



# PCTEST ENGINEERING LABORATORY, INC.

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## SAR EVALUATION REPORT

**Applicant Name:**  
LG Electronics MobileComm U.S.A  
1000 Sylvan Avenue  
Englewood Cliffs, NJ 07632  
United States

**Date of Testing:**  
11/12/12 - 11/19/12  
**Test Site/Location:**  
PCTEST Lab, Columbia, MD, USA  
**Document Serial No.:**  
0Y1211121633.ZNF

**FCC ID:** ZNFUN160

**APPLICANT:** LG ELECTRONICS MOBILECOMM U.S.A

**DUT Type:** Portable Handset  
**Application Type:** Certification  
**FCC Rule Part(s):** CFR §2.1093  
**Model(s):** LG-UN160, UN160, LGUN160, LG-UN161, UN161, LGUN161  
**Test Device Serial No.:** Pre-Production [S/N: 001, 002]

Band & Mode	Tx Frequency	Conducted Power [dBm]	SAR	
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)
Cell. CDMA	824.70 - 848.31 MHz	24.80	1.15	0.40
AWS CDMA	1711.25 - 1753.75 MHz	24.97	0.56	0.50
PCS CDMA	1851.25 - 1908.75 MHz	25.10	0.71	0.55
Bluetooth	2402 - 2480 MHz	9.94	N/A	

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

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



<b>FCC ID:</b> ZNFUN160		<b>SAR EVALUATION REPORT</b>		<b>Reviewed by:</b> Quality Manager
<b>Document S/N:</b> 0Y1211121633.ZNF	<b>Test Dates:</b> 11/12/12 - 11/19/12	<b>DUT Type:</b> Portable Handset		Page 1 of 26

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

1	DEVICE UNDER TEST .....	3
2	INTRODUCTION .....	5
3	SAR MEASUREMENT SETUP .....	6
4	DOSIMETRIC ASSESSMENT .....	7
5	DEFINITION OF REFERENCE POINTS .....	8
6	TEST CONFIGURATION POSITIONS FOR HANDSETS .....	9
7	FCC RF EXPOSURE LIMITS.....	12
8	FCC MEASUREMENT PROCEDURES.....	13
9	RF CONDUCTED POWERS.....	15
10	SYSTEM VERIFICATION.....	16
11	SAR DATA SUMMARY .....	18
12	FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS.....	21
13	EQUIPMENT LIST .....	22
14	MEASUREMENT UNCERTAINTIES .....	23
15	CONCLUSION.....	24
16	REFERENCES .....	25

<b>FCC ID:</b> ZNFUN160		<b>SAR EVALUATION REPORT</b>		<b>Reviewed by:</b> Quality Manager
<b>Document S/N:</b> 0Y1211121633.ZNF	<b>Test Dates:</b> 11/12/12 - 11/19/12	<b>DUT Type:</b> Portable Handset	Page 2 of 26	

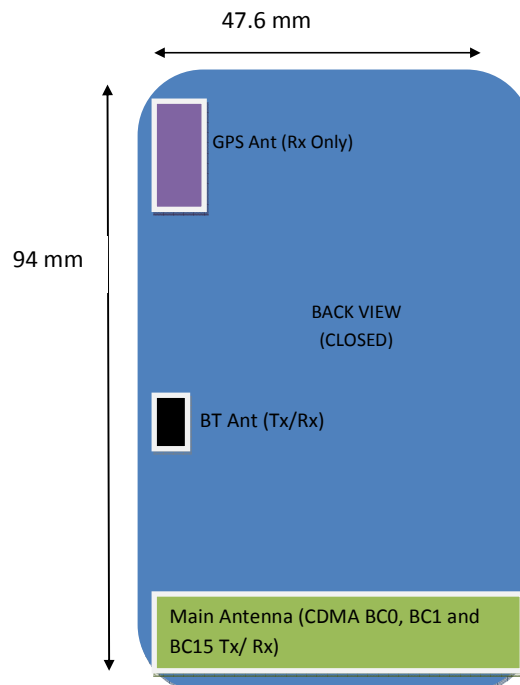
# 1 DEVICE UNDER TEST

## 1.1 Device Overview

Band & Mode	Tx Frequency
Cell. CDMA	824.70 - 848.31 MHz
AWS CDMA	1711.25 - 1753.75 MHz
PCS CDMA	1851.25 - 1908.75 MHz
Bluetooth	2402 - 2480 MHz

## 1.2 DUT Antenna Locations

**Figure 1-1**  
**DUT Antenna Locations**





## 1.3 SAR Test Exclusions Applied

### (A) BT

The separation between the main antenna and the Bluetooth Antenna is 13 mm.

RF Conducted Power of Bluetooth Tx is 9.86 mW (Please refer to the EMC DSS Report for a full set of Bluetooth conducted powers).

Per KDB Publication 648474, **Bluetooth SAR was not required** based on the maximum conducted power, the Bluetooth to main antenna separation distance and Body-SAR of the main antenna.



FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 3 of 26

## 1.4 Power Reduction for SAR

There is no power reduction for any band/mode implemented in this device for SAR purposes.

## 1.5 FCC Guidance Applied

- FCC OET Bulletin 65 Supplement C [June 2001]
- IEEE 1528-2003
- FCC KDB 941225 (2G/3G)
- FCC KDB 648474 (Simultaneous)

<b>FCC ID:</b> ZNFUN160		<b>SAR EVALUATION REPORT</b>		<b>Reviewed by:</b> Quality Manager
<b>Document S/N:</b> 0Y1211121633.ZNF	<b>Test Dates:</b> 11/12/12 - 11/19/12	<b>DUT Type:</b> Portable Handset		Page 4 of 26

## 2 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.

### 2.1 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 ( $\rho$ ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 2-1).

Equation 2-1  
SAR Mathematical Equation

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



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

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

where:

- $\sigma$  = conductivity of the tissue-simulating material (S/m)
- $\rho$  = mass density of the tissue-simulating material ( $\text{kg/m}^3$ )
- 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: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 5 of 26

## 3 SAR MEASUREMENT SETUP

### 3.1 Automated SAR Measurement System

Measurements are performed using the DASY automated dosimetric SAR assessment system. The DASY 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 [www.speag.com](http://www.speag.com) for more information about the specification of the SAR assessment system.





**Figure 3-1**  
SAR Measurement System



**Figure 3-2**  
Near-Field Probe

**Table 3-1**  
Composition of the Tissue Equivalent Matter

Frequency (MHz)	835	835	1750	1750	1900	1900
Tissue	Head	Body	Head	Body	Head	Body
Ingredients (% by weight)						
Bactericide	0.1	0.1				
DGBE			47	31	44.92	29.44
HEC	1	1				
NaCl	1.45	0.94	0.4	0.2	0.18	0.39
Sucrose	57	44.9				
Water	40.45	53.06	52.6	68.8	54.9	70.17

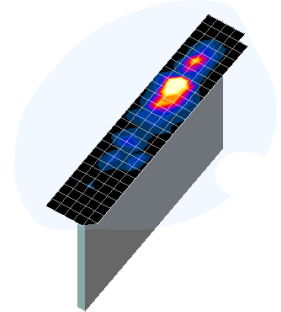
FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 6 of 26

## 4 DOSIMETRIC ASSESSMENT



### 4.1 Measurement Procedure

The evaluation was performed using the following procedure:

1. The SAR distribution at the exposed side of the head or body 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 device-head interface and the horizontal grid resolution was 15mm and 15mm for frequencies < 3 GHz in the x and y directions respectively. When applicable, for frequencies above 3 GHz, a 10 mm by 10 mm resolution was used.
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 the 1 gram cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak 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 at least 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 online 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 to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.



**Figure 4-1**  
**Sample SAR Area Scan**

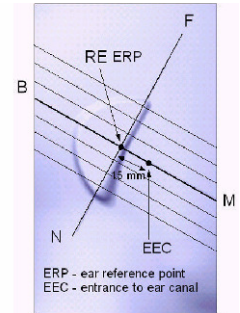
FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 7 of 26

# 5

## DEFINITION OF REFERENCE POINTS

### 5.1 EAR REFERENCE POINT

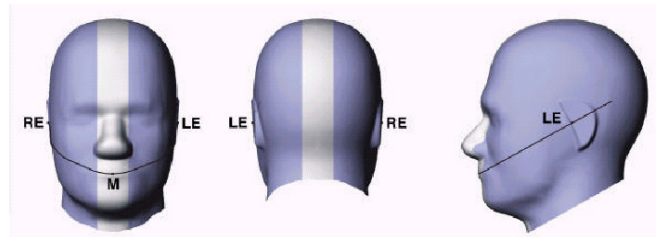
Figure 5-2 shows the front, back and side views of the SAM Twin Phantom. The point “M” is the reference point for the center of the mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERP is 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5-1. 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 5-2). 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].



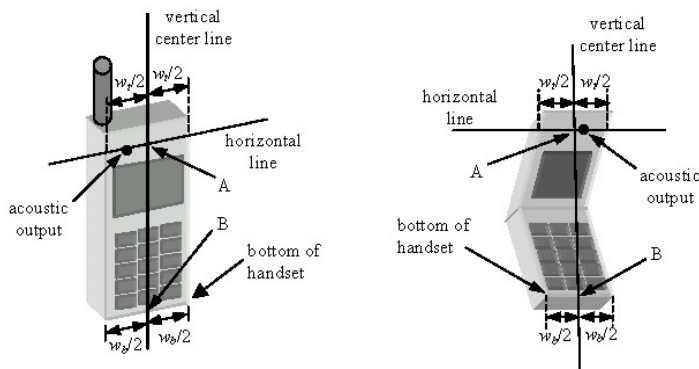
**Figure 5-1**  
Close-Up Side view of ERP

### 5.2 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 5-3). 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 5-2**  
Front, back and side view of SAM Twin Phantom



**Figure 5-3**  
Handset Vertical Center & Horizontal Line Reference Points

FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 8 of 26



## 6 TEST CONFIGURATION POSITIONS FOR HANDSETS

### 6.1 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  $\delta = 0.02$ .

### 6.2 Positioning for Cheek/Touch

1. The test device was positioned with the handset close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6-1), 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.

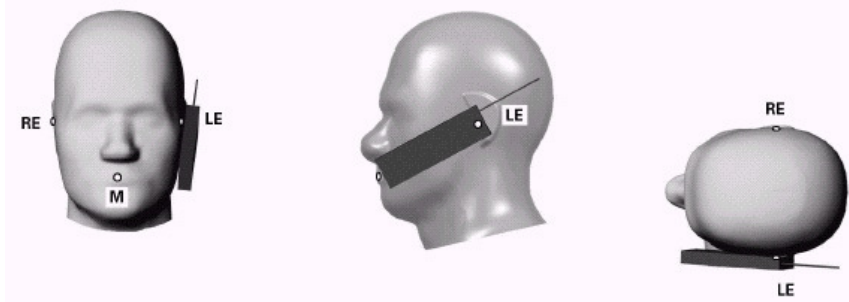




Figure 6-1 Front, Side and Top View of Cheek/Touch Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the ear.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the plane normal to MB-NF including the line MB (reference plane).
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical with respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the phone contact with the ear, the handset was rotated about the line NF until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 6-2).

### 6.3 Positioning for Ear / 15° Tilt

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

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degrees.
2. The phone was then rotated around the horizontal line by 15 degrees.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6-2).

FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 9 of 26

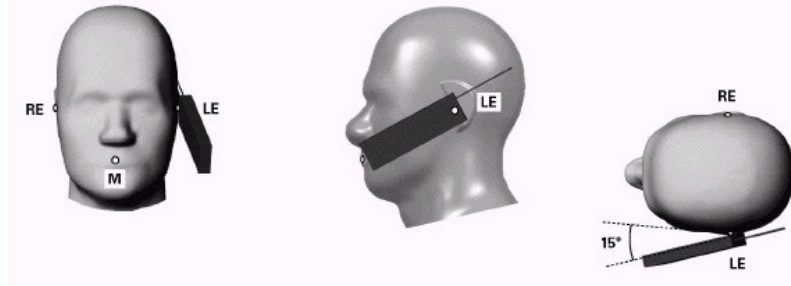


Figure 6-2 Front, Side and Top View of Ear/15° Tilt Position

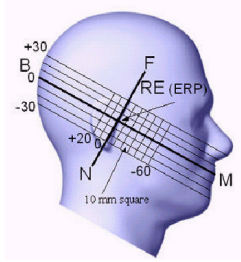


Figure 6-3 Side view w/ relevant markings



Figure 6-4 Body SAR Sample Photo (Not Actual EUT)

## 6.4 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.

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 latest IEEE 1528 committee developments propose the usage of a tilted phantom when the antenna of the phone is mounted at the bottom or in all cases the peak absorption is in the chin region. Both SAM heads of the TwinSAM-Chin20 are rotated 20 degrees around the NF line. Each head can be removed individually from the table for emptying and cleaning.

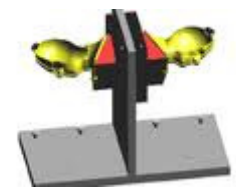




Figure 6-5 Twin SAM Chin20



## 6.5 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-4). A device with a headset output is tested with a headset connected to the device.

FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 10 of 26

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: ZNFUN160		SAR EVALUATION REPORT	 Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset	Page 11 of 26

# 7 FCC RF EXPOSURE LIMITS

## 7.1 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.



## 7.2 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 7-1  
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: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 12 of 26

## 8 FCC MEASUREMENT PROCEDURES

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

### 8.1 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. If the power drift deviated by more than 5%, the SAR test and drift measurements were repeated.

### 8.2 SAR Measurement Conditions for CDMA2000

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

#### 8.2.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by "SAR Measurement Procedures for 3G Devices" v02, October 2007. Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in the "All Up" condition.

1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1, Table 8-1 parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH<sub>0</sub> and demodulation of RC 3,4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2, Table 8-2 was applied.
5. FCHs were configured at full rate for maximum SAR with "All Up" power control bits.

**Table 8-1**  
Parameters for Max. Power for RC1



Parameter	Units	Value
$I_{or}$	dBm/1.23 MHz	-104
$\frac{Pilot E_c}{I_{or}}$	dB	-7
$\frac{Traffic E_c}{I_{or}}$	dB	-7.4

**Table 8-2**  
Parameters for Max. Power for RC3

Parameter	Units	Value
$I_{or}$	dBm/1.23 MHz	-86
$\frac{Pilot E_c}{I_{or}}$	dB	-7
$\frac{Traffic E_c}{I_{or}}$	dB	-7.4

#### 8.2.2 Head SAR Measurements



SAR for head exposure configurations is measured in RC3 with the DUT configured to transmit at full rate using Loopback Service Option SO55. SAR for RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1 using the exposure configuration that results in the highest SAR for that channel in RC3.

FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 13 of 26

### 8.2.3 Body SAR Measurements

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCH<sub>n</sub>) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCH<sub>n</sub>) with FCH at full rate and SCH<sub>0</sub> enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts. Body SAR was measured using TDSO / SO32 with power control bits in the “All Up”

Body SAR in RC1 is not required when the maximum average output of each channel is less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel in RC1; with Loopback Service Option SO55, at full rate, using the body exposure configuration that results in the highest SAR for that channel in RC3.

<b>FCC ID:</b> ZNFUN160	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>SAR EVALUATION REPORT</b>	 <b>LG</b>	<b>Reviewed by:</b> Quality Manager
<b>Document S/N:</b> 0Y1211121633.ZNF	<b>Test Dates:</b> 11/12/12 - 11/19/12	<b>DUT Type:</b> Portable Handset	Page 14 of 26	

# 9 RF CONDUCTED POWERS

## 9.1 CDMA Conducted Powers

Band	Channel	Frequency	SO55 [dBm]	SO55 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]
	F-RC	MHz	RC1	RC3	FCH+SCH	FCH
Cellular	1013	824.7	24.66	24.76	24.60	24.61
	384	836.52	24.63	24.75	24.57	24.59
	777	848.31	24.60	24.80	24.51	24.60
AWS	25	1711.25	24.97	24.99	25.01	25.07
	450	1732.5	24.94	24.93	24.95	24.97
	875	1753.75	24.90	24.89	24.90	24.99
PCS	25	1851.25	25.06	24.94	25.05	25.11
	600	1880	25.04	24.91	25.00	25.10
	1175	1908.75	24.97	25.07	25.01	25.04

Note: RC1 is only applicable for IS-95 compatibility.

Per KDB Publication 941225 D01:

1. Head SAR was tested with SO55 RC3. SO55 RC1 was not required since the average output power was not more than 0.25 dB than the SO55 RC3 powers.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. TDSO / SO32 FCH+SCH SAR tests were not required since the average output power was not more than 0.25 dB higher than the TDSO / SO32 FCH only powers.



