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SAR TEST REPORT

REPORT NO.: SA990317H06

MODEL NO.: WU5208

RECEIVED: Mar. 17, 2010

TESTED: Mar. 30, 2010

ISSUED: Apr. 01, 2010

APPLICANT: AboCom Systems, Inc.

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APPENDIX B: ADT SAR MEASUREMENT SYSTEM

APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION

APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION



1. CERTIFICATION

PRODUCT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter
MODEL: WU5208
BRAND: AboCom
APPLICANT: AboCom Systems, Inc.
TESTED: Mar. 30, 2010
TEST SAMPLE: ENGINEERING SAMPLE
STANDARDS: **FCC Part 2 (Section 2.1093)**
FCC OET Bulletin 65, Supplement C (01-01)
RSS-102

The above equipment (model: WU5208) 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 : Polly Chien , **DATE** : Apr. 01, 2010
Polly Chien / Specialist

TECHNICAL ACCEPTANCE : Mason Chang , **DATE** : Apr. 01, 2010
Responsible for RF Mason Chang / Engineer

APPROVED BY : Gary Chang , **DATE** : Apr. 01, 2010
Gary Chang / Assistant Manager



2. GENERAL INFORMATION

2.1 GENERAL DESCRIPTION OF EUT

EUT	802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter
MODEL NO.	WU5208
FCC ID	MQ4WU5208
POWER SUPPLY	5Vdc
MODULATION TYPE	CCK, DQPSK, DBPSK for DSSS 64QAM, 16QAM, QPSK, BPSK for OFDM
MODULATION TECHNOLOGY	DSSS, OFDM
TRANSFER RATE	802.11b: 1.0/ 2.0/ 5.5/ 11.0Mbps 802.11g: 6.0/9.0/12.0/18.0/24.0/36.0/48.0/54.0Mbps 802.11n (HT20 MCS0~7 (400NS GI)): 7.2/14.4/21.7/28.9/43.3/57.8/65.0/72.2Mbps, 802.11n (HT20 MCS8~15 (400NS GI)): 14.444/28.889/43.333/57.778/86.667/115.556/130.000/ 144.444Mbps. 802.11n (HT20 MCS0~7 (800NS GI)): 6.5/13.0/19.5/26.0/39.0/52.0/58.5/65.0Mbps 802.11n (HT20 MCS8~15 (800NS GI)): 13.0/26.0/39.0/52.0/78.0/104.0/117.0/130.0Mbps. 802.11n (HT40 MCS0~7 (400NS GI)): 15.0/30.0/45.0/60.0/90.0/120.0/135.0/150.0Mbps, 802.11n (HT40 MCS8~15 (400NS GI)): 30.0/60.0/90.0/120.0/180.0/240.0/270.0/300.0Mbps. 802.11n (HT40 MCS0~7 (800NS GI)): 13.5/27.0/40.5/54.0/81.0/108.0/121.5/135.0Mbps. 802.11n (HT40 MCS8~15 (800NS GI)): 27.0/54.0/81.0/108.0/162.0/216.0/243.0/270.0Mbps.
OPERATING FREQUENCY	2412 ~ 2462MHz
NUMBER OF CHANNEL	11 for 802.11b, 802.11g, 802.11n (20MHz) 7 for 802.11n (40MHz)
MAXIMUM SAR (1g)	0.795W/kg



ANTENNA TYPE	Refer to NOTE 1 for more details
ANTENNA CONNECTOR	NA
DATA CABLE	NA
I/O PORTS	USB
ACCESSORY DEVICES	NA

NOTE:

1. There are two antennas provided to this EUT, please refer to the following table:

Chain	Antenna Type	Connector	Antenna Gain (dBi)
Chain (0)	chip	NA	3.1
Chain (1)			

2. The EUT incorporates a MIMO function with 802.11n. Physically, the EUT provides two completed transmitters and two completed receivers.
3. The EUT is 2 * 2 spatial MIMO (2Tx & 2Rx) without beam forming function. The antenna configurations are two transmitter antennas and two receiver antennas, as there are 2 chip antennas. Spatial multiplexing modes for simultaneous transmission using 2 antennas, and for simultaneous receiver using 2 antennas. The 11bg legacy mode is limited to single transmitter only.
4. The EUT complies with 802.11n standards and backwards compatible with 802.11b, 802.11g products.
5. When the EUT operating in draft 802.11n, the software operation, which is defined by manufacturer, MCS (Modulation and Coding Schemes) from 0 to 15.
6. 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 INFORMATION 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 from the optical into digital electric signal of the DAE and transfers data to the PC.

EX3DV4 ISOTROPIC E-FIELD PROBE

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

NOTE

1. The Probe parameters have been calibrated by the SPEAG. Please reference "APPENDIX D" for the Calibration Certification Report.
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 1/4 balun enables measurement of feedpoint impedance with NWA matched for use near flat phantoms filled with brain simulating solutions. Includes distance holder and tripod adaptor

CALIBRATION

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

FREQUENCY

2450MHz

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 $\varepsilon = 3$ and loss tangent $\delta = 0.02$. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the influence of the clamp on the test results could thus be lowered. The device holder for the portable device makes up of the polyethylene foam. The dielectric parameters of material close to the dielectric parameters of the air.

DATA ACQUISITION ELECTRONICS

CONSTRUCTION

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



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2.4 TEST EQUIPMENT

FOR SAR MEASUREMENT

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 21, 2009	May 20, 2010
3	E-Field Probe	S & P	EX3DV4	3578	Jun. 26, 2009	Jun. 25, 2010
4	DAE	S & P	DAE4	861	Jan. 22, 2010	Jan. 21, 2011
5	Robot Positioner	Staubli Unimation	NA	NA	NA	NA
6	Validation Dipole	S & P	D2450V2	737	Feb. 19, 2010	Feb. 18, 2011

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

FOR TISSUE PROPERTY

ITEM	NAME	BRAND	TYPE	SERIES NO.	DATE OF CALIBRATION	DUE DATE OF CALIBRATION
1	Network Analyzer	Agilent	E8358A	US41480538	Dec. 03, 2009	Dec. 02, 2010
2	Dielectric Probe	Agilent	85070D	US01440176	NA	NA

NOTE:

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



2.5 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:

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

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

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

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

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

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

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

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

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

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

- SAR = local specific absorption rate in mW/g
- E_{tot} = total field strength in V/m
- 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	33497605792	CXSMM01BRD02D330

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

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

4. RECIPES FOR TISSUE SIMULATING LIQUIDS

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

The following ingredients are used :

- **WATER-** Deionized water (pure H₂O), resistivity ≈ 16 M - as basis for the liquid
- **DGMBE-** Diethylenglycol-monobuthyl ether (DGMBE), Fluka Chemie GmbH, CAS # 112-34-5 - to reduce relative permittivity

THE RECIPES FOR 2450MHz SIMULATING LIQUID TABLE

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

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

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



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FOR 2.4GHz BAND SIMULATING LIQUID

LIQUID TYPE		MSL-2450			
SIMULATING LIQUID TEMP.		22.7			
TEST DATE		Mar. 30, 2010			
TESTED BY		James Fan			
FREQ. (MHz)	LIQUID PARAMETER	STANDARD VALUE	MEASUREMENT VALUE	ERROR PERCENTAGE (%)	LIMIT(%)
2412.0	Permittivity (ϵ)	52.80	54.10	2.46	±5
2422.0		52.70	54.00	2.47	
2442.0		52.70	53.90	2.28	
2450.0		52.70	53.90	2.28	
2462.0		52.70	53.80	2.09	
2412.0	Conductivity (σ) S/m	1.91	1.92	0.52	
2422.0		1.92	1.94	1.04	
2442.0		1.94	1.96	1.03	
2450.0		1.95	1.98	1.54	
2462.0		1.97	1.99	1.02	

5. SYSTEM VALIDATION

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

5.1 TEST PROCEDURE

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

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



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

About the validation dipole positioning uncertainty, the constant and low loss dielectric spacer is used to establish the correct distance between the top surface of the dipole and the bottom surface of the phantom, the error component introduced by the uncertainty of the distance between the liquid (i.e., phantom shell) and the validation dipole in the DASy4 system is less than ±0.1mm.

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

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

5.2 VALIDATION RESULTS

SYSTEM VALIDATION TEST OF SIMULATING LIQUID					
FREQUENCY (MHz)	REQUIRED SAR (mW/g)	MEASURED SAR (mW/g)	DEVIATION (%)	SEPARATION DISTANCE	TESTED DATE
MSL2450	13.10 (1g)	13.20	0.76	10mm	Mar. 30, 2010

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

5.3 SYSTEM VALIDATION UNCERTAINTIES

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

Error Description	Tolerance (±%)	Probability Distribution	Divisor	(C _i)		Standard Uncertainty (±%)		(v _i)
				(1g)	(10g)	(1g)	(10g)	
Measurement System								
Probe Calibration	5.50	Normal	1	1	1	5.50	5.50	∞
Axial Isotropy	4.70	Rectangular	√3	0.7	0.7	1.90	1.90	∞
Hemispherical Isotropy	9.60	Rectangular	√3	0.7	0.7	3.88	3.88	∞
Boundary effects	1.00	Rectangular	√3	1	1	0.58	0.58	∞
Linearity	4.70	Rectangular	√3	1	1	2.71	2.71	∞
System Detection Limits	1.00	Rectangular	√3	1	1	0.58	0.58	∞
Readout Electronics	0.30	Normal	1	1	1	0.30	0.30	∞
Response Time	0.80	Rectangular	√3	1	1	0.46	0.46	∞
Integration Time	2.60	Rectangular	√3	1	1	1.50	1.50	∞
RF Ambient Noise	3.00	Rectangular	√3	1	1	1.73	1.73	∞
RF Ambient Reflections	3.00	Rectangular	√3	1	1	1.73	1.73	∞
Probe Positioner	0.40	Rectangular	√3	1	1	0.23	0.23	∞
Probe Positioning	2.90	Rectangular	√3	1	1	1.67	1.67	∞
Max. SAR Eval.	1.00	Rectangular	√3	1	1	0.58	0.58	∞
Dipole Related								
Dipole Axis to Liquid Distance	2.00	Rectangular	√3	1	1	1.15	1.15	145
Input Power Drift	5.00	Rectangular	√3	1	1	2.89	2.89	∞
Phantom and Tissue parameters								
Phantom Uncertainty	4.00	Rectangular	√3	1	1	2.31	2.31	∞
Liquid Conductivity (target)	5.00	Rectangular	√3	0.64	0.43	1.85	1.24	∞
Liquid Conductivity (measurement)	2.54	Normal	1	0.64	0.43	1.63	1.09	∞
Liquid Permittivity (target)	5.00	Rectangular	√3	0.6	0.49	1.73	1.41	∞
Liquid Permittivity (measurement)	3.19	Normal	1	0.6	0.49	1.91	1.56	∞
Combined Standard Uncertainty						9.82	9.53	
Coverage Factor for 95%						Kp=2		
Expanded Uncertainty (K=2)						19.64	19.06	

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

6. TEST RESULTS

6.1 TEST PROCEDURES

The EUT plugged into the notebook. Use the software to control the EUT channel and transmission power. Then record the conducted power before the testing. Place the EUT to the specific test location. After the testing, must writing down the conducted power of the EUT into the report. The SAR value was calculated via the 3D spline interpolation algorithm that has been implemented in the software of 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.



