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SAR EVALUATION REPORT

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

Date of Testing:
06/14/17 - 07/03/17
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
1M1706130193-01-R2.ZNF

FCC ID: ZNFUN220

APPLICANT: LG ELECTRONICS MOBILECOMM U.S.A., INC.

DUT Type: Portable Handset
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model: LG-UN220
Additional Model(s): LGUN220, UN220

Equipment Class	Band & Mode	Tx Frequency	SAR		
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)
PCE	Cell. CDMA	824.70 - 848.31 MHz	0.76	1.14	1.14
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.75	1.01	1.18
PCE	UMTS 850	826.40 - 846.60 MHz	0.56	0.24	0.24
PCE	PCS CDMA	1851.25 - 1908.75 MHz	0.18	1.10	1.25
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	< 0.1	0.42	0.44
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.12	0.88	0.89
PCE	LTE Band 12	699.7 - 715.3 MHz	0.42	0.75	0.75
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.66	0.92	0.92
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.30	1.02	1.02
PCE	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.16	1.01	1.07
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	N/A	N/A	N/A
DTS	2.4 GHz WLAN	2412 - 2462 MHz	< 0.1	0.19	0.19
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A		
Simultaneous SAR per KDB 690783 D01v01r03:			1.09	1.33	1.44

Note: This revised Test Report (S/N: 1M1706130193-01-R2.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.7 of this report; for North American frequency bands only.

I attest to the accuracy of data. All measurements reported herein were performed by me or were made under my supervision and are correct to the best of my knowledge and belief. I assume full responsibility for the completeness of these measurements and vouch for the qualifications of all persons taking them. Test results reported herein relate only to the item(s) tested.

Randy Ortanez
President

The SAR Tick is an initiative of the Mobile Manufacturers Forum (MMF). While a product may be considered eligible, use of the SAR Tick logo requires an agreement with the MMF. Further details can be obtained by emailing: sartick@mmfai.info.

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
Cell. CDMA	Voice/Data	824.70 - 848.31 MHz
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
PCS CDMA	Voice/Data	1851.25 - 1908.75 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
Bluetooth	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

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

1.3 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v06.

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)		Burst Average 8-PSK (dBm)	
		1 TX Slot	*1 TX Slots*	*2 TX Slots*	*1 TX Slots*	*2 TX Slots*
GSM/GPRS/EDGE 850	Maximum	**33.2**	**33.2**	**31.2**	**27.2**	**25.2**
	Nominal	**32.7**	**32.7**	**30.7**	**26.7**	**24.7**
GSM/GPRS/EDGE 1900	Maximum	**30.2**	**30.2**	**28.2**	**26.2**	**24.2**
	Nominal	**29.7**	**29.7**	**27.7**	**25.7**	**23.7**

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Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	*3GPP HSDPA*	*3GPP HSUPA*
UMTS Band 5 (850 MHz)	Maximum	**23.7**	**23.7**	**23.7**
	Nominal	**23.2**	**23.2**	**23.2**
UMTS Band 2 (1900 MHz)	Maximum	**24.7**	**24.7**	**24.7**
	Nominal	**24.2**	**24.2**	**24.2**
Mode / Band		Modulated Average (dBm)		
Cell. CDMA	Maximum	**24.7**		
	Nominal	**24.2**		
PCS CDMA	Maximum	**24.7**		
	Nominal	**24.2**		
Mode / Band		Modulated Average (dBm)		
LTE Band 12	Maximum	**23.2**		
	Nominal	**22.7**		
LTE Band 5 (Cell)	Maximum	**23.7**		
	Nominal	**23.2**		
LTE Band 4 (AWS)	Maximum	**23.2**		
	Nominal	**22.7**		
LTE Band 25 (PCS)	Maximum	**24.2**		
	Nominal	**23.7**		
LTE Band 2 (PCS)	Maximum	**24.2**		
	Nominal	**23.7**		

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Mode / Band		Modulated Average (dBm)		
		Ch 1	Ch 2-10	Ch11
IEEE 802.11b (2.4 GHz)	Maximum	**11.5**	**15.0**	**11.5**
	Nominal	**10.5**	**14.0**	**10.5**
IEEE 802.11g (2.4 GHz)	Maximum	**10.5**	**14.0**	**10.5**
	Nominal	**9.5**	**13.0**	**9.5**
IEEE 802.11n (2.4 GHz)	Maximum	**10.5**	**14.0**	**10.5**
	Nominal	**9.5**	**13.0**	**9.5**

Mode / Band		Modulated Average (dBm)
Bluetooth (1Mbps)	Maximum	**9.0**
	Nominal	**8.0**
Bluetooth (2Mbps)	Maximum	**9.0**
	Nominal	**8.0**
Bluetooth (3Mbps)	Maximum	**9.0**
	Nominal	**8.0**
Bluetooth LE	Maximum	**0.5**
	Nominal	**-0.5**

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1.4 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. A diagram showing the location of the device antennas can be found in Appendix F.

Table 1-1
Device Edges/Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
Cell. CDMA	Yes	Yes	No	Yes	Yes	Yes
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
PCS CDMA	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
UMTS 1900	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 25 (PCS)	Yes	Yes	No	Yes	Yes	Yes
2.4 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 D06v02r01 Section III. The distances between the transmit antennas and the edges of the device are included in the filing.

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, 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 1-1 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 1-1
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 D01v06 4.3.2 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 + 2.4 GHz Bluetooth	Yes^	Yes	N/A	^BT Tethering appications are cosidered.
3	GSM voice + 2.4 GHz WI-FI	Yes	Yes	N/A	
4	GSM voice + 2.4 GHz Bluetooth	Yes^	Yes	N/A	^BT Tethering appications are cosidered.
5	UMTS + 2.4 GHz WI-FI	Yes	Yes	Yes	
6	UMTS + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	^BT Tethering appications are cosidered.
7	LTE + 2.4 GHz WI-FI	Yes	Yes	Yes	
8	LTE + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	^BT Tethering appications are cosidered.
9	CDMA data + 2.4 GHz WI-FI	N/A	N/A	Yes	
10	CDMA data + 2.4 GHz Bluetooth	N/A	N/A	Yes^	^BT Tethering appications are cosidered.
11	GPRS/EDGE + 2.4 GHz WI-FI	N/A	N/A	Yes	
12	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	N/A	Yes^	^BT Tethering appications are cosidered.

1. 2.4 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
2. All licensed modes share the same antenna path and cannot transmit simultaneously.
3. 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.
4. Per the manufacturer, WIFI Direct is 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.
5. This device supports VOLTE.

1.6 Miscellaneous SAR Test Considerations

(A) WIFI/BT

Per FCC KDB 447498 D01v06, the 1g SAR exclusion threshold for distances <50mm is defined by the following equation:

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, body-worn Bluetooth SAR was not required; [(8/10)* √2.480] = 1.3< 3.0. Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before 8calculation.

(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.

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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 D01v03r01.

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 D05v02r04.

This device has a clamshell form factor which allows for both open and closed positions during hotspot use scenarios. Per FCC guidance, full hotspot SAR testing was performed with the device in closed position and additionally the configuration with the highest reported SAR was evaluated in the open position for each band and mode combination.

This device supports both LTE B25 (PCS) and LTE B2 (PCS). Since the supported frequency span for LTE B2 (PCS) falls completely within the supported frequency span for LTE B25 (PCS), both LTE bands have the same target power, and both LTE bands share the same transmission path, SAR was only assessed for LTE B25 (PCS).

1.7 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r04, D05Av01r02, D06v02r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)

1.8 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
Cell. CDMA	01612	01612	01612
GSM/GPRS/EDGE 850	01612	01612	01612
UMTS 850	01612	01620	01620
PCS CDMA	01612	01620	01620
GSM/GPRS/EDGE 1900	01612	01620	01620
UMTS 1900	01612	01620	01620
LTE Band 12	01646	01646	01646
LTE Band 5 (Cell)	01638	01638	01638
LTE Band 4 (AWS)	01646	01646	01646
LTE Band 25 (PCS)	01646	01638	01638
2.4 GHz WLAN	01653	01653	01653

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2 LTE INFORMATION

LTE Information			
FCC ID	**ZNFUN220**		
Form Factor	Portable Handset		
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)		
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)		
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)		
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)		
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)		
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz		
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz		
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz		
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz		
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz		
Channel Numbers and Frequencies (MHz)	Low	Mid	High
LTE Band 12: 1.4 MHz	699.7 (23017)	707.5 (23095)	715.3 (23173)
LTE Band 12: 3 MHz	700.5 (23025)	707.5 (23095)	714.5 (23165)
LTE Band 12: 5 MHz	701.5 (23035)	707.5 (23095)	713.5 (23155)
LTE Band 12: 10 MHz	704 (23060)	707.5 (23095)	711 (23130)
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)	836.5 (20525)	848.3 (20643)
LTE Band 5 (Cell): 3 MHz	825.5 (20415)	836.5 (20525)	847.5 (20635)
LTE Band 5 (Cell): 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)
LTE Band 5 (Cell): 10 MHz	829 (20450)	836.5 (20525)	844 (20600)
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)	1732.5 (20175)	1754.3 (20393)
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)	1732.5 (20175)	1753.5 (20385)
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)
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)	1882.5 (26365)	1914.3 (26683)
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)	1882.5 (26365)	1913.5 (26675)
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)	1882.5 (26365)	1912.5 (26665)
LTE Band 25 (PCS): 10 MHz	1855 (26090)	1882.5 (26365)	1910 (26640)
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)	1882.5 (26365)	1907.5 (26615)
LTE Band 25 (PCS): 20 MHz	1860 (26140)	1882.5 (26365)	1905 (26590)
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)	1880 (18900)	1909.3 (19193)
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)	1880 (18900)	1908.5 (19185)
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)	1880 (18900)	1902.5 (19125)
LTE Band 2 (PCS): 20 MHz	1860 (18700)	1880 (18900)	1900 (19100)
UE Category	4		
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		
LTE Release 10 Additional Information	This device does not support full CA features on 3GPP Release 10. All uplink communications are identical to the Release 8 Specifications. The following LTE Release 10 Features are not supported: Carrier Aggregation, Relay, HetNet, Enhanced MIMO, eICIC, WIFI Offloading, MDH, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.		

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3 INTRODUCTION

The FCC and Innovation, Science, and Economic Development Canada have adopted the guidelines for evaluating the environmental effects of radio frequency (RF) radiation in ET Docket 93-62 on Aug. 6, 1996 and Health Canada Safety Code 6 to protect the public and workers from the potential hazards of RF emissions due to FCC-regulated portable devices. [1]

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [22]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

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

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

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4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04 and IEEE 1528-2013:

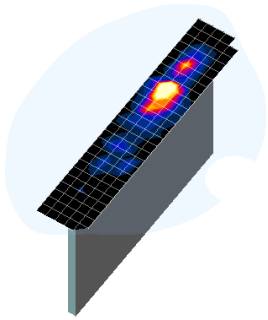

Figure 4-1 Sample SAR Area Scan

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 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

Table 4-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r04*

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

*Also compliant to IEEE 1528-2013 Table 6

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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), also called the Reference Pivoting Line, is not perpendicular to the reference plane (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].

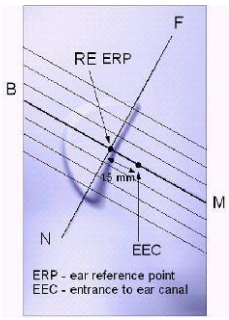

Figure 5-1
Close-Up Side view of ERP

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 acoustic output located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Figure 5-3). The acoustic output was than 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.

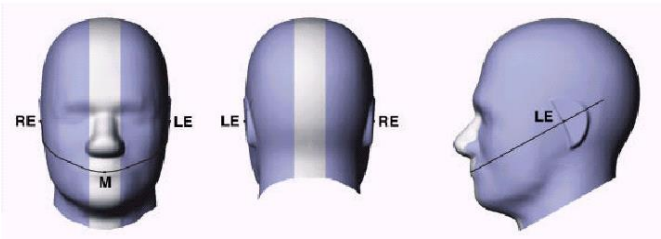

Figure 5-2
Front, back and side view of SAM Twin Phantom

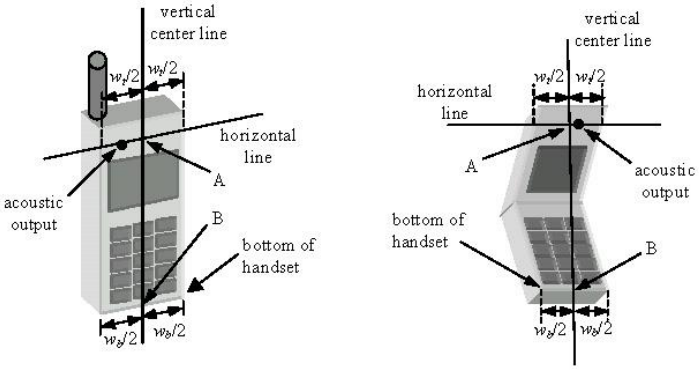

Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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6 TEST CONFIGURATION POSITIONS

6.1 Device Holder

The device holder is made out of low-loss POM material having the following dielectric parameters: relative permittivity ε = 3 and loss tangent δ = 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 pinna.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the reference plane.
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical was 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 / 15º 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 15degrees.
2. The phone was then rotated around the horizontal line by 15 degrees.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the handset touched the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. In this situation, the tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6-2).

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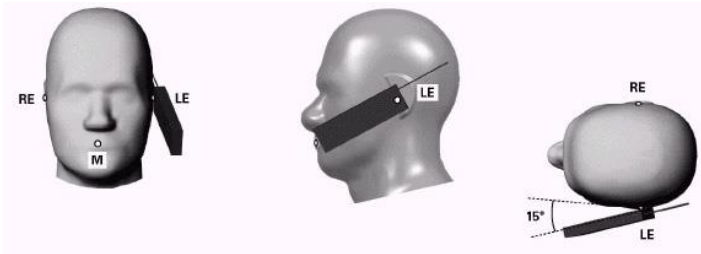

Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

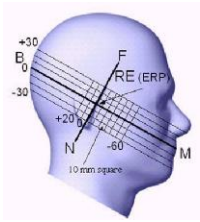

Figure 6-3
Side view w/ relevant markings

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. Per IEEE 1528-2013, a rotated SAM phantom is necessary to allow probe access to such regions. Both SAM heads of the TwinSAM-Chin20 are rotated 20 degrees around the NF line. Each head can be removed from the table for emptying and cleaning.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04v01r03. 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.

6.5 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-4). Per FCC KDB Publication 648474 D04v01r03, 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 D01v06 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 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.

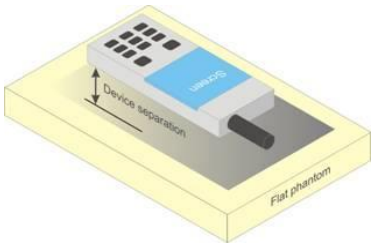

Figure 6-4
Sample Body-Worn Diagram

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

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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 447498 D01v06 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v06, 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 D06v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 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 D01v06 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 *General Population* (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT *Occupational* (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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8 FCC MEASUREMENT PROCEDURES

Power measurements for licensed transmitters are performed using a base station simulator under digital average power.

8.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, 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 D01v01r03.

8.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03r01, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is ≤ 0.25 dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is ≤ 1.2 W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

8.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.”

The device is 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 are 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 is 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 deviates by more than 5%, the SAR test and drift measurements are repeated.

8.4 SAR Measurement Conditions for CDMA2000

The following procedures were performed according to FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.”

8.4.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.” 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.

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1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1, Table 8-1 parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH_0 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.

Table 8-1
Parameters for Max. Power for RC1

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

Table 8-2
Parameters for Max. Power for RC3

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

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

8.4.2 Head SAR Measurements

SAR for next to the ear head exposure is measured in RC3 with the handset configured to transmit at fullrate in SO55. The 3G SAR test reduction procedure is applied to RC1 with RC3 as the primary mode; otherwise, SAR is required for the channel with maximum measured output in RC1 using the head exposure configuration that results in the highest reported SAR in RC3.

8.4.3 Body-worn SAR Measurements

SAR for body-worn 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. The 3G SAR test reduction procedure is applied to the multiple code channel configuration (FCH+SCHn), with FCH only as the primary mode. Otherwise, SAR is required for multiple code channel configuration (FCH + SCHn), with FCH at full rate and SCH0 enabled at 9600 bps, using the highest reported SAR configuration for FCH only. When multiple code channels are enabled, the transmitter output can shift by more than 0.5 dB and may lead to higher SAR drifts and SCH dropouts.

The 3G SAR test reduction procedure is applied to body-worn accessory SAR in RC1 with RC3 as the primary mode. Otherwise, SAR is required for RC1, with SO55 and full rate, using the highest reported SAR configuration for body-worn accessory exposure in RC3.

8.5 SAR Measurement Conditions for UMTS

8.5.1 Output Power Verification

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, using the appropriate RMC with TPC (transmit power control) set to all “1s” or applying the required inner loop power control procedures to maintain maximum output power while HSUPA is active. Results for all applicable physical channel configurations (DPCCH, DPDCHn and spreading codes, HS-DPCCH etc) are tabulated in this test report. All configurations that are not supported by the DUT or cannot be measured due to technical or equipment limitations are identified.

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8.5.2 Head SAR Measurements

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1's". The 3G SAR test reduction procedure is applied to AMR configurations with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured for 12.2 kbps AMR in 3.4 kbps SRB (signaling radio bearer) using the highest reported SAR configuration in 12.2 kbps RMC for head exposure.

8.5.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s". The 3G SAR test reduction procedure is applied to other spreading codes and multiple $DPDCH_n$ configurations supported by the handset with 12.2 kbps RMC as the primary mode. Otherwise, SAR is measured using an applicable RMC configuration with the corresponding spreading code or $DPDCH_n$, for the highest reported SAR configuration in 12.2 kbps RMC.

8.5.4 SAR Measurements with Rel 5 HSDPA

The 3G SAR test reduction procedure is applied to HSDPA body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSDPA is measured using an FRC with H-Set 1 in Sub-test 1 and a 12.2 kbps RMC configured in Test Loop Mode 1, for the highest reported SAR configuration in 12.2 kbps RMC without HSDPA. Handsets with both HSDPA and HSUPA are tested according to Release 6 HSPA test procedures.

8.5.5 SAR Measurements with Rel 6 HSUPA

The 3G SAR test reduction procedure is applied to HSPA (HSUPA/HSDPA with RMC) body configurations with 12.2 kbps RMC as the primary mode. Otherwise, Body SAR for HSPA is measured with E-DCH Sub-test 5, using H-Set 1 and QPSK for FRC and a 12.2 kbps RMC configured in Test Loop Mode 1 and power control algorithm 2, according to the highest reported body SAR configuration in 12.2 kbps RMC without HSPA.

When VOIP applies to head exposure, the 3G SAR test reduction procedure is applied with 12.2 kbps RMC as the primary mode; otherwise, the same HSPA configuration used for body SAR measurements are applied to head exposure testing.

8.6 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r04 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are 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. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

8.6.1 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.

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8.6.2 MPR

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

8.6.3 A-MPR

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

8.6.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

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 ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg.

8.7 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. 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 D01v02r02 for more details.

8.7.1 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.

A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid

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certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

8.7.2 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.

8.7.3 2.4 GHz SAR Test Requirements

SAR is measured for 2.4 GHz 802.11b DSSS using either the fixed test position or, when applicable, the initial test position procedure. SAR test reduction is determined according to the following:

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is › 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed.

8.7.4 OFDM Transmission Mode and SAR Test Channel Selection

When the same maximum output power was specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration with the largest channel bandwidth, lowest order modulation and lowest data rate. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11g then 802.11n, is used for SAR measurement. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

8.7.5 Initial Test Configuration Procedure

For OFDM, an initial test configuration is determined for each frequency band and aggregated band, according to the transmission mode with the highest maximum output power specified for SAR measurements. When the same maximum output power is specified for multiple OFDM transmission mode configurations in a frequency band or aggregated band, SAR is measured using the configuration(s) with the largest channel bandwidth, lowest order modulation, lowest data rate and lowest order IEEE 802.11 mode. The channel of the transmission mode with the highest average RF output conducted power will be the initial test configuration.

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When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 8.7.4).

8.7.6 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required.

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9 RF CONDUCTED POWERS

9.1 CDMA Conducted Powers

Band	Channel	Frequency	SO55 [dBm]	SO55 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]
	F-RC	MHz	RC1	RC3	FCH+SCH	FCH
Cellular	1013	824.7	24.46	24.55	24.35	24.51
	384	836.52	24.46	24.61	24.31	24.37
	777	848.31	24.37	24.66	24.45	24.40
PCS	25	1851.25	24.33	24.47	24.47	24.34
	600	1880	24.40	24.60	24.42	24.48
	1175	1908.75	24.49	24.53	24.25	24.47

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

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**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**
GSM 850	128	32.90	32.89	**30.96**	27.02	24.90
	190	32.69	32.81	**31.14**	27.18	25.07
	251	32.75	32.71	**31.04**	27.03	24.99
GSM 1900	512	30.16	30.19	**28.19**	26.11	24.02
	661	30.15	30.18	**28.18**	26.20	24.20
	810	30.20	30.20	**28.05**	26.14	24.06

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**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**
GSM 850	128	23.87	23.86	**24.94**	17.99	18.88
	190	23.66	23.78	**25.12**	18.15	19.05
	251	23.72	23.68	**25.02**	18.00	18.97
GSM 1900	512	21.13	21.16	**22.17**	17.08	18.00
	661	21.12	21.15	**22.16**	17.17	18.18
	810	21.17	21.17	**22.03**	17.11	18.04
GSM 850	**Frame Avg.Targets:**	23.67	23.67	**24.68**	17.67	18.68
GSM 1900		20.67	20.67	**21.68**	16.67	17.68

Note:

1. 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.
2. 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.
3. 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: 10 (Max 2 Tx uplink slots)
EDGE Multislot class: 10 (Max 2 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	23.68	23.70	23.59	24.59	24.70	24.70	-
99		12.2 kbps AMR	23.64	23.66	23.56	24.60	24.70	24.66	-
6	HSDPA	Subtest 1	23.50	23.56	23.50	24.52	24.55	24.43	0
6		Subtest 2	23.52	23.47	23.54	24.47	24.51	24.44	0
6		Subtest 3	23.13	23.11	23.08	23.98	24.04	24.03	0.5
6		Subtest 4	23.11	23.10	22.99	24.05	24.11	24.05	0.5
6	HSUPA	Subtest 1	23.63	23.57	23.48	24.56	24.41	24.60	0
6		Subtest 2	21.51	21.51	21.63	22.47	22.57	22.44	2
6		Subtest 3	22.62	22.53	22.45	23.47	23.51	23.62	1
6		Subtest 4	21.51	21.62	21.50	22.50	22.45	22.64	2
6		Subtest 5	23.63	23.55	23.47	24.60	24.44	24.63	0

This device does not support DC-HSDPA.

Figure 9-3
Power Measurement Setup

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9.4 LTE Conducted Powers

9.4.1 LTE Band 12

Table 9-1
LTE Band 12 Conducted Powers - 10 MHz Bandwidth

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23095 (707.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	22.96	0	0
	1	25	**23.08**		0
	1	49	22.85		0
	25	0	21.75	0-1	1
	25	12	**21.83**		1
	25	25	21.76		1
	50	0	21.74		1
16QAM	1	0	22.01	0-1	1
	1	25	21.65		1
	1	49	22.18		1
	25	0	20.57	0-2	2
	25	12	20.68		2
	25	25	20.64		2
	50	0	20.70		2

Note: LTE Band 12 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.