**Figure 9-1**  
Power Measurement Setup

FCC ID: ZNFUN160	PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 15 of 26

# 10 SYSTEM VERIFICATION

## 10.1 Tissue Verification

**Table 10-1  
Measured Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, $\sigma$ (S/m)	Measured Dielectric Constant, $\epsilon$	TARGET Conductivity, $\sigma$ (S/m)	TARGET Dielectric Constant, $\epsilon$	% dev $\sigma$	% dev $\epsilon$
11/14/2012	835H	20.9	820	0.908	42.61	0.898	41.571	1.11%	2.50%
			835	0.913	42.19	0.900	41.500	1.44%	1.66%
			850	0.929	42.08	0.916	41.500	1.42%	1.40%
11/19/2012	1750H	23.1	1710	1.377	38.41	1.348	40.136	2.15%	-4.30%
			1750	1.419	38.24	1.370	40.100	3.58%	-4.64%
			1790	1.459	38.08	1.394	40.020	4.66%	-4.85%
11/13/2012	1900H	23.1	1850	1.373	40.29	1.400	40.000	-1.93%	0.72%
			1880	1.422	40.01	1.400	40.000	1.57%	0.02%
			1910	1.444	39.97	1.400	40.000	3.14%	-0.08%
11/13/2012	835B	23.0	820	0.960	55.65	0.969	55.258	-0.93%	0.71%
			835	0.976	55.58	0.970	55.200	0.62%	0.69%
			850	0.997	55.50	0.988	55.154	0.91%	0.63%
11/17/2012	1750B	22.5	1710	1.493	54.52	1.460	53.540	2.26%	1.83%
			1750	1.532	54.34	1.490	53.430	2.82%	1.70%
			1790	1.577	54.18	1.510	53.330	4.44%	1.59%
11/12/2012	1900B	22.4	1850	1.525	50.92	1.520	53.300	0.33%	-4.47%
			1880	1.551	50.86	1.520	53.300	2.04%	-4.58%
			1910	1.580	50.82	1.520	53.300	3.95%	-4.65%

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).

## 10.2 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  $\epsilon$  can be calculated from the below equation (Pournaropoulos and Misra):

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

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,  $r^2 = \rho^2 + \rho'^2 - 2\rho\rho'\cos\phi'$ ,  $\omega$  is the angular frequency, and  $j = \sqrt{-1}$ .

FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 16 of 26

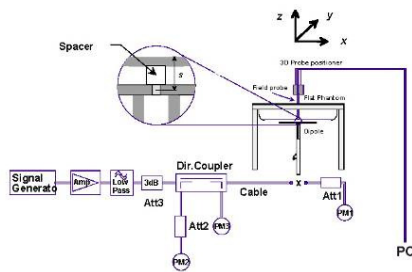


### 10.3 Test System Verification

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 10-2  
System Verification Results**

System Verification TARGET & MEASURED											
Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR <sub>1g</sub> (W/kg)	1 W Target SAR <sub>1g</sub> (W/kg)	1 W Normalized SAR <sub>1g</sub> (W/kg)	Deviation (%)
835	Head	11/14/2012	23.4	21.7	0.100	4d132	3213	0.947	9.450	9.470	0.21%
1750	Head	11/19/2012	24.6	23.0	0.100	1008	3209	3.76	36.400	37.600	3.30%
1900	Head	11/13/2012	23.6	22.1	0.100	5d149	3263	4.22	39.300	42.200	7.38%
835	Body	11/13/2012	24.1	23.2	0.100	4d026	3209	1.01	9.580	10.100	5.43%
1750	Body	11/17/2012	24.1	23.2	0.100	1008	3258	3.57	37.400	35.700	-4.55%
1900	Body	11/12/2012	22.7	21.1	0.100	5d149	3288	4.04	39.300	40.400	2.80%



**Figure 10-1  
System Verification Setup Diagram**



**Figure 10-2  
System Verification Setup Photo**

FCC ID: ZNFUN160	PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 17 of 26

# 11 SAR DATA SUMMARY



## 11.1 Standalone Head SAR Data

**Table 11-1  
Cell. CDMA Head SAR Results**

MEASUREMENT RESULTS								
FREQUENCY		Mode/Band	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	SAR (1g)
MHz	Ch.							(W/kg)
824.70	1013	Cell. CDMA	24.76	0.09	Right	Cheek	001	0.987
836.52	384	Cell. CDMA	24.75	-0.01	Right	Cheek	001	1.150
848.31	777	Cell. CDMA	24.80	0.01	Right	Cheek	001	1.130
836.52	384	Cell. CDMA	24.75	-0.04	Right	Tilt	001	0.495
824.70	1013	Cell. CDMA	24.76	-0.03	Left	Cheek	001	1.020
836.52	384	Cell. CDMA	24.75	0.13	Left	Cheek	001	1.130
848.31	777	Cell. CDMA	24.80	0.02	Left	Cheek	001	1.140
836.52	384	Cell. CDMA	24.75	0.19	Left	Tilt	001	0.495
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram			

**Table 11-2  
AWS CDMA Head SAR Results**

MEASUREMENT RESULTS								
FREQUENCY		Mode/Band	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	SAR (1g)
MHz	Ch.							(W/kg)
1732.50	450	AWS CDMA	24.93	0.00	Right	Cheek	001	0.508
1732.50	450	AWS CDMA	24.93	0.01	Right	Tilt	001	0.298
1732.50	450	AWS CDMA	24.93	-0.19	Left	Cheek	001	0.563
1732.50	450	AWS CDMA	24.93	0.05	Left	Tilt	001	0.297
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram			

FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 18 of 26



**Table 11-3  
PCS CDMA Head SAR Results**

<b>MEASUREMENT RESULTS</b>								
FREQUENCY		Mode/Band	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	SAR (1g)
MHz	Ch.							(W/kg)
1880.00	600	PCS CDMA	24.91	-0.20	Right	Cheek	001	0.708
1880.00	600	PCS CDMA	24.91	0.03	Right	Tilt	001	0.250
1880.00	600	PCS CDMA	24.91	-0.06	Left	Cheek	001	0.709
1880.00	600	PCS CDMA	24.91	0.19	Left	Tilt	001	0.260
<b>ANSI / IEEE C95.1 1992 - SAFETY LIMIT</b>					<b>Head</b>			
<b>Spatial Peak</b>					<b>1.6 W/kg (mW/g)</b>			
<b>Uncontrolled Exposure/General Population</b>					averaged over 1 gram			

## 11.2 Standalone Body-Worn SAR Data

**Table 11-4  
Licensed Transmitter Body-Worn SAR Results**

<b>MEASUREMENT RESULTS</b>									
FREQUENCY		Mode	Service	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Side	SAR (1g)
MHz	Ch.								(W/kg)
836.52	384	Cell. CDMA	TDSO / SO32	24.59	0.15	1.5 cm	002	back	0.395
1732.50	450	AWS CDMA	TDSO / SO32	24.97	0.01	1.5 cm	002	back	0.502
1880.00	600	PCS CDMA	TDSO / SO32	25.10	0.11	1.5 cm	002	back	0.551
<b>ANSI / IEEE C95.1 1992 - SAFETY LIMIT</b>						<b>Body</b>			
<b>Spatial Peak</b>						<b>1.6 W/kg (mW/g)</b>			
<b>Uncontrolled Exposure/General Population</b>						averaged over 1 gram			

FCC ID: ZNFUN160	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>SAR EVALUATION REPORT</b>		<b>Reviewed by:</b> Quality Manager
<b>Document S/N:</b> 0Y1211121633.ZNF	<b>Test Dates:</b> 11/12/12 - 11/19/12	<b>DUT Type:</b> Portable Handset		Page 19 of 26



### 11.3 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR value with the position set in a typical configuration. Test procedures used were according to FCC/OET Bulletin 65, Supplement C [June 2001].
2. Batteries are fully charged for all readings. The standard battery was used.
3. Tissue parameters and temperatures are listed on the SAR plots.
4. Liquid tissue depth was at least 15.0 cm. To confirm the proper SAR liquid depth, the z-axis plots from the system verifications were included since the system verifications were performed using the same liquid, probe and DAE as the SAR tests in the same time period.
5. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical, and thermal characteristics and are within operational tolerances expected for production units.
6. Per FCC/OET Bulletin 65 Supplement C and Public Notice DA-02-1438, if the SAR measured at the middle channel for each test configuration is at least 3.0 dB lower than the SAR limit, testing at the high and low channels is optional for such test configuration(s).
7. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 15 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
8. It was confirmed that all SAR results remain compliant when scaled to the maximum tune-up tolerance levels.

CDMA Notes:

1. Head SAR for CDMA2000 mode was tested under RC3/SO55 per KDB Publication 941225 D01.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. TDSO / SO32 FCH+SCH SAR tests were not required since the average output power was not more than 0.25 dB higher than the TDSO / SO32 FCH only powers.
3. AWS CDMA SAR was measured with a probe calibrated at 1750 MHz and is valid for measuring SAR from  $\pm 50$  MHz. The 1750MHz specific liquid was verified with specific probe calibration factors as required per FCC KDB Publication 450824 D01.

FCC ID: ZNFUN160		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset	Page 20 of 26	

# 12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

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

## 12.2 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 12-1**  
Output Power Thresholds for Unlicensed Transmitters

	Individual Transmitter	Simultaneous Transmission
<b>Licensed Transmitters</b>	<u>Routine evaluation required</u>	<b>SAR not required:</b> <u>Unlicensed only</u>
<b>Unlicensed Transmitters</b>	<p><u>When there is no simultaneous transmission –</u></p> <ul style="list-style-type: none"> <li>output <math>\leq 60</math>/f: SAR not required</li> <li>output <math>&gt; 60</math>/f: stand-alone SAR required</li> </ul> <p><u>When there is simultaneous transmission –</u></p> <p><u>Stand-alone SAR not required when</u></p> <ul style="list-style-type: none"> <li>output <math>\leq 2 \cdot P_{Ref}</math> and antenna is <math>\geq 5.0</math> cm from other antennas</li> <li>output <math>\leq P_{Ref}</math> and antenna is <math>\geq 2.5</math> cm from other antennas</li> <li>output <math>\leq P_{Ref}</math> and antenna is <math>&lt; 2.5</math> cm from other antennas, each with either output power <math>\leq P_{Ref}</math> or 1-g SAR <math>&lt; 1.2</math> W/kg</li> </ul> <p><u>Otherwise stand-alone SAR is required</u></p> <p><u>When stand-alone SAR is required</u></p> <ul style="list-style-type: none"> <li>test SAR on highest output channel for each wireless mode and exposure condition</li> <li>if SAR for highest output channel is <math>&gt; 50\%</math> of SAR limit, evaluate all channels according to normal procedures</li> </ul>	<ul style="list-style-type: none"> <li>when stand-alone 1-g SAR is not required and antenna is <math>\geq 5</math> cm from other antennas</li> </ul> <p><u>Licensed &amp; Unlicensed</u></p> <ul style="list-style-type: none"> <li>when the sum of the 1-g SAR is <math>&lt; 1.6</math> W/kg for all simultaneous transmitting antennas</li> <li>when SAR to peak location separation ratio of simultaneous transmitting antenna pair is <math>&lt; 0.3</math></li> </ul> <p><b>SAR required:</b></p> <p><u>Licensed &amp; Unlicensed</u></p> <p>antenna pairs with SAR to peak location separation ratio <math>\geq 0.3</math>; 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><b>Note: simultaneous transmission exposure conditions for head and body can be different for different style phones; therefore, different test requirements may apply</b></p>

**Figure 12-2**  
SAR Evaluation Requirements for Multiple Transmitter Handsets

## 12.3 Simultaneous Transmission Conclusion



Per KDB Publication 648474, standalone Bluetooth SAR tests were not required. Therefore, no further analysis was required to determine that simultaneous transmission scenarios would exceed the SAR limit.

FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 21 of 26

# 13 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/10/2012	Annual	10/10/2013	1833460
Gigatronics	8651A	Universal Power Meter	10/10/2012	Annual	10/10/2013	8650319
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	NRVD	Dual Channel Power Meter	10/12/2012	Biennial	10/12/2014	101695
Rohde & Schwarz	NRV-Z32	Peak Power Sensor	10/12/2012	Biennial	10/12/2014	836019/013
SPEAG	D1765V2	1765 MHz SAR Dipole	5/18/2012	Annual	5/18/2013	1008
SPEAG	D835V2	835 MHz SAR Dipole	8/23/2012	Annual	8/23/2013	4d026
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/19/2012	Annual	4/19/2013	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/20/2012	Annual	2/20/2013	649
SPEAG	ES3DV3	SAR Probe	4/24/2012	Annual	4/24/2013	3213
SPEAG	ES3DV3	SAR Probe	3/16/2012	Annual	3/16/2013	3209
Rohde & Schwarz	SMIQ03B	Signal Generator	4/5/2012	Annual	4/5/2013	DE27259
Anritsu	MA2411B	Power Sensor	3/5/2012	Annual	3/5/2013	846215
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	5318
Agilent	8648D	Signal Generator	4/3/2012	Annual	4/3/2013	3629U00687
Anritsu	ML2438A	Power Meter	10/11/2012	Annual	10/11/2013	1070030
Agilent	E5515C	Wireless Communications Test Set	2/14/2012	Annual	2/14/2013	GB43304447
Agilent	E5515C	Wireless Communications Tester	4/4/2012	Annual	4/4/2013	US41140256
Control Company	61220-416	Long-Stem Thermometer	2/15/2011	Biennial	2/15/2013	111331323
VWR	36934-158	Wall-Mounted Thermometer	1/21/2011	Biennial	1/21/2013	111286454
SPEAG	ES3DV3	SAR Probe	2/21/2012	Annual	2/21/2013	3258
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Agilent	E5515C	Wireless Communications Test Set	9/24/2012	Annual	9/24/2013	GB43163447
SPEAG	ES3DV3	SAR Probe	5/18/2012	Annual	5/18/2013	3263
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/18/2012	Annual	1/18/2013	1272
Agilent	85070E	Dielectric Probe Kit	3/8/2012	Annual	3/8/2013	MY44300633
Anritsu	MT8820C	Radio Communication Tester	11/6/2012	Annual	11/6/2013	6200901190
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Control Company	61220-416	Long-Stem Thermometer	7/1/2011	Biennial	7/1/2013	111642834
VWR	36934-158	Wall-Mounted Thermometer	9/30/2011	Biennial	9/30/2013	111859323
VWR	36934-158	Wall-Mounted Thermometer	9/30/2011	Biennial	9/30/2013	111859332
Agilent	E5515C	Wireless Communications Test Set	2/9/2012	Annual	2/9/2013	GB43460554
Agilent	E5515C	Wireless Communications Test Set	10/18/2012	Biennial	10/18/2014	GB43193563
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Intelligent Weigh	PD-3000	Electronic Balance	3/27/2012	Annual	3/27/2013	11081534
Control Company	36934-158	Wall-Mounted Thermometer	1/4/2012	Biennial	1/4/2014	122014497
Control Company	36934-158	Wall-Mounted Thermometer	1/4/2012	Biennial	1/4/2014	122014488
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/19/2012	Annual	9/19/2013	1323
Seekonk	NC-100	Torque Wrench (8" lb)	3/5/2012	Triennial	3/5/2015	N/A
SPEAG	D1900V2	1900 MHz SAR Dipole	2/22/2012	Annual	2/22/2013	5d149
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Agilent	85047A	S-Parameter Test Set	N/A	N/A	N/A	2904A00579
COMTECH	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M155A00-009
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/7/2012	Annual	5/7/2013	1334
VWR	62344-925	Mini-Thermometer	10/24/2011	Biennial	10/24/2013	111886430
VWR	62344-925	Mini-Thermometer	10/24/2011	Biennial	10/24/2013	111886443
SPEAG	DAK-3.5	Dielectric Assessment Kit	6/19/2012	Annual	6/19/2013	1070
Rohde & Schwarz	SME06	Signal Generator	10/11/2012	Annual	10/11/2013	832026
SPEAG	ES3DV3	SAR Probe	9/20/2012	Annual	9/20/2013	3288
SPEAG	D835V2	835 MHz SAR Dipole	2/3/2012	Annual	2/3/2013	4d132



Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, attenuator, amplifier, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path. The power meter offset was then adjusted to compensate for the measurement system losses. This level offset is stored within the power meter before measurements are made. This calibration verification procedure applies to the system verification and output power measurements. The calibrated reading is then taken directly from the power meter after compensation of the losses for all final power measurements.

