SAR TEST REPORT

Test item	:	Wi-Fi USB Dongle
Model No.	:	PTA127/55
Order No.	:	1112-01648
Date of receipt	:	2011-12-01
Test duration	:	2011-12-28 ~ 2012-01-24
Date of issue	:	2012-01-30
Use of report	:	FCC Original Grant

Applicant : PHILIPS Electronics Singapore Pte Ltd
620A, Lorong 1 Toa Payoh , Singapore 319726.

Test laboratory : Digital EMC Co., Ltd.
683-3, Yubang-Dong, Cheoin-Gu, Yongin-Si, Kyunggi-Do, 449-080, Korea

Test specification	:	§2.1093, FCC/OET Bulletin 65 Supplement C[July 2001]
Test environment	:	See appended test report
Test result	:	☒ Pass ☐ Fail

Tested by:	Witnessed by:	Reviewed by:
Engineer N.K.Lim	Engineer S.K. Ryu	Technical Director Harvey Sung

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1. INTROCUCTION

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency radiation in ET Docket 93-62 on Aug. 6, 1996 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-2005 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz. 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017. The measurement procedure described in IEEE/ANSI C95.3-1992 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave is used for guidance in measuring SAR due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the National Council on Radiation Protection and Measurements (NCRP) in Biological Effects and Exposure Criteria for Radio frequency Electromagnetic Fields," NCRP Report No. 86 NCRP, 1986, Bethesda, MD 20814. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

SAR Definition

Specific Absorption Rate (SAR) is defined as the time derivative (rate) of the incremental energy (dU)absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ) It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Fig. 1.1)

$$SAR = \frac{d}{dt}\left(\frac{dU}{dm}\right) = \frac{d}{dt}\left(\frac{dU}{\rho\, dv}\right)$$

Figure 1.1
SAR Mathematical Equation

SAR is expressed in units of Watts per Kilogram (W/kg).

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

Where:
σ = conductivity of the tissue-simulant material (S/m)
ρ = mass density of the tissue-simulant material (kg/m3)
E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relations to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.

2. DESCRIPTION OF DEVICE

Environmental evaluation measurements of specific absorption rate (SAR) distributions in emulated human head and body tissues exposed to radio frequency (RF) radiation from wireless portable devices for compliance with the rules and regulations of the U.S. Federal Communications Commission (FCC).

General Information

Equipment type	Wi-Fi USB Dongle
FCC ID:	A5H-TWFDL101D
Equipment model name	PTA127/55
Equipment add model name	N/A
Equipment serial no.	Identical prototype
Mode(s) of Operation	W-LAN(802.11b/g/n(HT20, HT40))
TX Frequency Range	2.4GHz Band ▪ 802.11b/g/n(20MHz): 2412 ~ 2462 MHz ▪ 802.11n(40MHz): 2422~2452 MHz
RX Frequency Range	2.4GHz Band ▪ 802.11b/g/n(20MHz): 2412 ~ 2462 MHz ▪ 802.11n(40MHz): 2422~2452 MHz
Max. SAR Measurement	**0.557** W/kg W-LAN Body SAR
FCC Equipment Class	Digital Transmission System (DTS)
Date(s) of Tests	2011-12-28 ~ 2012-01-24
Antenna Type	Internal(FIFA) Type Antenna (2TX 2RX)

3. DESCRIPTION OF TEST EQUIPMENT

3.1 SAR MEASUREMENT SETUP

Measurements are performed using the DASY4 automated dosimetric assessment system. The DASY4 is made by Schmid & Partner Engineering AG (SPEAG) in Zurich, Switzerland and consists of high precision robotics system (Staubli), robot controller, Pentium III computer, near-field probe, probe alignment sensor, and the generic twin phantom containing the brain equivalent material. The robot is a six-axis industrial robot performing precise movements to position the probe to the location (points) of maximum electromagnetic field (EMF) (see Fig. 3.1).

A cell controller system contains the power supply, robot controller teach pendant (Joystick), and a remote control used to drive the robot motors. The PC consists of the Micron Pentium IV 500 MHz computer with Windows NT system and SAR Measurement Software DASY4, A/D interface card, monitor, mouse, and keyboard. The Staubli Robot is connected to the cell controller to allow software manipulation of the robot. A data acquisition electronic (DAE) circuit that performs the signal amplification, signal multiplexing, AD-conversion, offset measurements, mechanical surface detection, collision detection, etc. is connected to the Electro-optical coupler (EOC). The EOC performs the conversion from the optical into digital electric signal of the DAE and transfers data to the PC plug-in card.

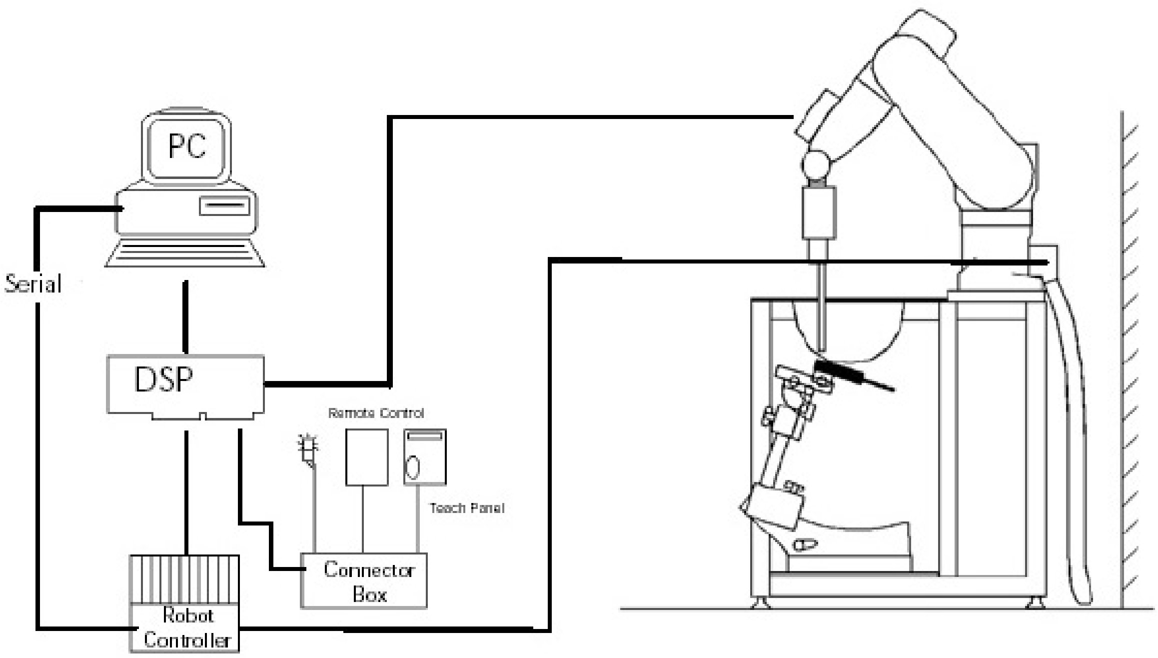


Figure 3.1 SAR Measurement System Setup

The DAE3 consists of a highly sensitive electrometer-grade preamplifier with auto-zeroing, a channel and gain-switching multiplexer, a fast 16 bit AD-converter and a command decoder and control logic unit. Transmission to the PC-card is accomplished through an optical downlink for data and status information and an optical uplink for commands and clock lines. The mechanical probe mounting device includes two different sensor systems for frontal and sidewise probe contacts. They are also used for mechanical surface detection and probe collision detection. The robot uses its own controller with a built in VME-bus computer. The system is described in detail.

3.2 EX3DV4Probe Specification

Calibration: In air from 10 MHz to 6.0 GHz
In brain and muscle simulating tissue at Frequencies of 450 MHz, 835 MHz, 1750 MHz, 1900 MHz 2450 MHz, 2600 MHz, 3500 MHz, 5200 MHz, 5300 MHz, 5600 MHz, 5800 MHz

Frequency: 10 MHz to 6 GHz

Linearity: ±0.2dB (30 MHz to 6 GHz)

Dynamic: 10 mW/kg to 100 W/kg

Range: Linearity: ±0.2dB

Dimensions: Overall length: 330 mm

Tip length: 20 mm

Body diameter: 12 mm

Tip diameter: 2.5 mm

Distance from probe tip to sensor center: 1 mm

Application: SAR Dosimetry Testing
Compliance tests of mobile phones

DAE System

The SAR measurements were conducted with the dosimetric probe EX3DV4,designed in the classical triangular configuration(see Fig. 3.2) and optimized for dosimetric evaluation. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi fiber line ending at the front of the probe tip (see Fig. 3.3). It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the maximum using a 2nd order fitting. The approach is stopped at reaching the maximum.

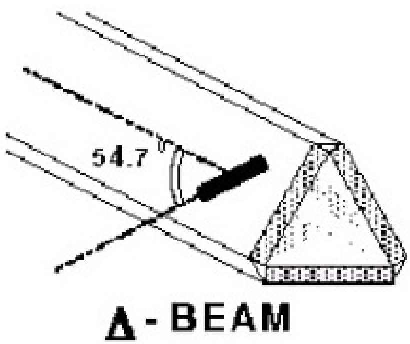


Figure 3.2 Triangular Probe Configurations

Figure 3.3 Probe Thick-Film Technique

3.3 Probe Calibration Process

3.3.1E-Probe Calibration

Dosimetric Assessment Procedure

Each probe is calibrated according to a dosimetric assessment procedure with accuracy better than +/- 10%. The spherical isotropy was evaluated with the procedure 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 is tested.

Free Space Assessment

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

Temperature Assessment *

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 the rmist or based temperature probe is used in conjunction with the E-field probe.

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

where:

Δt = exposure time (30 seconds),

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

ΔT = temperature increase due to RF exposure.

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

where:

σ = simulated tissue conductivity,

ρ = Tissue density (1.25 g/cm^3 for brain tissue)

SAR is proportional toΔT / Δt , the initial rate of tissue heating, before thermal diffusion takes place. Now it's possible to quantify the electric field in the simulated tissue by equating the thermally derived SAR to the E- field;

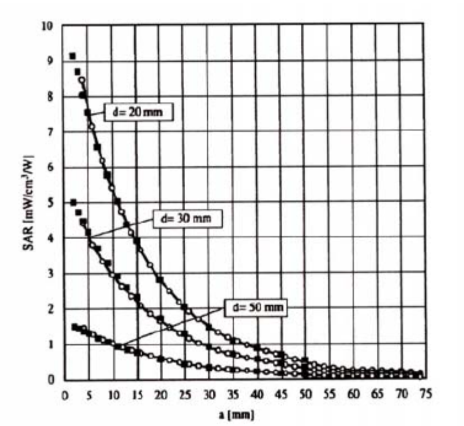


Figure 3.4E-Field and Temperature Measurements at 900MHz

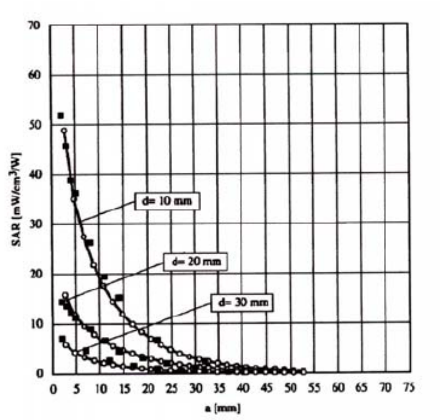


Figure 3.5 E-Field and Temperature Measurements at 1800MHz

3.4 Data Extrapolation

The DASY4 software automatically executes the following procedures to calculate the field units from the microvolt readings at the probe connector. 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 like below;

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

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:

$$E_i = \sqrt{\frac{V_i}{Norm_i \cdot ConvF}}$$

with V_i = compensated signal of channel i (i = x,y,z)
$Norm_i$ = sensor sensitivity of channel i (i = x,y,z) $\mu V/(V/m)^2$ for E-field probes
ConvF = sensitivity of enhancement in solution
E_i = electric field strength of channel i in V/m

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

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

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

$$SAR = E_{tot}^2 \cdot \frac{\sigma}{\rho \cdot 1000}$$

with SAR = local specific absorption rate in W/g
E_{tot} = total field strength in V/m
σ = conductivity in [mho/m] or [Siemens/m]
ρ = equivalent tissue density in g/cm^3

The power flow density is calculated assuming the excitation field to be a free space field.

$$P_{pwe} = \frac{E_{tot}^2}{3770}$$

with P_{pwe} = equivalent power density of a plane wave in W/cm^2
E_{tot} = total electric field strength in V/m

3.5 SAM PHANTOM

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a wooden table. 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. (see Fig. 3.6)

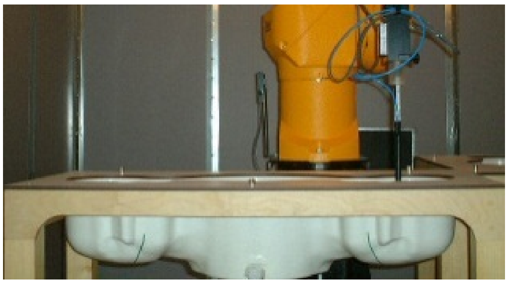


Figure 3.6 SAM Twin Phantom

3.6Device Holder for Transmitters

In combination with the SAM Twin Phantom V4.0 the Mounting Device(see Fig. 3.7),enables the rotation of the mounted transmitter in spherical coordinates whereby the rotation point is the ear opening. The devices can be easily, accurately, and repeat ably be positioned according to the FCC specifications. The device holder can be locked at different phantom locations (left head, right head, flat phantom).

Note: A simulating human hand is not used due to the complex anatomical and geometrical structure of the hand that may produce infinite number of configurations. To produce the worst-case condition (the hand absorbs antenna output power), the hand is omitted during the tests.

Figure 3.7 Mounting Device

3.7 Brain & Muscle Simulation Mixture Characterization

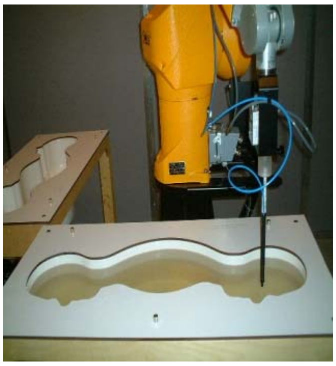


Figure 3.8 SimulatedTissue

The brain and muscle mixtures consist of a viscous gel using hydrox-ethyl cellulose (HEC) gelling agent and saline solution (see Table 3.1). Preservation with a bactericide is added and visual inspection is made to make sure air bubbles are not trapped during the mixing process. The mixture is calibrated to obtain proper dielectric constant (permittivity) and conductivity of the desired tissue. The mixture characterizations used for the brain and muscle tissue simulating liquids are according to the data by C. Gabriel and G. Harts grove.

Table3.1 Composition of the Tissue Equivalent Matter

INGREDIENTS	835MHz Brain	835MHz Muscle	1800MHz Brain	1800MHz Muscle	1900MHz Brain	1900MHz Muscle	2450MHz Brain	2450MHz Muscle
WATER	40.19%	50.75%	55.24%	69.04%	55.24%	70.23%	71.88%	73.4%
SUGAR	57.90%	48.21%	-	-	-	-	-	-
SALT	1.48%	0.94%	0.31%	2.72%	0.31%	0.29%	0.16%	0.06%
DGBE	-	-	44.45%	28.24%	44.45%	29.48%	7.99%	26.54%
Triton X-100	-	-	-	-	-	-	19.97%	-
BACTERIACIDE	0.18%	0.10%	-	-	-	-	-	-
HEC	0.25%	-	-	-	-	-	-	-
Dielectric Constant Target	41.5	55.2	40	53.3	40	53.3	39.2	52.7
Conductivity Target (S/m)	0.9	0.97	1.4	1.52	1.4	1.52	1.8	1.95

Salt: 99 % Pure Sodium Chloride Sugar: 98 % Pure Sucrose

Water: De-ionized, 16M resistivity HEC: Hydroxyethyl Cellulose

DGBE: 99 % Di(ethylene glycol) butyl ether,[2-(2-butoxyethoxy) ethanol]

Triton X-100(ultra pure): Polyethylene glycol mono[4-(1,1,3,3-tetramethylbutyl)phenyl]

3.8 SAR TEST EQUIPMENT

Table 3.2 Test Equipment Calibration

	Type	Manufacturer	Model	Cal.Date (dd/mm/yy)	Next.Cal.Date (dd/mm/yy)	S/N
☒	SEMITEC Engineering	SEMITEC	N/A	N/A	N/A	Shield Room
☒	Robot	SCHMID	RX90BL	N/A	N/A	F02/5Q85A1/A/01
☒	Robot Controller	SCHMID	CS7MB	N/A	N/A	F02/5Q85A1/C/01
☒	Joystick	SCHMID	N/A	N/A	N/A	D221340031
☒	Intel Core i5-2500 3.31 GHz Windows XP Professional	N/A	N/A	N/A	N/A	N/A
☒	Probe Alignment Unit LB	N/A	N/A	N/A	N/A	321
☒	Mounting Device	SCHMID	Holder	N/A	N/A	N/A
☐	Sam Phantom	SCHMID	TP1223	N/A	N/A	N/A
☒	Sam Phantom	SCHMID	TP1224	N/A	N/A	N/A
☐	Head/Body Equivalent Matter(450MHz)	N/A	N/A	01/01/12	01/01/13	N/A
☐	Head/Body Equivalent Matter(835MHz)	N/A	N/A	01/01/12	01/01/13	N/A
☐	Head/Body Equivalent Matter(1800MHz)	N/A	N/A	01/01/12	01/01/13	N/A
☐	Head/Body Equivalent Matter(1900MHz)	N/A	N/A	01/01/12	01/01/13	N/A
☒	Head/Body Equivalent Matter(2450MHz)	N/A	N/A	01/01/12	01/01/13	N/A
☒	Data Acquisition Electronics	SCHMID	DAE3V1	28/01/11	28/01/12	519
☒	Dosimetric E-Field Probe	SCHMID	EX3DV4	24/01/11	24/01/12	3643
☐	Dummy Probe	N/A	N/A	N/A	N/A	N/A
☐	450MHz System Validation Dipole	SCHMID	D450V2	24/01/11	24/01/13	1011
☐	835MHz System Validation Dipole	SCHMID	D835V2	22/03/10	22/03/12	464
☐	1800MHz System Validation Dipole	SCHMID	D1800V2	16/07/10	16/07/12	2d047
☐	1900MHz System Validation Dipole	SCHMID	D1900V2	23/03/10	23/03/12	5d029
☒	2450MHz System Validation Dipole	SCHMID	D2450V2	18/03/10	18/03/12	726
☐	2600MHz System Validation Dipole	SCHMID	D2600V2	27/05/10	27/05/12	1016
☐	3500MHz System Validation Dipole	SCHMID	D3500V2	27/05/10	27/05/12	1018
☒	Network Analyzer	Agilent	E5071C	25/11/11	25/11/12	MY46106970
☒	Signal Generator	HP	ESG-3000A	01/07/11	01/07/12	US37230529
☐	Amplifier	EMPOWER	BBS3Q7ELU	30/09/11	30/09/12	1020
☒	High Power RF Amplifier	EMPOWER	BBS3Q8CCJ	07/11/11	07/11/12	1005
☒	Power Meter	HP	EPM-442A	07/03/11	07/03/12	GB37170267
☒	Power Sensor	HP	8481A	07/03/11	07/03/12	3318A96566
☒	Power Sensor	HP	8481A	07/03/11	07/03/12	3318A90918
☐	Dual Directional Coupler	Agilent	778D-012	09/01/12	09/01/13	50228
☒	Directional Coupler	HP	773D	01/07/11	01/07/12	2389A00640
☐	Low Pass Filter 1.5GHz	Micro LAB	LA-15N	09/01/12	09/01/13	N/A
☒	Low Pass Filter 3.0GHz	Micro LAB	LA-30N	30/09/11	30/09/12	N/A
☒	Attenuators(3dB)	Agilent	8491B	02/07/11	02/07/12	MY39260700
☒	Attenuators(10dB)	WEINSCHEL	23-10-34	09/01/12	09/01/13	BP4387
☐	Step Attenuator	HP	8494A	30/09/11	30/09/12	3308A33341
☒	Dielectric Probe kit	Agilent	85070D	N/A	N/A	US01440118
☐	8960 Series 10 Wireless Comms. Test Set	Agilent	E5515C	07/03/11	07/03/12	GB43461134
☐	Bluetooth Tester	TESCOM	TC-3000B	01/07/11	01/07/12	3000B640046

NOTE: The E-field probe was calibrated by SPEAG, by temperature measurement procedure. Dipole Validation measurement is performed by Digital EMC before each test. The brain simulating material is calibrated by Digital EMC using the dielectric probe system and network analyzer to determine the conductivity and permittivity (dielectric constant) of the brain-equivalent material.

4. TEST SYSTEM SPECIFICATIONS

Automated Test System Specifications

Positioner

Robot: Stäubli Unimation Corp. Robot Model: RX60L
Repeatability: 0.02 mm
No. of axis: 6

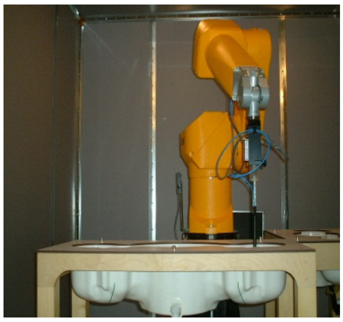


Figure 4.1 DASY4 Test System

Data Acquisition Electronic (DAE) System

Cell Controller

Processor: Intel Core i5-2500
Clock Speed: 3.31 GHz
Operating System: Windows XP Professional
Data Card: DASY4 PC-Board

Data Converter

Features: Signal, multiplexer, A/D converter. & control logic
Software: DASY4
Connecting Lines: Optical downlink for data and status info
Optical uplink for commands and clock

PC Interface Card

Function: 24 bit (64 MHz) DSP for real time processing
Link to DAE 3
16 bit A/D converter for surface detection system
serial link to robot
direct emergency stop output for robot

E-Field Probes

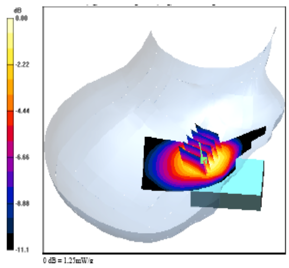
Model: EX3DV4 S/N: 3643
Construction: Triangular core fiber optic detection system
Frequency: 10 MHz to 6 GHz
Linearity: ±0.2dB (30MHz to 6GHz)

Phantom

Phantom: SAM Twin Phantom (V4.0)
Shell Material: Vivac Composite
Thickness: 2.0 ± 0.2 mm

5. SAR MEASUREMENT PROCEDURE

The evaluation was performed using the following procedure:



Sample SAR Area Scan

1. The SAR measurement was taken at a selected spatial reference point to monitor power variations during testing. This fixed location point was measured and used as a reference value.

2. The SAR distribution at the exposed side of the head was measured at a distance of 3.9mm from the Inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15 mm x 15 mm.

3. Based on the area scan data, the area of the maximum absorption was determined by sp line interpolation. Around this point, a volume of 30 mm x30 mm x 30 mm (fine resolution volume scan, zoom scan) was assessed by measuring 7 x 7 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see Sample SAR Area Scan):

   a. The data at the surface was extrapolated, since the center of the dipoles is 2.5 mm away from the tip of the probe and the distance between the surface and the lowest measuring point is 1.2mm. The extrapolation was based on a least square algorithm. A polynomial of the fourth order was calculated through the points in z-axes. This polynomial was then used to evaluate the points between the surface and the probe tip.

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

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

4. The SAR reference value, at the same location as procedure #1, was re-measured. If the value changed by more than 5%, the evaluation is repeated.

Specific Anthropomorphic Mannequin (SAM) Specifications

The phantom for handset SAR assessment testing is a low-loss dielectric shell, with shape and dimensions derived from the anthropometric data of the 90th percentile adult male head dimensions as tabulated by the US Army. The SAM Twin Phantom shell is bisected along the mid-sagittal plane into right and left halves (see Fig. 5.1). The perimeter side walls of each phantom halves are extended to allow filling with liquid to a depth that is sufficient to minimized reflections from the upper surface. The liquid depth is maintained at a minimum depth of 15cm to minimize reflections from the upper surface.

Figure 5.1 Sam Twin Phantom shell

6. DESCRIPTION OF TEST POSITION

6.1 HEAD POSITION

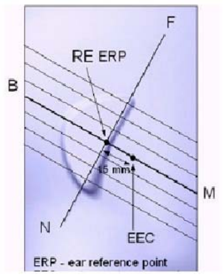


Figure 6.2 Close-up side view of ERPs

Figure 6.1 shows the front, back and side views of the SAM Twin Phantom. The point"M" is the reference point for the center of the mouth, "LE" is the left ear reference point(ERP), and "RE" is the right ERP. The ERPs are 15mm posterior to the entrance to the Ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 6.5. The plane Passing, through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck- Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 6.2). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate hand set positioning.

Figure 6.1 Front, back and side view SAM Twin Phantom

Handset Reference Points

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Fig. 6.3). The "test device reference point" was than located at the same level as the center of the ear reference point. The test device was positioned so that the "vertical centerline" was bisecting the front surface of the handset at it's top and bottom edges, positioning the "ear reference point" on the outer surface of the both the left and right head phantoms on the ear reference point.

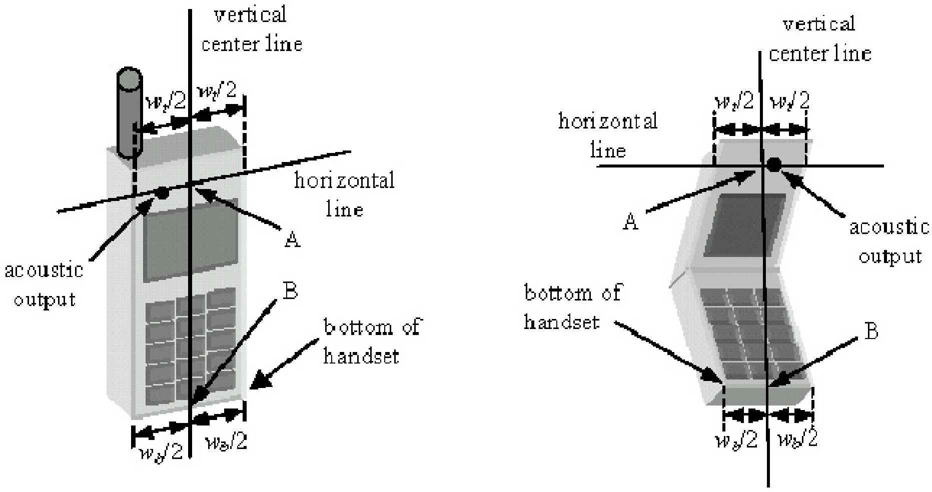


Figure 6.3 Handset Vertical Center & Horizontal Line Reference Points

6.2 Positioning for Cheek/Touch

1. The test device was positioned with the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6.4), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

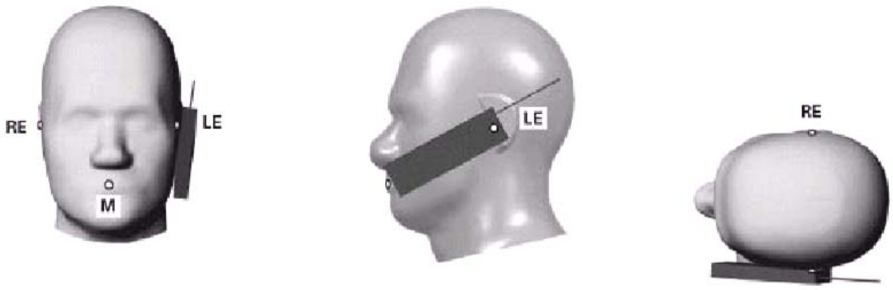


Figure 6.4Front, Side and Top View of Cheek/Touch Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.

