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TEST REPORT

Report Number: 100091268LEX-001
Project Number: G100091268

Evaluation of Model Number: 32 Channel Wireless EEG
Part Number 515-015400

FCCID: XGU-515-015X00
IC ID: 8516A-SM2144N2

Tested to the SAR Criteria in

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

Industry Canada RSS-102 Issue 4

For

Care Fusion

Test Performed by:	Test Authorized by:
Intertek 731 Enterprise Drive Lexington, KY 40510	Care Fusion 1850 Deming Way Middleton, WI 53562

Prepared By:_____ **Date:** 6/11/2010

Jason Centers, Senior Project Engineer

Approved By:_____ **Date:** 6/11/2010

Bryan Taylor, Team Leader – Engineering

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1.0 DOCUMENT HISTORY

Revision/ Project Number	Writer Initials	Date	Change
1.0 /G100091268	JC	6/11/2010	Original document

2.0 REFERENCES

[1] ANSI, *ANSI/IEEE C95.1-1991: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3kHz to 300 GHz*, The Institute of electrical and Electronics Engineers, Inc., New York, NY 10017, 1992

[2] Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", Supplement C (Edition 01-01) to OET Bulletin 65 (Edition 97-01), FCC, Washington, D.C. 20554, 1997

[3] Thomas Schmid, Oliver Egger, and Niels Kuster, "Automated E-field scanning system for dosimetric assessments", *IEEE Transaction on Microwave Theory and Techniques*, vol. 44, pp. 105-113, Jan. 1996.

[4] Niels Kuster, Ralph Kastle, and Thomas Schmid, "Dosimetic evaluation of mobile communications equipment with know precision", IEICE Transactions on Communications, vol. E80-B, no. 5, pp.645-652, May 1997.

[5] NIS81, NAMAS, "The treatment of uncertainty in EMC measurement", Tech. Rep., NAMAS Executive, National Physical Laboratory, Teddinton, Middlesex, England, 1994.

[6] Barry N. Tayor and Chris E. Kuyatt, "Guidelines for evaluating and expressing the uncertainty of NIST measurement results", Tech. Rep., National Institute of Standards and Technology, 1994.

[7] Federal Communications Commission, "SAR Measurement Procedures for 802.11 a/b/g Transmitters"

[8] Federal Communications Commission, KDB 648474 – "SAR Evaluation Considerations for Handsets with Multiple Transmitters and Antennas".

[9] Federal Communications Commission, KDB 447498 – "Mobile and Portable Device RF Exposure Procedures and Equipment Authorization Policies".

[10] ANSI, ANSI/IEEE C63.10-2009: American National Standard for Testing Unlicensed Wireless Devices.

3.0 INTRODUCTION

At the request of Care Fusion, the 32 Channel Wireless EEG was evaluated for SAR in accordance with the requirements for RF Exposure compliance testing defined in FCC OET Bulletin 65, Supplement C (Edition 01-01). Testing was performed at the Intertek facility in Lexington, Kentucky on 5/14/2010.

For the evaluation, the dosimetric assessment system DASY4 was used. The phantom employed was the "SAM Twin Phantom". The total uncertainty for the evaluation of the spatial peak SAR values averaged over a cube of 1g tissue mass had been assessed for this system to be ±21.9%.

The 32 Channel Wireless EEG was tested at the maximum output power measured by Intertek. Maximum output power measurements are tabulated under **Heading 11.0 - Tabular Test Results**.

The maximum spatial peak SAR value for the sample device averaged over 1g was found to be:

Phantom	Mode	Setup Details	Worst Case Extrapolated SAR_{1g} mW/g
Flat Section (Body Mode)	Ch 6 - 802.11b, 1 Mbps Data Rate	Antenna side of device against phantom	**0.128**

Table 1: Maximum Measured SAR

Based on the worst-case data presented above, the 32 Channel Wireless EEG was found to be **compliant** with the 1.6 mW/g requirement defined in OET Bulletin 65, Supplement C (Edition 01-01) for general population / uncontrolled exposure.

Modifications made to test sample

Intertek implemented no modifications.

4.0 TEST SITE DESCRIPTION

The SAR test site located at 731 Enterprise Drive, Lexington KY 40510 is comprised of the SPEAG model DASY 4 automated near-field scanning system, which is a package, optimized for dosimetric evaluation of mobile radios [3]. This system is installed in an ambient-free shielded chamber. The ambient temperature is controlled to 22.0 $\pm 2^{O}$C. . During the SAR evaluations, the RF ambient conditions are monitored continuously for signals that might interfere with the test results. The tissue simulating liquid is also stored in this area in order to keep it at the same constant ambient temperature as the room.

Figure 1: Intertek SAR Test Site

Measurement Equipment

The following major equipment/components were used for the SAR evaluations:

SAR Measurement System			
Equipment	**Specifications**	**S/N #**	**Cal. Due**
Robot	**Stäubli RX60L**	597412-01	N/A
	Repeatability: ± 0.025mm Accuracy: 0.806x10-3 degree Number of Axes: 6		
E-Field Probe	**EX3DV3**	3516	12/15/2010
	Frequency Range: 10MHz to 6GHz Probe Linearity: ± 0.2 dB (30MHz to 6GHz) Length: 337 mm Distance between the probe tip and the dipole center: 1 mm Tip Diameter: 2.5 mm Calibration: 835, 900, 1750, 1900, 2450, 5200, 5800MHz for head & body tissue simulating liquid		
Data Acquisition	**DAE4**	358	4/14/2011
	Measurement Range: 1µV to >200mV Input offset Voltage: < 1µV (with auto zero) Input Resistance: 200 M		
Phantom	**SAM Twin V4.0**	TP-1243	N/A
Complies with IEEE 1528-2003	Type SAM Twin, Homogenous Shell Material: Fiberglass Thickness: 2 ± 0.2 mm Capacity: 20 liter Size of the flat section: approx. 320 x 230 mm		
Device holder	Non-conductive holder supplied with DASY4, dielectric constant less than 5.0	N/A	N/A
Network Analyzer	**Agilent 8753A**	3018	2/24/2011
	Frequency Range: 30KHz – 3.0 GHz		
Signal Generator	**ESG-D3000A**	2038	10/19/2010
	Frequency Range: 10MHz – 3 GHz		
Spectrum Analyzer	**Rohde & Schwarz FSP 7**	1164.4391.07	8/17/2010
	Frequency Range: 9KHz – 7 GHz		

Table 2: Test Equipment Used for SAR Evaluation

Measurement Traceability

All measurements described in this report are traceable to National Institute of Standards and Technology (NIST) standards or appropriate national standards.

Measurement Uncertainty

The Table below includes the uncertainty budget suggested by the IEEE Std 1528-2003 and determined by SPEAG for the DASY4 measurement System

Error Description	Uncertainty Value	Prob. Dist.	Div.	c_i (1g)	c_i (10g)	Std.Unc. (1g)	Std.Unc. (10g)	(v_i) v_{eff}
Measurement System								
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 Effect	±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 Conditions	±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%	∞
Test sample Related								
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%	∞
Phantom and Tissue Parameters								
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 Standard Uncertainty						±10.9%	±10.7%	387
Expanded STD Uncertainty						**±21.9%**	**±21.4%**	

Notes.

1. Worst Case uncertainty budget for DASY4 assessed according to IEEE 1528. 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 considerably smaller.

5.0 JOB DESCRIPTION

At the request of Care Fusion, the 32 Channel Wireless EEG was evaluated to the requirements defined in OET Bulletin 65, Supplement C.

Test sample	
Manufacturer	Care Fusion
Model Number	32 Channel Wireless EEG
Serial Number	Not Labeled
Receive Date	5/13/2010
Device Received Condition	Good condition production unit
Device Category	Portable
RF Exposure Category	General Population/Uncontrolled Environment
Frequency Band	2.4GHz ISM Band
Mode(s) of Operation	802.11b/g
Duty Cycle	100% (Test Commands)
Maximum Output Power	802.11: 14.92 dBm - Peak
Test Channels	802.11b – Ch1 (2412MHz), Ch 6 (2437MHz), Ch 11 (2462MHz)
Antenna Type	802.11b/g – PCB
Test sample Accessories	
Battery Pack	BATTERY/LI-ION 10.8V 4.2AH; Part Number - 222-497900
Power Supply	PCM32; Part Number - 113-405500
Photic Cable	Wireless EEG Photic; Part Number - 085-481900
Patient Event Cable	Part Number - 085-470200
Electrodes	Part Number- 019-414400
SPO2	Nonin Pulse Oximiter; Model=7000A
Shoulder Bag	143-417700
Contact Information	
Contact Name	Dan Lombardi
Phone Number	(608) 441-2365
Email Address	daniel.lombardi@viasyshc.com

Table 3: Product Information

Test Sample Pictures:

Photographs of the test sample and its accessories are shown in Figure 2 through Figure 5.

Figure 2: Front of Test Sample

Figure 3: Back Side of Test Sample with Amp Installed

Figure 4: Left Side of Test Sample with Cables Installed

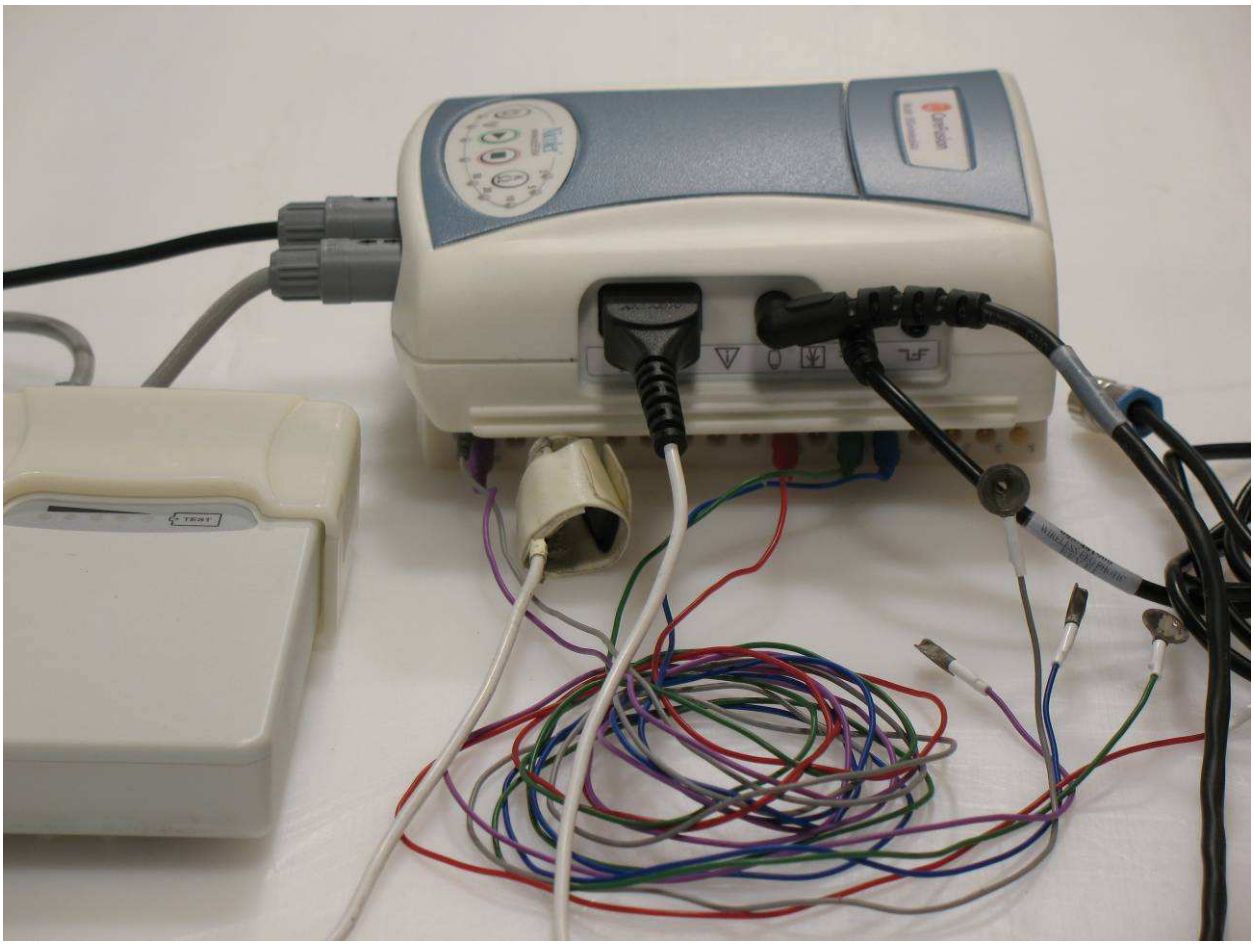
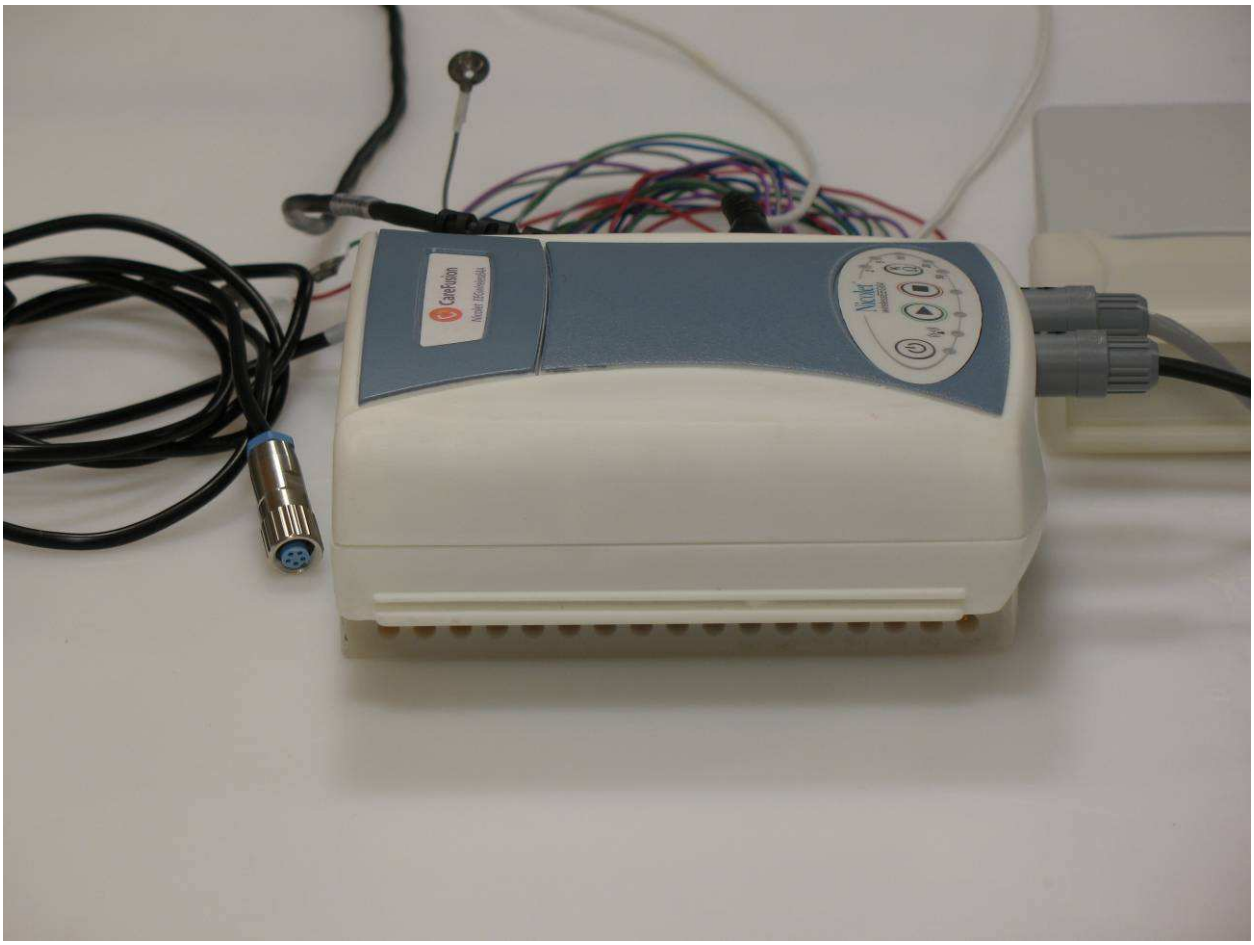


