



SAR EVALUATION REPORT

Applicant Name:

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Date of Testing:

04/17/14- 06/02/14

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

0Y1405130974.A3L

FCC ID:

A3LSMT235Y

APPLICANT:

SAMSUNG ELECTRONICS, CO. LTD.

DUT Type:

Portable Tablet

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model(s):

SM-T235Y

Equipment Class	Band & Mode	Tx Frequency	SAR	
			1 gm Head (W/kg)	1 gm Body (W/kg)
PCB	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.31	0.55
PCB	UMTS 850	826.40 - 846.60 MHz	0.79	0.80
PCB	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.32	1.00
PCB	UMTS 1900	1852.4 - 1907.6 MHz	0.24	0.77
DTS	2.4 GHz WLAN	2412 - 2462 MHz	< 0.1	1.06
DTS	Bluetooth LE	2402 - 2480 MHz	N/A	
DTS	5.8 GHz WLAN	5745 - 5825 MHz	< 0.1	< 0.1
NII	5.2 GHz WLAN	5180 - 5240 MHz	< 0.1	0.13
NII	5.3 GHz WLAN	5260 - 5320 MHz	< 0.1	0.14
NII	5.5 GHz WLAN	5500 - 5700 MHz	< 0.1	0.10
DSS	Bluetooth	2402 - 2480 MHz	N/A	0.44
Simultaneous SAR per KDB 690783 D01v01r02:			0.79	1.51

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 Section 1.7 of this report; 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.


Randy Ortanez
President



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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
5.8 GHz WLAN	Data	5745 - 5825 MHz
5.2 GHz WLAN	Data	5180 - 5240 MHz
5.3 GHz WLAN	Data	5260 - 5320 MHz
5.5 GHz WLAN	Data	5500 - 5700 MHz
Bluetooth	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

This device uses proximity sensing mechanisms for SAR compliance. Powers are reduced when the device is held-to-ear (for voice or VoIP calls) and when it is used in close proximity to the user's body (tablet operations). The proximity sensors trigger power reduction for all voice and data modes. There are no body-worn accessories for this device.

The held-to-ear RF exposure conditions were evaluated at reduced power according to the Head SAR test positions described in IEEE 1528. Since the device is a full size tablet, the body SAR was evaluated per FCC KDB Publication 616217 D04 for full sized tablets.

1.3 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v05.

1.3.1 Maximum Power

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
GSM/GPRS/EDGE 850	Maximum	33.4	33.0	31.5	30.5	29.0	27.5	26.0	24.5	23.0
	Nominal	32.9	32.5	31.0	30.0	28.5	27.0	25.5	24.0	22.5
GSM/GPRS/EDGE 1900	Maximum	30.2	30.2	29.0	27.5	26.5	26.0	25.0	23.0	22.0
	Nominal	29.7	29.7	28.5	27.0	26.0	25.5	24.5	22.5	21.5

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Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 6	3GPP HSUPA Rel 6	3GPP DC-HSDPA Rel 8
UMTS Band 5 (850 MHz)	Maximum	23.0	23.0	23.0	23.0
	Nominal	22.5	22.5	22.5	22.5
UMTS Band 2 (1900 MHz)	Maximum	23.0	23.0	23.0	23.0
	Nominal	22.5	22.5	22.5	22.5

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	12.0
	Nominal	11.5
IEEE 802.11g (2.4 GHz)	Maximum	10.5
	Nominal	10.0
IEEE 802.11n (2.4 GHz)	Maximum	10.5
	Nominal	10.0
IEEE 802.11a (5 GHz)	Maximum	9.5
	Nominal	9.0
IEEE 802.11n (5 GHz)	Maximum	8.5
	Nominal	8.0
Bluetooth	Maximum	12.0
	Nominal	11.5
Bluetooth LE	Maximum	9.5
	Nominal	9.0

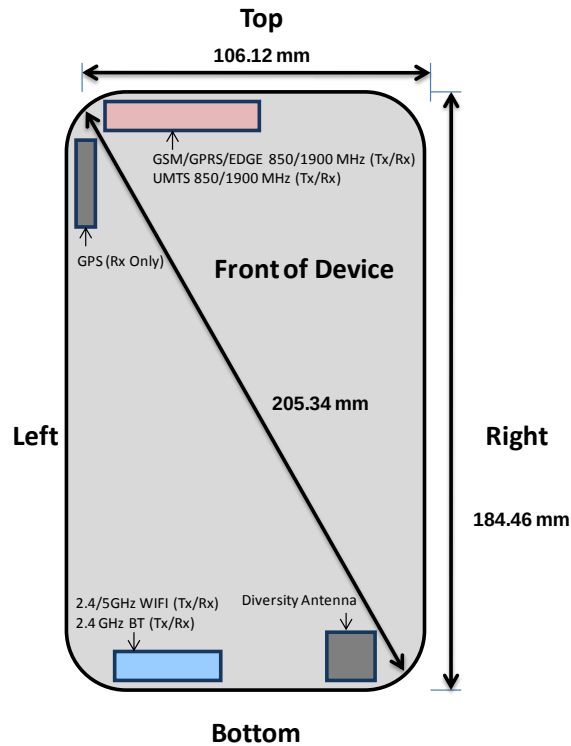
1.3.2 Reduced Power – Head and Body at 0mm:

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
GSM/GPRS/EDGE 850	Maximum	26.0	22.5	22.5	21.0	19.0	23.5	22.5	20.5	19.0
	Nominal	25.5	22.0	22.0	20.5	18.5	23.0	22.0	20.0	18.5
GSM/GPRS/EDGE 1900	Maximum	20.5	17.5	16.5	15.0	13.5	17.5	16.5	14.5	13.0
	Nominal	20.0	17.0	16.0	14.5	13.0	17.0	16.0	14.0	12.5

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 6	3GPP HSUPA Rel 6	3GPP DC-HSDPA Rel 8
UMTS Band 5 (850 MHz)	Maximum	20.5	20.5	20.5	20.5
	Nominal	20.0	20.0	20.0	20.0
UMTS Band 2 (1900 MHz)	Maximum	10.5	10.5	10.5	10.5
	Nominal	10.0	10.0	10.0	10.0

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1.4 DUT Antenna Locations



Note: Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC Filing.

Figure 1-1
DUT Antenna Locations

Table 1-1
Mobile Body Sides for SAR Testing

Sides for Body SAR Testing					
Mode	Back	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes
UMTS 1900	Yes	Yes	No	Yes	Yes
2.4 GHz WLAN	Yes	No	Yes	No	Yes
5 GHz WLAN	Yes	No	Yes	No	Yes
2.4 GHz Bluetooth	Yes	No	Yes	No	Yes

Note: Per FCC KDB 616217 D04v01r01, Particular DUT edges were not required to be evaluated for SAR based on the SAR exclusion threshold in KDB 447498 D01v05r01. The antenna document shows the distances between the transmit antennas and the edges of the device.

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1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Modes which share the same transmission path cannot transmit simultaneously with one another.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v05 3) procedures.

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body	Notes
1	GSM voice + 2.4 GHz Wi-Fi	Yes	Yes	
2	GSM voice + 5 GHz Wi-Fi	Yes	Yes	
3	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	
4	UMTS + 2.4 GHz Wi-Fi	Yes	Yes	
5	UMTS + 5 GHz Wi-Fi	Yes	Yes	
6	UMTS + 2.4 GHz Bluetooth	N/A	Yes	
7	GPRS/EDGE + 2.4 GHz Wi-Fi	N/A	Yes	
8	GPRS/EDGE + 5 GHz Wi-Fi	N/A	Yes	5 GHz WIFI Direct
9	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	Yes	

Notes:

- 2.4 GHz WLAN, 2.4 GHz Bluetooth, and 5 GHz WLAN share the same antenna path and cannot transmit simultaneously.
- When the user utilizes multiple services in UMTS 3G mode, it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
- Per the manufacturer, WIFI Direct is not expected to be used in conjunction with a held-to-ear. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.
- Per FCC KDB 616217 D04 4.3, when voice mode is limited to speaker mode or headset operations only for body operations, additional SAR testing for tablet voice use is not required. Therefore, voice standalone and simultaneous combinations are not evaluated for body configurations. Corresponding data modes are used for summation with Bluetooth when applicable.

1.6 SAR Test Exclusions Applied

(A) Bluetooth

Per FCC KDB 447498 D01v05, the SAR exclusion threshold for distances <50mm is defined by the following equation:

$$\frac{\text{Max Power of Channel (mW)}}{\text{Test Separation Dist (mm)}} * \sqrt{\text{Frequency (GHz)}} \leq 3.0$$

Based on the maximum conducted power of Bluetooth LE (rounded to the nearest mW) and the antenna to user separation distance, Bluetooth LE SAR was not required; $[(9/5) * \sqrt{2.44}] = 2.8 < 3.0$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

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(B) Licensed Transmitter(s)

GSM/GPRS/EDGE DTM is not supported for US bands. Therefore, the GSM Voice modes in this report do not transmit simultaneously with GPRS/EDGE Data.

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01v02.

1.7 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01-D06 (2G/3G)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05 (General SAR Guidance)
- FCC KDB Publication 865664 D01-D02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 616217 D04 (Tablet SAR Considerations)
- October 2013 TCB Workshop Notes (GPRS SAR Considerations)

1.8 Device Serial Numbers

Mode	Max Power Head Serial Number	Reduced Power Head Serial Number	Max Power Body Serial Number	Reduced Power Body Serial Number
GSM/GPRS/EDGE 850	N/A	1305-4	1305-2	1305-4
UMTS 850	N/A	1305-5	1305-2	1305-5
GSM/GPRS/EDGE 1900	N/A	1305-4	1305-2	1305-4
UMTS 1900	N/A	1305-5	1305-2	1305-5
2.4 GHz WLAN	FL-147-C	N/A	FL-147-C	N/A
5 GHz WLAN	FL-147-C	N/A	FL-147-A	N/A
Bluetooth	N/A	N/A	FL-147-C	N/A

Several samples were used with identical hardware to support SAR testing. 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.

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The FCC and Industry Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 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 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields,” Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

2.1 SAR Definition

Specific Absorption Rate is defined as the time derivative (rate) of the incremental energy (dU) absorbed by (dissipated in) an incremental mass (dm) contained in a volume element (dV) of a given density (ρ). It is also defined as the rate of RF energy absorption per unit mass at a point in an absorbing body (see Equation 2-1).

Equation 2-1
SAR Mathematical Equation

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

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

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

where:

- 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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DOSIMETRIC ASSESSMENT

3.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01 and IEEE 1528-2013:

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 and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01 (See Table 3-1) and IEEE 1528-2013.
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 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01 (See Table 3-1) and IEEE 1528-2013. On the 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. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 3-1. 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.

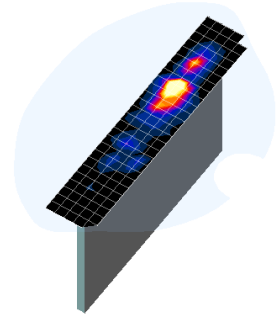


Figure 3-1
Sample SAR Area Scan

Table 3-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01*

Frequency	Maximum Area Scan Resolution (mm) ($\Delta x_{area}, \Delta y_{area}$)	Maximum Zoom Scan Resolution (mm) ($\Delta x_{zoom}, \Delta y_{zoom}$)	Maximum Zoom Scan Spatial Resolution (mm)			Minimum Zoom Scan Volume (mm) (x,y,z)
			Uniform Grid	Graded Grid		
				$\Delta z_{zoom}(n)$	$\Delta z_{zoom}(1)^*$	
≤ 2 GHz	≤ 15	≤ 8	≤ 5	≤ 4	≤ 1.5* $\Delta z_{zoom}(n-1)$	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5* $\Delta z_{zoom}(n-1)$	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5* $\Delta z_{zoom}(n-1)$	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5* $\Delta z_{zoom}(n-1)$	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5* $\Delta z_{zoom}(n-1)$	≥ 22

*Also compliant to IEEE 1528-2013 Table 6

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DEFINITION OF REFERENCE POINTS

4.1 EAR REFERENCE POINT

Figure 4-2 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 4-1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front), also called the Reference Pivoting Line, is not perpendicular to the reference plane (see Figure 4-1). 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].

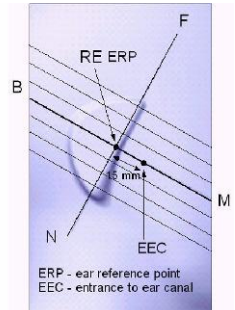


Figure 4-1
Close-Up Side view
of ERP

4.2 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 acoustic output located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (See Figure 4-3). The acoustic output was then located at the same level as the center of the ear reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at its top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.



Figure 4-2
Front, back and side view of SAM Twin Phantom

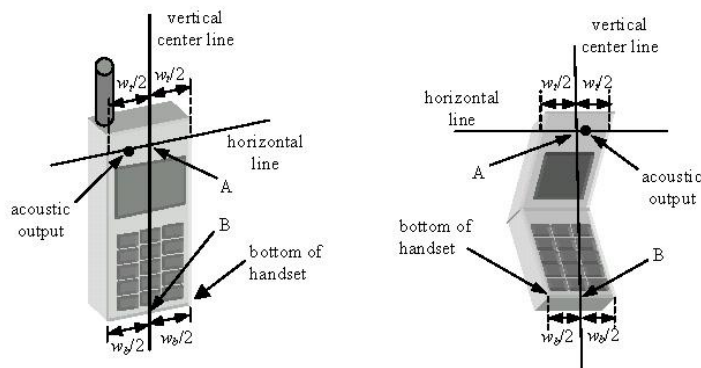


Figure 4-3
Handset Vertical Center & Horizontal Line Reference Points

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5

TEST CONFIGURATION POSITIONS FOR HANDSETS

5.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity $\epsilon = 3$ and loss tangent $\delta = 0.02$.

5.2 Positioning for Cheek

1. The test device was positioned with the device 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 5-1), 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.

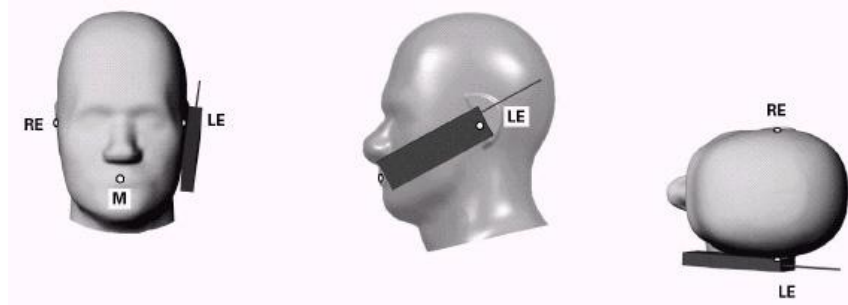


Figure 5-1 Front, Side and Top View of Cheek Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the pinna.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the 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 device contact with the ear, the device was rotated about the NF line until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 5-2).

5.3 Positioning for Ear / 15° Tilt

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

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degrees.
2. The phone was then rotated around the horizontal line by 15 degrees.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the handset touched 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. In this situation, 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 5-2).

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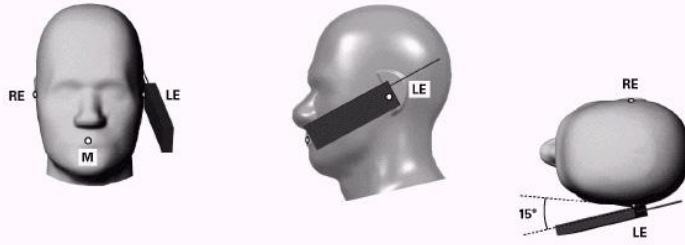


Figure 5-2 Front, Side and Top View of Ear/15° Tilt Position

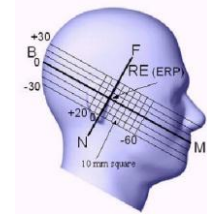


Figure 5-3 Side view w/ relevant markings

5.4 SAR Testing for Tablet per KDB Publication 616217 D04v01

This device can be used also in full sized tablet exposure conditions, due to its size. Per FCC KDB 616217, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D01v05 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

5.5 Additional Test Positions due to Proximity Sensor Considerations

This device uses a proximity sensor to reduce voice/data powers in tablet-device use conditions.

While the device is touching the user on the antenna, the proximity sensors activate and thus reduce the maximum output power allowed. However, when the device is moved beyond the sensor triggering distance, the sensors de-activate and thus maximum output power is no longer limited. Therefore, an additional exposure condition is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a non-reduced output power level. FCC KDB 616217 D04 Section 6 was used as a guideline for selecting SAR test distances for this device at these additional exposure conditions. Since the proximity sensor activation distance for the back side of the device is 22 mm, a conservative distance of 21 mm was tested for SAR on the back side at maximum power. Since the proximity sensor activation distance for the top edge of the device is 17 mm, a conservative distance of 16 mm was tested for SAR on the top edge at maximum power. Since the proximity sensor activation distance for the left edge of the device is 5 mm, a conservative distance of 4 mm was tested for SAR on the left edge at maximum power. Sensor triggering distance summary data is included in Appendix G.

The sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the sensor entirely covers the antenna.

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6 RF EXPOSURE LIMITS

6.1 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.

6.2 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 6-1
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)
Peak Spatial Average SAR Head	1.6	8.0
Whole Body SAR	0.08	0.4
Peak Spatial Average SAR Hands, Feet, Ankle, Wrists, etc.	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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7 FCC MEASUREMENT PROCEDURES

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

7.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v05, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r02.

7.2 Procedures Used to Establish RF Signal for SAR

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

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

7.3 SAR Measurement Conditions for UMTS

7.3.1 Output Power Verification

Maximum output power is measured on the High, Middle and Low channels for each applicable transmission band according to the general descriptions in section 5.2 of 3GPP TS 34.121, using the appropriate RMC or AMR with TPC (transmit power control) set to all "1s".

Maximum output power is verified on the High, Middle and Low channels according to the general descriptions in section 5.2 of 3GPP TS 34.121 (release 5), using the appropriate RMC with TPC (transmit power control) set to all "1s" or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

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7.3.2 Head SAR Measurements for Handsets

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all "1s". SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

7.3.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s".

7.3.4 Procedures Used to Establish RF Signal for SAR HSDPA Data Devices

The following procedures are applicable to HSDPA data devices operating under 3GPP Release 5. Body exposure conditions are typically applicable to these devices, including handsets and data modems operating in various electronic devices. HSDPA operates in conjunction with UMTS and requires an active DPCCCH. The default test configuration is to measure SAR in UMTS without HSDPA, with an established radio link between the DUT and a communication test set with 12.2 kbps RMC mode configured in Test Loop Mode 1; and tested with HSDPA with FRC and a 12.2 kbps RMC using the highest SAR configuration in UMTS. SAR is selectively confirmed for other physical channel configurations according to output power, exposure conditions and device operating capabilities. Maximum output power is verified according to 3GPP TS 23.121 (Release 5) and SAR must be measured according to these maximum output conditions.

Sub-Test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note 1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5
Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{HS} = \beta_{HS}/\beta_c = 30/15 \Leftrightarrow \beta_{HS} = 30/15 * \beta_c$. Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 8$ ($A_{HS} = 30/15$) with $\beta_{HS} = 30/15 * \beta_c$, and $\Delta_{CQI} = 7$ ($A_{HS} = 24/15$) with $\beta_{HS} = 24/15 * \beta_c$. Note 3: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{HS}/\beta_c = 24/15$. For all other combinations of DPDCCH, DPCCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.							

Figure 7-1
Table C.10.1.4 of TS 234.121-1

7.3.5 SAR Measurement Conditions for HSUPA Data Devices

SAR for body exposure configurations are measured according to the 'Body SAR Measurements' procedures in the 'WCDMA Handsets' section of the KDB 941225 D01 FCC 3G document. In addition, Body SAR is also measured for HSPA when the maximum average output of each RF channel with HSPA active is at least ¼ dB higher of that measured without HSPA in 12.2 kbps RMC mode or the maximum SAR for 12.2 kbps RMC is above 75% of the SAR limit. Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 with power control algorithm 2, according to the highest body SAR configuration in 12.2 kbps RMC without HSPA. When VOIP is applicable for head exposure, SAR is not required when the maximum output of each RF channel with HSPA is less than ¼ dB

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higher than that measured using 12.2 kbps RMC; otherwise, the same HSPA configuration used for body measurements should be used to test for head exposure.

Due to inner loop power control requirements in HSPA, a commercial communication test set should be used for the output power and SAR tests. The 12.2 kbps RMC, FRC H-set 1 and EDCH configurations for HSPA should be configured according to the β values indicated below as well as other applicable procedures described in the 'WCDMA Handset' and 'Release 5 HSDPA Data Devices' sections of the FCC 3G document.

Sub-test	β_c	β_d	β_d (SF)	β_c/β_d	$\beta_{hs}^{(1)}$	β_{ec}	β_{ed}	β_{ed} (SF)	β_{ed} (codes)	CM ⁽²⁾	MPR (dB)	AG ⁽⁴⁾ Index	E-TFCI
1	11/15 ⁽³⁾	15/15 ⁽³⁾	64	11/15 ⁽³⁾	22/15	209/225	1039/225	4	1	1.0	0.0	20	75
2	6/15	15/15	64	6/15	12/15	12/15	94/75	4	1	3.0	2.0	12	67
3	15/15	9/15	64	15/9	30/15	30/15	$\beta_{ed1}: 47/15$ $\beta_{ed2}: 47/15$	4	2	2.0	1.0	15	92
4	2/15	15/15	64	2/15	4/15	2/15	56/75	4	1	3.0	2.0	17	71
5	15/15 ⁽⁴⁾	15/15 ⁽⁴⁾	64	15/15 ⁽⁴⁾	30/15	24/15	134/15	4	1	1.0	0.0	21	81

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{15} = \beta_{15}/\beta_c = 30/15 \Leftrightarrow \beta_{15} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{15}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

7.3.6 SAR Measurement Conditions for DC-HSDPA

SAR test exclusion for DC-HSDPA devices is determined by power measurements according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to qualify for SAR test exclusion. DC-HSDPA uplink maximum output power measurements using the four Rel. 5 HSDPA subtests in Table C.10.1.4 of TS 23.4.121-1 is required.

When the maximum average output power of each RF channel with DC-HSDPA active is $\leq 1/4$ dB higher than that measured using 12.2 kbps RMC, or the maximum reported SAR for 12.2 kbps RMC is $\leq 75\%$ of the SAR limit, SAR evaluation for DC-HSDPA is not required

7.4 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n transmitters. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v01r02 for more details.

7.4.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters. The test frequencies should correspond to actual channel frequencies defined for domestic use. SAR for devices with switched diversity should be measured with only one antenna transmitting at a time during each SAR measurement, according to a fixed modulation and data rate. The same data pattern should be used for all measurements.

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7.4.2 Frequency Channel Configurations [24]

For 2.4 GHz, the highest average RF output power channel between the low, mid and high channel at the lowest data rate was selected for SAR evaluation in 802.11b mode. 802.11g/n modes and higher data rates for 802.11b were additionally evaluated for SAR if the output power of the respective mode was 0.25 dB or higher than the powers of the SAR configurations tested in the 802.11b mode.

