

# SAR TEST REPORT

Equipment Under Test	Wireless Lite-N USB Adapter
Model Number	TL-WN727N
Company Name	TP-LINK TECHNOLOGIES CO,LTD.
Company Address	Building 7, Second Part, Honghualing Industrial Zone, Xili town, Nanshan, Shenzhen, P. R China
Date of Receipt	2009.03.30
Date of Test(s)	2009.04.02-2009.04.18
Date of Issue	2009.04.30

Standards:

**FCC OET Bulletin 65 supplement C,  
ANSI/IEEE C95.1 , C95.3, IEEE 1528**

In the configuration tested, the EUT complied with the standards specified above.

## Remarks:

This report details the results of the testing carried out on one sample, the results contained in this test report do not relate to other samples of the same product. The manufacturer should ensure that all products in series production are in conformity with the product sample detailed in this report.

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Tested by : Antony Wu  
Engineer

Date : 2009.04.20

Approved by : Robert Chang  
Tech. Manager

Date : 2009.04.30

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# 1. General Information

## 1.1 Testing Laboratory

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## 1.2 Details of Applicant

Name	TP-LINK TECHNOLOGIES CO,LTD.
Address	Building 7, Second Part, Honghualing Industrial Zone, Xili town, Nanshan, Shenzhen, P. R China
Telephone	0755-26525554
Fax	0755-26504832
Contact Person	Lisai
E-mail	<a href="mailto:lisai@tp-link.com.cn">lisai@tp-link.com.cn</a>

## 1.3 Description of EUT

EUT Name	Wireless Lite-N USB Adapter
Brand Name	TL-LINK
Model Number	TL-WN727N
Mode of Operation	WLAN802.11 b/g/n
FCC ID	TE7WN727N
Duty Cycle	WLAN 802.11b/g/n
	1
Modulation mode	WLAN 802.11b/g/n
	CCK / OFDM

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Maximum RF Conducted Power (Average)	WLAN 802.11b	WLAN 802.11g	WLAN 802.11n
	14.86 dbm	14.74 dbm	14.02 dbm
TX Frequency range (MHz)	WLAN 802.11b/g/n 2412 - 2462		
Channel Number (ARFCN)	WLAN 802.11b/g/n 1 - 11		
Antenna Type	Internal Antenna		
Definition	Production unit		
Max. SAR Measured (1 g)	<b>1.13 mW/g</b> <b>At WLAN 802.11 b active _CH1_ Configuration 1</b>		

TL-LINK_TL-WN727N 802.11 n CH 6 All Data Rate Conducted Power (dbm)								
HT MixMode					Greenfield			
Bandwidth 20Mhz			Bandwidth 40Mhz		Bandwidth 20Mhz		Bandwidth 40Mhz	
Rate	6.5M	13.32	13.5M	13.56	6.5M	13.34	13.5M	13.57
	13M	13.07	27M	13.54	13M	13.19	27M	13.53
	19.5M	12.98	40.5M	13.50	19.5M	13.03	40.5M	13.52
	26M	12.88	54M	13.22	26M	12.96	54M	13.31
	39M	11.34	81M	11.68	39M	11.59	81M	11.70
	52M	11.33	108M	11.67	52M	11.53	108M	11.65
	58.5M	9.36	121.5M	9.77	58.5M	9.53	121.5M	9.8
	65M	9.32	135M	9.73	65M	9.49	135M	9.76

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## 1.4 Test Environment

Ambient Temperature:  $22 \pm 2^{\circ}\text{C}$

Tissue Simulating Liquid:  $22 \pm 2^{\circ}\text{C}$

## 1.5 Operation description

The EUT is a USB Data Modem. When we use it, it will be defined as a portable device since the Notebook will place on the thigh, so SAR measurement is mandatory. The EUT is controlled by chip-specific software installed in notebook, and the communication between the EUT and the tester is established by air link. Measurements are performed respectively on the lowest, middle and highest channels of the operating band(s). The EUT is set to maximum power level during all tests.

When test WLAN 802.11n, We measurement conducted power with all data rates, and choose the modes and data rates with maximum conducted power to test , on the lowest, middle and highest channels and 4 configurations

By using the program subordinated in the computer, and change into the written channel, and then test of set in highest power. We will test it with 4 configurations , according to KDB447498

Configuration 1: Back side of the EUT is paralleled and contacted with flat phantom.  
(Appendix-Fig.3)

Configuration 2: Front side of the EUT is paralleled and contacted with flat phantom.  
(Appendix-Fig.4)

Configuration 3: Bottom side of the Notebook is paralleled and contacted with flat phantom, and left side of the EUT is paralleled with flat phantom.  
(Appendix-Fig.5)

Configuration 4: Bottom side of the Notebook is paralleled and contacted with flat phantom, and right side of the EUT is paralleled with flat phantom.  
(Appendix-Fig.6)

## 1.6 The SAR Measurement System

A photograph of the SAR measurement System is given in Fig. a. This SAR Measurement System uses a Computer-controlled 3-D stepper motor system ( SPEAG DASY 5

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The DASY5 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Staubli RX family) with controller, teach pendant and software. An arm extension is for accommodating the data acquisition electronics (DAE).
- A dosimetric probe, i.e., an isotropic E-field probe optimized and calibrated for usage in tissue simulating liquid. The probe is equipped with an optical surface detector system.
- A data acquisition electronics (DAE) which performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. The unit is battery powered with standard or rechargeable batteries. The signal is optically transmitted to the EOC.

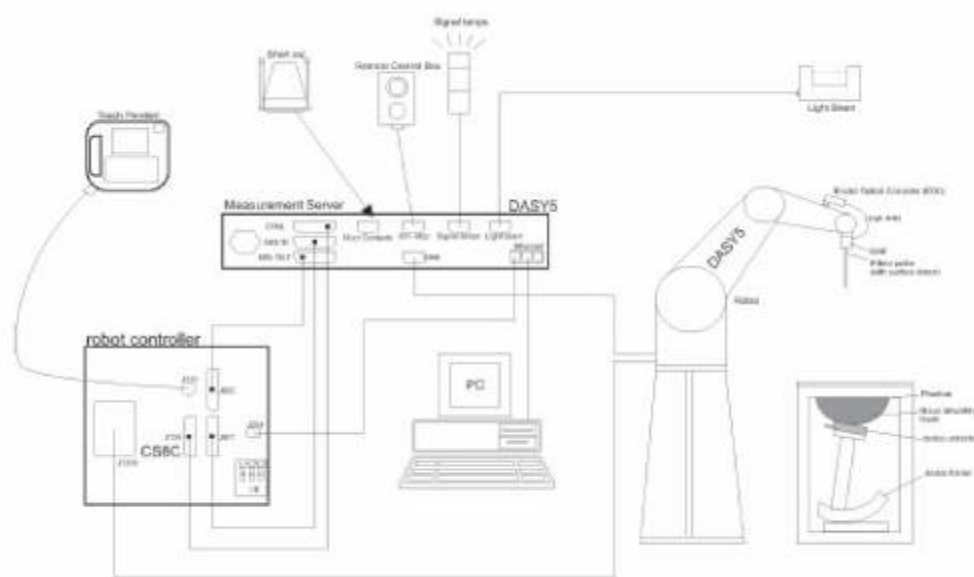


Fig.a The block diagram of SAR system.

- The Electro-optical converter (EOC) performs the conversion between optical and


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electrical of the signals for the digital communication to the DAE and for the analog signal from the optical surface detection. The EOC is connected to the measurement server.

- The function of the measurement server is to perform the time critical tasks such as signal filtering, control of the robot operation and fast movement interrupts.
- A probe alignment unit which improves the (absolute) accuracy of the probe positioning.
  - A computer operating Windows 2000 or Windows XP.
  - DASY5 software.
- Remote control with teach pendant and additional circuitry for robot safety such as warning lamps, etc.
  - The SAM twin phantom enabling testing left-hand and right-hand usage.
  - The device holder for handheld mobile phones.
  - Tissue simulating liquid mixed according to the given recipes.
  - Validation dipole kits allowing to validate the proper functioning of the system.

## 1.7 System Components

### ES3DV3 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)		
Calibration	Basic Broad Band Calibration in air Conversion Factors (CF) for HSL2450 MHZ Additional CF for other liquids and frequencies upon request		
Frequency	10 MHz to > 3 GHz; Linearity: $\pm 0.6$ 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 $\mu$ W/g to > 100 mW/g; Linearity: $\pm 0.6$ dB (noise: typically < 1 $\mu$ W/g)		

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Dimensions	Overall length: 337 mm (Tip: 10 mm) Tip diameter: 4 mm (Body: 10 mm) Typical distance from probe tip to dipole centers: 2 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%.


## SAM PHANTOM V4.0C

Construction	<p>The shell corresponds to the specifications of the Specific Anthropomorphic Mannequin (SAM) phantom defined in IEEE 1528-200X, CENELEC 50361 and IEC 62209.</p> <p>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.</p>	
Shell Thickness	2 ± 0.2 mm	
Filling Volume	Approx. 25 liters	
Dimensions	Height: 850 mm; Length: 1000 mm; Width: 500 mm	

## DEVICE HOLDER

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Construction	In combination with the Twin SAM Phantom V4.0/V4.0C or Twin SAM, the Mounting Device (made from POM) enables the rotation of the mounted transmitter in spherical coordinates, whereby the rotation point is the ear opening. The devices can be easily and accurately positioned according to IEC, IEEE, CENELEC, FCC or other specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).	 <p>Device Holder</p>
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## 1.8 SAR System Verification

The microwave circuit arrangement for system verification is sketched in Fig. b. The daily system accuracy verification occurs within the flat section of the SAM phantom. A SAR measurement was performed to see if the measured SAR was within  $\pm 5\%$  from the target SAR values. These tests were done at 2450 MHz. The tests were conducted on the same days as the measurement of the DUT. The obtained results from the system accuracy verification are displayed in the table 1 (SAR values are normalized to 1W forward power delivered to the dipole). During the tests, the ambient temperature of the laboratory was in the range  $22.2^{\circ}\text{C}$ , the relative humidity was in the range 62% and the liquid depth above the ear reference points was above 15 cm in all the cases. It is seen that the system is operating within its specification, as the results are within acceptable tolerance of the reference values.

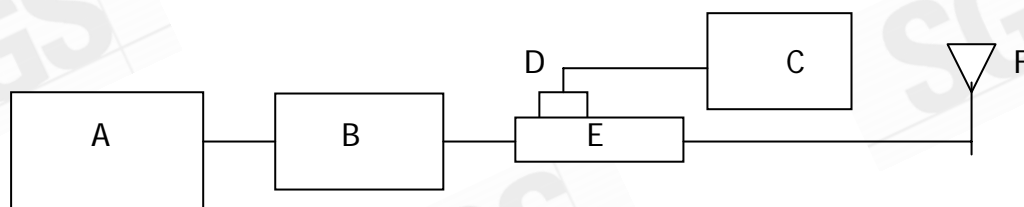
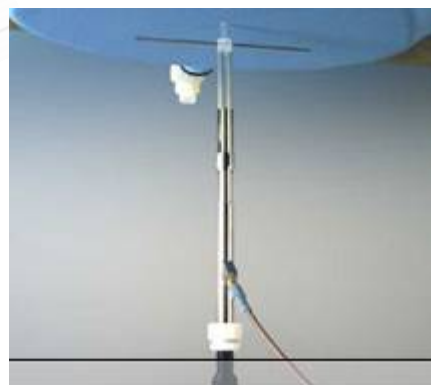


Fig.b The block diagram for SAR system verification

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- A. Agilent Model 8648D Signal Generator.
- B. Mini circuits Model ZHL-42 Amplifier.
- C. Agilent Model E4416A Power Meter.
- D. Agilent Model 8481H Power Sensor.
- E. Agilent Model 777D Dual directional Coupling.
- F. Reference dipole antenna.



Photograph of the dipole Antenna

Validation Kit	Frequency (MHz)	Target SAR (1g) (Pin=250mW)	Measured SAR (1g)	Variation	Measured Date
D2450V2 S/N: 727	2450 MHz (Body)	13.2 m W/g	12.7 m W/g	3.8 %	2009-04-02
D2450V2 S/N: 735	2450 MHz (Body)	12.7 m W/g	12.6 m W/g	0.8 %	2009-04-18

Table 1. Results of system validation

## 1.9 Tissue Simulant Fluid for the Frequency Band

The dielectric properties for this body-simulant fluid were measured by using the HP Model 85070D Dielectric Probe (rates frequency band 200 MHz to 20 GHz) in conjunction with HP 8753D Network Analyzer (30 KHz-6000 MHz ) by using a procedure detailed in Section V.

All dielectric parameters of tissue simulates were measured within 24 hours of SAR measurements. The depth of the tissue simulant in the ear reference point of the phantom was 15cm±5mm during all tests. (Fig .2)

Frequency (MHz)	Tissue type	Measurement date/ Limits	Dielectric Parameters		
			$\rho$	$\sigma$ (S/m)	Simulated Tissue Temperature(° C)
2450	Body	Measured, 2009.04.02	51.6	1.91	21.7
		Recommended Limits	48.36~53.45	1.88~2.08	20-24
2450	Body	Measured, 2009.04.18	53.9	1.98	21.7
		Recommended Limits	50.07~55.34	1.85~2.05	20-24

Table 2. Dielectric Parameters of Tissue Simulant Fluid

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The composition of the brain tissue simulating liquid is:

Ingredient	2450MHz (Body)
DGMBE	301.7ml
Water	698.3ml
Salt	X
Preventol D-7	X
Cellulose	X
Sugar	X
Total amount	1 L (1.0kg)

Table 3. Recipes for tissue simulating liquid

## 1.10 EVALUATION PROCEDURES

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 1 g and 10 g 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.

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In the Area Scan, the gradient of the interpolation function is evaluated to find all the extreme of the SAR distribution. The uncertainty on the locations of the extreme is less than 1/20 of the grid size. Only local maximum within -2 dB of the global maximum are searched and passed for the Cube Scan measurement. In the Cube Scan, the interpolation function is used to extrapolate the Peak SAR from the lowest measurement points to the inner phantom surface (the extrapolation distance). The uncertainty increases with the extrapolation distance. To keep the uncertainty within 1% for the 1 g and 10 g cubes, the extrapolation distance should not be larger than 5mm.

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 7x7x7 scans. The routines are verified and optimized for the grid dimensions used in these cube measurements. The measured volume of 30x30x30mm 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 the last step, a 1g cube is placed numerically into the volume and its averaged SAR is calculated. This cube is moved around until the highest averaged SAR is found. If the highest SAR is found at the edge of the measured volume, the system will issue a warning: higher SAR values might be found outside of the measured volume. In that case the cube measurement can be repeated, using the new interpolated maximum as the center.

## 1.11 Test Standards and Limits

According to FCC 47CFR §2.1093(d) The limits to be used for evaluation are based generally on criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate ("SAR") in Section 4.2 of "IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz," ANSI/IEEE C95.1-1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in "Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86, Section 17.4.5. Copyright

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NCRP, 1986, Bethesda, Maryland 20814.

SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards. The criteria to be used are specified in paragraphs (d)(1) and (d)(2) of this section and shall apply for portable devices transmitting in the frequency range from 100 kHz to 6 GHz. Portable devices that transmit at frequencies above 6 GHz are to be evaluated in terms of the MPE limits specified in § 1.1310 of this chapter. Measurements and calculations to demonstrate compliance with MPE field strength or power density limits for devices operating above 6 GHz should be made at a minimum distance of 5 cm from the radiating source.

(1) Limits for Occupational/Controlled exposure: 0.4 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 8 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 20 W/kg, as averaged over an 10 grams of tissue (defined as a tissue volume in the shape of a cube). Occupational/Controlled limits apply when persons are exposed as a consequence of their employment provided these persons are fully aware of and exercise control over their exposure. Awareness of exposure can be accomplished by use of warning labels or by specific training or education through appropriate means, such as an RF safety program in a work environment.

(2) Limits for General Population/Uncontrolled exposure: 0.08 W/kg as averaged over the whole-body and spatial peak SAR not exceeding 1.6 W/kg as averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube). Exceptions are the hands, wrists, feet and ankles where the spatial peak SAR shall not exceed 4 W/kg, as averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube). General Population/Uncontrolled limits apply when the general public may be exposed, or when persons that are exposed as a consequence of their employment may not be fully aware of the potential for exposure or do not exercise control over their exposure. Warning labels placed on consumer devices such as cellular telephones will not be sufficient reason to allow these devices to be evaluated subject to limits for occupational/controlled exposure in paragraph (d)(1) of this section.(Table .4)

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Human Exposure	Uncontrolled Environment General Population	Controlled Environment Occupational
<b>Spatial Peak SAR</b> (Brain)	1.60 m W/g	8.00 m W/g
<b>Spatial Average SAR</b> (Whole Body)	0.08 m W/g	0.40 m W/g
<b>Spatial Peak SAR</b> (Hands/Feet/Ankle/Wrist)	4.00 m W/g	20.00 m W/g

Table .4 RF exposure limits

## Notes:

1. Uncontrolled environments are defined as locations where there is potential exposure of individuals who have no knowledge or control of their potential exposure.
2. Controlled environments are defined as locations where there is potential exposure of individuals who have knowledge of their potential exposure and can exercise control over their exposure.

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## 2. Summary of Results

### WLAN 802.11b

<b>Configuration 1:</b> Back side of the EUT is paralleled and contacted with flat phantom.						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	1	2412	14.86 dbm	1.13	22.1	21.7
	6	2437	14.23 dbm	0.843	22.1	21.7
	11	2462	14.20 dbm	0.743	22.1	21.7
<b>Configuration 2:</b> Front side of the EUT is paralleled and contacted with flat phantom.						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450MHz	1	2412	14.86 dbm	0.866	22.1	21.7
	6	2437	14.23 dbm	0.643	22.1	21.7
	11	2462	14.20 dbm	0.563	22.1	21.7
<b>Configuration 3:</b> Bottom side of the Notebook is paralleled and contacted with flat phantom, and left side of the EUT is paralleled with flat phantom.						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	1	2412	14.86 dbm	0.294	22.1	21.7
	6	2437	14.23 dbm	0.205	22.1	21.7
	11	2462	14.20 dbm	0.196	22.1	21.7
<b>Configuration 4:</b> Bottom side of the Notebook is paralleled and contacted with flat phantom, and right side of the EUT is paralleled with flat phantom						
Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450MHz	1	2412	14.86 dbm	0.6	22.1	21.7
	6	2437	14.23 dbm	0.422	22.1	21.7
	11	2462	14.20 dbm	0.341	22.1	21.7

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## WLAN 802.11g

**Configuration 1:** Back side of the EUT is paralleled and contacted with flat phantom.

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	1	2412	14.74 dbm	0.448	22.1	21.7
	6	2437	14.25 dbm	0.345	22.1	21.7
	11	2462	14.17 dbm	0.305	22.1	21.7

**Configuration 2:** Front side of the EUT is paralleled and contacted with flat phantom.

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450MHz	1	2412	14.74 dbm	0.389	22.1	21.7
	6	2437	14.25 dbm	0.294	22.1	21.7
	11	2462	14.17 dbm	0.261	22.1	21.7

**Configuration 3:** Bottom side of the Notebook is paralleled and contacted with flat phantom, and left side of the EUT is paralleled with flat phantom.

