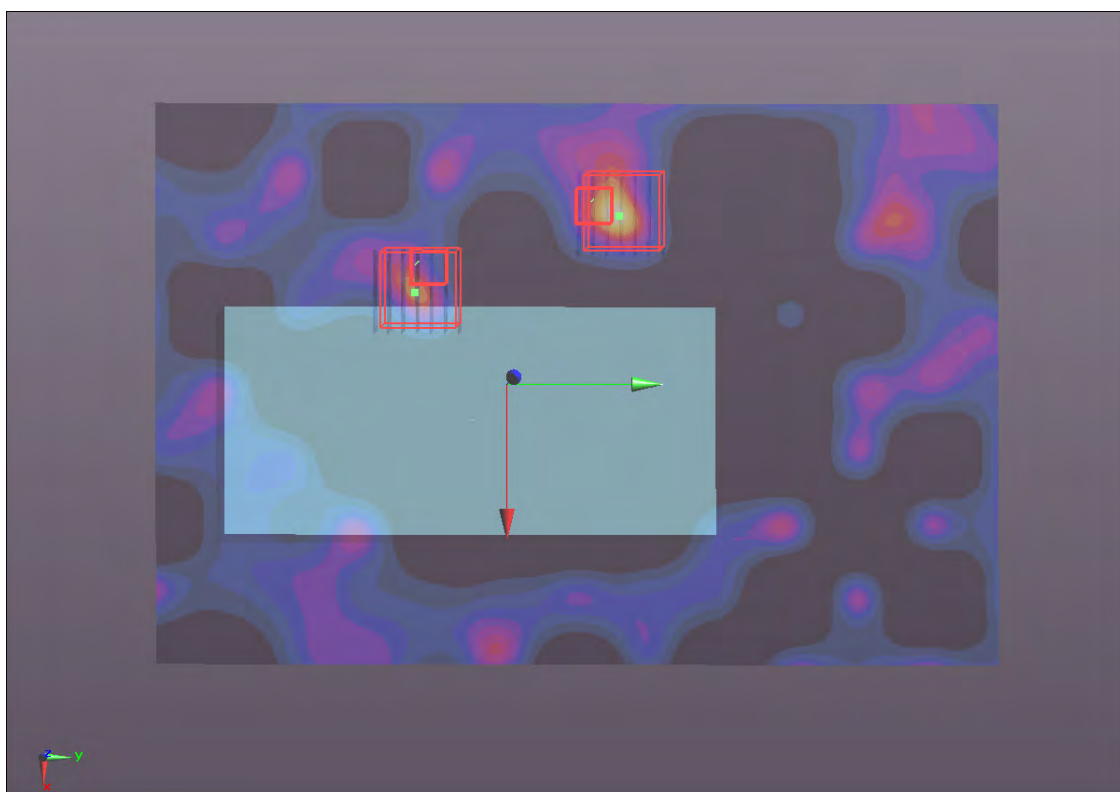
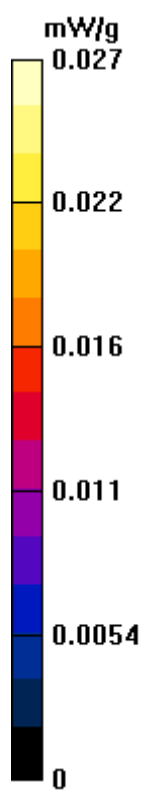
Ch36/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.210 V/m; Power Drift = -0.110 dB

Peak SAR (extrapolated) = 0.024 W/kg

SAR(1 g) = 0.000959 mW/g; SAR(10 g) = 0.000197 mW/g

Maximum value of SAR (measured) = 0.010 mW/g



P05 802.11a_Rear Face_0cm_Ch60**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5300$ MHz; $\sigma = 5.337$ mho/m; $\epsilon_r = 48.215$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.56, 4.56, 4.56); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.6.4 (4989)

Ch60/Area Scan (161x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.337 mW/g

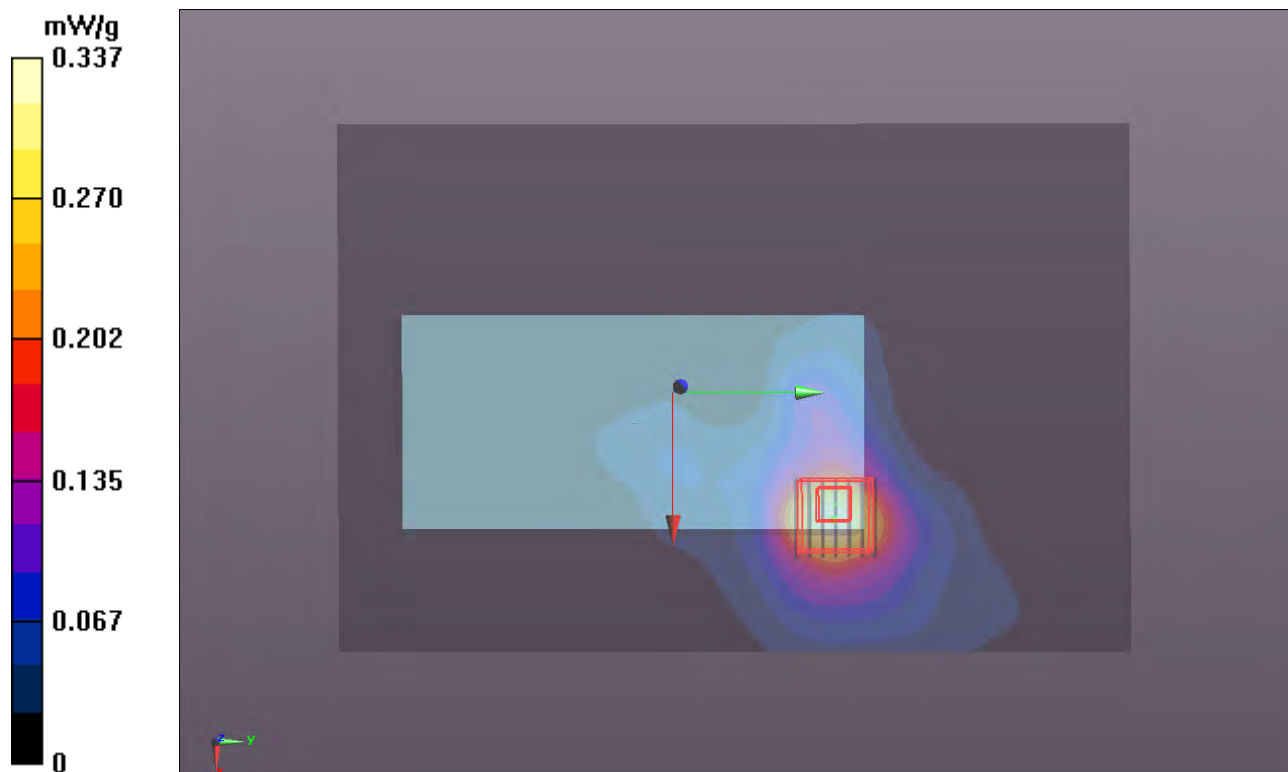
Ch60/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 1.208 V/m; Power Drift = -0.125 dB

Peak SAR (extrapolated) = 0.6830

SAR(1 g) = 0.203 mW/g; SAR(10 g) = 0.079 mW/g

Maximum value of SAR (measured) = 0.370 mW/g



P06 802.11a_Front Face_0cm_Ch60

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5300$ MHz; $\sigma = 5.337$ mho/m; $\epsilon_r = 48.215$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.56, 4.56, 4.56); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch60/Area Scan (161x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.022 mW/g

Ch60/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.119 V/m; Power Drift = 0.155 dB

Peak SAR (extrapolated) = 0.053 W/kg

SAR(1 g) = 0.00406 mW/g; SAR(10 g) = 0.0014 mW/g

Maximum value of SAR (measured) = 0.015 mW/g

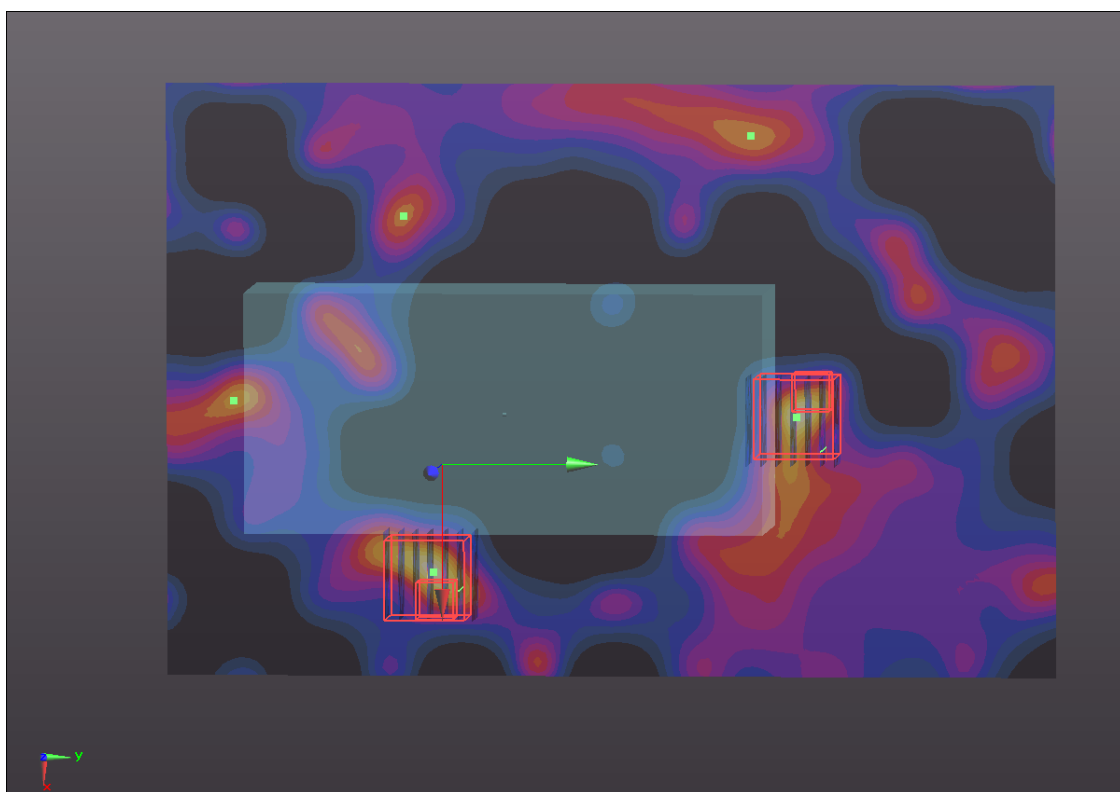
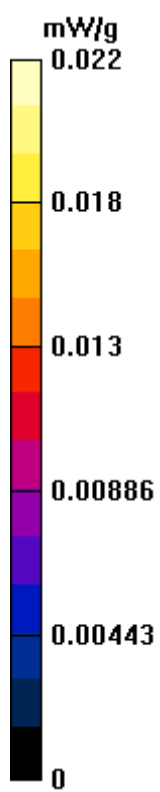
Configuration/Ch60/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.119 V/m; Power Drift = 0.155 dB

Peak SAR (extrapolated) = 0.278 W/kg

SAR(1 g) = 0.00148 mW/g; SAR(10 g) = 0.000332 mW/g

Maximum value of SAR (measured) = 0.153 mW/g



P07 802.11a_Rear Face_0cm_Ch116**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5580 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5580$ MHz; $\sigma = 5.787$ mho/m; $\epsilon_r = 47.389$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.01, 4.01, 4.01); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch116/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.427 mW/g

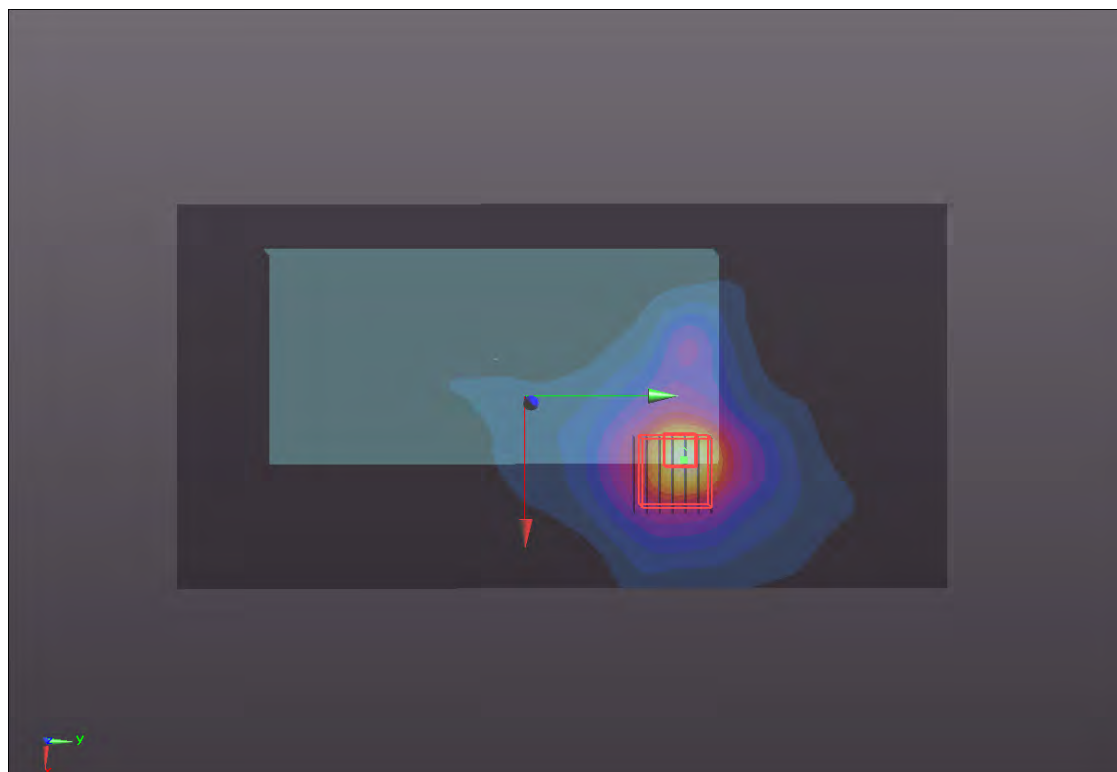
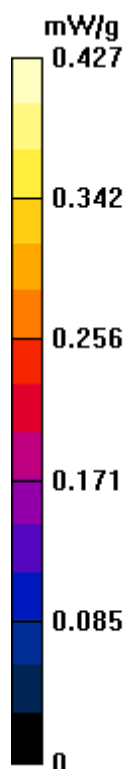
Ch116/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 2.762 V/m; Power Drift = -0.085 dB

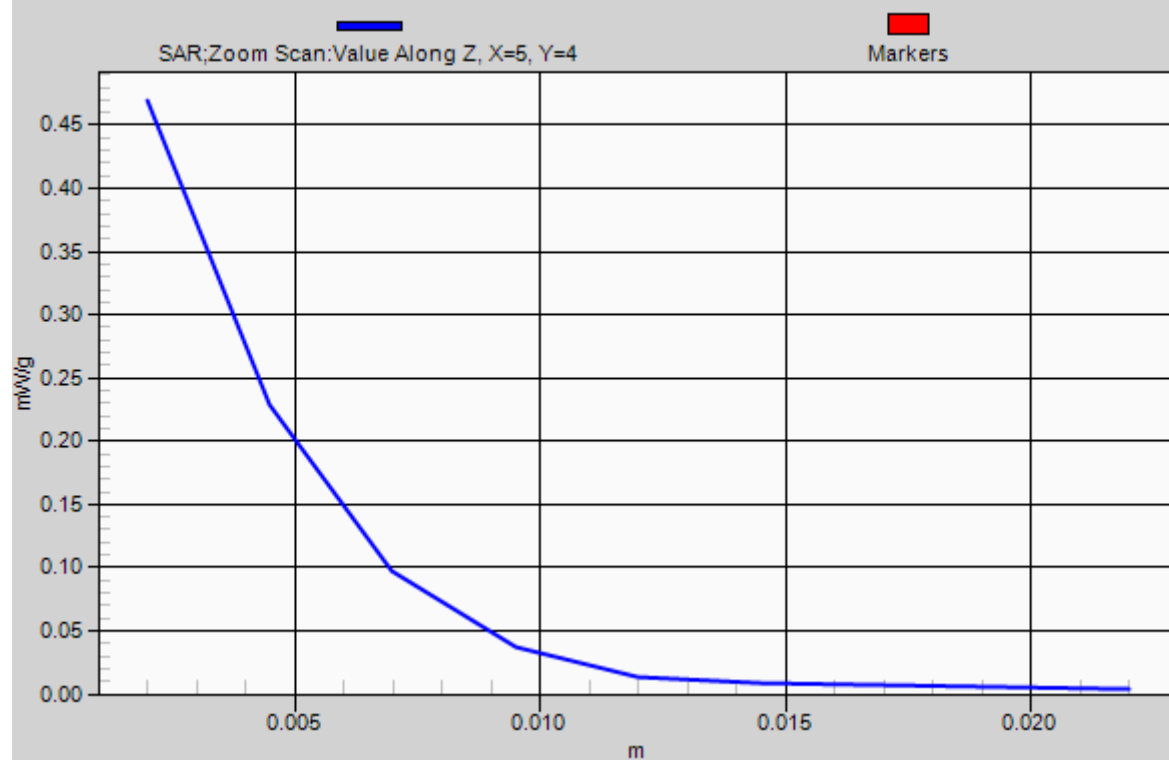
Peak SAR (extrapolated) = 0.8280

SAR(1 g) = 0.243 mW/g; SAR(10 g) = 0.085 mW/g

Maximum value of SAR (measured) = 0.469 mW/g



1g/10g Averaged SAR



P08 802.11a_Front Face_0cm_Ch116**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5580 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5580$ MHz; $\sigma = 5.787$ mho/m; $\epsilon_r = 47.389$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.01, 4.01, 4.01); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch116/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of Total (interpolated) = 0.486 mW/g m

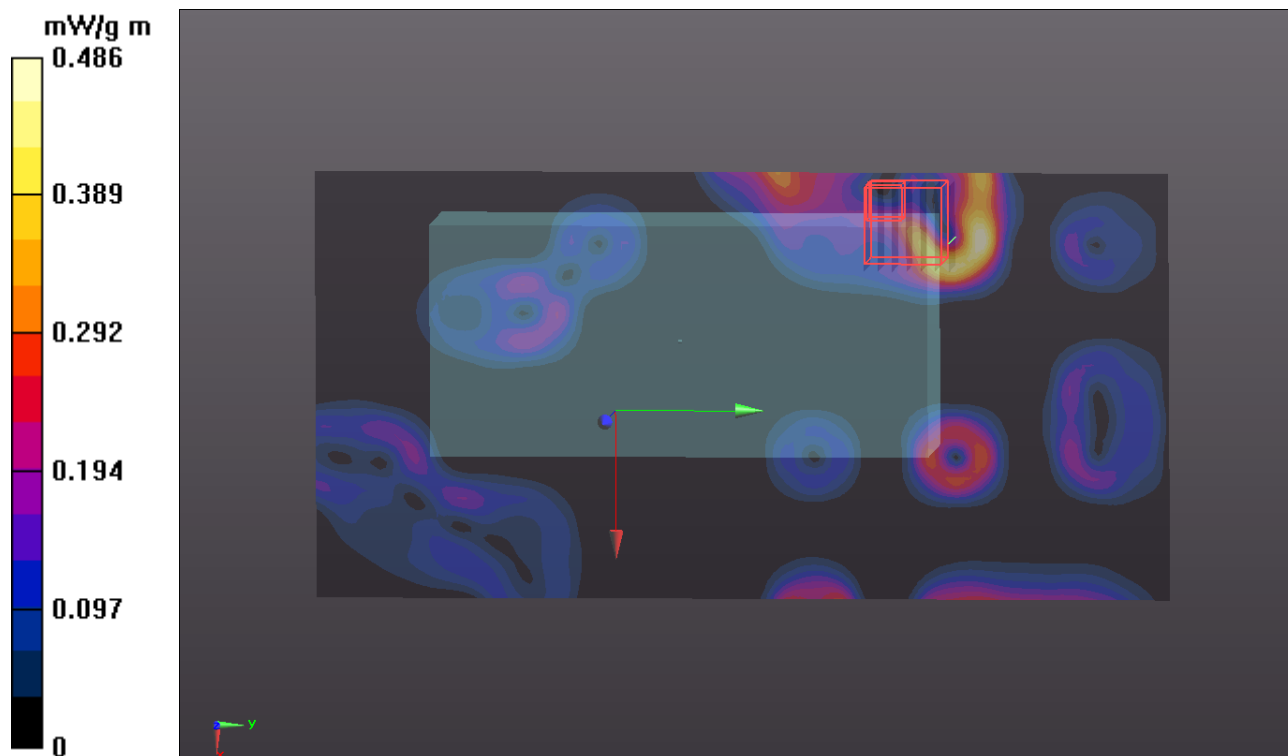
Ch116/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.372 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.1170

SAR(1 g) = 0.012 mW/g; SAR(10 g) = 0.00426 mW/g

Maximum value of SAR (measured) = 0.025 mW/g



P09 802.11a_Rear Face_0cm_Ch157**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5785$ MHz; $\sigma = 6.279$ mho/m; $\epsilon_r = 47.274$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.55, 4.55, 4.55); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch157/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.422 mW/g

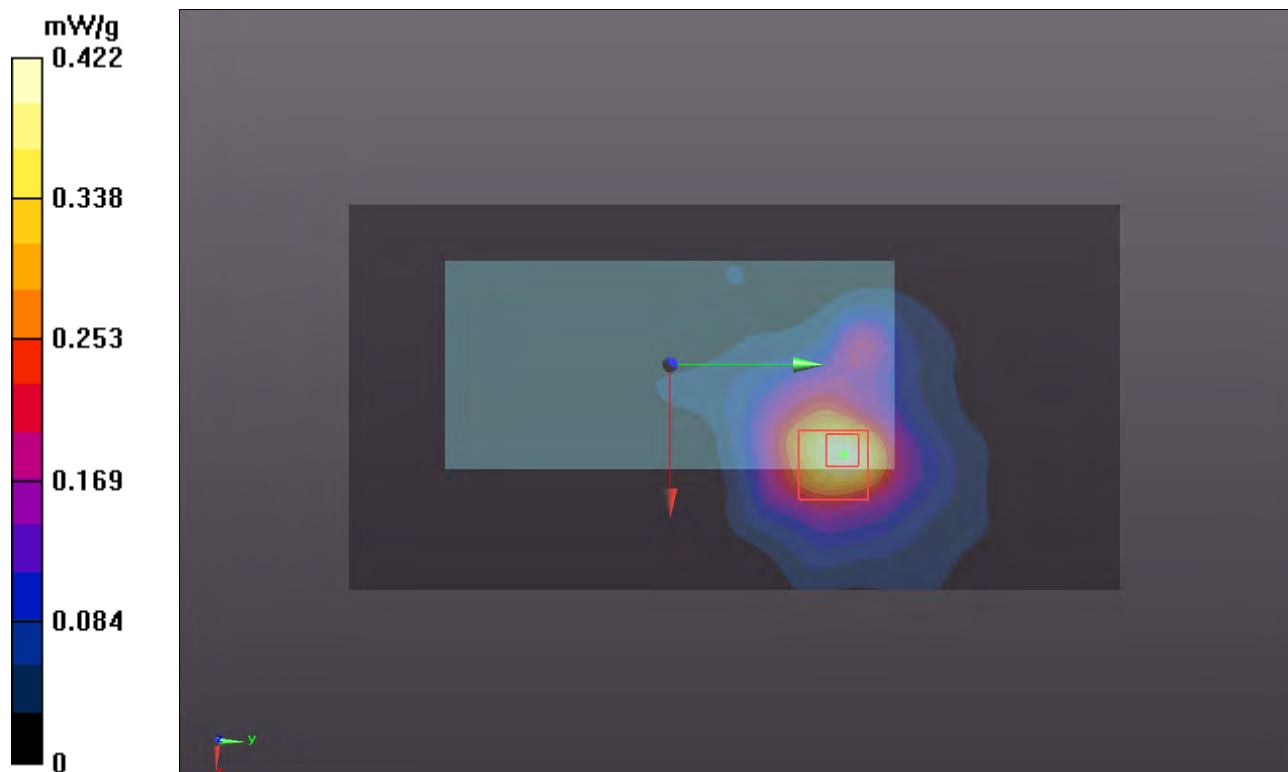
Ch157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 1.558 V/m; Power Drift = 0.093 dB

