



SAR EVALUATION REPORT

Applicant Name:

Samsung Electronics Co., Ltd.
416, Maetan 3-dong, Yeongtong-gu, Suwon-si
Gyeonggi-do, 443-742
Republic of Korea

Date of Testing:

07/23/12 - 07/30/12

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

0Y1207301069.A3L

FCC ID:

A3LSCHR820

APPLICANT:

SAMSUNG ELECTRONICS CO., LTD.

DUT Type:

Portable Handset

Application Type:

Class II Permissive Change

FCC Rule Part(s):

CFR §2.1093

Model(s):

SCH-R820

Test Device Serial No.:

Pre-Production [S/N: 16]

Permissive Change(s):

Adding 10 MHz Bandwidth for LTE Bands

Date of Original Certification:

04/03/2012

Band & Mode	Tx Frequency	Conducted Power [dBm]	SAR		
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)
LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	22.90	0.62	0.54	0.54
LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	23.32	0.92	0.58	0.58

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.

The table above shows LTE Band 4 (AWS) and LTE Band 2 (PCS) test data evaluated for this Test Report. Please see RF Exposure Technical Reports S/N 0Y1202210211.A3L and S/N 0Y1205300755.A3L for SAR Test Data filed for original and C2PC compliance evaluations.

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

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Tx Frequency
Cell. CDMA/EVDO	824.70 - 848.31 MHz
AWS CDMA/EVDO	1711.25 - 1753.75 MHz
PCS CDMA/EVDO	1851.25 - 1908.75 MHz
LTE Band 4 (AWS)	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	1850.7 - 1909.3 MHz
2.4 GHz WLAN	2412 - 2462 MHz
Bluetooth	2402 - 2480 MHz

1.2 DUT Antenna Locations

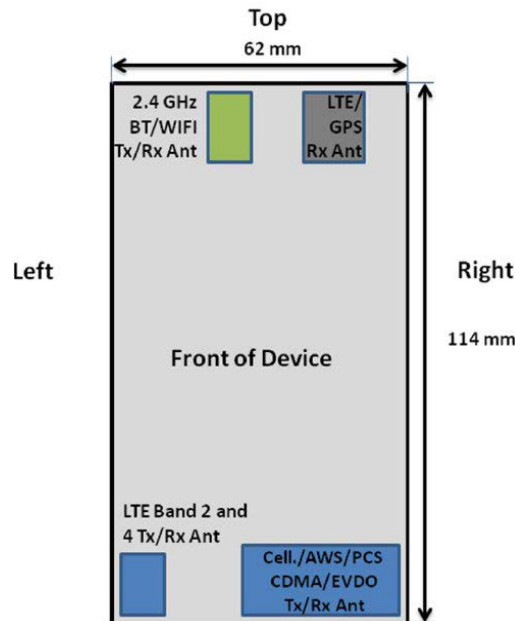


Figure 1-1
DUT Antenna Locations

Table 1-1
Mobile Hotspot Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
LTE Band 4 (AWS)	Yes	Yes	No	Yes	No	Yes
LTE Band 2 (PCS)	Yes	Yes	No	Yes	No	Yes

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06 guidance, page 2. The antenna document shows the distances between the transmit antennas and the edges of the device. When the wireless router mode is enabled, all 5 GHz bands are disabled. Therefore 5 GHz WIFI is not considered in this section.

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1.3 Simultaneous Transmission Analysis

The maximum simultaneous transmission results remain the same as original compliance evaluation since the SAR values measured for the current application resulted in simultaneous SAR equal to or less than the original maximum simultaneous SAR values. Please see RF Exposure Technical Report S/N 0Y1202210211.A3L filed with the original application for the device simultaneous transmission analysis.

1.4 SAR Test Exclusions Applied

(A) Licensed Transmitter(s)

LTE SAR for the lower BWs was not tested since the maximum average output power of all channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and LTE SAR for the highest BW was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05.

1.5 Power Reduction for SAR

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

1.6 Guidance Applied

- FCC OET Bulletin 65 Supplement C [June 2001]
- IEEE 1528-2003
- FCC KDB 941225 (LTE and Hotspot)

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LTE CHECKLIST PER KDB 941225 D05

KDB 941225 Pub LTE Information			
KDB 941225 Section	FCC ID	A3LSCHR820	
	Form Factor	Handset	
1)	Frequency Range of each LTE transmission band	BAND 2 : Tx (1850.7 ~ 1909.3MHz) BAND 4: Tx (1710.7 ~ 1754.3 MHz)	
2)	Channel Bandwidths	BAND 2: 1.4MHz, 3MHz, 5MHz, 10MHz BAND 4: 1.4MHz, 3MHz, 5MHz, 10MHz	
3)	Channel Numbers and Frequencies (MHz)	Low	Mid
	LTE Band 2 and BW 1.4MHz	1850.7MHz(18607)	1880MHz(18900)
	LTE Band 2 and BW 3MHz	1851.5MHz(18615)	1880MHz(18900)
	LTE Band 2 and BW 5MHz	1852.5MHz(18625)	1880MHz(18900)
	LTE Band 2 and BW 10MHz	1855MHz(18650)	1880MHz(18900)
	LTE Band 4 and BW 1.4MHz	1710.7MHz(19957)	1732.5MHz(20175)
	LTE Band 4 and BW 3MHz	1711.5MHz(19965)	1732.5MHz(20175)
	LTE Band 4 and BW 5MHz	1712.5MHz(19975)	1732.5MHz(20175)
	LTE Band 4 and BW 10MHz	1715MHz(20000)	1732.5MHz(20175)
4)(a)	UE Category	3	
(b)	Modulations Supported in UL	QPSK, 16QAM	
	LTE Transmitter and Antenna Implementation	CDMA and LTE have separate transmission paths	
5)	Description of LTE Tx and Ant. Implementation	1 Main TX/RX Ant and 1 Diversity RX Ant	
6)	LTE Voice available?	Yes	
	Hotspot with LTE+WIFI	Yes	
	Hotspot with LTE+WIFI active with 1XVoice sessions?	Yes	
7)	LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	Yes	
	A-MPR (Additional MPR) disabled for SAR Testing?	Yes	
8)	Conducted power Table provided for 1RB (low and high offset), 50% RB (centered), 100% RB	Yes	
9-10)	Non-LTE US Wireless Operating Modes/Band	RF Output Power	RF Exposure Configurations
	Cell. CDMA	See RF Exposure Technical Report S/N 0Y1202210211.A3L page 1	
	AWS CDMA		
	PCS CDMA		
	2.4 GHz Bluetooth		
2.4 GHz WLAN			
11)	Simultaneous Tx Conditions (Voice and Data Configurations)	See RF Exposure Technical Report S/N 0Y1202210211.A3L Section 1.3	
12)	Power Reduction used for SAR Compliance?	No	
13)	Describe Power Reduction (LTE Modes)	N/A	
14)	SAR Test Plan	N/A	
15)	SAR test data, preliminary	N/A	

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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.

3.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 3-1).

Equation 3-1
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:

- σ = conductivity of the tissue-simulating material (S/m)
- ρ = mass density of the tissue-simulating material (kg/m^3)
- E = Total RMS electric field strength (V/m)

NOTE: The primary factors that control rate of energy absorption were found to be the wavelength of the incident field in relation to the dimensions and geometry of the irradiated organism, the orientation of the organism in relation to the polarity of field vectors, the presence of reflecting surfaces, and whether conductive contact is made by the organism with a ground plane.[6]

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4 SAR MEASUREMENT SETUP

4.1 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 for more information about the specification of the SAR assessment system.



Figure 4-1
SAR Measurement System



Figure 4-2
Near-Field Probe

Table 4-1
Composition of the Tissue Equivalent Matter

Frequency (MHz)	1750	1750	1900	1900
Tissue	Head	Body	Head	Body
Ingredients (% by weight)				
DGBE	47	31	44.92	29.44
NaCl	0.4	0.2	0.18	0.39
Water	52.6	68.8	54.9	70.17

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5 DOSIMETRIC ASSESSMENT

5.1 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.

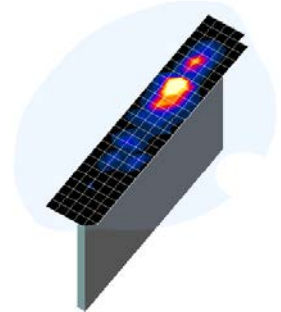


Figure 5-1
Sample SAR Area Scan

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DEFINITION OF REFERENCE POINTS

6.1 EAR REFERENCE POINT

Figure 6-2 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 6-1. 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 6-2). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].

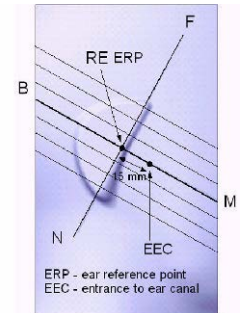


Figure 6-1
Close-Up Side view
of ERP

6.2 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 6-3). 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 it’s top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.



Figure 6-2
Front, back and side view of SAM Twin Phantom

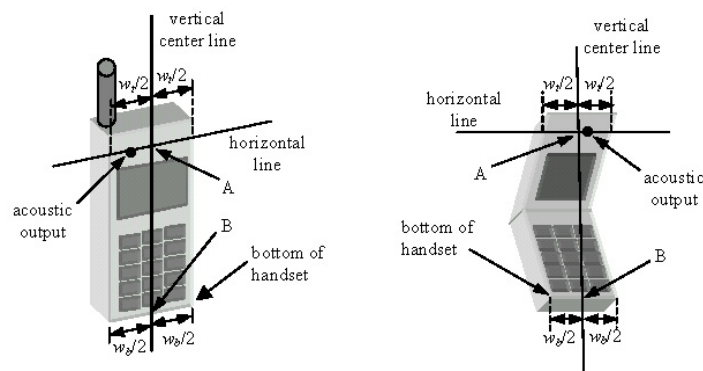


Figure 6-3
Handset Vertical Center & Horizontal Line Reference Points

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7 TEST CONFIGURATION POSITIONS FOR HANDSETS

7.1 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 $\delta = 0.02$.

7.2 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 7-1), 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.

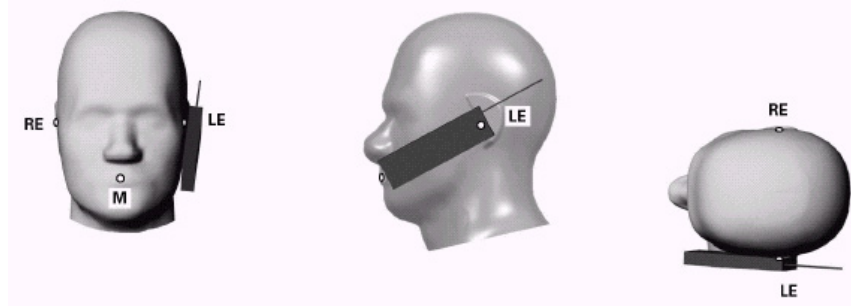


Figure 7-1 Front, Side and Top View of Cheek/Touch Position

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 7-2).

7.3 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 15degree.
2. The phone was then rotated around the horizontal line by 15 degree.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the phone touches the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 7-2).

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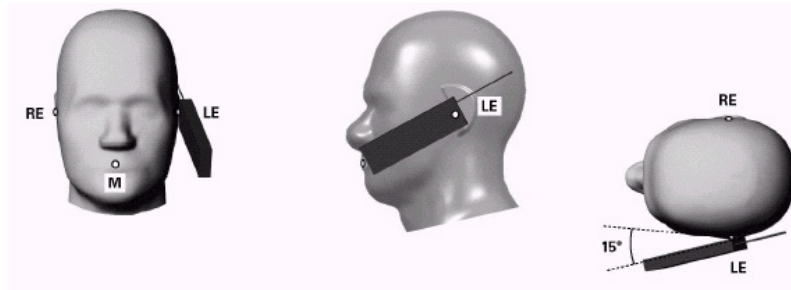


Figure 7-2 Front, Side and Top View of Ear/15° Tilt Position

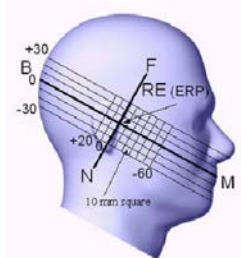


Figure 7-3
Side view w/ relevant markings



Figure 7-4 Body SAR Sample Photo
(Not Actual EUT)

7.4 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 $\frac{1}{2}$ 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.

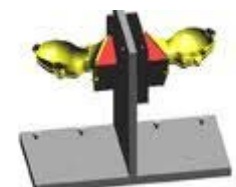


Figure 7-5 Twin SAM
Chin20

7.5 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 7-4). A device with a headset output is tested with a headset connected to the device.

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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.

7.6 Wireless Router Configurations

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

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

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8 FCC RF EXPOSURE LIMITS

8.1 Uncontrolled Environment

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

8.2 Controlled Environment

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

Table 8-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <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.

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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.

9.1 SAR Measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05 publication. Please see notes following SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.

9.1.1 MPR

MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1. See Section 10.1 for MPR targets.

9.1.2 A-MPR

A-MPR (Additional MPR) has been disabled for all SAR tests by setting NS=01 on the base station simulator.

9.1.3 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05:

- a. Per Page 4, 3) A), QPSK with 50% RB is required for the highest bandwidth.
- b. Per Page 4, footnote 2, when the maximum output power across high, mid., and low channels is < 0.5 dB, mid channel is tested. Low and high channel SAR tests are not required for QPSK, 50% RB allocation when the SAR is < 0.8 W/kg. When there are less than 3 channels required based on the size of the band and bandwidth of the signal, the channel with the maximum output power was tested.
- c. Per Page 4, 3) B), QPSK with 1 RB for both channel edges are required for the highest bandwidth.
- d. Per Page 4, footnote 6, QPSK 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocation was > 0.5 dB higher than the 50% RB allocation for QPSK. Otherwise, SAR tests are performed on the channel that produced the highest SAR for QPSK with 50% RB.
- e. Per Page 4, 3) B), I), when the SAR for QPSK 1 RB allocation tests is <1.45 W/kg, testing on the other channels is not required.
- f. Per Page 4, 4) A), 16QAM with 50% RB is required for the highest bandwidth on the channel with the highest measured SAR for QPSK with 50% RB allocation.
- g. Per Page 4, 4) A), I), when the SAR for 16 QAM, 50 % allocation tests is <1.45 W/kg, testing on the other channels is not required.

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- h. Per Page 4, 4) B) and Page 5 footnote 9, 16QAM with 1RB for both channel edges are required for the highest bandwidth on the highest output power channel for the 1 RB allocation when the average output power of the 1 RB allocation is >0.5 dB higher than the 50% allocation for 16 QAM. Otherwise, SAR tests are performed on the channel that produced the highest SAR for 16 QAM with 50% RB.
- i. Per Page 5, 4) B), I), when the SAR for 16 QAM 1 RB allocation tests is <1.45 W/kg, testing on the other channels is not required.
- j. Per Page 4, 4), A) I) and Page 5, 4), A)I, 100% RB Allocation is not required to be tested when the SAR is not > 1.45 W/kg for the highest bandwidth.
- k. Per Page 5, 5) B) I), smaller bandwidths are not required to be tested when SAR is not > 1.45 W/kg for the highest bandwidth and the maximum average output power of the smaller bandwidths across all channels and configurations is not more than 0.5 dB higher than the higher bandwidths.

