SAR TEST REPORT

REPORT NO.:	SA990623E01
MODEL NO.:	DWA-135
FCC ID:	KA2WA135A1
RECEIVED:	Jun. 23, 2010
TESTED:	Jul. 21, 2010
ISSUED:	Aug. 04, 2010

APPLICANT:	D-Link Corporation
ADDRESS:	No. 289, Sinhu 3rd Rd., Neihu District, Taipei City 114, Taiwan, R.O.C.

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

PRODUCT:	Wireless N USB adapter
MODEL:	DWA-135
BRAND:	D-Link
APPLICANT:	D-Link Corporation
TESTED:	Jul. 21, 2010
TEST SAMPLE:	MASS-PRODUCTION
STANDARDS:	**FCC Part 2 (Section 2.1093)**
	FCC OET Bulletin 65, Supplement C (01-01)
	RSS-102

The above equipment (model: DWA-135) has been tested by **Bureau Veritas Consumer Products Services (H.K.) Ltd., Taoyuan Branch**, and found compliance with the requirement of the above standards. The test record, data evaluation & Equipment Under Test (EUT) configurations represented herein are true and accurate accounts of the measurements of the sample's EMC characteristics under the conditions specified in this report.

PREPARED BY : _____ , **DATE :** Aug. 04, 2010
Pettie Chen / Specialist

TECHNICAL ACCEPTANCE : _____ , **DATE :** Aug. 04, 2010
Responsible for RF
Mason Chang / Engineer

APPROVED BY : _____ , **DATE :** Aug. 04, 2010
Gary Chang / Assistant Manager

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

EUT	Wireless N USB adapter
MODEL NO.	DWA-135
FCC ID	KA2WA135A1
POWER SUPPLY	5Vdc from host equipment
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 802.11n (20MHz, MCS 0~7, 800ns GI): 6.5/13/ 19.5/ 26/ 39/ 52/ 58.5/ 65Mbps 802.11n (20MHz, MCS 8~15, 800 ns GI): 13/ 26/ 39/ 52/ 78/ 104/ 117/ 130Mbps 802.11n (20MHz, MCS 0~7, 400 ns GI): 7.2/ 14.4/ 21.7/ 28.9/ 43.3/ 57.8/ 65.0/ 72.2Mbps 802.11n (20MHz, MCS 8~15, 400 ns GI): 14.444/ 28.889/ 43.333/ 57.778/ 86.667/ 115.556/ 130.000/ 144.444Mbps 802.11n (40MHz, MCS 0~7, 800 ns GI): 13.5/ 27/ 40.5/ 54/ 81/ 108/ 121.5/ 135Mbps 802.11n (40MHz, MCS 8~15, 800 ns GI): 27/ 54/ 81/ 108/ 162/ 216/ 243/ 270Mbps 802.11n (40MHz, MCS 0~7, 400 ns GI): 15.0/ 30.0/ 45.0/ 60.0/ 90.0/ 120.0/ 135.0/ 150.0Mbps 802.11n (40MHz, MCS 8~15, 400 ns GI): 30.0/ 60.0/ 90.0/ 120.0/ 180.0/ 240.0/ 270.0/ 300.0Mbps
OPERATING FREQUENCY	2412 ~ 2462MHz
NUMBER OF CHANNEL	11 for 802.11b, 802.11g, 802.11n (20MHz) 7 for 802.11n (40MHz)
MAXIMUM SAR (1g)	1.07W/kg
ANTENNA TYPE	Please see note 1
DATA CABLE	NA
I/O PORTS	USB
ACCESSORY DEVICES	NA

NOTE:

1. There is one antenna provided to this EUT, please refer to the following table:

Chain	Manufacture	Gain (dBi)	Antenna Type	Connector Type
Chain (0)	Alpha Networks Inc.	0dBi	PCB Antenna	RF-Switch
Chain (1)	Alpha Networks Inc.	0dBi	PCB Antenna	RF-Switch

2. The EUT incorporates a MIMO function. Physically, the EUT provides two completed transmitters and two receivers.

MODULATION MODE	TX FUNCTION
802.11b	1TX
802.11g	1TX
802.11n (20MHz)	1TX/2TX
802.11n (40MHz)	1TX/2TX

3. The above EUT information was declared by manufacturer and for more detailed features description, please refer to the manufacturer's specifications or user's manual.

2.2 GENERAL DESCRIPTION OF APPLIED STANDARDS

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

FCC Part 2 (2.1093)

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

RSS-102

IEEE 1528-2003

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

2.3 GENERAL INOFRMATION OF THE SAR SYSTEM

DASY5 (software 5.2 Build 162) 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 DASY5 software defined. The DASY5 software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

EX3DV3 ISOTROPIC E-FIELD PROBE

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

NOTE

1. The Probe parameters have been calibrated by the SPEAG. Please reference “APPENDIX D” for the Calibration Certification Report.
2. For frequencies above 800MHz, calibration in a rectangular wave-guide is used, because wave-guide size is manageable.
3. For frequencies below 800MHz, temperature transfer calibration is used because the wave-guide size becomes relatively large.

TWIN SAM V4.0

CONSTRUCTION	The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-2003, EN 62209-1 and IEC 62209. It enables the dosimetric evaluation of left and right hand phone usage as well as body mounted usage at the flat phantom region. A cover prevents evaporation of the liquid. Reference markings on the phantom allow the complete setup of all predefined phantom positions and measurement grids by manually teaching three points with the robot.
SHELL THICKNESS	2 ± 0.2mm
FILLING VOLUME	Approx. 25liters
DIMENSIONS	Height: 810mm; Length: 1000mm; Width: 500mm

SYSTEM VALIDATION KITS:

CONSTRUCTION	Symmetrical dipole with l/4 balun enables measurement of feedpoint impedance with NWA matched for use near flat phantoms filled with brain simulating solutions. Includes distance holder and tripod adaptor
CALIBRATION	Calibrated SAR value for specified position and input power at the flat phantom in brain simulating solutions
FREQUENCY	2450MHz
RETURN LOSS	> 20dB at specified validation position
POWER CAPABILITY	> 100W (f < 1GHz); > 40W (f > 1GHz)
OPTIONS	Dipoles for other frequencies or solutions and other calibration conditions upon request

DEVICE HOLDER FOR SAM TWIN PHANTOM

CONSTRUCTION

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

DATA ACQUISITION ELECTRONICS

CONSTRUCTION

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

2.4 TEST EQUIPMENT

FOR SAR MEASURENENT

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	SAM Phantom	S & P	QD000 P40 CA	TP-1485	NA	NA
2	Signal Generator	Agilent	E8257C	MY43320668	Feb. 23, 2010	Feb. 22, 2011
3	E-Field Probe	S & P	EX3DV3	3504	Jan. 26, 2010	Jan. 25, 2011
4	DAE	S & P	DAE 3	510	Dec. 16, 2009	Dec. 15, 2010
5	Robot Positioner	Staubli Unimation	NA	NA	NA	NA
6	Validation Dipole	S & P	D2450V2	737	Feb. 19, 2010	Feb. 18, 2011

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. 03, 2009	Dec. 02, 2010
2	Dielectric Probe	Agilent	85070D	US01440176	NA	NA

NOTE:

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

2.5 GENERAL DESCRIPTION OF THE SPATIAL PEAK SAR EVALUATION

The DASY5 post-processing software (SEMCAD) automatically executes the following procedures to calculate the field units from the micro-volt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	$Norm_i$, a_{i0}, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	dcp_i
Device parameters:	- Frequency	F
	- Crest factor	Cf
Media parameters:	- Conductivity	σ
	- Density	ρ

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

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

V_i	=compensated signal of channel i	(i = x, y, z)
U_i	=input signal of channel I	(i = x, y, z)
Cf	=crest factor of exciting field	(DASY parameter)
dcp_i	=diode compression point	(DASY parameter)

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

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

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

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

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

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

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

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

SAR	= local specific absorption rate in mW/g
E_{tot}	= total field strength in V/m
σ	= conductivity in [mho/m] or [Siemens/m]
ρ	= equivalent tissue density in g/cm3

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

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

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

The maximum search is automatically performed after each area scan measurement. It is based on splines in two or three dimensions. The procedure can find the maximum for most SAR distributions even with relatively large grid spacing. After the area scanning measurement, the probe is automatically moved to a position at the interpolated maximum. The following scan can directly use this position for reference, e.g., for a finer resolution grid or the cube evaluations. The 1g and 10g peak evaluations are only available for the predefined cube 7 x 7 x 7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30 x 30 x 30mm contains about 30g of tissue. The first procedure is an extrapolation (incl. boundary correction) to get the points between the lowest measured plane and the surface. The next step uses 3D interpolation to get all points within the measured volume in a 1mm grid (42875 points). In the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is the moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

2.6 DESCRIPTION OF SUPPORT UNITS

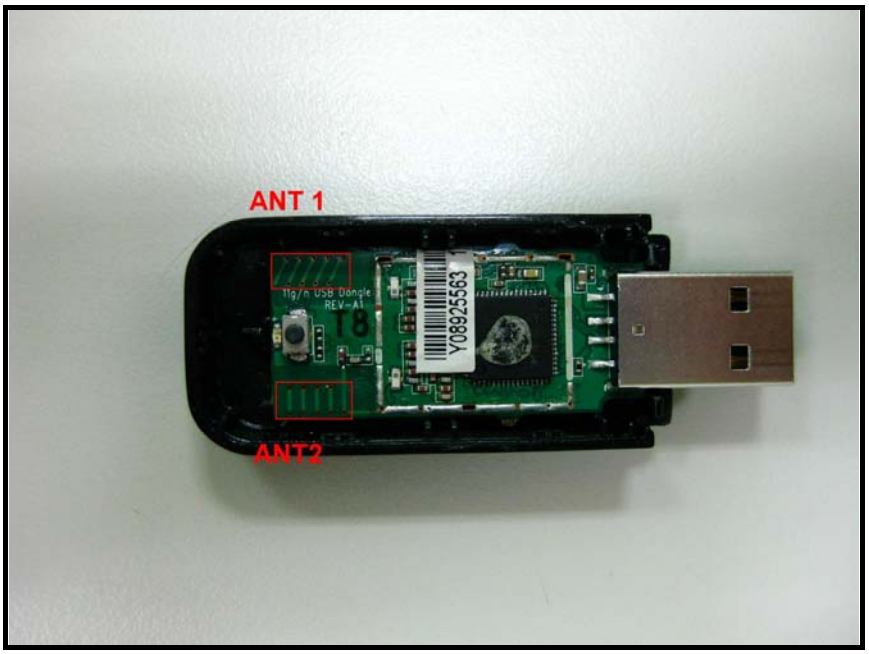
The EUT has been tested as an independent unit together with other necessary accessories or support units. The following support units or accessories were used to form a representative test configuration during the tests.

NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	PP18L	33497605792	CXSMM01BRD02D330

NO.	SIGNAL CABLE DESCRIPTION OF THE ABOVE SUPPORT UNITS
1	NA

NOTE: All power cords of the above support units are non shielded (1.8m).

3. DESCRIPTION OF ANTENNA LOCATION



NOTE: Only antenna 1 can transmit under 1TX mode.

4. RECIPES FOR TISSUE SIMULATING LIQUIDS

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

The following ingredients are used：

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

THE RECIPES FOR 2450MHz SIMULATING LIQUID TABLE

INGREDIENT	BODY SIMULATING LIQUID 2450MHz (MSL-2450)
Water	69.83%
DGMBE	30.17%
Dielectric Parameters at 22 ℃	f= 2450MHz ε= 52.7 ± 5% σ= 1.95 ± 5% S/m

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

1. Turn Network Analyzer on and allow at least 30min. warm up.
2. Mount dielectric probe kit so that interconnecting cable to Network Analyzer will not be moved during measurements or calibration.
3. Pour de-ionized water and measure water temperature (±1°).
4. Set water temperature in Agilent-Software (Calibration Setup).
5. Perform calibration.
6. Validate calibration with dielectric material of known properties (e.g. polished ceramic slab with >8mm thickness ε'=10.0, ε''=0.0). If measured parameters do not fit within tolerance, repeat calibration (±0.2 for ε': ±0.1 for ε'').
7. Conductivity can be calculated from ε'' by $\sigma = \omega \varepsilon_0 \varepsilon'' = \varepsilon'' f$ [GHz] / 18.
8. Measure liquid shortly after calibration. Repeat calibration every hour.
9. Stir the liquid to be measured. Take a sample (~ 50ml) with a syringe from the center of the liquid container.
10. Pour the liquid into a small glass flask. Hold the syringe at the bottom of the flask to avoid air bubbles.
11. Put the dielectric probe in the glass flask. Check that there are no air bubbles in front of the opening in the dielectric probe kit.
12. Perform measurements.
13. Adjust medium parameters in 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 2.4GHz BAND SIMULATING LIQUID

LIQUID TYPE		MSL-2450			
SIMULATING LIQUID TEMP.		22.6			
TEST DATE		Jul. 21, 2010			
TESTED BY		Match Tsui			
FREQ. (MHz)	**LIQUID PARAMETER**	**STANDARD VALUE**	**MEASUREMENT VALUE**	**ERROR PERCENTAGE (%)**	**LIMIT(%)**
2412.0	Permitivity (ε)	52.80	54.00	2.27	±5
2422.0		52.70	53.90	2.28	
2437.0		52.70	53.90	2.28	
2450.0		52.70	53.80	2.09	
2462.0		52.70	53.70	1.90	
2412.0	Conductivity (σ) S/m	1.91	1.98	3.66	
2422.0		1.92	2.00	4.17	
2437.0		1.94	2.01	3.61	
2450.0		1.95	2.03	4.10	
2462.0		1.97	2.05	4.06	

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 ±0.02dB.

