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SAR COMPLIANCE EVALUATION REPORT

Applicant Name:
Samsung Electronics, Co. Ltd.
18600 Broadwick St.
Rancho Dominguez, CA 90220
United States

Date of Testing:
11/15/11 - 11/22/11
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1111172010.A3L

FCC ID: **A3LSHVE160L**

APPLICANT: **SAMSUNG ELECTRONICS, CO. LTD.**

EUT Type: Portable Handset
Application Type: Certification
FCC Rule Part(s): CFR §2.1093; FCC/OET Bulletin 65 Supplement C [June 2001]
Model(s): SHV-E160L
Test Device Serial No.: Pre-Production [S/N: FI-290-A]

Band & Mode	Tx Frequency	Conducted Power [dBm]	SAR		
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)
GSM/GPRS 1900	1850.20 - 1909.80 MHz	29.46	0.12	0.71	0.71
2.4 GHz WLAN	2412 - 2462 MHz	16.53	0.10	0.17	0.17
5.8 GHz WLAN	5745 - 5825 MHz	13.36	0.18	0.06	
5.2 GHz WLAN	5180 - 5240 MHz	12.90	0.20	0.10	
5.3 GHz WLAN	5260 - 5320 MHz	13.24	0.16	0.09	
5.5 GHz WLAN	5500 - 5700 MHz	13.50	0.17	0.05	
Bluetooth	2402 - 2480 MHz	10.68	N/A		
Simultaneous SAR per KDB 690783 D01:			0.30	0.78	0.88

Note: Powers in the above table represent output powers for the SAR test configurations and may not represent the highest output powers for all capabilities.

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

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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

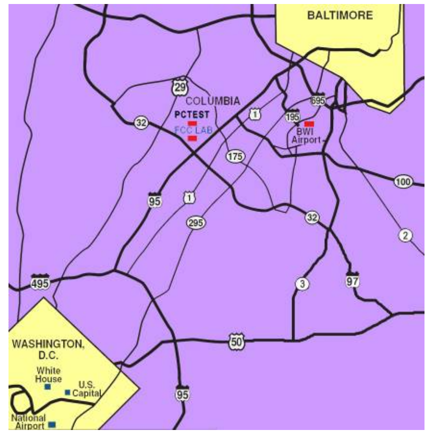


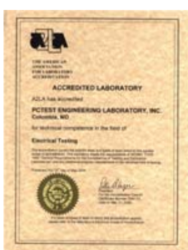
Figure 2-1
Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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

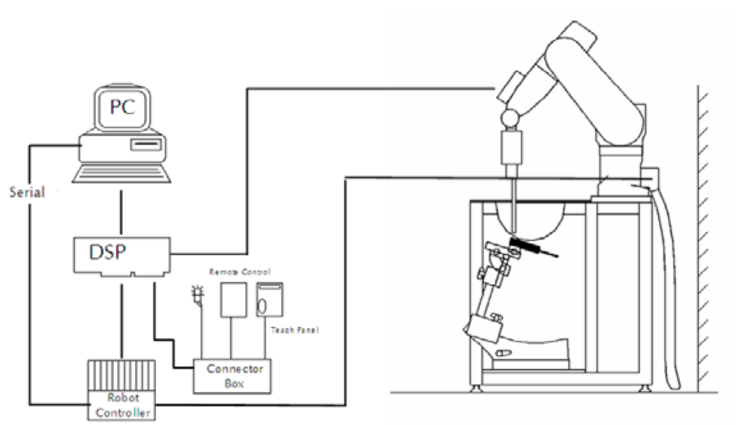


Figure 3-1
SAR Measurement System Setup

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

PC Interface Card

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

Phantom

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

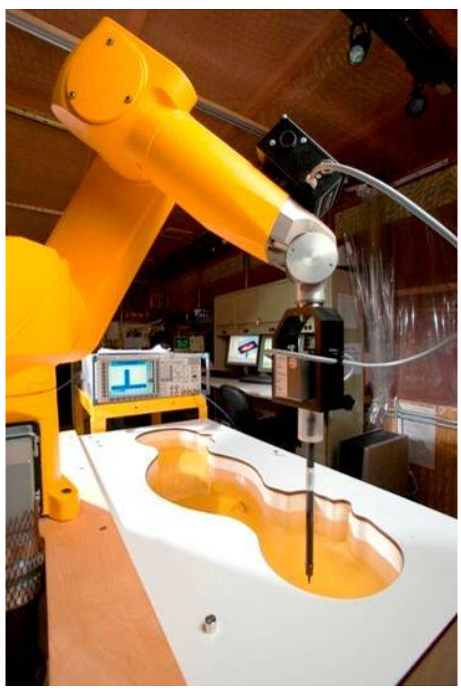


Figure 3-2
SAR Measurement System

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, ES3DV2)
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, ES3DV2
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

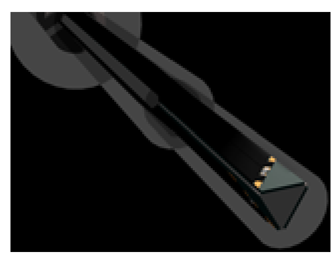


Figure 4-3
Triangular Probe Configuration

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.

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

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

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

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

SAR is proportional 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.

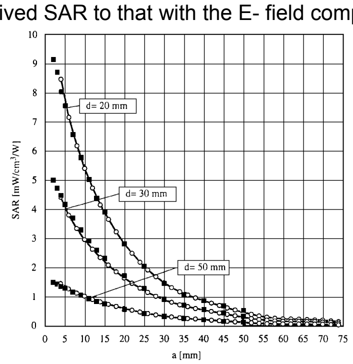


Figure 5-1 E-Field and Temperature measurements at 900MHz [9]

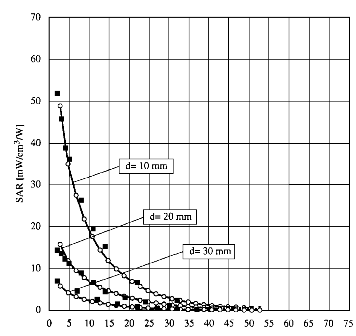


Figure 5-2 E-Field and temperature measurements at 1.9GHz [9]

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

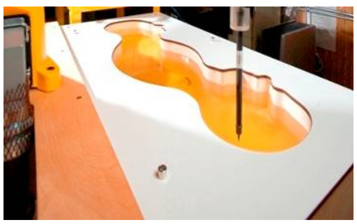


Figure 6-2
SAM Phantom with Simulating Tissue

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)	1900	1900	2450	2450	5200-5800	5200-5800
Tissue	Head	Body	Head	Body	Head	Body
Ingredients (% by weight)						
DGBE	44.92	29.44	7.99	26.7		
NaCl	0.18	0.39	0.16	0.1		
Triton X-100			19.97		17.24	10.67
Diethylenglycol monohexylether					17.24	10.67
Water	54.9	70.17	71.88	73.2	65.52	78.66

7 DOSIMETRIC ASSESSMENT & PHANTOM SPECS

7.1 Measurement Procedure

The evaluation was performed using the following procedure:

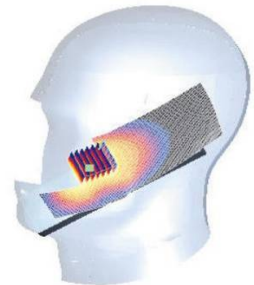


Figure 7-1
Sample SAR Area Scan

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 SAR test and drift measurements were repeated.
5. For 5 GHz testing finer resolution zoom scans were performed 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 DEFINITION OF REFERENCE POINTS

8.1 EAR REFERENCE POINT

Figure 8-1 shows the front, back and side views of the SAM Twin Phantom. The point "M" is the reference point for the center of the mouth, "LE" is the left ear reference point (ERP), and "RE" is the right ERP. The ERP is 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 8-1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front) is perpendicular to the reference plane and passing through the RE (or LE) is called the Reference Pivoting Line (see Figure 8-2). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

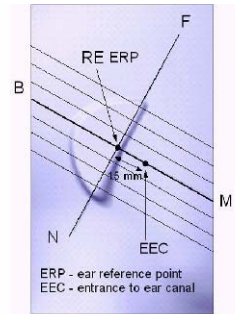


Figure 8-1
Close-Up Side view of ERP

8.2 HANDSET REFERENCE POINTS

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Figure 8-3). The "test device reference point" was than located at the same level as the center of the ear reference point. The test device was positioned so that the "vertical centerline" was bisecting the front surface of the handset at it's top and bottom edges, positioning the "ear reference point" on the outer surface of the both the left and right head phantoms on the ear reference point.

Figure 8-2
Front, back and side view of SAM Twin Phantom

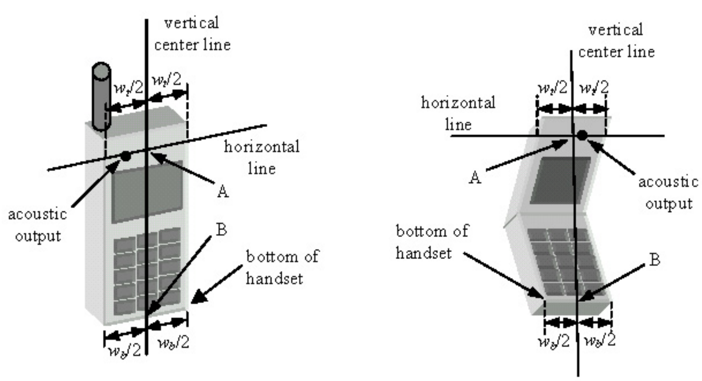


Figure 8-3
Handset Vertical Center & Horizontal Line Reference Points

9 TEST CONFIGURATION POSITIONS

9.1 Device Holder

The DASY device holder has been made out of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 0.02.

9.2 Positioning for Cheek/Touch

1. The test device was positioned with the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 9-1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

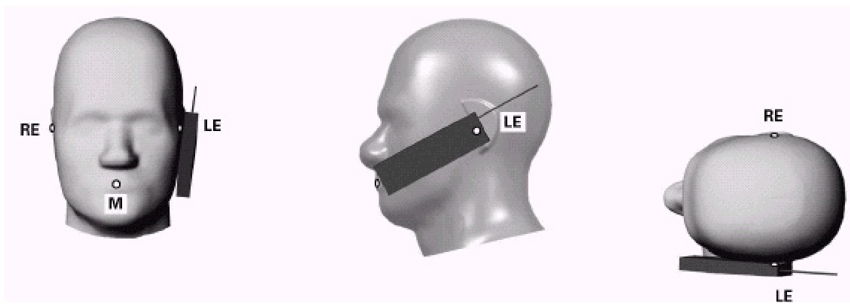


Figure 9-1 Front, Side and Top View of Cheek/Touch Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the plane normal to MB-NF including the line MB (reference plane).
4. The phone was hen rotated around the vertical centerline until the phone (horizontal line) was symmetrical was respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, the handset was rotated about the line NF until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 9-2).

9.3 Positioning for Ear / 15º Tilt

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

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15degree.
2. The phone was then rotated around the horizontal line by 15 degree.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 9-2).

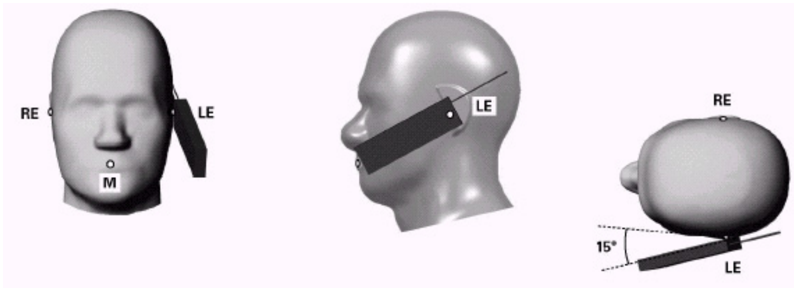


Figure 9-2 Front, Side and Top View of Ear/15º Tilt Position

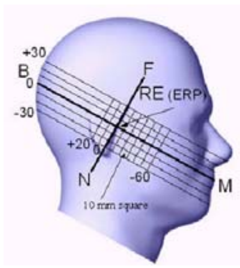


Figure 9-3
Side view w/ relevant markings

Figure 9-4 Body SAR Sample Photo
(Not Actual EUT)

9.4 SAR Evaluations near the Mouth/Jaw Regions of the SAM Phantom

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones. It has been known for some time that there are SAR measurement difficulties in these regions of the SAM phantom. SAR probes are calibrated in tissue equivalent liquids with sufficient separation between the probe sensors and nearby physical boundaries to ensure scattering does not affect probe calibration. When the probe tip is moved into tight regions with multiple boundaries surrounding its sensors, probe calibration and measurement accuracy can become questionable. In addition, these measurement locations often require a probe to be tilted at steep angles, where it may no longer comply with calibration requirements and measurement protocols, or satisfy the required measurement uncertainty. In some situations it is not feasible to tilt the probe or rotate the phantom, as suggested by measurement standards, to conduct these measurements.

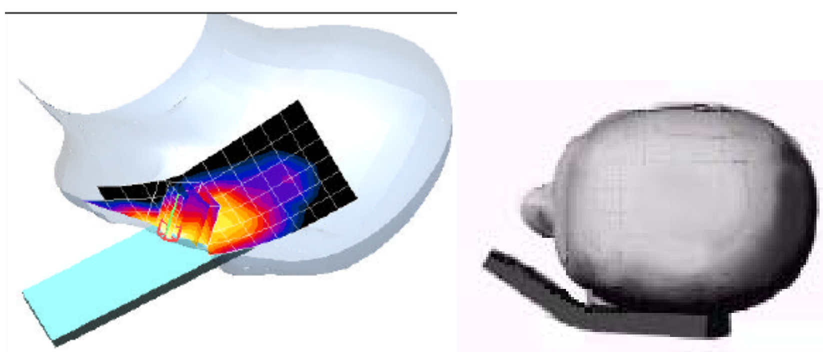


Figure 9-5
SAR Scans near the Jaw/Mouth

In order to ensure there is sufficient conservativeness for ensuring compliance until practical solutions are available, additional measurement considerations are necessary to address these technical difficulties. When measurements are required near the mouth, nose, jaw or similar tight regions of the SAM phantom, area or zoom scans are often unable to fully enclose the peak SAR location as required by IEEE 1528 and Supplement C, due to probe orientation and positioning difficulties. Even when limited measurements are possible, the test results could be questionable due to probe calibration and measurement uncertainty issues. Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document publication 648474. The SAR required in these regions of SAM should be measured using a flat phantom. **Rectangular shaped phones** should be positioned with its bottom edge positioned from the flat phantom with the same distance provided by the cheek touching position using SAM. The ear reference point (ERP, as defined for SAM) of the phone should be positioned ½ cm from the flat phantom shell. **Clam-shell phones** should be positioned with the hinge against a smooth edge of the flat phantom where the upper half of the phone is unfolded and extended beyond the phantom side wall. The lower half of the phone is secured in the test device holder at a fixed distance below the flat phantom determined by the minimum separation along the lower edge of the phone in the cheek touching position using SAM. Any case with substantial variation in separation distance along the lower edge of a clam shell is discussed with the FCC for best-to-use methodology.

The flat phantom data should allow test results to be compared uniformly across measurement systems, until suitable solutions are available in measurement standards to address certain probe calibration and positioning issues, due to implementation differences between horizontal and upright SAM configurations. These flat phantom procedures are only applicable for stand-alone SAR evaluation in tight regions of the SAM phantom, where measurement is not feasible or test results can be questionable due to probe calibration and accessibility issues. Details on device positioning and photos showing how separation distances are determined are included in the SAR report Photographs. SAR for other regions of the head must be evaluated using SAM; therefore, a phone with antennas at different locations may require flat and SAM phantom evaluation for the different antennas.

9.5 Body Holster /Belt Clip Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 9-4). A device with a headset output is tested with a headset connected to the device.

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

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented. Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

10 FCC RF EXPOSURE LIMITS

10.1 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.

10.2 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 10-1
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.

11 FCC MEASUREMENT PROCEDURES

Power measurements were performed using a base station simulator under digital average power.

11.1 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01 "SAR Measurement Procedures for 3G Devices" v02, October 2007.

The device was placed into a simulated call using a base station simulator in a RF shielded chamber. Establishing connections in this manner ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. Devices under test were evaluated prior to testing, with a fully charged battery and were configured to operate at maximum output power. In order to verify that the device was tested throughout the SAR test at maximum output power, the SAR measurement system measures a "point SAR" at an arbitrary reference point at the start and end of the 1 gram SAR evaluation, to assess for any power drifts during the evaluation. When the power drift was more than 5%, the SAR test was repeated.

11.2 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n 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. See KDB Publication 248227 for more details.

11.2.1 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.

11.2.2 Frequency Channel Configurations [27]

802.11 a/b/g/n operating modes are tested independently according to the service requirements in each frequency band. 802.11 b/g/n modes are tested on channels 1, 6 and 11. 802.11a/n 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 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. These are referred to as the "default test channels". For 2.4 GHz, 802.11g/n modes were evaluated only if the output power was 0.25 dB higher than the 802.11b mode. For 5 GHz, 802.11n modes were evaluated only if the output power was 0.25 dB higher than the 802.11a mode.

Table 11-1
802.11 Test Channels per FCC KDB Publication 248227

Mode		GHz	Channel	Turbo Channel	"Default Test Channels" §15.247 802.11b	"Default Test Channels" §15.247 802.11g	"Default Test Channels" UNII	
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		√			

Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client.

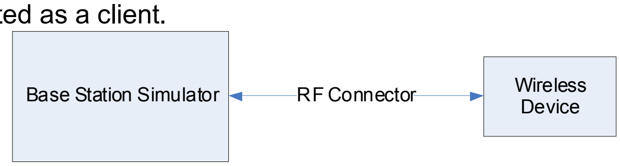


Figure 11-1
Power Measurement Setup

12 RF CONDUCTED POWERS

12.1 Licensed Transmitter Conducted Powers

12.1.1 GSM Conducted Powers

Maximum Burst-Averaged Output Power						
		Voice	*GPRS Data (GMSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**
PCS	512	29.24	29.26	**27.42**	25.07	23.95
	661	29.46	29.47	**27.53**	25.47	24.17
	810	29.67	29.70	**27.85**	25.63	24.25

Calculated Maximum Frame-Averaged Output Power						
		Voice	*GPRS Data (GMSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**
PCS	512	20.21	20.23	**21.40**	20.81	20.94
	661	20.43	20.44	**21.51**	21.21	21.16
	810	20.64	20.67	**21.83**	21.37	21.24

Note:

1. Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
2. The bolded GPRS modes were selected according to the highest frame-averaged output power table according to KDB 941225 D03.
3. GPRS (GMSK) output powers were measured with CS1.

GSM Class: B
GPRS Multislot class: 12 (max 4 Tx Uplink slots)
EDGE Multislot Class: N/A
DTM Multislot Class: N/A

12.2 WLAN Conducted Powers

Table 12-1
IEEE 802.11b Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1	16.49	16.43	16.42	16.38
802.11b	2437	6	16.53	16.47	16.40	16.48
802.11b	2462	11	16.47	16.47	16.44	16.44

Table 12-2
IEEE 802.11g Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	13.79	13.78	13.71	13.74	13.66	13.66	13.66	13.67
802.11g	2437	6	13.75	13.68	13.68	13.64	13.74	13.69	13.64	13.66
802.11g	2462	11	13.64	13.68	13.65	13.64	13.66	13.52	13.61	13.64

Table 12-3
IEEE 802.11n Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			6.5	13	20	26	39	52	58	65
802.11n	2412	1	11.72	11.61	11.68	11.80	11.63	11.64	11.65	11.71
802.11n	2437	6	11.62	11.65	11.63	11.63	11.71	11.62	11.67	11.67
802.11n	2462	11	11.64	11.61	11.57	11.58	11.53	11.46	11.46	11.51

Table 12-4
IEEE 802.11a Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm] Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36	12.77	12.82	12.76	12.74	12.76	12.82	12.93	12.83
802.11a	5200	40	12.80	12.78	12.72	12.75	12.81	12.86	12.94	12.96
802.11a	5220	44	12.82	12.91	12.80	12.90	12.90	12.99	13.00	12.99
802.11a	5240	48	12.90	12.88	12.99	13.06	12.93	13.09	13.06	13.07
802.11a	5260	52	12.98	12.97	12.99	13.11	13.08	13.04	13.13	13.15
802.11a	5280	56	13.07	13.09	13.05	13.10	13.15	13.19	13.26	13.29
802.11a	5300	60	13.15	13.22	13.20	13.20	13.27	13.27	13.32	13.28
802.11a	5320	64	13.24	13.23	13.23	13.29	13.30	13.32	13.39	13.31
802.11a	5500	100	13.09	13.11	13.04	13.25	13.16	13.26	13.25	13.27
802.11a	5520	104	13.22	13.14	13.17	13.28	13.25	13.24	13.42	13.34
802.11a	5540	108	13.26	13.22	13.25	13.34	13.27	13.31	13.32	13.42
802.11a	5560	112	13.22	13.29	13.26	13.37	13.38	13.39	13.44	13.39
802.11a	5580	116	13.35	13.31	13.33	13.40	13.39	13.37	13.42	13.45
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5660	132	13.43	13.43	13.46	13.52	13.51	13.58	13.60	13.55
802.11a	5680	136	13.50	13.55	13.54	13.49	13.62	13.55	13.57	13.62
802.11a	5700	140	13.46	13.54	13.49	13.65	13.62	13.66	13.64	13.69
802.11a	5745	149	13.29	13.35	13.30	13.32	13.36	13.40	13.41	13.52
802.11a	5765	153	13.33	13.28	13.30	13.32	13.36	13.41	13.54	13.46
802.11a	5785	157	13.32	13.36	13.39	13.41	13.45	13.57	13.51	13.48
802.11a	5805	161	13.35	13.34	13.38	13.51	13.38	13.46	13.48	13.49
802.11a	5825	165	13.36	13.43	13.39	13.44	13.44	13.52	13.56	13.60

Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client.

Table 12-5
IEEE 802.11n Average RF Power

Mode	Freq [MHz]	Channel	Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	20	26	39	52	58	65
802.11n	5180	36	11.53	11.54	11.62	11.55	11.68	11.71	11.83	11.72
802.11n	5200	40	11.70	11.67	11.76	11.72	11.72	11.76	11.74	11.87
802.11n	5220	44	11.69	11.78	11.77	11.83	11.79	11.89	11.82	11.92
802.11n	5240	48	11.79	11.78	11.84	11.85	11.88	11.89	11.88	11.99
802.11n	5260	52	11.84	11.87	11.88	11.90	11.96	12.02	11.96	12.00
802.11n	5280	56	11.94	12.01	11.99	12.00	11.98	11.91	12.05	12.03
802.11n	5300	60	11.88	11.97	12.16	12.16	12.13	12.10	12.11	12.26
802.11n	5320	64	12.08	12.06	12.11	12.12	12.17	12.14	12.20	12.19
802.11n	5500	100	11.96	11.98	12.04	12.07	12.09	12.14	12.19	12.19
802.11n	5520	104	12.02	12.10	12.12	12.15	12.08	12.16	12.16	12.19
802.11n	5540	108	12.02	12.18	12.20	12.14	12.23	12.19	12.16	12.17
802.11n	5560	112	11.98	12.17	12.16	12.14	12.25	12.20	12.22	12.31
802.11n	5580	116	12.14	12.21	12.23	12.19	12.32	12.33	12.33	12.39
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	12.35	12.37	12.30	12.43	12.43	12.51	12.57	12.50
802.11n	5680	136	12.38	12.35	12.44	12.48	12.52	12.44	12.53	12.66
802.11n	5700	140	12.36	12.51	12.41	12.52	12.46	12.54	12.61	12.62
802.11n	5745	149	12.25	12.23	12.29	12.25	12.36	12.40	12.31	12.39
802.11n	5765	153	12.31	12.23	12.28	12.28	12.34	12.42	12.46	12.48
802.11n	5785	157	12.25	12.30	12.33	12.35	12.38	12.48	12.53	12.38
802.11n	5805	161	12.28	12.28	12.38	12.35	12.36	12.43	12.51	12.55
802.11n	5825	165	12.39	12.34	12.44	12.49	12.40	12.46	12.52	12.56

Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client.

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes:

- For 2.4 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. IEEE 802.11 g/n modes 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 802.11b mode.
- For 5 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11a were selected for SAR evaluation. IEEE 802.11 n modes 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.
- The underlined data rates and channels above were tested for SAR.