Figure 5: Right of Test Sample



6.0 SYSTEM VERIFICATION

System Validation

Prior to the assessment, the system was verified to be within ±10% of the specifications by using the system validation kit. The validation was performed at 2450 MHz using muscle simulating tissue. The results from the daily dipole validation are shown in Table 4.

Figure 6: System Verification Setup

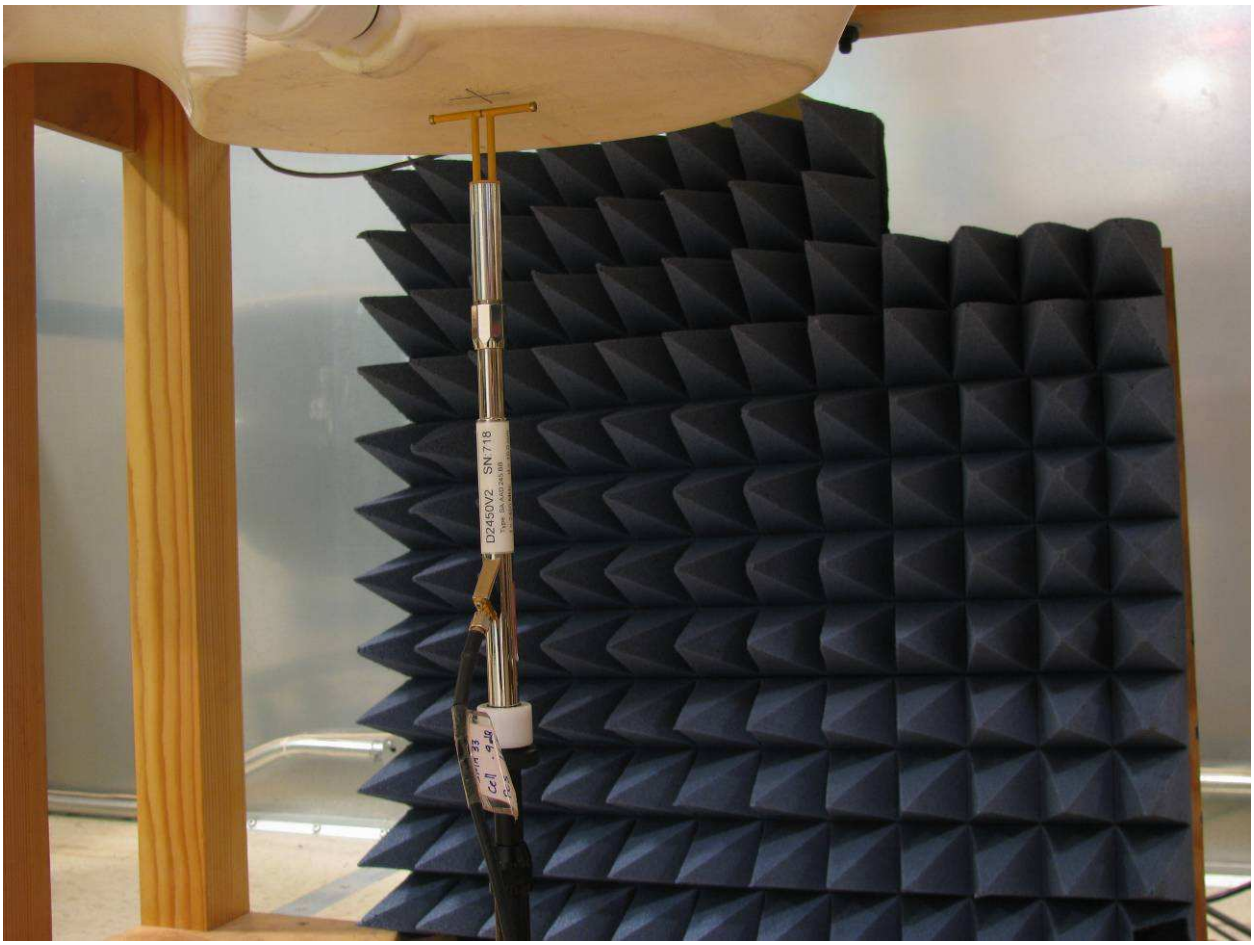


Table 4: Dipole Validation

Reference Dipole Validation								
Frequency Measure (MHz)	**Dipole Type**	**Dipole Serial Number**	**Fluid Type**	**Dipole Power Input**	**Cal. Lab SAR (1g)**	**Measured SAR (1g)**	**% Error SAR (1g)**	**Date**
2450	D2450	718	2450 MSL	1W	50.2	51.10	1.79	5/13/2010
2450	D2450	718	2450 MSL	1W	50.2	54.20	7.97	5/14/2010

Tissue Simulating Liquid Description and Validation

The dielectric parameters were verified to be within 5% of the target values each day prior to assessment. The dielectric parameters **(ε_r, σ)** and temperature on each day of testing are shown in Table 5 and Table 6. A recipe for the tissue simulating fluid used is shown in Table 7.

Table 5: Dielectric Parameter Validation

Body Tissue Parameters								
Frequency Measure (MHz)	**Dielectric Constant Target**	**Dielectric Constant Measure**	**Dielectric % Deviation**	**Imaginary Part**	**Conductivity Target**	**Conductivity Measure**	**Conductivity % Deviation**	**Date**
2412	52.75	52.7	**0.09**	14.65	1.91	1.96	**2.85**	
2437	52.72	52.5	**0.42**	14.78	1.94	2.00	**3.22**	
2450	52.7	52.42	**0.53**	14.82	1.95	2.02	**3.52**	
2462	52.68	52.27	**0.78**	14.97	1.97	2.05	**4.01**	5/13/2010
The % deviation should be below 5%.								

Body Tissue Parameters								
Frequency Measure (MHz)	**Dielectric Constant Target**	**Dielectric Constant Measure**	**Dielectric % Deviation**	**Imaginary Part**	**Conductivity Target**	**Conductivity Measure**	**Conductivity % Deviation**	**Date**
2412	52.75	52.6	**0.28**	14.66	1.91	1.97	**2.92**	
2437	52.72	52.45	**0.51**	14.67	1.94	1.99	**2.45**	
2450	52.7	52.33	**0.70**	14.85	1.95	2.02	**3.73**	
2462	52.68	52.2	**0.91**	14.8	1.97	2.03	**2.83**	5/14/2010
The % deviation should be below 5%.								

Table 6: Temperature Validation

Date	**Ambient Temperature(°C)**	**Muscle Simulating Liquid Temperature (°C) f=2450MHz**
5/13/2010	21.9	21.7
5/14/2010	22.1	21.6

Table 7: Tissue Simulating Fluid Recipe

TYPICAL COMPOSITION OF INGREDIENTS FOR LIQUID TISSUE PHANTOMS, Supplement C Edition 01-01 to OET Bulletin 65 Edition 97-01, Page 36. (450MHz to 2450 MHz data only)												
Ingredient (% by weight)	f (MHz)											
	450		835		915		1900		2450		5500	
Tissue Type	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body	Head	Body
Water	38.56	51.16	41.45	52.4	41.05	56	54.9	70.45	62.7	**68.64**	65.53	78.67
Salt (NaCl)	3.95	1.49	1.45	1.4	1.35	0.76	0.18	0.36	0.5	**0**	0	0
Sugar	56.32	46.78	56	45	56.5	41.76	0	0	0	**0**	0	0
HEC	0.98	0.52	1	1	1	1.21	0	0	0	**0**	0	0
Bactericide	0.19	0.05	0.1	0.1	0.1	0.27	0	0	0	**0**	0	0
Triton X-100	0	0	0	0	0	0	0	0	36.8	**0**	17.235	10.665
DGBE	0	0	0	0	0	0	44.92	29.18	0	**31.37**	0	0
DGHE	0	0	0	0	0	0	0	0	0	**0**	17.235	10.665
Dielectric Constant	43.42	58	42.54	56.1	42	56.8	39.9	53.3	39.8	**52.7**		
Conductivity (S/m)	0.85	0.83	0.91	0.95	1	1.07	1.42	1.52	1.88	**1.95**		

7.0 EVALUATION PROCEDURES

Prior to any testing, the appropriate fluid was used to fill the phantom to a depth of 15 cm ±0.2cm. The fluid parameters were verified and the dipole validation was performed as described in the previous sections.

Test Positions:

The Device was positioned against the SAM and flat phantom using the exact procedure described in Supplement C Edition 01 – 01 of Federal Communications Commission, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields", OET Bulletin 65, FCC, Washington, D.C. 20554, 1997.

Reference Power Measurement:

The measurement probe was positioned at a fixed location above the reference point. A power measurement was made with the probe above this reference position so it could used for the assessing the power drift later in the test procedure.

Coarse Scan:

A coarse area scan with a horizontal grid spacing of 15 x 15 mm was performed in order to find the approximate location of the peak SAR value. This scan was performed with the measurement probe at a constant height in the simulating fluid. A two dimensional spline interpolation algorithm was then used to determine the peaks and gradients within the scanned area.

Zoom Scan:

A zoom scan was performed around the approximate location of the peak SAR as determined from the coarse scan. The zoom scan was comprised of a measurement volume of 30 x 30 x 30 mm based on 7 x 7 x 7 points. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure:

Data Extrapolation:

Since the center of the dipoles in the measurement probe are 1 mm away from the tip of the probe, and the distance between the surface and the lowest measurement point is 2 mm the data at the surface was extrapolated. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in the Z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

The maximum interpolated value was searched with a straightforward sorting algorithm. Around this maximum, the SAR values averaged over the spatial volumes (1g or 10g) were computed using a 3-D spline interpolation algorithm. The 3-D spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y and z directions). The volume was integrated with a trapezoidal algorithm. 1000 points (10 x 10 x 10) were interpolated to calculate the average.

All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

Power Drift Measurement:

The probe was positioned at precisely the same reference point and the reference power measurement was repeated. The difference between the initial reference power and the final one is referred to as the power drift. The power drift measurement was used to assess the output power stability of the test sample throughout the SAR scan.

