



SAR EVALUATION REPORT

Applicant Name:

Samsung Electronics, Co. Ltd.
129, Samsung-ro, Maetan dong,
Yeongtong-gu, Suwon-si
Gyeonggi-do 443-742, Korea

Date of Testing:

12/23/13 - 01/23/14

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

0Y1312182457.A3L

FCC ID:

A3LSMW750V

APPLICANT:

SAMSUNG ELECTRONICS, CO. LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model(s):

SM-W750V

Equipment Class	Band & Mode	Tx Frequency	Measured Conducted Power [dBm]	SAR		
				1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	32.10	0.30	0.61	1.01
PCE	UMTS 850	826.40 - 846.60 MHz	23.44	0.24	0.41	0.50
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	29.36	0.27	0.21	0.29
PCE	UMTS 1900	1852.4 - 1907.6 MHz	23.19	0.36	0.29	0.34
PCE	Cell. CDMA/EVDO	824.70 - 848.31 MHz	24.31	0.34	0.66	0.66
PCE	PCS CDMA/EVDO	1851.25 - 1908.75 MHz	23.94	0.70	0.83	0.83
PCE	LTE Band 13	782 MHz	23.44	0.15	0.16	0.22
PCE	LTE Band 4 (AWS)	1712.5 - 1752.5 MHz	23.05	< 0.1	0.29	0.29
DTS	2.4 GHz WLAN	2412 - 2462 MHz	16.63	0.21	0.14	0.14
DTS	5.8 GHz WLAN	5745 - 5825 MHz	13.15	0.35	0.32	0.32
NII	5.2 GHz WLAN	5180 - 5240 MHz	13.95	< 0.1	0.17	
NII	5.3 GHz WLAN	5260 - 5320 MHz	14.29	< 0.1	0.21	
NII	5.5 GHz WLAN	5500 - 5700 MHz	14.17	0.24	0.55	
DSS	Bluetooth	2402 - 2480 MHz	9.44	N/A		
Simultaneous SAR per KDB 690783 D01v01r02:				1.05	1.49	1.26

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

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.8 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
Cell. CDMA/EVDO	Voice/Data	824.70 - 848.31 MHz
PCS CDMA/EVDO	Voice/Data	1851.25 - 1908.75 MHz
LTE Band 13	Data	782 MHz
LTE Band 4 (AWS)	Data	1712.5 - 1752.5 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
NFC	Data	13.56 MHz

1.2 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.

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	33.5	33.5	32.0	30.5	29.5	27.5	27.5	23.5	22.5
	Nominal	33.0	33.0	31.5	30.0	29.0	27.0	27.0	23.0	22.0
GSM/GPRS/EDGE 1900	Maximum	30.5	30.5	29.0	28.0	26.5	26.0	26.0	21.5	20.0
	Nominal	30.0	30.0	28.5	27.5	26.0	25.5	25.5	21.0	19.5

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6
UMTS Band 5 (850 MHz)	Maximum	23.5	22.5	22.5
	Nominal	23.0	22.0	22.0
UMTS Band 2 (1900 MHz)	Maximum	23.5	22.5	22.5
	Nominal	23.0	22.0	22.0

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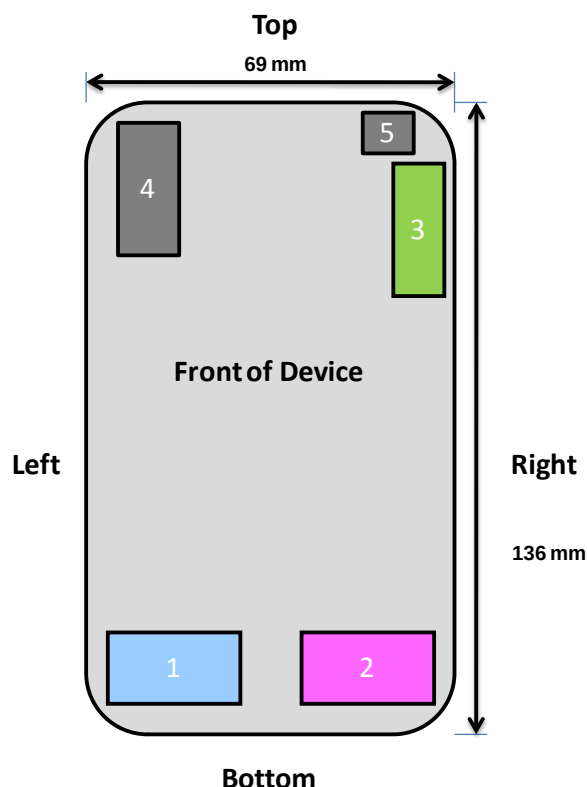
Mode / Band			Modulated Average (dBm)
Cell. CDMA/EVDO	Maximum	Maximum	25.0
		Nominal	24.5
Cell. CDMA	SVLTE LTE is not reducing	Maximum	18.5
		Nominal	18.0
PCS CDMA/EVDO	Maximum	Maximum	25.0
		Nominal	24.5
PCS CDMA	SVLTE LTE is not reducing	Maximum	18.5
		Nominal	18.0

Mode / Band			Modulated Average (dBm)
LTE Band 13	Maximum	Maximum	23.5
		Nominal	23.0
	Reduced CDMA Power $\geq$ Threshold Power	Maximum	19.5
		Nominal	19.0
LTE Band 4 (AWS)	Maximum	Maximum	23.5
		Nominal	23.0
	Reduced CDMA Power $\geq$ Threshold Power	Maximum	19.5
		Nominal	19.0

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	17.5
	Nominal	17.0
IEEE 802.11g (2.4 GHz)	Maximum	13.5
	Nominal	13.0
IEEE 802.11n (2.4 GHz)	Maximum	13.5
	Nominal	13.0
IEEE 802.11a (5 GHz)	Maximum	14.5
	Nominal	14.0
IEEE 802.11n (5 GHz)	Maximum	13.5
	Nominal	13.0
IEEE 802.11ac (5 GHz)	Maximum	12.5
	Nominal	12.0
Bluetooth	Maximum	9.5
	Nominal	9.0

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1.3 DUT Antenna Locations



1. Antenna 1
 - 850/1900 MHz GSM/GPRS/EDGE (Tx/Rx)
 - 850/1900 MHz UMTS (Tx/Rx)
 - BC0/BC1 CDMA/EVDO (Tx/Rx)
 - LTE B4 (Rx only)
2. Antenna 2
 - LTE B13 (Tx/Rx)
 - LTE B4 (Tx only)
3. Antenna 3
 - 2.4/5GHz WIFI (Tx/Rx)
 - 2.4 GHz BT (Tx/Rx)
4. Antenna 4
 - LTE B13/B4 (Rx only)
 - BC0/BC1 CDMA/EVDO (Rx only)
5. Antenna 5
 - GPS (Rx only)

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
Wireless Router Sides for SAR Testing

Mobile Hotspot Sides for SAR Testing						
Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	No	Yes
UMTS 850	Yes	Yes	No	Yes	No	Yes
GPRS 1900	Yes	Yes	No	Yes	No	Yes
UMTS 1900	Yes	Yes	No	Yes	No	Yes
Cell. EVDO	Yes	Yes	No	Yes	No	Yes
PCS EVDO	Yes	Yes	No	Yes	No	Yes
LTE Band 13	Yes	Yes	No	Yes	Yes	No
LTE Band 4 (AWS)	Yes	Yes	No	Yes	Yes	No
2.4 GHz WLAN	Yes	Yes	Yes	No	Yes	No
5.8 GHz WLAN	Yes	Yes	Yes	No	Yes	No

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v01r01 guidance and KDB Publication 648474 D04v01r01.

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1.4 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the battery. The SAR tests were performed with the specialized battery (model: B600BZ).

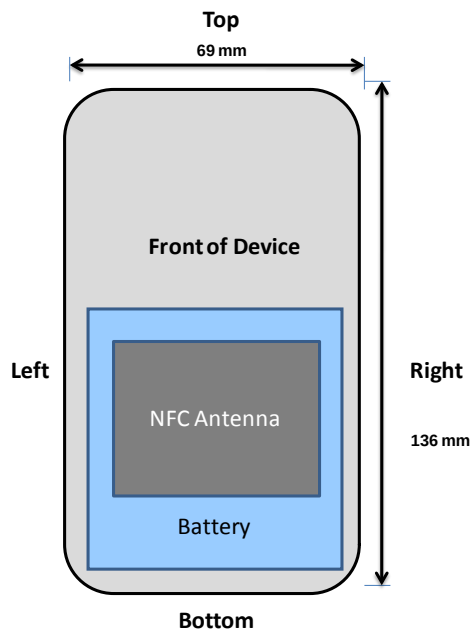


Figure 1-2
NFC Antenna Locations

1.5 Power Reduction for SAR

This device uses power reduction mechanisms for LTE during SVLTE operation (1x-RTT CDMA voice + LTE data) for SAR compliance. See Section 10 for more details.

1.6 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. Possible transmission paths for the DUT are shown in Figure 1-3 and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.

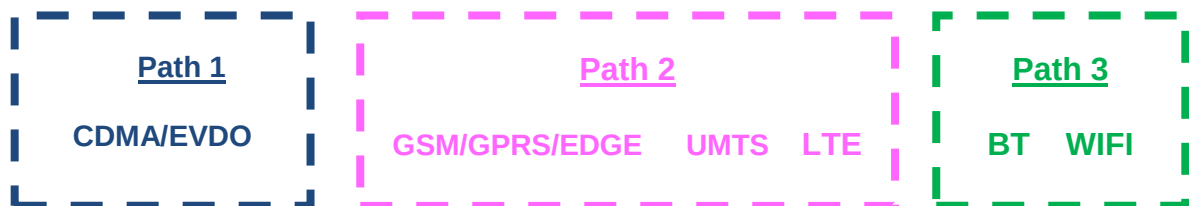


Figure 1-3
Simultaneous Transmission Paths

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.

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Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Notes
1	1x CDMA voice + 2.4 GHz Wi-Fi	Yes	Yes	N/A	
2	1x CDMA voice + 5 GHz Wi-Fi	Yes	Yes	N/A	
3	1x CDMA voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	
4	GSM voice + 2.4 GHz Wi-Fi	Yes	Yes	N/A	
5	GSM voice + 5 GHz Wi-Fi	Yes	Yes	N/A	
6	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	
7	UMTS + 2.4 GHz Wi-Fi	Yes	Yes	Yes	
8	UMTS + 5 GHz Wi-Fi	Yes	Yes	Yes	
9	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A	
10	LTE + 2.4 GHz Wi-Fi	Yes*	Yes*	Yes	*Pre-installed VOIP applications are considered.
11	LTE + 5 GHz Wi-Fi	Yes*	Yes*	Yes	*Pre-installed VOIP applications are considered.
12	LTE + 2.4 GHz Bluetooth	N/A	Yes*	N/A	*Pre-installed VOIP applications are considered.
13	CDMA/EVDO data + 2.4 GHz Wi-Fi	Yes*	Yes*	Yes	*Pre-installed VOIP applications are considered.
14	CDMA/EVDO data + 5 GHz Wi-Fi	Yes*	Yes*	Yes	*Pre-installed VOIP applications are considered.
15	CDMA/EVDO data + 2.4 GHz Bluetooth	N/A	Yes*	N/A	*Pre-installed VOIP applications are considered.
16	GPRS/EDGE + 2.4 GHz Wi-Fi	N/A	N/A	Yes	
17	GPRS/EDGE + 5 GHz Wi-Fi	N/A	N/A	Yes	
18	1x CDMA voice + LTE	Yes	Yes	N/A	
19	1x CDMA voice + LTE + 2.4 GHz Wi-Fi	Yes	Yes	Yes	
20	1x CDMA voice + LTE + 5 GHz Wi-Fi	Yes	Yes	Yes	
21	1x CDMA voice + LTE + 2.4 GHz Bluetooth	N/A	Yes	N/A	
22	1x CDMA voice + CDMA/EVDO data	N/A	N/A	N/A	Not supported by HW
23	CDMA/EVDO data + LTE	N/A	N/A	N/A	Not supported by SW
24	CDMA/EVDO + GSM/GPRS/EDGE/UMTS	N/A	N/A	N/A	Not supported by SW

Note:

1. CDMA and EVDO share the same antenna path and cannot transmit simultaneously. (Non-SVDO)
2. Bluetooth and 2.4/5 GHz WLAN share the same antenna path and cannot transmit simultaneously.
3. GSM/UMTS/LTE use one modem and transceiver IC. The signals cannot transmit simultaneously.
4. 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.
5. Per the manufacturer, WIFI Direct is not expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.
6. 5GHz hotspot is not enabled for 5.2 – 5.7 GHz WIFI. Therefore all data + 5.2 – 5.7 GHz WIFI hotspot scenarios are not supported.

1.7 SAR Test Exclusions Applied

(A) WIFI/BT

Since Wireless Router operations are not allowed by the chipset firmware using 5 GHz NII WIFI, only 2.4 GHz DTS WIFI and 5.8 GHz DTS WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v01.

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 (rounded to the nearest mW) and the antenna to user separation distance, Bluetooth SAR was not required; $[(9/10) * \sqrt{2.441}] = 1.4 < 3.0$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

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This device supports 20 MHz and 40 MHz Bandwidths for IEEE 802.11n for 5 GHz WIFI only. IEEE 802.11n was not evaluated for SAR since the average output power of 20 MHz and 40 MHz bandwidths was not more than 0.25 dB higher than the average output power of IEEE 802.11a.

This device supports IEEE 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only
- b) No aggregate channel configurations
- c) 1 Tx antenna output
- d) 256 QAM is supported
- e) No new 5 GHz channels

Per April 2013 TCB Workshop notes, full SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.

(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.

LTE SAR for the higher modulations and lower bandwidths were not tested since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05v02.

1.8 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01-D06 (2G/3G/4G and Hotspot)
- 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)
- April 2013 TCB Workshop Notes (IEEE 802.11ac)
- October 2013 TCB Workshop Notes (GPRS/EDGE)

1.9 Device Serial Numbers

Several samples with identical hardware were used 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.

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number
GSM/GPRS/EDGE 850	FCC#2	FCC#1	FCC#1
UMTS 850	FCC#2	FCC#1	FCC#1
GSM/GPRS/EDGE 1900	FCC#2	FCC#2	FCC#2
UMTS 1900	FCC#2	FCC#2	FCC#2
Cell. CDMA/EVDO Maximum	FCC#3	FCC#3	FCC#3
Cell. CDMA Reduced	FCC#5	FCC#5	FCC#5
PCS CDMA/EVDO Maximum	FCC#3	FCC#3	FCC#3
PCS CDMA Reduced	FCC#5	FCC#5	FCC#5
LTE Band 13 Maximum	FCC#3	FCC#2	FCC#2
LTE Band 13 Reduced	FCC#4	FCC#4	FCC#4
LTE Band 4 (AWS) Maximum	FCC#2	FCC#2	FCC#2
LTE Band 4 (AWS) Reduced	FCC#4	FCC#4	FCC#4
2.4 GHz WLAN	FCC#6	FCC#6	FCC#6
5 GHz WLAN	FCC#10	FCC#10	FCC#10

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LTE INFORMATION

LTE Information			
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Form Factor	Portable Handset		
Frequency Range of each LTE transmission band	LTE Band 13 (782 MHz)		
	LTE Band 4 (AWS) (1712.5 - 1752.5 MHz)		
Channel Bandwidths	LTE Band 13: 10 MHz		
	LTE Band 4 (AWS): 5 MHz, 10 MHz, 15 MHz, 20 MHz		
Channel Numbers and Frequencies (MHz)	Low	Mid	High
LTE Band 13: 10 MHz	782 (23230)	782 (23230)	782 (23230)
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)	1732.5 (20175)	1752.5 (20375)
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)	1732.5 (20175)	1747.5 (20325)
LTE Band 4 (AWS): 20 MHz	1720 (20050)	1732.5 (20175)	1745 (20300)
UE Category	3		
Modulations Supported in UL	QPSK, 16QAM		
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES		
A-MPR (Additional MPR) disabled for SAR Testing?	YES		

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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 [24]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

- σ = conductivity of the tissue-simulating material (S/m)
- ρ = mass density of the tissue-simulating material (kg/m³)
- 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

4.1 Measurement Procedure

The evaluation was performed using the following procedure:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01 (See Table 4-1).
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 4-1). 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. The data was extrapolated to the surface of the outer-shell of the phantom. The combined distance extrapolated was the combined distance from the center of the dipoles 2.7mm away from the tip of the probe housing plus the 1.2 mm distance between the surface and the lowest measuring point. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
 - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
 - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

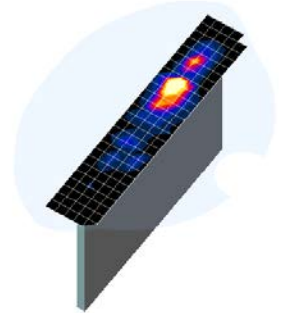


Figure 4-1
Sample SAR Area Scan

Table 4-1
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

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5

DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

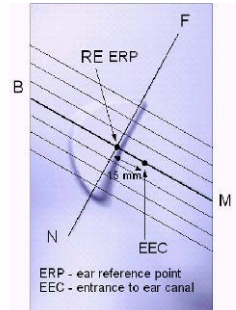


Figure 5-1
Close-Up Side view
of ERP

5.2 HANDSET REFERENCE POINTS

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the “test device reference point” located along the “vertical centerline” on the front of the device aligned to the “ear reference point” (See Figure 5-3). The “test device reference point” was then located at the same level as the center of the ear reference point. The test device was positioned so that the “vertical centerline” was bisecting the front surface of the handset at its top and bottom edges, positioning the “ear reference point” on the outer surface of the both the left and right head phantoms on the ear reference point.



Figure 5-2
Front, back and side view of SAM Twin Phantom

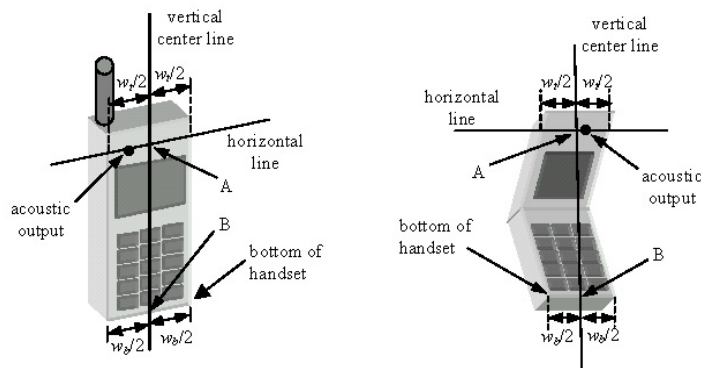


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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6.1 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 $\delta = 0.02$.

6.2 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 6-1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

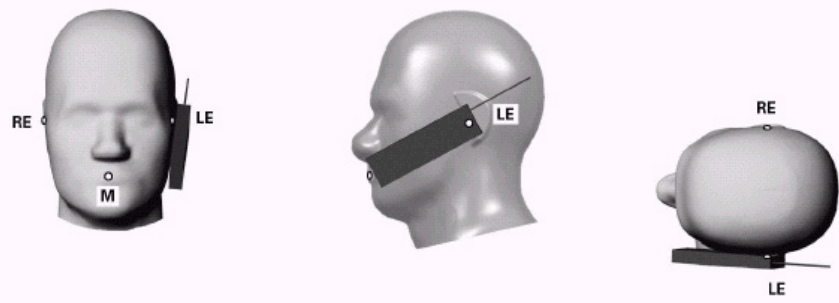


Figure 6-1 Front, Side and Top View of Cheek Position

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

6.3 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. The tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6-2).

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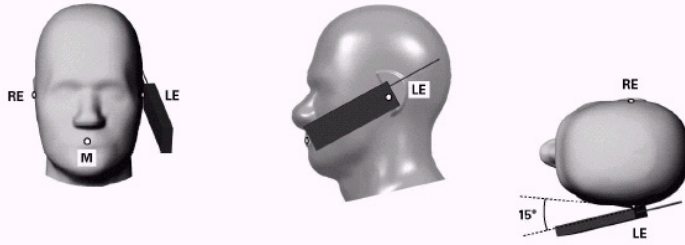


Figure 6-2 Front, Side and Top View of Ear/15° Tilt Position

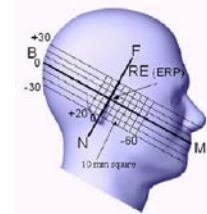


Figure 6-3 Side view w/ relevant markings

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

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04_v01. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR location identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

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

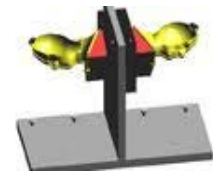


Figure 6-4 Twin SAM Chin20

6.5 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-5). Per FCC KDB Publication 648474 D04v01, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v05 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest

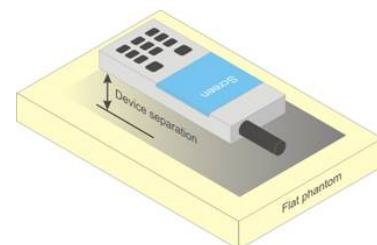


Figure 6-5 Sample Body-Worn Diagram

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reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

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

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

6.6 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1-g body and 10-g extremity SAR Exclusion Thresholds found in KDB Publication 44798 D01v05 should be applied to determine SAR test requirements.

Per KDB Publication 44798 D01v05, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

6.7 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06 v01 where SAR test considerations for handsets ($L \times W \geq 9 \text{ cm} \times 5 \text{ cm}$) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v05 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

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7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

Table 7-1
SAR Human Exposure Specified in ANSI/IEEE C95.1-1992 and Health Canada Safety Code 6

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <i>General Population</i> (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT <i>Occupational</i> (W/kg) or (mW/g)
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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Power measurements were performed using a base station simulator under digital average power.

8.1 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.

8.2 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.

8.3 SAR Measurement Conditions for CDMA2000

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

8.3.1 Output Power Verification

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

1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1, Table 8-1 parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH₀ and demodulation of RC 3,4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH₀ data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2, Table 8-2 was applied.

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Table 8-1
Parameters for Max. Power for RC1

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

Table 8-2
Parameters for Max. Power for RC3

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

5. FCHs were configured at full rate for maximum SAR with “All Up” power control bits.

8.3.2 Head SAR Measurements

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

Head SAR was additionally evaluated using EVDO Rev. A to support compliance for VoIP operations. See Section 8.3.4 for EVDO Rev. A configuration parameters.

8.3.3 Body SAR Measurements

SAR for body exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. SAR for multiple code channels (FCH + SCH_n) is not required when the maximum average output of each RF channel is less than ¼ dB higher than that measured with FCH only. Otherwise, SAR is measured on the maximum output channel (FCH + SCH_n) with FCH at full rate and SCH₀ enabled at 9600 bps using the exposure configuration that results in the highest SAR for that channel with FCH only. When multiple code channels are enabled, the DUT output may shift by more than 0.5 dB and lead to higher SAR drifts and SCH dropouts. Body SAR was measured using TDSO / SO32 with power control bits in the “All Up”

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

8.3.4 Handsets with EVDO

For handsets with Ev-Do capabilities, when the maximum average output of each channel in Rev. 0 is less than ¼ dB higher than that measured in RC3 (1x RTT), body SAR for EV-DO is not required. Otherwise, SAR for Rev. 0 is measured on the maximum output channel at 153.6 kbps using the body exposure configuration that results in the highest SAR for that channel in RC3. SAR for Rev. A is not required when the maximum average output of each channel is less than that measured in Rev. 0 or less than ¼ dB higher than that measured in RC3. Otherwise, SAR is measured on the maximum output channel for Rev. A using a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations. A Forward Traffic Channel data rate corresponding to the 2-slot version of 307.2 kbps with the ACK Channel transmitting in all slots would be configured in the downlink for both Rev. 0 and Rev. A.

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8.3.5 Body SAR Measurements for EVDO Hotspot

Hotspot Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 per KDB Publication 941225 D01 procedures for “1x Ev-Do data Devices”. SAR for Subtype 2 Physical layer configurations is not required for Rev. A when the maximum average output of each RF channels is less than that measured in Subtype 0/1 Physical layer configurations. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for the RF channels in Rev. 0. The AT is tested with a Reverse Data Channel rate of 153.6 kbps in Subtype 0/1 Physical Layer configurations; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer configurations.

SAR is not required for 1x RTT for Ev-Do devices that also support 1x RTT voice and/or data operations, when the maximum average output of each channel is less than 1/4 dB higher than that measured in Subtype 0/1 Physical Layer configurations for Rev. 0. Otherwise, CDMA “Body-SAR Measurement” procedures for “CDMA 2000 1x Handsets” were applied.

8.4 SAR Measurement Conditions for UMTS

8.4.1 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.

8.4.2 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.

8.4.3 Body SAR Measurements

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

8.4.4 SAR Measurements for Handsets with Rel 5 HSDPA

Body SAR for HSDPA is not required for handsets with HSDPA capabilities when the maximum average output power of each RF channel with HSDPA active is less than 0.25 dB higher than that measured without HSDPA using 12.2 kbps RMC and the maximum SAR for 12.2 kbps RMC is $\leq 75\%$ of the SAR limit. Otherwise, SAR is measured for HSDPA, using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, using the highest body SAR configuration measured in 12.2 kbps RMC without HSDPA, on the maximum output channel with the body exposure configuration that resulted in the highest SAR in 12.2 kbps RMC mode for that RF channel.

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The H-set used in FRC for HSDPA should be configured according to the UE category of a test device. The number of HS-DSCH/HSPDSCHs, HARQ processes, minimum inter-TTI interval, transport block sizes and RV coding sequence are defined by the applicable H-set. To maintain a consistent test configuration and stable transmission conditions, QPSK is used in the FRC for SAR testing. HS-DPCCH should be configured with a CQI feedback cycle of 2 ms to maintain a constant rate of active CQI slots. DPCCH and DPDCH gain factors of $\beta_c=9$ and $\beta_d=15$, and power offset parameters of $\Delta_{ACK} = \Delta_{NACK} = 5$ and $\Delta_{CQI}=2$ is used. The CQI value is determined by the UE category, transport block size, number of HS-PDSCHs and modulation used in the FRC.

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 $\Delta_{CQI} = 8 \Rightarrow A_{HS} = \beta_{HS}/\beta_c = 30/15 \Rightarrow \beta_{HS} = 30/15 * \beta_c$.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2.C, 5.7.A, 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 DPDCH, DPCCH 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 8-1
Table C.10.1.4 of TS 234.121-1

8.4.5 SAR Measurements for Handsets with Rel 6 HSUPA

Body SAR for HSUPA is not required when the maximum average output of each RF channel with HSUPA/HSDPA active is less than 0.25 dB higher than as measured without HSUPA/HSDPA using 12.2 kbps RMC and maximum SAR for 12.2 kbps RMC is $\leq 75\%$ of the SAR limit. Otherwise SAR is measured on the maximum output channel for the body exposure configuration produced highest SAR in 12.2 kbps RMC for that RF channel, using the additional procedures under "Release 6 HSPA data devices"

Head SAR for VOIP operations under HSPA is not required when maximum average output of each RF channel with HSPA is less than 0.25 dB higher than as measured using 12.2 kbps RMC. Otherwise SAR is measured using same HSPA configuration as used for body SAR.

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⁾ (dB)	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 $\Delta_{CQI} = 8 \Rightarrow A_{HS} = \beta_{HS}/\beta_c = 30/15 \Rightarrow \beta_{HS} = 30/15 * \beta_c$.

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{HS}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, 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.

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8.5 SAR Measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05v02 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.

8.5.1 Spectrum Plots for RB Configurations

A properly configured base station simulator was used for SAR tests and power measurements. Therefore, spectrum plots for RB configurations were not required to be included in this report.

8.5.2 MPR

MPR is implemented for this device by the manufacturer when the device is operating at maximum power. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.

8.5.3 A-MPR

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

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r01:

- a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
 - i. The required channel and offset combination with the highest maximum output power is required for SAR.
 - ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
 - iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
- b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
- c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
- d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to $\frac{1}{2}$ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is < 1.45 W/kg.

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8.6 SAR Testing with 802.11 Transmitters

Normal network operating configurations are not suitable for measuring the SAR of 802.11 a/b/g/n /ac 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.

8.6.1 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.

8.6.2 Frequency Channel Configurations [27]

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 0.25 dB or higher than the 802.11a mode. 802.11ac SAR was evaluated for highest 802.11a configuration in each 5 GHz band and each exposure condition. 802.11ac modes were additionally evaluated for SAR if the output power for the respective mode was more than 0.25 dB higher than powers of 802.11a modes.

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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9.1 CDMA Conducted Powers

Band	Channel	Rule Part	Frequency	SO55 [dBm]	SO55 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC		MHz	RC1	RC3	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	1013	22H	824.7	24.34	24.15	24.31	24.10	24.19	23.98
	384	22H	836.52	24.31	24.31	24.25	24.25	24.14	24.01
	777	22H	848.31	24.33	24.23	24.28	24.22	24.18	24.00
PCS	25	24E	1851.25	23.92	23.83	23.98	23.89	23.77	23.66
	600	24E	1880	23.85	23.87	23.88	23.94	23.72	23.71
	1175	24E	1908.75	23.74	23.89	23.73	23.66	23.51	23.48

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

Per KDB Publication 941225 D01v02:

1. Head SAR was tested with SO55 RC3. SO55 RC1 was not required since the average output power was not more than 0.25 dB than the SO55 RC3 powers.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH only. Ev-Do and TDSO / SO32 FCH+SCH SAR tests were not required since the average output powers were not more than 0.25 dB higher than the TDSO / SO32 FCH only powers.
3. Hotspot SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0. If the average output power of Subtype 2 for Rev. A is less than the Rev. 0 power levels, then Rev. A SAR is not required. Otherwise, SAR is measured on the maximum output channel for Rev. A using the exposure configuration that results in the highest SAR for that RF channel in Rev. 0.
4. CDMA 1x-RTT SAR was additionally required to be evaluated for Hotspot exposure conditions to support simultaneous transmission capabilities.
5. Head SAR was additionally evaluated with EVDO Rev. A to determine compliance for held-to-ear VoIP operations.

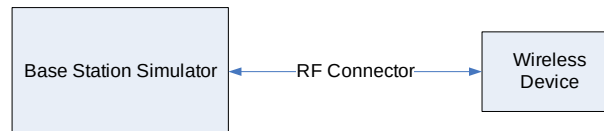


Figure 9-1
Power Measurement Setup

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9.2 GSM 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	32.08	32.05	31.78	30.17	28.97	27.00	26.96	23.19	22.13
	190	32.10	32.46	31.74	30.45	29.21	27.11	27.13	23.25	22.38
	251	32.42	32.39	31.67	30.45	29.17	27.20	27.14	23.30	22.41
GSM 1900	512	29.14	29.12	28.63	27.45	26.04	25.43	25.34	21.27	19.61
	661	29.36	29.33	29.00	27.84	26.36	25.79	25.73	21.50	19.97
	810	29.09	29.13	28.50	27.56	26.15	25.47	25.47	21.35	19.71
		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	23.05	23.02	25.76	25.91	25.96	17.97	20.94	18.93	19.12
	190	23.07	23.43	25.72	26.19	26.20	18.08	21.11	18.99	19.37
	251	23.39	23.36	25.65	26.19	26.16	18.17	21.12	19.04	19.40
GSM 1900	512	20.11	20.09	22.61	23.19	23.03	16.40	19.32	17.01	16.60
	661	20.33	20.30	22.98	23.58	23.35	16.76	19.71	17.24	16.96
	810	20.06	20.10	22.48	23.30	23.14	16.44	19.45	17.09	16.70
GSM 850	Frame Avg.Targets:	23.97	23.97	25.48	25.74	25.99	17.97	20.98	18.74	18.99
GSM 1900		20.97	20.97	22.48	23.24	22.99	16.47	19.48	16.74	16.49

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.
- Per October 2013 TCB Workshop notes, the source-based frame-averaged output power was evaluated for all GPRS slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot 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: 12 (Max 4 Tx uplink slots)
EDGE Multislot class: 12 (Max 4 Tx uplink slots)
DTM Multislot Class: N/A



Figure 9-2
Power Measurement Setup

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9.3 UMTS 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	23.09	23.44	23.40	22.74	23.19	22.46	-
99		12.2 kbps AMR	23.27	23.28	23.45	22.87	23.21	22.62	-
6	HSDPA	Subtest 1	22.10	22.27	22.19	22.01	22.13	21.81	0
6		Subtest 2	22.22	22.31	22.20	22.36	22.37	22.05	0
6		Subtest 3	21.21	21.17	21.25	21.21	21.14	21.25	0.5
6		Subtest 4	21.63	21.78	21.58	21.46	21.17	21.15	0.5
6	HSUPA	Subtest 1	22.09	22.32	22.16	21.62	21.91	21.50	0
6		Subtest 2	20.62	20.90	20.69	20.74	20.67	20.38	2
6		Subtest 3	20.65	20.70	20.50	20.90	21.34	20.80	1
6		Subtest 4	21.58	21.24	21.31	20.85	21.38	21.03	2
6		Subtest 5	22.10	22.36	22.19	21.92	22.20	21.57	0

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.

This device does not support DC-HSDPA.

It is expected by the manufacturer that MPR for some HSUPA subtests may be as low as 0 dB according to the chipset implementation in this model.

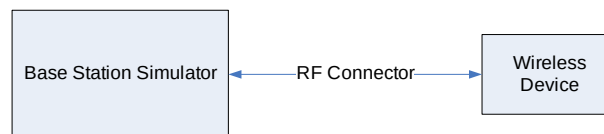


Figure 9-3
Power Measurement Setup

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9.4 LTE Conducted Powers

9.4.1 LTE Band 13

Table 9-1
LTE Band 13 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	782.0	23230	10	QPSK	1	0	23.44	0	0
	782.0	23230	10	QPSK	1	25	23.10	0	0
	782.0	23230	10	QPSK	1	49	23.05	0	0
	782.0	23230	10	QPSK	25	0	22.18	1	0-1
	782.0	23230	10	QPSK	25	12	22.16	1	0-1
	782.0	23230	10	QPSK	25	25	22.15	1	0-1
	782.0	23230	10	QPSK	50	0	22.14	1	0-1
	782.0	23230	10	16QAM	1	0	22.50	1	0-1
	782.0	23230	10	16QAM	1	25	22.32	1	0-1
	782.0	23230	10	16QAM	1	49	22.28	1	0-1
	782.0	23230	10	16QAM	25	0	21.14	2	0-2
	782.0	23230	10	16QAM	25	12	21.16	2	0-2
	782.0	23230	10	16QAM	25	25	21.13	2	0-2
	782.0	23230	10	16QAM	50	0	20.77	2	0-2

Note: LTE Band 13 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

9.4.2 LTE Band 4 (AWS)

Table 9-2
LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	1732.5	20175	20	QPSK	1	0	22.96	0	0
	1732.5	20175	20	QPSK	1	50	23.05	0	0
	1732.5	20175	20	QPSK	1	99	22.85	0	0
	1732.5	20175	20	QPSK	50	0	21.79	1	0-1
	1732.5	20175	20	QPSK	50	25	21.78	1	0-1
	1732.5	20175	20	QPSK	50	50	21.72	1	0-1
	1732.5	20175	20	QPSK	100	0	21.77	1	0-1
	1732.5	20175	20	16QAM	1	0	22.14	1	0-1
	1732.5	20175	20	16QAM	1	50	22.15	1	0-1
	1732.5	20175	20	16QAM	1	99	22.14	1	0-1
	1732.5	20175	20	16QAM	50	0	20.80	2	0-2
	1732.5	20175	20	16QAM	50	25	20.77	2	0-2
	1732.5	20175	20	16QAM	50	50	20.76	2	0-2
	1732.5	20175	20	16QAM	100	0	20.73	2	0-2

Note: LTE Band 4 (AWS) at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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Table 9-3
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1717.5	20025	15	QPSK	1	0	23.14	0	0
	1717.5	20025	15	QPSK	1	36	23.15	0	0
	1717.5	20025	15	QPSK	1	74	22.99	0	0
	1717.5	20025	15	QPSK	36	0	22.08	1	0-1
	1717.5	20025	15	QPSK	36	18	21.89	1	0-1
	1717.5	20025	15	QPSK	36	37	21.84	1	0-1
	1717.5	20025	15	QPSK	75	0	21.89	1	0-1
	1717.5	20025	15	16QAM	1	0	22.04	1	0-1
	1717.5	20025	15	16QAM	1	36	21.80	1	0-1
	1717.5	20025	15	16QAM	1	74	21.86	1	0-1
	1717.5	20025	15	16QAM	36	0	20.84	2	0-2
	1717.5	20025	15	16QAM	36	18	20.80	2	0-2
	1717.5	20025	15	16QAM	36	37	20.81	2	0-2
	1717.5	20025	15	16QAM	75	0	20.84	2	0-2
Mid	1732.5	20175	15	QPSK	1	0	22.56	0	0
	1732.5	20175	15	QPSK	1	36	22.85	0	0
	1732.5	20175	15	QPSK	1	74	22.68	0	0
	1732.5	20175	15	QPSK	36	0	21.95	1	0-1
	1732.5	20175	15	QPSK	36	18	21.78	1	0-1
	1732.5	20175	15	QPSK	36	37	21.76	1	0-1
	1732.5	20175	15	QPSK	75	0	21.76	1	0-1
	1732.5	20175	15	16QAM	1	0	22.11	1	0-1
	1732.5	20175	15	16QAM	1	36	22.11	1	0-1
	1732.5	20175	15	16QAM	1	74	21.95	1	0-1
	1732.5	20175	15	16QAM	36	0	21.00	2	0-2
	1732.5	20175	15	16QAM	36	18	20.83	2	0-2
	1732.5	20175	15	16QAM	36	37	20.85	2	0-2
	1732.5	20175	15	16QAM	75	0	20.75	2	0-2
High	1747.5	20325	15	QPSK	1	0	22.96	0	0
	1747.5	20325	15	QPSK	1	36	22.86	0	0
	1747.5	20325	15	QPSK	1	74	22.72	0	0
	1747.5	20325	15	QPSK	36	0	21.88	1	0-1
	1747.5	20325	15	QPSK	36	18	21.56	1	0-1
	1747.5	20325	15	QPSK	36	37	21.50	1	0-1
	1747.5	20325	15	QPSK	75	0	21.50	1	0-1
	1747.5	20325	15	16QAM	1	0	21.77	1	0-1
	1747.5	20325	15	16QAM	1	36	21.60	1	0-1
	1747.5	20325	15	16QAM	1	74	21.56	1	0-1
	1747.5	20325	15	16QAM	36	0	20.58	2	0-2
	1747.5	20325	15	16QAM	36	18	20.53	2	0-2
	1747.5	20325	15	16QAM	36	37	20.52	2	0-2
	1747.5	20325	15	16QAM	75	0	20.56	2	0-2

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Table 9-4
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1715	20000	10	QPSK	1	0	23.09	0	0
	1715	20000	10	QPSK	1	25	22.87	0	0
	1715	20000	10	QPSK	1	49	22.92	0	0
	1715	20000	10	QPSK	25	0	22.09	1	0-1
	1715	20000	10	QPSK	25	12	21.93	1	0-1
	1715	20000	10	QPSK	25	25	22.00	1	0-1
	1715	20000	10	QPSK	50	0	21.92	1	0-1
	1715	20000	10	16QAM	1	0	22.34	1	0-1
	1715	20000	10	16QAM	1	25	22.14	1	0-1
	1715	20000	10	16QAM	1	49	22.18	1	0-1
	1715	20000	10	16QAM	25	0	20.97	2	0-2
	1715	20000	10	16QAM	25	12	20.87	2	0-2
	1715	20000	10	16QAM	25	25	20.89	2	0-2
	1715	20000	10	16QAM	50	0	20.85	2	0-2
Mid	1732.5	20175	10	QPSK	1	0	22.88	0	0
	1732.5	20175	10	QPSK	1	25	22.95	0	0
	1732.5	20175	10	QPSK	1	49	22.87	0	0
	1732.5	20175	10	QPSK	25	0	21.92	1	0-1
	1732.5	20175	10	QPSK	25	12	21.90	1	0-1
	1732.5	20175	10	QPSK	25	25	21.87	1	0-1
	1732.5	20175	10	QPSK	50	0	21.81	1	0-1
	1732.5	20175	10	16QAM	1	0	21.88	1	0-1
	1732.5	20175	10	16QAM	1	25	21.92	1	0-1
	1732.5	20175	10	16QAM	1	49	21.75	1	0-1
	1732.5	20175	10	16QAM	25	0	21.00	2	0-2
	1732.5	20175	10	16QAM	25	12	20.97	2	0-2
	1732.5	20175	10	16QAM	25	25	20.94	2	0-2
	1732.5	20175	10	16QAM	50	0	20.75	2	0-2
High	1750	20350	10	QPSK	1	0	22.65	0	0
	1750	20350	10	QPSK	1	25	22.57	0	0
	1750	20350	10	QPSK	1	49	22.53	0	0
	1750	20350	10	QPSK	25	0	21.68	1	0-1
	1750	20350	10	QPSK	25	12	21.60	1	0-1
	1750	20350	10	QPSK	25	25	21.52	1	0-1
	1750	20350	10	QPSK	50	0	21.51	1	0-1
	1750	20350	10	16QAM	1	0	21.91	1	0-1
	1750	20350	10	16QAM	1	25	21.82	1	0-1
	1750	20350	10	16QAM	1	49	21.76	1	0-1
	1750	20350	10	16QAM	25	0	20.59	2	0-2
	1750	20350	10	16QAM	25	12	20.57	2	0-2
	1750	20350	10	16QAM	25	25	20.57	2	0-2
	1750	20350	10	16QAM	50	0	20.58	2	0-2

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Table 9-5
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1712.5	19975	5	QPSK	1	0	23.22	0	0
	1712.5	19975	5	QPSK	1	12	23.25	0	0
	1712.5	19975	5	QPSK	1	24	23.06	0	0
	1712.5	19975	5	QPSK	12	0	22.19	1	0-1
	1712.5	19975	5	QPSK	12	6	22.08	1	0-1
	1712.5	19975	5	QPSK	12	13	22.05	1	0-1
	1712.5	19975	5	QPSK	25	0	21.94	1	0-1
	1712.5	19975	5	16-QAM	1	0	22.29	1	0-1
	1712.5	19975	5	16-QAM	1	12	22.31	1	0-1
	1712.5	19975	5	16-QAM	1	24	22.11	1	0-1
	1712.5	19975	5	16-QAM	12	0	21.20	2	0-2
	1712.5	19975	5	16-QAM	12	6	21.07	2	0-2
	1712.5	19975	5	16-QAM	12	13	21.01	2	0-2
	1712.5	19975	5	16-QAM	25	0	20.93	2	0-2
Mid	1732.5	20175	5	QPSK	1	0	22.89	0	0
	1732.5	20175	5	QPSK	1	12	22.88	0	0
	1732.5	20175	5	QPSK	1	24	22.70	0	0
	1732.5	20175	5	QPSK	12	0	22.03	1	0-1
	1732.5	20175	5	QPSK	12	6	22.03	1	0-1
	1732.5	20175	5	QPSK	12	13	21.92	1	0-1
	1732.5	20175	5	QPSK	25	0	21.89	1	0-1
	1732.5	20175	5	16-QAM	1	0	21.75	1	0-1
	1732.5	20175	5	16-QAM	1	12	21.73	1	0-1
	1732.5	20175	5	16-QAM	1	24	21.57	1	0-1
	1732.5	20175	5	16-QAM	12	0	21.13	2	0-2
	1732.5	20175	5	16-QAM	12	6	21.11	2	0-2
	1732.5	20175	5	16-QAM	12	13	21.05	2	0-2
	1732.5	20175	5	16-QAM	25	0	20.84	2	0-2
High	1752.5	20375	5	QPSK	1	0	22.85	0	0
	1752.5	20375	5	QPSK	1	12	22.77	0	0
	1752.5	20375	5	QPSK	1	24	22.79	0	0
	1752.5	20375	5	QPSK	12	0	21.69	1	0-1
	1752.5	20375	5	QPSK	12	6	21.60	1	0-1
	1752.5	20375	5	QPSK	12	13	21.67	1	0-1
	1752.5	20375	5	QPSK	25	0	21.55	1	0-1
	1752.5	20375	5	16-QAM	1	0	21.78	1	0-1
	1752.5	20375	5	16-QAM	1	12	21.64	1	0-1
	1752.5	20375	5	16-QAM	1	24	21.66	1	0-1
	1752.5	20375	5	16-QAM	12	0	20.74	2	0-2
	1752.5	20375	5	16-QAM	12	6	20.66	2	0-2
	1752.5	20375	5	16-QAM	12	13	20.63	2	0-2
	1752.5	20375	5	16-QAM	25	0	20.56	2	0-2

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9.5 WLAN Conducted Powers

Table 9-6
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*	15.90	16.08	15.84	15.89
802.11b	2437	6*	16.63	16.82	16.58	16.65
802.11b	2462	11*	16.07	16.29	16.01	16.10

Table 9-7
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	11.51	11.30	11.15	11.60	11.27	11.45	11.42	11.23
802.11g	2437	6	12.39	12.11	11.97	12.51	12.22	12.34	12.26	12.12
802.11g	2462	11	11.95	11.75	11.52	12.01	11.71	11.86	11.89	11.57

Table 9-8
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	11.79	11.77	11.71	11.30	11.36	11.51	11.51	11.61
802.11n	2437	6	12.62	12.52	12.49	12.10	12.15	12.32	12.28	12.38
802.11n	2462	11	12.27	12.20	12.18	11.73	11.75	12.00	11.95	12.16

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Table 9-9
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*	13.60	13.71	13.71	13.69	13.75	13.70	13.50	13.62
802.11a	5200	40	13.30	13.40	13.35	13.39	13.42	13.39	13.24	13.37
802.11a	5220	44	13.87	13.96	14.02	14.00	13.94	13.98	13.71	13.86
802.11a	5240	48*	13.95	14.02	14.07	14.07	14.11	14.03	13.81	14.00
802.11a	5260	52*	14.01	14.05	14.06	14.11	14.04	14.03	14.00	14.06
802.11a	5280	56	14.15	14.20	14.25	14.22	14.24	14.15	14.14	14.22
802.11a	5300	60	14.19	14.22	14.28	14.28	14.26	14.25	14.20	14.22
802.11a	5320	64*	14.29	14.32	14.37	14.33	14.35	14.32	14.25	14.38
802.11a	5500	100	13.79	13.79	13.75	13.81	13.84	13.72	13.84	13.63
802.11a	5520	104*	13.88	13.84	13.82	13.97	13.89	13.83	13.89	13.72
802.11a	5540	108	13.43	13.41	13.36	13.40	13.46	13.36	13.49	13.22
802.11a	5560	112	13.80	13.79	13.73	13.79	13.87	13.66	13.80	13.67
802.11a	5580	116*	13.53	13.47	13.49	13.59	13.67	13.43	13.58	13.41
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	14.17	14.24	14.08	14.21	14.19	14.10	14.26	13.97
802.11a	5680	136*	13.55	13.57	13.55	13.60	13.59	13.49	13.58	13.42
802.11a	5700	140	13.71	13.65	13.60	13.81	13.73	13.59	13.71	13.55
802.11a	5745	149*	13.15	13.23	13.14	13.19	13.21	13.21	13.11	13.13
802.11a	5765	153	12.85	12.92	12.79	12.91	12.84	12.89	12.82	12.90
802.11a	5785	157*	12.78	12.89	12.69	12.79	12.92	12.81	12.78	12.74
802.11a	5805	161	13.05	13.19	13.05	13.18	13.06	13.10	13.01	13.09
802.11a	5825	165*	12.80	12.88	12.84	12.91	12.83	12.80	12.80	12.78

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.

