SAR TEST REPORT

REPORT NO.: SA980109H04

MODEL NO.: DWA-130

RECEIVED: Jan. 09, 2009

TESTED: Mar. 18, 2009

ISSUED: Mar. 30, 2009

APPLICANT: D-Link Co.

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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-130

BRAND: D-Link

APPLICANT: D-Link Co.

TESTED: Mar. 18, 2009

TEST SAMPLE: R&D SAMPLE

STANDARDS: **FCC Part 2 (Section 2.1093)**
FCC OET Bulletin 65, Supplement C (01-01)
RSS-102

The above equipment (model: DWA-130) 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 :** Mar. 30, 2009
Joanna Wang / Senior Specialist

TECHNICAL
ACCEPTANCE : _____ , **DATE :** Mar. 30, 2009
Responsible for RF James Fan / Engineer

APPROVED BY : _____ , **DATE :** Mar. 30, 2009
Gary Chang / Assistant Manager

2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

PRODUCT	Wireless N USB Adapter
MODEL NO.	DWA-130
FCC ID	KA2WA130C2
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 / 5.5 / 2 / 1Mbps 802.11g: 54 / 48 / 36 / 24 / 18 / 12 / 9 / 6Mbps HT20 MCS0~7 (800ns GI): 65 / 58.5 / 52 / 39 / 26 / 19.5 / 13 / 6.5Mbps. HT40 MCS0~7 (800ns GI): 135 / 121.5 / 108 / 81 / 54 / 40.5 / 27 / 13.5Mbps. HT20 MCS0~7 (400ns GI): 72.2 / 65 / 57.8 / 43.3 / 28.9 / 21.7 / 14.4 / 7.2Mbps. HT40 MCS0~7 (400ns GI): 150 / 135 / 120 / 90 / 60 / 45 / 30 / 15Mbps.
FREQUENCY RANGE	2412MHz ~ 2462MHz
NUMBER OF CHANNEL	11 for 802.11b, 802.11g, draft 802.11n (20MHz) 7 for draft 802.11n (40MHz)
CHANNEL FREQUENCIES UNDER TEST AND ITS CONDUCTED OUTPUT POWER	**802.11b:** 91.833mW / Ch1: 2412MHz 134.896mW / Ch6: 2437MHz 165.959mW / Ch11: 2462MHz **802.11g:** 272.898mW / Ch1: 2412MHz 342.768mW / Ch6: 2437MHz 334.195mW / Ch11: 2462MHz **DRAFT 802.11n (20MHz):** 262.422mW / Ch1: 2412MHz 344.350mW / Ch6: 2437MHz 295.801mW / Ch11: 2462MHz **DRAFT 802.11n (40MHz):** 299.226mW / Ch4: 2437MHz

AVERAGE SAR (1g)	1.070W/kg
ANTENNA TYPE	Printed antenna with -0.12dBi gain
I/O PORTS	USB
DATA CABLE	USB Cable (Unshielded, 1.0m) for Cradle
ACCESSORY DEVICES	Cradle

NOTE:

1. The EUT incorporates a SIMO function with draft 802.11n. Physically, the EUT provides one completed transmitter and two completed receivers. The EUT is 1 * 2 spatial SIMO without beam forming function. The antenna configurations are one transmitter antenna and two receiver antennas, as there are 2 printed antennas. Spatial multiplexing modes for simultaneous transmission using 1 antenna, and for simultaneous receiver using 2 antennas.

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

2. 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

DASY4 **(software 4.7 Build 80)** consists of high precision robot, probe alignment sensor, phantom, robot controller, controlled measurement server and near-field probe. The robot includes six axes that can move to the precision position of the DASY4 software defined. The DASY4 software can define the area that is detected by the probe. The robot is connected to controlled box. Controlled measurement server is connected to the controlled robot box. The DAE includes amplifier, signal multiplexing, AD converter, offset measurement and surface detection. It is connected to the Electro-optical coupler (ECO). The ECO performs the conversion form the optical into digital electric signal of the DAE and transfers data to the PC.

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: $\pm$ 0.2 dB (30 MHz to 6 GHz)
DIRECTIVITY	$\pm$ 0.3 dB in HSL (rotation around probe axis) $\pm$ 0.5 dB in tissue material (rotation normal to probe axis)
DYNAMIC RANGE	10 μW/g to > 100 mW/g Linearity: $\pm$ 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 GENERAL DESCRIPTION OF THE SPATIAL PEAK SAR EVALUATION

The DASY4 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.

$$SAR = E_{tot}^2 \cdot \frac{s}{r \cdot 1'000}$$

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.

3. 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.
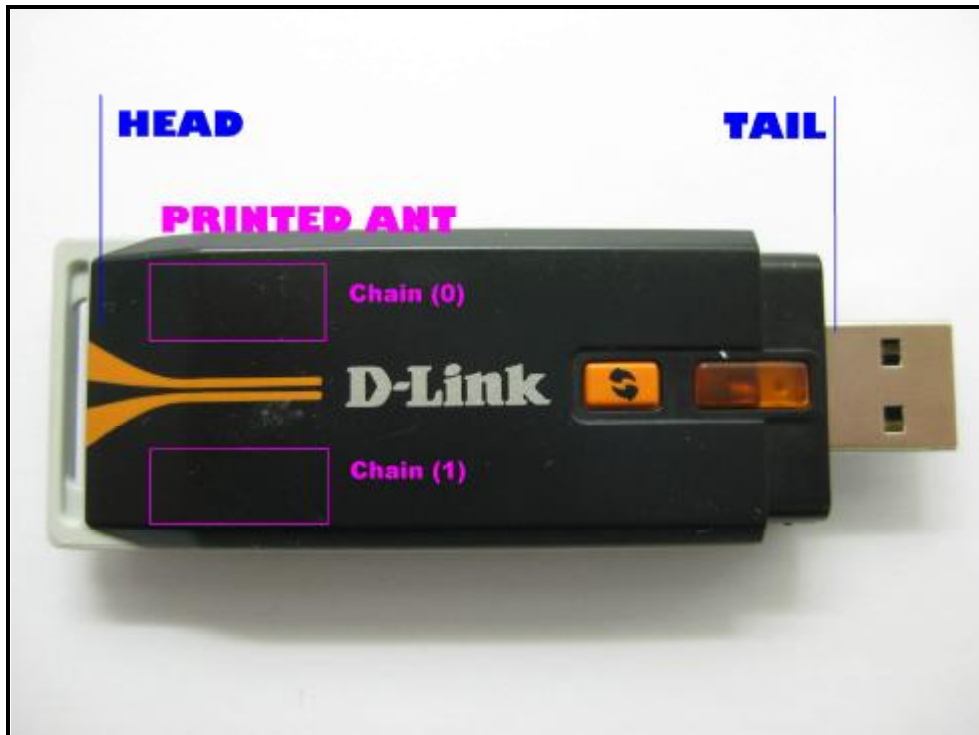
NO.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID
1	NOTEBOOK	DELL	PP18L	29144041120	CXSMM01BRD02D330

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

NOTE: The length of USB cable is 11.6 inch. USB cable does not affect device radiating characteristics and output power

4. DESCRIPTION OF TEST MODES AND CONFIGURATIONS

4.1. DESCRIPTION OF ANTENNA LOCATION

NOTE: Only chain(0) can transmit, chain(1) is for receiver only.

4.2. DESCRIPTION OF ASSESSMENT POSITION

The following test configurations have been applied in this test report:

A

The bottom of the EUT faces to the phantom with 5mm-separation distance.

B

The right edge of the EUT faces to the phantom with 5mm-separation distance.

C

The front of the EUT faces to the phantom with 5mm-separation distance.

D

The left edge of the EUT faces to the phantom with 5mm-separation distance.

E

The tip of the EUT faces to the phantom with 5mm-separation distance.

SETUP PHOTO

4.3. DESCRIPTION OF TEST MODE

The EUT supports 1TX / 2RX function. Only chain(0) can transmit, chain(1) can't.
TX antenna diversity function is not supported for the EUT.

Test tool is Reltek 11n Single Chip USB WLAN NIC Massproduction Kit provided by client.
It can control EUT to transmit continuously at specific channel, output power level, data
rates and 100 % duty signal.

"Per KDB 248277, for each frequency band, testing at higher data rates and higher order
modulations is not required when the maximum average output power for each of these
configurations is less than ¼ dB higher than those measured at the lowest data rate."

Comparing output power of all modulations and data rates of each mode can find the
lowest data rates has max output power. Therefore, EUT will set under lowest data rates
to test.

"Per KDB 447498, when the SAR procedures require multiple channels to be tested and
the 1-g SAR for the highest output channel is less than 0.8 W/kg and peak SAR is less
than 1.6w/kg, where the transmission band corresponding to all channels is ≤ 100 MHz,
testing for the other channels is not required."

According to test data from table of section 4.4, except mode 1~3, SAR value of highest
output power channel for other modes are less than 0.8 W / kg and Peak SAR values are
less than 1.6w/kg. Therefore, testing for other channels is not required except mode 1~3.

ITEM	TEST MODE	MODULATION	ASSESSMENT POSTITION	TESTED CHANNEL
1	802.11b	DBPSK	A	1, 6, 11
2	802.11g	BPSK		1, 6, 11
3	Draft 802.11n (20MHz)	BPSK		1, 6, 11
4	Draft 802.11n (40MHz)	BPSK		4
5	802.11b	DBPSK	B	11
6	802.11g	BPSK		6
7	Draft 802.11n (20MHz)	BPSK		6
8	Draft 802.11n (40MHz)	BPSK		4
9	802.11b	DBPSK	C	11
10	802.11g	BPSK		6
11	Draft 802.11n (20MHz)	BPSK		6
12	Draft 802.11n (40MHz)	BPSK		4
13	802.11b	DBPSK	D	11
14	802.11g	BPSK		6
15	Draft 802.11n (20MHz)	BPSK		6
16	Draft 802.11n (40MHz)	BPSK		4
17	802.11b	DBPSK	E	11
18	802.11g	BPSK		6
19	Draft 802.11n (20MHz)	BPSK		6
20	Draft 802.11n (40MHz)	BPSK		4

4.4. SUMMARY OF TEST RESULTS

ITEM		1	2	3	ITEM		4
TEST MODE		802.11b	802.11g	DRAFT 802.11n (20MHz)	**TEST MODE**		DRAFT 802.11n (40MHz)
CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)			CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)
1	2412 (Low)	0.680	0.544	0.524	1	2422 (Low)	-
6	2437 (Mid.)	0.885	1.020	**1.070**	4	2437 (Mid.)	0.628
11	2462 (High)	0.982	0.609	0.495	7	2452 (High)	-

ITEM		5	6	7	ITEM		8
TEST MODE		802.11b	802.11g	DRAFT 802.11n (20MHz)	**TEST MODE**		DRAFT 802.11n (40MHz)
CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)			CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)
1	2412 (Low)	-	-	-	1	2422 (Low)	-
6	2437 (Mid.)	-	0.684	0.739	4	2437 (Mid.)	0.378
11	2462 (High)	0.519	-	-	7	2452 (High)	-

ITEM		9	10	11	ITEM		12
TEST MODE		802.11b	802.11g	DRAFT 802.11n (20MHz)	**TEST MODE**		DRAFT 802.11n (40MHz)
CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)			CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)
1	2412 (Low)	-	-	-	1	2422 (Low)	-
6	2437 (Mid.)	-	0.654	0.721	4	2437 (Mid.)	0.357
11	2462 (High)	0.495	-	-	7	2452 (High)	-

ITEM	13	14	15	ITEM	16
TEST MODE	802.11b	802.11g	DRAFT 802.11n (20MHz)	TEST MODE	DRAFT 802.11n (40MHz)
CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)		CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)
1	2412 (Low)	-	-	-	1	2422 (Low)	-
6	2437 (Mid.)	-	0.309	0.339	4	2437 (Mid.)	0.183
11	2462 (High)	0.239	-	-	7	2452 (High)	-

ITEM	17	18	19	ITEM	20
TEST MODE	802.11b	802.11g	DRAFT 802.11n (20MHz)	TEST MODE	DRAFT 802.11n (40MHz)
CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)		CHAN.	FREQ. (MHz)	MEASURED VALUE OF 1g SAR (W/kg)
1	2412 (Low)	-	-	-	1	2422 (Low)	-
6	2437 (Mid.)	-	0.206	0.218	4	2437 (Mid.)	0.115
11	2462 (High)	0.167	-	-	7	2452 (High)	-

NOTE: The worst value has been marked by boldface.

4.5. CHECK FOR SCAN RESOLUTION

COMPARE WITH DIFFERENT SCAN RESOLUTION

With EUT hold on the worst case configuration (middle channel in test mode 3) with no any change in position or setting, 2 scans with different resolutions are preformed to evaluate the impact on the SAR value.

Test data as below:

SCAN RESOLUTION (mm)	SAR VALUE (W/kg)
5	1.070
2.5	1.050

CONCLUSION: No meaningful change detected.

4.6. ENHANCED ENERGY COUPLING AT INCREASED SEPARATION DISTANCES

INITIAL POSITION:

The probe tip is positioned at the peak SAR location of middle channel in test mode 6, at a distance of one half the probe tip diameter from the phantom surface. Under this condition to get a single sar value.

5mm INCREMENTS FROM INITIAL POSITION:

With the probe fixed at this location, the device is moved away from the phantom in 5mm increments from the initial touching or minimum separation position. A single point SAR is measured for each of these device positions until the SAR is less than 50% of that measured at the initial position.

DEVICE TEST POSITION MODE	INITIAL POSITION SAR VALUE (mW/g)	5mm INCREMENTS FROM INITIAL POSITION SAR VALUE (mW/g)
BOTTOM	2.310	0.810
EDGE-R	1.240	0.503
FRONT	0.890	0.327
EDGE-L	0.695	0.237
TIP	0.376	0.140

RESULT: No Enhancement Energy Coupling observed.

5. TEST RESULTS

5.1 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 DASY4 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%.

5.2 MEASURED SAR RESULTS

ENVIRONMENTAL CONDITION	Air Temperature：22.4°C, Liquid Temperature：21.3°C Humidity：62%RH						
TESTED BY	Sam Onn		DATE		Mar. 18, 2009		

CHAN.	FREQ. (MHz)	TEST MODE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST			
1	2412 (Low)	802.11b	91.833	90.630	-1.31	1	0.680
6	2437 (Mid.)	802.11b	134.896	133.021	-1.39	1	0.885
11	2462 (High)	802.11b	165.959	163.619	-1.41	1	0.982
1	2412 (Low)	802.11g	272.898	268.832	-1.49	2	0.544
6	2437 (Mid.)	802.11g	342.768	337.558	-1.52	2	1.020
11	2462 (High)	802.11g	334.195	328.982	-1.56	2	0.609
1	2412 (Low)	DRAFT 802.11n (20MHz)	262.422	258.118	-1.64	3	0.524
6	2437 (Mid.)	DRAFT 802.11n (20MHz)	344.350	338.530	-1.69	3	1.070
11	2462 (High)	DRAFT 802.11n (20MHz)	295.801	290.713	-1.72	3	0.495
4	2437.0 (Mid.)	DRAFT 802.11n (40MHz)	299.226	293.900	-1.78	4	0.628

NOTE:

1. Test configuration of each mode is described in section 3.

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%.

ENVIRONMENTAL CONDITION	Air Temperature：22.4°C, Liquid Temperature：21.3°C Humidity：62%RH						
TESTED BY	Sam Onn		**DATE**		Mar. 18, 2009		

CHAN.	FREQ. (MHz)	TEST MODE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST			
11	2462 (High)	802.11b	165.959	164.582	-0.83	5	0.519
6	2437 (Mid.)	802.11g	342.768	339.649	-0.91	6	0.684
6	2437 (Mid.)	DRAFT 802.11n (20MHz)	344.350	340.700	-1.06	7	0.739
4	2437 (Mid.)	DRAFT 802.11n (40MHz)	299.226	295.875	-1.12	8	0.378
11	2462 (High)	802.11b	165.959	163.918	-1.23	9	0.495
6	2437 (Mid.)	802.11g	342.768	338.449	-1.26	10	0.654
6	2437 (Mid.)	DRAFT 802.11n (20MHz)	344.350	339.770	-1.33	11	0.721
4	2437 (Mid.)	DRAFT 802.11n (40MHz)	299.226	295.127	-1.37	12	0.357

NOTE:

1. Test configuration of each mode is described in section 3.

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%.

ENVIRONMENTAL CONDITION	Air Temperature：22.4°C, Liquid Temperature：21.3°C Humidity：62%RH					
TESTED BY	Sam Onn		DATE		Mar. 18, 2009	

CHAN.	FREQ. (MHz)	TEST MODE	CONDUCTED POWER (mW)		POWER DRIFT (%)	DEVICE TEST POSITION MODE	MEASURED 1g SAR (W/kg)
			BEGIN TEST	AFTER TEST			
11	2462 (High)	802.11b	165.959	163.586	-1.43	13	0.239
6	2437 (Mid.)	802.11g	342.768	337.661	-1.49	14	0.309
6	2437 (Mid.)	DRAFT 802.11n (20MHz)	344.350	339.081	-1.53	15	0.339
4	2437 (Mid.)	DRAFT 802.11n (40MHz)	299.226	294.498	-1.58	16	0.183
11	2462 (High)	802.11b	165.959	163.270	-1.62	17	0.167
6	2437 (Mid.)	802.11g	342.768	336.770	-1.75	18	0.206
6	2437 (Mid.)	DRAFT 802.11n (20MHz)	344.350	338.117	-1.81	19	0.218
4	2437 (Mid.)	DRAFT 802.11n (40MHz)	299.226	293.480	-1.92	20	0.115

NOTE:

1. Test configuration of each mode is described in section 3.

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%.

5.3 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.

5.4 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
- **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℃	f= 2450MHz ε= 39.2 ± 5% σ= 1.80 ± 5% S/m	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 DASY4 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.		21.3		
TEST DATE		Mar. 18, 2009		
TESTED BY		Sam Onn		
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)
2412.0	Permitivity (ε)	52.80	53.90	2.08
2437.0		52.70	53.80	2.09
2450.0		52.70	53.70	1.90
2462.0		52.70	53.60	1.71
2412.0	Conductivity (σ) S/m	1.91	1.89	-1.05
2437.0		1.94	1.92	-1.03
2450.0		1.95	1.93	-1.03
2462.0		1.97	1.95	-1.02
Dielectric Parameters Required at 22℃		f= 2450MHz ε= 52.7 ± 5% σ= 1.95 ± 5% S/m		

5.5 TEST EQUIPMENT FOR TISSUE PROPERTY

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	Network Analyzer	Agilent	E8358A	US41480538	Nov. 27, 2008	Nov. 26, 2009
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.

