



## SAR EVALUATION REPORT

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

**Date of Testing:**  
 03/16/15 - 03/30/15  
**Test Site/Location:**  
 PCTEST Lab, Columbia, MD, USA  
**Document Serial No.:**  
 OY1503160600.ZNF

**FCC ID:** ZNFH811

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

**DUT Type:** Portable Handset  
**Application Type:** Certification  
**FCC Rule Part(s):** CFR §2.1093  
**Model(s):** LG-H811, LGH811, H811

Equipment Class	Band & Mode	Tx Frequency	SAR				
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)	10 gm Extremity (W/kg)	
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.53	0.88	0.88		
PCE	UMTS 850	826.40 - 846.60 MHz	0.52	0.67	0.67		
PCE	UMTS 1750	1712.4 - 1752.5 MHz	0.87	0.54	0.55		
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.60	0.38	0.61		
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.97	0.53	0.81		
PCE	LTE Band 12	699.7 - 715.3 MHz	0.34	0.51	0.58		
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.49	0.55	0.55		
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	1.03	0.62	0.71		
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	1.05	0.51	0.87		
PCE	LTE Band 7	2502.5 - 2567.5 MHz	0.40	0.29	0.35		
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.36	0.27	0.27		
Nil	5.2 GHz WLAN	5180 - 5240 MHz	0.51	0.25		0.50	
Nil	5.3 GHz WLAN	5260 - 5320 MHz	0.53	0.28		0.54	
Nil	5.5 GHz WLAN	5500 - 5720 MHz	0.27	0.25		0.26	
Nil	5.8 GHz WLAN	5745 - 5825 MHz	0.21	0.12	0.15		
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A				
<b>Simultaneous SAR per KDB 690783 D01v01r03:</b>			<b>1.36</b>	<b>1.16</b>	<b>1.14</b>	<b>0.54</b>	

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 1.9 of this report; for North American frequency bands only.

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

  
 Randy Ortanez  
 President



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<b>Document S/N:</b> OY1503160600.ZNF	<b>Test Dates:</b> 03/16/15 - 03/30/15	<b>DUT Type:</b> Portable Handset	Page 1 of 82	

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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 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
5.2 GHz WLAN	Voice/Data	5180 - 5240 MHz
5.3 GHz WLAN	Voice/Data	5260 - 5320 MHz
5.5 GHz WLAN	Voice/Data	5500 - 5720 MHz
5.8 GHz WLAN	Voice/Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

## 1.2 Nominal and Maximum Output Power Specifications

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

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
GSM/GPRS/EDGE 850	Maximum	<b>33.7</b>	<b>33.7</b>	<b>31.7</b>	<b>30.0</b>	<b>28.4</b>	<b>27.7</b>	<b>27.7</b>	<b>26.7</b>	<b>25.7</b>
	Nominal	<b>33.2</b>	<b>33.2</b>	<b>31.2</b>	<b>29.5</b>	<b>27.9</b>	<b>27.2</b>	<b>27.2</b>	<b>26.2</b>	<b>25.2</b>
GSM/GPRS/EDGE 1900	Maximum	<b>30.2</b>	<b>30.2</b>	<b>28.2</b>	<b>27.2</b>	<b>25.2</b>	<b>26.7</b>	<b>26.7</b>	<b>25.7</b>	<b>24.7</b>
	Nominal	<b>29.7</b>	<b>29.7</b>	<b>27.7</b>	<b>26.7</b>	<b>24.7</b>	<b>26.2</b>	<b>26.2</b>	<b>25.2</b>	<b>24.2</b>

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA	3GPP DC-HSDPA
UMTS Band 5 (850 MHz)	Maximum	<b>24.2</b>	<b>24.2</b>	<b>24.2</b>	<b>24.2</b>
	Nominal	<b>23.7</b>	<b>23.7</b>	<b>23.7</b>	<b>23.7</b>
UMTS Band 4 (1750 MHz)	Maximum	<b>24.7</b>	<b>24.7</b>	<b>24.7</b>	<b>24.7</b>
	Nominal	<b>24.2</b>	<b>24.2</b>	<b>24.2</b>	<b>24.2</b>
UMTS Band 2 (1900 MHz)	Maximum	<b>24.2</b>	<b>24.2</b>	<b>24.2</b>	<b>24.2</b>
	Nominal	<b>23.7</b>	<b>23.7</b>	<b>23.7</b>	<b>23.7</b>

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Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	24.2
	Nominal	23.7
LTE Band 5 (Cell)	Maximum	24.2
	Nominal	23.7
LTE Band 4 (AWS)	Maximum	24.7
	Nominal	24.2
LTE Band 2 (PCS)	Maximum	24.2
	Nominal	23.7
LTE Band 7	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	15.0
	Nominal	14.0
IEEE 802.11n (2.4 GHz)	Maximum	14.0
	Nominal	13.0
IEEE 802.11ac (2.4 GHz)	Maximum	12.0
	Nominal	11.0
IEEE 802.11a (5 GHz)	Maximum	12.0
	Nominal	11.0
IEEE 802.11ac (5 GHz)	Maximum	11.0
	Nominal	10.0
IEEE 802.11n (5 GHz)	Maximum	11.0
	Nominal	10.0
Bluetooth 1 Mbps (GFSK)	Maximum	11.5
	Nominal	10.5
Bluetooth 2 Mbps (DPSK)	Maximum	8.5
	Nominal	7.5
Bluetooth 3 Mbps (8DPSK)	Maximum	8.5
	Nominal	7.5
Bluetooth LE	Peak Power	7.0

### 1.3 DUT Antenna Locations

A diagram showing the location of the device antennas can be found in Appendix F. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filing. Since the diagonal dimension of this device is >160 mm and <200 mm, it is considered a “phablet.”

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**Table 1-1  
Sides for SAR Testing**

Sides for SAR Testing							
Mode	Condition	Back	Front	Top	Bottom	Right	Left
GPRS 850	Hotspot	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Hotspot	Yes	Yes	No	Yes	Yes	Yes
UMTS 1750	Hotspot	Yes	Yes	No	Yes	No	Yes
GPRS 1900	Hotspot	Yes	Yes	No	Yes	No	Yes
UMTS 1900	Hotspot	Yes	Yes	No	Yes	No	Yes
LTE Band 12	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Hotspot	Yes	Yes	No	Yes	No	Yes
LTE Band 2 (PCS)	Hotspot	Yes	Yes	No	Yes	No	Yes
LTE Band 7	Hotspot	Yes	Yes	No	Yes	No	Yes
2.4 GHz WLAN	Hotspot	Yes	Yes	Yes	No	Yes	No
5.8 GHz WLAN	Hotspot	Yes	Yes	Yes	No	Yes	No
5.2-5.7 GHz WLAN	Extremity	Yes	Yes	Yes	No	Yes	No

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR or Extremity SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v01 guidance, page 2 and FCC KDB 648474 D04v01r01. The distances between the transmit antennas and the edges of the device are included in the filing. When wireless router mode is enabled, 5.2-5.7 GHz WLAN operations are disabled.

#### 1.4 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna location diagram can be found in appendix F. The NFC antenna is integrated into the device; therefore all SAR tests were performed with the NFC antenna.

#### 1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-1 and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.



**Figure 1-1  
Simultaneous Transmission Paths**

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

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**Table 1-2  
Simultaneous Transmission Scenarios**

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Extremity
1	GSM voice + 2.4 GHz WI-FI	Yes	Yes	N/A	Yes
2	GSM voice + 5 GHz WI-FI	Yes	Yes	N/A	Yes
3	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes
4	UMTS + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes
5	UMTS + 5 GHz WI-FI	Yes	Yes	Yes	Yes
6	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes
7	LTE + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes
8	LTE + 5 GHz WI-FI	Yes	Yes	Yes	Yes
9	LTE + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes
10	GPRS/EDGE + 2.4 GHz WI-FI	Yes*	Yes*	Yes	Yes
11	GPRS/EDGE + 5 GHz WI-FI	Yes*	Yes*	Yes	Yes
12	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	Yes*	N/A	Yes

- 2.4 GHz WLAN, 5 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
- All licensed modes share the same antenna path and cannot transmit simultaneously.
- (\*) = for VOIP applications possibly used by the end-user
- When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
- Per the manufacturer, WIFI Direct is expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Simultaneous transmission scenarios involving WIFI direct are specified above.
- 5 GHz Wireless Router is only supported for the 5.8 GHz Band by S/W, therefore 5.2-5.7 GHz Bands were not evaluated for wireless router conditions.
- 5.8 GHz WIFI supports Hotspot and WIFI-Direct(GO/GC).
- This device supports VoLTE.

## 1.6 SAR Test Exclusions Applied

### (A) WIFI/BT

Since Wireless Router operations are not allowed by the chipset firmware using 5.2-5.7 GHz WIFI, only 2.4 GHz and 5.8 GHz WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v01.

Per FCC KDB 447498 D01v05, the 1g SAR exclusion threshold for distances <50mm is defined by the following equation:

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, body-worn Bluetooth SAR was not required;  $[(14/10) * \sqrt{2.480}] = 2.2 < 3.0$ . Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

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

This device supports IEEE 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only
- b) No aggregate channel configurations
- c) 1 Tx antenna output
- d) 256 QAM is supported
- e) New 5 GHz channels 138, 142, and 144 are supported

Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Because wireless router operations are not supported for 5.2 – 5.7 GHz WLAN, extremity SAR tests were performed. Extremity SAR was not evaluated for 2.4 GHz and 5.8 GHz WLAN operations since wireless router 1g SAR was < 1.2 W/kg.

### (B) Licensed Transmitter(s)

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

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

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

This device supports inter-band LTE Carrier Aggregation (CA) in the downlink only. All uplink communications are identical to Release 8 specifications. Per FCC Guidance, LTE CA SAR was not needed for testing since the data sent by uplink on uplink physical channels does not change between Rel 8 and Rel 10.

Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Therefore, extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

## 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 Quick Cover

This DUT may be used with a standard battery cover or with an optional quick cover which features an extension to wrap around and protect the front side of the device. Per FCC KDB Publication 648474 D04, SAR was measured using the standard battery cover and then repeated with the quick cover for the configuration with the highest measured SAR for each wireless technology, frequency band, operating mode, and exposure condition. Additional head and extremity tests using the quick cover were performed with the cover extension both open and closed. Additional body-worn and hotspot tests were performed with the cover extension closed because operations near the body with the cover extension open are not expected. Since reported SAR did not exceed 1.2 W/kg, additional testing with the quick cover was not required.

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## 1.9 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01v03, D05v02, D05Av01, D06v02 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r03, D02v01r01 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D03-D04 (Phablet Procedures, Wireless Charging Cover)
- April 2013 TCB Workshop Notes (IEEE 802.11 ac)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)

## 1.10 Device Serial Numbers

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

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number	Extremity Serial Number
GSM/GPRS/EDGE 850	1TFWD	1TFWD	1TFWD	-
UMTS 850	1TFFC	1TFFC	1TFFC	-
UMTS 1750	1TFFF	1TFFC	1TFFC	-
GSM/GPRS/EDGE 1900	1TFWD	1TFWD	1TFWD	-
UMTS 1900	1TFFC	1TFFC	1TFFC	-
LTE Band 12	1TFFP	1TFFP	1TFFP	-
LTE Band 5 (Cell)	1TFFP	1TFFP	1TFFP	-
LTE Band 4 (AWS)	1TFFF	1TFFF	1TFFF	-
LTE Band 2 (PCS)	1TFFP	1TFFP	1TFFP	-
LTE Band 7	1TFFP	1TFFP	1TFFP	-
2.4 GHz WLAN	1TFFC	1TFFC	1TFFC	-
5 GHz WLAN	1TFWD	1TFWD	1TFWD	1TFWD

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# 2

# LTE INFORMATION

LTE Information			
<b>FCC ID</b>	<b>ZNFH811</b>		
<b>Form Factor</b>	Portable Handset		
<b>Frequency Range of each LTE transmission band</b>	LTE Band 12 (699.7 - 715.3 MHz)		
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)		
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)		
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)		
	LTE Band 7 (2502.5 - 2567.5 MHz)		
<b>Channel Bandwidths</b>	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz		
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz		
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz		
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz		
	LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz		
<b>Channel Numbers and Frequencies (MHz)</b>	Low	Mid	High
LTE Band 12: 1.4 MHz	699.7 (23017)	707.5 (23095)	715.3 (23173)
LTE Band 12: 3 MHz	700.5 (23025)	707.5 (23095)	714.5 (23165)
LTE Band 12: 5 MHz	701.5 (23035)	707.5 (23095)	713.5 (23155)
LTE Band 12: 10 MHz	704 (23060)	707.5 (23095)	711 (23130)
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)	836.5 (20525)	848.3 (20643)
LTE Band 5 (Cell): 3 MHz	825.5 (20415)	836.5 (20525)	847.5 (20635)
LTE Band 5 (Cell): 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)
LTE Band 5 (Cell): 10 MHz	829 (20450)	836.5 (20525)	844 (20600)
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)	1732.5 (20175)	1754.3 (20393)
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)	1732.5 (20175)	1753.5 (20385)
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)	1732.5 (20175)	1752.5 (20375)
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)	1732.5 (20175)	1747.5 (20325)
LTE Band 4 (AWS): 20 MHz	1720 (20050)	1732.5 (20175)	1745 (20300)
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)	1880 (18900)	1909.3 (19193)
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)	1880 (18900)	1908.5 (19185)
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)	1880 (18900)	1902.5 (19125)
LTE Band 2 (PCS): 20 MHz	1860 (18700)	1880 (18900)	1900 (19100)
LTE Band 7: 5 MHz	2502.5 (20775)	2535 (21100)	2567.5 (21425)
LTE Band 7: 10 MHz	2505 (20800)	2535 (21100)	2565 (21400)
LTE Band 7: 15 MHz	2507.5 (20825)	2535 (21100)	2562.5 (21375)
LTE Band 7: 20 MHz	2510 (20850)	2535 (21100)	2560 (21350)
<b>UE Category</b>	6		
<b>Modulations Supported in UL</b>	QPSK, 16QAM		
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3-6.2.5? (manufacturer attestation to be provided)	YES		
A-MPR (Additional MPR) disabled for SAR Testing?	YES		
<b>LTE Carrier Aggregation Possible Combinations</b>	Please see next page for LTE Carrier Aggregation Possible Combinations		
<b>LTE Carrier Aggregation Additional Information</b>	This device does not support full CA features on 3GPP Release 10. It supports a maximum of 2 carriers in the downlink. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only the combinations listed on the following page are supported. The following LTE Release 10 Features are not supported: Relay, HetNet, Enhanced MIMO, eICI, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.		

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<u>LTE B12 (PCC) + LTE B4 (SCC)</u>	<u>LTE B12 (PCC) + LTE B2 (SCC)</u>	<u>LTE B4 (PCC) + LTE B12 (SCC)</u>	<u>LTE B4 (PCC) + LTE B4 (SCC)</u>
3MHz (B12) + 1.4MHz (B4)	3MHz (B12) + 5MHz (B2)	1.4MHz (B4) + 3MHz (B12)	5MHz(B4) + 5MHz(B4)
3MHz (B12) + 3MHz (B4)	3MHz (B12) + 10MHz (B2)	1.4MHz (B4) + 5MHz (B12)	5MHz(B4) + 10MHz(B4)
3MHz (B12) + 5MHz (B4)	3MHz (B12) + 15MHz (B2)	1.4MHz (B4) + 10MHz (B12)	5MHz(B4) + 15MHz(B4)
3MHz (B12) + 10MHz (B4)	3MHz (B12) + 20MHz (B2)	3MHz (B4) + 3MHz (B12)	5MHz(B4) + 20MHz(B4)
3MHz (B12) + 15MHz (B4)	5MHz (B12) + 5MHz (B2)	3MHz (B4) + 5MHz (B12)	10MHz(B4) + 5MHz(B4)
3MHz (B12) + 20MHz (B4)	5MHz (B12) + 10MHz (B2)	3MHz (B4) + 10MHz (B12)	10MHz(B4) + 10MHz(B4)
5MHz (B12) + 1.4MHz (B4)	5MHz (B12) + 15MHz (B2)	5MHz (B4) + 3MHz (B12)	10MHz(B4) + 15MHz(B4)
5MHz (B12) + 3MHz (B4)	5MHz (B12) + 20MHz (B2)	5MHz (B4) + 5MHz (B12)	10MHz(B4) + 20MHz(B4)
5MHz (B12) + 5MHz (B4)	10MHz (B12) + 5MHz (B2)	5MHz (B4) + 10MHz (B12)	15MHz(B4) + 5MHz(B4)
5MHz (B12) + 10MHz (B4)	10MHz (B12) + 10MHz (B2)	10MHz (B4) + 3MHz (B12)	15MHz(B4) + 10MHz(B4)
5MHz (B12) + 15MHz (B4)	10MHz (B12) + 15MHz (B2)	10MHz (B4) + 5MHz (B12)	15MHz(B4) + 15MHz(B4)
5MHz (B12) + 20MHz (B4)	10MHz (B12) + 20MHz (B2)	10MHz (B4) + 10MHz (B12)	15MHz(B4) + 20MHz(B4)
10MHz (B12) + 1.4MHz (B4)		15MHz (B4) + 3MHz (B12)	20MHz(B4) + 5MHz(B4)
10MHz (B12) + 3MHz (B4)		15MHz (B4) + 5MHz (B12)	20MHz(B4) + 10MHz(B4)
10MHz (B12) + 5MHz (B4)		15MHz (B4) + 10MHz (B12)	20MHz(B4) + 15MHz(B4)
10MHz (B12) + 10MHz (B4)		20MHz (B4) + 3MHz (B12)	20MHz(B4) + 20MHz(B4)
10MHz (B12) + 15MHz (B4)		20MHz (B4) + 5MHz (B12)	
10MHz (B12) + 20MHz (B4)		20MHz (B4) + 10MHz (B12)	
<u>LTE B4 (PCC) + LTE B2 (SCC)</u>	<u>LTE B2 (PCC) + LTE B12 (SCC)</u>	<u>LTE B2 (PCC) + LTE B4 (SCC)</u>	
5MHz (B4) + 1.4MHz (B2)	5MHz (B2) + 3MHz (B12)	1.4MHz (B2) + 5MHz (B4)	
5MHz (B4) + 3MHz (B2)	5MHz (B2) + 5MHz (B12)	1.4MHz (B2) + 10MHz (B4)	
5MHz (B4) + 5MHz (B2)	5MHz (B2) + 10MHz (B12)	1.4MHz (B2) + 15MHz (B4)	
5MHz (B4) + 10MHz (B2)	10MHz (B2) + 3MHz (B12)	1.4MHz (B2) + 20MHz (B4)	
5MHz (B4) + 15MHz (B2)	10MHz (B2) + 5MHz (B12)	3MHz (B2) + 5MHz (B4)	
5MHz (B4) + 20MHz (B2)	10MHz (B2) + 10MHz (B12)	3MHz (B2) + 10MHz (B4)	
10MHz (B4) + 1.4MHz (B2)	15MHz (B2) + 3MHz (B12)	3MHz (B2) + 15MHz (B4)	
10MHz (B4) + 3MHz (B2)	15MHz (B2) + 5MHz (B12)	3MHz (B2) + 20MHz (B4)	
10MHz (B4) + 5MHz (B2)	15MHz (B2) + 10MHz (B12)	5MHz (B2) + 5MHz (B4)	
10MHz (B4) + 10MHz (B2)	20MHz (B2) + 3MHz (B12)	5MHz (B2) + 10MHz (B4)	
10MHz (B4) + 15MHz (B2)	20MHz (B2) + 5MHz (B12)	5MHz (B2) + 15MHz (B4)	
10MHz (B4) + 20MHz (B2)	20MHz (B2) + 10MHz (B12)	5MHz (B2) + 20MHz (B4)	
15MHz (B4) + 1.4MHz (B2)		10MHz (B2) + 5MHz (B4)	
15MHz (B4) + 3MHz (B2)		10MHz (B2) + 10MHz (B4)	
15MHz (B4) + 5MHz (B2)		10MHz (B2) + 15MHz (B4)	
15MHz (B4) + 10MHz (B2)		10MHz (B2) + 20MHz (B4)	
15MHz (B4) + 15MHz (B2)		15MHz (B2) + 5MHz (B4)	
15MHz (B4) + 20MHz (B2)		15MHz (B2) + 10MHz (B4)	
20MHz (B4) + 1.4MHz (B2)		15MHz (B2) + 15MHz (B4)	
20MHz (B4) + 3MHz (B2)		15MHz (B2) + 20MHz (B4)	
20MHz (B4) + 5MHz (B2)		20MHz (B2) + 5MHz (B4)	
20MHz (B4) + 10MHz (B2)		20MHz (B2) + 10MHz (B4)	
20MHz (B4) + 15MHz (B2)		20MHz (B2) + 15MHz (B4)	
20MHz (B4) + 20MHz (B2)		20MHz (B2) + 20MHz (B4)	

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

### 3.1 SAR Definition

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

**Equation 3-1**  
**SAR Mathematical Equation**

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

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

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

where:

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

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

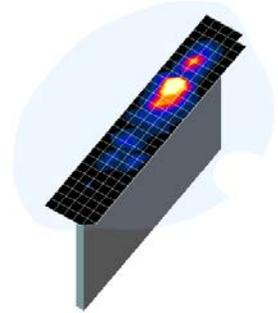
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## 4 DOSIMETRIC ASSESSMENT

### 4.1 Measurement Procedure

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

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASy manual online for more details):
  - a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
  - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
  - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.



**Figure 4-1**  
Sample SAR Area Scan

**Table 4-1**  
Area and Zoom Scan Resolutions per FCC KDB Publication 865664 D01v01\*

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

\*Also compliant to IEEE 1528-2013 Table 6

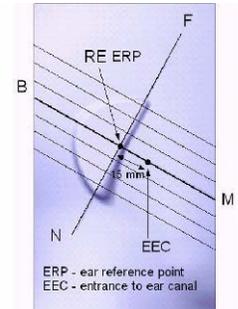
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# 5

## DEFINITION OF REFERENCE POINTS

### 5.1 EAR REFERENCE POINT

Figure 5-2 shows the front, back and side views of the SAM Twin Phantom. The point “M” is the reference point for the center of the mouth, “LE” is the left ear reference point (ERP), and “RE” is the right ERP. The ERP is 15mm posterior to the entrance to the ear canal (EEC) along the B-M line (Back-Mouth), as shown in Figure 5-1. The plane passing through the two ear canals and M is defined as the Reference Plane. The line N-F (Neck-Front), also called the Reference Pivoting Line, is not perpendicular to the reference plane (see Figure 5-1). Line B-M is perpendicular to the N-F line. Both N-F and B-M lines are marked on the external phantom shell to facilitate handset positioning [5].



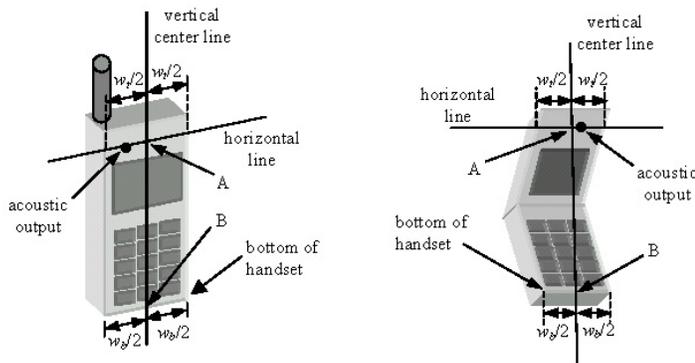
**Figure 5-1**  
Close-Up Side view of ERP

### 5.2 HANDSET REFERENCE POINTS

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



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



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

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## 6 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  $\epsilon = 3$  and loss tangent  $\delta = 0.02$ .

### 6.2 Positioning for Cheek

1. The test device was positioned with the device close to the surface of the phantom such that point A is on the (virtual) extension of the line passing through points RE and LE on the phantom (see Figure 6-1), such that the plane defined by the vertical center line and the horizontal line of the phone is approximately parallel to the sagittal plane of the phantom.

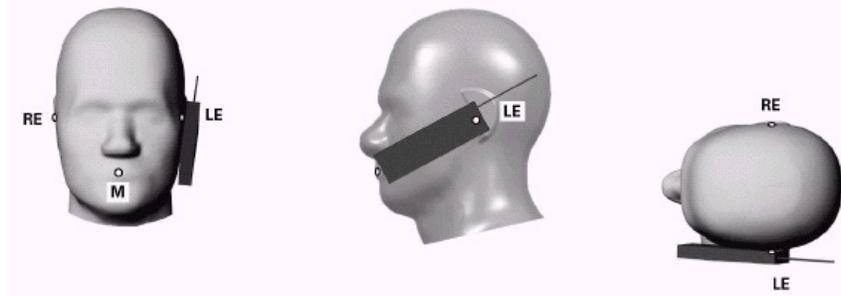


Figure 6-1 Front, Side and Top View of Cheek Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the pinna.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the reference plane.
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical with respect to the line NF.
5. While maintaining the vertical centerline in the reference plane, keeping point A on the line passing through RE and LE, and maintaining the device contact with the ear, the device was rotated about the NF line until any point on the handset made contact with a phantom point below the ear (cheek) (See Figure 6-2).

### 6.3 Positioning for Ear / 15° Tilt

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

1. While maintaining the orientation of the phone, the phone was retracted parallel to the reference plane far enough to enable a rotation of the phone by 15 degrees.
2. The phone was then rotated around the horizontal line by 15 degrees.
3. While maintaining the orientation of the phone, the phone was moved parallel to the reference plane until any part of the handset touched the head. (In this position, point A was located on the line RE-LE). The tilted position is obtained when the contact is on the pinna. If the contact was at any location other than the pinna, the angle of the phone would then be reduced. In this situation, the tilted position was obtained when any part of the phone was in contact of the ear as well as a second part of the phone was in contact with the head (see Figure 6-2).

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

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented.

Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

## 6.6 Extremity Exposure Configurations

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

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC minitables that support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04 v01r01DR04 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worn accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna  $\leq 25$  mm from that surface or edge, in direct contact with the phantom, for 10-g SAR. The UMPC mini-tablet 1-g SAR at 5 mm is not required. When hotspot mode applies, 10-g SAR is required only for the surfaces and edges with hotspot mode 1-g SAR scaled up to maximum output power tolerance > 1.2 W/kg.

## 6.7 Wireless Router Configurations

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

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

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# 7 RF EXPOSURE LIMITS

## 7.1 Uncontrolled Environment

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

## 7.2 Controlled Environment

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

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

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <i>General Population</i> (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT <i>Occupational</i> (W/kg) or (mW/g)
<b>Peak Spatial Average SAR</b> Head	1.6	8.0
<b>Whole Body SAR</b>	0.08	0.4
<b>Peak Spatial Average SAR</b> Hands, Feet, Ankle, Wrists, etc.	4.0	20

1. The Spatial Peak value of the SAR averaged over any 1 gram of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.
2. The Spatial Average value of the SAR averaged over the whole body.
3. The Spatial Peak value of the SAR averaged over any 10 grams of tissue (defined as a tissue volume in the shape of a cube) and over the appropriate averaging time.

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## 8 FCC MEASUREMENT PROCEDURES

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

### 8.1 Measured and Reported SAR

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

### 8.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03, certain transmission modes within a frequency band and wireless mode evaluated for SAR are defined as primary modes. The equivalent modes considered for SAR test reduction are denoted as secondary modes. When the maximum output power including tune-up tolerance specified for production units in a secondary mode is  $\leq 0.25$  dB higher than the primary mode or when the highest reported SAR of the primary mode, scaled by the ratio of specified maximum output power and tune-up tolerance of secondary to primary mode, is  $\leq 1.2$  W/kg, SAR measurements are not required for the secondary mode. These criteria are referred to as the 3G SAR test reduction procedure. When the 3G SAR test reduction procedure is not satisfied, SAR measurements are additionally required for the secondary mode.

### 8.3 Procedures Used to Establish RF Signal for SAR

The following procedures are according to FCC KDB Publication 941225 D01v03 "3G SAR Measurement Procedures."

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

### 8.4 SAR Measurement Conditions for UMTS

#### 8.4.1 Output Power Verification

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

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## 8.4.2 Head SAR Measurements

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

## 8.4.3 Body SAR Measurements

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

## 8.4.4 SAR Measurements with Rel 5 HSDPA

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

## 8.4.5 SAR Measurements with Rel 6 HSUPA

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

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

## 8.4.6 SAR Measurement Conditions for DC-HSDPA

SAR is required for Rel. 8 DC-HSDPA when SAR is required for Rel. 5 HSDPA; otherwise, the 3G SAR test reduction procedure is applied to DC-HSDPA with 12.2 kbps RMC as the primary mode. Power is measured for DC-HSDPA according to the H-Set 12, FRC configuration in Table C.8.1.12 of 3GPP TS 34.121-1 to determine SAR test reduction. A primary and a secondary serving HS-DSCH Cell are required to perform the power measurement and for the results to be acceptable.