Peak SAR (extrapolated) = 0.9110

SAR(1 g) = 0.239 mW/g; SAR(10 g) = 0.088 mW/g

Maximum value of SAR (measured) = 0.453 mW/g



P10 802.11a_Front Face_0cm_Ch157

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5785$ MHz; $\sigma = 6.279$ mho/m; $\epsilon_r = 47.274$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.55, 4.55, 4.55); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch157/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of Total (interpolated) = 0.791 mW/g m

Ch157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.431 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.0890

SAR(1 g) = 0.019 mW/g; SAR(10 g) = 0.00724 mW/g

Maximum value of SAR (measured) = 0.043 mW/g

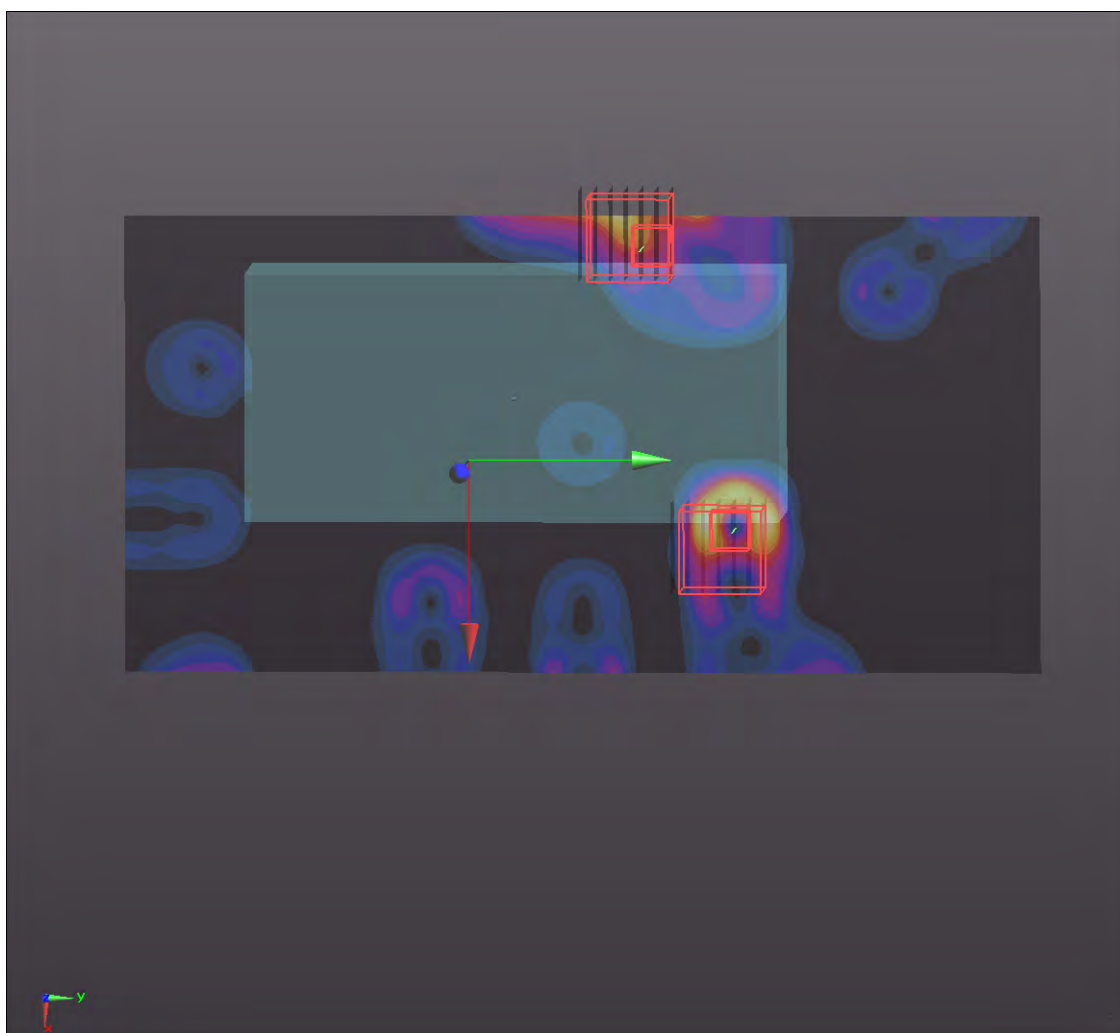
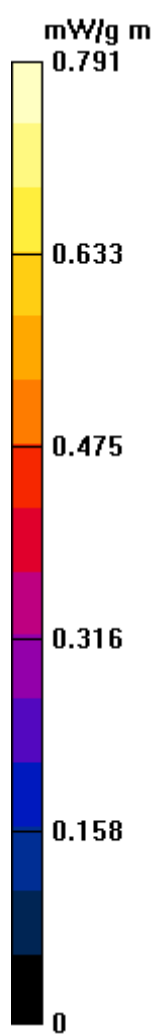
Ch157/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.431 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.1820

SAR(1 g) = 0.017 mW/g; SAR(10 g) = 0.00495 mW/g

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



P11 802.11b_Rear Face_1.5cm_Ch1**DUT: 110420C35**

Communication System: WLAN; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: MSL2450_0902 Medium parameters used : $f = 2412$ MHz; $\sigma = 1.964$ mho/m; $\epsilon_r = 53.978$;

$\rho = 1000$ kg/m³

Ambient Temperature : 22.4 °C; Liquid Temperature : 21.2 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(7.91, 7.91, 7.91); Calibrated: 2/25/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 7/29/2011
- Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: TP:1653
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch1/Area Scan (101x181x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.052 mW/g

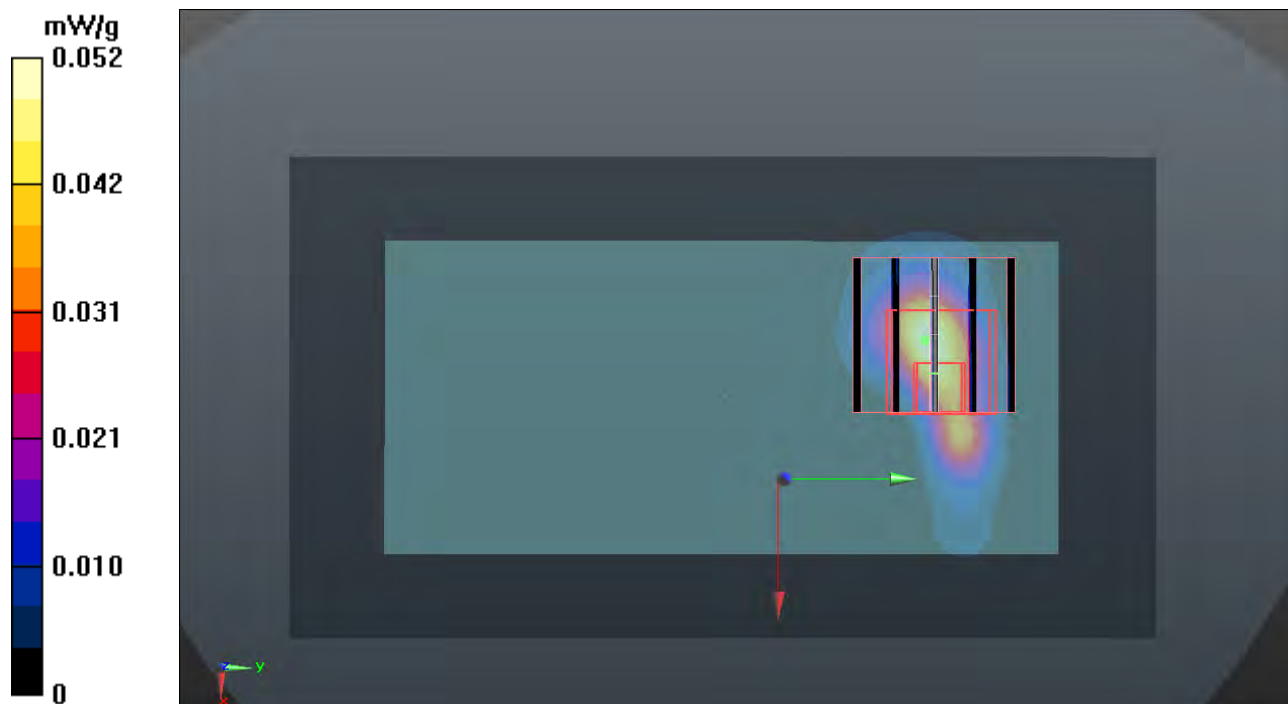
Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.53 V/m; Power Drift = -0.154 dB

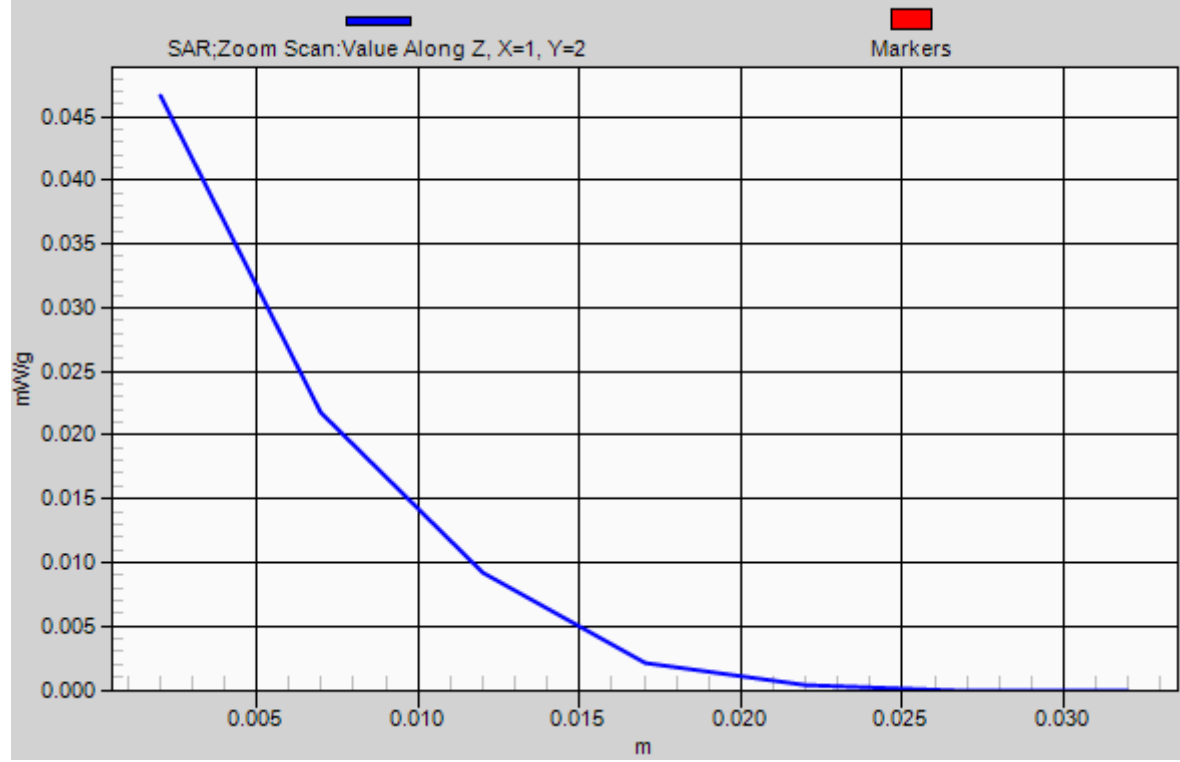
Peak SAR (extrapolated) = 0.134 W/kg

SAR(1 g) = 0.035 mW/g; SAR(10 g) = 0.012 mW/g

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



1g/10g Averaged SAR



P13 802.11a_Rear Face_1.5cm_Ch36**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5180 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5180$ MHz; $\sigma = 5.162$ mho/m; $\epsilon_r = 48.034$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.81, 4.81, 4.81); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch36/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

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

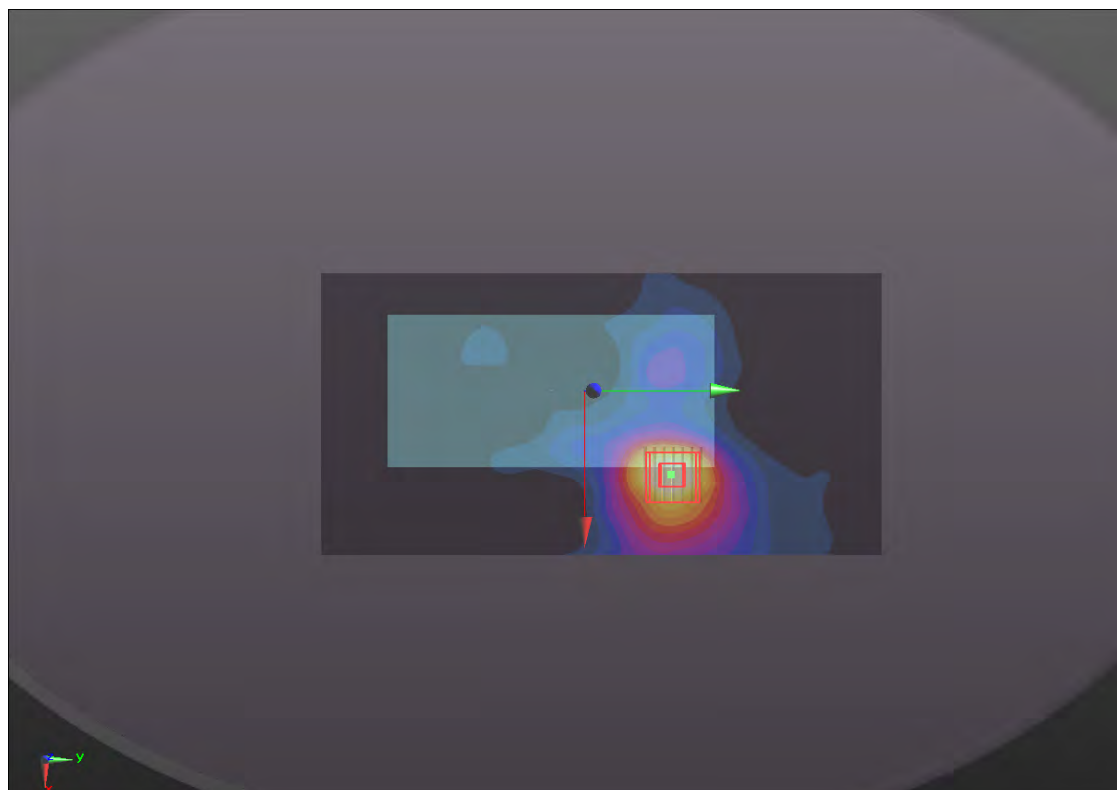
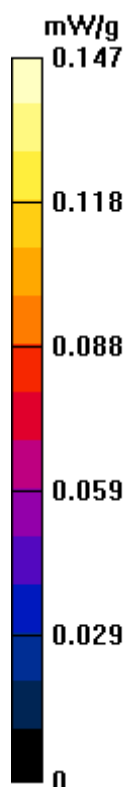
Ch36/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.661 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.2980

SAR(1 g) = 0.080 mW/g; SAR(10 g) = 0.036 mW/g

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



P14 802.11a_Front Face_1.5cm_Ch36

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5180 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5180$ MHz; $\sigma = 5.162$ mho/m; $\epsilon_r = 48.034$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.81, 4.81, 4.81); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch36/Area Scan (121x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.016 mW/g

Ch36/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.568 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.0460

SAR(1 g) = 0.00391 mW/g; SAR(10 g) = 0.00118 mW/g

Maximum value of SAR (measured) = 0.012 mW/g

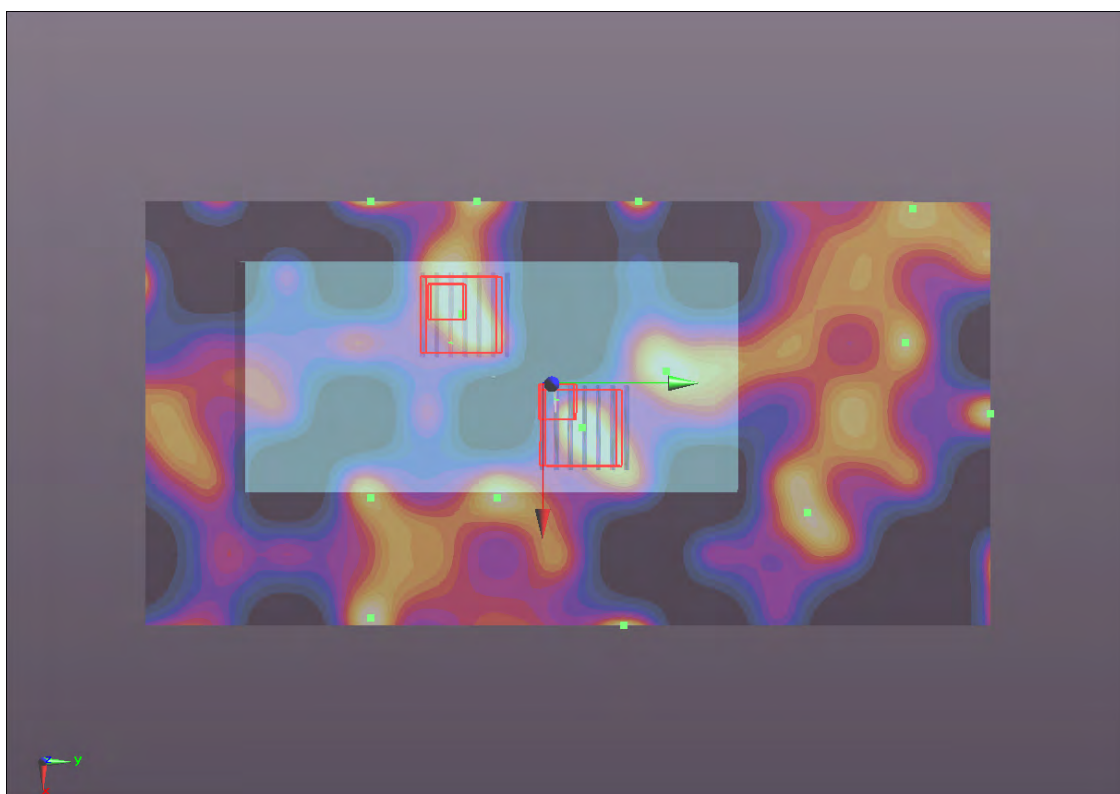
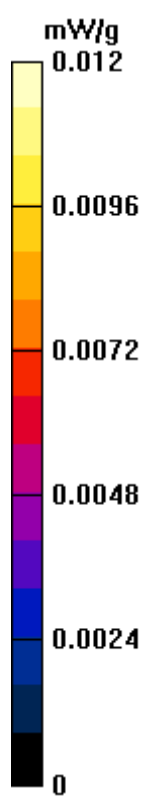
Ch36/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.568 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.0980

SAR(1 g) = 0.00443 mW/g; SAR(10 g) = 0.00134 mW/g

Maximum value of SAR (measured) = 0.098 mW/g



P15 802.11a_Rear Face_1.5cm_Ch60**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5300$ MHz; $\sigma = 5.337$ mho/m; $\epsilon_r = 48.215$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.56, 4.56, 4.56); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch60/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

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

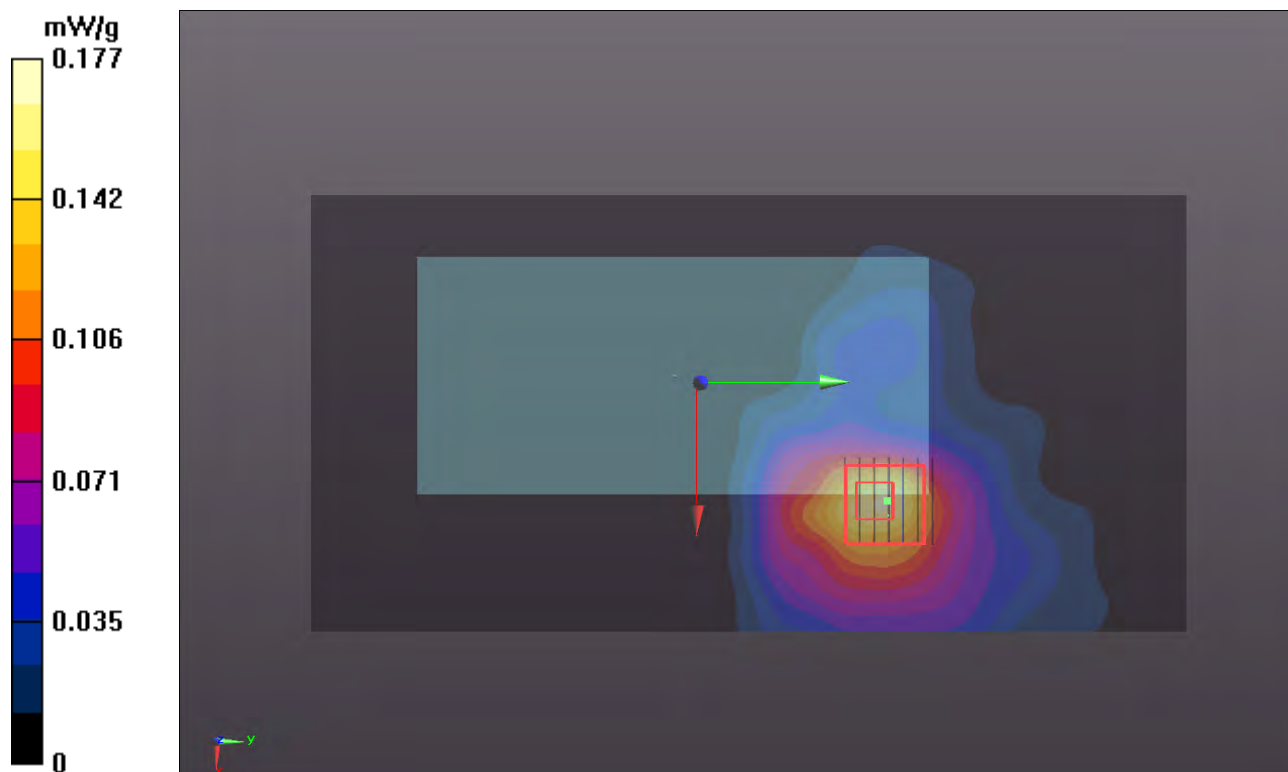
Ch60/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.592 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.3700