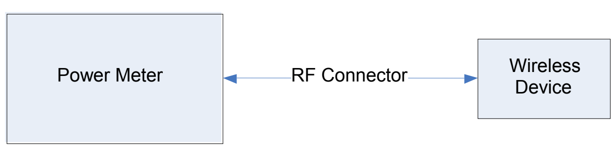


Figure 12-1
Power Measurement Setup

13 FCC PERSONAL WIRELESS ROUTER CONFIGURATIONS

13.1 Personal Wireless Router Considerations

Some battery-operated handsets have the capability to transmit and receive internet connectivity through simultaneous transmission of WIFI in conjunction with a separate licensed transmitter. The FCC has provided guidance in KDB Publication 941225 D06 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device with antennas 2.5 cm or closer to the edge of the device, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

13.2 SAR Test Setup for Personal Wireless Router Features

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions. Therefore, SAR must be evaluated for each frequency transmission and mode separately and summed with the WIFI transmitter according to KDB 648474 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal.

13.3 Power Reduction for Portable Hotspot Mode

This model does not support any power reduction for portable hotspot mode.

13.4 SAR Test Configurations

Table 13-1
Mobile Hotspot Sides for SAR Testing

Mobile Hotspot Sides for SAR Testing						
Mode	Back	Front	Top	Bottom	Right	Left
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN	Yes	Yes	Yes	No	No	Yes

When hotspot is enabled, all 5 GHz bands are disabled.

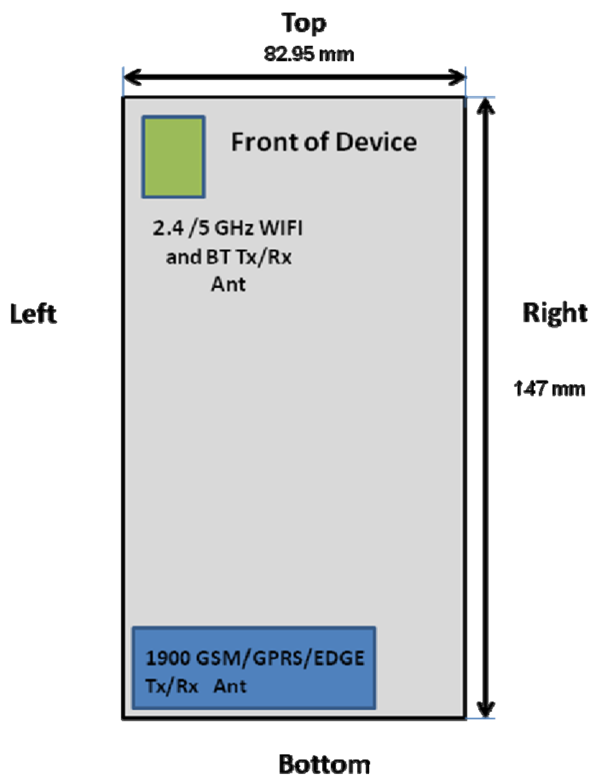


Figure 13-1 Identification of Sides for SAR Testing

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06 guidance, page 2. The antenna document shows the distances between the transmit antennas and the edges of the device.

14 SYSTEM VERIFICATION

14.1 Tissue Verification

Table 14-1
Measured Tissue Properties

Tissue Type	Calibrated for Tests Performed on:	Tissue Temp During Calibration (C˚)	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
1900H	11/17/2011	23.1	1850	1.419	41.11	1.400	40.000	1.36%	2.78%
			1880	1.409	41.02	1.400	40.000	0.64%	2.55%
			1910	1.414	40.20	1.400	40.000	1.00%	0.50%
2450H	11/21/2011	23.2	2401	1.836	39.67	1.758	39.298	4.44%	0.95%
			2450	1.874	39.41	1.800	39.200	4.11%	0.54%
			2499	1.940	39.23	1.852	39.135	4.75%	0.24%
5200H-5800H	11/19/2011	24.9	5200	4.702	36.15	4.660	36.000	0.90%	0.42%
			5240	4.766	36.08	4.700	35.960	1.40%	0.33%
			5320	4.849	35.88	4.780	35.880	1.44%	0.00%
			5500	5.004	35.56	4.965	35.650	0.79%	-0.25%
			5680	5.221	35.26	5.150	35.420	1.38%	-0.45%
			5800	5.354	35.20	5.270	35.300	1.59%	-0.28%
			5825	5.364	34.97	5.296	35.275	1.28%	-0.86%
1900B	11/15/2011	23.6	1850	1.452	51.24	1.520	53.300	-4.47%	-3.86%
			1880	1.485	51.10	1.520	53.300	-2.30%	-4.13%
			1910	1.515	51.09	1.520	53.300	-0.33%	-4.15%
2450B	11/21/2011	23.0	2401	1.879	50.78	1.903	52.765	-1.26%	-3.76%
			2450	1.949	50.48	1.950	52.700	-0.05%	-4.21%
			2499	2.016	50.44	2.019	52.638	-0.15%	-4.18%
5200B-5800B	11/22/2011	24.8	5200	5.386	47.06	5.299	49.014	1.64%	-3.99%
			5240	5.487	47.03	5.346	48.933	2.64%	-3.89%
			5320	5.530	46.88	5.439	48.607	1.67%	-3.55%
			5500	5.815	46.47	5.650	48.580	2.92%	-4.34%
			5680	6.017	46.14	5.860	48.336	2.68%	-4.54%
			5800	6.199	45.93	6.000	48.200	3.32%	-4.71%
			5825	6.247	45.92	6.029	48.132	3.62%	-4.60%

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.

Probe calibration used within ±100 MHz of the test frequency in either 5.725 - 5.85 or 5.47-5.725 GHz is acceptable per KDB Publication 865664 since the design of the SAR probe supports the extended frequency, provided the DASY software version recommended is used for the tests, and the expanded calibration uncertainty (k=2) is less than or equal to 15% (See SAR probe calibration certificate for this information). The dielectric and conductivities measured are within 10% and 5% respectively of the target parameters specified in Supplement C 01-01.

14.2 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 $j = \sqrt{-1}$.

14.3 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 14-2
System Verification Results

System Verification TARGET & MEASURED										
Tissue Frequency (MHz)	**Tissue Type**	**Date:**	**Amb. Temp (°C)**	**Liquid Temp (°C)**	**Input Power (W)**	**Dipole SN**	**Probe SN**	**Measured SAR_{1g} (W/kg)**	**1 W Target SAR_{1g} (W/kg)**	**1 W Normalized SAR_{1g} (W/kg)**	**Deviation (%)**
1900	Head	11/17/2011	23.4	22.2	0.100	502	3209	3.83	40.200	38.300	-4.73%
2450	Head	11/21/2011	24.1	22.0	0.040	797	3561	2.2	53.300	55.000	3.19%
5200	Head	11/19/2011	24.2	23.0	0.100	1057	3550	8.09	83.100	80.900	-2.65%
5500	Head	11/19/2011	24.6	23.1	0.100	1057	3550	9.36	90.100	93.600	3.88%
5800	Head	11/19/2011	24.4	23.0	0.100	1057	3550	8.52	82.900	85.200	2.77%
1900	Body	11/15/2011	23.4	22.0	0.100	502	3209	4.04	41.100	40.400	-1.70%
2450	Body	11/21/2011	24.2	22.2	0.025	797	3561	1.35	52.300	54.000	3.25%
5200	Body	11/22/2011	24.8	23.3	0.100	1007	3561	7.79	75.500	77.900	3.18%
5500	Body	11/22/2011	24.6	23.0	0.100	1007	3561	8.56	81.300	85.600	5.29%
5800	Body	11/22/2011	24.7	23.1	0.100	1007	3561	7.68	75.300	76.800	1.99%

Note: Per KDB Publication 865664, when a reference dipole is not defined within ±100MHz of the test frequency, the system verification may be conducted within ± 200 MHz of the center frequency of the measurement frequencies if the SAR probe calibration is valid and the same tissue-equivalent matter is used for verification and test measurements.

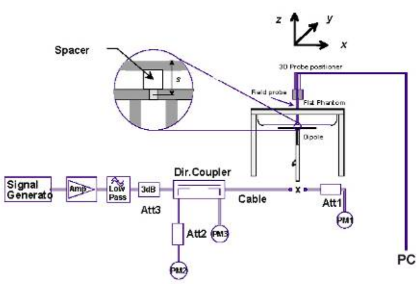


Figure 14-1
System Verification Setup Diagram

Figure 14-2
System Verification Setup Photo

15 SAR DATA SUMMARY

15.1 Head SAR Data

Table 15-1
GSM 1900 Head SAR Results

MEASUREMENT RESULTS							
FREQUENCY		Mode/Band	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	SAR (1g)
MHz	Ch.						(W/kg)
1880.00	661	GSM 1900	29.46	0.00	Right	Touch	0.105
1880.00	661	GSM 1900	29.46	-0.08	Right	Tilt	0.056
1880.00	661	GSM 1900	29.46	-0.09	Left	Touch	0.119
1880.00	661	GSM 1900	29.46	0.11	Left	Tilt	0.054
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram		

Table 15-2
2.4 and 5 GHz WLAN Head SAR Results

MEASUREMENT RESULTS									
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Data Rate (Mbps)	SAR (1g)
MHz	Ch.								(W/kg)
2437	6	IEEE 802.11b	DSSS	16.53	-0.18	Right	Touch	1	0.099
2437	6	IEEE 802.11b	DSSS	16.53	0.12	Right	Tilt	1	0.096
2437	6	IEEE 802.11b	DSSS	16.53	0.15	Left	Touch	1	0.057
2437	6	IEEE 802.11b	DSSS	16.53	-0.21	Left	Tilt	1	0.057
5825	165	IEEE 802.11a	OFDM	13.36	0.13	Right	Touch	6	0.136
5825	165	IEEE 802.11a	OFDM	13.36	-0.15	Right	Tilt	6	0.130
5825	165	IEEE 802.11a	OFDM	13.36	0.11	Left	Touch	6	0.179
5825	165	IEEE 802.11a	OFDM	13.36	0.12	Left	Tilt	6	0.162
5240	48	IEEE 802.11a	OFDM	12.90	0.19	Right	Touch	6	0.197
5240	48	IEEE 802.11a	OFDM	12.90	0.18	Right	Tilt	6	0.127
5240	48	IEEE 802.11a	OFDM	12.90	0.20	Left	Touch	6	0.129
5240	48	IEEE 802.11a	OFDM	12.90	0.13	Left	Tilt	6	0.119
5320	64	IEEE 802.11a	OFDM	13.24	0.18	Right	Touch	6	0.157
5320	64	IEEE 802.11a	OFDM	13.24	0.16	Right	Tilt	6	0.106
5320	64	IEEE 802.11a	OFDM	13.24	0.10	Left	Touch	6	0.116
5320	64	IEEE 802.11a	OFDM	13.24	0.16	Left	Tilt	6	0.117
5680	136	IEEE 802.11a	OFDM	13.50	0.15	Right	Touch	6	0.153
5680	136	IEEE 802.11a	OFDM	13.50	-0.11	Right	Tilt	6	0.142
5680	136	IEEE 802.11a	OFDM	13.50	0.16	Left	Touch	6	0.171
5680	136	IEEE 802.11a	OFDM	13.50	0.13	Left	Tilt	6	0.143
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Head 1.6 W/kg (mW/g) averaged over 1 gram			

15.2 Body-Worn SAR Data

Table 15-3
Licensed Transmitter Body-Worn SAR Results

MEASUREMENT RESULTS									
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	# of Time Slots	Side	SAR (1g)
MHz	Ch.								(W/kg)
1880.00	661	GSM 1900	GSM	29.46	0.05	1.0 cm	1	back	0.612
1880.00	661	GSM 1900	GPRS	27.53	-0.07	1.0 cm	2	back	0.707
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 15-4
2.4 and 5 GHz WLAN Body-Worn SAR Results

MEASUREMENT RESULTS									
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	Data Rate (Mbps)	Side	SAR (1g)
MHz	Ch.								(W/kg)
2437	6	IEEE 802.11b	DSSS	16.53	-0.16	1.0 cm	1	back	0.171
5825	165	IEEE 802.11a	OFDM	13.36	-0.08	1.0 cm	6	back	0.057
5240	48	IEEE 802.11a	OFDM	12.90	0.04	1.0 cm	6	back	0.096
5320	64	IEEE 802.11a	OFDM	13.24	-0.14	1.0 cm	6	back	0.087
5680	136	IEEE 802.11a	OFDM	13.50	-0.20	1.0 cm	6	back	0.045
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram			

15.3 Hotspot SAR Data

Table 15-5
Licensed Transmitter Hotspot SAR Data

MEASUREMENT RESULTS									
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	# of GPRS Slots	Side	SAR (1g)
MHz	Ch.								(W/kg)
1880.00	661	GSM 1900	GPRS	27.53	-0.07	1.0 cm	2	back	0.707
1880.00	661	GSM 1900	GPRS	27.53	-0.08	1.0 cm	2	front	0.526
1880.00	661	GSM 1900	GPRS	27.53	0.04	1.0 cm	2	bottom	0.547
1880.00	661	GSM 1900	GPRS	27.53	-0.03	1.0 cm	2	right	0.134
1880.00	661	GSM 1900	GPRS	27.53	0.06	1.0 cm	2	left	0.190
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 15-6
2.4 GHz WLAN Hotspot SAR Data

MEASUREMENT RESULTS									
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	Data Rate (Mbps)	Side	SAR (1g)
MHz	Ch.								(W/kg)
2437	6	IEEE 802.11b	DSSS	16.53	-0.16	1.0 cm	1	back	0.171
2437	6	IEEE 802.11b	DSSS	16.53	-0.18	1.0 cm	1	front	0.015
2437	6	IEEE 802.11b	DSSS	16.53	0.16	1.0 cm	1	top	0.046
2437	6	IEEE 802.11b	DSSS	16.53	-0.17	1.0 cm	1	left	0.034
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram			

15.4 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used were according to FCC/OET Bulletin 65, Supplement C [June 2001].
2. Batteries are fully charged for all readings. Standard battery was used.
3. Tissue parameters and temperatures are listed on the SAR plots.
4. Liquid tissue depth was at least 15.0 cm.
5. Device was tested using a fixed spacing for body-worn testing. A separation distance of 10 mm was tested because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
6. To confirm the proper SAR liquid depth, the z-axis plots from the system verifications were included since the system verifications were performed using the same probe, DAE, and liquid as the SAR tests in the same time period.
7. Per FCC KDB Publication 941225 D06, when the same wireless modes and device transmission configurations are required for body-worn accessories and hotspot mode, it is not necessary to additionally test body-worn accessory SAR for the same device orientation. Therefore, the hotspot data for the back side configuration additionally shows body-worn compliance at the same distance.
8. The standard battery cover contains a near field communications (NFC) antenna, and is the only battery that comes with the device. Per KDB Inquiry 277820, All tests were performed using the standard NFC battery. The technical description contains detailed information about the near field communications antenna. As described in Operational Description, the device does not allow any other battery cover.

GSM Notes:

1. Justification for reduced test configurations: Per FCC/OET Bulletin 65 Supplement C (June 2001) and Public Notice DA-02-1438, if the SAR measured at the middle channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).

2. Body-Worn accessory testing is typically associated with voice operations. Therefore body-worn SAR testing was additionally performed in GSM voice mode. GPRS Data mode is covered in the Hotspot SAR Testing at the same test distance.
3. Justification for reduced test configurations per KDB Publication 941225 D03: The source-based time-averaged output power was evaluated for all multi-slot operations. In addition to the worst-case reported, all source-based time-averaged powers within 10% of the worst-case were additionally included in the evaluation for data modes.

WLAN Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes for 2.4 GHz WIFI: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/n) 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 802.11b mode.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes for 5 GHz WIFI: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n) were not investigated since the average output powers were not greater than 0.25 dB than that of the corresponding channel in the lowest data rate IEEE 802.11a mode.
3. When Hotspot is enabled, all 5 GHz bands are disabled.
4. WLAN transmission was verified using a spectrum analyzer.

Hotspot Notes:

1. Top Edge for the licensed transmitter was not tested since the antenna distance from the edge was greater than 2.5 cm per FCC KDB Publication 941225 D06 guidance (see Section 13.4).
2. Bottom and Right Edges for the WLAN transmitter were not tested since the antenna distance from the edge was greater than 2.5 cm per FCC KDB Publication 941225 D06 (see Section 13.4).
3. During SAR Testing for the Wireless Router conditions per KDB 941225 D06, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 13.2).

16 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

16.1 Introduction

The following procedures adopted from "FCC SAR Considerations for Cell Phones with Multiple Transmitters" FCC KDB Publication 648474 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n and Bluetooth devices which may simultaneously transmit with the licensed transmitter. The RSS-102 Issue 4 §3.13 refers to this recommended procedure for such devices.

16.2 FCC Power Tables & Conditions

	2.45	5.15 - 5.35	5.47 - 5.85	GHz
P_{Ref}	12	6	5	mW
Device output power should be rounded to the nearest mW to compare with values specified in this table.				

Figure 16-1
Output Power Thresholds for Unlicensed Transmitters

	Individual Transmitter	Simultaneous Transmission
Licensed Transmitters	Routine evaluation required	SAR not required: Unlicensed only ○ when stand-alone 1-g SAR is not required and antenna is ≥ 5 cm from other antennas Licensed & Unlicensed ○ when the sum of the 1-g SAR is < 1.6 W/kg for all simultaneous transmitting antennas ○ when SAR to peak location separation ratio of simultaneous transmitting antenna pair is < 0.3 SAR required: Licensed & Unlicensed antenna pairs with SAR to peak location separation ratio ≥ 0.3; test is only required for the configuration that results in the highest SAR in stand-alone configuration for each wireless mode and exposure condition Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply
Unlicensed Transmitters	When there is no simultaneous transmission – ○ output ≤ 60/f: SAR not required ○ output > 60/f: stand-alone SAR required When there is simultaneous transmission – Stand-alone SAR not required when ○ output ≤ $2 \cdot P_{Ref}$ and antenna is ≥ 5.0 cm from other antennas ○ output ≤ P_{Ref} and antenna is ≥ 2.5 cm from other antennas ○ output ≤ P_{Ref} and antenna is < 2.5 cm from other antennas, each with either output power ≤ P_{Ref} or 1-g SAR < 1.2 W/kg Otherwise stand-alone SAR is required When stand-alone SAR is required ○ test SAR on highest output channel for each wireless mode and exposure condition ○ if SAR for highest output channel is > 50% of SAR limit, evaluate all channels according to normal procedures	

Figure 16-2
SAR Evaluation Requirements for Multiple Transmitter Handsets

16.3 Multiple Antenna/Transmission Information

The separation between the main antenna and the Bluetooth and WLAN antennas is 107 mm.
RF Conducted Power of Bluetooth Tx is 11.695 mW. RF Conducted Power of WLAN is 44.978 mW.

Per KDB Publications 447498 and 648474 and RSS 102 Section 2.5.1, based on the output power, antenna separation distance and the Body SAR of the dominant transmitter, a stand-alone Bluetooth SAR test is not required while for WLAN it is required.

2.4 GHz and 5 GHz WIFI and Bluetooth share the same antenna path and cannot transmit simultaneously.

16.4 Head SAR Simultaneous Transmission Analysis

Table 16-1
Simultaneous Transmission Scenario (Held to Ear)

Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.105	0.099	**0.204**
	Right Tilt	0.056	0.096	0.152
	Left Cheek	0.119	0.057	0.176
	Left Tilt	0.054	0.057	0.111

The above tables represent a held to ear voice call with 2.4 GHz WLAN.

Table 16-2
Simultaneous Transmission Scenario (Held to Ear)

Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.105	0.197	**0.302**
	Right Tilt	0.056	0.142	0.198
	Left Cheek	0.119	0.179	0.298
	Left Tilt	0.054	0.162	0.216

The above tables represent a held to ear voice call with 5 GHz WLAN.

16.5 Body-Worn Simultaneous Transmission Analysis

Table 16-3
Simultaneous Transmission Scenario (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G SAR (W/kg)	2.4 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 1900	0.612	0.171	**0.783**

The above tables represent a body-worn voice call with 2.4 GHz WLAN.

Table 16-4
Simultaneous Transmission Scenario (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G SAR (W/kg)	5 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 1900	0.612	0.096	**0.708**

The above tables represent a body-worn voice call with 5 GHz WLAN.

16.6 Hotspot SAR Simultaneous Transmission Analysis

Table 16-5
Simultaneous Transmission Scenario (Hotspot)

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.707	0.171	**0.878**
	Front	0.526	0.015	0.541
	Top	-	0.046	0.046
	Bottom	0.547	-	0.547
	Right	0.134	-	0.134
	Left	0.190	0.034	0.224

Note: Per FCC KDB Publication 941225 D06, the edges with antennas more than 2.5 cm are not required to be evaluated for SAR ("-").
The above tables represent a portable hotspot condition.
When hotspot is enabled, all 5 GHz WLAN bands are disabled

16.7 Simultaneous Transmission Conclusion

The above numerical summed SAR was below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit. No volumetric SAR summation is required per FCC KDB Publication 648474.

