PCTEST ENGINEERING LABORATORY, INC.
6660-B Dobbin Road, Columbia, MD 21045 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6554
http://www.pctestlab.com

SAR COMPLIANCE EVALUATION REPORT

Applicant Name:
Sony Corporation
1-7-1 Konan Minato-ku
Tokyo
Japan, 108-0075

Date of Testing:
04/05/11 - 04/06/11
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1104150763.AK8

FCC ID:	**AK8PCG41313L**
APPLICANT:	**SONY CORPORATION**

EUT Type:	Laptop PC with WLAN and Bluetooth
Application Type:	Certification
FCC Rule Part(s):	CFR §2.1093; FCC/OET Bulletin 65 Supplement C [June 2001]
Model(s):	PCG-41313L
Tx Frequency:	2412 - 2462 MHz (WLAN 802.11b/g/n) 5180 - 5240 MHz (WLAN 802.11a/n) 5260 - 5320 MHz (WLAN 802.11a/n) 5500 - 5700 MHz (WLAN 802.11 a/n) 5745 - 5825 MHz (WLAN 802.11a/n)
Conducted Power:	15.78 dBm 2.4 GHz WLAN 802.11n 16.02 dBm 5.2 GHz WLAN 802.11a 16.06 dBm 5.3 GHz WLAN 802.11a 16.86 dBm 5.5 GHz WLAN 802.11a 15.01 dBm 5.8 GHz WLAN 802.11a
Max. SAR Measurement:	0.03 W/kg 2.4 GHz WLAN 802.11b Body SAR 0.05 W/kg 5.2 GHz WLAN 802.11a Body SAR 0.03 W/kg 5.3 GHz WLAN 802.11a Body SAR 0.06 W/kg 5.5 GHz WLAN 802.11a Body SAR 0.09 W/kg 5.8 GHz WLAN 802.11a Body SAR
Test Device Serial No.:	Pre-Production [S/N: DVT 1559 1800006]

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in FCC/OET Bulletin 65 Supplement C (2001), IEEE 1528-2003 and in applicable Industry Canada Radio Standards Specifications (RSS); for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

PCTEST certifies that no party to this application has been subject to a denial of Federal benefits that includes FCC benefits pursuant to Section 5301 of the Anti-Drug Abuse Act of 1988, 21 U.S.C. 862.

Randy Ortanez
President

ACCREDITED
TESTING LABORATORY
CERTIFICATE #2041.01

TABLE OF CONTENTS

1 INTRODUCTION

The FCC has adopted the guidelines for evaluating the environmental effects of radio frequency (RF) 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. [1]

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 C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [24]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (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 International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. 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.

1.1 SAR Definition

Specific Absorption Rate 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-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/m^3)
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 relation 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.[6]

2 TEST SITE LOCATION

2.1 INTRODUCTION

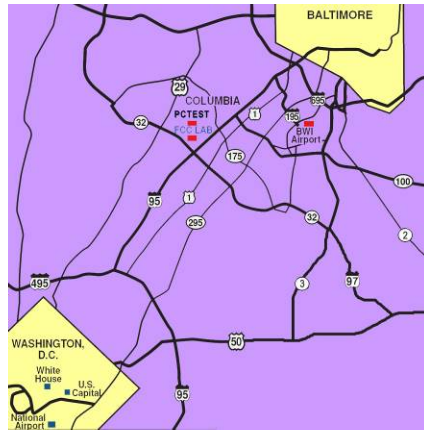


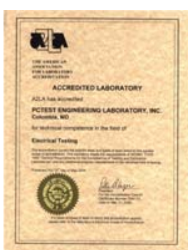
Figure 2-1
Map of the Greater Baltimore and Metropolitan Washington, D.C. area

The map at the right shows the location of the PCTEST LABORATORY in Columbia, Maryland. It is in proximity to the FCC Laboratory, the Baltimore-Washington International (BWI) airport, the city of Baltimore and Washington, DC.

These measurement tests were conducted at the PCTEST Engineering Laboratory, Inc. facility in New Concept Business Park, Guilford Industrial Park, Columbia, Maryland. The site address is 6660-B Dobbin Road, Columbia, MD 21045. The test site is one of the highest points in the Columbia area with an elevation of 390 feet above mean sea level. The site coordinates are 39° 11'15" N latitude and 76° 49' 38" W longitude. The facility is 1.5 miles north of the FCC laboratory, and the ambient signal and ambient signal strength are approximately equal to those of the FCC laboratory. There are no FM or TV transmitters within 15 miles of the site. The detailed description of the measurement facility was found to be in compliance with the requirements of § 2.948 according to ANSI C63.4 on January 27, 2006 and Industry Canada.

2.2 Test Facility / Accreditations:

Measurements were performed at an independent accredited PCTEST Engineering Lab located in Columbia, MD 21045, U.S.A.



- PCTEST Lab is accredited to ISO 17025-2005 by the American Association for Laboratory Accreditation (A2LA) in Specific Absorption Rate (SAR) testing, Hearing-Aid Compatibility (HAC), Battery Safety, CTIA Test Plans, and wireless testing for FCC and Industry Canada Rules.
- PCTEST Lab is accredited to ISO 17025 by U.S. National Institute of Standards and Technology (NIST) under the National Voluntary Laboratory Accreditation Program (NVLAP Lab code: 100431-0) in EMC, FCC and Telecommunications.
- PCTEST facility is an FCC registered (PCTEST Reg. No. 90864) test facility with the site description report on file and has met all the requirements specified in Section 2.948 of the FCC Rules and Industry Canada (IC-2451).
- PCTEST Lab is a recognized U.S. Conformity Assessment Body (CAB) in EMC and R&TTE (n.b. 0982) under the U.S.-EU Mutual Recognition Agreement (MRA).
- PCTEST TCB is a Telecommunication Certification Body (TCB) accredited to ISO/IEC Guide 65 by the American National Standards Institute (ANSI) in all scopes of FCC Rules and all Industry Canada Standards (RSS).
- PCTEST facility is an IC registered (IC-2451) test laboratory with the site description on file at Industry Canada.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for AMPS and CDMA, and EvDO mobile phones.
- PCTEST is a CTIA Authorized Test Laboratory (CATL) for Over-the-Air (OTA) Antenna Performance testing for AMPS, CDMA, GSM, GPRS, EGPRS, UMTS (W-CDMA), CDMA 1xEVDO Data, CDMA 1xRTT Data

3 SAR MEASUREMENT SETUP

3.1 Robotic System

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 a high precision robotics system (Staubli), robot controller, desktop computer, near-field probe, probe alignment sensor, and the SAM phantom containing the head or body 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 Figure 3-1).

3.2 System Hardware

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 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, A/D 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 from the DAE and transfers data to the PC card.

3.3 System Electronics

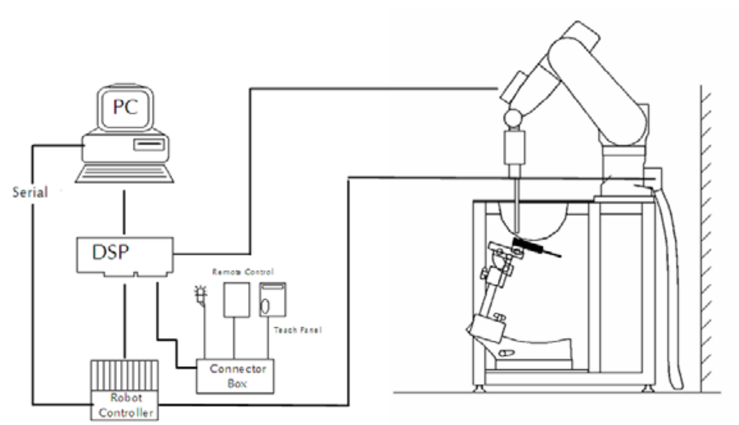


Figure 3-1
SAR Measurement System Setup

The DAE consists of a highly sensitive electrometer-grade auto-zeroing preamplifier, 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.

3.4 Automated Test System Specifications

Test Software:	SPEAG DASY4 version 4.7 Measurement Software
Robot:	Stäubli Unimation Corp. Robot RX60L
Repeatability:	0.02 mm
No. of Axes:	6

Data Acquisition Electronic System (DAE)

Data Converter

Features:	Signal Amplifier, multiplexer, A/D converter & control logic
Software:	SEMCAD software
Connecting Lines:	Optical Downlink for data and status info Optical upload for commands and clock

<u>PC Interface Card</u>

Function:	Link to DAE 16-bit A/D converter for surface detection system Two Serial & Ethernet link to robotics Direct emergency stop output for robot

<u>Phantom</u>

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

Figure 3-2
SAR Measurement System

4 DASY E-FIELD PROBE SYSTEM

4.1 Probe Measurement System

Figure 4-1
SAR System

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration (see Figure 4-3) and optimized for dosimetric evaluation [9]. 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. 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 curve fitting (see Figure 5-1). The approach is stopped at reaching the maximum.

4.2 Probe Specifications

Model(s):	ES3DV2, ES3DV3, EX3DV4
Frequency Range:	10 MHz – 6.0 GHz (EX3DV4) 10 MHz – 4 GHz (ES3DV3)
Calibration:	In head and body simulating tissue at Frequencies from 300 up to 6000MHz
Linearity:	± 0.2 dB (30 MHz to 6 GHz) for EX3DV4 ± 0.2 dB (30 MHz to 4 GHz) for ES3DV3
Dynamic Range:	10 mW/kg – 100 W/kg
Probe Length:	330 mm
Probe Tip Length:	20 mm
Body Diameter:	12 mm
Tip Diameter:	2.5 mm (3.9mm for ES3DV3)
Tip-Center:	1 mm (2.0 mm for ES3DV3)
Application:	SAR Dosimetry Testing Compliance tests of mobile phones Dosimetry in strong gradient fields

Figure 4-2
Near-Field Probe

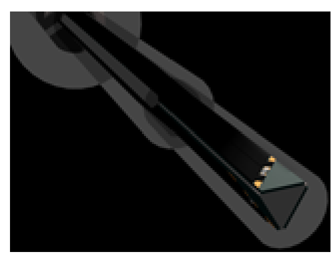


Figure 4-3
Triangular Probe Configuration

5 PROBE CALIBRATION PROCESS

5.1 Dosimetric Assessment Procedure

Each E-Probe/Probe Amplifier combination has unique calibration parameters. A TEM cell calibration procedure is conducted to determine the proper amplifier settings to enter in the probe parameters. The amplifier settings are determined for a given frequency by subjecting the probe to a known E-field density (1 mW/cm^2) using an RF Signal generator, TEM cell, and RF Power Meter.

5.2 Free Space Assessment

The free space E-field from amplified probe outputs is determined in a test chamber. This calibration can be performed in a TEM cell if the frequency is below 1 GHz and in a waveguide or other methodologies above 1 GHz for free space. For the free space calibration, the probe is placed in the volumetric center of the cavity and at the proper orientation with the field. The probe is rotated 360 degrees until the three channels show the maximum reading. The power density readings equates to 1 mW/cm^2.

5.3 Temperature Assessment

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

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

where:
Δt = exposure time (30 seconds),
C = heat capacity of tissue (brain or muscle),
ΔT = temperature increase due to RF exposure.

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

where:
σ = simulated tissue conductivity,
ρ = Tissue density (1.25 g/cm^3 for brain tissue)

SAR is proportional to $\Delta T/\Delta t$, the initial rate of tissue heating, before thermal diffusion takes place. The electric field in the simulated tissue can be used to estimate SAR by equating the thermally derived SAR to that with the E- field component.

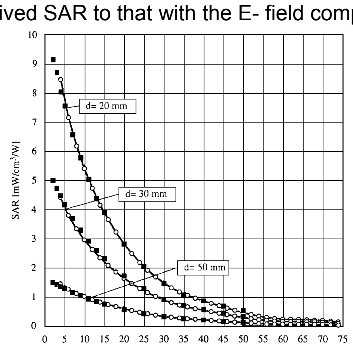


Figure 5-1 E-Field and Temperature measurements at 900MHz [9]

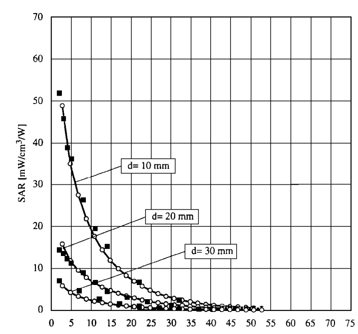


Figure 5-2 E-Field and temperature measurements at 1.9GHz [9]

6 PHANTOM AND EQUIVALENT TISSUES

6.1 SAM Phantoms

Figure 6-1
SAM Phantoms

The SAM Twin Phantom V4.0 is constructed of a fiberglass shell integrated in a table. The shape of the shell is based on data from an anatomical study designed to represent the 90th percentile of the population [12][13]. The phantom enables the dosimetric evaluation of SAR for both left and right handed handset usage, as well as body-worn usage using the flat phantom region. 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. The shell phantom has a 2mm shell thickness (except the ear region where shell thickness increases to 6 mm).

6.2 Tissue Simulating Mixture Characterization

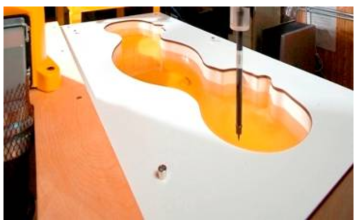


Figure 6-2
SAM Phantom with Simulating Tissue

The mixture is characterized to obtain proper dielectric constant (permittivity) and conductivity of the tissue of interest. The tissue dielectric parameters recommended in IEEE 1528 and IEC 62209 have been used as targets for the compositions, and are to match within 5%, per the FCC recommendations.

Table 6-1
Composition of the Tissue Equivalent Matter

Frequency (MHz)	2450	5200-5800
Tissue	Body	Body
Ingredients (% by weight)		
DGBE	26.7	
NaCl	0.1	
Triton X-100		10.67
Diethylenglycol monohexylether		10.67
Water	73.2	78.66

7 DOSIMETRIC ASSESSMENT & PHANTOM SPECS

7.1 Measurement Procedure

The evaluation was performed using the following procedure:

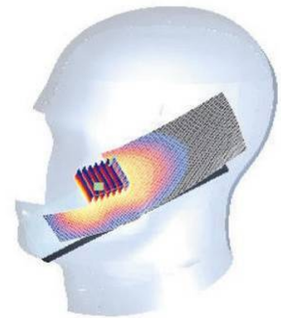


Figure 7-1
Sample SAR Area Scan

1. The SAR distribution at the exposed side of the head was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the head and the horizontal grid spacing was 15mm x 15mm.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during testing the 1 gram cube. This fixed point was measured and used as a reference value.
3. Based on the area scan data, the area of the maximum absorption was determined by spline interpolation. Around this point, a volume of 32mm x 32mm x 30mm (fine resolution volume scan, zoom scan) was assessed by measuring 5 x 5 x 7 points. On this basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual for more details):
   a. The data was extrapolated to the surface of the outer-shell of the phantom. The combined distance extrapolated was the combined distance from the center of the dipoles 2.7mm away from the tip of the probe housing plus the 1.2 mm distance between the surface and the lowest measuring point. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
   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 step 2, was re-measured after the zoom scan was complete. If the value deviated by more than 5%, the evaluation was repeated.
5. For 5 GHz testing finer resolution zoom scans were preformed as specified by FCC SAR Measurement Requirements for 3 – 6 GHz, KDB pub 865664. The 5 GHz zoom scan requires a minimum volume of 24mm x 24mm x 20mm and 7 x 7 x 11 points.

7.2 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 Figure 7-2). The perimeter sidewalls of each phantom halves are extended to allow filling with liquid to a depth that is sufficient to minimize reflections from the upper surface. The liquid depth is maintained at a minimum depth of 15 cm.

Figure 7-2
SAM Twin Phantom Shell

8 FCC RF EXPOSURE LIMITS

8.1 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.

8.2 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 applicable to situations in which persons are exposed as a consequence of their 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 C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (W/kg) or (mW/g)
SPATIAL PEAK SAR Brain	1.6	8.0
SPATIAL AVERAGE SAR Whole Body	0.08	0.4
SPATIAL PEAK SAR Hands, Feet, Ankles, Wrists	4.0	20

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

9 SAR TESTING WITH IEEE 802.11 TRANSMITTERS

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g transmitters. Unpredictable fluctuations 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 according to KDB 248227.

9.1 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 used for all measurements.

9.2 Frequency Channel Configurations [27]

802.11 a/b/g and 4.9 GHz operating 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 channels 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 instead 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 9-1
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		√			

Table 9-2
IEEE 802.11b Average RF Power

Mode	Freq [MHz]	Channel	Tx Chain	Conducted Power [dBm] Data Rate [Mbps]			
				1	2	5.5	11
802.11b	2412	1	1	13.08	12.96	13.00	12.90
802.11b	2437	6	1	14.00	14.01	14.14	14.01
802.11b	2462	11	1	13.82	13.80	13.89	13.76

Mode	Freq [MHz]	Channel	Tx Chain	Conducted Power [dBm] Data Rate [Mbps]			
				1	2	5.5	11
802.11b	2412	1	2	13.14	13.13	13.12	13.10
802.11b	2437	6	2	14.08	14.10	14.09	14.10
802.11b	2462	11	2	13.79	13.70	13.75	13.77

Table 9-3
IEEE 802.11g Average RF Power

Mode	Freq [MHz]	Channel	Tx Chain	Conducted Power [dBm] Data Rate [Mbps]							
				6.5	13	20	26	39	52	58	65
802.11g	2412	1	1	12.82	12.72	12.75	12.75	12.57	12.50	12.50	11.96
802.11g	2417	2	1	15.50	15.25	15.20	15.30	15.10	15.10	13.65	12.10
802.11g	2437	6	1	15.64	15.54	15.55	15.54	15.35	15.27	13.67	11.85
802.11g	2457	10	1	15.55	15.15	15.14	15.30	15.11	14.77	13.50	11.40
802.11g	2462	11	1	12.36	12.38	12.37	12.36	12.25	12.13	12.19	12.05

Mode	Freq [MHz]	Channel	Tx Chain	Conducted Power [dBm] Data Rate [Mbps]							
				6	9	12	18	24	36	48	54
802.11g	2412	1	2	11.94	11.95	11.97	12.06	11.85	11.91	12.06	12.03
802.11g	2417	2	2	15.00	14.90	14.85	14.86	14.72	14.32	13.25	11.50
802.11g	2437	6	2	15.16	15.10	15.09	15.14	14.97	15.03	13.62	11.41
802.11g	2457	10	2	13.63	14.00	13.82	13.92	13.70	13.75	12.45	10.70
802.11g	2462	11	2	11.30	11.34	11.33	11.38	11.26	11.27	11.33	11.36

Table 9-4
IEEE 802.11n 20 MHz Bandwidth Average RF Power

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	2.4GHz 802.11n (20MHz BW) Conducted Power [dBm] Data Rate [Mbps]							
					6.5	13	20	26	39	52	58	65
802.11n	2412	1	20	1	12.57	12.43	12.43	12.40	12.33	12.36	11.81	10.30
802.11n	2417	2	20	1	15.21	15.17	15.00	14.95	14.90	13.62	11.75	10.40
802.11n	2437	6	20	1	15.42	15.29	15.37	15.35	15.26	14.00	11.73	10.23
802.11n	2457	10	20	1	14.60	14.88	14.95	14.90	14.90	13.15	11.10	10.18
802.11n	2462	11	20	1	12.23	12.05	12.20	12.14	12.05	12.03	11.90	10.35

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	Conducted Power [dBm] Data Rate [Mbps]							
					6.5	13	20	26	39	52	58	65
802.11n	2412	1	20	2	11.72	11.65	11.83	11.82	11.88	11.90	11.83	10.59
802.11n	2417	2	20	2	14.97	14.25	14.45	14.82	14.70	12.80	11.20	9.62
802.11n	2437	6	20	2	15.10	15.03	15.04	15.07	15.09	13.42	11.33	10.23
802.11n	2457	10	20	2	13.50	13.55	13.83	13.57	13.75	12.66	10.90	9.25
802.11n	2462	11	20	2	11.07	11.01	11.03	11.15	11.19	11.22	11.24	9.64

Table 9-5
IEEE 802.11n 40 MHz Bandwidth Average RF Power

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	2.4GHz 802.11n (40MHz BW) Conducted Power [dBm] Data Rate [Mbps] 6.5	13	20	26	39	52	58	65
802.11n	2422	1	40	1	8.47	8.50	8.43	8.38	8.41	8.46	8.49	8.48
802.11n	2417	2	40	1	10.75	10.53	10.55	10.50	10.51	10.50	10.60	10.55
802.11n	2437	6	40	1	15.78	15.57	15.57	15.44	15.49	13.89	12.50	11.01
802.11n	2447	8	40	1	7.60	7.63	7.58	7.46	7.50	7.48	7.67	7.55
802.11n	2452	11	40	1	7.72	7.79	7.79	7.70	7.76	7.80	7.89	7.86

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	2.4GHz 802.11n (40MHz BW) Conducted Power [dBm] Data Rate [Mbps] 6.5	13	20	26	39	52	58	65
802.11n	2422	1	40	2	8.00	8.15	7.79	7.61	7.53	7.52	7.51	7.45
802.11n	2417	2	40	2	10.20	10.41	10.02	10.21	9.95	9.92	10.02	9.97
802.11n	2437	6	40	2	15.56	15.28	15.18	15.00	14.53	13.16	11.40	9.89
802.11n	2447	8	40	2	7.66	8.05	7.98	7.95	7.80	7.90	8.11	8.05
802.11n	2452	11	40	2	7.39	7.35	7.30	7.17	7.01	6.98	7.01	6.83

According to KDB 248227 D01 Page 4, "802.11b/g modes are tested on channels 1,6,11; however, if output power reduction is necessary for channels 1 and/or 11 to meet restricted band requirements the highest output channels closest to each of these channels must be tested instead."

