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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:
09/21/11 - 09/25/11
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Test Report Serial No.:
0Y1109191667.A3L

FCC ID: A3LGTS8600

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): GT-S8600
Test Device Serial No.: Pre-Production [S/N: R24B853847N]

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 and EDGE Rx 850	824.20 - 848.80 MHz	32.39	0.13	0.14	0.27
GSM/GPRS and EDGE RX 1900	1850.20 - 1909.80 MHz	29.95	0.53	0.44	0.82
2.4 GHz WLAN	2412 - 2462 MHz	15.34	0.15	0.03	0.03
Bluetooth	2402 - 2480 MHz	10.76	N/A		
Simultaneous SAR per draft KDB publication 690783 DR01			0.85 W/kg		

Note: Powers in the above table represent output powers for the SAR test configurations applicable 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



FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 1 of 38	

T A B L E O F C O N T E N T S

1	INTRODUCTION	3
2	TEST SITE LOCATION	4
3	SAR MEASUREMENT SETUP	5
4	DASY E-FIELD PROBE SYSTEM	7
5	PROBE CALIBRATION PROCESS	8
6	PHANTOM AND EQUIVALENT TISSUES.....	9
7	DOSIMETRIC ASSESSMENT & PHANTOM SPECS.....	10
8	DEFINITION OF REFERENCE POINTS	11
9	TEST CONFIGURATION POSITIONS	12
10	FCC RF EXPOSURE LIMITS.....	15
11	FCC 3G MEASUREMENT PROCEDURES.....	16
12	SAR TESTING WITH IEEE 802.11 TRANSMITTERS.....	18
13	FCC PERSONAL WIRELESS ROUTER CONFIGURATIONS.....	21
14	SYSTEM VERIFICATION.....	23
15	SAR DATA SUMMARY	25
16	FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS.....	32
17	EQUIPMENT LIST.....	34
18	MEASUREMENT UNCERTAINTIES	35
19	CONCLUSION.....	36
20	REFERENCES	37

FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 2 of 38

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]

FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 3 of 38

2 TEST SITE LOCATION

2.1 INTRODUCTION

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.

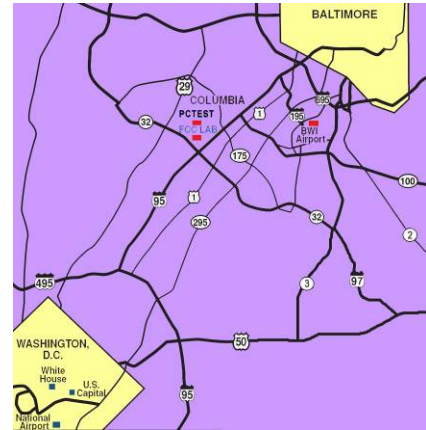




Figure 2-1
Map of the Greater Baltimore and Metropolitan Washington, D.C. area

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

FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 4 of 38	

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

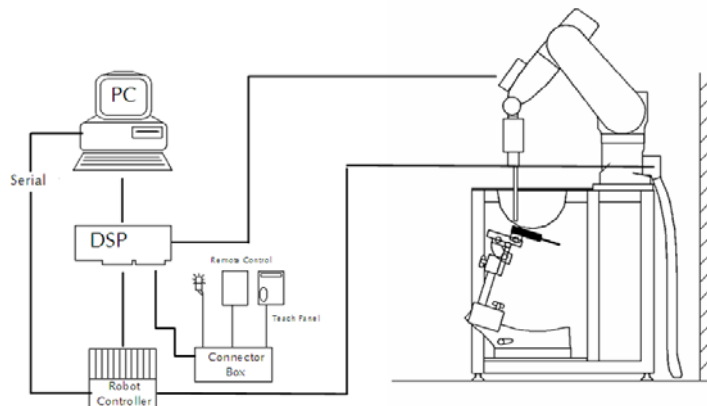




Figure 3-1
SAR Measurement System Setup

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.

FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 5 of 38	

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

FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 6 of 38

4 DASY E-FIELD PROBE SYSTEM

4.1 Probe Measurement System



**Figure 4-1
SAR System**

The SAR measurements were conducted with the dosimetric probe designed in the classical triangular configuration (see Figure 4-3) and optimized for dosimetric evaluation [9]. The probe is constructed using the thick film technique; with printed resistive lines on ceramic substrates. The probe is equipped with an optical multi-fiber line ending at the front of the probe tip. It is connected to the EOC box on the robot arm and provides an automatic detection of the phantom surface. Half of the fibers are connected to a pulsed infrared transmitter, the other half to a synchronized receiver. As the probe approaches the surface, the reflection from the surface produces a coupling from the transmitting to the receiving fibers. This reflection increases first during the approach, reaches maximum and then decreases. If the probe is flatly touching the surface, the coupling is zero. The distance of the coupling maximum to the surface is independent of the surface reflectivity and largely independent of the surface to probe angle. The DASY4 software reads the reflection during a software approach and looks for the

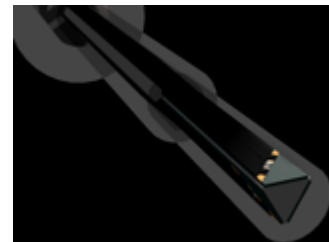
maximum using a 2nd order curve fitting (see Figure 5-1). The approach is stopped at reaching the maximum.

4.2 Probe Specifications



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



**Figure 4-2
Near-Field Probe**



**Figure 4-3
Triangular Probe
Configuration**

FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 7 of 38

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/cm²) 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/cm².

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/cm³ 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.

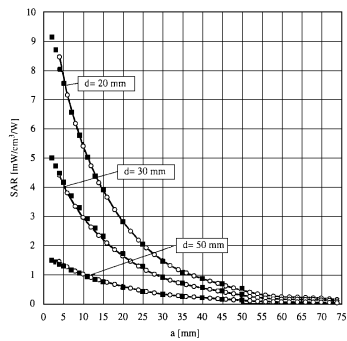


Figure 5-1 E-Field and Temperature measurements at 900MHz [9]



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

FCC ID: A3LGT8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 8 of 38

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)	835	835	1900	1900	2450	2450
Tissue	Head	Body	Head	Body	Head	Body
Ingredients (% by weight)						
Bactericide	0.1	0.1				
DGBE			44.92	29.44	7.99	26.7
HEC	1	1				
NaCl	1.45	0.94	0.18	0.39	0.16	0.1
Sucrose	57	44.9				
Triton X-100					19.97	
Water	40.45	53.06	54.9	70.17	71.88	73.2

FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 9 of 38

7 DOSIMETRIC ASSESSMENT & PHANTOM SPECS

7.1 Measurement Procedure

The evaluation was performed using the following procedure:

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

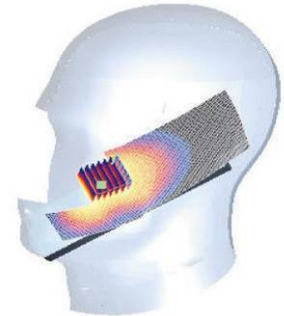




Figure 7-1
Sample SAR Area Scan

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

FCC ID: A3LGT8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 10 of 38

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].

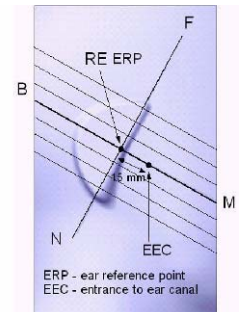


Figure 8-1
Close-Up Side view of ERP

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 then 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 its 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

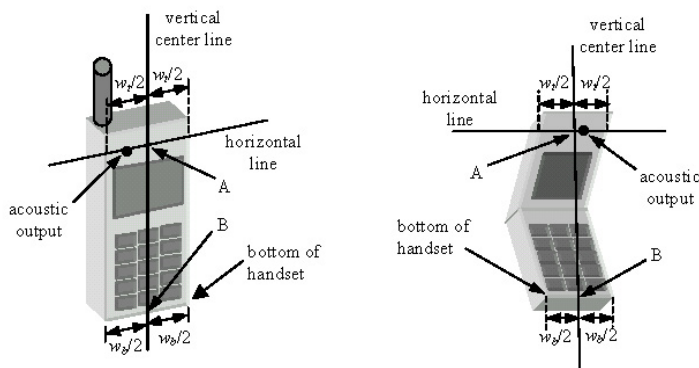




Figure 8-3
Handset Vertical Center & Horizontal Line Reference Points

FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 11 of 38

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 $\epsilon = 3$ and loss tangent $\delta = 0.02$.

9.2 Positioning for Cheek/Touch

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.

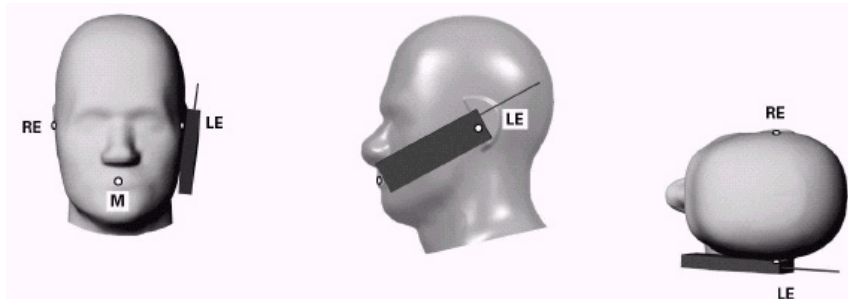


Figure 9-1 Front, Side and Top View of Cheek/Touch Position

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

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).

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

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 / 15° Tilt

With the test device aligned in the “Cheek/Touch Position”:

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

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

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).



FCC ID: A3LGT8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 12 of 38



Figure 9-2 Front, Side and Top View of Ear/15° 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.

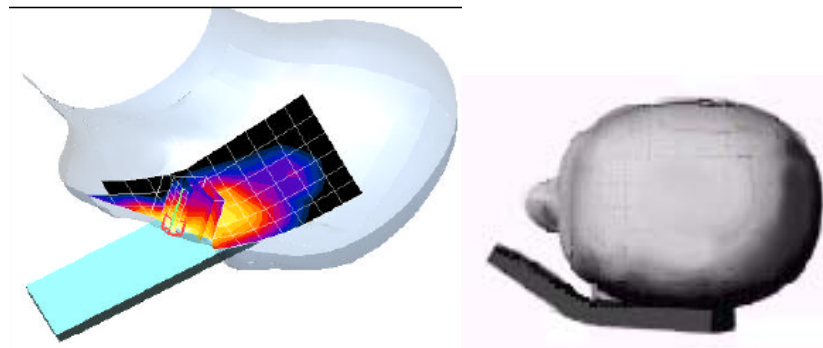




Figure 9-5 SAR Scans near the Jaw/Mouth

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,

FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT	 SAMSUNG	Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 13 of 38	

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.

FCC ID: A3LGT8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 14 of 38	

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 <i>General Population</i> (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT <i>Occupational</i> (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.

FCC ID: A3LGT8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 15 of 38

11 FCC 3G 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. Any SAR tests with power drifts greater than 5% were repeated.

11.2 RF Conducted Powers

11.2.1 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
Cellular	128	32.13	32.09	32.14	29.25	27.02
	190	32.39	32.17	32.36	29.36	27.18
	251	32.27	32.11	32.31	29.31	27.09
PCS	512	29.82	29.76	29.78	26.38	23.89
	661	29.87	29.81	29.83	26.42	23.95
	810	29.94	29.90	29.95	26.49	23.98

FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 16 of 38

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
Cellular	128	23.10	23.06	26.12	24.99	24.01
	190	23.36	23.14	26.34	25.10	24.17
	251	23.24	23.08	26.29	25.05	24.08
PCS	512	20.79	20.73	23.76	22.12	20.88
	661	20.84	20.78	23.81	22.16	20.94
	810	20.91	20.87	23.93	22.23	20.97

Note:

1. Both burst-averaged and calculated frame-averaged powers are included.
2. 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.
3. The bolded GPRS modes were selected according to the highest frame-averaged output power table according to KDB 941225 D03.
4. GPRS (GMSK) output powers were measured with CS1.

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

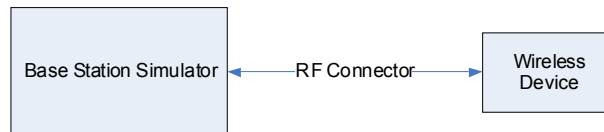




Figure 11-1
Power Measurement Setup

FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 17 of 38	

12 SAR TESTING WITH IEEE 802.11 TRANSMITTERS

Normal network operating configurations are not suitable for measuring the SAR of 802.11 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.

12.1 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.

12.2 Frequency Channel Configurations [27]

802.11 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. 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.

**Table 12-1
802.11 Test Channels per FCC Requirements**

Mode	GHz	Channel	Turbo Channel	"Default Test Channels"			
				§15.247		UNII	
				802.11b	802.11g		
802.11 b/g	2.412	1		√	∇		
	2.437	6	6	√	∇		
	2.462	11		√	∇		



FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 18 of 38

Table 12-2
IEEE 802.11b Average RF Power

Freq [MHz]	Channel	Data Rate [Mbps]	Average Power (dBm)
2412	1	1	15.30
		2	15.27
		5.5	15.43
		11	15.37
2437	6	1	15.34
		2	15.29
		5.5	15.55
		11	15.48
2462	11	1	15.34
		2	15.35
		5.5	15.53
		11	15.46

Table 12-3
IEEE 802.11g Average RF Power

Freq [MHz]	Channel	Data Rate [Mbps]	Average Power (dBm)
2412	1	6	12.56
		9	12.53
		12	12.5
		18	12.51
		24	12.46
		36	12.55
		48	12.57
		54	12.51
		2437	6
9	12.54		
12	12.55		
18	12.58		
24	12.56		
36	12.57		
48	12.56		
54	12.58		
2462	11		
		9	12.61
		12	12.62
		18	12.58
		24	12.55
		36	12.62
		48	12.65
		54	12.48



FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 19 of 38

Table 12-4
IEEE 802.11n Average RF Power



Freq [MHz]	Channel	Data Rate [Mbps]	Average Power (dBm)
2412	1	6.5/7.2	11.45
		13/14.40	11.44
		19.5/21.70	11.42
		26/28.90	11.44
		29/43.3	11.4
		52/57.80	11.38
		58.50/65	11.38
		65/72.2	11.39
		2437	6
13/14.40	11.43		
19.5/21.70	11.42		
26/28.90	11.48		
29/43.3	11.47		
52/57.80	11.5		
58.50/65	11.49		
65/72.2	11.47		
2462	11		
		13/14.40	11.55
		19.5/21.70	11.48
		26/28.90	11.46
		29/43.3	11.44
		52/57.80	11.46
		58.50/65	11.5
		65/72.2	11.5

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.
- The bolded data rate and channel above were tested for SAR.



Figure 12-1
Power Measurement Setup

FCC ID: A3LGT8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 20 of 38	

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 for handsets greater than 9 cm x 5 cm where SAR test considerations are based on a composite test separation distance of 10 mm from the edges, front and back 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.

FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 21 of 38

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 850	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN	Yes	Yes	Yes	No	Yes	No

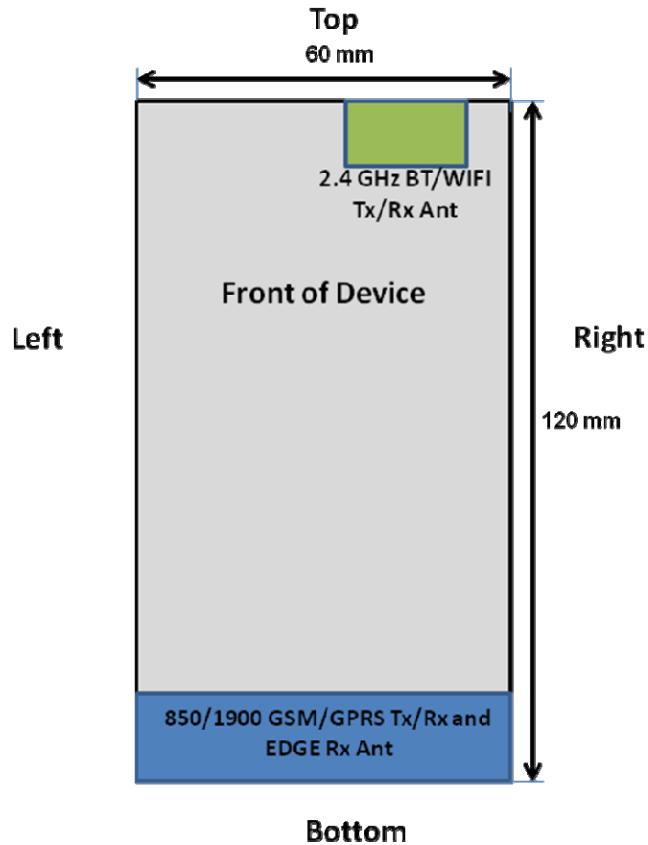




Figure 13-1 Identification of Sides for SAR Testing

Note: Per FCC KDB Publication 941225 D06, the edges with antennas within 2.5 cm are required to be evaluated for SAR. The antenna distance document contains the measured distances of the actual device.

FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 22 of 38

14 SYSTEM VERIFICATION

14.1 Tissue Verification

**Table 14-1
Measured Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
09/22/2011	835H	815	0.910	41.31	0.90	41.60	1.11%	-0.70%
		835	0.920	41.07	0.90	41.50	2.22%	-1.04%
		855	0.930	40.97	0.92	41.50	1.09%	-1.28%
09/25/2011	835B	815	0.960	55.25	0.97	55.28	-1.03%	-0.05%
		835	0.990	55.15	0.97	55.20	2.06%	-0.09%
		855	1.010	55.06	0.99	55.14	2.02%	-0.15%
09/21/2011	1900H	1850	1.380	39.76	1.40	40.00	-1.43%	-0.60%
		1880	1.400	39.64	1.40	40.00	0.00%	-0.90%
		1910	1.420	39.59	1.40	40.00	1.43%	-1.02%
09/24/2011	1900B	1850	1.490	52.21	1.52	53.30	-1.97%	-2.05%
		1880	1.520	51.64	1.52	53.30	0.00%	-3.11%
		1910	1.540	51.41	1.52	53.30	1.32%	-3.55%
09/23/2011	2450H	2410	1.780	39.09	1.76	39.26	1.14%	-0.43%
		2440	1.830	39.00	1.79	39.22	2.23%	-0.56%
		2470	1.880	38.91	1.82	39.17	3.30%	-0.66%
09/23/2011	2450B	2410	1.930	52.45	1.91	52.75	1.05%	-0.57%
		2440	1.970	52.38	1.94	52.71	1.55%	-0.63%
		2470	2.010	52.32	1.98	52.67	1.52%	-0.66%

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.

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):

$$Y = \frac{j2\omega\epsilon_r\epsilon_0}{[\ln(b/a)]^2} \int_a^b \int_a^b \int_0^\pi \frac{\cos\phi' \exp[-j\omega r(\mu_0\epsilon_r\epsilon_0)^{1/2}]}{r} d\phi' d\rho' d\rho$$

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 $j = \sqrt{-1}$.

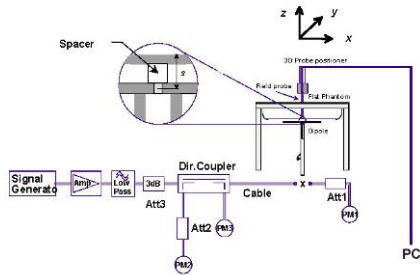
FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 23 of 38

14.3 Test System Verification

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

**Table 14-2
System Verification Results**



System Verification TARGET & MEASURED											
Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Tissue Frequency (MHz)	Probe SN	Dipole SN	Tissue Type	Measured SAR _{1g} (W/kg)	1 W Target SAR _{1g} (W/kg)	1 W Normalized SAR _{1g} (W/kg)	Deviation (%)
09/22/2011	23.6	20.6	0.100	835	3662	4d026	Head	0.922	9.460	9.220	-2.54%
09/25/2011	24.1	21.3	0.100	835	3662	4d026	Body	0.977	9.660	9.770	1.14%
09/21/2011	22.9	20.2	0.100	1900	3662	5d080	Head	4.000	39.900	40.000	0.25%
09/24/2011	23.7	20.7	0.100	1900	3662	5d080	Body	3.950	40.900	39.500	-3.42%
09/23/2011	24.2	21.0	0.100	2450	3662	719	Head	5.380	53.800	53.800	0.00%
09/23/2011	22.5	19.9	0.100	2450	3662	719	Body	5.180	51.300	51.800	0.97%



**Figure 14-1
System Verification Setup Diagram**



**Figure 14-2
System Verification Setup Photo**

FCC ID: A3LGT8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 24 of 38	



15 SAR DATA SUMMARY

Table 15-1
GSM 850 Head SAR Results

MEASUREMENT RESULTS								
FREQUENCY		Mode/Band	Conducted Power [dBm] (Peak)	Power Drift [dB]	# of GSM Slots	Side	Test Position	SAR (1g)
MHz	Ch.							(W/kg)
836.60	190	GSM 850	32.39	-0.09	1	Right	Touch	0.128
836.60	190	GSM 850	32.39	-0.09	1	Right	Tilt	0.032
836.60	190	GSM 850	32.39	-0.10	1	Left	Touch	0.103
836.60	190	GSM 850	32.39	0.10	1	Left	Tilt	0.038
IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Head 1.6 W/kg (mW/g) averaged over 1 gram		

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. All modes of operation were investigated, and worst-case results are reported.
3. Batteries are fully charged for all readings. Standard battery was used.
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Liquid tissue depth was at least 15.0 cm.
6. Justification for reduced test configurations: Per April 2010 TCB Workshop notes SAR was measured at the maximum output power channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted) If the SAR measured is at least 3.0 dB lower than the SAR limit, testing at the other channels is optional for such test configuration(s).



FCC ID: A3LGT8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 25 of 38

**Table 15-2
GSM 1900 Head SAR Results**

MEASUREMENT RESULTS								
FREQUENCY		Mode/Band	Conducted Power [dBm]	Power Drift [dB]	# of GSM Slots	Side	Test Position	SAR (1g)
MHz	Ch.							(W/kg)
1909.80	810	GSM 1900	29.94	0.10	1	Right	Touch	0.252
1909.80	810	GSM 1900	29.94	-0.04	1	Right	Tilt	0.153
1909.80	810	GSM 1900	29.94	0.10	1	Left	Touch	0.534
1909.80	810	GSM 1900	29.94	0.08	1	Left	Tilt	0.149
IEEE C95.1 1992 - SAFETY LIMIT						Head		
Spatial Peak						1.6 W/kg (mW/g)		
Uncontrolled Exposure/General Population						averaged over 1 gram		

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. All modes of operation were investigated, and worst-case results are reported.
3. Batteries are fully charged for all readings. Standard battery was used.
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Liquid tissue depth was at least 15.0 cm.
6. Justification for reduced test configurations: Per April 2010 TCB Workshop notes SAR was measured at the maximum output power channel for each test configuration (left, right, cheek/touch, tilt/ear, extended and retracted). If the SAR measured is at least 3.0 dB lower than the SAR limit, testing at the other channels is optional for such test configuration(s).



FCC ID: A3LGT8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 26 of 38	

**Table 15-3
2.4 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	15.34	-0.09	Right	Touch	1	0.059
2437	6	IEEE 802.11b	DSSS	15.34	0.08	Right	Tilt	1	0.053
2437	6	IEEE 802.11b	DSSS	15.34	-0.10	Left	Touch	1	0.150
2437	6	IEEE 802.11b	DSSS	15.34	0.10	Left	Tilt	1	0.086
IEEE C95.1 1992 - SAFETY LIMIT						Head			
Spatial Peak						1.6 W/kg (mW/g)			
Uncontrolled Exposure/General Population						averaged over 1 gram			

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. All modes of operation were investigated, and worst-case results are reported.
3. Batteries are fully charged for all readings. Standard battery was used.
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Liquid tissue depth was at least 15.0 cm.
6. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/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.
7. WLAN transmission was verified using a spectrum analyzer.



FCC ID: A3LGT8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 27 of 38	

**Table 15-4
GSM Body-Worn SAR Results**

MEASUREMENT RESULTS									
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	# of GSM Slots	Side	SAR (1g)
MHz	Ch.								(W/kg)
836.60	190	GSM 850	GSM	32.39	0.08	1.0 cm	1	back	0.137
1909.80	810	GSM 1900	GSM	29.94	-0.07	1.0 cm	1	back	0.441
IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram			

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. All modes of operation were investigated, and worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plots.
4. Batteries are fully charged for all readings. Standard battery was used.
5. Liquid tissue depth was at least 15.0 cm.
6. 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.
7. Body-Worn accessory testing is typically associated with voice operations. Therefore body-worn SAR testing was performed in GSM voice mode only. GPRS Data mode is covered in the Hotspot SAR Testing at the same test distance.
8. Justification for reduced test configurations: Per April 2010 TCB Workshop notes SAR was measured at the maximum output power 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 other channels is optional for such test configuration(s).



FCC ID: A3LGT8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 28 of 38	

**Table 15-5
2.4 GHz 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	15.34	0.10	1.0 cm	1	back	0.029
IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram			

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. All modes of operation were investigated, and worst-case results are reported.
3. Batteries are fully charged for all readings. Standard battery was used.
4. Tissue parameters and temperatures are listed on the SAR plots.
5. Liquid tissue depth is was at least 15.0 cm.
6. 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.
7. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/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.
8. WLAN transmission was verified using a spectrum analyzer.
9. 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.



FCC ID: A3LGT8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 29 of 38	

**Table 15-6
GPRS Hotspot SAR Results**

MEASUREMENT RESULTS									
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	# of GPRS Slots	Side	SAR (1g)
MHz	Ch.								(W/kg)
836.60	190	GSM 850	GPRS	32.36	0.09	1.0 cm	2	back	0.266
836.60	190	GSM 850	GPRS	32.36	-0.06	1.0 cm	2	front	0.185
836.60	190	GSM 850	GPRS	32.36	-0.07	1.0 cm	2	bottom	0.047
836.60	190	GSM 850	GPRS	32.36	0.04	1.0 cm	2	right	0.153
836.60	190	GSM 850	GPRS	32.36	-0.05	1.0 cm	2	left	0.246
1850.20	512	GSM 1900	GPRS	29.78	0.07	1.0 cm	2	back	0.594
1880.00	661	GSM 1900	GPRS	29.83	0.01	1.0 cm	2	back	0.707
1909.80	810	GSM 1900	GPRS	29.95	0.10	1.0 cm	2	back	0.819
1909.80	810	GSM 1900	GPRS	29.95	0.01	1.0 cm	2	front	0.683
1909.80	810	GSM 1900	GPRS	29.95	0.02	1.0 cm	2	bottom	0.662
1909.80	810	GSM 1900	GPRS	29.95	0.09	1.0 cm	2	right	0.075
1909.80	810	GSM 1900	GPRS	29.95	0.03	1.0 cm	2	left	0.206
IEEE C95.1 1992 - SAFETY LIMIT						Body			
Spatial Peak						1.6 W/kg (mW/g)			
Uncontrolled Exposure/General Population						averaged over 1 gram			

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. All modes of operation were investigated, and worst-case results are reported.
3. Tissue parameters and temperatures are listed on the SAR plots.
4. Batteries are fully charged for all readings. Standard battery was used.
5. Liquid tissue depth was at least 15.0 cm.
6. Device was tested using a fixed spacing.
7. 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.
8. Justification for reduced test configurations: Per April 2010 TCB Workshop notes SAR was measured at the maximum output power 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 other channels is optional for such test configuration(s).
9. Top Edge 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).
10. During SAR Testing for the Wireless Router conditions per KDB 941225 D06, the actual Portable Hotspot operation (with actual simultaneous transmission with WIFI) was not activated (See Section 13.2).



FCC ID: A3LGT8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: OY1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 30 of 38	

**Table 15-7
Hotspot 2.4 GHz Body 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	15.34	0.10	1.0 cm	1	back	0.029
2437	6	IEEE 802.11b	DSSS	15.34	-0.10	1.0 cm	1	front	0.022
2437	6	IEEE 802.11b	DSSS	15.34	0.09	1.0 cm	1	top	0.031
2437	6	IEEE 802.11b	DSSS	15.34	0.09	1.0 cm	1	right	0.012
IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram			

Notes:

- 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].
- All modes of operation were investigated, and worst-case results are reported.
- Batteries are fully charged for all readings. Standard battery was used.
- Tissue parameters and temperatures are listed on the SAR plots.
- Liquid tissue depth is was at least 15.0 cm.
- Justification for reduced test configurations for WIFI channels per KDB Publication 248227 and April 2010 FCC/TCB Meeting Notes: Highest average RF output power channel for the lowest data rate were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/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.
- WLAN transmission was verified using a spectrum analyzer.
- Bottom and Left Edges 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).
- During SAR Testing for the Wireless Router conditions per KDB 941225 D06, the actual Portable Hotspot operation (with actual simultaneous transmission with another transmitter) was not activated (See Section 13.2).
- 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.
- To confirm the proper SAR liquid depth for 2.4 GHz Body tests, the z-axis plots from the system verification performed with the same liquid that was tested for 2.4 GHz head SAR tests were included to confirm the liquid depth, since the measured SAR was low and could not be used to determine this requirement

FCC ID: A3LGT8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 31 of 38	

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 and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

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
Unlicensed Transmitters	<p>When there is no simultaneous transmission –</p> <ul style="list-style-type: none"> output ≤ 60/f: SAR not required output > 60/f: stand-alone SAR required <p>When there is simultaneous transmission –</p> <p>Stand-alone SAR not required when</p> <ul style="list-style-type: none"> output $\leq 2 \cdot P_{Ref}$ and antenna is ≥ 5.0 cm from other antennas output $\leq P_{Ref}$ and antenna is ≥ 2.5 cm from other antennas output $\leq P_{Ref}$ and antenna is < 2.5 cm from other antennas, each with either output power $\leq P_{Ref}$ or 1-g SAR < 1.2 W/kg <p>Otherwise stand-alone SAR is required</p> <p>When stand-alone SAR is required</p> <ul style="list-style-type: none"> 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 	<p>Unlicensed only</p> <ul style="list-style-type: none"> when stand-alone 1-g SAR is not required and antenna is ≥ 5 cm from other antennas <p>Licensed & Unlicensed</p> <ul style="list-style-type: none"> 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 <p>SAR required:</p> <p>Licensed & Unlicensed</p> <p>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</p> <p>Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply</p>

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 112 mm. The maximum average RF Conducted Power of Bluetooth Tx is 11.912 mW. RF Conducted Power of WLAN is 35.89 mW.

