PCTEST ENGINEERING LABORATORY, INC.
7185 Oakland Mills Road, Columbia, MD 21046 USA
Tel. +1.410.290.6652 / Fax +1.410.290.6654
http://www.pctestlab.com

SAR EVALUATION REPORT

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

Date of Testing:
06/25/13 - 08/06/13
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1306241083-R3.ZNF

FCC ID: **ZNFD801**

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

DUT Type:	Portable Handset
Application Type:	Class II Permissive Change
FCC Rule Part(s):	CFR §2.1093
Model(s):	LG-D801, LGD801, D801
Permissive Change(s):	See FCC Change Document
Date of Original Certification:	July 23, 2013

Equipment Class	Band & Mode	Tx Frequency	Measured Conducted Power [dBm]	SAR		
				1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Wireless Router (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	33.17	0.40	0.81	0.81
PCE	UMTS 850	826.40 - 846.60 MHz	23.08	0.22	0.42	0.42
PCE	UMTS 1750	1712.4 - 1752.5 MHz	24.04	0.30	1.01	1.01
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	31.15	0.31	0.55	0.55
PCE	UMTS 1900	1852.4 - 1907.6 MHz	23.87	0.38	0.66	0.71
PCE	LTE Band 17	706.5 - 713.5 MHz	23.58	0.12	0.21	0.21
PCE	LTE Band 4 (AWS)	1712.5 - 1752.5 MHz	23.85	0.16	1.01	1.01
PCE	LTE Band 2 (PCS)	1852.5 - 1907.5 MHz	23.69	0.26	0.71	0.76
DTS	2.4 GHz WLAN	2412 - 2462 MHz	15.50	0.40	0.10	0.10
DTS/NII	5.8 GHz WLAN	5745 - 5825 MHz	8.83	0.12	0.17	0.17
NII	5.2 GHz WLAN	5180 - 5240 MHz	9.72	0.10	0.10	
NII	5.3 GHz WLAN	5260 - 5320 MHz	9.87	< 0.1	0.10	
NII	5.5 GHz WLAN	5500 - 5700 MHz	9.53	< 0.1	0.14	
DSS/DTS	Bluetooth	2402 - 2480 MHz	8.73	N/A		
Simultaneous SAR per KDB 690783 D01v01r02:				0.79	1.22	1.18

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

Note: This revised Test Report (S/N: 0Y1306241083-R3.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 1.8 of this report; for North American frequency bands only.

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

Randy Ortanez
President

ACCREDITED
TESTING LABORATORY
CERTIFICATE #2041.01

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.5 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 17	Data	706.5 - 713.5 MHz
LTE Band 4 (AWS)	Data	1712.5 - 1752.5 MHz
LTE Band 2 (PCS)	Data	1852.5 - 1907.5 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
5.8 GHz WLAN	Data	5745 - 5825 MHz
5.2 GHz WLAN	Data	5180 - 5240 MHz
5.3 GHz WLAN	Data	5260 - 5320 MHz
5.5 GHz WLAN	Data	5500 - 5700 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

1.2 Nominal and Maximum Output Power Specifications

This device operates using the following maximum and nominal output power specifications. SAR values were scaled to the maximum allowed power to determine compliance per KDB Publication 447498 D01v05r01.

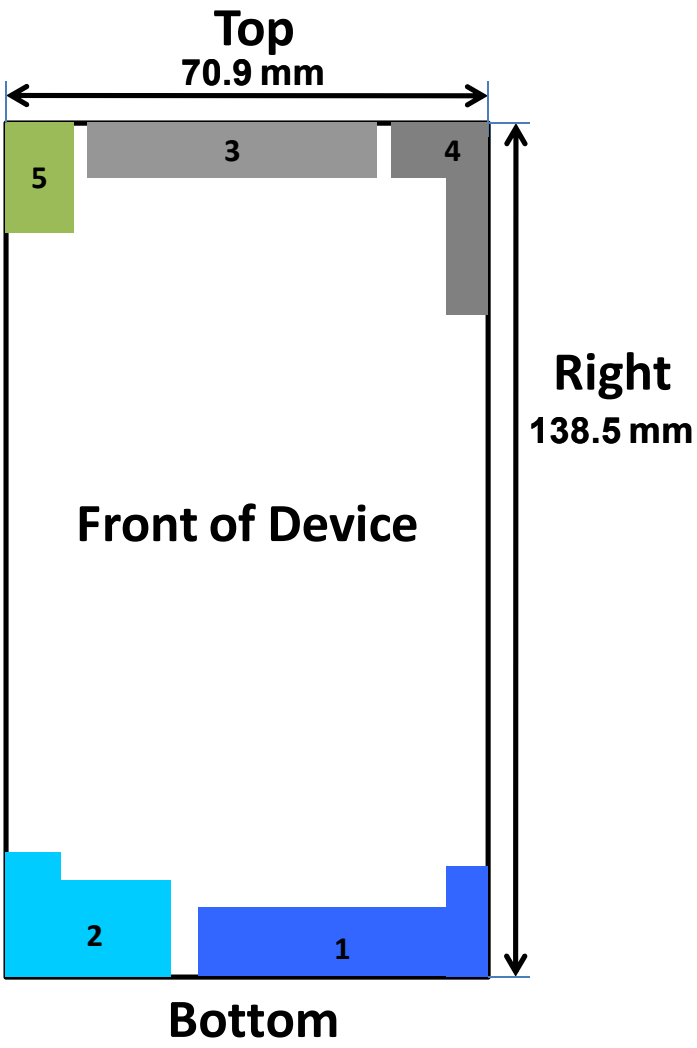
Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	*1 TX Slots*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*	*1 TX Slots*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*
GSM/GPRS/EDGE 850	Maximum	**33.2**	**33.2**	**31.5**	**29.5**	**28.0**	**27.5**	**27.5**	**26.5**	**25.5**
	Nominal	**32.7**	**32.7**	**31.0**	**29.0**	**27.5**	**27.0**	**27.0**	**26.0**	**25.0**
GSM/GPRS/EDGE 1900	Maximum	**31.2**	**31.2**	**29.5**	**27.5**	**26.0**	**26.5**	**26.5**	**25.5**	**24.5**
	Nominal	**30.7**	**30.7**	**29.0**	**27.0**	**25.5**	**26.0**	**26.0**	**25.0**	**24.0**

Mode / Band		Modulated Average (dBm)			
		3GPP Rel 99	*3GPP Rel 5*	*3GPP Rel 6*	*3GPP Rel 8*
		WCDMA	*HSDPA*	*HSUPA*	*DC-HSDPA*
UMTS Band 5 (850 MHz)	Maximum	**23.2**	**23.2**	**23.2**	**23.2**
	Nominal	**22.7**	**22.7**	**22.7**	**22.7**
UMTS Band 4 (1750 MHz)	Maximum	**24.2**	**24.2**	**24.2**	**24.2**
	Nominal	**23.7**	**23.7**	**23.7**	**23.7**
UMTS Band 2 (1900 MHz)	Maximum	**24.2**	**24.2**	**24.2**	**24.2**
	Nominal	**23.7**	**23.7**	**23.7**	**23.7**

Mode / Band		Modulated Average (dBm)
LTE Band 17	Maximum	**23.7**
	Nominal	**23.2**
LTE Band 4 (AWS)	Maximum	**24.0**
	Nominal	**23.5**
LTE Band 2 (PCS)	Maximum	**23.7**
	Nominal	**23.2**

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	**16.0**
	Nominal	**15.0**
IEEE 802.11g (2.4 GHz)	Maximum	**13.0**
	Nominal	**12.0**
IEEE 802.11n (2.4 GHz)	Maximum	**12.0**
	Nominal	**11.0**
IEEE 802.11a (5 GHz)	Maximum	**10.0**
	Nominal	**9.0**
IEEE 802.11n (5 GHz)	Maximum	**10.0**
	Nominal	**9.0**
IEEE 802.11ac (5 GHz)	Maximum	**9.0**
	Nominal	**8.0**
Bluetooth	Maximum	**10.0**
	Nominal	**9.0**
Bluetooth LE	Maximum	**5.6**
	Nominal	**4.0**

1.3 DUT Antenna Locations



1. Tx/Rx Ant: GSM/GPRS/EDGE 850/1900 MHz, UMTS Band 5/2, LTE Band 2
   Rx Only Ant: UMTS/LTE Band 4
2. Tx/Rx Ant: LTE Band 17
   Tx Only Ant: UMTS/LTE Band 4
3. Rx Only Diversity Ant: UMTS Band 4/2, LTE Band 17/4/2
4. Rx Only Ant: GPS
5. Tx/Rx Ant: WLAN 2.4 GHz/5 GHz, Bluetooth 2.4 GHz

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

Figure 1-1
DUT Antenna Locations

Table 1-1
Wireless Router Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes	No
UMTS 850	Yes	Yes	No	Yes	Yes	No
UMTS 1750	Yes	Yes	No	Yes	No	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	No
UMTS 1900	Yes	Yes	No	Yes	Yes	No
LTE Band 17	Yes	Yes	No	Yes	No	Yes
LTE Band 4 (AWS)	Yes	Yes	No	Yes	No	Yes
LTE Band 2 (PCS)	Yes	Yes	No	Yes	Yes	No
2.4 GHz WLAN	Yes	Yes	Yes	No	No	Yes
5.8 GHz WLAN	Yes	Yes	Yes	No	No	Yes

Note:

1. Particular DUT edges were not required to be evaluated for Wireless Router SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v01r01 guidance, page 2. When Hotspot is enabled, all 5 GHz bands are disabled. Therefore no 5 GHz WIFI Wireless Router SAR Data was required.
2. 5 GHz Wifi Direct GO is supported in the 5.8 GHz band only. The manufacturer expects 5.8 GHz Wifi Direct GO may be used similar to wireless router usage. Therefore, 5.8 GHz Wifi Direct GO was evaluated for SAR similar to wireless router SAR procedures in FCC KDB Publication 941225.

1.4 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the specialized battery cover. The SAR tests were performed with the specialized battery cover.

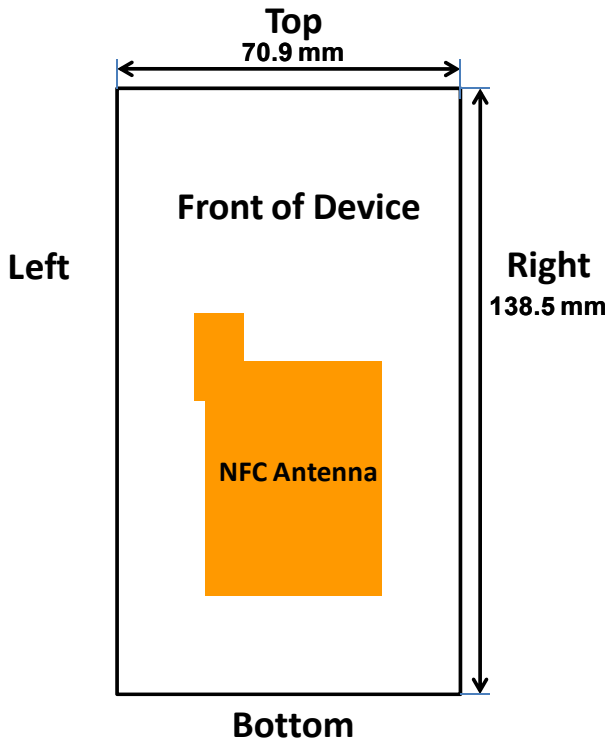


Figure 1-2
NFC Antenna Locations

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v05r01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in
Figure **1-3** and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.

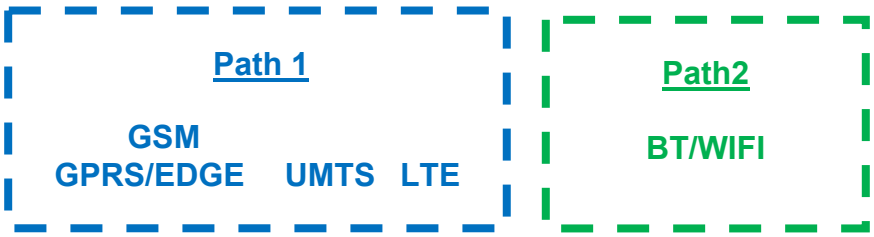


Figure 1-3
Simultaneous Transmission Paths

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v05r01 3) procedures.

Table 1-2
Simultaneous Transmission Scenarios

No.	Simultaneous Tx Configuration	Head SAR	Body-Worn SAR	Hotspot SAR	Note
		IEEE 1528, Supp C	Supp C	FCC KDB 941225 D06 edges/sides	
1	GSM 850/1900 Voice + WIFI 2.4 GHz	Yes	Yes	No	
2	GSM 850/1900 Voice + WIFI 5 GHz	Yes	Yes	No	
3	GSM 850/1900 Voice + Bluetooth 2.4 GHz	No	Yes	No	
4	GSM/GPRS/EDGE 850/1900 Data + WIFI 2.4 GHz	Yes	Yes	Yes	
5	GSM/GPRS/EDGE 850/1900 Data + WIFI 5.8 GHz	Yes	Yes	Yes	WIFI 5 Ghz Direct
6	UMTS Band 5/4/2 + WIFI 2.4 GHz	Yes	Yes	Yes	
7	UMTS Band 5/4/2 + WIFI 5.8 GHz	Yes	Yes	Yes	WIFI 5 Ghz Direct
8	UMTS Band 5/4/2 + Bluetooth 2.4 GHz	No	Yes	No	
9	LTE Band 17/4/2 + WIFI 2.4 GHz	Yes	Yes	Yes	
10	LTE Band 17/4/2 + WIFI 5.8 GHz	Yes	Yes	Yes	WIFI 5 Ghz Direct
11	LTE Band 17/4/2 + Bluetooth 2.4 GHz	No	Yes	No	
12	GSM/GPRS/EDGE 850/1900 Data + WIFI 5.2/5.3/5.5 GHz	No	No	No	Not Supported by SW
13	LTE Band 17/4/2 + WIFI 5.2/5.3/5.8 GHz	No	No	No	Not Supported by SW

Notes:
1. WiFi 2.4 Ghz is supported by Hotspot and WiFi-Direct(GO/GC).
2. WiFi 5.8 Ghz is not supported by Hotspot but supported by WiFi-Direct.
3. LTE, UMTS, GPRS/EDGE is supported Hotspot.
4. VoIP is supported in LTE, WCDMA, GSM (e.g. 3rd part VoIP and VoLTE)
5. Bluetooth and WiFi can not transmit simultaneously since they share the same chip.
6. GSM, WCDMA and LTE can not transmit simultaneously since they share the same chip.

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.

1.6 SAR Test Exclusions Applied

(A) WIFI/BT

Since Wireless Router operations are not allowed by the chipset firmware using 5 GHz WIFI, only 2.4 GHz WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v01r01. 5 GHz Wifi Direct GO is supported in the 5.8 GHz band only.

The manufacturer expects 5.8 GHz Wifi Direct GO may be used similar to wireless router usage. Therefore, 5.8 GHz Wifi Direct GO was evaluated for SAR similar to wireless router SAR procedures in FCC KDB Publication 941225.

Per FCC KDB 447498 D01v05r01, the 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 averaged conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, Bluetooth SAR was not required;
[(10/10)* √2.441] = 1.6< 3.0. Based on the maximum conducted power of Bluetooth LE (rounded to the nearest mW) and the antenna to user separation distance, Bluetooth LE SAR was not required;
[(3/10)* √2.440] = 0.5< 3.0. Per KDB Publication 447498 D01v05r01, the maximum power of the channel was rounded to the nearest mW before calculation.

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

This device supports IEEE 802.11ac with the following features:
a) Up to 80 MHz Bandwidth only
b) No aggregate channel configurations
c) 1 Tx antenna output
d) 256 QAM is supported
e) No new 5 GHz channels

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

(B) Licensed Transmitter(s)

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

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

LTE SAR for the higher modulations and lower bandwidths were not tested since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05v02r02.

1.7 Power Reduction for SAR

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

1.8 Guidance Applied

- FCC OET Bulletin 65 Supplement C [June 2001]
- IEEE 1528-2003
- FCC KDB Publication 941225 D01-D06 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r01 (General SAR Guidance)
- FCC KDB Publication 865664 D01-D02 (SAR Measurements up to 6 GHz)
- April 2013 TCB Workshop Notes (IEEE 802.11ac)

1.9 Device Serial Numbers

Several samples were used with identical hardware to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.

Mode/Band	Head Serial Number	Body-Worn Serial Number	Wireless Router Serial Number
GSM/GPRS/EDGE 850	NY352095	NY352095	NY352095
UMTS 850	NY352095	NY352095	NY352095
UMTS 1750	AE352096	AE352096	AE352096
GSM/GPRS/EDGE 1900	AE352096	AE352096	AE352096
UMTS 1900	AE352096	AE352096	AE352096
LTE Band 17	XV352098	XV352098	XV352098
LTE Band 4 (AWS)	XV352098	XV352098	XV352098
LTE Band 2 (PCS)	XV352098	WQ352097	WQ352097
2.4 GHz WLAN	FX352099	FX352099	FX352099
5 GHz WLAN	FX352099	JP352100	JP352100

2 LTE INFORMATION

LTE Information			
FCC ID	**ZNFD801**		
Form Factor	Portable Handset		
Frequency Range of each LTE transmission band	LTE Band 17 (706.5 - 713.5 MHz)		
	LTE Band 4 (AWS) (1712.5 - 1752.5 MHz)		
	LTE Band 2 (PCS) (1852.5 - 1907.5 MHz)		
Channel Bandwidths	LTE Band 17: 5 MHz, 10 MHz		
	LTE Band 4 (AWS): 5 MHz, 10 MHz, 15 MHz, 20 MHz		
	LTE Band 2 (PCS): 5 MHz, 10 MHz		
Channel Numbers and Frequencies (MHz)	Low	Mid	High
LTE Band 17: 5 MHz	706.5 (23755)	710 (23790)	713.5 (23825)
LTE Band 17: 10 MHz	709 (23780)	710 (23790)	711 (23800)
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 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)
UE Category	3		
Modulations Supported in UL	QPSK, 16QAM		
LTE Voice available?	NO		
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	YES		
Conducted power Table provided for 1RB (low, mid and high offset), 50% RB (low, mid, and high offset), and 100% RB	YES		

3 INTRODUCTION

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

The safety limits used for the environmental evaluation measurements are based on the criteria published by the American National Standards Institute (ANSI) for localized specific absorption rate (SAR) in IEEE/ANSI C95.1-1992 Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz [3] and Health Canada RF Exposure Guidelines Safety Code 6 [24]. The measurement procedure described in IEEE/ANSI C95.3-2002 Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave [4] is used for guidance in measuring the Specific Absorption Rate (SAR) due to the RF radiation exposure from the Equipment Under Test (EUT). These criteria for SAR evaluation are similar to those recommended by the International Committee for Non-Ionizing Radiation Protection (ICNIRP) in Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields," Report No. Vol 74. SAR is a measure of the rate of energy absorption due to exposure to an RF transmitting source. SAR values have been related to threshold levels for potential biological hazards.

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

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

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure:

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r01 (See Table 4-1).

2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.

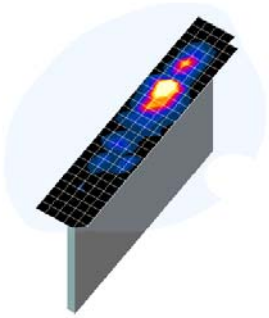


Figure 4-1
Sample SAR Area Scan

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 D01v01r01 (See Table 4-1). On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

   a. The data was extrapolated to the surface of the outer-shell of the phantom. The combined distance extrapolated was the combined distance from the center of the dipoles 2.7mm away from the tip of the probe housing plus the 1.2 mm distance between the surface and the lowest measuring point. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.

   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.

4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

Table 4-1
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01r01

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

5 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

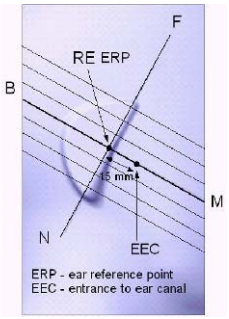


Figure 5-1
Close-Up Side view of ERP

5.2 HANDSET REFERENCE POINTS

Two imaginary lines on the handset were established: the vertical centerline and the horizontal line. The test device was placed in a normal operating position with the "test device reference point" located along the "vertical centerline" on the front of the device aligned to the "ear reference point" (See Figure 5-3). The "test device reference point" was 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

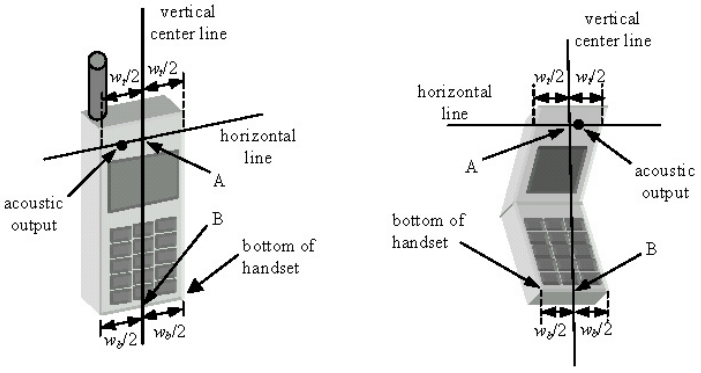


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

6 TEST CONFIGURATION POSITIONS FOR HANDSETS

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.

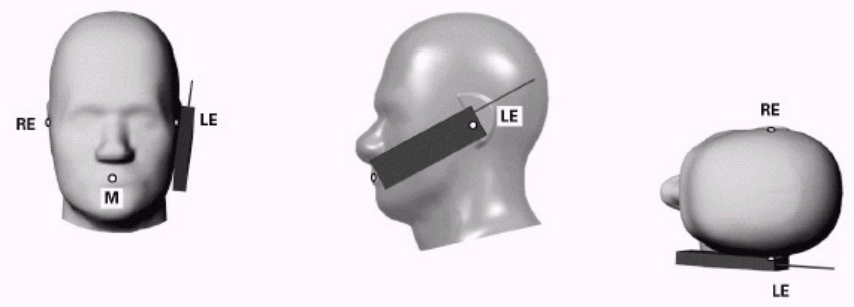


Figure 6-1 Front, Side and Top View of Cheek Position

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

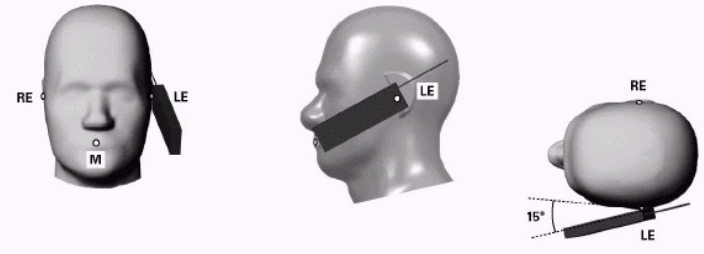


Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

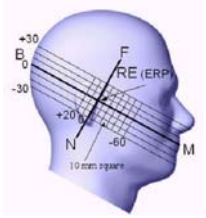


Figure 6-3
Side view w/ relevant markings

6.4 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 D04v01r01, 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 D01v05r01 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.

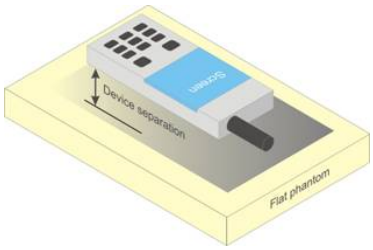


Figure 6-4
Sample Body-Worn Diagram

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 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.

6.5 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 D01v05r01 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v05r01, 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.

6.6 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 D06v01r01 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 D01v05r01 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

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.

8 FCC MEASUREMENT PROCEDURES

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

8.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v05r01, When SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r02.

8.2 Procedures Used to Establish RF Signal for SAR

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

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

8.3 SAR Measurement Conditions for UMTS

8.3.1 Output Power Verification

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

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

8.3.2 Head SAR Measurements for Handsets

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

3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

8.3.3 Body SAR Measurements

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

8.3.4 SAR Measurements for Handsets with Rel 5 HSDPA

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

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

Sub-Test	β_c	β_d	β_d (SF)	β_c/β_d	β_{HS} (Note1, Note 2)	CM (dB) (Note 3)	MPR (dB) (Note 3)
1	2/15	15/15	64	2/15	4/15	0.0	0.0
2	12/15 (Note 4)	15/15 (Note 4)	64	12/15 (Note 4)	24/15	1.0	0.0
3	15/15	8/15	64	15/8	30/15	1.5	0.5
4	15/15	4/15	64	15/4	30/15	1.5	0.5

Note 1: Δ_{ACK}, Δ_{NACK} and Δ_{CQI} = 8 ⇔ $A_{hs} = \beta_{hs}/\beta_c$ = 30/15 ⇔ β_{hs}= 30/15 *β_c.

Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and Δ_{NACK} = 8 (A_{hs} = 30/15) with β_{hs} = 30/15 * β_c, and Δ_{CQI} = 7 (A_{hs} = 24/15) with β_{hs} = 24/15 * β_c.

Note 3: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

Figure 8-1
Table C.10.1.4 of TS 234.121-1

8.3.5 SAR Measurements for Handsets with Rel 6 HSUPA

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

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

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

Note 1: Δ_{ACK}, Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: CM = 1 for β_c/β_d =12/15, β_{hs}/β_c=24/15. For all other combinations of DPDCH, DPCCH, HS- DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.
Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 10/15 and β_d = 15/15.
Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to β_c = 14/15 and β_d = 15/15.
Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.
Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

8.3.6 SAR Measurement Conditions for DC-HSDPA

SAR test exclusion for DC-HSDPA devices is determined by power measurements according to the H-Set 12, Fixed Reference Channel (FRC) configuration in Table C.8.1.12 of 3GPP TS 34.121-1. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to qualify for SAR test exclusion. DC-HSDPA uplink maximum output power measurements using the four Rel. 5 HSDPA subtests in Table C.10.1.4 of TS 234.121-1 is required.

When the maximum average output power of each RF channel with DC-HSDPA active is ≤ ¼ dB higher than that measured using 12.2 kbps RMC, or the maximum reported SAR for 12.2 kbps RMC is ≤ 75% of the SAR limit, SAR evaluation for DC-HSDPA is not required.

8.4 SAR Measurement Conditions for LTE

LTE modes were tested according to FCC KDB 941225 D05v02r02 publication. Please see notes after the tabulated SAR data for required test configurations. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 was used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing.

8.4.1 Spectrum Plots for RB Configurations

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

8.4.2 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.

8.4.3 A-MPR

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

8.4.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r02:

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.

8.5 SAR Testing with 802.11 Transmitters

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

8.5.1 General Device Setup

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

8.5.2 Frequency Channel Configurations [27]

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

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

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

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

9 RF CONDUCTED POWERS

9.1 GSM Conducted Powers

		Maximum Burst-Averaged Output Power								
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 850	128	33.16	33.15	**31.49**	29.50	27.49	27.08	27.00	26.00	24.80
	190	33.17	33.19	**31.27**	29.38	27.49	27.04	26.95	26.05	24.81
	251	33.11	33.13	**31.44**	29.22	27.47	26.95	26.85	25.81	24.78
GSM 1900	512	31.05	31.02	**29.33**	27.01	25.62	25.88	25.76	25.35	24.20
	661	31.15	31.10	**29.18**	27.14	25.50	25.90	25.84	25.20	24.13
	810	31.16	31.13	**29.24**	27.22	25.48	25.82	25.61	25.05	23.97

		Calculated Maximum Frame-Averaged Output Power								
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 850	128	24.13	24.12	**25.47**	25.24	24.48	18.05	20.98	21.74	21.79
	190	24.14	24.16	**25.25**	25.12	24.48	18.01	20.93	21.79	21.80
	251	24.08	24.10	**25.42**	24.96	24.46	17.92	20.83	21.55	21.77
GSM 1900	512	22.02	21.99	**23.31**	22.75	22.61	16.85	19.74	21.09	21.19
	661	22.12	22.07	**23.16**	22.88	22.49	16.87	19.82	20.94	21.12
	810	22.13	22.10	**23.22**	22.96	22.47	16.79	19.59	20.79	20.96

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. The bolded GPRS modes were selected for SAR testing according to the highest frame-averaged output power table according to KDB 941225 D03v01.

3. 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.

4. 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.

5. Per the FCC change document for this device, the licensed transmitter remains the same as the original certified device. Therefore, GSM/GPRS/EDGE conducted powers remain the same as the original certification.

GSM Class: B
GPRS Multislot class: 12 (Max 4 Tx uplink slots)
EDGE Multislot class: 12 (Max 4 Tx uplink slots)
DTM Multislot Class: N/A

Figure 9-1
Power Measurement Setup

9.2 UMTS Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	1312	1412	1862	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	23.12	23.08	22.92	24.04	24.01	23.93	23.97	23.87	23.93	-
99		12.2 kbps AMR	23.04	23.11	22.86	24.03	23.91	23.90	23.89	23.82	23.75	-
6	HSDPA	Subtest 1	23.17	23.20	23.14	24.15	24.03	24.02	23.94	23.93	23.99	0
6		Subtest 2	23.10	23.13	23.07	24.19	24.03	24.08	24.00	23.94	23.96	0
6		Subtest 3	22.62	22.70	22.68	23.66	23.55	23.61	23.44	23.51	23.37	0.5
6		Subtest 4	22.61	22.69	22.67	23.66	23.60	23.62	23.55	23.51	23.58	0.5
6	HSUPA	Subtest 1	22.90	22.85	22.78	23.71	23.47	23.58	23.59	23.55	23.63	0
6		Subtest 2	21.10	21.18	21.12	22.07	21.90	21.98	21.88	21.89	22.04	2
6		Subtest 3	21.89	22.20	21.67	22.93	22.86	22.85	22.83	22.67	22.75	1
6		Subtest 4	21.68	21.66	21.60	22.72	22.52	22.57	22.36	22.69	22.61	2
6		Subtest 5	22.88	22.75	23.05	23.48	23.43	23.34	23.21	23.27	23.28	0
8	DC-HSDPA	Subtest 1	22.93	22.96	22.97	23.98	23.93	23.96	23.71	23.80	23.75	0
8		Subtest 2	22.93	22.94	23.03	23.94	23.96	23.93	23.66	23.82	23.74	0
8		Subtest 3	22.37	22.45	22.57	23.46	23.42	23.50	23.18	23.41	23.33	0.5
8		Subtest 4	22.35	22.55	22.58	23.47	23.36	23.43	23.11	23.36	23.28	0.5

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

DC-HSDPA considerations

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

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

Per the FCC change document for this device, the licensed transmitter remains the same as the original certified device. Therefore, UMTS conducted powers remain the same as the original certification.

Figure 9-2
Power Measurement Setup

9.3 LTE Conducted Powers

Per the FCC change document for this device, the licensed transmitter remains the same as the original certified device. Therefore, LTE conducted powers remain the same as the original certification.

9.3.1 LTE Band 17

Table 9-1
LTE Band 17 Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	710.0	23790	10	QPSK	1	0	23.52	0	0
	710.0	23790	10	QPSK	1	25	23.47	0	0
	710.0	23790	10	QPSK	1	49	**23.58**	0	0
	710.0	23790	10	QPSK	25	0	**22.49**	1	0-1
	710.0	23790	10	QPSK	25	12	22.41	1	0-1
	710.0	23790	10	QPSK	25	25	22.38	1	0-1
	710.0	23790	10	QPSK	50	0	22.37	1	0-1
	710.0	23790	10	16QAM	1	0	22.41	1	0-1
	710.0	23790	10	16QAM	1	25	22.31	1	0-1
	710.0	23790	10	16QAM	1	49	22.39	1	0-1
	710.0	23790	10	16QAM	25	0	21.40	2	0-2
	710.0	23790	10	16QAM	25	12	21.44	2	0-2
	710.0	23790	10	16QAM	25	25	21.46	2	0-2
	710.0	23790	10	16QAM	50	0	21.28	2	0-2

Note: LTE Band 17 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02r02, 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 17 Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	710.0	23790	5	QPSK	1	0	23.42	0	0
	710.0	23790	5	QPSK	1	12	23.53	0	0
	710.0	23790	5	QPSK	1	24	23.41	0	0
	710.0	23790	5	QPSK	12	0	22.48	1	0-1
	710.0	23790	5	QPSK	12	6	22.49	1	0-1
	710.0	23790	5	QPSK	12	13	22.44	1	0-1
	710.0	23790	5	QPSK	25	0	22.42	1	0-1
	710.0	23790	5	16-QAM	1	0	22.39	1	0-1
	710.0	23790	5	16-QAM	1	12	22.34	1	0-1
	710.0	23790	5	16-QAM	1	24	22.31	1	0-1
	710.0	23790	5	16-QAM	12	0	21.53	2	0-2
	710.0	23790	5	16-QAM	12	6	21.48	2	0-2
	710.0	23790	5	16-QAM	12	13	21.45	2	0-2
	710.0	23790	5	16-QAM	25	0	21.41	2	0-2

Note: LTE Band 17 at 5 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02r02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

9.3.2 LTE Band 4 (AWS)

Table 9-3
LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Mid	1732.5	20175	20	QPSK	1	0	23.81	0	0
	1732.5	20175	20	QPSK	1	50	**23.85**	0	0
	1732.5	20175	20	QPSK	1	99	23.84	0	0
	1732.5	20175	20	QPSK	50	0	22.58	1	0-1
	1732.5	20175	20	QPSK	50	25	22.53	1	0-1
	1732.5	20175	20	QPSK	50	50	**22.63**	1	0-1
	1732.5	20175	20	QPSK	100	0	22.51	1	0-1
	1732.5	20175	20	16QAM	1	0	22.61	1	0-1
	1732.5	20175	20	16QAM	1	50	22.67	1	0-1
	1732.5	20175	20	16QAM	1	99	22.71	1	0-1
	1732.5	20175	20	16QAM	50	0	21.57	2	0-2
	1732.5	20175	20	16QAM	50	25	21.46	2	0-2
	1732.5	20175	20	16QAM	50	50	21.49	2	0-2
	1732.5	20175	20	16QAM	100	0	21.50	2	0-2

Note: LTE Band 4 (AWS) at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02r02, 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 9-4
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1717.5	20025	15	QPSK	1	0	23.78	0	0
	1717.5	20025	15	QPSK	1	36	23.80	0	0
	1717.5	20025	15	QPSK	1	74	23.76	0	0
	1717.5	20025	15	QPSK	36	0	22.63	1	0-1
	1717.5	20025	15	QPSK	36	18	22.65	1	0-1
	1717.5	20025	15	QPSK	36	37	22.64	1	0-1
	1717.5	20025	15	QPSK	75	0	22.52	1	0-1
	1717.5	20025	15	16QAM	1	0	22.58	1	0-1
	1717.5	20025	15	16QAM	1	36	22.57	1	0-1
	1717.5	20025	15	16QAM	1	74	22.61	1	0-1
	1717.5	20025	15	16QAM	36	0	21.67	2	0-2
	1717.5	20025	15	16QAM	36	18	21.70	2	0-2
	1717.5	20025	15	16QAM	36	37	21.54	2	0-2
	1717.5	20025	15	16QAM	75	0	21.54	2	0-2
Mid	1732.5	20175	15	QPSK	1	0	23.88	0	0
	1732.5	20175	15	QPSK	1	36	23.86	0	0
	1732.5	20175	15	QPSK	1	74	23.79	0	0
	1732.5	20175	15	QPSK	36	0	22.67	1	0-1
	1732.5	20175	15	QPSK	36	18	22.64	1	0-1
	1732.5	20175	15	QPSK	36	37	22.75	1	0-1
	1732.5	20175	15	QPSK	75	0	22.63	1	0-1
	1732.5	20175	15	16QAM	1	0	22.67	1	0-1
	1732.5	20175	15	16QAM	1	36	22.73	1	0-1
	1732.5	20175	15	16QAM	1	74	22.56	1	0-1
	1732.5	20175	15	16QAM	36	0	21.53	2	0-2
	1732.5	20175	15	16QAM	36	18	21.53	2	0-2
	1732.5	20175	15	16QAM	36	37	21.57	2	0-2
	1732.5	20175	15	16QAM	75	0	21.47	2	0-2
High	1747.5	20325	15	QPSK	1	0	23.77	0	0
	1747.5	20325	15	QPSK	1	36	23.78	0	0
	1747.5	20325	15	QPSK	1	74	23.87	0	0
	1747.5	20325	15	QPSK	36	0	22.78	1	0-1
	1747.5	20325	15	QPSK	36	18	22.72	1	0-1
	1747.5	20325	15	QPSK	36	37	22.71	1	0-1
	1747.5	20325	15	QPSK	75	0	22.65	1	0-1
	1747.5	20325	15	16QAM	1	0	22.75	1	0-1
	1747.5	20325	15	16QAM	1	36	22.71	1	0-1
	1747.5	20325	15	16QAM	1	74	22.70	1	0-1
	1747.5	20325	15	16QAM	36	0	21.69	2	0-2
	1747.5	20325	15	16QAM	36	18	21.75	2	0-2
	1747.5	20325	15	16QAM	36	37	21.65	2	0-2
	1747.5	20325	15	16QAM	75	0	21.60	2	0-2

Table 9-5
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1715	20000	10	QPSK	1	0	23.84	0	0
	1715	20000	10	QPSK	1	25	23.77	0	0
	1715	20000	10	QPSK	1	49	23.85	0	0
	1715	20000	10	QPSK	25	0	22.66	1	0-1
	1715	20000	10	QPSK	25	12	22.65	1	0-1
	1715	20000	10	QPSK	25	25	22.67	1	0-1
	1715	20000	10	QPSK	50	0	22.56	1	0-1
	1715	20000	10	16QAM	1	0	22.69	1	0-1
	1715	20000	10	16QAM	1	25	22.57	1	0-1
	1715	20000	10	16QAM	1	49	22.56	1	0-1
	1715	20000	10	16QAM	25	0	21.51	2	0-2
	1715	20000	10	16QAM	25	12	21.54	2	0-2
	1715	20000	10	16QAM	25	25	21.65	2	0-2
	1715	20000	10	16QAM	50	0	21.54	2	0-2
Mid	1732.5	20175	10	QPSK	1	0	23.91	0	0
	1732.5	20175	10	QPSK	1	25	23.90	0	0
	1732.5	20175	10	QPSK	1	49	23.83	0	0
	1732.5	20175	10	QPSK	25	0	22.60	1	0-1
	1732.5	20175	10	QPSK	25	12	22.61	1	0-1
	1732.5	20175	10	QPSK	25	25	22.59	1	0-1
	1732.5	20175	10	QPSK	50	0	22.51	1	0-1
	1732.5	20175	10	16QAM	1	0	22.53	1	0-1
	1732.5	20175	10	16QAM	1	25	22.66	1	0-1
	1732.5	20175	10	16QAM	1	49	22.67	1	0-1
	1732.5	20175	10	16QAM	25	0	21.47	2	0-2
	1732.5	20175	10	16QAM	25	12	21.47	2	0-2
	1732.5	20175	10	16QAM	25	25	21.55	2	23.48
	1732.5	20175	10	16QAM	50	0	21.34	2	0-2
High	1750	20350	10	QPSK	1	0	23.90	0	0
	1750	20350	10	QPSK	1	25	23.78	0	0
	1750	20350	10	QPSK	1	49	23.83	0	0
	1750	20350	10	QPSK	25	0	22.71	1	0-1
	1750	20350	10	QPSK	25	12	22.52	1	0-1
	1750	20350	10	QPSK	25	25	22.54	1	0-1
	1750	20350	10	QPSK	50	0	22.50	1	0-1
	1750	20350	10	16QAM	1	0	22.56	1	0-1
	1750	20350	10	16QAM	1	25	22.43	1	0-1
	1750	20350	10	16QAM	1	49	22.46	1	0-1
	1750	20350	10	16QAM	25	0	21.59	2	0-2
	1750	20350	10	16QAM	25	12	21.39	2	0-2
	1750	20350	10	16QAM	25	25	21.51	2	0-2
	1750	20350	10	16QAM	50	0	21.46	2	0-2

