Report No.: RZA2010-0405FCC

TESTING
No. L2264

OET 65

TEST REPORT

Product Name	Pogoplug Wireless Extender
Model	POGO-W01
FCC ID	X6S21DE
Client	Cloud Engines, Inc.

上海同耀通信技术有限公司
报告专用章

TA Technology (Shanghai) Co., Ltd.

GENERAL SUMMARY

Product Name	Pogoplug Wireless Extender	**Model**	POGO-W01
FCC ID	X6S21DE	**Report No.**	RZA2010-0405FCC
Client	Cloud Engines, Inc.		
Manufacturer	Alpha Networks Inc.		
Standard(s)	**IEEE Std C95.1, 1999:** IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz. **OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002:** Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits. Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65. **IEC 62209-2 Ed.1(2008-10):** Human exposure to radio frequency fields from handheld and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR)for wireless communication devices used in close proximity to the human body-(frequency rang of 30MHz to 6GHz). **KDB 248227:**SAR Measurement Procedures for 802.11a/b/g Transmitters May 2007 **Tracking number: 532450**		
Conclusion	Localized Specific Absorption Rate (SAR) of this portable wireless equipment has been measured in all cases requested by the relevant standards cited in Clause 5.2 of this test report. Maximum localized SAR is below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report. General Judgment: **Pass** 报告专用章 (Stamp) **Date of issue: March 23rd, 2010**		
Comment	The test result only responds to the measured sample.		

Approved by ______________ **Revised by** ______________ **Performed by** ______________

Yang Weizhong — Ling Minbao — Li Jinchang

TABLE OF CONTENT

1. General Information

1.1. Notes of the test report

TA Technology (Shanghai) Co., Ltd. guarantees the reliability of the data presented in this test report, which is the results of measurements and tests performed for the items under test on the date and under the conditions stated in this test report and is based on the knowledge and technical facilities available at TA Technology (Shanghai) Co., Ltd. at the time of execution of the test.

TA Technology (Shanghai) Co., Ltd. is liable to the client for the maintenance by its personnel of the confidentiality of all information related to the items under test and the results of the test. This report only refers to the item that has undergone the test.

This report standalone dose not constitute or imply by its own an approval of the product by the certification Bodies or competent Authorities. This report cannot be used partially or in full for publicity and/or promotional purposes without previous written approval of **TA Technology (Shanghai) Co., Ltd.** and the Accreditation Bodies, if it applies.

1.2. Testing laboratory

Company:	TA Technology (Shanghai) Co., Ltd.
Address:	No.145, Jintang Rd, Tangzhen Industry Park, Pudong Shanghai,China
City:	Shanghai
Post code:	201201
Country:	P. R. China
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1.1. Applicant Information

Company:	Cloud Engines, Inc.
Address:	480 Pacific Avenue San Francisco, CA 94133
City:	San Francisco
Postal Code:	/
Country:	USA
Telephone:	/
Fax:	/

1.2. Manufacturer Information

Company:	Alpha Networks Inc.
Address:	NO.8 Li-shing Rd. VII, Science-based Industrial Park, Hsinchu, Taiwan.
City:	/
Postal Code:	/
Country:	/
Telephone:	/
Fax:	/

1.3. Information of EUT

General information

Device type :	portable device	
Exposure category:	uncontrolled environment / general population	
Name of EUT:	Pogoplug Wireless Extender	
S/N or IMEI	00240113D793	
Device operating configurations :		
Operating mode(s):	802.11b/g; （tested） 802.11n; （tested）	
Operating frequency range(s)	Band	Tx (MHz)
	802.11b/g/n	2412~2462MHz
Test channel (Low –Middle –High)	1-6-11 (802.11b/g) 1-6-11 [802.11n (HT20)] 3-6-9 [802.11n (HT40)]	
Antenna type:	Internal antenna	
Used host products:	IBM T61 BenQ Joybook R55V	

Equipment Under Test (EUT) is a model of Pogoplug Wireless Extender. During SAR test of the EUT, it was connected to a portable computer. SAR is tested for 802.11b, 802.11g and 802.11n. The measurements were performed in combination with two different host products (IBM T61, BenQ Joybook R55V). IBM T61 laptop has vertical USB slot and horizontal USB slot , BenQ Joybook R55V laptop has horizontal USB slot.

ALPHA
Alpha Networks Inc.

Product Change Description

We, Alpha Networks Inc., declare on our sole responsibility that the product,

Name: Pogoplug Wireless Extender
M/N: POGO-W01

is the variant of the initial certified product,

Name: Wireless N 150 USB Adapter
M/N: DWA-125

Except the following changes on the latest MODEL: POGO-W01

	[Initial Model]	[Variant Model]
USB cradle	Have USB cradle	Haven't USB Cradle
Color of cabinet	Black	White
Application	D-LINK Corporation	Cloud Engines, Inc.
Device name	Wireless N 150 USB Adapter	Pogoplug Wireless Extender
Model name	DWA-125	POGO-W01

We also declare that except above changes, all the other characteristics of variant device (like material of cabinet and button ,Antenna type and gain, PCB layout, circuit, function, RF power) are exactly same with initial certified product.

Sincerely,

Kelly Tsai / Senior Manager
Alpha Networks Inc.
TEL: 886-3-5636666
FAX: 886- 3-5665091
E-mail: kelly_tsai@alphanetworks.com

2010/3/23

The SAR values of this report are the Initial model (DWA-125), but not Variant Model (POGO-W01) , POGO-W01 is not be tested in this report, The Initial model (DWA-125) report is RZA2009-1456.

The sample under test was selected by the Client.

Components list please refer to documents of the manufacturer.

1.4. Test Date

The test is performed on November 9, 2009.

2. Operational Conditions during Test

2.1. General description of test procedures

For the 802.11b/g SAR body tests, a communication link is set up with the test mode software for WIFI mode test. The Absolute Radio Frequency Channel Number (ARFCN) is allocated to 1, 6 and 11 respectively in the case of 2450 MHz. During the test, at the each test frequency channel, the EUT is operated at the RF continuous emission mode.

802.11b/g operating modes are tested independently according to the service requirements in each frequency band.802.11b/g modes are tested on channels1,6,11;however,if output power reduction is necessary for channels 1 and /or 11 to meet restricted band requirements the highest output channels closest to each of these channels must be tested instead.

SAR is not required for 802.11g channels when the maximum average output power is less than 0.25dB higher than that measured on the corresponding 802.11b channels. When the maximum average output channel in each frequency band is not included in the “default test channels”, the maximum channel should be tested instead of an adjacent “default test channels”, these are referred to as the “required test channels” and are illustrated in table 1.

And according to the "3 dB rule" FCC Public Notice, DA 02-1948, June 19.2002 " **If the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s)"**. Then The Absolute Radio Frequency Channel Number (ARFCN) is firstly allocated to 2437 respectively in the case of 802.11b/g.

Table 1: “Default Test Channels”

Mode	GHz	Channel	Turbo Channel	“Default Test Channels”			
				15.247		UNII	
				802.11b	802.11g		
802.11b/g	2.412	1#		√	*		
	2.437	6	6	√	*		
	2.462	11#		√	*		

Note: #=when output power is reduced for channel 1 and /or 11to meet restricted band requirements the highest out put channels closet to each of these channels should be tested.

√= ” default test channels”

* =possible 802.11g channels with maximum average output 0.25dB>=the “default test channels”

2.2. Position of module in Portable devices

The measurements were performed in combination with two host products (IBMT61, BenQ Joybook R55V). IBM T61 laptop has vertical USB slot and horizontal USB slot, BenQ Joybook R55V laptop has horizontal USB slot.

A test distance of 5mm or less, according to KDB 447498, should be considered for the orientation that can satisfy such requirements.

For each channel, the EUT is tested at the following 5 test positions:

- Test Position 1: The EUT is connected to the portable computer with horizontal USB slot. The back side of the EUT towards the bottom of the flat phantom. The distance from the EUT back side to the bottom of the flat phantom is 5mm.

- Test Position 2: The EUT is connected to the portable computer with horizontal USB slot. The top side of the EUT towards the bottom of the flat phantom. The distance from the EUT top side to the bottom of the flat phantom is 0mm.

- Test Position 3: The EUT is connected to the portable computer with horizontal USB slot. The left side of the EUT towards the bottom of the flat phantom. The distance from the EUT left side to the bottom of the flat phantom is 5mm.

- Test Position 4: The EUT is connected to the portable computer with vertical USB slot. The right side of the EUT towards the bottom of the flat phantom. The distance from the EUT right side to the bottom of the flat phantom is 5mm.

- Test Position 5: The EUT is connected to the portable computer with vertical USB slot. The front side of the EUT towards the bottom of the flat phantom. The distance from the EUT front side to the bottom of the flat phantom is 5mm.

2.3. Picture of host product

During the test, IBM T61 and BenQ Joybook R55V laptop were used as an assistant to help to setup communication. (See Picture 1)

Picture 1-a: IBM T61 Close

Picture 1-b: IBM T61 Open

Picture 1-c: BenQ Joybook R55V Close

Picture 1-d: BenQ Joybook R55V Open

Picture 1-e: BenQ Joybook R55V with horizontal USB slot

Picture 1-f: IBM T61 with horizontal USB slot

Picture 1-g: IBM T61 with vertical USB slot

Picture 1: Computer as a test assistant

3. SAR Measurements System Configuration

3.1. SAR Measurement Set-up

The DASY4 system for performing compliance tests consists of the following items:

- A standard high precision 6-axis robot (Stäubli RX family) with controller and software. An arm extension 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 electronic (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.
- A unit to operate the optical surface detector which is connected to the EOC.
- The Electro-Optical Coupler (EOC) performs the conversion from the optical into a digital electric signal of the DAE. The EOC is connected to the DASY4 measurement server.
- The DASY4 measurement server, which performs all real-time data evaluation for field measurements and surface detection, controls robot movements and handles safety operation. A computer operating Windows 2003
- DASY4 software and SEMCAD data evaluation software.
- Remote control with teach panel and additional circuitry for robot safety such as warning lamps, etc.
- The generic twin phantom enabling the testing of left-hand and right-hand usage.
- The device holder for handheld mobile phones.
- Tissue simulating liquid mixed according to the given recipes.
- System validation dipoles allowing to validate the proper functioning of the system.

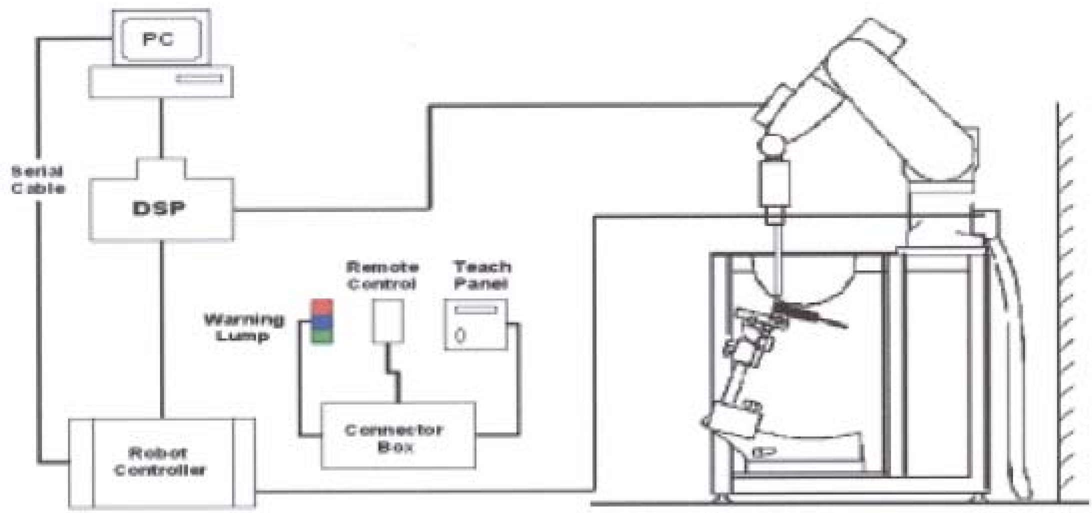

Figure 1 SAR Lab Test Measurement Set-up

3.2. DASY4 E-field Probe System

The SAR measurements were conducted with the dosimetric probe ET3DV6 (manufactured by SPEAG), designed in the classical triangular configuration and optimized for dosimetric evaluation.

3.2.1. ET3DV6 Probe Specification

Construction	Symmetrical design with triangular core Built-in optical fiber for surface detection System (ET3DV6 only) Built-in shielding against static charges PEEK enclosure material (resistant to organic solvents, e.q., glycol)
Calibration	In air from 10 MHz to 3 GHz In brain and muscle simulating tissue at frequencies of 450MHz, 900MHz, 1750 MHz, 1950MHz and 2450 MHz. (accuracy±8%) Calibration for other liquids and frequencies upon request
Frequency	10 MHz to 2.5 GHz; Linearity: ±0.2 dB (30 MHz to 2.5 GHz)
Directivity	±0.2 dB in brain tissue (rotation around probe axis) ±0.4 dB in brain tissue (rotation around probe axis)
Dynamic Range	5u W/g to > 100mW/g; Linearity: ±0.2dB
Surface Detection	±0.2 mm repeatability in air and clear liquids over diffuse reflecting surface (ET3DV6 only)
Dimensions	Overall length: 330mm Tip length: 16mm Body diameter: 12mm Tip diarneter: 6.8mm Distance from probe tip to dipole centers: 2.7mm
Application	General dosimetry up to 2.5GHz Compliance tests of mobile phones Fast automatic scanning in arbitrary Phantoms

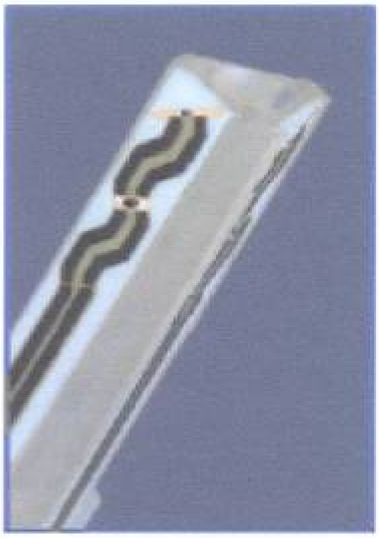

Figure 2 ET3DV6 E-field Probe

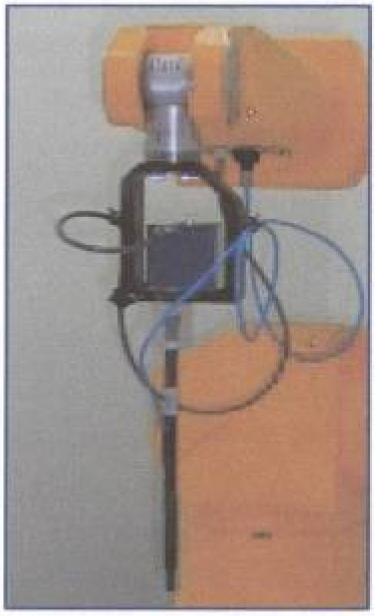

Figure 3 ET3DV6 E-field probe

3.2.2. E-field Probe Calibration

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than ± 10%. The spherical isotropy was evaluated and found to be better than ± 0.25dB. The sensitivity parameters (NormX, NormY, NormZ), the diode compression parameter (DCP) and the conversion factor (ConvF) of the probe are tested.

The free space E-field from amplified probe outputs is determined in a test chamber. This is performed in a TEM cell for frequencies bellow 1 GHz, and in a wave guide above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is then rotated 360 degrees.

E-field temperature correlation calibration is performed in a flat phantom filled with the appropriate simulated brain tissue. The measured free space E-field in the medium correlates to temperature rise in a dielectric medium. For temperature correlation calibration a RF transparent thermistor-based temperature probe is used in conjunction with the E-field probe.

$$\mathbf{SAR} = \mathbf{C}\frac{\Delta T}{\Delta t}$$

Where: Δt = Exposure time (30 seconds),

C = Heat capacity of tissue (brain or muscle),

ΔT = Temperature increase due to RF exposure.

Or

$$\mathbf{SAR} = \frac{|E|^2 \sigma}{\rho}$$

Where:

σ = Simulated tissue conductivity,

ρ = Tissue density (kg/m3).

3.3. Other Test Equipment

3.3.1. Device Holder for Transmitters

The DASY device holder is designed to cope with the die rent positions given in the standard. It has two scales for device rotation (with respect to the body axis) and device inclination (with respect to the line between the ear reference points). The rotation centers for both scales is the ear reference point (ERP). Thus the device needs no repositioning when changing the angles. The amount of dielectric material has been reduced in the closest vicinity of the device, since measurements have suggested that the inference of the clamp on the test results could thus be lowered.

Figure 4 Device Holder

3.3.2. Phantom

The Generic Twin Phantom is constructed of a fiberglass shell integrated in a wooden Figure. The shape of the shell is based on data from an anatomical study designed to determine the maximum exposure in at least 90% of all users. 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 the 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 in the robot.

Shell Thickness	2±0.1 mm
Filling Volume	Approx. 20 liters
Dimensions	810 x l000 x 500 mm (H x L x W)
Aailable	Special

Figure 5 Generic Twin Phantom

3.4. Scanning procedure

The DASY4 installation includes predefined files with recommended procedures for measurements and validation. They are read-only document files and destined as fully defined but unmeasured masks. All test positions (head or body-worn) are tested with the same configuration of test steps differing only in the grid definition for the different test positions.

- The ”reference“ and ”drift“ measurements are located at the beginning and end of the batch process. They measure the field drift at one single point in the liquid over the complete procedure. The indicated drift is mainly the variation of the DUT’s output power and should vary max. ± 5 %.

- The ”surface check“ measurement tests the optical surface detection system of the DASY4 system by repeatedly detecting the surface with the optical and mechanical surface detector and comparing the results. The output gives the detecting heights of both systems, the difference between the two systems and the standard deviation of the detection repeatability. Air bubbles or refraction in the liquid due to separation of the sugar-water mixture gives poor repeatability (above ± 0.1mm). To prevent wrong results tests are only executed when the liquid is free of air bubbles. The difference between the optical surface detection and the actual surface depends on the probe and is specified with each probe. (It does not depend on the surface reflectivity or the probe angle to the surface within ± 30°.)

- Area Scan

The Area Scan is used as a fast scan in two dimensions to find the area of high field values before running a detailed measurement around the hot spot.Before starting the area scan a grid

spacing of 10 mm x 10 mm is set. During the scan the distance of the probe to the phantom remains unchanged.
After finishing area scan, the field maxima within a range of 2 dB will be ascertained.

- Zoom Scan
  Zoom Scans are used to estimate the peak spatial SAR values within a cubic averaging volume containing 1 g and 10 g of simulated tissue. The default Zoom Scan is done by 7x7x7 points within a cube whose base is centered around the maxima found in the preceding area scan.

- Spatial Peak Detection

The procedure for spatial peak SAR evaluation has been implemented and can determine values of masses of 1g and 10g, as well as for user-specific masses.The DASY4 system allows evaluations that combine measured data and robot positions, such as:
• maximum search
• extrapolation
• boundary correction
• peak search for averaged SAR
During a maximum search, global and local maxima searches are automatically performed in 2-D after each Area Scan measurement with at least 6 measurement points. It is based on the evaluation of the local SAR gradient calculated by the Quadratic Shepard's method. The algorithm will find the global maximum and all local maxima within -2 dB of the global maxima for all SAR distributions.
Extrapolation routines are used to obtain SAR values between the lowest measurement points and the inner phantom surface. The extrapolation distance is determined by the surface detection distance and the probe sensor offset. Several measurements at different distances are necessary for the extrapolation. Extrapolation routines require at least 10 measurement points in 3-D space. They are used in the Zoom Scan to obtain SAR values between the lowest measurement points and the inner phantom surface. The routine uses the modified Quadratic Shepard's method for extrapolation. For a grid using 7x7x7 measurement points with 5mm resolution amounting to 343 measurement points, the uncertainty of the extrapolation routines is less than 1% for 1g and 10g cubes.

- A Z-axis scan measures the total SAR value at the x-and y-position of the maximum SAR value found during the cube 7x7x7 scan. The probe is moved away in z-direction from the bottom of the SAM phantom in 5mm steps.

3.5. Data Storage and Evaluation

3.5.1. Data Storage

The DASY4 software stores the acquired data from the data acquisition electronics as raw data (in microvolt readings from the probe sensors), together with all necessary software parameters for the data evaluation (probe calibration data, liquid parameters and device frequency and modulation data) in measurement files with the extension ".DA4". The software evaluates the desired unit and format for output each time the data is visualized or exported. This allows verification of the complete software setup even after the measurement and allows correction of incorrect parameter settings. For example, if a measurement has been performed with a wrong crest factor parameter in the device setup, the parameter can be corrected afterwards and the data can be re-evaluated.

The measured data can be visualized or exported in different units or formats, depending on the selected probe type ([V/m], [A/m], [°C], [mW/g], [mW/cm²], [dBrel], etc.). Some of these units are not available in certain situations or show meaningless results, e.g., a SAR output in a lossless media will always be zero. Raw data can also be exported to perform the evaluation with other software packages.

3.5.2. Data Evaluation by SEMCAD

The SEMCAD software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. The parameters used in the evaluation are stored in the configuration modules of the software:

Probe parameters:	- Sensitivity	Normi, ai_0, a_{i1}, a_{i2}
	- Conversion factor	$ConvF_i$
	- Diode compression point	Dcp_i
Device parameters:	- Frequency	f
	- Crest factor	cf
Media parameters:	- Conductivity	
	- Density	

These parameters must be set correctly in the software. They can be found in the component documents or they can be imported into the software from the configuration files issued for the DASY4 components. In the direct measuring mode of the multimeter option, the parameters of the actual system setup are used. In the scan visualization and export modes, the parameters stored in the corresponding document files are used.

The first step of the evaluation is a linearization of the filtered input signal to account for the compression characteristics of the detector diode. The compensation depends on the input signal, the diode type and the DC-transmission factor from the diode to the evaluation electronics.

If the exciting field is pulsed, the crest factor of the signal must be known to correctly compensate for peak power. The formula for each channel can be given as:

$$V_i = U_i + U_i^2 \cdot c\,f \,/\, d\,c\,p_i$$

With V_i = compensated signal of channel i (i = x, y, z)

U_i = input signal of channel i (i = x, y, z)

cf = crest factor of exciting field (DASY parameter)

dcp_i = diode compression point (DASY parameter)

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

E-field probes: $$E_i = (V_i \,/\, Norm_i \cdot ConvF)^{1/2}$$

H-field probes: $$H_i = (V_i)^{1/2} \cdot (a_{i0} + a_{i1} f + a_{i2} f^2) \,/\, f$$

With V_i = compensated signal of channel i (i = x, y, z)

$Norm_i$ = sensor sensitivity of channel i (i = x, y, z)
[mV/(V/m)^2] for E-field Probes

$ConvF$ = sensitivity enhancement in solution

a_{ij} = sensor sensitivity factors for H-field probes

f = carrier frequency [GHz]

E_i = electric field strength of channel i in V/m

H_i = magnetic field strength of channel i in A/m

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

$$E_{tot} = (E_x^2 + E_Y^2 + E_z^2)^{1/2}$$

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

$$SAR = (E_{tot}^2 \cdot \quad) \,/\, (\quad \cdot 1000)$$

with ***SAR*** = local specific absorption rate in mW/g

$\boldsymbol{E_{tot}}$ = total field strength in V/m

. = conductivity in [mho/m] or [Siemens/m]

. = equivalent tissue density in g/cm^3

Note that the density is normally set to 1 (or 1.06), to account for actual brain density rather than the density of the simulation liquid. The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = E_{tot}^2 / 3770 \quad \text{or} \quad \boldsymbol{P_{pwe} = H_{tot}^2 \cdot 37.7}$$

with P_{pwe} = equivalent power density of a plane wave in mW/cm^2

$\boldsymbol{E_{tot}}$ = total electric field strength in V/m

$\boldsymbol{H_{tot}}$ = total magnetic field strength in A/m

3.6. System check

The manufacturer calibrates the probes annually. Dielectric parameters of the tissue simulates were measured every day using the dielectric probe kit and the network analyzer. A system check measurement was made following the determination of the dielectric parameters of the simulates, using the dipole validation kit. A power level of 250 mW was supplied to the dipole antenna, which was placed under the flat section of the twin SAM phantom. The system check results (dielectric parameters and SAR values) are given in the Table 6.

System check results have to be equal or near the values determined during dipole calibration with the relevant liquids and test system (±10 %).

System check is performed regularly on all frequency bands where tests are performed with the DASY4 system.