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	1	2412	14.74 dbm	0.137	22.1	21.7
	6	2437	14.25 dbm	0.116	22.1	21.7
	11	2462	14.17 dbm	0.107	22.1	21.7

**Configuration 4:** Bottom side of the Notebook is paralleled and contacted with flat phantom, and right side of the EUT is paralleled with flat phantom

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450MHz	1	2412	14.74 dbm	0.278	22.1	21.7
	6	2437	14.25 dbm	0.194	22.1	21.7
	11	2462	14.17 dbm	0.159	22.1	21.7

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## WLAN 802.11n

**Configuration 1:** Back side of the EUT is paralleled and contacted with flat phantom.

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	1	2412	14.02 dbm	0.964	22.1	21.7
	6	2437	13.57 dbm	0.738	22.1	21.7
	11	2462	13.48 dbm	0.647	22.1	21.7

**Configuration 2:** Front side of the EUT is paralleled and contacted with flat phantom.

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450MHz	1	2412	14.02 dbm	0.786	22.1	21.7
	6	2437	13.57 dbm	0.598	22.1	21.7
	11	2462	13.48 dbm	0.532	22.1	21.7

**Configuration 3:** Bottom side of the Notebook is paralleled and contacted with flat phantom, and left side of the EUT is paralleled with flat phantom.

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450 MHz	1	2412	14.02 dbm	0.656	22.1	21.7
	6	2437	13.57 dbm	0.507	22.1	21.7
	11	2462	13.48 dbm	0.424	22.1	21.7

**Configuration 4:** Bottom side of the Notebook is paralleled and contacted with flat phantom, and right side of the EUT is paralleled with flat phantom

Frequency	Channel	MHz	Conducted Output Power (Average)	Measured(W/kg) 1g	Amb. Temp[ ° C]	Liquid Temp[ ° C]
2450MHz	1	2412	14.02 dbm	0.5	22.1	21.7
	6	2437	13.57 dbm	0.379	22.1	21.7
	11	2462	13.48 dbm	0.284	22.1	21.7

Note: SAR measurement results for the data card at maximum output power.

### 3. Instruments List

Manufacturer	Device	Type	Serial number	Date of last calibration
Schmid & Partner Engineering AG	Dosimetric E-FieldProbe	ES3DV3	3172	Jun.23.2008
Schmid & Partner Engineering AG	2450MHz System Validation Dipole	D2450V2 D2450V2	727 735	Apr.11.2008 May.22.2008
Schmid & Partner Engineering AG	Data acquisition Electronics	DAE4	856	May.07.2008
Schmid & Partner Engineering AG	Software	DASY 5 V5.0 Build125	N/A	Calibration isn't necessary
Schmid & Partner Engineering AG	Phantom	SAM	N/A	Calibration isn't necessary
Agilent	Network Analyzer	8753D	3410A05547	Mar.31.2009
Agilent	Dielectric Probe Kit	85070D	US01440168	Calibration isn't necessary
Agilent	Dual-directional coupler	777D	50114	Aug.26.2008
Agilent	RF Signal Generator	E4438c	MY45093613	May.21.2008
Agilent	Power Sensor	8481H	MY41091361	May.20.2008
R&S	Radio Communication Test	CMU200	109326	May.11.2008

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## 4. Measurements

Date/Time: 04/02/2009 02:48:54

### Configuration 1\_CH1

**DUT: TL-WN727N;**

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.88 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (interpolated) = 1.24 mW/g

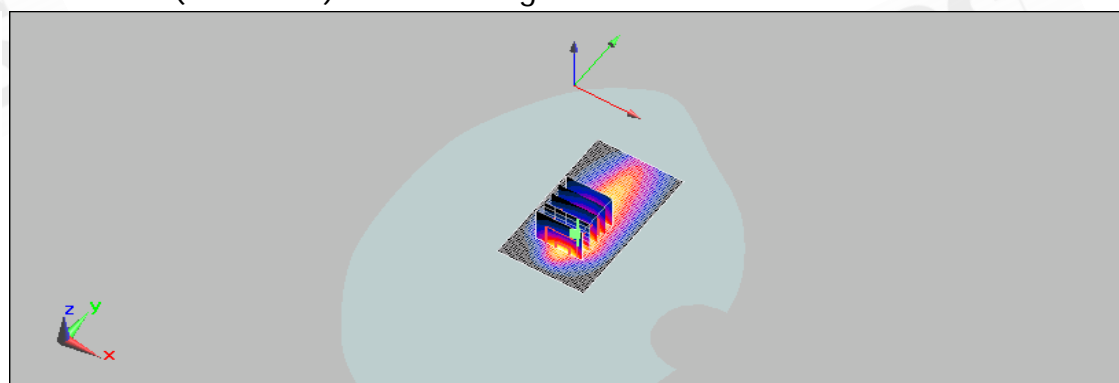
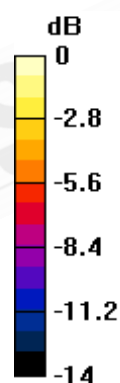
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 7.19 V/m; Power Drift = -0.148 dB

Peak SAR (extrapolated) = 3.02 W/kg

**SAR(1 g) = 1.13 mW/g; SAR(10 g) = 0.531 mW/g**

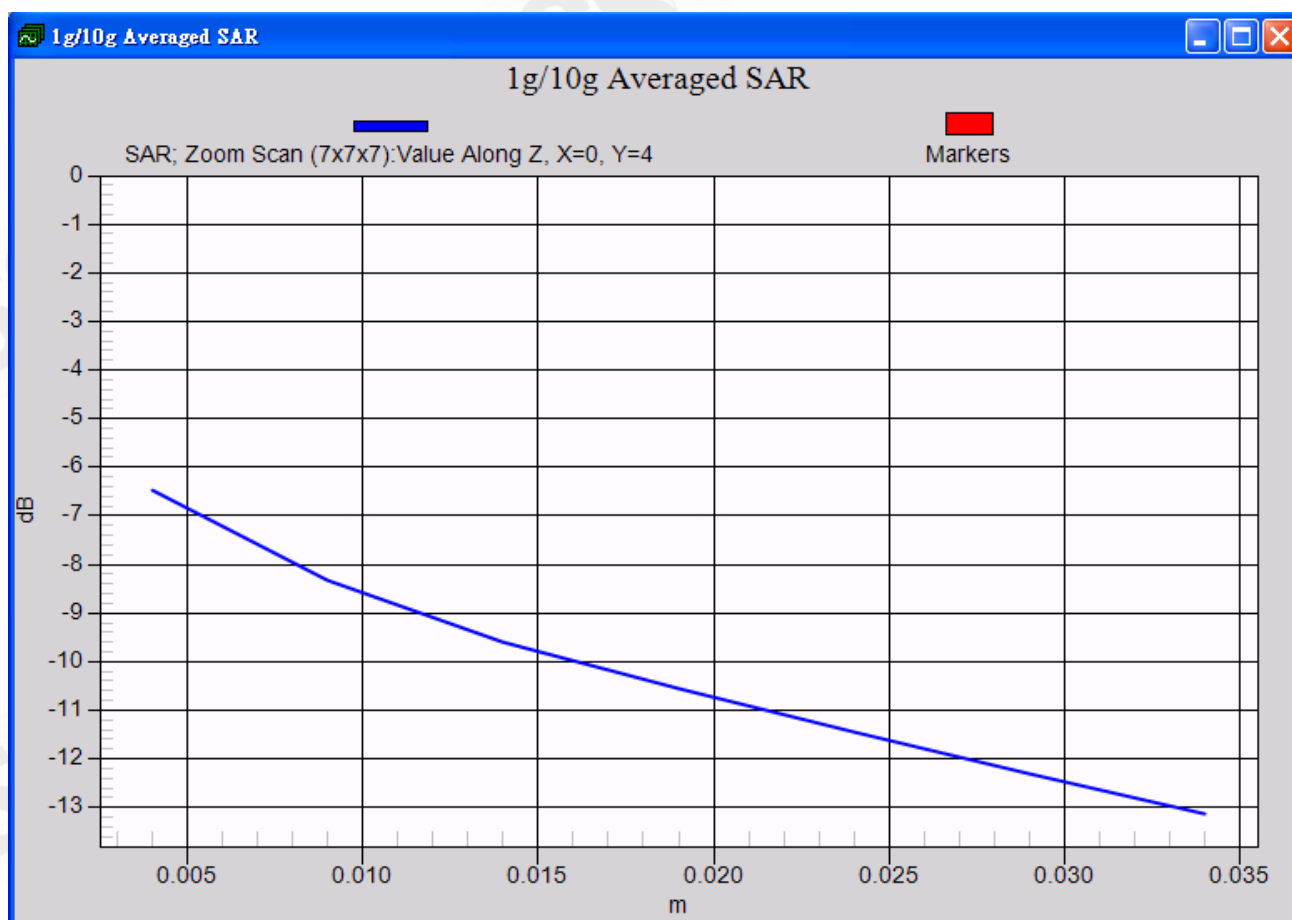
Maximum value of SAR (measured) = 1.09 mW/g



0 dB = 1.09mW/g

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Date/Time: 04/02/2009 03:19:59

## Configuration 1\_CH6

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

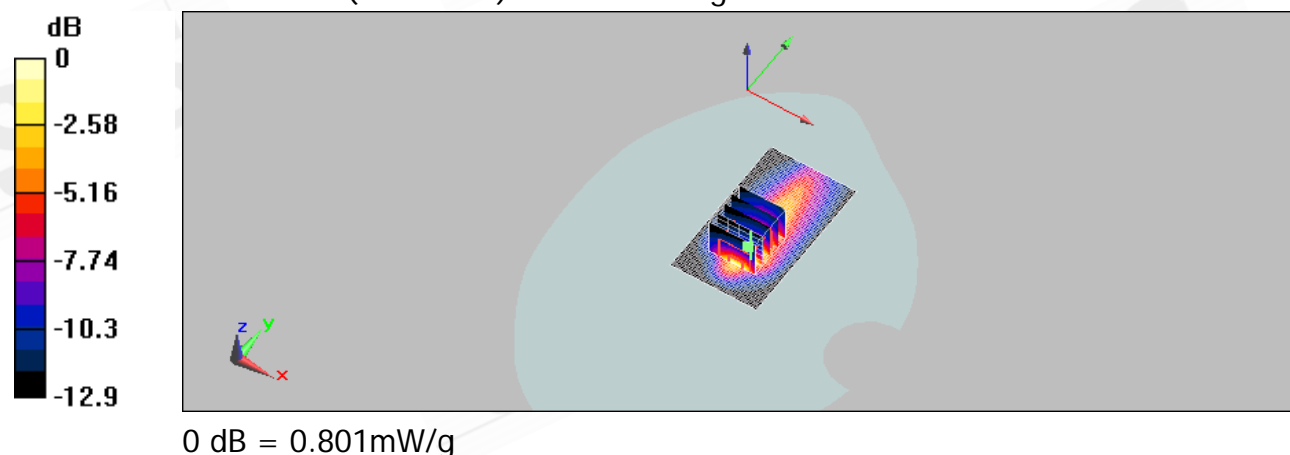
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.903 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 6.42 V/m; Power Drift = -0.00825 dB  
Peak SAR (extrapolated) = 2.26 W/kg

**SAR(1 g) = 0.843 mW/g; SAR(10 g) = 0.399 mW/g**  
Maximum value of SAR (measured) = 0.801 mW/g



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Date/Time: 04/02/2009 03:47:58

## Configuration 1\_CH11

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

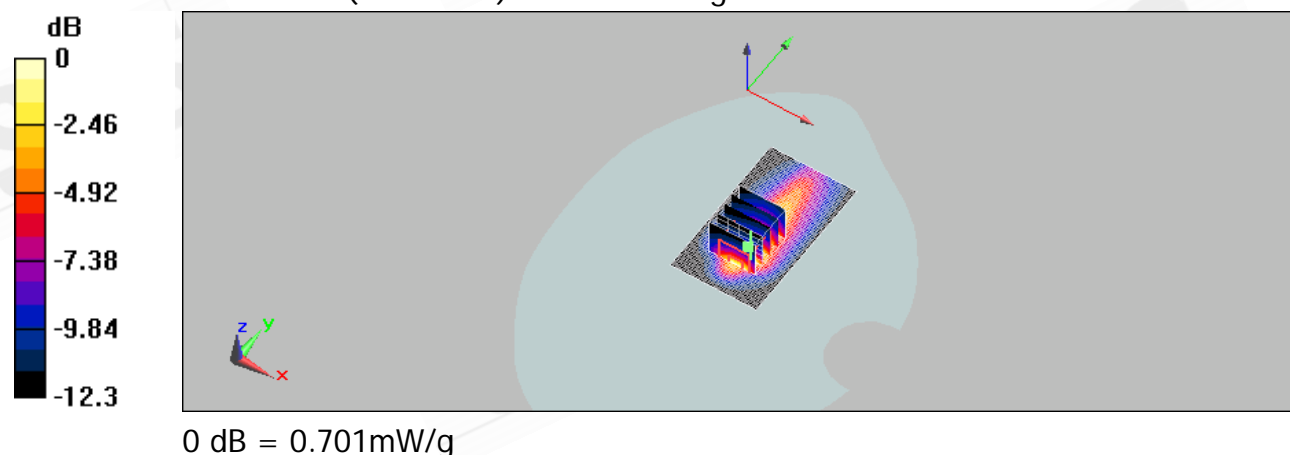
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.786 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 6.13 V/m; Power Drift = -0.053 dB  
Peak SAR (extrapolated) = 2.01 W/kg

**SAR(1 g) = 0.743 mW/g; SAR(10 g) = 0.350 mW/g**  
Maximum value of SAR (measured) = 0.701 mW/g



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Date/Time: 04/02/2009 04:17:34

## Configuration 2\_CH1

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.88 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

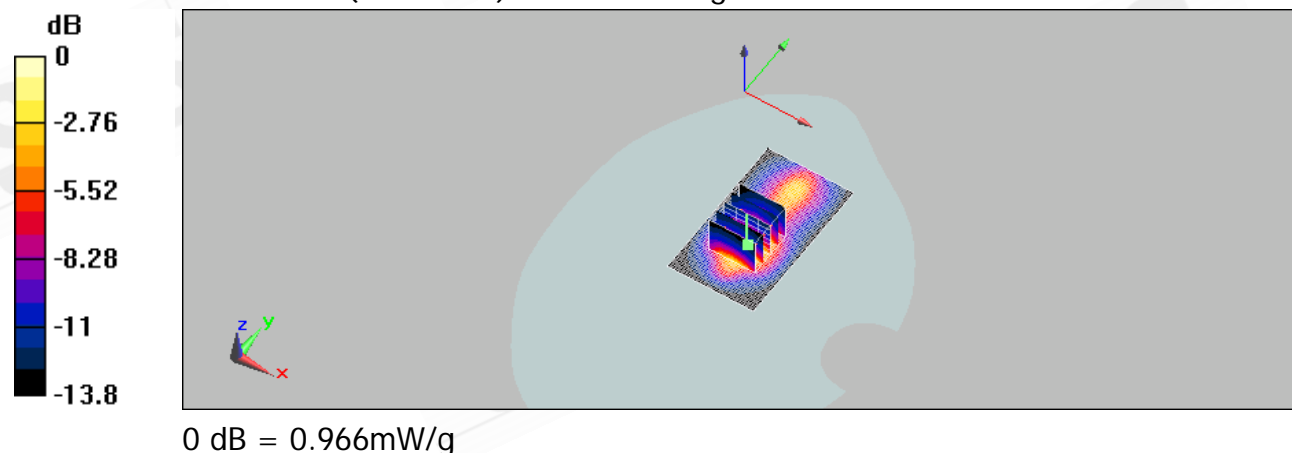
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 1.03 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 7.35 V/m; Power Drift = -0.128 dB  
Peak SAR (extrapolated) = 1.75 W/kg

**SAR(1 g) = 0.866 mW/g; SAR(10 g) = 0.425 mW/g**  
Maximum value of SAR (measured) = 0.966 mW/g



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Date/Time: 04/02/2009 04:49:18

## Configuration 2\_CH6

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.743 mW/g

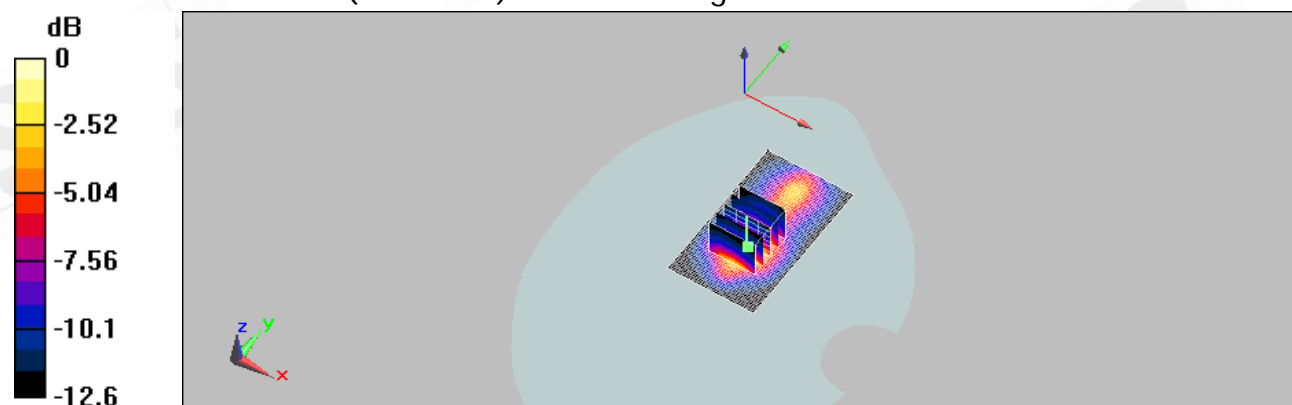
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 6.53 V/m; Power Drift = 0.043 dB