3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the plane normal to MB-NF including the line MB (reference plane).

4. The phone was hen rotated around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.

5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, the handset was rotated about the line NF until any point on the handset made contact with a phantom point below the ear (cheek). (See Figure 6.5)

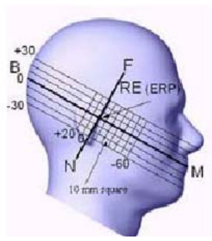


Figure 6.5Side view w/relevant markings

6.3 Positioning for Ear / 15 ° Tilt

With the test device aligned in the "Cheek/Touch Position":

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degree.

2. The phone was then rotated around the horizontal line by 15 degree.

3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6.6).

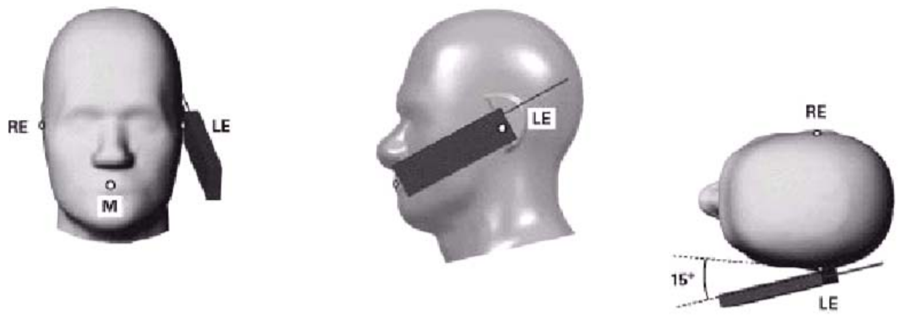


Figure 6.6 Front, Side and Top View of Ear/15°Position

6.4 Body Holster /Belt Clip Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6.8). A device with a headset output is tested with a headset connected to the device. Body dielectric parameters are used.

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are supplied with the device, the device is tested with each accessory that contains a unique metallic component. If multiple accessories share an identical metallic component(i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

Figure 6.8 Body Belt Clip & Holster Configurations

Body-worn accessories may not always be supplied or available as options for some.

Devices intended to be authorized for body-worn use. In this case, a test configuration where a separation distances between the back of the device and the flat phantom is used. All test position spacing is documented.

Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom.

For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessory (ies), including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

In all cases SAR measurements are performed to investigate the worst-case positioning. Worst-case positioning is then documented and used to perform Body SAR testing. In order for users to be aware of the body-worn operating requirements for meeting RF exposure compliance, operating instructions and cautions statements are included in the user's manual.

7. IEEE P1528 –MEASUREMENT UNCERTAINTIES

Error Description	Uncertaint value ±%	Probability Distribution	Divisor	(Ci) 1g	Standard (1g)	vi 2 or Veff
Measurement System						
Probe calibration	± 4.8	Normal	1	1	± 4.8 %	∞
Axial isotropy	± 4.7	Rectangular	√3	0.7	± 2.7 %	∞
Hemispherical isotropy	± 9.6	Rectangular	√3	0.7	± 5.5 %	∞
Boundary Effects	± 0.8	Rectangular	√3	1	± 0.5 %	∞
Probe Linearity	± 4.7	Rectangular	√3	1	± 2.7 %	∞
Detection limits	± 0.25	Rectangular	√3	1	± 0.14 %	∞
Readout Electronics	± 1.0	Normal	1	1	± 1.0 %	∞
Response time	± 0.8	Rectangular	√3	1	± 0.5 %	∞
Integration time	± 2.6	Rectangular	√3	1	± 1.5 %	∞
RF Ambient Conditions	± 3.0	Rectangular	√3	1	± 1.7 %	∞
Probe Positioner	± 0.4	Rectangular	√3	1	± 0.2 %	∞
Probe Positioning	± 2.9	Rectangular	√3	1	± 1.7 %	∞
Algorithms for Max. SAR Eval.	± 1.0	Rectangular	√3	1	± 0.6 %	∞
Test Sample Related						
Device Positioning	± 2.9	Normal	1	1	± 2.9 %	145
Device Holder	± 3.6	Normal	1	1	± 3.6 %	5
Power Drift	± 5.0	Rectangular	√3	1	± 2.9 %	∞
Physical Parameters						
Phantom Shell	± 4.0	Rectangular	√3	1	± 2.3 %	∞
Liquid conductivity (Target)	± 5.0	Rectangular	√3	0.64	± 1.8 %	∞
Liquid conductivity (Meas.)	± 5.0	Normal	1	0.64	± 1.6 %	∞
Liquid permittivity (Target)	± 5.0	Rectangular	√3	0.6	± 1.7 %	∞
Liquid permittivity (Meas.)	± 5.0	Normal	1	0.6	± 1.5 %	∞
CombinedStandard Uncertainty					**± 11.8 %**	330
Expanded Uncertainty (k=2)					**± 23.6 %**	

The above measurement uncertainties are according to IEEE P1528 (2003)

8. ANSI / IEEE C95.1-2005 RF EXPOSURE LIMITS

Uncontrolled Environment

UNCONTROLLED ENVIRONMENTS are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure. The general population/uncontrolled exposure limits are applicable to situations in which the general public may be exposed or in which persons who are exposed as a consequence of their employment may not be made fully aware of the potential for exposure or cannot exercise control over their exposure. Members of the general public would come under this category when exposure is not employment-related; for example, in the case of a wireless transmitter that exposes persons in its vicinity.

Controlled Environment

CONTROLLED ENVIRONMENTS are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e. as a result of employment or occupation). In general, occupational/controlled exposure limits are employment, who have been made fully aware of the potential for exposure and can exercise control over their exposure. This exposure category is also applicable when the exposure is of a transient nature due to incidental passage through a location where the exposure levels may be higher than the general population/uncontrolled limits, but the exposed person is fully aware of the potential for exposure and can exercise control over his or her exposure by leaving the area or by some other appropriate means.

Table 8.1.SAR Human Exposure Specified in ANSI/IEEE C95.1-2005

	HUMAN EXPOSURE LIMITS	
	General Public Exposure (W/kg) or (mW/g)	Occupational Exposure (W/kg) or (mW/g)
SPATIAL PEAK SAR * (Brain)	1.60	8.00
SPATIAL AVERAGE SAR ** (Whole Body)	0.08	0.40
SPATIAL PEAK SAR *** (Hands / Feet / Ankle / Wrist)	4.00	20.0

NOTES:

* The Spatial Peak value of the SAR averaged over any 1 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

** The Spatial Average value of the SAR averaged over the whole-body.

*** The Spatial Peak value of the SAR averaged over any 10 g of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

Uncontrolled Environments are defined as locations where there is the exposure of individuals who have no knowledge or control of their exposure.

Controlled Environments are defined as locations where there is exposure that may be incurred by persons who are aware of the potential for exposure, (i.e.as a result of employment or occupation).

9. SYSTEM VERIFICATION

9.1 Tissue Verification

MEASURED TISSUE PARAMETERS									
Freq. [MHz]	Date(s)	Liquid	Ambient Temp.[°C]	Liquid Temp.[°C]	Parameters	Target Value	Measured Value	Deviation [%]	Limit [%]
2450	Dec. 28, 2011	Body	22.1	22.5	εr	52.70	53.80	2.09	± 5
					σ	1.950	1.940	-0.51	± 5
2450	Dec. 29, 2011	Body	21.8	22.1	εr	52.70	52.30	-0.76	± 5
					σ	1.950	1.990	2.05	± 5
2450	Jan. 24, 2012	Body	22.1	22.3	εr	52.70	51.70	-1.90	± 5
					σ	1.950	1.990	2.05	± 5

9.2 Test System Validation

Prior to assessment, the system is verified to the± 10 % of the specifications at 2450 MHz by using the system validation kit(s). (Graphic Plots Attached)

SYSTEM DIPOLE VALIDATION TARGET & MEASURED											
Freq. [MHz]	System Validation Kit	Date(s)	Liquid	Ambient Temp. [°C]	Liquid Temp .[°C]	Input Power (mW)	SAR Average	Targeted SAR_{1g} (W/kg)	Measured SAR_{1g} (W/kg)	Deviation [%]	Limit [%]
2450	D-2450V2 S/N: 726	Dec. 28, 2011	Body	22.1	22.5	250	1g	12.83	13.0	1.33	± 10
2450	D-2450V2 S/N: 726	Dec. 29, 2011	Body	21.8	22.1	250	1g	12.83	13.0	1.33	± 10
2450	D-2450V2 S/N: 726	Jan. 24, 2012	Body	22.1	22.3	250	1g	12.83	12.9	0.55	± 10

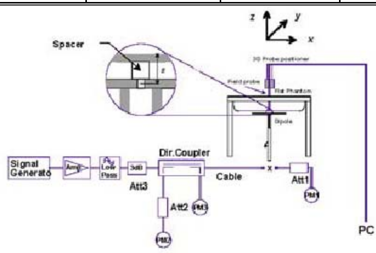


Figure 9.1 Dipole Validation Test Setup

Justification for Extended SAR Dipole Calibrations

About KDB Publication 450824-2

The following are the recommended FCC procedures for SAR dipole calibration.

1) The phantom configuration, tissue dielectric parameters, dipole positioning requirements, dielectric spacer and other electrical and mechanical details should be clearly specified in the dipole calibration report. Dipoles must be recalibrated at least once every three years; however, immediate re-calibration is required for the following conditions. The test laboratory must ensure that the required supporting information and documentation have been included in the SAR report to qualify for the extended 3-year calibration interval; otherwise, the IEEE Standard 1528-2003 recommended annual calibration is expected.

When the most recent return-loss, measured at least annually, deviates by more than 20% from the previous measurement (i.e. 0.2 of the dB value) or not meeting the required -20 dB return-loss specification

Antenna Parameters

Date(s)	Frequency	Return loss (Head)	Impedance (Ω)	Return loss (Body)	Impedance (Ω)
March 17, 2011	2450 MHz	-27.3 dB	53.6	-27.7 dB	49.9

10. SAR Measurement Procedures for USB Dongle Transmitters

Simple Dongle Procedures

Test all USB orientations [see figure below: (A) Horizontal-Up, (B) Horizontal-Down, (C) Vertical-Front, and (D) Vertical-Back] with a device-to-phantom separation distance of 5 mm or less, according to KDB 447498 requirements. These test orientations are intended for the exposure conditions found in typical laptop/notebook/netbook or tablet computers with either horizontal or vertical USB connector configurations at various locations in the keyboard section of the computer. Current generation portable host computers should be used to establish the required SAR measurement separation distance. The same test separation distance must be used to test all frequency bands and modes in each USB orientation. The typical Horizontal-Up USB connection (A), found in the majority of host computers, must be tested using an appropriate host computer. A host computer with either Vertical-Front (C) or Vertical-Back (D) USB connection should be used to test one of the vertical USB orientations. If a suitable host computer is not available for testing the Horizontal-Down (B) or the remaining Vertical USB orientation, a high quality USB cable, 12 inches or less, may be used for testing these other orientations. It must be documented that the USB cable does not influence the radiating characteristics and output power of the transmitter.

Dongles with Swivel or Rotating Connectors

A swivel or rotating USB connector may enable the dongle to connect in different orientations to host computers. When the antenna is built-in within the housing of a dongle, a swivel or rotating connector may allow the antenna to assume different positions. The combination of these possible configurations must be considered to determine the SAR test requirements. When the antenna is located near the tip of a dongle, it may operate at closer proximity to users in certain connector orientations where dongle tip testing may be required.

The 5 mm test separation distance used for testing simple dongles has been established based on the overall host platform (laptop/notebook/netbook) and device variations, and varying user operating configurations and exposure conditions expected for a peripheral device. The same test distance should generally apply to dongles with swivel or rotating connectors. The procedures described for simple dongles should be used to position the four surfaces of the dongle at 5 mm from the phantom to evaluate SAR. At least one of the horizontal and one of the vertical positions should be tested using an applicable host computer. If the antenna is within 1 cm from the tip of the dongle (the end without the USB connector), the tip of the dongle should also be tested at 5 mm perpendicular to the phantom. For antennas located within 2.5 cm from the USB connector and if the dongle can be positioned at 45º to 90º from the horizontal position [(A) or (B)], testing in one or more of these configurations may need to be considered. A KDB inquiry should be submitted to determine the applicable test configurations.

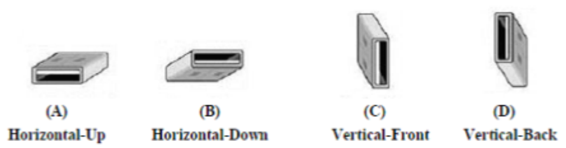
Dongles with External, Swivel or Rotating Antennas

For dongles with external antennas or antennas that may swivel or rotate, a KDB inquiry should be submitted to the FCC Laboratory to determine the applicable test configurations. The inquiry should identify if the antenna may transmit in its stowed position, and if a swivel or rotating USB connector is also used. Depending on the antenna configurations used in the individual dongle design and its operating configurations, different test separation distances may apply and must be determined on a case-by-case basis.

Other SAR Test Considerations

USB dongles have a rather small footprint; therefore, the SAR scan resolutions should be smaller than those typically used for testing devices with larger form factors, to maintain acceptable uncertainty for the interpolation and extrapolation algorithms used in the 1-g SAR analysis. In addition, when USB cables are used to connect a dongle to the host for SAR testing, the dongle should be supported in several cm of foamed polystyrene (e.g., Styrofoam) to minimize any field perturbation effects due to test device holder used to position the dongle for SAR testing. Dongles with certain spacers, contours or tapering added to the housing should generally be tested according to the 5 mm test separation requirement required for simple dongles, which is based on overall host platform, device and user operating configurations and exposure conditions of a peripheral device as compared to individual use conditions.

USB dongle transmitters must show compliance at a test separation distance of 5 mm. When the SAR is ≥ 1.2 W/kg, applications for equipment certification require a PBA for TCB approval. Preliminary data submitted through KDB inquiries showing compliance at test distances greater than 5 mm are usually inapplicable and insufficient for the FCC to determine if potential exposure concerns may be eliminated to enable the device to satisfy compliance. The information must clearly demonstrate that the likelihood of non-compliance is remote. When the SAR is ≥ 1.2 W/kg, especially for SAR > 1.5 W/kg, certain caution statements, labels and other means to ensure compliance may be required.



Note: These are USB connector orientations on laptop computers; USB dongles have the reverse configuration for plugging into the corresponding laptop computers.

USB Connector Orientations Implemented on Laptop Computers

11. Configuring 802.11 a/b/g Transmitters for SAR Measurement

SAR Testing with IEEE 802.11 a/b/g Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable.

General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be sued for all measurements.

Frequency Channel Configurations

802.11 a/b/g and 4.9 GHz operation modes are tested independently according to the service requirements in each frequency band. 802.11 b/g modes are tested on channels 1. 6 and 11. 802.11a is tested for UNII operations on channels 36 and 48 in the 5.15-5.25 GHz Band; channels 52 and 64 in the 5.25-5.35 GHz band; channels 104, 116, 124 and 136 in the 5.470-5.725 GHz BAND; and channel 149 and 161 in the 5.8 GHz band. When 5.8 GHz § 15.247 is also available, channels 149, 157 and 165 should be tested of the UNII channels. 4.9 GHz is tested on channels 1., 10 and 5 or 6, whichever has the higher output power, for 5 MHz channels; channels 11, 15 and 19 for 10 MHz channels; and channels 21 and 25 for 20 MHz channels. These are referred to as the "default test channels". 802.11g mode was evaluated only if the output power was 0.25 dB higher than the 802.11b mode.

Table 11.1 802.11 Test channels per FCC Requirements

Mode		GHz	Channel	Turbo Channel	"Default Test Channels"			
					§15.247		UNII	
					802.11b	802.11g		
802.11 b/g		2.412	1*		√	∇		
		2.437	6	6	√	∇		
		2.462	11*		√	∇		
802.11a	UNII	5.18	36				√	
		5.20	40	42 (5.21 GHz)				*
		5.22	44					*
		5.24	48	50 (5.25 GHz)			√	
		5.26	52				√	
		5.28	56	58 (5.29 GHz)				*
		5.30	60					*
		5.32	64				√	
		5.500	100	Unknown				*
		5.520	104				√	
		5.540	108					*
		5.560	112					*
		5.580	116				√	
		5.600	120					*
		5.620	124				√	
		5.640	128					*
		5.660	132					*
		5.680	136				√	
		5.700	140					*
	UNII or §15.247	5.745	149		√		√	
		5.765	153	152 (5.76 GHz)		*		*
		5.785	157		√			*
		5.805	161	160 (5.80 GHz)		*	√	
	§15.247	5.825	165		√			

MIMO and other Multiple Antenna Configurations

SAR for MIMO and similar multiple antenna configurations is measured with all antennas transmitting simultaneously. The antennas should be transmitting at close to 100% duty factor during the SAR measurements. If the test mode software does not support simultaneous transmission, each antenna is tested independently, one at a time; and the SAR measured for all antennas must be summed spatially, grid by grid, to compute the 1-g SAR. When the sum of individual 1-g SAR for all antennas are less than the SAR limit, grid by grid summing is optional. The 1-g SAR should be scaled to 100% duty factor to determine compliance.

MIMO and other SISO Configurations

The discussions in this document are based on single-input single-output (SISO) 802.11a/b/g transmitters that do not transmit simultaneously with multiple antennas. However, multiple-input multiple-output (MIMO) devices have been introduced and these early generation MIMO transmitters are already available in some 802.11 wireless LAN products. The rationale in setting up a MIMO device for exposure evaluation should be similar to SISO. When a group of antennas are transmitting simultaneously in a spatial multiplexing MIMO configuration, the SAR distribution and peak SAR locations are expected to spread over an area corresponding to the locations of the radiating antennas. If the antennas are in close proximity to each other; for example, within 3-5 cm, it would be necessary to consider the exposure from all antennas to determine the 1-g averaged SAR within the region. Depending on the test software, if the antennas are tested independently, one at a time, the exposure from all antennas must be summed spatially, grid by grid, to compute the 1-g SAR. If the test software allows all antennas to transmit simultaneously and continuously, the resulting SAR distribution may be used to compute the 1-g SAR directly. For many low-power devices, when the peak SAR locations are more than 5 cm apart, the 1-g SAR can usually be treated independently with little or no noticeable impact; therefore, spatial summing could be optional.

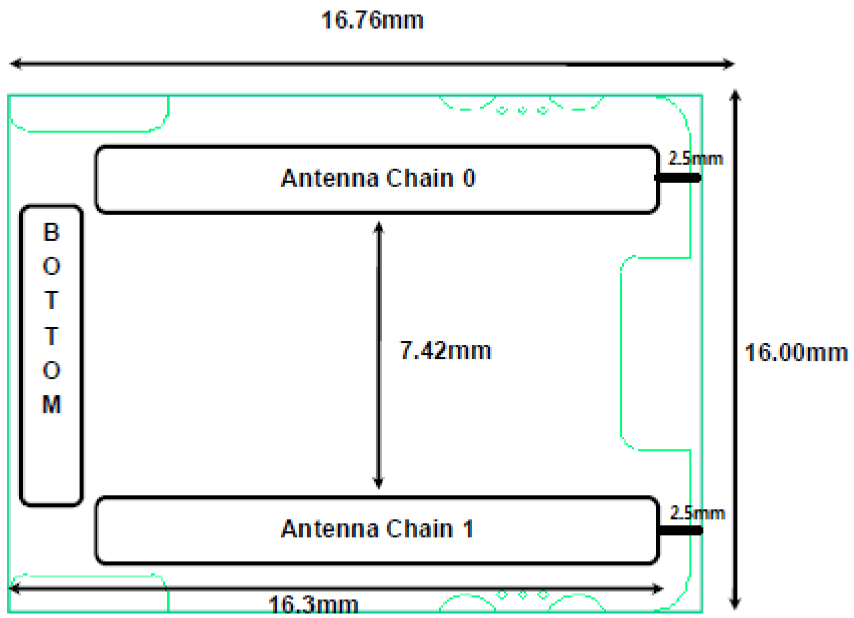
12. DESCRIPTION OF SUPPORTED UNITS

The EUT has been tested with other necessary accessories or supported units. The following supported units or accessories were used to perform SAR tests for this device.

- Supported Units

No.	PRODUCT	BRAND	MODEL NO.	SERIAL NO.	FCC ID	Note
1	LAPTOP	ACER	P5LJ0	LXRMY0C0091252F8711601	FCC DOC Approval	-
2	USB Cable	-	-	-	-	12.5cm

13. DESCRIPTION OF ANTENNA LOCATION



1. **Antenna 0, 1 for Wi-Fi Single Band Antenna**

Note:

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

Chain	Antenna Type
Chain (0)	PIFA
Chain (1)	PIFA

2. The EUT incorporates a MIMO function with 802.11n. Physically, the EUT provides two completed transmits and two completed receivers.

3. The EUT 2 X 2 spatial MIMO (2TX & 2RX) without beam forming function. The antenna configurations are two transmit antennas and two receiver antennas, as there are 2 PIFA antennas. Spatial multiplexing modes for simultaneous transmission using 2 antennas, and for simultaneous receiver using 2 antennas. The 802.11b/g legacy mode is limited to single transmitter only.

4. The EUT complies with 802.11n standards and backwards compatible with 802.11b, 802.11g products.

5. The spacing between antenna chain 0 and antenna chain 1 is a 7 mm.

6. The above EUT information was declared by manufacturer and for more detailed features description, please refers to the manufacturer's specifications or user's manual.

14. SAR TEST DATA SUMMARY AND POWER TABLE

See Measurement Result Data Pages

Procedures Used To Establish Test Signal

The EUT was placed into simulated call mode (W-LAN) using manufacturers test codes. This EUT was tested WLAN test program to control DUT. The channel was selected at Low, Middle, and High channel. The output power level was set to rated max output power using the WLAN test program. This output power level was measured and recorded on the report as a begin power.

Device Test Conditions

The EUT is battery operated. Each SAR measurement was taken with a fully charged battery.
In order to verify that the device was tested at full power, conducted output power measurements were performed before and after each SAR measurement to confirm the output power. If a conducted power deviation of more than 5% occurred, the test was repeated.

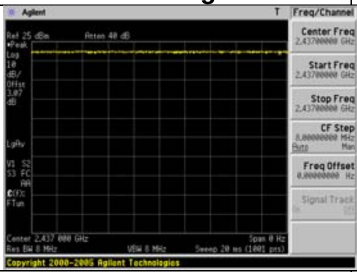
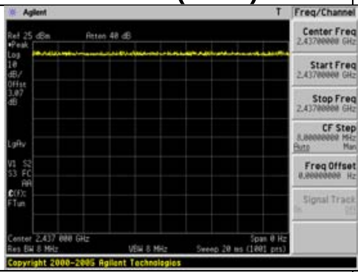
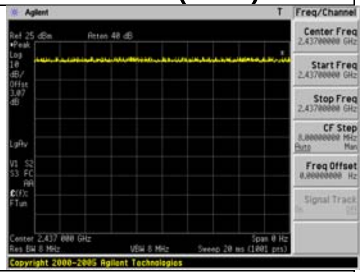
Max. Power Output Table for PTA127/55 (W-LAN)

Mode	Frequency (MHz)	Channel No.	Output Power (dBm) Using the Average Power Meter	
			Ant. 0	Ant. 1
802.11b	2412	1	14.78	14.73
	2437	**6**	**15.13**	**14.81**
	2462	11	14.81	14.80
802.11g	2412	1	12.46	12.17
	2437	6	12.83	12.42
	2462	11	12.72	12.72
802.11n HT20 (2TX 2RX)	2412	1	15.65	
	2437	6	15.91	
	2462	11	15.84	
802.11n HT40 (2TX 2RX)	2422	3	14.37	
	2437	6	14.71	
	2452	9	14.64	

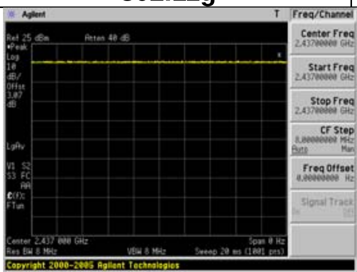
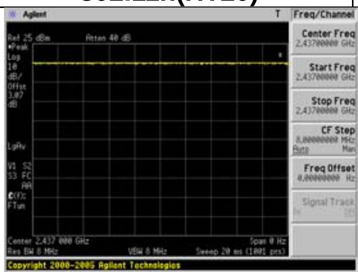
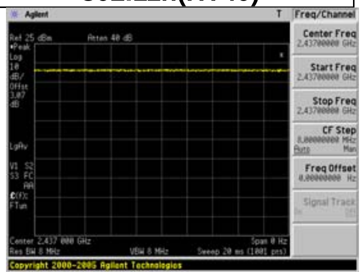
Table 14.1 The power was measured the Average Power Meter

Duty Factors for W-LAN

Antenna port 0

802.11b	802.11g	802.11n(HT20)	802.11n(HT40)
			
Duty = 100% Duty Cycle Correction Factor = 10log(1/Duty) = 0	Duty = 100% Duty Cycle Correction Factor = 10log(1/Duty) = 0	Duty = 100% Duty Cycle Correction Factor = 10log(1/Duty) = 0	Duty = 100% Duty Cycle Correction Factor = 10log(1/Duty) = 0

Antenna port 1

802.11b	802.11g	802.11n(HT20)	802.11n(HT40)
			
Duty = 100% Duty Cycle Correction Factor = 10log(1/Duty) = 0	Duty = 100% Duty Cycle Correction Factor = 10log(1/Duty) = 0	Duty = 100% Duty Cycle Correction Factor = 10log(1/Duty) = 0	Duty = 100% Duty Cycle Correction Factor = 10log(1/Duty) = 0

15. SAR TEST DATA SUMMARY

15.1 Measurement Results (W-LAN (802.11b Ant. 0) Body SAR)

FREQUENCY		Modulation	Begin Power (dBm)	Drift Power (dB)	Configuration	Phantom Position	Antenna Type	Antenna Chain	SAR (W/kg)
MHz	Ch								
2437	6	802.11b	15.13	0.145	Tip	5 mm	Internal	Ant. 0	0.091
2412	**1**	**802.11b**	**14.78**	**-0.172**	**Horizontal Up**	**5 mm**	**Internal**	**Ant. 0**	**0.557**
2437	6	802.11b	15.13	0.024	Horizontal Up	5 mm	Internal	Ant. 0	0.505
2462	11	802.11b	14.81	-0.047	Horizontal Up	5 mm	Internal	Ant. 0	0.394
2437	6	802.11b	15.13	0.173	Horizontal Down	5 mm	Internal	Ant. 0	0.461
2437	6	802.11b	15.13	-0.192	Vertical Front	5 mm	Internal	Ant. 0	0.130
2437	6	802.11b	15.13	0.122	Vertical Back	5 mm	Internal	Ant. 0	0.282
ANSI / IEEE C95.1-2005 – SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population Exposure**						**Body** **1.6 W/kg (mW/g)** averaged over 1 gram			

NOTE:

1. The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Prior to testing the conducted output power was measured.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2dB below the highest peak.
5. Battery is fully charged for all readings.
6. Test Signal Call Mode □ Continuous Tx On ▣ Manu. Test Codes □ Base Station Simulator
7. Tissue parameters and temperatures are listed on the SAR plots.
8. Liquid tissue depth is 15.0cm.±0.1
9. Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) 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).
10. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n) were not investigated since the average output power were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11b mode.