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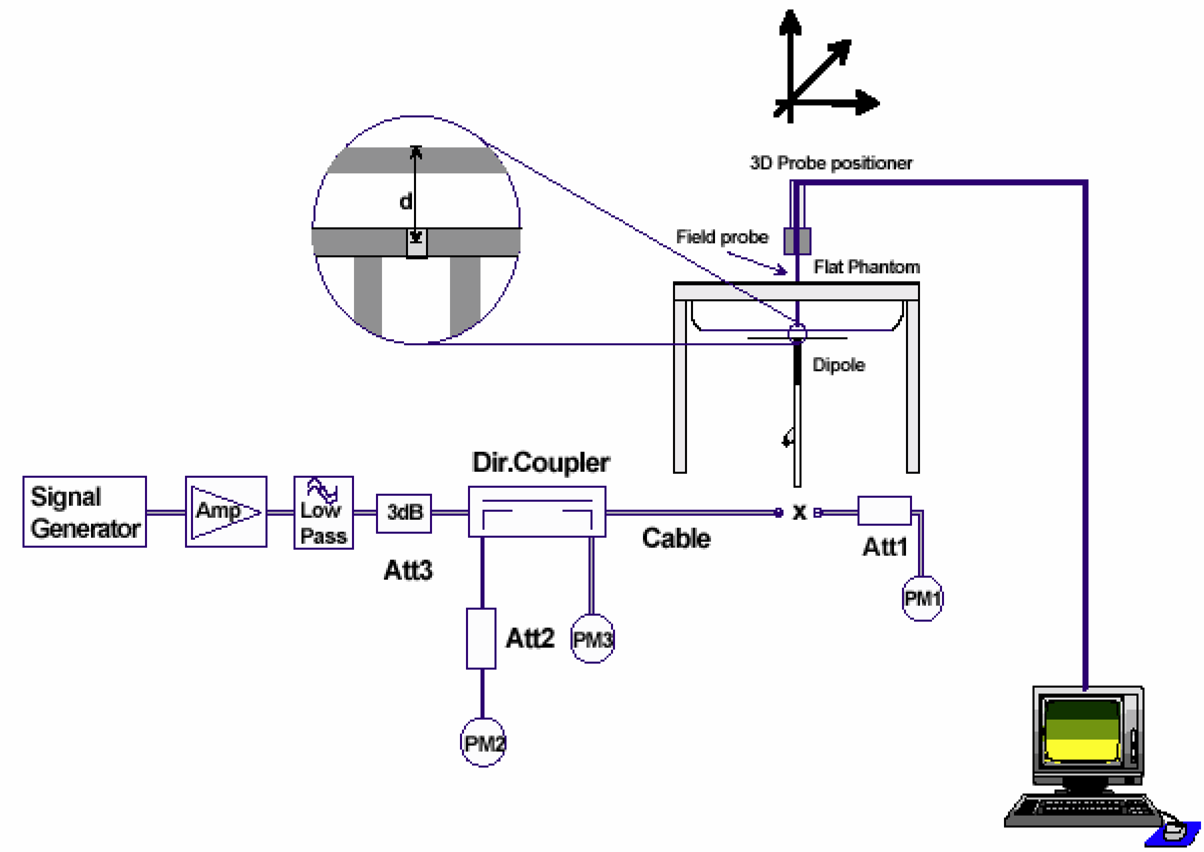


Figure 6 System Check Set-up

3.7. Equivalent Tissues

The liquid is consisted of water, salt and Glycol. The liquid has previously been proven to be suited for worst-case. The Table 2 shows the detail solution. It's satisfying the latest tissue dielectric parameters requirements proposed by the OET 65.

Table 2: Composition of the Body Tissue Equivalent Matter

MIXTURE%	FREQUENCY 2450MHz
Water	73.2
Glycol	26.7
Salt	0.1
Dielectric Parameters Target Value	f=2450MHz ε=52.70 σ=1.95

4. Laboratory Environment

Table 3: The Ambient Conditions during Test

Temperature	Min. = 20°C, Max. = 25 °C
Relative humidity	Min. = 30%, Max. = 70%
Ground system resistance	< 0.5 Ω
Ambient noise is checked and found very low and in compliance with requirement of standards. Reflection of surrounding objects is minimized and in compliance with requirement of standards.	

5. Characteristics of the Test

5.1. Applicable Limit Regulations

IEEE Std C95.1, 1999: IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz.

5.2. Applicable Measurement Standards

OET Bulletin 65 supplement C, published June 2001 including DA 02-1438, published June 2002: Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits. Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65.

IEC 62209-2 Ed.1(2008-10): Human exposure to radio frequency fields from handheld and body-mounted wireless communication devices – Human models, instrumentation, and procedures –Part 2: Procedure to determine the Specific Absorption Rate (SAR)for wireless communication devices used in close proximity to the human body-(frequency
rang of 30MHz to 6GHz).

KDB 248227:SAR Measurement Procedures for 802.11a/b/g Transmitters May 2007

6. Conducted Output Power Measurement

6.1. Summary

The DUT is tested using an E5515C communications tester as controller unit to set test channels and maximum output power to the DUT, as well as for measuring the conducted power. Conducted output power was measured using an integrated RF connector and attached RF cable. This result contains conducted output power for the EUT.

6.2. Conducted Power Results

Table 4: Conducted Power Measurement Results

802.11b		Conducted Power		
		Channel 1	Channel 6	Channel 11
		(2412MHz)	(2437MHz)	(2462MHz)
AV	Before Test (dBm)	17.65	17.42	17.62
	After Test (dBm)	17.64	17.41	17.61
PK	Before Test (dBm)	20.12	20.03	20.37
	After Test (dBm)	20.11	20.02	20.36
802.11g		Conducted Power		
		Channel 1	Channel 6	Channel 11
		(2412MHz)	(2437MHz)	(2462MHz)
AV	Before Test (dBm)	17.48	17.35	17.54
	After Test (dBm)	17.47	17.34	17.53
PK	Before Test (dBm)	26.02	26.07	26.22
	After Test (dBm)	26.01	26.06	26.21
802.11n (HT20)		Conducted Power		
		Channel 1	Channel 6	Channel 11
		(2412MHz)	(2437MHz)	(2462MHz)
AV	Before Test (dBm)	17.51	17.40	17.65
	After Test (dBm)	17.50	17.39	17.64
PK	Before Test (dBm)	26.03	26.18	26.34
	After Test (dBm)	26.02	26.17	26.33
802.11n (HT40)		Conducted Power		
		Channel 3	Channel 6	Channel 9

		(2422MHz)	(2437MHz)	(2452MHz)
AV	Before Test (dBm)	17.70	17.54	17.54
	After Test (dBm)	17.69	17.53	17.53
PK	Before Test (dBm)	26.58	26.54	26.52
	After Test (dBm)	26.57	26.53	26.51

7. Test Results

7.1. Dielectric Performance

Table 5: Dielectric Performance of Body Tissue Simulating Liquid

Frequency	Description	Dielectric Parameters		Temp
		ε_r	σ(s/m)	℃
2450MHz (body)	Target value ±10% window	52.70 50.07 — 55.34	1.95 1.85 — 2.05	/
	Measurement value 2009-11-9	51.37	1.98	21.9

7.2. System Check

Table 6: System Check for Body tissue simulating liquid

Frequency	Description	SAR(W/kg)		Dielectric Parameters		Temp
		10g	1g	ε_r	σ(s/m)	℃
2450MHz	Recommended value ±10% window	6.18 5.56—6.80	13.10 11.79 — 14.41	52.5	2.02	/
	Measurement value 2009-11-9	6.46	14.00	51.37	1.98	21.7

Note：1. The graph results see ANNEX B.

2. Recommended Values used derive from the calibration certificate and 250 mW is used as feeding power to the calibrated dipole.

7.3. Summary of Measurement Results

7.3.1. 802.11b/g

Table 7: SAR Values (802.11b/g)

Limit of SAR (W/kg)		10 g Average	1 g Average	Power Drift (dB)	Graph Results
		2.0	1.6	± 0.21	
Test Case Of Body		Measurement Result(W/kg)		Power Drift(dB)	
Different Test Position	Channel	10 g Average	1 g Average		
IBM T61					
Test Position 1	Middle	0.121	0.231	-0.165	Figure 9
Test Position 2	Middle	0.040	0.075	0.024	Figure 11
Test Position 3	Middle	0.038	0.082	0.144	Figure 13
Test Position 4	Middle	0.072	0.148	-0.038	Figure 15
BenQ Joybook R55V					
Test Position 5	High	0.150	0.309	-0.083	Figure 17
	Middle	0.156	0.315	-0.195	Figure 19
	Low	0.150	0.306	-0.039	Figure 21
worst case position of 802.11b with 802.11g					
Test Position 5	Middle	0.156	0.318	0.129	Figure 23

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB (< 0.8W/kg) lower than the SAR limit, testing at the high and low channels is optional.
3. Upper and lower frequencies were measured at the worst case.
4. The SAR values in table 7 are the Initial model (DWA-125), and the Initial model (DWA-125) report is RZA2009-1456.

Table 8: SAR Values [802.11b/g, enhanced energy coupling at increased separation distances]

Different Test Position	Distance of EUT to Phantom	Channel	Measurement Result (W/kg)	50% of initial position SAR (W/kg)	125% of initial position SAR (W/kg)
Test Position 5	initial position	Middle	0.424	0.212	0.530
	5mm		0.240		
	10mm		0.116		

Note: 1. The probe tip location is fixed at the distance of one half the probe tip diameter from the phantom surface.

2. when the device position with the highest point SAR is > 25% of that measured at the initial position, a complete 1-g SAR evaluation is required for this configuration.

3. A single point SAR is measured for each of these device positions until the SAR is less than 50% of that measured at the initial position.

4. The SAR values in table 8 are the Initial model (DWA-125), and the Initial model (DWA-125) report is RZA2009-1456.

7.3.2. 802.11n

Table 9: SAR Values [802.11n (HT20/HT40)]

Limit of SAR (W/kg)		10 g Average	1 g Average	Power Drift (dB)	Graph Results
		2.0	1.6	± 0.21	
Test Case Of Body		**Measurement Result(W/kg)**		**Power Drift(dB)**	
Different Test Position	**Channel**	**10 g Average**	**1 g Average**		
IBM T61（HT20）					
Test Position 1	Middle	0.143	0.285	-0.141	Figure 25
Test Position 2	Middle	0.038	0.076	-0.061	Figure 27
Test Position 3	Middle	0.048	0.103	0.155	Figure 29
Test Position 4	Middle	0.091	0.184	0.184	Figure 31
BenQ Joybook R55V（HT20）					
Test Position 5	High	0.159	0.322	-0.039	Figure 33
	Middle	0.201	0.404	0.057	Figure 35
	Low	0.167	0.339	-0.035	Figure 37
worst case position of HT20 with HT40					
Test Position 5	Middle	0.217	0.438	-0.038	Figure 39

Note: 1.The value with blue color is the maximum SAR Value of each test band.

2. The SAR test shall be performed at the high, middle and low frequency channels of each operating mode. If the SAR measured at mid-band channel for each test configuration is at least 3.0 dB (< 0.8W/kg) lower than the SAR limit, testing at the high and low channels is optional.
3. Upper and lower frequencies were measured at the worst case.
4. The SAR values in table 9 are the Initial model (DWA-125), and the Initial model (DWA-125) report is RZA2009-1456.

Table 10: SAR Values [802.11n, enhanced energy coupling at increased separation distances]

Different Test Position	Distance of EUT to Phantom	Channel	Measurement Result (W/kg)	50% of initial position SAR (W/kg)	125% of initial position SAR (W/kg)
Test Position 5	initial position	Middle	0.641	0.321	0.801
	5mm		0.300		

Note: 1. The probe tip location is fixed at the distance of one half the probe tip diameter from the phantom surface.

2. when the device position with the highest point SAR is > 25% of that measured at the initial position, a complete 1-g SAR evaluation is required for this configuration.

3. A single point SAR is measured for each of these device positions until the SAR is less than 50% of that measured at the initial position.

4. The SAR values in table 10 are the Initial model (DWA-125), and the Initial model (DWA-125) report is RZA2009-1456.

7.4. Conclusion

Localized Specific Absorption Rate (SAR) of this portable wireless device has been measured in all cases requested by the relevant standards cited in Clause 5.2 of this report. Maximum localized SAR_{1g} is 0.438 W/kg that is below exposure limits specified in the relevant standards cited in Clause 5.1 of this test report.

8. Measurement Uncertainty

No.	source	Type	Uncertainty Value (%)	Probability Distribution	k	c_i	Standard ncertainty $u_i^{'}$ (%)	Degree of freedom V_{eff} or v_i
1	System repetivity	A	0.5	N	1	1	0.5	9
Measurement system								
2	probe calibration	B	5.9	N	1	1	5.9	∞
3	axial isotropy of the probe	B	4.7	R	$\sqrt{3}$	$\sqrt{0.5}$	1.9	∞
4	Hemispherical isotropy of the probe	B	9.4	R	$\sqrt{3}$	$\sqrt{0.5}$	3.9	∞
6	boundary effect	B	1.9	R	$\sqrt{3}$	1	1.1	∞
7	probe linearity	B	4.7	R	$\sqrt{3}$	1	2.7	∞
8	System detection limits	B	1.0	R	$\sqrt{3}$	1	0.6	∞
9	readout Electronics	B	1.0	N	1	1	1.0	∞
10	response time	B	0	R	$\sqrt{3}$	1	0	∞
11	integration time	B	4.32	R	$\sqrt{3}$	1	2.5	∞
12	noise	B	0	R	$\sqrt{3}$	1	0	∞
13	RF Ambient Conditions	B	3	R	$\sqrt{3}$	1	1.73	∞
14	Probe Positioner Mechanical Tolerance	B	0.4	R	$\sqrt{3}$	1	0.2	∞
15	Probe Positioning with respect to Phantom Shell	B	2.9	R	$\sqrt{3}$	1	1.7	∞
16	Extrapolation, interpolation and Integration Algorithms for Max. SAR Evaluation	B	3.9	R	$\sqrt{3}$	1	2.3	∞
Test sample Related								
17	-Test Sample Positioning	A	2.9	N	1	1	2.9	5
18	-Device Holder Uncertainty	A	4.1	N	1	1	4.1	5
19	-Output Power Variation - SAR drift measurement	B	5.0	R	$\sqrt{3}$	1	2.9	∞
Physical parameter								

20	-phantom	B	4.0	R	$\sqrt{3}$	1	2.3	∞
21	-liquid conductivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.64	1.8	∞
22	-liquid conductivity (measurement uncertainty)	B	5.0	N	1	0.64	3.2	∞
23	-liquid permittivity (deviation from target)	B	5.0	R	$\sqrt{3}$	0.6	1.7	∞
24	-liquid permittivity (measurement uncertainty)	B	5.0	N	1	0.6	3.0	∞
Combined standard uncertainty		$u_c^{'} = \sqrt{\sum_{i=1}^{21} c_i^2 u_i^2}$					12.0	
Expanded uncertainty (confidence interval of 95 %)		$u_e = 2u_c$		N	k=2		24.0	

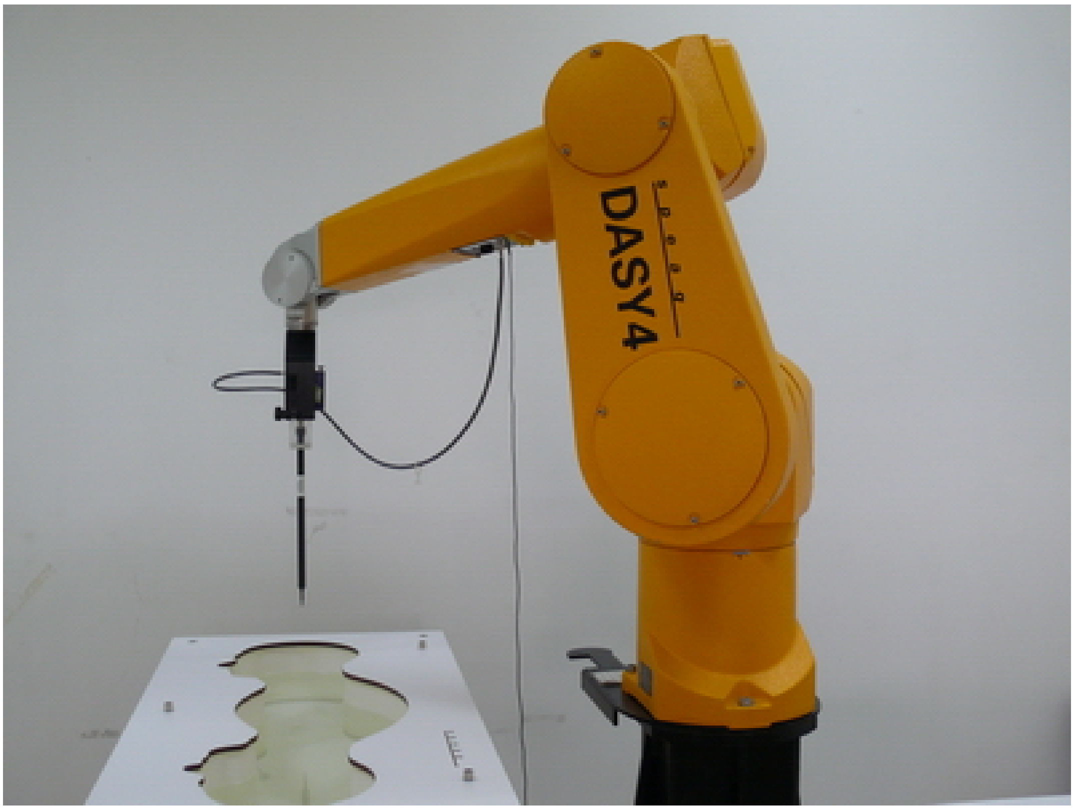
9. Main Test Instruments

Table 11: List of Main Instruments

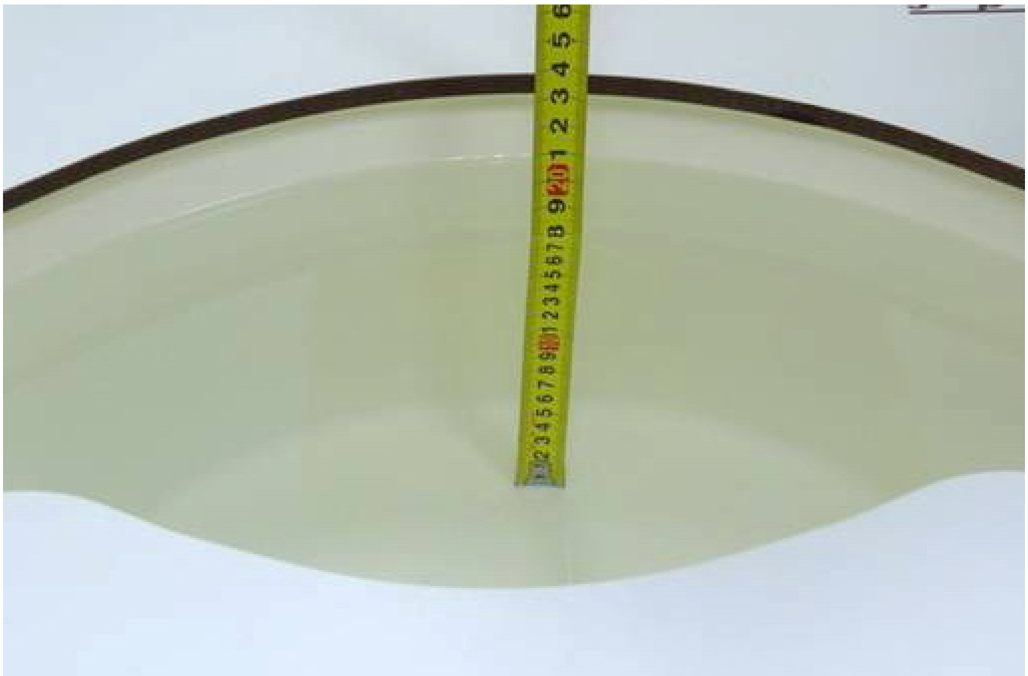
No.	Name	Type	Serial Number	Calibration Date	Valid Period
01	Network analyzer	Agilent 8753E	US37390326	September 13, 2009	One year
02	Dielectric Probe Kit	Agilent 85070E	US44020115	No Calibration Requested	
03	Power meter	Agilent E4417A	GB41291714	March 14, 2009	One year
04	Power sensor	Agilent 8481H	MY41091316	March 14, 2009	One year
05	Signal Generator	HP 8341B	2730A00804	September 13, 2009	One year
06	Amplifier	IXA-020	0401	No Calibration Requested	
07	BTS	E5515C	MY48360988	December 4, 2009	One year
08	E-field Probe	ET3DV6	1737	November 25, 2008	One year
09	DAE	DAE4	452	November 18, 2008	One year
10	Validation Kit 2450MHz	D2450V2	786	July 15, 2009	One year

*******END OF REPORT BODY*******

ANNEX A: Test Layout



Picture 2: Specific Absorption Rate Test Layout



Picture 3: Liquid depth in the flat Phantom (2450 MHz)

ANNEX B: System Check Results

System Performance Check at 2450 MHz

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:786

Date/Time: 11/9/2009 9:10:36 AM

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

Medium parameters used: f = 2450 MHz; σ = 1.98 mho/m; ε_r = 51.37; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

Phantom section: Flat Section

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

d=10mm, Pin=250mW/Area Scan (71x71x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 21.5 mW/g

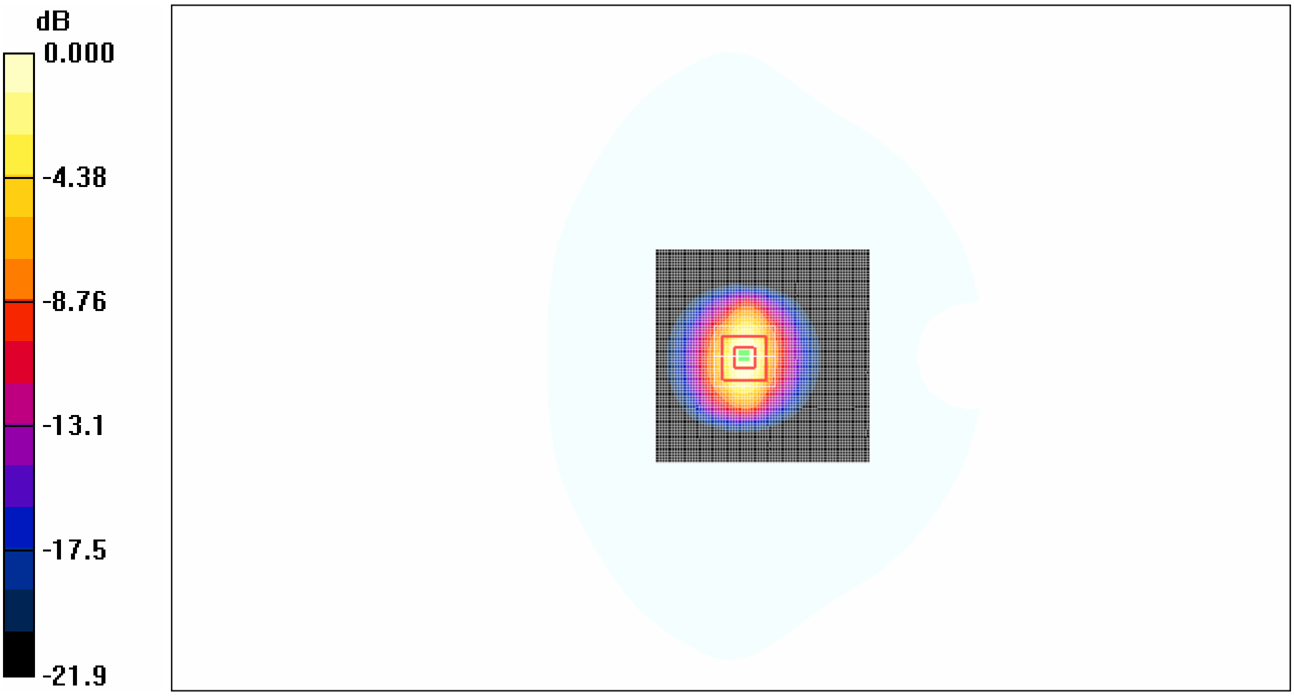
d=10mm, Pin=250mW/Zoom Scan (7x7x7) (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 71.0 V/m; Power Drift = 0.011 dB