## 8.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

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### 8.5.1 Spectrum Plots for RB Configurations

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

### 8.5.2 MPR

MPR is 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.

### 8.5.3 A-MPR

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

### 8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02:

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

### 8.5.5 Downlink Carrier Aggregation

LTE Carrier Aggregation (CA) measurements are made in accordance to 3GPP TS 36.521-1 V10.4.0 (2012-12). The RRC connection is only handled by one cell, the Primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds the Secondary component carrier (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to release 8 specifications on the PCC. Additional output powers are measured using two carriers in the downlink for the release 8 configurations with the highest output power among all channels, RB configurations and bandwidths for each uplink band. Per FCC KDB Publication 941225 D05A v01, no SAR measurements are required when the average output power with downlink carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink carrier aggregation inactive.

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## 8.6 SAR Testing with 802.11 Transmitters

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

### 8.6.1 General Device Setup

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

### 8.6.2 Frequency Channel Configurations [24]

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

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

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

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# 9 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	33.50	33.38	31.01	<b>29.26</b>	27.87	27.63	27.15	26.03	24.87
	190	33.30	33.23	30.51	<b>29.30</b>	27.50	27.42	26.96	25.76	24.69
	251	33.31	33.30	30.69	<b>29.20</b>	27.58	27.32	26.91	25.78	24.64
GSM 1900	512	29.81	29.80	28.03	<b>27.01</b>	24.79	26.62	26.52	25.44	24.28
	661	29.93	29.89	28.10	<b>26.95</b>	24.74	26.67	26.51	25.56	24.38
	810	29.91	29.90	28.02	<b>26.75</b>	24.57	26.68	26.46	25.40	24.27
		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	24.47	24.35	24.99	<b>25.00</b>	24.86	18.60	21.13	21.77	21.86
	190	24.27	24.20	24.49	<b>25.04</b>	24.49	18.39	20.94	21.50	21.68
	251	24.28	24.27	24.67	<b>24.94</b>	24.57	18.29	20.89	21.52	21.63
GSM 1900	512	20.78	20.77	22.01	<b>22.75</b>	21.78	17.59	20.50	21.18	21.27
	661	20.90	20.86	22.08	<b>22.69</b>	21.73	17.64	20.49	21.30	21.37
	810	20.88	20.87	22.00	<b>22.49</b>	21.56	17.65	20.44	21.14	21.26
GSM 850	Frame	24.17	24.17	25.18	<b>25.24</b>	24.89	18.17	21.18	21.94	22.19
GSM 1900	Avg.Targets:	20.67	20.67	21.68	<b>22.44</b>	21.69	17.17	20.18	20.94	21.19

Note:

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

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



**Figure 9-1**  
**Power Measurement Setup**

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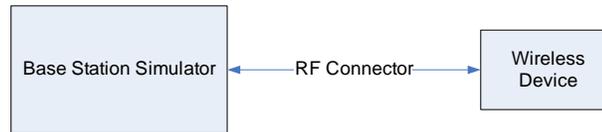
## 9.2 UMTS Conducted Powers

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	23.93	24.10	23.87	24.20	24.15	24.12	24.12	24.11	23.97	-
99		12.2 kbps AMR	23.86	24.09	23.78	24.19	24.06	24.03	24.11	24.09	24.20	-
6	HSDPA	Subtest 1	23.87	24.11	23.85	24.12	23.99	24.05	23.82	23.88	23.80	0
6		Subtest 2	23.73	24.14	23.78	23.99	23.98	24.00	23.87	23.75	23.72	0
6		Subtest 3	23.47	23.71	23.47	23.41	23.28	23.23	23.45	23.25	23.51	0.5
6		Subtest 4	23.45	23.70	23.46	23.42	23.28	23.25	23.48	23.27	23.50	0.5
6	HSUPA	Subtest 1	23.98	24.01	23.99	24.19	23.95	23.99	23.81	23.77	23.73	0
6		Subtest 2	23.06	23.11	23.08	22.82	22.49	22.78	22.23	22.07	22.79	2
6		Subtest 3	23.66	23.54	23.61	23.27	22.95	23.07	22.92	22.82	23.04	1
6		Subtest 4	23.01	22.98	23.00	22.78	22.54	22.58	22.48	22.41	22.63	2
6		Subtest 5	24.02	24.07	24.01	24.07	23.95	23.98	23.90	23.72	23.72	0
8	DC-HSDPA	Subtest 1	23.83	24.12	23.87	23.95	23.85	23.76	23.88	23.81	23.82	0
8		Subtest 2	23.77	24.13	23.84	23.90	23.86	23.81	23.91	23.81	23.89	0
8		Subtest 3	23.52	23.72	23.51	23.51	23.20	23.25	23.47	23.16	23.48	0.5
8		Subtest 4	23.48	23.63	23.52	23.40	23.33	23.35	23.44	23.36	23.54	0.5

### 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
- The DUT supports UE category 24 for HSDPA

It is expected by the manufacturer that MPR for some HSPA subtests may be up to 1 dB more than specified by 3GPP, but also as low as 0 dB according to the chipset implementation in this model.



**Figure 9-2**  
**Power Measurement Setup**

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## 9.3 LTE Conducted Powers

### 9.3.1 LTE Band 12

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	707.5	23095	10	QPSK	1	0	24.01	0	0
	707.5	23095	10	QPSK	1	25	<b>24.06</b>	0	0
	707.5	23095	10	QPSK	1	49	24.03	0	0
	707.5	23095	10	QPSK	25	0	<b>23.05</b>	0-1	1
	707.5	23095	10	QPSK	25	12	22.94	0-1	1
	707.5	23095	10	QPSK	25	25	23.02	0-1	1
	707.5	23095	10	QPSK	50	0	22.98	0-1	1
	707.5	23095	10	16QAM	1	0	22.95	0-1	1
	707.5	23095	10	16QAM	1	25	22.90	0-1	1
	707.5	23095	10	16QAM	1	49	22.83	0-1	1
	707.5	23095	10	16QAM	25	0	21.91	0-2	2
	707.5	23095	10	16QAM	25	12	21.82	0-2	2
	707.5	23095	10	16QAM	25	25	21.87	0-2	2
	707.5	23095	10	16QAM	50	0	21.83	0-2	2

Note: LTE Band 12 at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	701.5	23035	5	QPSK	1	0	24.15	0	0
	701.5	23035	5	QPSK	1	12	24.07	0	0
	701.5	23035	5	QPSK	1	24	24.08	0	0
	701.5	23035	5	QPSK	12	0	23.00	0-1	1
	701.5	23035	5	QPSK	12	6	23.05	0-1	1
	701.5	23035	5	QPSK	12	13	23.02	0-1	1
	701.5	23035	5	QPSK	25	0	22.97	0-1	1
	701.5	23035	5	16-QAM	1	0	23.15	0-1	1
	701.5	23035	5	16-QAM	1	12	23.11	0-1	1
	701.5	23035	5	16-QAM	1	24	23.03	0-1	1
	701.5	23035	5	16-QAM	12	0	21.88	0-2	2
	701.5	23035	5	16-QAM	12	6	21.94	0-2	2
701.5	23035	5	16-QAM	12	13	21.86	0-2	2	
Mid	701.5	23035	5	16-QAM	25	0	21.85	0-2	2
	707.5	23095	5	QPSK	1	0	23.81	0	0
	707.5	23095	5	QPSK	1	12	24.00	0	0
	707.5	23095	5	QPSK	1	24	24.02	0	0
	707.5	23095	5	QPSK	12	0	22.74	0-1	1
	707.5	23095	5	QPSK	12	6	22.87	0-1	1
	707.5	23095	5	QPSK	12	13	22.75	0-1	1
	707.5	23095	5	QPSK	25	0	22.68	0-1	1
	707.5	23095	5	16-QAM	1	0	22.67	0-1	1
	707.5	23095	5	16-QAM	1	12	22.85	0-1	1
	707.5	23095	5	16-QAM	1	24	22.86	0-1	1
	707.5	23095	5	16-QAM	12	0	21.62	0-2	2
707.5	23095	5	16-QAM	12	6	21.75	0-2	2	
707.5	23095	5	16-QAM	12	13	21.78	0-2	2	
707.5	23095	5	16-QAM	25	0	21.48	0-2	2	
High	713.5	23155	5	QPSK	1	0	23.99	0	0
	713.5	23155	5	QPSK	1	12	24.07	0	0
	713.5	23155	5	QPSK	1	24	24.05	0	0
	713.5	23155	5	QPSK	12	0	23.18	0-1	1
	713.5	23155	5	QPSK	12	6	22.94	0-1	1
	713.5	23155	5	QPSK	12	13	22.89	0-1	1
	713.5	23155	5	QPSK	25	0	22.85	0-1	1
	713.5	23155	5	16-QAM	1	0	22.82	0-1	1
	713.5	23155	5	16-QAM	1	12	22.86	0-1	1
	713.5	23155	5	16-QAM	1	24	22.91	0-1	1
	713.5	23155	5	16-QAM	12	0	21.93	0-2	2
	713.5	23155	5	16-QAM	12	6	21.81	0-2	2
713.5	23155	5	16-QAM	12	13	21.70	0-2	2	
713.5	23155	5	16-QAM	25	0	21.86	0-2	2	

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	700.5	23025	3	QPSK	1	0	24.12	0	0
	700.5	23025	3	QPSK	1	7	23.95	0	0
	700.5	23025	3	QPSK	1	14	24.04	0	0
	700.5	23025	3	QPSK	8	0	23.20	0-1	1
	700.5	23025	3	QPSK	8	4	23.19	0-1	1
	700.5	23025	3	QPSK	8	7	23.20	0-1	1
	700.5	23025	3	QPSK	15	0	23.17	0-1	1
	700.5	23025	3	16-QAM	1	0	22.97	0-1	1
	700.5	23025	3	16-QAM	1	7	22.84	0-1	1
	700.5	23025	3	16-QAM	1	14	22.88	0-1	1
	700.5	23025	3	16-QAM	8	0	22.15	0-2	2
	700.5	23025	3	16-QAM	8	4	22.01	0-2	2
700.5	23025	3	16-QAM	8	7	22.03	0-2	2	
700.5	23025	3	16-QAM	15	0	22.11	0-2	2	
Mid	707.5	23095	3	QPSK	1	0	23.93	0	0
	707.5	23095	3	QPSK	1	7	24.13	0	0
	707.5	23095	3	QPSK	1	14	23.99	0	0
	707.5	23095	3	QPSK	8	0	23.13	0-1	1
	707.5	23095	3	QPSK	8	4	23.20	0-1	1
	707.5	23095	3	QPSK	8	7	23.09	0-1	1
	707.5	23095	3	QPSK	15	0	23.12	0-1	1
	707.5	23095	3	16-QAM	1	0	23.05	0-1	1
	707.5	23095	3	16-QAM	1	7	23.20	0-1	1
	707.5	23095	3	16-QAM	1	14	23.15	0-1	1
	707.5	23095	3	16-QAM	8	0	22.10	0-2	2
	707.5	23095	3	16-QAM	8	4	22.19	0-2	2
	707.5	23095	3	16-QAM	8	7	22.07	0-2	2
	707.5	23095	3	16-QAM	15	0	22.02	0-2	2
High	714.5	23165	3	QPSK	1	0	23.96	0	0
	714.5	23165	3	QPSK	1	7	23.91	0	0
	714.5	23165	3	QPSK	1	14	24.02	0	0
	714.5	23165	3	QPSK	8	0	23.08	0-1	1
	714.5	23165	3	QPSK	8	4	23.10	0-1	1
	714.5	23165	3	QPSK	8	7	23.08	0-1	1
	714.5	23165	3	QPSK	15	0	23.09	0-1	1
	714.5	23165	3	16-QAM	1	0	22.94	0-1	1
	714.5	23165	3	16-QAM	1	7	22.75	0-1	1
	714.5	23165	3	16-QAM	1	14	23.00	0-1	1
	714.5	23165	3	16-QAM	8	0	22.01	0-2	2
	714.5	23165	3	16-QAM	8	4	21.94	0-2	2
	714.5	23165	3	16-QAM	8	7	22.03	0-2	2
	714.5	23165	3	16-QAM	15	0	22.01	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	699.7	23017	1.4	QPSK	1	0	24.02	0	0
	699.7	23017	1.4	QPSK	1	2	24.07	0	0
	699.7	23017	1.4	QPSK	1	5	23.94	0	0
	699.7	23017	1.4	QPSK	3	0	24.09	0	0
	699.7	23017	1.4	QPSK	3	2	24.11	0	0
	699.7	23017	1.4	QPSK	3	3	24.00	0	0
	699.7	23017	1.4	QPSK	6	0	23.20	0-1	1
	699.7	23017	1.4	16-QAM	1	0	23.04	0-1	1
	699.7	23017	1.4	16-QAM	1	2	23.17	0-1	1
	699.7	23017	1.4	16-QAM	1	5	23.03	0-1	1
	699.7	23017	1.4	16-QAM	3	0	22.78	0-1	1
	699.7	23017	1.4	16-QAM	3	2	22.84	0-1	1
699.7	23017	1.4	16-QAM	3	3	22.68	0-1	1	
699.7	23017	1.4	16-QAM	6	0	22.14	0-2	2	
Mid	707.5	23095	1.4	QPSK	1	0	24.20	0	0
	707.5	23095	1.4	QPSK	1	2	24.19	0	0
	707.5	23095	1.4	QPSK	1	5	24.17	0	0
	707.5	23095	1.4	QPSK	3	0	24.15	0	0
	707.5	23095	1.4	QPSK	3	2	24.20	0	0
	707.5	23095	1.4	QPSK	3	3	24.07	0	0
	707.5	23095	1.4	QPSK	6	0	23.13	0-1	1
	707.5	23095	1.4	16-QAM	1	0	22.94	0-1	1
	707.5	23095	1.4	16-QAM	1	2	22.98	0-1	1
	707.5	23095	1.4	16-QAM	1	5	22.97	0-1	1
	707.5	23095	1.4	16-QAM	3	0	22.85	0-1	1
	707.5	23095	1.4	16-QAM	3	2	22.94	0-1	1
	707.5	23095	1.4	16-QAM	3	3	22.82	0-1	1
	707.5	23095	1.4	16-QAM	6	0	22.14	0-2	2
High	715.3	23173	1.4	QPSK	1	0	23.84	0	0
	715.3	23173	1.4	QPSK	1	2	23.98	0	0
	715.3	23173	1.4	QPSK	1	5	23.91	0	0
	715.3	23173	1.4	QPSK	3	0	23.91	0	0
	715.3	23173	1.4	QPSK	3	2	24.04	0	0
	715.3	23173	1.4	QPSK	3	3	24.02	0	0
	715.3	23173	1.4	QPSK	6	0	23.02	0-1	1
	715.3	23173	1.4	16-QAM	1	0	22.77	0-1	1
	715.3	23173	1.4	16-QAM	1	2	22.88	0-1	1
	715.3	23173	1.4	16-QAM	1	5	22.90	0-1	1
	715.3	23173	1.4	16-QAM	3	0	22.63	0-1	1
	715.3	23173	1.4	16-QAM	3	2	22.74	0-1	1
	715.3	23173	1.4	16-QAM	3	3	22.74	0-1	1
	715.3	23173	1.4	16-QAM	6	0	21.94	0-2	2

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### 9.3.2

### LTE Band 5 (Cell)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	20525	10	QPSK	1	0	<b>24.01</b>	0	0
	836.5	20525	10	QPSK	1	25	23.80	0	0
	836.5	20525	10	QPSK	1	49	23.89	0	0
	836.5	20525	10	QPSK	25	0	<b>22.77</b>	0-1	1
	836.5	20525	10	QPSK	25	12	22.63	0-1	1
	836.5	20525	10	QPSK	25	25	22.61	0-1	1
	836.5	20525	10	QPSK	50	0	22.72	0-1	1
	836.5	20525	10	16QAM	1	0	22.95	0-1	1
	836.5	20525	10	16QAM	1	25	22.72	0-1	1
	836.5	20525	10	16QAM	1	49	22.86	0-1	1
	836.5	20525	10	16QAM	25	0	21.77	0-2	2
	836.5	20525	10	16QAM	25	12	21.70	0-2	2
	836.5	20525	10	16QAM	25	25	21.66	0-2	2
	836.5	20525	10	16QAM	50	0	21.64	0-2	2

Note: LTE Band 5 (Cell) at 10 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	826.5	20425	5	QPSK	1	0	24.09	0	0
	826.5	20425	5	QPSK	1	12	24.19	0	0
	826.5	20425	5	QPSK	1	24	24.19	0	0
	826.5	20425	5	QPSK	12	0	23.07	0-1	1
	826.5	20425	5	QPSK	12	6	23.18	0-1	1
	826.5	20425	5	QPSK	12	13	23.20	0-1	1
	826.5	20425	5	QPSK	25	0	23.19	0-1	1
	826.5	20425	5	16-QAM	1	0	22.96	0-1	1
	826.5	20425	5	16-QAM	1	12	23.20	0-1	1
	826.5	20425	5	16-QAM	1	24	23.19	0-1	1
	826.5	20425	5	16-QAM	12	0	22.03	0-2	2
	826.5	20425	5	16-QAM	12	6	22.17	0-2	2
Mid	836.5	20525	5	QPSK	12	13	22.13	0-2	2
	826.5	20425	5	16-QAM	25	0	22.11	0-2	2
	836.5	20525	5	QPSK	1	0	24.10	0	0
	836.5	20525	5	QPSK	1	12	23.91	0	0
	836.5	20525	5	QPSK	1	24	23.89	0	0
	836.5	20525	5	QPSK	12	0	22.74	0-1	1
	836.5	20525	5	QPSK	12	6	22.73	0-1	1
	836.5	20525	5	QPSK	12	13	22.81	0-1	1
	836.5	20525	5	QPSK	25	0	22.78	0-1	1
	836.5	20525	5	16-QAM	1	0	22.96	0-1	1
	836.5	20525	5	16-QAM	1	12	22.81	0-1	1
	836.5	20525	5	16-QAM	1	24	22.80	0-1	1
High	836.5	20525	5	16-QAM	12	0	21.73	0-2	2
	836.5	20525	5	16-QAM	12	6	21.72	0-2	2
	836.5	20525	5	16-QAM	12	13	21.81	0-2	2
	836.5	20525	5	16-QAM	25	0	21.78	0-2	2
	846.5	20625	5	QPSK	1	0	24.20	0	0
	846.5	20625	5	QPSK	1	12	24.17	0	0
	846.5	20625	5	QPSK	1	24	24.16	0	0
	846.5	20625	5	QPSK	12	0	23.06	0-1	1
	846.5	20625	5	QPSK	12	6	23.16	0-1	1
	846.5	20625	5	QPSK	12	13	23.13	0-1	1
	846.5	20625	5	QPSK	25	0	23.14	0-1	1
	846.5	20625	5	16-QAM	1	0	23.00	0-1	1
846.5	20625	5	16-QAM	1	12	23.02	0-1	1	
846.5	20625	5	16-QAM	1	24	22.91	0-1	1	
846.5	20625	5	16-QAM	12	0	22.18	0-2	2	
846.5	20625	5	16-QAM	12	6	22.20	0-2	2	
846.5	20625	5	16-QAM	12	13	22.12	0-2	2	
846.5	20625	5	16-QAM	25	0	22.11	0-2	2	

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	825.5	20415	3	QPSK	1	0	24.00	0	0
	825.5	20415	3	QPSK	1	7	24.13	0	0
	825.5	20415	3	QPSK	1	14	24.17	0	0
	825.5	20415	3	QPSK	8	0	22.93	0-1	1
	825.5	20415	3	QPSK	8	4	23.01	0-1	1
	825.5	20415	3	QPSK	8	7	23.00	0-1	1
	825.5	20415	3	QPSK	15	0	22.99	0-1	1
	825.5	20415	3	16-QAM	1	0	22.80	0-1	1
	825.5	20415	3	16-QAM	1	7	23.01	0-1	1
	825.5	20415	3	16-QAM	1	14	23.02	0-1	1
	825.5	20415	3	16-QAM	8	0	21.88	0-2	2
	825.5	20415	3	16-QAM	8	4	22.00	0-2	2
825.5	20415	3	16-QAM	8	7	21.98	0-2	2	
825.5	20415	3	16-QAM	15	0	22.00	0-2	2	
Mid	836.5	20525	3	QPSK	1	0	24.03	0	0
	836.5	20525	3	QPSK	1	7	23.90	0	0
	836.5	20525	3	QPSK	1	14	23.84	0	0
	836.5	20525	3	QPSK	8	0	22.74	0-1	1
	836.5	20525	3	QPSK	8	4	22.75	0-1	1
	836.5	20525	3	QPSK	8	7	22.77	0-1	1
	836.5	20525	3	QPSK	15	0	22.71	0-1	1
	836.5	20525	3	16-QAM	1	0	23.16	0-1	1
	836.5	20525	3	16-QAM	1	7	23.06	0-1	1
	836.5	20525	3	16-QAM	1	14	22.96	0-1	1
	836.5	20525	3	16-QAM	8	0	21.79	0-2	2
	836.5	20525	3	16-QAM	8	4	21.78	0-2	2
836.5	20525	3	16-QAM	8	7	21.84	0-2	2	
836.5	20525	3	16-QAM	15	0	21.68	0-2	2	
High	847.5	20635	3	QPSK	1	0	24.18	0	0
	847.5	20635	3	QPSK	1	7	24.20	0	0
	847.5	20635	3	QPSK	1	14	24.17	0	0
	847.5	20635	3	QPSK	8	0	23.05	0-1	1
	847.5	20635	3	QPSK	8	4	23.13	0-1	1
	847.5	20635	3	QPSK	8	7	23.04	0-1	1
	847.5	20635	3	QPSK	15	0	23.07	0-1	1
	847.5	20635	3	16-QAM	1	0	23.18	0-1	1
	847.5	20635	3	16-QAM	1	7	23.20	0-1	1
	847.5	20635	3	16-QAM	1	14	23.14	0-1	1
	847.5	20635	3	16-QAM	8	0	22.19	0-2	2
	847.5	20635	3	16-QAM	8	4	22.18	0-2	2
847.5	20635	3	16-QAM	8	7	22.09	0-2	2	
847.5	20635	3	16-QAM	15	0	22.09	0-2	2	

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	824.7	20407	1.4	QPSK	1	0	23.79	0	0
	824.7	20407	1.4	QPSK	1	2	23.96	0	0
	824.7	20407	1.4	QPSK	1	5	23.97	0	0
	824.7	20407	1.4	QPSK	3	0	23.85	0	0
	824.7	20407	1.4	QPSK	3	2	23.98	0	0
	824.7	20407	1.4	QPSK	3	3	23.97	0	0
	824.7	20407	1.4	QPSK	6	0	22.80	0-1	1
	824.7	20407	1.4	16-QAM	1	0	22.83	0-1	1
	824.7	20407	1.4	16-QAM	1	2	23.02	0-1	1
	824.7	20407	1.4	16-QAM	1	5	23.05	0-1	1
	824.7	20407	1.4	16-QAM	3	0	22.56	0-1	1
	824.7	20407	1.4	16-QAM	3	2	22.71	0-1	1
824.7	20407	1.4	16-QAM	3	3	22.68	0-1	1	
824.7	20407	1.4	16-QAM	6	0	21.88	0-2	2	
Mid	836.5	20525	1.4	QPSK	1	0	23.83	0	0
	836.5	20525	1.4	QPSK	1	2	24.03	0	0
	836.5	20525	1.4	QPSK	1	5	24.03	0	0
	836.5	20525	1.4	QPSK	3	0	23.80	0	0
	836.5	20525	1.4	QPSK	3	2	23.93	0	0
	836.5	20525	1.4	QPSK	3	3	23.90	0	0
	836.5	20525	1.4	QPSK	6	0	22.57	0-1	1
	836.5	20525	1.4	16-QAM	1	0	22.79	0-1	1
	836.5	20525	1.4	16-QAM	1	2	23.03	0-1	1
	836.5	20525	1.4	16-QAM	1	5	23.07	0-1	1
	836.5	20525	1.4	16-QAM	3	0	22.48	0-1	1
	836.5	20525	1.4	16-QAM	3	2	22.65	0-1	1
836.5	20525	1.4	16-QAM	3	3	22.64	0-1	1	
836.5	20525	1.4	16-QAM	6	0	21.58	0-2	2	
High	848.3	20643	1.4	QPSK	1	0	24.05	0	0
	848.3	20643	1.4	QPSK	1	2	23.97	0	0
	848.3	20643	1.4	QPSK	1	5	23.95	0	0
	848.3	20643	1.4	QPSK	3	0	24.13	0	0
	848.3	20643	1.4	QPSK	3	2	24.10	0	0
	848.3	20643	1.4	QPSK	3	3	24.05	0	0
	848.3	20643	1.4	QPSK	6	0	22.93	0-1	1
	848.3	20643	1.4	16-QAM	1	0	23.12	0-1	1
	848.3	20643	1.4	16-QAM	1	2	23.05	0-1	1
	848.3	20643	1.4	16-QAM	1	5	22.94	0-1	1
	848.3	20643	1.4	16-QAM	3	0	22.72	0-1	1
	848.3	20643	1.4	16-QAM	3	2	22.71	0-1	1
848.3	20643	1.4	16-QAM	3	3	22.66	0-1	1	
848.3	20643	1.4	16-QAM	6	0	21.90	0-2	2	

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### 9.3.3

### LTE Band 4 (AWS)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	1732.5	20175	20	QPSK	1	0	24.51	0	0
	1732.5	20175	20	QPSK	1	50	24.44	0	0
	1732.5	20175	20	QPSK	1	99	<b>24.55</b>	0	0
	1732.5	20175	20	QPSK	50	0	<b>23.57</b>	0-1	1
	1732.5	20175	20	QPSK	50	25	23.50	0-1	1
	1732.5	20175	20	QPSK	50	50	23.21	0-1	1
	1732.5	20175	20	QPSK	100	0	23.29	0-1	1
	1732.5	20175	20	16QAM	1	0	23.39	0-1	1
	1732.5	20175	20	16QAM	1	50	23.43	0-1	1
	1732.5	20175	20	16QAM	1	99	23.18	0-1	1
	1732.5	20175	20	16QAM	50	0	22.63	0-2	2
	1732.5	20175	20	16QAM	50	25	22.49	0-2	2
	1732.5	20175	20	16QAM	50	50	22.22	0-2	2
	1732.5	20175	20	16QAM	100	0	22.42	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1717.5	20025	15	QPSK	1	0	24.24	0	0
	1717.5	20025	15	QPSK	1	36	24.50	0	0
	1717.5	20025	15	QPSK	1	74	24.44	0	0
	1717.5	20025	15	QPSK	36	0	23.22	0-1	1
	1717.5	20025	15	QPSK	36	18	23.49	0-1	1
	1717.5	20025	15	QPSK	36	37	23.64	0-1	1
	1717.5	20025	15	QPSK	75	0	23.47	0-1	1
	1717.5	20025	15	16QAM	1	0	23.42	0-1	1
	1717.5	20025	15	16QAM	1	36	23.31	0-1	1
	1717.5	20025	15	16QAM	1	74	23.53	0-1	1
	1717.5	20025	15	16QAM	36	0	21.92	0-2	2
	1717.5	20025	15	16QAM	36	18	22.14	0-2	2
1717.5	20025	15	16QAM	36	37	22.47	0-2	2	
1717.5	20025	15	16QAM	75	0	22.18	0-2	2	
Mid	1732.5	20175	15	QPSK	1	0	24.54	0	0
	1732.5	20175	15	QPSK	1	36	24.39	0	0
	1732.5	20175	15	QPSK	1	74	24.20	0	0
	1732.5	20175	15	QPSK	36	0	23.62	0-1	1
	1732.5	20175	15	QPSK	36	18	23.50	0-1	1
	1732.5	20175	15	QPSK	36	37	23.28	0-1	1
	1732.5	20175	15	QPSK	75	0	23.35	0-1	1
	1732.5	20175	15	16QAM	1	0	23.62	0-1	1
	1732.5	20175	15	16QAM	1	36	23.48	0-1	1
	1732.5	20175	15	16QAM	1	74	23.28	0-1	1
	1732.5	20175	15	16QAM	36	0	22.56	0-2	2
	1732.5	20175	15	16QAM	36	18	22.44	0-2	2
1732.5	20175	15	16QAM	36	37	22.18	0-2	2	
1732.5	20175	15	16QAM	75	0	22.32	0-2	2	
High	1747.5	20325	15	QPSK	1	0	24.40	0	0
	1747.5	20325	15	QPSK	1	36	24.32	0	0
	1747.5	20325	15	QPSK	1	74	24.35	0	0
	1747.5	20325	15	QPSK	36	0	23.13	0-1	1
	1747.5	20325	15	QPSK	36	18	23.16	0-1	1
	1747.5	20325	15	QPSK	36	37	23.19	0-1	1
	1747.5	20325	15	QPSK	75	0	23.07	0-1	1
	1747.5	20325	15	16QAM	1	0	23.04	0-1	1
	1747.5	20325	15	16QAM	1	36	23.45	0-1	1
	1747.5	20325	15	16QAM	1	74	23.33	0-1	1
	1747.5	20325	15	16QAM	36	0	22.04	0-2	2
	1747.5	20325	15	16QAM	36	18	22.12	0-2	2
1747.5	20325	15	16QAM	36	37	22.09	0-2	2	
1747.5	20325	15	16QAM	75	0	22.16	0-2	2	