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

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Table 9-10
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	12.99	12.92	12.88	12.98	12.94	12.87	12.94	12.64
802.11n	5200	40	12.52	12.45	12.46	12.57	12.47	12.34	12.43	12.15
802.11n	5220	44	13.25	13.14	13.17	13.29	13.28	13.11	13.22	12.88
802.11n	5240	48	13.45	13.42	13.30	13.47	13.35	13.32	13.37	13.11
802.11n	5260	52	12.31	12.41	12.22	12.31	12.26	12.42	12.41	12.11
802.11n	5280	56	12.66	12.73	12.60	12.67	12.64	12.75	12.75	12.43
802.11n	5300	60	12.58	12.62	12.46	12.60	12.54	12.63	12.64	12.35
802.11n	5320	64	12.76	12.88	12.68	12.78	12.73	12.87	12.88	12.61
802.11n	5500	100	13.00	13.04	13.02	12.87	12.96	13.03	12.60	12.67
802.11n	5520	104	13.03	13.03	13.10	12.84	12.97	13.00	12.64	12.68
802.11n	5540	108	12.65	12.64	12.70	12.54	12.57	12.66	12.21	12.34
802.11n	5560	112	13.18	13.23	13.18	13.02	13.21	13.17	12.79	12.92
802.11n	5580	116	12.61	12.63	12.64	12.49	12.58	12.68	12.27	12.28
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	13.45	13.46	13.46	13.22	13.37	13.55	12.96	13.09
802.11n	5680	136	12.89	12.90	12.88	12.79	12.84	12.93	12.40	12.55
802.11n	5700	140	13.09	13.08	13.18	13.02	13.08	13.17	12.68	12.75
802.11n	5745	149	12.55	12.52	12.43	12.46	12.46	12.39	12.47	12.18
802.11n	5765	153	11.96	12.00	11.84	11.88	11.87	11.81	11.88	11.65
802.11n	5785	157	11.85	11.82	11.69	11.77	11.71	11.73	11.78	11.48
802.11n	5805	161	12.14	12.14	12.06	12.07	12.06	12.03	12.02	11.85
802.11n	5825	165	12.14	12.10	12.03	12.06	12.01	11.94	12.08	11.77

Table 9-11
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	12.72	12.84	12.73	12.65	12.76	12.69	12.64	12.66
802.11n	5230	46	12.77	12.98	12.83	12.66	12.79	12.75	12.69	12.69
802.11n	5270	54	12.76	12.69	12.79	12.62	12.78	12.62	12.60	12.74
802.11n	5310	62	12.82	12.83	12.87	12.70	12.92	12.70	12.68	12.83
802.11n	5510	102	12.62	12.79	12.63	12.47	12.46	12.62	12.56	12.85
802.11n	5550	110	12.78	12.92	12.87	12.61	12.57	12.72	12.64	13.03
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	12.78	12.98	12.80	12.62	12.61	12.72	12.81	13.02
802.11n	5755	151	12.59	12.84	12.61	12.63	12.75	12.70	12.71	12.96
802.11n	5795	159	12.80	13.06	12.79	12.87	12.97	12.89	12.87	13.11

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Table 9-12
IEEE 802.11ac Average RF Power – 80 MHz Bandwidth

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3	58.5	87.8	117	175.5	234	263.3	292.5	351	390
802.11ac	5210	42	12.11	12.15	12.18	12.13	12.27	12.17	12.16	12.07	12.15	12.24
802.11ac	5290	58	12.16	12.19	12.15	12.19	12.13	12.09	12.28	12.04	12.28	12.29
802.11ac	5530	106	12.09	12.08	12.16	12.09	12.18	12.18	12.04	12.02	12.01	12.02
802.11ac	5775	155	12.09	12.17	12.17	12.26	12.28	12.23	12.21	12.18	12.07	12.18

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.
- Full SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
- 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.

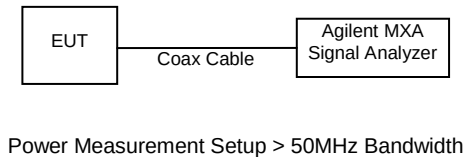
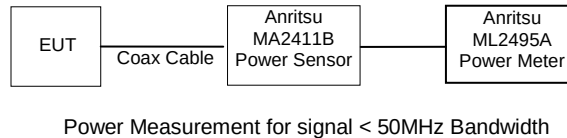


Figure 9-4
Power Measurement Setup

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10 LTE POWER REDUCTION

10.1 Introduction to LTE Power Reduction

This device is capable of Simultaneous Voice and LTE (SVLTE) calls, with the voice call supported by a CDMA 1x-RTT transmitter and the data connection supported by a separate LTE transmitter. A LTE power reduction scheme is applied during a LTE connection operating simultaneously with 1x-RTT voice calls. The maximum transmit power of LTE is limited depending on the CDMA 1x voice transmit power level. When CDMA 1x Voice is operating at a certain range of high power levels, the maximum LTE transmit power is limited. When CDMA 1x Voice transmit power is below a certain threshold transmit power level, LTE can transmit at the maximum power. Target levels of power reduction and CDMA voice threshold levels are provided in Table 10-1.

Table 10-1
SVLTE Power Reduction Scheme

Mode	Voice Avg Power (P) 1x 850/1900 MHz (dBm)	Target B13/4 LTE Data Avg Power (dBm)
SVLTE	$P \geq 18$	19.0
	$P < 18$	23.0

10.2 Output Power Verification

Per KDB Publication 941225 D05v02 Section 4.4, output powers were measured in SVLTE mode to determine that the power reduction mechanism was operating reliably and consistently. The power reduction was investigated by simultaneously connecting the device to both LTE and CDMA base station simulators. LTE output powers were measured through conducted RF connections by first connecting the device in a LTE data call and subsequently a CDMA 1x-RTT call. CDMA powers were controlled by configuring the CDMA base station simulator to active bits. The LTE output power was monitored while changing the cell output power level. The power reduction targets and threshold level described in Table 10-1 were confirmed. Please see results in Table 10-2.

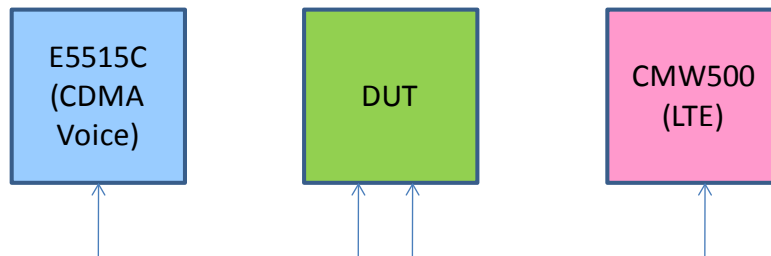


Figure 10-1
SVLTE Conducted Power Measurement Setup

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Table 10-2
SVLTE Power Reduction Verification Results

BC0 1xRTT CDMA Voice Channel	BC0 1xRTT CDMA Voice Tx [dBm]	LTE Band 13 Conducted Power (dBm)													
		Mid													
		QPSK 1 RB, Low Edge	QPSK 1 RB, Mid Edge	QPSK 1 RB, Upper Edge	QPSK 50% RB, Low Edge	QPSK 50% RB, Mid Edge	QPSK 50% RB, Upper Edge	QPSK 100% RB ORB offset	16 QAM 1 RB, Low Edge	16 QAM 1 RB, Mid Edge	16 QAM 1 RB, Upper Edge	16 QAM 50% RB, Low Edge	16 QAM 50% RB, Mid Edge	16 QAM 50% RB, Upper Edge	16 QAM 100% RB ORB offset
384	25	18.75	18.92	18.99	18.85	18.97	19.08	18.93	18.72	18.99	19.04	18.94	19.05	19.03	18.80
	24	18.74	18.94	18.98	18.87	18.97	19.03	18.92	18.83	18.98	19.05	18.92	19.06	19.02	18.83
	23	18.73	18.96	18.98	18.90	18.97	19.04	18.90	18.82	19.00	19.07	18.95	19.05	19.00	18.81
	22	18.74	18.98	18.99	18.92	18.98	19.06	18.92	18.80	18.87	19.03	18.94	19.03	19.11	18.80
	21	18.74	18.99	19.00	18.93	18.99	19.00	18.91	18.78	18.99	19.04	18.95	19.01	19.08	18.84
	20	18.75	18.95	19.01	18.95	19.00	19.01	18.90	18.77	19.02	19.07	18.92	19.02	19.08	18.83
	19	18.76	18.95	18.96	18.95	19.02	19.05	18.93	18.79	18.98	19.06	18.95	19.00	19.07	18.82
	18	18.77	18.94	19.00	18.94	19.03	19.04	18.93	18.80	19.00	19.05	18.94	19.01	19.05	18.82
	17	22.83	22.89	22.81	21.95	22.06	22.04	21.91	22.01	22.14	22.15	21.02	21.13	21.14	20.79
	16	22.82	22.85	22.84	21.96	22.05	22.04	21.95	22.01	22.12	22.14	21.01	21.12	21.13	20.78
	15	22.75	22.87	22.81	21.97	22.01	22.05	21.90	22.03	22.13	22.10	21.03	21.11	21.14	20.87
	14	22.79	22.88	22.82	21.99	22.04	22.05	21.91	22.02	22.15	22.13	21.02	21.14	21.15	20.84
	13	22.83	22.88	22.88	22.00	22.03	22.02	21.92	22.01	22.10	22.19	21.04	21.09	21.13	20.85
	12	22.84	22.87	22.84	22.00	22.00	22.01	21.90	22.03	22.11	22.18	21.02	21.08	21.14	20.83
	11	22.92	22.86	22.90	21.99	22.01	22.03	21.91	22.07	22.15	22.16	21.05	21.08	21.12	20.84

BC1 1xRTT CDMA Voice Channel	BC1 1xRTT CDMA Voice Tx [dBm]	LTE Band 13 Conducted Power (dBm)													
		Mid													
		QPSK 1 RB, Low Edge	QPSK 1 RB, Mid Edge	QPSK 1 RB, Upper Edge	QPSK 50% RB, Low Edge	QPSK 50% RB, Mid Edge	QPSK 50% RB, Upper Edge	QPSK 100% RB ORB offset	16 QAM 1 RB, Low Edge	16 QAM 1 RB, Mid Edge	16 QAM 1 RB, Upper Edge	16 QAM 50% RB, Low Edge	16 QAM 50% RB, Mid Edge	16 QAM 50% RB, Upper Edge	16 QAM 100% RB ORB offset
600	25	18.74	18.92	19.00	18.96	19.07	19.08	18.91	18.89	19.03	19.06	18.94	19.03	19.09	18.82
	24	18.73	18.93	19.01	18.95	19.05	19.07	18.90	18.85	19.02	19.07	18.93	19.04	19.06	18.80
	23	18.75	18.90	19.02	18.96	19.05	19.09	18.91	18.86	19.03	19.09	18.94	19.03	19.07	18.82
	22	18.77	18.94	19.00	18.95	19.04	19.08	18.92	18.87	19.04	19.08	18.95	19.07	19.05	18.81
	21	18.76	18.95	18.98	18.97	19.07	19.05	18.94	18.85	19.01	19.03	18.97	19.08	19.03	18.80
	20	18.72	18.93	18.99	18.98	19.03	19.03	18.95	18.86	19.02	19.07	18.98	19.08	19.04	18.78
	19	18.78	18.95	19.01	19.00	19.05	19.04	18.93	18.84	19.00	19.06	18.97	19.09	19.03	18.79
	18	18.72	18.94	19.02	19.00	19.06	19.03	18.85	18.82	19.00	19.06	18.94	19.10	19.05	18.80
	17	22.81	22.91	22.92	22.02	22.12	22.14	21.86	22.04	22.12	22.11	21.05	21.11	21.16	20.82
	16	22.77	22.90	22.91	22.06	22.10	22.10	21.87	22.05	22.14	22.13	21.04	21.12	21.16	20.83
	15	22.76	22.91	22.90	22.04	22.11	22.09	21.86	22.08	22.13	22.15	21.03	21.11	21.17	20.84
	14	22.76	22.92	22.91	22.04	22.10	22.08	21.88	22.04	22.11	22.16	21.06	21.12	21.09	20.83
	13	22.74	22.93	22.92	22.06	22.12	22.07	21.90	22.00	22.13	22.15	21.07	21.14	21.15	20.85
	12	22.78	22.91	22.91	22.05	22.13	22.05	21.87	21.98	22.13	22.12	21.05	21.13	21.14	20.84
	11	22.79	22.92	22.92	22.06	22.13	22.15	21.88	21.97	22.12	22.13	20.98	21.16	21.12	20.85

BC0 1xRTT CDMA Voice Channel	BC0 1xRTT CDMA Voice Tx [dBm]	LTE Band 4 Conducted Power (dBm) - 20 MHz BW													
		Mid													
		QPSK 1 RB, Low Edge	QPSK 1 RB, Mid Edge	QPSK 1 RB, Upper Edge	QPSK 50% RB, Low Edge	QPSK 50% RB, Mid Edge	QPSK 50% RB, Upper Edge	QPSK 100% RB ORB offset	16 QAM 1 RB, Low Edge	16 QAM 1 RB, Mid Edge	16 QAM 1 RB, Upper Edge	16 QAM 50% RB, Low Edge	16 QAM 50% RB, Mid Edge	16 QAM 50% RB, Upper Edge	16 QAM 100% RB ORB offset
384	25	19.18	19.41	19.02	18.91	19.07	19.01	19.04	19.21	19.41	19.06	18.92	19.08	18.95	18.97
	24	19.21	19.37	19.10	18.99	19.11	19.12	19.03	19.31	19.40	19.11	18.91	19.12	18.94	19.01
	23	19.21	19.37	19.02	18.98	19.15	19.05	19.01	19.32	19.43	19.02	18.91	19.10	18.97	19.08
	22	19.22	19.36	19.05	19.02	19.19	19.06	18.95	19.31	19.42	19.04	18.88	19.04	18.92	19.02
	21	19.16	19.34	19.07	19.05	19.22	19.07	19.00	19.28	19.40	19.11	18.96	19.05	18.91	18.99
	20	19.18	19.35	19.07	19.06	19.21	19.03	19.04	19.24	19.41	19.13	18.95	19.13	18.98	19.20
	19	19.20	19.25	19.03	19.10	19.20	19.10	19.03	19.23	19.42	19.17	18.94	19.11	19.00	19.00
	18	19.23	19.32	19.03	18.94	19.09	19.05	19.06	19.27	19.42	19.15	18.89	19.07	18.91	18.92
	17	23.04	23.23	22.94	21.98	22.09	21.96	21.97	22.09	22.28	21.94	20.85	21.13	20.94	20.97
	16	23.12	23.26	22.91	21.97	22.11	22.01	22.06	22.13	22.22	22.01	20.95	21.15	21.10	20.98
	15	23.11	23.33	22.92	21.95	22.12	22.06	22.00	22.15	22.24	22.07	20.97	21.10	21.06	21.06
	14	23.16	23.31	22.91	21.90	22.14	22.08	22.01	22.21	22.26	22.10	20.99	21.03	21.04	21.13
	13	23.06	23.31	22.94	21.91	22.18	21.99	22.05	22.24	22.28	22.22	20.91	21.08	21.02	21.11
	12	23.10	23.32	22.97	21.92	22.21	22.00	22.02	22.19	22.32	22.01	20.92	21.12	21.00	21.10
	11	23.07	23.25	22.89	21.95	22.11	21.99	22.00	22.10	22.30	21.96	20.88	21.07	20.97	20.98

BC1 1xRTT CDMA Voice Channel	BC1 1xRTT CDMA Voice Tx [dBm]	LTE Band 4 Conducted Power (dBm) - 20 MHz BW													
		Mid													
		QPSK 1 RB, Low Edge	QPSK 1 RB, Mid Edge	QPSK 1 RB, Upper Edge	QPSK 50% RB, Low Edge	QPSK 50% RB, Mid Edge	QPSK 50% RB, Upper Edge	QPSK 100% RB ORB offset	16 QAM 1 RB, Low Edge	16 QAM 1 RB, Mid Edge	16 QAM 1 RB, Upper Edge	16 QAM 50% RB, Low Edge	16 QAM 50% RB, Mid Edge	16 QAM 50% RB, Upper Edge	16 QAM 100% RB ORB offset
600	25	19.19	19.35	19.07	18.96	19.12	18.98	19.05	19.21	19.45	19.10	18.91	19.06	18.95	18.96
	24	19.21	19.36	19.11	18.97	19.15	19.00	19.02	19.28	19.44	19.11	18.93	19.07	19.01	18.97
	23	19.22	19.39	19.12	18.96	19.16	19.07	19.01	19.31	19.43	19.09	18.91	19.11	19.02	19.03
	22	19.27	19.40	19.15	18.98	19.20	19.06	19.00	19.23	19.44	19.12	18.97	19.10	18.98	19.00
	21	19.25	19.37	19.13	18.94	19.21	19.02	19.06	19.25	19.41	19.11	18.96	19.06	19.01	19.01
	20	19.21	19.38	19.18	18.91	19.16	19.10	18.97	19.31	19.42	19.10	18.95	19.07	19.05	18.96
	19	19.19	19.41	19.08	18.95	19.15	19.06	19.04	19.32	19.43	19.08	18.93	19.11	18.99	19.02
	18	19.22	19.38	19.02	18.99	19.14	19.01	19.07	19.24	19.44	19.07	18.95	19.08	18.95	18.96
	17	23.03	23.22	22.93	21.98	22.14	22.04	21.97	22.15	22.31	21.93	20.97	21.09	20.95	20.93
	16	23.12	23.27	22.91	21.99	22.24	22.10	22.10	22.15	22.32	22.00	20.92	21.12	21.00	20.94
	15	23.24	23.24	22.93	22.01	22.10	22.03	22.08	22.10	22.33	22.01	20.97	21.10	21.02	20.91
	14	23.15	23.26	22.97	22.04	22.15	22.17	22.06	22.12	22.34	22.02	20.96	21.08	21.03	20.85
	13	23.24	23.31	22.88	22.03	22.17	22.11	22.05	22.11	22.35	22.05	20.94	21.15	21.05	20.88
	12	23.26	23.35	22.80	22.01	22.20	22.16	22.01	22.12	22.31	22.07	20.95	21.13	21.01	20.93
	11	23.05	23.23	22.91	21.98	22.16	22.06	21.99	22.13	22.33	21.92	20.94	21.11	20.93	20.91

10.3 SVLTE SAR Testing Procedures

Per KDB 941225 D05v02 Section 4.4 B), SAR testing was additionally performed at the reduced CDMA and LTE power levels with respect to the simultaneous transmission scenarios. Additional samples were tuned to fixed reduced power levels to represent the SVLTE condition in a standalone environment. While the power reduction mechanism is activated at the CDMA Voice power level of 18 dBm, simultaneous SAR summations of maximum power LTE were evaluated at this reduced fixed CDMA voice power level. SAR was additionally evaluated at reduced power LTE levels to perform simultaneous SAR analysis when CDMA voice is at maximum power.

10.3.1 Reduced LTE B13 Conducted Powers

Table 10-3
Reduced LTE Band 13 Conducted Power – 10MHz Bandwidths

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	782.0	23230	10	QPSK	1	0	19.43	0	0
	782.0	23230	10	QPSK	1	25	19.26	0	0
	782.0	23230	10	QPSK	1	49	19.41	0	0
	782.0	23230	10	QPSK	25	0	19.29	0	0-1
	782.0	23230	10	QPSK	25	12	19.24	0	0-1
	782.0	23230	10	QPSK	25	25	19.01	0	0-1
	782.0	23230	10	QPSK	50	0	19.15	0	0-1
	782.0	23230	10	16QAM	1	0	19.21	0	0-1
	782.0	23230	10	16QAM	1	25	19.02	0	0-1
	782.0	23230	10	16QAM	1	49	19.13	0	0-1
	782.0	23230	10	16QAM	25	0	19.32	0	0-2
	782.0	23230	10	16QAM	25	12	19.14	0	0-2
	782.0	23230	10	16QAM	25	25	19.02	0	0-2
	782.0	23230	10	16QAM	50	0	18.96	0	0-2

Note: LTE Band 13 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

10.3.2 Reduced LTE B4 Conducted Powers

Table 10-4
Reduced LTE Band 4 Conducted Power – 20MHz Bandwidths

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	1732.5	20175	20	QPSK	1	0	18.94	0	0
	1732.5	20175	20	QPSK	1	50	18.92	0	0
	1732.5	20175	20	QPSK	1	99	18.99	0	0
	1732.5	20175	20	QPSK	50	0	19.00	0	0-1
	1732.5	20175	20	QPSK	50	25	18.96	0	0-1
	1732.5	20175	20	QPSK	50	50	18.90	0	0-1
	1732.5	20175	20	QPSK	100	0	18.85	0	0-1
	1732.5	20175	20	16QAM	1	0	18.66	0	0-1
	1732.5	20175	20	16QAM	1	50	18.50	0	0-1
	1732.5	20175	20	16QAM	1	99	18.62	0	0-1
	1732.5	20175	20	16QAM	50	0	18.53	0	0-2
	1732.5	20175	20	16QAM	50	25	18.71	0	0-2
	1732.5	20175	20	16QAM	50	50	18.54	0	0-2
	1732.5	20175	20	16QAM	100	0	18.62	0	0-2

Note: LTE Band 4 (AWS) at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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Table 10-5
Reduced LTE Band 4 Conducted Power – 15MHz Bandwidths

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1717.5	20025	15	QPSK	1	0	18.55	0	0
	1717.5	20025	15	QPSK	1	36	18.68	0	0
	1717.5	20025	15	QPSK	1	74	18.81	0	0
	1717.5	20025	15	QPSK	36	0	18.87	0	0-1
	1717.5	20025	15	QPSK	36	18	18.76	0	0-1
	1717.5	20025	15	QPSK	36	37	18.81	0	0-1
	1717.5	20025	15	QPSK	75	0	18.73	0	0-1
	1717.5	20025	15	16QAM	1	0	18.50	0	0-1
	1717.5	20025	15	16QAM	1	36	18.56	0	0-1
	1717.5	20025	15	16QAM	1	74	18.54	0	0-1
	1717.5	20025	15	16QAM	36	0	18.65	0	0-2
	1717.5	20025	15	16QAM	36	18	18.68	0	0-2
	1717.5	20025	15	16QAM	36	37	18.63	0	0-2
	1717.5	20025	15	16QAM	75	0	18.70	0	0-2
Mid	1732.5	20175	15	QPSK	1	0	18.54	0	0
	1732.5	20175	15	QPSK	1	36	18.61	0	0
	1732.5	20175	15	QPSK	1	74	18.52	0	0
	1732.5	20175	15	QPSK	36	0	18.50	0	0-1
	1732.5	20175	15	QPSK	36	18	18.51	0	0-1
	1732.5	20175	15	QPSK	36	37	18.55	0	0-1
	1732.5	20175	15	QPSK	75	0	18.51	0	0-1
	1732.5	20175	15	16QAM	1	0	18.53	0	0-1
	1732.5	20175	15	16QAM	1	36	18.51	0	0-1
	1732.5	20175	15	16QAM	1	74	18.50	0	0-1
	1732.5	20175	15	16QAM	36	0	18.55	0	0-2
	1732.5	20175	15	16QAM	36	18	18.50	0	0-2
	1732.5	20175	15	16QAM	36	37	18.52	0	0-2
	1732.5	20175	15	16QAM	75	0	18.51	0	0-2
High	1747.5	20325	15	QPSK	1	0	18.72	0	0
	1747.5	20325	15	QPSK	1	36	18.52	0	0
	1747.5	20325	15	QPSK	1	74	18.60	0	0
	1747.5	20325	15	QPSK	36	0	18.55	0	0-1
	1747.5	20325	15	QPSK	36	18	18.50	0	0-1
	1747.5	20325	15	QPSK	36	37	18.51	0	0-1
	1747.5	20325	15	QPSK	75	0	18.53	0	0-1
	1747.5	20325	15	16QAM	1	0	18.60	0	0-1
	1747.5	20325	15	16QAM	1	36	18.56	0	0-1
	1747.5	20325	15	16QAM	1	74	18.50	0	0-1
	1747.5	20325	15	16QAM	36	0	18.53	0	0-2
	1747.5	20325	15	16QAM	36	18	18.53	0	0-2
	1747.5	20325	15	16QAM	36	37	18.55	0	0-2
	1747.5	20325	15	16QAM	75	0	18.50	0	0-2

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Table 10-6
Reduced LTE Band 4 Conducted Power – 10MHz Bandwidths

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1715	20000	10	QPSK	1	0	18.88	0	0
	1715	20000	10	QPSK	1	25	18.78	0	0
	1715	20000	10	QPSK	1	49	18.79	0	0
	1715	20000	10	QPSK	25	0	18.67	0	0-1
	1715	20000	10	QPSK	25	12	18.58	0	0-1
	1715	20000	10	QPSK	25	25	18.68	0	0-1
	1715	20000	10	QPSK	50	0	18.73	0	0-1
	1715	20000	10	16QAM	1	0	18.53	0	0-1
	1715	20000	10	16QAM	1	25	18.66	0	0-1
	1715	20000	10	16QAM	1	49	18.51	0	0-1
	1715	20000	10	16QAM	25	0	18.68	0	0-2
	1715	20000	10	16QAM	25	12	18.70	0	0-2
	1715	20000	10	16QAM	25	25	18.92	0	0-2
	1715	20000	10	16QAM	50	0	18.93	0	0-2
Mid	1732.5	20175	10	QPSK	1	0	18.84	0	0
	1732.5	20175	10	QPSK	1	25	18.91	0	0
	1732.5	20175	10	QPSK	1	49	18.82	0	0
	1732.5	20175	10	QPSK	25	0	18.80	0	0-1
	1732.5	20175	10	QPSK	25	12	18.58	0	0-1
	1732.5	20175	10	QPSK	25	25	18.76	0	0-1
	1732.5	20175	10	QPSK	50	0	18.52	0	0-1
	1732.5	20175	10	16QAM	1	0	18.56	0	0-1
	1732.5	20175	10	16QAM	1	25	18.51	0	0-1
	1732.5	20175	10	16QAM	1	49	18.52	0	0-1
	1732.5	20175	10	16QAM	25	0	18.67	0	0-2
	1732.5	20175	10	16QAM	25	12	18.66	0	0-2
	1732.5	20175	10	16QAM	25	25	18.53	0	0-2
	1732.5	20175	10	16QAM	50	0	18.54	0	0-2
High	1750	20350	10	QPSK	1	0	18.62	0	0
	1750	20350	10	QPSK	1	25	18.52	0	0
	1750	20350	10	QPSK	1	49	18.66	0	0
	1750	20350	10	QPSK	25	0	18.67	0	0-1
	1750	20350	10	QPSK	25	12	18.63	0	0-1
	1750	20350	10	QPSK	25	25	18.55	0	0-1
	1750	20350	10	QPSK	50	0	18.50	0	0-1
	1750	20350	10	16QAM	1	0	18.97	0	0-1
	1750	20350	10	16QAM	1	25	18.88	0	0-1
	1750	20350	10	16QAM	1	49	18.67	0	0-1
	1750	20350	10	16QAM	25	0	18.59	0	0-2
	1750	20350	10	16QAM	25	12	18.55	0	0-2
	1750	20350	10	16QAM	25	25	18.50	0	0-2
	1750	20350	10	16QAM	50	0	18.57	0	0-2

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Table 10-7
Reduced LTE Band 4 Conducted Power – 5MHz Bandwidths

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1712.5	19975	5	QPSK	1	0	18.96	0	0
	1712.5	19975	5	QPSK	1	12	19.01	0	0
	1712.5	19975	5	QPSK	1	24	18.89	0	0
	1712.5	19975	5	QPSK	12	0	19.00	0	0-1
	1712.5	19975	5	QPSK	12	6	18.97	0	0-1
	1712.5	19975	5	QPSK	12	13	18.98	0	0-1
	1712.5	19975	5	QPSK	25	0	18.93	0	0-1
	1712.5	19975	5	16-QAM	1	0	18.95	0	0-1
	1712.5	19975	5	16-QAM	1	12	18.82	0	0-1
	1712.5	19975	5	16-QAM	1	24	18.87	0	0-1
	1712.5	19975	5	16-QAM	12	0	19.19	0	0-2
	1712.5	19975	5	16-QAM	12	6	19.10	0	0-2
	1712.5	19975	5	16-QAM	12	13	19.05	0	0-2
Mid	1732.5	20175	5	QPSK	1	0	18.65	0	0
	1732.5	20175	5	QPSK	1	12	18.67	0	0
	1732.5	20175	5	QPSK	1	24	18.82	0	0
	1732.5	20175	5	QPSK	12	0	18.68	0	0-1
	1732.5	20175	5	QPSK	12	6	18.95	0	0-1
	1732.5	20175	5	QPSK	12	13	18.90	0	0-1
	1732.5	20175	5	QPSK	25	0	18.82	0	0-1
	1732.5	20175	5	16-QAM	1	0	18.74	0	0-1
	1732.5	20175	5	16-QAM	1	12	18.79	0	0-1
	1732.5	20175	5	16-QAM	1	24	18.61	0	0-1
	1732.5	20175	5	16-QAM	12	0	18.83	0	0-2
	1732.5	20175	5	16-QAM	12	6	18.97	0	0-2
	1732.5	20175	5	16-QAM	12	13	18.92	0	0-2
	1732.5	20175	5	16-QAM	25	0	18.80	0	0-2
High	1752.5	20375	5	QPSK	1	0	18.77	0	0
	1752.5	20375	5	QPSK	1	12	18.67	0	0
	1752.5	20375	5	QPSK	1	24	18.56	0	0
	1752.5	20375	5	QPSK	12	0	18.63	0	0-1
	1752.5	20375	5	QPSK	12	6	18.61	0	0-1
	1752.5	20375	5	QPSK	12	13	18.74	0	0-1
	1752.5	20375	5	QPSK	25	0	18.65	0	0-1
	1752.5	20375	5	16-QAM	1	0	18.64	0	0-1
	1752.5	20375	5	16-QAM	1	12	18.50	0	0-1
	1752.5	20375	5	16-QAM	1	24	18.62	0	0-1
	1752.5	20375	5	16-QAM	12	0	18.57	0	0-2
	1752.5	20375	5	16-QAM	12	6	18.58	0	0-2
	1752.5	20375	5	16-QAM	12	13	18.73	0	0-2
	1752.5	20375	5	16-QAM	25	0	18.51	0	0-2

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10.3.3 Fixed CDMA Conducted Powers

Table 10-8
Fixed CDMA Conducted Powers

Band	Channel	Rule Part	Frequency	SO55 [dBm]	SO55 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]
	F-RC		MHz	RC1	RC3	FCH+SCH	FCH
Cellular	1013	22H	824.7	17.61	17.67	17.77	17.72
	384	22H	836.52	18.00	17.97	18.05	18.05
	777	22H	848.31	17.40	17.43	17.44	17.43
PCS	25	24E	1851.25	17.48	17.43	17.45	17.39
	600	24E	1880	17.70	17.50	17.88	17.90
	1175	24E	1908.75	17.42	17.48	17.50	17.50

Note:

1. RC1 is only applicable for IS-95 compatibility.
2. There is no power reduction applied to the CDMA Voice modes, however the device with output powers represented in the table above was tuned down (for SAR Test purposes only) to analyze simultaneous SAR scenarios in the SVLTE condition where LTE is operating at maximum output power in conjunction with a lower CDMA voice level (see Table 10-1).

Per KDB Publication 941225 D01v02:

1. Head SAR was tested with SO55 RC3. SO55 RC1 was not required since the average output power was not more than 0.25 dB than the SO55 RC3 powers.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. TDSO / SO32 FCH+SCH SAR tests were not required since the average output power was not more than 0.25 dB higher than the TDSO / SO32 FCH only powers.
3. CDMA 1x-RTT SAR was required to be evaluated for Hotspot exposure conditions to support simultaneous transmission capabilities.



Figure 10-2
Power Measurement Setup

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11 SYSTEM VERIFICATION

11.1 Tissue Verification

Table 11-1
Measured Tissue Properties - Head

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
12/30/2013	750H	20.2	740	0.897	40.798	0.893	41.994	0.45%	-2.85%
			755	0.912	40.608	0.894	41.916	2.01%	-3.12%
			770	0.925	40.351	0.895	41.838	3.35%	-3.55%
			785	0.940	40.149	0.896	41.760	4.91%	-3.86%
12/30/2013	835H	21.9	820	0.894	41.519	0.899	41.578	-0.56%	-0.14%
			835	0.909	41.335	0.900	41.500	1.00%	-0.40%
			850	0.924	41.172	0.916	41.500	0.87%	-0.79%
12/31/2013	835H	22.7	820	0.882	40.409	0.899	41.578	-1.89%	-2.81%
			835	0.894	40.197	0.900	41.500	-0.67%	-3.14%
			850	0.909	40.016	0.916	41.500	-0.76%	-3.58%
12/26/2013	1750H	22.8	1710	1.373	40.613	1.348	40.142	1.85%	1.17%
			1750	1.413	40.355	1.371	40.079	3.06%	0.69%
			1790	1.459	40.204	1.394	40.016	4.66%	0.47%
12/30/2013	1900H	20.8	1850	1.389	39.168	1.400	40.000	-0.79%	-2.08%
			1880	1.422	39.046	1.400	40.000	1.57%	-2.39%
			1910	1.455	38.946	1.400	40.000	3.93%	-2.64%
			1850	1.390	39.428	1.400	40.000	-0.71%	-1.43%
01/20/2014	1900H	21.1	1880	1.426	39.276	1.400	40.000	1.86%	-1.81%
			1910	1.441	39.273	1.400	40.000	2.93%	-1.82%
			2401	1.734	39.038	1.756	39.287	-1.25%	-0.63%
12/23/2013	2450H	22.7	2450	1.790	38.858	1.800	39.200	-0.56%	-0.87%
			2499	1.840	38.688	1.853	39.138	-0.70%	-1.15%
			5200	4.494	36.716	4.655	35.986	-3.46%	2.03%
01/10/2014	5200H-5800H	23.4	5220	4.521	36.658	4.676	35.963	-3.31%	1.93%
			5240	4.548	36.619	4.696	35.940	-3.15%	1.89%
			5280	4.586	36.652	4.737	35.894	-3.19%	2.11%
			5300	4.591	36.609	4.758	35.871	-3.51%	2.06%
			5320	4.617	36.543	4.778	35.849	-3.37%	1.94%
			5500	4.807	36.301	4.963	35.643	-3.14%	1.85%
			5520	4.833	36.307	4.983	35.620	-3.01%	1.93%
			5540	4.855	36.294	5.004	35.597	-2.98%	1.96%
			5600	4.909	36.184	5.065	35.529	-3.08%	1.84%
			5660	4.967	36.155	5.127	35.460	-3.12%	1.96%
			5745	5.077	36.009	5.214	35.363	-2.63%	1.83%
			5765	5.092	36.019	5.234	35.340	-2.71%	1.92%
			5785	5.095	35.993	5.255	35.317	-3.04%	1.91%
			5800	5.110	35.984	5.270	35.300	-3.04%	1.94%

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Table 11-2
Measured Tissue Properties – Body

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
12/26/2013	750B	21.9	740	0.964	54.961	0.963	55.570	0.10%	-1.10%
			755	0.979	54.810	0.964	55.512	1.56%	-1.26%
			770	0.993	54.649	0.965	55.453	2.90%	-1.45%
			785	1.007	54.472	0.966	55.395	4.24%	-1.67%
01/08/2014	835B	21.2	820	0.989	54.182	0.969	55.258	2.06%	-1.95%
			835	1.003	54.041	0.970	55.200	3.40%	-2.10%
			850	1.018	53.917	0.988	55.154	3.04%	-2.24%
01/10/2014	835B	23.0	820	0.999	55.119	0.969	55.258	3.10%	-0.25%
			835	1.014	54.960	0.970	55.200	4.54%	-0.43%
			850	1.030	54.814	0.988	55.154	4.25%	-0.62%
01/23/2014	1750B	23.0	1710	1.449	51.473	1.463	53.537	-0.96%	-3.86%
			1750	1.495	51.218	1.488	53.432	0.47%	-4.14%
			1790	1.541	51.090	1.514	53.326	1.78%	-4.19%
01/09/2014	1900B	22.0	1850	1.522	52.977	1.520	53.300	0.13%	-0.61%
			1880	1.557	52.870	1.520	53.300	2.43%	-0.81%
			1910	1.591	52.779	1.520	53.300	4.67%	-0.98%
12/26/2013	2450B	23.1	2401	1.956	51.984	1.903	52.765	2.79%	-1.48%
			2450	2.028	51.818	1.950	52.700	4.00%	-1.67%
			2499	2.089	51.613	2.019	52.638	3.47%	-1.95%
			5200	5.509	47.132	5.299	49.014	3.96%	-3.84%
01/06/2014	5200B-5800B	22.5	5220	5.511	47.256	5.323	48.987	3.53%	-3.53%
			5240	5.573	47.208	5.346	48.960	4.25%	-3.58%
			5280	5.631	47.308	5.393	48.906	4.41%	-3.27%
			5300	5.622	47.050	5.416	48.879	3.80%	-3.74%
			5320	5.638	47.180	5.439	48.851	3.66%	-3.42%
			5500	5.871	46.873	5.650	48.607	3.91%	-3.57%
			5520	5.892	46.852	5.673	48.580	3.86%	-3.56%
			5540	5.907	46.806	5.696	48.553	3.70%	-3.60%
			5560	5.938	46.846	5.720	48.526	3.81%	-3.46%
			5600	5.988	46.765	5.766	48.471	3.85%	-3.52%
			5660	6.075	46.633	5.837	48.390	4.08%	-3.63%
			5745	6.180	46.422	5.936	48.275	4.11%	-3.84%
			5765	6.216	46.304	5.959	48.248	4.31%	-4.03%
			5785	6.245	46.344	5.982	48.220	4.40%	-3.89%
			5800	6.294	46.218	6.000	48.200	4.90%	-4.11%

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 IEEE 1528 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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12 SAR DATA SUMMARY