Peak SAR (extrapolated) = 28.2 W/kg

SAR(1 g) = 14.0 mW/g; SAR(10 g) = 6.46 mW/g

Maximum value of SAR (measured) = 19.8 mW/g



0 dB = 19.8mW/g

Figure 7 System Performance Check 2450MHz 250mW

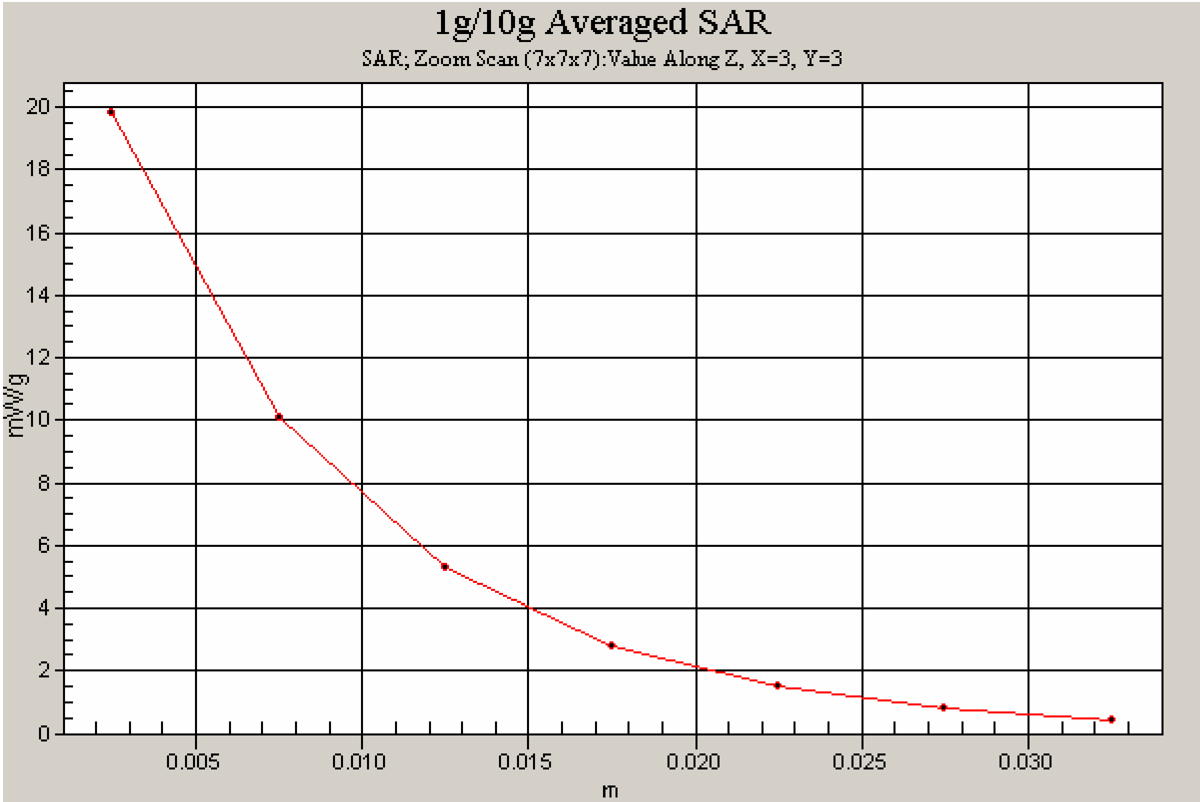


Figure 8 Z-Scan at power reference point (System Check at 2450 MHz Dipole)

ANNEX C: Graph Results

802.11b with IBM T61 Test Position 1 Middle

Date/Time: 11/9/2009 11:19:16 AM
Communication System: 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3
Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃
DASY4 Configuration:
Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008
Electronics: DAE4 Sn452; Calibrated: 11/18/2008
Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 1 Middle/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.253 mW/g

Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.99 V/m; Power Drift = -0.165 dB
Peak SAR (extrapolated) = 0.455 W/kg
SAR(1 g) = 0.231 mW/g; SAR(10 g) = 0.121 mW/g
Maximum value of SAR (measured) = 0.260 mW/g

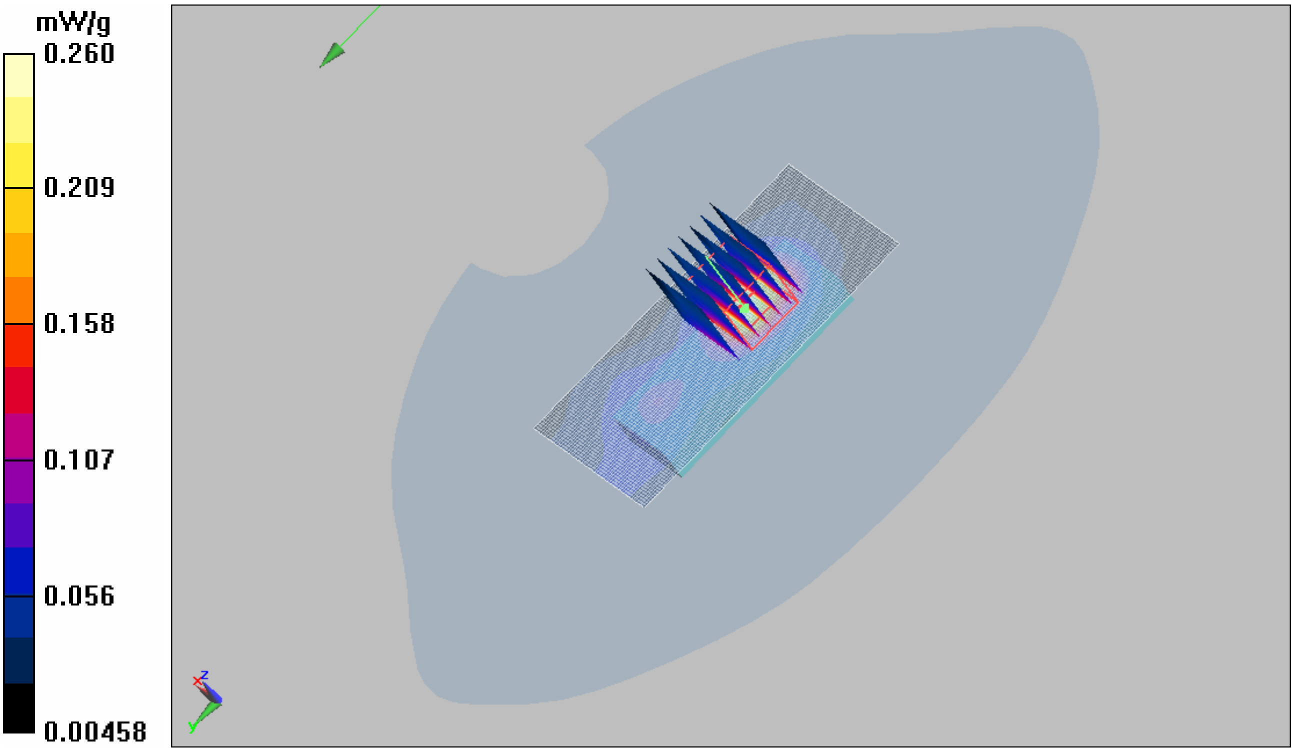


Figure 9 802.11b with IBM T61 Test Position 1 Channel 6

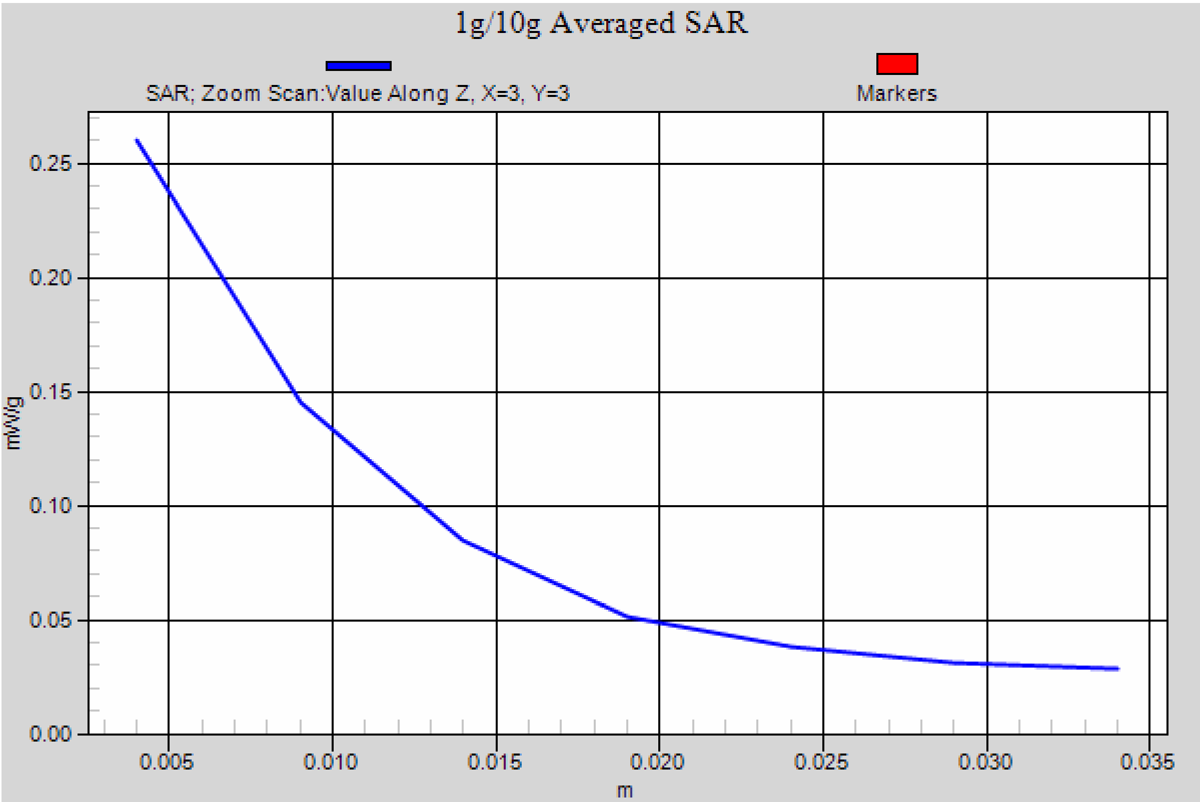


Figure 10 Z-Scan at power reference point (802.11b with IBM T61 Test Position 1 Channel 6)

802.11b with IBM T61 Test Position 2 Middle

Date/Time: 11/9/2009 2:14:08 PM

Communication System: 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 2 Middle/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.080 mW/g

Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 5.74 V/m; Power Drift = 0.024 dB

Peak SAR (extrapolated) = 0.127 W/kg

SAR(1 g) = 0.075 mW/g; SAR(10 g) = 0.040 mW/g

Maximum value of SAR (measured) = 0.086 mW/g

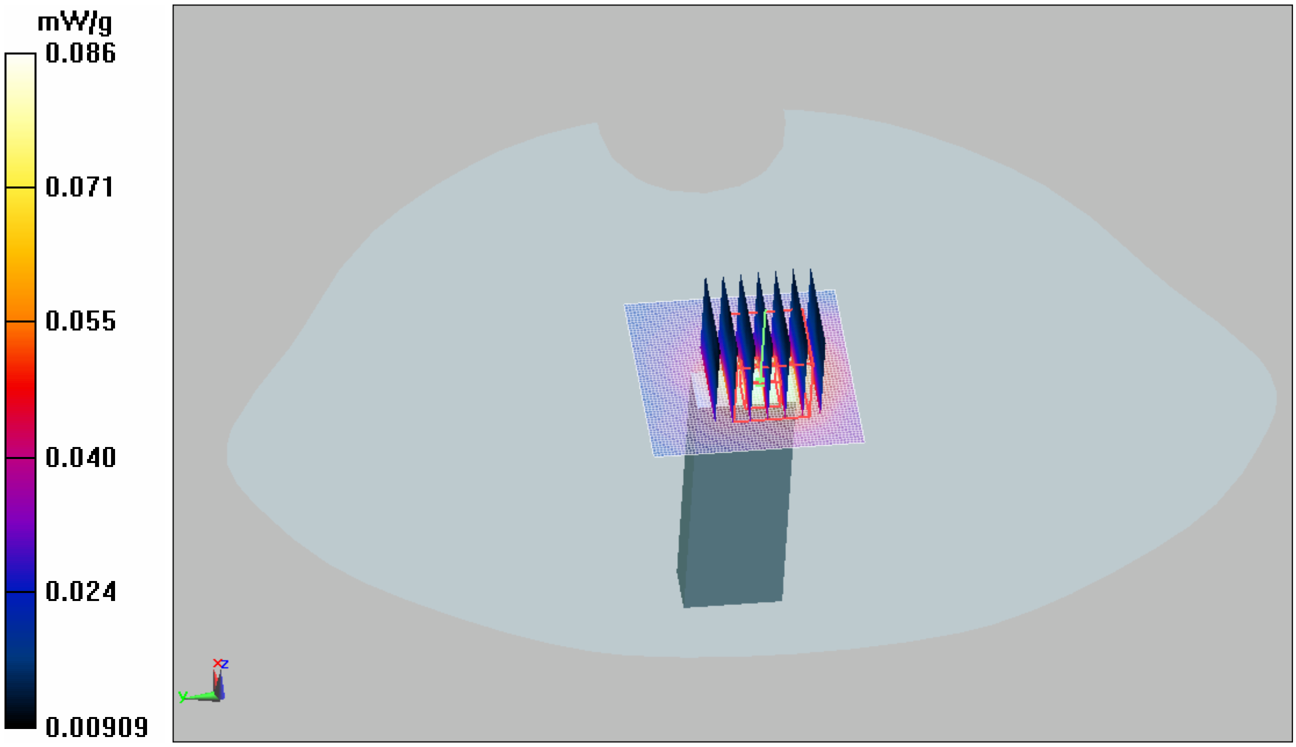


Figure 11 802.11b with IBM T61 Test Position 2 Channel 6

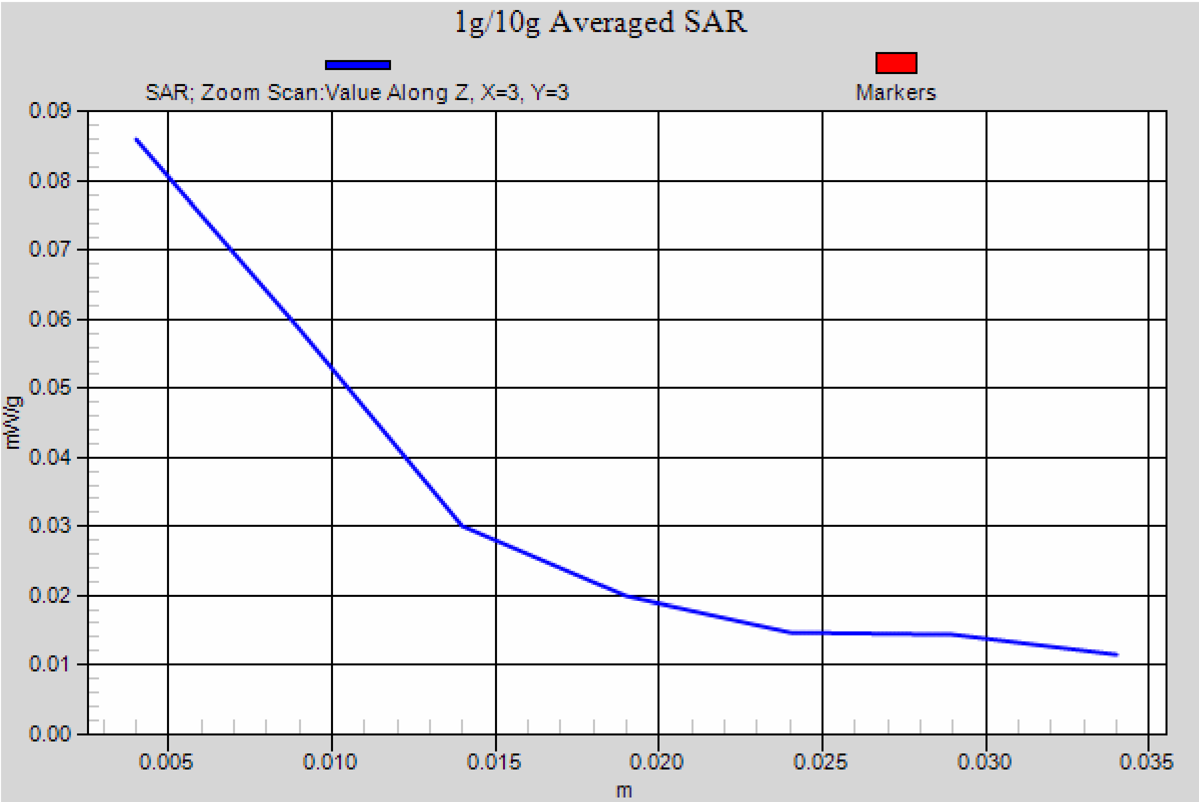


Figure 12 Z-Scan at power reference point (802.11b with IBM T61 Test Position 2 Channel 6)

802.11b with IBM T61 Test Position 3 Middle

Date/Time: 11/9/2009 1:44:33 PM

Communication System: 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 3 Middle/Area Scan (51x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.103 mW/g

Test Position 3 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 4.9 V/m; Power Drift = 0.144 dB

Peak SAR (extrapolated) = 0.163 W/kg

SAR(1 g) = 0.082 mW/g; SAR(10 g) = 0.038 mW/g

Maximum value of SAR (measured) = 0.096 mW/g

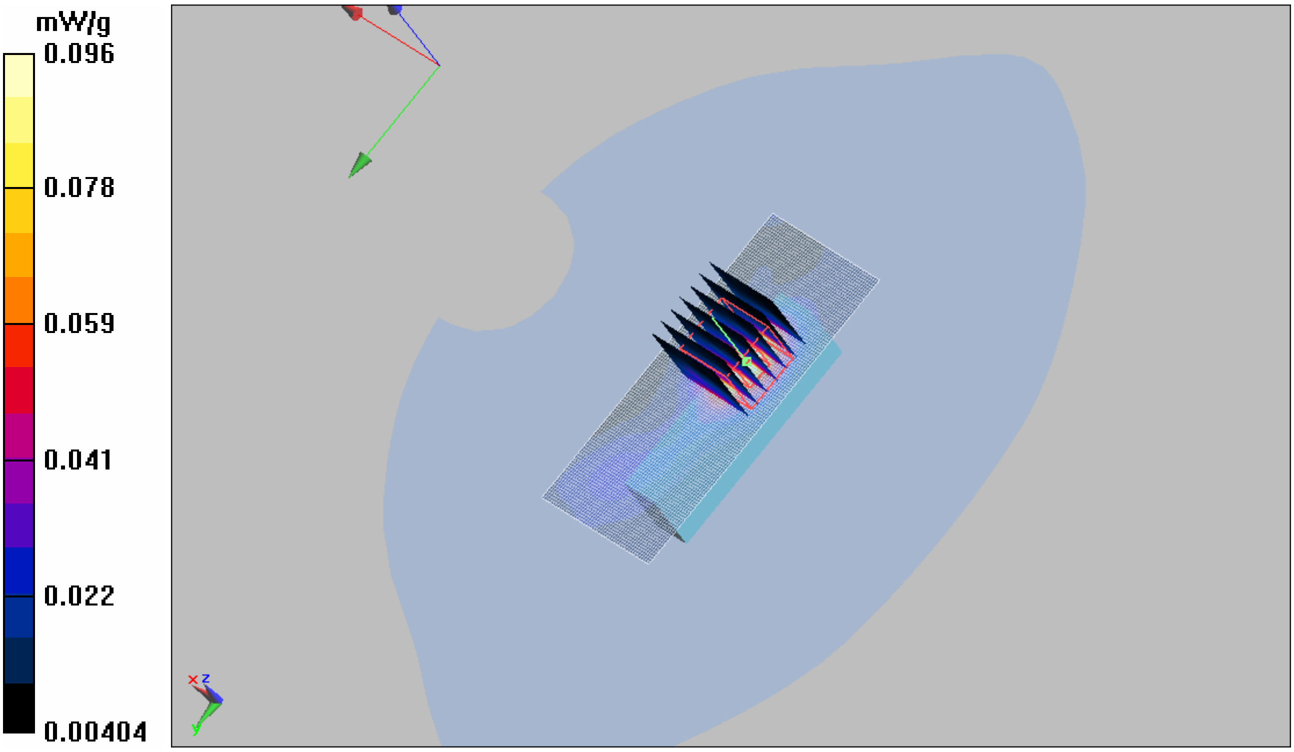


Figure 13 802.11b with IBM T61 Test Position 3 Channel 6

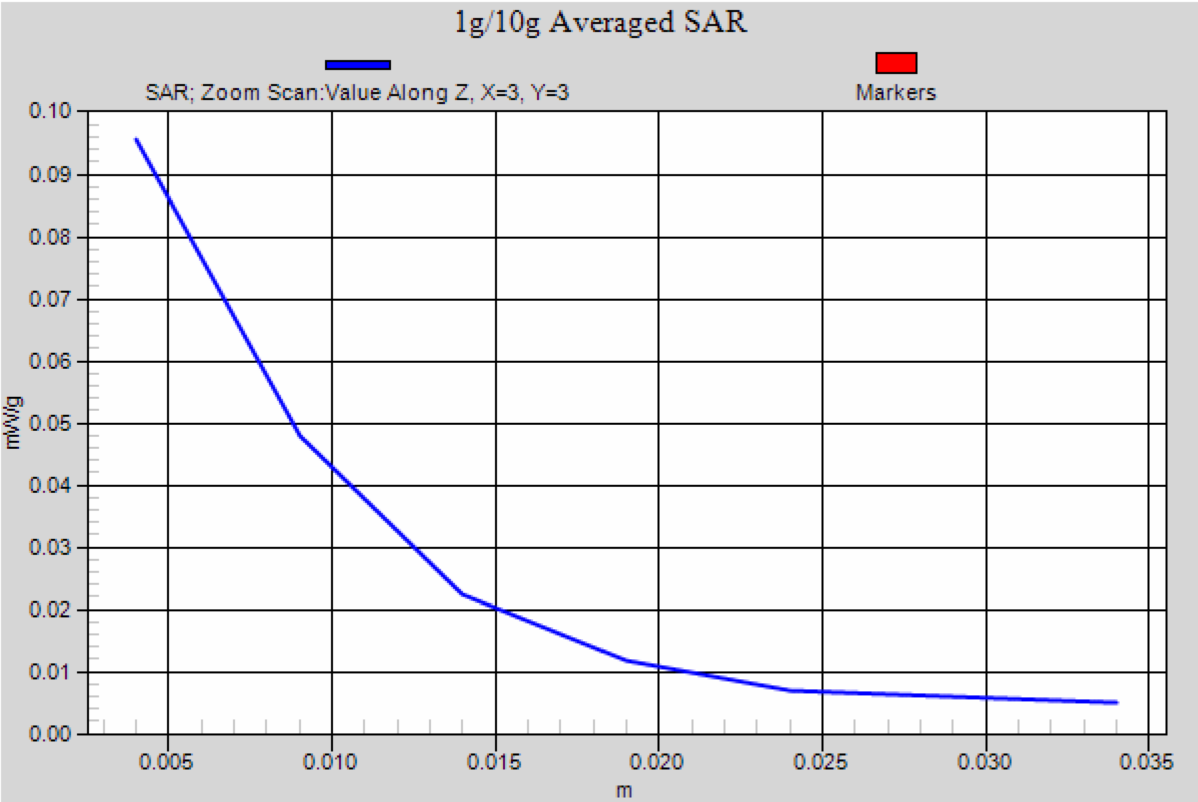


Figure 14 Z-Scan at power reference point (802.11b with IBM T61 Test Position 3 Channel 6)

802.11b with IBM T61 Test Position 4 Middle

Date/Time: 11/9/2009 12:52:20 PM

Communication System: 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 4 Middle/Area Scan (51x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.181 mW/g

Test Position 4 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 7.52 V/m; Power Drift = -0.038 dB