SAR(1 g) = 0.098 mW/g; SAR(10 g) = 0.042 mW/g

Maximum value of SAR (measured) = 0.177 mW/g



P16 802.11a_Front Face_1.5cm_Ch60

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5300$ MHz; $\sigma = 5.337$ mho/m; $\epsilon_r = 48.215$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.56, 4.56, 4.56); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch60/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.018 mW/g

Ch60/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.619 V/m; Power Drift = -0.152 dB

Peak SAR (extrapolated) = 0.056 W/kg

SAR(1 g) = 0.0044 mW/g; SAR(10 g) = 0.00161 mW/g

Maximum value of SAR (measured) = 0.015 mW/g

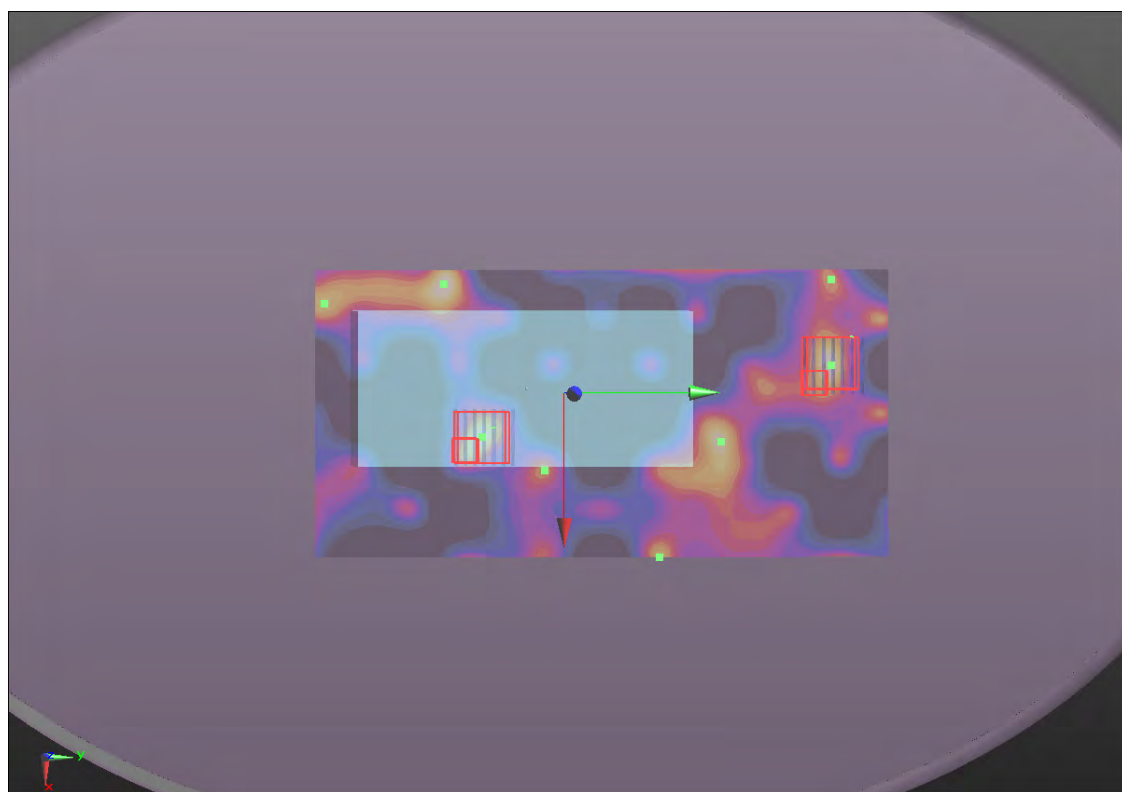
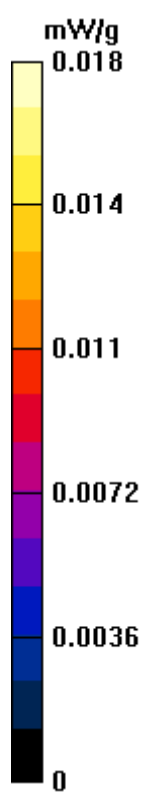
Ch60/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.619 V/m; Power Drift = -0.152 dB

Peak SAR (extrapolated) = 0.031 W/kg

SAR(1 g) = 0.00196 mW/g; SAR(10 g) = 0.000469 mW/g

Maximum value of SAR (measured) = 0.00961 mW/g



P17 802.11a_Rear Face_1.5cm_Ch116**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5580 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5580$ MHz; $\sigma = 5.787$ mho/m; $\epsilon_r = 47.389$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.01, 4.01, 4.01); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch116/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.243 mW/g

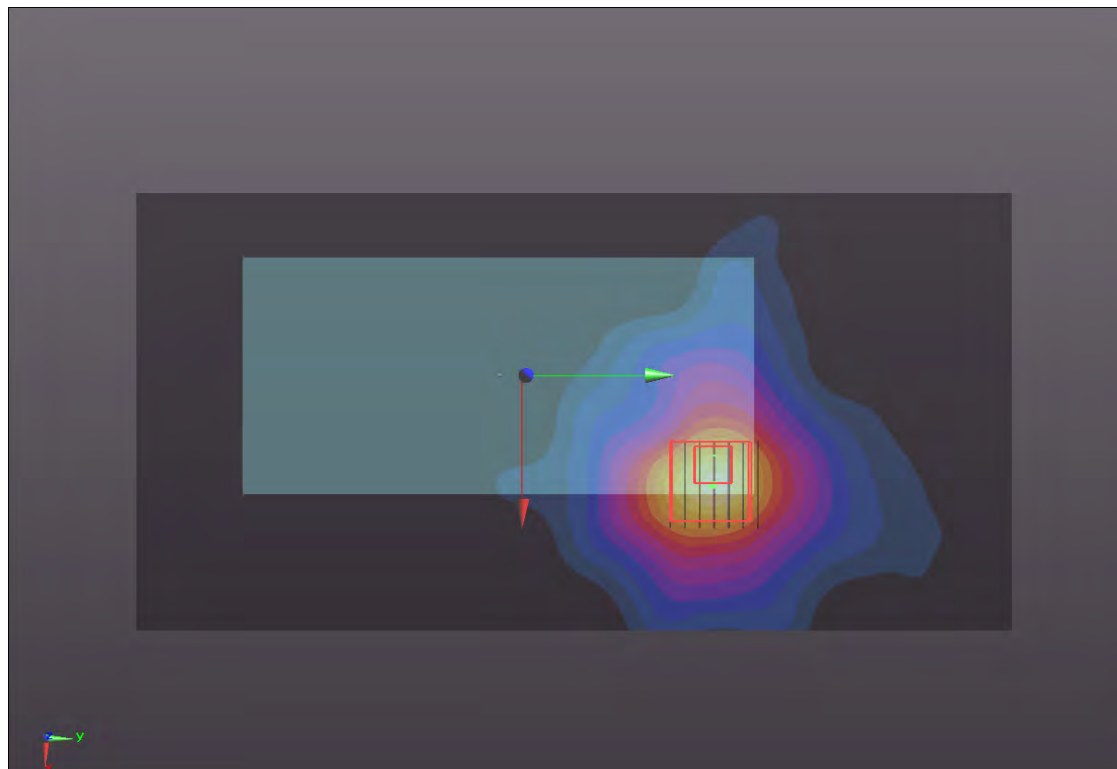
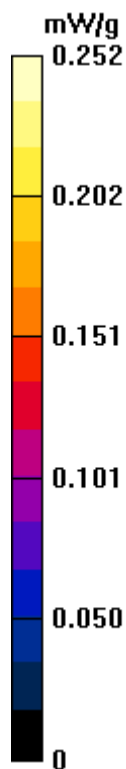
Ch116/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.529 V/m; Power Drift = 0.127 dB

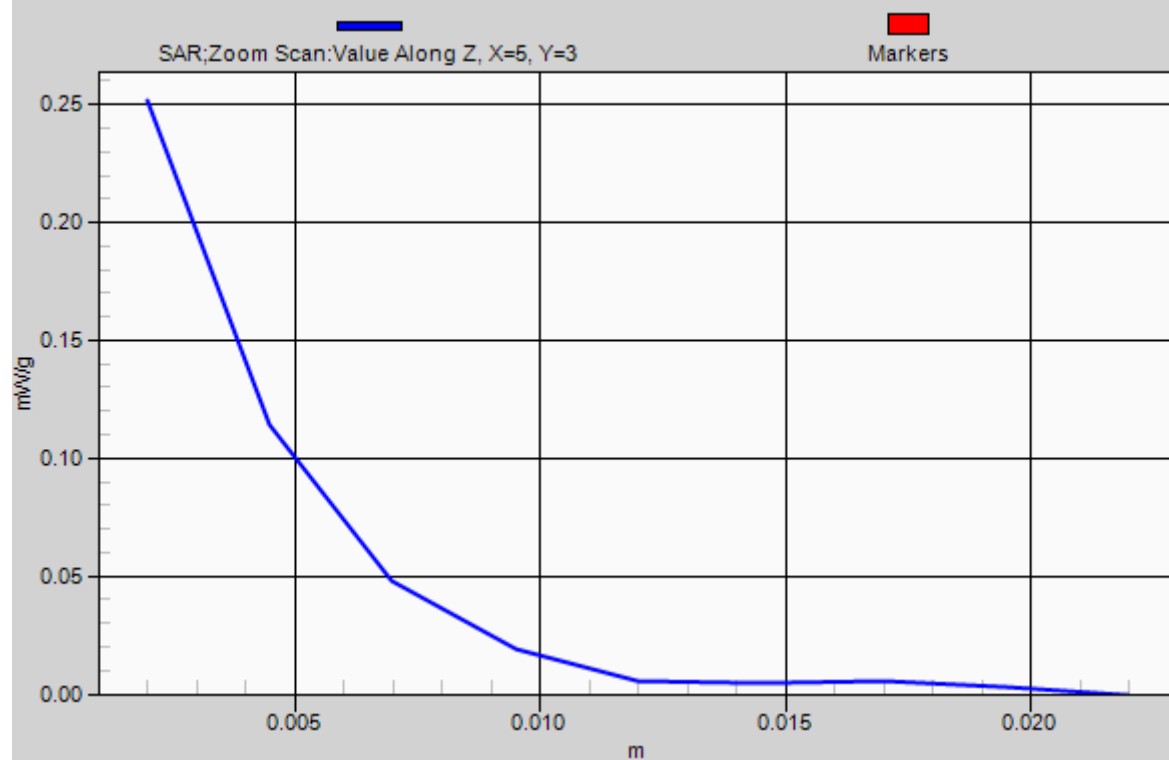
Peak SAR (extrapolated) = 0.4940

SAR(1 g) = 0.139 mW/g; SAR(10 g) = 0.057 mW/g

Maximum value of SAR (measured) = 0.252 mW/g



1g/10g Averaged SAR



P18 802.11a_Front Face_1.5cm_Ch116

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5580 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5580$ MHz; $\sigma = 5.787$ mho/m; $\epsilon_r = 47.389$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.01, 4.01, 4.01); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch116/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.022 mW/g

Ch116/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.605 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.0610

SAR(1 g) = 0.00496 mW/g; SAR(10 g) = 0.00182 mW/g

Maximum value of SAR (measured) = 0.017 mW/g

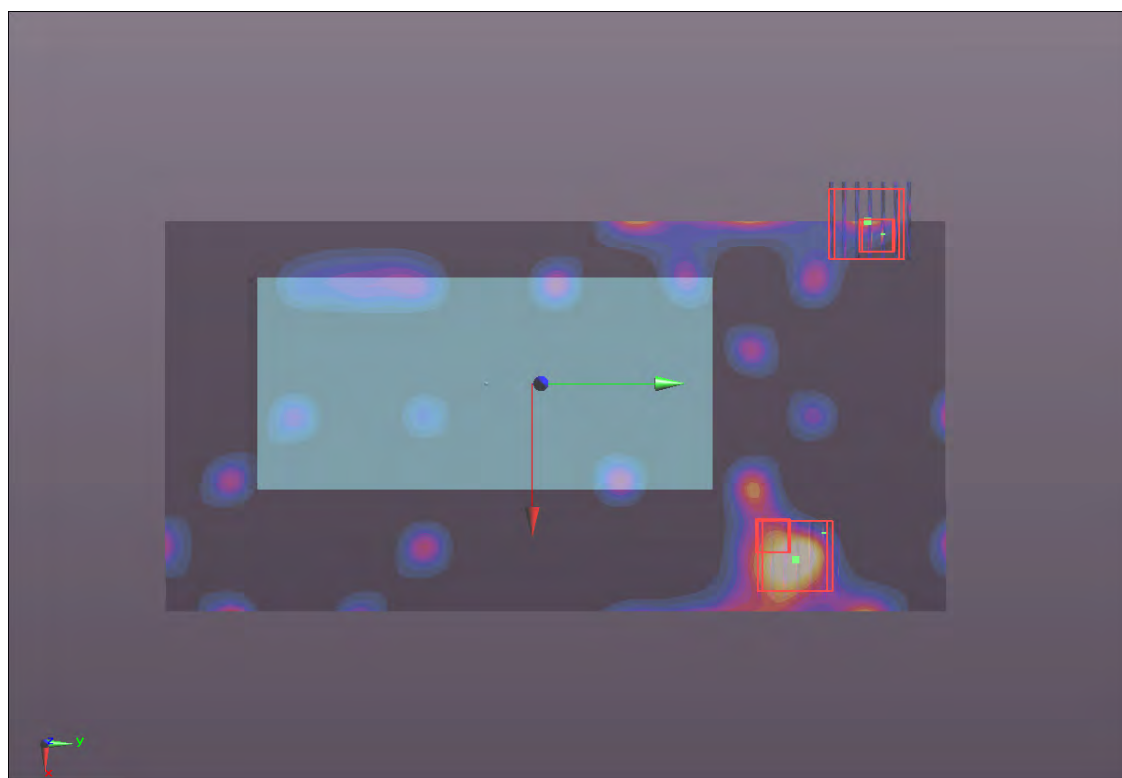
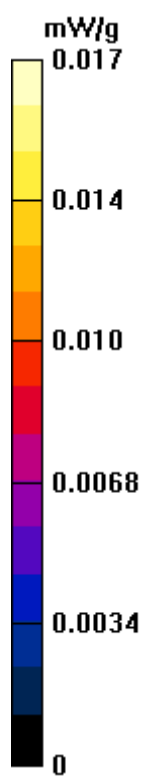
Ch116/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.605 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.0790

SAR(1 g) = 0.00416 mW/g; SAR(10 g) = 0.000634 mW/g

Maximum value of SAR (measured) = 0.045 mW/g



P19 802.11a_Rear Face_1.5cm_Ch157**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5785$ MHz; $\sigma = 6.279$ mho/m; $\epsilon_r = 47.274$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.55, 4.55, 4.55); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.6.4 (4989)

Ch157/Area Scan (121x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.557 mW/g

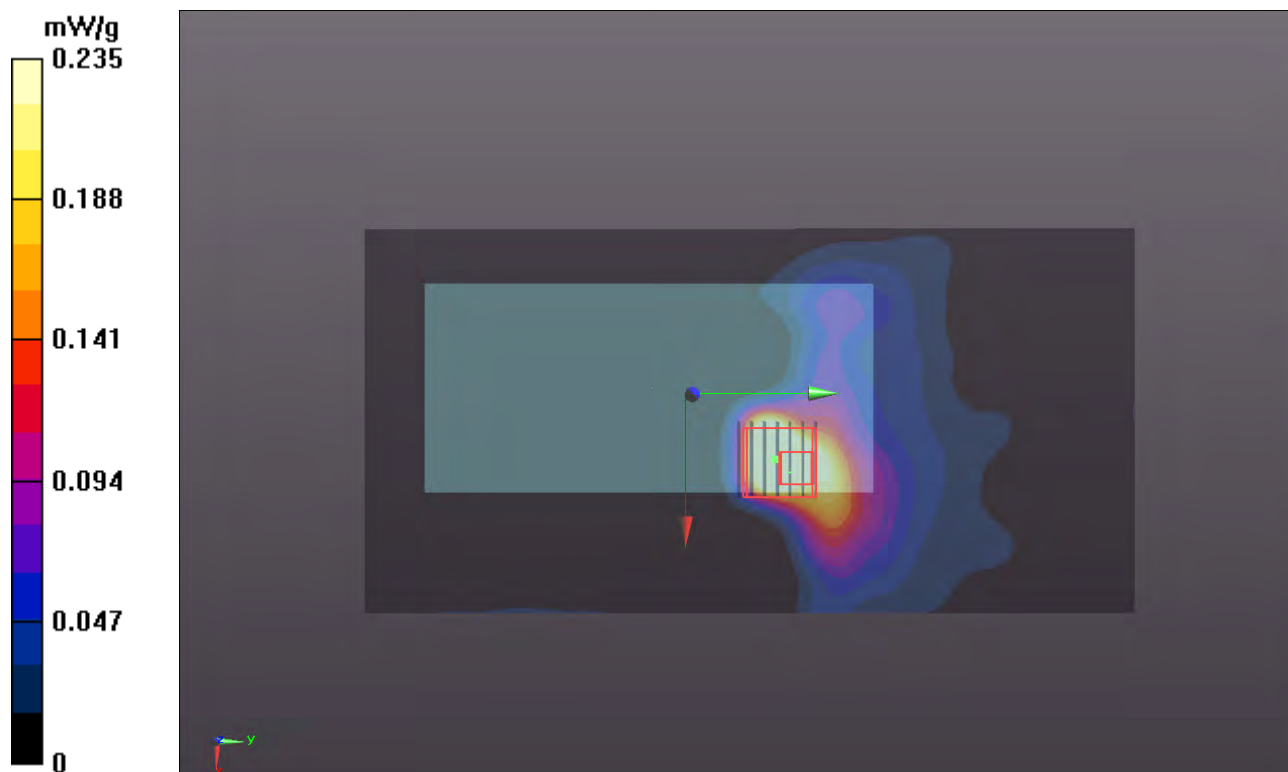
Ch157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 1.124 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 0.4500

SAR(1 g) = 0.121 mW/g; SAR(10 g) = 0.050 mW/g

Maximum value of SAR (measured) = 0.235 mW/g



P20 802.11a_Front Face_1.5cm_Ch157

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: B5G_1226 Medium parameters used: $f = 5300$ MHz; $\sigma = 5.337$ mho/m; $\epsilon_r = 48.215$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.8 °C; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.56, 4.56, 4.56); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch60/Area Scan (141x241x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.024 mW/g

Ch60/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.549 V/m; Power Drift = -0.150 dB

Peak SAR (extrapolated) = 0.079 W/kg

SAR(1 g) = 0.011 mW/g; SAR(10 g) = 0.00466 mW/g

Maximum value of SAR (measured) = 0.025 mW/g

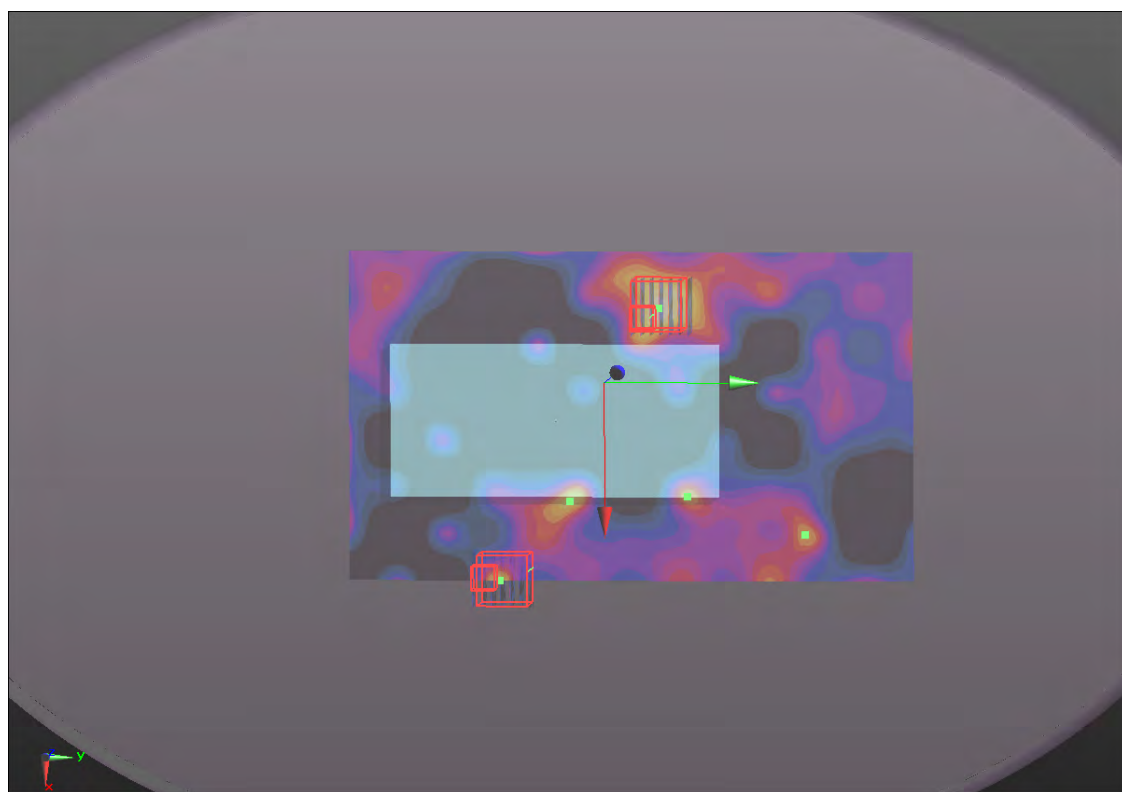
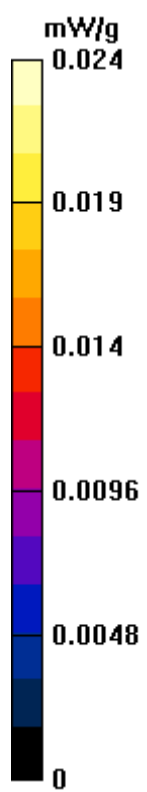
Ch60/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 0.549 V/m; Power Drift = -0.150 dB