RF Ambient Activity:

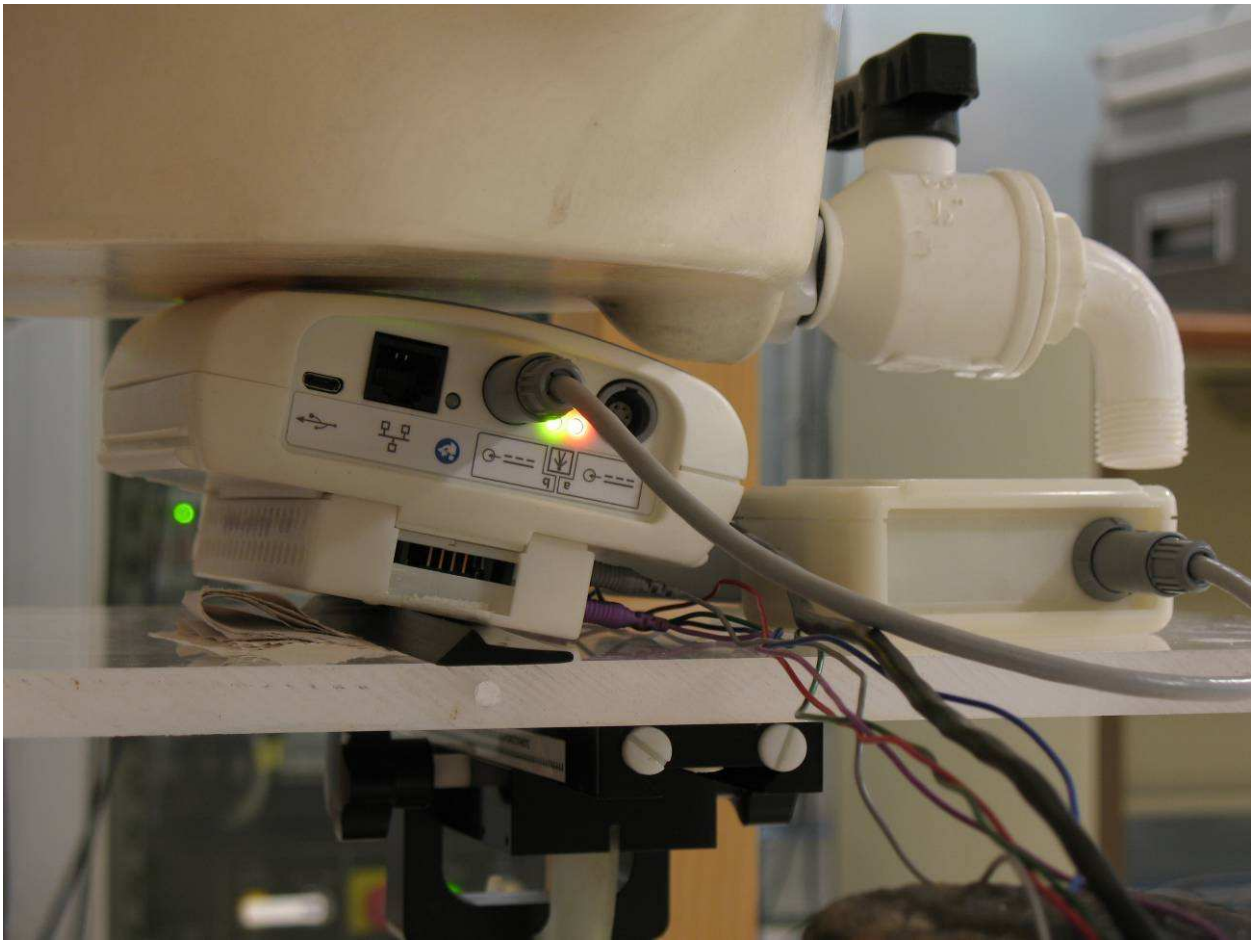
During the entire SAR evaluation, the RF ambient activity was monitored using a spectrum analyzer with an antenna connected to it. The spectrum analyzer was tuned to the frequency of measurement and with one trace set to max hold mode. In this way, it was possible to determine if at any point during the SAR measurement there was an interfering ambient signal. If an ambient signal was detected, then the SAR measurement was repeated.

8.0 TEST CONFIGURATION

For the purpose of this evaluation, the 32 Channel Wireless EEG was considered to be a device that could be operated when held against the body. All SAR scans were performed with a freshly charged battery installed.

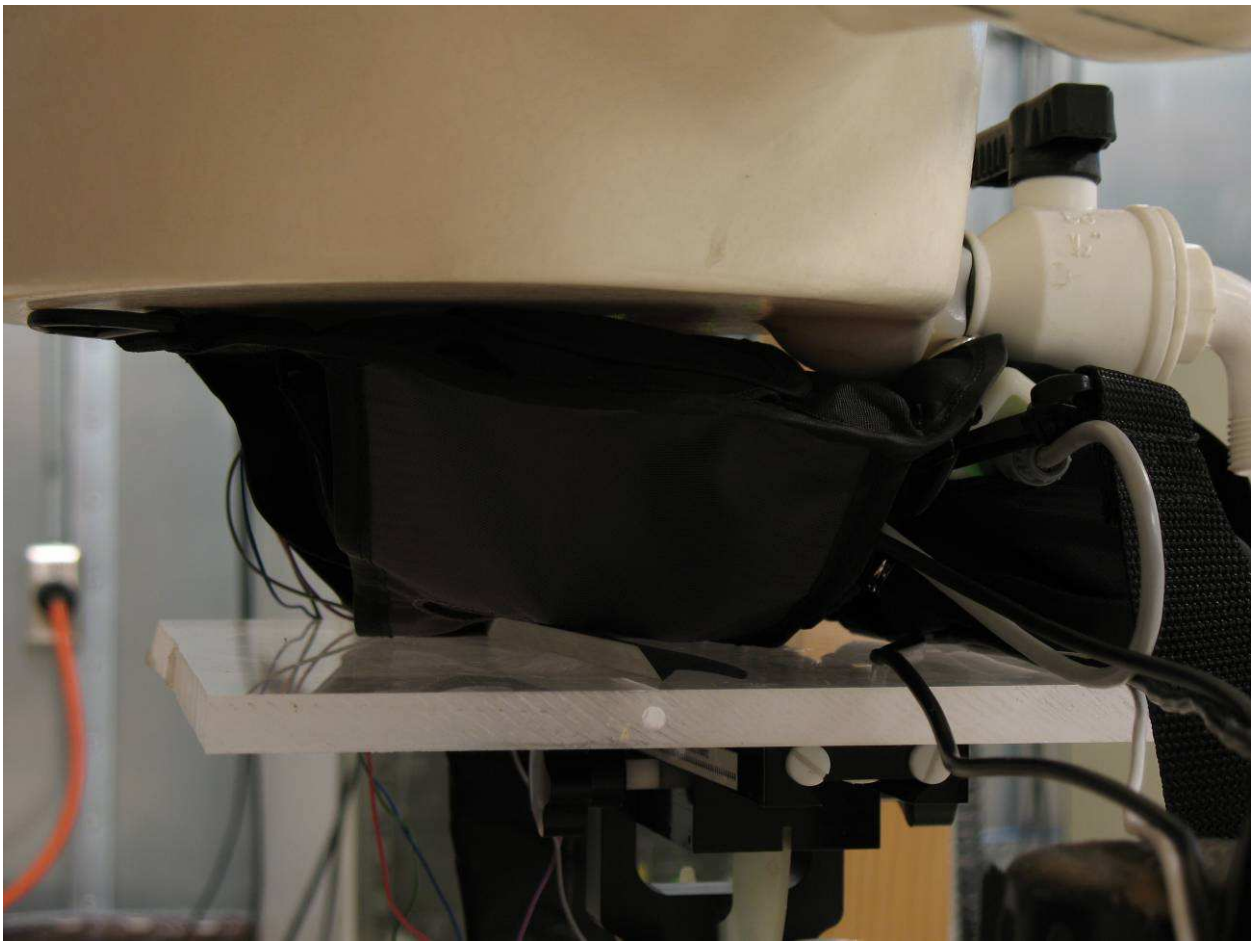
The test channels and operating modes were selected using software based test commands. The device was positioned against the bottom of the phantom with zero clearance during the evaluation. A photograph of the 32 Channel Wireless EEG, as positioned for testing, is shown in Figure 7.

Figure 7: Device Positioning for SAR Scans – Front Side Against Phantom[1]



[1] The position of the device was manipulated to provide the minimum distance from the phantom to the antenna.

Figure 8: Device Positioning for SAR Scans – Front Side Against Phantom In Garment Bag[2]



[2] The position of the device was manipulated to provide the minimum distance from the phantom to the antenna.

Figure 9: Device Positioning for SAR Scans – Back Side Against Phantom

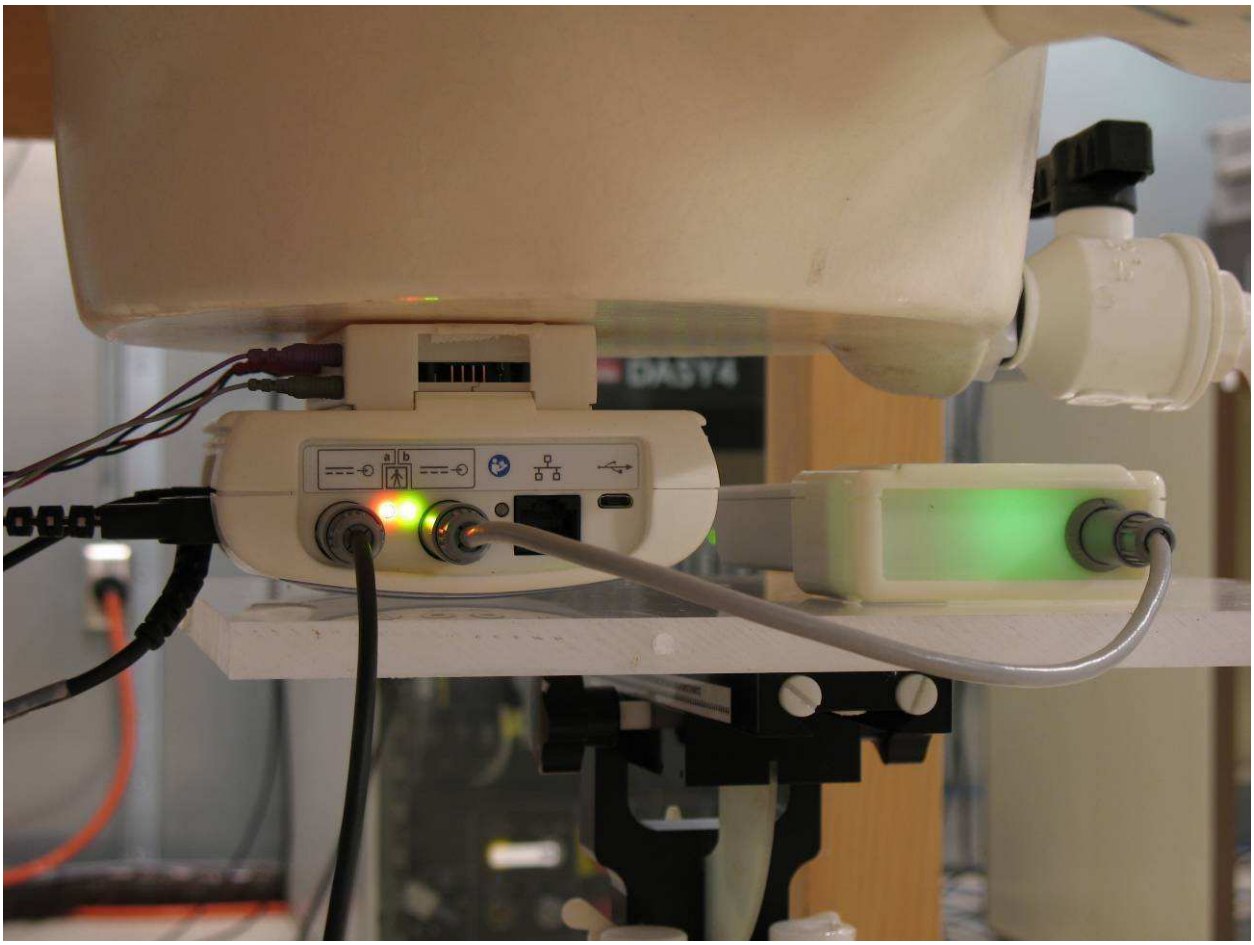


Figure 10: Device Positioning for SAR Scans – Back Side Against Phantom In Garment Bag