15.2 Measurement Results (W-LAN (802.11b Ant. 1) Body SAR)

FREQUENCY		Modulation	Begin Power (dBm)	Drift Power (dB)	Configuration	Phantom Position	Antenna Type	Antenna Chain	SAR (W/kg)
MHz	Ch								
2437	6	802.11b	14.81	-0.063	Tip	5 mm	Internal	Ant. 1	0.048
2412	1	802.11b	14.73	-0.107	Horizontal Up	5 mm	Internal	Ant. 1	0.410
2437	**6**	**802.11b**	**14.81**	**-0.188**	**Horizontal Up**	**5 mm**	**Internal**	**Ant. 1**	**0.453**
2462	11	802.11b	14.80	0.072	Horizontal Up	5 mm	Internal	Ant. 1	0.330
2437	6	802.11b	14.81	-0.133	Horizontal Down	5 mm	Internal	Ant. 1	0.360
2437	6	802.11b	14.81	-0.154	Vertical Front	5 mm	Internal	Ant. 1	0.236
2437	6	802.11b	14.81	0.131	Vertical Back	5 mm	Internal	Ant. 1	0.079
ANSI / IEEE C95.1-2005 – SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population Exposure**						**Body** **1.6 W/kg (mW/g)** averaged over 1 gram			

NOTE:

1. The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Prior to testing the conducted output power was measured.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2dB below the highest peak.
5. Battery is fully charged for all readings.
6. Test Signal Call Mode □ Continuous Tx On ▣ Manu. Test Codes □ Base Station Simulator
7. Tissue parameters and temperatures are listed on the SAR plots.
8. Liquid tissue depth is 15.0cm.±0.1
9. Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) 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).
10. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n) were not investigated since the average output power were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11b mode.

15.3 Measurement Results (W-LAN (802.11n HT20) MIMO Body SAR)

FREQUENCY		Modulation	Begin Power (dBm)	Drift Power (dB)	Configuration	Phantom Position	Antenna Type	Antenna Chain	SAR (W/kg)
MHz	Ch								
2437	6	802.11n HT20	15.91	-0.192	Tip	5 mm	Internal	2TX	0.048
2412	1	802.11n HT20	15.65	-0.048	Horizontal Up	5 mm	Internal	2TX	0.276
2437	**6**	**802.11n HT20**	**15.91**	**-0.030**	**Horizontal Up**	**5 mm**	**Internal**	**2TX**	**0.287**
2462	11	802.11n HT20	15.84	-0.096	Horizontal Up	5 mm	Internal	2TX	0.245
2437	6	802.11n HT20	15.91	-0.082	Horizontal Down	5 mm	Internal	2TX	0.272
2437	6	802.11n HT20	15.91	0.010	Vertical Front	5 mm	Internal	2TX	0.125
2437	6	802.11n HT20	15.91	-0.164	Vertical Back	5 mm	Internal	2TX	0.102
ANSI / IEEE C95.1-2005 – SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population Exposure**						**Body** **1.6 W/kg (mW/g)** averaged over 1 gram			

NOTE:

1. The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Prior to testing the conducted output power was measured.
4. The EUT is tested 2nd hot-spot peak, if it is less than 2dB below the highest peak.
5. Battery is fully charged for all readings.
6. Test Signal Call Mode □ Continuous Tx On ▣ Manu. Test Codes □ Base Station Simulator
7. Tissue parameters and temperatures are listed on the SAR plots.
8. Liquid tissue depth is 15.0cm.±0.1
9. Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) 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).
10. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n) were not investigated since the average output power were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11b mode.

15.4 Measurement Results (W-LAN (802.11n HT40) MIMO Body SAR)

FREQUENCY		Modulation	Begin Power (dBm)	Drift Power (dB)	Configuration	Phantom Position	Antenna Type	Antenna Chain	SAR (W/kg)
MHz	Ch								
2437	6	802.11n HT40	14.71	0.105	Tip	5 mm	Internal	2TX	0.029
2422	**3**	**802.11n HT40**	**14.37**	**-0.128**	**Horizontal Up**	**5 mm**	**Internal**	**2TX**	**0.167**
2437	6	802.11n HT40	14.71	-0.015	Horizontal Up	5 mm	Internal	2TX	0.166
2452	9	802.11n HT40	14.64	-0.142	Horizontal Up	5 mm	Internal	2TX	0.148
2437	6	802.11n HT40	14.71	0.105	Horizontal Down	5 mm	Internal	2TX	0.139
2437	6	802.11n HT40	14.71	-0.033	Vertical Front	5 mm	Internal	2TX	0.082
2437	6	802.11n HT40	14.71	-0.137	Vertical Back	5 mm	Internal	2TX	0.061
ANSI / IEEE C95.1-2005 – SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population Exposure						**Body 1.6 W/kg (mW/g)** averaged over 1 gram			

NOTE:

1. The test data reported are the worst-case SAR value with the antenna-body position set in a typical configuration. Test procedures used are according to FCC/OET Bulletin 65, Supp.C [July 2001].
2. All modes of operation were investigated, and worst-case results are reported.
3. Prior to testing the conducted output power was measured.
4. The EUT is tested 2^{nd} hot-spot peak, if it is less than 2dB below the highest peak.
5. Battery is fully charged for all readings.
6. Test Signal Call Mode □ Continuous Tx On ▣ Manu. Test Codes □ Base Station Simulator
7. Tissue parameters and temperatures are listed on the SAR plots.
8. Liquid tissue depth is 15.0cm.±0.1
9. Justification for reduced test configurations: per FCC/OET Supplement C (July, 2001), if the SAR measured at the middle channel for each test configuration (Left, right, cheek/touch, tilt/ear, extended and retracted) 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).
10. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n) were not investigated since the average output power were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11b mode.

16. CONCLUSION

Measurement Conclusion

The SAR measurement indicates that the EUT complies with the RF radiation exposure limits of the FCC. These measurements are taken to simulate the RF effects exposure under the worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The tested device complies with the requirements in respect to all parameters subject to the test. The test results and statements relate only to the item(s)tested.

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role impossible biological effect are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease).

Because innumerable factors may interact to determine the specific biological outcome of an exposure to electromagnetic fields, any protection guide shall consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables.

17. REFERENCES

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Attachment 1. – Dipole Validation Plots

DIGITAL EMC CO., LTD

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:726

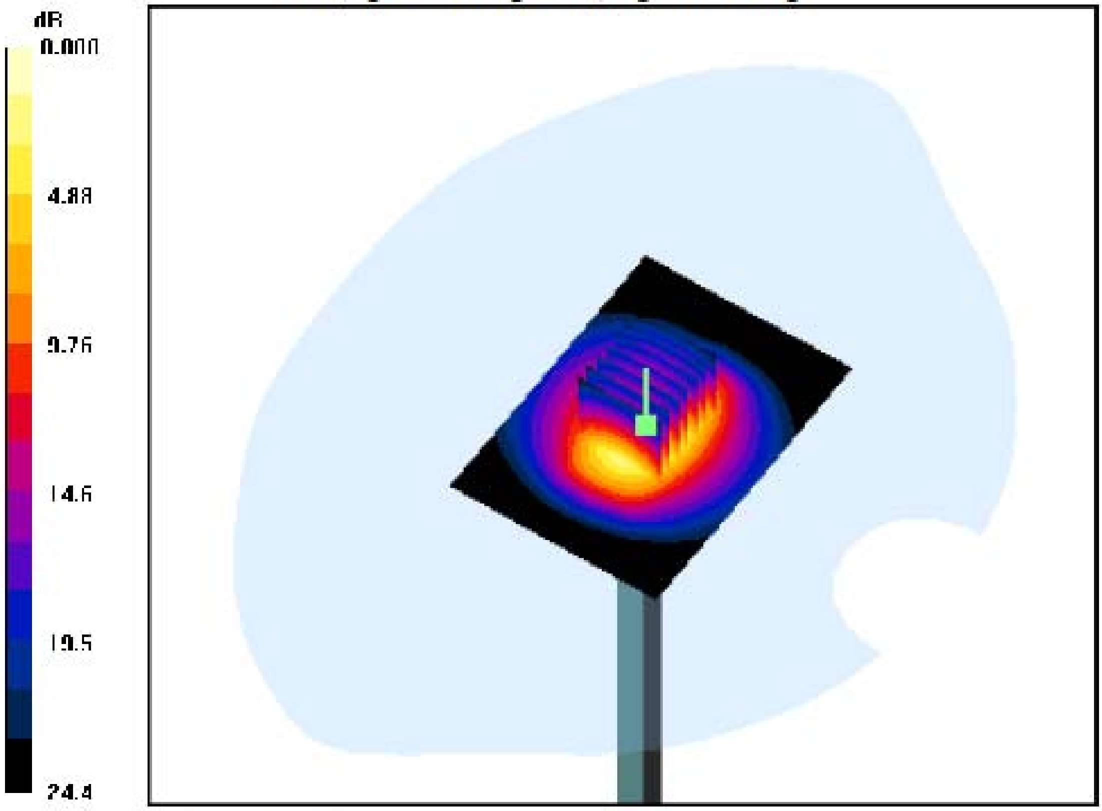
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.94 mho/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

Dipole Validation

Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.063 dB
Peak SAR (extrapolated) = 28.8 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 5.8 mW/g



0 dB = 18.8mW/g

DIGITAL EMC CO., LTD

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:726

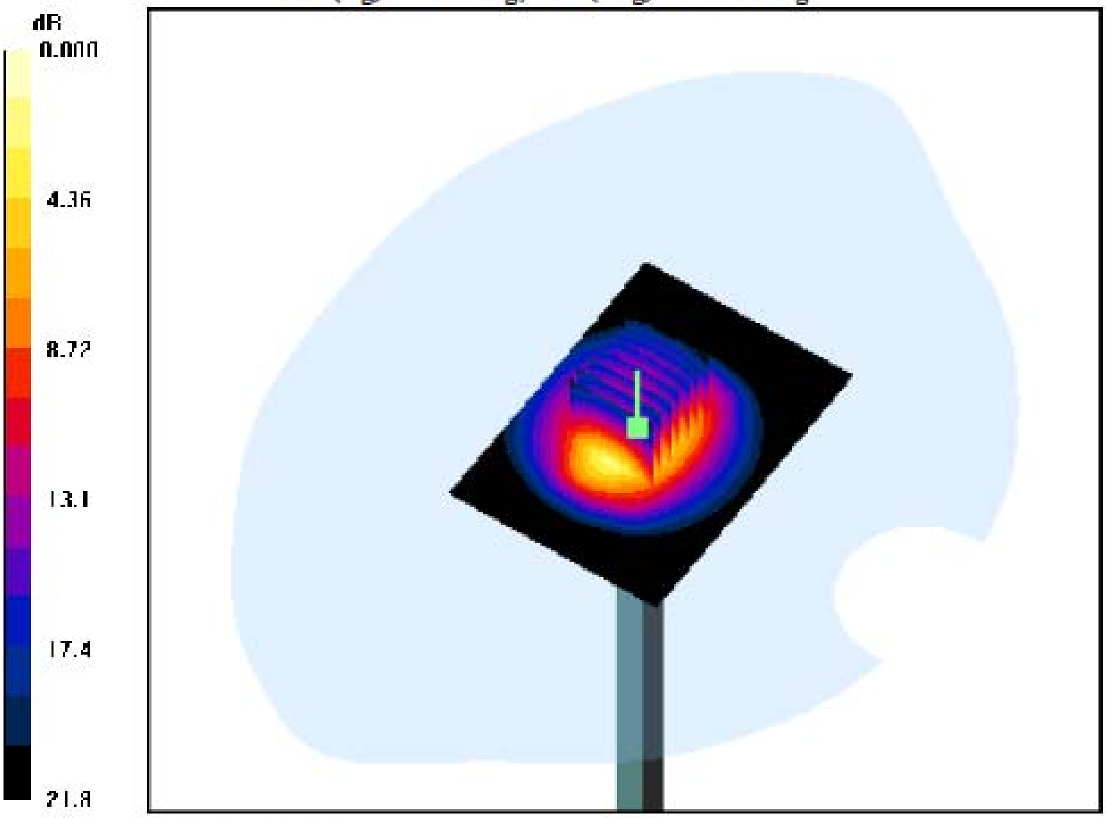
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.99 mho/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

Dipole Validation

Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.006 dB
Peak SAR (extrapolated) = 27.0 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 6.05 mW/g



0 dB = 18.4mW/g

DIGITAL EMC CO., LTD

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:726

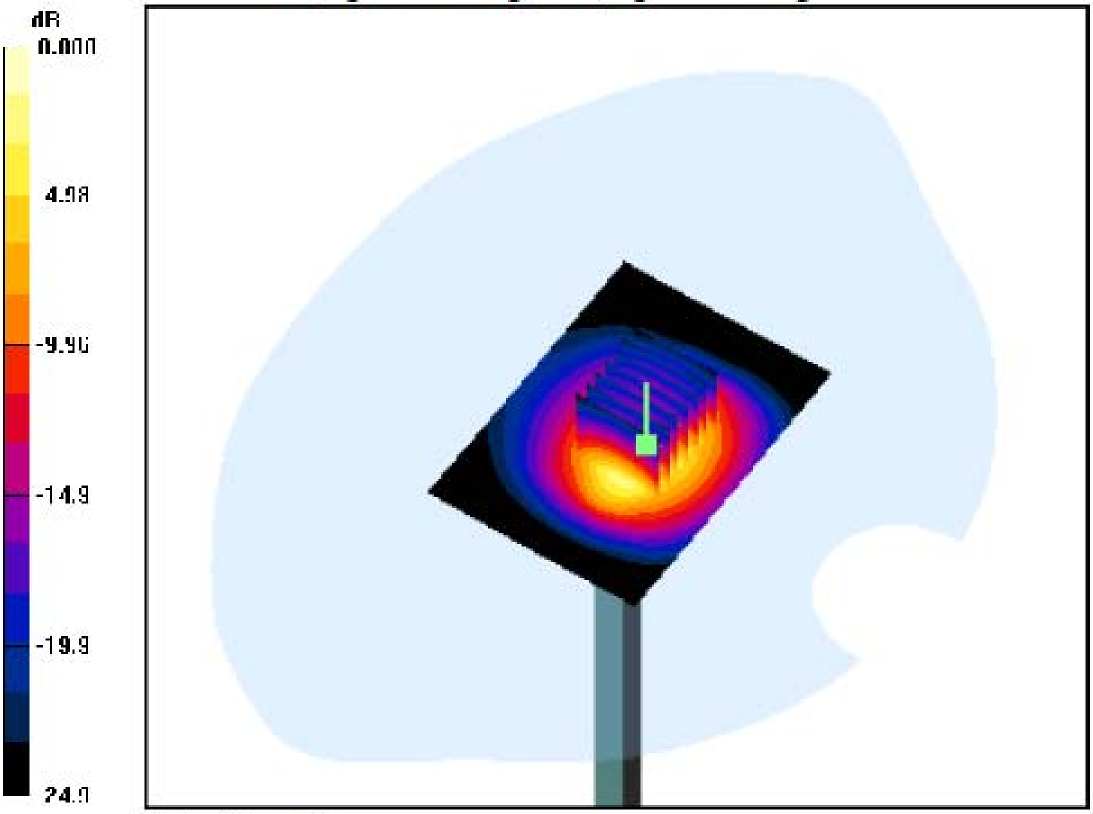
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2450 MHz; σ = 1.99 mho/m; ε_r = 51.7; ρ = 1000 kg/m^3
Phantom section: Flat Section

DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2012-01-24; Ambient Temp: 22.1; Tissue Temp:22.3

Dipole Validation

Area Scan (51x71x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.070 dB
Peak SAR (extrapolated) = 29.7 W/kg
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 5.68 mW/g



0 dB = 18.7mW/g

Attachment 2. – SAR Test Plots

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; $\sigma = 1.96$ mho/m; $\varepsilon_r = 51.5$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

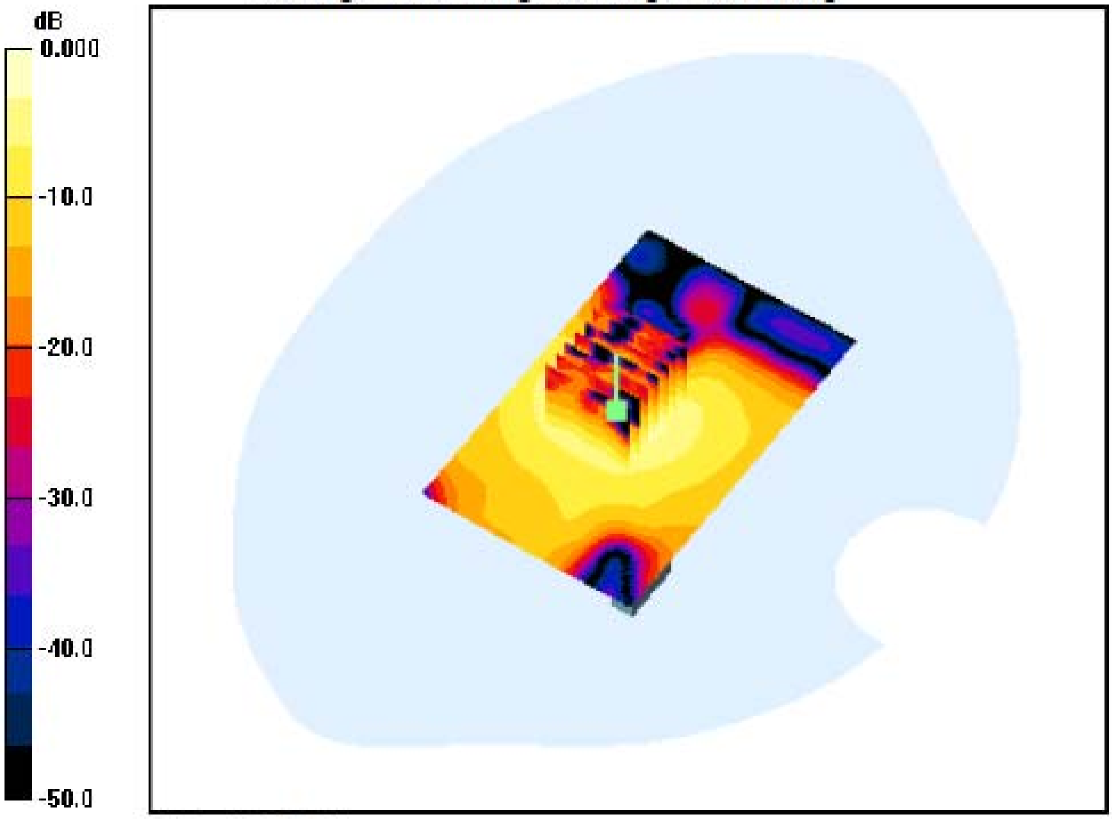
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2012-01-24; Ambient Temp: 22.1; Tissue Temp:22.3

5 mm space from Body, Tip, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant. 0, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.145 dB
Peak SAR (extrapolated) = 0.210 W/kg
SAR(1 g) = 0.091 mW/g; SAR(10 g) = 0.039 mW/g



0 dB = 0.127mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.91 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

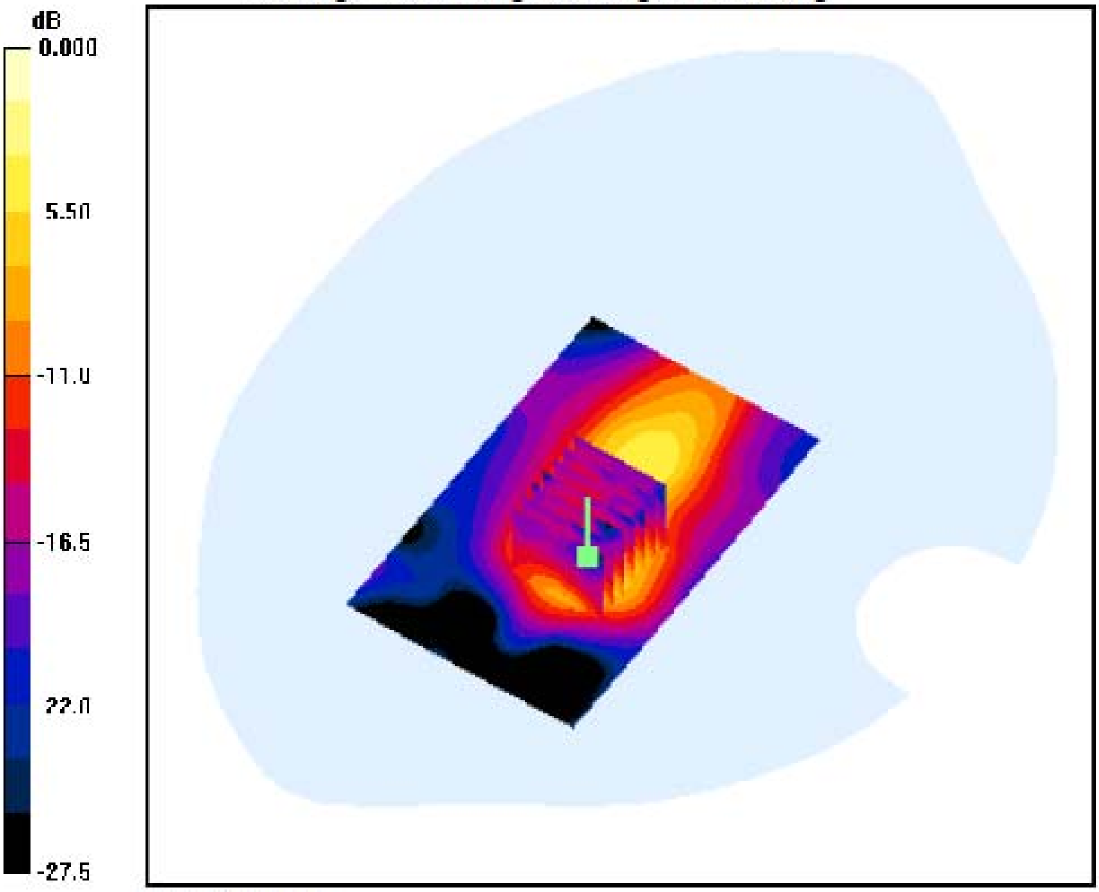
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Up, W-LAN(802.11b) Ch. 1(2412 MHz)

Antenna Position : Ant 0, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.172 dB
Peak SAR (extrapolated) = 1.40 W/kg
SAR(1 g) = 0.557 mW/g; SAR(10 g) = 0.239 mW/g



0 dB = 0.810mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; $\sigma = 1.92$ mho/m; $\varepsilon_r = 53.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

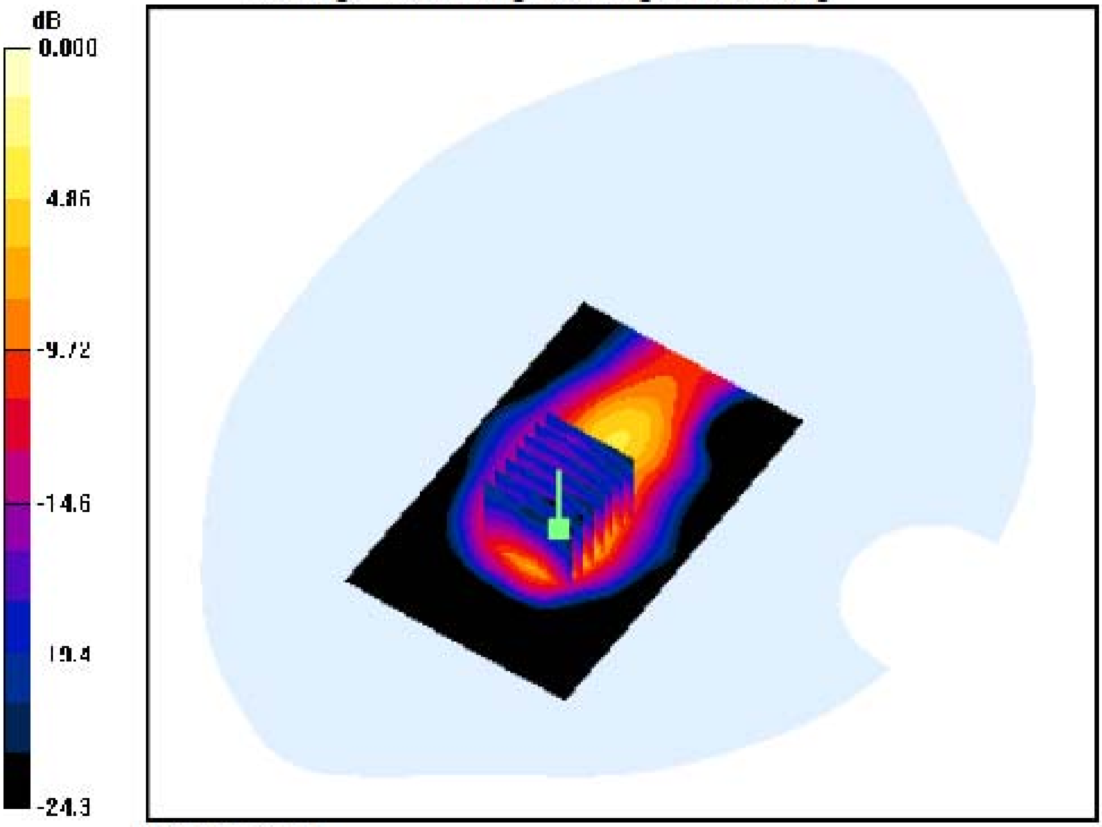
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Up, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 0, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.024 dB
Peak SAR (extrapolated) = 1.28 W/kg
SAR(1 g) = 0.505 mW/g; SAR(10 g) = 0.213 mW/g



0 dB = 0.749mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.95 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