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1715	20000	10	QPSK	1	0	24.42	0	0
	1715	20000	10	QPSK	1	25	24.53	0	0
	1715	20000	10	QPSK	1	49	24.50	0	0
	1715	20000	10	QPSK	25	0	23.19	0-1	1
	1715	20000	10	QPSK	25	12	23.54	0-1	1
	1715	20000	10	QPSK	25	25	23.44	0-1	1
	1715	20000	10	QPSK	50	0	23.58	0-1	1
	1715	20000	10	16QAM	1	0	23.48	0-1	1
	1715	20000	10	16QAM	1	25	23.18	0-1	1
	1715	20000	10	16QAM	1	49	23.69	0-1	1
	1715	20000	10	16QAM	25	0	22.03	0-2	2
	1715	20000	10	16QAM	25	12	22.37	0-2	2
Mid	1732.5	20175	10	QPSK	1	0	24.54	0	0
	1732.5	20175	10	QPSK	1	25	24.55	0	0
	1732.5	20175	10	QPSK	1	49	24.19	0	0
	1732.5	20175	10	QPSK	25	0	23.57	0-1	1
	1732.5	20175	10	QPSK	25	12	23.65	0-1	1
	1732.5	20175	10	QPSK	25	25	23.33	0-1	1
	1732.5	20175	10	QPSK	50	0	23.49	0-1	1
	1732.5	20175	10	16QAM	1	0	23.64	0-1	1
	1732.5	20175	10	16QAM	1	25	23.43	0-1	1
	1732.5	20175	10	16QAM	1	49	23.28	0-1	1
	1732.5	20175	10	16QAM	25	0	22.62	0-2	2
	1732.5	20175	10	16QAM	25	12	22.55	0-2	2
High	1750	20350	10	QPSK	1	0	24.21	0	0
	1750	20350	10	QPSK	1	25	24.40	0	0
	1750	20350	10	QPSK	1	49	24.63	0	0
	1750	20350	10	QPSK	25	0	23.13	0-1	1
	1750	20350	10	QPSK	25	12	23.23	0-1	1
	1750	20350	10	QPSK	25	25	23.48	0-1	1
	1750	20350	10	QPSK	50	0	23.27	0-1	1
	1750	20350	10	16QAM	1	0	23.11	0-1	1
	1750	20350	10	16QAM	1	25	23.59	0-1	1
	1750	20350	10	16QAM	1	49	23.29	0-1	1
	1750	20350	10	16QAM	25	0	22.15	0-2	2
	1750	20350	10	16QAM	25	12	22.23	0-2	2
1750	20350	10	16QAM	25	25	22.39	0-2	2	
1750	20350	10	16QAM	50	0	22.13	0-2	2	

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1712.5	19975	5	QPSK	1	0	24.35	0	0
	1712.5	19975	5	QPSK	1	12	24.19	0	0
	1712.5	19975	5	QPSK	1	24	24.12	0	0
	1712.5	19975	5	QPSK	12	0	23.13	0-1	1
	1712.5	19975	5	QPSK	12	6	23.05	0-1	1
	1712.5	19975	5	QPSK	12	13	23.06	0-1	1
	1712.5	19975	5	QPSK	25	0	23.04	0-1	1
	1712.5	19975	5	16-QAM	1	0	23.07	0-1	1
	1712.5	19975	5	16-QAM	1	12	23.25	0-1	1
	1712.5	19975	5	16-QAM	1	24	23.09	0-1	1
	1712.5	19975	5	16-QAM	12	0	22.24	0-2	2
	1712.5	19975	5	16-QAM	12	6	22.21	0-2	2
Mid	1732.5	19975	5	16-QAM	12	13	22.03	0-2	2
	1712.5	19975	5	16-QAM	25	0	22.20	0-2	2
	1732.5	20175	5	QPSK	1	0	24.52	0	0
	1732.5	20175	5	QPSK	1	12	24.28	0	0
	1732.5	20175	5	QPSK	1	24	24.11	0	0
	1732.5	20175	5	QPSK	12	0	23.33	0-1	1
	1732.5	20175	5	QPSK	12	6	23.14	0-1	1
	1732.5	20175	5	QPSK	12	13	22.90	0-1	1
	1732.5	20175	5	QPSK	25	0	23.08	0-1	1
	1732.5	20175	5	16-QAM	1	0	23.25	0-1	1
	1732.5	20175	5	16-QAM	1	12	23.61	0-1	1
	1732.5	20175	5	16-QAM	1	24	23.12	0-1	1
High	1732.5	20175	5	16-QAM	12	0	22.39	0-2	2
	1732.5	20175	5	16-QAM	12	6	22.25	0-2	2
	1732.5	20175	5	16-QAM	12	13	21.98	0-2	2
	1732.5	20175	5	16-QAM	25	0	22.14	0-2	2
	1752.5	20375	5	QPSK	1	0	24.55	0	0
	1752.5	20375	5	QPSK	1	12	24.23	0	0
	1752.5	20375	5	QPSK	1	24	24.18	0	0
	1752.5	20375	5	QPSK	12	0	22.95	0-1	1
	1752.5	20375	5	QPSK	12	6	23.15	0-1	1
	1752.5	20375	5	QPSK	12	13	23.13	0-1	1
	1752.5	20375	5	QPSK	25	0	22.88	0-1	1
	1752.5	20375	5	16-QAM	1	0	23.05	0-1	1
1752.5	20375	5	16-QAM	1	12	23.44	0-1	1	
1752.5	20375	5	16-QAM	1	24	22.97	0-1	1	
1752.5	20375	5	16-QAM	12	0	22.28	0-2	2	
1752.5	20375	5	16-QAM	12	6	22.23	0-2	2	
1752.5	20375	5	16-QAM	12	13	22.21	0-2	2	
1752.5	20375	5	16-QAM	25	0	22.29	0-2	2	

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1711.5	19965	3	QPSK	1	0	24.24	0	0
	1711.5	19965	3	QPSK	1	7	24.22	0	0
	1711.5	19965	3	QPSK	1	14	24.33	0	0
	1711.5	19965	3	QPSK	8	0	23.38	0-1	1
	1711.5	19965	3	QPSK	8	4	23.33	0-1	1
	1711.5	19965	3	QPSK	8	7	23.26	0-1	1
	1711.5	19965	3	QPSK	15	0	23.16	0-1	1
	1711.5	19965	3	16-QAM	1	0	23.43	0-1	1
	1711.5	19965	3	16-QAM	1	7	23.47	0-1	1
	1711.5	19965	3	16-QAM	1	14	23.38	0-1	1
	1711.5	19965	3	16-QAM	8	0	22.62	0-2	2
	1711.5	19965	3	16-QAM	8	4	22.49	0-2	2
Mid	1732.5	19965	3	16-QAM	8	7	22.43	0-2	2
	1711.5	19965	3	16-QAM	15	0	22.14	0-2	2
	1732.5	20175	3	QPSK	1	0	24.54	0	0
	1732.5	20175	3	QPSK	1	7	24.39	0	0
	1732.5	20175	3	QPSK	1	14	24.29	0	0
	1732.5	20175	3	QPSK	8	0	23.37	0-1	1
	1732.5	20175	3	QPSK	8	4	23.24	0-1	1
	1732.5	20175	3	QPSK	8	7	23.17	0-1	1
	1732.5	20175	3	QPSK	15	0	23.20	0-1	1
	1732.5	20175	3	16-QAM	1	0	23.49	0-1	1
	1732.5	20175	3	16-QAM	1	7	23.53	0-1	1
	1732.5	20175	3	16-QAM	1	14	23.32	0-1	1
High	1732.5	20175	3	16-QAM	8	0	22.40	0-2	2
	1732.5	20175	3	16-QAM	8	4	22.45	0-2	2
	1732.5	20175	3	16-QAM	8	7	22.21	0-2	2
	1732.5	20175	3	16-QAM	15	0	22.28	0-2	2
	1753.5	20385	3	QPSK	1	0	24.44	0	0
	1753.5	20385	3	QPSK	1	7	24.12	0	0
	1753.5	20385	3	QPSK	1	14	24.29	0	0
	1753.5	20385	3	QPSK	8	0	23.45	0-1	1
	1753.5	20385	3	QPSK	8	4	23.15	0-1	1
	1753.5	20385	3	QPSK	8	7	23.29	0-1	1
	1753.5	20385	3	QPSK	15	0	23.18	0-1	1
	1753.5	20385	3	16-QAM	1	0	23.24	0-1	1
1753.5	20385	3	16-QAM	1	7	23.38	0-1	1	
1753.5	20385	3	16-QAM	1	14	23.51	0-1	1	
1753.5	20385	3	16-QAM	8	0	22.36	0-2	2	
1753.5	20385	3	16-QAM	8	4	22.46	0-2	2	
1753.5	20385	3	16-QAM	8	7	22.24	0-2	2	
1753.5	20385	3	16-QAM	15	0	22.15	0-2	2	

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1710.7	19957	1.4	QPSK	1	0	24.50	0	0
	1710.7	19957	1.4	QPSK	1	2	24.49	0	0
	1710.7	19957	1.4	QPSK	1	5	24.35	0	0
	1710.7	19957	1.4	QPSK	3	0	24.47	0	0
	1710.7	19957	1.4	QPSK	3	2	24.52	0	0
	1710.7	19957	1.4	QPSK	3	3	24.52	0	0
	1710.7	19957	1.4	QPSK	6	0	23.55	0-1	1
	1710.7	19957	1.4	16-QAM	1	0	23.20	0-1	1
	1710.7	19957	1.4	16-QAM	1	2	23.56	0-1	1
	1710.7	19957	1.4	16-QAM	1	5	23.52	0-1	1
	1710.7	19957	1.4	16-QAM	3	0	23.60	0-1	1
	1710.7	19957	1.4	16-QAM	3	2	23.48	0-1	1
	1710.7	19957	1.4	16-QAM	3	3	23.68	0-1	1
1710.7	19957	1.4	16-QAM	6	0	22.64	0-2	2	
Mid	1732.5	20175	1.4	QPSK	1	0	24.55	0	0
	1732.5	20175	1.4	QPSK	1	2	24.51	0	0
	1732.5	20175	1.4	QPSK	1	5	24.49	0	0
	1732.5	20175	1.4	QPSK	3	0	24.52	0	0
	1732.5	20175	1.4	QPSK	3	2	24.53	0	0
	1732.5	20175	1.4	QPSK	3	3	24.45	0	0
	1732.5	20175	1.4	QPSK	6	0	23.37	0-1	1
	1732.5	20175	1.4	16-QAM	1	0	23.21	0-1	1
	1732.5	20175	1.4	16-QAM	1	2	23.60	0-1	1
	1732.5	20175	1.4	16-QAM	1	5	23.65	0-1	1
	1732.5	20175	1.4	16-QAM	3	0	23.51	0-1	1
	1732.5	20175	1.4	16-QAM	3	2	23.68	0-1	1
	1732.5	20175	1.4	16-QAM	3	3	23.49	0-1	1
1732.5	20175	1.4	16-QAM	6	0	22.55	0-2	2	
High	1754.3	20393	1.4	QPSK	1	0	24.42	0	0
	1754.3	20393	1.4	QPSK	1	2	24.55	0	0
	1754.3	20393	1.4	QPSK	1	5	24.39	0	0
	1754.3	20393	1.4	QPSK	3	0	24.27	0	0
	1754.3	20393	1.4	QPSK	3	2	24.52	0	0
	1754.3	20393	1.4	QPSK	3	3	24.50	0	0
	1754.3	20393	1.4	QPSK	6	0	23.62	0-1	1
	1754.3	20393	1.4	16-QAM	1	0	23.34	0-1	1
	1754.3	20393	1.4	16-QAM	1	2	23.39	0-1	1
	1754.3	20393	1.4	16-QAM	1	5	23.45	0-1	1
	1754.3	20393	1.4	16-QAM	3	0	23.42	0-1	1
	1754.3	20393	1.4	16-QAM	3	2	23.33	0-1	1
	1754.3	20393	1.4	16-QAM	3	3	23.53	0-1	1
1754.3	20393	1.4	16-QAM	6	0	22.53	0-2	2	

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### 9.3.4

### LTE Band 2 (PCS)

**Table 9-15**  
**LTE Band 2 (PCS) Conducted Powers - 20 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	18700	20	QPSK	1	0	23.93	0	0
	1860	18700	20	QPSK	1	50	23.81	0	0
	1860	18700	20	QPSK	1	99	23.85	0	0
	1860	18700	20	QPSK	50	0	22.82	0-1	1
	1860	18700	20	QPSK	50	25	22.76	0-1	1
	1860	18700	20	QPSK	50	50	22.78	0-1	1
	1860	18700	20	QPSK	100	0	22.74	0-1	1
	1860	18700	20	16QAM	1	0	22.90	0-1	1
	1860	18700	20	16QAM	1	50	22.82	0-1	1
	1860	18700	20	16QAM	1	99	22.94	0-1	1
	1860	18700	20	16QAM	50	0	21.80	0-2	2
	1860	18700	20	16QAM	50	25	21.74	0-2	2
	1860	18700	20	16QAM	50	50	21.81	0-2	2
	1860	18700	20	16QAM	100	0	21.76	0-2	2
Mid	1880.0	18900	20	QPSK	1	0	23.95	0	0
	1880.0	18900	20	QPSK	1	50	<b>24.02</b>	0	0
	1880.0	18900	20	QPSK	1	99	23.74	0	0
	1880.0	18900	20	QPSK	50	0	23.06	0-1	1
	1880.0	18900	20	QPSK	50	25	<b>23.11</b>	0-1	1
	1880.0	18900	20	QPSK	50	50	22.90	0-1	1
	1880.0	18900	20	QPSK	100	0	23.07	0-1	1
	1880.0	18900	20	16QAM	1	0	23.00	0-1	1
	1880.0	18900	20	16QAM	1	50	22.93	0-1	1
	1880.0	18900	20	16QAM	1	99	22.82	0-1	1
	1880.0	18900	20	16QAM	50	0	22.02	0-2	2
	1880.0	18900	20	16QAM	50	25	22.19	0-2	2
	1880.0	18900	20	16QAM	50	50	21.88	0-2	2
	1880.0	18900	20	16QAM	100	0	21.80	0-2	2
High	1900	19100	20	QPSK	1	0	23.95	0	0
	1900	19100	20	QPSK	1	50	23.69	0	0
	1900	19100	20	QPSK	1	99	23.50	0	0
	1900	19100	20	QPSK	50	0	22.52	0-1	1
	1900	19100	20	QPSK	50	25	22.64	0-1	1
	1900	19100	20	QPSK	50	50	23.00	0-1	1
	1900	19100	20	QPSK	100	0	22.72	0-1	1
	1900	19100	20	16QAM	1	0	22.73	0-1	1
	1900	19100	20	16QAM	1	50	22.71	0-1	1
	1900	19100	20	16QAM	1	99	22.76	0-1	1
	1900	19100	20	16QAM	50	0	21.55	0-2	2
	1900	19100	20	16QAM	50	25	21.57	0-2	2
	1900	19100	20	16QAM	50	50	21.87	0-2	2
	1900	19100	20	16QAM	100	0	21.72	0-2	2

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**Table 9-16  
LTE Band 2 (PCS) Conducted Powers - 15 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	18675	15	QPSK	1	0	23.89	0	0
	1857.5	18675	15	QPSK	1	36	23.83	0	0
	1857.5	18675	15	QPSK	1	74	23.86	0	0
	1857.5	18675	15	QPSK	36	0	22.72	0-1	1
	1857.5	18675	15	QPSK	36	18	22.82	0-1	1
	1857.5	18675	15	QPSK	36	37	22.81	0-1	1
	1857.5	18675	15	QPSK	75	0	22.78	0-1	1
	1857.5	18675	15	16QAM	1	0	22.89	0-1	1
	1857.5	18675	15	16QAM	1	36	22.83	0-1	1
	1857.5	18675	15	16QAM	1	74	22.93	0-1	1
	1857.5	18675	15	16QAM	36	0	21.77	0-2	2
	1857.5	18675	15	16QAM	36	18	21.88	0-2	2
1857.5	18675	15	16QAM	36	37	21.89	0-2	2	
1857.5	18675	15	16QAM	75	0	21.78	0-2	2	
Mid	1880.0	18900	15	QPSK	1	0	24.02	0	0
	1880.0	18900	15	QPSK	1	36	23.76	0	0
	1880.0	18900	15	QPSK	1	74	23.65	0	0
	1880.0	18900	15	QPSK	36	0	23.04	0-1	1
	1880.0	18900	15	QPSK	36	18	22.91	0-1	1
	1880.0	18900	15	QPSK	36	37	22.83	0-1	1
	1880.0	18900	15	QPSK	75	0	22.93	0-1	1
	1880.0	18900	15	16QAM	1	0	23.11	0-1	1
	1880.0	18900	15	16QAM	1	36	22.70	0-1	1
	1880.0	18900	15	16QAM	1	74	22.73	0-1	1
	1880.0	18900	15	16QAM	36	0	22.17	0-2	2
	1880.0	18900	15	16QAM	36	18	22.00	0-2	2
1880.0	18900	15	16QAM	36	37	21.92	0-2	2	
1880.0	18900	15	16QAM	75	0	21.98	0-2	2	
High	1902.5	19125	15	QPSK	1	0	23.56	0	0
	1902.5	19125	15	QPSK	1	36	23.87	0	0
	1902.5	19125	15	QPSK	1	74	23.42	0	0
	1902.5	19125	15	QPSK	36	0	22.58	0-1	1
	1902.5	19125	15	QPSK	36	18	22.82	0-1	1
	1902.5	19125	15	QPSK	36	37	22.88	0-1	1
	1902.5	19125	15	QPSK	75	0	22.65	0-1	1
	1902.5	19125	15	16QAM	1	0	22.78	0-1	1
	1902.5	19125	15	16QAM	1	36	23.00	0-1	1
	1902.5	19125	15	16QAM	1	74	22.83	0-1	1
	1902.5	19125	15	16QAM	36	0	21.60	0-2	2
	1902.5	19125	15	16QAM	36	18	21.89	0-2	2
1902.5	19125	15	16QAM	36	37	22.04	0-2	2	
1902.5	19125	15	16QAM	75	0	21.73	0-2	2	

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**Table 9-17**  
**LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	18650	10	QPSK	1	0	23.85	0	0
	1855	18650	10	QPSK	1	25	24.01	0	0
	1855	18650	10	QPSK	1	49	23.75	0	0
	1855	18650	10	QPSK	25	0	23.01	0-1	1
	1855	18650	10	QPSK	25	12	22.99	0-1	1
	1855	18650	10	QPSK	25	25	22.93	0-1	1
	1855	18650	10	QPSK	50	0	22.92	0-1	1
	1855	18650	10	16QAM	1	0	23.13	0-1	1
	1855	18650	10	16QAM	1	25	23.20	0-1	1
	1855	18650	10	16QAM	1	49	23.04	0-1	1
	1855	18650	10	16QAM	25	0	21.84	0-2	2
	1855	18650	10	16QAM	25	12	21.96	0-2	2
	1855	18650	10	16QAM	25	25	21.95	0-2	2
	1855	18650	10	16QAM	50	0	21.93	0-2	2
Mid	1880.0	18900	10	QPSK	1	0	24.00	0	0
	1880.0	18900	10	QPSK	1	25	23.96	0	0
	1880.0	18900	10	QPSK	1	49	23.73	0	0
	1880.0	18900	10	QPSK	25	0	23.16	0-1	1
	1880.0	18900	10	QPSK	25	12	23.13	0-1	1
	1880.0	18900	10	QPSK	25	25	23.06	0-1	1
	1880.0	18900	10	QPSK	50	0	23.13	0-1	1
	1880.0	18900	10	16QAM	1	0	23.20	0-1	1
	1880.0	18900	10	16QAM	1	25	23.15	0-1	1
	1880.0	18900	10	16QAM	1	49	23.01	0-1	1
	1880.0	18900	10	16QAM	25	0	22.18	0-2	2
	1880.0	18900	10	16QAM	25	12	22.14	0-2	2
	1880.0	18900	10	16QAM	25	25	22.07	0-2	2
	1880.0	18900	10	16QAM	50	0	22.16	0-2	2
High	1905	19150	10	QPSK	1	0	23.74	0	0
	1905	19150	10	QPSK	1	25	23.99	0	0
	1905	19150	10	QPSK	1	49	23.28	0	0
	1905	19150	10	QPSK	25	0	22.96	0-1	1
	1905	19150	10	QPSK	25	12	23.18	0-1	1
	1905	19150	10	QPSK	25	25	22.80	0-1	1
	1905	19150	10	QPSK	50	0	23.00	0-1	1
	1905	19150	10	16QAM	1	0	22.92	0-1	1
	1905	19150	10	16QAM	1	25	23.18	0-1	1
	1905	19150	10	16QAM	1	49	22.79	0-1	1
	1905	19150	10	16QAM	25	0	22.04	0-2	2
	1905	19150	10	16QAM	25	12	22.19	0-2	2
	1905	19150	10	16QAM	25	25	21.88	0-2	2
	1905	19150	10	16QAM	50	0	22.14	0-2	2

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**Table 9-18**  
**LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	18625	5	QPSK	1	0	24.01	0	0
	1852.5	18625	5	QPSK	1	12	24.02	0	0
	1852.5	18625	5	QPSK	1	24	24.00	0	0
	1852.5	18625	5	QPSK	12	0	23.09	0-1	1
	1852.5	18625	5	QPSK	12	6	23.11	0-1	1
	1852.5	18625	5	QPSK	12	13	23.16	0-1	1
	1852.5	18625	5	QPSK	25	0	23.14	0-1	1
	1852.5	18625	5	16-QAM	1	0	23.14	0-1	1
	1852.5	18625	5	16-QAM	1	12	23.20	0-1	1
	1852.5	18625	5	16-QAM	1	24	23.18	0-1	1
	1852.5	18625	5	16-QAM	12	0	22.19	0-2	2
	1852.5	18625	5	16-QAM	12	6	22.20	0-2	2
1852.5	18625	5	16-QAM	12	13	22.16	0-2	2	
1852.5	18625	5	16-QAM	25	0	22.08	0-2	2	
Mid	1880.0	18900	5	QPSK	1	0	24.02	0	0
	1880.0	18900	5	QPSK	1	12	24.00	0	0
	1880.0	18900	5	QPSK	1	24	24.00	0	0
	1880.0	18900	5	QPSK	12	0	22.94	0-1	1
	1880.0	18900	5	QPSK	12	6	22.92	0-1	1
	1880.0	18900	5	QPSK	12	13	23.11	0-1	1
	1880.0	18900	5	QPSK	25	0	23.10	0-1	1
	1880.0	18900	5	16-QAM	1	0	23.19	0-1	1
	1880.0	18900	5	16-QAM	1	12	23.15	0-1	1
	1880.0	18900	5	16-QAM	1	24	23.18	0-1	1
	1880.0	18900	5	16-QAM	12	0	22.13	0-2	2
	1880.0	18900	5	16-QAM	12	6	22.11	0-2	2
1880.0	18900	5	16-QAM	12	13	22.19	0-2	2	
1880.0	18900	5	16-QAM	25	0	22.18	0-2	2	
High	1907.5	19175	5	QPSK	1	0	24.00	0	0
	1907.5	19175	5	QPSK	1	12	23.81	0	0
	1907.5	19175	5	QPSK	1	24	23.58	0	0
	1907.5	19175	5	QPSK	12	0	22.85	0-1	1
	1907.5	19175	5	QPSK	12	6	22.93	0-1	1
	1907.5	19175	5	QPSK	12	13	22.61	0-1	1
	1907.5	19175	5	QPSK	25	0	22.85	0-1	1
	1907.5	19175	5	16-QAM	1	0	23.20	0-1	1
	1907.5	19175	5	16-QAM	1	12	23.10	0-1	1
	1907.5	19175	5	16-QAM	1	24	22.98	0-1	1
	1907.5	19175	5	16-QAM	12	0	22.19	0-2	2
	1907.5	19175	5	16-QAM	12	6	22.16	0-2	2
1907.5	19175	5	16-QAM	12	13	21.91	0-2	2	
1907.5	19175	5	16-QAM	25	0	22.08	0-2	2	

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**Table 9-19  
LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	18615	3	QPSK	1	0	24.02	0	0
	1851.5	18615	3	QPSK	1	7	24.00	0	0
	1851.5	18615	3	QPSK	1	14	24.01	0	0
	1851.5	18615	3	QPSK	8	0	23.12	0-1	1
	1851.5	18615	3	QPSK	8	4	23.18	0-1	1
	1851.5	18615	3	QPSK	8	7	23.15	0-1	1
	1851.5	18615	3	QPSK	15	0	23.16	0-1	1
	1851.5	18615	3	16-QAM	1	0	23.19	0-1	1
	1851.5	18615	3	16-QAM	1	7	23.16	0-1	1
	1851.5	18615	3	16-QAM	1	14	23.11	0-1	1
	1851.5	18615	3	16-QAM	8	0	22.18	0-2	2
	1851.5	18615	3	16-QAM	8	4	22.04	0-2	2
	1851.5	18615	3	16-QAM	8	7	22.05	0-2	2
1851.5	18615	3	16-QAM	15	0	22.03	0-2	2	
Mid	1880.0	18900	3	QPSK	1	0	23.98	0	0
	1880.0	18900	3	QPSK	1	7	24.01	0	0
	1880.0	18900	3	QPSK	1	14	24.00	0	0
	1880.0	18900	3	QPSK	8	0	23.12	0-1	1
	1880.0	18900	3	QPSK	8	4	23.11	0-1	1
	1880.0	18900	3	QPSK	8	7	23.12	0-1	1
	1880.0	18900	3	QPSK	15	0	23.10	0-1	1
	1880.0	18900	3	16-QAM	1	0	23.19	0-1	1
	1880.0	18900	3	16-QAM	1	7	23.20	0-1	1
	1880.0	18900	3	16-QAM	1	14	23.18	0-1	1
	1880.0	18900	3	16-QAM	8	0	22.18	0-2	2
	1880.0	18900	3	16-QAM	8	4	22.17	0-2	2
	1880.0	18900	3	16-QAM	8	7	22.19	0-2	2
1880.0	18900	3	16-QAM	15	0	22.15	0-2	2	
High	1908.5	19185	3	QPSK	1	0	23.75	0	0
	1908.5	19185	3	QPSK	1	7	23.66	0	0
	1908.5	19185	3	QPSK	1	14	23.55	0	0
	1908.5	19185	3	QPSK	8	0	22.77	0-1	1
	1908.5	19185	3	QPSK	8	4	22.60	0-1	1
	1908.5	19185	3	QPSK	8	7	22.52	0-1	1
	1908.5	19185	3	QPSK	15	0	22.64	0-1	1
	1908.5	19185	3	16-QAM	1	0	23.01	0-1	1
	1908.5	19185	3	16-QAM	1	7	23.08	0-1	1
	1908.5	19185	3	16-QAM	1	14	23.11	0-1	1
	1908.5	19185	3	16-QAM	8	0	21.99	0-2	2
	1908.5	19185	3	16-QAM	8	4	21.91	0-2	2
	1908.5	19185	3	16-QAM	8	7	21.80	0-2	2
1908.5	19185	3	16-QAM	15	0	21.81	0-2	2	