2. The ”Surface Check” job tests the optical surface detection system of the DASY system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ±0.1mm). In that case it is better to abort the system performance check and stir the liquid.

3. The ”Area Scan” job measures the SAR above the dipole on a plane parallel to the surface. It is used to locate the approximate location of the peak SAR. The proposed scan uses large grid spacing for faster measurement; due to the symmetric field, the peak detection is reliable. If a finer graphic is desired, the grid spacing can be reduced. Grid spacing and orientation have no influence on the SAR result.

4. The ”Zoom Scan” job measures the field in a volume around the peak SAR value assessed in the previous ”Area Scan” job (for more information see the application note on SAR evaluation).

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

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

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

5.2 VALIDATION RESULTS

SYSTEM VALIDATION TEST OF SIMULATING LIQUID					
FREQUENCY (MHz)	**REQUIRED SAR (mW/g)**	**MEASURED SAR (mW/g)**	**DEVIATION (%)**	**SEPARATION DISTANCE**	**TESTED DATE**
MSL2450	13.10 (1g)	12.40	-5.34	10mm	Jul. 21, 2010

NOTE: 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	5.50	Normal	1	1	1	5.50	5.50	∞
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	∞
RF Ambient Reflections	3.00	Rectangular	√3	1	1	1.73	1.73	∞
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	4.28	Rectangular	√3	1	1	2.47	2.47	1
Dipole Related								
Dipole Axis to Liquid Distance	1.60	Rectangular	√3	1	1	0.92	0.92	4
Input Power Drift	3.94	Rectangular	√3	1	1	2.27	2.27	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)	4.17	Normal	1	0.64	0.43	2.67	1.79	9
Liquid Permittivity (target)	5.00	Rectangular	√3	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	2.28	Normal	1	0.6	0.49	1.37	1.12	9
Combined Standard Uncertainty						**9.34**	**8.94**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**18.69**	**17.88**	

NOTE: About the system validation uncertainty assessment, please reference the section 7.

6. TEST RESULTS

6.1 TEST PROCEDURES

The EUT plugged into the notebook. 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 with 30mm x 30mm x 30mm volume was performed for SAR value averaged over 1g and 10g spatial volumes.

In the zoom scan, the distance between the measurement point at the probe sensor location (geometric center behind the probe tip) and the phantom surface is 3mm and maintained at a constant distance of ±0.5mm during a zoom scan to determine peak SAR locations. The distance is 3mm between the first measurement point and the bottom surface of the phantom. The secondary measurement point to the bottom surface of the phantom is with 8mm separation distance. The cube size is 7 x 7 x 7 points consists of 343 points and the grid space is 5mm.

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

In the area scan, the separation distance is 3mm between the each measurement point and the phantom surface. The scan size shall be included the transmission portion of the EUT. The measurement time is the same as the zoom scan. At last the reference power drift shall be less than ±5%.

6.2 CONDUCTED POWER

TEST MODE				802.11b	
CHAN.	FREQ. (MHz)	MODULATION TYPE	DATA RATE (Mbps)	PEAK	AVG
1	2412 (Low)	DBPSK	1	20.00	18.60
6	2437 (Mid.)	DBPSK	1	18.28	17.40
11	2462 (High)	DBPSK	1	18.22	17.30

TEST MODE				802.11g	
CHAN.	FREQ. (MHz)	MODULATION TYPE	DATA RATE (Mbps)	PEAK	AVG
1	2412 (Low)	BPSK	6	22.66	17.80
6	2437 (Mid.)	BPSK	6	22.69	17.02
11	2462 (High)	BPSK	6	23.05	17.03

TEST MODE				802.11n (20MHz)	
CHAN.	FREQ. (MHz)	MODULATION TYPE	DATA RATE (Mbps)	PEAK	AVG
1	2412 (Low)	BPSK	6.5	25.07	20.68
6	2437 (Mid.)	BPSK	6.5	25.39	20.78
11	2462 (High)	BPSK	6.5	25.33	20.73

TEST MODE				802.11N (40MHz)	
CHAN.	FREQ. (MHz)	MODULATION TYPE	DATA RATE (Mbps)	PEAK	AVG
1	2422 (Low)	BPSK	13.5	24.83	20.45
4	2437 (Mid.)	BPSK	13.5	25.03	20.44
7	2452 (High)	BPSK	13.5	24.98	19.96

NOTE: SAR for 802.11g mode is not required since max average power of 802.11g is less than 802.11b.

6.3 DESCRIPTION OF TEST CONDITION

TEST DATE	TEMPERATURE(°C)		HUMIDITY(%RH)	TESTED BY
	AIMBENT	LIQUID		
Jul. 21, 2010	23.0	22.6	61	Match Tsui

6.4 MEASURED SAR RESULT

Distance between EUT and phantom is 5mm					
	Horizontal-Up	Horizontal-Down	Vertical-Front	Vertical-Back	TIP
802.11b					
2412 (Low)	0.571	**1.070**	0.191	0.218	0.524
2437 (Mid.)	-	0.973	-	-	-
2462 (High)	-	0.937	-	-	-
802.11n (20MHz)					
2412 (Low)	-	0.80	-	-	-
2437 (Mid.)	0.555	1.04	0.191	0.215	0.52
2462 (High)	-	1.03	-	-	-
802.11n (40MHz)					
2422 (Low)	0.438	0.734	0.169	0.191	0.482
2437 (Mid.)	-	-	-	-	-
2452 (High)	-	-	-	-	-

NOTE:

1. SAR for 802.11g mode is not required since max average power of 802.11g is less than 802.11b.
2. In this testing, the limit for General Population Spatial Peak averaged over 1g, 1.6 W/kg, is applied.
3. Please see the Appendix A for the data.
4. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.
5. Per KDB 447498, when 1-g SAR for the highest output channel is less than 0.8 W/kg, testing for the other channels is not required.

6.5 POWER DRIFT TABLE

Modulation Mode	Test Position	Test Channel	Test Frequency	Power (dBm)		Power drift (%)
				Begin	After	
802.11b	Horizontal up	1	2412	18.6	18.48	-2.73
	Horizontal Down	1	2412	18.6	18.45	-3.39
		6	2437	17.4	17.23	-3.84
		11	2462	17.3	17.15	-3.39
	Vertical front	1	2412	18.6	18.43	-3.84
	Vertical back	1	2412	18.6	18.41	-4.28
	Tip	1	2412	18.6	18.44	-3.62
802.11n (20MHz)	Horizontal up	6	2412	20.78	20.62	-3.62
	Horizontal Down	1	2412	20.68	20.51	-3.77
		6	2437	20.78	20.63	-3.41
		11	2462	20.73	20.61	-2.62
	Vertical front	6	2437	20.78	20.6	-4.06
	Vertical back	6	2437	20.78	20.65	-2.95
	Tip	6	2437	20.78	20.62	-3.62
802.11n (40MHz)	Horizontal up	1	2422	20.45	20.37	-1.83
	Horizontal Down	1	2422	20.45	20.35	-2.28
	Vertical front	1	2422	20.45	20.31	-3.17
	Vertical back	1	2422	20.45	20.34	-2.50
	Tip	1	2422	20.45	20.29	-3.62

6.6 SAR LIMITS

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

NOTE:

1. This limits accord to 47 CFR 2.1093 – Safety Limit.
2. The EUT property been complied with the partial body exposure limit under the general population environment.

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

Web Site: www.adt.com.tw

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

---END---

APPENDIX A: TEST DATA

Liquid Level Photo

Tissue MSL2450MHz D=151mm

Date/Time: 2010/7/21 00:51:33

Test Laboratory: Bureau Veritas ADT

M01-11B- Horizontal Up -Ch01

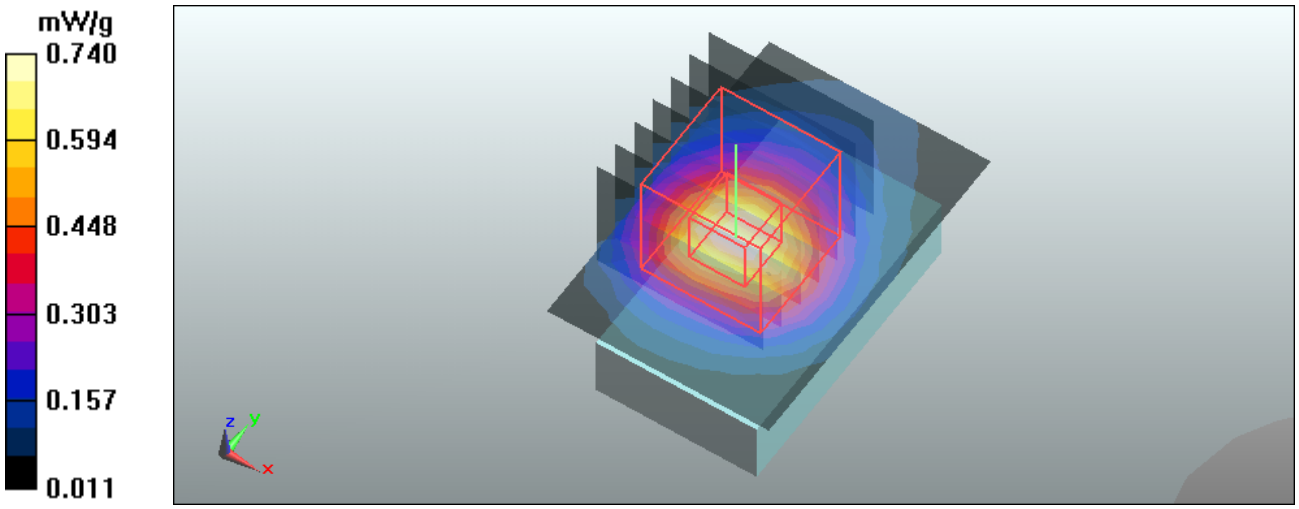
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2412 MHz; σ = 1.98 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.733 mW/g

Low Channel 1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 18.4 V/m; Power Drift = -0.137 dB
Peak SAR (extrapolated) = 1.17 W/kg
SAR(1 g) = 0.571 mW/g; SAR(10 g) = 0.276 mW/g
Maximum value of SAR (measured) = 0.740 mW/g



Date/Time: 2010/7/21 01:47:33

Test Laboratory: Bureau Veritas ADT

M02-11N HT20-Horizontal Up-Ch06

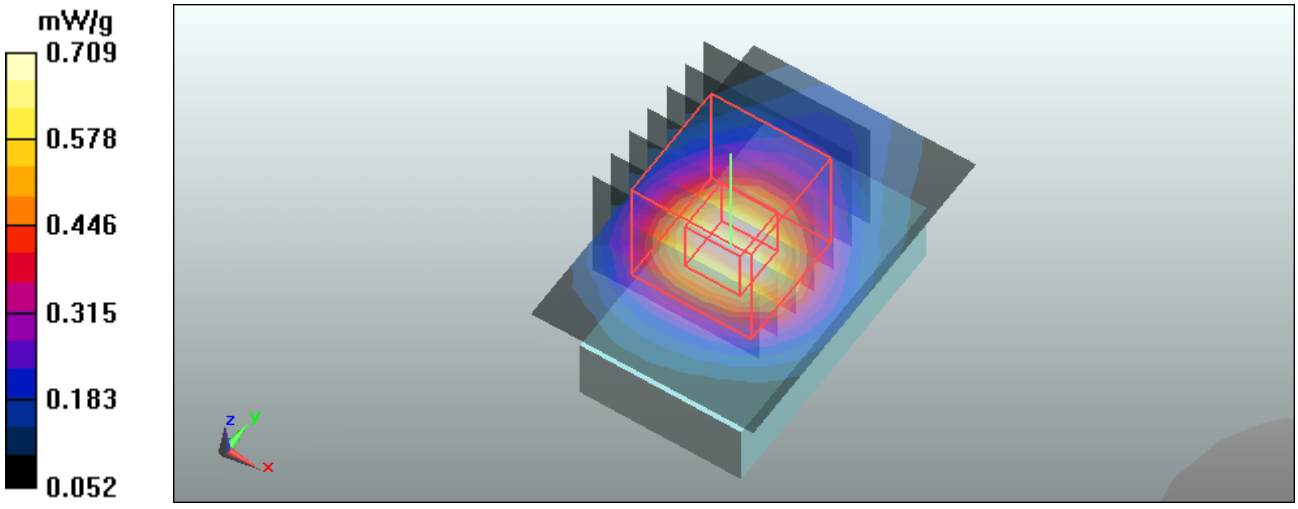
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 2.4G 11n span20 ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 2.01 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Mid Channel 6/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.173 mW/g