Peak SAR (extrapolated) = 1.3 W/kg

**SAR(1 g) = 0.643 mW/g; SAR(10 g) = 0.319 mW/g**

Maximum value of SAR (measured) = 0.713 mW/g



0 dB = 0.713mW/g

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Date/Time: 04/02/2009 05:21:58

## Configuration 2\_CH11

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.656 mW/g

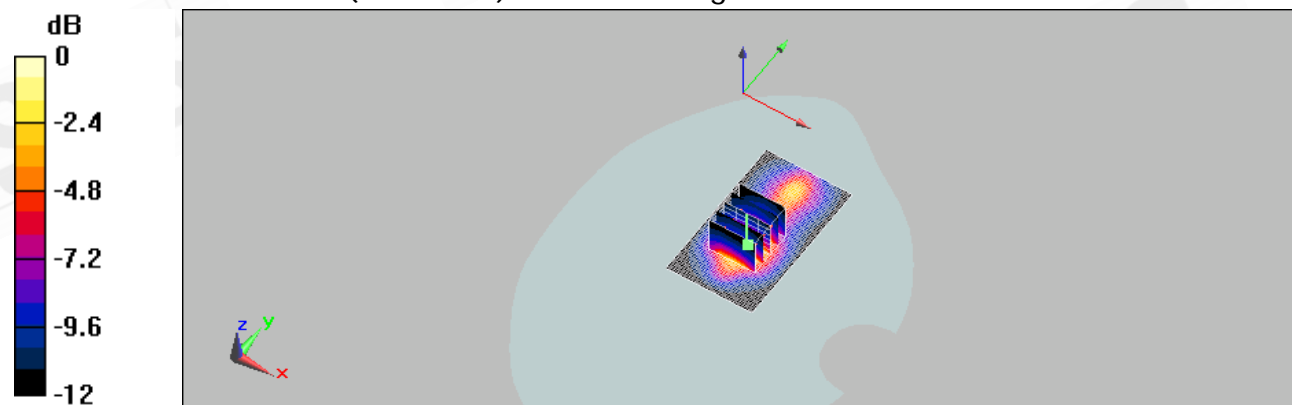
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 6.23 V/m; Power Drift = 0.000333 dB

Peak SAR (extrapolated) = 1.14 W/kg

**SAR(1 g) = 0.563 mW/g; SAR(10 g) = 0.283 mW/g**

Maximum value of SAR (measured) = 0.628 mW/g



0 dB = 0.628mW/g

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Date/Time: 04/02/2009 05:50:45

## Configuration 3\_CH1

**DUT: TL-WN727N;**

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.88 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

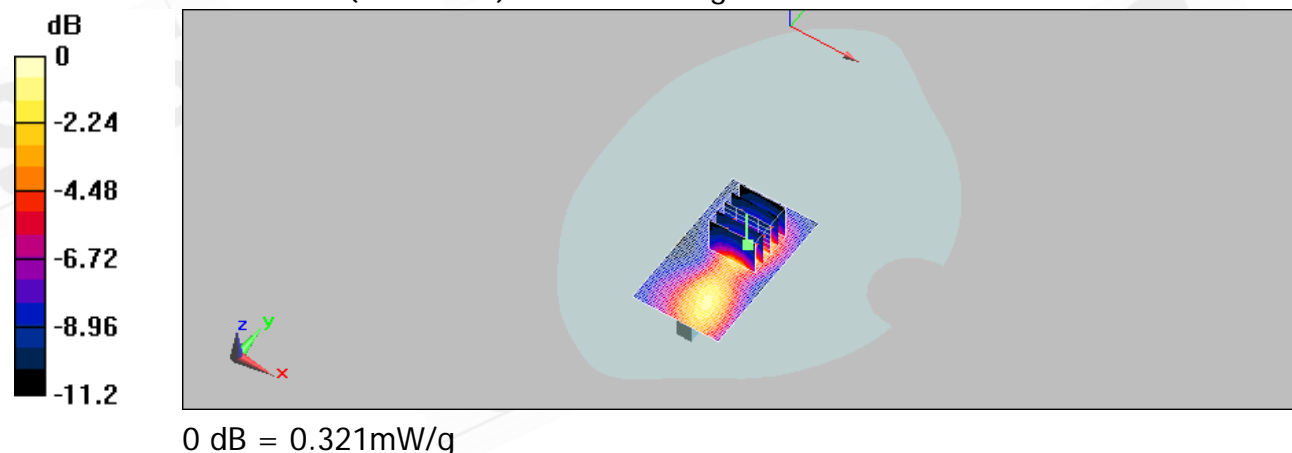
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.342 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 6.13 V/m; Power Drift = -0.153 dB  
Peak SAR (extrapolated) = 0.596 W/kg

**SAR(1 g) = 0.294 mW/g; SAR(10 g) = 0.150 mW/g**  
Maximum value of SAR (measured) = 0.321 mW/g



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Date/Time: 04/02/2009 06:23:55

## Configuration 3\_CH6

**DUT: TL-WN727N;**

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (interpolated) = 0.228 mW/g

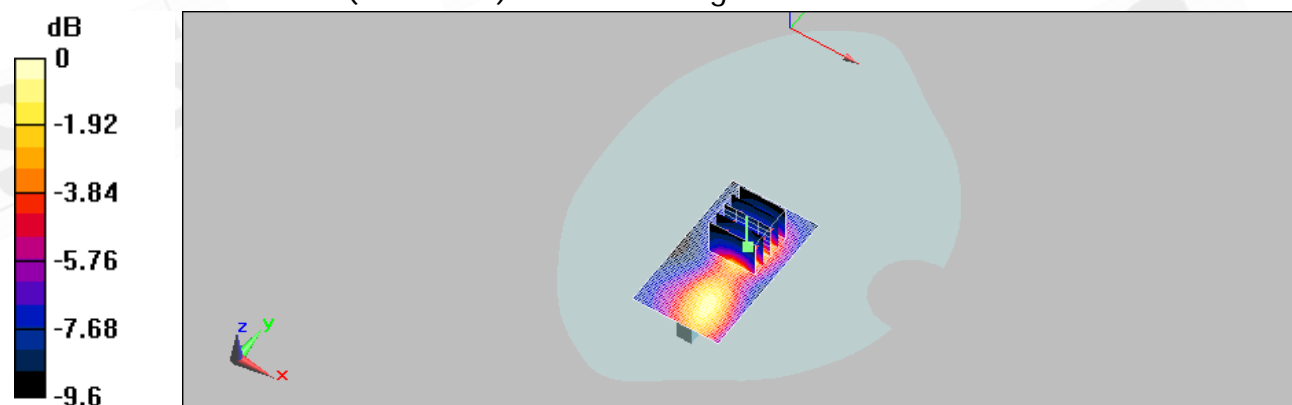
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 5.3 V/m; Power Drift = -0.00714 dB

Peak SAR (extrapolated) = 0.414 W/kg

**SAR(1 g) = 0.205 mW/g; SAR(10 g) = 0.109 mW/g**

Maximum value of SAR (measured) = 0.222 mW/g



0 dB = 0.222mW/g

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Date/Time: 04/02/2009 06:55:45

## Configuration 3\_CH11

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

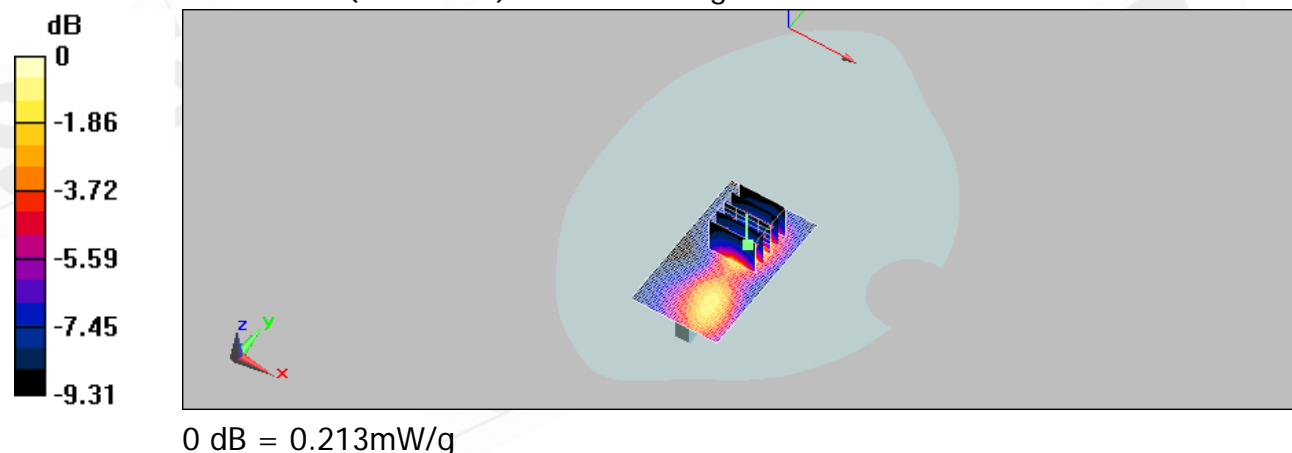
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.220 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 5.4 V/m; Power Drift = 0.030 dB  
Peak SAR (extrapolated) = 0.400 W/kg

**SAR(1 g) = 0.196 mW/g; SAR(10 g) = 0.104 mW/g**  
Maximum value of SAR (measured) = 0.213 mW/g



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Date/Time: 04/02/2009 07:24:16

## Configuration 4\_CH1

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.88 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

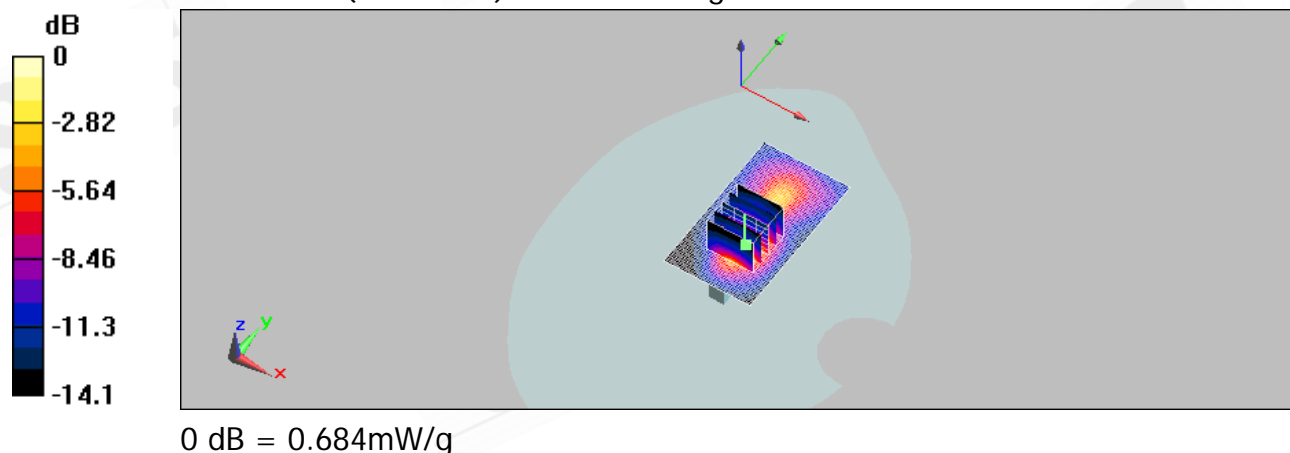
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.677 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 6.4 V/m; Power Drift = 0.189 dB  
Peak SAR (extrapolated) = 1.38 W/kg

**SAR(1 g) = 0.600 mW/g; SAR(10 g) = 0.273 mW/g**  
Maximum value of SAR (measured) = 0.684 mW/g



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Date/Time: 04/02/2009 07:56:39

## Configuration 4\_CH6

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

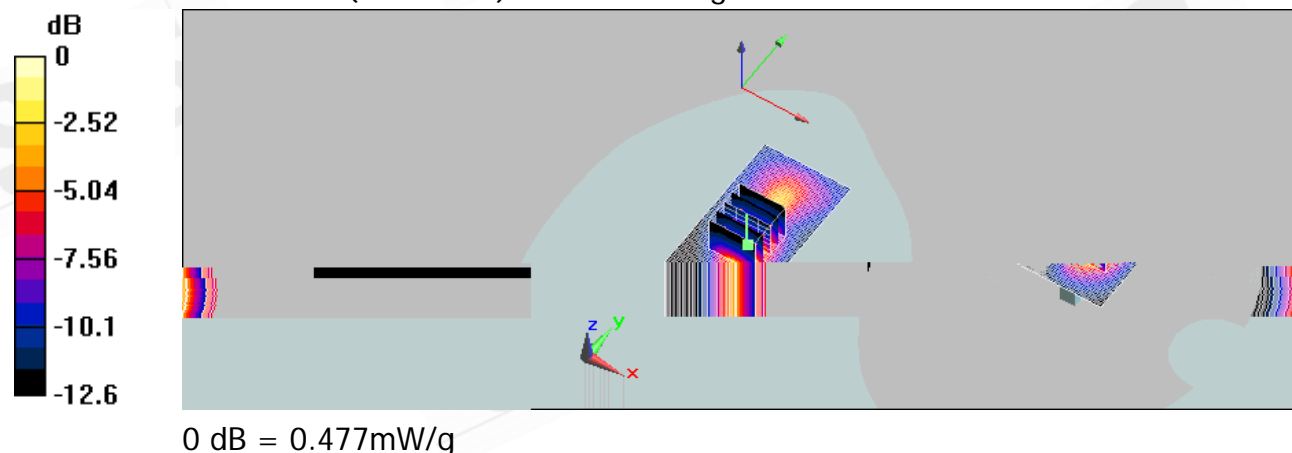
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.498 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 5.83 V/m; Power Drift = -0.035 dB  
Peak SAR (extrapolated) = 0.980 W/kg

**SAR(1 g) = 0.422 mW/g; SAR(10 g) = 0.195 mW/g**  
Maximum value of SAR (measured) = 0.477 mW/g



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Date/Time: 04/02/2009 08:27:02

## Configuration 4\_CH11

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.402 mW/g

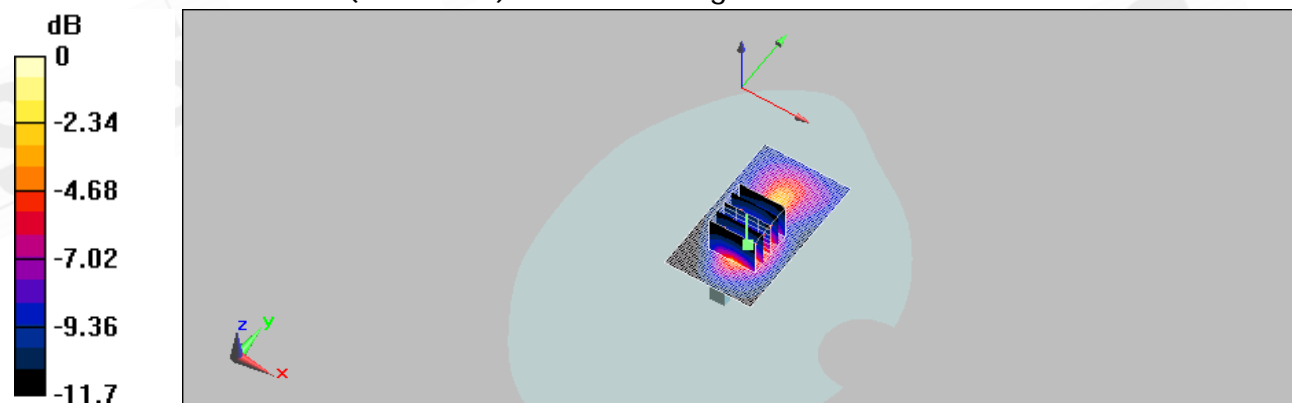
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 5.35 V/m; Power Drift = -0.081 dB

Peak SAR (extrapolated) = 0.799 W/kg

**SAR(1 g) = 0.341 mW/g; SAR(10 g) = 0.159 mW/g**

Maximum value of SAR (measured) = 0.380 mW/g



0 dB = 0.380mW/g

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Date/Time: 04/02/2009 08:59:01

## Configuration 1\_CH1

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.88 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.524 mW/g

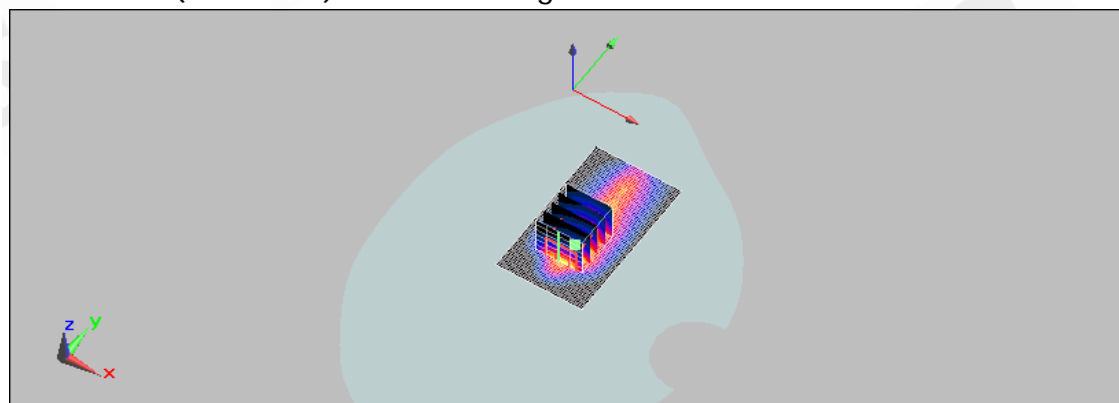
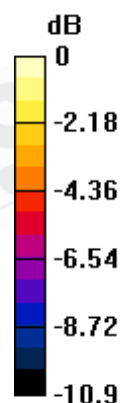
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 5.37 V/m; Power Drift = 0.076 dB

Peak SAR (extrapolated) = 1.41 W/kg

**SAR(1 g) = 0.448 mW/g; SAR(10 g) = 0.229 mW/g**

Maximum value of SAR (measured) = 0.479 mW/g



0 dB = 0.479mW/g

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Date/Time: 04/02/2009 09:31:38