Table 9-6
IEEE 802.11a Average RF Power

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	802.11a (20MHz) Conducted Power [dBm] Data Rate [Mbps] 6	9	12	18	24	36	48	54
802.11a	**5180**	**36**	20	1	13.43	13.06	13.36	13.33	13.22	12.86	13.18	11.42
802.11a	5200	40	20	1	14.83	14.82	14.75	14.76	14.61	14.55	13.76	11.53
802.11a	5220	44	20	1	14.70	14.74	14.71	14.72	14.55	14.16	13.70	11.50
802.11a	**5240**	**48**	20	1	14.64	14.63	14.55	14.61	14.79	14.30	13.54	11.39
802.11a	**5260**	**52**	20	1	14.64	14.57	14.54	14.55	14.28	14.26	13.40	11.65
802.11a	5280	56	20	1	14.73	14.72	14.68	14.72	14.56	14.52	13.64	11.43
802.11a	5300	60	20	1	14.58	14.50	14.53	14.55	14.34	14.34	13.49	11.73
802.11a	**5320**	**64**	20	1	15.01	14.92	14.85	14.87	14.71	14.65	13.72	11.56
802.11a	5500	100	20	1	15.40	15.58	15.35	15.22	15.00	14.96	14.14	12.11
802.11a	**5520**	**104**	20	1	15.22	15.14	15.12	15.19	15.08	15.14	14.16	11.97
802.11a	5540	108	20	1	15.05	14.99	14.97	15.05	14.94	15.20	14.15	11.78
802.11a	5560	112	20	1	14.80	14.80	14.77	14.83	14.70	14.71	13.75	11.49
802.11a	**5580**	**116**	20	1	14.43	14.47	14.41	14.50	14.45	14.42	13.77	11.33
802.11a	5600	120	20	1	14.31	14.20	14.10	13.97	13.98	13.90	13.16	10.87
802.11a	**5620**	**124**	20	1	14.12	13.98	13.71	13.79	13.63	13.66	13.01	11.06
802.11a	5640	128	20	1	14.06	13.97	13.92	13.98	13.88	13.90	12.88	11.18
802.11a	5660	132	20	1	14.02	14.04	14.03	14.12	14.02	13.98	13.25	11.05
802.11a	**5680**	**136**	20	1	14.05	13.95	13.94	14.01	13.93	13.93	13.35	11.31
802.11a	5700	140	20	1	14.11	14.07	14.05	14.11	14.02	14.03	13.35	11.01
802.11a	**5745**	**149**	20	1	13.73	13.73	13.73	13.75	13.71	13.68	13.07	10.62
802.11a	5765	153	20	1	13.68	13.67	13.67	13.58	13.52	13.56	12.83	10.29
802.11a	**5785**	**157**	20	1	13.55	13.43	13.54	13.60	13.50	13.53	12.80	10.35
802.11a	**5805**	**161**	20	1	13.52	13.50	13.49	13.58	13.45	13.48	12.28	10.22
802.11a	5825	165	20	1	13.32	13.38	13.35	13.34	13.31	13.32	12.13	10.18

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	Conducted Power [dBm] Data Rate [Mbps] 6	9	12	18	24	36	48	54
802.11a	**5180**	**36**	20	2	14.43	14.39	14.12	14.14	14.32	14.14	14.28	12.32
802.11a	5200	40	20	2	15.92	15.47	15.11	15.61	15.37	15.81	14.15	12.17
802.11a	5220	44	20	2	15.77	15.73	15.71	15.77	15.65	15.67	14.51	12.78
802.11a	**5240**	**48**	20	2	15.63	16.00	15.98	16.02	15.80	15.89	14.74	12.62
802.11a	**5260**	**52**	20	2	15.57	15.76	15.61	15.70	15.45	15.48	14.74	12.96
802.11a	5280	56	20	2	15.78	15.75	15.79	15.70	15.59	15.58	14.85	13.09
802.11a	5300	60	20	2	15.67	15.77	15.70	15.79	15.65	15.78	15.07	12.81
802.11a	**5320**	**64**	20	2	16.06	15.98	15.96	16.05	16.00	15.74	14.98	12.71
802.11a	5500	100	20	2	16.81	16.85	16.82	16.86	16.77	16.67	15.83	13.95
802.11a	**5520**	**104**	20	2	16.68	16.69	16.71	16.72	16.53	16.52	15.61	13.76
802.11a	5540	108	20	2	16.46	16.48	16.52	16.59	16.54	16.49	15.59	13.79
802.11a	5560	112	20	2	16.26	16.26	16.27	16.34	16.29	16.33	15.37	13.53
802.11a	**5580**	**116**	20	2	15.92	15.80	15.77	15.86	15.60	15.60	14.82	12.88
802.11a	5600	120	20	2	15.48	15.46	15.45	15.47	15.33	15.46	14.47	12.44
802.11a	**5620**	**124**	20	2	15.33	15.29	15.22	15.31	14.91	15.25	14.32	12.32
802.11a	5640	128	20	2	15.27	15.24	15.25	15.26	15.20	15.03	14.31	12.34
802.11a	5660	132	20	2	15.32	15.31	15.28	15.35	15.25	15.04	14.40	12.41
802.11a	**5680**	**136**	20	2	15.31	15.30	15.27	15.28	15.26	15.29	14.55	12.53
802.11a	5700	140	20	2	15.16	15.13	15.18	15.21	15.17	15.13	14.51	12.49
802.11a	**5745**	**149**	20	2	14.90	14.95	14.96	15.01	14.93	14.92	13.86	12.09
802.11a	5765	153	20	2	14.50	14.56	14.63	14.68	14.54	14.59	13.90	12.14
802.11a	**5785**	**157**	20	2	14.59	14.50	14.45	14.48	14.38	14.42	13.71	11.60
802.11a	**5805**	**161**	20	2	14.37	14.41	14.36	14.35	14.33	14.00	13.41	11.57
802.11a	5825	165	20	2	13.93	13.95	13.95	13.99	13.94	13.92	13.31	11.44

Table 9-7
IEEE 802.11n 20 MHz Bandwidth Average RF Power

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	802.11n (20MHz) Conducted Power [dBm]							
					Data Rate [Mbps]							
					6.5	13	20	26	39	52	58	65
802.11n	**5180**	**36**	20	1	13.31	13.12	13.20	13.18	13.12	13.05	11.30	9.34
802.11n	5200	40	20	1	14.79	14.64	14.70	14.61	14.52	13.70	11.50	9.66
802.11n	5220	44	20	1	14.64	14.45	14.53	14.45	14.43	13.54	11.36	9.53
802.11n	**5240**	**48**	20	1	14.56	14.46	14.48	14.47	14.45	13.53	11.32	9.47
802.11n	**5260**	**52**	20	1	14.85	14.30	14.35	14.25	14.18	13.30	11.55	9.75
802.11n	5280	56	20	1	14.63	14.48	14.56	14.58	14.50	13.57	11.43	9.58
802.11n	5300	60	20	1	14.47	14.35	14.45	14.42	14.31	13.41	11.70	9.88
802.11n	**5320**	**64**	20	1	14.81	14.64	14.74	14.68	14.58	13.60	11.41	10.06
802.11n	5500	100	20	1	15.28	15.08	15.39	15.29	15.50	14.15	12.37	10.63
802.11n	**5520**	**104**	20	1	15.22	14.88	14.87	15.22	15.14	14.01	12.26	10.51
802.11n	5540	108	20	1	15.06	14.79	14.89	14.97	14.96	13.84	11.67	10.29
802.11n	5560	112	20	1	14.73	14.58	14.65	14.65	14.77	13.62	11.85	10.06
802.11n	**5580**	**116**	20	1	14.41	14.41	14.46	14.46	14.37	13.35	11.28	9.67
802.11n	5600	120	20	1	13.98	14.12	14.16	14.12	13.94	13.00	11.01	9.22
802.11n	**5620**	**124**	20	1	13.83	13.73	13.64	13.60	13.62	12.87	10.77	9.20
802.11n	5640	128	20	1	13.84	13.78	13.86	13.90	13.93	12.80	11.04	9.23
802.11n	5660	132	20	1	13.92	13.87	14.01	14.04	14.08	13.24	11.23	9.26
802.11n	**5680**	**136**	20	1	13.90	13.81	13.87	13.92	13.92	13.19	11.31	9.48
802.11n	5700	140	20	1	14.02	13.92	13.98	13.99	14.06	13.31	11.04	9.01
802.11n	**5745**	**149**	20	1	13.57	13.55	13.59	13.66	13.69	12.96	10.62	9.21
802.11n	5765	153	20	1	13.44	13.42	13.47	13.53	13.53	12.71	10.80	8.92
802.11n	**5785**	**157**	20	1	13.48	13.38	13.48	13.50	13.55	12.72	10.31	8.88
802.11n	**5805**	**161**	20	1	13.42	13.41	13.41	13.46	13.46	12.53	10.23	8.56
802.11n	5825	165	20	1	13.21	13.04	13.20	13.20	13.23	12.33	10.18	8.49

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	Conducted Power [dBm]							
					Data Rate [Mbps]							
					6.5	13	20	26	39	52	58	65
802.11n	**5180**	**36**	20	2	14.01	14.40	14.47	14.48	14.00	14.14	12.36	10.56
802.11n	5200	40	20	2	14.57	14.43	14.97	15.49	15.18	14.39	12.36	10.92
802.11n	5220	44	20	2	15.50	15.30	15.50	15.58	15.11	14.29	12.59	10.80
802.11n	**5240**	**48**	20	2	15.50	15.36	15.41	15.43	15.47	14.53	13.03	10.65
802.11n	**5260**	**52**	20	2	15.71	15.16	15.30	15.35	15.63	14.49	12.79	10.59
802.11n	5280	56	20	2	15.65	15.61	15.58	15.60	15.56	15.09	13.06	11.24
802.11n	5300	60	20	2	15.47	15.34	15.46	15.44	15.73	14.96	12.82	11.40
802.11n	**5320**	**64**	20	2	16.02	15.82	15.91	15.96	15.66	15.23	12.65	10.96
802.11n	5500	100	20	2	16.60	16.38	16.20	16.76	16.77	15.40	13.51	12.05
802.11n	**5520**	**104**	20	2	16.19	15.99	16.11	16.67	16.50	15.80	13.35	11.52
802.11n	5540	108	20	2	16.66	16.11	16.58	16.30	16.19	15.53	13.64	11.79
802.11n	5560	112	20	2	16.11	15.93	16.06	16.08	16.04	15.10	13.30	11.77
802.11n	**5580**	**116**	20	2	15.94	15.58	15.32	15.42	15.38	14.57	12.53	10.72
802.11n	5600	120	20	2	15.41	15.36	15.45	15.47	15.13	14.34	12.22	10.06
802.11n	**5620**	**124**	20	2	15.02	14.89	14.99	15.00	15.01	14.14	12.62	10.35
802.11n	5640	128	20	2	14.67	14.50	14.64	14.96	14.66	13.55	11.82	9.99
802.11n	5660	132	20	2	15.34	14.52	15.09	15.02	15.45	14.23	12.21	10.38
802.11n	**5680**	**136**	20	2	15.15	15.38	15.38	14.73	15.13	14.29	12.30	10.57
802.11n	5700	140	20	2	15.27	15.10	15.19	14.82	15.25	14.36	11.91	10.56
802.11n	**5745**	**149**	20	2	14.41	14.75	14.85	14.90	14.83	14.15	12.04	10.26
802.11n	5765	153	20	2	14.50	14.37	14.42	14.41	14.11	13.77	11.90	10.18
802.11n	**5785**	**157**	20	2	13.71	13.63	14.17	14.30	14.39	13.73	11.45	10.60
802.11n	**5805**	**161**	20	2	14.08	13.51	13.68	13.62	13.71	12.82	10.95	9.72
802.11n	5825	165	20	2	13.21	13.82	13.86	13.60	13.59	12.71	10.91	9.06

Table 9-8
IEEE 802.11n 40 MHz Bandwidth Average RF Power

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	802.11n (40MHz) Conducted Power [dBm]							
					Data Rate [Mbps]							
					6.5	13	20	26	39	52	58	65
802.11n	**5190**	**38**	40	1	9.99	9.95	9.93	9.82	9.95	9.97	10.04	10.02
802.11n	**5230**	**46**	40	1	13.57	13.90	13.99	13.93	13.54	13.19	11.58	9.73
802.11n	**5270**	**54**	40	1	14.34	14.31	14.25	14.09	14.29	13.90	11.84	10.05
802.11n	**5310**	**62**	40	1	11.28	11.29	11.28	11.24	11.30	11.35	11.42	10.21
802.11n	5510	102	40	1	13.82	13.74	13.56	13.68	13.76	13.78	12.22	10.77
802.11n	5550	110	40	1	14.63	14.67	14.89	14.81	14.57	13.82	11.79	10.41
802.11n	**5590**	**118**	40	1	13.96	14.23	14.13	14.05	14.11	13.33	11.35	9.39
802.11n	**5630**	**126**	40	1	13.66	13.71	13.68	13.66	13.67	12.94	10.88	8.97
802.11n	5670	134	40	1	13.90	13.88	13.87	13.79	13.83	13.07	11.14	9.64
802.11n	**5755**	**151**	40	1	13.86	13.99	13.92	13.56	13.99	12.72	10.93	9.08
802.11n	5795	159	40	1	13.51	13.52	13.47	13.04	13.49	12.35	10.51	9.12

Mode	Freq [MHz]	Channel	BW [MHz]	Tx Chain	802.11n (40MHz) Conducted Power [dBm]							
					Data Rate [Mbps]							
					6.5	13	20	26	39	52	58	65
802.11n	**5190**	**38**	40	2	10.55	10.83	9.86	9.85	10.00	9.66	9.80	9.62
802.11n	**5230**	**46**	40	2	13.81	14.31	14.15	13.95	13.84	13.25	11.07	9.66
802.11n	**5270**	**54**	40	2	14.87	14.94	15.15	14.51	14.51	13.47	11.60	10.26
802.11n	**5310**	**62**	40	2	11.66	11.69	11.51	11.36	11.31	11.23	11.25	10.35
802.11n	5510	102	40	2	14.43	14.70	14.63	14.34	14.23	14.18	12.57	11.04
802.11n	5550	110	40	2	15.88	15.86	15.84	15.57	15.45	14.24	12.78	10.82
802.11n	**5590**	**118**	40	2	15.48	15.41	15.35	14.78	14.71	13.51	11.89	9.93
802.11n	**5630**	**126**	40	2	14.51	15.12	14.23	14.43	14.40	13.59	11.19	9.74
802.11n	5670	134	40	2	14.91	14.88	15.10	14.50	14.51	13.72	11.25	9.76
802.11n	**5755**	**151**	40	2	14.70	14.04	13.89	14.00	14.11	13.07	11.02	9.53
802.11n	5795	159	40	2	13.91	13.93	13.40	13.53	13.55	12.46	10.89	9.32

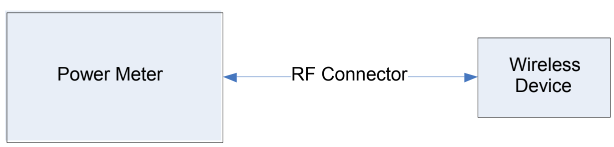


Figure 9-1
Power Measurement Setup

9.3 SAR Test Configurations

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Per band, highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Higher data rates and 802.11n for 5GHz bands were not investigated since the average output powers were not greater than 0.25 dB that of the corresponding channel in the lowest data rate. Required test configurations:

- 802.11b/g/n - 2.4 GHz – Channel 6, 1 Mbps
- 802.11a - 5.2 GHz - Channel 40, 6 Mbps
- 802.11a - 5.3 GHz - Channel 64, 6 Mbps
- 802.11a - 5.5 GHz - Channel 100, 6 Mbps
- 802.11a - 5.8 GHz - Channel 149, 6 Mbps

10 SAR TEST CONFIGURATIONS

10.1 SAR for Notebooks and Lap-touching Devices

Per KDB Publication 616217, Lap-touching devices that have transmitting antennas located less than 20 cm from the lap of the user require routine SAR evaluation. Such devices are considered portable and are capable of being held to the body. Devices are to be setup touching the phantom and are configured with maximum output power during SAR assessment for a worst-case SAR evaluation.

Figure 10-1
Notebook Setup for SAR

10.2 Threshold Distance Calculations per KDB Publication 616217

All antennas within 5 cm of the user must be tested for stand-alone SAR. With antennas with a larger separation distance to the user, a threshold distance can be calculated using the output power and frequency of each mode. Any antenna with a separation distance less than the threshold distance must be tested for SAR. **Figure 10-2** shows the antenna to antenna separation distances for the three transmitters. **Table 10-1** shows the calculations for the threshold distances for this device, per mode.

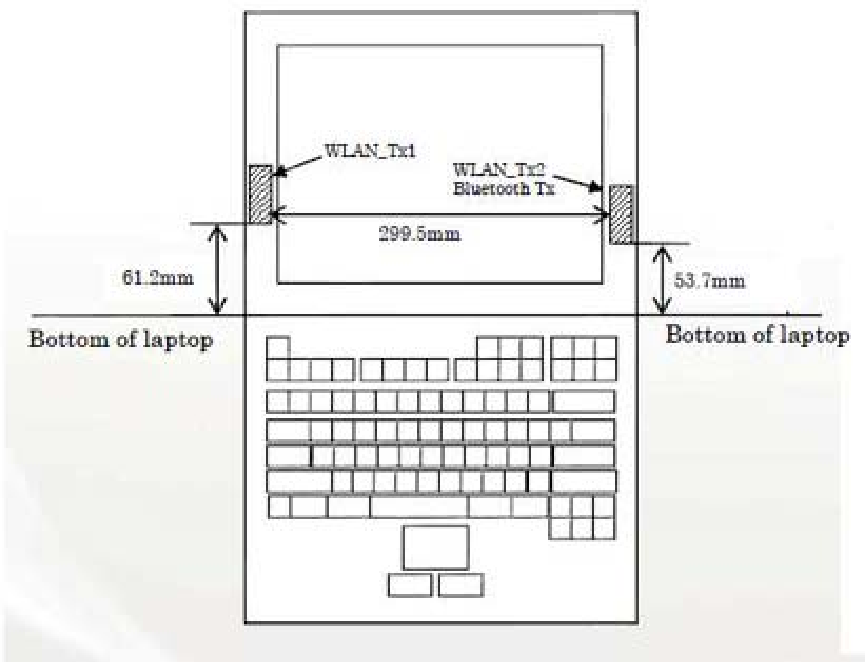


Figure 10-2
Antenna Diagram

Table 10-1
Stand-alone SAR Threshold Distances

Mode	Freq (GHz)	Power (mW)	60/f	n={P/(60/f)}-1	distance threshold (5+1/2n) (cm) D	Tx Antenna	Antenna Distance to User (cm) d	Stand-alone SAR Required? (d < D ?)
WIFI b	2.437	38	24.62	0.54	5.27	Tx Chain 1	6.12	No
						Tx Chain 2	5.37	No
WIFI a	5.8	32	10.34	2.09	6.05	Tx Chain 1	6.12	**Yes**
						Tx Chain 2	5.37	**Yes**
	5.5	49	10.91	3.45	6.72	Tx Chain 1	6.12	**Yes**
						Tx Chain 2	5.37	**Yes**
	5.3	40	11.32	2.57	6.28	Tx Chain 1	6.12	**Yes**
						Tx Chain 2	5.37	**Yes**
	5.2	40	11.54	2.47	6.23	Tx Chain 1	6.12	**Yes**
						Tx Chain 2	5.37	**Yes**

WLAN 802.11b was not required but was additionally tested.

The RF output power of Bluetooth was 3.802 mW, with is less than the threshold power (60/f). Therefore, SAR is not required for the Bluetooth transmitter per KDB publication 616217.

10.3 Simultaneous Transmission Requirements per KDB Publication 616217

WIFI Tx Chain 1 is more than 5 cm from WIFI Tx Chain 2. Therefore, there are no additional simultaneous SAR conditions.

11 SAR DATA SUMMARY

Table 11-1
2.4 GHz Body SAR Results

MEASUREMENT RESULTS												
FREQUENCY		Mode	Service	C_Power[dBm]		Spacing	Serial Number	Data Rate (Mbps)	Bandwidth (MHz)	Antenna	Position	SAR (1g)
MHz	Ch.			Start	End							(W/kg)
2437	6	802.11 b	DSSS	14.00	13.53	0.0 cm	DVT15590 1800006	1	20	Tx1	Lap	**0.016**
2437	6	802.11 b	DSSS	14.08	14.15	0.0 cm	DVT15590 1800006	1	20	Tx2	Lap	**0.016**
2437	6	802.11 g	DSSS	15.64	15.66	0.0 cm	DVT15590 1800006	6	20	Tx1	Lap	0.021
2437	6	802.11 g	DSSS	15.16	15.28	0.0 cm	DVT15590 1800006	6	20	Tx2	Lap	**0.028**
2437	6	802.11 n	DSSS	15.78	16.04	0.0 cm	DVT15590 1800006	6.5	40	Tx1	Lap	0.018
2437	6	802.11 n	DSSS	15.56	15.49	0.0 cm	DVT15590 1800006	6.5	40	Tx2	Lap	**0.033**
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**						**Body** **1.6 W/kg (mW/g)** averaged over 1 gram						

Table 11-2
5 GHz Body SAR Results

MEASUREMENT RESULTS												
FREQUENCY		Mode	Service	C_Power[dBm]		Spacing	Serial Number	Data Rate (Mbps)	Bandwidth (MHz)	Antenna	Position	SAR (1g)
MHz	Ch.			Start	End							(W/kg)
5200	40	5.2 GHz WLAN	OFDM	14.83	14.93	0.0 cm	DVT15590 1800006	6	20	Tx1	Lap	**0.052**
5200	40	5.2 GHz WLAN	OFDM	15.92	15.99	0.0 cm	DVT15590 1800006	6	20	Tx2	Lap	0.028
5320	64	5.3 GHz WLAN	OFDM	15.01	15.08	0.0 cm	DVT15590 1800006	6	20	Tx1	Lap	0.025
5320	64	5.3 GHz WLAN	OFDM	16.06	16.13	0.0 cm	DVT15590 1800006	6	20	Tx2	Lap	**0.030**
5500	100	5.5 GHz WLAN	OFDM	15.40	15.42	0.0 cm	DVT15590 1800006	6	20	Tx1	Lap	**0.058**
5500	100	5.5 GHz WLAN	OFDM	16.81	16.88	0.0 cm	DVT15590 1800006	6	20	Tx2	Lap	0.056
5745	149	5.8 GHz WLAN	OFDM	13.73	13.81	0.0 cm	DVT15590 1800006	6	20	Tx1	Lap	**0.086**
5745	149	5.8 GHz WLAN	OFDM	14.90	14.98	0.0 cm	DVT15590 1800006	6	20	Tx2	Lap	0.080
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**						**Body** **1.6 W/kg (mW/g)** averaged over 1 gram						

SAR Test Notes:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration, with the laptop open at a 90 degree angle, at 0 cm from the flat SAM phantom according to KDB 447498 4) a) (see Section 10.1).
2. All modes of operation were investigated, and worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plots.
4. Batteries are fully charged for all readings.
5. Liquid tissue depth was at least 15.0 cm.
6. Justification for reduced test configurations for 2.4 GHz 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. Higher data rates were not investigated since the average output powers were not greater than 0.25 dB that of the corresponding channel in the lowest data rate.
7. For 5 GHz, other IEEE 802.11 modes (including 40MHz BW and 802.11n) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11a mode.
8. WLAN transmission was verified using a spectrum analyzer to confirm the SAR results observed.
9. To confirm the proper SAR liquid depth for 5 GHz Body tests, the z-axis plots from the system verification of the same liquid that was tested for 5 GHz body SAR tests were included to confirm the liquid depth, since the measured SAR was low.
10. SAR for 2.4 GHz WLAN was additionally measured but not required er KDB 447498 3) and 616217 Publication to be measured for SAR, based on output power and antenna-to-user and antenna-to-antenna separation distance calculations. See Section10.