Peak SAR (extrapolated) = 0.068 W/kg

SAR(1 g) = 0.00461 mW/g; SAR(10 g) = 0.00136 mW/g

Maximum value of SAR (measured) = 0.013 mW/g



P31 802.11b_Rear Face_0cm_Ch1

DUT: 110823C26

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

Medium: MSL2450_0909 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.96$ mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.4 °C ; Liquid Temperature : 21.2 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.05, 7.05, 7.05); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/7/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.316 mW/g

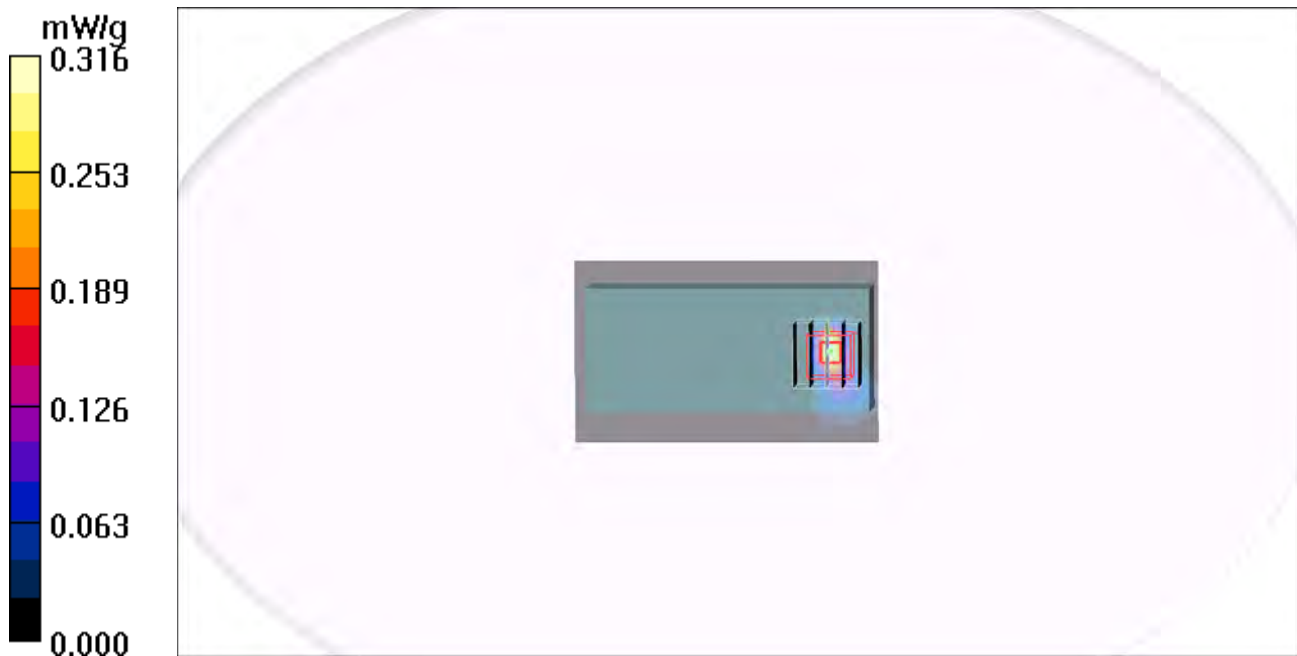
Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.21 V/m; Power Drift = 0.139 dB

Peak SAR (extrapolated) = 0.359 W/kg

SAR(1 g) = 0.178 mW/g; SAR(10 g) = 0.064 mW/g

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



P31 802.11b_Rear Face_0cm_Ch1_2D

DUT: 110823C26

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

Medium: MSL2450_0909 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.96$ mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.4 °C ; Liquid Temperature : 21.6 °C

DASY4 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.05, 7.05, 7.05); Calibrated: 2011/1/24
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 2011/7/29
- Phantom: Flat Phantom ELI4.0; Type: QDOVA001BA; Serial: SN:1039
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Ch1/Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.316 mW/g

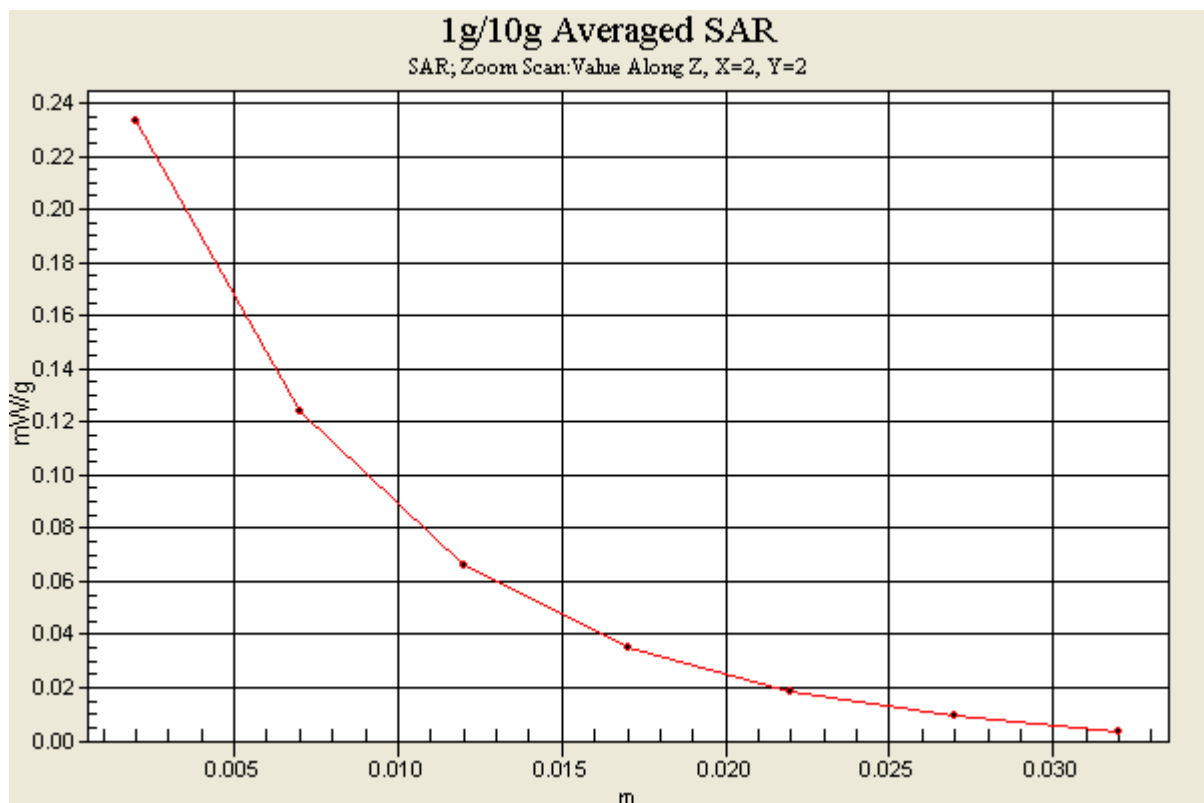
Ch1/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 1.21 V/m; Power Drift = 0.139 dB

Peak SAR (extrapolated) = 0.359 W/kg

SAR(1 g) = 0.178 mW/g; SAR(10 g) = 0.064 mW/g

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



P32 802.11a_Rear Face_0cm_Ch36_Holster**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5180 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used (interpolated): $f = 5180$ MHz; $\sigma = 5.134$ mho/m; $\epsilon_r =$

48.523 ; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C ; Liquid Temperature : 21.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.81, 4.81, 4.81); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch36/Area Scan (51x91x1): Measurement grid: dx=20mm, dy=20mm

Maximum value of SAR (interpolated) = 0.086 mW/g

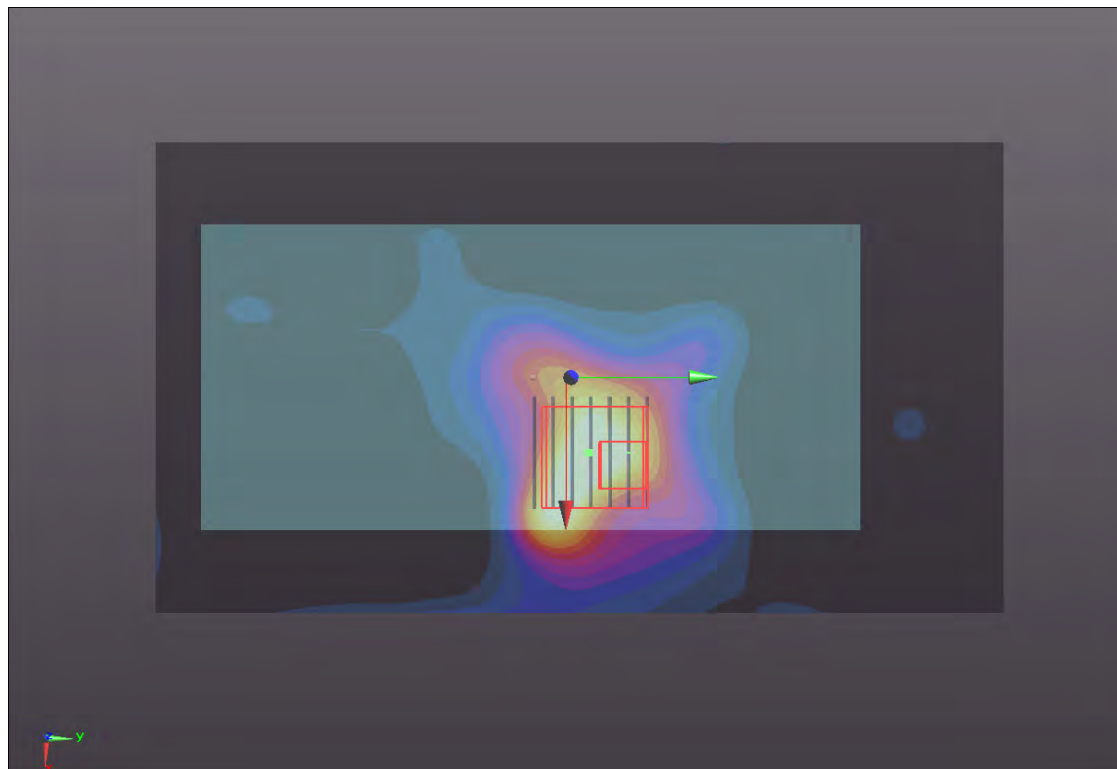
Ch36/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 2.529 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.2660

SAR(1 g) = 0.034 mW/g; SAR(10 g) = 0.014 mW/g

Maximum value of SAR (measured) = 0.074 mW/g



P33 802.11a_Rear Face_0cm_Ch60_Holster**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used: $f = 5300$ MHz; $\sigma = 5.301$ mho/m; $\epsilon_r = 48.29$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C; Liquid Temperature : 21.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.56, 4.56, 4.56); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch60/Area Scan (101x181x1): Measurement grid: dx=10mm, dy=10mm

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

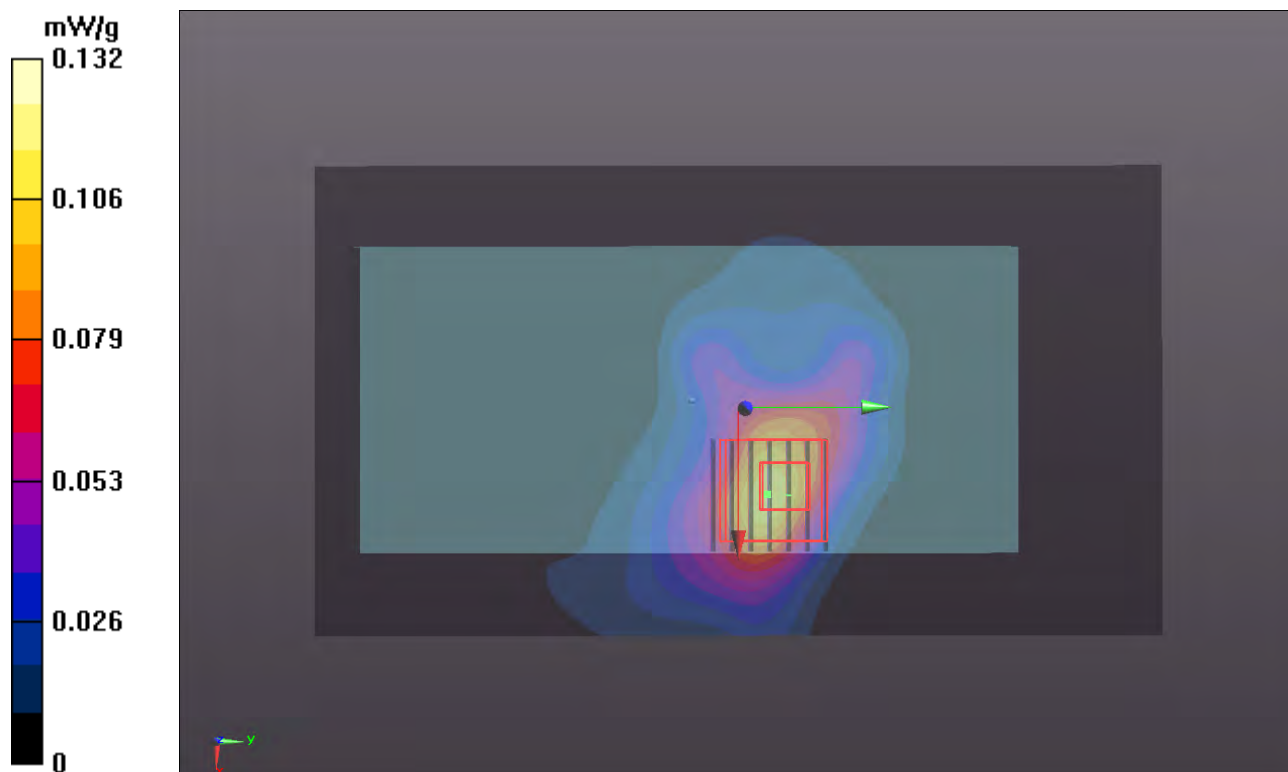
Ch60/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 2.630 V/m; Power Drift = -0.18 dB

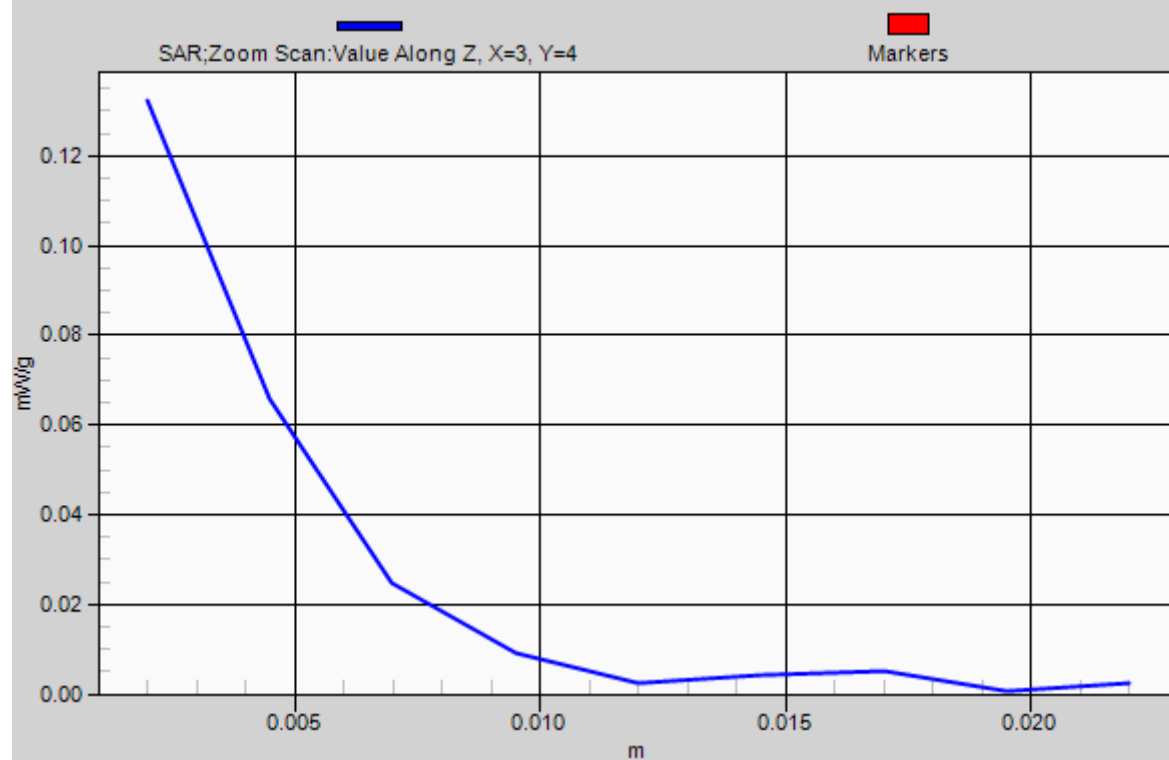
Peak SAR (extrapolated) = 0.2150

SAR(1 g) = 0.065 mW/g; SAR(10 g) = 0.023 mW/g

Maximum value of SAR (measured) = 0.132 mW/g



1g/10g Averaged SAR



P34 802.11a_Rear Face_0cm_Ch116_Holster

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5580 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used : $f = 5580$ MHz; $\sigma = 5.688$ mho/m; $\epsilon_r = 47.693$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C ; Liquid Temperature : 21.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.01, 4.01, 4.01); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch116/Area Scan (101x181x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.030 mW/g

Ch116/Zoom Scan (7x7x9)/Cube 1: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 1.768 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.1380

SAR(1 g) = 0.014 mW/g; SAR(10 g) = 0.00318 mW/g

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

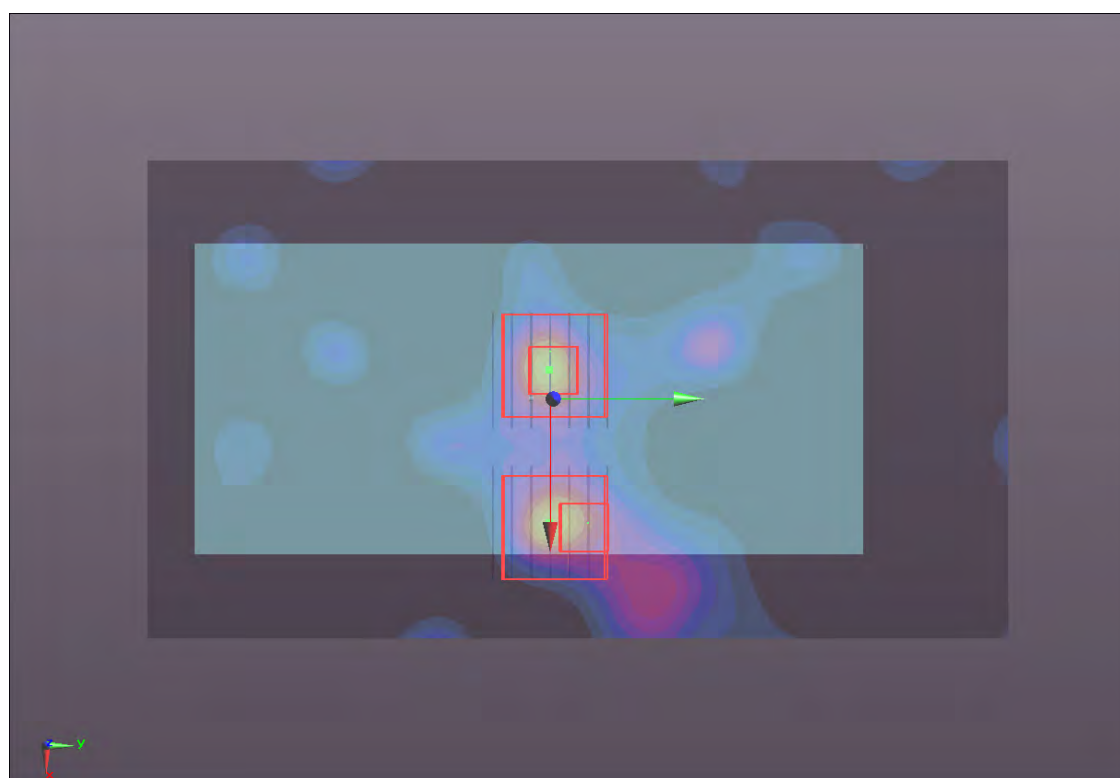
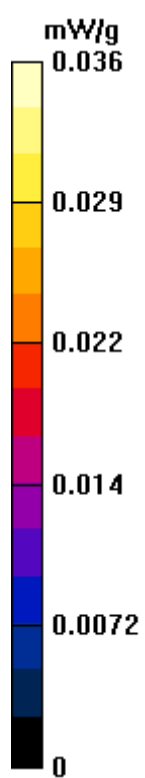
Ch116/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

Reference Value = 1.768 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.0890

SAR(1 g) = 0.011 mW/g; SAR(10 g) = 0.00364 mW/g

Maximum value of SAR (measured) = 0.021 mW/g



P35 802.11a_Rear Face_0cm_Ch157_Holster**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used : $f = 5785$ MHz; $\sigma = 5.961$ mho/m; $\epsilon_r =$

47.221 ; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C ; Liquid Temperature : 21.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.55, 4.55, 4.55); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch157/Area Scan (101x181x1): Measurement grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 0.060 mW/g

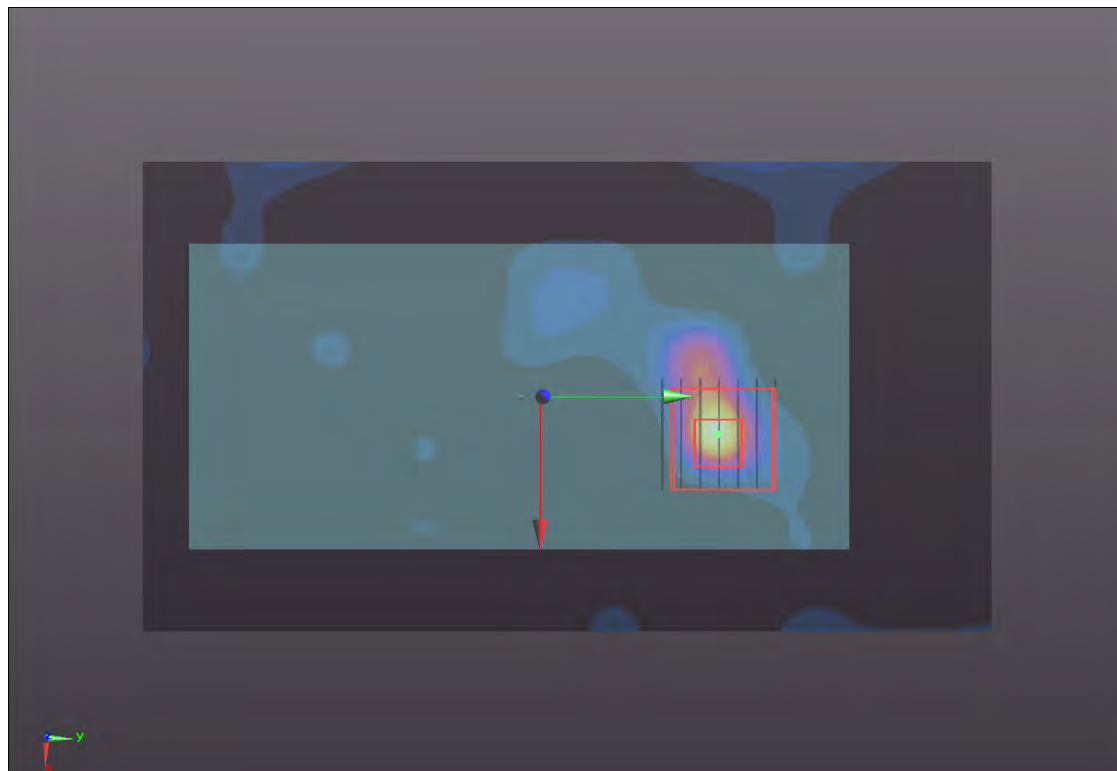
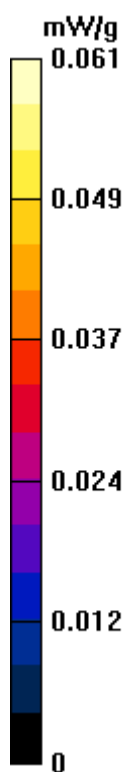
Ch157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2.5$ mm