12.1 Standalone Head SAR Data

Table 12-1
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	33.5	32.10	-0.04	Right	Cheek	FCC#2	1:8.3	0.179	1.380	0.247	
836.60	190	GSM 850	GSM	33.5	32.10	-0.05	Right	Tilt	FCC#2	1:8.3	0.144	1.380	0.199	
836.60	190	GSM 850	GSM	33.5	32.10	0.09	Left	Cheek	FCC#2	1:8.3	0.220	1.380	0.304	A1
836.60	190	GSM 850	GSM	33.5	32.10	0.08	Left	Tilt	FCC#2	1:8.3	0.160	1.380	0.221	
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 12-2
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	23.5	23.44	0.13	Right	Cheek	FCC#2	1:1	0.196	1.014	0.199	
836.60	4183	UMTS 850	RMC	23.5	23.44	-0.05	Right	Tilt	FCC#2	1:1	0.144	1.014	0.146	
836.60	4183	UMTS 850	RMC	23.5	23.44	-0.02	Left	Cheek	FCC#2	1:1	0.239	1.014	0.242	A2
836.60	4183	UMTS 850	RMC	23.5	23.44	0.00	Left	Tilt	FCC#2	1:1	0.151	1.014	0.153	
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 12-3
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)	
1880.00	661	GSM 1900	GSM	30.5	29.36	0.16	Right	Cheek	FCC#2	1:8.3	0.105	1.300	0.137	
1880.00	661	GSM 1900	GSM	30.5	29.36	-0.13	Right	Tilt	FCC#2	1:8.3	0.075	1.300	0.098	
1880.00	661	GSM 1900	GSM	30.5	29.36	-0.07	Left	Cheek	FCC#2	1:8.3	0.210	1.300	0.273	A3
1880.00	661	GSM 1900	GSM	30.5	29.36	-0.10	Left	Tilt	FCC#2	1:8.3	0.050	1.300	0.065	
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 12-4
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	23.5	23.19	0.20	Right	Cheek	FCC#2	1:1	0.179	1.074	0.192	
1880.00	9400	UMTS 1900	RMC	23.5	23.19	0.00	Right	Tilt	FCC#2	1:1	0.121	1.074	0.130	
1880.00	9400	UMTS 1900	RMC	23.5	23.19	-0.09	Left	Cheek	FCC#2	1:1	0.333	1.074	0.358	A4
1880.00	9400	UMTS 1900	RMC	23.5	23.19	-0.01	Left	Tilt	FCC#2	1:1	0.077	1.074	0.083	
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 12-5
Cell. CDMA Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maxim um Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Num ber	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.52	384	Cell. CDMA	RC3 / SO55	25.0	24.31	0.05	Right	Cheek	FCC#3	1:1	0.245	1.172	0.287	
836.52	384	Cell. CDMA	RC3 / SO55	25.0	24.31	0.00	Right	Tilt	FCC#3	1:1	0.224	1.172	0.263	
836.52	384	Cell. CDMA	RC3 / SO55	25.0	24.31	0.03	Left	Cheek	FCC#3	1:1	0.290	1.172	0.340	A5
836.52	384	Cell. CDMA	RC3 / SO55	25.0	24.31	0.07	Left	Tilt	FCC#3	1:1	0.250	1.172	0.293	
836.52	384	Cell. CDMA	RC3 / SO55	18.5	17.97	0.13	Right	Cheek	FCC#5	1:1	0.053	1.130	0.060	
836.52	384	Cell. CDMA	RC3 / SO55	18.5	17.97	0.15	Right	Tilt	FCC#5	1:1	0.043	1.130	0.049	
836.52	384	Cell. CDMA	RC3 / SO55	18.5	17.97	0.05	Left	Cheek	FCC#5	1:1	0.062	1.130	0.070	
836.52	384	Cell. CDMA	RC3 / SO55	18.5	17.97	0.15	Left	Tilt	FCC#5	1:1	0.042	1.130	0.047	
836.52	384	Cell. CDMA	EVDO Rev. A	25.0	24.01	-0.04	Right	Cheek	FCC#3	1:1	0.218	1.256	0.274	
836.52	384	Cell. CDMA	EVDO Rev. A	25.0	24.01	0.09	Right	Tilt	FCC#3	1:1	0.178	1.256	0.224	
836.52	384	Cell. CDMA	EVDO Rev. A	25.0	24.01	0.09	Left	Cheek	FCC#3	1:1	0.244	1.256	0.306	
836.52	384	Cell. CDMA	EVDO Rev. A	25.0	24.01	0.05	Left	Tilt	FCC#3	1:1	0.176	1.256	0.221	
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 12-6
PCS CDMA 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	600	PCS CDMA	RC3 / SO55	25.0	23.87	-0.02	Right	Cheek	FCC#3	1:1	0.301	1.297	0.390	
1880.00	600	PCS CDMA	RC3 / SO55	25.0	23.87	0.02	Right	Tilt	FCC#3	1:1	0.206	1.297	0.267	
1880.00	600	PCS CDMA	RC3 / SO55	25.0	23.87	-0.16	Left	Cheek	FCC#3	1:1	0.452	1.297	0.586	
1880.00	600	PCS CDMA	RC3 / SO55	25.0	23.87	0.13	Left	Tilt	FCC#3	1:1	0.110	1.297	0.143	
1880.00	600	PCS CDMA	RC3 / SO55	18.5	17.50	-0.03	Right	Cheek	FCC#5	1:1	0.105	1.259	0.132	
1880.00	600	PCS CDMA	RC3 / SO55	18.5	17.50	0.18	Right	Tilt	FCC#5	1:1	0.072	1.259	0.091	
1880.00	600	PCS CDMA	RC3 / SO55	18.5	17.50	-0.02	Left	Cheek	FCC#5	1:1	0.235	1.259	0.296	
1880.00	600	PCS CDMA	RC3 / SO55	18.5	17.50	-0.01	Left	Tilt	FCC#5	1:1	0.045	1.259	0.057	
1880.00	600	PCS CDMA	EVDO Rev. A	25.0	23.71	0.10	Right	Cheek	FCC#3	1:1	0.224	1.346	0.302	
1880.00	600	PCS CDMA	EVDO Rev. A	25.0	23.71	0.00	Right	Tilt	FCC#3	1:1	0.143	1.346	0.192	
1880.00	600	PCS CDMA	EVDO Rev. A	25.0	23.71	0.12	Left	Cheek	FCC#3	1:1	0.522	1.346	0.703	A6
1880.00	600	PCS CDMA	EVDO Rev. A	25.0	23.71	0.11	Left	Tilt	FCC#3	1:1	0.121	1.346	0.163	
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 12-7
LTE Band 13 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.														(W/kg)				
782.00	23230	Mid	LTE Band 13	10	23.5	23.44	0.10	0	Right	Cheek	QPSK	1	0	FCC#3	1:1	0.140	1.014	0.142	A7
782.00	23230	Mid	LTE Band 13	10	22.5	22.18	0.12	1	Right	Cheek	QPSK	25	0	FCC#3	1:1	0.136	1.076	0.146	
782.00	23230	Mid	LTE Band 13	10	23.5	23.44	0.21	0	Right	Tilt	QPSK	1	0	FCC#3	1:1	0.097	1.014	0.098	
782.00	23230	Mid	LTE Band 13	10	22.5	22.18	0.06	1	Right	Tilt	QPSK	25	0	FCC#3	1:1	0.077	1.076	0.083	
782.00	23230	Mid	LTE Band 13	10	23.5	23.44	0.13	0	Left	Cheek	QPSK	1	0	FCC#3	1:1	0.119	1.014	0.121	
782.00	23230	Mid	LTE Band 13	10	22.5	22.18	0.15	1	Left	Cheek	QPSK	25	0	FCC#3	1:1	0.102	1.076	0.110	
782.00	23230	Mid	LTE Band 13	10	23.5	23.44	0.16	0	Left	Tilt	QPSK	1	0	FCC#3	1:1	0.091	1.014	0.092	
782.00	23230	Mid	LTE Band 13	10	22.5	22.18	0.18	1	Left	Tilt	QPSK	25	0	FCC#3	1:1	0.076	1.076	0.082	
782.00	23230	Mid	LTE Band 13	10	19.5	19.43	0.00	0	Right	Cheek	QPSK	1	0	FCC#4	1:1	0.035	1.016	0.036	
782.00	23230	Mid	LTE Band 13	10	19.5	19.29	0.20	0	Right	Cheek	QPSK	25	0	FCC#4	1:1	0.038	1.050	0.040	
782.00	23230	Mid	LTE Band 13	10	19.5	19.43	0.19	0	Right	Tilt	QPSK	1	0	FCC#4	1:1	0.022	1.016	0.022	
782.00	23230	Mid	LTE Band 13	10	19.5	19.29	0.15	0	Right	Tilt	QPSK	25	0	FCC#4	1:1	0.024	1.050	0.025	
782.00	23230	Mid	LTE Band 13	10	19.5	19.43	0.18	0	Left	Cheek	QPSK	1	0	FCC#4	1:1	0.026	1.016	0.026	
782.00	23230	Mid	LTE Band 13	10	19.5	19.29	0.17	0	Left	Cheek	QPSK	25	0	FCC#4	1:1	0.030	1.050	0.032	
782.00	23230	Mid	LTE Band 13	10	19.5	19.43	0.21	0	Left	Tilt	QPSK	1	0	FCC#4	1:1	0.019	1.016	0.019	
782.00	23230	Mid	LTE Band 13	10	19.5	19.29	-0.05	0	Left	Tilt	QPSK	25	0	FCC#4	1:1	0.021	1.050	0.022	
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 12-8
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.														(W/kg)				
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.05	0.00	0	Right	Cheek	QPSK	1	50	FCC#2	1:1	0.074	1.109	0.082	A8
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.79	0.11	1	Right	Cheek	QPSK	50	0	FCC#2	1:1	0.059	1.178	0.070	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.05	0.15	0	Right	Tilt	QPSK	1	50	FCC#2	1:1	0.025	1.109	0.028	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.79	0.19	1	Right	Tilt	QPSK	50	0	FCC#2	1:1	0.018	1.178	0.021	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.05	-0.21	0	Left	Cheek	QPSK	1	50	FCC#2	1:1	0.073	1.109	0.081	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.79	0.03	1	Left	Cheek	QPSK	50	0	FCC#2	1:1	0.056	1.178	0.066	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.05	0.11	0	Left	Tilt	QPSK	1	50	FCC#2	1:1	0.029	1.109	0.032	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.79	0.16	1	Left	Tilt	QPSK	50	0	FCC#2	1:1	0.023	1.178	0.027	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	18.99	0.08	0	Right	Cheek	QPSK	1	99	FCC#4	1:1	0.032	1.125	0.036	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.00	-0.04	0	Right	Cheek	QPSK	50	0	FCC#4	1:1	0.037	1.122	0.042	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	18.99	0.06	0	Right	Tilt	QPSK	1	99	FCC#4	1:1	0.007	1.125	0.008	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.00	0.12	0	Right	Tilt	QPSK	50	0	FCC#4	1:1	0.009	1.122	0.010	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	18.99	0.00	0	Left	Cheek	QPSK	1	99	FCC#4	1:1	0.036	1.125	0.041	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.00	0.08	0	Left	Cheek	QPSK	50	0	FCC#4	1:1	0.041	1.122	0.046	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	18.99	0.07	0	Left	Tilt	QPSK	1	99	FCC#4	1:1	0.006	1.125	0.007	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.00	0.13	0	Left	Tilt	QPSK	50	0	FCC#4	1:1	0.010	1.122	0.011	
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 12-9
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) (W/kg)	Plot #
MHz	Ch.											(W/kg)			
2437	6	IEEE 802.11b	DSSS	17.5	16.63	0.21	Right	Cheek	FCC#6	1	1:1	0.073	1.222	0.089	
2437	6	IEEE 802.11b	DSSS	17.5	16.63	0.19	Right	Tilt	FCC#6	1	1:1	0.065	1.222	0.079	
2437	6	IEEE 802.11b	DSSS	17.5	16.63	0.05	Left	Cheek	FCC#6	1	1:1	0.170	1.222	0.208	A9
2437	6	IEEE 802.11b	DSSS	17.5	16.63	0.19	Left	Tilt	FCC#6	1	1:1	0.059	1.222	0.072	
5745	149	IEEE 802.11a	OFDM	14.5	13.15	0.12	Right	Cheek	FCC#10	6	1:1	0.045	1.365	0.061	
5745	149	IEEE 802.11a	OFDM	14.5	13.15	-0.05	Right	Tilt	FCC#10	6	1:1	0.045	1.365	0.061	
5745	149	IEEE 802.11a	OFDM	14.5	13.15	0.20	Left	Cheek	FCC#10	6	1:1	0.256	1.365	0.349	A10
5775	155	IEEE 802.11ac	OFDM	12.5	12.09	0.04	Left	Cheek	FCC#10	29.3	1:1	0.068	1.099	0.075	
5745	149	IEEE 802.11a	OFDM	14.5	13.15	0.15	Left	Tilt	FCC#10	6	1:1	0.048	1.365	0.066	
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 12-10
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	14.5	13.95	0.18	Right	Cheek	FCC#10	6	1:1	0.014	1.135	0.016	
5240	48	IEEE 802.11a	OFDM	14.5	13.95	0.04	Right	Tilt	FCC#10	6	1:1	0.014	1.135	0.016	
5240	48	IEEE 802.11a	OFDM	14.5	13.95	-0.20	Left	Cheek	FCC#10	6	1:1	0.076	1.135	0.086	
5210	42	IEEE 802.11ac	OFDM	12.5	12.11	-0.13	Left	Cheek	FCC#10	29.3	1:1	0.007	1.094	0.008	
5240	48	IEEE 802.11a	OFDM	14.5	13.95	-0.21	Left	Tilt	FCC#10	6	1:1	0.025	1.135	0.028	
5320	64	IEEE 802.11a	OFDM	14.5	14.29	0.16	Right	Cheek	FCC#10	6	1:1	0.026	1.050	0.027	
5320	64	IEEE 802.11a	OFDM	14.5	14.29	0.11	Right	Tilt	FCC#10	6	1:1	0.025	1.050	0.026	
5320	64	IEEE 802.11a	OFDM	14.5	14.29	0.17	Left	Cheek	FCC#10	6	1:1	0.083	1.050	0.087	
5290	58	IEEE 802.11ac	OFDM	12.5	12.16	0.16	Left	Cheek	FCC#10	29.3	1:1	0.002	1.081	0.002	
5320	64	IEEE 802.11a	OFDM	14.5	14.29	-0.04	Left	Tilt	FCC#10	6	1:1	0.038	1.050	0.040	
5660	132	IEEE 802.11a	OFDM	14.5	14.17	-0.14	Right	Cheek	FCC#10	6	1:1	0.047	1.079	0.051	
5660	132	IEEE 802.11a	OFDM	14.5	14.17	-0.19	Right	Tilt	FCC#10	6	1:1	0.052	1.079	0.056	
5660	132	IEEE 802.11a	OFDM	14.5	14.17	0.18	Left	Cheek	FCC#10	6	1:1	0.226	1.079	0.244	A11
5530	106	IEEE 802.11ac	OFDM	12.5	12.09	0.15	Left	Cheek	FCC#10	29.3	1:1	0.028	1.099	0.031	
5660	132	IEEE 802.11a	OFDM	14.5	14.17	0.18	Left	Tilt	FCC#10	6	1:1	0.051	1.079	0.055	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

12.2 Standalone Body-Worn SAR Data

Table 12-11
GSM/UMTS Body-Worn SAR Data

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.5	32.10	0.00	10 mm	FCC#1	1:8.3	back	0.444	1.380	0.613	A12
836.60	4183	UMTS 850	RMC	23.5	23.44	-0.03	10 mm	FCC#1	1:1	back	0.407	1.014	0.413	A14
1880.00	661	GSM 1900	GSM	30.5	29.36	0.04	10 mm	FCC#2	1:8.3	back	0.161	1.300	0.209	A16
1880.00	9400	UMTS 1900	RMC	23.5	23.19	0.14	10 mm	FCC#2	1:1	back	0.269	1.074	0.289	A18
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 12-12
CDMA Body-Worn SAR Data

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.52	384	Cell. CDMA	TDSD / SO32	25.0	24.25	-0.05	10 mm	FCC#3	1:1	back	0.555	1.189	0.660	A20
836.52	384	Cell. CDMA	TDSD / SO32	18.5	18.05	0.09	10 mm	FCC#5	1:1	back	0.116	1.109	0.129	
1851.25	25	PCS CDMA	TDSD / SO32	25.0	23.89	-0.03	10 mm	FCC#3	1:1	back	0.559	1.291	0.722	
1880.00	600	PCS CDMA	TDSD / SO32	25.0	23.94	-0.01	10 mm	FCC#3	1:1	back	0.650	1.276	0.829	A21
1908.75	1175	PCS CDMA	TDSD / SO32	25.0	23.66	0.02	10 mm	FCC#3	1:1	back	0.553	1.361	0.753	
1880.00	600	PCS CDMA	TDSD / SO32	18.5	17.90	-0.04	10 mm	FCC#5	1:1	back	0.159	1.148	0.183	
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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Table 12-13
LTE Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
782.00	23230	Mid	LTE Band 13	10	23.5	23.44	0.07	0	FCC#2	QPSK	1	0	10 mm	back	1:1	0.158	1.014	0.160	A22
782.00	23230	Mid	LTE Band 13	10	22.5	22.18	0.04	1	FCC#2	QPSK	25	0	10 mm	back	1:1	0.131	1.076	0.141	
782.00	23230	Mid	LTE Band 13	10	19.5	19.43	0.21	0	FCC#4	QPSK	1	0	10 mm	back	1:1	0.038	1.016	0.039	
782.00	23230	Mid	LTE Band 13	10	19.5	19.29	0.16	0	FCC#4	QPSK	25	0	10 mm	back	1:1	0.033	1.050	0.035	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.05	-0.08	0	FCC#2	QPSK	1	50	10 mm	back	1:1	0.259	1.109	0.287	A24
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.79	0.03	1	FCC#2	QPSK	50	0	10 mm	back	1:1	0.197	1.178	0.232	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	18.99	0.02	0	FCC#4	QPSK	1	99	10 mm	back	1:1	0.098	1.125	0.110	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.00	-0.02	0	FCC#4	QPSK	50	0	10 mm	back	1:1	0.100	1.122	0.112	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak										Body 1.6 W/kg (mW/g) averaged over 1 gram									
Uncontrolled Exposure/General Population																			

Table 12-14
DTS Body-Worn 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)	
2437	6	IEEE 802.11b	DSSS	17.5	16.63	0.11	10 mm	FCC#6	1	back	1:1	0.117	1.222	0.143	A25
5745	149	IEEE 802.11a	OFDM	14.5	13.15	-0.17	10 mm	FCC#10	6	back	1:1	0.232	1.365	0.317	A26
5775	155	IEEE 802.11ac	OFDM	12.5	12.09	0.21	10 mm	FCC#10	29.3	back	1:1	0.206	1.099	0.226	
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 12-15
NII Body-Worn 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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.														
5240	48	IEEE 802.11a	OFDM	14.5	13.95	0.06	10 mm	FCC#10	6	back	1:1	0.152	1.135	0.173	
5210	42	IEEE 802.11ac	OFDM	12.5	12.11	0.12	10 mm	FCC#10	29.3	back	1:1	0.028	1.094	0.031	
5320	64	IEEE 802.11a	OFDM	14.5	14.29	-0.19	10 mm	FCC#10	6	back	1:1	0.200	1.050	0.210	
5290	58	IEEE 802.11ac	OFDM	12.5	12.16	0.16	10 mm	FCC#10	29.3	back	1:1	0.018	1.081	0.019	
5520	104	IEEE 802.11a	OFDM	14.5	13.88	0.13	10 mm	FCC#10	6	back	1:1	0.394	1.153	0.454	
5560	112	IEEE 802.11a	OFDM	14.5	13.80	-0.16	10 mm	FCC#10	6	back	1:1	0.421	1.175	0.495	
5660	132	IEEE 802.11a	OFDM	14.5	14.17	-0.05	10 mm	FCC#10	6	back	1:1	0.508	1.079	0.548	A27
5530	106	IEEE 802.11ac	OFDM	12.5	12.09	0.09	10 mm	FCC#10	29.3	back	1:1	0.081	1.099	0.089	
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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12.3 Standalone Wireless Router SAR Data

Table 12-16
GPRS/UMTS Hotspot 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)	
824.20	128	GSM 850	GPRS	29.5	28.97	-0.01	10 mm	FCC#1	4	1:2.076	back	0.753	1.130	0.851	
836.60	190	GSM 850	GPRS	29.5	29.21	0.04	10 mm	FCC#1	4	1:2.076	back	0.823	1.069	0.880	
848.80	251	GSM 850	GPRS	29.5	29.17	0.16	10 mm	FCC#1	4	1:2.076	back	0.869	1.079	0.938	
836.60	190	GSM 850	GPRS	29.5	29.21	0.02	10 mm	FCC#1	4	1:2.076	front	0.541	1.069	0.578	
836.60	190	GSM 850	GPRS	29.5	29.21	0.03	10 mm	FCC#1	4	1:2.076	bottom	0.417	1.069	0.446	
824.20	128	GSM 850	GPRS	29.5	28.97	-0.08	10 mm	FCC#1	4	1:2.076	left	0.558	1.130	0.631	
836.60	190	GSM 850	GPRS	29.5	29.21	0.08	10 mm	FCC#1	4	1:2.076	left	0.792	1.069	0.847	
848.80	251	GSM 850	GPRS	29.5	29.17	-0.07	10 mm	FCC#1	4	1:2.076	left	0.934	1.079	1.008	A13
848.80	251	GSM 850	GPRS	29.5	29.17	-0.04	10 mm	FCC#1	4	1:2.076	left	0.932	1.079	1.006	
836.60	4183	UMTS 850	RMC	23.5	23.44	-0.03	10 mm	FCC#1	N/A	1:1	back	0.407	1.014	0.413	
836.60	4183	UMTS 850	RMC	23.5	23.44	0.01	10 mm	FCC#1	N/A	1:1	front	0.254	1.014	0.258	
836.60	4183	UMTS 850	RMC	23.5	23.44	-0.03	10 mm	FCC#1	N/A	1:1	bottom	0.156	1.014	0.158	
836.60	4183	UMTS 850	RMC	23.5	23.44	-0.04	10 mm	FCC#1	N/A	1:1	left	0.489	1.014	0.496	A15
1880.00	661	GSM 1900	GPRS	28.0	27.84	-0.12	10 mm	FCC#2	3	1:2.76	back	0.278	1.038	0.289	A17
1880.00	661	GSM 1900	GPRS	28.0	27.84	-0.01	10 mm	FCC#2	3	1:2.76	front	0.223	1.038	0.231	
1880.00	661	GSM 1900	GPRS	28.0	27.84	0.05	10 mm	FCC#2	3	1:2.76	bottom	0.254	1.038	0.264	
1880.00	661	GSM 1900	GPRS	28.0	27.84	0.03	10 mm	FCC#2	3	1:2.76	left	0.219	1.038	0.227	
1880.00	9400	UMTS 1900	RMC	23.5	23.19	0.14	10 mm	FCC#2	N/A	1:1	back	0.269	1.074	0.289	
1880.00	9400	UMTS 1900	RMC	23.5	23.19	0.12	10 mm	FCC#2	N/A	1:1	front	0.213	1.074	0.229	
1880.00	9400	UMTS 1900	RMC	23.5	23.19	-0.03	10 mm	FCC#2	N/A	1:1	bottom	0.317	1.074	0.340	A19
1880.00	9400	UMTS 1900	RMC	23.5	23.19	0.06	10 mm	FCC#2	N/A	1:1	left	0.168	1.074	0.180	
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: Blue entry represents variability test data.

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Table 12-17
CDMA/EVDO Hotspot SAR Data

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.52	384	Cell. CDMA	TDSO / SO32	25.0	24.25	-0.05	10 mm	FCC#3	1:1	back	0.555	1.189	0.660	A20
836.52	384	Cell. CDMA	TDSO / SO32	25.0	24.25	-0.03	10 mm	FCC#3	1:1	front	0.380	1.189	0.452	
836.52	384	Cell. CDMA	TDSO / SO32	25.0	24.25	-0.06	10 mm	FCC#3	1:1	bottom	0.250	1.189	0.297	
836.52	384	Cell. CDMA	TDSO / SO32	25.0	24.25	0.00	10 mm	FCC#3	1:1	left	0.442	1.189	0.526	
836.52	384	Cell. CDMA	TDSO / SO32	18.5	18.05	0.09	10 mm	FCC#5	1:1	back	0.116	1.109	0.129	
836.52	384	Cell. CDMA	TDSO / SO32	18.5	18.05	-0.01	10 mm	FCC#5	1:1	front	0.080	1.109	0.089	
836.52	384	Cell. CDMA	TDSO / SO32	18.5	18.05	-0.02	10 mm	FCC#5	1:1	bottom	0.060	1.109	0.067	
836.52	384	Cell. CDMA	TDSO / SO32	18.5	18.05	0.09	10 mm	FCC#5	1:1	left	0.105	1.109	0.116	
836.52	384	Cell. CDMA	EVDO Rev. 0	25.0	24.14	-0.06	10 mm	FCC#3	1:1	back	0.525	1.219	0.640	
836.52	384	Cell. CDMA	EVDO Rev. 0	25.0	24.14	-0.05	10 mm	FCC#3	1:1	front	0.346	1.219	0.422	
836.52	384	Cell. CDMA	EVDO Rev. 0	25.0	24.14	-0.02	10 mm	FCC#3	1:1	bottom	0.223	1.219	0.272	
836.52	384	Cell. CDMA	EVDO Rev. 0	25.0	24.14	0.03	10 mm	FCC#3	1:1	left	0.425	1.219	0.518	
1851.25	25	PCS CDMA	TDSO / SO32	25.0	23.89	-0.03	10 mm	FCC#3	1:1	back	0.559	1.291	0.722	
1880.00	600	PCS CDMA	TDSO / SO32	25.0	23.94	-0.01	10 mm	FCC#3	1:1	back	0.650	1.276	0.829	A21
1908.75	1175	PCS CDMA	TDSO / SO32	25.0	23.66	0.02	10 mm	FCC#3	1:1	back	0.553	1.361	0.753	
1851.25	25	PCS CDMA	TDSO / SO32	25.0	23.89	0.00	10 mm	FCC#3	1:1	front	0.531	1.291	0.686	
1880.00	600	PCS CDMA	TDSO / SO32	25.0	23.94	-0.01	10 mm	FCC#3	1:1	front	0.650	1.276	0.829	
1908.75	1175	PCS CDMA	TDSO / SO32	25.0	23.66	0.12	10 mm	FCC#3	1:1	front	0.564	1.361	0.768	
1880.00	600	PCS CDMA	TDSO / SO32	25.0	23.94	0.00	10 mm	FCC#3	1:1	bottom	0.457	1.276	0.583	
1880.00	600	PCS CDMA	TDSO / SO32	25.0	23.94	0.08	10 mm	FCC#3	1:1	left	0.477	1.276	0.609	
1880.00	600	PCS CDMA	TDSO / SO32	18.5	17.90	-0.04	10 mm	FCC#5	1:1	back	0.159	1.148	0.183	
1880.00	600	PCS CDMA	TDSO / SO32	18.5	17.90	0.02	10 mm	FCC#5	1:1	front	0.153	1.148	0.176	
1880.00	600	PCS CDMA	TDSO / SO32	18.5	17.90	-0.05	10 mm	FCC#5	1:1	bottom	0.102	1.148	0.117	
1880.00	600	PCS CDMA	TDSO / SO32	18.5	17.90	-0.04	10 mm	FCC#5	1:1	left	0.115	1.148	0.132	
1880.00	600	PCS CDMA	EVDO Rev. 0	25.0	23.72	0.12	10 mm	FCC#3	1:1	back	0.559	1.343	0.751	
1880.00	600	PCS CDMA	EVDO Rev. 0	25.0	23.72	-0.01	10 mm	FCC#3	1:1	front	0.579	1.343	0.778	
1880.00	600	PCS CDMA	EVDO Rev. 0	25.0	23.72	-0.06	10 mm	FCC#3	1:1	bottom	0.416	1.343	0.559	
1880.00	600	PCS CDMA	EVDO Rev. 0	25.0	23.72	-0.20	10 mm	FCC#3	1:1	left	0.410	1.343	0.551	
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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Table 12-18
LTE Band 13 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
782.00	23230	Mid	LTE Band 13	10	23.5	23.44	0.07	0	FCC#2	QPSK	1	0	10 mm	back	1:1	0.158	1.014	0.160	
782.00	23230	Mid	LTE Band 13	10	22.5	22.18	0.04	1	FCC#2	QPSK	25	0	10 mm	back	1:1	0.131	1.076	0.141	
782.00	23230	Mid	LTE Band 13	10	23.5	23.44	0.04	0	FCC#2	QPSK	1	0	10 mm	front	1:1	0.144	1.014	0.146	
782.00	23230	Mid	LTE Band 13	10	22.5	22.18	-0.04	1	FCC#2	QPSK	25	0	10 mm	front	1:1	0.119	1.076	0.128	
782.00	23230	Mid	LTE Band 13	10	23.5	23.44	0.03	0	FCC#2	QPSK	1	0	10 mm	bottom	1:1	0.140	1.014	0.142	
782.00	23230	Mid	LTE Band 13	10	22.5	22.18	0.03	1	FCC#2	QPSK	25	0	10 mm	bottom	1:1	0.121	1.076	0.130	
782.00	23230	Mid	LTE Band 13	10	23.5	23.44	-0.02	0	FCC#2	QPSK	1	0	10 mm	right	1:1	0.221	1.014	0.224	A23
782.00	23230	Mid	LTE Band 13	10	22.5	22.18	0.05	1	FCC#2	QPSK	25	0	10 mm	right	1:1	0.186	1.076	0.200	
782.00	23230	Mid	LTE Band 13	10	19.5	19.43	0.21	0	FCC#4	QPSK	1	0	10 mm	back	1:1	0.038	1.016	0.039	
782.00	23230	Mid	LTE Band 13	10	19.5	19.29	0.16	0	FCC#4	QPSK	25	0	10 mm	back	1:1	0.033	1.050	0.035	
782.00	23230	Mid	LTE Band 13	10	19.5	19.43	0.16	0	FCC#4	QPSK	1	0	10 mm	front	1:1	0.037	1.016	0.038	
782.00	23230	Mid	LTE Band 13	10	19.5	19.29	0.05	0	FCC#4	QPSK	25	0	10 mm	front	1:1	0.031	1.050	0.033	
782.00	23230	Mid	LTE Band 13	10	19.5	19.43	0.13	0	FCC#4	QPSK	1	0	10 mm	bottom	1:1	0.044	1.016	0.045	
782.00	23230	Mid	LTE Band 13	10	19.5	19.29	0.08	0	FCC#4	QPSK	25	0	10 mm	bottom	1:1	0.037	1.050	0.039	
782.00	23230	Mid	LTE Band 13	10	19.5	19.43	0.01	0	FCC#4	QPSK	1	0	10 mm	right	1:1	0.051	1.016	0.052	
782.00	23230	Mid	LTE Band 13	10	19.5	19.29	-0.07	0	FCC#4	QPSK	25	0	10 mm	right	1:1	0.044	1.050	0.046	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak								Body 1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

Table 12-19
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.05	-0.08	0	FCC#2	QPSK	1	50	10 mm	back	1:1	0.259	1.109	0.287	A24
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.79	0.03	1	FCC#2	QPSK	50	0	10 mm	back	1:1	0.197	1.178	0.232	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.05	0.02	0	FCC#2	QPSK	1	50	10 mm	front	1:1	0.210	1.109	0.233	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.79	0.08	1	FCC#2	QPSK	50	0	10 mm	front	1:1	0.160	1.178	0.188	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.05	-0.01	0	FCC#2	QPSK	1	50	10 mm	bottom	1:1	0.246	1.109	0.273	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.79	-0.10	1	FCC#2	QPSK	50	0	10 mm	bottom	1:1	0.187	1.178	0.220	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	23.05	-0.08	0	FCC#2	QPSK	1	50	10 mm	right	1:1	0.120	1.109	0.133	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.79	-0.01	1	FCC#2	QPSK	50	0	10 mm	right	1:1	0.091	1.178	0.107	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	18.99	0.02	0	FCC#4	QPSK	1	99	10 mm	back	1:1	0.098	1.125	0.110	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.00	-0.02	0	FCC#4	QPSK	50	0	10 mm	back	1:1	0.100	1.122	0.112	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	18.99	0.21	0	FCC#4	QPSK	1	99	10 mm	front	1:1	0.099	1.125	0.111	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.00	0.04	0	FCC#4	QPSK	50	0	10 mm	front	1:1	0.104	1.122	0.117	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	18.99	0.07	0	FCC#4	QPSK	1	99	10 mm	bottom	1:1	0.095	1.125	0.107	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.00	0.06	0	FCC#4	QPSK	50	0	10 mm	bottom	1:1	0.092	1.122	0.103	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	18.99	0.03	0	FCC#4	QPSK	1	99	10 mm	right	1:1	0.051	1.125	0.057	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.00	0.12	0	FCC#4	QPSK	50	0	10 mm	right	1:1	0.052	1.122	0.058	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

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Table 12-20
WLAN Hotspot 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)	
2437	6	IEEE 802.11b	DSSS	17.5	16.63	0.11	10 mm	FCC#6	1	back	1:1	0.117	1.222	0.143	A25
2437	6	IEEE 802.11b	DSSS	17.5	16.63	0.10	10 mm	FCC#6	1	front	1:1	0.039	1.222	0.048	
2437	6	IEEE 802.11b	DSSS	17.5	16.63	0.01	10 mm	FCC#6	1	top	1:1	0.035	1.222	0.043	
2437	6	IEEE 802.11b	DSSS	17.5	16.63	-0.02	10 mm	FCC#6	1	right	1:1	0.076	1.222	0.093	
5745	149	IEEE 802.11a	OFDM	14.5	13.15	-0.17	10 mm	FCC#10	6	back	1:1	0.232	1.365	0.317	A26
5775	155	IEEE 802.11ac	OFDM	12.5	12.09	0.21	10 mm	FCC#10	29.3	back	1:1	0.206	1.099	0.226	
5745	149	IEEE 802.11a	OFDM	14.5	13.15	-0.16	10 mm	FCC#10	6	front	1:1	0.027	1.365	0.037	
5745	149	IEEE 802.11a	OFDM	14.5	13.15	-0.07	10 mm	FCC#10	6	top	1:1	0.011	1.365	0.015	
5745	149	IEEE 802.11a	OFDM	14.5	13.15	0.08	10 mm	FCC#10	6	right	1:1	0.125	1.365	0.171	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram								

12.4 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 and FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements. A specialized battery with NFC antenna was used for all 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. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB Publication 648474 D04v01, SAR was evaluated without a headset connected to the device. Since the standalone reported SAR was ≤ 1.2 W/kg, no additional SAR evaluations using a headset cable were required.
8. Per FCC KDB 865664 D01 v01, variability SAR tests were performed when the measured 1 gram SAR results for a frequency band were greater than 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 14 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).

GSM Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. Per October 2013 TCB Workshop notes, the source-based frame-averaged output power was evaluated for all GPRS slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot 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.

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- 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.

CDMA Notes:

- Head SAR for CDMA2000 mode was tested under RC3/SO55 per FCC KDB Publication 941225 D01v02.
- Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH only. EVDO and TDSO / SO32 FCH+SCH SAR tests were not required since the average output power was not more than 0.25 dB higher than the TDSO / SO32 FCH only powers, per FCC KDB Publication 941225 D01v02.
- CDMA Wireless Router SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 according to KDB 941225 D01 procedures for data devices. Since the average output power of Subtype 2 for Rev. A is less than the Rev. 0 power levels, then EVDO Rev. A SAR is not required.
- Head SAR was additionally evaluated using EVDO Rev. A to determine compliance for VoIP operations.
- 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.
- CDMA 1x-RTT SAR was required to be evaluated for Hotspot exposure conditions to support simultaneous transmission capabilities.

UMTS Notes:

- UMTS mode in Body 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.
- 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.

LTE Notes:

- LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r01. The general test procedures used for testing can be found in Section 8.5.4.
- MPR is implemented for this device by the manufacturer when the device is operating at maximum power. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
- A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

WLAN Notes:

- 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.

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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 20 MHz and 40 MHz bandwidths) 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. Per April 2013 TCB Workshop notes, full SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
4. This device only supports Hotspot for 2.4 GHz and 5.8 GHz bands. Therefore all other bands were not evaluated for Hotspot SAR conditions.
5. WIFI transmission was verified using an uncalibrated spectrum analyzer.
6. 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 is required.

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13 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

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

13.2 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, 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 13-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2441	9.50	10	0.187

Note: Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

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Head SAR Simultaneous Transmission Analysis

Table 13-2
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	0.247	0.089	0.336	Head SAR	Right Cheek	0.199	0.089	0.288
	Right Tilt	0.199	0.079	0.278		Right Tilt	0.146	0.079	0.225
	Left Cheek	0.304	0.208	0.512		Left Cheek	0.242	0.208	0.450
	Left Tilt	0.221	0.072	0.293		Left Tilt	0.153	0.072	0.225
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	0.137	0.089	0.226	Head SAR	Right Cheek	0.192	0.089	0.281
	Right Tilt	0.098	0.079	0.177		Right Tilt	0.130	0.079	0.209
	Left Cheek	0.273	0.208	0.481		Left Cheek	0.358	0.208	0.566
	Left Tilt	0.065	0.072	0.137		Left Tilt	0.083	0.072	0.155
Simult Tx	Configuration	Cell. CDMA SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS CDMA SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.287	0.089	0.376	Head SAR	Right Cheek	0.390	0.089	0.479
	Right Tilt	0.263	0.079	0.342		Right Tilt	0.267	0.079	0.346
	Left Cheek	0.340	0.208	0.548		Left Cheek	0.586	0.208	0.794
	Left Tilt	0.293	0.072	0.365		Left Tilt	0.143	0.072	0.215
Simult Tx	Configuration	Cell. EVDO SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.274	0.089	0.363	Head SAR	Right Cheek	0.302	0.089	0.391
	Right Tilt	0.224	0.079	0.303		Right Tilt	0.192	0.079	0.271
	Left Cheek	0.306	0.208	0.514		Left Cheek	0.703	0.208	0.911
	Left Tilt	0.221	0.072	0.293		Left Tilt	0.163	0.072	0.235
Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.146	0.089	0.235	Head SAR	Right Cheek	0.082	0.089	0.171
	Right Tilt	0.098	0.079	0.177		Right Tilt	0.028	0.079	0.107
	Left Cheek	0.121	0.208	0.329		Left Cheek	0.081	0.208	0.289
	Left Tilt	0.092	0.072	0.164		Left Tilt	0.032	0.072	0.104

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Table 13-3
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	0.247	0.061	0.308	Head SAR	Right Cheek	0.199	0.061	0.260
	Right Tilt	0.199	0.061	0.260		Right Tilt	0.146	0.061	0.207
	Left Cheek	0.304	0.349	0.653		Left Cheek	0.242	0.349	0.591
	Left Tilt	0.221	0.066	0.287		Left Tilt	0.153	0.066	0.219
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	0.137	0.061	0.198	Head SAR	Right Cheek	0.192	0.061	0.253
	Right Tilt	0.098	0.061	0.159		Right Tilt	0.130	0.061	0.191
	Left Cheek	0.273	0.349	0.622		Left Cheek	0.358	0.349	0.707
	Left Tilt	0.065	0.066	0.131		Left Tilt	0.083	0.066	0.149
Simult Tx	Configuration	Cell. CDMA SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS CDMA SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.287	0.061	0.348	Head SAR	Right Cheek	0.390	0.061	0.451
	Right Tilt	0.263	0.061	0.324		Right Tilt	0.267	0.061	0.328
	Left Cheek	0.340	0.349	0.689		Left Cheek	0.586	0.349	0.935
	Left Tilt	0.293	0.066	0.359		Left Tilt	0.143	0.066	0.209
Simult Tx	Configuration	Cell. EVDO SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.274	0.061	0.335	Head SAR	Right Cheek	0.302	0.061	0.363
	Right Tilt	0.224	0.061	0.285		Right Tilt	0.192	0.061	0.253
	Left Cheek	0.306	0.349	0.655		Left Cheek	0.703	0.349	1.052
	Left Tilt	0.221	0.066	0.287		Left Tilt	0.163	0.066	0.229
Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.146	0.061	0.207	Head SAR	Right Cheek	0.082	0.061	0.143
	Right Tilt	0.098	0.061	0.159		Right Tilt	0.028	0.061	0.089
	Left Cheek	0.121	0.349	0.470		Left Cheek	0.081	0.349	0.430
	Left Tilt	0.092	0.066	0.158		Left Tilt	0.032	0.066	0.098

Note: The worst case 5 GHz WLAN reported SAR for each head configuration was used for SAR summation, regardless of whether the WLAN channel has WIFI hotspot capability. Therefore, the summations above represent the absolute worst cases for simultaneous transmission with 5 GHz WLAN.

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13.3 Body-Worn Simultaneous Transmission Analysis

Table 13-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 10 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.613	0.143	0.756
Back Side	UMTS 850	0.413	0.143	0.556
Back Side	GSM 1900	0.209	0.143	0.352
Back Side	UMTS 1900	0.289	0.143	0.432
Back Side	Cell. CDMA	0.660	0.143	0.803
Back Side	PCS CDMA	0.829	0.143	0.972
Back Side	LTE Band 13	0.160	0.143	0.303
Back Side	LTE Band 4 (AWS)	0.287	0.143	0.430

Table 13-5
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 10 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.613	0.548	1.161
Back Side	UMTS 850	0.413	0.548	0.961
Back Side	GSM 1900	0.209	0.548	0.757
Back Side	UMTS 1900	0.289	0.548	0.837
Back Side	Cell. CDMA	0.660	0.548	1.208
Back Side	PCS CDMA	0.829	0.548	1.377
Back Side	LTE Band 13	0.160	0.548	0.708
Back Side	LTE Band 4 (AWS)	0.287	0.548	0.835

Note: The worst case 5 GHz WLAN reported SAR for each body-worn configuration was used for SAR summation, regardless of whether the WLAN channel has WIFI hotspot capability. Therefore, the summations above represent the absolute worst cases for simultaneous transmission with 5 GHz WLAN.

Table 13-6
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 10 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.613	0.187	0.800
Back Side	UMTS 850	0.413	0.187	0.600
Back Side	GSM 1900	0.209	0.187	0.396
Back Side	UMTS 1900	0.289	0.187	0.476
Back Side	Cell. CDMA	0.660	0.187	0.847
Back Side	PCS CDMA	0.829	0.187	1.016
Back Side	LTE Band 13	0.160	0.187	0.347
Back Side	LTE Band 4 (AWS)	0.287	0.187	0.474

Note: Bluetooth SAR was not required to be measured per FCC KDB 447498. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

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13.4 Hotspot SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06v01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR (“-”).

Table 13-7
Simultaneous Transmission Scenario (2.4 GHz Hotspot at 10 mm)

Simult Tx	Configuration	GPRS 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)
Body SAR	Back	0.938	0.143	1.081	Body SAR	Back	0.413	0.143	0.556
	Front	0.578	0.048	0.626		Front	0.258	0.048	0.306
	Top	-	0.043	0.043		Top	-	0.043	0.043
	Bottom	0.446	-	0.446		Bottom	0.158	-	0.158
	Right	-	0.093	0.093		Right	-	0.093	0.093
	Left	1.008	-	1.008		Left	0.496	-	0.496
Simult Tx	Configuration	GPRS 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)
Body SAR	Back	0.289	0.143	0.432	Body SAR	Back	0.289	0.143	0.432
	Front	0.231	0.048	0.279		Front	0.229	0.048	0.277
	Top	-	0.043	0.043		Top	-	0.043	0.043
	Bottom	0.264	-	0.264		Bottom	0.340	-	0.340
	Right	-	0.093	0.093		Right	-	0.093	0.093
	Left	0.227	-	0.227		Left	0.180	-	0.180
Simult Tx	Configuration	Cell. EVDO SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.640	0.143	0.783	Body SAR	Back	0.751	0.143	0.894
	Front	0.422	0.048	0.470		Front	0.778	0.048	0.826
	Top	-	0.043	0.043		Top	-	0.043	0.043
	Bottom	0.272	-	0.272		Bottom	0.559	-	0.559
	Right	-	0.093	0.093		Right	-	0.093	0.093
	Left	0.518	-	0.518		Left	0.551	-	0.551
Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.160	0.143	0.303	Body SAR	Back	0.287	0.143	0.430
	Front	0.146	0.048	0.194		Front	0.233	0.048	0.281
	Top	-	0.043	0.043		Top	-	0.043	0.043
	Bottom	0.142	-	0.142		Bottom	0.273	-	0.273
	Right	0.224	0.093	0.317		Right	0.133	0.093	0.226
	Left	-	-	0.000		Left	-	-	0.000

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Table 13-8
Simultaneous Transmission Scenario (5.8 GHz Wireless Router at 10 mm)

Simult Tx	Configuration	GPRS 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	0.938	0.317	1.255	Body SAR	Back	0.413	0.317	0.730
	Front	0.578	0.037	0.615		Front	0.258	0.037	0.295
	Top	-	0.015	0.015		Top	-	0.015	0.015
	Bottom	0.446	-	0.446		Bottom	0.158	-	0.158
	Right	-	0.171	0.171		Right	-	0.171	0.171
	Left	1.008	-	1.008		Left	0.496	-	0.496
Simult Tx	Configuration	GPRS 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	0.289	0.317	0.606	Body SAR	Back	0.289	0.317	0.606
	Front	0.231	0.037	0.268		Front	0.229	0.037	0.266
	Top	-	0.015	0.015		Top	-	0.015	0.015
	Bottom	0.264	-	0.264		Bottom	0.340	-	0.340
	Right	-	0.171	0.171		Right	-	0.171	0.171
	Left	0.227	-	0.227		Left	0.180	-	0.180
Simult Tx	Configuration	Cell. EVDO SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	PCS EVDO SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.640	0.317	0.957	Body SAR	Back	0.751	0.317	1.068
	Front	0.422	0.037	0.459		Front	0.778	0.037	0.815
	Top	-	0.015	0.015		Top	-	0.015	0.015
	Bottom	0.272	-	0.272		Bottom	0.559	-	0.559
	Right	-	0.171	0.171		Right	-	0.171	0.171
	Left	0.518	-	0.518		Left	0.551	-	0.551
Simult Tx	Configuration	LTE Band 13 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.160	0.317	0.477	Body SAR	Back	0.287	0.317	0.604
	Front	0.146	0.037	0.183		Front	0.233	0.037	0.270
	Top	-	0.015	0.015		Top	-	0.015	0.015
	Bottom	0.142	-	0.142		Bottom	0.273	-	0.273
	Right	0.224	0.171	0.395		Right	0.133	0.171	0.304
	Left	-	-	0.000		Left	-	-	0.000

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13.5 SVLTE Simultaneous Transmission Analysis

Table 13-9
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Held to Ear)

Simult Tx	CDMA Target Power Level (dBm)	Configuration	Cell. CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
		Tx Antenna	1	2	3	1+2	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	17.5		
Head SAR	$P \geq 18$	Right Cheek	0.287	0.040	0.089	0.327	0.416
		Right Tilt	0.263	0.025	0.079	0.288	0.367
		Left Cheek	0.340	0.032	0.208	0.372	0.580
		Left Tilt	0.293	0.022	0.072	0.315	0.387
		Maximum Allowed Power (dBm)	18.5	23.5	17.5		
	$P < 18$	Right Cheek	0.060	0.146	0.089	0.206	0.295
		Right Tilt	0.049	0.098	0.079	0.147	0.226
		Left Cheek	0.070	0.121	0.208	0.191	0.399
		Left Tilt	0.047	0.092	0.072	0.139	0.211

Simult Tx	CDMA Target Power Level (dBm)	Configuration	Cell. CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
		Tx Antenna	1	2	3	1+2	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	17.5		
Head SAR	$P \geq 18$	Right Cheek	0.287	0.042	0.089	0.329	0.418
		Right Tilt	0.263	0.010	0.079	0.273	0.352
		Left Cheek	0.340	0.046	0.208	0.386	0.594
		Left Tilt	0.293	0.011	0.072	0.304	0.376
		Maximum Allowed Power (dBm)	18.5	23.5	17.5		
	$P < 18$	Right Cheek	0.060	0.082	0.089	0.142	0.231
		Right Tilt	0.049	0.028	0.079	0.077	0.156
		Left Cheek	0.070	0.081	0.208	0.151	0.359
		Left Tilt	0.047	0.032	0.072	0.079	0.151

Simult Tx	CDMA Target Power Level (dBm)	Configuration	PCS CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
		Tx Antenna	1	2	3	1+2	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	17.5		
Head SAR	$P \geq 18$	Right Cheek	0.390	0.040	0.089	0.430	0.519
		Right Tilt	0.267	0.025	0.079	0.292	0.371
		Left Cheek	0.586	0.032	0.208	0.618	0.826
		Left Tilt	0.143	0.022	0.072	0.165	0.237
		Maximum Allowed Power (dBm)	18.5	23.5	17.5		
	$P < 18$	Right Cheek	0.132	0.146	0.089	0.278	0.367
		Right Tilt	0.091	0.098	0.079	0.189	0.268
		Left Cheek	0.296	0.121	0.208	0.417	0.625
		Left Tilt	0.057	0.092	0.072	0.149	0.221

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Simult Tx	CDMA Target Power Level (dBm)	Configuration	PCS CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
		Tx Antenna	1	2	3	1+2	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	17.5		
Head SAR	P $\geq$ 18	Right Cheek	0.390	0.042	0.089	0.432	0.521
		Right Tilt	0.267	0.010	0.079	0.277	0.356
		Left Cheek	0.586	0.046	0.208	0.632	0.840
		Left Tilt	0.143	0.011	0.072	0.154	0.226
		Maximum Allowed Power (dBm)	18.5	23.5	17.5		
	P < 18	Right Cheek	0.132	0.082	0.089	0.214	0.303
		Right Tilt	0.091	0.028	0.079	0.119	0.198
		Left Cheek	0.296	0.081	0.208	0.377	0.585
		Left Tilt	0.057	0.032	0.072	0.089	0.161

Table 13-10
Simultaneous Transmission Scenario with 5 GHz WLAN (Held to Ear)

Simult Tx	CDMA Target Power Level (dBm)	Configuration	Cell. CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
		Tx Antenna	1	2	3	1+2	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	14.5		
Head SAR	P $\geq$ 18	Right Cheek	0.287	0.040	0.061	0.327	0.388
		Right Tilt	0.263	0.025	0.061	0.288	0.349
		Left Cheek	0.340	0.032	0.349	0.372	0.721
		Left Tilt	0.293	0.022	0.066	0.315	0.381
		Maximum Allowed Power (dBm)	18.5	23.5	14.5		
	P < 18	Right Cheek	0.060	0.146	0.061	0.206	0.267
		Right Tilt	0.049	0.098	0.061	0.147	0.208
		Left Cheek	0.070	0.121	0.349	0.191	0.540
		Left Tilt	0.047	0.092	0.066	0.139	0.205

Simult Tx	CDMA Target Power Level (dBm)	Configuration	Cell. CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
		Tx Antenna	1	2	3	1+2	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	14.5		
Head SAR	P $\geq$ 18	Right Cheek	0.287	0.042	0.061	0.329	0.390
		Right Tilt	0.263	0.010	0.061	0.273	0.334
		Left Cheek	0.340	0.046	0.349	0.386	0.735
		Left Tilt	0.293	0.011	0.066	0.304	0.370
		Maximum Allowed Power (dBm)	18.5	23.5	14.5		
	P < 18	Right Cheek	0.060	0.082	0.061	0.142	0.203
		Right Tilt	0.049	0.028	0.061	0.077	0.138
		Left Cheek	0.070	0.081	0.349	0.151	0.500
		Left Tilt	0.047	0.032	0.066	0.079	0.145

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Simult Tx	CDMA Target Power Level (dBm)	Configuration	PCS CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
		Tx Antenna	1	2	3	1+2	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	14.5		
Head SAR	$P \geq 18$	Right Cheek	0.390	0.040	0.061	0.430	0.491
		Right Tilt	0.267	0.025	0.061	0.292	0.353
		Left Cheek	0.586	0.032	0.349	0.618	0.967
		Left Tilt	0.143	0.022	0.066	0.165	0.231
		Maximum Allowed Power (dBm)	18.5	23.5	14.5		
	$P < 18$	Right Cheek	0.132	0.146	0.061	0.278	0.339
		Right Tilt	0.091	0.098	0.061	0.189	0.250
		Left Cheek	0.296	0.121	0.349	0.417	0.766
		Left Tilt	0.057	0.092	0.066	0.149	0.215

Simult Tx	CDMA Target Power Level (dBm)	Configuration	PCS CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
		Tx Antenna	1	2	3	1+2	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	14.5		
Head SAR	$P \geq 18$	Right Cheek	0.390	0.042	0.061	0.432	0.493
		Right Tilt	0.267	0.010	0.061	0.277	0.338
		Left Cheek	0.586	0.046	0.349	0.632	0.981
		Left Tilt	0.143	0.011	0.066	0.154	0.220
		Maximum Allowed Power (dBm)	18.5	23.5	14.5		
	$P < 18$	Right Cheek	0.132	0.082	0.061	0.214	0.275
		Right Tilt	0.091	0.028	0.061	0.119	0.180
		Left Cheek	0.296	0.081	0.349	0.377	0.726
		Left Tilt	0.057	0.032	0.066	0.089	0.155

Note: The worst case 5 GHz WLAN reported SAR for each Head configuration was used for SAR summation, regardless of whether the WLAN channel has WIFI Hotspot capability. Therefore, the summations above represent the absolute worst cases for simultaneous transmission with 5 GHz WLAN.