12 SIMULTANEOUS ANALYSIS

12.1 Simultaneous Transmission Calculations

Table 12-1
Simultaneous Transmission Analysis

Body SAR	Mode	WLAN Tx Chain 1 (W/kg)		WLAN Tx Chain 2 (W/kg)		Σ SAR (W/kg)				SAR/Distance Ratio	Volumetric Simultaneous Transmissoin SAR (W/kg)
		2.4 GHz	5 GHz	2.4 GHz	5 GHz						
	Transmitter	1	1a	2	2a	1+2	1+2a	1a+2	1a+2a		
	Back	0.021	0.086	0.033	0.080	**0.054**	**0.101**	**0.119**	**0.166**	N/A	N/A

12.2 Simultaneous Transmission Conclusion

The above numerical summed SAR calculations show that all simultaneous transmissions are below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission scenarios will not exceed the SAR limit. Therefore, no additional volumetric SAR summation is required per FCC KDB Publication 648474.

13 SYSTEM VERIFICATION

13.1 Tissue Verification

Table 13-1
Measured Tissue Properties

Calibrated for Tests Performed	Tissue Type	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
04/06/2011	2450B	2401	1.978	50.93	**1.90**	**52.77**	*3.94%*	*-3.48%*
		2450	2.036	50.76	**1.95**	**52.70**	*4.41%*	*-3.68%*
		2499	2.103	50.58	**2.02**	**52.64**	*4.16%*	*-3.91%*
04/05/2011	5200B-5800B	5170	5.393	47.29	**5.26**	**49.06**	*2.45%*	*-3.60%*
		5210	5.452	47.04	**5.31**	**49.00**	*2.65%*	*-4.00%*
		5250	5.512	46.97	**5.36**	**48.95**	*2.87%*	*-4.04%*
		5270	5.540	47.05	**5.38**	**48.92**	*2.95%*	*-3.82%*
		5310	5.604	46.91	**5.43**	**48.87**	*3.24%*	*-4.00%*
		5350	5.650	46.84	**5.47**	**48.81**	*3.29%*	*-4.04%*
		5470	5.851	46.58	**5.62**	**48.65**	*4.20%*	*-4.25%*
		5510	5.870	46.56	**5.66**	**48.59**	*3.69%*	*-4.19%*
		5550	5.942	46.49	**5.71**	**48.54**	*4.10%*	*-4.22%*
		5570	5.978	46.33	**5.73**	**48.51**	*4.31%*	*-4.50%*
		5610	6.039	46.36	**5.78**	**48.46**	*4.52%*	*-4.33%*
		5650	6.111	46.26	**5.83**	**48.40**	*4.91%*	*-4.43%*
		5670	6.098	46.17	**5.85**	**48.38**	*4.27%*	*-4.56%*
		5710	6.161	46.09	**5.90**	**48.32**	*4.51%*	*-4.62%*
		5750	6.235	46.09	**5.94**	**48.27**	*4.93%*	*-4.51%*
		5770	6.258	46.03	**5.97**	**48.24**	*4.91%*	*-4.58%*
		5810	6.284	45.95	**6.01**	**48.19**	*4.52%*	*-4.64%*
		5850	6.330	45.85	**6.06**	**48.13**	*4.49%*	*-4.74%*

Note: KDB Publication 450824 was ensured to be applied for probe calibration frequencies greater than or equal to 50 MHz of the DUT frequencies.

The above measured tissue parameters were used in the DASY software to perform interpolation via the DASY software to determine actual dielectric parameters at the test frequencies (per IEEE 1528 6.6.1.2). The SAR test plots may slightly differ from the table above since the DASY software rounds to three significant digits.

13.2 Measurement Procedure for Tissue verification

1) The network analyzer and probe system was configured and calibrated.
2) The probe was immersed in the sample which was placed in a nonmetallic container. Trapped air bubbles beneath the flange were minimized by placing the probe at a slight angle.
3) The complex admittance with respect to the probe aperture was measured
4) The complex relative permittivity , for example from the below equation (Pournaropoulos and Misra):

$$Y = \frac{j2\omega\varepsilon_r\varepsilon_0}{[\ln(b/a)]^2} \int_a^b \int_a^b \int_0^\pi \cos\phi' \frac{\exp\left[-j\omega r(\mu_0\varepsilon_r^{'}\varepsilon_0)^{1/2}\right]}{r} d\phi' d\rho' d\rho$$

where *Y* is the admittance of the probe in contact with the sample, the primed and unprimed coordinates refer to source and observation points, respectively, $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$, ω is the angular frequency, and $j = \sqrt{-1}$.

13.3 Justification for Extended SAR Dipole Calibrations

Usage of SAR dipoles calibrated less than 2 years ago but more than 1 year ago were confirmed in maintaining return loss (< - 20 dB, within 20% of prior calibration) and impedance (within 5 ohm from prior calibration) requirements per extended calibrations in KDB Publication 450824:

D2450V2 SN: 719								
	Head				Body			
Date of Measurement	Return Loss (dB)	**Δ %**	Impedance (Ω)	**ΔΩ**	Return Loss (dB)	**Δ %**	Impedance (Ω)	**ΔΩ**
8/27/2009	-28.6		53.4		-27.2		48.2	**0.0**
3/2/2011	-28.6	**0.0%**	52	**-1.4**	-27.4	**0.7%**	49.9	**1.7**

13.4 Test System Verification

Prior to assessment, the system is verified to ±10% of the manufacturer SAR measurement on the reference dipole at the time of calibration.

Table 13-2
System Verification Results

System Verification TARGET & MEASURED										
Date:	**Amb. Temp (°C)**	**Liquid Temp (°C)**	**Input Power (W)**	**Tissue Frequency (MHz)**	**Dipole SN**	**Tissue Type**	**Measured SAR_{1g} (W/kg)**	**1 W Target SAR_{1g} (W/kg)**	**1 W Normalized SAR_{1g} (W/kg)**	**Deviation (%)**
04/06/2011	24.2	22.6	0.025	2450	719	Body	1.34	51.400	53.600	4.28%
04/05/2011	24.3	22.7	0.025	5200	1057	Body	2	77.700	80.000	2.96%
04/05/2011	24.5	22.8	0.025	5500	1057	Body	2.03	84.400	81.200	-3.79%
04/05/2011	24.6	22.9	0.025	5800	1057	Body	1.93	75.000	77.200	2.93%

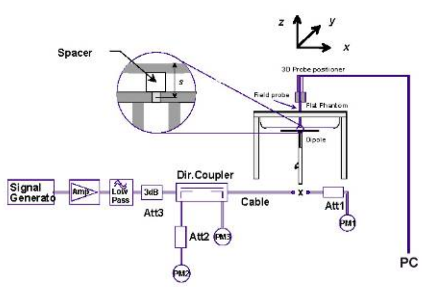


Figure 13-1
System Verification Setup Diagram

Figure 13-2
System Verification Setup Photo

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	85070B	Dielectric Probe Kit	8/22/2010	Annual	8/22/2011	US33020316
Agilent	8648D	(9kHz-4GHz) Signal Generator	10/13/2010	Annual	10/13/2011	3613A00315
Agilent	E5515C	Wireless Communications Test Set	10/11/2010	Annual	10/11/2011	GB46110872
Agilent	E5515C	Wireless Communications Test Set	10/8/2010	Annual	10/8/2011	GB46310798
Agilent	E5515C	Wireless Communications Test Set	8/13/2010	Annual	8/13/2011	GB41450275
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/11/2010	Annual	10/11/2011	1833460
Gigatronics	8651A	Universal Power Meter	10/11/2010	Annual	10/11/2011	8650319
Index SAR	IXTL-010	Dielectric Measurement Kit	N/A		N/A	N/A
Index SAR	IXTL-030	30MM TEM line for 6 GHz	N/A		N/A	N/A
Pasternack	PE2208-6	Bidirectional Coupler	N/A		N/A	N/A
Pasternack	PE2209-10	Bidirectional Coupler	N/A		N/A	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	11/11/2010	Annual	11/11/2011	836371/0079
Rohde & Schwarz	CMU200	Base Station Simulator	6/21/2010	Annual	6/21/2011	833855/0010
SPEAG	D1450V2	1450 MHz SAR Dipole	5/20/2009	Biennial	5/20/2011	1025
SPEAG	D1765V2	1765 MHz SAR Dipole	5/19/2009	Biennial	5/19/2011	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	2/17/2011	Annual	2/17/2012	502
SPEAG	D1900V2	1900 MHz SAR Dipole	8/18/2009	Biennial	8/18/2011	5d080
SPEAG	D2450V2	2450 MHz SAR Dipole	8/27/2009	Biennial	8/27/2011	719
SPEAG	D2450V2	2450 MHz SAR Dipole	2/8/2011	Annual	2/8/2012	797
SPEAG	D2600V2	2600 MHz SAR Dipole	8/12/2009	Biennial	8/12/2011	1004
SPEAG	D5GHzV2	5 GHz SAR Dipole	8/19/2009	Biennial	8/19/2011	1007
SPEAG	D5GHzV2	5 GHz SAR Dipole	2/11/2011	Annual	2/11/2012	1057
SPEAG	D835V2	835 MHz SAR Dipole	2/9/2011	Annual	2/9/2012	4d047
SPEAG	D835V2	835 MHz SAR Dipole	8/24/2009	Biennial	8/24/2011	4d026
SPEAG	DAE3	Dasy Data Acquisition Electronics	11/18/2010	Annual	11/18/2011	455
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2011	Annual	3/17/2012	704
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/21/2010	Annual	4/21/2011	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/21/2011	Annual	2/21/2012	649
SPEAG	ES3DV2	SAR Probe	9/21/2010	Annual	9/21/2011	3022
SPEAG	EX3DV4	SAR Probe	8/19/2010	Annual	8/19/2011	3561
SPEAG	EX3DV4	SAR Probe	2/14/2011	Annual	2/14/2012	3550
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/8/2010	Annual	7/8/2011	859
SPEAG	D750V3	750 MHz Dipole	2/14/2011	Annual	2/14/2012	1003
SPEAG	ES3DV3	SAR Probe	3/24/2011	Annual	3/24/2012	3213
SPEAG	ES3DV3	SAR Probe	4/20/2010	Annual	4/20/2011	3209
SPEAG	D1640V2	1640 MHz Dipole	8/17/2010	Biennial	8/17/2012	321
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	8/30/2010	Annual	8/30/2011	100976
Anritsu	MA2481A	Power Sensor	2/7/2011	Annual	2/7/2012	5318
Anritsu	MA2481A	Power Sensor	2/7/2011	Annual	2/7/2012	5442
Anritsu	ML2438A	Power Meter	2/7/2011	Annual	2/7/2012	1190013
Anritsu	ML2438A	Power Meter	2/7/2011	Annual	2/7/2012	98150041
Anritsu	ML2438A	Power Meter	2/7/2011	Annual	2/7/2012	1070030
Anritsu	MA2481A	Power Sensor	2/7/2011	Annual	2/7/2012	5821
Anritsu	MA2481A	Power Sensor	2/7/2011	Annual	2/7/2012	8013
Anritsu	MA2481A	Power Sensor	2/7/2011	Annual	2/7/2012	2400
Aprel	ALS-PR-DIEL	Dielectric Probe Kit	N/A		N/A	260-00959
Agilent	E5515C	Wireless Communications Test Set	8/13/2010	Annual	8/13/2011	GB43304447
Amplifier Research	5S1G4	5W, 800MHz-4.2GHz	N/A			17042
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	N/A			N/A
Agilent	E5515C	Wireless Communications Test Set	2/8/2011	Annual	2/8/2012	GB45360985
Speag	D3700V2	3700 MHz SAR Dipole	2/16/2011	Annual	2/16/2012	1002
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	3/11/2011	Annual	3/11/2012	103962
Control Company	61220-416	Long-Stem Thermometer	2/15/2011	Biennial	2/15/2013	111331322
Control Company	61220-416	Long-Stem Thermometer	2/15/2011	Biennial	2/15/2013	111331323
Control Company	61220-416	Long-Stem Thermometer	2/15/2011	Biennial	2/15/2013	111331330
Control Company	61220-416	Long-Stem Thermometer	2/15/2011	Biennial	2/15/2013	111331332
Control Company	61220-416	Long-Stem Thermometer	3/16/2011	Biennial	3/16/2013	111391601
Speag	D2600V2	2600 MHz SAR Dipole	N/A			1027

Justification for 2-year calibration cycle for SAR dipoles is found in Section 13.3.

15 MEASUREMENT UNCERTAINTIES

Applicable for 750 – 3000 MHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	**IEEE 1528 Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i 1gm**	**c_i 10 gms**	**1gm u_i (± %)**	**10gms u_i (± %)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	5.5	N	1	1.0	1.0	5.5	5.5	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)			RSS				11.8	11.5	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				23.7	23.0	

The above measurement uncertainties are according to IEEE Std. 1528-2003

Applicable for 5 GHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	**IEEE 1528 Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i 1gm**	**c_i 10 gms**	**1gm u_i (± %)**	**10gms u_i (± %)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	6.6	N	1	1.0	1.0	6.6	6.6	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)			RSS				12.4	12.0	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.7	24.0	

The above measurement uncertainties are according to IEEE Std. 1528-2003

16 CONCLUSION

16.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Industry Canada, with respect to all parameters subject to this test. These measurements were taken to simulate the RF effects of RF exposure under worst-case conditions. Precise laboratory measures were taken to assure repeatability of the tests. The 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 in possible biological effects 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 various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

17 REFERENCES

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300kHz to 100GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 300kHz to 100GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, June 2001.

[6] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices.

[7] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[8] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[9] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 120-124.

[10] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[11] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[12] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Head Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[13] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[14] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[15] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[16] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[17] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recepies in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[18] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.

[19] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[20] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[21] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

[22] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), Feb. 2005.

[23] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 4, March 2010.

[24] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2009

[25] FCC Public Notice DA-02-1438. Office of Engineering and Technology Announces a Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65, June 19, 2002

[26] FCC SAR Measurement Procedures for 3G Devices KDB Publication 941225

[27] SAR Measurement procedures for IEEE 802.11a/b/g KDB Publication 248227

[28] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publication 648474

[29] FCC Application Note for SAR Probe Calibration and System Verification Consideration for Measurements at 150 MHz – 3 GHz, KDB Publication 450824

[30] FCC SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens, KDB Publication 616217

[31] FCC SAR Measurement Requirements for 3 – 6 GHz, KDB Publication 865664

[32] FCC Mobile Portable RF Exposure Procedure, KDB Publication 447498

[33] FCC SAR Procedures for Dongle Transmitters, KDB Publication 447498

[34] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[35] FCC SAR Test Considerations for LTE Handsets and Data Modems, KDB Publication 941225.

[36] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG-41311L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

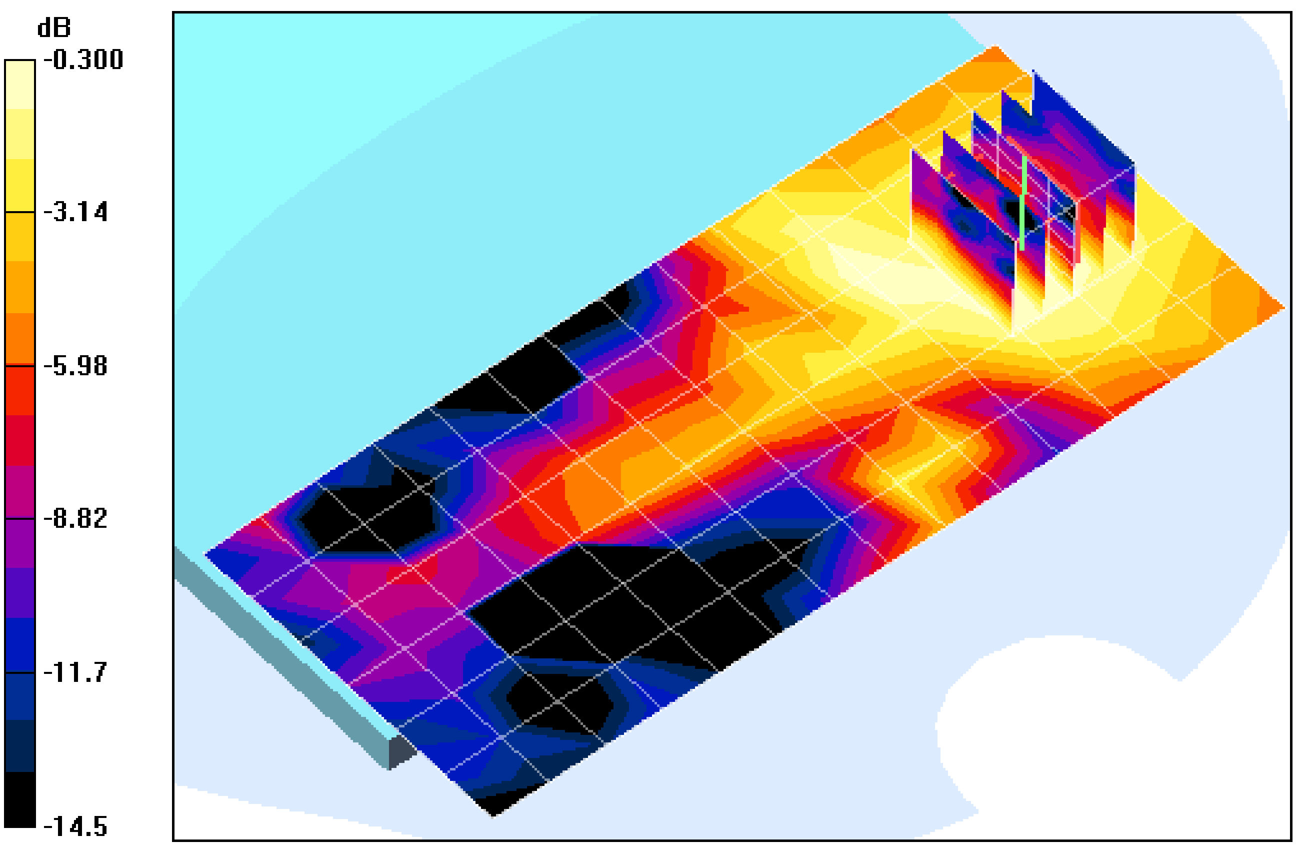
Communication System: IEEE 802.11g; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used (interpolated):
f = 2437 MHz; σ = 2.02 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-06-2011; Ambient Temp: 24.2 °C; Tissue Temp: 22.6 °C

Probe: EX3DV4 - SN3550; ConvF(6.25, 6.25, 6.25); Calibrated: 2/14/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11g, Body SAR, Laptop Position, Ch.06, 6Mbps, Tx Chain 1

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 3.16 V/m
Peak SAR (extrapolated) = 0.037 W/kg
SAR(1 g) = 0.021 mW/g; SAR(10 g) = 0.013 mW/g



0 dB = 0.026mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

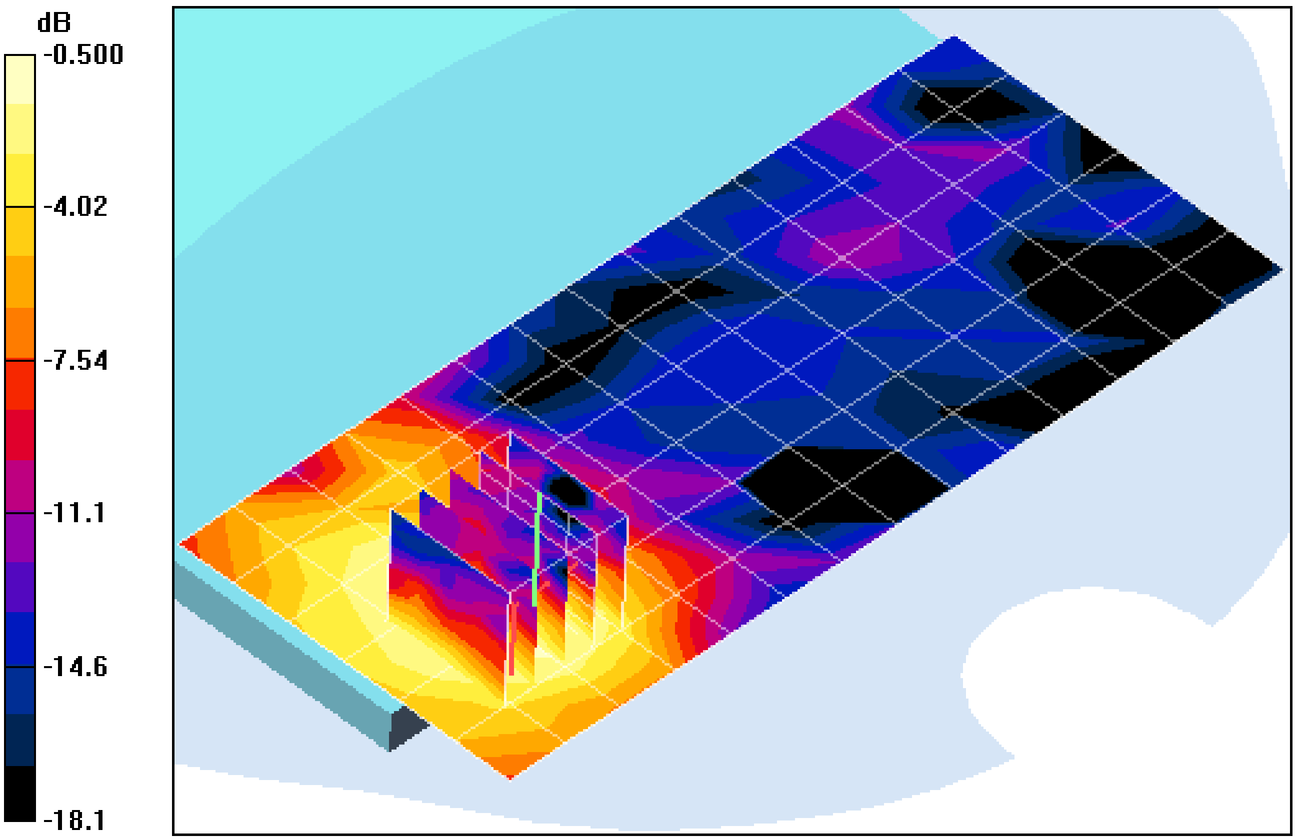
Communication System: IEEE 802.11n; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used (interpolated):
f = 2437 MHz; $\sigma = 2.02$ mho/m; $\varepsilon_r = 50.8$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-06-2011; Ambient Temp: 24.2 °C; Tissue Temp: 22.6 °C