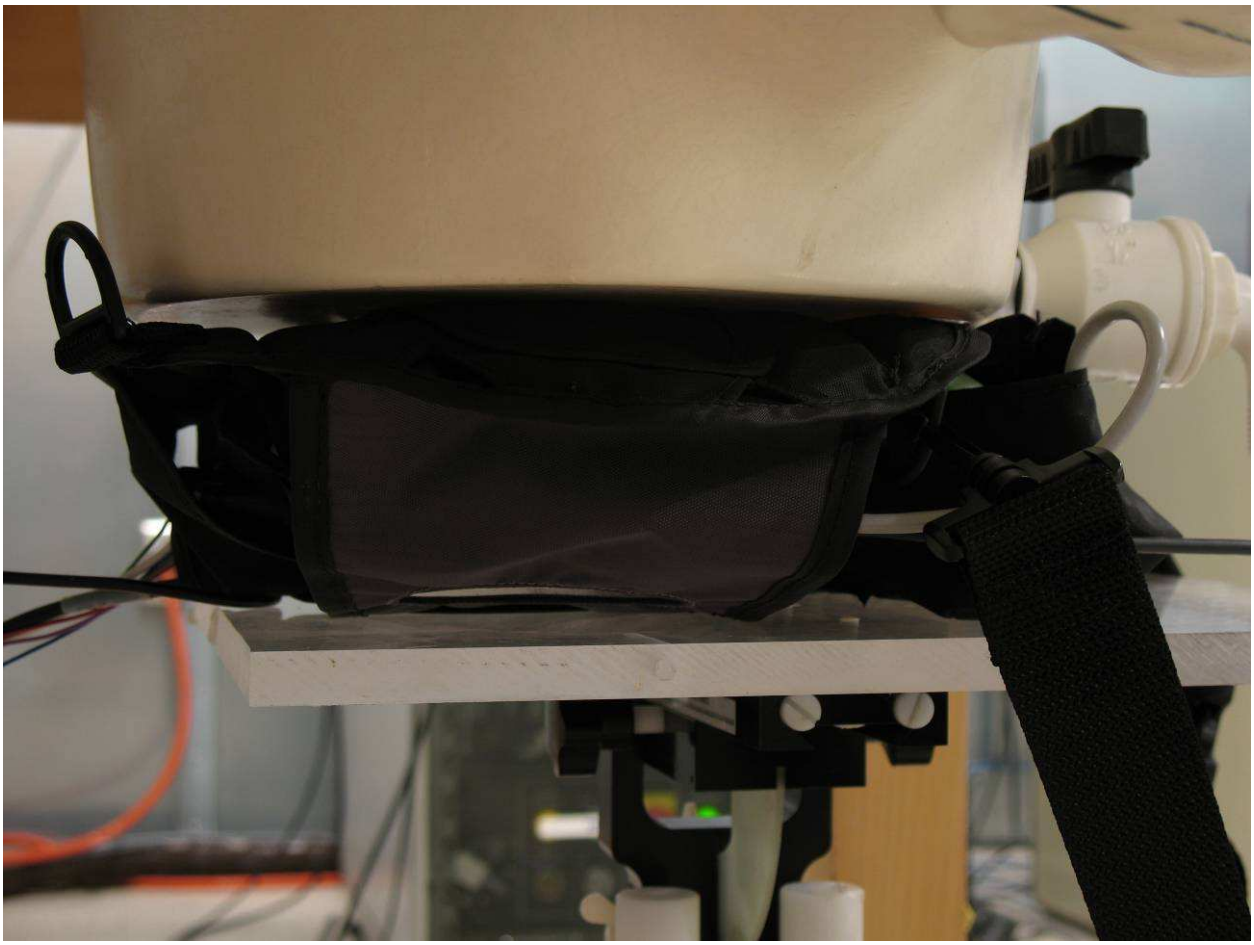


Figure 11: Device Positioning for SAR Scans – Antenna Side Against Phantom

9.0 CRITERIA

The following FCC limits for SAR apply to devices operating in the General Population/Uncontrolled Exposure environment:

Exposure **(General Population/Uncontrolled Exposure environment)**	**SAR** **(W/kg)**
Average over the whole body	0.08
Spatial Peak (1g)	1.60
Spatial Peak for hands, wrists, feet and ankles (10g)	4.00

10.0 TABULAR TEST RESULTS

The results on the following page(s) were obtained when the device was transmitting at maximum output power. Detailed measurement data and plots, which reveal information about the location of the maximum SAR with respect to the device, are referenced under **Heading 12.0 - Graphical SAR Scan Results** on page 32.

Conducted Power Measurements

The conducted power measurements for the 32 Channel Wireless EEG were performed in accordance to ANSI C63.19:2009 Section 6.10.2.1 using the channel integration method. The measurements were performed using the channel power function of the spectrum analyzer in peak and average detection mode. Cable loss was accounted for by offsetting the readings by the appropriate amount.

Table 8: Conducted Output Power – 802.11b/g Mode

Channel	Frequency (MHz)	Modulation	Data Rate	Peak Conducted Output Power (dBm)	Avg Conducted Output Power (dBm)
1	2412	BPSK	1 Mbps	14.74	12.96
		CCK	11 Mbps	14.67	12.92
		64 QAM	54 Mbps	12.45	10.25
6	2437	BPSK	1 Mbps	14.5	10.78
		CCK	11 Mbps	**14.92**	**13.30**
		64 QAM	54 Mbps	12.39	10.77
11	2462	BPSK	1 Mbps	13.4	9.52
		CCK	11 Mbps	14.55	12.10
		64 QAM	54 Mbps	12.5	10.65

Body Mode SAR Test Results

The device could be held against the body using a body worn garment or set next to or on the patient during normal use. The device had optional cable and power accessories that could be used while operating near the body. The device was tested in the different configurations shown in Table 9 to determine the worst case exposure condition. Scans was performed at 11Mbps data rate in b-mode on the channel with the highest output power. A scan was performed in the worse case configuration with the device operating with a data rate of 1 Mbps on the channel with the highest output power. Since the output power in 802.11g mode was less than 802.11b mode, no scans were required for that mode. The worse case 1-g SAR value was less than the 1.6mW/g limit.

Table 9: Configuration List

Configuration	Channel	Data Rate (Mbps)	Orientation	Description
1	6	11	Front	Minimum cable configuration - 5 electrode cables, patient event cable, battery pack
2	6	11	Front	Maximum cable configuration - 5 electrode cables, patient event cable, battery pack, power supply, photic out cable, Nonin cable
3	6	11	Front	Worst case cable configuration installed the body worn garment.
4	6	11	Back	Worse case cable configuration.
5	6	11	Back	Worst case cable configuration installed the body worn garment.
6	6	11	Antenna Side	Side of product closest to antenna against phantom. Worse case cable configuration.
7	6	1	Antenna Side	Worse 1g SAR configuration with device operating in 1mbps data rate.

Table 10: Body Mode SAR Results – 802.11b/g Mode

Configuration	Mode/Channel	Data Rate	Freq. (MHz)	Position	SAR Drift (dB)	Measured 1-g SAR (mW/g)	Meas. 10g-SAR (mw/g)
1	802.11b - Ch. 6	11 Mbps	2437	Front	0.001	0.110	0.050
2	802.11b - Ch. 6	11 Mbps	2437	Front	0.001	0.115	0.052
3	802.11b - Ch. 6	11 Mbps	2437	Front	-0.204	0.037	0.019
4	802.11b - Ch. 6	11 Mbps	2437	Back	0.156	0.003	0.002
5	802.11b - Ch. 6	11 Mbps	2437	Back	0.047	0.001	0.001
6	802.11b - Ch. 6	11 Mbps	2437	Side	-0.202	0.118	0.052
7	802.11b - Ch. 6	1 Mbps	2437	Side	-0.050	**0.128**	0.055
FCC Limit = 1.6mW/g (General Population / Uncontrolled Exposure)							

11.0 DIPOLE VALIDATION SCANS

Date/Time: 5/13/2010 9:19:40 AM

Test Laboratory: Intertek ETL Semko
File Name: Dipole Validation 5_13_2010.da4

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:718
Program Name: System Performance Check at 2450 MHz

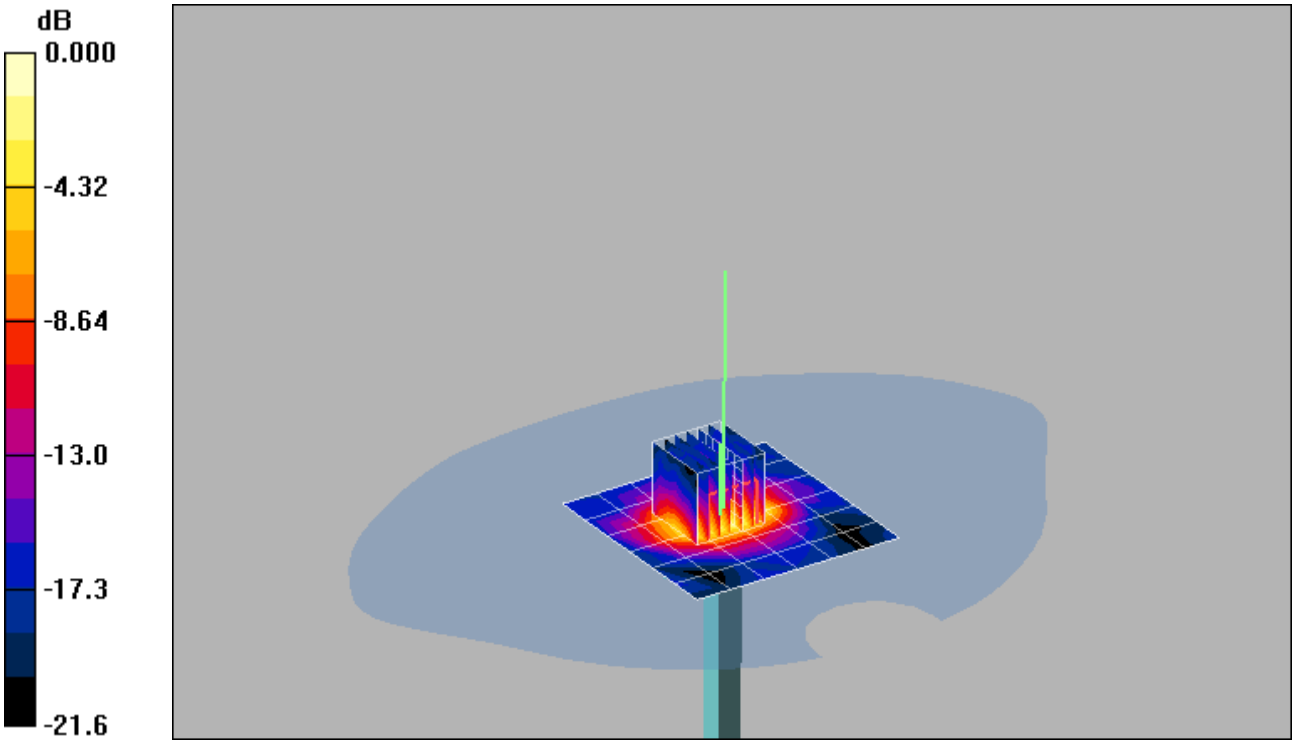
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.02 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3516; ConvF(8.22, 8.22, 8.22); Calibrated: 12/15/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn358; Calibrated: 4/14/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1243
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

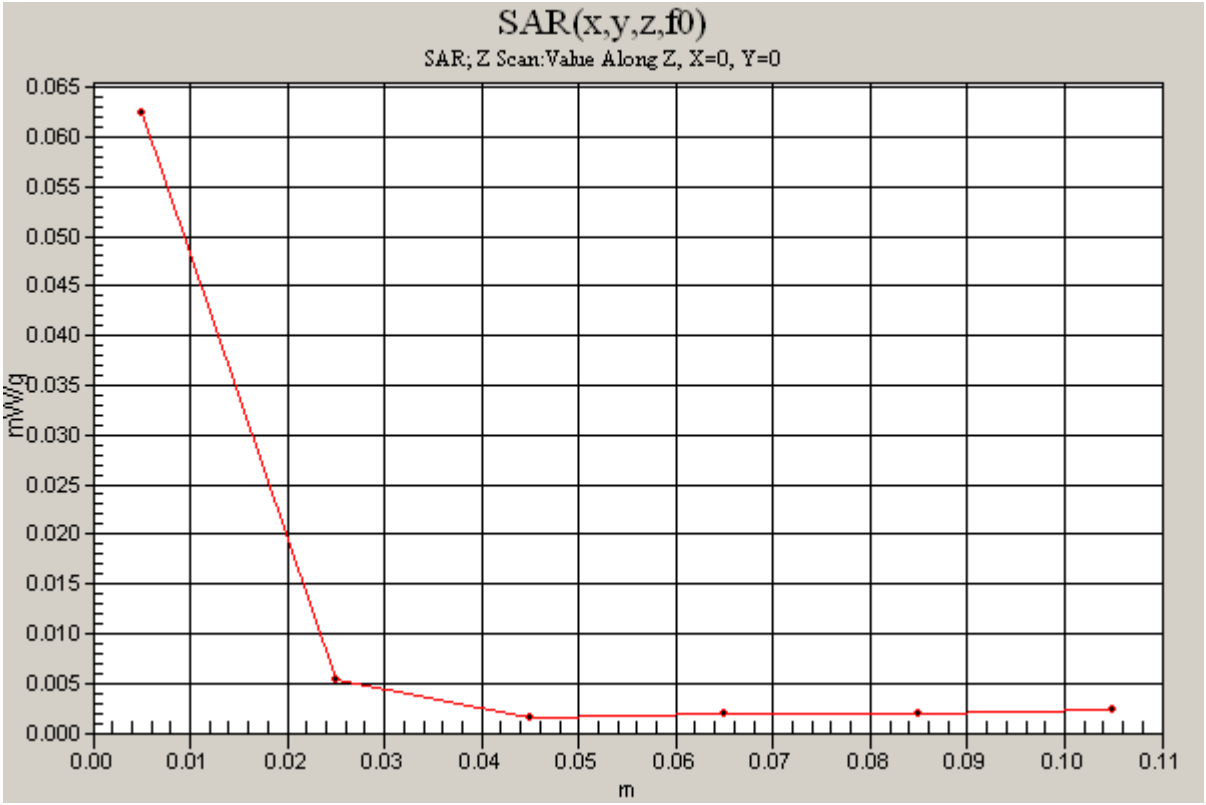
d=10mm, Pin=10mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.044 mW/g

d=10mm, Pin=10mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.35 V/m; Power Drift = 0.007 dB
Peak SAR (extrapolated) = 107.9 W/kg
SAR(1 g) = 51.1 mW/g; SAR(10 g) = 23.7 mW/g
Normalized to target power = 1 W and actual power = 0.001 W
Maximum value of SAR (measured) = 57.6 mW/g

d=10mm, Pin=10mW/Z Scan (1x1x6): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Maximum value of SAR (measured) = 0.062 mW/g


dB
0.000
-4.32
-8.64
-13.0
-17.3
-21.6

0 dB = 0.044mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11
m

Test Laboratory: Intertek ETL Semko
File Name: Dipole Validation 5_14_2010.da4

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:718
Program Name: System Performance Check at 2450 MHz