17 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8648D	(9kHz-4GHz) Signal Generator	10/10/2011	Annual	10/10/2012	3613A00315
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/21/2011	Annual	4/21/2012	JP38020182
Agilent	E5515C	Wireless Communications Test Set	10/10/2011	Annual	10/10/2012	GB46110872
Agilent	E5515C	Wireless Communications Test Set	7/6/2011	Annual	7/6/2012	GB41450275
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/8/2011	Annual	4/8/2012	MY45470194
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/12/2011	Annual	10/12/2012	1833460
Gigatronics	8651A	Universal Power Meter	10/12/2011	Annual	10/12/2012	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	6/1/2011	Annual	6/1/2012	833855/0010
Rohde & Schwarz	CMU200	Base Station Simulator	4/19/2011	Annual	4/19/2012	107826
Rohde & Schwarz	NRVD	Dual Channel Power Meter	4/8/2011	Biennial	4/8/2013	101695
SPEAG	D1900V2	1900 MHz SAR Dipole	2/17/2011	Annual	2/17/2012	502
SPEAG	D2450V2	2450 MHz SAR Dipole	2/8/2011	Annual	2/8/2012	797
SPEAG	D5GHzV2	5 GHz SAR Dipole	7/26/2011	Annual	7/26/2012	1007
SPEAG	D5GHzV2	5 GHz SAR Dipole	2/11/2011	Annual	2/11/2012	1057
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/20/2011	Annual	4/20/2012	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/21/2011	Annual	2/21/2012	649
SPEAG	EX3DV4	SAR Probe	7/27/2011	Annual	7/27/2012	3561
SPEAG	EX3DV4	SAR Probe	2/14/2011	Annual	2/14/2012	3550
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/19/2011	Annual	5/19/2012	859
Rohde & Schwarz	SMIQ03B	Signal Generator	4/6/2011	Annual	4/6/2012	DE27259
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	8/25/2011	Annual	8/25/2012	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
Agilent	8648D	Signal Generator	4/5/2011	Annual	4/5/2012	3629U00687
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	5605
Anritsu	MA2481A	Power Sensor	2/7/2011	Annual	2/7/2012	2400
Agilent	E5515C	Wireless Communications Test Set	7/6/2011	Annual	7/6/2012	GB43304447
Agilent	E5515C	Wireless Communications Tester	4/21/2011	Annual	4/21/2012	US41140256
Amplifier Research	5S1G4	5W, 800MHz-4.2GHz	N/A		N/A	21910
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	N/A		N/A	N/A
Agilent	E5515C	Wireless Communications Test Set	2/8/2011	Annual	2/8/2012	GB45360985
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	10/7/2011	Annual	10/7/2012	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
VWR	36934-158	Wall-Mounted Thermometer	1/21/2011	Biennial	1/21/2013	111286445
VWR	36934-158	Wall-Mounted Thermometer	1/21/2011	Biennial	1/21/2013	111286460
VWR	36934-158	Wall-Mounted Thermometer	5/26/2010	Biennial	5/26/2012	101718589
VWR	36934-158	Wall-Mounted Thermometer	1/21/2011	Biennial	1/21/2013	111286454
VWR	36934-158	Wall-Mounted Thermometer	2/26/2010	Biennial	2/26/2012	101536273
MiniCircuits	SLP-2400+	Low Pass Filter	N/A		N/A	R8979500903
Narda	4772-3	Attenuator (3dB)	N/A		N/A	9406
Narda	BW-S3W2	Attenuator (3dB)	N/A		N/A	120
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	8/5/2011	Annual	8/5/2012	112347
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	N/A		N/A	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	N/A		N/A	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	N/A			N/A
MiniCircuits	VLF-6000+	Low Pass Filter	N/A			N/A

18 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	6.0	N	1	1.0	1.0	6.0	6.0	∞
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				12.1	11.7	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.2	23.5	

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	6.55	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

19 CONCLUSION

19.1 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]

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

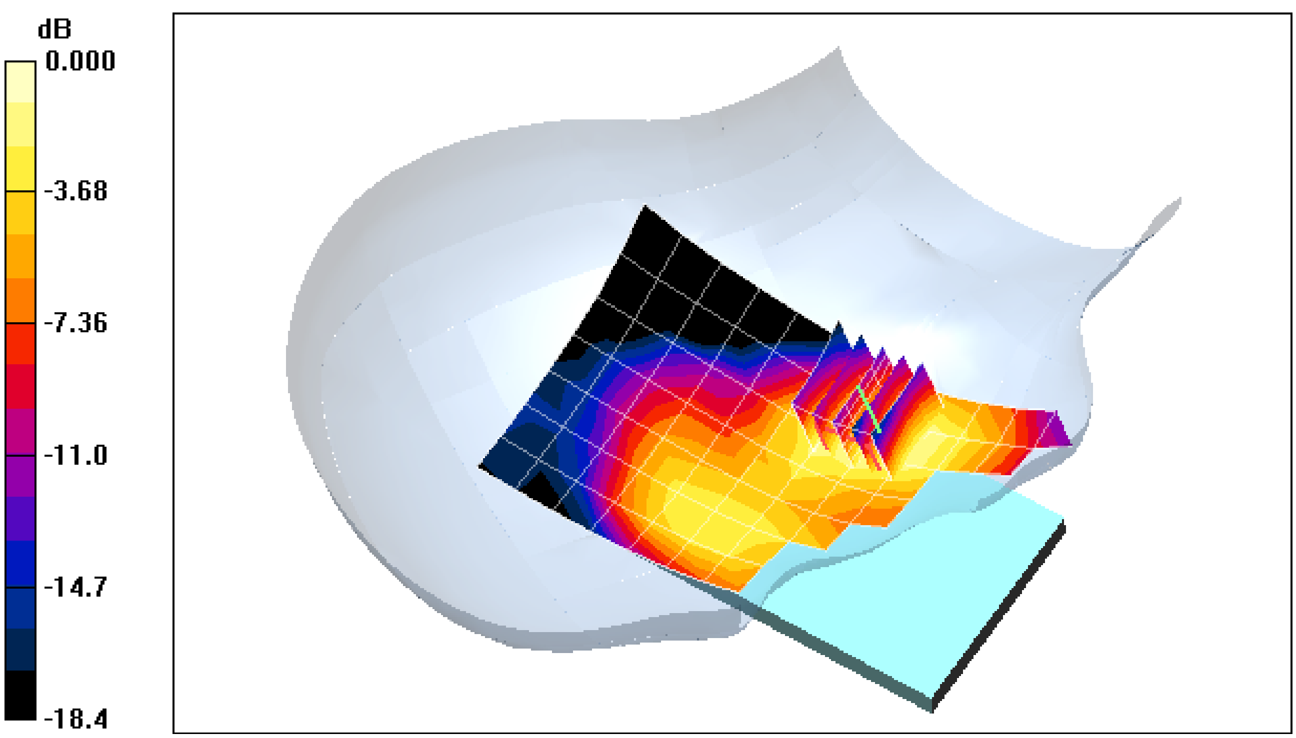
Communication System: GSM1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.41 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 11-17-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3209; ConvF(5.11, 5.11, 5.11); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GSM 1900, Right Head, Touch, Mid.ch

Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 8.44 V/m; Power Drift = 0.004 dB
Peak SAR (extrapolated) = 0.166 W/kg
SAR(1 g) = 0.105 mW/g; SAR(10 g) = 0.063 mW/g



0 dB = 0.113mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

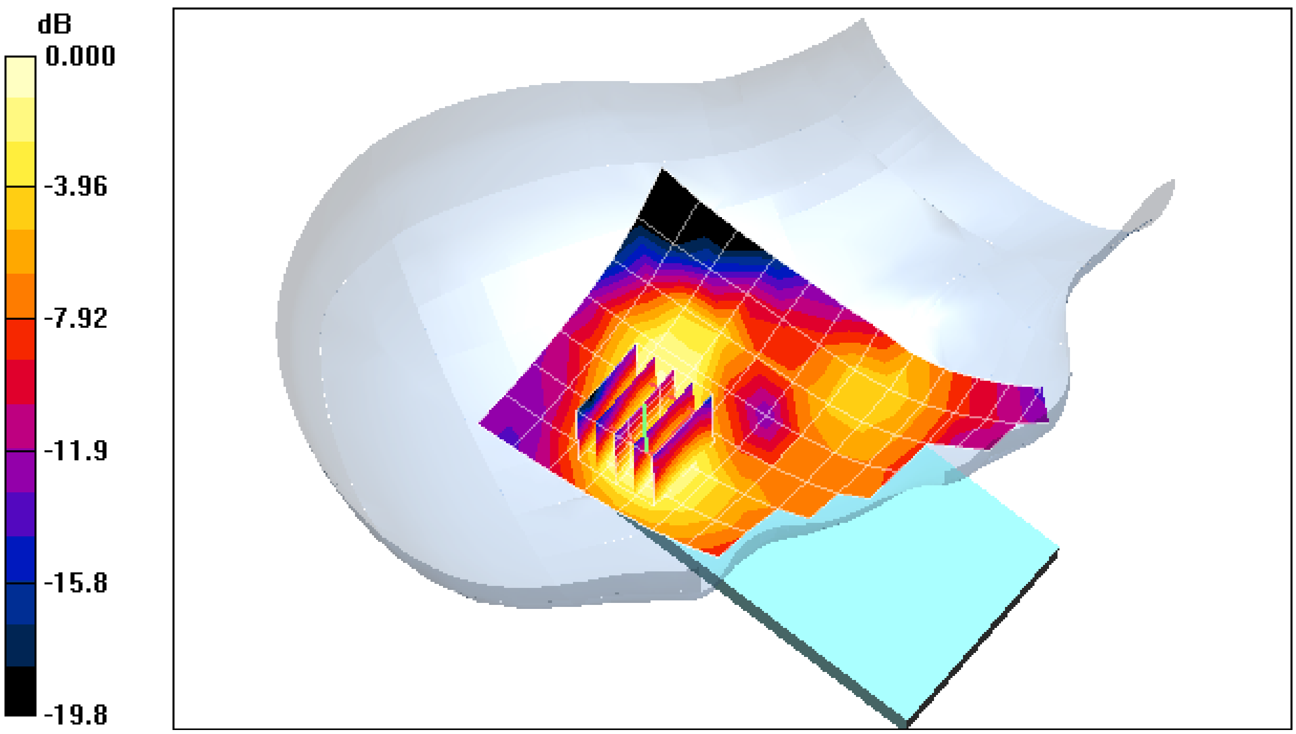
Communication System: GSM1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: 1900 Head Medium parameters used:
$f = 1880$ MHz; $\sigma = 1.41$ mho/m; $\varepsilon_r = 41$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 11-17-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3209; ConvF(5.11, 5.11, 5.11); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GSM 1900, Right Head, Tilt, Mid.ch

Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.51 V/m; Power Drift = -0.078 dB
Peak SAR (extrapolated) = 0.087 W/kg
SAR(1 g) = 0.056 mW/g; SAR(10 g) = 0.034 mW/g



0 dB = 0.061mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

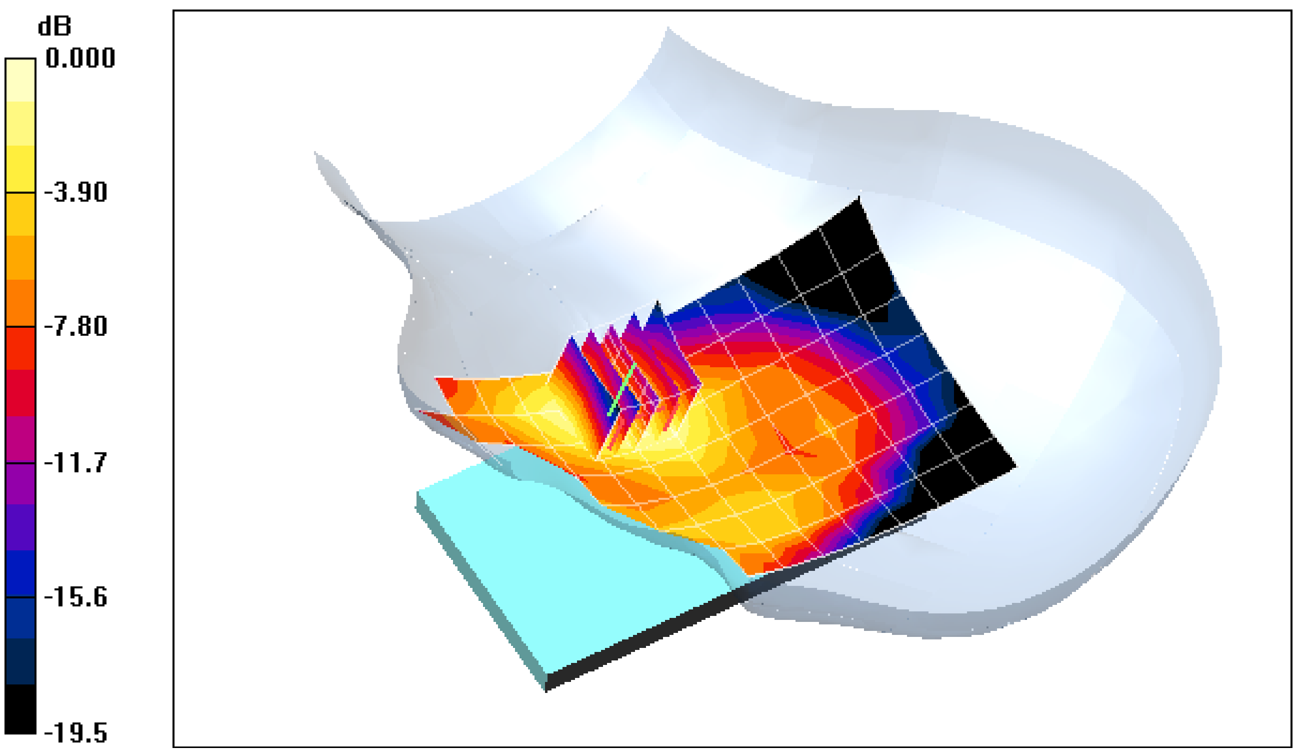
Communication System: GSM1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.41 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-17-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3209; ConvF(5.11, 5.11, 5.11); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GSM 1900, Left Head, Touch, Mid.ch

Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.14 V/m; Power Drift = -0.088 dB
Peak SAR (extrapolated) = 0.187 W/kg
SAR(1 g) = 0.119 mW/g; SAR(10 g) = 0.072 mW/g



0 dB = 0.130mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

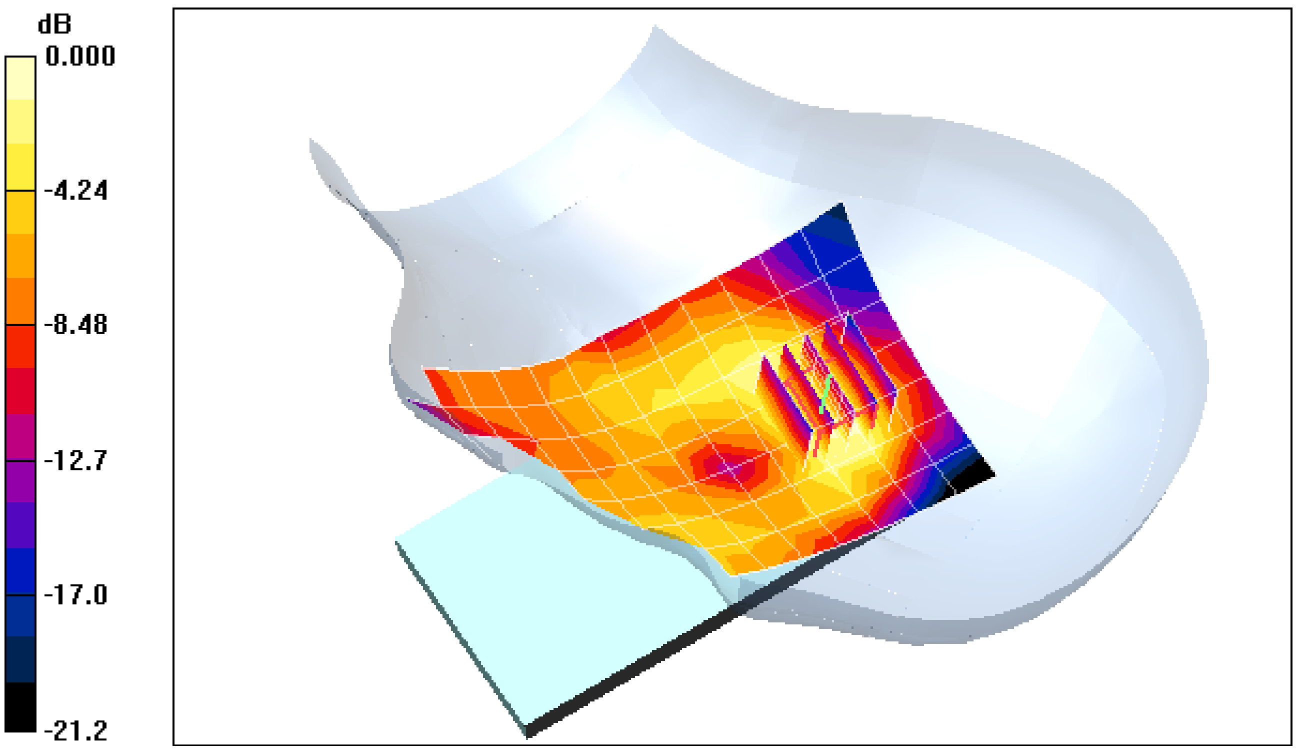
Communication System: GSM1900; Frequency: 1880 MHz;Duty Cycle: 1:8.3
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.41 mho/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-17-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3209; ConvF(5.11, 5.11, 5.11); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GSM 1900, Left Head, Tilt, Mid.ch

Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.98 V/m; Power Drift = 0.106 dB
Peak SAR (extrapolated) = 0.093 W/kg
SAR(1 g) = 0.054 mW/g; SAR(10 g) = 0.030 mW/g



0 dB = 0.058mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

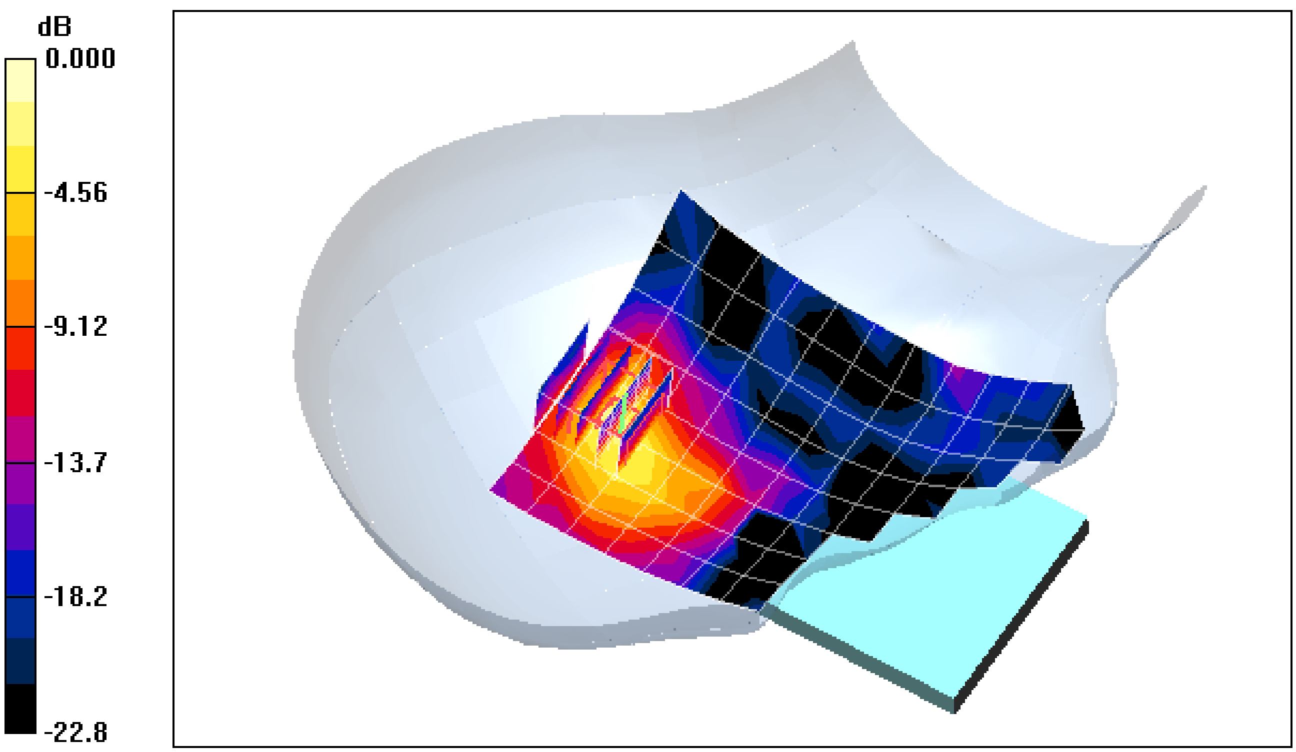
Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
$f = 2437$ MHz; $\sigma = 1.86$ mho/m; $\varepsilon_r = 39.5$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 11-21-2011; Ambient Temp: 24.1°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3561; ConvF(6.42, 6.42, 6.42); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 802.11b, Right Head, Touch, Ch 06, 1 Mbps

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 6.90 V/m; Power Drift = -0.177 dB
Peak SAR (extrapolated) = 0.218 W/kg
SAR(1 g) = 0.099 mW/g; SAR(10 g) = 0.041 mW/g



0 dB = 0.136mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

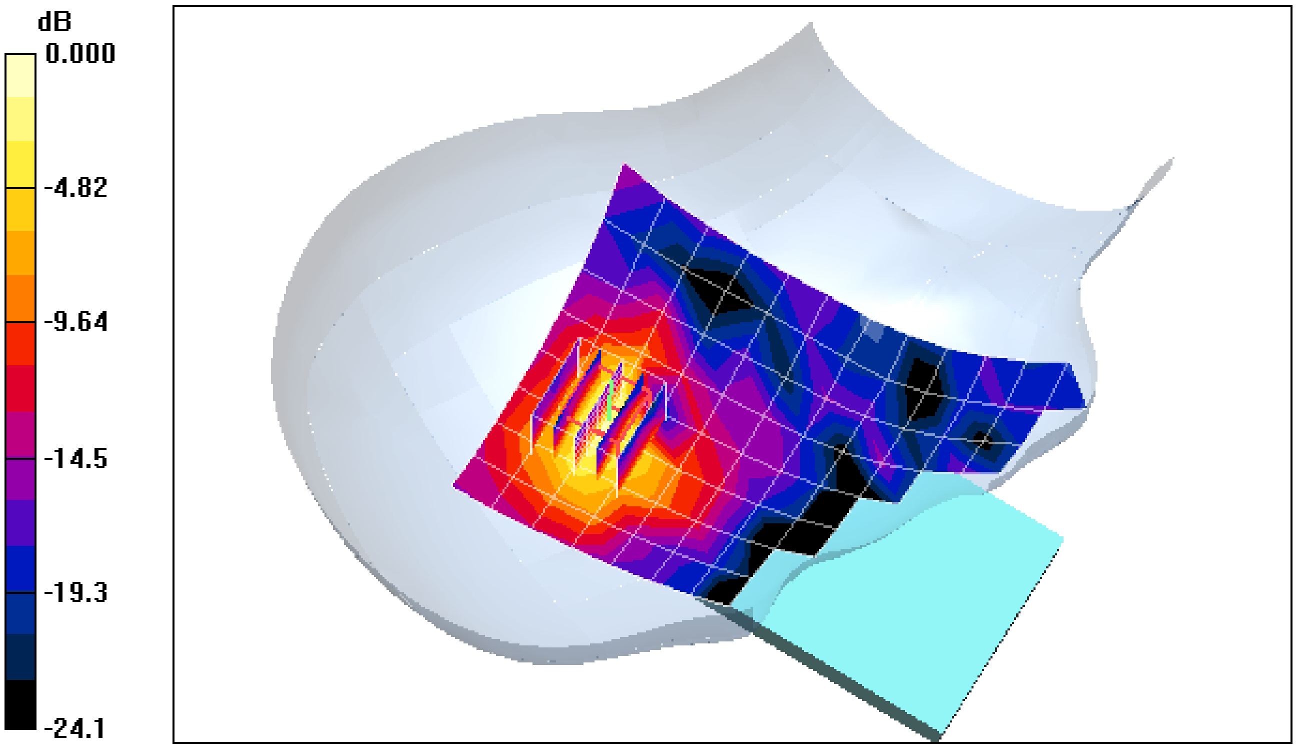
Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.86 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 11-21-2011; Ambient Temp: 24.1°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3561; ConvF(6.42, 6.42, 6.42); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 802.11b, Right Head, Tilt, Ch 06, 1 Mbps

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.13 V/m; Power Drift = 0.115 dB
Peak SAR (extrapolated) = 0.235 W/kg
SAR(1 g) = 0.096 mW/g; SAR(10 g) = 0.040 mW/g



0 dB = 0.125mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

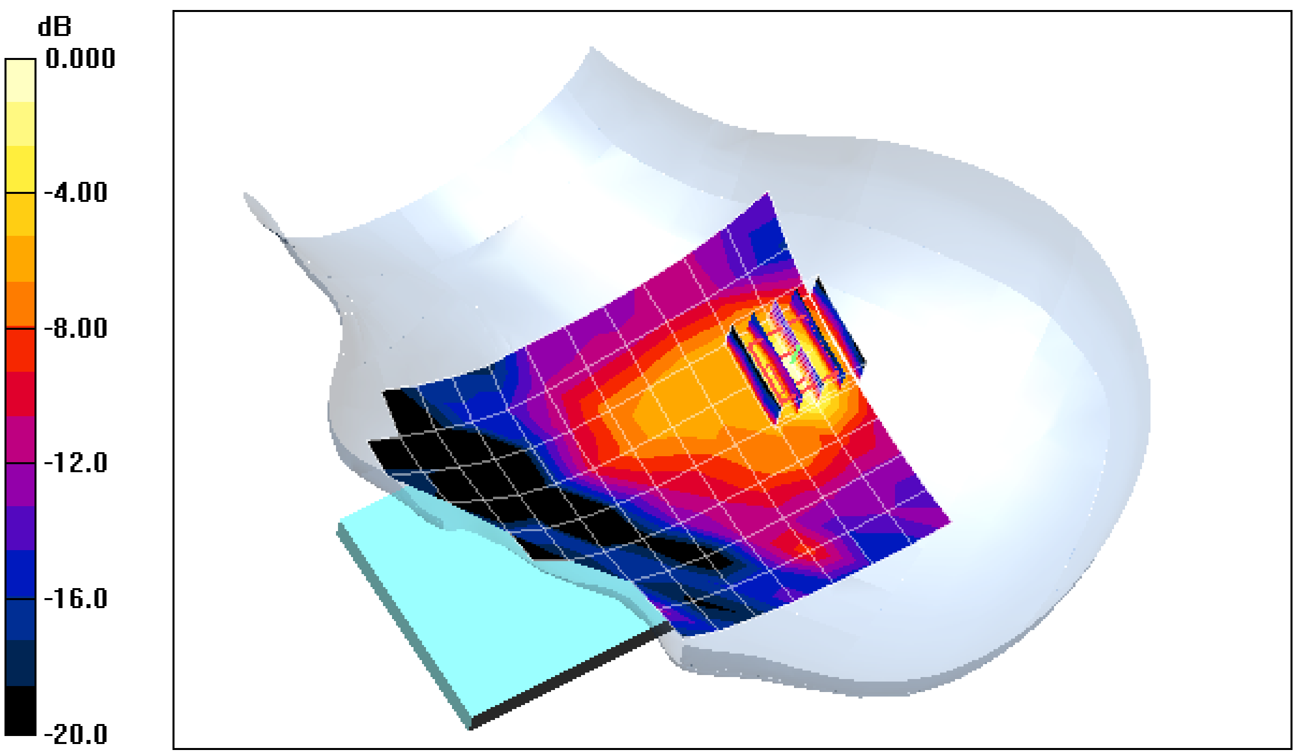
Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.86 mho/m; ε_r = 39.5; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-21-2011; Ambient Temp: 24.1°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3561; ConvF(6.42, 6.42, 6.42); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 802.11b, Left Head, Touch, Ch 06, 1 Mbps