Probe: EX3DV4 - SN3550; ConvF(6.25, 6.25, 6.25); Calibrated: 2/14/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11n, Body SAR, Laptop Position, Ch.06, 6.5 Mbps, Tx Chain 2

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.20 V/m
Peak SAR (extrapolated) = 0.064 W/kg
SAR(1 g) = 0.033 mW/g; SAR(10 g) = 0.018 mW/g



0 dB = 0.041mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

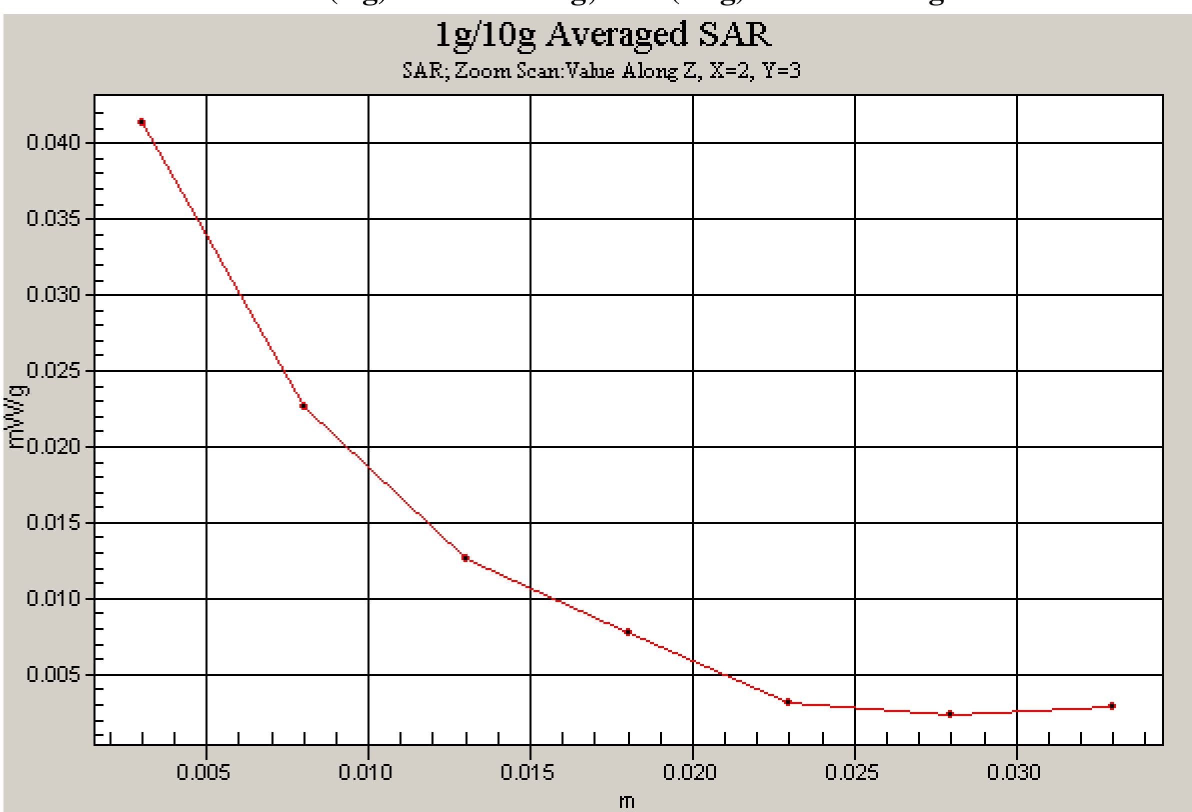
Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used (interpolated):
f = 2437 MHz; σ = 2.02 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0. cm

Test Date: 04-06-2011; Ambient Temp: 24.2 °C; Tissue Temp: 22.6 °C

Probe: EX3DV4 - SN3550; ConvF(6.25, 6.25, 6.25); Calibrated: 2/14/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11n, Body SAR, Laptop Position, Ch.06, 6.5 Mbps, Tx Chain 2

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.20 V/m
Peak SAR (extrapolated) = 0.064 W/kg
SAR(1 g) = 0.033 mW/g; SAR(10 g) = 0.018 mW/g



PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

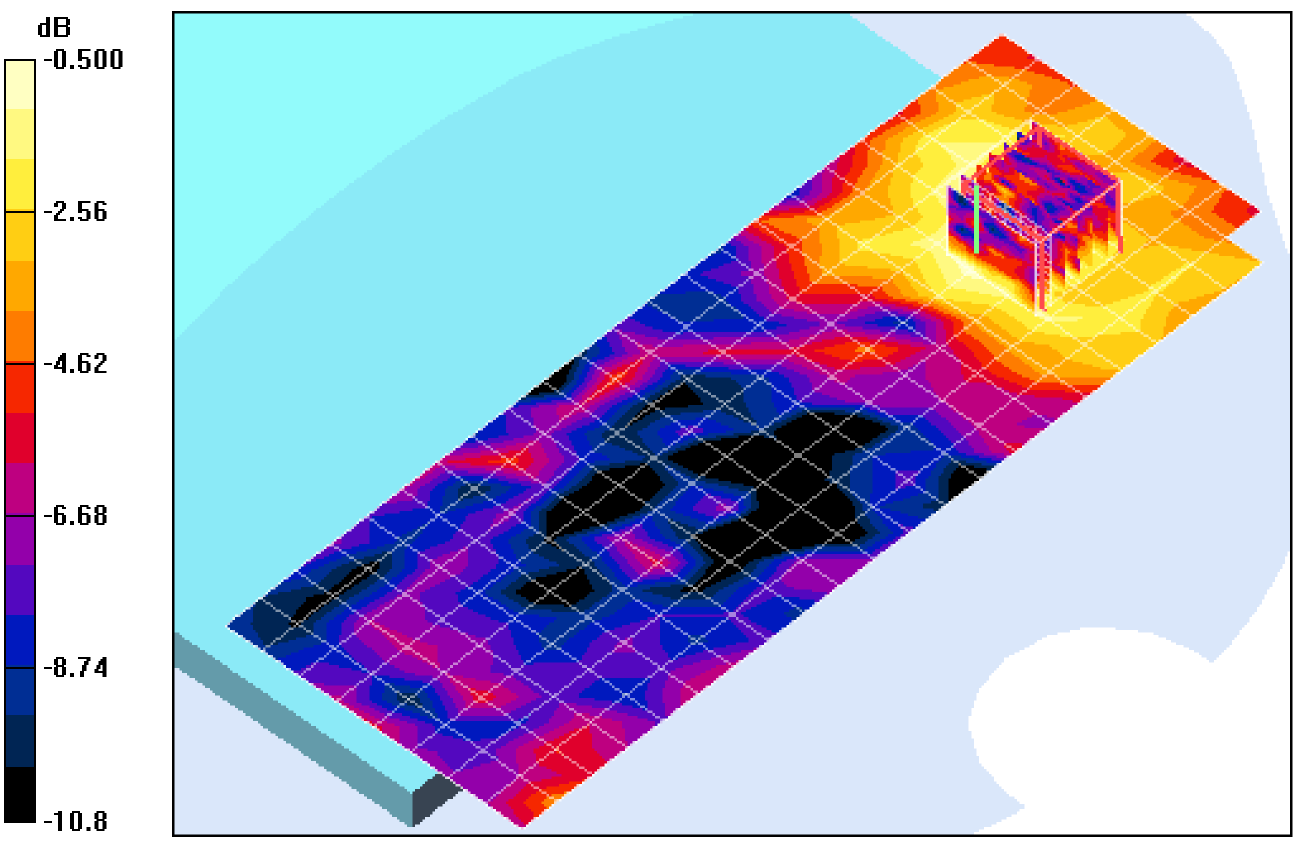
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body M;edium parameters used (interpolated):
f = 5200 MHz; σ = 5.44 mho/m; ε_r = 47.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0. cm

Test Date: 04-05-2011; Ambient Temp: 24.3 °C; Tissue Temp: 22.7 °C

Probe: EX3DV4 - SN3550; ConvF(3.58, 3.58, 3.58); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: WLAN 802.11a 5.2 GHz, Laptop position, Ch.40, 6Mbps, Tx Chain 1

Area Scan (9x23x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.48 V/m
Peak SAR (extrapolated) = 0.433 W/kg
SAR(1 g) = 0.052 mW/g; SAR(10 g) = 0.035 mW/g



0 dB = 0.091mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

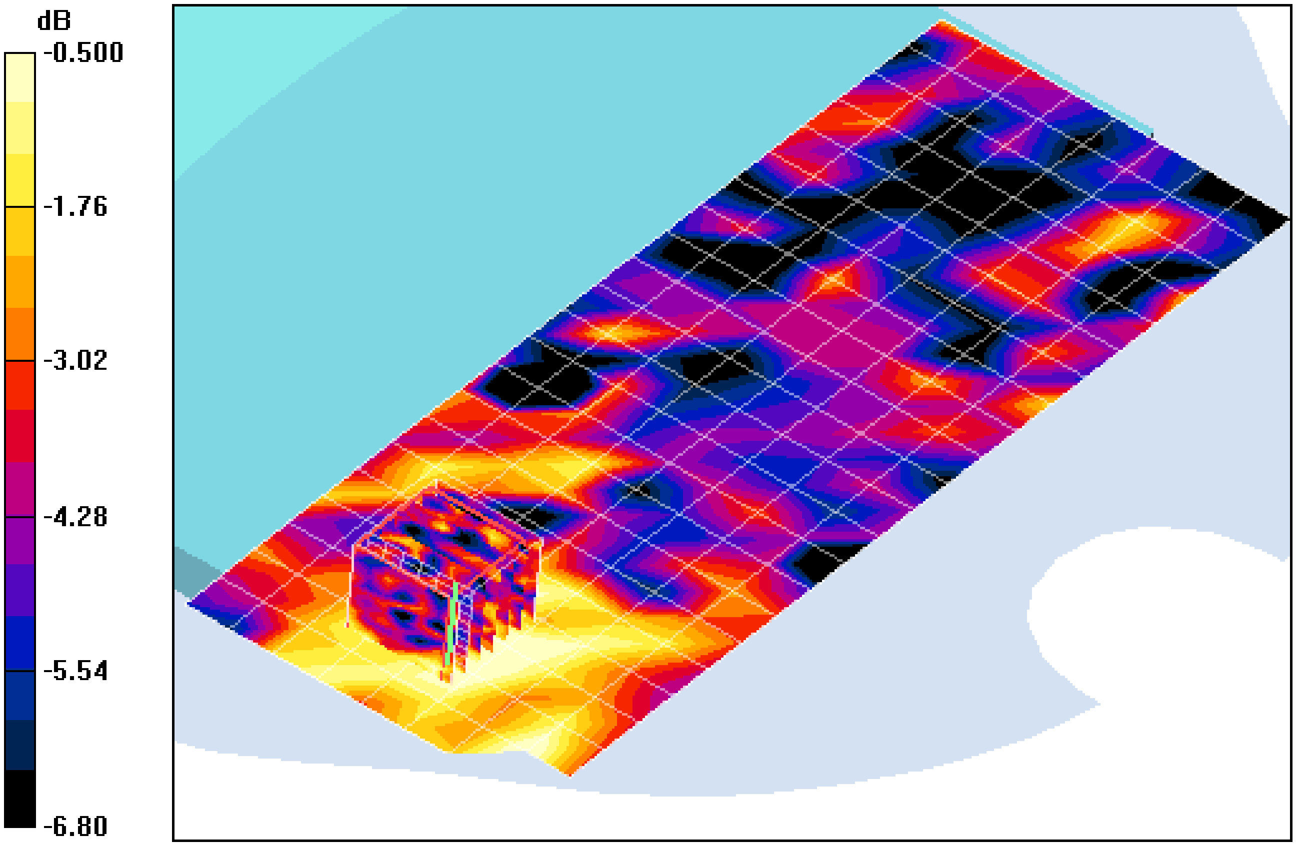
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5200 MHz; σ = 5.44 mho/m; ε_r = 47.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0. cm

Test Date: 04-05-2011; Ambient Temp:24.3 °C; Tissue Temp: 22.7 °C

Probe: EX3DV4 - SN3550; ConvF(3.58, 3.58, 3.58); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: WLAN 802.11a 5.2 GHz, Laptop position, Ch.40, 6Mbps, Tx Chain 2

Area Scan (9x23x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 1.09 V/m
Peak SAR (extrapolated) = 0.071 W/kg
SAR(1 g) = 0.028 mW/g; SAR(10 g) = 0.022 mW/g



0 dB = 0.048mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

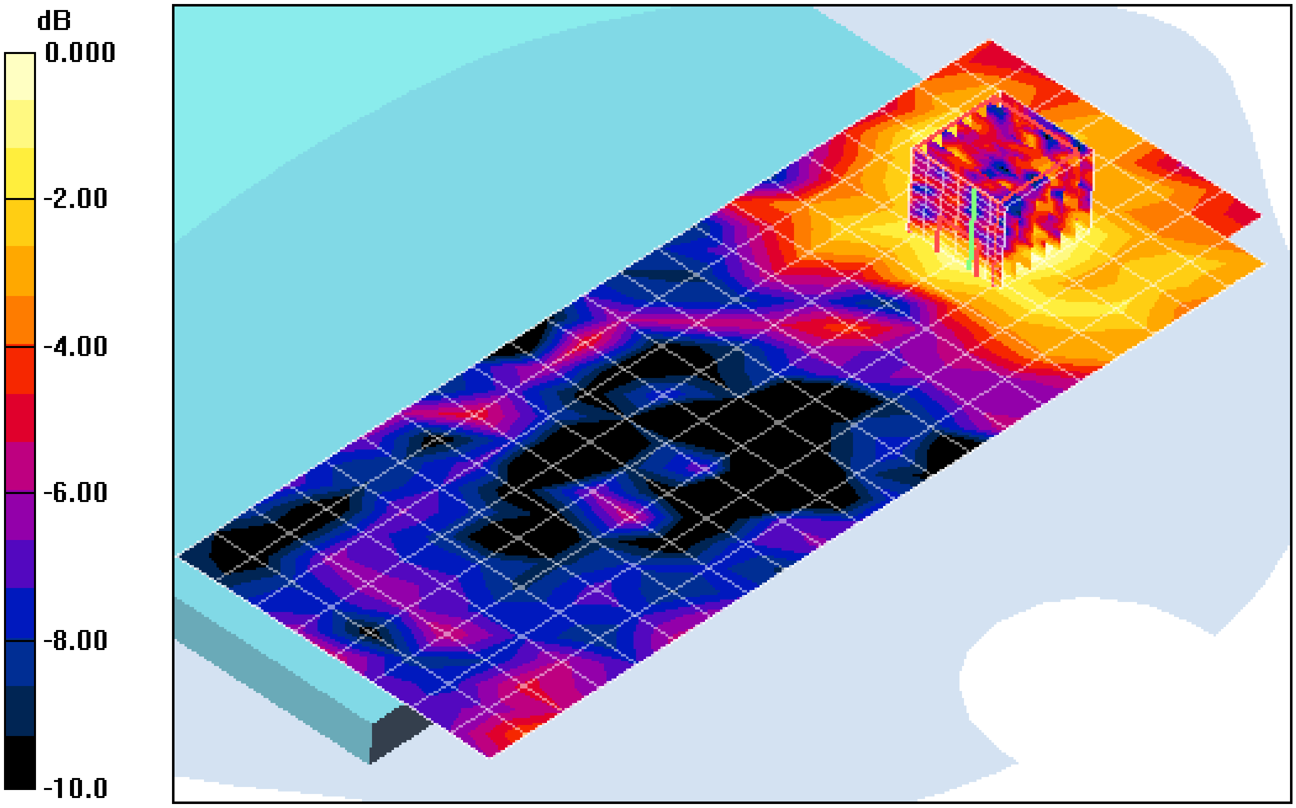
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5320 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5320 MHz; σ = 5.62 mho/m; ε_r = 46.9; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-05-2011; Ambient Temp: 24.3 °C; Tissue Temp: 22.7 °C

Probe: EX3DV4 - SN3550; F(3.31, 3.31, 3.31); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: WLAN 802.11a 5.3 GHz, Laptop position, Ch.64, 6Mbps, Tx Chain 1

Area Scan (9x23x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 1.10 V/m
Peak SAR (extrapolated) = 0.054 W/kg
SAR(1 g) = 0.025 mW/g; SAR(10 g) = 0.019 mW/g



0 dB = 0.046mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

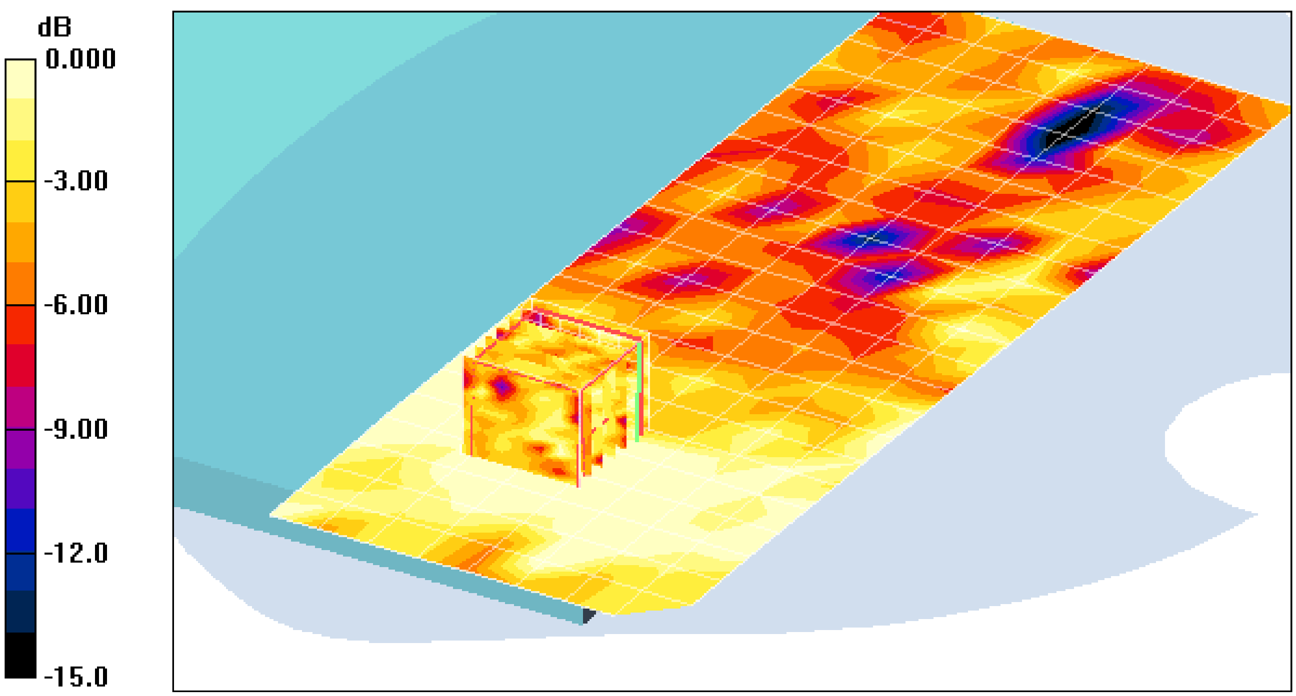
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5320 MHz;Duty Cycle: 1:1
Medium: 5 GHz Medium parameters used (interpolated):
f = 5320 MHz; σ = 5.62 mho/m; ε_r = 46.9; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-05-2011; Ambient Temp: 24.3 °C; Tissue Temp: 22.7 °C

Probe: EX3DV4 - SN3550; ConvF(3.31, 3.31, 3.31); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: WLAN 802.11a 5.3 GHz, Laptop position, Ch.64, 6Mbps, Tx Chain 2

Area Scan (9x23x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0.908 V/m
Peak SAR (extrapolated) = 0.126 W/kg
SAR(1 g) = 0.030 mW/g; SAR(10 g) = 0.023 mW/g