16.4 Simultaneous Transmission Analysis

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.



FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: OY1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 32 of 38	

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

Simult Tx	Configuration	GSM 850	2.4 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900	2.4 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.128	0.059	0.187	Head SAR	Right Cheek	0.252	0.059	0.311
	Right Tilt	0.032	0.053	0.085		Right Tilt	0.153	0.053	0.206
	Left Cheek	0.103	0.150	0.253		Left Cheek	0.534	0.150	0.684
	Left Tilt	0.038	0.086	0.124		Left Tilt	0.149	0.086	0.235

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

Table 16-2
Simultaneous Transmission Scenario (Body-Worn)

Configuration	Mode	2G/3G SAR (W/kg)	2.4 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.137	0.029	0.166
Back Side	GSM 1900	0.441	0.029	0.470

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



Table 16-3
Simultaneous Transmission Scenario (Hotspot)

Simult Tx	Configuration	GSM 850	2.4 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GSM 1900	2.4 GHz WIFI SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.266	0.029	0.295	Body SAR	Back	0.819	0.029	0.848
	Front	0.185	0.022	0.207		Front	0.683	0.022	0.705
	Top	-	0.031	0.031		Top	-	0.031	0.031
	Bottom	0.047	-	0.047		Bottom	0.662	-	0.662
	Right	0.153	0.012	0.165		Right	0.075	0.012	0.087
	Left	0.246	-	0.246		Left	0.206	-	0.206

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.



16.5 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.

FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: OY1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 33 of 38

17 EQUIPMENT LIST



Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	N1911A	Power Meter	3/30/2011	Annual	3/30/2012	GB45100254
Agilent	N1922A	Power Sensor	3/30/2011	Annual	3/30/2012	MY45240464
Advantest	R3261A	Spectrum Analyzer	3/30/2011	Annual	3/30/2012	31720068
Agilent	8350B	Signal Generator	3/31/2011	Annual	3/31/2012	2749A10226
Agilent	83525A	RF Plug-In	3/31/2011	Annual	3/31/2012	2647A01172
Agilent	8753C	Vector Network Analyzer	3/30/2011	Annual	3/30/2012	3135A01724
Agilent	85047A	S-Parameter Test Set	3/31/2011	Annual	3/31/2012	2904A00595
Agilent	8960	Base Station Simulator	3/25/2010	Biennial	3/25/2012	MY48360364
SPEAG	EX3DV4	E-Field Probe	3/21/2011	Annual	3/21/2012	3662
SPEAG	DAE4	Data Acquisition Electronics	3/9/2011	Annual	3/9/2012	1217
Apriel	ALS-PR-DIEL	Dielectric Probe Assembly	N/A	N/A	N/A	11
SPEAG	D1900V2	1900 MHz SAR Dipole	7/22/2011	Annual	7/22/2012	5d080
SPEAG	D2450V2	2450 MHz SAR Dipole	8/19/2011	Annual	8/19/2012	719
SPEAG	D835V2	835 MHz SAR Dipole	8/15/2011	Annual	8/15/2012	4d026

FCC ID: A3LGT8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 34 of 38	

18 MEASUREMENT UNCERTAINTIES

Applicable for 750 – 3000 MHz.

Source of Uncertainty	Tolerance Value	Probability Distribution	Divisor	c_i^1 (1-g)	c_i^1 (10-g)	Standard Uncertainty (1-g) %	Standard Uncertainty (10-g) %	v_i
Measurement System								
Probe Calibration	6.00	normal	1	1	1	6.0	6.0	∞
Axial Isotropy	4.70	rectangular	√3	0.7	0.7	1.9	1.9	∞
Hemispherical Isotropy	9.60	rectangular	√3	0.7	0.7	3.9	3.9	∞
Boundary Effect	1.00	rectangular	√3	1	1	0.6	0.6	∞
Linearity	4.70	rectangular	√3	1	1	2.7	2.7	∞
Detection Limit	1.00	rectangular	√3	1	1	0.6	0.6	∞
Readout Electronics	0.30	normal	1	1	1	0.3	0.3	∞
Response Time	0.80	rectangular	√3	1	1	0.5	0.5	∞
Integration Time	2.60	rectangular	√3	1	1	1.5	1.5	∞
RF Ambient Condition	3.00	rectangular	√3	1	1	1.7	1.7	∞
Probe Positioner Mech. Restriction	0.40	rectangular	√3	1	1	0.2	0.2	∞
Probe Positioning with respect to Phantom Shell	2.90	rectangular	√3	1	1	1.7	1.7	∞
Extrapolation and Integration	1.00	rectangular	√3	1	1	0.6	0.6	∞
Test Sample Positioning	2.90	normal	1	1	1	2.9	2.9	145
Device Holder Uncertainty	3.60	normal	1	1	1	3.6	3.6	5
Drift of Output Power	5.00	rectangular	√3	1	1	2.9	2.9	∞
Phantom and Setup								
Phantom Uncertainty(shape & thickness tolerance)	4.00	rectangular	√3	1	1	2.3	2.3	∞
Liquid Conductivity(target)	5.00	rectangular	√3	0.64	0.43	1.8	1.2	∞
Liquid Conductivity(meas.)	2.50	normal	1	0.64	0.43	1.6	1.1	∞
Liquid Permittivity(target)	5.00	rectangular	√3	0.60	0.49	1.7	1.4	∞
Liquid Permittivity(meas.)	2.50	normal	1	0.60	0.49	1.5	1.2	∞
Combined Uncertainty				RSS		10.8	10.6	387
Combined Uncertainty (coverage factor=2)				Normal (k=2)		21.7	21.2	



FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 35 of 38

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]

FCC ID: A3LGTS8600	 PCTEST ENGINEERING LABORATORY, INC.	SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 36 of 38	

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FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset		Page 37 of 38

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FCC ID: A3LGTS8600		SAR COMPLIANCE REPORT		Reviewed by: Quality Manager
Filename: 0Y1109191667.A3L	Test Dates: 09/21/11 - 09/25/11	EUT Type: Portable Handset	Page 38 of 38	

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.922$ mho/m; $\epsilon_r = 41.029$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 09-22-2011; Ambient Temp: 23.6 °C; Tissue Temp: 20.6 °C

- Probe: EX3DV4 - SN3662; ConvF(8.75, 8.75, 8.75); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM850, Right Head, Touch, Mid.ch

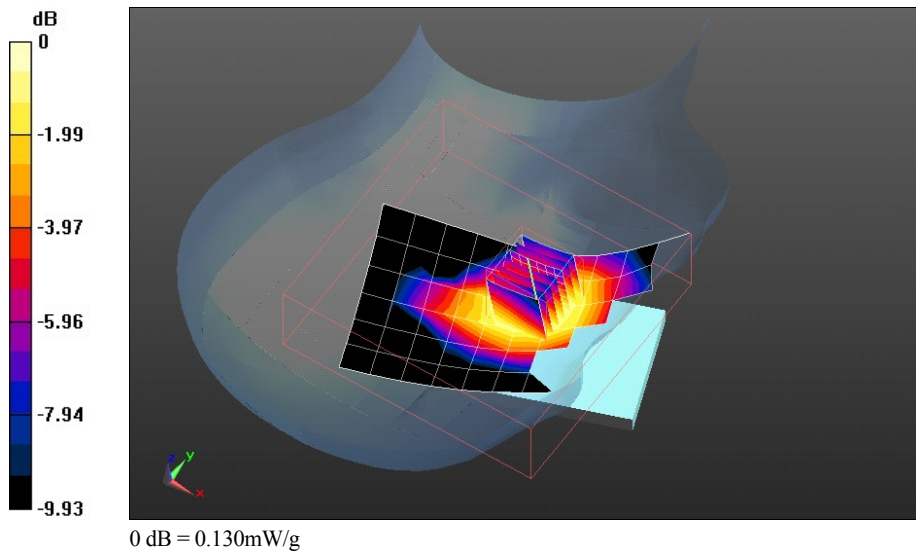
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 5.497 V/m

Peak SAR (extrapolated) = 0.151 W/kg

SAR(1 g) = 0.128 mW/g; SAR(10 g) = 0.092 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.922$ mho/m, $\epsilon_r = 41.029$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 09-22-2011; Ambient Temp: 23.6 °C; Tissue Temp: 20.6 °C

- Probe: EX3DV4 - SN3662; ConvF(8.75, 8.75, 8.75); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM850, Right Head, Touch, Mid.ch

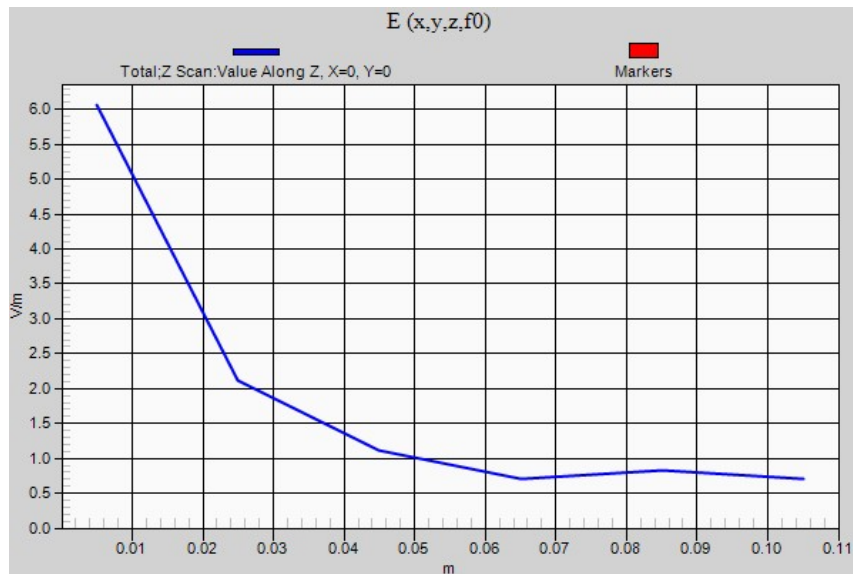
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 5.497 V/m

Peak SAR (extrapolated) = 0.151 W/kg

SAR(1 g) = 0.128 mW/g; SAR(10 g) = 0.092 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.922$ mho/m; $\epsilon_r = 41.029$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 09-22-2011; Ambient Temp: 23.6 °C; Tissue Temp: 20.6 °C

- Probe: EX3DV4 - SN3662; ConvF(8.75, 8.75, 8.75); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM850, Right Head, Tilt, Mid.ch

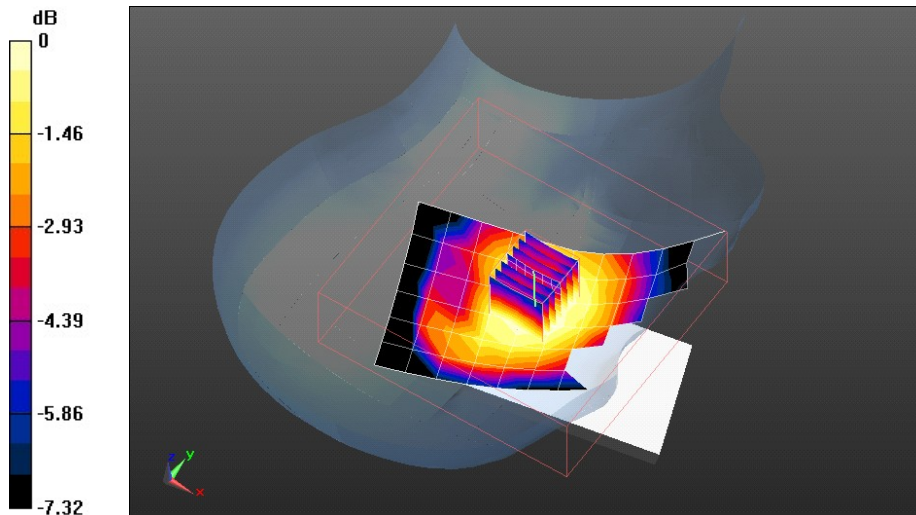
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 4.077 V/m

Peak SAR (extrapolated) = 0.039 W/kg

SAR(1 g) = 0.032 mW/g; SAR(10 g) = 0.024 mW/g



0 dB = 0.030mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.922$ mho/m; $\epsilon_r = 41.029$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Test Date: 09-22-2011; Ambient Temp: 23.6 °C; Tissue Temp: 20.6 °C

- Probe: EX3DV4 - SN3662; ConvF(8.75, 8.75, 8.75); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM850, Left Head, Touch, Mid.ch

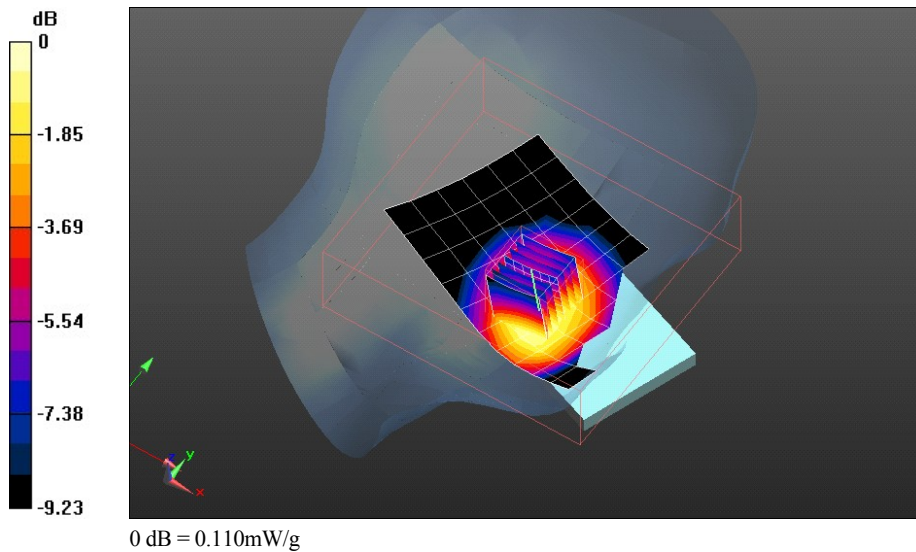
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 2.706 V/m

Peak SAR (extrapolated) = 0.133 W/kg

SAR(1 g) = 0.103 mW/g; SAR(10 g) = 0.074 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.922$ mho/m; $\epsilon_r = 41.029$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Test Date: 09-22-2011; Ambient Temp: 23.6 °C; Tissue Temp: 20.6 °C

- Probe: EX3DV4 - SN3662; ConvF(8.75, 8.75, 8.75); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM850, Left Head, Tilt, Mid.ch