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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 ± 0.5 mm 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 $\pm 5\%$.



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6.2 CONDUCTED POWER

TEST MODE		802.11b		802.11g	
CHAN.	FREQ. (MHz)	PEAK	AVG	PEAK	AVG
1	2412 (Low)	17.9	15.7	21.3	12.7
6	2437 (Mid.)	17.8	15.6	21.2	12.6
11	2462 (High)	17.8	15.6	21.3	12.5

TEST MODE		802.11n (20MHz)		TEST MODE		802.11N (40MHz)	
CHAN.	FREQ. (MHz)	PEAK	AVG	CHAN.	FREQ. (MHz)	PEAK	AVG
1	2412 (Low)	23.1	14.6	1	2422 (Low)	22.8	14.5
6	2437 (Mid.)	23.0	14.5	4	2437 (Mid.)	22.8	14.5
11	2462 (High)	23.0	14.5	7	2452 (High)	22.8	14.5

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

6.3 DESCRIPTION OF TEST CONDITION

TEST DATE	TEST ITEM	TEMPERATURE(°C)		HUMIDITY(%RH)	TESTED BY
		AIRBENT	LIQUID		
Mar. 30, 2010	1 ~ 15	23.1	22.7	60	James Fan

6.4 MEASURED SAR RESULT

TEST POSTITION	TEST ITEM	ANTENNA	TEST MODE	CHAN.	FREQ. (MHz)	MEASURED 1g SAR (W/kg)
Horizontal-Up	1	Ant 0	802.11b	1	2412 (Low)	0.795
	2	Ant 0, Ant 1	802.11n (20MHz)	1	2412 (Low)	0.544
	3	Ant 0, Ant 1	802.11n (40MHz)	1	2422 (Low)	0.443
Horizontal-Down	4	Ant 0	802.11b	1	2412 (Low)	0.791
	5	Ant 0, Ant 1	802.11n (20MHz)	1	2412 (Low)	0.446
	6	Ant 0, Ant 1	802.11n (40MHz)	1	2422 (Low)	0.510
Vertical-Front	7	Ant 0	802.11b	1	2412 (Low)	0.141
	8	Ant 0, Ant 1	802.11n (20MHz)	1	2412 (Low)	0.140
	9	Ant 0, Ant 1	802.11n (40MHz)	1	2422 (Low)	0.131
Vertical-Back	10	Ant 0	802.11b	1	2412 (Low)	0.181
	11	Ant 0, Ant 1	802.11n (20MHz)	1	2412 (Low)	0.195
	12	Ant 0, Ant 1	802.11n (40MHz)	1	2422 (Low)	0.231
TIP	13	Ant 0	802.11b	1	2412 (Low)	0.518
	14	Ant 0, Ant 1	802.11n (20MHz)	1	2412 (Low)	0.309
	15	Ant 0, Ant 1	802.11n (40MHz)	1	2422 (Low)	0.313

NOTE:

1. SAR for 802.11g mode is not required since max average power of 802.11g is less than 802.11b.
2. 802.11b mode is only support 1 TX mode and only antenna 0 can transmit.
3. In this testing, the limit for General Population Spatial Peak averaged over 1g, 1.6 W/kg, is applied.
4. Please see the Appendix A for the data.
5. The variation of the EUT conducted power measured before and after SAR testing should not over 5%.



6.5 SAR LIMITS

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

NOTE:

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.

6.6 CHECK FOR SCAN RESOLUTION

Compare with different scan resolution

With EUT hold on the worst case configuration 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:

AREA SCAN RESOLUTION	ZOOM SCAN RESOLUTION	SAR VALUE(W/KG)
5mm	5mm	0.795
5mm	2.5mm	0.792

Conclusion: No meaningful change detected.



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7. INFORMATION ON THE TESTING LABORATORIES

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

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

Linko EMC/RF Lab:

Tel: 886-2-26052180

Fax: 886-2-26051924

Hsin Chu EMC/RF Lab:

Tel: 886-3-5935343

Fax: 886-3-5935342

Hwa Ya EMC/RF/Safety/Telecom Lab:

Tel: 886-3-3183232

Fax: 886-3-3185050

Web Site: www.adt.com.tw

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

---END---

APPENDIX A: TEST DATA

Liquid Level Photo

MSL 2450MHz D=152mm



Test Laboratory: Bureau Veritas ADT

M01-Horizontal-Up-11B-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Separation distance : 5 mm (The Horizontal-Up side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11B CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 1.23 mW/g

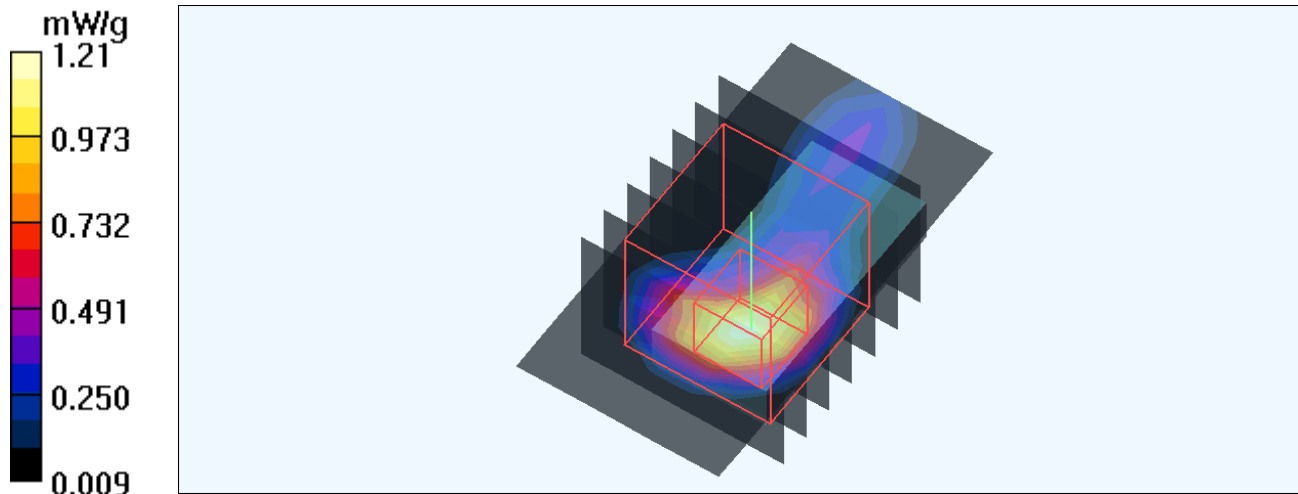
11B CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 23.1 V/m; Power Drift = -0.047 dB

Peak SAR (extrapolated) = 2.26 W/kg

SAR(1 g) = 0.795 mW/g; SAR(10 g) = 0.360 mW/g

Maximum value of SAR (measured) = 1.21 mW/g



Test Laboratory: Bureau Veritas ADT

M02- Horizontal-Up -11N20M--CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11n 20MHz ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³

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

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11N-20M CH1/Area Scan (7x11x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.752 mW/g

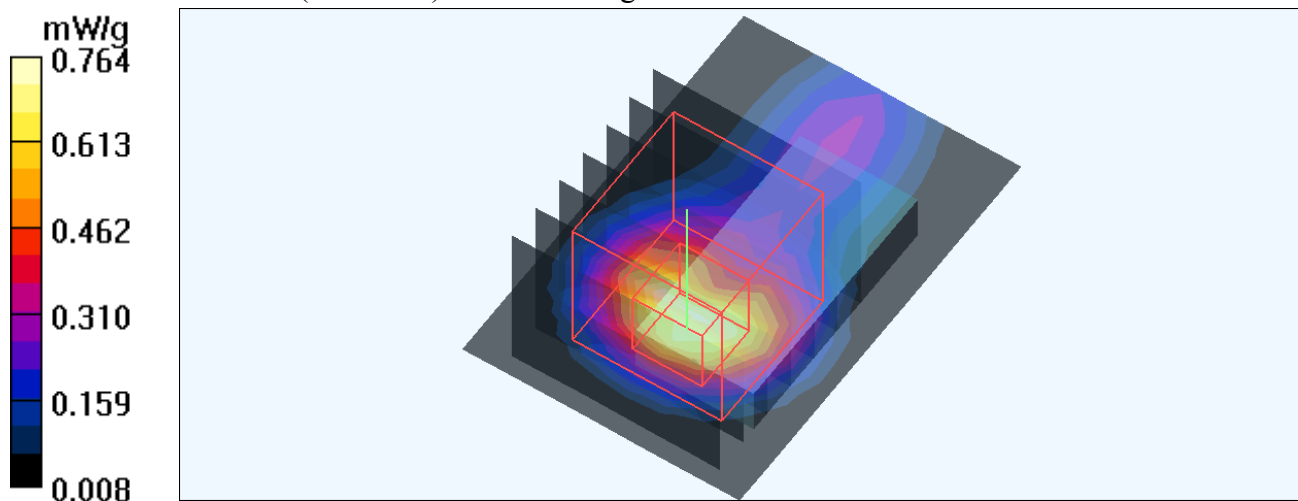
11N-20M CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 21.3 V/m; Power Drift = -0.095 dB