## Configuration 1\_CH6

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

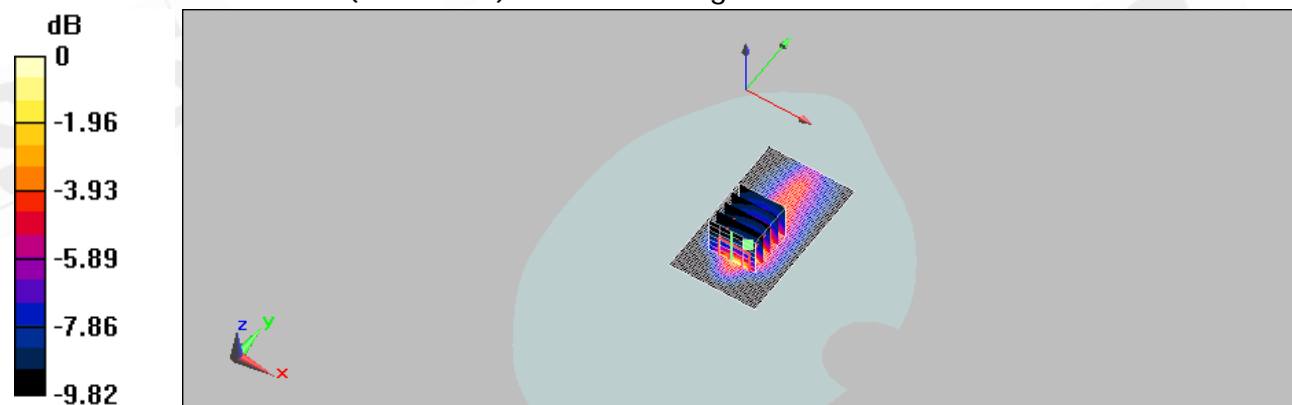
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.393 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 5.16 V/m; Power Drift = -0.013 dB  
Peak SAR (extrapolated) = 1.13 W/kg

**SAR(1 g) = 0.345 mW/g; SAR(10 g) = 0.179 mW/g**  
Maximum value of SAR (measured) = 0.367 mW/g



0 dB = 0.367mW/g

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Date/Time: 04/02/2009 10:02:57

## Configuration 1\_CH11

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

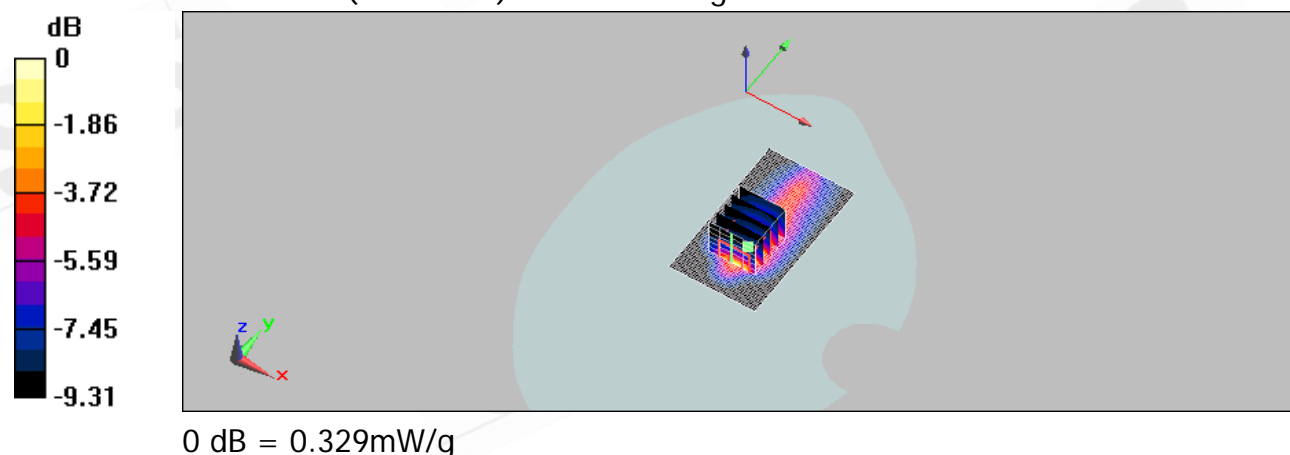
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.343 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 5 V/m; Power Drift = 0.078 dB  
Peak SAR (extrapolated) = 1.03 W/kg

**SAR(1 g) = 0.305 mW/g; SAR(10 g) = 0.160 mW/g**  
Maximum value of SAR (measured) = 0.329 mW/g



Date/Time: 04/02/2009 10:35:38

## Configuration 2\_CH1

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.88 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

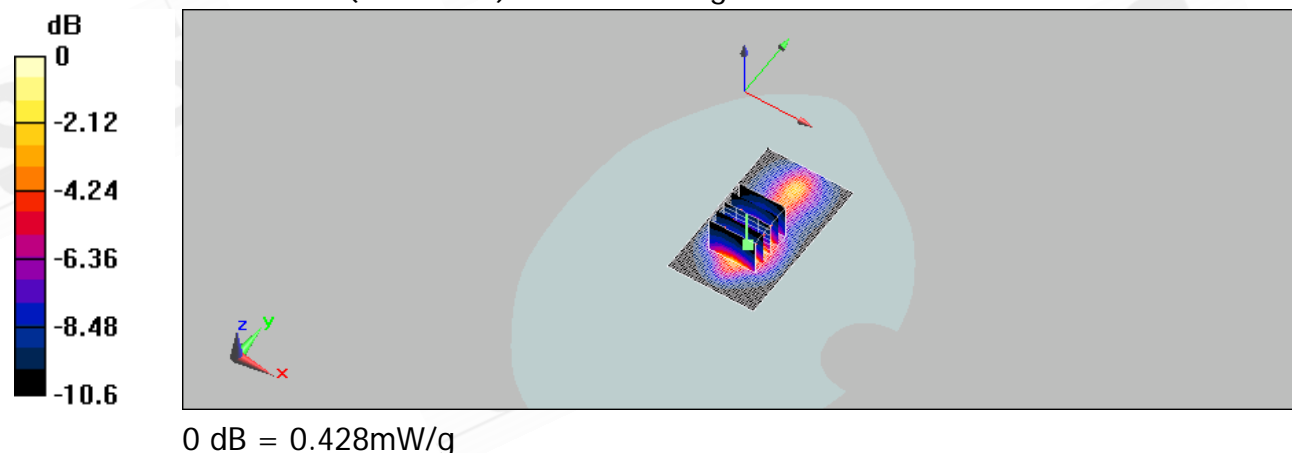
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.445 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 5.76 V/m; Power Drift = -0.010 dB  
Peak SAR (extrapolated) = 0.784 W/kg

**SAR(1 g) = 0.389 mW/g; SAR(10 g) = 0.200 mW/g**  
Maximum value of SAR (measured) = 0.428 mW/g



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Date/Time: 04/02/2009 11:04:06

## Configuration 2\_CH6

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.336 mW/g

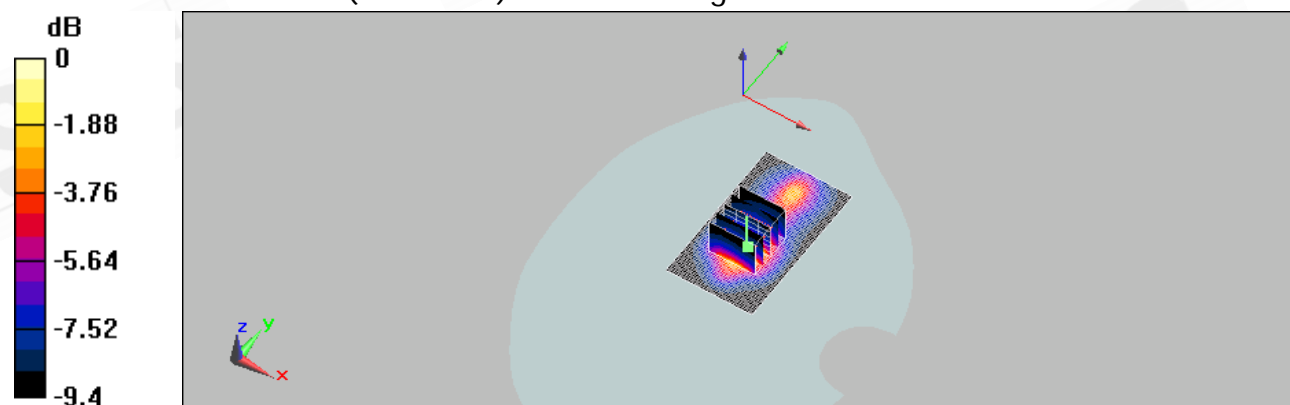
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 5.38 V/m; Power Drift = 0.023 dB

Peak SAR (extrapolated) = 0.596 W/kg

**SAR(1 g) = 0.294 mW/g; SAR(10 g) = 0.156 mW/g**

Maximum value of SAR (measured) = 0.322 mW/g



0 dB = 0.322mW/g

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Date/Time: 04/02/2009 11:37:35

## Configuration 2\_CH11

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.300 mW/g

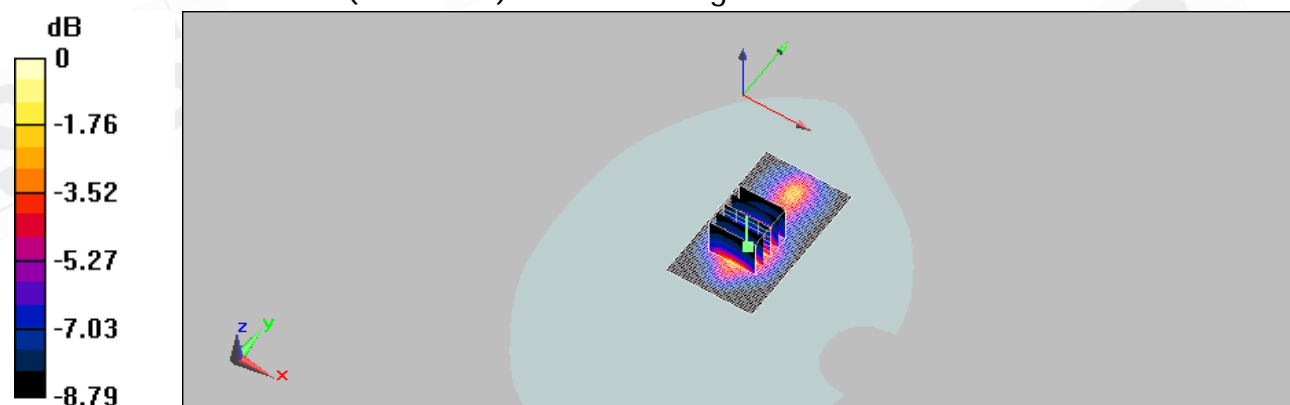
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 5.31 V/m; Power Drift = -0.090 dB

Peak SAR (extrapolated) = 0.520 W/kg

**SAR(1 g) = 0.261 mW/g; SAR(10 g) = 0.141 mW/g**

Maximum value of SAR (measured) = 0.286 mW/g



0 dB = 0.286mW/g

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Date/Time: 04/02/2009 12:06:14

## Configuration 3\_CH1

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.88 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

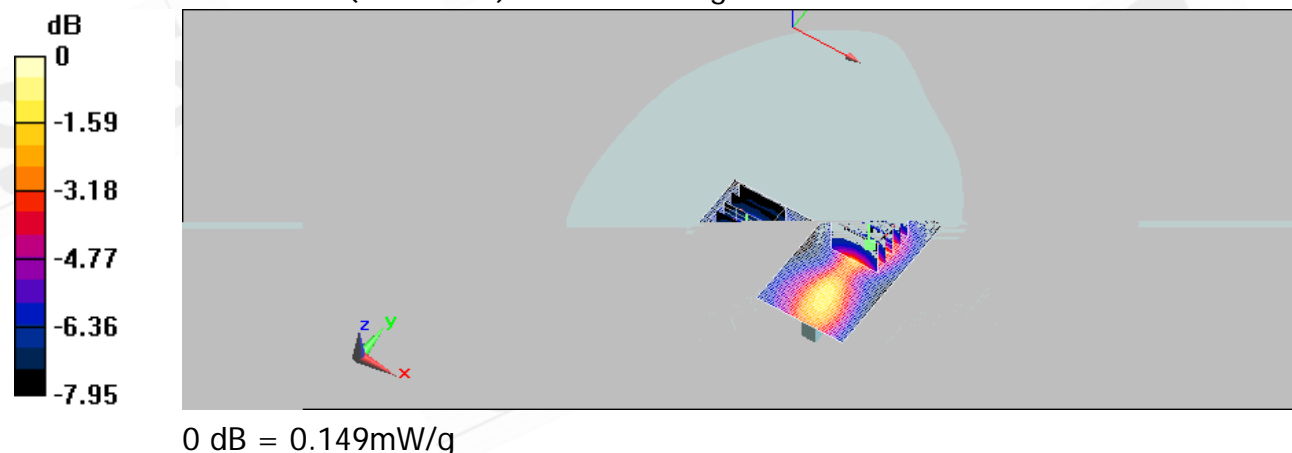
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.153 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 4.7 V/m; Power Drift = -0.122 dB  
Peak SAR (extrapolated) = 0.273 W/kg

**SAR(1 g) = 0.137 mW/g; SAR(10 g) = 0.076 mW/g**  
Maximum value of SAR (measured) = 0.149 mW/g



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Date/Time: 04/02/2009 12:39:45

## Configuration 3\_CH6

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

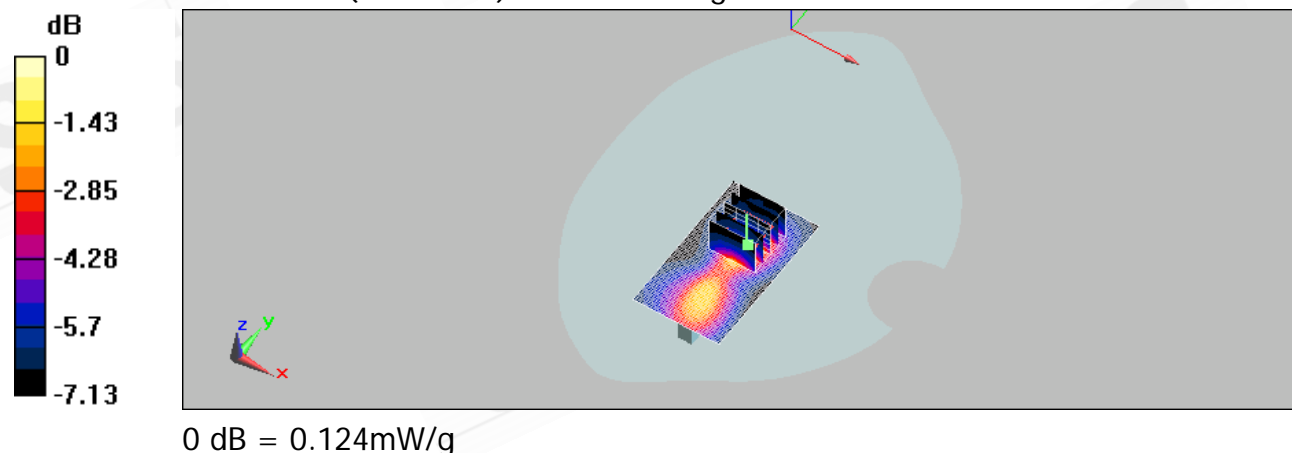
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.125 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 4.44 V/m; Power Drift = 0.068 dB  
Peak SAR (extrapolated) = 0.236 W/kg

**SAR(1 g) = 0.116 mW/g; SAR(10 g) = 0.066 mW/g**  
Maximum value of SAR (measured) = 0.124 mW/g



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Date/Time: 04/02/2009 13:10:01

## Configuration 3\_CH11

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.118 mW/g

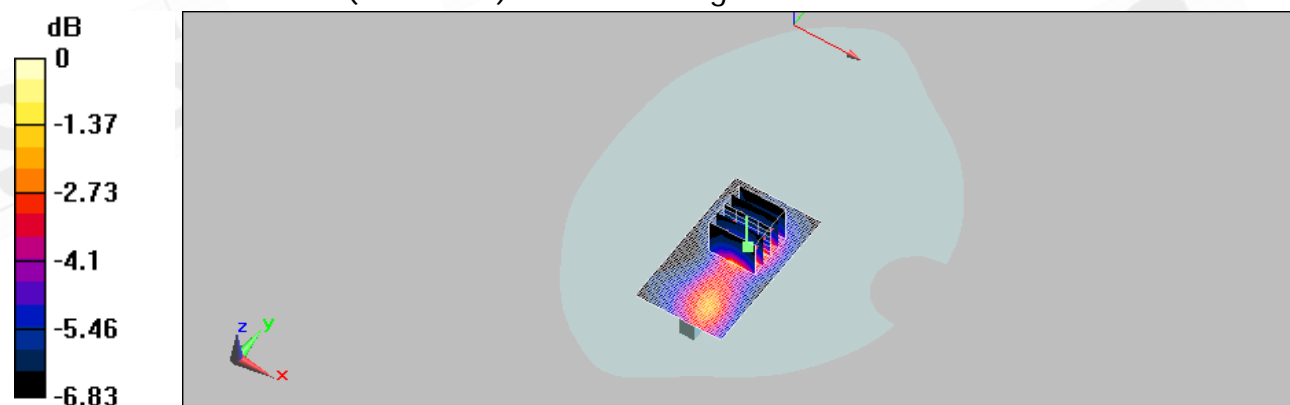
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 4.19 V/m; Power Drift = 0.029 dB

Peak SAR (extrapolated) = 0.216 W/kg

**SAR(1 g) = 0.107 mW/g; SAR(10 g) = 0.062 mW/g**

Maximum value of SAR (measured) = 0.116 mW/g



0 dB = 0.116mW/g

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Date/Time: 04/02/2009 13:39:37

## Configuration 4\_CH1

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.88 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