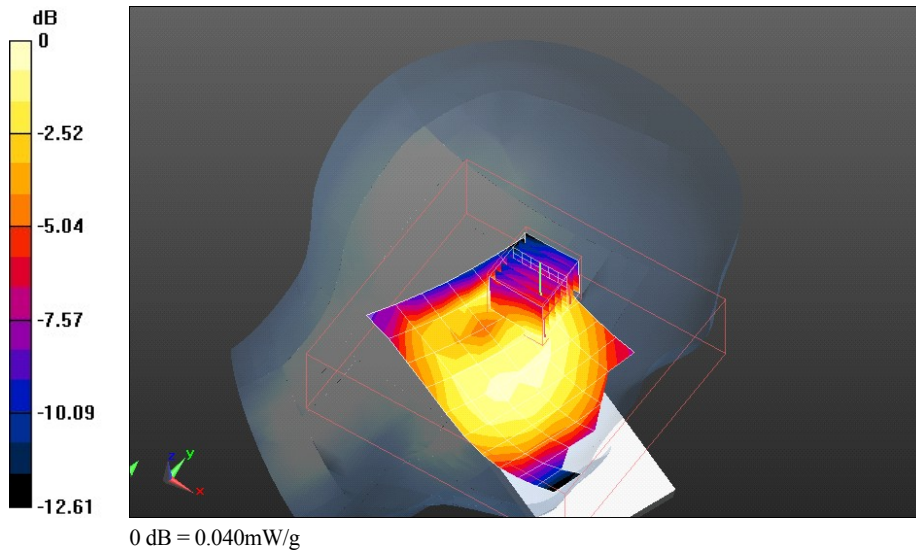
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 4.347 V/m

Peak SAR (extrapolated) = 0.069 W/kg

SAR(1 g) = 0.038 mW/g; SAR(10 g) = 0.023 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GSM1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1910$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.59$; $\rho = 1000$ kg/m³
Phantom section: Right Section

Test Date: 09-21-2011; Ambient Temp: 22.9 °C; Tissue Temp: 20.2 °C

- Probe: EX3DV4 - SN3662; ConvF(7.56, 7.56, 7.56); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM1900, Right Head, Touch, High.ch

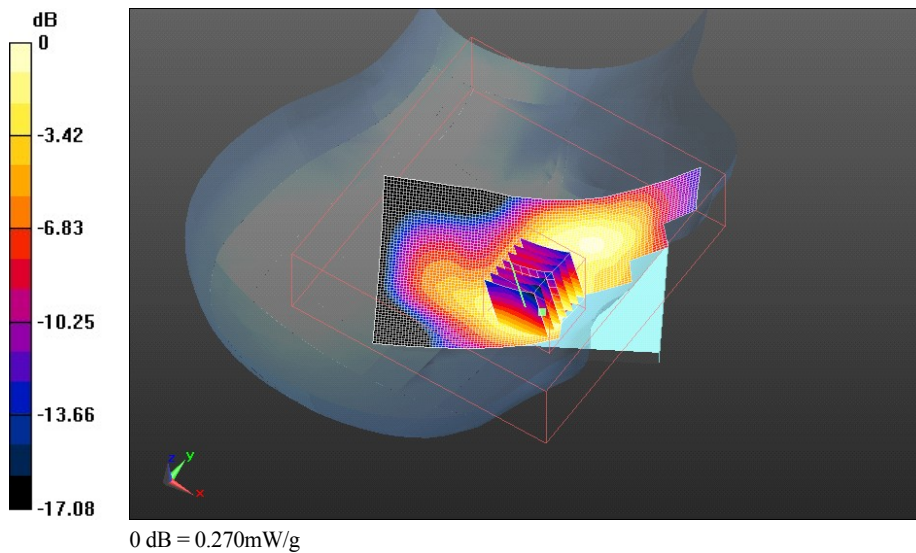
Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 5.752 V/m

Peak SAR (extrapolated) = 0.388 W/kg

SAR(1 g) = 0.252 mW/g; SAR(10 g) = 0.158 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

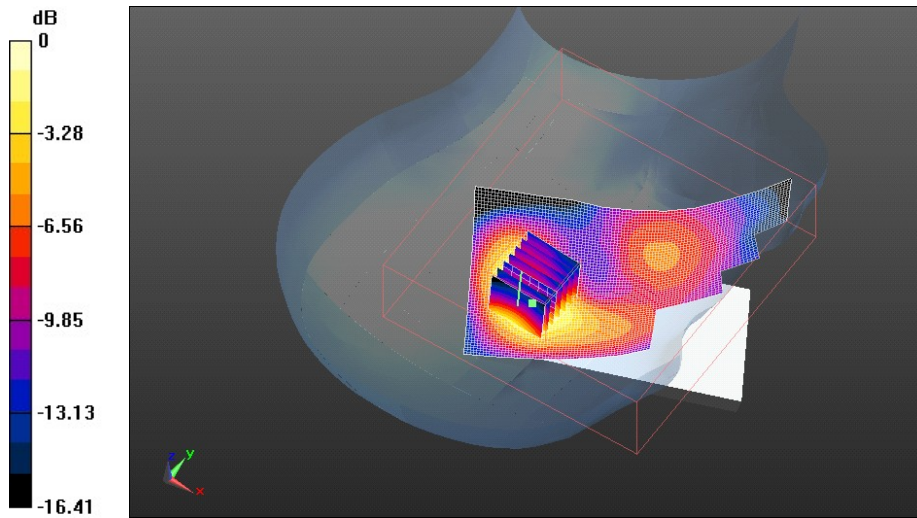
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Medium parameters used: $f = 1910$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.59$; $\rho = 1000$ kg/m³
Phantom section: Right Section

Test Date: 09-21-2011; Ambient Temp: 22.9 °C; Tissue Temp: 20.2 °C

- Probe: EX3DV4 - SN3662; ConvF(7.56, 7.56, 7.56); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM1900, Right Head, Tilt, High.ch

Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 9.063 V/m
Peak SAR (extrapolated) = 0.234 W/kg
SAR(1 g) = 0.153 mW/g; SAR(10 g) = 0.089 mW/g



0 dB = 0.170mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

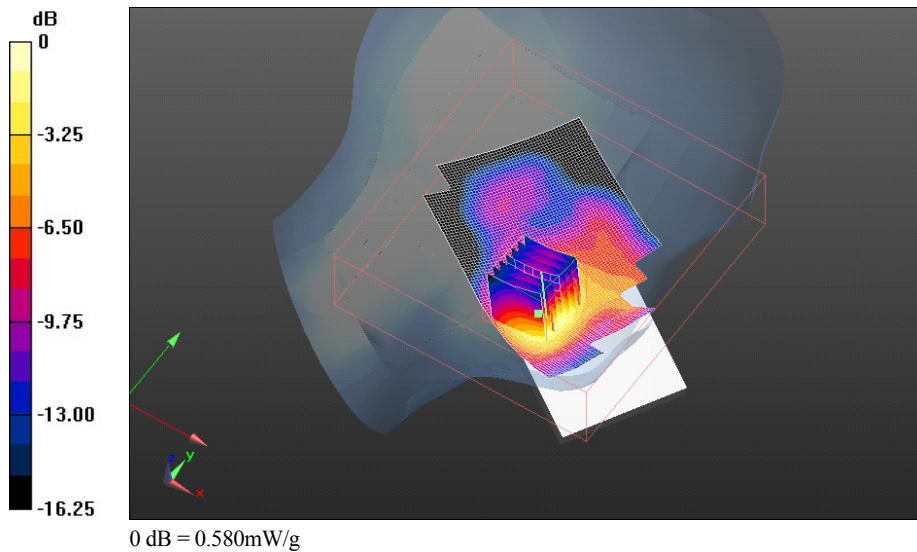
Communication System: GSM1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1910$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.59$; $\rho = 1000$ kg/m³
Phantom section: Left Section

Test Date: 09-21-2011; Ambient Temp: 22.9 °C; Tissue Temp: 20.2 °C

- Probe: EX3DV4 - SN3662; ConvF(7.56, 7.56, 7.56); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM1900, Left Head, Touch, High.ch

Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.736 V/m
Peak SAR (extrapolated) = 0.837 W/kg
SAR(1 g) = 0.534 mW/g; SAR(10 g) = 0.316 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GSM1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1910$ MHz; $\sigma = 1.42$ mho/m, $\epsilon_r = 32.59$; $\rho = 1000$ kg/m³
Phantom section: Left Section

Test Date: 09-21-2011; Ambient Temp: 22.9 °C; Tissue Temp: 20.2 °C

- Probe: EX3DV4 - SN3662; ConvF(7.56, 7.56, 7.56); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

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

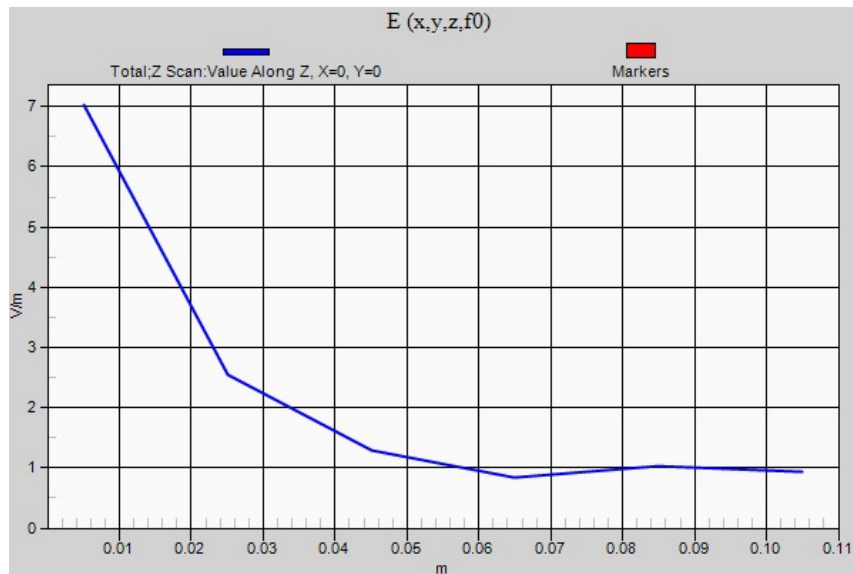
Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 6.736 V/m

Peak SAR (extrapolated) = 0.837 W/kg

SAR(1 g) = 0.534 mW/g; SAR(10 g) = 0.316 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

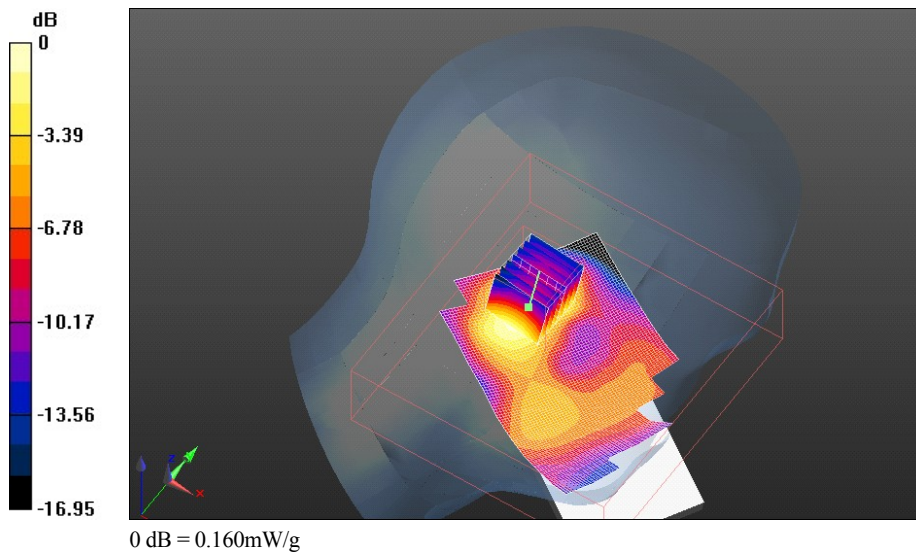
Communication System: GSM1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1910$ MHz; $\sigma = 1.42$ mho/m; $\epsilon_r = 39.59$; $\rho = 1000$ kg/m³
Phantom section: Left Section

Test Date: 09-21-2011; Ambient Temp: 22.9 °C; Tissue Temp: 20.2 °C

- Probe: EX3DV4 - SN3662; ConvF(7.56, 7.56, 7.56); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM1900, Left Head, Tilt, High.ch

Area Scan (61x101x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.541 V/m
Peak SAR (extrapolated) = 0.235 W/kg
SAR(1 g) = 0.149 mW/g; SAR(10 g) = 0.086 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

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

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.827$ mho/m; $r = 39.019$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 09-23-2011; Ambient Temp: 24.2 °C; Tissue Temp: 21.0 °C

- Probe: EX3DV4 - SN3662; ConvF(6.89, 6.89, 6.89); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: 802.11b, 1Mbps, Right Head, Touch, Mid.ch

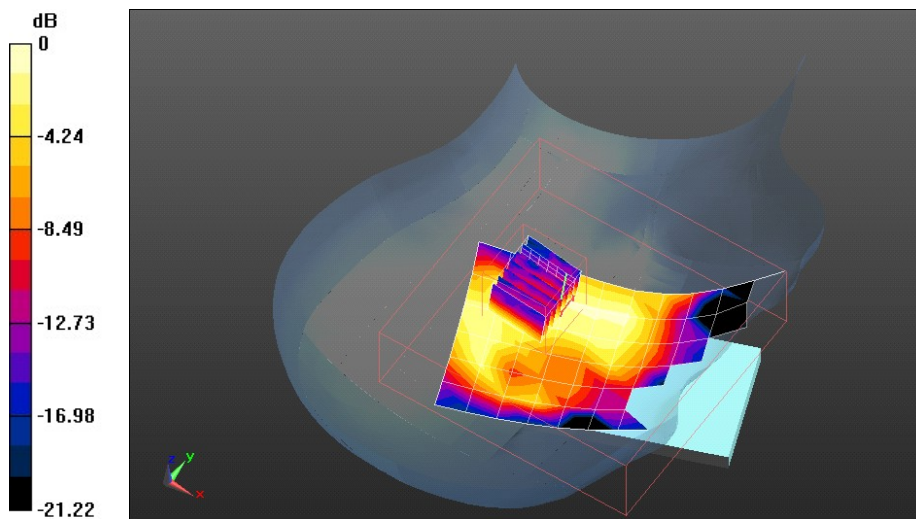
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 5.056 V/m

Peak SAR (extrapolated) = 0.128 W/kg

SAR(1 g) = 0.059 mW/g; SAR(10 g) = 0.031 mW/g



0 dB = 0.070mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

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

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.827$ mho/m; $r = 39.019$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 09-23-2011; Ambient Temp: 24.2 °C; Tissue Temp: 21.0 °C

- Probe: EX3DV4 - SN3662; ConvF(6.89, 6.89, 6.89); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: 802.11b, 1Mbps, Right Head, Tilt, Mid.ch

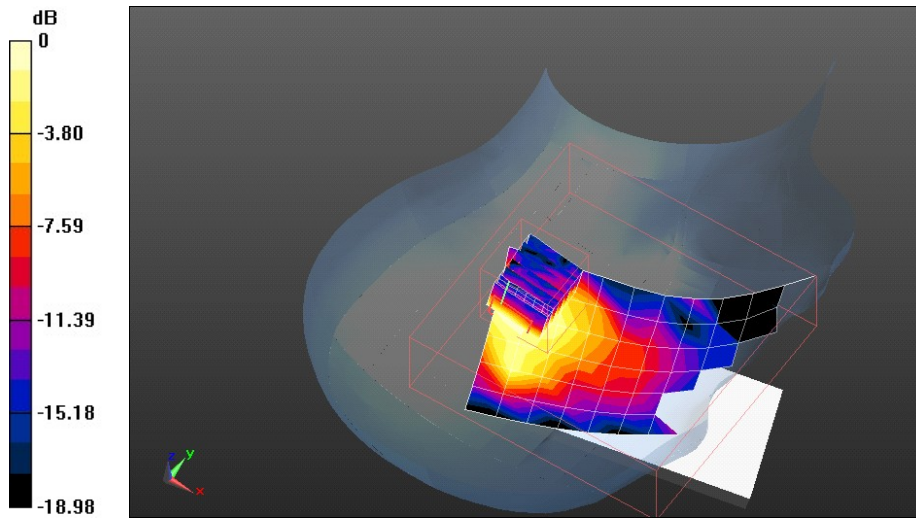
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 4.666 V/m