Mid Channel 6/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 20.9 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.555 mW/g; SAR(10 g) = 0.288 mW/g
Maximum value of SAR (measured) = 0.709 mW/g



Date/Time: 2010/7/21 02:38:30

Test Laboratory: Bureau Veritas ADT

M03-11N HT40-Horizontal Up-Ch01

DUT: WIRELESS N USB ADAPTER ; Type: DWA-135

Communication System: 802.11n 40MHz ; Frequency: 2422 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: f = 2422 MHz; σ = 2 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3

Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 3/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.145 mW/g

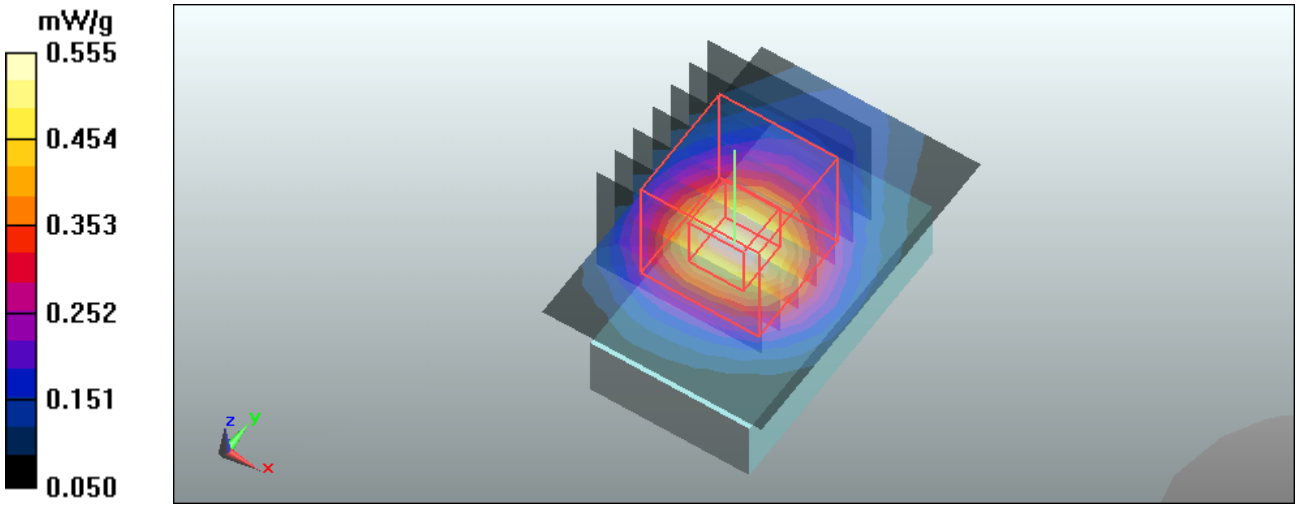
Low Channel 3/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 17.1 V/m; Power Drift = -0.182 dB

Peak SAR (extrapolated) = 0.845 W/kg

SAR(1 g) = 0.438 mW/g; SAR(10 g) = 0.233 mW/g

Maximum value of SAR (measured) = 0.555 mW/g



Date/Time: 2010/7/21 03:18:41

Test Laboratory: Bureau Veritas ADT

M04-11B- Horizontal Down -Ch01

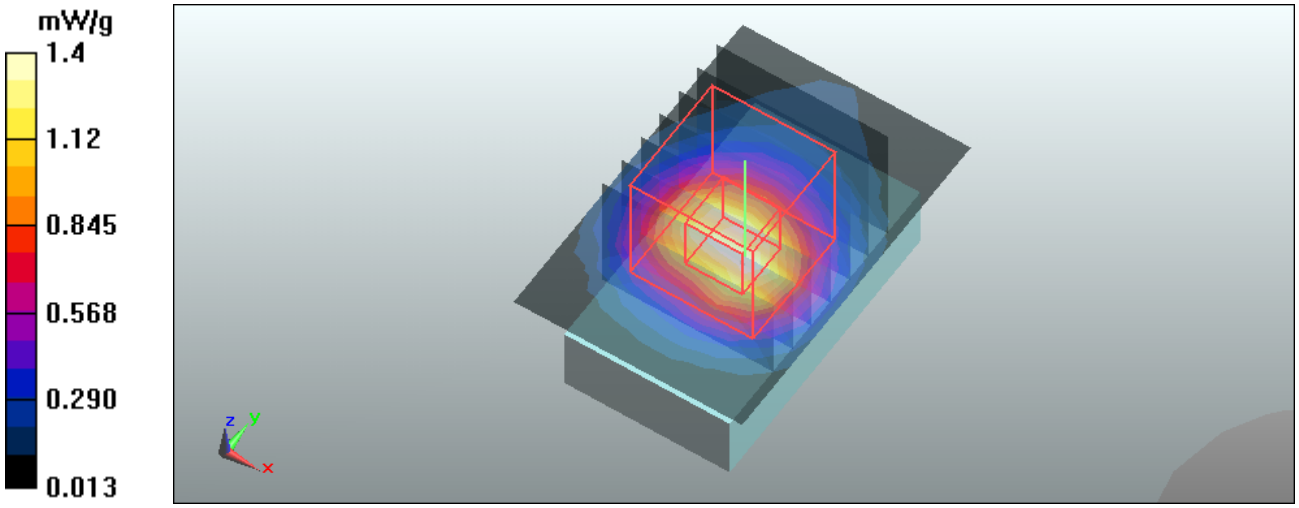
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2412 MHz; σ = 1.98 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

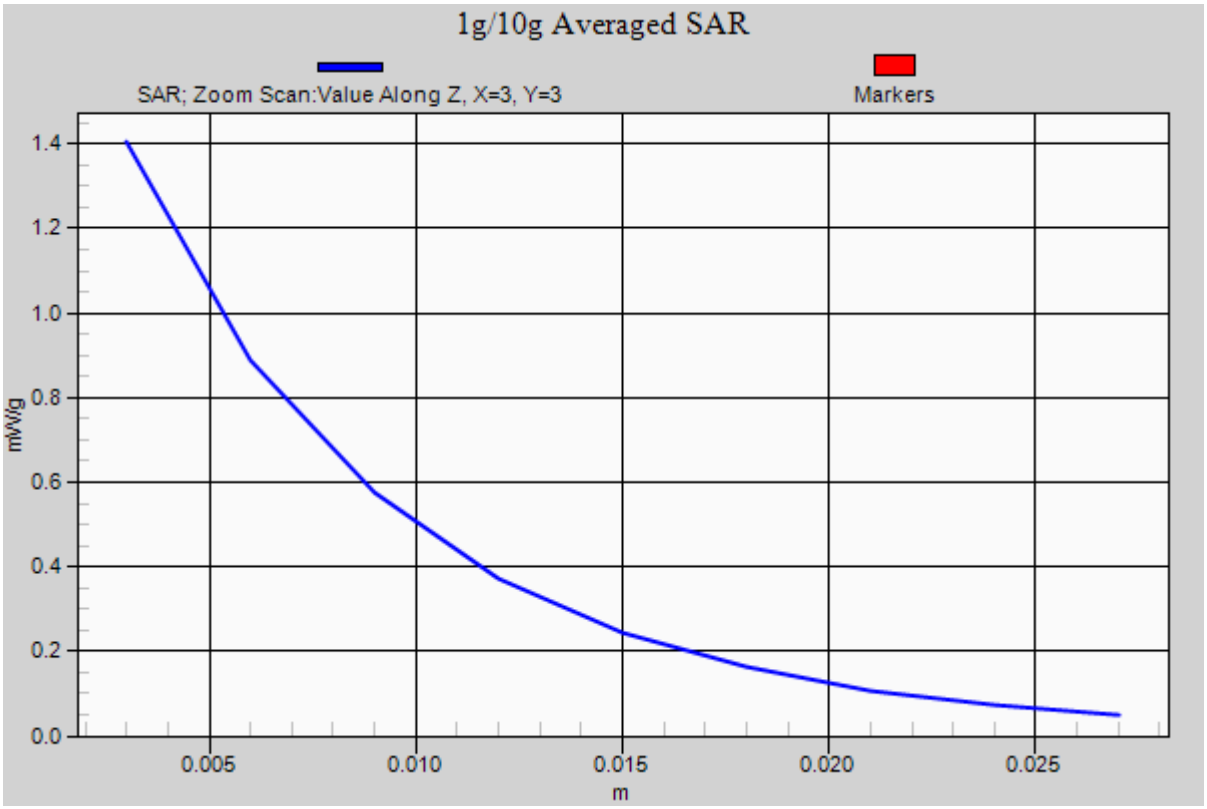
DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 1.41 mW/g

Low Channel 1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 23.4 V/m; Power Drift = -0.193 dB
Peak SAR (extrapolated) = 2.3 W/kg
SAR(1 g) = 1.070 mW/g; SAR(10 g) = 0.504 mW/g
Maximum value of SAR (measured) = 1.4 mW/g




1g/10g Averaged SAR
SAR; Zoom Scan:Value Along Z, X=3, Y=3
Markers
mW/g
1.4
1.2
1.0
0.8
0.6
0.4
0.2
0.0
0.005
0.010
0.015
0.020
0.025
m

Date/Time: 2010/7/21 04:06:12

Test Laboratory: Bureau Veritas ADT

M04-11B- Horizontal Down -Ch06

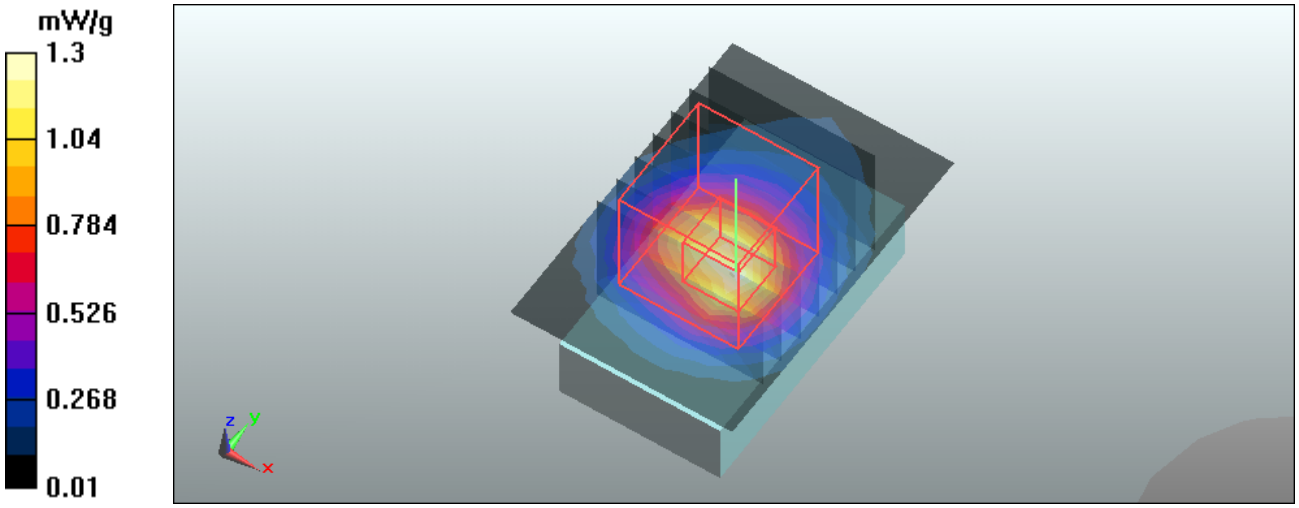
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 2.01 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Mid Channel 6/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 1.26 mW/g

Mid Channel 6/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 23.3 V/m; Power Drift = -0.063 dB
Peak SAR (extrapolated) = 2.13 W/kg
SAR(1 g) = 0.973 mW/g; SAR(10 g) = 0.442 mW/g
Maximum value of SAR (measured) = 1.3 mW/g