0 dB = 0.048mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

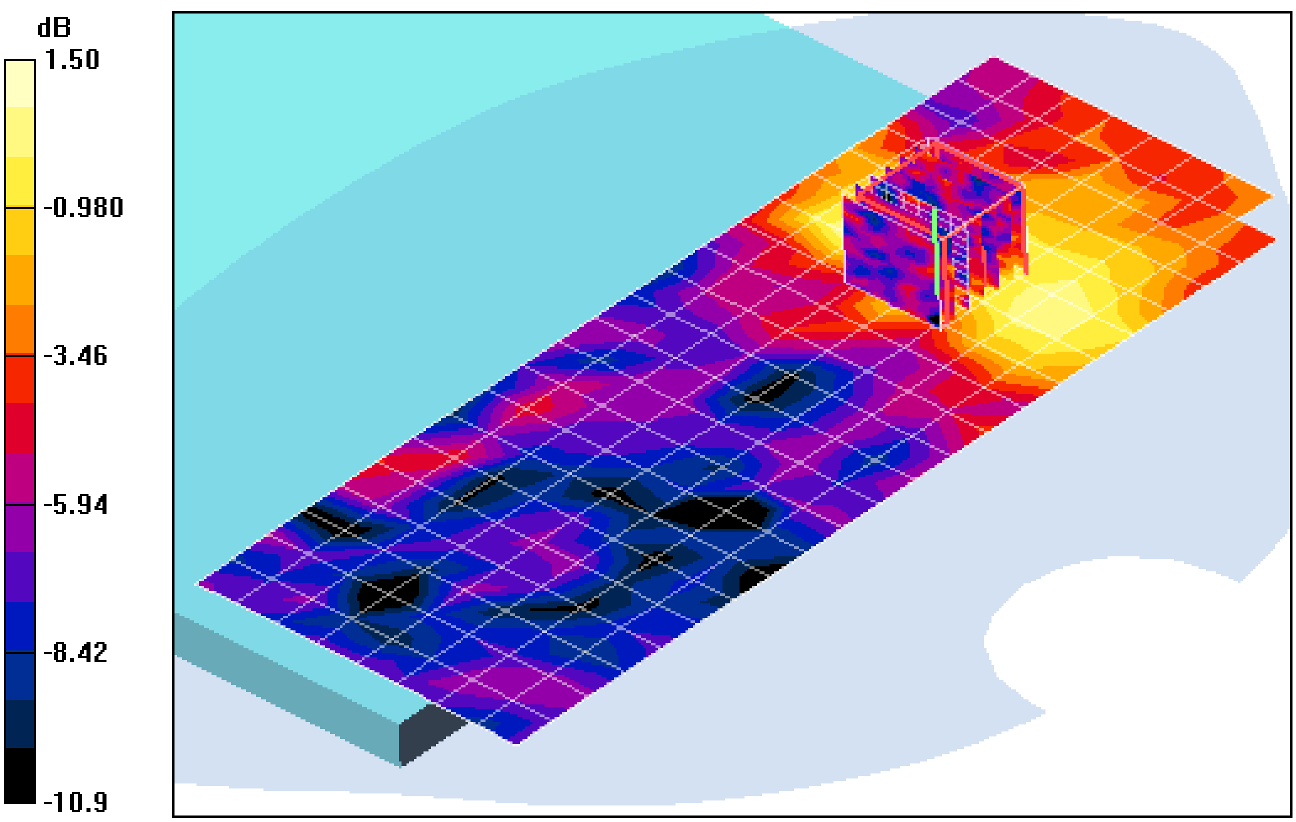
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5500 MHz; σ = 5.87 mho/m; ε_r = 46.6; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-05-2011; Ambient Temp: 24.5 °C; Tissue Temp: 22.8 °C

Probe: EX3DV4 - SN3550; ConvF(3.21, 3.21, 3.21); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: WLAN 802.11a 5.5 GHz, Laptop position, Ch.100, 6Mbps, Tx Chain 1

Area Scan (9x23x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 2.86 V/m
Peak SAR (extrapolated) = 0.423 W/kg
SAR(1 g) = 0.058 mW/g; SAR(10 g) = 0.035 mW/g



0 dB = 0.103mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

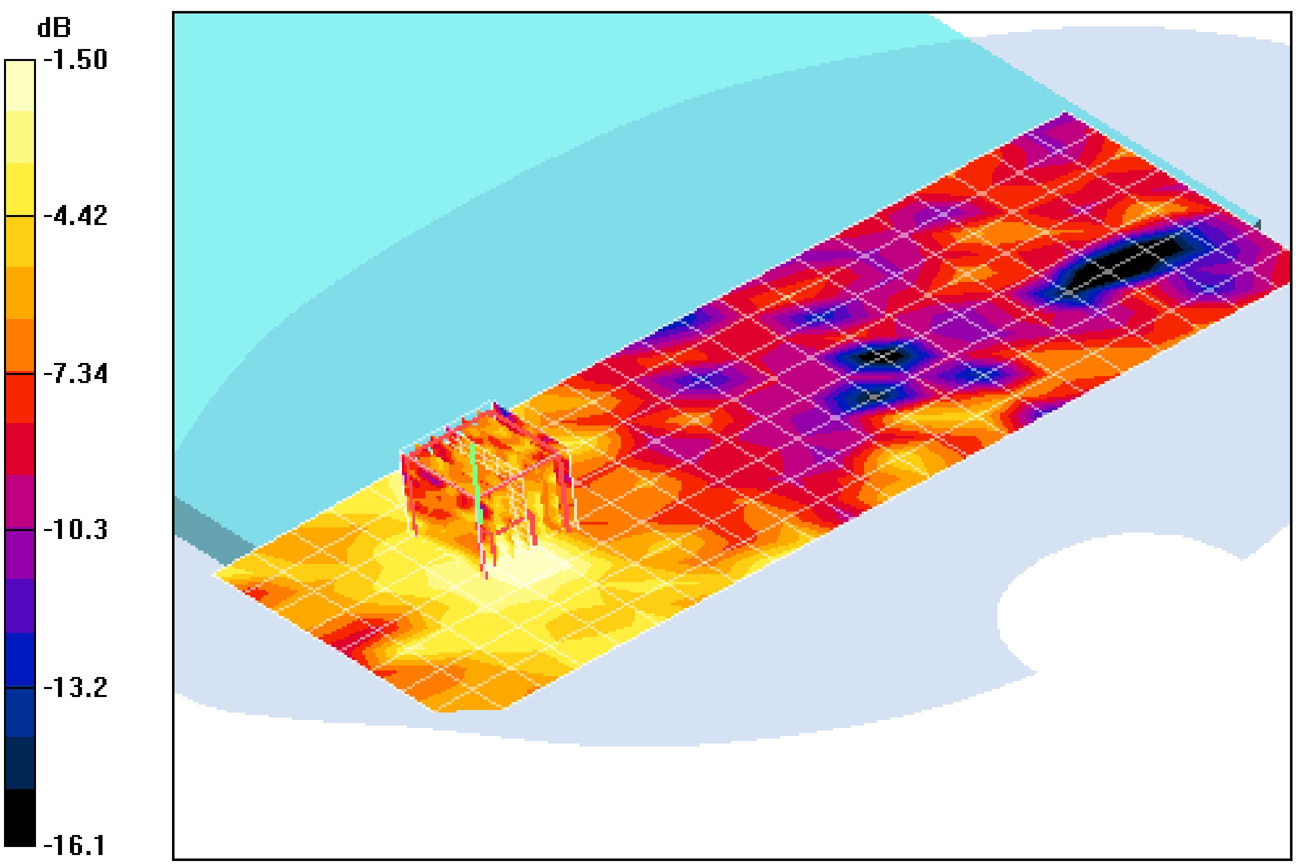
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5500 MHz; σ = 5.87 mho/m; ε_r = 46.6; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-05-2011; Ambient Temp: 24.5 °C; Tissue Temp: 22.8 °C

Probe: EX3DV4 - SN3550; ConvF(3.21, 3.21, 3.21); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: WLAN 802.11a 5.5 GHz, Laptop position, Ch.100, 6Mbps, Tx Chain 2

Area Scan (9x23x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.19 V/m
Peak SAR (extrapolated) = 0.144 W/kg
SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.033 mW/g



0 dB = 0.097mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

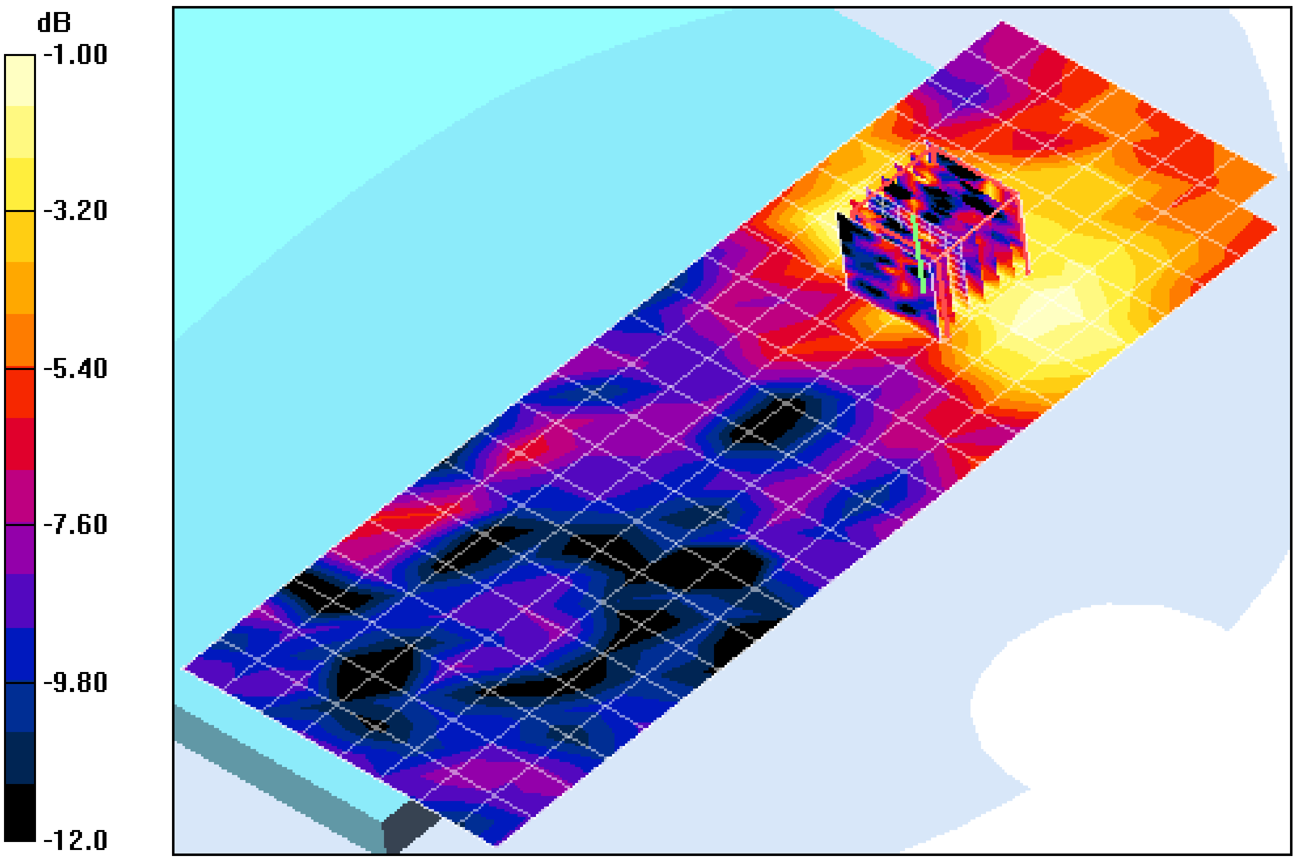
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5745 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5745 MHz; σ = 6.23 mho/m; ε_r = 46.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0. cm

Test Date: 04-05-2011; Ambient Temp:24.6 °C; Tissue Temp: 22.9 °C

Probe: EX3DV4 - SN3550; ConvF(3.29, 3.29, 3.29); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: WLAN 802.11a 5.8 GHz, Laptop position, Ch.149, 6Mbps, Tx Chain 1

Area Scan (9x23x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.04 V/m
Peak SAR (extrapolated) = 0.884 W/kg
SAR(1 g) = 0.086 mW/g; SAR(10 g) = 0.044 mW/g



0 dB = 0.154mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: PCG -41313L; Type: Laptop PC with WLAN and Bluetooth
Serial: DVT15590 1800006

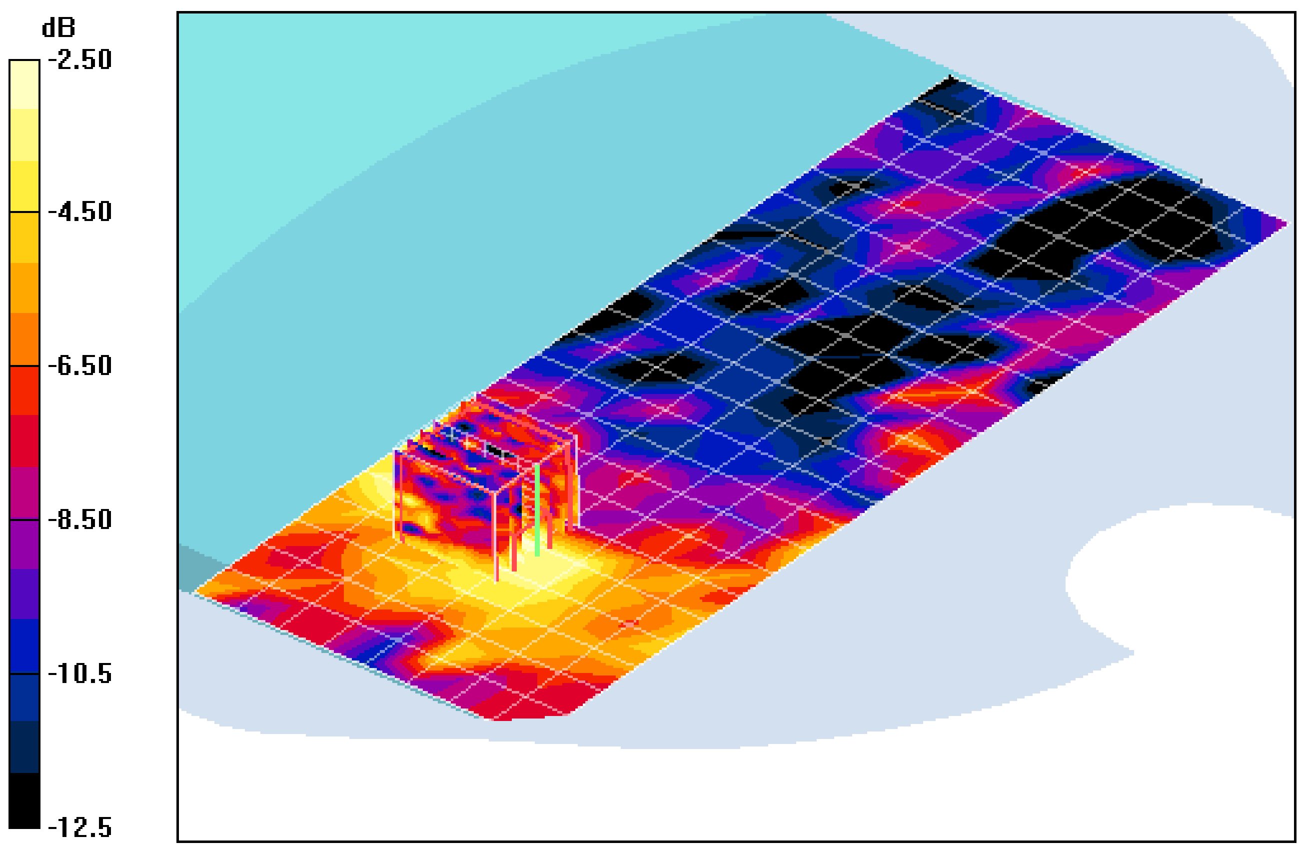
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5745 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5745 MHz; σ = 6.23 mho/m; ε_r = 46.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0. cm

Test Date: 04-05-2011; Ambient Temp:24.6 °C; Tissue Temp: 22.9 °C

Probe: EX3DV4 - SN3550; ConvF(3.29, 3.29, 3.29); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: WLAN 802.11a 5.8 GHz, Laptop position, Ch.149, 6Mbps, Tx Chain 2

Area Scan (9x23x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 1.44 V/m
Peak SAR (extrapolated) = 0.515 W/kg
SAR(1 g) = 0.080 mW/g; SAR(10 g) = 0.035 mW/g



0 dB = 0.150mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1057

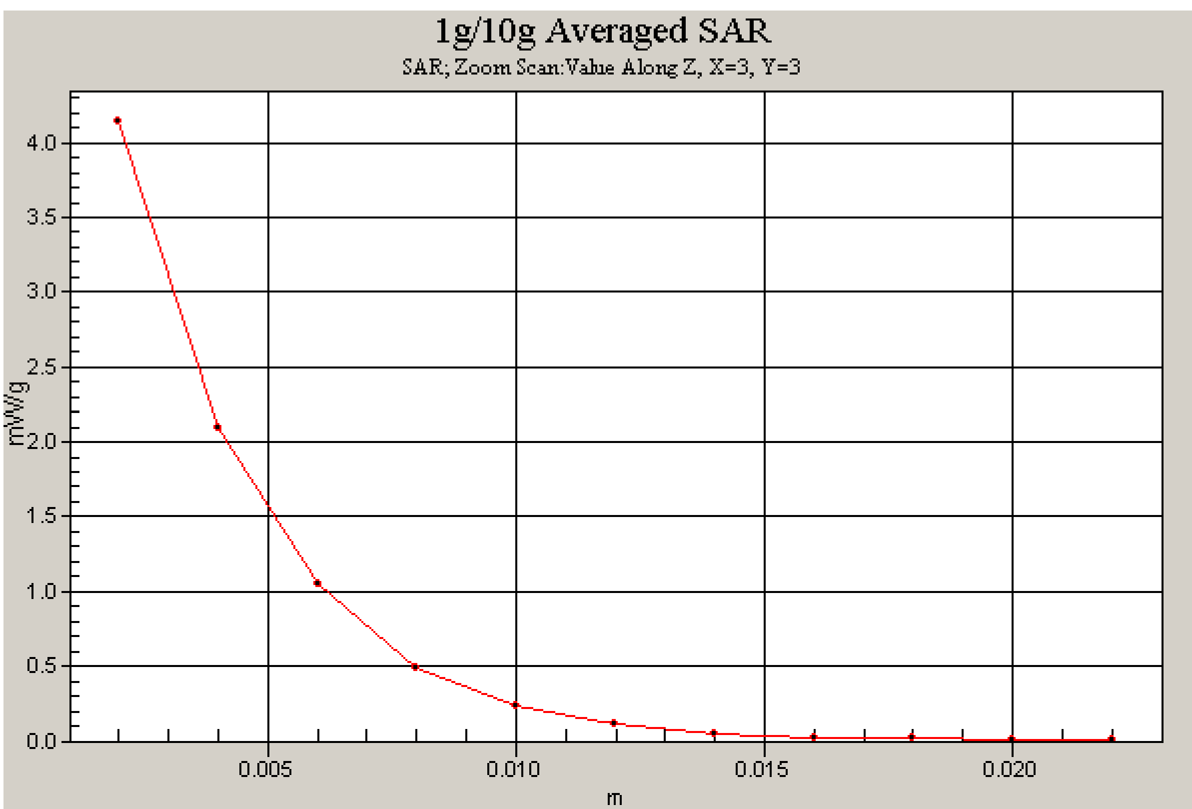
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5800 MHz; σ = 6.28 mho/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-05-2011; Ambient Temp: 24.6 °C; Tissue Temp: 22.9 °C

Probe: EX3DV4 - SN3550; ConvF(3.29, 3.29, 3.29); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 14.0 dBm (25 mW)
SAR(1 g) = 1.93 mW/g; SAR(10 g) = 0.527 mW/g
Deviation = 2.93 %



APPENDIX B: DIPOLE VALIDATION

PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 2450 MHz; Type: D2450V2; Serial: 719

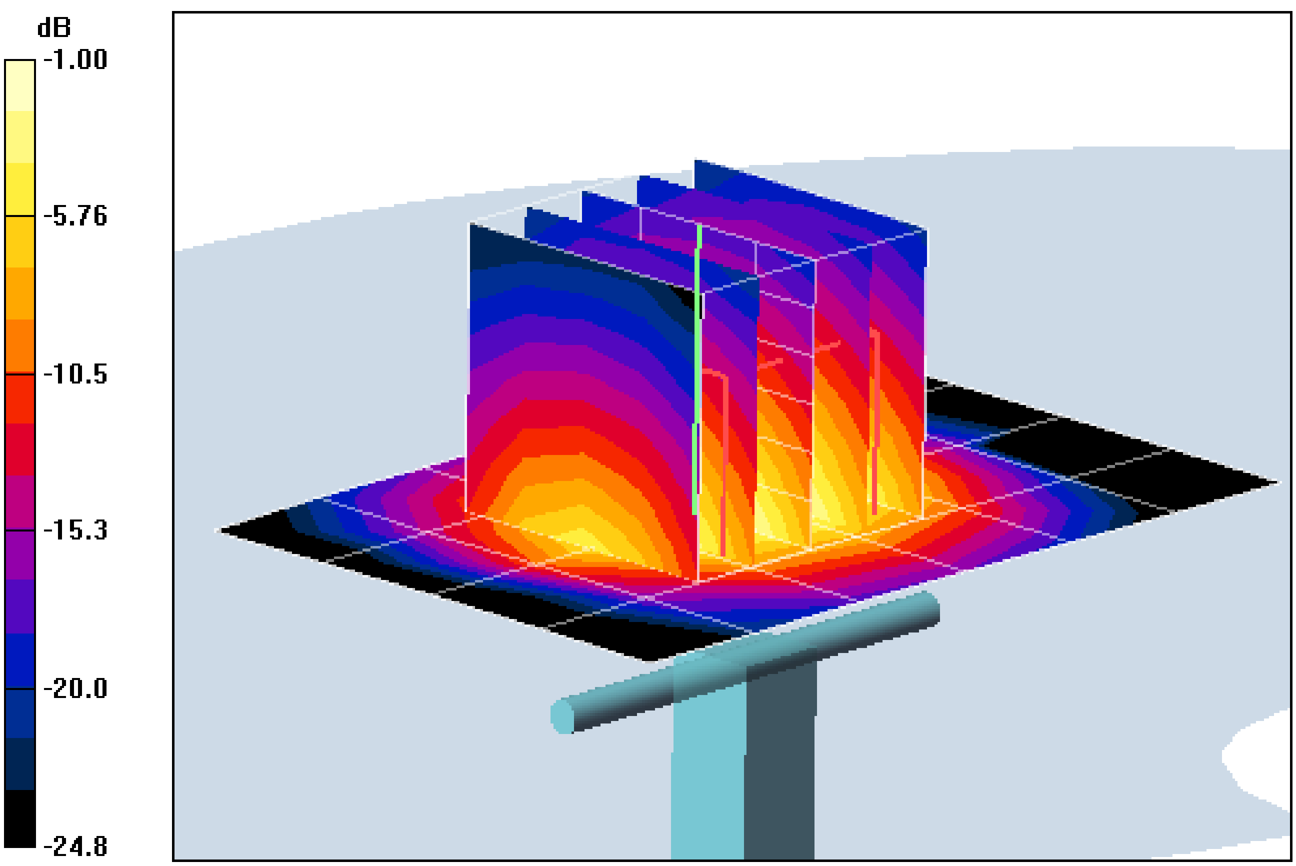
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2450 MHz; σ = 2.04 mho/m; ε_r = 50.8; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-06-2011; Ambient Temp: 24.2 °C; Tissue Temp: 22.6 °C