Peak SAR (extrapolated) = 0.110 W/kg

SAR(1 g) = 0.053 mW/g; SAR(10 g) = 0.026 mW/g



0 dB = 0.060mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

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

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.827$ mho/m; $r = 39.019$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Test Date: 09-23-2011; Ambient Temp: 24.2 °C; Tissue Temp: 21.0 °C

- Probe: EX3DV4 - SN3662; ConvF(6.89, 6.89, 6.89); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: 802.11b, 1Mbps, Left Head, Touch, Mid.ch

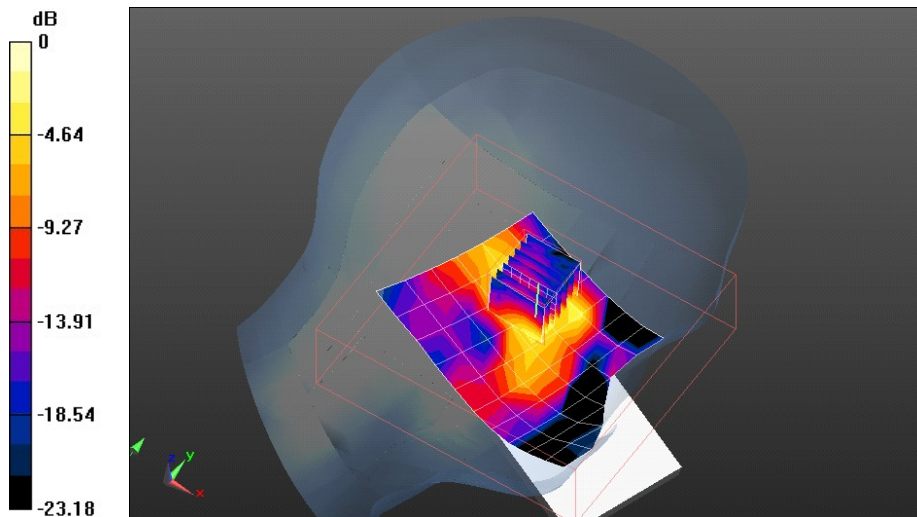
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 4.949 V/m

Peak SAR (extrapolated) = 0.358 W/kg

SAR(1 g) = 0.150 mW/g; SAR(10 g) = 0.071 mW/g



0 dB = 0.170mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

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

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.827$ mho/m, $\epsilon_r = 39.019$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Test Date: 09-23-2011; Ambient Temp: 24.2 °C; Tissue Temp: 21.0 °C

- Probe: EX3DV4 - SN3662; ConvF(6.89, 6.89, 6.89); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: 802.11b, 1Mbps, Left Head, Touch, Mid.ch

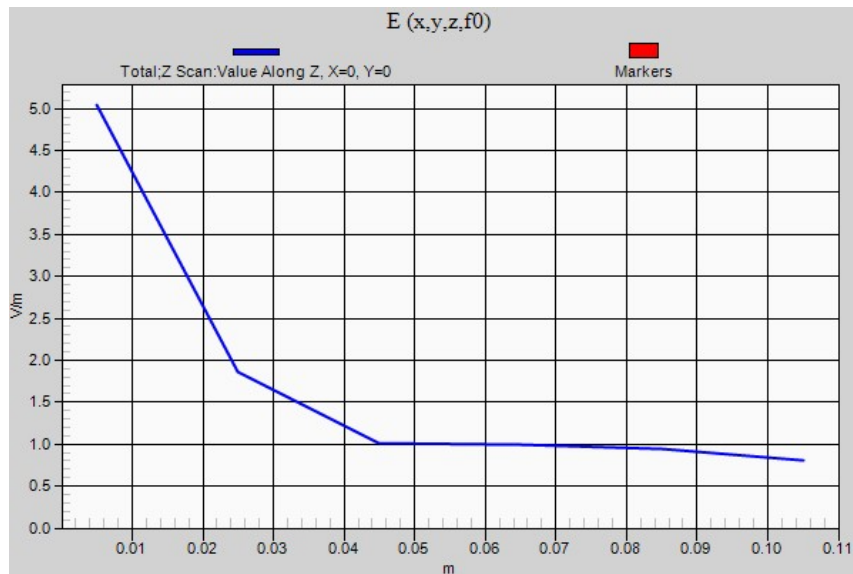
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 4.949 V/m

Peak SAR (extrapolated) = 0.358 W/kg

SAR(1 g) = 0.150 mW/g; SAR(10 g) = 0.071 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

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

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.827$ mho/m; $r = 39.019$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Test Date: 09-23-2011; Ambient Temp: 24.2 °C; Tissue Temp: 21.0 °C

- Probe: EX3DV4 - SN3662; ConvF(6.89, 6.89, 6.89); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: 802.11b, 1Mbps, Left Head, Tilt, Mid.ch

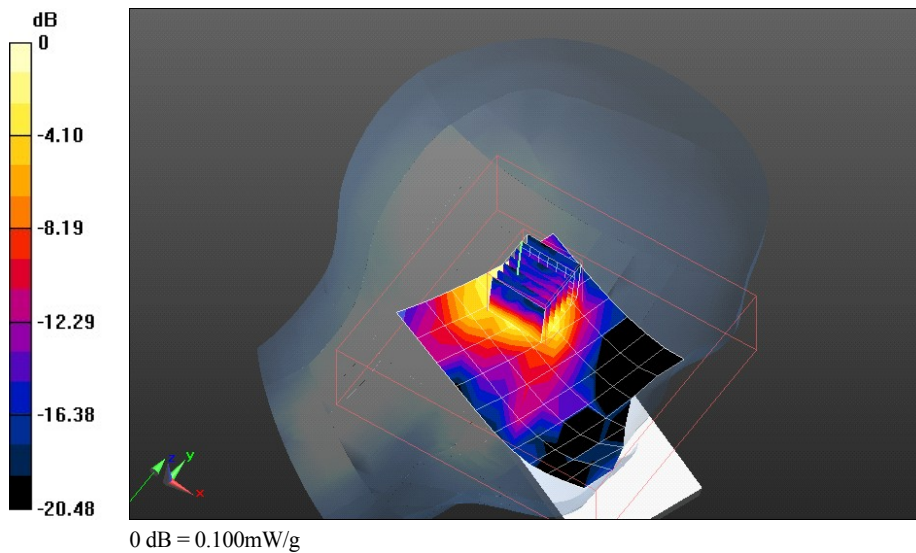
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 5.218 V/m

Peak SAR (extrapolated) = 0.239 W/kg

SAR(1 g) = 0.086 mW/g; SAR(10 g) = 0.042 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.993$ mho/m; $\epsilon_r = 55.142$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-25-2011; Ambient Temp: 24.1 °C; Tissue Temp: 21.3 °C

- Probe: EX3DV4 - SN3662; ConvF(8.79, 8.79, 8.79); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM850, Body, Back, Mid.ch

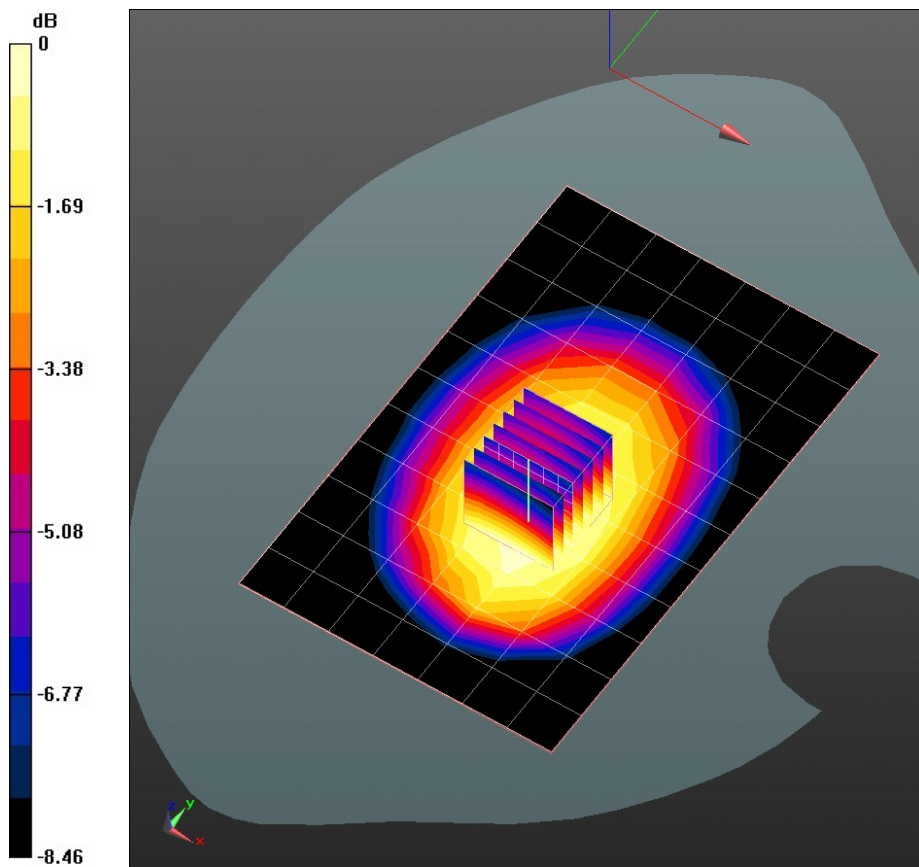
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 11.379 V/m

Peak SAR (extrapolated) = 0.175 W/kg

SAR(1 g) = 0.137 mW/g; SAR(10 g) = 0.106 mW/g



0 dB = 0.140mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GPRS850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.993$ mho/m; $\epsilon_r = 55.142$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-25-2011; Ambient Temp: 24.1 °C; Tissue Temp: 21.3 °C

- Probe: EX3DV4 - SN3662; ConvF(8.79, 8.79, 8.79); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS850, 2 Tx Slot, Body, Back, Mid.ch

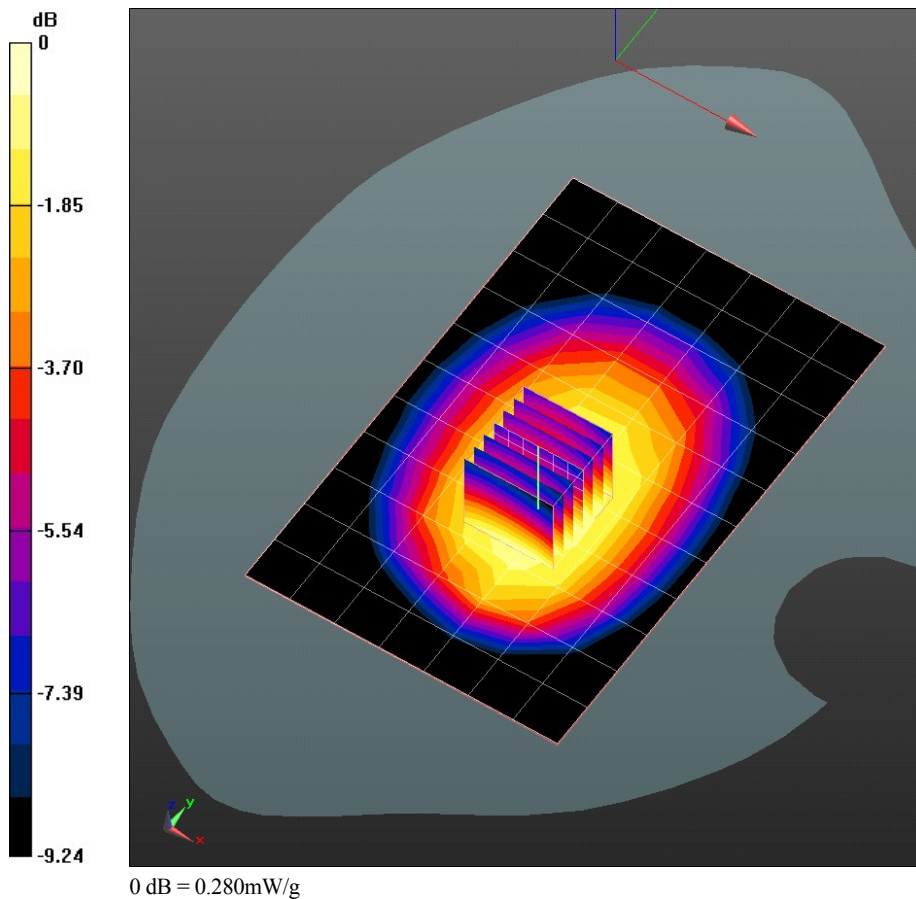
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.498 V/m

Peak SAR (extrapolated) = 0.341 W/kg

SAR(1 g) = 0.266 mW/g; SAR(10 g) = 0.202 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R26B729893Z

Communication System: GPRS850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.993$ mho/m, $\epsilon_r = 55.142$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-25-2011; Ambient Temp: 24.1 °C; Tissue Temp: 21.3 °C

- Probe: EX3DV4 - SN3662; ConvF(8.79, 8.79, 8.79); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS850, 2 Tx Slot, Body, Back, Mid.ch

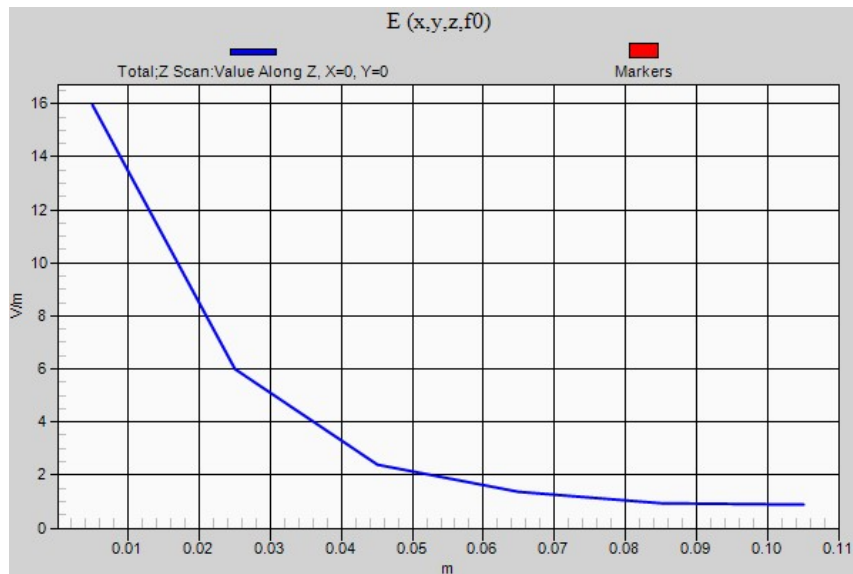
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.498 V/m