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.54 V/m; Power Drift = 0.149 dB
Peak SAR (extrapolated) = 0.108 W/kg
SAR(1 g) = 0.057 mW/g; SAR(10 g) = 0.025 mW/g



0 dB = 0.069mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

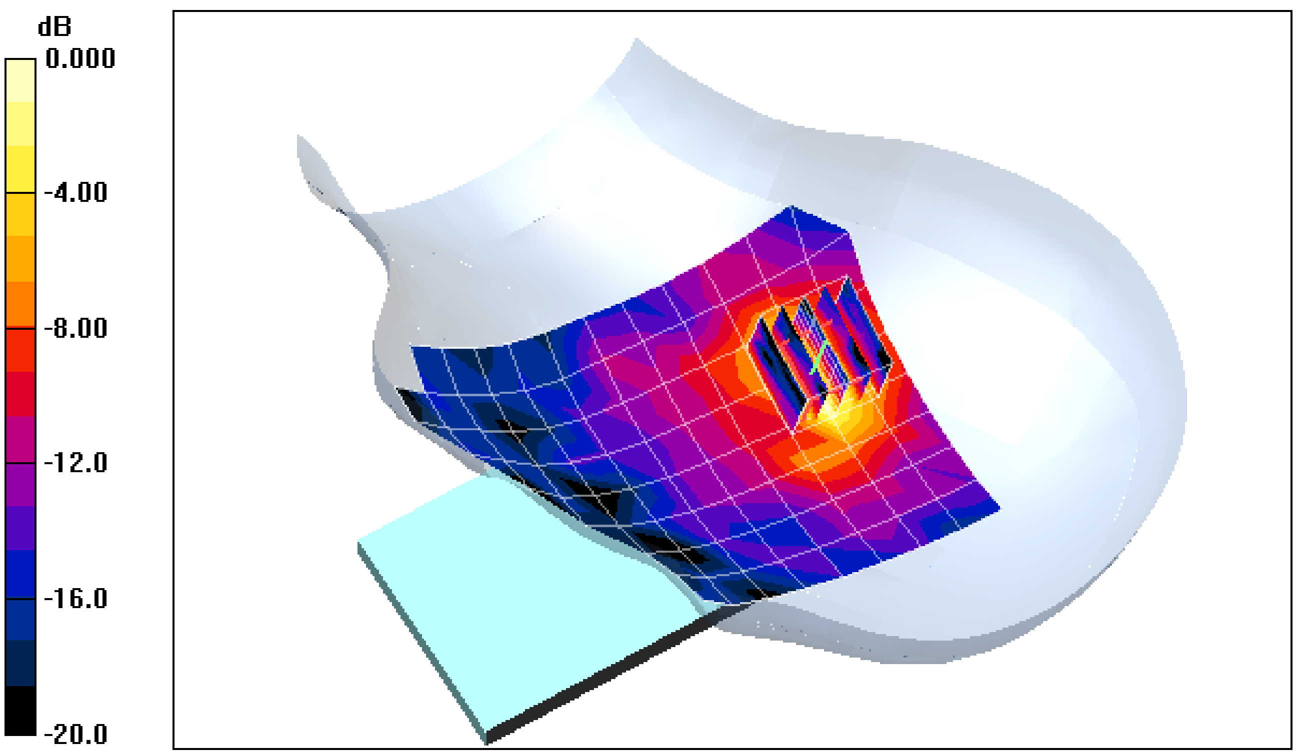
Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
$f = 2437$ MHz; $\sigma = 1.86$ mho/m; $\varepsilon_r = 39.5$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

Test Date: 11-21-2011; Ambient Temp: 24.1°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3561; ConvF(6.42, 6.42, 6.42); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 802.11b, Left Head, Tilt, Ch 06, 1 Mbps

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.88 V/m; Power Drift = -0.211 dB
Peak SAR (extrapolated) = 0.108 W/kg
SAR(1 g) = 0.057 mW/g; SAR(10 g) = 0.025 mW/g



0 dB = 0.073mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

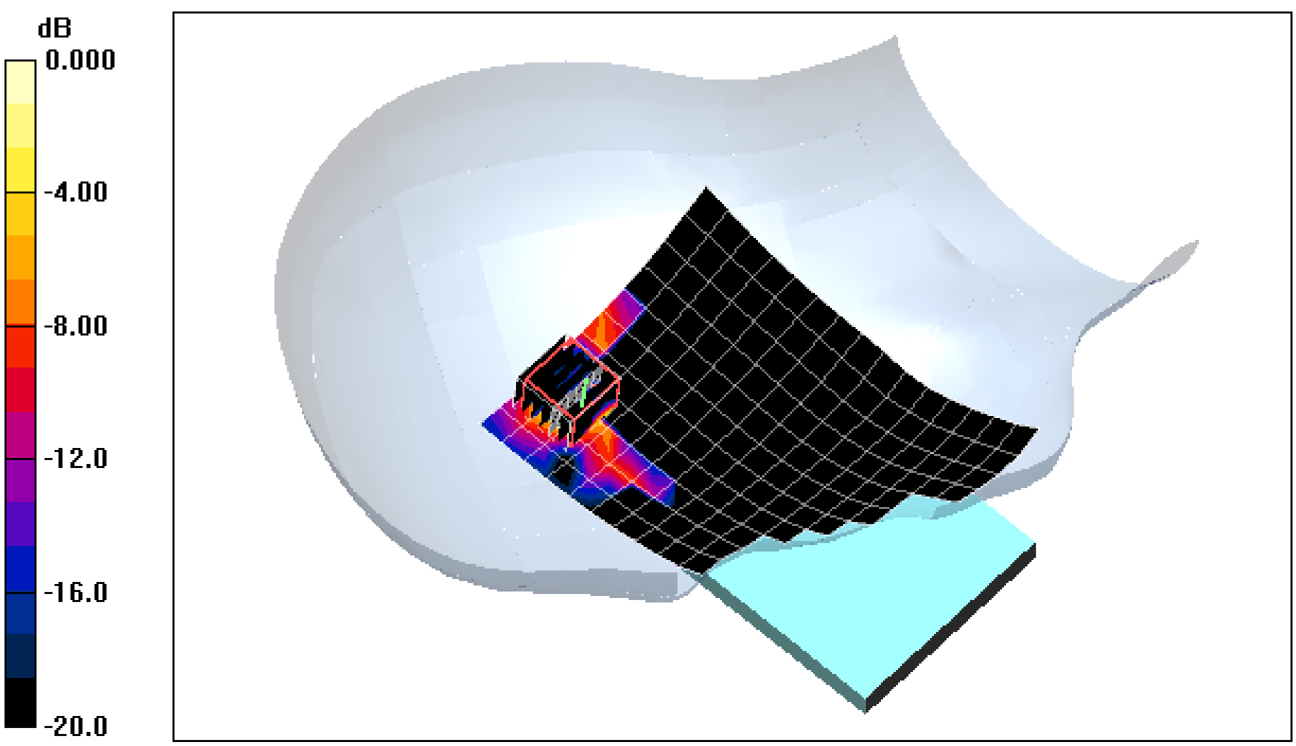
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5240 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5240 MHz; σ = 4.766 mho/m; ε_r = 36.08; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 11-19-2011; Ambient Temp: 24.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3550; ConvF(4.06, 4.06, 4.06); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11a 5.2 GHz, Right Head, Touch, Ch 48, 6 Mbps

Area Scan (12x16x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 1.25 V/m; Power Drift = 0.192 dB
Peak SAR (extrapolated) = 0.798 W/kg
SAR(1 g) = 0.197 mW/g; SAR(10 g) = 0.043 mW/g



0 dB = 0.436mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

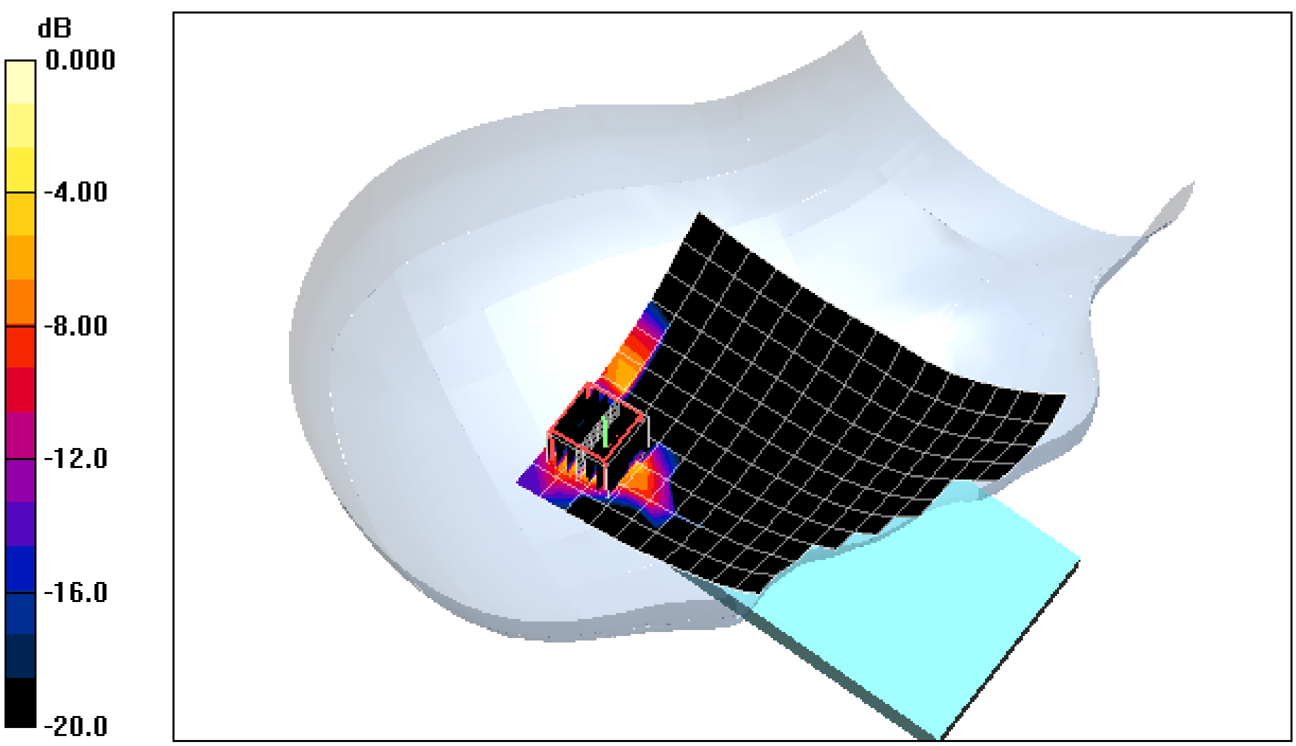
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5680 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
$f = 5680$ MHz; $\sigma = 5.221$ mho/m; $\varepsilon_r = 35.26$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 11-19-2011; Ambient Temp: 24.6°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3550; ConvF(3.5, 3.5, 3.5); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11a 5.5 GHz, Right Head, Tilt, Ch 136, 6 Mbps

Area Scan (12x16x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 6.27 V/m; Power Drift = -0.112 dB
Peak SAR (extrapolated) = 0.624 W/kg
SAR(1 g) = 0.142 mW/g; SAR(10 g) = 0.037 mW/g



0 dB = 0.327mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

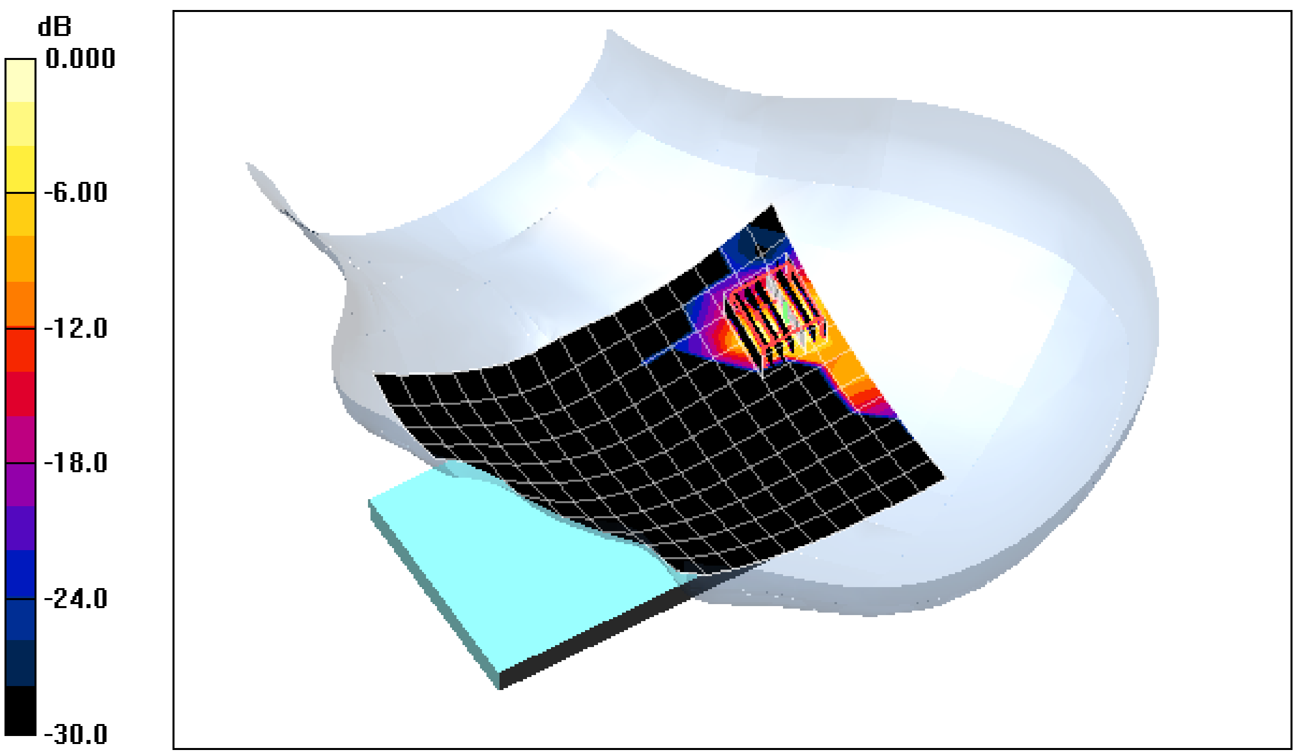
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5825 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5825 MHz; σ = 5.364 mho/m; ε_r = 34.97; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-19-2011; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3550; ConvF(3.64, 3.64, 3.64); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11a, 5.8 GHz Left Head, Touch, Ch 165, 6 Mbps

Area Scan (12x16x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 0.578 V/m; Power Drift = 0.112 dB
Peak SAR (extrapolated) = 0.744 W/kg
SAR(1 g) = 0.179 mW/g; SAR(10 g) = 0.043 mW/g



0 dB = 0.404mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

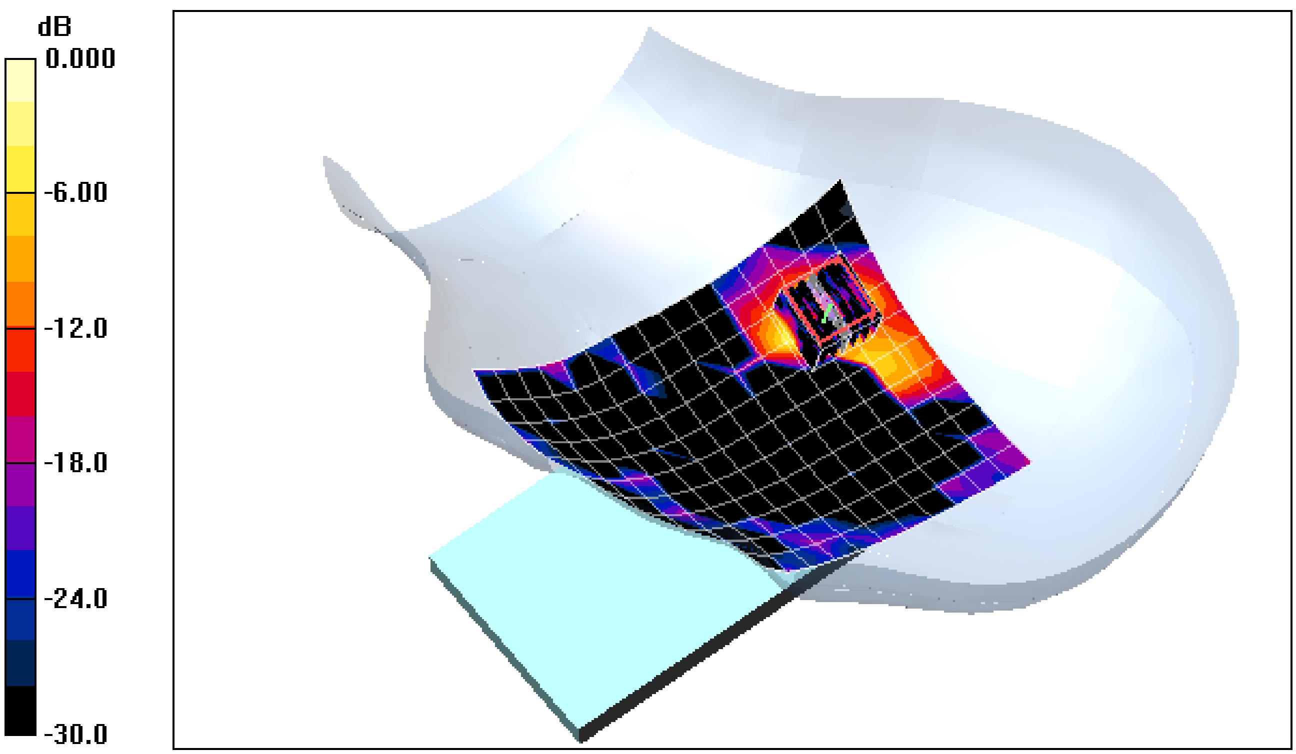
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5825 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5825 MHz; σ = 5.364 mho/m; ε_r = 34.97; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 11-19-2011; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3550; ConvF(3.64, 3.64, 3.64); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11a, 5.8 GHz Left Head, Tilt, Ch 165, 6 Mbps

Area Scan (12x16x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 3.92 V/m; Power Drift = 0.123 dB
Peak SAR (extrapolated) = 0.670 W/kg
SAR(1 g) = 0.162 mW/g; SAR(10 g) = 0.039 mW/g



0 dB = 0.350mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

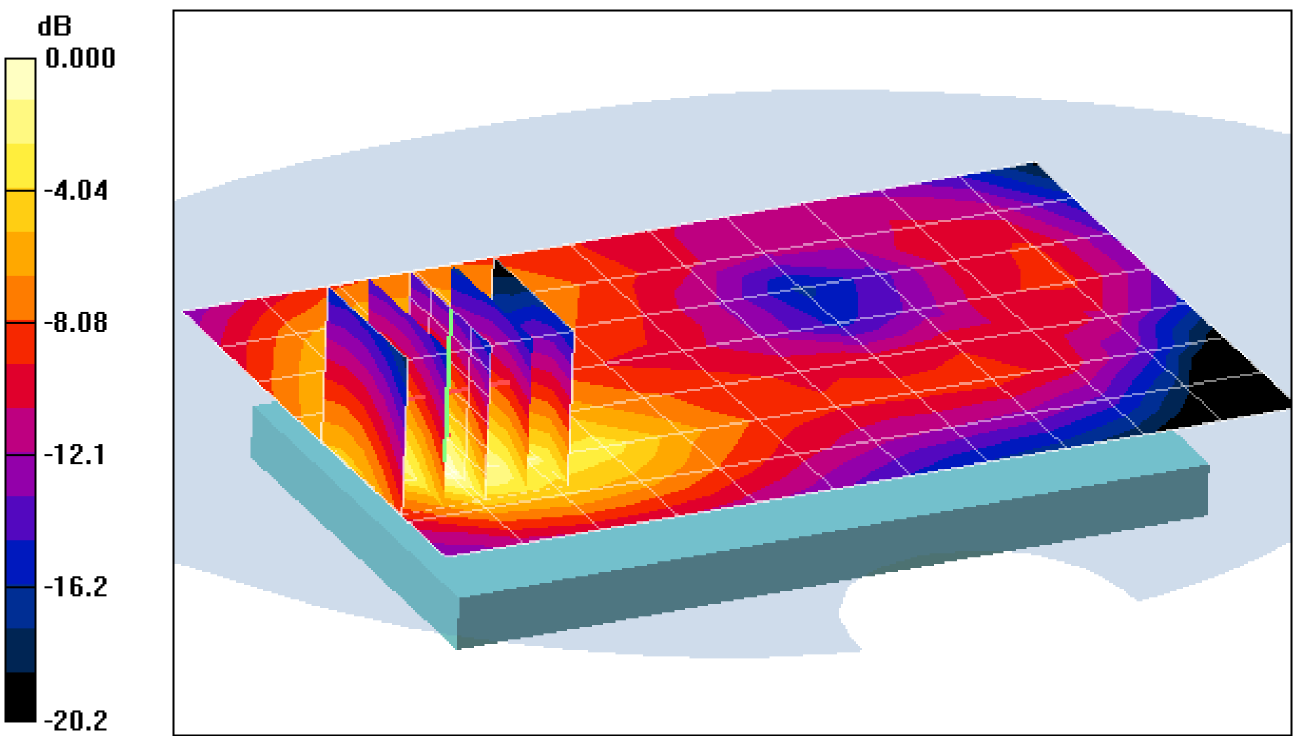
Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.49 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-15-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3209; ConvF(4.48, 4.48, 4.48); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM Sub Dasy B; Type: SAM 4.0; Serial: TP-1626
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 2 Tx Slots

Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.7 V/m; Power Drift = -0.074 dB
Peak SAR (extrapolated) = 1.28 W/kg
SAR(1 g) = 0.707 mW/g; SAR(10 g) = 0.363 mW/g



0 dB = 0.782mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

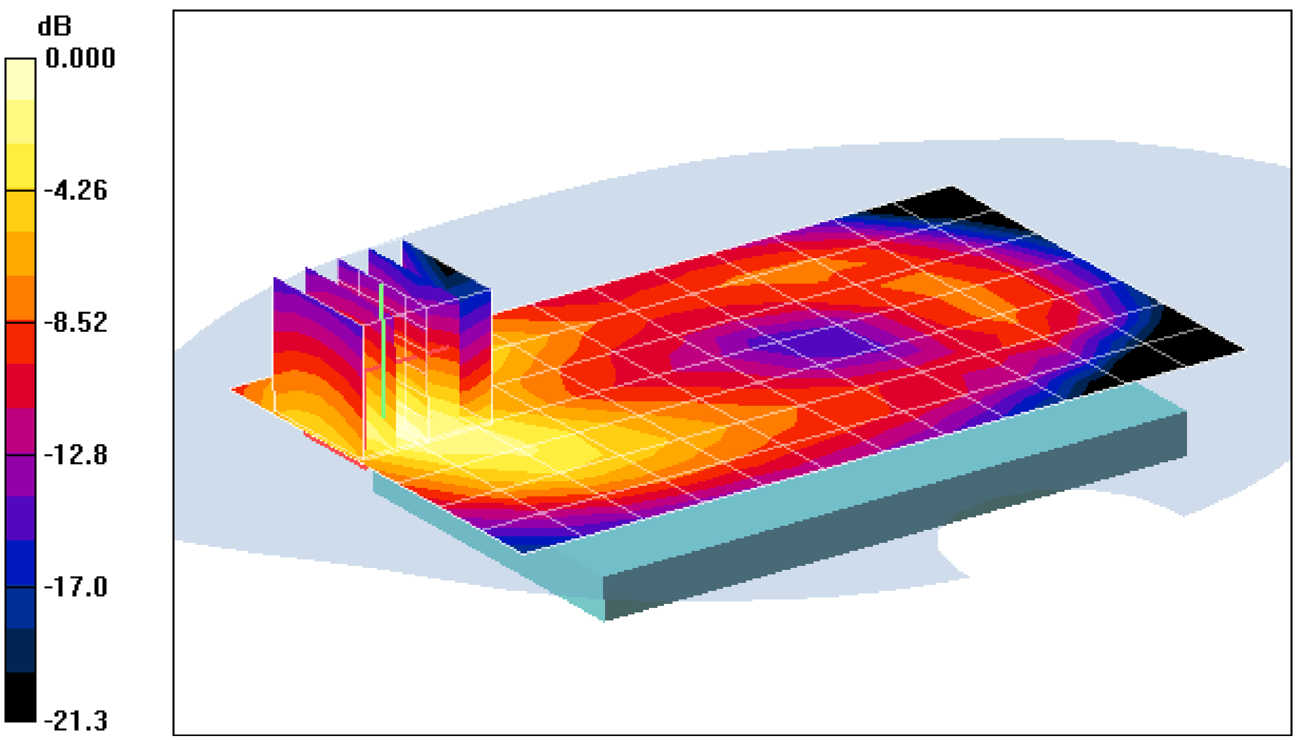
Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.49 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-15-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3209; ConvF(4.48, 4.48, 4.48); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM Sub Dasy B; Type: SAM 4.0; Serial: TP-1626
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GPRS 1900, Body SAR, Front side, Mid.ch, 2 Tx Slots