Probe: EX3DV4 - SN3550; ConvF(6.25, 6.25, 6.25); Calibrated: 2/14/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

2450MHz System Verification

Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 14.0 dBm (25 mW)
SAR(1 g) = 1.34 mW/g; SAR(10 g) = 0.608 mW/g
Deviation = 4.28 %



0 dB = 1.75mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1057

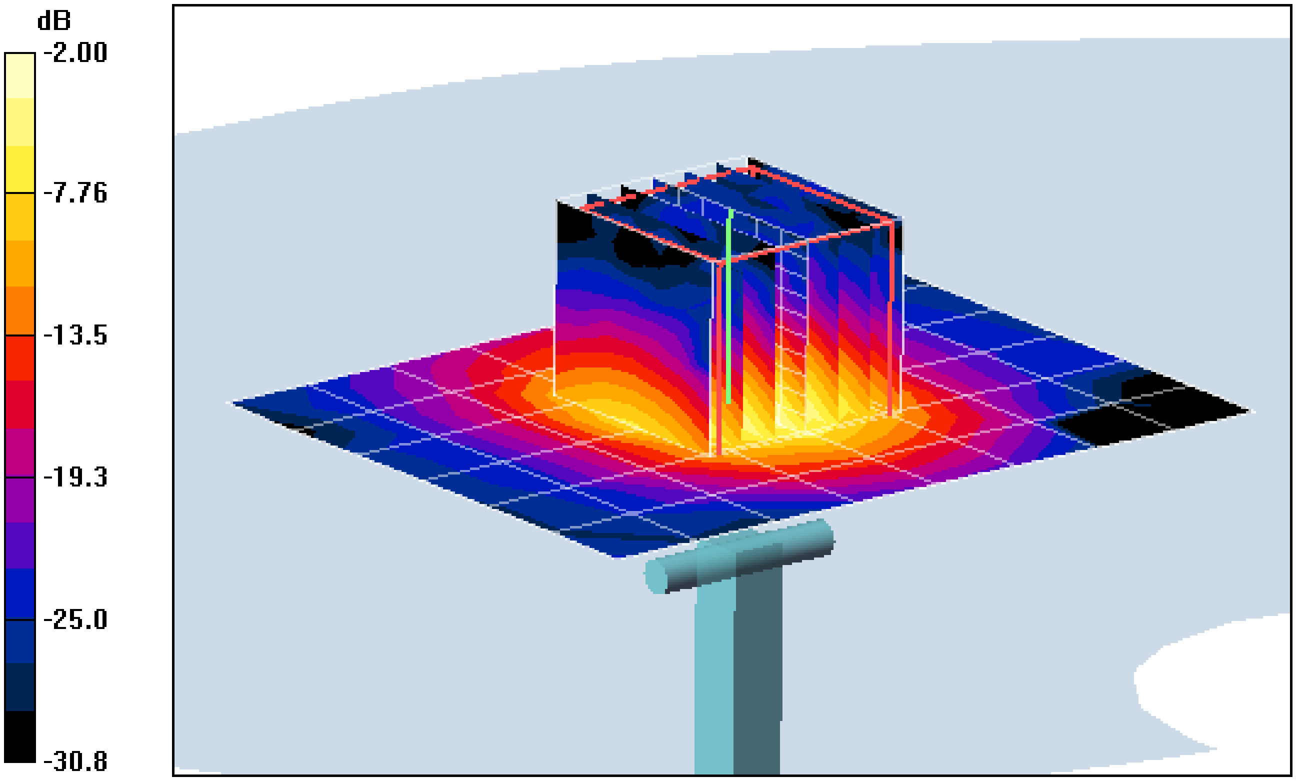
Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5200 MHz; $\sigma = 5.44$ mho/m; $\varepsilon_r = 47.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-05-2011; Ambient Temp:24.3 °C; Tissue Temp: 22.7 °C

Probe: EX3DV4 - SN3550; ConvF(3.58, 3.58, 3.58); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5200MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 14.0 dBm (25 mW)
SAR(1 g) = 2 mW/g; SAR(10 g) = 0.555 mW/g
Deviation = 2.96 %



0 dB = 4.31mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057

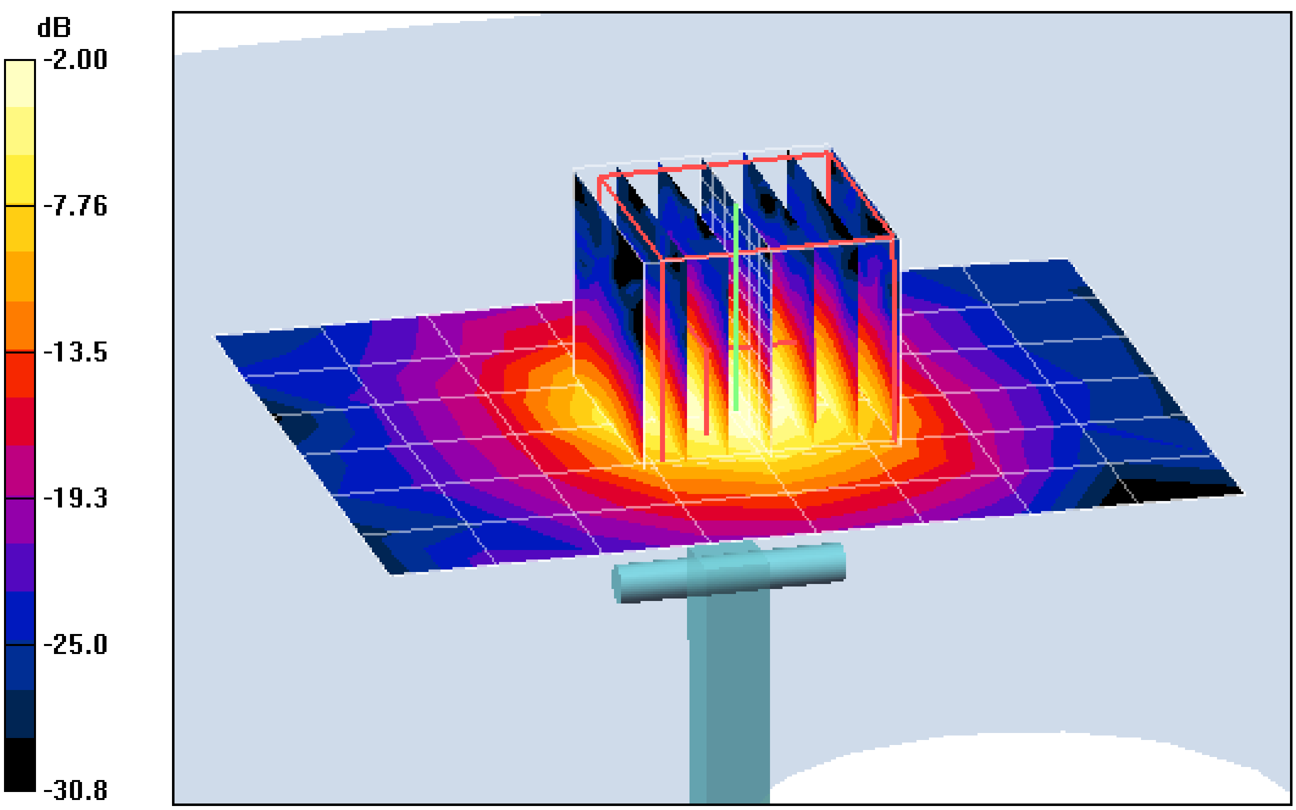
Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5500 MHz; σ = 5.87 mho/m; ε_r = 46.6; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-05-2011; Ambient Temp:24.5 °C; Tissue Temp: 22.8 °C

Probe: EX3DV4 - SN3550; ConvF(3.21, 3.21, 3.21); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5500MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan 2 (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 14.0 dBm (25 mW)
SAR(1 g) = 2.03 mW/g; SAR(10 g) = 0.555 mW/g
Deviation = -3.79 %



0 dB = 4.39mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1057

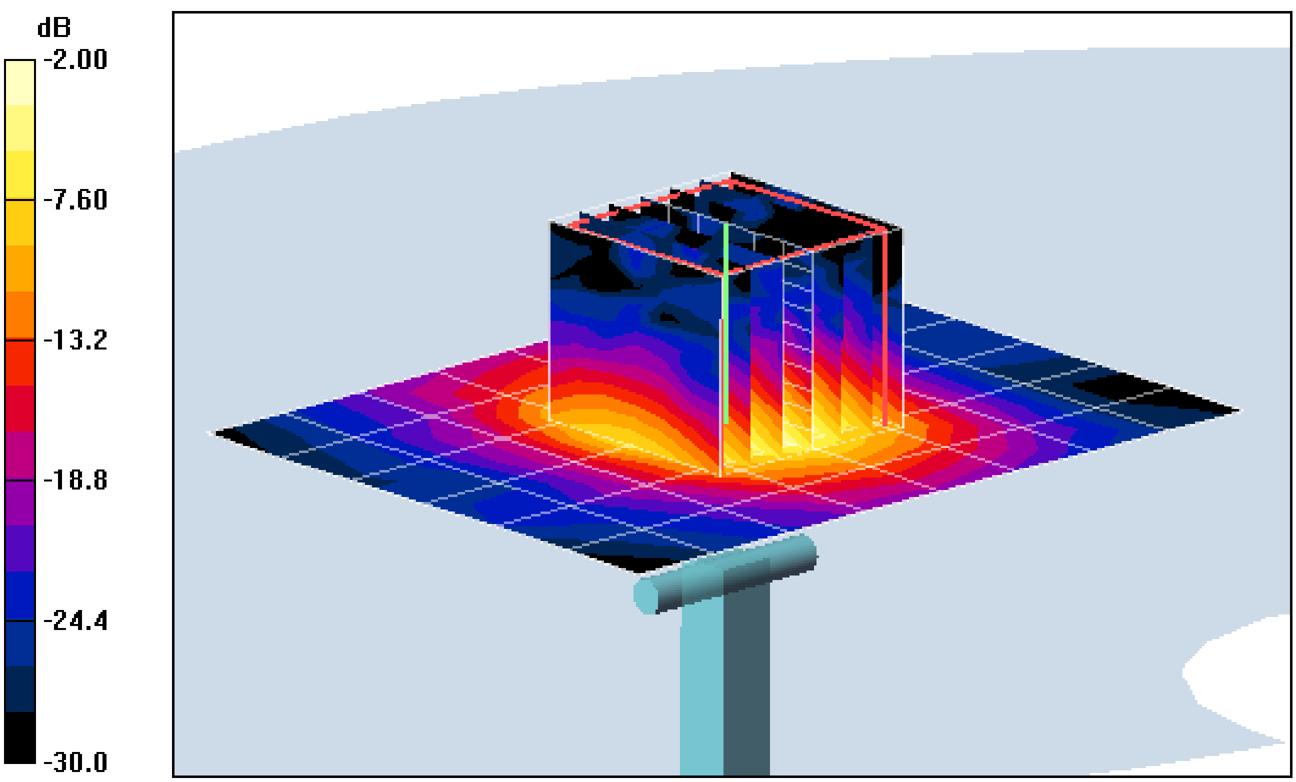
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used (interpolated):
f = 5800 MHz; σ = 6.28 mho/m; ε_r = 46; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-05-2011; Ambient Temp:24.6 °C; Tissue Temp: 22.9 °C

Probe: EX3DV4 - SN3550; ConvF(3.29, 3.29, 3.29); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 7/8/2010
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 14.0 dBm (25 mW)
SAR(1 g) = 1.93 mW/g; SAR(10 g) = 0.527 mW/g
Deviation = 2.93 %



0 dB = 4.14mW/g

APPENDIX C: PROBE CALIBRATION

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

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

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

Accreditation No.: SCS 108

Client PC Test

Certificate No: EX-3550_Feb11

CALIBRATION CERTIFICATE

Object	EX3DV4 - SN:3550
Calibration procedure(s)	QA CAL-01.v7, QA CAL-14.v3, QA CAL-23.v4, QA CAL-25.v3 Calibration procedure for dosimetric E-field probes
Calibration date:	February 14, 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%.

KOK 2/22/11

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41495277	01-Apr-10 (No. 217-01136)	Apr-11
Power sensor E4412A	MY41498087	01-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: 654	23-Apr-10 (No. DAE4-654_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:	Niels Kuster	Quality Manager	

Issued: February 14, 2011

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

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

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

Accreditation No.: **SCS 108**

Glossary:

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 affect 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.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z* are numerical linearization parameters in dB assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media.
- *VR:* VR is the validity range of the calibration related to the average diode voltage or DAE voltage in mV.
- *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:3550

Manufactured: May 19, 2004
Calibrated: February 14, 2011

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3550

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.52	0.45	0.50	± 10.1 %
DCP (mV)[B]	100.3	98.8	99.0	

Modulation Calibration Parameters

UID	Communication System Name	PAR		A dB	B dB	C dB	VR mV	Unc[E] (k=2)
10000	CW	0.00	X	0.00	0.00	1.00	110.7	±2.2 %
			Y	0.00	0.00	1.00	145.7	
			Z	0.00	0.00	1.00	148.8	

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 max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3550

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	41.9	0.89	8.42	8.42	8.42	0.48	0.69	± 12.0 %
835	41.5	0.90	8.04	8.04	8.04	0.33	0.84	± 12.0 %
1750	40.1	1.37	7.33	7.33	7.33	0.46	0.65	± 12.0 %
1900	40.0	1.40	7.01	7.01	7.01	0.42	0.72	± 12.0 %
2450	39.2	1.80	6.29	6.29	6.29	0.13	1.57	± 12.0 %
2600	39.0	1.96	6.13	6.13	6.13	0.20	1.32	± 12.0 %
4950	36.3	4.40	4.37	4.37	4.37	0.35	1.80	± 13.1 %
5200	36.0	4.66	4.06	4.06	4.06	0.35	1.80	± 13.1 %
5300	35.9	4.76	3.92	3.92	3.92	0.35	1.80	± 13.1 %
5500	35.6	4.96	3.77	3.77	3.77	0.35	1.80	± 13.1 %
5600	35.5	5.07	3.50	3.50	3.50	0.40	1.80	± 13.1 %
5800	35.3	5.27	3.64	3.64	3.64	0.40	1.80	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

DASY/EASY - Parameters of Probe: EX3DV4- SN:3550

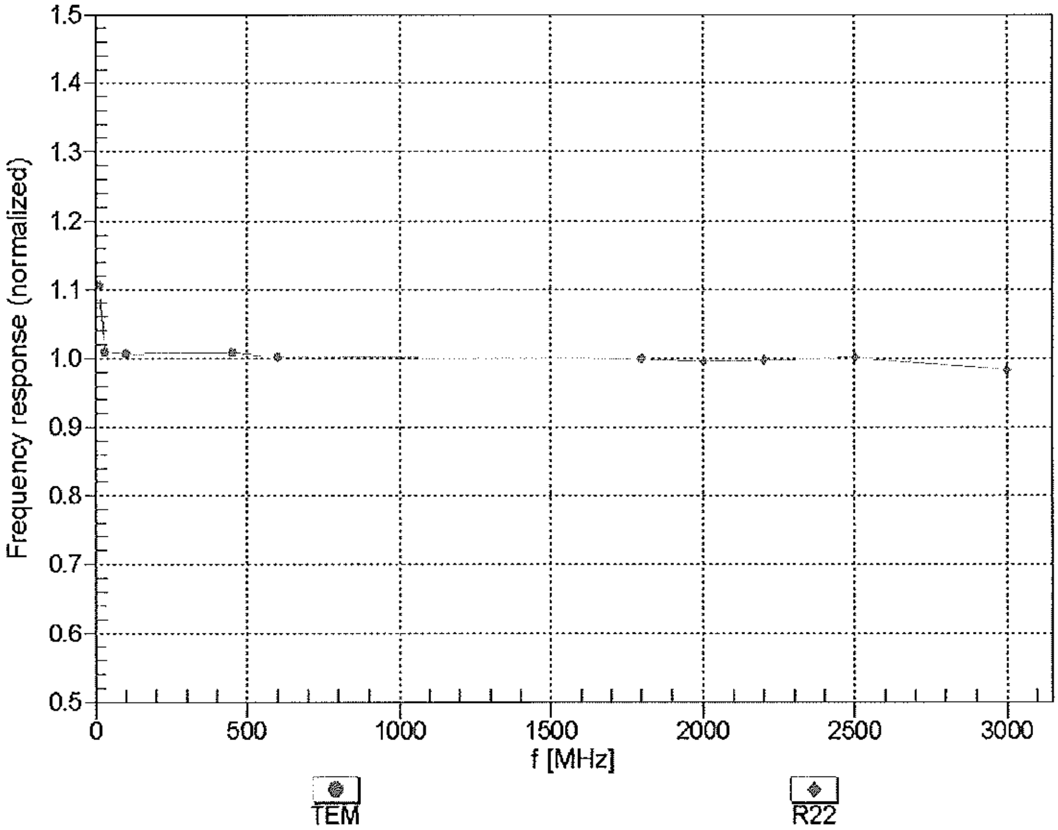
Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha	Depth (mm)	Unct. (k=2)
750	55.5	0.96	8.18	8.18	8.18	0.23	1.09	± 12.0 %
835	55.2	0.97	8.11	8.11	8.11	0.25	1.05	± 12.0 %
1750	53.4	1.49	7.21	7.21	7.21	0.42	0.89	± 12.0 %
1900	53.3	1.52	6.77	6.77	6.77	0.35	0.84	± 12.0 %
2450	52.7	1.95	6.25	6.25	6.25	0.30	0.86	± 12.0 %
2600	52.5	2.16	5.98	5.98	5.98	0.21	1.03	± 12.0 %
3700	51.0	3.55	5.42	5.42	5.42	0.20	1.95	± 13.1 %
4950	49.4	5.01	3.72	3.72	3.72	0.45	1.90	± 13.1 %
5200	49.0	5.30	3.58	3.58	3.58	0.45	1.90	± 13.1 %
5300	48.9	5.42	3.31	3.31	3.31	0.48	1.90	± 13.1 %
5500	48.6	5.65	3.21	3.21	3.21	0.47	1.90	± 13.1 %
5600	48.5	5.77	3.19	3.19	3.19	0.45	1.90	± 13.1 %
5800	48.2	6.00	3.29	3.29	3.29	0.50	1.90	± 13.1 %

[C] Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.
[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

Frequency Response of E-Field

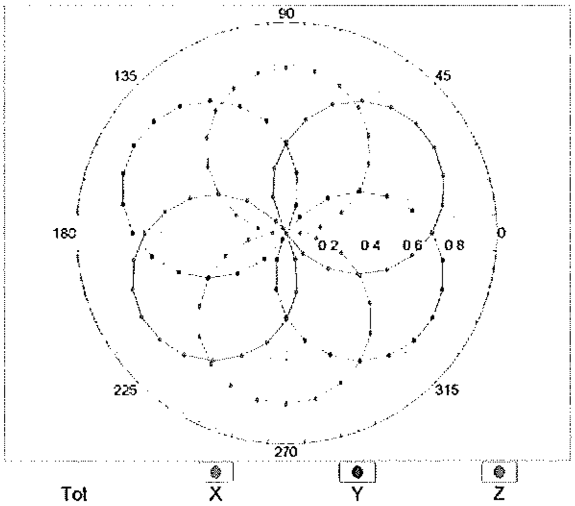
(TEM-Cell:ifi110 EXX, Waveguide: R22)



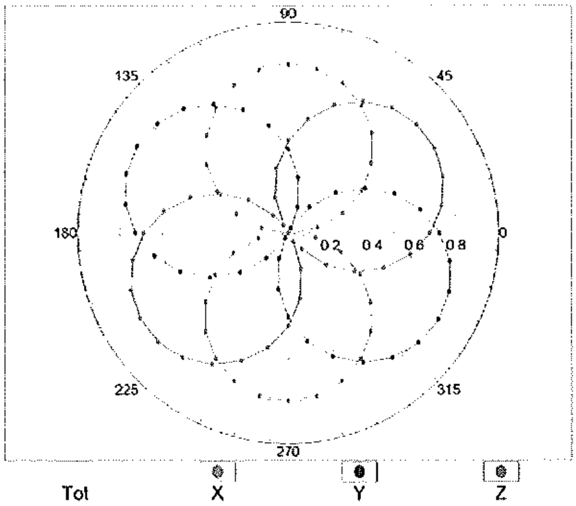
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

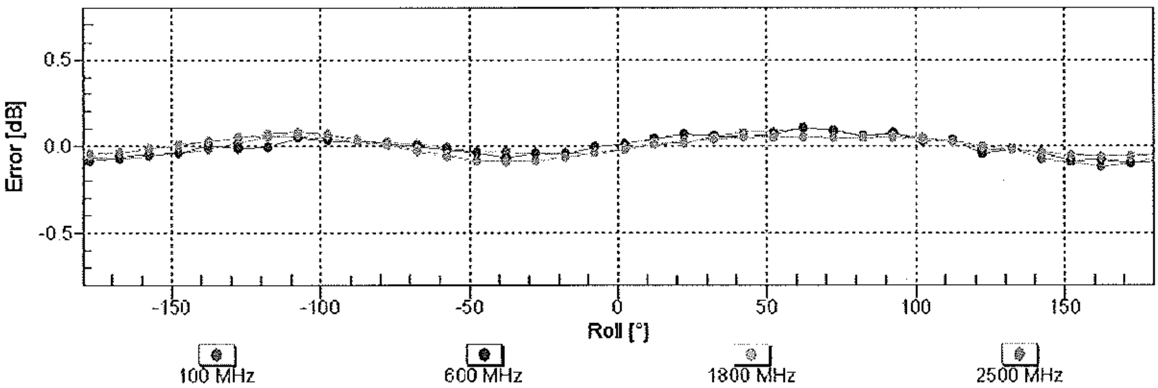
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