Reference Value = 1.057 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 0.3160

SAR(1 g) = 0.028 mW/g; SAR(10 g) = 0.00723 mW/g

Maximum value of SAR (measured) = 0.061 mW/g



P36 802.11b_Rear Face_1.5cm_Ch01_Earphone1**DUT: 110823C26**

Communication System: WLAN 2.4G; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: MSL2450_110907 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.876$ mho/m; $\epsilon_r = 53.364$;

$\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.05, 7.05, 7.05); Calibrated: 1/24/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 7/29/2011
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch01/Area Scan (61x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.062 mW/g

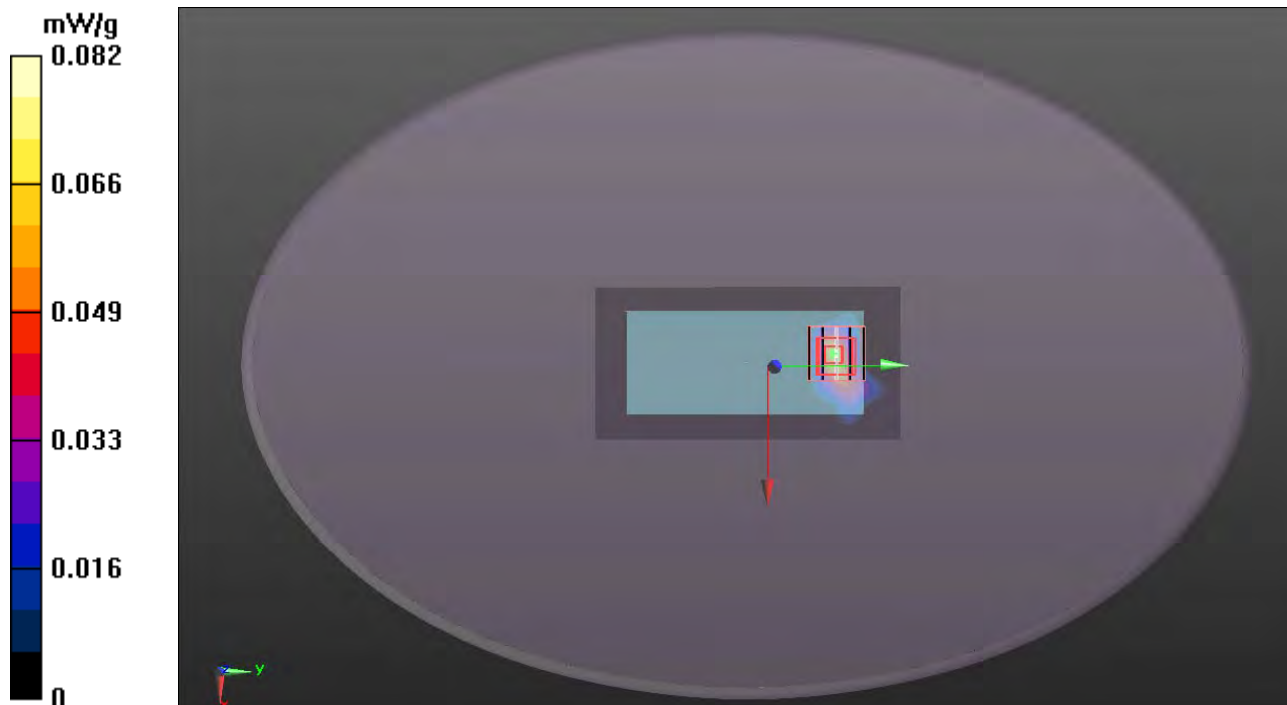
Ch01/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.433 V/m; Power Drift = 0.129 dB

Peak SAR (extrapolated) = 0.128 W/kg

SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.014 mW/g

Maximum value of SAR (measured) = 0.082 mW/g



P36 802.11b_Rear Face_1.5cm_Ch01_Earphone1**DUT: 110823C26**

Communication System: WLAN 2.4G; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: MSL2450_110907 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.876$ mho/m; $\epsilon_r =$

53.364; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C ; Liquid Temperature : 21.3 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3650; ConvF(7.05, 7.05, 7.05); Calibrated: 1/24/2011
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1277; Calibrated: 7/29/2011
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.6 (2); SEMCAD X Version 14.4.5 (3634)

Ch01/Area Scan (61x121x1): Measurement grid: dx=15mm, dy=15mm

Maximum value of SAR (interpolated) = 0.062 mW/g

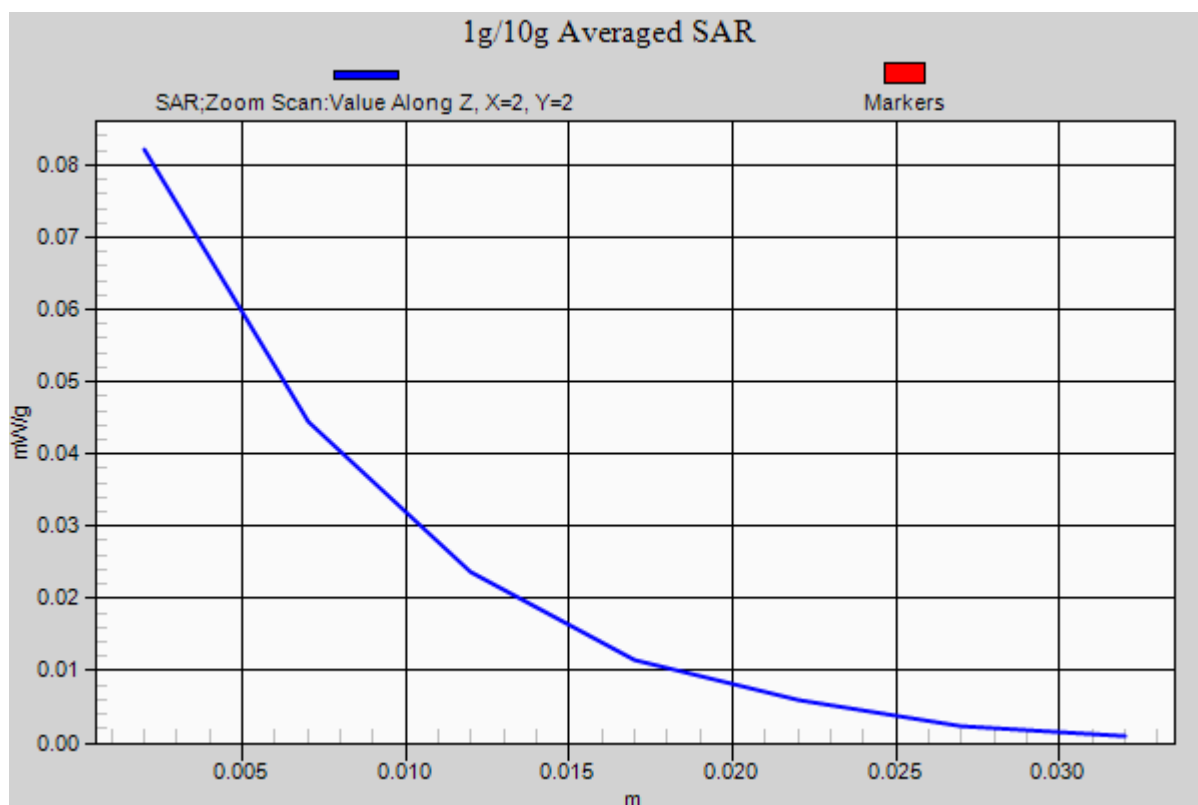
Ch01/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 0.433 V/m; Power Drift = 0.129 dB

Peak SAR (extrapolated) = 0.128 W/kg

SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.014 mW/g

Maximum value of SAR (measured) = 0.082 mW/g



P37 802.11a_Rear Face_1.5cm_Ch36

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5180 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used : $f = 5180 \text{ MHz}$; $\sigma = 5.134 \text{ mho/m}$; $\epsilon_r =$

48.523 ; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : $22.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.1 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.81, 4.81, 4.81); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch36/Area Scan (101x181x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Configuration/Ch36/Zoom Scan (7x7x9)/Cube 1: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 1.121 V/m ; Power Drift = 0.18dB

Peak SAR (extrapolated) = 0.1680

SAR(1 g) = 0.015 mW/g ; SAR(10 g) = 0.00435 mW/g

Maximum value of SAR (measured) = 0.032 mW/g

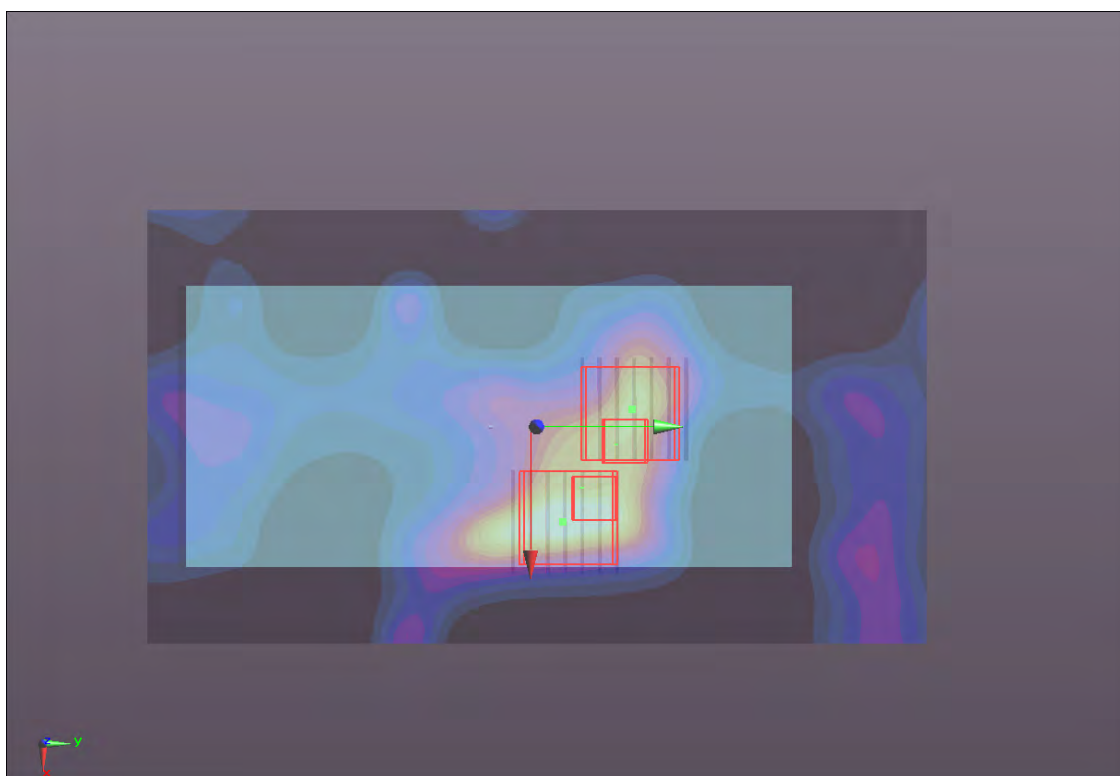
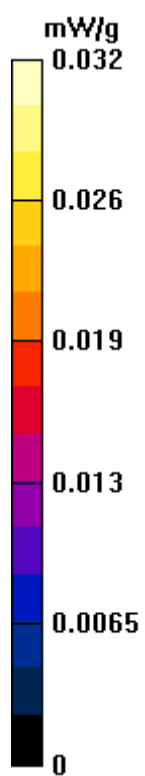
Ch36/Zoom Scan (7x7x9)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 1.121 V/m ; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.1560

SAR(1 g) = 0.014 mW/g ; SAR(10 g) = 0.0041 mW/g

Maximum value of SAR (measured) = 0.028 mW/g



P38 802.11a_Rear Face_1.5cm_Ch60**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used: $f = 5300$ MHz; $\sigma = 5.301$ mho/m; $\epsilon_r = 48.29$; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C; Liquid Temperature : 21.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.56, 4.56, 4.56); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch60/Area Scan (101x181x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.061 mW/g

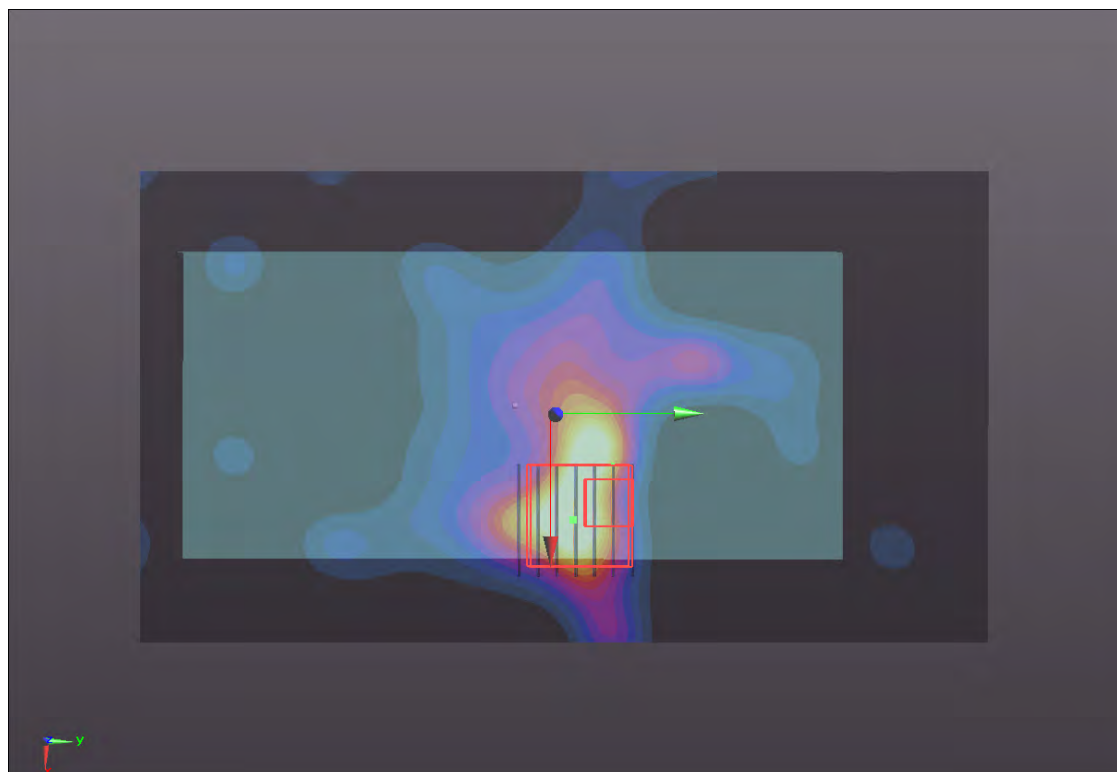
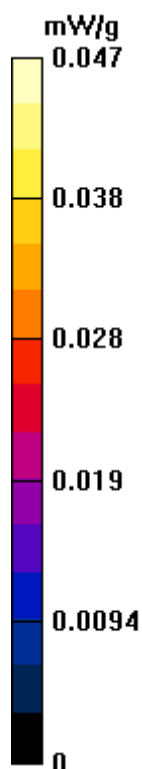
Ch60/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2.5mm

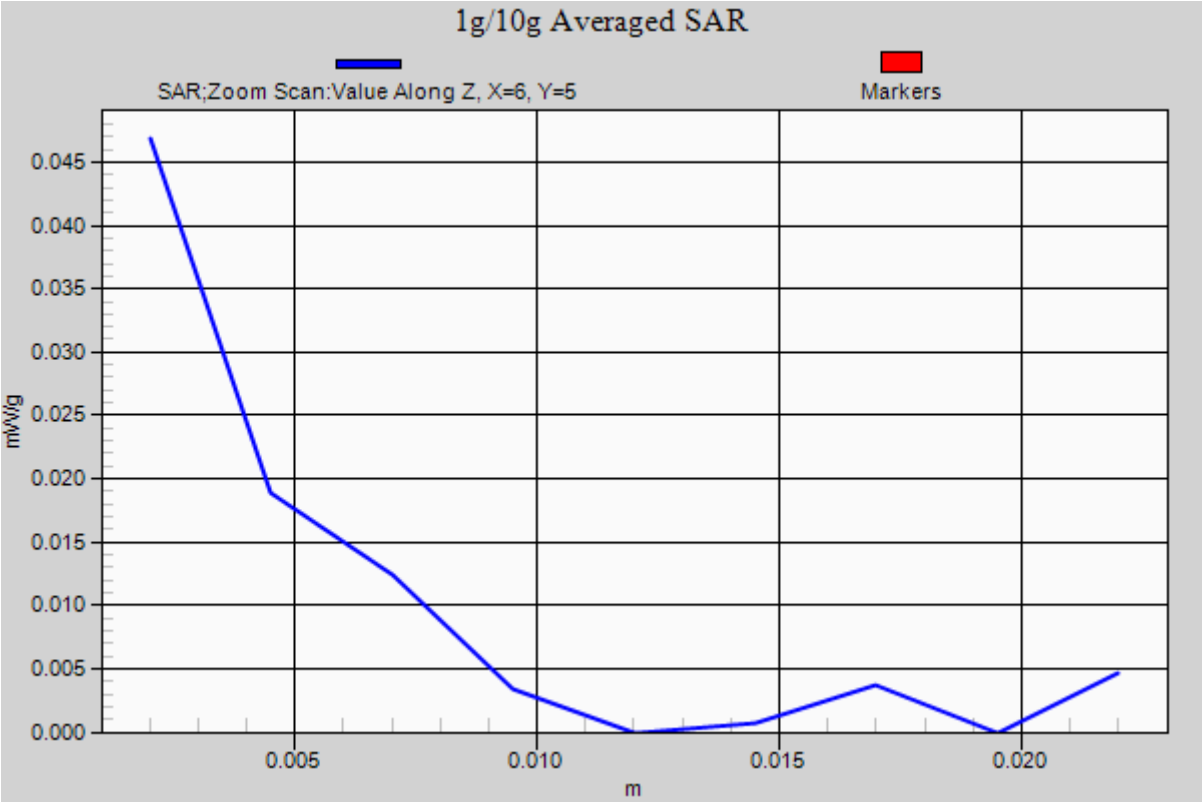
Reference Value = 1.868 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 0.2660

SAR(1 g) = 0.026 mW/g; SAR(10 g) = 0.00927 mW/g

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





P39 802.11a_Rear Face_1.5cm_Ch116

DUT: 110420C35

Communication System: WLAN_5G; Frequency: 5580 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used : $f = 5580 \text{ MHz}$; $\sigma = 5.688 \text{ mho/m}$; $\epsilon_r =$

47.693 ; $\rho = 1000 \text{ kg/m}^3$

Ambient Temperature : $22.5 \text{ }^\circ\text{C}$; Liquid Temperature : $21.1 \text{ }^\circ\text{C}$

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.01, 4.01, 4.01); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch116/Area Scan (121x181x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Maximum value of SAR (interpolated) = 0.016 mW/g

Ch116/Zoom Scan (7x7x9)/Cube 1: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 1.047 V/m ; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.0640

SAR(1 g) = 0.00414 mW/g ; SAR(10 g) = 0.00101 mW/g

Maximum value of SAR (measured) = 0.029 mW/g

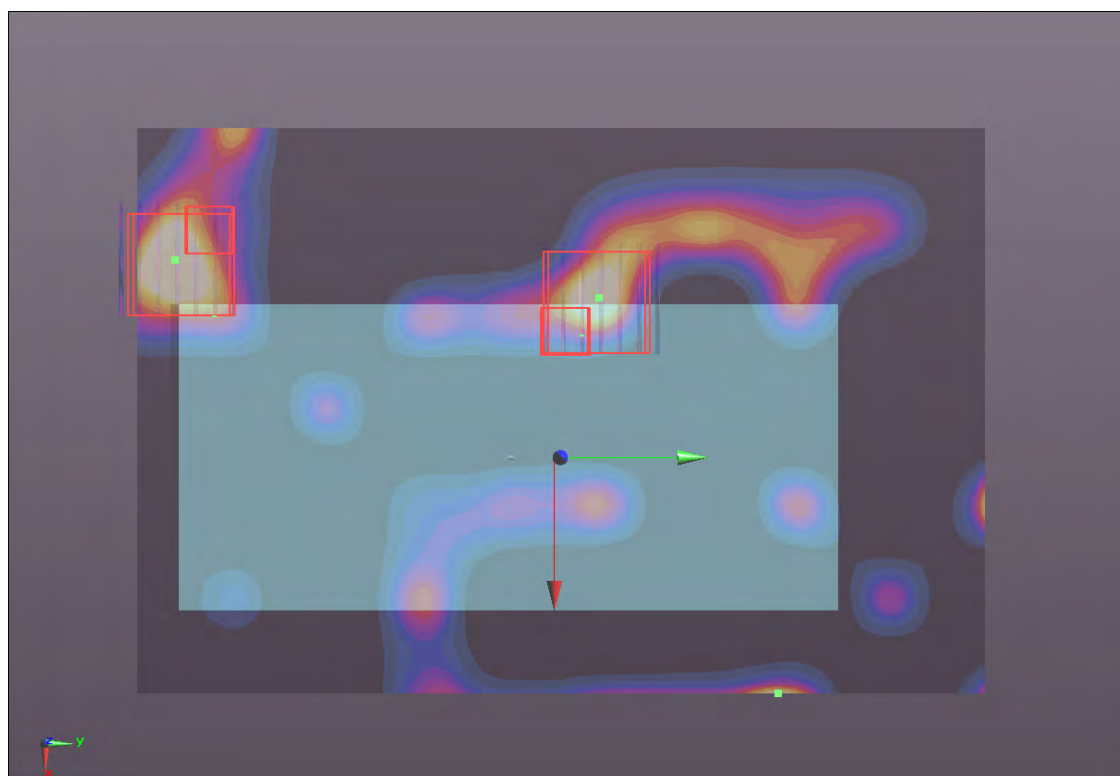
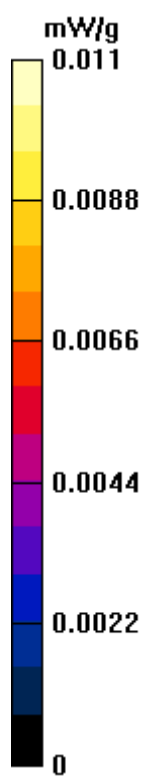
Ch116/Zoom Scan (7x7x9)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=2.5\text{mm}$