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10 RF CONDUCTED POWERS

10.1 LTE Conducted Powers

10.1.1 LTE Band 4 (AWS)

Table 10-1
LTE Band 4 (AWS) Conducted Powers – 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1710.7	19957	1.4	QPSK	1	0	22.95	0	0
	1710.7	19957	1.4	QPSK	1	5	23.03	0	0
	1710.7	19957	1.4	QPSK	3	2	23.14	0	0
	1710.7	19957	1.4	QPSK	6	0	22.29	1	0-1
	1710.7	19957	1.4	16-QAM	1	0	22.28	1	0-1
	1710.7	19957	1.4	16-QAM	1	5	22.20	1	0-1
	1710.7	19957	1.4	16-QAM	3	2	22.15	1	0-1
Mid	1710.7	19957	1.4	16-QAM	6	0	20.90	2	0-2
	1732.5	20175	1.4	QPSK	1	0	23.06	0	0
	1732.5	20175	1.4	QPSK	1	5	22.96	0	0
	1732.5	20175	1.4	QPSK	3	2	22.99	0	0
	1732.5	20175	1.4	QPSK	6	0	22.49	1	0-1
	1732.5	20175	1.4	16-QAM	1	0	22.13	1	0-1
	1732.5	20175	1.4	16-QAM	1	5	21.99	1	0-1
High	1732.5	20175	1.4	16-QAM	3	2	22.25	1	0-1
	1732.5	20175	1.4	16-QAM	6	0	21.37	2	0-2
	1754.3	20393	1.4	QPSK	1	0	23.03	0	0
	1754.3	20393	1.4	QPSK	1	5	23.01	0	0
	1754.3	20393	1.4	QPSK	3	2	23.05	0	0
	1754.3	20393	1.4	QPSK	6	0	22.28	1	0-1
	1754.3	20393	1.4	16-QAM	1	0	22.30	1	0-1
	1754.3	20393	1.4	16-QAM	1	5	22.22	1	0-1
	1754.3	20393	1.4	16-QAM	3	2	22.40	1	0-1
	1754.3	20393	1.4	16-QAM	6	0	21.50	2	0-2

Table 10-2
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1711.5	19965	3	QPSK	1	0	23.27	0	0
	1711.5	19965	3	QPSK	1	14	23.31	0	0
	1711.5	19965	3	QPSK	8	4	21.81	1	0-1
	1711.5	19965	3	QPSK	15	0	22.00	1	0-1
	1711.5	19965	3	16-QAM	1	0	22.23	1	0-1
	1711.5	19965	3	16-QAM	1	14	22.06	1	0-1
	1711.5	19965	3	16-QAM	8	4	21.23	2	0-2
	1711.5	19965	3	16-QAM	15	0	21.07	2	0-2
Mid	1732.5	20175	3	QPSK	1	0	23.28	0	0
	1732.5	20175	3	QPSK	1	14	23.23	0	0
	1732.5	20175	3	QPSK	8	4	22.38	1	0-1
	1732.5	20175	3	QPSK	15	0	22.33	1	0-1
	1732.5	20175	3	16-QAM	1	0	22.17	1	0-1
	1732.5	20175	3	16-QAM	1	14	22.12	1	0-1
	1732.5	20175	3	16-QAM	8	4	21.41	2	0-2
	1732.5	20175	3	16-QAM	15	0	21.30	2	0-2
High	1753.5	20385	3	QPSK	1	0	23.18	0	0
	1753.5	20385	3	QPSK	1	14	23.26	0	0
	1753.5	20385	3	QPSK	8	4	22.50	1	0-1
	1753.5	20385	3	QPSK	15	0	22.30	1	0-1
	1753.5	20385	3	16-QAM	1	0	22.25	1	0-1
	1753.5	20385	3	16-QAM	1	14	22.06	1	0-1
	1753.5	20385	3	16-QAM	8	4	21.45	2	0-2
	1753.5	20385	3	16-QAM	15	0	21.19	2	0-2

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Table 10-3
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1712.5	19975	5	QPSK	1	0	23.17	0	0
	1712.5	19975	5	QPSK	1	24	23.05	0	0
	1712.5	19975	5	QPSK	12	6	22.08	1	0-1
	1712.5	19975	5	QPSK	25	0	21.92	1	0-1
	1712.5	19975	5	16-QAM	1	0	21.74	1	0-1
	1712.5	19975	5	16-QAM	1	24	21.73	1	0-1
	1712.5	19975	5	16-QAM	12	6	20.96	2	0-2
	1712.5	19975	5	16-QAM	25	0	21.02	2	0-2
Mid	1732.5	20175	5	QPSK	1	0	22.81	0	0
	1732.5	20175	5	QPSK	1	24	22.99	0	0
	1732.5	20175	5	QPSK	12	6	22.33	1	0-1
	1732.5	20175	5	QPSK	25	0	21.93	1	0-1
	1732.5	20175	5	16-QAM	1	0	22.03	1	0-1
	1732.5	20175	5	16-QAM	1	24	21.98	1	0-1
	1732.5	20175	5	16-QAM	12	6	21.24	2	0-2
	1732.5	20175	5	16-QAM	25	0	20.90	2	0-2
High	1752.5	20375	5	QPSK	1	0	23.39	0	0
	1752.5	20375	5	QPSK	1	24	23.26	0	0
	1752.5	20375	5	QPSK	12	6	22.27	1	0-1
	1752.5	20375	5	QPSK	25	0	22.24	1	0-1
	1752.5	20375	5	16-QAM	1	0	22.16	1	0-1
	1752.5	20375	5	16-QAM	1	24	22.11	1	0-1
	1752.5	20375	5	16-QAM	12	6	21.19	2	0-2
	1752.5	20375	5	16-QAM	25	0	21.12	2	0-2

Table 10-4
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1715	20000	10	QPSK	1	0	22.83	0	0
	1715	20000	10	QPSK	1	49	22.83	0	0
	1715	20000	10	QPSK	25	12	22.35	1	0-1
	1715	20000	10	QPSK	50	0	22.19	1	0-1
	1715	20000	10	16QAM	1	0	22.12	1	0-1
	1715	20000	10	16QAM	1	49	21.98	1	0-1
	1715	20000	10	16QAM	25	12	21.38	2	0-2
	1715	20000	10	16QAM	50	0	21.13	2	0-2
Mid	1732.5	20175	10	QPSK	1	0	22.53	0	0
	1732.5	20175	10	QPSK	1	49	22.52	0	0
	1732.5	20175	10	QPSK	25	12	22.32	1	0-1
	1732.5	20175	10	QPSK	50	0	22.26	1	0-1
	1732.5	20175	10	16QAM	1	0	21.83	1	0-1
	1732.5	20175	10	16QAM	1	49	21.86	1	0-1
	1732.5	20175	10	16QAM	25	12	21.09	2	0-2
	1732.5	20175	10	16QAM	50	0	21.09	2	0-2
High	1750	20350	10	QPSK	1	0	22.90	0	0
	1750	20350	10	QPSK	1	49	22.84	0	0
	1750	20350	10	QPSK	25	12	22.37	1	0-1
	1750	20350	10	QPSK	50	0	22.37	1	0-1
	1750	20350	10	16QAM	1	0	21.75	1	0-1
	1750	20350	10	16QAM	1	49	21.73	1	0-1
	1750	20350	10	16QAM	25	12	21.10	2	0-2
	1750	20350	10	16QAM	50	0	21.22	2	0-2

10.1.2

LTE Band 2 (PCS)

Table 10-5

LTE Band 2 (PCS) Conducted Powers – 1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1850.7	18607	1.4	QPSK	1	0	23.25	0	0
	1850.7	18607	1.4	QPSK	1	5	23.12	0	0
	1850.7	18607	1.4	QPSK	3	2	23.29	0	0
	1850.7	18607	1.4	QPSK	6	0	22.17	1	0-1
	1850.7	18607	1.4	16-QAM	1	0	22.15	1	0-1
	1850.7	18607	1.4	16-QAM	1	5	22.20	1	0-1
	1850.7	18607	1.4	16-QAM	3	2	22.31	1	0-1
Mid	1850.7	18607	1.4	16-QAM	6	0	21.22	2	0-2
	1880.0	18900	1.4	QPSK	1	0	22.88	0	0
	1880.0	18900	1.4	QPSK	1	5	22.97	0	0
	1880.0	18900	1.4	QPSK	3	2	23.19	0	0
	1880.0	18900	1.4	QPSK	6	0	22.18	1	0-1
	1880.0	18900	1.4	16-QAM	1	0	22.00	1	0-1
	1880.0	18900	1.4	16-QAM	1	5	22.01	1	0-1
High	1880.0	18900	1.4	16-QAM	3	2	22.10	1	0-1
	1880.0	18900	1.4	16-QAM	6	0	20.94	2	0-2
	1909.3	19193	1.4	QPSK	1	0	23.20	0	0
	1909.3	19193	1.4	QPSK	1	5	23.08	0	0
	1909.3	19193	1.4	QPSK	3	2	23.07	0	0
	1909.3	19193	1.4	QPSK	6	0	22.20	1	0-1
	1909.3	19193	1.4	16-QAM	1	0	22.10	1	0-1
	1909.3	19193	1.4	16-QAM	1	5	22.08	1	0-1
	1909.3	19193	1.4	16-QAM	3	2	22.20	1	0-1
	1909.3	19193	1.4	16-QAM	6	0	21.04	2	0-2

Table 10-6

LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1851.5	18615	3	QPSK	1	0	23.06	0	0
	1851.5	18615	3	QPSK	1	14	23.08	0	0
	1851.5	18615	3	QPSK	8	4	22.12	1	0-1
	1851.5	18615	3	QPSK	15	0	22.05	1	0-1
	1851.5	18615	3	16-QAM	1	0	22.12	1	0-1
	1851.5	18615	3	16-QAM	1	14	22.15	1	0-1
	1851.5	18615	3	16-QAM	8	4	21.30	2	0-2
Mid	1851.5	18615	3	16-QAM	15	0	21.17	2	0-2
	1880.0	18900	3	QPSK	1	0	23.00	0	0
	1880.0	18900	3	QPSK	1	14	22.91	0	0
	1880.0	18900	3	QPSK	8	4	21.97	1	0-1
	1880.0	18900	3	QPSK	15	0	22.17	1	0-1
	1880.0	18900	3	16-QAM	1	0	21.90	1	0-1
	1880.0	18900	3	16-QAM	1	14	22.04	1	0-1
High	1880.0	18900	3	16-QAM	8	4	21.20	2	0-2
	1880.0	18900	3	16-QAM	15	0	20.95	2	0-2
	1908.5	19185	3	QPSK	1	0	22.55	0	0
	1908.5	19185	3	QPSK	1	14	22.72	0	0
	1908.5	19185	3	QPSK	8	4	22.35	1	0-1
	1908.5	19185	3	QPSK	15	0	22.10	1	0-1
	1908.5	19185	3	16-QAM	1	0	21.83	1	0-1
	1908.5	19185	3	16-QAM	1	14	21.85	1	0-1
	1908.5	19185	3	16-QAM	8	4	21.11	2	0-2
	1908.5	19185	3	16-QAM	15	0	21.09	2	0-2

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Table 10-7
LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1852.5	18625	5	QPSK	1	0	23.09	0	0
	1852.5	18625	5	QPSK	1	24	23.07	0	0
	1852.5	18625	5	QPSK	12	6	22.24	1	0-1
	1852.5	18625	5	QPSK	25	0	22.16	1	0-1
	1852.5	18625	5	16-QAM	1	0	22.05	1	0-1
	1852.5	18625	5	16-QAM	1	24	22.20	1	0-1
	1852.5	18625	5	16-QAM	12	6	21.10	2	0-2
Mid	1852.5	18625	5	16-QAM	25	0	21.05	2	0-2
	1880.0	18900	5	QPSK	1	0	22.87	0	0
	1880.0	18900	5	QPSK	1	24	22.76	0	0
	1880.0	18900	5	QPSK	12	6	21.97	1	0-1
	1880.0	18900	5	QPSK	25	0	21.94	1	0-1
	1880.0	18900	5	16-QAM	1	0	21.86	1	0-1
	1880.0	18900	5	16-QAM	1	24	22.00	1	0-1
High	1880.0	18900	5	16-QAM	12	6	20.85	2	0-2
	1880.0	18900	5	16-QAM	25	0	21.00	2	0-2
	1907.5	19175	5	QPSK	1	0	22.73	0	0
	1907.5	19175	5	QPSK	1	24	22.87	0	0
	1907.5	19175	5	QPSK	12	6	22.17	1	0-1
	1907.5	19175	5	QPSK	25	0	21.80	1	0-1
	1907.5	19175	5	16-QAM	1	0	21.63	1	0-1
	1907.5	19175	5	16-QAM	1	24	21.80	1	0-1
	1907.5	19175	5	16-QAM	12	6	21.30	2	0-2
	1907.5	19175	5	16-QAM	25	0	20.90	2	0-2
	1907.5	19175	5	16-QAM	25	0	20.90	2	0-2

Table 10-8
LTE Band 2 (PCS) Conducted Powers – 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1855	18650	10	QPSK	1	0	22.79	0	0
	1855	18650	10	QPSK	1	49	22.79	0	0
	1855	18650	10	QPSK	25	12	21.82	1	0-1
	1855	18650	10	QPSK	50	0	22.11	1	0-1
	1855	18650	10	16QAM	1	0	22.19	1	0-1
	1855	18650	10	16QAM	1	49	22.01	1	0-1
	1855	18650	10	16QAM	25	12	21.48	2	0-2
Mid	1855	18650	10	16QAM	50	0	21.47	2	0-2
	1880.0	18900	10	QPSK	1	0	23.32	0	0
	1880.0	18900	10	QPSK	1	49	22.93	0	0
	1880.0	18900	10	QPSK	25	12	22.24	1	0-1
	1880.0	18900	10	QPSK	50	0	22.14	1	0-1
	1880.0	18900	10	16QAM	1	0	21.96	1	0-1
	1880.0	18900	10	16QAM	1	49	22.06	1	0-1
High	1880.0	18900	10	16QAM	25	12	21.25	2	0-2
	1880.0	18900	10	16QAM	50	0	21.23	2	0-2
	1905	19150	10	QPSK	1	0	22.91	0	0
	1905	19150	10	QPSK	1	49	23.12	0	0
	1905	19150	10	QPSK	25	12	22.42	1	0-1
	1905	19150	10	QPSK	50	0	22.26	1	0-1
	1905	19150	10	16QAM	1	0	22.09	1	0-1
	1905	19150	10	16QAM	1	49	22.02	1	0-1
	1905	19150	10	16QAM	25	12	21.29	2	0-2
	1905	19150	10	16QAM	50	0	21.43	2	0-2

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10.1.3 Required RB Size and RB Offsets for SAR Testing

The bolded configurations above were tested for SAR.

The powers above for LTE Band 4 (AWS) bandwidths 1.4 MHz, 3 MHz, and 5 MHz and LTE Band 2 (PCS) bandwidths 1.4 MHz, 3 MHz, and 5 MHz were also reported in RF Exposure Technical Report S/N 0Y1205300755.A3L for C2PC compliance evaluation.

According to FCC KDB 941225 D05:

- 1) Per Page 4, 3) A), QPSK with 50% RB is required for the highest bandwidth.
- 2) Per Page 4, footnote 2, when the maximum output power across high, mid., and low channels is < 0.5 dB, mid channel is tested. Low and high channel SAR tests are not required for QPSK, 50% RB allocation when the SAR is < 0.8 W/kg.
- 3) Per Page 4, 3) B), QPSK with 1 RB for both channel edges are required for the highest bandwidth.
- 4) Per Page 4, footnote 6, QPSK 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocations were > 0.5 dB higher than the 50% RB allocation for QPSK. Otherwise, SAR tests are performed on the channel that produced the highest SAR for QPSK with 50% RB.
- 5) Per Page 4, 3) B), I), when the SAR for QPSK 1 RB allocation tests is <1.45 W/kg, testing on the other channels is not required.
- 6) Per Page 4, 4) A), 16QAM with 50% RB is required for the highest bandwidth on the channel with the highest measured SAR for QPSK with 50% RB allocation.
- 7) Per Page 4, 4) A), I), when the SAR for 16 QAM, 50 % allocation tests is <1.45 W/kg, testing on the other channels is not required.
- 8) Per Page 4, 4) B) and Page 5 footnote 9, 16QAM with 1RB for both channel edges are required for the highest bandwidth on the highest output power channel for the 1 RB allocation when the average output power of the 1 RB allocation is >0.5 dB higher than the 50% allocation for 16 QAM. Otherwise, SAR tests are performed on the channel that produced the highest SAR for 16 QAM with 50% RB.
- 9) Per Page 5, 4) B), I), when the SAR for 16 QAM 1 RB allocation tests is <1.45 W/kg, testing on the other channels is not required.
- 10) Per Page 4, 4), A) I) and Page 5, 4), A),I), 100% RB Allocation is not required to be tested when the SAR is not > 1.45 W/kg for the highest bandwidth.
- 11) Per Page 5, 5) B) I), smaller bandwidths are not required to be tested when SAR is not > 1.45 W/kg for the highest bandwidth and the maximum average output power of the smaller bandwidths across all channels and configurations is not more than 0.5 dB higher than the higher bandwidths



Figure 10-1
Power Measurement Setup

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11 SYSTEM VERIFICATION

11.1 Tissue Verification

Table 11-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
7/25/2012	1750H	24.8	1710	1.329	38.71	1.348	40.136	-1.41%	-3.55%
			1750	1.365	38.57	1.370	40.100	-0.36%	-3.82%
			1790	1.403	38.39	1.394	40.020	0.65%	-4.07%
7/24/2012	1900H	22.4	1850	1.334	39.27	1.400	40.000	-4.71%	-1.82%
			1880	1.375	38.92	1.400	40.000	-1.79%	-2.70%
			1910	1.403	38.82	1.400	40.000	0.21%	-2.95%
7/30/2012	1750B	21.7	1710	1.414	53.48	1.460	53.540	-3.15%	-0.11%
			1750	1.453	53.02	1.490	53.430	-2.48%	-0.77%
			1790	1.515	53.08	1.510	53.330	0.33%	-0.47%
7/23/2012	1900B	22.2	1850	1.482	52.60	1.520	53.300	-2.50%	-1.31%
			1880	1.528	52.61	1.520	53.300	0.53%	-1.29%
			1910	1.558	52.39	1.520	53.300	2.50%	-1.71%

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

11.2 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 ϵ can be calculated from the below equation (Pournaropoulos and Misra):

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

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

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11.3 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 11-2
System Verification Results

System Verification TARGET & MEASURED											
Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR _{1g} (W/kg)	1 W Target SAR _{1g} (W/kg)	1 W Normalized SAR _{1g} (W/kg)	Deviation (%)
1750	Head	07/25/2012	24.7	23.4	0.100	1008	3209	3.66	36.400	36.600	0.55%
1900	Head	07/24/2012	23.8	21.9	0.100	5d148	3288	4.15	40.500	41.500	2.47%
1750	Body	07/30/2012	21.4	21.1	0.100	1051	3213	3.84	37.600	38.400	2.13%
1900	Body	07/23/2012	23.1	22.2	0.100	5d149	3287	4.16	39.300	41.600	5.85%