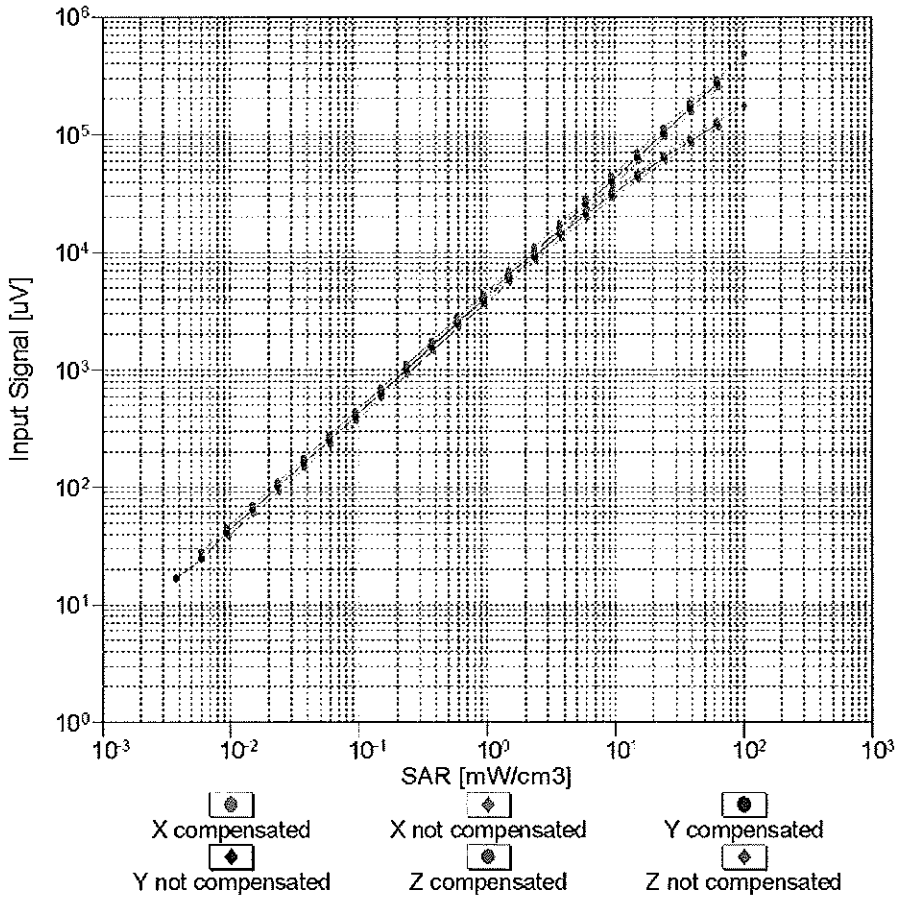
f=1800 MHz,R22

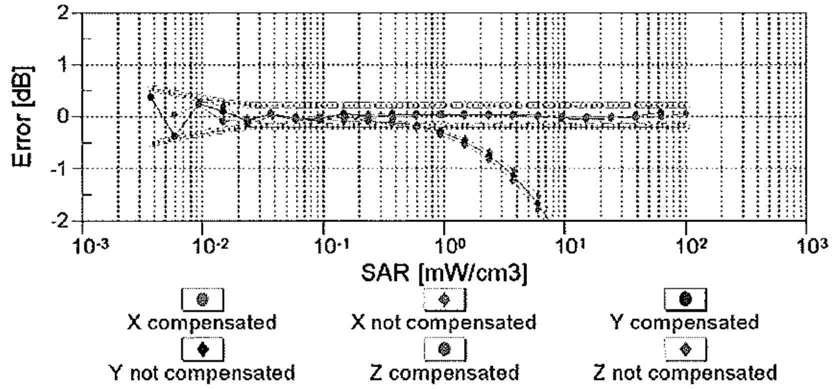




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

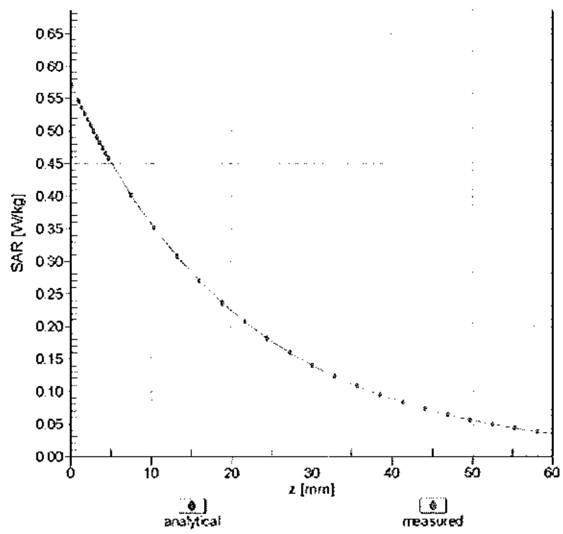
Dynamic Range f(SAR$_{head}$)
(TEM cell , f = 900 MHz)

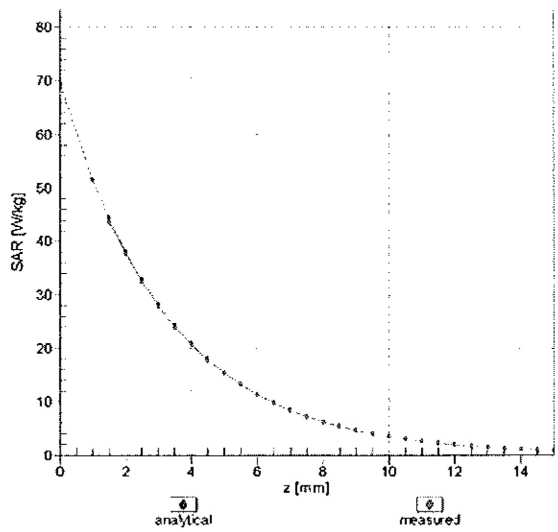




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

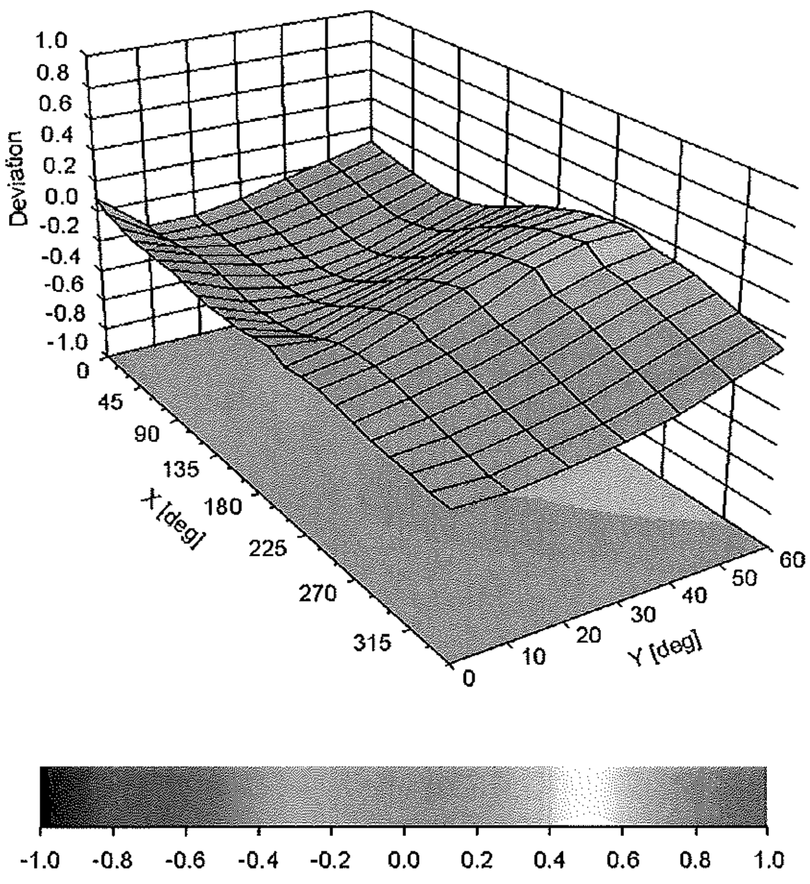
Conversion Factor Assessment





Deviation from Isotropy in Air

Error (ϕ, ϑ), f = 900 MHz



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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:3550

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	3 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

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

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

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

Accreditation No.: SCS 108

Client PC Test

Certificate No: D2450V2-719_Aug09

CALIBRATION CERTIFICATE

Object	D2450V2 - SN: 719
Calibration procedure(s)	QA CAL-05.v7 Calibration procedure for dipole validation kits
Calibration date:	August 27, 2009
Condition of the calibrated item	In Tolerance

✓ ok & 8/31/09

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 (Calibrated by, Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	08-Oct-08 (No. 217-00898)	Oct-09
Power sensor HP 8481A	US37292783	08-Oct-08 (No. 217-00898)	Oct-09
Reference 20 dB Attenuator	SN: 5086 (20g)	31-Mar-09 (No. 217-01025)	Mar-10
Type-N mismatch combination	SN: 5047.2 / 06327	31-Mar-09 (No. 217-01029)	Mar-10
Reference Probe ES3DV3	SN: 3205	26-Jun-09 (No. ES3-3205_Jun09)	Jun-10
DAE4	SN: 601	07-Mar-09 (No. DAE4-601_Mar09)	Mar-10

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

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

Issued: August 27, 2009

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	V5.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 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	40.1 ± 6 %	1.80 mho/m ± 6 %
Head TSL temperature during test	(22.3 ± 0.2) °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 mW / g
SAR normalized	normalized to 1W	53.2 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**53.5 mW /g ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.23 mW / g
SAR normalized	normalized to 1W	24.9 mW / g
SAR for nominal Head TSL parameters [1]	normalized to 1W	**25.0 mW /g ± 16.5 % (k=2)**

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

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.2 ± 6 %	2.01 mho/m ± 6 %
Body TSL temperature during test	(22.5 ± 0.2) °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 mW / g
SAR normalized	normalized to 1W	52.0 mW / g
SAR for nominal Body TSL parameters [2]	normalized to 1W	**51.4 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 [2]	normalized to 1W	**23.9 mW /g ± 16.5 % (k=2)**

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

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.4 Ω + 1.8 jΩ
Return Loss	- 28.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.2 Ω + 3.9 jΩ
Return Loss	- 27.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 10, 2002

DASY5 Validation Report for Head TSL

Date/Time: 27.08.2009 11:14:47

Test Laboratory: SPEAG, Zurich, Switzerland

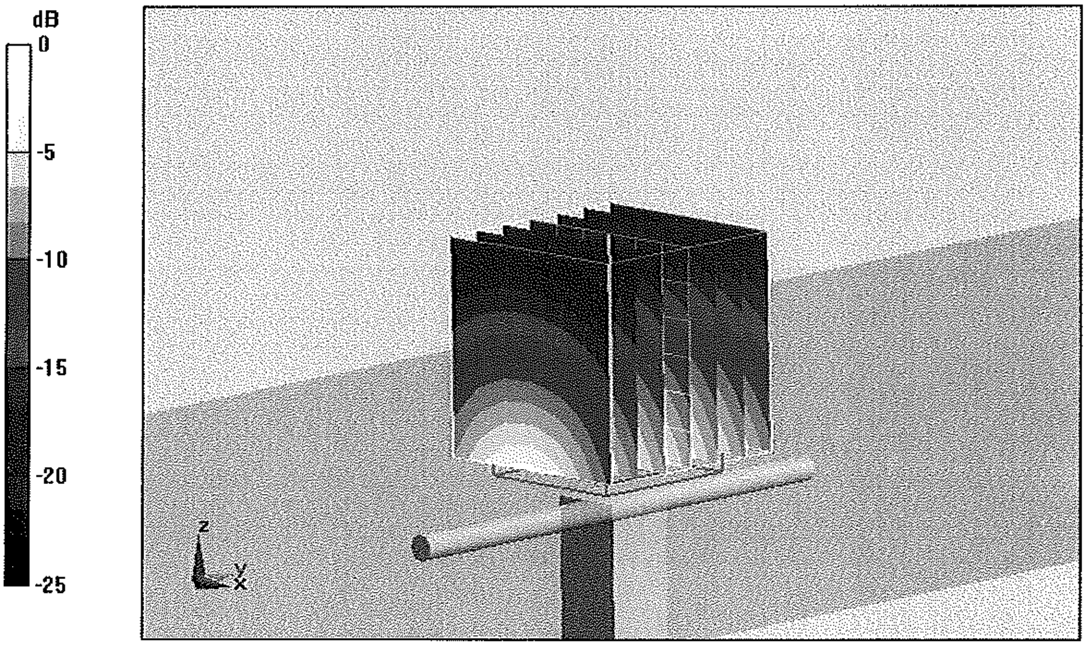
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN719

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: HSL U11 BB
Medium parameters used: f = 2450 MHz; $\sigma = 1.8$ mho/m; $\varepsilon_r = 40.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

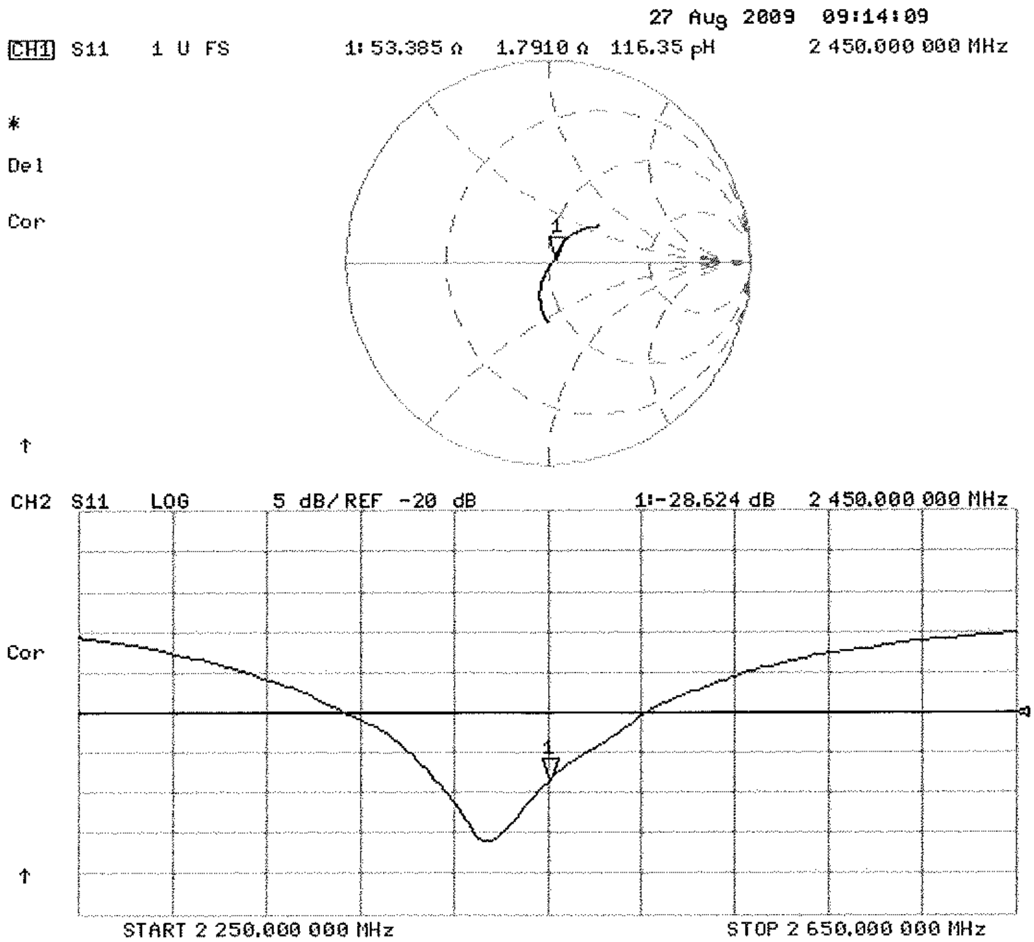
- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 101.4 V/m; Power Drift = 0.025 dB
Peak SAR (extrapolated) = 27 W/kg
SAR(1 g) = 13.3 mW/g; SAR(10 g) = 6.23 mW/g
Maximum value of SAR (measured) = 17.2 mW/g



0 dB = 17.2mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 17.08.2009 15:35:28

Test Laboratory: SPEAG, Zurich, Switzerland

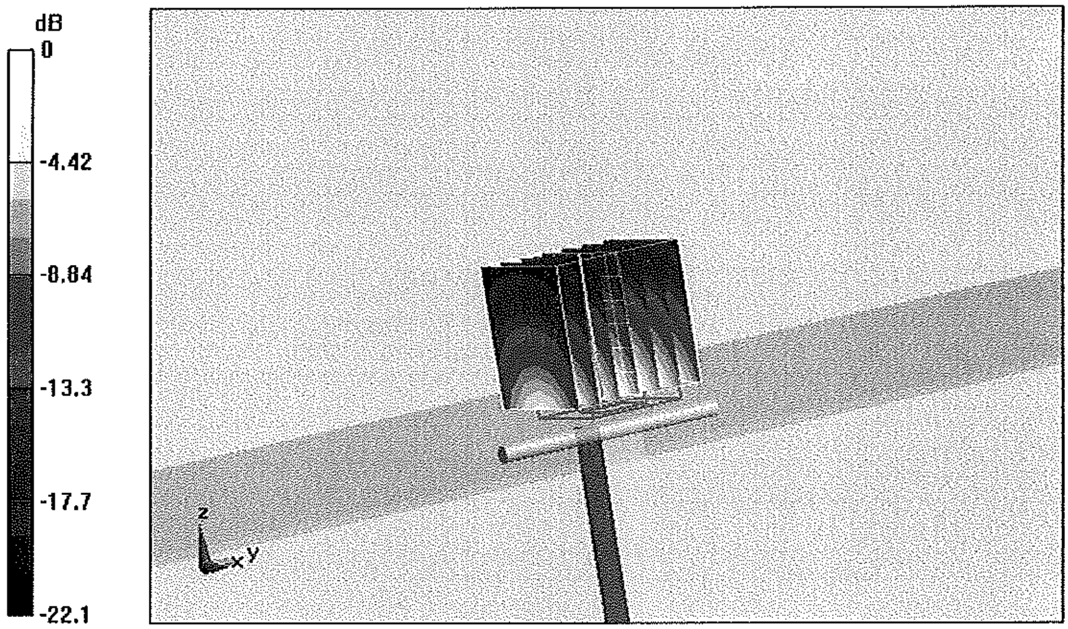
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:719

Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: MSL U10 BB
Medium parameters used: f = 2450 MHz; σ = 2.01 mho/m; ε_r = 53.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC)

DASY5 Configuration:

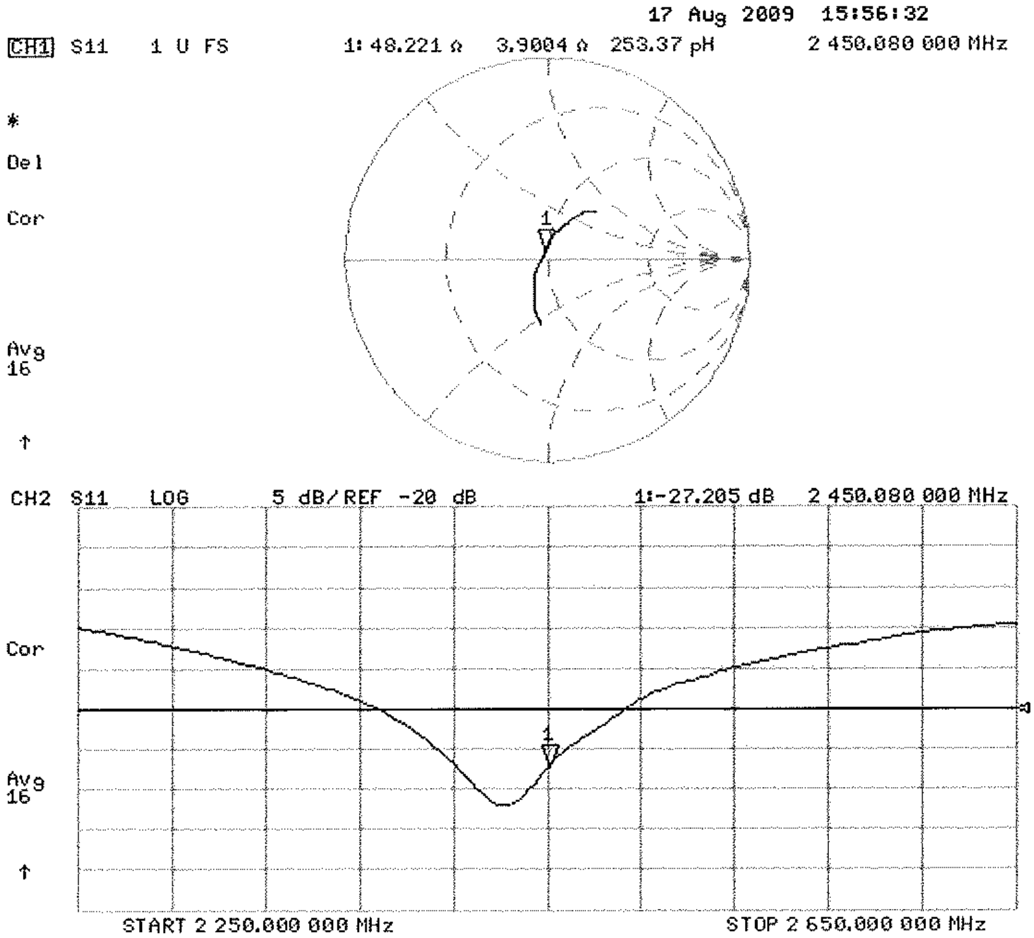
- Probe: ES3DV3 - SN3205; ConvF(4.31, 4.31, 4.31); Calibrated: 26.06.2009
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 07.03.2009
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY5, V5.0 Build 120; SEMCAD X Version 13.4 Build 45

Pin = 250 mW; d = 10 mm/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 94.8 V/m; Power Drift = -0.00649 dB
Peak SAR (extrapolated) = 27.2 W/kg
SAR(1 g) = 13 mW/g; SAR(10 g) = 6 mW/g
Maximum value of SAR (measured) = 17 mW/g