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.6 V/m; Power Drift = -0.077 dB
Peak SAR (extrapolated) = 0.937 W/kg
SAR(1 g) = 0.526 mW/g; SAR(10 g) = 0.284 mW/g



0 dB = 0.594mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

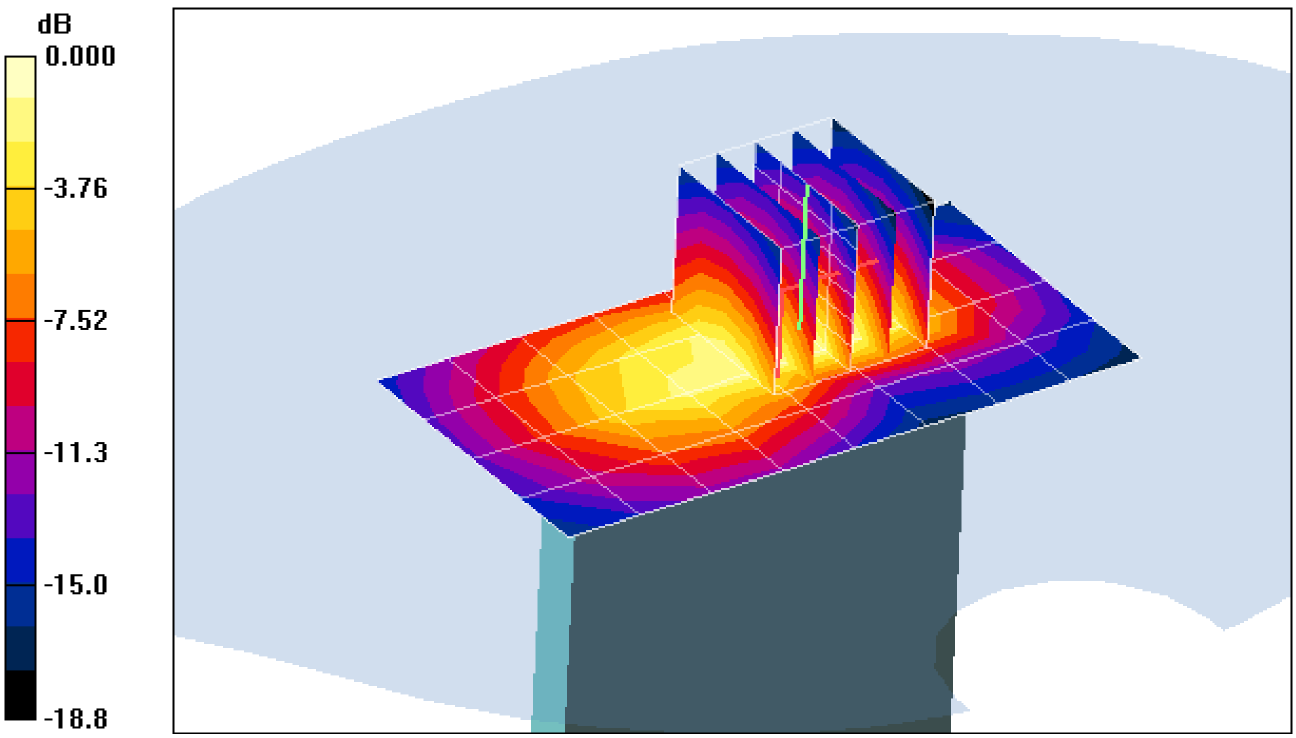
Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: 1900 Body Medium parameters used:
$f = 1880$ MHz; $\sigma = 1.49$ mho/m; $\varepsilon_r = 51.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-15-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3209; ConvF(4.48, 4.48, 4.48); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM Sub Dasy B; Type: SAM 4.0; Serial: TP-1626
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GPRS 1900, Body SAR, Bottom Edge, Mid.ch, 2 Tx Slots

Area Scan (5x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.5 V/m; Power Drift = 0.039 dB
Peak SAR (extrapolated) = 1.01 W/kg
SAR(1 g) = 0.547 mW/g; SAR(10 g) = 0.280 mW/g



0 dB = 0.619mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

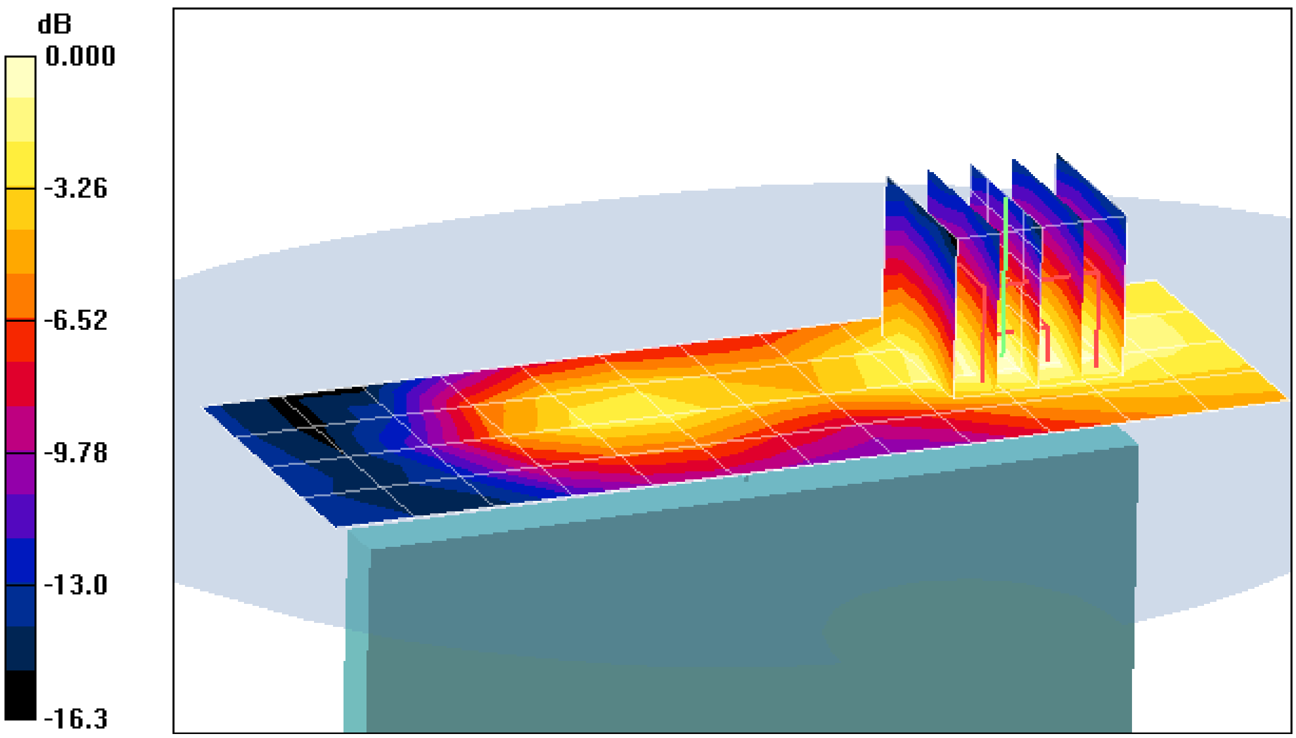
Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.49 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-15-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3209; ConvF(4.48, 4.48, 4.48); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM Sub Dasy B; Type: SAM 4.0; Serial: TP-1626
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GPRS 1900, Body SAR, Right Edge, Mid.ch, 2 Tx Slots

Area Scan (5x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.46 V/m; Power Drift = -0.032 dB
Peak SAR (extrapolated) = 0.224 W/kg
SAR(1 g) = 0.134 mW/g; SAR(10 g) = 0.079 mW/g



0 dB = 0.147mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

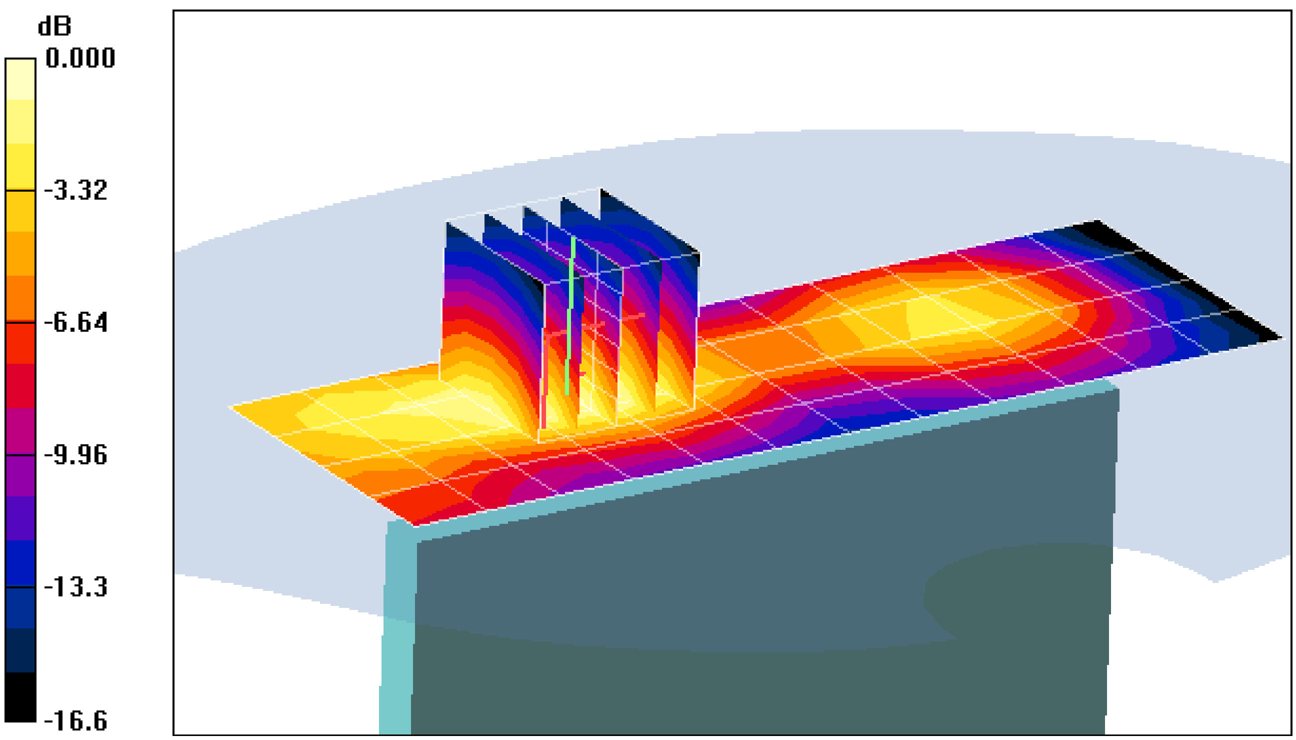
Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz;Duty Cycle: 1:4.15
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.49 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-15-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3209; ConvF(4.48, 4.48, 4.48); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM Sub Dasy B; Type: SAM 4.0; Serial: TP-1626
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: GPRS 1900, Body SAR, Left Edge, Mid.ch, 2 Tx Slots

Area Scan (5x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.6 V/m; Power Drift = 0.063 dB
Peak SAR (extrapolated) = 0.325 W/kg
SAR(1 g) = 0.190 mW/g; SAR(10 g) = 0.107 mW/g



0 dB = 0.208mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

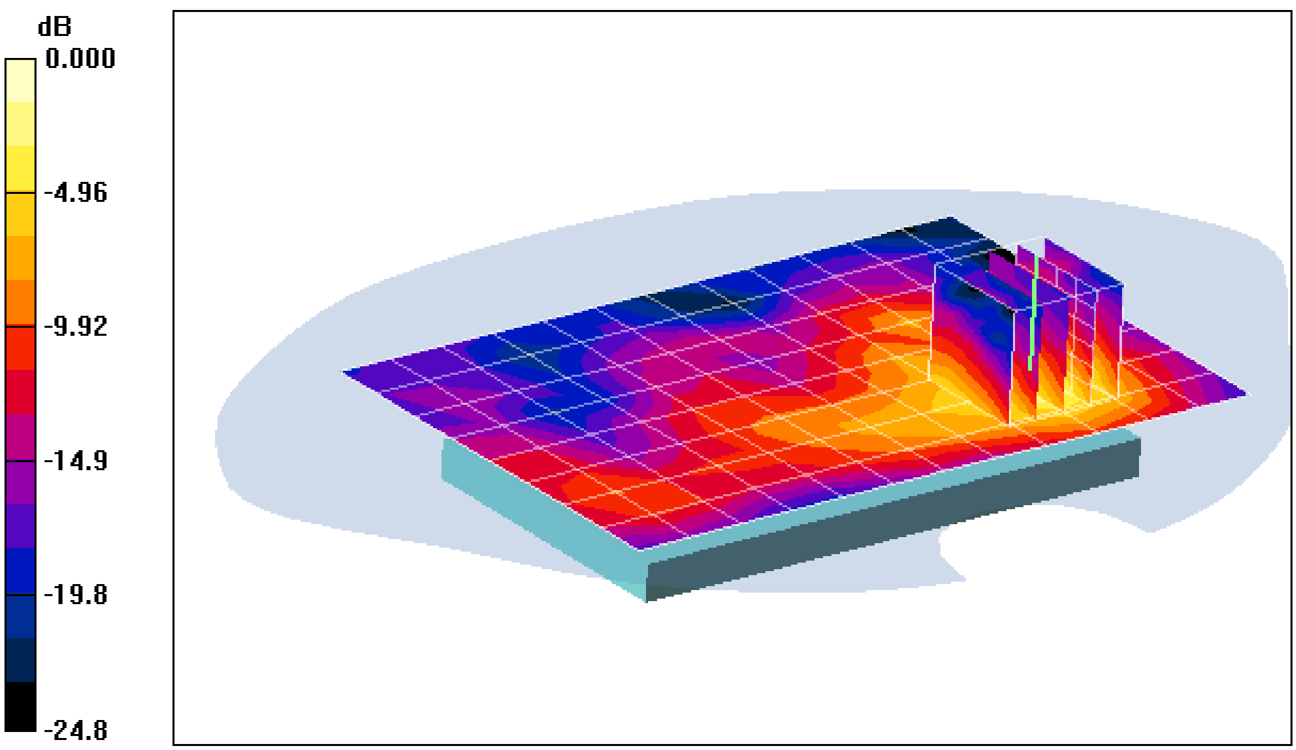
Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.93 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-21-2011; Ambient Temp: 24.2°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN3561; ConvF(6.26, 6.26, 6.26); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Body SAR, Ch 06, 1 Mbps, Back Side

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.62 V/m; Power Drift = -0.157 dB
Peak SAR (extrapolated) = 0.356 W/kg
SAR(1 g) = 0.171 mW/g; SAR(10 g) = 0.078 mW/g



0 dB = 0.220mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

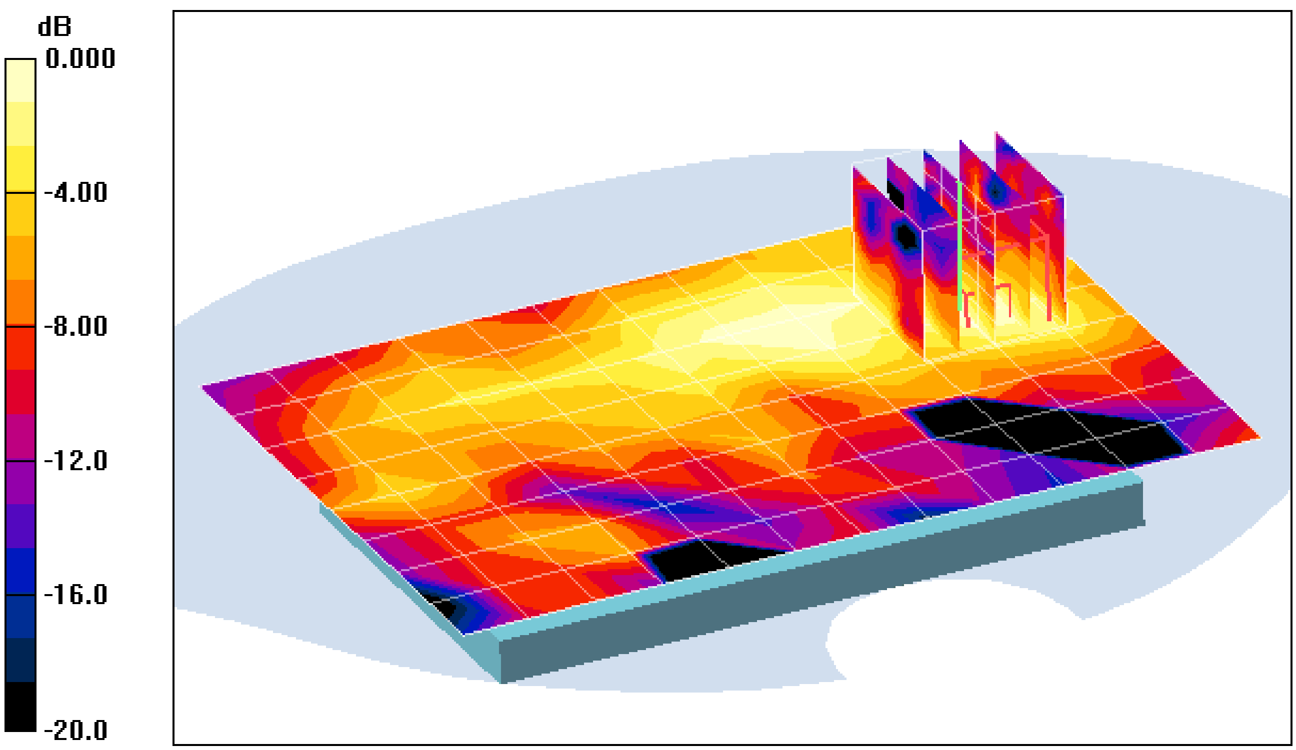
Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.93 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-21-2011; Ambient Temp: 24.2°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN3561; ConvF(6.26, 6.26, 6.26); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Body SAR, Ch 06, 1 Mbps, Front Side

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.96 V/m; Power Drift = -0.178 dB
Peak SAR (extrapolated) = 0.028 W/kg
SAR(1 g) = 0.015 mW/g; SAR(10 g) = 0.00787 mW/g



0 dB = 0.019mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

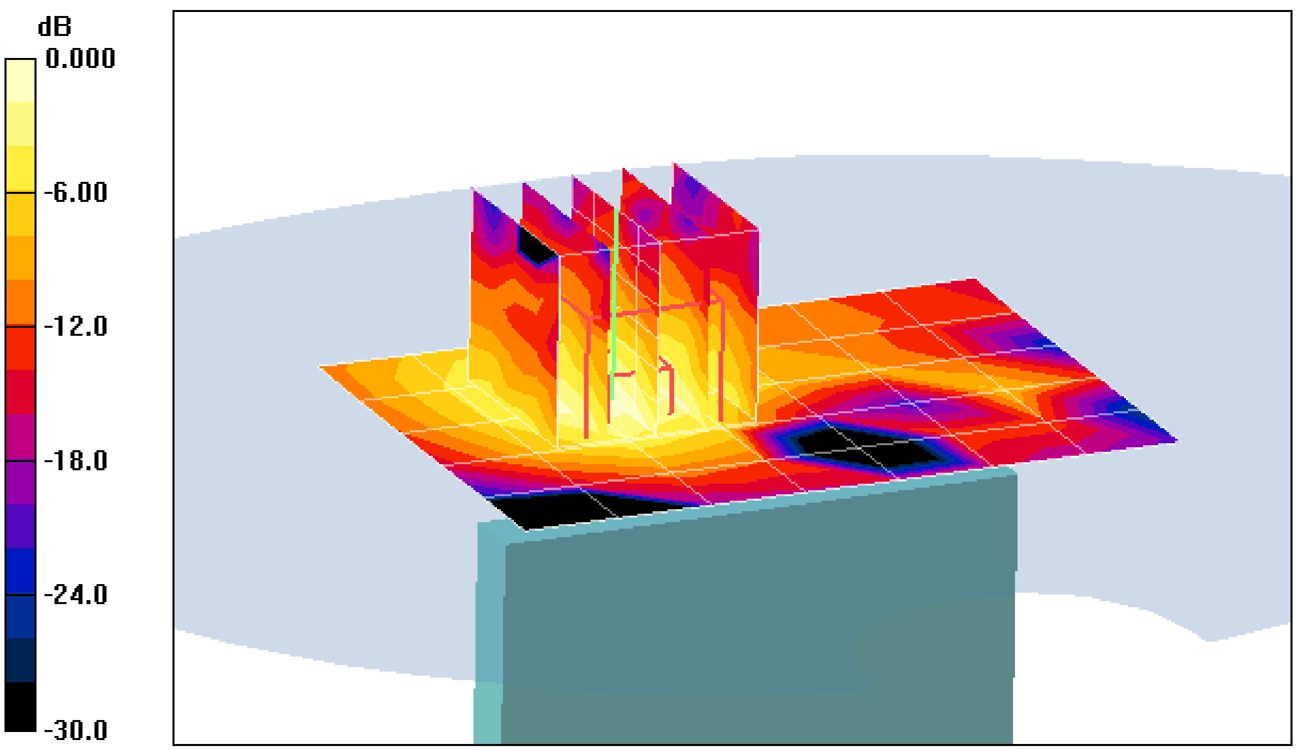
Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.93 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-21-2011; Ambient Temp: 24.2°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN3561; ConvF(6.26, 6.26, 6.26); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Body SAR, Ch 06, 1 Mbps, Top Edge

Area Scan (6x8x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.87 V/m; Power Drift = 0.159 dB
Peak SAR (extrapolated) = 0.088 W/kg
SAR(1 g) = 0.046 mW/g; SAR(10 g) = 0.022 mW/g



0 dB = 0.058mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

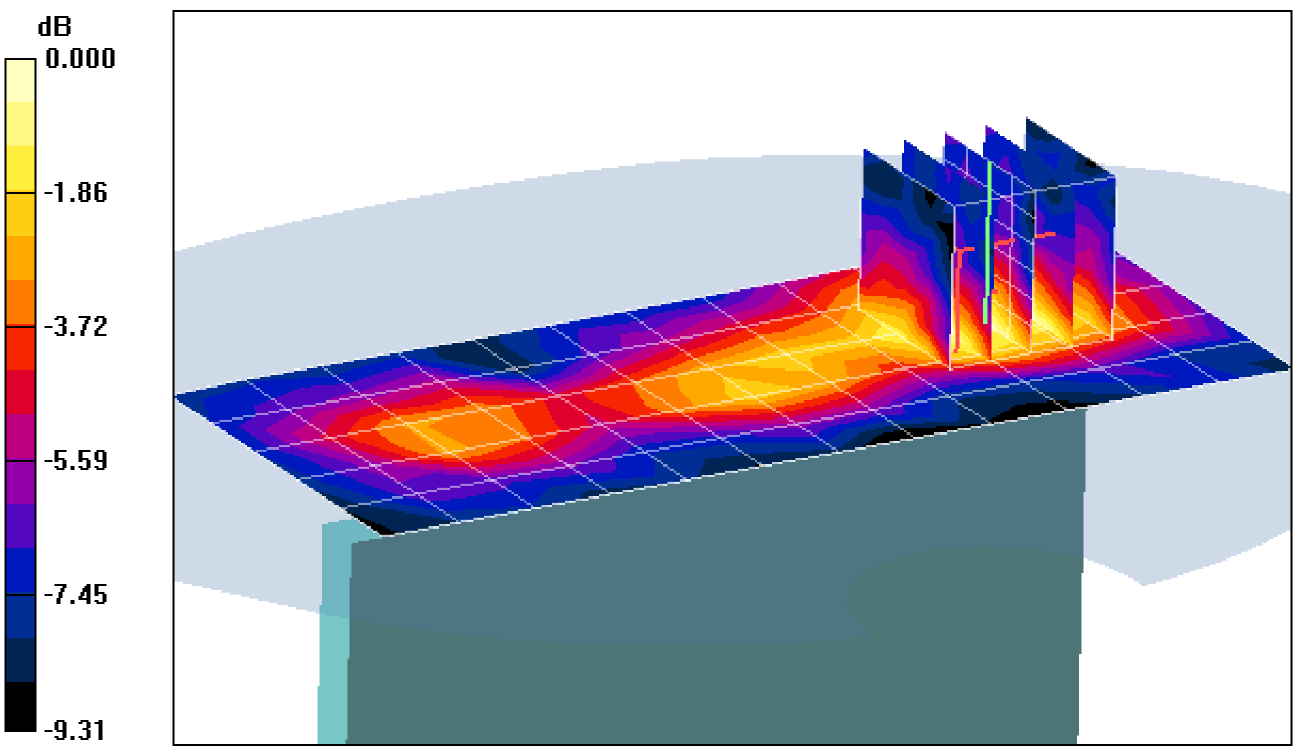
Communication System: IEEE 802.11b; Frequency: 2437 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.93 mho/m; ε_r = 50.6; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-21-2011; Ambient Temp: 24.2°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN3561; ConvF(6.26, 6.26, 6.26); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