For 5 GHz, the highest average RF output power channel across the default test channels at the lowest data rate was selected for SAR evaluation in 802.11a. When the adjacent channels are higher in power than the default channels, these “required channels” were considered instead of the default channels for SAR testing. 802.11n modes and higher data rates for 802.11a/n were evaluated only if the respective mode was higher than 0.25 dB or more than the 802.11a mode.

If the maximum extrapolated peak SAR of the zoom scan for the highest output channel was less than 1.6 W/kg and if the 1g averaged SAR was less than 0.8 W/kg, SAR testing was not required for the other test channels in the band.

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8 RF CONDUCTED POWERS

8.1 GSM Conducted Powers

Table 8-1
Maximum GSM/GPRS/EDGE Average RF Conducted Powers

		Maximum Burst-Averaged Output Power								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	32.18	32.22	31.24	30.26	28.66	26.61	25.42	24.36	22.58
	190	32.22	32.31	31.27	30.26	28.65	26.51	25.46	24.00	22.45
	251	32.36	32.40	31.42	30.41	28.95	26.76	25.75	24.23	22.63
GSM 1900	512	29.12	29.14	28.04	26.95	25.76	25.50	24.78	22.85	21.43
	661	29.00	29.03	27.91	26.84	25.78	25.82	24.88	22.91	21.62
	810	29.32	29.36	28.33	27.31	26.33	25.91	24.69	22.99	21.53
		Calculated Maximum Frame-Averaged Output Power								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	23.15	23.19	25.22	26.00	25.65	17.58	19.40	20.10	19.57
	190	23.19	23.28	25.25	26.00	25.64	17.48	19.44	19.74	19.44
	251	23.33	23.37	25.40	26.15	25.94	17.73	19.73	19.97	19.62
GSM 1900	512	20.09	20.11	22.02	22.69	22.75	16.47	18.76	18.59	18.42
	661	19.97	20.00	21.89	22.58	22.77	16.79	18.86	18.65	18.61
	810	20.29	20.33	22.31	23.05	23.32	16.88	18.67	18.73	18.52
GSM 850	Frame	23.87	23.47	24.98	25.74	25.49	17.97	19.48	19.74	19.49
GSM 1900	Avg. Targets:	20.67	20.67	22.48	22.74	22.99	16.47	18.48	18.24	18.49

Table 8-2
Reduced GSM/GPRS/EDGE Average RF Conducted Powers
Representing Head and Body at 0 mm

		Maximum Burst-Averaged Output Power								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	25.60	22.41	22.20	20.79	18.55	23.08	21.93	19.88	18.44
	190	25.62	22.40	22.28	20.83	18.56	23.31	22.04	20.42	18.71
	251	25.49	22.25	22.06	20.83	18.32	23.29	22.17	20.46	18.88
GSM 1900	512	20.21	17.22	16.18	14.48	13.17	17.25	16.00	14.42	12.66
	661	19.11	15.91	15.04	13.25	11.82	17.19	16.08	14.48	12.63
	810	20.17	17.25	16.16	14.65	13.05	17.37	16.23	14.49	12.64

		Calculated Maximum Frame-Averaged Output Power								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	16.57	13.38	16.18	16.53	15.54	14.05	15.91	15.62	15.43
	190	16.59	13.37	16.26	16.57	15.55	14.28	16.02	16.16	15.70
	251	16.46	13.22	16.04	16.57	15.31	14.26	16.15	16.20	15.87
GSM 1900	512	11.18	8.19	10.16	10.22	10.16	8.22	9.98	10.16	9.65
	661	10.08	6.88	9.02	8.99	8.81	8.16	10.06	10.22	9.62
	810	11.14	8.22	10.14	10.39	10.04	8.34	10.21	10.23	9.63
GSM 850	Frame	16.47	12.97	15.98	16.24	15.49	13.97	15.98	15.74	15.49
GSM 1900	Avg.Targets:	10.97	7.97	9.98	10.24	9.99	7.97	9.98	9.74	9.49

Note:

- Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
- The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for body SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
- GPRS/EDGE (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.
- EDGE (8-PSK) output powers were measured with MCS7 on the base station simulator. MCS7 coding scheme was used to measure the output powers for EDGE since investigation has shown that choosing MCS7 coding scheme will ensure 8-PSK modulation. It has been shown that MCS levels that produce 8PSK modulation do not have an impact on output power.

GSM Class: B

GPRS Multislot class: 33 (Max 4 Tx uplink slots)

EDGE Multislot class: 33 (Max 4 Tx uplink slots)

DTM Multislot Class: N/A

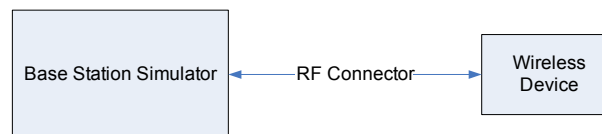


Figure 8-1
Power Measurement Setup

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8.2 UMTS Conducted Powers

Table 8-3
Maximum UMTS Average RF Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	22.93	22.76	22.69	22.74	22.67	22.78	-
99		12.2 kbps AMR	23.00	22.86	22.74	22.65	22.58	22.76	-
6	HSDPA	Subtest 1	22.65	22.49	22.41	22.43	22.46	22.73	0
6		Subtest 2	21.48	21.45	21.46	21.62	21.63	21.86	0
6		Subtest 3	20.58	20.51	20.50	20.56	20.59	20.73	0.5
6		Subtest 4	20.63	20.53	20.51	20.61	20.60	20.70	0.5
6	HSUPA	Subtest 1	21.13	21.01	21.02	21.18	21.05	21.23	0
6		Subtest 2	19.05	19.02	19.01	19.04	19.05	19.23	2
6		Subtest 3	20.07	20.04	20.01	20.01	20.11	20.27	1
6		Subtest 4	19.03	19.05	19.00	19.05	19.06	19.13	2
6		Subtest 5	22.95	22.81	22.76	22.85	22.81	22.92	0
8	DC-HSDPA	Subtest 1	22.65	22.54	22.45	22.87	22.64	22.73	0
8		Subtest 2	21.82	21.67	21.49	21.67	21.73	21.82	0
8		Subtest 3	20.81	20.94	20.67	20.64	20.66	20.68	0.5
8		Subtest 4	20.62	20.54	20.50	20.62	20.56	20.65	0.5

Table 8-4
Reduced UMTS Average RF Conducted Powers
(Representing Head and Body at 0mm)

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	20.05	20.22	20.23	10.35	10.15	10.50	-
99		12.2 kbps AMR	20.02	20.12	20.17	10.33	10.17	10.49	-
6	HSDPA	Subtest 1	20.03	20.17	20.24	10.26	10.14	10.44	0
6		Subtest 2	20.07	20.16	20.23	10.27	10.18	10.47	0
6		Subtest 3	20.08	20.21	20.24	10.25	10.15	10.46	0.5
6		Subtest 4	20.05	20.24	20.26	10.22	10.12	10.47	0.5
6	HSUPA	Subtest 1	19.06	19.20	19.23	10.28	10.09	10.27	0
6		Subtest 2	19.08	19.25	19.28	10.29	10.11	10.48	2
6		Subtest 3	19.06	19.18	19.27	10.30	10.11	10.49	1
6		Subtest 4	18.98	19.09	19.14	10.27	10.13	10.48	2
6		Subtest 5	20.08	20.20	20.25	10.27	10.09	10.47	0
8	DC-HSDPA	Subtest 1	20.06	20.13	20.07	10.47	10.25	10.49	0
8		Subtest 2	20.12	20.19	20.11	10.48	10.23	10.48	0
8		Subtest 3	20.11	20.14	20.20	10.40	10.17	10.50	0.5
8		Subtest 4	20.14	20.17	20.08	10.43	10.15	10.46	0.5

UMTS SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.

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DC-HSDPA considerations

- 3GPP Specification 34.121-1 Release 8 Ver 8.10.0 was used for DC-HSDPA guidance
- H-Set 12 (QPSK) was confirmed to be used during DC-HSDPA measurements
- Measured maximum output powers for DC-HSDPA were not greater than 1/4 dB higher than the WCDMA 12.2 kbps RMC maximum output, as a result, SAR is not required for DC-HSDPA
- The DUT supports UE category 24 for HSDPA

It is expected by the manufacturer that MPR for some HSUPA subtests may be up to 2 dB more than specified by 3GPP, but also as low as 0 dB according to the chipset implementation in this model.



Figure 8-2
Power Measurement Setup

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8.3 WLAN/Bluetooth Conducted Powers

Table 8-5
IEEE 802.11b Average RF Power

Mode	Freq [MHz]	Channel	802.11b Conducted Power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1*	11.67	11.73	11.80	11.76
802.11b	2437	6*	11.69	11.78	11.85	11.81
802.11b	2462	11*	11.71	11.69	11.77	11.75

Table 8-6
IEEE 802.11g Average RF Power

Mode	Freq [MHz]	Channel	802.11g Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	10.18	10.25	10.20	10.33	10.21	10.20	10.15	10.24
802.11g	2437	6	9.51	9.54	9.51	9.64	9.56	9.61	9.52	9.52
802.11g	2462	11	9.73	9.80	9.81	9.76	9.85	9.80	9.71	9.73

Table 8-7
IEEE 802.11n Average RF Power

Mode	Freq [MHz]	Channel	802.11n (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	9.83	9.86	9.85	9.82	9.82	9.90	9.82	9.87
802.11n	2437	6	9.42	9.49	9.44	9.33	9.36	9.28	9.41	9.18
802.11n	2462	11	10.24	10.23	10.30	10.21	10.24	10.27	10.34	10.20

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Table 8-8
IEEE 802.11a Average RF Power

Mode	Freq [MHz]	Channel	802.11a Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36*	8.91	8.94	8.98	8.83	9.06	8.99	9.05	8.95
802.11a	5200	40	8.91	8.97	8.96	8.88	9.16	8.98	9.06	9.03
802.11a	5220	44	8.95	8.95	9.06	8.85	9.07	9.03	9.12	9.00
802.11a	5240	48*	9.08	9.09	9.14	9.03	9.26	9.22	9.22	9.17
802.11a	5260	52*	8.64	8.77	8.70	8.68	8.74	8.81	8.78	8.78
802.11a	5280	56	8.61	8.77	8.70	8.66	8.66	8.70	8.70	8.77
802.11a	5300	60	8.75	8.85	8.87	8.72	8.88	8.91	8.90	8.85
802.11a	5320	64*	8.87	9.05	8.90	8.89	9.00	9.05	8.98	9.02
802.11a	5500	100	8.85	8.76	8.79	8.76	8.80	8.87	8.82	8.88
802.11a	5520	104*	8.67	8.65	8.62	8.59	8.59	8.69	8.66	8.74
802.11a	5540	108	8.68	8.62	8.63	8.65	8.62	8.71	8.69	8.75
802.11a	5560	112	8.79	8.81	8.75	8.76	8.85	8.86	8.77	8.86
802.11a	5580	116*	8.78	8.73	8.71	8.75	8.83	8.87	8.87	8.80
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5660	132	8.62	8.63	8.63	8.54	8.59	8.74	8.63	8.66
802.11a	5680	136*	8.58	8.56	8.63	8.51	8.55	8.63	8.56	8.72
802.11a	5700	140	8.70	8.66	8.66	8.58	8.69	8.76	8.74	8.76
802.11a	5745	149*	8.79	8.94	8.74	8.79	8.83	8.89	8.92	8.84
802.11a	5765	153	8.80	8.91	8.80	8.81	8.84	8.91	8.91	8.87
802.11a	5785	157*	8.72	8.82	8.69	8.65	8.85	8.87	8.79	8.81
802.11a	5805	161	8.76	8.96	8.77	8.70	8.85	8.90	8.90	8.79
802.11a	5825	165*	8.75	8.85	8.72	8.76	8.87	8.92	8.91	8.79

Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client. This device does not transmit any beacons or initiate any transmissions in 5.3 and 5.5 GHz Band.

(*) – indicates default channels per KDB Publication 248227 D01v01r02. When the adjacent channels are higher in power than the default channels, these “required channels” are considered for SAR testing instead of the default channels.

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Table 8-9
IEEE 802.11n Average RF Power – 20 MHz Bandwidth

Mode	Freq [MHz]	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	8.23	8.19	8.36	8.29	8.21	8.19	8.24	8.25
802.11n	5200	40	8.33	8.25	8.44	8.41	8.33	8.30	8.36	8.37
802.11n	5220	44	8.36	8.29	8.47	8.42	8.39	8.27	8.35	8.32
802.11n	5240	48	8.47	8.45	8.48	8.49	8.49	8.35	8.48	8.45
802.11n	5260	52	8.44	8.01	8.18	8.21	8.25	8.43	8.38	8.39
802.11n	5280	56	8.46	8.06	8.16	8.17	8.21	8.46	8.32	8.43
802.11n	5300	60	8.37	8.00	8.06	8.10	8.18	8.34	8.33	8.33
802.11n	5320	64	8.25	7.81	7.99	8.04	8.02	8.25	8.25	8.18
802.11n	5500	100	8.08	8.14	8.23	8.25	8.33	8.35	8.32	8.41
802.11n	5520	104	8.08	8.13	8.26	8.25	8.36	8.40	8.34	8.47
802.11n	5540	108	8.07	8.15	8.21	8.19	8.33	8.33	8.29	8.44
802.11n	5560	112	8.04	8.17	8.13	8.29	8.23	8.33	8.27	8.40
802.11n	5580	116	8.10	8.19	8.33	8.21	8.36	8.40	8.31	8.40
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	7.97	8.11	8.07	8.20	8.23	8.27	8.25	8.31
802.11n	5680	136	8.02	8.08	8.15	8.20	8.31	8.23	8.28	8.27
802.11n	5700	140	8.00	8.05	8.13	8.16	8.21	8.28	8.21	8.33
802.11n	5745	149	7.63	7.60	7.75	7.81	7.86	7.92	7.79	7.83
802.11n	5765	153	7.62	7.53	7.82	7.82	7.76	7.92	7.76	7.83
802.11n	5785	157	7.63	7.63	7.72	7.77	7.94	7.87	7.78	7.83
802.11n	5805	161	7.61	7.59	7.66	7.72	7.87	7.86	7.82	7.87
802.11n	5825	165	7.60	7.54	7.76	7.86	7.78	7.96	7.75	7.78

Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client. This device does not transmit any beacons or initiate any transmissions in 5.3 and 5.5 GHz Band

Table 8-10
IEEE 802.11n Average RF Power – 40 MHz Bandwidth

Mode	Freq [MHz]	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	7.59	7.63	7.41	7.86	7.79	7.83	7.85	7.77
802.11n	5230	46	7.63	7.60	7.53	7.93	7.77	7.87	7.87	7.80
802.11n	5270	54	7.66	7.46	7.58	7.93	7.89	7.86	7.88	7.82
802.11n	5310	62	7.50	7.29	7.42	7.77	7.68	7.62	7.72	7.61
802.11n	5510	102	8.09	8.19	8.22	8.46	8.31	8.29	8.41	8.38
802.11n	5550	110	8.06	8.18	8.20	8.45	8.37	8.28	8.46	8.32
802.11n	5590	118	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5630	126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5670	134	7.99	8.08	8.18	8.35	8.16	8.15	8.26	8.34
802.11n	5755	151	8.20	8.33	8.38	8.19	8.46	8.45	8.41	8.46
802.11n	5795	159	8.31	8.38	8.48	8.43	8.39	8.41	8.45	8.47

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Per FCC KDB Publication 443999 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client. This device does not transmit any beacons or initiate any transmissions in 5.3 and 5.5 GHz Band

Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012/April 2013 FCC/TCB Meeting Notes:

- For 2.4 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
- For 5 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11a were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
- When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
- The bolded data rate and channel above were tested for SAR

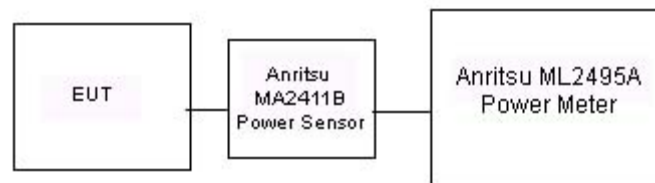


Figure 8-3
Power Measurement Setup

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Table 8-11
Bluetooth RF Conducted Powers

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	10.88	12.234
2441	1.0	39	11.69	14.753
2480	1.0	78	11.25	13.330
2402	2.0	0	8.16	6.542
2441	2.0	39	9.54	8.989
2480	2.0	78	7.93	6.211
2402	3.0	0	8.19	6.599
2441	3.0	39	9.60	9.128
2480	3.0	78	8.09	6.445

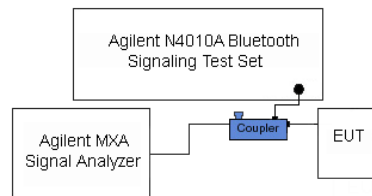


Figure 8-4
Power Measurement Setup

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9 SYSTEM VERIFICATION

9.1 Tissue Verification

Table 9-1
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
5/14/2014	835H	21.9	820	0.890	41.136	0.899	41.578	-1.00%	-1.06%
			835	0.905	40.853	0.900	41.500	0.56%	-1.56%
			850	0.919	40.724	0.916	41.500	0.33%	-1.87%
5/22/2014	835H	22.1	820	0.915	42.772	0.899	41.578	1.78%	2.87%
			835	0.930	42.572	0.900	41.500	3.33%	2.58%
			850	0.942	42.370	0.916	41.500	2.84%	2.10%
5/19/2014	1900H	22.8	1850	1.397	40.270	1.400	40.000	-0.21%	0.68%
			1880	1.427	40.125	1.400	40.000	1.93%	0.31%
			1910	1.462	40.036	1.400	40.000	4.43%	0.09%
4/17/2014	2450H	22.5	2401	1.745	38.163	1.756	39.287	-0.63%	-2.86%
			2450	1.798	37.988	1.800	39.200	-0.11%	-3.09%
			2499	1.852	37.854	1.853	39.138	-0.05%	-3.28%
04/23/2014	5200H-5800H	24.4	5200	4.480	36.870	4.655	35.986	-3.76%	2.46%
			5240	4.531	36.821	4.696	35.940	-3.51%	2.45%
			5300	4.583	36.745	4.758	35.871	-3.68%	2.44%
			5320	4.597	36.706	4.778	35.849	-3.79%	2.39%
			5500	4.781	36.534	4.963	35.643	-3.67%	2.50%
			5765	5.052	36.217	5.234	35.340	-3.48%	2.48%
			5800	5.060	36.154	5.270	35.300	-3.98%	2.42%
6/1/2014	835B	23.4	820	0.996	55.067	0.969	55.258	2.79%	-0.35%
			835	1.010	54.930	0.970	55.200	4.12%	-0.49%
			850	1.025	54.768	0.988	55.154	3.74%	-0.70%
5/19/2014	1900B	22.1	1850	1.512	54.006	1.520	53.300	-0.53%	1.32%
			1880	1.546	53.896	1.520	53.300	1.71%	1.12%
			1910	1.580	53.778	1.520	53.300	3.95%	0.90%
5/21/2014	1900B	21.8	1850	1.490	52.830	1.520	53.300	-1.97%	-0.88%
			1880	1.527	52.703	1.520	53.300	0.46%	-1.12%
			1910	1.563	52.598	1.520	53.300	2.83%	-1.32%
6/2/2014	1900B	21.5	1850	1.477	53.220	1.520	53.300	-2.83%	-0.15%
			1880	1.510	53.112	1.520	53.300	-0.66%	-0.35%
			1910	1.543	53.005	1.520	53.300	1.51%	-0.55%
4/21/2014	2450B	22.8	2401	1.968	51.220	1.903	52.765	3.42%	-2.93%
			2450	2.032	50.970	1.950	52.700	4.21%	-3.28%
			2499	2.100	50.831	2.019	52.638	4.01%	-3.43%
04/25/2014	5200B-5800B	22.9	5200	5.456	46.973	5.299	49.014	2.96%	-4.16%
			5240	5.507	46.903	5.346	48.960	3.01%	-4.20%
			5300	5.573	46.793	5.416	48.879	2.90%	-4.27%
			5320	5.603	46.756	5.439	48.851	3.02%	-4.29%
			5500	5.852	46.471	5.650	48.607	3.58%	-4.39%
			5765	6.233	46.041	5.959	48.248	4.60%	-4.57%
			5800	6.280	45.944	6.000	48.200	4.67%	-4.68%

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB 865664 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

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9.2 Test System Verification

Prior to SAR assessment, the system is verified to $\pm 10\%$ of the SAR measurement on the reference dipole at the time of calibration by the calibration facility. Full system validation status and result summary can be found in Appendix E.