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**Table 9-20  
LTE Band 2 (PCS) Conducted Powers – 1.4 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	18607	1.4	QPSK	1	0	24.02	0	0
	1850.7	18607	1.4	QPSK	1	2	24.00	0	0
	1850.7	18607	1.4	QPSK	1	5	24.01	0	0
	1850.7	18607	1.4	QPSK	3	0	24.00	0	0
	1850.7	18607	1.4	QPSK	3	2	23.96	0	0
	1850.7	18607	1.4	QPSK	3	3	24.02	0	0
	1850.7	18607	1.4	QPSK	6	0	23.03	0-1	1
	1850.7	18607	1.4	16-QAM	1	0	23.18	0-1	1
	1850.7	18607	1.4	16-QAM	1	2	23.19	0-1	1
	1850.7	18607	1.4	16-QAM	1	5	23.11	0-1	1
	1850.7	18607	1.4	16-QAM	3	0	23.10	0-1	1
	1850.7	18607	1.4	16-QAM	3	2	23.12	0-1	1
1850.7	18607	1.4	16-QAM	3	3	23.11	0-1	1	
1850.7	18607	1.4	16-QAM	6	0	22.15	0-2	2	
Mid	1880.0	18900	1.4	QPSK	1	0	24.01	0	0
	1880.0	18900	1.4	QPSK	1	2	24.00	0	0
	1880.0	18900	1.4	QPSK	1	5	24.02	0	0
	1880.0	18900	1.4	QPSK	3	0	23.95	0	0
	1880.0	18900	1.4	QPSK	3	2	23.97	0	0
	1880.0	18900	1.4	QPSK	3	3	23.93	0	0
	1880.0	18900	1.4	QPSK	6	0	23.03	0-1	1
	1880.0	18900	1.4	16-QAM	1	0	22.90	0-1	1
	1880.0	18900	1.4	16-QAM	1	2	22.94	0-1	1
	1880.0	18900	1.4	16-QAM	1	5	23.15	0-1	1
	1880.0	18900	1.4	16-QAM	3	0	22.87	0-1	1
	1880.0	18900	1.4	16-QAM	3	2	22.88	0-1	1
1880.0	18900	1.4	16-QAM	3	3	22.84	0-1	1	
1880.0	18900	1.4	16-QAM	6	0	21.91	0-2	2	
High	1909.3	19193	1.4	QPSK	1	0	23.76	0	0
	1909.3	19193	1.4	QPSK	1	2	23.71	0	0
	1909.3	19193	1.4	QPSK	1	5	23.64	0	0
	1909.3	19193	1.4	QPSK	3	0	23.68	0	0
	1909.3	19193	1.4	QPSK	3	2	23.65	0	0
	1909.3	19193	1.4	QPSK	3	3	23.57	0	0
	1909.3	19193	1.4	QPSK	6	0	22.38	0-1	1
	1909.3	19193	1.4	16-QAM	1	0	22.82	0-1	1
	1909.3	19193	1.4	16-QAM	1	2	22.98	0-1	1
	1909.3	19193	1.4	16-QAM	1	5	22.93	0-1	1
	1909.3	19193	1.4	16-QAM	3	0	22.54	0-1	1
	1909.3	19193	1.4	16-QAM	3	2	22.87	0-1	1
1909.3	19193	1.4	16-QAM	3	3	22.79	0-1	1	
1909.3	19193	1.4	16-QAM	6	0	21.52	0-2	2	

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### 9.3.5

### LTE Band 7

**Table 9-21**  
**LTE Band 7 Conducted Powers - 20 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2510	20850	20	QPSK	1	0	23.32	0	0
	2510	20850	20	QPSK	1	50	<b>23.58</b>	0	0
	2510	20850	20	QPSK	1	99	23.50	0	0
	2510	20850	20	QPSK	50	0	22.35	0-1	1
	2510	20850	20	QPSK	50	25	22.36	0-1	1
	2510	20850	20	QPSK	50	50	<b>22.38</b>	0-1	1
	2510	20850	20	QPSK	100	0	22.36	0-1	1
	2510	20850	20	16QAM	1	0	22.52	0-1	1
	2510	20850	20	16QAM	1	50	22.70	0-1	1
	2510	20850	20	16QAM	1	99	22.64	0-1	1
	2510	20850	20	16QAM	50	0	21.25	0-2	2
	2510	20850	20	16QAM	50	25	21.27	0-2	2
	2510	20850	20	16QAM	50	50	21.29	0-2	2
	2510	20850	20	16QAM	100	0	21.27	0-2	2
Mid	2535.0	21100	20	QPSK	1	0	23.48	0	0
	2535.0	21100	20	QPSK	1	50	23.54	0	0
	2535.0	21100	20	QPSK	1	99	23.49	0	0
	2535.0	21100	20	QPSK	50	0	22.04	0-1	1
	2535.0	21100	20	QPSK	50	25	22.24	0-1	1
	2535.0	21100	20	QPSK	50	50	22.31	0-1	1
	2535.0	21100	20	QPSK	100	0	22.10	0-1	1
	2535.0	21100	20	16QAM	1	0	22.65	0-1	1
	2535.0	21100	20	16QAM	1	50	22.70	0-1	1
	2535.0	21100	20	16QAM	1	99	22.69	0-1	1
	2535.0	21100	20	16QAM	50	0	21.02	0-2	2
	2535.0	21100	20	16QAM	50	25	21.13	0-2	2
	2535.0	21100	20	16QAM	50	50	21.27	0-2	2
	2535.0	21100	20	16QAM	100	0	21.04	0-2	2
High	2560	21350	20	QPSK	1	0	23.38	0	0
	2560	21350	20	QPSK	1	50	23.27	0	0
	2560	21350	20	QPSK	1	99	23.23	0	0
	2560	21350	20	QPSK	50	0	22.17	0-1	1
	2560	21350	20	QPSK	50	25	22.24	0-1	1
	2560	21350	20	QPSK	50	50	22.21	0-1	1
	2560	21350	20	QPSK	100	0	22.23	0-1	1
	2560	21350	20	16QAM	1	0	22.70	0-1	1
	2560	21350	20	16QAM	1	50	22.67	0-1	1
	2560	21350	20	16QAM	1	99	22.57	0-1	1
	2560	21350	20	16QAM	50	0	21.11	0-2	2
	2560	21350	20	16QAM	50	25	21.18	0-2	2
	2560	21350	20	16QAM	50	50	21.17	0-2	2
	2560	21350	20	16QAM	100	0	21.13	0-2	2

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**Table 9-22  
LTE Band 7 Conducted Powers - 15 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2507.5	20825	15	QPSK	1	0	23.11	0	0
	2507.5	20825	15	QPSK	1	36	23.03	0	0
	2507.5	20825	15	QPSK	1	74	23.30	0	0
	2507.5	20825	15	QPSK	36	0	22.13	0-1	1
	2507.5	20825	15	QPSK	36	18	22.21	0-1	1
	2507.5	20825	15	QPSK	36	37	22.29	0-1	1
	2507.5	20825	15	QPSK	75	0	22.18	0-1	1
	2507.5	20825	15	16QAM	1	0	22.03	0-1	1
	2507.5	20825	15	16QAM	1	36	22.00	0-1	1
	2507.5	20825	15	16QAM	1	74	22.27	0-1	1
	2507.5	20825	15	16QAM	36	0	21.02	0-2	2
	2507.5	20825	15	16QAM	36	18	21.11	0-2	2
2507.5	20825	15	16QAM	36	37	21.10	0-2	2	
2507.5	20825	15	16QAM	75	0	21.11	0-2	2	
Mid	2535.0	21100	15	QPSK	1	0	23.35	0	0
	2535.0	21100	15	QPSK	1	36	23.20	0	0
	2535.0	21100	15	QPSK	1	74	23.17	0	0
	2535.0	21100	15	QPSK	36	0	22.08	0-1	1
	2535.0	21100	15	QPSK	36	18	22.15	0-1	1
	2535.0	21100	15	QPSK	36	37	22.16	0-1	1
	2535.0	21100	15	QPSK	75	0	22.11	0-1	1
	2535.0	21100	15	16QAM	1	0	22.37	0-1	1
	2535.0	21100	15	16QAM	1	36	22.39	0-1	1
	2535.0	21100	15	16QAM	1	74	22.36	0-1	1
	2535.0	21100	15	16QAM	36	0	21.03	0-2	2
	2535.0	21100	15	16QAM	36	18	21.09	0-2	2
2535.0	21100	15	16QAM	36	37	21.12	0-2	2	
2535.0	21100	15	16QAM	75	0	21.08	0-2	2	
High	2562.5	21375	15	QPSK	1	0	23.30	0	0
	2562.5	21375	15	QPSK	1	36	23.27	0	0
	2562.5	21375	15	QPSK	1	74	23.17	0	0
	2562.5	21375	15	QPSK	36	0	22.46	0-1	1
	2562.5	21375	15	QPSK	36	18	22.33	0-1	1
	2562.5	21375	15	QPSK	36	37	22.27	0-1	1
	2562.5	21375	15	QPSK	75	0	22.28	0-1	1
	2562.5	21375	15	16QAM	1	0	22.61	0-1	1
	2562.5	21375	15	16QAM	1	36	22.41	0-1	1
	2562.5	21375	15	16QAM	1	74	22.28	0-1	1
	2562.5	21375	15	16QAM	36	0	21.23	0-2	2
	2562.5	21375	15	16QAM	36	18	21.10	0-2	2
2562.5	21375	15	16QAM	36	37	21.09	0-2	2	
2562.5	21375	15	16QAM	75	0	21.05	0-2	2	

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**Table 9-23**  
**LTE Band 7 Conducted Powers - 10 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2505	20800	10	QPSK	1	0	22.71	0	0
	2505	20800	10	QPSK	1	25	23.04	0	0
	2505	20800	10	QPSK	1	49	22.77	0	0
	2505	20800	10	QPSK	25	0	21.78	0-1	1
	2505	20800	10	QPSK	25	12	21.92	0-1	1
	2505	20800	10	QPSK	25	25	21.88	0-1	1
	2505	20800	10	QPSK	50	0	21.82	0-1	1
	2505	20800	10	16QAM	1	0	21.81	0-1	1
	2505	20800	10	16QAM	1	25	22.00	0-1	1
	2505	20800	10	16QAM	1	49	21.99	0-1	1
	2505	20800	10	16QAM	25	0	20.72	0-2	2
	2505	20800	10	16QAM	25	12	20.86	0-2	2
	2505	20800	10	16QAM	25	25	20.82	0-2	2
	2505	20800	10	16QAM	50	0	20.74	0-2	2
Mid	2535.0	21100	10	QPSK	1	0	22.74	0	0
	2535.0	21100	10	QPSK	1	25	23.16	0	0
	2535.0	21100	10	QPSK	1	49	22.75	0	0
	2535.0	21100	10	QPSK	25	0	21.89	0-1	1
	2535.0	21100	10	QPSK	25	12	22.08	0-1	1
	2535.0	21100	10	QPSK	25	25	21.93	0-1	1
	2535.0	21100	10	QPSK	50	0	21.90	0-1	1
	2535.0	21100	10	16QAM	1	0	22.00	0-1	1
	2535.0	21100	10	16QAM	1	25	22.38	0-1	1
	2535.0	21100	10	16QAM	1	49	21.95	0-1	1
	2535.0	21100	10	16QAM	25	0	20.72	0-2	2
	2535.0	21100	10	16QAM	25	12	20.93	0-2	2
	2535.0	21100	10	16QAM	25	25	20.77	0-2	2
	2535.0	21100	10	16QAM	50	0	20.76	0-2	2
High	2565	21400	10	QPSK	1	0	23.13	0	0
	2565	21400	10	QPSK	1	25	23.26	0	0
	2565	21400	10	QPSK	1	49	22.81	0	0
	2565	21400	10	QPSK	25	0	22.16	0-1	1
	2565	21400	10	QPSK	25	12	22.14	0-1	1
	2565	21400	10	QPSK	25	25	21.93	0-1	1
	2565	21400	10	QPSK	50	0	22.04	0-1	1
	2565	21400	10	16QAM	1	0	22.28	0-1	1
	2565	21400	10	16QAM	1	25	22.37	0-1	1
	2565	21400	10	16QAM	1	49	21.92	0-1	1
	2565	21400	10	16QAM	25	0	21.06	0-2	2
	2565	21400	10	16QAM	25	12	21.05	0-2	2
	2565	21400	10	16QAM	25	25	20.84	0-2	2
	2565	21400	10	16QAM	50	0	20.96	0-2	2

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**Table 9-24  
LTE Band 7 Conducted Powers - 5 MHz Bandwidth**

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	2502.5	20775	5	QPSK	1	0	22.73	0	0
	2502.5	20775	5	QPSK	1	12	23.00	0	0
	2502.5	20775	5	QPSK	1	24	22.95	0	0
	2502.5	20775	5	QPSK	12	0	21.72	0-1	1
	2502.5	20775	5	QPSK	12	6	21.75	0-1	1
	2502.5	20775	5	QPSK	12	13	21.70	0-1	1
	2502.5	20775	5	QPSK	25	0	21.71	0-1	1
	2502.5	20775	5	16-QAM	1	0	21.84	0-1	1
	2502.5	20775	5	16-QAM	1	12	21.99	0-1	1
	2502.5	20775	5	16-QAM	1	24	22.00	0-1	1
	2502.5	20775	5	16-QAM	12	0	20.77	0-2	2
	2502.5	20775	5	16-QAM	12	6	20.73	0-2	2
	2502.5	20775	5	16-QAM	12	13	20.70	0-2	2
	2502.5	20775	5	16-QAM	25	0	20.70	0-2	2
Mid	2535.0	21100	5	QPSK	1	0	23.00	0	0
	2535.0	21100	5	QPSK	1	12	23.04	0	0
	2535.0	21100	5	QPSK	1	24	23.04	0	0
	2535.0	21100	5	QPSK	12	0	21.88	0-1	1
	2535.0	21100	5	QPSK	12	6	21.86	0-1	1
	2535.0	21100	5	QPSK	12	13	21.80	0-1	1
	2535.0	21100	5	QPSK	25	0	21.85	0-1	1
	2535.0	21100	5	16-QAM	1	0	21.96	0-1	1
	2535.0	21100	5	16-QAM	1	12	22.05	0-1	1
	2535.0	21100	5	16-QAM	1	24	21.94	0-1	1
	2535.0	21100	5	16-QAM	12	0	20.70	0-2	2
	2535.0	21100	5	16-QAM	12	6	20.79	0-2	2
	2535.0	21100	5	16-QAM	12	13	20.72	0-2	2
	2535.0	21100	5	16-QAM	25	0	20.77	0-2	2
High	2567.5	21425	5	QPSK	1	0	23.27	0	0
	2567.5	21425	5	QPSK	1	12	23.17	0	0
	2567.5	21425	5	QPSK	1	24	23.00	0	0
	2567.5	21425	5	QPSK	12	0	22.00	0-1	1
	2567.5	21425	5	QPSK	12	6	21.97	0-1	1
	2567.5	21425	5	QPSK	12	13	21.85	0-1	1
	2567.5	21425	5	QPSK	25	0	21.94	0-1	1
	2567.5	21425	5	16-QAM	1	0	22.15	0-1	1
	2567.5	21425	5	16-QAM	1	12	22.09	0-1	1
	2567.5	21425	5	16-QAM	1	24	21.90	0-1	1
	2567.5	21425	5	16-QAM	12	0	20.92	0-2	2
	2567.5	21425	5	16-QAM	12	6	20.89	0-2	2
	2567.5	21425	5	16-QAM	12	13	20.77	0-2	2
	2567.5	21425	5	16-QAM	25	0	20.85	0-2	2

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### 9.3.6

### LTE Carrier Aggregation Conducted Powers

**Table 9-25**

**LTE Carrier Aggregation Conducted Powers – Band 12 (PCC) 5 MHz BW + Band 4 (SCC) 20 MHz BW**

PCC		PCC Bandwidth [MHz]		+	SCC		SCC Bandwidth [MHz]	
LTE B12		5			LTE B4		20	
PCC Frequency [MHz]	PCC Channel	SCC Frequency [MHz]	SCC Channel	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)	
701.5	23035	2132.5	2175	1	0	24.16	24.15	

**Table 9-26**

**LTE Carrier Aggregation Conducted Powers – Band 12 (PCC) 5 MHz BW + Band 2 (SCC) 20 MHz BW**

PCC		PCC Bandwidth [MHz]		+	SCC		SCC Bandwidth [MHz]	
LTE B12		5			LTE B2		20	
PCC Frequency [MHz]	PCC Channel	SCC Frequency [MHz]	SCC Channel	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)	
701.5	23035	1960.0	900	1	0	24.17	24.15	

**Table 9-27**

**LTE Carrier Aggregation Conducted Powers – Band 4 (PCC) 10 MHz BW + Band 12 (SCC) 10 MHz BW**

PCC		PCC Bandwidth [MHz]		+	SCC		SCC Bandwidth [MHz]	
LTE B4		10			LTE 12		10	
PCC Frequency [MHz]	PCC Channel	SCC Frequency [MHz]	SCC Channel	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)	
1750.0	20350	737.5	5095	1	49	24.65	24.63	

**Table 9-28**

**LTE Carrier Aggregation Conducted Powers – Band 4 (PCC) 10 MHz BW + Band 4 (SCC) 20 MHz BW**

PCC		PCC Bandwidth [MHz]		+	SCC		SCC Bandwidth [MHz]	
LTE B4		10			LTE B4		20	
PCC Frequency [MHz]	PCC Channel	SCC Frequency [MHz]	SCC Channel	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)	
1750.0	20350	2132.5	2175	1	49	24.67	24.63	

**Table 9-29**

**LTE Carrier Aggregation Conducted Powers – Band 4 (PCC) 10 MHz BW + Band 2 (SCC) 20 MHz BW**

PCC		PCC Bandwidth [MHz]		+	SCC		SCC Bandwidth [MHz]	
LTE B4		10			LTE B2		20	
PCC Frequency [MHz]	PCC Channel	SCC Frequency [MHz]	SCC Channel	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)	
1750.0	20350	1960.0	900	1	49	24.64	24.63	

**Table 9-30**

**LTE Carrier Aggregation Conducted Powers – Band 2 (PCC) 20 MHz BW + Band 4 (SCC) 20 MHz BW**

PCC		PCC Bandwidth [MHz]		+	SCC		SCC Bandwidth [MHz]	
LTE B2		20			LTE B4		20	
PCC Frequency [MHz]	PCC Channel	SCC Frequency [MHz]	SCC Channel	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)	
1880.0	18900	2132.5	2175	1	50	24.08	24.02	

**Table 9-31**

**LTE Carrier Aggregation Conducted Powers – Band 2 (PCC) 20 MHz BW + Band 12 (SCC) 10 MHz BW**

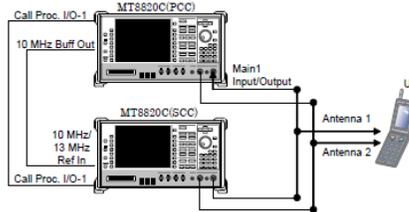
PCC		PCC Bandwidth [MHz]		+	SCC		SCC Bandwidth [MHz]	
LTE B2		20			LTE B12		10	
PCC Frequency [MHz]	PCC Channel	SCC Frequency [MHz]	SCC Channel	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE Rel. 8 Tx.Power (dBm)	
1880.0	18900	737.5	5095	1	50	24.01	24.02	

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Notes:

1. The device does not support all Rel. 10 Carrier Aggregation features due to modem chipset limitation.
2. The device only supports LTE downlink Carrier Aggregation. Uplink Carrier Aggregation is not supported. Power measurements were performed with two DL carriers for the Release 8 configuration that had the highest output power (across all bandwidths, channels and RB Configurations) for each band
3. This device supports inter-band and intra-brand CA with 2 carriers (B12+B4, B12+B2, B4+B12, B4+B4, B4+B2, B2+B12, B2+B4).
4. All control and acknowledge data is sent on uplink channels that operate identical to release 8 specifications.



**Figure 9-2**  
**Power Measurement Setup**

## 9.4 WLAN Conducted Powers

**Table 9-32**  
**IEEE 802.11b Average RF Power**

Mode	Freq [MHz]	Channel	802.11b Conducted Power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1*	15.36	15.68	15.66	15.63
802.11b	2437	6*	15.62	15.79	15.81	15.86
802.11b	2462	11*	15.16	15.51	15.49	15.61

**Table 9-33**  
**IEEE 802.11g Average RF Power**

Mode	Freq [MHz]	Channel	802.11g Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	14.41	14.62	14.58	14.61	14.78	14.66	14.86	14.62
802.11g	2437	6	14.53	14.57	14.52	14.57	14.84	14.72	14.79	14.60
802.11g	2462	11	14.48	14.49	14.52	14.46	14.84	14.60	14.79	14.65

**Table 9-34**  
**IEEE 802.11n Average RF Power**

Mode	Freq [MHz]	Channel	802.11n (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	13.26	13.28	13.24	13.52	13.63	13.54	13.57	13.55
802.11n	2437	6	13.56	13.37	13.53	13.72	13.73	13.78	13.72	13.58
802.11n	2462	11	12.01	12.04	12.02	12.29	12.33	12.33	12.35	12.46

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**Table 9-35**  
**IEEE 802.11ac Average RF Power**

802.11ac (2.4GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate
			6.5 Mbps
802.11ac	2412	1	11.30
802.11ac	2437	6	11.65
802.11ac	2462	11	11.34

**Table 9-36**  
**IEEE 802.11a Average RF Power**

Mode	Freq [MHz]	Channel	802.11a Conducted Power [dBm]								
			Data Rate [Mbps]								
			6	9	12	18	24	36	48	54	
802.11a	5180	36*	11.13	11.08	11.07	11.00	11.09	11.12	11.34	11.07	
802.11a	5200	40	11.04	10.93	11.01	10.97	11.18	11.23	11.24	10.99	
802.11a	5220	44	10.78	10.88	10.87	10.76	11.11	11.13	11.20	11.00	
802.11a	5240	48*	11.00	10.78	10.89	10.79	11.06	11.01	11.14	11.03	
802.11a	5260	52*	11.30	11.26	11.33	11.27	11.53	11.42	11.51	11.21	
802.11a	5280	56	11.15	11.03	11.34	11.07	11.44	11.33	11.43	11.12	
802.11a	5300	60	11.14	11.16	11.33	11.26	11.43	11.33	11.38	11.17	
802.11a	5320	64*	11.13	11.03	11.21	11.09	11.35	11.24	11.32	11.11	
802.11a	5500	100	10.66	10.50	10.68	10.62	10.80	10.85	10.85	10.65	
802.11a	5520	104*	10.44	10.49	10.57	10.52	10.74	10.60	10.71	10.54	
802.11a	5540	108	10.35	10.34	10.49	10.37	10.55	10.60	10.72	10.37	
802.11a	5560	112	10.21	10.27	10.37	10.24	10.55	10.48	10.54	10.41	
802.11a	5580	116*	10.03	10.07	10.25	10.11	10.45	10.31	10.58	10.27	
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	10.85	10.91	10.93	10.01	10.07	10.97	10.12	10.04	
802.11a	5680	136*	10.84	10.79	10.92	10.80	10.15	10.01	10.24	11.03	
802.11a	5700	140	10.82	10.92	10.99	10.82	10.09	10.17	10.22	11.06	
802.11a	5720	144	10.04	10.05	10.16	10.03	10.22	10.32	10.33	10.22	
802.11a	5745	149*	10.14	10.28	10.28	10.24	10.52	10.46	10.53	10.39	
802.11a	5765	153	10.31	10.32	10.52	10.46	10.41	10.53	10.50	10.25	
802.11a	5785	157*	10.33	10.24	10.50	10.31	10.60	10.58	10.64	10.30	
802.11a	5805	161	10.58	10.30	10.52	10.41	10.68	10.56	10.75	10.48	
802.11a	5825	165*	10.70	10.41	10.55	10.50	10.66	10.59	10.92	10.43	

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

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

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**Table 9-37**  
**IEEE 802.11n Average RF Power – 20 MHz Bandwidth**

Mode	Freq [MHz]	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	10.06	10.07	10.12	10.32	10.34	10.38	10.32	10.45
802.11n	5200	40	10.07	10.04	10.01	10.25	10.36	10.36	10.40	10.30
802.11n	5220	44	10.00	10.08	10.05	10.31	10.27	10.18	10.27	10.34
802.11n	5240	48	10.03	9.97	9.91	10.12	10.37	10.21	10.19	10.17
802.11n	5260	52	10.41	10.34	10.46	10.77	10.70	10.57	10.62	10.48
802.11n	5280	56	10.36	10.26	10.16	10.64	10.65	10.57	10.56	10.52
802.11n	5300	60	10.23	10.24	10.20	10.58	10.51	10.51	10.55	10.57
802.11n	5320	64	10.17	10.28	10.25	10.65	10.49	10.39	10.40	10.41
802.11n	5500	100	9.71	9.68	9.67	9.90	9.97	9.86	9.83	9.80
802.11n	5520	104	9.54	9.55	9.46	9.97	9.84	9.81	9.84	9.84
802.11n	5540	108	9.56	9.39	9.48	9.73	9.63	9.67	9.82	9.81
802.11n	5560	112	9.38	9.33	9.38	9.71	9.71	9.75	9.61	9.60
802.11n	5580	116	9.20	9.20	9.34	9.40	9.53	9.53	9.61	9.52
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	9.06	9.01	9.18	9.51	9.49	9.44	9.32	9.42
802.11n	5680	136	9.23	9.12	9.13	9.51	9.50	9.34	9.51	9.41
802.11n	5700	140	9.32	9.12	9.23	9.45	9.48	9.47	9.49	9.57
802.11n	5720	144	9.26	9.09	9.20	9.60	9.50	9.45	9.48	9.36
802.11n	5745	149	9.05	9.03	9.07	9.43	9.30	9.36	9.36	9.32
802.11n	5765	153	9.24	9.24	9.06	9.44	9.50	9.56	9.26	9.23
802.11n	5785	157	9.15	9.21	9.22	9.51	9.65	9.57	9.60	9.41
802.11n	5805	161	9.22	9.29	9.19	9.53	9.51	9.56	9.67	9.54
802.11n	5825	165	9.39	9.22	9.26	9.58	9.69	9.59	9.53	9.49

**Table 9-38**  
**IEEE 802.11n Average RF Power – 40 MHz Bandwidth**

Mode	Freq [MHz]	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	9.65	9.57	9.64	9.82	9.88	9.82	9.70	9.67
802.11n	5230	46	9.82	9.93	9.86	10.09	10.12	10.15	10.10	9.94
802.11n	5270	54	10.33	10.21	10.29	10.55	10.58	10.39	10.58	10.62
802.11n	5310	62	10.01	9.94	9.87	10.03	10.06	10.07	10.12	10.09
802.11n	5510	102	10.16	10.05	10.21	10.26	10.19	10.24	10.22	10.25
802.11n	5550	110	9.97	10.01	10.00	9.13	10.01	9.13	9.10	10.06
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	9.65	9.61	9.66	9.73	9.67	9.64	9.74	9.64
802.11n	5710	142	9.15	9.07	9.03	9.25	9.24	9.21	9.09	9.32
802.11n	5755	151	9.60	9.52	9.43	9.62	9.75	9.61	9.73	9.67
802.11n	5795	159	9.76	9.71	9.60	9.82	9.74	9.90	9.75	9.76

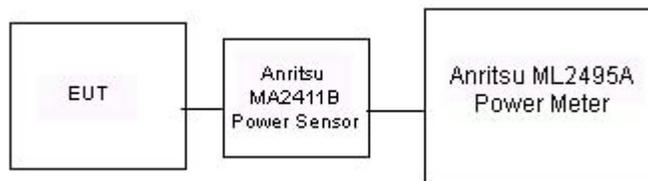
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**Table 9-39  
IEEE 802.11ac Average RF Power – 80 MHz Bandwidth**

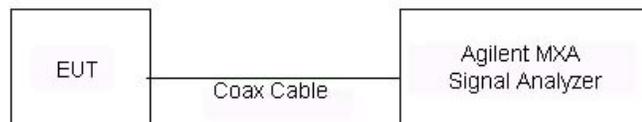
Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3	58.5	87.8	117	175.5	234	263.3	292.5	351	390
802.11ac	5210	42	<b>10.81</b>	10.77	10.87	10.94	10.97	10.91	10.95	10.97	10.98	10.96
802.11ac	5290	58	<b>9.22</b>	9.08	9.11	9.44	9.46	9.41	9.31	9.43	9.45	9.42
802.11ac	5530	106	<b>9.76</b>	9.80	9.69	10.00	9.99	9.97	9.99	9.95	9.97	9.98
802.11ac	5690	138	9.45	9.38	9.33	9.66	9.60	9.63	9.72	9.88	9.62	9.66
802.11ac	5775	155	<b>9.32</b>	9.24	9.22	9.56	9.30	9.46	9.56	9.38	9.41	9.46