Mode: IEEE 802.11b, Body SAR, Ch 06, 1 Mbps, Left Edge

Area Scan (6x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.29 V/m; Power Drift = -0.167 dB
Peak SAR (extrapolated) = 0.057 W/kg
SAR(1 g) = 0.034 mW/g; SAR(10 g) = 0.021 mW/g



0 dB = 0.039mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSHVE160L; Type: Portable Handset; Serial: FI-290-A

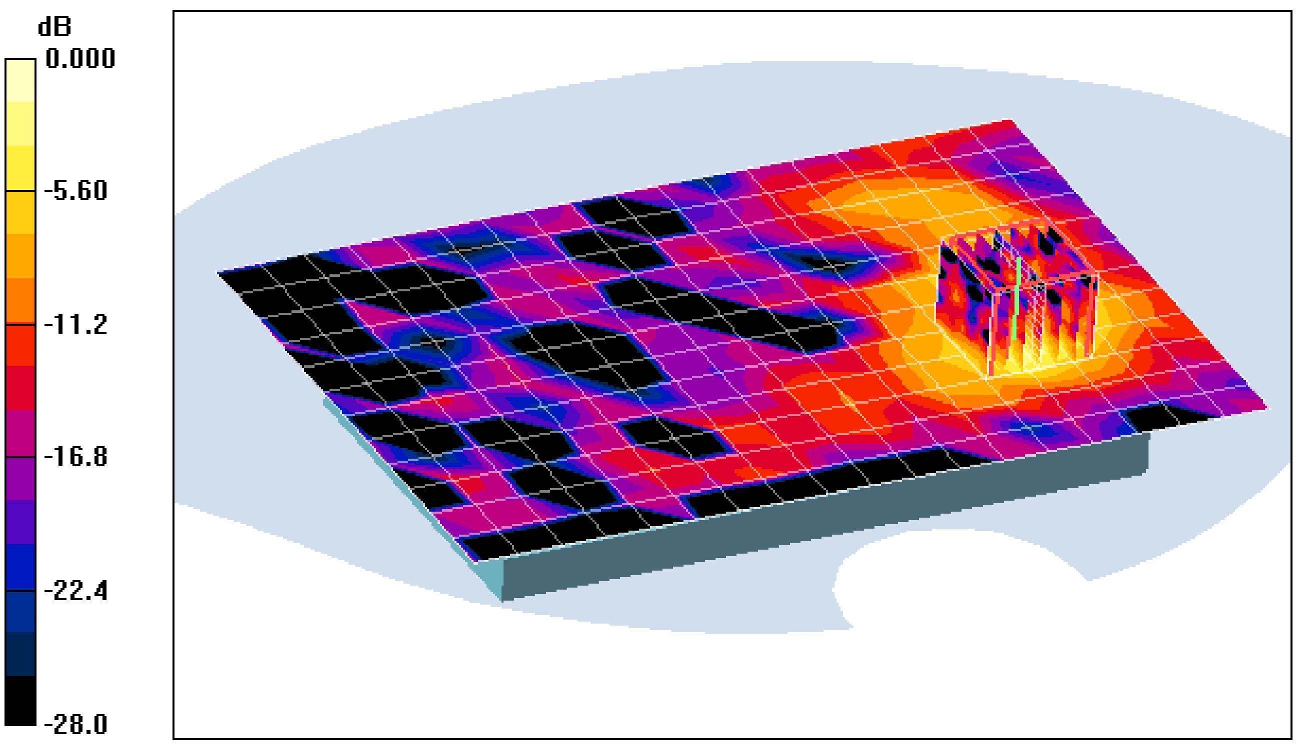
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5240 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5240 MHz; σ = 5.487 mho/m; ε_r = 47.06; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-22-2011; Ambient Temp: 24.8°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3561; ConvF(3.7, 3.7, 3.7); Calibrated: 7/27/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 802.11a, 5.2 GHz, Body SAR, Ch 48, 6 Mbps, Back Side

Area Scan (13x19x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Reference Value = 4.45 V/m; Power Drift = 0.044 dB
Peak SAR (extrapolated) = 0.520 W/kg
SAR(1 g) = 0.096 mW/g; SAR(10 g) = 0.027 mW/g



0 dB = 0.178mW/g

APPENDIX B: DIPOLE VALIDATION

PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 502

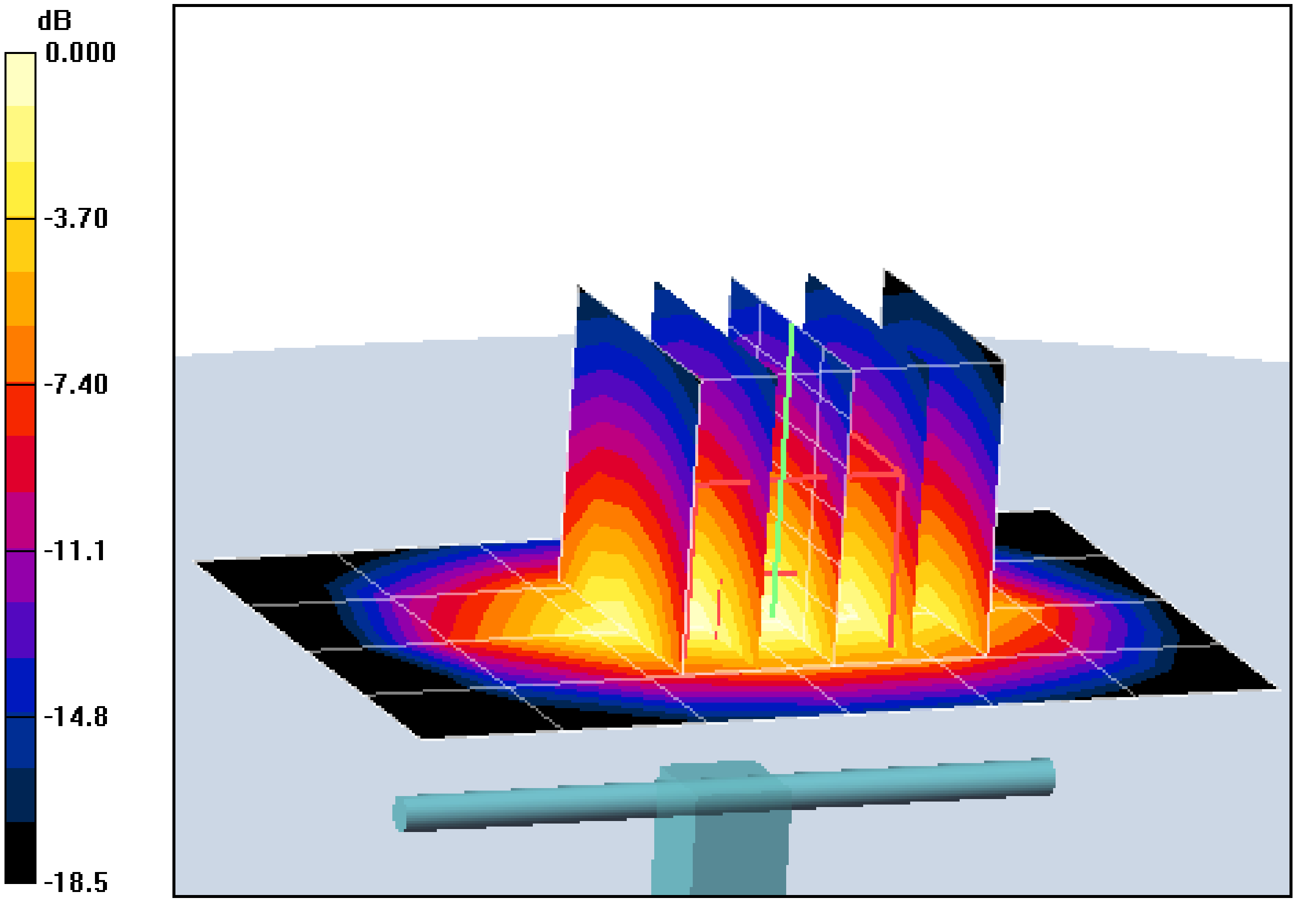
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.41 mho/m; ε_r = 40.47; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-17-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3209; ConvF(5.11, 5.11, 5.11); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

1900MHz 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 = 20.0 dBm (100 mW)
SAR(1 g) = 3.83 mW/g; SAR(10 g) = 1.97 mW/g
Deviation = -4.73 %



0 dB = 4.22mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 502

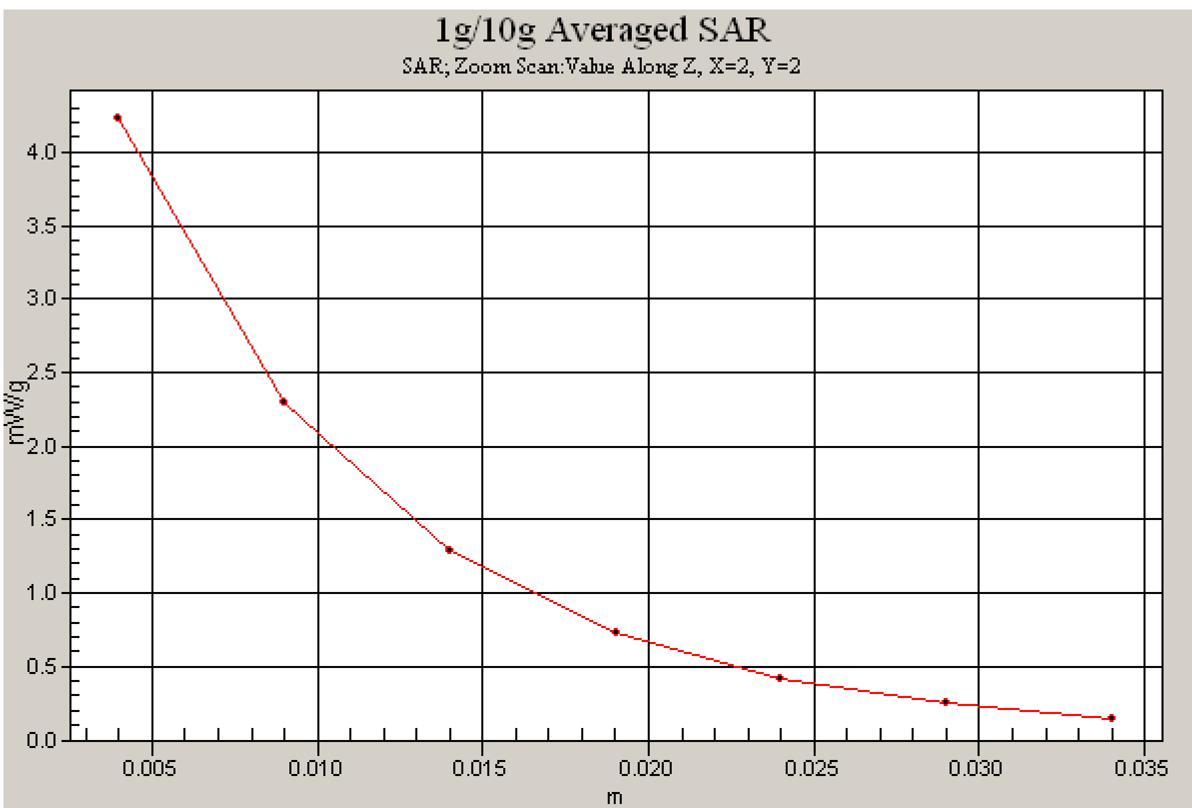
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.41 mho/m; ε_r = 40.47; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-17-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3209; ConvF(5.11, 5.11, 5.11); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM with CRP; Type: SAM; Serial: TP1375
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

1900MHz 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 = 20.0 dBm (100 mW)
SAR(1 g) = 3.83 mW/g; SAR(10 g) = 1.97 mW/g
Deviation = -4.73 %



PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 2450 MHz; Type: D2450V2; Serial: 797

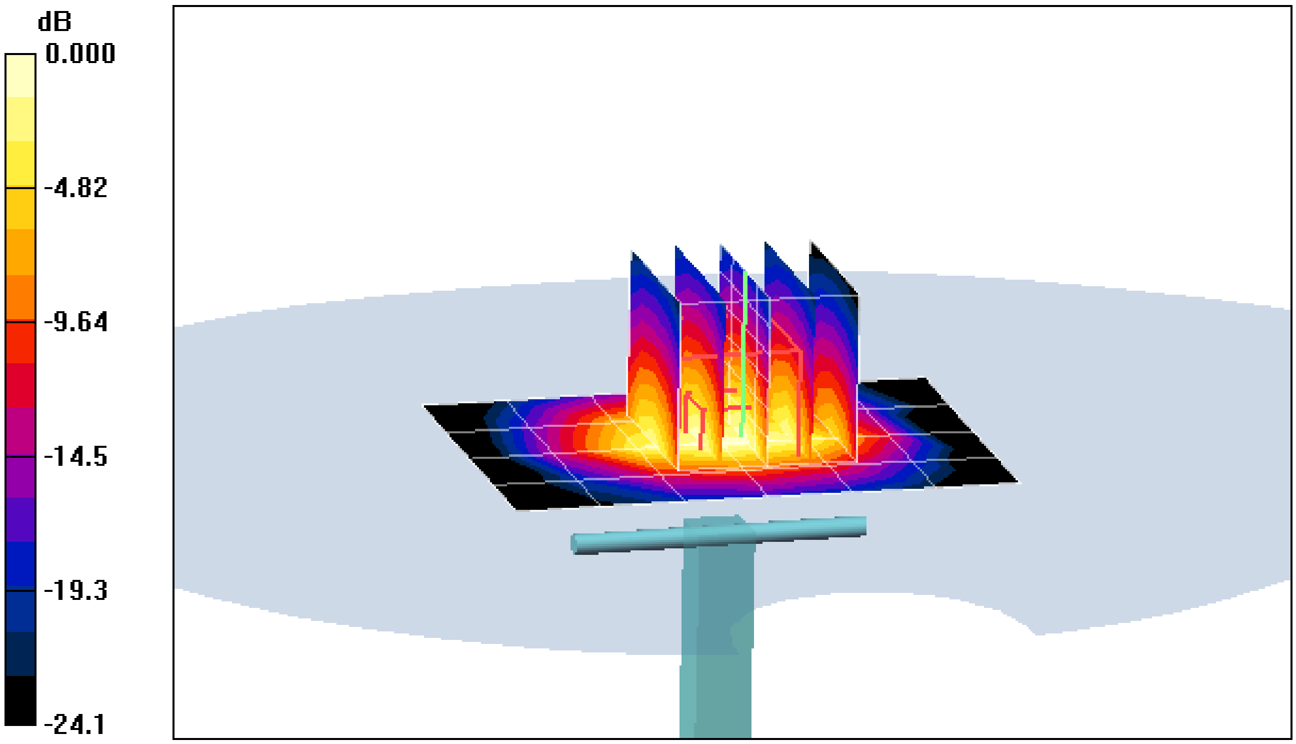
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.87 mho/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-21-2011; Ambient Temp: 24.1°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3561; ConvF(6.42, 6.42, 6.42); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 = 16 dBm (40 mW)
SAR(1 g) = 2.2 mW/g; SAR(10 g) = 0.992 mW/g
Deviation = 3.19%



0 dB = 2.86mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 2450 MHz; Type: D2450V2; Serial: 797

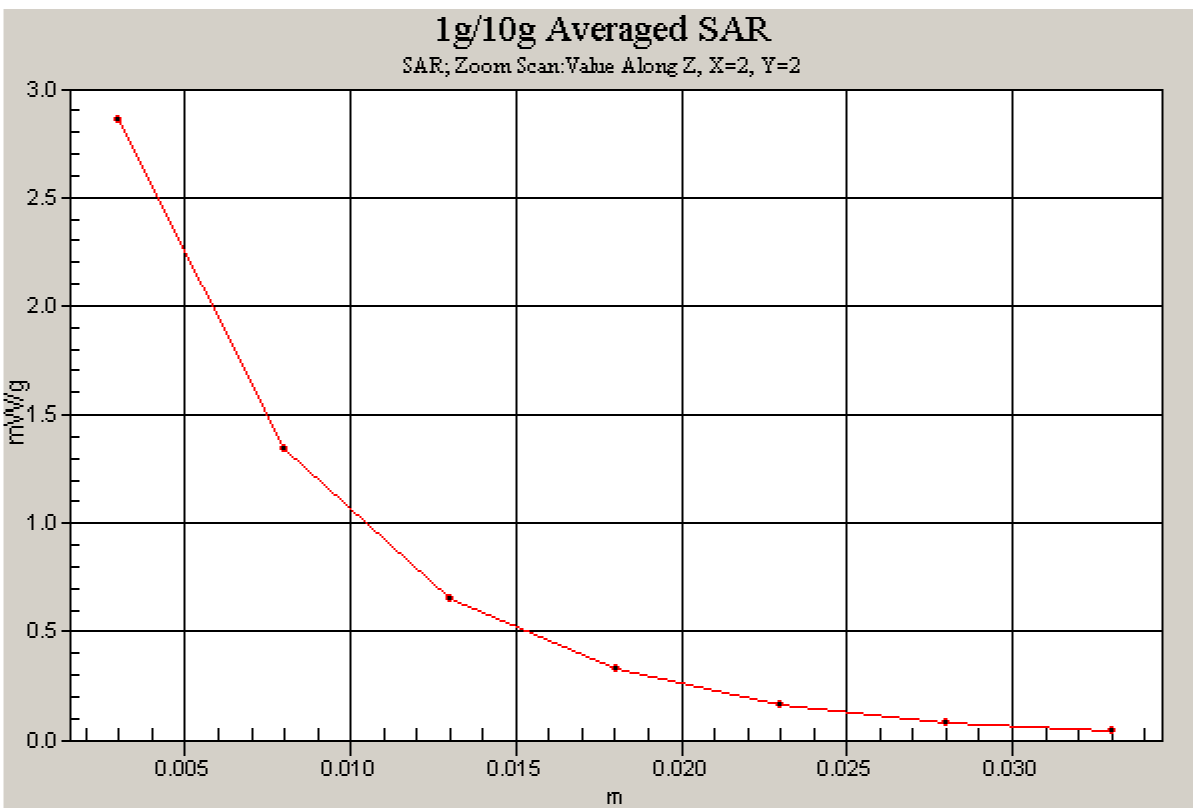
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.87 mho/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-21-2011; Ambient Temp: 24.1°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3561; ConvF(6.42, 6.42, 6.42); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 = 16 dBm (40 mW)
SAR(1 g) = 2.2 mW/g; SAR(10 g) = 0.992 mW/g
Deviation = 3.19%



PCTEST ENGINEERING LABORATORY, INC.

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

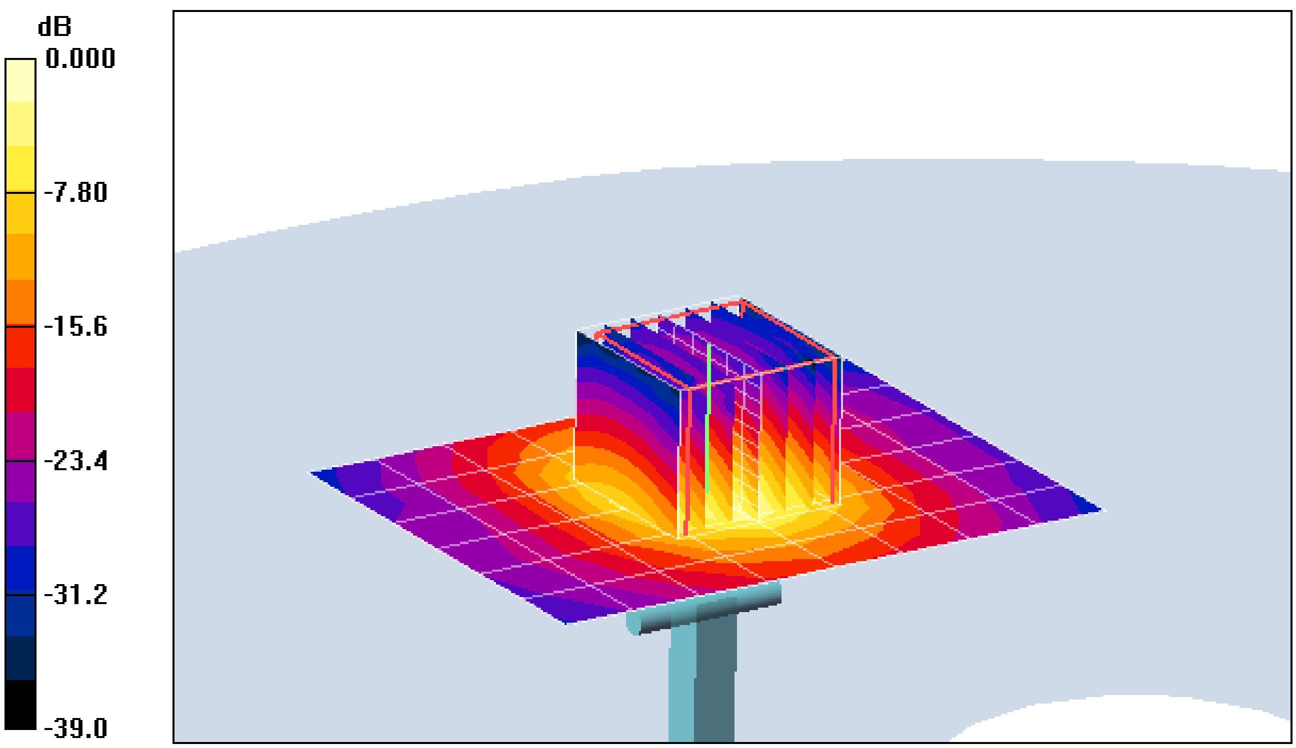
Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5200 MHz; σ = 4.702 mho/m; ε_r = 36.15; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2011; Ambient Temp: 24.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3550; ConvF(4.06, 4.06, 4.06); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
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 = 20 dBm (100 mW)
SAR(1 g) = 8.09 mW/g; SAR(10 g) = 2.3 mW/g
Deviation = -2.65%



0 dB = 16.7mW/g

PCTEST ENGINEERING LABORATORY, INC.