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.544 mW/g; SAR(10 g) = 0.228 mW/g

Maximum value of SAR (measured) = 0.764 mW/g



Test Laboratory: Bureau Veritas ADT

M03- Horizontal-Up-11N40M-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

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

Medium: MSL2450 Medium parameters used: $f = 2422$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

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

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

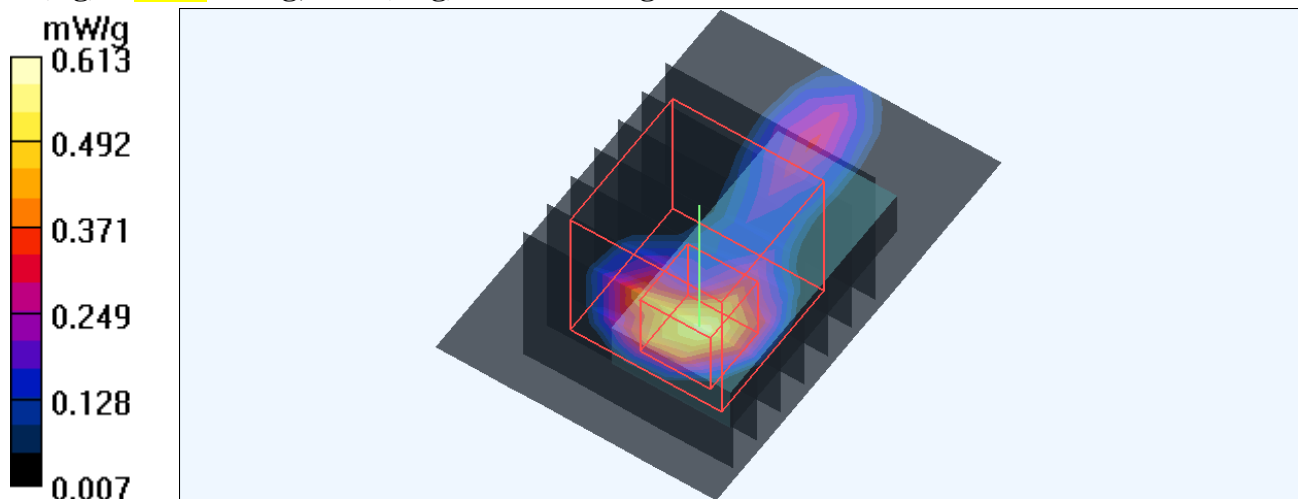
11N-40M CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.613 mW/g

11N-40M CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 19.2 V/m; Power Drift = -0.113 dB

Peak SAR (extrapolated) = 1.15 W/kg

SAR(1 g) = **0.443 mW/g**; SAR(10 g) = **0.198 mW/g**

Test Laboratory: Bureau Veritas ADT

M04-Horizontal-Down-11B-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Separation distance : 5 mm (The Horizontal-Down side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11B CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 1.09 mW/g

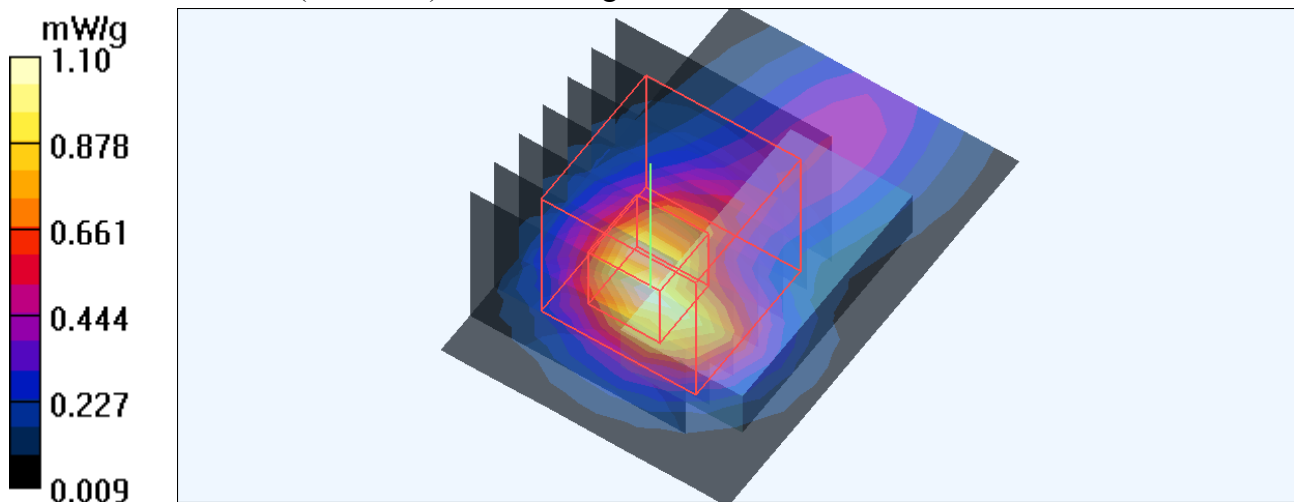
11B CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 24.3 V/m; Power Drift = -0.151 dB

Peak SAR (extrapolated) = 1.98 W/kg

SAR(1 g) = 0.791 mW/g; SAR(10 g) = 0.332 mW/g

Maximum value of SAR (measured) = 1.10 mW/g



Test Laboratory: Bureau Veritas ADT

M05- Horizontal-Down -11N20M-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11n 20MHz ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Separation distance : 5 mm (The Horizontal-Down side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11N-20M CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.608 mW/g

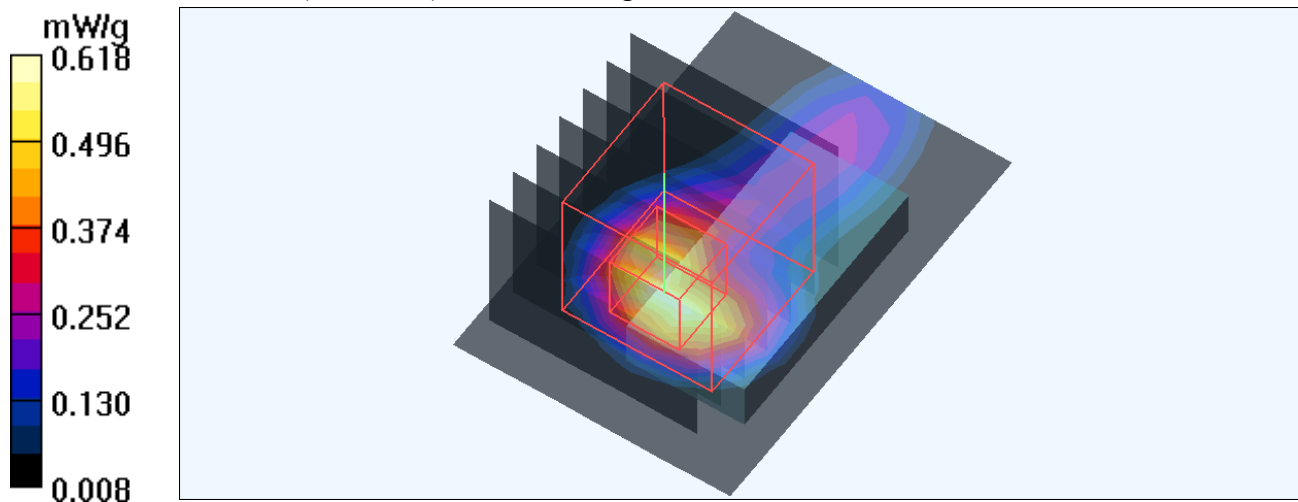
11N-20M CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 22.5 V/m; Power Drift = -0.123 dB

Peak SAR (extrapolated) = 1.14 W/kg

SAR(1 g) = 0.446 mW/g; SAR(10 g) = 0.198 mW/g

Maximum value of SAR (measured) = 0.618 mW/g



Test Laboratory: Bureau Veritas ADT

M06 Horizontal-Down -11N40M-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

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

Medium: MSL2450 Medium parameters used: $f = 2422$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

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

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11N-40M CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.722 mW/g

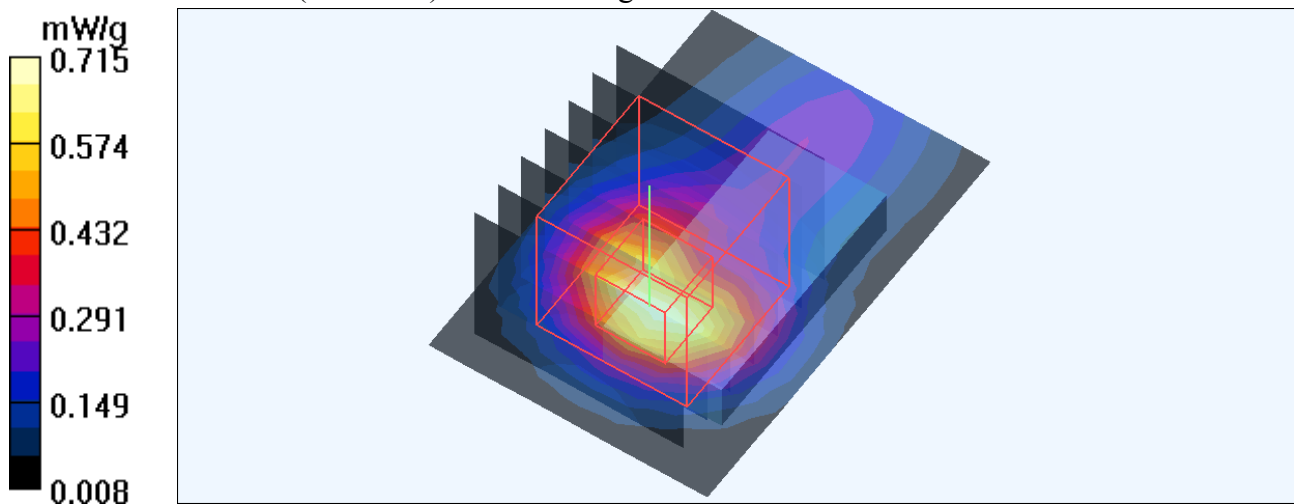
11N-40M CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 20.9 V/m; Power Drift = -0.147 dB