Table 9-2
LTE Band 12 Conducted Powers - 5 MHz Bandwidth

LTE Band 12 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 23035 (701.5 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23155 (713.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.03	23.03	23.06	0	0
	1	12	23.12	23.13	23.03		0
	1	24	22.80	22.81	22.98		0
	12	0	21.75	21.70	21.87	0-1	1
	12	6	21.83	21.87	21.83		1
	12	13	21.83	21.71	21.86		1
	25	0	21.68	21.70	21.78		1
16QAM	1	0	21.98	21.97	21.99	0-1	1
	1	12	21.63	21.68	21.71		1
	1	24	22.20	22.13	22.11		1
	12	0	20.64	20.63	20.55	0-2	2
	12	6	20.67	20.73	20.72		2
	12	13	20.76	20.70	20.67		2
	25	0	20.74	20.83	20.67		2

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Table 9-3
LTE Band 12 Conducted Powers - 3 MHz Bandwidth

LTE Band 12 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 23025 (700.5 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23165 (714.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.91	23.05	22.98	0	0
	1	7	23.19	23.19	23.05		0
	1	14	22.84	22.89	22.91		0
	8	0	21.73	21.82	21.75	0-1	1
	8	4	21.82	21.85	21.83		1
	8	7	21.73	21.75	21.76		1
	15	0	21.80	21.69	21.71		1
16QAM	1	0	21.99	22.11	22.00	0-1	1
	1	7	21.64	21.75	21.68		1
	1	14	22.18	22.19	22.20		1
	8	0	20.60	20.60	20.58	0-2	2
	8	4	20.62	20.78	20.67		2
	8	7	20.70	20.76	20.76		2
	15	0	20.77	20.69	20.67		2

Table 9-4
LTE Band 12 Conducted Powers -1.4 MHz Bandwidth

LTE Band 12 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 23017 (699.7 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23173 (715.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.98	22.88	22.91	0	0
	1	2	23.08	23.09	23.05		0
	1	5	22.85	22.84	22.83		0
	3	0	22.79	22.76	22.68		0
	3	2	22.81	22.85	22.77		0
	3	3	22.72	22.77	22.84		0
	6	0	21.79	21.68	21.84	0-1	1
16QAM	1	0	22.09	21.98	22.02	0-1	1
	1	2	21.65	21.72	21.53		1
	1	5	22.14	21.90	22.20		1
	3	0	21.66	21.77	21.90		1
	3	2	21.61	21.74	21.77		1
	3	3	21.72	21.66	21.86		1
	6	0	20.71	20.63	20.65	0-2	2

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9.4.2 LTE Band 5 (Cell)

Table 9-5
LTE Band 5 (Cell) Conducted Powers - 10 MHz Bandwidth

LTE Band 5 (Cell) 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20525 (836.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**23.70**	0	0
	1	25	23.66		0
	1	49	23.63		0
	25	0	**22.66**	0-1	1
	25	12	22.56		1
	25	25	22.54		1
	50	0	22.65		1
16QAM	1	0	22.63	0-1	1
	1	25	22.56		1
	1	49	22.04		1
	25	0	21.10	0-2	2
	25	12	21.09		2
	25	25	21.16		2
	50	0	21.13		2

Note: LTE Band 5 (Cell) 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.

Table 9-6
LTE Band 5 (Cell) Conducted Powers - 5 MHz Bandwidth

LTE Band 5 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20425 (826.5 MHz)	Mid Channel 20525 (836.5 MHz)	High Channel 20625 (846.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.60	23.66	23.55	0	0
	1	12	23.70	23.62	23.70		0
	1	24	23.52	23.50	23.66		0
	12	0	22.66	22.60	22.64	0-1	1
	12	6	22.70	22.63	22.67		1
	12	13	22.65	22.61	22.42		1
	25	0	22.69	22.64	22.61		1
16QAM	1	0	22.66	22.58	22.56	0-1	1
	1	12	22.46	22.58	22.56		1
	1	24	21.99	22.04	22.10		1
	12	0	21.07	21.04	21.16	0-2	2
	12	6	21.12	21.06	21.11		2
	12	13	21.24	21.16	21.18		2
	25	0	21.00	21.05	21.10		2

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Table 9-7
LTE Band 5 (Cell) Conducted Powers - 3 MHz Bandwidth

LTE Band 5 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20415 (825.5 MHz)	Mid Channel 20525 (836.5 MHz)	High Channel 20635 (847.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.69	23.70	23.65	0	0
	1	7	23.70	23.64	23.66		0
	1	14	23.53	23.45	23.65		0
	8	0	22.70	22.53	22.70	0-1	1
	8	4	22.59	22.52	22.67		1
	8	7	22.61	22.61	22.39		1
	15	0	22.55	22.52	22.61		1
16QAM	1	0	22.70	22.54	22.51	0-1	1
	1	7	22.37	22.60	22.47		1
	1	14	22.04	21.97	22.03		1
	8	0	21.10	21.13	21.17	0-2	2
	8	4	21.16	21.04	21.15		2
	8	7	21.27	21.04	21.22		2
	15	0	20.94	20.95	21.14		2

Table 9-8
LTE Band 5 (Cell) Conducted Powers -1.4 MHz Bandwidth

LTE Band 5 (Cell) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20407 (824.7 MHz)	Mid Channel 20525 (836.5 MHz)	High Channel 20643 (848.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.50	23.55	23.63	0	0
	1	2	23.60	23.66	23.62		0
	1	5	23.50	23.63	23.65		0
	3	0	23.66	23.66	23.64		0
	3	2	23.69	23.62	23.67		0
	3	3	23.64	23.61	23.36		0
	6	0	22.68	22.61	22.69	0-1	1
16QAM	1	0	22.66	22.50	22.50	0-1	1
	1	2	22.43	22.60	22.63		1
	1	5	22.46	22.11	22.19		1
	3	0	22.06	22.14	22.15		1
	3	2	22.14	22.16	22.15		1
	3	3	22.22	22.23	22.04		1
	6	0	20.98	20.94	20.97	0-2	2

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9.4.3 LTE Band 4 (AWS)

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

LTE Band 4 (AWS) 20 MHzBandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20175 (1732.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**23.19**	0	0
	1	50	23.06		0
	1	99	23.09		0
	50	0	22.04	0-1	1
	50	25	21.99		1
	50	50	**22.18**		1
	100	0	21.97		1
16QAM	1	0	22.00	0-1	1
	1	50	22.04		1
	1	99	21.86		1
	50	0	20.70	0-2	2
	50	25	20.77		2
	50	50	20.76		2
	100	0	20.76		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.

Table 9-10
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

LTE Band 4 (AWS) 15 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel 20025 (1717.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20325 (1747.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.19	23.14	23.20	0	0
	1	36	23.08	23.09	23.08		0
	1	74	23.12	23.07	23.16		0
	36	0	22.17	22.08	22.10	0-1	1
	36	18	21.91	22.05	22.08		1
	36	37	22.12	22.16	22.19		1
	75	0	21.98	21.97	21.89		1
16QAM	1	0	21.98	21.88	21.91	0-1	1
	1	36	22.07	22.01	21.93		1
	1	74	21.89	21.82	21.80		1
	36	0	20.75	20.61	20.74	0-2	2
	36	18	20.70	20.75	20.74		2
	36	37	20.85	20.74	20.86		2
	75	0	20.76	20.71	20.74		2

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Table 9-11
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

LTE Band 4 (AWS) 10 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel 20000 (1715.0 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20350 (1750.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.13	23.13	23.18	0	0
	1	25	23.07	22.97	23.14		0
	1	49	23.16	23.13	23.14		0
	25	0	22.18	22.07	22.14	0-1	1
	25	12	21.94	22.10	21.95		1
	25	25	22.20	22.13	22.19		1
	50	0	22.03	21.88	21.89		1
16QAM	1	0	22.05	21.99	21.86	0-1	1
	1	25	22.03	22.14	21.91		1
	1	49	21.90	21.80	21.79		1
	25	0	20.77	20.54	20.80	0-2	2
	25	12	20.78	20.75	20.79		2
	25	25	20.88	20.78	20.88		2
	50	0	20.77	20.78	20.69		2

Table 9-12
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

LTE Band 4 (AWS) 5 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel 19975 (1712.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20375 (1752.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.15	23.13	23.16	0	0
	1	12	23.15	22.99	23.10		0
	1	24	23.14	23.15	23.14		0
	12	0	22.14	22.04	22.04	0-1	1
	12	6	21.86	22.01	22.15		1
	12	13	22.15	22.13	22.11		1
	25	0	21.99	21.98	21.90		1
16QAM	1	0	21.96	21.88	21.88	0-1	1
	1	12	22.04	21.99	21.95		1
	1	24	21.79	21.82	21.74		1
	12	0	20.83	20.67	20.83	0-2	2
	12	6	20.65	20.73	20.70		2
	12	13	20.94	20.83	20.82		2
	25	0	20.67	20.70	20.68		2

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Table 9-13
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth

LTE Band 4 (AWS) 3 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel 19965 (1711.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20385 (1753.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.20	23.14	23.20	0	0
	1	7	23.09	23.09	23.06		0
	1	14	23.17	23.07	23.16		0
	8	0	22.14	22.07	22.04	0-1	1
	8	4	21.82	22.04	21.97		1
	8	7	22.19	22.13	22.17		1
	15	0	22.04	21.97	21.79		1
16QAM	1	0	21.89	21.92	21.83	0-1	1
	1	7	22.03	22.01	21.98		1
	1	14	21.96	21.75	21.78		1
	8	0	20.76	20.61	20.76	0-2	2
	8	4	20.75	20.83	20.77		2
	8	7	20.80	20.81	20.84		2
	15	0	20.89	20.67	20.61		2

Table 9-14
LTE Band 4 (AWS) Conducted Powers -1.4 MHz Bandwidth

LTE Band 4 (AWS) 1.4 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel 19957 (1710.7 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20393 (1754.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.12	23.15	23.11	0	0
	1	2	23.05	23.08	23.03		0
	1	5	23.13	22.99	23.07		0
	3	0	23.19	23.03	23.15		0
	3	2	22.95	22.95	23.02		0
	3	3	23.11	23.20	23.12		0
	6	0	22.01	22.08	21.83	0-1	1
16QAM	1	0	21.99	21.85	22.01	0-1	1
	1	2	22.11	21.91	21.91		1
	1	5	21.87	21.82	21.80		1
	3	0	21.77	21.66	21.69		1
	3	2	21.78	21.84	21.72		1
	3	3	21.81	21.81	21.79		1
	6	0	20.77	20.67	20.82	0-2	2

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9.4.4 LTE Band 25 (PCS)

Table 9-15
LTE Band 25 (PCS) Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26140 (1860.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26590 (1905.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.10	**24.20**	24.13	0	0
	1	50	24.08	24.10	24.09		0
	1	99	23.99	24.09	24.14		0
	50	0	22.98	23.10	23.01	0-1	1
	50	25	23.00	23.11	22.94		1
	50	50	23.17	**23.18**	23.04		1
	100	0	23.12	22.96	23.10		1
16QAM	1	0	23.04	23.16	23.01	0-1	1
	1	50	23.01	23.20	22.97		1
	1	99	23.01	23.11	23.06		1
	50	0	22.15	22.20	22.00	0-2	2
	50	25	21.98	22.10	21.94		2
	50	50	21.97	22.15	21.98		2
	100	0	22.00	22.05	21.97		2

Table 9-16
LTE Band 25 (PCS) Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26115 (1857.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26615 (1907.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.09	24.16	24.04	0	0
	1	36	24.08	24.05	24.01		0
	1	74	23.97	24.10	24.19		0
	36	0	22.91	23.11	22.99	0-1	1
	36	18	22.99	23.05	22.89		1
	36	37	23.10	23.11	23.02		1
	75	0	23.15	22.96	23.16		1
16QAM	1	0	23.02	23.17	23.02	0-1	1
	1	36	23.03	23.08	22.97		1
	1	74	22.97	23.20	23.06		1
	36	0	22.11	22.13	22.02	0-2	2
	36	18	21.92	22.12	21.91		2
	36	37	22.03	22.13	22.02		2
	75	0	21.98	22.13	21.92		2

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Table 9-17
LTE Band 25 (PCS) Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26090 (1855.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26640 (1910.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.02	24.03	24.15	0	0
	1	25	24.13	23.99	24.16		0
	1	49	24.01	24.20	24.20		0
	25	0	23.07	23.03	23.06	0-1	1
	25	12	23.05	23.01	22.87		1
	25	25	23.20	23.09	23.05		1
	50	0	23.01	22.95	23.08		1
16QAM	1	0	23.04	23.08	23.09	0-1	1
	1	25	22.97	23.14	22.89		1
	1	49	22.95	23.16	23.02		1
	25	0	22.11	22.17	21.90	0-2	2
	25	12	21.91	22.13	21.93		2
	25	25	21.89	22.12	21.98		2
	50	0	22.10	22.04	22.01		2

Table 9-18
LTE Band 25 (PCS) Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26065 (1852.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26665 (1912.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.16	24.18	24.06	0	0
	1	12	24.07	24.15	24.02		0
	1	24	24.04	24.06	24.08		0
	12	0	22.90	23.09	22.95	0-1	1
	12	6	23.02	23.07	23.01		1
	12	13	23.13	23.10	22.99		1
	25	0	23.14	23.05	23.01		1
16QAM	1	0	23.04	23.05	23.09	0-1	1
	1	12	22.99	23.19	22.94		1
	1	24	22.97	23.03	23.12		1
	12	0	22.14	22.15	21.93	0-2	2
	12	6	21.97	22.14	21.86		2
	12	13	22.09	22.18	21.91		2
	25	0	21.99	22.07	21.94		2

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Table 9-19
LTE Band 25 (PCS) Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26055 (1851.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26675 (1913.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.09	24.03	24.17	0	0
	1	7	24.02	24.13	24.12		0
	1	14	23.89	24.09	24.17		0
	8	0	22.92	23.19	23.01	0-1	1
	8	4	23.05	23.10	23.01		1
	8	7	23.13	23.19	23.14		1
	15	0	23.13	22.89	23.16		1
16QAM	1	0	22.98	23.15	22.97	0-1	1
	1	7	23.09	23.04	23.00		1
	1	14	22.98	23.01	23.01		1
	8	0	22.06	22.12	22.07	0-2	2
	8	4	21.92	21.98	21.97		2
	8	7	21.99	22.13	22.01		2
	15	0	22.00	22.02	22.09		2

Table 9-20
LTE Band 25 (PCS) Conducted Powers -1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26047 (1850.7 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26683 (1914.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.11	24.16	24.16	0	0
	1	2	24.15	24.14	24.06		0
	1	5	23.92	24.02	24.11		0
	3	0	23.94	24.11	24.05		0
	3	2	24.06	24.04	23.99		0
	3	3	24.10	24.13	24.03		0
	6	0	23.08	22.92	23.13	0-1	1
16QAM	1	0	23.10	23.20	23.13	0-1	1
	1	2	23.00	23.06	23.03		1
	1	5	22.99	23.16	22.97		1
	3	0	23.13	23.11	22.80		1
	3	2	23.02	23.03	22.94		1
	3	3	22.98	23.01	22.94		1
	6	0	21.89	21.97	22.04	0-2	2

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9.5 WLAN Conducted Powers

Table 9-21
2.4 GHz WLAN Average RF Power

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
2412	1	10.53	10.01	10.18
2417	2	**14.65**	13.58	13.56
2437	6	14.44	13.62	13.66
2457	10	14.57	13.50	13.51
2462	11	10.82	10.03	10.03

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02:

- Power measurements were performed for the transmission mode configuration with the highest maximum output power specified for production units.
- For transmission modes with the same maximum output power specification, powers were measured for the largest channel bandwidth, lowest order modulation and lowest data rate.
- For transmission modes with identical maximum specified output power, channel bandwidth, modulation and data rates, power measurements were required for all identical configurations.
- For each transmission mode configuration, powers were measured for the highest and lowest channels; and at the mid-band channel(s) when there were at least 3 channels supported. For configurations with multiple mid-band channels, due to an even number of channels, both channels were measured.
- The bolded data rate and channel above were tested for SAR.

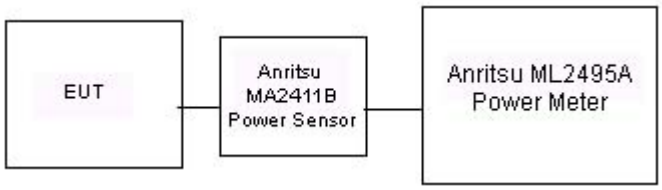

Figure 9-4
Power Measurement Setup for Bandwidths < 50 MHz

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10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (˚C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
6/21/2017	750H	25.0	700	0.861	42.957	0.889	42.201	-3.15%	1.79%
			710	0.870	42.792	0.890	42.149	-2.25%	1.53%
			740	0.896	42.439	0.893	41.994	0.34%	1.06%
			755	0.910	42.230	0.894	41.916	1.79%	0.75%
6/20/2017	835H	23.9	820	0.882	42.010	0.899	41.578	-1.89%	1.04%
			835	0.896	41.838	0.900	41.500	-0.44%	0.81%
			850	0.910	41.644	0.916	41.500	-0.66%	0.35%
6/26/2017	1750H	21.0	1710	1.361	38.578	1.348	40.142	0.96%	-3.90%
			1750	1.403	38.373	1.371	40.079	2.33%	-4.26%
			1790	1.439	38.205	1.394	40.016	3.23%	-4.53%
6/26/2017	1900H	21.5	1850	1.379	40.337	1.400	40.000	-1.50%	0.84%
			1880	1.412	40.196	1.400	40.000	0.86%	0.49%
			1910	1.444	40.082	1.400	40.000	3.14%	0.21%
6/14/2017	2450H	22.0	2400	1.811	38.791	1.756	39.289	3.13%	-1.27%
			2450	1.866	38.628	1.800	39.200	3.67%	-1.46%
			2500	1.924	38.436	1.855	39.136	3.72%	-1.79%
6/14/2017	750B	22.8	700	0.914	56.901	0.959	55.726	-4.69%	2.11%
			710	0.924	56.757	0.960	55.687	-3.75%	1.92%
			740	0.954	56.473	0.963	55.570	-0.93%	1.62%
			755	0.968	56.371	0.964	55.512	0.41%	1.55%
6/22/2017	835B	25.0	820	0.987	52.978	0.969	55.258	1.86%	-4.13%
			835	1.001	52.828	0.970	55.200	3.20%	-4.30%
			850	1.013	52.734	0.988	55.154	2.53%	-4.39%
6/27/2017	835B	20.4	820	0.977	53.273	0.969	55.258	0.83%	-3.59%
			835	0.991	53.110	0.970	55.200	2.16%	-3.79%
			850	1.005	52.963	0.988	55.154	1.72%	-3.97%
6/19/2017	1750B	22.0	1710	1.399	52.672	1.463	53.537	-4.37%	-1.62%
			1750	1.440	52.565	1.488	53.432	-3.23%	-1.62%
			1790	1.481	52.384	1.514	53.326	-2.18%	-1.77%
7/3/2017	1750B	21.4	1710	1.459	51.617	1.463	53.537	-0.27%	-3.59%
			1750	1.500	51.443	1.488	53.432	0.81%	-3.72%
			1790	1.547	51.298	1.514	53.326	2.18%	-3.80%
6/24/2017	1900B	23.7	1850	1.452	52.539	1.520	53.300	-4.47%	-1.43%
			1880	1.486	52.433	1.520	53.300	-2.24%	-1.63%
			1910	1.521	52.318	1.520	53.300	0.07%	-1.84%
6/27/2017	1900B	22.5	1850	1.510	53.192	1.520	53.300	-0.66%	-0.20%
			1880	1.542	53.146	1.520	53.300	1.45%	-0.29%
			1910	1.575	53.059	1.520	53.300	3.62%	-0.45%
6/19/2017	2450B	23.1	2400	1.959	51.489	1.902	52.767	3.00%	-2.42%
			2450	2.018	51.288	1.950	52.700	3.49%	-2.68%
			2500	2.093	51.068	2.021	52.636	3.56%	-2.98%

The above measured tissue parameters were used in the DASY software. The DASY software was used to perform interpolation to determine the dielectric parameters at the SAR test device frequencies (per KDB Publication 865664 D01v01r04 and IEEE 1528-2013 6.6.1.2). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

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10.2 Test System Verification

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

Table 10-2
System Verification Results

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
J	750	HEAD	06/21/2017	24.9	23.7	0.200	1034	3209	1.620	8.220	8.100	-1.46%
I	835	HEAD	06/20/2017	23.8	23.9	0.200	4d047	3213	1.870	9.130	9.350	2.41%
E	1750	HEAD	06/26/2017	21.7	21.1	0.100	1148	3319	3.700	36.400	37.000	1.65%
J	1900	HEAD	06/26/2017	21.3	21.2	0.100	5d080	3209	3.820	39.300	38.200	-2.80%
I	2450	HEAD	06/14/2017	23.0	21.2	0.100	797	3213	5.610	52.100	56.100	7.68%
J	750	BODY	06/14/2017	21.1	21.4	0.200	1003	3209	1.730	8.790	8.650	-1.59%
H	835	BODY	06/22/2017	24.8	24.5	0.200	4d133	3318	2.000	9.500	10.000	5.26%
K	835	BODY	06/27/2017	22.4	20.4	0.200	4d133	7406	2.060	9.500	10.300	8.42%
H	1750	BODY	06/19/2017	24.6	22.4	0.100	1148	3318	3.660	37.000	36.600	-1.08%
E	1750	BODY	07/03/2017	23.7	21.4	0.100	1148	3319	3.940	37.000	39.400	6.49%
H	1900	BODY	06/24/2017	21.7	23.7	0.100	5d080	3318	4.010	39.100	40.100	2.56%
H	1900	BODY	06/27/2017	20.4	22.5	0.100	5d080	3318	4.170	39.100	41.700	6.65%
K	2450	BODY	06/19/2017	22.1	22.6	0.100	981	7406	5.100	50.800	51.000	0.39%

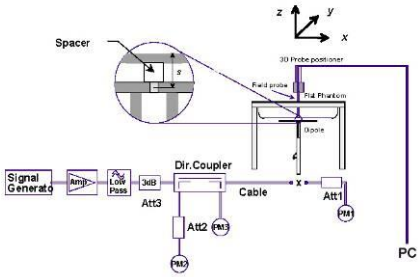

Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

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11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
Cell. 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	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.52	384	Cell. CDMA	RC3 / SO55	24.7	24.61	-0.19	Right	Cheek	01612	1:1	0.739	1.021	**0.755**	
836.52	384	Cell. CDMA	RC3 / SO55	24.7	24.61	-0.07	Right	Tilt	01612	1:1	0.345	1.021	0.352	
836.52	384	Cell. CDMA	RC3 / SO55	24.7	24.61	-0.06	Left	Cheek	01612	1:1	0.741	1.021	**0.757**	A1
836.52	384	Cell. CDMA	RC3 / SO55	24.7	24.61	0.00	Left	Tilt	01612	1:1	0.341	1.021	0.348	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-2
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	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.2	32.69	0.05	Right	Cheek	01612	1	1:8.3	0.656	1.125	0.738	
836.60	190	GSM 850	GSM	33.2	32.69	0.00	Right	Tilt	01612	1	1:8.3	0.264	1.125	0.297	
836.60	190	GSM 850	GSM	33.2	32.69	0.11	Left	Cheek	01612	1	1:8.3	0.665	1.125	0.748	A2
836.60	190	GSM 850	GSM	33.2	32.69	-0.01	Left	Tilt	01612	1	1:8.3	0.319	1.125	0.359	
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 11-3
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	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	23.7	23.70	-0.07	Right	Cheek	01612	1:1	0.553	1.000	0.553	
836.60	4183	UMTS 850	RMC	23.7	23.70	0.04	Right	Tilt	01612	1:1	0.240	1.000	0.240	
836.60	4183	UMTS 850	RMC	23.7	23.70	-0.06	Left	Cheek	01612	1:1	0.564	1.000	0.564	A3
836.60	4183	UMTS 850	RMC	23.7	23.70	0.00	Left	Tilt	01612	1:1	0.291	1.000	0.291	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-4
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	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	600	PCS CDMA	RC3 / SO55	24.7	24.60	0.08	Right	Cheek	01612	1:1	0.107	1.023	0.109	
1880.00	600	PCS CDMA	RC3 / SO55	24.7	24.60	0.08	Right	Tilt	01612	1:1	0.058	1.023	0.059	
1880.00	600	PCS CDMA	RC3 / SO55	24.7	24.60	-0.09	Left	Mouth-Jaw	01612	1:1	0.177	1.023	0.181	A4
1880.00	600	PCS CDMA	RC3 / SO55	24.7	24.60	0.08	Left	Tilt	01612	1:1	0.076	1.023	0.078	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-5
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	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.2	30.15	-0.03	Right	Mouth-Jaw	01612	1	1:8.3	0.045	1.012	0.046	
1880.00	661	GSM 1900	GSM	30.2	30.15	-0.05	Right	Tilt	01612	1	1:8.3	0.023	1.012	0.023	
1880.00	661	GSM 1900	GSM	30.2	30.15	-0.03	Left	Mouth-Jaw	01612	1	1:8.3	0.076	1.012	0.077	A5
1880.00	661	GSM 1900	GSM	30.2	30.15	0.02	Left	Tilt	01612	1	1:8.3	0.034	1.012	0.034	
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 11-6
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	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	0.07	Right	Cheek	01612	1:1	0.082	1.000	0.082	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	0.04	Right	Tilt	01612	1:1	0.049	1.000	0.049	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	0.02	Left	Mouth-Jaw	01612	1:1	0.122	1.000	0.122	A6
1880.00	9400	UMTS 1900	RMC	24.7	24.70	0.11	Left	Tilt	01612	1:1	0.065	1.000	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							