6. SYSTEM VALIDATION

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

6.1 TEST EQUIPMENT

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	SAM Phantom	S & P	QD000 P40 CA	TP-1150	NA	NA
2	Signal Generator	Anritsu	68247B	984703	May 27, 2008	May 26, 2009
3	E-Field Probe	S & P	EX3DV3	3578	May 20, 2008	May 19, 2009
4	DAE	S & P	DAE 3	510	Jan. 21, 2009	Jan. 20, 2010
5	Robot Positioner	Staubli Unimation	NA	NA	NA	NA
6	Validation Dipole	S & P	D2450V2	737	Apr. 22, 2008	Apr. 21, 2009

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

6.2 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. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ±30°.) However, varying breaking indices of different liquid compositions might also influence the distance. If the indicated difference varies from the actual setting, the probe parameter "optical surface

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 DASY4 system is less than ±0.1mm.

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

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

6.3 VALIDATION RESULTS

SYSTEM VALIDATION TEST OF SIMULATING LIQUID					
FREQUENCY (MHz)	REQUIRED SAR (mW/g)	MEASURED SAR (mW/g)	DEVIATION (%)	SEPARATION DISTANCE	TESTED DATE
MSL2450	12.80 (1g)	13.10	2.34	10mm	Mar. 18, 2009
TESTED BY	Sam Onn				

NOTE: Please see Appendix for the photo of system validation test.

6.4 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	3.28	Normal	1	1	1	3.28	3.28	∞
Axial Isotropy	4.70	Rectangular	$\sqrt{3}$	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.60	Rectangular	$\sqrt{3}$	0.7	0.7	3.88	3.88	∞
Boundary effects	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.70	Rectangular	$\sqrt{3}$	1	1	2.71	2.71	∞
System Detection Limits	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	0.30	Normal	1	1	1	0.30	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	1	0.46	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1	1.50	1.50	∞
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	∞
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe Positioner	0.40	Rectangular	$\sqrt{3}$	1	1	0.23	0.23	∞
Probe Positioning	2.90	Rectangular	$\sqrt{3}$	1	1	1.67	1.67	∞
Max. SAR Eval.	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Dipole Related								
Dipole Axis to Liquid Distance	2.00	Rectangular	$\sqrt{3}$	1	1	1.15	1.15	145
Input Power Drift	5.00	Rectangular	$\sqrt{3}$	1	1	2.89	2.89	∞
Phantom and Tissue parameters								
Phantom Uncertainty	4.00	Rectangular	$\sqrt{3}$	1	1	2.31	2.31	∞
Liquid Conductivity (target)	5.00	Rectangular	$\sqrt{3}$	0.64	0.43	1.85	1.24	∞
Liquid Conductivity (measurement)	2.28	Normal	1	0.64	0.43	1.46	0.98	∞
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	2.91	Normal	1	0.6	0.49	1.75	1.43	∞
Combined Standard Uncertainty						8.70	8.41	
Coverage Factor for 95%						Kp=2		
Expanded Uncertainty (K=2)						17.41	16.82	

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

7. MEASUREMENT SAR PROCEDURE UNCERTAINTIES

The assessment of spatial peak SAR of the hand handheld devices is according to IEEE 1528 / EN 62209-1. All testing situation shall be met below these requirements.

- The system is used by an experienced engineer who follows the manual and the guidelines taught during the training provided by SPEAG.

- The probe has been calibrated within the requested period and the stated uncertainty for the relevant frequency bands does not exceed 4.8% (k=1).

- The validation dipole has been calibrated within the requested period and the system performance check has been successful.

- The DAE unit has been calibrated within the within the requested period.

- The minimum distance between the probe sensor and inner phantom shell is selected to be between 4 and 5mm.

- The operational mode of the DUT is CW, CDMA, FDMA or TDMA (GSM, DCS, PCS, IS136 and PDC) and the measurement/integration time per point is >500 ms.

- The dielectric parameters of the liquid have been assessed using Agilent 85070D dielectric probe kit or a more accurate method.

- The dielectric parameters are within 5% of the target values.

- The DUT has been positioned as described in section 3.

7.1. PROBE CALIBRATION UNCERTAINTY

SPEAG conducts the probe calibration in compliance with international and national standards (e.g. IEEE 1528, EN 62209-1, IEC 62209, etc.) under ISO17025. The uncertainties are stated on the calibration certificate. For the most relevant frequency bands, these values do not exceed 4.8% (k=1). If evaluations of other bands are performed for which the uncertainty exceeds these values, the uncertainty tables given in the summary have to be revised accordingly.

7.2. ISOTROPY UNCERTAINTY

The axial isotropy tolerance accounts for probe rotation around its axis while the hemispherical isotropy error includes all probe orientations and field polarizations. These parameters are assessed by SPEAG during initial calibration. In 2001, SPEAG further tightened its quality controls and warrants that the maximal deviation from axial isotropy is ±0.20dB, while the maximum deviation of hemispherical isotropy is ±0.40dB, corresponding to ±4.7% and ±9.6%, respectively. A weighting factor of cp equal to 0.5 can be applied, since the axis of the probe deviates less than 30 degrees from the normal surface orientation.

7.3. BOUNDARY EFFECT UNCERTAINTY

The effect can be estimated according to the following error approximation formula

$$SAR_{tolerance}[\%] = SAR_{be}[\%] \times \frac{(d_{be} + d_{step})^2}{2d_{step}} \frac{e^{-\frac{d_{be}}{d/2}}}{d/2}$$

$$d_{be} + d_{step} < 10mm$$

The parameter d_{be} is the distance in mm between the surface and the closest measurement point used in the averaging process; d_{step} is the separation distance in mm between the first and second measurement points; δ is the minimum penetration depth in mm within the head tissue equivalent liquids (i.e., δ= 13.95mm at 3GHz); SAR_{be} is the deviation between the measured SAR value at the distance d_{be} from the boundary and the wave-guide analytical value SAR_{ref}.DASY4 applies a boundary effect compensation algorithm according to IEEE 1528, which is possible since the axis of the probe never deviates more than 30 degrees from the normal surface orientation. $SAR_{be}[\%]$ is assessed during the calibration process and SPEAG warrants that the uncertainty at distances larger than 4mm is always less than 1%.In summary, the worst case boundary effect SAR tolerance[%] for scanning distances larger than 4mm is < ± 0.8%.

7.4. PROBE LINEARITY UNCERTAINTY

Field probe linearity uncertainty includes errors from the assessment and compensation of the diode compression effects for CW and pulsed signals with known duty cycles. This error is assessed using the procedure described in IEEE 1528 / EN 62209-1. For SPEAG field probes, the measured difference between CW and pulsed signals, with pulse frequencies between 10Hz and 1kHz and duty cycles between 1 and 100, is < ±0.20dB (< ±4.7%).

7.5. READOUT ELECTRONICS UNCERTAINTY

All uncertainties related to the probe readout electronics (DAE unit), including the gain and linearity of the instrumentation amplifier, its loading effect on the probe, and accuracy of the signal conversion algorithm, have been assessed accordingly to IEEE 1528 / EN 62209-1.The combination (root-sum-square RSS method) of these components results in an overall maximum error of ±1.0%.

7.6. RESPONSE TIME UNCERTAINTY

The time response of the field probes is assessed by exposing the probe to a well-controlled electric field producing SAR larger than 2.0W/kg at the tissue medium surface. The signal response time is evaluated as the time required by the system to reach 90% of the expected final value after an on/of switch of the power source. Analytically, it can be expressed as:

$$SAR_{tolerance}[\%] = 100 \times (\frac{T_m}{T_m + te^{-T_m/t} - t} - 1)$$

where Tm is 500 ms, i.e., the time between measurement samples, and $_T$ the time constant. The response time $_T$ of SPEAG's probes is <5ms. In the current implementation, DASY4 waits longer than 100 ms after having reached the grid point before starting a measurement, i.e., the response time uncertainty is negligible.

7.7. INTEGRATION TIME UNCERTAINTY

If the device under test does not emit a CW signal, the integration time applied to measure the electric field at a specific point may introduce additional uncertainties due to the discretization and can be assessed as follows

$$SAR_{tolerance}[\%] = 100 \times \sum_{allsub-frames} \frac{t_{frame}}{t_{int\,egration}} \frac{slot_{idle}}{slot_{total}}$$

The tolerances for the different systems are given in Table 7.1, whereby the worst-case SAR$_{tolerance}$ is 2.6%.

System	SAR$_{tolerance}$ %
CW	0
CDMA*	0
WCDMA*	0
FDMA	0
IS-136	2.6
PDC	2.6
GSM/DCS/PCS	1.7
DECT	1.9
Worst-Case	2.6

TABLE 7.1

7.8. PROBE POSITIONER MECHANICAL TOLERANCE

The mechanical tolerance of the field probe positioner can introduce probe positioning uncertainties. The resulting SAR uncertainty is assessed by comparing the SAR obtained according to the specifications of the probe positioner with respect to the actual position defined by the geometric enter of the probe sensors. The tolerance is determined as:

$$SAR_{tolerance}[\%] = 100 \times \frac{d_{ph}}{d/2}$$

The specified repeatability of the RX robot family used in DASY4 systems is ±25μm. The absolute accuracy for short distance movements is better than ±0.1mm, i.e., the $SAR_{tolerance}[\%]$ is better than 1.5% (rectangular).

7.9. PROBE POSITIONING

The probe positioning procedures affect the tolerance of the separation distance between the probe tip and the phantom surface as:

$$SAR_{tolerance}[\%] = 100 \times \frac{d_{ph}}{d/2}$$

where d_{ph} is the maximum deviation of the distance between the probe tip and the phantom surface. The optical surface detection has a precision of better than 0.2mm, resulting in an $SAR_{tolerance}[\%]$ of <2.9% (rectangular distribution). Since the mechanical detection provides better accuracy, 2.9% is a worst-case figure for DASY4 system.

7.10. PHANTOM UNCERTAINTY

The SAR measurement uncertainty due to SPEAG phantom shell production tolerances has been evaluated using

$$SAR_{tolerance}[\%] \cong 100 \times \frac{2d}{a}, \qquad d << a$$

For a maximum deviation d of the inner and outer shell of the phantom from that specified in the CAD file of ±0.2mm, and a 10mm spacing a between source and tissue liquid, the calculated phantom uncertainty is ±4.0%.

7.11. DASY4 UNCERTAINTY BUDGET

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C$_i$)		Standard Uncertainty (±%)		(v$_i$)
				(1g)	(10g)	(1g)	(10g)	
Measurement System								
Probe Calibration	3.28	Normal	1	1	1	3.28	3.28	∞
Axial Isotropy	4.70	Rectangular	$\sqrt{3}$	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.60	Rectangular	$\sqrt{3}$	0.7	0.7	3.88	3.88	∞
Boundary effects	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Linearity	4.70	Rectangular	$\sqrt{3}$	1	1	2.71	2.71	∞
System Detection Limits	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Readout Electronics	0.30	Normal	1	1	1	0.30	0.30	∞
Response Time	0.80	Rectangular	$\sqrt{3}$	1	1	0.46	0.46	∞
Integration Time	2.60	Rectangular	$\sqrt{3}$	1	1	1.50	1.50	∞
RF Ambient Noise	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	∞
RF Ambient Reflections	3.00	Rectangular	$\sqrt{3}$	1	1	1.73	1.73	∞
Probe Positioner	0.40	Rectangular	$\sqrt{3}$	1	1	0.23	0.23	∞
Probe Positioning	2.90	Rectangular	$\sqrt{3}$	1	1	1.67	1.67	∞
Max. SAR Eval.	1.00	Rectangular	$\sqrt{3}$	1	1	0.58	0.58	∞
Dipole Related								
Device Positioning	0.69	Normal	1	1	1	0.69	0.69	10
Device Holder	3.60	Normal	1	1	1	3.60	3.60	5
Power Drift	5.00	Rectangular	$\sqrt{3}$	1	1	2.89	2.89	∞
Phantom and Tissue parameters								
Phantom Uncertainty	4.00	Rectangular	$\sqrt{3}$	1	1	2.31	2.31	∞
Liquid Conductivity (target)	5.00	Rectangular	$\sqrt{3}$	0.64	0.43	1.85	1.24	∞
Liquid Conductivity (measurement)	2.28	Normal	1	0.64	0.43	1.46	0.98	∞
Liquid Permittivity (target)	5.00	Rectangular	$\sqrt{3}$	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	2.91	Normal	1	0.6	0.49	1.75	1.43	∞
Combined Standard Uncertainty						**9.37**	**9.10**	
Coverage Factor for 95%						**Kp=2**		
Expanded Uncertainty (K=2)						**18.75**	**18.20**	

TABLE 7.2

The table 7.2: Worst-Case uncertainty budget for DASY4 assessed according to IEEE 1528. The budget is valid for the frequency range 300MHz ~ 3GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

8. 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 by the following approval agencies according to ISO/IEC 17025.

USA	FCC, NVLAP
GERMANY	TUV Rheinland
JAPAN	VCCI
NORWAY	NEMKO
CANADA	INDUSTRY CANADA, CSA
R.O.C.	TAF, BSMI, NCC
NETHERLANDS	Telefication
SINGAPORE	GOST-ASIA (MOU)
RUSSIA	CERTIS (MOU)

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

MSL 2450MHz D=154mm

Test Laboratory: Bureau Veritas ADT

M01-11b-Ch1

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2412 MHz; σ = 1.89 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)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Low Channel 1/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.762 mW/g

Low Channel 1/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,
dz=5mm
Reference Value = 7.25 V/m
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.680 mW/g; SAR(10 g) = 0.326 mW/g
Maximum value of SAR (measured) = 0.844 mW/g
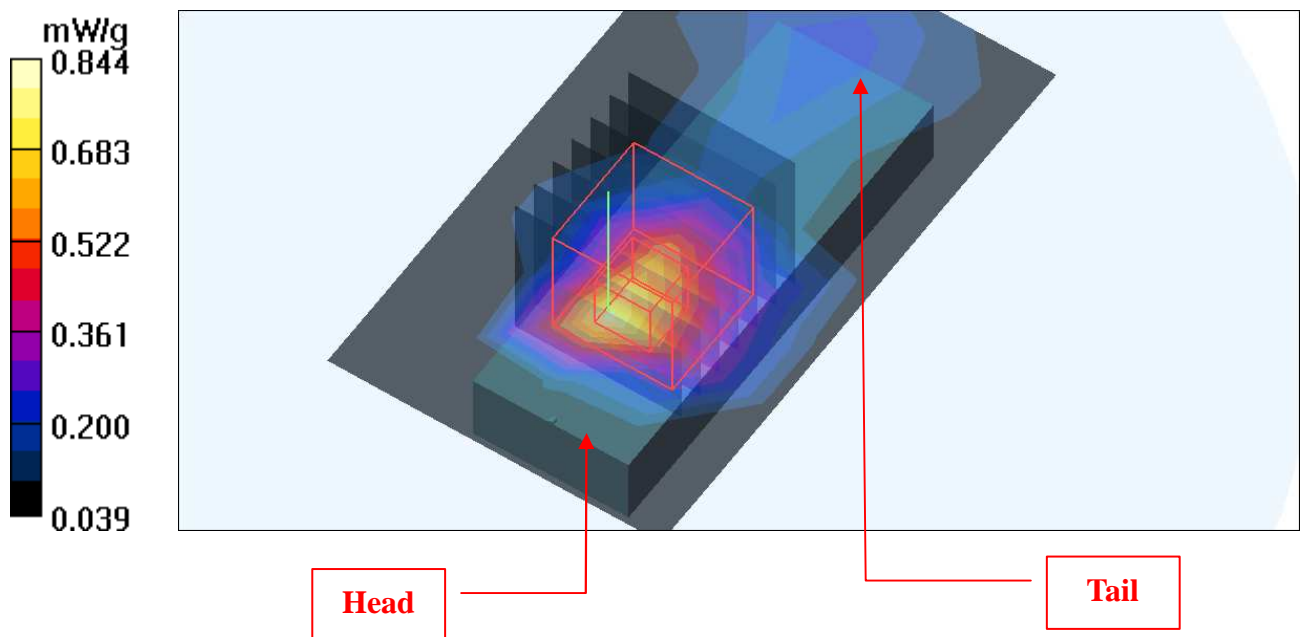
Test Laboratory: Bureau Veritas ADT

M01-11b-Ch6

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11b ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.02 mW/g

Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,
dz=5mm
Reference Value = 8.22 V/m
Peak SAR (extrapolated) = 1.75 W/kg
SAR(1 g) = 0.885 mW/g; SAR(10 g) = 0.417 mW/g
Maximum value of SAR (measured) = 1.12 mW/g
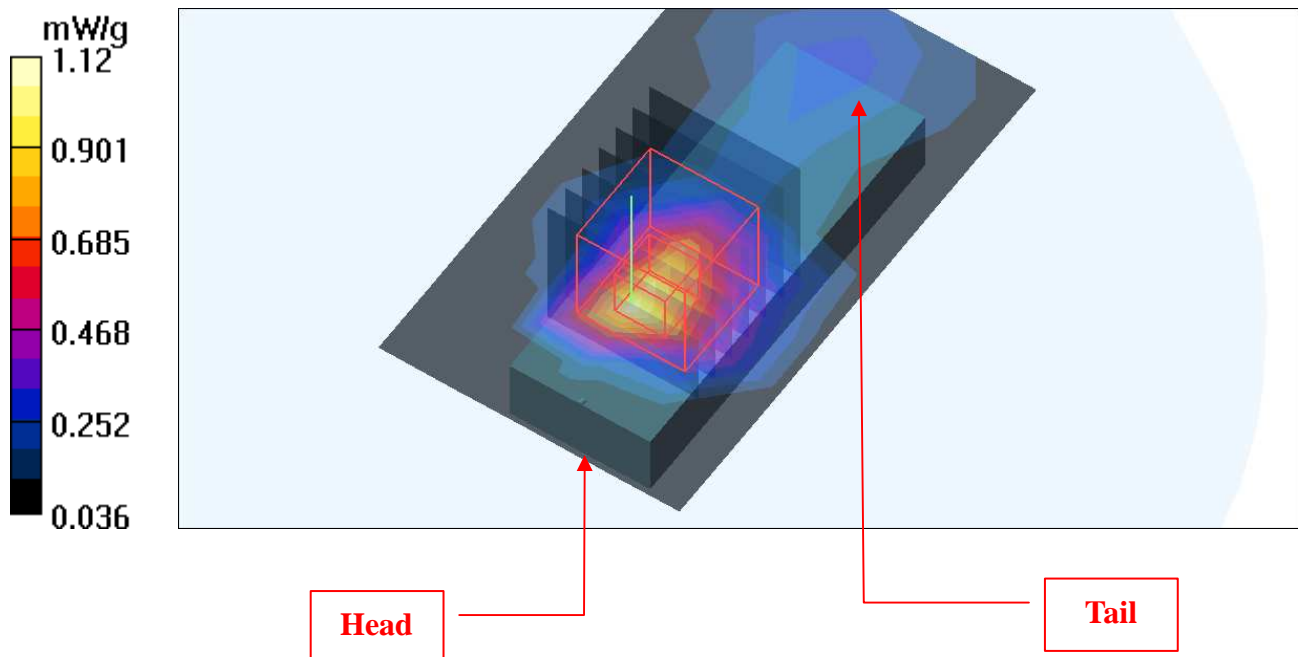
Test Laboratory: Bureau Veritas ADT

M01-11b-Ch11

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11b ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2462 MHz; σ = 1.95 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 11/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.16 mW/g

High Channel 11/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,
dz=5mm
Reference Value = 9.49 V/m
Peak SAR (extrapolated) = 1.95 W/kg
SAR(1 g) = 0.982 mW/g; SAR(10 g) = 0.486 mW/g
Maximum value of SAR (measured) = 1.24 mW/g
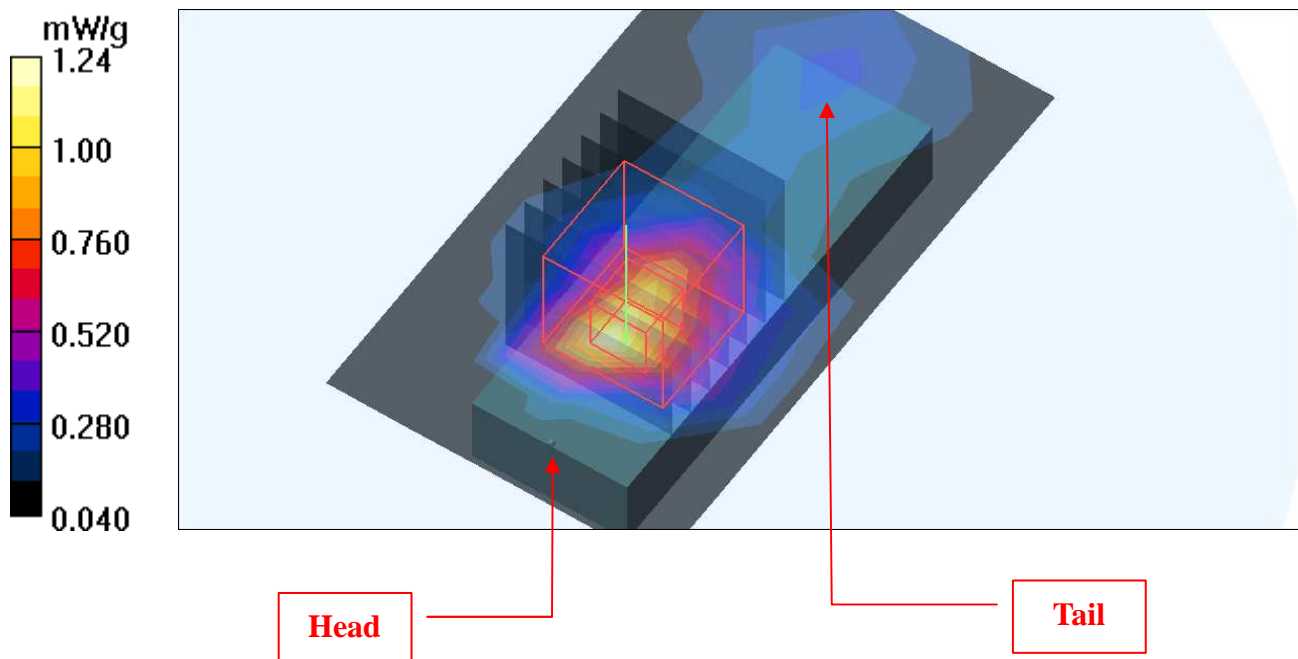
Test Laboratory: Bureau Veritas ADT

M02-11g-Ch1

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11g ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2412 MHz; σ = 1.89 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)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Low Channel 1/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.621 mW/g

Low Channel 1/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.67 V/m
Peak SAR (extrapolated) = 1.06 W/kg
SAR(1 g) = 0.544 mW/g; SAR(10 g) = 0.261 mW/g
Maximum value of SAR (measured) = 0.673 mW/g
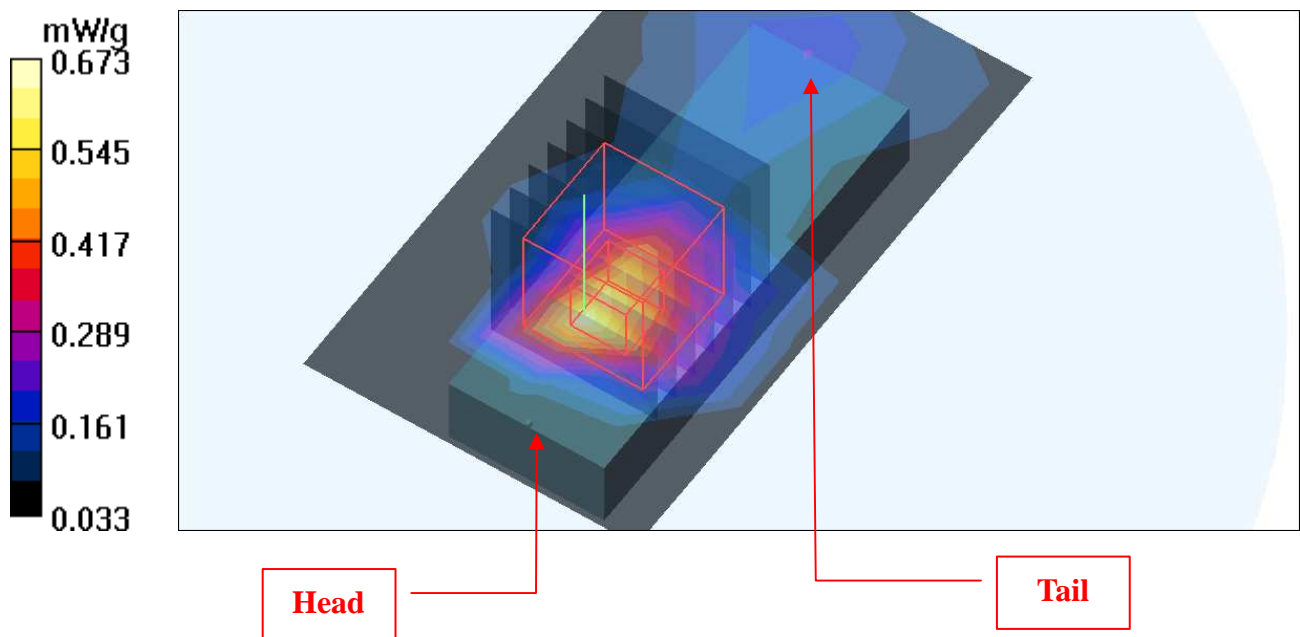
Test Laboratory: Bureau Veritas ADT

M02-11g-Ch6

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11g ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; $ε_r$ = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.21 mW/g

**Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.24 V/m
Peak SAR (extrapolated) = 2.01 W/kg
SAR(1 g) = 1.02 mW/g; SAR(10 g) = 0.497 mW/g
Maximum value of SAR (measured) = 1.31 mW/g
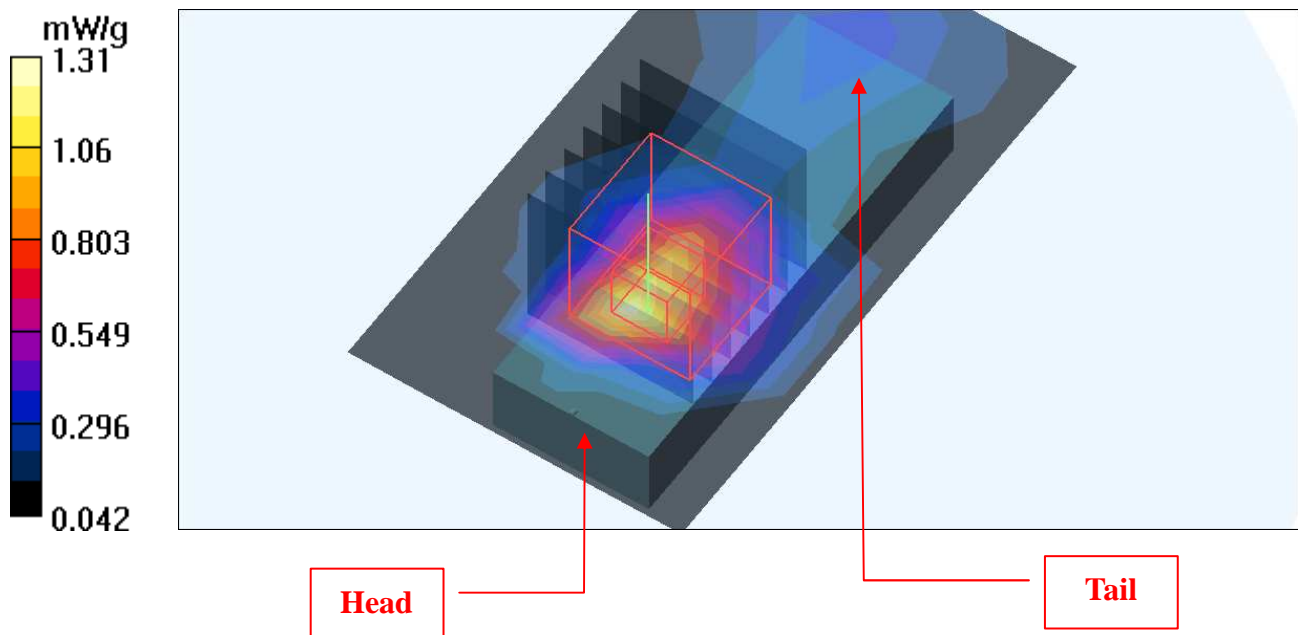
Test Laboratory: Bureau Veritas ADT

M02-11g-Ch11

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11g ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2462 MHz; σ = 1.95 mho/m; $ε_r$ = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 11/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.722 mW/g

**High Channel 11/Zoom Scan (7x7x7) (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.14 V/m
Peak SAR (extrapolated) = 1.19 W/kg
SAR(1 g) = 0.609 mW/g; SAR(10 g) = 0.296 mW/g
Maximum value of SAR (measured) = 0.768 mW/g
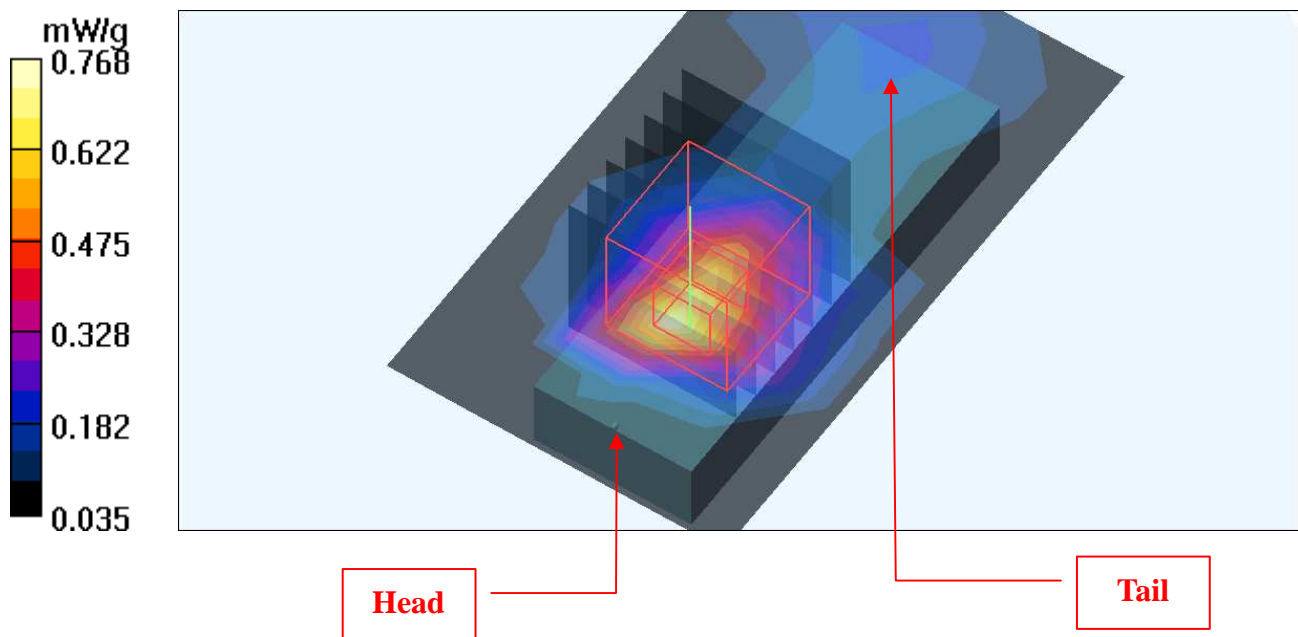
Test Laboratory: Bureau Veritas ADT

M03-11n 20M-Ch1

DUT: Wireless N USB Adapter ; Type: DWA-130

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 = 1.89 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)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Low Channel 1/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.603 mW/g

Low Channel 1/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.19 V/m
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.524 mW/g; SAR(10 g) = 0.254 mW/g
Maximum value of SAR (measured) = 0.648 mW/g

8
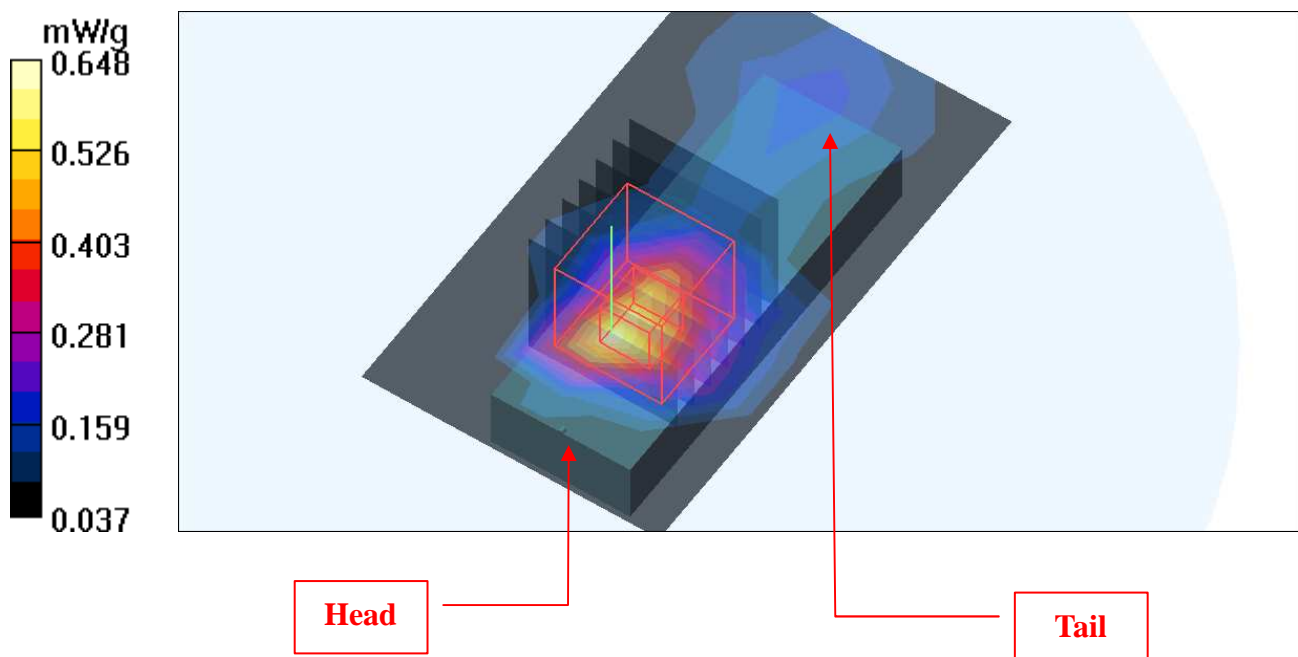
Test Laboratory: Bureau Veritas ADT

M03-11n 20M-Ch6

DUT: Wireless N USB Adapter ; Type: DWA-130

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 = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 1.23 mW/g

Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.02 V/m
Peak SAR (extrapolated) = 2.13 W/kg
SAR(1 g) = 1.07 mW/g; SAR(10 g) = 0.502 mW/g
Maximum value of SAR (measured) = 1.38 mW/g