Table 9-2
System Verification Results

System Verification TARGET & MEASURED												
SAR System #	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 _{1g} (%)
C	835	HEAD	05/14/2014	22.5	21.9	0.100	4d133	3213	0.964	9.620	9.640	0.21%
G	835	HEAD	05/22/2014	21.1	22.0	0.100	4d119	3258	0.982	9.220	9.820	6.51%
G	1900	HEAD	05/19/2014	24.0	22.5	0.100	5d149	3258	3.910	40.400	39.100	-3.22%
K	2450	HEAD	04/17/2014	24.3	22.6	0.100	797	3287	5.400	51.800	54.000	4.25%
E	5200	HEAD	04/23/2014	24.5	24.4	0.100	1057	3914	7.420	78.000	74.200	-4.87%
E	5300	HEAD	04/23/2014	24.5	24.3	0.100	1057	3914	8.290	83.000	82.900	-0.12%
E	5500	HEAD	04/23/2014	24.4	24.3	0.100	1057	3914	7.890	84.300	78.900	-6.41%
E	5800	HEAD	04/23/2014	24.5	24.4	0.100	1057	3914	7.770	79.300	77.700	-2.02%
I	835	BODY	06/01/2014	23.8	23.3	0.100	4d132	3209	1.000	9.310	10.000	7.41%
I	1900	BODY	05/19/2014	21.9	21.6	0.100	5d149	3209	4.260	40.500	42.600	5.19%
J	1900	BODY	05/21/2014	22.4	21.8	0.100	5d149	3332	4.310	40.500	43.100	6.42%
B	1900	BODY	06/02/2014	23.0	21.9	0.100	5d148	3288	3.810	39.300	38.100	-3.05%
G	2450	BODY	04/21/2014	24.3	23.0	0.100	797	3258	4.900	49.400	49.000	-0.81%
A	5200	BODY	04/25/2014	23.4	21.8	0.100	1007	3920	7.740	72.600	77.400	6.61%
A	5300	BODY	04/25/2014	23.4	21.8	0.100	1007	3920	7.970	74.700	79.700	6.69%
A	5500	BODY	04/25/2014	23.4	21.8	0.100	1007	3920	7.890	75.900	78.900	3.95%
A	5800	BODY	04/25/2014	23.4	21.8	0.100	1007	3920	7.580	72.900	75.800	3.98%

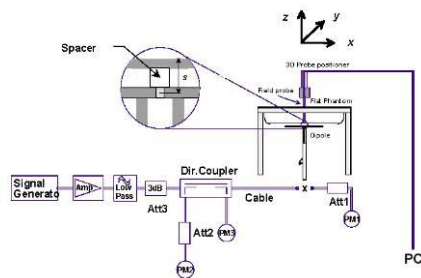


Figure 9-1
System Verification Setup Diagram



Figure 9-2
System Verification Setup Photo

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10 SAR DATA SUMMARY

10.1 Standalone Head SAR Data

Table 10-1
GSM 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	26.0	25.62	0.06	Right	Cheek	1305-4	1:8.3	0.287	1.091	0.313	A1
836.60	190	GSM 850	GSM	26.0	25.62	-0.11	Right	Tilt	1305-4	1:8.3	0.220	1.091	0.240	
836.60	190	GSM 850	GSM	26.0	25.62	0.02	Left	Cheek	1305-4	1:8.3	0.183	1.091	0.200	
836.60	190	GSM 850	GSM	26.0	25.62	0.02	Left	Tilt	1305-4	1:8.3	0.162	1.091	0.177	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 10-2
UMTS 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	20.5	20.22	0.01	Right	Cheek	1305-5	1:1	0.736	1.067	0.785	A2
836.60	4183	UMTS 850	RMC	20.5	20.22	0.07	Right	Tilt	1305-5	1:1	0.566	1.067	0.604	
836.60	4183	UMTS 850	RMC	20.5	20.22	0.00	Left	Cheek	1305-5	1:1	0.708	1.067	0.755	
836.60	4183	UMTS 850	RMC	20.5	20.22	-0.01	Left	Tilt	1305-5	1:1	0.650	1.067	0.694	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 10-3
GSM 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1850.20	512	GSM 1900	GSM	20.5	20.21	0.02	Right	Cheek	1305-4	1:8.3	0.301	1.069	0.322	A3
1850.20	512	GSM 1900	GSM	20.5	20.21	0.02	Right	Tilt	1305-4	1:8.3	0.255	1.069	0.273	
1850.20	512	GSM 1900	GSM	20.5	20.21	0.20	Left	Cheek	1305-4	1:8.3	0.115	1.069	0.123	
1850.20	512	GSM 1900	GSM	20.5	20.21	0.03	Left	Tilt	1305-4	1:8.3	0.115	1.069	0.123	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

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Table 10-4
UMTS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	10.5	10.15	0.05	Right	Cheek	1305-5	1:1	0.224	1.084	0.243	A4
1880.00	9400	UMTS 1900	RMC	10.5	10.15	0.05	Right	Tilt	1305-5	1:1	0.186	1.084	0.202	
1880.00	9400	UMTS 1900	RMC	10.5	10.15	-0.09	Left	Cheek	1305-5	1:1	0.090	1.084	0.098	
1880.00	9400	UMTS 1900	RMC	10.5	10.15	-0.07	Left	Tilt	1305-5	1:1	0.088	1.084	0.095	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 10-5
DTS Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2462	11	IEEE 802.11b	DSSS	12.0	11.71	0.12	Right	Cheek	FL-147-C	1	1:1	0.003	1.069	0.003	A5
2462	11	IEEE 802.11b	DSSS	12.0	11.71	0.17	Right	Tilt	FL-147-C	1	1:1	0.001	1.069	0.001	
2462	11	IEEE 802.11b	DSSS	12.0	11.71	0.04	Left	Cheek	FL-147-C	1	1:1	0.003	1.069	0.003	
2462	11	IEEE 802.11b	DSSS	12.0	11.71	0.14	Left	Tilt	FL-147-C	1	1:1	0.003	1.069	0.003	
5765	153	IEEE 802.11a	OFDM	9.5	8.80	0.00	Right	Cheek	FL-147-C	6	1:1	0.000	1.175	0.000	
5765	153	IEEE 802.11a	OFDM	9.5	8.80	0.00	Right	Tilt	FL-147-C	6	1:1	0.000	1.175	0.000	
5765	153	IEEE 802.11a	OFDM	9.5	8.80	0.00	Left	Cheek	FL-147-C	6	1:1	0.000	1.175	0.000	
5765	153	IEEE 802.11a	OFDM	9.5	8.80	-0.09	Left	Tilt	FL-147-C	6	1:1	0.001	1.175	0.001	A6
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 10-6
NII Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
5240	48	IEEE 802.11a	OFDM	9.5	9.08	0.00	Right	Cheek	FL-147-C	6	1:1	0.000	1.102	0.000	
5240	48	IEEE 802.11a	OFDM	9.5	9.08	0.00	Right	Tilt	FL-147-C	6	1:1	0.000	1.102	0.000	
5240	48	IEEE 802.11a	OFDM	9.5	9.08	0.00	Left	Cheek	FL-147-C	6	1:1	0.001	1.102	0.001	A7
5240	48	IEEE 802.11a	OFDM	9.5	9.08	-0.09	Left	Tilt	FL-147-C	6	1:1	0.000	1.102	0.000	
5320	64	IEEE 802.11a	OFDM	9.5	8.87	0.00	Right	Cheek	FL-147-C	6	1:1	0.000	1.156	0.000	
5320	64	IEEE 802.11a	OFDM	9.5	8.87	0.00	Right	Tilt	FL-147-C	6	1:1	0.000	1.156	0.000	
5320	64	IEEE 802.11a	OFDM	9.5	8.87	0.00	Left	Cheek	FL-147-C	6	1:1	0.000	1.156	0.000	
5320	64	IEEE 802.11a	OFDM	9.5	8.87	0.00	Left	Tilt	FL-147-C	6	1:1	0.000	1.156	0.000	
5500	100	IEEE 802.11a	OFDM	9.5	8.85	0.00	Right	Cheek	FL-147-C	6	1:1	0.000	1.161	0.000	
5500	100	IEEE 802.11a	OFDM	9.5	8.85	0.00	Right	Tilt	FL-147-C	6	1:1	0.000	1.161	0.000	
5500	100	IEEE 802.11a	OFDM	9.5	8.85	0.00	Left	Cheek	FL-147-C	6	1:1	0.000	1.161	0.000	
5500	100	IEEE 802.11a	OFDM	9.5	8.85	0.00	Left	Tilt	FL-147-C	6	1:1	0.001	1.161	0.001	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

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10.2 Standalone Body SAR Data

Table 10-7
GPRS/UMTS Body SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GPRS	30.5	30.26	0.03	21 mm	1305-2	3	1:2.76	back	0.296	1.057	0.313	
836.60	190	GSM 850	GPRS	30.5	30.26	0.03	16 mm	1305-2	3	1:2.76	top	0.390	1.057	0.412	
836.60	190	GSM 850	GPRS	30.5	30.26	0.02	0 mm	1305-2	3	1:2.76	right	0.344	1.057	0.364	
836.60	190	GSM 850	GPRS	30.5	30.26	-0.16	4 mm	1305-2	3	1:2.76	left	0.516	1.057	0.545	A8
836.60	190	GSM 850	GPRS	21.0	20.83	0.11	0 mm	1305-4	3	1:2.76	back	0.345	1.040	0.359	
836.60	190	GSM 850	GPRS	21.0	20.83	-0.04	0 mm	1305-4	3	1:2.76	top	0.240	1.040	0.250	
836.60	190	GSM 850	GPRS	21.0	20.83	0.06	0 mm	1305-4	3	1:2.76	left	0.212	1.040	0.220	
836.00	4183	UMTS 850	RMC	23.0	22.76	0.06	21 mm	1305-2	N/A	1:1	back	0.137	1.057	0.145	
836.60	4183	UMTS 850	RMC	23.0	22.76	0.03	16 mm	1305-2	N/A	1:1	top	0.166	1.057	0.175	
836.60	4183	UMTS 850	RMC	23.0	22.76	-0.02	0 mm	1305-2	N/A	1:1	right	0.140	1.057	0.148	
836.60	4183	UMTS 850	RMC	23.0	22.76	0.05	4 mm	1305-2	N/A	1:1	left	0.235	1.057	0.248	
836.60	4183	UMTS 850	RMC	20.5	20.22	0.00	0 mm	1305-5	N/A	1:1	back	0.747	1.067	0.797	A9
836.60	4183	UMTS 850	RMC	20.5	20.22	0.01	0 mm	1305-5	N/A	1:1	top	0.496	1.067	0.529	
836.60	4183	UMTS 850	RMC	20.5	20.22	0.01	0 mm	1305-5	N/A	1:1	left	0.365	1.067	0.389	
1909.80	810	GSM 1900	GPRS	26.5	26.33	0.01	21 mm	1305-2	4	1:2.076	back	0.614	1.040	0.639	
1850.20	512	GSM 1900	GPRS	26.5	25.76	-0.04	16 mm	1305-2	4	1:2.076	top	0.487	1.186	0.578	
1880.00	661	GSM 1900	GPRS	26.5	25.78	0.02	16 mm	1305-2	4	1:2.076	top	0.769	1.180	0.907	
1909.80	810	GSM 1900	GPRS	26.5	26.33	0.02	16 mm	1305-2	4	1:2.076	top	0.897	1.040	0.933	
1909.80	810	GSM 1900	GPRS	26.5	26.33	0.05	0 mm	1305-2	4	1:2.076	right	0.402	1.040	0.418	
1909.80	810	GSM 1900	GPRS	26.5	26.33	-0.03	4 mm	1305-2	4	1:2.076	left	0.309	1.040	0.321	
1850.20	512	GSM 1900	GPRS	15.0	14.48	-0.04	0 mm	1305-4	3	1:2.76	back	0.749	1.127	0.844	
1880.00	661	GSM 1900	GPRS	15.0	13.25	-0.02	0 mm	1305-4	3	1:2.76	back	0.631	1.496	0.944	
1909.80	810	GSM 1900	GPRS	15.0	14.65	0.01	0 mm	1305-4	3	1:2.76	back	0.919	1.084	0.996	A10
1909.80	810	GSM 1900	GPRS	15.0	14.65	-0.09	0 mm	1305-4	3	1:2.76	top	0.517	1.084	0.560	
1909.80	810	GSM 1900	GPRS	15.0	14.65	-0.19	0 mm	1305-4	3	1:2.76	left	0.039	1.084	0.042	
1909.80	810	GSM 1900	GPRS	15.0	14.65	0.03	0 mm	1305-4	3	1:2.76	back	0.879	1.084	0.953	
1880.00	9400	UMTS 1900	RMC	23.0	22.67	0.00	21 mm	1305-2	N/A	1:1	back	0.419	1.079	0.452	
1880.00	9400	UMTS 1900	RMC	23.0	22.67	-0.01	16 mm	1305-2	N/A	1:1	top	0.540	1.079	0.583	
1880.00	9400	UMTS 1900	RMC	23.0	22.67	0.06	0 mm	1305-2	N/A	1:1	right	0.310	1.079	0.334	
1880.00	9400	UMTS 1900	RMC	23.0	22.67	0.01	4 mm	1305-2	N/A	1:1	left	0.232	1.079	0.250	
1880.00	9400	UMTS 1900	RMC	10.5	10.15	0.03	0 mm	1305-5	N/A	1:1	back	0.707	1.084	0.766	A11
1880.00	9400	UMTS 1900	RMC	10.5	10.15	0.08	0 mm	1305-5	N/A	1:1	top	0.329	1.084	0.357	
1880.00	9400	UMTS 1900	RMC	10.5	10.15	-0.04	0 mm	1305-5	N/A	1:1	left	0.170	1.084	0.184	
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: Variability test is highlighted blue in the above table.

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**Table 10-8
DTS Body SAR**

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2412	1	IEEE 802.11b	DSSS	12.0	11.67	-0.17	0 mm	FL-147-C	1	back	1:1	0.943	1.079	1.017	
2437	6	IEEE 802.11b	DSSS	12.0	11.69	-0.03	0 mm	FL-147-C	1	back	1:1	0.861	1.074	0.925	
2462	11	IEEE 802.11b	DSSS	12.0	11.71	-0.05	0 mm	FL-147-C	1	back	1:1	0.822	1.069	0.879	
2462	11	IEEE 802.11b	DSSS	12.0	11.71	-0.14	0 mm	FL-147-C	1	bottom	1:1	0.412	1.069	0.440	
2462	11	IEEE 802.11b	DSSS	12.0	11.71	0.09	0 mm	FL-147-C	1	left	1:1	0.009	1.069	0.010	
2412	1	IEEE 802.11b	DSSS	12.0	11.67	-0.06	0 mm	FL-147-C	1	back	1:1	0.981	1.079	1.058	A12
5765	153	IEEE 802.11a	OFDM	9.5	8.80	0.18	0 mm	FL-147-A	6	back	1:1	0.024	1.175	0.028	A13
5765	153	IEEE 802.11a	OFDM	9.5	8.80	-0.11	0 mm	FL-147-A	6	bottom	1:1	0.005	1.175	0.006	
5765	153	IEEE 802.11a	OFDM	9.5	8.80	0.16	0 mm	FL-147-A	6	left	1:1	0.005	1.175	0.006	
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: Variability test is highlighted blue in the above table.

**Table 10-9
NII Body SAR**

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
5240	48	IEEE 802.11a	OFDM	9.5	9.08	0.20	0 mm	FL-147-A	6	back	1:1	0.119	1.102	0.131	
5240	48	IEEE 802.11a	OFDM	9.5	9.08	-0.13	0 mm	FL-147-A	6	bottom	1:1	0.030	1.102	0.033	
5240	48	IEEE 802.11a	OFDM	9.5	9.08	0.13	0 mm	FL-147-A	6	left	1:1	0.024	1.102	0.026	
5320	64	IEEE 802.11a	OFDM	9.5	8.87	0.13	0 mm	FL-147-A	6	back	1:1	0.120	1.156	0.139	A14
5320	64	IEEE 802.11a	OFDM	9.5	8.87	-0.17	0 mm	FL-147-A	6	bottom	1:1	0.030	1.156	0.035	
5320	64	IEEE 802.11a	OFDM	9.5	8.87	0.18	0 mm	FL-147-A	6	left	1:1	0.024	1.156	0.028	
5500	100	IEEE 802.11a	OFDM	9.5	8.85	0.03	0 mm	FL-147-A	6	back	1:1	0.082	1.161	0.095	
5500	100	IEEE 802.11a	OFDM	9.5	8.85	-0.11	0 mm	FL-147-A	6	bottom	1:1	0.018	1.161	0.021	
5500	100	IEEE 802.11a	OFDM	9.5	8.85	0.18	0 mm	FL-147-A	6	left	1:1	0.017	1.161	0.020	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram								

**Table 10-10
DSS Body SAR**

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2441	39	Bluetooth	FHSS	12.0	11.69	-0.09	0 mm	FL-147-C	1	back	1:1	0.406	1.074	0.436	A15
2441	39	Bluetooth	FHSS	12.0	11.69	-0.15	0 mm	FL-147-C	1	bottom	1:1	0.269	1.074	0.289	
2441	39	Bluetooth	FHSS	12.0	11.69	0.11	0 mm	FL-147-C	1	left	1:1	0.007	1.074	0.008	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram								

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10.3 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2003, FCC KDB 616217 D04, and FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. 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.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
6. Per FCC KDB 865664 D01v01, variability SAR test was performed when the measured SAR result for a frequency band were greater than 0.8 W/kg. Repeat SAR measurement is highlighted blue in the table above for clarity. Please see Section 13 for variability analysis.
7. Per FCC KDB 616217 D04 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v05 was applied to determine SAR test exclusion for adjacent edge configurations. SAR tests were required for top, right and left edge for the main antenna and bottom and left edge for the BT/WLAN antenna.
8. Head SAR testing was required for this tablet because it has a speaker/receiver and microphone positioning that allows for a held-to-ear configuration usage. All head SAR tests were performed at reduced power levels for all modes.

GSM Test Notes:

1. Justification for reduced test configurations per KDB Publication 941225 D03v01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for body SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
2. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is > 0.8 W/kg then testing at the other channels is required for such test configuration(s). When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel was used.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel was used.

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WLAN/BT Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 2.4 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 5 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE 802.11 modes (including 802.11n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
3. WIFI transmission was verified using an uncalibrated spectrum analyzer.
4. When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is >1.6 W/kg or the reported 1g averaged SAR is >0.8 W/kg, SAR testing on other default channels was required.
5. There is no proximity sensor power reduction mechanism applied for WIFI/BT modes.
6. The Bluetooth highest average output power channel was tested for SAR.

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11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

11.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05 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.

11.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05 IV.C.1.iii and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤ 1.6 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05 4.3.2 2), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated SAR} = \frac{\sqrt{f(\text{GHz})}}{7.5} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$

Table 11-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth LE	2440	9.50	5*	0.375

Note:

1. Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission.
2. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.
3. (*) – Per FCC KDB 447498, when the test separation distance is < 5 mm, a distance of 5 mm is applied to determine estimated SAR.

11.3 Head SAR Simultaneous Transmission Analysis

Table 11-2
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.313	0.003	0.316	Head SAR	Right Cheek	0.785	0.003	0.788
	Right Tilt	0.240	0.001	0.241		Right Tilt	0.604	0.001	0.605
	Left Cheek	0.200	0.003	0.203		Left Cheek	0.755	0.003	0.758
	Left Tilt	0.177	0.003	0.180		Left Tilt	0.694	0.003	0.697

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Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.322	0.003	0.325	Head SAR	Right Cheek	0.243	0.003	0.246
	Right Tilt	0.273	0.001	0.274		Right Tilt	0.202	0.001	0.203
	Left Cheek	0.123	0.003	0.126		Left Cheek	0.098	0.003	0.101
	Left Tilt	0.123	0.003	0.126		Left Tilt	0.095	0.003	0.098

Table 11-3
Simultaneous Transmission Scenario with 5 GHz WLAN (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.313	0.000	0.313	Head SAR	Right Cheek	0.785	0.000	0.785
	Right Tilt	0.240	0.000	0.240		Right Tilt	0.604	0.000	0.604
	Left Cheek	0.200	0.001	0.201		Left Cheek	0.755	0.001	0.756
	Left Tilt	0.177	0.001	0.178		Left Tilt	0.694	0.001	0.695
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.322	0.000	0.322	Head SAR	Right Cheek	0.243	0.000	0.243
	Right Tilt	0.273	0.000	0.273		Right Tilt	0.202	0.000	0.202
	Left Cheek	0.123	0.001	0.124		Left Cheek	0.098	0.001	0.099
	Left Tilt	0.123	0.001	0.124		Left Tilt	0.095	0.001	0.096

11.4 Body Simultaneous Transmission Analysis

Table 11-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 0.0 cm)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.359	1.058	1.417	N/A	Body SAR	Back	0.797	1.058	See Note 1	0.02
	Top	0.250	0.400	0.650	N/A		Top	0.529	0.400	0.929	N/A
	Bottom	0.400	0.440	0.840	N/A		Bottom	0.400	0.440	0.840	N/A
	Right	0.364	0.400	0.764	N/A		Right	0.148	0.400	0.548	N/A
	Left	0.220	0.010	0.230	N/A		Left	0.389	0.010	0.399	N/A
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Body SAR	Back	0.996	1.058	See note 1	0.02	Body SAR	Back	0.766	1.058	See note 1	0.01
	Top	0.560	0.400	0.960	N/A		Top	0.357	0.400	0.757	N/A
	Bottom	0.400	0.440	0.840	N/A		Bottom	0.400	0.440	0.840	N/A
	Right	0.418	0.400	0.818	N/A		Right	0.334	0.400	0.734	N/A
	Left	0.042	0.010	0.052	N/A		Left	0.184	0.010	0.194	N/A

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Table 11-5
Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 0.0 cm)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.359	0.139	0.498	Body SAR	Back	0.797	0.139	0.936
	Top	0.250	0.400	0.650		Top	0.529	0.400	0.929
	Bottom	0.400	0.035	0.435		Bottom	0.400	0.035	0.435
	Right	0.364	0.400	0.764		Right	0.148	0.400	0.548
	Left	0.220	0.028	0.248		Left	0.389	0.028	0.417
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.996	0.139	1.135	Body SAR	Back	0.766	0.139	0.905
	Top	0.560	0.400	0.960		Top	0.357	0.400	0.757
	Bottom	0.400	0.035	0.435		Bottom	0.400	0.035	0.435
	Right	0.418	0.400	0.818		Right	0.334	0.400	0.734
	Left	0.042	0.028	0.070		Left	0.184	0.028	0.212

Table 11-6
Simultaneous Transmission Scenario with Bluetooth (Body at 0.0 cm)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.359	0.436	0.795	Body SAR	Back	0.797	0.436	1.233
	Top	0.250	0.400	0.650		Top	0.529	0.400	0.929
	Bottom	0.400	0.375	0.775		Bottom	0.400	0.375	0.775
	Right	0.364	0.400	0.764		Right	0.148	0.400	0.548
	Left	0.220	0.375	0.595		Left	0.389	0.375	0.764
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.996	0.436	1.432	Body SAR	Back	0.766	0.436	1.202
	Top	0.560	0.400	0.960		Top	0.357	0.400	0.757
	Bottom	0.400	0.375	0.775		Bottom	0.400	0.375	0.775
	Right	0.418	0.400	0.818		Right	0.334	0.400	0.734
	Left	0.042	0.375	0.417		Left	0.184	0.375	0.559

Estimated Bluetooth LE values are used for Bottom and Left edges instead of the measured Bluetooth values since estimated Bluetooth LE SAR is greater than measured Bluetooth SAR for these configurations.