Table 13-11
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 10 mm)

Configuration	CDMA Target Power Level (dBm)	Mode		CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
			Tx Antenna	1	2	3	1+2	1+2+3
			Maximum Allowed Power (dBm)	25	19.5	17.5		
Back Side	$P \geq 18$	Cell. CDMA	25.0	0.660	0.039	0.143	0.699	0.842
Back Side		PCS CDMA	25.0	0.829	0.039	0.143	0.868	1.011
			Maximum Allowed Power (dBm)	18.5	23.5	17.5		
Back Side	$P < 18$	Cell. CDMA	18.5	0.129	0.160	0.143	0.289	0.432
Back Side		PCS CDMA	18.5	0.183	0.160	0.143	0.343	0.486

Configuration	CDMA Target Power Level (dBm)	Mode		CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
			Tx Antenna	1	2	3	1+2	1+2+3
			Maximum Allowed Power (dBm)	25	19.5	17.5		
Back Side	$P \geq 18$	Cell. CDMA	25.0	0.660	0.112	0.143	0.772	0.915
Back Side		PCS CDMA	25.0	0.829	0.112	0.143	0.941	1.084
			Maximum Allowed Power (dBm)	18.5	23.5	17.5		
Back Side	$P < 18$	Cell. CDMA	18.5	0.129	0.287	0.143	0.416	0.559
Back Side		PCS CDMA	18.5	0.183	0.287	0.143	0.470	0.613

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Table 13-12
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 10 mm)

Configuration	CDMA Target Power Level (dBm)	Mode		CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
			Tx Antenna	1	2	3		
			Maximum Allowed Power (dBm)	25	19.5	14.5	1+2	1+2+3
Back Side	P $\geq$ 18	Cell. CDMA	25.0	0.660	0.039	0.548	0.699	1.247
Back Side		PCS CDMA	25.0	0.829	0.039	0.548	0.868	1.416
			Maximum Allowed Power (dBm)	18.5	23.5	14.5		
Back Side	P < 18	Cell. CDMA	18.5	0.129	0.160	0.548	0.289	0.837
Back Side		PCS CDMA	18.5	0.183	0.160	0.548	0.343	0.891

Configuration	CDMA Target Power Level (dBm)	Mode		CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	
			Tx Antenna	1	2	3		
			Maximum Allowed Power (dBm)	25	19.5	14.5	1+2	1+2+3
Back Side	P $\geq$ 18	Cell. CDMA	25.0	0.660	0.112	0.548	0.772	1.320
Back Side		PCS CDMA	25.0	0.829	0.112	0.548	0.941	1.489
			Maximum Allowed Power (dBm)	18.5	23.5	14.5		
Back Side	P < 18	Cell. CDMA	18.5	0.129	0.287	0.548	0.416	0.964
Back Side		PCS CDMA	18.5	0.183	0.287	0.548	0.470	1.018

Note: The worst case 5 GHz WLAN reported SAR for each body worn configuration was used for SAR summation, regardless of whether the WLAN channel has WIFI Hotspot capability. Therefore, the summations above represent the absolute worst cases for simultaneous transmission with 5 GHz WLAN.

Table 13-13
Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Body-Worn at 10 mm)

Configuration	CDMA Target Power Level (dBm)	Mode		CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	
			Tx Antenna	1	2	3		
			Maximum Allowed Power (dBm)	25	19.5	9.5	1+2	1+2+3
Back Side	P $\geq$ 18	Cell. CDMA	25.0	0.660	0.039	0.187	0.699	0.886
Back Side		PCS CDMA	25.0	0.829	0.039	0.187	0.868	1.055
			Maximum Allowed Power (dBm)	18.5	23.5	9.5		
Back Side	P < 18	Cell. CDMA	18.5	0.129	0.160	0.187	0.289	0.476
Back Side		PCS CDMA	18.5	0.183	0.160	0.187	0.343	0.530

Configuration	CDMA Target Power Level (dBm)	Mode		CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	
			Tx Antenna	1	2	3		
			Maximum Allowed Power (dBm)	25	19.5	9.5	1+2	1+2+3
Back Side	P $\geq$ 18	Cell. CDMA	25.0	0.660	0.112	0.187	0.772	0.959
Back Side		PCS CDMA	25.0	0.829	0.112	0.187	0.941	1.128
			Maximum Allowed Power (dBm)	18.5	23.5	9.5		
Back Side	P < 18	Cell. CDMA	18.5	0.129	0.287	0.187	0.416	0.603
Back Side		PCS CDMA	18.5	0.183	0.287	0.187	0.470	0.657

Note: Bluetooth SAR was not required to be measured per FCC KDB 447498. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

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Table 13-14
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Hotspot at 10 mm)

Simult Tx	CDMA Target Power Level (dBm)	Configuration	Cell. CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		Tx Antenna	1	2	3	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	17.5	
Body SAR	P ≥ 18	Back	0.660	0.039	0.143	0.842
		Front	0.452	0.038	0.048	0.538
		Top	-	-	0.043	0.043
		Bottom	0.297	0.045	-	0.342
		Right	-	0.052	0.093	0.145
		Left	0.526	-	-	0.526
	P < 18	Maximum Allowed Power (dBm)	18.5	23.5	17.5	
		Back	0.129	0.160	0.143	0.432
		Front	0.089	0.146	0.048	0.283
		Top	-	-	0.043	0.043
		Bottom	0.067	0.142	-	0.209
		Right	-	0.224	0.093	0.317
		Left	0.116	-	-	0.116

Simult Tx	CDMA Target Power Level (dBm)	Configuration	Cell. CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		Tx Antenna	1	2	3	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	17.5	
Body SAR	P ≥ 18	Back	0.660	0.112	0.143	0.915
		Front	0.452	0.117	0.048	0.617
		Top	-	-	0.043	0.043
		Bottom	0.297	0.107	-	0.404
		Right	-	0.058	0.093	0.151
		Left	0.526	-	-	0.526
	P < 18	Maximum Allowed Power (dBm)	18.5	23.5	17.5	
		Back	0.129	0.287	0.143	0.559
		Front	0.089	0.233	0.048	0.370
		Top	-	-	0.043	0.043
		Bottom	0.067	0.273	-	0.340
		Right	-	0.133	0.093	0.226
		Left	0.116	-	-	0.116

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Simult Tx	CDMA Target Power Level (dBm)	Configuration	PCS CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		Tx Antenna	1	2	3	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	17.5	
Body SAR	P ≥ 18	Back	0.829	0.039	0.143	1.011
		Front	0.829	0.038	0.048	0.915
		Top	-	-	0.043	0.043
		Bottom	0.583	0.045	-	0.628
		Right	-	0.052	0.093	0.145
		Left	0.609	-	-	0.609
	P < 18	Maximum Allowed Power (dBm)	18.5	23.5	17.5	
		Back	0.183	0.160	0.143	0.486
		Front	0.176	0.146	0.048	0.370
		Top	-	-	0.043	0.043
		Bottom	0.117	0.142	-	0.259
		Right	-	0.224	0.093	0.317
		Left	0.132	-	-	0.132

Simult Tx	CDMA Target Power Level (dBm)	Configuration	PCS CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		Tx Antenna	1	2	3	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	17.5	
Body SAR	P ≥ 18	Back	0.829	0.112	0.143	1.084
		Front	0.829	0.117	0.048	0.994
		Top	-	-	0.043	0.043
		Bottom	0.583	0.107	-	0.690
		Right	-	0.058	0.093	0.151
		Left	0.609	-	-	0.609
	P < 18	Maximum Allowed Power (dBm)	18.5	23.5	17.5	
		Back	0.183	0.287	0.143	0.613
		Front	0.176	0.233	0.048	0.457
		Top	-	-	0.043	0.043
		Bottom	0.117	0.273	-	0.390
		Right	-	0.133	0.093	0.226
		Left	0.132	-	-	0.132

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Table 13-15
Simultaneous Transmission Scenario with 5.8 GHz WLAN (Wireless Router at 10 mm)

Simult Tx	CDMA Target Power Level (dBm)	Configuration	Cell. CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		Tx Antenna	1	2	3	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	14.5	
Body SAR	P ≥ 18	Back	0.660	0.039	0.317	1.016
		Front	0.452	0.038	0.037	0.527
		Top	-	-	0.015	0.015
		Bottom	0.297	0.045	-	0.342
		Right	-	0.052	0.171	0.223
		Left	0.526	-	-	0.526
	P < 18	Maximum Allowed Power (dBm)	18.5	23.5	14.5	
		Back	0.129	0.160	0.317	0.606
		Front	0.089	0.146	0.037	0.272
		Top	-	-	0.015	0.015
		Bottom	0.067	0.142	-	0.209
		Right	-	0.224	0.171	0.395
		Left	0.116	-	-	0.116

Simult Tx	CDMA Target Power Level (dBm)	Configuration	Cell. CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		Tx Antenna	1	2	3	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	14.5	
Body SAR	P ≥ 18	Back	0.660	0.112	0.317	1.089
		Front	0.452	0.117	0.037	0.606
		Top	-	-	0.015	0.015
		Bottom	0.297	0.107	-	0.404
		Right	-	0.058	0.171	0.229
		Left	0.526	-	-	0.526
	P < 18	Maximum Allowed Power (dBm)	18.5	23.5	14.5	
		Back	0.129	0.287	0.317	0.733
		Front	0.089	0.233	0.037	0.359
		Top	-	-	0.015	0.015
		Bottom	0.067	0.273	-	0.340
		Right	-	0.133	0.171	0.304
		Left	0.116	-	-	0.116

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Simult Tx	CDMA Target Power Level (dBm)	Configuration	PCS CDMA SAR (W/kg)	LTE Band 13 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		Tx Antenna	1	2	3	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	14.5	
Body SAR	P ≥ 18	Back	0.829	0.039	0.317	1.185
		Front	0.829	0.038	0.037	0.904
		Top	-	-	0.015	0.015
		Bottom	0.583	0.045	-	0.628
		Right	-	0.052	0.171	0.223
		Left	0.609	-	-	0.609
		Maximum Allowed Power (dBm)	18.5	23.5	14.5	
	P < 18	Back	0.183	0.160	0.317	0.660
		Front	0.176	0.146	0.037	0.359
		Top	-	-	0.015	0.015
		Bottom	0.117	0.142	-	0.259
		Right	-	0.224	0.171	0.395
		Left	0.132	-	-	0.132

Simult Tx	CDMA Target Power Level (dBm)	Configuration	PCS CDMA SAR (W/kg)	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		Tx Antenna	1	2	3	1+2+3
		Maximum Allowed Power (dBm)	25	19.5	14.5	
Body SAR	P ≥ 18	Back	0.829	0.112	0.317	1.258
		Front	0.829	0.117	0.037	0.983
		Top	-	-	0.015	0.015
		Bottom	0.583	0.107	-	0.690
		Right	-	0.058	0.171	0.229
		Left	0.609	-	-	0.609
		Maximum Allowed Power (dBm)	18.5	23.5	14.5	
	P < 18	Back	0.183	0.287	0.317	0.787
		Front	0.176	0.233	0.037	0.446
		Top	-	-	0.015	0.015
		Bottom	0.117	0.273	-	0.390
		Right	-	0.133	0.171	0.304
		Left	0.132	-	-	0.132

13.6 Simultaneous Transmission Conclusion

The above numerical summed SAR 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.

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14 SAR MEASUREMENT VARIABILITY

14.1 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 14-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS														
Band	FREQUENCY		Mode	Service	# of Time Slots	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)	
835	848.80	251	GSM 850	GPRS	4	left	10 mm	0.934	0.932	1.00	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							

14.2 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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15 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
SPEAG	D1765V2	1765 MHz SAR Dipole	5/14/2013	Annual	5/14/2014	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	5/2/2013	Annual	5/2/2014	5d141
SPEAG	D1900V2	1900 MHz SAR Dipole	2/6/2013	Annual	2/6/2014	5d148
SPEAG	D2450V2	2450 MHz SAR Dipole	1/8/2013	Annual	1/8/2014	797
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/11/2013	Annual	1/11/2014	1057
SPEAG	D5GHzV2	5 GHz SAR Dipole	2/14/2013	Annual	2/14/2014	1120
SPEAG	D750V3	750 MHz Dipole	1/7/2013	Annual	1/7/2014	1003
SPEAG	D835V2	835 MHz SAR Dipole	4/25/2013	Annual	4/25/2014	4d119
SPEAG	D835V2	835 MHz SAR Dipole	7/17/2013	Annual	7/17/2014	4d133
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/13/2013	Annual	5/13/2014	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/17/2013	Annual	1/17/2014	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/21/2013	Annual	8/21/2014	1322
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	4/22/2013	Annual	4/22/2014	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1408
SPEAG	ES3DV2	SAR Probe	8/22/2013	Annual	8/22/2014	3022
SPEAG	ES3DV3	SAR Probe	5/16/2013	Annual	5/16/2014	3263
SPEAG	ES3DV3	SAR Probe	9/23/2013	Annual	9/23/2014	3288
SPEAG	ES3DV3	SAR Probe	4/29/2013	Annual	4/29/2014	3319
SPEAG	ES3DV3	SAR Probe	11/22/2013	Annual	11/22/2014	3333
SPEAG	EX3DV4	SAR Probe	1/17/2013	Annual	1/17/2014	3589
SPEAG	EX3DV4	SAR Probe	10/23/2013	Annual	10/23/2014	3914

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Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/16/2013	Annual	4/16/2014	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/16/2013	Annual	4/16/2014	JP38020182
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/17/2013	Annual	4/17/2014	3629U00687
Agilent	85070C	Dielectric Probe Kit	2/14/2013	Annual	2/14/2014	MY44300633
Agilent	N9020A	MXA Signal Analyzer	10/29/2013	Annual	10/29/2014	US46470561
Agilent	N5182A	MXG Vector Signal Generator	10/28/2013	Annual	10/28/2014	US46240505
Agilent	8753ES	S-Parameter Network Analyzer	10/29/2013	Annual	10/29/2014	US39170122
Agilent	85047A	S-Parameter Test Set	N/A	N/A	N/A	2904A00579
Agilent	E5515C	Wireless Communications Test Set	10/18/2012	Biennial	10/18/2014	GB43193563
Agilent	E5515C	Wireless Communications Test Set	5/9/2013	Biennial	5/9/2015	GB43304447
Amplifier Research	5S1G4	5W, 800MHz-4.2GHz	CBT	N/A	CBT	21910
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2014	1039008
Anritsu	ML2496A	Power Meter	11/14/2013	Annual	11/14/2014	1138001
Anritsu	MA2481A	Power Sensor	2/14/2013	Annual	2/14/2014	2400
Anritsu	MA2481A	Power Sensor	2/14/2013	Annual	2/14/2014	5318
Anritsu	MA2411B	Pulse Power Sensor	11/14/2013	Annual	11/14/2014	1126066
Anritsu	MT8820C	Radio Communication Analyzer	6/28/2013	Annual	6/28/2014	6201240328
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M155A00-009
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Fisher Scientific	15-07BJ	Long Stem Thermometer	1/7/2013	Biennial	1/7/2015	130018204
Fisher Scientific	15-07BJ	Long Stem Thermometer	1/7/2013	Biennial	1/7/2015	130018243
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/30/2013	Annual	10/30/2014	1833460
Gigatronics	8651A	Universal Power Meter	10/30/2013	Annual	10/30/2014	8650319
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
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
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
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	CMU200	Base Station Simulator	5/3/2013	Annual	5/3/2014	836371/0079
Rohde & Schwarz	NRVD	Dual Channel Power Meter	10/12/2012	Biennial	10/12/2014	101695
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	10/4/2013	Annual	10/4/2014	108798
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	12/9/2013	Annual	12/9/2014	109366
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	6/6/2013	Annual	6/6/2014	111427
Rohde & Schwarz	NRV-232	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
Rohde & Schwarz	SMI003B	Signal Generator	4/17/2013	Annual	4/17/2014	DE27259
Rohde & Schwarz	NRVS	Single Channel Power Meter	10/31/2013	Annual	10/31/2014	835360/0079
Seekonk	NC-100	Torque Wrench (8" lb)	11/29/2011	Triennial	11/29/2014	21053
Seekonk	NC-100	Torque Wrench (8" lb)	3/5/2012	Triennial	3/5/2015	N/A
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/17/2013	Annual	4/17/2014	B010177
VWR	36934-158	Digital Thermometer	8/8/2013	Annual	8/8/2014	130258636
VWR	36934-158	Digital Thermometer	8/8/2013	Annual	8/8/2014	130477877
VWR	23226-658	Long Stem Thermometer	3/30/2012	Biennial	3/30/2014	122179874
VWR	23226-658	Long Stem Thermometer	5/16/2012	Biennial	5/16/2014	122295544

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 calibrated equipments were used during their calibration period.

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16 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
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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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17 CONCLUSION

17.1 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: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.911 \text{ S/m}$; $\epsilon_r = 41.318$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-30-2013; Ambient Temp: 23.4°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(6.29, 6.29, 6.29); Calibrated: 5/16/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/13/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

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

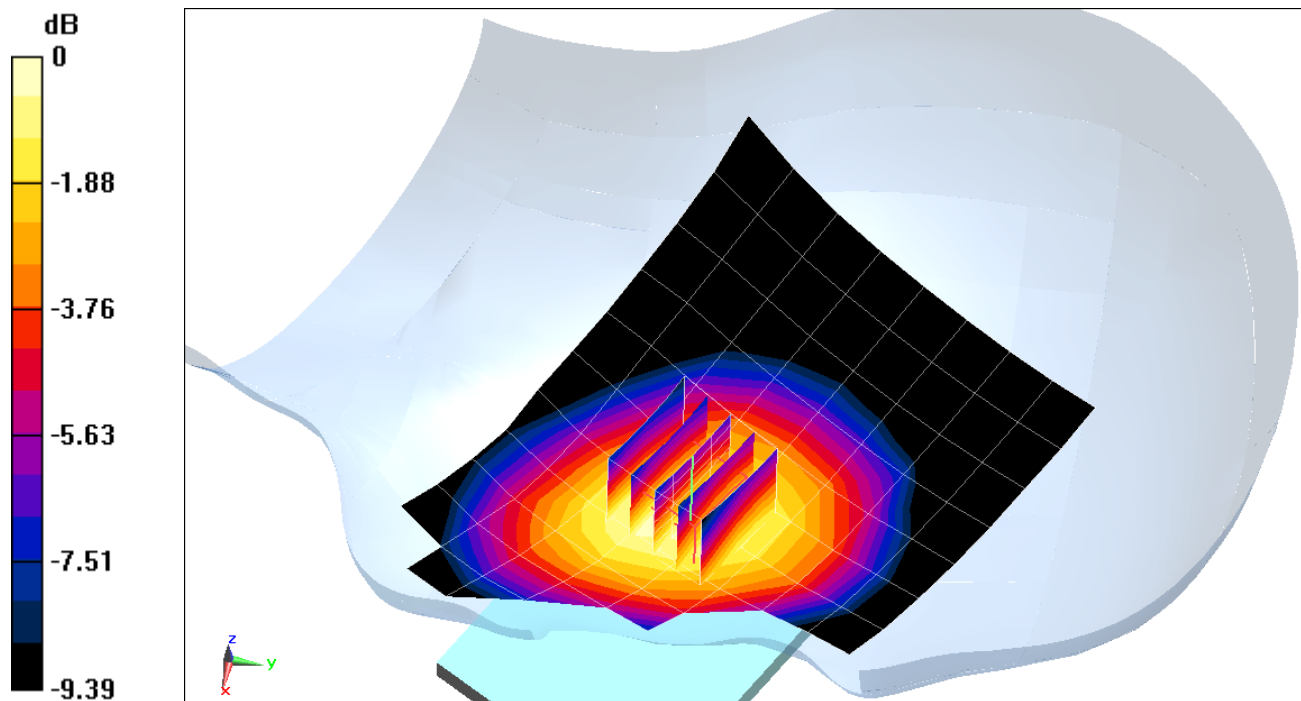
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.802 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.282 W/kg

SAR(1 g) = 0.220 W/kg



0 dB = 0.231 W/kg = -6.36 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, UMTS850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.911 \text{ S/m}$; $\epsilon_r = 41.318$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-30-2013; Ambient Temp: 23.4°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(6.29, 6.29, 6.29); Calibrated: 5/16/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/13/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

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

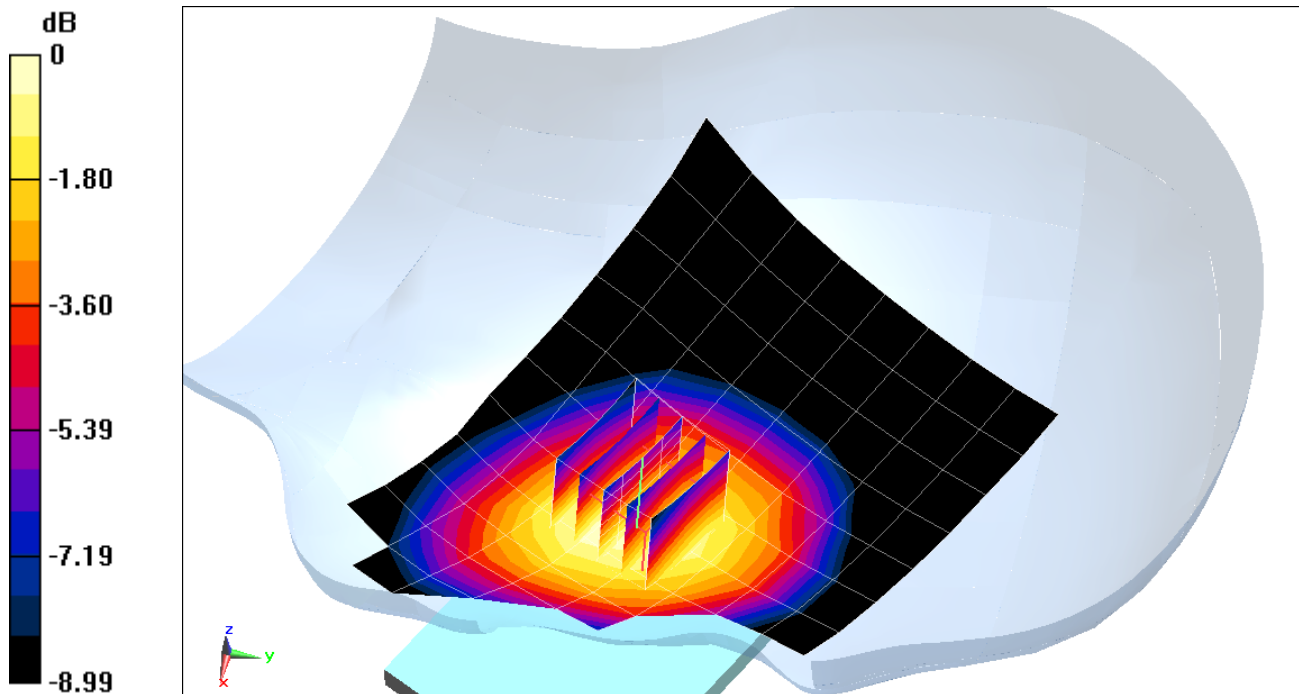
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 16.524 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.299 W/kg

SAR(1 g) = 0.239 W/kg



0 dB = 0.253 W/kg = -5.97 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.422 \text{ S/m}$; $\epsilon_r = 39.046$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-30-2013; Ambient Temp: 21.1°C; Tissue Temp: 20.7°C

Probe: ES3DV3 - SN3263; ConvF(5.11, 5.11, 5.11); Calibrated: 5/16/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/13/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

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

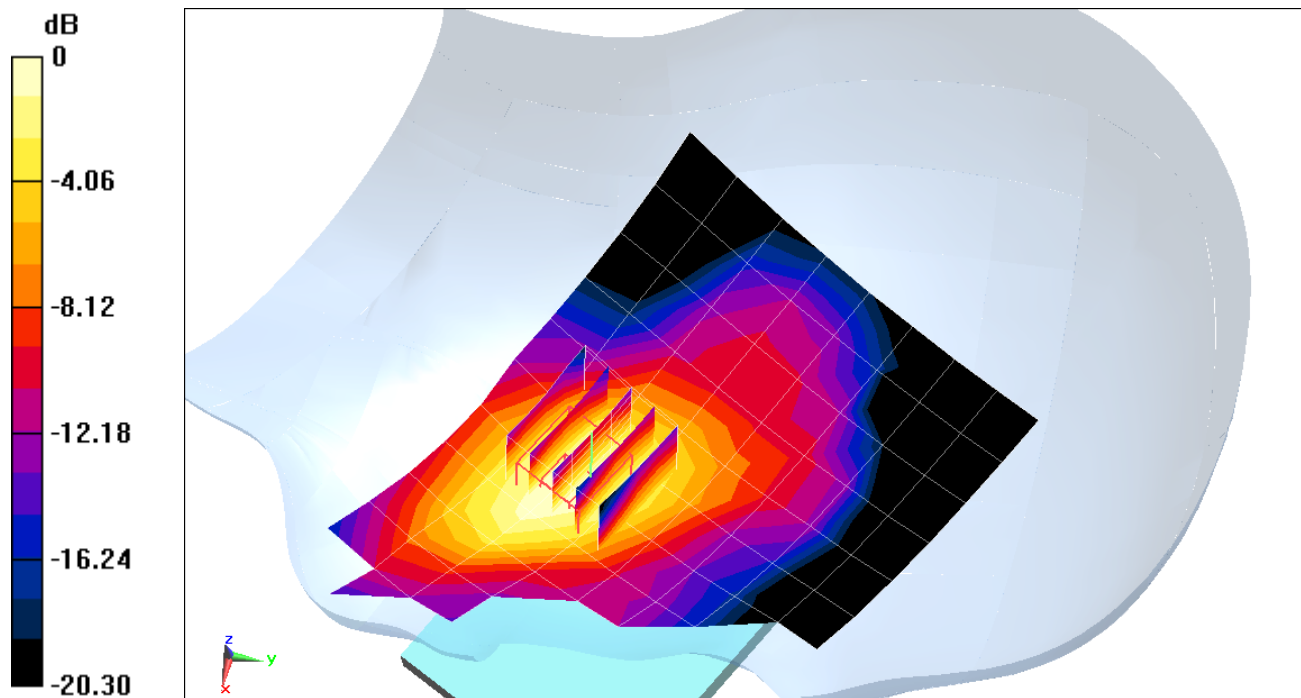
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.879 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.337 W/kg

SAR(1 g) = 0.210 W/kg



0 dB = 0.223 W/kg = -6.52 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, UMTS1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.422 \text{ S/m}$; $\epsilon_r = 39.046$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-30-2013; Ambient Temp: 21.1°C; Tissue Temp: 20.7°C

Probe: ES3DV3 - SN3263; ConvF(5.11, 5.11, 5.11); Calibrated: 5/16/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/13/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

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

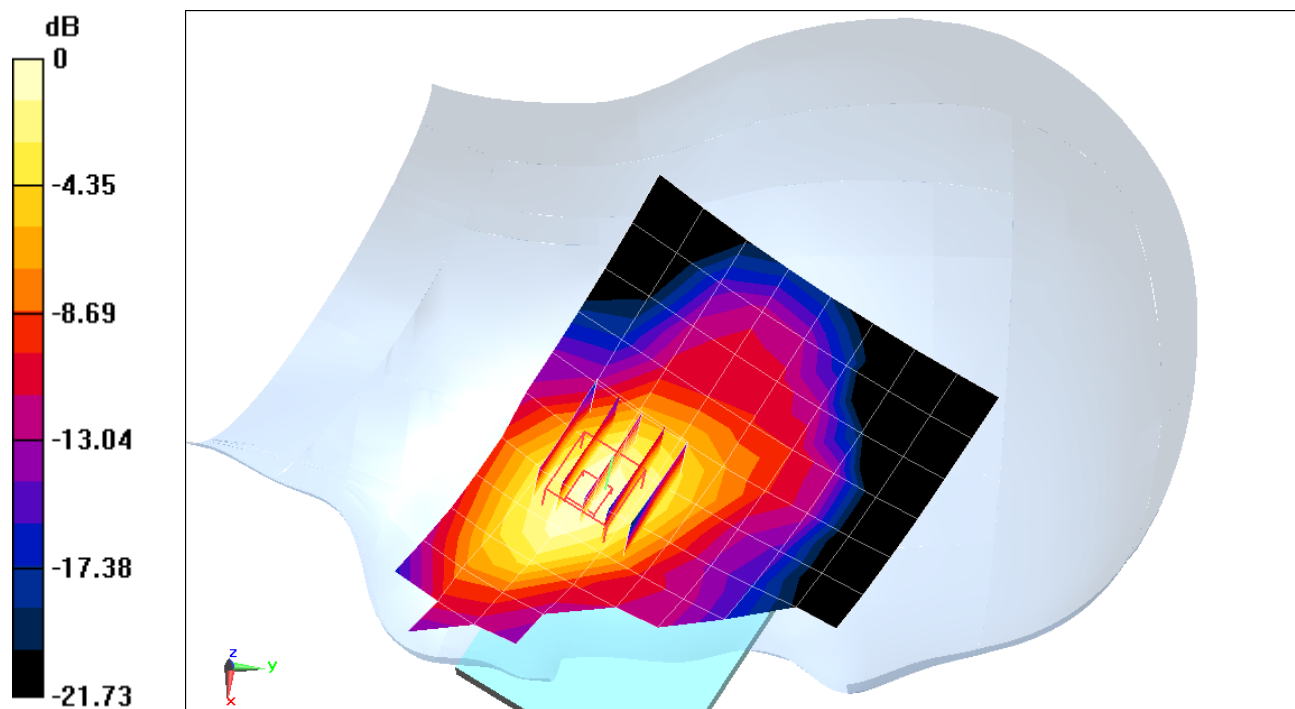
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 16.132 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.528 W/kg

SAR(1 g) = 0.333 W/kg



0 dB = 0.351 W/kg = -4.55 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#3

Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.896 \text{ S/m}$; $\epsilon_r = 40.179$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-31-2013; Ambient Temp: 24.7°C; Tissue Temp: 23.7°C

Probe: EX3DV4 - SN3914; ConvF(9.34, 9.34, 9.34); Calibrated: 10/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

Mode: Cell. CDMA, Left Head, Cheek, Mid.ch

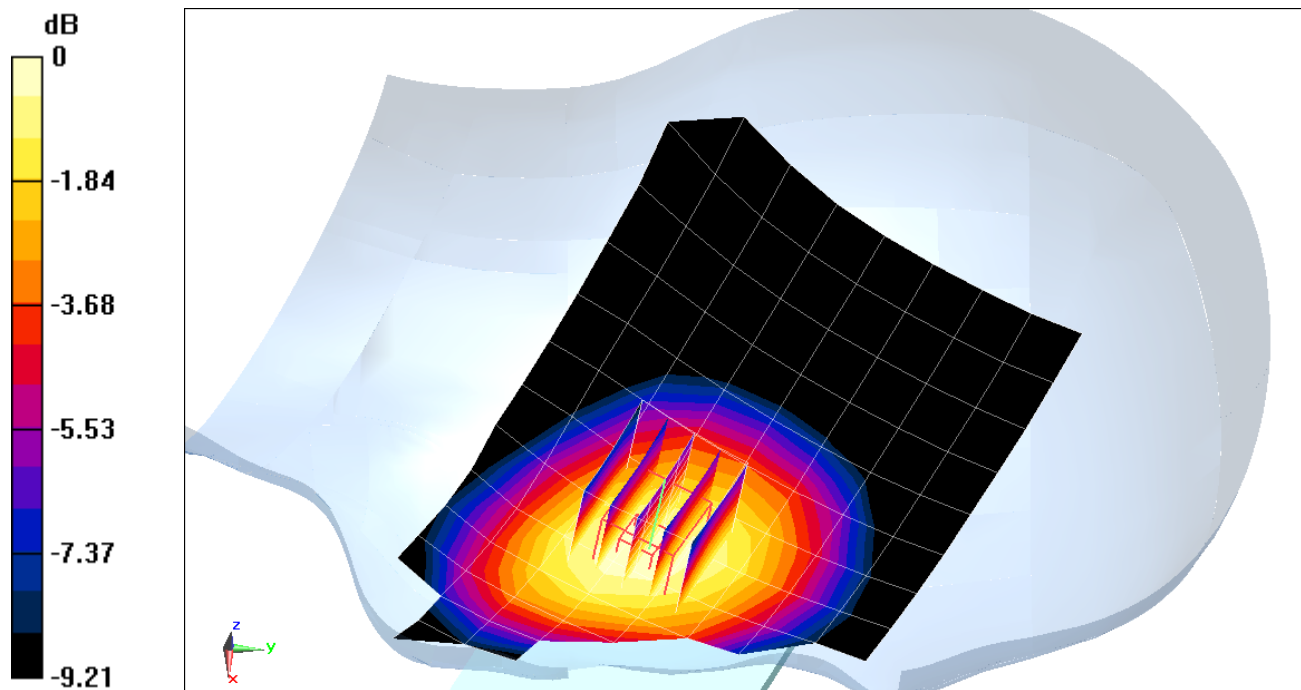
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.988 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.374 W/kg

SAR(1 g) = 0.290 W/kg



0 dB = 0.305 W/kg = -5.16 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#3

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

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.426 \text{ S/m}$; $\epsilon_r = 39.276$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 01-20-2014; Ambient Temp: 23.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3263; ConvF(5.11, 5.11, 5.11); Calibrated: 5/16/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/13/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

Mode: PCS EVDO RevA, Left Head, Cheek, Mid.ch

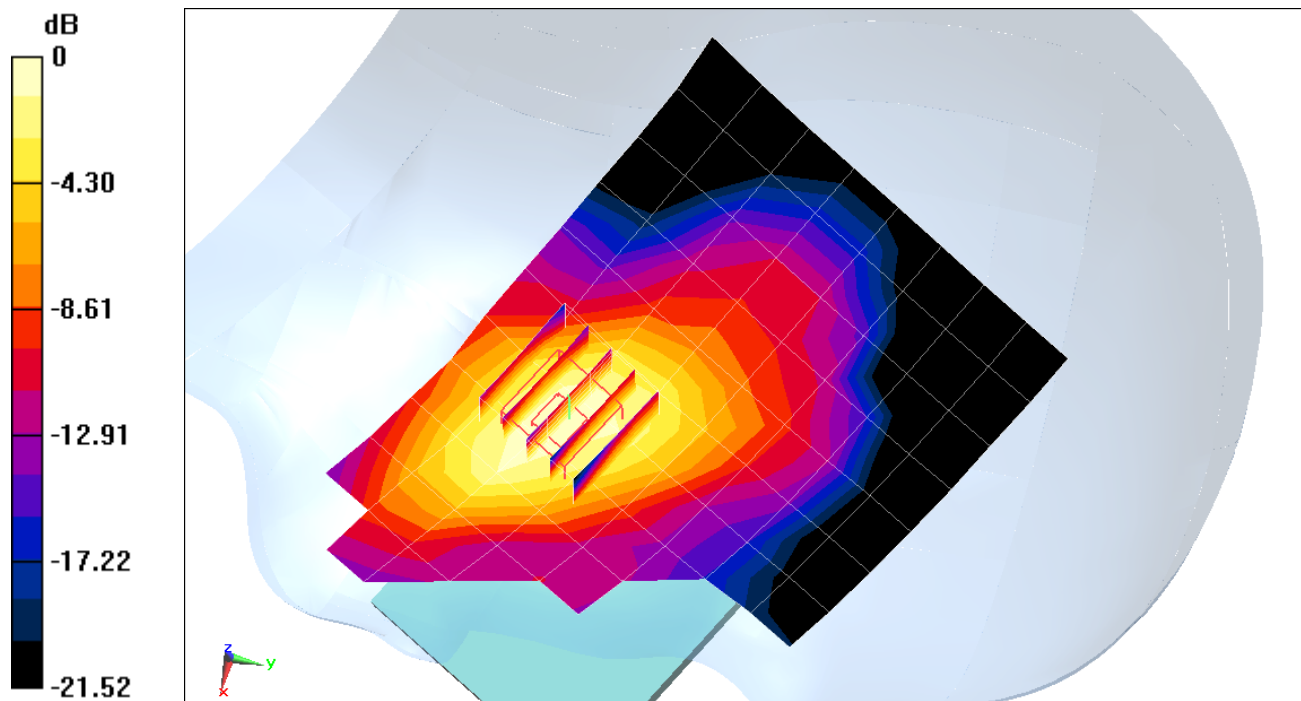
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.083 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.799 W/kg

SAR(1 g) = 0.522 W/kg



0 dB = 0.566 W/kg = -2.47 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#3

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Head Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.937 \text{ S/m}$; $\epsilon_r = 40.189$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-30-2013; Ambient Temp: 23.3°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN3914; ConvF(9.7, 9.7, 9.7); Calibrated: 10/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

Mode: LTE Band 13, Right Head, Cheek, Mid.ch
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

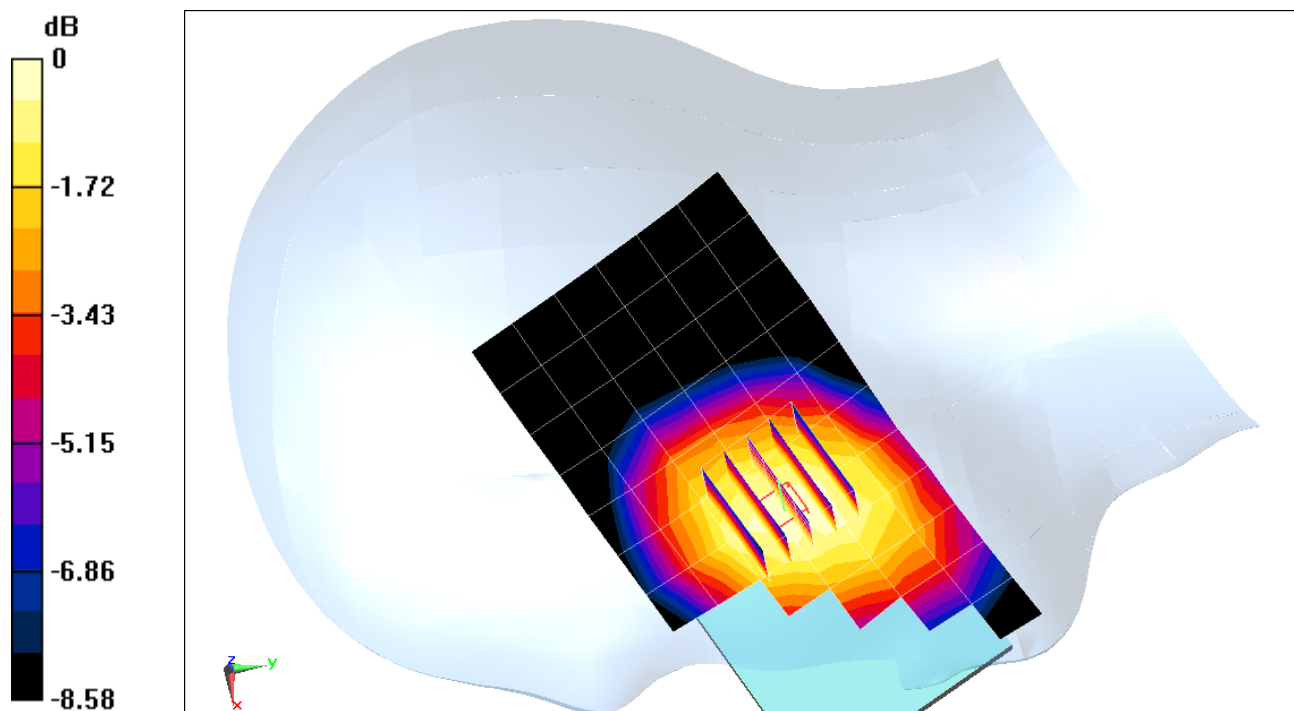
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.825 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.169 W/kg

SAR(1 g) = 0.140 W/kg



0 dB = 0.148 W/kg = -8.30 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, LTE RF; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.396 \text{ S/m}$; $\epsilon_r = 40.468$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 12-26-2013; Ambient Temp: 23.7°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3288; ConvF(5.67, 5.67, 5.67); Calibrated: 9/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM with CRP; Type: SAM 4.0; Serial: TP1375

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

Mode: LTE Band 4 (AWS), Right Head, Cheek, Mid.ch
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

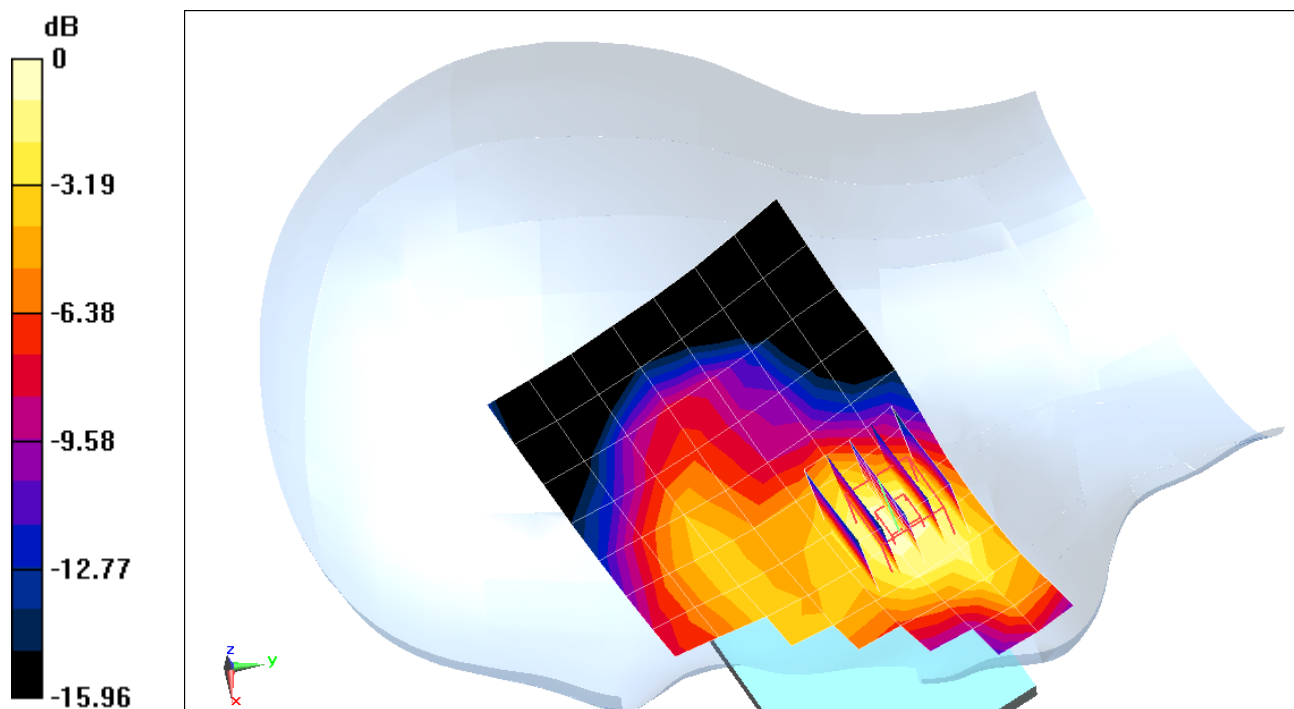
Area Scan (8x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 8.276 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.114 W/kg