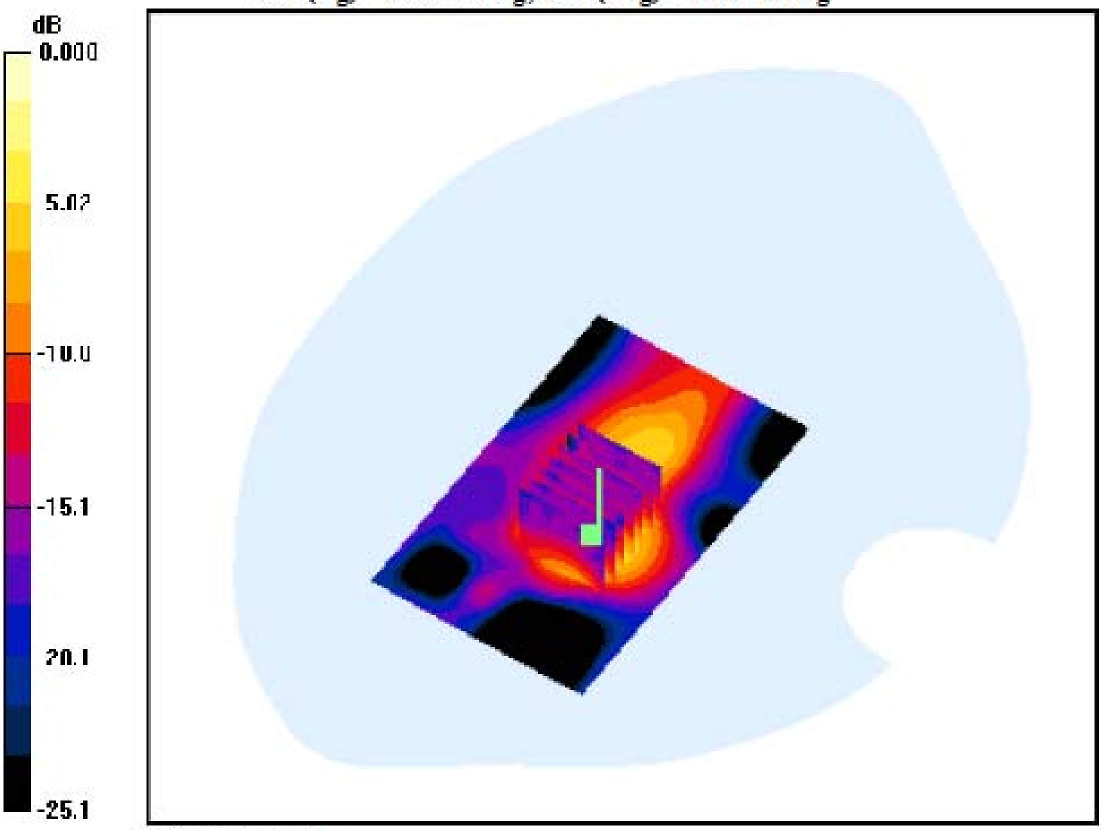
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Up, W-LAN(802.11b) Ch. 11(2462 MHz)

Antenna Position : Ant 0, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.047 dB
Peak SAR (extrapolated) = 0.999 W/kg
SAR(1 g) = 0.394 mW/g; SAR(10 g) = 0.171 mW/g



0 dB = 0.561mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; $\sigma = 1.92$ mho/m; $\varepsilon_r = 53.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

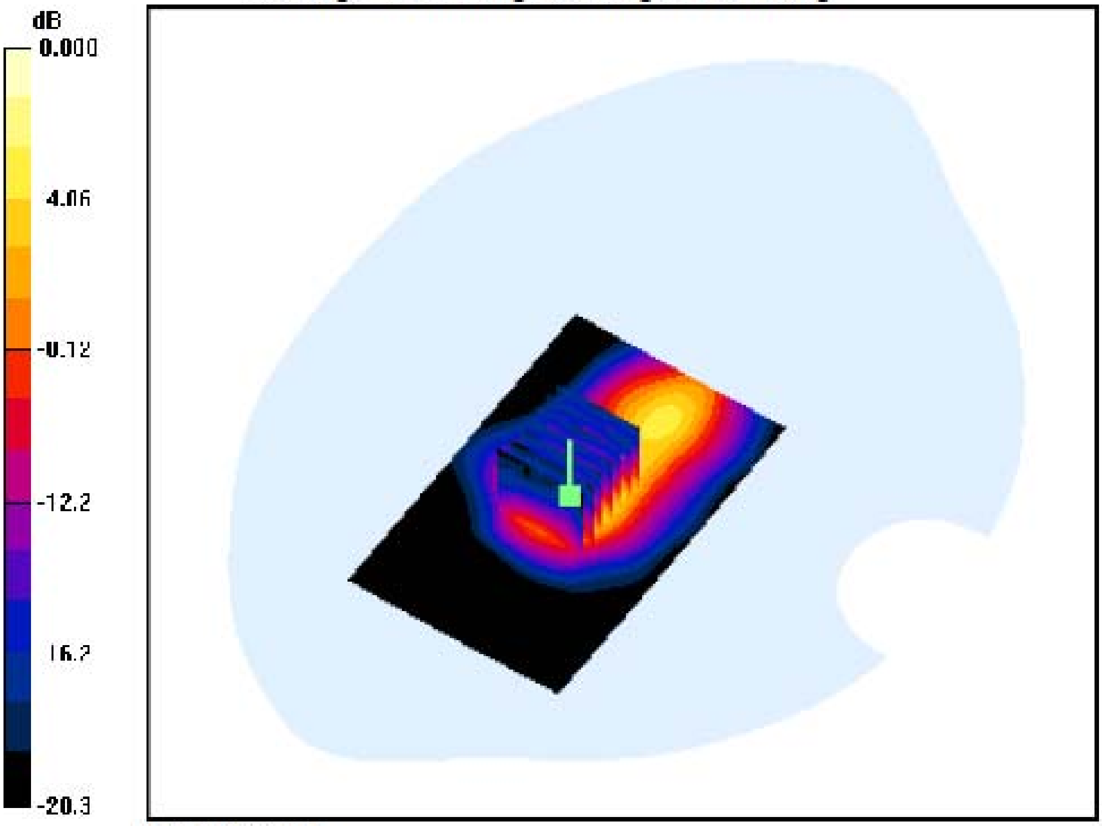
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Down, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 0, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.173 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.461 mW/g; SAR(10 g) = 0.201 mW/g



0 dB = 0.668mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

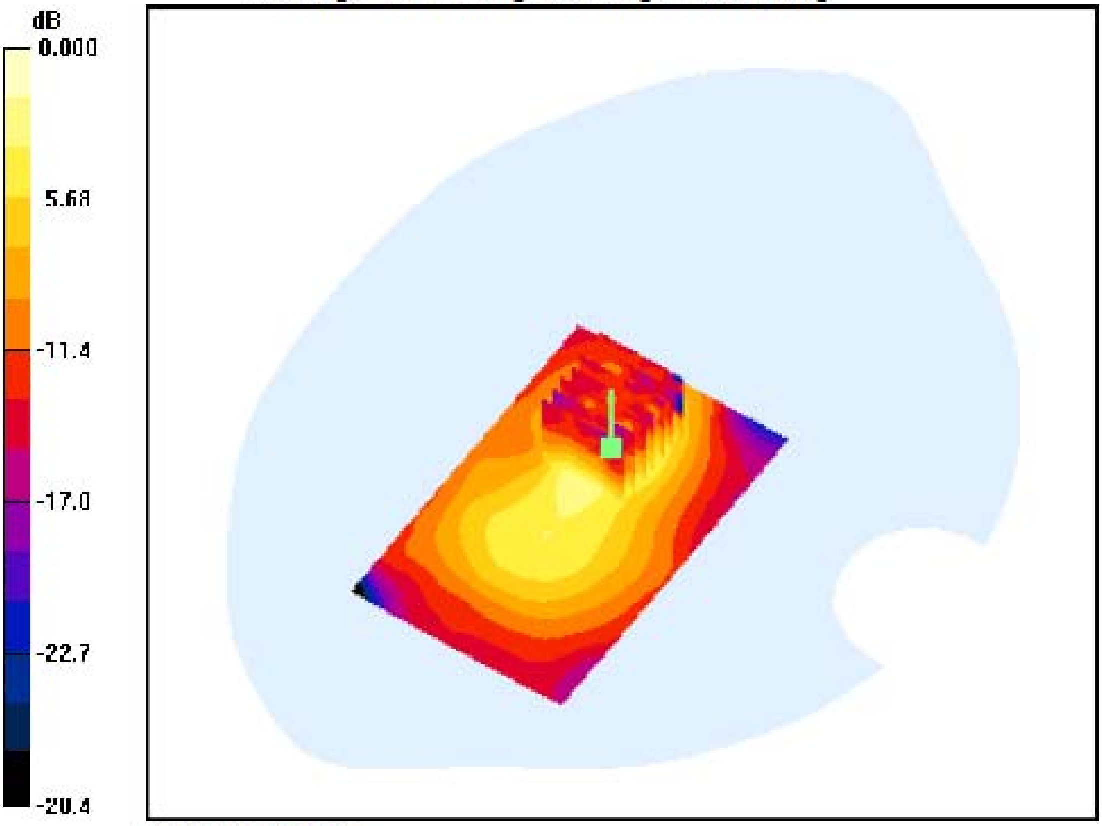
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Vertical Front, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 0, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.192 dB
Peak SAR (extrapolated) = 0.266 W/kg
SAR(1 g) = 0.130 mW/g; SAR(10 g) = 0.064 mW/g



0 dB = 0.180mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

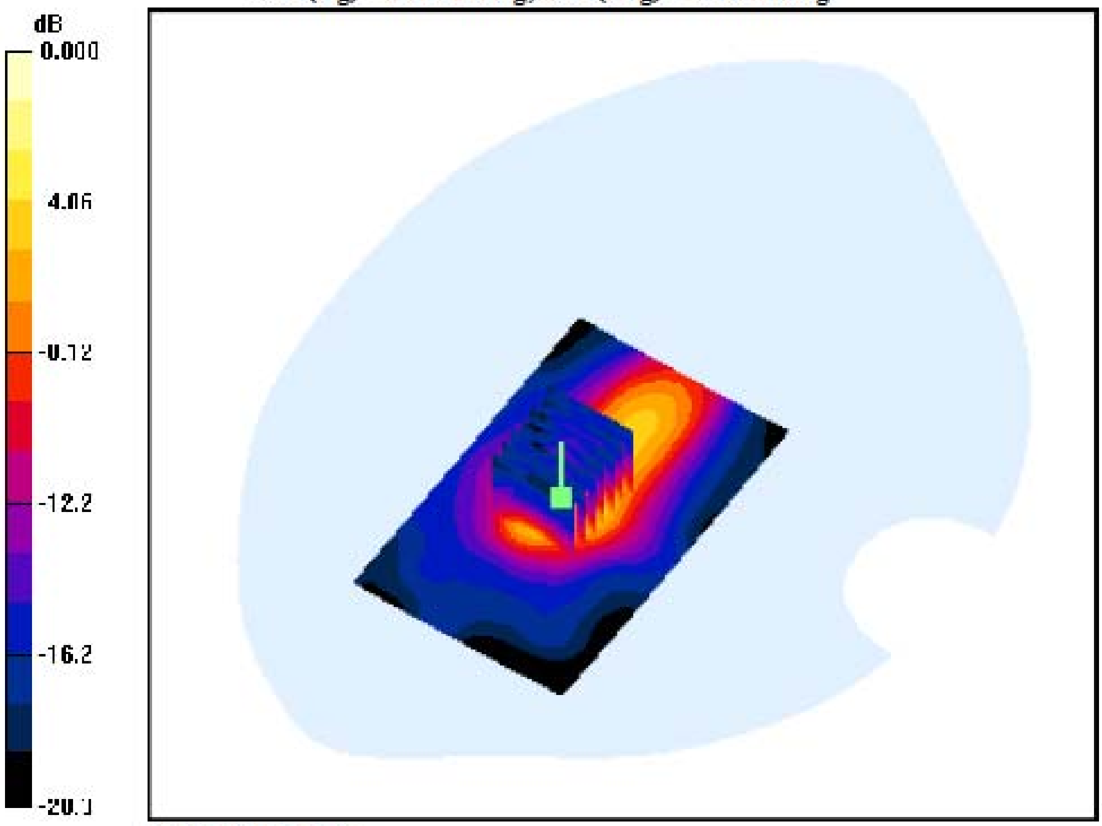
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Vertical Back, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 0, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.122 dB
Peak SAR (extrapolated) = 0.719 W/kg
SAR(1 g) = 0.282 mW/g; SAR(10 g) = 0.113 mW/g



0 dB = 0.422mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; $\sigma = 1.96$ mho/m; $\varepsilon_r = 51.5$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

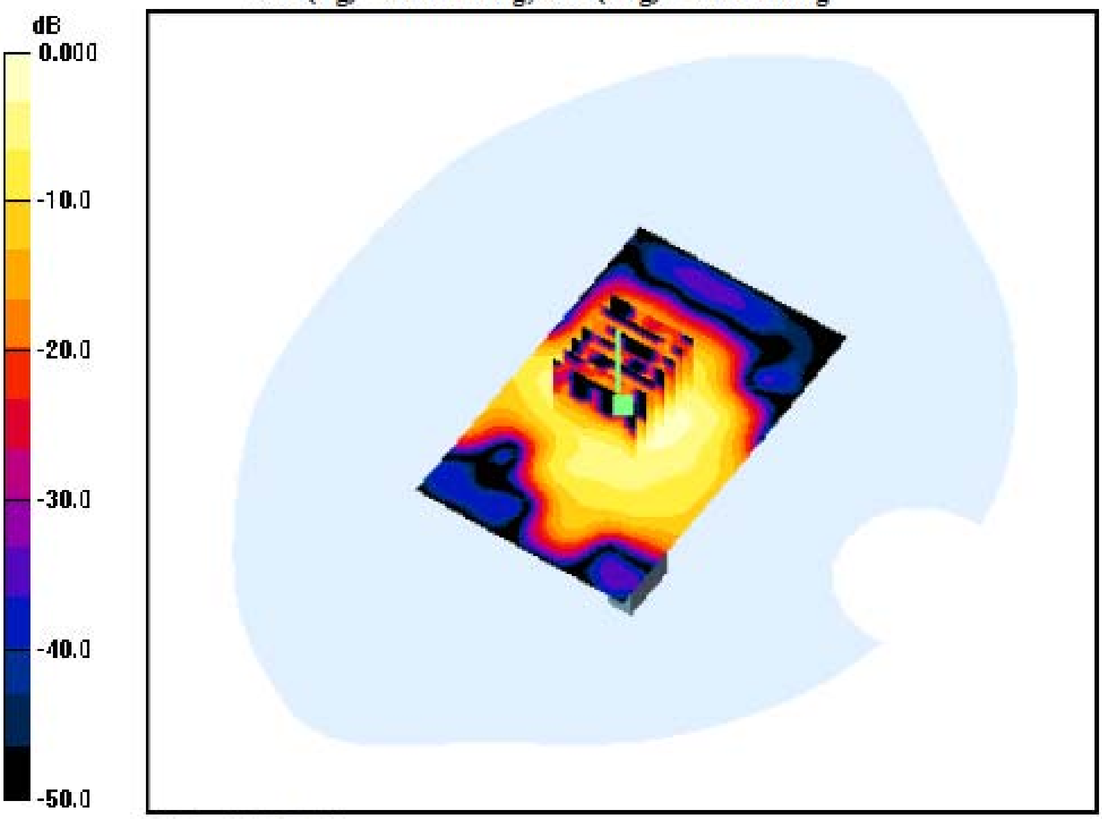
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2012-01-24; Ambient Temp: 22.1; Tissue Temp:22.3

5 mm space from Body, Tip, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant. 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.063 dB
Peak SAR (extrapolated) = 0.181 W/kg
SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.020 mW/g



0 dB = 0.068mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.91 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

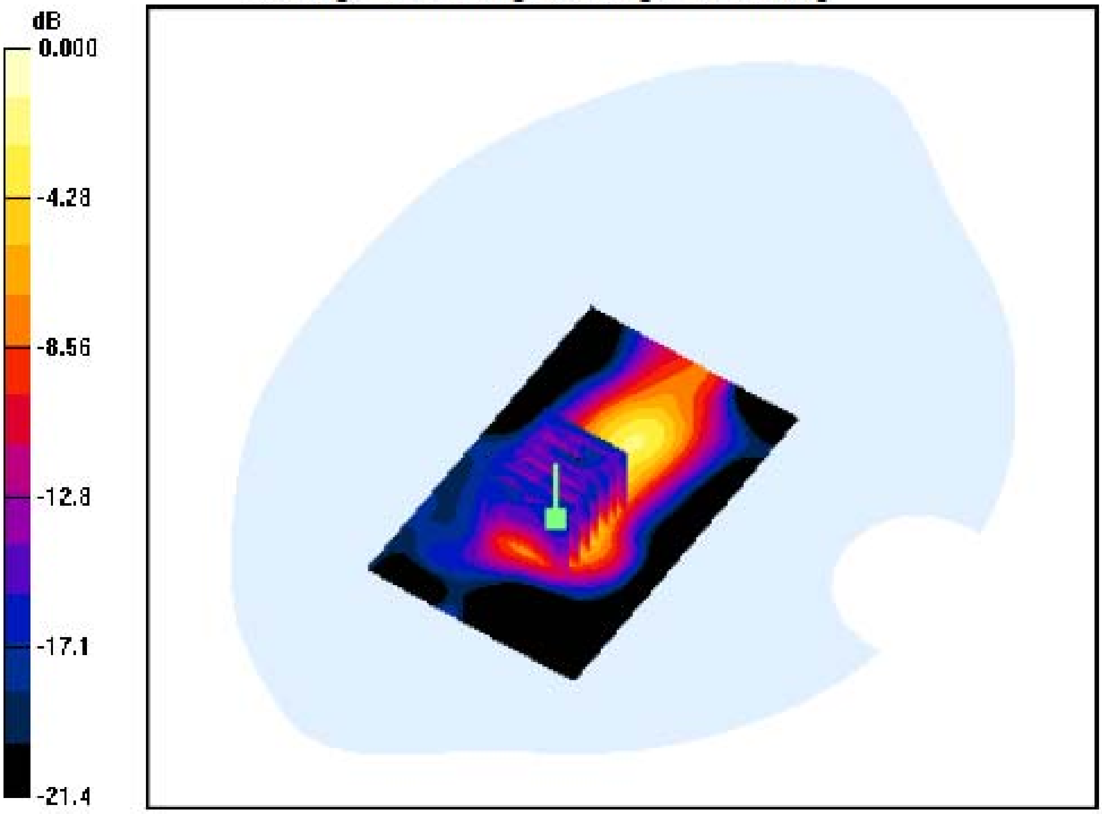
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Up, W-LAN(802.11b) Ch. 1(2412 MHz)

Antenna Position : Ant 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.107 dB
Peak SAR (extrapolated) = 0.941 W/kg
SAR(1 g) = 0.410 mW/g; SAR(10 g) = 0.170 mW/g



0 dB = 0.615mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; $\sigma = 1.92$ mho/m; $\varepsilon_r = 53.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

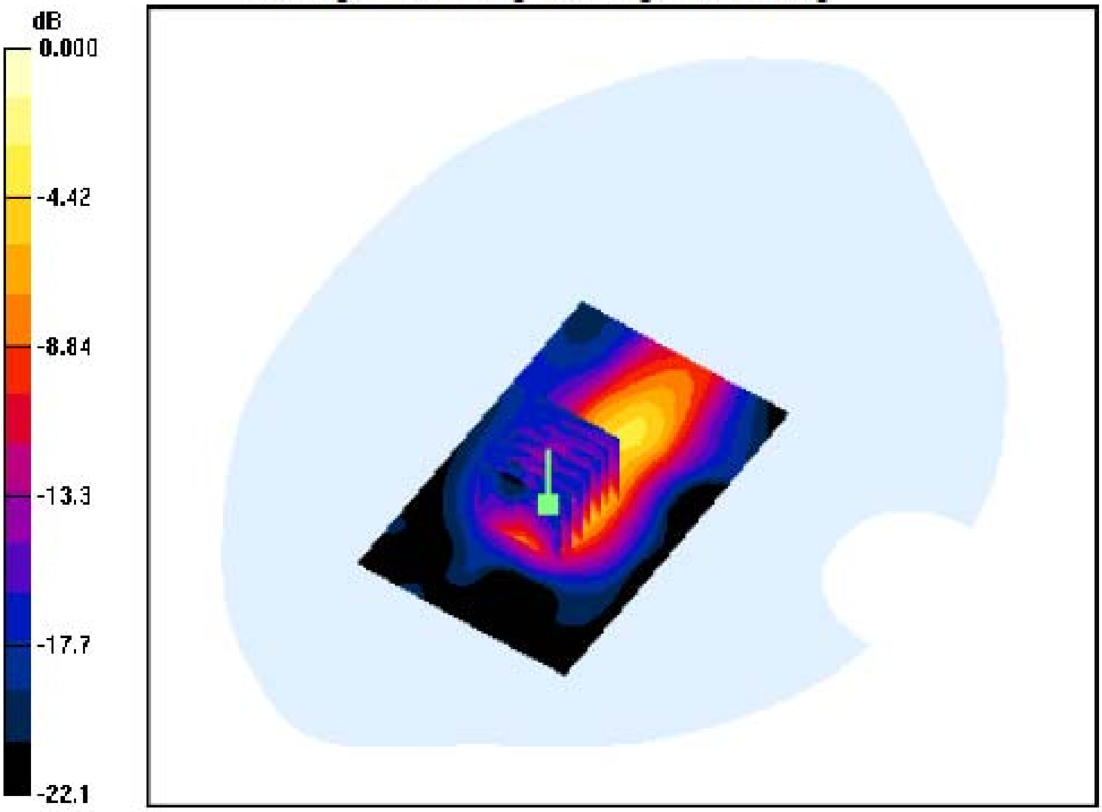
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Up, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.188 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.453 mW/g; SAR(10 g) = 0.179 mW/g



0 dB = 0.686mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 1.95 mho/m; ε_r = 53.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

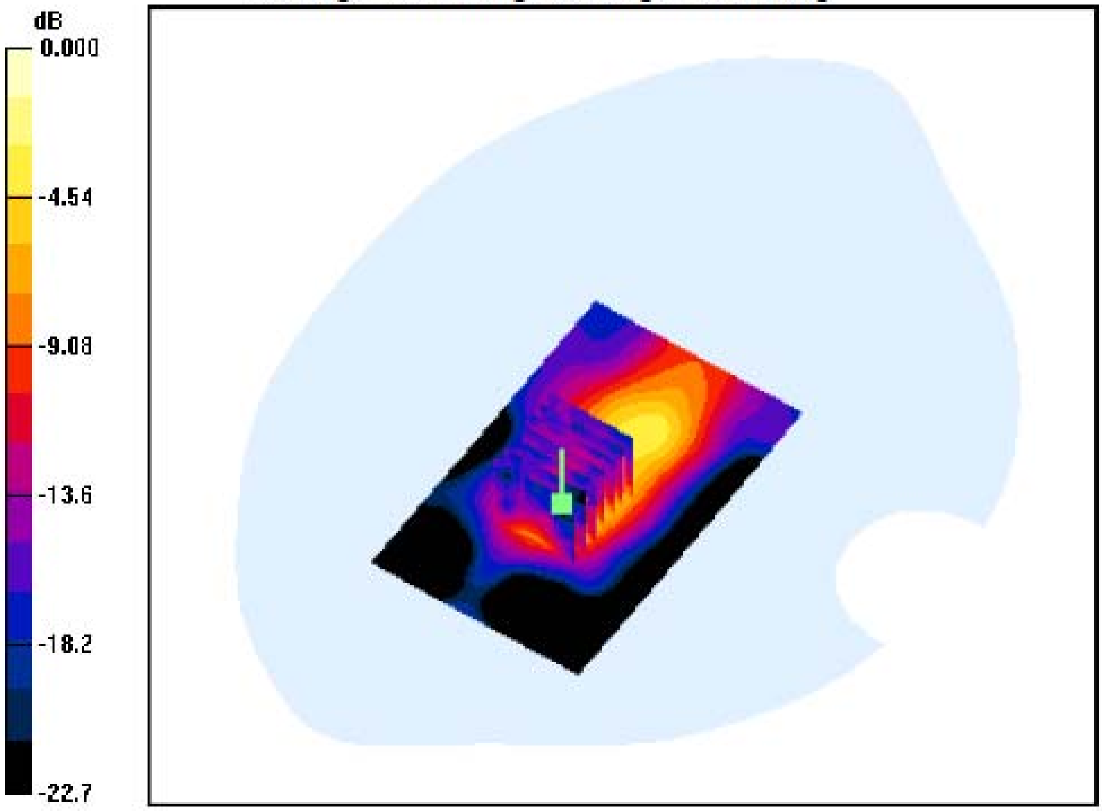
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Up, W-LAN(802.11b) Ch. 11(2462 MHz)

Antenna Position : Ant 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.072 dB
Peak SAR (extrapolated) = 0.813 W/kg
SAR(1 g) = 0.330 mW/g; SAR(10 g) = 0.134 mW/g



0 dB = 0.492mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

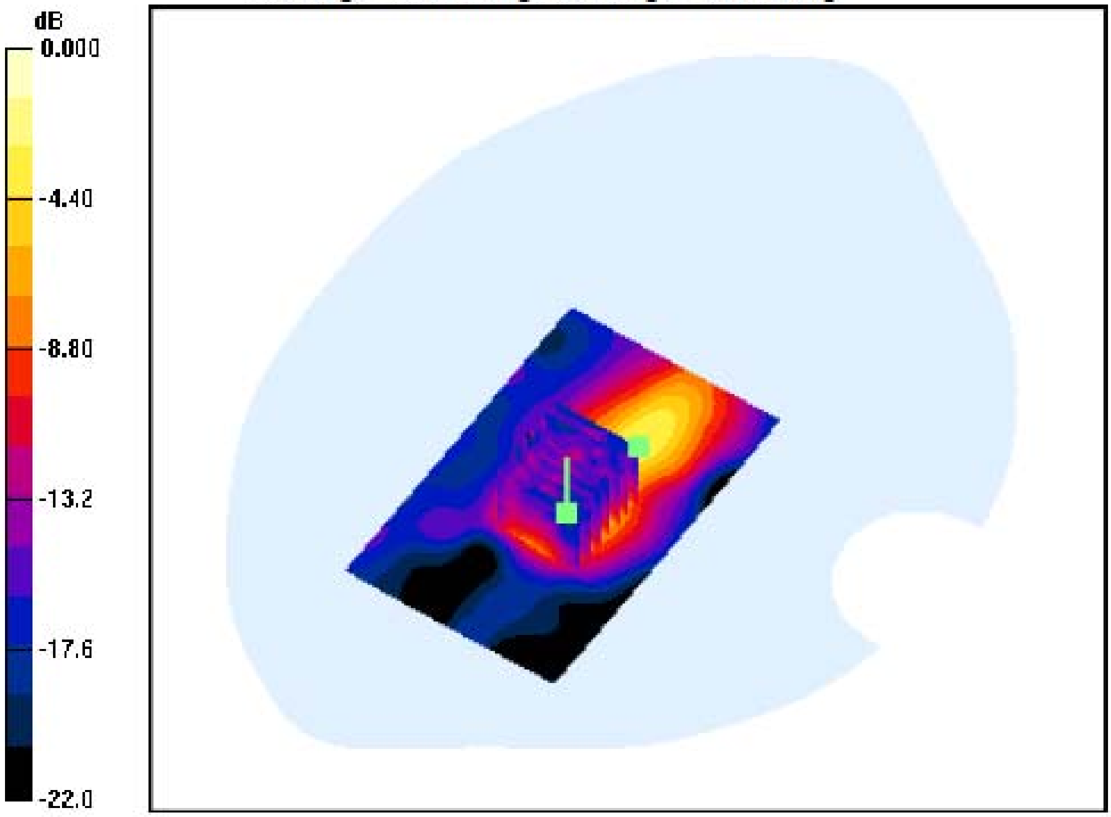
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Down, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.133 dB
Peak SAR (extrapolated) = 0.897 W/kg
SAR(1 g) = 0.360 mW/g; SAR(10 g) = 0.145 mW/g