Table 9-6
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1712.5	19975	5	QPSK	1	0	23.90	0	0
	1712.5	19975	5	QPSK	1	12	23.87	0	0
	1712.5	19975	5	QPSK	1	24	23.76	0	0
	1712.5	19975	5	QPSK	12	0	22.65	1	0-1
	1712.5	19975	5	QPSK	12	6	22.67	1	0-1
	1712.5	19975	5	QPSK	12	13	22.59	1	0-1
	1712.5	19975	5	QPSK	25	0	22.55	1	0-1
	1712.5	19975	5	16-QAM	1	0	22.57	1	0-1
	1712.5	19975	5	16-QAM	1	12	22.61	1	0-1
	1712.5	19975	5	16-QAM	1	24	22.53	1	0-1
	1712.5	19975	5	16-QAM	12	0	21.51	2	0-2
	1712.5	19975	5	16-QAM	12	6	21.52	2	0-2
	1712.5	19975	5	16-QAM	12	13	21.58	2	0-2
	1712.5	19975	5	16-QAM	25	0	21.53	2	0-2
Mid	1732.5	20175	5	QPSK	1	0	23.82	0	0
	1732.5	20175	5	QPSK	1	12	23.79	0	0
	1732.5	20175	5	QPSK	1	24	23.75	0	0
	1732.5	20175	5	QPSK	12	0	22.68	1	0-1
	1732.5	20175	5	QPSK	12	6	22.63	1	0-1
	1732.5	20175	5	QPSK	12	13	22.62	1	0-1
	1732.5	20175	5	QPSK	25	0	22.53	1	0-1
	1732.5	20175	5	16-QAM	1	0	22.69	1	0-1
	1732.5	20175	5	16-QAM	1	12	22.54	1	0-1
	1732.5	20175	5	16-QAM	1	24	22.51	1	0-1
	1732.5	20175	5	16-QAM	12	0	21.54	2	0-2
	1732.5	20175	5	16-QAM	12	6	21.57	2	0-2
	1732.5	20175	5	16-QAM	12	13	21.57	2	0-2
	1732.5	20175	5	16-QAM	25	0	21.51	2	0-2
High	1752.5	20375	5	QPSK	1	0	23.76	0	0
	1752.5	20375	5	QPSK	1	12	23.73	0	0
	1752.5	20375	5	QPSK	1	24	23.86	0	0
	1752.5	20375	5	QPSK	12	0	22.63	1	0-1
	1752.5	20375	5	QPSK	12	6	22.70	1	0-1
	1752.5	20375	5	QPSK	12	13	22.65	1	0-1
	1752.5	20375	5	QPSK	25	0	22.61	1	0-1
	1752.5	20375	5	16-QAM	1	0	22.60	1	0-1
	1752.5	20375	5	16-QAM	1	12	22.56	1	0-1
	1752.5	20375	5	16-QAM	1	24	22.57	1	0-1
	1752.5	20375	5	16-QAM	12	0	21.57	2	0-2
	1752.5	20375	5	16-QAM	12	6	21.63	2	0-2
	1752.5	20375	5	16-QAM	12	13	21.59	2	0-2
	1752.5	20375	5	16-QAM	25	0	21.55	2	0-2

9.3.3 LTE Band 2 (PCS)

Table 9-7
LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1855	18650	10	QPSK	1	0	23.61	0	0
	1855	18650	10	QPSK	1	25	23.52	0	0
	1855	18650	10	QPSK	1	49	23.65	0	0
	1855	18650	10	QPSK	25	0	22.34	1	0-1
	1855	18650	10	QPSK	25	12	22.28	1	0-1
	1855	18650	10	QPSK	25	25	22.42	1	0-1
	1855	18650	10	QPSK	50	0	22.21	1	0-1
	1855	18650	10	16QAM	1	0	22.03	1	0-1
	1855	18650	10	16QAM	1	25	21.93	1	0-1
	1855	18650	10	16QAM	1	49	22.02	1	0-1
	1855	18650	10	16QAM	25	0	21.25	2	0-2
	1855	18650	10	16QAM	25	12	21.30	2	0-2
	1855	18650	10	16QAM	25	25	21.44	2	0-2
	1855	18650	10	16QAM	50	0	21.32	2	0-2
Mid	1880.0	18900	10	QPSK	1	0	23.61	0	0
	1880.0	18900	10	QPSK	1	25	23.68	0	0
	1880.0	18900	10	QPSK	1	49	23.59	0	0
	1880.0	18900	10	QPSK	25	0	22.23	1	0-1
	1880.0	18900	10	QPSK	25	12	22.23	1	0-1
	1880.0	18900	10	QPSK	25	25	22.21	1	0-1
	1880.0	18900	10	QPSK	50	0	22.20	1	0-1
	1880.0	18900	10	16QAM	1	0	22.24	1	0-1
	1880.0	18900	10	16QAM	1	25	22.25	1	0-1
	1880.0	18900	10	16QAM	1	49	22.17	1	0-1
	1880.0	18900	10	16QAM	25	0	21.29	2	0-2
	1880.0	18900	10	16QAM	25	12	21.41	2	0-2
	1880.0	18900	10	16QAM	25	25	21.31	2	0-2
	1880.0	18900	10	16QAM	50	0	21.21	2	0-2
High	1905	19150	10	QPSK	1	0	**23.69**	0	0
	1905	19150	10	QPSK	1	25	23.62	0	0
	1905	19150	10	QPSK	1	49	23.64	0	0
	1905	19150	10	QPSK	25	0	**22.58**	1	0-1
	1905	19150	10	QPSK	25	12	22.47	1	0-1
	1905	19150	10	QPSK	25	25	**22.58**	1	0-1
	1905	19150	10	QPSK	50	0	22.44	1	0-1
	1905	19150	10	16QAM	1	0	22.42	1	0-1
	1905	19150	10	16QAM	1	25	22.23	1	0-1
	1905	19150	10	16QAM	1	49	22.36	1	0-1
	1905	19150	10	16QAM	25	0	21.56	2	0-2
	1905	19150	10	16QAM	25	12	21.49	2	0-2
	1905	19150	10	16QAM	25	25	21.41	2	0-2
	1905	19150	10	16QAM	50	0	21.58	2	0-2

Table 9-8
LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	Target MPR [dB]	MPR Allowed per 3GPP [dB]
Low	1852.5	18625	5	QPSK	1	0	23.61	0	0
	1852.5	18625	5	QPSK	1	12	23.56	0	0
	1852.5	18625	5	QPSK	1	24	23.62	0	0
	1852.5	18625	5	QPSK	12	0	22.40	1	0-1
	1852.5	18625	5	QPSK	12	6	22.38	1	0-1
	1852.5	18625	5	QPSK	12	13	22.43	1	0-1
	1852.5	18625	5	QPSK	25	0	22.29	1	0-1
	1852.5	18625	5	16-QAM	1	0	22.21	1	0-1
	1852.5	18625	5	16-QAM	1	12	22.26	1	0-1
	1852.5	18625	5	16-QAM	1	24	22.30	1	0-1
	1852.5	18625	5	16-QAM	12	0	21.50	2	0-2
	1852.5	18625	5	16-QAM	12	6	21.42	2	0-2
	1852.5	18625	5	16-QAM	12	13	21.45	2	0-2
	1852.5	18625	5	16-QAM	25	0	21.30	2	0-2
Mid	1880.0	18900	5	QPSK	1	0	23.52	0	0
	1880.0	18900	5	QPSK	1	12	23.56	0	0
	1880.0	18900	5	QPSK	1	24	23.55	0	0
	1880.0	18900	5	QPSK	12	0	22.35	1	0-1
	1880.0	18900	5	QPSK	12	6	22.50	1	0-1
	1880.0	18900	5	QPSK	12	13	22.40	1	0-1
	1880.0	18900	5	QPSK	25	0	22.33	1	0-1
	1880.0	18900	5	16-QAM	1	0	22.38	1	0-1
	1880.0	18900	5	16-QAM	1	12	22.37	1	0-1
	1880.0	18900	5	16-QAM	1	24	22.37	1	0-1
	1880.0	18900	5	16-QAM	12	0	21.27	2	0-2
	1880.0	18900	5	16-QAM	12	6	21.31	2	0-2
	1880.0	18900	5	16-QAM	12	13	21.28	2	0-2
	1880.0	18900	5	16-QAM	25	0	21.26	2	0-2
High	1907.5	19175	5	QPSK	1	0	23.60	0	0
	1907.5	19175	5	QPSK	1	12	23.45	0	0
	1907.5	19175	5	QPSK	1	24	23.41	0	0
	1907.5	19175	5	QPSK	12	0	22.47	1	0-1
	1907.5	19175	5	QPSK	12	6	22.60	1	0-1
	1907.5	19175	5	QPSK	12	13	22.61	1	0-1
	1907.5	19175	5	QPSK	25	0	22.44	1	0-1
	1907.5	19175	5	16-QAM	1	0	22.37	1	0-1
	1907.5	19175	5	16-QAM	1	12	22.31	1	0-1
	1907.5	19175	5	16-QAM	1	24	22.30	1	0-1
	1907.5	19175	5	16-QAM	12	0	21.43	2	0-2
	1907.5	19175	5	16-QAM	12	6	21.44	2	0-2
	1907.5	19175	5	16-QAM	12	13	21.35	2	0-2
	1907.5	19175	5	16-QAM	25	0	21.33	2	0-2

9.4 WLAN Conducted Powers

Table 9-9
IEEE 802.11b Average RF Power

Mode	Freq	Channel	802.11b (2.4 GHz) Conducted Power [dBm]			
			Data Rate [Mbps]			
	[MHz]		1	2	5.5	11
802.11b	2412	1*	**15.50**	15.43	15.51	15.47
802.11b	2437	6*	15.16	15.19	15.27	15.23
802.11b	2462	11*	15.35	15.30	15.52	15.46

Table 9-10
IEEE 802.11g Average RF Power

Mode	Freq	Channel	802.11g (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11g	2412	1	11.84	11.92	12.03	11.94	11.91	11.97	11.94	11.95
802.11g	2437	6	11.71	11.59	11.74	11.80	11.69	11.82	11.65	11.72
802.11g	2462	11	11.82	11.80	11.83	11.99	11.82	11.75	11.69	11.81

Table 9-11
IEEE 802.11n Average RF Power

Mode	Freq	Channel	802.11n (2.4 GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	20	26	39	52	58	65
802.11n	2412	1	11.03	10.98	10.98	10.98	10.93	11.11	10.97	11.10
802.11n	2437	6	10.81	10.88	10.83	10.77	10.84	10.82	10.95	10.92
802.11n	2462	11	10.79	10.97	10.89	10.94	10.92	10.96	11.06	11.09

Table 9-12
IEEE 802.11a Average RF Power

Mode	Freq	Channel	802.11a (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6	9	12	18	24	36	48	54
802.11a	5180	36*	**9.72**	9.67	9.82	9.76	9.71	9.63	9.82	9.56
802.11a	5200	40	9.52	9.53	9.64	9.58	9.57	9.47	9.63	9.36
802.11a	5220	44	9.56	9.62	9.65	9.70	9.65	9.61	9.68	9.46
802.11a	5240	48*	9.41	9.42	9.44	9.52	9.46	9.51	9.63	9.44
802.11a	5260	52*	**9.87**	9.70	9.86	9.70	9.69	9.52	9.80	9.64
802.11a	5280	56	9.76	9.91	9.83	9.84	9.91	9.80	9.93	9.71
802.11a	5300	60	9.64	9.71	9.74	9.75	9.64	9.51	9.69	9.44
802.11a	5320	64*	9.53	9.58	9.52	9.47	9.41	9.39	9.48	9.26
802.11a	5500	100	9.50	9.49	9.67	9.56	9.67	9.44	9.52	9.35
802.11a	5520	104*	9.46	9.61	9.68	9.70	9.49	9.33	9.62	9.50
802.11a	5540	108	**9.53**	9.44	9.54	9.46	9.36	9.39	9.69	9.42
802.11a	5560	112	9.37	9.39	9.43	9.40	9.22	9.21	9.36	9.10
802.11a	5580	116*	9.31	9.46	9.41	9.46	9.33	9.31	9.37	9.26
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5660	132	8.92	9.03	9.05	9.05	8.97	8.95	8.89	8.83
802.11a	5680	136*	8.81	8.95	8.94	8.87	8.84	8.78	8.96	8.69
802.11a	5700	140	8.60	8.59	8.62	8.67	8.57	8.59	8.66	8.38
802.11a	5720	144	8.79	8.58	8.55	8.51	8.60	8.56	8.52	8.47
802.11a	5745	149*	**8.83**	8.73	8.74	8.72	8.66	8.72	8.86	8.52
802.11a	5765	153	8.79	8.69	8.61	8.74	8.56	8.57	8.67	8.49
802.11a	5785	157*	8.58	8.47	8.55	8.54	8.49	8.46	8.57	8.39
802.11a	5805	161*	8.35	8.44	8.48	8.48	8.46	8.32	8.51	8.31
802.11a	5825	165	8.31	8.25	8.32	8.27	8.27	8.37	8.34	8.16

Per FCC KDB Publication 443999 D01v01 and RSS-210 A9.2(3), transmission on channels which overlap the 5600-5650 MHz is prohibited as a client. This device does not transmit any beacons or initiate any transmissions in 5.3 and 5.5 GHz Band.

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

Table 9-13
IEEE 802.11n Average RF Power – 20 MHz Bandwidth

Mode	Freq	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		6.5	13	20	26	39	52	58	65
802.11n	5180	36	9.42	9.50	9.54	9.55	9.46	9.50	9.53	9.50
802.11n	5200	40	9.49	9.34	9.44	9.35	9.39	9.45	9.49	9.50
802.11n	5220	44	9.43	9.54	9.50	9.47	9.52	9.48	9.38	9.43
802.11n	5240	48	9.30	9.36	9.32	9.38	9.36	9.36	9.31	9.40
802.11n	5260	52	9.45	9.53	9.58	9.49	9.47	9.52	9.56	9.50
802.11n	5280	56	9.54	9.45	9.56	9.55	9.55	9.50	9.63	9.56
802.11n	5300	60	9.70	9.52	9.62	9.58	9.56	9.55	9.58	9.50
802.11n	5320	64	9.64	9.61	9.64	9.50	9.46	9.42	9.47	9.39
802.11n	5500	100	9.42	9.47	9.38	9.49	9.49	9.48	9.45	9.47
802.11n	5520	104	9.49	9.44	9.48	9.43	9.44	9.38	9.45	9.35
802.11n	5540	108	9.46	9.46	9.35	9.38	9.33	9.44	9.42	9.43
802.11n	5560	112	9.36	9.30	9.37	9.36	9.37	9.41	9.30	9.30
802.11n	5580	116	9.29	9.30	9.27	9.38	9.20	9.23	9.22	9.31
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	8.97	8.90	8.92	8.91	8.91	8.90	8.92	8.82
802.11n	5680	136	8.99	8.86	8.90	8.81	8.85	8.76	8.74	8.73
802.11n	5700	140	8.71	8.77	8.74	8.80	8.74	8.77	8.76	8.70
802.11n	5720	144	8.61	8.52	8.60	8.65	8.42	8.58	8.41	8.39
802.11n	5745	149	8.59	8.58	8.48	8.65	8.56	8.74	8.73	8.70
802.11n	5765	153	8.52	8.59	8.54	8.54	8.52	8.53	8.57	8.50
802.11n	5785	157	8.47	8.43	8.42	8.41	8.44	8.47	8.39	8.42
802.11n	5805	161	8.51	8.33	8.28	8.28	8.24	8.27	8.42	8.27
802.11n	5825	165	8.32	8.15	8.24	8.21	8.06	8.18	8.17	8.17

Table 9-14
IEEE 802.11n Average RF Power – 40 MHz Bandwidth

Mode	Freq	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
	[MHz]		13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	9.60	9.47	9.87	9.76	9.45	9.45	9.56	9.85
802.11n	5230	46	9.35	9.58	9.30	9.62	9.49	9.53	9.27	9.71
802.11n	5270	54	9.71	9.76	9.84	9.87	9.77	9.59	9.77	9.68
802.11n	5310	62	9.57	9.56	9.53	9.54	9.57	9.54	9.84	9.62
802.11n	5510	102	9.64	9.72	9.63	9.75	9.44	9.61	9.66	9.39
802.11n	5550	110	9.45	9.30	9.49	9.54	9.46	9.47	9.29	9.56
802.11n	5590	118	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5630	126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5670	134	8.80	8.83	8.75	8.91	8.81	8.81	8.74	8.58
802.11n	5710	142	8.57	8.54	8.57	8.52	8.58	8.51	8.44	8.52
802.11n	5755	151	8.12	8.22	8.25	8.22	8.29	8.37	8.09	8.20
802.11n	5795	159	8.45	8.39	8.15	8.52	8.07	8.42	8.27	8.22

Table 9-15
IEEE 802.11ac Average RF Power – 80 MHz Bandwidth

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3	58.5	87.8	117	175.5	234	263.3	292.5	351	390
802.11ac	5210	42	**8.71**	8.57	8.65	8.52	8.45	8.62	8.48	8.50	8.65	8.49
802.11ac	5290	58	**8.57**	8.73	8.61	8.49	8.57	8.49	8.45	8.48	8.52	8.36
802.11ac	5530	106	**8.65**	8.64	8.65	8.47	8.65	8.57	8.71	8.37	8.62	8.47
802.11ac	5690	138	7.79	7.89	7.77	7.73	7.67	7.71	7.65	7.64	7.68	7.71
802.11ac	5775	155	**7.48**	7.52	7.48	7.37	7.33	7.35	7.37	7.34	7.43	7.32

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

- For 2.4 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
- For 5 GHz, highest average RF output power channel for the lowest data rate for IEEE 802.11a were selected for SAR evaluation. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
- Full SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
- When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
- Per the FCC change document for this device, the 2.4 GHz WLAN/Bluetooth and 5 GHz WLAN chipset remains the same as the original certified device. Therefore, conducted powers IEEE 802.11 a/b/g/n/ac and Bluetooth remain the same as the original certification.
- The bolded data rate and channel above were tested for SAR.

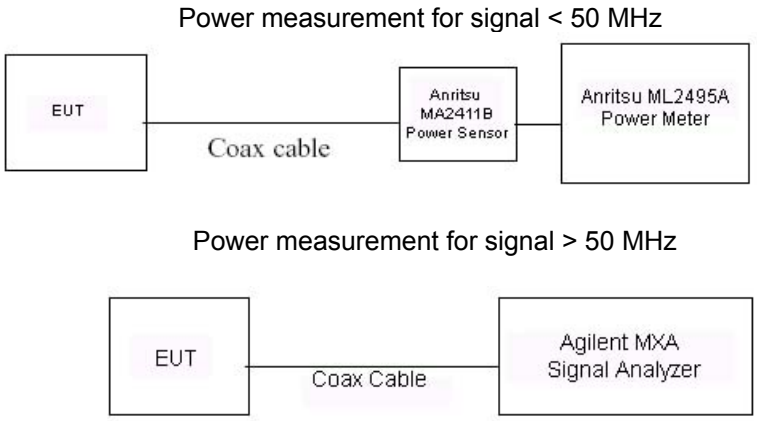


Figure 9-3
Power Measurement Setup

10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Tissue Properties – Head

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
07/03/2013	750H	23.8	710	0.870	41.047	0.887	42.113	-1.92%	-2.53%
			725	0.878	40.976	0.888	42.033	-1.13%	-2.51%
			740	0.899	40.831	0.889	41.953	1.12%	-2.67%
			755	0.914	40.459	0.891	41.876	2.58%	-3.38%
08/06/2013	750H	22.2	710	0.881	42.241	0.887	42.113	-0.68%	0.30%
			725	0.895	42.123	0.888	42.033	0.79%	0.21%
			740	0.912	41.840	0.889	41.953	2.59%	-0.27%
			755	0.923	41.593	0.891	41.876	3.59%	-0.68%
06/25/2013	835H	23.9	820	0.914	41.043	0.898	41.571	1.78%	-1.27%
			835	0.928	40.871	0.900	41.500	3.11%	-1.52%
			850	0.942	40.693	0.916	41.500	2.84%	-1.94%
07/01/2013	1750H	22.7	1710	1.366	38.990	1.348	40.136	1.34%	-2.86%
			1750	1.409	38.805	1.370	40.100	2.85%	-3.23%
			1790	1.447	38.589	1.394	40.020	3.80%	-3.58%
07/01/2013	1900H	21.8	1850	1.342	40.138	1.400	40.000	-4.14%	0.34%
			1880	1.371	40.056	1.400	40.000	-2.07%	0.14%
			1910	1.401	39.955	1.400	40.000	0.07%	-0.11%
07/05/2013	1900H	22.7	1850	1.395	39.236	1.400	40.000	-0.36%	-1.91%
			1880	1.425	39.104	1.400	40.000	1.79%	-2.24%
			1910	1.456	38.966	1.400	40.000	4.00%	-2.59%
06/26/2013	2450H	22.5	2401	1.761	39.092	1.758	39.298	0.17%	-0.52%
			2450	1.819	38.941	1.800	39.200	1.06%	-0.66%
			2499	1.872	38.774	1.852	39.135	1.08%	-0.92%
07/08/2013	5200-5800H	23.1	5180	4.447	35.102	4.639	36.020	-4.14%	-2.55%
			5200	4.468	35.069	4.660	36.000	-4.12%	-2.59%
			5220	4.485	35.044	4.680	35.980	-4.17%	-2.60%
			5260	4.525	34.989	4.720	35.940	-4.13%	-2.65%
			5280	4.545	34.956	4.740	35.920	-4.11%	-2.68%
			5300	4.565	34.928	4.760	35.900	-4.10%	-2.71%
			5500	4.760	34.630	4.965	35.650	-4.13%	-2.86%
			5520	4.783	34.606	4.986	35.620	-4.07%	-2.85%
			5540	4.804	34.574	5.007	35.590	-4.05%	-2.85%
			5745	5.019	34.293	5.215	35.355	-3.76%	-3.00%
			5765	5.039	34.263	5.235	35.335	-3.74%	-3.03%
			5785	5.057	34.238	5.255	35.315	-3.77%	-3.05%
			5800	5.075	34.216	5.270	35.300	-3.70%	-3.07%

Table 10-2
Measured Tissue Properties – Body

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
06/27/2013	750B	22.6	710	0.944	54.886	0.960	55.687	-1.67%	-1.44%
			725	0.955	54.817	0.961	55.629	-0.62%	-1.46%
			740	0.974	54.724	0.963	55.570	1.14%	-1.52%
			755	0.987	54.418	0.964	55.512	2.39%	-1.97%
08/05/2013	750B	22.6	710	0.931	55.074	0.960	55.687	-3.02%	-1.10%
			725	0.944	54.903	0.961	55.629	-1.77%	-1.31%
			740	0.957	54.744	0.963	55.570	-0.62%	-1.49%
			755	0.970	54.593	0.964	55.512	0.62%	-1.66%
06/27/2013	835B	23.7	820	1.004	55.944	0.969	55.258	3.61%	1.24%
			835	1.017	55.860	0.970	55.200	4.85%	1.20%
			850	1.030	55.776	0.988	55.154	4.25%	1.13%
07/01/2013	1750B	23.7	1710	1.401	52.582	1.460	53.540	-4.04%	-1.79%
			1750	1.442	52.329	1.490	53.430	-3.22%	-2.06%
			1790	1.503	52.326	1.510	53.330	-0.46%	-1.88%
07/01/2013	1900B	23.7	1850	1.468	52.002	1.520	53.300	-3.42%	-2.44%
			1880	1.497	51.920	1.520	53.300	-1.51%	-2.59%
			1910	1.539	51.762	1.520	53.300	1.25%	-2.89%
06/26/2013	2450B	23.9	2401	1.944	52.261	1.903	52.765	2.15%	-0.96%
			2450	2.008	52.116	1.950	52.700	2.97%	-1.11%
			2499	2.074	51.956	2.019	52.638	2.72%	-1.30%
07/01/2013	5200-5800B	23.1	5180	5.291	46.969	5.276	49.041	0.28%	-4.23%
			5200	5.335	47.080	5.299	49.014	0.68%	-3.95%
			5220	5.362	47.009	5.323	48.987	0.73%	-4.04%
			5260	5.417	46.803	5.369	48.906	0.89%	-4.30%
			5280	5.422	46.756	5.393	48.879	0.54%	-4.34%
			5300	5.438	46.810	5.416	48.851	0.41%	-4.18%
			5500	5.732	46.335	5.650	48.580	1.45%	-4.62%
			5520	5.782	46.255	5.673	48.553	1.92%	-4.73%
			5540	5.817	46.208	5.696	48.526	2.12%	-4.78%
			5745	6.160	45.976	5.936	48.248	3.77%	-4.71%
			5765	6.199	45.924	5.959	48.220	4.03%	-4.76%
			5785	6.207	45.987	5.982	48.242	3.76%	-4.67%
			5800	6.224	45.956	6.000	48.200	3.73%	-4.66%

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

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 10-3
System Verification Results

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
B	750	HEAD	07/03/2013	23.9	22.3	0.100	1003	3287	0.844	8.460	8.440	-0.24%
D	750	HEAD	08/06/2013	23.6	22.2	0.100	1003	3288	0.808	8.460	8.080	-4.49%
D	835	HEAD	06/25/2013	24.6	23.8	0.100	4d132	3288	0.972	9.660	9.720	0.62%
D	1750	HEAD	07/01/2013	23.8	22.7	0.100	1051	3288	3.560	36.500	35.600	-2.47%
G	1900	HEAD	07/01/2013	24.3	22.5	0.100	5d148	3209	3.760	39.700	37.600	-5.29%
E	1900	HEAD	07/05/2013	23.6	23.0	0.100	5d148	3920	4.060	39.700	40.600	2.27%
E	2450	HEAD	06/26/2013	24.6	22.8	0.100	797	3920	5.590	52.500	55.900	6.48%
E	5200	HEAD	07/08/2013	24.7	23.1	0.040	1120	3920	3.030	76.000	75.750	-0.33%
E	5300	HEAD	07/08/2013	24.8	23.1	0.040	1120	3920	2.970	78.700	74.250	-5.65%
E	5500	HEAD	07/08/2013	24.8	23.2	0.040	1120	3920	2.980	80.100	74.500	-6.99%
E	5800	HEAD	07/08/2013	24.9	23.2	0.040	1120	3920	2.980	74.900	74.500	-0.53%
B	750	BODY	06/27/2013	23.1	22.6	0.100	1054	3287	0.863	8.720	8.630	-1.03%
D	750	BODY	08/05/2013	23.0	22.6	0.100	1003	3288	0.866	8.830	8.660	-1.93%
G	835	BODY	06/27/2013	24.1	23.7	0.100	4d132	3209	0.958	9.360	9.580	2.35%
E	1750	BODY	07/01/2013	24.4	23.8	0.100	1051	3920	3.660	37.800	36.600	-3.17%
C	1900	BODY	07/01/2013	23.5	23.7	0.100	5d080	3022	4.020	40.300	40.200	-0.25%
B	2450	BODY	06/26/2013	23.2	22.9	0.100	719	3287	5.240	51.600	52.400	1.55%
A	5200	BODY	07/01/2013	24.4	23.2	0.100	1057	3589	7.510	75.500	75.100	-0.53%
A	5300	BODY	07/01/2013	24.3	23.1	0.100	1057	3589	7.980	75.300	79.800	5.98%
A	5500	BODY	07/01/2013	24.2	23.2	0.100	1057	3589	8.150	80.800	81.500	0.87%
A	5800	BODY	07/01/2013	24.2	23.2	0.100	1057	3589	7.200	75.100	72.000	-4.13%

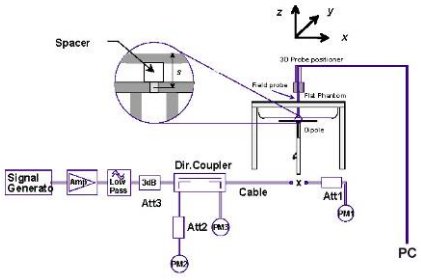


Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.2	33.17	0.00	Right	Cheek	NY352095	1	1:8.3	0.235	1.007	0.237	
836.60	190	GSM 850	GSM	33.2	33.17	0.14	Right	Tilt	NY352095	1	1:8.3	0.135	1.007	0.136	
836.60	190	GSM 850	GSM	33.2	33.17	-0.10	Left	Cheek	NY352095	1	1:8.3	0.191	1.007	0.192	
836.60	190	GSM 850	GSM	33.2	33.17	0.07	Left	Tilt	NY352095	1	1:8.3	0.124	1.007	0.125	
836.60	190	GSM 850	GPRS	31.5	31.27	0.01	Right	Cheek	NY352095	2	1:4.15	0.375	1.054	**0.395**	A1
836.60	190	GSM 850	GPRS	31.5	31.27	-0.03	Right	Tilt	NY352095	2	1:4.15	0.223	1.054	0.235	
836.60	190	GSM 850	GPRS	31.5	31.27	0.02	Left	Cheek	NY352095	2	1:4.15	0.310	1.054	0.327	
836.60	190	GSM 850	GPRS	31.5	31.27	-0.12	Left	Tilt	NY352095	2	1:4.15	0.206	1.054	0.217	
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
UMTS 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	23.2	23.08	0.12	Right	Cheek	NY352095	1:1	0.214	1.028	0.220	A2
836.60	4183	UMTS 850	RMC	23.2	23.08	0.06	Right	Tilt	NY352095	1:1	0.129	1.028	0.133	
836.60	4183	UMTS 850	RMC	23.2	23.08	0.07	Left	Cheek	NY352095	1:1	0.170	1.028	0.175	
836.60	4183	UMTS 850	RMC	23.2	23.08	0.13	Left	Tilt	NY352095	1:1	0.110	1.028	0.113	
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 11-3
UMTS 1750 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1732.40	1412	UMTS 1750	RMC	24.2	24.01	0.09	Right	Cheek	AE352096	1:1	0.281	1.045	0.294	
1732.40	1412	UMTS 1750	RMC	24.2	24.01	0.07	Right	Tilt	AE352096	1:1	0.177	1.045	0.185	
1732.40	1412	UMTS 1750	RMC	24.2	24.01	-0.03	Left	Cheek	AE352096	1:1	0.289	1.045	0.302	A3
1732.40	1412	UMTS 1750	RMC	24.2	24.01	0.04	Left	Tilt	AE352096	1:1	0.160	1.045	0.167	
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
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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.														
1880.00	661	GSM 1900	GSM	31.2	31.15	-0.05	Right	Cheek	AE352096	1	1:8.3	0.224	1.012	0.227	
1880.00	661	GSM 1900	GSM	31.2	31.15	0.06	Right	Tilt	AE352096	1	1:8.3	0.086	1.012	0.087	
1880.00	661	GSM 1900	GSM	31.2	31.15	0.00	Left	Cheek	AE352096	1	1:8.3	0.200	1.012	0.202	
1880.00	661	GSM 1900	GSM	31.2	31.15	0.06	Left	Tilt	AE352096	1	1:8.3	0.101	1.012	0.102	
1880.00	661	GSM 1900	GPRS	29.5	29.18	0.06	Right	Cheek	AE352096	2	1:4.15	0.285	1.076	0.307	A4
1880.00	661	GSM 1900	GPRS	29.5	29.18	0.00	Right	Tilt	AE352096	2	1:4.15	0.104	1.076	0.112	
1880.00	661	GSM 1900	GPRS	29.5	29.18	-0.17	Left	Cheek	AE352096	2	1:4.15	0.261	1.076	0.281	
1880.00	661	GSM 1900	GPRS	29.5	29.18	0.00	Left	Tilt	AE352096	2	1:4.15	0.118	1.076	0.127	
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
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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.													
1880.00	9400	UMTS 1900	RMC	24.2	23.87	0.16	Right	Cheek	AE352096	1:1	0.290	1.079	0.313	
1880.00	9400	UMTS 1900	RMC	24.2	23.87	0.08	Right	Tilt	AE352096	1:1	0.137	1.079	0.148	
1880.00	9400	UMTS 1900	RMC	24.2	23.87	0.05	Left	Cheek	AE352096	1:1	0.348	1.079	0.375	A5
1880.00	9400	UMTS 1900	RMC	24.2	23.87	-0.03	Left	Tilt	AE352096	1:1	0.175	1.079	0.189	
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 11-6
LTE Band 17 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
710.00	23790	Mid	LTE Band 17	10	23.7	23.58	0.05	0	Right	Cheek	QPSK	1	49	XV352098	1:1	0.095	1.028	0.098	
710.00	23790	Mid	LTE Band 17	10	22.7	22.49	0.03	1	Right	Cheek	QPSK	25	0	XV352098	1:1	0.029	1.050	0.030	
710.00	23790	Mid	LTE Band 17	10	23.7	23.58	0.04	0	Right	Tilt	QPSK	1	49	XV352098	1:1	0.047	1.028	0.048	
710.00	23790	Mid	LTE Band 17	10	22.7	22.49	0.21	1	Right	Tilt	QPSK	25	0	XV352098	1:1	0.013	1.050	0.014	
710.00	23790	Mid	LTE Band 17	10	23.7	23.58	-0.10	0	Left	Cheek	QPSK	1	49	XV352098	1:1	0.115	1.028	0.118	A6
710.00	23790	Mid	LTE Band 17	10	22.7	22.49	0.19	1	Left	Cheek	QPSK	25	0	XV352098	1:1	0.044	1.050	0.046	
710.00	23790	Mid	LTE Band 17	10	23.7	23.58	0.10	0	Left	Tilt	QPSK	1	49	XV352098	1:1	0.049	1.028	0.050	
710.00	23790	Mid	LTE Band 17	10	22.7	22.49	0.03	1	Left	Tilt	QPSK	25	0	XV352098	1:1	0.017	1.050	0.018	
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 4 (AWS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	0.08	0	Right	Cheek	QPSK	1	50	XV352098	1:1	0.153	1.035	0.158	A7
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.63	0.04	1	Right	Cheek	QPSK	50	50	XV352098	1:1	0.083	1.089	0.090	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	-0.06	0	Right	Tilt	QPSK	1	50	XV352098	1:1	0.074	1.035	0.077	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.63	0.02	1	Right	Tilt	QPSK	50	50	XV352098	1:1	0.052	1.089	0.057	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	0.07	0	Left	Cheek	QPSK	1	50	XV352098	1:1	0.152	1.035	0.157	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.63	-0.03	1	Left	Cheek	QPSK	50	50	XV352098	1:1	0.070	1.089	0.076	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	0.08	0	Left	Tilt	QPSK	1	50	XV352098	1:1	0.073	1.035	0.076	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.63	0.16	1	Left	Tilt	QPSK	50	50	XV352098	1:1	0.042	1.089	0.046	
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 2 (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	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1905.00	19150	High	LTE Band 2 (PCS)	10	23.7	23.69	0.00	0	Right	Cheek	QPSK	1	0	XV352098	1:1	0.260	1.002	0.261	A8
1905.00	19150	High	LTE Band 2 (PCS)	10	22.7	22.58	0.05	1	Right	Cheek	QPSK	25	0	XV352098	1:1	0.182	1.028	0.187	
1905.00	19150	High	LTE Band 2 (PCS)	10	23.7	23.69	0.21	0	Right	Tilt	QPSK	1	0	XV352098	1:1	0.090	1.002	0.090	
1905.00	19150	High	LTE Band 2 (PCS)	10	22.7	22.58	0.08	1	Right	Tilt	QPSK	25	0	XV352098	1:1	0.068	1.028	0.070	
1905.00	19150	High	LTE Band 2 (PCS)	10	23.7	23.69	0.01	0	Left	Cheek	QPSK	1	0	XV352098	1:1	0.259	1.002	0.260	
1905.00	19150	High	LTE Band 2 (PCS)	10	22.7	22.58	0.11	1	Left	Cheek	QPSK	25	0	XV352098	1:1	0.143	1.028	0.147	
1905.00	19150	High	LTE Band 2 (PCS)	10	23.7	23.69	0.10	0	Left	Tilt	QPSK	1	0	XV352098	1:1	0.087	1.002	0.087	
1905.00	19150	High	LTE Band 2 (PCS)	10	22.7	22.58	0.04	1	Left	Tilt	QPSK	25	0	XV352098	1:1	0.068	1.028	0.070	
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 11-9
DTS Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2412	1	IEEE 802.11b	DSSS	16.0	15.50	0.07	Right	Cheek	FX352099	1	1:1	0.354	1.122	**0.397**	A9
2412	1	IEEE 802.11b	DSSS	16.0	15.50	0.09	Right	Tilt	FX352099	1	1:1	0.234	1.122	0.263	
2412	1	IEEE 802.11b	DSSS	16.0	15.50	0.02	Left	Cheek	FX352099	1	1:1	0.202	1.122	0.227	
2412	1	IEEE 802.11b	DSSS	16.0	15.50	0.12	Left	Tilt	FX352099	1	1:1	0.185	1.122	0.208	
5745	149	IEEE 802.11a	OFDM	10.0	8.83	0.11	Right	Cheek	FX352099	6	1:1	0.089	1.309	0.117	A10
5775	155	IEEE 802.11ac	OFDM	9.0	7.48	0.04	Right	Cheek	FX352099	29.3	1:1	0.052	1.419	0.074	
5745	149	IEEE 802.11a	OFDM	10.0	8.83	0.03	Right	Tilt	FX352099	6	1:1	0.058	1.309	0.076	
5745	149	IEEE 802.11a	OFDM	10.0	8.83	0.03	Left	Cheek	FX352099	6	1:1	0.043	1.309	0.056	
5745	149	IEEE 802.11a	OFDM	10.0	8.83	-0.06	Left	Tilt	FX352099	6	1:1	0.046	1.309	0.060	
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
NII Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	10.0	9.72	0.04	Right	Cheek	FX352099	6	1:1	0.091	1.067	**0.097**	
5210	42	IEEE 802.11ac	OFDM	9.0	8.71	0.03	Right	Cheek	FX352099	29.3	1:1	0.053	1.069	0.057	
5180	36	IEEE 802.11a	OFDM	10.0	9.72	0.14	Right	Tilt	FX352099	6	1:1	0.064	1.067	0.068	
5180	36	IEEE 802.11a	OFDM	10.0	9.72	0.13	Left	Cheek	FX352099	6	1:1	0.036	1.067	0.038	
5180	36	IEEE 802.11a	OFDM	10.0	9.72	-0.04	Left	Tilt	FX352099	6	1:1	0.035	1.067	0.037	
5260	52	IEEE 802.11a	OFDM	10.0	9.87	0.21	Right	Cheek	FX352099	6	1:1	0.091	1.030	0.094	A11
5290	58	IEEE 802.11ac	OFDM	9.0	8.57	0.10	Right	Cheek	FX352099	29.3	1:1	0.050	1.104	0.055	
5260	52	IEEE 802.11a	OFDM	10.0	9.87	0.13	Right	Tilt	FX352099	6	1:1	0.061	1.030	0.063	
5260	52	IEEE 802.11a	OFDM	10.0	9.87	0.06	Left	Cheek	FX352099	6	1:1	0.033	1.030	0.034	
5260	52	IEEE 802.11a	OFDM	10.0	9.87	-0.19	Left	Tilt	FX352099	6	1:1	0.037	1.030	0.038	
5540	108	IEEE 802.11a	OFDM	10.0	9.53	0.17	Right	Cheek	FX352099	6	1:1	0.076	1.114	0.085	
5530	106	IEEE 802.11ac	OFDM	9.0	8.65	0.04	Right	Cheek	FX352099	29.3	1:1	0.047	1.084	0.051	
5540	108	IEEE 802.11a	OFDM	10.0	9.53	0.08	Right	Tilt	FX352099	6	1:1	0.048	1.114	0.053	
5540	108	IEEE 802.11a	OFDM	10.0	9.53	0.05	Left	Cheek	FX352099	6	1:1	0.039	1.114	0.043	
5540	108	IEEE 802.11a	OFDM	10.0	9.53	0.03	Left	Tilt	FX352099	6	1:1	0.034	1.114	0.038	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							**Head 1.6 W/kg (mW/g) averaged over 1 gram**								

11.2 Standalone Body-Worn SAR Data

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

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.2	33.17	0.00	10 mm	NY352095	1	1:8.3	back	0.521	1.007	0.525	
824.20	128	GSM 850	GPRS	31.5	31.49	-0.01	10 mm	NY352095	2	1:4.15	back	0.644	1.002	0.645	
836.60	190	GSM 850	GPRS	31.5	31.27	-0.04	10 mm	NY352095	2	1:4.15	back	0.770	1.054	0.812	A12
848.80	251	GSM 850	GPRS	31.5	31.44	0.01	10 mm	NY352095	2	1:4.15	back	0.744	1.014	0.754	
836.60	4183	UMTS 850	RMC	23.2	23.08	0.07	10 mm	NY352095	N/A	1:1	back	0.406	1.028	0.417	A13
1712.40	1312	UMTS 1750	RMC	24.2	24.04	0.02	10 mm	AE352096	N/A	1:1	back	0.896	1.038	0.930	
1732.40	1412	UMTS 1750	RMC	24.2	24.01	0.03	10 mm	AE352096	N/A	1:1	back	0.964	1.045	1.007	A14
1752.50	1862	UMTS 1750	RMC	24.2	23.93	-0.07	10 mm	AE352096	N/A	1:1	back	0.934	1.064	0.994	
1880.00	661	GSM 1900	GSM	31.2	31.15	0.08	10 mm	AE352096	1	1:8.3	back	0.374	1.012	0.378	
1880.00	661	GSM 1900	GPRS	29.5	29.18	-0.03	10 mm	AE352096	2	1:4.15	back	0.511	1.076	0.550	A15
1880.00	9400	UMTS 1900	RMC	24.2	23.87	-0.03	10 mm	AE352096	N/A	1:1	back	0.615	1.079	0.664	A16
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 11-12
LTE Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
710.00	23790	Mid	LTE Band 17	10	23.7	23.58	0.02	0	XV352098	QPSK	1	49	10 mm	back	1:1	0.207	1.028	0.213	A18
710.00	23790	Mid	LTE Band 17	10	22.7	22.49	0.10	1	XV352098	QPSK	25	0	10 mm	back	1:1	0.088	1.050	0.092	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	0.00	0	XV352098	QPSK	1	50	10 mm	back	1:1	0.976	1.035	**1.010**	A19
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.63	0.00	1	XV352098	QPSK	50	50	10 mm	back	1:1	0.609	1.089	0.663	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.51	0.00	1	XV352098	QPSK	100	0	10 mm	back	1:1	0.721	1.119	0.807	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	0.02	0	XV352098	QPSK	1	50	10 mm	back	1:1	0.860	1.035	0.890	
1905.00	19150	High	LTE Band 2 (PCS)	10	23.7	23.69	-0.09	0	WQ352097	QPSK	1	0	10 mm	back	1:1	0.712	1.002	0.713	A20
1905.00	19150	High	LTE Band 2 (PCS)	10	22.7	22.58	-0.01	1	WQ352097	QPSK	25	0	10 mm	back	1:1	0.667	1.028	0.686	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram										

Note: Blue entry represents variability test data.