Table 11-7
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 2.1 cm)

Configuration	Mode	2G/3G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
Back Side	GSM 850	0.313	<1.058	<1.371	N/A
Back Side	UMTS 850	0.145	<1.058	<1.203	N/A
Back Side	GSM 1900	0.639	<1.058	See note 1	<0.01
Back Side	UMTS 1900	0.452	<1.058	<1.510	N/A

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Table 11-8
Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 2.1 cm)

Configuration	Mode	2G/3G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.313	<0.139	<0.452
Back Side	UMTS 850	0.145	<0.139	<0.284
Back Side	GSM 1900	0.639	<0.139	<0.778
Back Side	UMTS 1900	0.452	<0.139	<0.591

Table 11-9
Simultaneous Transmission Scenario with Bluetooth (Body at 2.1 cm)

Configuration	Mode	2G/3G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.313	<0.436	<0.749
Back Side	UMTS 850	0.145	<0.436	<0.581
Back Side	GSM 1900	0.639	<0.436	<1.075
Back Side	UMTS 1900	0.452	<0.436	<0.888

Table 11-10
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 1.6 cm)

Configuration	Mode	2G/3G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GSM 850	0.412	0.400	0.812
Top Edge	UMTS 850	0.175	0.400	0.575
Top Edge	GSM 1900	0.933	0.400	1.333
Top Edge	UMTS 1900	0.583	0.400	0.983

Table 11-11
Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 1.6 cm)

Configuration	Mode	2G/3G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GSM 850	0.412	0.400	0.812
Top Edge	UMTS 850	0.175	0.400	0.575
Top Edge	GSM 1900	0.933	0.400	1.333
Top Edge	UMTS 1900	0.583	0.400	0.983

Table 11-12
Simultaneous Transmission Scenario with Bluetooth (Body at 1.6 cm)

Configuration	Mode	2G/3G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Top Edge	GSM 850	0.412	0.400	0.812
Top Edge	UMTS 850	0.175	0.400	0.575
Top Edge	GSM 1900	0.933	0.400	1.333
Top Edge	UMTS 1900	0.583	0.400	0.983

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Table 11-13
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body at 0.4 cm)

Configuration	Mode	2G/3G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Left Edge	GSM 850	0.545	<0.010	<0.555
Left Edge	UMTS 850	0.248	<0.010	<0.258
Left Edge	GSM 1900	0.321	<0.010	<0.331
Left Edge	UMTS 1900	0.250	<0.010	<0.260

Table 11-14
Simultaneous Transmission Scenario with 5 GHz WLAN (Body at 0.4 cm)

Configuration	Mode	2G/3G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Left Edge	GSM 850	0.545	<0.028	<0.573
Left Edge	UMTS 850	0.248	<0.028	<0.276
Left Edge	GSM 1900	0.321	<0.028	<0.349
Left Edge	UMTS 1900	0.250	<0.028	<0.278

Table 11-15
Simultaneous Transmission Scenario with Bluetooth (Body at 0.4 cm)

Configuration	Mode	2G/3G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Left Edge	GSM 850	0.545	<0.375	<0.920
Left Edge	UMTS 850	0.248	<0.375	<0.623
Left Edge	GSM 1900	0.321	<0.375	<0.696
Left Edge	UMTS 1900	0.250	<0.375	<0.625

Notes:

1. No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was not higher than 0.04 per FCC KDB 447498 D01v05. See Section 11.5 for detailed SPLS ratio analysis.
2. When the test separation distance was > 50 mm, an estimated SAR of 0.4 W/kg was used to determine simultaneous transmission SAR exclusion, for configuration excluded per FCC KDB 447498 D01v05. Therefore, an estimated SAR of 0.4 W/kg for 2.4 GHz WLAN, 5 GHz WLAN, and Bluetooth was used to evaluate the simultaneous sums in **Table 11-4, Table 11-5, Table 11-6, Table 11-10, Table 11-11, and Table 11-12.**
3. For SAR summations for body 2.1 cm and 0.4 cm, 2.4 GHz WLAN, Bluetooth and 5GHz WLAN SAR values for 0.0 cm were used since the 0.0 cm test distance for 2.4 GHz WLAN, Bluetooth and 5GHz WLAN were more conservative. "<" denotes that the 0.0 cm 2.4 GHz WLAN, Bluetooth and 5GHz WLAN SAR values were used for summation purposes.
4. Per FCC KDB 616217 D04 4.3, when the voice mode is limited to speaker mode or headset operations only for body configurations, additional SAR testing for tablet voice use is not required. Therefore voice standalone and simultaneous combinations with Bluetooth are not evaluated for body configurations.

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11.5 SPLSR Evaluation and Analysis

Per FCC KDB Publication 447498 D01v05, when the sum of the standalone transmitters is more than 1.6 W/kg, the SAR sum to peak locations can be analyzed to determine SAR distribution overlaps. When the SAR peak to location ratio (shown below) for each pair of antennas is ≤ 0.04 , simultaneous SAR evaluation is not required. The distance between the transmitters was calculated using the following formula.

$$\text{Distance}_{\text{Tx1} - \text{Tx2}} = R_i = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2}$$

$$\text{SPLS Ratio} = \frac{(SAR_1 + SAR_2)^{1.5}}{R_i}$$

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The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 21 mm with GPRS 1900 MHz antenna operating at maximum output power with 2.4 GHz WLAN.

Table 11-16
Peak SAR Locations for Body Back Side at 21 mm GPRS 1900 MHz and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)
GPRS 1900 MHz	-1.97	90.01
802.11b	-10.00	-84.00

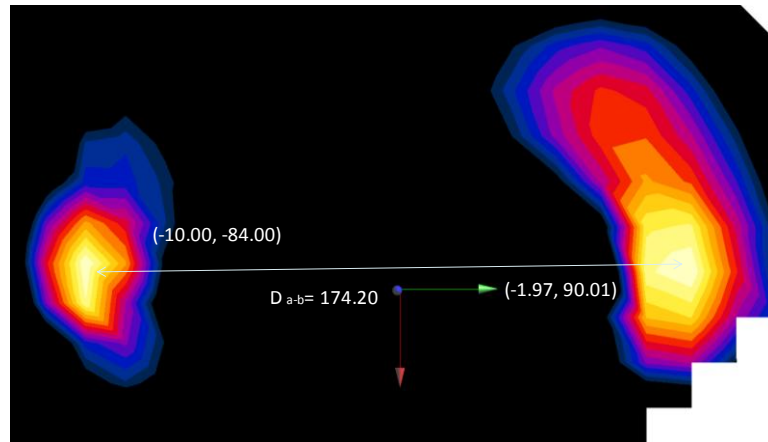


Figure 11-1
Peak SAR Locations of 2.4 GHz WLAN and GPRS 1900 MHz

Table 11-17
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
GPRS 1900 MHz	802.11b	0.639	<1.058	<1.697	174.2	<0.01

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The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0 mm with UMTS 850 MHz antenna operating at limited output power with 2.4 GHz WLAN.

Table 11-18
Peak SAR Locations for Body Back Side at 0 mm UMTS 850 MHz and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)
UMTS 850 MHz	13.00	75.00
802.11b	-10.00	-84.00

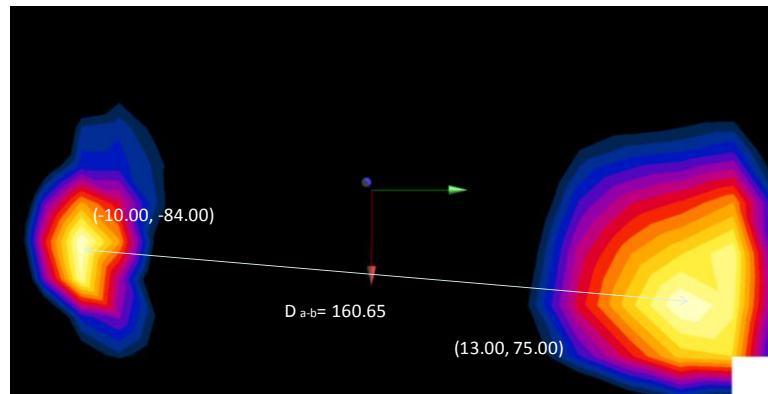


Figure 11-2
Peak SAR Locations of 2.4 GHz WLAN and UMTS 850 MHz

Table 11-19
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
UMTS 850 MHz	802.11b	0.797	1.058	1.855	160.65	0.02

The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0 mm with GPRS 1900 MHz antenna operating at limited output power with 2.4 GHz WLAN.

Table 11-20
Peak SAR Locations for Body Back Side at 0 mm GPRS 1900 MHz and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)
GPRS 1900 MHz	13.00	90.00
802.11b	-10.00	-84.00

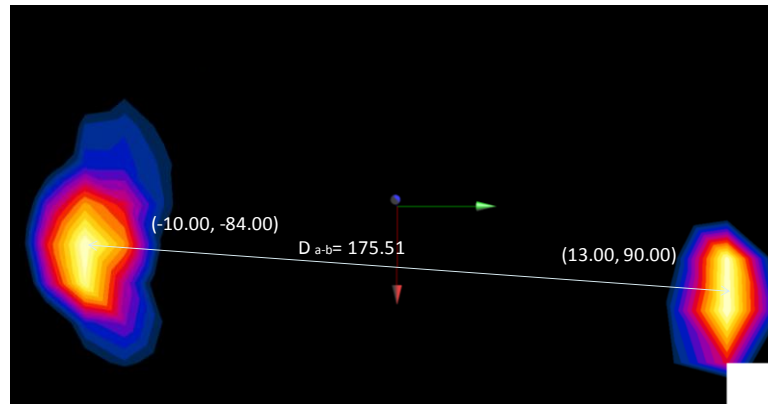


Figure 11-3
Peak SAR Locations of 2.4 GHz WLAN and GPRS 1900 MHz

Table 11-21
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
GPRS 1900 MHz	802.11b	0.996	1.058	2.054	175.51	0.02

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The sum of the standalone SAR values was above 1.6 W/kg for the Body Back side configuration at a separation distance of 0 mm with UMTS 1900 MHz antenna operating at limited output power with 2.4 GHz WLAN.

Table 11-22
Peak SAR Locations for Body Back Side at 0 mm UMTS 1900 MHz and 2.4 GHz WLAN

Mode/Band	x (mm)	y (mm)
UMTS 1900 MHz	13.00	82.50
802.11b	-10.00	-84.00

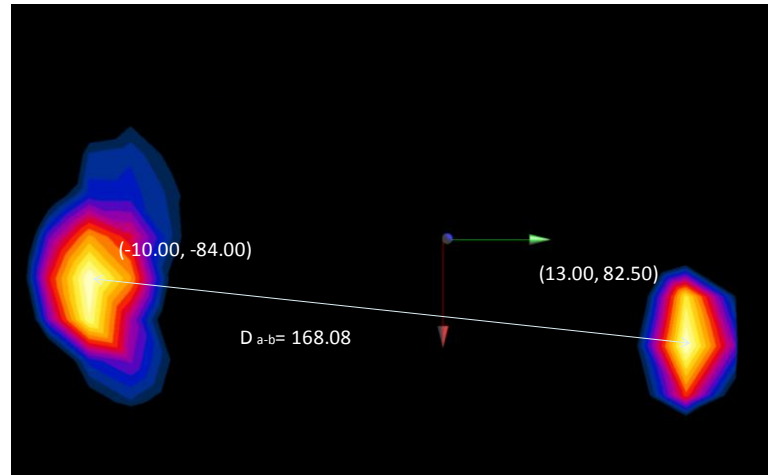


Figure 11-4
Peak SAR Locations of 2.4 GHz WLAN and UMTS 1900 MHz

Table 11-23
SAR Sum to Peak Location Separation Ratio Calculation

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$
UMTS 1900 MHz	802.11b	0.766	1.058	1.824	168.08	0.01

11.6 Simultaneous Transmission Conclusion

The above numerical summed SAR and SPLSR analysis results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v05 and IEEE 1528-2003 Section 6.3.4.1.2.

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12 SAR MEASUREMENT VARIABILITY

12.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

SAR Measurement Variability was assessed using the following procedures for each frequency band:

- 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
- 2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg ($\sim 10\%$ from the 1-g SAR limit).
- 3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .
- 4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg

Table 12-1
Body SAR Measurement Variability Result

BODY VARIABILITY RESULTS															
Band	FREQUENCY		Mode	Service	# of Time Slots	Data Rate (Mbps)	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.							(W/kg)	(W/kg)		(W/kg)		(W/kg)	
1900	1909.80	810	GSM 1900	GPRS	3	N/A	back	0 mm	0.919	0.879	1.05	N/A	N/A	N/A	N/A
2450	2412.00	1	IEEE 802.11b	DSSS	N/A	1	back	0 mm	0.943	0.981	1.04	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body							
Spatial Peak								1.6 W/kg (mW/g)							
Uncontrolled Exposure/General Population								averaged over 1 gram							

12.2 Measurement Uncertainty

The measured SAR was < 1.5 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01, the extended measurement uncertainty analysis per IEEE 1528-2003 was not required.

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13 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/15/2014	Annual	4/15/2015	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	7/23/2013	Annual	7/23/2014	US37390350
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/15/2014	Annual	4/15/2015	3629U00687
Agilent	E4438C	ESG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY45091346
Agilent	N9020A	MXA Signal Analyzer	10/29/2013	Annual	10/29/2014	US46470561
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420800
Agilent	8753ES	S-Parameter Network Analyzer	10/29/2013	Annual	10/29/2014	US39170122
Agilent	E5515C	Wireless Communications Test Set	3/19/2014	Annual	3/19/2015	GB45360985
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433977
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433978
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2014	1039008
Anritsu	ML2469A	Power Meter	3/14/2014	Annual	3/14/2015	1306009
Anritsu	MA2481A	Power Sensor	10/30/2013	Annual	10/30/2014	5605
Anritsu	MA2411B	Pulse Power Sensor	3/25/2014	Annual	3/25/2015	1207470
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1349514
Control Company	4353	Long Stem Thermometer	9/25/2012	Biennial	9/25/2014	122541139
Control Company	4353	Long Stem Thermometer	9/25/2012	Biennial	9/25/2014	122541143
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764551
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764558
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
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-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	9/23/2013	Annual	9/23/2014	109892
Rohde & Schwarz	NRVD	Dual Channel Power Meter	10/12/2012	Biennial	10/12/2014	101695
Rohde & Schwarz	NRV-Z32	Peak Power Sensor	10/12/2012	Biennial	10/12/2014	836019/013
Rohde & Schwarz	SME06	Signal Generator	10/30/2013	Annual	10/30/2014	832026
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	22313
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	N/A
SPEAG	D1900V2	1900 MHz SAR Dipole	2/27/2014	Annual	2/27/2015	5d148
SPEAG	D1900V2	1900 MHz SAR Dipole	7/22/2013	Annual	7/22/2014	5d149
SPEAG	D2450V2	2450 MHz SAR Dipole	1/21/2014	Annual	1/21/2015	797
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/23/2013	Annual	9/23/2014	1007
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/27/2014	Annual	1/27/2015	1057
SPEAG	D835V2	835 MHz SAR Dipole	4/7/2014	Annual	4/7/2015	4d119
SPEAG	D835V2	835 MHz SAR Dipole	1/22/2014	Annual	1/22/2015	4d132
SPEAG	D835V2	835 MHz SAR Dipole	7/17/2013	Annual	7/17/2014	4d133
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2013	Annual	12/12/2014	649
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/26/2014	Annual	2/26/2015	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/17/2013	Annual	9/17/2014	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2014	Annual	3/17/2015	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2014	Annual	3/17/2015	1364
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/18/2013	Annual	11/18/2014	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1408
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/14/2013	Annual	5/14/2014	1070
SPEAG	DAK-3.5	Dielectric Assessment Kit	11/13/2013	Annual	11/13/2014	1091
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	8/18/2013	Annual	8/18/2014	1008
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	8/18/2013	Annual	8/18/2014	1009
SPEAG	ES3DV3	SAR Probe	3/19/2014	Annual	3/19/2015	3209
SPEAG	ES3DV3	SAR Probe	4/11/2014	Annual	4/11/2015	3213
SPEAG	ES3DV3	SAR Probe	2/25/2014	Annual	2/25/2015	3258
SPEAG	ES3DV3	SAR Probe	11/20/2013	Annual	11/20/2014	3287
SPEAG	ES3DV3	SAR Probe	9/23/2013	Annual	9/23/2014	3288
SPEAG	ES3DV3	SAR Probe	11/25/2013	Annual	11/25/2014	3332
SPEAG	EX3DV4	SAR Probe	10/23/2013	Annual	10/23/2014	3914
SPEAG	EX3DV4	SAR Probe	12/18/2013	Annual	12/18/2014	3920
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/16/2014	Annual	4/16/2015	8010177

Note:

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

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14 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

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

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c _i 1gm	c _i 10 gms	1gm u _i (± %)	10gms u _i (± %)	v _i
Measurement System									
Probe Calibration	E.2.1	6.55	N	1	1.0	1.0	6.6	6.6	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)							RSS	12.4	12.0
Expanded Uncertainty (95% CONFIDENCE LEVEL)							k=2	24.7	24.0

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

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15 CONCLUSION

15.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: 1305-4

Communication System: UID 0, GSM850; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.906 \text{ S/m}$; $\epsilon_r = 40.839$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 05-14-2014; Ambient Temp: 22.5°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3213; ConvF(6.37, 6.37, 6.37); Calibrated: 4/11/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 3/17/2014

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

Mode: GSM 850, Right Head, Cheek, Mid.ch

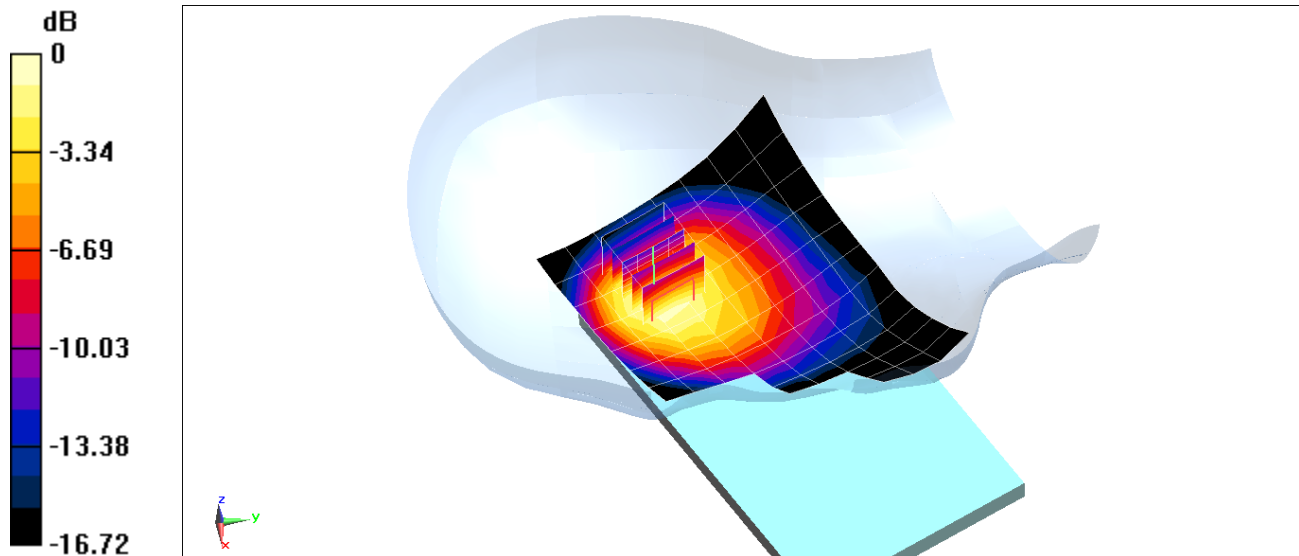
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 18.170 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.517 W/kg

SAR(1 g) = 0.287 W/kg



0 dB = 0.304 W/kg = -5.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: 1305-5

Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6$ MHz; $\sigma = 0.931$ S/m; $\epsilon_r = 42.55$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 05-22-2014; Ambient Temp: 21.1°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3258; ConvF(6.27, 6.27, 6.27); Calibrated: 2/25/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: UMTS 850, Right Head, Cheek, Mid.ch

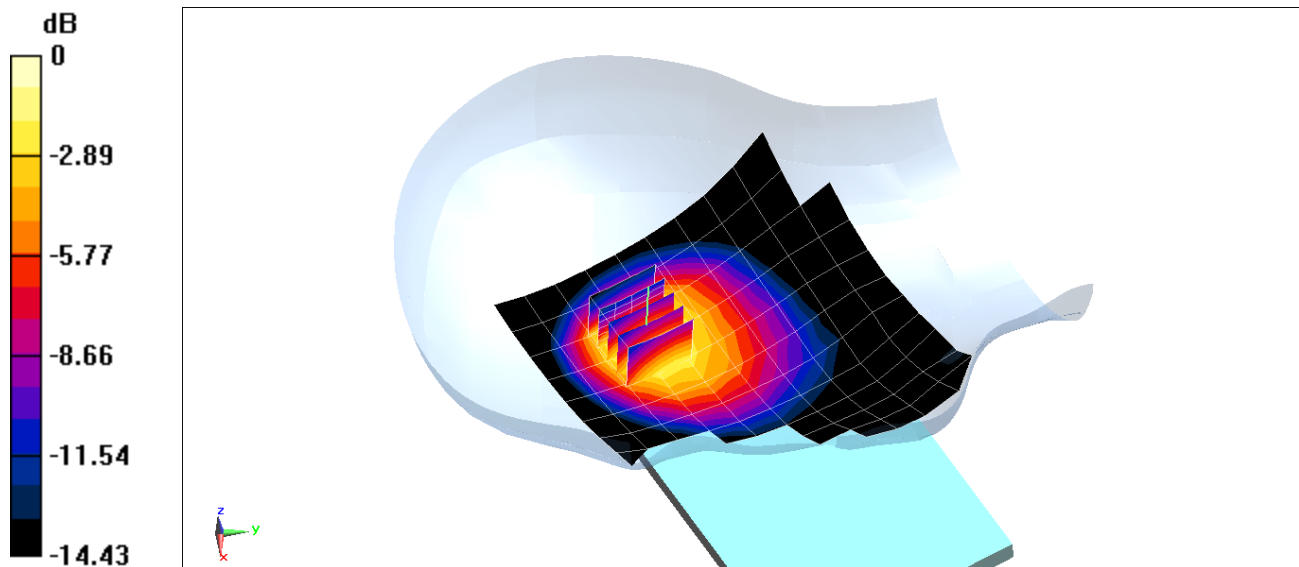
Area Scan (11x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 28.180 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.36 W/kg

SAR(1 g) = 0.736 W/kg



0 dB = 0.813 W/kg = -0.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: 1305-4

Communication System: UID 0, GSM1900; Frequency: 1850.2 MHz; Duty Cycle: 1:8.3

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1850.2 \text{ MHz}$; $\sigma = 1.397 \text{ S/m}$; $\epsilon_r = 40.269$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 05-19-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: GSM 1900, Right Head, Cheek, Low.ch

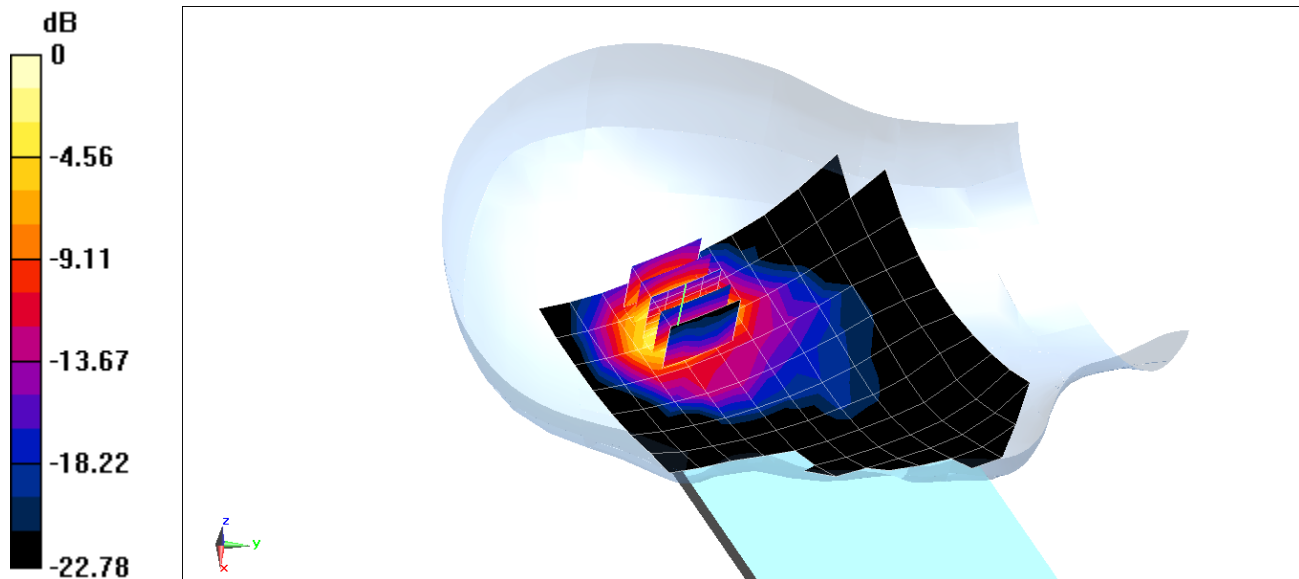
Area Scan (11x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.758 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.617 W/kg