0 dB = 0.539mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

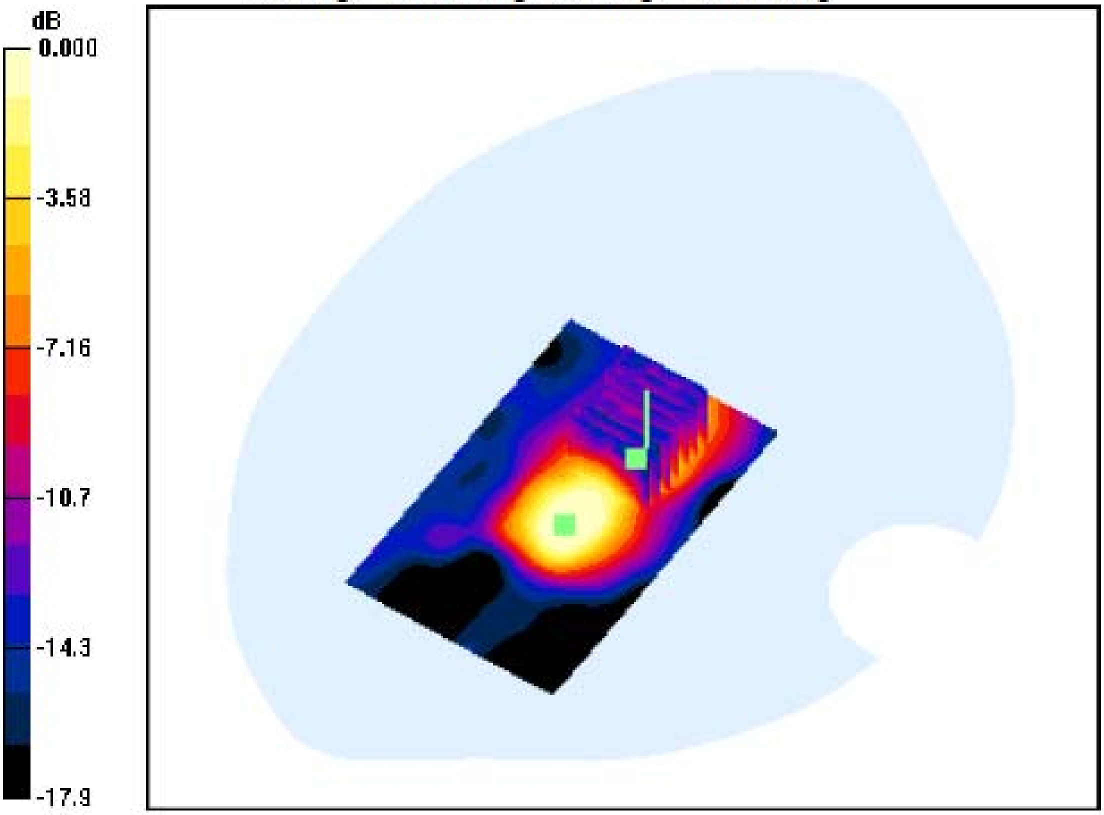
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Down, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.133 dB
Peak SAR (extrapolated) = 0.431 W/kg
SAR(1 g) = 0.218 mW/g; SAR(10 g) = 0.108 mW/g



0 dB = 0.304mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

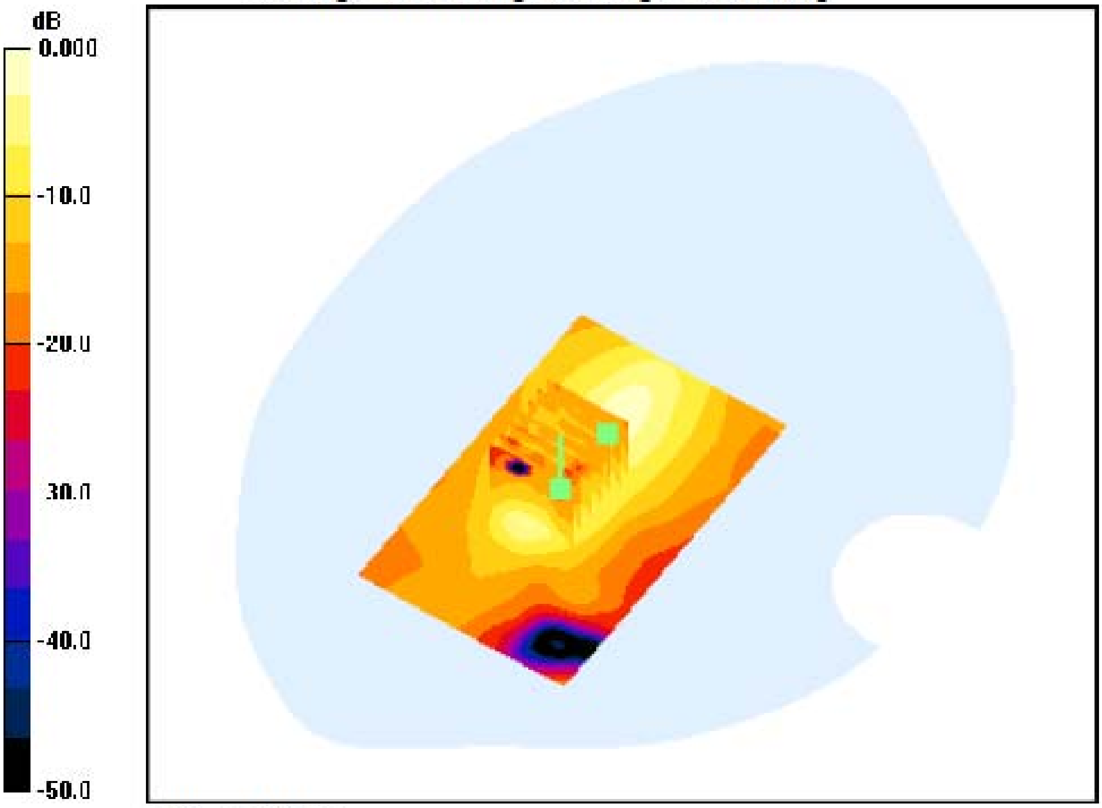
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Vertical Front, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.154 dB
Peak SAR (extrapolated) = 0.550 W/kg
SAR(1 g) = 0.236 mW/g; SAR(10 g) = 0.104 mW/g



0 dB = 0.340mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

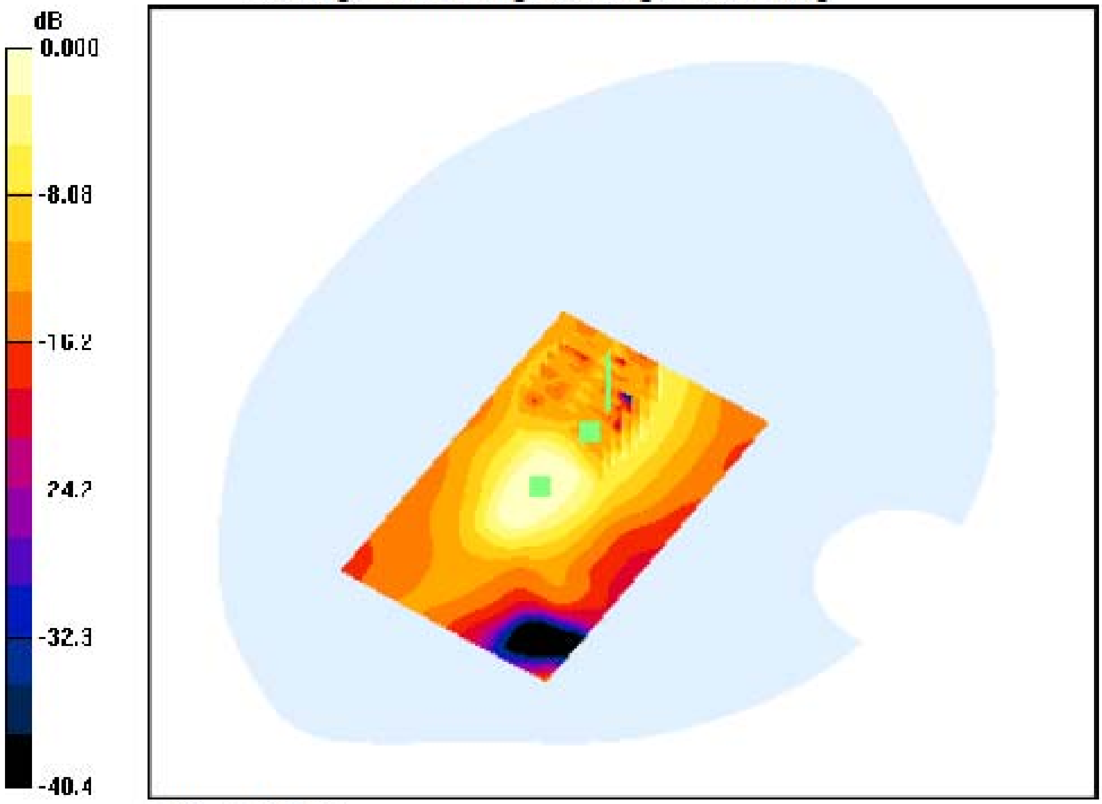
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Vertical Front, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.154 dB
Peak SAR (extrapolated) = 0.350 W/kg
SAR(1 g) = 0.176 mW/g; SAR(10 g) = 0.088 mW/g



0 dB = 0.243mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

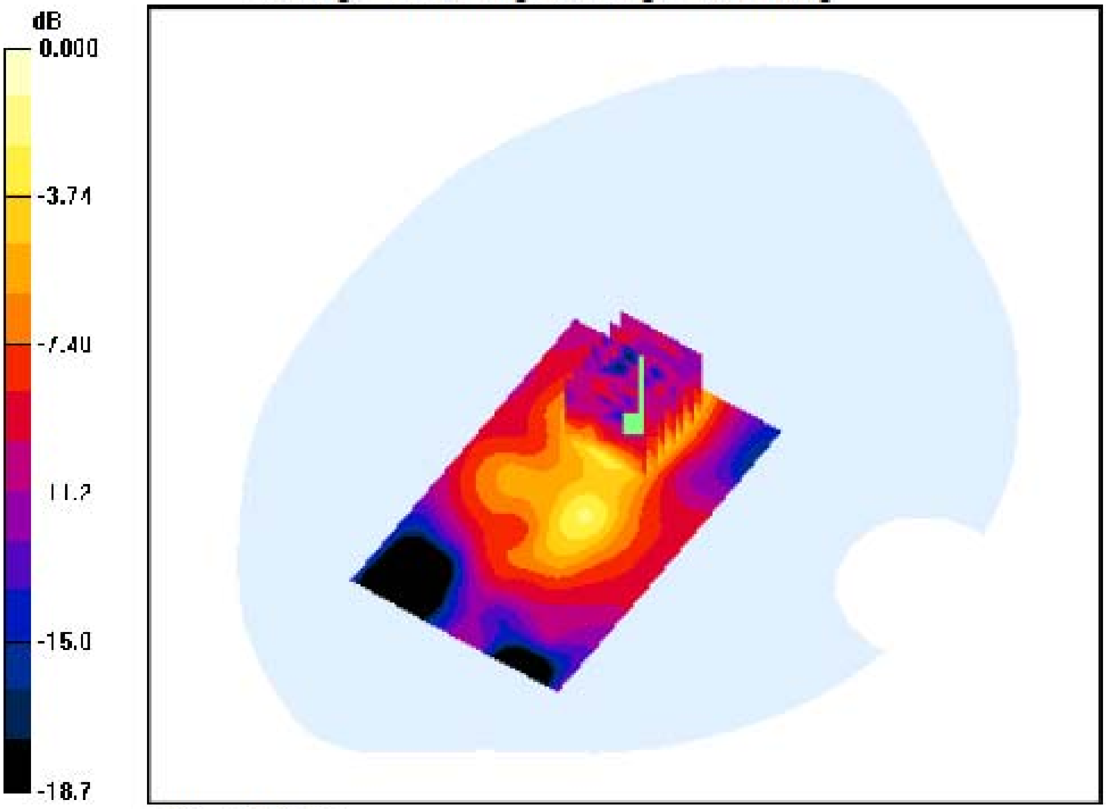
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Vertical Back, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.131 dB
Peak SAR (extrapolated) = 0.174 W/kg
SAR(1 g) = 0.079 mW/g; SAR(10 g) = 0.039 mW/g



0 dB = 0.107mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

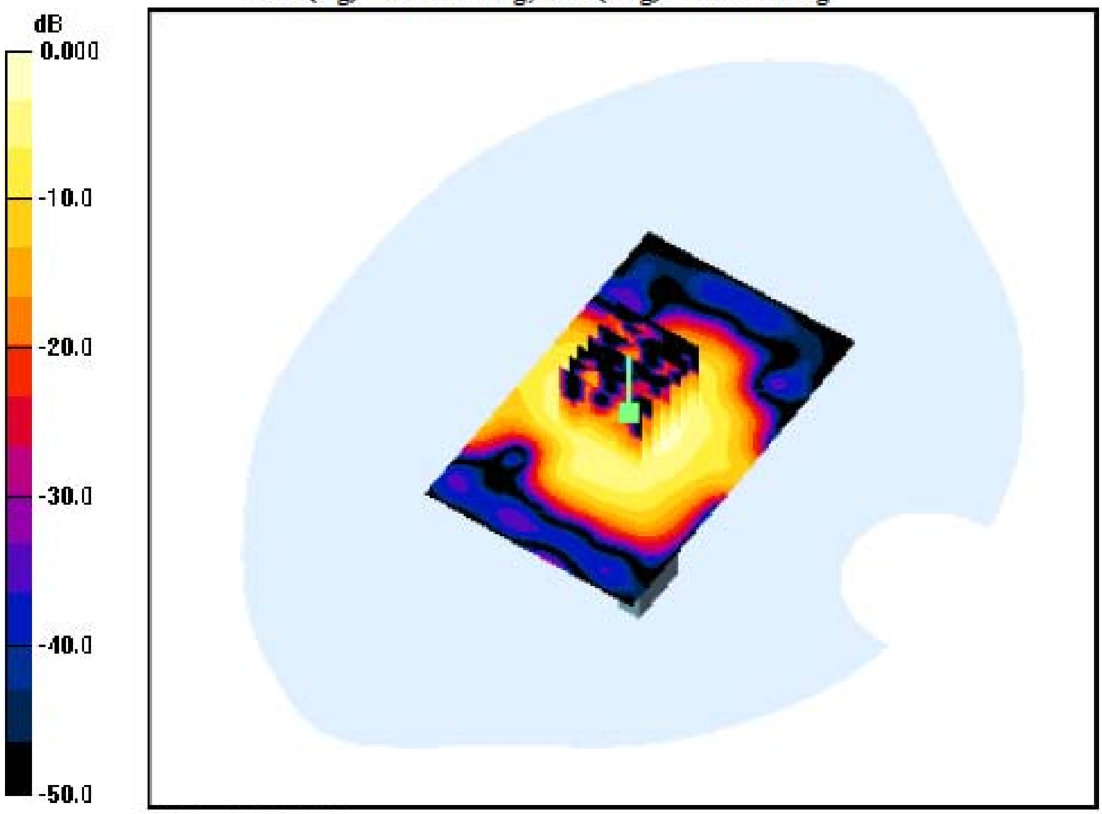
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2012-01-24; Ambient Temp: 22.1; Tissue Temp:22.3

5 mm space from Body, Tip, W-LAN(802.11n HT20) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.192 dB
Peak SAR (extrapolated) = 0.111 W/kg
SAR(1 g) = 0.048 mW/g; SAR(10 g) = 0.020 mW/g



0 dB = 0.069mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.9 mho/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

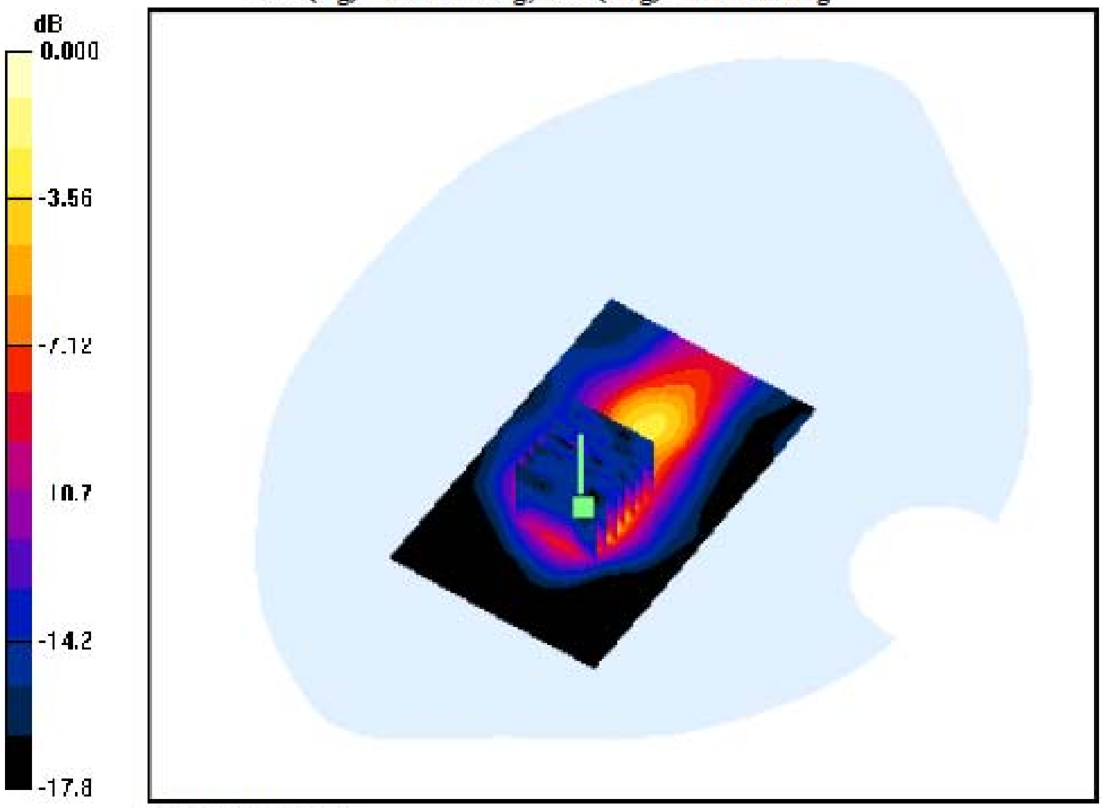
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Up, W-LAN(802.11n HT 20) Ch. 1(2412 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.048 dB
Peak SAR (extrapolated) = 0.641 W/kg
SAR(1 g) = 0.276 mW/g; SAR(10 g) = 0.124 mW/g



0 dB = 0.388mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

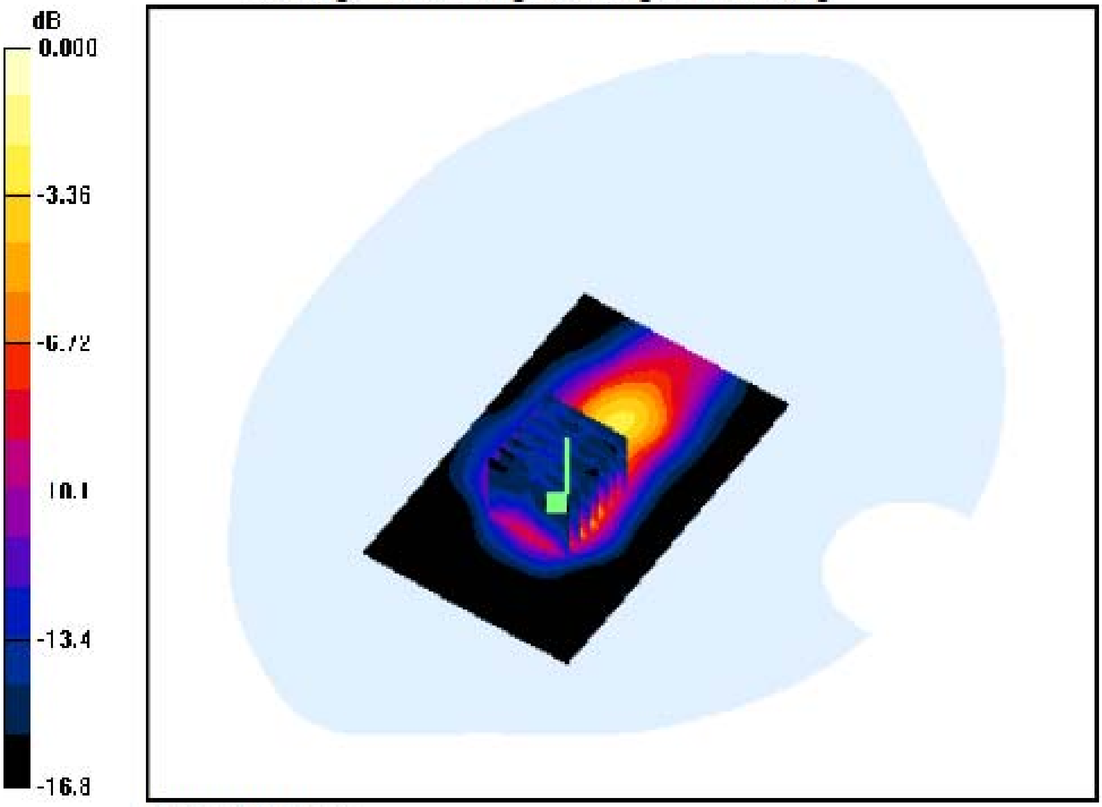
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Up, W-LAN(802.11n HT 20) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.030 dB
Peak SAR (extrapolated) = 0.684 W/kg
SAR(1 g) = 0.287 mW/g; SAR(10 g) = 0.130 mW/g



0 dB = 0.404mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2462 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2462 MHz; σ = 2.01 mho/m; ε_r = 52.6; ρ = 1000 kg/m^3
Phantom section: Flat Section

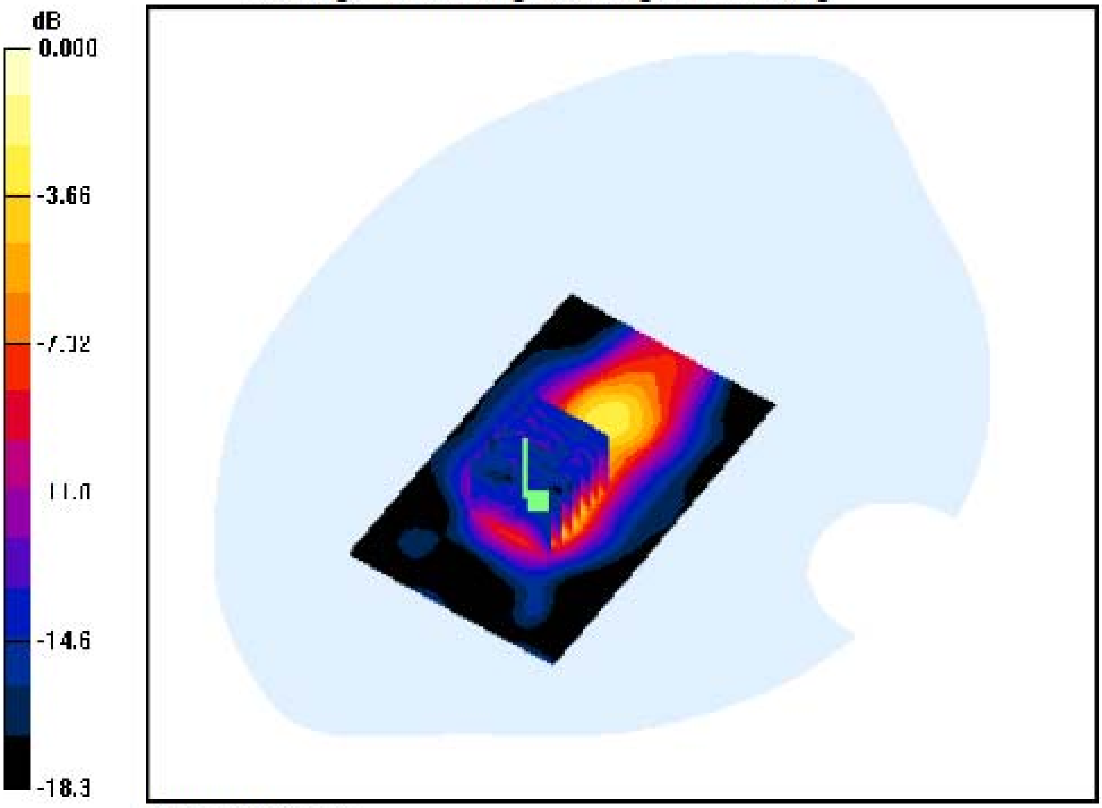
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Up, W-LAN(802.11n HT 20) Ch. 11(2462 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.096 dB
Peak SAR (extrapolated) = 0.566 W/kg
SAR(1 g) = **0.245** mW/g; SAR(10 g) = **0.110** mW/g