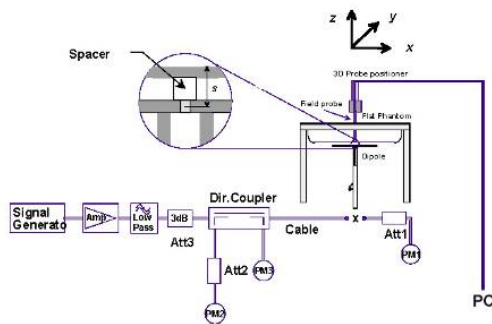


Figure 11-1
System Verification Setup Diagram



Figure 11-2
System Verification Setup Photo

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12 SAR DATA SUMMARY

12.1 Standalone Head SAR Data

Table 12-1
LTE Band 4 (AWS) Head SAR Results

MEASUREMENT RESULTS													
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	# of RB	RB Offset	SAR (1g) (W/kg)
MHz	Ch.												
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.32	-0.11	1	Right	Cheek	QPSK	25	12	0.309
1750.00	20350	High	LTE Band 4 (AWS)	10	22.90	0.06	0	Right	Cheek	QPSK	1	0	0.316
1750.00	20350	High	LTE Band 4 (AWS)	10	22.84	0.05	0	Right	Cheek	QPSK	1	49	0.343
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.09	0.16	2	Right	Cheek	16 QAM	25	12	0.225
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.12	-0.01	1	Right	Cheek	16 QAM	1	0	0.248
1715.00	20000	Low	LTE Band 4 (AWS)	10	21.98	0.02	1	Right	Cheek	16 QAM	1	49	0.275
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.32	-0.01	1	Right	Tilt	QPSK	25	12	0.211
1750.00	20350	High	LTE Band 4 (AWS)	10	22.90	0.05	0	Right	Tilt	QPSK	1	0	0.226
1750.00	20350	High	LTE Band 4 (AWS)	10	22.84	0.01	0	Right	Tilt	QPSK	1	49	0.229
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.09	0.07	2	Right	Tilt	16 QAM	25	12	0.155
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.12	-0.03	1	Right	Tilt	16 QAM	1	0	0.175
1715.00	20000	Low	LTE Band 4 (AWS)	10	21.98	-0.10	1	Right	Tilt	16 QAM	1	49	0.181
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.32	0.03	1	Left	Cheek	QPSK	25	12	0.586
1750.00	20350	High	LTE Band 4 (AWS)	10	22.90	0.01	0	Left	Cheek	QPSK	1	0	0.593
1750.00	20350	High	LTE Band 4 (AWS)	10	22.84	0.09	0	Left	Cheek	QPSK	1	49	0.624
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.09	-0.17	2	Left	Cheek	16 QAM	25	12	0.416
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.12	0.07	1	Left	Cheek	16 QAM	1	0	0.475
1715.00	20000	Low	LTE Band 4 (AWS)	10	21.98	-0.01	1	Left	Cheek	16 QAM	1	49	0.487
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.32	-0.18	1	Left	Tilt	QPSK	25	12	0.181
1750.00	20350	High	LTE Band 4 (AWS)	10	22.90	0.12	0	Left	Tilt	QPSK	1	0	0.220
1750.00	20350	High	LTE Band 4 (AWS)	10	22.84	0.21	0	Left	Tilt	QPSK	1	49	0.232
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.09	0.08	2	Left	Tilt	16 QAM	25	12	0.149
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.12	0.02	1	Left	Tilt	16 QAM	1	0	0.176
1715.00	20000	Low	LTE Band 4 (AWS)	10	21.98	0.07	1	Left	Tilt	16 QAM	1	49	0.161
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram					

Note: QPSK and 16 QAM 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocation was > 0.5 dB higher than the 50% RB allocation for QPSK and 16 QAM, respectively. Therefore, high channel was tested for LTE Band 4 (AWS) for QPSK 1 RB cases and low channel was tested for LTE Band 4 (AWS) for 16 QAM 1 RB cases.

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Table 12-2
LTE Band 2 (PCS) Head SAR Results

MEASUREMENT RESULTS													
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	# of RB	RB Offset	SAR (1g)
MHz	Ch.												(W/kg)
1905.00	19150	High	LTE Band 2 (PCS)	10	22.42	0.13	1	Right	Cheek	QPSK	25	12	0.415
1880.00	18900	Mid	LTE Band 2 (PCS)	10	23.32	-0.05	0	Right	Cheek	QPSK	1	0	0.476
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.93	-0.07	0	Right	Cheek	QPSK	1	49	0.515
1905.00	19150	High	LTE Band 2 (PCS)	10	21.29	0.12	2	Right	Cheek	16 QAM	25	12	0.313
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.19	-0.17	1	Right	Cheek	16 QAM	1	0	0.355
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.01	-0.12	1	Right	Cheek	16 QAM	1	49	0.413
1905.00	19150	High	LTE Band 2 (PCS)	10	22.42	0.04	1	Right	Tilt	QPSK	25	12	0.239
1880.00	18900	Mid	LTE Band 2 (PCS)	10	23.32	-0.09	0	Right	Tilt	QPSK	1	0	0.333
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.93	0.00	0	Right	Tilt	QPSK	1	49	0.343
1905.00	19150	High	LTE Band 2 (PCS)	10	21.29	0.10	2	Right	Tilt	16 QAM	25	12	0.201
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.19	0.02	1	Right	Tilt	16 QAM	1	0	0.245
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.01	-0.04	1	Right	Tilt	16 QAM	1	49	0.276
1905.00	19150	High	LTE Band 2 (PCS)	10	22.42	0.17	1	Left	Cheek	QPSK	25	12	0.670
1880.00	18900	Mid	LTE Band 2 (PCS)	10	23.32	0.02	0	Left	Cheek	QPSK	1	0	0.899
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.93	0.06	0	Left	Cheek	QPSK	1	49	0.920
1905.00	19150	High	LTE Band 2 (PCS)	10	21.29	-0.12	2	Left	Cheek	16 QAM	25	12	0.527
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.19	-0.03	1	Left	Cheek	16 QAM	1	0	0.678
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.01	-0.04	1	Left	Cheek	16 QAM	1	49	0.750
1905.00	19150	High	LTE Band 2 (PCS)	10	22.42	0.15	1	Left	Tilt	QPSK	25	12	0.262
1880.00	18900	Mid	LTE Band 2 (PCS)	10	23.32	-0.03	0	Left	Tilt	QPSK	1	0	0.316
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.93	-0.18	0	Left	Tilt	QPSK	1	49	0.332
1905.00	19150	High	LTE Band 2 (PCS)	10	21.29	-0.07	2	Left	Tilt	16 QAM	25	12	0.195
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.19	0.09	1	Left	Tilt	16 QAM	1	0	0.232
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.01	-0.11	1	Left	Tilt	16 QAM	1	49	0.260
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Head					
Spatial Peak								1.6 W/kg (mW/g)					
Uncontrolled Exposure/General Population								averaged over 1 gram					

Note:

1. QPSK 50% RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power deviation across low, mid, and high channels was > 0.5 dB for QPSK. Therefore, high channel was tested for LTE Band 2 (PCS) for QPSK 50% RB cases.
2. Since 16 QAM 50% RB allocation out powers were not > 0.5 dB than QPSK 50% RB allocation output powers, 16 QAM 50% RB allocation SAR tests were performed on the highest SAR channel measured for QPSK 50% RB allocations. Therefore, high channel was tested for LTE Band 2 (PCS) for 16 QAM 50% RB cases.
3. QPSK and 16 QAM 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocation was > 0.5 dB higher than the 50% RB allocation for QPSK and 16 QAM, respectively. Therefore, mid channel was tested for LTE Band 2 (PCS) for QPSK 1 RB cases and low channel was tested for LTE Band 2 (PCS) for 16 QAM 1 RB cases.

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12.2 Standalone Body-Worn SAR Data

Table 12-3
LTE Body-Worn SAR Results

MEASUREMENT RESULTS													
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Modulation	# of RB	RB Offset	Spacing	Side	SAR (1g)
MHz	Ch.												(W/kg)
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.32	0.03	0	QPSK	25	12	1.0 cm	back	0.395
1750.00	20350	High	LTE Band 4 (AWS)	10	22.90	-0.04	0	QPSK	1	0	1.0 cm	back	0.491
1750.00	20350	High	LTE Band 4 (AWS)	10	22.84	0.00	0	QPSK	1	49	1.0 cm	back	0.538
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.09	-0.02	0	16 QAM	25	12	1.0 cm	back	0.319
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.12	0.01	0	16 QAM	1	0	1.0 cm	back	0.357
1715.00	20000	Low	LTE Band 4 (AWS)	10	21.98	-0.10	0	16 QAM	1	49	1.0 cm	back	0.347
1905.00	19150	High	LTE Band 2 (PCS)	10	22.42	0.16	0	QPSK	25	12	1.0 cm	back	0.461
1880.00	18900	Mid	LTE Band 2 (PCS)	10	23.32	-0.01	0	QPSK	1	0	1.0 cm	back	0.573
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.93	0.02	0	QPSK	1	49	1.0 cm	back	0.576
1905.00	19150	High	LTE Band 2 (PCS)	10	21.29	0.12	0	16 QAM	25	12	1.0 cm	back	0.340
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.19	-0.16	0	16 QAM	1	0	1.0 cm	back	0.416
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.01	0.08	0	16 QAM	1	49	1.0 cm	back	0.426
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body					
Spatial Peak								1.6 W/kg (mW/g)					
Uncontrolled Exposure/General Population								averaged over 1 gram					

Note:

1. QPSK and 16 QAM 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocation was > 0.5 dB higher than the 50% RB allocation for QPSK and 16 QAM, respectively. Therefore, high channel was tested for LTE Band 4 (AWS) for QPSK 1 RB cases and low channel was tested for LTE Band 4 (AWS) for 16 QAM 1 RB cases.
2. QPSK 50% RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power deviation across low, mid, and high channels was > 0.5 dB for QPSK. Therefore, high channel was tested for LTE Band 2 (PCS) for QPSK 50% RB cases.
3. Since 16 QAM 50% RB allocation output powers were not > 0.5 dB than QPSK 50% RB allocation output powers, 16 QAM 50% RB allocation SAR tests were performed on the highest SAR channel measured for QPSK 50% RB allocations. Therefore, high channel was tested for LTE Band 2 (PCS) for 16 QAM 50% RB cases.
4. QPSK and 16 QAM 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocation was > 0.5 dB higher than the 50% RB allocation for QPSK and 16 QAM, respectively. Therefore, mid channel was tested for LTE Band 2 (PCS) for QPSK 1 RB cases and low channel was tested for LTE Band 2 (PCS) for 16 QAM 1 RB cases.
5. For LTE Mode, Hotspot SAR Data was used for supporting body-worn accessory compliance per FCC KDB Publication 941225 D06.

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12.3 Standalone Wireless Router SAR Data

Table 12-4
LTE Band 4 (AWS) Hotspot SAR Data

MEASUREMENT RESULTS													
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Modulation	# of RB	RB Offset	Spacing	Side	SAR (1g)
MHz	Ch.	High											(W/kg)
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.32	0.03	0	QPSK	25	12	1.0 cm	back	0.395
1750.00	20350	High	LTE Band 4 (AWS)	10	22.90	-0.04	0	QPSK	1	0	1.0 cm	back	0.491
1750.00	20350	High	LTE Band 4 (AWS)	10	22.84	0.00	0	QPSK	1	49	1.0 cm	back	0.538
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.09	-0.02	0	16 QAM	25	12	1.0 cm	back	0.319
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.12	0.01	0	16 QAM	1	0	1.0 cm	back	0.357
1715.00	20000	Low	LTE Band 4 (AWS)	10	21.98	-0.10	0	16 QAM	1	49	1.0 cm	back	0.347
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.32	0.05	0	QPSK	25	12	1.0 cm	front	0.360
1750.00	20350	High	LTE Band 4 (AWS)	10	22.90	0.01	0	QPSK	1	0	1.0 cm	front	0.468
1750.00	20350	High	LTE Band 4 (AWS)	10	22.84	-0.12	0	QPSK	1	49	1.0 cm	front	0.531
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.09	0.00	0	16 QAM	25	12	1.0 cm	front	0.286
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.12	0.04	0	16 QAM	1	0	1.0 cm	front	0.323
1715.00	20000	Low	LTE Band 4 (AWS)	10	21.98	-0.12	0	16 QAM	1	49	1.0 cm	front	0.322
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.32	-0.02	0	QPSK	25	12	1.0 cm	bottom	0.191
1750.00	20350	High	LTE Band 4 (AWS)	10	22.90	0.08	0	QPSK	1	0	1.0 cm	bottom	0.248
1750.00	20350	High	LTE Band 4 (AWS)	10	22.84	0.09	0	QPSK	1	49	1.0 cm	bottom	0.258
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.09	0.03	0	16 QAM	25	12	1.0 cm	bottom	0.151
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.12	-0.06	0	16 QAM	1	0	1.0 cm	bottom	0.159
1715.00	20000	Low	LTE Band 4 (AWS)	10	21.98	0.09	0	16 QAM	1	49	1.0 cm	bottom	0.164
1732.50	20175	Mid	LTE Band 4 (AWS)	10	22.32	-0.03	0	QPSK	25	12	1.0 cm	left	0.188
1750.00	20350	High	LTE Band 4 (AWS)	10	22.90	0.12	0	QPSK	1	0	1.0 cm	left	0.269
1750.00	20350	High	LTE Band 4 (AWS)	10	22.84	-0.19	0	QPSK	1	49	1.0 cm	left	0.264
1732.50	20175	Mid	LTE Band 4 (AWS)	10	21.09	-0.03	0	16 QAM	25	12	1.0 cm	left	0.157
1715.00	20000	Low	LTE Band 4 (AWS)	10	22.12	-0.14	0	16 QAM	1	0	1.0 cm	left	0.169
1715.00	20000	Low	LTE Band 4 (AWS)	10	21.98	-0.08	0	16 QAM	1	49	1.0 cm	left	0.162
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body					
Spatial Peak								1.6 W/kg (mW/g)					
Uncontrolled Exposure/General Population								averaged over 1 gram					

Note: QPSK and 16 QAM 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocation was > 0.5 dB higher than the 50% RB allocation for QPSK and 16 QAM, respectively. Therefore, high channel was tested for LTE Band 4 (AWS) for QPSK 1 RB cases and low channel was tested for LTE Band 4 (AWS) for 16 QAM 1 RB cases.

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Table 12-5
LTE Band 2 (PCS) Hotspot SAR Data

MEASUREMENT RESULTS													
FREQUENCY			Mode	Bandwidth [MHz]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Modulation	# of RB	RB Offset	Spacing	Side	SAR (1g)
MHz	Ch.												(W/kg)
1905.00	19150	High	LTE Band 2 (PCS)	10	22.42	0.16	1	QPSK	25	12	1.0 cm	back	0.461
1880.00	18900	Mid	LTE Band 2 (PCS)	10	23.32	-0.01	0	QPSK	1	0	1.0 cm	back	0.573
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.93	0.02	0	QPSK	1	49	1.0 cm	back	0.576
1905.00	19150	High	LTE Band 2 (PCS)	10	21.29	0.12	2	16 QAM	25	12	1.0 cm	back	0.340
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.19	-0.16	1	16 QAM	1	0	1.0 cm	back	0.416
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.01	0.08	1	16 QAM	1	49	1.0 cm	back	0.426
1905.00	19150	High	LTE Band 2 (PCS)	10	22.42	0.18	1	QPSK	25	12	1.0 cm	front	0.464
1880.00	18900	Mid	LTE Band 2 (PCS)	10	23.32	-0.04	0	QPSK	1	0	1.0 cm	front	0.553
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.93	0.01	0	QPSK	1	49	1.0 cm	front	0.583
1905.00	19150	High	LTE Band 2 (PCS)	10	21.29	-0.14	2	16 QAM	25	12	1.0 cm	front	0.359
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.19	0.03	1	16 QAM	1	0	1.0 cm	front	0.419
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.01	0.17	1	16 QAM	1	49	1.0 cm	front	0.484
1905.00	19150	High	LTE Band 2 (PCS)	10	22.42	0.03	1	QPSK	25	12	1.0 cm	bottom	0.099
1880.00	18900	Mid	LTE Band 2 (PCS)	10	23.32	0.05	0	QPSK	1	0	1.0 cm	bottom	0.124
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.93	0.20	0	QPSK	1	49	1.0 cm	bottom	0.133
1905.00	19150	High	LTE Band 2 (PCS)	10	21.29	-0.07	2	16 QAM	25	12	1.0 cm	bottom	0.074
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.19	-0.03	1	16 QAM	1	0	1.0 cm	bottom	0.096
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.01	-0.05	1	16 QAM	1	49	1.0 cm	bottom	0.105
1905.00	19150	High	LTE Band 2 (PCS)	10	22.42	-0.07	1	QPSK	25	12	1.0 cm	left	0.269
1880.00	18900	Mid	LTE Band 2 (PCS)	10	23.32	-0.03	0	QPSK	1	0	1.0 cm	left	0.317
1880.00	18900	Mid	LTE Band 2 (PCS)	10	22.93	-0.16	0	QPSK	1	49	1.0 cm	left	0.369
1905.00	19150	High	LTE Band 2 (PCS)	10	21.29	-0.18	2	16 QAM	25	12	1.0 cm	left	0.204
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.19	-0.15	1	16 QAM	1	0	1.0 cm	left	0.245
1855.00	18650	Low	LTE Band 2 (PCS)	10	22.01	0.00	1	16 QAM	1	49	1.0 cm	left	0.297
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram					

Note:

1. QPSK 50% RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power deviation across low, mid, and high channels was > 0.5 dB for QPSK. Therefore, high channel was tested for LTE Band 2 (PCS) for QPSK 50% RB cases.
2. Since 16 QAM 50% RB allocation out powers were not > 0.5 dB than QPSK 50% RB allocation output powers, 16 QAM 50% RB allocation SAR tests were performed on the highest SAR channel measured for QPSK 50% RB allocations. Therefore, high channel was tested for LTE Band 2 (PCS) for 16 QAM 50% RB cases.
3. QPSK and 16 QAM 1 RB allocation SAR tests were performed on the highest output power channel for the RB allocation when the average output power of the 1 RB allocation was > 0.5 dB higher than the 50% RB allocation for QPSK and 16 QAM, respectively. Therefore, mid channel was tested for LTE Band 2 (PCS) for QPSK 1 RB cases and low channel was tested for LTE Band 2 (PCS) for 16 QAM 1 RB cases.