Reference Value = 1.047 V/m ; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.0160

SAR(1 g) = 0.000448 mW/g ; SAR(10 g) = $7.54\text{e-}005 \text{ mW/g}$

Maximum value of SAR (measured) = 0.011 mW/g



P40 802.11a_Rear Face_1.5cm_Ch157**DUT: 110420C35**

Communication System: WLAN_5G; Frequency: 5785 MHz; Duty Cycle: 1:1

Medium: B5G_1228 Medium parameters used : $f = 5785$ MHz; $\sigma = 5.961$ mho/m; $\epsilon_r =$

47.221 ; $\rho = 1000$ kg/m³

Ambient Temperature : 22.5 °C ; Liquid Temperature : 21.1 °C

DASY5 Configuration:

- Probe: EX3DV4 - SN3590; ConvF(4.55, 4.55, 4.55); Calibrated: 2011/02/25
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2011/08/29
- Phantom: ELI v4.0; Type: QDOVA001BA; Serial: TP:1043
- Measurement SW: DASY52, Version 52.8 (0); SEMCAD X Version 14.6.4 (4989)

Ch157/Area Scan (121x181x1): Measurement grid: $dx=10$ mm, $dy=10$ mm

Maximum value of SAR (interpolated) = 0.030 mW/g

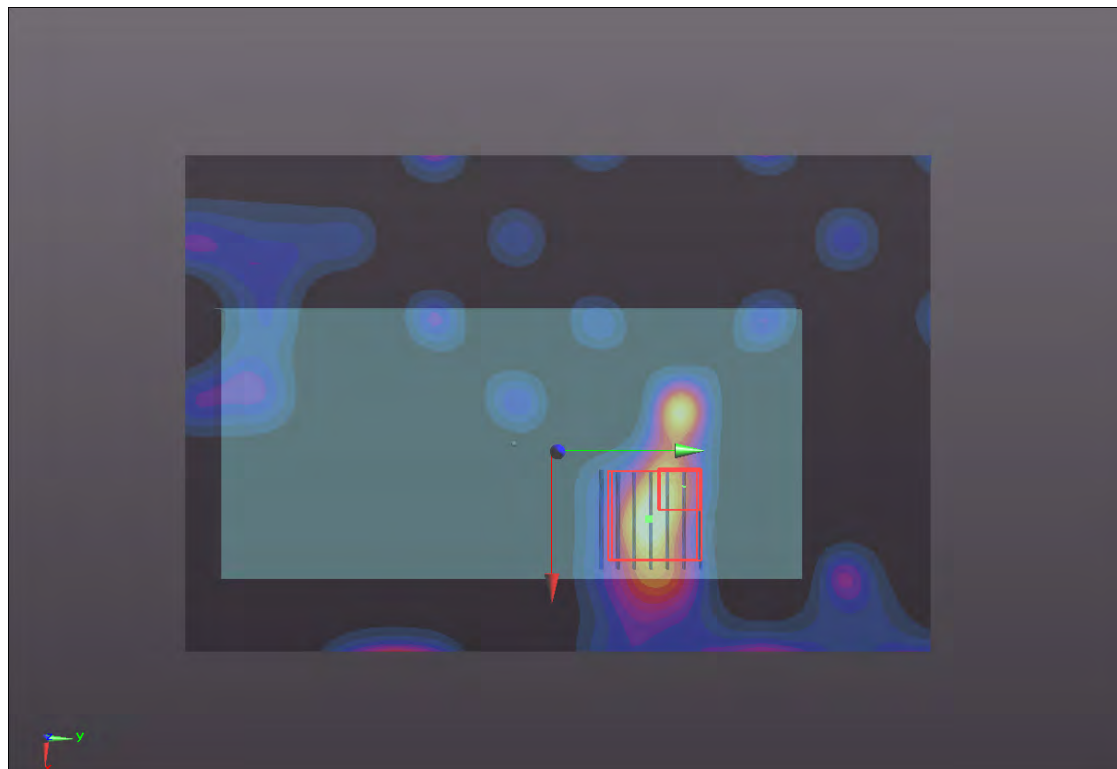
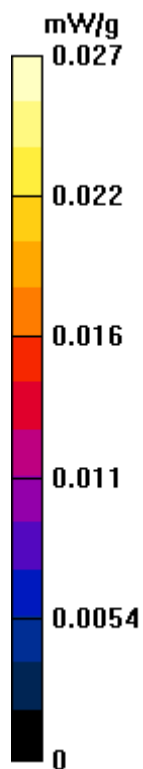
Ch157/Zoom Scan (7x7x9)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=2.5$ mm

Reference Value = 0.723 V/m; Power Drift = 0.18 dB

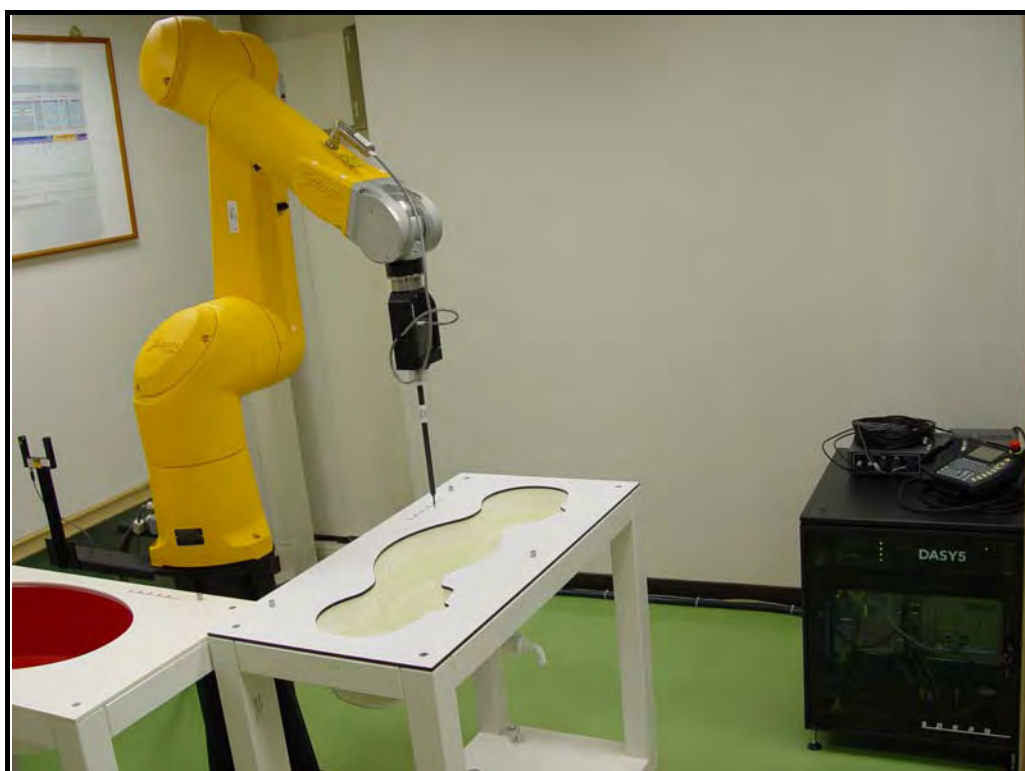
Peak SAR (extrapolated) = 0.1190

SAR(1 g) = 0.00402 mW/g; SAR(10 g) = 0.000688 mW/g

Maximum value of SAR (measured) = 0.027 mW/g



APPENDIX B: BV ADT SAR MEASUREMENT SYSTEM



APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION





APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION

D1: DOSIMETRIC E-FIELD PROBE



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **BV ADT (Auden)**

Certificate No: **EX3-3590_Feb11**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3590**

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

Calibration date: **February 25, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

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

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Niels Kuster	Quality Manager	
Issued: February 25, 2011			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



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Accreditation No.: **SCS 108**

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Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
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:

- 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
- 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:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep 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
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}** are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- VR**: VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3590

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

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

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

Basic Calibration Parameters

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

Modulation Calibration Parameters

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

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

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter; uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

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

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

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

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

Calibration Parameter Determined in Body Tissue Simulating Media

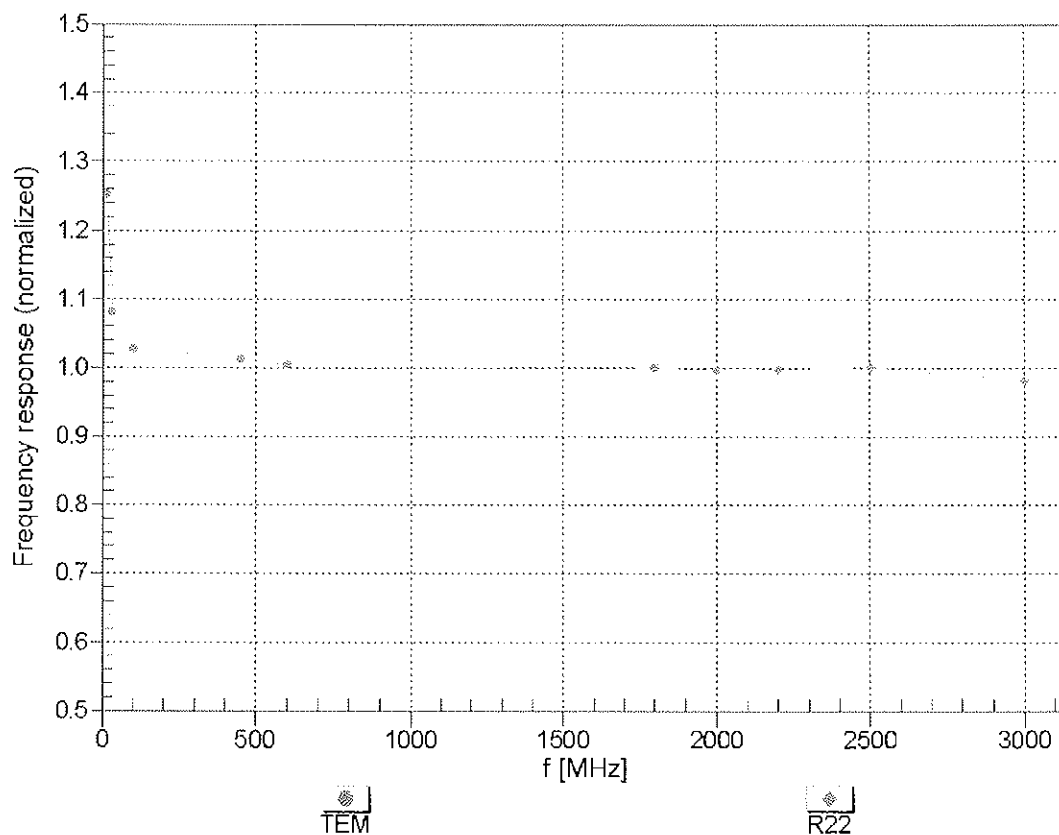
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
835	55.2	0.97	10.32	10.32	10.32	0.38	0.82	± 12.0 %
1640	53.8	1.40	9.72	9.72	9.72	0.51	0.79	± 12.0 %
1750	53.4	1.49	8.77	8.77	8.77	0.37	0.92	± 12.0 %
1950	53.3	1.52	8.49	8.49	8.49	0.60	0.67	±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

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

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

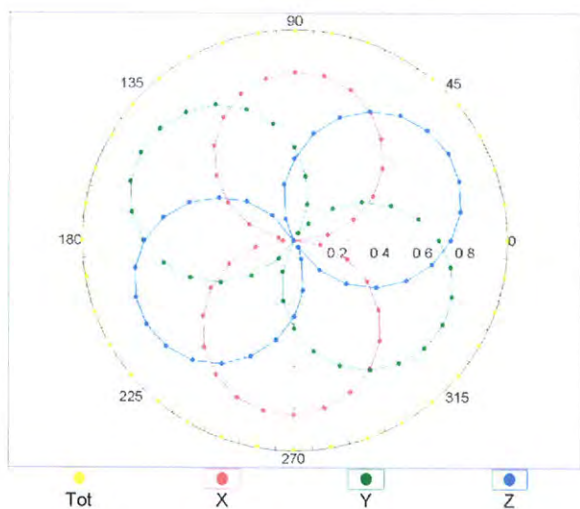
(TEM-Cell:ifi110 EXX, Waveguide: R22)



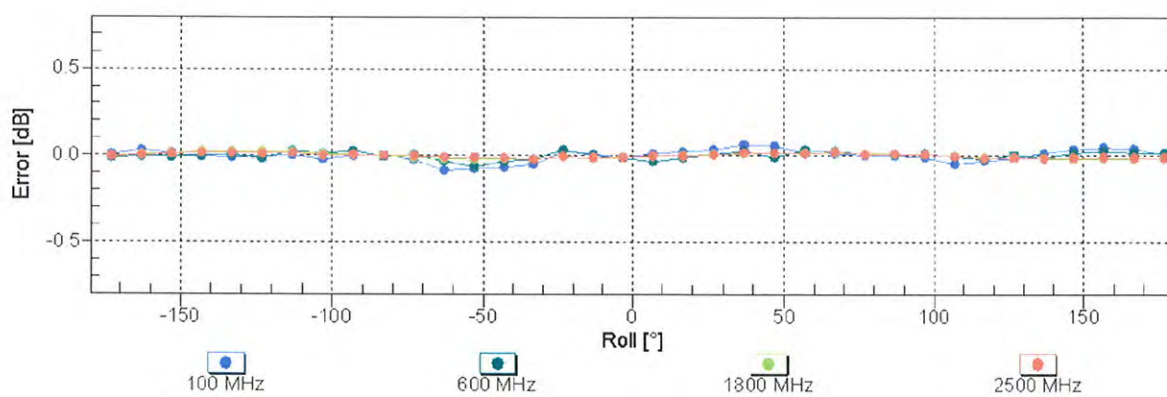
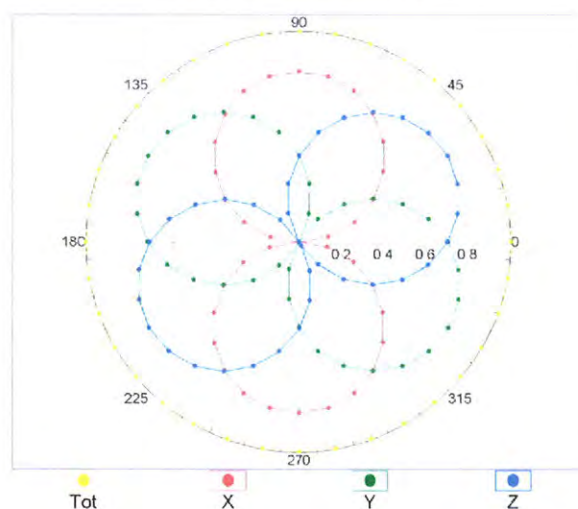
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f=600 MHz, TEM



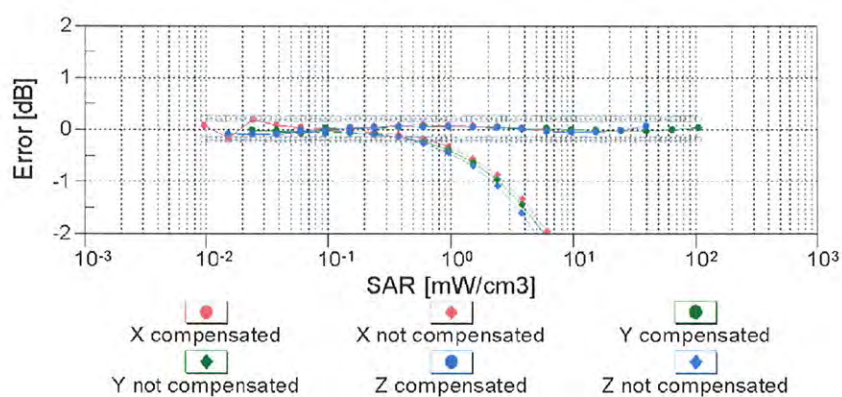
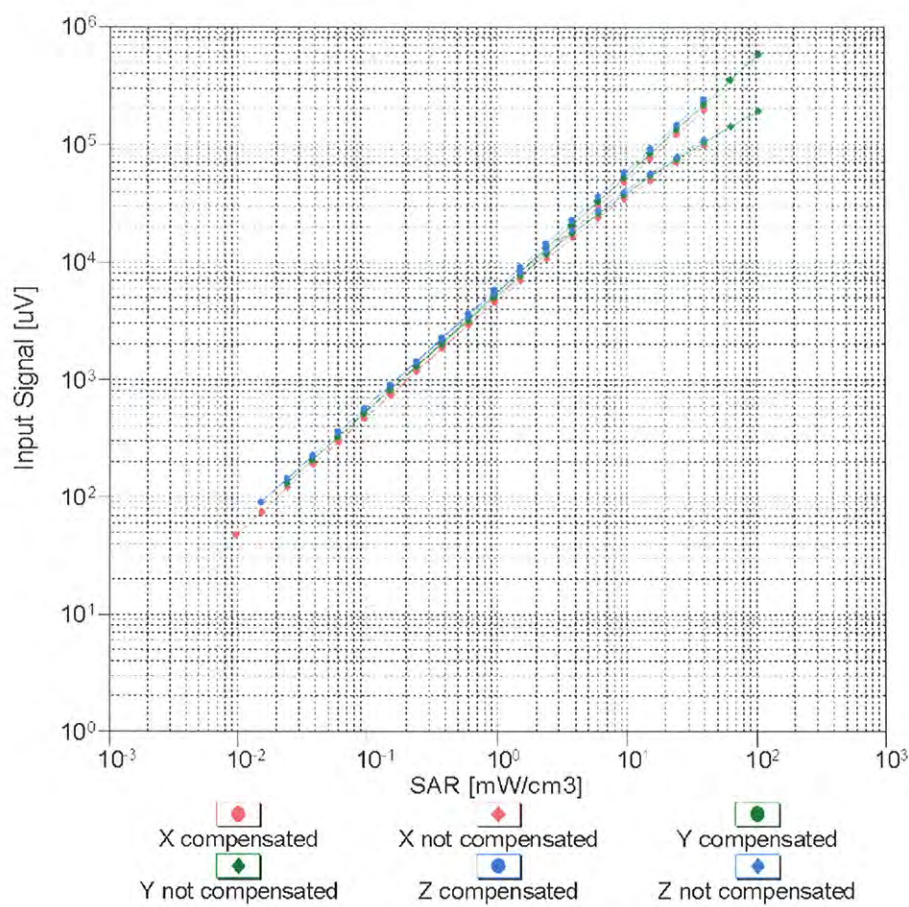
f=1800 MHz, R22



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

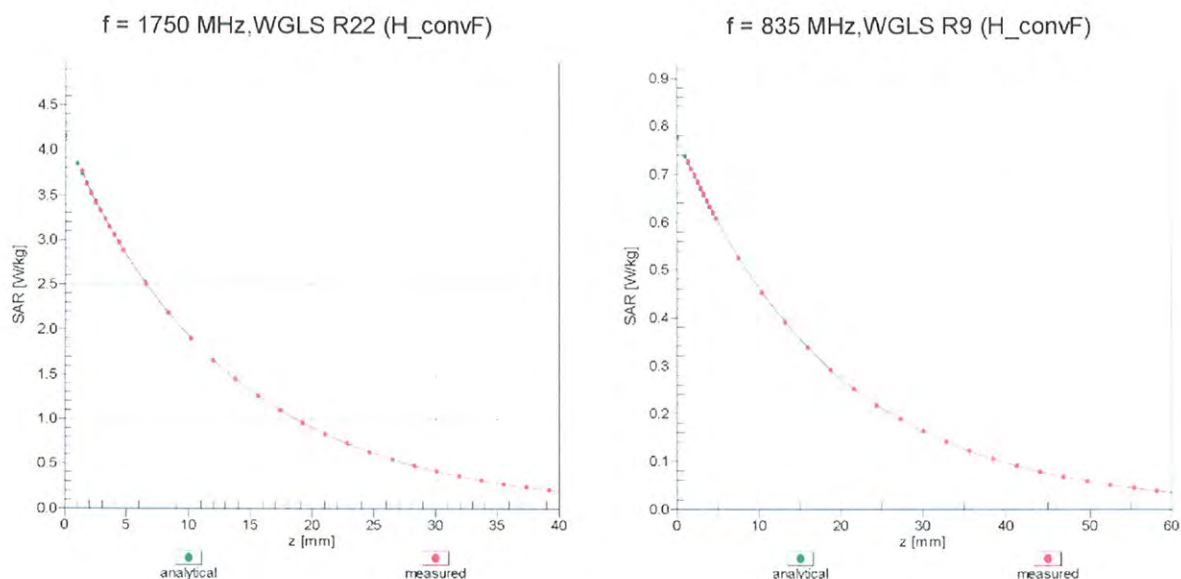
Dynamic Range f(SAR_{head})

(TEM cell , f = 900 MHz)



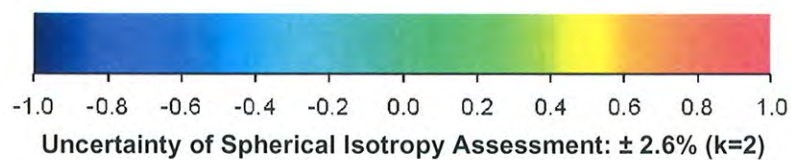
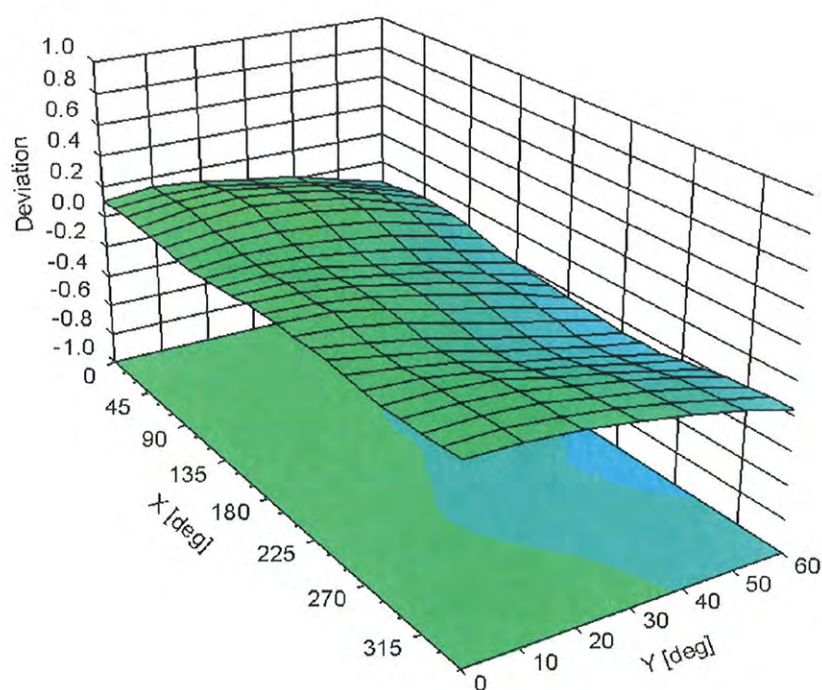
Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Air

Error (ϕ, ϑ), $f = 900 \text{ MHz}$



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

Other Probe Parameters

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



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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

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

Certificate No: **EX3-3650_Jan11**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3650**

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

Calibration date: **January 24, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by: **Katja Pokovic** Name
 Function **Technical Manager**

Signature

Approved by: **Fin Bornholt** Name
 R&D Director

Issued: January 25, 2011

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
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:

- 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
- 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:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not effect the E^2 -field uncertainty inside TSL (see below **ConvF**).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of **ConvF**.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; VR_{x,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 NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3650

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

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

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

Basic Calibration Parameters

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

Modulation Calibration Parameters

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

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

^A The uncertainties of NormX,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the maximum deviation from linear response applying recatangular distribution and is expressed for the square of the field value.