Peak SAR (extrapolated) = 0.341 W/kg

SAR(1 g) = 0.266 mW/g; SAR(10 g) = 0.202 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GPRS850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.993$ mho/m; $\epsilon_r = 55.142$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-25-2011; Ambient Temp: 24.1 °C; Tissue Temp: 21.3 °C

- Probe: EX3DV4 - SN3662; ConvF(8.79, 8.79, 8.79); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS850, 2 Tx Slot, Body, Front, Mid.ch

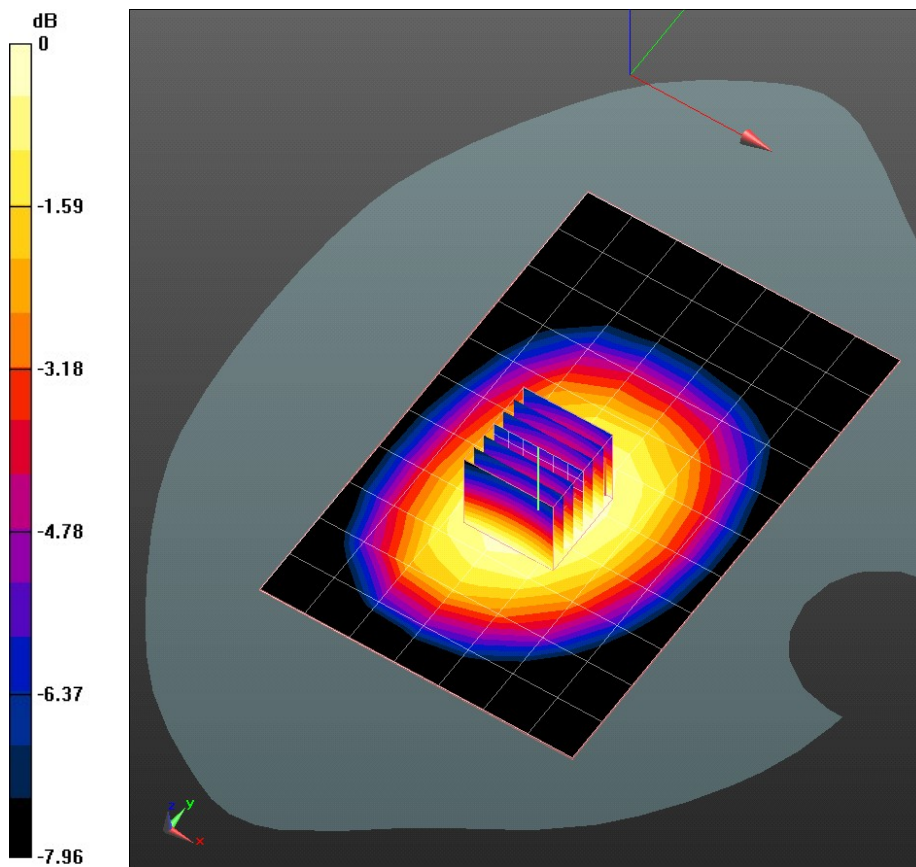
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 13.595 V/m

Peak SAR (extrapolated) = 0.230 W/kg

SAR(1 g) = 0.185 mW/g; SAR(10 g) = 0.144 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GPRS850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.993$ mho/m; $\epsilon_r = 55.142$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-25-2011; Ambient Temp: 24.1 °C; Tissue Temp: 21.3 °C

- Probe: EX3DV4 - SN3662; ConvF(8.79, 8.79, 8.79); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS850, 2 Tx Slot, Body, Bottom, Mid.ch

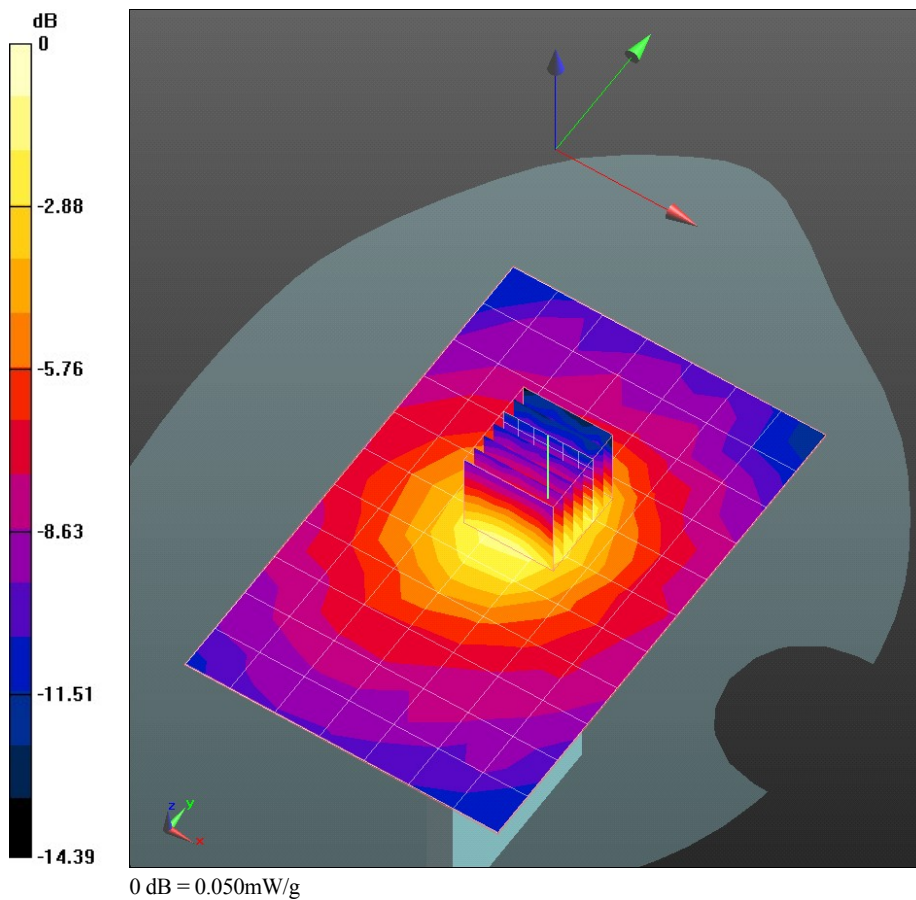
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 6.428 V/m

Peak SAR (extrapolated) = 0.093 W/kg

SAR(1 g) = 0.047 mW/g; SAR(10 g) = 0.028 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GPRS850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.993$ mho/m; $\epsilon_r = 55.142$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-25-2011; Ambient Temp: 24.1 °C; Tissue Temp: 21.3 °C

- Probe: EX3DV4 - SN3662; ConvF(8.79, 8.79, 8.79); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS850, 2 Tx Slot, Body, Right, Mid.ch

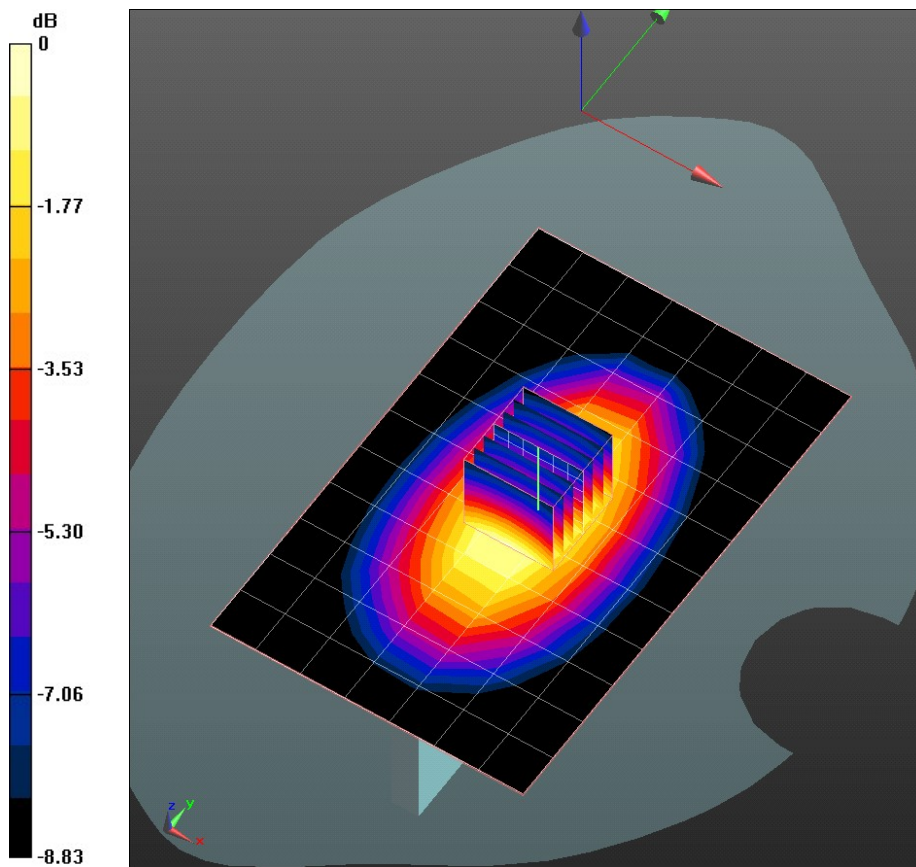
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 12.618 V/m

Peak SAR (extrapolated) = 0.213 W/kg

SAR(1 g) = 0.153 mW/g; SAR(10 g) = 0.107 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GPRS850; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium parameters used (interpolated): $f = 836.6$ MHz; $\sigma = 0.993$ mho/m; $\epsilon_r = 55.142$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-25-2011; Ambient Temp: 24.1 °C; Tissue Temp: 21.3 °C

- Probe: EX3DV4 - SN3662; ConvF(8.79, 8.79, 8.79); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS850, 2 Tx Slot, Body, Left, Mid.ch

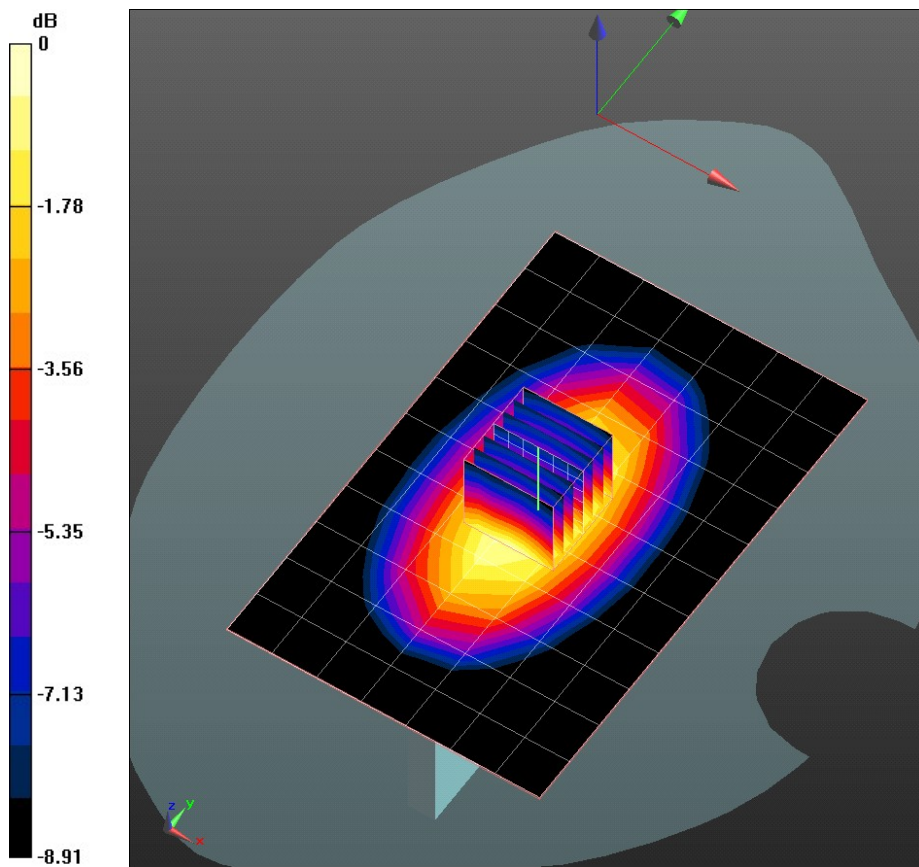
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.987 V/m

Peak SAR (extrapolated) = 0.346 W/kg

SAR(1 g) = 0.246 mW/g; SAR(10 g) = 0.171 mW/g



0 dB = 0.260mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

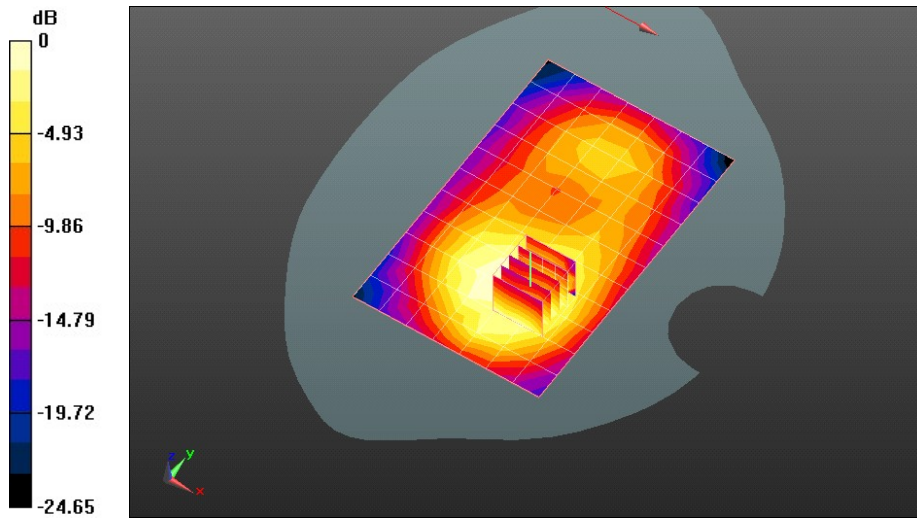
Communication System: GSM1900; Frequency: 1909.8 MHz; Duty Cycle: 1:8.3
Medium parameters used: $f = 1910$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.41$; $\rho = 1000$ kg/m³
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-24-2011; Ambient Temp: 23.7 °C; Tissue Temp: 20.7 °C

- Probe: EX3DV4 - SN3662; ConvF(7.42, 7.42, 7.42); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GSM1900, Body, Back, High.ch

Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x5)/Cube 0: Measurement grid: dx=7mm, dy=7mm, dz=7mm
Reference Value = 7.480 V/m
Peak SAR (extrapolated) = 0.765 W/kg
SAR(1 g) = 0.441 mW/g; SAR(10 g) = 0.238 mW/g



0 dB = 0.460mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GPRS1900; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.41$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-24-2011; Ambient Temp: 23.7 °C; Tissue Temp: 20.7 °C

- Probe: EX3DV4 - SN3662; ConvF(7.42, 7.42, 7.42); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS1900, 2 Tx Slot, Body, Back, High.ch