Peak SAR (extrapolated) = 0.281 W/kg

SAR(1 g) = 0.148 mW/g; SAR(10 g) = 0.072 mW/g

Maximum value of SAR (measured) = 0.171 mW/g

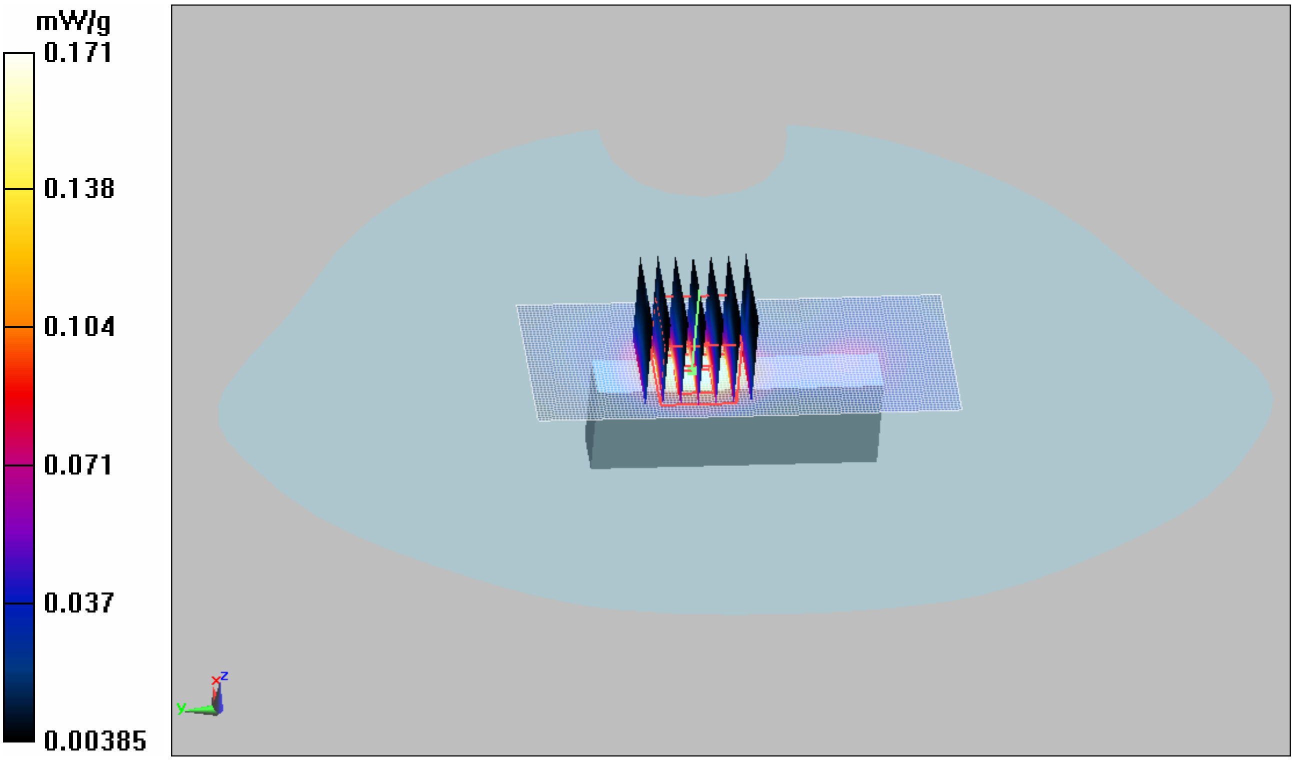


Figure 15 802.11b with IBM T61 Test Position 4 Channel 6

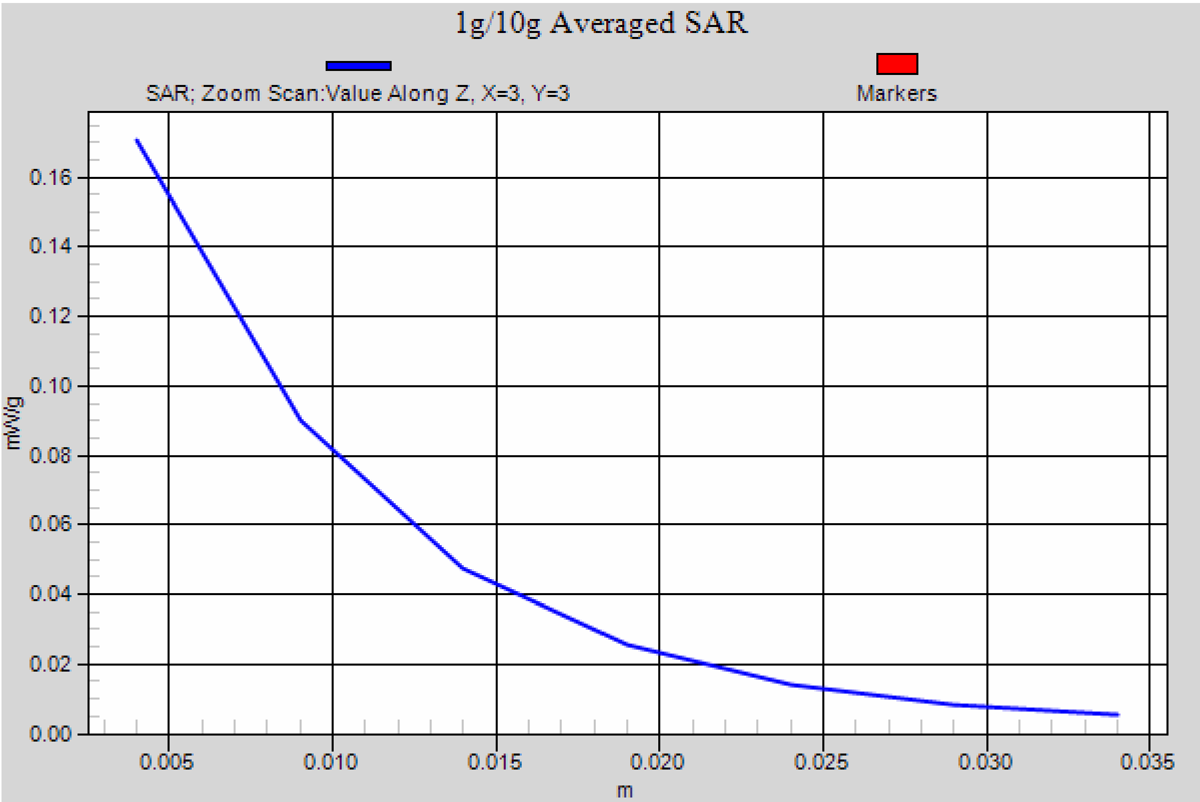


Figure 16 Z-Scan at power reference point (802.11b with IBM T61 Test Position 4 Channel 6)

802.11b with BenQ Joybook R55V Test Position 5 High

Date/Time: 11/9/2009 7:43:47 PM

Communication System: 802.11b; Frequency: 2462 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2462 MHz; σ = 2 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 5 High/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.364 mW/g

Test Position 5 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.8 V/m; Power Drift = -0.083 dB

Peak SAR (extrapolated) = 0.593 W/kg

SAR(1 g) = 0.309 mW/g; SAR(10 g) = 0.150 mW/g

Maximum value of SAR (measured) = 0.356 mW/g

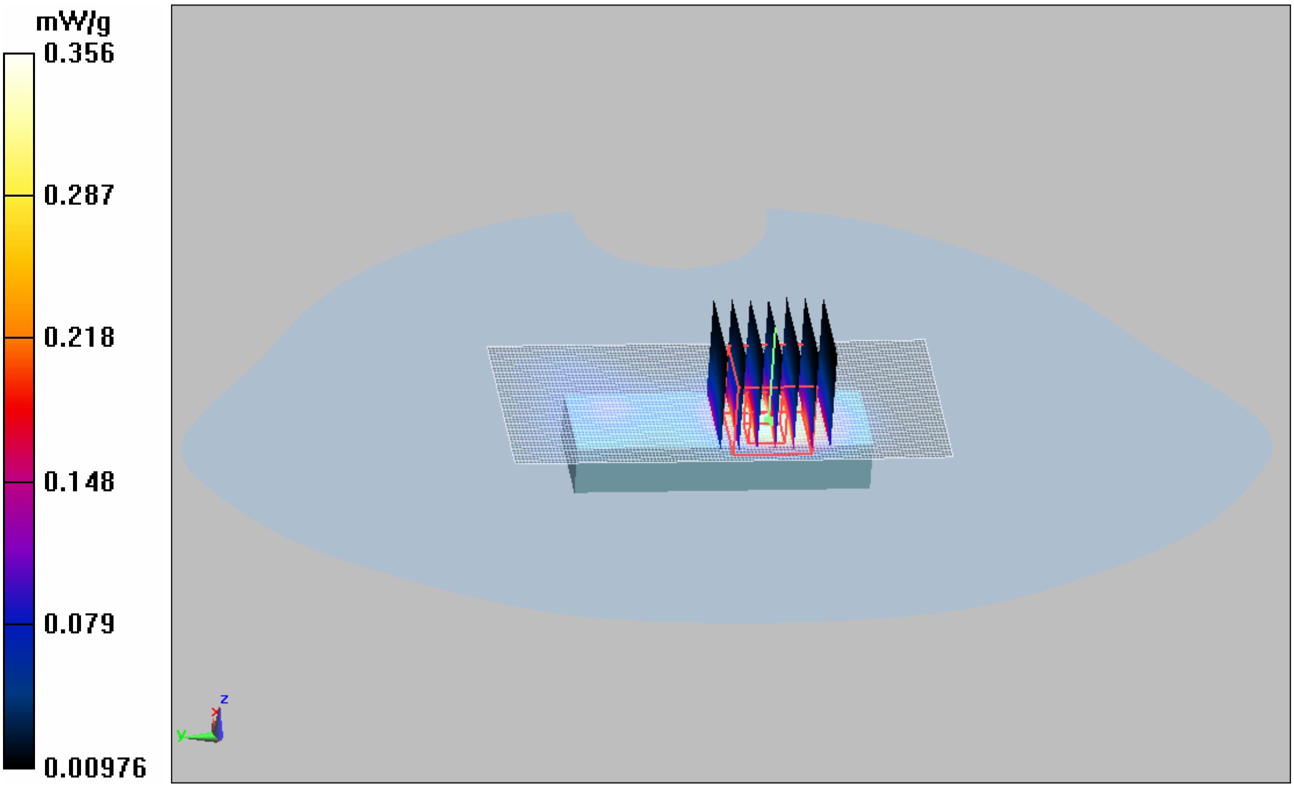


Figure 17 802.11b with BenQ Joybook R55V Test Position 5 Channel 11

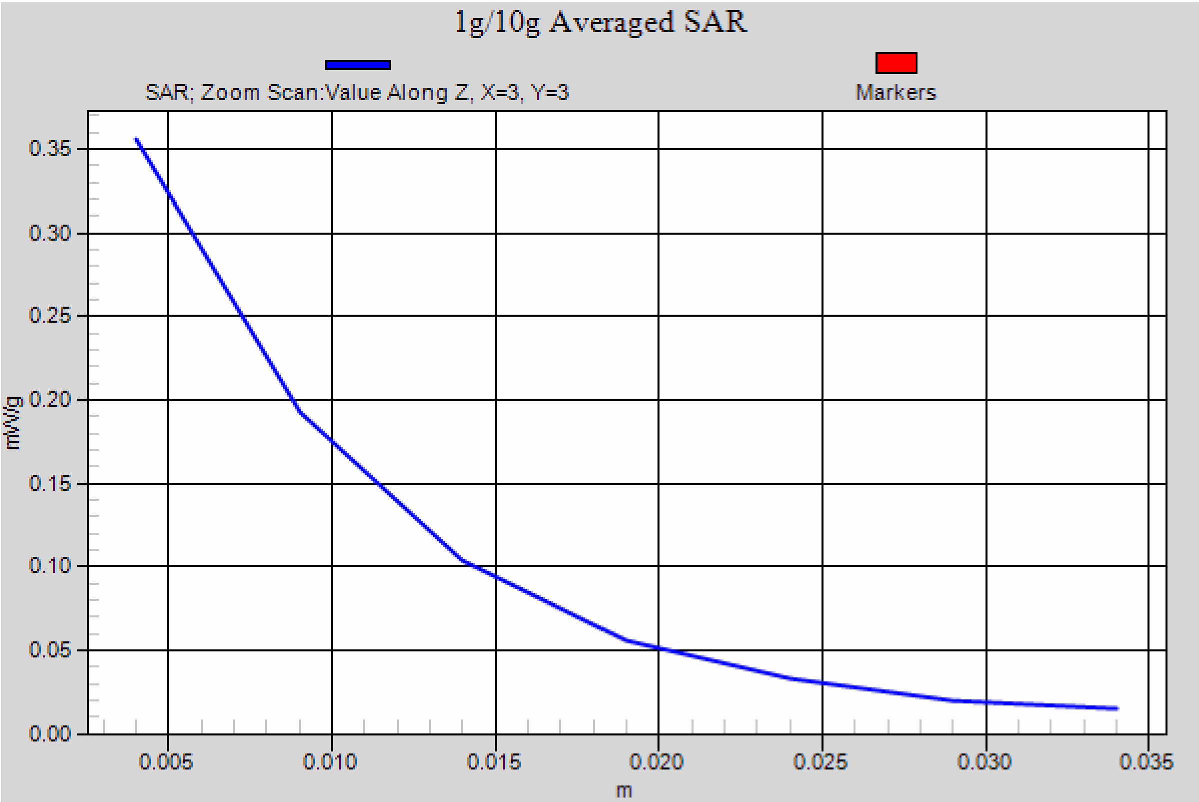


Figure 18 Z-Scan at power reference point (802.11b with BenQ Joybook R55V Test Position 5 Channel 11)

802.11b with BenQ Joybook R55V Test Position 5 Middle

Date/Time: 11/9/2009 12:05:33 PM

Communication System: 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 5 Middle/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.412 mW/g

Test Position 5 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.87 V/m; Power Drift = -0.195 dB

Peak SAR (extrapolated) = 0.602 W/kg

SAR(1 g) = 0.315 mW/g; SAR(10 g) = 0.156 mW/g

Maximum value of SAR (measured) = 0.360 mW/g

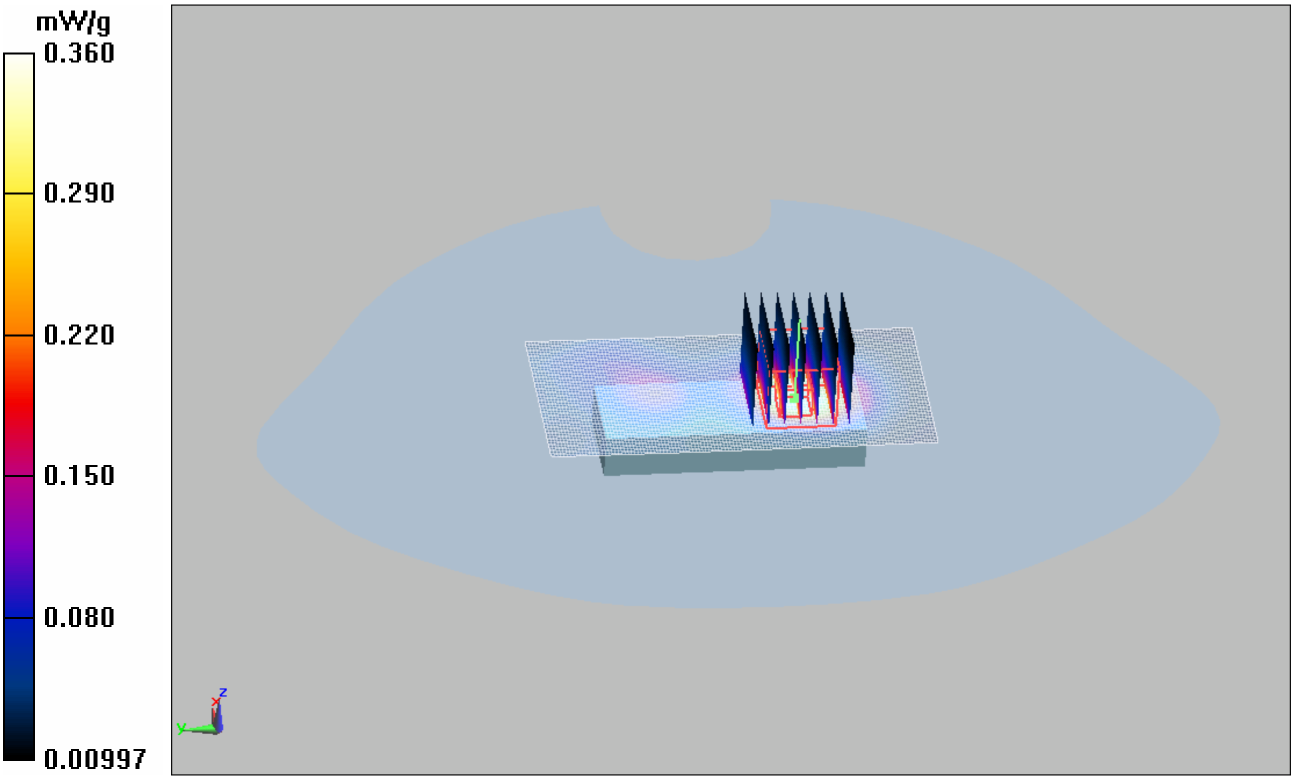


Figure 19 802.11b with BenQ Joybook R55V Test Position 5 Channel 6

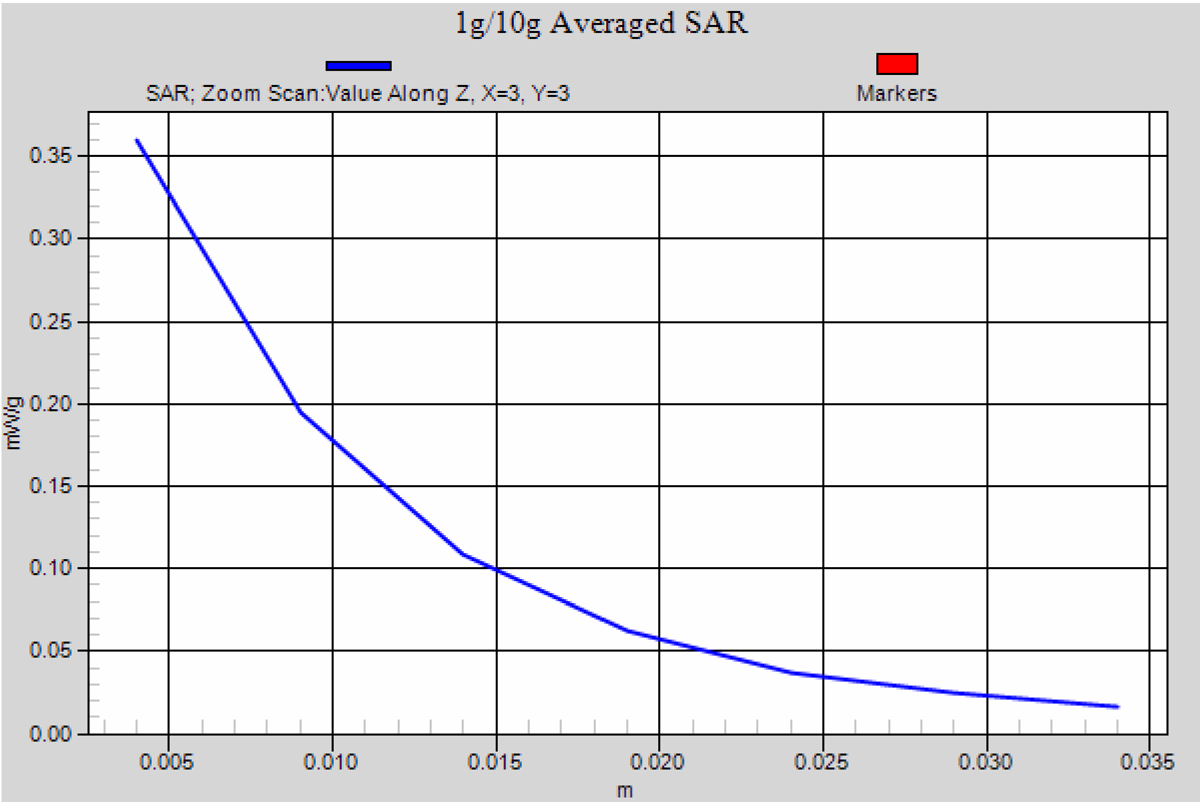


Figure 20 Z-Scan at power reference point (802.11b with BenQ Joybook R55V Test Position 5 Channel 6)

802.11b with BenQ Joybook R55V Test Position 5 Low

Date/Time: 11/9/2009 7:14:23 PM

Communication System: 802.11b; Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.93 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 5 Low/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.359 mW/g

Test Position 5 Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.84 V/m; Power Drift = -0.039 dB

Peak SAR (extrapolated) = 0.586 W/kg

SAR(1 g) = 0.306 mW/g; SAR(10 g) = 0.150 mW/g

Maximum value of SAR (measured) = 0.353 mW/g

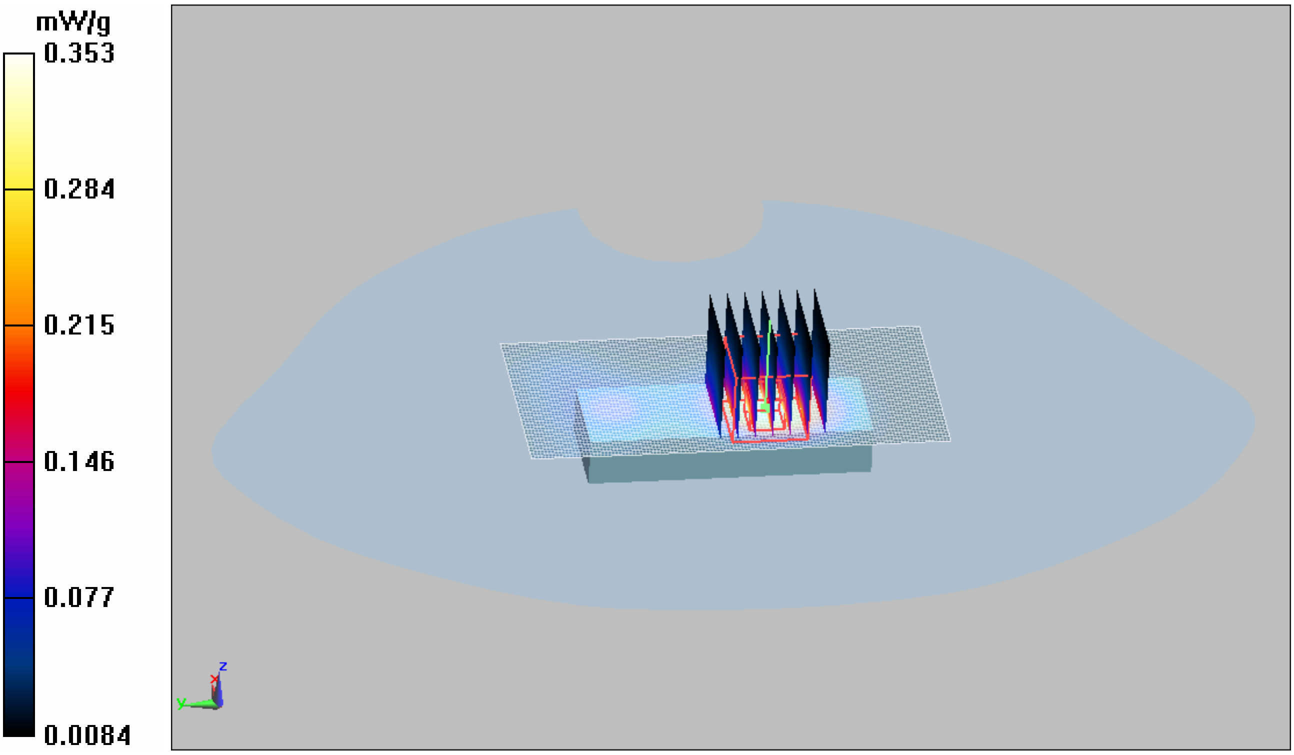


Figure 21 802.11b with BenQ Joybook R55V Test Position 5 Channel 1

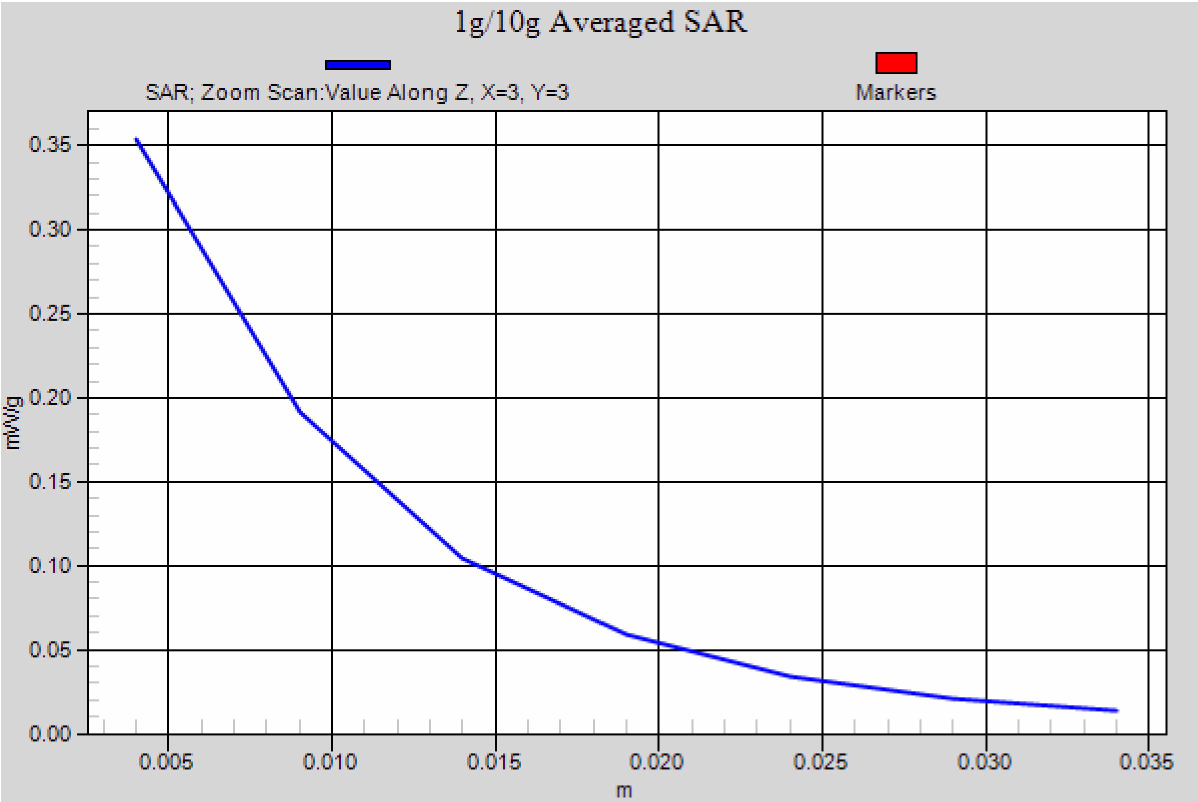


Figure 22 Z-Scan at power reference point (802.11b with BenQ Joybook R55V Test Position 5 Channel 1)