Table 11-7
LTE Band 12 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	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	0.12	0	Right	Cheek	QPSK	1	25	01646	1:1	0.411	1.028	0.423	A7
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	0.02	1	Right	Cheek	QPSK	25	12	01646	1:1	0.308	1.089	0.335	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	-0.03	0	Right	Tilt	QPSK	1	25	01646	1:1	0.184	1.028	0.189	
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	-0.18	1	Right	Tilt	QPSK	25	12	01646	1:1	0.123	1.089	0.134	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	-0.04	0	Left	Cheek	QPSK	1	25	01646	1:1	0.386	1.028	0.397	
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	-0.04	1	Left	Cheek	QPSK	25	12	01646	1:1	0.286	1.089	0.311	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	-0.05	0	Left	Tilt	QPSK	1	25	01646	1:1	0.170	1.028	0.175	
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	0.09	1	Left	Tilt	QPSK	25	12	01646	1:1	0.124	1.089	0.135	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-8
LTE Band 5 (Cell) 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	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	-0.20	0	Right	Cheek	QPSK	1	0	01638	1:1	0.659	1.000	0.659	A8
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	-0.05	1	Right	Cheek	QPSK	25	0	01638	1:1	0.502	1.009	0.507	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	0.00	0	Right	Tilt	QPSK	1	0	01638	1:1	0.314	1.000	0.314	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	-0.13	1	Right	Tilt	QPSK	25	0	01638	1:1	0.196	1.009	0.198	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	0.13	0	Left	Cheek	QPSK	1	0	01638	1:1	0.626	1.000	0.626	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	-0.08	1	Left	Cheek	QPSK	25	0	01638	1:1	0.488	1.009	0.492	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	-0.01	0	Left	Tilt	QPSK	1	0	01638	1:1	0.326	1.000	0.326	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	-0.03	1	Left	Tilt	QPSK	25	0	01638	1:1	0.249	1.009	0.251	
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 11-9
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	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	-0.06	0	Right	Cheek	QPSK	1	0	01646	1:1	0.303	1.002	0.304	A9
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	-0.07	1	Right	Cheek	QPSK	50	50	01646	1:1	0.200	1.005	0.201	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	0.05	0	Right	Tilt	QPSK	1	0	01646	1:1	0.238	1.002	0.238	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	0.01	1	Right	Tilt	QPSK	50	50	01646	1:1	0.147	1.005	0.148	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	-0.06	0	Left	Cheek	QPSK	1	0	01646	1:1	0.242	1.002	0.242	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	0.16	1	Left	Cheek	QPSK	50	50	01646	1:1	0.166	1.005	0.167	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	0.21	0	Left	Tilt	QPSK	1	0	01646	1:1	0.302	1.002	0.303	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	0.06	1	Left	Tilt	QPSK	50	50	01646	1:1	0.203	1.005	0.204	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-10
LTE Band 25 (PCS) 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	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	0.00	0	Right	Mouth-Jaw	QPSK	1	0	01646	1:1	0.105	1.000	0.105	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	-0.05	1	Right	Mouth-Jaw	QPSK	50	50	01646	1:1	0.084	1.005	0.084	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	-0.03	0	Right	Tilt	QPSK	1	0	01646	1:1	0.055	1.000	0.055	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	-0.05	1	Right	Tilt	QPSK	50	50	01646	1:1	0.040	1.005	0.040	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	-0.12	0	Left	Mouth-Jaw	QPSK	1	0	01646	1:1	0.160	1.000	0.160	A10
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	-0.03	1	Left	Mouth-Jaw	QPSK	50	50	01646	1:1	0.130	1.005	0.131	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	0.10	0	Left	Tilt	QPSK	1	0	01646	1:1	0.065	1.000	0.065	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	-0.07	1	Left	Tilt	QPSK	50	50	01646	1:1	0.047	1.005	0.047	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-11
DTS Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2417	2	802.11b	DSSS	22	15.0	14.65	-0.11	Right	Cheek	01653	1	99.9	0.086	0.069	1.084	1.001	**0.075**	A11
2417	2	802.11b	DSSS	22	15.0	14.65	0.13	Right	Tilt	01653	1	99.9	0.020	-	1.084	1.001	-	
2417	2	802.11b	DSSS	22	15.0	14.65	0.10	Left	Cheek	01653	1	99.9	0.079	-	1.084	1.001	-	
2417	2	802.11b	DSSS	22	15.0	14.65	0.14	Left	Tilt	01653	1	99.9	0.016	-	1.084	1.001	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram										

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11.2 Standalone Body-Worn SAR Data

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

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
824.70	1013	Cell. CDMA	TDSO / SO32	24.7	24.51	0.03	10 mm	01612	N/A	1:1	back	1.090	1.045	**1.139**	A12
836.52	384	Cell. CDMA	TDSO / SO32	24.7	24.37	0.03	10 mm	01612	N/A	1:1	back	1.000	1.079	1.079	
848.31	777	Cell. CDMA	TDSO / SO32	24.7	24.40	-0.10	10 mm	01612	N/A	1:1	back	0.864	1.072	0.926	
824.20	128	GSM 850	GSM	33.2	32.90	0.02	10 mm	01612	1	1:8.3	back	0.944	1.072	1.012	A13
836.60	190	GSM 850	GSM	33.2	32.69	0.15	10 mm	01612	1	1:8.3	back	0.850	1.125	0.956	
848.80	251	GSM 850	GSM	33.2	32.75	-0.04	10 mm	01612	1	1:8.3	back	0.842	1.109	0.934	
836.60	4183	UMTS 850	RMC	23.7	23.70	-0.18	10 mm	01620	N/A	1:1	back	0.240	1.000	0.240	A15
1851.25	25	PCS CDMA	TDSO / SO32	24.7	24.34	-0.08	10 mm	01620	N/A	1:1	back	1.010	1.086	1.097	A16
1880.00	600	PCS CDMA	TDSO / SO32	24.7	24.48	-0.08	10 mm	01620	N/A	1:1	back	1.000	1.052	1.052	
1908.75	1175	PCS CDMA	TDSO / SO32	24.7	24.47	0.00	10 mm	01620	N/A	1:1	back	0.979	1.054	1.032	
1880.00	661	GSM 1900	GSM	30.2	30.15	0.01	10 mm	01620	1	1:8.3	back	0.414	1.012	0.419	A18
1852.40	9262	UMTS 1900	RMC	24.7	24.59	-0.19	10 mm	01620	N/A	1:1	back	0.858	1.026	0.880	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	-0.11	10 mm	01620	N/A	1:1	back	0.860	1.000	0.860	A21
1907.60	9538	UMTS 1900	RMC	24.7	24.70	-0.12	10 mm	01620	N/A	1:1	back	0.832	1.000	0.832	
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 11-13
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	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	0.00	0	01646	QPSK	1	25	10 mm	back	1:1	0.725	1.028	0.745	A22
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	-0.10	1	01646	QPSK	25	12	10 mm	back	1:1	0.550	1.089	0.599	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	-0.12	0	01638	QPSK	1	0	10 mm	back	1:1	0.918	1.000	0.918	A23
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	-0.13	1	01638	QPSK	25	0	10 mm	back	1:1	0.690	1.009	0.696	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.65	-0.03	1	01638	QPSK	50	0	10 mm	back	1:1	0.677	1.012	0.685	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	0.21	0	01646	QPSK	1	0	10 mm	back	1:1	1.020	1.002	1.022	A24
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	0.19	1	01646	QPSK	50	50	10 mm	back	1:1	0.667	1.005	0.670	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	21.97	0.03	1	01646	QPSK	100	0	10 mm	back	1:1	0.717	1.054	0.756	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	0.00	0	01646	QPSK	1	0	10 mm	back	1:1	1.010	1.002	1.012	
1860.00	26140	Low	LTE Band 25 (PCS)	20	24.2	24.10	0.09	0	01638	QPSK	1	0	10 mm	back	1:1	0.990	1.023	1.013	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	0.06	0	01638	QPSK	1	0	10 mm	back	1:1	1.000	1.000	1.000	A25
1905.00	26590	High	LTE Band 25 (PCS)	20	24.2	24.14	-0.12	0	01638	QPSK	1	99	10 mm	back	1:1	0.986	1.014	1.000	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	-0.04	1	01638	QPSK	50	50	10 mm	back	1:1	0.747	1.005	0.751	
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.2	23.12	0.02	1	01638	QPSK	100	0	10 mm	back	1:1	0.782	1.019	0.797	
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 measurement.

Table 11-14
DTS Body-Worn SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2417	2	802.11b	DSSS	22	15.0	14.65	0.14	10 mm	01653	1	back	99.9	0.269	0.177	1.084	1.001	**0.192**	A27
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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11.3 Standalone Hotspot SAR Data

Table 11-15
GPRS/UMTS/CDMA 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	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
824.70	1013	Cell. CDMA	TDSO / SO32	24.7	24.51	0.03	10 mm	01612	N/A	1:1	back closed	1.090	1.045	1.139	A12
824.70	1013	Cell. CDMA	TDSO / SO32	24.7	24.51	-0.17	10 mm	01612	N/A	1:1	back open	1.080	1.045	1.129	
836.52	384	Cell. CDMA	TDSO / SO32	24.7	24.37	0.03	10 mm	01612	N/A	1:1	back	1.000	1.079	1.079	
848.31	777	Cell. CDMA	TDSO / SO32	24.7	24.40	-0.10	10 mm	01612	N/A	1:1	back	0.864	1.072	0.926	
836.52	384	Cell. CDMA	TDSO / SO32	24.7	24.37	0.00	10 mm	01612	N/A	1:1	front	0.503	1.079	0.543	
836.52	384	Cell. CDMA	TDSO / SO32	24.7	24.37	-0.02	10 mm	01612	N/A	1:1	bottom	0.092	1.079	0.099	
836.52	384	Cell. CDMA	TDSO / SO32	24.7	24.37	-0.11	10 mm	01612	N/A	1:1	right	0.720	1.079	0.777	
836.52	384	Cell. CDMA	TDSO / SO32	24.7	24.37	-0.02	10 mm	01612	N/A	1:1	left	0.397	1.079	0.428	
824.20	128	GSM 850	GPRS	31.2	30.96	-0.07	10 mm	01612	2	1:4.15	back closed	1.120	1.057	1.184	A14
824.20	128	GSM 850	GPRS	31.2	30.96	0.14	10 mm	01612	2	1:4.15	back open	0.784	1.057	0.829	
836.60	190	GSM 850	GPRS	31.2	31.14	-0.02	10 mm	01612	2	1:4.15	back	1.040	1.014	1.055	
848.80	251	GSM 850	GPRS	31.2	31.04	0.02	10 mm	01612	2	1:4.15	back	0.900	1.038	0.934	
836.60	190	GSM 850	GPRS	31.2	31.14	-0.06	10 mm	01612	2	1:4.15	front	0.350	1.014	0.355	
836.60	190	GSM 850	GPRS	31.2	31.14	0.12	10 mm	01612	2	1:4.15	bottom	0.085	1.014	0.086	
836.60	190	GSM 850	GPRS	31.2	31.14	-0.09	10 mm	01612	2	1:4.15	right	0.715	1.014	0.725	
836.60	190	GSM 850	GPRS	31.2	31.14	-0.06	10 mm	01612	2	1:4.15	left	0.482	1.014	0.489	
824.20	128	GSM 850	GPRS	31.2	30.96	0.13	10 mm	01612	2	1:4.15	back closed	1.010	1.057	1.068	
836.60	4183	UMTS 850	RMC	23.7	23.70	-0.18	10 mm	01620	N/A	1:1	back closed	0.240	1.000	0.240	A15
836.60	4183	UMTS 850	RMC	23.7	23.70	-0.18	10 mm	01620	N/A	1:1	back open	0.129	1.000	0.129	
836.60	4183	UMTS 850	RMC	23.7	23.70	-0.05	10 mm	01620	N/A	1:1	front	0.061	1.000	0.061	
836.60	4183	UMTS 850	RMC	23.7	23.70	0.12	10 mm	01620	N/A	1:1	bottom	0.026	1.000	0.026	
836.60	4183	UMTS 850	RMC	23.7	23.70	0.19	10 mm	01620	N/A	1:1	right	0.111	1.000	0.111	
836.60	4183	UMTS 850	RMC	23.7	23.70	0.03	10 mm	01620	N/A	1:1	left	0.040	1.000	0.040	
1851.25	25	PCS CDMA	TDSO / SO32	24.7	24.34	-0.08	10 mm	01620	N/A	1:1	back closed	1.010	1.086	1.097	
1851.25	25	PCS CDMA	TDSO / SO32	24.7	24.34	0.00	10 mm	01620	N/A	1:1	back open	1.150	1.086	**1.249**	A17
1880.00	600	PCS CDMA	TDSO / SO32	24.7	24.48	-0.08	10 mm	01620	N/A	1:1	back	1.000	1.052	1.052	
1908.75	1175	PCS CDMA	TDSO / SO32	24.7	24.47	0.00	10 mm	01620	N/A	1:1	back	0.979	1.054	1.032	
1880.00	600	PCS CDMA	TDSO / SO32	24.7	24.48	-0.09	10 mm	01620	N/A	1:1	front	0.310	1.052	0.326	
1880.00	600	PCS CDMA	TDSO / SO32	24.7	24.48	0.09	10 mm	01620	N/A	1:1	bottom	0.227	1.052	0.239	
1880.00	600	PCS CDMA	TDSO / SO32	24.7	24.48	-0.02	10 mm	01620	N/A	1:1	right	0.190	1.052	0.200	
1880.00	600	PCS CDMA	TDSO / SO32	24.7	24.48	-0.01	10 mm	01620	N/A	1:1	left	0.229	1.052	0.241	
1851.25	25	PCS CDMA	TDSO / SO32	24.7	24.34	0.06	10 mm	01620	N/A	1:1	back open	0.999	1.086	1.085	
1880.00	661	GSM 1900	GPRS	28.2	28.18	0.01	10 mm	01620	2	1:4.15	back closed	0.438	1.005	0.440	
1880.00	661	GSM 1900	GPRS	28.2	28.18	0.00	10 mm	01620	2	1:4.15	back open	0.439	1.005	0.441	A19
1880.00	661	GSM 1900	GPRS	28.2	28.18	-0.03	10 mm	01620	2	1:4.15	front	0.143	1.005	0.144	
1880.00	661	GSM 1900	GPRS	28.2	28.18	0.12	10 mm	01620	2	1:4.15	bottom	0.111	1.005	0.112	
1880.00	661	GSM 1900	GPRS	28.2	28.18	0.06	10 mm	01620	2	1:4.15	right	0.090	1.005	0.090	
1880.00	661	GSM 1900	GPRS	28.2	28.18	-0.05	10 mm	01620	2	1:4.15	left	0.112	1.005	0.113	
1852.40	9262	UMTS 1900	RMC	24.7	24.59	-0.19	10 mm	01620	N/A	1:1	back	0.858	1.026	0.880	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	-0.11	10 mm	01620	N/A	1:1	back closed	0.860	1.000	0.860	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	-0.02	10 mm	01620	N/A	1:1	back open	0.893	1.000	0.893	A21
1907.60	9538	UMTS 1900	RMC	24.7	24.70	-0.12	10 mm	01620	N/A	1:1	back	0.832	1.000	0.832	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	0.03	10 mm	01620	N/A	1:1	front	0.126	1.000	0.126	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	0.08	10 mm	01620	N/A	1:1	bottom	0.224	1.000	0.224	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	-0.01	10 mm	01620	N/A	1:1	right	0.195	1.000	0.195	
1880.00	9400	UMTS 1900	RMC	24.7	24.70	0.00	10 mm	01620	N/A	1:1	left	0.241	1.000	0.241	
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 measurement.

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Table 11-16
LTE Band 12 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	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	0.00	0	01646	QPSK	1	25	10 mm	back closed	1:1	0.725	1.028	0.745	A22
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	0.00	0	01646	QPSK	1	25	10 mm	back open	1:1	0.335	1.028	0.344	
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	-0.10	1	01646	QPSK	25	12	10 mm	back	1:1	0.550	1.089	0.599	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	0.14	0	01646	QPSK	1	25	10 mm	front	1:1	0.261	1.028	0.268	
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	-0.04	1	01646	QPSK	25	12	10 mm	front	1:1	0.194	1.089	0.211	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	-0.12	0	01646	QPSK	1	25	10 mm	bottom	1:1	0.082	1.028	0.084	
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	-0.02	1	01646	QPSK	25	12	10 mm	bottom	1:1	0.059	1.089	0.064	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	-0.09	0	01646	QPSK	1	25	10 mm	right	1:1	0.299	1.028	0.307	
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	0.06	1	01646	QPSK	25	12	10 mm	right	1:1	0.234	1.089	0.255	
707.50	23095	Mid	LTE Band 12	10	23.2	23.08	0.19	0	01646	QPSK	1	25	10 mm	left	1:1	0.248	1.028	0.255	
707.50	23095	Mid	LTE Band 12	10	22.2	21.83	-0.07	1	01646	QPSK	25	12	10 mm	left	1:1	0.190	1.089	0.207	
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 11-17
LTE Band 5 (Cell) 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	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	-0.12	0	01638	QPSK	1	0	10 mm	back closed	1:1	0.918	1.000	0.918	A23
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	0.11	0	01638	QPSK	1	0	10 mm	back open	1:1	0.891	1.000	0.891	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	-0.13	1	01638	QPSK	25	0	10 mm	back	1:1	0.690	1.009	0.696	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.65	-0.03	1	01638	QPSK	50	0	10 mm	back	1:1	0.677	1.012	0.685	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	-0.13	0	01638	QPSK	1	0	10 mm	front	1:1	0.285	1.000	0.285	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	-0.04	1	01638	QPSK	25	0	10 mm	front	1:1	0.221	1.009	0.223	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	0.08	0	01638	QPSK	1	0	10 mm	bottom	1:1	0.055	1.000	0.055	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	0.04	1	01638	QPSK	25	0	10 mm	bottom	1:1	0.047	1.009	0.047	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	0.06	0	01638	QPSK	1	0	10 mm	right	1:1	0.520	1.000	0.520	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	-0.05	1	01638	QPSK	25	0	10 mm	right	1:1	0.414	1.009	0.418	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.7	23.70	0.11	0	01638	QPSK	1	0	10 mm	left	1:1	0.293	1.000	0.293	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.7	22.66	-0.04	1	01638	QPSK	25	0	10 mm	left	1:1	0.218	1.009	0.220	
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 11-18
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	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	0.21	0	01646	QPSK	1	0	10 mm	back closed	1:1	1.020	1.002	1.022	A24
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	-0.19	0	01646	QPSK	1	0	10 mm	back open	1:1	0.975	1.002	0.977	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	0.19	1	01646	QPSK	50	50	10 mm	back	1:1	0.667	1.005	0.670	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	21.97	0.03	1	01646	QPSK	100	0	10 mm	back	1:1	0.717	1.054	0.756	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	0.12	0	01646	QPSK	1	0	10 mm	front	1:1	0.308	1.002	0.309	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	-0.03	1	01646	QPSK	50	50	10 mm	front	1:1	0.232	1.005	0.233	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	0.07	0	01646	QPSK	1	0	10 mm	bottom	1:1	0.187	1.002	0.187	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	0.04	1	01646	QPSK	50	50	10 mm	bottom	1:1	0.142	1.005	0.143	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	-0.07	0	01646	QPSK	1	0	10 mm	right	1:1	0.161	1.002	0.161	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	0.16	1	01646	QPSK	50	50	10 mm	right	1:1	0.119	1.005	0.120	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	-0.12	0	01646	QPSK	1	0	10 mm	left	1:1	0.301	1.002	0.302	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.2	22.18	0.11	1	01646	QPSK	50	50	10 mm	left	1:1	0.225	1.005	0.226	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.2	23.19	0.00	0	01646	QPSK	1	0	10 mm	back closed	1:1	1.010	1.002	1.012	
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 measurement.

Table 11-19
LTE Band 25 (PCS) 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	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1860.00	26140	Low	LTE Band 25 (PCS)	20	24.2	24.10	0.09	0	01638	QPSK	1	0	10 mm	back	1:1	0.990	1.023	1.013	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	0.06	0	01638	QPSK	1	0	10 mm	back closed	1:1	1.000	1.000	1.000	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	0.11	0	01638	QPSK	1	0	10 mm	back open	1:1	1.070	1.000	1.070	A26
1905.00	26590	High	LTE Band 25 (PCS)	20	24.2	24.14	-0.12	0	01638	QPSK	1	99	10 mm	back	1:1	0.986	1.014	1.000	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	-0.04	1	01638	QPSK	50	50	10 mm	back	1:1	0.747	1.005	0.751	
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.2	23.12	0.02	1	01638	QPSK	100	0	10 mm	back	1:1	0.782	1.019	0.797	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	-0.01	0	01638	QPSK	1	0	10 mm	front	1:1	0.311	1.000	0.311	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	0.14	1	01638	QPSK	50	50	10 mm	front	1:1	0.233	1.005	0.234	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	0.12	0	01638	QPSK	1	0	10 mm	bottom	1:1	0.239	1.000	0.239	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	-0.08	1	01638	QPSK	50	50	10 mm	bottom	1:1	0.173	1.005	0.174	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	-0.12	0	01638	QPSK	1	0	10 mm	right	1:1	0.224	1.000	0.224	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	-0.06	1	01638	QPSK	50	50	10 mm	right	1:1	0.157	1.005	0.158	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.20	0.18	0	01638	QPSK	1	0	10 mm	left	1:1	0.225	1.000	0.225	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.2	23.18	0.06	1	01638	QPSK	50	50	10 mm	left	1:1	0.156	1.005	0.157	
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 11-20
WLAN Hotspot SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2417	2	802.11b	DSSS	22	15.0	14.65	0.14	10 mm	01653	1	back closed	99.9	0.269	0.177	1.084	1.001	**0.192**	A27
2417	2	802.11b	DSSS	22	15.0	14.65	0.04	10 mm	01653	1	back open	99.9	0.075	0.054	1.084	1.001	0.059	
2417	2	802.11b	DSSS	22	15.0	14.65	0.19	10 mm	01653	1	front	99.9	0.141	-	1.084	1.001	-	
2417	2	802.11b	DSSS	22	15.0	14.65	-0.10	10 mm	01653	1	top	99.9	0.105	-	1.084	1.001	-	
2417	2	802.11b	DSSS	22	15.0	14.65	0.14	10 mm	01653	1	right	99.9	0.137	-	1.084	1.001	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram										

11.4 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
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 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
10. Body-worn SAR tests were performed with the phone in closed position only because operations during body-worn use scenarios with the open position are not expected. Additional hotspot SAR tests were performed with the phone in open position for the worst-case configuration of each mode and band.

GSM Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. Justification for reduced test configurations per KDB Publication 941225 D01v03r01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for 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.
3. Per FCC KDB Publication 447498 D01v06, 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

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the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.

CDMA Notes:

1. Head SAR for CDMA2000 mode was tested under RC3/SO55 per FCC KDB Publication 941225 D01v03r01.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. TDSO / SO32 FCH+SCH SAR tests were not required per the 3G SAR Test Reduction Procedure in FCC KDB Publication 941225 D01v03r01.
3. Per FCC KDB Publication 447498 D01v06, 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 > ½ dB, instead of the middle channel, the highest output power channel was used.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. AMR and HSPA SAR was not required per the 3G Test Reduction Procedure in KDB Publication 941225 D01v03r01.
2. Per FCC KDB Publication 447498 D01v06, 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 > ½ dB, instead of the middle channel, the highest output power channel was used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 8.6.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. 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).

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WLAN Notes:

1. For held-to-ear and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 8.7.3 for more information. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg or all test channels were measured.
3. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.

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12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v06 are applicable to devices with built-in unlicensed transmitters such as 802.11 and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

12.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 4.3.2 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1-g or 10-g SAR.

When standalone SAR is not required to be measured, per FCC KDB 447498 D01v06 4.3.2 b), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

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

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)	Separation Distance (Head)	Estimated SAR (Head)
	[MHz]	[dBm]	[mm]	[W/kg]	[mm]	[W/kg]
Bluetooth	2480	9.00	10	0.168	5*	0.336

(*) – Per FCC KDB Publication 447498, when the test separation distance is < 5 mm, a distance of 5 mm is applied to determine estimated SAR.