SAR(1 g) = 0.074 W/kg



0 dB = 0.0813 W/kg = -10.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#6

Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 1.775 \text{ S/m}$; $\epsilon_r = 38.906$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-23-2013; Ambient Temp: 24.2°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN3914; ConvF(6.95, 6.95, 6.95); Calibrated: 10/23/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

Mode: IEEE 802.11b, Left Head, Cheek, Ch 06, 1 Mbps

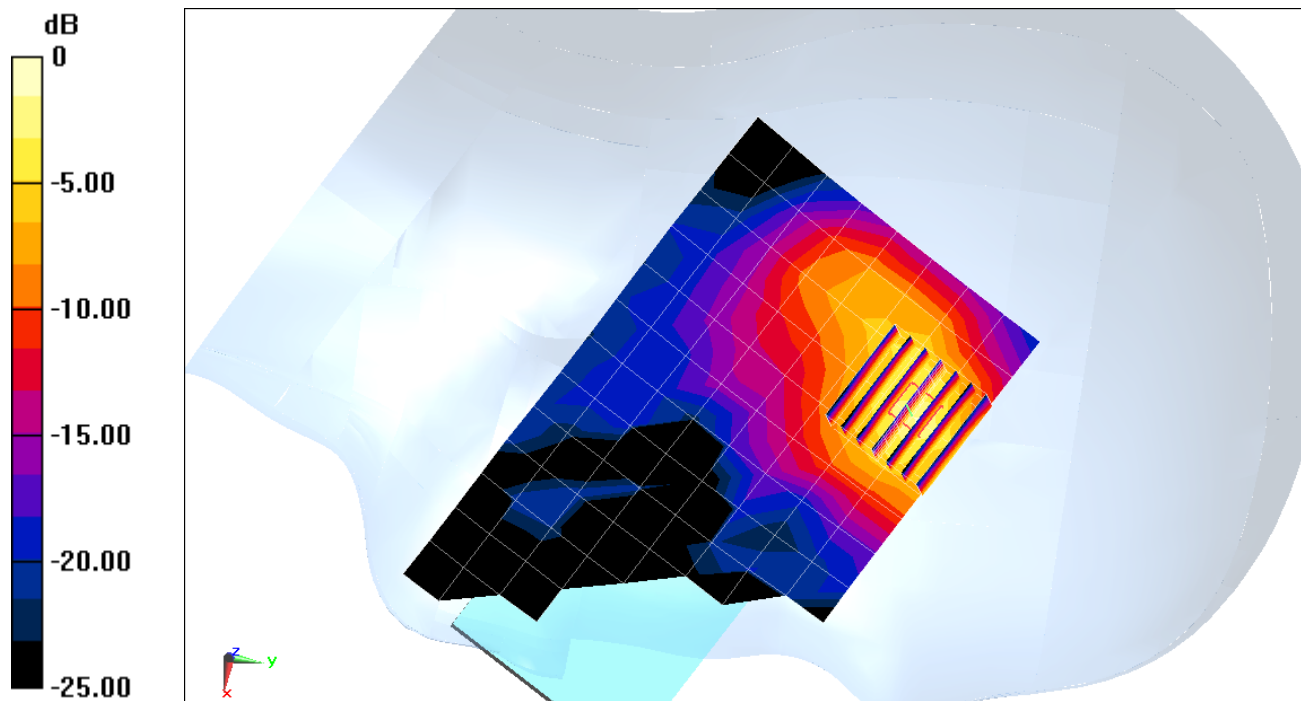
Area Scan (9x15x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 10.374 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.396 W/kg

SAR(1 g) = 0.170 W/kg



0 dB = 0.222 W/kg = -6.54 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#10

Communication System: UID 0, IEEE 802.11a; Frequency: 5745 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5745 \text{ MHz}$; $\sigma = 5.077 \text{ S/m}$; $\epsilon_r = 36.009$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 01-10-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.3°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, Cheek, Ch 149, 6 Mbps

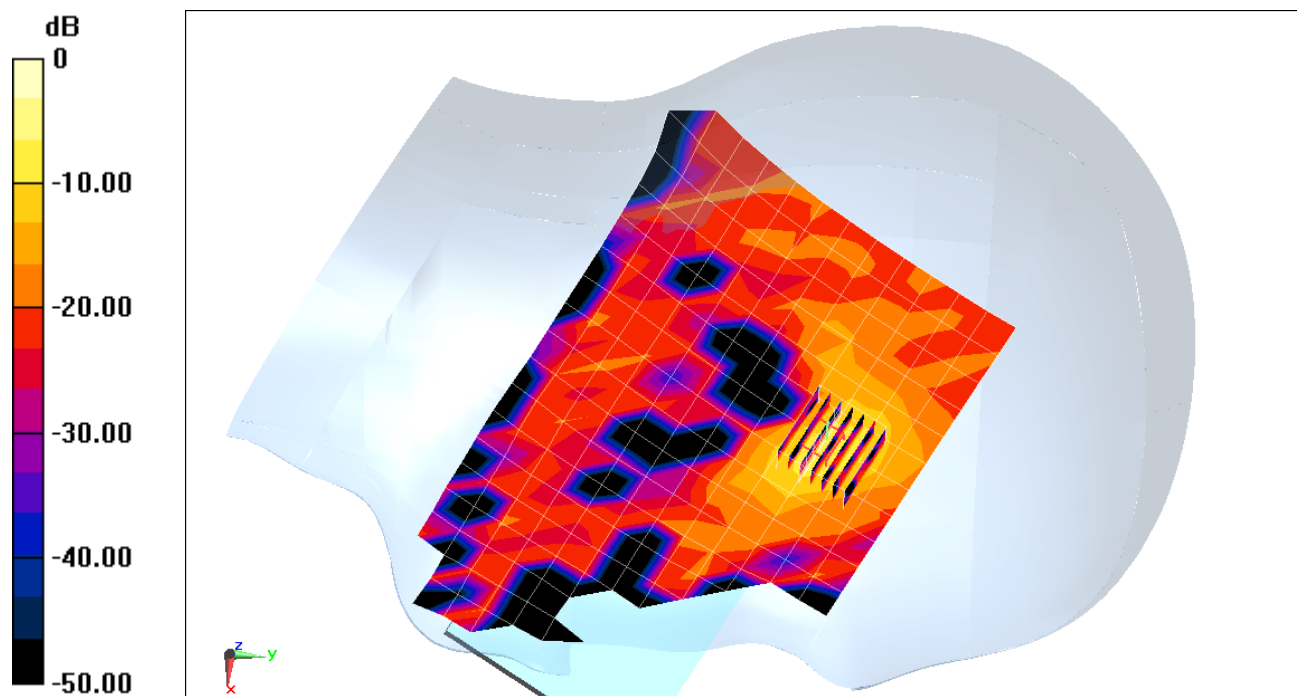
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 7.052 V/m; Power Drift = 0.20 dB

Peak SAR (extrapolated) = 1.27 W/kg

SAR(1 g) = 0.256 W/kg



0 dB = 0.691 W/kg = -1.61 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#10

Communication System: UID 0, IEEE 802.11a; Frequency: 5660 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5660 \text{ MHz}$; $\sigma = 4.967 \text{ S/m}$; $\epsilon_r = 36.155$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 01-10-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3914; ConvF(4.37, 4.37, 4.37); 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, 5.5- 5.7 GHz, Left Head, Cheek, Ch 132, 6 Mbps

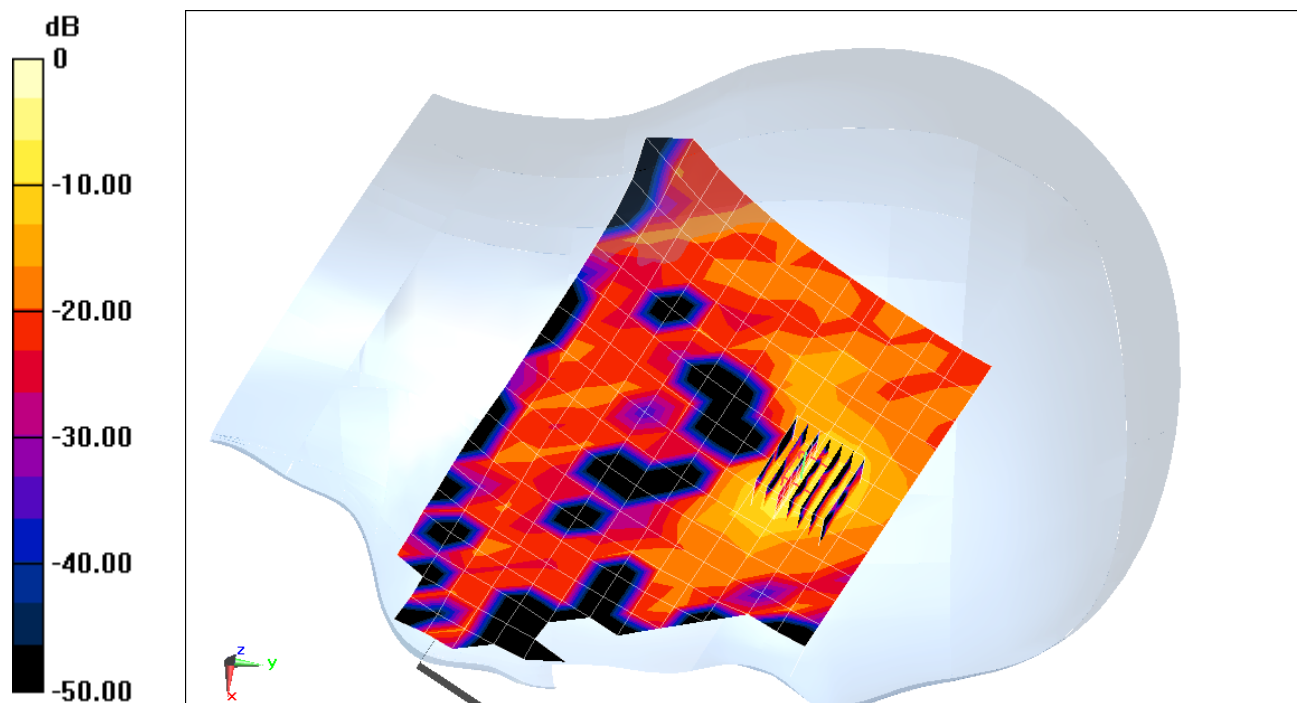
Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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 = 6.719 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 1.07 W/kg

SAR(1 g) = 0.226 W/kg



0 dB = 0.583 W/kg = -2.34 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#1

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.005 \text{ S/m}$; $\epsilon_r = 54.028$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-08-2014; Ambient Temp: 24.2°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229

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

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

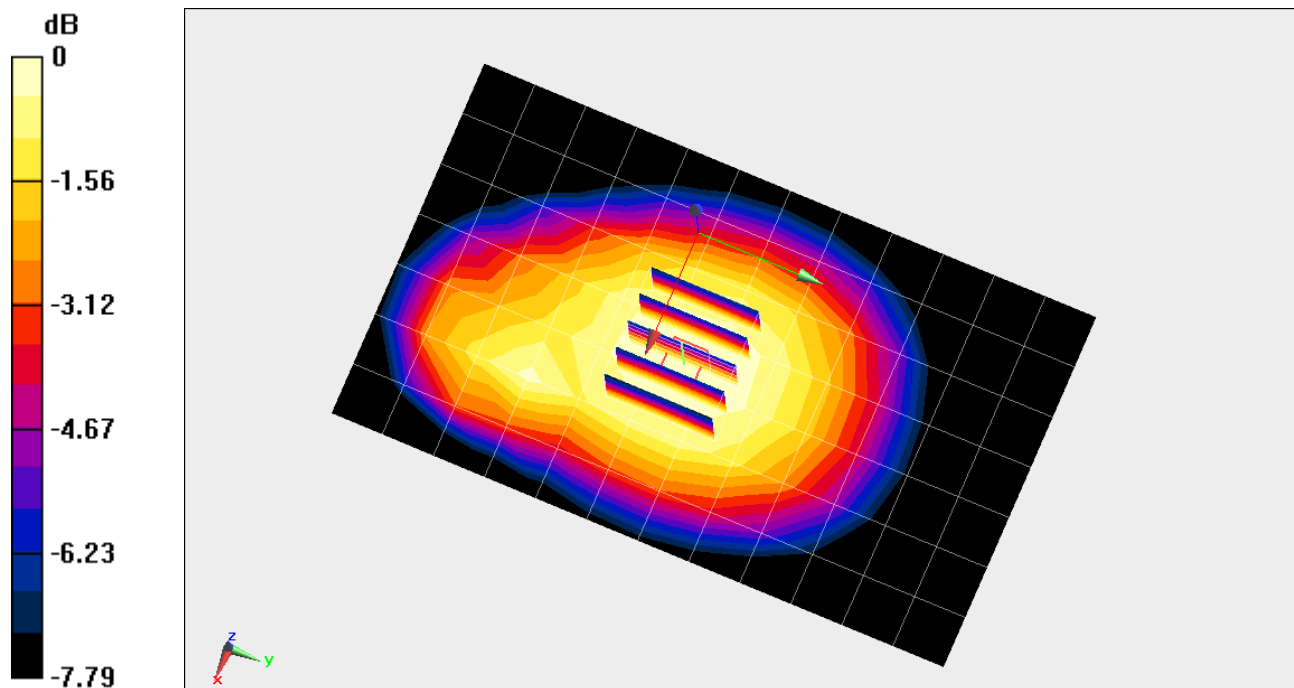
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.508 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.547 W/kg

SAR(1 g) = 0.444 W/kg



0 dB = 0.466 W/kg = -3.32 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#1

Communication System: UID 0, GSM850 GPRS; 4 Tx slots; Frequency: 848.8 MHz; Duty Cycle: 1:2.076

Medium: 835 Body Medium parameters used (interpolated):

$f = 848.8 \text{ MHz}$; $\sigma = 1.029 \text{ S/m}$; $\epsilon_r = 54.826$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-10-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.1°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

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

Mode: GPRS 850, Body SAR, Left Edge, High.ch, 4 Tx Slots

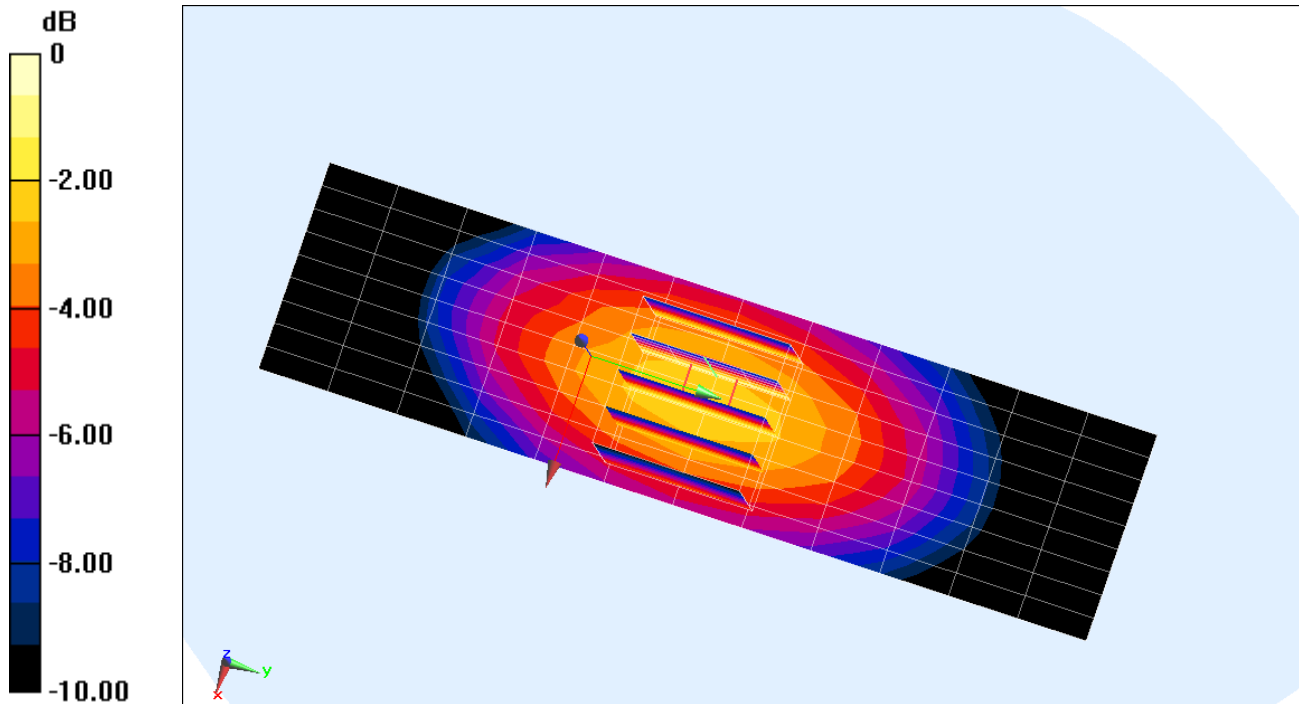
Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 30.698 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 1.29 W/kg

SAR(1 g) = 0.934 W/kg



0 dB = 0.994 W/kg = -0.03 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#1

Communication System: UID 0, UMTS850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.005 \text{ S/m}$; $\epsilon_r = 54.028$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-08-2014; Ambient Temp: 24.2°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229

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

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

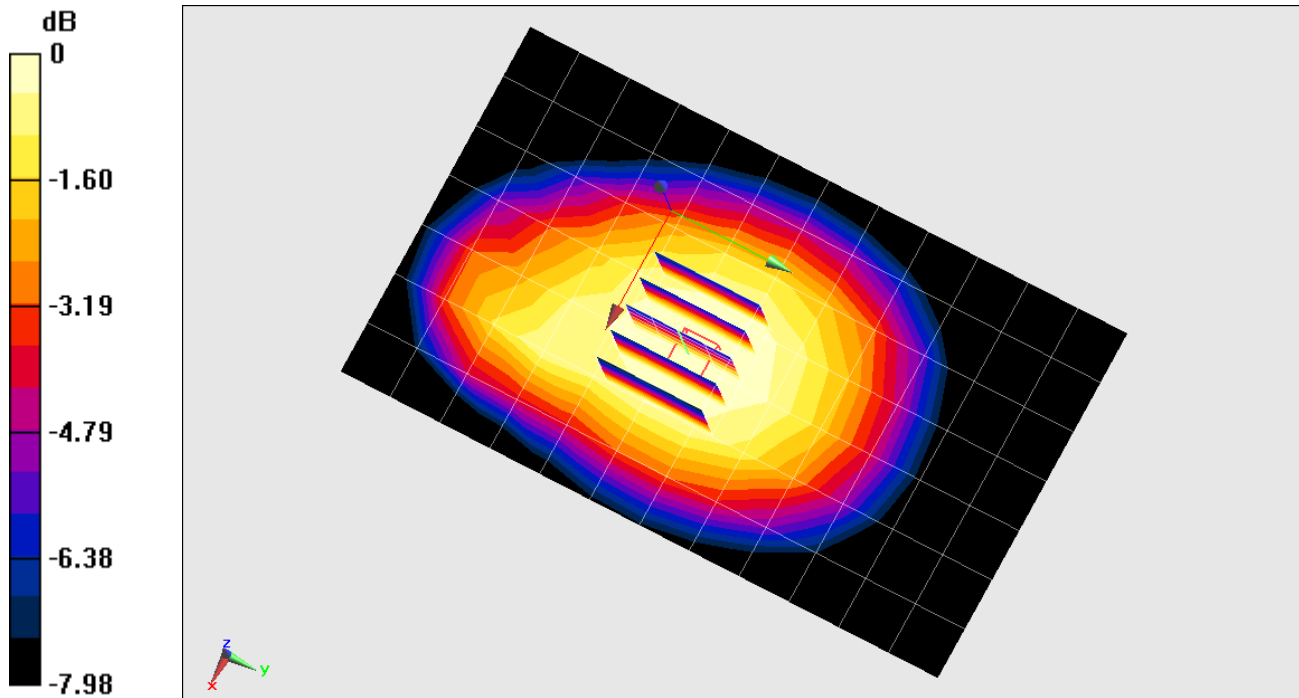
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.865 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.505 W/kg

SAR(1 g) = 0.407 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#1

Communication System: UID 0, UMTS850; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.005 \text{ S/m}$; $\epsilon_r = 54.028$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-08-2014; Ambient Temp: 24.2°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229

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

Mode: UMTS 850, Body SAR, Left Edge, Mid.ch

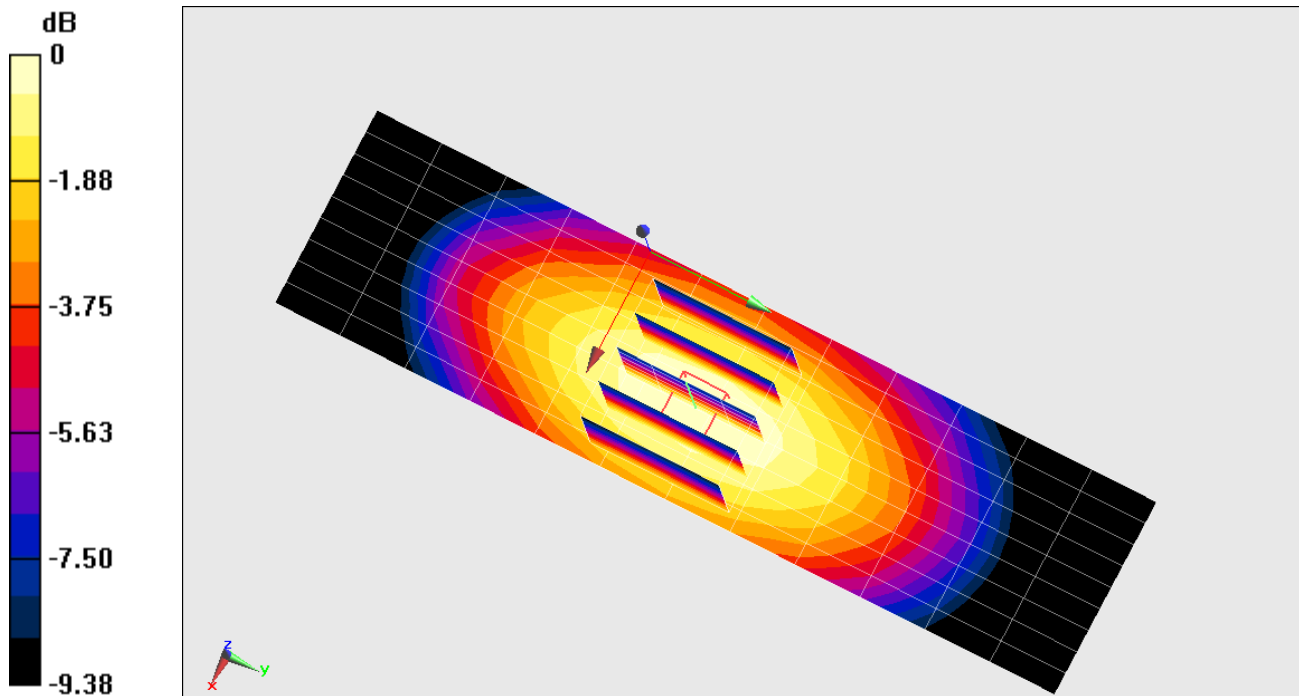
Area Scan (10x13x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 23.264 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.681 W/kg

SAR(1 g) = 0.489 W/kg



0 dB = 0.524 W/kg = -2.81 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.557 \text{ S/m}$; $\epsilon_r = 51.363$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-09-2014; Ambient Temp: 23.1°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

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

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

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

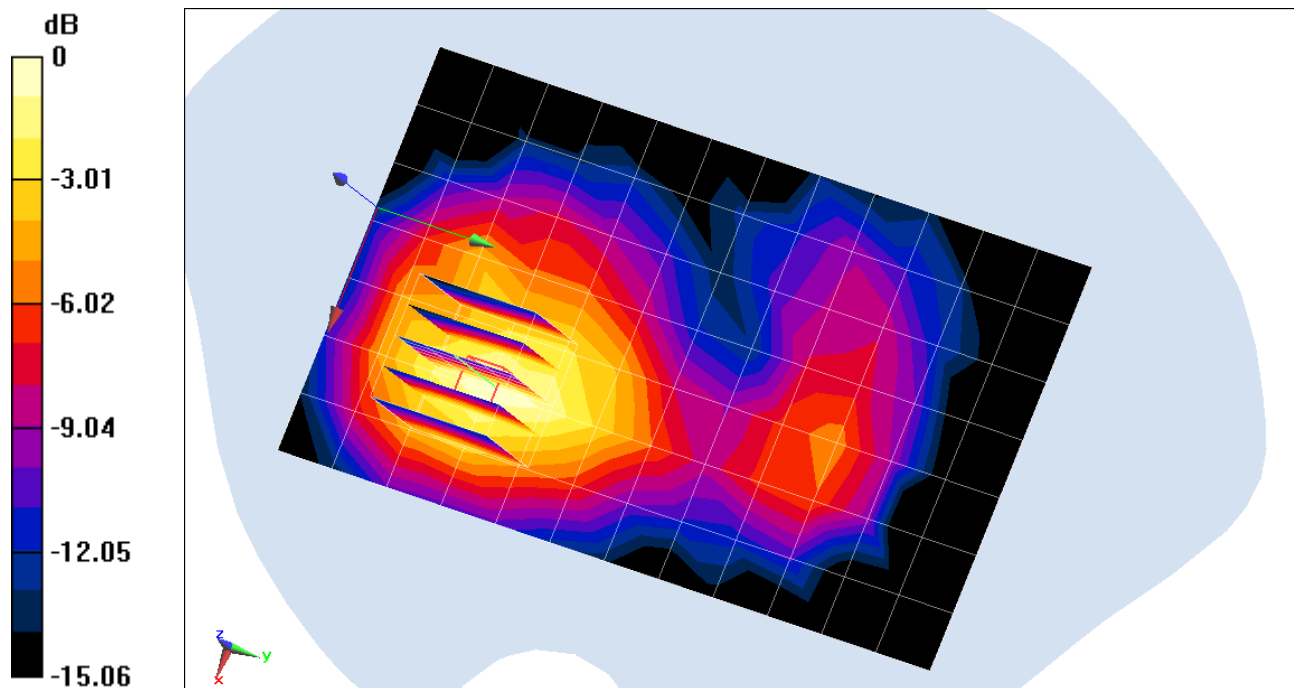
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 10.983 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.255 W/kg

SAR(1 g) = 0.161 W/kg



0 dB = 0.176 W/kg = -7.54 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, GSM1900 GPRS; 3 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.76

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.557 \text{ S/m}$; $\epsilon_r = 51.363$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-09-2014; Ambient Temp: 23.1°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

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, Mid.ch, 3 Tx Slots

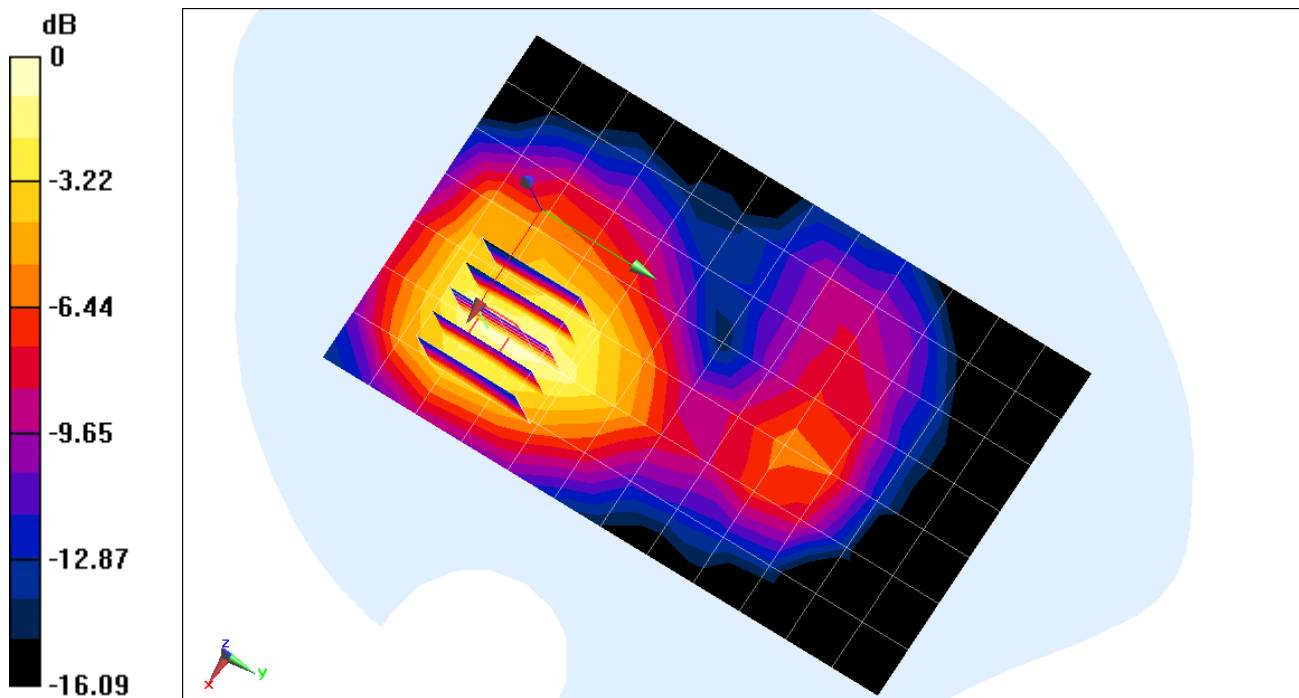
Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 13.890 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.451 W/kg

SAR(1 g) = 0.278 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, UMTS1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.557 \text{ S/m}$; $\epsilon_r = 51.363$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-09-2014; Ambient Temp: 23.1°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

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

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

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

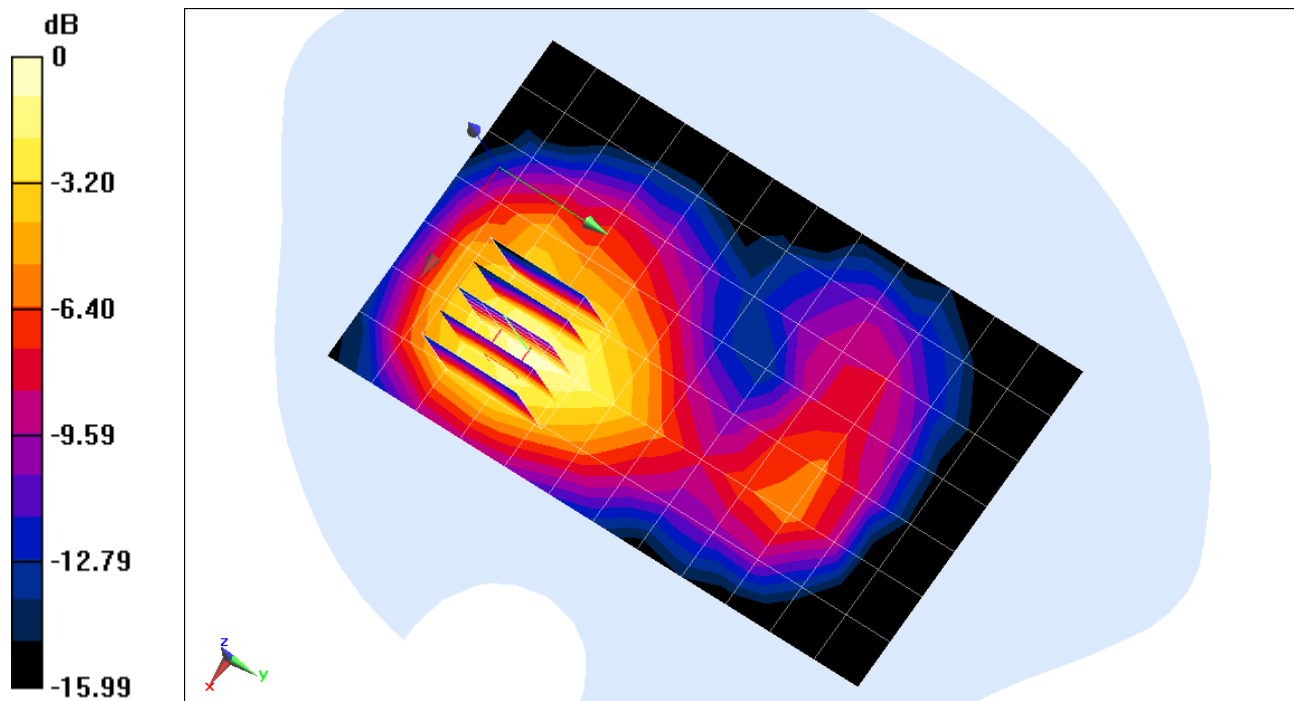
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.978 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.445 W/kg

SAR(1 g) = 0.269 W/kg



0 dB = 0.290 W/kg = -5.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, UMTS1900; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.557 \text{ S/m}$; $\epsilon_r = 51.363$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-09-2014; Ambient Temp: 23.1°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

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

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

Mode: UMTS 1900, Body SAR, Bottom Edge, Mid.ch

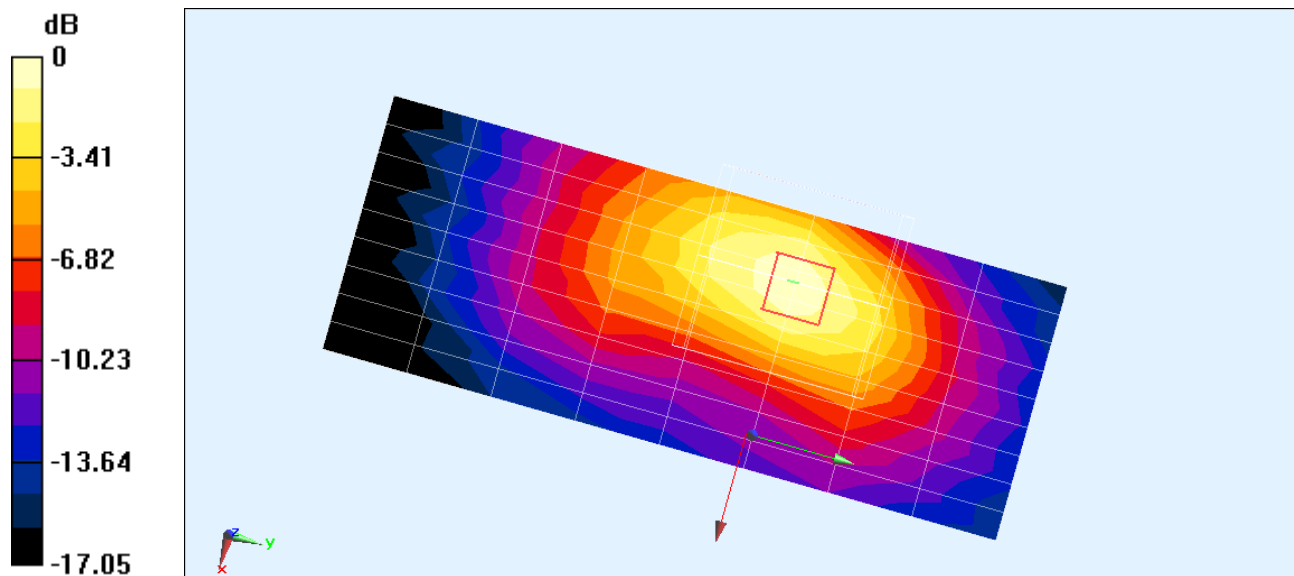
Area Scan (10x9x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 15.398 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.569 W/kg

SAR(1 g) = 0.317 W/kg



0 dB = 0.367 W/kg = -4.35 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#3

Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 1.016 \text{ S/m}$; $\epsilon_r = 54.945$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-10-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.1°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

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

Mode: Cell. CDMA, Body SAR, Back side, Mid.ch

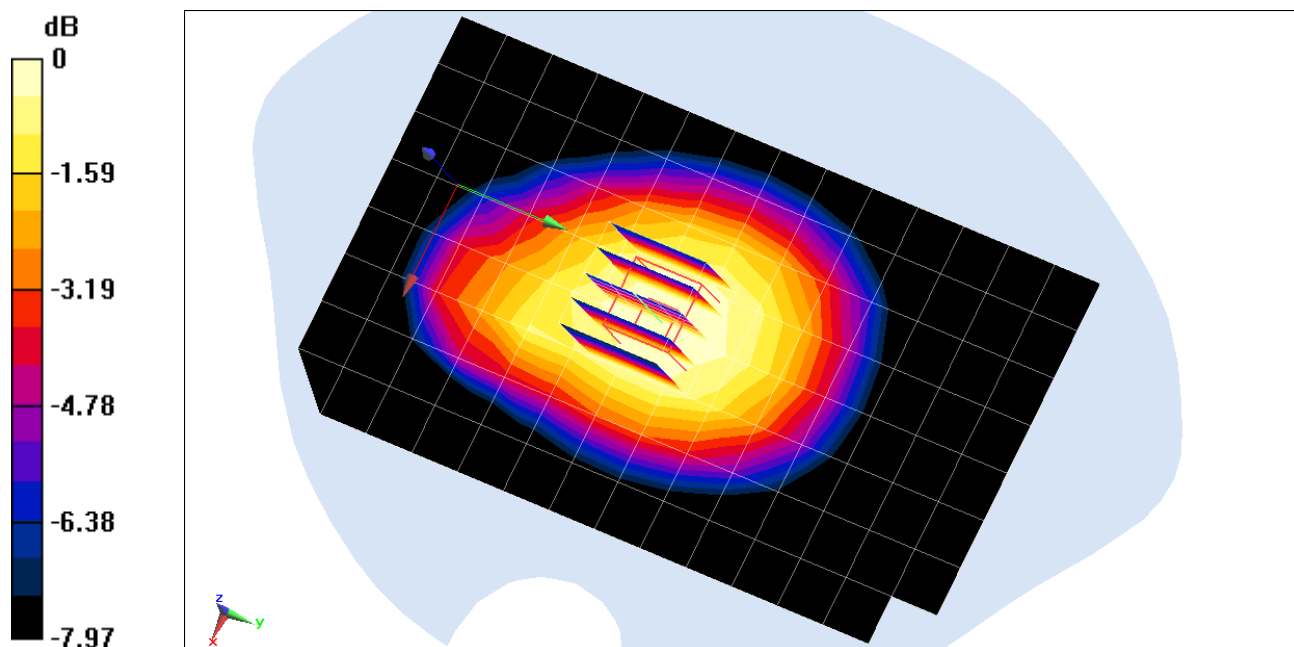
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 24.267 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.684 W/kg

SAR(1 g) = 0.555 W/kg



0 dB = 0.582 W/kg = -2.35 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#3

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.557 \text{ S/m}$; $\epsilon_r = 52.87$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-09-2014; Ambient Temp: 23.1°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

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

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

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

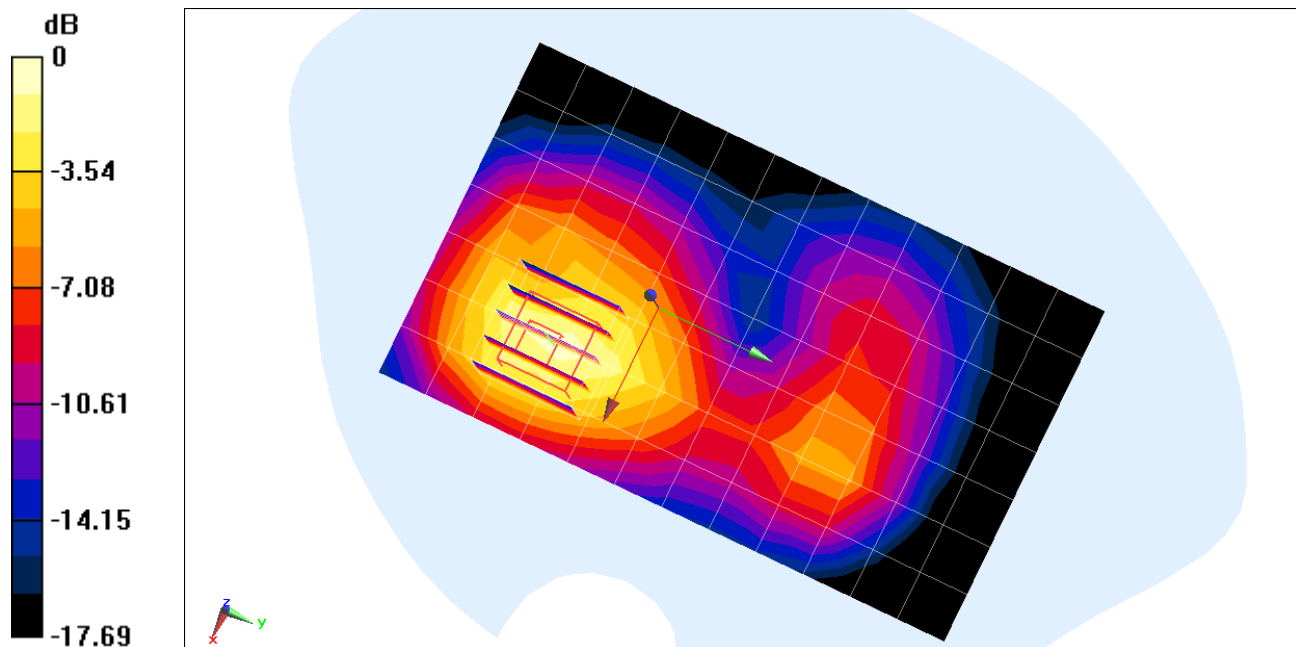
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.039 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.09 W/kg

SAR(1 g) = 0.650 W/kg



0 dB = 0.702 W/kg = -1.54 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 54.507$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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: LTE Band 13, Body SAR, Back side, Mid.ch

10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

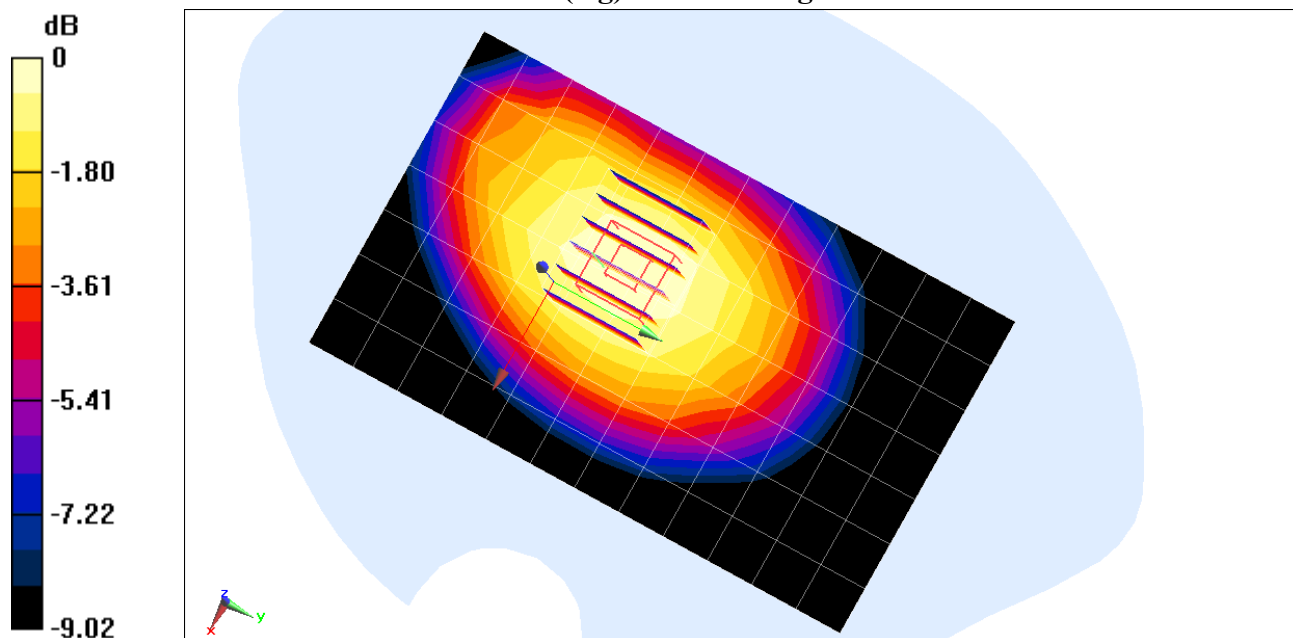
Area Scan (8x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 12.692 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.202 W/kg

SAR(1 g) = 0.158 W/kg



0 dB = 0.164 W/kg = -7.85 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 54.507$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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: LTE Band 13, Body SAR, Right Edge, Mid.ch
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