802.11g with BenQ Joybook R55V Test Position 5 Middle

Date/Time: 11/9/2009 8:18:14 PM

Communication System: 802.11g; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 5 Middle/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.370 mW/g

Test Position 5 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 8.4 V/m; Power Drift = 0.129 dB

Peak SAR (extrapolated) = 0.611 W/kg

SAR(1 g) = 0.318 mW/g; SAR(10 g) = 0.156 mW/g

Maximum value of SAR (measured) = 0.366 mW/g

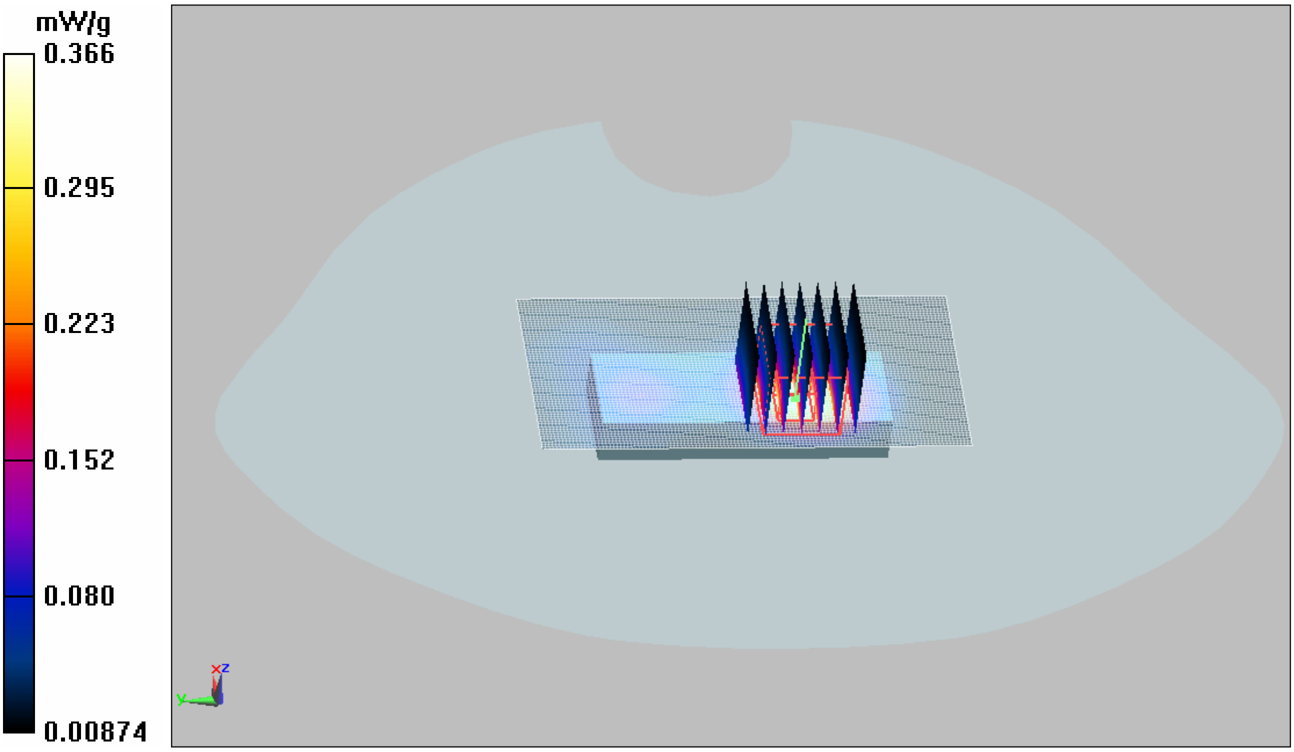


Figure 23 802.11g with BenQ Joybook R55V Test Position 5 Channel 6

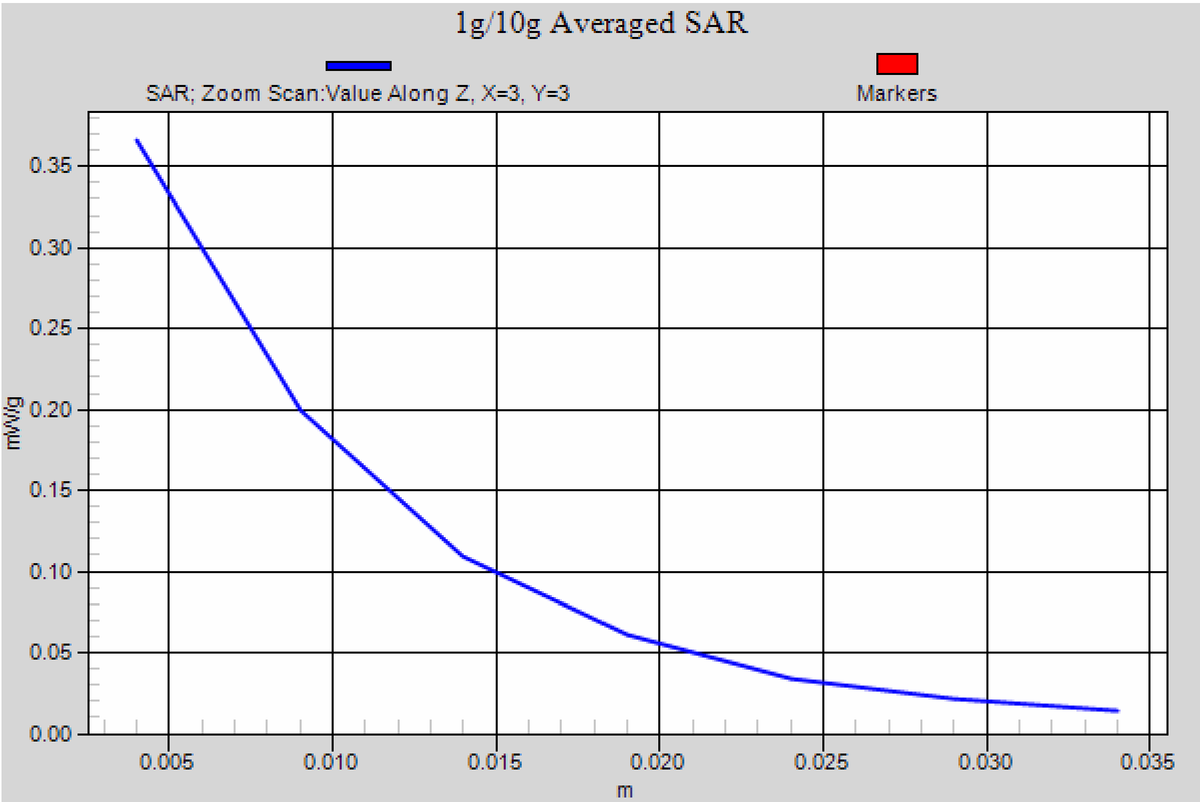


Figure 24 Z-Scan at power reference point (802.11g with BenQ Joybook R55V Test Position 5 Channel 6)

802.11n HT20 with IBM T61 Test Position 1 Middle

Date/Time: 11/9/2009 4:59:44 PM

Communication System: 802.11n; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 1 Middle/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.370 mW/g

Test Position 1 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 12.7 V/m; Power Drift = -0.141 dB

Peak SAR (extrapolated) = 0.534 W/kg

SAR(1 g) = 0.285 mW/g; SAR(10 g) = 0.143 mW/g

Maximum value of SAR (measured) = 0.326 mW/g

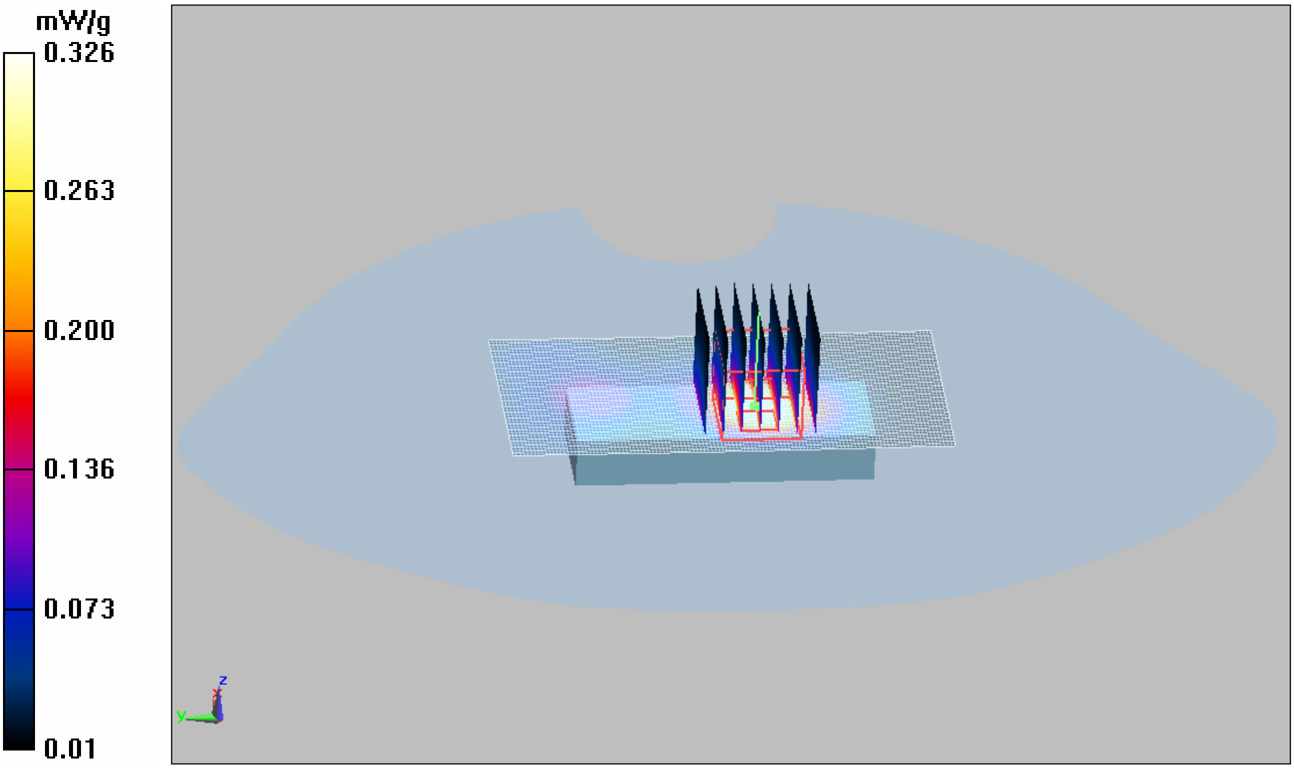


Figure 25 802.11n HT20 with IBM T61 Test Position 1 Channel 6

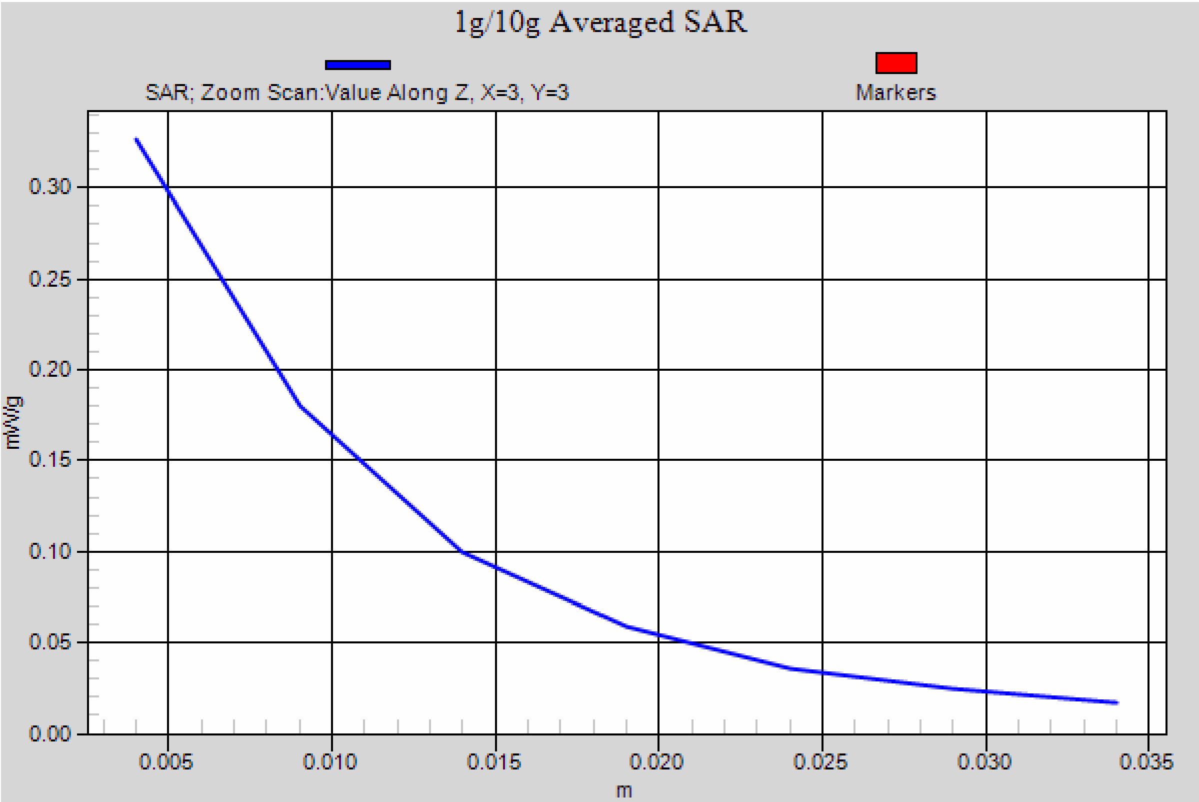


Figure 26 Z-Scan at power reference point (802.11n HT20 with IBM T61 Test Position 1 Channel 6)

802.11n HT20 with IBM T61 Test Position 2 Middle

Date/Time: 11/9/2009 2:44:11 PM

Communication System: 802.11n; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 2 Middle/Area Scan (61x61x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.085 mW/g

Test Position 2 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.13 V/m; Power Drift = -0.061 dB

Peak SAR (extrapolated) = 0.150 W/kg

SAR(1 g) = 0.076 mW/g; SAR(10 g) = 0.038 mW/g

Maximum value of SAR (measured) = 0.088 mW/g

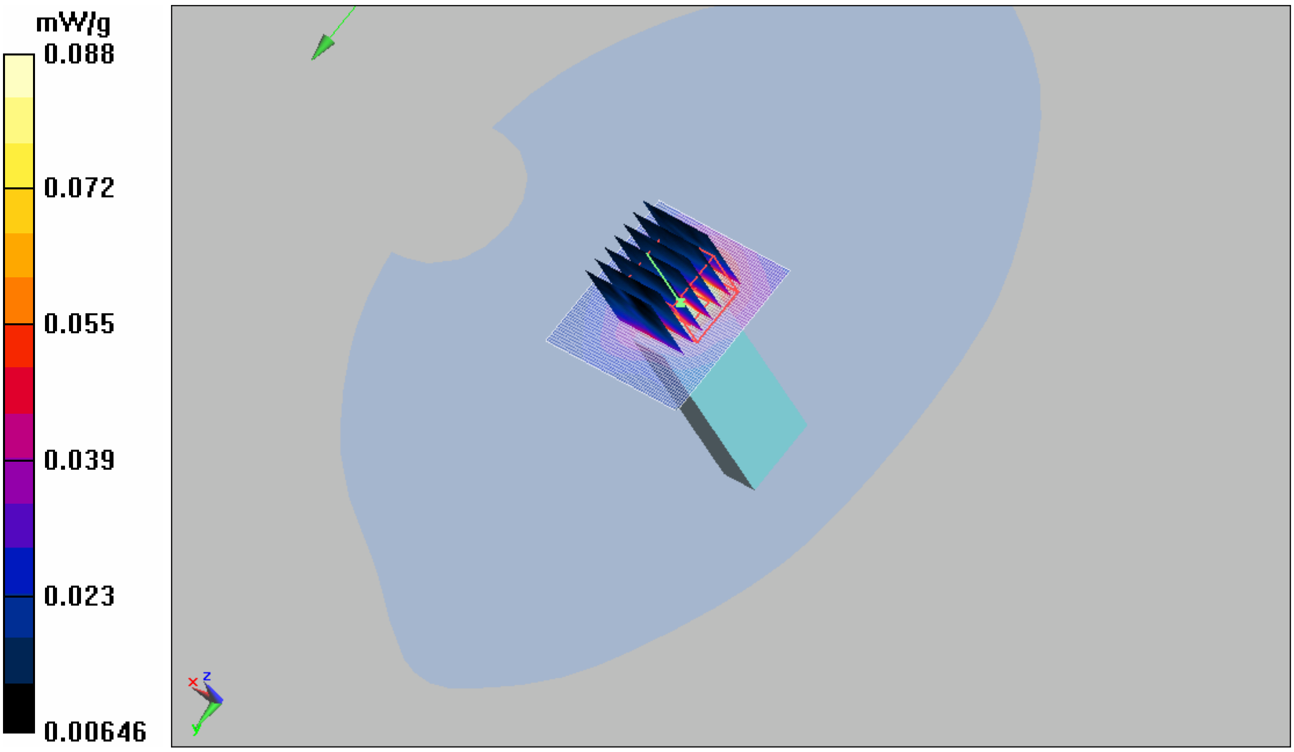


Figure 27 802.11n HT20 with IBM T61 Test Position 2 Channel 6

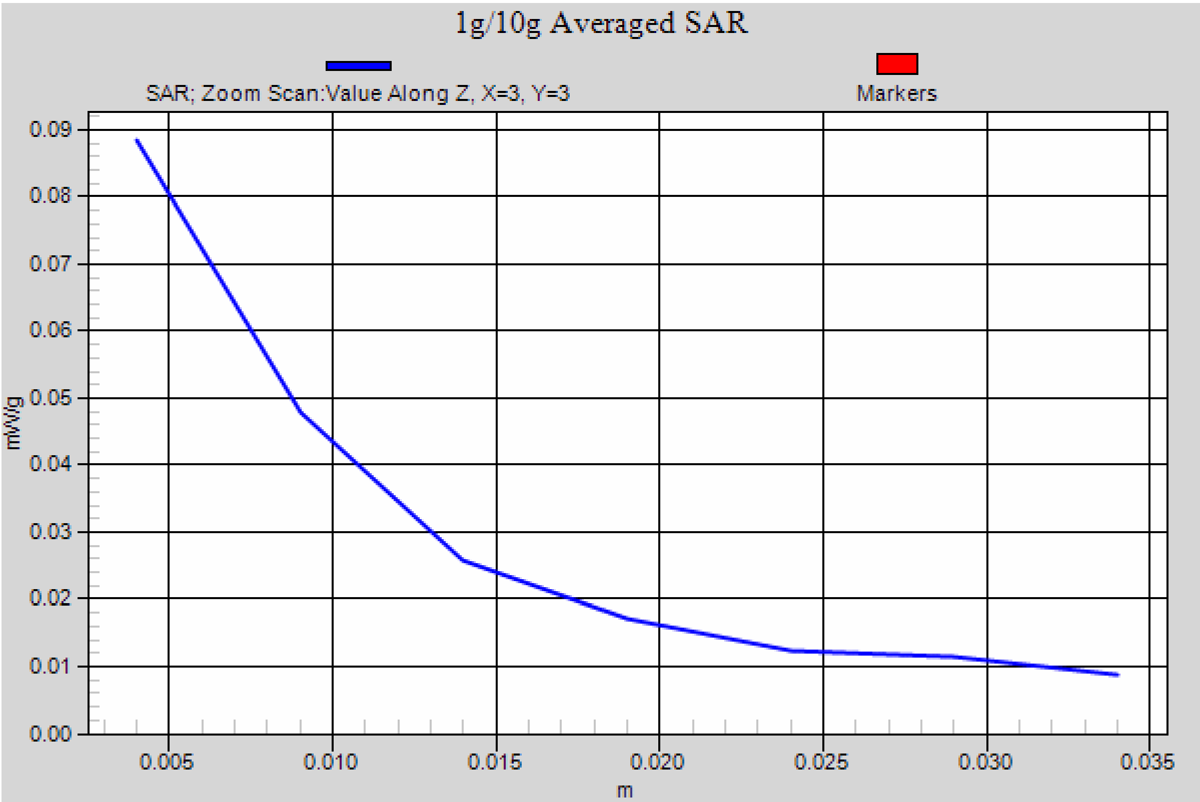


Figure 28 Z-Scan at power reference point (802.11n HT20 with IBM T61 Test Position 2 Channel 6)

802.11n HT20 with IBM T61 Test Position 3 Middle

Date/Time: 11/9/2009 3:13:25 PM

Communication System: 802.11n; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 3 Middle/Area Scan (51x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.129 mW/g

Test Position 3 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 6.06 V/m; Power Drift = 0.155 dB