SAR(1 g) = 0.301 W/kg



0 dB = 0.348 W/kg = -4.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: 1305-5

Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.427 \text{ S/m}$; $\epsilon_r = 40.125$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 05-19-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: UMTS 1900, Right Head, Cheek, Mid.ch

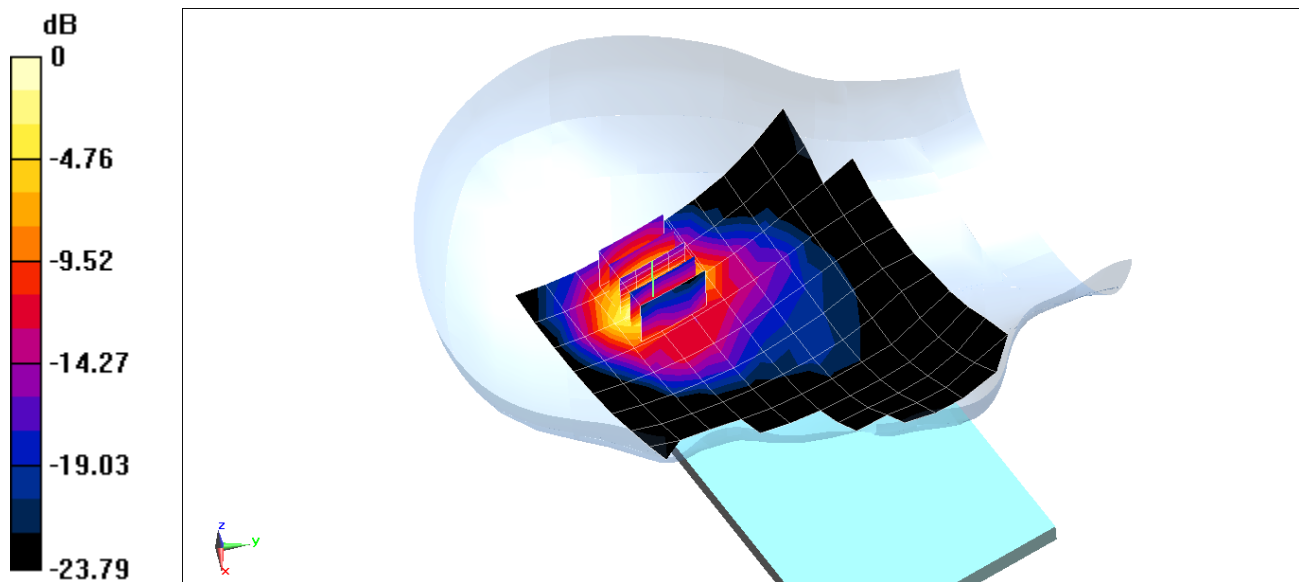
Area Scan (11x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.812 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.463 W/kg

SAR(1 g) = 0.224 W/kg



0 dB = 0.264 W/kg = -5.78 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: FL-147-C

Communication System: UID 0, IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 1.811 \text{ S/m}$; $\epsilon_r = 37.955$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 04-17-2014; Ambient Temp: 24.3°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3287; ConvF(4.43, 4.43, 4.43); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 11/19/2013

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11b, Right Head, Cheek, Ch 11, 1 Mbps

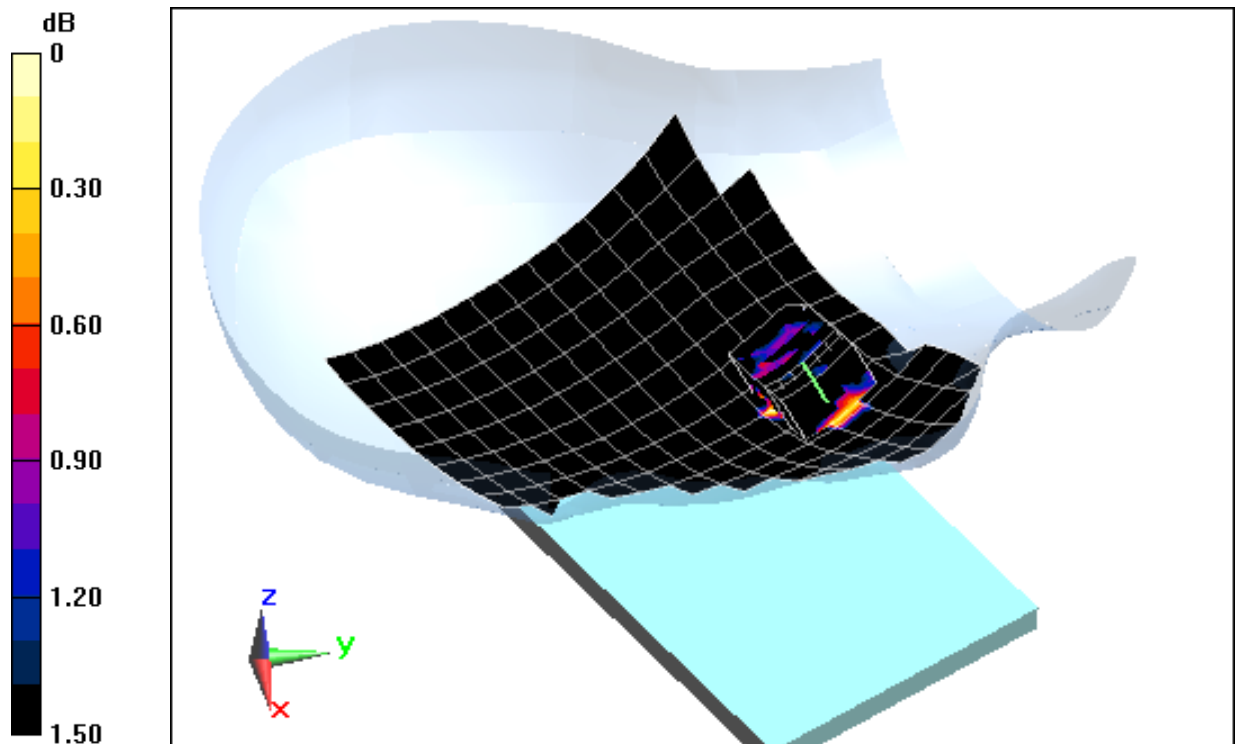
Area Scan (14x21x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 1.237 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.00779 W/kg

SAR(1 g) = 0.003 W/kg



0 dB = 0.00449 W/kg = -23.48 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: FL-147-C

Communication System: UID 0, IEEE 802.11a; Frequency: 5765 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5765 \text{ MHz}$; $\sigma = 5.052 \text{ S/m}$; $\epsilon_r = 36.217$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 04-23-2014; Ambient Temp: 24.5°C; Tissue Temp: 24.4°C

Probe: EX3DV4 - SN3914; ConvF(4.52, 4.52, 4.52); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.8 GHz, Left Head, Tilt, Ch 153, 6 Mbps

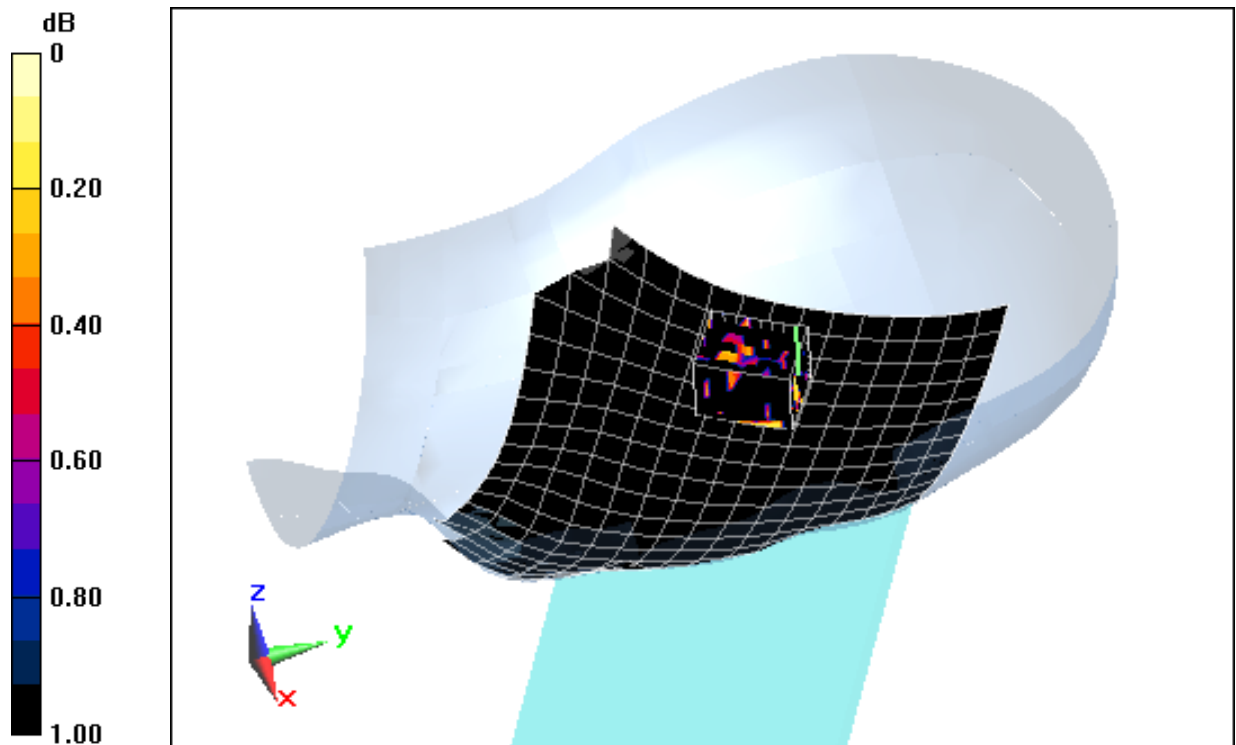
Area Scan (16x22x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (9x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Reference Value = 1.066 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.0460 W/kg

SAR(1 g) = 0.00125 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: FL-147-C

Communication System: UID 0, IEEE 802.11a; Frequency: 5240 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5240 \text{ MHz}$; $\sigma = 4.531 \text{ S/m}$; $\epsilon_r = 36.821$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 04-23-2014; Ambient Temp: 24.5°C; Tissue Temp: 24.4°C

Probe: EX3DV4 - SN3914; ConvF(4.99, 4.99, 4.99); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.2 GHz, Left Head, Cheek, Ch 48, 6 Mbps

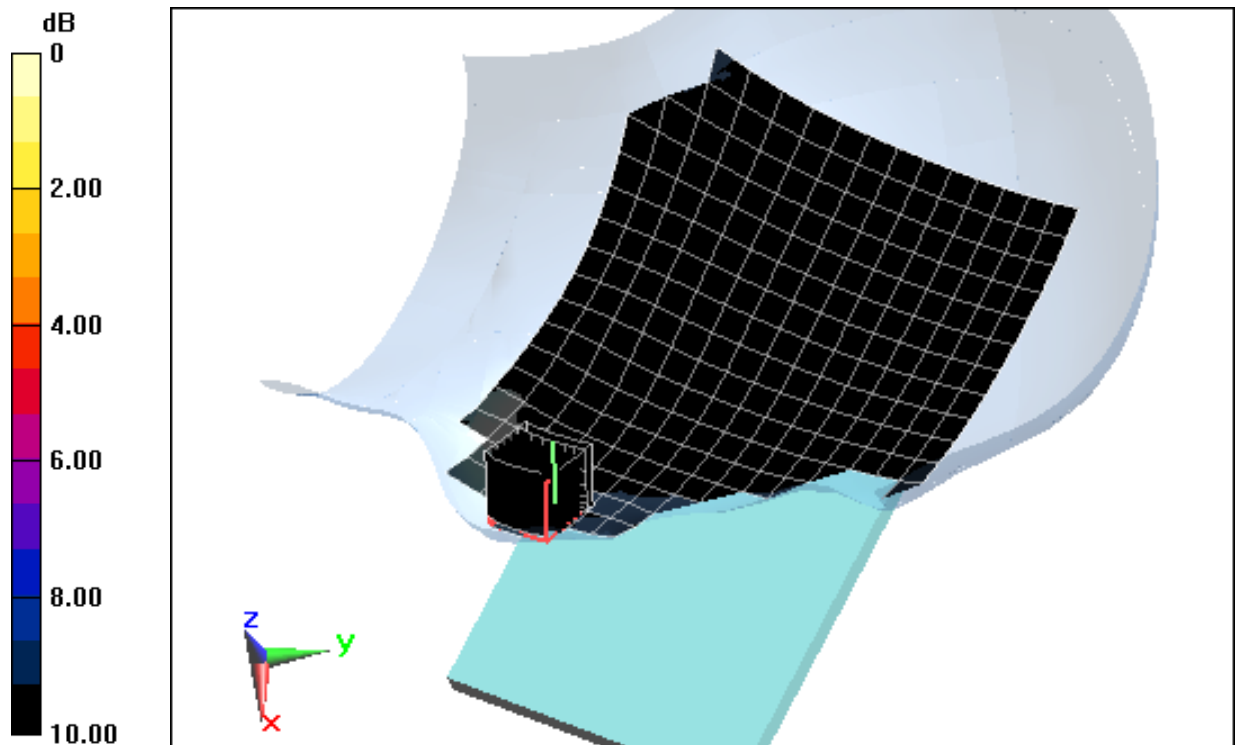
Area Scan (16x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Reference Value = 0 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.0300 W/kg

SAR(1 g) = 0.000867 W/kg



0 dB = 0.00873 W/kg = -20.59 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: 1305-2

Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.012 \text{ S/m}$; $\epsilon_r = 54.913$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.4 cm

Test Date: 06-01-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.3°C

Probe: ES3DV3 - SN3209; ConvF(6.14, 6.14, 6.14); Calibrated: 3/19/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: GPRS 850, Body SAR, Left Edge, Mid.ch, 3 Tx Slots

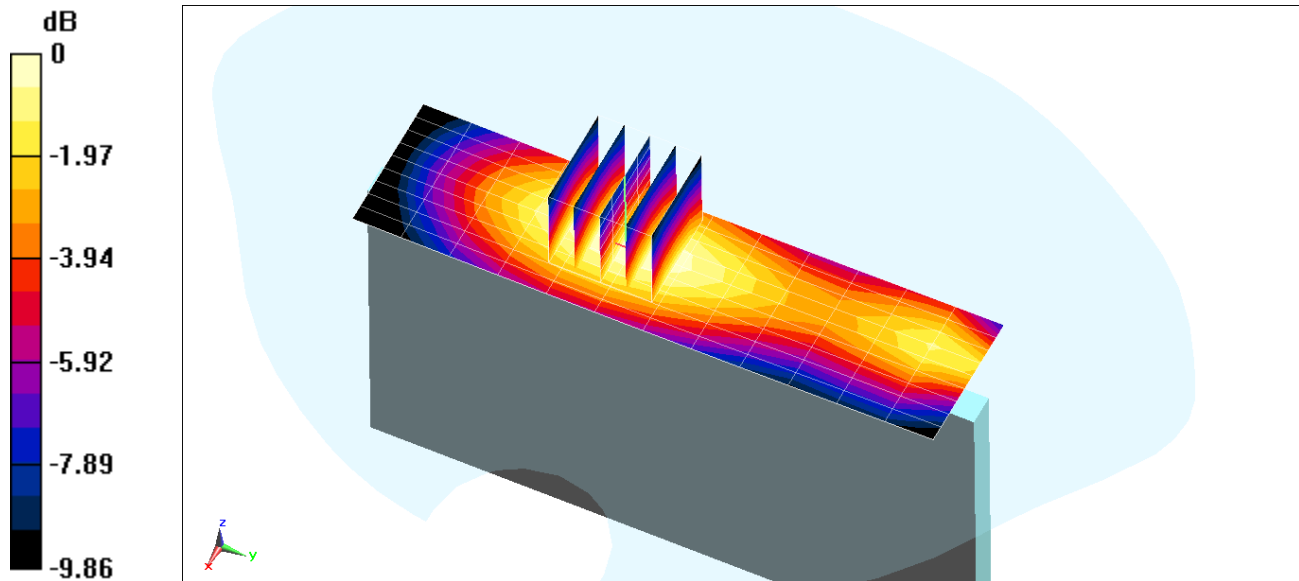
Area Scan (10x13x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 23.712 V/m; Power Drift = -0.16 dB

Peak SAR (extrapolated) = 0.750 W/kg

SAR(1 g) = 0.516 W/kg



0 dB = 0.557 W/kg = -2.54 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: 1305-5

Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.012 \text{ S/m}$; $\epsilon_r = 54.913$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 06-01-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.3°C

Probe: ES3DV3 - SN3209; ConvF(6.14, 6.14, 6.14); Calibrated: 3/19/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: UMTS 850, Body SAR, Back side, Mid.ch

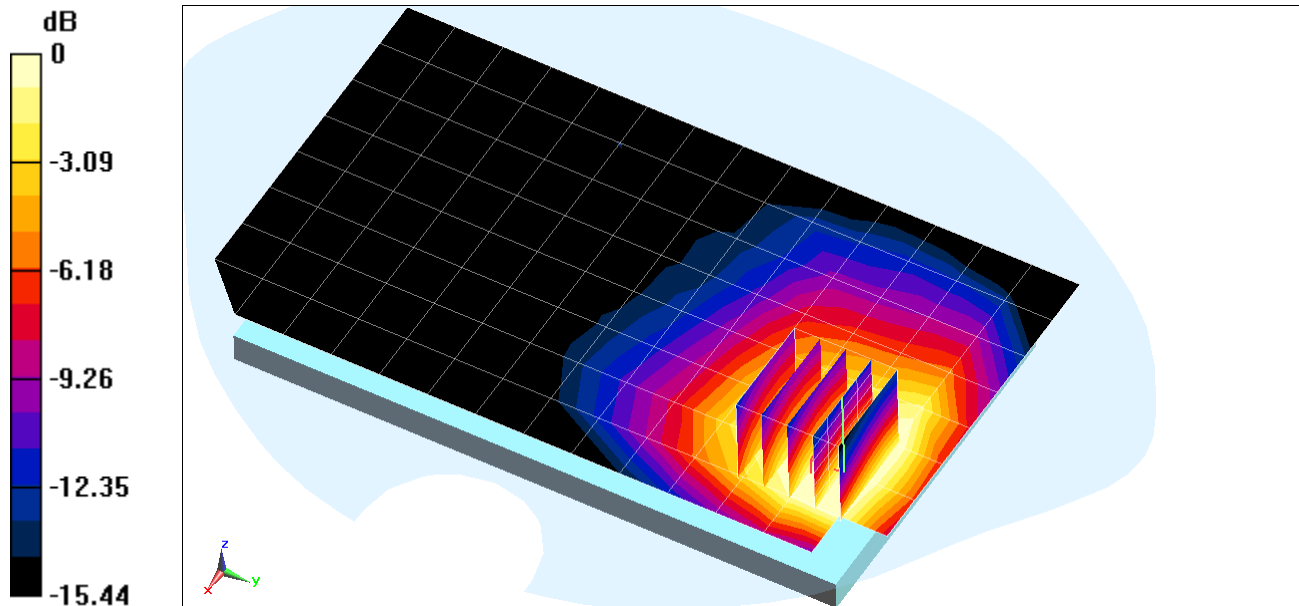
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 27.580 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 1.30 W/kg

SAR(1 g) = 0.747 W/kg



0 dB = 0.855 W/kg = -0.68 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: 1305-4

Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 1909.8 MHz; Duty Cycle: 1:2.76

Medium: 1900 Body Medium parameters used:

$f = 1910 \text{ MHz}$; $\sigma = 1.58 \text{ S/m}$; $\epsilon_r = 53.778$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 05-19-2014; Ambient Temp: 21.9°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.68, 4.68, 4.68); Calibrated: 3/19/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: GPRS 1900, Body SAR, Back side, High.ch, 3 Tx Slots

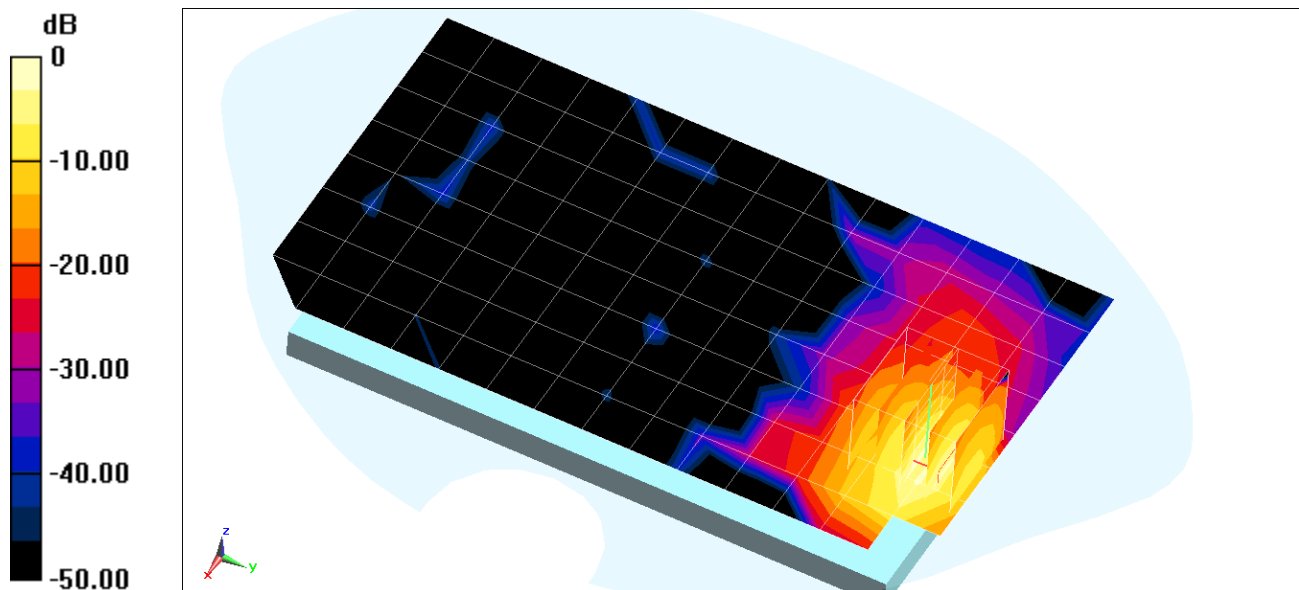
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.613 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 2.10 W/kg

SAR(1 g) = 0.919 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: 1305-5

Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.527 \text{ S/m}$; $\epsilon_r = 52.703$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space 0.0 cm

Test Date: 05-21-2014; Ambient Temp: 22.4°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.7, 4.7, 4.7); Calibrated: 11/25/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: UMTS 1900, Body SAR, Back side, Mid.ch