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12.4 SAR Test Notes

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. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 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.
7. Per FCC KDB Publication 941225 D06, when the same wireless modes and device transmission configurations are required for body-worn accessories and hotspot mode, it is not necessary to additionally test body-worn accessory SAR for the same device orientation. Therefore, the hotspot data for the back side configuration additionally shows body-worn compliance at the same distance.
8. LTE Considerations: LTE test configurations are determined according to SAR Test Considerations for LTE handsets and Data Modems KDB 941225 D05 Publication and were evaluated independently of test position. General test procedures can be found in Section 9.1.3.
9. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
10. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator.
11. LTE Band 4 (AWS) SAR was measured with a probe calibrated at 1750 MHz and is valid for measuring SAR from ± 50 MHz. The 1750MHz specific liquid was verified with specific probe calibration factors as required per FCC KDB Publication 450824 D01.
12. Top Edge and Right Edge for the LTE transmitter were not tested since the antenna distance from the edge was greater than 2.5 cm per FCC KDB Publication 941225 D06 guidance (see Section 1.2).

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13 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

13.1 Introduction

The following procedures adopted from “FCC SAR Considerations for Cell Phones with Multiple Transmitters” FCC KDB Publication 648474 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

13.2 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 13-1
Output Power Thresholds for Unlicensed Transmitters

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

Figure 13-2
SAR Evaluation Requirements for Multiple Transmitter Handsets

13.3 Simultaneous Transmission Conclusion

The maximum simultaneous transmission results remain the same as original compliance evaluation since the SAR values measured for the current application resulted in simultaneous SAR equal to or less than the original maximum simultaneous SAR values. Please see RF Exposure Technical Report S/N 0Y1202210211.A3L filed with the original application for simultaneous transmission analysis.

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14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	10/10/2011	Annual	10/10/2012	3613A00315
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/4/2012	Annual	4/4/2013	JP38020182
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/5/2012	Annual	4/5/2013	MY45470194
Agilent	8648D	Signal Generator	4/3/2012	Annual	4/3/2013	3629U00687
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/3/2012	Annual	4/3/2013	US37390350
Agilent	85070E	Dielectric Probe Kit	3/8/2012	Annual	3/8/2013	MY44300633
Agilent	85047A	S-Parameter Test Set	N/A	N/A	N/A	2904A00579
Amplifier Research	5S1G4	5W, 800MHz-4.2GHz	CBT	N/A	CBT	21910
Anritsu	ML2438A	Power Meter	2/14/2012	Annual	2/14/2013	1190013
Anritsu	ML2438A	Power Meter	2/14/2012	Annual	2/14/2013	98150041
Anritsu	ML2438A	Power Meter	10/13/2011	Annual	10/13/2012	1070030
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	8013
Anritsu	MA2481A	Power Sensor	4/5/2012	Annual	4/5/2013	5605
Anritsu	MA2481A	Power Sensor	2/14/2012	Annual	2/14/2013	2400
Anritsu	MA2411B	Pulse Sensor	10/13/2011	Annual	10/13/2012	1027293
Anritsu	ML2495A	Power Meter	10/13/2011	Annual	10/13/2012	1039008
Anritsu	MT8820C	Radio Communication Tester	11/11/2011	Annual	11/11/2012	6200901190
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
COMTECH	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M1S5A00-009
Control Company	61220-416	Long-Stem Thermometer	2/15/2011	Biennial	2/15/2013	111331322
Control Company	61220-416	Long-Stem Thermometer	2/15/2011	Biennial	2/15/2013	111331323
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/12/2011	Annual	10/12/2012	1833460
Gigatronics	8651A	Universal Power Meter	10/12/2011	Annual	10/12/2012	8650319
Intelligent Weigh	PD-3000	Electronic Balance	3/27/2012	Annual	3/27/2013	11081534
Intelligent Weighing	PD-3000	Electronic Balance	6/29/2012	Annual	6/29/2013	120405017
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	NRVD	Dual Channel Power Meter	4/8/2011	Biennial	4/8/2013	101695
Rohde & Schwarz	SMI903B	Signal Generator	4/5/2012	Annual	4/5/2013	DE27259
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	8/25/2011	Annual	8/25/2012	100976
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	10/7/2011	Annual	10/7/2012	103962
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	11/30/2011	Annual	11/30/2012	101699
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	3/5/2012	Annual	3/5/2013	102060
Seekonk	NC-100	Torque Wrench (8" lb)	11/29/2011	Triennial	11/29/2014	21053
Seekonk	NC-100	Torque Wrench (8" lb)	3/5/2012	Triennial	3/5/2015	N/A
Seekonk	NC-100	Torque Wrench (8" lb)	3/5/2012	Triennial	3/5/2015	N/A
SPEAG	D1765V2	1765 MHz SAR Dipole	5/18/2012	Annual	5/18/2013	1008
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
SPEAG	D1750V2	1750 MHz SAR Dipole	4/24/2012	Annual	4/24/2013	1051
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/15/2012	Annual	2/15/2013	1323
SPEAG	ES3DV3	SAR Probe	2/7/2012	Annual	2/7/2013	3288
SPEAG	D1900V2	1900 MHz SAR Dipole	2/22/2012	Annual	2/22/2013	5d149
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/12/2012	Annual	4/12/2013	1333
SPEAG	D1900V2	1900 MHz SAR Dipole	2/8/2012	Annual	2/8/2013	5d148
SPEAG	ES3DV3	SAR Probe	2/7/2012	Annual	2/7/2013	3287
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/7/2012	Annual	5/7/2013	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	6/19/2012	Annual	6/19/2013	1070
Tektronix	RSA-6114A	Real Time Spectrum Analyzer	4/5/2012	Annual	4/5/2013	B010177
VWR	36934-158	Wall-Mounted Thermometer	1/21/2011	Biennial	1/21/2013	111286445
VWR	62344-925	Mini-Thermometer	10/24/2011	Biennial	10/24/2013	111886441

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, attenuator, coupler, amplifier, 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.

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

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

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16 CONCLUSION

16.1 Measurement Conclusion

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

Please note that the absorption and distribution of electromagnetic energy in the body are very complex phenomena that depend on the mass, shape, and size of the body, the orientation of the body with respect to the field vectors, and the electrical properties of both the body and the environment. Other variables that may play a substantial role in possible biological effects are those that characterize the environment (e.g. ambient temperature, air velocity, relative humidity, and body insulation) and those that characterize the individual (e.g. age, gender, activity level, debilitation, or disease). Because various factors may interact with one another to vary the specific biological outcome of an exposure to electromagnetic fields, any protection guide should consider maximal amplification of biological effects as a result of field-body interactions, environmental conditions, and physiological variables. [3]

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FCC ID: A3LSCHR820		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1207301069.A3L	Test Dates: 07/23/12 - 07/30/12	DUT Type: Portable Handset		Page 33 of 34

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 4 (AWS); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.365 \text{ mho/m}$; $\epsilon_r = 38.57$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 07-25-2012; Ambient Temp: 24.7°C; Tissue Temp: 23.4°C

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

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 2/15/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 4 (AWS), Right Head, Cheek, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

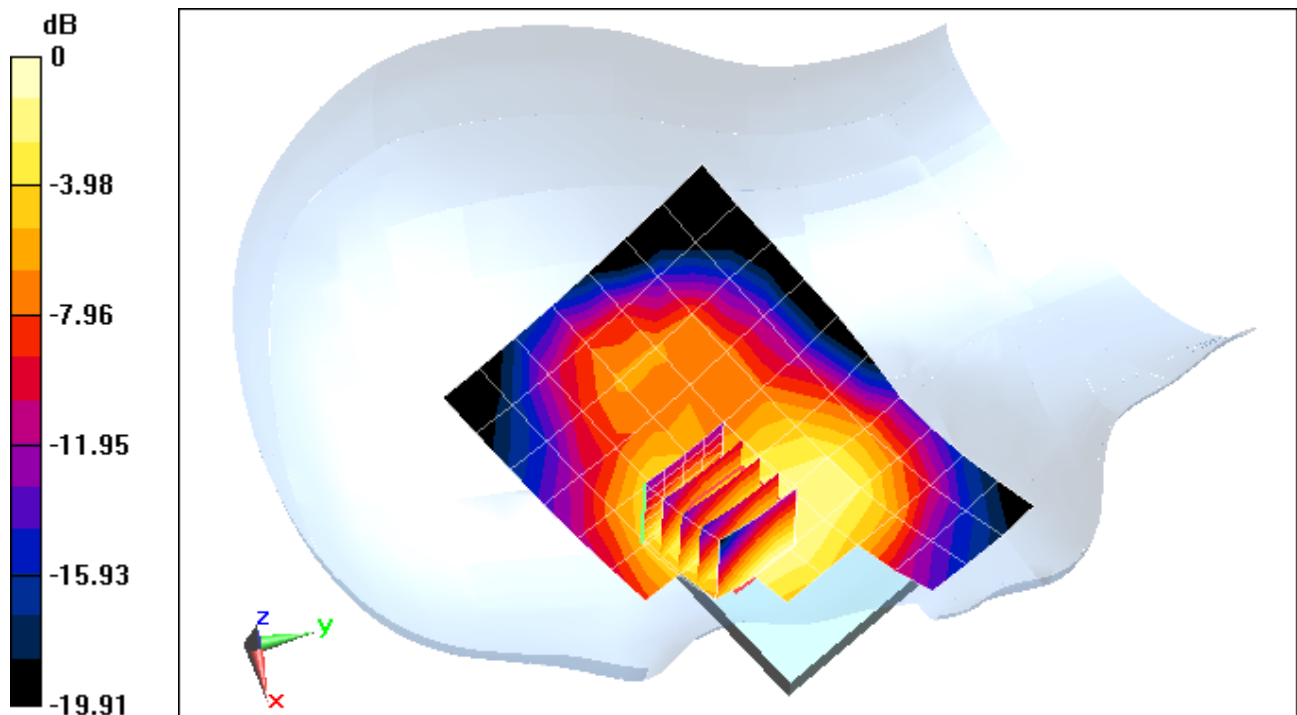
Area Scan (8x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 16.931 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.491 mW/g

SAR(1 g) = 0.343 mW/g; SAR(10 g) = 0.227 mW/g



0 dB = 0.365 mW/g = -8.75 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 4 (AWS); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.365 \text{ mho/m}$; $\epsilon_r = 38.57$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 07-25-2012; Ambient Temp: 24.7°C; Tissue Temp: 23.4°C

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

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 2/15/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 4 (AWS), Right Head, Tilt, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

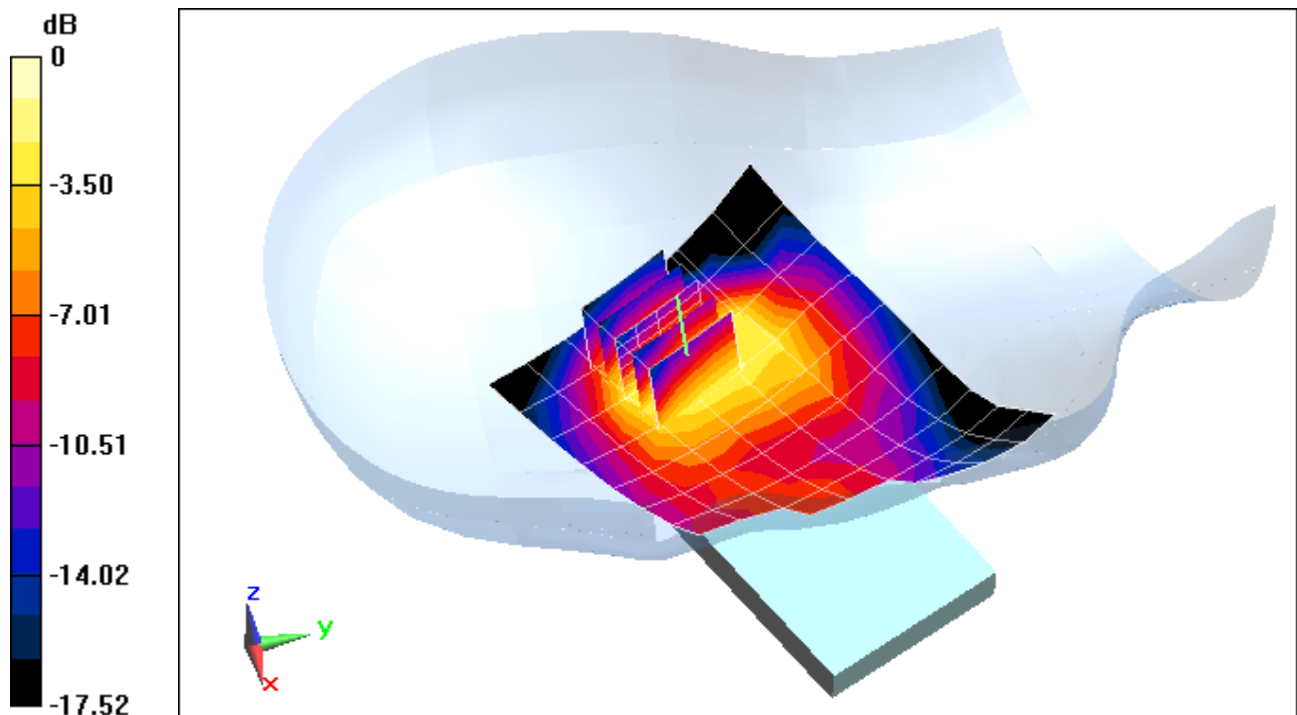
Area Scan (8x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 14.457 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.355 mW/g

SAR(1 g) = 0.229 mW/g; SAR(10 g) = 0.138 mW/g



0 dB = 0.248 mW/g = -12.11 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 4 (AWS); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.365 \text{ mho/m}$; $\epsilon_r = 38.57$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 07-25-2012; Ambient Temp: 24.7°C; Tissue Temp: 23.4°C

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

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 2/15/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 4 (AWS), Left Head, Cheek, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

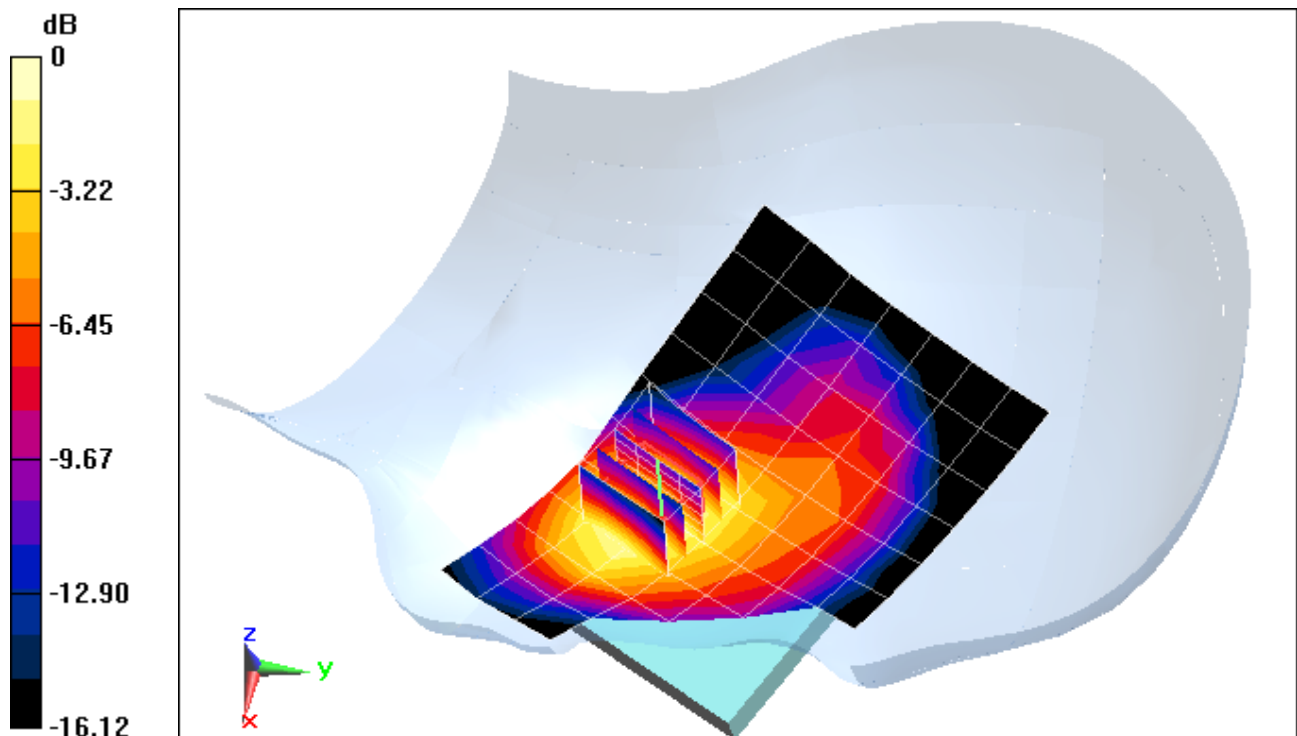
Area Scan (8x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 23.496 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.962 mW/g

SAR(1 g) = 0.624 mW/g; SAR(10 g) = 0.382 mW/g



0 dB = 0.661 mW/g = -3.60 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 4 (AWS); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.365 \text{ mho/m}$; $\epsilon_r = 38.57$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 07-25-2012; Ambient Temp: 24.7°C; Tissue Temp: 23.4°C

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

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 2/15/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 4 (AWS), Left Head, Tilt, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