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



**Figure 9-3  
Power Measurement Setup for Bandwidths < 50 MHz**



**Figure 9-4  
Power Measurement Setup for Bandwidths > 50 MHz**

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# 10 SYSTEM VERIFICATION

## 10.1 Tissue Verification

**Table 10-1  
Measured Head Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C)	Measured Frequency (MHz)	Measured Conductivity, $\sigma$ (S/m)	Measured Dielectric Constant, $\epsilon$	TARGET Conductivity, $\sigma$ (S/m)	TARGET Dielectric Constant, $\epsilon$	% dev $\sigma$	% dev $\epsilon$
03/25/2015	750H	21.8	695	0.855	41.707	0.889	42.227	-3.82%	-1.23%
			710	0.870	41.474	0.890	42.149	-2.25%	-1.60%
			725	0.883	41.277	0.891	42.071	-0.90%	-1.89%
			740	0.898	41.103	0.893	41.994	0.56%	-2.12%
			755	0.911	40.903	0.894	41.916	1.90%	-2.42%
03/17/2015	835H	21.6	820	0.895	41.675	0.899	41.578	-0.44%	0.23%
			835	0.911	41.496	0.900	41.500	1.22%	-0.01%
			850	0.924	41.318	0.916	41.500	0.87%	-0.44%
03/23/2015	1750H	20.4	1710	1.365	38.761	1.348	40.142	1.26%	-3.44%
			1750	1.409	38.615	1.371	40.079	2.77%	-3.65%
			1790	1.444	38.393	1.394	40.016	3.59%	-4.06%
03/26/2015	1900H	22.6	1850	1.347	39.718	1.400	40.000	-3.79%	-0.70%
			1880	1.381	39.569	1.400	40.000	-1.36%	-1.08%
			1910	1.415	39.458	1.400	40.000	1.07%	-1.36%
03/30/2015	1900H	21.6	1850	1.382	38.588	1.400	40.000	-1.29%	-3.53%
			1880	1.411	38.367	1.400	40.000	0.79%	-4.08%
			1910	1.443	38.152	1.400	40.000	3.07%	-4.62%
03/27/2015	2450H	23.2	2401	1.819	39.800	1.756	39.287	3.59%	1.31%
			2450	1.876	39.599	1.800	39.200	4.22%	1.02%
			2499	1.932	39.409	1.853	39.138	4.26%	0.69%
			2550	1.996	39.203	1.909	39.073	4.56%	0.33%
			2600	2.058	38.993	1.964	39.009	4.79%	-0.04%
			5180	4.567	36.864	4.635	36.009	-1.47%	2.37%
03/26/2015	5200H-5800H	21.1	5200	4.582	36.798	4.655	35.986	-1.57%	2.26%
			5220	4.596	36.813	4.676	35.963	-1.71%	2.36%
			5260	4.649	36.728	4.717	35.917	-1.44%	2.26%
			5280	4.664	36.688	4.737	35.894	-1.54%	2.21%
			5300	4.691	36.654	4.758	35.871	-1.41%	2.18%
			5500	4.868	36.398	4.963	35.643	-1.91%	2.12%
			5520	4.900	36.361	4.983	35.620	-1.67%	2.08%
			5540	4.926	36.333	5.004	35.597	-1.56%	2.07%
			5600	4.987	36.259	5.065	35.529	-1.54%	2.05%
			5660	5.061	36.171	5.127	35.460	-1.29%	2.01%
			5765	5.167	35.992	5.234	35.340	-1.28%	1.84%
			5785	5.184	35.960	5.255	35.317	-1.35%	1.82%
			5800	5.201	35.955	5.270	35.300	-1.31%	1.86%
			5825	5.231	35.903	5.296	35.271	-1.23%	1.79%

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**Table 10-2  
Measured Body Tissue Properties**

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, $\sigma$ (S/m)	Measured Dielectric Constant, $\epsilon$	TARGET Conductivity, $\sigma$ (S/m)	TARGET Dielectric Constant, $\epsilon$	% dev $\sigma$	% dev $\epsilon$
03/24/2015	750B	22.1	695	0.924	55.511	0.959	55.745	-3.65%	-0.42%
			710	0.936	55.316	0.960	55.687	-2.50%	-0.67%
			725	0.950	55.208	0.961	55.629	-1.14%	-0.76%
			740	0.965	55.021	0.963	55.570	0.21%	-0.99%
			755	0.977	54.880	0.964	55.512	1.35%	-1.14%
03/16/2015	835B	23.6	820	0.941	54.035	0.969	55.258	-2.89%	-2.21%
			835	0.955	53.888	0.970	55.200	-1.55%	-2.38%
			850	0.971	53.740	0.988	55.154	-1.72%	-2.56%
03/18/2015	835B	22.5	820	0.996	54.682	0.969	55.258	2.79%	-1.04%
			835	1.010	54.531	0.970	55.200	4.12%	-1.21%
			850	1.023	54.403	0.988	55.154	3.54%	-1.36%
03/23/2015	1750B	21.8	1710	1.432	52.326	1.463	53.537	-2.12%	-2.26%
			1750	1.477	52.150	1.488	53.432	-0.74%	-2.40%
			1790	1.524	52.001	1.514	53.326	0.66%	-2.48%
03/16/2015	1900B	22.0	1850	1.502	52.076	1.520	53.300	-1.18%	-2.30%
			1880	1.533	51.949	1.520	53.300	0.86%	-2.53%
			1910	1.569	51.812	1.520	53.300	3.22%	-2.79%
03/23/2015	1900B	21.7	1850	1.506	52.078	1.520	53.300	-0.92%	-2.29%
			1880	1.537	51.957	1.520	53.300	1.12%	-2.52%
			1910	1.575	51.822	1.520	53.300	3.62%	-2.77%
03/30/2015	1900B	22.2	1850	1.514	52.414	1.520	53.300	-0.39%	-1.66%
			1880	1.548	52.312	1.520	53.300	1.84%	-1.85%
			1910	1.587	52.191	1.520	53.300	4.41%	-2.08%
03/17/2015	2450B	22.4	2401	1.958	50.991	1.903	52.765	2.89%	-3.36%
			2450	2.028	50.797	1.950	52.700	4.00%	-3.61%
			2499	2.089	50.607	2.019	52.638	3.47%	-3.86%
			2550	2.159	50.405	2.092	52.573	3.20%	-4.12%
			2600	2.228	50.192	2.163	52.509	3.01%	-4.41%
03/23/2015	5200B-5800B	24.5	5180	5.363	48.127	5.276	49.041	1.65%	-1.86%
			5200	5.395	48.053	5.299	49.014	1.81%	-1.96%
			5220	5.430	48.022	5.323	48.987	2.01%	-1.97%
			5260	5.475	47.984	5.369	48.933	1.97%	-1.94%
			5280	5.483	47.934	5.393	48.906	1.67%	-1.99%
			5300	5.499	47.886	5.416	48.879	1.53%	-2.03%
			5500	5.716	47.553	5.650	48.607	1.17%	-2.17%
			5520	5.737	47.530	5.673	48.580	1.13%	-2.16%
			5540	5.766	47.480	5.696	48.553	1.23%	-2.21%
			5600	5.841	47.378	5.766	48.471	1.30%	-2.25%
			5660	5.928	47.299	5.837	48.390	1.56%	-2.25%
			5765	6.084	47.160	5.959	48.248	2.10%	-2.26%
			5785	6.110	47.086	5.982	48.220	2.14%	-2.35%
5800	6.149	47.074	6.000	48.200	2.48%	-2.34%			
5825	6.192	47.018	6.029	48.166	2.70%	-2.38%			

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

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## 10.2 Test System Verification

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

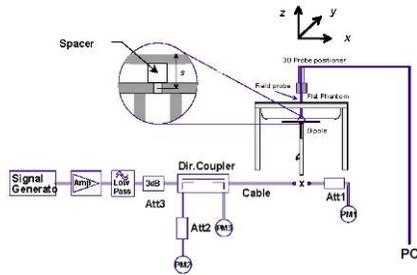
**Table 10-3  
System Verification Results – 1g**

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 <sub>1g</sub> (W/kg)	1 W Target SAR <sub>1g</sub> (W/kg)	1 W Normalized SAR <sub>1g</sub> (W/kg)	Deviation <sub>1g</sub> (%)
J	750	HEAD	03/25/2015	22.4	21.9	0.100	1003	3022	0.856	8.090	8.560	5.81%
J	835	HEAD	03/17/2015	23.6	21.3	0.100	4d119	3022	0.927	9.220	9.270	0.54%
B	1750	HEAD	03/23/2015	22.3	20.4	0.100	1051	3334	3.860	36.200	38.600	6.63%
C	1900	HEAD	03/26/2015	23.9	22.6	0.100	5d148	3333	3.990	40.600	39.900	-1.72%
C	1900	HEAD	03/30/2015	23.7	21.6	0.100	5d148	3333	4.070	40.600	40.700	0.25%
E	2450	HEAD	03/27/2015	24.1	22.6	0.100	719	3332	5.390	52.100	53.900	3.45%
H	5200	HEAD	03/26/2015	21.4	21.1	0.050	1057	3920	3.710	81.500	74.200	-8.96%
H	5300	HEAD	03/26/2015	21.5	21.1	0.050	1057	3920	4.060	84.700	81.200	-4.13%
H	5500	HEAD	03/26/2015	21.6	21.1	0.050	1057	3920	3.870	84.300	77.400	-8.19%
H	5600	HEAD	03/26/2015	21.7	21.1	0.050	1057	3920	3.950	83.800	79.000	-5.73%
H	5800	HEAD	03/26/2015	21.7	21.1	0.050	1057	3920	3.990	81.100	79.800	-1.60%
D	750	BODY	03/24/2015	23.8	22.3	0.100	1003	3263	0.916	8.460	9.160	8.27%
C	835	BODY	03/16/2015	24.4	23.6	0.100	4d132	3333	0.961	9.140	9.610	5.14%
K	835	BODY	03/18/2015	22.8	22.5	0.100	4d119	3288	1.010	9.340	10.100	8.14%
E	1750	BODY	03/23/2015	22.4	21.8	0.100	1008	3332	3.520	37.600	35.200	-6.38%
E	1900	BODY	03/16/2015	23.6	22.0	0.100	5d149	3332	4.280	40.400	42.800	5.94%
J	1900	BODY	03/23/2015	21.8	21.5	0.100	5d141	3022	4.310	40.600	43.100	6.16%
J	1900	BODY	03/30/2015	23.6	21.0	0.100	5d149	3022	4.320	40.400	43.200	6.93%
G	2450	BODY	03/17/2015	24.3	22.4	0.100	719	3213	5.290	51.800	52.900	2.12%
A	5200	BODY	03/23/2015	23.4	23.2	0.050	1191	3914	3.860	77.800	77.200	-0.77%
A	5300	BODY	03/23/2015	23.4	23.2	0.050	1191	3914	4.050	79.900	81.000	1.38%
A	5500	BODY	03/23/2015	23.4	23.2	0.050	1191	3914	4.090	83.100	81.800	-1.56%
A	5600	BODY	03/23/2015	22.5	20.5	0.050	1191	3914	4.050	84.100	81.000	-3.69%
A	5800	BODY	03/23/2015	23.4	23.2	0.050	1191	3914	3.800	78.000	76.000	-2.56%

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**Table 10-4  
System Verification Results – 10g**

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 <sub>10g</sub> (W/kg)	1 W Target SAR <sub>10g</sub> (W/kg)	1 W Normalized SAR <sub>10g</sub> (W/kg)	Deviation <sub>10g</sub> (%)
A	5200	BODY	03/23/2015	23.4	23.2	0.050	1191	3914	1.070	21.600	21.400	-0.93%
A	5300	BODY	03/23/2015	23.4	23.2	0.050	1191	3914	1.110	22.300	22.200	-0.45%
A	5500	BODY	03/23/2015	23.4	23.2	0.050	1191	3914	1.130	23.000	22.600	-1.74%
A	5600	BODY	03/23/2015	22.5	20.5	0.050	1191	3914	1.110	23.300	22.200	-4.72%



**Figure 10-1  
System Verification Setup Diagram**



**Figure 10-2  
System Verification Setup Photo**

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# 11 SAR DATA SUMMARY

## 11.1 Standalone Head SAR Data

**Table 11-1  
GSM 850 Head SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	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	GSM850	GSM	33.7	33.30	0.03	Right	Cheek	Standard	1TFWD	1	1:8.3	0.433	1.096	0.475	
836.60	190	GSM850	GSM	33.7	33.30	0.10	Right	Cheek	Quick Cover (Open)	1TFWD	1	1:8.3	0.345	1.096	0.378	
836.60	190	GSM850	GSM	33.7	33.30	0.08	Right	Cheek	Quick Cover (Closed)	1TFWD	1	1:8.3	0.303	1.096	0.332	
836.60	190	GSM850	GSM	33.7	33.30	0.12	Right	Tilt	Standard	1TFWD	1	1:8.3	0.207	1.096	0.227	
836.60	190	GSM850	GSM	33.7	33.30	-0.13	Left	Cheek	Standard	1TFWD	1	1:8.3	0.304	1.096	0.333	
836.60	190	GSM850	GSM	33.7	33.30	0.01	Left	Tilt	Standard	1TFWD	1	1:8.3	0.205	1.096	0.225	
836.60	190	GSM850	GPRS	30.0	29.30	-0.09	Right	Cheek	Standard	1TFWD	3	1:2.76	0.454	1.175	0.533	A1
836.60	190	GSM850	GPRS	30.0	29.30	0.02	Right	Cheek	Quick Cover (Open)	1TFWD	3	1:2.76	0.412	1.175	0.484	
836.60	190	GSM850	GPRS	30.0	29.30	-0.21	Right	Cheek	Quick Cover (Closed)	1TFWD	3	1:2.76	0.385	1.175	0.452	
836.60	190	GSM850	GPRS	30.0	29.30	-0.01	Right	Tilt	Standard	1TFWD	3	1:2.76	0.241	1.175	0.283	
836.60	190	GSM850	GPRS	30.0	29.30	0.04	Left	Cheek	Standard	1TFWD	3	1:2.76	0.321	1.175	0.377	
836.60	190	GSM850	GPRS	30.0	29.30	0.02	Left	Tilt	Standard	1TFWD	3	1:2.76	0.245	1.175	0.288	
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	Cover Type	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	24.2	24.10	-0.03	Right	Cheek	Standard	1TFFC	1:1	0.512	1.023	0.524	A2
836.60	4183	UMTS 850	RMC	24.2	24.10	0.06	Right	Cheek	Quick Cover (Open)	1TFFC	1:1	0.438	1.023	0.448	
836.60	4183	UMTS 850	RMC	24.2	24.10	0.01	Right	Cheek	Quick Cover (Closed)	1TFFC	1:1	0.453	1.023	0.463	
836.60	4183	UMTS 850	RMC	24.2	24.10	0.06	Right	Tilt	Standard	1TFFC	1:1	0.272	1.023	0.278	
836.60	4183	UMTS 850	RMC	24.2	24.10	0.01	Left	Cheek	Standard	1TFFC	1:1	0.342	1.023	0.350	
836.60	4183	UMTS 850	RMC	24.2	24.10	0.05	Left	Tilt	Standard	1TFFC	1:1	0.255	1.023	0.261	
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	Cover Type	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	24.7	24.15	-0.17	Right	Cheek	Standard	1TFFF	1:1	0.303	1.135	0.344	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	0.04	Right	Tilt	Standard	1TFFF	1:1	0.305	1.135	0.346	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	-0.07	Left	Cheek	Standard	1TFFF	1:1	0.557	1.135	0.632	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	0.04	Left	Cheek	Quick Cover (Open)	1TFFF	1:1	0.768	1.135	0.872	A3
1732.40	1412	UMTS 1750	RMC	24.7	24.15	-0.03	Left	Cheek	Quick Cover (Closed)	1TFFF	1:1	0.761	1.135	0.864	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	-0.06	Left	Tilt	Standard	1TFFF	1:1	0.277	1.135	0.314	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram						

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**Table 11-4  
GSM 1900 Head SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.2	29.93	0.00	Right	Cheek	Standard	1TFWD	1	1:8.3	0.209	1.064	0.222	
1880.00	661	GSM 1900	GSM	30.2	29.93	-0.08	Right	Tilt	Standard	1TFWD	1	1:8.3	0.181	1.064	0.193	
1880.00	661	GSM 1900	GSM	30.2	29.93	-0.13	Left	Cheek	Standard	1TFWD	1	1:8.3	0.415	1.064	0.442	
1880.00	661	GSM 1900	GSM	30.2	29.93	0.09	Left	Cheek	Quick Cover (Open)	1TFWD	1	1:8.3	0.352	1.064	0.375	
1880.00	661	GSM 1900	GSM	30.2	29.93	0.02	Left	Cheek	Quick Cover (Closed)	1TFWD	1	1:8.3	0.385	1.064	0.410	
1880.00	661	GSM 1900	GSM	30.2	29.93	0.08	Left	Tilt	Standard	1TFWD	1	1:8.3	0.171	1.064	0.182	
1880.00	661	GSM 1900	GPRS	27.2	26.95	0.05	Right	Cheek	Standard	1TFWD	3	1:2.76	0.270	1.059	0.286	
1880.00	661	GSM 1900	GPRS	27.2	26.95	-0.01	Right	Tilt	Standard	1TFWD	3	1:2.76	0.250	1.059	0.265	
1880.00	661	GSM 1900	GPRS	27.2	26.95	-0.11	Left	Cheek	Standard	1TFWD	3	1:2.76	0.548	1.059	0.580	
1880.00	661	GSM 1900	GPRS	27.2	26.95	0.14	Left	Cheek	Quick Cover (Open)	1TFWD	3	1:2.76	0.562	1.059	0.595	A4
1880.00	661	GSM 1900	GPRS	27.2	26.95	-0.09	Left	Cheek	Quick Cover (Closed)	1TFWD	3	1:2.76	0.533	1.059	0.564	
1880.00	661	GSM 1900	GPRS	27.2	26.95	0.04	Left	Tilt	Standard	1TFWD	3	1:2.76	0.242	1.059	0.256	
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	Cover Type	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	0.01	Right	Cheek	Standard	1TFFC	1:1	0.420	1.021	0.429	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	0.06	Right	Tilt	Standard	1TFFC	1:1	0.414	1.021	0.423	
1852.40	9262	UMTS 1900	RMC	24.2	24.12	0.02	Left	Cheek	Standard	1TFFC	1:1	0.727	1.019	0.741	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	0.01	Left	Cheek	Standard	1TFFC	1:1	0.861	1.021	0.879	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	-0.13	Left	Cheek	Quick Cover (Open)	1TFFC	1:1	0.824	1.021	0.841	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	-0.07	Left	Cheek	Quick Cover (Closed)	1TFFC	1:1	0.954	1.021	0.974	A5
1907.60	9538	UMTS 1900	RMC	24.2	23.97	-0.09	Left	Cheek	Standard	1TFFC	1:1	0.798	1.054	0.841	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	0.12	Left	Tilt	Standard	1TFFC	1:1	0.417	1.021	0.426	
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 12 Head SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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)		
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	-0.07	0	Right	Cheek	QPSK	1	25	1TFFP	1:1	0.325	1.033	0.336	A6
707.50	23095	Mid	LTE Band 12	10	Quick Cover (Open)	24.2	24.06	-0.02	0	Right	Cheek	QPSK	1	25	1TFFP	1:1	0.320	1.033	0.331	
707.50	23095	Mid	LTE Band 12	10	Quick Cover (Closed)	24.2	24.06	-0.15	0	Right	Cheek	QPSK	1	25	1TFFP	1:1	0.284	1.033	0.293	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	0.01	1	Right	Cheek	QPSK	25	0	1TFFP	1:1	0.285	1.035	0.295	
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	0.01	0	Right	Tilt	QPSK	1	25	1TFFP	1:1	0.150	1.033	0.155	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	0.05	1	Right	Tilt	QPSK	25	0	1TFFP	1:1	0.133	1.035	0.138	
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	0.06	0	Left	Cheek	QPSK	1	25	1TFFP	1:1	0.253	1.033	0.261	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	0.03	1	Left	Cheek	QPSK	25	0	1TFFP	1:1	0.216	1.035	0.224	
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	0.07	0	Left	Tilt	QPSK	1	25	1TFFP	1:1	0.155	1.033	0.160	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	0.02	1	Left	Tilt	QPSK	25	0	1TFFP	1:1	0.127	1.035	0.131	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram													

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**Table 11-7  
LTE Band 5 (Cell) Head SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.																			
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	-0.05	0	Right	Cheek	QPSK	1	0	1TFFF	1:1	0.464	1.045	0.485	A7
836.50	20525	Mid	LTE Band 5 (Cell)	10	Quick Cover (Open)	24.2	24.01	-0.01	0	Right	Cheek	QPSK	1	0	1TFFF	1:1	0.436	1.045	0.456	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Quick Cover (Closed)	24.2	24.01	-0.06	0	Right	Cheek	QPSK	1	0	1TFFF	1:1	0.356	1.045	0.372	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	0.10	1	Right	Cheek	QPSK	25	0	1TFFF	1:1	0.350	1.104	0.386	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	-0.11	0	Right	Tilt	QPSK	1	0	1TFFF	1:1	0.231	1.045	0.241	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	0.06	1	Right	Tilt	QPSK	25	0	1TFFF	1:1	0.182	1.104	0.201	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	-0.05	0	Left	Cheek	QPSK	1	0	1TFFF	1:1	0.371	1.045	0.388	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	-0.08	1	Left	Cheek	QPSK	25	0	1TFFF	1:1	0.253	1.104	0.279	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	0.10	0	Left	Tilt	QPSK	1	0	1TFFF	1:1	0.243	1.045	0.254	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	-0.02	1	Left	Tilt	QPSK	25	0	1TFFF	1:1	0.170	1.104	0.188	
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 4 (AWS) Head SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.																			
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.55	0.05	0	Right	Cheek	QPSK	1	99	1TFFF	1:1	0.318	1.035	0.329	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.57	0.14	1	Right	Cheek	QPSK	50	0	1TFFF	1:1	0.237	1.030	0.244	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.55	0.03	0	Right	Tilt	QPSK	1	99	1TFFF	1:1	0.334	1.035	0.346	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.57	0.15	1	Right	Tilt	QPSK	50	0	1TFFF	1:1	0.215	1.030	0.221	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.55	0.01	0	Left	Cheek	QPSK	1	99	1TFFF	1:1	0.734	1.035	0.760	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Quick Cover (Open)	24.7	24.55	0.12	0	Left	Cheek	QPSK	1	99	1TFFF	1:1	0.869	1.035	0.899	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Quick Cover (Closed)	24.7	24.55	-0.10	0	Left	Cheek	QPSK	1	99	1TFFF	1:1	0.992	1.035	1.027	A8
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.57	0.12	1	Left	Cheek	QPSK	50	0	1TFFF	1:1	0.616	1.030	0.634	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.55	-0.07	0	Left	Tilt	QPSK	1	99	1TFFF	1:1	0.343	1.035	0.355	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.57	-0.05	1	Left	Tilt	QPSK	50	0	1TFFF	1:1	0.271	1.030	0.279	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Quick Cover (Closed)	24.7	24.55	0.06	0	Left	Cheek	QPSK	1	99	1TFFF	1:1	0.987	1.035	1.022	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Head 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Blue entry represents variability measurement

**Table 11-9  
LTE Band 2 (PCS) Head SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.																			
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.2	24.02	-0.04	0	Right	Cheek	QPSK	1	50	1TFFF	1:1	0.385	1.042	0.401	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.11	0.05	1	Right	Cheek	QPSK	50	25	1TFFF	1:1	0.346	1.021	0.353	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.2	24.02	-0.03	0	Right	Tilt	QPSK	1	50	1TFFF	1:1	0.404	1.042	0.421	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.11	0.02	1	Right	Tilt	QPSK	50	25	1TFFF	1:1	0.333	1.021	0.340	
1880.00	18700	Low	LTE Band 2 (PCS)	20	Standard	24.2	23.93	-0.01	0	Left	Cheek	QPSK	1	0	1TFFF	1:1	0.756	1.064	0.804	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.2	24.02	0.11	0	Left	Cheek	QPSK	1	50	1TFFF	1:1	0.794	1.042	0.827	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Quick Cover (Open)	24.2	24.02	-0.16	0	Left	Cheek	QPSK	1	50	1TFFF	1:1	1.010	1.042	1.052	A9
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Quick Cover (Closed)	24.2	24.02	0.00	0	Left	Cheek	QPSK	1	50	1TFFF	1:1	0.983	1.042	1.024	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	24.2	23.95	0.07	0	Left	Cheek	QPSK	1	0	1TFFF	1:1	0.565	1.059	0.598	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.11	0.00	1	Left	Cheek	QPSK	50	25	1TFFF	1:1	0.691	1.021	0.706	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.07	0.03	1	Left	Cheek	QPSK	100	0	1TFFF	1:1	0.661	1.030	0.681	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.2	24.02	0.03	0	Left	Tilt	QPSK	1	50	1TFFF	1:1	0.369	1.042	0.384	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.11	-0.04	1	Left	Tilt	QPSK	50	25	1TFFF	1:1	0.307	1.021	0.313	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Quick Cover (Open)	24.2	24.02	-0.10	0	Left	Cheek	QPSK	1	50	1TFFF	1:1	1.000	1.042	1.042	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Head 1.6 W/kg (mW/g) averaged over 1 gram									

Note: Blue entry represents variability measurement

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**Table 11-10  
LTE Band 7 Head SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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)		
2510.00	20850	Low	LTE Band 7	20	Standard	23.7	23.58	0.03	0	Right	Cheek	QPSK	1	50	1TFFP	1:1	0.177	1.028	0.182	
2510.00	20850	Low	LTE Band 7	20	Standard	22.7	22.38	0.09	1	Right	Cheek	QPSK	50	50	1TFFP	1:1	0.148	1.076	0.159	
2510.00	20850	Low	LTE Band 7	20	Standard	23.7	23.58	0.13	0	Right	Tilt	QPSK	1	50	1TFFP	1:1	0.250	1.028	0.257	
2510.00	20850	Low	LTE Band 7	20	Standard	22.7	22.38	0.09	1	Right	Tilt	QPSK	50	50	1TFFP	1:1	0.173	1.076	0.186	
2510.00	20850	Low	LTE Band 7	20	Standard	23.7	23.58	-0.03	0	Left	Cheek	QPSK	1	50	1TFFP	1:1	0.379	1.028	0.390	
2510.00	20850	Low	LTE Band 7	20	Quick Cover (Open)	23.7	23.58	-0.03	0	Left	Cheek	QPSK	1	50	1TFFP	1:1	0.385	1.028	0.396	A9
2510.00	20850	Low	LTE Band 7	20	Quick Cover (Closed)	23.7	23.58	0.04	0	Left	Cheek	QPSK	1	50	1TFFP	1:1	0.290	1.028	0.298	
2510.00	20850	Low	LTE Band 7	20	Standard	22.7	22.38	0.13	1	Left	Cheek	QPSK	50	50	1TFFP	1:1	0.334	1.076	0.359	
2510.00	20850	Low	LTE Band 7	20	Standard	23.7	23.58	0.03	0	Left	Tilt	QPSK	1	50	1TFFP	1:1	0.186	1.028	0.191	
2510.00	20850	Low	LTE Band 7	20	Standard	22.7	22.38	-0.06	1	Left	Tilt	QPSK	50	50	1TFFP	1:1	0.151	1.076	0.162	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram										

**Table 11-11  
DTS Head SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2437	6	IEEE 802.11b	DSSS	16.0	15.62	-0.06	Right	Cheek	Standard	1TFFC	1	1:1	0.174	1.091	0.190	
2437	6	IEEE 802.11b	DSSS	16.0	15.62	-0.15	Right	Tilt	Standard	1TFFC	1	1:1	0.170	1.091	0.185	
2437	6	IEEE 802.11b	DSSS	16.0	15.62	0.09	Left	Cheek	Standard	1TFFC	1	1:1	0.280	1.091	0.305	
2437	6	IEEE 802.11b	DSSS	16.0	15.62	0.07	Left	Standard	Standard	1TFFC	1	1:1	0.293	1.091	0.320	
2437	6	IEEE 802.11b	DSSS	16.0	15.62	-0.04	Left	Tilt	Quick Cover (Open)	1TFFC	1	1:1	0.331	1.091	0.361	A11
2437	6	IEEE 802.11b	DSSS	16.0	15.62	0.09	Left	Tilt	Quick Cover (Closed)	1TFFC	1	1:1	0.212	1.091	0.231	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram						