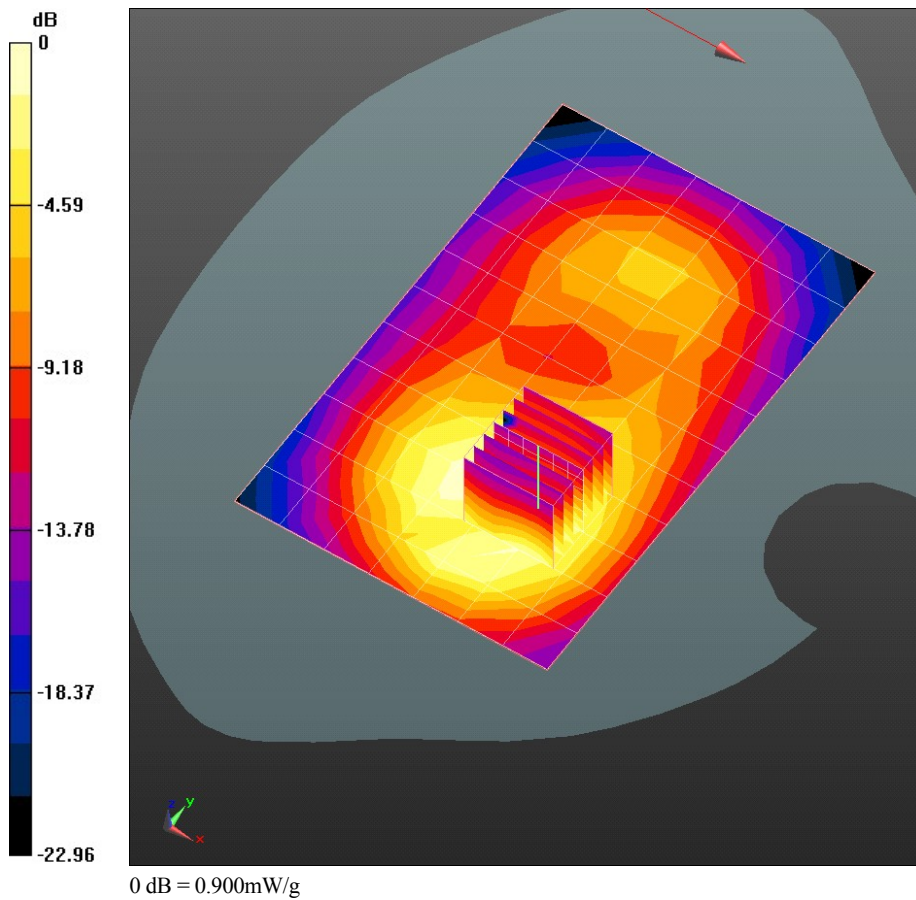
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 8.301 V/m

Peak SAR (extrapolated) = 1.440 W/kg

SAR(1 g) = 0.819 mW/g; SAR(10 g) = 0.467 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

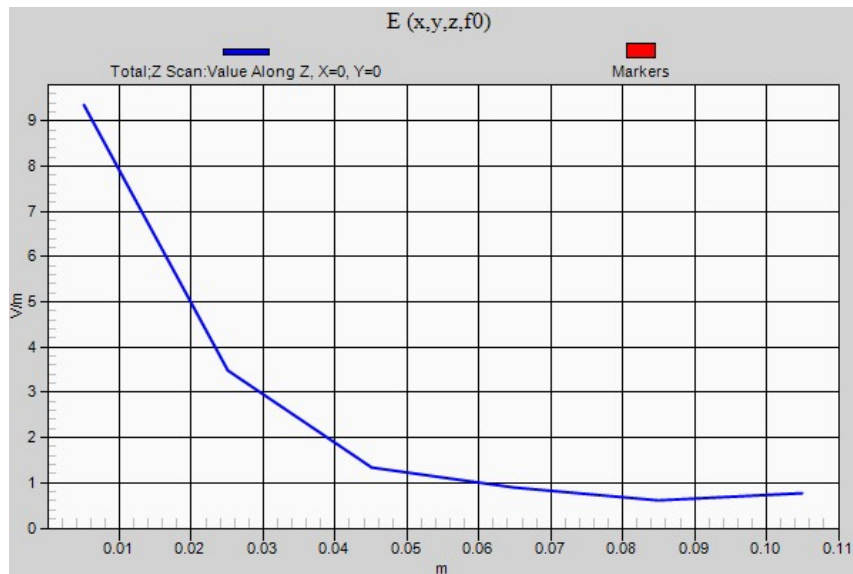
Communication System: GPRS1900; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15
Medium parameters used: $f = 1910$ MHz; $\sigma = 1.54$ mho/m, $\epsilon_r = 51.41$; $\rho = 1000$ kg/m³
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-24-2011; Ambient Temp: 23.7 °C; Tissue Temp: 20.7 °C

- Probe: EX3DV4 - SN3662; ConvF(7.42, 7.42, 7.42); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS1900, 2 Tx Slot, Body, Back, High.ch

Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.301 V/m
Peak SAR (extrapolated) = 1.440 W/kg
SAR(1 g) = 0.819 mW/g; SAR(10 g) = 0.467 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GPRS1900; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.41$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-24-2011; Ambient Temp: 23.7 °C; Tissue Temp: 20.7 °C

- Probe: EX3DV4 - SN3662; ConvF(7.42, 7.42, 7.42); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS1900, 2 Tx Slot, Body, Front, High.ch

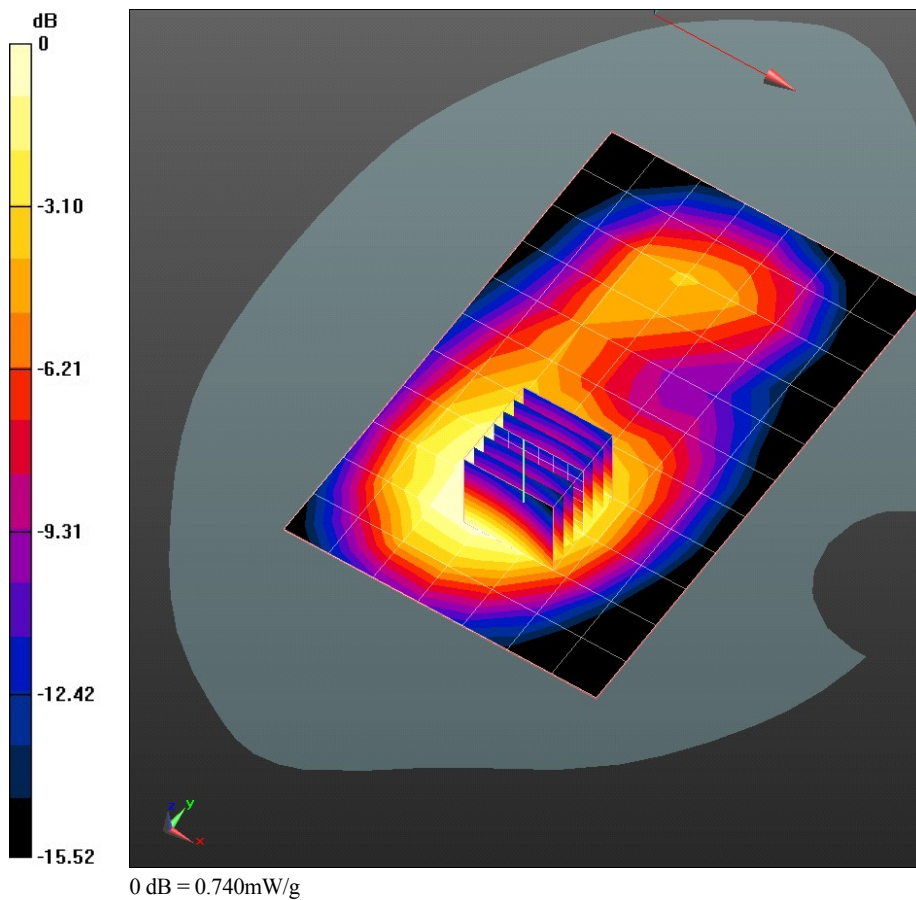
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 11.080 V/m

Peak SAR (extrapolated) = 1.124 W/kg

SAR(1 g) = 0.683 mW/g; SAR(10 g) = 0.423 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

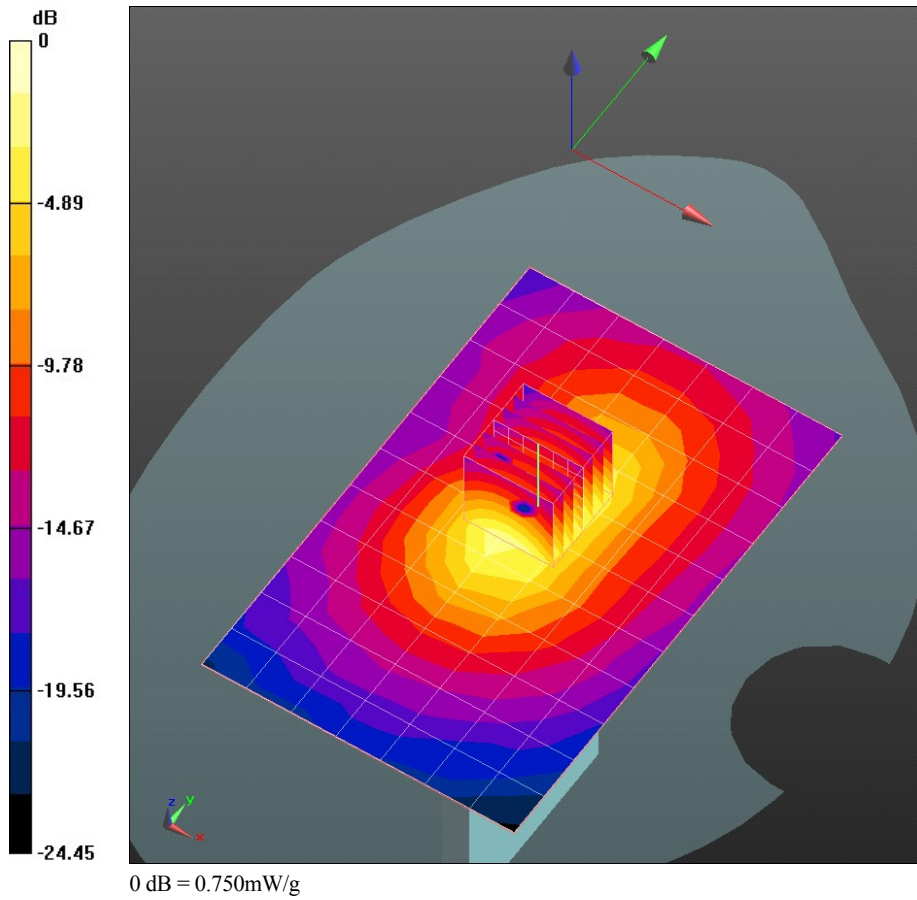
Communication System: GPRS1900; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15
Medium parameters used: $f = 1910$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.41$; $\rho = 1000$ kg/m³
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-24-2011; Ambient Temp: 23.7 °C; Tissue Temp: 20.7 °C

- Probe: EX3DV4 - SN3662; ConvF(7.42, 7.42, 7.42); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS1900, 2 Tx Slot, Body, Bottom, High.ch

Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.837 V/m
Peak SAR (extrapolated) = 1.173 W/kg
SAR(1 g) = 0.662 mW/g; SAR(10 g) = 0.348 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GPRS1900; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.41$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-24-2011; Ambient Temp: 23.7 °C; Tissue Temp: 20.7 °C

- Probe: EX3DV4 - SN3662; ConvF(7.42, 7.42, 7.42); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS1900, 2 Tx Slot, Body, Right, High.ch

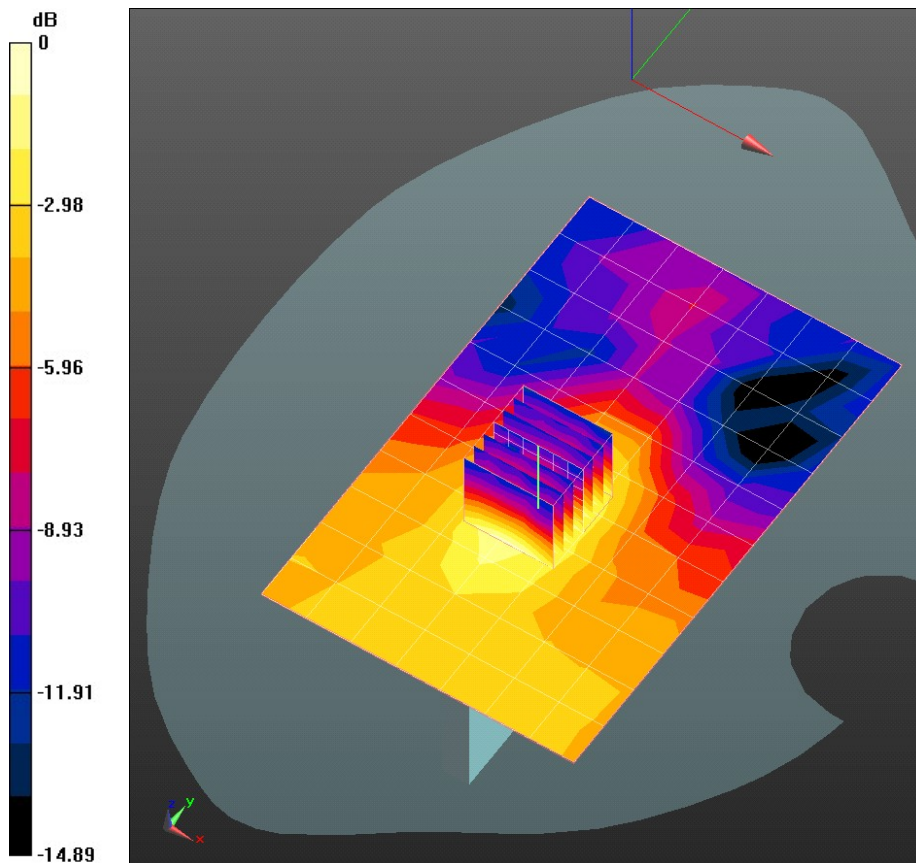
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 6.447 V/m

Peak SAR (extrapolated) = 0.117 W/kg

SAR(1 g) = 0.075 mW/g; SAR(10 g) = 0.047 mW/g



0 dB = 0.080mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

Communication System: GPRS1900; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15

Medium parameters used: $f = 1910$ MHz; $\sigma = 1.54$ mho/m; $\epsilon_r = 51.41$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-24-2011; Ambient Temp: 23.7 °C; Tissue Temp: 20.7 °C

- Probe: EX3DV4 - SN3662; ConvF(7.42, 7.42, 7.42); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: GPRS1900, 2 Tx Slot, Body, Left, High.ch