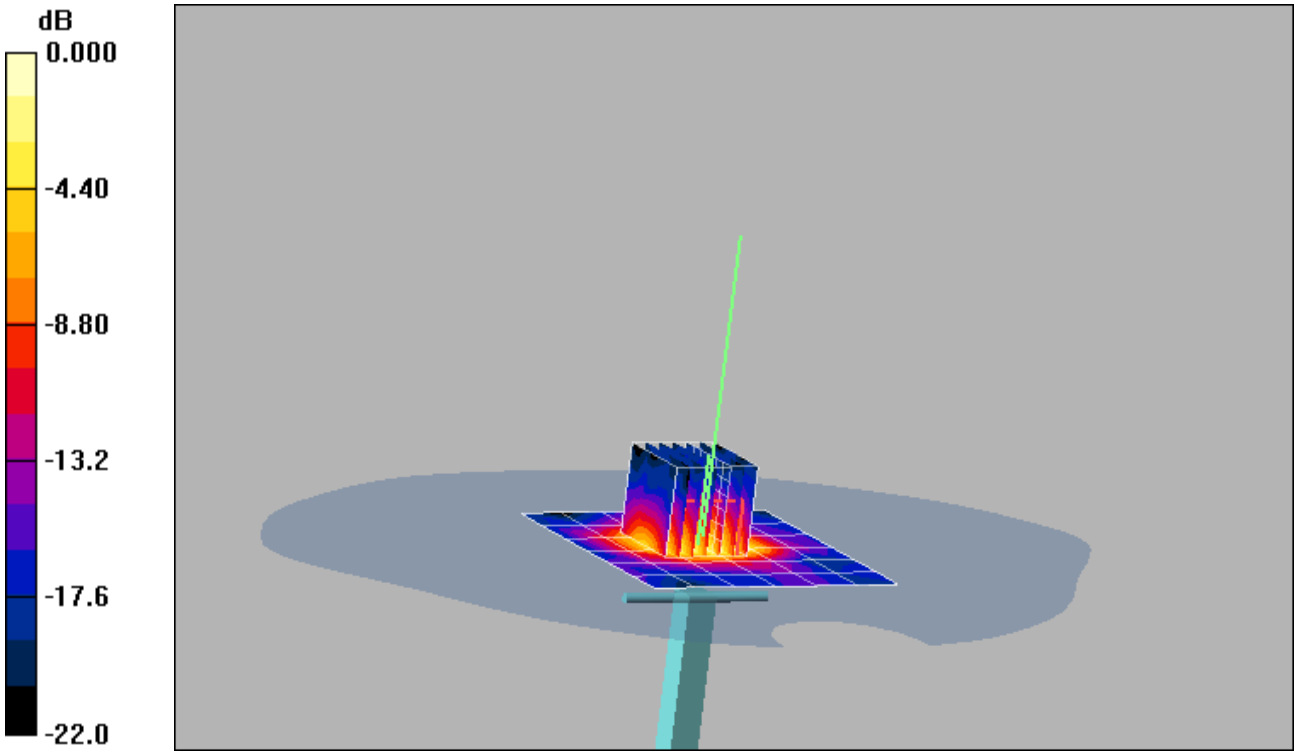
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 2.02 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3516; ConvF(8.22, 8.22, 8.22); Calibrated: 12/15/2009
- Sensor-Surface: 4mm (Mechanical Surface Detection)Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn358; Calibrated: 4/14/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1243
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

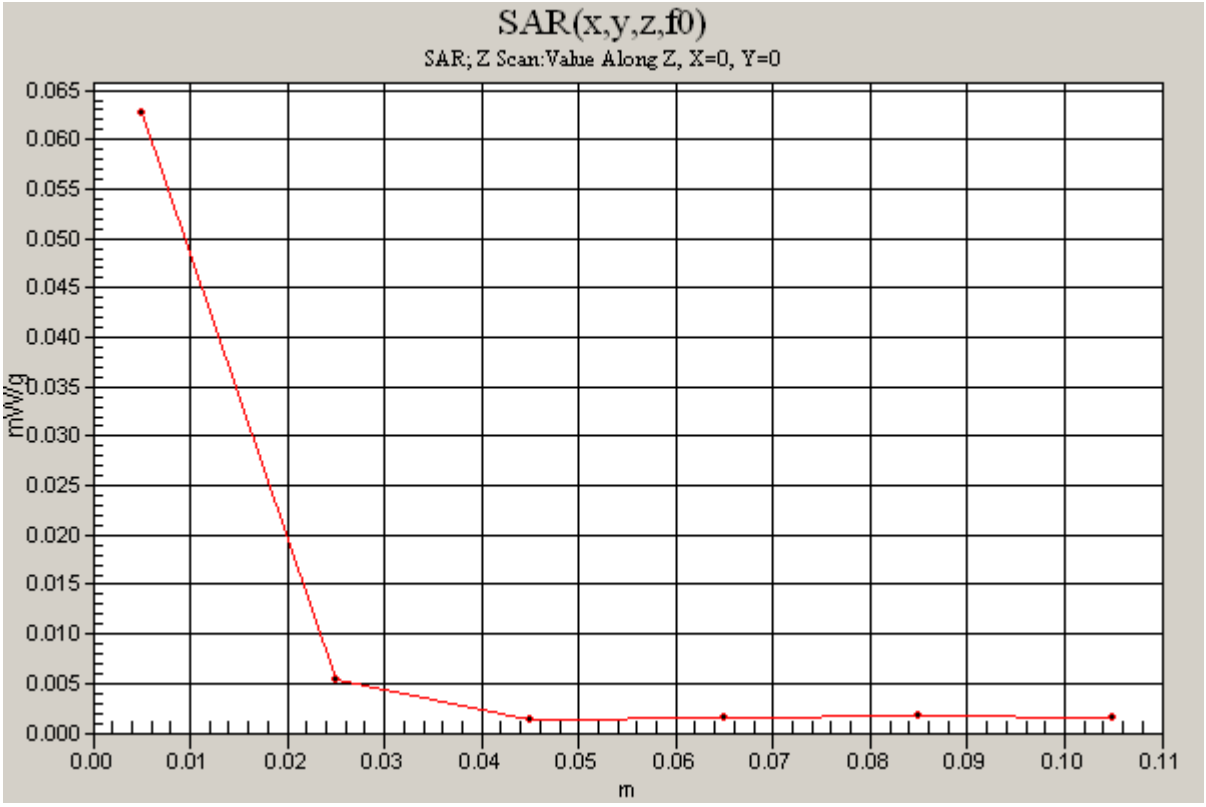
d=10mm, Pin=10mW/Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm
Maximum value of SAR (measured) = 0.044 mW/g

d=10mm, Pin=10mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.52 V/m; Power Drift = -0.017 dB
Peak SAR (extrapolated) = 117.2 W/kg
SAR(1 g) = 54.2 mW/g; SAR(10 g) = 25 mW/g
Normalized to target power = 1 W and actual power = 0.001 W
Maximum value of SAR (measured) = 62.1 mW/g

d=10mm, Pin=10mW/Z Scan (1x1x6): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Maximum value of SAR (measured) = 0.063 mW/g


dB
0.000
-4.40
-8.80
-13.2
-17.6
-22.0

0 dB = 0.044mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
0.065
0.060
0.055
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11
m

12.0 GRAPHICAL SAR SCAN RESULTS

Date/Time: 5/13/2010 2:04:39 PM

Test Laboratory: Intertek ETL Semko
File Name: CH 6 802.11b 11mbps front of device against phantom.da4

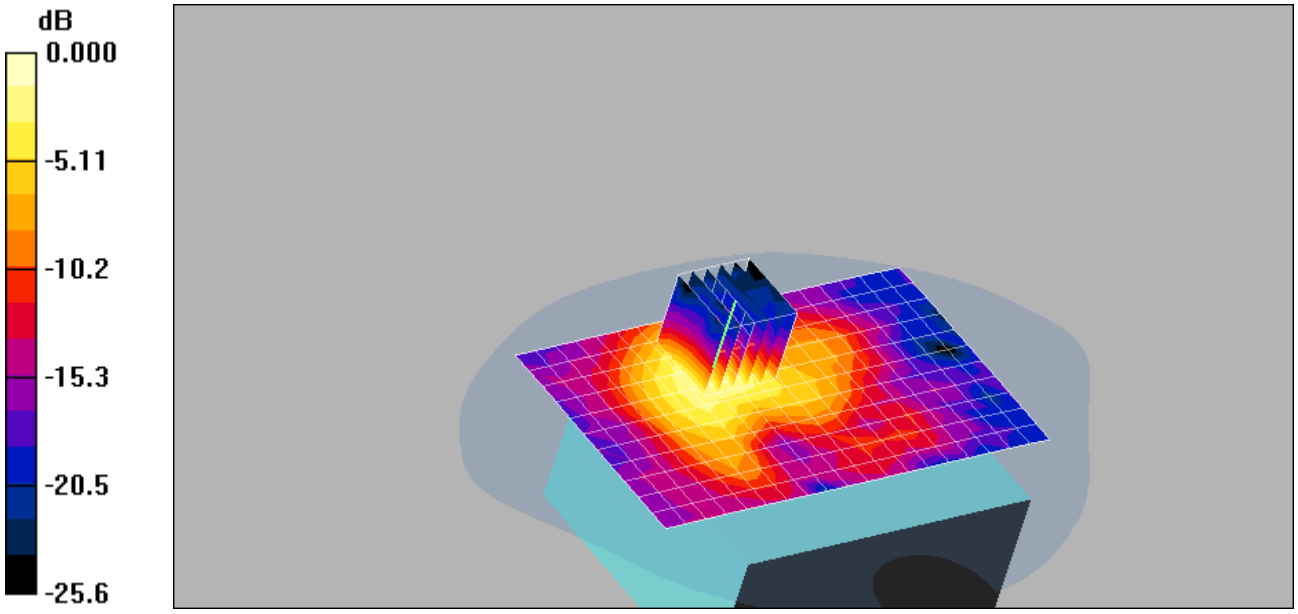
DUT: CareFusion;
Program Name: Different Test Procedures (Left-Hand Side)

Communication System: 802.11b/g; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 2 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

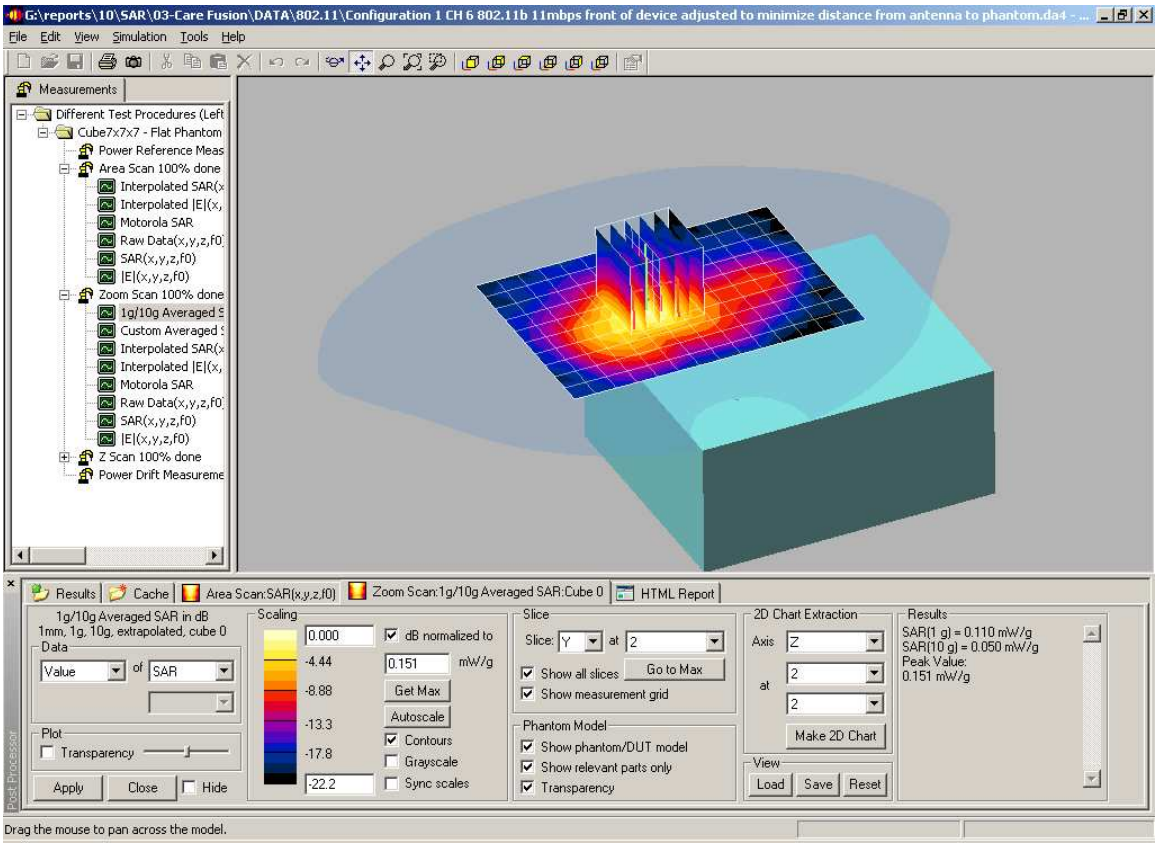
DASY4 Configuration:
- Probe: EX3DV3 - SN3516; ConvF(8.22, 8.22, 8.22); Calibrated: 12/15/2009
- Sensor-Surface: 2.7mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 4/14/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1243
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Cube7x7x7 - Flat Phantom/Area Scan (12x20x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.068 mW/g