0 dB = 0.341mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

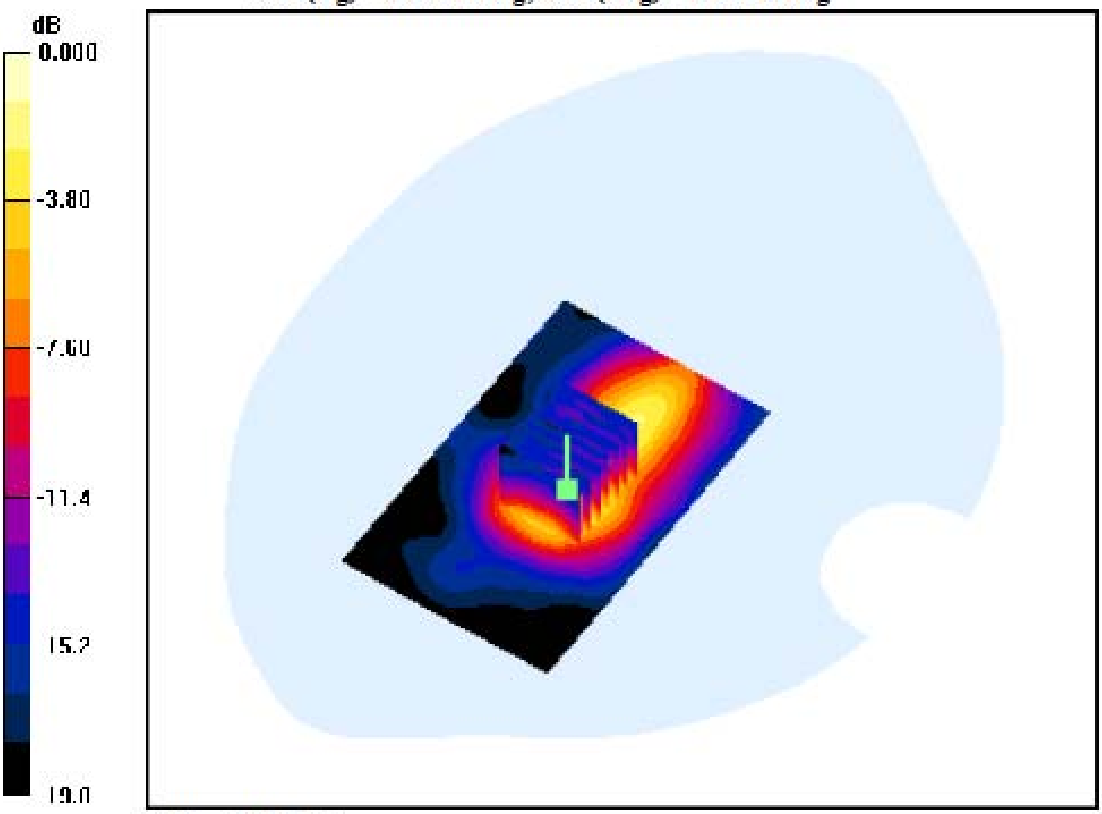
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Down, W-LAN(802.11n HT 20) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.082 dB
Peak SAR (extrapolated) = 0.597 W/kg
SAR(1 g) = 0.272 mW/g; SAR(10 g) = 0.127 mW/g



0 dB = 0.383mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

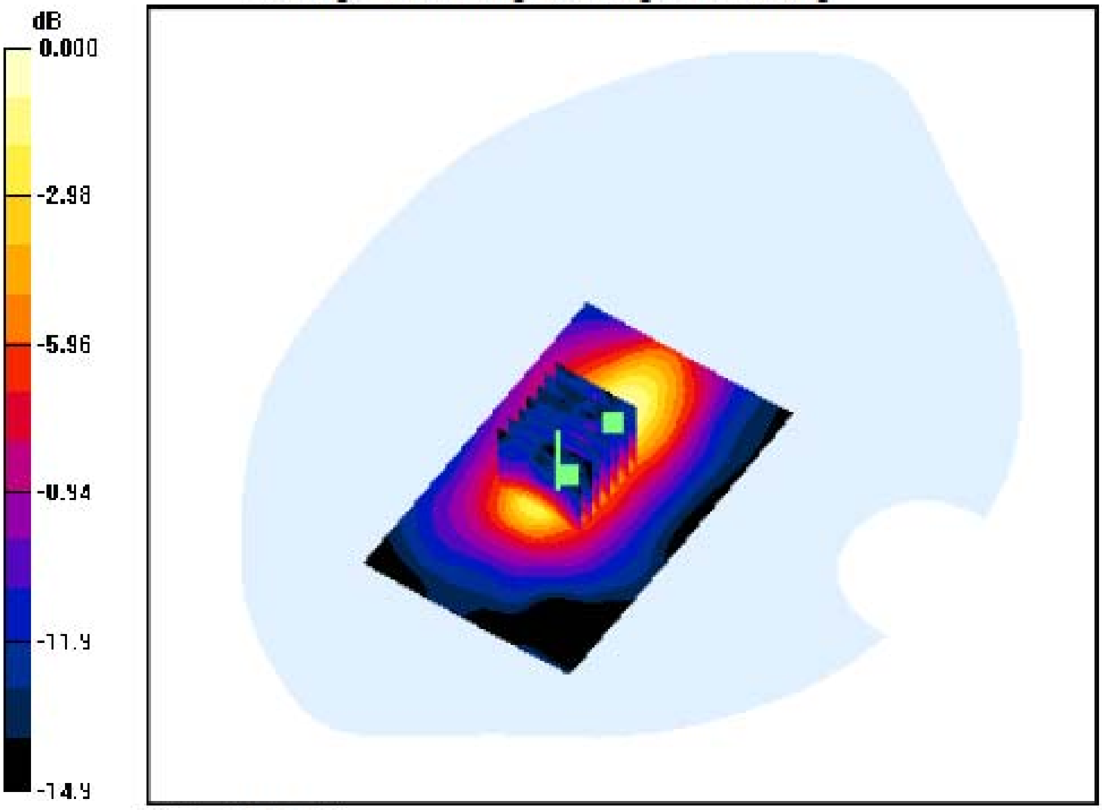
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Vertical Front, W-LAN(802.11n HT 20) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.010 dB
Peak SAR (extrapolated) = 0.283 W/kg
SAR(1 g) = 0.125 mW/g; SAR(10 g) = 0.059 mW/g



0 dB = 0.177mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; $\sigma = 1.95$ mho/m; $\varepsilon_r = 52$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

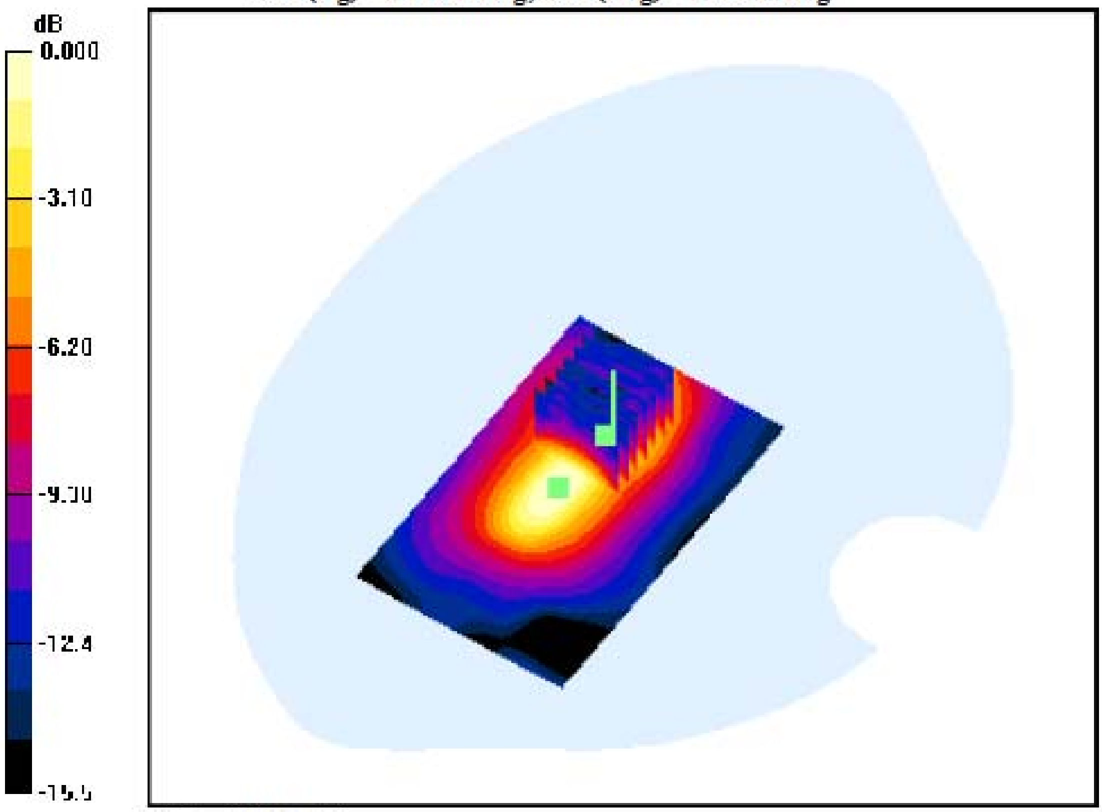
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Vertical Front, W-LAN(802.11n HT 20) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.010 dB
Peak SAR (extrapolated) = 0.242 W/kg
SAR(1 g) = 0.119 mW/g; SAR(10 g) = 0.060 mW/g



0 dB = 0.164mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

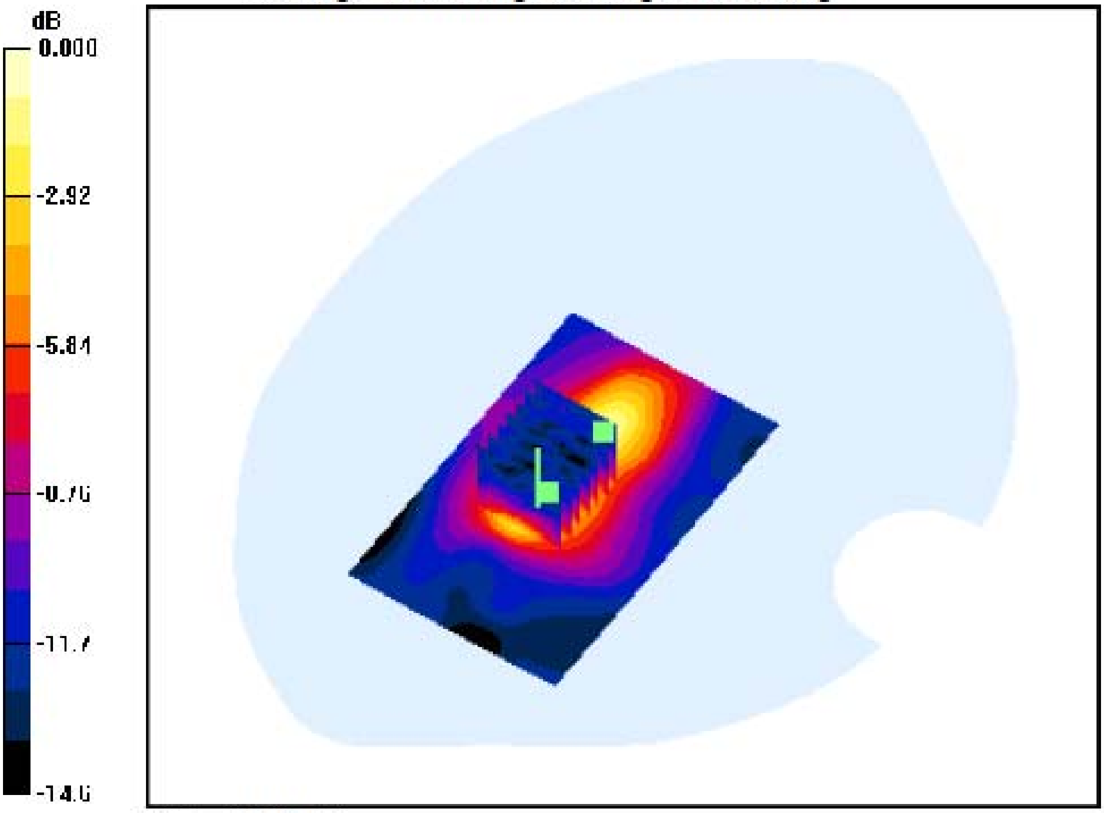
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Vertical Back, W-LAN(802.11n HT 20) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.164 dB
Peak SAR (extrapolated) = 0.255 W/kg
SAR(1 g) = 0.102 mW/g; SAR(10 g) = 0.045 mW/g



0 dB = 0.150mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

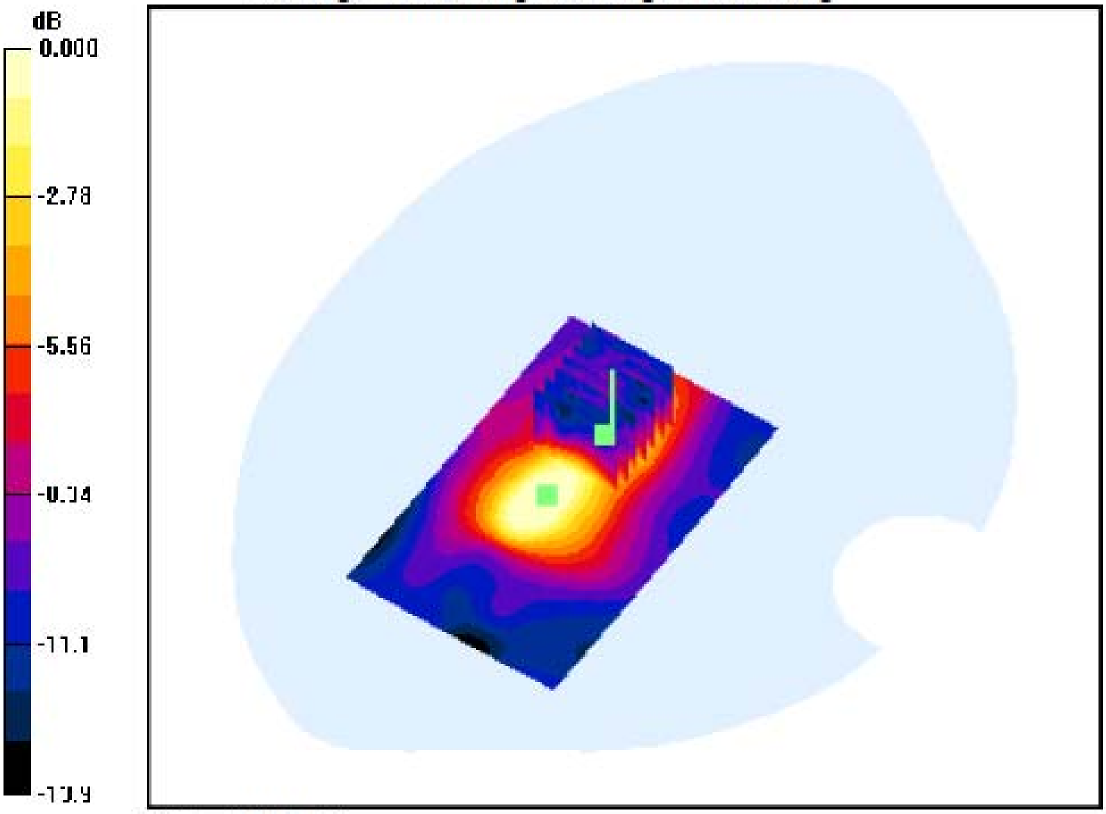
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Vertical Back, W-LAN(802.11n HT 20) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.164 dB
Peak SAR (extrapolated) = 0.160 W/kg
SAR(1 g) = 0.079 mW/g; SAR(10 g) = 0.040 mW/g



0 dB = 0.108mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.96 mho/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section

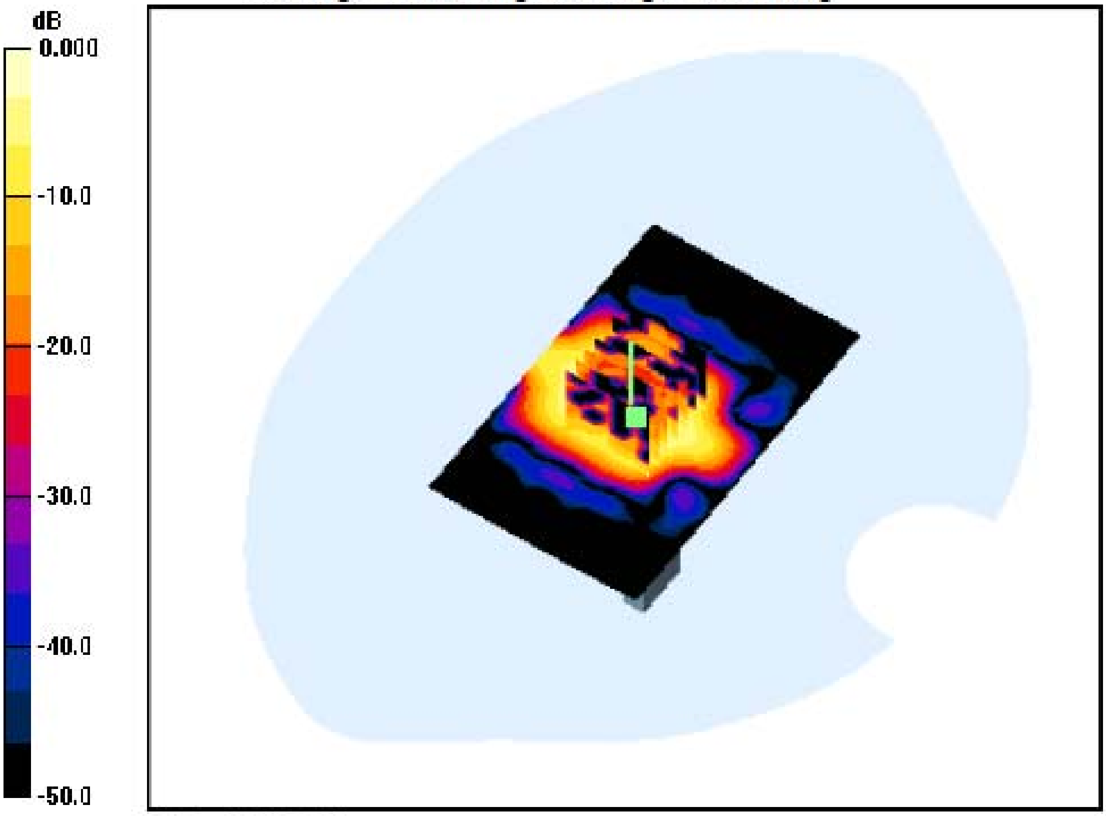
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2012-01-24; Ambient Temp: 22.1; Tissue Temp:22.3

5 mm space from Body, Tip, W-LAN(802.11n HT40) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.105 dB
Peak SAR (extrapolated) = 0.061 W/kg
SAR(1 g) = 0.029 mW/g; SAR(10 g) = 0.011 mW/g



0 dB = 0.043mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2422 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2422 MHz; σ = 1.92 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

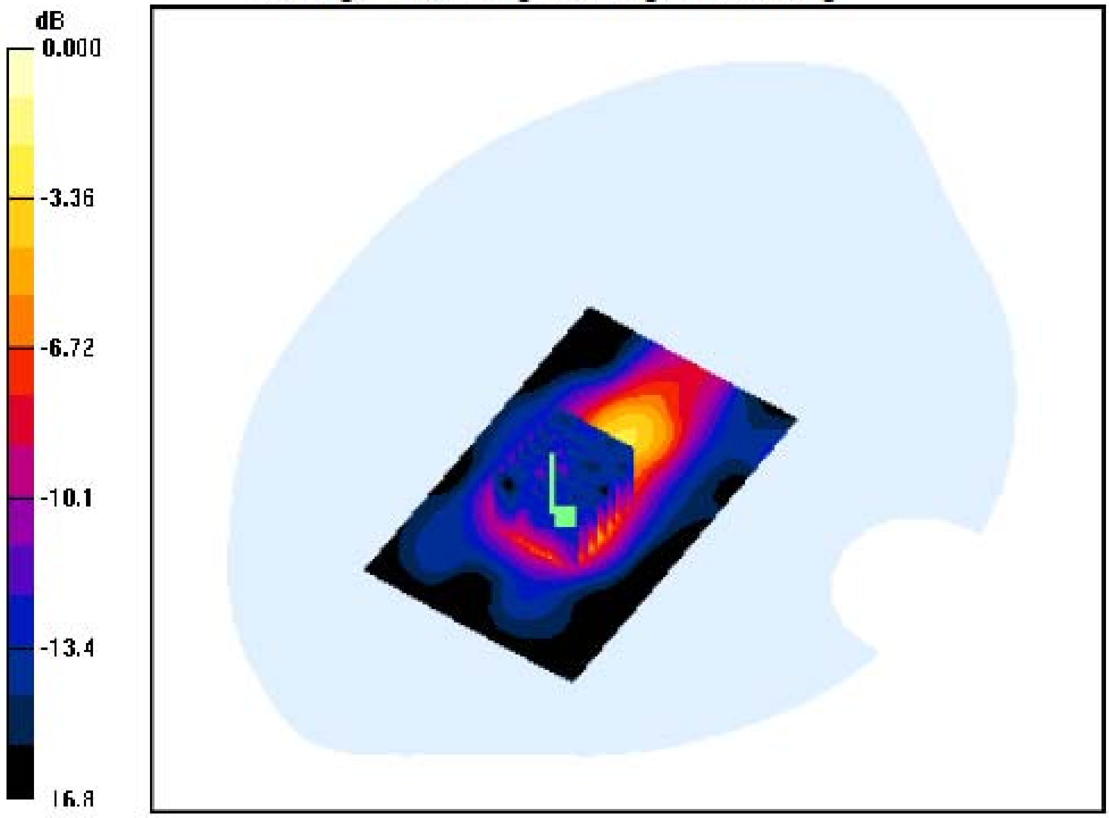
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Up, W-LAN(802.11n HT 40) Ch. 3(2422 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.128 dB
Peak SAR (extrapolated) = 0.375 W/kg
SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.076 mW/g



0 dB = 0.232mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

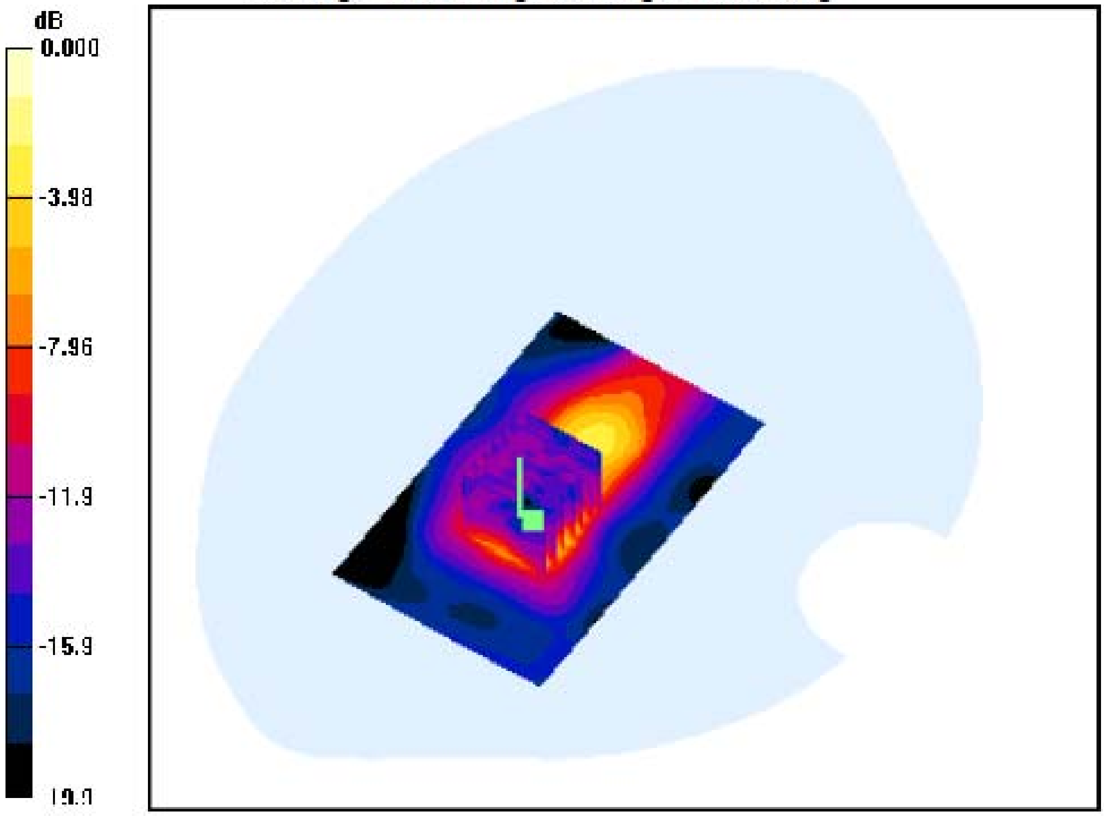
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Up, W-LAN(802.11n HT 40) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.015 dB
Peak SAR (extrapolated) = 0.401 W/kg
SAR(1 g) = 0.166 mW/g; SAR(10 g) = 0.076 mW/g



0 dB = 0.235mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2452 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2452 MHz; σ = 1.99 mho/m; ε_r = 52.4; ρ = 1000 kg/m^3
Phantom section: Flat Section

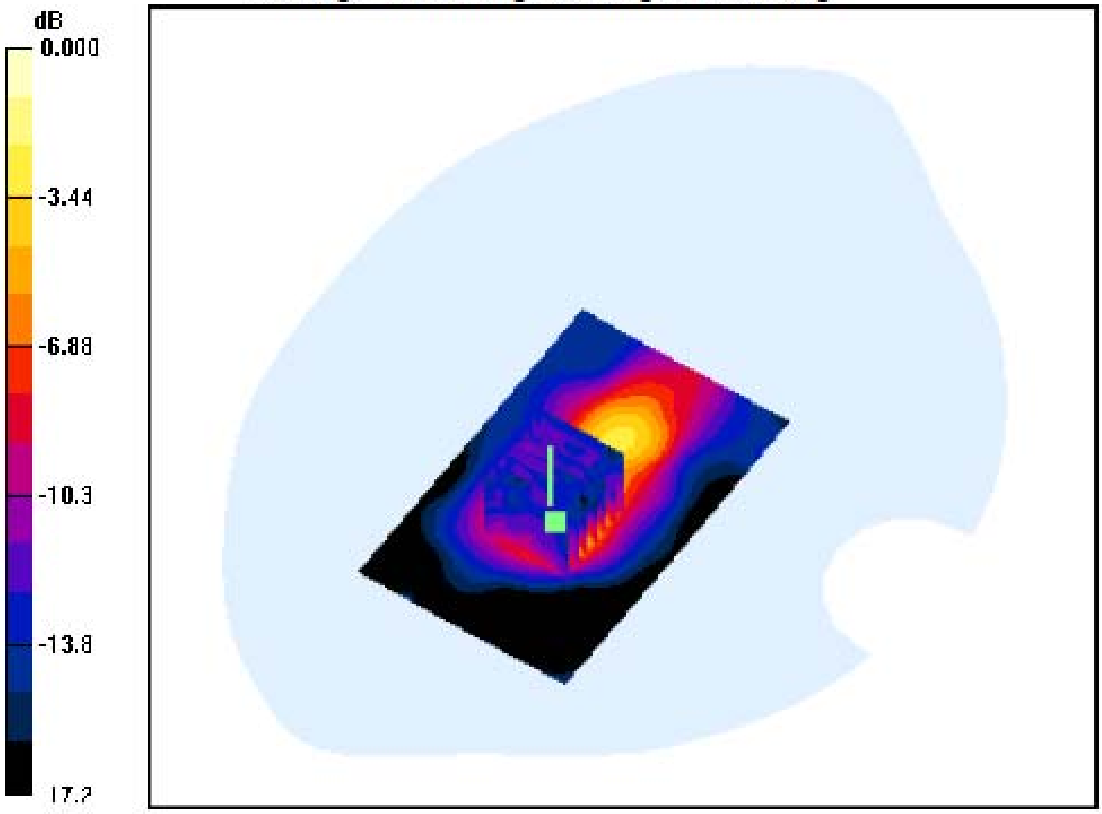
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Up, W-LAN(802.11n HT 40) Ch. 9(2452 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.142 dB
Peak SAR (extrapolated) = 0.353 W/kg
SAR(1 g) = 0.148 mW/g; SAR(10 g) = 0.069 mW/g