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12.3 Head SAR Simultaneous Transmission Analysis

Table 12-2
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Held to Ear)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Cell. CDMA	0.757	0.075	**0.832**
	GSM 850	0.748	0.075	0.823
	UMTS 850	0.564	0.075	0.639
	PCS CDMA	0.181	0.075	0.256
	GSM 1900	0.077	0.075	0.152
	UMTS 1900	0.122	0.075	0.197
	LTE Band 12	0.423	0.075	0.498
	LTE Band 5 (Cell)	0.659	0.075	0.734
	LTE Band 4 (AWS)	0.304	0.075	0.379
	LTE Band 25 (PCS)	0.160	0.075	0.235

Table 12-3
Simultaneous Transmission Scenario with Bluetooth (Held to Ear)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Cell. CDMA	0.757	0.336	**1.093**
	GSM 850	0.748	0.336	1.084
	UMTS 850	0.564	0.336	0.900
	PCS CDMA	0.181	0.336	0.517
	GSM 1900	0.077	0.336	0.413
	UMTS 1900	0.122	0.336	0.458
	LTE Band 12	0.423	0.336	0.759
	LTE Band 5 (Cell)	0.659	0.336	0.995
	LTE Band 4 (AWS)	0.304	0.336	0.640
	LTE Band 25 (PCS)	0.160	0.336	0.496

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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12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body-Worn	Cell. CDMA	1.139	0.192	**1.331**
	GSM 850	1.012	0.192	1.204
	UMTS 850	0.240	0.192	0.432
	PCS CDMA	1.097	0.192	1.289
	GSM 1900	0.419	0.192	0.611
	UMTS 1900	0.880	0.192	1.072
	LTE Band 12	0.745	0.192	0.937
	LTE Band 5 (Cell)	0.918	0.192	1.110
	LTE Band 4 (AWS)	1.022	0.192	1.214
	LTE Band 25 (PCS)	1.013	0.192	1.205

Table 12-5
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body-Worn	Cell. CDMA	1.139	0.168	**1.307**
	GSM 850	1.012	0.168	1.180
	UMTS 850	0.240	0.168	0.408
	PCS CDMA	1.097	0.168	1.265
	GSM 1900	0.419	0.168	0.587
	UMTS 1900	0.880	0.168	1.048
	LTE Band 12	0.745	0.168	0.913
	LTE Band 5 (Cell)	0.918	0.168	1.086
	LTE Band 4 (AWS)	1.022	0.168	1.190
	LTE Band 25 (PCS)	1.013	0.168	1.181

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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12.5 Hotspot SAR Simultaneous Transmission Analysis

Table 12-6
Simultaneous Transmission Scenario With 2.4 GHz WLAN (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Hotspot SAR	Cell. CDMA	1.139	0.192	1.331
	GPRS 850	1.184	0.192	1.376
	UMTS 850	0.240	0.192	0.432
	PCS CDMA	1.249	0.192	**1.441**
	GPRS 1900	0.441	0.192	0.633
	UMTS 1900	0.893	0.192	1.085
	LTE Band 12	0.745	0.192	0.937
	LTE Band 5 (Cell)	0.918	0.192	1.110
	LTE Band 4 (AWS)	1.022	0.192	1.214
	LTE Band 25 (PCS)	1.070	0.192	1.262

Table 12-7
Simultaneous Transmission Scenario With Bluetooth (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Hotspot SAR	Cell. CDMA	1.139	0.168	1.307
	GPRS 850	1.184	0.168	1.352
	UMTS 850	0.240	0.168	0.408
	PCS CDMA	1.249	0.168	**1.417**
	GPRS 1900	0.441	0.168	0.609
	UMTS 1900	0.893	0.168	1.061
	LTE Band 12	0.745	0.168	0.913
	LTE Band 5 (Cell)	0.918	0.168	1.086
	LTE Band 4 (AWS)	1.022	0.168	1.190
	LTE Band 25 (PCS)	1.070	0.168	1.238

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.

12.6 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 D01v06 and IEEE 1528-2013 Section 6.3.4.1.2.

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13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, 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 preformed 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 (~ 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 13-1
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	824.20	128	GSM 850	GPRS	2	back closed	10 mm	1.120	1.010	1.11	N/A	N/A	N/A	N/A
1750	1732.50	20175	LTE Band 4 (AWS), 20 MHz Bandwidth	QPSK, 1 RB, 0 RB Offset	N/A	back closed	10 mm	1.020	1.010	1.01	N/A	N/A	N/A	N/A
1900	1851.25	25	PCS CDMA	TDSO / SO32	N/A	back open	10 mm	1.150	0.999	1.15	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram							

13.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

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14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Vector Network Analyzer	8/19/2016	Annual	8/19/2017	MY40003841
Agilent	E4432B	ESG-D Series Signal Generator	3/24/2017	Annual	3/24/2018	US40053896
Agilent	E4438C	ESG Vector Signal Generator	3/23/2017	Annual	3/23/2018	MY47270002
Agilent	E5515C	8960 Series 10 Wireless Communications Test Set	10/5/2016	Annual	10/5/2017	GB42230325
Agilent	E5515C	Wireless Communications Test Set	10/23/2015	Biennial	10/23/2017	GB43193563
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/22/2017	Annual	3/22/2018	MY45470194
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Agilent	N5182A	MXG Vector Signal Generator	10/27/2016	Annual	10/27/2017	MY47420603
Agilent	N9020A	MXA Signal Analyzer	10/28/2016	Annual	10/28/2017	US46470561
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	MA24106A	USB Power Sensor	10/27/2016	Annual	10/27/2017	1344545
Anritsu	MA24106A	USB Power Sensor	10/27/2016	Annual	10/27/2017	1344559
Anritsu	MA2411B	Pulse Power Sensor	8/18/2016	Annual	8/18/2017	1126066
Anritsu	MA2411B	Pulse Power Sensor	8/18/2016	Annual	8/18/2017	1207470
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Anritsu	MT8820C	Radio Communication Analyzer	9/13/2016	Annual	9/13/2017	6201144419
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M1S5A00-009
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Control Company	4040	Therm./ Clock/ Humidity Monitor	3/1/2017	Biennial	3/1/2019	170152021
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mitutoyo	CD-6"CSX	Digital Caliper	3/2/2016	Biennial	3/2/2018	13264162
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	12/12/2016	Annual	12/12/2017	833855/0010
Rohde & Schwarz	CMW500	Radio Communication Tester	10/20/2016	Annual	10/20/2017	100976
Rohde & Schwarz	CMW500	Radio Communication Tester	4/19/2017	Annual	4/19/2018	140148
Seekonk	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	N/A
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A
Seekonk	NC-100	Torque Wrench (8" lb)	8/30/2016	Biennial	8/30/2018	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/13/2016	Annual	9/13/2017	1091
SPEAG	D750V3	750 MHz SAR Dipole	5/11/2017	Annual	5/11/2018	1034
SPEAG	D835V2	835 MHz SAR Dipole	7/13/2016	Annual	7/13/2017	4d047
SPEAG	D1750V2	SAR Dipole	5/9/2017	Annual	5/9/2018	1148
SPEAG	D1900V2	1900 MHz SAR Dipole	7/8/2016	Annual	7/8/2017	5d080
SPEAG	D2450V2	2450 MHz SAR Dipole	9/13/2016	Annual	9/13/2017	797
SPEAG	D750V3	750 MHz SAR Dipole	1/11/2017	Annual	1/11/2018	1003
SPEAG	D835V2	835 MHz SAR Dipole	7/14/2016	Annual	7/14/2017	4d133
SPEAG	D2450V2	2450 MHz SAR Dipole	7/25/2016	Annual	7/25/2017	981
SPEAG	ES3DV3	SAR Probe	3/14/2017	Annual	3/14/2018	3209
SPEAG	ES3DV3	SAR Probe	2/10/2017	Annual	2/10/2018	3213
SPEAG	ES3DV3	SAR Probe	3/14/2017	Annual	3/14/2018	3319
SPEAG	ES3DV3	SAR Probe	2/10/2017	Annual	2/10/2018	3318
SPEAG	EX3DV4	SAR Probe	4/18/2017	Annual	4/18/2018	7406
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2017	Annual	3/13/2018	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/8/2017	Annual	3/8/2018	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2017	Annual	4/11/2018	1407

Note: 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.

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15 MEASUREMENT UNCERTAINTIES

a	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	Tol. (± %)	Prob. Dist.	Div.	c_i 1gm	c_i 10 gms	1gm u_i (± %)	10gms u_i (± %)	v_i
Measurement System								
Probe Calibration	6.55	N	1	1.0	1.0	6.6	6.6	∞
Axial Isotropy	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	1.3	N	1	0.7	0.7	0.9	0.9	∞
Boundary Effect	2.0	R	1.73	1.0	1.0	1.2	1.2	∞
Linearity	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	0.25	R	1.73	1.0	1.0	0.1	0.1	∞
Readout Electronics	0.3	N	1	1.0	1.0	0.3	0.3	∞
Response Time	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions - Noise	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
RF Ambient Conditions - Reflections	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	6.7	R	1.73	1.0	1.0	3.9	3.9	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Test Sample Related								
Test Sample Positioning	2.7	N	1	1.0	1.0	2.7	2.7	35
Device Holder Uncertainty	1.67	N	1	1.0	1.0	1.7	1.7	5
Output Power Variation - SAR drift measurement	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
SAR Scaling	0.0	R	1.73	1.0	1.0	0.0	0.0	∞
Phantom & Tissue Parameters								
Phantom Uncertainty (Shape & Thickness tolerances)	7.6	R	1.73	1.0	1.0	4.4	4.4	∞
Liquid Conductivity - measurement uncertainty	4.2	N	1	0.78	0.71	3.3	3.0	10
Liquid Permittivity - measurement uncertainty	4.1	N	1	0.23	0.26	1.0	1.1	10
Liquid Conductivity - Temperature Uncertainty	3.4	R	1.73	0.78	0.71	1.5	1.4	∞
Liquid Permittivity - Temperature Unceritainty	0.6	R	1.73	0.23	0.26	0.1	0.1	∞
Liquid Conductivity - deviation from target values	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Permittivity - deviation from target values	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Combined Standard Uncertainty (k=1)		RSS				11.5	11.3	60
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				23.0	22.6	

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16 CONCLUSION

16.1 Measurement Conclusion

The SAR evaluation indicates that the EUT complies with the RF radiation exposure limits of the FCC and Innovation, Science, and Economic Development 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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17 REFERENCES

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] IEEE Standards Coordinating Committee 39 –Standards Coordinating Committee 34 – IEEE Std. 1528-2013, IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

[6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 1 -124.

[9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

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[18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[19] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

[20] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), Feb. 2005.

[21] Innovation, Science, Economic Development Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 5, March 2015.

[22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2015

[23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D07

[24] SAR Measurement Guidance for IEEE 802.11 Transmitters, KDB Publication 248227 D01

[25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D03-D04

[26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04

[27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02

[28] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02

[29] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[30] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 2: Procedure to determine the specific absorption rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz), Mar. 2010.

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APPENDIX A: SAR TEST DATA

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PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01612

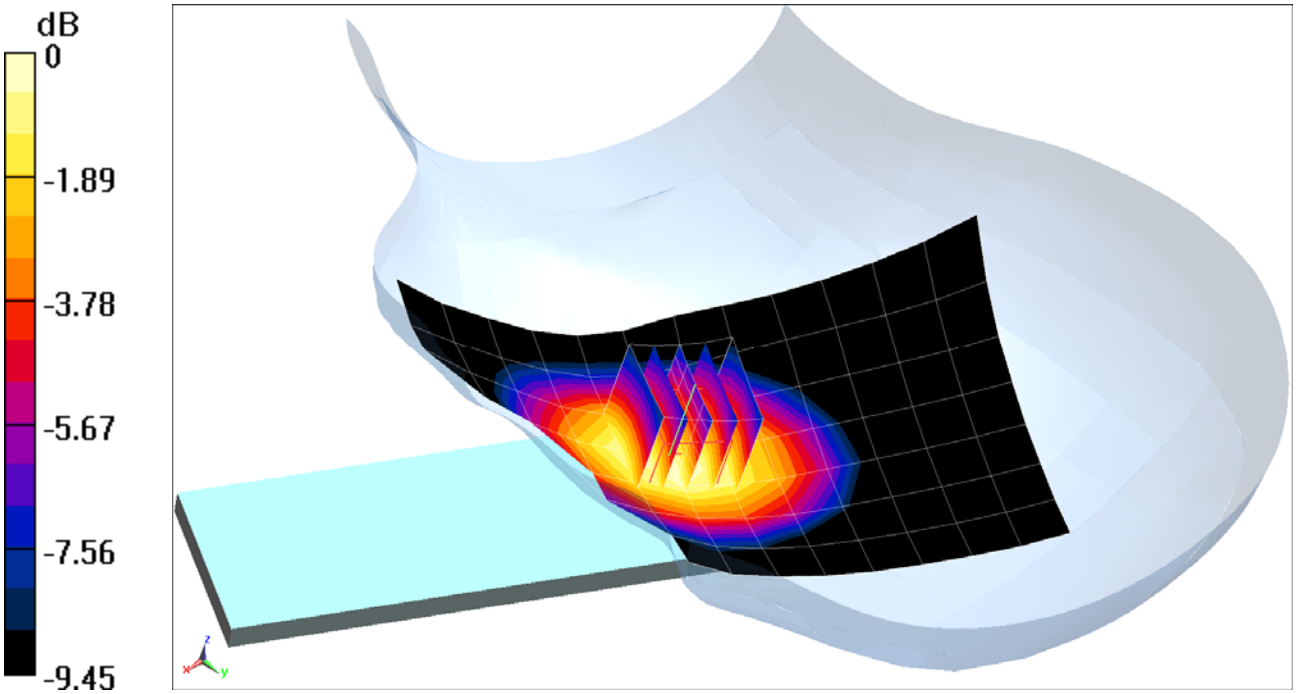
Communication System: UID 0, Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.52 MHz; σ = 0.897 S/m; ε_r = 41.818; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 06-20-2017; Ambient Temp: 23.8°C; Tissue Temp: 23.9°C

Probe: ES3DV3 - SN3213; ConvF(6.49, 6.49, 6.49); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: BC0 Cell. CDMA, Left Head, Cheek, Mid.ch

Area Scan (8x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 30.03 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.926 W/kg
SAR(1 g) = 0.741 W/kg



0 dB = 0.816 W/kg = -0.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01612

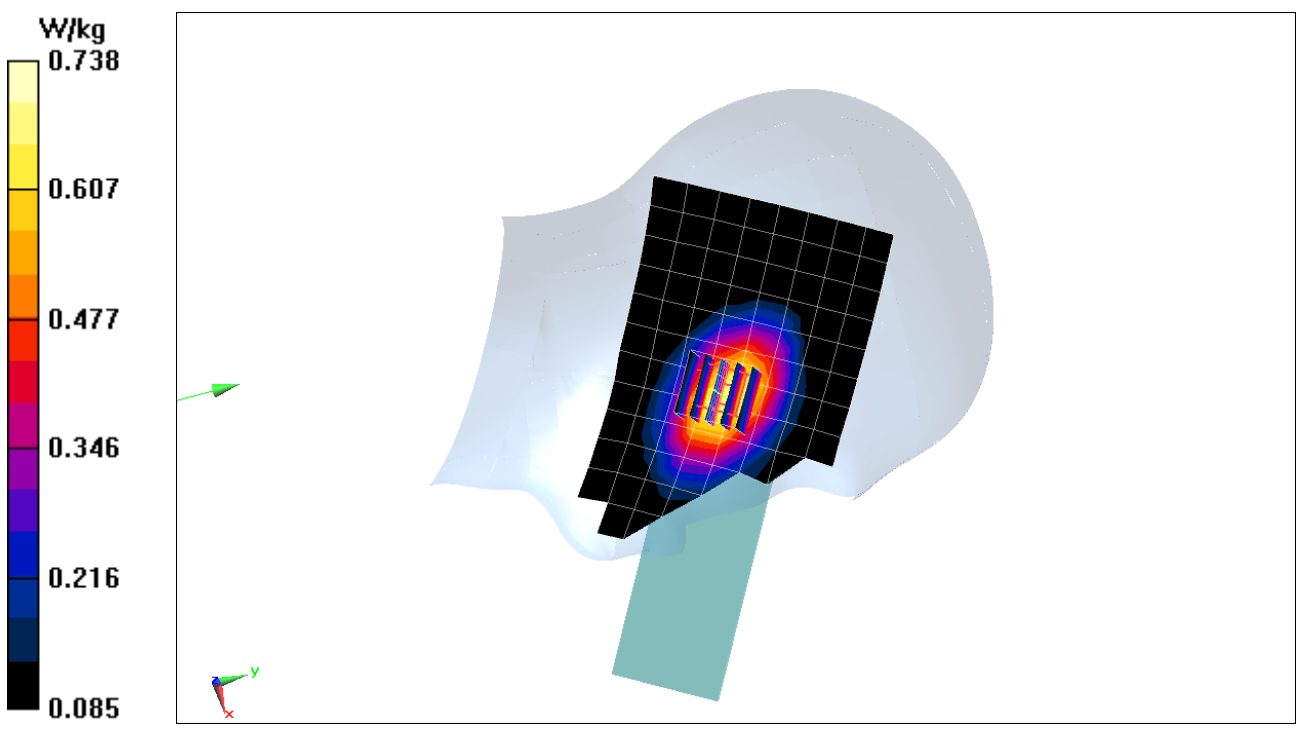
Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.897 S/m; ε_r = 41.817; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 06-20-2017; Ambient Temp: 23.8°C; Tissue Temp: 23.9°C

Probe: ES3DV3 - SN3213; ConvF(6.49, 6.49, 6.49); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.52 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.823 W/kg
SAR(1 g) = 0.665 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01612

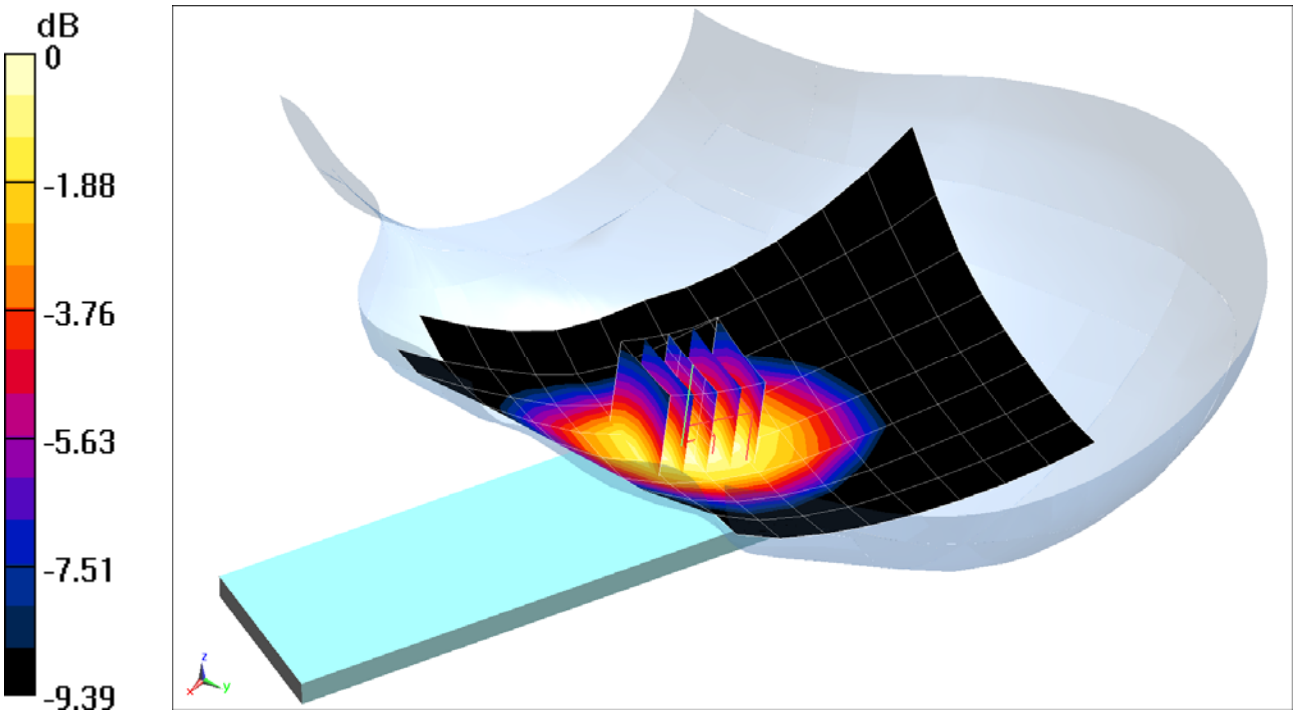
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.897 S/m; ε_r = 41.817; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 06-20-2017; Ambient Temp: 23.8°C; Tissue Temp: 23.9°C

Probe: ES3DV3 - SN3213; ConvF(6.49, 6.49, 6.49); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.22 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.708 W/kg
SAR(1 g) = 0.564 W/kg



0 dB = 0.624 W/kg = -2.05 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01612

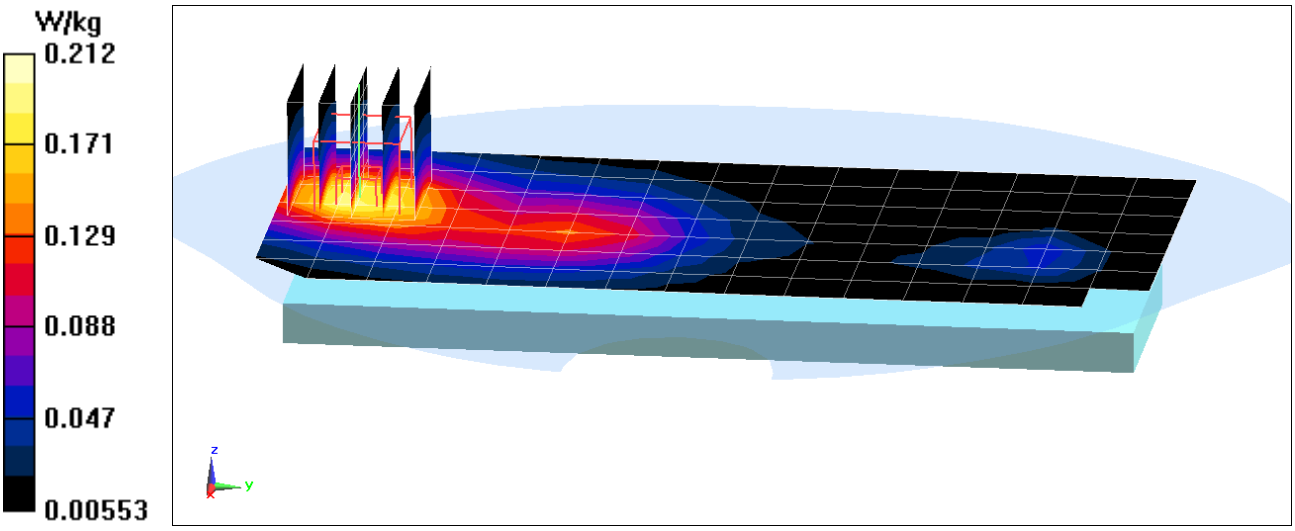
Communication System: UID 0, CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.412 S/m; ε_r = 40.196; ρ = 1000 kg/m^3
Phantom section: Flat Section;

Test Date: 06-26-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(5.31, 5.31, 5.31); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: PCS CDMA, Mouth Jaw replacing Left Cheek, Mid.ch

Area Scan (8x16x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.79 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.289 W/kg
SAR(1 g) = 0.177 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01612

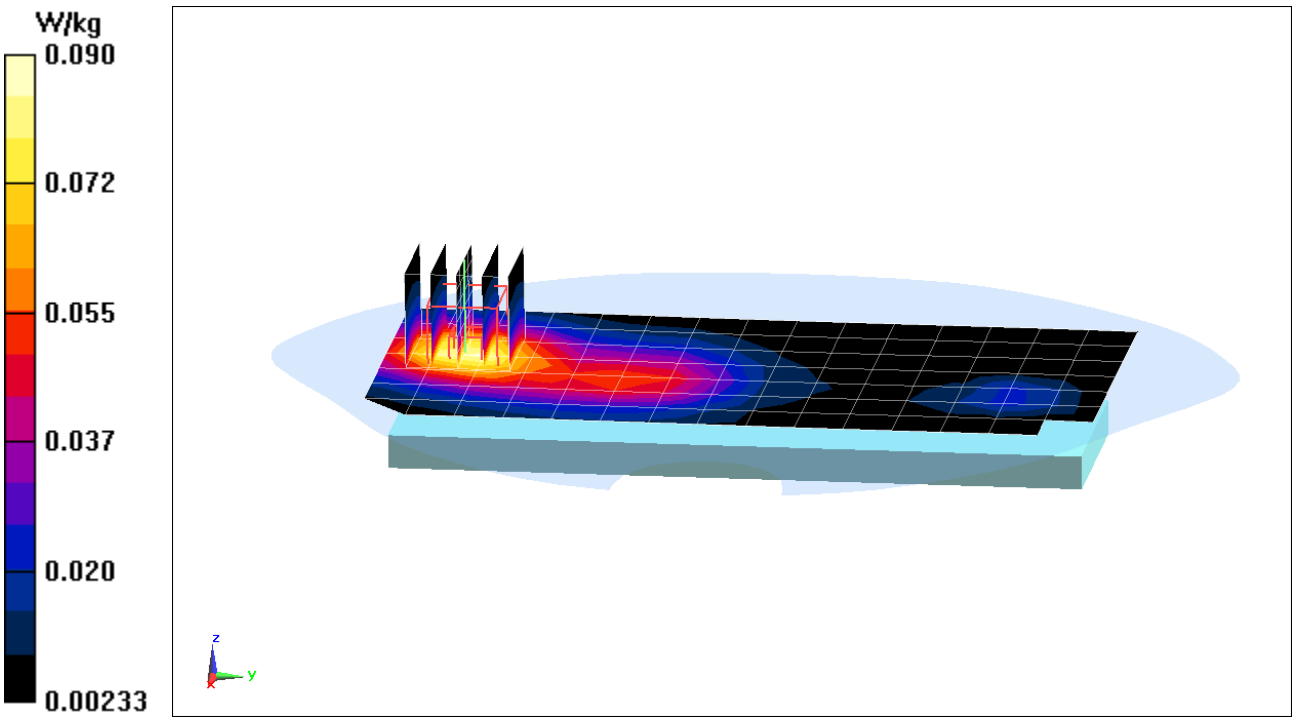
Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.412 S/m; ε_r = 40.196; ρ = 1000 kg/m^3
Phantom section: Flat Section