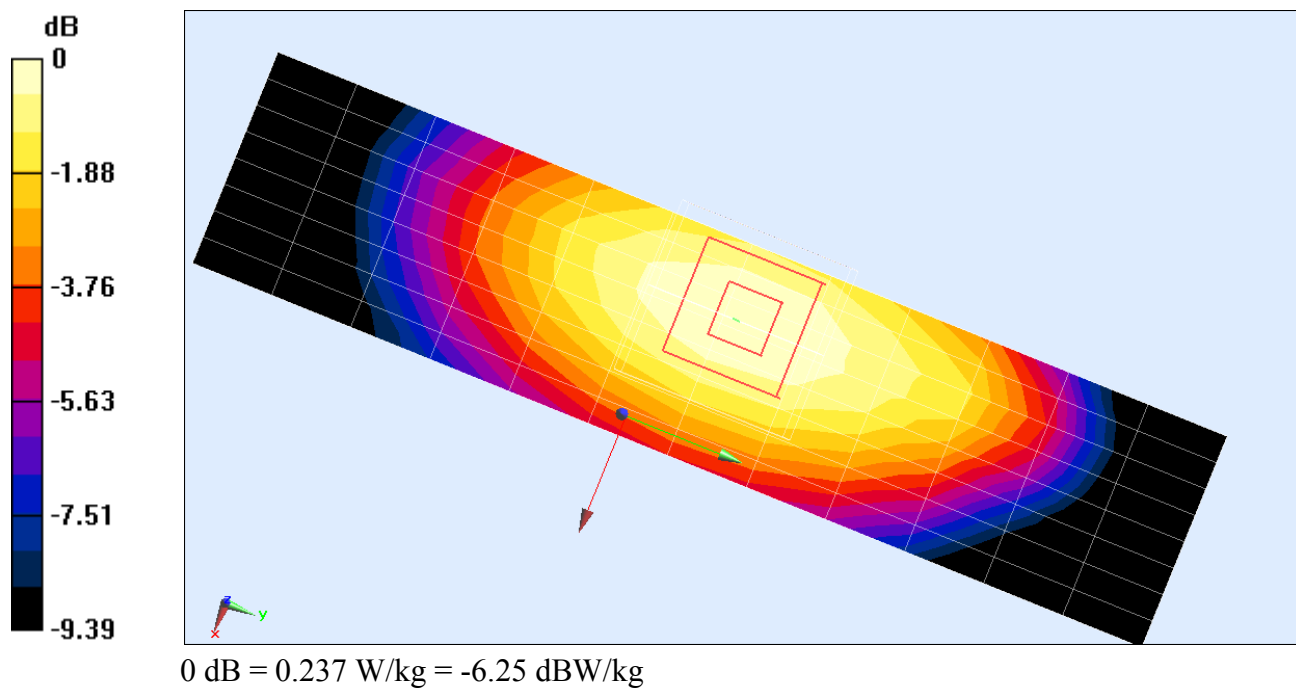
Area Scan (9x13x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.235 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.311 W/kg

SAR(1 g) = 0.221 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#2

Communication System: UID 0, LTE RF; Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.475 \text{ S/m}$; $\epsilon_r = 51.33$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-23-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3288; ConvF(5.1, 5.1, 5.1); Calibrated: 9/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

Mode: LTE Band 4 (AWS), Body SAR, Back side, Mid.ch
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

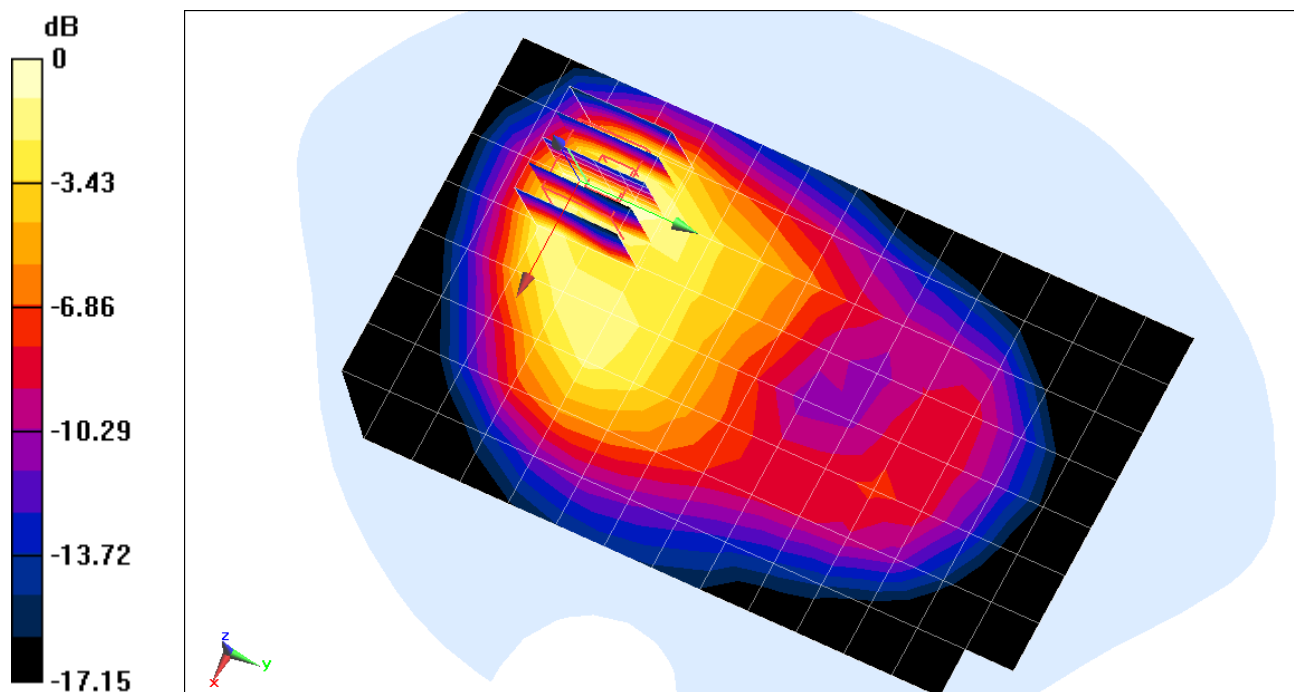
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.699 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.475 W/kg

SAR(1 g) = 0.259 W/kg



0 dB = 0.273 W/kg = -5.64 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#6

Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2437 \text{ MHz}$; $\sigma = 2.009 \text{ S/m}$; $\epsilon_r = 51.862$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.8°C; Tissue Temp: 23.2°C

Probe: ES3DV2 - SN3022; ConvF(4.01, 4.01, 4.01); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

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

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

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

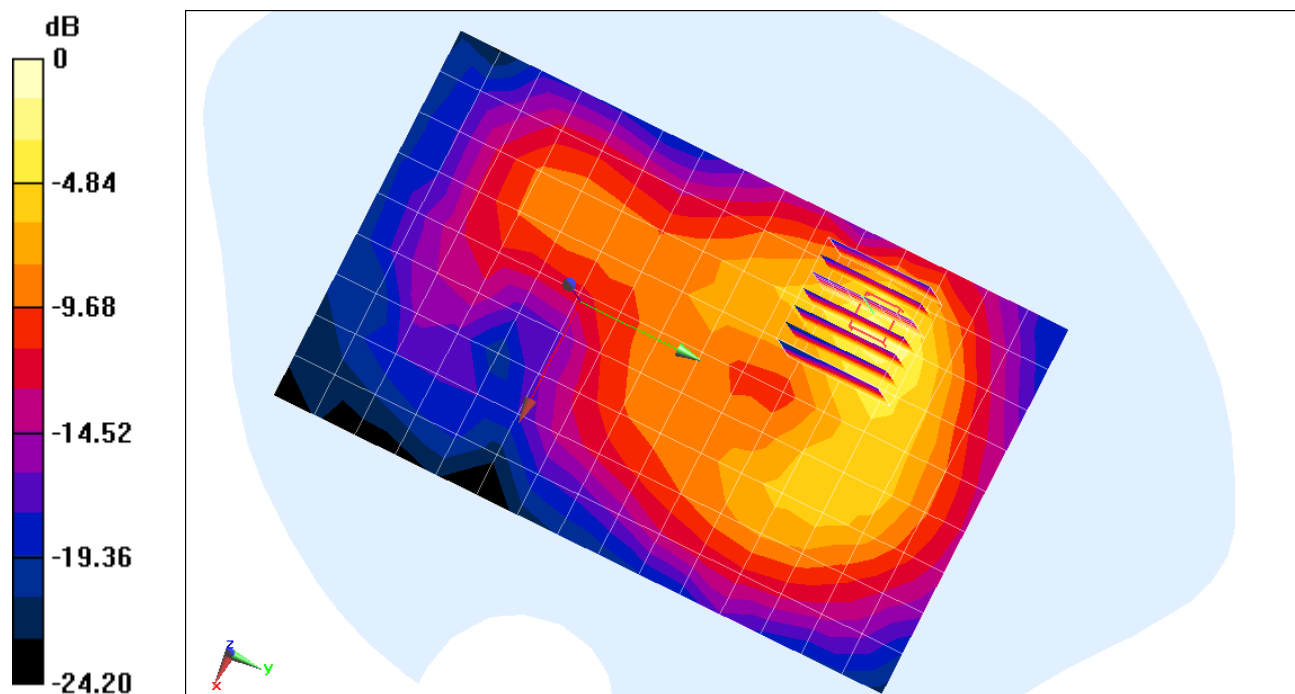
Area Scan (10x16x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 7.861 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.243 W/kg

SAR(1 g) = 0.117 W/kg



0 dB = 0.152 W/kg = -8.18 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#10

Communication System: UID 0, IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5745 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5745 \text{ MHz}$; $\sigma = 6.18 \text{ S/m}$; $\epsilon_r = 46.422$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-06-2014; Ambient Temp: 22.8°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(3.66, 3.66, 3.66); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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 149, 6 Mbps, Back Side

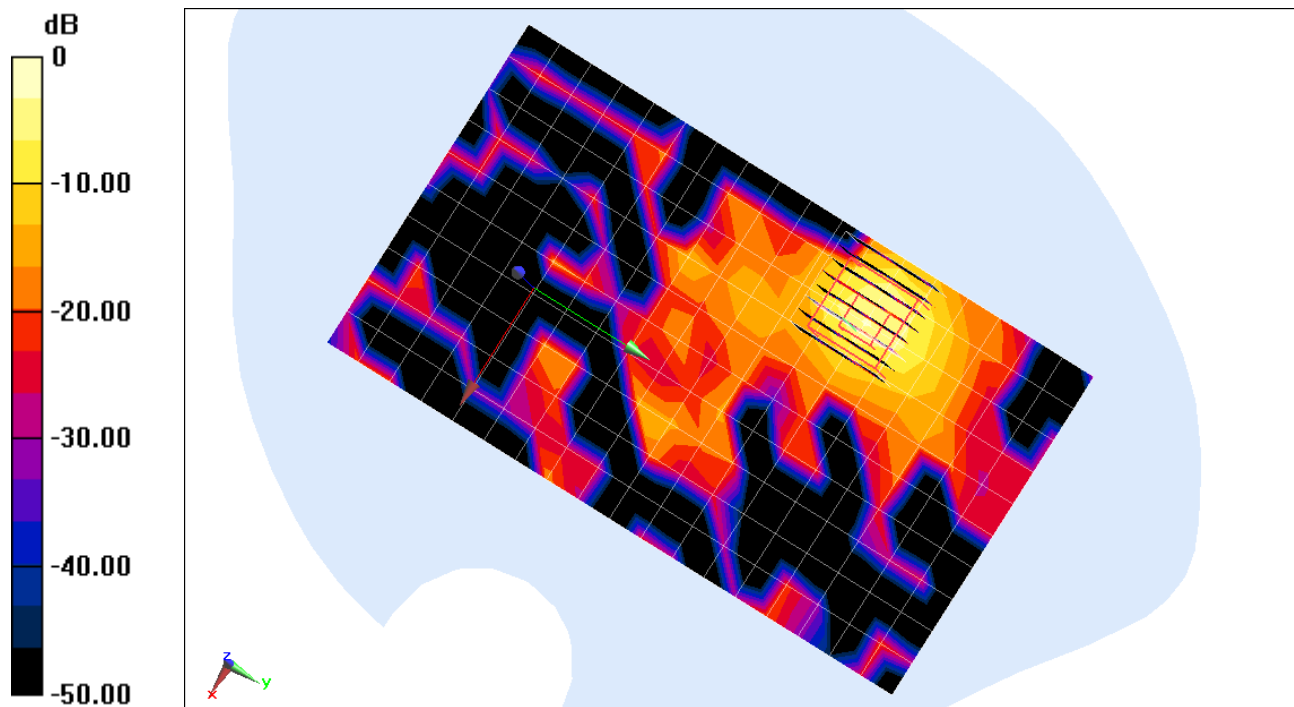
Area Scan (11x19x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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 = 6.461 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 1.00 W/kg

SAR(1 g) = 0.232 W/kg



0 dB = 0.569 W/kg = -2.45 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMW750V; Type: Portable Handset; Serial: FCC#10

Communication System: UID 0, IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5660 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5660 \text{ MHz}$; $\sigma = 6.075 \text{ S/m}$; $\epsilon_r = 46.633$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-06-2014; Ambient Temp: 22.8°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(3.32, 3.32, 3.32); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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, 5.5-5.7 GHz, Body SAR, Ch 132, 6 Mbps, Back Side

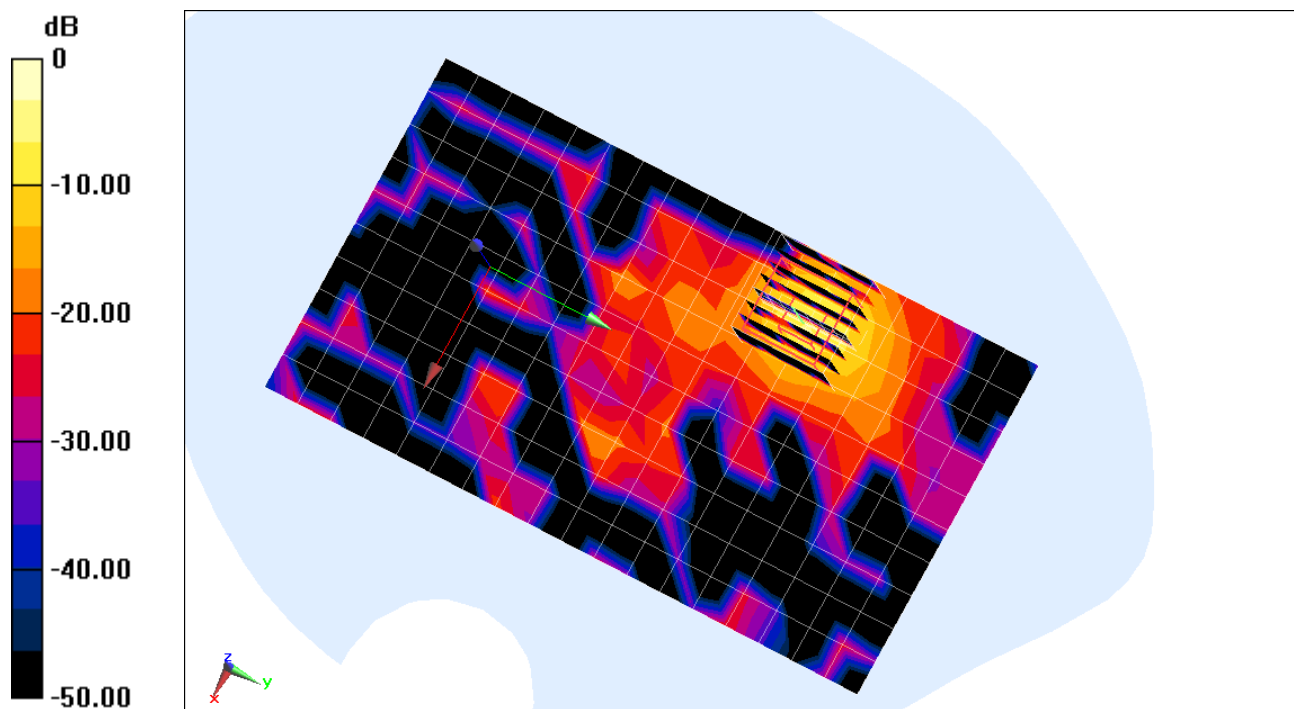
Area Scan (11x19x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 9.239 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 2.36 W/kg

SAR(1 g) = 0.508 W/kg



0 dB = 1.22 W/kg = 0.86 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1003

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: 750 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.907 \text{ S/m}$; $\epsilon_r = 40.671$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-30-2013; Ambient Temp: 23.3°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN3914; ConvF(9.7, 9.7, 9.7); Calibrated: 10/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

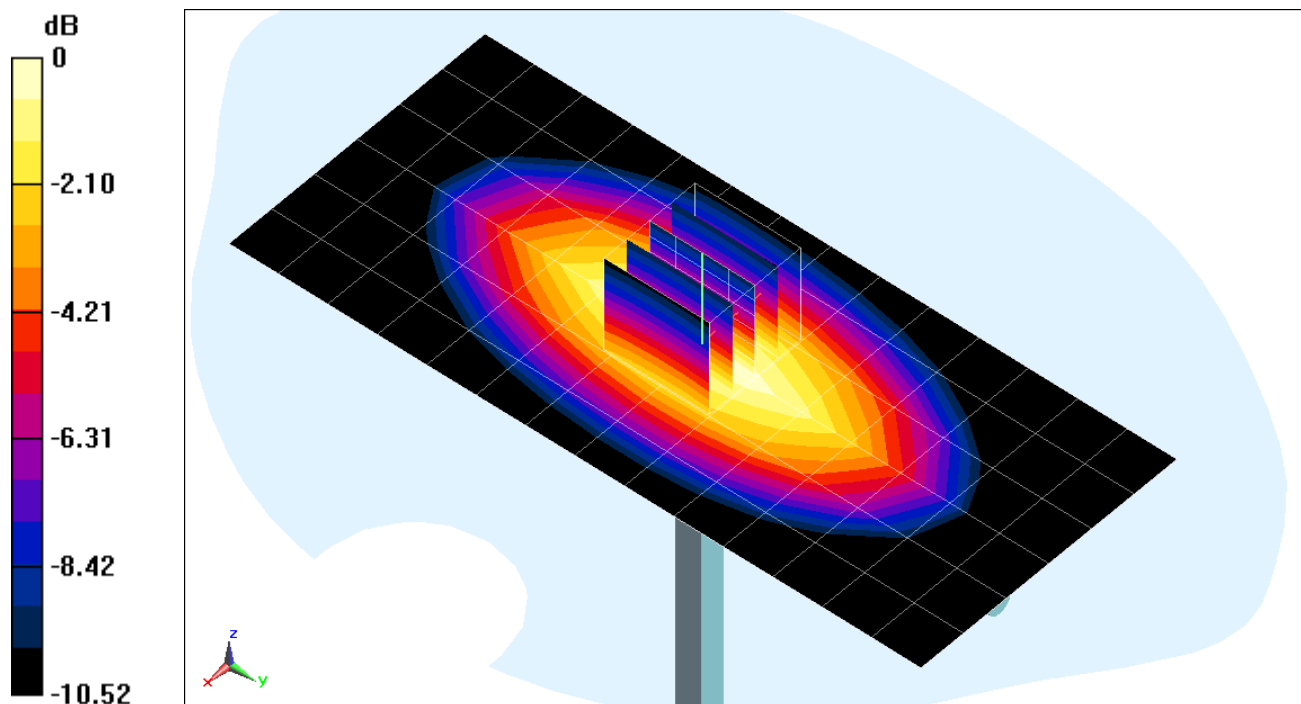
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.23 W/kg

SAR(1 g) = 0.824 W/kg

Deviation = -2.60%



0 dB = 0.890 W/kg = -0.51 dBW/kg

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:

$f = 835 \text{ MHz}$; $\sigma = 0.909 \text{ S/m}$; $\epsilon_r = 41.335$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-30-2013; Ambient Temp: 23.4°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3263; ConvF(6.29, 6.29, 6.29); Calibrated: 5/16/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/13/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403

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

835MHz System Verification

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

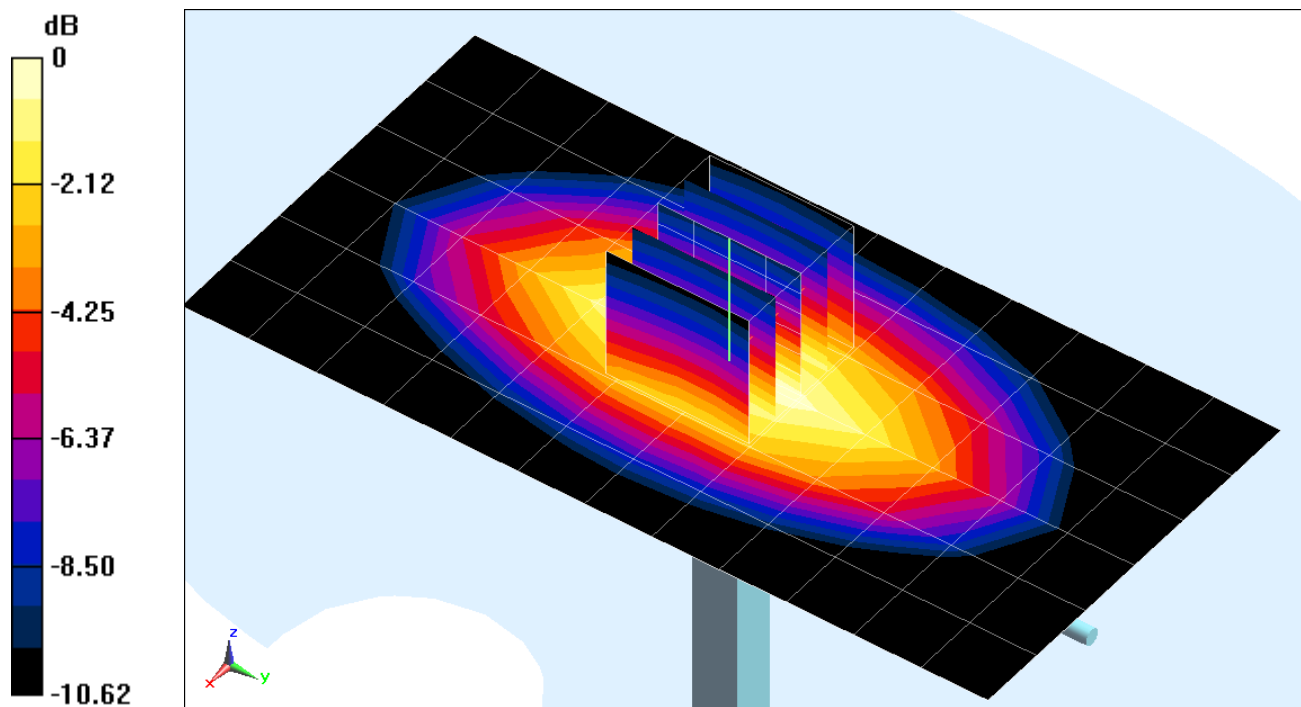
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.36 W/kg

SAR(1 g) = 0.923 W/kg

Deviation = -4.05%



0 dB = 1.00 W/kg = 0.00 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:

$f = 835 \text{ MHz}$; $\sigma = 0.894 \text{ S/m}$; $\epsilon_r = 40.197$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-31-2013; Ambient Temp: 24.7°C; Tissue Temp: 23.7°C

Probe: EX3DV4 - SN3914; ConvF(9.34, 9.34, 9.34); Calibrated: 10/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

835 MHz System Verification

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

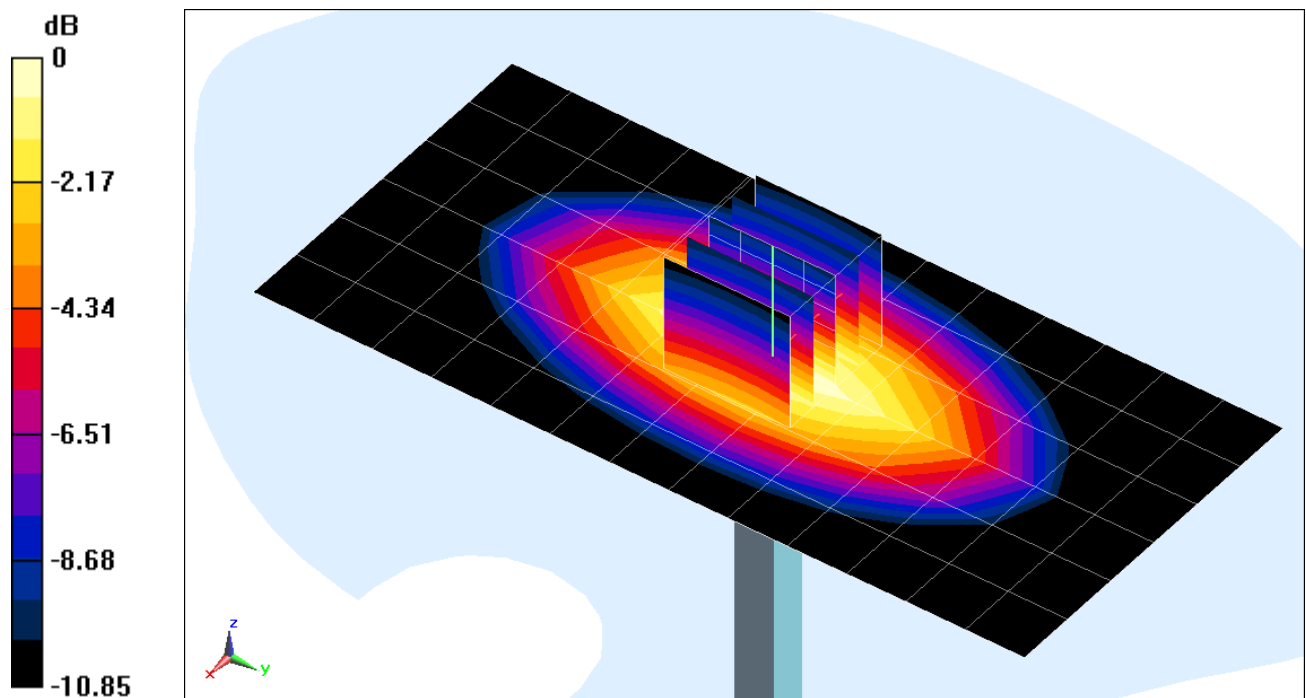
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.47 W/kg

SAR(1 g) = 0.978 W/kg

Deviation = 1.03%



0 dB = 1.05 W/kg = 0.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.413 \text{ S/m}$; $\epsilon_r = 40.355$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.7°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3288; ConvF(5.67, 5.67, 5.67); Calibrated: 9/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

1750 MHz System Verification

Area Scan (6x8x1): Measurement grid: dx=15mm, dy=15mm

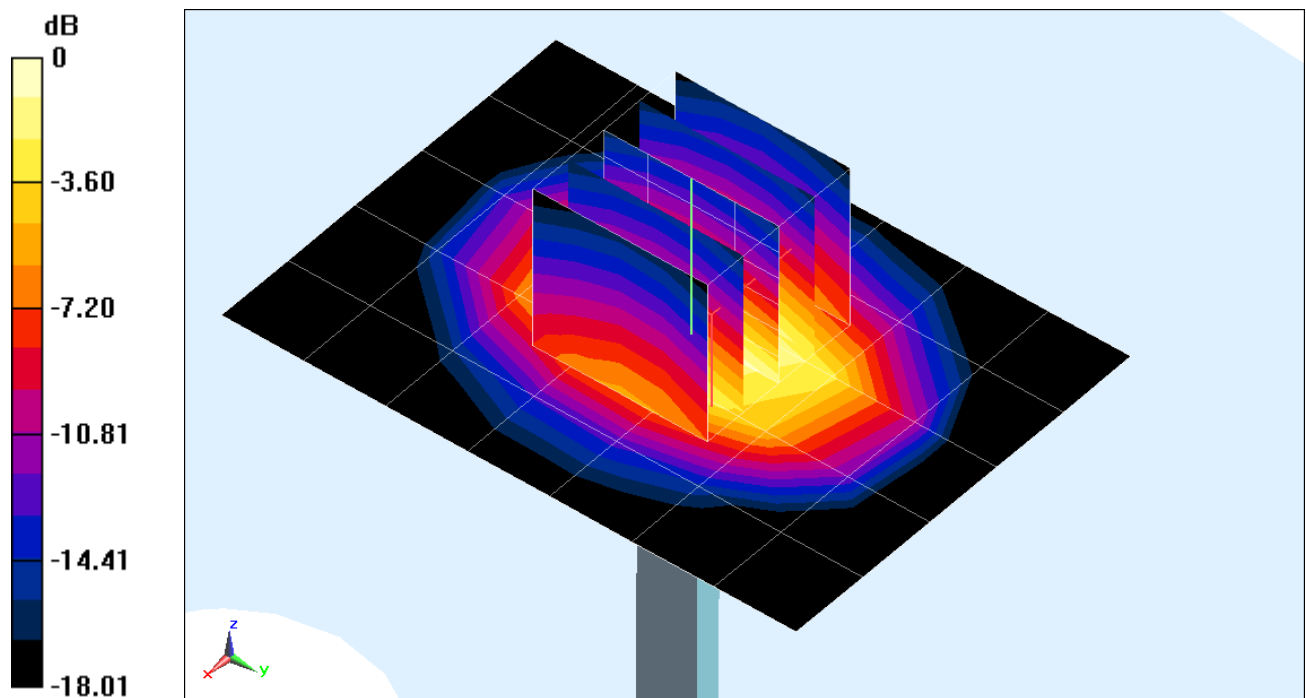
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 6.70 W/kg

SAR(1 g) = 3.61 W/kg

Deviation = -1.90%



0 dB = 4.04 W/kg = 6.06 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d141

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

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.444 \text{ S/m}$; $\epsilon_r = 38.979$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-30-2013; Ambient Temp: 21.1°C; Tissue Temp: 20.7°C

Probe: ES3DV3 - SN3263; ConvF(5.11, 5.11, 5.11); Calibrated: 5/16/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/13/2013

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

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

1900MHz System Verification

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

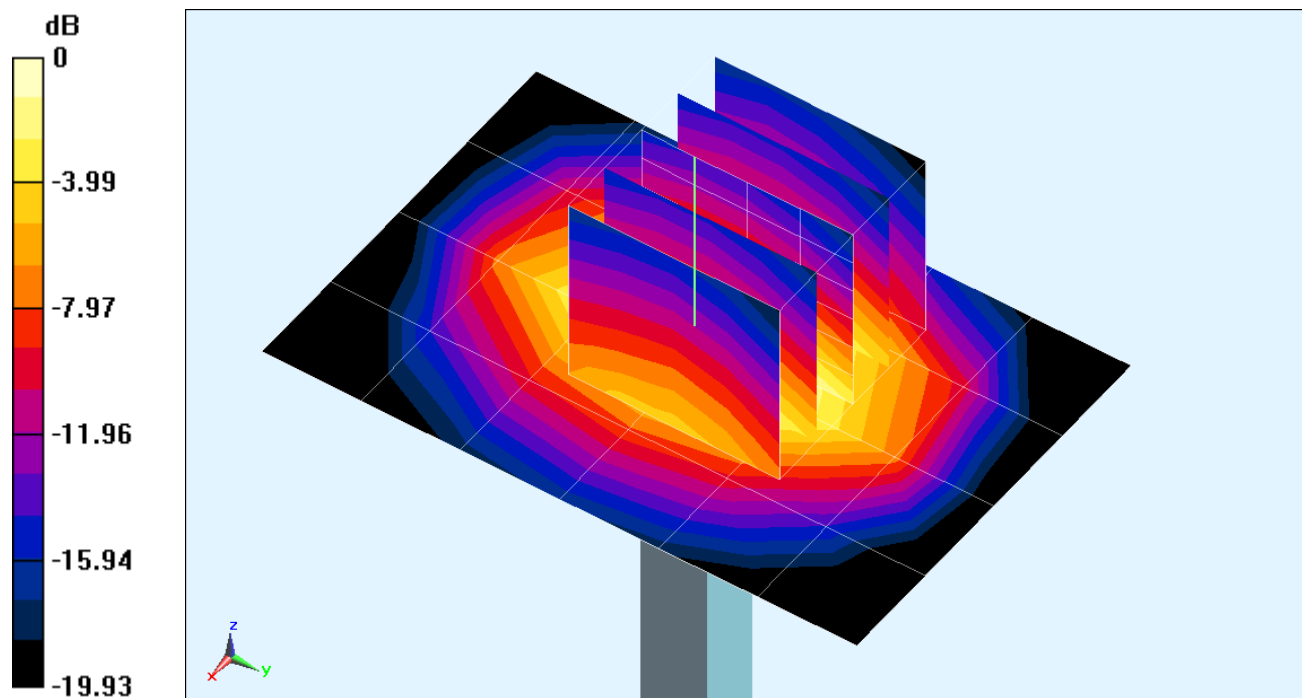
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.18 W/kg

SAR(1 g) = 3.87 W/kg

Deviation = -5.15%



0 dB = 4.25 W/kg = 6.28 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:

$f = 2450 \text{ MHz}$; $\sigma = 1.79 \text{ S/m}$; $\epsilon_r = 38.858$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-23-2013; Ambient Temp: 24.2°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN3914; ConvF(6.95, 6.95, 6.95); Calibrated: 10/23/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648

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

2450 MHz System Verification

Area Scan (9x10x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

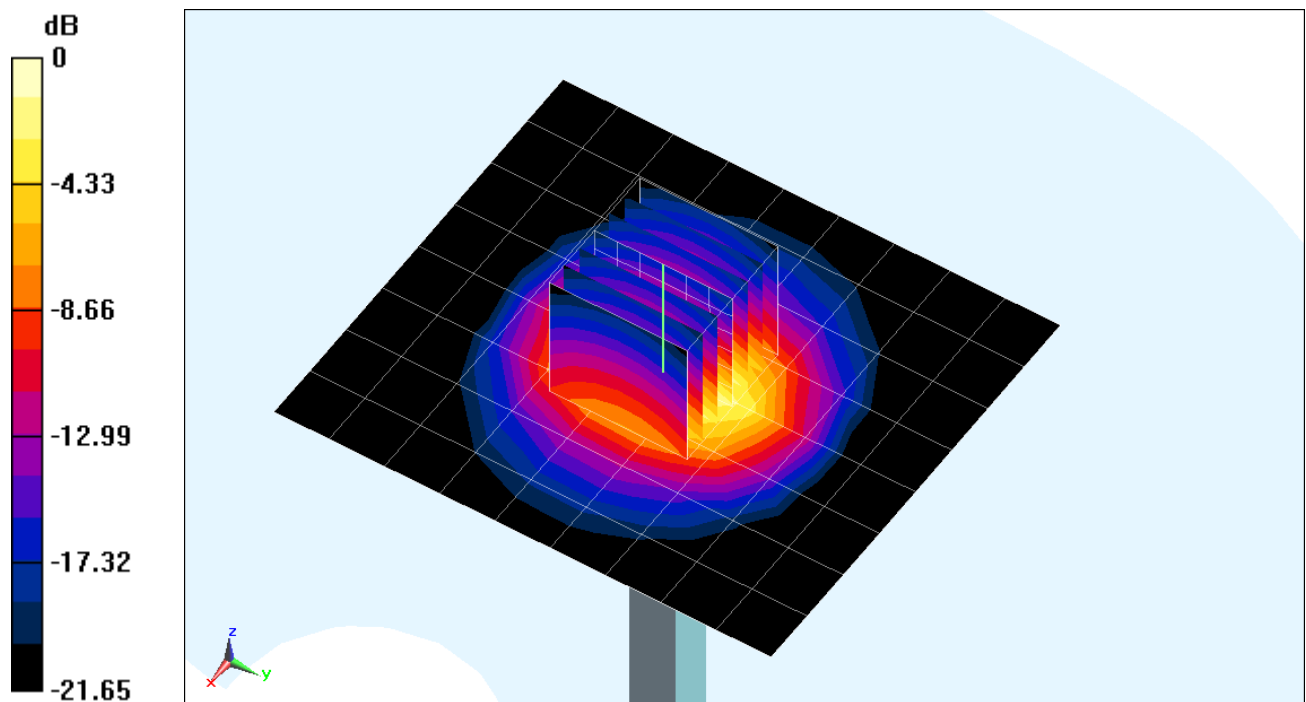
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 10.4 W/kg

SAR(1 g) = 5.01 W/kg

Deviation = -4.57%



0 dB = 6.60 W/kg = 8.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Head Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 4.494 \text{ S/m}$; $\epsilon_r = 36.716$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-10-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.3°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: $dx=10\text{mm}$, $dy=10\text{mm}$

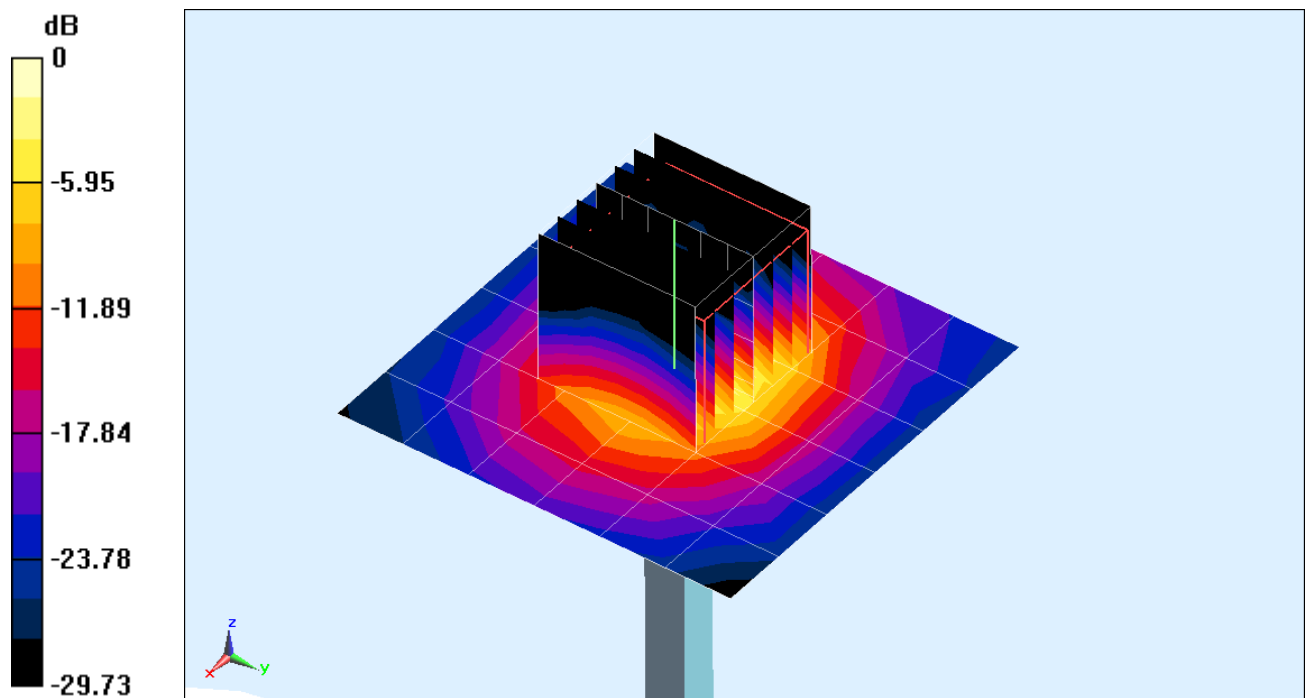
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 13.6 W/kg

SAR(1 g) = 3.23 W/kg

Deviation = 6.25%



0 dB = 7.55 W/kg = 8.78 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Head Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 4.591 \text{ S/m}$; $\epsilon_r = 36.609$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-10-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.1°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=10mm, dy=10mm

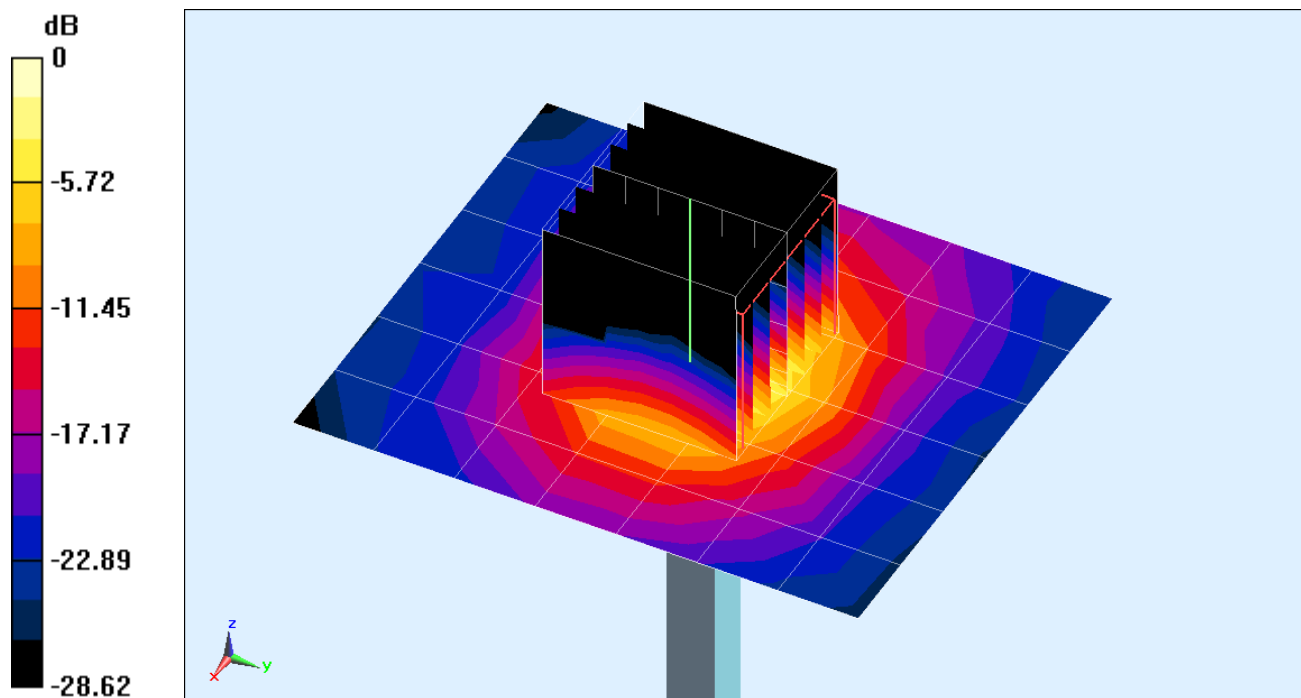
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 13.2 W/kg

SAR(1 g) = 3.12 W/kg

Deviation = -0.89%



0 dB = 6.05 W/kg = 7.82 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Head Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 4.807 \text{ S/m}$; $\epsilon_r = 36.301$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-10-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.0°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: $dx=10\text{mm}$, $dy=10\text{mm}$

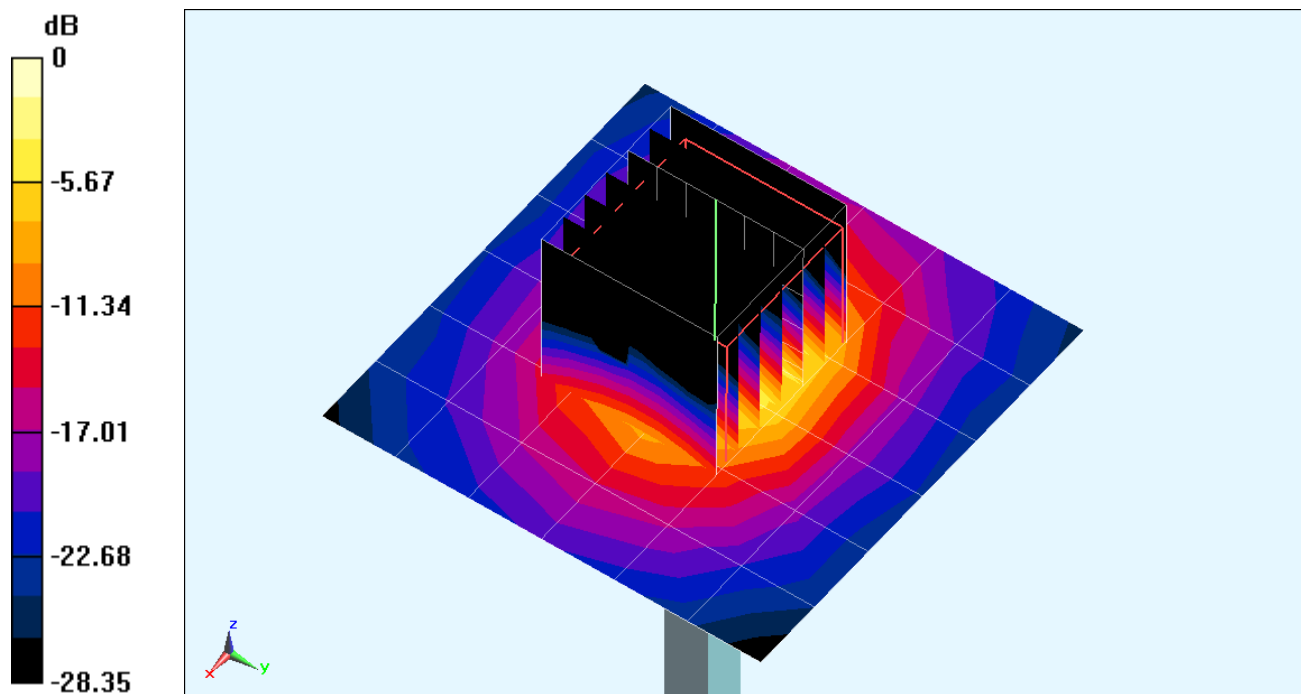
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 13.7 W/kg

SAR(1 g) = 3.11 W/kg

Deviation = -2.93%



0 dB = 7.52 W/kg = 8.76 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1120

Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 4.909 \text{ S/m}$; $\epsilon_r = 36.184$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-10-2014; Ambient Temp: 24.1°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3914; ConvF(4.37, 4.37, 4.37); 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)