1g/10g Averaged SAR

SAR; Zoom Scan (7x7x7):Value Along Z, X=3, Y=2
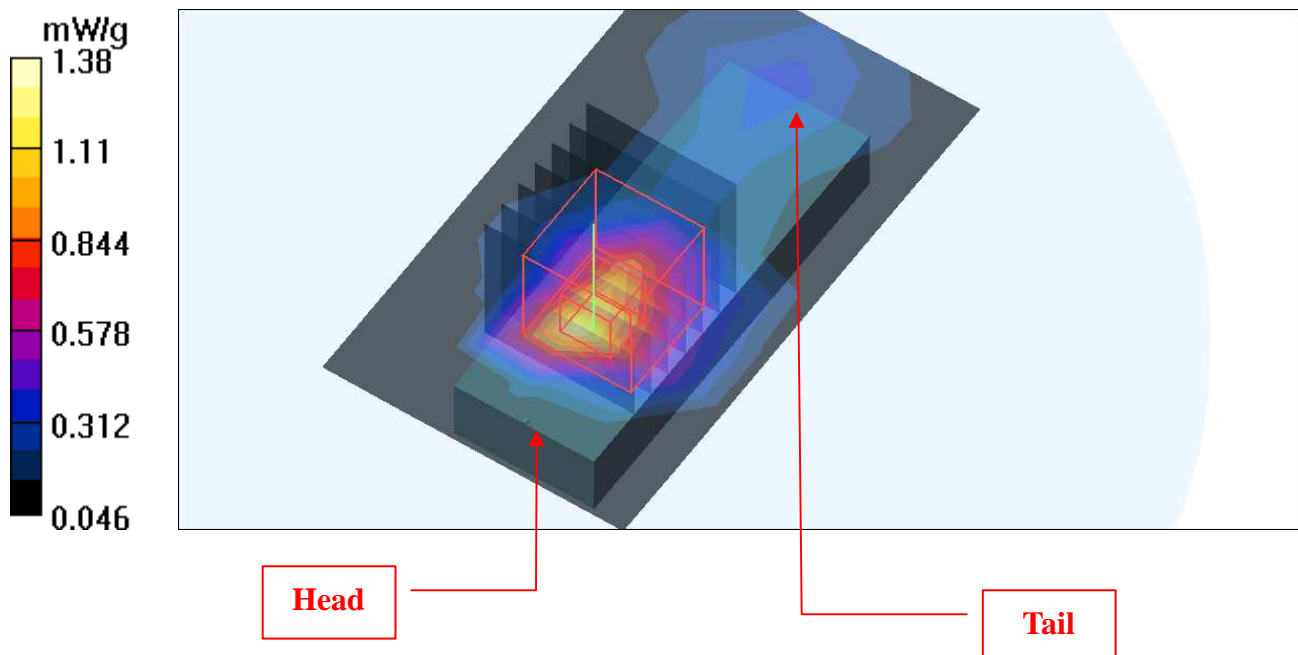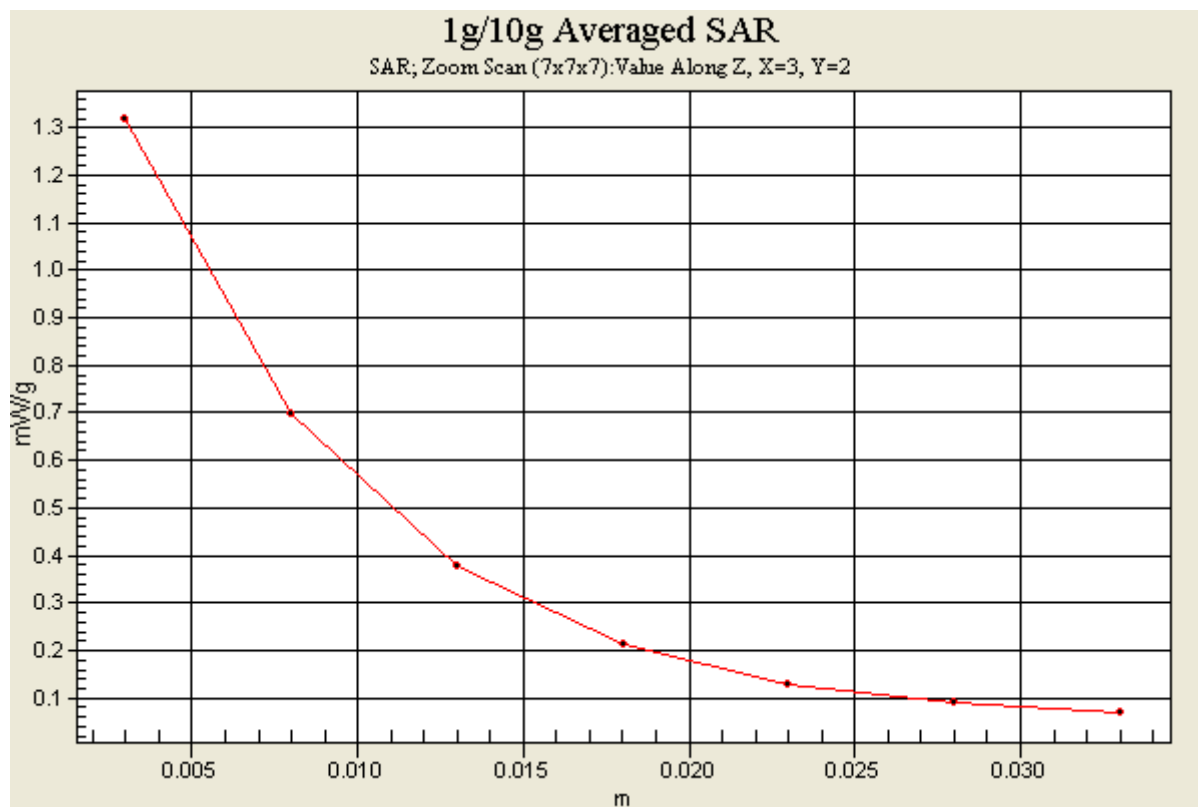
Test Laboratory: Bureau Veritas ADT

M03-11n 20M-Ch11

DUT: Wireless N USB Adapter ; Type: DWA-130

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 = 1.95 mho/m; $ε_r$ = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 11/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.589 mW/g

High Channel 11/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.72 V/m
Peak SAR (extrapolated) = 0.962 W/kg
SAR(1 g) = 0.495 mW/g; SAR(10 g) = 0.241 mW/g
Maximum value of SAR (measured) = 0.627 mW/g
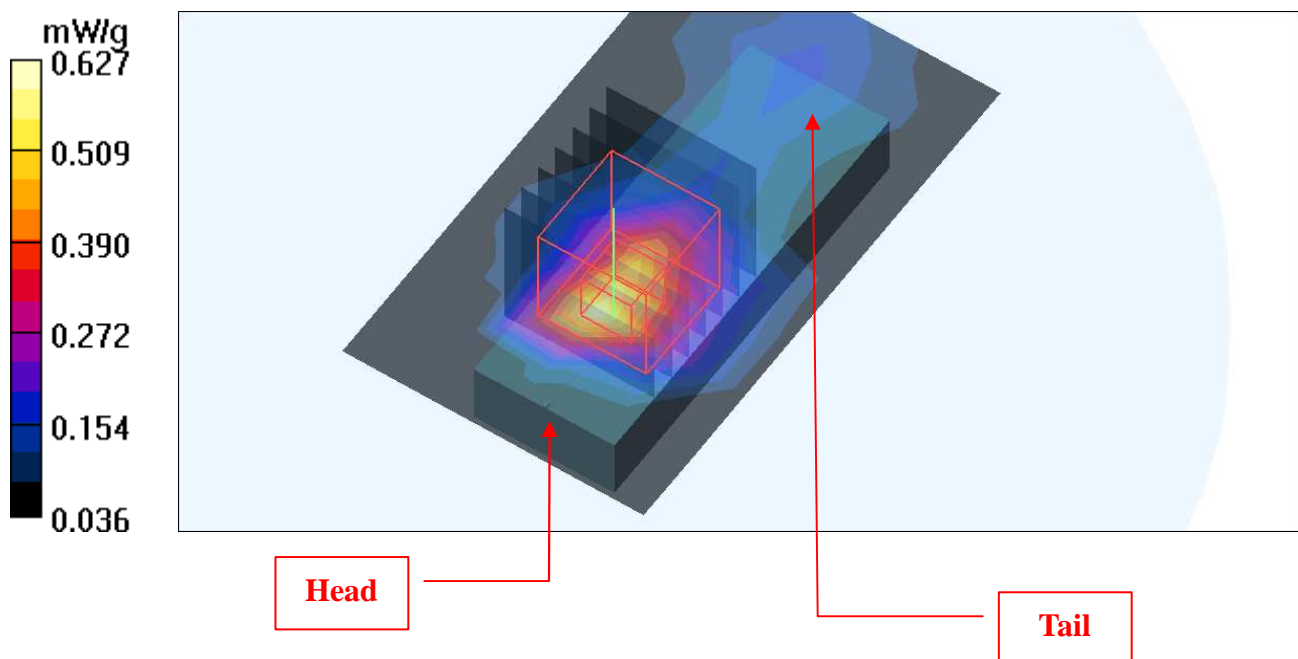
Test Laboratory: Bureau Veritas ADT

M04-11n 40M-Ch4

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11n 40MHz ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 4/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.734 mW/g

Mid Channel 4/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.24 V/m
Peak SAR (extrapolated) = 1.23 W/kg
SAR(1 g) = 0.628 mW/g; SAR(10 g) = 0.297 mW/g
Maximum value of SAR (measured) = 0.789 mW/g
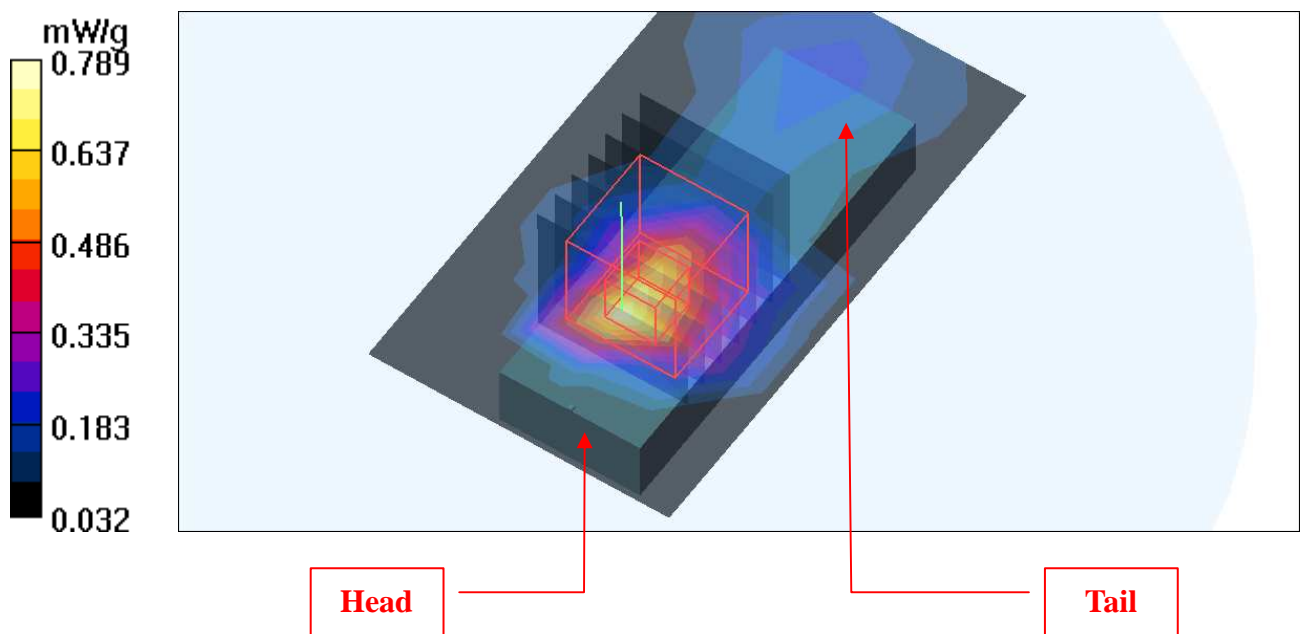
Test Laboratory: Bureau Veritas ADT

M05-11b-Ch11

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11b ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2462 MHz; σ = 1.95 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The edge side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 11/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.577 mW/g

High Channel 11/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.32 V/m
Peak SAR (extrapolated) = 1.37 W/kg
SAR(1 g) = 0.519 mW/g; SAR(10 g) = 0.226 mW/g
Maximum value of SAR (measured) = 0.570 mW/g
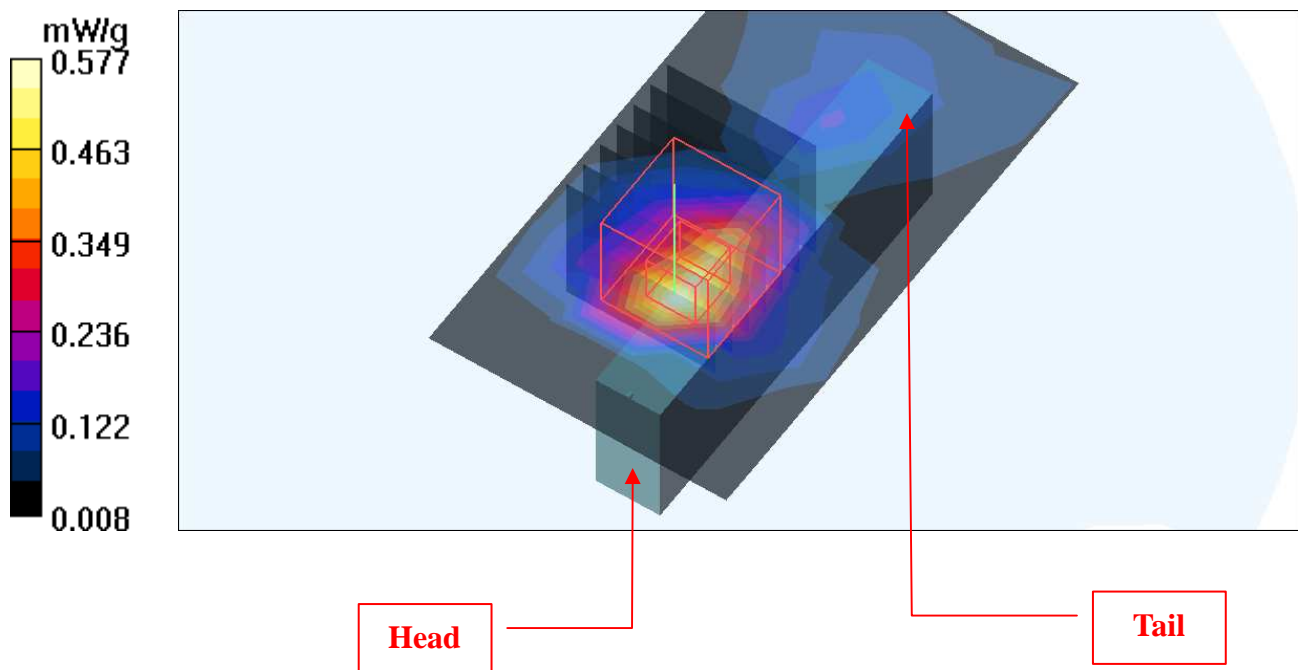
Test Laboratory: Bureau Veritas ADT

M06-11g-Ch6

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11g ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The edge side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.705 mW/g

Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,
dz=5mm
Reference Value = 5.58 V/m
Peak SAR (extrapolated) = 1.81 W/kg
SAR(1 g) = 0.684 mW/g; SAR(10 g) = 0.294 mW/g
Maximum value of SAR (measured) = 0.756 mW/g
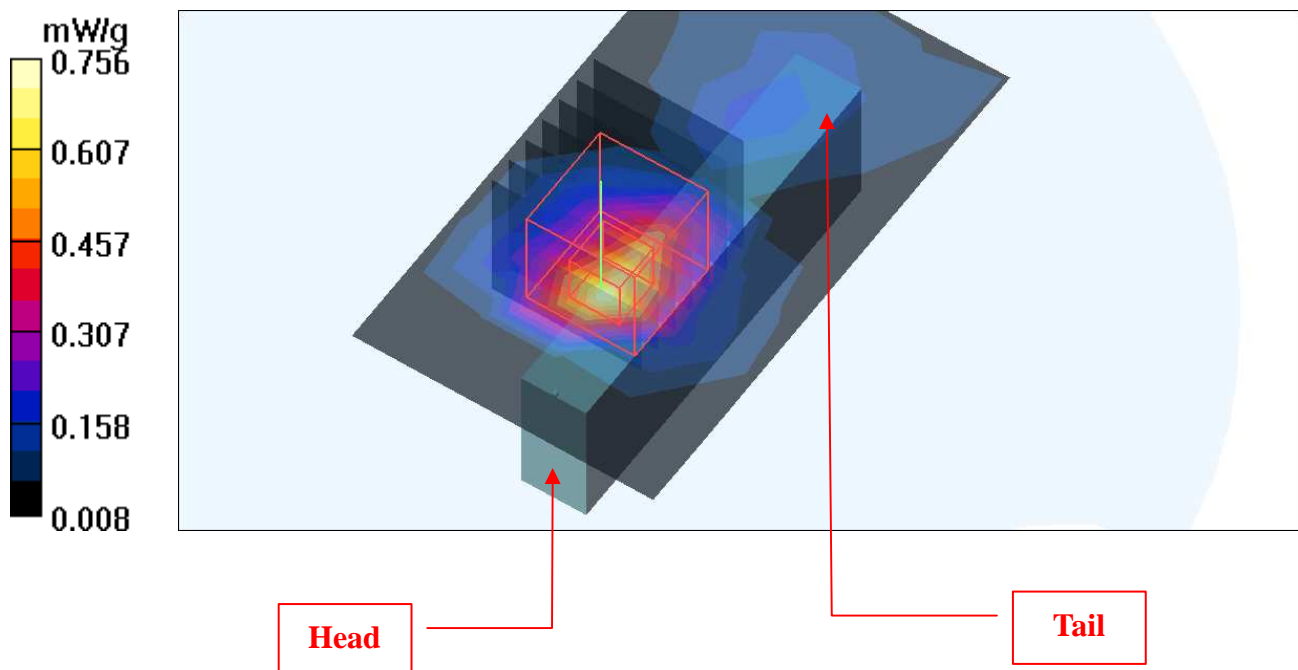
Test Laboratory: Bureau Veritas ADT

M07-11n 20M-Ch6

DUT: Wireless N USB Adapter ; Type: DWA-130

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 = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The edge side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.731 mW/g

Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.73 V/m
Peak SAR (extrapolated) = 1.98 W/kg
SAR(1 g) = 0.739 mW/g; SAR(10 g) = 0.317 mW/g
Maximum value of SAR (measured) = 0.817 mW/g
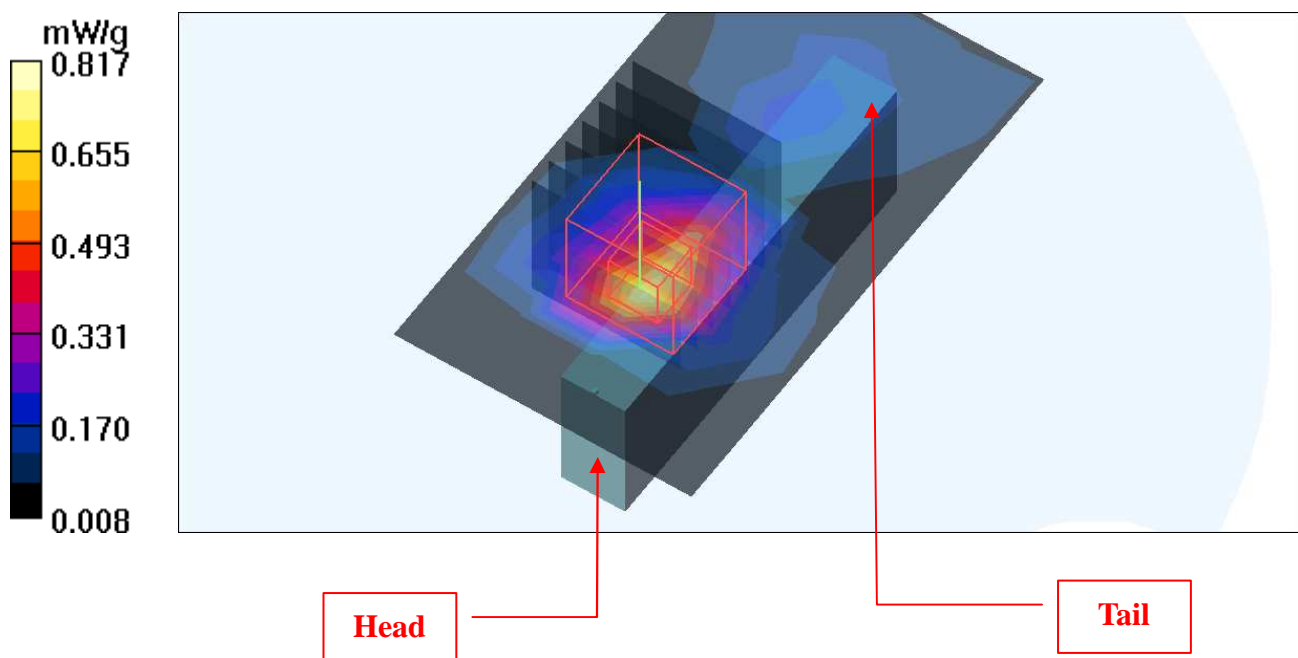
Test Laboratory: Bureau Veritas ADT

M08-11n 40M-Ch4

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11n 40MHz ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The edge side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 4/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.373 mW/g

Mid Channel 4/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.88 V/m
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.378 mW/g; SAR(10 g) = 0.164 mW/g
Maximum value of SAR (measured) = 0.413 mW/g
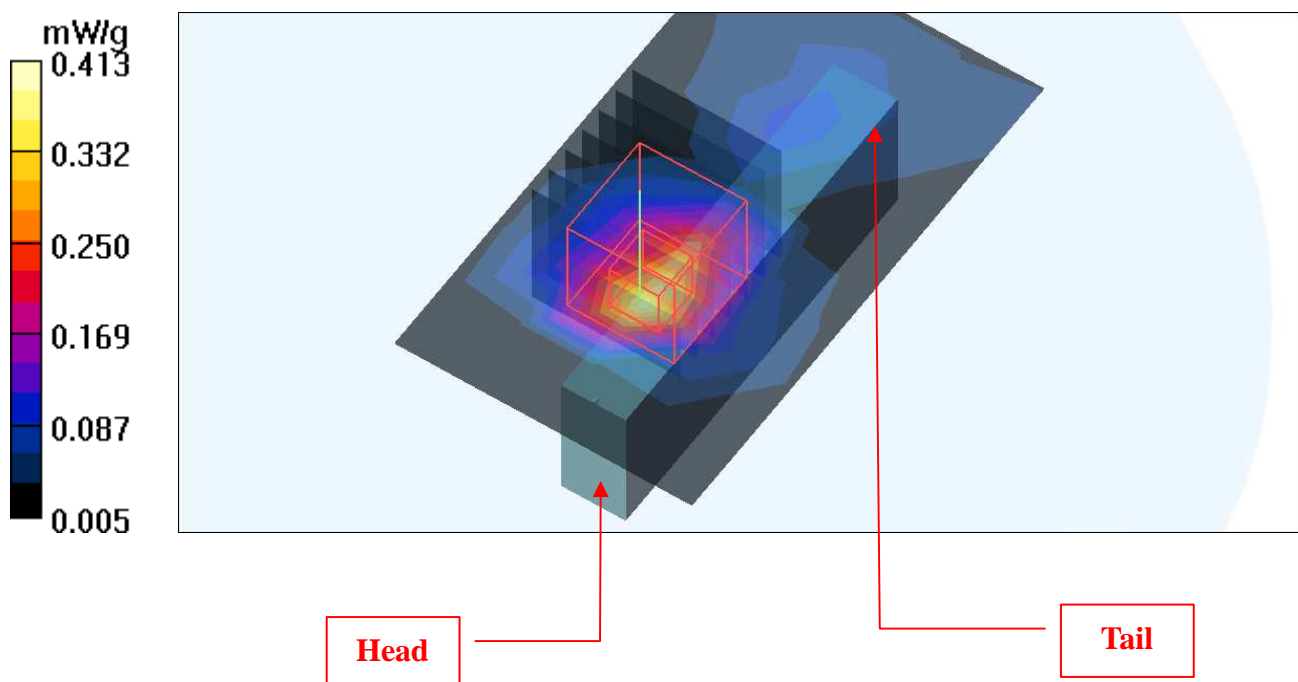
Test Laboratory: Bureau Veritas ADT

M09-11b-Ch11

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11b ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2462 MHz; σ = 1.95 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The front side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 11/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.531 mW/g

High Channel 11/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.85 V/m
Peak SAR (extrapolated) = 0.962 W/kg
SAR(1 g) = 0.495 mW/g; SAR(10 g) = 0.235 mW/g
Maximum value of SAR (measured) = 0.627 mW/g
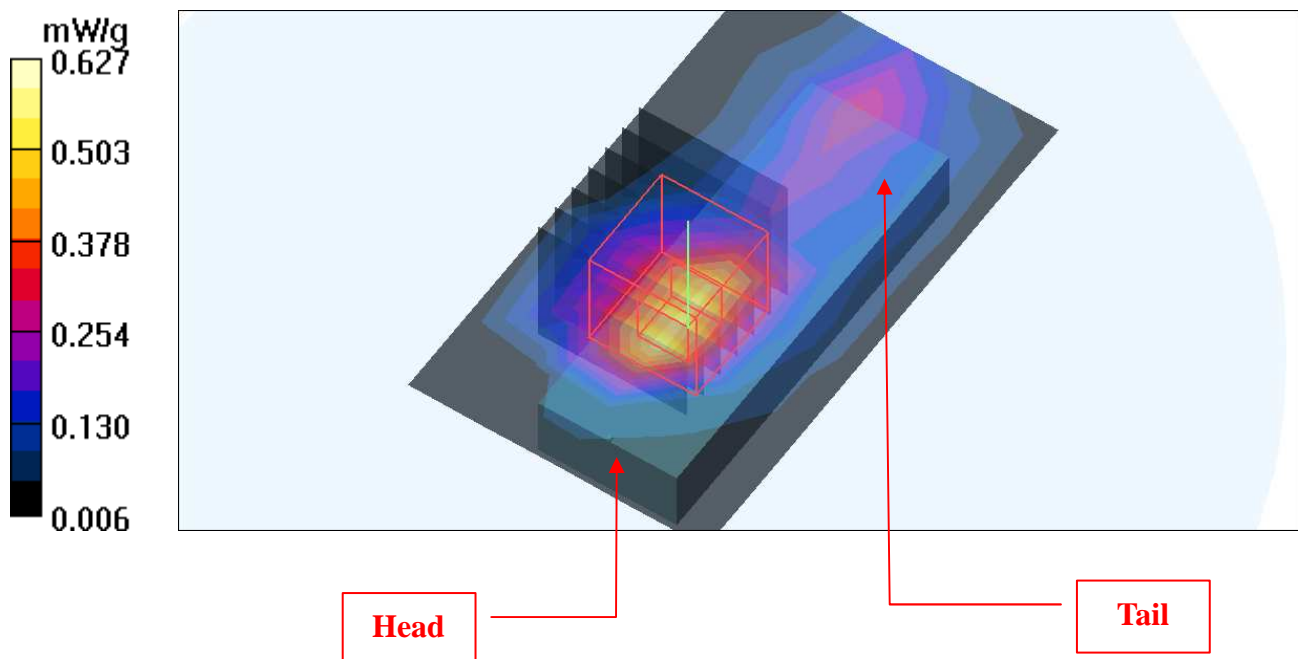
Test Laboratory: Bureau Veritas ADT

M10-11g-Ch6

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11g ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The front side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.714 mW/g

Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.01 V/m
Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.654 mW/g; SAR(10 g) = 0.309 mW/g
Maximum value of SAR (measured) = 0.827 mW/g
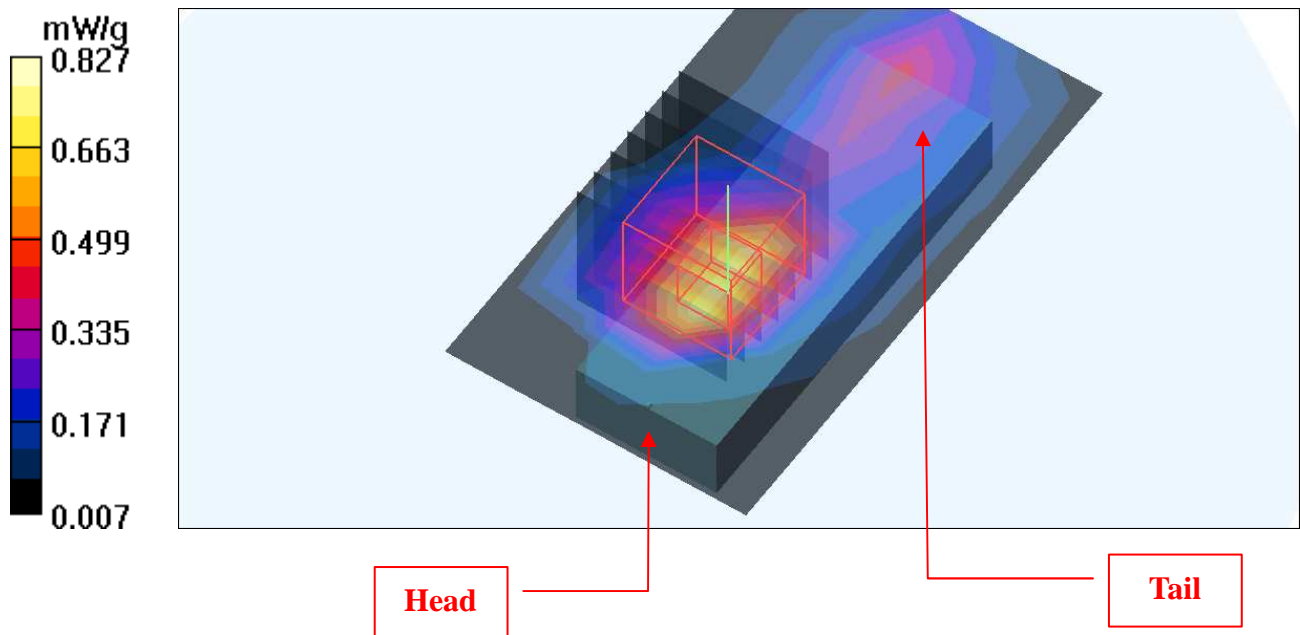
Test Laboratory: Bureau Veritas ADT

M11-11n 20M-Ch6

DUT: Wireless N USB Adapter ; Type: DWA-130

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 = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The front side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.871 mW/g

Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.25 V/m
Peak SAR (extrapolated) = 1.39 W/kg
SAR(1 g) = 0.721 mW/g; SAR(10 g) = 0.342 mW/g
Maximum value of SAR (measured) = 0.918 mW/g
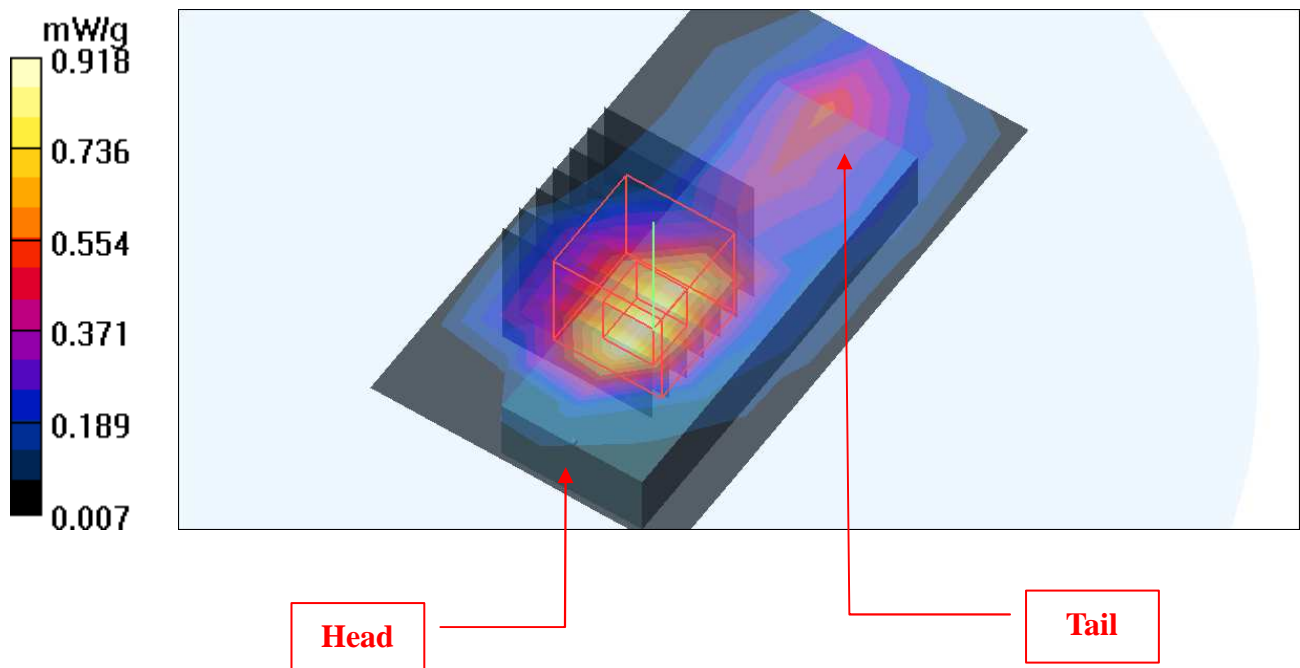
Test Laboratory: Bureau Veritas ADT

M12-11n 40M-Ch4

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11n 40MHz ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; $ε_r$ = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (Thefront side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 4/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.372 mW/g

Mid Channel 4/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.69 V/m
Peak SAR (extrapolated) = 0.695 W/kg
SAR(1 g) = 0.357 mW/g; SAR(10 g) = 0.170 mW/g
Maximum value of SAR (measured) = 0.467 mW/g
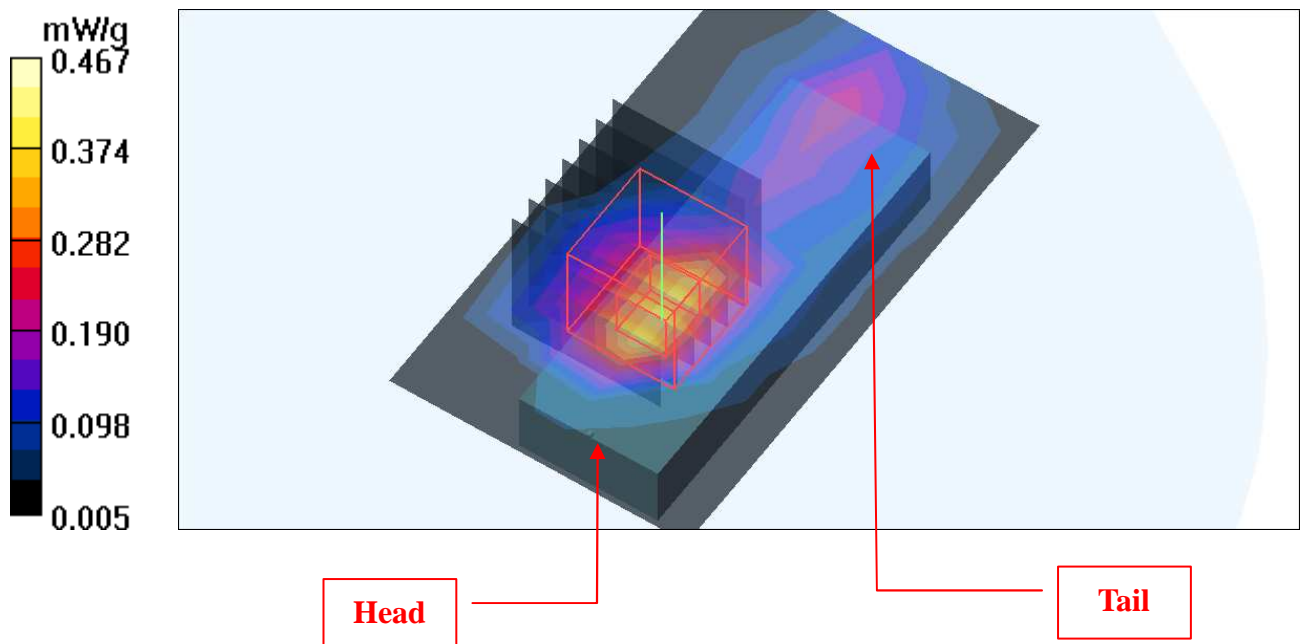
Test Laboratory: Bureau Veritas ADT