Cube7x7x7 - Flat Phantom/Zoom Scan (6x6x6)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=7mm
Reference Value = 1.67 V/m; Power Drift = 0.188 dB
Peak SAR (extrapolated) = 0.105 W/kg
SAR(1 g) = 0.053 mW/g; SAR(10 g) = 0.026 mW/g
Maximum value of SAR (measured) = 0.071 mW/g



0 dB = 0.068mW/g


G:\reports\10\SAR\03-Care Fusion\DATA\802.11\Configuration 1 CH 6 802.11b 11mbps front of device adjusted to minimize distance from antenna to phantom.da4 - ...
File Edit View Simulation Tools Help
Measurements
Different Test Procedures (Left
Cube7x7x7 - Flat Phantom
Power Reference Meas
Area Scan 100% done
Interpolated SAR(x
Interpolated |E|(x,
Motorola SAR
Raw Data(x,y,z,f0)
SAR(x,y,z,f0)
|E|(x,y,z,f0)
Zoom Scan 100% done
1g/10g Averaged S
Custom Averaged S
Interpolated SAR(x
Interpolated |E|(x,
Motorola SAR
Raw Data(x,y,z,f0)
SAR(x,y,z,f0)
|E|(x,y,z,f0)
Z Scan 100% done
Power Drift Measureme
Results
Cache
Area Scan:SAR(x,y,z,f0)
Zoom Scan:1g/10g Averaged SAR:Cube 0
HTML Report
1g/10g Averaged SAR in dB
1mm, 1g, 10g, extrapolated, cube 0
Data
Value
of
SAR
Plot
Transparency
Apply
Close
Hide
Post Processor
Scaling
0.000
-4.44
-8.88
-13.3
-17.8
-22.2
dB normalized to
0.151
mW/g
Get Max
Autoscale
Contours
Grayscale
Sync scales
Slice
Slice: Y at 2
Show all slices
Go to Max
Show measurement grid
Phantom Model
Show phantom/DUT model
Show relevant parts only
Transparency
2D Chart Extraction
Axis Z
at 2
2
Make 2D Chart
View
Load
Save
Reset
Results
SAR(1 g) = 0.110 mW/g
SAR(10 g) = 0.050 mW/g
Peak Value:
0.151 mW/g
Drag the mouse to pan across the model.

Test Laboratory: Intertek ETL Semko
File Name: Configuration 2 CH 6 802.11b 11mbps front of device against phantom all cables connected.da4

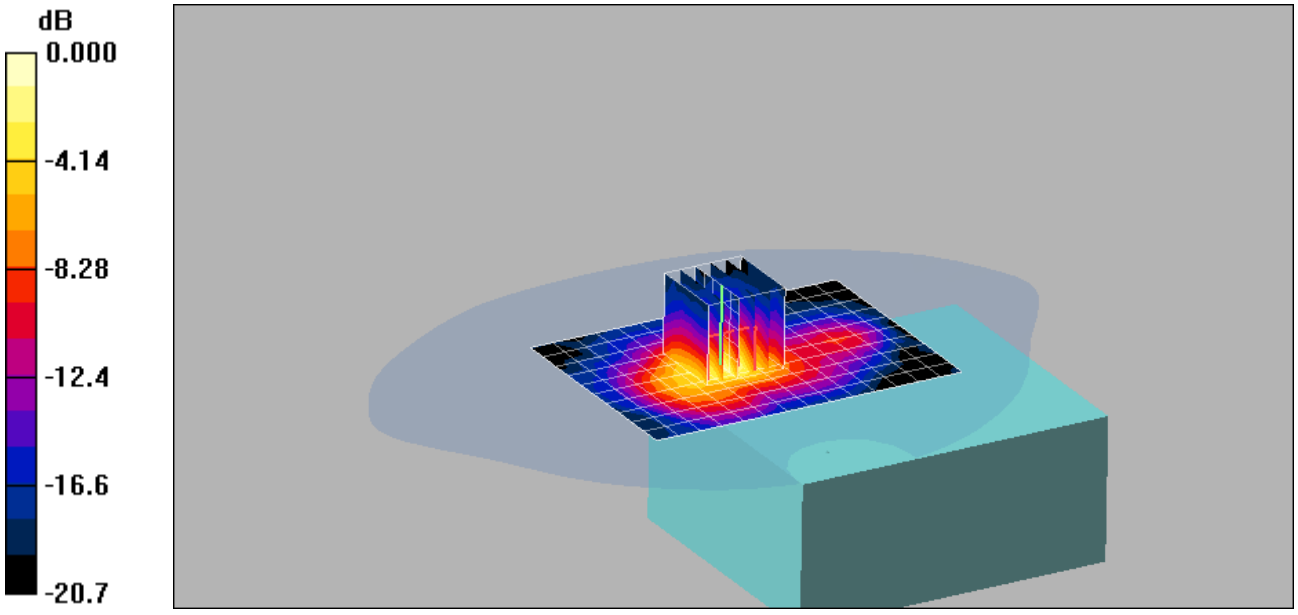
DUT: CareFusion;
Program Name: Different Test Procedures (Left-Hand Side)

Communication System: 802.11b/g; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 2 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3516; ConvF(8.22, 8.22, 8.22); Calibrated: 12/15/2009
- Sensor-Surface: 2.7mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 4/14/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1243
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Cube7x7x7 - Flat Phantom/Area Scan (11x15x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.159 mW/g

Cube7x7x7 - Flat Phantom/Zoom Scan (6x6x6)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=7mm
Reference Value = 8.25 V/m; Power Drift = 0.001 dB
Peak SAR (extrapolated) = 0.244 W/kg
SAR(1 g) = 0.115 mW/g; SAR(10 g) = 0.052 mW/g
Maximum value of SAR (measured) = 0.157 mW/g



0 dB = 0.157mW/g

Test Laboratory: Intertek ETL Semko
File Name: Configuration 4 CH 6 802.11b 11mbps back of device against phantom all cables connected.da4

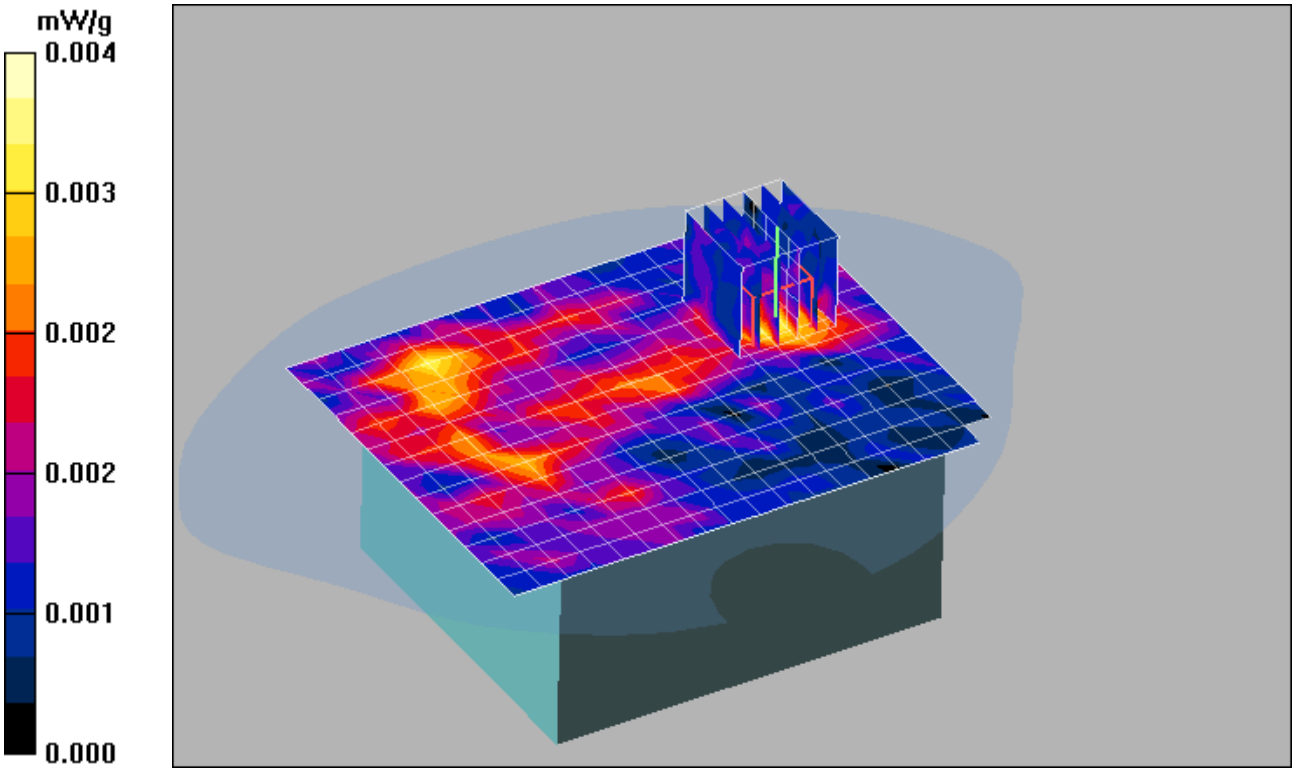
DUT: CareFusion;
Program Name: Different Test Procedures (Left-Hand Side)

Communication System: 802.11b/g; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.99 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3516; ConvF(8.22, 8.22, 8.22); Calibrated: 12/15/2009
- Sensor-Surface: 2.7mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn358; Calibrated: 4/14/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1243
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Cube7x7x7 - Flat Phantom/Area Scan (15x19x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.004 mW/g

Cube7x7x7 - Flat Phantom/Zoom Scan (6x6x6)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=7mm
Reference Value = 0.965 V/m; Power Drift = 0.156 dB
Peak SAR (extrapolated) = 0.005 W/kg
SAR(1 g) = 0.00344 mW/g; SAR(10 g) = 0.00225 mW/g


mW/g
0.004
0.003
0.002
0.002
0.001
0.000

Test Laboratory: Intertek ETL Semko
File Name: Configuration 6 CH 6 802.11b 11mbps Side Against Phantom.da4

DUT: CareFusion;
Program Name: Different Test Procedures (Left-Hand Side)

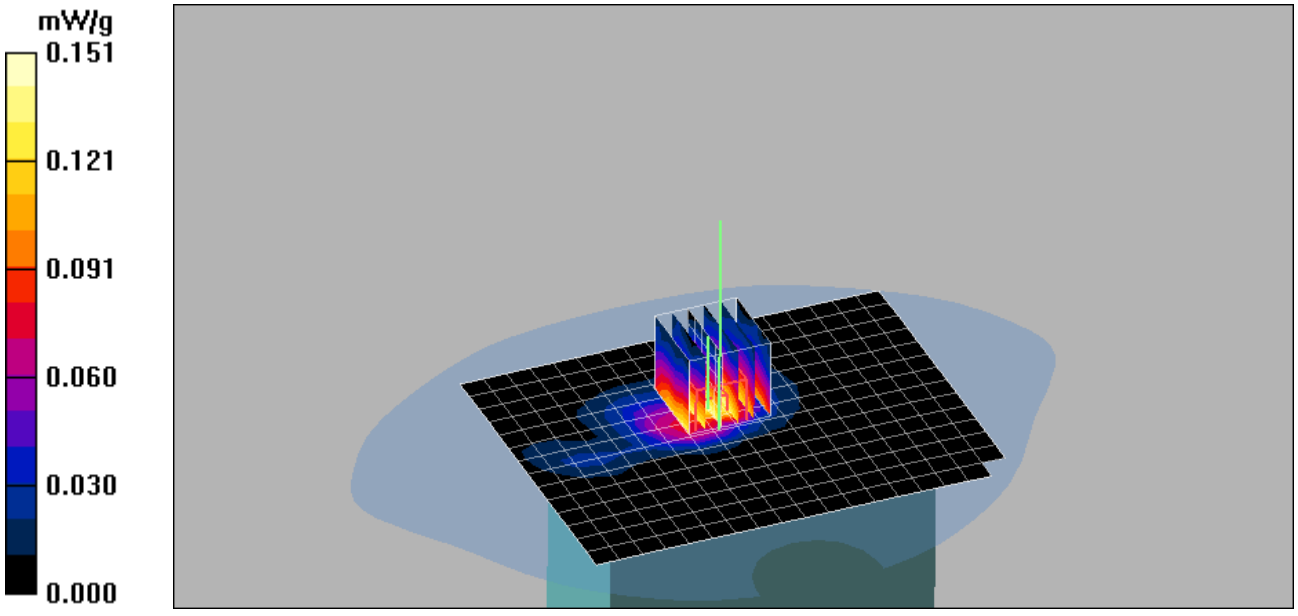
Communication System: 802.11b/g; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.99 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
- Probe: EX3DV3 - SN3516; ConvF(8.22, 8.22, 8.22); Calibrated: 12/15/2009
- Sensor-Surface: 2.7mm (Mechanical Surface Detection)Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn358; Calibrated: 4/14/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1243
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Cube7x7x7 - Flat Phantom/Area Scan (15x19x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.151 mW/g

Cube7x7x7 - Flat Phantom/Zoom Scan (6x6x6)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=7mm
Reference Value = 3.99 V/m; Power Drift = -0.202 dB
Peak SAR (extrapolated) = 0.274 W/kg
SAR(1 g) = 0.118 mW/g; SAR(10 g) = 0.052 mW/g
Maximum value of SAR (measured) = 0.165 mW/g

Cube7x7x7 - Flat Phantom/Z Scan (1x1x6): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Maximum value of SAR (measured) = 0.031 mW/g



Test Laboratory: Intertek ETL Semko
File Name: Configuration 7 CH 6 802.11b 1mbps Side Against Phantom.da4

DUT: CareFusion;
Program Name: Different Test Procedures (Left-Hand Side)

Communication System: 802.11b/g; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.99 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