Table 11-13
DTS Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2412	1	IEEE 802.11b	DSSS	16.0	15.50	0.03	10 mm	FX352099	1	back	1:1	0.089	1.122	0.100	A22
5745	149	IEEE 802.11a	OFDM	10.0	8.83	-0.19	10 mm	JP352100	6	back	1:1	0.127	1.309	**0.166**	A23
5775	155	IEEE 802.11ac	OFDM	9.0	7.48	0.17	10 mm	JP352100	29.3	back	1:1	0.067	1.419	0.095	
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 11-14
NII Body-Worn SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	10.0	9.72	0.02	10 mm	JP352100	6	back	1:1	0.094	1.067	0.100	
5210	42	IEEE 802.11ac	OFDM	9.0	8.71	-0.03	10 mm	JP352100	29.3	back	1:1	0.058	1.069	0.062	
5260	52	IEEE 802.11a	OFDM	10.0	9.87	-0.09	10 mm	JP352100	6	back	1:1	0.099	1.030	0.102	
5290	58	IEEE 802.11ac	OFDM	9.0	8.57	0.03	10 mm	JP352100	29.3	back	1:1	0.062	1.104	0.068	
5540	108	IEEE 802.11a	OFDM	10.0	9.53	0.04	10 mm	JP352100	6	back	1:1	0.124	1.114	**0.138**	A24
5530	106	IEEE 802.11ac	OFDM	9.0	8.65	0.07	10 mm	JP352100	29.3	back	1:1	0.088	1.084	0.095	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							**Body 1.6 W/kg (mW/g) averaged over 1 gram**								

11.3 Standalone Wireless Router SAR Data

Table 11-15
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
824.20	128	GSM 850	GPRS	31.5	31.49	-0.01	10 mm	NY352095	2	1:4.15	back	0.644	1.002	0.645	
836.60	190	GSM 850	GPRS	31.5	31.27	-0.04	10 mm	NY352095	2	1:4.15	back	0.770	1.054	0.812	A12
848.80	251	GSM 850	GPRS	31.5	31.44	0.01	10 mm	NY352095	2	1:4.15	back	0.744	1.014	0.754	
836.60	190	GSM 850	GPRS	31.5	31.27	0.03	10 mm	NY352095	2	1:4.15	front	0.519	1.054	0.547	
836.60	190	GSM 850	GPRS	31.5	31.27	0.06	10 mm	NY352095	2	1:4.15	bottom	0.248	1.054	0.261	
836.60	190	GSM 850	GPRS	31.5	31.27	0.02	10 mm	NY352095	2	1:4.15	right	0.686	1.054	0.723	
836.60	4183	UMTS 850	RMC	23.2	23.08	0.07	10 mm	NY352095	N/A	1:1	back	0.406	1.028	0.417	A13
836.60	4183	UMTS 850	RMC	23.2	23.08	0.00	10 mm	NY352095	N/A	1:1	front	0.272	1.028	0.280	
836.60	4183	UMTS 850	RMC	23.2	23.08	0.01	10 mm	NY352095	N/A	1:1	bottom	0.146	1.028	0.150	
836.60	4183	UMTS 850	RMC	23.2	23.08	-0.04	10 mm	NY352095	N/A	1:1	right	0.374	1.028	0.384	
1712.40	1312	UMTS 1750	RMC	24.2	24.04	0.02	10 mm	AE352096	N/A	1:1	back	0.896	1.038	0.930	
1732.40	1412	UMTS 1750	RMC	24.2	24.01	0.03	10 mm	AE352096	N/A	1:1	back	0.964	1.045	**1.007**	A14
1752.50	1862	UMTS 1750	RMC	24.2	23.93	-0.07	10 mm	AE352096	N/A	1:1	back	0.934	1.064	0.994	
1732.40	1412	UMTS 1750	RMC	24.2	24.01	0.05	10 mm	AE352096	N/A	1:1	front	0.588	1.045	0.614	
1732.40	1412	UMTS 1750	RMC	24.2	24.01	0.00	10 mm	AE352096	N/A	1:1	bottom	0.598	1.045	0.625	
1732.40	1412	UMTS 1750	RMC	24.2	24.01	0.02	10 mm	AE352096	N/A	1:1	left	0.525	1.045	0.549	
1880.00	661	GSM 1900	GPRS	29.5	29.18	-0.03	10 mm	AE352096	2	1:4.15	back	0.511	1.076	0.550	A15
1880.00	661	GSM 1900	GPRS	29.5	29.18	0.04	10 mm	AE352096	2	1:4.15	front	0.474	1.076	0.510	
1880.00	661	GSM 1900	GPRS	29.5	29.18	-0.04	10 mm	AE352096	2	1:4.15	bottom	0.471	1.076	0.507	
1880.00	661	GSM 1900	GPRS	29.5	29.18	0.03	10 mm	AE352096	2	1:4.15	right	0.242	1.076	0.260	
1880.00	9400	UMTS 1900	RMC	24.2	23.87	-0.03	10 mm	AE352096	N/A	1:1	back	0.615	1.079	0.664	
1880.00	9400	UMTS 1900	RMC	24.2	23.87	-0.04	10 mm	AE352096	N/A	1:1	front	0.602	1.079	0.650	
1880.00	9400	UMTS 1900	RMC	24.2	23.87	0.05	10 mm	AE352096	N/A	1:1	bottom	0.654	1.079	0.706	A17
1880.00	9400	UMTS 1900	RMC	24.2	23.87	-0.01	10 mm	AE352096	N/A	1:1	right	0.303	1.079	0.327	
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 11-16
LTE Band 17 Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
710.00	23790	Mid	LTE Band 17	10	23.7	23.58	0.02	0	XV352098	QPSK	1	49	10 mm	back	1:1	0.207	1.028	0.213	A18
710.00	23790	Mid	LTE Band 17	10	22.7	22.49	0.10	1	XV352098	QPSK	25	0	10 mm	back	1:1	0.088	1.050	0.092	
710.00	23790	Mid	LTE Band 17	10	23.7	23.58	-0.02	0	XV352098	QPSK	1	49	10 mm	front	1:1	0.195	1.028	0.200	
710.00	23790	Mid	LTE Band 17	10	22.7	22.49	0.08	1	XV352098	QPSK	25	0	10 mm	front	1:1	0.041	1.050	0.043	
710.00	23790	Mid	LTE Band 17	10	23.7	23.58	0.02	0	XV352098	QPSK	1	49	10 mm	bottom	1:1	0.089	1.028	0.091	
710.00	23790	Mid	LTE Band 17	10	22.7	22.49	0.05	1	XV352098	QPSK	25	0	10 mm	bottom	1:1	0.040	1.050	0.042	
710.00	23790	Mid	LTE Band 17	10	23.7	23.58	-0.02	0	XV352098	QPSK	1	49	10 mm	left	1:1	0.203	1.028	0.209	
710.00	23790	Mid	LTE Band 17	10	22.7	22.49	0.04	1	XV352098	QPSK	25	0	10 mm	left	1:1	0.089	1.050	0.093	
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 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	0.00	0	XV352098	QPSK	1	50	10 mm	back	1:1	0.976	1.035	**1.010**	A19
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.63	0.00	1	XV352098	QPSK	50	50	10 mm	back	1:1	0.609	1.089	0.663	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.51	0.00	1	XV352098	QPSK	100	0	10 mm	back	1:1	0.721	1.119	0.807	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	0.03	0	XV352098	QPSK	1	50	10 mm	front	1:1	0.402	1.035	0.416	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.63	-0.12	1	XV352098	QPSK	50	50	10 mm	front	1:1	0.290	1.089	0.316	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	0.01	0	XV352098	QPSK	1	50	10 mm	bottom	1:1	0.653	1.035	0.676	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.63	-0.05	1	XV352098	QPSK	50	50	10 mm	bottom	1:1	0.396	1.089	0.431	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	-0.02	0	XV352098	QPSK	1	50	10 mm	left	1:1	0.529	1.035	0.548	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.63	0.03	1	XV352098	QPSK	50	50	10 mm	left	1:1	0.268	1.089	0.292	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.85	0.02	0	XV352098	QPSK	1	50	10 mm	back	1:1	0.860	1.035	0.890	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram						

Note: Blue entry represents variability test data.

Table 11-18
LTE Band 2 (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	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1905.00	19150	High	LTE Band 2 (PCS)	10	23.7	23.69	-0.09	0	WQ352097	QPSK	1	0	10 mm	back	1:1	0.712	1.002	0.713	
1905.00	19150	High	LTE Band 2 (PCS)	10	22.7	22.58	-0.01	1	WQ352097	QPSK	25	0	10 mm	back	1:1	0.667	1.028	0.686	
1905.00	19150	High	LTE Band 2 (PCS)	10	23.7	23.69	0.04	0	WQ352097	QPSK	1	0	10 mm	front	1:1	0.601	1.002	0.602	
1905.00	19150	High	LTE Band 2 (PCS)	10	22.7	22.58	0.00	1	WQ352097	QPSK	25	0	10 mm	front	1:1	0.460	1.028	0.473	
1905.00	19150	High	LTE Band 2 (PCS)	10	23.7	23.69	-0.16	0	WQ352097	QPSK	1	0	10 mm	bottom	1:1	0.758	1.002	0.760	A21
1905.00	19150	High	LTE Band 2 (PCS)	10	22.7	22.58	-0.09	1	WQ352097	QPSK	25	0	10 mm	bottom	1:1	0.655	1.028	0.673	
1905.00	19150	High	LTE Band 2 (PCS)	10	23.7	23.69	0.01	0	WQ352097	QPSK	1	0	10 mm	right	1:1	0.265	1.002	0.266	
1905.00	19150	High	LTE Band 2 (PCS)	10	22.7	22.58	0.08	1	WQ352097	QPSK	25	0	10 mm	right	1:1	0.176	1.028	0.181	
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 11-19
WLAN Wireless Router SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
2412	1	IEEE 802.11b	DSSS	16.0	15.50	0.03	10 mm	FX352099	1	back	1:1	0.089	1.122	0.100	A22
2412	1	IEEE 802.11b	DSSS	16.0	15.50	-0.01	10 mm	FX352099	1	front	1:1	0.067	1.122	0.075	
2412	1	IEEE 802.11b	DSSS	16.0	15.50	-0.05	10 mm	FX352099	1	top	1:1	0.070	1.122	0.079	
2412	1	IEEE 802.11b	DSSS	16.0	15.50	0.04	10 mm	FX352099	1	left	1:1	0.048	1.122	0.054	
5745	149	IEEE 802.11a	OFDM	10.0	8.83	-0.19	10 mm	JP352100	6	back	1:1	0.127	1.309	**0.166**	A23
5775	155	IEEE 802.11ac	OFDM	9.0	7.48	0.17	10 mm	JP352100	29.3	back	1:1	0.067	1.419	0.095	
5745	149	IEEE 802.11a	OFDM	10.0	8.83	0.04	10 mm	JP352100	6	front	1:1	0.012	1.309	0.016	
5745	149	IEEE 802.11a	OFDM	10.0	8.83	0.00	10 mm	JP352100	6	top	1:1	0.046	1.309	0.060	
5745	149	IEEE 802.11a	OFDM	10.0	8.83	-0.05	10 mm	JP352100	6	left	1:1	0.104	1.309	0.136	
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 1528-2003, FCC/OET Bulletin 65, Supplement C [June 2001] and FCC KDB Publication 447498 D01v05r01.
2. Liquid tissue depth was at least 15.0 cm for all frequencies.
3. 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.
4. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05r01.
5. 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.
6. Per FCC KDB Publication 648474 D04v01r01, 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 SAR evaluations using a headset cable were required.
7. Per FCC KDB 865664 D01v01r01, variability SAR tests were performed when the measured SAR results for a frequency band were greater than 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
8. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v01r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.6 for more details).

GSM/GPRS Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. This device supports GSM VOIP in the head and body-worn configurations; therefore GPRS was additionally evaluated for head and body-worn compliance.
3. Justification for reduced test configurations per KDB Publication 941225 D03v01: The source-based time-averaged output power was evaluated for all multi-slot operations. The multi-slot configuration with the highest frame averaged output power was evaluated for SAR.
4. Per FCC KDB Publication 447498 D01v05r01, since 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). Since the maximum output power variation across the required test channels was ≤ ½ dB, middle channel was the default channel used.

UMTS Notes:

1. UMTS mode in Body SAR was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. Per FCC KDB Publication 447498 D01v05r01, when 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). Since the maximum output power variation across the required test channels was ≤ ½ dB, middle channel was the default channel used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r01. The general test procedures used for testing can be found in Section 8.4.4.
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.

WLAN Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 2.4 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 5 GHz WIFI: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz bandwidths) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
3. Per April 2013 TCB Workshop notes, full SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a configuration in each 5 GHz band and exposure condition.
4. When wireless router is enabled, all 5GHz bands are disabled. Therefore no 5GHz WIFI wireless router SAR was required.
5. This device can operate in the 2.4 GHz and 5.8 GHz bands using WIFI Direct GO capability. The manufacturer expects 5.8 GHz Wifi Direct GO may be used similar to wireless router usage. Therefore, 5.8 GHz Wifi Direct GO was evaluated for SAR similar to wireless router SAR procedures in FCC KDB Publication 941225.
6. WIFI transmission was verified using an uncalibrated spectrum analyzer.
7. Since the maximum extrapolated peak SAR of the zoom scan for the maximum output channel was <1.6 W/kg and the reported 1g averaged SAR was <0.8 W/kg, SAR testing on other default channels was not required.

12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05r01 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n/ac and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

12.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05r01 IV.C.1.iii, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05r01 4.3.2 2), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

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

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2441	10.00	10	**0.208**

Note: Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission. Per KDB Publication 447498 D01v05r01, the maximum power of the channel was rounded to the nearest mW before calculation.

12.3 Head SAR Simultaneous Transmission Analysis

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

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.237	0.397	0.634	Head SAR	Right Cheek	0.395	0.397	0.792
	Right Tilt	0.136	0.263	0.399		Right Tilt	0.235	0.263	0.498
	Left Cheek	0.192	0.227	0.419		Left Cheek	0.327	0.227	0.554
	Left Tilt	0.125	0.208	0.333		Left Tilt	0.217	0.208	0.425
Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.220	0.397	0.617	Head SAR	Right Cheek	0.294	0.397	0.691
	Right Tilt	0.133	0.263	0.396		Right Tilt	0.185	0.263	0.448
	Left Cheek	0.175	0.227	0.402		Left Cheek	0.302	0.227	0.529
	Left Tilt	0.113	0.208	0.321		Left Tilt	0.167	0.208	0.375
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.227	0.397	0.624	Head SAR	Right Cheek	0.307	0.397	0.704
	Right Tilt	0.087	0.263	0.350		Right Tilt	0.112	0.263	0.375
	Left Cheek	0.202	0.227	0.429		Left Cheek	0.281	0.227	0.508
	Left Tilt	0.102	0.208	0.310		Left Tilt	0.127	0.208	0.335
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.313	0.397	0.710	Head SAR	Right Cheek	0.098	0.397	0.495
	Right Tilt	0.148	0.263	0.411		Right Tilt	0.048	0.263	0.311
	Left Cheek	0.375	0.227	0.602		Left Cheek	0.118	0.227	0.345
	Left Tilt	0.189	0.208	0.397		Left Tilt	0.050	0.208	0.258
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.158	0.397	0.555	Head SAR	Right Cheek	0.261	0.397	0.658
	Right Tilt	0.077	0.263	0.340		Right Tilt	0.090	0.263	0.353
	Left Cheek	0.157	0.227	0.384		Left Cheek	0.260	0.227	0.487
	Left Tilt	0.076	0.208	0.284		Left Tilt	0.087	0.208	0.295

Table 12-3
Simultaneous Transmission Scenario with 5 GHz WLAN (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.237	0.117	0.354	Head SAR	Right Cheek	0.395	0.117	0.512
	Right Tilt	0.136	0.076	0.212		Right Tilt	0.235	0.076	0.311
	Left Cheek	0.192	0.056	0.248		Left Cheek	0.327	0.056	0.383
	Left Tilt	0.125	0.060	0.185		Left Tilt	0.217	0.060	0.277
Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.220	0.117	0.337	Head SAR	Right Cheek	0.294	0.117	0.411
	Right Tilt	0.133	0.076	0.209		Right Tilt	0.185	0.076	0.261
	Left Cheek	0.175	0.056	0.231		Left Cheek	0.302	0.056	0.358
	Left Tilt	0.113	0.060	0.173		Left Tilt	0.167	0.060	0.227
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.227	0.117	0.344	Head SAR	Right Cheek	0.307	0.117	0.424
	Right Tilt	0.087	0.076	0.163		Right Tilt	0.112	0.076	0.188
	Left Cheek	0.202	0.056	0.258		Left Cheek	0.281	0.056	0.337
	Left Tilt	0.102	0.060	0.162		Left Tilt	0.127	0.060	0.187
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.313	0.117	0.430	Head SAR	Right Cheek	0.098	0.117	0.215
	Right Tilt	0.148	0.076	0.224		Right Tilt	0.048	0.076	0.124
	Left Cheek	0.375	0.056	0.431		Left Cheek	0.118	0.056	0.174
	Left Tilt	0.189	0.060	0.249		Left Tilt	0.050	0.060	0.110
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.158	0.117	0.275	Head SAR	Right Cheek	0.261	0.117	0.378
	Right Tilt	0.077	0.076	0.153		Right Tilt	0.090	0.076	0.166
	Left Cheek	0.157	0.056	0.213		Left Cheek	0.260	0.056	0.316
	Left Tilt	0.076	0.060	0.136		Left Tilt	0.087	0.060	0.147

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

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 10 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.525	0.100	0.625
Back Side	UMTS 850	0.417	0.100	0.517
Back Side	UMTS 1750	1.007	0.100	1.107
Back Side	GSM 1900	0.378	0.100	0.478
Back Side	UMTS 1900	0.664	0.100	0.764
Back Side	GPRS 850	0.812	0.100	0.912
Back Side	GPRS 1900	0.550	0.100	0.650
Back Side	LTE Band 17	0.213	0.100	0.313
Back Side	LTE Band 4 (AWS)	1.010	0.100	1.110
Back Side	LTE Band 2 (PCS)	0.713	0.100	0.813

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

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.525	0.166	0.691
Back Side	UMTS 850	0.417	0.166	0.583
Back Side	UMTS 1750	1.007	0.166	1.173
Back Side	GSM 1900	0.378	0.166	0.544
Back Side	UMTS 1900	0.664	0.166	0.830
Back Side	GPRS 850	0.812	0.166	0.978
Back Side	GPRS 1900	0.550	0.166	0.716
Back Side	LTE Band 17	0.213	0.166	0.379
Back Side	LTE Band 4 (AWS)	1.010	0.166	1.176
Back Side	LTE Band 2 (PCS)	0.713	0.166	0.879

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

Table 12-6
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 10 mm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.525	0.208	0.733
Back Side	UMTS 850	0.417	0.208	0.625
Back Side	UMTS 1750	1.007	0.208	1.215
Back Side	GSM 1900	0.378	0.208	0.586
Back Side	UMTS 1900	0.664	0.208	0.872
Back Side	GPRS 850	0.812	0.208	1.020
Back Side	GPRS 1900	0.550	0.208	0.758
Back Side	LTE Band 17	0.213	0.208	0.421
Back Side	LTE Band 4 (AWS)	1.010	0.208	**1.218**
Back Side	LTE Band 2 (PCS)	0.713	0.208	0.921

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.

12.5 WIFI Direct SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06v01r01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR ("-").

Table 12-7
Simultaneous Transmission Scenario (2.4 GHz Hotspot at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.812	0.100	0.912	Body SAR	Back	0.417	0.100	0.517
	Front	0.547	0.075	0.622		Front	0.280	0.075	0.355
	Top	-	0.079	0.079		Top	-	0.079	0.079
	Bottom	0.261	-	0.261		Bottom	0.150	-	0.150
	Right	0.723	-	0.723		Right	0.384	-	0.384
	Left	-	0.054	0.054		Left	-	0.054	0.054
Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.007	0.100	1.107	Body SAR	Back	0.550	0.100	0.650
	Front	0.614	0.075	0.689		Front	0.510	0.075	0.585
	Top	-	0.079	0.079		Top	-	0.079	0.079
	Bottom	0.625	-	0.625		Bottom	0.507	-	0.507
	Right	-	-	0.000		Right	0.260	-	0.260
	Left	0.549	0.054	0.603		Left	-	0.054	0.054
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.664	0.100	0.764	Body SAR	Back	0.213	0.100	0.313
	Front	0.650	0.075	0.725		Front	0.200	0.075	0.275
	Top	-	0.079	0.079		Top	-	0.079	0.079
	Bottom	0.706	-	0.706		Bottom	0.091	-	0.091
	Right	0.327	-	0.327		Right	-	-	0.000
	Left	-	0.054	0.054		Left	0.209	0.054	0.263
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.010	0.100	1.110	Body SAR	Back	0.713	0.100	0.813
	Front	0.416	0.075	0.491		Front	0.602	0.075	0.677
	Top	-	0.079	0.079		Top	-	0.079	0.079
	Bottom	0.676	-	0.676		Bottom	0.760	-	0.760
	Right	-	-	0.000		Right	0.266	-	0.266
	Left	0.548	0.054	0.602		Left	-	0.054	0.054

Table 12-8
Simultaneous Transmission Scenario (5 GHz WIFI Direct at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.812	0.166	0.978	Body SAR	Back	0.417	0.166	0.583
	Front	0.547	0.016	0.563		Front	0.280	0.016	0.296
	Top	-	0.060	0.060		Top	-	0.060	0.060
	Bottom	0.261	-	0.261		Bottom	0.150	-	0.150
	Right	0.723	-	0.723		Right	0.384	-	0.384
	Left	-	0.136	0.136		Left	-	0.136	0.136
Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.007	0.166	1.173	Body SAR	Back	0.550	0.166	0.716
	Front	0.614	0.016	0.630		Front	0.510	0.016	0.526
	Top	-	0.060	0.060		Top	-	0.060	0.060
	Bottom	0.625	-	0.625		Bottom	0.507	-	0.507
	Right	-	-	0.000		Right	0.260	-	0.260
	Left	0.549	0.136	0.685		Left	-	0.136	0.136
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 17 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.664	0.166	0.830	Body SAR	Back	0.213	0.166	0.379
	Front	0.650	0.016	0.666		Front	0.200	0.016	0.216
	Top	-	0.060	0.060		Top	-	0.060	0.060
	Bottom	0.706	-	0.706		Bottom	0.091	-	0.091
	Right	0.327	-	0.327		Right	-	-	0.000
	Left	-	0.136	0.136		Left	0.209	0.136	0.345
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	1.010	0.166	1.176	Body SAR	Back	0.713	0.166	0.879
	Front	0.416	0.016	0.432		Front	0.602	0.016	0.618
	Top	-	0.060	0.060		Top	-	0.060	0.060
	Bottom	0.676	-	0.676		Bottom	0.760	-	0.760
	Right	-	-	0.000		Right	0.266	-	0.266
	Left	0.548	0.136	0.684		Left	-	0.136	0.136

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 D01v05r01.

13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r01, 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	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)	
1750	1732.50	20175	LTE Band 4 (AWS)	QPSK, 1 RB, 50 RB Offset	back	10 mm	0.976	0.860	1.13	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 D01v01r01, the extended measurement uncertainty analysis per IEEE 1528-2003 was not required.

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/16/2013	Annual	4/16/2014	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	4/16/2013	Annual	4/16/2014	JP38020182
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/17/2013	Annual	4/17/2014	3629U00687
Agilent	85070C	Dielectric Probe Kit	2/14/2013	Annual	2/14/2014	MY44300633
Agilent	N9020N	MXA Signal Analyzer	10/9/2012	Annual	10/9/2013	US46470561
Agilent	85047A	S-Parameter Test Set	N/A	N/A	N/A	2904A00579
Agilent	E5515C	Wireless Communications Test Set	10/18/2012	Biennial	10/18/2014	GB43193563
Amplifier Research	5S1G4	5W, 800MHz-4.2GHz	CBT	N/A	CBT	21910
Anritsu	ML2438A	Power Meter	2/14/2013	Annual	2/14/2014	1190013
Anritsu	ML2438A	Power Meter	2/14/2013	Annual	2/14/2014	98150041
Anritsu	ML2495A	Power Meter	10/11/2012	Annual	10/11/2013	1039008
Anritsu	MA2481A	Power Sensor	2/14/2013	Annual	2/14/2014	5318
Anritsu	MA2481A	Power Sensor	2/14/2013	Annual	2/14/2014	5821
Anritsu	MA2481B	Power Sensor	12/5/2012	Annual	12/5/2013	1126066
Anritsu	MA2411B	Pulse Power Sensor	12/4/2012	Annual	12/4/2013	1207364
Anritsu	MA2411B	Pulse Power Sensor	12/5/2012	Annual	12/5/2013	1126066
Anritsu	MT8820C	Radio Communication Analyzer	11/6/2012	Annual	11/6/2013	6200901190
Anritsu	MA24106A	USB Power Sensor	12/7/2012	Annual	12/7/2013	1244515
Anritsu	MA24106A	USB Power Sensor	12/7/2012	Annual	12/7/2013	1244512
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M1S5A00-009
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/10/2012	Annual	10/10/2013	1833460
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
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
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	5/3/2013	Annual	5/3/2014	836371/0079
Rohde & Schwarz	CMW500	LTE Radio Communication Tester	9/26/2012	Annual	9/26/2013	108798
Rohde & Schwarz	NRV-Z32	Peak Power Sensor	10/12/2012	Biennial	10/12/2014	836019/013
Rohde & Schwarz	SME06	Signal Generator	10/11/2012	Annual	10/11/2013	832026
Rohde & Schwarz	SMIQ03B	Signal Generator	4/17/2013	Annual	4/17/2014	DE27259
Seekonk	NC-100	Torque Wrench (8" lb)	11/29/2011	Triennial	11/29/2014	21053
SPEAG	D1750V2	1750 MHz SAR Dipole	4/30/2013	Annual	4/30/2014	1051
SPEAG	D1900V2	1900 MHz SAR Dipole	7/20/2012	Annual	7/20/2013	5d080
SPEAG	D1900V2	1900 MHz SAR Dipole	2/6/2013	Annual	2/6/2014	5d148
SPEAG	D2450V2	2450 MHz SAR Dipole	8/23/2012	Annual	8/23/2013	719
SPEAG	D2450V2	2450 MHz SAR Dipole	1/8/2013	Annual	1/8/2014	797
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/11/2013	Annual	1/11/2014	1057
SPEAG	D5GHzV2	5 GHz SAR Dipole	2/14/2013	Annual	2/14/2014	1120
SPEAG	D750V3	750 MHz Dipole	1/7/2013	Annual	1/7/2014	1003
SPEAG	D750V3	750 MHz Dipole	3/18/2013	Annual	3/18/2014	1054
SPEAG	D835V2	835 MHz SAR Dipole	1/7/2013	Annual	1/7/2014	4d132
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/24/2012	Annual	8/24/2013	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/19/2012	Annual	9/19/2013	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/13/2012	Annual	11/13/2013	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/17/2013	Annual	1/17/2014	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/6/2013	Annual	2/6/2014	649
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/8/2013	Annual	3/8/2014	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	12/11/2012	Annual	12/11/2013	1091
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/14/2013	Annual	5/14/2014	1070
SPEAG	ES3DV2	SAR Probe	8/28/2012	Annual	8/28/2013	3022
SPEAG	ES3DV3	SAR Probe	9/20/2012	Annual	9/20/2013	3288
SPEAG	ES3DV3	SAR Probe	11/15/2012	Annual	11/15/2013	3287
SPEAG	EX3DV4	SAR Probe	1/17/2013	Annual	1/17/2014	3589
SPEAG	EX3DV4	SAR Probe	2/27/2013	Annual	2/27/2014	3920
SPEAG	ES3DV3	SAR Probe	3/15/2013	Annual	3/15/2014	3209
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/17/2013	Annual	4/17/2014	B010177
VWR	23226-658	Long Stem Thermometer	3/30/2012	Biennial	3/30/2014	122179874
VWR	62344-925	Mini-Thermometer	10/24/2011	Biennial	10/24/2013	111886414
VWR	36934-158	Wall-Mounted Thermometer	9/30/2011	Biennial	9/30/2013	111859323

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.
- All calibrated equipments were used during their calibration periods.

15 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

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

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

Applicable for frequencies up to 6 GHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	**IEEE 1528 Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i 1gm**	**c_i 10 gms**	**1gm u_i (± %)**	**10gms u_i (± %)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	6.55	N	1	1.0	1.0	6.6	6.6	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)			RSS				12.4	12.0	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.7	24.0	

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

16 CONCLUSION

16.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFD801; Type: Portable Handset; Serial: NY352095

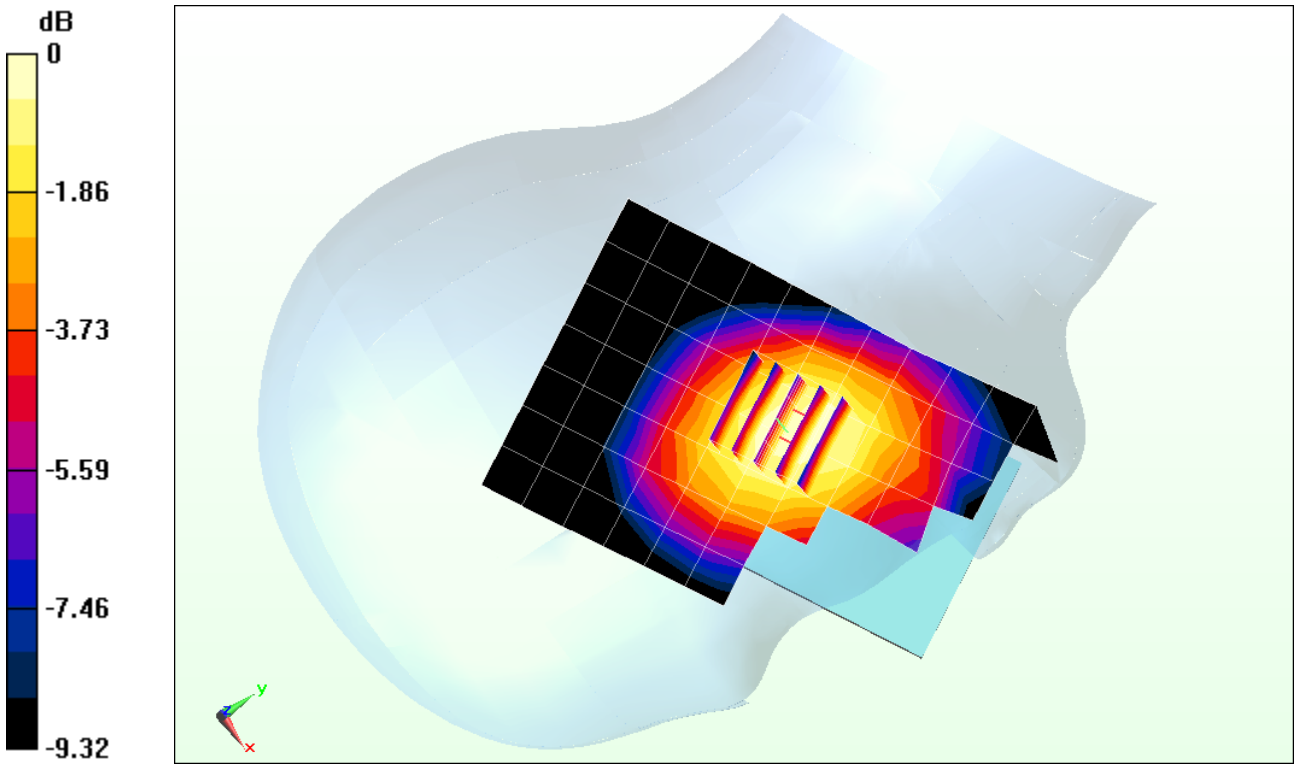
Communication System: GSM GPRS; 2 Tx slots; Frequency: 836.6 MHz;Duty Cycle: 1:4.15
Medium: 835 Head; Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.929$ S/m; $\varepsilon_r = 40.852$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 06-25-2013; Ambient Temp: 24.6°C; Tissue Temp: 23.8°C

Probe: ES3DV3 - SN3288; ConvF(6.41, 6.41, 6.41); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: GPRS 850, Right Head, Cheek, Mid.ch, 2 Tx slots

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.527 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.481 W/kg
SAR(1 g) = 0.375 W/kg



0 dB = 0.393 W/kg = -4.06 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFD801; Type: Portable Handset; Serial: NY352095

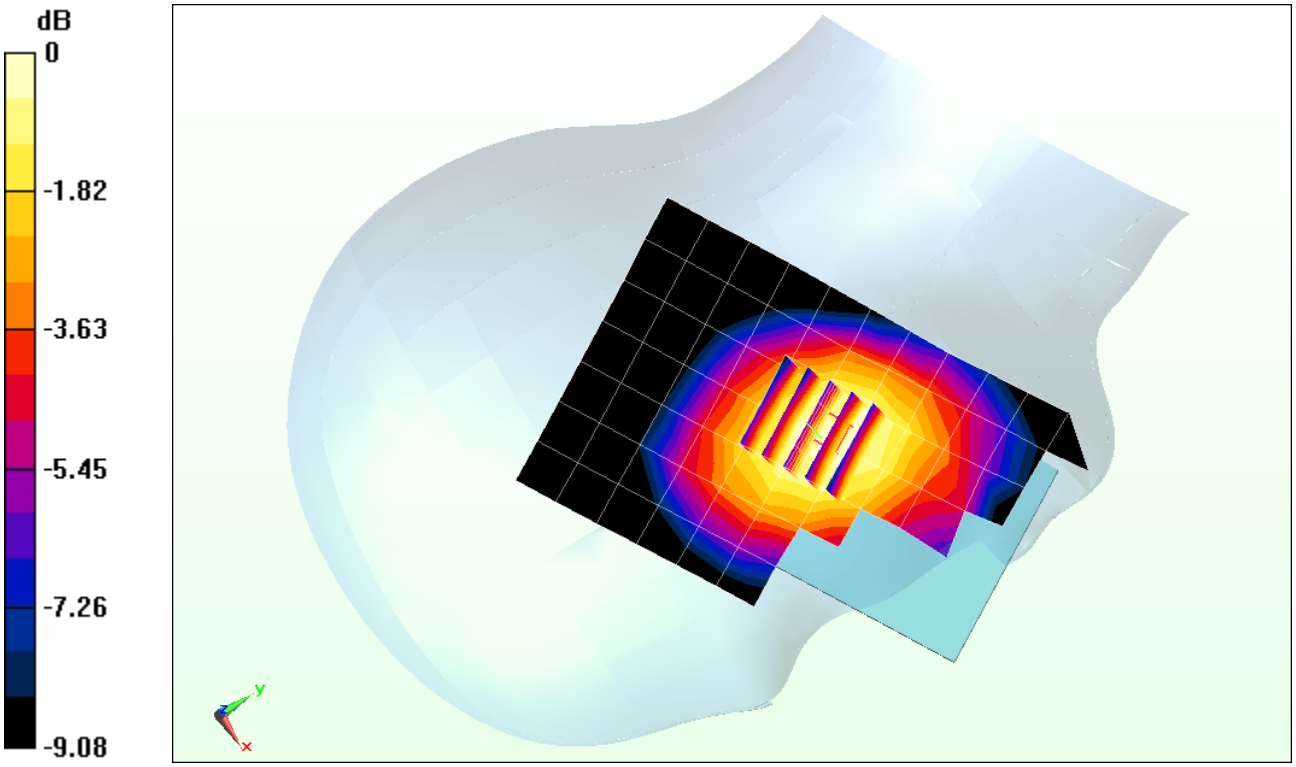
Communication System: UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head; Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.929 S/m; ε_r = 40.852; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 06-25-2013; Ambient Temp: 24.6°C; Tissue Temp: 23.8°C