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

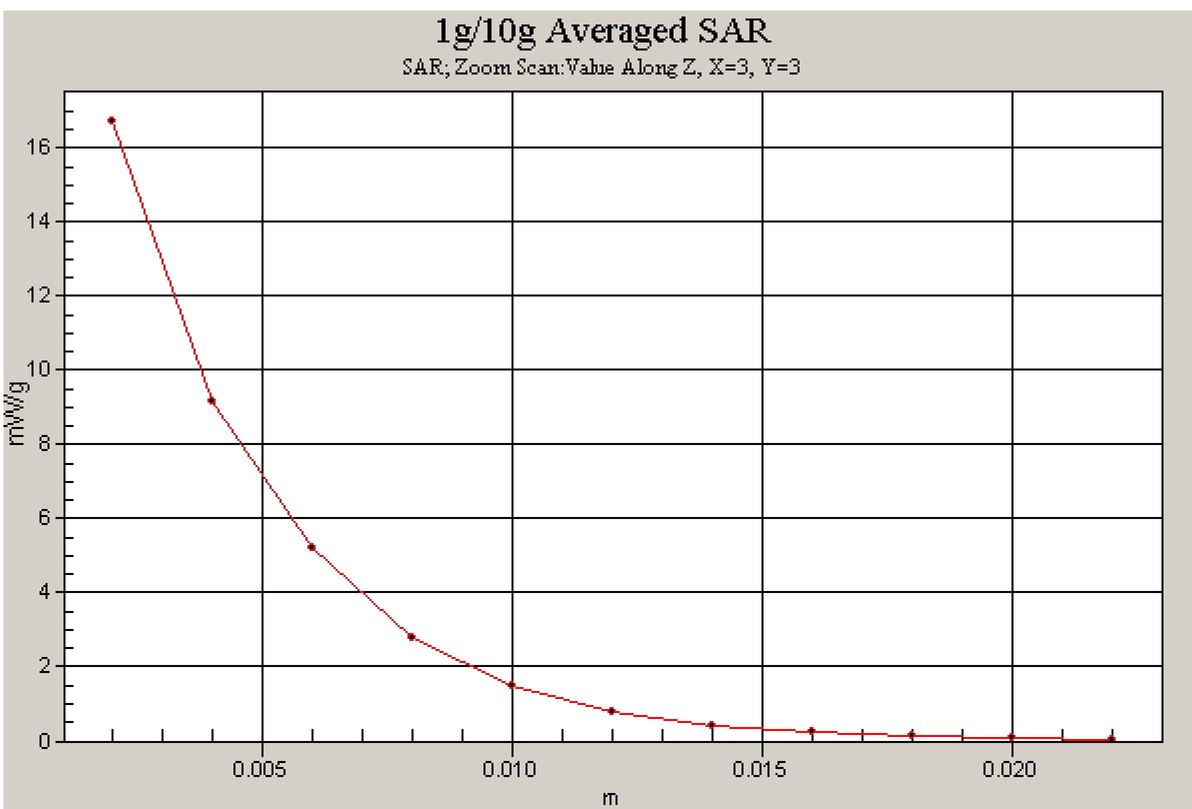
Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5200 MHz; σ = 4.702 mho/m; ε_r = 36.15; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2011; Ambient Temp: 24.2°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3550; ConvF(4.06, 4.06, 4.06); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
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 = 20 dBm (100 mW)
SAR(1 g) = 8.09 mW/g; SAR(10 g) = 2.3 mW/g
Deviation = -2.65%



PCTEST ENGINEERING LABORATORY, INC.

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

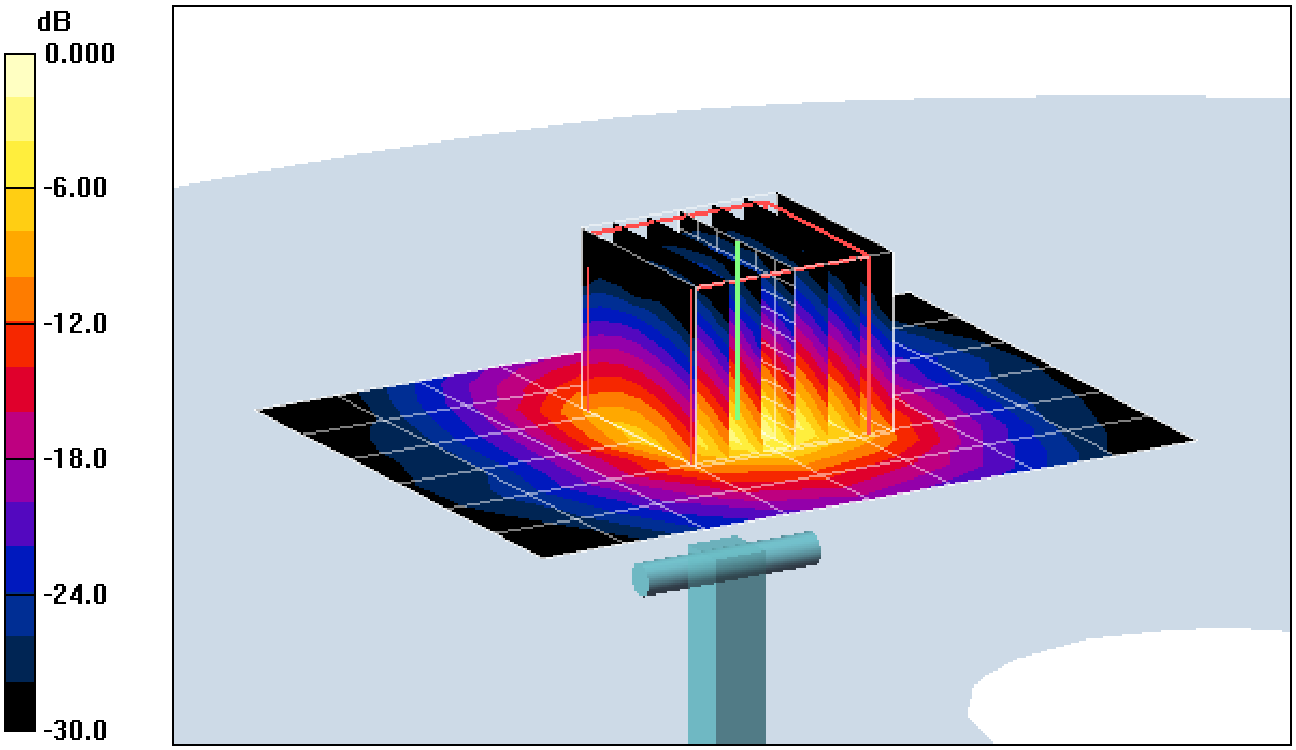
Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5500 MHz; σ = 5.004 mho/m; ε_r = 35.56; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2011; Ambient Temp: 24.6°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3550; ConvF(3.77, 3.77, 3.77); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
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 (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 20 dBm (100 mW)
SAR(1 g) = 9.36 mW/g; SAR(10 g) = 2.63 mW/g
Deviation = 3.88%



0 dB = 19.3mW/g

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

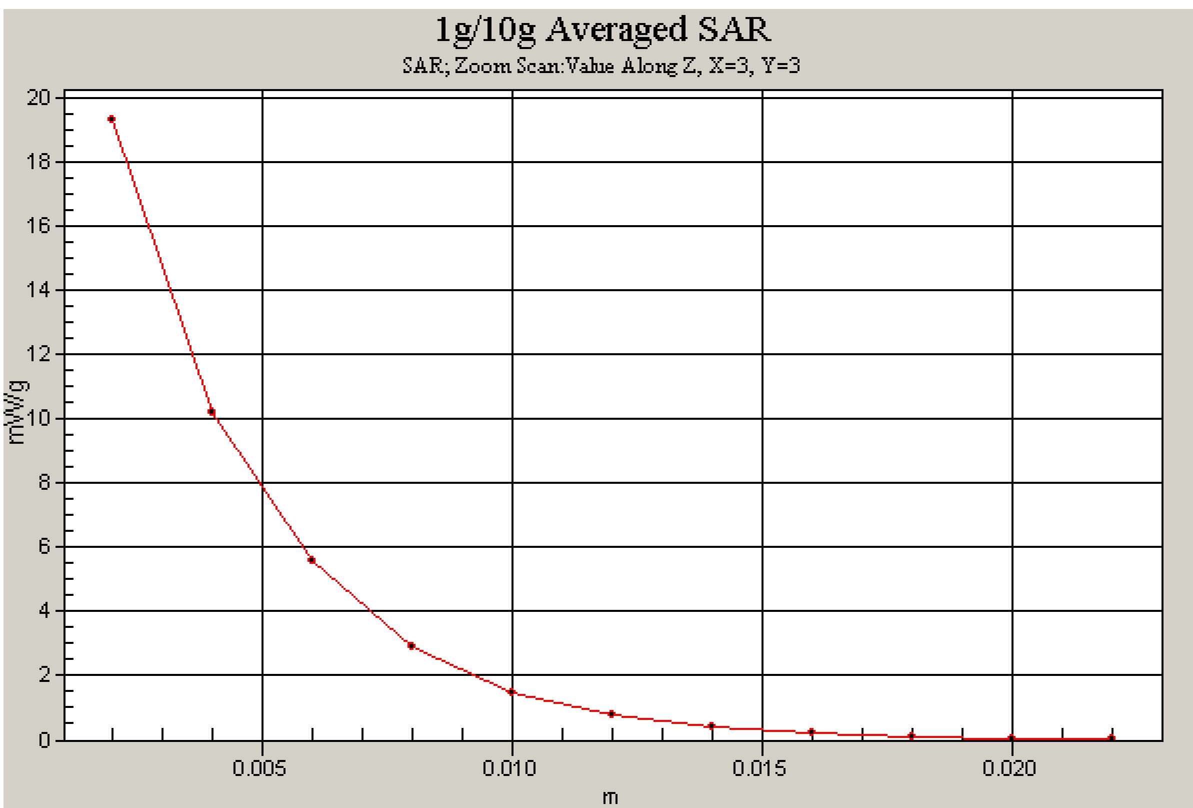
Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5500 MHz; σ = 5.004 mho/m; ε_r = 35.56; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2011; Ambient Temp: 24.6°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3550; ConvF(3.77, 3.77, 3.77); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
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 (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 20 dBm (100 mW)
SAR(1 g) = 9.36 mW/g; SAR(10 g) = 2.63 mW/g
Deviation = 3.88%



PCTEST ENGINEERING LABORATORY, INC.

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

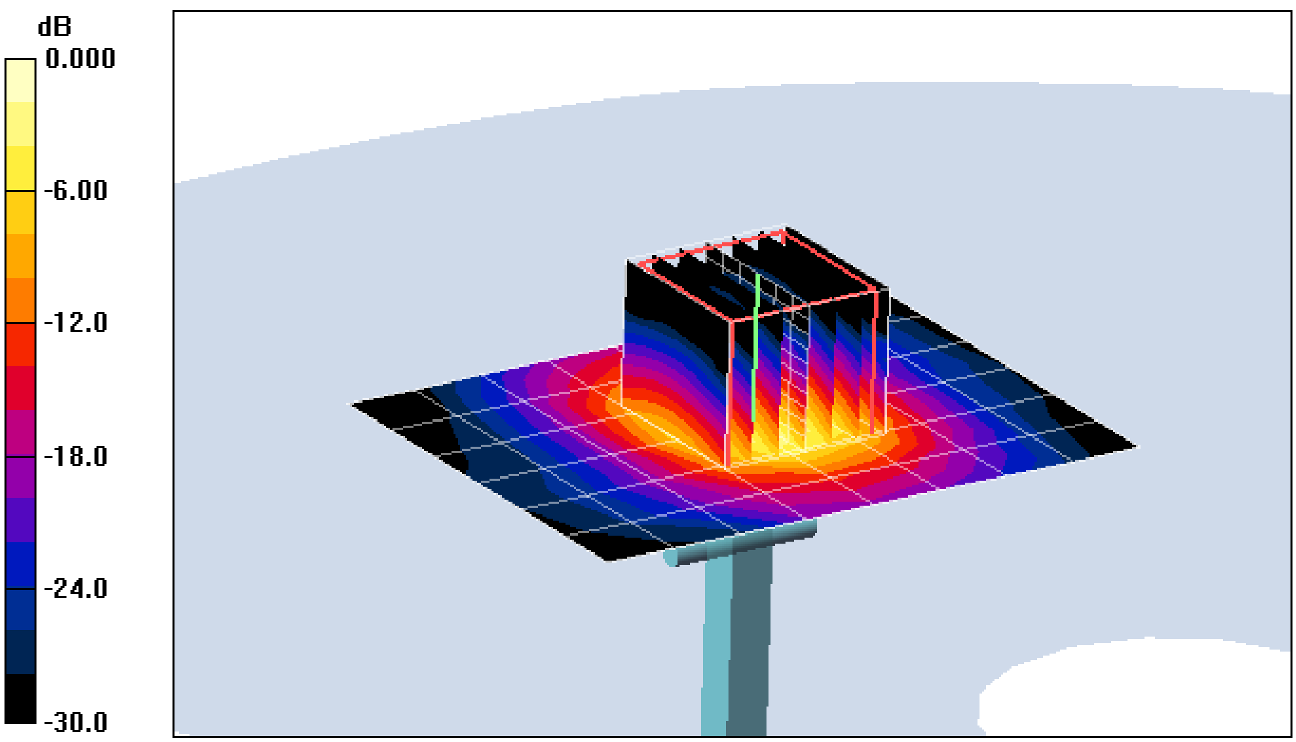
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5800 MHz; σ = 5.354 mho/m; ε_r = 35.2; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2011; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3550; ConvF(3.64, 3.64, 3.64); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
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 = 20 dBm (100 mW)
SAR(1 g) = 8.52 mW/g; SAR(10 g) = 2.41 mW/g
Deviation = 2.77%



0 dB = 18.1mW/g

PCTEST ENGINEERING LABORATORY, INC.

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

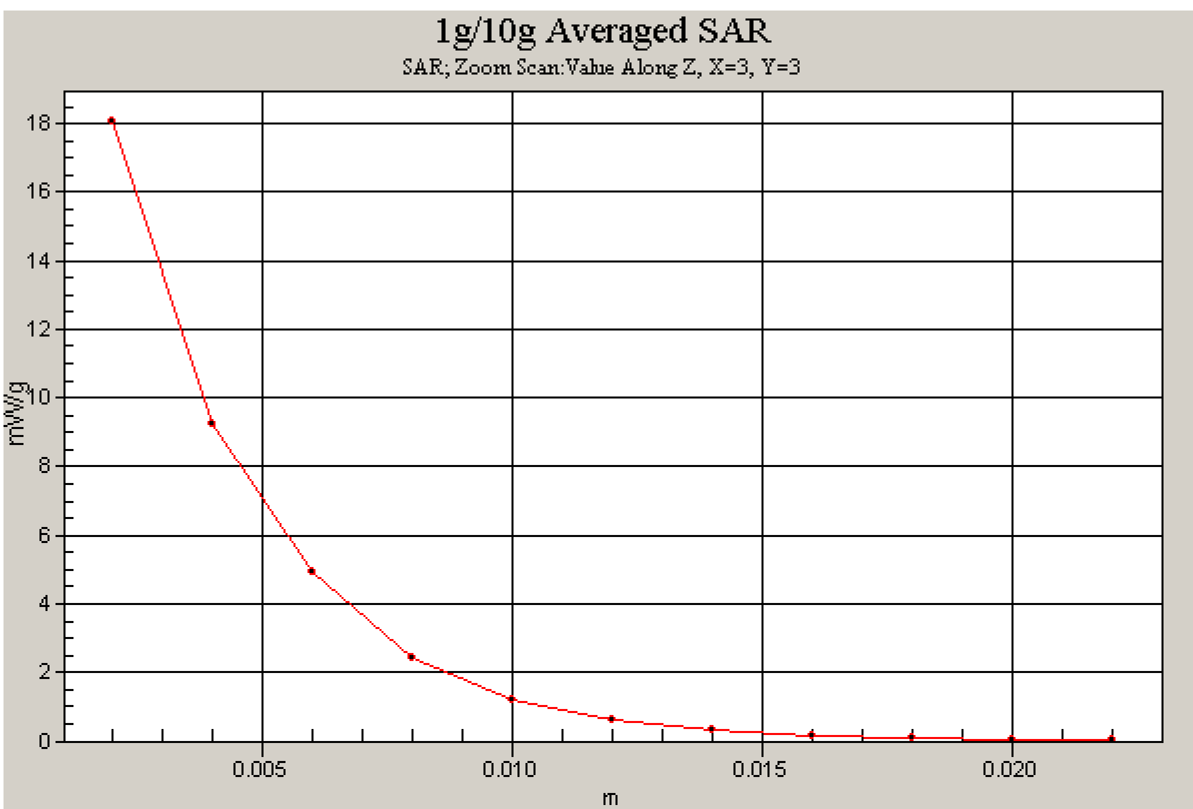
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5800 MHz; σ = 5.354 mho/m; ε_r = 35.2; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2011; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3550; ConvF(3.64, 3.64, 3.64); Calibrated: 2/14/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/21/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
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 = 20 dBm (100 mW)
SAR(1 g) = 8.52 mW/g; SAR(10 g) = 2.41 mW/g
Deviation = 2.77%



PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 502

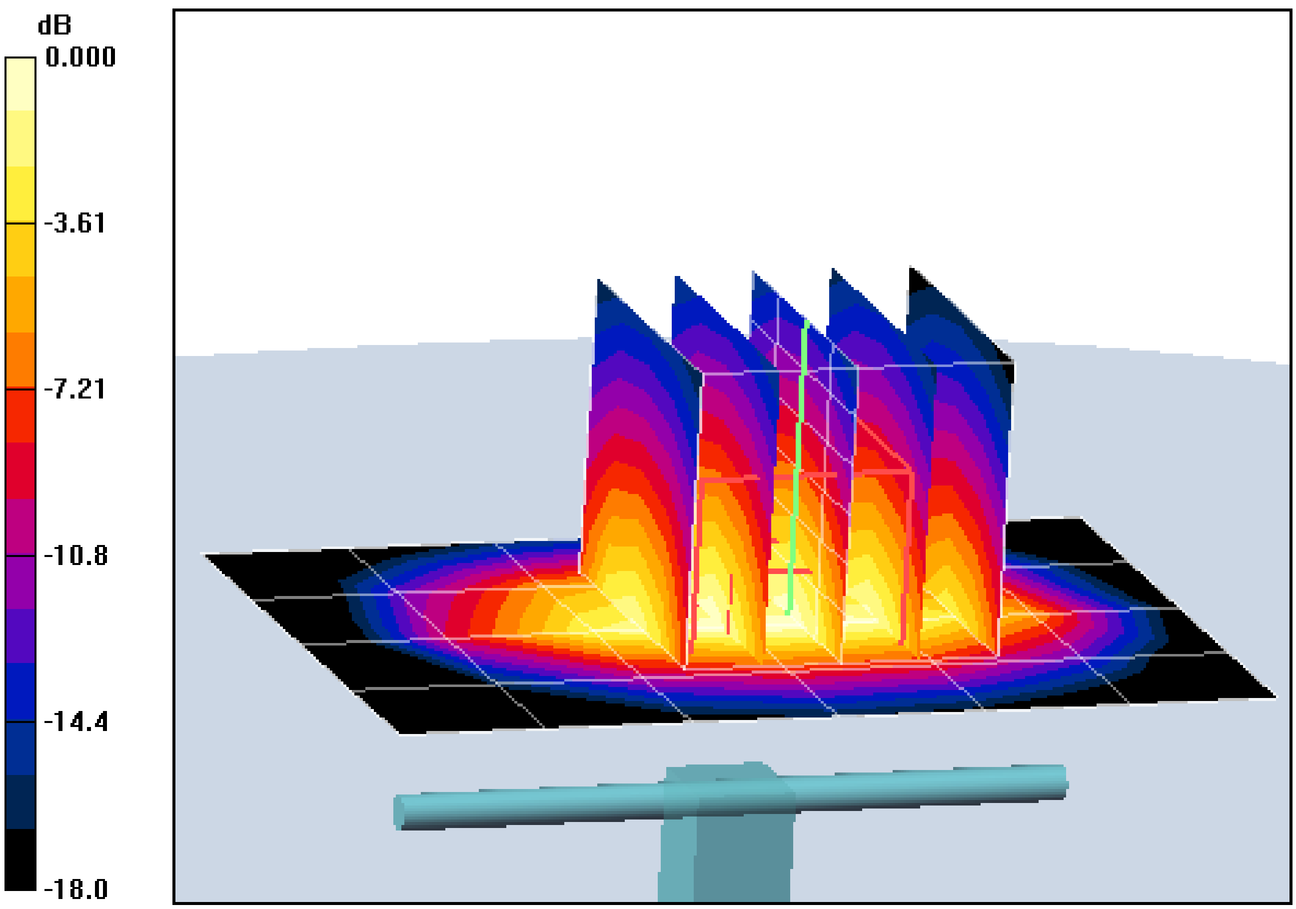
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; $\sigma = 1.5$ mho/m; $\varepsilon_r = 51.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-15-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3209; ConvF(4.48, 4.48, 4.48); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM Sub Dasy B; Type: SAM 4.0; Serial: TP-1626
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

1900MHz 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 = 20.0 dBm (100 mW)
SAR(1 g) = 4.04 mW/g; SAR(10 g) = 2.09 mW/g
Deviation = -1.70 %



0 dB = 4.50mW/g

DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 502

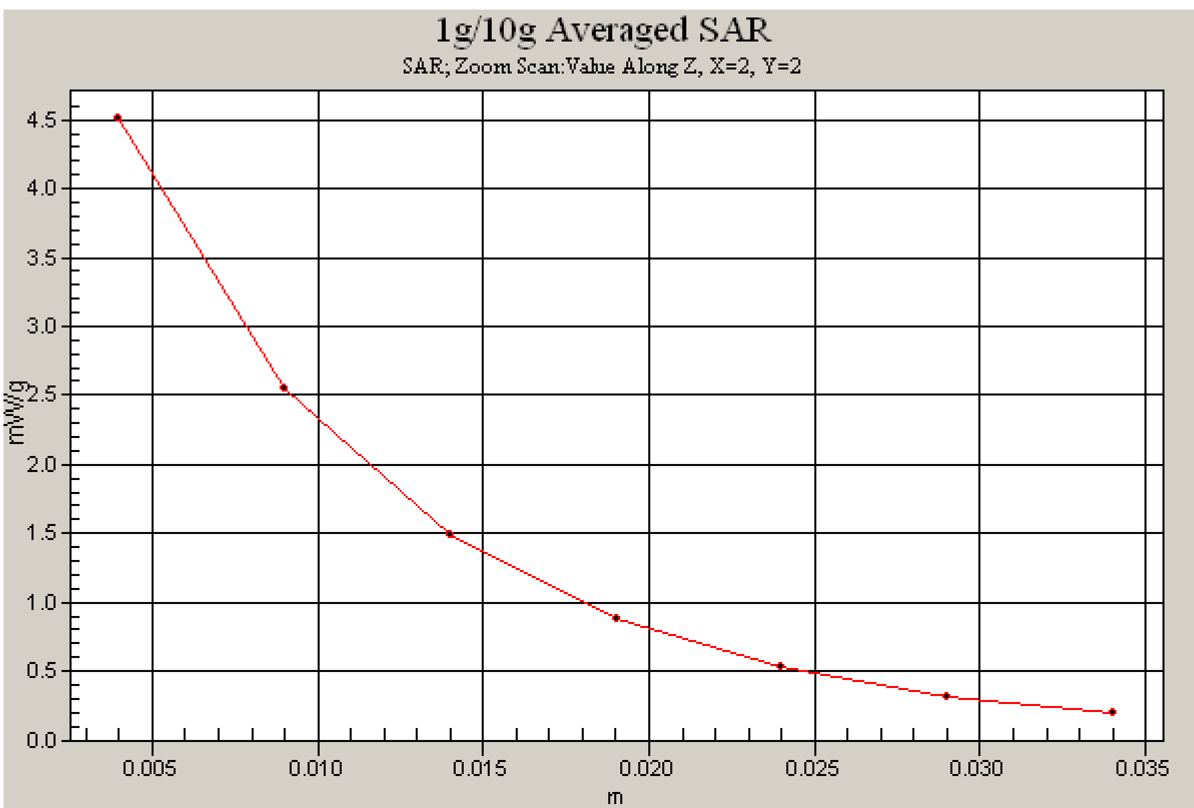
Communication System: CW; Frequency: 1900 MHz;Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.5 mho/m; ε_r = 51.1; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-15-2011; Ambient Temp: 23.4°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3209; ConvF(4.48, 4.48, 4.48); Calibrated: 4/18/2011
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/19/2011
Phantom: SAM Sub Dasy B; Type: SAM 4.0; Serial: TP-1626
Measurement SW: DASY4, V4.7 Build 80; Postprocessing SW: SEMCAD, V1.8 Build 186

1900MHz 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 = 20.0 dBm (100 mW)
SAR(1 g) = 4.04 mW/g; SAR(10 g) = 2.09 mW/g
Deviation = -1.70 %



PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 2450 MHz; Type: D2450V2; Serial: 797