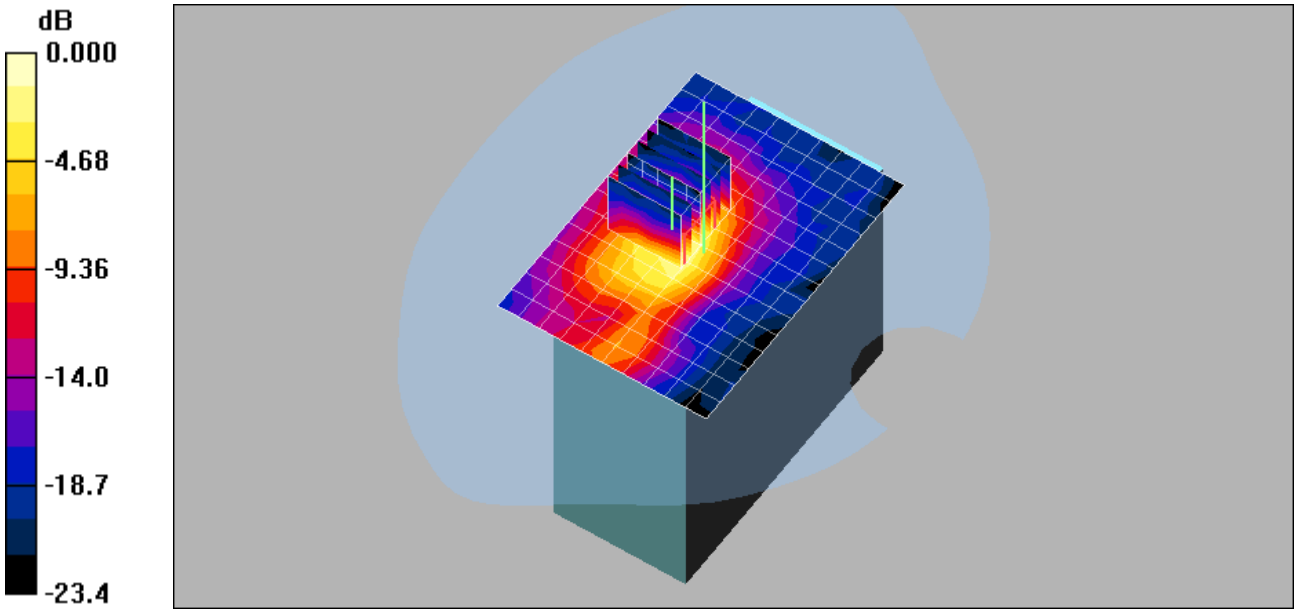
DASY4 Configuration:
- Probe: EX3DV3 - SN3516; ConvF(8.22, 8.22, 8.22); Calibrated: 12/15/2009
- Sensor-Surface: 2.7mm (Mechanical Surface Detection)Sensor-Surface: 0mm (Fix Surface)
- Electronics: DAE4 Sn358; Calibrated: 4/14/2010
- Phantom: SAM with CRP; Type: SAM; Serial: TP-1243
- Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Cube7x7x7 - Flat Phantom/Area Scan (11x15x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (measured) = 0.158 mW/g

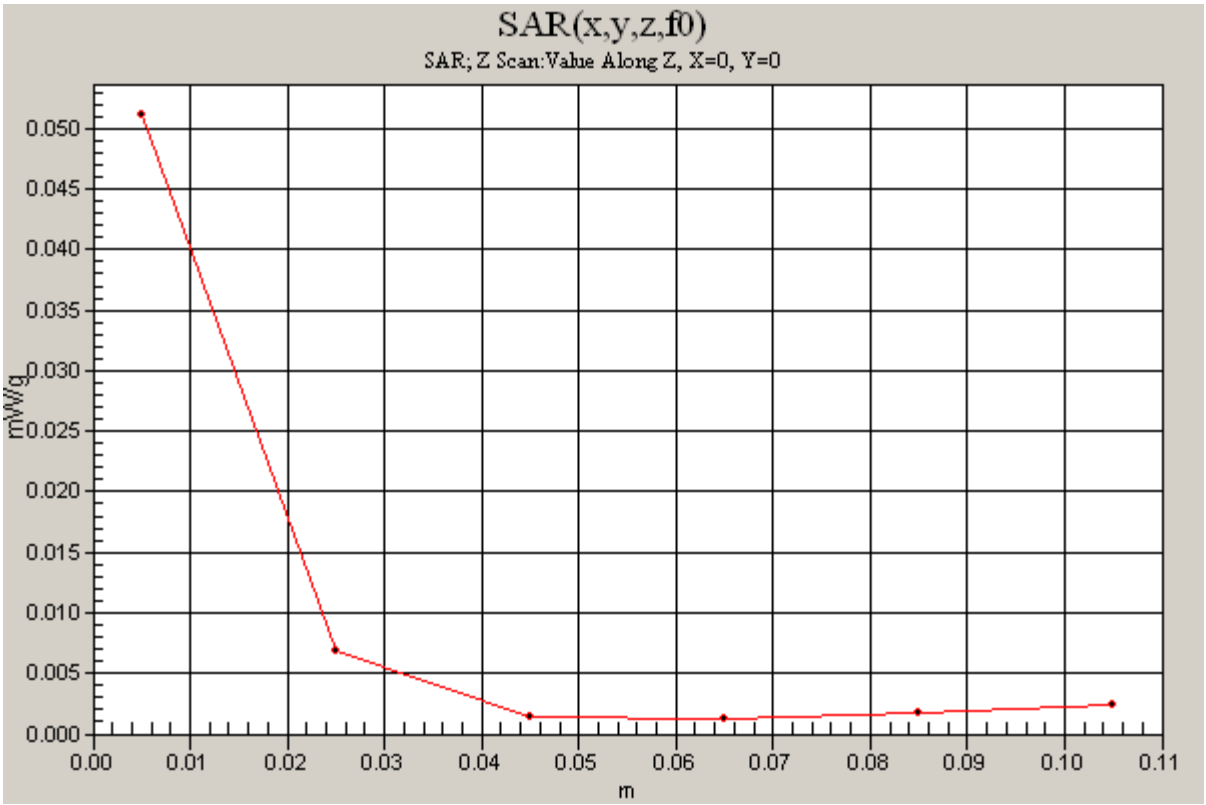
Cube7x7x7 - Flat Phantom/Zoom Scan (6x6x6)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=7mm
Reference Value = 5.08 V/m; Power Drift = -0.050 dB
Peak SAR (extrapolated) = 0.309 W/kg
SAR(1 g) = 0.128 mW/g; SAR(10 g) = 0.055 mW/g

Maximum value of SAR (measured) = 0.195 mW/g

Cube7x7x7 - Flat Phantom/Z Scan (1x1x6): Measurement grid: dx=20mm, dy=20mm, dz=20mm
Maximum value of SAR (measured) = 0.051 mW/g


dB
0.000
-4.68
-9.36
-14.0
-18.7
-23.4

0 dB = 0.158mW/g


SAR(x,y,z,f0)
SAR; Z Scan:Value Along Z, X=0, Y=0
mW/g
0.050
0.045
0.040
0.035
0.030
0.025
0.020
0.015
0.010
0.005
0.000
0.00
0.01
0.02
0.03
0.04
0.05
0.06
0.07
0.08
0.09
0.10
0.11
m

13.0 PROBE CERTIFICATE

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

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

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

Accreditation No.: SCS 108

Client Intertek **Certificate No: EX3-3516_Dec09**

CALIBRATION CERTIFICATE

Object	EX3DV3 - SN:3516
Calibration procedure(s)	QA CAL-01.v6, QA CAL-14.v3, QA CAL-23.v3 and QA CAL-25.v2 Calibration procedure for dosimetric E-field probes
Calibration date:	December 15, 2009

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41495277	1-Apr-09 (No. 217-01030)	Apr-10
Power sensor E4412A	MY41498087	1-Apr-09 (No. 217-01030)	Apr-10
Reference 3 dB Attenuator	SN: S5054 (3c)	31-Mar-09 (No. 217-01026)	Mar-10
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-09 (No. 217-01028)	Mar-10
Reference 30 dB Attenuator	SN: S5129 (30b)	31-Mar-09 (No. 217-01027)	Mar-10
Reference Probe ES3DV2	SN: 3013	2-Jan-09 (No. ES3-3013_Jan09)	Jan-10
DAE4	SN: 660	29-Sep-09 (No. DAE4-660_Sep09)	Sep-10

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Oct-09)	In house check: Oct-11
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-09)	In house check: Oct10

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

Issued: December 16, 2009

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

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

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

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

Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV3

SN:3516

Manufactured:	March 8, 2004
Last calibrated:	November 13, 2008
Recalibrated:	December 15, 2009

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

EX3DV3 SN:3516 December 15, 2009

DASY - Parameters of Probe: EX3DV3 SN:3516

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.86	0.77	0.62	± 10.1%
DCP (mV)[B]	92.7	94.5	93.6	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dBuV	C	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	300	± 1.5%
			Y	0.00	0.00	1.00	300	
			Z	0.00	0.00	1.00	300	

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

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

[B] Numerical linearization parameter: uncertainty not required.

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

EX3DV3 SN:3516

December 15, 2009

DASY - Parameters of Probe: EX3DV3 SN:3516

Calibration Parameter Determined in Head Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	10.65	10.65	10.65	0.67	0.65 ± 11.0%
900	± 50 / ± 100	41.5 ± 5%	0.97 ± 5%	10.35	10.35	10.35	0.63	0.66 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	9.27	9.27	9.27	0.40	0.72 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	9.00	9.00	9.00	0.52	0.67 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	8.15	8.15	8.15	0.30	0.88 ± 11.0%
5200	± 50 / ± 100	36.0 ± 5%	4.66 ± 5%	5.32	5.32	5.32	0.40	1.80 ± 13.1%
5800	± 50 / ± 100	35.3 ± 5%	5.27 ± 5%	4.67	4.67	4.67	0.45	1.80 ± 13.1%

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

EX3DV3 SN:3516 **December 15, 2009**

DASY - Parameters of Probe: EX3DV3 SN:3516

Calibration Parameter Determined in Body Tissue Simulating Media

f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth	Unc (k=2)
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	10.54	10.54	10.54	0.59	0.70	± 11.0%
900	± 50 / ± 100	55.0 ± 5%	1.05 ± 5%	10.32	10.32	10.32	0.58	0.72	± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	9.16	9.16	9.16	0.45	0.79	± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	8.71	8.71	8.71	0.34	0.86	± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	8.22	8.22	8.22	0.30	0.95	± 11.0%
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	4.18	4.18	4.18	0.60	1.80	± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	3.84	3.84	3.84	0.60	1.80	± 13.1%

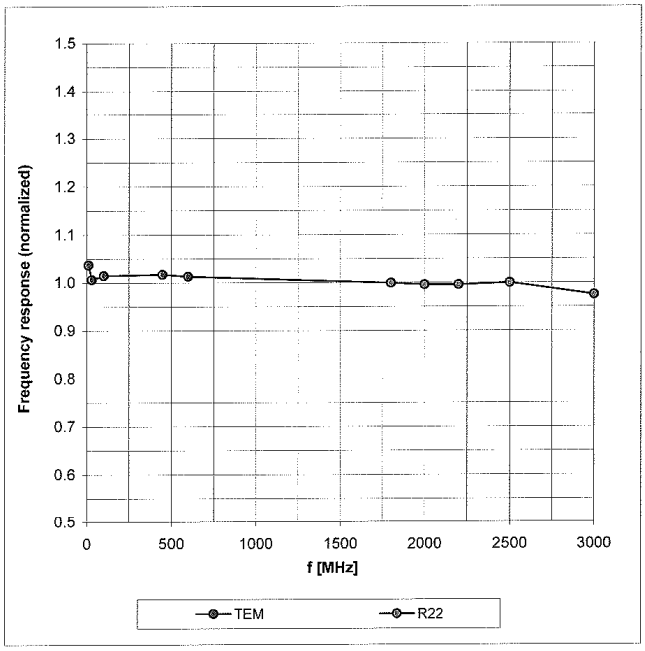
[C] The validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2). The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

EX3DV3 SN:3516

December 15, 2009

Frequency Response of E-Field

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

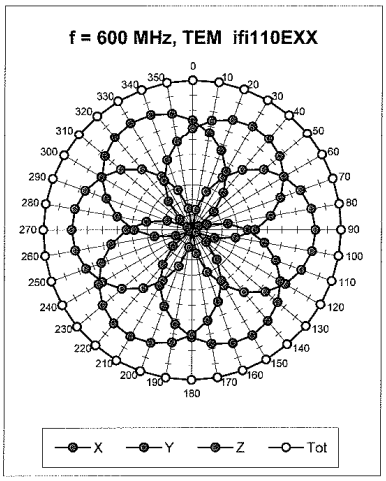


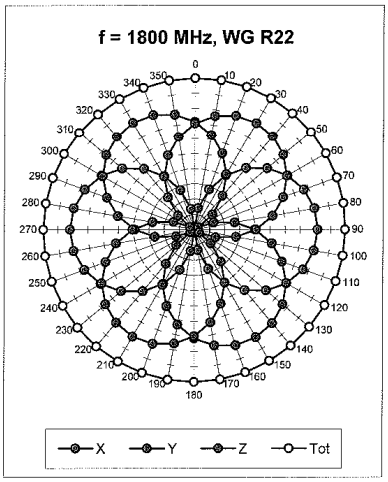
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