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

Calibration Parameter Determined in Head Tissue Simulating Media

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

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

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

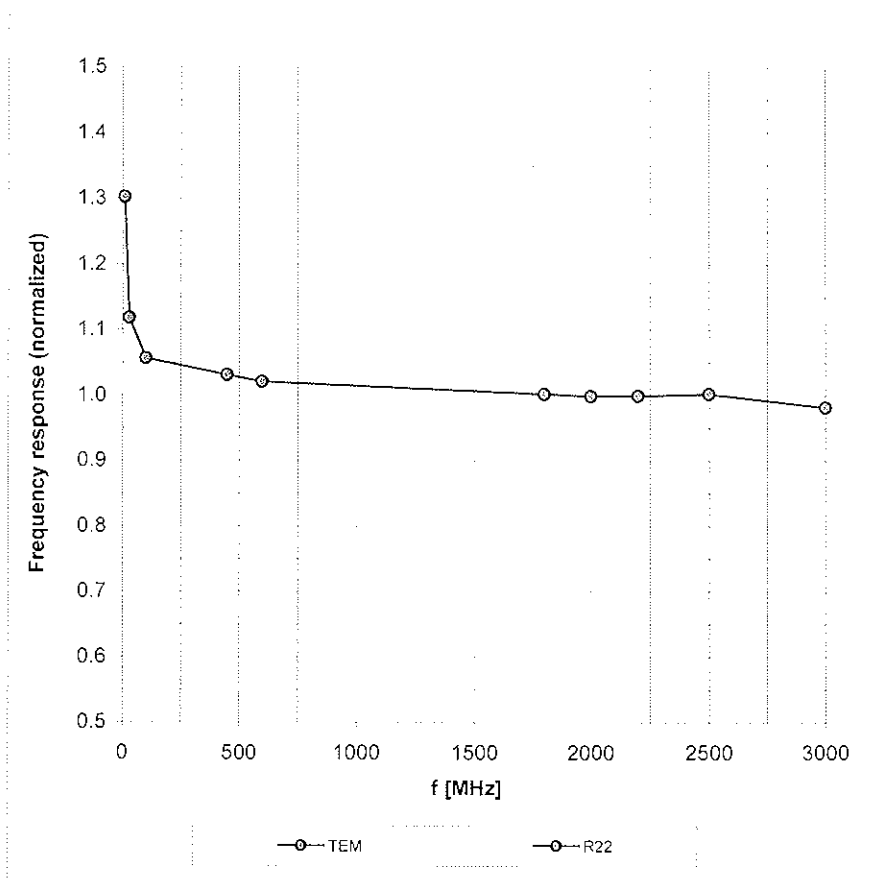
Calibration Parameter Determined in Body Tissue Simulating Media

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

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

Frequency Response of E-Field

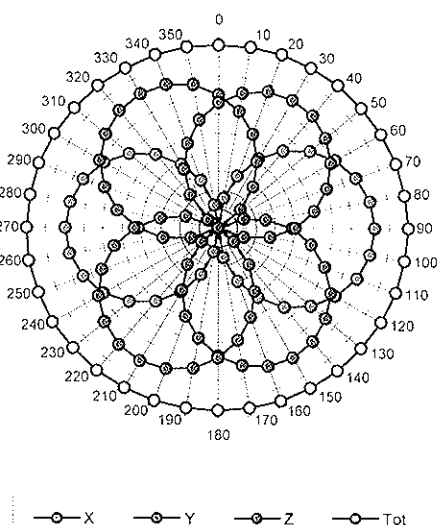
(TEM-Cell:ifi110 EXX, Waveguide: R22)



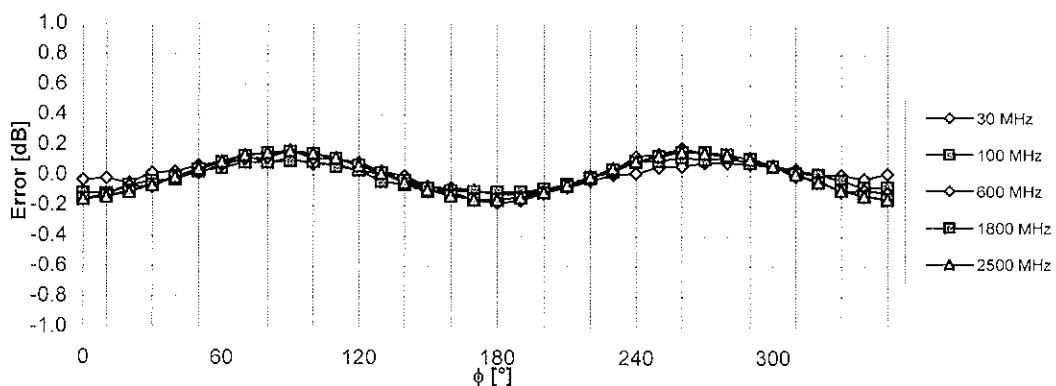
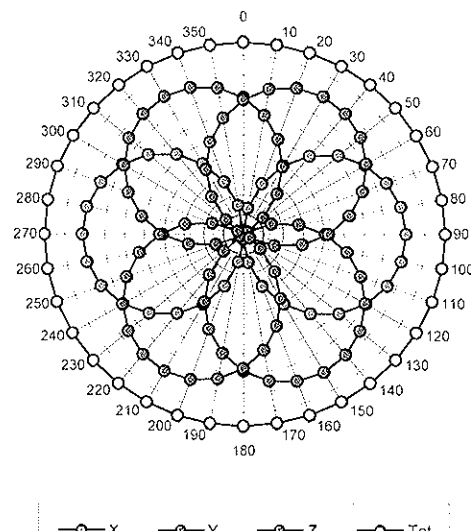
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

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

f = 600 MHz, TEM ifi110EXX



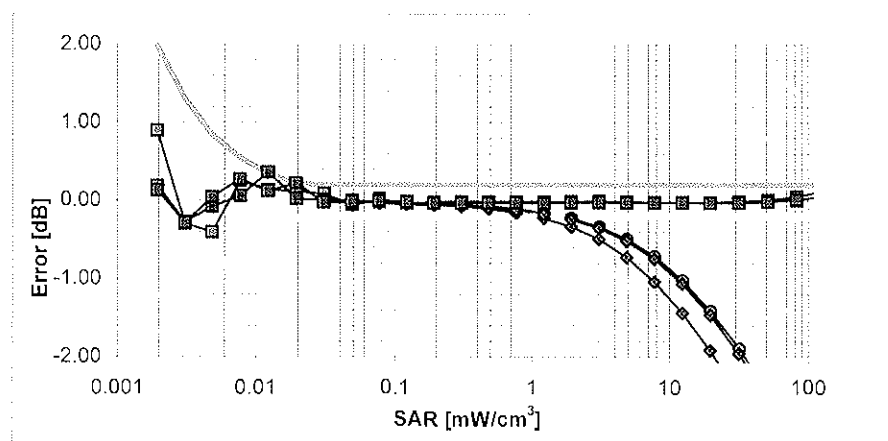
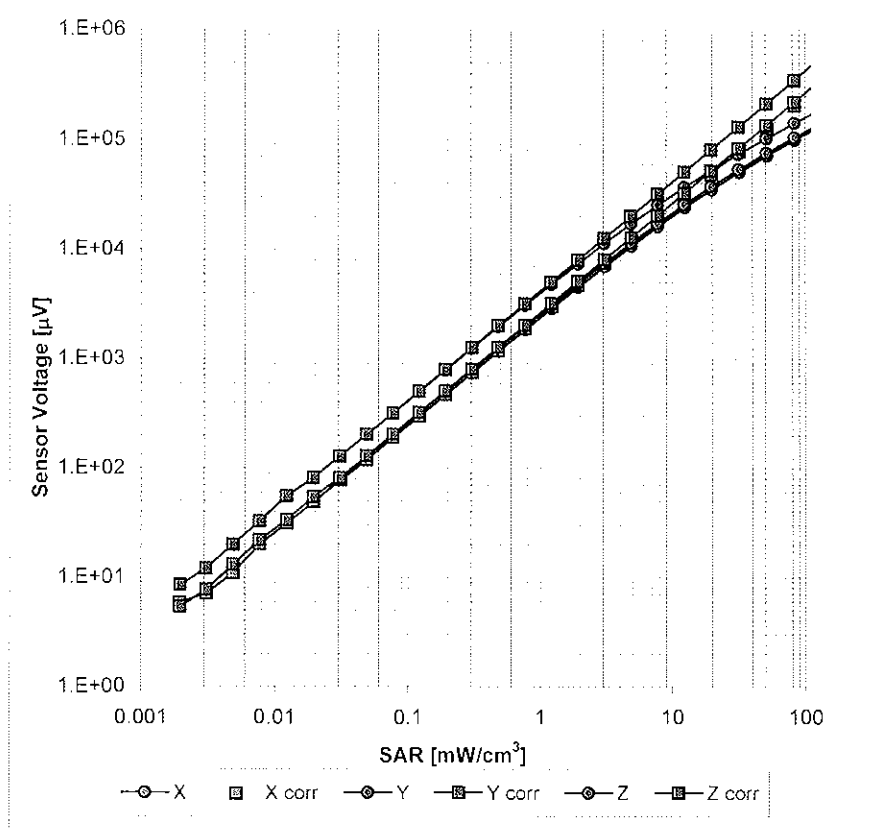
f = 1800 MHz, WG R22



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

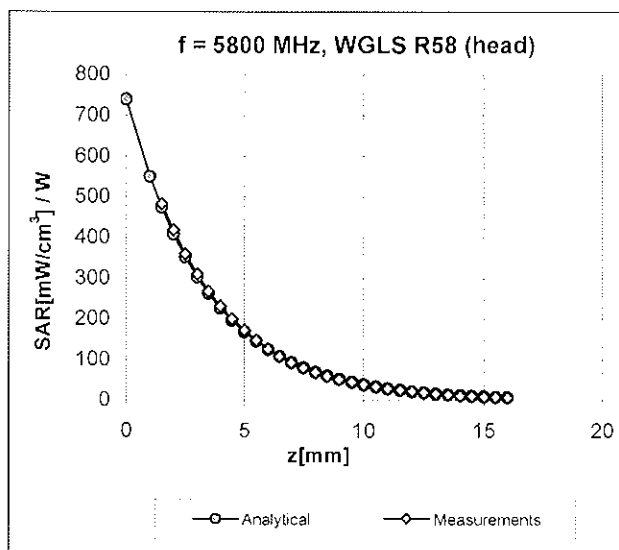
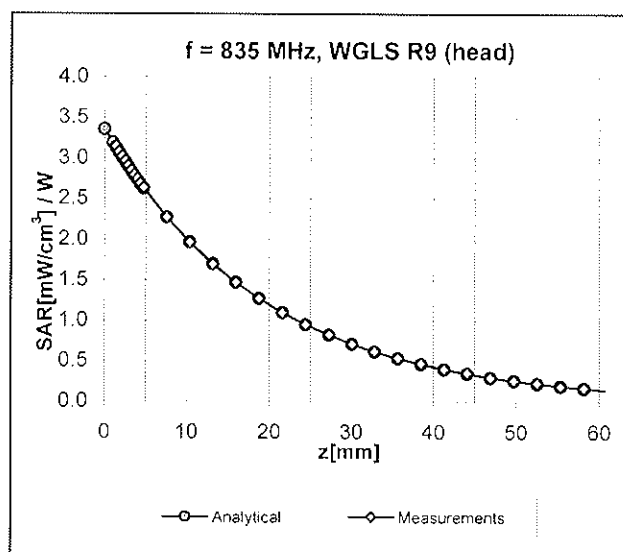
Dynamic Range f(SAR_{head})

(TEM cell, f = 900 MHz)



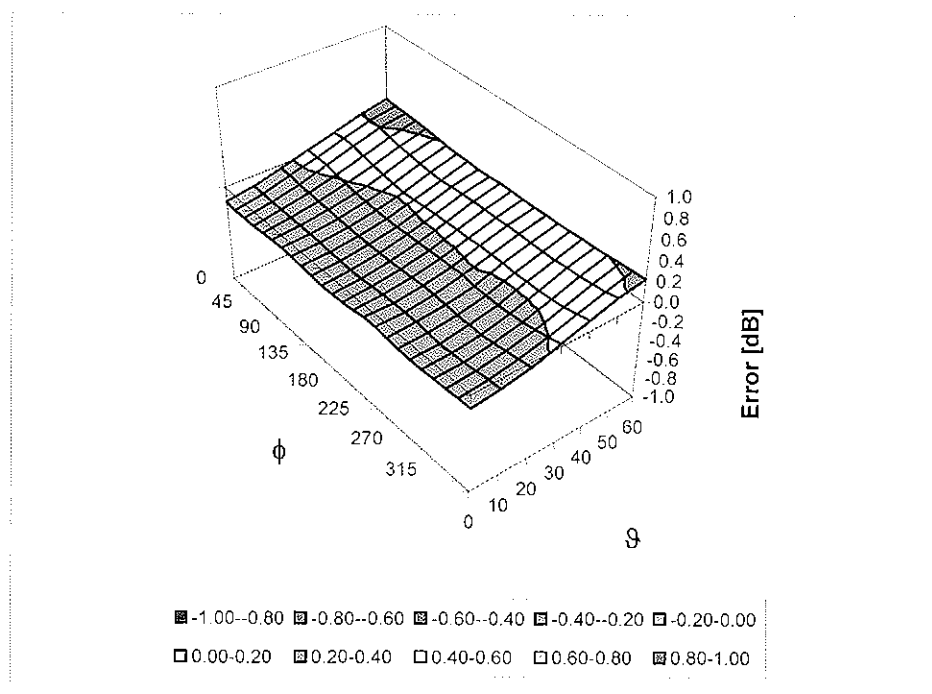
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in HSL

Error (ϕ , θ), f = 900 MHz



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

Other Probe Parameters

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



D2: DAE



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

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

Certificate No: **DAE4-1277_Jul11**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BJ - SN: 1277**

Calibration procedure(s) **QA CAL-06.v23**
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: **July 29, 2011**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-10 (No:10376)	Sep-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	08-Jun-11 (in house check)	In house check: Jun-12

Calibrated by:	Name	Function	Signature
	Andrea Guntli	Technician	
Approved by:	Fin Bomholt	R&D Director	

Issued: July 29, 2011

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Accreditation No.: **SCS 108**

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Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

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

Calibration Factors	X	Y	Z
High Range	405.508 \pm 0.1% (k=2)	404.400 \pm 0.1% (k=2)	405.608 \pm 0.1% (k=2)
Low Range	4.01150 \pm 0.7% (k=2)	3.99808 \pm 0.7% (k=2)	3.94735 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	330.0 ° \pm 1 °
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Appendix

1. DC Voltage Linearity

High Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	200012.2	2.59	0.00
Channel X	+ Input	20000.02	0.32	0.00
Channel X	- Input	-19998.75	1.75	-0.01
Channel Y	+ Input	200009.4	0.74	0.00
Channel Y	+ Input	19995.02	-4.58	-0.02
Channel Y	- Input	-19999.88	-0.28	0.00
Channel Z	+ Input	200008.7	0.85	0.00
Channel Z	+ Input	19996.89	-2.51	-0.01
Channel Z	- Input	-20000.25	-0.85	0.00

Low Range		Reading (μV)	Difference (μV)	Error (%)
Channel X	+ Input	1999.6	-0.36	-0.02
Channel X	+ Input	199.94	-0.06	-0.03
Channel X	- Input	-199.60	0.40	-0.20
Channel Y	+ Input	1999.8	-0.36	-0.02
Channel Y	+ Input	199.31	-0.49	-0.25
Channel Y	- Input	-200.76	-0.76	0.38
Channel Z	+ Input	2000.3	0.49	0.02
Channel Z	+ Input	198.51	-1.49	-0.74
Channel Z	- Input	-201.32	-1.42	0.71

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	-20.60	-22.40
	- 200	24.24	22.26
Channel Y	200	-12.18	-11.78
	- 200	10.76	10.25
Channel Z	200	1.85	2.01
	- 200	-4.45	-4.31

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	2.54	-1.13
Channel Y	200	2.90	-	5.32
Channel Z	200	1.19	-0.48	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15917	15565
Channel Y	16322	15815
Channel Z	16119	16292

5. Input Offset Measurement

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

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	-1.37	-2.71	0.38	0.58
Channel Y	-2.06	-3.89	-0.52	0.56
Channel Z	-2.20	-3.36	-0.62	0.50

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **BV-ADT (Auden)**

Certificate No: **DAE3-579_Sep10**

CALIBRATION CERTIFICATE

Object **DAE3 - SD 000 D03 AA - SN: 579**

Calibration procedure(s) **QA CAL-06.v22
Calibration procedure for the data acquisition electronics (DAE)**

Calibration date: **September 20, 2010**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: September 20, 2010

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Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

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

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

Connector Angle

Connector Angle to be used in DASY system	358.0 $^{\circ}$ \pm 1 $^{\circ}$
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Appendix

1. DC Voltage Linearity

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

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

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	7.07	5.75
	- 200	-4.60	-6.25
Channel Y	200	9.48	9.62
	- 200	-10.39	-10.96
Channel Z	200	8.79	8.42
	- 200	-9.64	-9.80

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	0.03	0.35
Channel Y	200	1.14	-	2.31
Channel Z	200	2.01	0.80	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	16343	16314
Channel Y	16194	16427
Channel Z	15816	16265

5. Input Offset Measurement

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

Input 10M Ω

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

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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



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Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

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

Certificate No: **DAE4-861_Aug11**

CALIBRATION CERTIFICATE

Object **DAE4 - SD 000 D04 BJ - SN: 861**

Calibration procedure(s) **QA CAL-06.v23**
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: **August 29, 2011**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Keithley Multimeter Type 2001	SN: 0810278	28-Sep-10 (No:10376)	Sep-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	08-Jun-11 (in house check)	In house check: Jun-12

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

Issued: August 29, 2011

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Accreditation No.: **SCS 108**

Glossary

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

Methods Applied and Interpretation of Parameters

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

DC Voltage Measurement

A/D - Converter Resolution nominal

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

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

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

Calibration Factors	X	Y	Z
High Range	404.369 \pm 0.1% (k=2)	404.758 \pm 0.1% (k=2)	405.720 \pm 0.1% (k=2)
Low Range	4.01191 \pm 0.7% (k=2)	4.00807 \pm 0.7% (k=2)	4.02061 \pm 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	126.0 ° \pm 1 °
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Appendix

1. DC Voltage Linearity

High Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	200003.7	2.18	0.00
Channel X + Input	19998.70	-2.10	-0.01
Channel X - Input	-20000.72	-0.82	0.00
Channel Y + Input	200003.3	3.09	0.00
Channel Y + Input	19997.06	-2.54	-0.01
Channel Y - Input	-20001.61	-1.81	0.01
Channel Z + Input	200001.0	1.32	0.00
Channel Z + Input	19998.31	-1.39	-0.01
Channel Z - Input	-20000.55	-0.75	0.00

Low Range	Reading (μV)	Difference (μV)	Error (%)
Channel X + Input	2000.2	0.12	0.01
Channel X + Input	200.25	0.05	0.02
Channel X - Input	-198.30	1.80	-0.90
Channel Y + Input	2000.4	0.44	0.02
Channel Y + Input	198.69	-1.21	-0.60
Channel Y - Input	-200.48	-0.48	0.24
Channel Z + Input	2000.1	0.13	0.01
Channel Z + Input	199.88	-0.22	-0.11
Channel Z - Input	-201.71	-1.81	0.91

2. Common mode sensitivity

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

	Common mode Input Voltage (mV)	High Range Average Reading (μV)	Low Range Average Reading (μV)
Channel X	200	5.00	3.52
	- 200	-2.54	-4.10
Channel Y	200	0.95	1.43
	- 200	-2.77	-2.63
Channel Z	200	-9.47	-9.71
	- 200	7.61	7.59

3. Channel separation

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

	Input Voltage (mV)	Channel X (μV)	Channel Y (μV)	Channel Z (μV)
Channel X	200	-	4.12	-0.79
Channel Y	200	2.04	-	4.95
Channel Z	200	1.95	-0.33	-

4. AD-Converter Values with inputs shorted

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

	High Range (LSB)	Low Range (LSB)
Channel X	15976	16003
Channel Y	16064	16134
Channel Z	16042	16211

5. Input Offset Measurement

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

Input 10M Ω

	Average (μ V)	min. Offset (μ V)	max. Offset (μ V)	Std. Deviation (μ V)
Channel X	-0.28	-2.06	1.31	0.64
Channel Y	-0.44	-1.89	2.45	0.60
Channel Z	-1.18	-2.63	1.47	0.74

6. Input Offset Current

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

7. Input Resistance (Typical values for information)

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

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

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

9. Power Consumption (Typical values for information)

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



D3: SYSTEM VALIDATION DIPOLE



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Accreditation No.: **SCS 108**

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

Certificate No: **D2450V2-716_Jan11**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 716**

Calibration procedure(s) **QA CAL-05.v8**
Calibration procedure for dipole validation kits

Calibration date: **January 26, 2011**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

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

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

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

Issued: January 27, 2011

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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
- 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
- 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:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz \pm 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

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

SAR result with Head TSL

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

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

Body TSL parameters

The following parameters and calculations were applied.