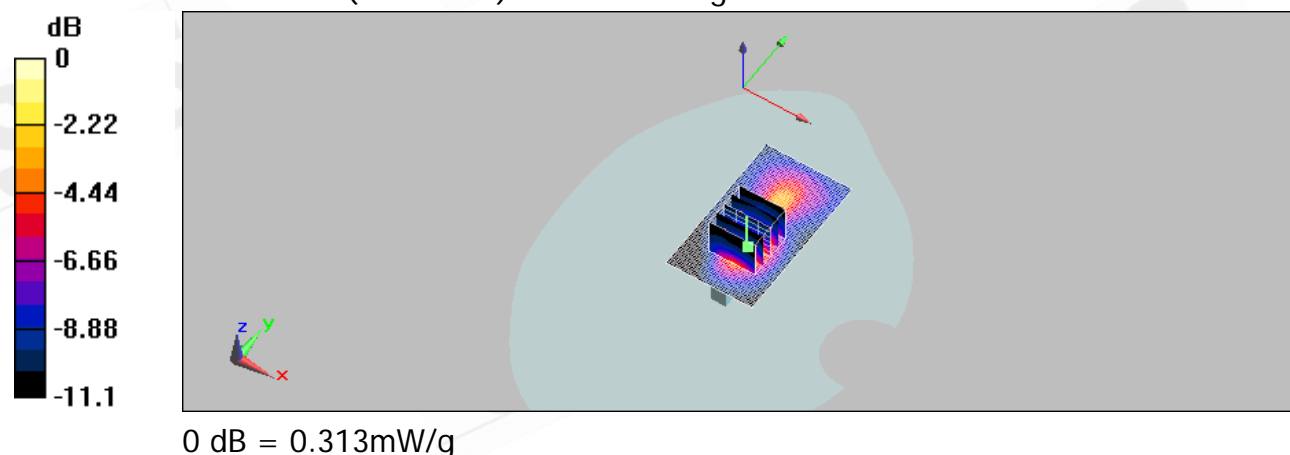
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.328 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 5.13 V/m; Power Drift = -0.114 dB  
Peak SAR (extrapolated) = 0.644 W/kg

**SAR(1 g) = 0.278 mW/g; SAR(10 g) = 0.132 mW/g**  
Maximum value of SAR (measured) = 0.313 mW/g



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Date/Time: 04/02/2009 14:11:41

## Configuration 4\_CH6

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

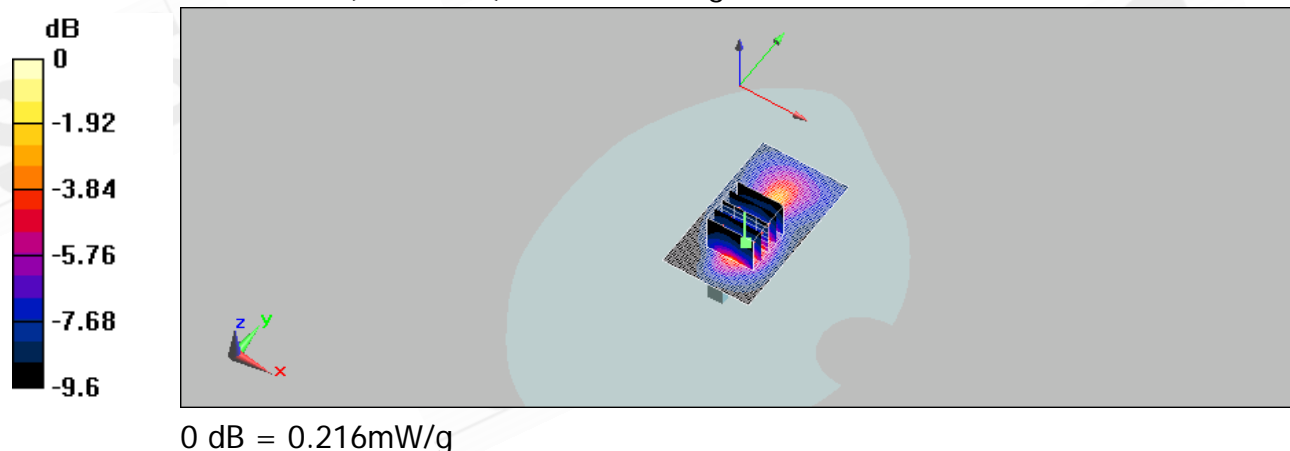
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.228 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 4.61 V/m; Power Drift = -0.027 dB  
Peak SAR (extrapolated) = 0.445 W/kg

**SAR(1 g) = 0.194 mW/g; SAR(10 g) = 0.096 mW/g**  
Maximum value of SAR (measured) = 0.216 mW/g



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Date/Time: 04/02/2009 14:44:01

## Configuration 4\_CH11

DUT: TL-WN727N;

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

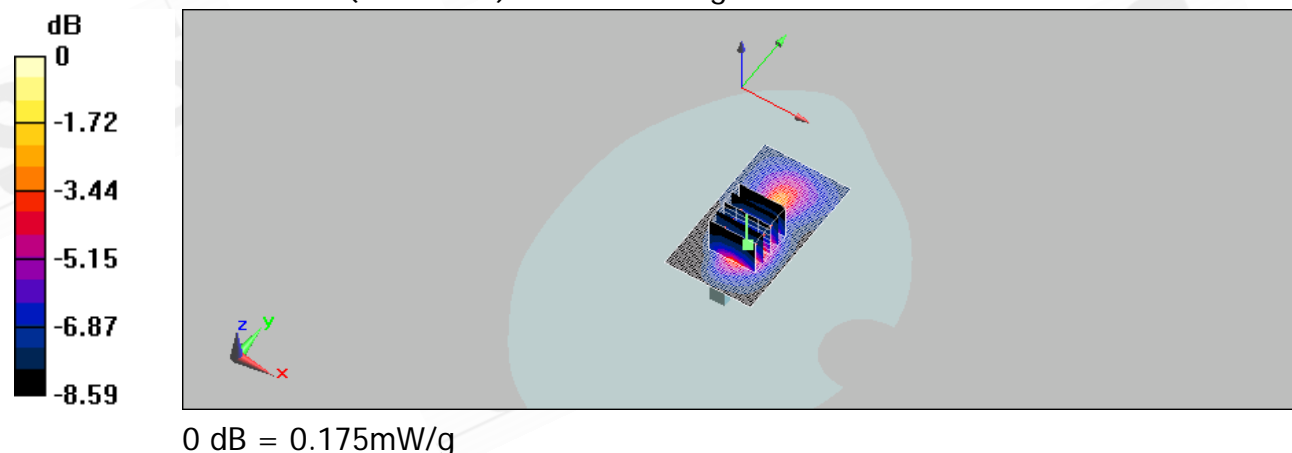
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.186 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 4.36 V/m; Power Drift = 0.087 dB  
Peak SAR (extrapolated) = 0.375 W/kg

**SAR(1 g) = 0.159 mW/g; SAR(10 g) = 0.081 mW/g**  
Maximum value of SAR (measured) = 0.175 mW/g



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Date/Time: 04/18/2009 10:40:25

## Configuration 1\_CH1

### DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.87 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

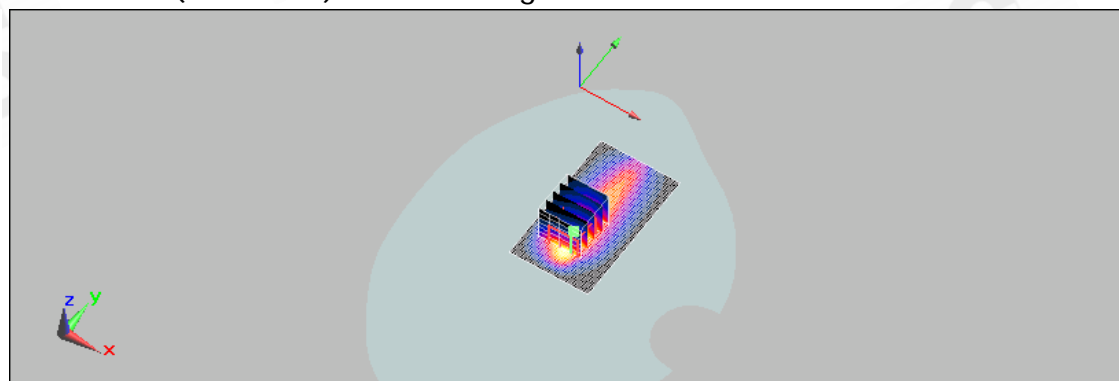
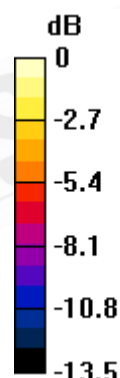
### DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 1.13 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 11.4 V/m; Power Drift = -0.141 dB  
Peak SAR (extrapolated) = 3.92 W/kg

**SAR(1 g) = 0.964 mW/g; SAR(10 g) = 0.489 mW/g**  
Maximum value of SAR (measured) = 1.25 mW/g



0 dB = 1.25mW/g

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Date/Time: 04/18/2009 11:19:56

## Configuration 1\_CH6

DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

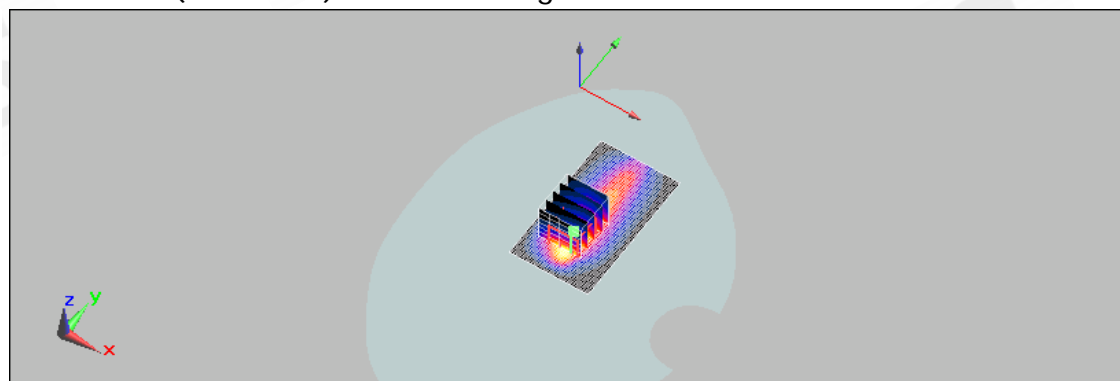
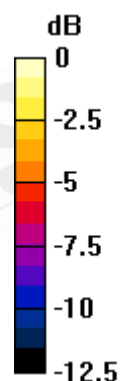
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.842 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 10.1 V/m; Power Drift = -0.065 dB  
Peak SAR (extrapolated) = 3.11 W/kg

**SAR(1 g) = 0.738 mW/g; SAR(10 g) = 0.380 mW/g**  
Maximum value of SAR (measured) = 0.958 mW/g



0 dB = 0.958mW/g

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Date/Time: 04/18/2009 11:45:58

## Configuration 1\_CH11

**DUT: TL-WN727N**

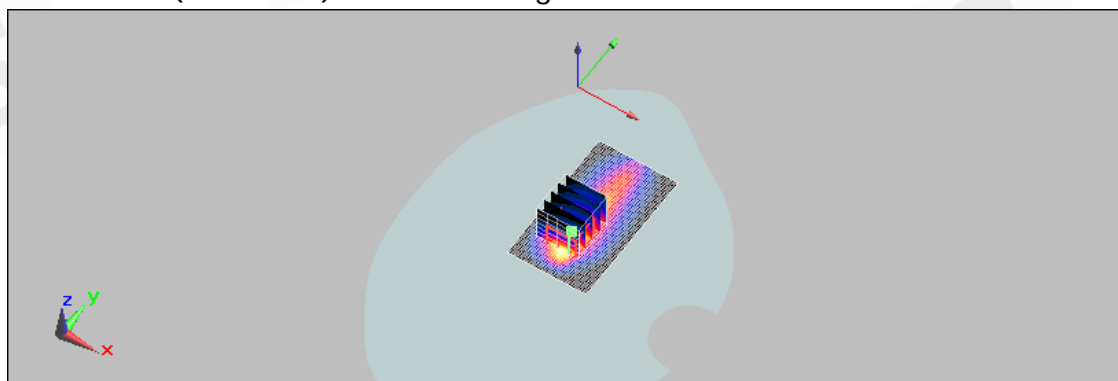
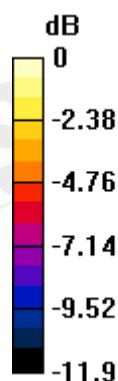
Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ Maximum value of SAR (interpolated) =  $0.730 \text{ mW/g}$ **Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ Reference Value =  $9.54 \text{ V/m}$ ; Power Drift =  $-0.124 \text{ dB}$ Peak SAR (extrapolated) =  $2.85 \text{ W/kg}$ **SAR(1 g) =  $0.647 \text{ mW/g}$ ; SAR(10 g) =  $0.336 \text{ mW/g}$** Maximum value of SAR (measured) =  $0.849 \text{ mW/g}$ 0 dB =  $0.849 \text{ mW/g}$ 

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Date/Time: 04/18/2009 12:28:46

## Configuration 2\_CH1

DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.87 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.941 mW/g

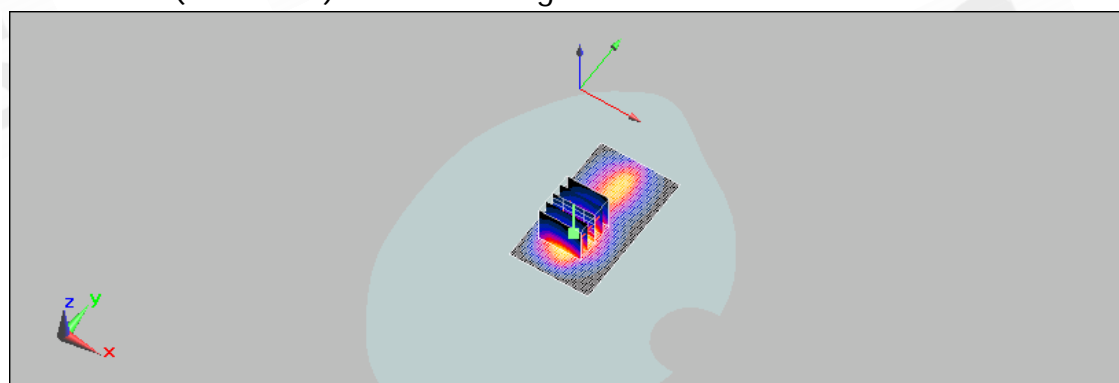
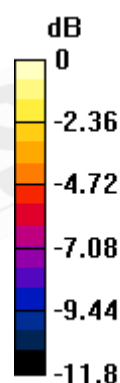
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 9.36 V/m; Power Drift = 0.057 dB

Peak SAR (extrapolated) = 1.58 W/kg

**SAR(1 g) = 0.786 mW/g; SAR(10 g) = 0.396 mW/g**

Maximum value of SAR (measured) = 0.848 mW/g



0 dB = 0.848mW/g

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Date/Time: 04/18/2009 12:56:37

## Configuration 2\_CH6

DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

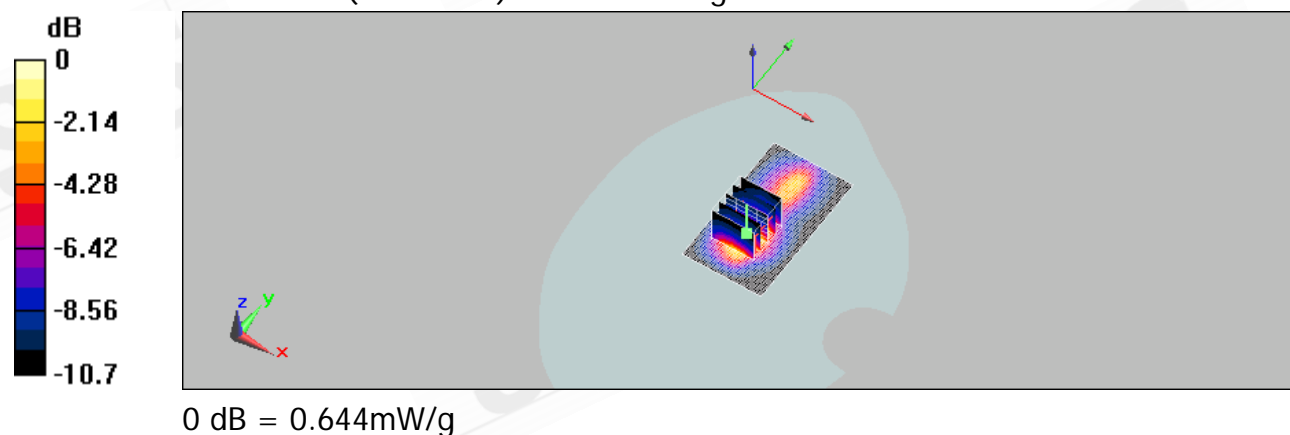
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.721 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 8.5 V/m; Power Drift = -0.068 dB  
Peak SAR (extrapolated) = 1.2 W/kg

**SAR(1 g) = 0.598 mW/g; SAR(10 g) = 0.307 mW/g**  
Maximum value of SAR (measured) = 0.644 mW/g



Date/Time: 04/18/2009 13:33:34

## Configuration 2\_CH11

**DUT: TL-WN727N**

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$ 

Maximum value of SAR (interpolated) = 0.633 mW/g

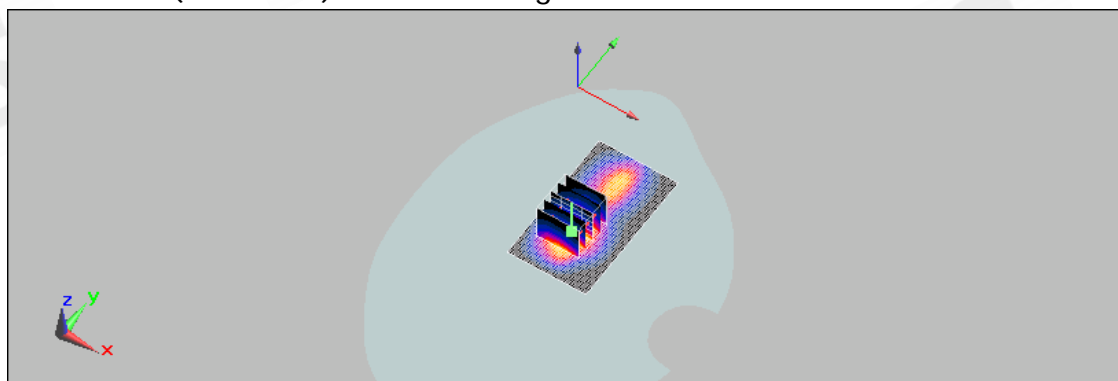
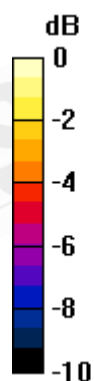
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 8.01 V/m; Power Drift = -0.00367 dB

Peak SAR (extrapolated) = 1.07 W/kg

**SAR(1 g) = 0.532 mW/g; SAR(10 g) = 0.275 mW/g**

Maximum value of SAR (measured) = 0.569 mW/g



0 dB = 0.569mW/g

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Date/Time: 04/18/2009 14:04:54

## Configuration 3\_CH1

DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.87 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