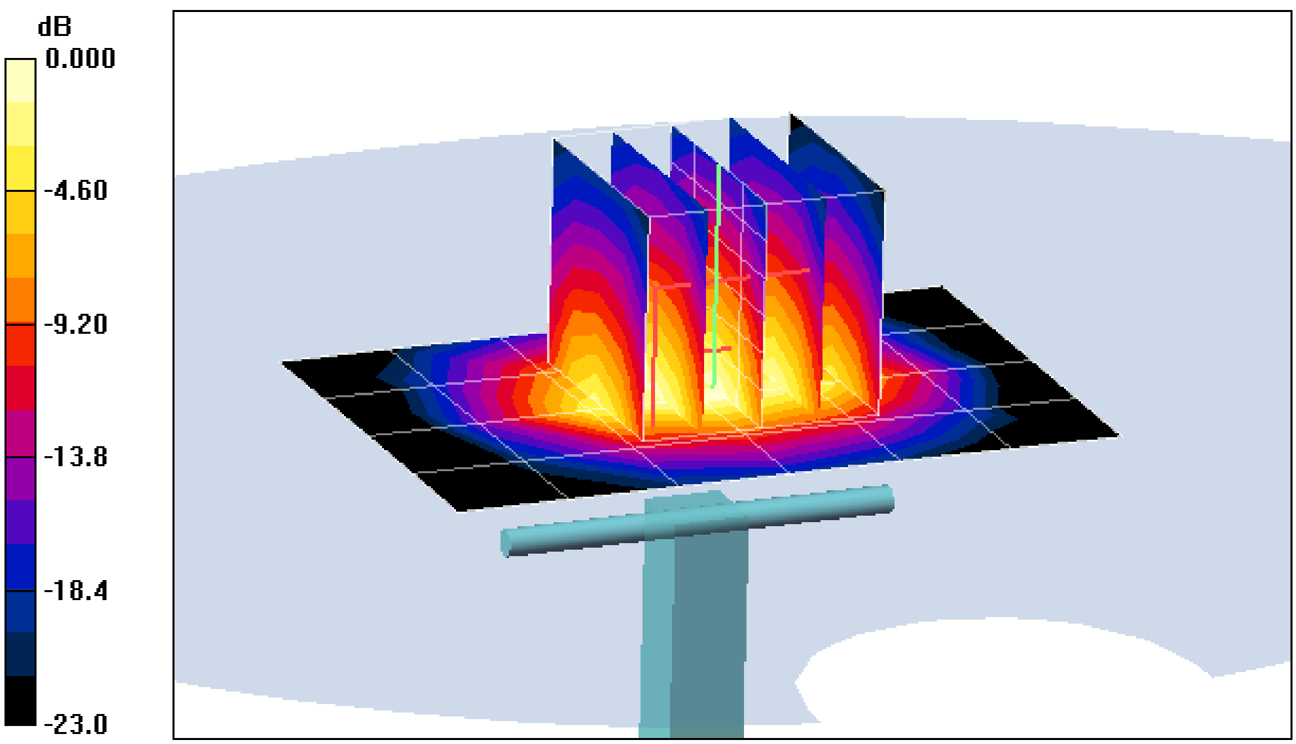
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 1.95 mho/m; ε_r = 50.5; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-21-2011; Ambient Temp: 24.2°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN3561; ConvF(6.26, 6.26, 6.26); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
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 dBm (25 mW)
SAR(1 g) = 1.35 mW/g; SAR(10 g) = 0.616 mW/g
Deviation = 3.25%



0 dB = 1.78mW/g

DUT: SAR Dipole 2450 MHz; Type: D2450V2; Serial: 797

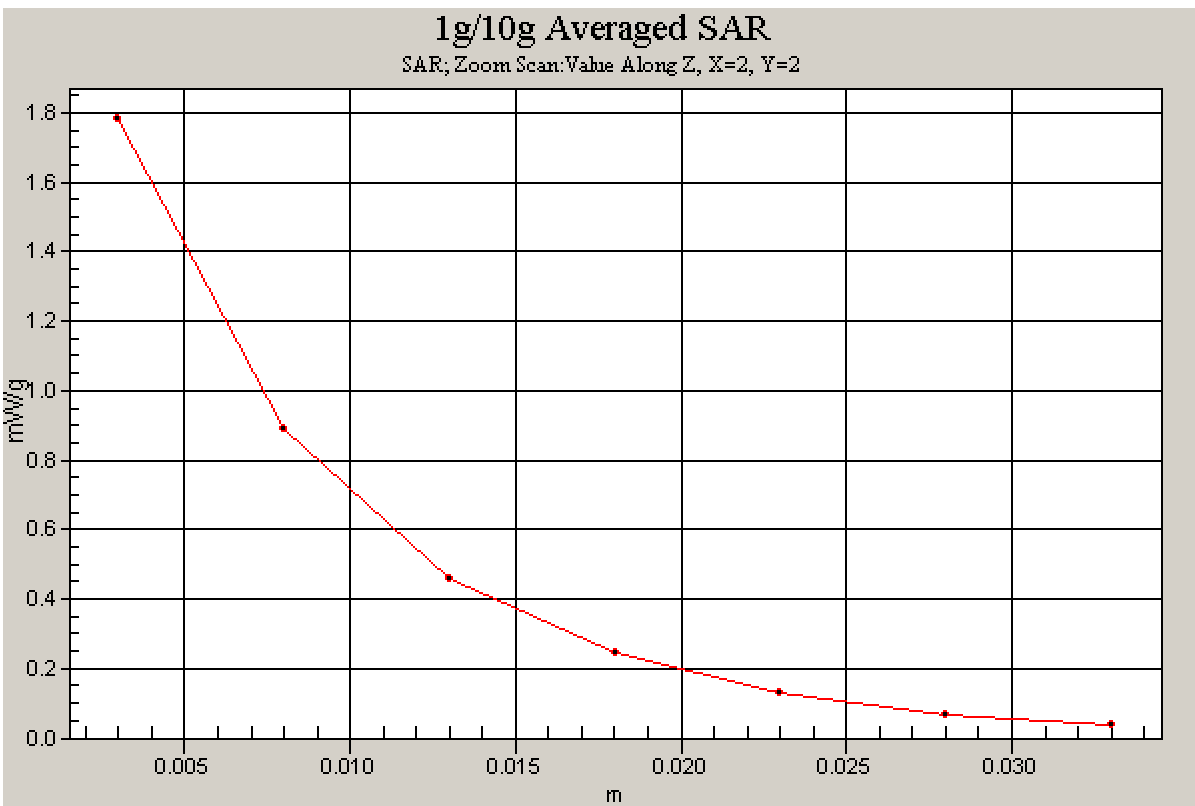
Communication System: CW; Frequency: 2450 MHz;Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 1.95 mho/m; ε_r = 50.5; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-21-2011; Ambient Temp: 24.2°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN3561; ConvF(6.26, 6.26, 6.26); Calibrated: 7/27/2011
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
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 dBm (25 mW)
SAR(1 g) = 1.35 mW/g; SAR(10 g) = 0.616 mW/g
Deviation = 3.25%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1007

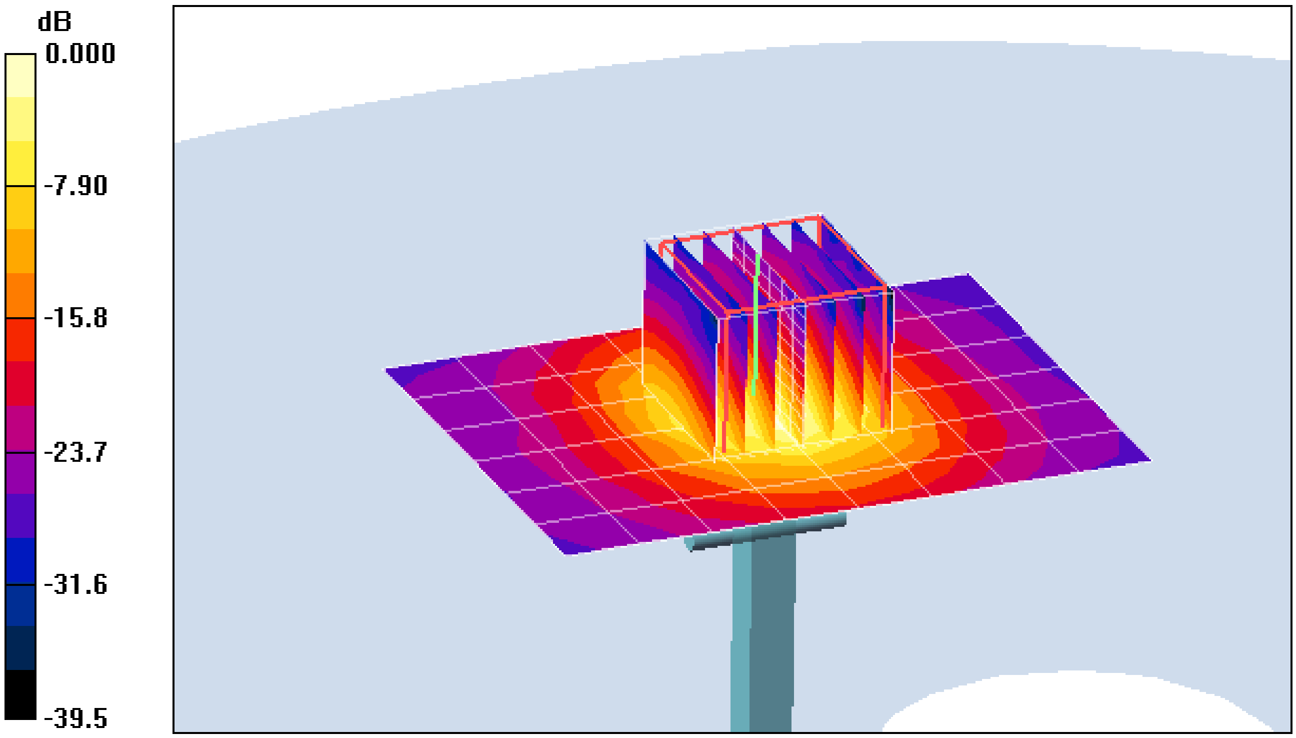
Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5200 MHz; σ = 5.386 mho/m; ε_r = 47.06; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-22-2011; Ambient Temp: 24.8°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3561; ConvF(3.7, 3.7, 3.7); Calibrated: 7/27/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 = 20 dBm (100 mW)
SAR(1 g) = 7.79 mW/g; SAR(10 g) = 2.16 mW/g
Deviation = 3.18%



0 dB = 16.0mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1007

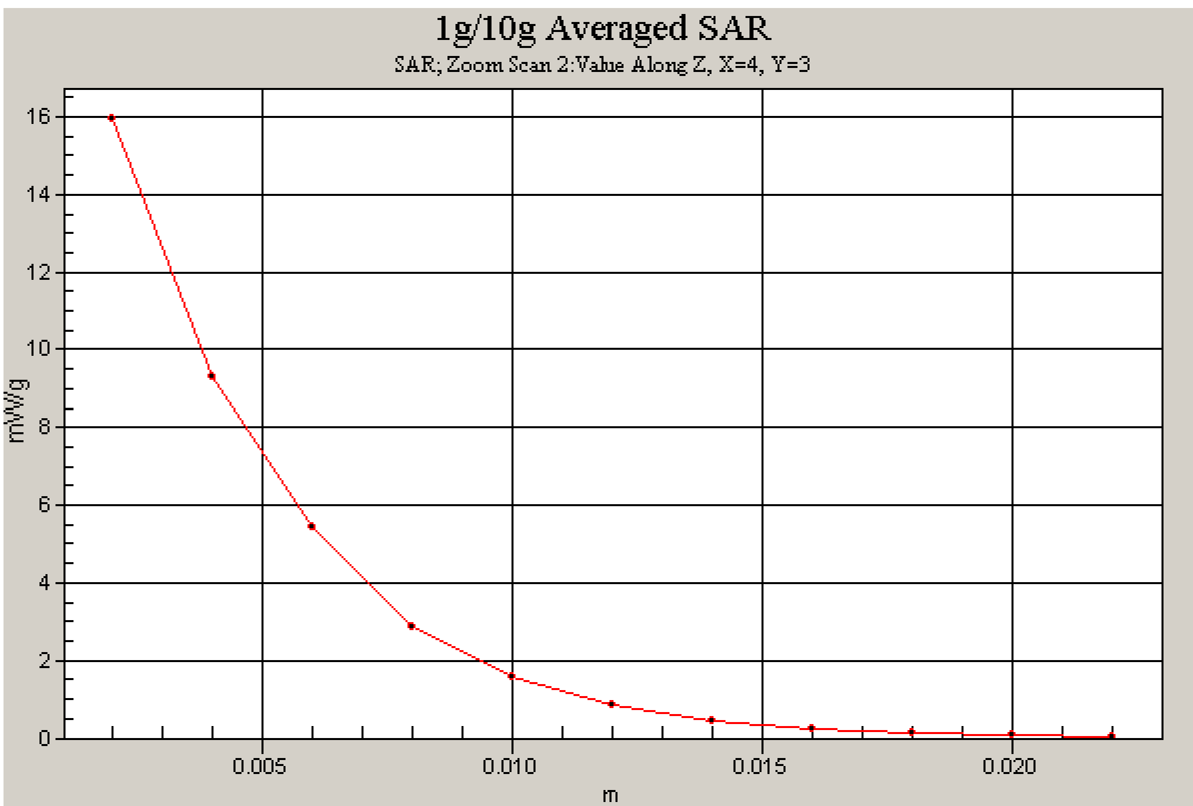
Communication System: CW; Frequency: 5200 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5200 MHz; σ = 5.386 mho/m; ε_r = 47.06; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-22-2011; Ambient Temp: 24.8°C; Tissue Temp: 23.3°C

Probe: EX3DV4 - SN3561; ConvF(3.7, 3.7, 3.7); Calibrated: 7/27/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 = 20 dBm (100 mW)
SAR(1 g) = 7.79 mW/g; SAR(10 g) = 2.16 mW/g
Deviation = 3.18%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1007

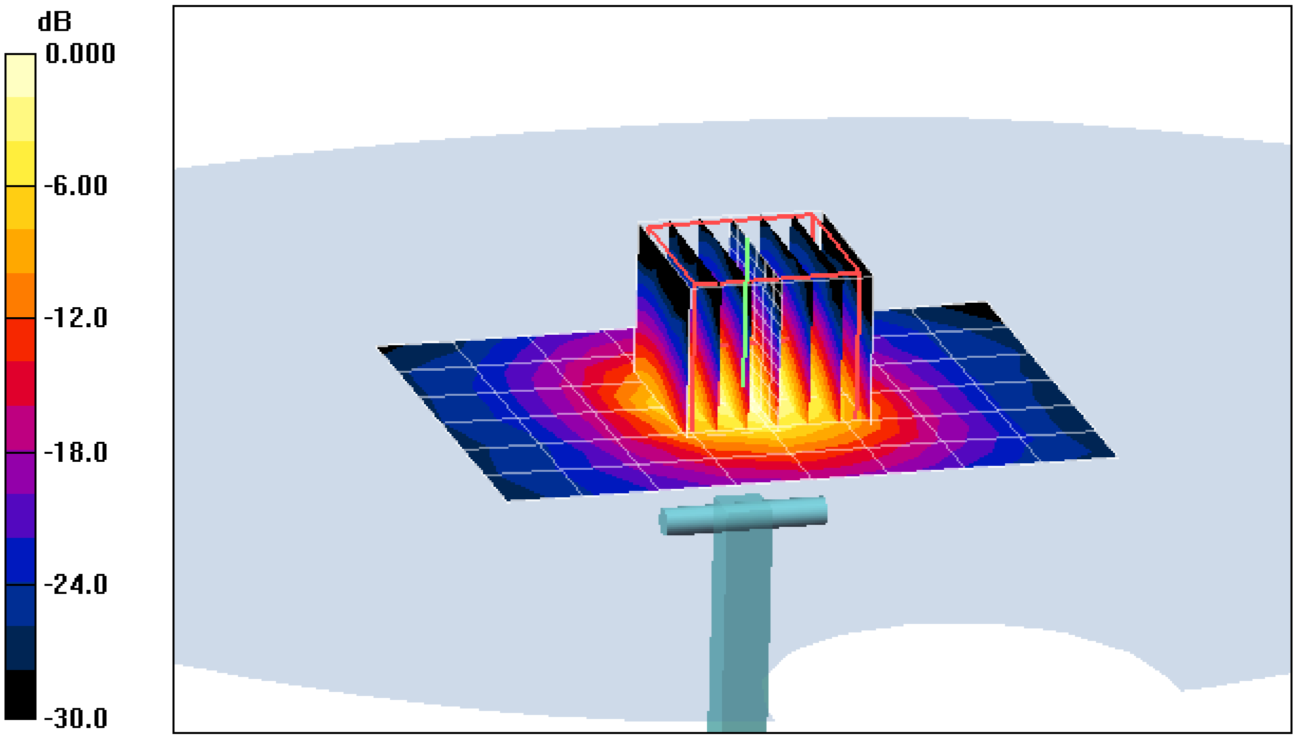
Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5500 MHz; σ = 5.815 mho/m; ε_r = 46.47; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-22-2011; Ambient Temp: 24.6°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3561; ConvF(3.28, 3.28, 3.28); Calibrated: 7/27/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 20 dBm (100 mW)
SAR(1 g) = 8.56 mW/g; SAR(10 g) = 2.33 mW/g
Deviation = 5.29%



0 dB = 18.4mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1007

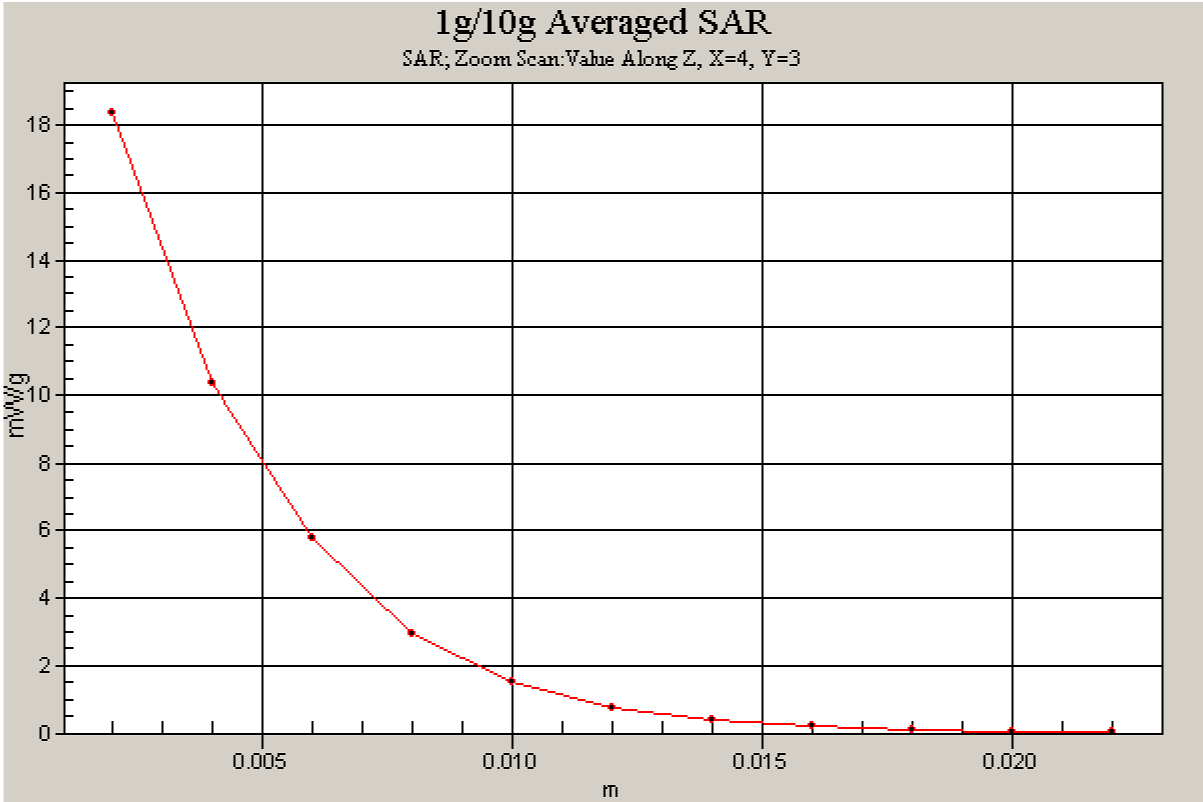
Communication System: CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5500 MHz; σ = 5.815 mho/m; ε_r = 46.47; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-22-2011; Ambient Temp: 24.6°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3561; ConvF(3.28, 3.28, 3.28); Calibrated: 7/27/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 (7x7x11)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=2mm
Input Power = 20 dBm (100 mW)
SAR(1 g) = 8.56 mW/g; SAR(10 g) = 2.33 mW/g
Deviation = 5.29%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1007

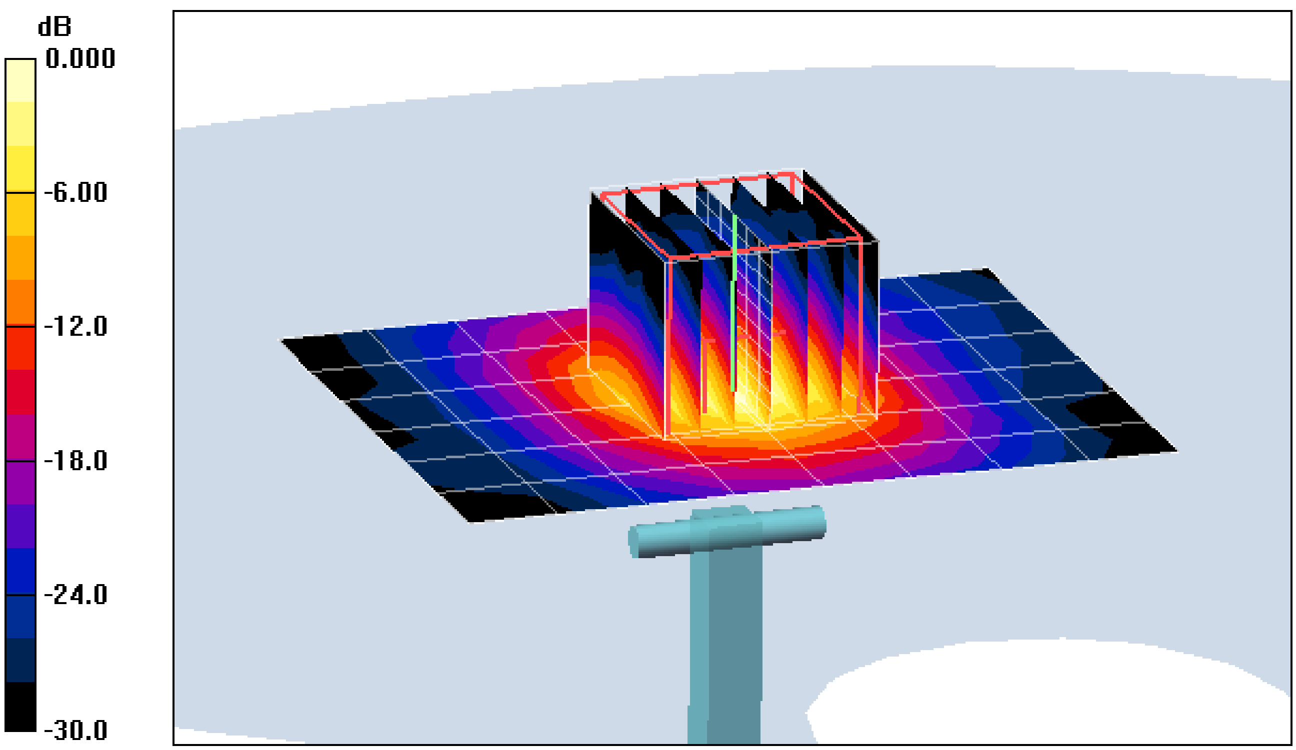
Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5800 MHz; σ = 6.199 mho/m; ε_r = 45.93; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-22-2011; Ambient Temp: 24.7°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3561; ConvF(3.34, 3.34, 3.34); Calibrated: 7/27/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 = 20 dBm (100 mW)
SAR(1 g) = 7.68 mW/g; SAR(10 g) = 2.13 mW/g
Deviation = 1.99%



0 dB = 16.5mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1007

Communication System: CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5800 MHz; σ = 6.199 mho/m; ε_r = 45.93; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-22-2011; Ambient Temp: 24.7°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3561; ConvF(3.34, 3.34, 3.34); Calibrated: 7/27/2011
Sensor-Surface: 2mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 4/20/2011
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 = 20 dBm (100 mW)
SAR(1 g) = 7.68 mW/g; SAR(10 g) = 2.13 mW/g
Deviation = 1.99%