Test Date: 06-26-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(5.31, 5.31, 5.31); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: GSM 1900, Body SAR, Mouth Jaw replacing Left Cheek, Mid.ch

Area Scan (8x16x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.769 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.122 W/kg
SAR(1 g) = 0.076 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01612

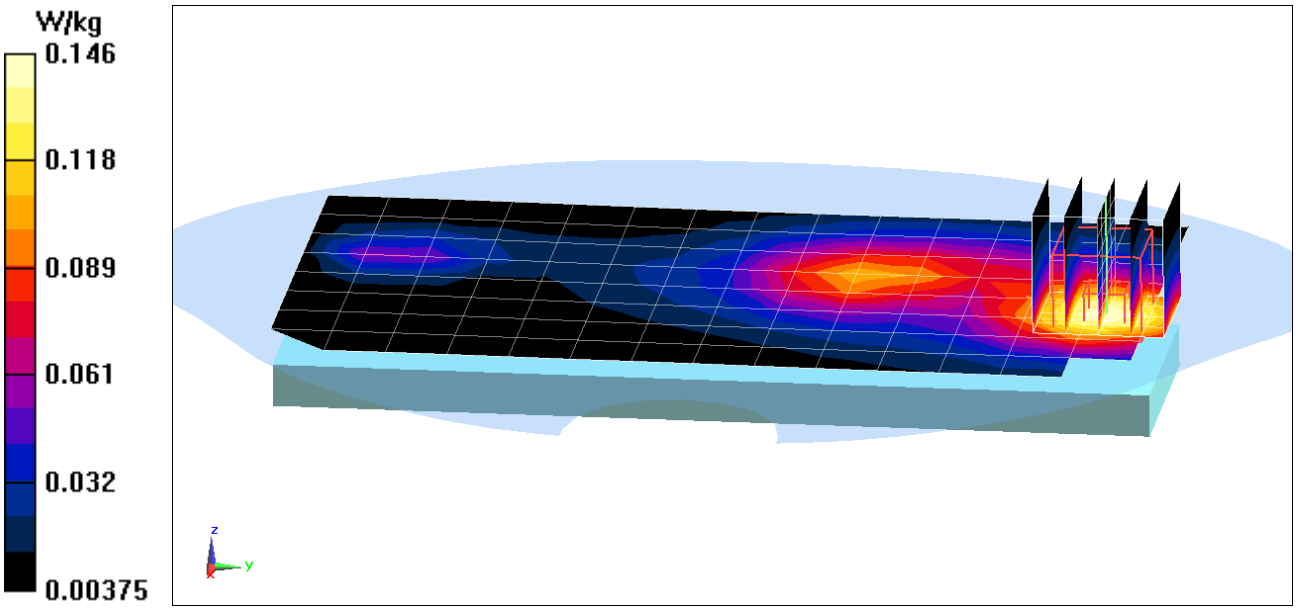
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.412 S/m; ε_r = 40.196; ρ = 1000 kg/m^3
Phantom section: Flat Section;

Test Date: 06-26-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(5.31, 5.31, 5.31); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: UMTS 1900, Mouth Jaw replacing Left Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.797 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.201 W/kg
SAR(1 g) = 0.122 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01646

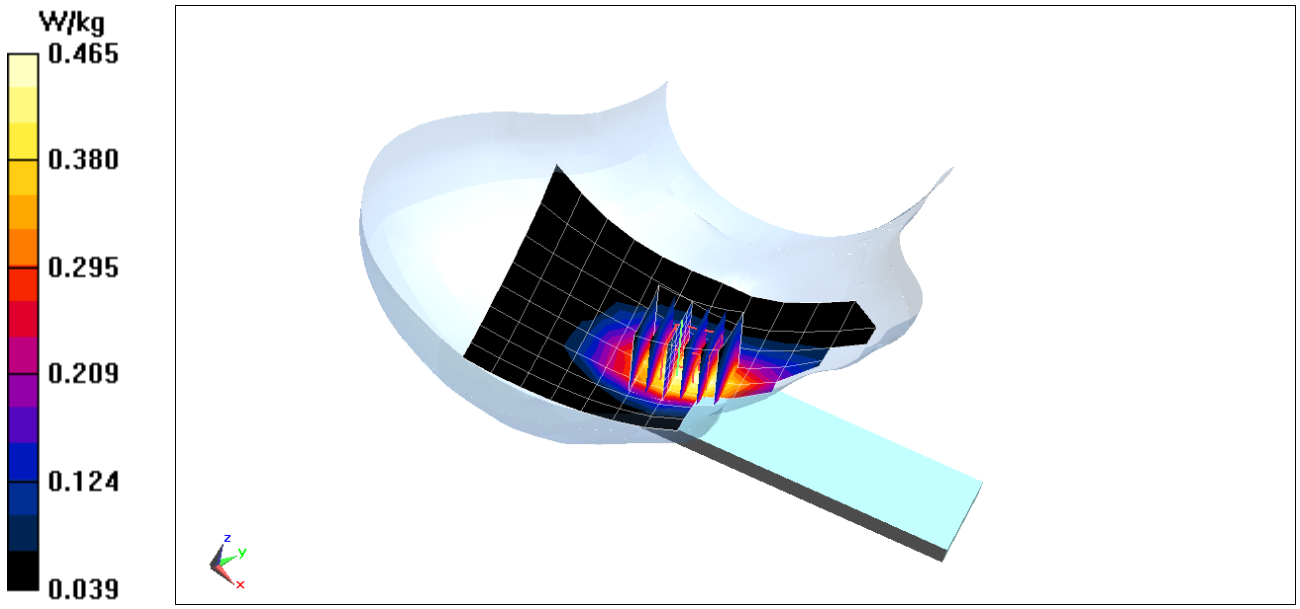
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.868 S/m; ε_r = 42.833; ρ = 1000 kg/m^3
Phantom section: Right Section;

Test Date: 06-21-2017; Ambient Temp: 24.9°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3209; ConvF(6.76, 6.76, 6.76); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 12, Right Head, Cheek, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x8x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.60 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.526 W/kg
SAR(1 g) = 0.411 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01638

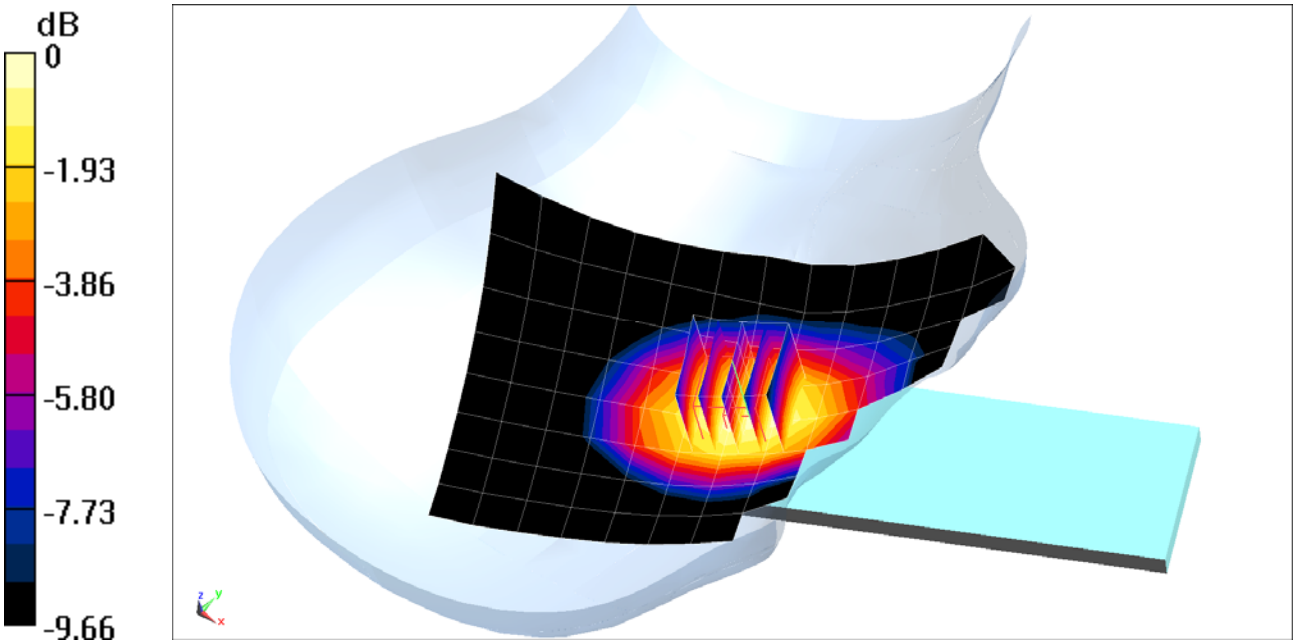
Communication System: UID 0, LTE Band 5 (Cell.); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.897 S/m; ε_r = 41.819; ρ = 1000 kg/m^3
Phantom section: Right Section;

Test Date: 06-20-2017; Ambient Temp: 23.8°C; Tissue Temp: 23.9°C

Probe: ES3DV3 - SN3213; ConvF(6.49, 6.49, 6.49); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 5 (Cell.), Right Head, Cheek, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.95 V/m; Power Drift = -0.20 dB
Peak SAR (extrapolated) = 0.805 W/kg
SAR(1 g) = 0.659 W/kg



0 dB = 0.726 W/kg = -1.39 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01646

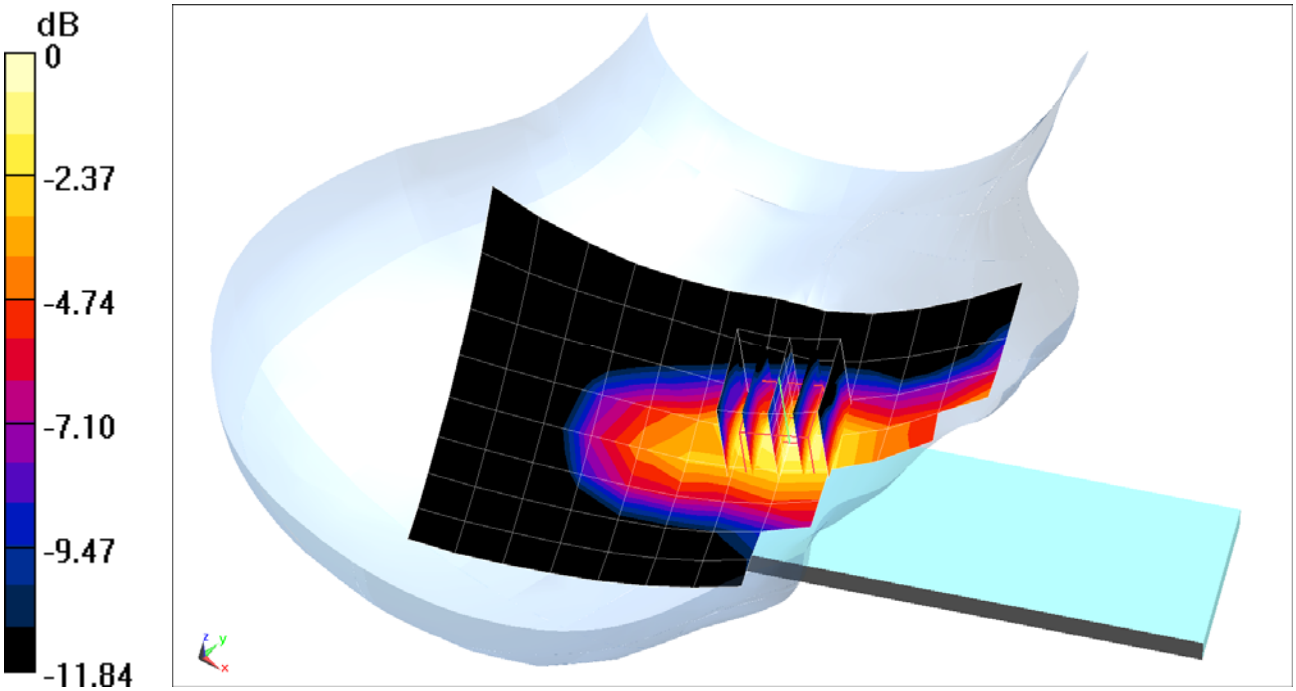
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.385 S/m; ε_r = 38.463; ρ = 1000 kg/m^3
Phantom section: Right Section;

Test Date: 06-26-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3319; ConvF(5.38, 5.38, 5.38); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/8/2017
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 4 (AWS), Right Head, Cheek, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.69 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.457 W/kg
SAR(1 g) = 0.303 W/kg



0 dB = 0.352 W/kg = -4.53 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01646

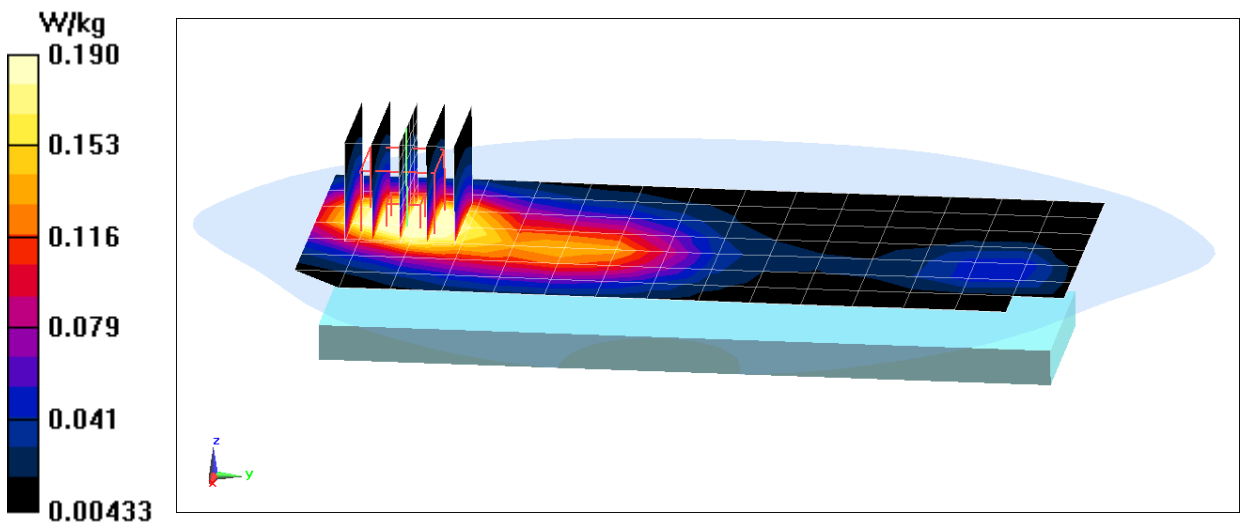
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1882.5 MHz; σ = 1.415 S/m; ε_r = 40.187; ρ = 1000 kg/m^3
Phantom section: Flat Section;

Test Date: 06-26-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(5.31, 5.31, 5.31); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 25 (PCS), Mouth Jaw replacing Left Cheek, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (8x16x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.40 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.262 W/kg
SAR(1 g) = 0.160 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01653

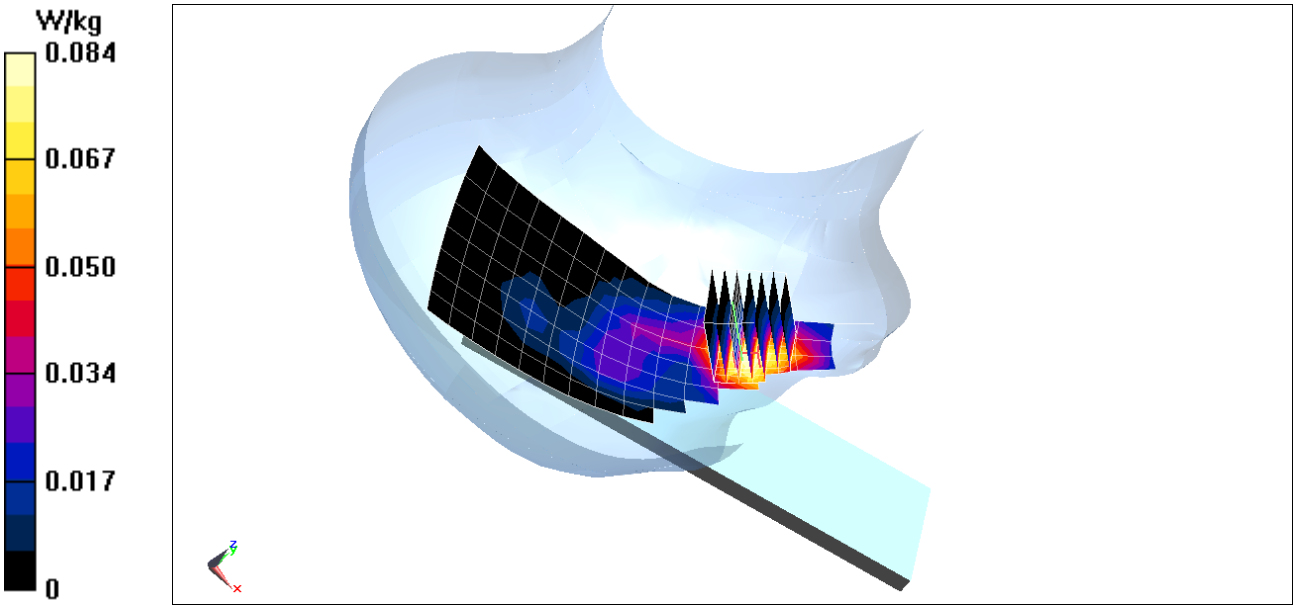
Communication System: UID 0, IEEE 802.11b; Frequency: 2417 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2417 MHz; σ = 1.83 S/m; ε_r = 38.736; ρ = 1000 kg/m^3
Phantom section: Right Section;

Test Date: 06-14-2017; Ambient Temp: 23.0°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3213; ConvF(4.7, 4.7, 4.7); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11b, 22 MHz Bandwidth,
Right Head, Cheek, Ch 2, 1 Mbps

Area Scan (8x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.319 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.122 W/kg
SAR(1 g) = 0.069 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01612

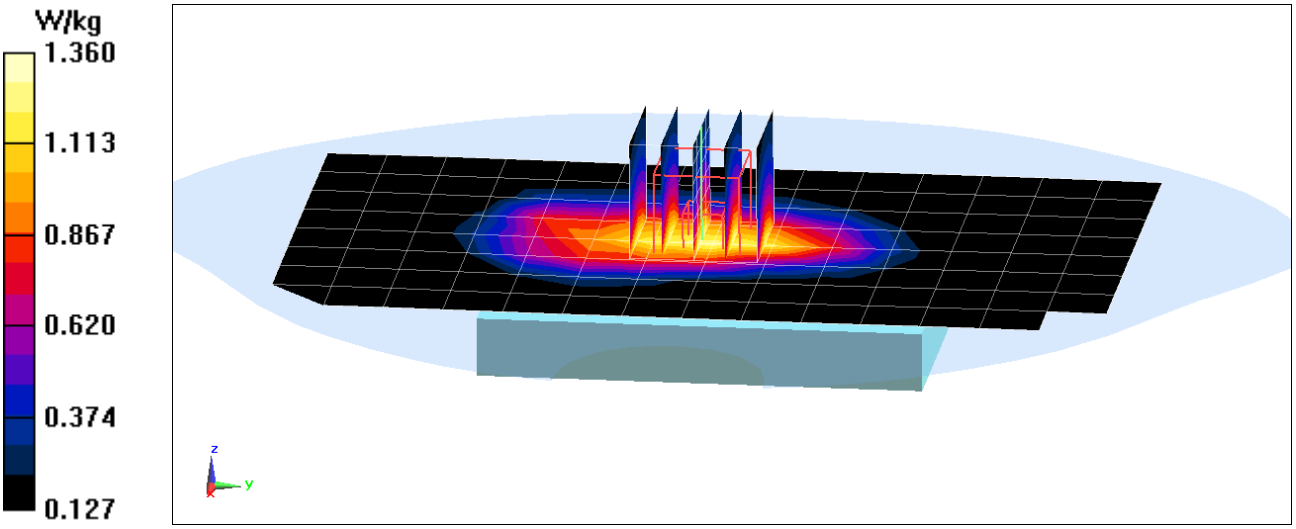
Communication System: UID 0, CDMA; Frequency: 824.7 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 824.7 MHz; σ = 0.981 S/m; ε_r = 53.222; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-27-2017; Ambient Temp: 22.4°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7406; ConvF(9.77, 9.77, 9.77); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: Cell. CDMA, Body SAR, Back side closed, Low.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 33.90 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.50 W/kg
SAR(1 g) = 1.09 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01612

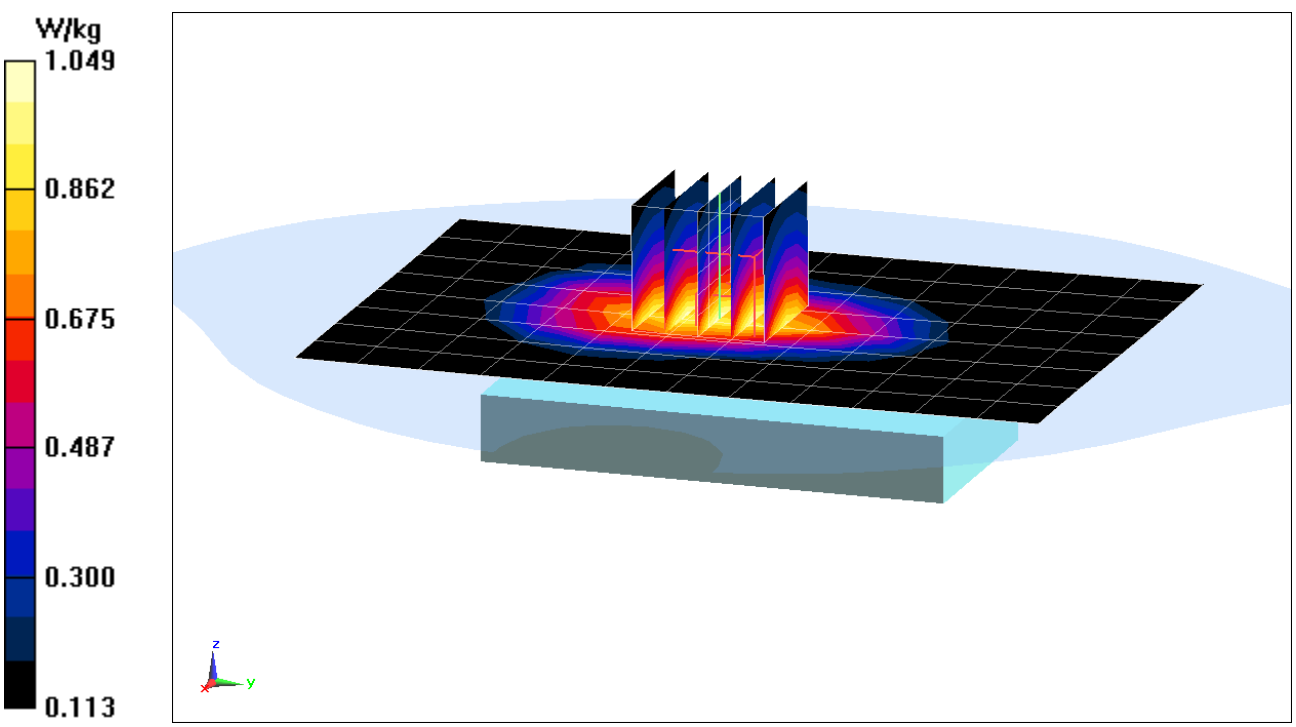
Communication System: UID 0, GSM; Frequency: 824.2 MHz; Duty Cycle: 1:8.3
Medium: 835 Body Medium parameters used (interpolated):
f = 824.2 MHz; σ = 0.991 S/m; ε_r = 52.936; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-22-2017; Ambient Temp: 24.8°C; Tissue Temp: 24.5°C

Probe: ES3DV3 - SN3318; ConvF(6.37, 6.37, 6.37); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 32.04 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.944 W/kg