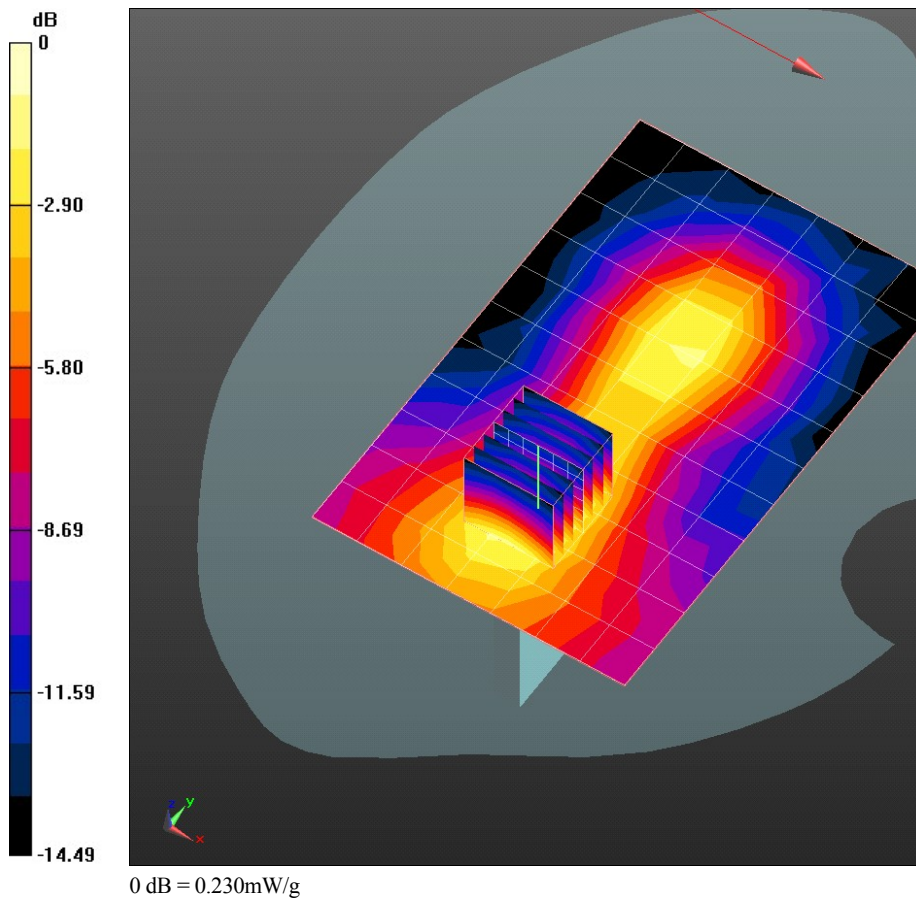
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 9.276 V/m

Peak SAR (extrapolated) = 0.337 W/kg

SAR(1 g) = 0.206 mW/g; SAR(10 g) = 0.120 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

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

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.968$ mho/m; $\epsilon_r = 52.396$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-23-2011; Ambient Temp: 22.5 °C; Tissue Temp: 19.9 °C

- Probe: EX3DV4 - SN3662; ConvF(7, 7, 7); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: 802.11b, 1Mbps, Back, Mid.ch

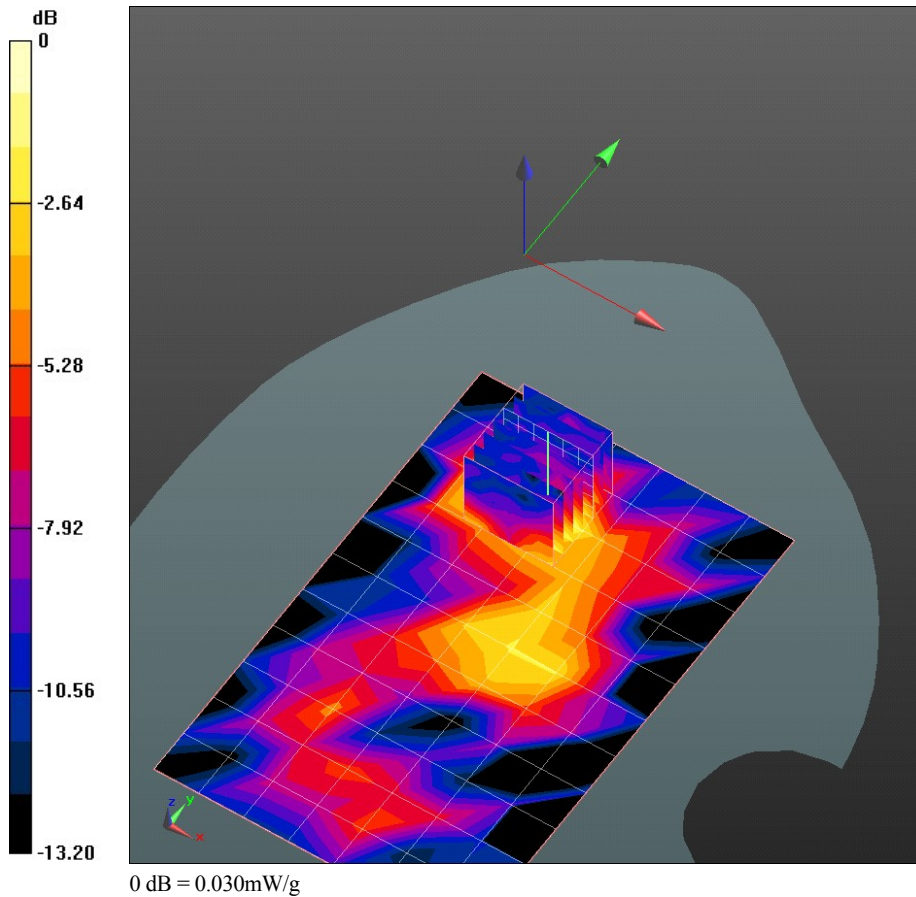
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 2.801 V/m

Peak SAR (extrapolated) = 0.049 W/kg

SAR(1 g) = 0.029 mW/g; SAR(10 g) = 0.015 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

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

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.968$ mho/m; $r = 52.396$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-23-2011; Ambient Temp: 22.5 °C; Tissue Temp: 19.9 °C

- Probe: EX3DV4 - SN3662; ConvF(7, 7, 7); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: 802.11b, 1Mbps, Front, Mid.ch

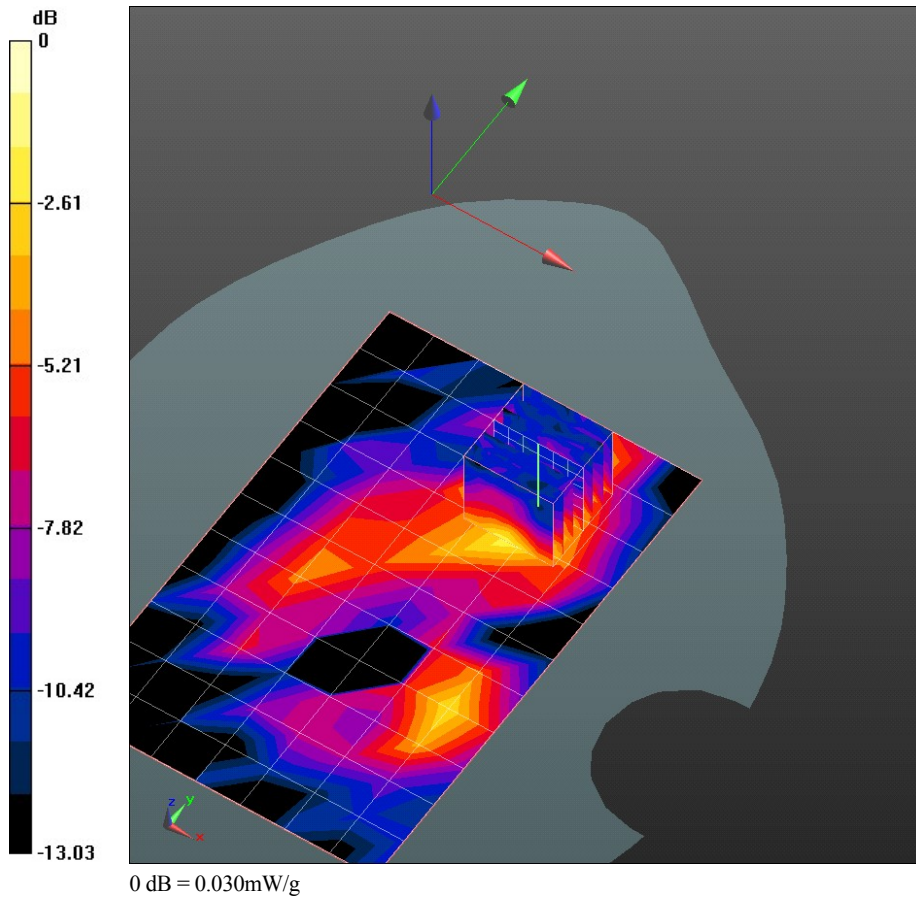
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 1.737 V/m

Peak SAR (extrapolated) = 0.037 W/kg

SAR(1 g) = 0.022 mW/g; SAR(10 g) = 0.013 mW/g



PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

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

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.968$ mho/m; $r = 52.396$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-23-2011; Ambient Temp: 22.5 °C; Tissue Temp: 19.9 °C

- Probe: EX3DV4 - SN3662; ConvF(7, 7, 7); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: 802.11b, 1Mbps, Top, Mid.ch

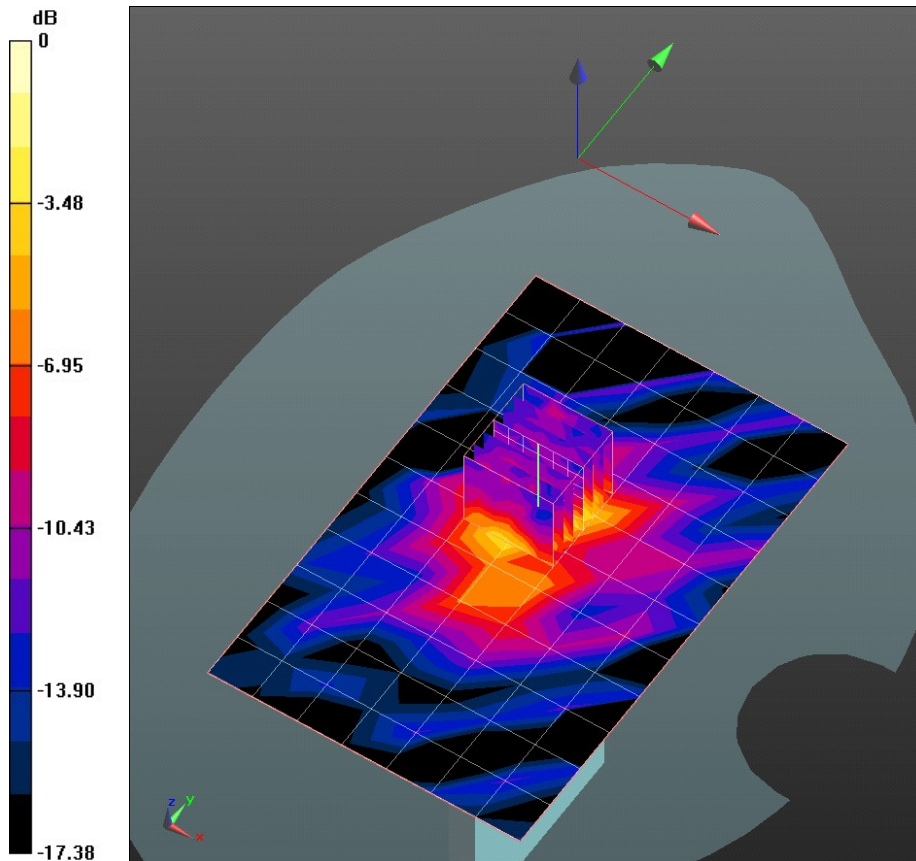
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 2.413 V/m

Peak SAR (extrapolated) = 0.054 W/kg

SAR(1 g) = 0.031 mW/g; SAR(10 g) = 0.015 mW/g



0 dB = 0.040mW/g

PCTEST ENGINEERING LABORATORY, INC

DUT: GT-S8600; Type: Portable Handset; Serial: R24B853847N

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

Medium parameters used (interpolated): $f = 2437$ MHz; $\sigma = 1.968$ mho/m; $r = 52.396$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 09-23-2011; Ambient Temp: 22.5 °C; Tissue Temp: 19.9 °C

- Probe: EX3DV4 - SN3662; ConvF(7, 7, 7); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Mode: 802.11b, 1Mbps, Right, Mid.ch

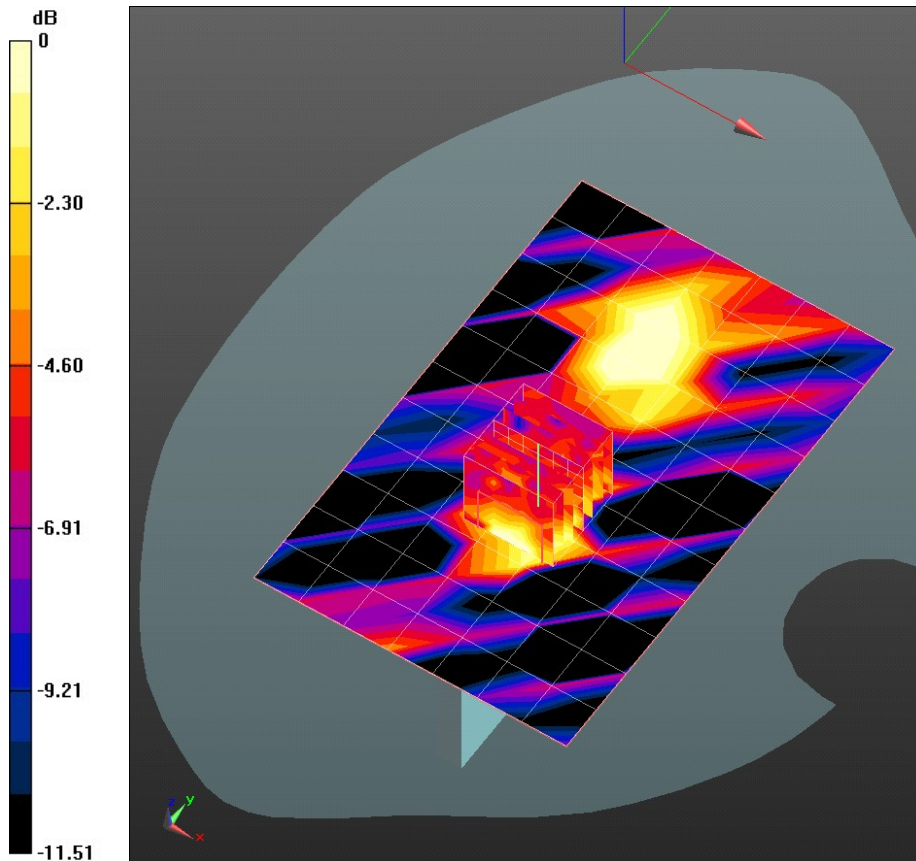
Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 1.490 V/m

Peak SAR (extrapolated) = 0.019 W/kg

SAR(1 g) = 0.012 mW/g; SAR(10 g) = 0.00724 mW/g



0 dB = 0.010mW/g

PCTEST ENGINEERING LABORATORY, INC

2450 MHz Body Verification

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

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

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.98$ mho/m, $\epsilon_r = 52.36$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Test Date: 09-24-2011; Ambient Temp: 22.5 °C; Tissue Temp: 19.9 °C

- Probe: EX3DV4 - SN3662; ConvF(7, 7, 7); Calibrated: 3/21/2011
- Sensor-Surface: 4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn1217; Calibrated: 3/9/2011
- Phantom: SAM 1; Type: SAM Twin Phantom; Serial: TP-1554
- DASY52 52.6.2(482); SEMCAD X 14.4.5(3634)

Area Scan (7x7x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (5x5x8)/Cube 0: Measurement grid: dx=7.5mm, dy=7.5mm, dz=4mm

Input Power = 20 dBm (100 mW)

SAR(1 g) = 5.18 mW/g; SAR(10 g) = 2.51 mW/g

Deviation = 0.97%