Date/Time: 2010/7/21 04:56:54

Test Laboratory: Bureau Veritas ADT

M04-11B- Horizontal Down -Ch11

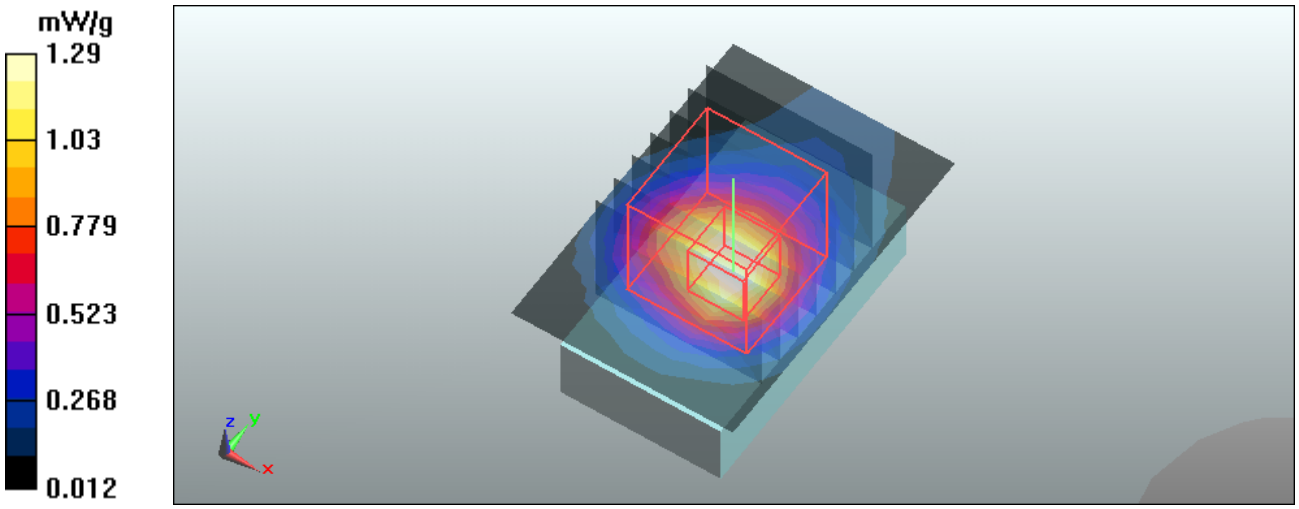
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11b ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2462 MHz; σ = 2.05 mho/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

High Channel 11/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 1.39 mW/g

High Channel 11/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 23.5 V/m; Power Drift = -0.137 dB
Peak SAR (extrapolated) = 2.08 W/kg
SAR(1 g) = 0.937 mW/g; SAR(10 g) = 0.414 mW/g
Maximum value of SAR (measured) = 1.29 mW/g



Date/Time: 2010/7/21 05:49:30

Test Laboratory: Bureau Veritas ADT

M05-11N HT20-Horizontal Down-Ch01

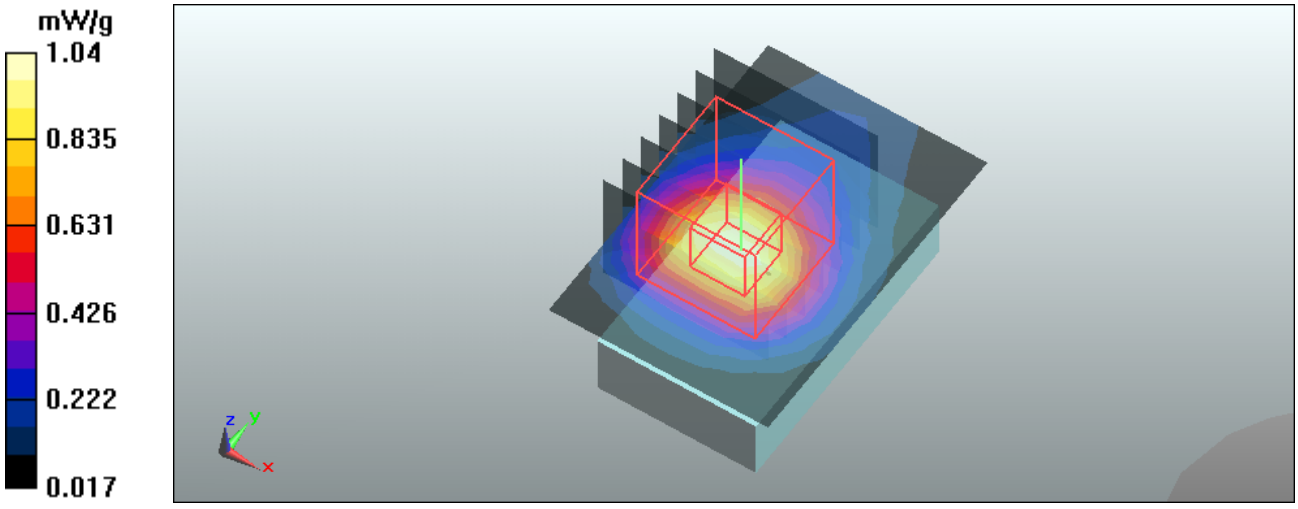
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 2.4G 11n span20 ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2412 MHz; σ = 1.98 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 1.05 mW/g

Low Channel 1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 25 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 1.65 W/kg
SAR(1 g) = 0.800 mW/g; SAR(10 g) = 0.380 mW/g
Maximum value of SAR (measured) = 1.04 mW/g



Date/Time: 2010/7/21 06:37:20

Test Laboratory: Bureau Veritas ADT

M05-11N HT20- Horizontal Down-Ch06

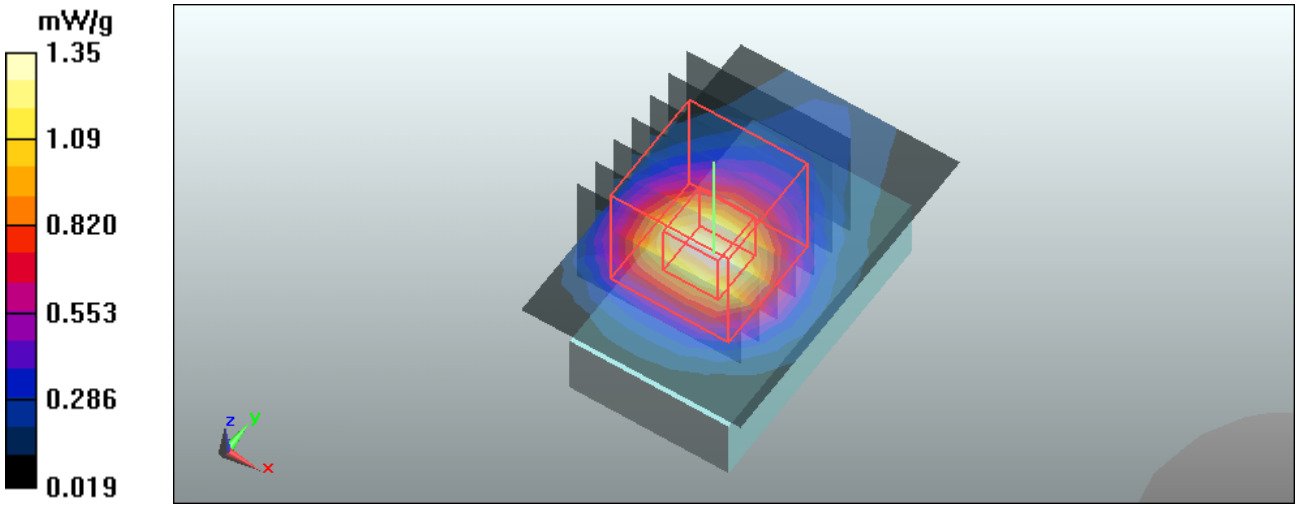
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 2.01 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Mid Channel 6/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 1.37 mW/g

Mid Channel 6/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 29.8 V/m; Power Drift = -0.194 dB
Peak SAR (extrapolated) = 2.15 W/kg
SAR(1 g) = 1.04 mW/g; SAR(10 g) = 0.489 mW/g
Maximum value of SAR (measured) = 1.35 mW/g



Date/Time: 2010/7/21 07:20:51

Test Laboratory: Bureau Veritas ADT

M05-11N HT20- Horizontal Down -Ch11

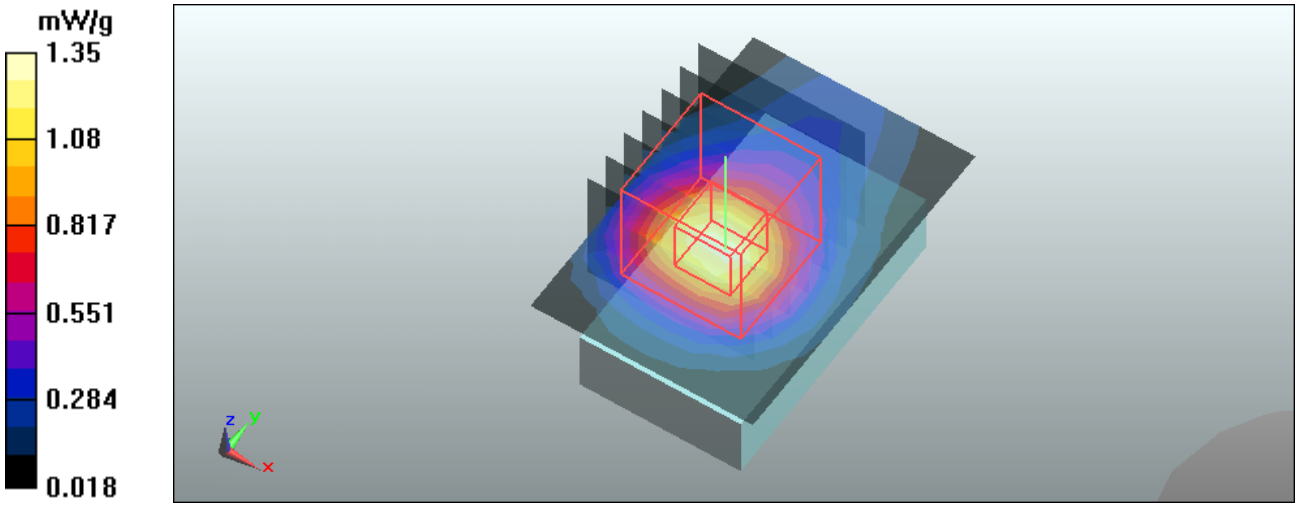
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 2.4G 11n span20 ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2462 MHz; σ = 2.05 mho/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

High Channel 11/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 1.33 mW/g

High Channel 11/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 25.7 V/m; Power Drift = -0.187 dB
Peak SAR (extrapolated) = 2.16 W/kg
SAR(1 g) = 1.03 mW/g; SAR(10 g) = 0.480 mW/g
Maximum value of SAR (measured) = 1.35 mW/g



Date/Time: 2010/7/21 08:01:41

Test Laboratory: Bureau Veritas ADT

M06-11N HT40- Horizontal Down -Ch01

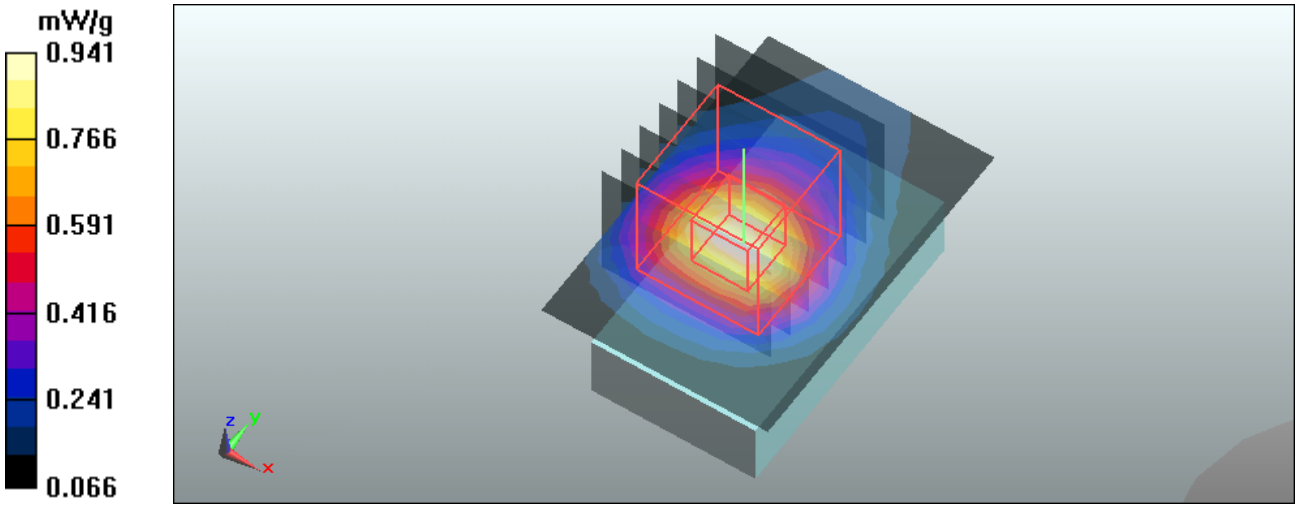
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11n 40MHz ; Frequency: 2422 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2422 MHz; σ = 2 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 3/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.141 mW/g