Peak SAR (extrapolated) = 0.204 W/kg

SAR(1 g) = 0.103 mW/g; SAR(10 g) = 0.048 mW/g

Maximum value of SAR (measured) = 0.120 mW/g

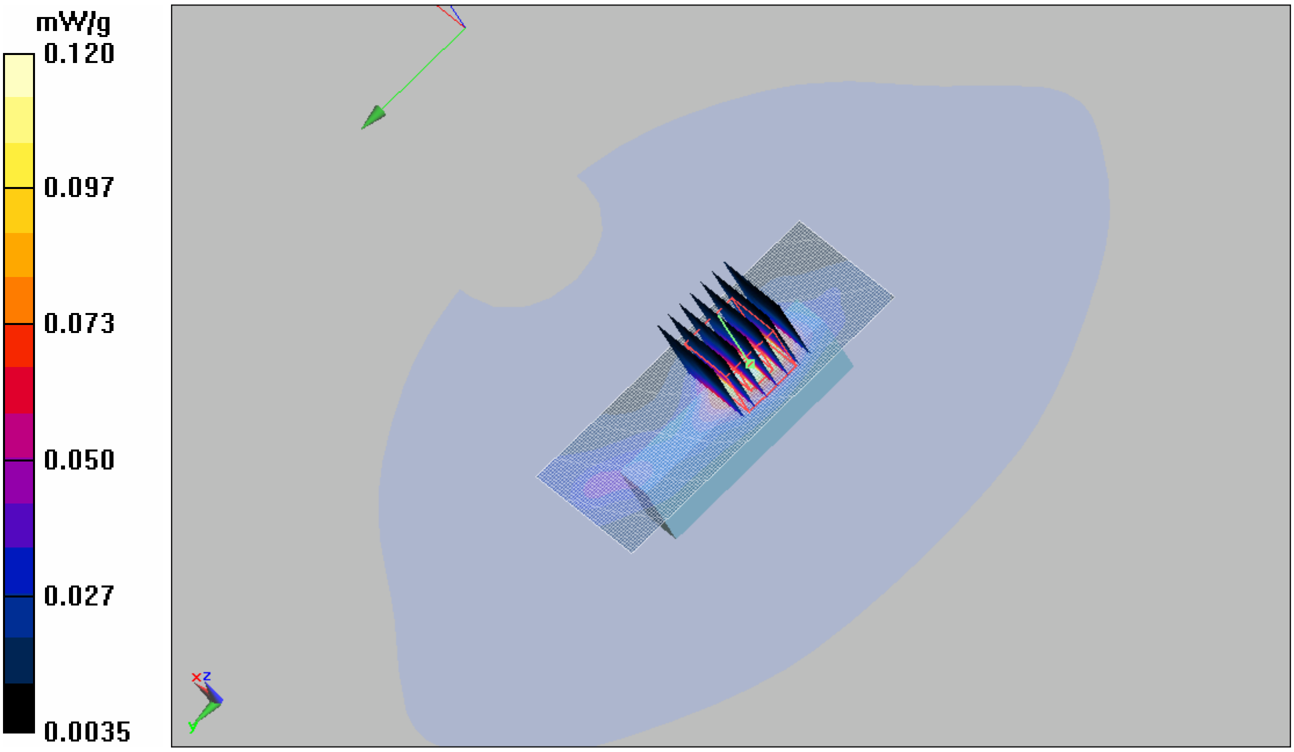


Figure 29 802.11n HT20 with IBM T61 Test Position 3 Channel 6

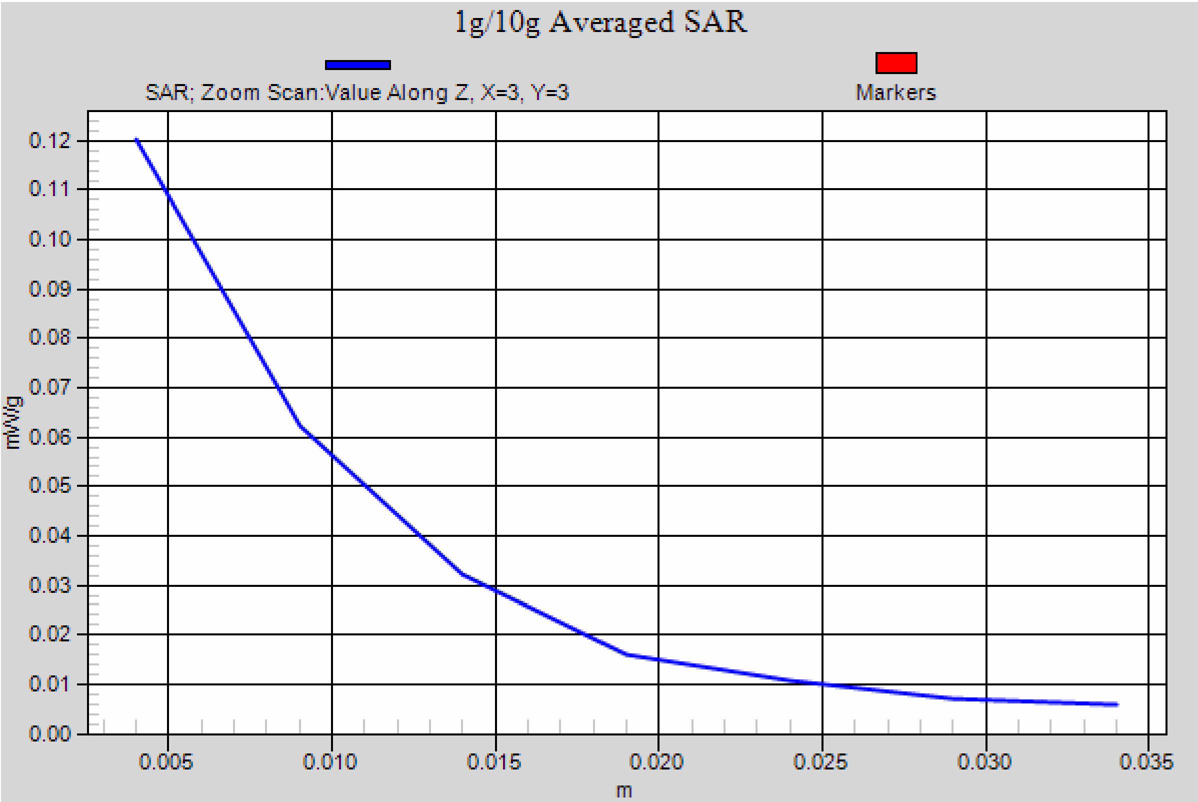


Figure 30 Z-Scan at power reference point (802.11n HT20 with IBM T61 Test Position 3 Channel 6)

802.11n HT20 with IBM T61 Test Position 4 Middle

Date/Time: 11/9/2009 3:41:12 PM

Communication System: 802.11n; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 4 Middle/Area Scan (51x121x1): Measurement grid: dx=10mm, dy=10mm
Maximum value of SAR (interpolated) = 0.210 mW/g

Test Position 4 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.76 V/m; Power Drift = 0.184 dB
Peak SAR (extrapolated) = 0.350 W/kg
SAR(1 g) = 0.184 mW/g; SAR(10 g) = 0.091 mW/g
Maximum value of SAR (measured) = 0.210 mW/g

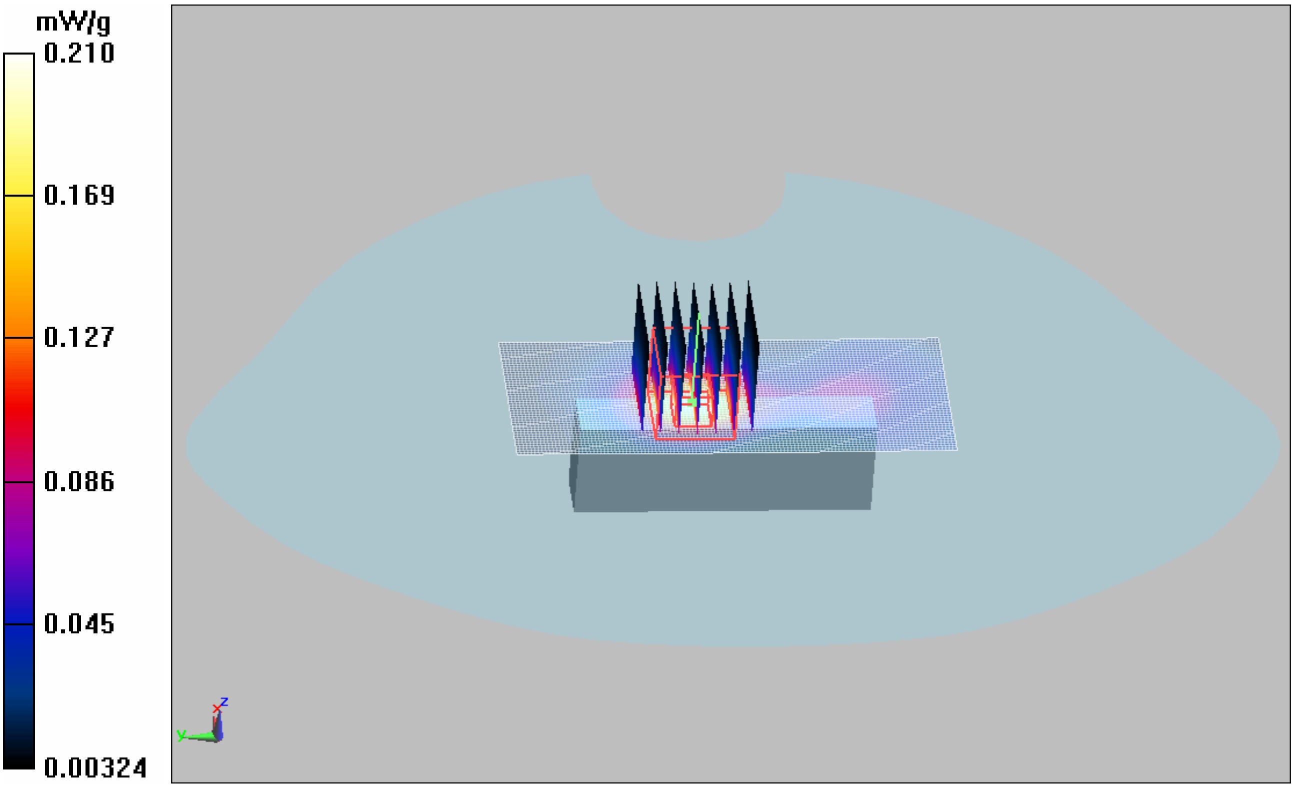


Figure 31 802.11n HT20 with IBM T61 Test Position 4 Channel 6

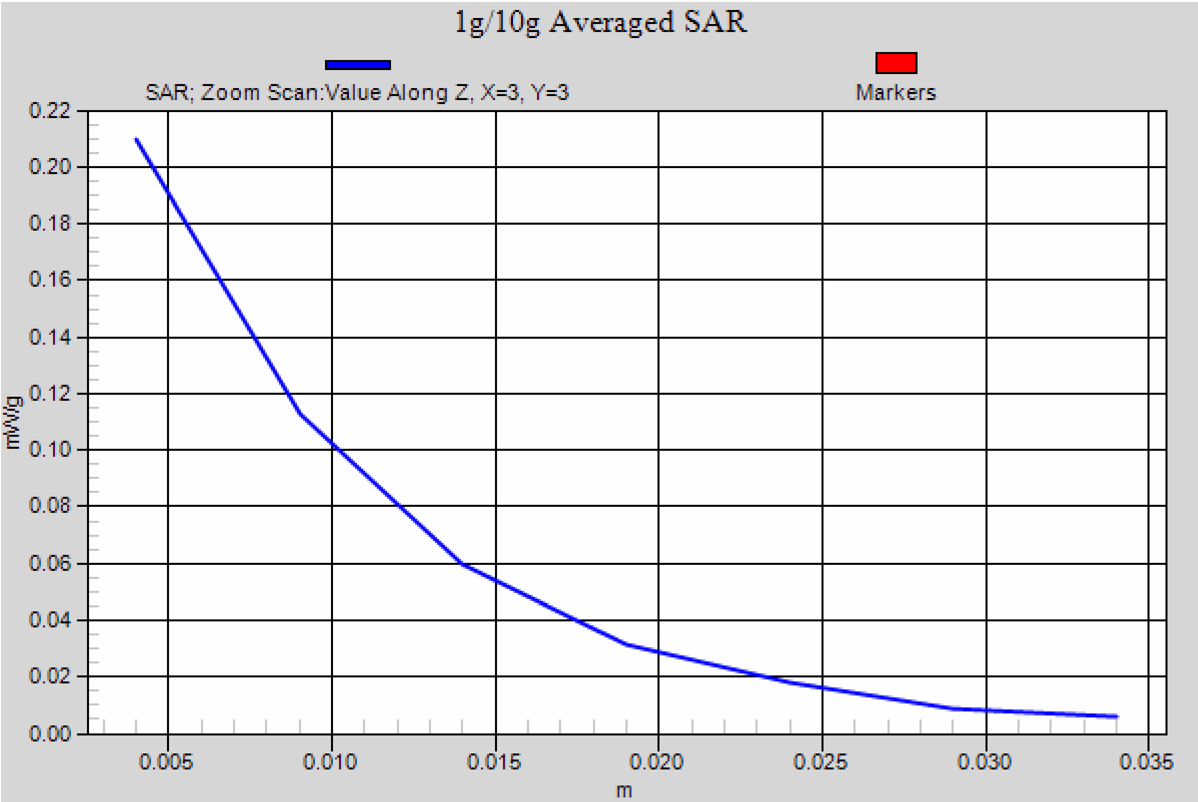


Figure 32 Z-Scan at power reference point (802.11n HT20 with IBM T61 Test Position 4 Channel 6)

802.11n HT20 with BenQ Joybook R55V Test Position 5 High

Date/Time: 11/9/2009 6:13:16 PM

Communication System: 802.11n; Frequency: 2462 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2462 MHz; σ = 2 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 5 High/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.382 mW/g

Test Position 5 High/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.2 V/m; Power Drift = -0.039 dB

Peak SAR (extrapolated) = 0.613 W/kg

SAR(1 g) = 0.322 mW/g; SAR(10 g) = 0.159 mW/g

Maximum value of SAR (measured) = 0.365 mW/g

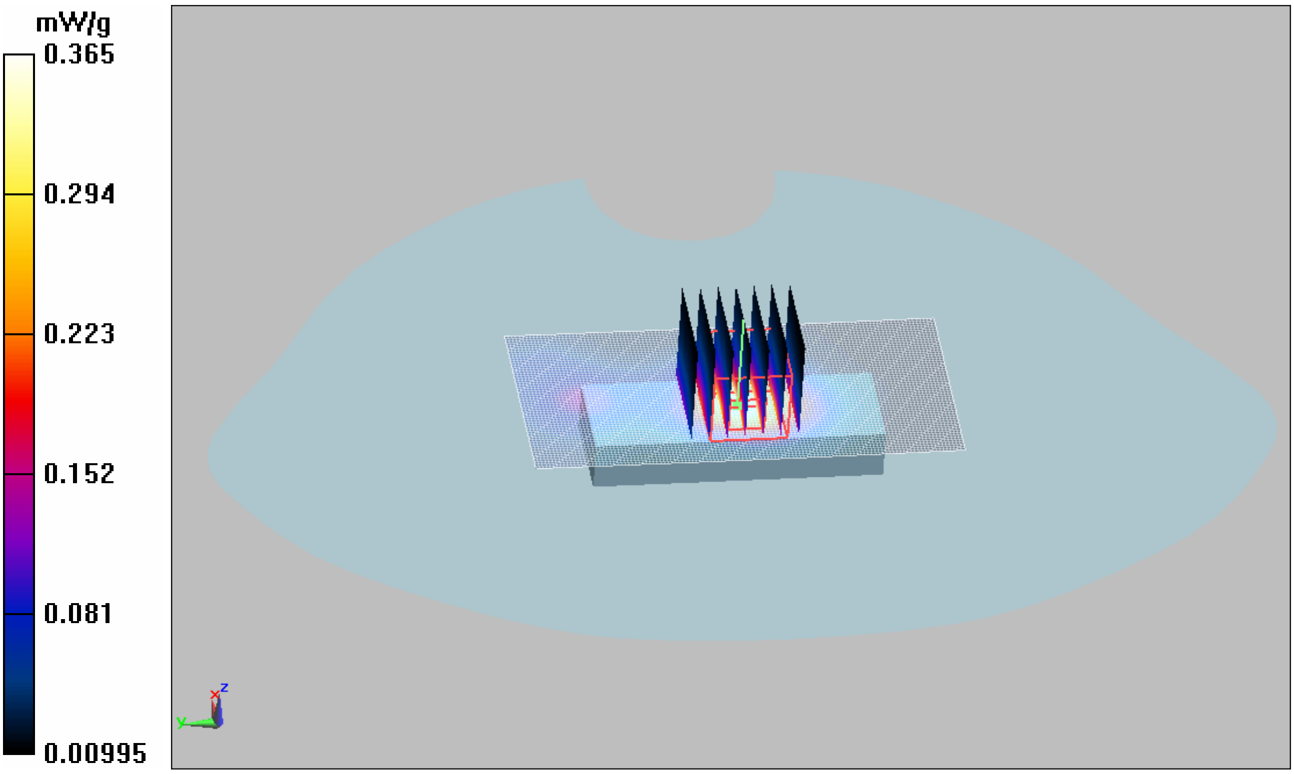


Figure 33 802.11n HT20 with BenQ Joybook R55V Test Position 5 Channel 11

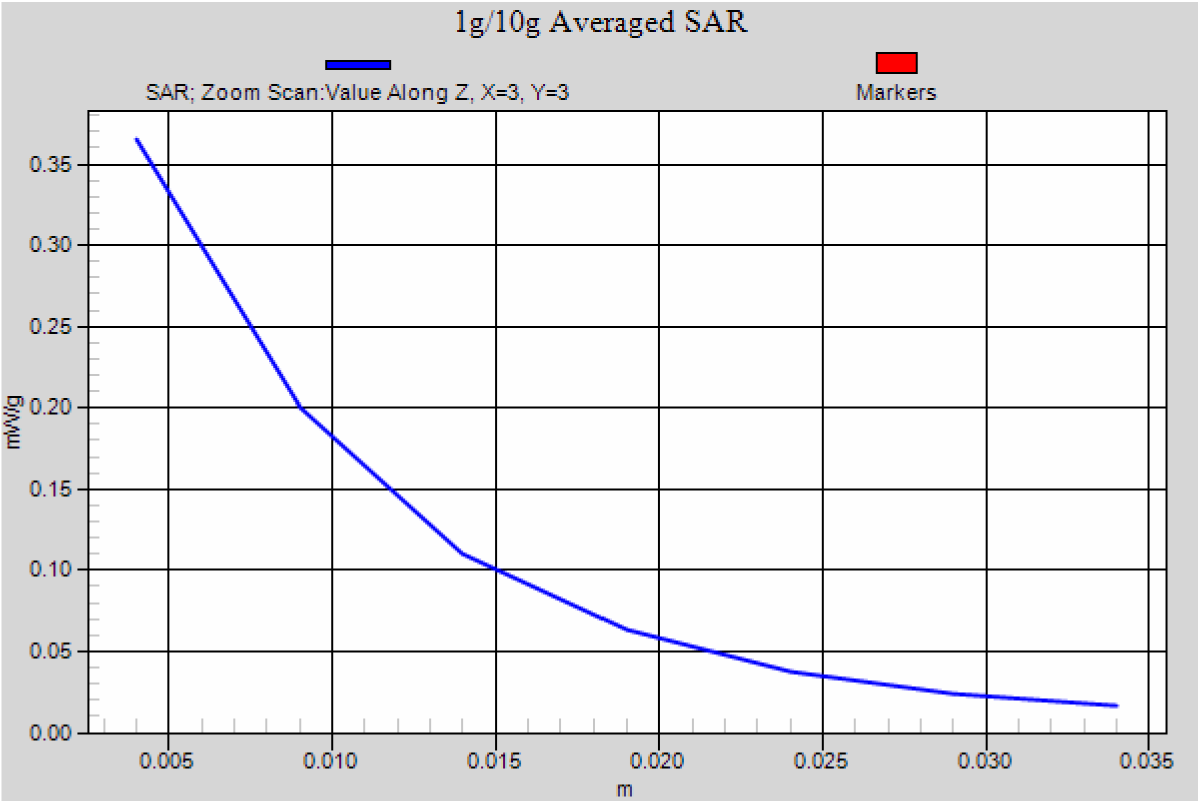


Figure 34 Z-Scan at power reference point (802.11n HT20 with BenQ Joybook R55V Test Position 5 Channel 11)

802.11n HT20 with BenQ Joybook R55V Test Position 5 Middle

Date/Time: 11/9/2009 4:15:22 PM

Communication System: 802.11n; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 5 Middle/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.489 mW/g

Test Position 5 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 13.2 V/m; Power Drift = 0.057 dB

Peak SAR (extrapolated) = 0.778 W/kg

SAR(1 g) = 0.404 mW/g; SAR(10 g) = 0.201 mW/g

Maximum value of SAR (measured) = 0.464 mW/g

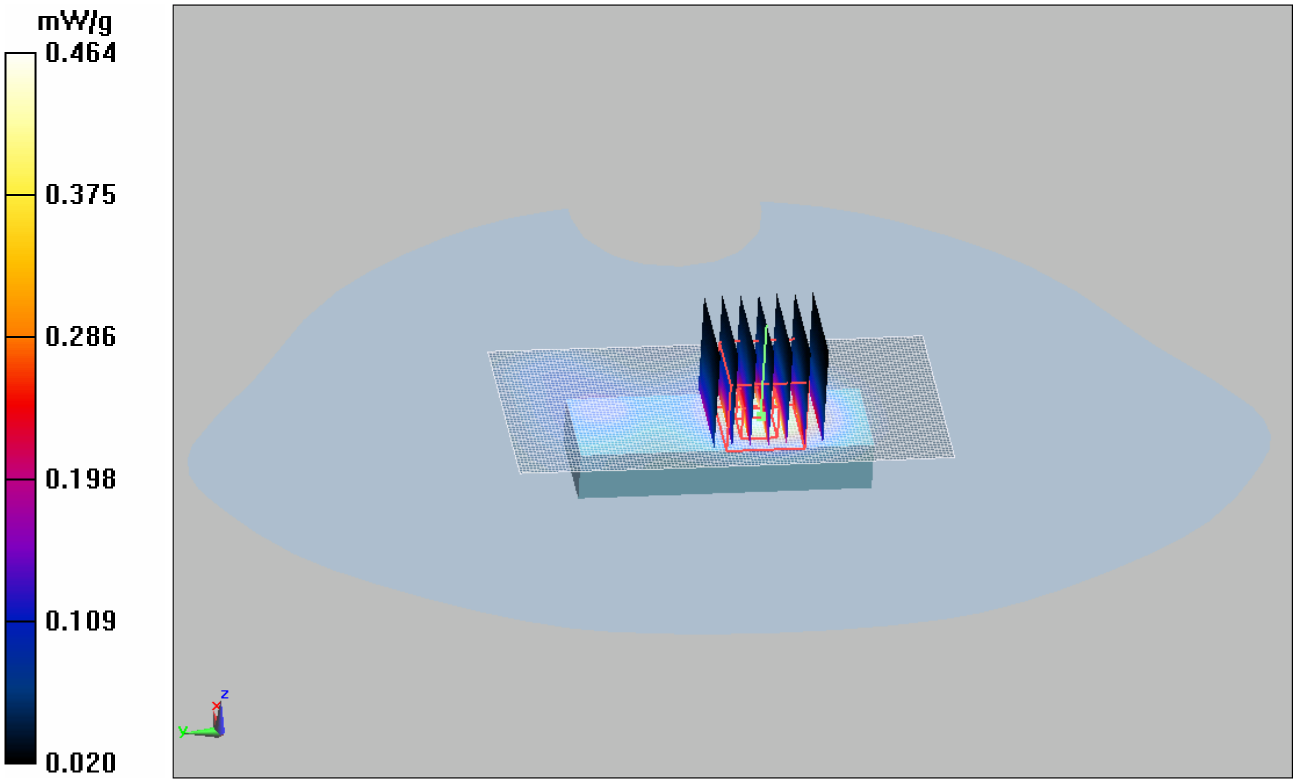


Figure 35 802.11n HT20 with BenQ Joybook R55V Test Position 5 Channel 6

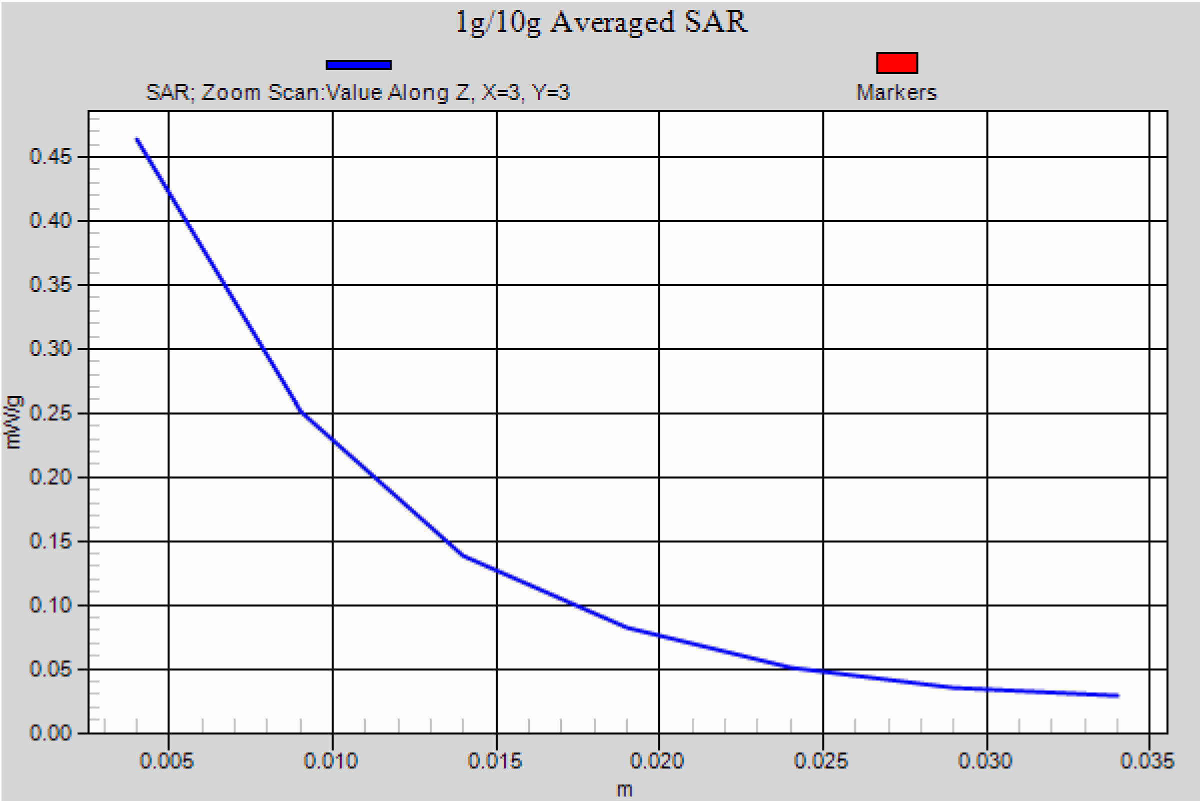


Figure 36 Z-Scan at power reference point (802.11n HT20 with BenQ Joybook R55V Test Position 5 Channel 6)