Probe: ES3DV3 - SN3288; ConvF(6.41, 6.41, 6.41); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.349 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.270 W/kg
SAR(1 g) = 0.214 W/kg



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

DUT: ZNFD801; Type: Portable Handset; Serial: AE352096

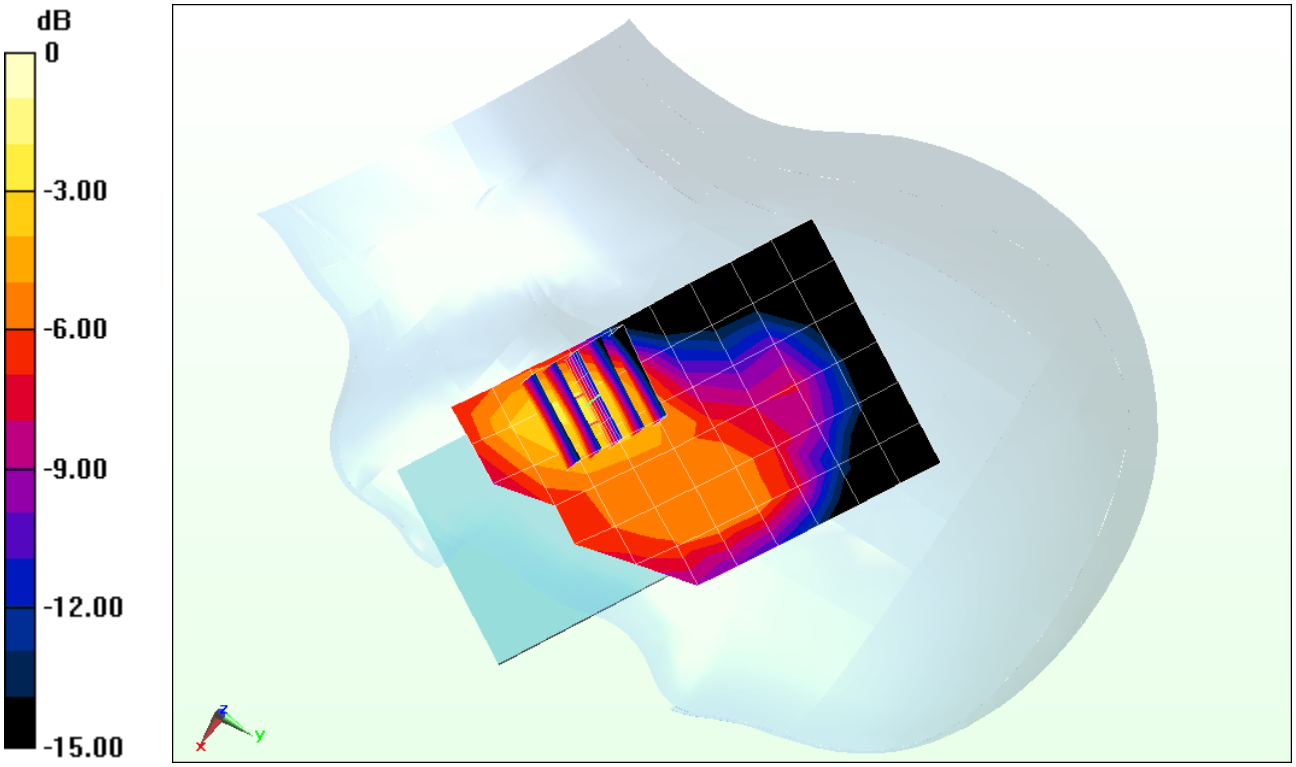
Communication System: UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Head; Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.39 S/m; ε_r = 38.886; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 07-01-2013; Ambient Temp: 23.8°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3288; ConvF(5.51, 5.51, 5.51); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.276 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.441 W/kg
SAR(1 g) = 0.289 W/kg



0 dB = 0.515 W/kg = -2.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFD801; Type: Portable Handset; Serial: AE352096

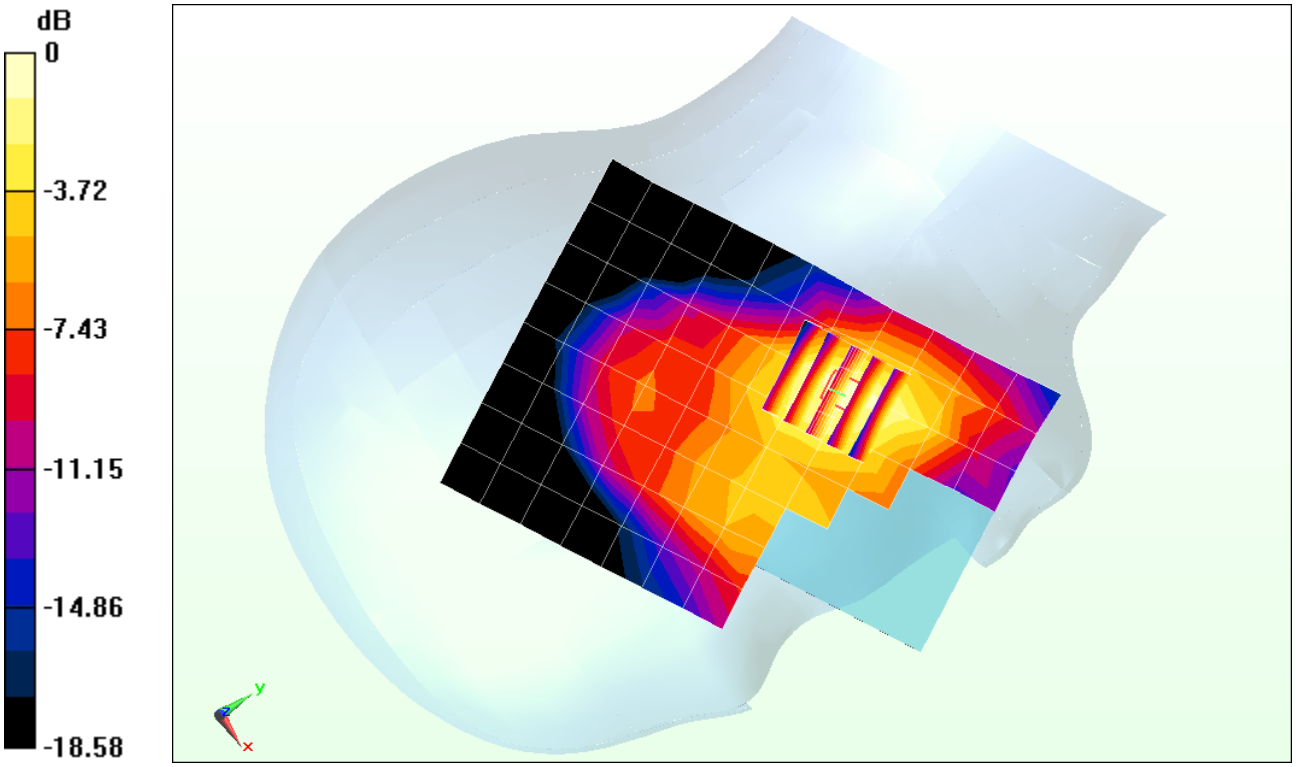
Communication System: GSM GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15
Medium: 1900 Head; Medium parameters used:
f = 1880 MHz; σ = 1.371 S/m; ε_r = 40.056; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 07-01-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(5.21, 5.21, 5.21); Calibrated: 3/15/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/8/2013
Phantom: SAM Right; Type: QD000P40CD; Serial: 1686
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: GPRS 1900, Right Head, Cheek, Mid.ch, 2 Tx slots

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.916 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.440 W/kg
SAR(1 g) = 0.285 W/kg



0 dB = 0.313 W/kg = -5.04 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFD801; Type: Portable Handset; Serial: AE352096

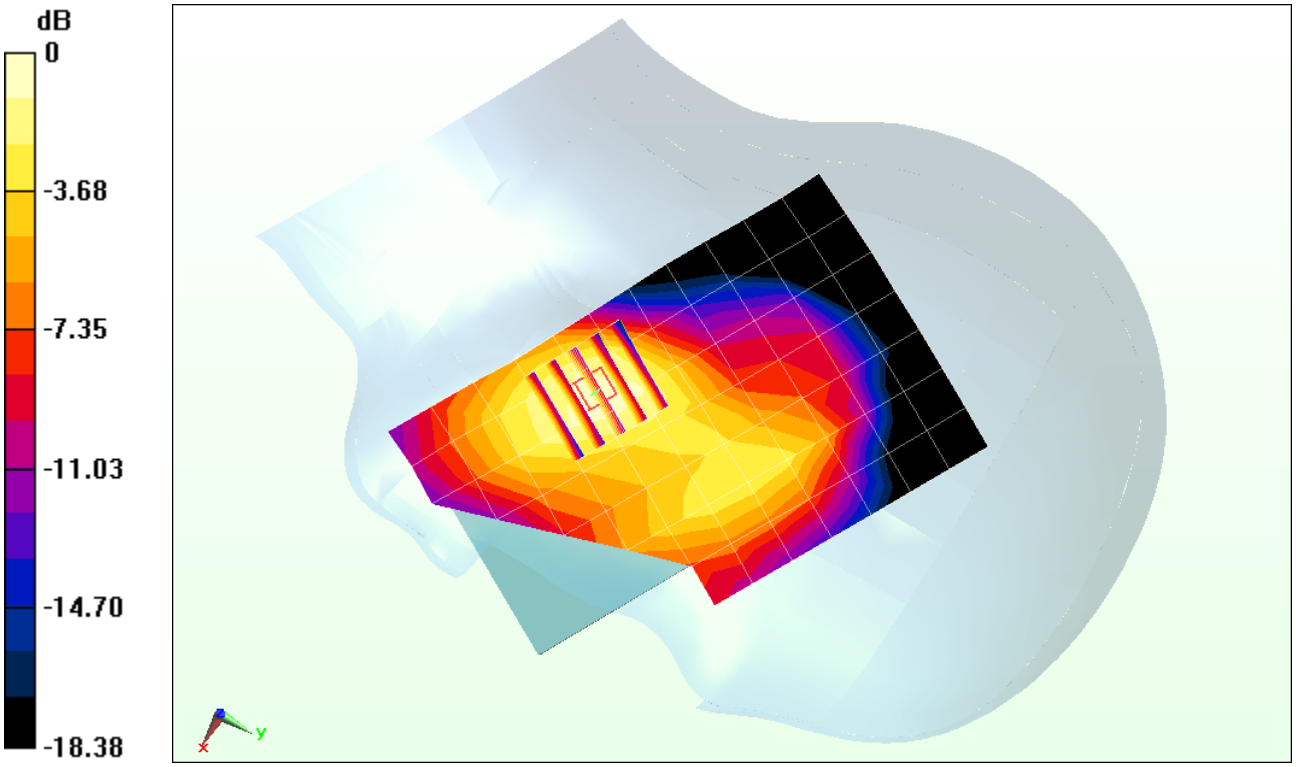
Communication System: UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head; Medium parameters used:
f = 1880 MHz; σ = 1.371 S/m; ε_r = 40.056; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 07-01-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(5.21, 5.21, 5.21); Calibrated: 3/15/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/8/2013
Phantom: SAM Right; Type: QD000P40CD; Serial: 1686
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.340 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.541 W/kg
SAR(1 g) = 0.348 W/kg



0 dB = 0.376 W/kg = -4.25 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFD801; Type: Portable Handset; Serial: XV352098

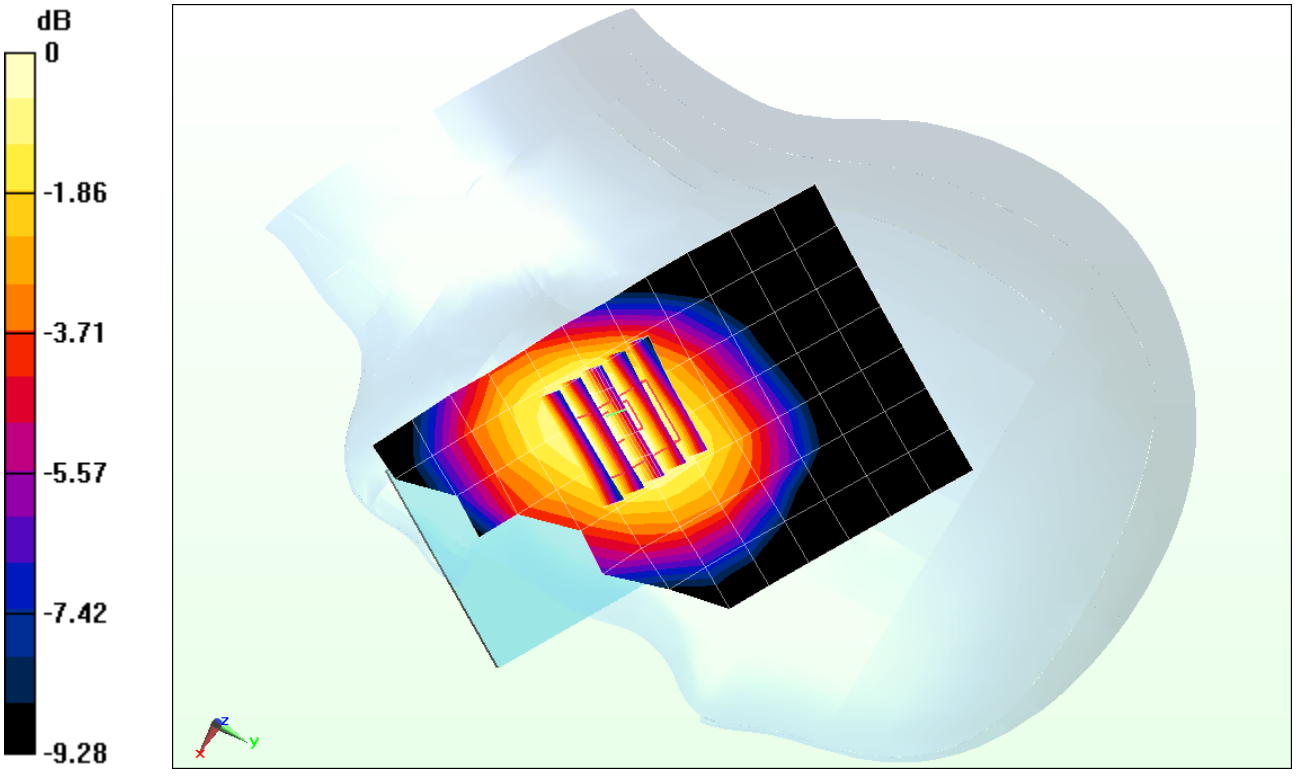
Communication System: LTE Band 17; Frequency: 710 MHz; Duty Cycle: 1:1
Medium: 740 Head; Medium parameters used:
f = 710 MHz; σ = 0.881 S/m; ε_r = 42.241; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 08-06-2013; Ambient Temp: 23.6°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3288; ConvF(6.67, 6.67, 6.67); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: LTE Band 17, Left Head, Cheek, Mid.ch,
QPSK, 10 MHz Bandwidth, 1 RB, 49 RB Offset

Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.321 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.146 W/kg
SAR(1 g) = 0.115 W/kg



0 dB = 0.121 W/kg = -9.17 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: XV352098

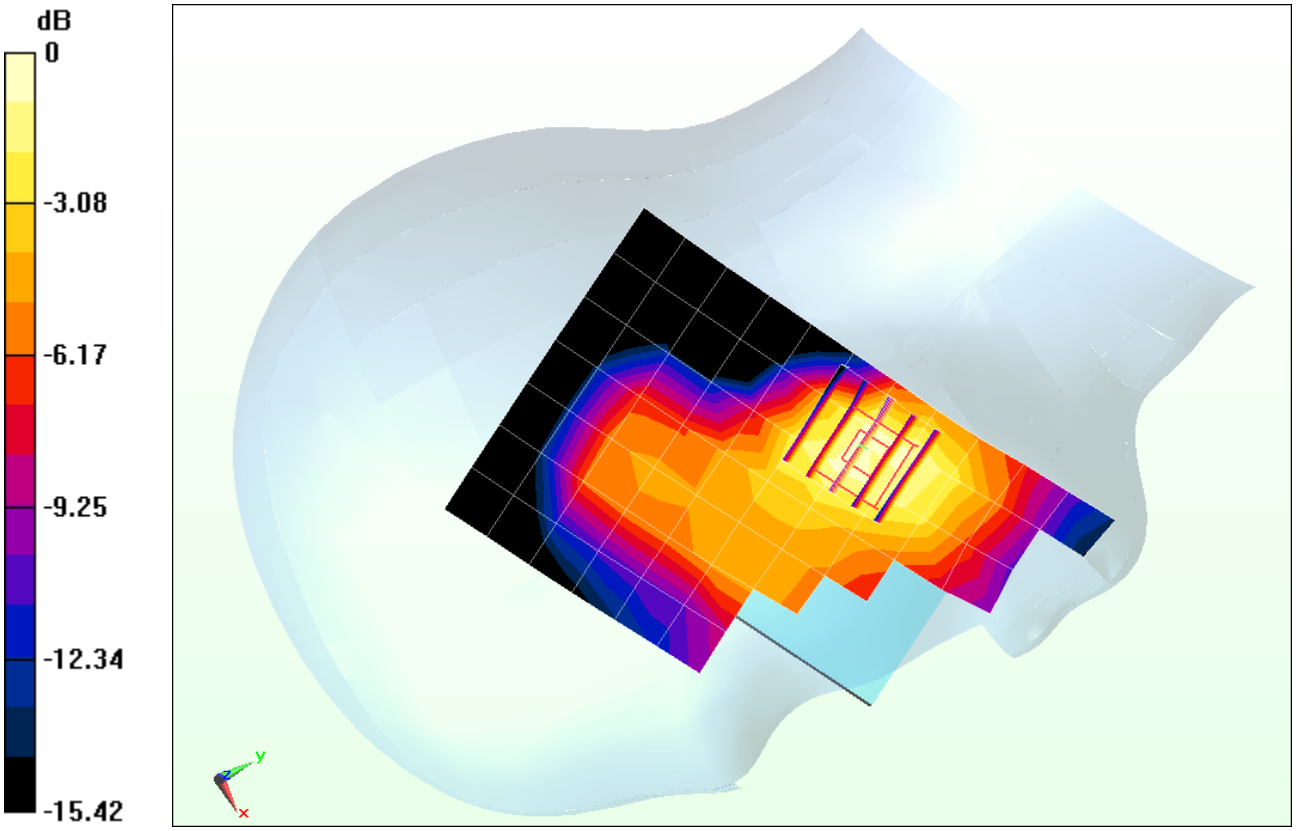
Communication System: LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head; Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.39 S/m; ε_r = 38.886; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 07-01-2013; Ambient Temp: 23.8°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3288; ConvF(5.51, 5.51, 5.51); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.497 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.223 W/kg
SAR(1 g) = 0.153 W/kg



DUT: ZNFD801; Type: Portable Handset; Serial: XV352098

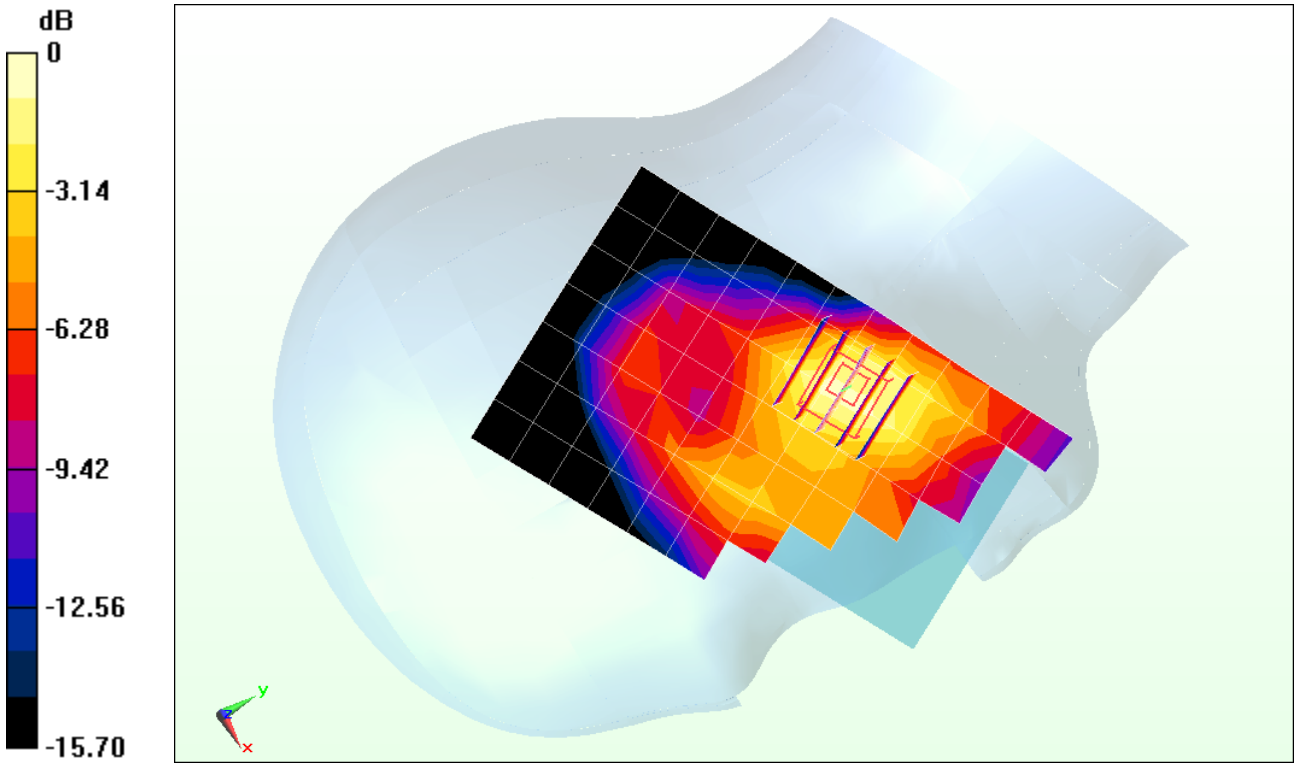
Communication System: LTE Band 2 (PCS); Frequency: 1905 MHz; Duty Cycle: 1:1
Medium: 1900 Head; Medium parameters used (interpolated):
f = 1905 MHz; σ = 1.451 S/m; ε_r = 38.989; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 07-05-2013; Ambient Temp: 23.6°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3920; ConvF(7.73, 7.73, 7.73); Calibrated: 2/27/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: LTE Band 2 (PCS), Right Head, Cheek, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.560 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.393 W/kg
SAR(1 g) = 0.260 W/kg



0 dB = 0.285 W/kg = -5.45 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: FX352099

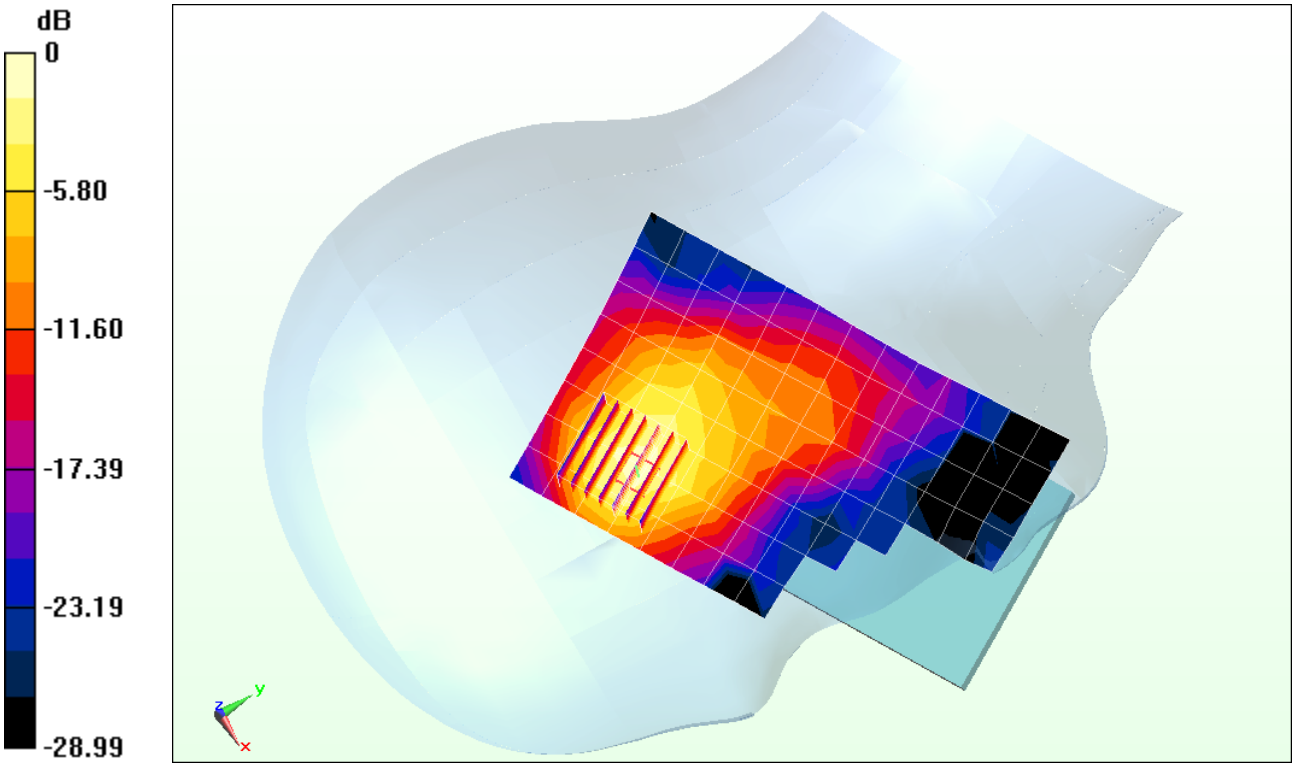
Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Head; Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.774 S/m; ε_r = 39.058; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 06-26-2013; Ambient Temp: 24.6°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3920; ConvF(7.04, 7.04, 7.04); Calibrated: 2/27/2013;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11b, Right Head, Cheek, Ch 01, 1 Mbps

Area Scan (9x15x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.991 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.750 W/kg
SAR(1 g) = 0.354 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFD801; Type: Portable Handset; Serial: FX352099

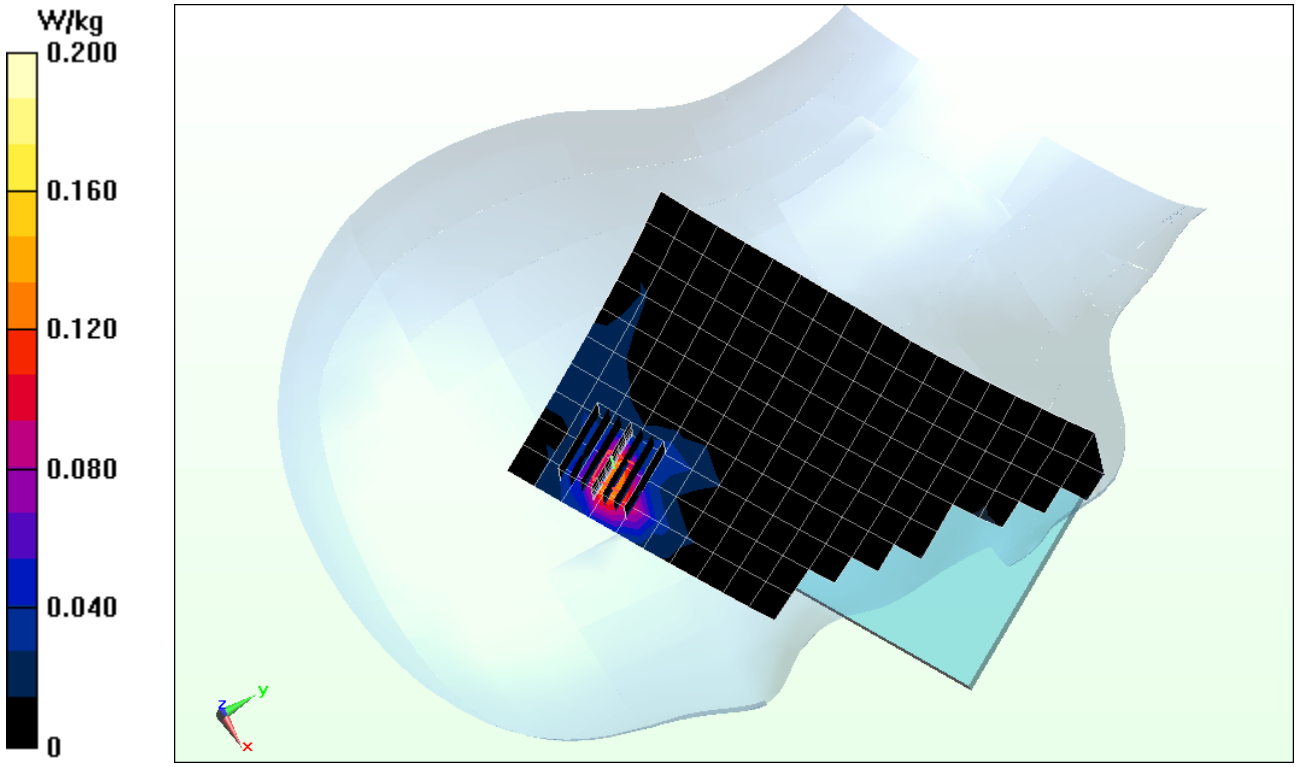
Communication System: IEEE 802.11a; Frequency: 5745 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head; Medium parameters used:
f = 5745 MHz; σ = 5.019 S/m; ε_r = 34.293; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 07-08-2013; Ambient Temp: 24.9°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3920; ConvF(4.02, 4.02, 4.02); Calibrated: 2/27/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.8 GHz, Right Head, Cheek, Ch 149, 6 Mbps

Area Scan (11x21x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 4.297 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.370 W/kg
SAR(1 g) = 0.089 W/kg



DUT: ZNFD801; Type: Portable Handset; Serial: FX352099

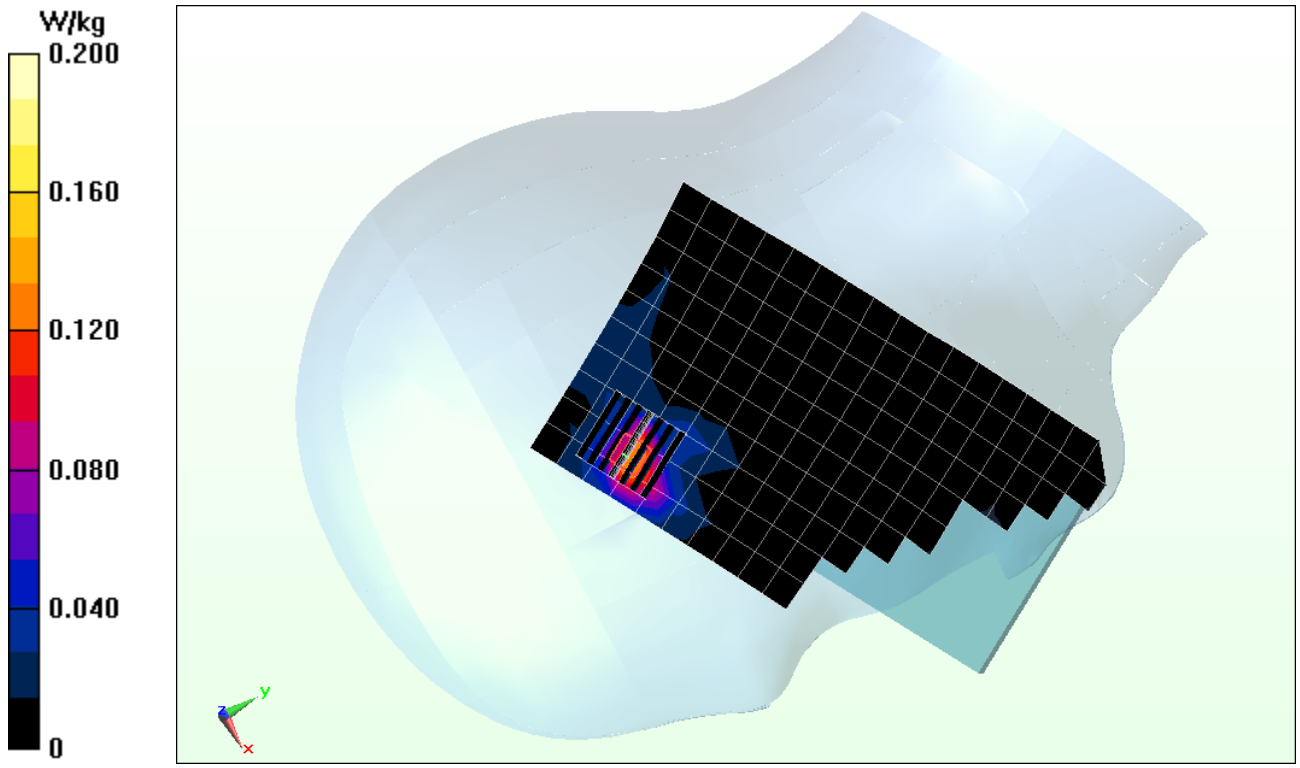
Communication System: IEEE 802.11a; Frequency: 5260 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head; Medium parameters used:
f = 5260 MHz; σ = 4.525 S/m; ε_r = 34.989; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 07-08-2013; Ambient Temp: 24.8°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3920; ConvF(4.73, 4.73, 4.73); Calibrated: 2/27/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.3 GHz, Right Head, Cheek, Ch 52, 6 Mbps

Area Scan (11x21x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 3.745 V/m; Power Drift = 0.21 dB
Peak SAR (extrapolated) = 0.352 W/kg
SAR(1 g) = 0.091 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFD801; Type: Portable Handset; Serial: NY352095

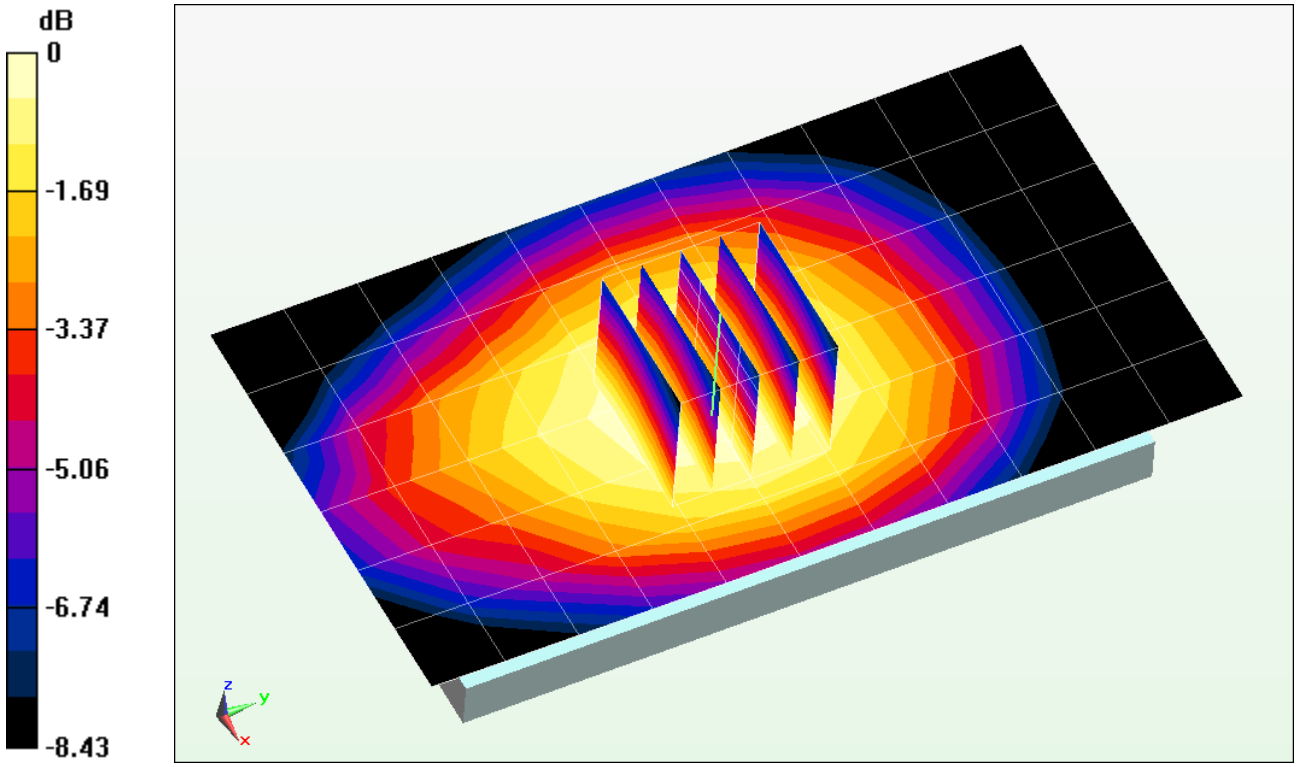
Communication System: GSM GPRS; 2 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:4.15
Medium: 835 Body; Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 1.018$ S/m; $\varepsilon_r = 55.851$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-27-2013; Ambient Temp: 24.1°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3209; ConvF(6.28, 6.28, 6.28); Calibrated: 3/15/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/8/2013
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (7x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.524 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.958 W/kg
SAR(1 g) = 0.770 W/kg



0 dB = 0.804 W/kg = -0.95 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: NY352095