0 dB = 0.212mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

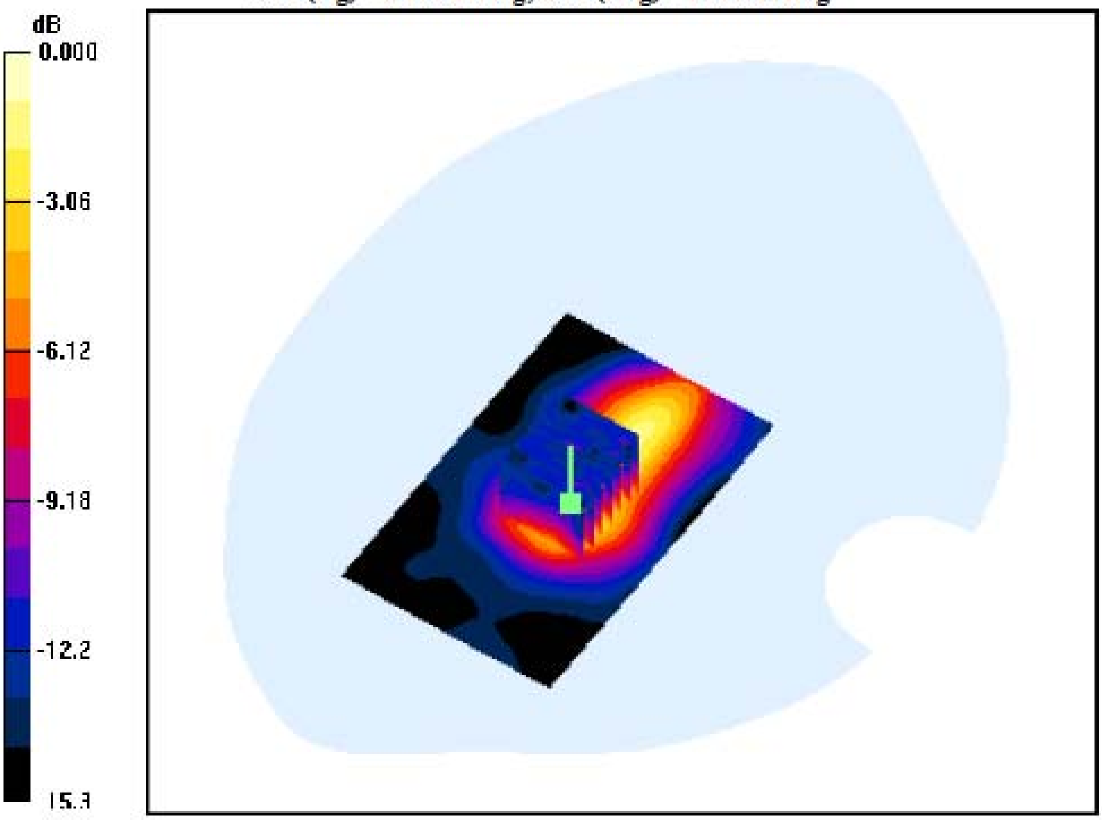
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Down, W-LAN(802.11n HT 40) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = 0.105 dB
Peak SAR (extrapolated) = 0.295 W/kg
SAR(1 g) = 0.139 mW/g; SAR(10 g) = 0.068 mW/g



0 dB = 0.192mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

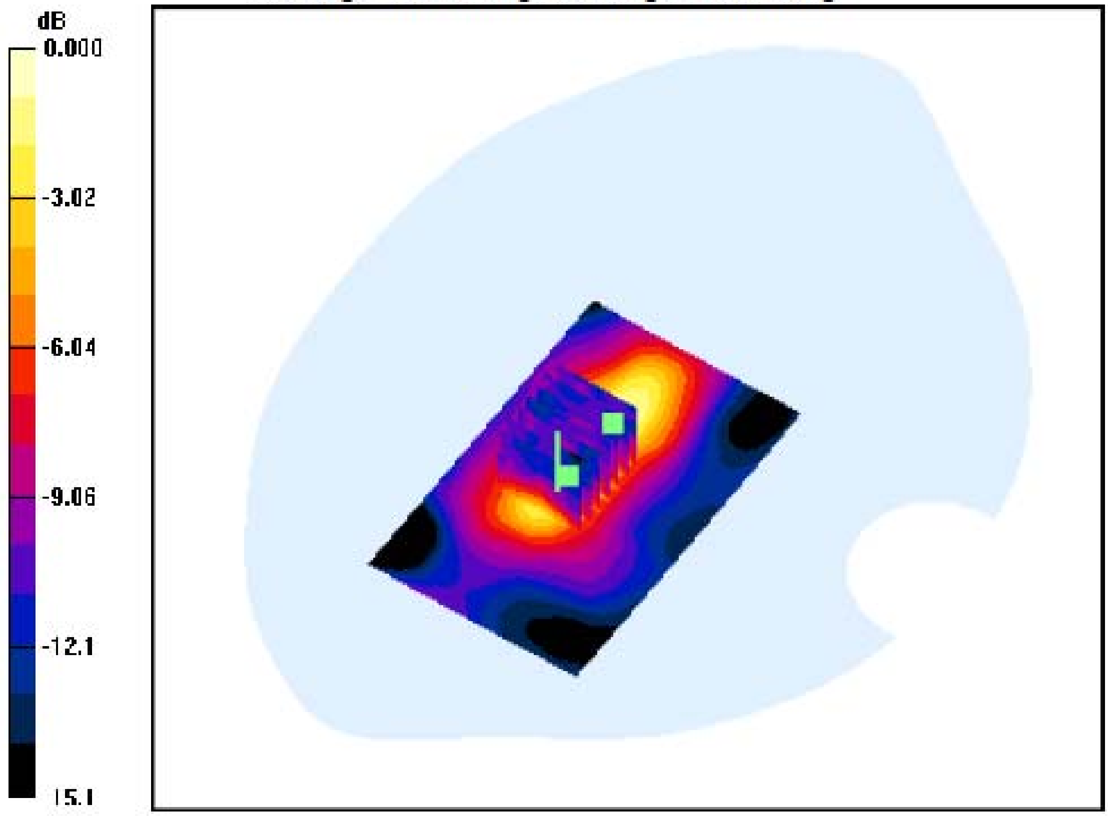
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Vertical Front, W-LAN(802.11n HT 40) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.033 dB
Peak SAR (extrapolated) = 0.194 W/kg
SAR(1 g) = 0.082 mW/g; SAR(10 g) = 0.040 mW/g



0 dB = 0.117mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

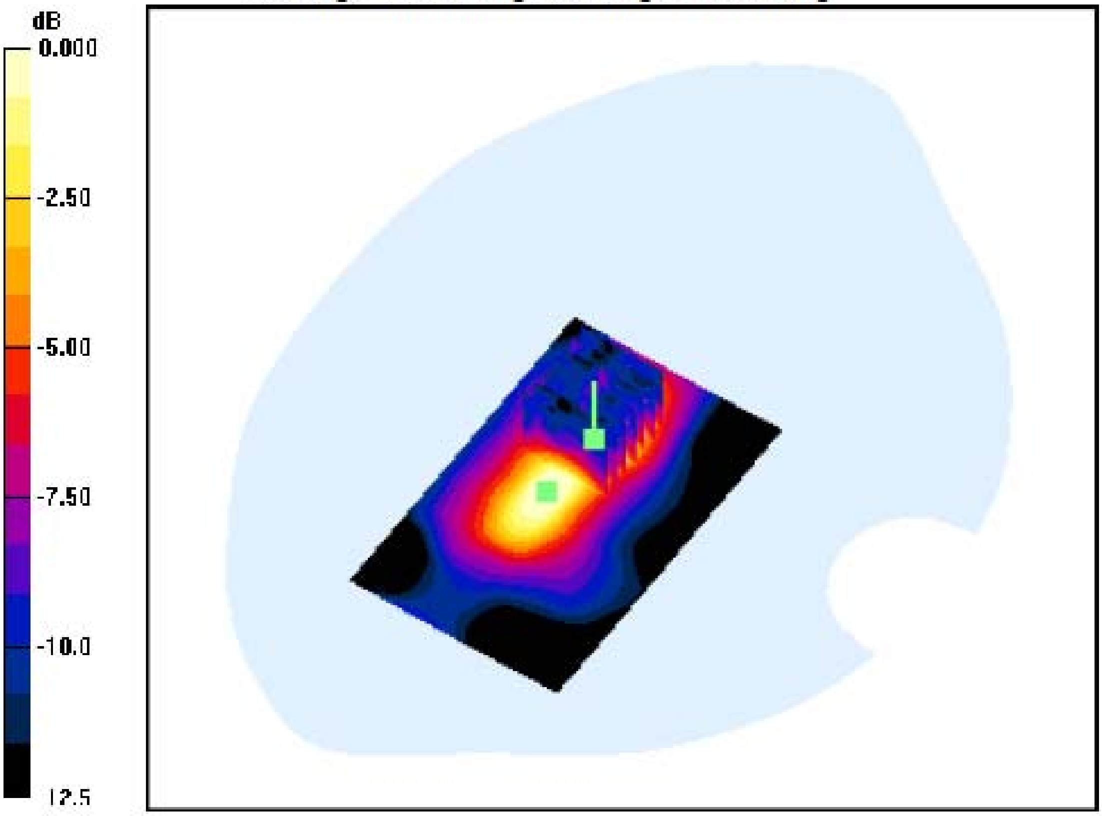
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Vertical Front, W-LAN(802.11n HT 40) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.033 dB
Peak SAR (extrapolated) = 0.157 W/kg
SAR(1 g) = 0.072 mW/g; SAR(10 g) = 0.038 mW/g



0 dB = 0.101mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; $\sigma = 1.95$ mho/m; $\varepsilon_r = 52$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section

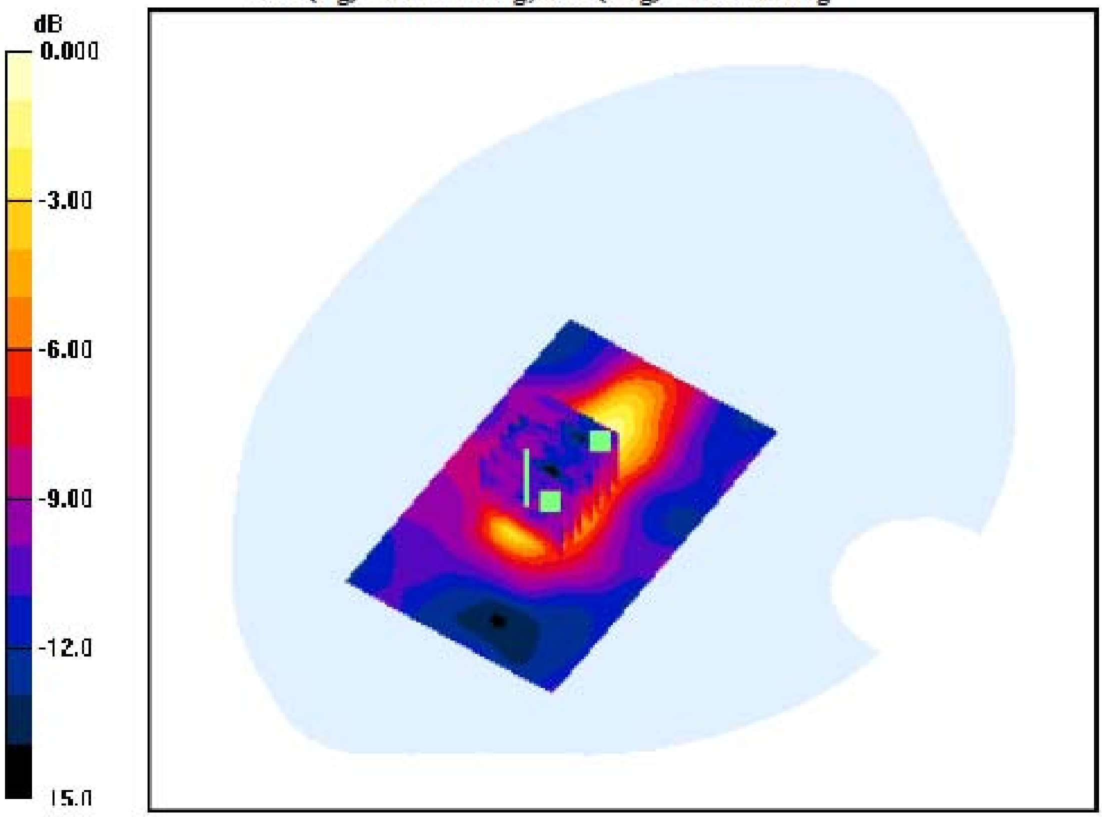
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Vertical Back, W-LAN(802.11n HT 40) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.137 dB
Peak SAR (extrapolated) = 0.153 W/kg
SAR(1 g) = 0.061 mW/g; SAR(10 g) = 0.029 mW/g



0 dB = 0.090mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

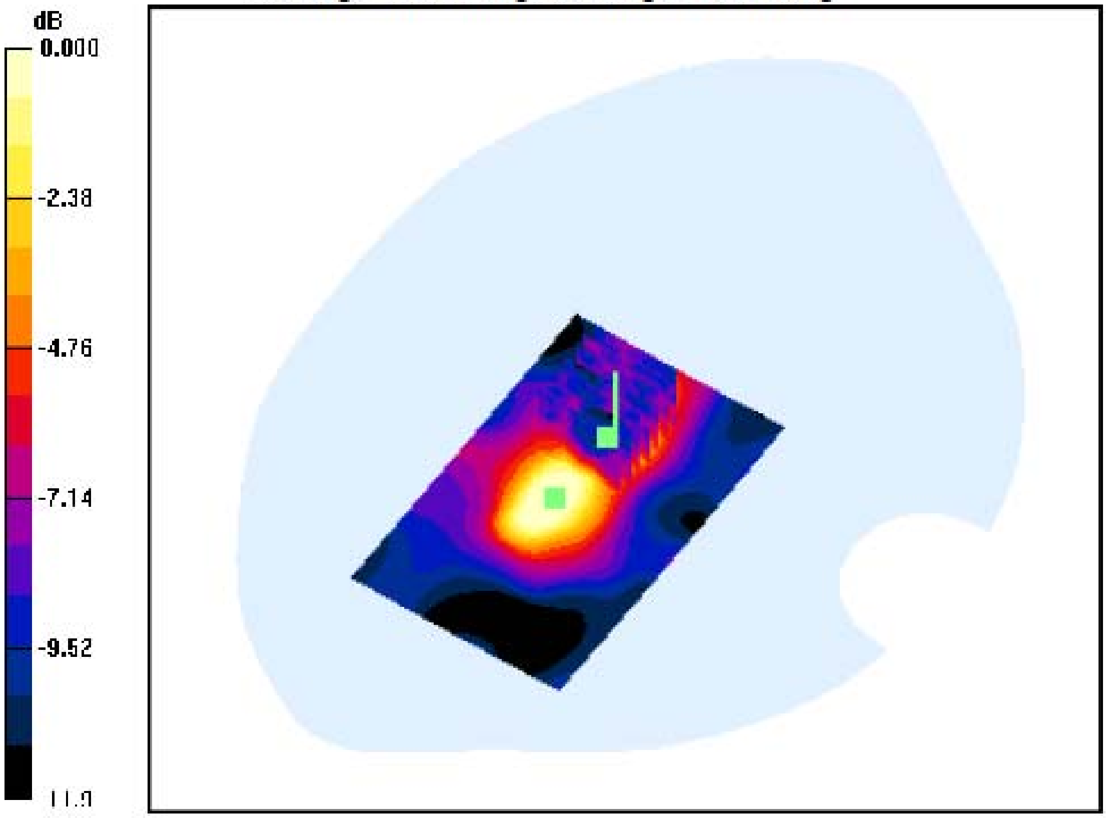
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Vertical Back, W-LAN(802.11n HT 40) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 1: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.137 dB
Peak SAR (extrapolated) = 0.096 W/kg
SAR(1 g) = 0.050 mW/g; SAR(10 g) = 0.027 mW/g



0 dB = 0.068mW/g

DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2412 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2412 MHz; σ = 1.91 mho/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section

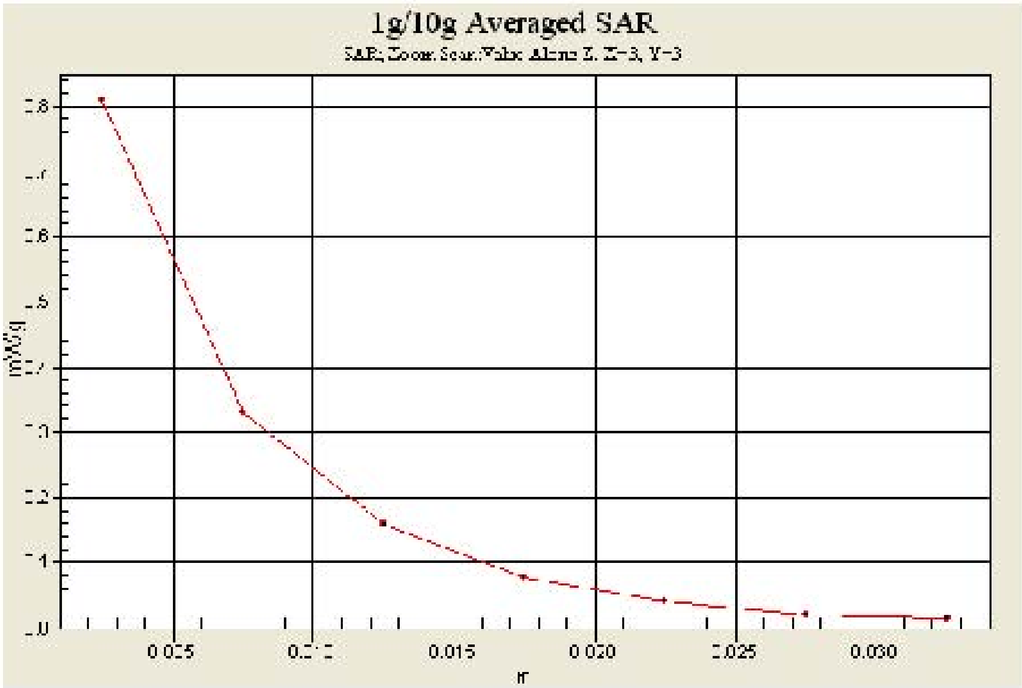
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Up, W-LAN(802.11b) Ch. 1(2412 MHz)

Antenna Position : Ant 0, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.172 dB
Peak SAR (extrapolated) = 1.40 W/kg
SAR(1 g) = 0.557 mW/g; SAR(10 g) = 0.239 mW/g



DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.92 mho/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section

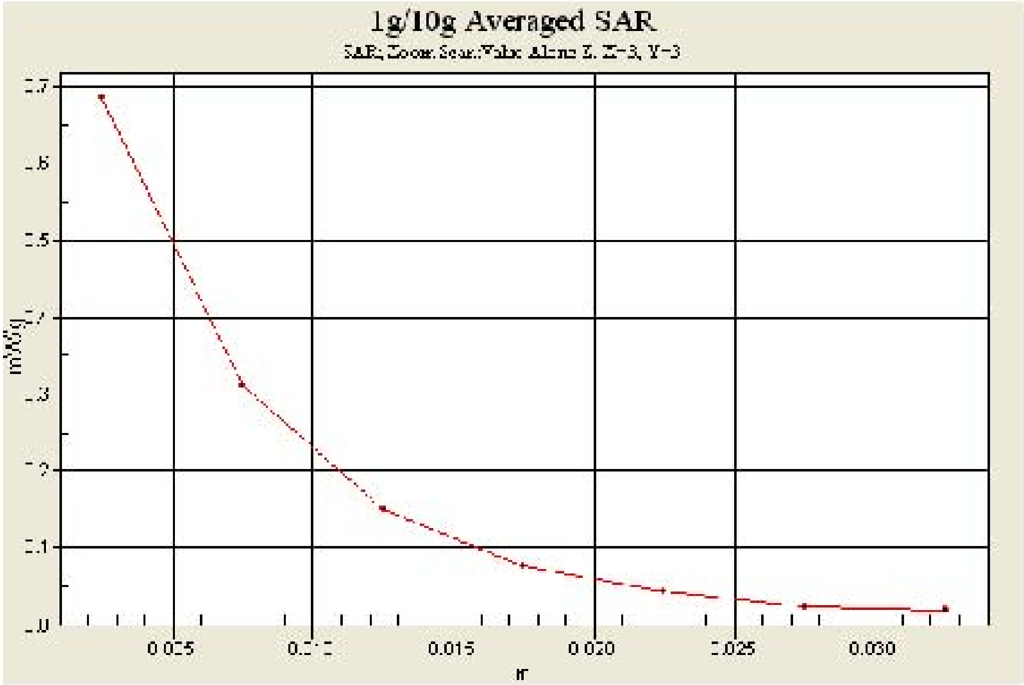
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-28; Ambient Temp: 22.1; Tissue Temp:22.5

5 mm space from Body, Horizontal Up, W-LAN(802.11b) Ch. 6(2437 MHz)

Antenna Position : Ant 1, Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.188 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.453 mW/g; SAR(10 g) = 0.179 mW/g



DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2437 MHz; σ = 1.95 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

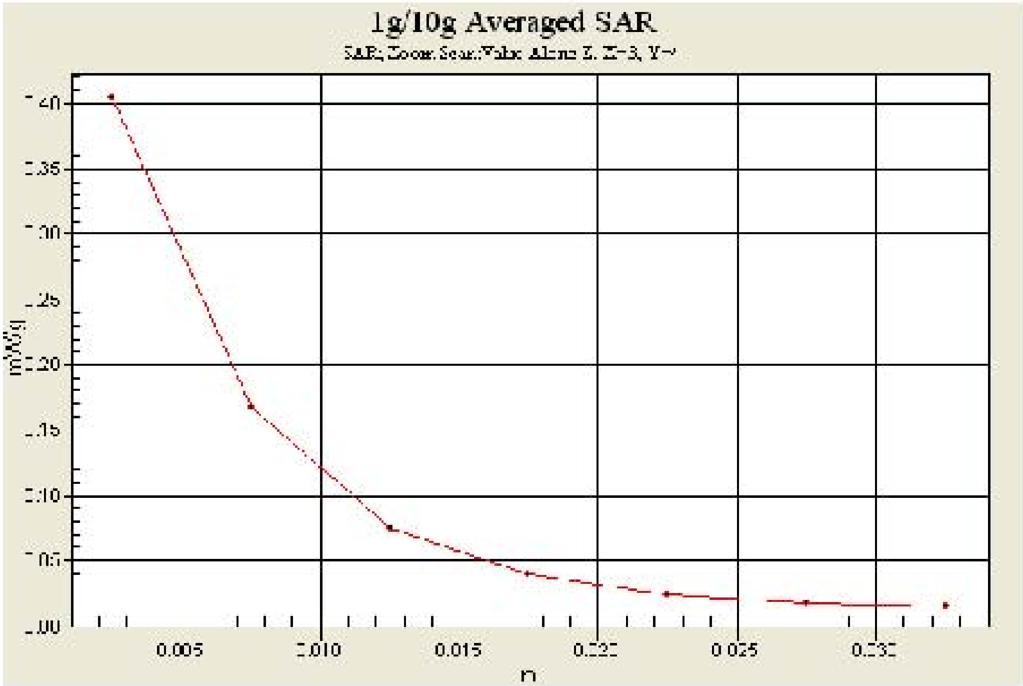
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Up, W-LAN(802.11n HT 20) Ch. 6(2437 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.030 dB
Peak SAR (extrapolated) = 0.684 W/kg
SAR(1 g) = 0.287 mW/g; SAR(10 g) = 0.130 mW/g



DIGITAL EMC CO., LTD

DUT: PTA127/55; Type: Wi-Fi Dongle

Communication System: W-LAN; Frequency: 2422 MHz;Duty Cycle: 1:1
Medium parameters used: f = 2422 MHz; σ = 1.92 mho/m; ε_r = 52; ρ = 1000 kg/m^3
Phantom section: Flat Section

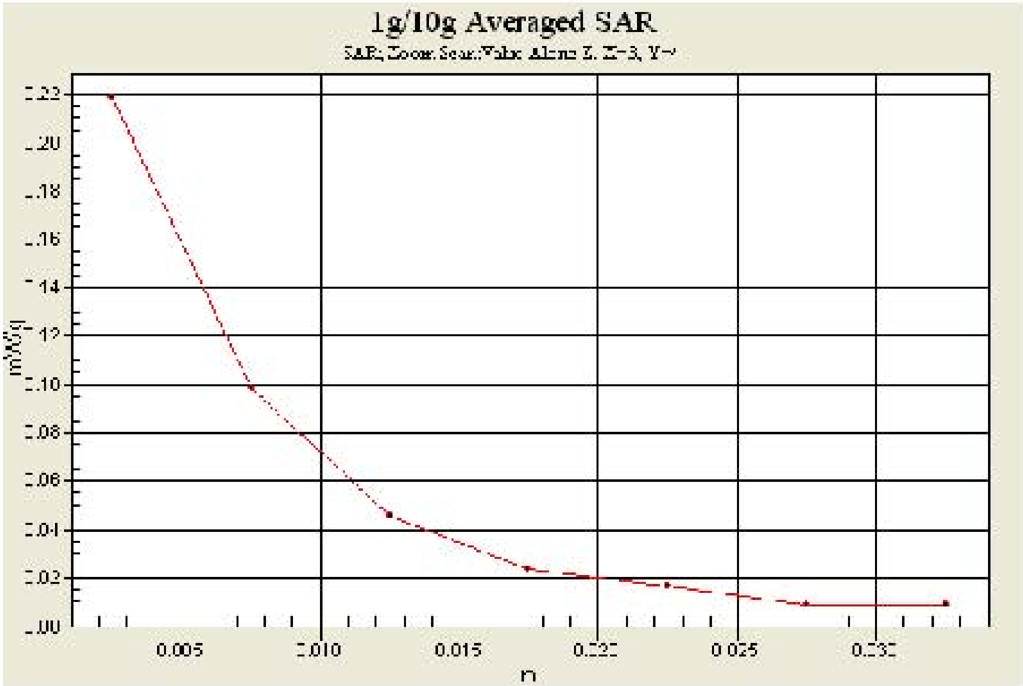
DASY4 Configuration:
Probe: EX3DV4 - SN3643; ConvF(7.03, 7.03, 7.03); Calibrated: 2011-01-24; Electronics: DAE3 Sn519
Phantom: SAM 1800/1900 MHz; Type: SAM; Serial: TP-1224
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Test Date: 2011-12-29; Ambient Temp: 21.8; Tissue Temp:22.1

5 mm space from Body, Horizontal Up, W-LAN(802.11n HT 40) Ch. 3(2422 MHz)

Antenna Position : 2T2R(MIMO), Internal

Area Scan (51x81x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Power Drift = -0.128 dB
Peak SAR (extrapolated) = 0.375 W/kg
SAR(1 g) = 0.167 mW/g; SAR(10 g) = 0.076 mW/g



Attachment 3. – Probe Calibration Data

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

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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 **Digital EMC (Dymstec)**

Certificate No: **EX3-3643_Jan11**

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:3643

Calibration procedure(s): QA CAL-01.v7, QA CAL-12.v6, QA CAL-14.v3, QA CAL-23.v4 and QA CAL-25.v3
Calibration procedure for dosimetric E-field probes

Calibration date: January 24, 2011

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-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	1-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	1-Apr-10 (No. 217-01136)	Apr-11
Reference 3 dB Attenuator	SN: S5054 (3c)	30-Mar-10 (No. 217-01159)	Mar-11
Reference 20 dB Attenuator	SN: S5086 (20b)	30-Mar-10 (No. 217-01161)	Mar-11
Reference 30 dB Attenuator	SN: S5129 (30b)	30-Mar-10 (No. 217-01160)	Mar-11
Reference Probe ES3DV2	SN: 3013	29-Dec-10 (No. ES3-3013_Dec10)	Dec-11
DAE4	SN: 660	20-Apr-10 (No. DAE4-660_Apr10)	Apr-11

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-10)	In house check: Oct-11

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

Issued: January 26, 2011

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

Certificate No: EX3-3643_Jan11 Page 1 of 11

Calibration Laboratory of
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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 EX3DV4

SN:3643

Manufactured:	January 8, 2008
Last calibrated:	January 26, 2010
Recalibrated:	January 24, 2011

Calibrated for DASY/EASY Systems

(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 SN:3643

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.39	0.42	0.46	± 10.1%
DCP (mV)[B]	96.6	95.4	95.0	

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	134.8	± 2.4 %
			Y	0.00	0.00	1.00	128.6	
			Z	0.00	0.00	1.00	145.3	

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.