FCC ID: ZNFUN160	 PCTEST Engineering Laboratory, Inc.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 22 of 26

# 14 MEASUREMENT UNCERTAINTIES

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k	
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c <sub>i</sub> 1gm	c <sub>i</sub> 10 gms	1gm u <sub>i</sub> (± %)	10gms u <sub>i</sub> (± %)	v <sub>i</sub>	
<b>Measurement System</b>										
Probe Calibration	E.2.1	6.0	N	1	1.0	1.0	6.0	6.0	∞	
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞	
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞	
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞	
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞	
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞	
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞	
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞	
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞	
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞	
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞	
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞	
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞	
<b>Test Sample Related</b>										
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287	
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞	
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞	
<b>Phantom &amp; Tissue Parameters</b>										
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞	
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞	
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6	
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞	
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6	
<b>Combined Standard Uncertainty (k=1)</b>							RSS	12.1	11.7	299
<b>Expanded Uncertainty</b> (95% CONFIDENCE LEVEL)							k=2	24.2	23.5	

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



FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 23 of 26

## 15 CONCLUSION

### 15.1 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]

<b>FCC ID:</b> ZNFUN160	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>SAR EVALUATION REPORT</b>	 <b>LG</b>	<b>Reviewed by:</b> Quality Manager
<b>Document S/N:</b> 0Y1211121633.ZNF	<b>Test Dates:</b> 11/12/12 - 11/19/12	<b>DUT Type:</b> Portable Handset	Page 24 of 26	





## 16 REFERENCES

- [1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.
- [2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.
- [3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.
- [4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.
- [5] Federal Communications Commission, OET Bulletin 65 (Edition 97-01), Supplement C (Edition 01-01), Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields, June 2001.
- [6] IEEE Standards Coordinating Committee 34 – IEEE Std. 1528-2003, Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Body Due to Wireless Communications Devices.
- [7] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.
- [8] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.
- [9] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 120-124.
- [10] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.
- [11] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.
- [12] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Head Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.
- [13] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.
- [14] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.
- [15] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.
- [16] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.
- [17] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

FCC ID: ZNFUN160	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 LG	Reviewed by: Quality Manager
Document S/N: 0Y1211121633.ZNF	Test Dates: 11/12/12 - 11/19/12	DUT Type: Portable Handset		Page 25 of 26

- [18] Federal Communications Commission, OET Bulletin 65, Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields. Supplement C, Dec. 1997.
- [19] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.
- [20] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.
- [21] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hochschule Zürich, Dosimetric Evaluation of the Cellular Phone.
- [22] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), Feb. 2005.
- [23] Industry Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 4, March 2010.
- [24] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2009
- [25] FCC Public Notice DA-02-1438. Office of Engineering and Technology Announces a Transition Period for the Phantom Requirements of Supplement C to OET Bulletin 65, June 19, 2002
- [26] FCC SAR Measurement Procedures for 3G Devices KDB Publication 941225
- [27] SAR Measurement procedures for IEEE 802.11a/b/g KDB Publication 248227
- [28] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publication 648474
- [29] FCC Application Note for SAR Probe Calibration and System Verification Consideration for Measurements at 150 MHz – 3 GHz, KDB Publication 450824
- [30] FCC SAR Evaluation Considerations for Laptop Computers with Antennas Built-in on Display Screens, KDB Publication 616217
- [31] FCC SAR Measurement Requirements for 3 – 6 GHz, KDB Publication 865664
- [32] FCC Mobile Portable RF Exposure Procedure, KDB Publication 447498
- [33] FCC SAR Procedures for Dongle Transmitters, KDB Publication 447498
- [34] Anexo à Resolução No. 533, de 10 de Setembro de 2009.
- [35] FCC SAR Test Considerations for LTE Handsets and Data Modems, KDB Publication 941225.
- [36] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.
- [37] FCC Hot Spot SAR v01, KDB Publication 941225 D06.

<b>FCC ID:</b> ZNFUN160		<b>SAR EVALUATION REPORT</b>		<b>Reviewed by:</b> Quality Manager
<b>Document S/N:</b> 0Y1211121633.ZNF	<b>Test Dates:</b> 11/12/12 - 11/19/12	<b>DUT Type:</b> Portable Handset	Page 26 of 26	

## APPENDIX A: SAR TEST DATA

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$ ;  $\sigma = 0.915 \text{ mho/m}$ ;  $\epsilon_r = 42.179$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 11-14-2012; Ambient Temp: 23.4°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: SAM Right; Type: QD000P40CD; Serial: 1686

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

**Mode: Cell. CDMA, Right Head, Cheek, Mid.ch**

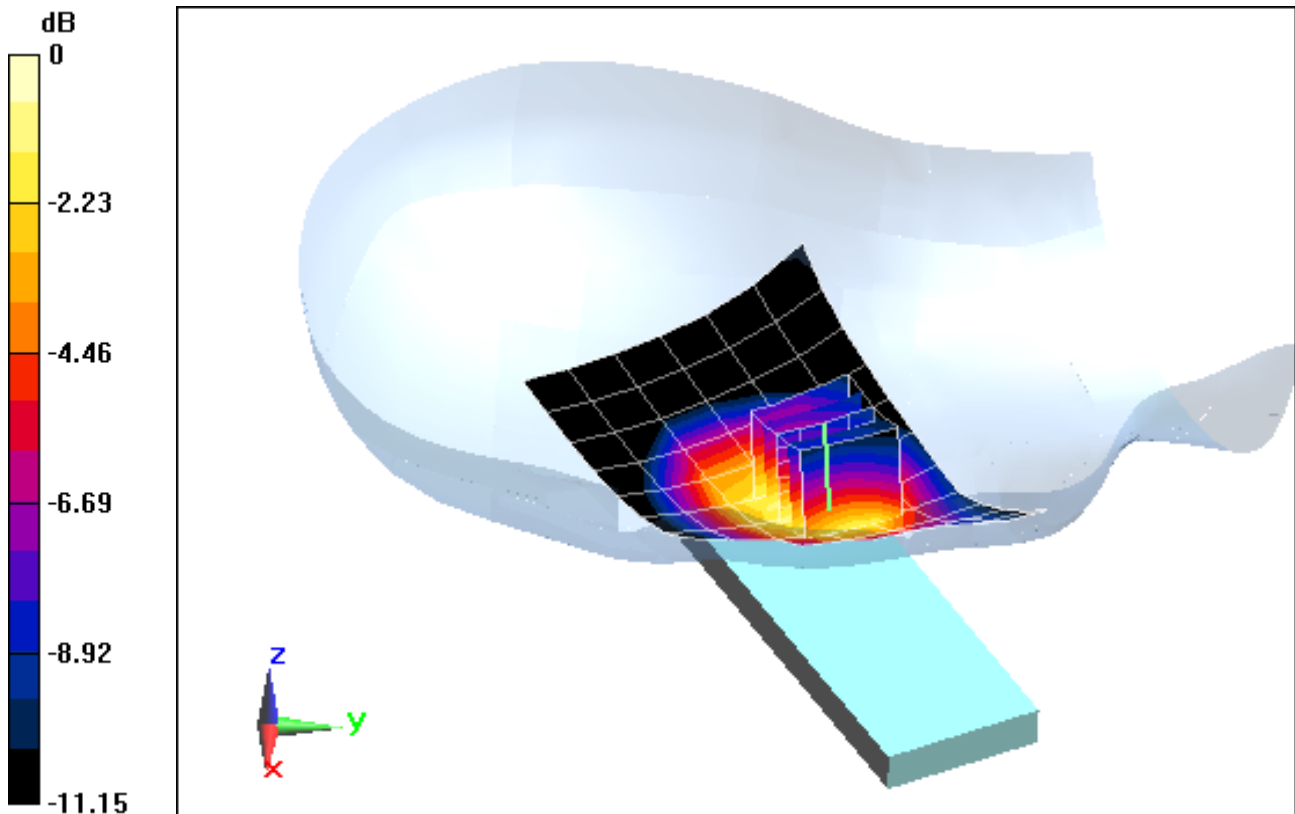
**Area Scan (7x12x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 35.719 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.739 mW/g

**SAR(1 g) = 1.15 mW/g**



0 dB = 1.24 mW/g = 1.87 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$ ;  $\sigma = 0.915 \text{ mho/m}$ ;  $\epsilon_r = 42.179$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 11-14-2012; Ambient Temp: 23.4°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: SAM Right; Type: QD000P40CD; Serial: 1686

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

**Mode: Cell. CDMA, Right Head, Tilt, Mid.ch**

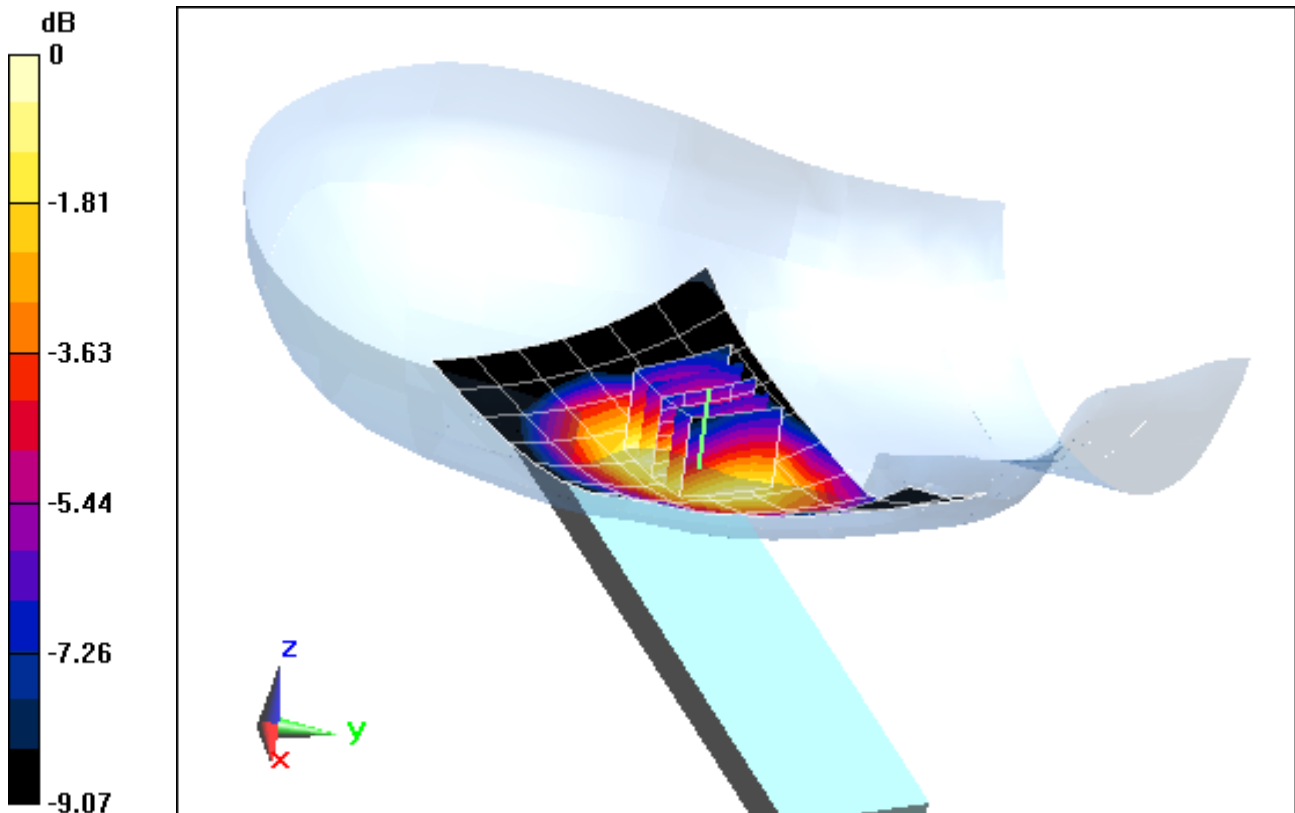
**Area Scan (7x12x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.787 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.611 mW/g

**SAR(1 g) = 0.495 mW/g**



0 dB = 0.520 mW/g = -5.68 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: CDMA; Frequency: 848.31 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 848.31 \text{ MHz}$ ;  $\sigma = 0.927 \text{ mho/m}$ ;  $\epsilon_r = 42.092$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 11-14-2012; Ambient Temp: 23.4°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: SAM Right; Type: QD000P40CD; Serial: 1686

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

**Mode: Cell. CDMA, Left Head, Cheek, High.ch**

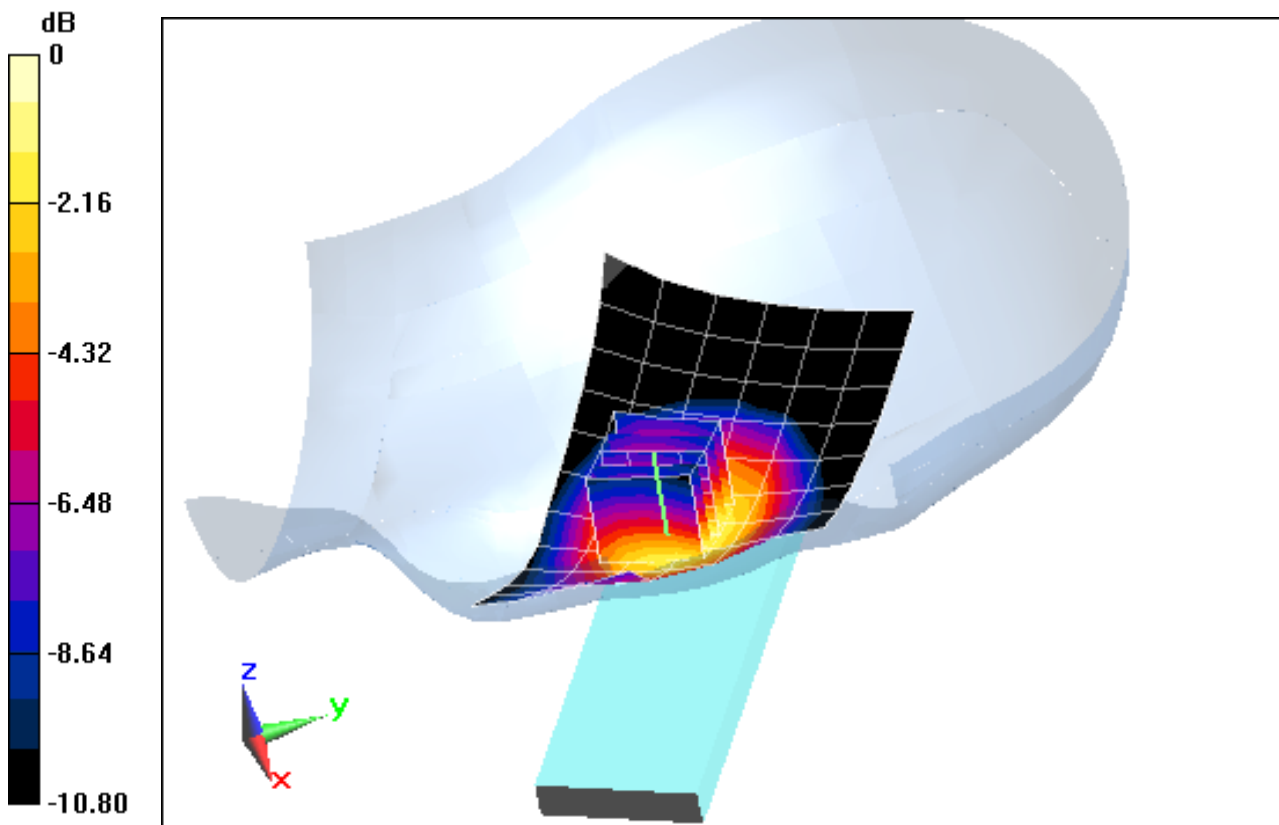
**Area Scan (7x14x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 36.838 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.618 mW/g

**SAR(1 g) = 1.14 mW/g**



0 dB = 1.22 mW/g = 1.73 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$ ;  $\sigma = 0.915 \text{ mho/m}$ ;  $\epsilon_r = 42.179$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 11-14-2012; Ambient Temp: 23.4°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: SAM Right; Type: QD000P40CD; Serial: 1686

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

**Mode: Cell. CDMA, Left Head, Tilt, Mid.ch**

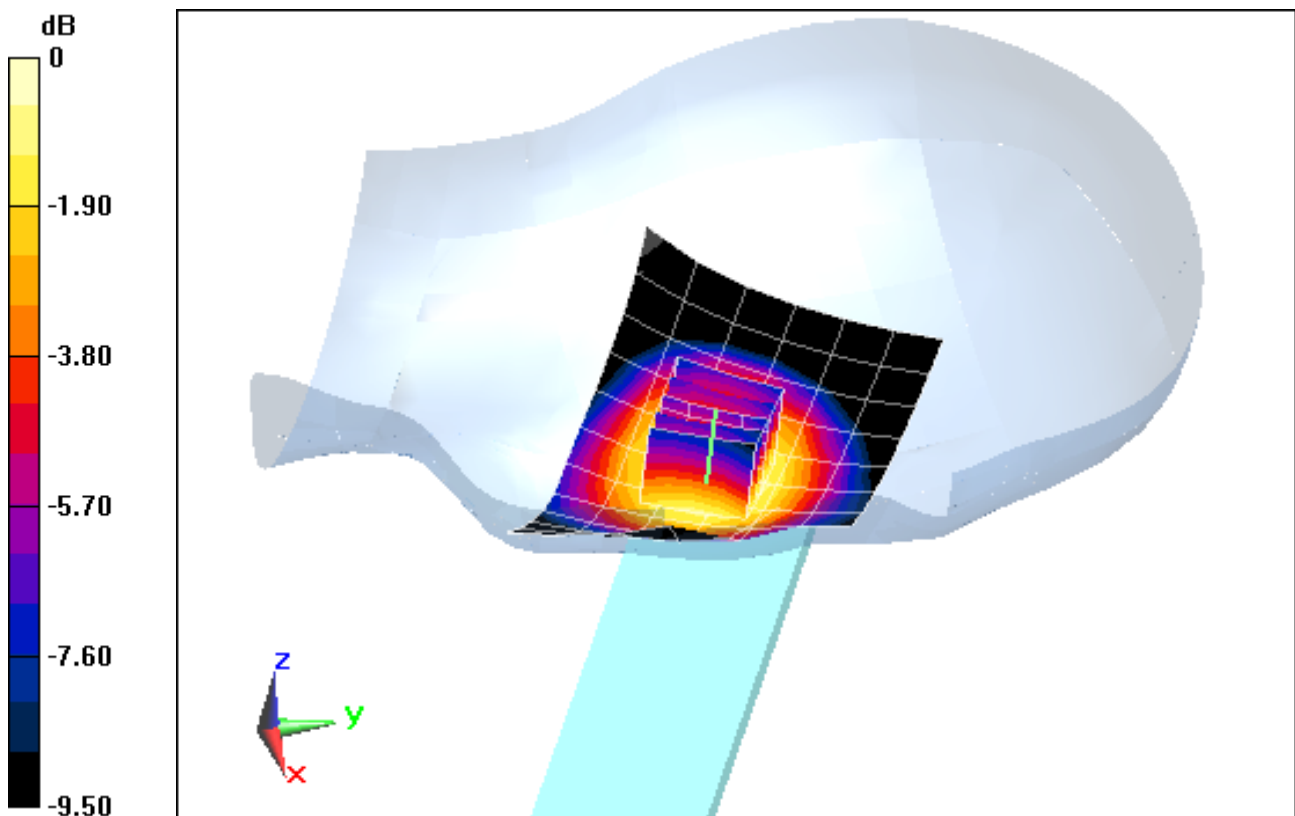
**Area Scan (7x12x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.580 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.604 mW/g