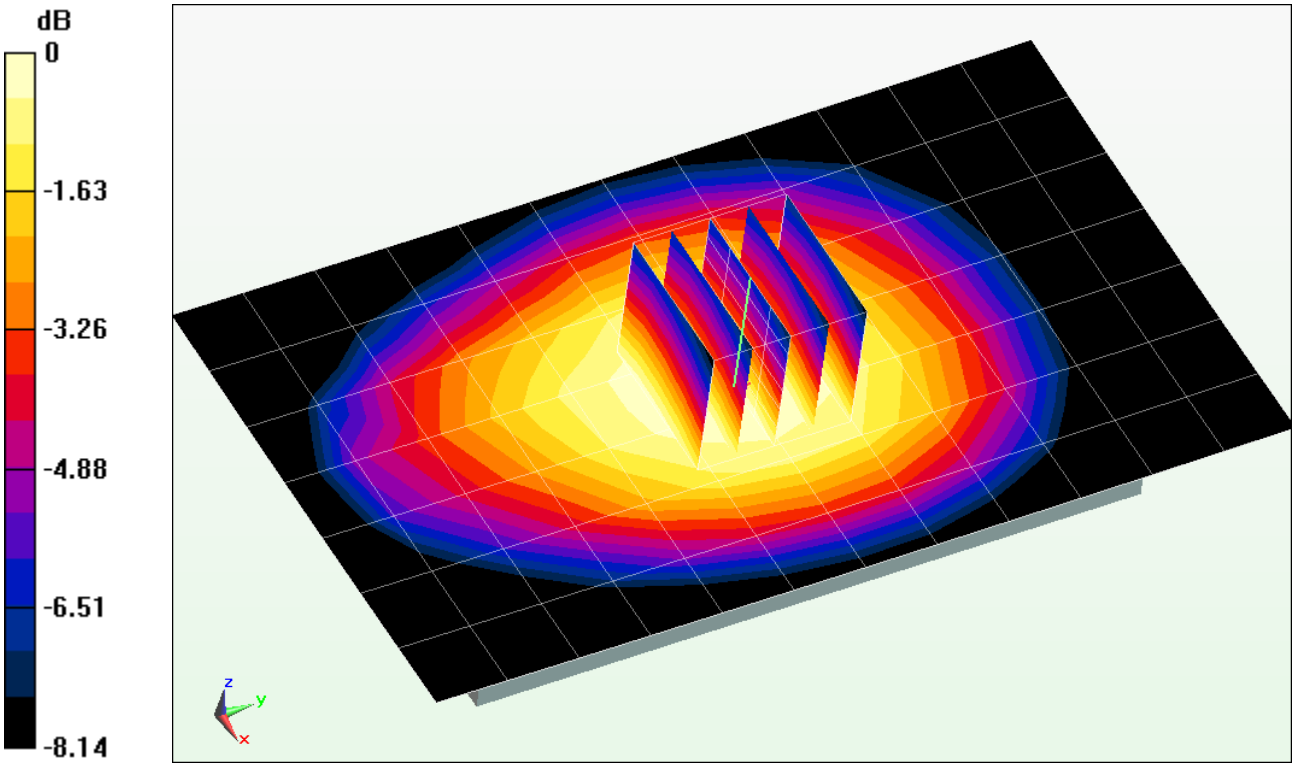
Communication System: UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body; Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 1.018$ S/m; $\varepsilon_r = 55.851$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-27-2013; Ambient Temp: 24.1°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3209; ConvF(6.28, 6.28, 6.28); Calibrated: 3/15/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/8/2013
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.725 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.502 W/kg
SAR(1 g) = 0.406 W/kg



0 dB = 0.425 W/kg = -3.72 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: AE352096

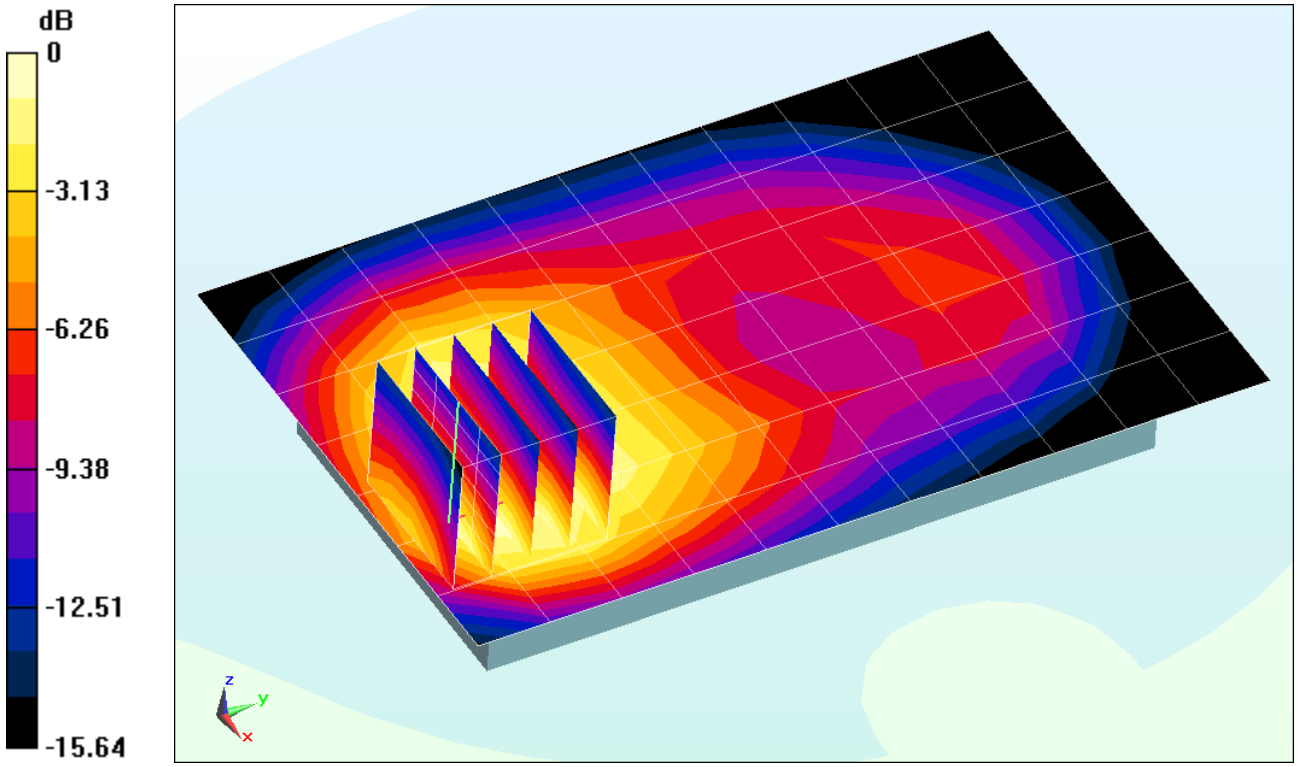
Communication System: UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Body; Medium parameters used (interpolated):
$f = 1732.4$ MHz; $\sigma = 1.424$ S/m; $\varepsilon_r = 52.44$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.8°C

Probe: EX3DV4 - SN3920; ConvF(7.59, 7.59, 7.59); Calibrated: 2/27/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.382 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.63 W/kg
SAR(1 g) = 0.964 W/kg



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

DUT: ZNFD801; Type: Portable Handset; Serial: AE352096

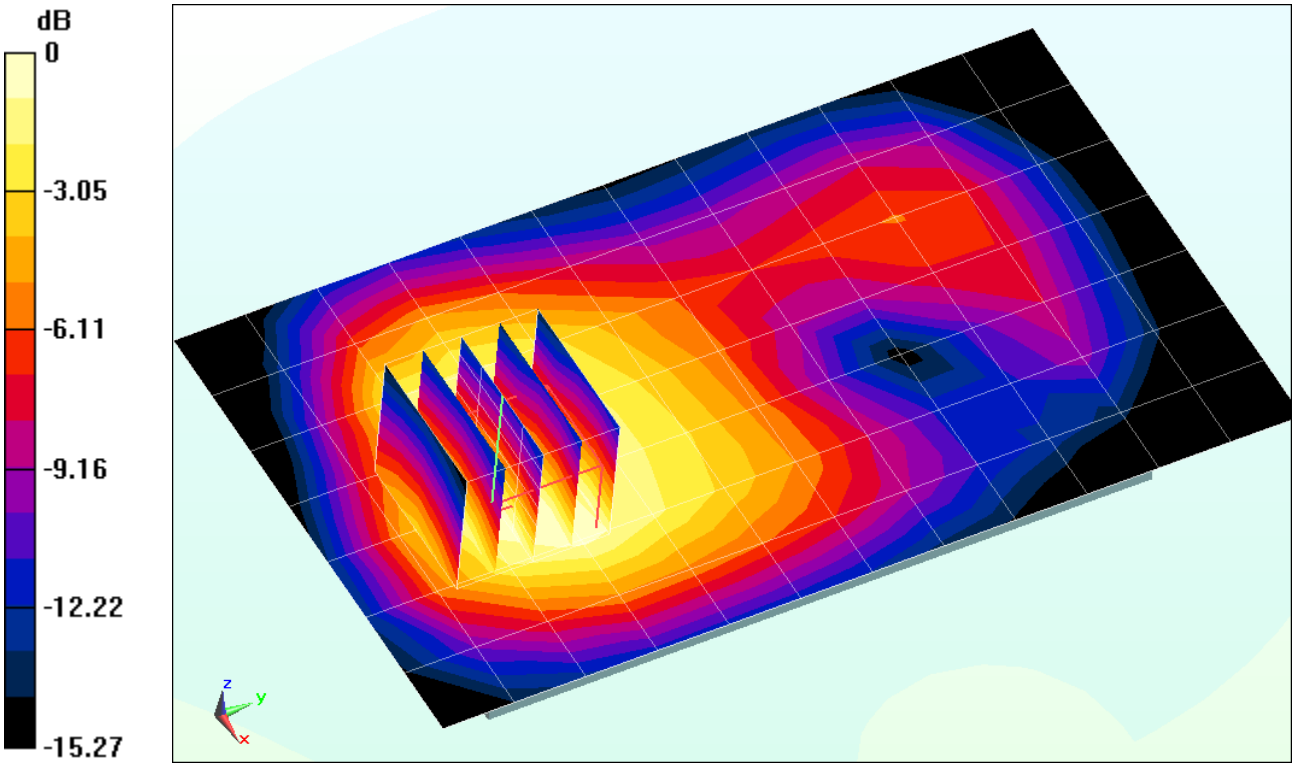
Communication System: GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15
Medium: 1900 Body; Medium parameters used:
f = 1880 MHz; σ = 1.497 S/m; ε_r = 51.92; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 23.5°C; Tissue Temp: 23.7°C

Probe: ES3DV2 - SN3022; ConvF(4.43, 4.43, 4.43); Calibrated: 8/28/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.519 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.794 W/kg
SAR(1 g) = 0.511 W/kg



0 dB = 0.547 W/kg = -2.62 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: AE352096

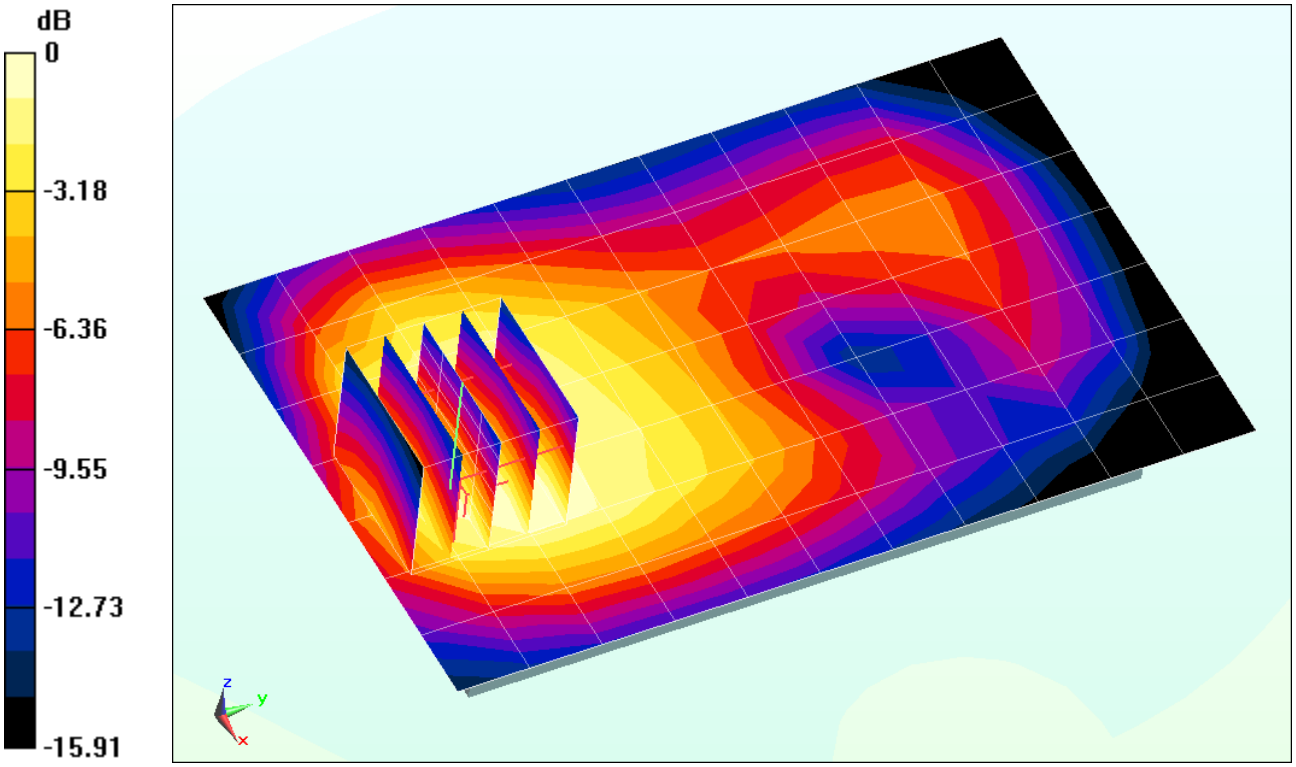
Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used:
f = 1880 MHz; σ = 1.497 S/m; ε_r = 51.92; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 23.5°C; Tissue Temp: 23.7°C

Probe: ES3DV2 - SN3022; ConvF(4.43, 4.43, 4.43); Calibrated: 8/28/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.772 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.948 W/kg
SAR(1 g) = 0.615 W/kg



0 dB = 0.664 W/kg = -1.78 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: AE352096

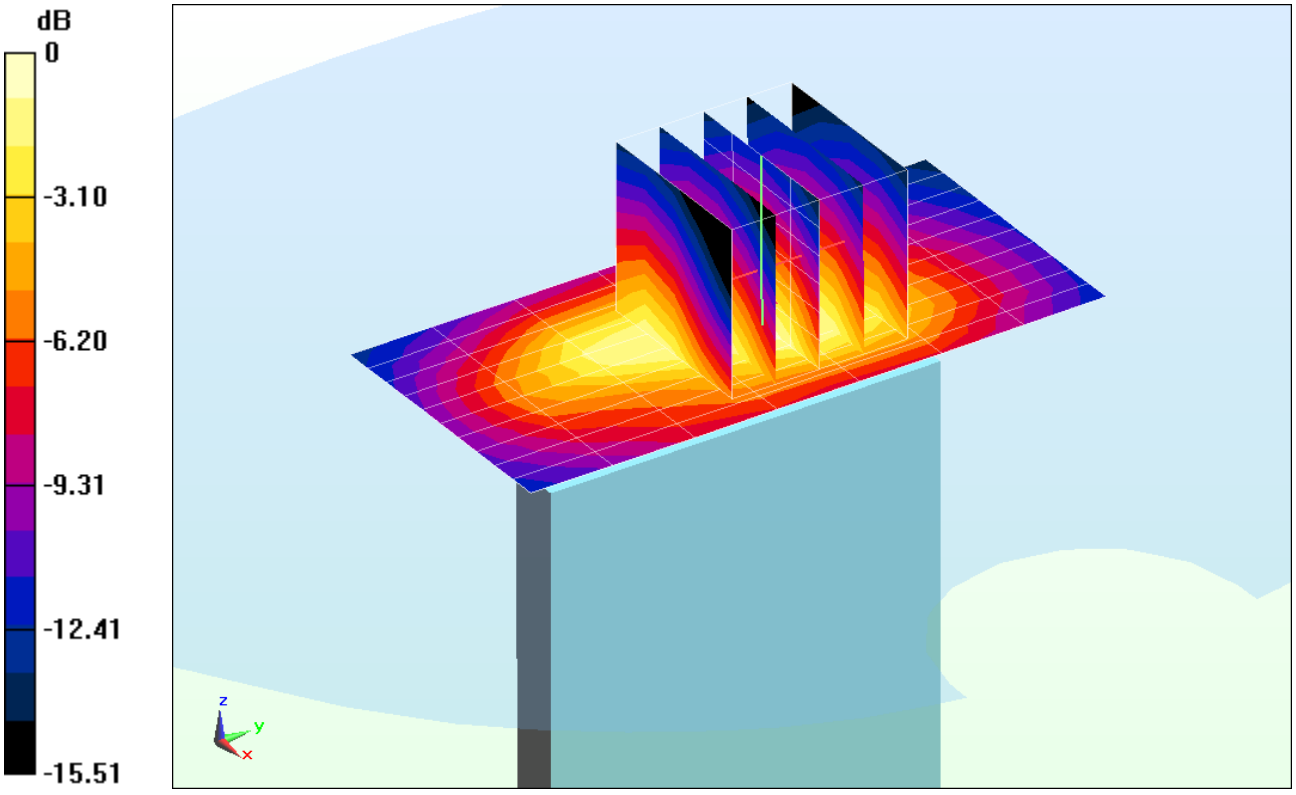
Communication System: WCDMA1900; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used:
f = 1880 MHz; σ = 1.497 S/m; ε_r = 51.92; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 23.5°C; Tissue Temp: 23.7°C

Probe: ES3DV2 - SN3022; ConvF(4.43, 4.43, 4.43); Calibrated: 8/28/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (11x8x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.348 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR(1 g) = 0.654 W/kg



0 dB = 0.740 W/kg = -1.31 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: XV352098

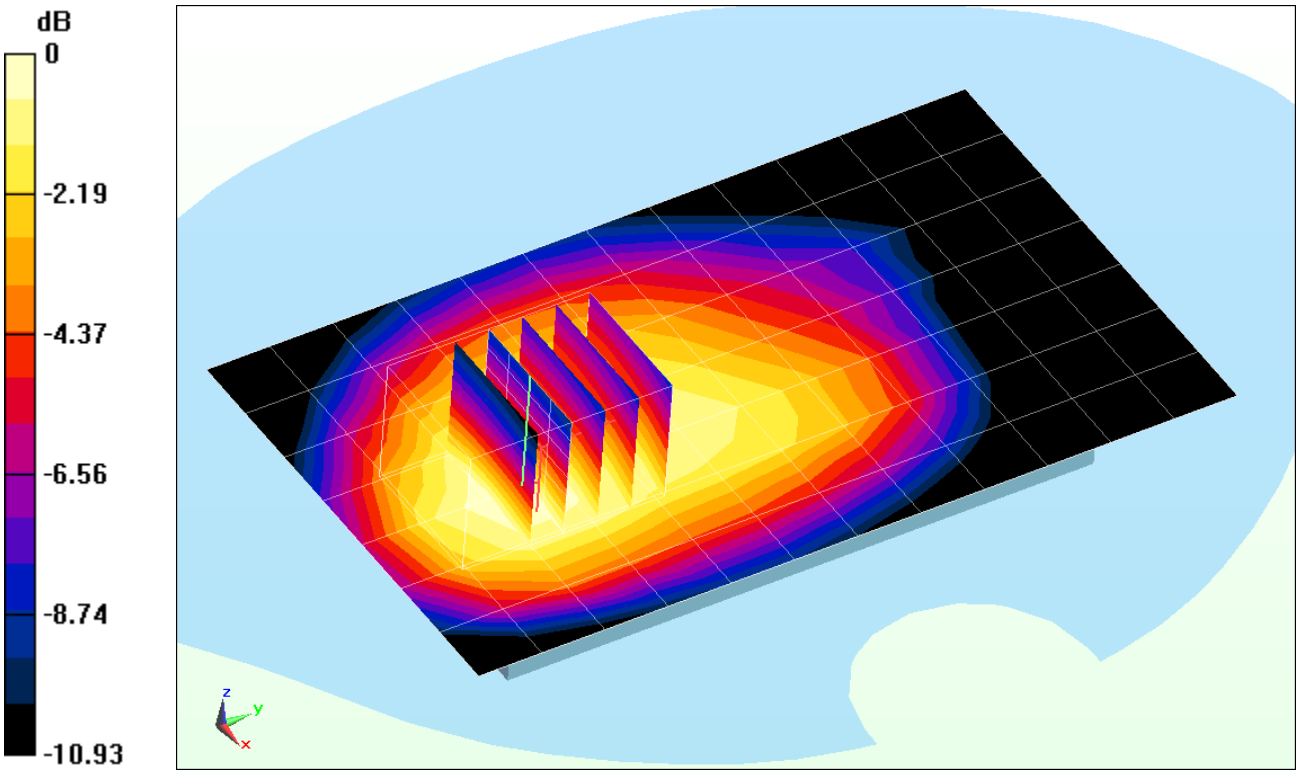
Communication System: LTE Band 17; Frequency: 710 MHz; Duty Cycle: 1:1
Medium: 740 Body; Medium parameters used:
f = 710 MHz; σ = 0.931 S/m; ε_r = 55.074; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2013; Ambient Temp: 23.0°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3288; ConvF(6.44, 6.44, 6.44); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

LTE Band 17, Body SAR, Back side, Mid.ch,
QPSK, 10 MHz Bandwidth, 1 RB, 49 RB Offset

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.339 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.322 W/kg
SAR(1 g) = 0.207 W/kg



0 dB = 0.221 W/kg = -6.56 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: XV352098

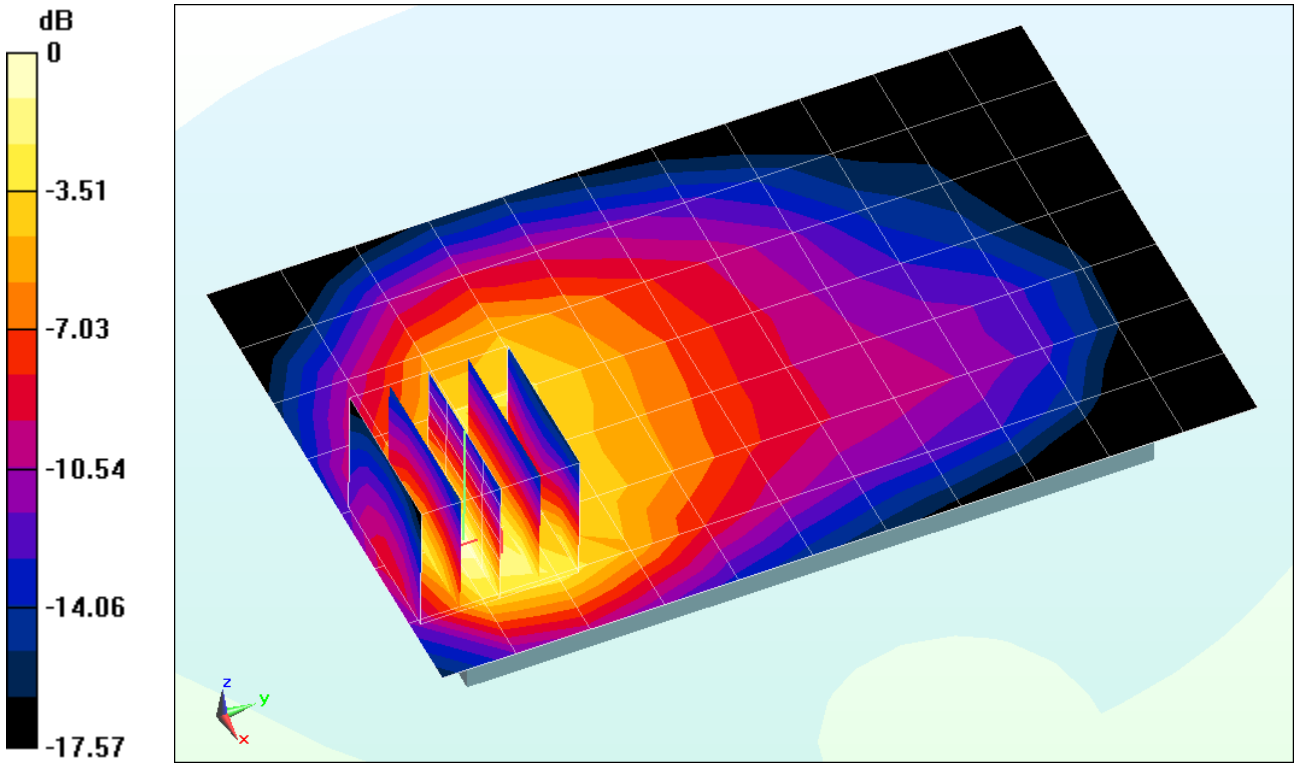
Communication System: LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body; Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.424$ S/m; $\varepsilon_r = 52.44$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.8°C

Probe: EX3DV4 - SN3920; ConvF(7.59, 7.59, 7.59); Calibrated: 2/27/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

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

Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.396 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.74 W/kg
SAR(1 g) = 0.976 W/kg



0 dB = 1.14 W/kg = 0.57 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: WQ352097

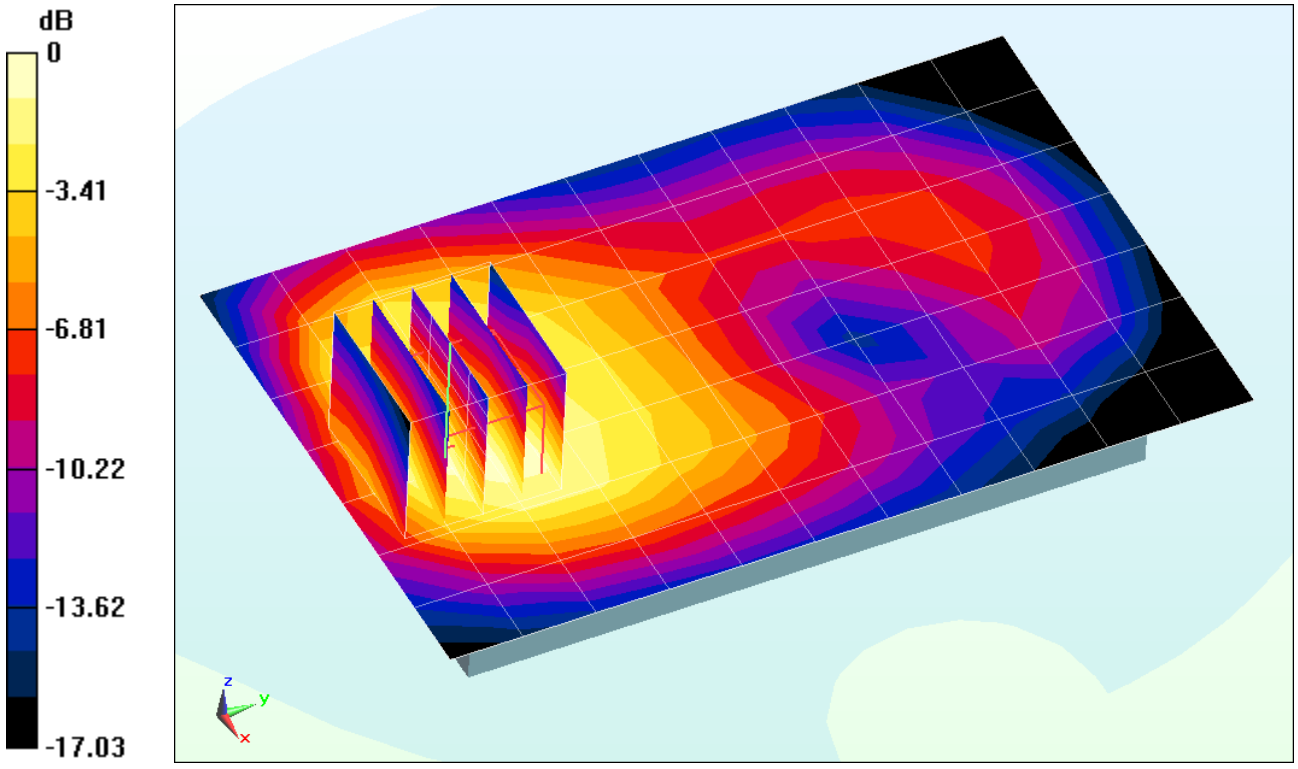
Communication System: LTE PCS 10 MHz; Frequency: 1905 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used (interpolated):
f = 1905 MHz; σ = 1.532 S/m; ε_r = 51.788; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 23.5°C; Tissue Temp: 23.7°C

Probe: ES3DV2 - SN3022; ConvF(4.43, 4.43, 4.43); Calibrated: 8/28/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

Mode: LTE Band 2 (PCS), Body SAR, Back side, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (8x12x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.638 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 1.13 W/kg
SAR(1 g) = 0.712 W/kg



0 dB = 0.778 W/kg = -1.09 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFD801; Type: Portable Handset; Serial: WQ352097

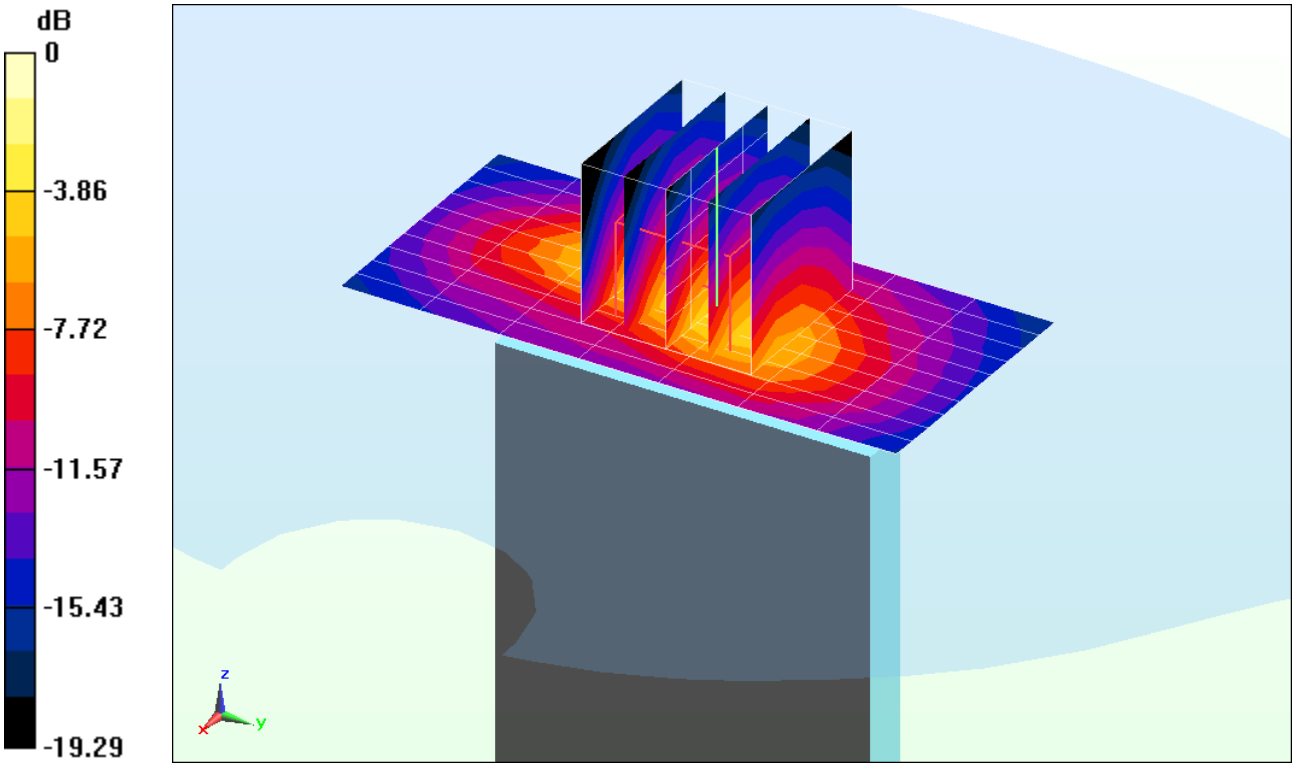
Communication System: LTE PCS 10 MHz; Frequency: 1905 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used (interpolated):
f = 1905 MHz; σ = 1.532 S/m; ε_r = 51.788; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 23.5°C; Tissue Temp: 23.7°C

Probe: ES3DV2 - SN3022; ConvF(4.43, 4.43, 4.43); Calibrated: 8/28/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

**Mode: LTE Band 2 (PCS), Body SAR, Bottom Edge, High.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

Area Scan (11x8x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.430 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 1.25 W/kg
SAR(1 g) = 0.758 W/kg



0 dB = 1.85 W/kg = 2.66 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: FX352099

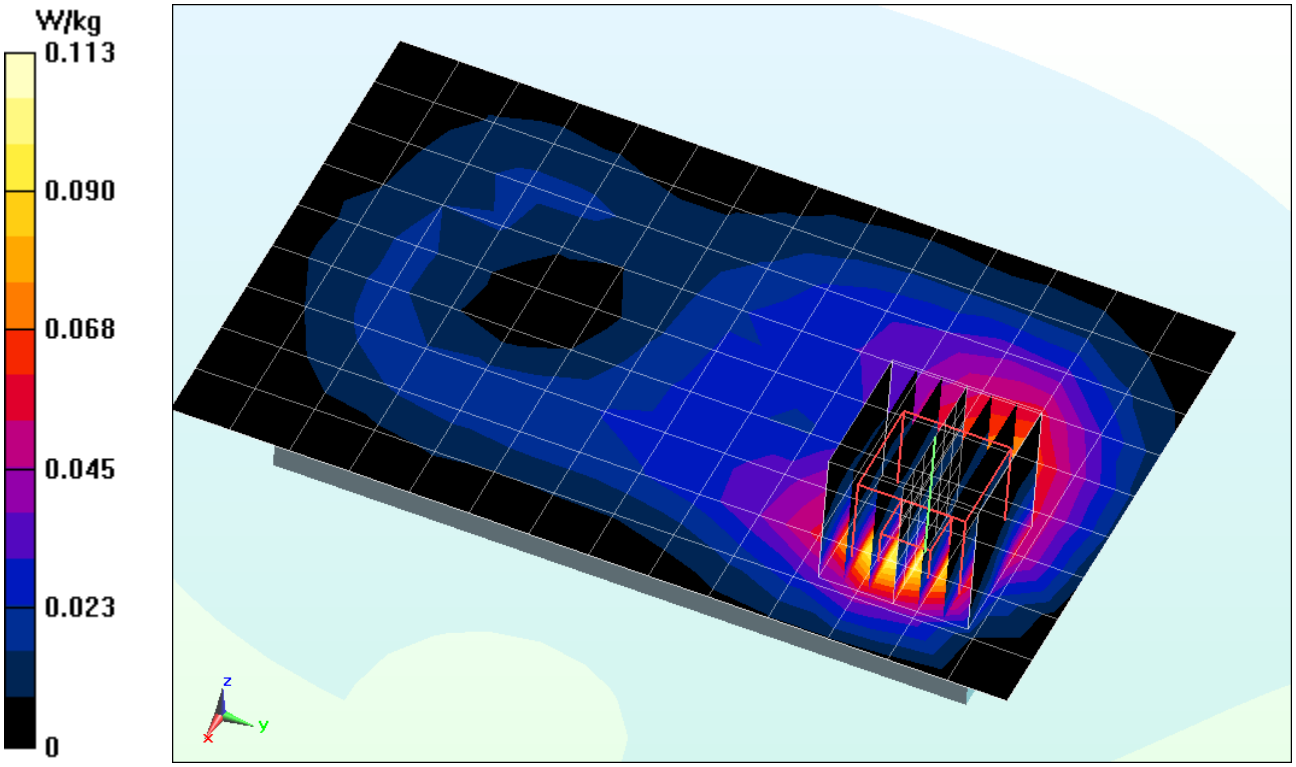
Communication System: IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.958 S/m; ε_r = 52.228; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-26-2013; Ambient Temp: 23.2°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3287; ConvF(4.29, 4.29, 4.29); Calibrated: 11/15/2012;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 11/13/2012
Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11b, Body SAR, Ch 01, 1 Mbps, Back Side

Area Scan (10x15x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.898 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.200 W/kg
SAR(1 g) = 0.089 W/kg



DUT: ZNFD801; Type: Portable Handset; Serial: JP352100

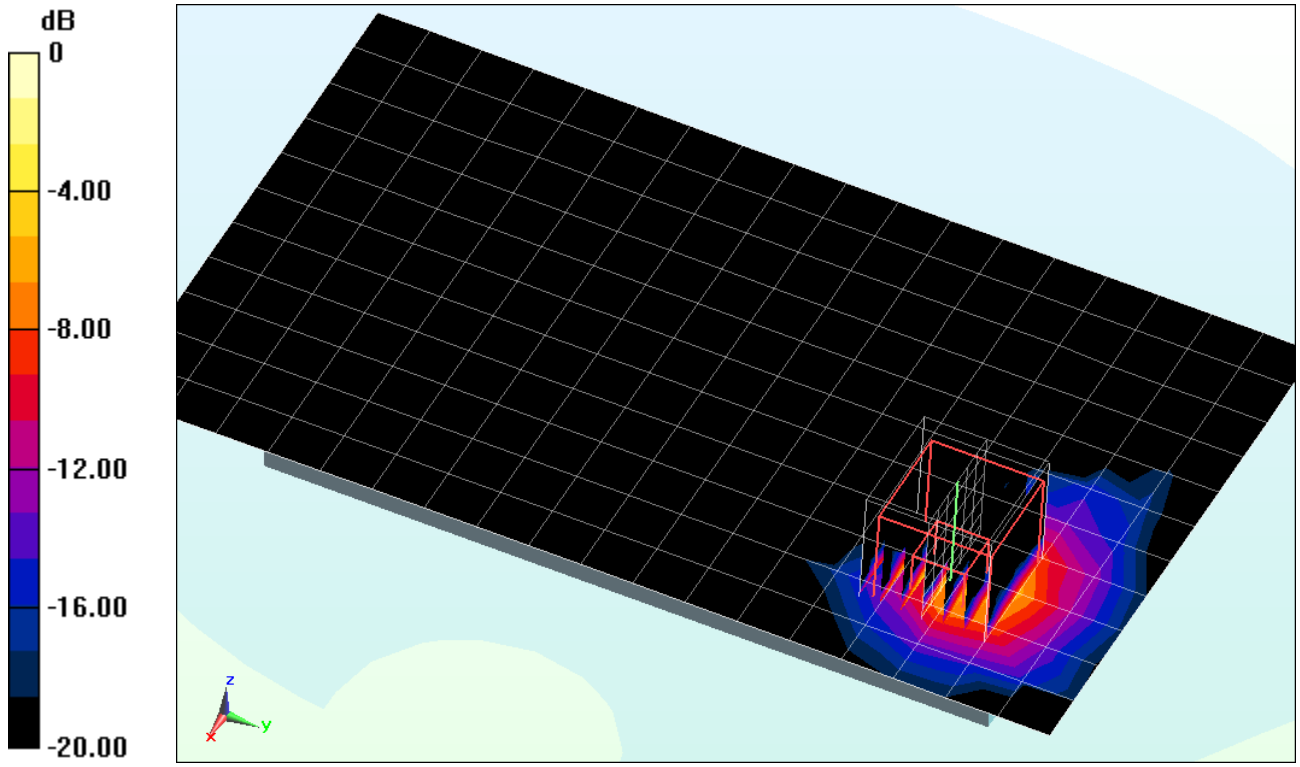
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5745 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5745 MHz; σ = 6.16 S/m; ε_r = 45.976; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.2°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3589; ConvF(3.66, 3.66, 3.66); Calibrated: 1/17/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/17/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.8 GHz, Body SAR, Ch 149, 6 Mbps, Back Side