802.11n HT20 with BenQ Joybook R55V Test Position 5 Low

Date/Time: 11/9/2009 5:39:02 PM

Communication System: 802.11n; Frequency: 2412 MHz;Duty Cycle: 1:1

Medium parameters used: f = 2412 MHz; σ = 1.93 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 5 Low/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.409 mW/g

Test Position 5 Low/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.3 V/m; Power Drift = -0.035 dB

Peak SAR (extrapolated) = 0.659 W/kg

SAR(1 g) = 0.339 mW/g; SAR(10 g) = 0.167 mW/g

Maximum value of SAR (measured) = 0.390 mW/g

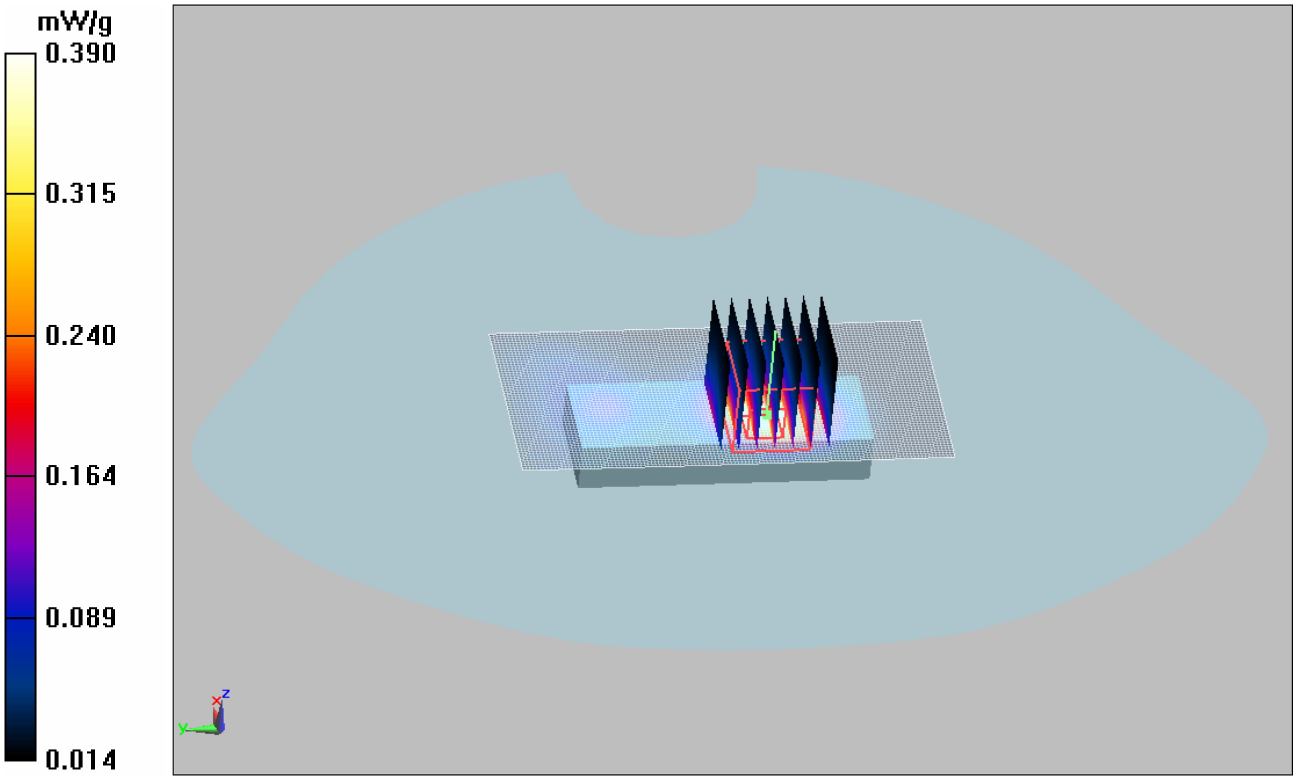


Figure 37 802.11n HT20 with BenQ Joybook R55V Test Position 5 Channel 1

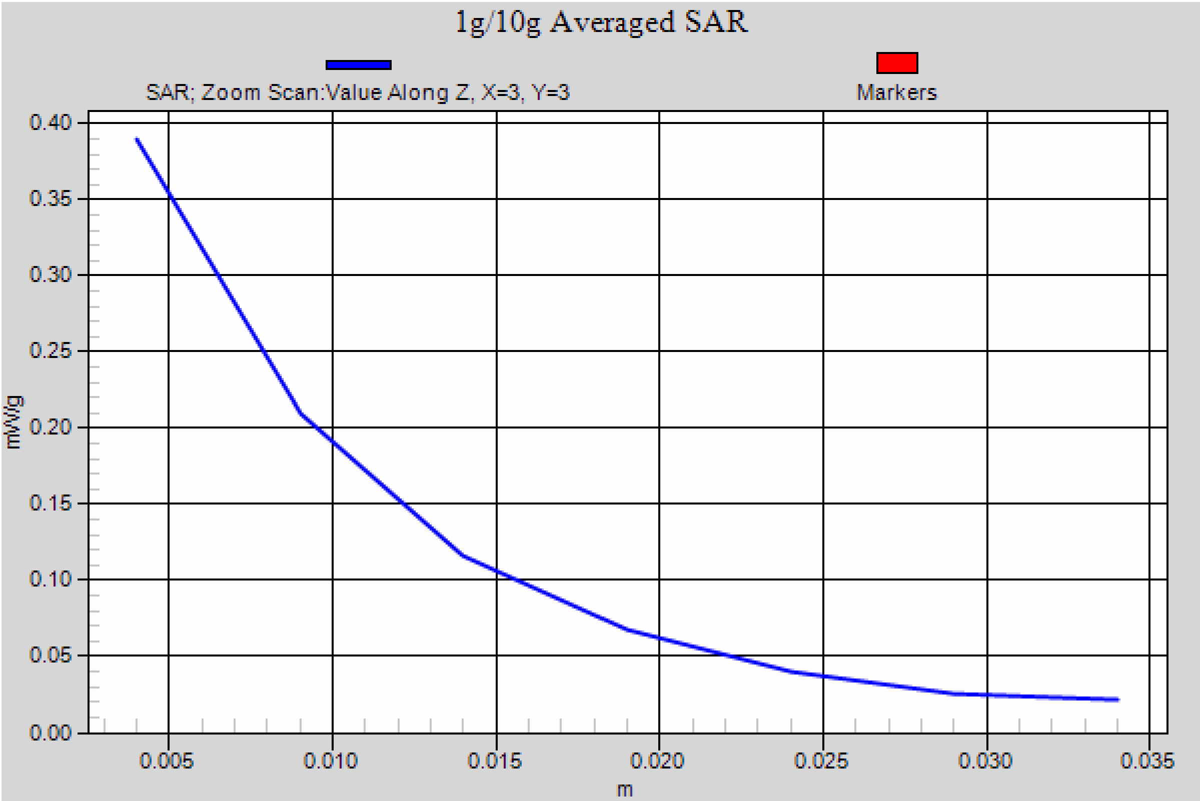


Figure 38 Z-Scan at power reference point (802.11n HT20 with BenQ Joybook R55V Test Position 5 Channel 1)

802.11n HT40 with BenQ Joybook R55V Test Position 5 Middle

Date/Time: 11/9/2009 6:42:47 PM

Communication System: 802.11n; Frequency: 2437 MHz;Duty Cycle: 1:1

Medium parameters used (interpolated): f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.4; ρ = 1000 kg/m^3

Ambient Temperature:22.3 ℃ Liqiud Temperature: 21.5℃

DASY4 Configuration:

Probe: ET3DV6 - SN1737; ConvF(3.91, 3.91, 3.91); Calibrated: 11/25/2008

Electronics: DAE4 Sn452; Calibrated: 11/18/2008

Phantom: SAM000 T01 ; Type: SAM V4.0; Serial: TP-1246

Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Position 5 Middle/Area Scan (61x121x1): Measurement grid: dx=10mm, dy=10mm

Maximum value of SAR (interpolated) = 0.501 mW/g

Test Position 5 Middle/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 10.4 V/m; Power Drift = -0.038 dB

Peak SAR (extrapolated) = 0.834 W/kg

SAR(1 g) = 0.438 mW/g; SAR(10 g) = 0.217 mW/g

Maximum value of SAR (measured) = 0.503 mW/g

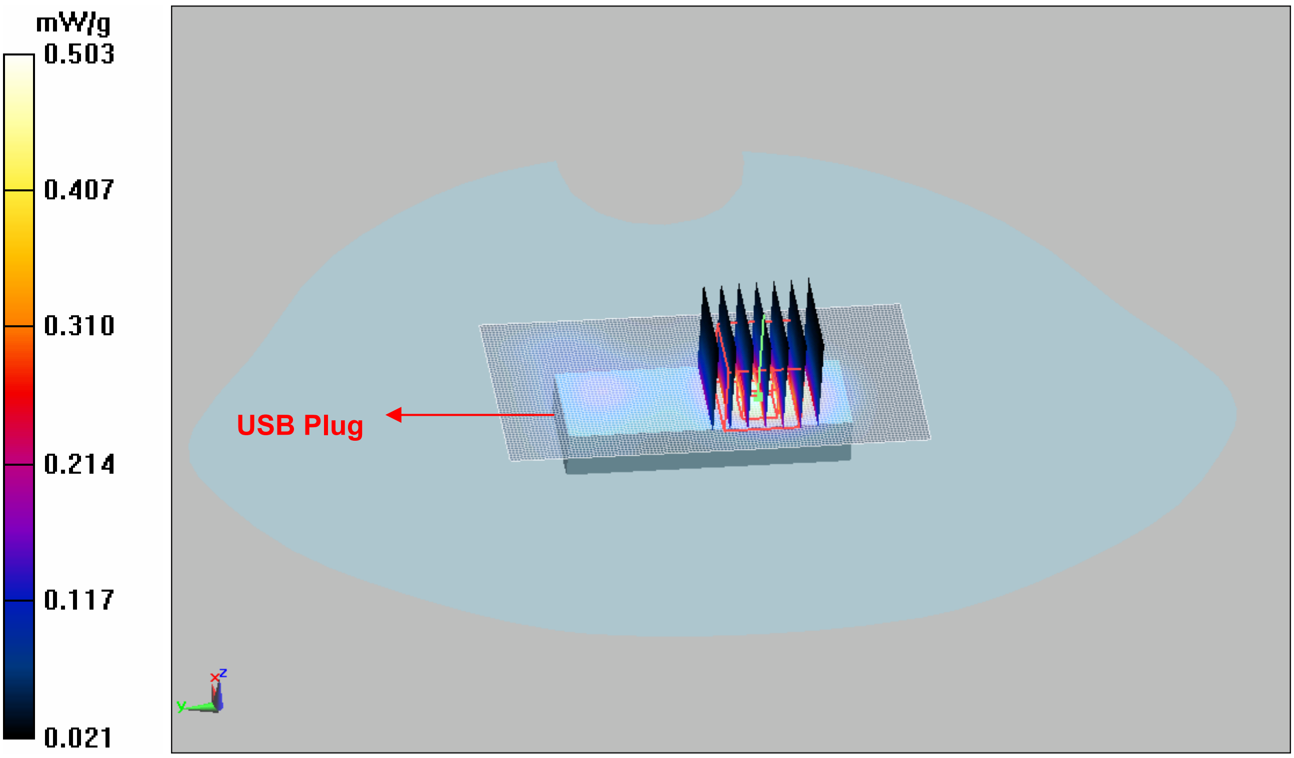


Figure 39 802.11n HT40 with BenQ Joybook R55V Test Position 5 Channel 6

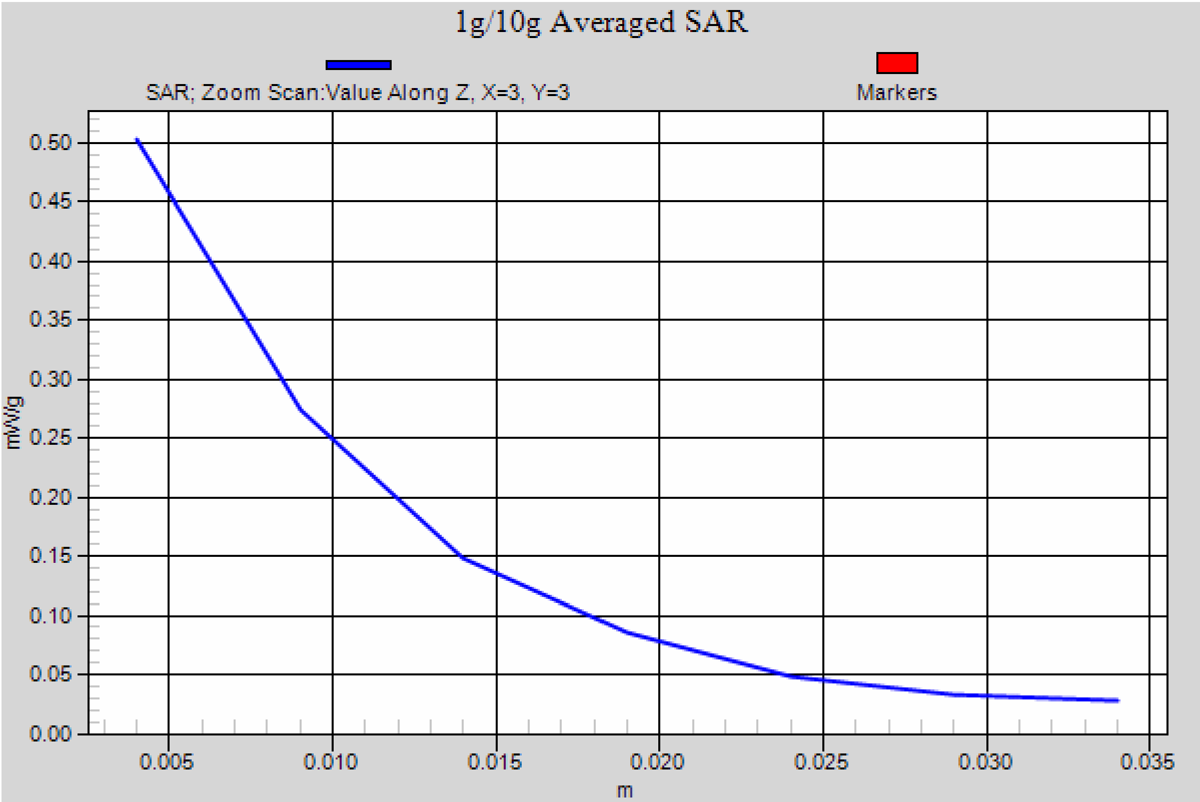


Figure 40 Z-Scan at power reference point (802.11n HT40 with BenQ Joybook R55V Test Position 5 Channel 6)

ANNEX D: Probe Calibration Certificate

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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 **TA Shanghai (Auden)**

Certificate No: **ET3-1737_Nov08**

CALIBRATION CERTIFICATE

Object	ET3DV6 - SN:1737
Calibration procedure(s)	QA CAL-01.v6, QA CAL-12.v5 and QA CAL-23.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	November 25, 2008
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41495277	1-Apr-08 (No. 217-00788)	Apr-09
Power sensor E4412A	MY41498087	1-Apr-08 (No. 217-00788)	Apr-09
Reference 3 dB Attenuator	SN: S5054 (3c)	1-Jul-08 (No. 217-00865)	Jul-09
Reference 20 dB Attenuator	SN: S5086 (20b)	31-Mar-08 (No. 217-00787)	Apr-09
Reference 30 dB Attenuator	SN: S5129 (30b)	1-Jul-08 (No. 217-00866)	Jul-09
Reference Probe ES3DV2	SN: 3013	2-Jan-08 (No. ES3-3013_Jan08)	Jan-09
DAE4	SN: 660	9-Sep-08 (No. DAE4-660_Sep08)	Sep-09

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

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

Issued: November 25, 2008

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
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 (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 ≤ 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 ET3DV6

SN:1737

Manufactured:	September 27, 2002
Last calibrated:	February 19, 2007
Repaired:	November 18, 2008
Recalibrated:	November 25, 2008

Calibrated for DASY Systems

(Note: non-compatible with DASY2 system!)

ET3DV6 SN:1737 November 25, 2008

DASY - Parameters of Probe: ET3DV6 SN:1737

Sensitivity in Free Space[A]

NormX	**1.42** ± 10.1%	$\mu V/(V/m)^2$
NormY	**1.68** ± 10.1%	$\mu V/(V/m)^2$
NormZ	**1.63** ± 10.1%	$\mu V/(V/m)^2$

Diode Compression[B]

DCP X	**93** mV
DCP Y	**94** mV
DCP Z	**85** 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		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	10.7	6.9
SAR_{be} [%]	With Correction Algorithm	0.3	0.4

TSL **1750 MHz** **Typical SAR gradient: 10 % per mm**

Sensor Center to Phantom Surface Distance		**3.7 mm**	**4.7 mm**
SAR_{be} [%]	Without Correction Algorithm	12.5	8.4
SAR_{be} [%]	With Correction Algorithm	0.8	0.5

Sensor Offset

Probe Tip to Sensor Center **2.7** 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%.

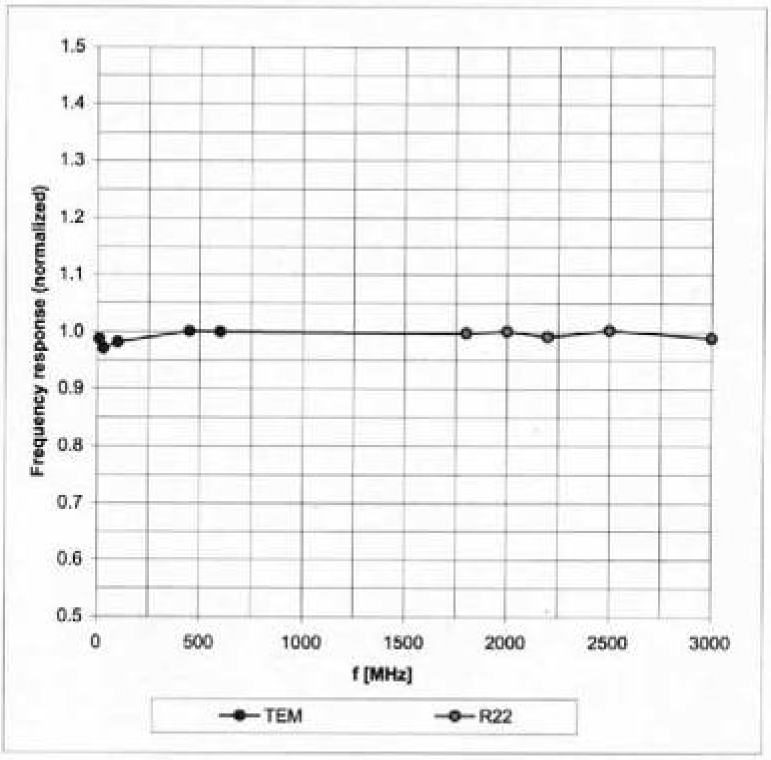
[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Page 8).

[B] Numerical linearization parameter: uncertainty not required.

ET3DV6 SN:1737 November 25, 2008

Frequency Response of E-Field

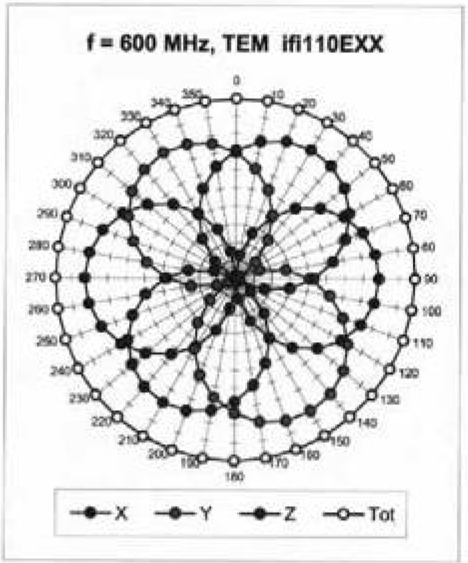
(TEM-Cell:ifi110 EXX, Waveguide: R22)

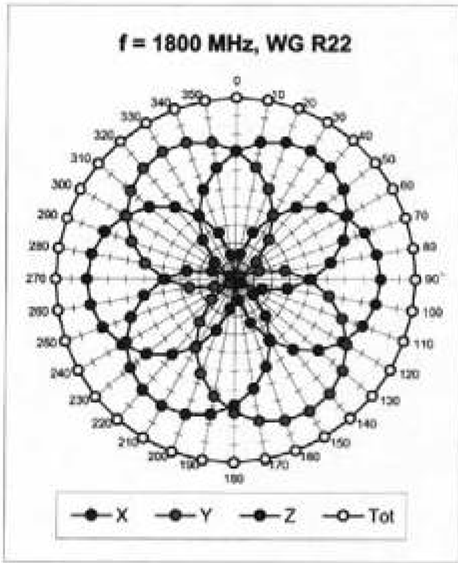


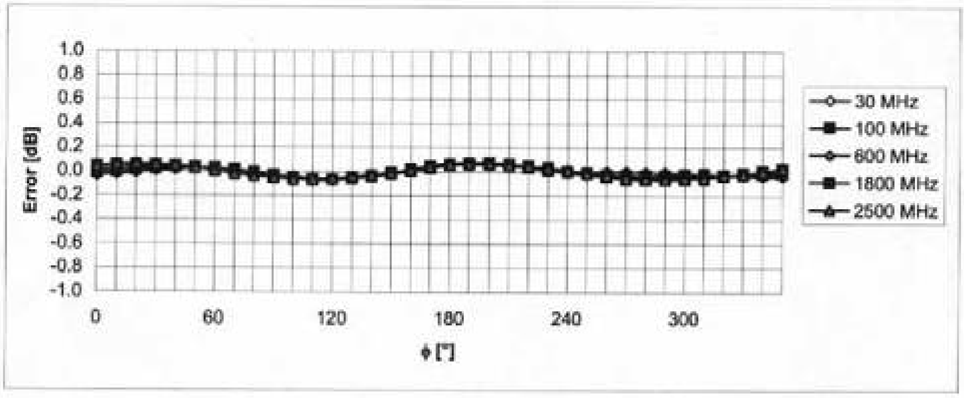
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

ET3DV6 SN:1737 November 25, 2008

Receiving Pattern (φ), ϑ = 0°





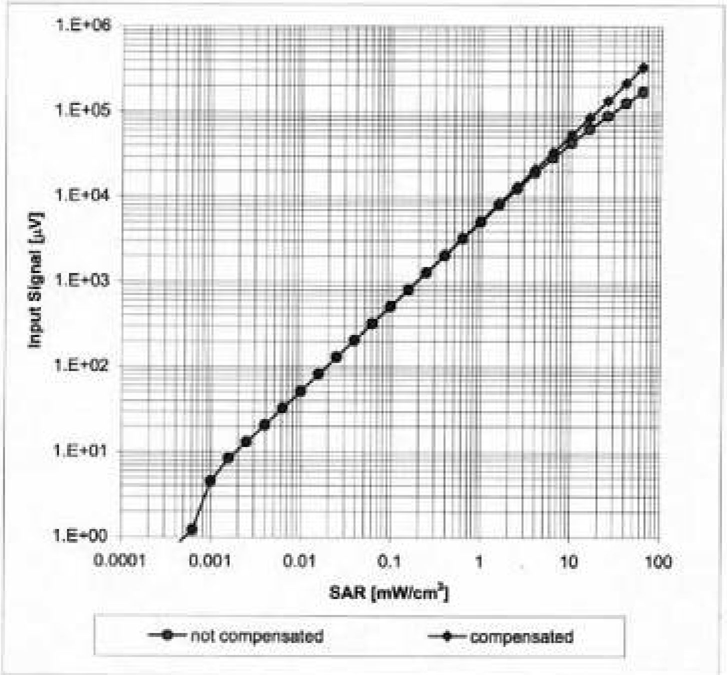


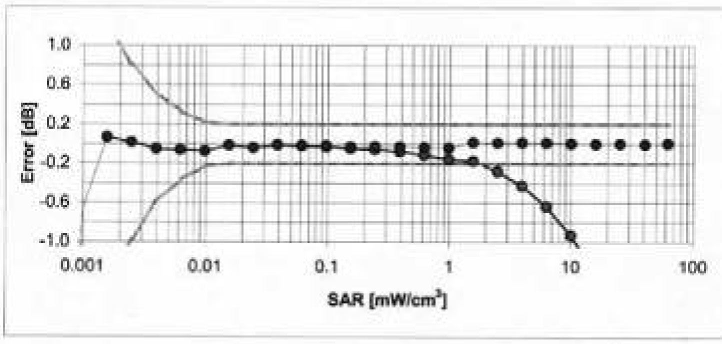
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