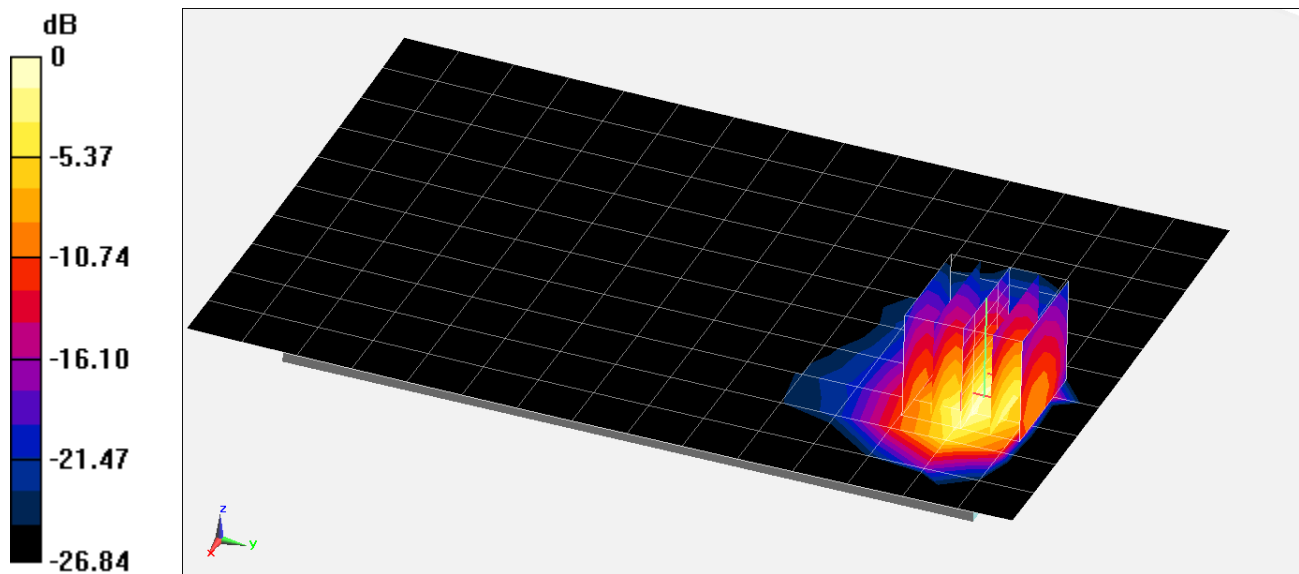
Area Scan (11x16x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.120 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.59 W/kg

SAR(1 g) = 0.707 W/kg



0 dB = 0.841 W/kg = -0.75 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: FL-147-C

Communication System: UID 0, IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.982 \text{ S/m}$; $\epsilon_r = 51.164$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-21-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3258; ConvF(4.14, 4.14, 4.14); Calibrated: 2/25/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

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

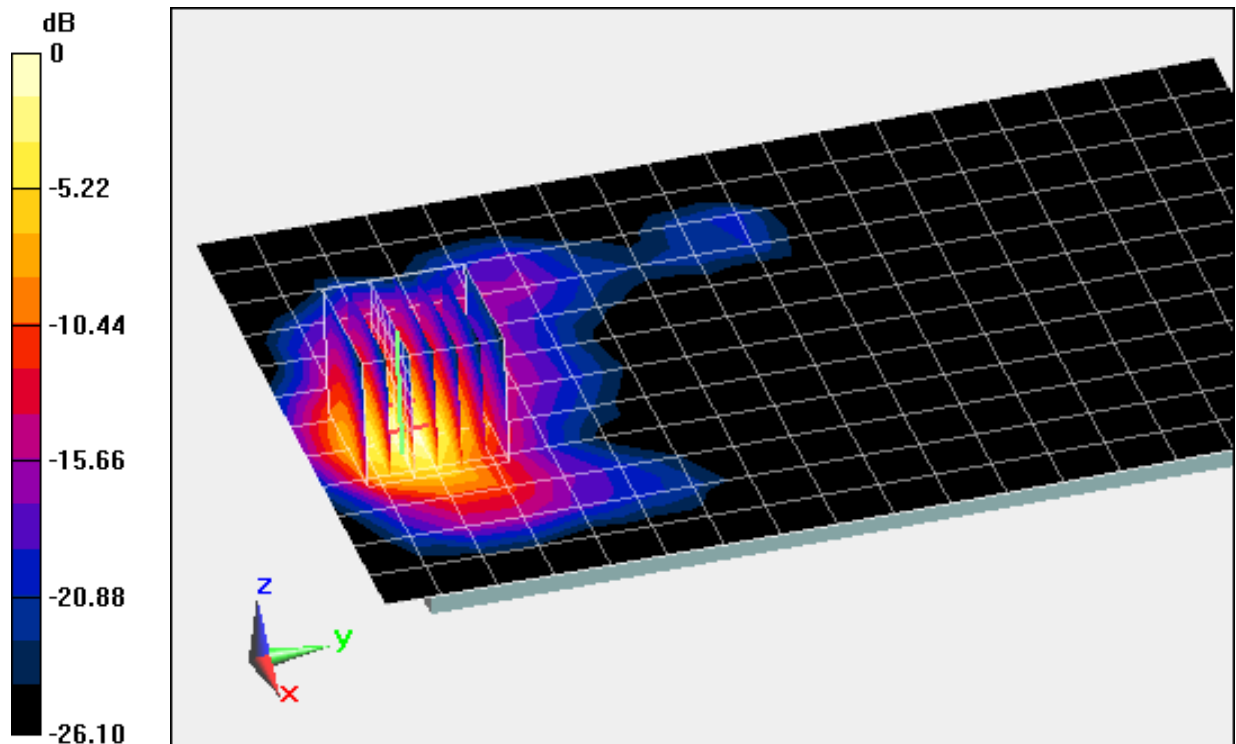
Area Scan (13x19x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 22.561 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 2.61 W/kg

SAR(1 g) = 0.981 W/kg



0 dB = 1.36 W/kg = 1.34 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: FL-147-A

Communication System: UID 0, IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5765 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5765 \text{ MHz}$; $\sigma = 6.233 \text{ S/m}$; $\epsilon_r = 46.041$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-25-2014; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3920; ConvF(4, 4, 4); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.8 GHz, Body SAR, Ch 153, 6 Mbps, Back Side

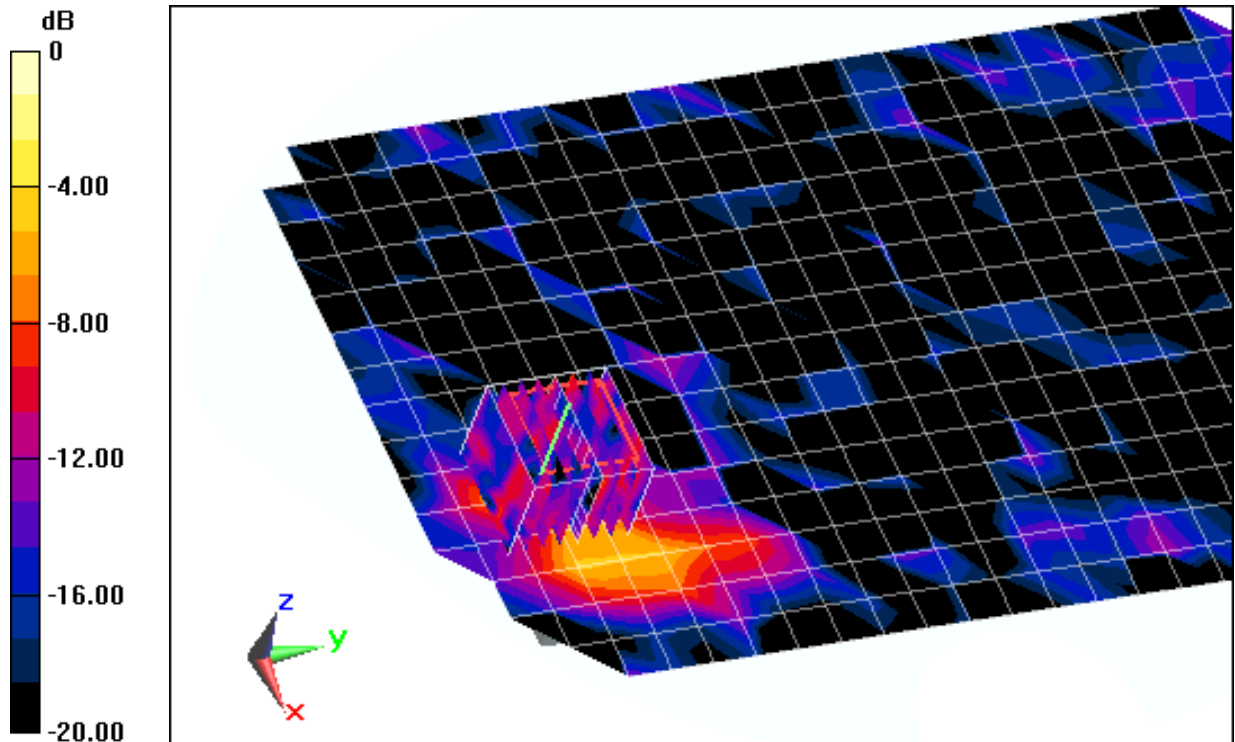
Area Scan (16x24x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Reference Value = 1.905 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.186 W/kg

SAR(1 g) = 0.024 W/kg



0 dB = 0.102 W/kg = -9.91 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: FL-147-A

Communication System: UID 0, IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5320 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5320 \text{ MHz}$; $\sigma = 5.603 \text{ S/m}$; $\epsilon_r = 46.756$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-25-2014; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3920; ConvF(4.11, 4.11, 4.11); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.3 GHz, Body SAR, Ch 64, 6 Mbps, Back Side

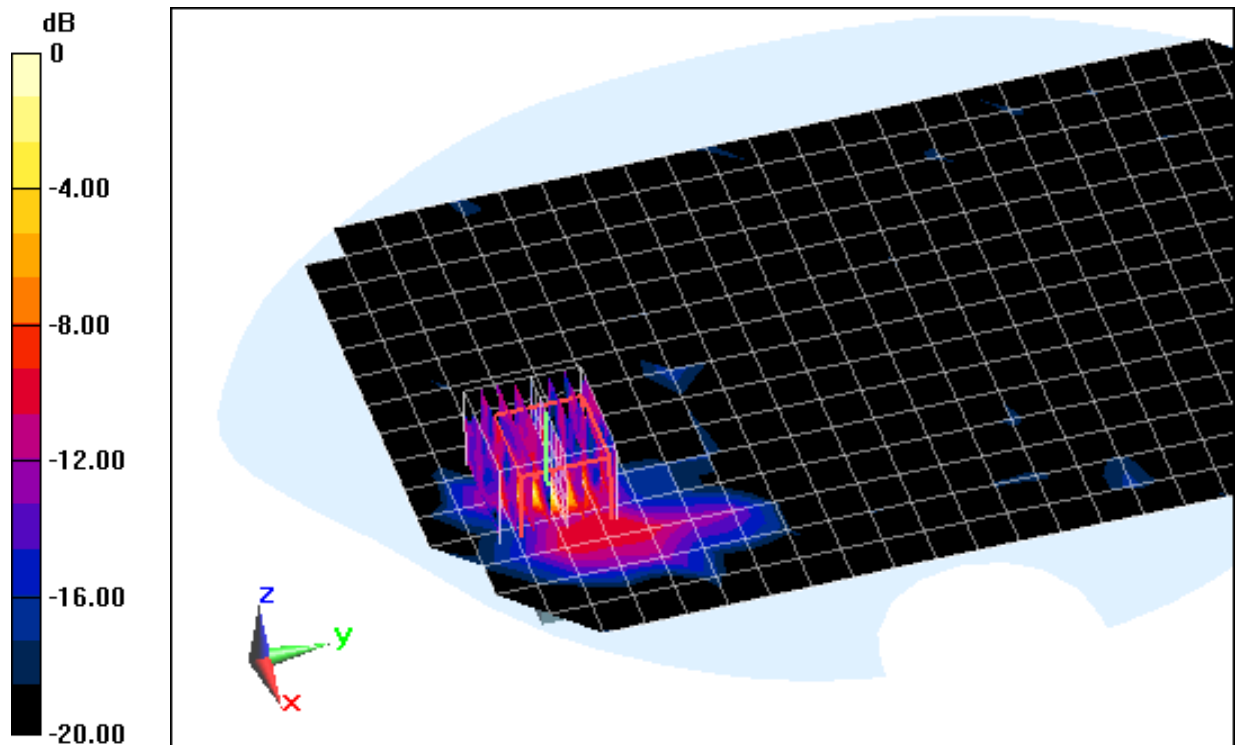
Area Scan (16x24x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Reference Value = 5.283 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.657 W/kg

SAR(1 g) = 0.120 W/kg



0 dB = 0.284 W/kg = -5.47 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMT235Y; Type: Portable Tablet; Serial: FL-147-C

Communication System: UID 0, Bluetooth ; Frequency: 2441 MHz;Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 2.02 \text{ S/m}$; $\epsilon_r = 51.016$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-21-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3258; ConvF(4.14, 4.14, 4.14); Calibrated: 2/25/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

Mode: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side

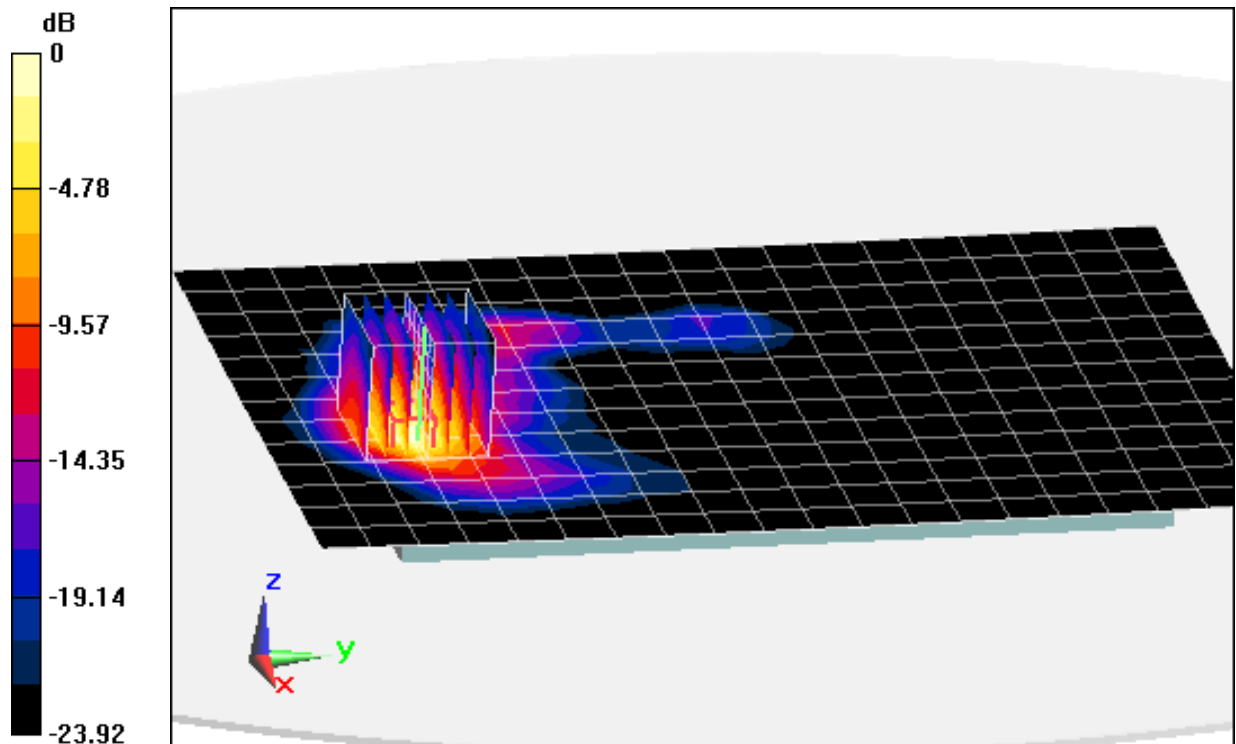
Area Scan (14x21x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 15.685 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.406 W/kg



0 dB = 0.557 W/kg = -2.54 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d133

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.905 \text{ S/m}$; $\epsilon_r = 40.853$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section: Space: 1.5 cm

Test Date: 05-14-2014; Ambient Temp: 22.5°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3213; ConvF(6.37, 6.37, 6.37); Calibrated: 4/11/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 3/17/2014

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

835 MHz System Verification

Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

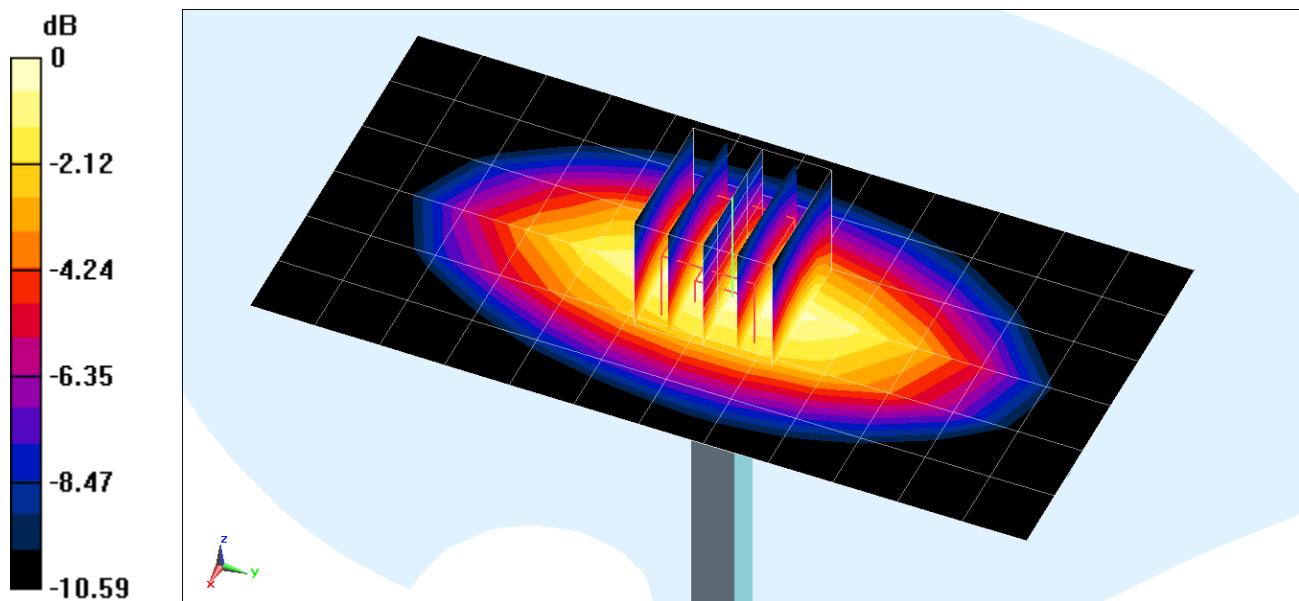
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.40 W/kg

SAR(1 g) = 0.964 W/kg

Deviation = 0.21%



0 dB = 1.04 W/kg = 0.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d119

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.93 \text{ S/m}$; $\epsilon_r = 42.572$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 05-22-2014; Ambient Temp: 21.1°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3258; ConvF(6.27, 6.27, 6.27); Calibrated: 2/25/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

835 MHz System Verification

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

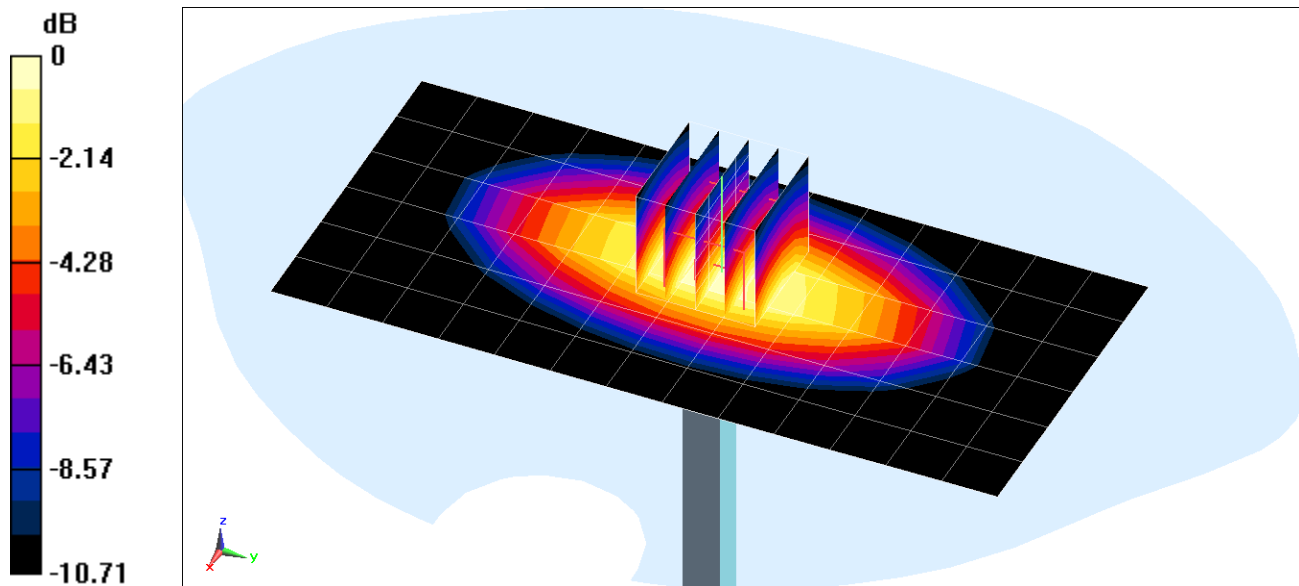
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.47 W/kg

SAR(1 g) = 0.982 W/kg

Deviation = 6.51%



0 dB = 1.06 W/kg = 0.25 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.45 \text{ S/m}$; $\epsilon_r = 40.066$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-19-2014; Ambient Temp: 24.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3258; ConvF(5.04, 5.04, 5.04); Calibrated: 2/25/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