5600 MHz System Verification

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

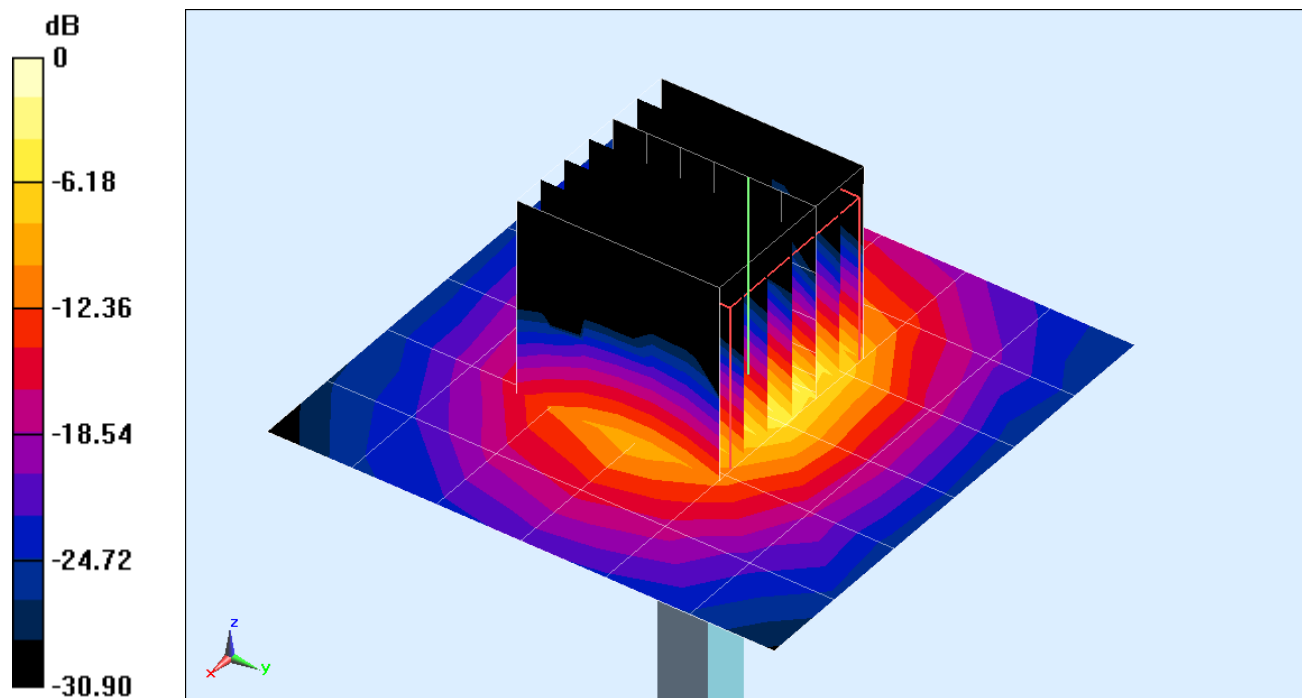
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 14.7 W/kg

SAR(1 g) = 3.27 W/kg

Deviation = 2.32%



0 dB = 7.97 W/kg = 9.01 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1120

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

Medium: 5 GHz Head Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 5.11 \text{ S/m}$; $\epsilon_r = 35.984$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-10-2014; Ambient Temp: 24.0°C; Tissue Temp: 23.3°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: $dx=10\text{mm}$, $dy=10\text{mm}$

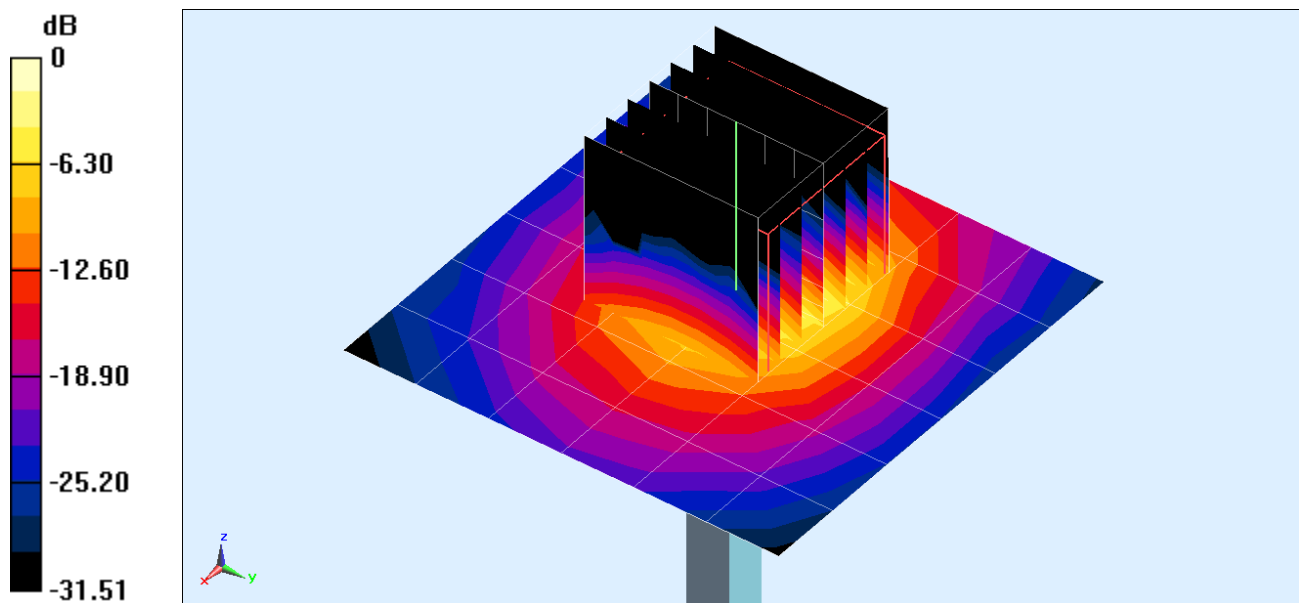
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 16.0 dBm (40 mW)

Peak SAR (extrapolated) = 14.4 W/kg

SAR(1 g) = 3.02 W/kg

Deviation = 0.80%



0 dB = 7.48 W/kg = 8.74 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1003

Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.974 \text{ S/m}$; $\epsilon_r = 54.86$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-26-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN3914; ConvF(9.39, 9.39, 9.39); Calibrated: 10/23/2013;

Sensor-Surface: 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)

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

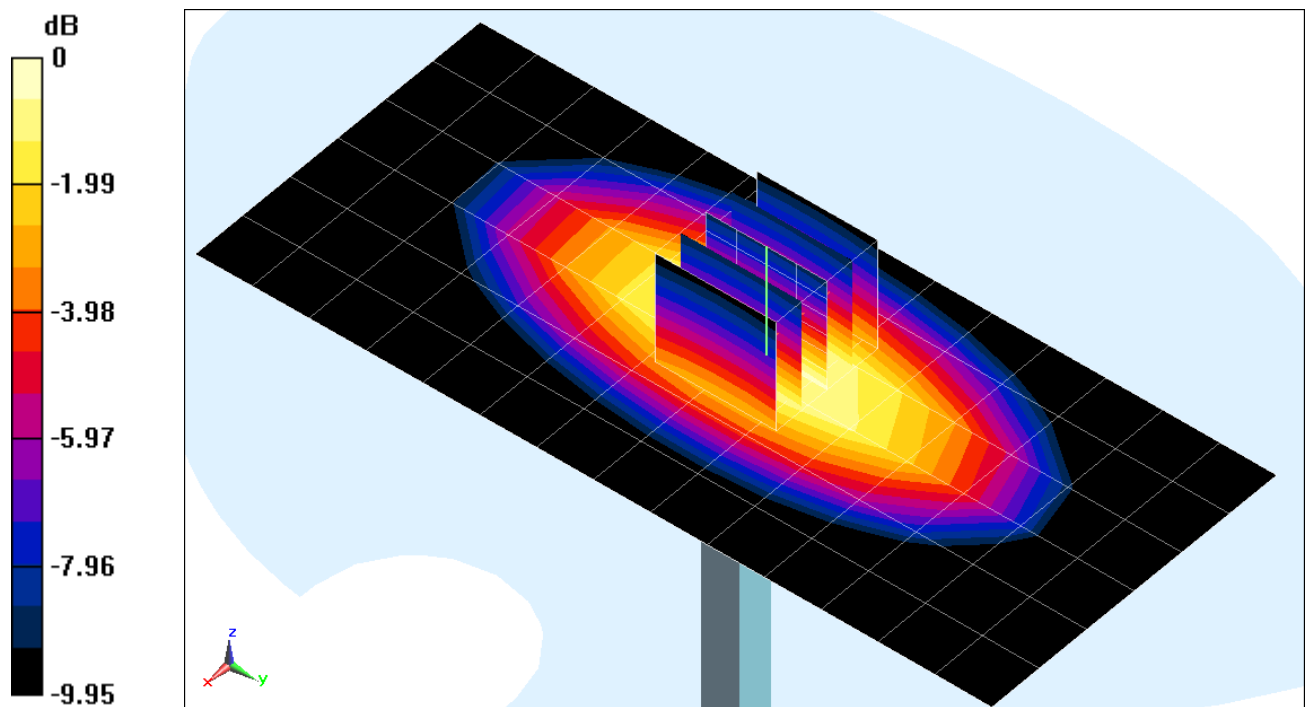
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.30 W/kg

SAR(1 g) = 0.882 W/kg

Deviation = -0.11%



0 dB = 0.950 W/kg = -0.22 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 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 1.003 \text{ S/m}$; $\epsilon_r = 54.041$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-08-2014; Ambient Temp: 24.2°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3333; ConvF(6.07, 6.07, 6.07); Calibrated: 11/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229

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

835 MHz System Verification

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

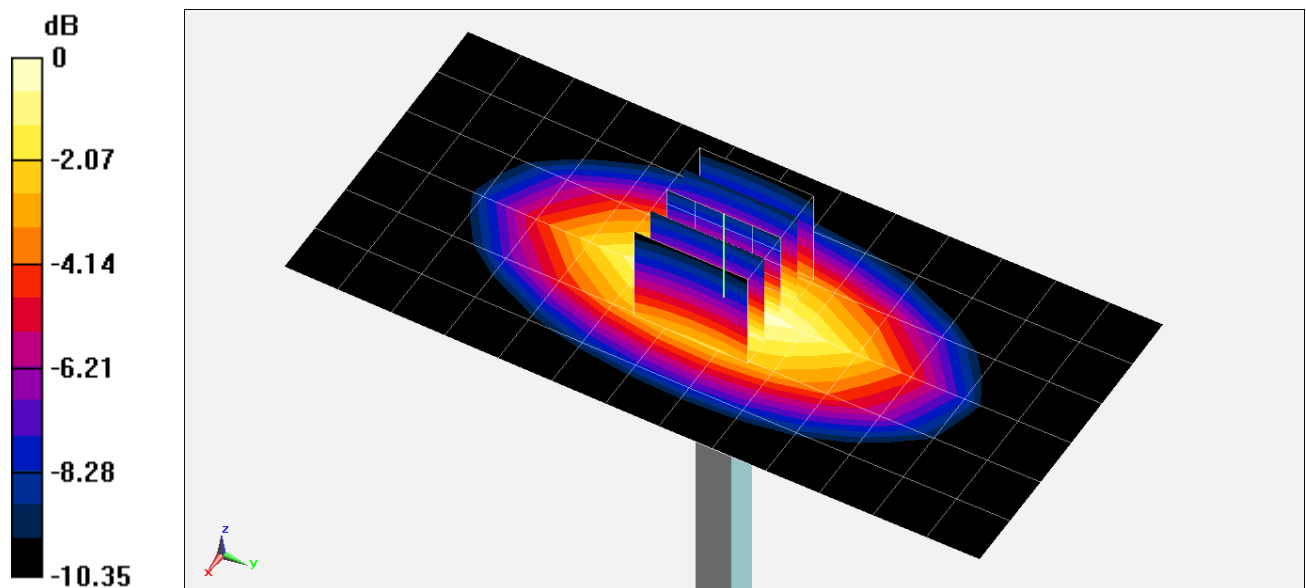
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.38 W/kg

SAR(1 g) = 0.939 W/kg

Deviation = -1.57%



0 dB = 1.01 W/kg = 0.04 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 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 1.014 \text{ S/m}$; $\epsilon_r = 54.96$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-10-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.1°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

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

835 MHz System Verification

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

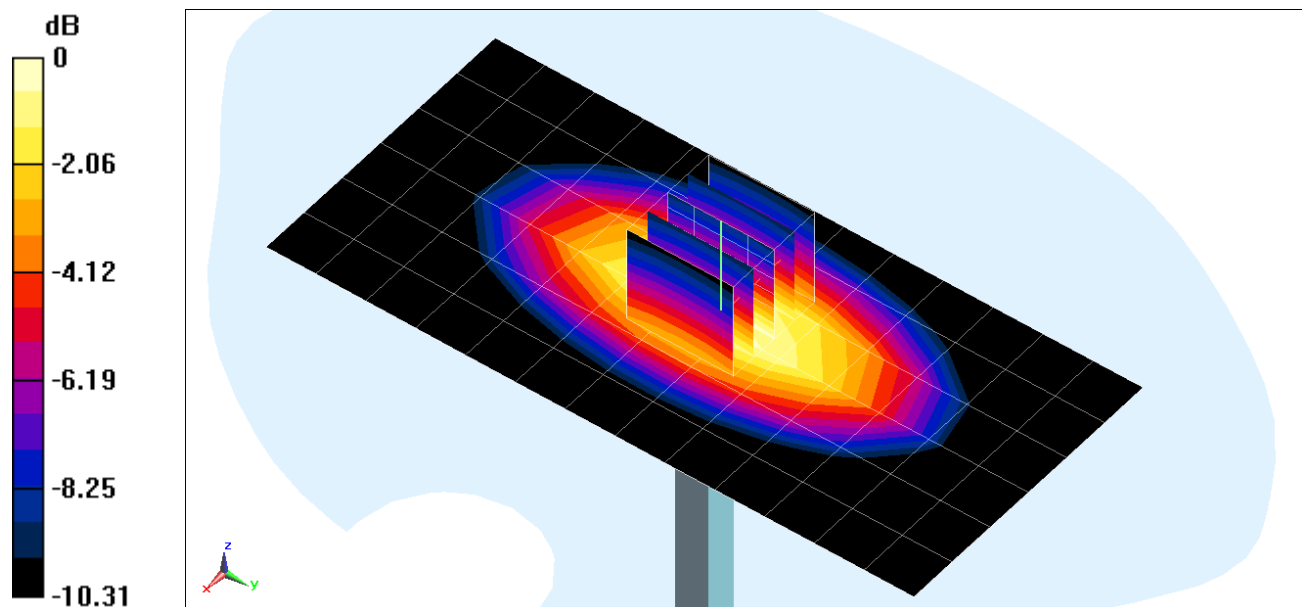
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.38 W/kg

SAR(1 g) = 0.957 W/kg

Deviation = 0.31%



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

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.495 \text{ S/m}$; $\epsilon_r = 51.218$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-23-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3288; ConvF(5.1, 5.1, 5.1); Calibrated: 9/23/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

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

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

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

1750 MHz System Verification

Area Scan (6x8x1): Measurement grid: dx=15mm, dy=15mm

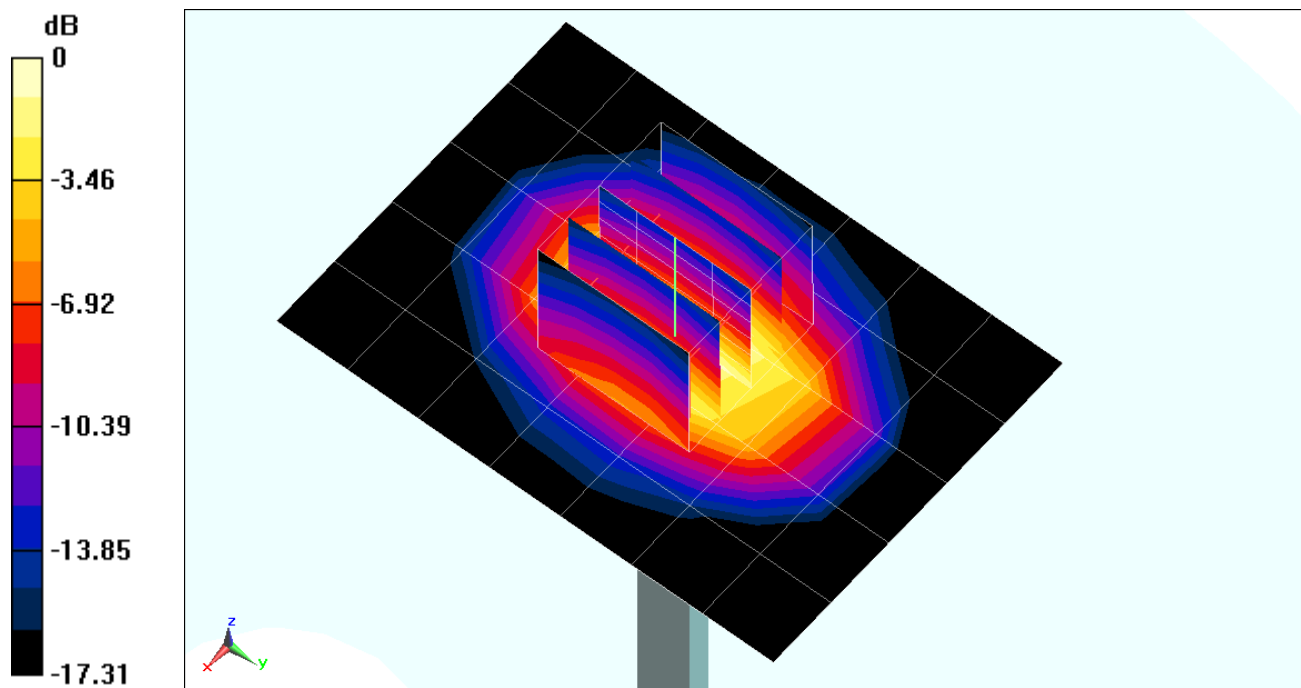
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 6.57 W/kg

SAR(1 g) = 3.66 W/kg

Deviation = -4.19%



0 dB = 4.11 W/kg = 6.14 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: 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):

$f = 1900 \text{ MHz}$; $\sigma = 1.58 \text{ S/m}$; $\epsilon_r = 52.809$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-09-2014; Ambient Temp: 23.1°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(4.85, 4.85, 4.85); Calibrated: 4/29/2013;

Sensor-Surface: 4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/22/2013

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: $dx=15\text{mm}$, $dy=15\text{mm}$

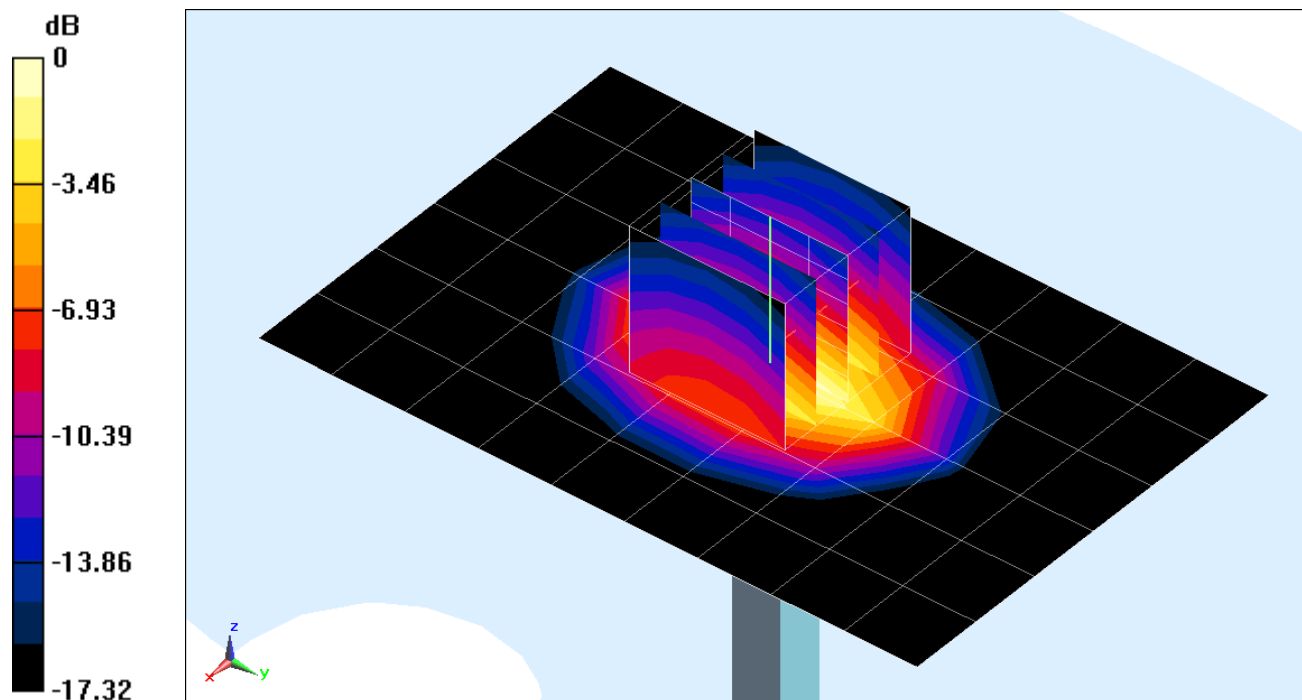
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.06 W/kg

SAR(1 g) = 3.89 W/kg

Deviation = -4.66%



0 dB = 4.38 W/kg = 6.41 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 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.028 \text{ S/m}$; $\epsilon_r = 51.818$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2013; Ambient Temp: 23.8°C; Tissue Temp: 23.2°C

Probe: ES3DV2 - SN3022; ConvF(4.01, 4.01, 4.01); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

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

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

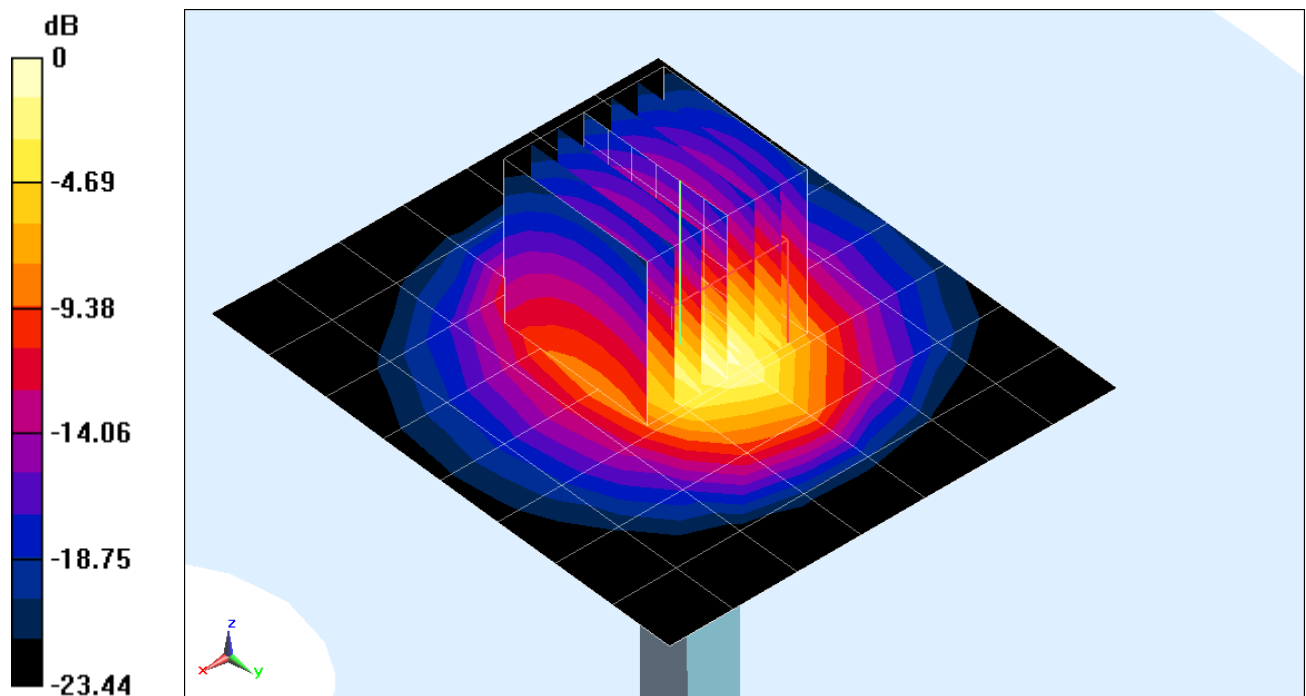
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 11.5 W/kg

SAR(1 g) = 5.33 W/kg

Deviation = 7.46%



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 Body Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 5.509 \text{ S/m}$; $\epsilon_r = 47.132$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-06-2014; Ambient Temp: 22.8°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(3.99, 3.99, 3.99); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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=10mm, dy=10mm

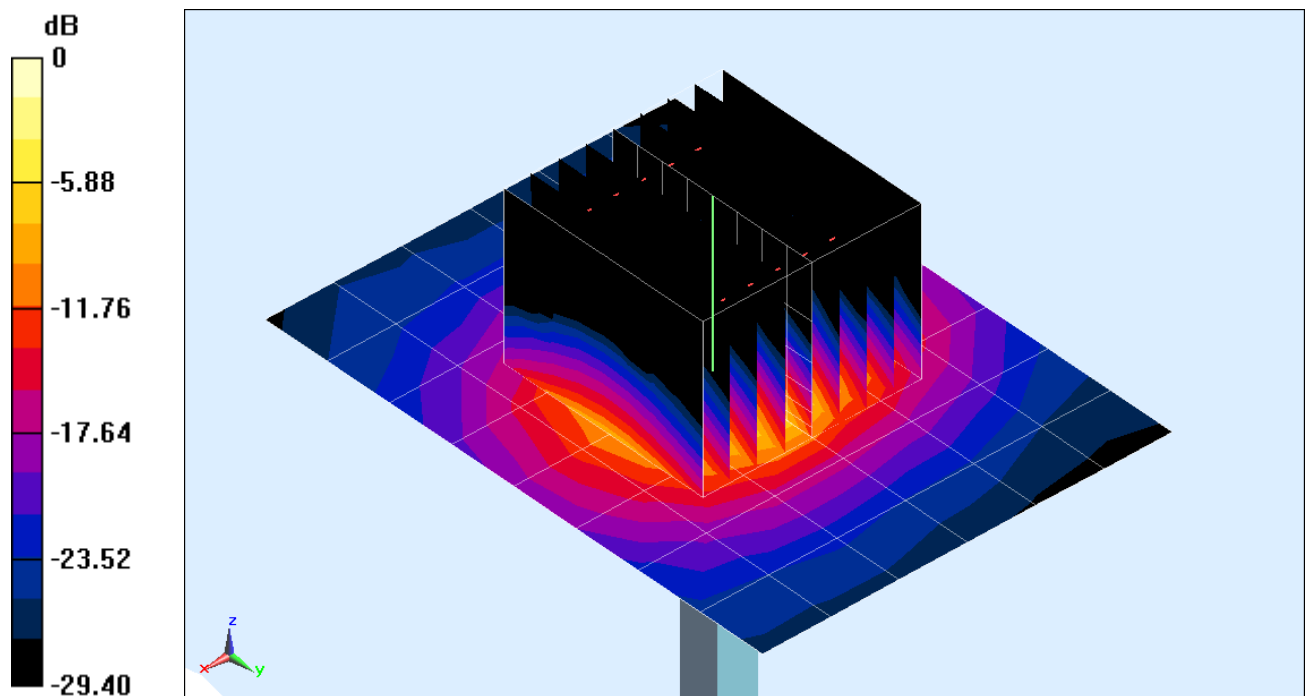
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 31.8 W/kg

SAR(1 g) = 7.64 W/kg

Deviation = 1.19%



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

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 Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.622 \text{ S/m}$; $\epsilon_r = 47.05$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-06-2014; Ambient Temp: 22.8°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

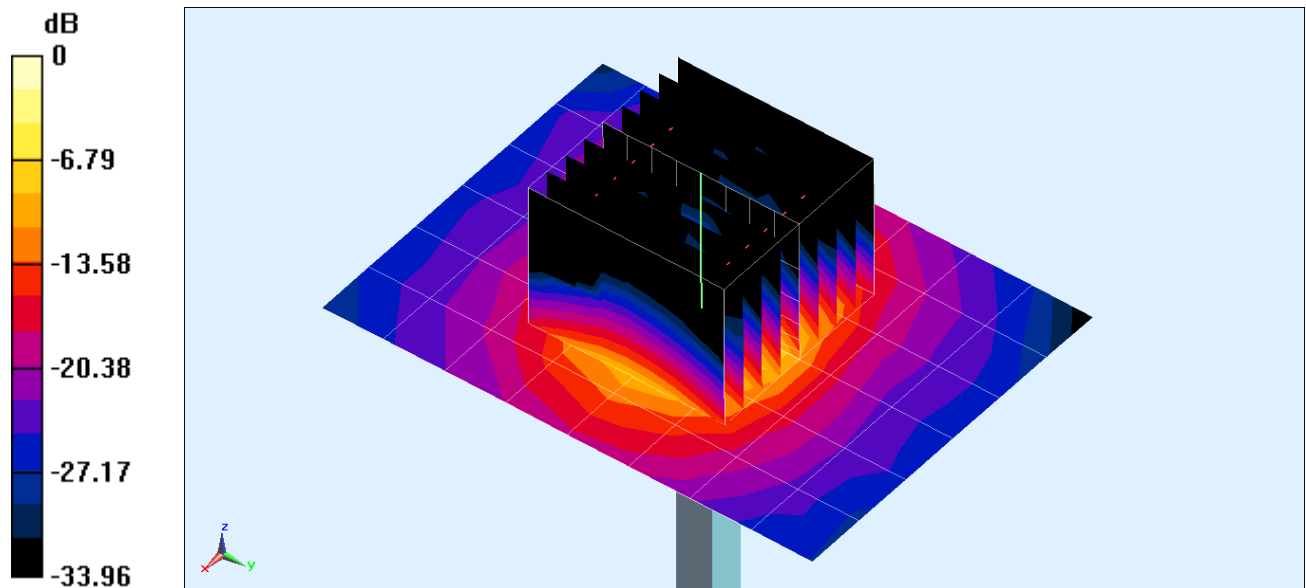
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 34.3 W/kg

SAR(1 g) = 7.92 W/kg

Deviation = 5.18%



0 dB = 19.2 W/kg = 12.83 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 Body Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.871 \text{ S/m}$; $\epsilon_r = 46.873$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-06-2014; Ambient Temp: 22.8°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(3.52, 3.52, 3.52); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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=10mm, dy=10mm

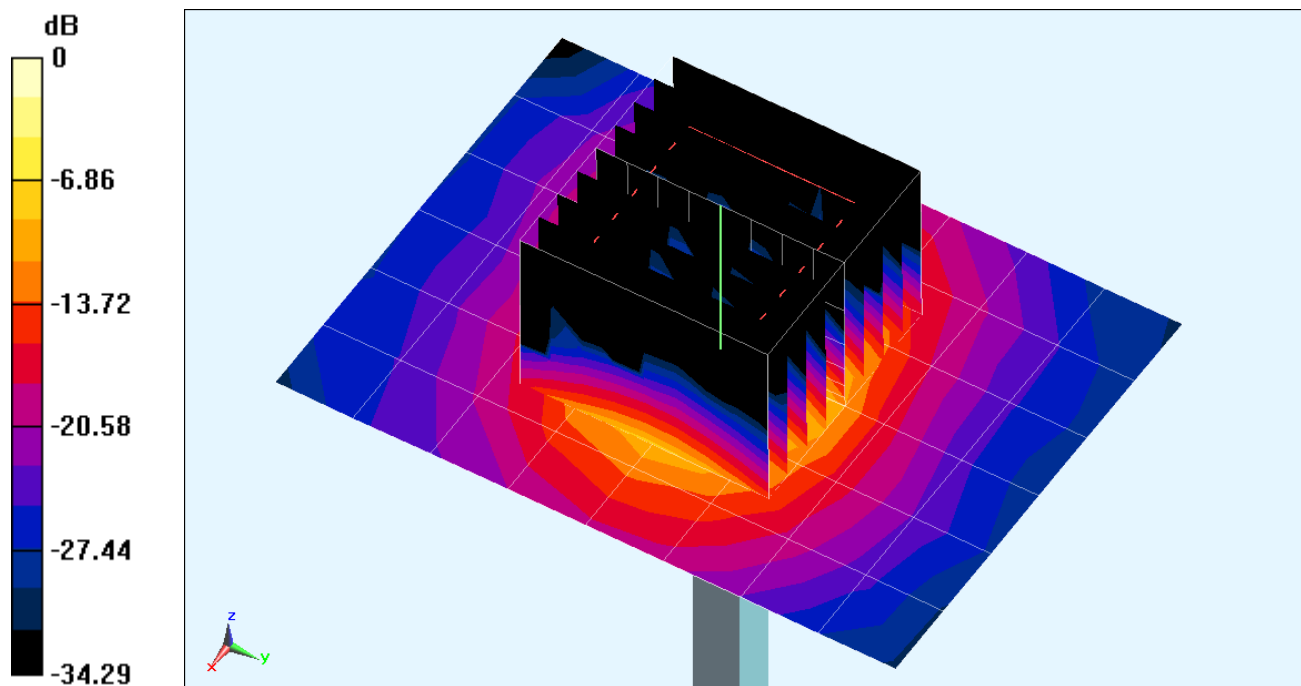
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 36.5 W/kg

SAR(1 g) = 8.18 W/kg

Deviation = 1.24%



0 dB = 20.3 W/kg = 13.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.988 \text{ S/m}$; $\epsilon_r = 46.765$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-06-2014; Ambient Temp: 22.8°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(3.32, 3.32, 3.32); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

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

5600MHz System Verification

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

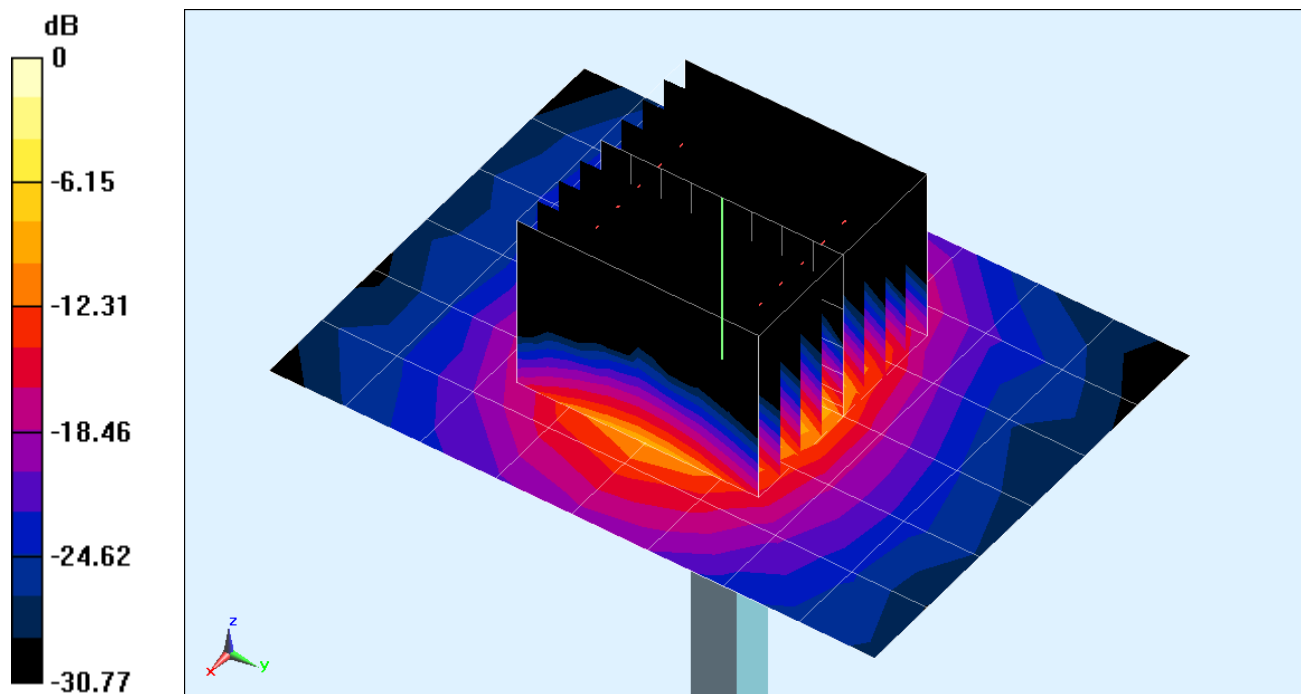
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 36.5 W/kg

SAR(1 g) = 8.39 W/kg

Deviation = 4.48%



0 dB = 20.9 W/kg = 13.20 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 Body Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 6.294 \text{ S/m}$; $\epsilon_r = 46.218$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-06-2014; Ambient Temp: 22.8°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(3.66, 3.66, 3.66); Calibrated: 1/17/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 1/17/2013

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

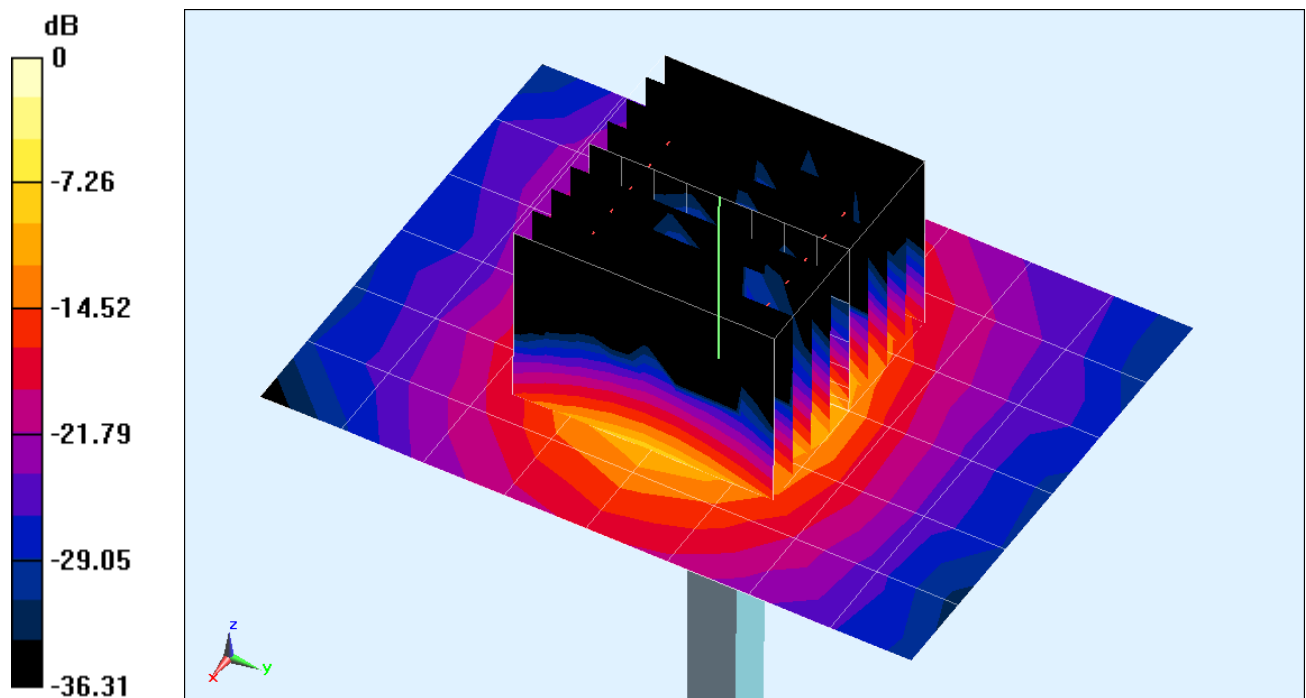
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 35.9 W/kg

SAR(1 g) = 7.44 W/kg

Deviation = -0.93%



0 dB = 18.8 W/kg = 12.74 dBW/kg

APPENDIX C: PROBE CALIBRATION



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
 Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **D750V3-1003_Jan13**

CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1003**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **January 07, 2013**

✓ KOK
1/28/13

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 8, 2013

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.4 $\pm$ 6 %	0.89 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.46 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.51 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.8 $\pm$ 6 %	0.97 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.83 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.87 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	56.1 Ω - 0.2 j Ω
Return Loss	- 24.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.6 Ω - 3.5 j Ω
Return Loss	- 29.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

DASY5 Validation Report for Head TSL

Date: 07.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1003

Communication System: CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.89 \text{ S/m}$; $\epsilon_r = 41.4$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.28, 6.28, 6.28); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

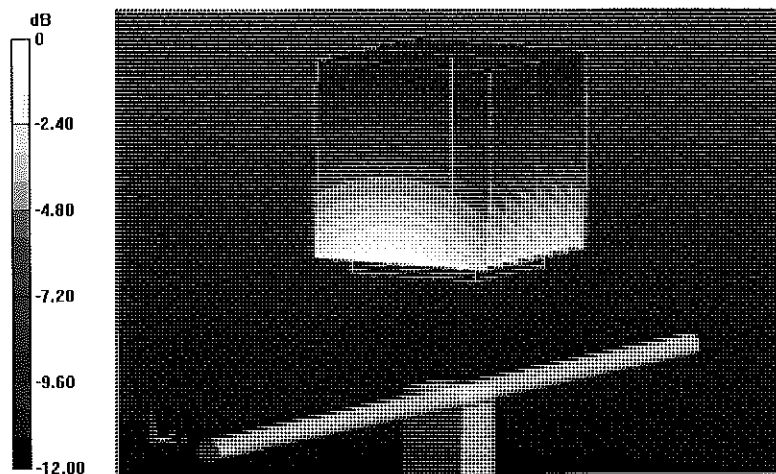
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.114 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.24 W/kg

SAR(1 g) = 2.12 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (measured) = 2.47 W/kg

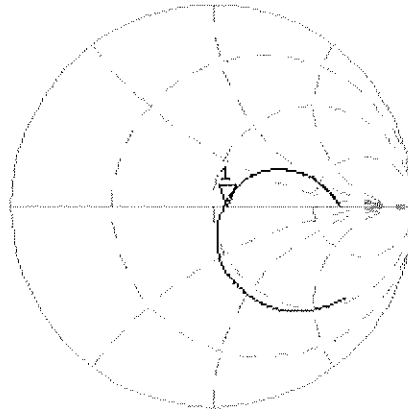


0 dB = 2.47 W/kg = 3.93 dBW/kg

Impedance Measurement Plot for Head TSL

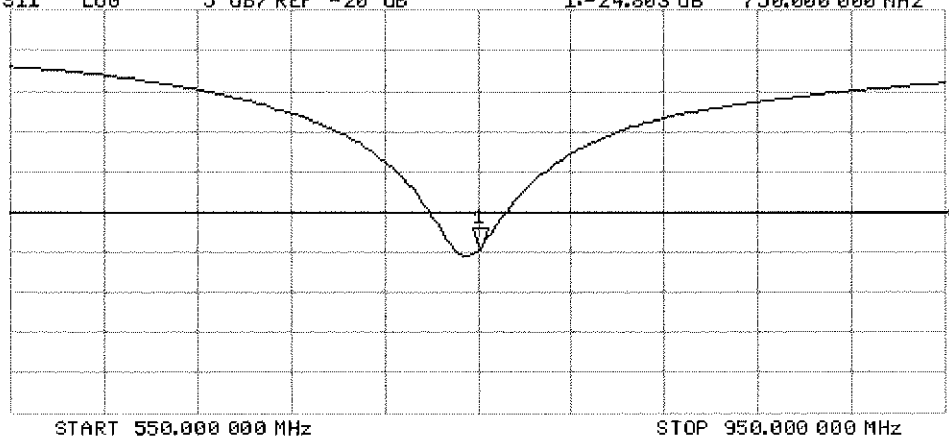
7 Jan 2013 12:55:14
 [CH1] S11 1 U FS 1: 56.100 Ω -179.69 m Ω 1.1810 nF 750.000 000 MHz

*
 De1
 Ca
 Avg
 16
 H1d



CH2 S11 LOG 5 dB/REF -20 dB 1: -24.803 dB 750.000 000 MHz

Ca
 Avg
 16
 H1d



DASY5 Validation Report for Body TSL

Date: 07.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1003

Communication System: CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.97 \text{ S/m}$; $\epsilon_r = 54.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.11, 6.11, 6.11); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

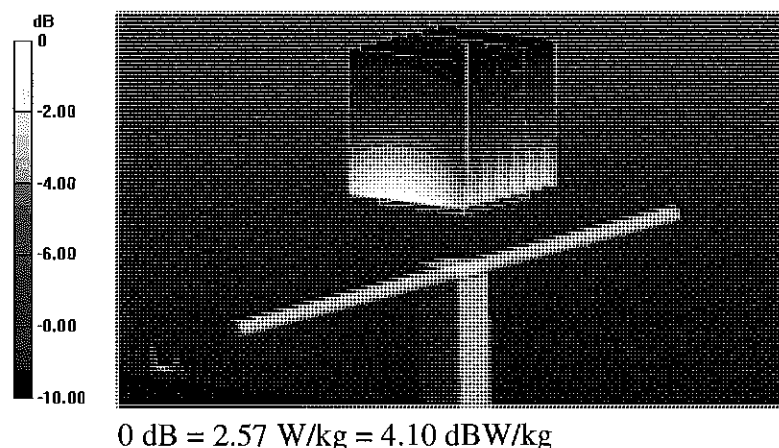
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.114 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.25 W/kg