**SAR(1 g) = 0.495 mW/g**



0 dB = 0.516 mW/g = -5.75 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: AWS CDMA; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.401 \text{ mho/m}$ ;  $\epsilon_r = 38.314$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 11-19-2012; Ambient Temp: 24.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(5.26, 5.26, 5.26); Calibrated: 3/16/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/20/2012

Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

**Mode: AWS CDMA, Right Head, Cheek, Mid.ch**

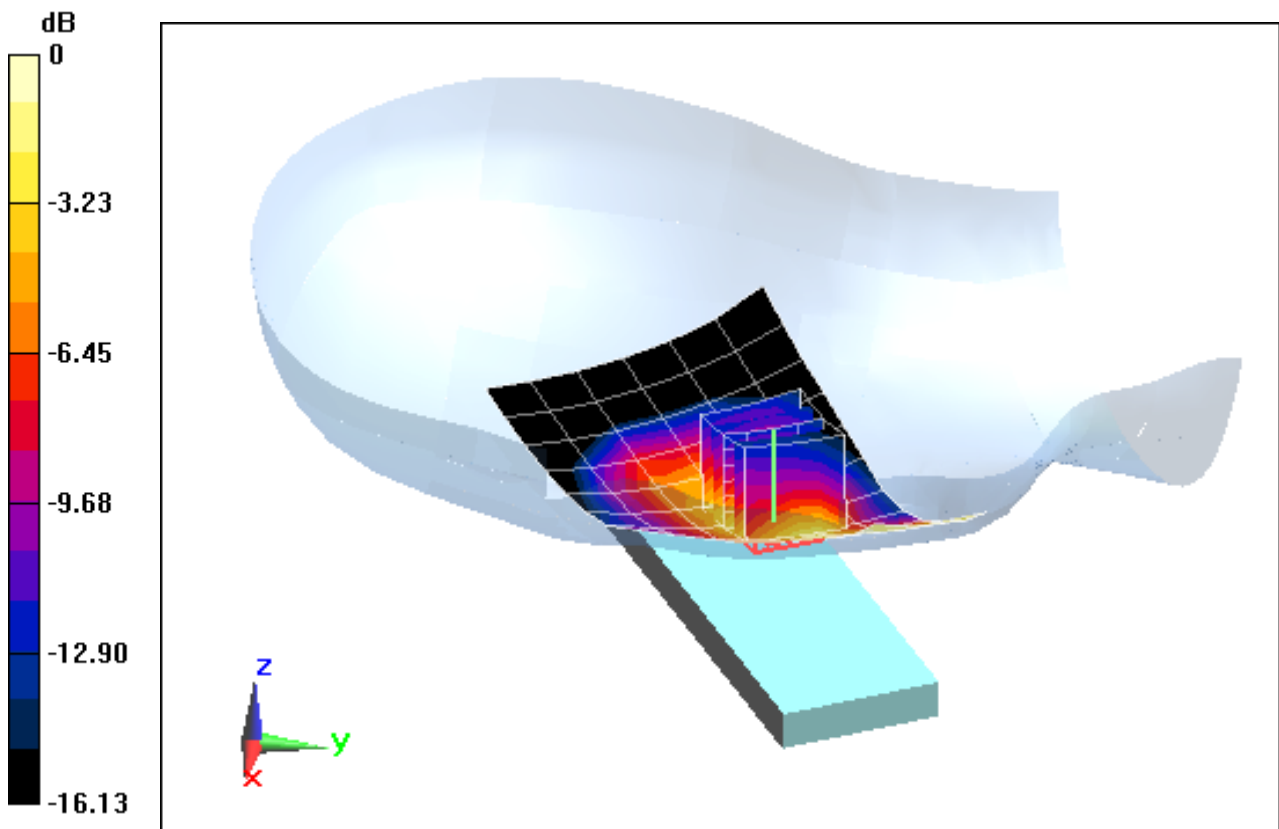
**Area Scan (7x14x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.213 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 0.856 mW/g

**SAR(1 g) = 0.508 mW/g; SAR(10 g) = 0.289 mW/g**



0 dB = 0.553 mW/g = -5.15 dB mW/g



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: AWS CDMA; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.401 \text{ mho/m}$ ;  $\epsilon_r = 38.314$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 11-19-2012; Ambient Temp: 24.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(5.26, 5.26, 5.26); Calibrated: 3/16/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/20/2012

Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

**Mode: AWS CDMA, Right Head, Tilt, Mid.ch**

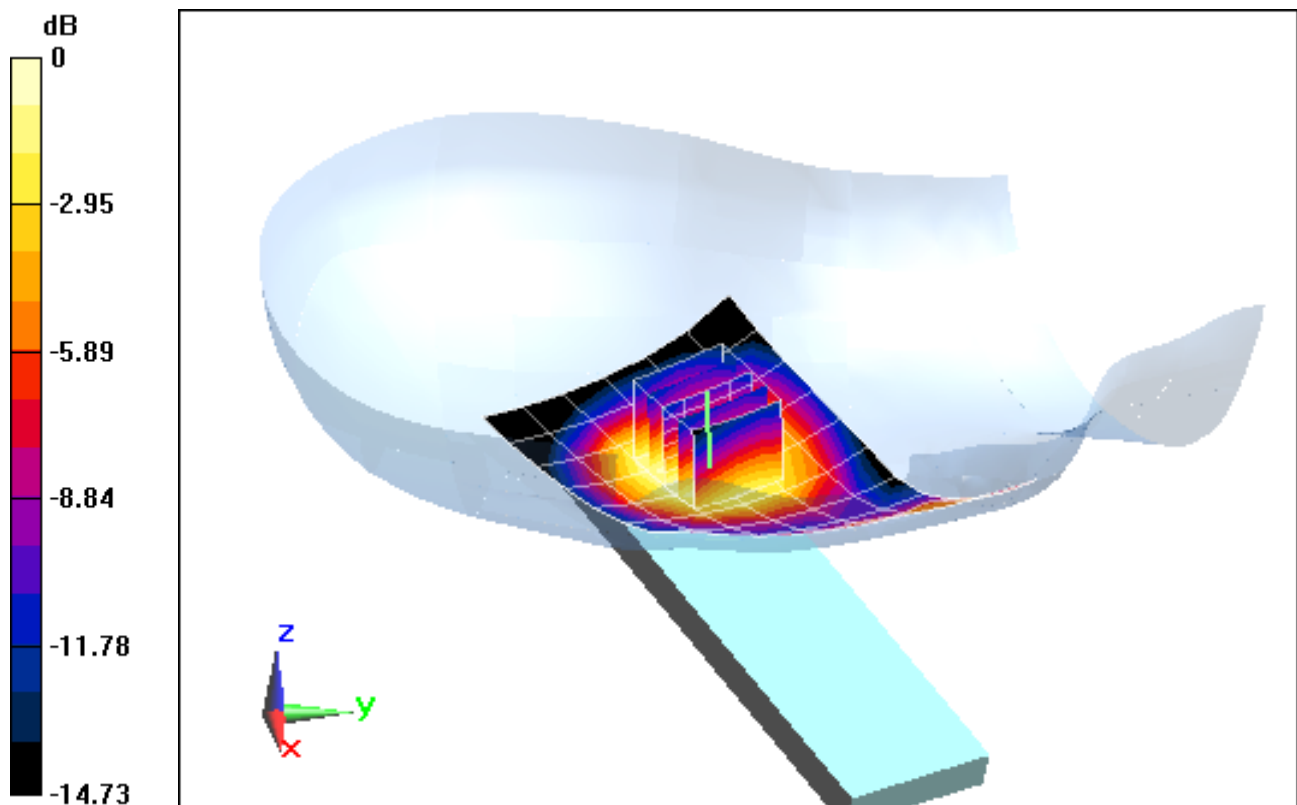
**Area Scan (7x14x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.731 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.439 mW/g

**SAR(1 g) = 0.298 mW/g; SAR(10 g) = 0.192 mW/g**



0 dB = 0.321 mW/g = -9.87 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: AWS CDMA; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5$  MHz;  $\sigma = 1.401$  mho/m;  $\epsilon_r = 38.314$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Left Section

Test Date: 11-19-2012; Ambient Temp: 24.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(5.26, 5.26, 5.26); Calibrated: 3/16/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/20/2012

Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

**Mode: AWS CDMA, Left Head, Cheek, Mid.ch**

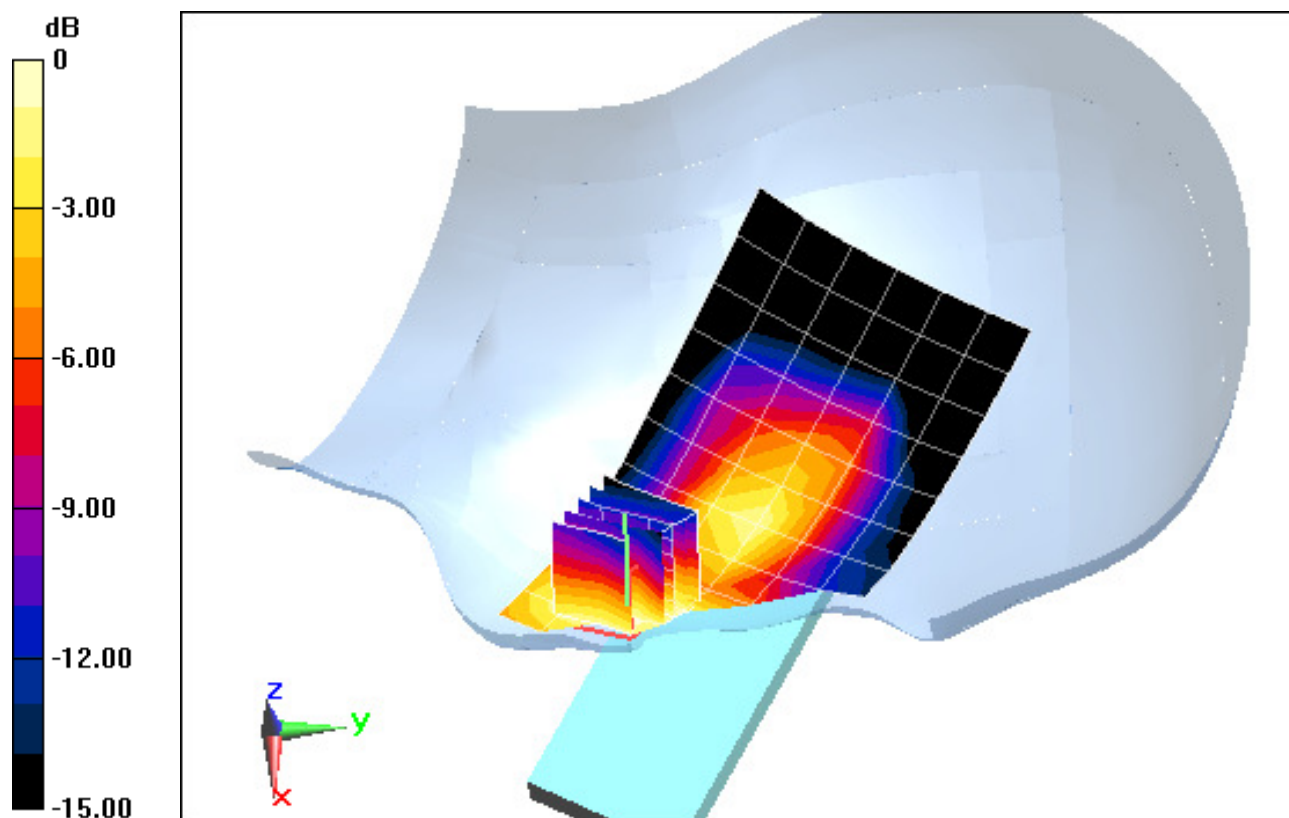
**Area Scan (7x14x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.271 V/m; Power Drift = -0.19 dB

Peak SAR (extrapolated) = 0.867 mW/g

**SAR(1 g) = 0.563 mW/g; SAR(10 g) = 0.350 mW/g**



0 dB = 0.611 mW/g = -4.28 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: AWS CDMA; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.401 \text{ mho/m}$ ;  $\epsilon_r = 38.314$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 11-19-2012; Ambient Temp: 24.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(5.26, 5.26, 5.26); Calibrated: 3/16/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/20/2012

Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

**Mode: AWS CDMA, Left Head, Tilt, Mid.ch**

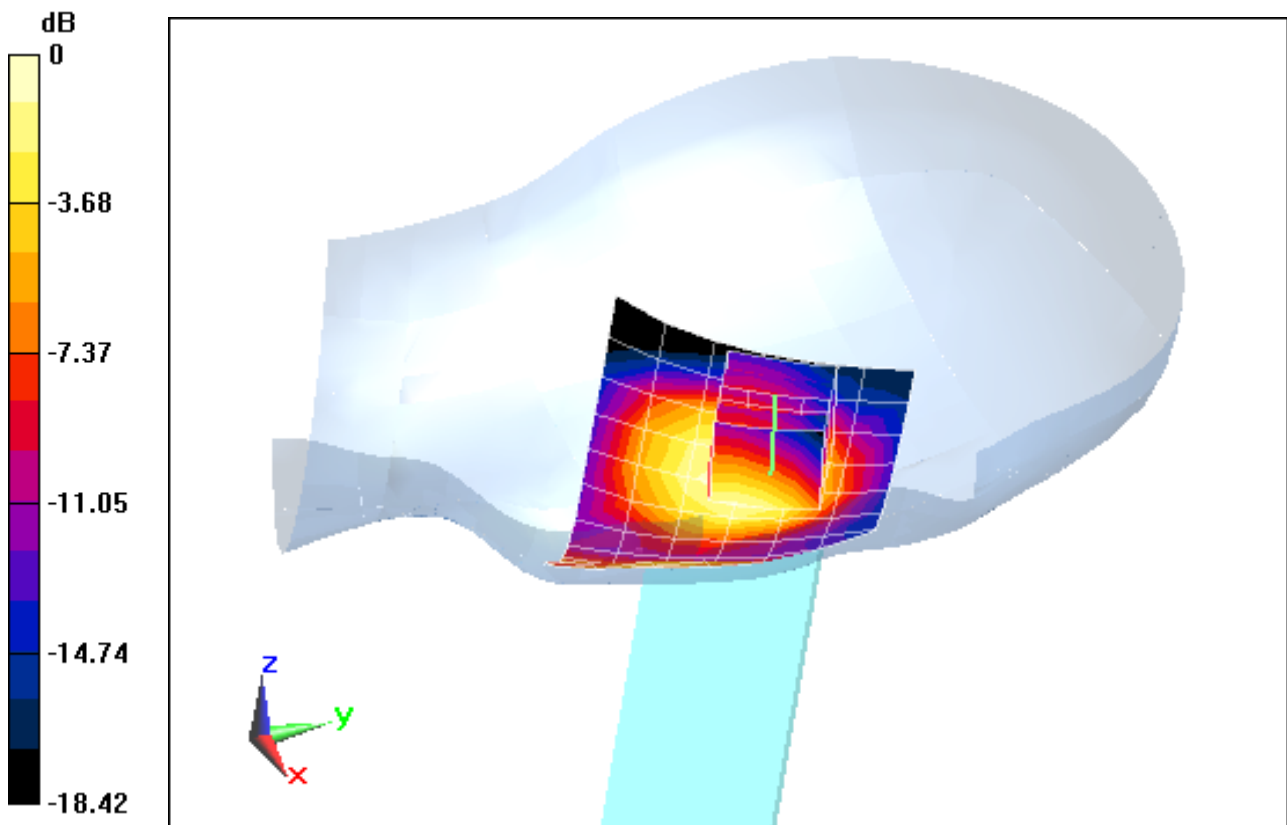
**Area Scan (7x14x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.950 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.445 mW/g

**SAR(1 g) = 0.297 mW/g; SAR(10 g) = 0.188 mW/g**



0 dB = 0.314 mW/g = -10.06 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.422 \text{ mho/m}$ ;  $\epsilon_r = 40.01$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 11-13-2012; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