ET3DV6 SN:1737 November 25, 2008

Dynamic Range f(SAR_{head})

(Waveguide R22, f = 1800 MHz)

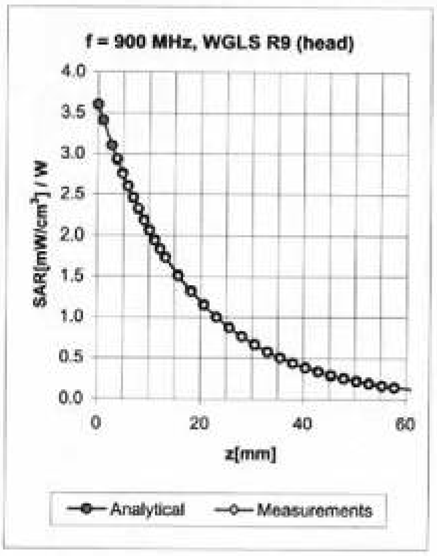


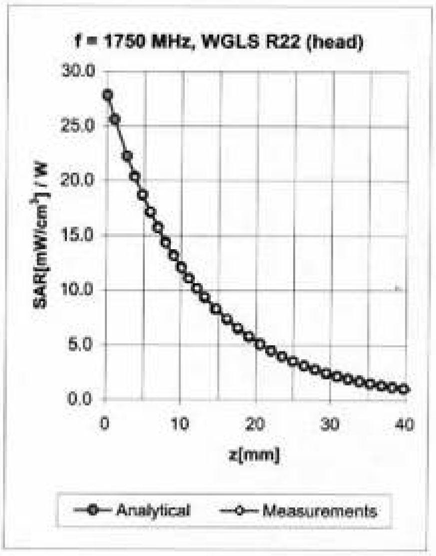


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

ET3DV6 SN:1737 November 25, 2008

Conversion Factor Assessment



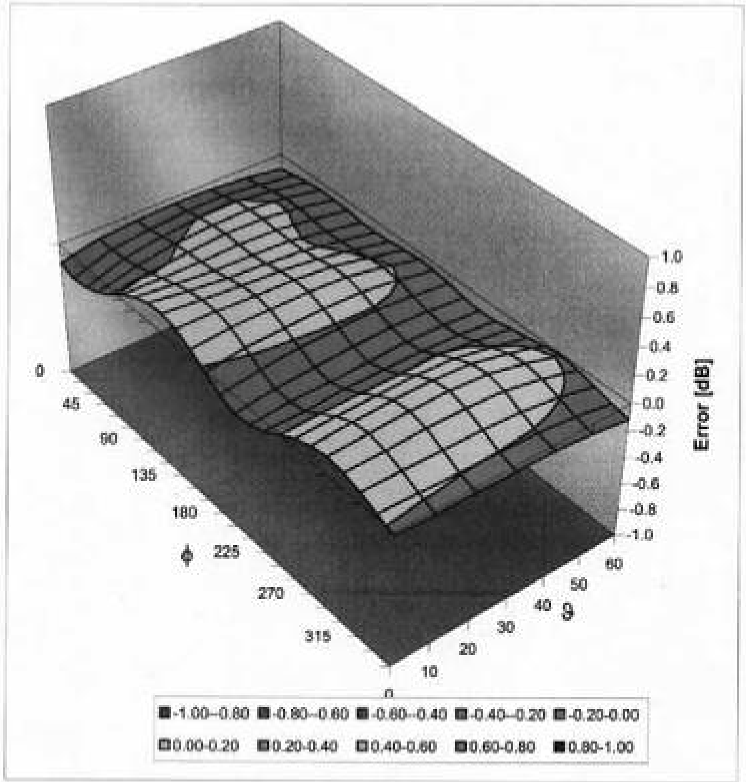


f [MHz]	Validity [MHz][c]	TSL	Permittivity	Conductivity	Alpha	Depth	ConvF	Uncertainty
450	± 50 / ± 100	Head	43.5 ± 5%	0.87 ± 5%	0.36	1.84	7.20	± 13.3% (k=2)
835	± 50 / ± 100	Head	41.5 ± 5%	0.90 ± 5%	0.25	3.53	6.33	± 11.0% (k=2)
900	± 50 / ± 100	Head	41.5 ± 5%	0.97 ± 5%	0.27	3.53	6.14	± 11.0% (k=2)
1750	± 50 / ± 100	Head	40.1 ± 5%	1.37 ± 5%	0.56	2.77	5.35	± 11.0% (k=2)
1950	± 50 / ± 100	Head	40.0 ± 5%	1.40 ± 5%	0.57	2.72	4.89	± 11.0% (k=2)
2450	± 50 / ± 100	Head	39.2 ± 5%	1.80 ± 5%	0.51	1.60	4.39	± 11.0% (k=2)
450	± 50 / ± 100	Body	56.7 ± 5%	0.94 ± 5%	0.27	1.80	7.52	± 13.3% (k=2)
835	± 50 / ± 100	Body	55.2 ± 5%	0.97 ± 5%	0.36	2.75	6.14	± 11.0% (k=2)
900	± 50 / ± 100	Body	55.0 ± 5%	1.05 ± 5%	0.43	2.51	5.98	± 11.0% (k=2)
1750	± 50 / ± 100	Body	53.4 ± 5%	1.49 ± 5%	0.99	1.74	4.84	± 11.0% (k=2)
1950	± 50 / ± 100	Body	53.3 ± 5%	1.52 ± 5%	0.99	1.50	4.60	± 11.0% (k=2)
2450	± 50 / ± 100	Body	52.7 ± 5%	1.95 ± 5%	0.98	1.42	3.91	± 11.0% (k=2)

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

Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

ANNEX E: D2450V2 Dipole Calibration Certificate

信息产业部通信计量中心
Telecommunication Metrology Center of MII

CNAS L0442

Client TA

Certificate No: D2450V2-SN786_July09

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 786
Calibration Procedure(s)	TMC-XZ-01-027 Calibration procedure for dipole validation kits
Calibration date:	July 15, 2009
Condition of the calibrated item	In Tolerance

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date(Calibrated by, Certificate No.)	Scheduled Calibration
Power Meter NRVD	101253	19-Jun-09 (TMC, No. JZ09-248)	Jun-10
Power sensor NRV-Z5	100333	19-Jun-09 (TMC, No. JZ09-248)	Jun-10
Reference Probe ES3DV3	SN 3149	08-Dec-08(SPEAG, No.ES3-3149_Dec08)	Dec-09
DAE4	SN 771	21-Nov-08(SPEAG, No.DAE4-771_Nov08)	Nov-09
RF generator E4438C	MY45092879	18-Jun-09(TMC, No.JZ09-302)	Jun-10
Network Analyzer 8753E	US38433212	03-Aug-08(TMC, No.JZ08-056)	Aug-09

	Name	Function	Signature
Calibrated by:	Lin Hao	SAR Test Engineer	林浩
Reviewed by:	Qi Dianyuan	SAR Project Leader	
Approved by:	Lu Bingsong	Deputy Director of the laboratory	

Issued: July 15, 2009

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORMx,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 300MHz to 3GHz)", 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) DASY 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	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	2mm Oval Phantom ELI4	
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	40.0 ± 6 %	1.78 mho/m ± 6 %
Head TSL temperature during test	(21.9 ± 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	13.3 mW / g
SAR normalized	normalized to 1W	53.2 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**53.7 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	Condition	
SAR measured	250 mW input power	6.22 mW / g
SAR normalized	normalized to 1W	24.9 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**25.0 mW /g ± 16.5 % (k=2)**

[1] 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	52.5 ± 6%	2.02 mho/m ± 6 %
Body TSL temperature during test	(21.8 ± 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	13.1 mW / g
SAR normalized	normalized to 1W	52.4 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**52.6 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	Condition	
SAR measured	250 mW input power	6.18 mW / g
SAR normalized	normalized to 1W	24.7 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**24.8 mW /g ± 16.5 % (k=2)**

[2] Correction to nominal TSL parameters according to d), chapter "SAR Sensitivities"

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	46.8Ω + 4.0 jΩ
Return Loss	- 26.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.9Ω + 7.1 jΩ
Return Loss	- 25.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 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 06, 2005

DASY5 Validation Report for Head TSL

Date/Time: 2009-7-15 9:15:30

Test Laboratory: TMC, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: SN: 786

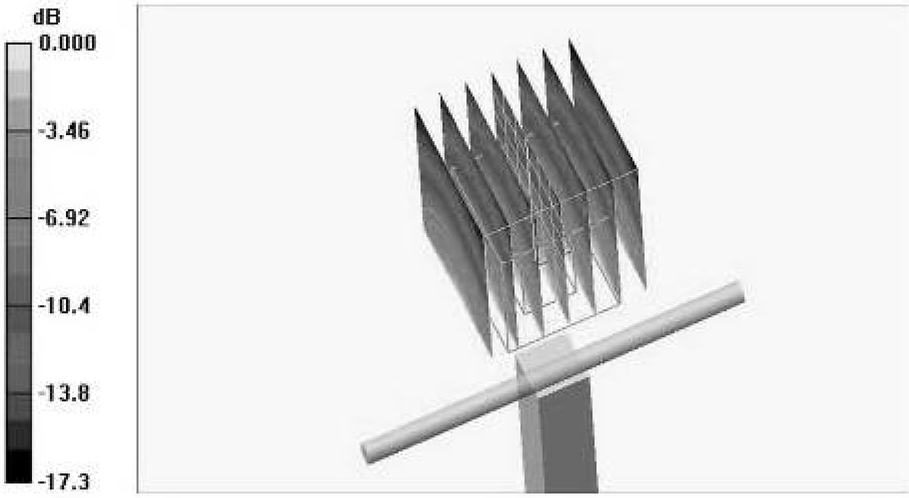
Communication System: CW Frequency: 1800 MHz Duty Cycle: 1:1
Medium: Head 2450MHz
Medium parameters used: f = 2450 MHz; σ = 1.78 mho/m; ε_r = 40.0; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(5.18, 5.18, 5.18); Calibrated: 08.12.08
- Electronics: DAE4 Sn771; Calibration: 21.11.08
- Phantom: 2mm Oval Phantom ELI4; Type: QDOVA001BB
- Measurement SW: DASY5, V5.0 Build 119.9; Postprocessing SW: SEMCAD, V13.2 Build 87

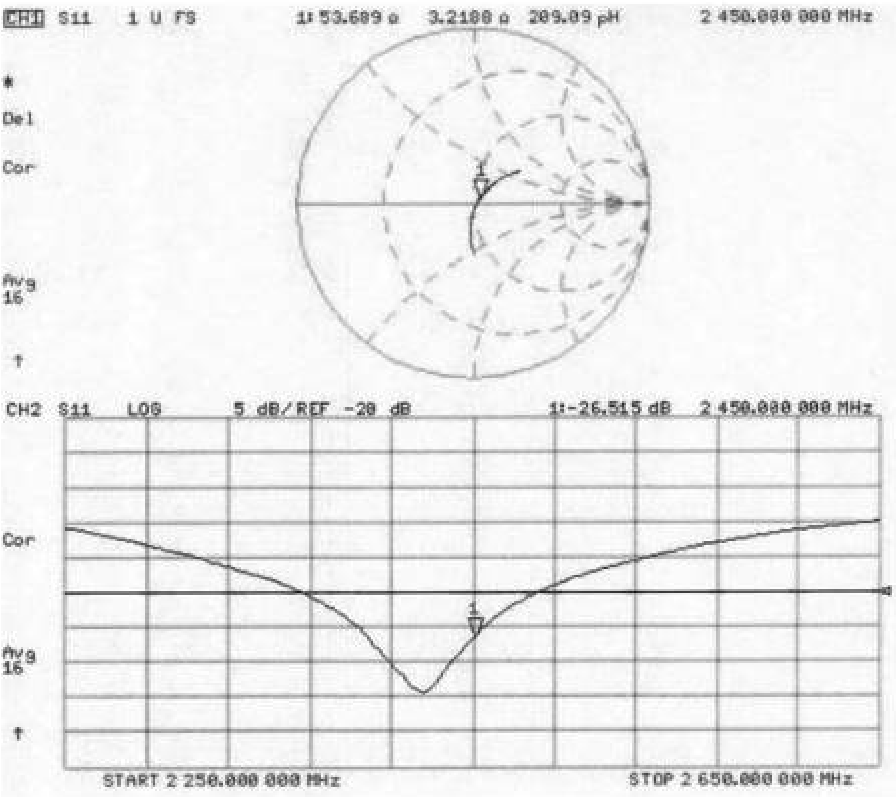
Pin=250mW; d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.1 V/m; Power Drift = -0.057 dB
Peak SAR (extrapolated) = 28.8 W/kg
SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.22 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 TSL

Date/Time: 2009-7-15 10:37:31

Test Laboratory: TMC, Beijing, China

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: SN: 786

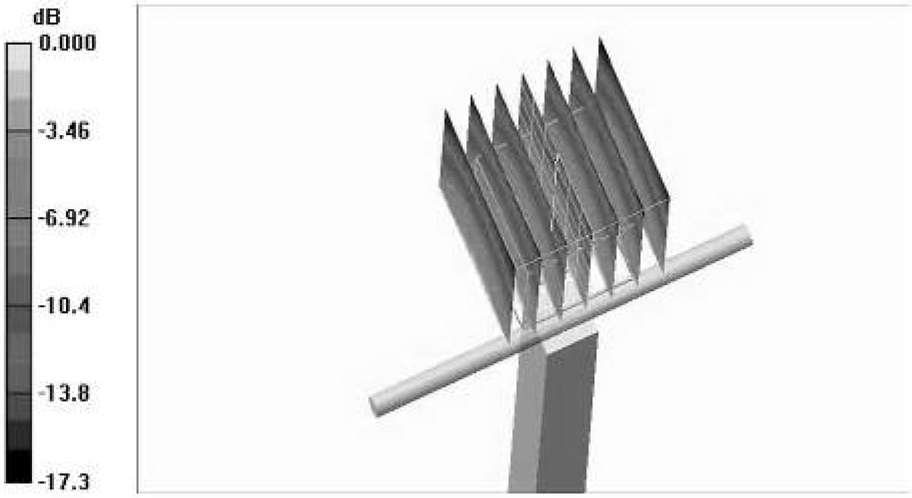
Communication System: CW Frequency: 2450 MHz Duty Cycle: 1:1
Medium: Body 1800MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 mho/m; ε_r = 52.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY5 Configuration:

- Probe: ES3DV3 - SN3149; ConvF(4.97, 4.97, 4.97); Calibrated: 08.12.08
- Electronics: DAE4 Sn771; Calibration: 21.11.08
- Phantom: 2mm Oval Phantom ELI4; Type: QDOVA001BB
- Measurement SW: DASY5, V5.0 Build 119.9; Postprocessing SW: SEMCAD, V13.2 Build 87

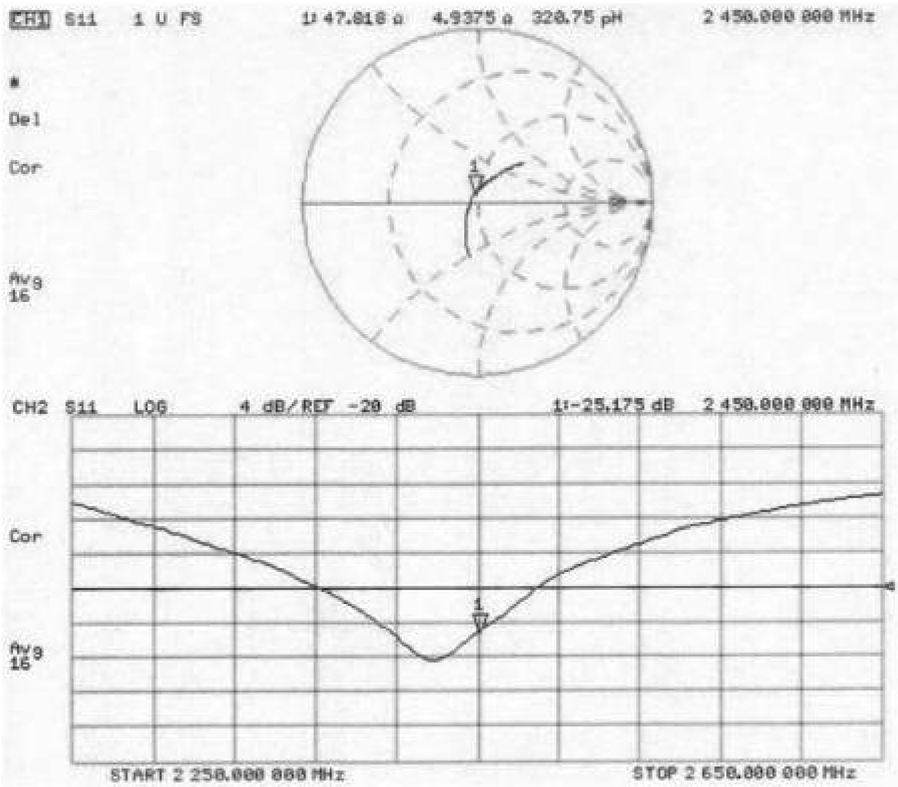
Pin=250mW; d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.8 V/m; Power Drift = -0.009 dB
Peak SAR (extrapolated) =29.1 W/kg
SAR(1 g) = 13.1 mW/g; SAR(10 g) = 6.18 mW/g
Maximum value of SAR (measured) = 16.5 mW/g



0 dB = 16.5mW/g

Impedance Measurement Plot for Body TSL



ANNEX F: DAE4 Calibration 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 **Auden**

Certificate No: **DAE4-452_Nov08**

CALIBRATION CERTIFICATE

Object	DAE4 - SD 000 D04 BJ - SN: 452
Calibration procedure(s)	QA CAL-06.v12 Calibration procedure for the data acquisition electronics (DAE)
Calibration date:	November 18, 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
Fluke Process Calibrator Type 702	SN: 6295803	30-Sep-08 (No: 7673)	Sep-09
Keithley Multimeter Type 2001	SN: 0810278	30-Sep-08 (No: 7670)	Sep-09
Secondary Standards	**ID #**	**Check Date (in house)**	**Scheduled Check**
Calibrator Box V1.1	SE UMS 006 AB 1004	06-Jun-08 (in house check)	In house check: Jun-09

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

Issued: November 18, 2008

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

Certificate No: DAE4-452_Nov08 Page 1 of 5

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
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

DAE	data acquisition electronics
Connector angle	information used in DASY system to align probe sensor X to the robot coordinate system.

Methods Applied and Interpretation of Parameters

- *DC Voltage Measurement:* Calibration Factor assessed for use in DASY system by comparison with a calibrated instrument traceable to national standards. The figure given corresponds to the full scale range of the voltmeter in the respective range.
- *Connector angle*: The angle of the connector is assessed measuring the angle mechanically by a tool inserted. Uncertainty is not required.
- The following parameters as documented in the Appendix contain technical information as a result from the performance test and require no uncertainty.
  - *DC Voltage Measurement Linearity:* Verification of the Linearity at +10% and -10% of the nominal calibration voltage. Influence of offset voltage is included in this measurement.
  - *Common mode sensitivity:* Influence of a positive or negative common mode voltage on the differential measurement.
  - *Channel separation:* Influence of a voltage on the neighbor channels not subject to an input voltage.
  - *AD Converter Values with inputs shorted:* Values on the internal AD converter corresponding to zero input voltage
  - *Input Offset Measurement*: Output voltage and statistical results over a large number of zero voltage measurements.
  - *Input Offset Current:* Typical value for information; Maximum channel input offset current, not considering the input resistance.
  - *Input resistance:* DAE input resistance at the connector, during internal auto-zeroing and during measurement.
  - *Low Battery Alarm Voltage:* Typical value for information. Below this voltage, a battery alarm signal is generated.
  - *Power consumption:* Typical value for information. Supply currents in various operating modes.

DC Voltage Measurement

A/D - Converter Resolution nominal

High Range: 1LSB = 6.1μV , full range = -100...+300 mV

Low Range: 1LSB = 61nV , full range = -1.......+3mV

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

Calibration Factors	X	Y	Z
High Range	404.585 ± 0.1% (k=2)	404.416 ± 0.1% (k=2)	404.565 ± 0.1% (k=2)
Low Range	3.97854 ± 0.7% (k=2)	3.95135 ± 0.7% (k=2)	3.98063 ± 0.7% (k=2)

Connector Angle

Connector Angle to be used in DASY system	148 ° ± 1 °

Appendix

1. DC Voltage Linearity

High Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	200000	200000	0.00
Channel X	+ Input	20000	20006.89	0.03
Channel X	- Input	20000	-20003.71	0.02
Channel Y	+ Input	200000	200000.5	0.00
Channel Y	+ Input	20000	20008.05	0.04
Channel Y	- Input	20000	-20006.61	0.03
Channel Z	+ Input	200000	199999.6	0.00
Channel Z	+ Input	20000	20006.84	0.03
Channel Z	- Input	20000	-20004.66	0.02

Low Range		Input (µV)	Reading (µV)	Error (%)
Channel X	+ Input	2000	2000	0.00
Channel X	+ Input	200	200.19	0.09
Channel X	- Input	200	-199.99	0.00
Channel Y	+ Input	2000	2000	0.00
Channel Y	+ Input	200	199.38	-0.31
Channel Y	- Input	200	-200.73	0.36
Channel Z	+ Input	2000	2000.1	0.00
Channel Z	+ Input	200	199.25	-0.38
Channel Z	- Input	200	-201.52	0.76

2. Common mode sensitivity

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Common mode Input Voltage (mV)	High Range Average Reading (µV)	Low Range Average Reading (µV)
Channel X	200	2.99	1.90
	- 200	-1.54	-1.85
Channel Y	200	-8.82	-8.73
	- 200	6.90	6.96
Channel Z	200	9.94	10.21
	- 200	-13.53	-13.21

3. Channel separation

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	Input Voltage (mV)	Channel X (µV)	Channel Y (µV)	Channel Z (µV)
Channel X	200	-	1.31	-0.98
Channel Y	200	1.52	-	2.97
Channel Z	200	-1.16	0.18	-

4. AD-Converter Values with inputs shorted

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec

	High Range (LSB)	Low Range (LSB)
Channel X	16123	16646
Channel Y	15886	16452
Channel Z	16175	16346

5. Input Offset Measurement

DASY measurement parameters: Auto Zero Time: 3 sec; Measuring time: 3 sec
Input 10MΩ

	Average (μV)	min. Offset (μV)	max. Offset (μV)	Std. Deviation (μV)
Channel X	0.53	-0.80	1.64	0.33
Channel Y	-1.51	-2.67	-0.89	0.35
Channel Z	-1.99	-3.07	-1.43	0.29

6. Input Offset Current

Nominal Input circuitry offset current on all channels: <25fA

7. Input Resistance

	Zeroing (MOhm)	Measuring (MOhm)
Channel X	0.1999	198.3
Channel Y	0.1999	200.1
Channel Z	0.1999	199.3

8. Low Battery Alarm Voltage (verified during pre test)

Typical values	Alarm Level (VDC)
Supply (+ Vcc)	+7.9
Supply (- Vcc)	-7.6

9. Power Consumption (verified during pre test)

Typical values	Switched off (mA)	Stand by (mA)	Transmitting (mA)
Supply (+ Vcc)	+0.0	+6	+14
Supply (- Vcc)	−0.01	-8	-9

ANNEX G: The EUT Appearances

Picture 4: Constituents of the EUT