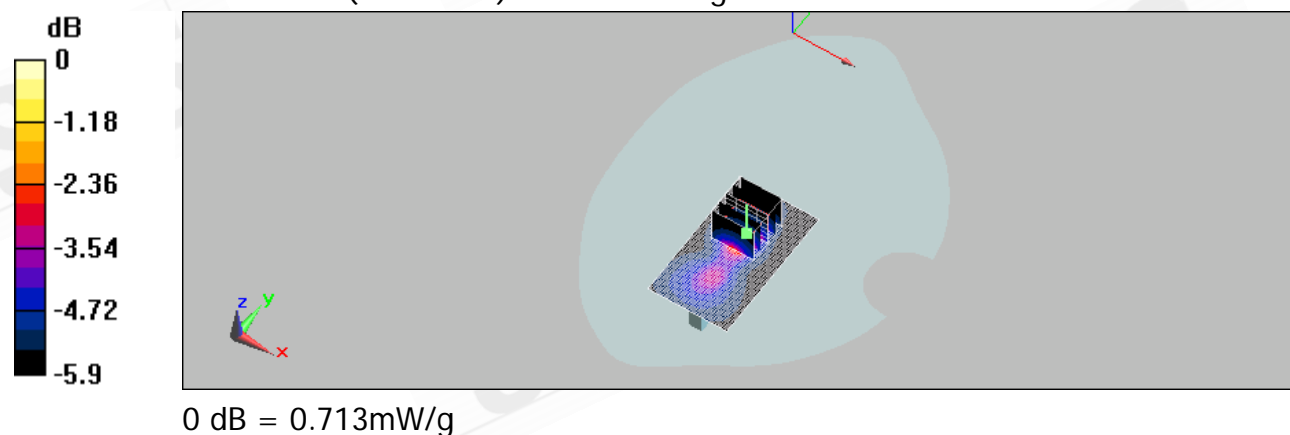
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.692 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 11.4 V/m; Power Drift = -0.121 dB  
Peak SAR (extrapolated) = 1.53 W/kg

**SAR(1 g) = 0.656 mW/g; SAR(10 g) = 0.368 mW/g**  
Maximum value of SAR (measured) = 0.713 mW/g



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Date/Time: 04/18/2009 14:42:06

## Configuration 3\_CH6

DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

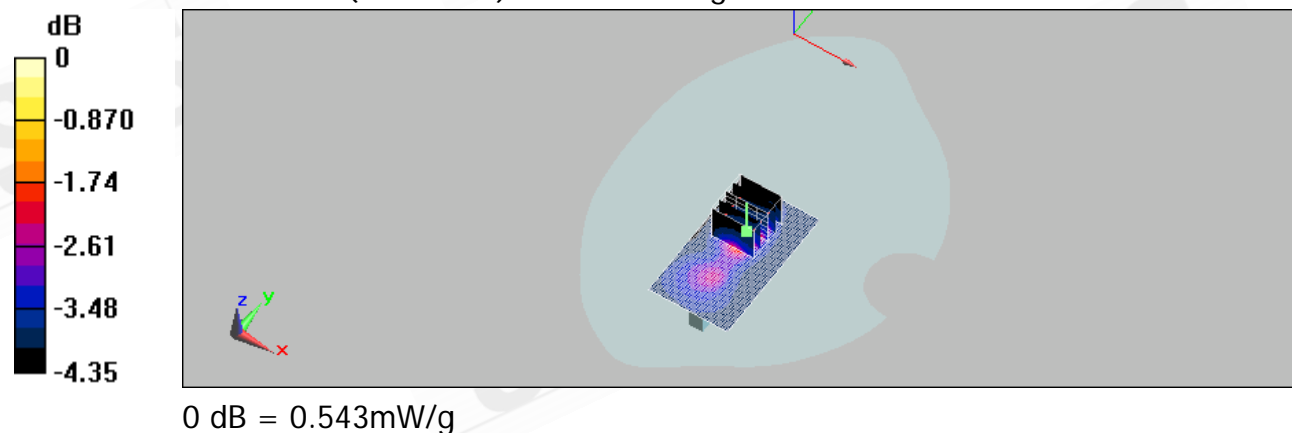
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.527 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 12.1 V/m; Power Drift = -0.194 dB  
Peak SAR (extrapolated) = 1.12 W/kg

**SAR(1 g) = 0.507 mW/g; SAR(10 g) = 0.320 mW/g**  
Maximum value of SAR (measured) = 0.543 mW/g



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Date/Time: 04/18/2009 15:11:33

## Configuration 3\_CH11

DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

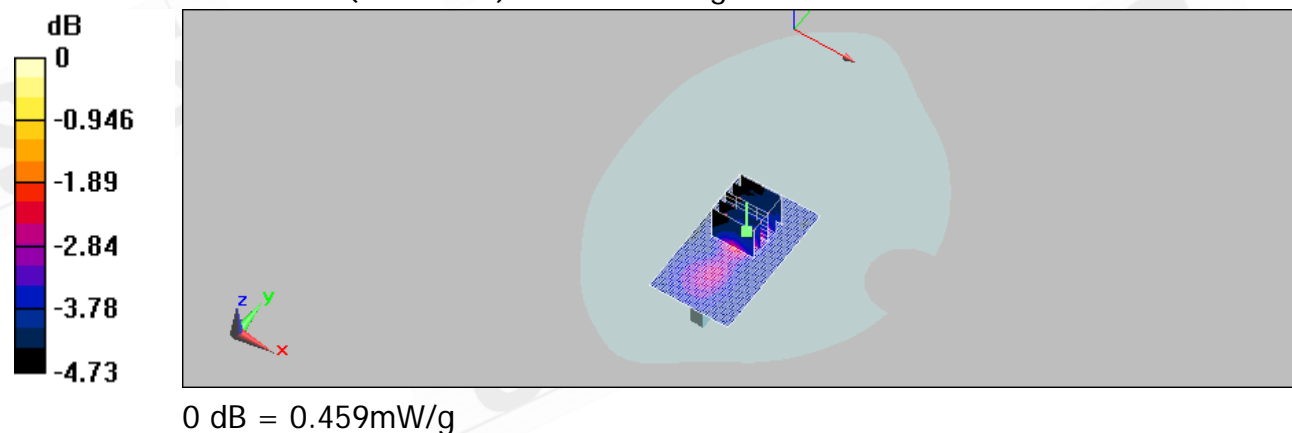
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.445 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 10.4 V/m; Power Drift = -0.190 dB  
Peak SAR (extrapolated) = 0.899 W/kg

**SAR(1 g) = 0.424 mW/g; SAR(10 g) = 0.266 mW/g**  
Maximum value of SAR (measured) = 0.459 mW/g



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Date/Time: 04/18/2009 15:47:32

## Configuration 4\_CH1

DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2412 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2412 \text{ MHz}$ ;  $\sigma = 1.87 \text{ mho/m}$ ;  $\epsilon_r = 51.8$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.543 mW/g

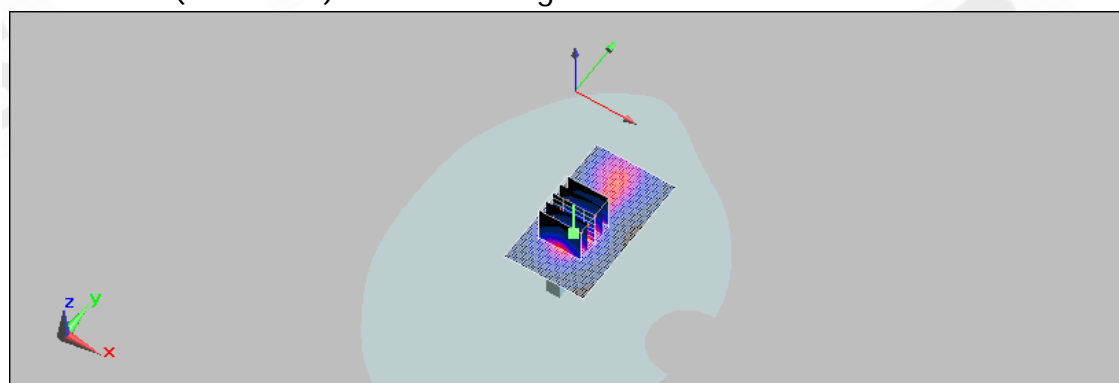
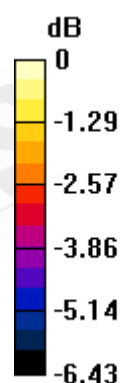
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 9.25 V/m; Power Drift = -0.129 dB

Peak SAR (extrapolated) = 1.01 W/kg

**SAR(1 g) = 0.500 mW/g; SAR(10 g) = 0.292 mW/g**

Maximum value of SAR (measured) = 0.538 mW/g



0 dB = 0.538mW/g

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Date/Time: 04/18/2009 16:14:48

## Configuration 4\_CH6

DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2437 \text{ MHz}$ ;  $\sigma = 1.89 \text{ mho/m}$ ;  $\epsilon_r = 51.7$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

Maximum value of SAR (interpolated) = 0.410 mW/g

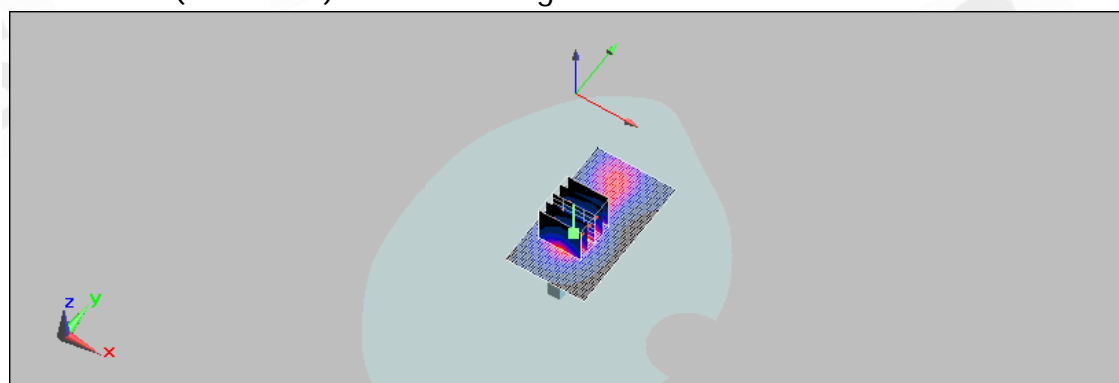
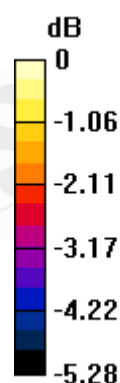
**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 8.69 V/m; Power Drift = -0.199 dB

Peak SAR (extrapolated) = 0.732 W/kg

**SAR(1 g) = 0.379 mW/g; SAR(10 g) = 0.236 mW/g**

Maximum value of SAR (measured) = 0.399 mW/g



0 dB = 0.399mW/g

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Date/Time: 04/18/2009 16:50:33

## Configuration 4\_CH11

DUT: TL-WN727N

Communication System: Wireless LAN; Frequency: 2462 MHz; Duty Cycle: 1:1  
Medium: BODY 2450 Medium parameters used:  $f = 2462 \text{ MHz}$ ;  $\sigma = 1.93 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section

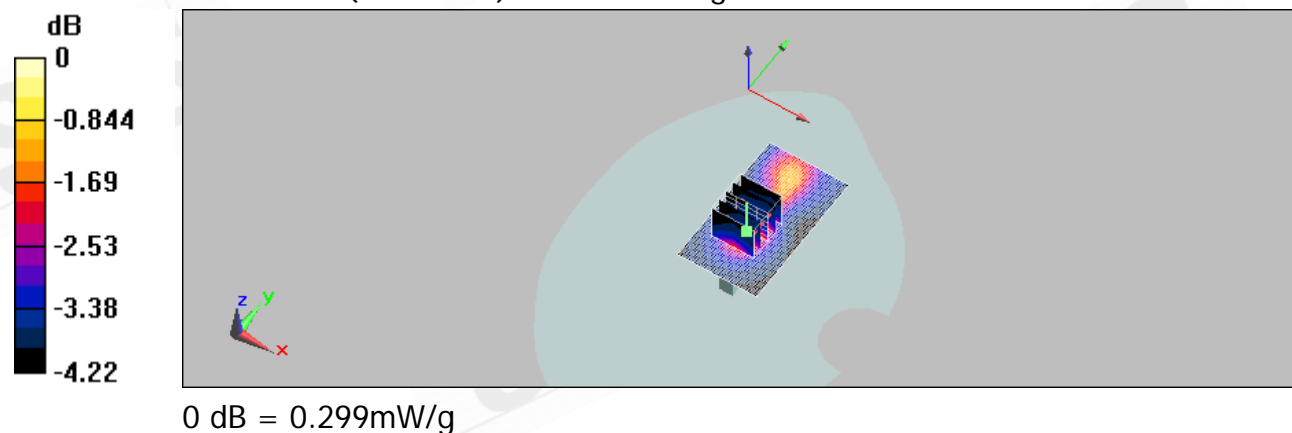
DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**Body/Area Scan (41x71x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
Maximum value of SAR (interpolated) = 0.301 mW/g

**Body/Zoom Scan (7x7x7) (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 8.36 V/m; Power Drift = -0.154 dB  
Peak SAR (extrapolated) = 0.505 W/kg

**SAR(1 g) = 0.284 mW/g; SAR(10 g) = 0.192 mW/g**  
Maximum value of SAR (measured) = 0.299 mW/g



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## 5. SAR System Performance Verification

Date/Time: 04/02/2009 01:33:13

**DUT: Dipole 2450 MHz;**

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

Medium: HSL2450 Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.91 \text{ mho/m}$ ;  $\epsilon_r = 51.6$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**d=15mm, Pin=250mW, dist=3.4mm** : Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 16.5 mW/g

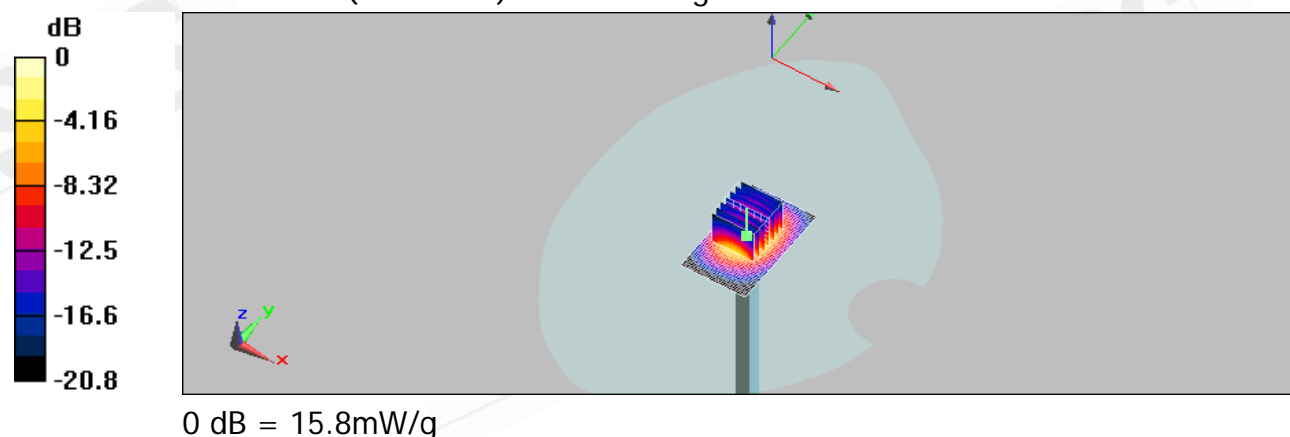
**d=15mm, Pin=250mW, dist=3.4mm** : Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.7 V/m; Power Drift = -0.052 dB

Peak SAR (extrapolated) = 26.5 W/kg

**SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.87 mW/g**

Maximum value of SAR (measured) = 15.8 mW/g



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Date/Time: 04/18/2009 09:24:21

## DUT: Dipole 2450 MHz;

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

Medium: BODY 2450 Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.98 \text{ mho/m}$ ;  $\epsilon_r = 53.9$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

## DASY5 Configuration:

- Probe: ES3DV3 - SN3172; ConvF(3.92, 3.92, 3.92); Calibrated: 6/23/2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn856; Calibrated: 5/7/2008
- Phantom: SAM1; Type: SAM;
- Measurement SW: DASY5, V5.0 Build 125; SEMCAD X Version 13.4 Build 125

**d=15mm, Pin=250mW, dist=3.4mm** : Measurement grid: dx=15mm, dy=15mm  
Maximum value of SAR (interpolated) = 17.8 mW/g

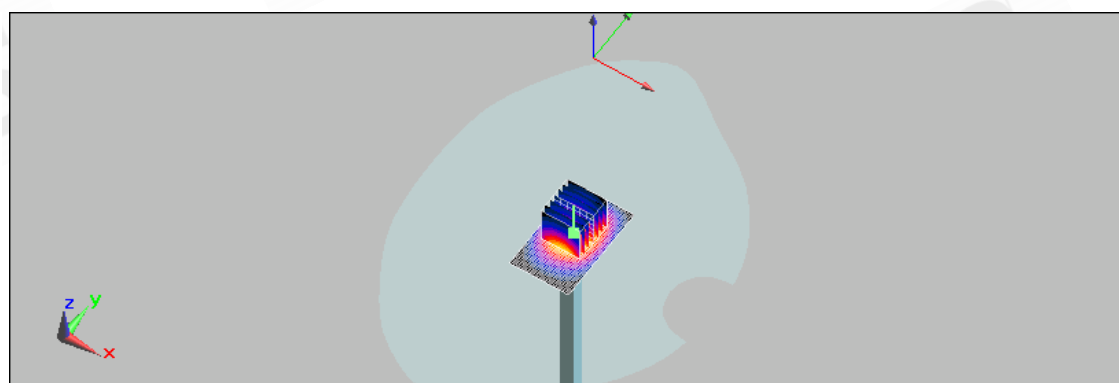
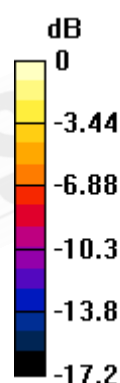
**d=15mm, Pin=250mW, dist=3.4mm** : Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.1 V/m; Power Drift = -0.040 dB

Peak SAR (extrapolated) = 25.7 W/kg

**SAR(1 g) = 12.6 mW/g; SAR(10 g) = 5.94 mW/g**

Maximum value of SAR (measured) = 15.7 mW/g



0 dB = 15.7mW/g

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## 6. DAE & Probe Calibration certificate

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Schmid & Partner  
Engineering AG  
Zeughausstrasse 43, 8004 Zurich, Switzerland



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client

SGS (Audeu)

Certificate No: DAE4-856\_May08

### CALIBRATION CERTIFICATE

Object: DAE4 - SD 000 D04 BG - SN: 856

Calibration procedure(s): QA CAL-06.v12  
Calibration procedure for the data acquisition electronics (DAE)

Calibration date: May 7, 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&E critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Fluke Process Calibrator Type 702	SN: 6295803	04-Oct-07 (No: 6467)	Oct-08
Keithley Multimeter Type 2001	SN: 0810278	03-Oct-07 (No: 6465)	Oct-08
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Calibrator Box V1.1	SE UMS 006 AB 1004	25-Jun-07 (in house check)	In house check: Jun-08

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

Issued: May 7, 2008

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Certificate No: DAE4-856\_May08

Page 1 of 5

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Accreditation No.: **SCS 108**

Client **SGS (Auden)**

Certificate No: **ES3-3172\_Jun08**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3172**

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

Calibration date: **June 23, 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 E4415B	GB41293574	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-08 (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:	Nikola Kuster	Quality Manager	

Issued: June 24, 2008

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Certificate No: **ES3-3172\_Jun08**

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Accreditation No.: SCS 108

## Glossary:

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
Polarization $\phi$	$\phi$ rotation around probe axis
Polarization $\theta$	$\theta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\theta = 0$ 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<sub>x,y,z</sub>**: Assessed for E-field polarization  $\theta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not effect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* 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<sub>x,y,z</sub>**: 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<sub>x,y,z</sub> \* 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  $\pm 50$  MHz to  $\pm 100$  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.