**Mode: PCS CDMA, Right Head, Cheek, Mid.ch**

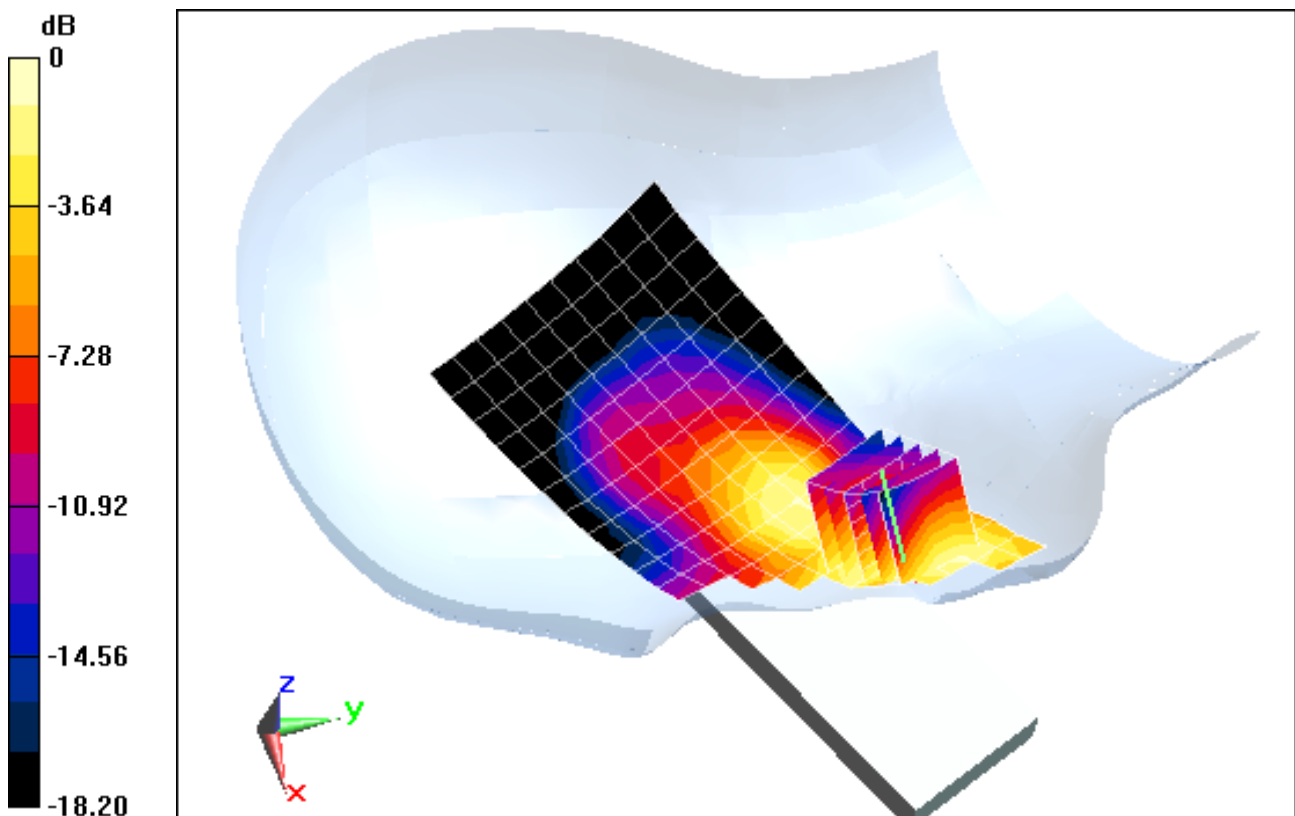
**Area Scan (10x18x1):** Measurement grid: dx=10mm, dy=10mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 22.613 V/m; Power Drift = -0.20 dB

Peak SAR (extrapolated) = 1.123 mW/g

**SAR(1 g) = 0.708 mW/g**



0 dB = 0.746 mW/g = -2.55 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.422 \text{ mho/m}$ ;  $\epsilon_r = 40.01$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 11-13-2012; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

**Mode: PCS CDMA, Right Head, Tilt, Mid.ch**

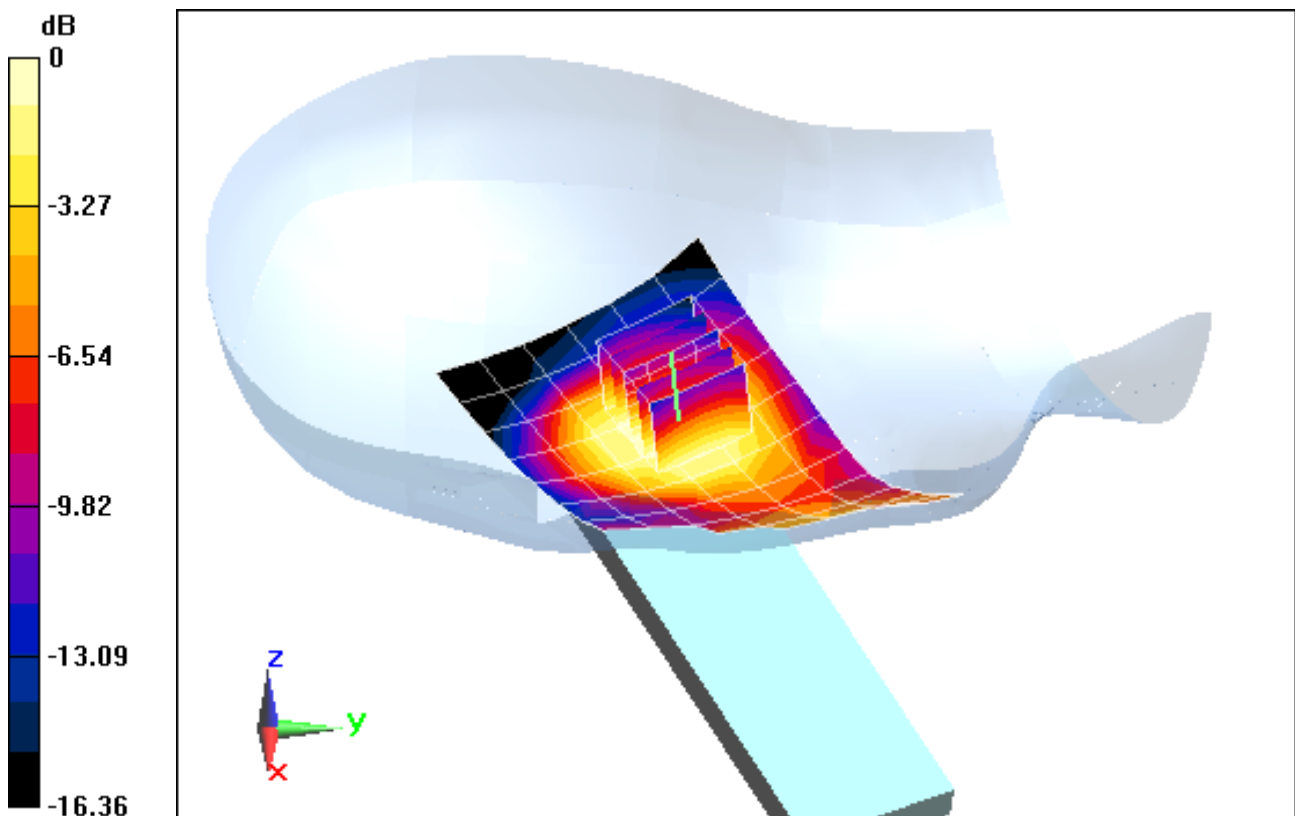
**Area Scan (7x12x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.524 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.368 mW/g

**SAR(1 g) = 0.250 mW/g**



0 dB = 0.266 mW/g = -11.50 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.422 \text{ mho/m}$ ;  $\epsilon_r = 40.01$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 11-13-2012; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

**Mode: PCS CDMA, Left Head, Cheek, Mid.ch**

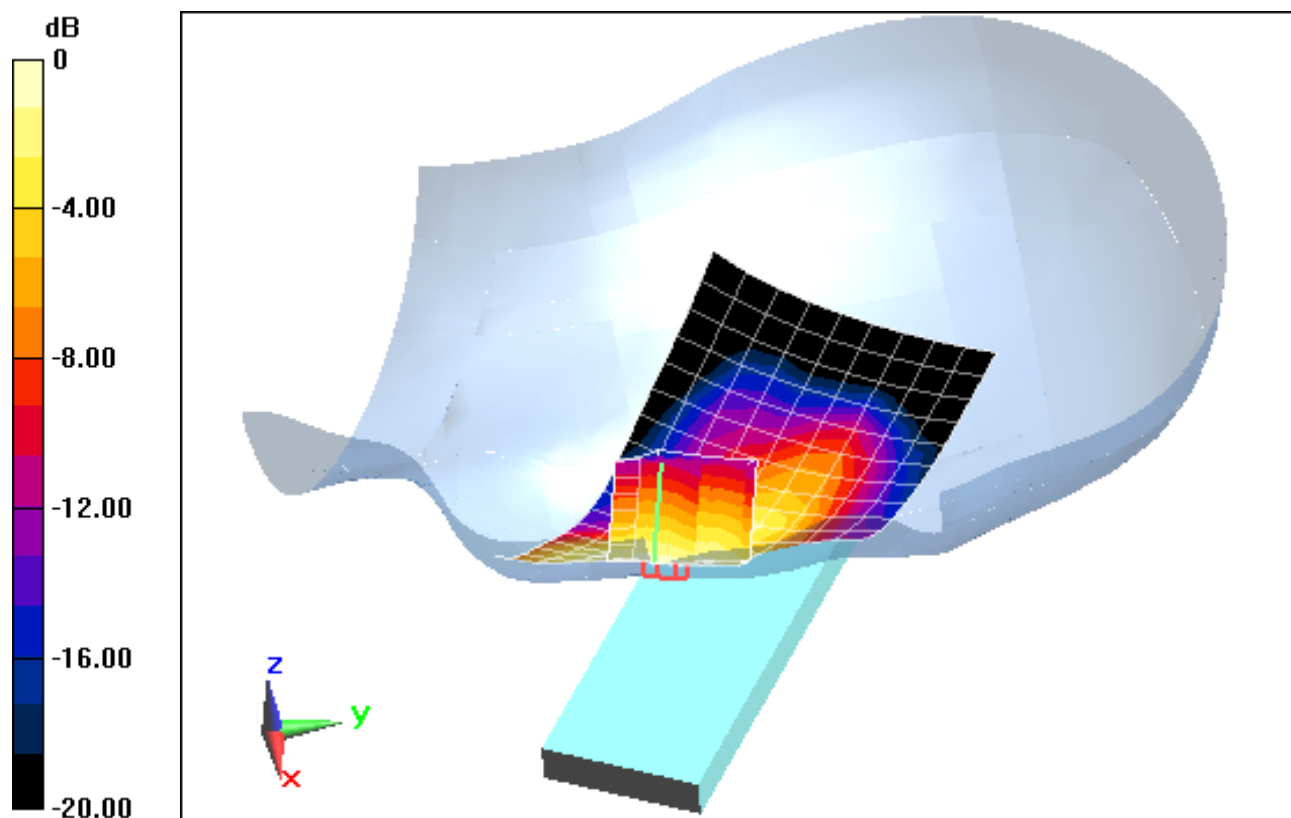
**Area Scan (10x20x1):** Measurement grid: dx=10mm, dy=10mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 23.384 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 1.059 mW/g

**SAR(1 g) = 0.709 mW/g**



0 dB = 0.758 mW/g = -2.41 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 001**

Communication System: CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.422 \text{ mho/m}$ ;  $\epsilon_r = 40.01$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 11-13-2012; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

**Mode: PCS CDMA, Left Head, Tilt, Mid.ch**

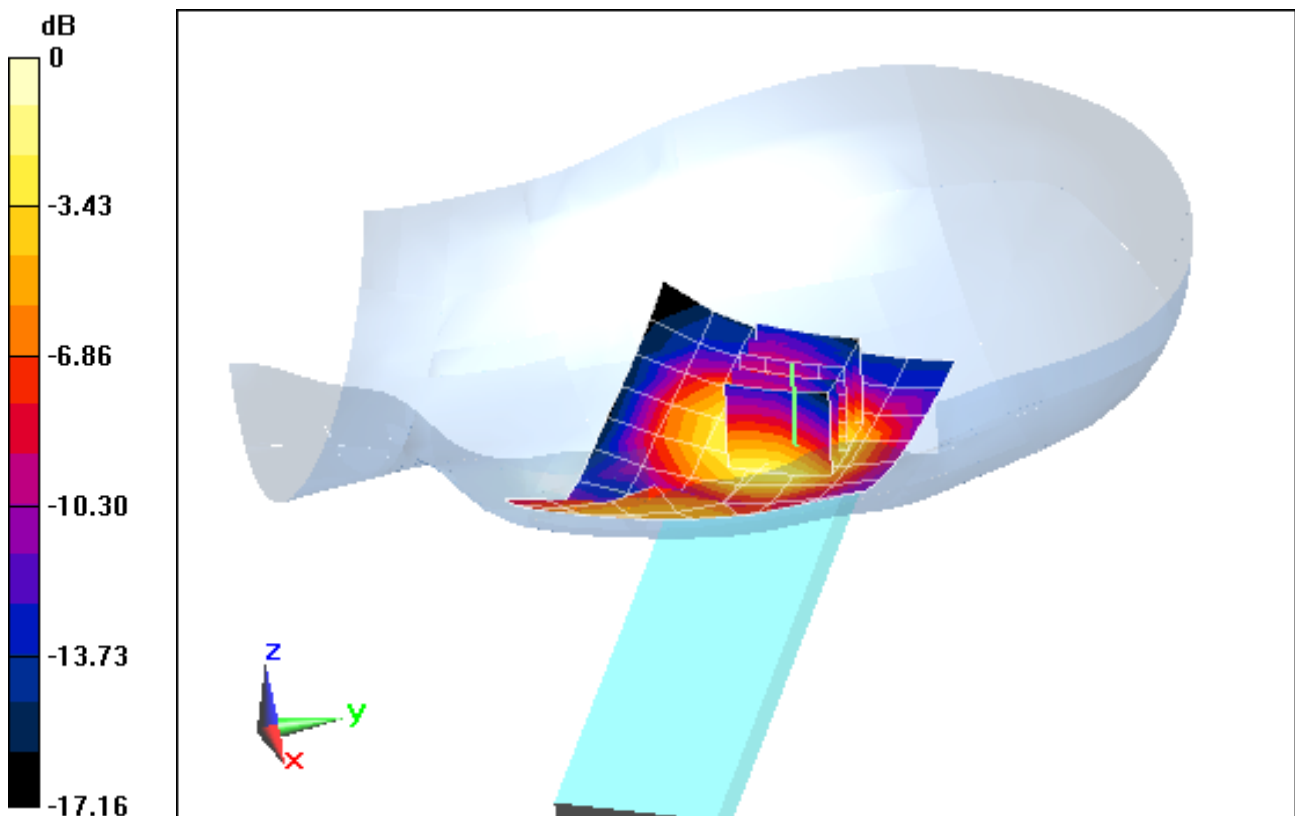
**Area Scan (7x12x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 12.875 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.405 mW/g

**SAR(1 g) = 0.260 mW/g**



0 dB = 0.283 mW/g = -10.96 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 002**

Communication System: Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$ ;  $\sigma = 0.978 \text{ mho/m}$ ;  $\epsilon_r = 55.572$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space 1.5 cm

Test Date: 11-13-2012; Ambient Temp: 24.1°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3209; ConvF(6.13, 6.13, 6.13); Calibrated: 3/16/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/20/2012

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

**Mode: Cellular CDMA, Body SAR, Back side, Mid.ch**

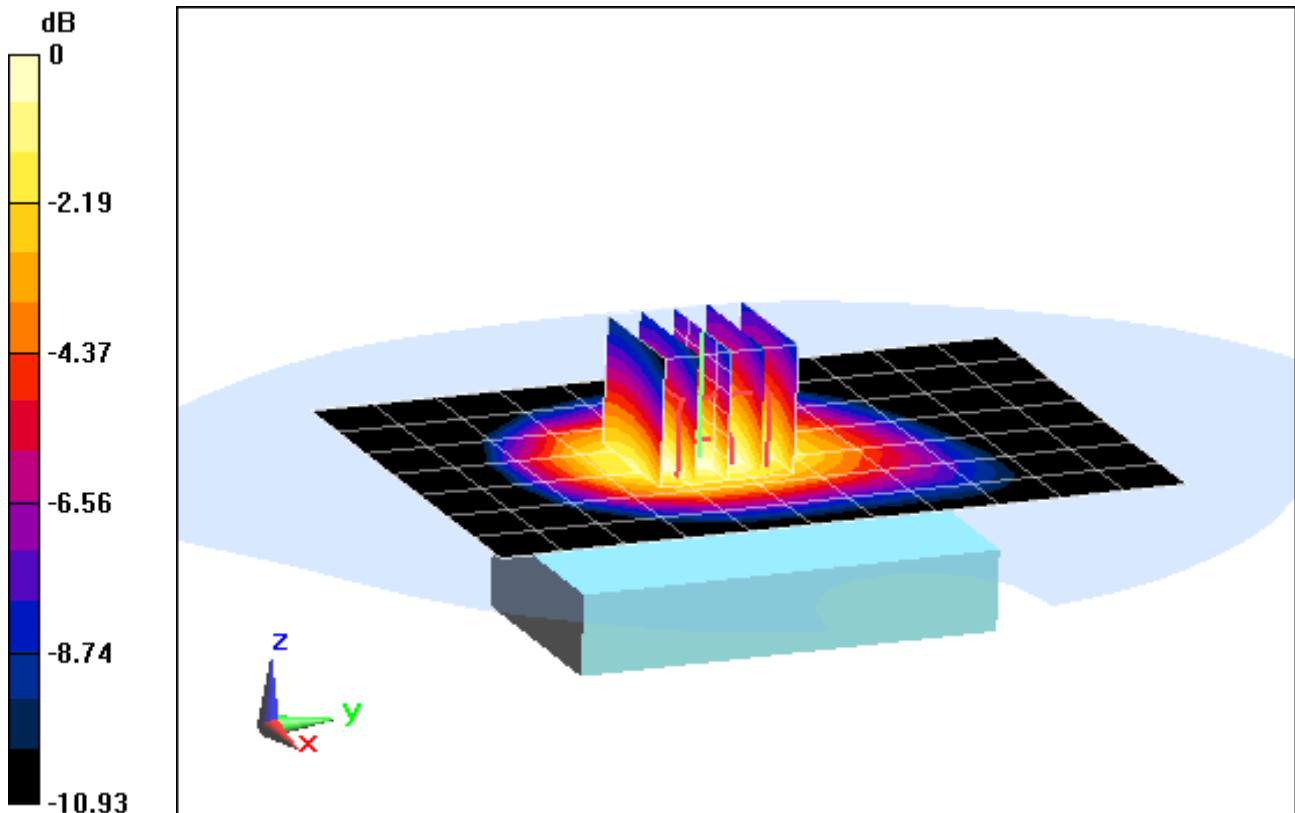
**Area Scan (8x12x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 21.425 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.522 mW/g