Peak SAR (extrapolated) = 1.34 W/kg

SAR(1 g) = 0.510 mW/g; SAR(10 g) = 0.218 mW/g

Maximum value of SAR (measured) = 0.715 mW/g



Test Laboratory: Bureau Veritas ADT

M07-Vertical-Front-11B-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Separation distance : 5 mm (The Vertical-Front side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11B CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.190 mW/g

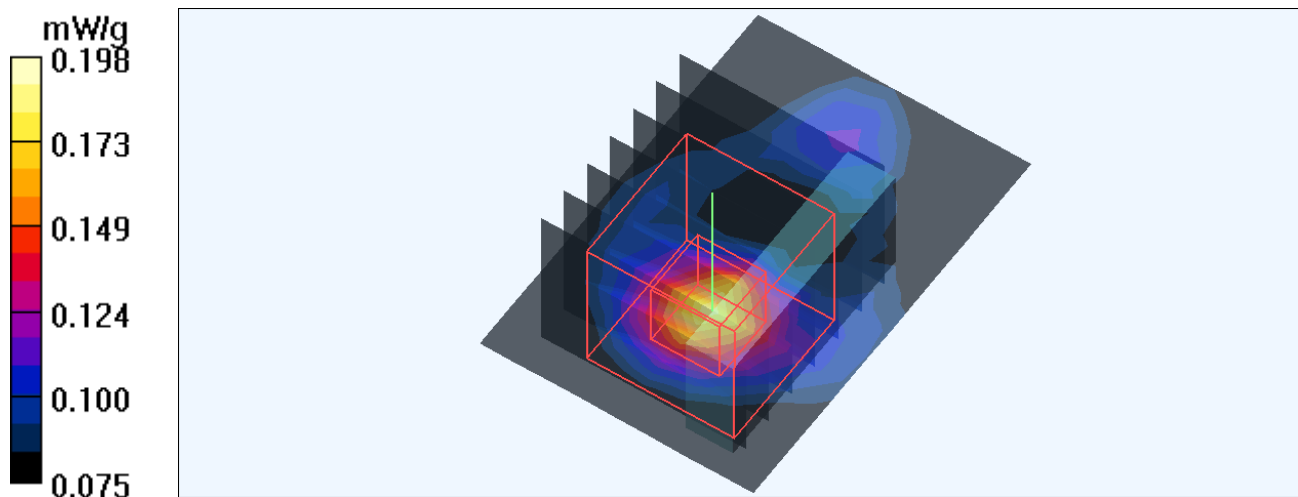
11B CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 11.2 V/m; Power Drift = -0.158 dB

Peak SAR (extrapolated) = 0.372 W/kg

SAR(1 g) = 0.141 mW/g; SAR(10 g) = 0.062 mW/g

Maximum value of SAR (measured) = 0.198 mW/g



Test Laboratory: Bureau Veritas ADT

M08-Vertical-Front-11N20-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11n 20MHz ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³

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

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11N-20M CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.201 mW/g

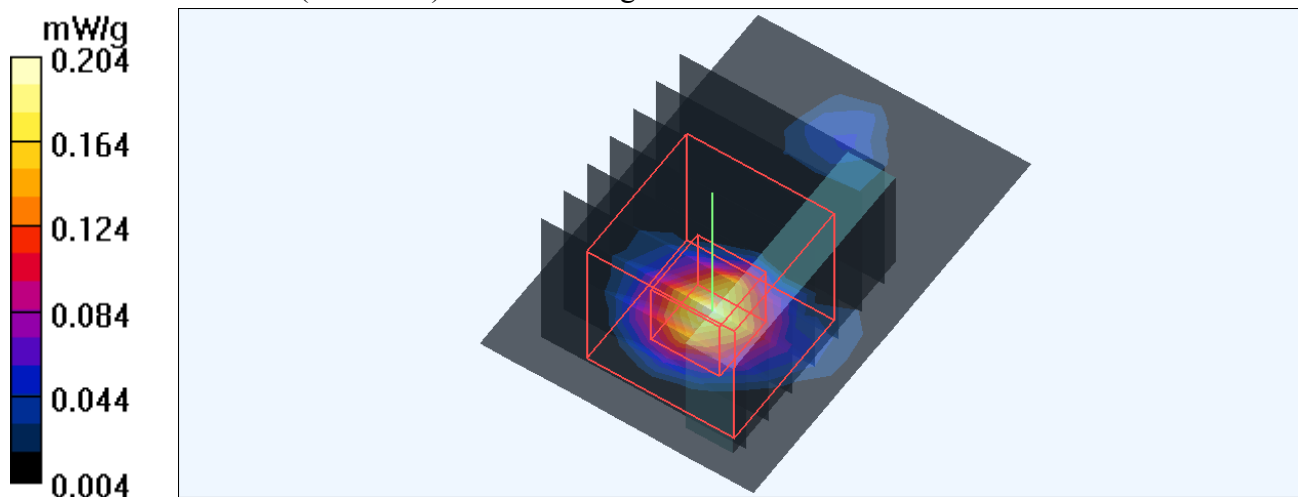
11N-20M CH1 /Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 11.1 V/m; Power Drift = -0.111 dB

Peak SAR (extrapolated) = 0.379 W/kg

SAR(1 g) = 0.140 mW/g; SAR(10 g) = 0.060 mW/g

Maximum value of SAR (measured) = 0.204 mW/g



Test Laboratory: Bureau Veritas ADT

M09-Vertical-Front11N40-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

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

Medium: MSL2450 Medium parameters used: $f = 2422$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

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

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

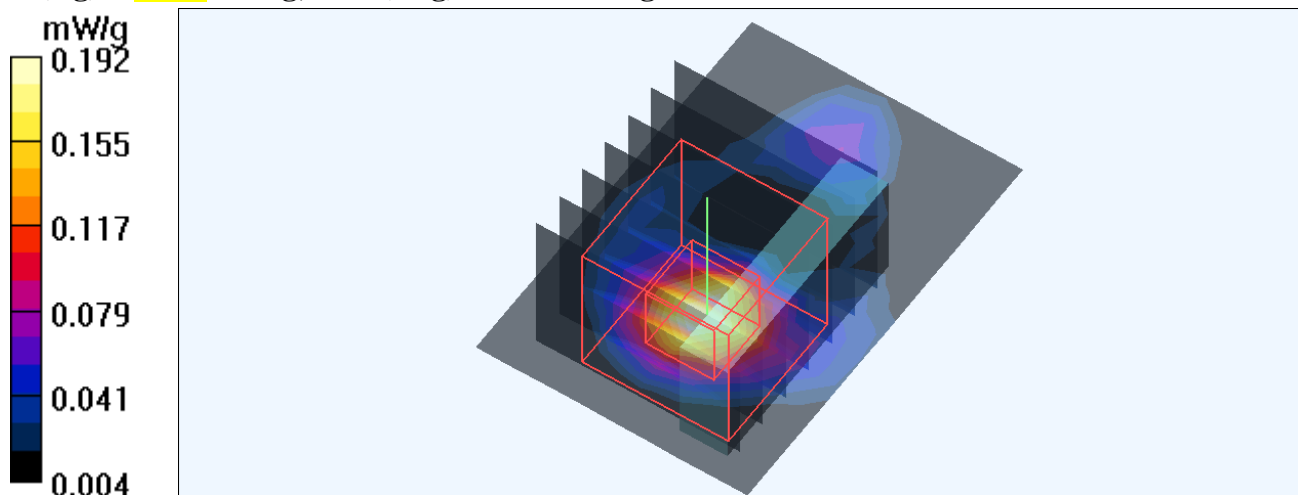
11N-40M CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.192 mW/g

11N-40M CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 10.4 V/m; Power Drift = -0.142 dB

Peak SAR (extrapolated) = 0.350 W/kg

SAR(1 g) = **0.131** mW/g; SAR(10 g) = 0.057 mW/g

Test Laboratory: Bureau Veritas ADT

M10-Vertical -Back-11B-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Separation distance : 5 mm (The Vertical-Back side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11B CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.264 mW/g

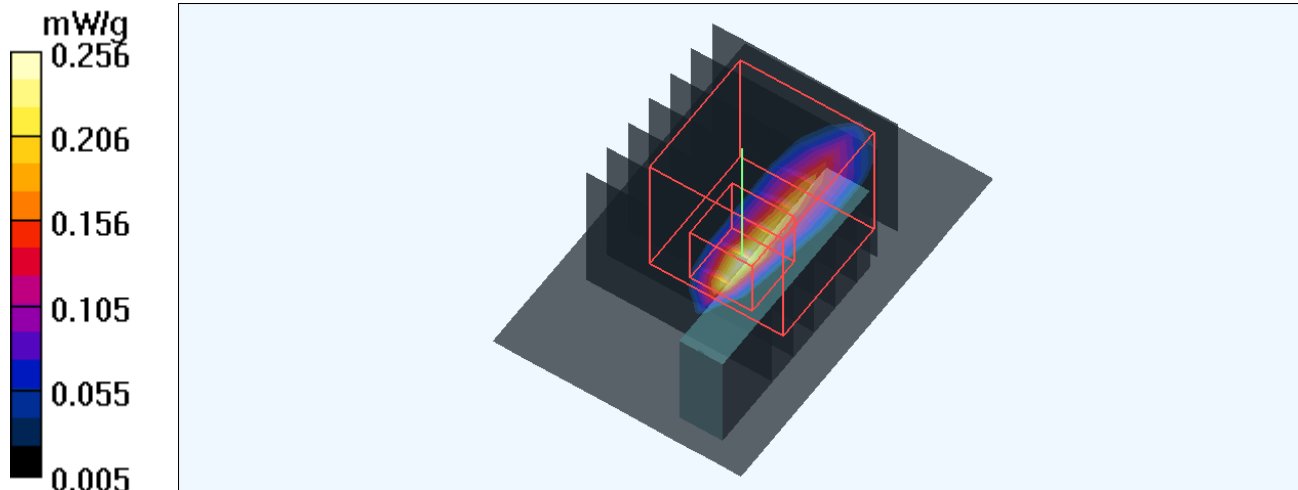
11B CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 11.5 V/m; Power Drift = -0.126 dB