ES3DV3 SN:3172

June 23, 2008

## Probe ES3DV3

SN:3172

Manufactured:	January 23, 2008
Calibrated:	June 23, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

Certificate No: ES3-3172\_Jun08

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ES3DV3 SN:3172

June 23, 2008

**DASY - Parameters of Probe: ES3DV3 SN:3172****Sensitivity in Free Space<sup>A</sup>**

NormX	1.38 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormY	1.15 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$
NormZ	0.94 ± 10.1%	$\mu\text{V}/(\text{V}/\text{m})^2$

**Diode Compression<sup>B</sup>**

DCP X	93 mV
DCP Y	93 mV
DCP Z	89 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		3.0 mm	4.0 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	11.8	6.1
SAR <sub>be</sub> [%]	With Correction Algorithm	0.6	0.2

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

Sensor Center to Phantom Surface Distance		3.0 mm	4.0 mm
SAR <sub>be</sub> [%]	Without Correction Algorithm	10.2	6.5
SAR <sub>be</sub> [%]	With Correction Algorithm	0.4	0.4

**Sensor Offset**

Probe Tip to Sensor Center 2.0 mm

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%.

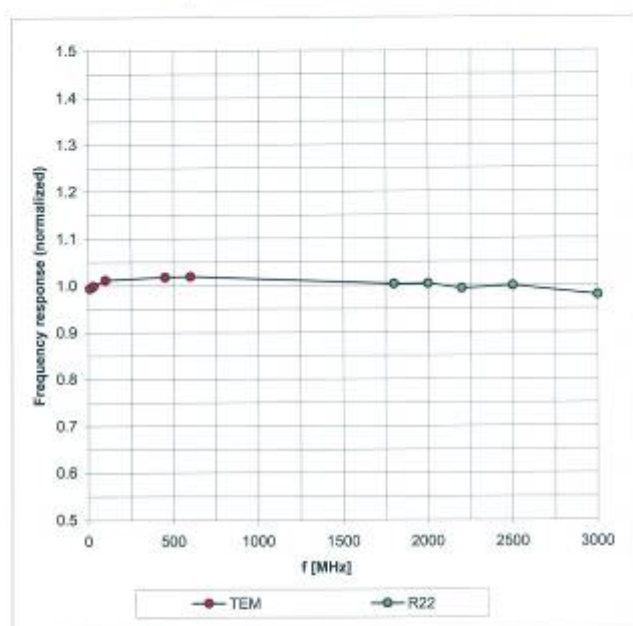
<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Page 8).<sup>B</sup> Numerical linearization parameter: uncertainty not required.

ES3DV3 SN:3172

June 23, 2008

## Frequency Response of E-Field

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



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

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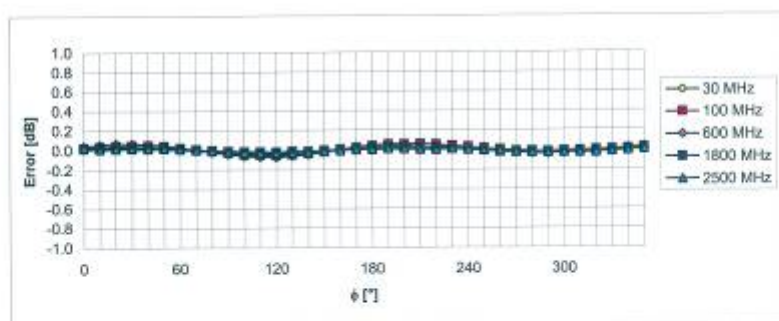
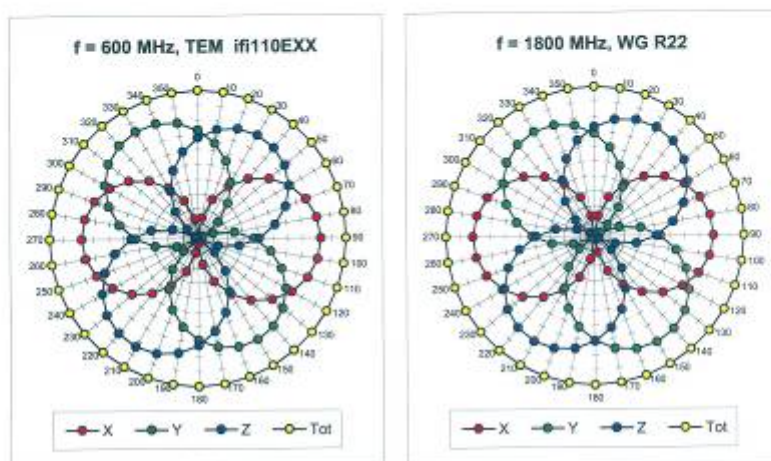
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June 23, 2008

## Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$



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

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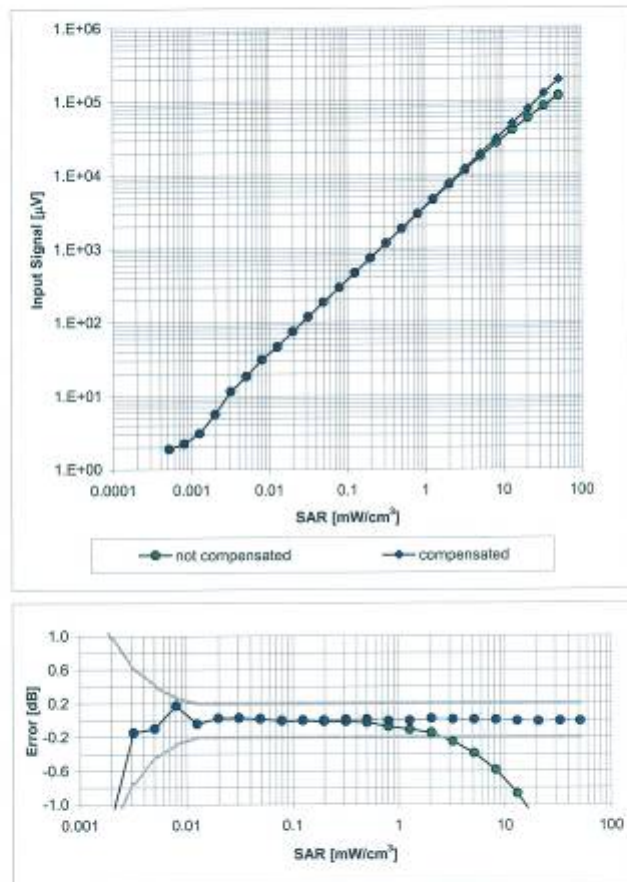
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ES3DV3 SN:3172

June 23, 2008

## Dynamic Range f(SAR<sub>head</sub>) (Waveguide R22, f = 1800 MHz)



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

Certificate No: ES3-3172\_Jun08

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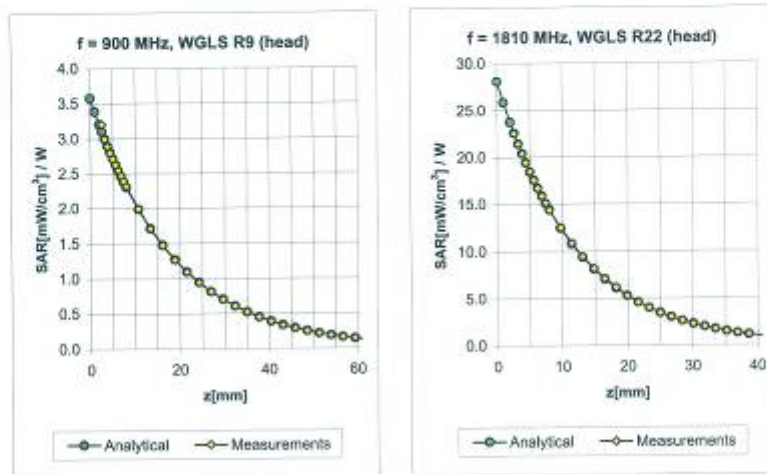
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ES3DV3 SN:3172

June 23, 2008

## Conversion Factor Assessment



f [MHz]	Validity [MHz] <sup>c</sup>	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF Uncertainty
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.23	2.36	5.66 ± 11.0% (k=2)
1810	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.32	2.07	4.97 ± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.65	1.40	4.80 ± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.72	1.34	4.38 ± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.35	1.83	5.61 ± 11.0% (k=2)
1810	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.55	1.50	4.73 ± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.80	1.35	4.57 ± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.75	1.25	3.92 ± 11.0% (k=2)

<sup>c</sup> 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.

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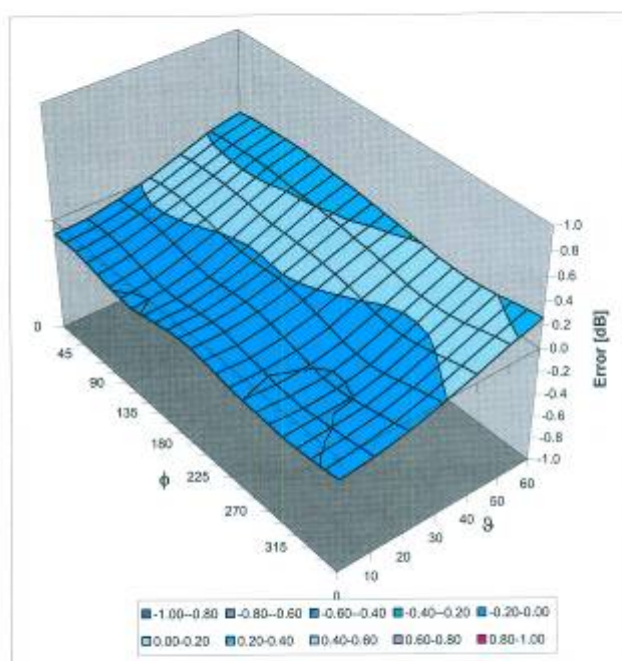
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ES3DV3 SN:3172

June 23, 2008

## Deviation from Isotropy in HSL

Error ( $\phi$ ,  $\theta$ ),  $f = 900$  MHz



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

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## 7. Uncertainty Analysis

DASY5 Uncertainty Budget According to IEEE 1528 [1]								
Error Description	Uncertainty value	Prob. Dist.	Div.	( $c_i$ ) 1g	( $c_i$ ) 10g	Std. Unc. (1g)	Std. Unc. (10g)	( $v_i$ ) $v_{eff}$
<b>Measurement System</b>								
Probe Calibration	±5.9%	N	1	1	1	±5.9%	±5.9%	∞
Axial Isotropy	±4.7%	R	√3	0.7	0.7	±1.9%	±1.9%	∞
Hemispherical Isotropy	±9.6%	R	√3	0.7	0.7	±3.9%	±3.9%	∞
Boundary Effects	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Linearity	±4.7%	R	√3	1	1	±2.7%	±2.7%	∞
System Detection Limits	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
Readout Electronics	±0.3%	N	1	1	1	±0.3%	±0.3%	∞
Response Time	±0.8%	R	√3	1	1	±0.5%	±0.5%	∞
Integration Time	±2.6%	R	√3	1	1	±1.5%	±1.5%	∞
RF Ambient Noise	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
RF Ambient Reflections	±3.0%	R	√3	1	1	±1.7%	±1.7%	∞
Probe Positioner	±0.4%	R	√3	1	1	±0.2%	±0.2%	∞
Probe Positioning	±2.9%	R	√3	1	1	±1.7%	±1.7%	∞
Max. SAR Eval.	±1.0%	R	√3	1	1	±0.6%	±0.6%	∞
<b>Test Sample Related</b>								
Device Positioning	±2.9%	N	1	1	1	±2.9%	±2.9%	145
Device Holder	±3.6%	N	1	1	1	±3.6%	±3.6%	5
Power Drift	±5.0%	R	√3	1	1	±2.9%	±2.9%	∞
<b>Phantom and Setup</b>								
Phantom Uncertainty	±4.0%	R	√3	1	1	±2.3%	±2.3%	∞
Liquid Conductivity (target)	±5.0%	R	√3	0.64	0.43	±1.8%	±1.2%	∞
Liquid Conductivity (meas.)	±2.5%	N	1	0.64	0.43	±1.6%	±1.1%	∞
Liquid Permittivity (target)	±5.0%	R	√3	0.6	0.49	±1.7%	±1.4%	∞
Liquid Permittivity (meas.)	±2.5%	N	1	0.6	0.49	±1.5%	±1.2%	∞
Combined Std. Uncertainty						±10.9%	±10.7%	387
Expanded STD Uncertainty						±21.9%	±21.4%	

Table 19.6: Worst-Case uncertainty budget for DASY5 assessed according to IEEE 1528 [1]. The budget is valid for the frequency range 300 MHz - 3 GHz and represents a worst-case analysis. For specific tests and configurations, the uncertainty could be considerable smaller.

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## 8. Phantom Description

Schmid &amp; Partner Engineering AG

**s p e a g**

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

### Certificate of Conformity / First Article Inspection

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

#### Tests

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

Test	Requirement	Details	Units tested
Dimensions	Compliant with the geometry according to the CAD model.	IT15 CAD File (*)	First article, Samples
Material thickness of shell	Compliant with the requirements according to the standards	2mm +/- 0.2mm in flat and specific areas of head section	First article, Samples, TP-1314 ff.
Material thickness at ERP	Compliant with the requirements according to the standards	6mm +/- 0.2mm at ERP	First article, All items
Material parameters	Dielectric parameters for required frequencies	300 MHz – 6 GHz: Relative permittivity < 5, Loss tangent < 0.05	Material samples
Material resistivity	The material has been tested to be compatible with the liquids defined in the standards if handled and cleaned according to the instructions. Observe technical Note for material compatibility.	DEGMBE based simulating liquids	Pre-series, First article, Material samples
Sagging	Compliant with the requirements according to the standards. Sagging of the flat section when filled with tissue simulating liquid.	< 1% typical < 0.8% if filled with 155mm of HSL900 and without DUT below	Prototypes, Sample testing

#### Standards

- [1] CENELEC EN 50351
- [2] IEEE Std 1528-2003
- [3] IEC 62209 Part I
- [4] FCC OET Bulletin 65, Supplement C, Edition 01-01

(\*) The IT15 CAD file is derived from [2] and is also within the tolerance requirements of the shapes of the other documents.

#### Conformity

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

Date 07.07.2005

**s p e a g**

Signature / Stamp

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

Doc No. 881 – QD 000 P40 C – F

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## 9. System Validation from Original equipment supplier

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



S Schweizerischer Kalibrierdienst  
S 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: **SGS (Auden)**

Certificate No: **D2450V2-727\_Apr08**

### CALIBRATION CERTIFICATE

Object: **D2450V2 - SN: 727**

Calibration procedure(s): **QA CAL-05.v7**  
Calibration procedure for dipole validation kits

Calibration date: **April 11, 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 ( $22 \pm 3^\circ\text{C}$  and humidity  $< 70\%$ ).