**SAR(1 g) = 0.395 mW/g; SAR(10 g) = 0.278 mW/g**



0 dB = 0.420 mW/g = -7.54 dB mW/g



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 002**

Communication System: AWS CDMA; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5$  MHz;  $\sigma = 1.515$  mho/m;  $\epsilon_r = 54.419$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-17-2012; Ambient Temp: 24.1°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3258; ConvF(4.99, 4.99, 4.99); Calibrated: 2/21/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/18/2012

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

**Mode: AWS TDSO, Body SAR, Back side, Mid.ch**

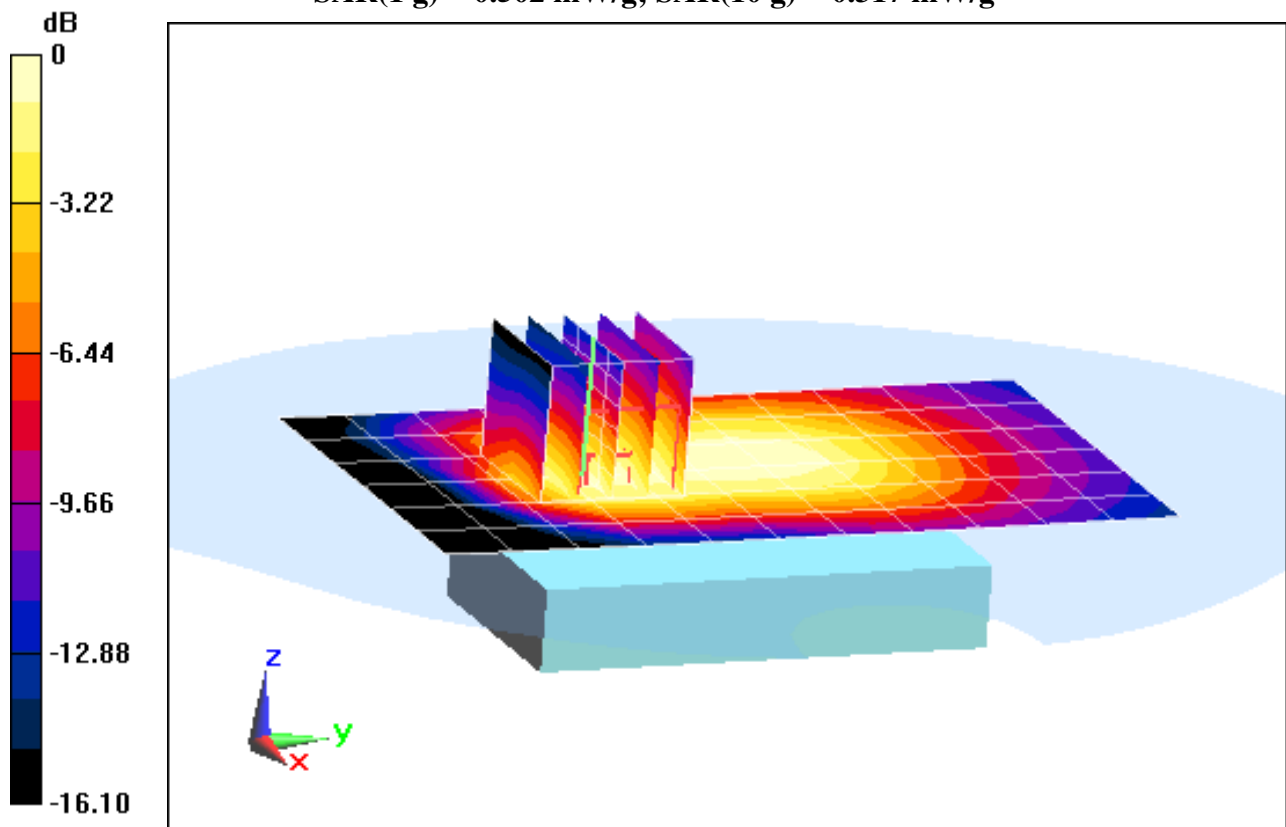
**Area Scan (7x12x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 20.746 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.812 mW/g

**SAR(1 g) = 0.502 mW/g; SAR(10 g) = 0.317 mW/g**



0 dB = 0.535 mW/g = -5.43 dB mW/g

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFUN160; Type: Portable Handset; Serial: 002**

Communication System: CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.551 \text{ mho/m}$ ;  $\epsilon_r = 50.86$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-12-2012; Ambient Temp: 22.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3288; ConvF(4.89, 4.89, 4.89); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

**Mode: PCS CDMA, Body SAR, Back side, Mid.ch**

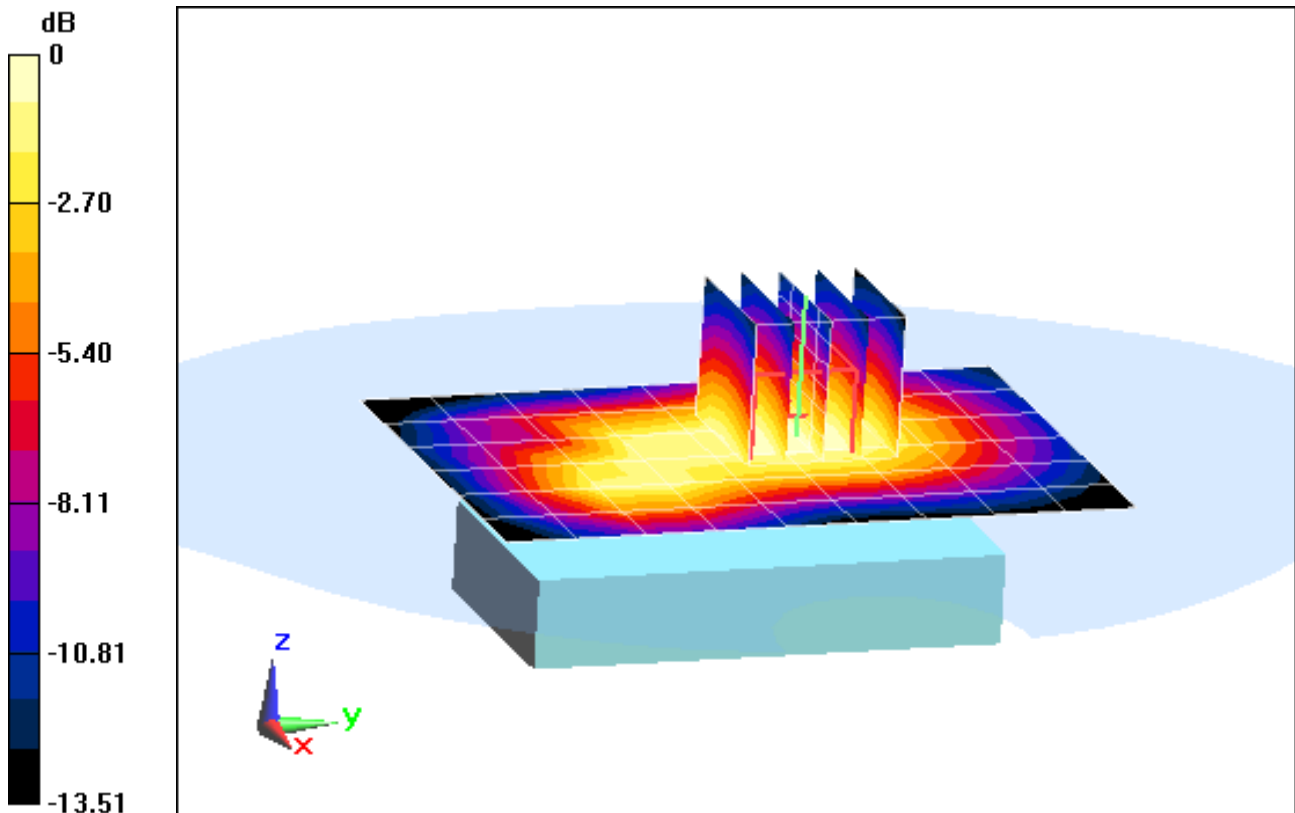
**Area Scan (7x10x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 19.117 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.831 mW/g

**SAR(1 g) = 0.551 mW/g; SAR(10 g) = 0.354 mW/g**



0 dB = 0.588 mW/g = -4.61 dB mW/g

## APPENDIX B: SYSTEM VERIFICATION

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 835 MHz; Type: D835V2; Serial: 4d132**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Head; Medium parameters used:

$f = 835 \text{ MHz}$ ;  $\sigma = 0.913 \text{ mho/m}$ ;  $\epsilon_r = 42.19$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-14-2012; Ambient Temp: 23.4°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: SAM Right; Type: QD000P40CD; Serial: 1686

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

## 835 MHz System Verification

**Area Scan (7x14x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

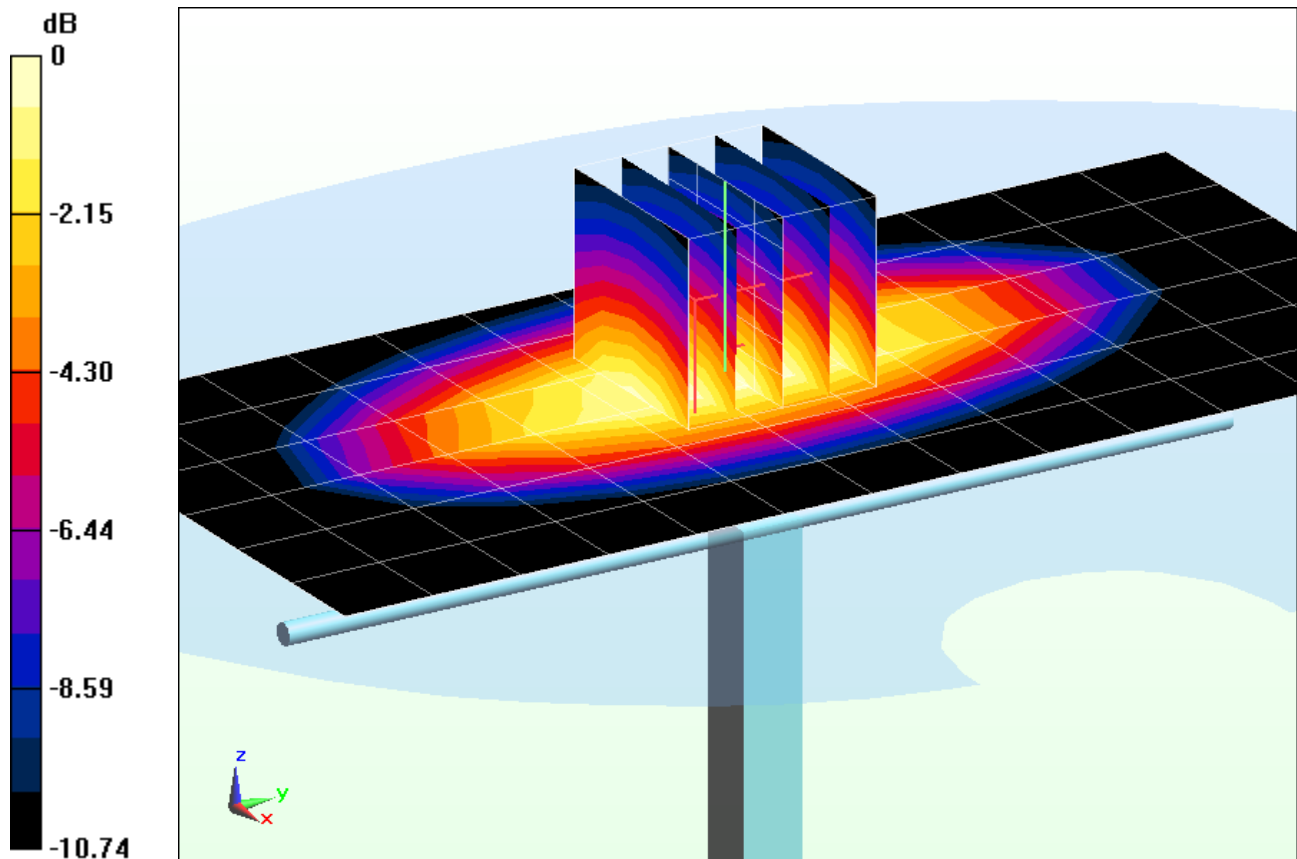
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.39 W/kg

**SAR(1 g) = 0.947 W/kg; SAR(10 g) = 0.617 W/kg**

Deviation = 0.21%



0 dB = 1.03 W/kg = 0.13 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 835 MHz; Type: D835V2; Serial: 4d132**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium: 835 Head; Medium parameters used:

$$f = 835 \text{ MHz}; \sigma = 0.913 \text{ mho/m}; \epsilon_r = 42.19; \rho = 1000 \text{ kg/m}^3$$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-14-2012; Ambient Temp: 23.4°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 4/19/2012

Phantom: SAM Right; Type: QD000P40CD; Serial: 1686

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

## 835 MHz System Verification

**Area Scan (7x14x1):** Measurement grid: dx=15mm, dy=15mm

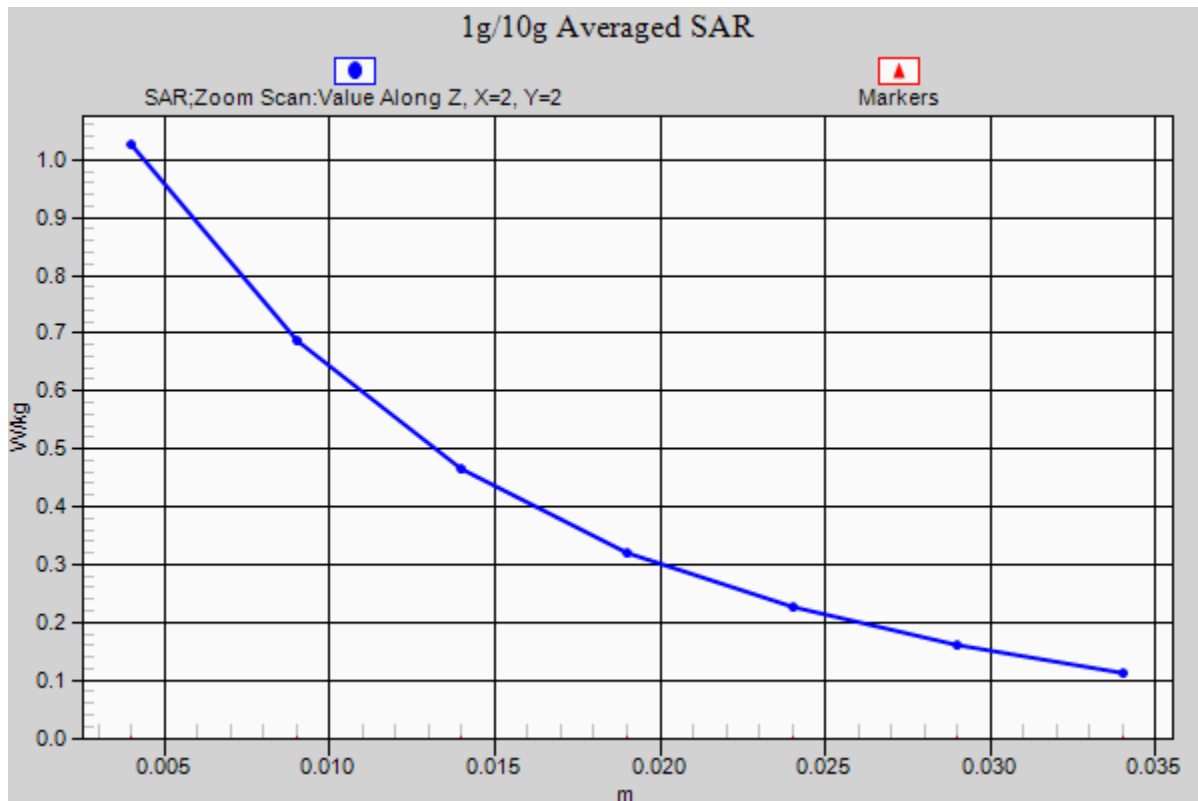
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.39 W/kg