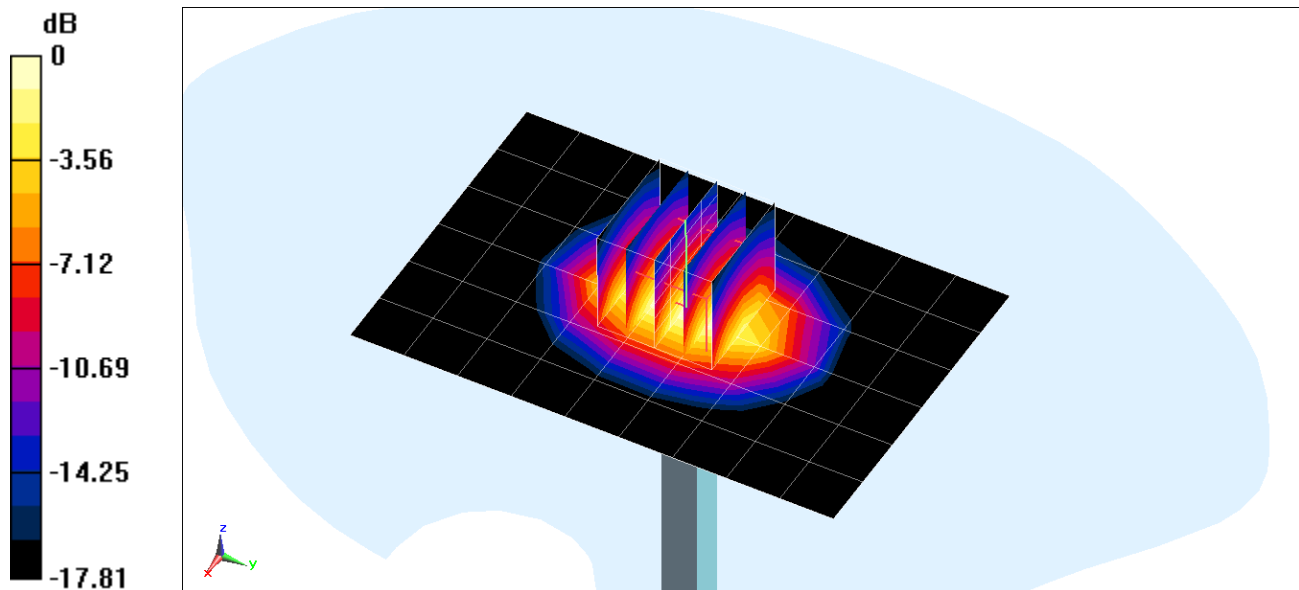
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.27 W/kg

SAR(1 g) = 3.91 W/kg

Deviation = -3.22%



0 dB = 4.40 W/kg = 6.43 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Head Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.798 \text{ S/m}$; $\epsilon_r = 37.988$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-17-2014; Ambient Temp: 24.3°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3287; ConvF(4.43, 4.43, 4.43); Calibrated: 11/20/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 11/19/2013

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

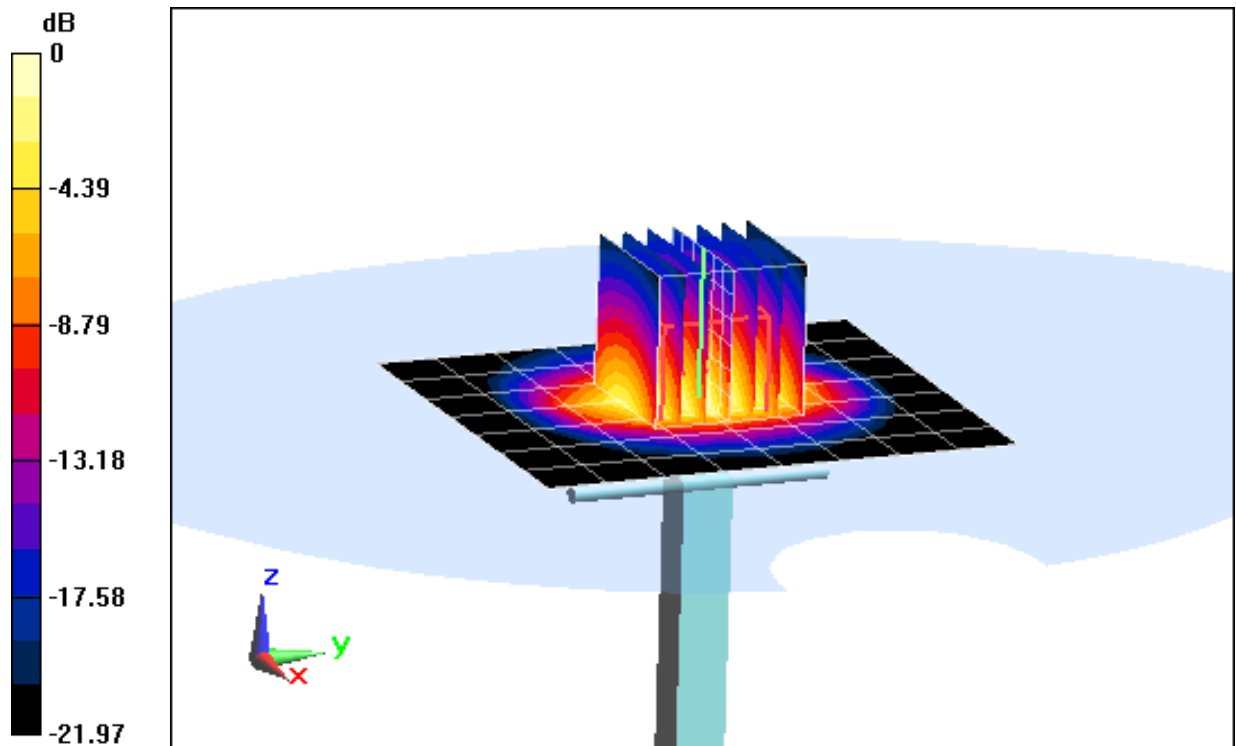
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 11.1 W/kg

SAR(1 g) = 5.4 W/kg

Deviation: 4.25%



0 dB = 7.06 W/kg = 8.49 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 4.48 \text{ S/m}$; $\epsilon_r = 36.87$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-23-2014; Ambient Temp: 24.5°C; Tissue Temp: 24.4°C

Probe: EX3DV4 - SN3914; ConvF(4.99, 4.99, 4.99); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5200 MHz System Verification

Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

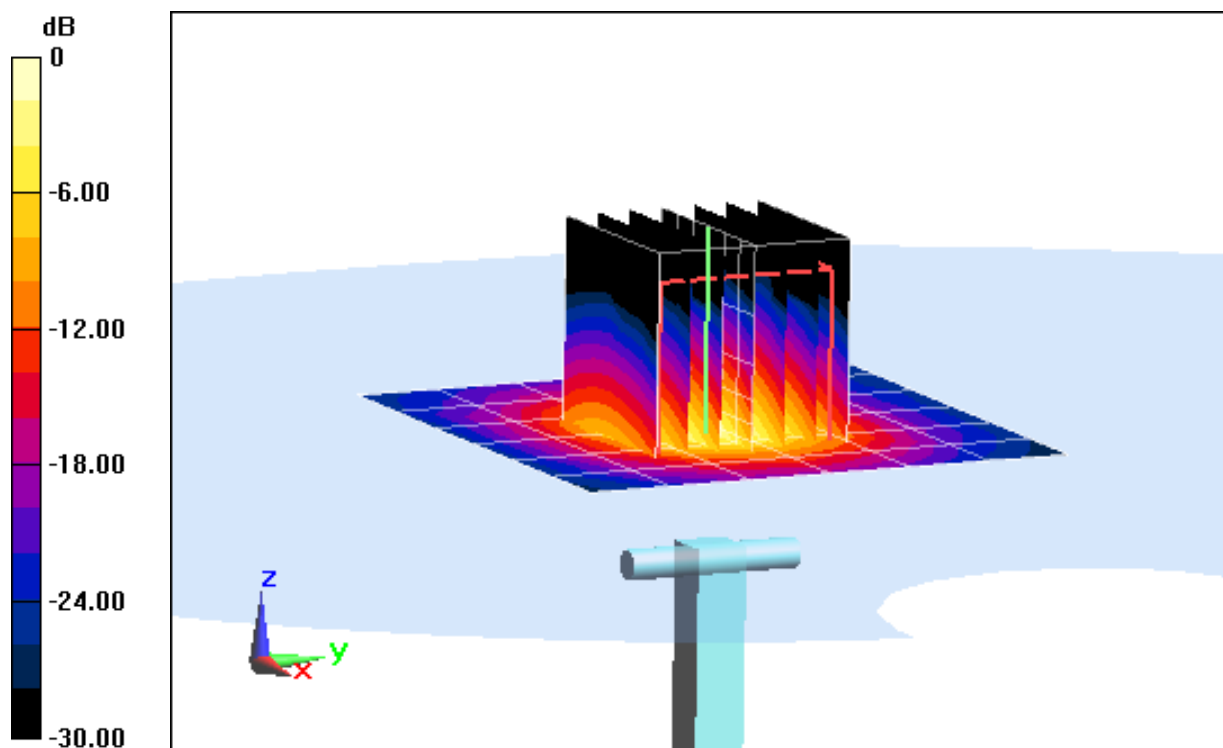
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 30.5 W/kg

SAR(1 g) = 7.42 W/kg

Deviation: -4.87%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 4.583 \text{ S/m}$; $\epsilon_r = 36.745$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-23-2014; Ambient Temp: 24.5°C; Tissue Temp: 24.3°C

Probe: EX3DV4 - SN3914; ConvF(4.82, 4.82, 4.82); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

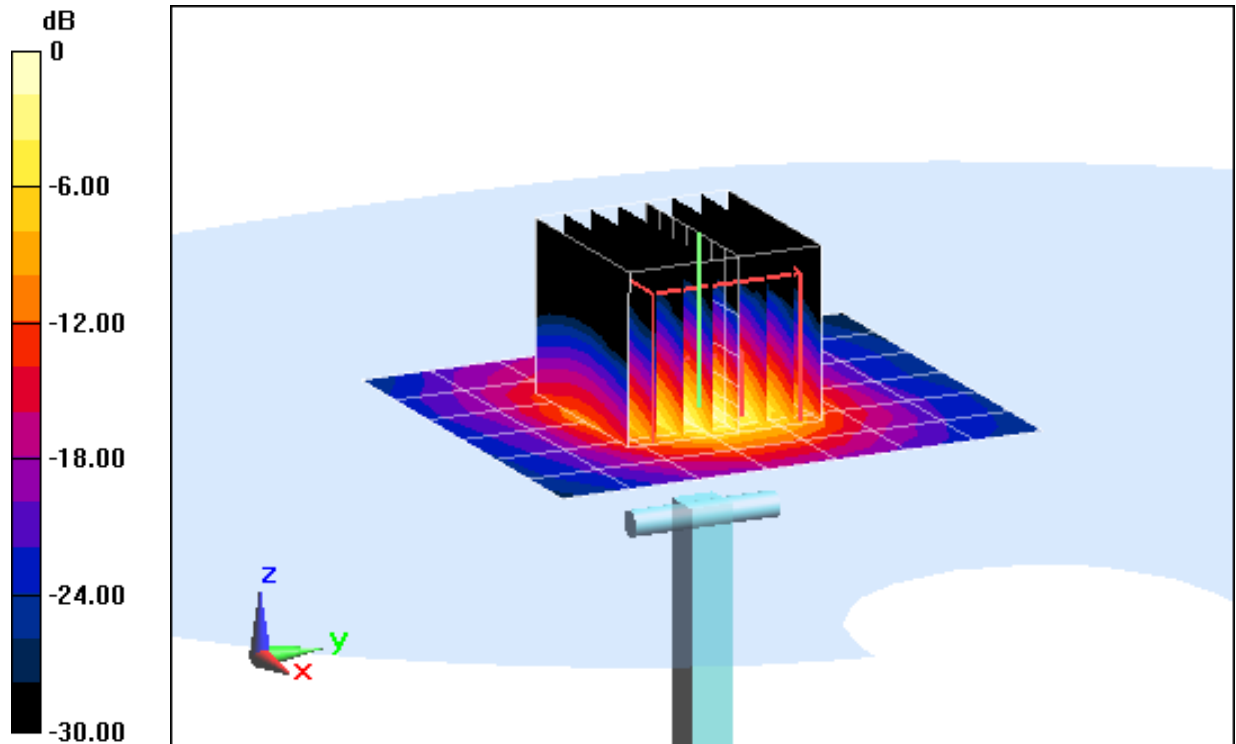
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 35.4 W/kg

SAR(1 g) = 8.29 W/kg

Deviation: -0.12%



0 dB = 18.1 W/kg = 12.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 4.781 \text{ S/m}$; $\epsilon_r = 36.534$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-23-2014; Ambient Temp: 24.4°C; Tissue Temp: 24.3°C

Probe: EX3DV4 - SN3914; ConvF(4.55, 4.55, 4.55); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5500 MHz System Verification

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

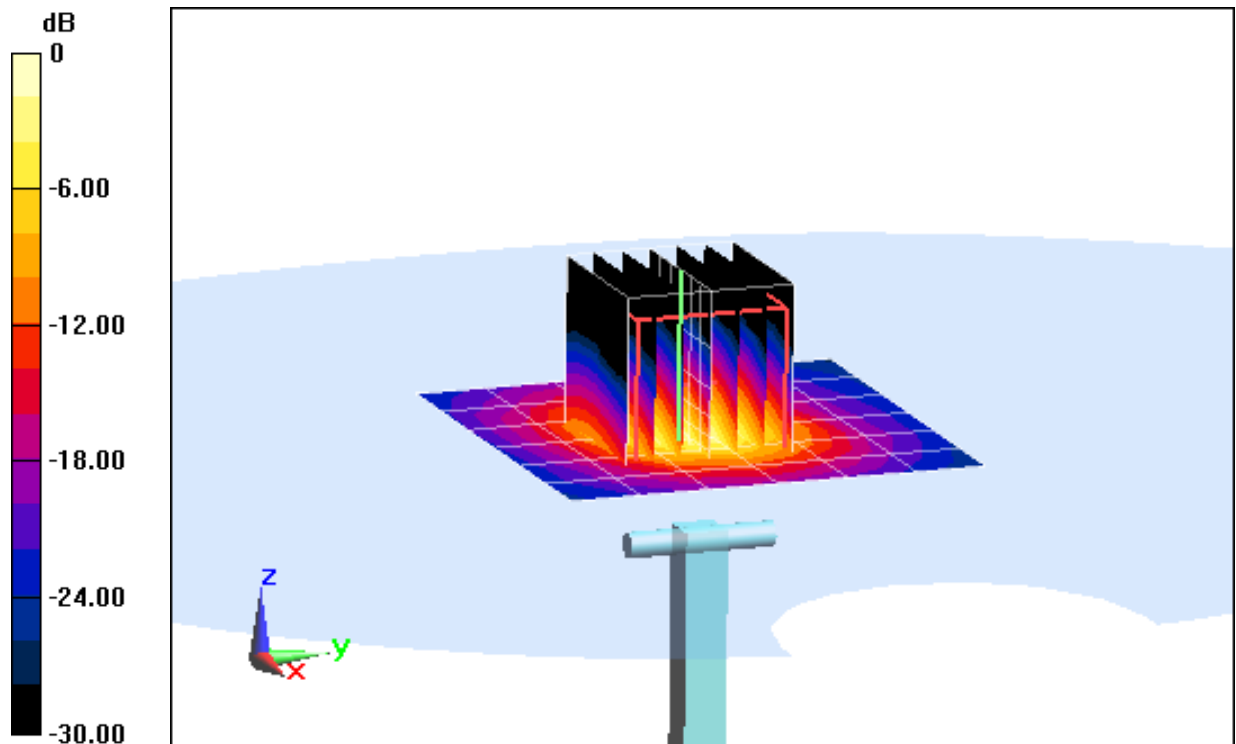
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 34.1 W/kg

SAR(1 g) = 7.89 W/kg

Deviation: -6.41%



0 dB = 18.6 W/kg = 12.70 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 5.06 \text{ S/m}$; $\epsilon_r = 36.154$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-23-2014; Ambient Temp: 24.5°C; Tissue Temp: 24.4°C

Probe: EX3DV4 - SN3914; ConvF(4.52, 4.52, 4.52); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

5800 MHz System Verification

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

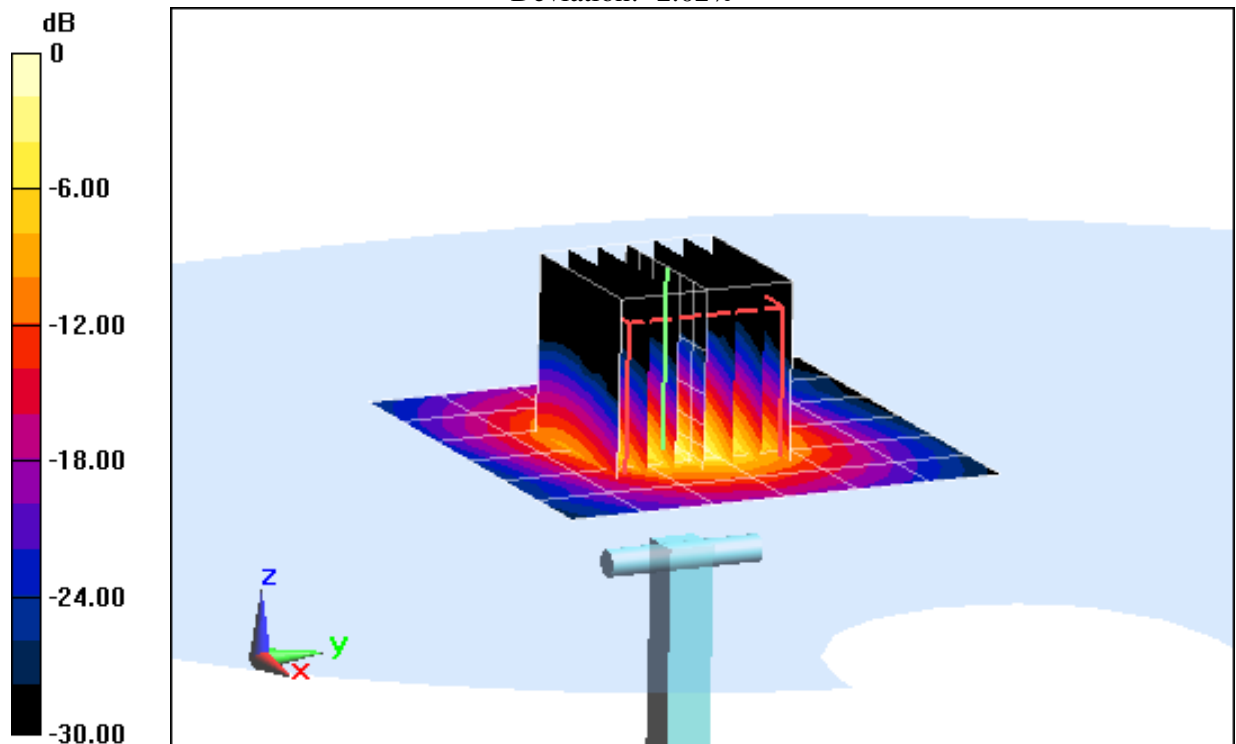
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 36 W/kg

SAR(1 g) = 7.77 W/kg

Deviation: -2.02%



0 dB = 20.4 W/kg = 13.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 54.93$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-01-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.3°C

Probe: ES3DV3 - SN3209; ConvF(6.14, 6.14, 6.14); Calibrated: 3/19/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

835 MHz System Verification

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

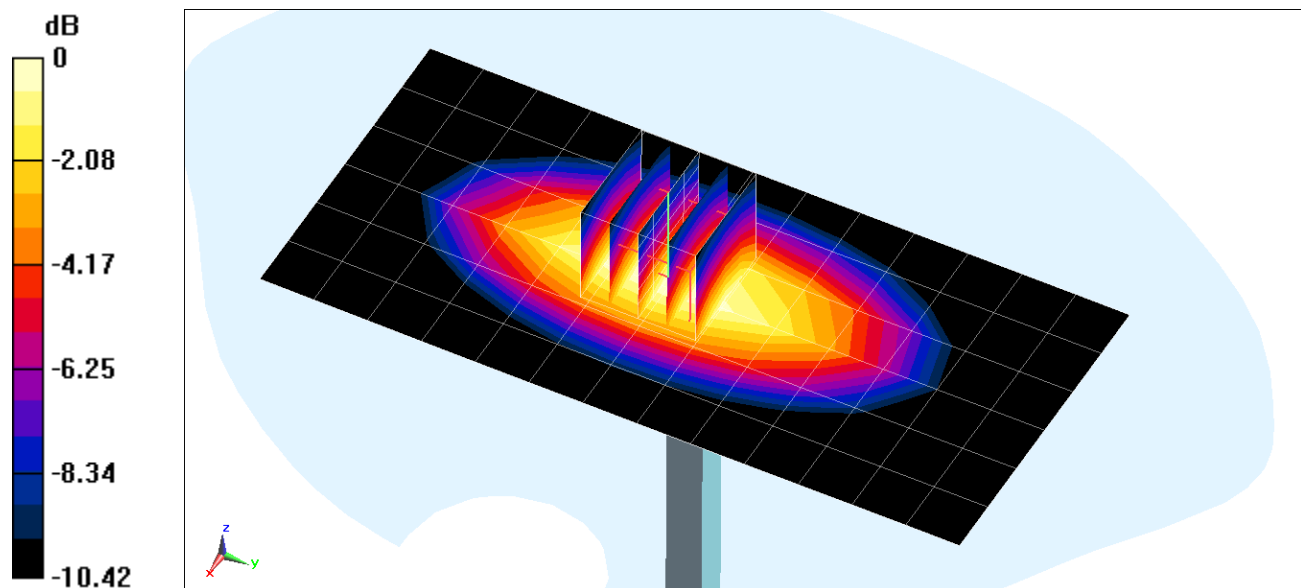
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.49 W/kg

SAR(1 g) = 1 W/kg

Deviation = 7.41%



0 dB = 1.08 W/kg = 0.33 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.569 \text{ S/m}$; $\epsilon_r = 53.817$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-19-2014; Ambient Temp: 21.9°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.68, 4.68, 4.68); Calibrated: 3/19/2014;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

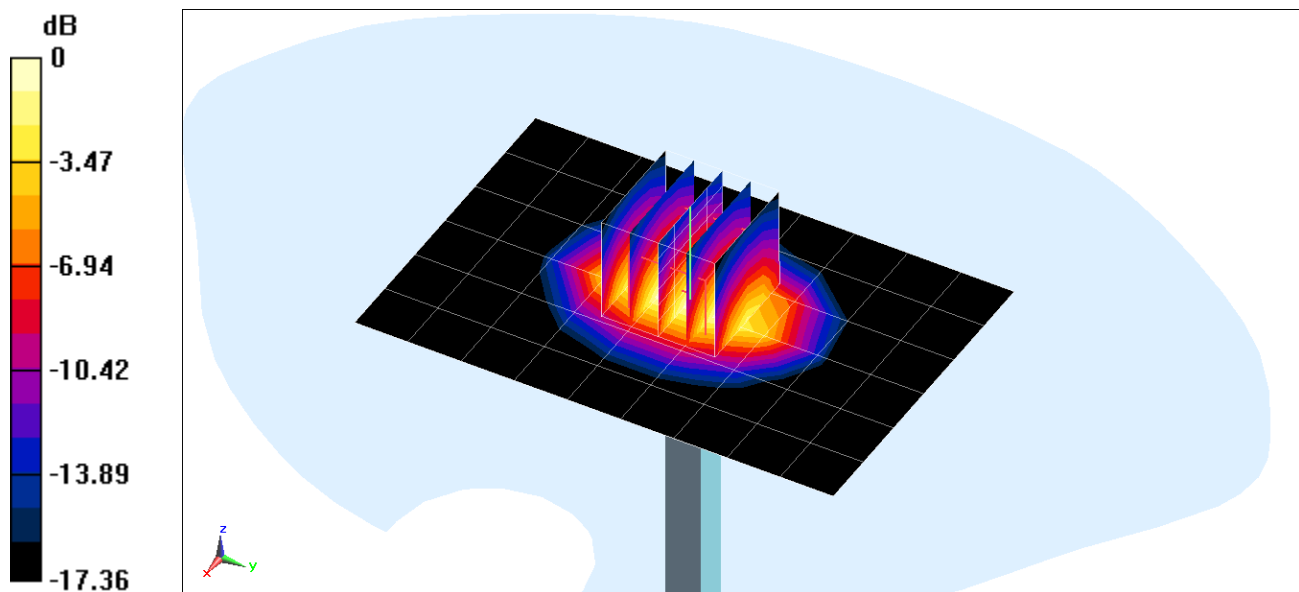
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.68 W/kg