SAR(1 g) = 2.23 W/kg; SAR(10 g) = 1.48 W/kg

Maximum value of SAR (measured) = 2.57 W/kg



Impedance Measurement Plot for Body TSL

7 Jan 2013 09:57:48
CH1 S11 1 U FS 1: 49.564 Ω -3.4629 Ω 61.280 pF 750.000 000 MHz

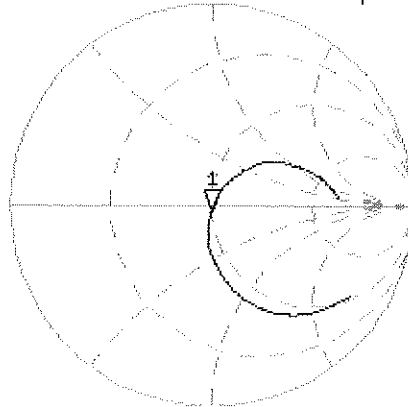
*

De1

Ca

Avg
16

H1 d

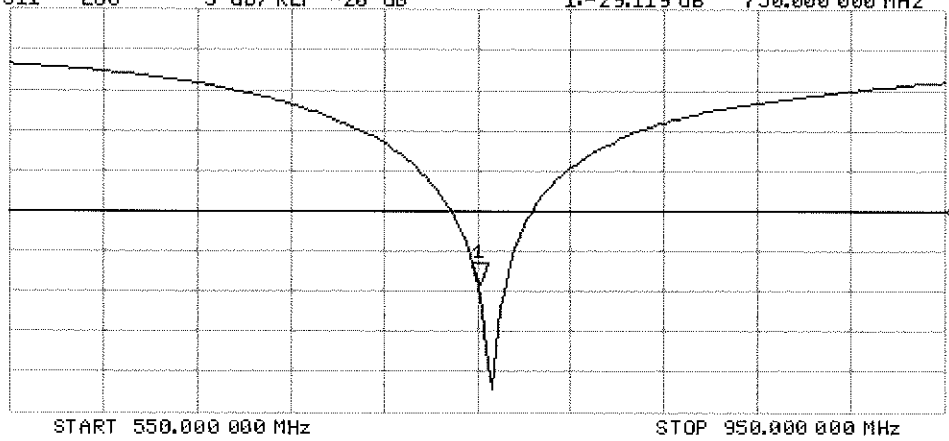


CH2 S11 LOG 5 dB/REF -20 dB 1:-29.119 dB 750.000 000 MHz

Ca

Avg
16

H1 d





Accredited by the Swiss Accreditation Service (SAS)
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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d119_Apr13**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d119**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **April 25, 2013**

✓
KOK
5/8/13

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 909	11-Sep-12 (No. DAE4-909_Sep12)	Sep-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by: **Claudio Leubler** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

Issued: April 26, 2013

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.8 $\pm$ 6 %	0.94 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.51 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.68 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.30 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.0 $\pm$ 6 %	1.01 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.54 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.31 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.1 Ω - 4.7 j Ω
Return Loss	- 26.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.8 Ω - 6.3 j Ω
Return Loss	- 22.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.385 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 29, 2010

DASY5 Validation Report for Head TSL

Date: 25.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.94$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

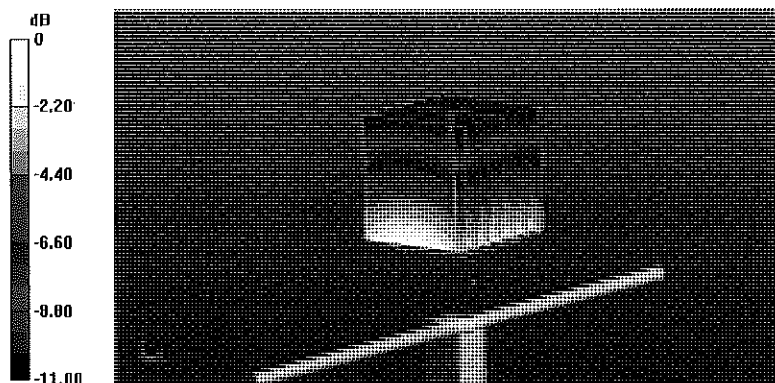
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.387 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.86 W/kg

SAR(1 g) = 2.51 W/kg; SAR(10 g) = 1.62 W/kg

Maximum value of SAR (measured) = 2.93 W/kg

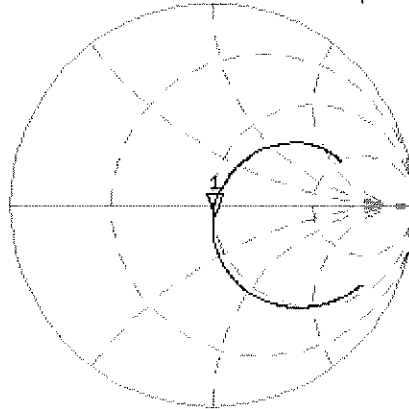


0 dB = 2.93 W/kg = 4.67 dBW/kg

Impedance Measurement Plot for Head TSL

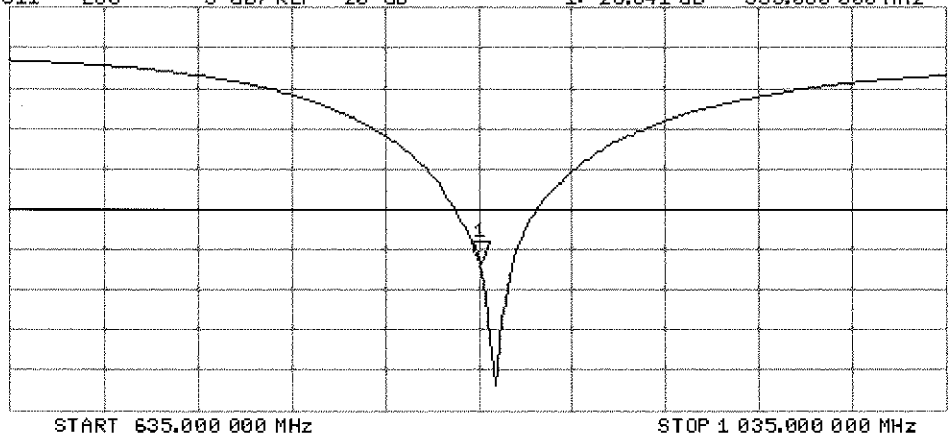
25 Apr 2013 09:11:06
 CH1 S11 1 U FS 1: 50.061 Ω -4.6621 Ω 40.884 pF 835.000 000 MHz

*
 Del
 CA
 Avg
 16
 H1 d



CH2 S11 LOG 5 dB/REF -20 dB 1:-26.641 dB 835.000 000 MHz

CA
 Avg
 16
 H1 d



DASY5 Validation Report for Body TSL

Date: 24.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 54$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn909; Calibrated: 11.09.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

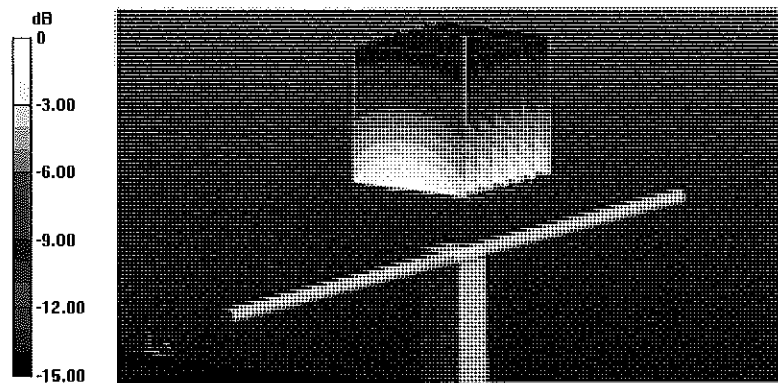
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.178 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.68 W/kg

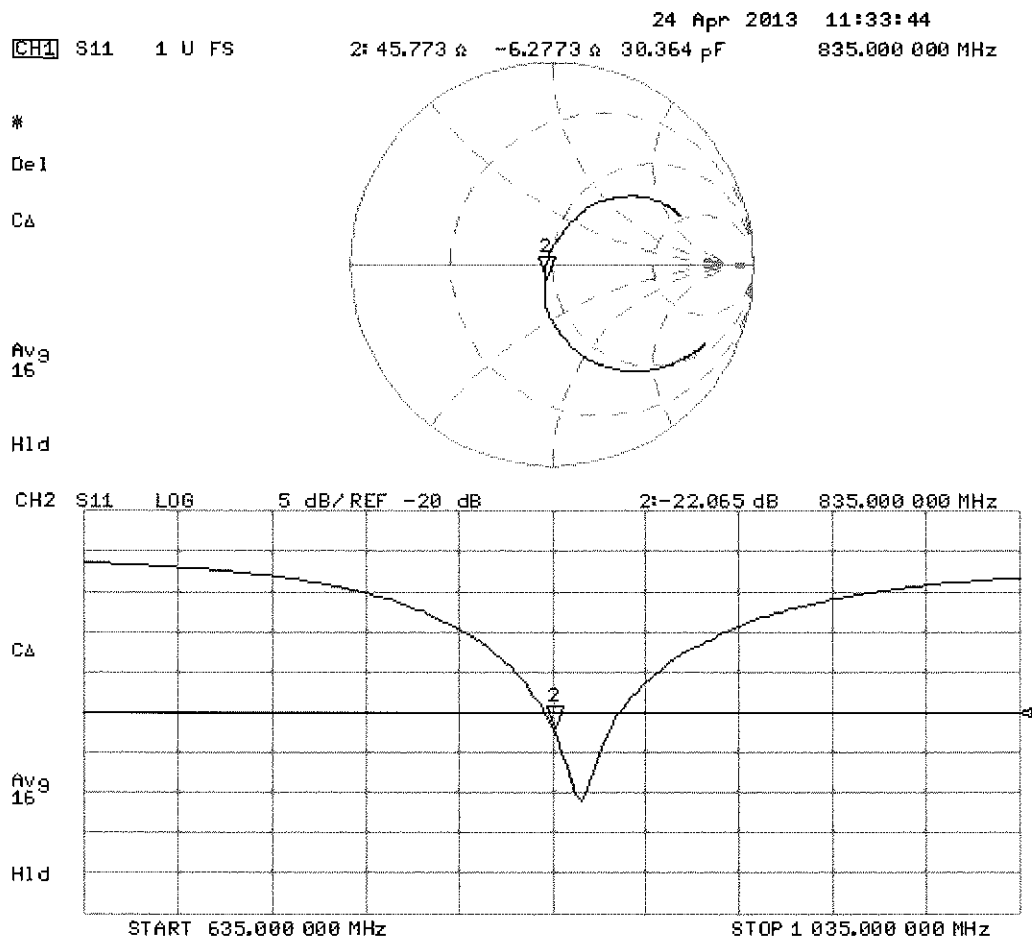
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.62 W/kg

Maximum value of SAR (measured) = 2.89 W/kg



0 dB = 2.89 W/kg = 4.61 dBW/kg

Impedance Measurement Plot for Body TSL





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d133_Jul13**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d133**

Calibration procedure(s) **QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **July 17, 2013**

✓
KOK
8/12/13

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 18, 2013

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.8 $\pm$ 6 %	0.92 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.62 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.28 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.9 $\pm$ 6 %	1.00 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.61 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.36 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.0 Ω - 1.8 j Ω
Return Loss	- 31.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.2 Ω - 3.6 j Ω
Return Loss	- 27.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.395 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 17.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW ; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.92 \text{ S/m}$; $\epsilon_r = 41.8$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

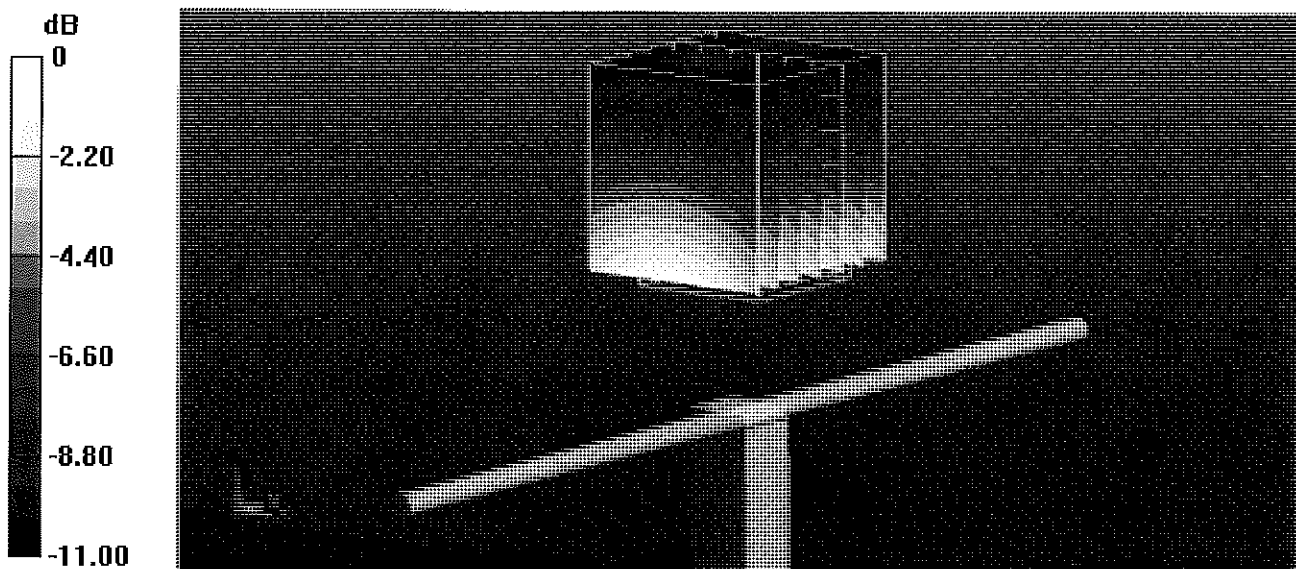
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 57.188 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.66 W/kg

SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.59 W/kg

Maximum value of SAR (measured) = 2.84 W/kg

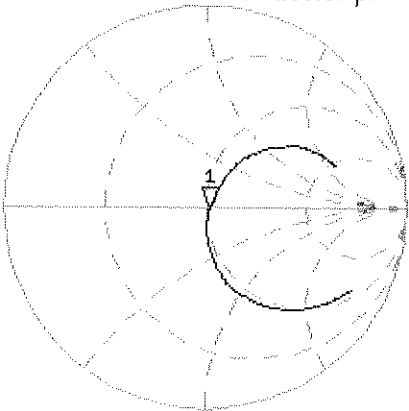


0 dB = 2.84 W/kg = 4.53 dBW/kg

Impedance Measurement Plot for Head TSL

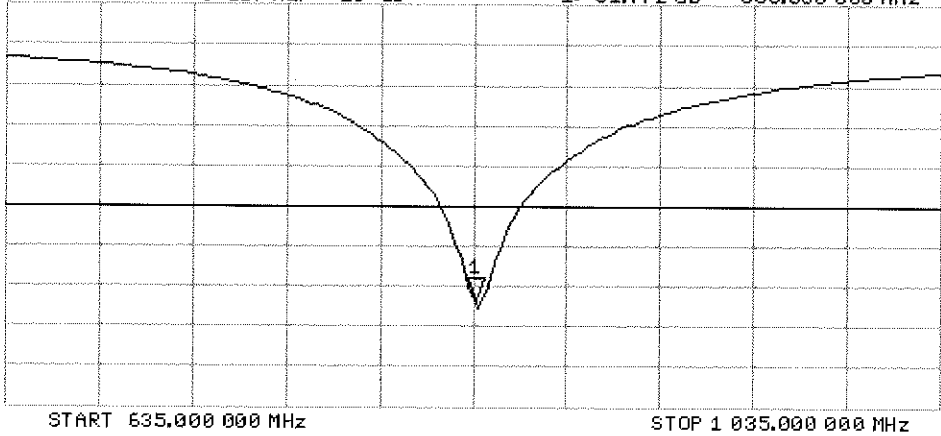
18 Jul 2013 09:49:17
[CH1] S11 1 U FS 1: 51.957 $\angle$ -1.7539 $\angle$ 108.67 pF 835.000 000 MHz

*
De1
CA
Avg
16
H1d



CH2 S11 L00 5 dB/REF -20 dB 1:-31.772 dB 835.000 000 MHz

CA
Avg
16
H1d



DASY5 Validation Report for Body TSL

Date: 17.07.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW ; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 54.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

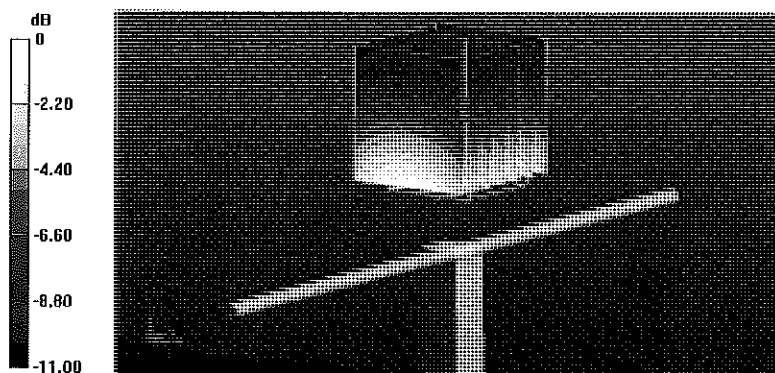
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.351 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 3.59 W/kg

SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.62 W/kg

Maximum value of SAR (measured) = 2.86 W/kg

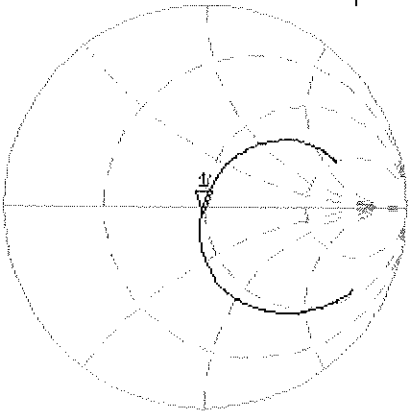


0 dB = 2.86 W/kg = 4.56 dBW/kg

Impedance Measurement Plot for Body TSL

18 Jul 2013 09:11:04
[CH1] S11 1 U FS 1: 48.184 Ω -3.6035 Ω 52.894 pF 835.000 000 MHz

*
De1
CA

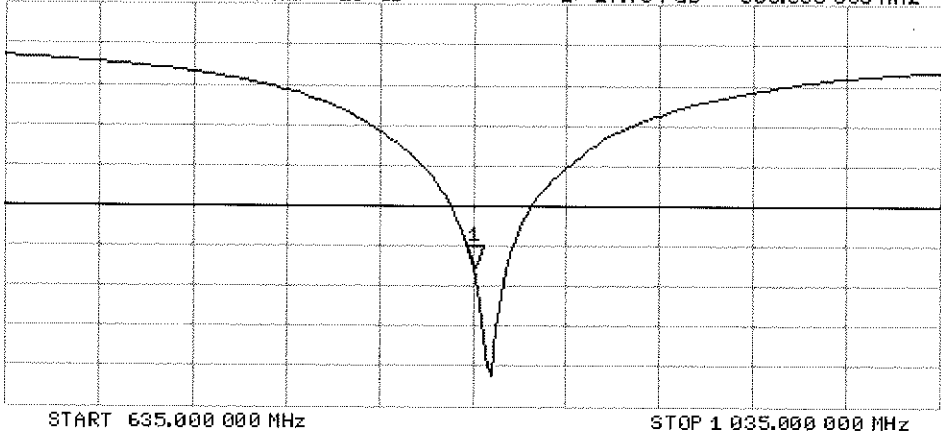


Avg
16
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -27.734 dB 835.000 000 MHz

CA

Avg
16
H1d





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1765V2-1008_May13**

CALIBRATION CERTIFICATE

Object **D1765V2 - SN: 1008**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **May 14, 2013**

*✓ 100K
5/23/13*

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by: **Jeton Kastrat** Function: **Laboratory Technician** Signature: *[Signature]*

Approved by: **Katja Pokovic** Technical Manager *[Signature]*

Issued: May 15, 2013

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Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.1 $\pm$ 6 %	1.33 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.6 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.7 $\pm$ 6 %	1.47 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.53 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	38.2 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.10 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.4 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	48.3 Ω - 6.4 j Ω
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.8 Ω - 6.1 j Ω
Return Loss	- 20.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.211 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 06, 2005

DASY5 Validation Report for Head TSL

Date: 14.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008

Communication System: UID 0 - CW ; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.33$ S/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.18, 5.18, 5.18); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

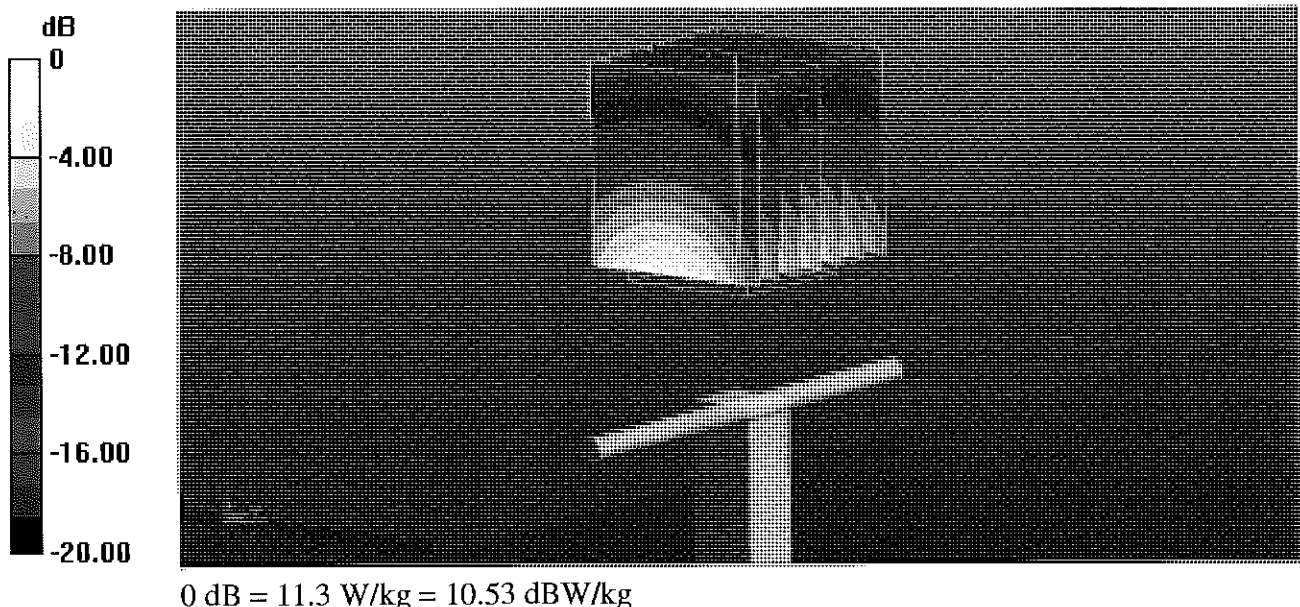
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.430 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 9.09 W/kg; SAR(10 g) = 4.85 W/kg

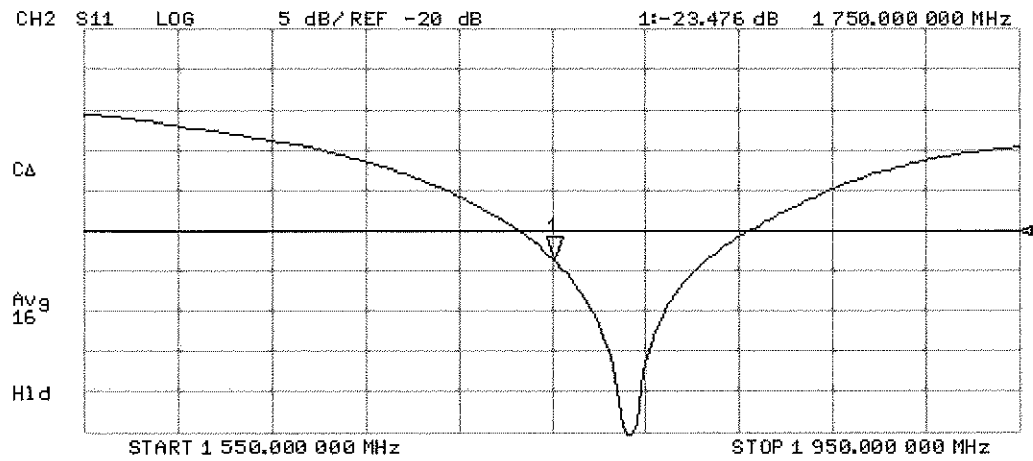
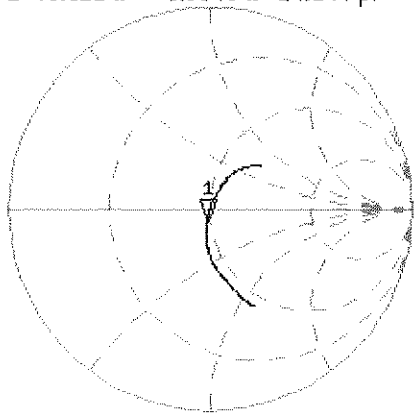
Maximum value of SAR (measured) = 11.3 W/kg



Impedance Measurement Plot for Head TSL

14 May 2013 15:57:39
[CH1] S11 1 U FS 1: 48.322 Ω -6.3848 Ω 14.244 pF 1 750.000 000 MHz

*
De1
CA
Avg
16
H1d



DASY5 Validation Report for Body TSL

Date: 13.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN: 1008

Communication System: UID 0 - CW ; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.47$ S/m; $\epsilon_r = 51.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.83, 4.83, 4.83); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

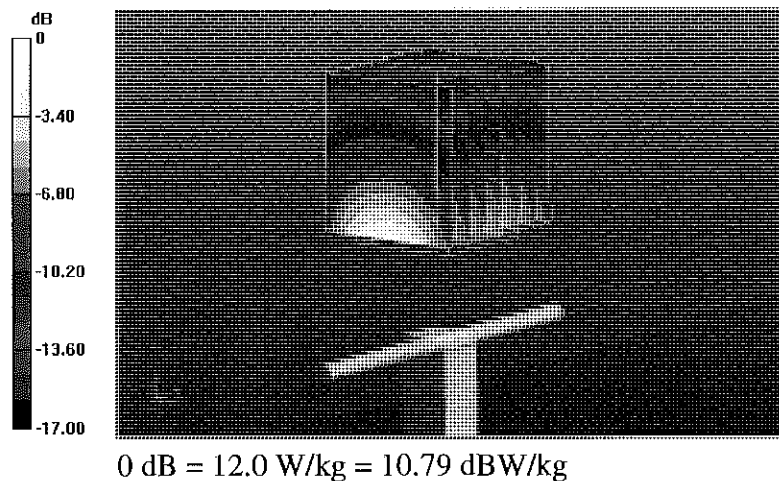
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.430 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.4 W/kg

SAR(1 g) = 9.53 W/kg; SAR(10 g) = 5.1 W/kg

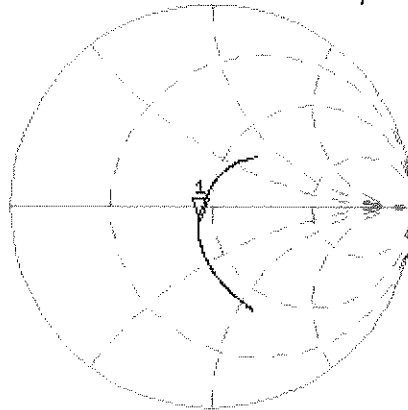
Maximum value of SAR (measured) = 12.0 W/kg



Impedance Measurement Plot for Body TSL

13 May 2013 15:25:53
[CH1] S11 1 U FS 1: 43.775 Ω -6.1426 Ω 14.806 pF 1 750.000 000 MHz

*
De1
Cor



Avg
16

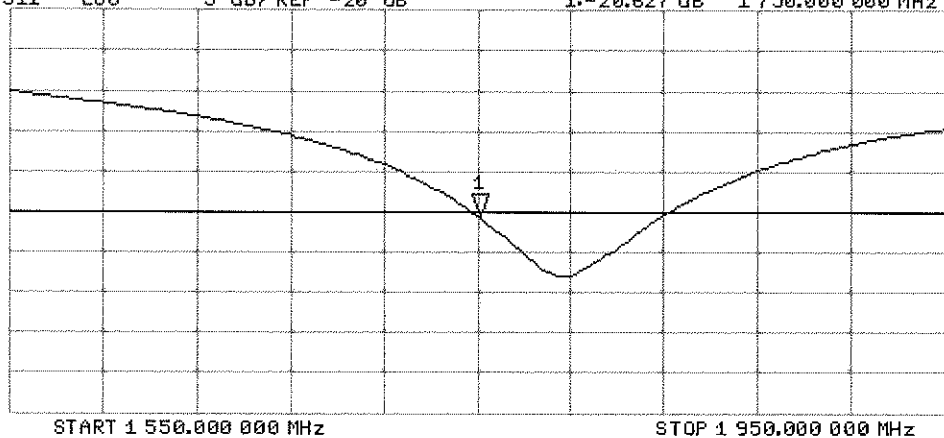
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-20.627 dB 1 750.000 000 MHz

Cor

Avg
16

H1d





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 Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **D1900V2-5d141_May13**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d141**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **May 02, 2013**

✓
5/8/13

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by: **Claudio Leubler** Name: **Claudio Leubler** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Technical Manager

Signature

Issued: May 2, 2013

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Accreditation No.: **SCS 108**

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Multilateral Agreement for the recognition of calibration certificates

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:** Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:** The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:** These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:** One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:** SAR measured at the stated antenna input power.
- SAR normalized:** SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:** The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.3 $\pm$ 6 %	1.37 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	10.1 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.3 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.0 $\pm$ 6 %	1.51 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	41.5 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.51 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.1 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.6 \Omega + 4.9 j\Omega$
Return Loss	- 25.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.3 \Omega + 5.9 j\Omega$
Return Loss	- 24.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 02.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d141

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.37$ S/m; $\epsilon_r = 39.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

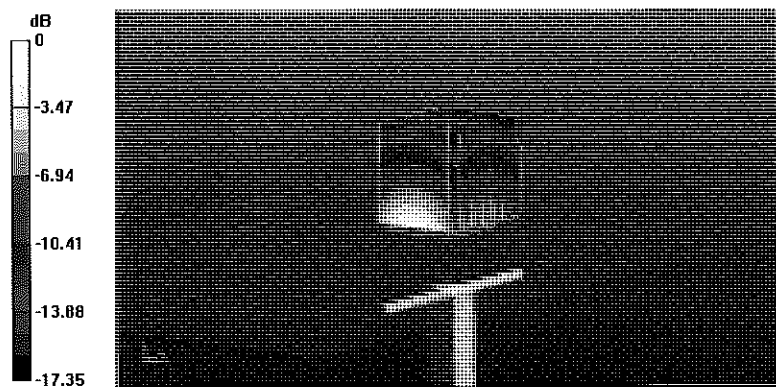
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.124 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.3 W/kg

Maximum value of SAR (measured) = 12.5 W/kg

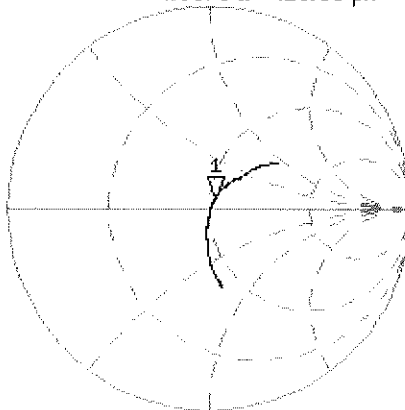


0 dB = 12.5 W/kg = 10.97 dBW/kg

Impedance Measurement Plot for Head TSL

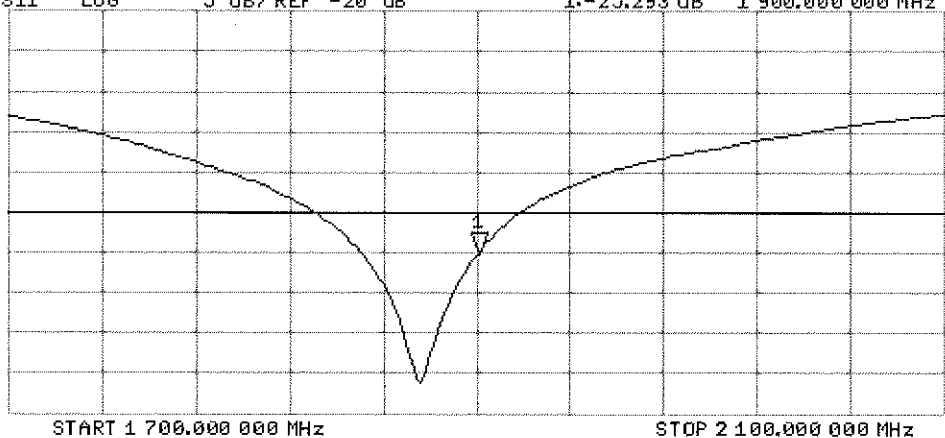
2 May 2013 15:38:50
 CH1 S11 1 U FS 1: 52.600 Ω 4.9375 Ω 413.59 μH 1 900.000 000 MHz

*
 Del
 Cor
 Avg
 4
 Hld



CH2 S11 LOG 5 dB/REF -20 dB 1:-25.293 dB 1 900.000 000 MHz

Cor
 Avg
 4
 Hld



DASY5 Validation Report for Body TSL

Date: 02.05.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d141

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 54$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

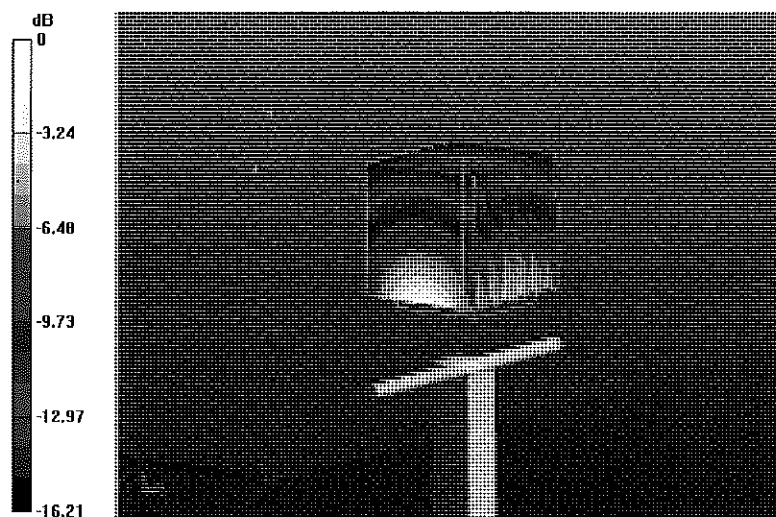
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 97.124 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 17.6 W/kg

SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.51 W/kg

Maximum value of SAR (measured) = 13.0 W/kg



0 dB = 13.0 W/kg = 11.14 dBW/kg

Impedance Measurement Plot for Body TSL

2 May 2013 15:38:04
 [CH1] S11 1 U FS 1: 48.273 Ω 5.9121 Ω 495.23 μ H 1 900.000 000 MHz

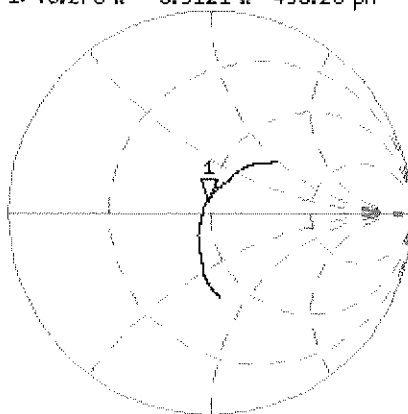
*

De1

Cor

Avg
16

H1d

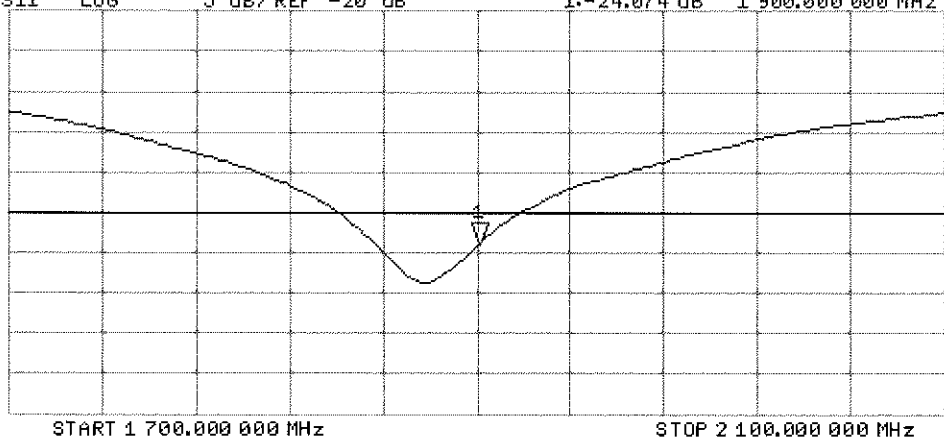


CH2 S11 LOG 5 dB/REF -20 dB 1:-24.074 dB 1 900.000 000 MHz

Cor

Avg
16

H1d





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Client **PC Test**

Certificate No: **D1900V2-5d148_Feb13**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d148**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **February 06, 2013**

✓
KOK
2/21/13

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
 The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by: **Leif Klysner** Name: **Leif Klysner** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Technical Manager

Signature

Issued: February 6, 2013

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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2003, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", December 2003
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- Federal Communications Commission Office of Engineering & Technology (FCC OET), "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields; Additional Information for Evaluating Compliance of Mobile and Portable Devices with FCC Limits for Human Exposure to Radiofrequency Emissions", Supplement C (Edition 01-01) to Bulletin 65

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- SAR measured:* SAR measured at the stated antenna input power.
- SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	39.4 $\pm$ 6 %	1.38 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.7 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.8 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.9 $\pm$ 6 %	1.53 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.7 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 5.9 j Ω
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3 Ω + 6.3 j Ω
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns
----------------------------------	----------

After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 06.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d148

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.38$ S/m; $\epsilon_r = 39.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

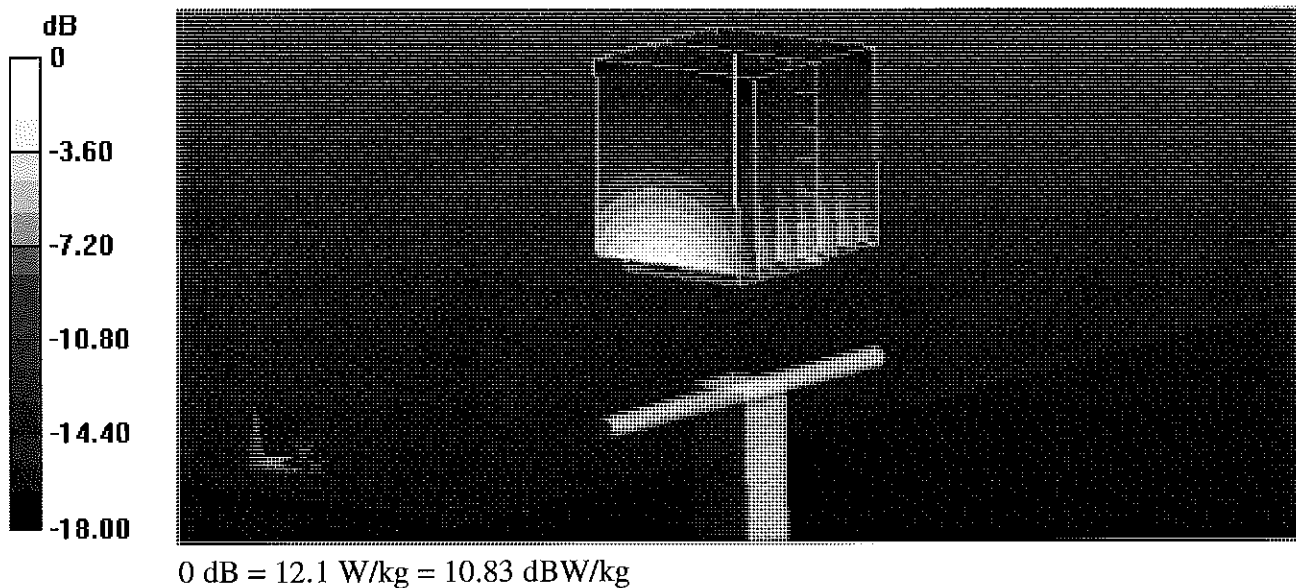
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.534 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 17.8 W/kg

SAR(1 g) = 9.87 W/kg; SAR(10 g) = 5.18 W/kg

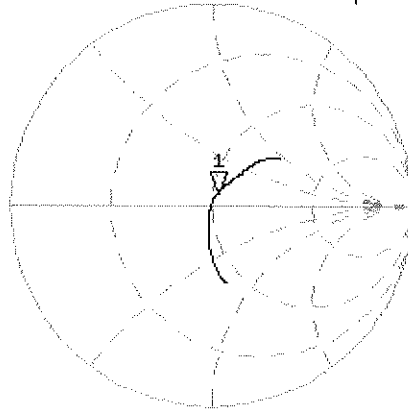
Maximum value of SAR (measured) = 12.1 W/kg



Impedance Measurement Plot for Head TSL

6 Feb 2013 09:25:10
 CH1 S11 1 U FS 1: 52.125 $\angle$ 5.8711 $\angle$ 491.80 μ H 1 900.000 000 MHz

*
 Del
 CA



Avg
 16

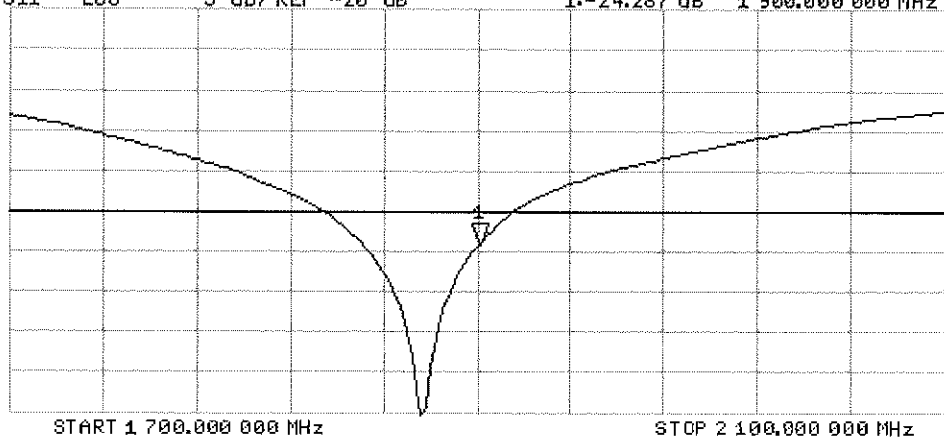
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -24.287 dB 1 900.000 000 MHz

CA

Avg
 16

H1d



DASY5 Validation Report for Body TSL

Date: 06.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d148

Communication System: CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.53$ S/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

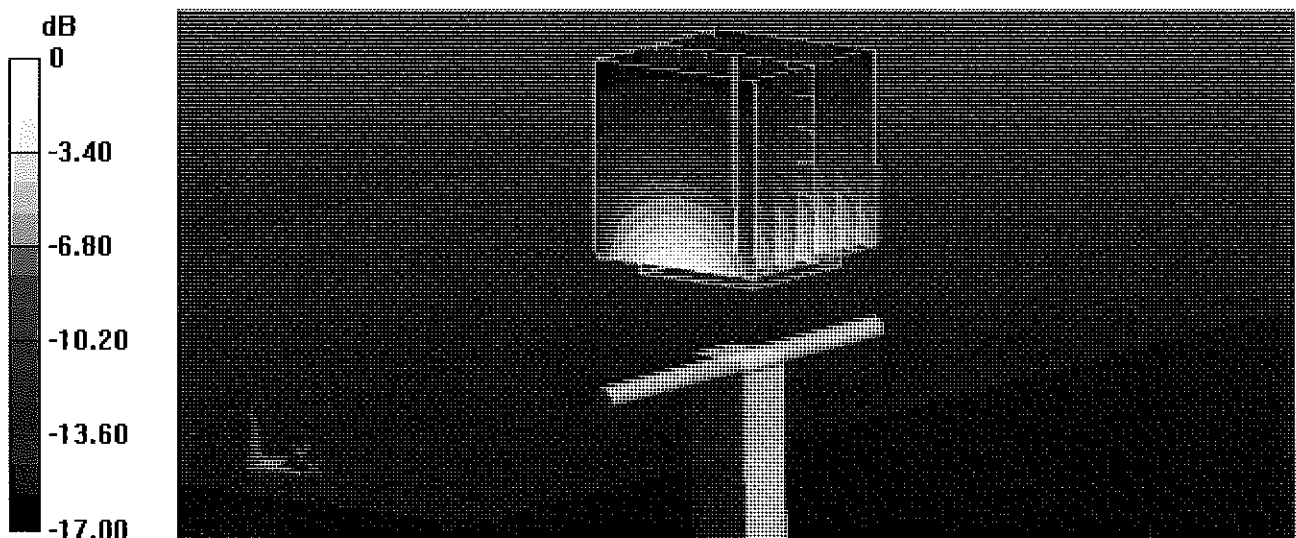
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.534 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 17.9 W/kg

SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.45 W/kg

Maximum value of SAR (measured) = 13.1 W/kg



0 dB = 13.1 W/kg = 11.17 dBW/kg

Impedance Measurement Plot for Body TSL