0 dB = 17mW/g

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D5GHzV2-1057_Feb11/2**

CALIBRATION CERTIFICATE (Replacement of No: D5GHzV2-1057_Feb11)

Object	D5GHzV2 - SN: 1057
Calibration procedure(s)	QA CAL-22.v1 Calibration procedure for dipole validation kits between 3-6 GHz
Calibration date:	February 11, 2011

✓ KOK 2/24/11

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-10 (No. 217-01266)	Oct-11
Power sensor HP 8481A	US37292783	06-Oct-10 (No. 217-01266)	Oct-11
Reference 20 dB Attenuator	SN: 5086 (20g)	30-Mar-10 (No. 217-01158)	Mar-11
Type-N mismatch combination	SN: 5047.2 / 06327	30-Mar-10 (No. 217-01162)	Mar-11
Reference Probe EX3DV4	SN: 3503	05-Mar-10 (No. EX3-3503_Mar10)	Mar-11
DAE4	SN: 601	10-Jun-10 (No. DAE4-601_Jun10)	Jun-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-10)	In house check: Oct-11

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	i.V. [signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: February 23, 2011

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) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010

b) 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:

c) 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	V52.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Area Scan resolution	dx, dy = 10 mm	
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 2.0 mm	
Frequency	5200 MHz ± 1 MHz 5500 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.5 ± 6 %	4.56 mho/m ± 6 %
Head TSL temperature during test	(22.1 ± 0.2) °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	100 mW input power	8.29 mW / g
SAR normalized	normalized to 1W	82.9 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**83.1 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 mW / g
SAR normalized	normalized to 1W	23.5 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.5 mW / g ± 19.5 % (k=2)**

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.0 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature during test	(22.1 ± 0.2) °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	100 mW input power	9.00 mW / g
SAR normalized	normalized to 1W	90.0 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**90.1 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.53 mW / g
SAR normalized	normalized to 1W	25.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**25.3 mW / g ± 19.5 % (k=2)**

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.6 ± 6 %	5.17 mho/m ± 6 %
Head TSL temperature during test	(22.1 ± 0.2) °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	condition	
SAR measured	100 mW input power	8.28 mW / g
SAR normalized	normalized to 1W	82.8 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**82.9 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 mW / g
SAR normalized	normalized to 1W	23.3 mW / g
SAR for nominal Head TSL parameters	normalized to 1W	**23.3 mW / g ± 19.5 % (k=2)**

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.37 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	100 mW input power	7.83 mW / g
SAR normalized	normalized to 1W	78.3 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**77.7 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 mW / g
SAR normalized	normalized to 1W	21.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 mW / g ± 19.5 % (k=2)**

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.75 mho/m ± 6 %
Body TSL temperature during test	(22.0 ± 0.2) °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	100 mW input power	8.51 mW / g
SAR normalized	normalized to 1W	85.1 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**84.4 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.34 mW / g
SAR normalized	normalized to 1W	23.4 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**23.2 mW / g ± 19.5 % (k=2)**

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.1 ± 6 %	6.14 mho/m ± 6 %
Body TSL temperature during test	(21.5 ± 0.2) °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	condition	
SAR measured	100 mW input power	7.56 mW / g
SAR normalized	normalized to 1W	75.6 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**75.0 mW / g ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.07 mW / g
SAR normalized	normalized to 1W	20.7 mW / g
SAR for nominal Body TSL parameters	normalized to 1W	**20.5 mW / g ± 19.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	50.2 Ω - 8.0 jΩ
Return Loss	-22.0 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	50.3 Ω - 4.9 jΩ
Return Loss	-26.3 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	51.9 Ω - 2.0 jΩ
Return Loss	-31.2 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	50.9 Ω - 6.6 jΩ
Return Loss	-23.7 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.5 Ω - 3.9 jΩ
Return Loss	-28.2 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	52.0 Ω - 1.1 jΩ
Return Loss	-33.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns

After long term use with 40 W 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	November 27, 2006

DASY5 Validation Report for Head TSL

Date/Time: 11.02.2011 14:44:40

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1057

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: HSL 5000
Medium parameters used: f = 5200 MHz; σ = 4.56 mho/m; ε_r = 36.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5500 MHz; σ = 4.86 mho/m; ε_r = 36; ρ = 1000 kg/m^3 , Medium parameters used: f = 5800 MHz; σ = 5.17 mho/m; ε_r = 35.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

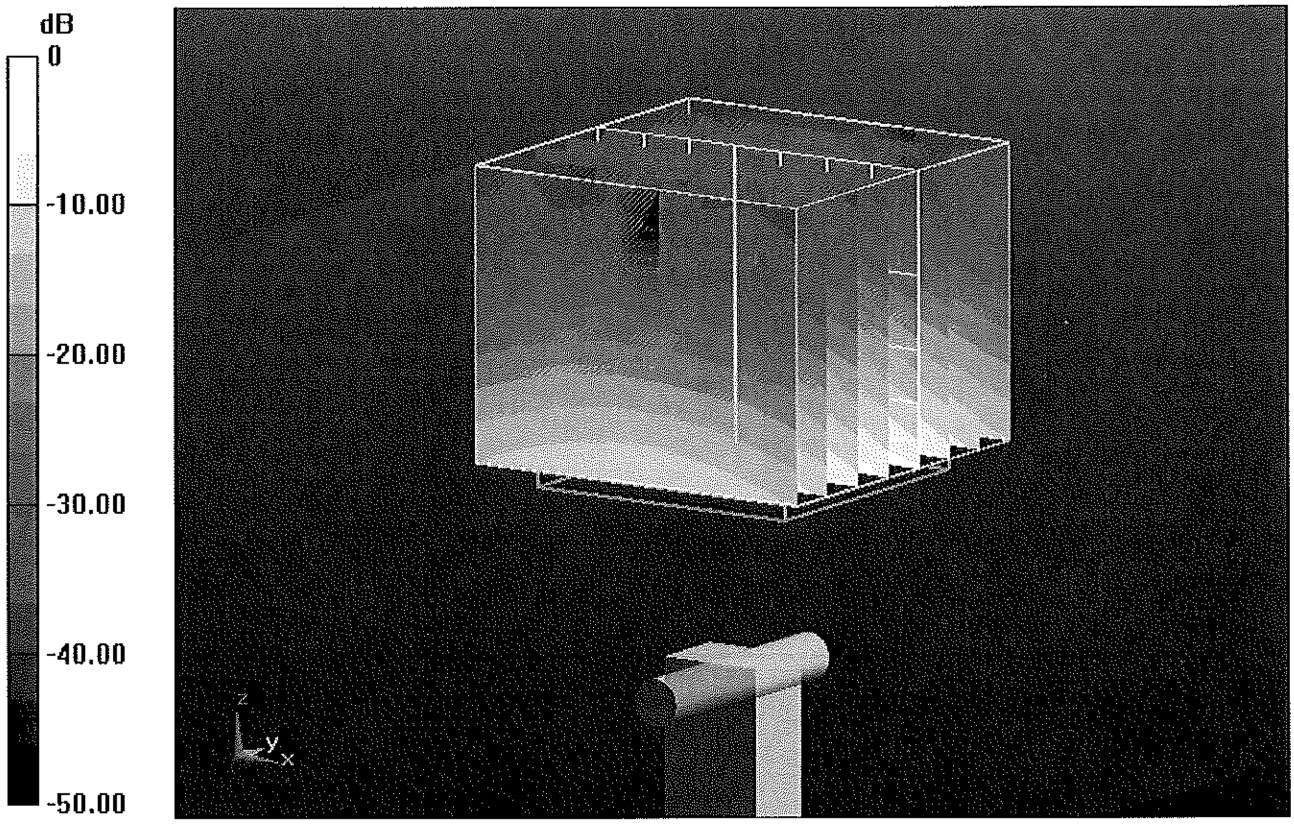
DASY5 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.36, 5.36, 5.36), ConvF(4.85, 4.85, 4.85), ConvF(4.74, 4.74, 4.74); Calibrated: 05.03.2010
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=100mW/d=10mm, f=5200 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 65.700 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 31.538 W/kg
SAR(1 g) = 8.29 mW/g; SAR(10 g) = 2.35 mW/g
Maximum value of SAR (measured) = 16.059 mW/g

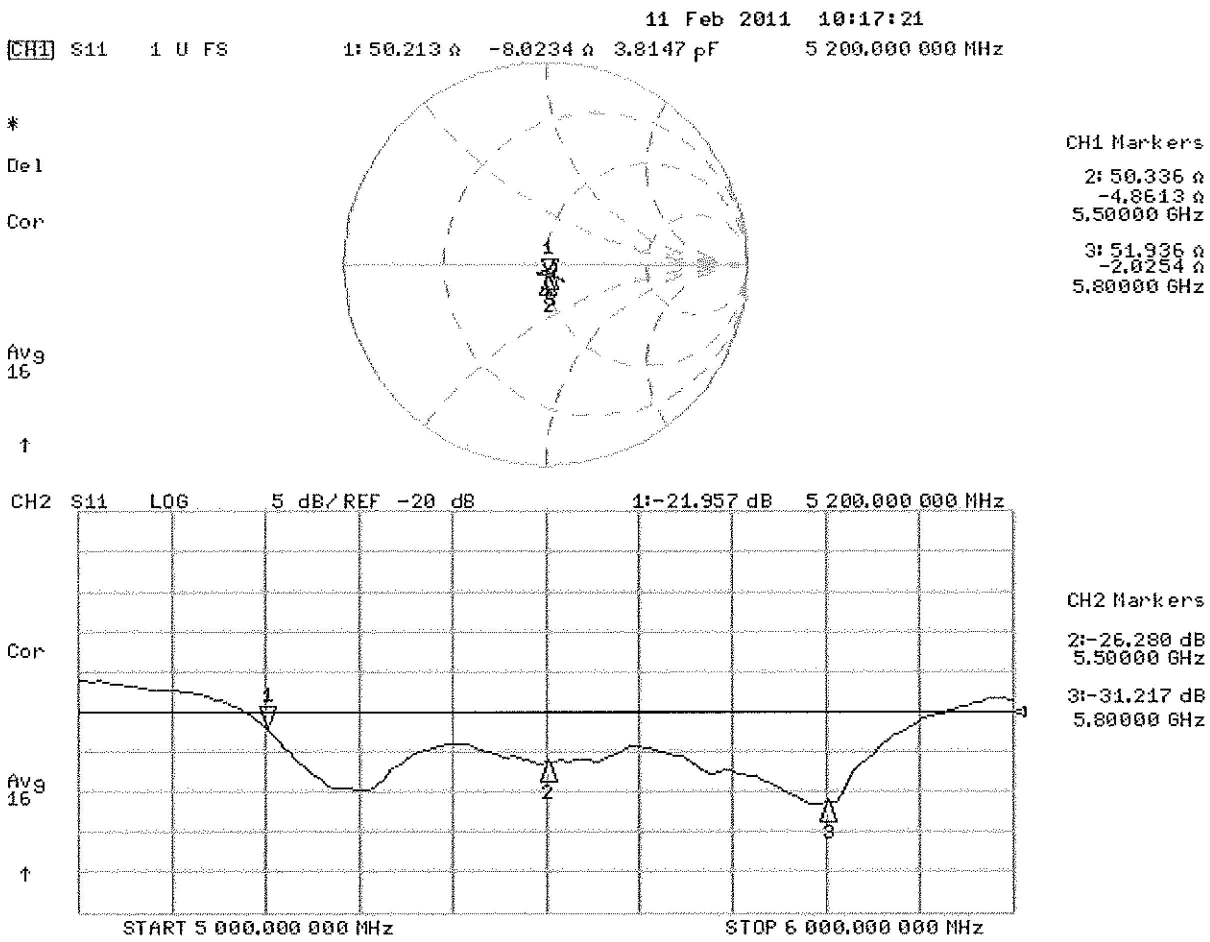
Pin=100mW/d=10mm, f=5500 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 67.167 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 36.356 W/kg
SAR(1 g) = 9 mW/g; SAR(10 g) = 2.53 mW/g
Maximum value of SAR (measured) = 17.641 mW/g

Pin=100mW/d=10mm, f=5800 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 62.634 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 34.882 W/kg
SAR(1 g) = 8.28 mW/g; SAR(10 g) = 2.33 mW/g
Maximum value of SAR (measured) = 16.490 mW/g



0 dB = 16.490mW/g

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date/Time: 10.02.2011 17:14:02

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHz; Serial: D5GHzV2 - SN:1057

Communication System: CW; Frequency: 5200 MHz, Frequency: 5500 MHz, Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: MSL 5000 MHz
Medium parameters used: f = 5200 MHz; σ = 5.37 mho/m; εr = 47.2; ρ = 1000 kg/m3 , Medium parameters used: f = 5500 MHz; σ = 5.75 mho/m; εr = 46.6; ρ = 1000 kg/m3 , Medium parameters used: f = 5800 MHz; σ = 6.16 mho/m; εr = 46.2; ρ = 1000 kg/m3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

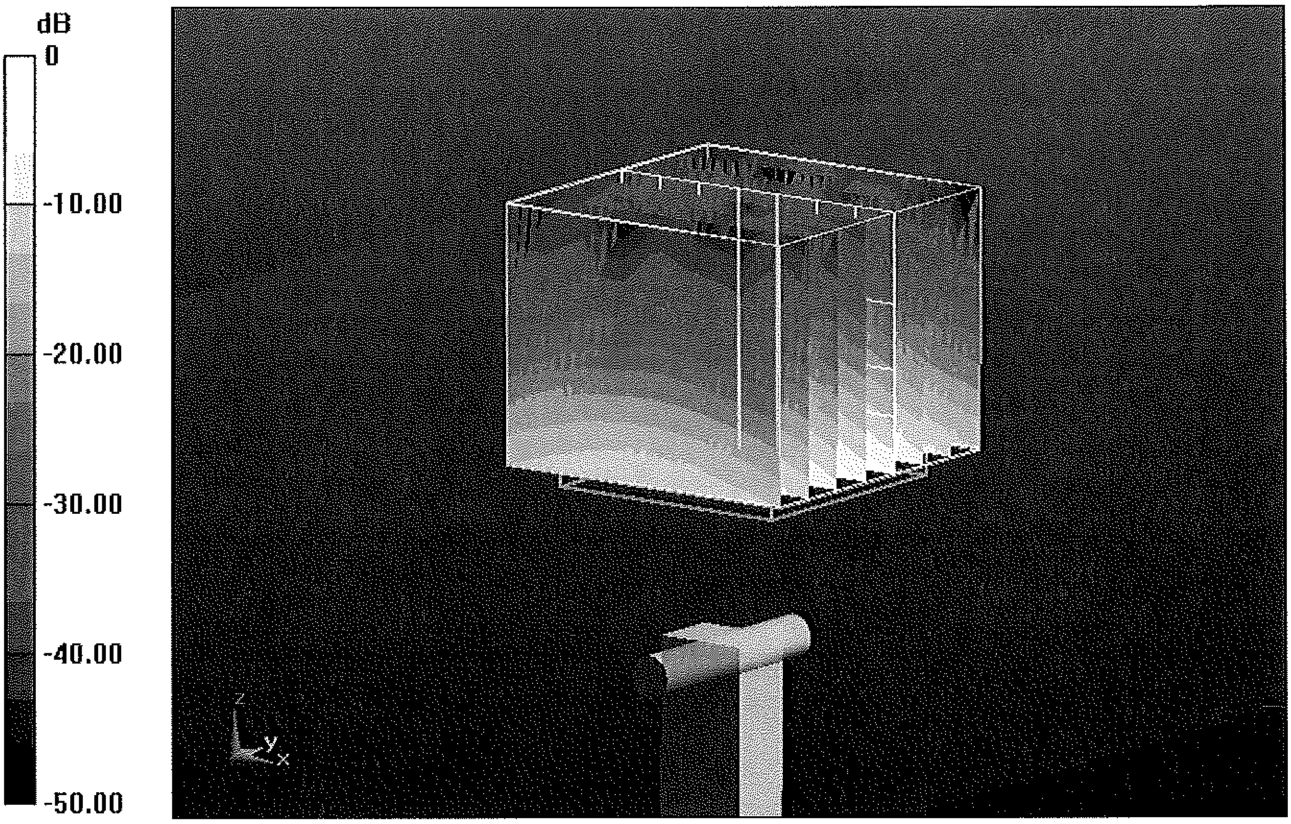
DASY5 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.88, 4.88, 4.88), ConvF(4.37, 4.37, 4.37), ConvF(4.57, 4.57, 4.57); Calibrated: 05.03.2010
- Sensor-Surface: 2mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 10.06.2010
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- Measurement SW: DASY52, V52.6.1 Build (408)
- Postprocessing SW: SEMCAD X, V14.4.2 Build (2595)

Pin=100mW/d=10mm, f=5200 MHz 2/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 60.106 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 30.996 W/kg
SAR(1 g) = 7.83 mW/g; SAR(10 g) = 2.17 mW/g
Maximum value of SAR (measured) = 15.137 mW/g

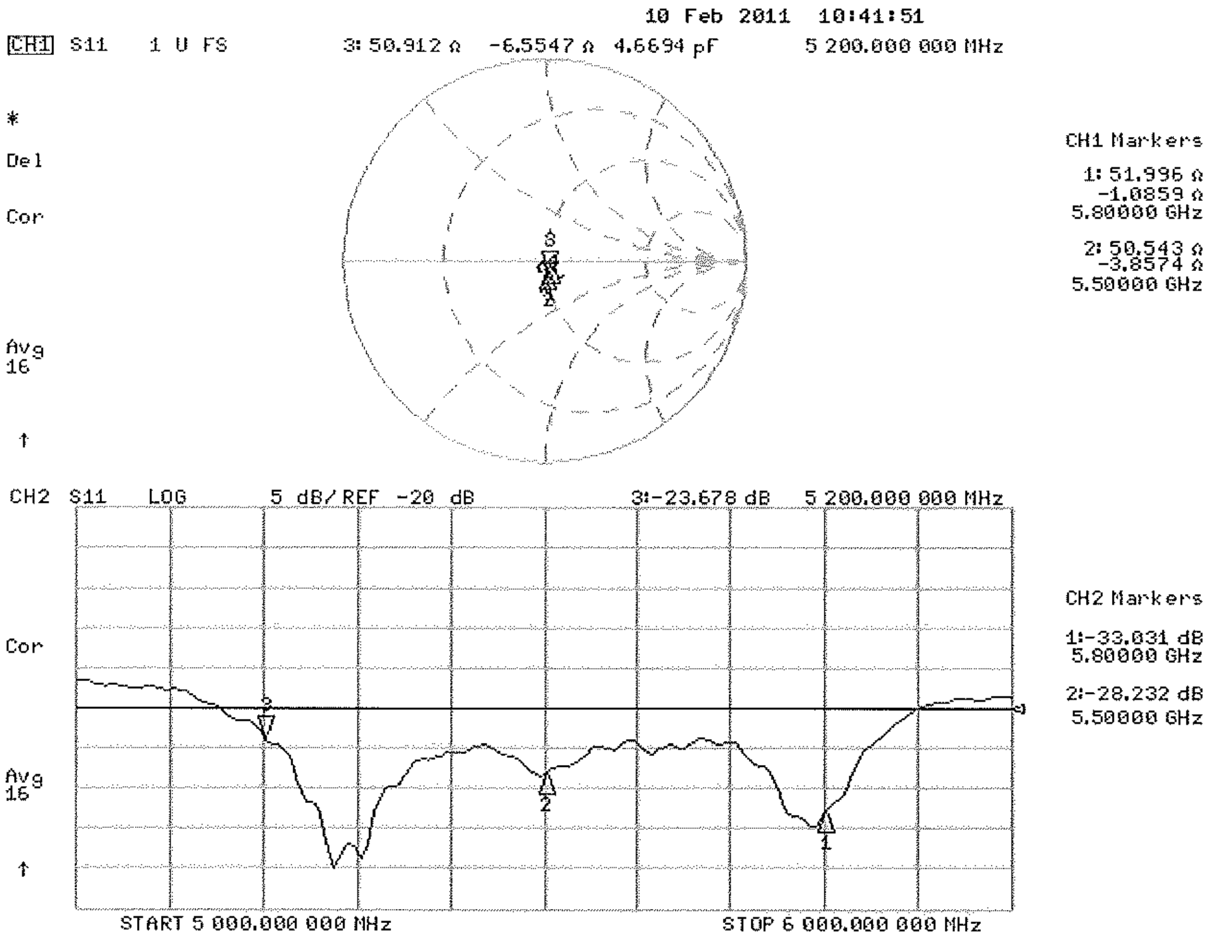
Pin=100mW/d=10mm, f=5500 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 60.894 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 35.975 W/kg
SAR(1 g) = 8.51 mW/g; SAR(10 g) = 2.34 mW/g
Maximum value of SAR (measured) = 16.704 mW/g

Pin=100mW/d=10mm, f=5800 MHz/Zoom Scan (4x4x2mm), dist=2mm (8x8x6)/Cube 0:
Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 56.118 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 33.913 W/kg
SAR(1 g) = 7.56 mW/g; SAR(10 g) = 2.07 mW/g
Maximum value of SAR (measured) = 15.043 mW/g



0 dB = 15.040mW/g

Impedance Measurement Plot for Body TSL



Schmid & Partner Engineering AG

s p e a g

Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

REPLACEMENT FOR

- ☐ **Probe calibration certificate(s)**
- ☐ **Probe configuration file(s)**
- ☑ **Dipole calibration certificate(s)**
- ☐ **DAE calibration certificate(s)**
- ☐ **DAE configuration file(s)**

Dear Customer,

Enclosed please find the replacement document (and diskette if applicable) for the marked item(s).

All those customers receiving a probe(s) or DAE(s) replacement configuration file(s) must replace their current configuration file(s) with the new one(s). In addition, please send back to us, destroy or declare obsolete the old probe(s) or DAE(s) certificates at your earliest convenience.

All those customers receiving a replacement dipole certificate(s) are kindly asked to send back to us, destroy or declare obsolete the old dipole certificate at your earliest convenience.

We would like to greatly apologize for this situation and all circumstances you may have been caused. We will continuously improve our internal quality assurance to avoid reoccurrence of similar difficulties in the future.

Best regards

s p e a g
Schmid & Partner Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland
Phone +41 44 245 9700, Fax +41 44 245 9779
info@speag.com, http://www.speag.com

Schmid & Partner Engineering AG