DUT: ZNFUN220; Type: Portable Handset; Serial: 01612

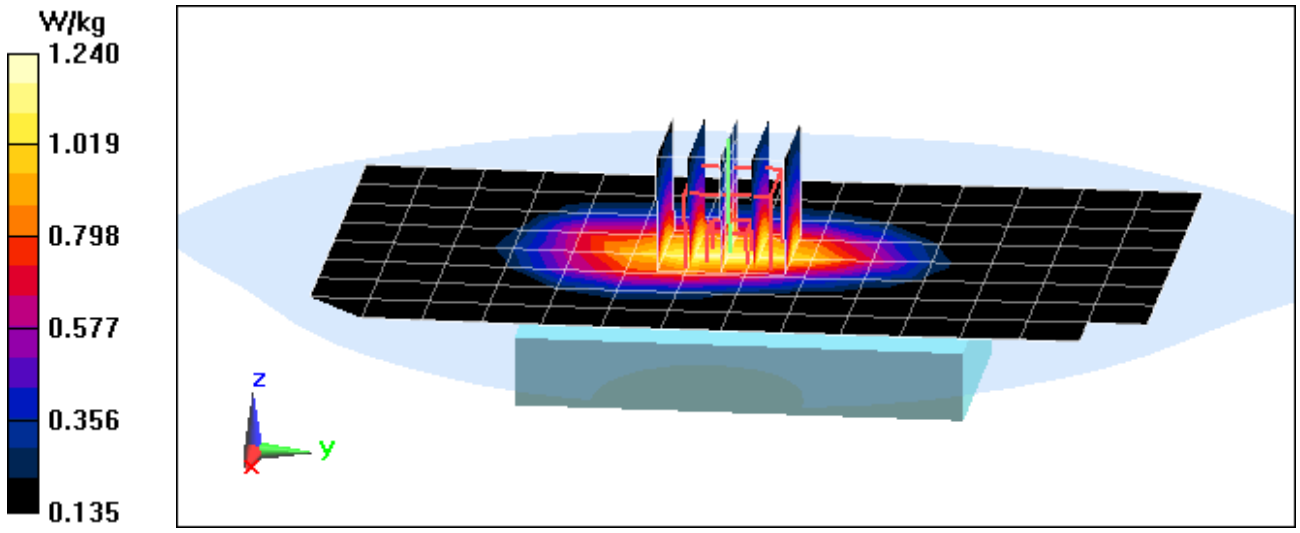
Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 824.2 MHz; Duty Cycle: 1:4.15
Medium: 835 Body Medium parameters used (interpolated):
f = 824.2 MHz; σ = 0.991 S/m; ε_r = 52.936; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-22-2017; Ambient Temp: 24.8°C; Tissue Temp: 24.5°C

Probe: ES3DV3 - SN3318; ConvF(6.37, 6.37, 6.37); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: GPRS 850, Body SAR, Back side closed, Low.ch, 2 Tx Slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 35.17 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 1.44 W/kg
SAR(1 g) = 1.12 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01620

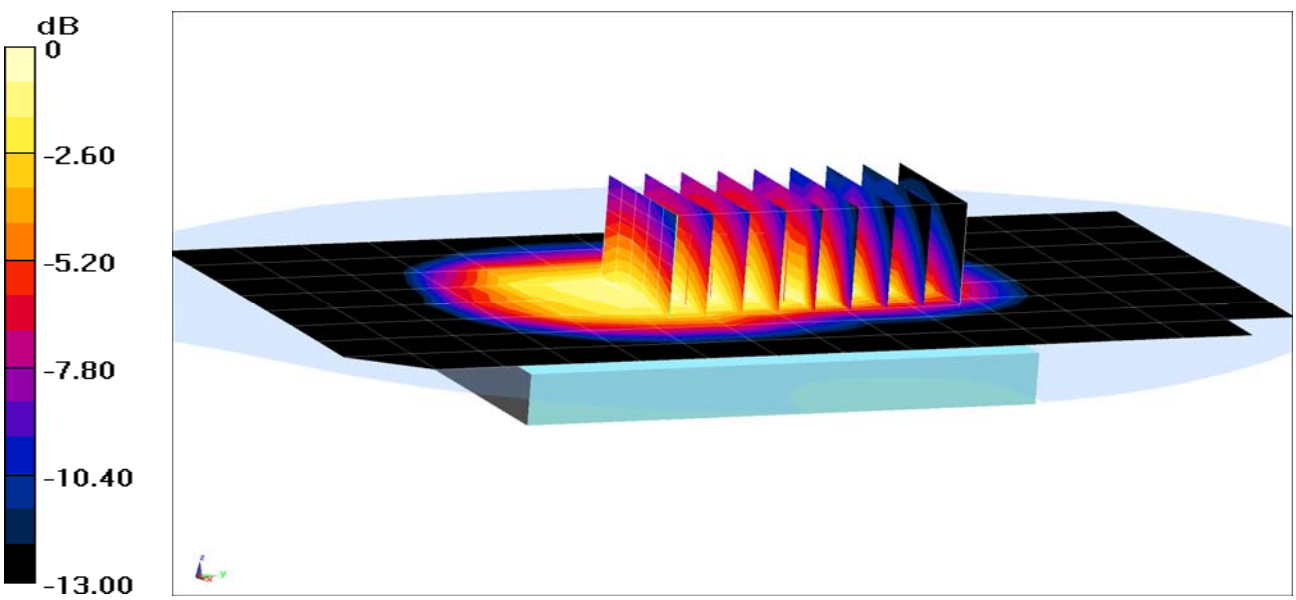
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.992 S/m; ε_r = 53.094; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-27-2017; Ambient Temp: 22.4°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7406; ConvF(9.77, 9.77, 9.77); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x9x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.99 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.336 W/kg
SAR(1 g) = 0.240 W/kg



0 dB = 0.316 W/kg = -5.00 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01620

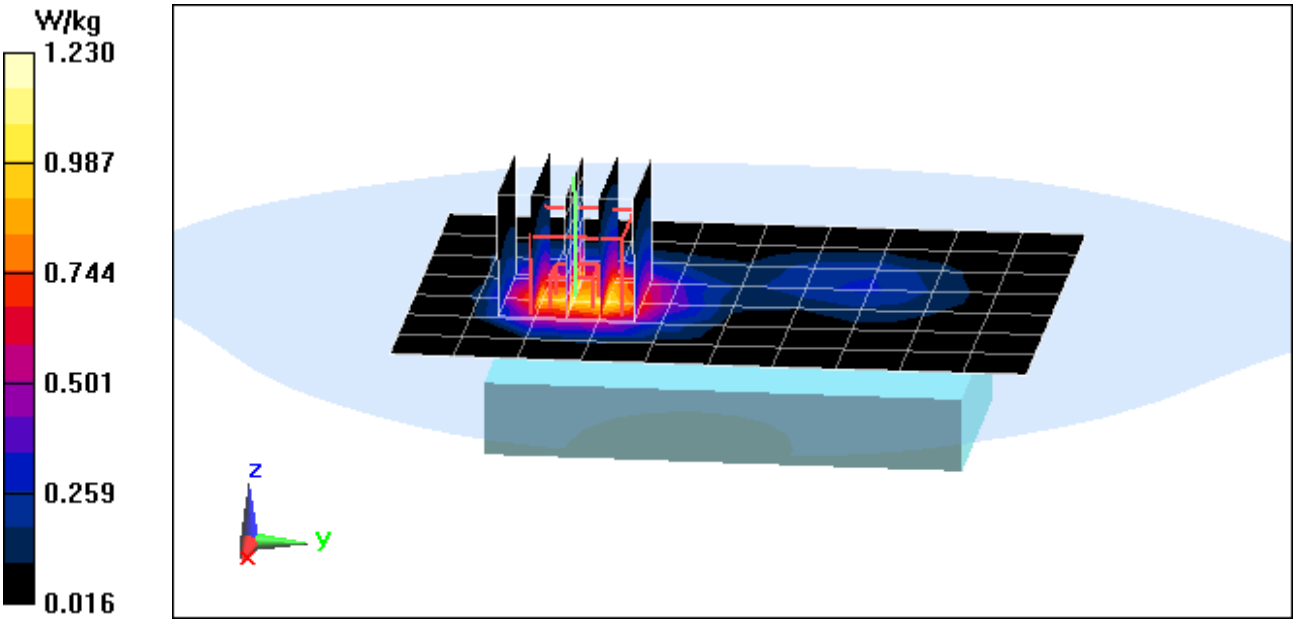
Communication System: UID 0, CDMA; Frequency: 1851.25 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1851.25 MHz; σ = 1.453 S/m; ε_r = 52.535; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-24-2017; Ambient Temp: 21.7°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3318; ConvF(4.96, 4.96, 4.96); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: PCS CDMA, Body SAR, Back side closed, Low.ch

Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.42 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 1.70 W/kg
SAR(1 g) = 1.01 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01620

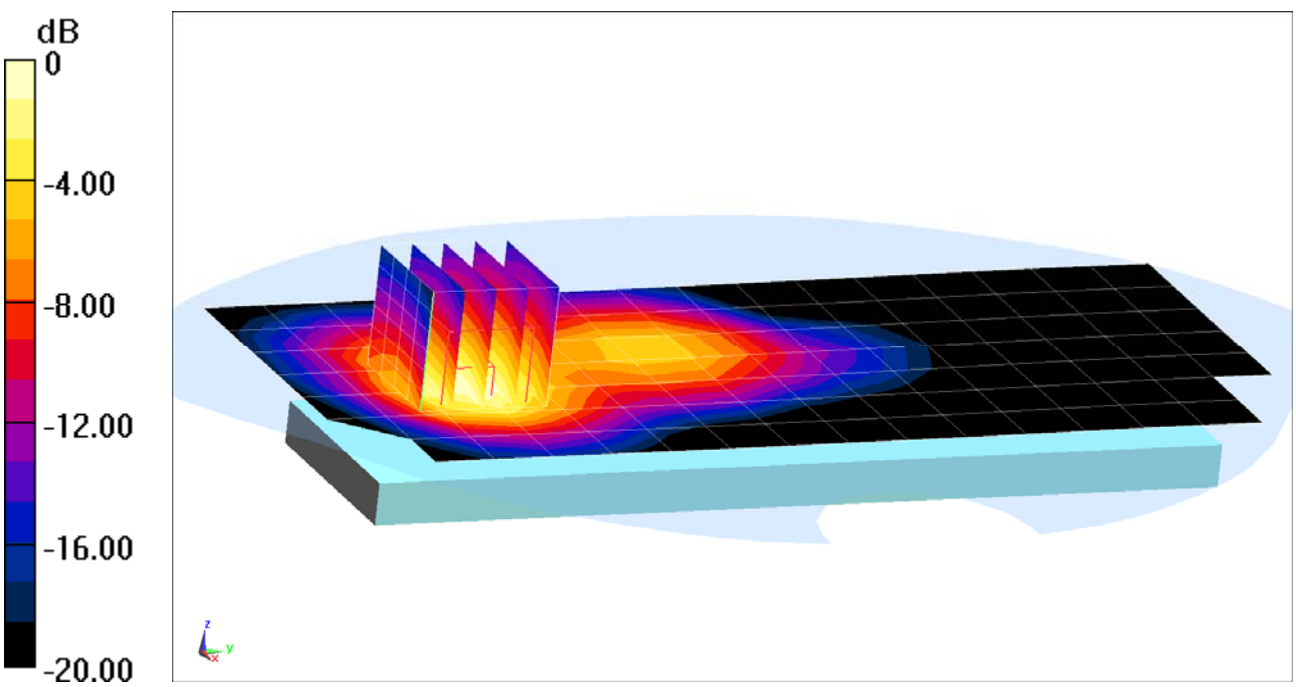
Communication System: UID 0, CDMA; Frequency: 1851.25 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1851.25 MHz; σ = 1.453 S/m; ε_r = 52.535; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-24-2017; Ambient Temp: 21.7°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3318; ConvF(4.96, 4.96, 4.96); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: PCS CDMA Open, Body SAR, Back side open, Low.ch

Area Scan (8x17x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.98 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.98 W/kg
SAR(1 g) = 1.15 W/kg



0 dB = 1.31 W/kg = 1.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01620

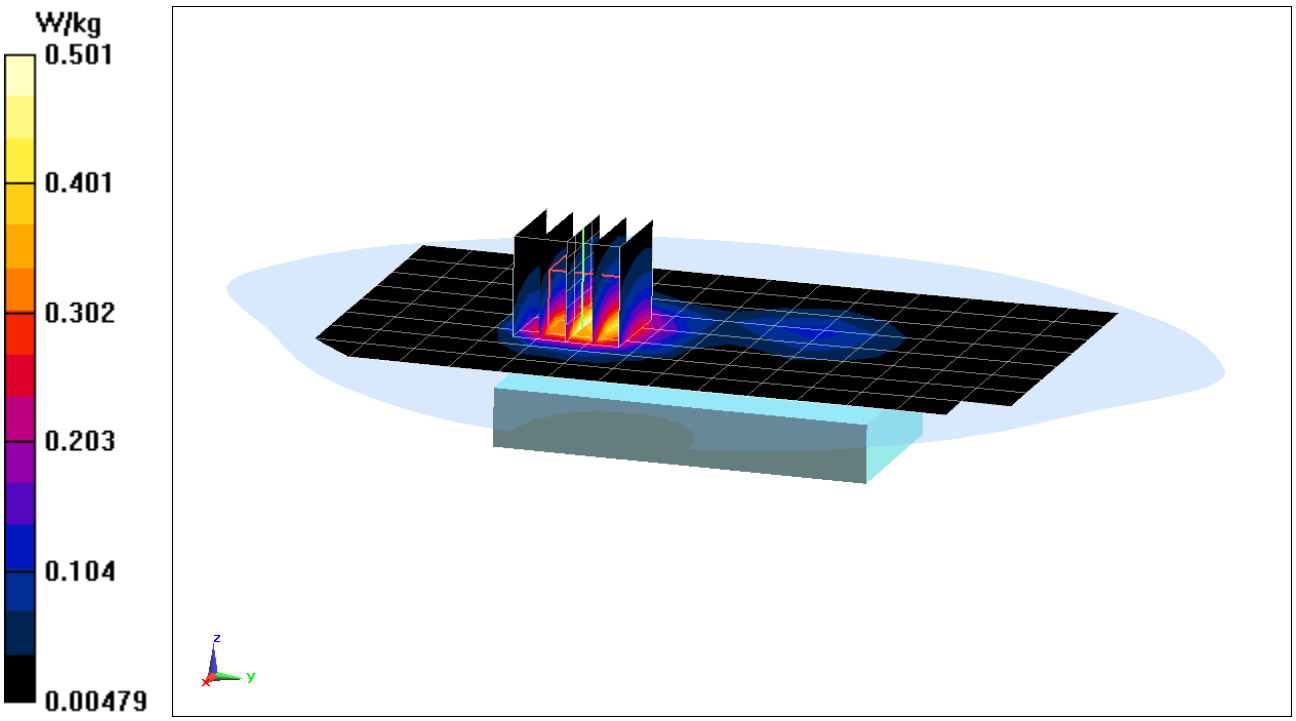
Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.486 S/m; ε_r = 52.433; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 10 cm

Test Date: 06-24-2017; Ambient Temp: 21.7°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3318; ConvF(4.96, 4.96, 4.96); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.78 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.702 W/kg
SAR(1 g) = 0.414 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01620

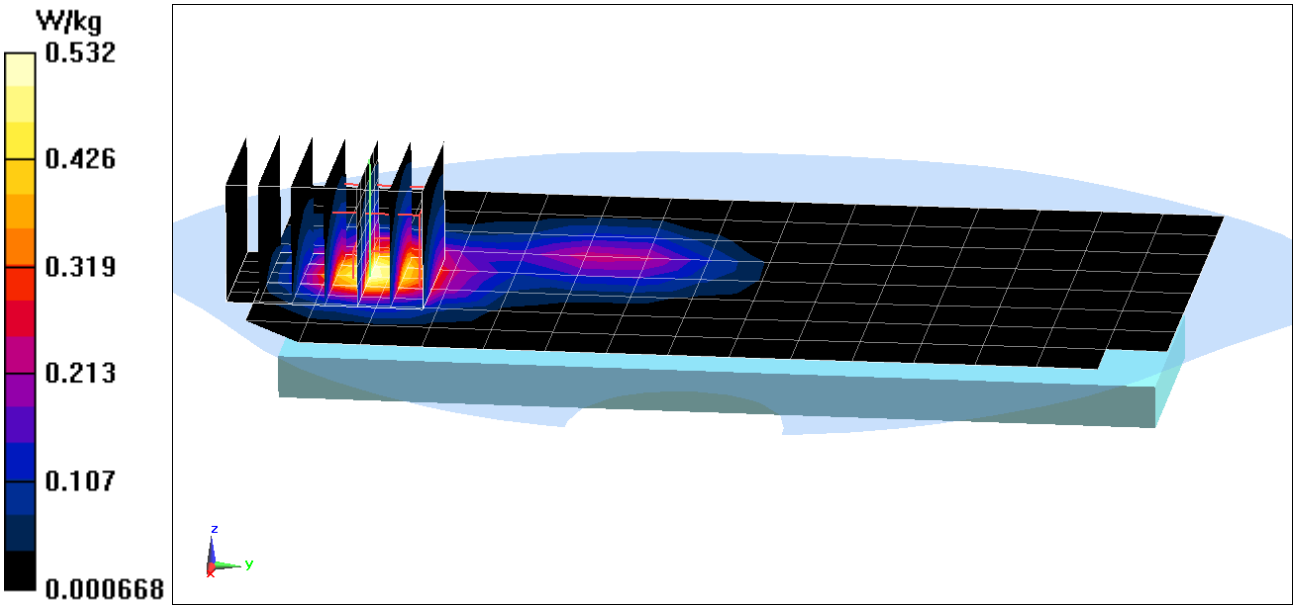
Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.486 S/m; ε_r = 52.433; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-24-2017; Ambient Temp: 21.7°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3318; ConvF(4.96, 4.96, 4.96); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: GPRS 1900, Body SAR, Back side open, Mid.ch, 2 Tx Slots

Area Scan (9x16x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 0 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.749 W/kg
SAR(1 g) = 0.439 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01620

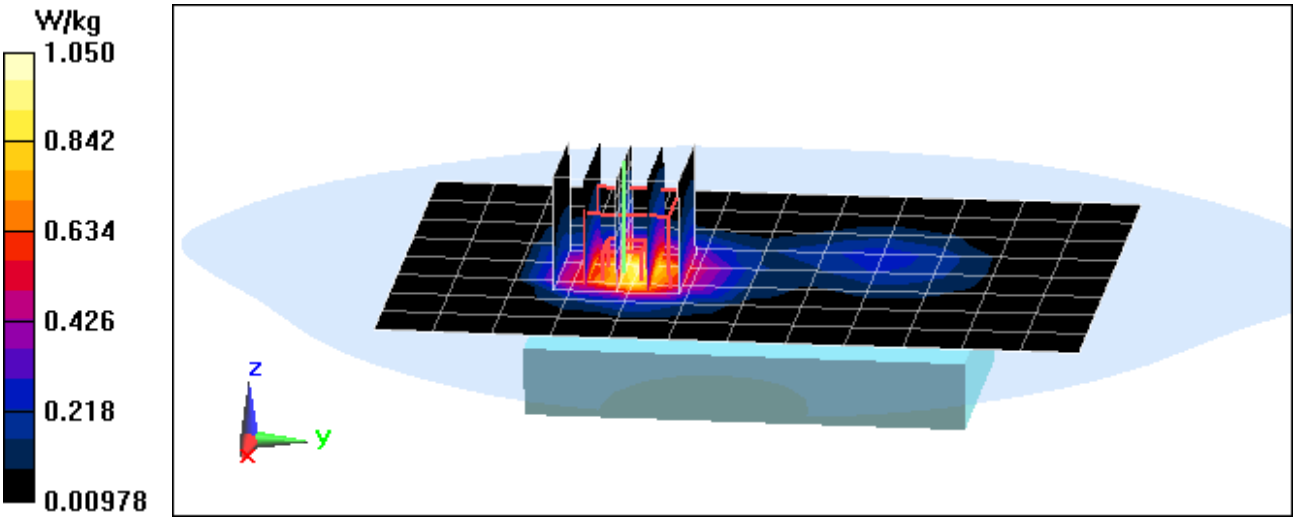
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.486 S/m; ε_r = 52.433; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-24-2017; Ambient Temp: 21.7°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3318; ConvF(4.96, 4.96, 4.96); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.08 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.860 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01620

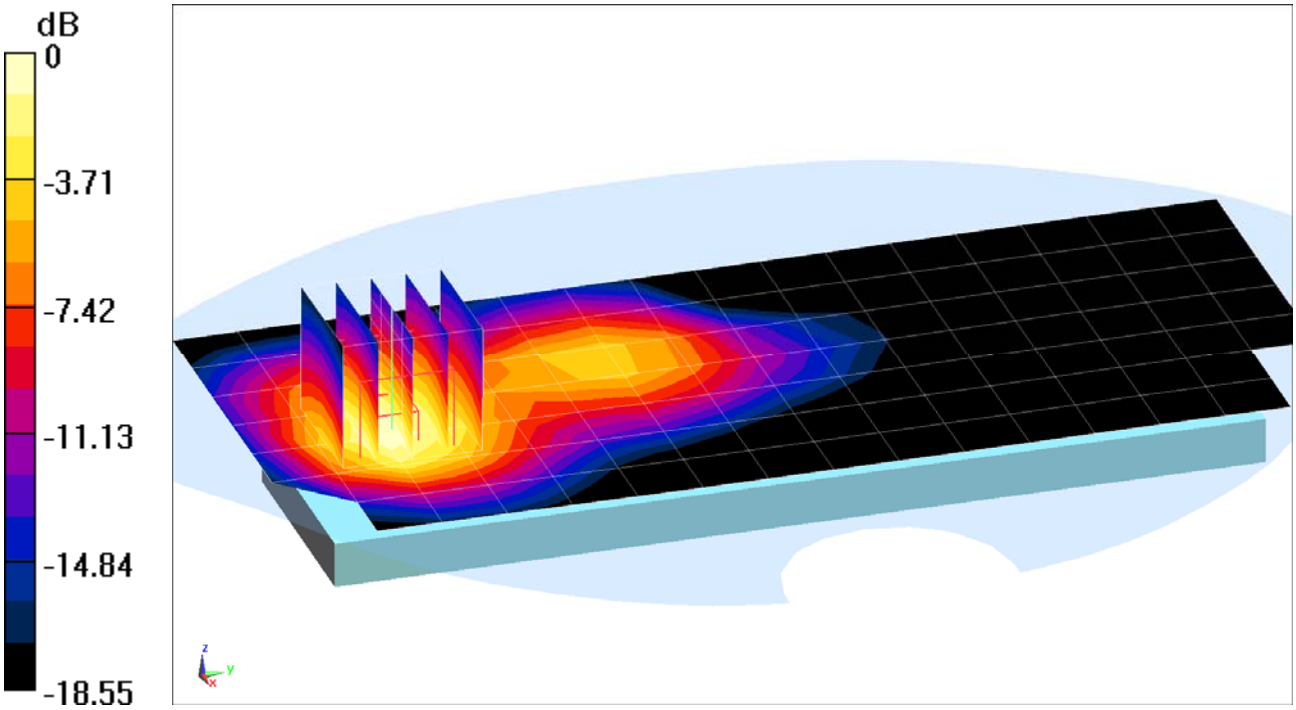
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.486 S/m; ε_r = 52.433; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-24-2017; Ambient Temp: 21.7°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3318; ConvF(4.96, 4.96, 4.96); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (8x17x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.17 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.52 W/kg
SAR(1 g) = 0.893 W/kg;



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01646

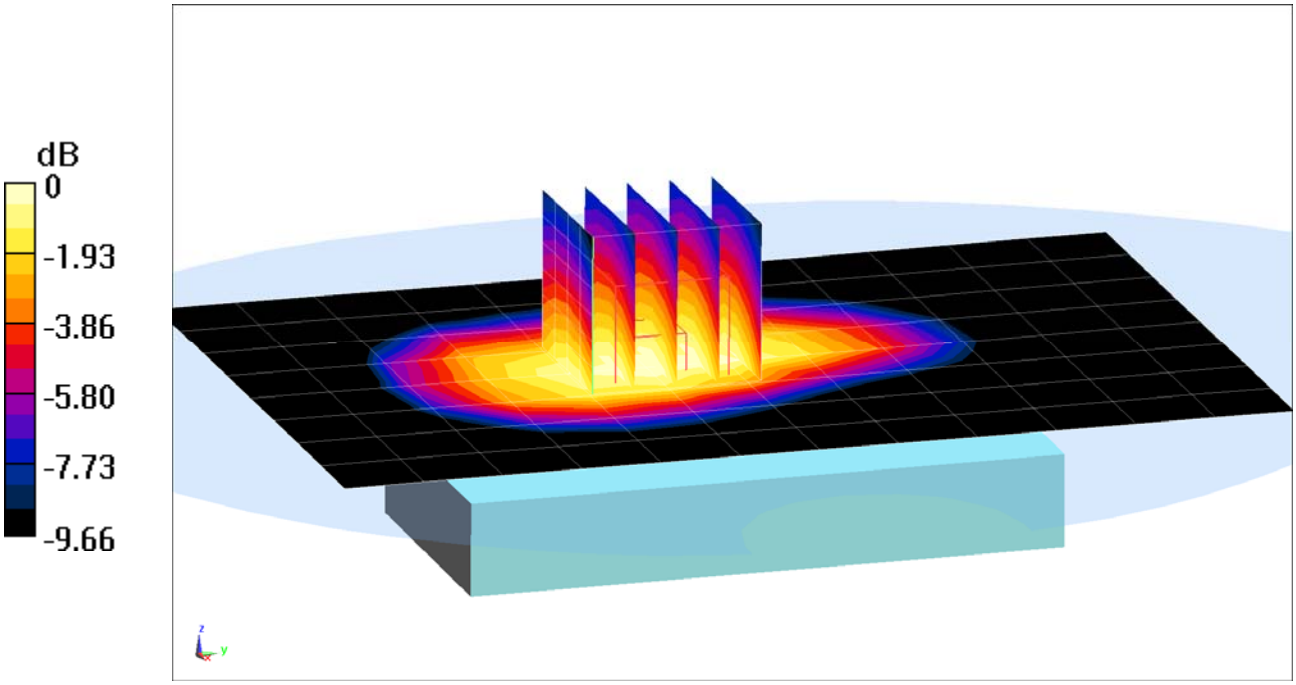
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.921 S/m; ε_r = 56.793; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-14-2017; Ambient Temp: 21.1°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3209; ConvF(6.44, 6.44, 6.44); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 12, Body SAR, Back side closed, Mid.ch, 10 MHz Bandwidth QPSK, 1 RB, 25 RB Offset