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37460704	04-Oct-07 (No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (No 217-00718)	Aug-08
Reference Probe ES3DV2	SN: 3025	01-Mar-08 (No. ES3-3025_Mar08)	Mar-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 84206	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

Calibrated by: Name: **Mike Meili** Function: **Laboratory Technician** Signature:

Approved by: **Katja Pokovic** Technical Manager

Issued: April 14, 2008

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

Certificate No: D2450V2-727\_Apr08

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



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

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

Accreditation No.: **SCS 108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

## Additional Documentation:

- DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

**SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

**Measurement Conditions**

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

DASY Version	DASY4	V4.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.4 $\pm$ 6 %	1.84 mho/m $\pm$ 6 %
Head TSL temperature during test	(21.6 $\pm$ 0.2) °C	-----	-----

**SAR result with Head TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Head TSL	condition	
SAR measured	250 mW input power	13.9 mW / g
SAR normalized	normalized to 1W	55.6 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	55.2 mW / g $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.44 mW / g
SAR normalized	normalized to 1W	25.8 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	25.7 mW / g $\pm$ 16.5 % (k=2)

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivity"

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**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	50.9 ± 6 %	1.98 mho/m ± 6 %
Body TSL temperature during test	(21.2 ± 0.2) °C		

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	condition	
SAR measured	250 mW input power	13.2 mW / g
SAR normalized	normalized to 1W	52.8 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	51.4 mW / g ± 17.0 % (k=2)

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.15 mW / g
SAR normalized	normalized to 1W	24.6 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	24.2 mW / g ± 16.5 % (k=2)

<sup>2</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.2 \Omega + 3.3 j\Omega$
Return Loss	- 27.0 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$50.6 \Omega + 7.5 j\Omega$
Return Loss	- 22.5 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.149 ns
----------------------------------	----------

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

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

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

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 9, 2003

## DASY4 Validation Report for Head TSL

Date/Time: 11.04.2008 13:11:14

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN727**

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

Medium: HSL U10 BB;

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.84$  mho/m;  $\epsilon_r = 39.4$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.4, 4.4, 4.4); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (Front); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:**

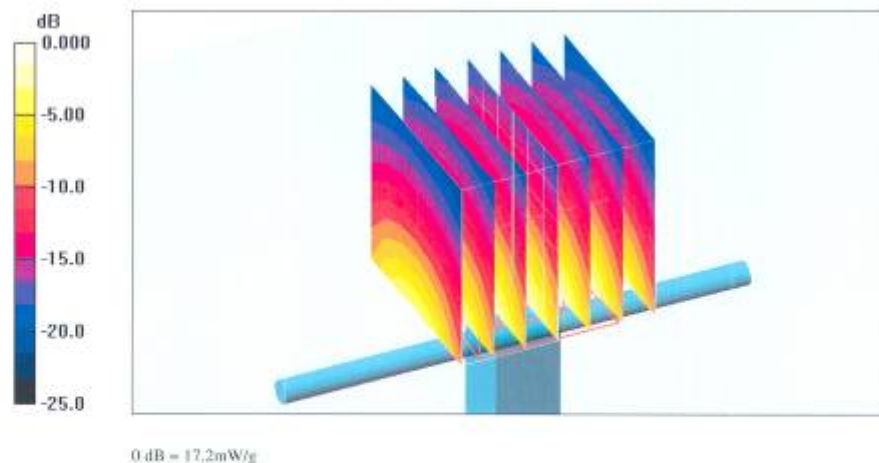
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.0 V/m; Power Drift = 0.015 dB

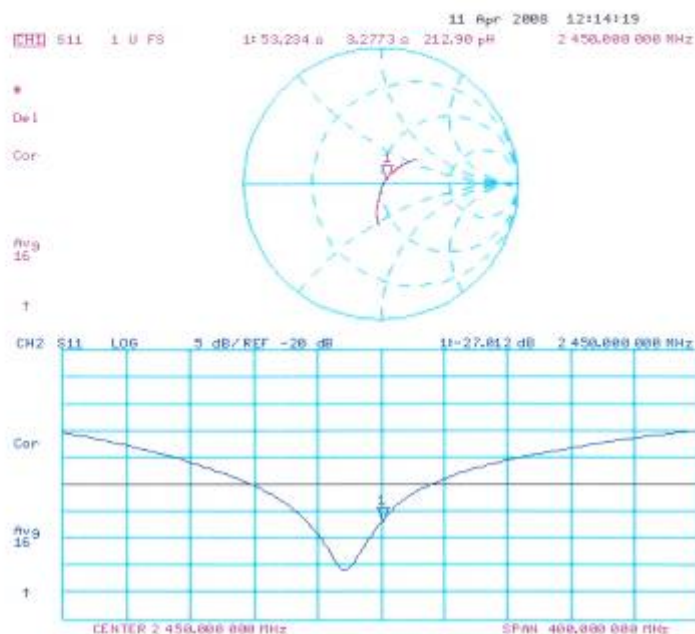
Peak SAR (extrapolated) = 28.6 W/kg

**SAR(1 g) = 13.9 mW/g; SAR(10 g) = 6.44 mW/g**

Maximum value of SAR (measured) = 17.2 mW/g



## Impedance Measurement Plot for Head TSL



## DASY4 Validation Report for Body TSL

Date/Time: 11.04.2008 15:23:03

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN727**

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

Medium: MSL U10;

Medium parameters used:  $f = 2450$  MHz;  $\sigma = 1.99$  mho/m;  $\epsilon_r = 51$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

### DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.07, 4.07, 4.07); Calibrated: 01.03.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 55; Postprocessing SW: SEMCAD, V1.8 Build 172

### Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:

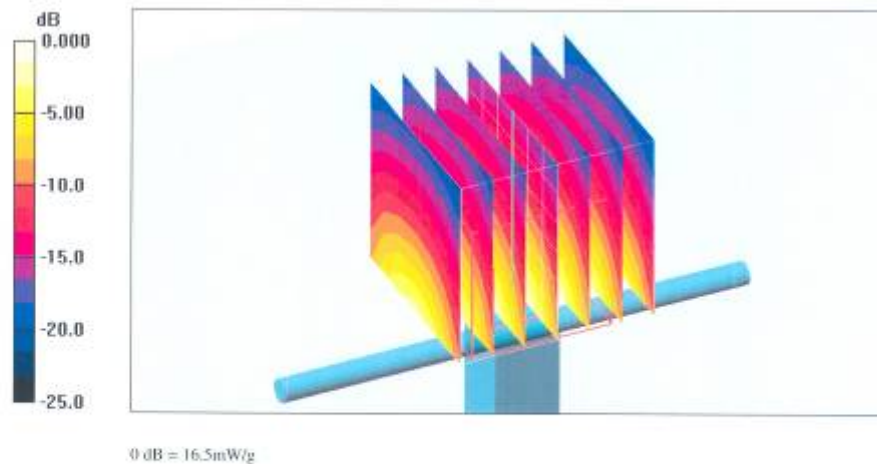
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.5 V/m; Power Drift = 0.010 dB

Peak SAR (extrapolated) = 26.5 W/kg

**SAR(1 g) = 13.2 mW/g; SAR(10 g) = 6.15 mW/g**

Maximum value of SAR (measured) = 16.5 mW/g



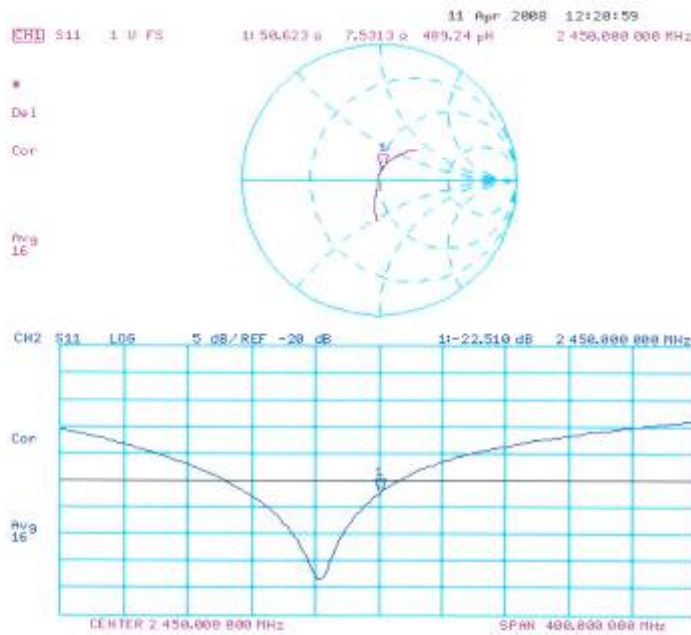
Certificate No: D2450V2-727\_Apr08

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## Impedance Measurement Plot for Body TSL



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**Engineering AG**  
Zeughausstrasse 43, 8004 Zurich, Switzerland



**S** Schweizerischer Kalibrierdienst  
**S** Service suisse d'étalonnage  
**C** Servizio svizzero di taratura  
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **Auden**

Certificate No: **D2450V2\_735\_May08**

## CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 735**

Calibration procedure(s) **QA CAL-05.v7**  
**Calibration procedure for dipole validation kits**

Calibration date: **May 22, 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 EPM-442A	GB37480704	04-Oct-07 (No. 217-00736)	Oct-08
Power sensor HP 8481A	US37292783	04-Oct-07 (No. 217-00736)	Oct-08
Reference 20 dB Attenuator	SN: 5086 (20g)	07-Aug-07 (No. 217-00718)	Aug-08
Type-N mismatch combination	SN: 5047.2 / 06327	08-Aug-07 (No. 217-00721)	Aug-08
Reference Probe ES3DV2	SN: 3025	28-Apr-08 (No. ES3-3025_Apr08)	Apr-09
DAE4	SN: 601	14-Mar-08 (No. DAE4-601_Mar08)	Mar-09

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-07)	In house check: Oct-09
RF generator R&S SMT-06	100005	4-Aug-99 (in house check Oct-07)	In house check: Oct-09
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-07)	In house check: Oct-08

Calibrated by:	Name <b>Mike Meili</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function <b>Technical Manager</b>	Signature 

Issued: May 22, 2008

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Certificate No: D2450V2-735\_May08

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



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

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The Swiss Accreditation Service is one of the signatories to the EA  
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Accreditation No.: **SCS 108**

## Glossary:

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

## Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

## Additional Documentation:

- DASY4/5 System Handbook

## Methods Applied and Interpretation of Parameters:

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

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**Measurement Conditions**

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

<b>DASY Version</b>	DASY4	V4.7
<b>Extrapolation</b>	Advanced Extrapolation	
<b>Phantom</b>	Modular Flat Phantom V5.0	
<b>Distance Dipole Center - TSL</b>	10 mm	with Spacer
<b>Zoom Scan Resolution</b>	dx, dy, dz = 5 mm	
<b>Frequency</b>	2450 MHz $\pm$ 1 MHz	

**Head TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
<b>Nominal Head TSL parameters</b>	22.0 °C	39.2	1.80 mho/m
<b>Measured Head TSL parameters</b>	(22.0 $\pm$ 0.2) °C	38.8 $\pm$ 6 %	1.81 mho/m $\pm$ 6 %
<b>Head TSL temperature during test</b>	(21.7 $\pm$ 0.2) °C	----	----

**SAR result with Head TSL**

<b>SAR averaged over 1 cm<sup>3</sup> (1 g) of Head TSL</b>	Condition	
SAR measured	250 mW input power	13.5 mW / g
SAR normalized	normalized to 1W	54.0 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>53.6 mW / g <math>\pm</math> 17.0 % (k=2)</b>

<b>SAR averaged over 10 cm<sup>3</sup> (10 g) of Head TSL</b>	condition	
SAR measured	250 mW input power	6.26 mW / g
SAR normalized	normalized to 1W	25.0 mW / g
SAR for nominal Head TSL parameters <sup>1</sup>	normalized to 1W	<b>24.9 mW / g <math>\pm</math> 16.5 % (k=2)</b>

<sup>1</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

**Body TSL parameters**

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.5 ± 6 %	1.95 mho/m ± 6 %
Body TSL temperature during test	(22.1 ± 0.2) °C	----	----

**SAR result with Body TSL**

SAR averaged over 1 cm <sup>3</sup> (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.7 mW / g
SAR normalized	normalized to 1W	50.8 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>50.2 mW / g ± 17.0 % (k=2)</b>

SAR averaged over 10 cm <sup>3</sup> (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.92 mW / g
SAR normalized	normalized to 1W	23.7 mW / g
SAR for nominal Body TSL parameters <sup>2</sup>	normalized to 1W	<b>23.5 mW / g ± 16.5 % (k=2)</b>

<sup>2</sup> Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

## Appendix

### Antenna Parameters with Head TSL

Impedance, transformed to feed point	$54.0 \Omega + 3.8 j\Omega$
Return Loss	- 25.4 dB

### Antenna Parameters with Body TSL

Impedance, transformed to feed point	$49.0 \Omega + 5.1 j\Omega$
Return Loss	- 25.6 dB

### General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns
----------------------------------	----------

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

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

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

### Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 7, 2003

## DASY4 Validation Report for Head TSL

Date/Time: 22.05.2008 14:52:26

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN735**

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

Medium: HSL U10 BB;

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.81 \text{ mho/m}$ ;  $\epsilon_r = 38.8$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

DASY4 Configuration:

- Probe: ES3DV2 - SN3025; ConvF(4.4, 4.4, 4.4); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:**

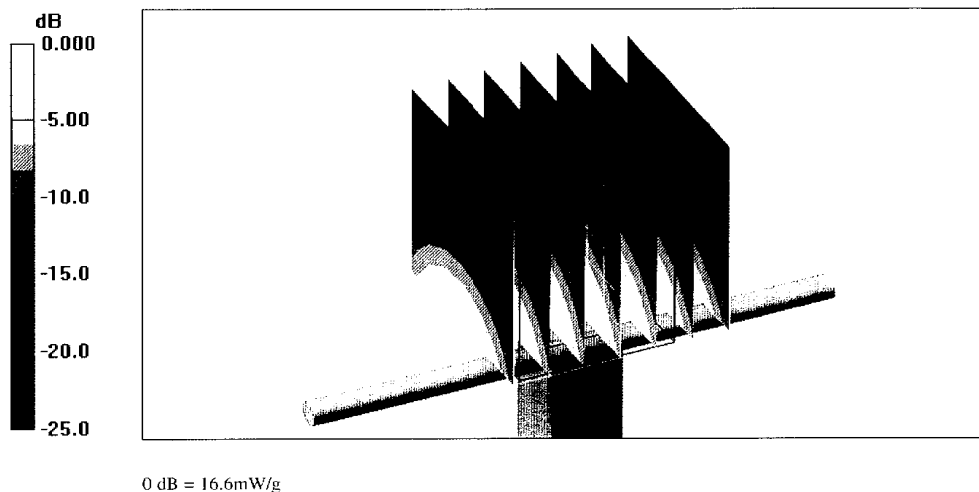
Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 98.5 V/m; Power Drift = 0.054 dB

Peak SAR (extrapolated) = 28.1 W/kg

**SAR(1 g) = 13.5 mW/g; SAR(10 g) = 6.26 mW/g**

Maximum value of SAR (measured) = 16.6 mW/g



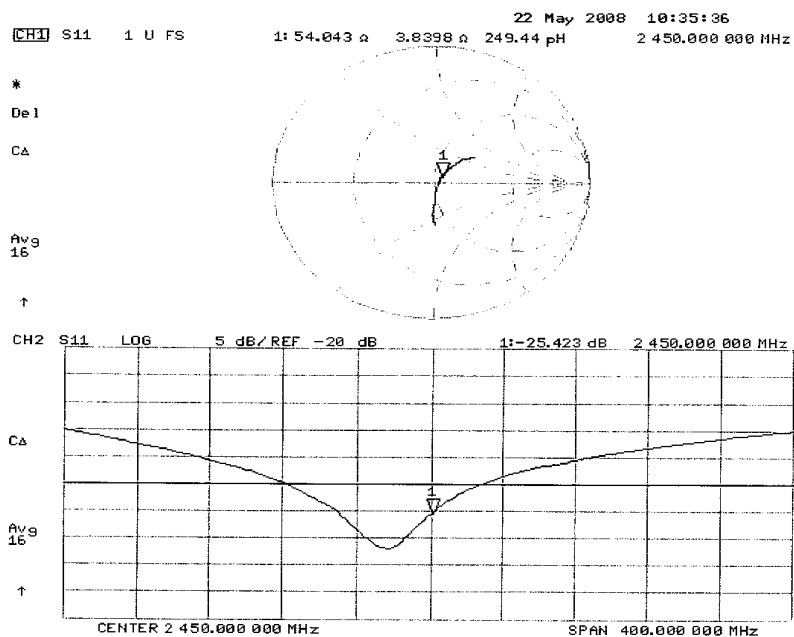
Certificate No: D2450V2-735\_May08

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## Impedance Measurement Plot for Head TSL



**DASY4 Validation Report for Body TSL**

Date/Time: 22.05.2008 13:03:17

Test Laboratory: SPEAG, Zurich, Switzerland

**DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:735**

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

Medium: MSL U10 BB;

Medium parameters used:  $f = 2450 \text{ MHz}$ ;  $\sigma = 1.95 \text{ mho/m}$ ;  $\epsilon_r = 51.5$ ;  $\rho = 1000 \text{ kg/m}^3$ 

Phantom section: Flat Section

Measurement Standard: DASY4 (High Precision Assessment)

**DASY4 Configuration:**

- Probe: ES3DV2 - SN3025; ConvF(4.07, 4.07, 4.07); Calibrated: 28.04.2008
- Sensor-Surface: 3.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 14.03.2008
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA
- Measurement SW: DASY4, V4.7 Build 71; Postprocessing SW: SEMCAD, V1.8 Build 184

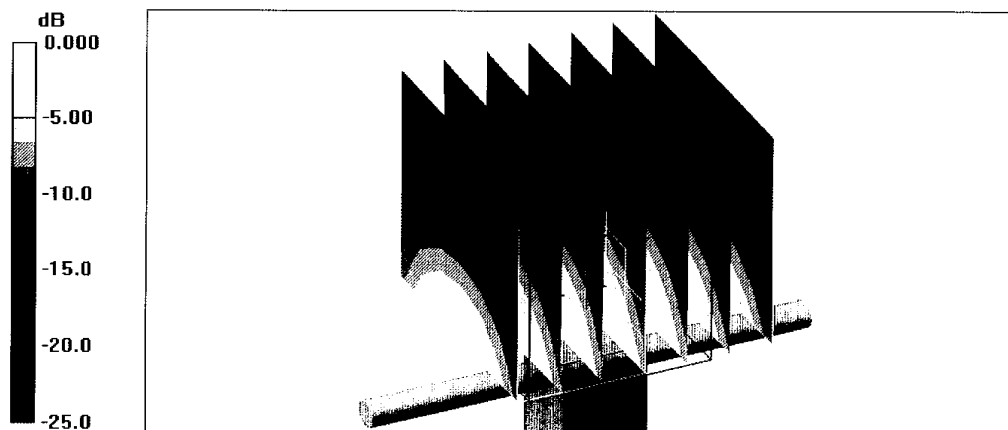
**Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0:**Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$ 

Reference Value = 92.5 V/m; Power Drift = 0.012 dB

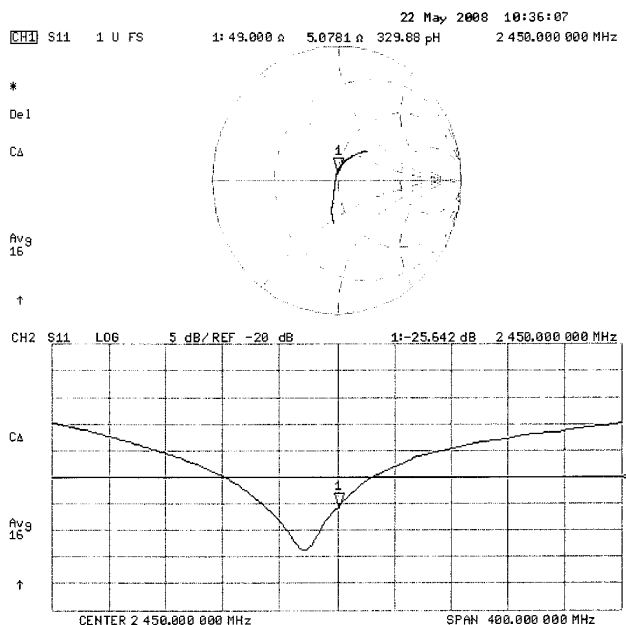
Peak SAR (extrapolated) = 26.1 W/kg

**SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.92 mW/g**

Maximum value of SAR (measured) = 15.7 mW/g



## Impedance Measurement Plot for Body TSL

End of 1<sup>st</sup> part of report

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