Low Channel 3/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 21.3 V/m; Power Drift = -0.130 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.734 mW/g; SAR(10 g) = 0.370 mW/g



Date/Time: 2010/7/21 08:53:37

Test Laboratory: Bureau Veritas ADT

M07-11B- Vertical Front-Ch01

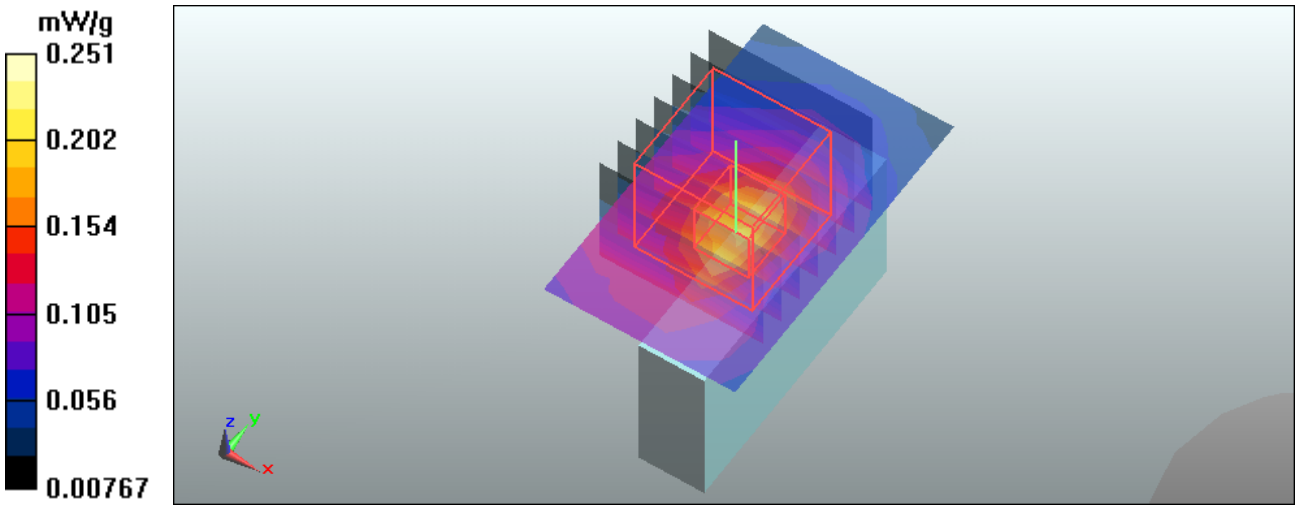
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2412 MHz; σ = 1.98 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 1/Area Scan (8x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.192 mW/g

Low Channel 1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 6.68 V/m; Power Drift = 0.138 dB
Peak SAR (extrapolated) = 0.170 W/kg
SAR(1 g) = 0.191 mW/g; SAR(10 g) = 0.096 mW/g
Maximum value of SAR (measured) = 0.251 mW/g



Date/Time: 2010/7/21 09:44:34

Test Laboratory: Bureau Veritas ADT

M08-11N HT20-Vertical Front-Ch06

DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 2.4G 11n span20 ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 2.01 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

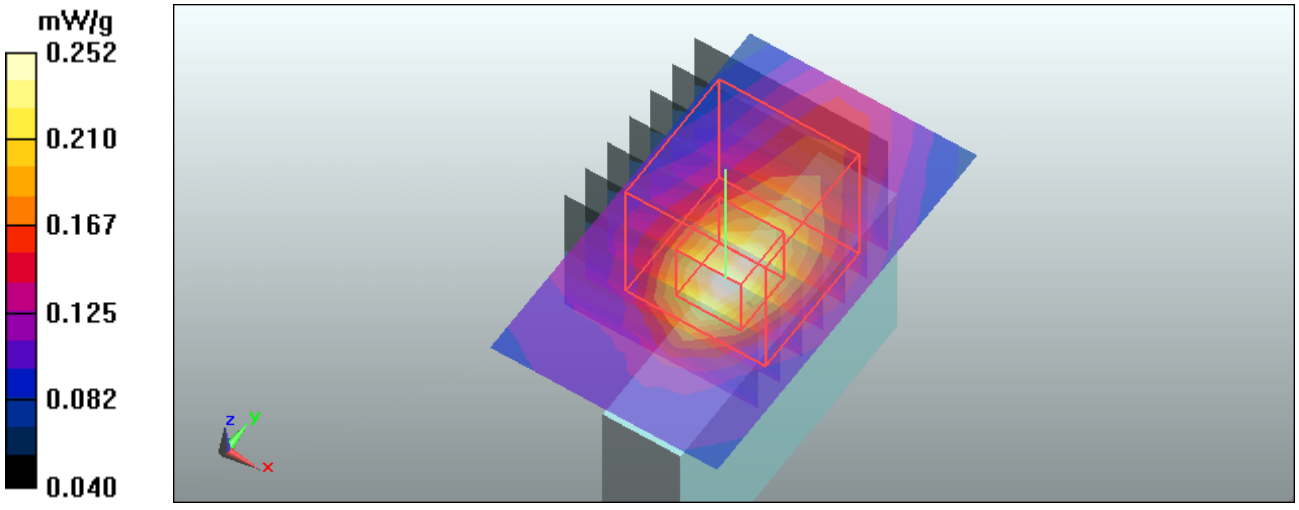
DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Mid Channel 6/Area Scan (7x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.250 mW/g

Mid Channel 6/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 10.8 V/m; Power Drift = -0.061 dB
Peak SAR (extrapolated) = 0.385 W/kg
SAR(1 g) = 0.191 mW/g; SAR(10 g) = 0.114 mW/g

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



Date/Time: 2010/7/21 10:21:58

Test Laboratory: Bureau Veritas ADT

M09-11N HT40- Vertical Front -Ch01

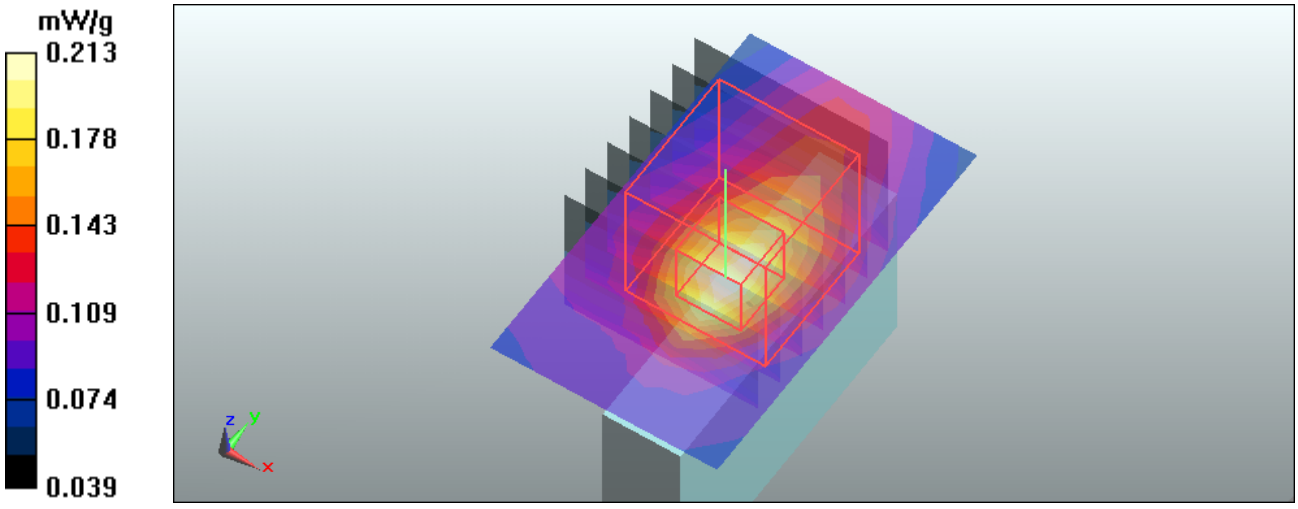
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11n 40MHz ; Frequency: 2422 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2422 MHz; σ = 2 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 3/Area Scan (7x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.211 mW/g

Low Channel 3/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 9.88 V/m; Power Drift = 0.0846 dB
Peak SAR (extrapolated) = 0.327 W/kg
SAR(1 g) = 0.169 mW/g; SAR(10 g) = 0.098 mW/g
Maximum value of SAR (measured) = 0.213 mW/g



Date/Time: 2010/7/21 11:18:51

Test Laboratory: Bureau Veritas ADT

M10-11B -Vertical Back-Ch01

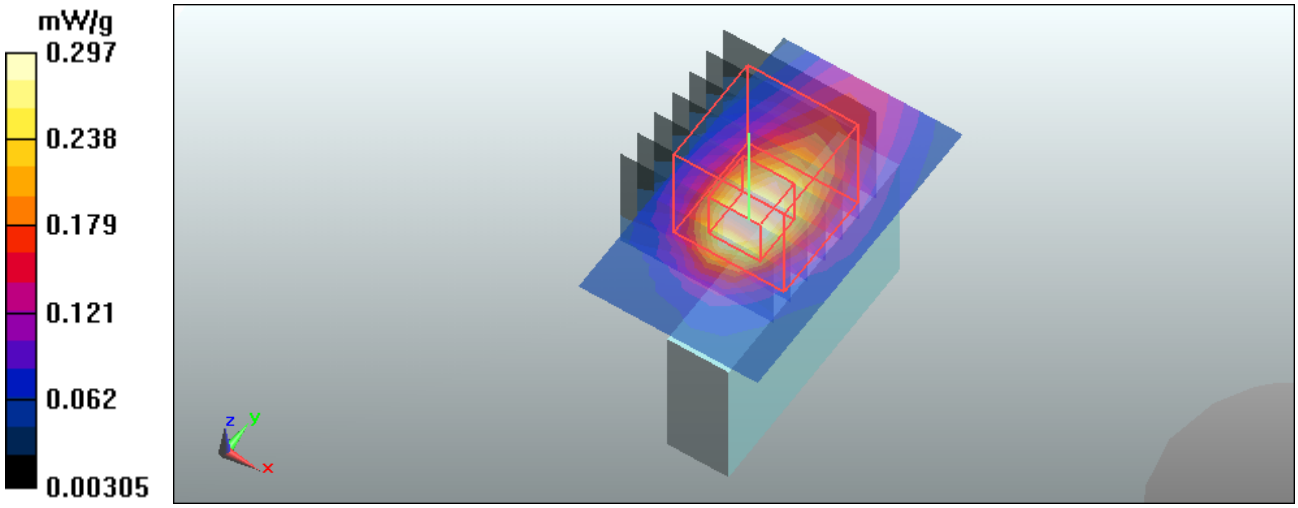
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11b ; Frequency: 2412Hz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2412Hz; σ = 1.98 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 1/Area Scan (8x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.337 mW/g

Low Channel 1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 11.4 V/m; Power Drift = -0.181 dB
Peak SAR (extrapolated) = 0.479 W/kg
SAR(1 g) = 0.218 mW/g; SAR(10 g) = 0.099 mW/g
Maximum value of SAR (measured) = 0.297 mW/g