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**Table 11-12  
NII Head SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
MHz	Ch.															
5180	36	IEEE 802.11a	OFDM	12.0	11.13	0.00	Right	Cheek	Standard	1TFWD	6	1:1	0.368	1.222	0.450	
5180	36	IEEE 802.11a	OFDM	12.0	11.13	0.02	Right	Tilt	Standard	1TFWD	6	1:1	0.413	1.222	0.505	
5210	42	IEEE 802.11ac	OFDM	11.0	10.81	0.05	Right	Tilt	Standard	1TFWD	29.3	1:1	0.093	1.045	0.097	
5180	36	IEEE 802.11a	OFDM	12.0	11.13	0.08	Left	Cheek	Standard	1TFWD	6	1:1	0.211	1.222	0.258	
5180	36	IEEE 802.11a	OFDM	12.0	11.13	0.08	Left	Tilt	Standard	1TFWD	6	1:1	0.396	1.222	0.484	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.16	Right	Cheek	Standard	1TFWD	6	1:1	0.427	1.175	0.502	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.07	Right	Tilt	Standard	1TFWD	6	1:1	0.447	1.175	0.525	A12
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.19	Right	Tilt	Quick Cover (Open)	1TFWD	6	1:1	0.419	1.175	0.492	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.02	Right	Tilt	Quick Cover (Closed)	1TFWD	6	1:1	0.383	1.175	0.450	
5290	58	IEEE 802.11ac	OFDM	11.0	9.22	0.04	Right	Tilt	Standard	1TFWD	29.3	1:1	0.136	1.507	0.205	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.06	Left	Cheek	Standard	1TFWD	6	1:1	0.260	1.175	0.306	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.12	Left	Tilt	Standard	1TFWD	6	1:1	0.416	1.175	0.489	
5300	60	IEEE 802.11a	OFDM	12.0	11.14	0.14	Left	Tilt	Standard	1TFWD	6	1:1	0.382	1.219	0.466	
5660	132	IEEE 802.11a	OFDM	12.0	10.85	0.03	Right	Cheek	Standard	1TFWD	6	1:1	0.183	1.303	0.238	
5660	132	IEEE 802.11a	OFDM	12.0	10.85	0.18	Right	Tilt	Standard	1TFWD	6	1:1	0.206	1.303	0.268	
5530	106	IEEE 802.11ac	OFDM	11.0	9.76	0.03	Right	Tilt	Standard	1TFWD	29.3	1:1	0.129	1.330	0.172	
5660	132	IEEE 802.11a	OFDM	12.0	10.85	-0.19	Left	Cheek	Standard	1TFWD	6	1:1	0.148	1.303	0.193	
5660	132	IEEE 802.11a	OFDM	12.0	10.85	0.03	Left	Tilt	Standard	1TFWD	6	1:1	0.169	1.303	0.220	
5825	165	IEEE 802.11a	OFDM	12.0	10.70	0.04	Right	Cheek	Standard	1TFWD	6	1:1	0.139	1.349	0.188	
5825	165	IEEE 802.11a	OFDM	12.0	10.70	0.15	Right	Tilt	Standard	1TFWD	6	1:1	0.157	1.349	0.212	
5775	155	IEEE 802.11ac	OFDM	11.0	9.32	0.08	Right	Tilt	Standard	1TFWD	29.3	1:1	0.095	1.472	0.140	
5825	165	IEEE 802.11a	OFDM	12.0	10.70	0.11	Left	Cheek	Standard	1TFWD	6	1:1	0.119	1.349	0.161	
5825	165	IEEE 802.11a	OFDM	12.0	10.70	0.04	Left	Tilt	Standard	1TFWD	6	1:1	0.150	1.349	0.202	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram									

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## 11.2 Standalone Body-Worn SAR Data

Table 11-13  
GSM/UMTS Body-Worn SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	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	33.7	33.30	0.00	10 mm	Standard	1TFWD	1	1:8.3	back	0.622	1.096	0.682	
836.60	190	GSM 850	GSM	33.7	33.30	-0.01	10 mm	Quick Cover (Closed)	1TFWD	1	1:8.3	back	0.567	1.096	0.621	
824.20	128	GSM 850	GPRS	30.0	29.26	0.01	10 mm	Standard	1TFWD	3	1:2.76	back	0.739	1.186	0.876	A13
824.20	128	GSM 850	GPRS	30.0	29.26	0.09	10 mm	Quick Cover (Closed)	1TFWD	3	1:2.76	back	0.648	1.186	0.769	
836.60	190	GSM 850	GPRS	30.0	29.30	0.00	10 mm	Standard	1TFWD	3	1:2.76	back	0.725	1.175	0.852	
848.80	251	GSM 850	GPRS	30.0	29.20	0.01	10 mm	Standard	1TFWD	3	1:2.76	back	0.667	1.202	0.802	
836.60	4183	UMTS 850	RMC	24.2	24.10	0.01	10 mm	Standard	1TFFC	n/a	1:1	back	0.650	1.023	0.665	A14
836.60	4183	UMTS 850	RMC	24.2	24.10	-0.03	10 mm	Quick Cover (Closed)	1TFFC	n/a	1:1	back	0.552	1.023	0.565	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	0.04	10 mm	Standard	1TFFC	n/a	1:1	back	0.417	1.135	0.473	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	-0.04	10 mm	Quick Cover (Closed)	1TFFC	n/a	1:1	back	0.472	1.135	0.536	A16
1880.00	661	GSM 1900	GSM	30.2	29.93	0.00	10 mm	Standard	1TFWD	1	1:8.3	back	0.205	1.064	0.218	
1880.00	661	GSM 1900	GSM	30.2	29.93	0.10	10 mm	Quick Cover (Closed)	1TFWD	1	1:8.3	back	0.219	1.064	0.233	
1880.00	661	GSM 1900	GPRS	27.2	26.95	-0.17	10 mm	Standard	1TFWD	3	1:2.76	back	0.286	1.059	0.303	
1880.00	661	GSM 1900	GPRS	27.2	26.95	0.11	10 mm	Quick Cover (Closed)	1TFWD	3	1:2.76	back	0.362	1.059	0.383	A18
1880.00	9400	UMTS 1900	RMC	24.2	24.11	-0.03	10 mm	Standard	1TFFC	n/a	1:1	back	0.514	1.021	0.525	A20
1880.00	9400	UMTS 1900	RMC	24.2	24.11	0.05	10 mm	Quick Cover (Closed)	1TFFC	n/a	1:1	back	0.511	1.021	0.522	
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  
LTE Body-Worn SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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)		
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	0.04	0	1TFFP	QPSK	1	25	10 mm	back	1:1	0.498	1.033	0.514	A22
707.50	23095	Mid	LTE Band 12	10	Quick Cover (Closed)	24.2	24.06	0.02	0	1TFFP	QPSK	1	25	10 mm	back	1:1	0.403	1.033	0.416	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	-0.19	1	1TFFP	QPSK	25	0	10 mm	back	1:1	0.366	1.035	0.379	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	-0.02	0	1TFFP	QPSK	1	0	10 mm	back	1:1	0.526	1.045	0.550	A24
836.50	20525	Mid	LTE Band 5 (Cell)	10	Quick Cover (Closed)	24.2	24.01	-0.03	0	1TFFP	QPSK	1	0	10 mm	back	1:1	0.465	1.045	0.486	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	0.00	1	1TFFP	QPSK	25	0	10 mm	back	1:1	0.452	1.104	0.499	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.55	-0.12	0	1TFFF	QPSK	1	99	10 mm	back	1:1	0.599	1.035	0.620	A25
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Quick Cover (Closed)	24.7	24.55	-0.07	0	1TFFF	QPSK	1	99	10 mm	back	1:1	0.558	1.035	0.578	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.57	-0.02	1	1TFFF	QPSK	50	0	10 mm	back	1:1	0.485	1.030	0.500	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.2	24.02	0.01	0	1TFFP	QPSK	1	50	10 mm	back	1:1	0.486	1.042	0.506	A27
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Quick Cover (Closed)	24.2	24.02	0.06	0	1TFFP	QPSK	1	50	10 mm	back	1:1	0.425	1.042	0.443	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.11	0.04	1	1TFFP	QPSK	50	25	10 mm	back	1:1	0.417	1.021	0.426	
2510.00	20850	Low	LTE Band 7	20	Standard	23.7	23.58	0.05	0	1TFFP	QPSK	1	50	10 mm	back	1:1	0.284	1.028	0.292	A29
2510.00	20850	Low	LTE Band 7	20	Quick Cover (Closed)	23.7	23.58	-0.06	0	1TFFP	QPSK	1	50	10 mm	back	1:1	0.270	1.028	0.278	
2510.00	20850	Low	LTE Band 7	20	Standard	22.7	22.38	0.06	1	1TFFP	QPSK	50	50	10 mm	back	1:1	0.249	1.076	0.268	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram													

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**Table 11-15  
DTS Body-Worn SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
2437	6	IEEE 802.11b	DSSS	16.0	15.62	-0.04	10 mm	Standard	1TFFC	1	back	1:1	0.245	1.091	0.267	A31
2437	6	IEEE 802.11b	DSSS	16.0	15.62	0.01	10 mm	Quick Cover (Closed)	1TFFC	1	back	1:1	0.215	1.091	0.235	
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  
NII Body-Worn SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	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	12.0	11.13	0.03	10 mm	Standard	1TFWD	6	back	1:1	0.208	1.222	0.254	
5210	42	IEEE 802.11ac	OFDM	11.0	10.81	0.03	10 mm	Standard	1TFWD	29.3	back	1:1	0.035	1.045	0.037	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.08	10 mm	Standard	1TFWD	6	back	1:1	0.217	1.175	0.255	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.02	10 mm	Quick Cover (Closed)	1TFWD	6	back	1:1	0.239	1.175	0.281	A32
5290	58	IEEE 802.11ac	OFDM	11.0	9.22	0.03	10 mm	Standard	1TFWD	29.3	back	1:1	0.050	1.507	0.075	
5660	132	IEEE 802.11a	OFDM	12.0	10.85	-0.02	10 mm	Standard	1TFWD	6	back	1:1	0.192	1.303	0.250	
5530	106	IEEE 802.11ac	OFDM	11.0	9.76	0.18	10 mm	Standard	1TFWD	29.3	back	1:1	0.042	1.330	0.056	
5825	165	IEEE 802.11a	OFDM	12.0	10.70	0.06	10 mm	Standard	1TFWD	6	back	1:1	0.092	1.349	0.124	
5775	155	IEEE 802.11ac	OFDM	11.0	9.32	0.12	10 mm	Standard	1TFWD	29.3	back	1:1	0.040	1.472	0.059	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram								

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# 11.3 Standalone Wireless Router SAR Data

Table 11-17  
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	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	30.0	29.26	0.01	10 mm	Standard	1TFWD	3	1.2.76	back	0.739	1.186	0.876	A13
824.20	128	GSM 850	GPRS	30.0	29.26	0.09	10 mm	Quick Cover (Closed)	1TFWD	3	1.2.76	back	0.648	1.186	0.769	
836.60	190	GSM 850	GPRS	30.0	29.30	0.00	10 mm	Standard	1TFWD	3	1.2.76	back	0.725	1.175	0.852	
848.80	251	GSM 850	GPRS	30.0	29.20	0.01	10 mm	Standard	1TFWD	3	1.2.76	back	0.667	1.202	0.802	
824.20	128	GSM 850	GPRS	30.0	29.26	0.05	10 mm	Standard	1TFWD	3	1.2.76	front	0.714	1.186	0.847	
836.60	190	GSM 850	GPRS	30.0	29.30	0.05	10 mm	Standard	1TFWD	3	1.2.76	front	0.729	1.175	0.857	
848.80	251	GSM 850	GPRS	30.0	29.20	0.01	10 mm	Standard	1TFWD	3	1.2.76	front	0.693	1.202	0.833	
836.60	190	GSM 850	GPRS	30.0	29.30	0.01	10 mm	Standard	1TFWD	3	1.2.76	bottom	0.498	1.175	0.585	
824.20	128	GSM 850	GPRS	30.0	29.26	0.02	10 mm	Standard	1TFWD	3	1.2.76	right	0.628	1.186	0.745	
836.60	190	GSM 850	GPRS	30.0	29.30	0.02	10 mm	Standard	1TFWD	3	1.2.76	right	0.690	1.175	0.811	
848.80	251	GSM 850	GPRS	30.0	29.20	0.02	10 mm	Standard	1TFWD	3	1.2.76	right	0.668	1.202	0.803	
836.60	190	GSM 850	GPRS	30.0	29.30	-0.07	10 mm	Standard	1TFWD	3	1.2.76	left	0.379	1.175	0.445	
836.60	4183	UMTS 850	RMC	24.2	24.10	0.01	10 mm	Standard	1TFFC	n/a	1:1	back	0.650	1.023	0.665	
836.60	4183	UMTS 850	RMC	24.2	24.10	0.02	10 mm	Standard	1TFFC	n/a	1:1	front	0.655	1.023	0.670	A15
836.60	4183	UMTS 850	RMC	24.2	24.10	-0.03	10 mm	Quick Cover (Closed)	1TFFC	n/a	1:1	front	0.469	1.023	0.480	
836.60	4183	UMTS 850	RMC	24.2	24.10	0.02	10 mm	Standard	1TFFC	n/a	1:1	bottom	0.433	1.023	0.443	
836.60	4183	UMTS 850	RMC	24.2	24.10	-0.01	10 mm	Standard	1TFFC	n/a	1:1	right	0.616	1.023	0.630	
836.60	4183	UMTS 850	RMC	24.2	24.10	0.00	10 mm	Standard	1TFFC	n/a	1:1	left	0.353	1.023	0.361	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	0.04	10 mm	Standard	1TFFC	n/a	1:1	back	0.417	1.135	0.473	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	-0.05	10 mm	Standard	1TFFC	n/a	1:1	front	0.488	1.135	0.554	A17
1732.40	1412	UMTS 1750	RMC	24.7	24.15	0.02	10 mm	Quick Cover (Closed)	1TFFC	n/a	1:1	front	0.441	1.135	0.501	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	0.18	10 mm	Standard	1TFFC	n/a	1:1	bottom	0.375	1.135	0.426	
1732.40	1412	UMTS 1750	RMC	24.7	24.15	0.00	10 mm	Standard	1TFFC	n/a	1:1	left	0.367	1.135	0.417	
1880.00	661	GSM 1900	GPRS	27.2	26.95	-0.17	10 mm	Standard	1TFWD	3	1.2.76	back	0.286	1.059	0.303	
1880.00	661	GSM 1900	GPRS	27.2	26.95	-0.18	10 mm	Standard	1TFWD	3	1.2.76	front	0.574	1.059	0.608	A19
1880.00	661	GSM 1900	GPRS	27.2	26.95	-0.03	10 mm	Quick Cover (Closed)	1TFWD	3	1.2.76	front	0.393	1.059	0.416	
1880.00	661	GSM 1900	GPRS	27.2	26.95	0.03	10 mm	Standard	1TFWD	3	1.2.76	bottom	0.309	1.059	0.327	
1880.00	661	GSM 1900	GPRS	27.2	26.95	0.03	10 mm	Standard	1TFWD	3	1.2.76	left	0.468	1.059	0.496	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	-0.03	10 mm	Standard	1TFFC	n/a	1:1	back	0.514	1.021	0.525	
1852.40	9262	UMTS 1900	RMC	24.2	24.12	-0.03	10 mm	Standard	1TFFC	n/a	1:1	front	0.676	1.019	0.689	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	0.00	10 mm	Standard	1TFFC	n/a	1:1	front	0.789	1.021	0.806	A21
1880.00	9400	UMTS 1900	RMC	24.2	24.11	0.09	10 mm	Quick Cover (Closed)	1TFFC	n/a	1:1	front	0.587	1.021	0.599	
1907.60	9538	UMTS 1900	RMC	24.2	23.97	0.06	10 mm	Standard	1TFFC	n/a	1:1	front	0.765	1.054	0.806	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	0.07	10 mm	Standard	1TFFC	n/a	1:1	bottom	0.598	1.021	0.611	
1880.00	9400	UMTS 1900	RMC	24.2	24.11	0.05	10 mm	Standard	1TFFC	n/a	1:1	left	0.665	1.021	0.679	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak							Body 1.6 W/kg (mW/g) averaged over 1 gram									
Uncontrolled Exposure/General Population																

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**Table 11-18  
LTE Band 12 Hotspot SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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)		
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	0.04	0	1TFFP	QPSK	1	25	10 mm	back	1:1	0.498	1.033	0.514	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	-0.19	1	1TFFP	QPSK	25	0	10 mm	back	1:1	0.366	1.035	0.379	
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	0.00	0	1TFFP	QPSK	1	25	10 mm	front	1:1	0.558	1.033	0.576	A23
707.50	23095	Mid	LTE Band 12	10	Quick Cover (Closed)	24.2	24.06	-0.07	0	1TFFP	QPSK	1	25	10 mm	front	1:1	0.492	1.033	0.508	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	0.01	1	1TFFP	QPSK	25	0	10 mm	front	1:1	0.427	1.035	0.442	
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	-0.07	0	1TFFP	QPSK	1	25	10 mm	bottom	1:1	0.263	1.033	0.272	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	-0.10	1	1TFFP	QPSK	25	0	10 mm	bottom	1:1	0.171	1.035	0.177	
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	0.05	0	1TFFP	QPSK	1	25	10 mm	right	1:1	0.512	1.033	0.529	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	-0.02	1	1TFFP	QPSK	25	0	10 mm	right	1:1	0.377	1.035	0.390	
707.50	23095	Mid	LTE Band 12	10	Standard	24.2	24.06	0.03	0	1TFFP	QPSK	1	25	10 mm	left	1:1	0.325	1.033	0.336	
707.50	23095	Mid	LTE Band 12	10	Standard	23.2	23.05	-0.10	1	1TFFP	QPSK	25	0	10 mm	left	1:1	0.183	1.035	0.189	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Body										
Spatial Peak										1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population										averaged over 1 gram										

**Table 11-19  
LTE Band 5 (Cell) Hotspot SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	-0.02	0	1TFFP	QPSK	1	0	10 mm	back	1:1	0.526	1.045	0.550	A24
836.50	20525	Mid	LTE Band 5 (Cell)	10	Quick Cover (Closed)	24.2	24.01	-0.03	0	1TFFP	QPSK	1	0	10 mm	back	1:1	0.465	1.045	0.486	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	0.00	1	1TFFP	QPSK	25	0	10 mm	back	1:1	0.452	1.104	0.499	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	0.05	0	1TFFP	QPSK	1	0	10 mm	front	1:1	0.504	1.045	0.527	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	0.02	1	1TFFP	QPSK	25	0	10 mm	front	1:1	0.438	1.104	0.484	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	0.01	0	1TFFP	QPSK	1	0	10 mm	bottom	1:1	0.359	1.045	0.375	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	0.03	1	1TFFP	QPSK	25	0	10 mm	bottom	1:1	0.310	1.104	0.342	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	0.04	0	1TFFP	QPSK	1	0	10 mm	right	1:1	0.458	1.045	0.479	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	0.01	1	1TFFP	QPSK	25	0	10 mm	right	1:1	0.406	1.104	0.448	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.2	24.01	0.05	0	1TFFP	QPSK	1	0	10 mm	left	1:1	0.296	1.045	0.309	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	23.2	22.77	0.02	1	1TFFP	QPSK	25	0	10 mm	left	1:1	0.249	1.104	0.275	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Body										
Spatial Peak										1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population										averaged over 1 gram										

**Table 11-20  
LTE Band 4 (AWS) Hotspot SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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	Standard	24.7	24.55	-0.12	0	1TFFF	QPSK	1	99	10 mm	back	1:1	0.599	1.035	0.620	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.57	-0.02	1	1TFFF	QPSK	50	0	10 mm	back	1:1	0.485	1.030	0.500	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.55	-0.06	0	1TFFF	QPSK	1	99	10 mm	front	1:1	0.681	1.035	0.705	A26
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Quick Cover (Closed)	24.7	24.55	0.00	0	1TFFF	QPSK	1	99	10 mm	front	1:1	0.575	1.035	0.595	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.57	0.01	1	1TFFF	QPSK	50	0	10 mm	front	1:1	0.548	1.030	0.564	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.55	0.03	0	1TFFF	QPSK	1	99	10 mm	bottom	1:1	0.605	1.035	0.626	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.57	0.09	1	1TFFF	QPSK	50	0	10 mm	bottom	1:1	0.445	1.030	0.458	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	24.7	24.55	0.02	0	1TFFF	QPSK	1	99	10 mm	left	1:1	0.533	1.035	0.552	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.7	23.57	0.06	1	1TFFF	QPSK	50	0	10 mm	left	1:1	0.437	1.030	0.450	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Body										
Spatial Peak										1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population										averaged over 1 gram										

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**Table 11-21  
LTE Band 2 (PCS) Hotspot SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.																			
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.2	24.02	0.01	0	1TFFP	QPSK	1	50	10 mm	back	1:1	0.486	1.042	0.506	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.11	0.04	1	1TFFP	QPSK	50	25	10 mm	back	1:1	0.417	1.021	0.426	
1860.00	18700	Low	LTE Band 2 (PCS)	20	Standard	24.2	23.93	-0.04	0	1TFFP	QPSK	1	0	10 mm	front	1:1	0.804	1.064	0.855	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.2	24.02	-0.05	0	1TFFP	QPSK	1	50	10 mm	front	1:1	0.837	1.042	0.872	A28
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Quick Cover (Closed)	24.2	24.02	0.00	0	1TFFP	QPSK	1	50	10 mm	front	1:1	0.424	1.042	0.442	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	24.2	23.95	-0.14	0	1TFFP	QPSK	1	0	10 mm	front	1:1	0.724	1.059	0.767	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.11	0.08	1	1TFFP	QPSK	50	25	10 mm	front	1:1	0.765	1.021	0.781	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.07	-0.06	1	1TFFP	QPSK	100	0	10 mm	front	1:1	0.769	1.030	0.792	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.2	24.02	-0.05	0	1TFFP	QPSK	1	50	10 mm	bottom	1:1	0.585	1.042	0.610	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.11	0.00	1	1TFFP	QPSK	50	25	10 mm	bottom	1:1	0.488	1.021	0.498	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	24.2	24.02	-0.05	0	1TFFP	QPSK	1	50	10 mm	left	1:1	0.670	1.042	0.698	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.2	23.11	0.04	1	1TFFP	QPSK	50	25	10 mm	left	1:1	0.567	1.021	0.579	
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 11-22  
LTE Band 7 Hotspot SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	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) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.																			
2510.00	20850	Low	LTE Band 7	20	Standard	23.7	23.58	0.05	0	1TFFP	QPSK	1	50	10 mm	back	1:1	0.284	1.028	0.292	
2510.00	20850	Low	LTE Band 7	20	Standard	22.7	22.38	0.06	1	1TFFP	QPSK	50	50	10 mm	back	1:1	0.249	1.076	0.268	
2510.00	20850	Low	LTE Band 7	20	Standard	23.7	23.58	-0.06	0	1TFFP	QPSK	1	50	10 mm	front	1:1	0.343	1.028	0.353	A30
2510.00	20850	Low	LTE Band 7	20	Quick Cover (Closed)	23.7	23.58	-0.05	0	1TFFP	QPSK	1	50	10 mm	front	1:1	0.262	1.028	0.269	
2510.00	20850	Low	LTE Band 7	20	Standard	22.7	22.38	0.03	1	1TFFP	QPSK	50	50	10 mm	front	1:1	0.294	1.076	0.316	
2510.00	20850	Low	LTE Band 7	20	Standard	23.7	23.58	0.02	0	1TFFP	QPSK	1	50	10 mm	bottom	1:1	0.137	1.028	0.141	
2510.00	20850	Low	LTE Band 7	20	Standard	22.7	22.38	0.11	1	1TFFP	QPSK	50	50	10 mm	bottom	1:1	0.133	1.076	0.143	
2510.00	20850	Low	LTE Band 7	20	Standard	23.7	23.58	0.04	0	1TFFP	QPSK	1	50	10 mm	left	1:1	0.235	1.028	0.242	
2510.00	20850	Low	LTE Band 7	20	Standard	22.7	22.38	-0.01	1	1TFFP	QPSK	50	50	10 mm	left	1:1	0.234	1.076	0.252	
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 11-23  
WLAN Hotspot SAR**

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.																
2437	6	IEEE 802.11b	DSSS	16.0	15.62	-0.04	10 mm	Standard	1TFFC	1	back	1:1	0.245	1.091	0.267	A31	
2437	6	IEEE 802.11b	DSSS	16.0	15.62	0.01	10 mm	Quick Cover (Closed)	1TFFC	1	back	1:1	0.215	1.091	0.235		
2437	6	IEEE 802.11b	DSSS	16.0	15.62	-0.01	10 mm	Standard	1TFFC	1	front	1:1	0.135	1.091	0.147		
2437	6	IEEE 802.11b	DSSS	16.0	15.62	0.03	10 mm	Standard	1TFFC	1	top	1:1	0.211	1.091	0.230		
2437	6	IEEE 802.11b	DSSS	16.0	15.62	-0.02	10 mm	Standard	1TFFC	1	right	1:1	0.051	1.091	0.056		
5825	165	IEEE 802.11a	OFDM	12.0	10.70	0.06	10 mm	Standard	1TFWD	6	back	1:1	0.092	1.349	0.124		
5825	165	IEEE 802.11a	OFDM	12.0	10.70	0.02	10 mm	Standard	1TFWD	6	front	1:1	0.024	1.349	0.032		
5825	165	IEEE 802.11a	OFDM	12.0	10.70	0.09	10 mm	Standard	1TFWD	6	top	1:1	0.108	1.349	0.146	A33	
5825	165	IEEE 802.11a	OFDM	12.0	10.70	-0.20	10 mm	Quick Cover (Closed)	1TFWD	6	top	1:1	0.095	1.349	0.128		
5775	155	IEEE 802.11ac	OFDM	11.0	9.32	0.02	10 mm	Standard	1TFWD	29.3	top	1:1	0.068	1.472	0.100		
5825	165	IEEE 802.11a	OFDM	12.0	10.70	0.10	10 mm	Standard	1TFWD	6	right	1:1	0.006	1.349	0.008		
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram							

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**Table 11-24  
WLAN Extremity SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (10g)	Scaling Factor	Scaled SAR (10g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
5180	36	IEEE 802.11a	OFDM	12.0	11.13	-0.12	0 mm	Standard	1TFWD	6	back	1:1	0.362	1.222	0.442	
5180	36	IEEE 802.11a	OFDM	12.0	11.13	-0.02	0 mm	Standard	1TFWD	6	front	1:1	0.152	1.222	0.186	
5180	36	IEEE 802.11a	OFDM	12.0	11.13	0.01	0 mm	Standard	1TFWD	6	top	1:1	0.410	1.222	0.501	
5210	42	IEEE 802.11ac	OFDM	11.0	10.81	0.08	0 mm	Standard	1TFWD	29.3	top	1:1	0.101	1.045	0.106	
5180	36	IEEE 802.11a	OFDM	12.0	11.13	0.13	0 mm	Standard	1TFWD	6	right	1:1	0.022	1.222	0.027	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	-0.16	0 mm	Standard	1TFWD	6	back	1:1	0.404	1.175	0.475	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.00	0 mm	Standard	1TFWD	6	front	1:1	0.162	1.175	0.190	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	-0.05	0 mm	Standard	1TFWD	6	top	1:1	0.459	1.175	0.539	A34
5260	52	IEEE 802.11a	OFDM	12.0	11.30	0.17	0 mm	Quick Cover (Open)	1TFWD	6	top	1:1	0.429	1.175	0.504	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	-0.13	0 mm	Quick Cover (Closed)	1TFWD	6	top	1:1	0.433	1.175	0.509	
5290	58	IEEE 802.11ac	OFDM	11.0	9.22	0.04	0 mm	Standard	1TFWD	29.3	top	1:1	0.138	1.507	0.208	
5260	52	IEEE 802.11a	OFDM	12.0	11.30	-0.08	0 mm	Standard	1TFWD	6	right	1:1	0.023	1.175	0.027	
5660	132	IEEE 802.11a	OFDM	12.0	10.85	-0.10	0 mm	Standard	1TFWD	6	back	1:1	0.200	1.303	0.261	
5660	132	IEEE 802.11a	OFDM	12.0	10.85	0.06	0 mm	Standard	1TFWD	6	front	1:1	0.065	1.303	0.085	
5660	132	IEEE 802.11a	OFDM	12.0	10.85	-0.03	0 mm	Standard	1TFWD	6	top	1:1	0.200	1.303	0.261	
5530	106	IEEE 802.11ac	OFDM	11.0	9.76	0.02	0 mm	Standard	1TFWD	29.3	top	1:1	0.115	1.330	0.153	
5660	132	IEEE 802.11a	OFDM	12.0	10.85	0.03	0 mm	Standard	1TFWD	6	right	1:1	0.014	1.303	0.018	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Hand 4.0 W/kg (mW/g) averaged over 10 grams								

### 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, and FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
6. Per FCC KDB 865664 D01 v01, 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.
7. 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.
8. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 0 for more details).
9. Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg when scaled up to the maximum output power tolerances.