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.00 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.945 W/kg
SAR(1 g) = 0.725 W/kg



0 dB = 0.809 W/kg = -0.92 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01638

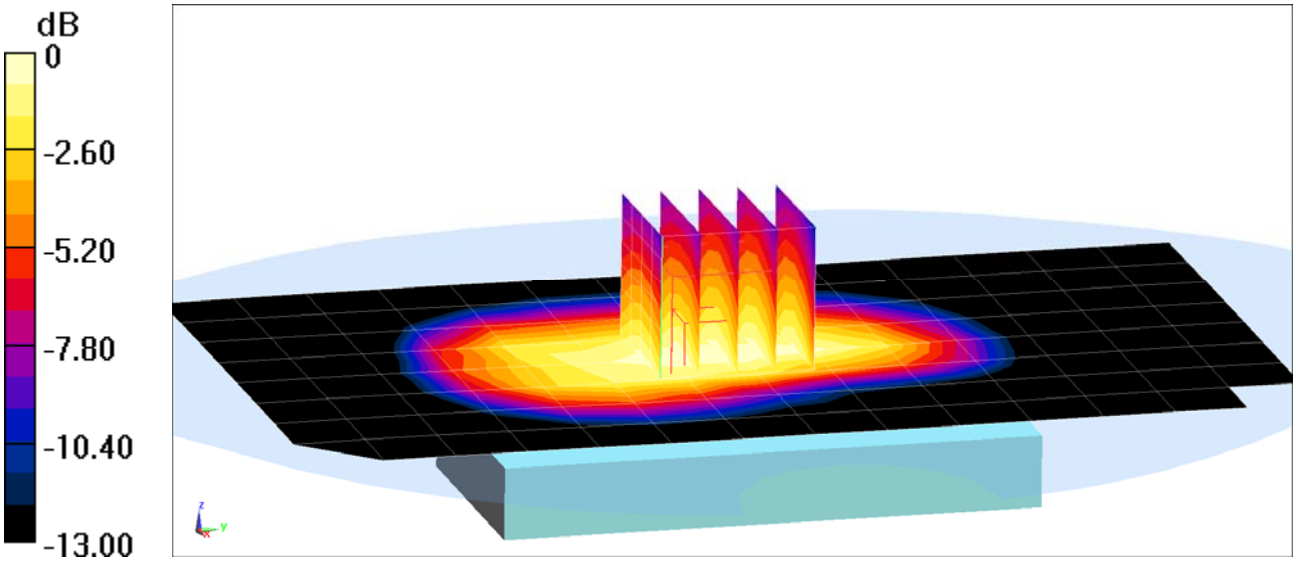
Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.992 S/m; ε_r = 53.095; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-27-2017; Ambient Temp: 22.4°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7406; ConvF(9.77, 9.77, 9.77); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 5 (Cell.), Body SAR, Back side closed, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 31.88 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 1.25 W/kg
SAR(1 g) = 0.918 W/kg



0 dB = 1.18 W/kg = 0.72 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01646

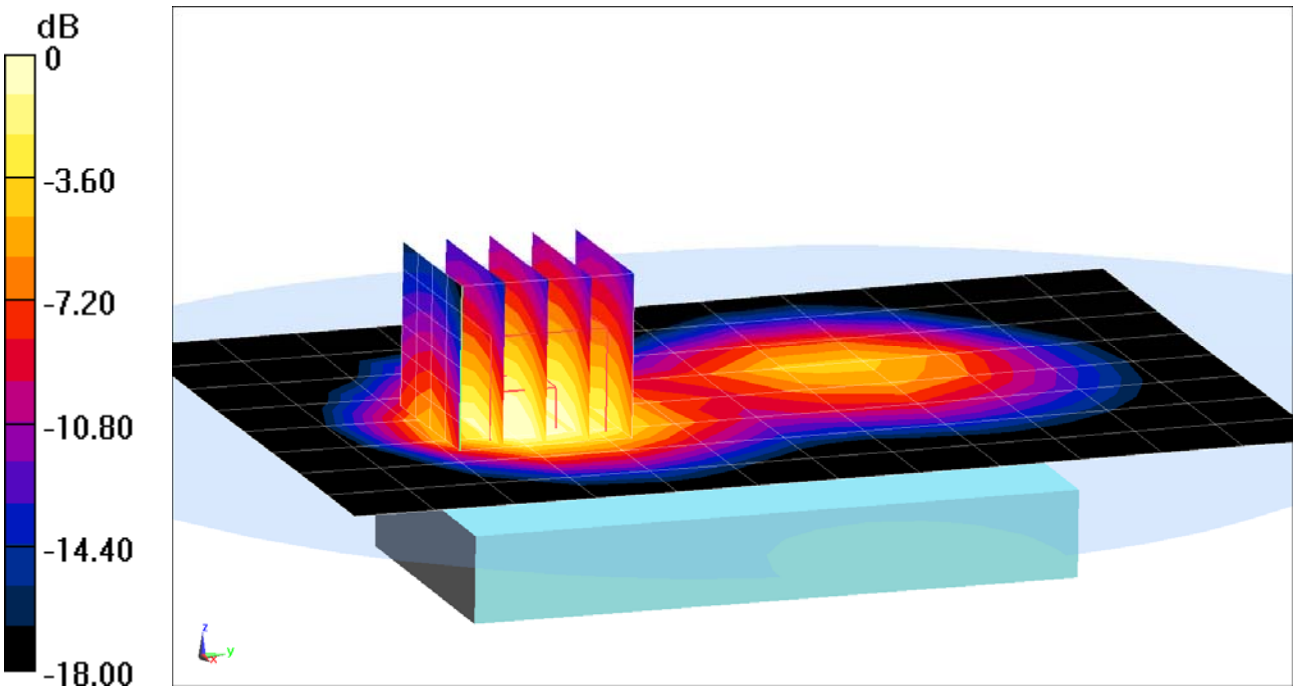
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.422 S/m; ε_r = 52.612; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-19-2017; Ambient Temp: 24.6°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3318; ConvF(5.12, 5.12, 5.12); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 4 (AWS), Body SAR, Back side closed, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.65 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.65 W/kg
SAR(1 g) = 1.02 W/kg



0 dB = 1.05 W/kg = 0.22 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01638

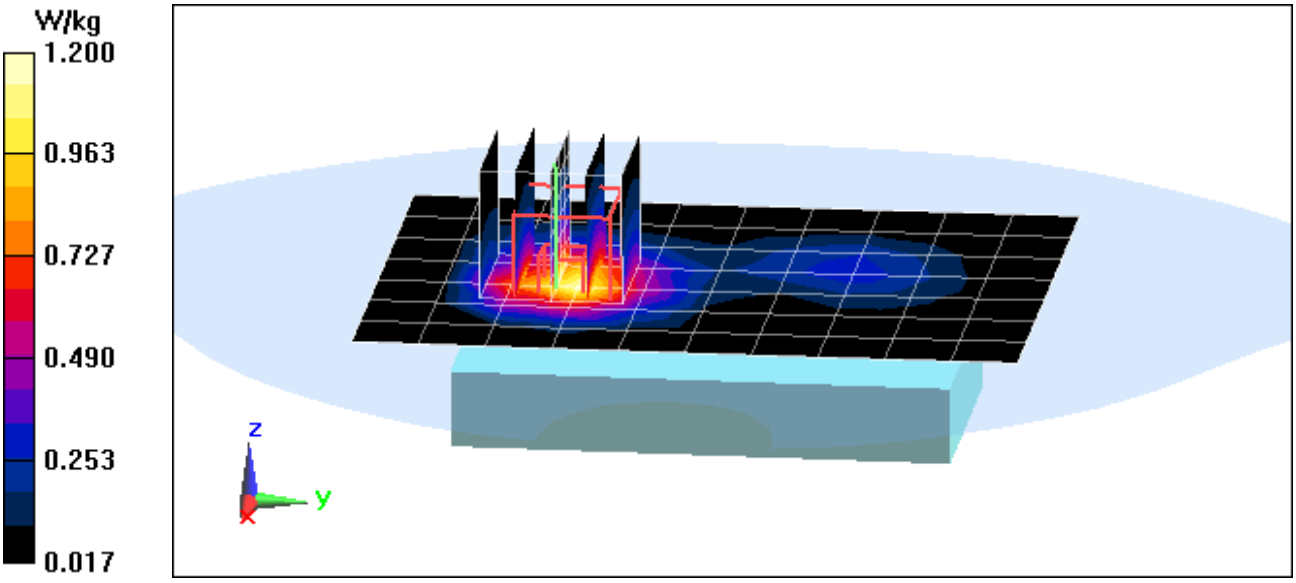
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1882.5 MHz; σ = 1.489 S/m; ε_r = 52.423; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-24-2017; Ambient Temp: 21.7°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3318; ConvF(4.96, 4.96, 4.96); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 25 (PCS), Body SAR, Back side closed, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (8x11x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.21 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 1.72 W/kg
SAR(1 g) = 1 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01638

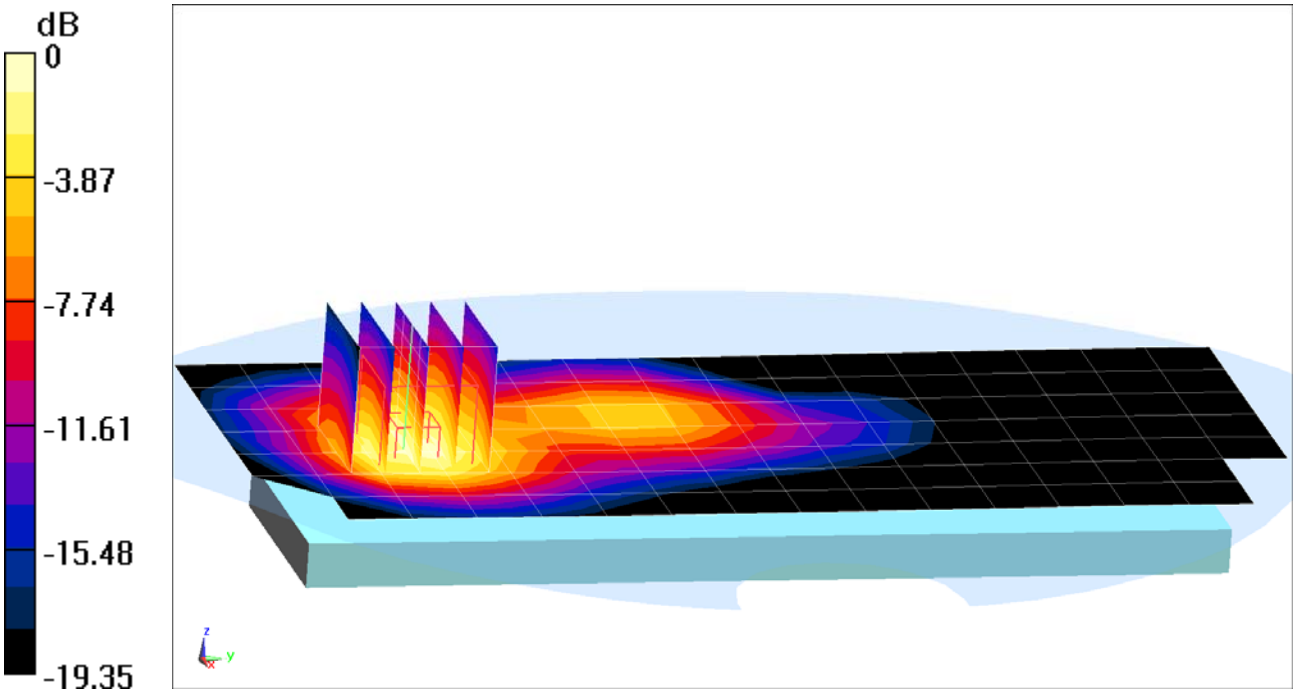
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1882.5 MHz; σ = 1.489 S/m; ε_r = 52.423; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-24-2017; Ambient Temp: 21.7°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3318; ConvF(4.96, 4.96, 4.96); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 25 (PCS), Body SAR, Back Side open, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (8x17x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.32 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.77 W/kg
SAR(1 g) = 1.07 W/kg



0 dB = 1.30 W/kg = 1.14 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFUN220; Type: Portable Handset; Serial: 01653

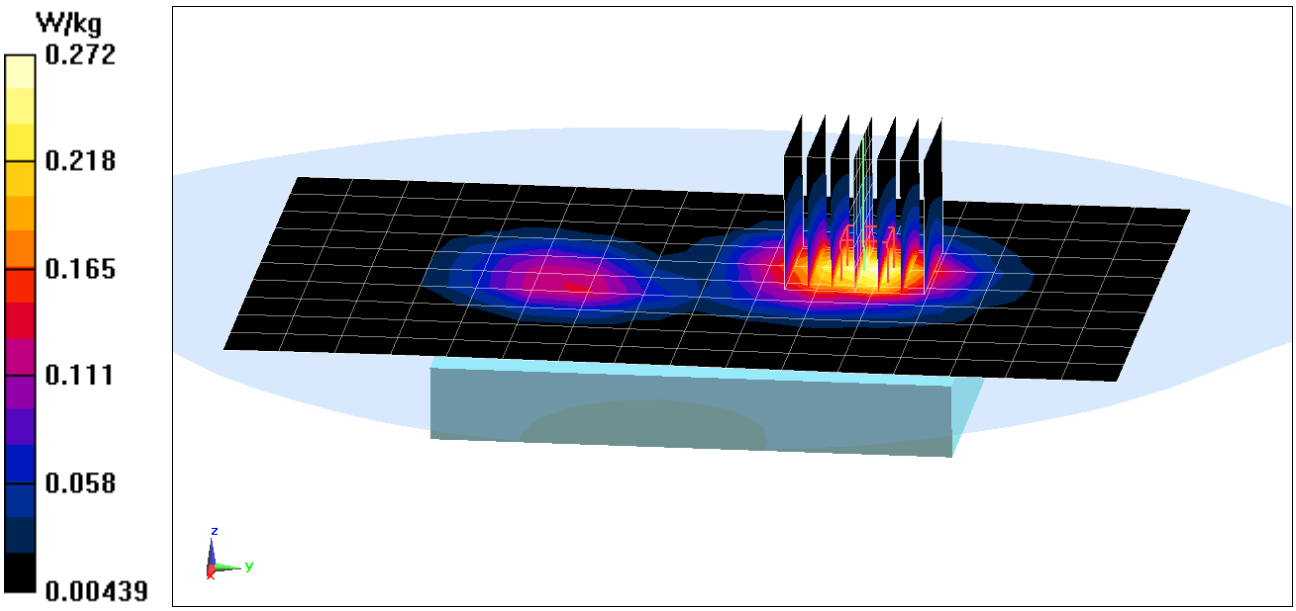
Communication System: UID 0, IEEE 802.11b; Frequency: 2417 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2417 MHz; σ = 1.979 S/m; ε_r = 51.421; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-19-2017; Ambient Temp: 22.1°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7406; ConvF(7.6, 7.6, 7.6); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11b, Body SAR, 22 MHz Bandwidth, SAR, Ch 2, 1 Mbps, Back Side closed

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.595 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.341 W/kg
SAR(1 g) = 0.177 W/kg



APPENDIX B: SYSTEM VERIFICATION

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PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1034

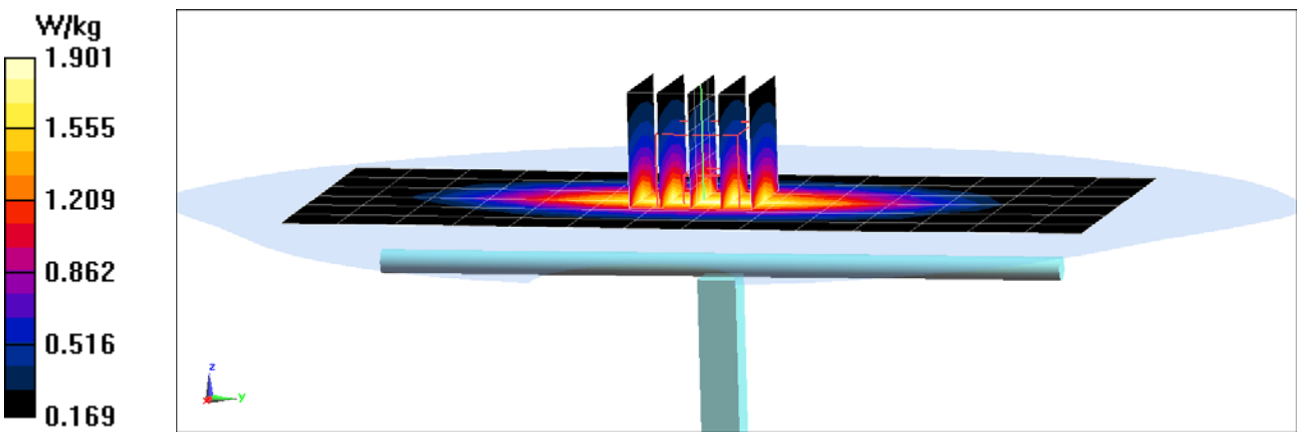
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 750 MHz; σ = 0.905 S/m; ε_r = 42.3; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-21-2017; Ambient Temp: 24.9°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3209; ConvF(6.76, 6.76, 6.76); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.42 W/kg
SAR(1 g) = 1.62 W/kg
Deviation(1 g) = -1.46%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d047

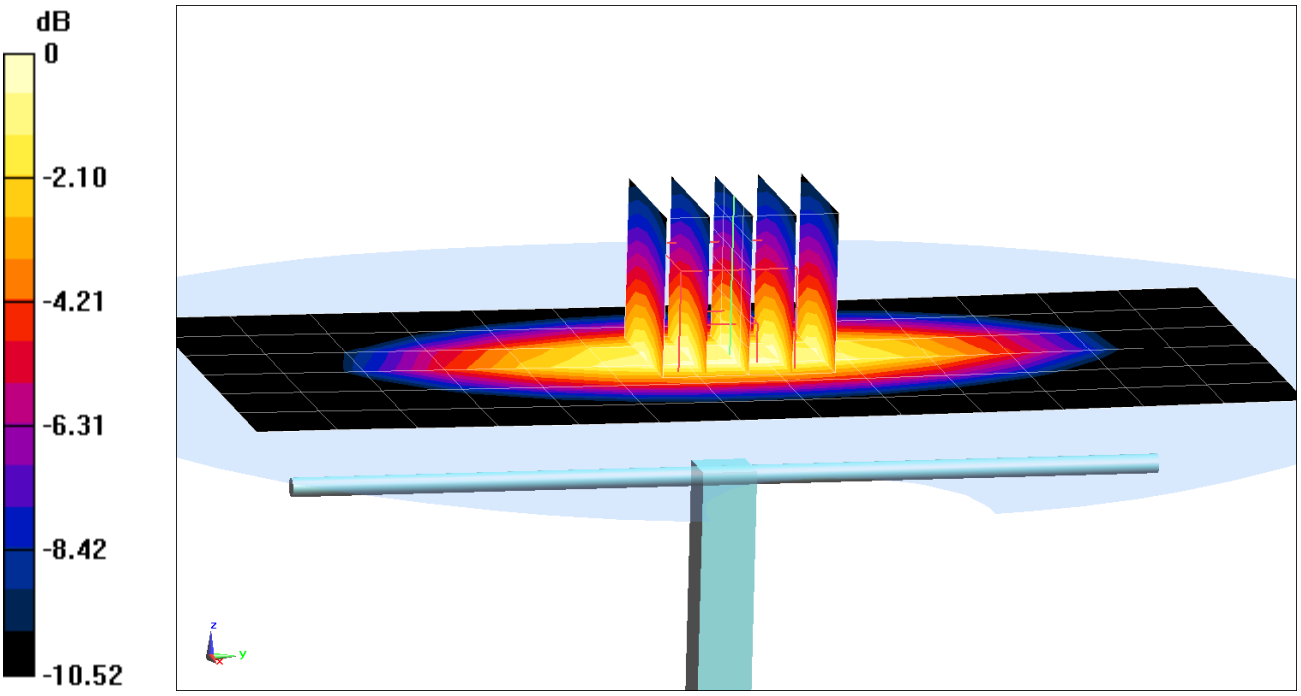
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.896 S/m; ε_r = 41.838; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-20-2017; Ambient Temp: 23.8°C; Tissue Temp: 23.9°C

Probe: ES3DV3 - SN3213; ConvF(6.49, 6.49, 6.49); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.73 W/kg
SAR(1 g) = 1.87 W/kg
Deviation(1 g) = 2.41%



0 dB = 2.18 W/kg = 3.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1148

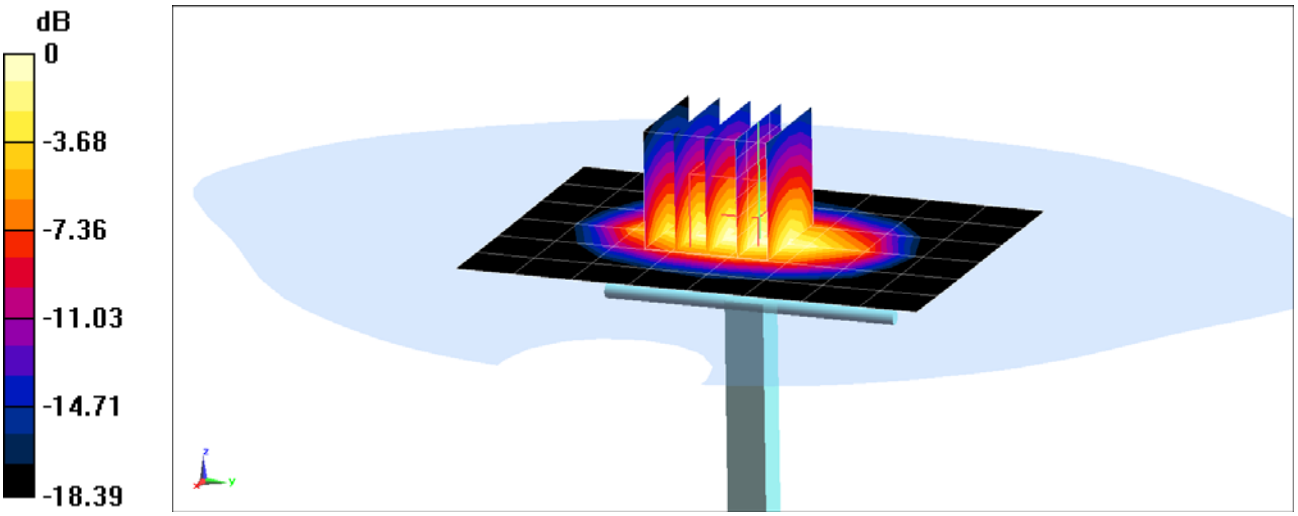
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used:
f = 1750 MHz; σ = 1.403 S/m; ε_r = 38.373; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-26-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3319; ConvF(5.38, 5.38, 5.38); Calibrated: 03/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 03/08/2017
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.68 W/kg
SAR(1 g) = 3.7 W/kg
Deviation(1 g) = 1.65%



0 dB = 4.63 W/kg = 6.66 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d080

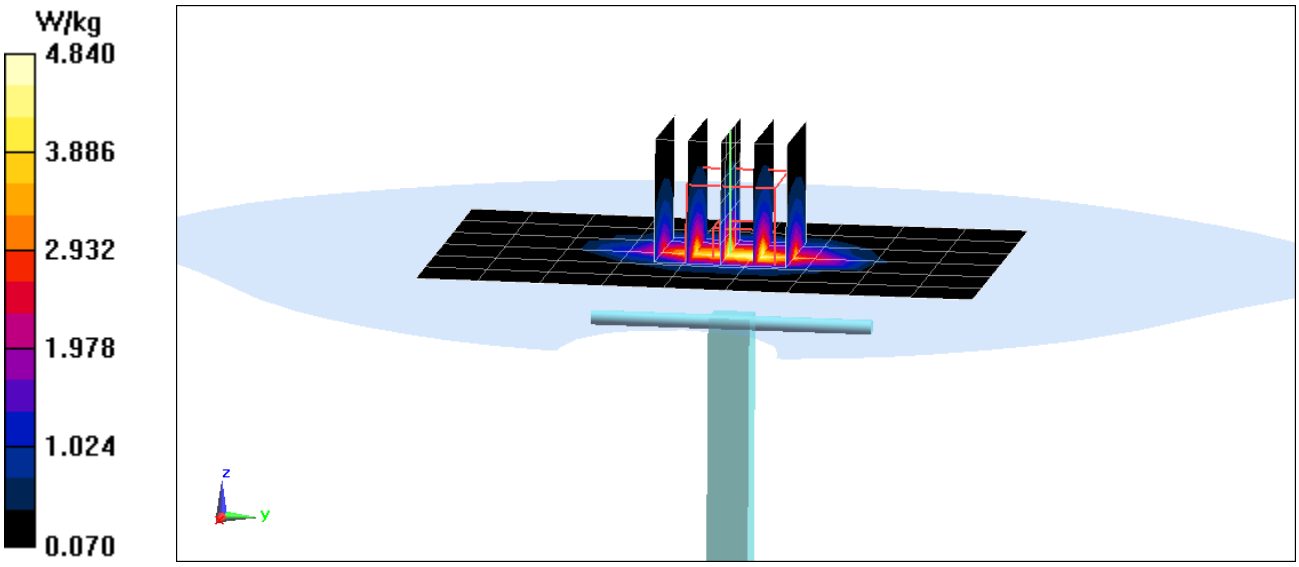
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.433 S/m; ε_r = 40.12; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-26-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(5.31, 5.31, 5.31); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.06 W/kg
SAR(1 g) = 3.82 W/kg
Deviation(1 g) = -2.80%



PCTEST ENGINEERING LABORATORY, INC.