M13-11b-Ch11
DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11b ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2462 MHz; σ = 1.95 mho/m; ε_r = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The edge side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 11/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.259 mW/g
High Channel 11/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,
dz=5mm
Reference Value = 8.12 V/m
Peak SAR (extrapolated) = 0.567 W/kg
SAR(1 g) = 0.233 mW/g; SAR(10 g) = 0.120 mW/g
Maximum value of SAR (measured) = 0.249 mW/g
High Channel 11/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm,
dz=5mm
Reference Value = 8.12 V/m
Peak SAR (extrapolated) = 0.534 W/kg
SAR(1 g) = 0.239 mW/g; SAR(10 g) = 0.123 mW/g
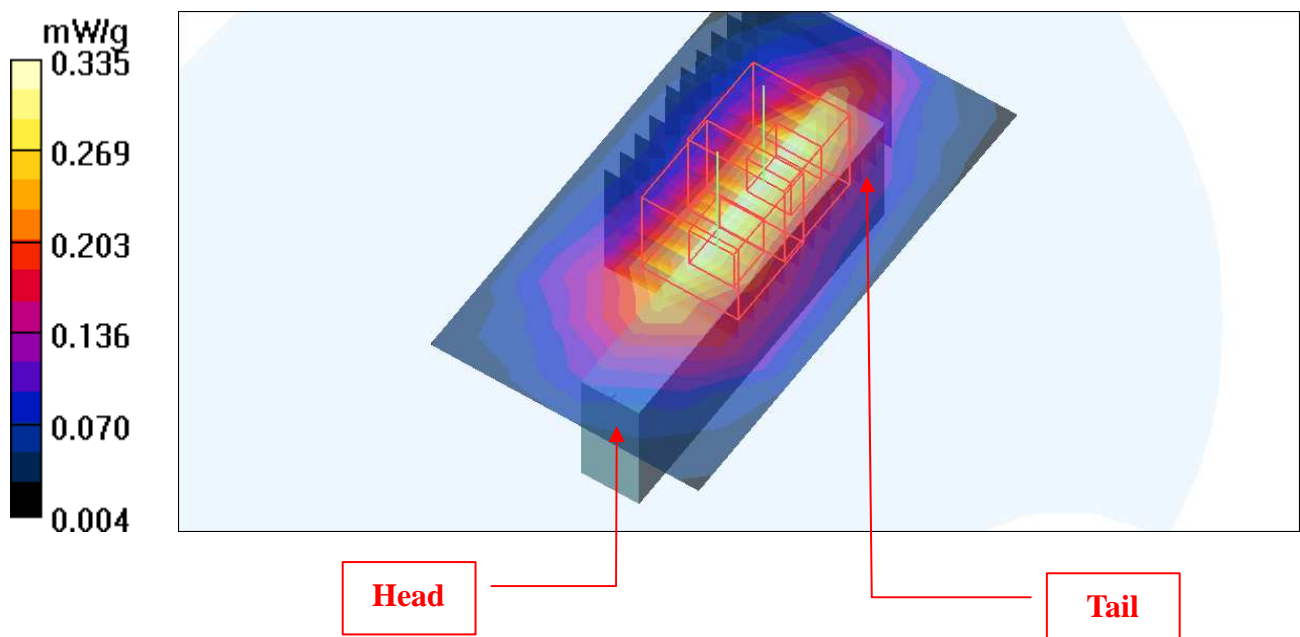Maximum value of SAR (measured) = 0.262 mW/g
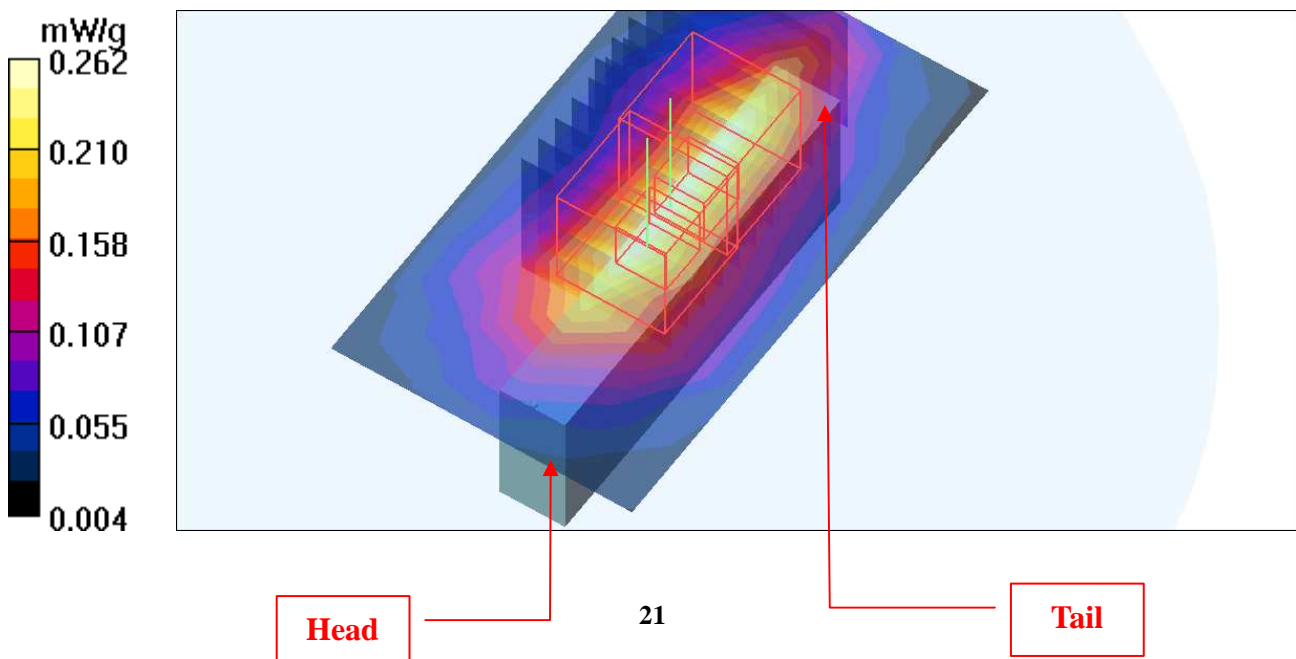
Test Laboratory: Bureau Veritas ADT

M14-11g-Ch6
DUT: Wireless N USB Adapter ; Type: DWA-130
Communication System: 802.11g ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The edge side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.321 mW/g
Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm,
dz=5mm
Reference Value = 8.60 V/m
Peak SAR (extrapolated) = 0.693 W/kg
SAR(1 g) = 0.297 mW/g; SAR(10 g) = 0.154 mW/g
Maximum value of SAR (measured) = 0.318 mW/g
Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm,
dz=5mm
Reference Value = 8.60 V/m
Peak SAR (extrapolated) = 0.698 W/kg
SAR(1 g) = 0.309 mW/g; SAR(10 g) = 0.158 mW/g
Maximum value of SAR (measured) = 0.335 mW/g

Test Laboratory: Bureau Veritas ADT

M15-11n 20M-Ch6
DUT: Wireless N USB Adapter ; Type: DWA-130
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 = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The edge side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.356 mW/g
Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.93 V/m
Peak SAR (extrapolated) = 0.753 W/kg
SAR(1 g) = <mark>0.339</mark> mW/g; SAR(10 g) = 0.172 mW/g
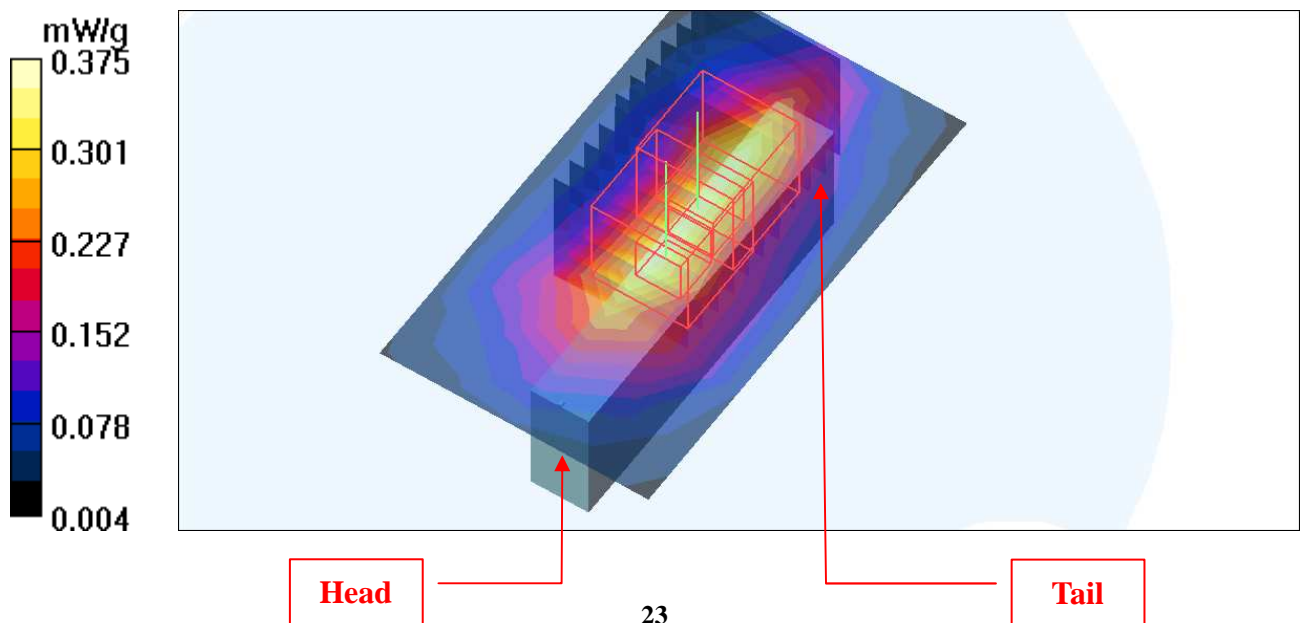Maximum value of SAR (measured) = 0.375 mW/g
Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.93 V/m
Peak SAR (extrapolated) = 0.779 W/kg
SAR(1 g) = 0.331 mW/g; SAR(10 g) = 0.170 mW/g
Maximum value of SAR (measured) = 0.357 mW/g

Test Laboratory: Bureau Veritas ADT

M16-11n 40M-Ch4
DUT: Wireless N USB Adapter ; Type: DWA-130
Communication System: 802.11n 40MHz ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The edge side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 4/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.182 mW/g
Mid Channel 4/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.27 V/m
Peak SAR (extrapolated) = 0.379 W/kg
SAR(1 g) = 0.172 mW/g; SAR(10 g) = 0.090 mW/g
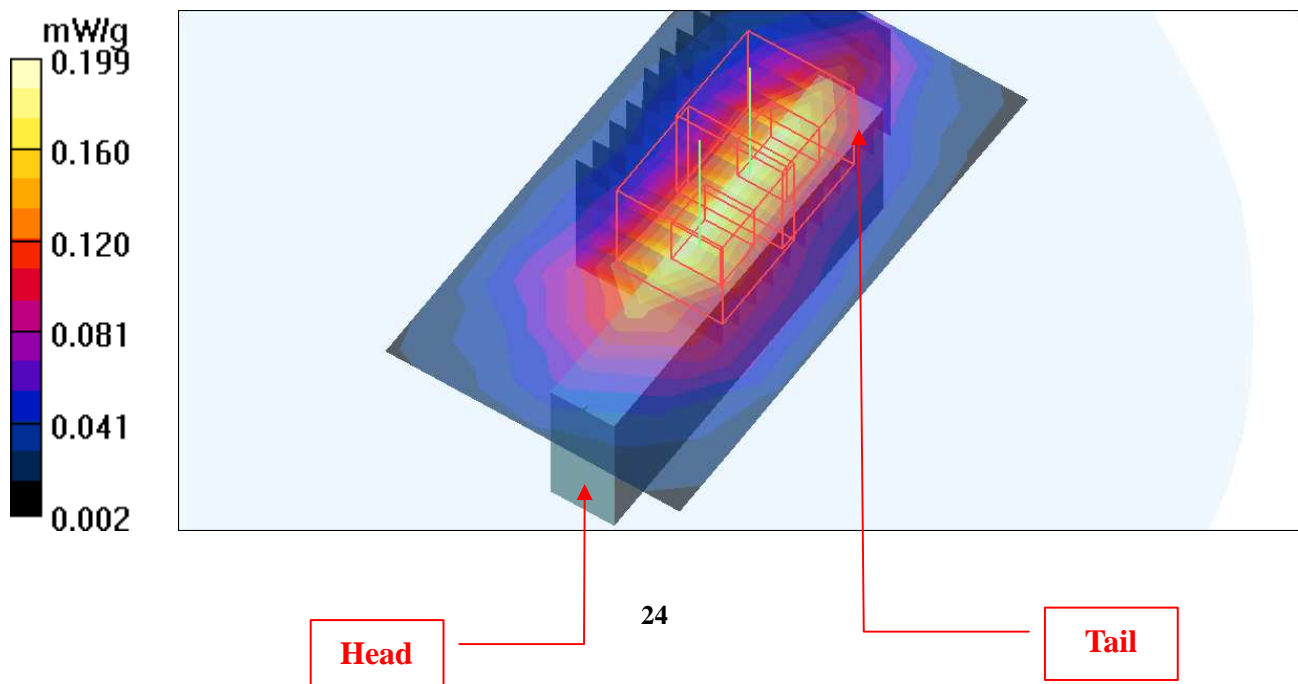Maximum value of SAR (measured) = 0.186 mW/g
Mid Channel 4/Zoom Scan (7x7x7) (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.27 V/m
Peak SAR (extrapolated) = 0.425 W/kg
SAR(1 g) = 0.183 mW/g; SAR(10 g) = 0.093 mW/g
Maximum value of SAR (measured) = 0.199 mW/g

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Test Laboratory: Bureau Veritas ADT

M17-11b-Ch11

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11b ; Frequency: 2462 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: f = 2462 MHz; σ = 1.95 mho/m; $ε_r$ = 53.6; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The tip side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

High Channel 11/Area Scan (5x5x1): Measurement grid: dx=15mm, dy=15mm
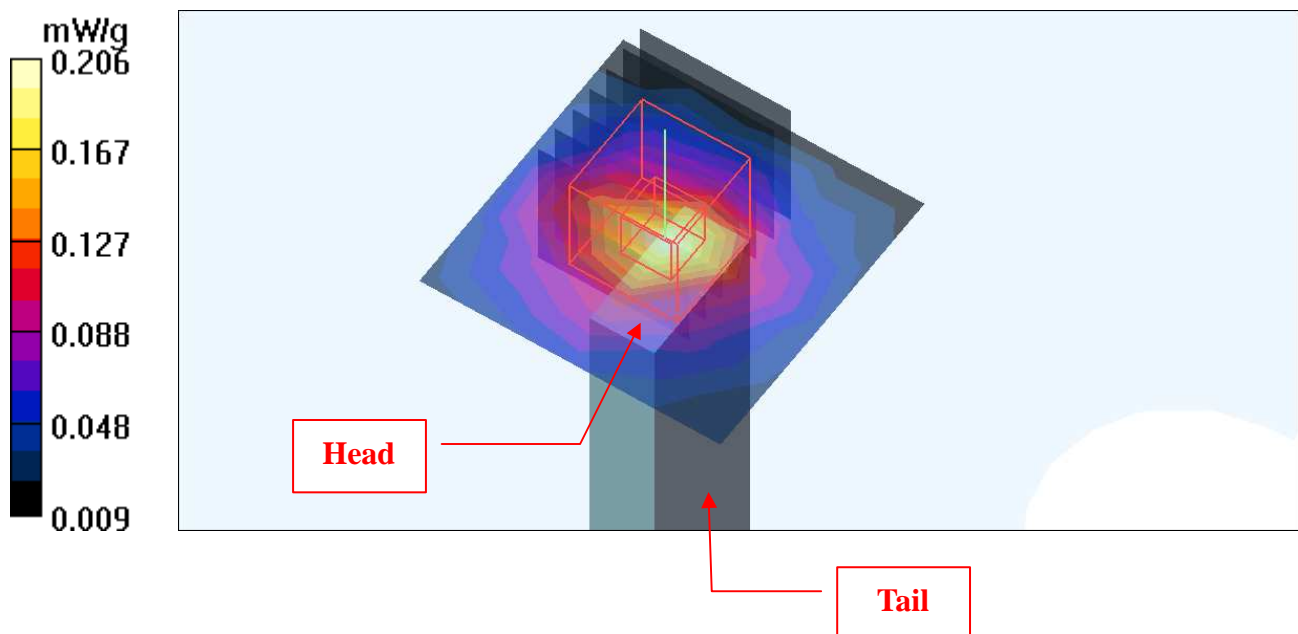Maximum value of SAR (measured) = 0.206 mW/g

High Channel 11/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.4 V/m
Peak SAR (extrapolated) = 0.374 W/kg
SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.084 mW/g
Maximum value of SAR (measured) = 0.180 mW/g