Date/Time: 2010/7/21 12:06:25

Test Laboratory: Bureau Veritas ADT

M11-11N HT20- Vertical Back -Ch06

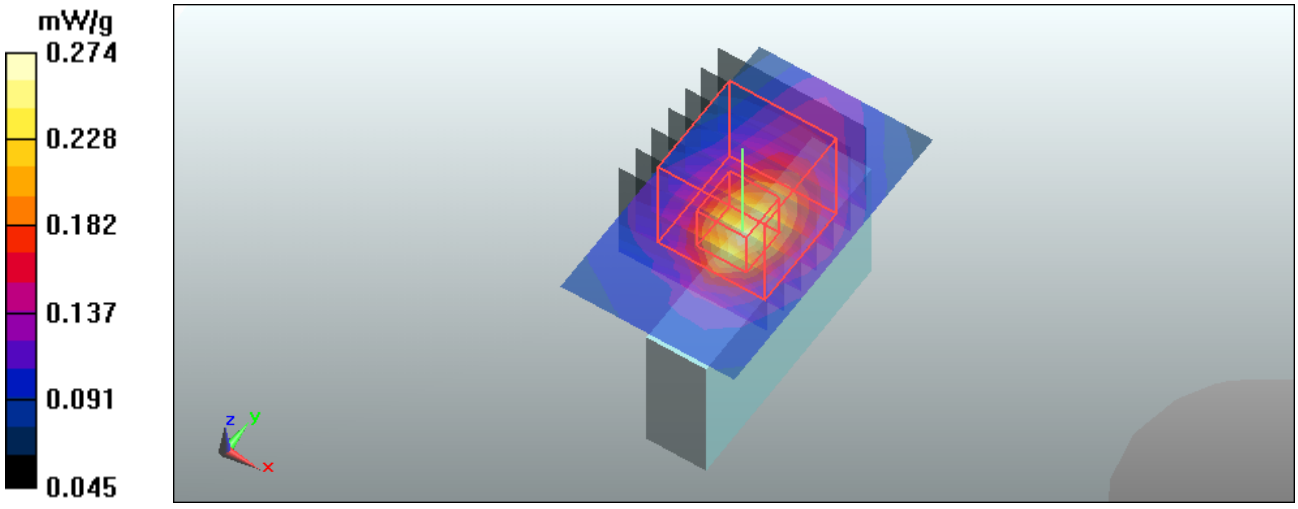
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 2.4G 11n span20 ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 2.01 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Mid Channel 6/Area Scan (8x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.254 mW/g

Mid Channel 6/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 11.1 V/m; Power Drift = 0.189 dB
Peak SAR (extrapolated) = 0.452 W/kg
SAR(1 g) = 0.215 mW/g; SAR(10 g) = 0.118 mW/g
Maximum value of SAR (measured) = 0.274 mW/g



Date/Time: 2010/7/21 13:00:16

Test Laboratory: Bureau Veritas ADT

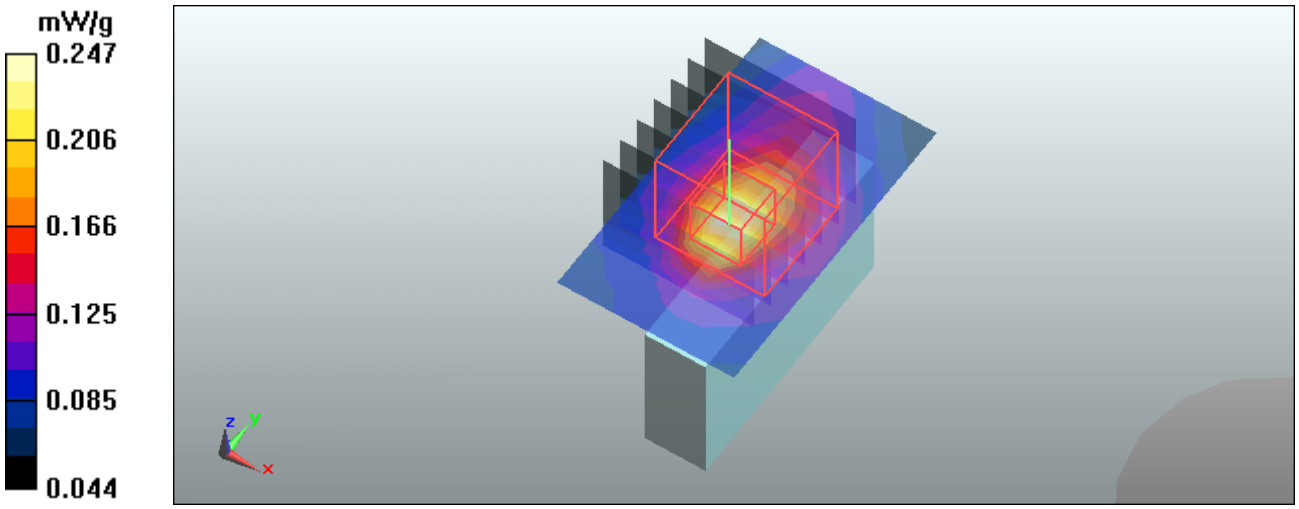
M12-11N HT40 -Vertical Back -Ch01

DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11n 40MHz ; Frequency: 2422 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2422 MHz; σ = 2 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 3/Area Scan (8x13x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.239 mW/g
Low Channel 3/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 10.5 V/m; Power Drift = -0.052 dB
Peak SAR (extrapolated) = 0.387 W/kg
SAR(1 g) = 0.191 mW/g; SAR(10 g) = 0.107 mW/g
Maximum value of SAR (measured) = 0.247 mW/g



Date/Time: 2010/7/21 13:54:10

Test Laboratory: Bureau Veritas ADT

M13-11B-Tip-Ch01

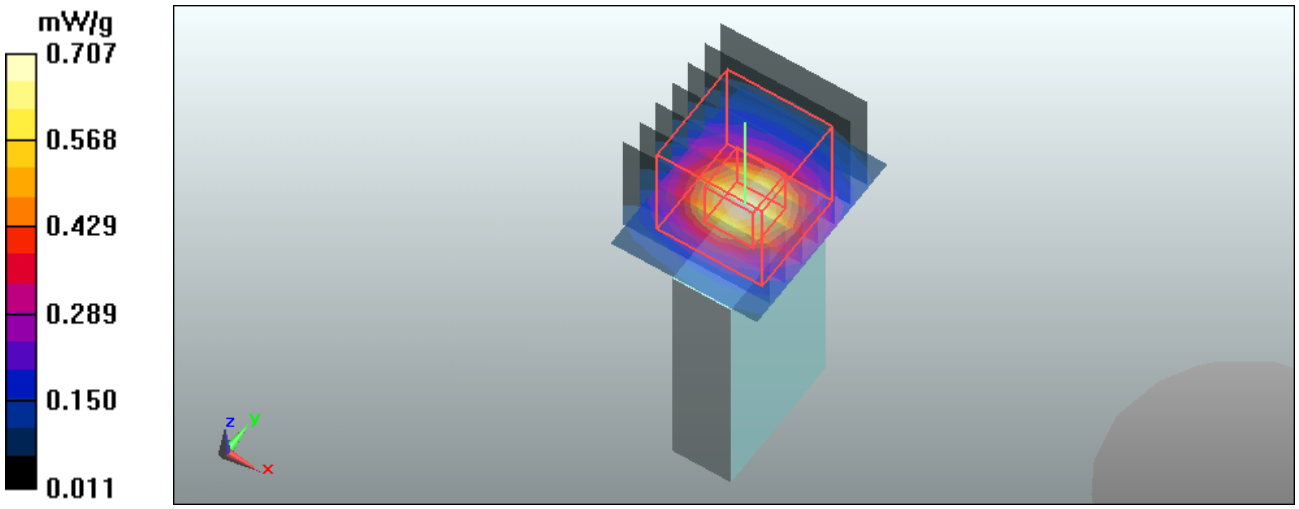
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2412 MHz; σ = 1.98 mho/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 1/Area Scan (7x9x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.710 mW/g

Low Channel 1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 21.8 V/m; Power Drift = -0.093 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.524 mW/g; SAR(10 g) = 0.230 mW/g
Maximum value of SAR (measured) = 0.707 mW/g



Date/Time: 2010/7/21 14:39:42

Test Laboratory: Bureau Veritas ADT

M14-11N HT20-Tip-Ch06

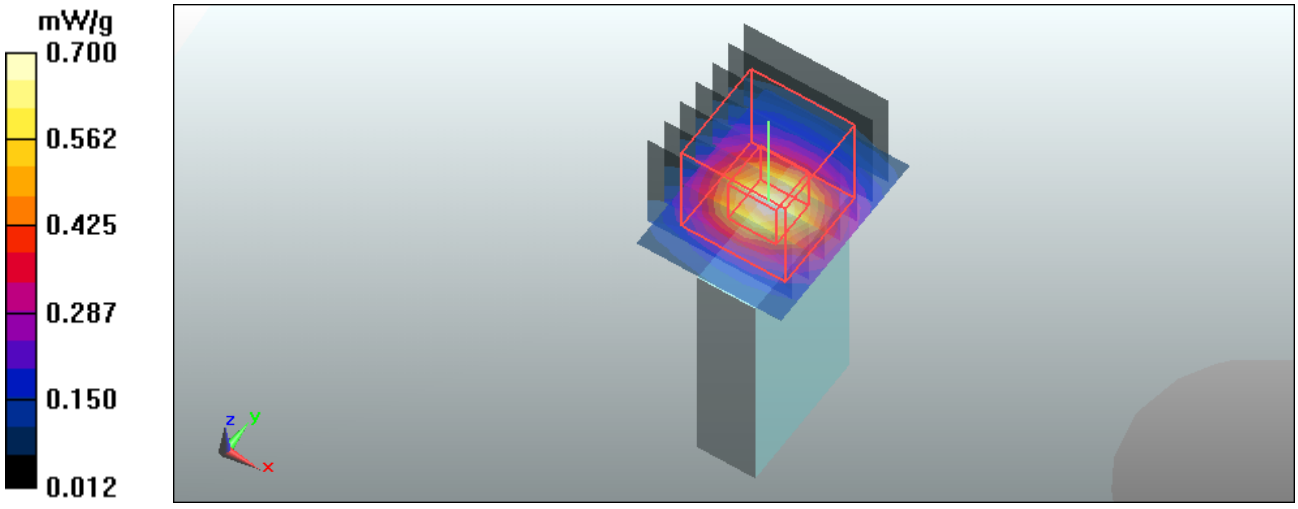
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 2.4G 11n span20 ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 2.01 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Mid Channel 6/Area Scan (7x9x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.718 mW/g

Mid Channel 6/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 20 V/m; Power Drift = -0.133 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.520 mW/g; SAR(10 g) = 0.230 mW/g
Maximum value of SAR (measured) = 0.700 mW/g



Date/Time: 2010/7/21 15:26:55

Test Laboratory: Bureau Veritas ADT

M15-11N HT40-Tip-Ch01

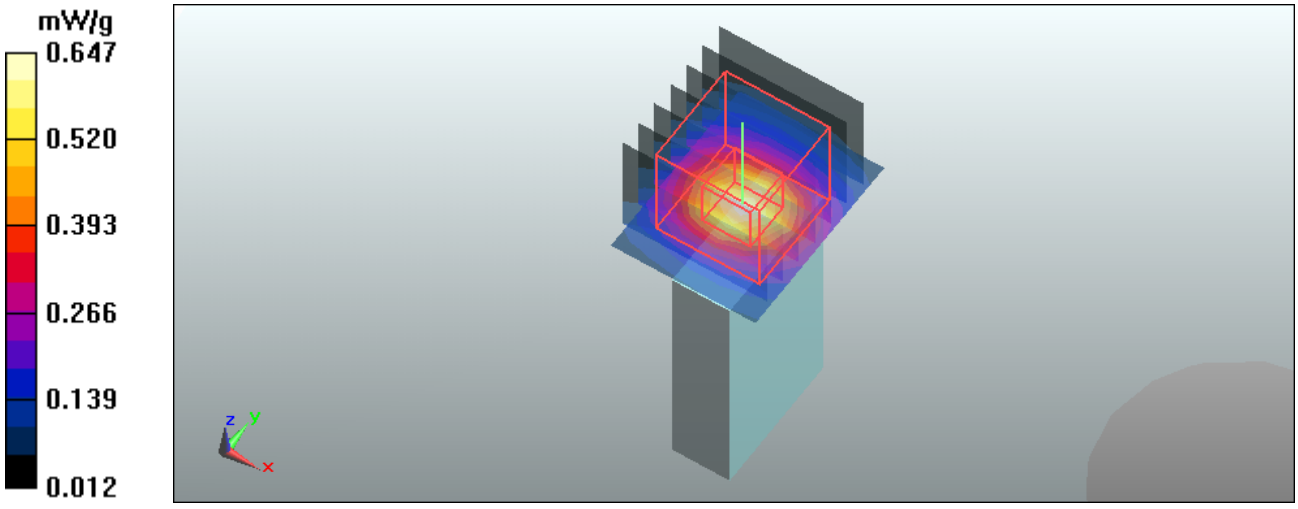
DUT: WIRELESS N USB ADAPTER ; Type: DWA-135
Communication System: 802.11n 40MHz ; Frequency: 2422 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2422 MHz; σ = 2 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61

Low Channel 3/Area Scan (7x9x1): Measurement grid: dx=5mm, dy=5mm
Maximum value of SAR (measured) = 0.652 mW/g