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10. Per FCC KDB Publication 648474 D03, SAR was measured using the standard battery cover and then repeated with the quick cover for the configuration with the highest measured SAR for each wireless technology, frequency band, operating mode, and exposure condition. Since reported SAR did not exceed 1.2 W/kg, additional testing with the quick cover was not required.
11. Head and Extremity tests using the quick cover were performed with the cover extension both open and closed. Body-worn and Hotspot tests were performed with the cover extension closed because operations near the body with the cover extension open are not expected.

**GSM Test Notes:**

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR. GPRS was additionally evaluated for head and body-worn voice calls to cover VoIP.
2. Justification for reduced test configurations per KDB Publication 941225 D03v01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is  $\leq 0.8$  W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is  $> \frac{1}{2}$  dB, instead of the middle channel, the highest output power channel was used.

**UMTS Notes:**

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

**LTE Notes:**

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02. The general test procedures used for testing can be found in Section 8.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC Guidance, LTE CA SAR was not needed for testing since the data sent by uplink on the uplink physical channels does not change between Rel. 8 and Rel. 10.

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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 operations: 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 operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE 802.11 modes (including 802.11n 20 MHz and 40 MHz bandwidths) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
3. Per April 2013 TCB Workshop notes, full SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
4. When wireless router mode is enabled, 5.2-5.7 GHz WLAN operations are disabled.
5. WIFI transmission was verified using an uncalibrated spectrum analyzer.
6. When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other default channels was not required.

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## 12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

### 12.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05 are applicable to handsets with built-in unlicensed transmitters such as 802.11a/b/g/n/ac and Bluetooth devices which may simultaneously transmit with the licensed transmitter.

### 12.2 Simultaneous Transmission Procedures

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

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

**Table 12-1  
Estimated SAR**

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2480	11.50	10	0.294

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

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## 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	0.475	0.190	<b>0.665</b>	Head SAR	Right Cheek	0.533	0.190	<b>0.723</b>
	Right Tilt	0.227	0.185	0.412		Right Tilt	0.283	0.185	0.468
	Left Cheek	0.333	0.305	0.638		Left Cheek	0.377	0.305	0.682
	Left Tilt	0.225	0.361	0.586		Left Tilt	0.288	0.361	0.649
Head SAR	Right Cheek	0.524	0.190	<b>0.714</b>	Head SAR	Right Cheek	0.344	0.190	0.534
	Right Tilt	0.278	0.185	0.463		Right Tilt	0.346	0.185	0.531
	Left Cheek	0.350	0.305	0.655		Left Cheek	0.872	0.305	<b>1.177</b>
	Left Tilt	0.261	0.361	0.622		Left Tilt	0.314	0.361	0.675
Head SAR	Right Cheek	0.222	0.190	0.412	Head SAR	Right Cheek	0.286	0.190	0.476
	Right Tilt	0.193	0.185	0.378		Right Tilt	0.265	0.185	0.450
	Left Cheek	0.442	0.305	<b>0.747</b>		Left Cheek	0.595	0.305	<b>0.900</b>
	Left Tilt	0.182	0.361	0.543		Left Tilt	0.256	0.361	0.617
Head SAR	Right Cheek	0.429	0.190	0.619	Head SAR	Right Cheek	0.336	0.190	0.526
	Right Tilt	0.423	0.185	0.608		Right Tilt	0.155	0.185	0.340
	Left Cheek	0.974	0.305	<b>1.279</b>		Left Cheek	0.261	0.305	<b>0.566</b>
	Left Tilt	0.426	0.361	0.787		Left Tilt	0.160	0.361	0.521
Head SAR	Right Cheek	0.485	0.190	0.675	Head SAR	Right Cheek	0.329	0.190	0.519
	Right Tilt	0.241	0.185	0.426		Right Tilt	0.346	0.185	0.531
	Left Cheek	0.388	0.305	<b>0.693</b>		Left Cheek	1.027	0.305	<b>1.332</b>
	Left Tilt	0.254	0.361	0.615		Left Tilt	0.355	0.361	0.716
Head SAR	Right Cheek	0.401	0.190	0.591	Head SAR	Right Cheek	0.182	0.190	0.372
	Right Tilt	0.421	0.185	0.606		Right Tilt	0.257	0.185	0.442
	Left Cheek	1.052	0.305	<b>1.357</b>		Left Cheek	0.396	0.305	<b>0.701</b>
	Left Tilt	0.384	0.361	0.745		Left Tilt	0.191	0.361	0.552

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**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	0.475	0.502	<b>0.977</b>	Head SAR	Right Cheek	0.533	0.502	<b>1.035</b>
	Right Tilt	0.227	0.525	0.752		Right Tilt	0.283	0.525	0.808
	Left Cheek	0.333	0.306	0.639		Left Cheek	0.377	0.306	0.683
	Left Tilt	0.225	0.489	0.714		Left Tilt	0.288	0.489	0.777
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	0.524	0.502	<b>1.026</b>	Head SAR	Right Cheek	0.344	0.502	0.846
	Right Tilt	0.278	0.525	0.803		Right Tilt	0.346	0.525	0.871
	Left Cheek	0.350	0.306	0.656		Left Cheek	0.872	0.306	<b>1.178</b>
	Left Tilt	0.261	0.489	0.750		Left Tilt	0.314	0.489	0.803
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	0.222	0.502	0.724	Head SAR	Right Cheek	0.286	0.502	0.788
	Right Tilt	0.193	0.525	0.718		Right Tilt	0.265	0.525	0.790
	Left Cheek	0.442	0.306	<b>0.748</b>		Left Cheek	0.595	0.306	<b>0.901</b>
	Left Tilt	0.182	0.489	0.671		Left Tilt	0.256	0.489	0.745
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.429	0.502	0.931	Head SAR	Right Cheek	0.336	0.502	<b>0.838</b>
	Right Tilt	0.423	0.525	0.948		Right Tilt	0.155	0.525	0.680
	Left Cheek	0.974	0.306	<b>1.280</b>		Left Cheek	0.261	0.306	0.567
	Left Tilt	0.426	0.489	0.915		Left Tilt	0.160	0.489	0.649
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.485	0.502	<b>0.987</b>	Head SAR	Right Cheek	0.329	0.502	0.831
	Right Tilt	0.241	0.525	0.766		Right Tilt	0.346	0.525	0.871
	Left Cheek	0.388	0.306	0.694		Left Cheek	1.027	0.306	<b>1.333</b>
	Left Tilt	0.254	0.489	0.743		Left Tilt	0.355	0.489	0.844
Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Head SAR	Right Cheek	0.401	0.502	0.903	Head SAR	Right Cheek	0.182	0.502	0.684
	Right Tilt	0.421	0.525	0.946		Right Tilt	0.257	0.525	<b>0.782</b>
	Left Cheek	1.052	0.306	<b>1.358</b>		Left Cheek	0.396	0.306	0.702
	Left Tilt	0.384	0.489	0.873		Left Tilt	0.191	0.489	0.680

The worst case 5 GHz WIFI reported SAR for each head configuration was considered for simultaneous SAR exclusion via summation of standalone SAR, regardless of whether the WIFI channel has WIFI Hotspot capability, for simplicity to determine compliance. Please note that the actual simultaneous transmission SAR will not exceed the summed levels indicated.

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## 12.4 Body-Worn Simultaneous Transmission Analysis

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

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.682	0.267	0.949
Back Side	GPRS 850	0.876	0.267	1.143
Back Side	UMTS 850	0.665	0.267	0.932
Back Side	UMTS 1750	0.536	0.267	0.803
Back Side	GSM 1900	0.233	0.267	0.500
Back Side	GPRS 1900	0.383	0.267	0.650
Back Side	UMTS 1900	0.525	0.267	0.792
Back Side	LTE Band 12	0.514	0.267	0.781
Back Side	LTE Band 5 (Cell)	0.550	0.267	0.817
Back Side	LTE Band 4 (AWS)	0.620	0.267	0.887
Back Side	LTE Band 2 (PCS)	0.506	0.267	0.773
Back Side	LTE Band 7	0.292	0.267	0.559

**Table 12-5**  
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.682	0.281	0.963
Back Side	GPRS 850	0.876	0.281	1.157
Back Side	UMTS 850	0.665	0.281	0.946
Back Side	UMTS 1750	0.536	0.281	0.817
Back Side	GSM 1900	0.233	0.281	0.514
Back Side	GPRS 1900	0.383	0.281	0.664
Back Side	UMTS 1900	0.525	0.281	0.806
Back Side	LTE Band 12	0.514	0.281	0.795
Back Side	LTE Band 5 (Cell)	0.550	0.281	0.831
Back Side	LTE Band 4 (AWS)	0.620	0.281	0.901
Back Side	LTE Band 2 (PCS)	0.506	0.281	0.787
Back Side	LTE Band 7	0.292	0.281	0.573

The worst case 5 GHz WIFI reported SAR for each body-worn configuration was considered for simultaneous SAR exclusion via summation of standalone SAR, regardless of whether the WIFI channel has WIFI Hotspot capability, for simplicity to determine compliance. Please note that the actual simultaneous transmission SAR will not exceed the summed levels indicated.

**Table 12-6**  
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.0 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	0.682	0.294	0.976
Back Side	GPRS 850	0.876	0.294	1.170
Back Side	UMTS 850	0.665	0.294	0.959
Back Side	UMTS 1750	0.536	0.294	0.830
Back Side	GSM 1900	0.233	0.294	0.527
Back Side	GPRS 1900	0.383	0.294	0.677
Back Side	UMTS 1900	0.525	0.294	0.819
Back Side	LTE Band 12	0.514	0.294	0.808
Back Side	LTE Band 5 (Cell)	0.550	0.294	0.844
Back Side	LTE Band 4 (AWS)	0.620	0.294	0.914
Back Side	LTE Band 2 (PCS)	0.506	0.294	0.800
Back Side	LTE Band 7	0.292	0.294	0.586

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

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## 12.5 Hotspot SAR Simultaneous Transmission Analysis

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

**Table 12-7**  
**Simultaneous Transmission Scenario (2.4 GHz Hotspot)**

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	0.876	0.267	<b>1.143</b>	Body SAR	Back	0.665	0.267	<b>0.932</b>
	Front	0.857	0.147	1.004		Front	0.670	0.147	0.817
	Top	-	0.230	0.230		Top	-	0.230	0.230
	Bottom	0.585	-	0.585		Bottom	0.443	-	0.443
	Right	0.811	0.056	0.867		Right	0.630	0.056	0.686
	Left	0.445	-	0.445		Left	0.361	-	0.361
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	0.473	0.267	<b>0.740</b>	Body SAR	Back	0.303	0.267	0.570
	Front	0.554	0.147	0.701		Front	0.608	0.147	<b>0.755</b>
	Top	-	0.230	0.230		Top	-	0.230	0.230
	Bottom	0.426	-	0.426		Bottom	0.327	-	0.327
	Right	-	0.056	0.056		Right	-	0.056	0.056
	Left	0.417	-	0.417		Left	0.496	-	0.496
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.525	0.267	0.792	Body SAR	Back	0.514	0.267	<b>0.781</b>
	Front	0.806	0.147	<b>0.953</b>		Front	0.576	0.147	0.723
	Top	-	0.230	0.230		Top	-	0.230	0.230
	Bottom	0.611	-	0.611		Bottom	0.272	-	0.272
	Right	-	0.056	0.056		Right	0.529	0.056	0.585
	Left	0.679	-	0.679		Left	0.336	-	0.336
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.550	0.267	<b>0.817</b>	Body SAR	Back	0.620	0.267	<b>0.887</b>
	Front	0.527	0.147	0.674		Front	0.705	0.147	0.852
	Top	-	0.230	0.230		Top	-	0.230	0.230
	Bottom	0.375	-	0.375		Bottom	0.626	-	0.626
	Right	0.479	0.056	0.535		Right	-	0.056	0.056
	Left	0.309	-	0.309		Left	0.552	-	0.552
Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.506	0.267	0.773	Body SAR	Back	0.292	0.267	<b>0.559</b>
	Front	0.872	0.147	<b>1.019</b>		Front	0.353	0.147	0.500
	Top	-	0.230	0.230		Top	-	0.230	0.230
	Bottom	0.610	-	0.610		Bottom	0.143	-	0.143
	Right	-	0.056	0.056		Right	-	0.056	0.056
	Left	0.698	-	0.698		Left	0.252	-	0.252

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**Table 12-8  
Simultaneous Transmission Scenario (5 GHz Hotspot)**

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	0.876	0.124	<b>1.000</b>	Body SAR	Back	0.665	0.124	<b>0.789</b>
	Front	0.857	0.032	0.889		Front	0.670	0.032	0.702
	Top	-	0.146	0.146		Top	-	0.146	0.146
	Bottom	0.585	-	0.585		Bottom	0.443	-	0.443
	Right	0.811	0.008	0.819		Right	0.630	0.008	0.638
	Left	0.445	-	0.445		Left	0.361	-	0.361
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	0.473	0.124	<b>0.597</b>	Body SAR	Back	0.303	0.124	0.427
	Front	0.554	0.032	0.586		Front	0.608	0.032	<b>0.640</b>
	Top	-	0.146	0.146		Top	-	0.146	0.146
	Bottom	0.426	-	0.426		Bottom	0.327	-	0.327
	Right	-	0.008	0.008		Right	-	0.008	0.008
	Left	0.417	-	0.417		Left	0.496	-	0.496
Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.525	0.124	0.649	Body SAR	Back	0.514	0.124	<b>0.638</b>
	Front	0.806	0.032	<b>0.838</b>		Front	0.576	0.032	0.608
	Top	-	0.146	0.146		Top	-	0.146	0.146
	Bottom	0.611	-	0.611		Bottom	0.272	-	0.272
	Right	-	0.008	0.008		Right	0.529	0.008	0.537
	Left	0.679	-	0.679		Left	0.336	-	0.336
Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.550	0.124	<b>0.674</b>	Body SAR	Back	0.620	0.124	<b>0.744</b>
	Front	0.527	0.032	0.559		Front	0.705	0.032	0.737
	Top	-	0.146	0.146		Top	-	0.146	0.146
	Bottom	0.375	-	0.375		Bottom	0.626	-	0.626
	Right	0.479	0.008	0.487		Right	-	0.008	0.008
	Left	0.309	-	0.309		Left	0.552	-	0.552
Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.506	0.124	0.630	Body SAR	Back	0.292	0.124	<b>0.416</b>
	Front	0.872	0.032	<b>0.904</b>		Front	0.353	0.032	0.385
	Top	-	0.146	0.146		Top	-	0.146	0.146
	Bottom	0.610	-	0.610		Bottom	0.143	-	0.143
	Right	-	0.008	0.008		Right	-	0.008	0.008
	Left	0.698	-	0.698		Left	0.252	-	0.252

## 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 D01v05 and IEEE 1528-2013 Section 6.3.4.1.2.

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# 13 SAR MEASUREMENT VARIABILITY

## 13.1 Measurement Variability

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

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

- 1) When the original highest measured SAR is  $\geq 0.80$  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  $\geq 1.45$  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  $\geq 1.5$  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
- 5) 10g extremity SAR measurement variability analysis applies a factor of 2.5 to the procedures outlined above

**Table 13-1  
Head SAR Measurement Variability Results**

HEAD VARIABILITY RESULTS														
Band	FREQUENCY		Mode/Band	Service	Side	Test Position	Cover Type	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, 99 RB Offset	Left	Cheek	Quick Cover (Closed)	0.992	0.987	1.01	N/A	N/A	N/A	N/A
1900	1880.00	18900	LTE Band 2 (PCS)	QPSK, 1 RB, 50 RB Offset	Left	Cheek	Quick Cover (Open)	1.010	1.000	1.01	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 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 D01v01, the extended measurement uncertainty analysis per IEEE 1528-2003 was not required.

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# 14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/15/2014	Annual	4/15/2015	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	12/30/2014	Annual	12/30/2015	JP38020182
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/15/2014	Annual	4/15/2015	3629U00687
Agilent	E4438C	ESG Vector Signal Generator	4/1/2014	Annual	4/1/2015	MY47270002
Agilent	N9020A	MXA Signal Analyzer	10/27/2014	Annual	10/27/2015	US46470561
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420800
Agilent	8753ES	S-Parameter Network Analyzer	5/22/2014	Annual	5/22/2015	US39170118
Agilent	E5515C	Wireless Communications Test Set	2/23/2015	Biennial	2/23/2017	GB41450275
Agilent	E5515C	Wireless Communications Test Set	11/20/2014	Annual	11/20/2015	GB42361078
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433977
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433978
Anritsu	MA2411B	Pulse Power Sensor	11/17/2014	Annual	11/17/2015	1126066
Anritsu	MA2411B	Pulse Power Sensor	11/17/2014	Annual	11/17/2015	1207364
Anritsu	MA2411B	Pulse Power Sensor	11/13/2014	Annual	11/13/2015	1339018
Anritsu	ML2495A	Power Meter	7/12/2013	Biennial	7/12/2015	1328004
Anritsu	MT8820C	Radio Communication Analyzer	9/19/2014	Annual	9/19/2015	6201144418
Anritsu	MT8820C	Radio Communication Analyzer	5/6/2014	Annual	5/6/2015	6201144419
Anritsu	MA24106A	USB Power Sensor	5/15/2014	Annual	5/15/2015	1244524
Anritsu	MA24106A	USB Power Sensor	5/14/2014	Annual	5/14/2015	1248508
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M155A00-009
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764551
Fisher Scientific	15-077-960	Digital Thermometer	12/4/2013	Biennial	12/4/2015	130764558
Fisher Scientific	S407993	Long Stem Thermometer	11/4/2013	Biennial	11/4/2015	130671801
Fisher Scientific	S407993	Long Stem Thermometer	11/4/2013	Biennial	11/4/2015	130671821
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/30/2014	Annual	10/30/2015	1832460
Gigatronics	8651A	Universal Power Meter	10/30/2014	Annual	10/30/2015	8650319
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
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	6/6/2014	Annual	6/6/2015	109892
Rohde & Schwarz	CMW500	Radio Communication Tester	7/22/2014	Annual	7/22/2015	116743
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	22313
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	N/A
SPEAG	D1750V2	1750 MHz SAR Dipole	4/10/2014	Annual	4/10/2015	1051
SPEAG	D1765V2	1750 MHz SAR Dipole	5/7/2014	Annual	5/7/2015	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	4/9/2014	Annual	4/9/2015	5d141
SPEAG	D1900V2	1900 MHz SAR Dipole	2/18/2015	Annual	2/18/2016	5d148
SPEAG	D1900V2	1900 MHz SAR Dipole	7/23/2014	Annual	7/23/2015	5d149
SPEAG	D2450V2	2450 MHz SAR Dipole	8/11/2014	Annual	8/11/2015	719
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/21/2016	Annual	1/21/2016	1057
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/25/2014	Annual	9/25/2015	1191
SPEAG	D750V3	750 MHz Dipole	1/16/2015	Annual	1/16/2016	1003
SPEAG	D835V2	835 MHz SAR Dipole	4/7/2014	Annual	4/7/2015	4d119
SPEAG	D835V2	835 MHz SAR Dipole	1/16/2015	Annual	1/16/2016	4d132
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/18/2015	Annual	2/18/2016	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/14/2014	Annual	5/14/2015	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/12/2014	Annual	8/12/2015	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/17/2014	Annual	9/17/2015	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/31/2014	Annual	10/31/2015	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/18/2014	Annual	9/18/2015	1364
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/19/2015	Annual	1/19/2016	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/23/2014	Annual	10/23/2015	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2014	Annual	12/12/2015	1415
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/6/2014	Annual	5/6/2015	1070
SPEAG	DAK-3.5	Dielectric Assessment Kit	10/21/2014	Annual	10/21/2015	1091
SPEAG	ES3DV2	SAR Probe	8/19/2014	Annual	8/19/2015	3022
SPEAG	ES3DV3	SAR Probe	1/20/2015	Annual	1/20/2016	3213
SPEAG	ES3DV3	SAR Probe	5/15/2014	Annual	5/15/2015	3263
SPEAG	ES3DV3	SAR Probe	9/24/2014	Annual	9/24/2015	3288
SPEAG	ES3DV3	SAR Probe	9/18/2014	Annual	9/18/2015	3332
SPEAG	ES3DV3	SAR Probe	10/24/2014	Annual	10/24/2015	3333
SPEAG	ES3DV3	SAR Probe	12/16/2014	Annual	12/16/2015	3334
SPEAG	EX3DV4	SAR Probe	2/10/2015	Annual	2/10/2016	3914
SPEAG	EX3DV4	SAR Probe	12/12/2014	Annual	12/12/2015	3920
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/16/2014	Annual	4/16/2015	8010177
VWR	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	111859323
VWR	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	111859332
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Biennial	8/8/2015	13047866
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Biennial	8/8/2015	13047877

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

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# 15 MEASUREMENT UNCERTAINTIES

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 <sub>i</sub> 1gm	c <sub>i</sub> 10 gms	1gm u <sub>i</sub> (± %)	10gms u <sub>i</sub> (± %)	v <sub>i</sub>
<b>Measurement System</b>									
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	∞
<b>Test Sample Related</b>									
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	∞
<b>Phantom &amp; Tissue Parameters</b>									
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
<b>Combined Standard Uncertainty (k=1)</b>	RSS						12.1	11.7	299
<b>Expanded Uncertainty</b> (95% CONFIDENCE LEVEL)	k=2						24.2	23.5	

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

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Applicable for frequencies up to 6 GHz.

a	b	c	d	e= f(d,k)	f	g	h= c x f/e	i= c x g/e	k
Uncertainty Component	IEEE 1528 Sec.	Tol. (± %)	Prob. Dist.	Div.	c <sub>i</sub> 1gm	c <sub>i</sub> 10 gms	1gm u <sub>i</sub> (± %)	10gms u <sub>i</sub> (± %)	v <sub>i</sub>
<b>Measurement System</b>									
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 E ffect	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 E lectronics	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	∞
<b>Test Sample Related</b>									
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	∞
<b>Phantom &amp; Tissue Parameters</b>									
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
<b>Combined Standard Uncertainty (k=1)</b>				RSS			12.4	12.0	299
<b>Expanded Uncertainty</b> (95% CONFIDENCE LEVEL)				k=2			24.7	24.0	

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

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## 16 CONCLUSION

### 16.1 Measurement Conclusion

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

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

FCC ID: ZNFH811	 <b>PCTEST</b> ENGINEERING LABORATORY, INC.	<b>SAR EVALUATION REPORT</b>	 <b>LG</b>	<b>Reviewed by:</b> Quality Manager
<b>Document S/N:</b> 0Y1503160600.ZNF	<b>Test Dates:</b> 03/16/15 - 03/30/15	<b>DUT Type:</b> Portable Handset	Page 80 of 82	

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<b>Document S/N:</b> OY1503160600.ZNF	<b>Test Dates:</b> 03/16/15 - 03/30/15	<b>DUT Type:</b> Portable Handset	Page 81 of 82	

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FCC ID: ZNFH811	 <b>SAR EVALUATION REPORT</b> 		Reviewed by: Quality Manager
Document S/N: 0Y1503160600.ZNF	Test Dates: 03/16/15 - 03/30/15	DUT Type: Portable Handset	Page 82 of 82

## APPENDIX A: SAR TEST DATA

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFWD**

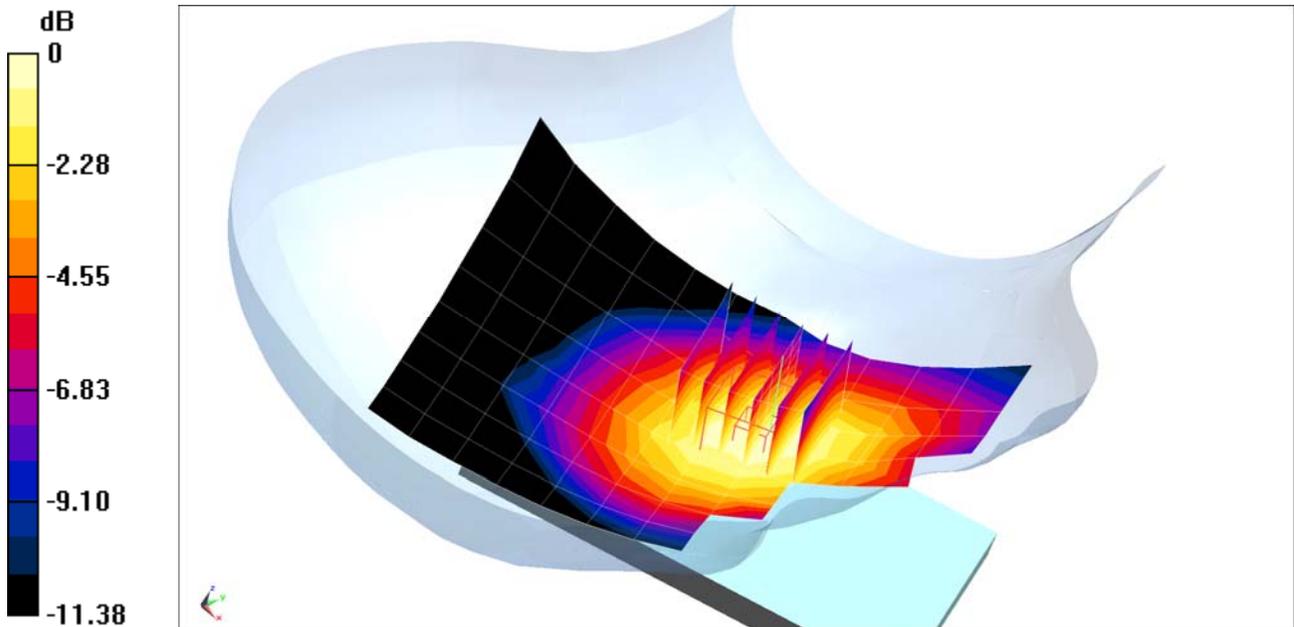
Communication System: UID 0, GSM850 GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76  
Medium: 835 Head Medium parameters used (interpolated):  
 $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.912 \text{ S/m}$ ;  $\epsilon_r = 41.477$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section

Test Date: 03-17-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(6.18, 6.18, 6.18); Calibrated: 8/19/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014  
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: GPRS 850, Right Head, Cheek, Mid.ch, 3 Tx slots, Standard Cover**

**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (6x6x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 23.295 V/m; Power Drift = -0.09 dB  
Peak SAR (extrapolated) = 0.599 W/kg  
**SAR(1 g) = 0.454 W/kg**



0 dB = 0.492 W/kg = -3.08 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

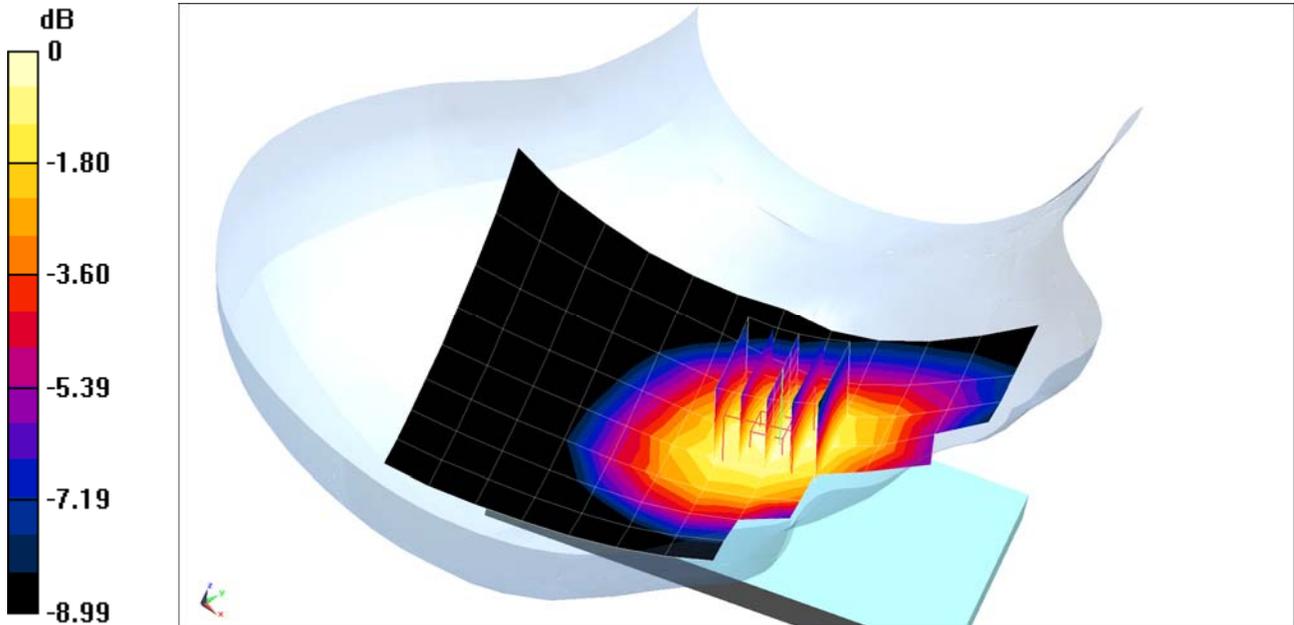
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1  
Medium: 835 Head Medium parameters used (interpolated):  
 $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.912 \text{ S/m}$ ;  $\epsilon_r = 41.477$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section