EX3DV4 SN:3643 January 24, 2011

DASY/EASY - Parameters of Probe: EX3DV4 SN:3643

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)
450	± 50 / ± 100	43.5 ± 5%	0.87 ± 5%	9.69	9.69	9.69	0.12	1.00 ± 13.3%
835	± 50 / ± 100	41.5 ± 5%	0.90 ± 5%	8.96	8.96	8.96	0.69	0.64 ± 11.0%
1750	± 50 / ± 100	40.1 ± 5%	1.37 ± 5%	8.58	8.58	8.58	0.63	0.72 ± 11.0%
1900	± 50 / ± 100	40.0 ± 5%	1.40 ± 5%	8.26	8.26	8.26	0.64	0.72 ± 11.0%
2450	± 50 / ± 100	39.2 ± 5%	1.80 ± 5%	7.40	7.40	7.40	0.52	0.77 ± 11.0%

[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.

Certificate No: EX3-3643_Jan11 Page 5 of 11

DASY/EASY - Parameters of Probe: EX3DV4 SN:3643

Calibration Parameter Determined in Body Tissue Simulating Media

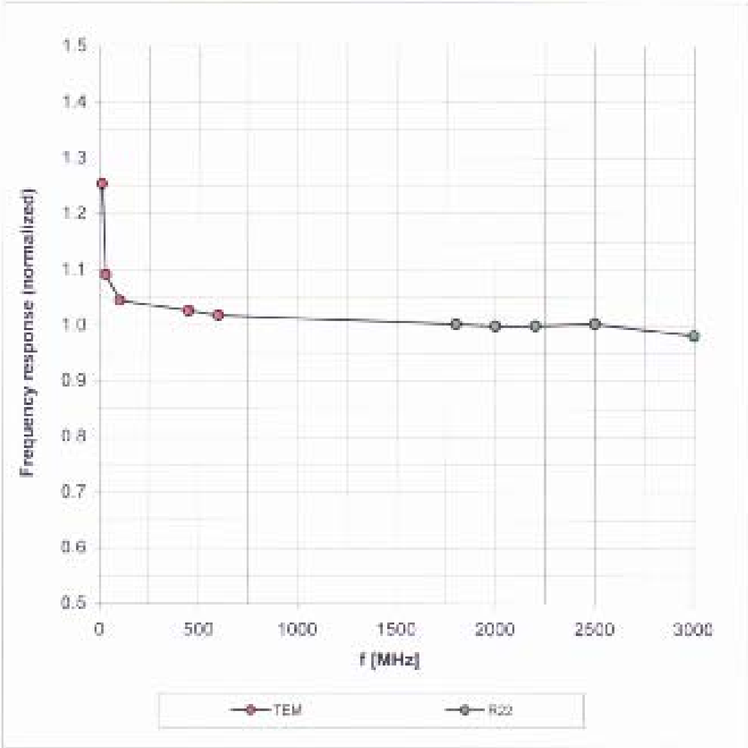
f [MHz]	Validity [MHz][C]	Permittivity	Conductivity	ConvF X	ConvF Y	ConvF Z	Alpha	Depth Unc (k=2)
450	± 50 / ± 100	56.7 ± 5%	0.94 ± 5%	10.31	10.31	10.31	0.05	1.05 ± 13.3%
835	± 50 / ± 100	55.2 ± 5%	0.97 ± 5%	8.97	8.97	8.97	0.52	0.77 ± 11.0%
1750	± 50 / ± 100	53.4 ± 5%	1.49 ± 5%	7.48	7.48	7.48	0.69	0.65 ± 11.0%
1900	± 50 / ± 100	53.3 ± 5%	1.52 ± 5%	7.19	7.19	7.19	0.44	0.83 ± 11.0%
2450	± 50 / ± 100	52.7 ± 5%	1.95 ± 5%	7.03	7.03	7.03	0.51	0.74 ± 11.0%
2600	± 50 / ± 100	52.5 ± 5%	2.16 ± 5%	6.96	6.96	6.96	0.26	1.07 ± 11.0%
3500	± 50 / ± 100	51.3 ± 5%	3.31 ± 5%	6.15	6.15	6.15	0.33	1.30 ± 13.1%
5200	± 50 / ± 100	49.0 ± 5%	5.30 ± 5%	4.32	4.32	4.32	0.45	1.90 ± 13.1%
5300	± 50 / ± 100	48.9 ± 5%	5.42 ± 5%	4.15	4.15	4.15	0.50	1.90 ± 13.1%
5600	± 50 / ± 100	48.5 ± 5%	5.77 ± 5%	3.72	3.72	3.72	0.50	1.90 ± 13.1%
5800	± 50 / ± 100	48.2 ± 5%	6.00 ± 5%	3.86	3.86	3.86	0.60	1.90 ± 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.

EX3DV4 SN:3643 January 24, 2011

Frequency Response of E-Field

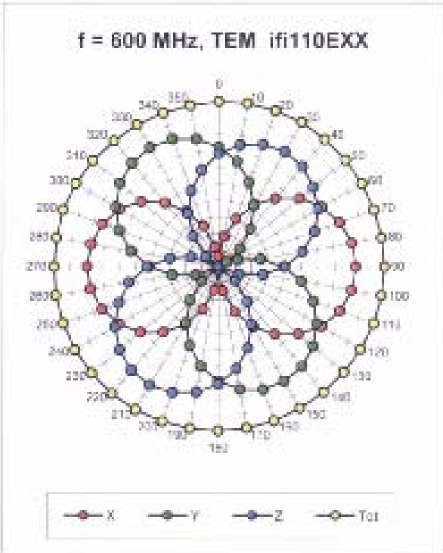
(TEM-Cell:ifi110 EXX, Waveguide: R22)

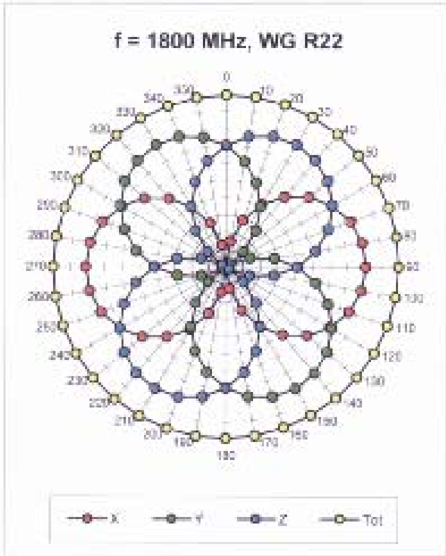


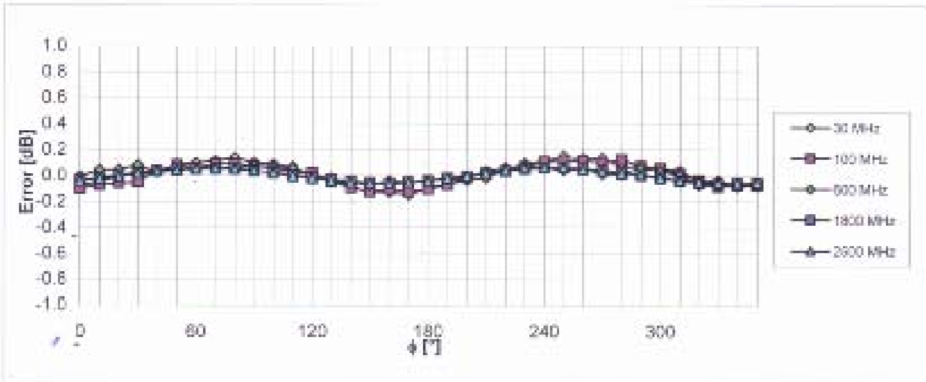
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

Certificate No: EX3-3643_Jan11 Page 7 of 11

Receiving Pattern (ϕ), $\vartheta = 0°$





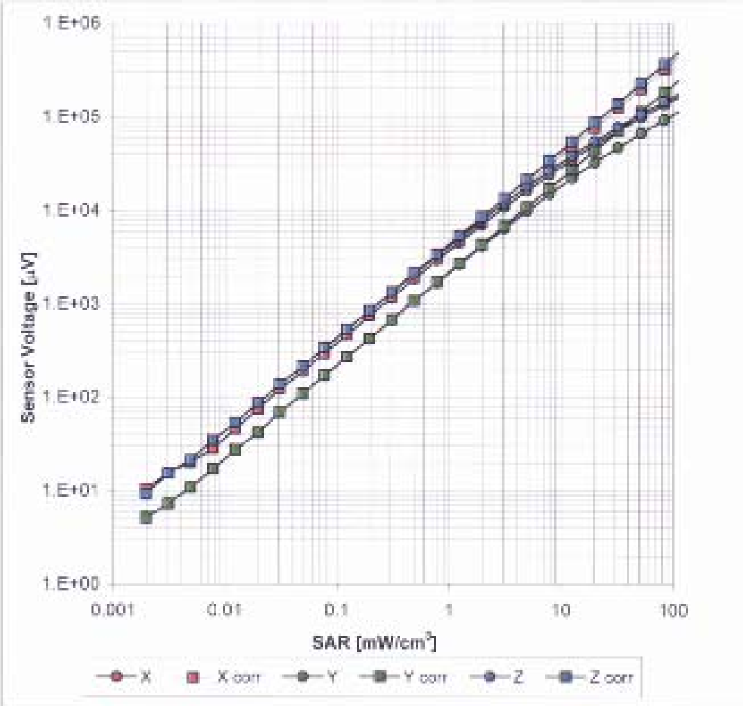


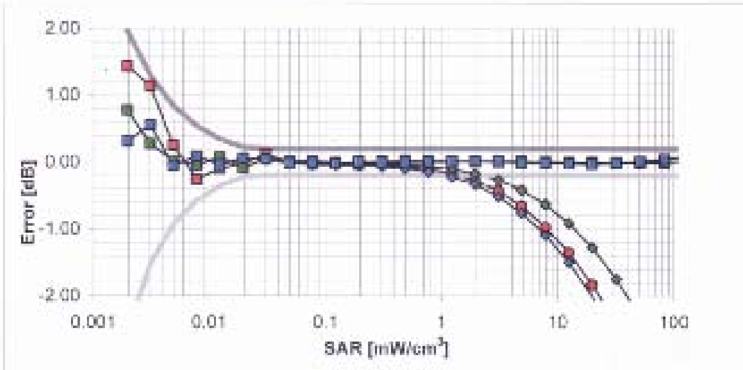
Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

EX3DV4 SN:3643 January 24, 2011

Dynamic Range f(SAR_{head})

(TEM cell, f = 900 MHz)

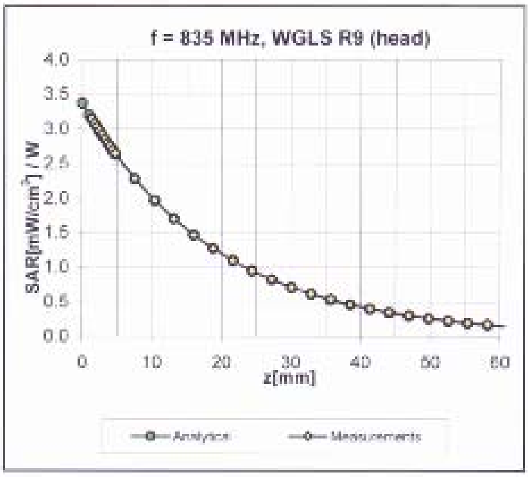


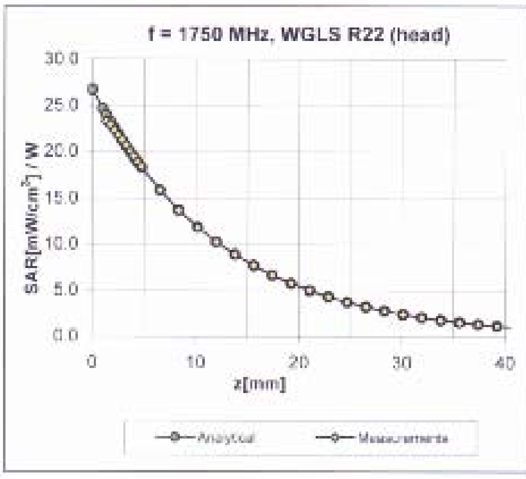


Uncertainty of Linearity Assessment: ± 0.6% (k=2)

EX3DV4 SN:3643 January 24, 2011

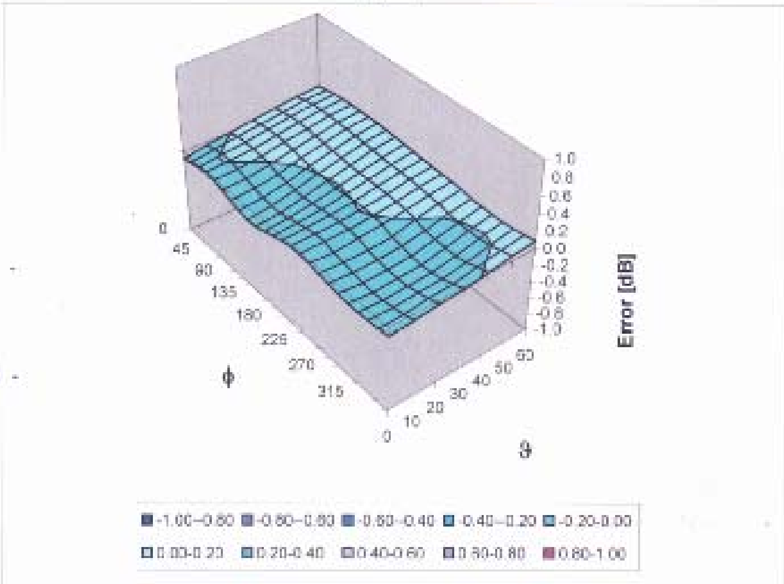
Conversion Factor Assessment





Deviation from Isotropy in HSL

Error (ϕ, ϑ), f = 900 MHz



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

Certificate No: EX3-3643_Jan11 Page 10 of 11

EX3DV4 SN:3643 January 24, 2011

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

Attachment 4. – Dipole Calibration Data

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

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Accreditation No.: **SCS 108**

Client **Digital EMC (Dymstec)**

Certificate No: **D2450V2-726_Mar10**

CALIBRATION CERTIFICATE

Object: D2450V2 - SN: 726

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

Calibration date: March 18, 2010

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	02-Mar-10 (No. DAE4-601_Mar10)	Mar-11

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: March 22, 2010

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

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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	40.4 ± 6 %	1.80 mho/m ± 6 %
Head TSL temperature during test	(22.0 ± 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	13.0 mW / g
SAR normalized	normalized to 1W	52.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.13 mW / g
SAR normalized	normalized to 1W	24.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 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	54.4 ± 6 %	2.00 mho/m ± 6 %
Body TSL temperature during test	(21.4 ± 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	12.9 mW / g
SAR normalized	normalized to 1W	51.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**51.3 mW / g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.00 mW / g
SAR normalized	normalized to 1W	24.0 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**24.0 mW / g ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω + 2.8 jΩ
Return Loss	- 27.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.8 Ω + 4.2 jΩ
Return Loss	- 27.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 09, 2003

DASY5 Validation Report for Head TSL

Date/Time: 18.03.2010 10:06:22

Test Laboratory: SPEAG, Zurich, Switzerland

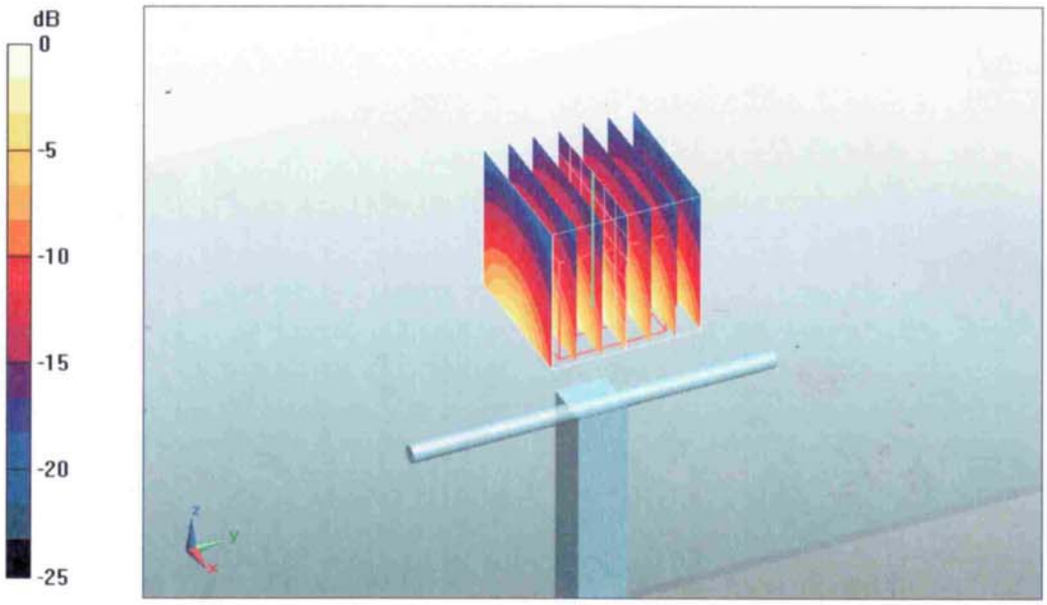
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:726

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 2450 MHz; σ = 1.8 mho/m; ε_r = 40.4; 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: 02.03.2010
- 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 = 99.8 V/m; Power Drift = 0.099 dB
Peak SAR (extrapolated) = 26.4 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 6.13 mW/g
Maximum value of SAR (measured) = 16.8 mW/g



0 dB = 16.8mW/g

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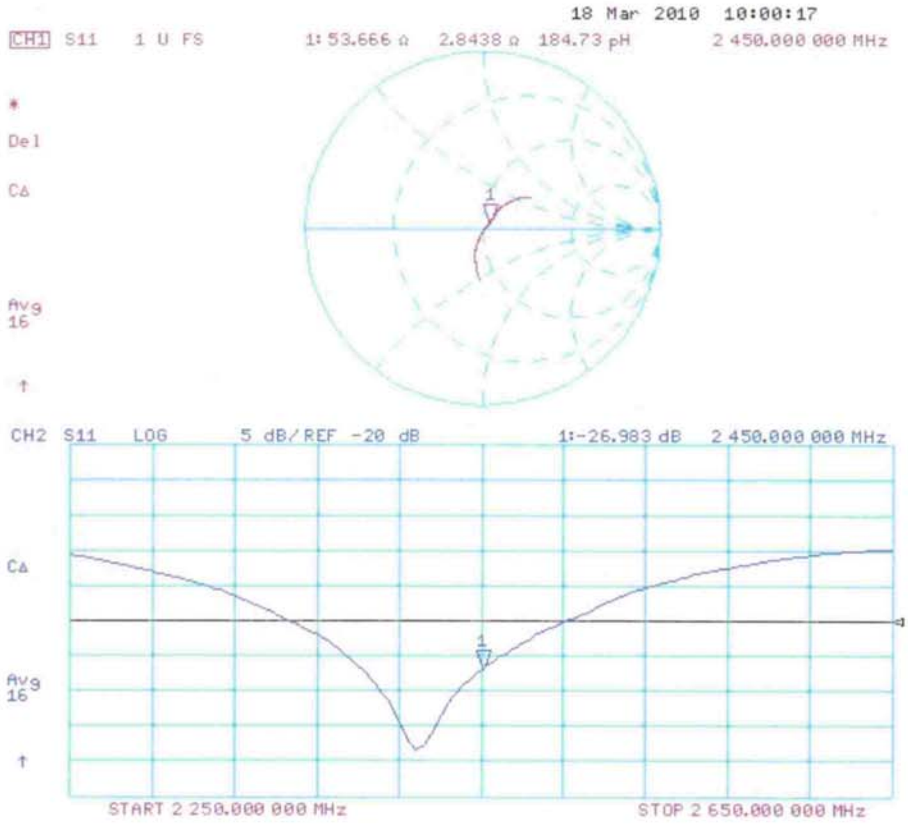
Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body

Date/Time: 18.03.2010 12:27:16

Test Laboratory: SPEAG, Zurich, Switzerland

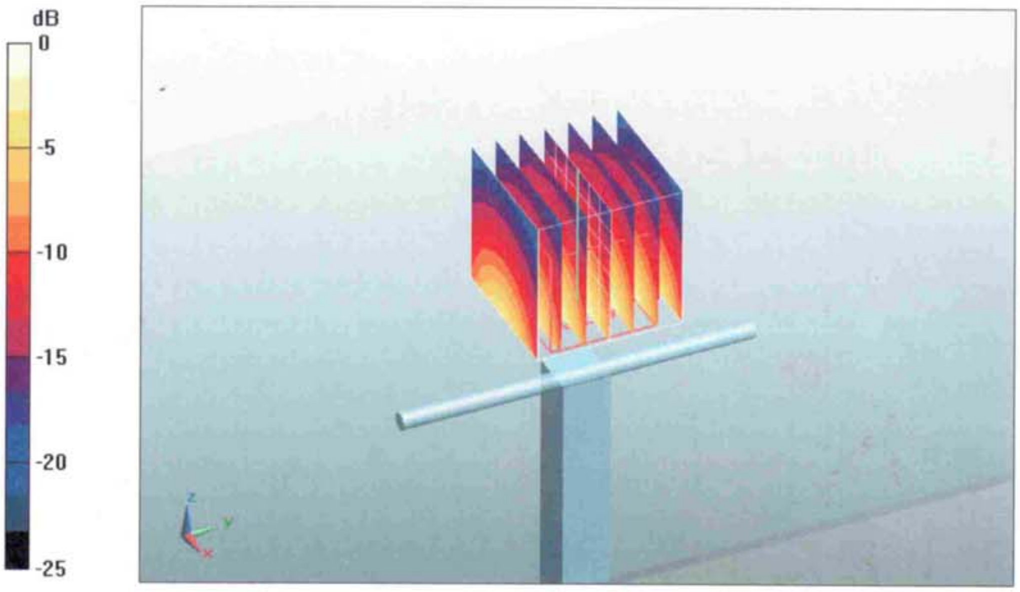
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:726

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U11 BB
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 54.5; 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: 02.03.2010
- 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 = 93.9 V/m; Power Drift = 0.073 dB
Peak SAR (extrapolated) = 26.6 W/kg
SAR(1 g) = 12.9 mW/g; SAR(10 g) = 6 mW/g
Maximum value of SAR (measured) = 16.9 mW/g



0 dB = 16.9mW/g

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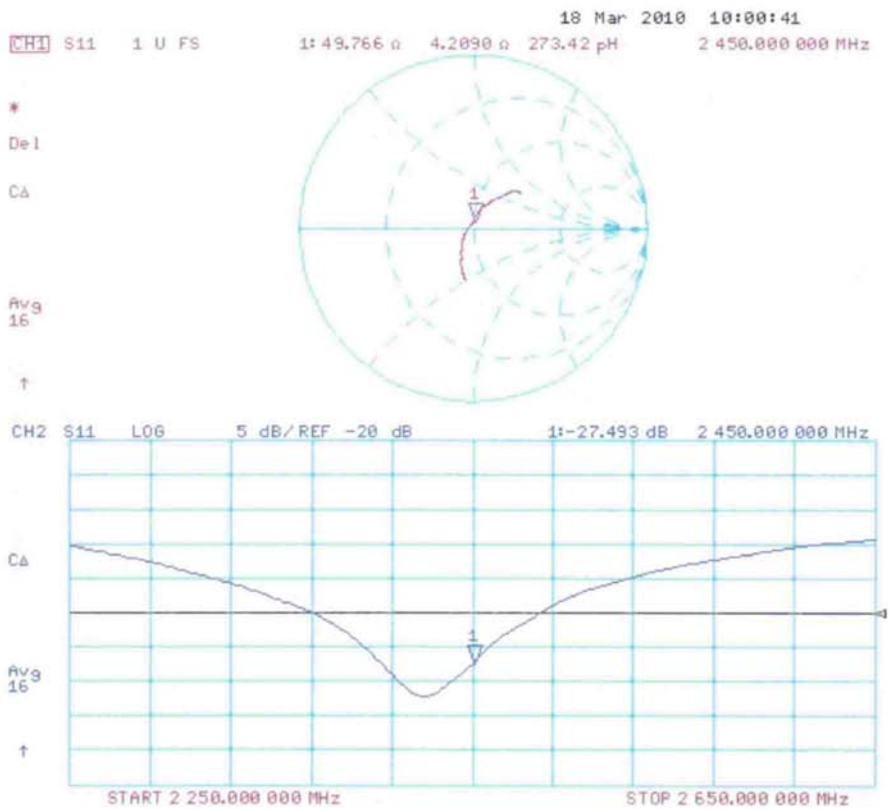
Impedance Measurement Plot for Body TSL



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