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

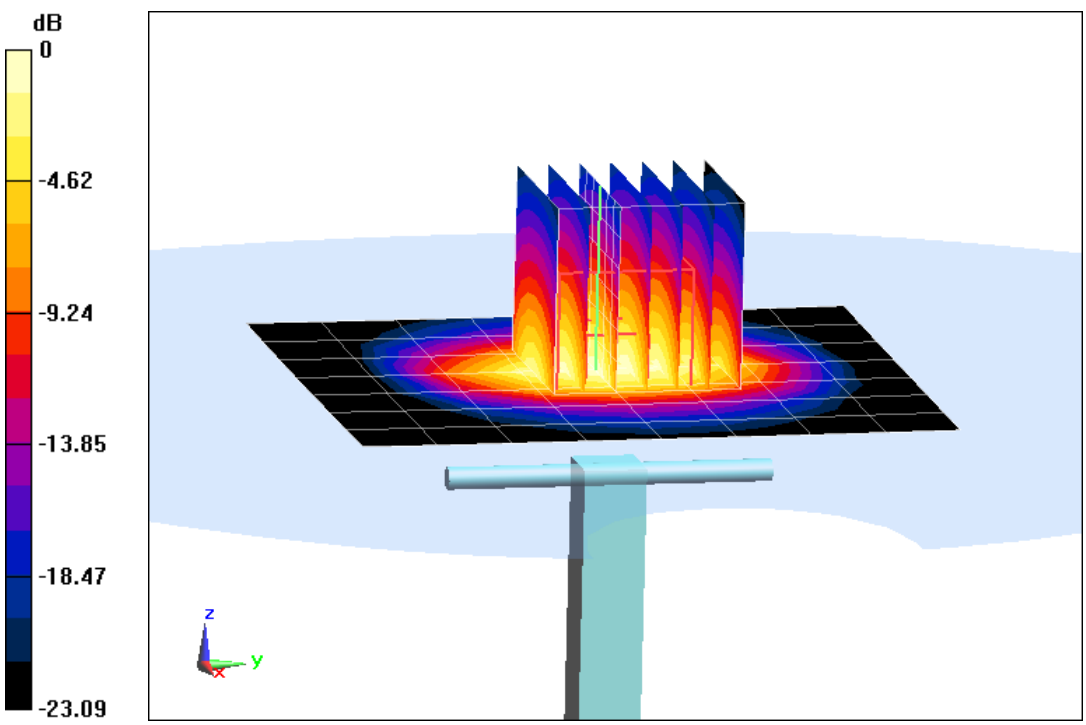
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.866 S/m; ε_r = 38.628; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-14-2017; Ambient Temp: 23.0°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3213; ConvF(4.7, 4.7, 4.7); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.7 W/kg
SAR(1 g) = 5.61 W/kg
Deviation(1 g) = 7.68%



0 dB = 7.36 W/kg = 8.67 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

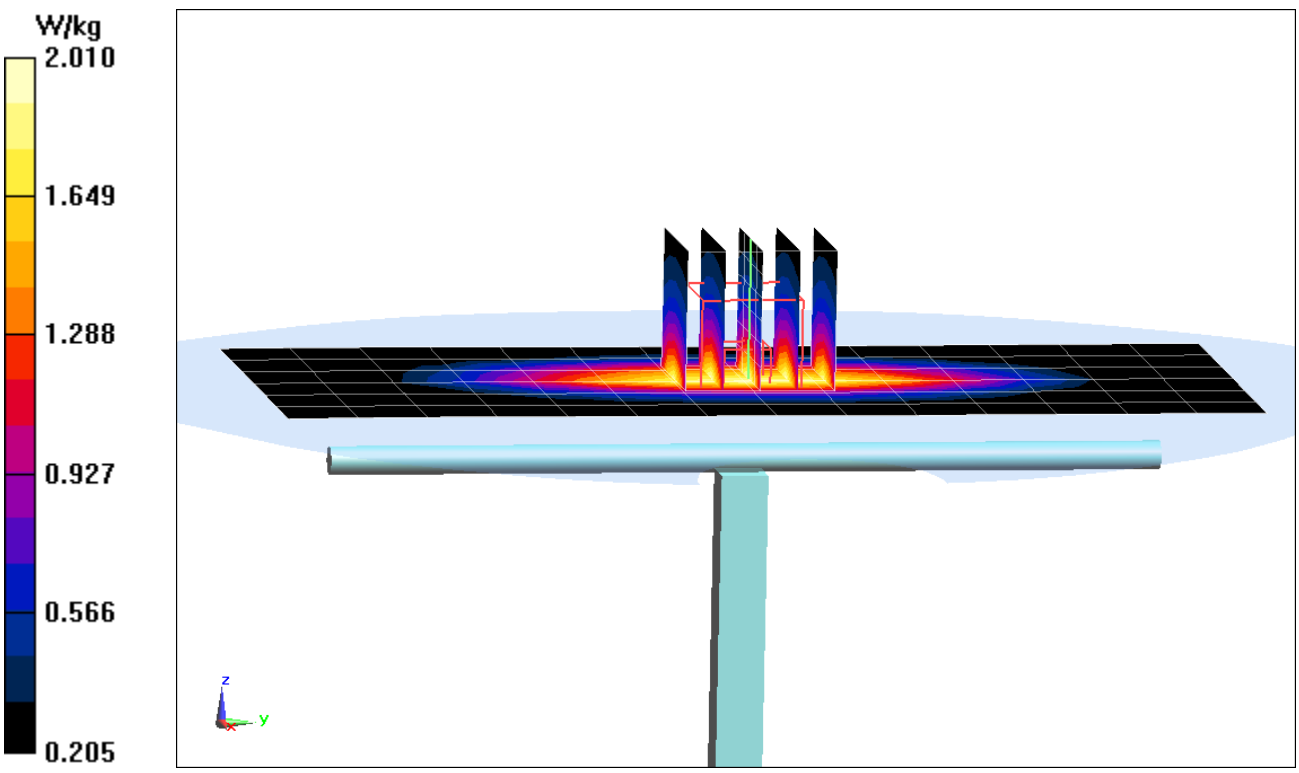
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.963 S/m; ε_r = 56.405; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-14-2017; Ambient Temp: 21.1°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3209; ConvF(6.44, 6.44, 6.44); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.51 W/kg
SAR(1 g) = 1.73 W/kg
Deviation(1 g) = -1.59%



PCTEST ENGINEERING LABORATORY, INC.

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

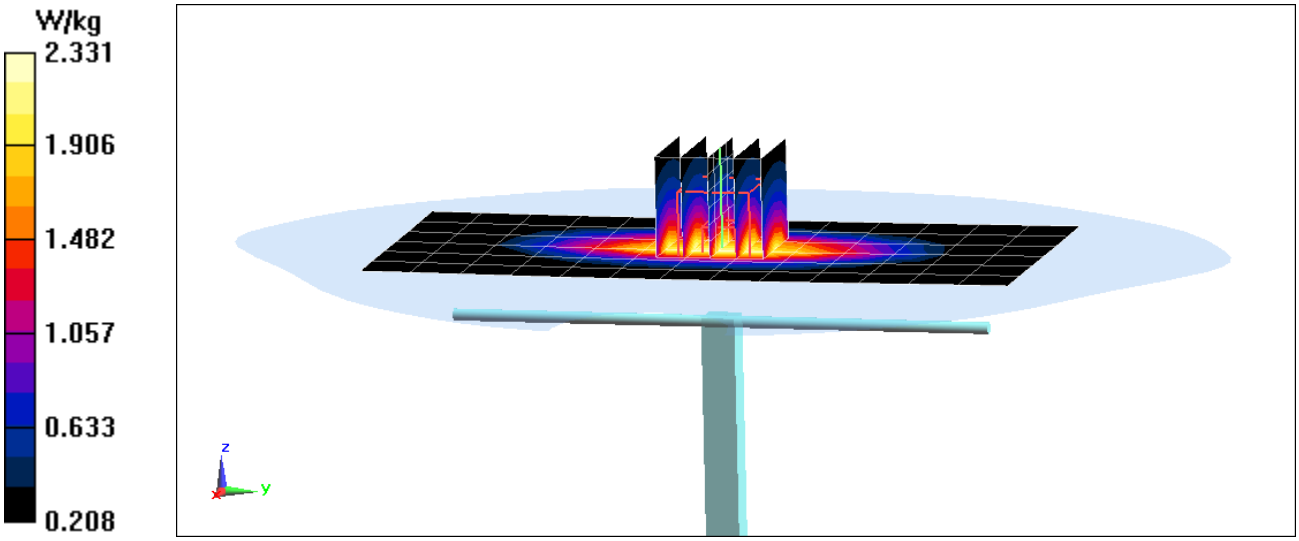
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 1.001 S/m; ε_r = 52.828; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-22-2017; Ambient Temp: 24.8°C; Tissue Temp: 24.5°C

Probe: ES3DV3 - SN3318; ConvF(6.37, 6.37, 6.37); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.92 W/kg
SAR(1 g) = 2.00 W/kg
Deviation(1 g) = 5.26%



PCTEST ENGINEERING LABORATORY, INC.

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

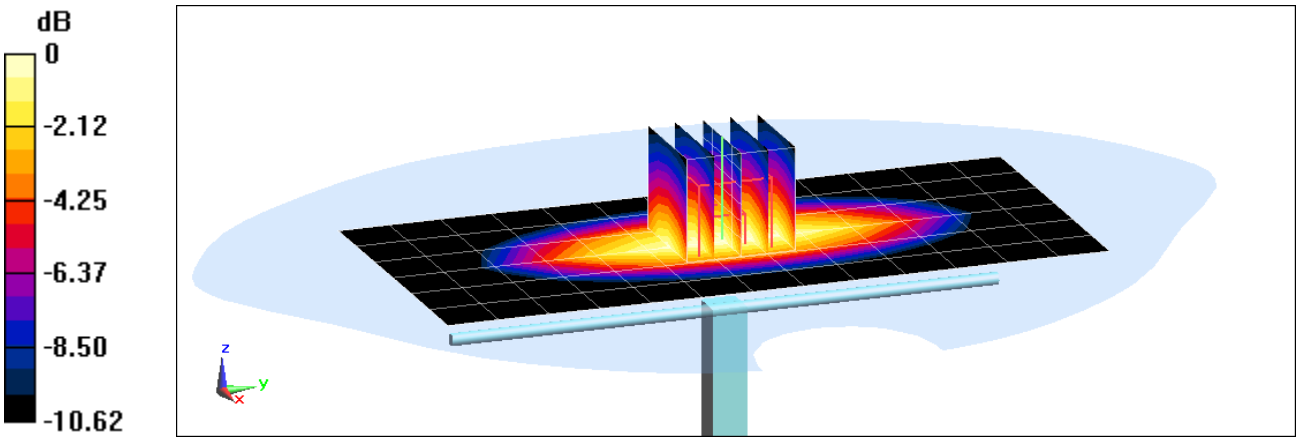
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.991 S/m; ε_r = 53.11; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-27-2017; Ambient Temp: 22.4°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7406; ConvF(9.77, 9.77, 9.77); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 3.14 W/kg
SAR(1 g) = 2.06 W/kg
Deviation(1 g) = 8.42%



0 dB = 2.77 W/kg = 4.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1148

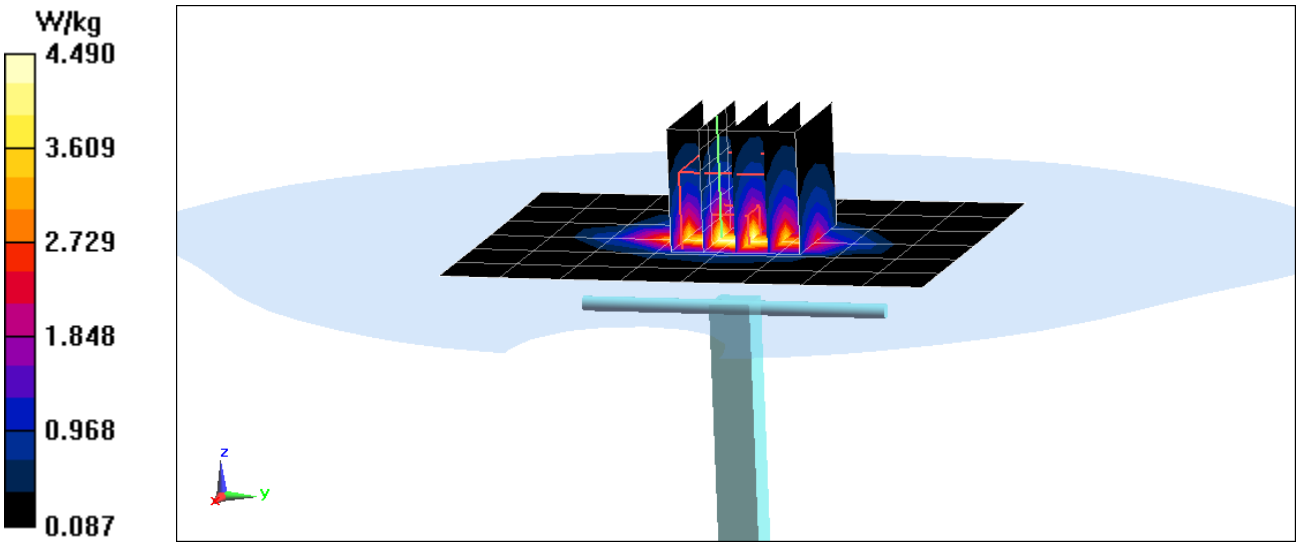
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.44 S/m; ε_r = 52.565; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-19-2017; Ambient Temp: 24.6°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3318; ConvF(5.12, 5.12, 5.12); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.37 W/kg
SAR(1 g) = 3.66 W/kg
Deviation(1 g) = -1.08%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1148

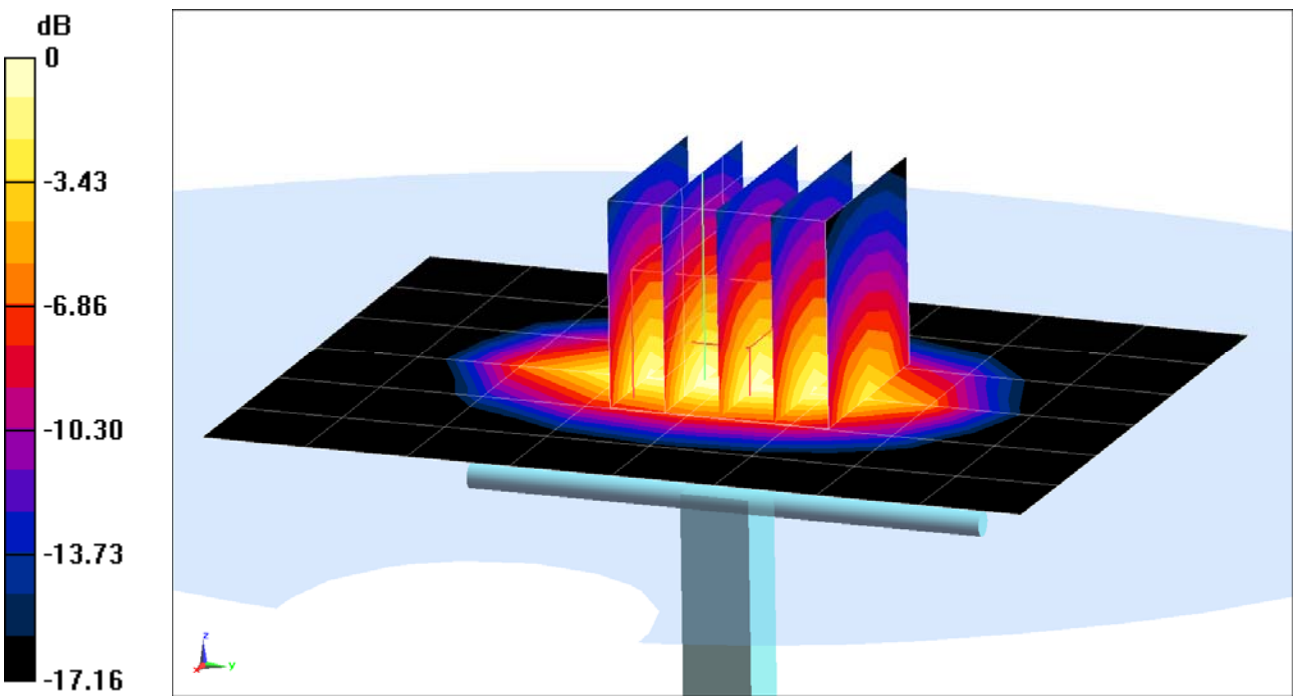
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.5 S/m; ε_r = 51.443; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-03-2017; Ambient Temp: 22.10-C; Tissue Temp: 21.40-C

Probe: ES3DV3 - SN3319; ConvF(5.07, 5.07, 5.07); Calibrated: 03/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 03/08/2017
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.10 (0);SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.56 W/kg
SAR(1 g) = 3.79 W/kg
Deviation(1 g) = 2.43%



0 dB = 4.69 W/kg = 6.71 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d080

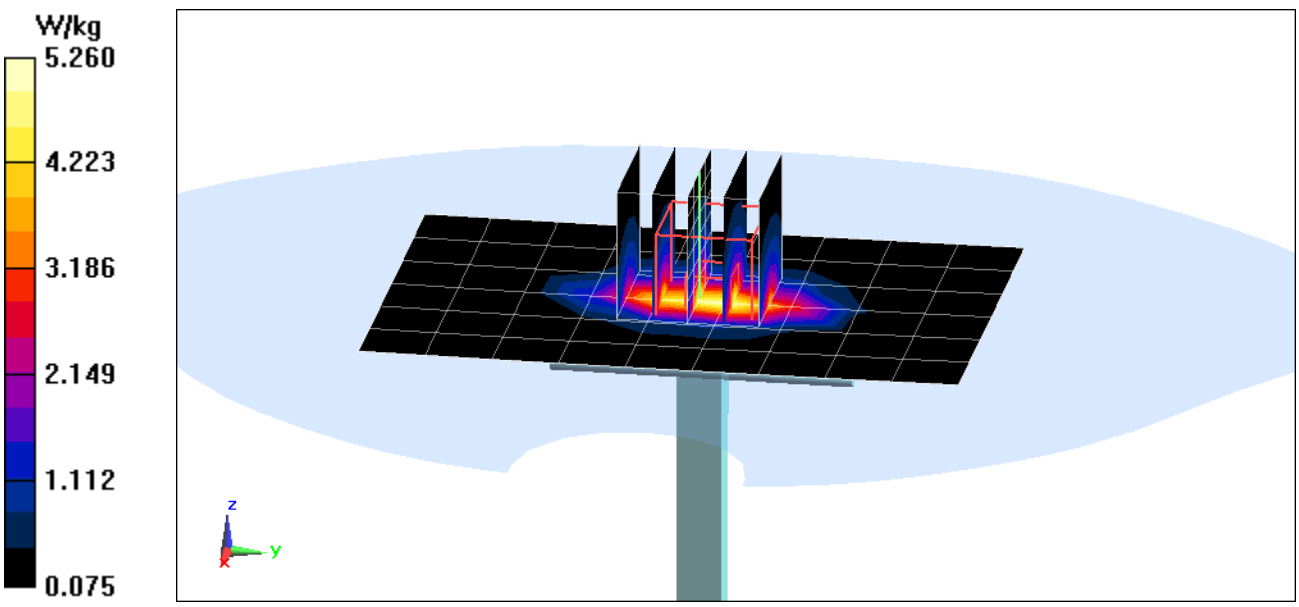
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.564 S/m; ε_r = 53.088; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Medium Notes: Test Date: 06-27-2017; Ambient Temp: 20.40-C; Tissue Temp: 22.50-C

Probe: ES3DV3 - SN3318; ConvF(4.96, 4.96, 4.96); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10 (0);SEMCAD X Version 14.6.10 (7417)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.65 W/kg
SAR(1 g) = 4.17 W/kg
Deviation(1 g) = 6.65%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 981

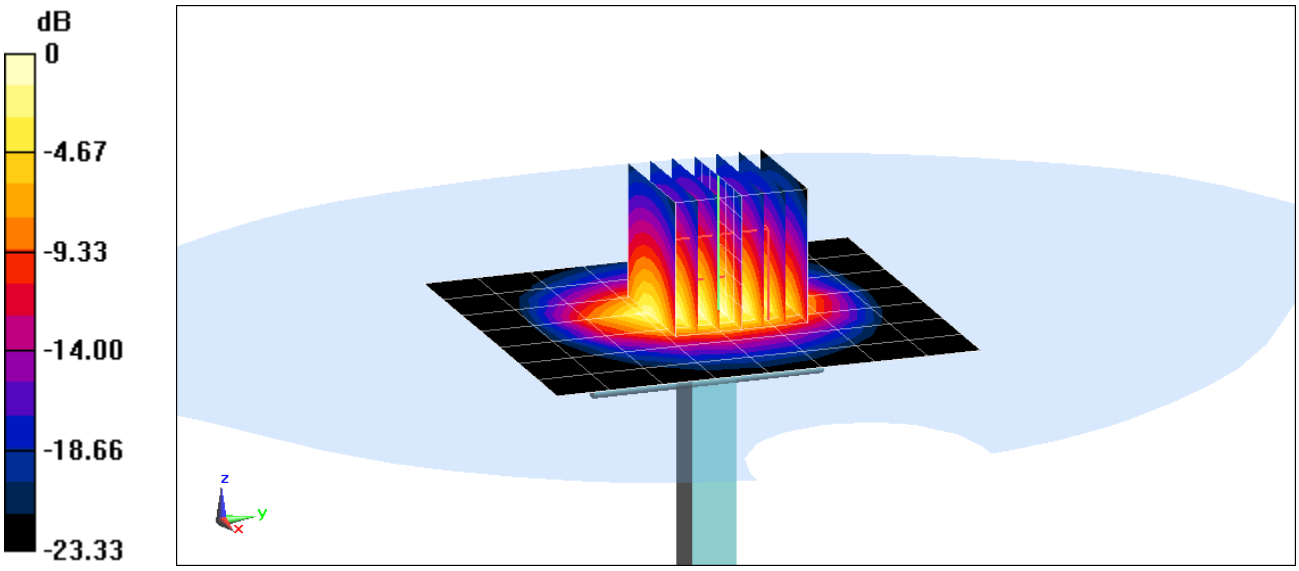
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.018 S/m; ε_r = 51.288; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-19-2017; Ambient Temp: 22.1°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7406; ConvF(7.6, 7.6, 7.6); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.0 W/kg
SAR(1 g) = 5.10 W/kg
Deviation(1 g) = 0.39%



0 dB = 8.68 W/kg = 9.39 dBW/kg