Low Channel 3/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm
Reference Value = 18.8 V/m; Power Drift = -0.191 dB
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.482 mW/g; SAR(10 g) = 0.215 mW/g
Maximum value of SAR (measured) = 0.647 mW/g



Date/Time: 2010/7/21 00:10:37

Test Laboratory: Bureau Veritas ADT

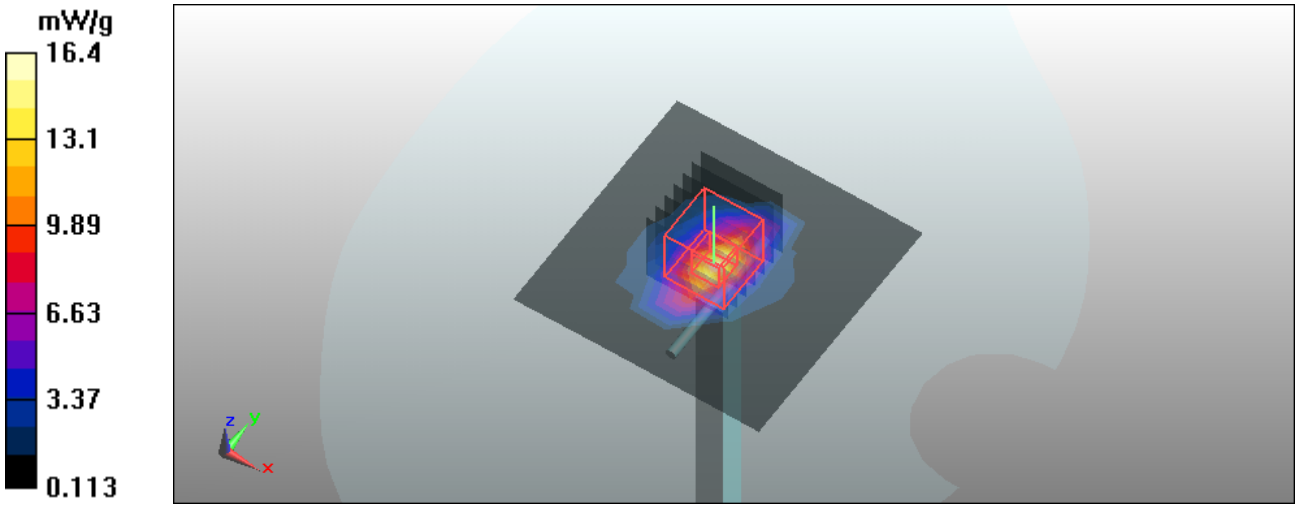
SystemPerformanceCheck-MSL2450

DUT: Dipole 2450 MHz ; Type: D2450V2
Communication System: CW ; Frequency: 2450 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2450 MHz; σ = 2.03 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 10 mm (The bottom side of the EUT to the Phantom)
Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom)Air temp. : 23 degrees ; Liquid temp. : 22.6 degrees

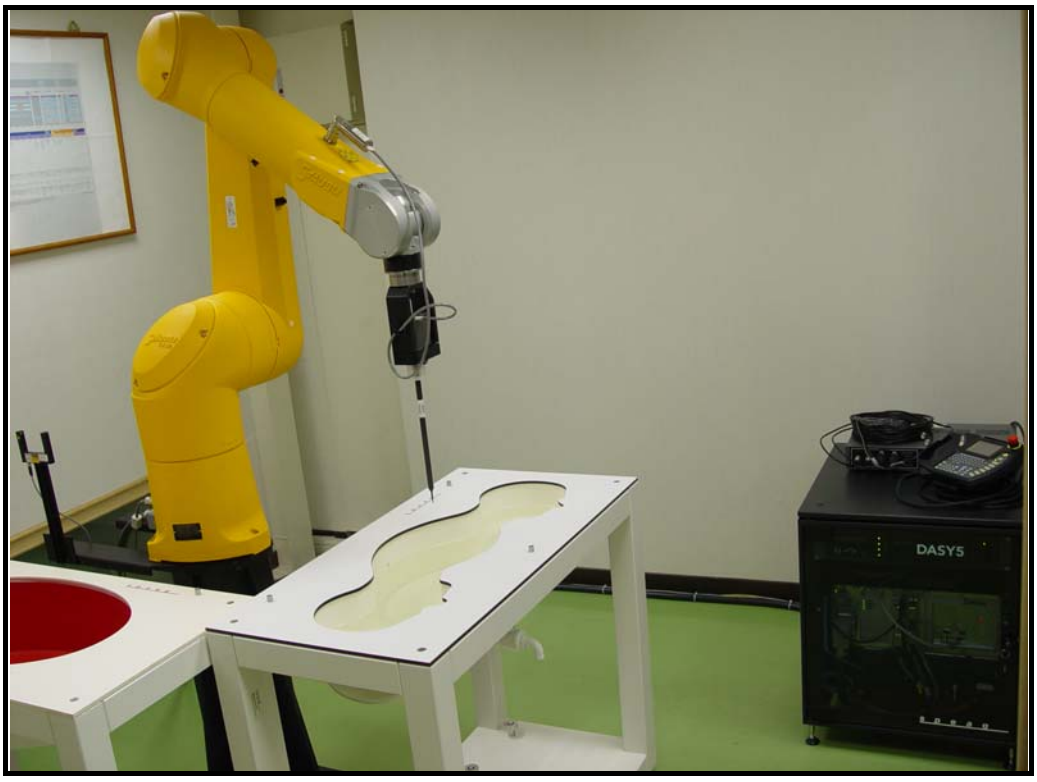
DASY5 Configuration:

- Probe: EX3DV3 - SN3504; ConvF(7.91, 7.91, 7.91); Calibrated: 2010/1/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/12/16
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1485
- Measurement SW: DASY5, V5.2 Build 162; SEMCAD X Version 14.0 Build 61
- **System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Area Scan (7x7x1):** Measurement grid: dx=15mm, dy=15mm
  Maximum value of SAR (measured) = 16.1 mW/g

  System Performance Check at Frequencies above 1 GHz/d=10mm, Pin=250 mW, dist=3.0mm (EX-Probe)/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
  Reference Value = 89.2 V/m; Power Drift = -0.168 dB
  Peak SAR (extrapolated) = 25.4 W/kg
  SAR(1 g) = 12.4 mW/g; SAR(10 g) = 5.71 mW/g
  Maximum value of SAR (measured) = 16.4 mW/g



APPENDIX B: BV ADT SAR MEASUREMENT SYSTEM



APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION

APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION

D1: PHANTOM

Schmid & Partner Engineering AG

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

Certificate of Conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 C
Series No	TP-1150 and higher
Manufacturer	SPEAG Zeughausstrasse 43 CH-8004 Zürich Switzerland

Tests

The series production process used allows the limitation to test of first articles.
Complete tests were made on the pre-series Type No. QD 000 P40 AA, Serial No. TP-1001 and on the series first article Type No. QD 000 P40 BA, Serial No. TP-1006. Certain parameters have been retested using further series items (called samples) or are tested at each item.

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

Standards

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

Conformity

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

Date 07.07.2005

Signature / Stamp

D2: DOSIMETRIC E-FIELD PROBE

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

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

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

Accreditation No.: SCS 108

Client **BV-ADT (Auden)**

Certificate No: EX3-3504_Jan10

CALIBRATION CERTIFICATE

Object: EX3DV3 - SN:3504

Calibration procedure(s): QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2
Calibration procedure for dosimetric E-field probes

Calibration date: January 26, 2010

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	30-Dec-09 (No. ES3-3013_Dec09)	Dec-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

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-09)	In house check: Oct10

	Name	Function	Signature
Calibrated by:	Katja Pokovic	Technical Manager	
Approved by:	Fin Bomholt	R&D Director	

Issued: January 26, 2010

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

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

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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV3

SN:3504

Manufactured:	December 15, 2003
Last calibrated:	January 21, 2009
Recalibrated:	January 26, 2010

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV3 SN:3504

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm (μV/(V/m)^2)[A]	0.59	0.62	0.62	± 10.1%
DCP (mV)[B]	97.9	95.0	98.0	

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	300	± 1.5%
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

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 - Parameters of Probe: EX3DV3 SN:3504

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)
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	9.80	9.80	9.80	0.48	0.73 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	8.70	8.70	8.70	0.50	0.67 ± 11.0%
1950	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	8.20	8.20	8.20	0.38	0.75 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.77	7.77	7.77	0.21	1.06 ± 11.0%
2600	± 50 / ± 100	39.0 ± 5%	1.96 ± 5%	7.79	7.79	7.79	0.22	1.16 ± 11.0%
5200	± 50 / ± 100	36.0 ± 5%	4.66 ± 5%	4.87	4.87	4.87	0.45	1.70 ± 13.1%
5300	± 50 / ± 100	35.9 ± 5%	4.76 ± 5%	4.62	4.62	4.62	0.45	1.70 ± 13.1%
5500	± 50 / ± 100	35.6 ± 5%	4.96 ± 5%	4.51	4.51	4.51	0.50	1.70 ± 13.1%
5600	± 50 / ± 100	35.5 ± 5%	5.07 ± 5%	4.25	4.25	4.25	0.55	1.70 ± 13.1%
5800	± 50 / ± 100	35.3 ± 5%	5.27 ± 5%	4.53	4.53	4.53	0.50	1.70 ± 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 - Parameters of Probe: EX3DV3 SN:3504

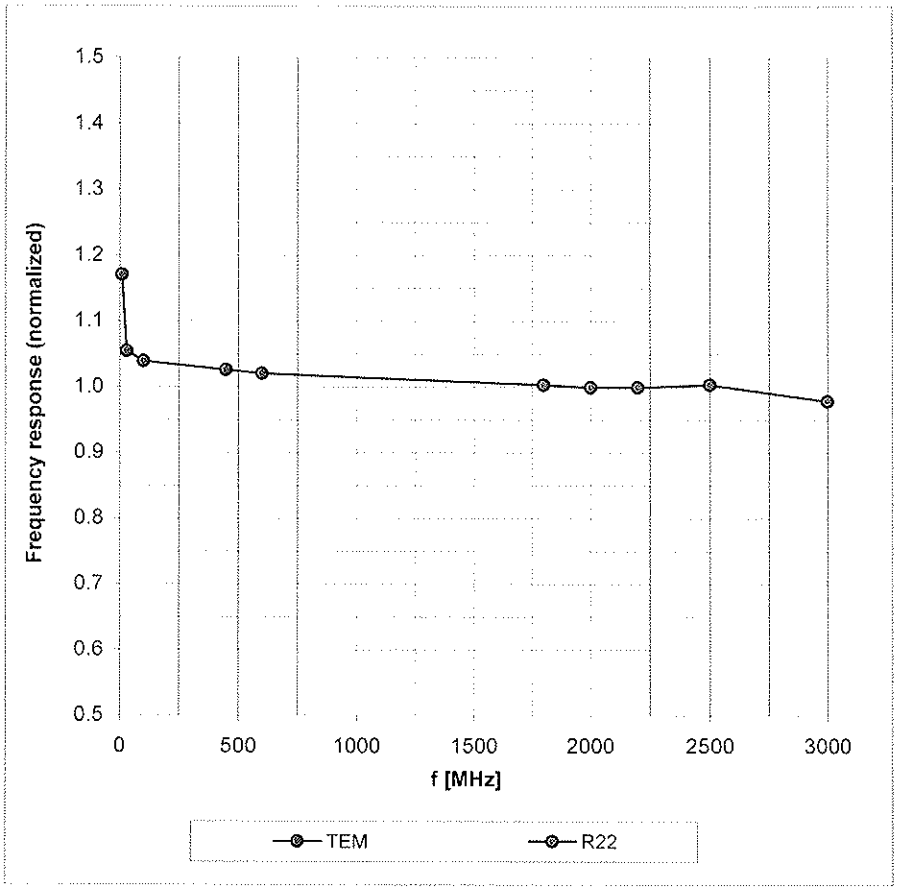
Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	9.83	9.83	9.83	0.44	0.76	± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	8.64	8.64	8.64	0.44	0.74	± 11.0%
1950	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	8.52	8.52	8.52	0.39	0.79	± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	7.91	7.91	7.91	0.32	0.86	± 11.0%
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	7.80	7.80	7.80	0.27	0.90	± 11.0%
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	4.45	4.45	4.45	0.50	1.80	± 13.1%
5300	± 50 / ± 100	48.5 ± 5%	5.42 ± 5%	4.18	4.18	4.18	0.55	1.80	± 13.1%
5500	± 50 / ± 100	48.6 ± 5%	5.65 ± 5%	3.91	3.91	3.91	0.60	1.80	± 13.1%
5600	± 50 / ± 100	48.5 ± 5%	5.77 ± 5%	3.70	3.70	3.70	0.65	1.80	± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	3.95	3.95	3.95	0.60	1.75	± 13.1%