Test Laboratory: Bureau Veritas ADT

M18-11g-Ch6

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11g ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The tip side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x5x1): Measurement grid: dx=15mm, dy=15mm
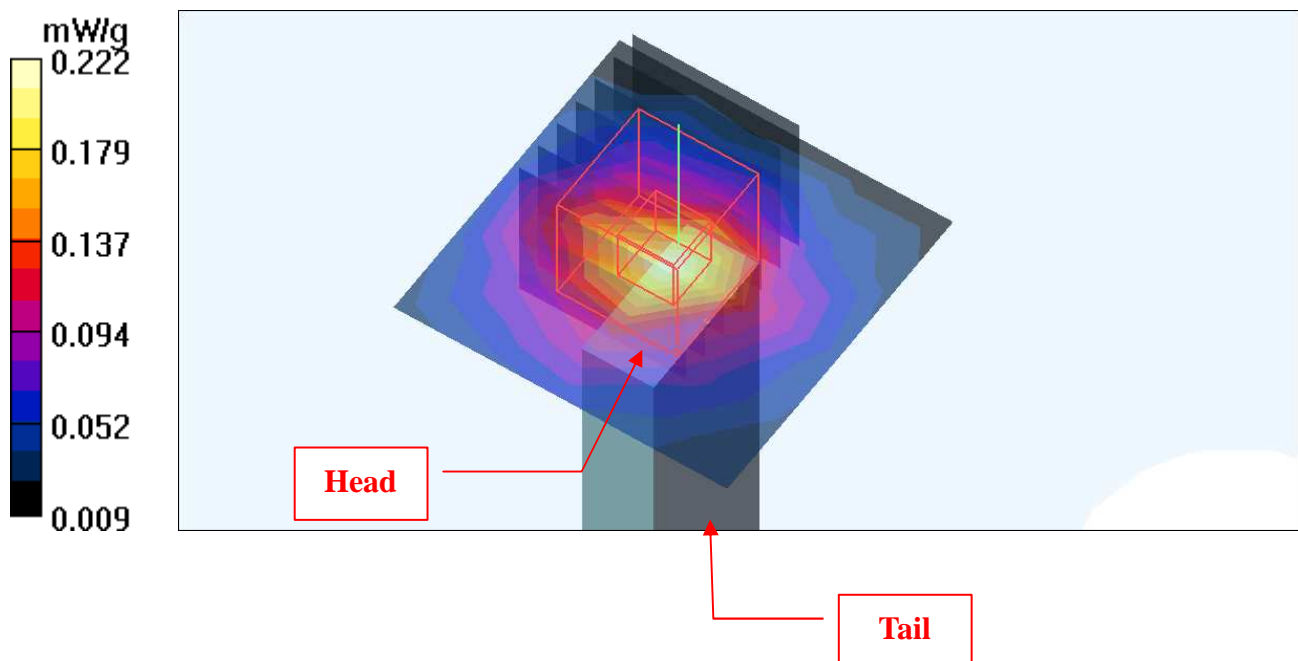Maximum value of SAR (measured) = 0.222 mW/g

Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.4 V/m
Peak SAR (extrapolated) = 0.474 W/kg
SAR(1 g) = 0.206 mW/g; SAR(10 g) = 0.102 mW/g
Maximum value of SAR (measured) = 0.221 mW/g

Test Laboratory: Bureau Veritas ADT

M19-11n 20M-Ch6

DUT: Wireless N USB Adapter ; Type: DWA-130

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 = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The tip side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x5x1): Measurement grid: dx=15mm, dy=15mm
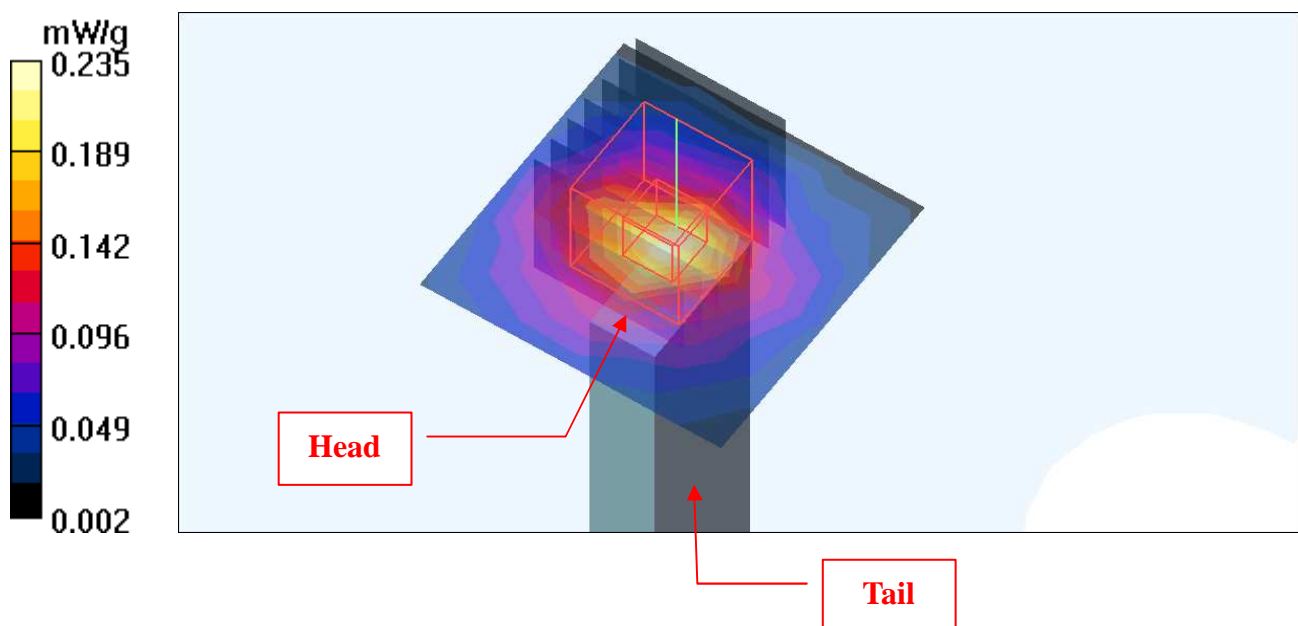Maximum value of SAR (measured) = 0.234 mW/g

Mid Channel 6/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.9 V/m
Peak SAR (extrapolated) = 0.494 W/kg
SAR(1 g) = 0.218 mW/g; SAR(10 g) = 0.108 mW/g
Maximum value of SAR (measured) = 0.235 mW/g

Test Laboratory: Bureau Veritas ADT

M20-11n 40M-Ch4

DUT: Wireless N USB Adapter ; Type: DWA-130

Communication System: 802.11n 40MHz ; Frequency: 2437 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK
Medium: MSL2450 Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The tip side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 4/Area Scan (5x5x1): Measurement grid: dx=15mm, dy=15mm
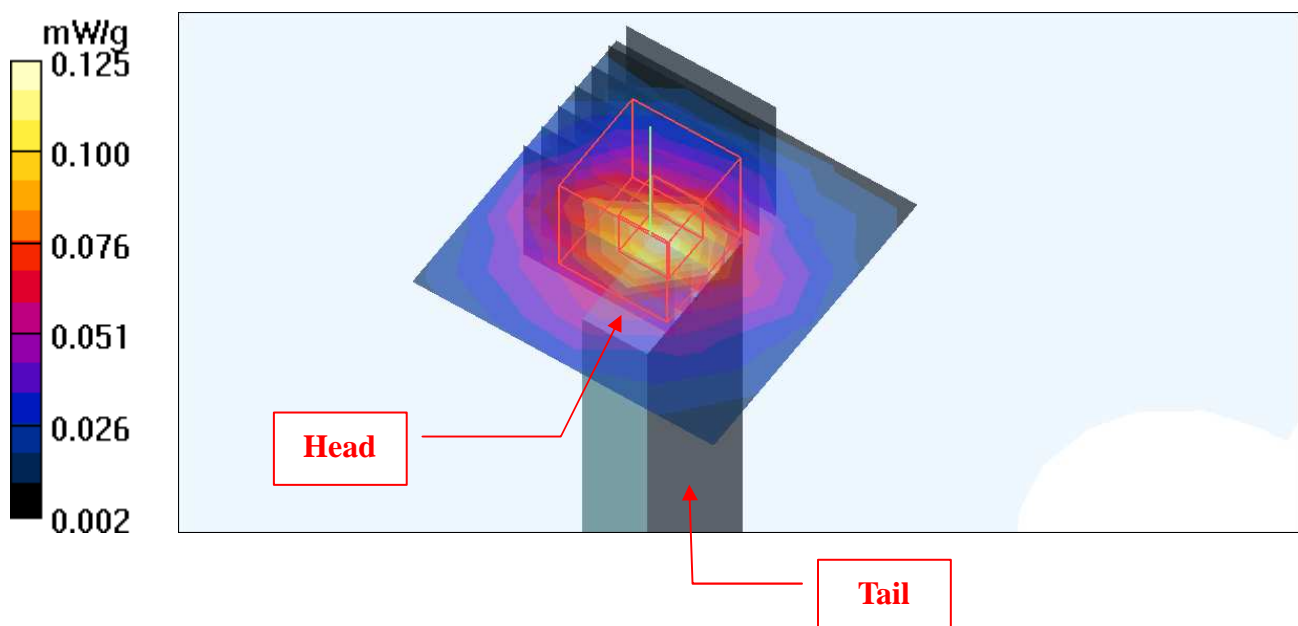Maximum value of SAR (measured) = 0.120 mW/g

Mid Channel 4/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.36 V/m
Peak SAR (extrapolated) = 0.268 W/kg
SAR(1 g) = 0.115 mW/g; SAR(10 g) = 0.057 mW/g
Maximum value of SAR (measured) = 0.125 mW/g

Test Laboratory: Bureau Veritas ADT

Bottom-D630-11n 20M-Ch6 Zoom Step Size Set Minimum

DUT: Wireless N USB Adapter ; Type: DWA-130

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 = 1.92 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Separation distance : 5 mm (The bottom side of the EUT to the Phantom)

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510 ; Calibrated: 2009/1/21
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

Mid Channel 6/Area Scan (5x8x1): Measurement grid: dx=15mm, dy=15mm
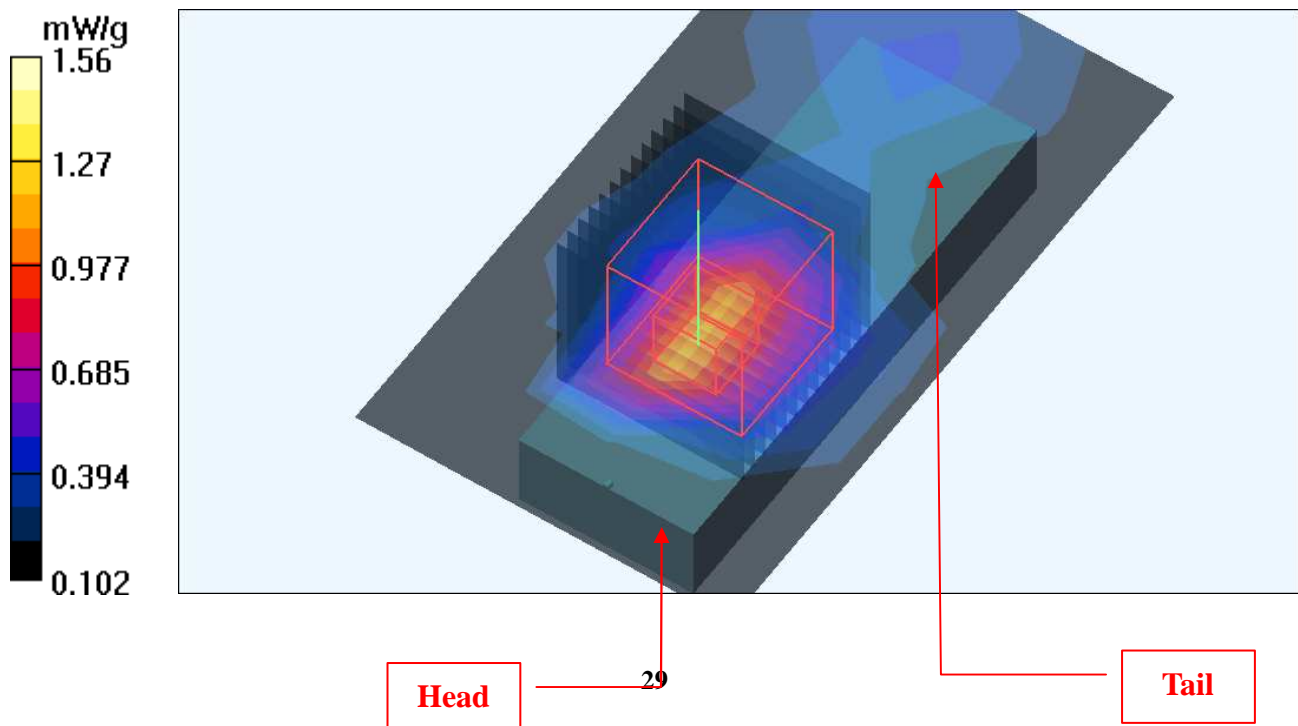Maximum value of SAR (measured) = 1.21 mW/g

Mid Channel 6/Zoom Scan (7x7x7) (13x13x13)/Cube 0: Measurement grid: dx=2.5mm, dy=2.5mm, dz=2.5mm
Reference Value = 9.88 V/m
Peak SAR (extrapolated) = 2.03 W/kg
SAR(1 g) = 1.05 mW/g; SAR(10 g) = 0.524 mW/g
Maximum value of SAR (measured) = 1.56 mW/g

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Test Laboratory: Bureau Veritas ADT

System Validation Check-MSL 2450MHz

DUT: Dipole 2450 MHz ; Type: D2450V2 ; Serial: 737 ; Test Frequency: 2450 MHz

Communication System: CW ; Frequency: 2450 MHz; Duty Cycle: 1:1; Modulation type: CW
Medium: MSL2450;Medium parameters used: f = 2450 MHz; σ = 1.93 mho/m; $ε_r$ = 53.7; ρ = 1000 kg/m^3 ; Liquid level : 154 mm
Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of   the dipole to the Phantom)Air temp. : 22.4 degrees ; Liquid temp. : 21.3 degrees

DASY4 Configuration:
- Probe: EX3DV4 - SN3578 ; ConvF(6.55, 6.55, 6.55) ; Calibrated: 2008/5/20
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE3 Sn510; Calibrated: 2009/1/21
- Phantom: SAM 12; Type: SAM V4.0; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
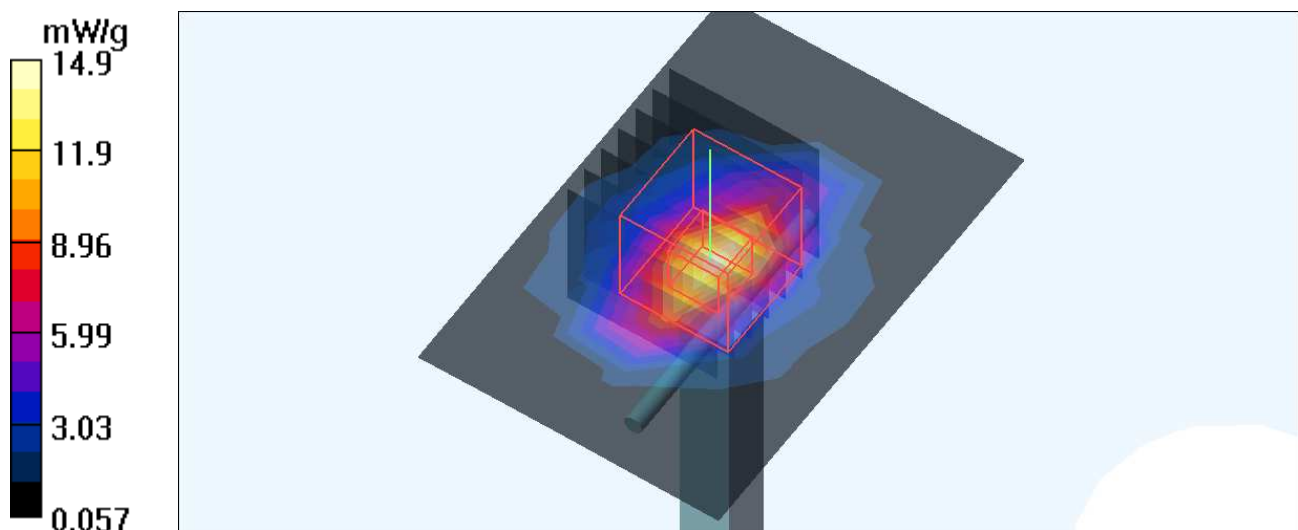Maximum value of SAR (measured) = 14.7 mW/g

d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 91.7 V/m; Power Drift = -0.015 dB
Peak SAR (extrapolated) = 30.3 W/kg
SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.03 mW/g
Maximum value of SAR (measured) = 14.9 mW/g

APPENDIX B: ADT SAR MEASUREMENT SYSTEM

APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION

APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION

D1: SAM PHANTOM

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 CA
Series No	TP-1150 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

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

Test	Requirement	Details	Units tested
Shape	Compliance with the geometry according to the CAD model.	IT'IS CAD File (*)	First article, Samples
Material thickness	Compliant with the requirements according to the standards	2mm +/- 0.2mm in specific areas	First article, Samples
Material parameters	Dielectric parameters for required frequencies	200 MHz – 3 GHz Relative permittivity < 5 Loss tangent < 0.05.	Material sample TP 104-5
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards	Liquid type HSL 1800 and others according to the standard.	Pre-series, First article

Standards

[1] CENELEC EN 50361
[2] IEEE P1528-200x draft 6.5
[3] IEC PT 62209 draft 0.9
(*) The IT'IS CAD file is derived from [2] and is also within the tolerance requirements of the shapes of [1] and [3].

Conformity

Based on the sample tests above, we certify that this item is in compliance with the uncertainty requirements of SAR measurements specified in standard [1] and draft standards [2] and [3].

Date   28.02.2002

Signature / Stamp

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

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 ▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓▓   Certificate No: EX3-3578_May08

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3578
Calibration procedure(s)	QA CAL-01.v4, QA CAL-14.v9 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	May 20, 2008
Condition of the calibrated item	In Tolerance

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-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	8-Aug-07 (No. 217-00719)	Aug-08
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	8-Aug-07 (No. 217-00720)	Aug-08
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	3-Sep-07 (No. DAE4-660_Sep07)	Sep-08

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

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

Issued: May 21, 2008

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

S   Schweizerischer Kalibrierdienst
C   Service suisse d'étalonnage
C   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
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003

b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ (f $\leq$ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not 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 (no uncertainty required). DCP does not depend on frequency nor media.

- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f $\leq$ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.

- *Spherical isotropy (3D deviation from isotropy):* in a field of low gradients realized using a flat phantom exposed by a patch antenna.

- *Sensor Offset:* The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3578

Manufactured:	November 4, 2005
Last calibrated:	April 24, 2007
Recalibrated:	May 20, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

DASY - Parameters of Probe: EX3DV4 SN:3578

Sensitivity in Free Space[A]   ## Diode Compression[B]

NormX	**0.520** ± 10.1%	$\mu V/(V/m)^2$	DCP X	**98** mV
NormY	**0.500** ± 10.1%	$\mu V/(V/m)^2$	DCP Y	**90** mV
NormZ	**0.540** ± 10.1%	$\mu V/(V/m)^2$	DCP Z	**93** mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL   **900 MHz**   **Typical SAR gradient: 5 % per mm**

		2.0 mm	3.0 mm
Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	11.3	5.6
SAR_{be} [%]	With Correction Algorithm	0.6	0.2

TSL   **1810 MHz**   **Typical SAR gradient: 10 % per mm**

		2.0 mm	3.0 mm
Sensor Center to Phantom Surface Distance		**2.0 mm**	**3.0 mm**
SAR_{be} [%]	Without Correction Algorithm	9.2	4.6
SAR_{be} [%]	With Correction Algorithm	0.5	0.2

Sensor Offset

Probe Tip to Sensor Center   **1.0** mm

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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 Page 8).