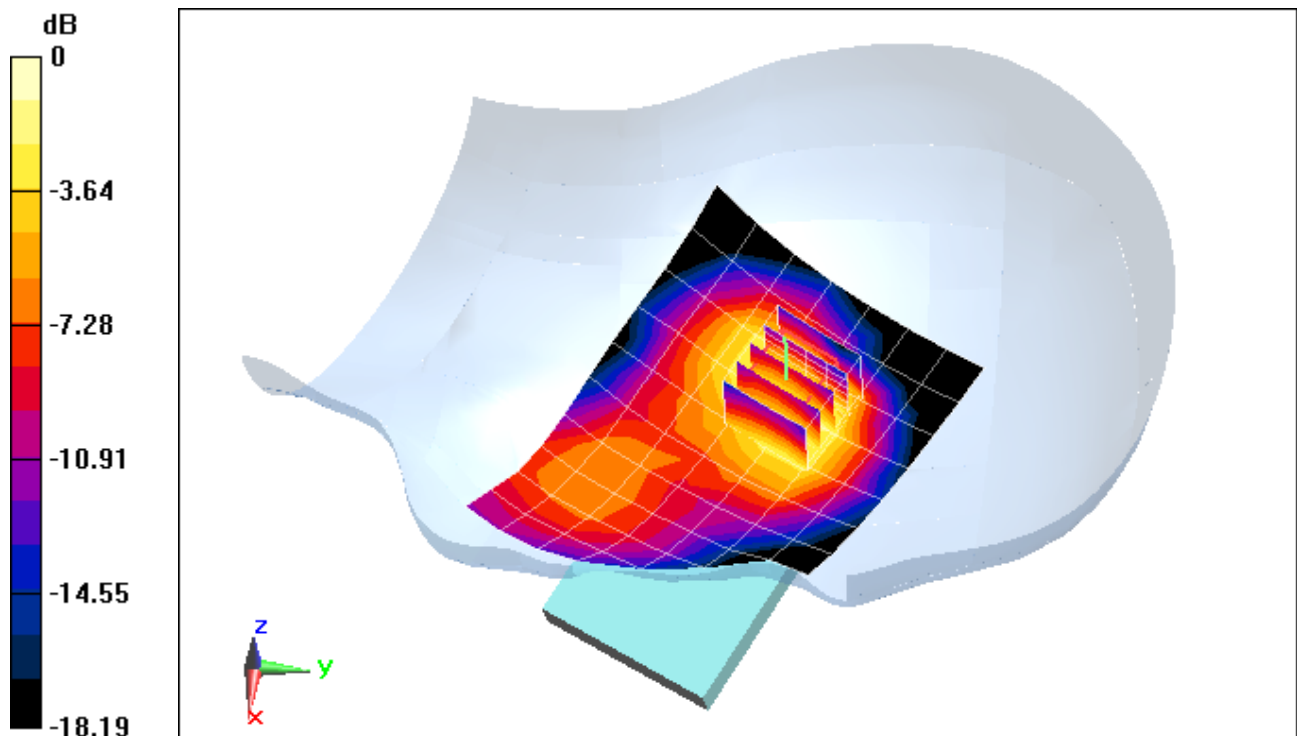
Area Scan (8x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.671 V/m; Power Drift = 0.21 dB

Peak SAR (extrapolated) = 0.341 mW/g

SAR(1 g) = 0.232 mW/g; SAR(10 g) = 0.149 mW/g



0 dB = 0.251 mW/g = -12.01 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.375 \text{ mho/m}$; $\epsilon_r = 38.92$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 07-24-2012; Ambient Temp: 23.8°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(5.16, 5.16, 5.16); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 4/12/2012

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 2 (PCS), Right Head, Cheek, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

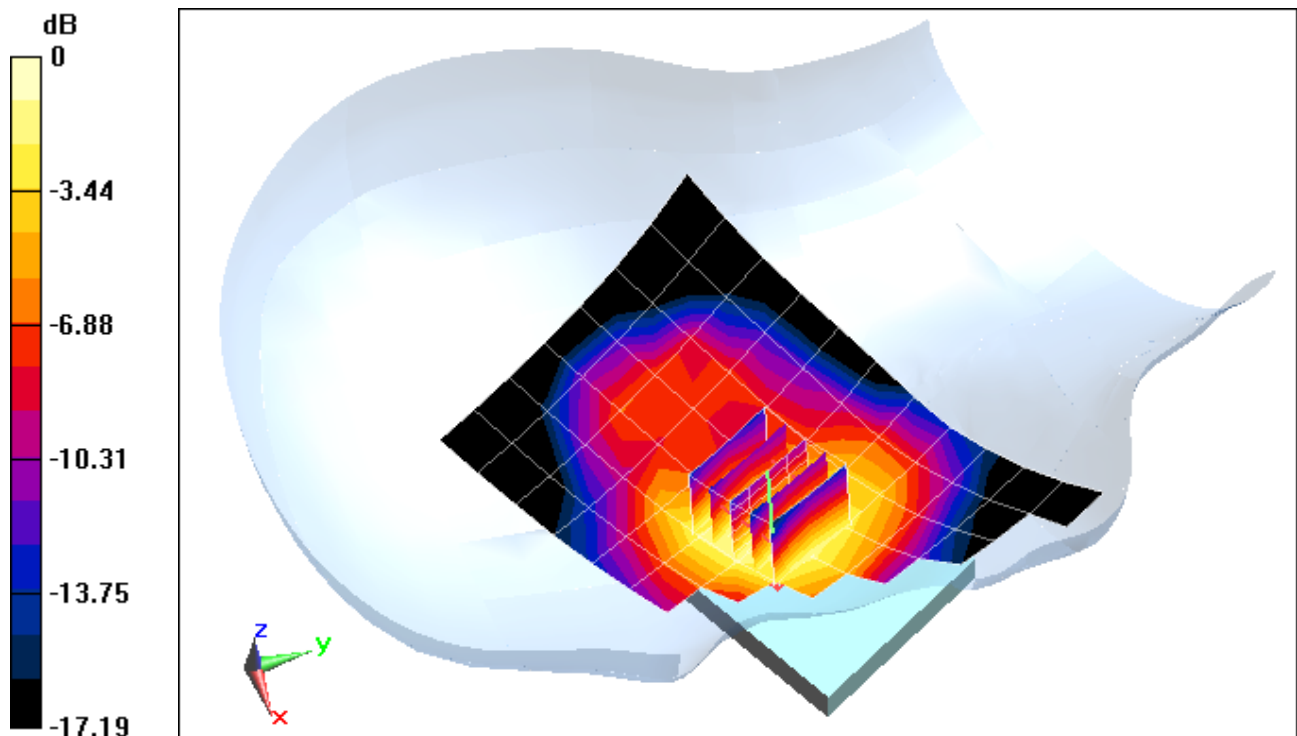
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.328 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.771 mW/g

SAR(1 g) = 0.515 mW/g; SAR(10 g) = 0.334 mW/g



0 dB = 0.543 mW/g = -5.30 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.375 \text{ mho/m}$; $\epsilon_r = 38.92$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 07-24-2012; Ambient Temp: 23.8°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(5.16, 5.16, 5.16); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 4/12/2012

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 2 (PCS), Right Head, Tilt, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

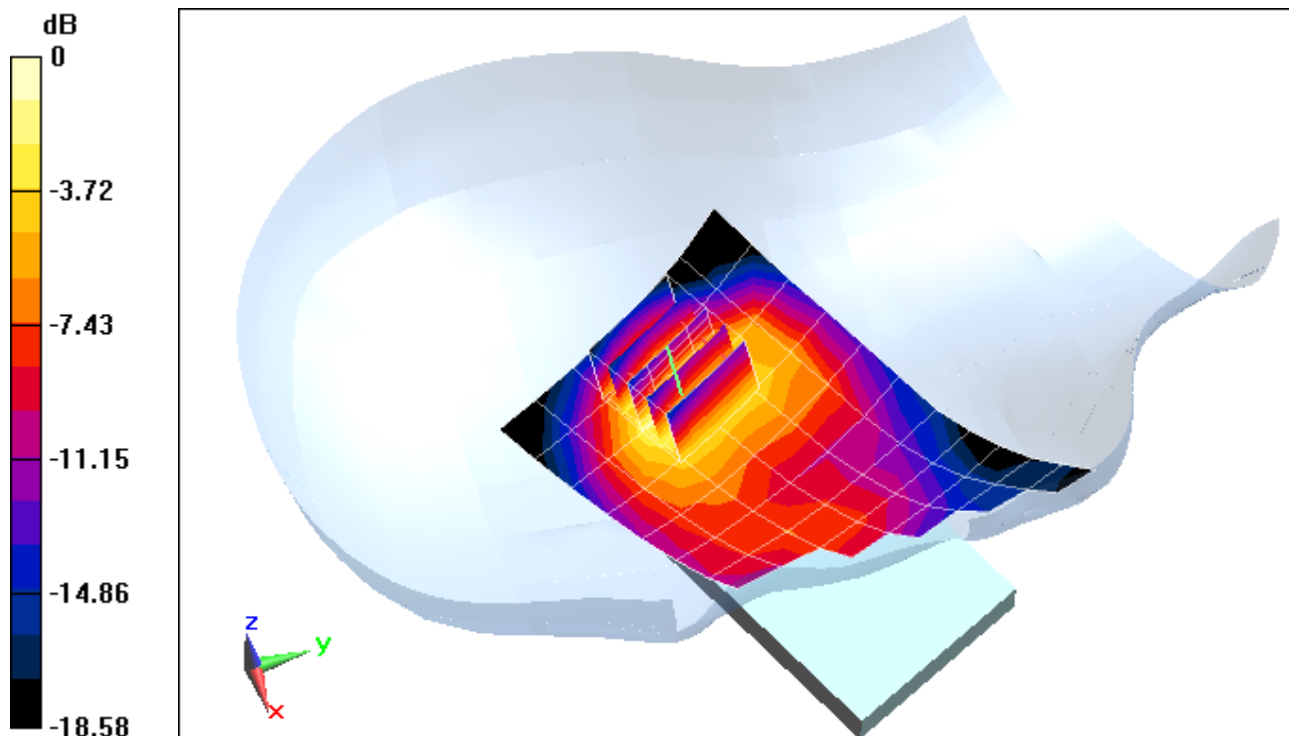
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.896 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.563 mW/g

SAR(1 g) = 0.343 mW/g; SAR(10 g) = 0.198 mW/g



0 dB = 0.378 mW/g = -8.45 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.375 \text{ mho/m}$; $\epsilon_r = 38.92$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 07-24-2012; Ambient Temp: 23.8°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(5.16, 5.16, 5.16); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 4/12/2012

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 2 (PCS), Left Head, Cheek, Mid.ch, QPSK,
10 MHz Bandwidth, 1 RB, 49 RB Offset**

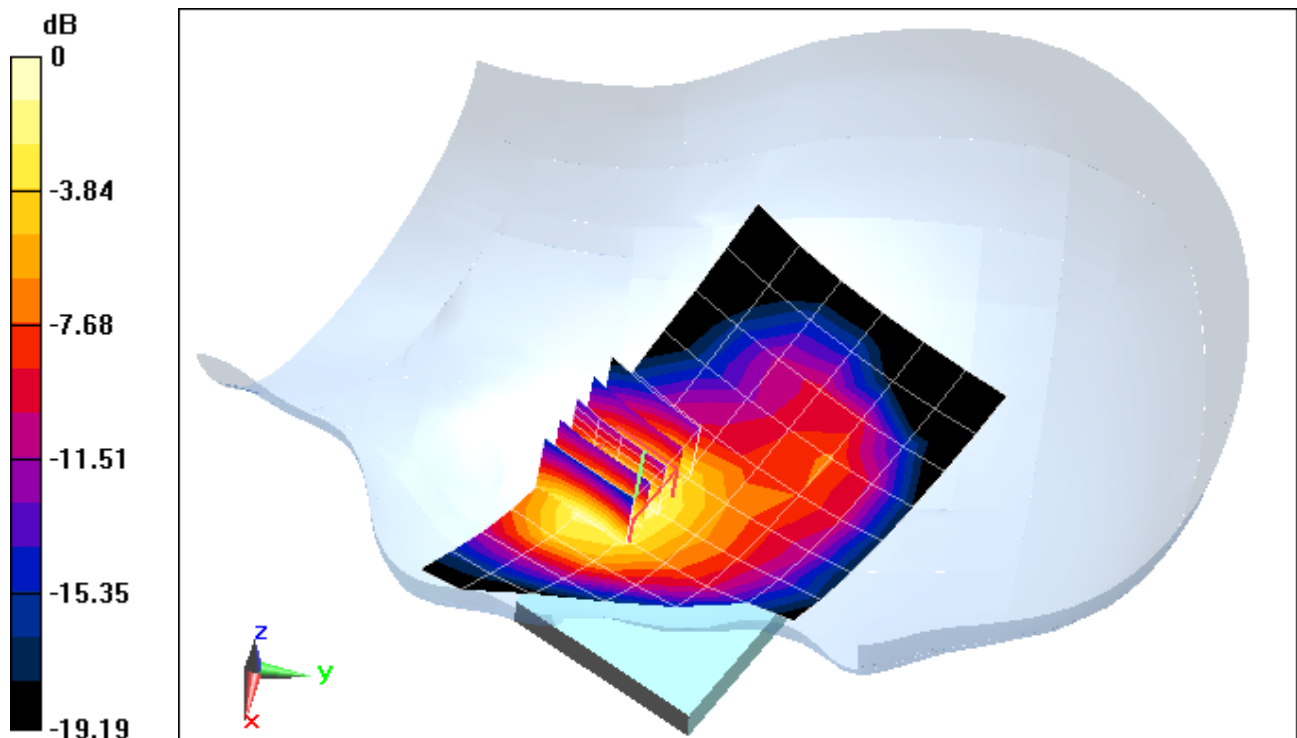
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 27.701 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 1.455 mW/g

SAR(1 g) = 0.920 mW/g; SAR(10 g) = 0.552 mW/g



0 dB = 0.968 mW/g = -0.28 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.375 \text{ mho/m}$; $\epsilon_r = 38.92$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 07-24-2012; Ambient Temp: 23.8°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(5.16, 5.16, 5.16); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 4/12/2012

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 2 (PCS), Left Head, Tilt, Mid.ch, QPSK,
10 MHz Bandwidth, 1 RB, 49 RB Offset**

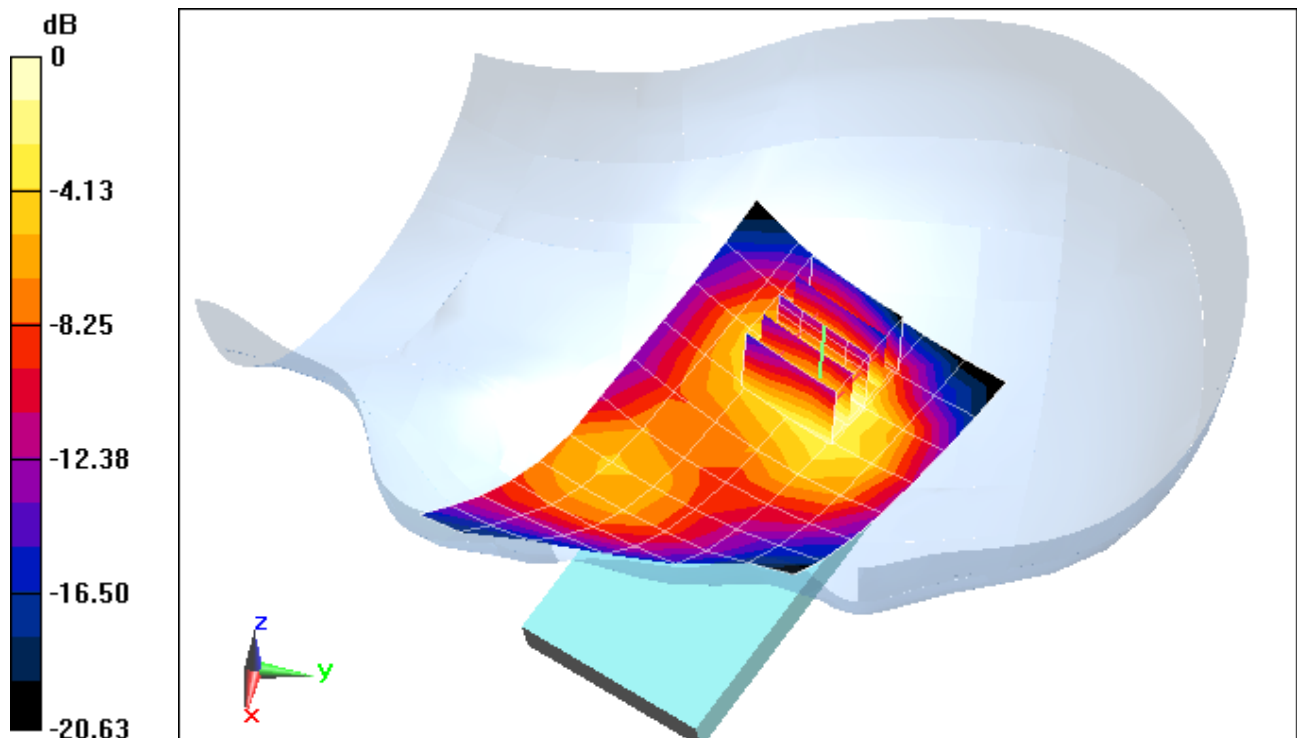
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.716 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 0.560 mW/g

SAR(1 g) = 0.332 mW/g; SAR(10 g) = 0.197 mW/g



0 dB = 0.366 mW/g = -8.73 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 4 (AWS); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.453 \text{ mho/m}$; $\epsilon_r = 53.02$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2012; Ambient Temp: 21.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(4.68, 4.68, 4.68); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 4 (AWS), Body SAR, Back side, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