Peak SAR (extrapolated) = 0.452 W/kg

SAR(1 g) = 0.181 mW/g; SAR(10 g) = 0.081 mW/g

Maximum value of SAR (measured) = 0.256 mW/g



Test Laboratory: Bureau Veritas ADT

M11-Vertical-Back-11N20M-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11n 20MHz ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³

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

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11N-20M CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.287 mW/g

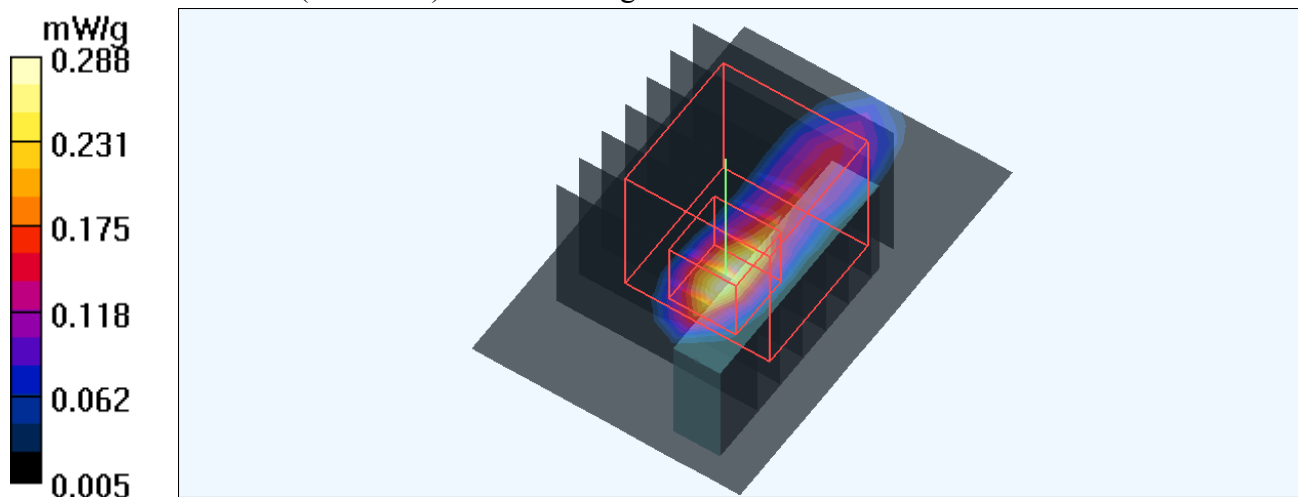
11N-20M CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 13.5 V/m; Power Drift = -0.180 dB

Peak SAR (extrapolated) = 0.515 W/kg

SAR(1 g) = 0.195 mW/g; SAR(10 g) = 0.081 mW/g

Maximum value of SAR (measured) = 0.288 mW/g



Test Laboratory: Bureau Veritas ADT

M12-Vertical-Back-11N40M-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

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

Medium: MSL2450 Medium parameters used: $f = 2422$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

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

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11N-40M CH1/Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.338 mW/g

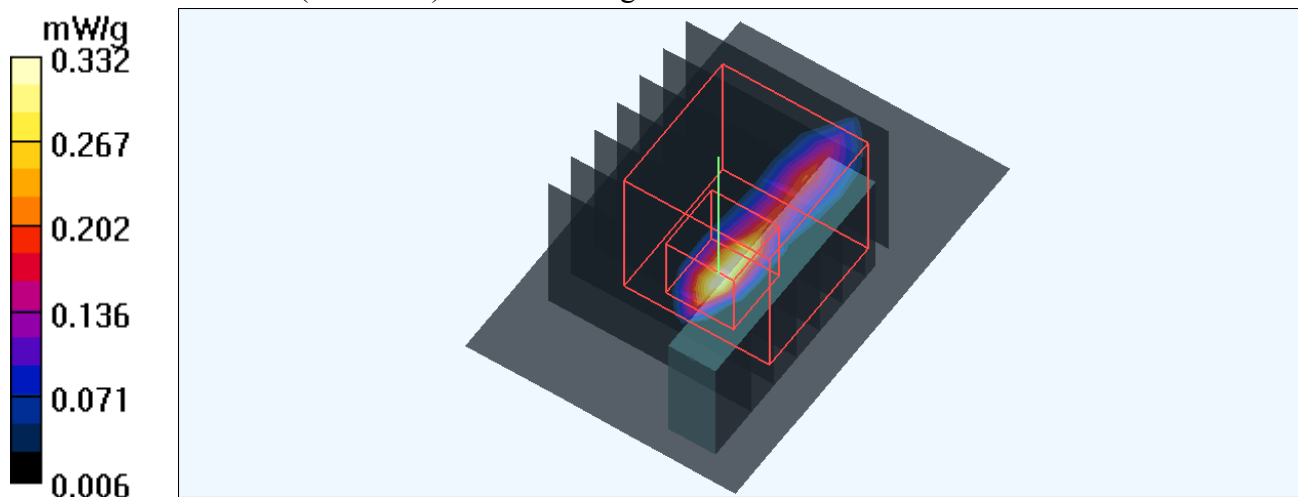
11N-40M CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 11.1 V/m; Power Drift = 0.164 dB

Peak SAR (extrapolated) = 0.591 W/kg

SAR(1 g) = 0.231 mW/g; SAR(10 g) = 0.102 mW/g

Maximum value of SAR (measured) = 0.332 mW/g



Test Laboratory: Bureau Veritas ADT

M13-Tip-11B-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Separation distance : 5 mm (The Tip side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11B CH1/Area Scan (9x9x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.784 mW/g

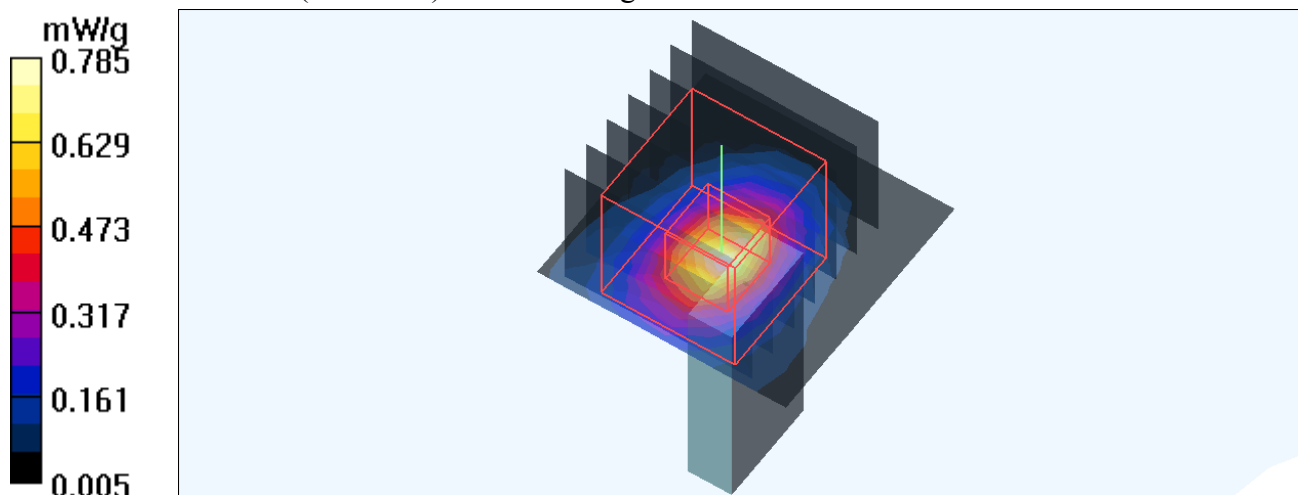
11B CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 20.5 V/m; Power Drift = -0.062 dB

Peak SAR (extrapolated) = 1.53 W/kg

SAR(1 g) = 0.518 mW/g; SAR(10 g) = 0.182 mW/g

Maximum value of SAR (measured) = 0.785 mW/g



Test Laboratory: Bureau Veritas ADT

M14-Tip-11N20-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11n 20MHz ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: BPSK

Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Separation distance : 5 mm (The Tip side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11N-20M CH1/Area Scan (9x9x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.434 mW/g

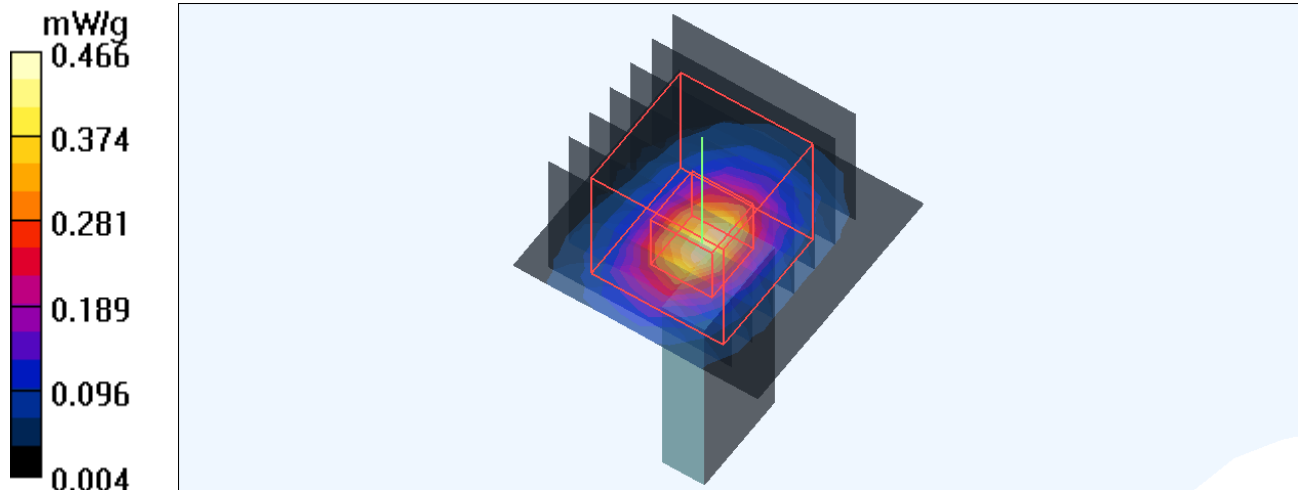
11N-20M CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 15.3 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 0.905 W/kg