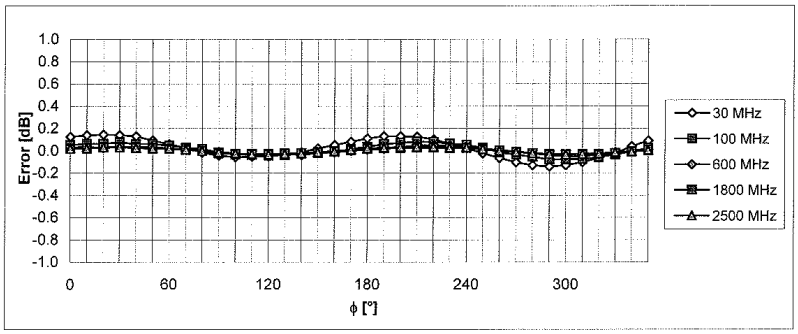
EX3DV3 SN:3516

December 15, 2009

Receiving Pattern (ϕ), ϑ = 0°





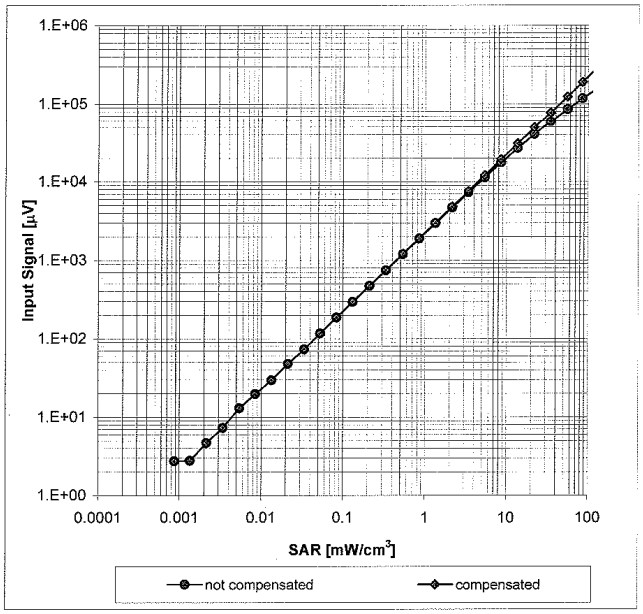


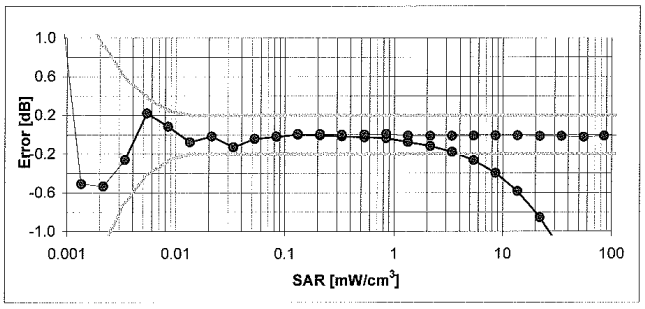
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV3 SN:3516 **December 15, 2009**

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)

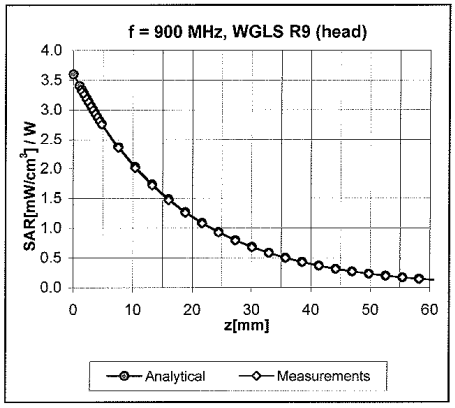


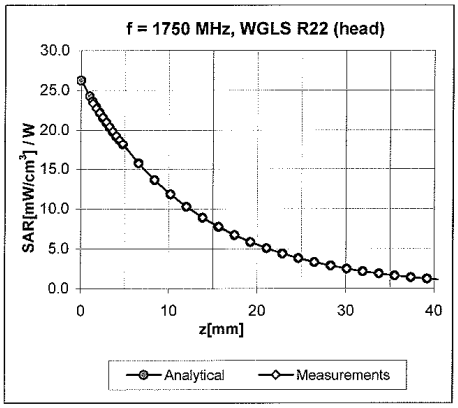


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

EX3DV3 SN:3516 **December 15, 2009**

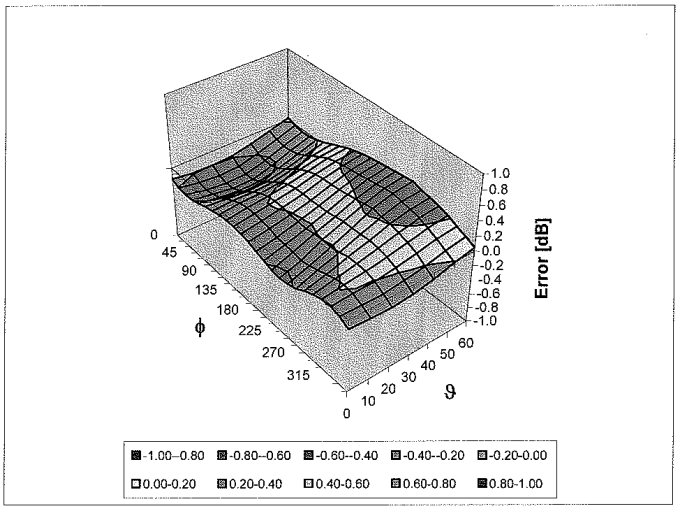
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

EX3DV3 SN:3516 **December 15, 2009**

Other Probe Parameters

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

14.0 DIPOLE CERTIFICATE

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

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

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

Accreditation No.: SCS 108

Client Intertek

Certificate No: D2450V2-718_Dec09

CALIBRATION CERTIFICATE

Object D2450V2 - SN: 718

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

Calibration date: December 10, 2009

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	06-Oct-09 (No. 217-01086)	Oct-10
Power sensor HP 8481A	US37292783	06-Oct-09 (No. 217-01086)	Oct-10
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

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

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: December 16, 2009

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

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) Accreditation No.: **SCS 108**
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Glossary:

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

Calibration is Performed According to the Following Standards:

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

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

Measurement Conditions

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

DASY Version	DASY5	V5.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V4.9	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 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 ± 0.2) °C	39.3 ± 6 %	1.82 mho/m ± 6 %
Head TSL temperature during test	(21.4 ± 0.2) °C	----	----

SAR result with Head TSL

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

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.31 mW / g
SAR normalized	normalized to 1W	25.2 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**25.2 mW /g ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.6 ± 6 %	2.01 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Body TSL

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

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.82 mW / g
SAR normalized	normalized to 1W	23.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.2 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2 Ω + 2.8 jΩ
Return Loss	- 26.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.1 Ω + 4.5 jΩ
Return Loss	- 26.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.147 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 10, 2002

DASY5 Validation Report for Head TSL

Date/Time: 09.12.2009 12:32:31

Test Laboratory: SPEAG, Zurich, Switzerland

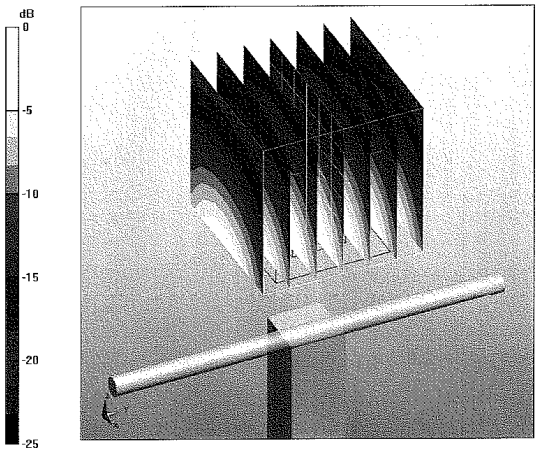
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:718

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 2450 MHz; σ = 1.82 mho/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

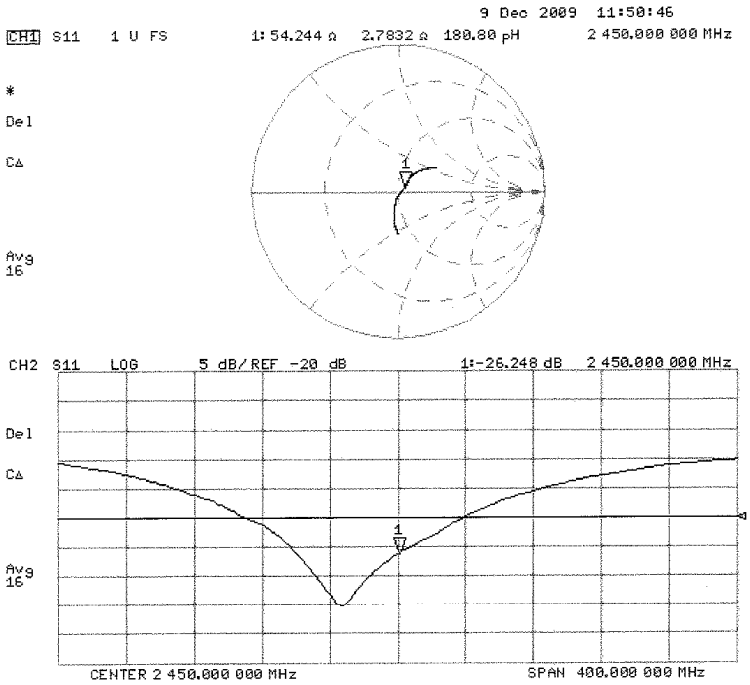
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin=250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 100.3 V/m; Power Drift = 0.052 dB
Peak SAR (extrapolated) = 27.3 W/kg
SAR(1 g) = 13.4 mW/g; SAR(10 g) = 6.31 mW/g
Maximum value of SAR (measured) = 17.1 mW/g



0 dB = 17.1mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 10.12.2009 13:47:28

Test Laboratory: SPEAG, Zurich, Switzerland

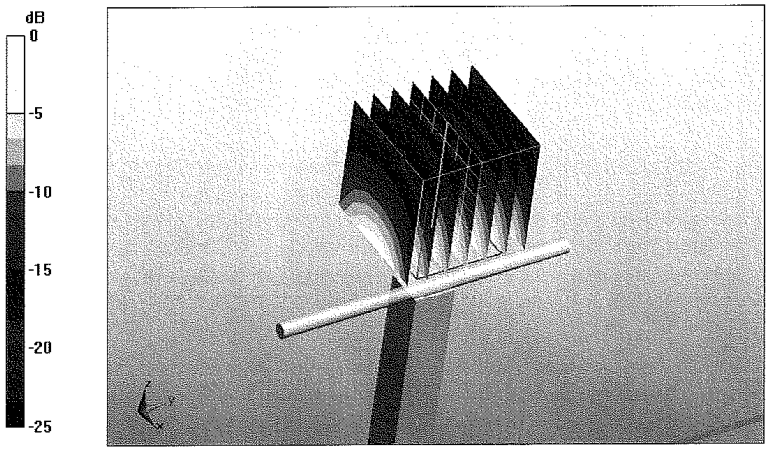
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:718

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY5 Configuration:

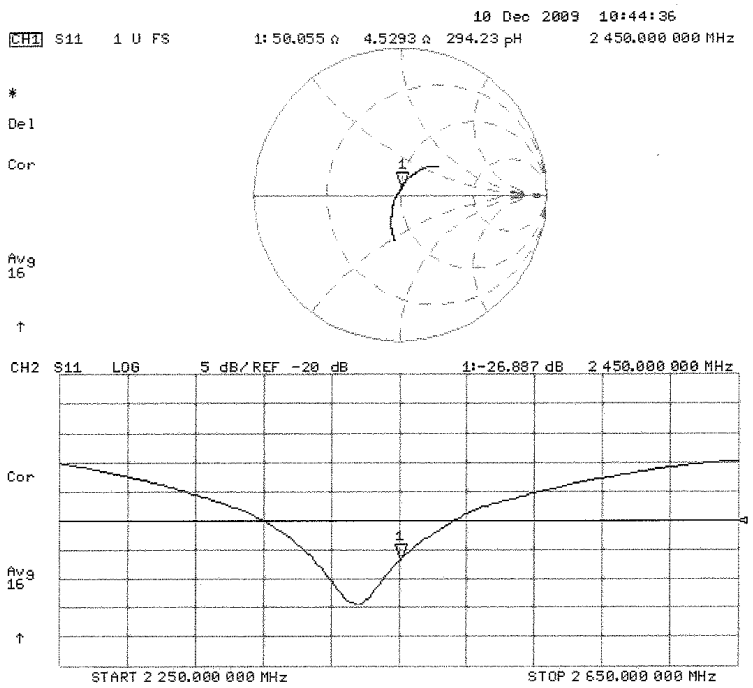
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.2 Build 157; SEMCAD X Version 14.0 Build 57

Pin250 mW /d=10mm, dist=3.0mm (ES-Probe)/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94 V/m; Power Drift = 0.051 dB
Peak SAR (extrapolated) = 27.1 W/kg
SAR(1 g) = 12.7 mW/g; SAR(10 g) = 5.82 mW/g
Maximum value of SAR (measured) = 16.8 mW/g



0 dB = 16.8mW/g

Impedance Measurement Plot for Body TSL



15.0 PHANTOM CERTIFICATE

Schmid & Partner
Engineering AG

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

Certificate of conformity / First Article Inspection

Item	SAM Twin Phantom V4.0
Type No	QD 000 P40 BA
Series No	TP-1002 and higher
Manufacturer / Origin	Untersee Composites Hauptstr. 69 CH-8559 Fruthwilen Switzerland

Tests

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

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

Standards

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

Conformity

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

Date 18.11.2001

Signature / Stamp