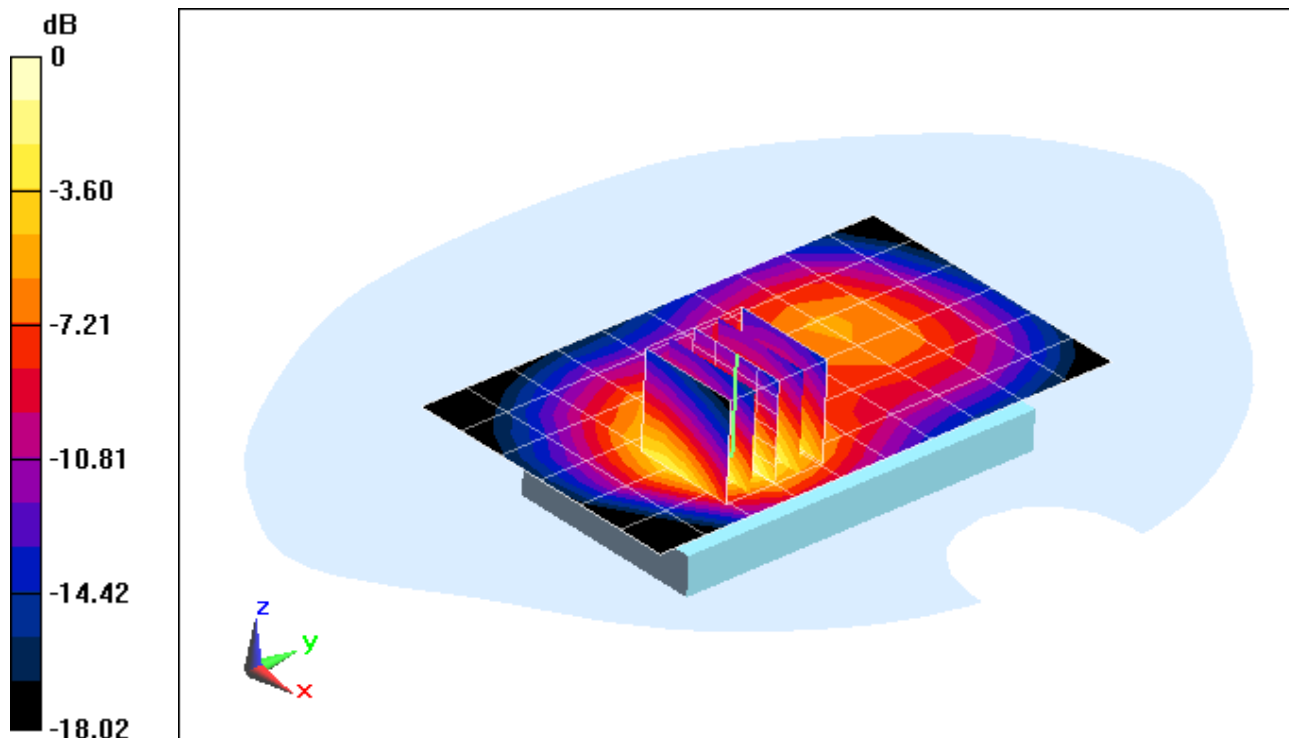
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.260 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.887 mW/g

SAR(1 g) = 0.538 mW/g; SAR(10 g) = 0.316 mW/g



0 dB = 0.577 mW/g = -4.78 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 4 (AWS); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.453 \text{ mho/m}$; $\epsilon_r = 53.02$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2012; Ambient Temp: 21.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(4.68, 4.68, 4.68); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 4 (AWS), Body SAR, Front side, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

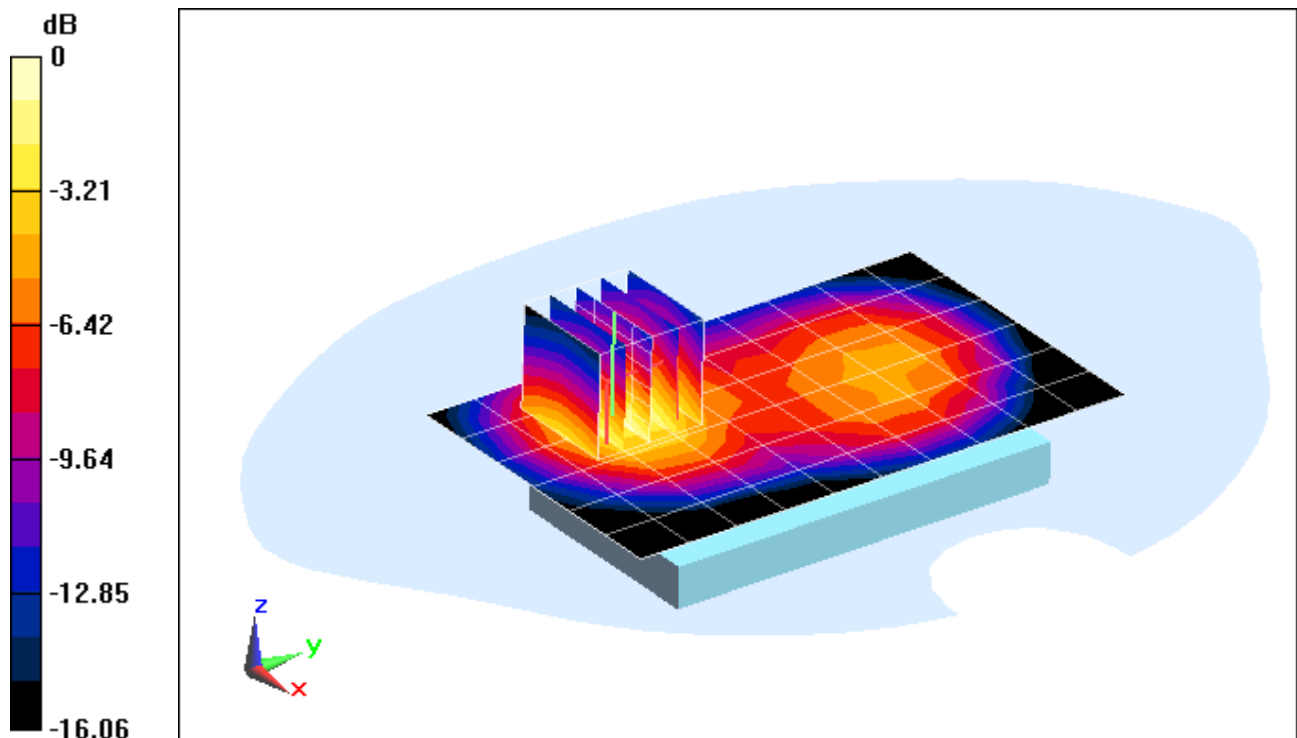
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 19.017 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.837 mW/g

SAR(1 g) = 0.531 mW/g; SAR(10 g) = 0.319 mW/g



0 dB = 0.578 mW/g = -4.76 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 4 (AWS); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.453 \text{ mho/m}$; $\epsilon_r = 53.02$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2012; Ambient Temp: 21.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(4.68, 4.68, 4.68); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 4 (AWS), Body SAR, Bottom Edge, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

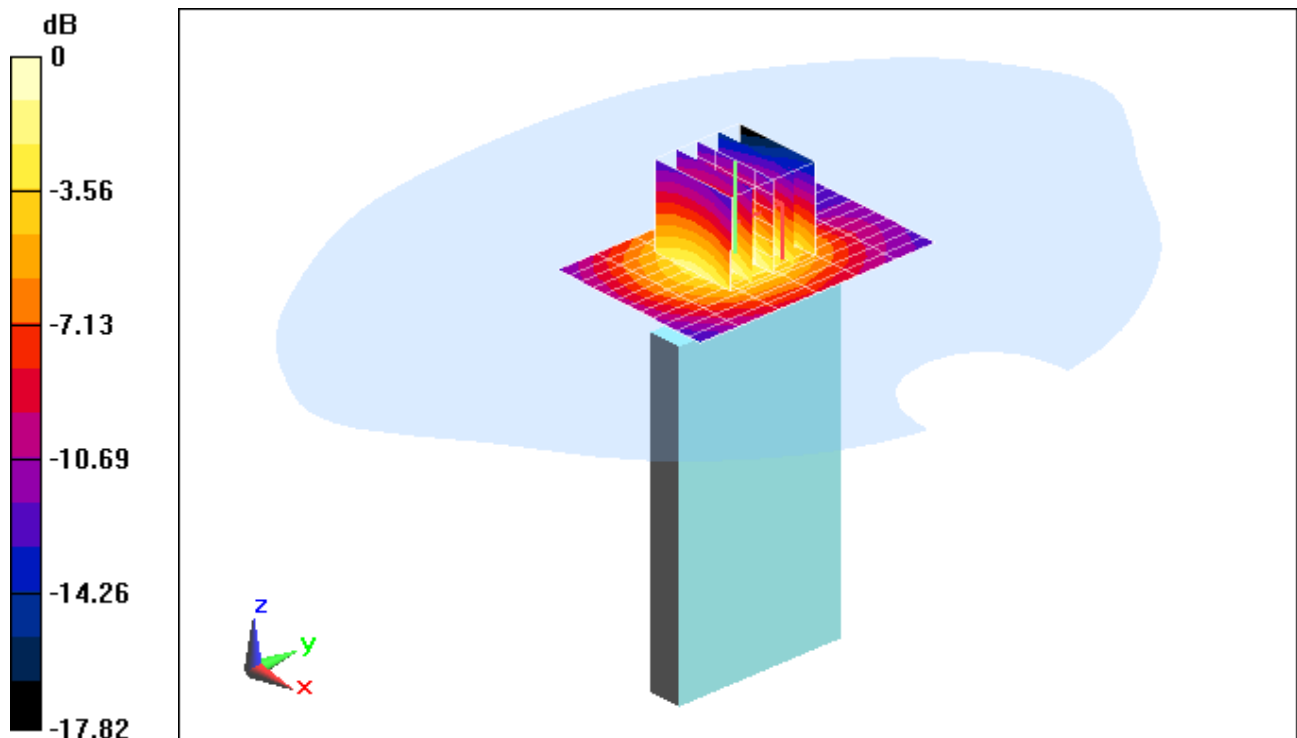
Area Scan (13x7x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 14.074 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.409 mW/g

SAR(1 g) = 0.258 mW/g; SAR(10 g) = 0.157 mW/g



0 dB = 0.281 mW/g = -11.03 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 4 (AWS); Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.453 \text{ mho/m}$; $\epsilon_r = 53.02$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2012; Ambient Temp: 21.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(4.68, 4.68, 4.68); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

Mode: LTE Band 4 (AWS), Body SAR, Left Edge, High.ch, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

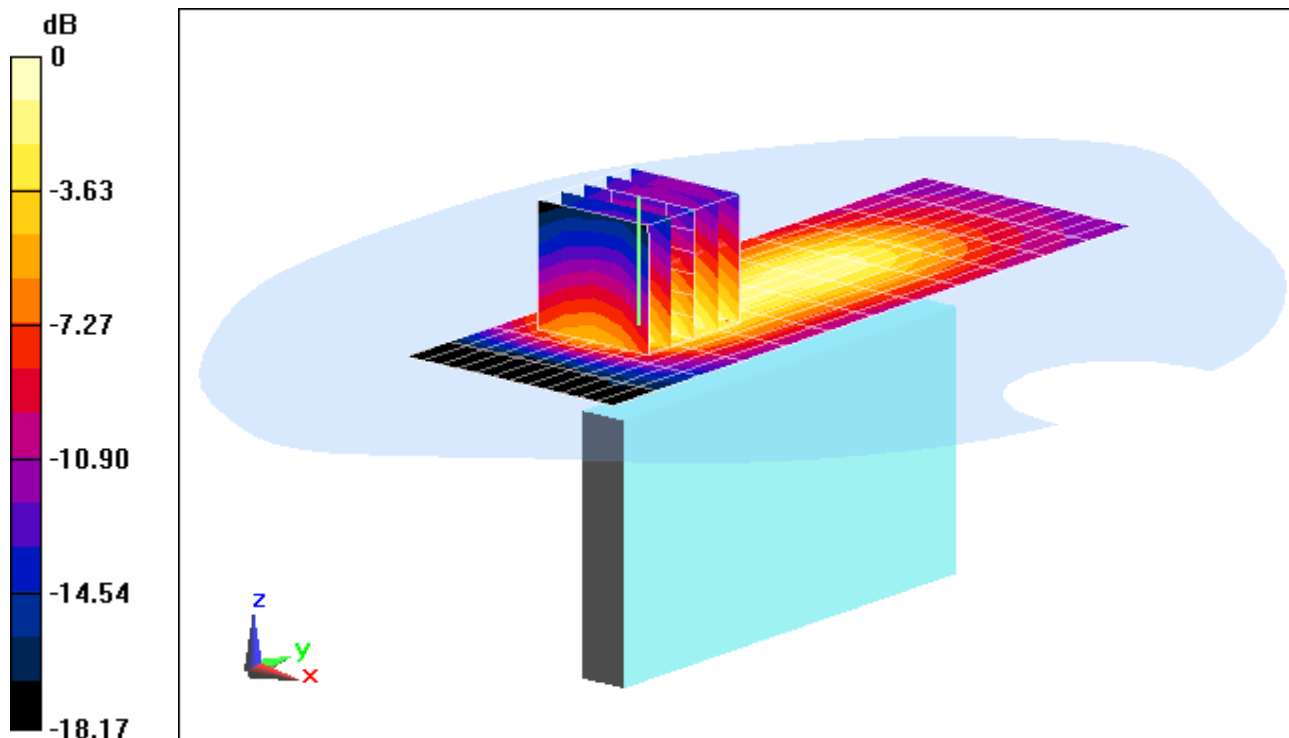
Area Scan (13x13x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.996 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.437 mW/g

SAR(1 g) = 0.269 mW/g; SAR(10 g) = 0.156 mW/g



0 dB = 0.290 mW/g = -10.75 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.528 \text{ mho/m}$; $\epsilon_r = 52.61$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-23-2012; Ambient Temp: 23.1°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3287; ConvF(4.76, 4.76, 4.76); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 2 (PCS), Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

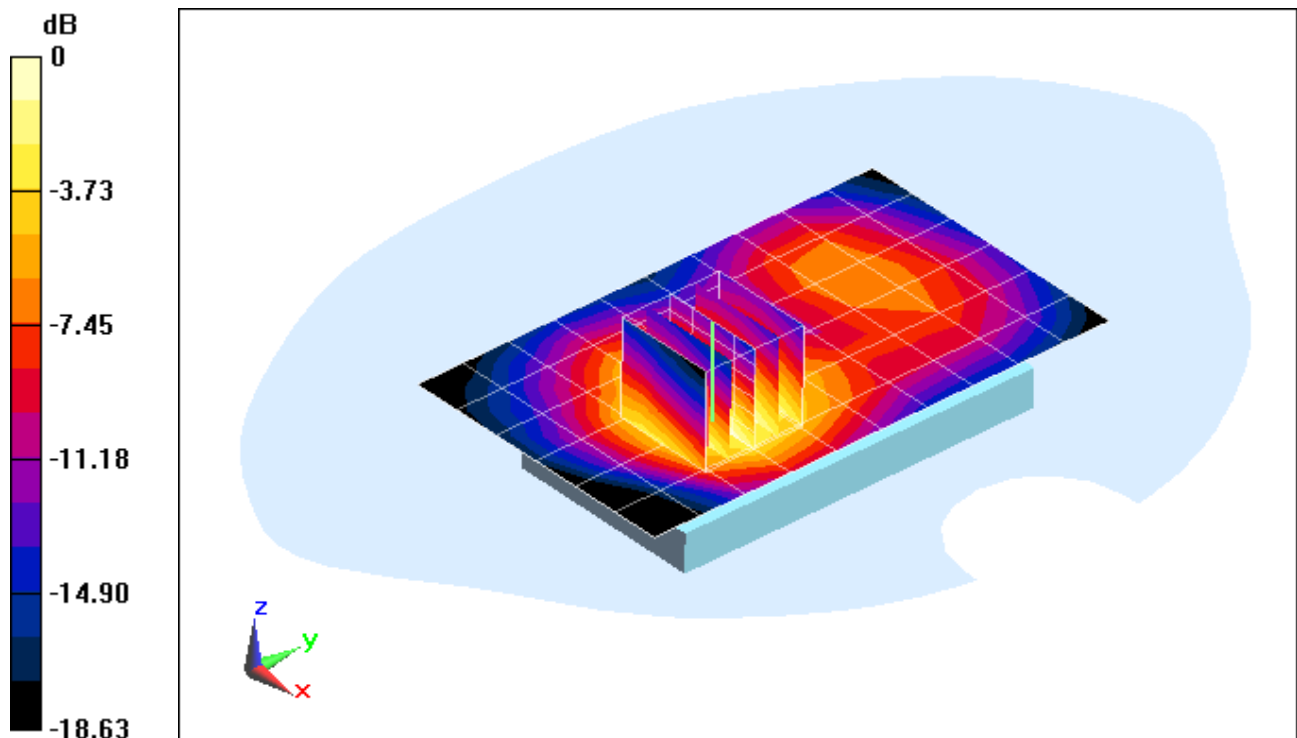
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.292 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.930 mW/g

SAR(1 g) = 0.576 mW/g; SAR(10 g) = 0.350 mW/g



0 dB = 0.617 mW/g = -4.19 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.528 \text{ mho/m}$; $\epsilon_r = 52.61$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-23-2012; Ambient Temp: 23.1°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3287; ConvF(4.76, 4.76, 4.76); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 2 (PCS), Body SAR, Front side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