SAR(1 g) = 0.309 mW/g; SAR(10 g) = 0.108 mW/g

Maximum value of SAR (measured) = 0.466 mW/g



Test Laboratory: Bureau Veritas ADT

M15-Tip-11N40-CH1

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

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

Medium: MSL2450 Medium parameters used: $f = 2422$ MHz; $\sigma = 1.94$ mho/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

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

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11N-40M CH1/Area Scan (9x9x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 0.454 mW/g

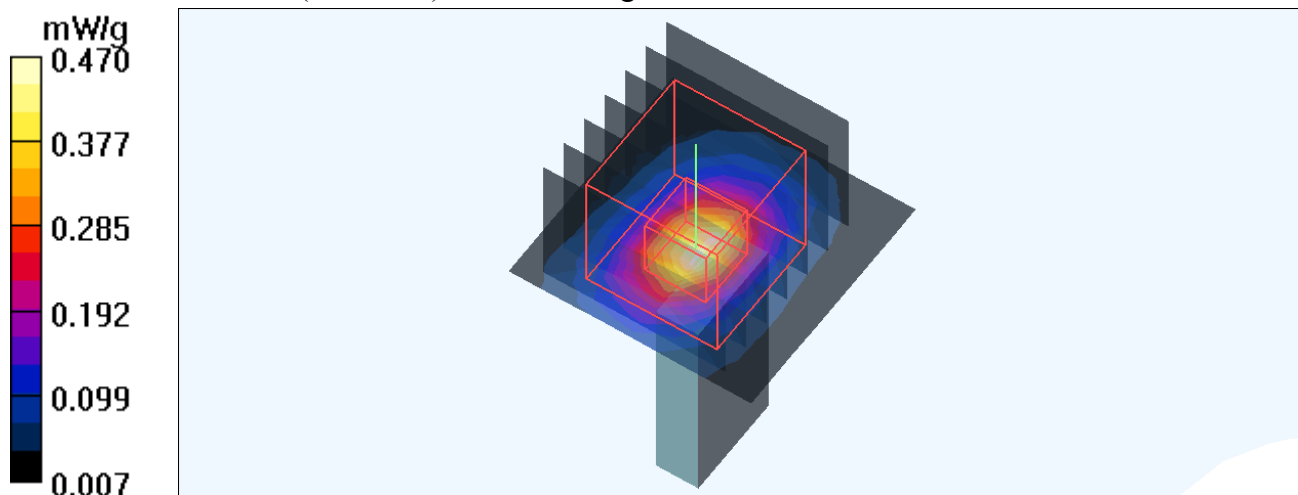
11N-40M CH1/Zoom Scan (7x7x9)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=3mm

Reference Value = 18.6 V/m; Power Drift = -0.079 dB

Peak SAR (extrapolated) = 0.905 W/kg

SAR(1 g) = 0.313 mW/g; SAR(10 g) = 0.111 mW/g

Maximum value of SAR (measured) = 0.470 mW/g



Test Laboratory: Bureau Veritas ADT

M16 –Step Size minimum

DUT: 802.11b/g/n Mini-size Wireless LAN USB2.0 Adapter; Type: WU5208

Communication System: 802.11b ; Frequency: 2412 MHz ; Duty Cycle: 1:1 ; Modulation type: DBPSK
Medium: MSL2450 Medium parameters used: $f = 2412$ MHz; $\sigma = 1.92$ mho/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³
Phantom section: Flat Section ; Separation distance : 5 mm (The Horizontal-Up side of the EUT to the Phantom)

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 1.5mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861 ; Calibrated: 2010/1/22
- Phantom: SAM 12 ; Type: SAM V4.0 ; Serial: TP 1202
- Measurement SW: DASY4, V4.7 Build 80 ; Postprocessing SW: SEMCAD, V1.8 Build 186

11B CH1 /Area Scan (9x13x1): Measurement grid: dx=5mm, dy=5mm

Maximum value of SAR (measured) = 1.31 mW/g

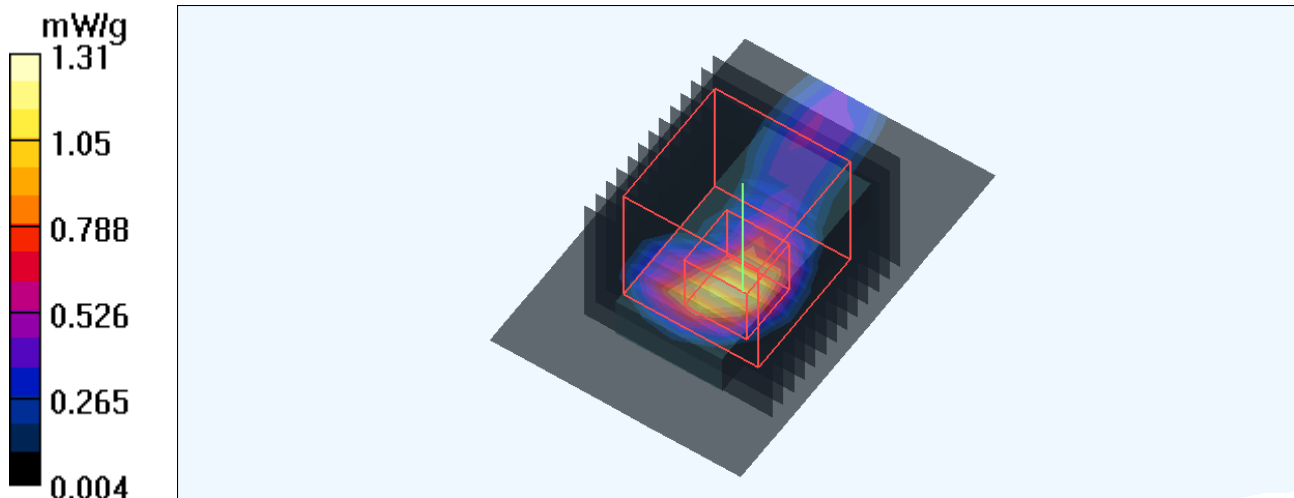
11B CH1 /Zoom Scan (13x13x17)/Cube 0: Measurement grid: dx=2.5mm, dy=2.5mm, dz=1.5mm

Reference Value = 13.6 V/m; Power Drift = -0.123 dB

Peak SAR (extrapolated) = 2.05 W/kg

SAR(1 g) = 0.792 mW/g; SAR(10 g) = 0.353 mW/g

Maximum value of SAR (measured) = 1.35 mW/g



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; $\sigma = 1.98$ mho/m; $\epsilon_r = 53.9$; $\rho = 1000$ kg/m³ ; Liquid level : 152 mm

Phantom section: Flat Section ; Separation distance : 10 mm (The feetpoint of the dipole to the Phantom) Air temp. : 23.1 degrees ; Liquid temp. : 22.7 degrees

DASY4 Configuration:

- Probe: EX3DV4 - SN3578 ; ConvF(6.62, 6.62, 6.62) ; Calibrated: 2009/6/26
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn861; Calibrated: 2010/1/22
- 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) = 17.3 mW/g

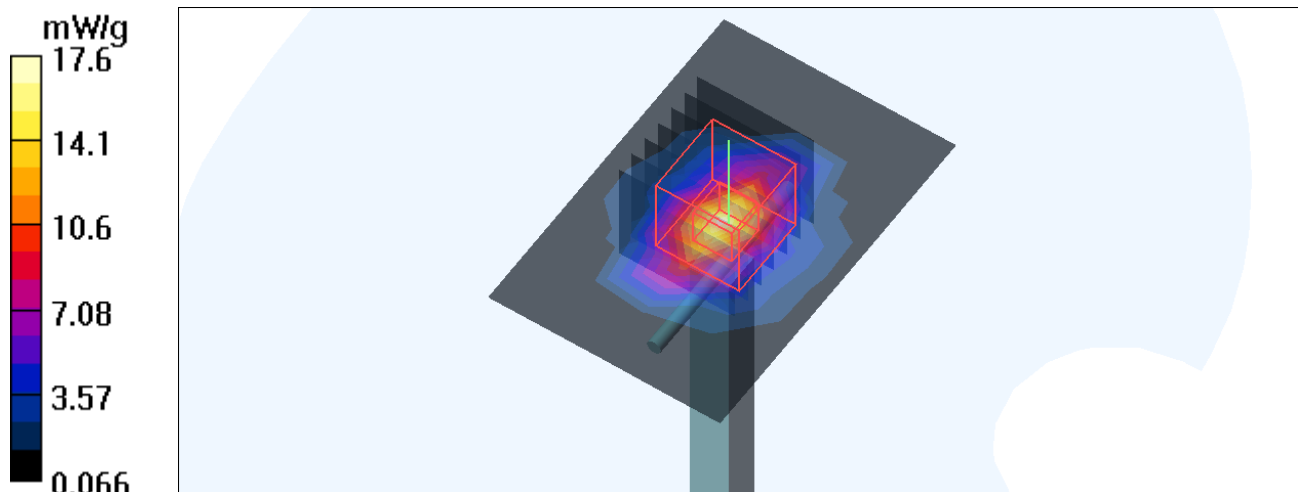
d=10mm, Pin=250mW/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.9 V/m; Power Drift = -0.028 dB