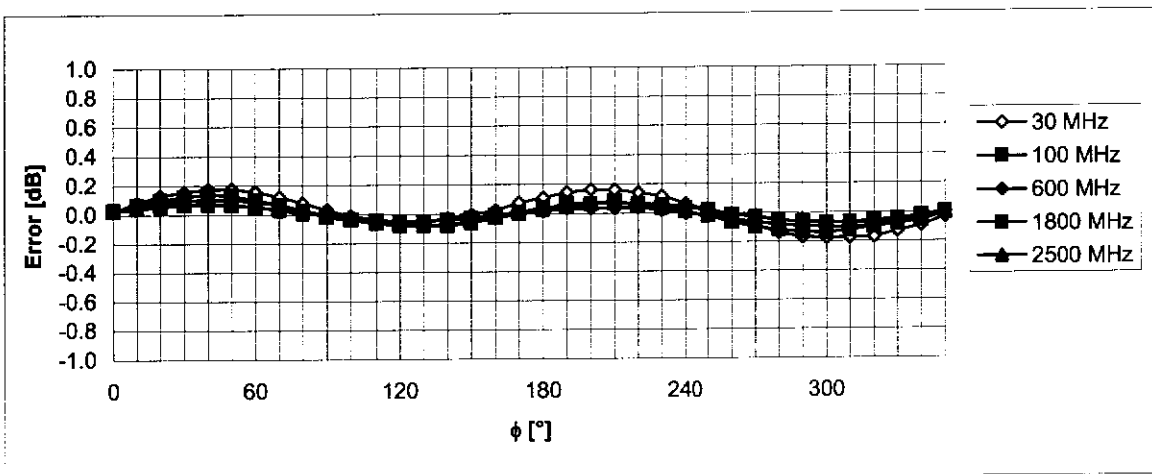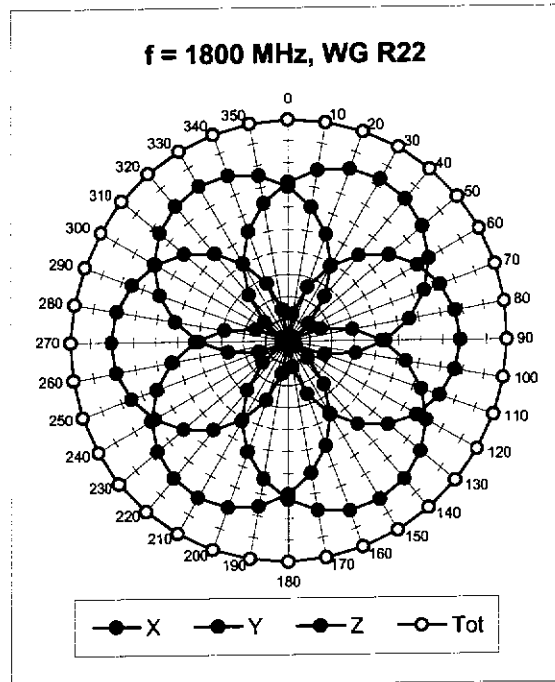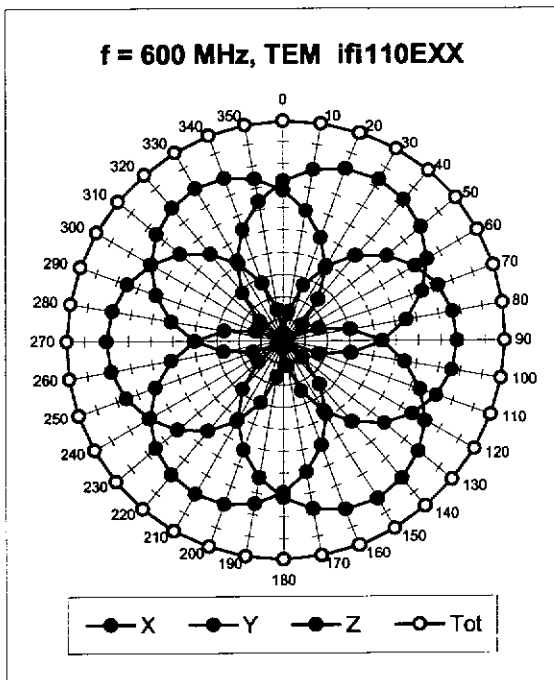[B] Numerical linearization parameter: uncertainty not required.

Frequency Response of E-Field

(TEM-Cell:ifi110 EXX, Waveguide: R22)
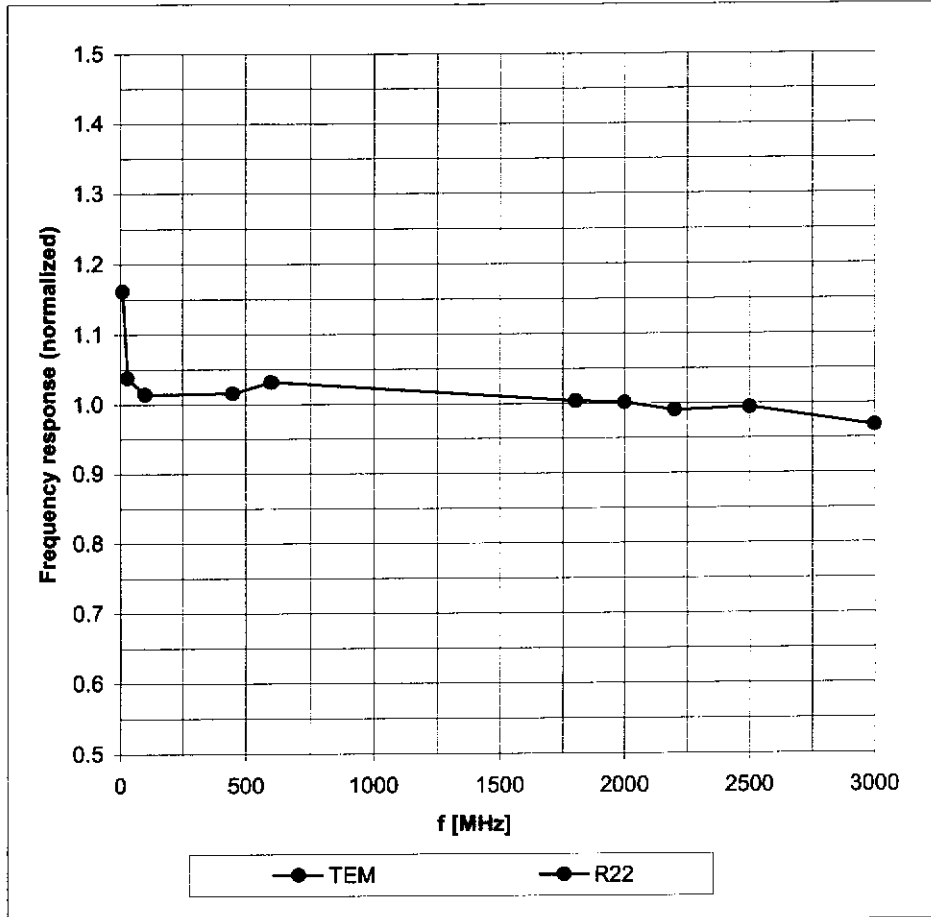
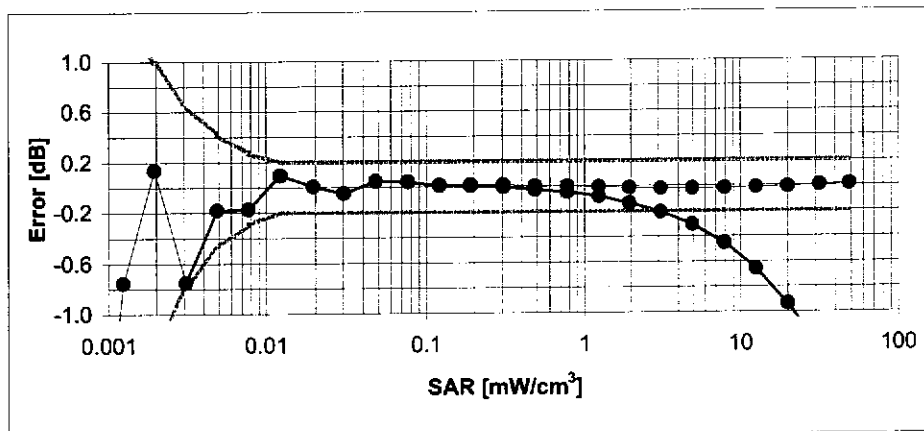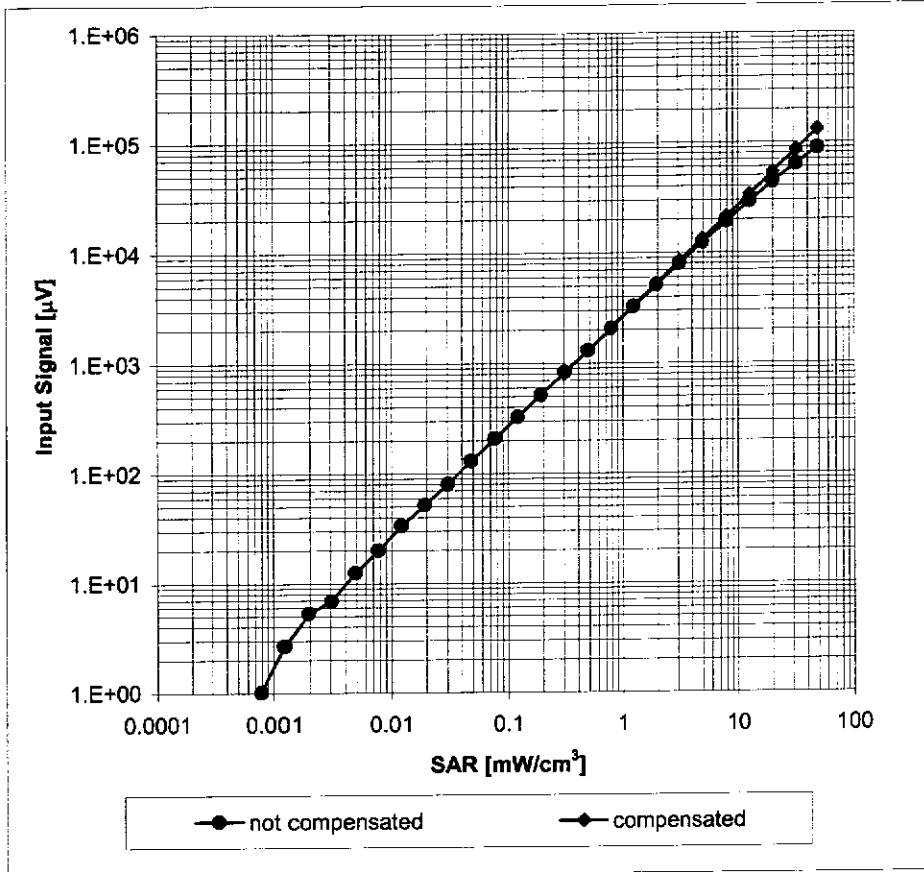**Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)**
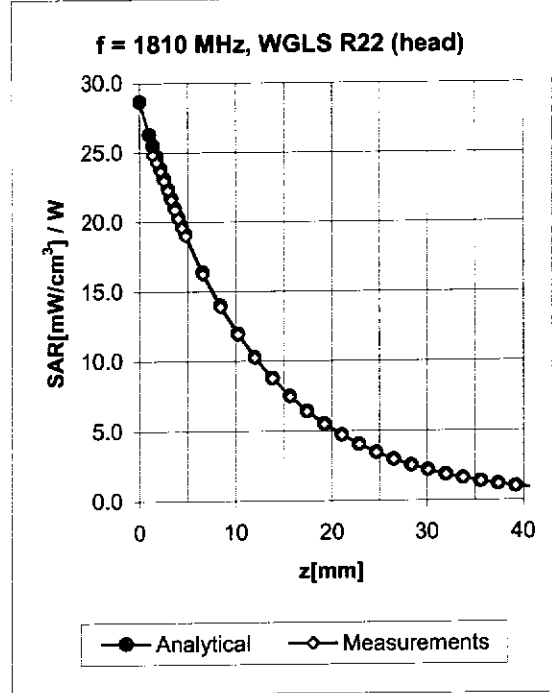
Receiving Pattern (ϕ), $\vartheta = 0°$
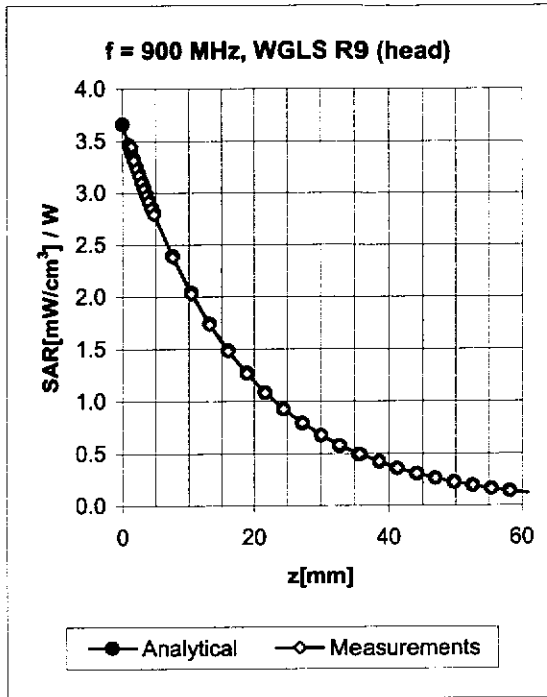

f = 600 MHz, TEM ifi110EXX

f = 1800 MHz, WG R22

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

f = 900 MHz, WGLS R9 (head)

f = 1810 MHz, WGLS R22 (head)

f [MHz]	Validity [MHz]^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.48	0.80	8.55	± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.51	0.75	7.28	± 11.0% (k=2)
2000	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.48	0.77	7.10	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.40	0.87	6.66	± 11.0% (k=2)
5200	± 50 / ± 100	Head	36.0 ± 5%	4.66 ± 5%	0.43	1.70	4.65	± 13.1% (k=2)
5500	± 50 / ± 100	Head	35.6 ± 5%	4.96 ± 5%	0.48	1.70	4.30	± 13.1% (k=2)
5800	± 50 / ± 100	Head	35.3 ± 5%	5.27 ± 5%	0.50	1.70	4.22	± 13.1% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.45	0.80	8.42	± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.49	0.80	7.41	± 11.0% (k=2)
2000	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.43	0.87	7.08	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.55	0.80	6.55	± 11.0% (k=2)
5200	± 50 / ± 100	Body	49.0 ± 5%	5.30 ± 5%	0.47	1.75	3.84	± 13.1% (k=2)
5500	± 50 / ± 100	Body	48.6 ± 5%	5.65 ± 5%	0.35	1.75	4.12	± 13.1% (k=2)
5800	± 50 / ± 100	Body	48.2 ± 5%	6.00 ± 5%	0.46	1.75	3.92	± 13.1% (k=2)

^{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.

Deviation from Isotropy in HSL

Error (φ, ϑ), f = 900 MHz
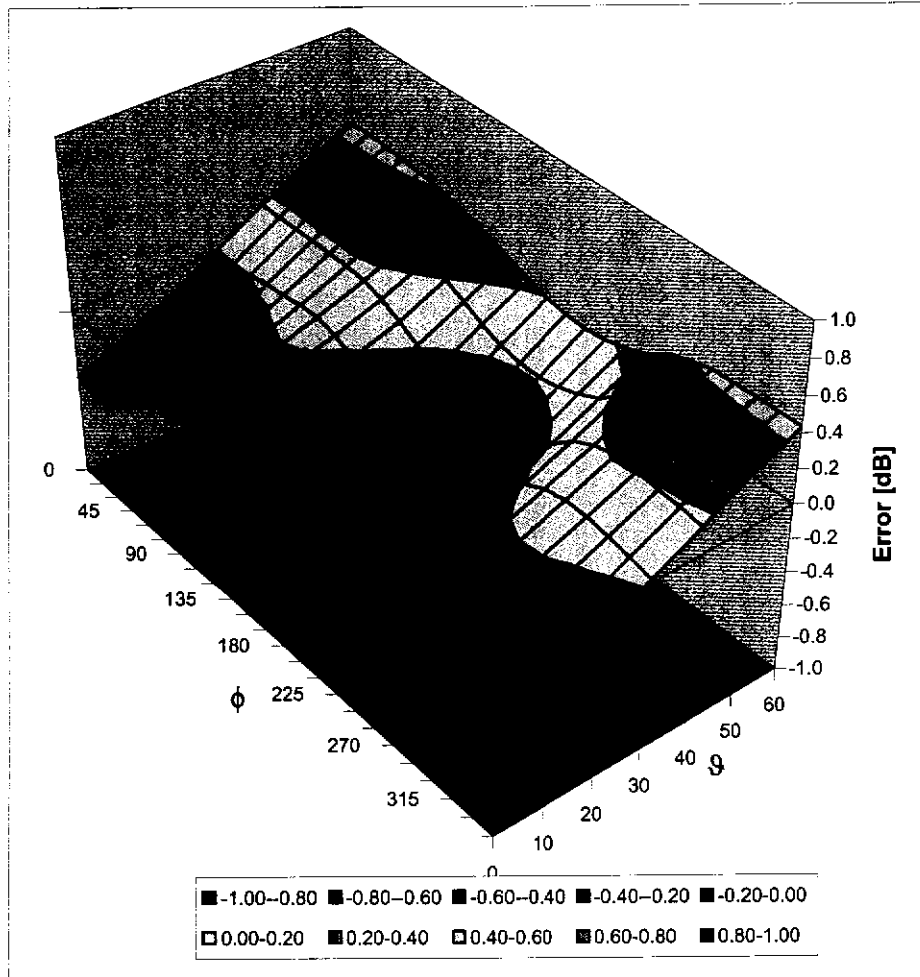
Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)