Area Scan (12x19x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 4.806 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 0.613 W/kg
SAR(1 g) = 0.127 W/kg



0 dB = 0.530 W/kg = -2.76 dBW/kg

DUT: ZNFD801; Type: Portable Handset; Serial: JP352100

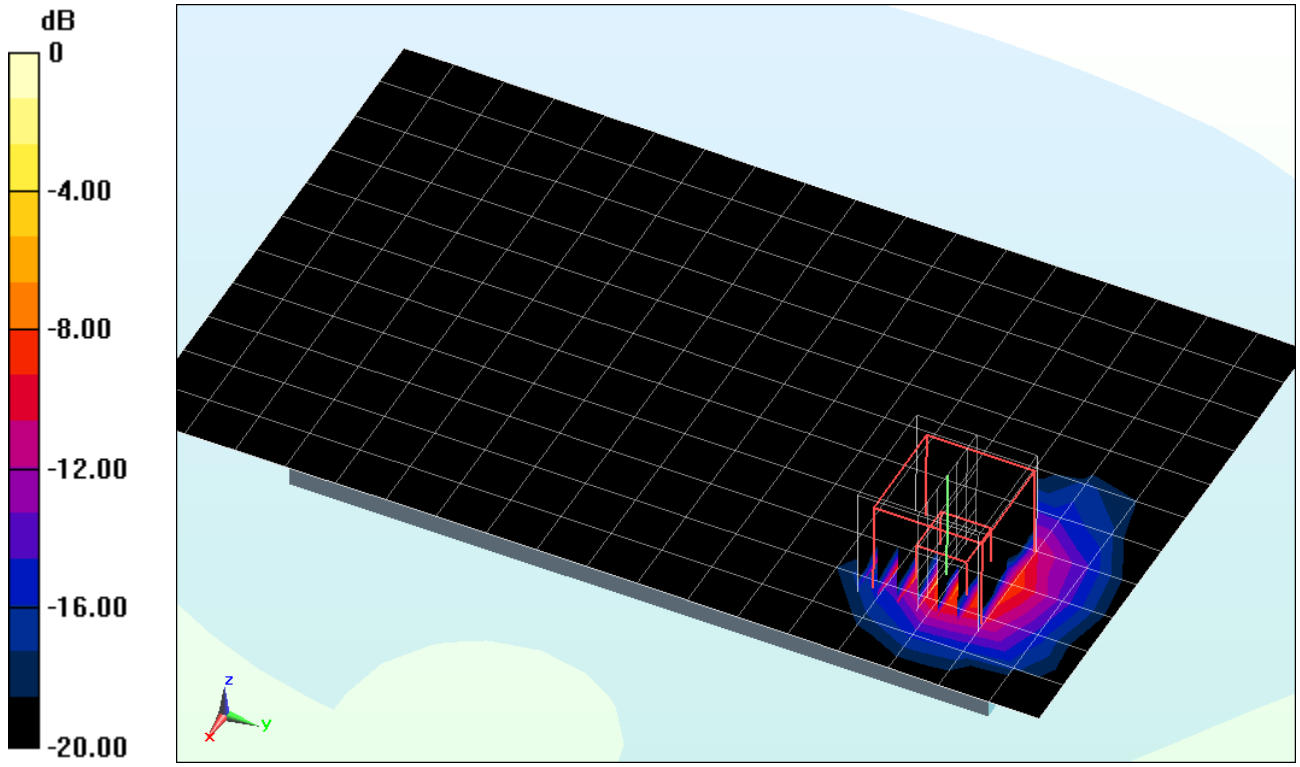
Communication System: IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5540 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5540 MHz; σ = 5.817 S/m; ε_r = 46.208; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.2°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3589; ConvF(3.52, 3.52, 3.52); Calibrated: 1/17/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/17/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

Mode: IEEE 802.11a, 5.5 GHz, Body SAR, Ch 108, 6 Mbps, Back Side

Area Scan (12x19x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 4.718 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.528 W/kg
SAR(1 g) = 0.124 W/kg



0 dB = 0.800 W/kg = -0.97 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

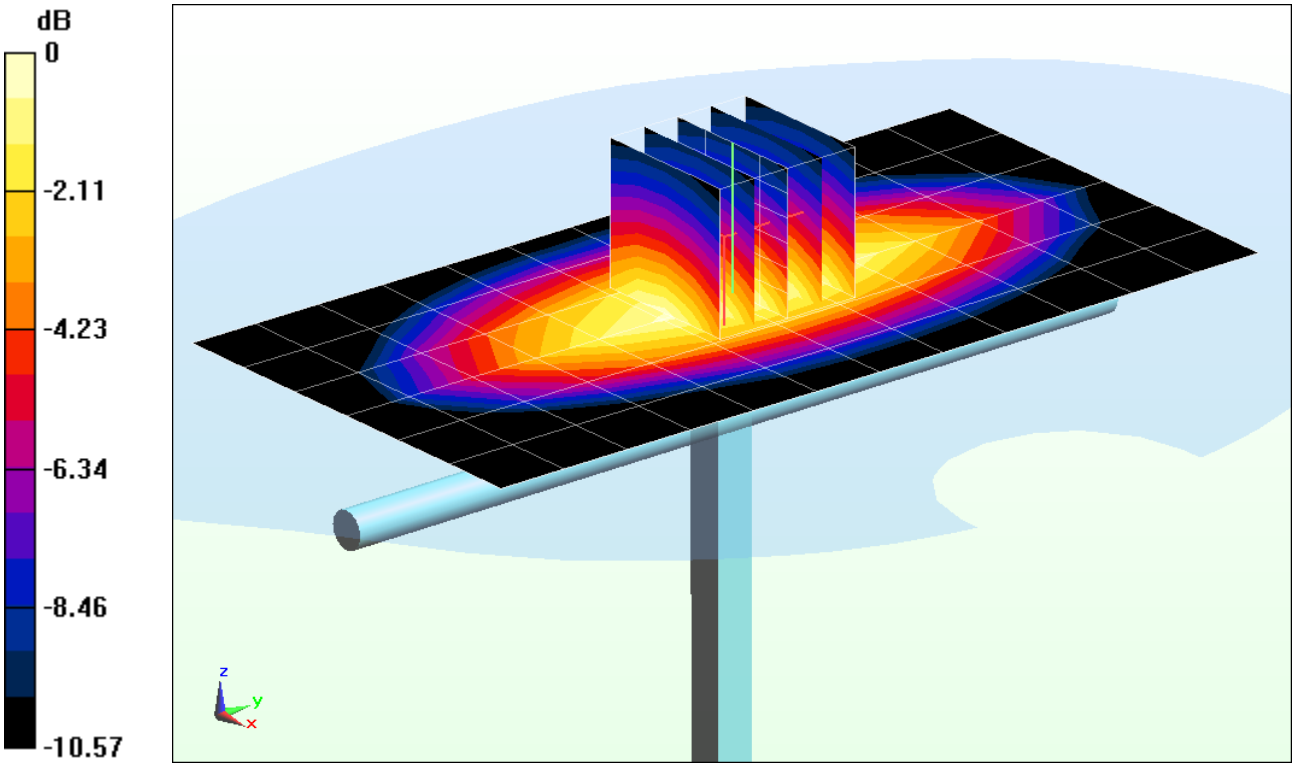
Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 740 Head; Medium parameters used (interpolated):
f = 750 MHz; σ = 0.909 S/m; ε_r = 40.583; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-03-2013; Ambient Temp: 23.9°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3287; ConvF(6.4, 6.4, 6.4); Calibrated: 11/15/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 11/13/2012
Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

750MHz System Verification

Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.22 W/kg
SAR(1 g) = 0.844 W/kg
Deviation = -0.24%



0 dB = 0.916 W/kg = -0.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

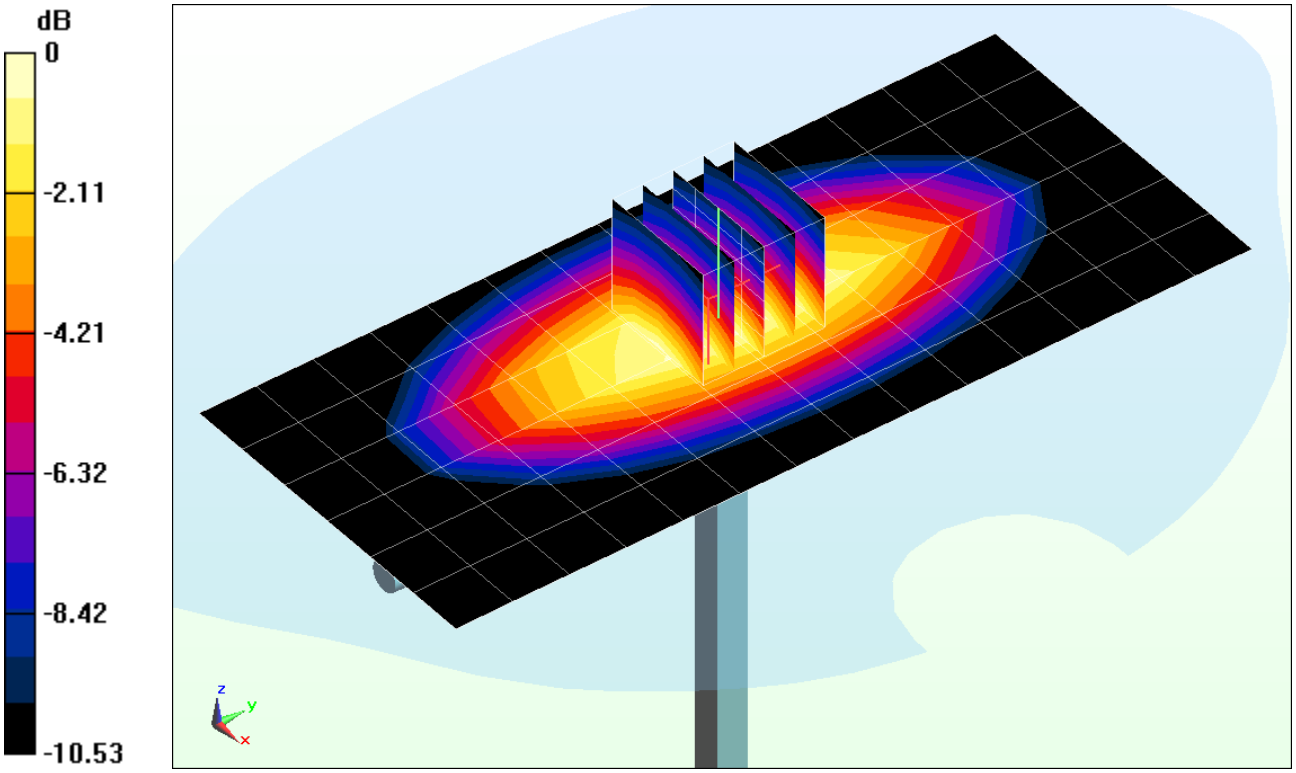
Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 740 Head; Medium parameters used (interpolated):
f = 750 MHz; σ = 0.919 S/m; ε_r = 41.675; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-06-2013; Ambient Temp: 23.6°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3288; ConvF(6.67, 6.67, 6.67); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.808 W/kg
Deviation = -4.49%



0 dB = 0.874 W/kg = -0.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

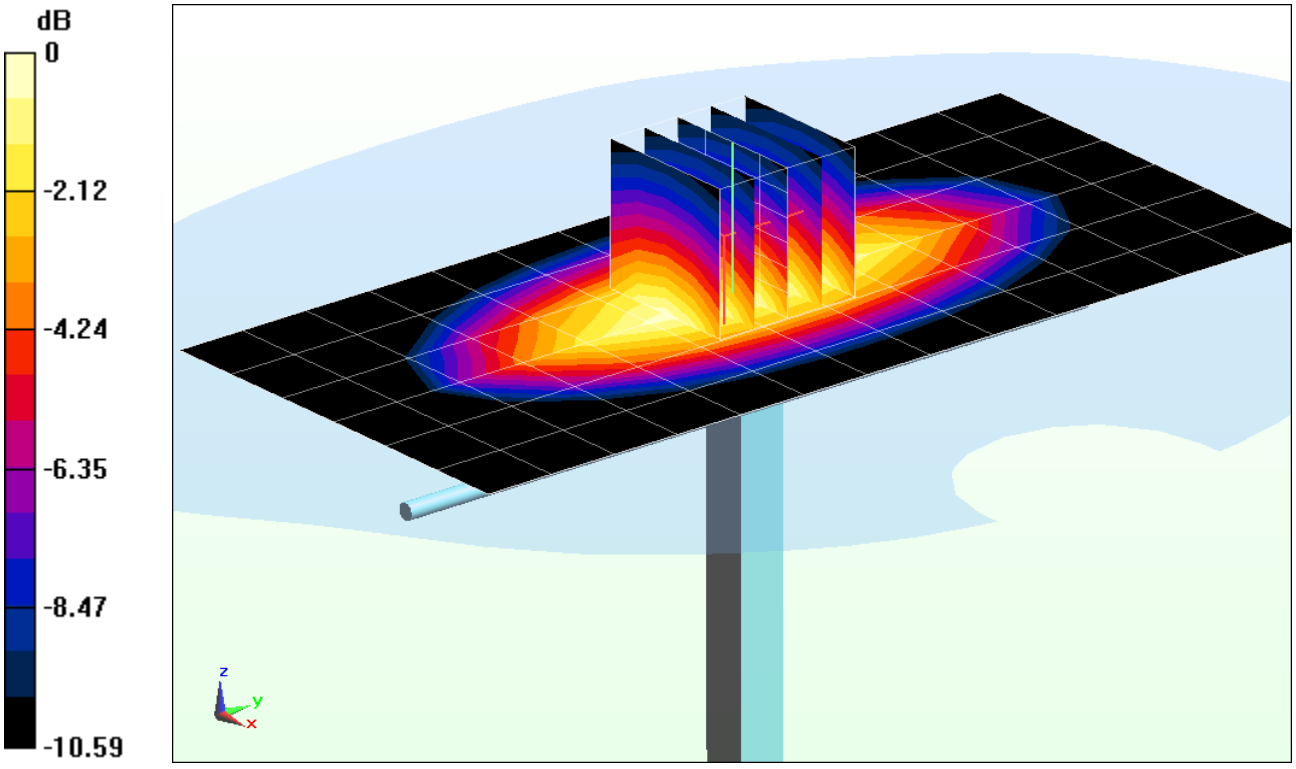
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head; Medium parameters used:
f = 835 MHz; σ = 0.928 S/m; ε_r = 40.871; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-25-2013; Ambient Temp: 24.6°C; Tissue Temp: 23.8°C

Probe: ES3DV3 - SN3288; ConvF(6.41, 6.41, 6.41); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.45 W/kg
SAR(1 g) = 0.972 W/kg
Deviation = 0.62%



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

PCTEST ENGINEERING LABORATORY, INC.

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

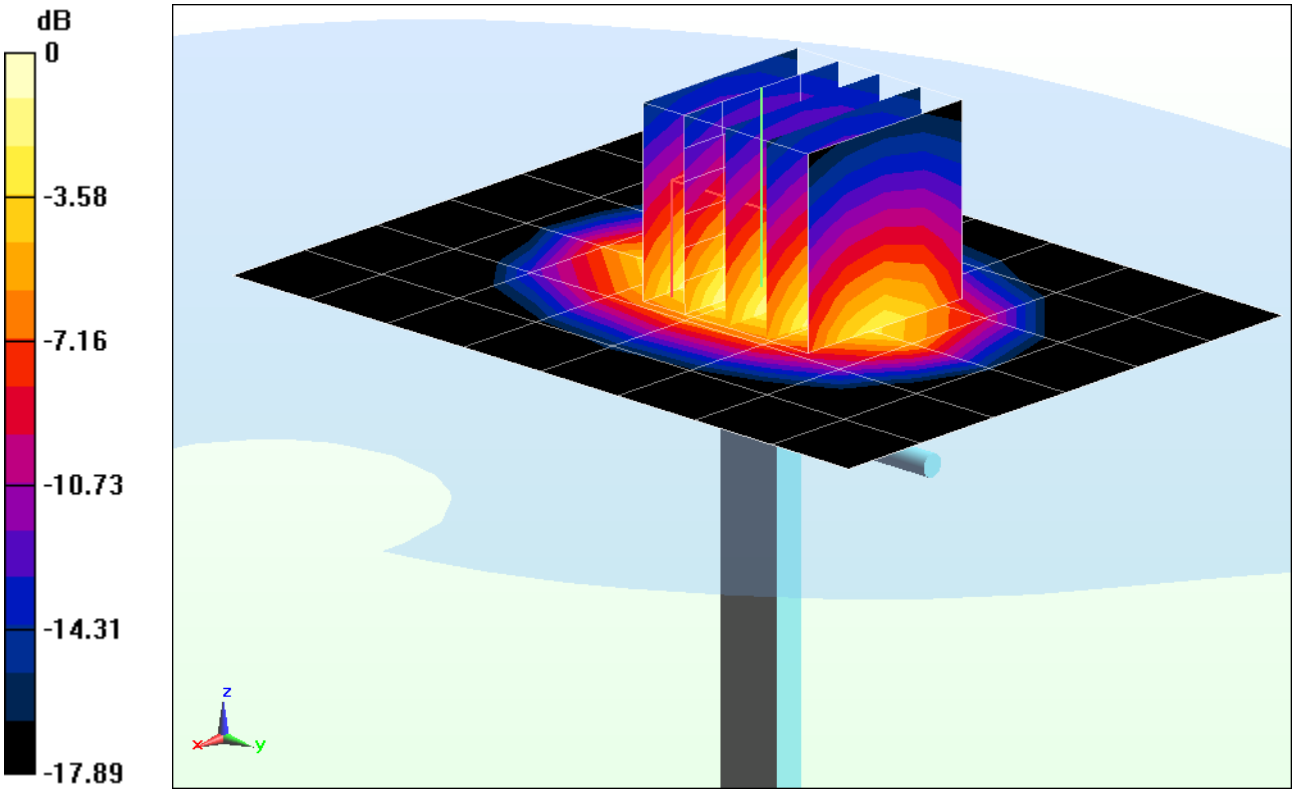
Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head; Medium parameters used:
f = 1750 MHz; σ = 1.409 S/m; ε_r = 38.805; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 23.8°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3288; ConvF(5.51, 5.51, 5.51); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

1750 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 6.46 W/kg
SAR(1 g) = 3.56 W/kg
Deviation = -2.47%



0 dB = 3.90 W/kg = 5.91 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

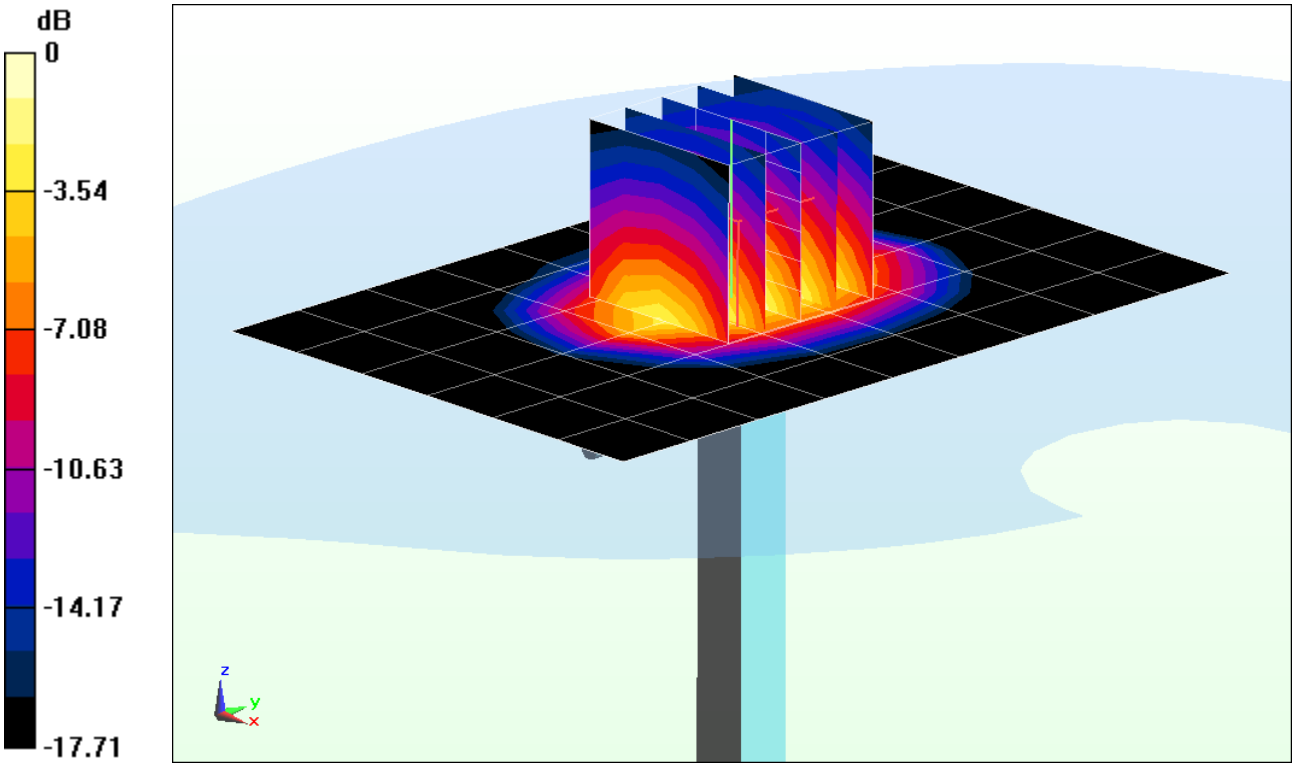
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head; Medium parameters used (interpolated):
$f = 1900$ MHz; $\sigma = 1.391$ S/m; $\varepsilon_r = 39.989$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.3°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3209; ConvF(5.21, 5.21, 5.21); Calibrated: 3/15/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/8/2013
Phantom: SAM Right; Type: QD000P40CD; Serial: 1686
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 6.88 W/kg
SAR(1 g) = 3.76 W/kg
Deviation = -5.29%



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

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

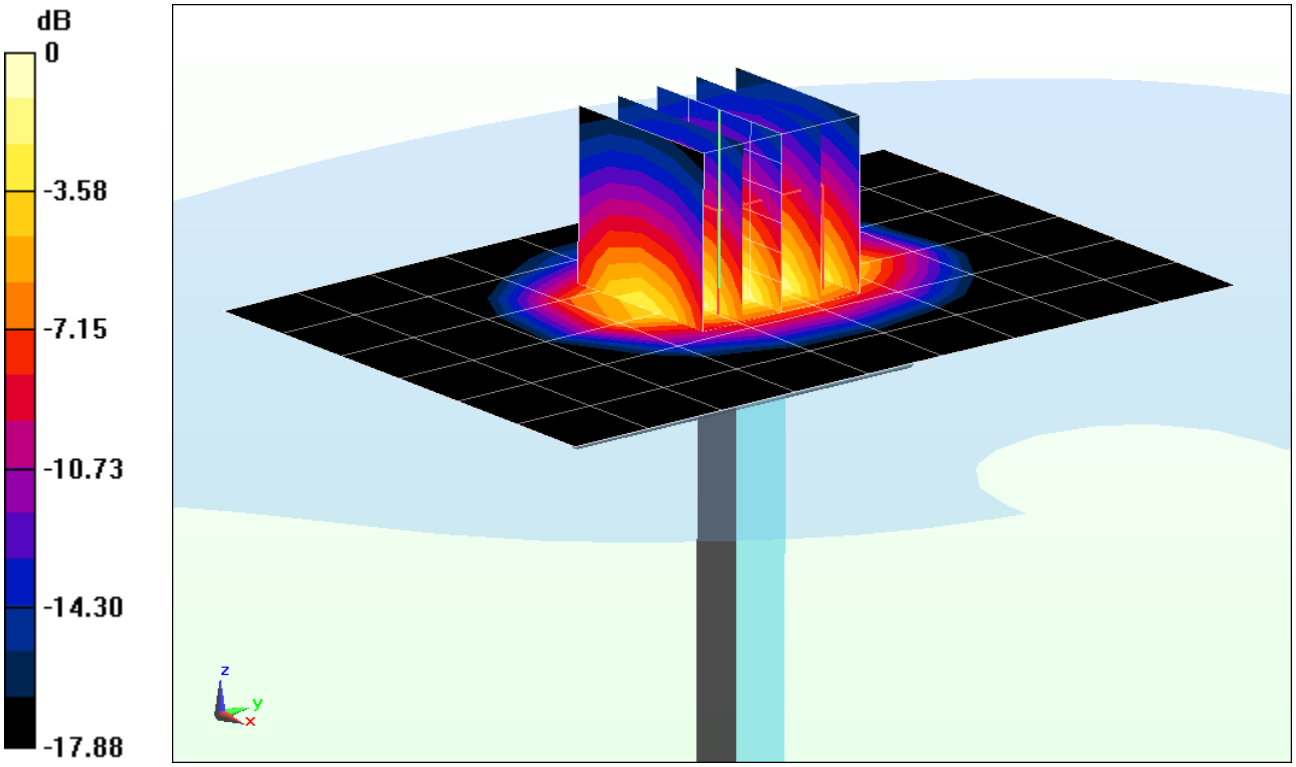
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head; Medium parameters used (interpolated):
$f = 1900$ MHz; $\sigma = 1.446$ S/m; $\varepsilon_r = 39.012$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-05-2013; Ambient Temp: 23.6°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN3920; ConvF(7.73, 7.73, 7.73); Calibrated: 2/27/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 7.48 W/kg
SAR(1 g) = 4.06 W/kg
Deviation = 2.27%



0 dB = 4.53 W/kg = 6.56 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

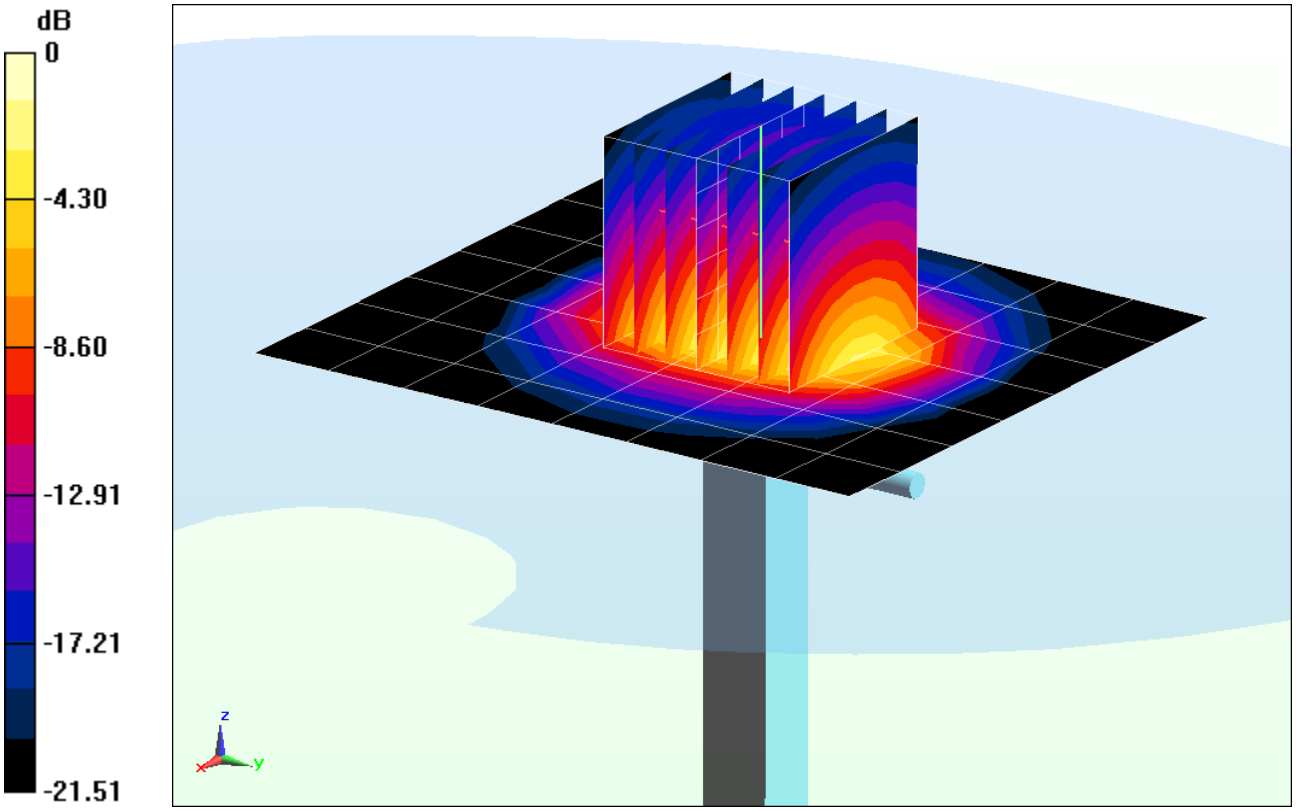
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head; Medium parameters used:
f = 2450 MHz; σ = 1.819 S/m; ε_r = 38.941; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-26-2013; Ambient Temp: 24.6°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3920; ConvF(7.04, 7.04, 7.04); Calibrated: 2/27/2013;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 11.5 W/kg
SAR(1 g) = 5.59 W/kg
Deviation = 6.48%



0 dB = 7.22 W/kg = 8.59 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

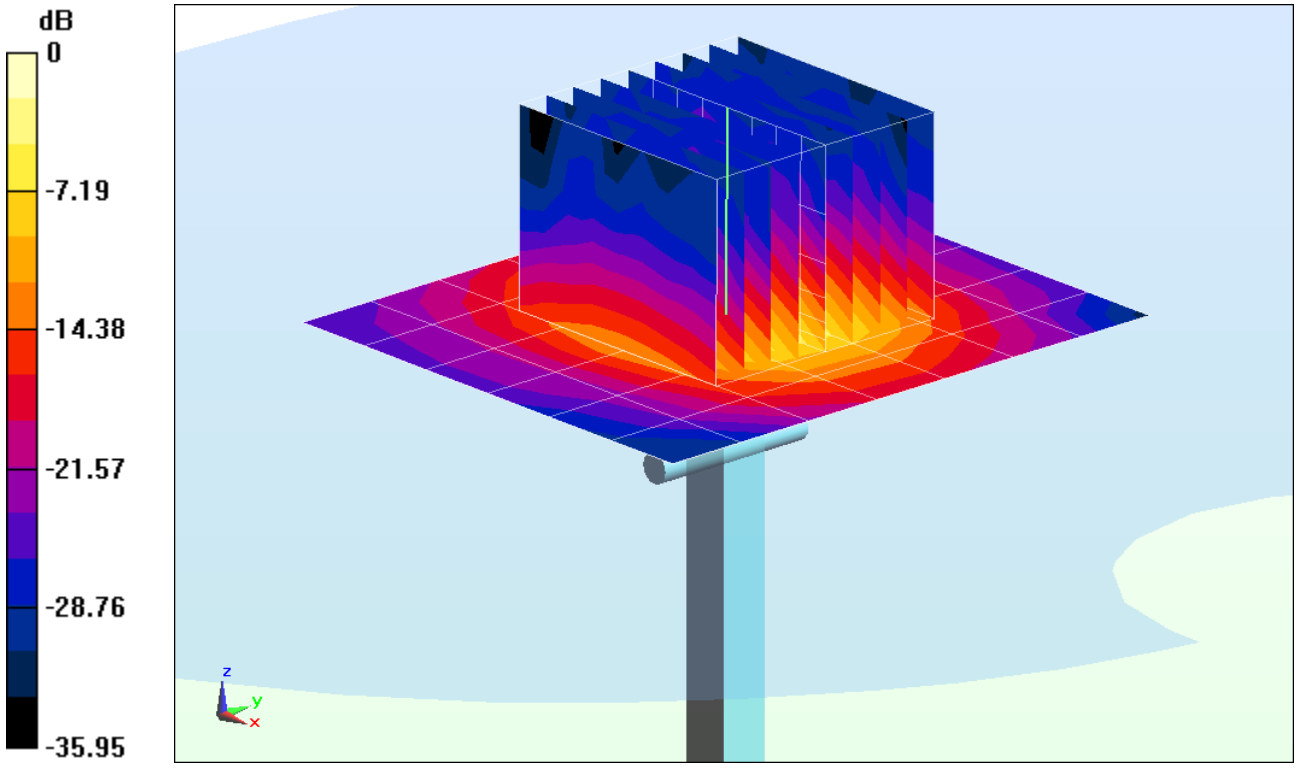
Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head; Medium parameters used:
f = 5200 MHz; σ = 4.468 S/m; ε_r = 35.069; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-08-2013; Ambient Temp: 24.7°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3920; ConvF(4.87, 4.87, 4.87); Calibrated: 2/27/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

5200 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 16.0 dBm (40 mW)
Peak SAR (extrapolated) = 12.1 W/kg
SAR(1 g) = 3.03 W/kg
Deviation = -0.33%



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

PCTEST ENGINEERING LABORATORY, INC.

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

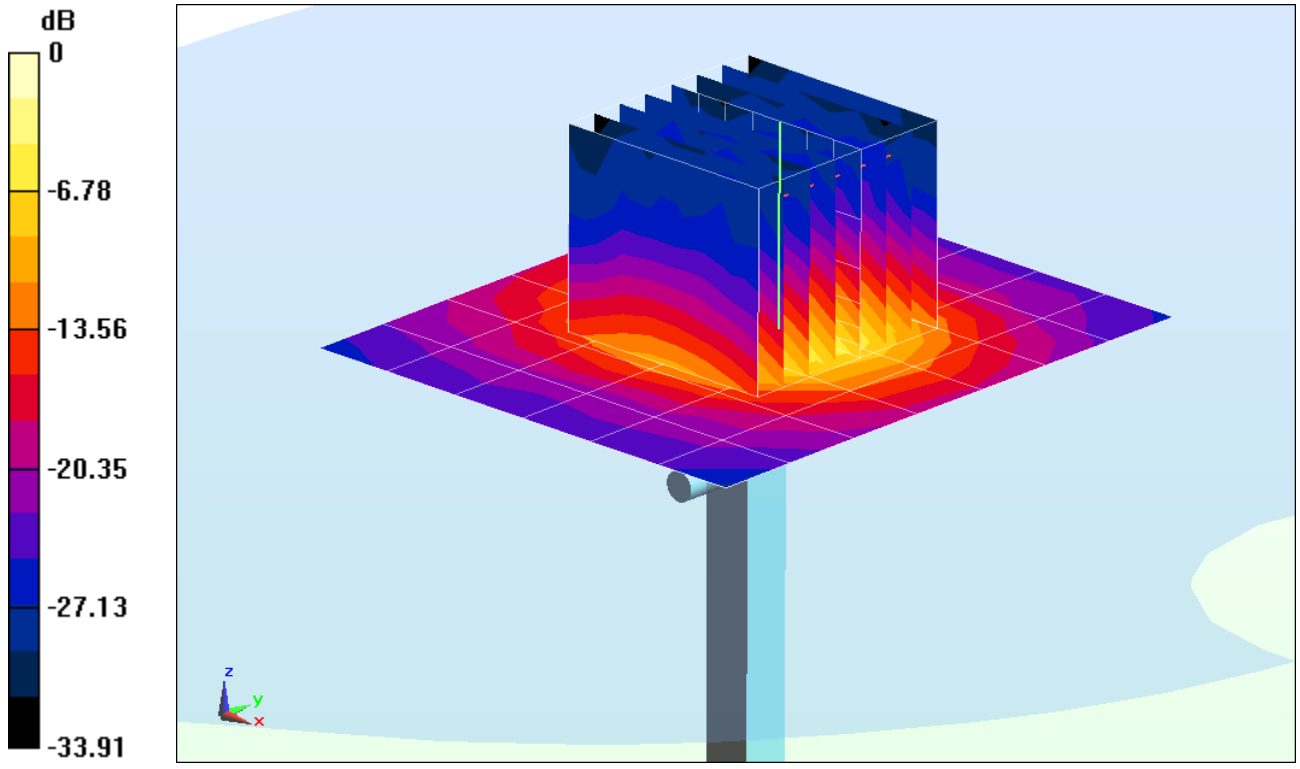
Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head; Medium parameters used:
f = 5300 MHz; σ = 4.565 S/m; ε_r = 34.928; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-08-2013; Ambient Temp: 24.8°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3920; ConvF(4.73, 4.73, 4.73); Calibrated: 2/27/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 16.0 dBm (40 mW)
Peak SAR (extrapolated) = 12.2 W/kg
SAR(1 g) = 2.97 W/kg
Deviation = -5.65%



0 dB = 7.08 W/kg = 8.50 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

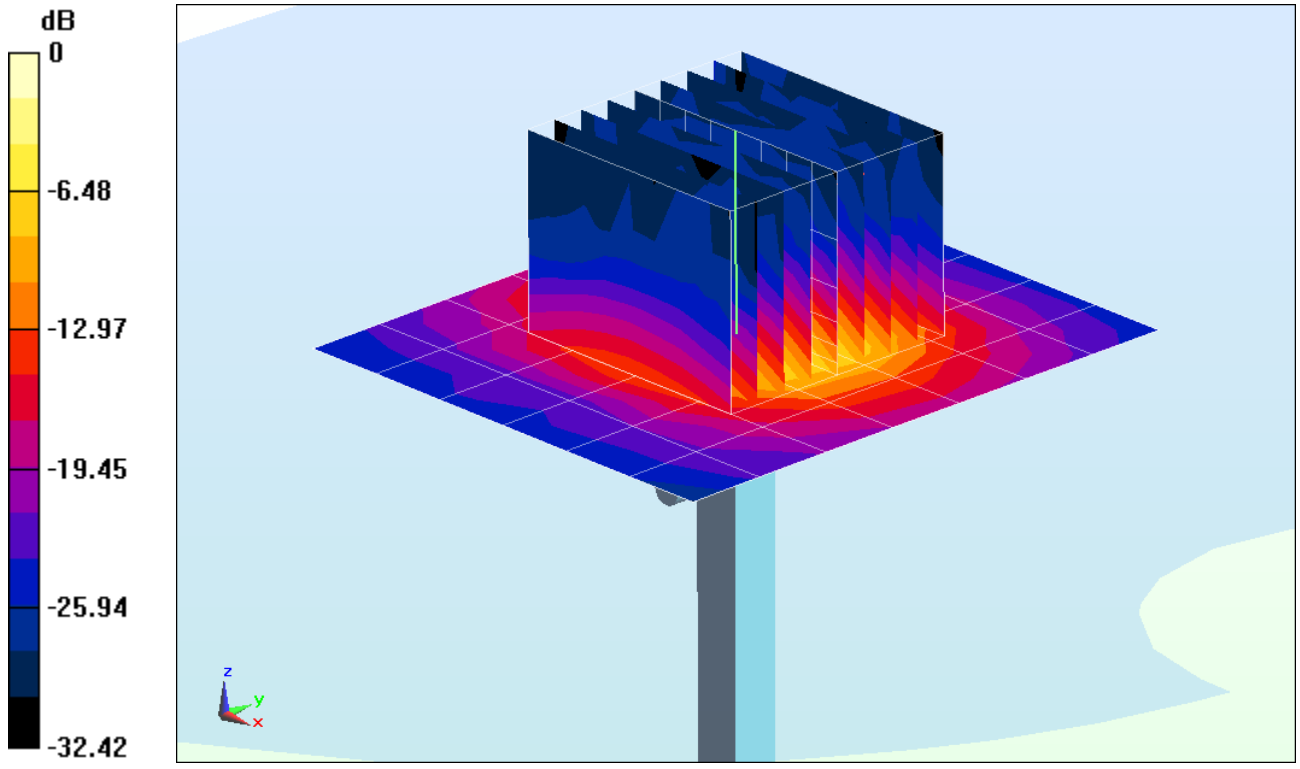
Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head; Medium parameters used:
f = 5500 MHz; σ = 4.76 S/m; ε_r = 34.63; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-08-2013; Ambient Temp: 24.8°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3920; ConvF(4.52, 4.52, 4.52); Calibrated: 2/27/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