Peak SAR (extrapolated) = 29.0 W/kg

SAR(1 g) = 13.2 mW/g; SAR(10 g) = 5.86 mW/g

Maximum value of SAR (measured) = 17.6 mW/g



APPENDIX B: BV ADT SAR MEASUREMENT SYSTEM



APPENDIX C: PHOTOGRAPHS OF SYSTEM VALIDATION





APPENDIX D: SYSTEM CERTIFICATE & CALIBRATION

D1: SAM PHANTOM

Schmid & Partner Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland, Phone +41 1 245 97 00, Fax +41 1 245 97 79

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

F. Bumbult

**Schmid & Partner
Engineering AG**

Zeughausstrasse 43, CH-8004 Zurich
Tel. +41 1 245 97 00, Fax +41 1 245 97 79

Volker Kapp



A D T

D2: DOSIMETRIC E-FIELD PROBE



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

Accreditation No.: **SCS 108**

Client **Auden**

Certificate No: **EX3-3578_Jun09**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:3578**

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

Calibration date: **June 26, 2009**

Condition of the calibrated item **In Tolerance**


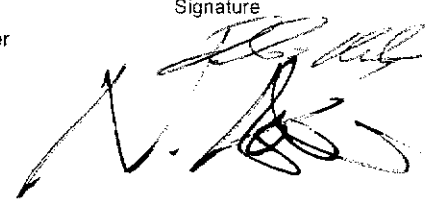
This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

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-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

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-08)	In house check: Oct-09

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

Issued: June 26, 2009

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



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
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,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:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}*: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). *NORM_{x,y,z}* are only intermediate values, i.e., the uncertainties of *NORM_{x,y,z}* does not effect the E^2 -field uncertainty inside TSL (see below *ConvF*).
- NORM(f)_{x,y,z} = NORM_{x,y,z} * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- DCP_{x,y,z}*: DCP are numerical linearization parameters assessed based on the data of power sweep (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 *NORM_{x,y,z} * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.

Probe EX3DV4

SN:3578

Manufactured:	November 4, 2005
Last calibrated:	May 20, 2008
Recalibrated:	June 26, 2009

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	0.55 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP X	90 mV
NormY	0.50 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Y	91 mV
NormZ	0.55 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$	DCP Z	97 mV

Sensitivity in Tissue Simulating Liquid (Conversion Factors)

Please see Page 8.

Boundary Effect

TSL	900 MHz	Typical SAR gradient: 5 % per mm		
	Sensor Center to Phantom Surface Distance	2.0 mm	3.0 mm	
	SAR _{be} [%] Without Correction Algorithm	10.2	5.6	
	SAR _{be} [%] With Correction Algorithm	0.6	0.3	
TSL	1810 MHz	Typical SAR gradient: 10 % per mm		
	Sensor Center to Phantom Surface Distance	2.0 mm	3.0 mm	
	SAR _{be} [%] Without Correction Algorithm	11.2	5.9	
	SAR _{be} [%] With Correction Algorithm	0.8	0.6	

Sensor Offset

Probe Tip to Sensor Center	1.0 mm
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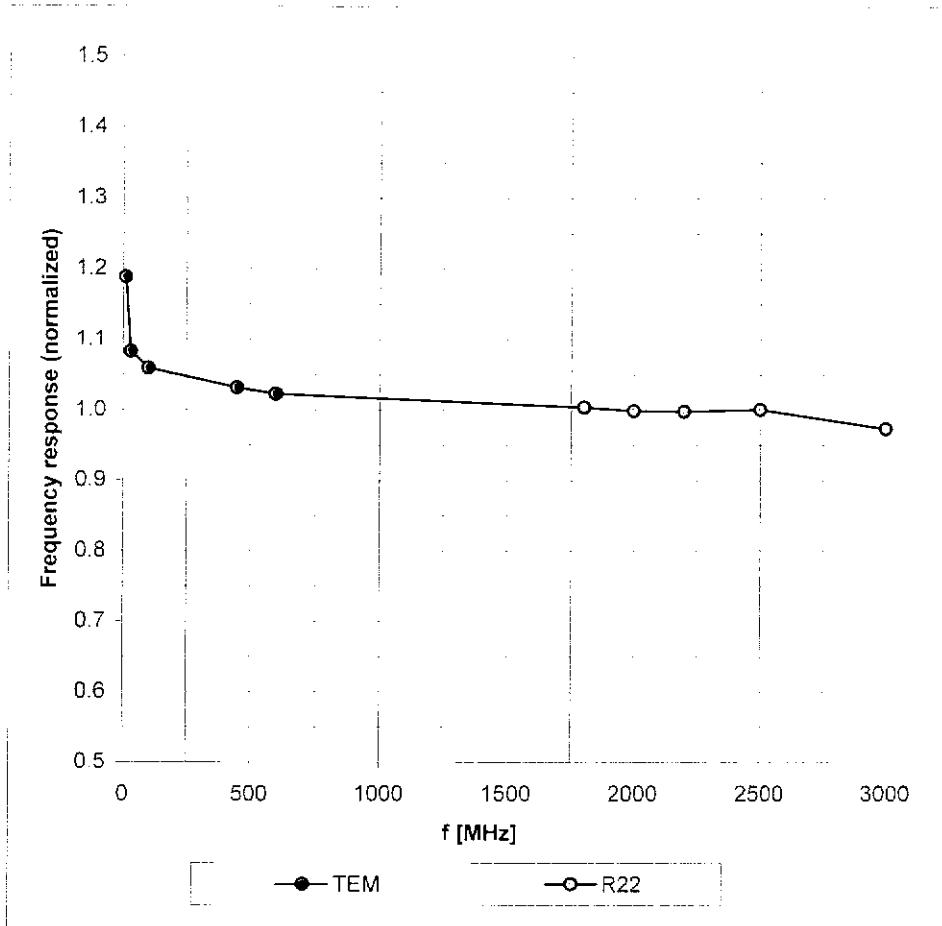
The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

^A The uncertainties of NormX,Y,Z do not affect the E²-field uncertainty inside TSL (see Page 8).

^B Numerical linearization parameter: uncertainty not required.

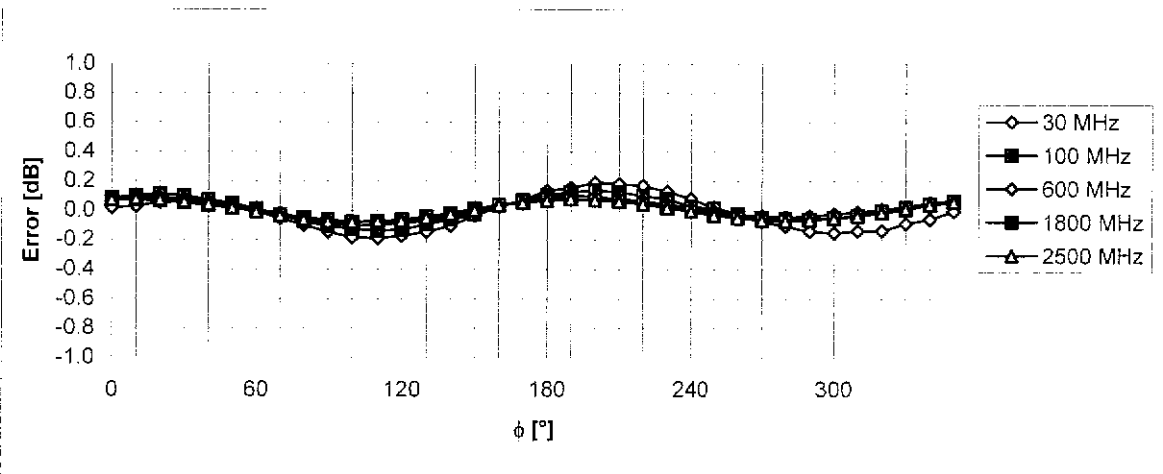
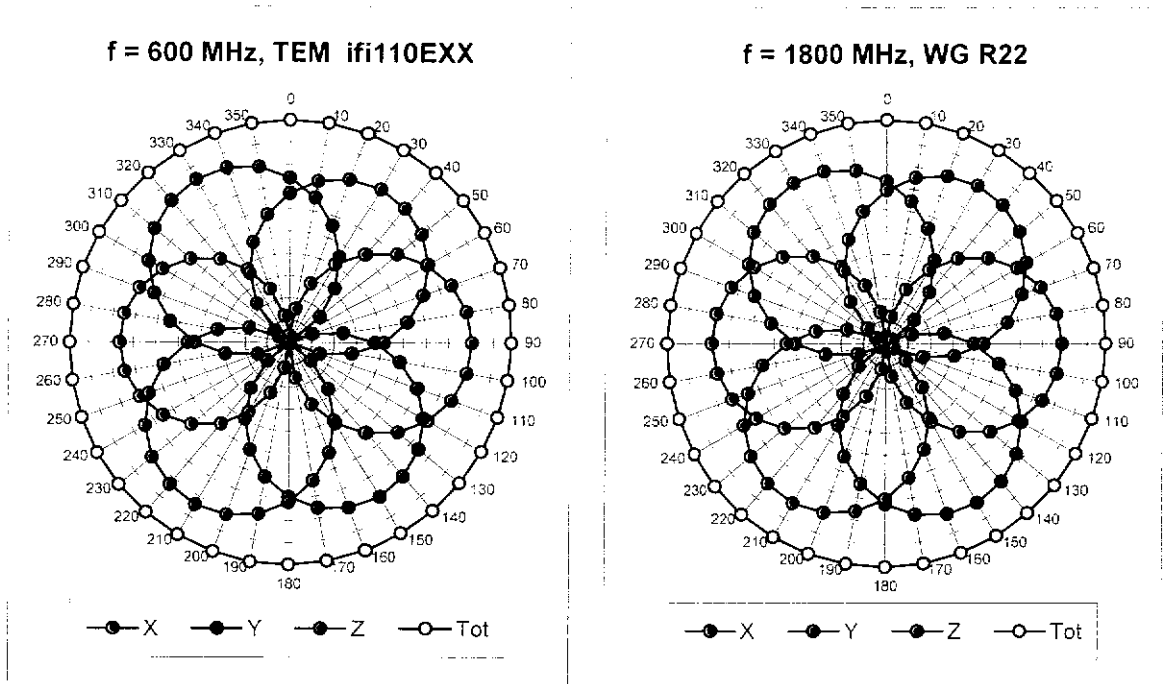
Frequency Response of E-Field