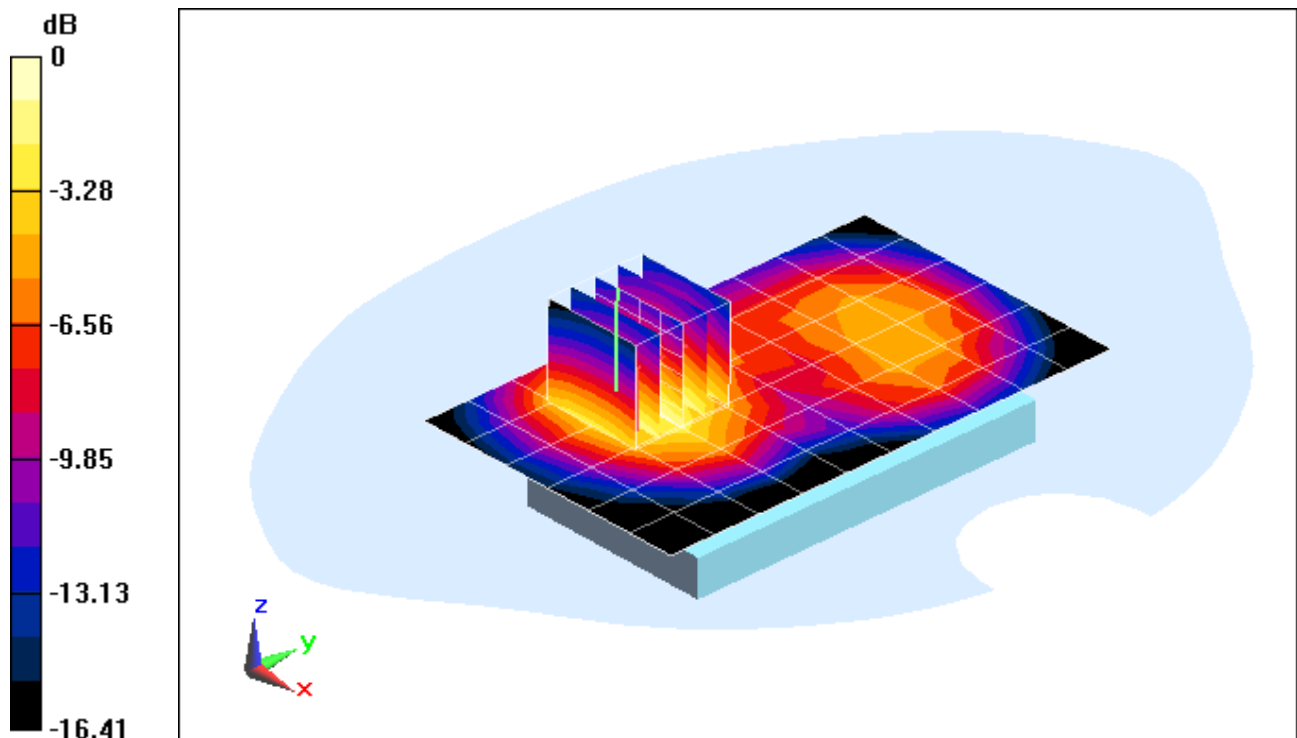
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.647 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.910 mW/g

SAR(1 g) = 0.583 mW/g; SAR(10 g) = 0.358 mW/g



0 dB = 0.625 mW/g = -4.08 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.528 \text{ mho/m}$; $\epsilon_r = 52.61$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-23-2012; Ambient Temp: 23.1°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3287; ConvF(4.76, 4.76, 4.76); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 2 (PCS), Body SAR, Bottom Edge, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

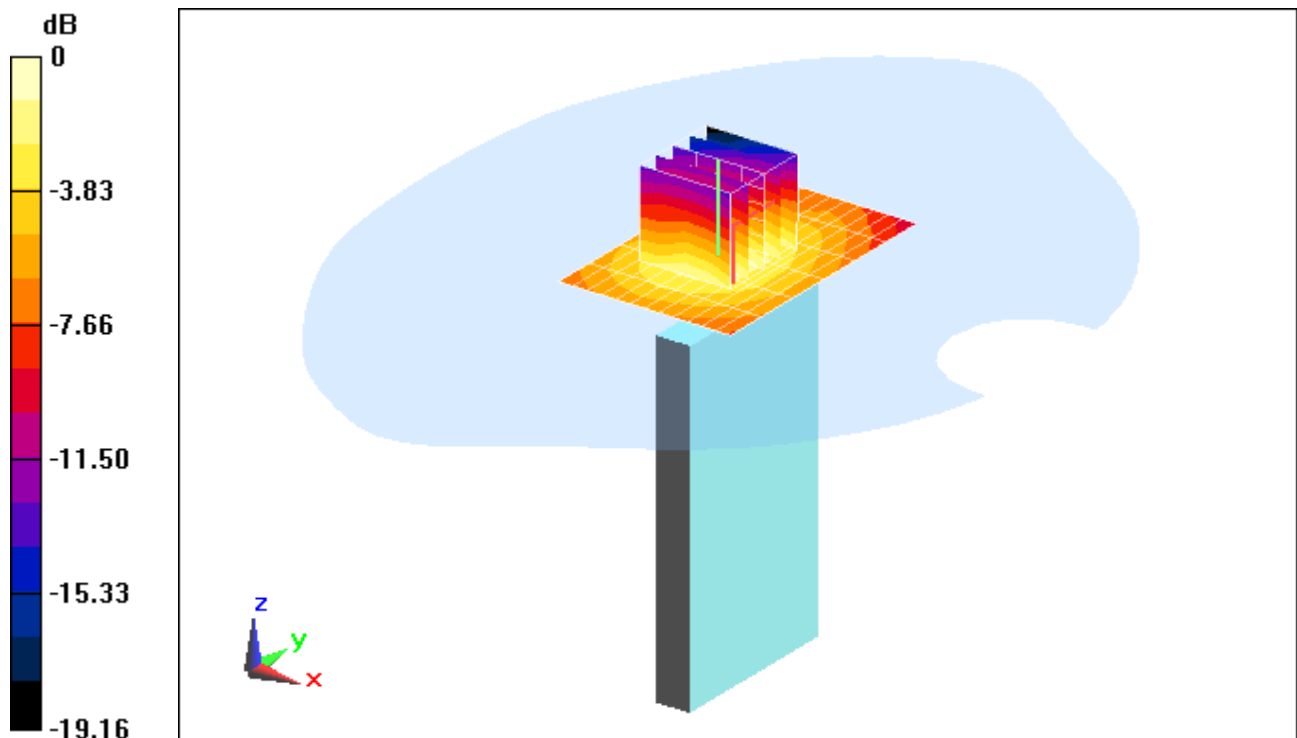
Area Scan (13x7x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 9.732 V/m; Power Drift = 0.20 dB

Peak SAR (extrapolated) = 0.211 mW/g

SAR(1 g) = 0.133 mW/g; SAR(10 g) = 0.082 mW/g



0 dB = 0.143 mW/g = -16.89 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSCHR820; Type: Portable Handset; Serial: 16

Communication System: LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.528 \text{ mho/m}$; $\epsilon_r = 52.61$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-23-2012; Ambient Temp: 23.1°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3287; ConvF(4.76, 4.76, 4.76); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

**Mode: LTE Band 2 (PCS), Body SAR, Left Edge, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

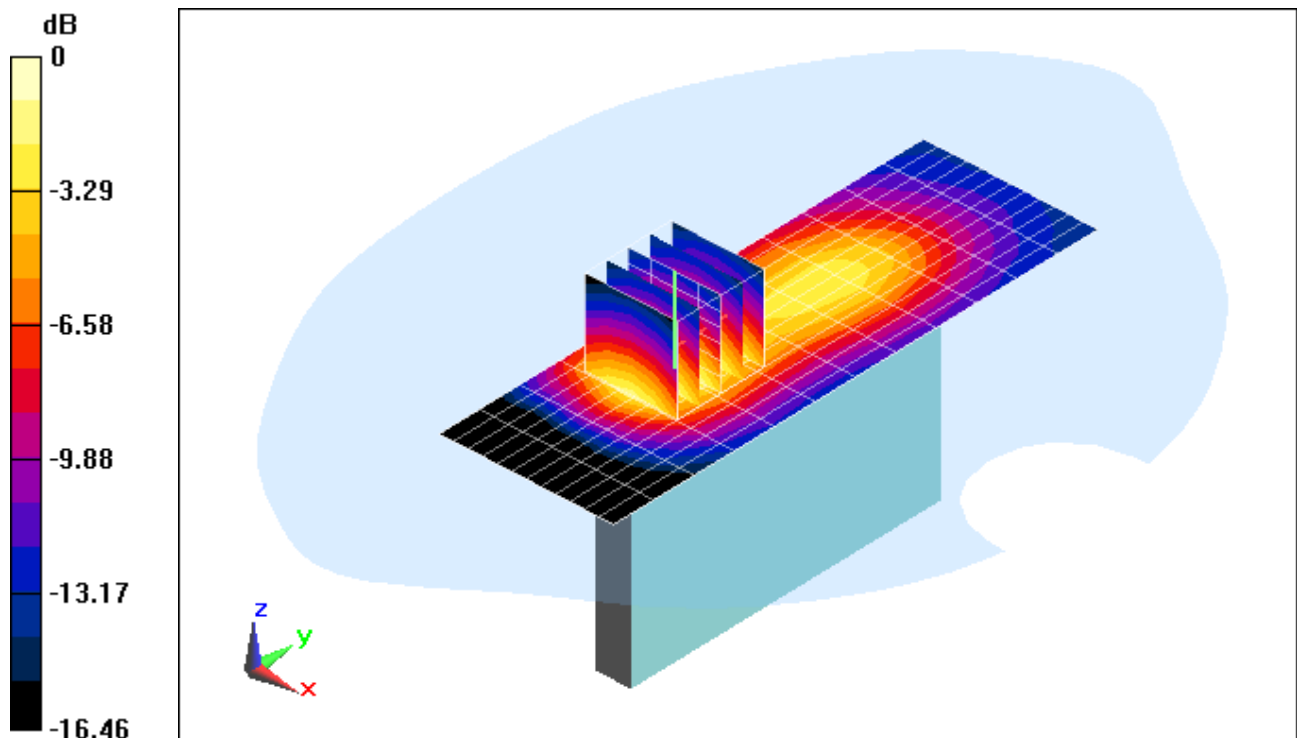
Area Scan (13x13x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 16.645 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 0.616 mW/g

SAR(1 g) = 0.369 mW/g; SAR(10 g) = 0.208 mW/g



0 dB = 0.396 mW/g = -8.05 dB mW/g

APPENDIX B: SYSTEM VERIFICATION

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:

$f = 1750 \text{ MHz}$; $\sigma = 1.365 \text{ mho/m}$; $\epsilon_r = 38.57$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-25-2012; Ambient Temp: 24.7°C; Tissue Temp: 23.4°C

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

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 2/15/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

1750 MHz System Verification

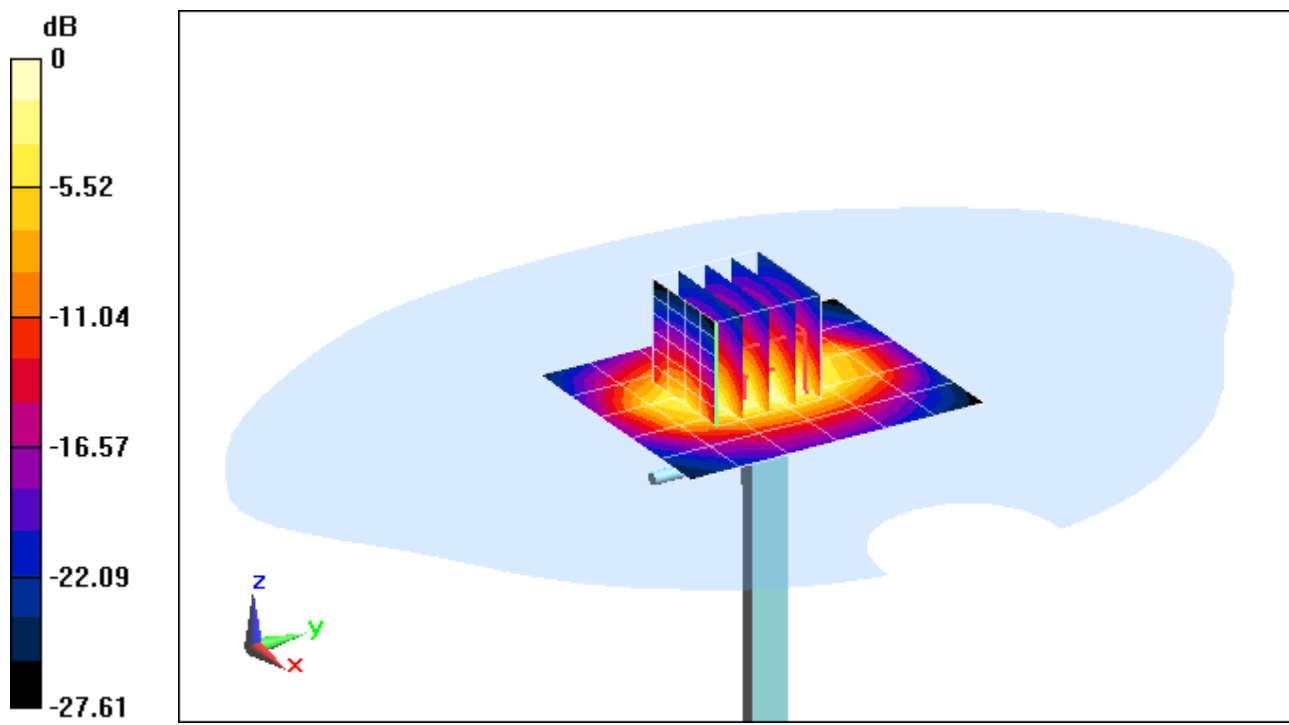
Area Scan (6x7x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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)

SAR(1 g) = 3.66 mW/g; SAR(10 g) = 1.93 mW/g

Deviation: 0.55%



0 dB = 3.67 mW/g = 11.30 dB mW/g

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:

$f = 1750 \text{ MHz}$; $\sigma = 1.365 \text{ mho/m}$; $\epsilon_r = 38.57$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-25-2012; Ambient Temp: 24.7°C; Tissue Temp: 23.4°C

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

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 2/15/2012

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.5 (6469)

1750 MHz System Verification

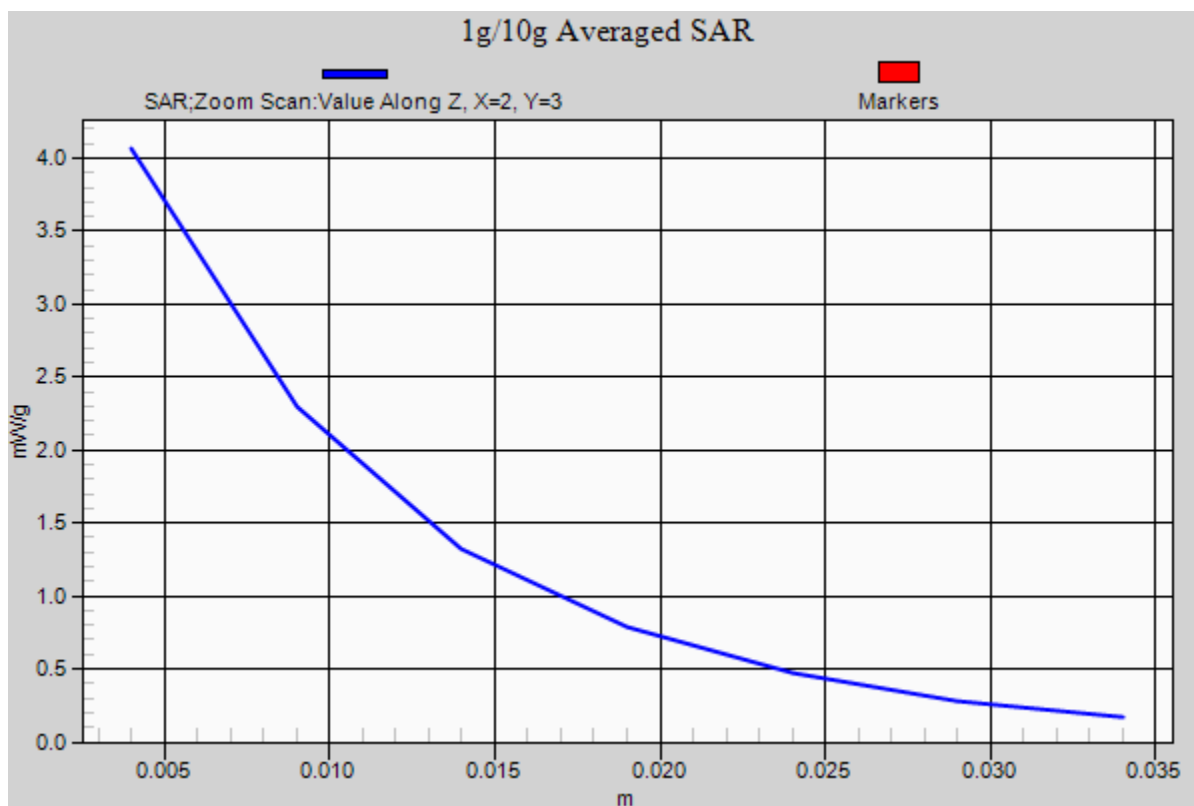
Area Scan (6x7x1): Measurement grid: dx=15mm, dy=15mm

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

Input Power: 20.0 dBm (100 mW)

SAR(1 g) = 3.66 mW/g; SAR(10 g) = 1.93 mW/g

Deviation: 0.55%



PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 5d148

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

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.394 \text{ mho/m}$; $\epsilon_r = 38.853$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section: Space: 1.0 cm

Test Date: 07-24-2012; Ambient Temp: 23.8°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(5.16, 5.16, 5.16); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 4/12/2012