5500 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 16.0 dBm (40 mW)
Peak SAR (extrapolated) = 12.2 W/kg
SAR(1 g) = 2.98 W/kg
Deviation = -6.99%



0 dB = 7.54 W/kg = 8.77 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

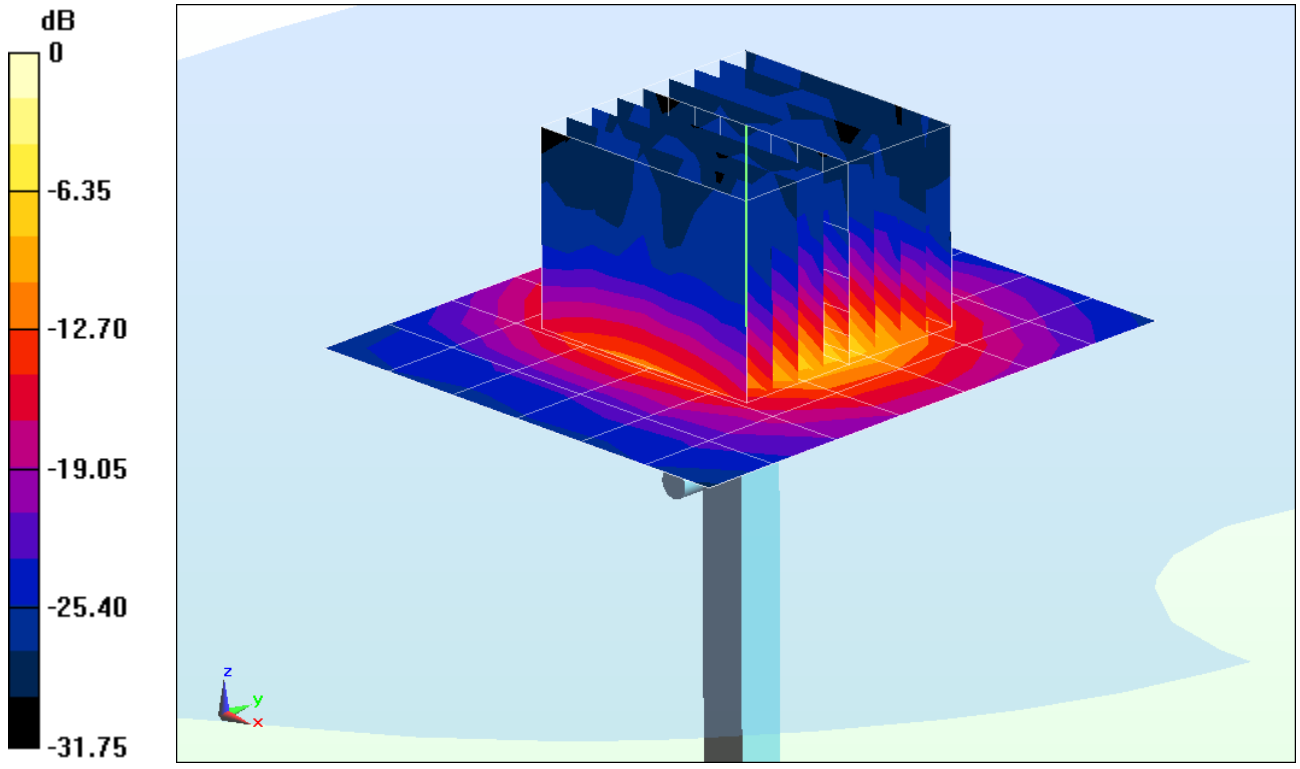
Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head; Medium parameters used:
f = 5800 MHz; σ = 5.075 S/m; ε_r = 34.216; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-08-2013; Ambient Temp: 24.9°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3920; ConvF(4.02, 4.02, 4.02); Calibrated: 2/27/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

5800 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 16.0 dBm (40 mW)
Peak SAR (extrapolated) = 12.5 W/kg
SAR(1 g) = 2.98 W/kg
Deviation = -0.53%



0 dB = 7.63 W/kg = 8.83 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1054

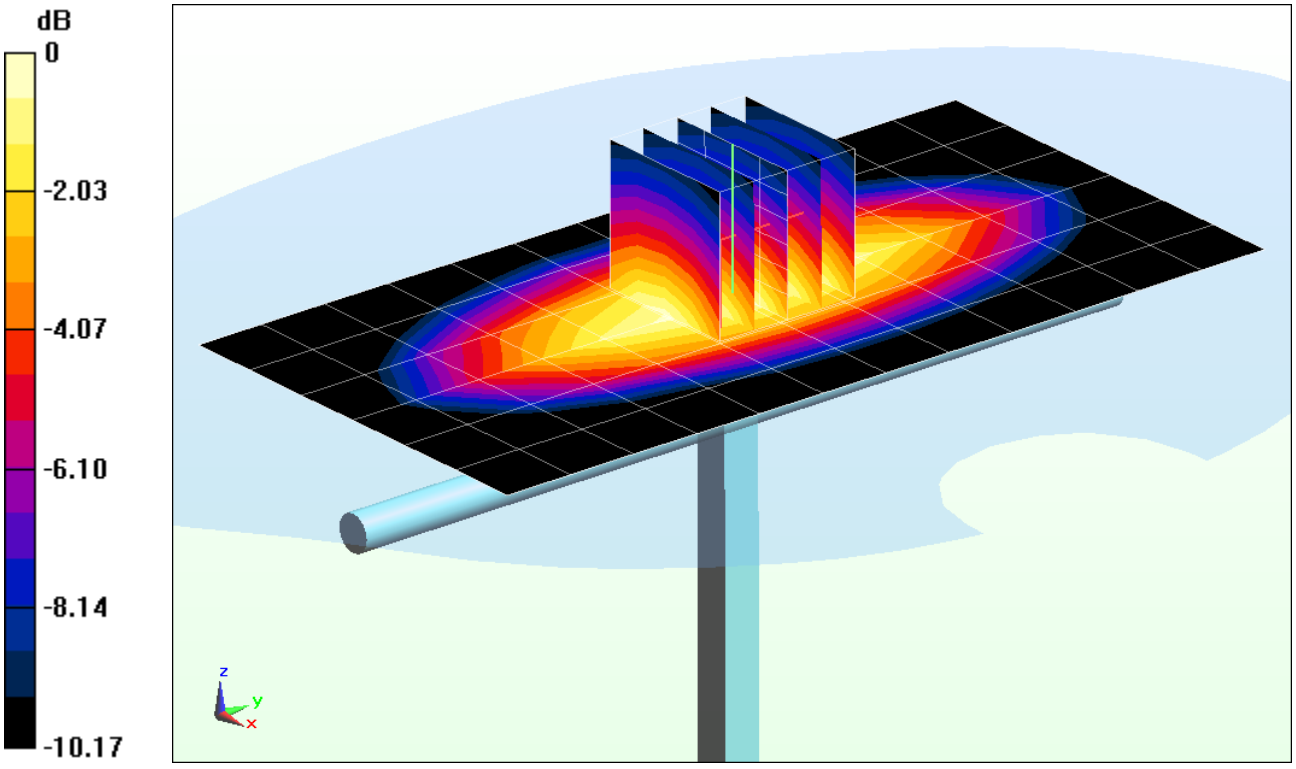
Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 740 Body; Medium parameters used (interpolated):
f = 750 MHz; σ = 0.983 S/m; ε_r = 54.52; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-27-2013; Ambient Temp: 23.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3287; ConvF(6.14, 6.14, 6.14); Calibrated: 11/15/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 11/13/2012
Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

750MHz System Verification

Area Scan (7x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.23 W/kg
SAR(1 g) = 0.863 W/kg
Deviation = -1.03%



0 dB = 0.933 W/kg = -0.30 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

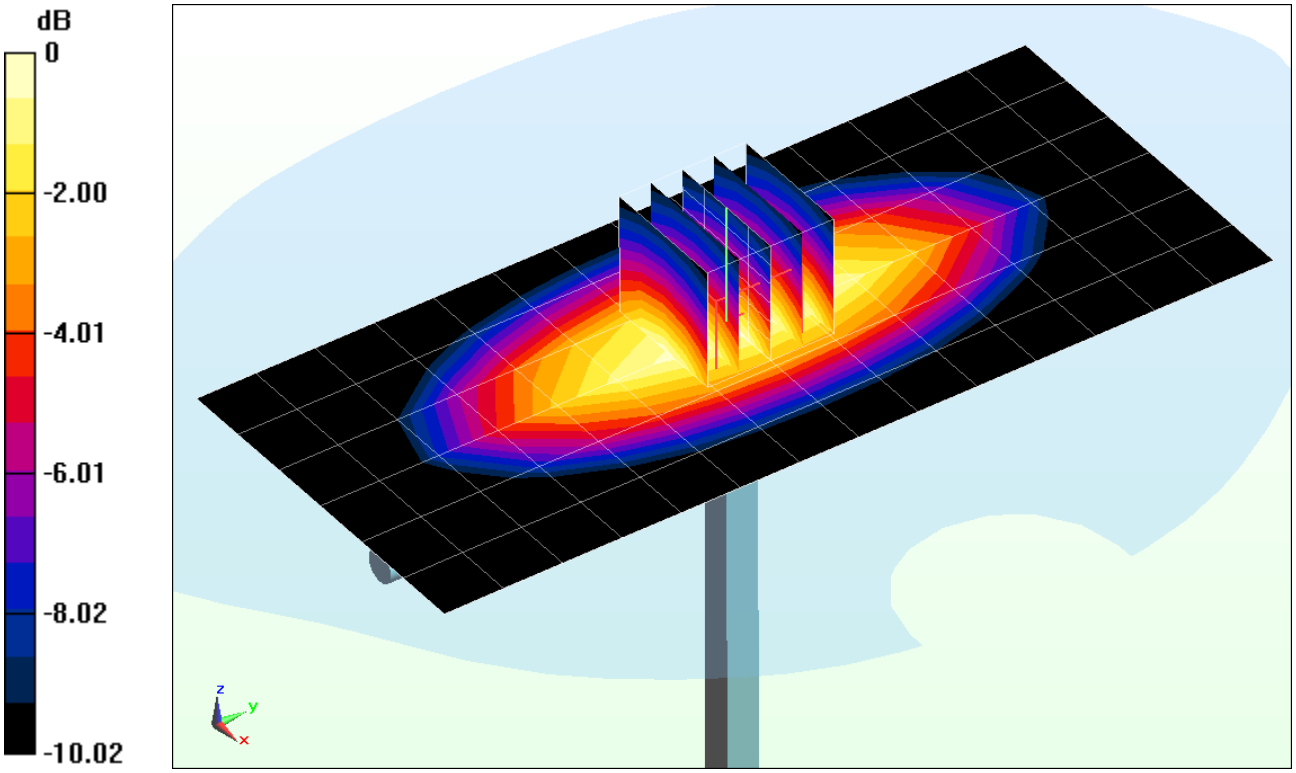
Communication System: CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 740 Body; Medium parameters used (interpolated):
f = 750 MHz; σ = 0.966 S/m; ε_r = 54.643; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-05-2013; Ambient Temp: 23.0°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3288; ConvF(6.44, 6.44, 6.44); Calibrated: 9/20/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/19/2012
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.25 W/kg
SAR(1 g) = 0.866 W/kg
Deviation = -1.93%



0 dB = 0.934 W/kg = -0.30 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

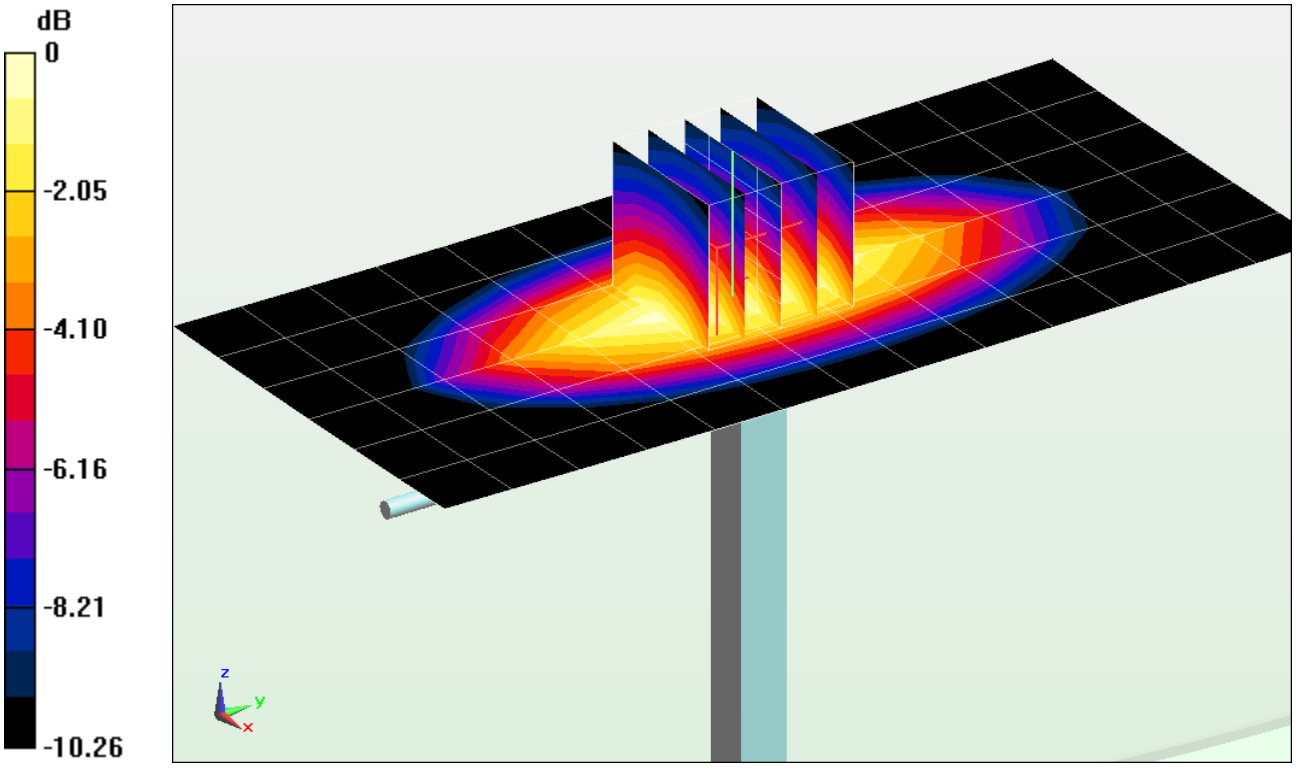
Communication System: CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body; Medium parameters used:
f = 835 MHz; σ = 1.017 S/m; ε_r = 55.86; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-27-2013; Ambient Temp: 24.1°C; Tissue Temp: 23.7°C

Probe: ES3DV3 - SN3209; ConvF(6.28, 6.28, 6.28); Calibrated: 3/15/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/8/2013
Phantom: ELI v5.0; Type: QDOVA002AA; Serial: TP-1158
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 1.39 W/kg
SAR(1 g) = 0.958 W/kg
Deviation = 2.35%



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

PCTEST ENGINEERING LABORATORY, INC.

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

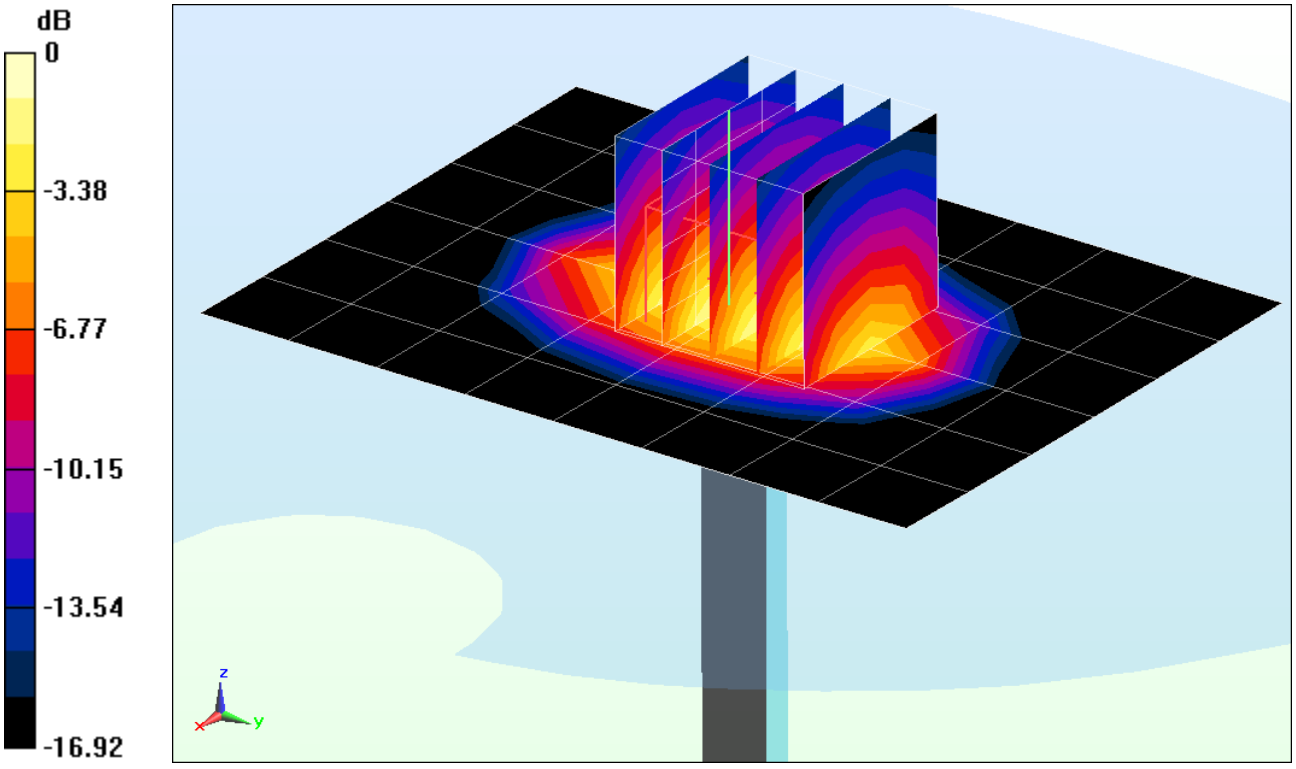
Communication System: CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body; Medium parameters used:
f = 1750 MHz; σ = 1.442 S/m; ε_r = 52.329; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.8°C

Probe: EX3DV4 - SN3920; ConvF(7.59, 7.59, 7.59); Calibrated: 2/27/2013;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn649; Calibrated: 2/6/2013
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (7);SEMCAD X Version 14.6.10 (7164)

1750 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 6.50 W/kg
SAR(1 g) = 3.66 W/kg
Deviation = -3.17%



0 dB = 4.03 W/kg = 6.05 dBW/kg

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

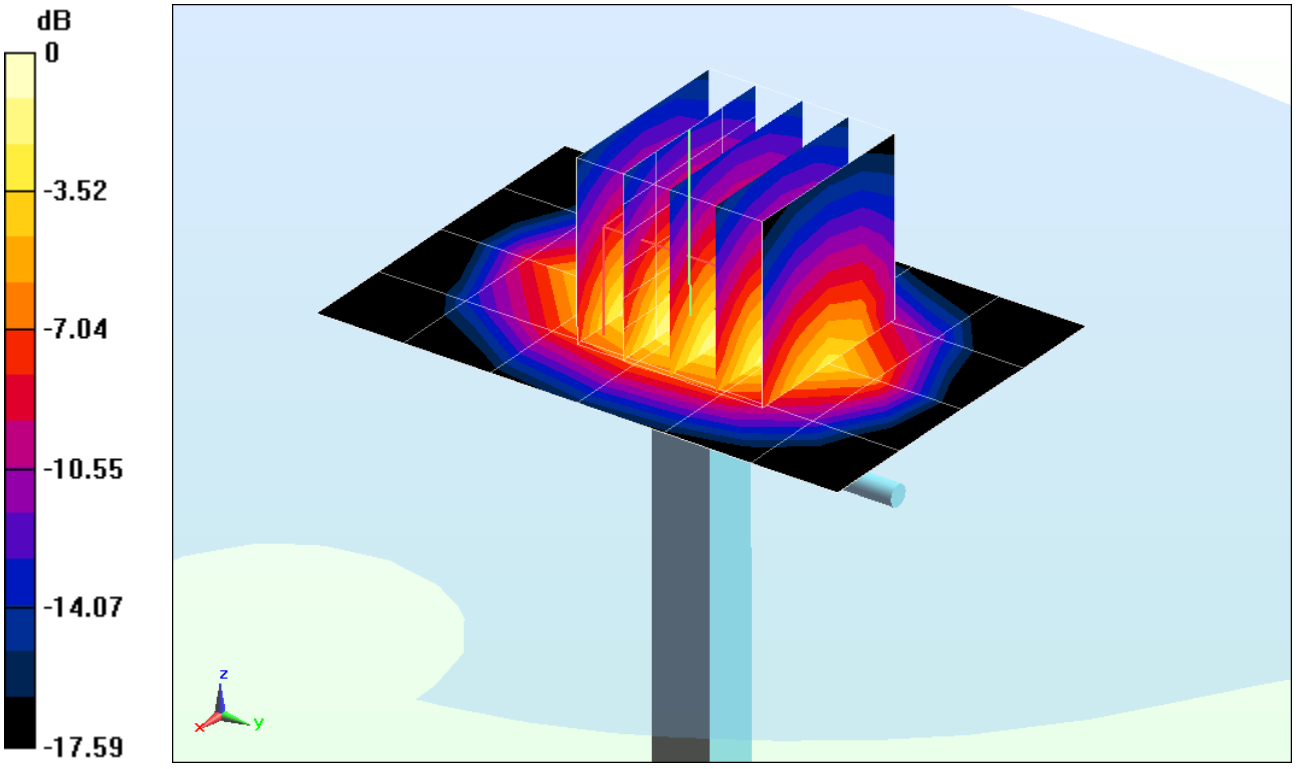
Communication System: CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.525 S/m; ε_r = 51.815; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 23.5°C; Tissue Temp: 23.7°C

Probe: ES3DV2 - SN3022; ConvF(4.43, 4.43, 4.43); Calibrated: 8/28/2012;
Sensor-Surface: 4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 8/24/2012
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

1900MHz System Verification

Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 6.99 W/kg
SAR(1 g) = 4.02 W/kg
Deviation = -0.25%



0 dB = 4.48 W/kg = 6.51 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 719

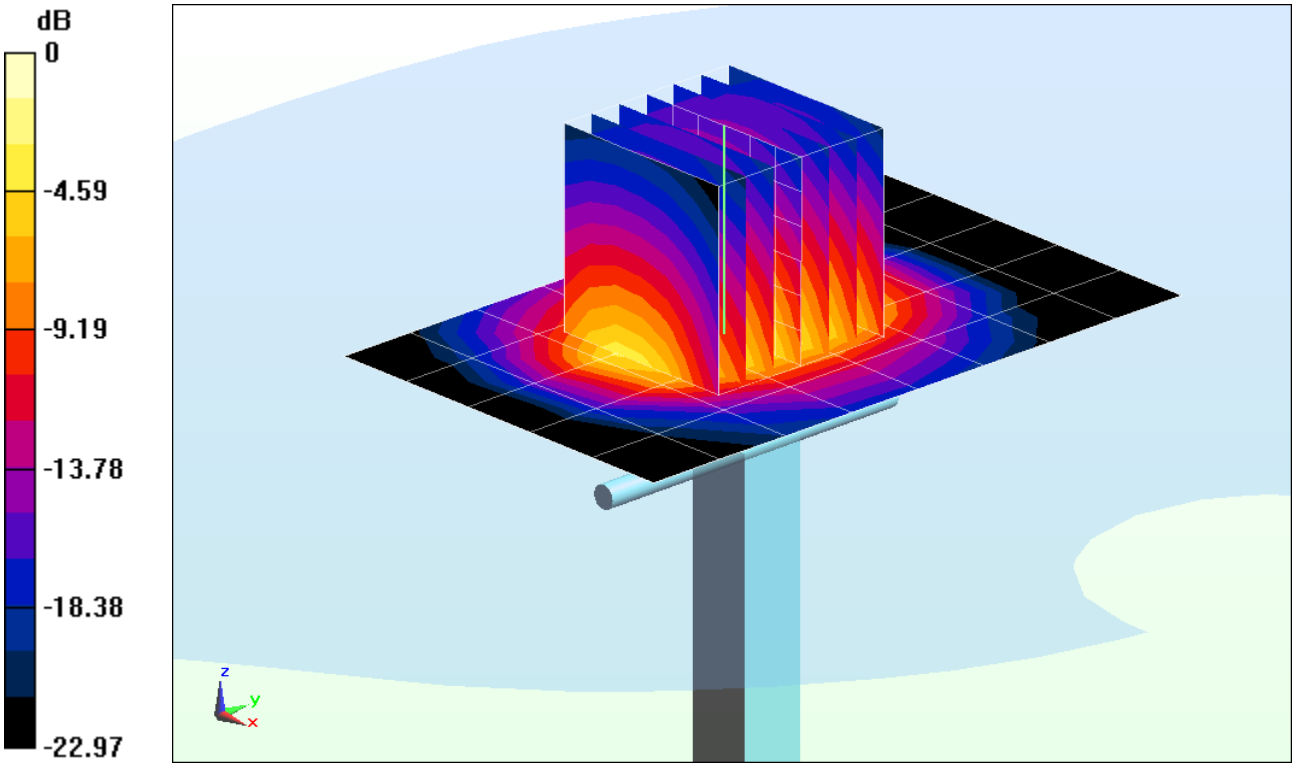
Communication System: CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2450 MHz; σ = 2.008 S/m; ε_r = 52.116; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-26-2013; Ambient Temp: 23.2°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3287; ConvF(4.29, 4.29, 4.29); Calibrated: 11/15/2012;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 11/13/2012
Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

2450MHz System Verification

Area Scan (6x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 11.2 W/kg
SAR(1 g) = 5.24 W/kg
Deviation = 1.55%



0 dB = 6.71 W/kg = 8.27 dBW/kg

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

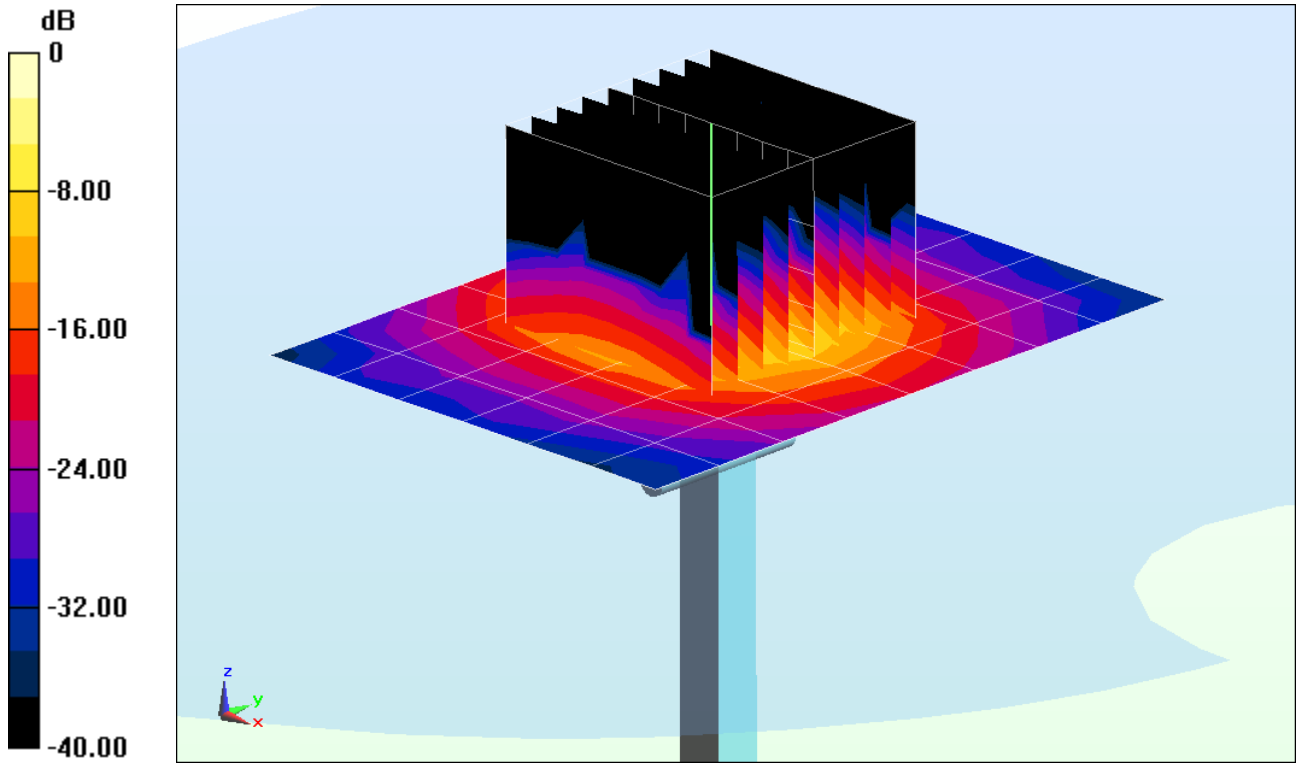
Communication System: CW; Frequency: 5200 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5200 MHz; σ = 5.335 S/m; ε_r = 47.08; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.4°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3589; ConvF(3.99, 3.99, 3.99); Calibrated: 1/17/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/17/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

5200MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 28.7 W/kg
SAR(1 g) = 7.51 W/kg
Deviation = -0.53%



0 dB = 18.4 W/kg = 12.65 dBW/kg

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

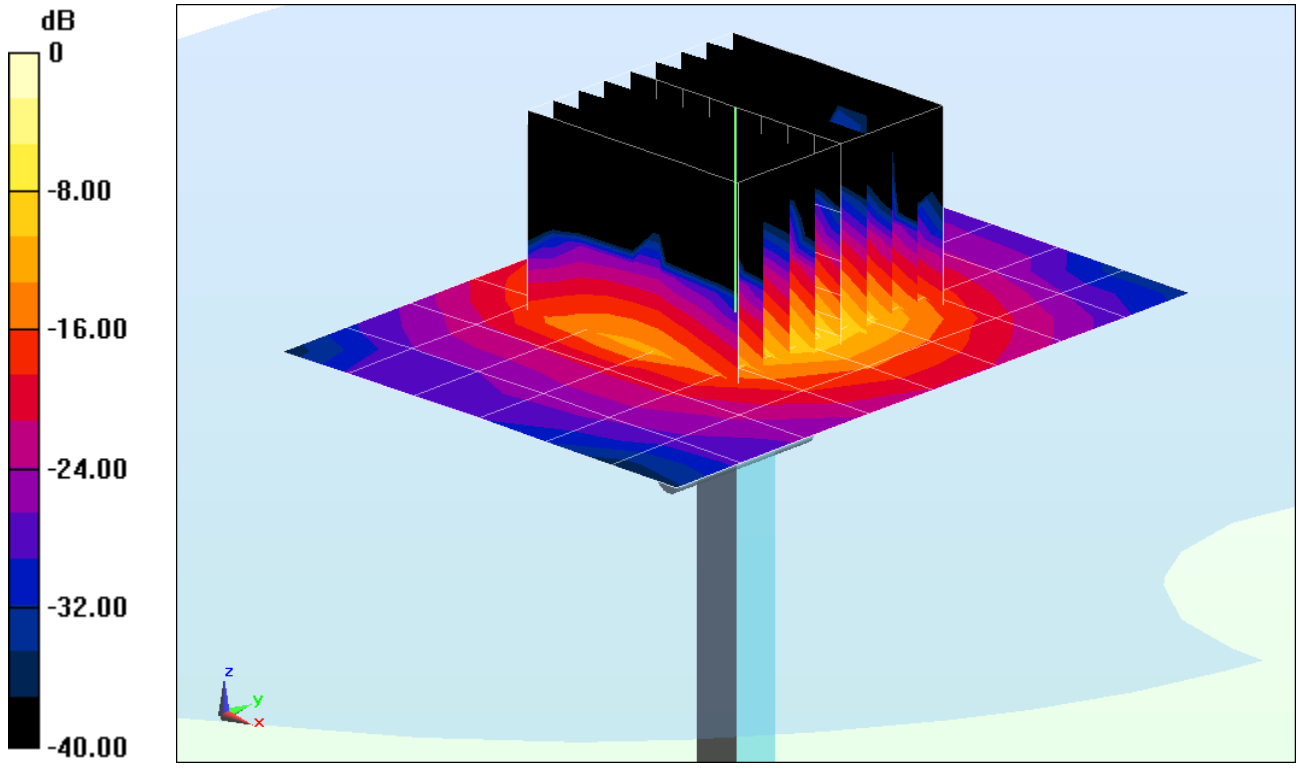
Communication System: CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5300 MHz; σ = 5.438 S/m; ε_r = 46.81; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.3°C; Tissue Temp: 23.1°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/17/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/17/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

5300MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 33.0 W/kg
SAR(1 g) = 7.98 W/kg
Deviation = 5.98%



0 dB = 19.1 W/kg = 12.81 dBW/kg

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

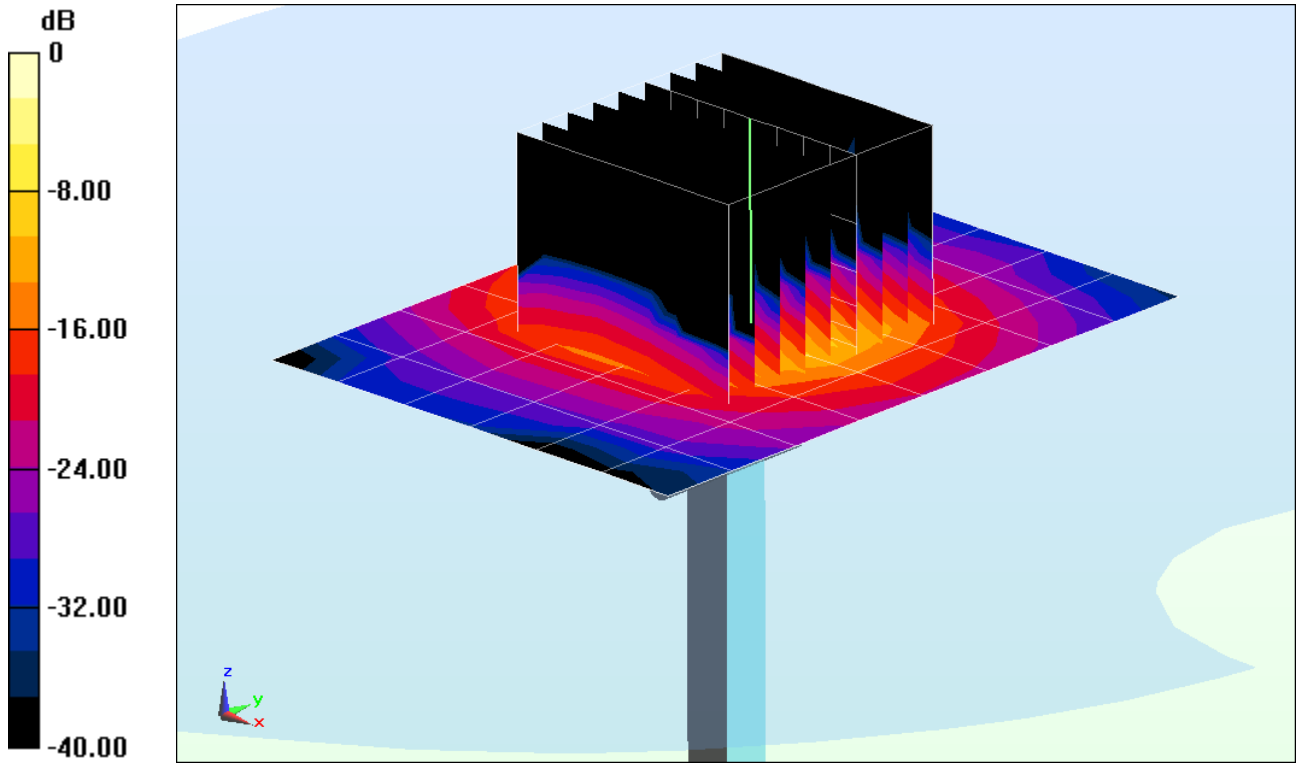
Communication System: CW; Frequency: 5500 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5500 MHz; σ = 5.732 S/m; ε_r = 46.335; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.2°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3589; ConvF(3.52, 3.52, 3.52); Calibrated: 1/17/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/17/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

5500MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 39.7 W/kg
SAR(1 g) = 8.15 W/kg
Deviation = 0.87%



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

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

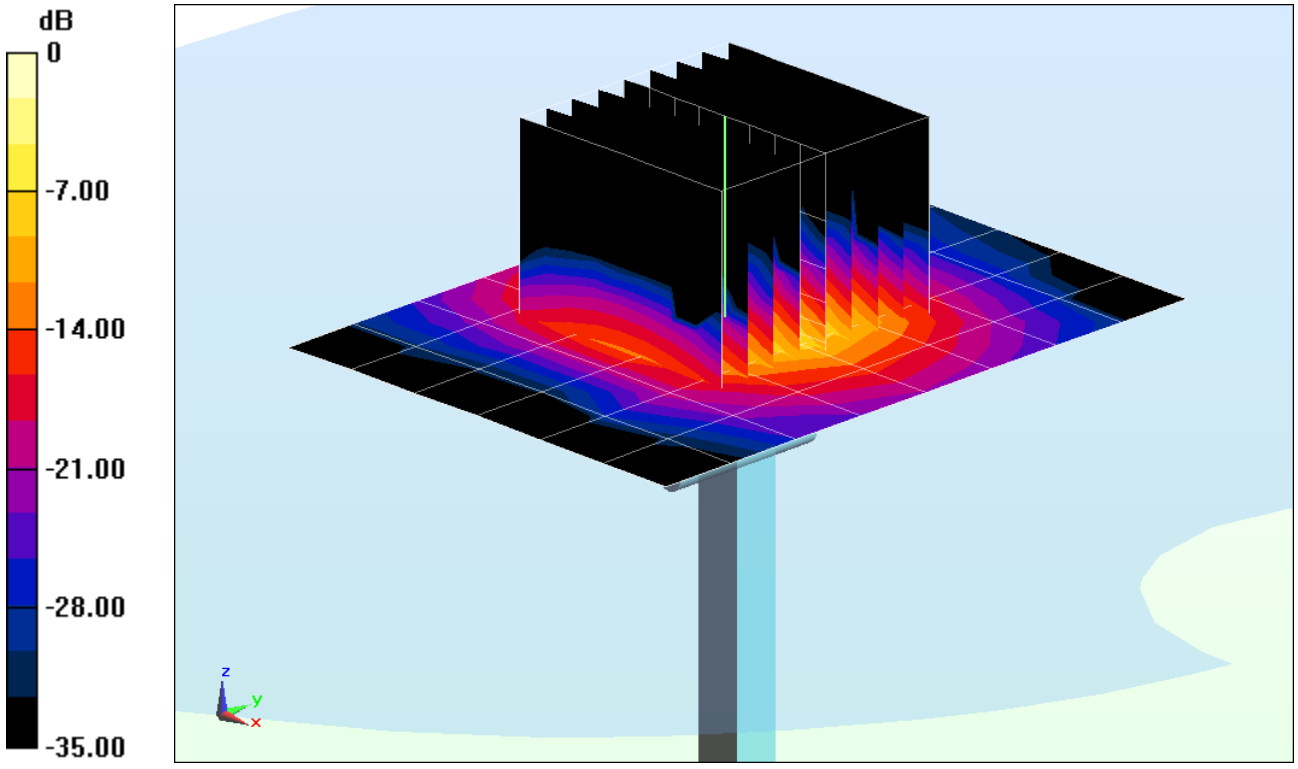
Communication System: CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body; Medium parameters used:
f = 5800 MHz; σ = 6.224 S/m; ε_r = 45.956; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-01-2013; Ambient Temp: 24.2°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3589; ConvF(3.66, 3.66, 3.66); Calibrated: 1/17/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/17/2013
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80);SEMCAD X Version 14.6.10 (7164)

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 20.0 dBm (100 mW)
Peak SAR (extrapolated) = 32.2 W/kg
SAR(1 g) = 7.2 W/kg
Deviation = -4.13%



0 dB = 17.8 W/kg = 12.50 dBW/kg

APPENDIX C: PROBE CALIBRATION

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 108

Client **PC Test**

Certificate No: D750V3-1003_Jan13

CALIBRATION CERTIFICATE

Object D750V3 - SN: 1003

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

Calibration date: January 07, 2013

OK 1/25/13

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: January 8, 2013

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

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

SAR result with Head TSL

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

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

Body TSL parameters

The following parameters and calculations were applied.