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



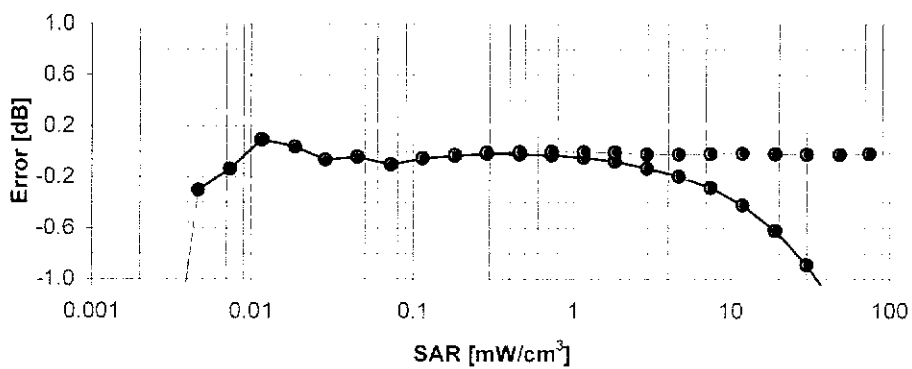
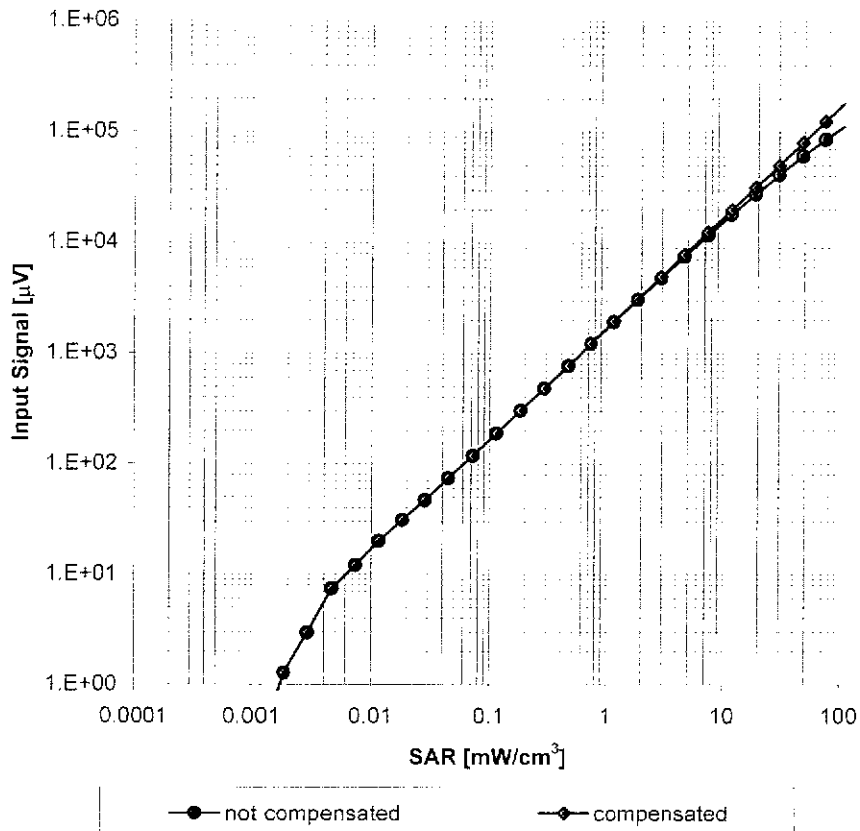
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

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



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

Dynamic Range $f(\text{SAR}_{\text{head}})$ (Waveguide R22, $f = 1800 \text{ MHz}$)



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

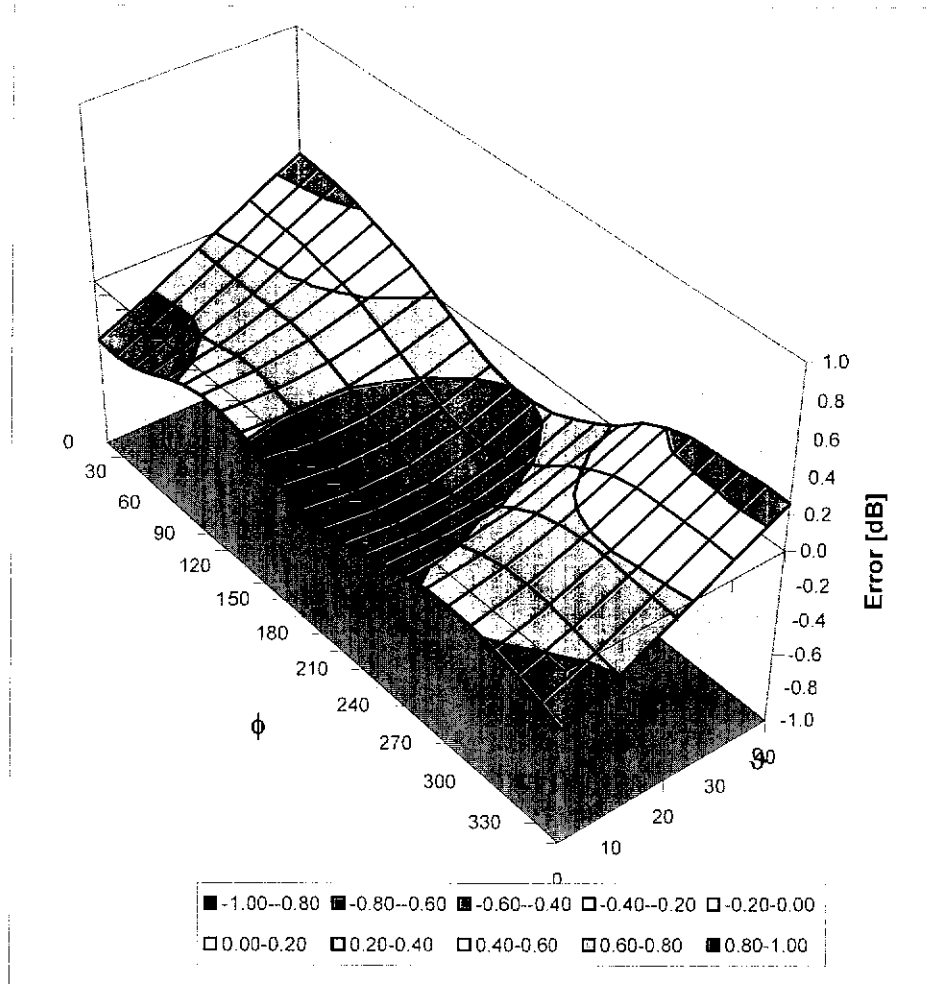
Conversion Factor Assessment

f [MHz]	Validity [MHz] ^c	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.95	0.58	8.27 ± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.83	0.62	7.97 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.88	0.62	6.99 ± 11.0% (k=2)
1900	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.93	0.60	6.96 ± 11.0% (k=2)
2300	± 50 / ± 100	Head	39.5 ± 5%	1.67 ± 5%	0.79	0.63	6.71 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.71	0.61	6.39 ± 11.0% (k=2)
2600	± 50 / ± 100	Head	39.0 ± 5%	1.96 ± 5%	0.56	0.68	6.38 ± 11.0% (k=2)
3500	± 50 / ± 100	Head	37.9 ± 5%	2.91 ± 5%	0.45	0.96	6.16 ± 13.1% (k=2)
5200	± 50 / ± 100	Head	36.0 ± 5%	4.66 ± 5%	0.50	1.80	4.07 ± 13.1% (k=2)
5300	± 50 / ± 100	Head	35.9 ± 5%	4.76 ± 5%	0.50	1.80	3.85 ± 13.1% (k=2)
5500	± 50 / ± 100	Head	35.6 ± 5%	4.96 ± 5%	0.50	1.80	3.80 ± 13.1% (k=2)
5600	± 50 / ± 100	Head	35.5 ± 5%	5.07 ± 5%	0.50	1.80	3.80 ± 13.1% (k=2)
5800	± 50 / ± 100	Head	35.3 ± 5%	5.27 ± 5%	0.50	1.80	3.70 ± 13.1% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.82	0.64	8.26 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.76	0.65	8.04 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.74	0.67	6.95 ± 11.0% (k=2)
1900	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.75	0.68	6.76 ± 11.0% (k=2)
2300	± 50 / ± 100	Body	52.8 ± 5%	1.85 ± 5%	0.65	0.69	6.80 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.75	0.62	6.62 ± 11.0% (k=2)
2600	± 50 / ± 100	Body	52.5 ± 5%	2.16 ± 5%	0.51	0.81	6.47 ± 11.0% (k=2)
3500	± 50 / ± 100	Body	51.3 ± 5%	3.31 ± 5%	0.27	1.51	5.68 ± 13.1% (k=2)
5200	± 50 / ± 100	Body	49.0 ± 5%	5.30 ± 5%	0.60	1.90	3.70 ± 13.1% (k=2)
5300	± 50 / ± 100	Body	48.5 ± 5%	5.42 ± 5%	0.60	1.90	3.55 ± 13.1% (k=2)
5500	± 50 / ± 100	Body	48.6 ± 5%	5.65 ± 5%	0.55	1.90	3.42 ± 13.1% (k=2)
5600	± 50 / ± 100	Body	48.5 ± 5%	5.77 ± 5%	0.55	1.90	3.40 ± 13.1% (k=2)
5800	± 50 / ± 100	Body	48.2 ± 5%	6.00 ± 5%	0.60	1.90	3.40 ± 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: $\pm 2.6\%$ ($k=2$)