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

1900 MHz System Verification

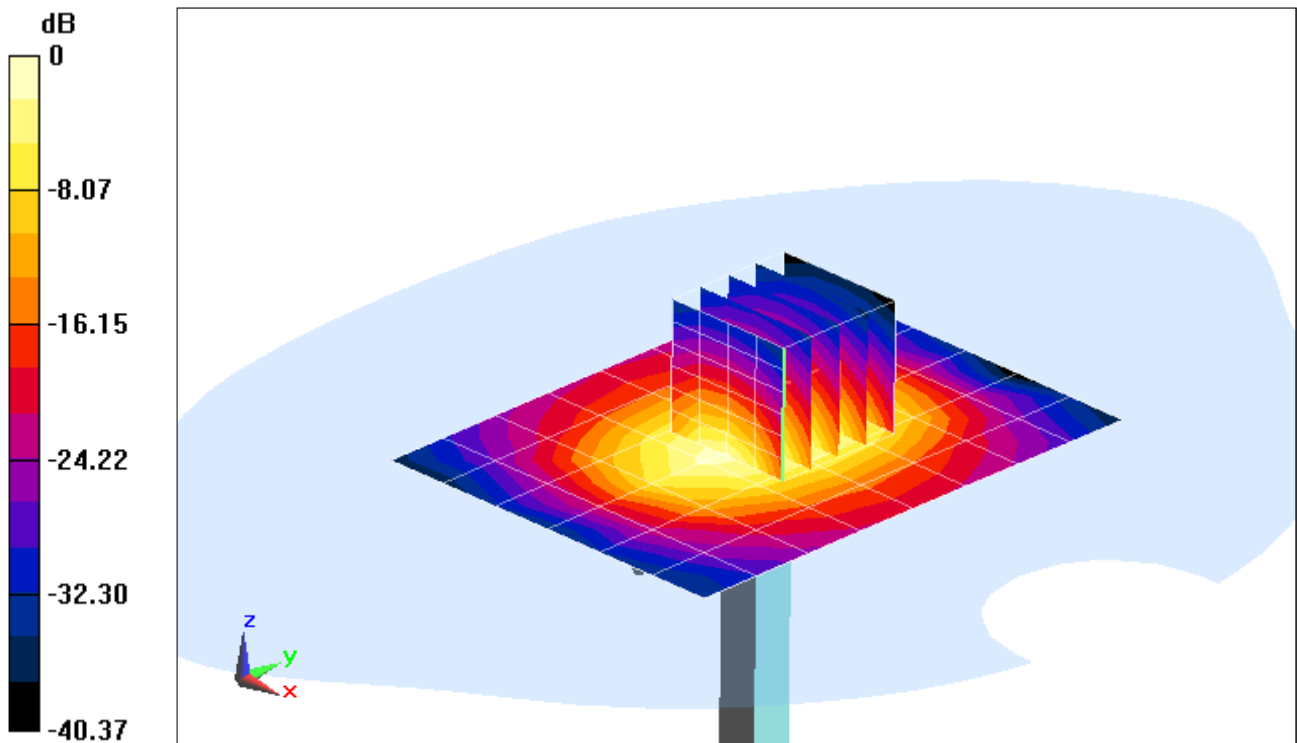
Area Scan (7x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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)

SAR(1 g) = 4.15 mW/g; SAR(10 g) = 2.15 mW/g

Deviation = 2.47 %



0 dB = 4.67 mW/g = 13.38 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: SAR Dipole 1900 MHz; Type: D1900V2; Serial: 5d148

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

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.394 \text{ mho/m}$; $\epsilon_r = 38.853$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section: Space: 1.0 cm

Test Date: 07-24-2012; Ambient Temp: 23.8°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(5.16, 5.16, 5.16); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 4/12/2012

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

1900 MHz System Verification

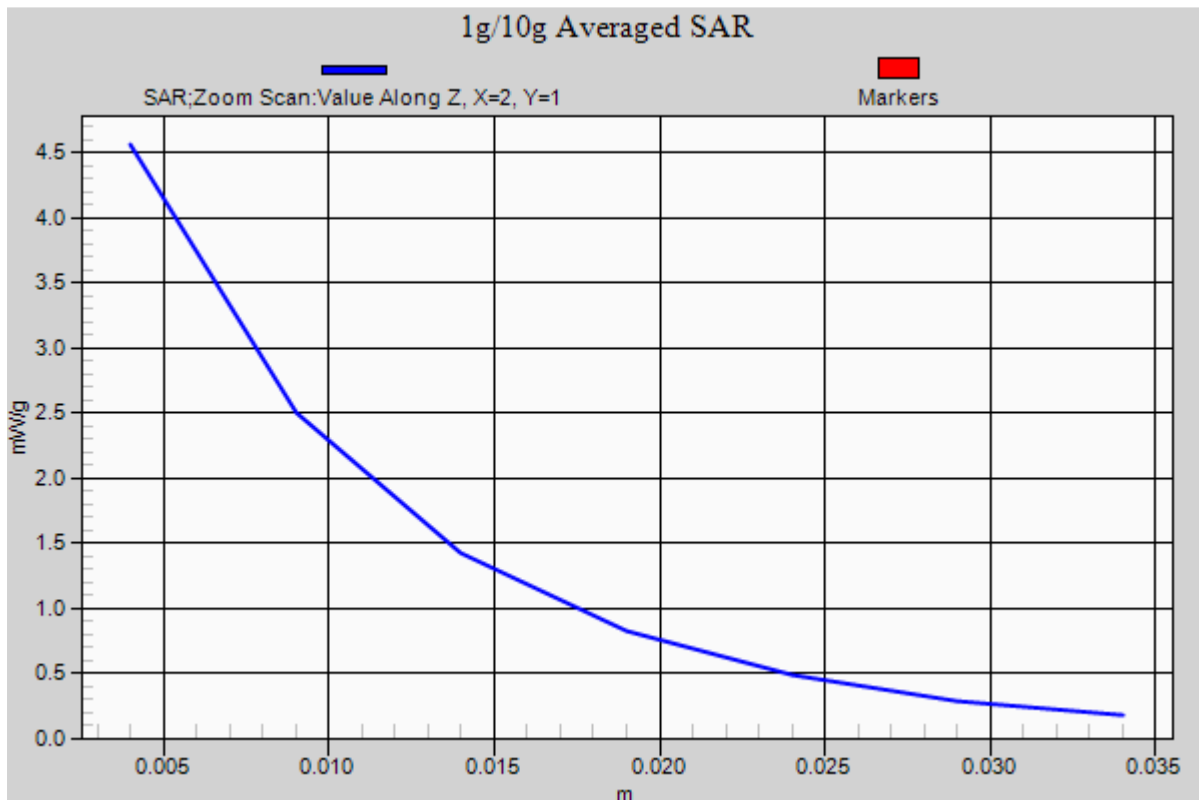
Area Scan (7x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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)

SAR(1 g) = 4.15 mW/g; SAR(10 g) = 2.15 mW/g

Deviation = 2.47 %



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1051

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

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.453 \text{ mho/m}$; $\epsilon_r = 53.02$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2012; Ambient Temp: 21.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(4.68, 4.68, 4.68); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

1750 MHz System Verification

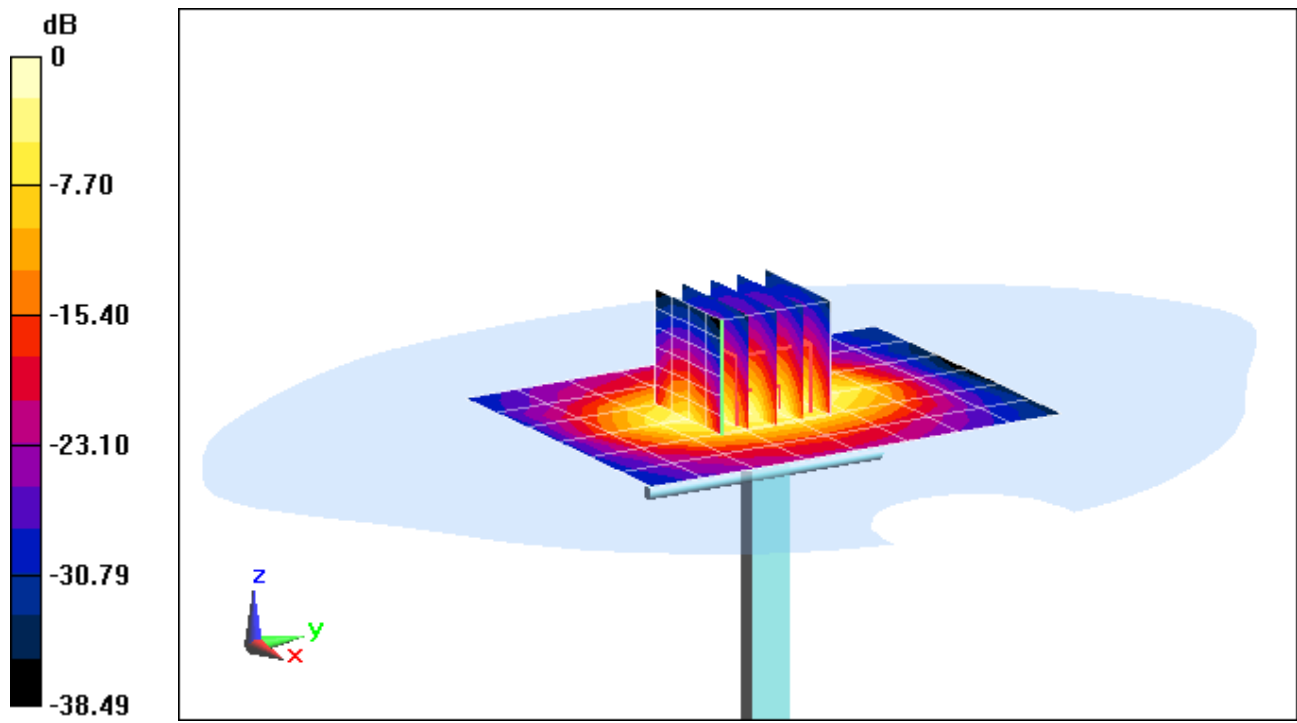
Area Scan (7x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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)

SAR(1 g) = 3.84 mW/g; SAR(10 g) = 2.05 mW/g

Deviation: 2.13%



0 dB = 4.30 mW/g = 12.67 dB mW/g

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1051

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

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.453 \text{ mho/m}$; $\epsilon_r = 53.02$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2012; Ambient Temp: 21.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(4.68, 4.68, 4.68); Calibrated: 4/24/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM Front; Type: SAM; Serial: 1686

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

1750 MHz System Verification

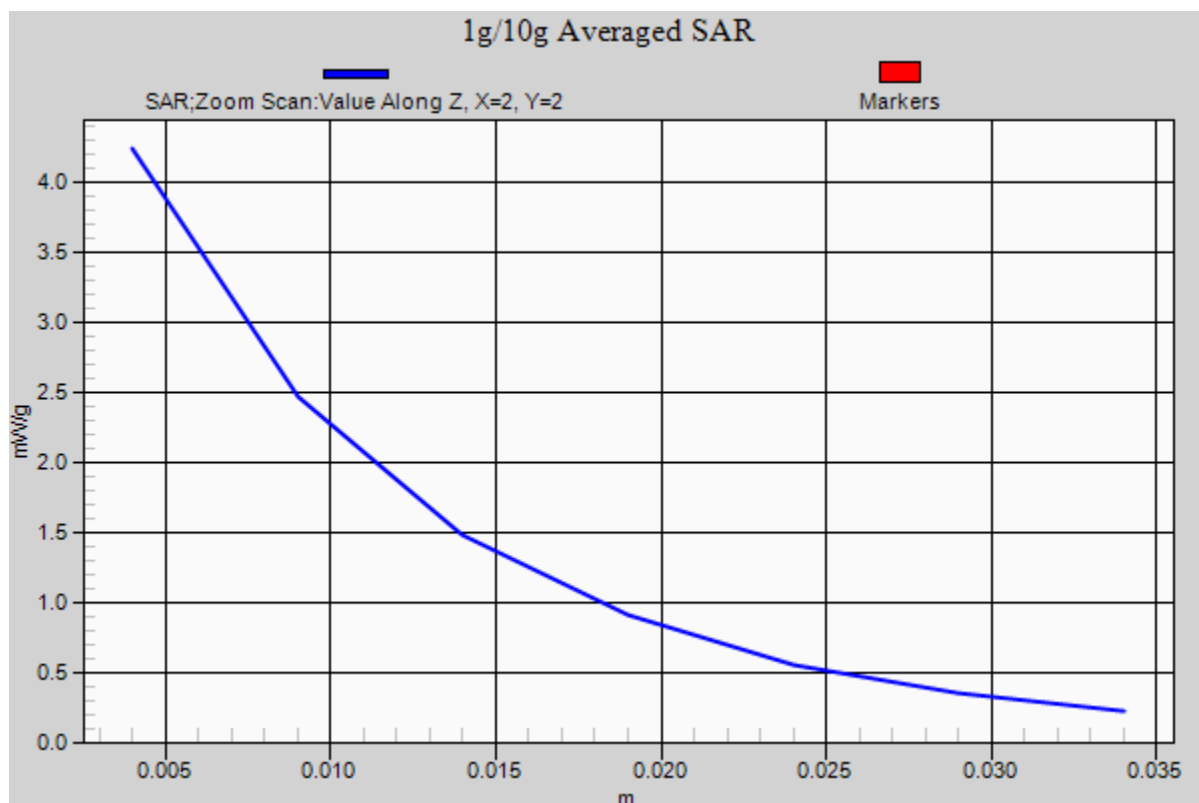
Area Scan (7x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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)

SAR(1 g) = 3.84 mW/g; SAR(10 g) = 2.05 mW/g

Deviation: 2.13%



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):

$f = 1900 \text{ MHz}$; $\sigma = 1.548 \text{ mho/m}$; $\epsilon_r = 52.463$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-23-2012; Ambient Temp: 23.1°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3287; ConvF(4.76, 4.76, 4.76); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (1); SEMCAD X Version 14.6.5 (6469)

1900 MHz System Verification

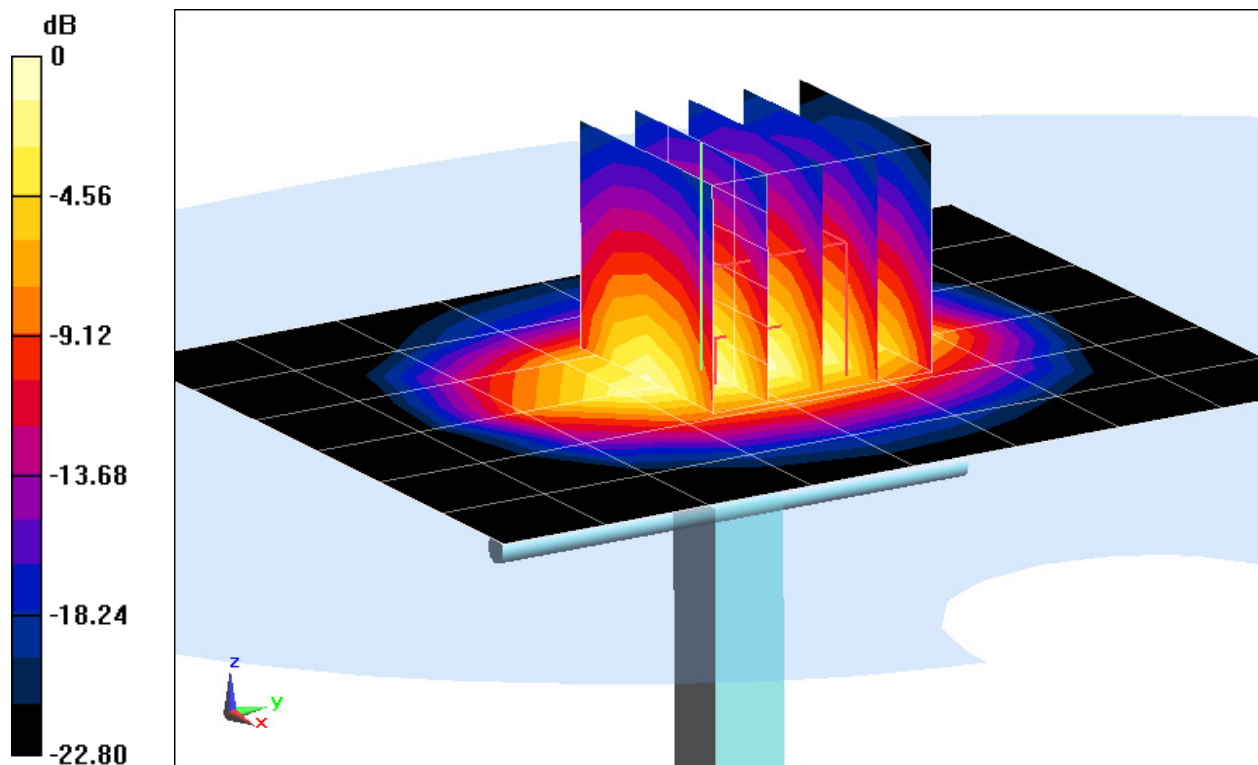
Area Scan (7x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Input Power = 20.0 dBm (100mW)

SAR(1 g) = 4.16 mW/g; SAR(10 g) = 2.18 mW/g

Deviation = 5.85%



0 dB = 4.63 mW/g = 13.31 dB mW/g

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):

$f = 1900 \text{ MHz}$; $\sigma = 1.548 \text{ mho/m}$; $\epsilon_r = 52.463$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-23-2012; Ambient Temp: 23.1°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3287; ConvF(4.76, 4.76, 4.76); Calibrated: 2/7/2012;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

Measurement SW: DASY52, Version 52.8 (1);SEMCAD X Version 14.6.5 (6469)

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 (100mW)

SAR(1 g) = 4.16 mW/g; SAR(10 g) = 2.18 mW/g

Deviation = 5.85%