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

SAR result with Body TSL

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

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

Appendix

Antenna Parameters with Head TSL

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

Antenna Parameters with Body TSL

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

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

DASY5 Validation Report for Head TSL

Date: 07.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

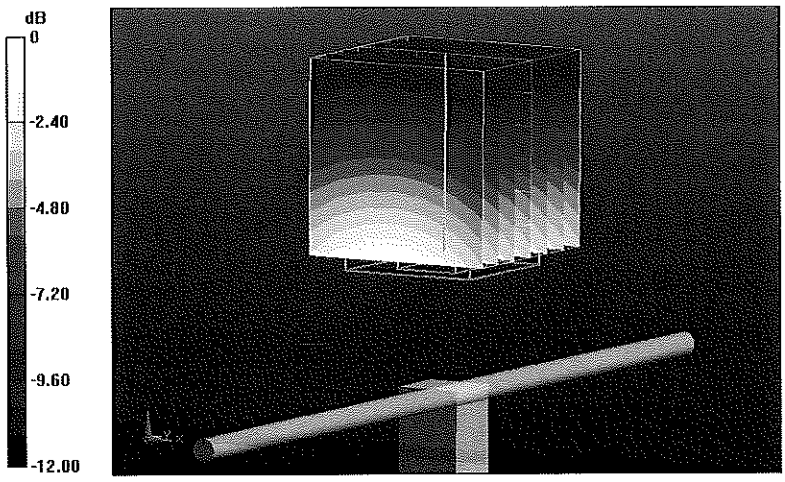
Communication System: CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.89 S/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

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

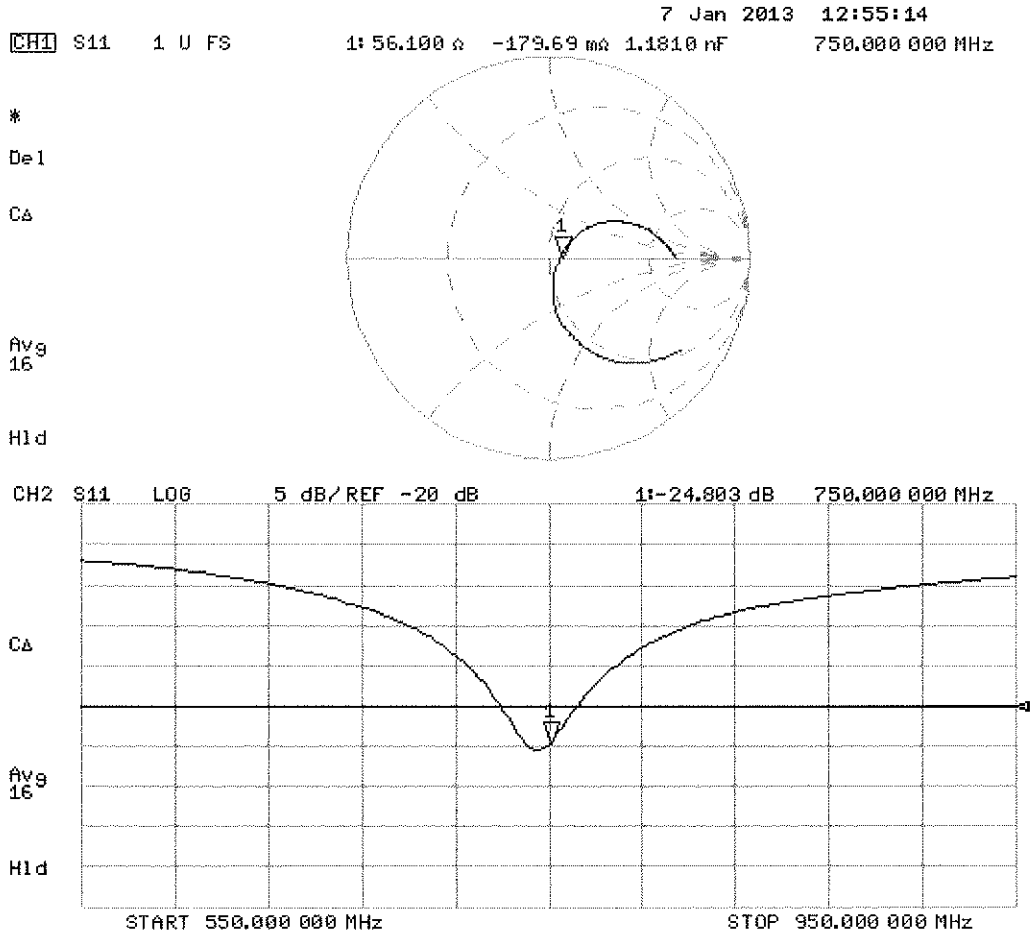
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.114 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.24 W/kg
SAR(1 g) = 2.12 W/kg; SAR(10 g) = 1.38 W/kg
Maximum value of SAR (measured) = 2.47 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

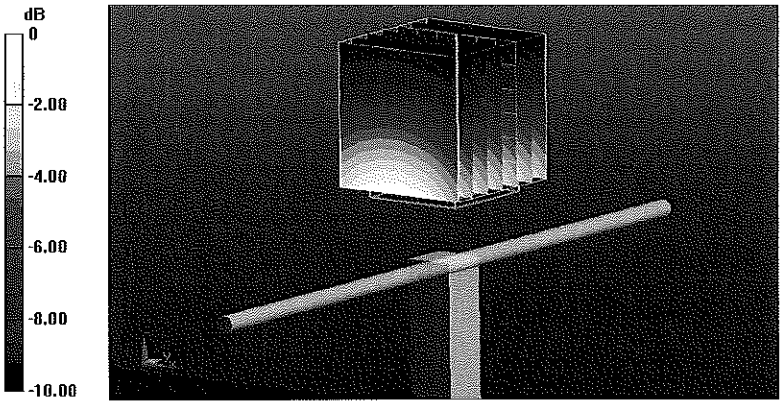
Communication System: CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.97 S/m; ε_r = 54.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

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

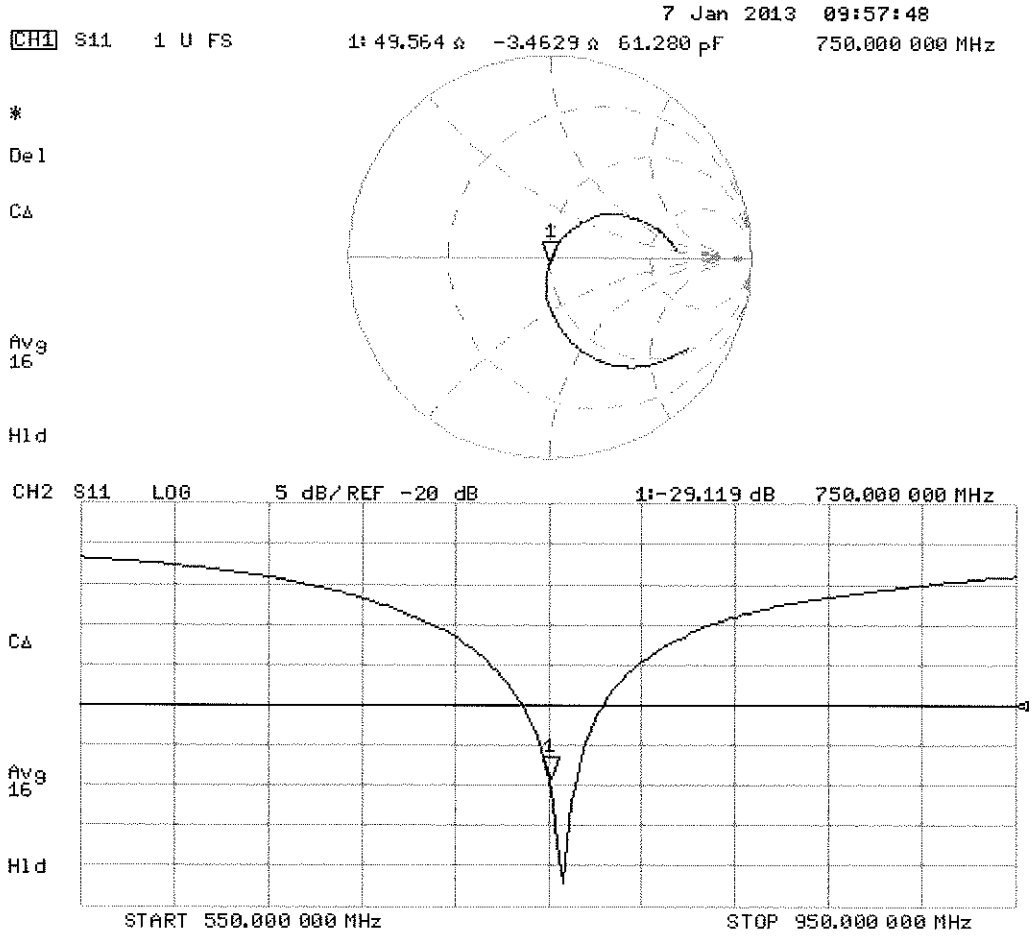
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 53.114 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 3.25 W/kg
SAR(1 g) = 2.23 W/kg; SAR(10 g) = 1.48 W/kg
Maximum value of SAR (measured) = 2.57 W/kg



0 dB = 2.57 W/kg = 4.10 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
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S Servizio svizzero di taratura
S Swiss Calibration Service

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

Accreditation No.: SCS 108

Client **PC Test**

Certificate No: D835V2-4d132_Jan13

CALIBRATION CERTIFICATE

Object: D835V2 - SN: 4d132

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

Calibration date: January 07, 2013

OK 1/28/13

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: January 8, 2013

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.4
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	42.0 ± 6 %	0.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.66 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.29 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.7 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.38 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.36 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.57 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.20 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.2 Ω + 1.3 jΩ
Return Loss	- 27.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.8 Ω - 1.3 jΩ
Return Loss	- 34.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.391 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 07.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

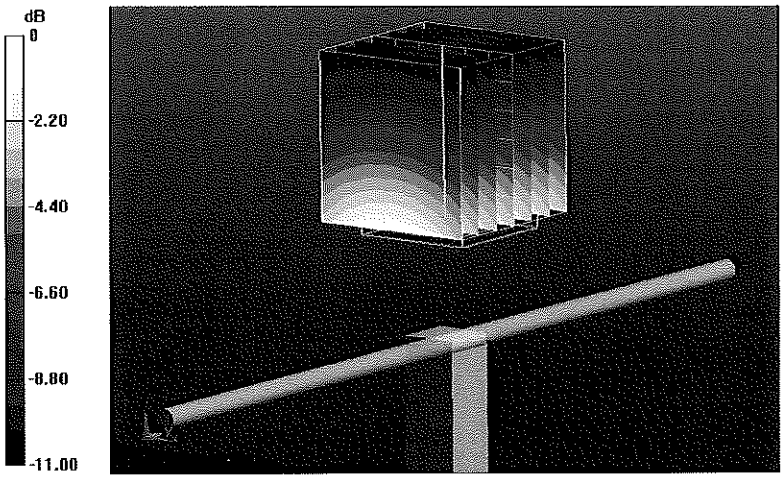
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; ε_r = 42; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.05, 6.05, 6.05); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

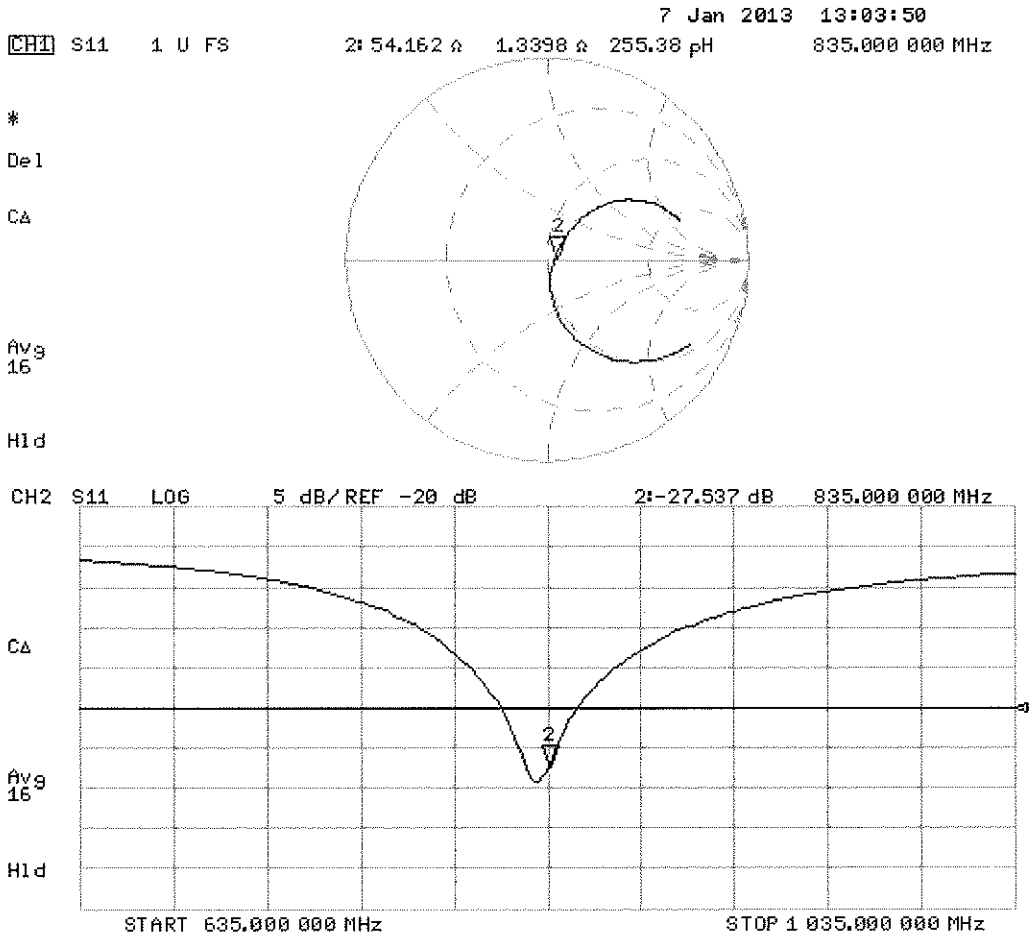
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.542 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 3.71 W/kg
SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 2.88 W/kg



0 dB = 2.88 W/kg = 4.59 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.01.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

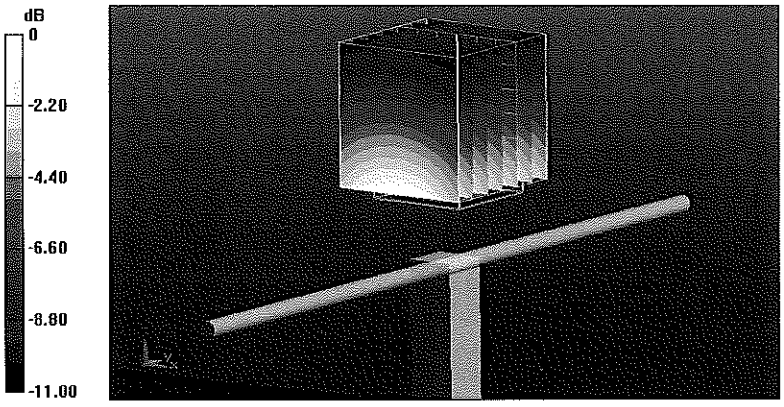
Communication System: CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 54.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.04, 6.04, 6.04); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.4(1052); SEMCAD X 14.6.8(7028)

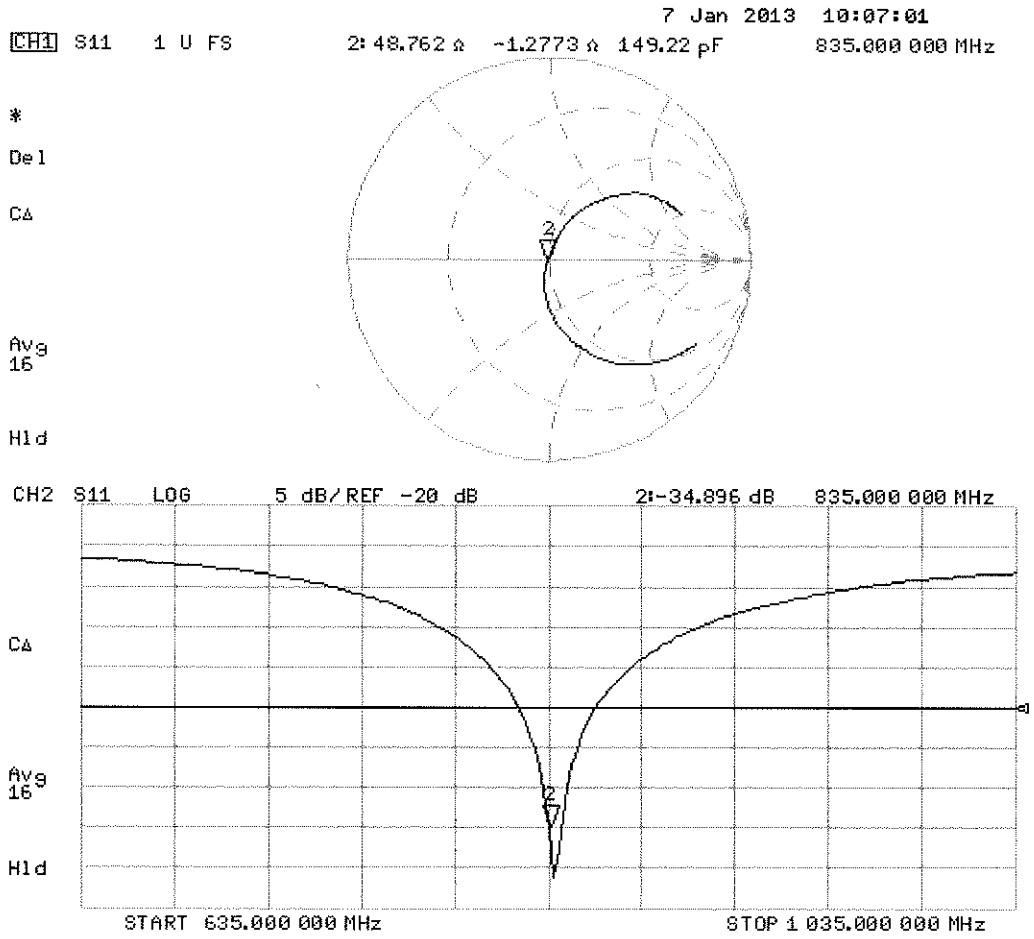
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 54.512 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 3.47 W/kg
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.57 W/kg
Maximum value of SAR (measured) = 2.77 W/kg



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

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Client **PC Test**

Certificate No: D1750V2-1051_Apr13

CALIBRATION CERTIFICATE

Object D1750V2 - SN: 1051

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

Calibration date: April 30, 2013

OK 5/5/13

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 30, 2013

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.6
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.1 ± 6 %	1.33 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.5 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	1.50 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.55 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.4 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9 Ω + 0.3 jΩ
Return Loss	- 40.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.0 Ω + 0.4 jΩ
Return Loss	- 30.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.222 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 19, 2010

DASY5 Validation Report for Head TSL

Date: 30.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

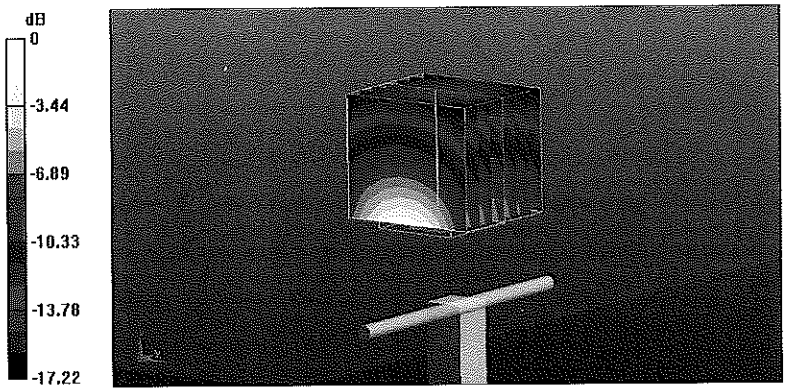
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.33 S/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.18, 5.18, 5.18); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

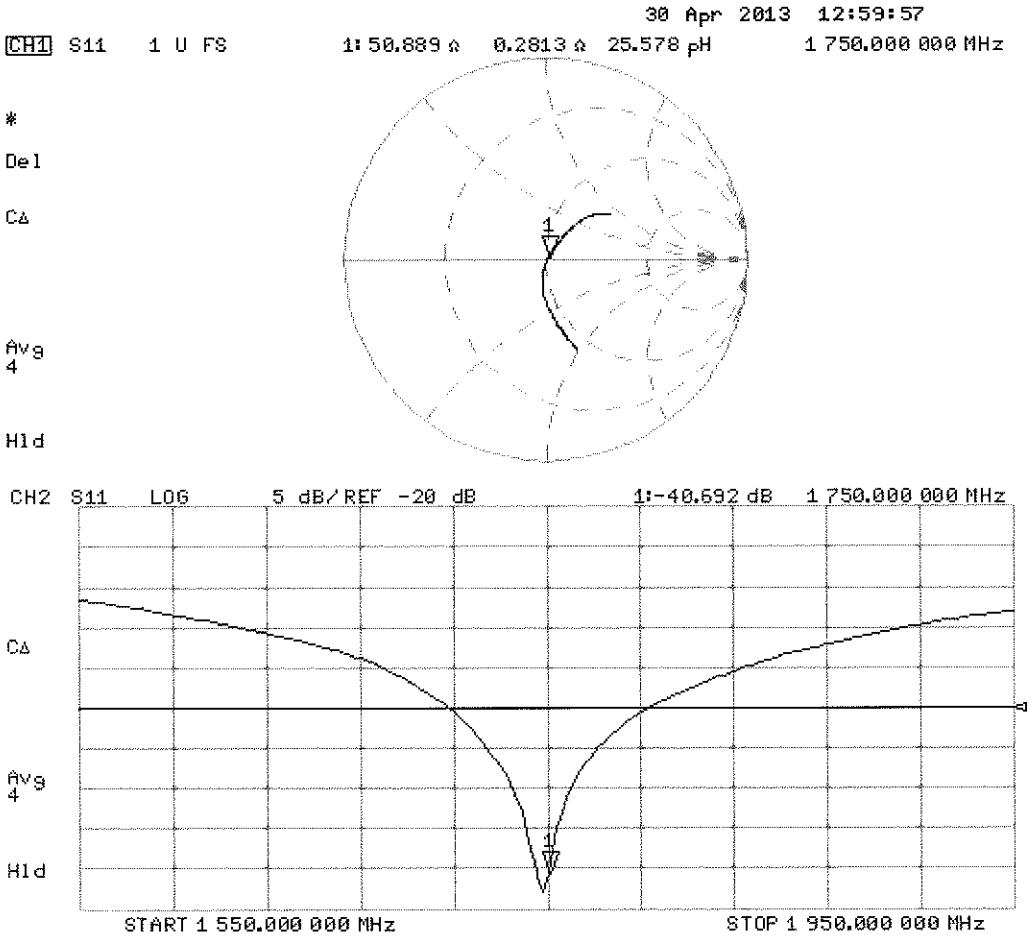
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (8x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.104 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 16.0 W/kg
SAR(1 g) = 9.01 W/kg; SAR(10 g) = 4.83 W/kg
Maximum value of SAR (measured) = 11.3 W/kg



0 dB = 11.3 W/kg = 10.53 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 30.04.2013

Test Laboratory: SPEAG, Zurich, Switzerland

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

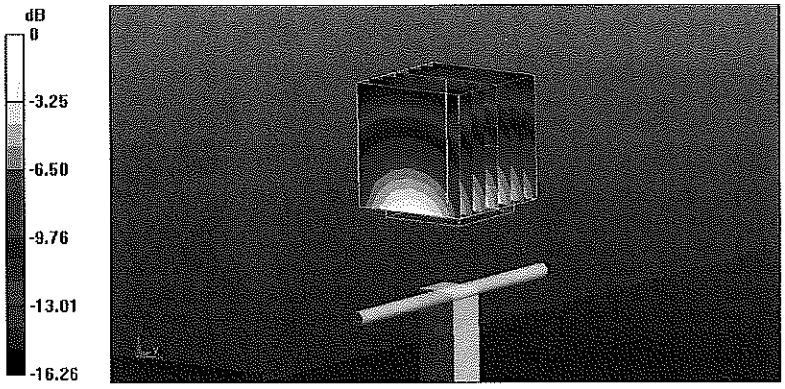
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.5 S/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.83, 4.83, 4.83); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.6(1115); SEMCAD X 14.6.9(7117)

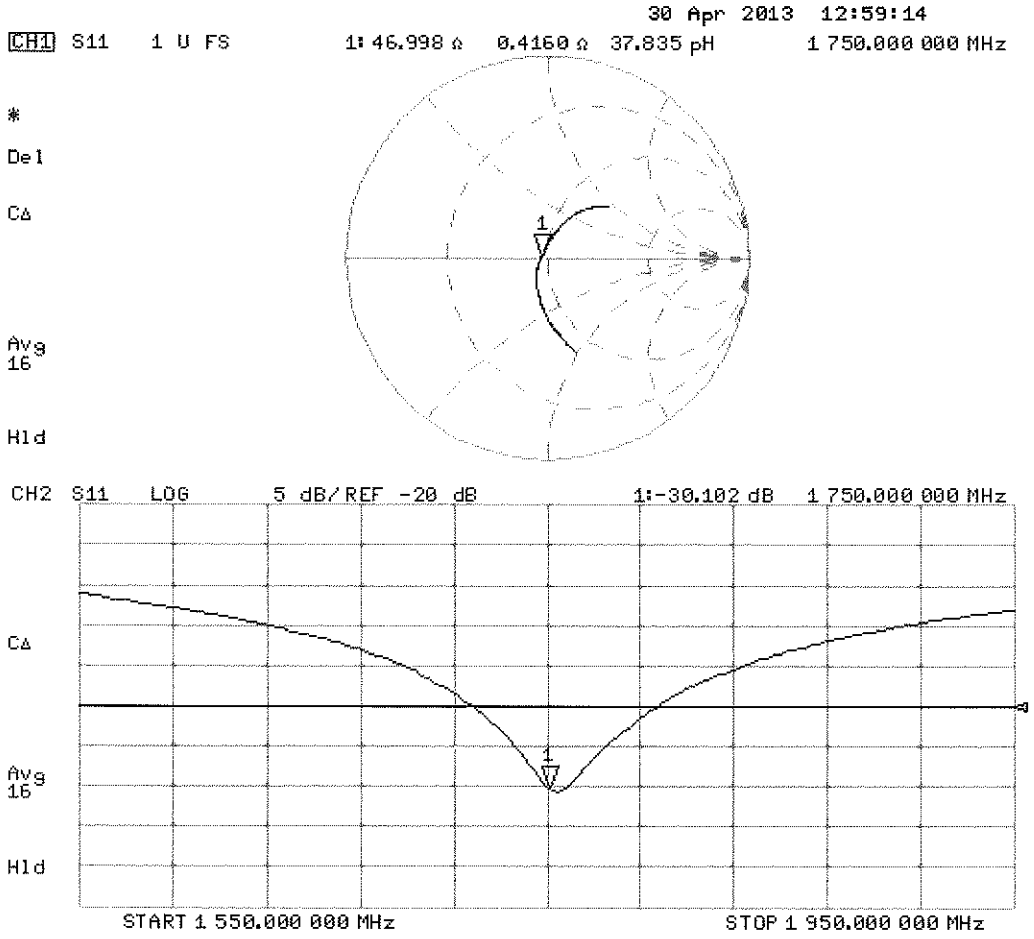
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 93.473 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 16.4 W/kg
SAR(1 g) = 9.55 W/kg; SAR(10 g) = 5.13 W/kg
Maximum value of SAR (measured) = 12.0 W/kg



0 dB = 12.0 W/kg = 10.79 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Client PC Test

Certificate No: D1900V2-5d148_Feb13

CALIBRATION CERTIFICATE

Object: D1900V2 - SN: 5d148

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

Calibration date: February 06, 2013

KOK 2/21/13

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	27-Mar-12 (No. 217-01530)	Apr-13
Type-N mismatch combination	SN: 5047.3 / 06327	27-Mar-12 (No. 217-01533)	Apr-13
Reference Probe ES3DV3	SN: 3205	28-Dec-12 (No. ES3-3205_Dec12)	Dec-13
DAE4	SN: 601	27-Jun-12 (No. DAE4-601_Jun12)	Jun-13

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

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

Issued: February 6, 2013

Calibration Laboratory of
Schmid & Partner
Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 108

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.5
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.4 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.8 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.9 ± 6 %	1.53 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.3 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.7 W/kg ± 16.5 % (k=2)**

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 5.9 jΩ
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3 Ω + 6.3 jΩ
Return Loss	- 23.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.
No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 06.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d148

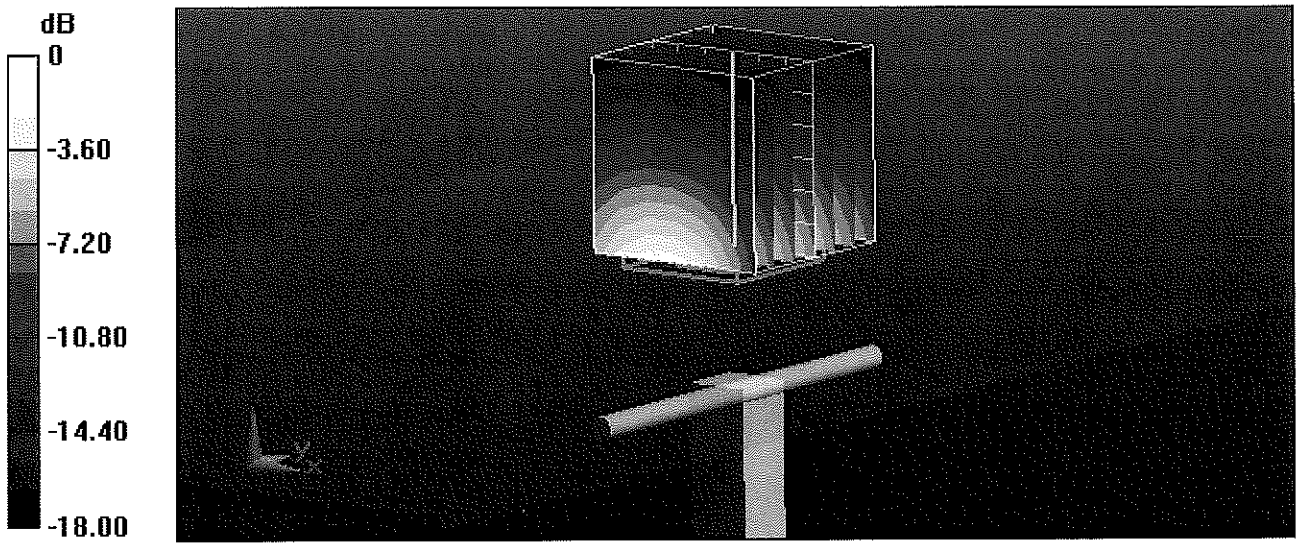
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 39.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.98, 4.98, 4.98); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

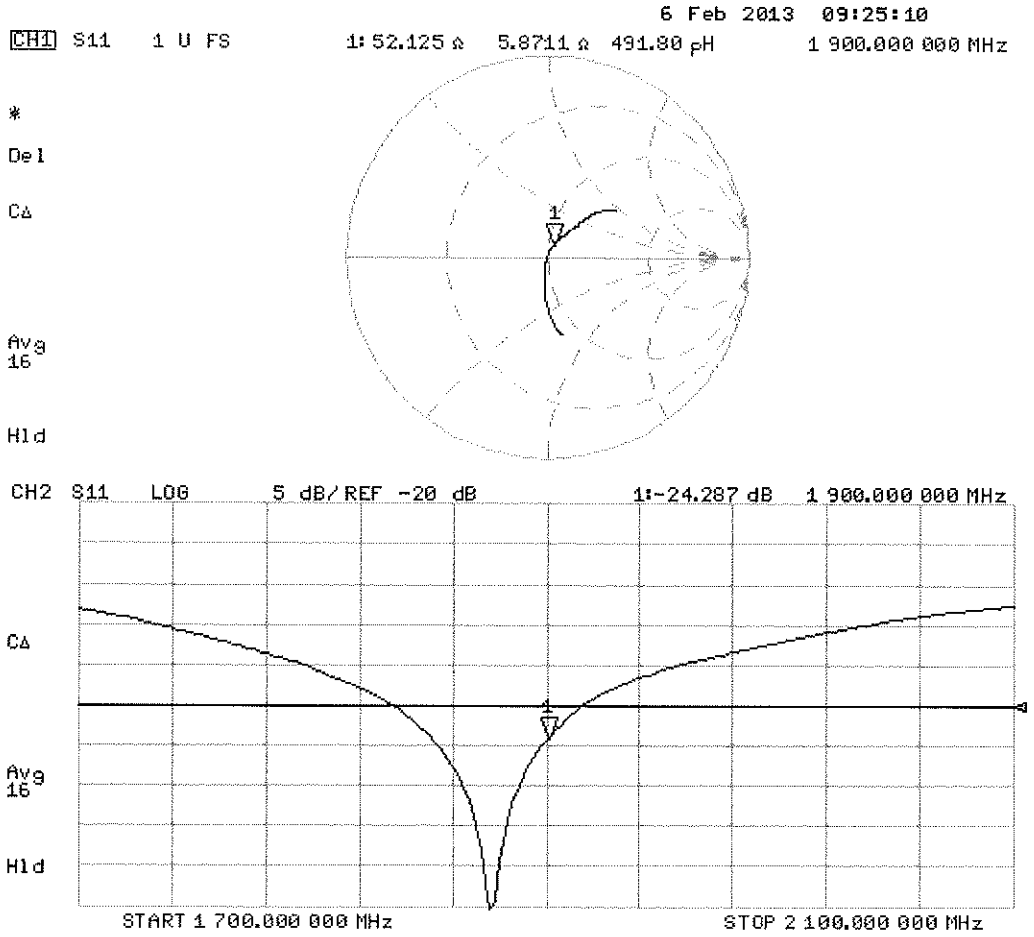
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.534 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 17.8 W/kg
SAR(1 g) = 9.87 W/kg; SAR(10 g) = 5.18 W/kg
Maximum value of SAR (measured) = 12.1 W/kg



0 dB = 12.1 W/kg = 10.83 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 06.02.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d148

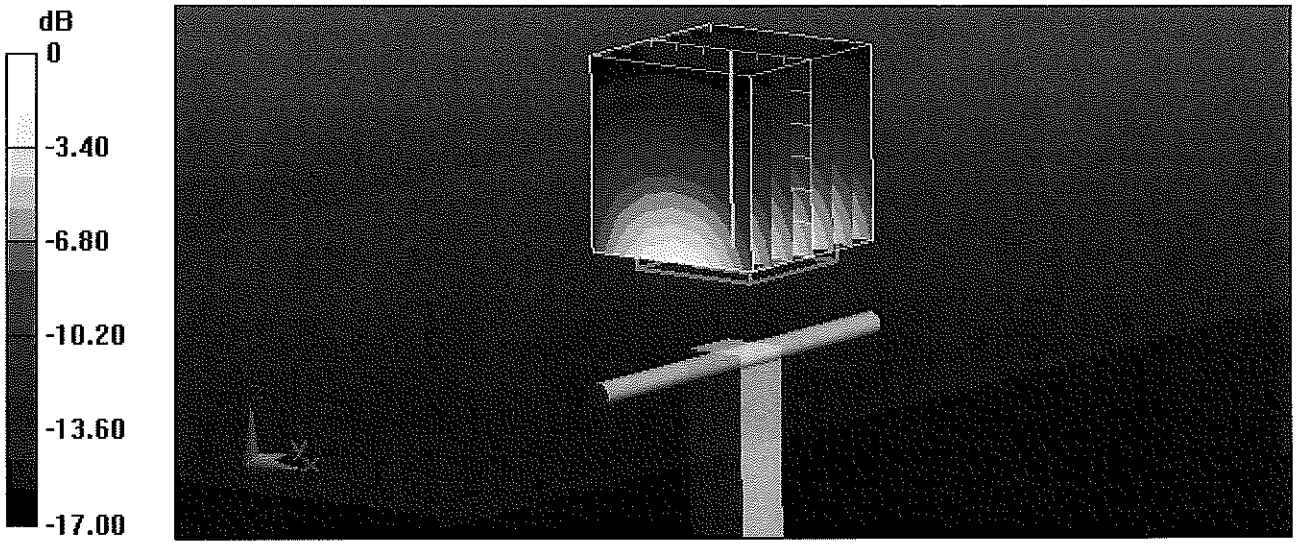
Communication System: CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.53 S/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.6, 4.6, 4.6); Calibrated: 28.12.2012;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 27.06.2012
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.5(1059); SEMCAD X 14.6.8(7028)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 96.534 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 10.3 W/kg; SAR(10 g) = 5.45 W/kg
Maximum value of SAR (measured) = 13.1 W/kg



0 dB = 13.1 W/kg = 11.17 dBW/kg

Impedance Measurement Plot for Body TSL