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

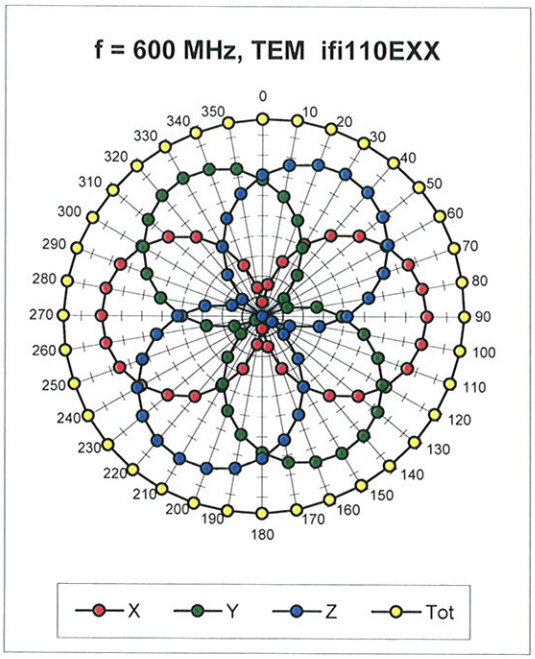
Frequency Response of E-Field

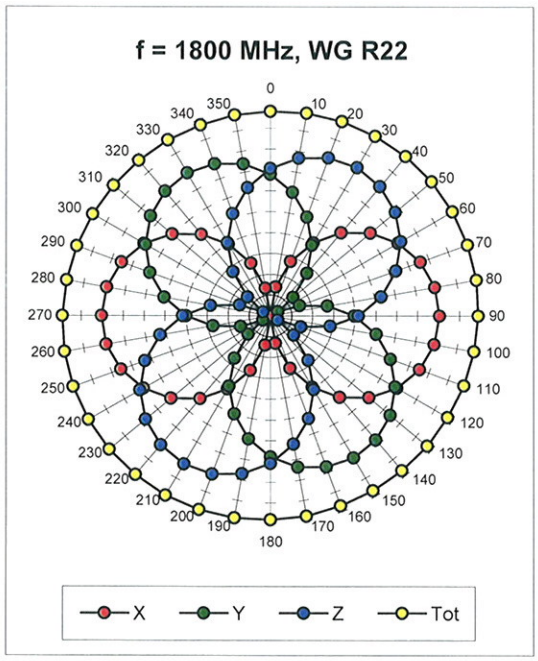
(TEM-Cell:ifi110 EXX, Waveguide: R22)

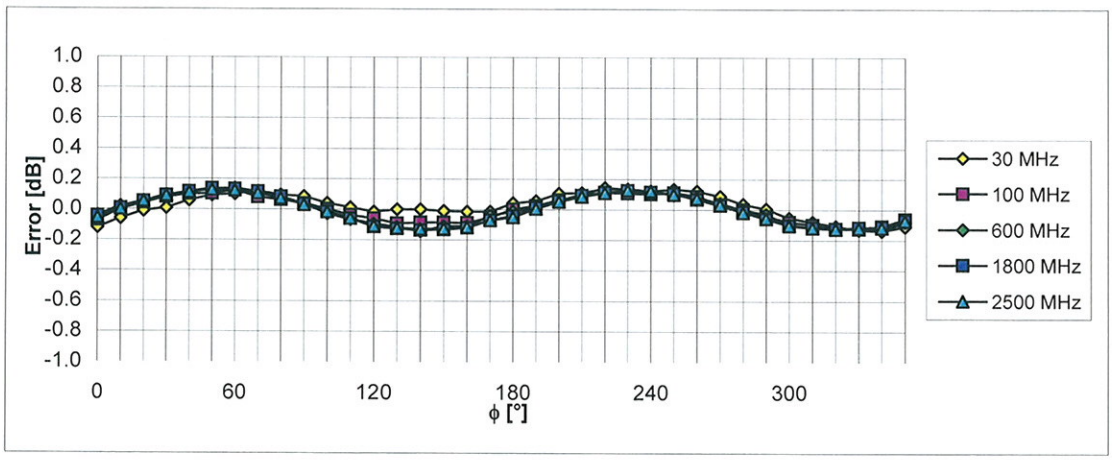


Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Receiving Pattern (ϕ), ϑ = 0°



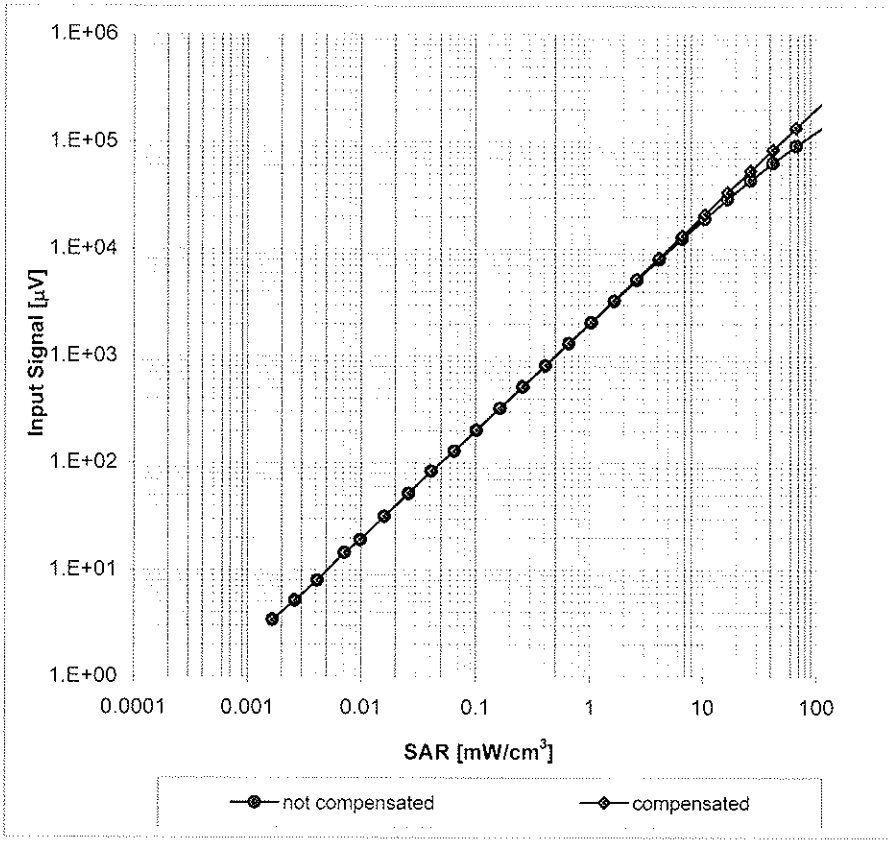


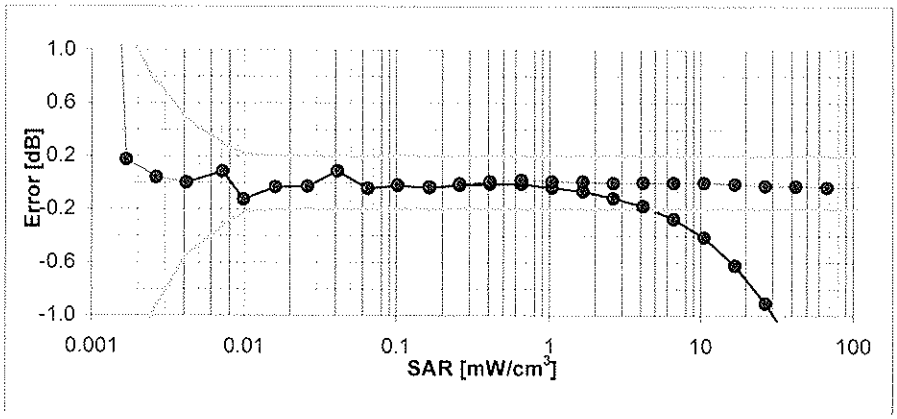


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

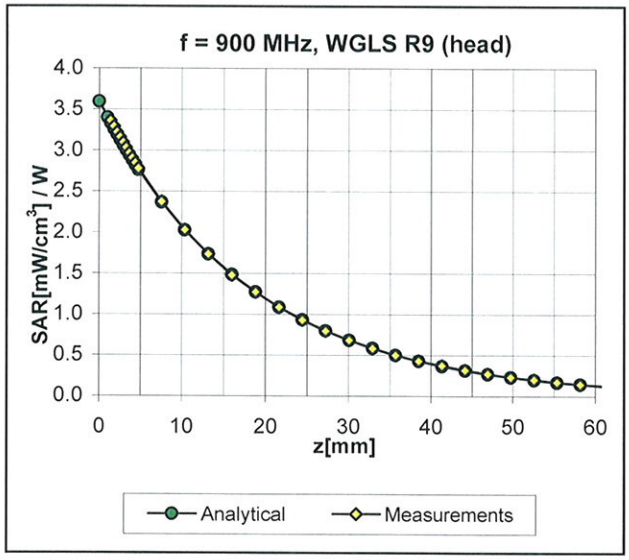
(Waveguide R22, f = 1800 MHz)

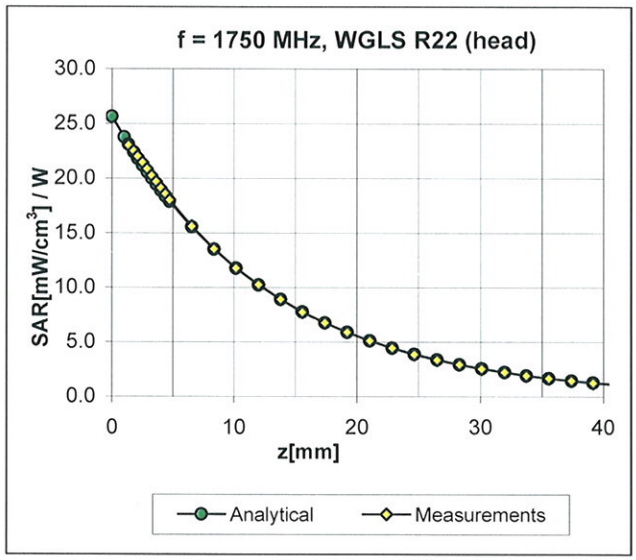




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

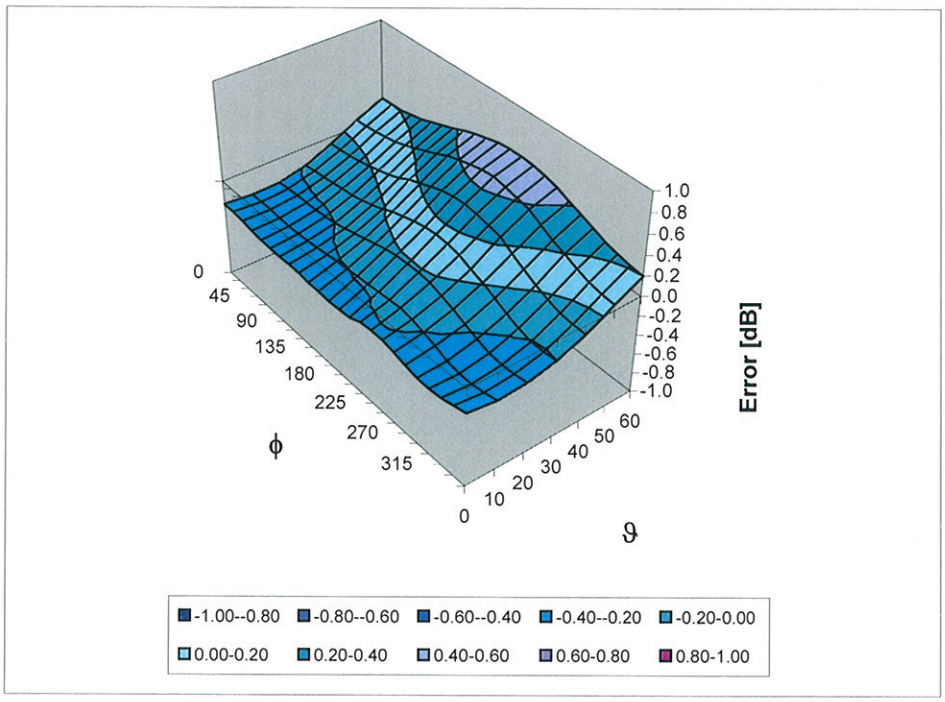
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Other Probe Parameters

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