**SAR(1 g) = 0.947 W/kg; SAR(10 g) = 0.617 W/kg**

Deviation = 0.21%



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1765V2; Serial: 1008**

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1  
Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.419 \text{ mho/m}$ ;  $\epsilon_r = 38.24$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-19-2012; Ambient Temp: 24.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(5.26, 5.26, 5.26); Calibrated: 3/16/2012;  
Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/20/2012

Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

## 1750 MHz System Verification

**Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

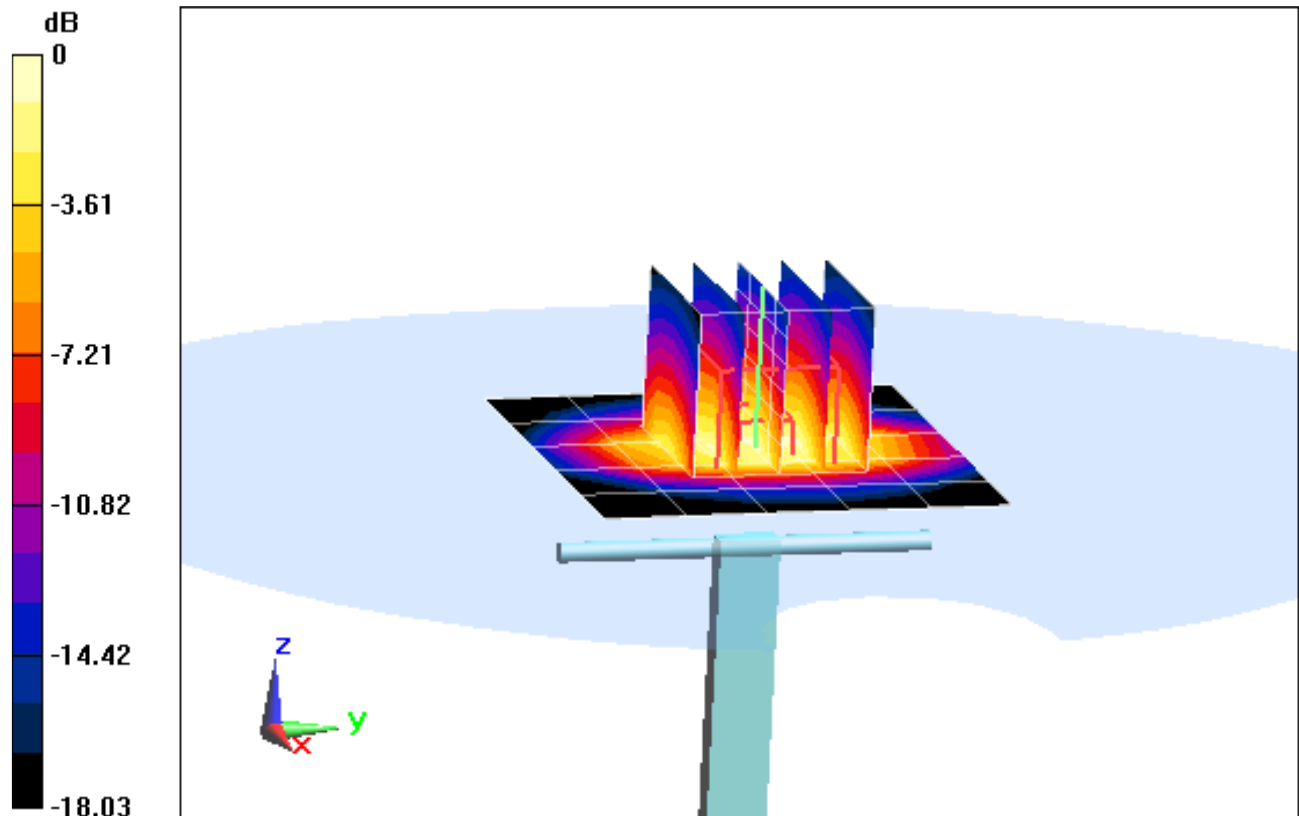
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power= 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.03 W/kg

**SAR(1 g) = 3.76 W/kg; SAR(10 g) = 1.94 W/kg**

Deviation: 3.30%



0 dB = 4.21 W/kg = 6.24 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1765V2; Serial: 1008**

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1  
Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.419 \text{ mho/m}$ ;  $\epsilon_r = 38.24$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section Space: 1.0 cm

Test Date: 11-19-2012; Ambient Temp: 24.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(5.26, 5.26, 5.26); Calibrated: 3/16/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/20/2012

Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

## 1750 MHz System Verification

**Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

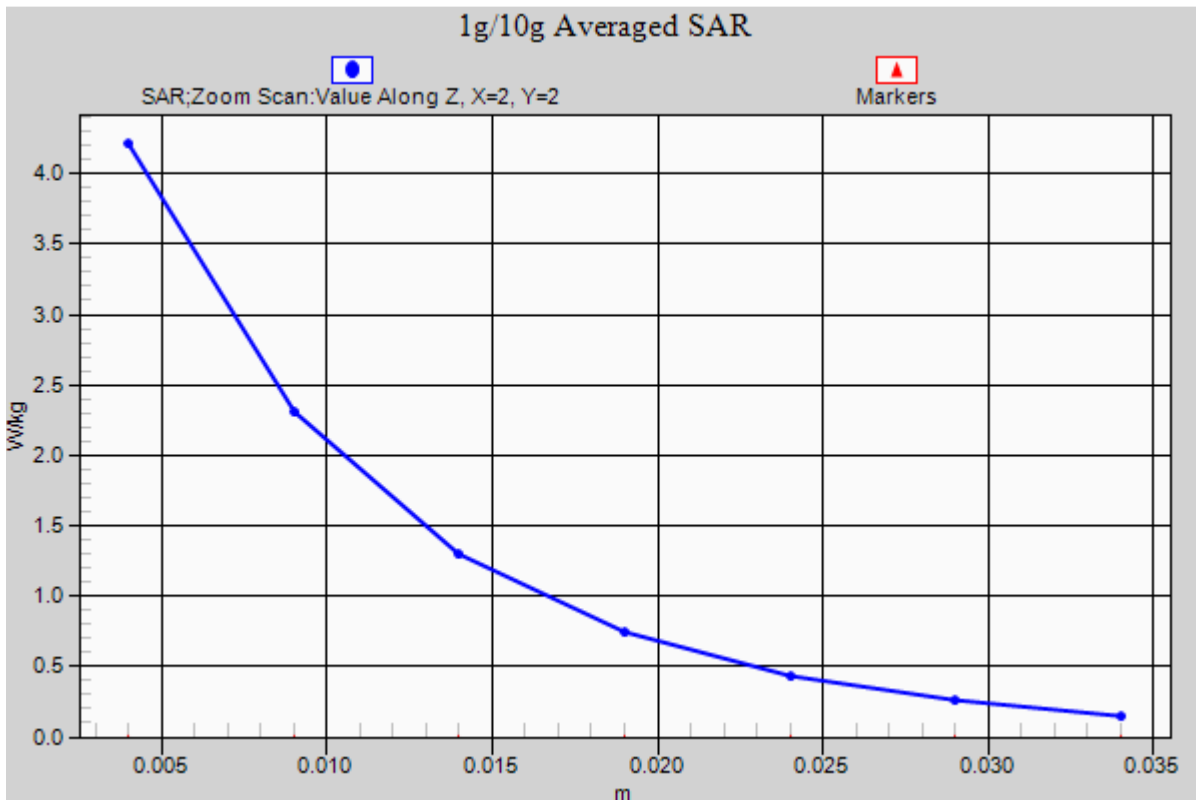
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power= 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.03 W/kg

**SAR(1 g) = 3.76 W/kg; SAR(10 g) = 1.94 W/kg**

Deviation: 3.30%



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 5d149**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Head; Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$ ;  $\sigma = 1.437 \text{ mho/m}$ ;  $\epsilon_r = 39.983$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-13-2012; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647

Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.7 (6848)

## 1900 MHz System Verification

**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm

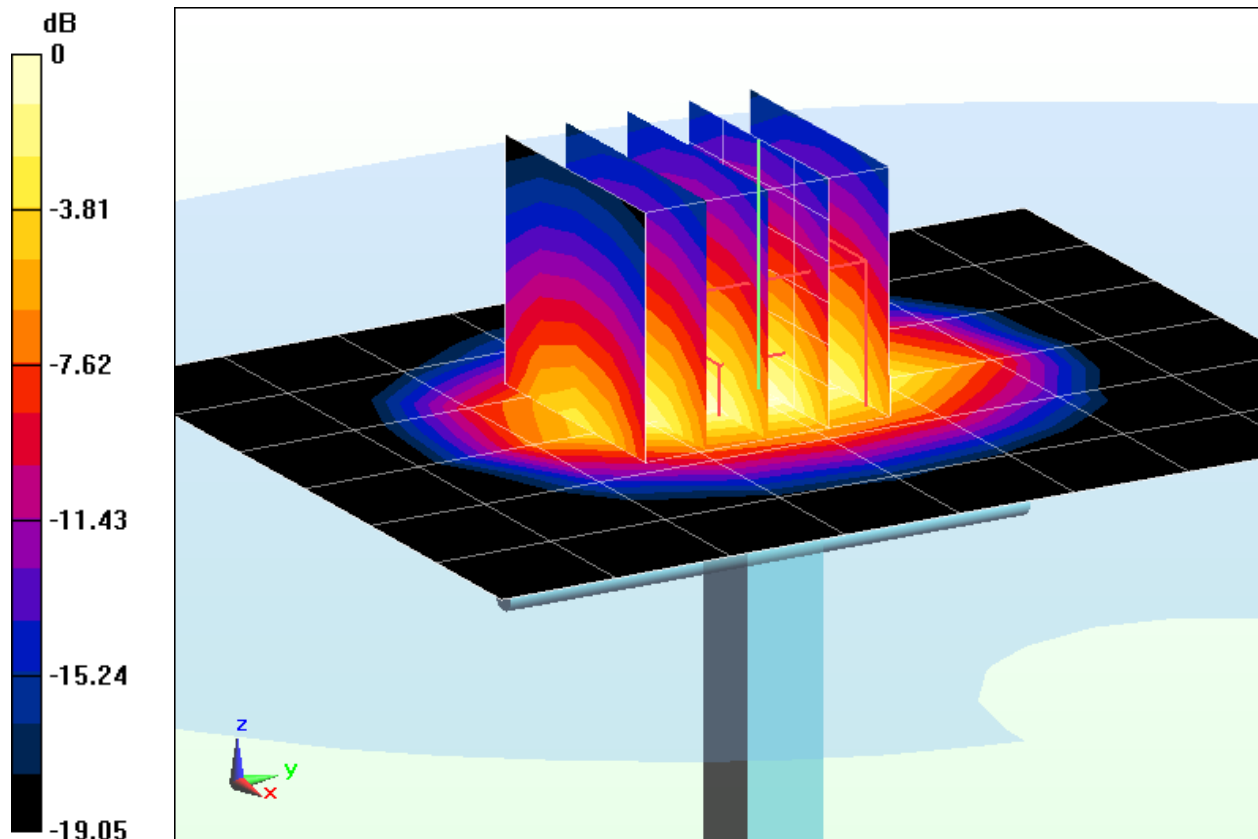
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.91 W/kg

**SAR(1 g) = 4.22 W/kg; SAR(10 g) = 2.18 W/kg**

Deviation = 7.38%



0 dB = 4.62 W/kg = 6.65 dBW/kg



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 5d149**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Head; Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$ ;  $\sigma = 1.437 \text{ mho/m}$ ;  $\epsilon_r = 39.983$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-13-2012; Ambient Temp: 23.6°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(5.09, 5.09, 5.09); Calibrated: 5/18/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 5/7/2012

Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647

Measurement SW: DASY52, Version 52.8 (3);SEMCAD X Version 14.6.7 (6848)

## 1900 MHz System Verification

**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm

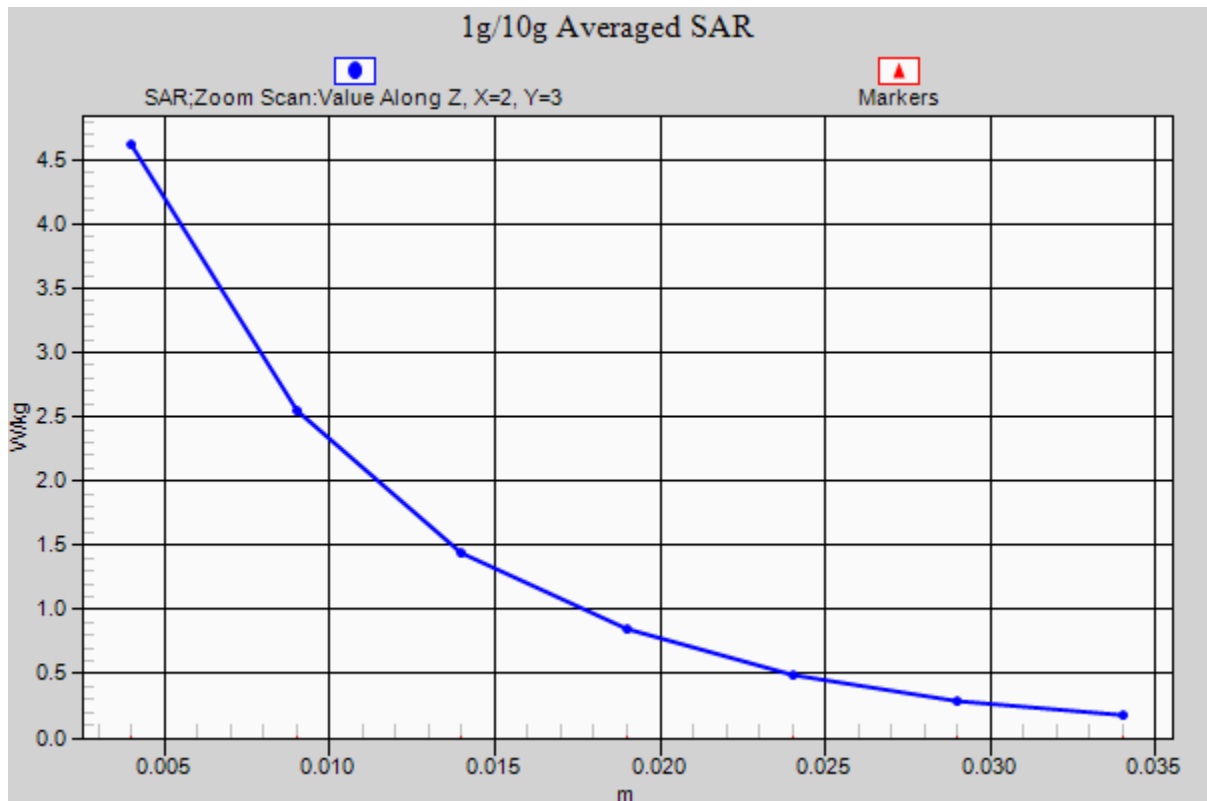
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.91 W/kg

**SAR(1 g) = 4.22 W/kg; SAR(10 g) = 2.18 W/kg**

Deviation = 7.38%



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d026**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1  
Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$ ;  $\sigma = 0.976 \text{ mho/m}$ ;  $\epsilon_r = 55.58$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-13-2012; Ambient Temp: 24.1°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3209; ConvF(6.13, 6.13, 6.13); Calibrated: 3/16/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/20/2012

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

## 835MHz System Verification

**Area Scan (7x13x1):** Measurement grid: dx=15mm, dy=15mm

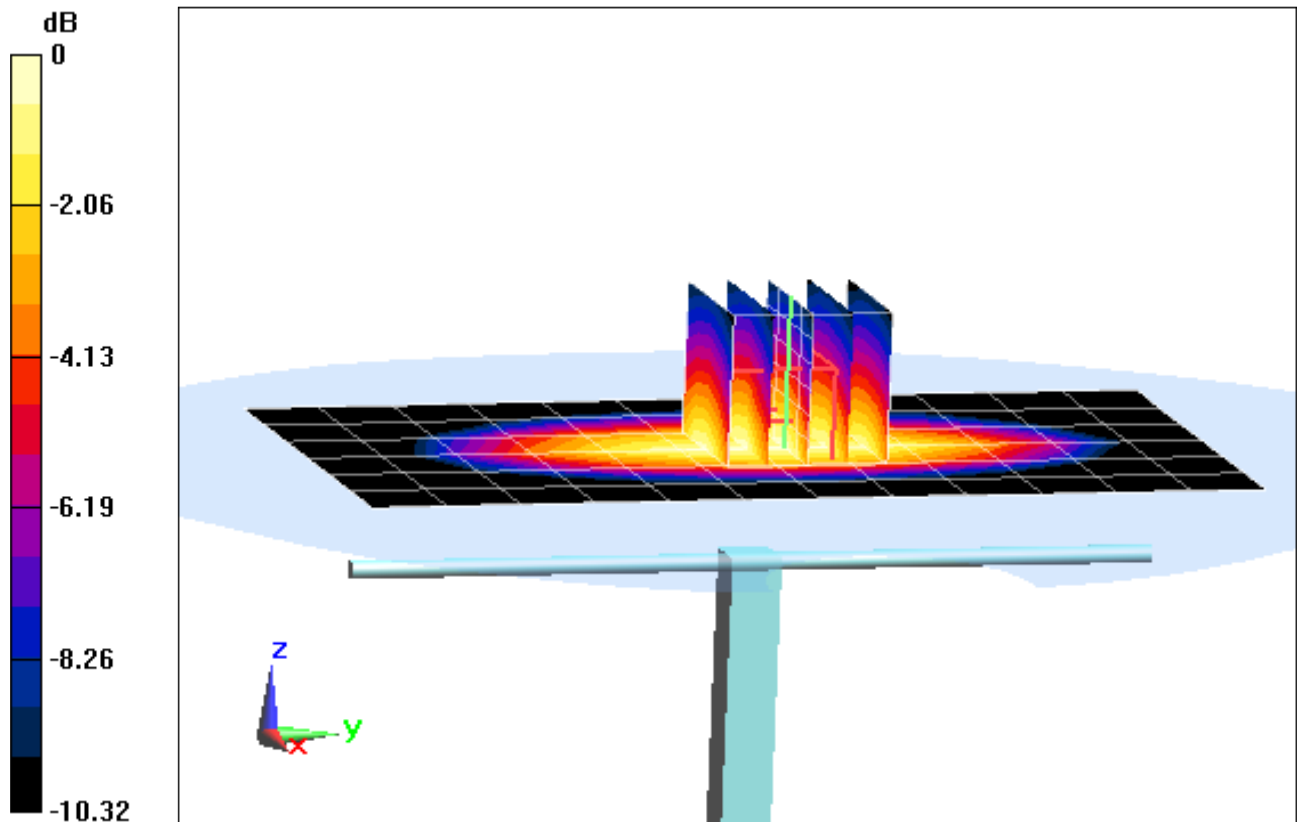
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power= 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.44 W/kg

**SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.658 W/kg**

Deviation: 5.43%



0 dB = 1.09 W/kg = 0.37 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d026**

Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$ ;  $\sigma = 0.976 \text{ mho/m}$ ;  $\epsilon_r = 55.58$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section Space: 1.5 cm

Test Date: 11-13-2012; Ambient Temp: 24.1°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3209; ConvF(6.13, 6.13, 6.13); Calibrated: 3/16/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 2/20/2012

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

## 835MHz System Verification

**Area Scan (7x13x1):** Measurement grid: dx=15mm, dy=15mm

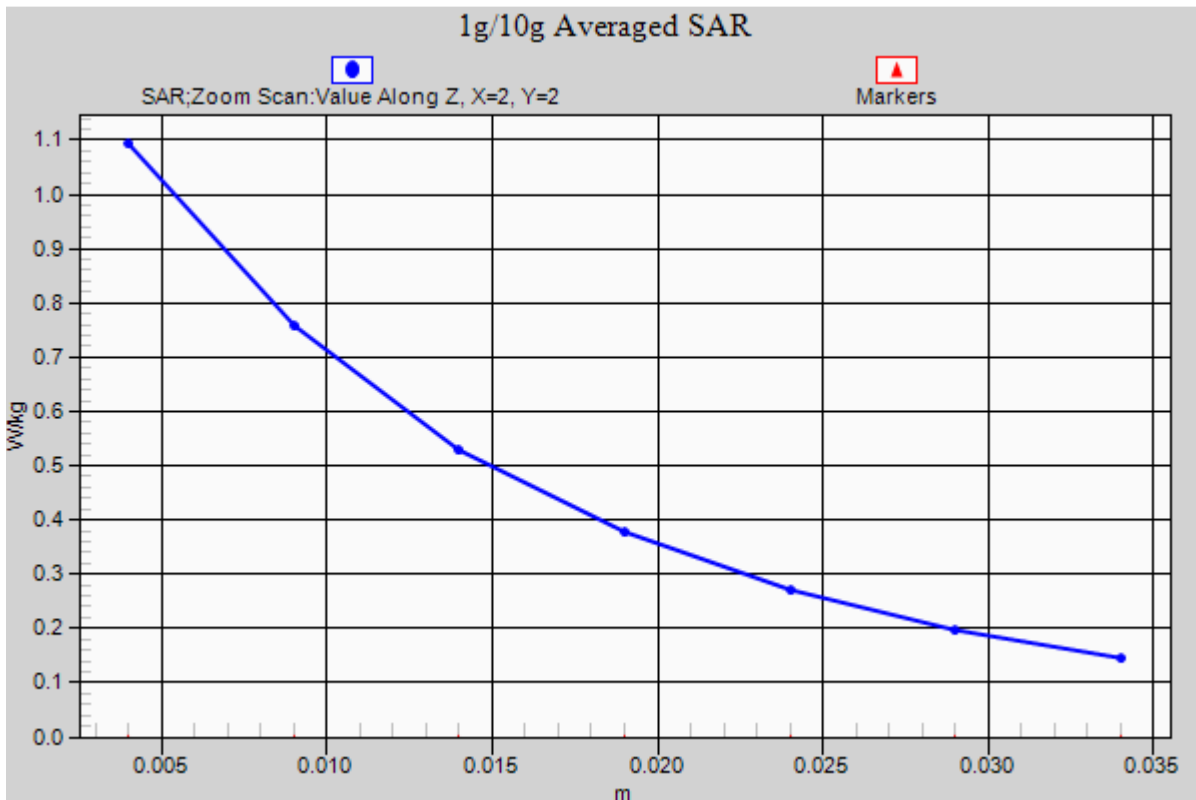
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power= 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.44 W/kg

**SAR(1 g) = 1.01 W/kg; SAR(10 g) = 0.658 W/kg**

Deviation: 5.43%



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1765V2; Serial: 1008**

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.532 \text{ mho/m}$ ;  $\epsilon_r = 54.34$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-17-2012; Ambient Temp: 24.1°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3258; ConvF(4.99, 4.99, 4.99); Calibrated: 2/21/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/18/2012

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

## 1750 MHz System Verification

**Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

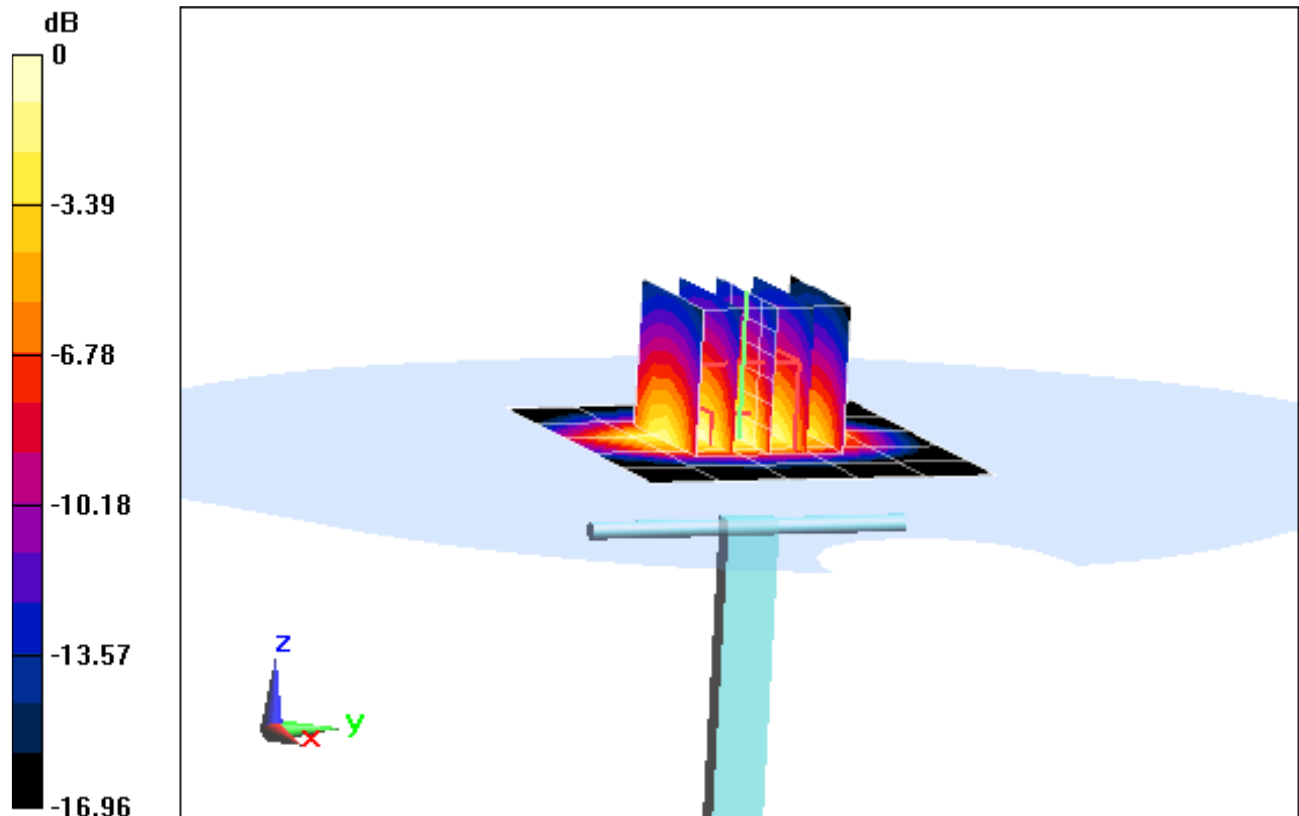
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power= 20 dBm (100 mW)

Peak SAR (extrapolated) = 6.36 W/kg

**SAR(1 g) = 3.57 W/kg; SAR(10 g) = 1.88 W/kg**

Deviation: -4.55%



0 dB = 3.98 W/kg = 6.00 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1765V2; Serial: 1008**

Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1  
Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.532 \text{ mho/m}$ ;  $\epsilon_r = 54.34$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section Space: 1.0 cm

Test Date: 07-17-2012; Ambient Temp: 24.1°C; Tissue Temp: 23.2°C

Probe: ES3DV3 - SN3258; ConvF(4.99, 4.99, 4.99); Calibrated: 2/21/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/18/2012

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.7 (6848)

## 1750 MHz System Verification

**Area Scan (6x6x1):** Measurement grid: dx=15mm, dy=15mm

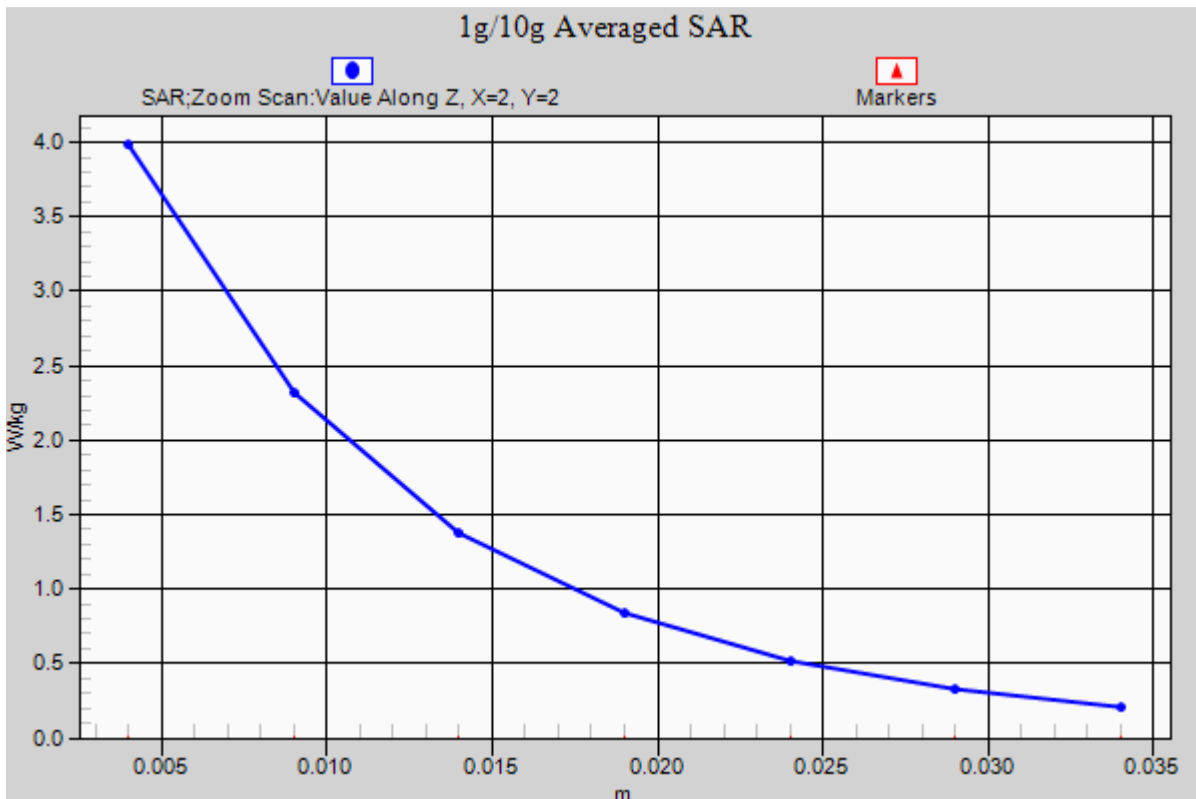
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power= 20 dBm (100 mW)

Peak SAR (extrapolated) = 6.36 W/kg

**SAR(1 g) = 3.57 W/kg; SAR(10 g) = 1.88 W/kg**

Deviation: -4.55%



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 5d149**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900$  MHz;  $\sigma = 1.57$  mho/m;  $\epsilon_r = 50.833$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-12-2012; Ambient Temp: 22.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3288; ConvF(4.89, 4.89, 4.89); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

## 1900 MHz System Verification

**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm

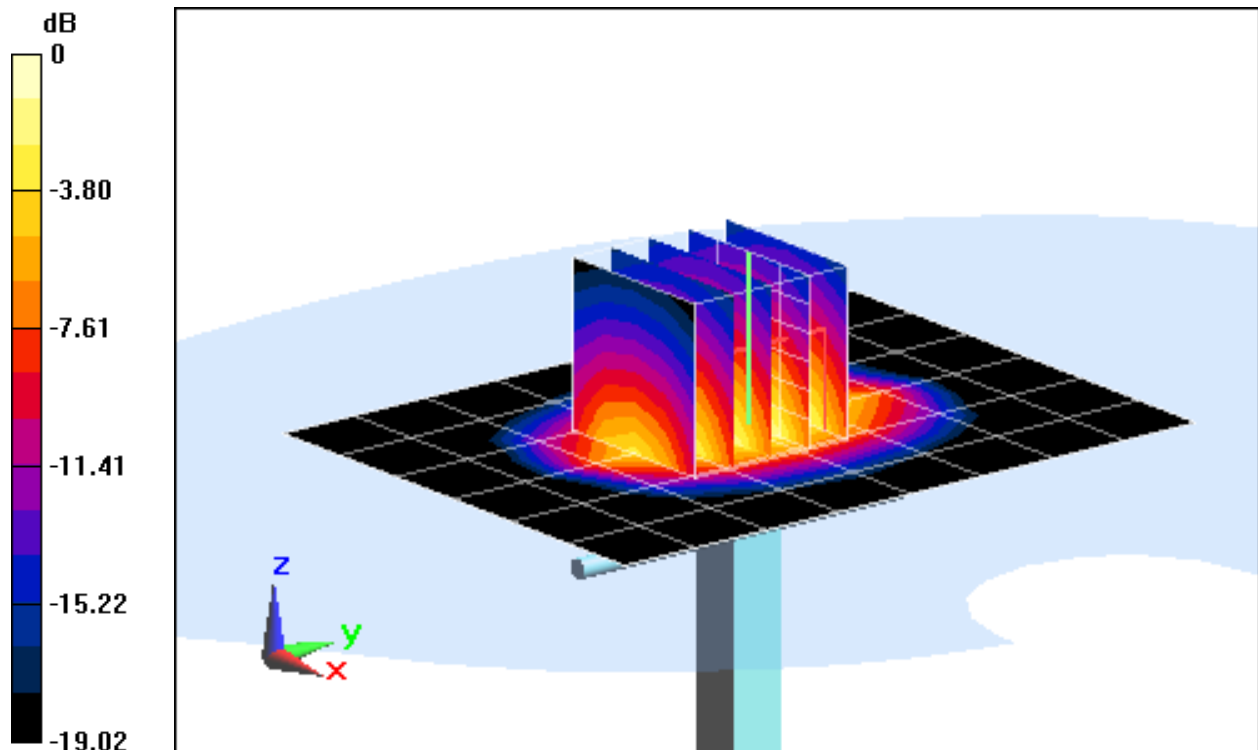
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power= 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.33 W/kg

**SAR(1 g) = 4.04 W/kg; SAR(10 g) = 2.09 W/kg**

Deviation: 2.80%



0 dB = 4.51 W/kg = 6.54 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 5d149**

Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$ ;  $\sigma = 1.57 \text{ mho/m}$ ;  $\epsilon_r = 50.833$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-12-2012; Ambient Temp: 22.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3288; ConvF(4.89, 4.89, 4.89); Calibrated: 9/20/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/19/2012

Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646

Measurement SW: DASY52, Version 52.8 (3); SEMCAD X Version 14.6.7 (6848)

## 1900 MHz System Verification

**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm

**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power= 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.33 W/kg

**SAR(1 g) = 4.04 W/kg; SAR(10 g) = 2.09 W/kg**

Deviation: 2.80%