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

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.4 mW / g
SAR normalized	normalized to 1W	53.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	53.3 mW / g ± 17.0 % (k=2)

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

Appendix

Antenna Parameters with Head TSL

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

Antenna Parameters with Body TSL

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

General Antenna Parameters and Design

Electrical Delay (one direction)	1.143 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 10, 2002

DASY5 Validation Report for Head TSL

Date/Time: 24.01.2011 13:05:38

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: HSL U12 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.75$ mho/m; $\epsilon_r = 38.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

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

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement
grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.2 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 27.976 W/kg

SAR(1 g) = 13.6 mW/g; SAR(10 g) = 6.37 mW/g

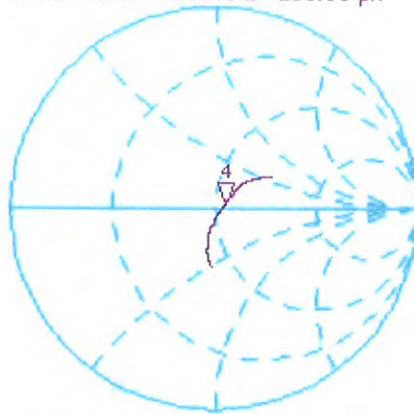
Maximum value of SAR (measured) = 17.366 mW/g



Impedance Measurement Plot for Head TSL

24 Jan 2011 10:25:33
[CH1] S11 1 U FS 4: 55.020 Ω 2.0840 Ω 135.38 μ H 2 450.000 000 MHz

*
De l
CΔ



Avg
16

↑

CH2 S11 LOG 5 dB/REF -20 dB 4:-25.719 dB 2 450.000 000 MHz

CΔ

Avg
16

↑



START 2 250.000 000 MHz

STOP 2 650.000 000 MHz

DASY5 Validation Report for Body TSL

Date/Time: 26.01.2011 13:56:41

Test Laboratory: SPEAG, Zurich, Switzerland

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

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

Medium: MSL U12 BB

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.97$ mho/m; $\epsilon_r = 52.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

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

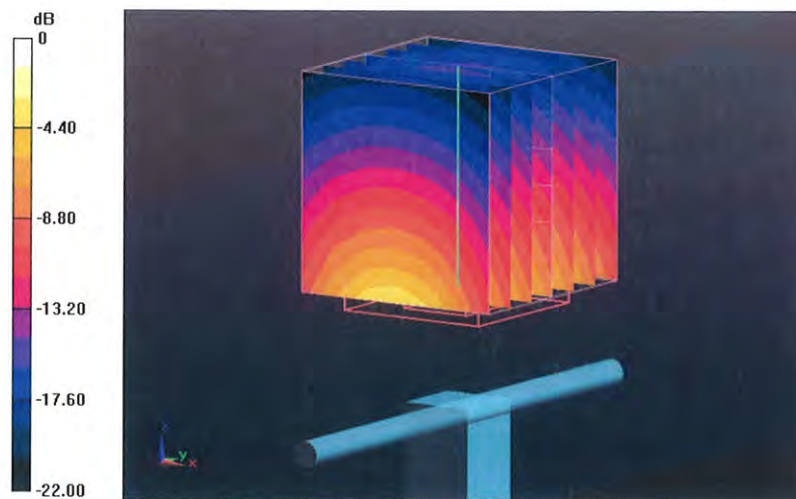
Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7) /Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.445 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 28.276 W/kg

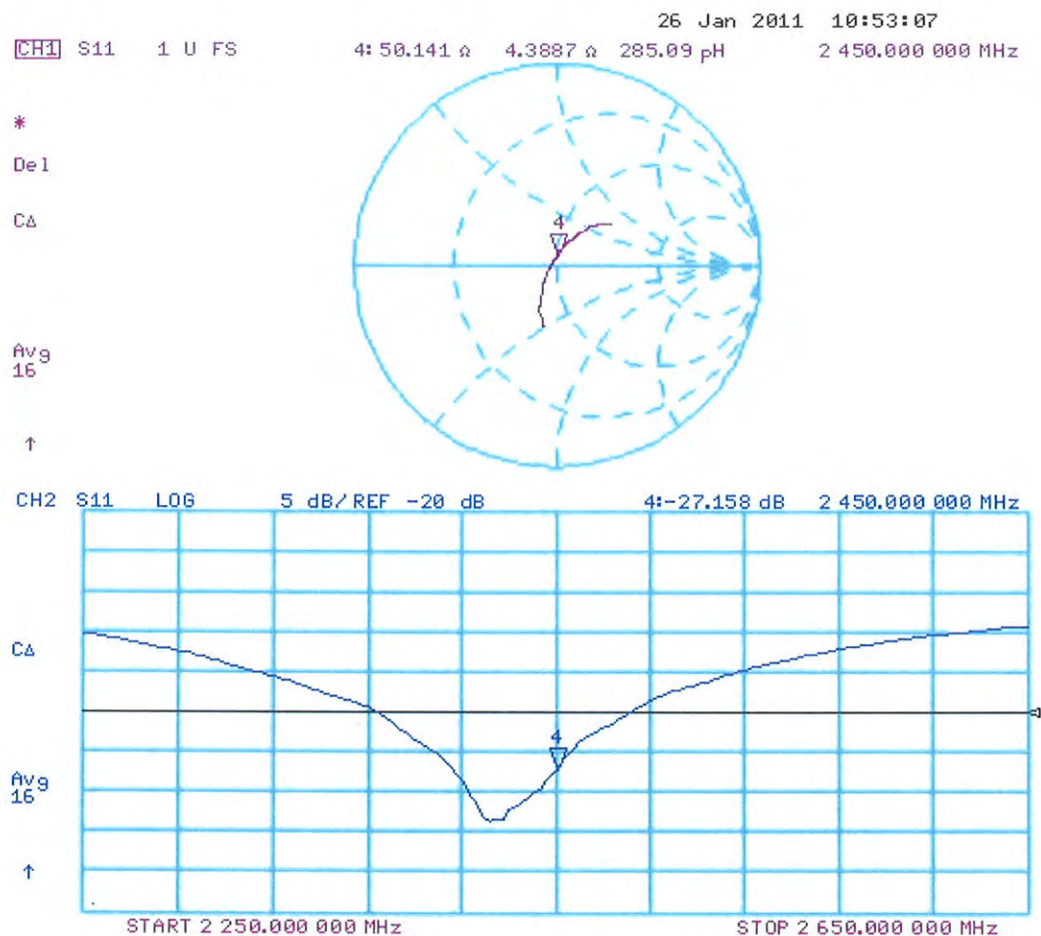
SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.22 mW/g

Maximum value of SAR (measured) = 17.680 mW/g



0 dB = 17.680mW/g

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

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

Certificate No: **D5GHzV2-1019_Jan11**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1019**

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

Calibration date: **January 25, 2011**

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

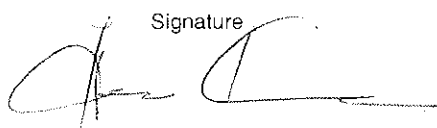
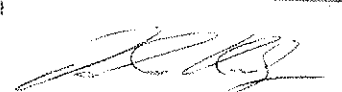
All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe EX3DV4	SN: 3503	05-Mar-10 (No. EX3-3503_Mar10)	Mar-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-11
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-09)	In house check: Oct-11
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-10)	In house check: Oct-11

Calibrated by: **Jeton Kastrati** Name
 Laboratory Technician Function

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

Signature



Issued: January 25, 2011

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Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
- b) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- c) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V52.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Area Scan resolution	dx, dy = 10 mm	
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 2.0 mm	
Frequency	5200 MHz \pm 1 MHz 5500 MHz \pm 1 MHz 5800 MHz \pm 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 \pm 0.2) °C	35.3 \pm 6 %	4.50 mho/m \pm 6 %
Head TSL temperature during test	(21.8 \pm 0.2) °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	100 mW input power	8.21 mW / g
SAR normalized	normalized to 1W	82.1 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	81.8 mW / g \pm 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 mW / g
SAR normalized	normalized to 1W	23.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	23.1 mW / g \pm 19.5 % (k=2)

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.2 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature during test	(21.8 ± 0.2) °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	100 mW input power	8.87 mW / g
SAR normalized	normalized to 1W	88.7 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	88.9 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.49 mW / g
SAR normalized	normalized to 1W	24.9 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	24.9 mW / g ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	5.17 mho/m ± 6 %
Head TSL temperature during test	(21.8 ± 0.2) °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	condition	
SAR measured	100 mW input power	8.32 mW / g
SAR normalized	normalized to 1W	83.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	83.2 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 mW / g
SAR normalized	normalized to 1W	23.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	23.3 mW / g ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.37 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	condition	
SAR measured	100 mW input power	7.77 mW / g
SAR normalized	normalized to 1W	77.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	77.1 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.15 mW / g
SAR normalized	normalized to 1W	21.5 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	21.3 mW / g ± 19.5 % (k=2)

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.75 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	condition	
SAR measured	100 mW input power	8.31 mW / g
SAR normalized	normalized to 1W	83.1 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	82.4 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.29 mW / g
SAR normalized	normalized to 1W	22.9 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	22.7 mW / g ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.1 ± 6 %	6.14 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	condition	
SAR measured	100 mW input power	7.40 mW / g
SAR normalized	normalized to 1W	74.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	73.4 mW / g ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.02 mW / g
SAR normalized	normalized to 1W	20.2 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	20.0 mW / g ± 19.5 % (k=2)

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	$51.9\ \Omega - 8.4\ j\Omega$
Return Loss	-21.5 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	$51.4\ \Omega - 2.1\ j\Omega$
Return Loss	-31.9 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	$56.3\ \Omega + 2.6\ j\Omega$
Return Loss	-23.9 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	$51.8\ \Omega - 6.7\ j\Omega$
Return Loss	-23.3 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	$51.6\ \Omega - 0.4\ j\Omega$
Return Loss	-36.0 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	$56.4\ \Omega + 3.9\ j\Omega$
Return Loss	-23.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns
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After long term use with 40 W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 05, 2004

DASY5 Validation Report for Head TSL

Date/Time: 25.01.2011 15:44:08

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1019

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: HSL 5000

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.51$ mho/m; $\epsilon_r = 35.3$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5500$ MHz; $\sigma = 4.87$ mho/m; $\epsilon_r = 36.2$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5800$ MHz; $\sigma = 5.18$ mho/m; $\epsilon_r = 35.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.36, 5.36, 5.36), ConvF(4.85, 4.85, 4.85), ConvF(4.74, 4.74, 4.74); Calibrated: 05.03.2010
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=100mW/d=10mm, f=5200 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 63.766 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 31.432 W/kg

SAR(1 g) = 8.21 mW/g; SAR(10 g) = 2.32 mW/g

Maximum value of SAR (measured) = 16.241 mW/g

Pin=100mW/d=10mm, f=5500 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 64.225 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 36.205 W/kg

SAR(1 g) = 8.87 mW/g; SAR(10 g) = 2.49 mW/g

Maximum value of SAR (measured) = 17.917 mW/g

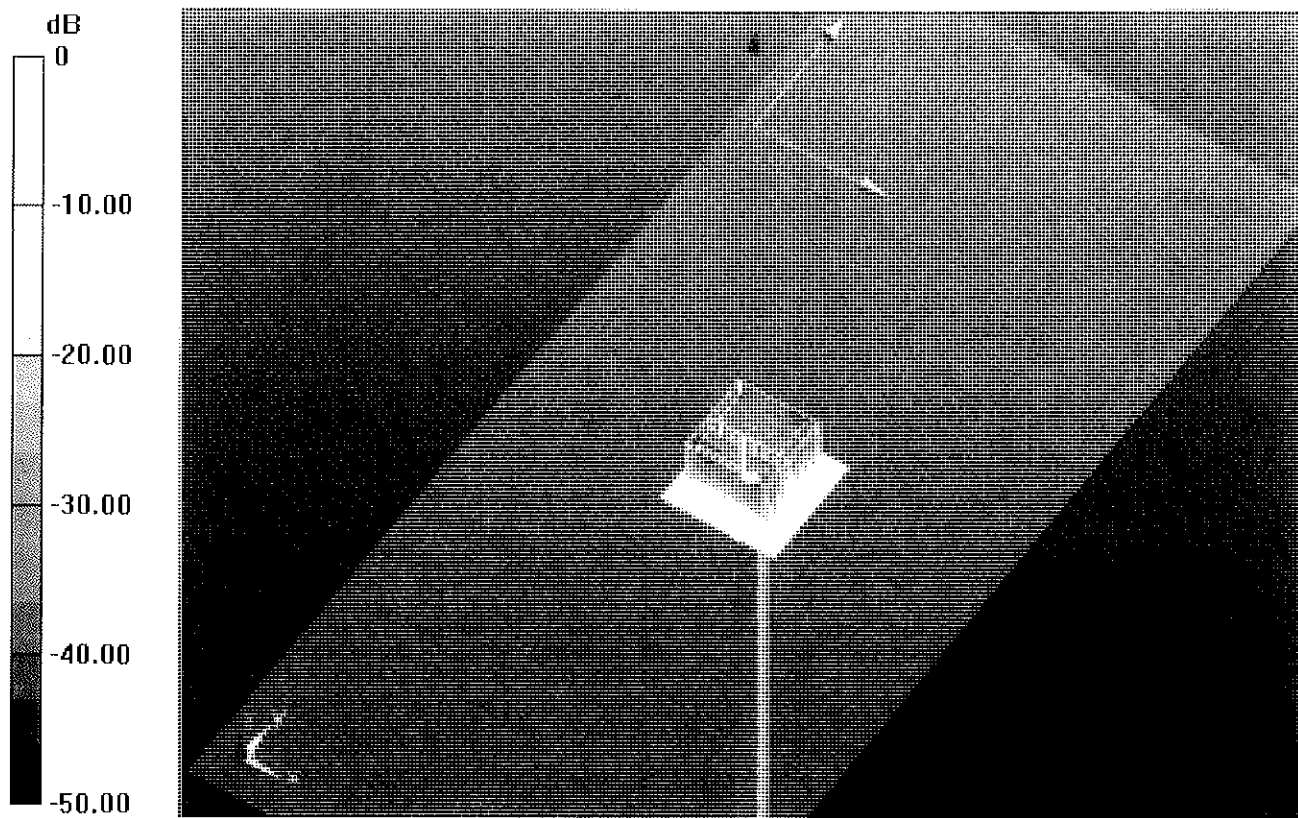
Pin=100mW/d=10mm, f=5800 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm

Reference Value = 60.818 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 37.120 W/kg

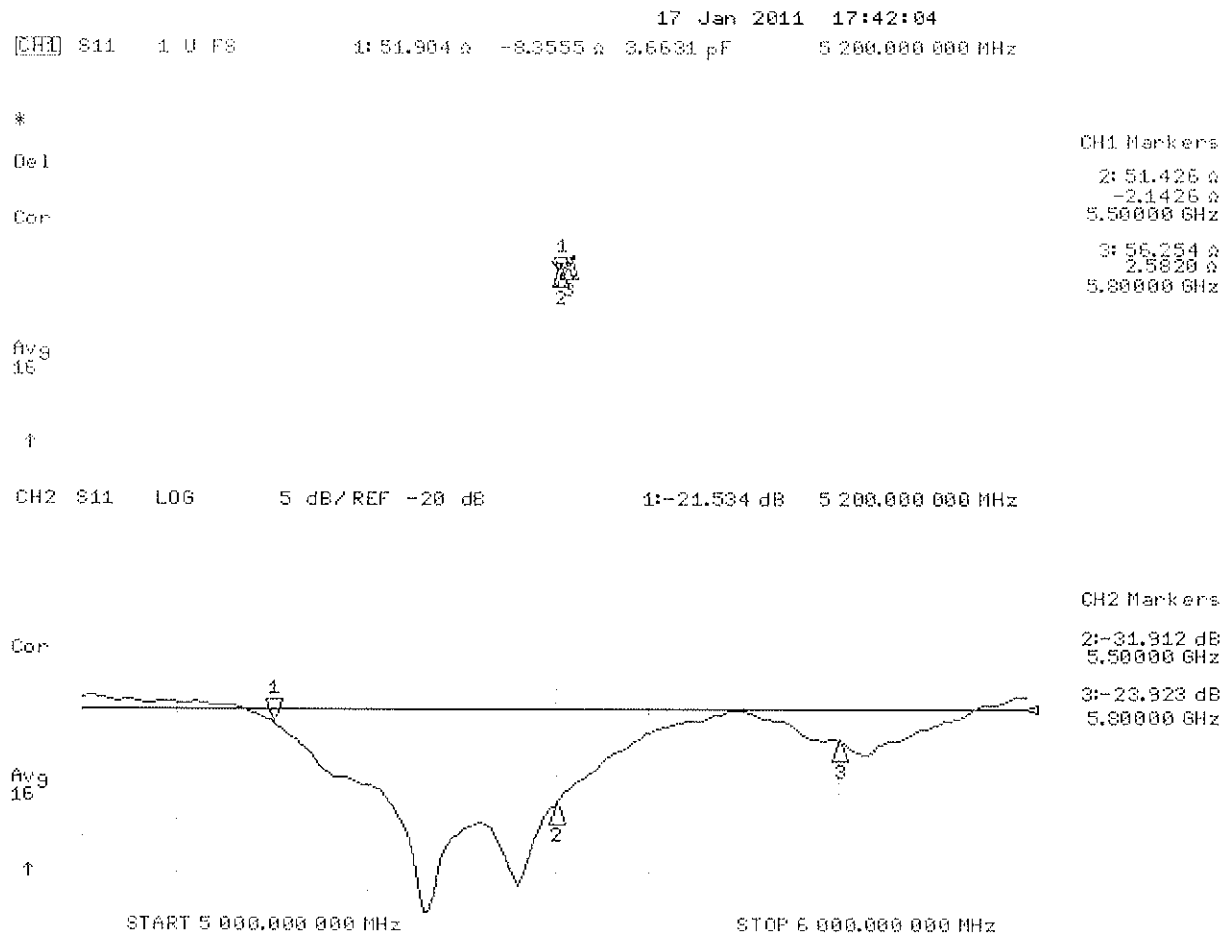
SAR(1 g) = 8.32 mW/g; SAR(10 g) = 2.33 mW/g

Maximum value of SAR (measured) = 16.571 mW/g



0 dB = 16.570mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 19.01.2011 11:41:41

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1019

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: MSL 5000 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.4$ mho/m; $\epsilon_r = 47.2$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5500$ MHz; $\sigma = 5.78$ mho/m; $\epsilon_r = 46.6$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.18$ mho/m; $\epsilon_r = 46.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.88, 4.88, 4.88), ConvF(4.37, 4.37, 4.37), ConvF(4.57, 4.57, 4.57); Calibrated: 05.03.2010
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=100mW/d=10mm, f=5200 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 60.081 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 30.750 W/kg

SAR(1 g) = 7.77 mW/g; SAR(10 g) = 2.15 mW/g

Maximum value of SAR (measured) = 15.289 mW/g

Pin=100mW/d=10mm, f=5500 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm

Reference Value = 60.368 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 35.267 W/kg

SAR(1 g) = 8.31 mW/g; SAR(10 g) = 2.29 mW/g

Maximum value of SAR (measured) = 16.599 mW/g

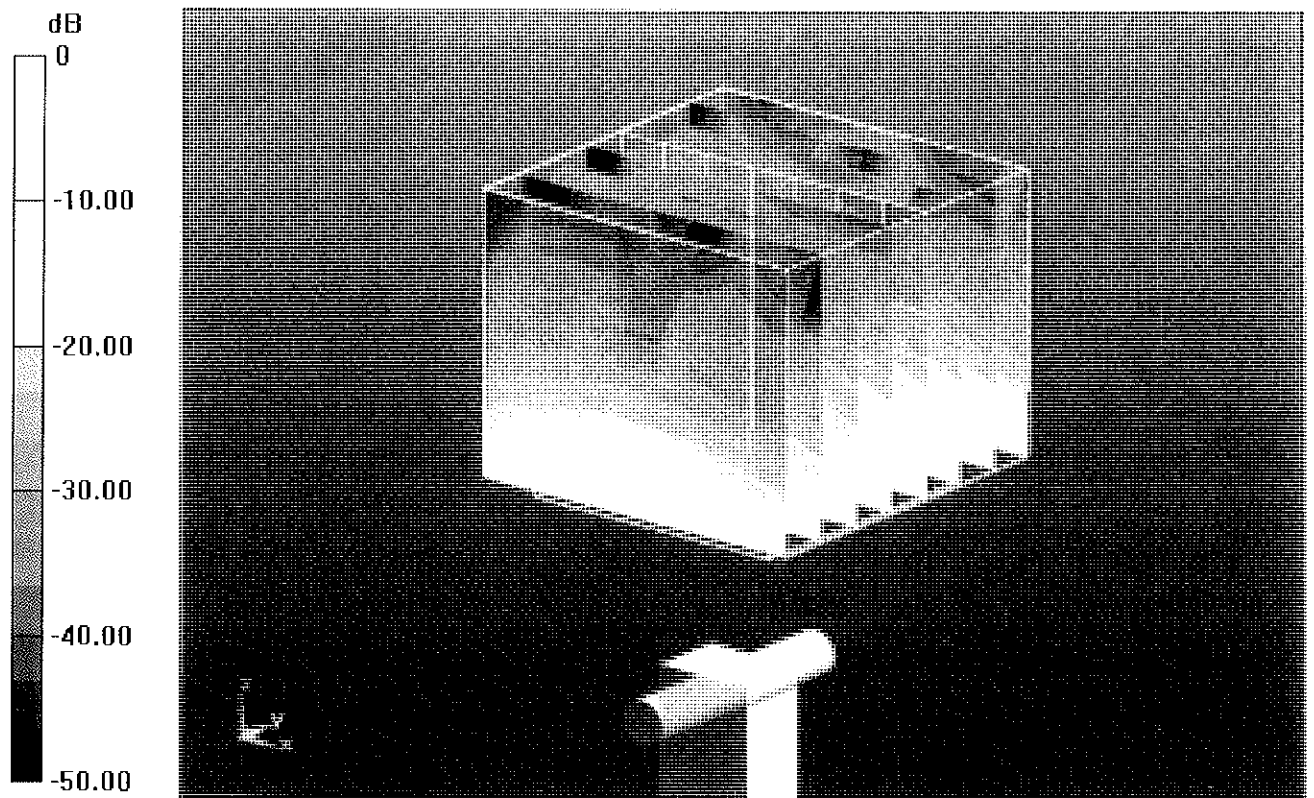
Pin=100mW/d=10mm, f=5800 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=4mm

Reference Value = 54.998 V/m; Power Drift = -0.0083 dB

Peak SAR (extrapolated) = 35.336 W/kg

SAR(1 g) = 7.4 mW/g; SAR(10 g) = 2.02 mW/g

Maximum value of SAR (measured) = 14.674 mW/g



0 dB = 14.670mW/g

Impedance Measurement Plot for Body TSL

19 Jan 2011 09:35:32
[CH1] S11 1 U FS 1: 51.754 Ω -6.7227 Ω 4.5528 pF 5 200.000 000 MHz

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Del

Cor

1
2
3
4
5
Z

CH1 Markers

2: 51.551 Ω
-417.97 m Ω
5.50000 GHz
3: 56.357 Ω
3.9434 Ω
5.00000 GHz

Avg
16

CH2 S11 L06 5 dB/REF -20 dB 1: -23.328 dB 5 200.000 000 MHz

Cor

Avg
16

CH2 Markers

2: -36.029 dB
5.50000 GHz
3: -23.065 dB
5.00000 GHz