SAR(1 g) = 4.26 W/kg

Deviation = 5.19%



0 dB = 4.80 W/kg = 6.81 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.551 \text{ S/m}$; $\epsilon_r = 52.633$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section: Space: 1.0 cm

Test Date: 05-21-2014; Ambient Temp: 22.4°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.7, 4.7, 4.7); Calibrated: 11/25/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

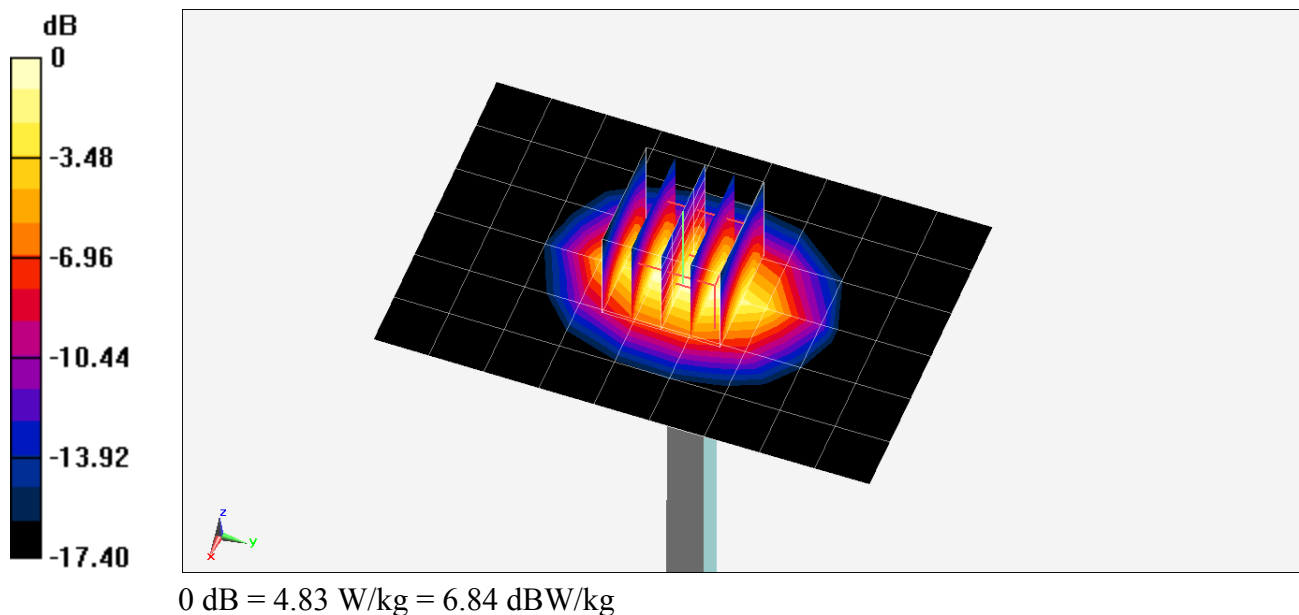
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.77 W/kg

SAR(1 g) = 4.31 W/kg

Deviation = 6.42%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.532 \text{ S/m}$; $\epsilon_r = 53.041$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-02-2014; Ambient Temp: 23.0°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(4.82, 4.82, 4.82); Calibrated: 9/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2013

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

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

Area Scan (5x7x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

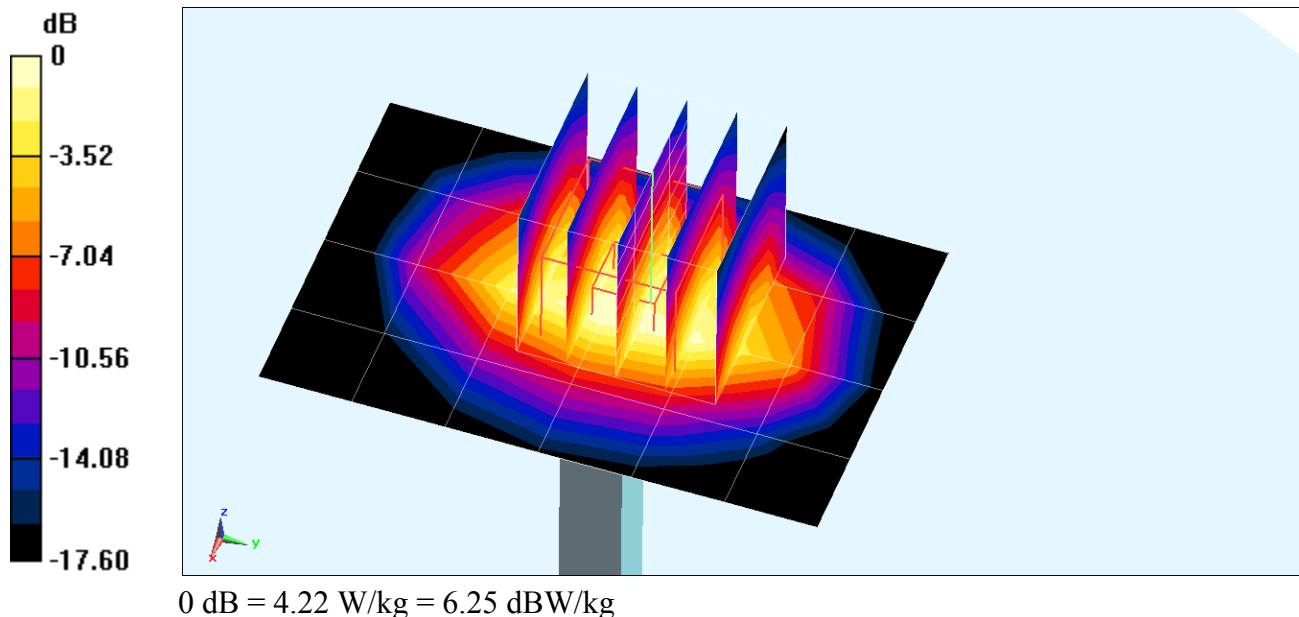
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 6.61 W/kg

SAR(1 g) = 3.81 W/kg

Deviation = -3.05%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.032 \text{ S/m}$; $\epsilon_r = 50.97$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-21-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3258; ConvF(4.14, 4.14, 4.14); Calibrated: 2/25/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158

Measurement SW: DASY52, Version 52.8 (7); SEMCAD X Version 14.6.10 (7164)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

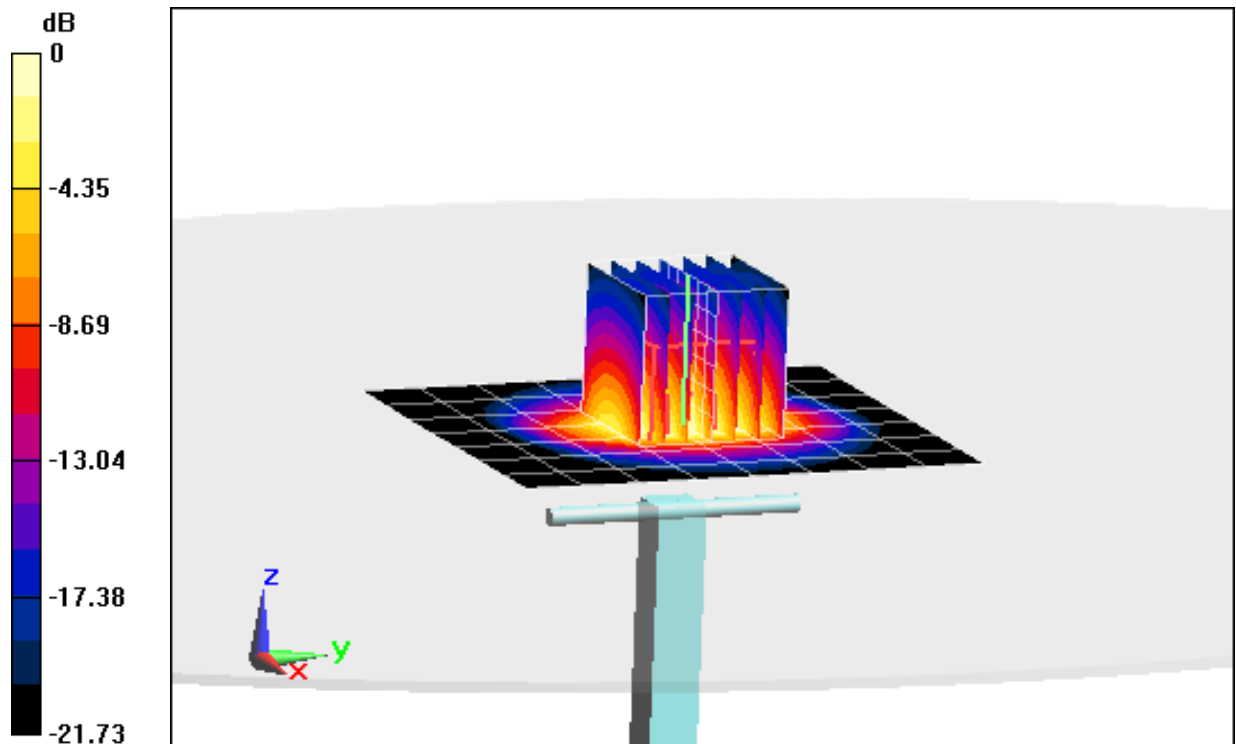
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 10.4 W/kg

SAR(1 g) = 4.9 W/kg

Deviation: -0.81%



0 dB = 6.49 W/kg = 8.12 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5200 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 5.456 \text{ S/m}$; $\epsilon_r = 46.973$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-25-2014; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3920; ConvF(4.23, 4.23, 4.23); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

5200MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

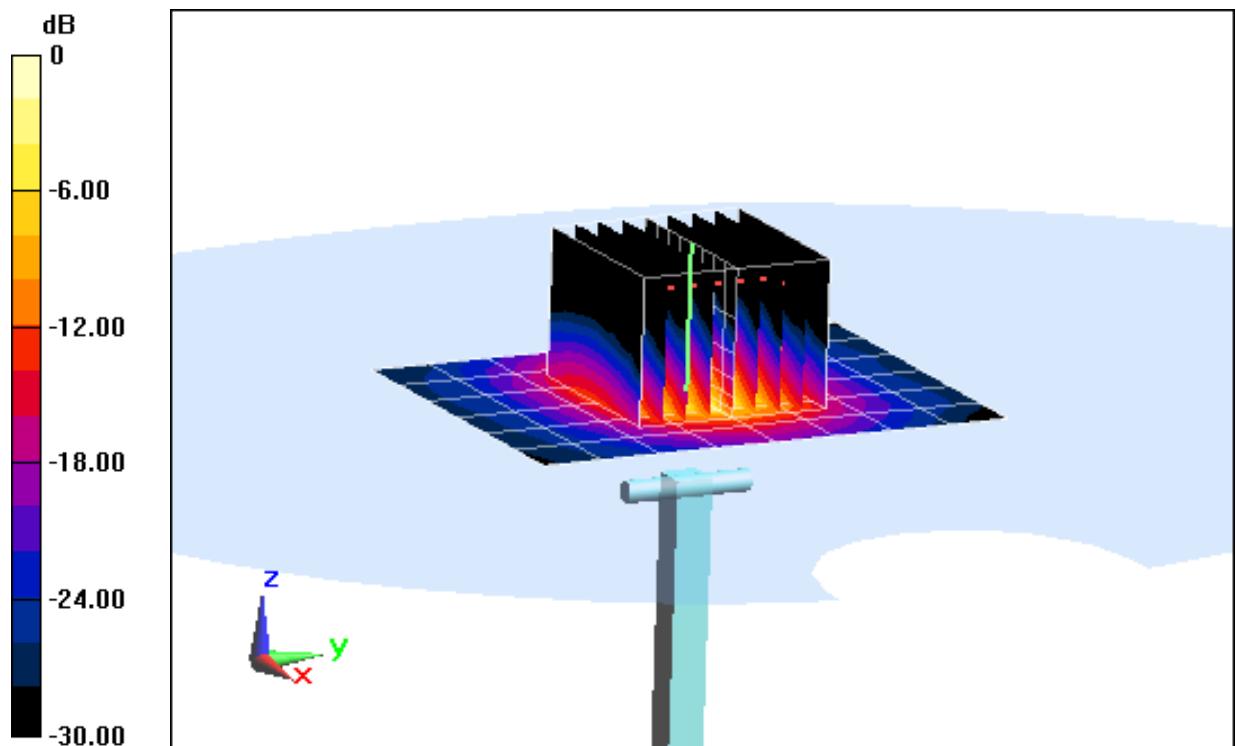
Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 30.8 W/kg

SAR(1 g) = 7.74 W/kg

Deviation: 6.61 %



0 dB = 19.7 W/kg = 12.94 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1007

Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.573 \text{ S/m}$; $\epsilon_r = 46.793$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-25-2014; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3920; ConvF(4.11, 4.11, 4.11); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

5300MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm

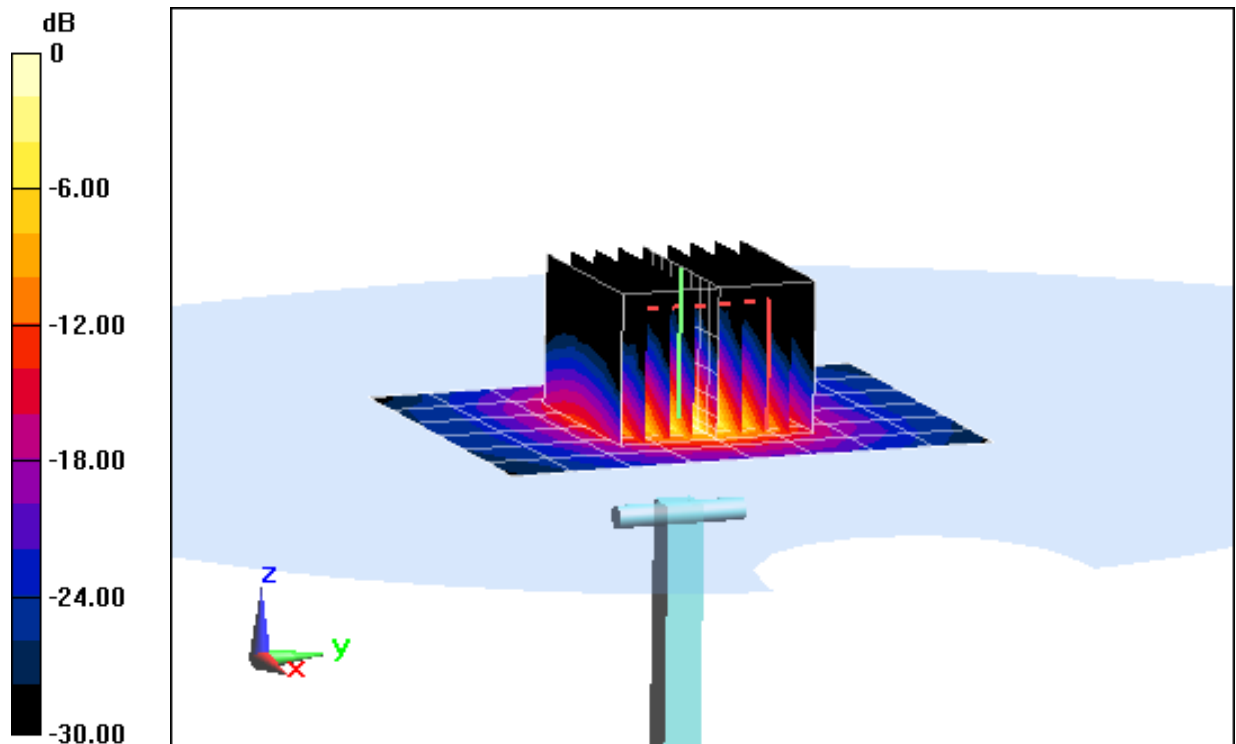
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 32.9 W/kg

SAR(1 g) = 7.97 W/kg

Deviation: 6.69%



0 dB = 20.7 W/kg = 13.16 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.852 \text{ S/m}$; $\epsilon_r = 46.471$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-25-2014; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3920; ConvF(3.8, 3.8, 3.8); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

5500MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

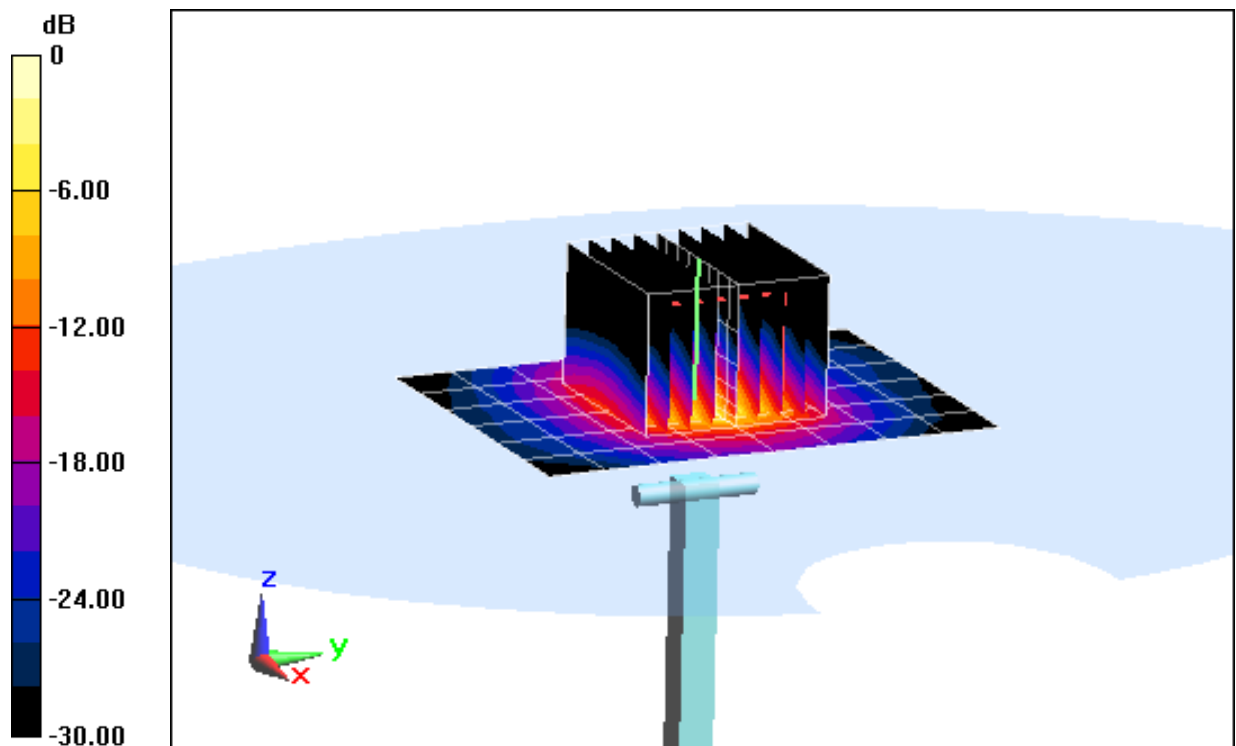
Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 35.1 W/kg

SAR(1 g) = 7.89 W/kg

Deviation: 3.95%



0 dB = 21.3 W/kg = 13.28 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 6.28 \text{ S/m}$; $\epsilon_r = 45.944$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-25-2014; Ambient Temp: 23.4°C; Tissue Temp: 21.8°C

Probe: EX3DV4 - SN3920; ConvF(4, 4, 4); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7164)

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm

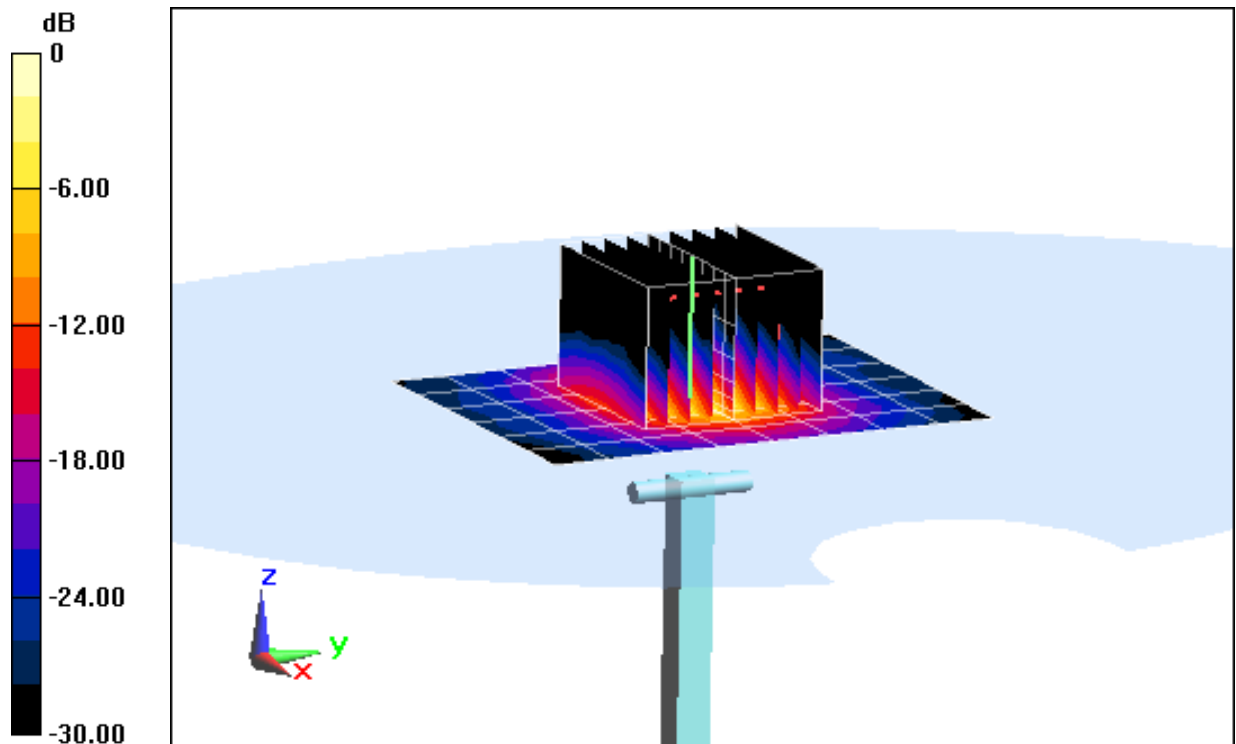
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power: 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 33.7 W/kg

SAR(1 g) = 7.58 W/kg

Deviation: 3.98%



0 dB = 20.0 W/kg = 13.01 dBW/kg