Test Date: 03-17-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(6.18, 6.18, 6.18); Calibrated: 8/19/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014  
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: UMTS 850, Right Head, Cheek, Mid.ch, Standard Cover**

**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 24.565 V/m; Power Drift = -0.03 dB  
Peak SAR (extrapolated) = 0.651 W/kg  
**SAR(1 g) = 0.512 W/kg**



0 dB = 0.562 W/kg = -2.50 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFF**

Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1  
Medium: 1750 Head Medium parameters used (interpolated):  
 $f = 1732.4 \text{ MHz}$ ;  $\sigma = 1.39 \text{ S/m}$ ;  $\epsilon_r = 38.679$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section

Test Date: 03-23-2015; Ambient Temp: 22.3°C; Tissue Temp: 20.4°C

Probe: ES3DV3 - SN3334; ConvF(5.21, 5.21, 5.21); Calibrated: 12/16/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1415; Calibrated: 12/12/2014

Phantom: Sub Twin Sam v5.0; Type: QD000P40CD; Serial: TP:1626  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: AWS UMTS, Left Head, Cheek, Mid.ch, Quick Cover Open**

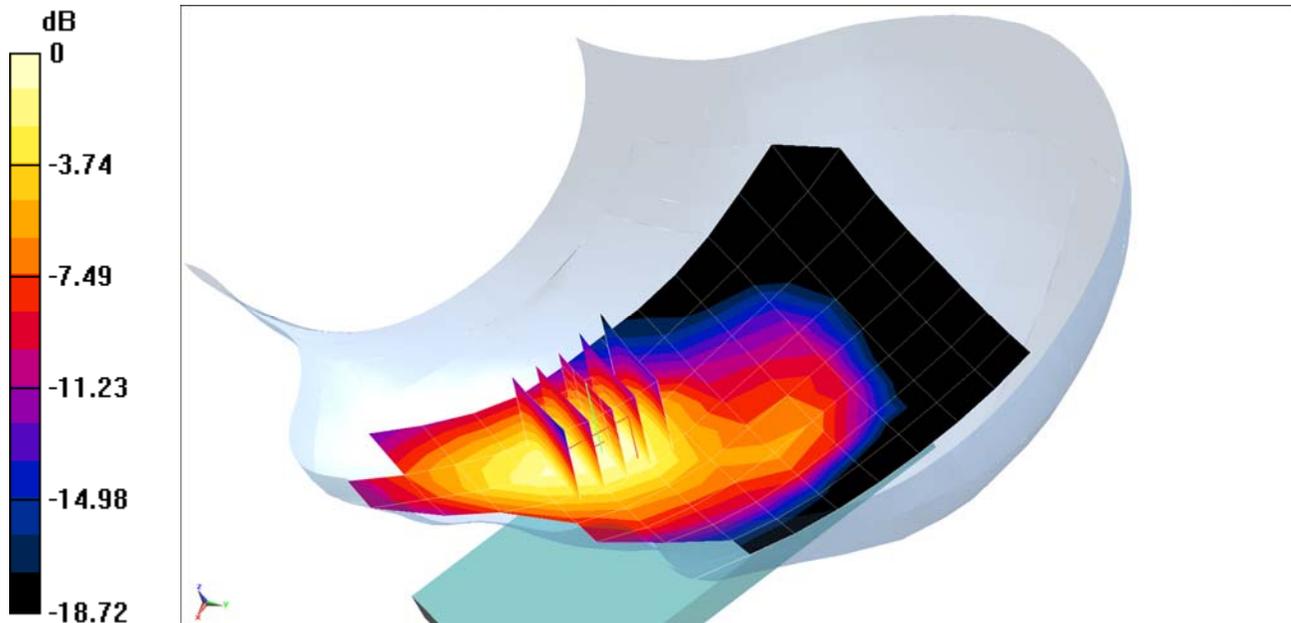
**Area Scan (9x15x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 24.525 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 1.15 W/kg

**SAR(1 g) = 0.768 W/kg**



0 dB = 0.876 W/kg = -0.57 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFWD**

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

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.381 \text{ S/m}$ ;  $\epsilon_r = 39.569$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 03-26-2015; Ambient Temp: 23.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3333; ConvF(5.11, 5.11, 5.11); Calibrated: 10/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 10/23/2014

Phantom: Main TWIN SAM; Type: QD000P40CC; Serial: TP-1406

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: GPRS 1900, Left Head, Cheek, Mid.ch, 3 Tx slots, Quick Cover Open**

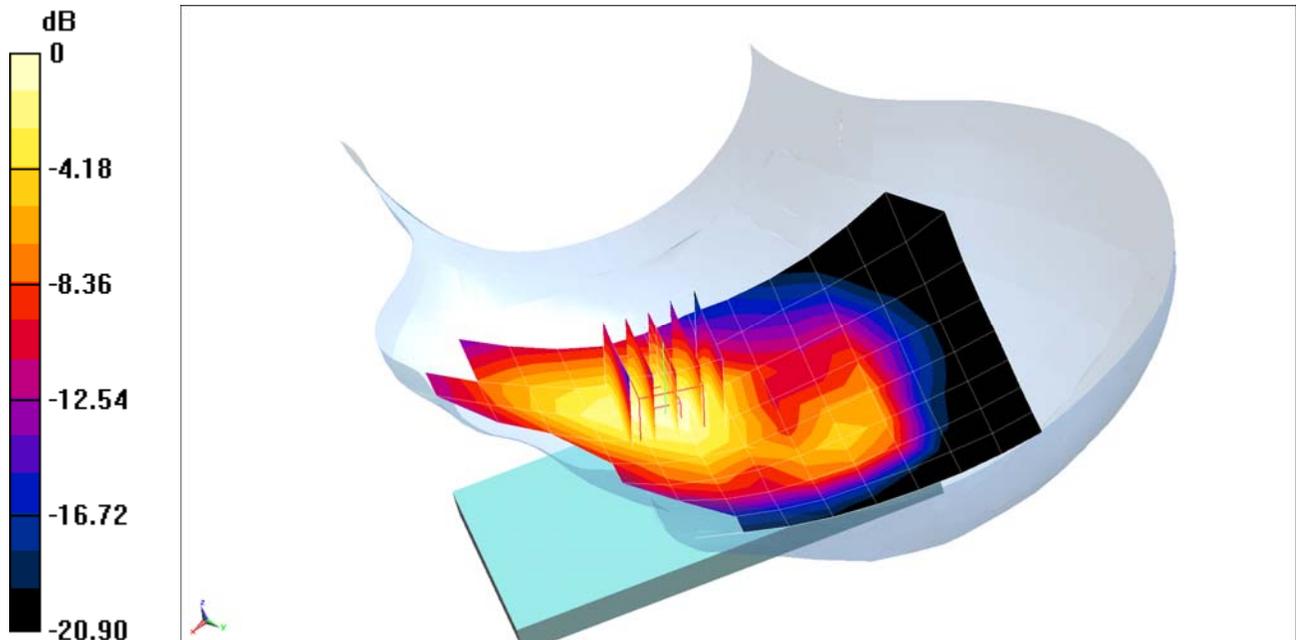
**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 19.748 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.820 W/kg

**SAR(1 g) = 0.562 W/kg**



0 dB = 0.649 W/kg = -1.88 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

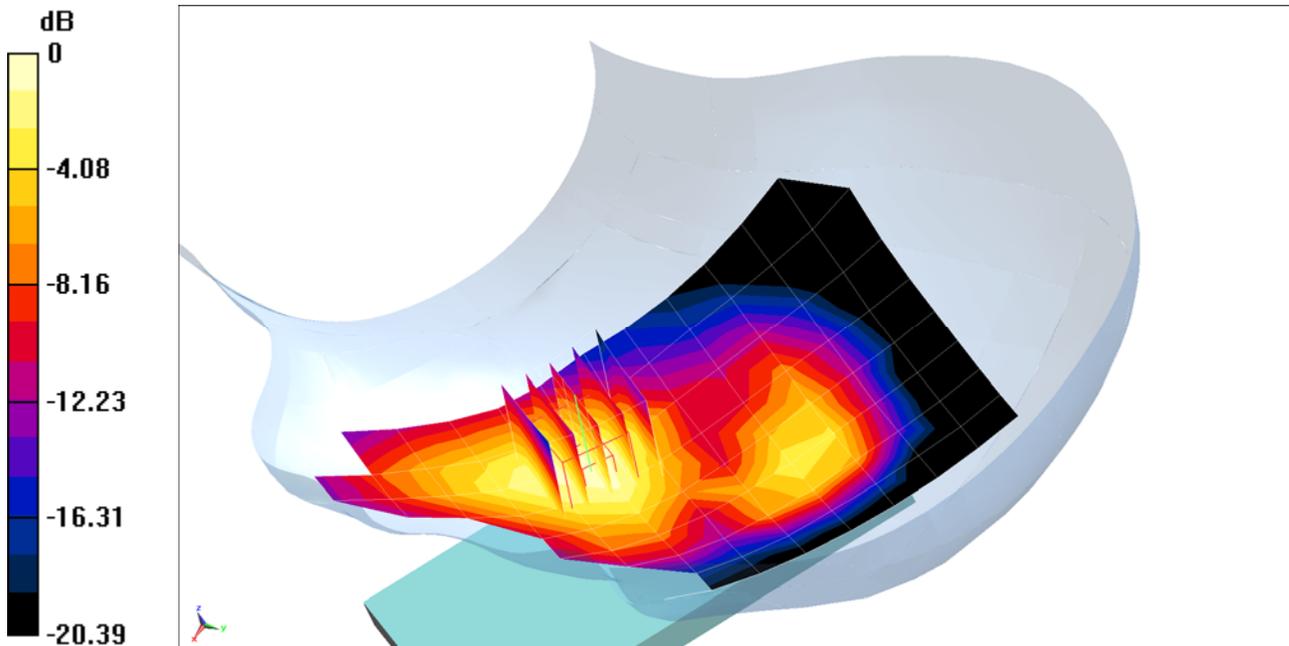
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium: 1900 Head Medium parameters used:  
 $f = 1880 \text{ MHz}$ ;  $\sigma = 1.381 \text{ S/m}$ ;  $\epsilon_r = 39.569$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section

Test Date: 03-26-2015; Ambient Temp: 23.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3333; ConvF(5.11, 5.11, 5.11); Calibrated: 10/24/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014  
Phantom: Main TWIN SAM; Type: QD000P40CC; Serial: TP-1406  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: UMTS 1900, Left Head, Cheek, Mid.ch, Quick Cover Closed**

**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 26.914 V/m; Power Drift = -0.07 dB  
Peak SAR (extrapolated) = 1.37 W/kg  
**SAR(1 g) = 0.954 W/kg**



0 dB = 1.11 W/kg = 0.45 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

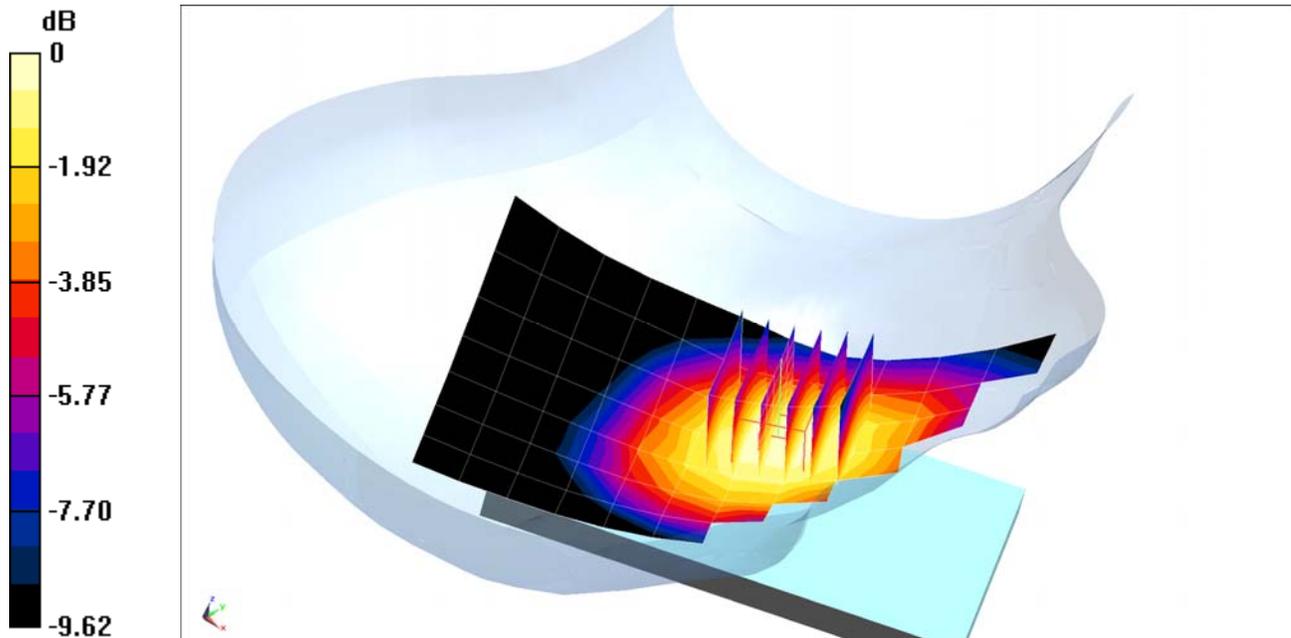
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1  
Medium: 750 Head Medium parameters used (interpolated):  
 $f = 707.5 \text{ MHz}$ ;  $\sigma = 0.867 \text{ S/m}$ ;  $\epsilon_r = 41.513$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section

Test Date: 03-25-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.9°C

Probe: ES3DV2 - SN3022; ConvF(6.39, 6.39, 6.39); Calibrated: 8/19/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014  
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

**Area Scan (8x13x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (6x6x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 20.291 V/m; Power Drift = -0.07 dB  
Peak SAR (extrapolated) = 0.411 W/kg  
**SAR(1 g) = 0.325 W/kg**



0 dB = 0.357 W/kg = -4.47 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

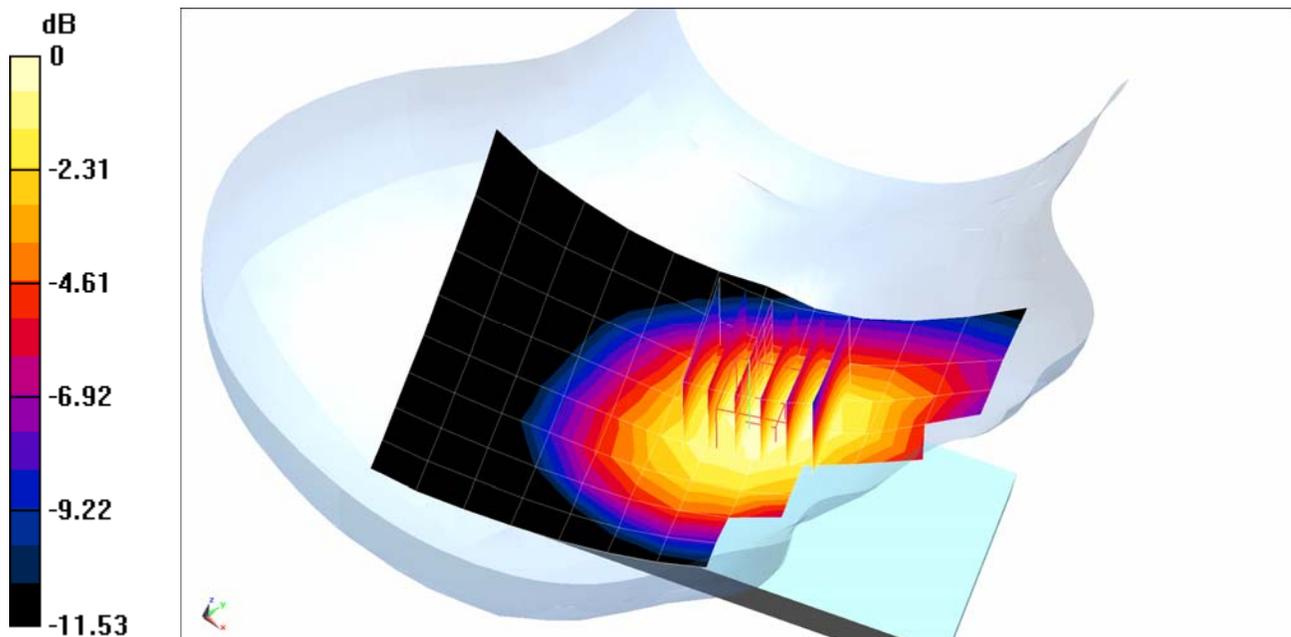
Communication System: UID 0, LTE Band 5 (Cell.); Frequency: 836.5 MHz; Duty Cycle: 1:1  
Medium: 835 Head Medium parameters used (interpolated):  
 $f = 836.5 \text{ MHz}$ ;  $\sigma = 0.912 \text{ S/m}$ ;  $\epsilon_r = 41.478$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Right Section

Test Date: 03-17-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(6.18, 6.18, 6.18); Calibrated: 8/19/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014  
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (6x6x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 24.124 V/m; Power Drift = -0.05 dB  
Peak SAR (extrapolated) = 0.590 W/kg  
**SAR(1 g) = 0.464 W/kg**



0 dB = 0.508 W/kg = -2.94 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFF**

Communication System: UID 0, LTE RF Band 4; Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium: 1750 Head Medium parameters used (interpolated):  
 $f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.39 \text{ S/m}$ ;  $\epsilon_r = 38.679$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section

Test Date: 03-23-2015; Ambient Temp: 22.3°C; Tissue Temp: 20.4°C

Probe: ES3DV3 - SN3334; ConvF(5.21, 5.21, 5.21); Calibrated: 12/16/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 12/12/2014

Phantom: Sub Twin Sam v5.0; Type: QD000P40CD; Serial: TP:1626

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 4 (AWS), Left Head, Cheek, Mid.ch, Quick Cover Closed**  
**20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

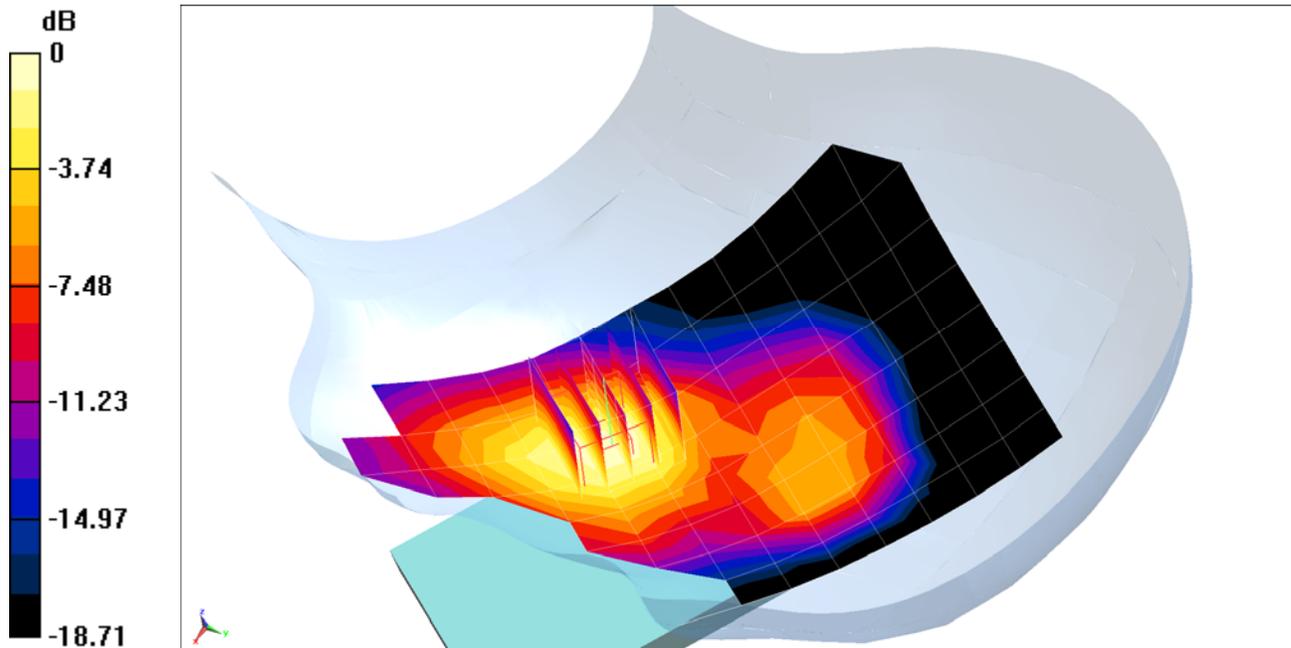
**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 30.193 V/m; Power Drift = -0.10 dB

Peak SAR (extrapolated) = 1.49 W/kg

**SAR(1 g) = 0.992 W/kg**



0 dB = 1.17 W/kg = 0.68 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

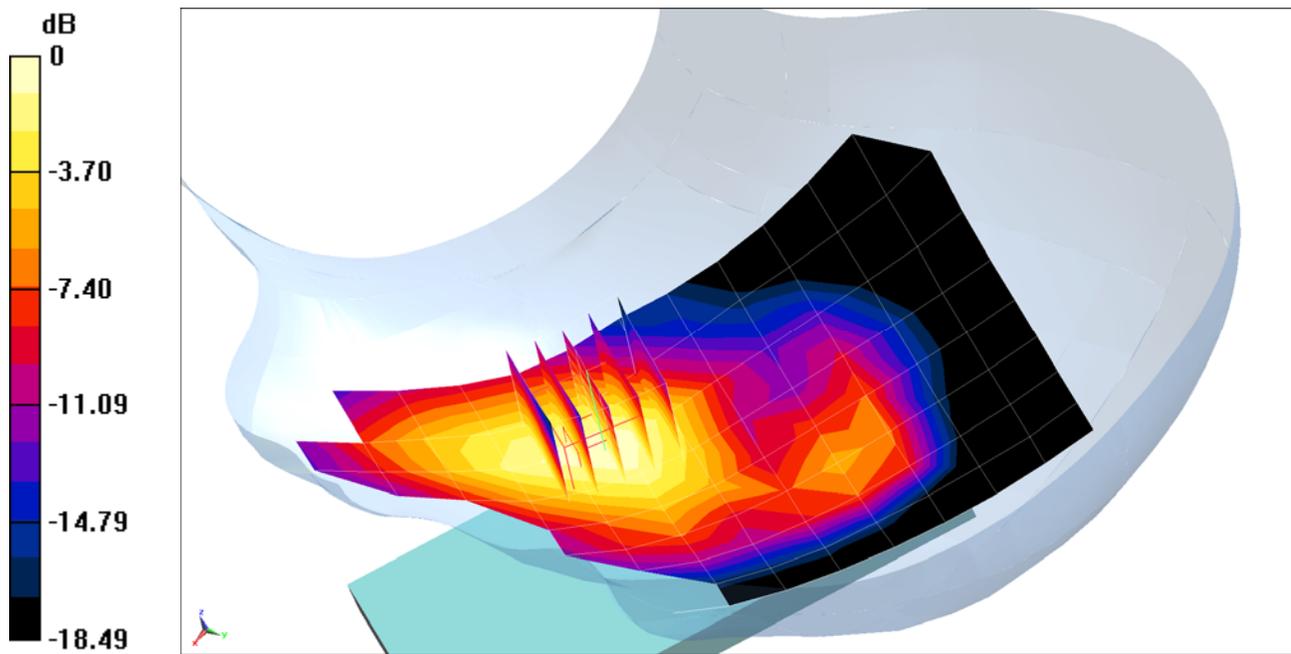
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium: 1900 Head Medium parameters used:  
 $f = 1880 \text{ MHz}$ ;  $\sigma = 1.381 \text{ S/m}$ ;  $\epsilon_r = 39.569$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section

Test Date: 03-26-2015; Ambient Temp: 23.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3333; ConvF(5.11, 5.11, 5.11); Calibrated: 10/24/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014  
Phantom: Main TWIN SAM; Type: QD000P40CC; Serial: TP-1406  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 2 (PCS), Left Head, Cheek, Mid.ch, Quick Cover Open**  
**20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 0.537 V/m; Power Drift = -0.16 dB  
Peak SAR (extrapolated) = 1.51 W/kg  
**SAR(1 g) = 1.01 W/kg**



0 dB = 1.19 W/kg = 0.76 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

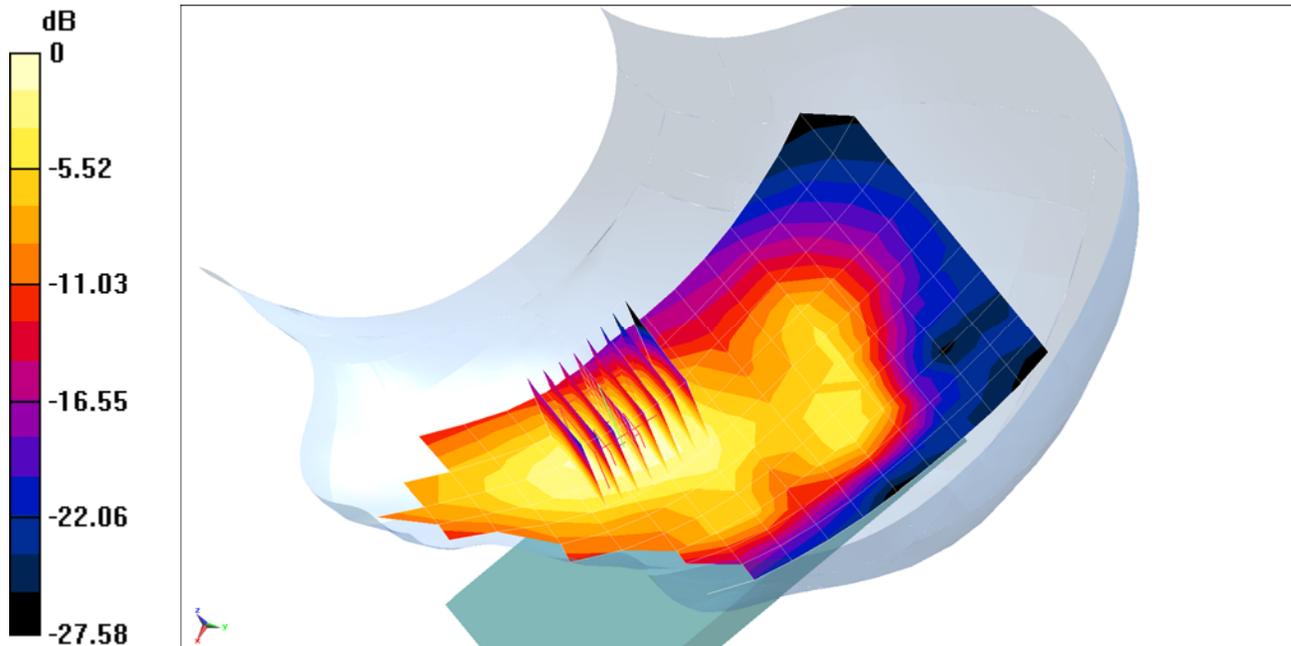
Communication System: UID 0, LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1  
Medium: 2450 Head Medium parameters used (interpolated):  
 $f = 2510 \text{ MHz}$ ;  $\sigma = 1.947 \text{ S/m}$ ;  $\epsilon_r = 39.369$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section

Test Date: 03-27-2015; Ambient Temp: 24.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3332; ConvF(4.49, 4.49, 4.49); Calibrated: 9/18/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014  
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 7, Left Head, Cheek, Low.ch, Quick Cover Open**  
**20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

**Area Scan (11x18x1):** Measurement grid:  $dx=12\text{mm}$ ,  $dy=12\text{mm}$   
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 16.234 V/m; Power Drift = -0.03 dB  
Peak SAR (extrapolated) = 0.691 W/kg  
**SAR(1 g) = 0.385 W/kg**



0 dB = 0.478 W/kg = -3.21 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

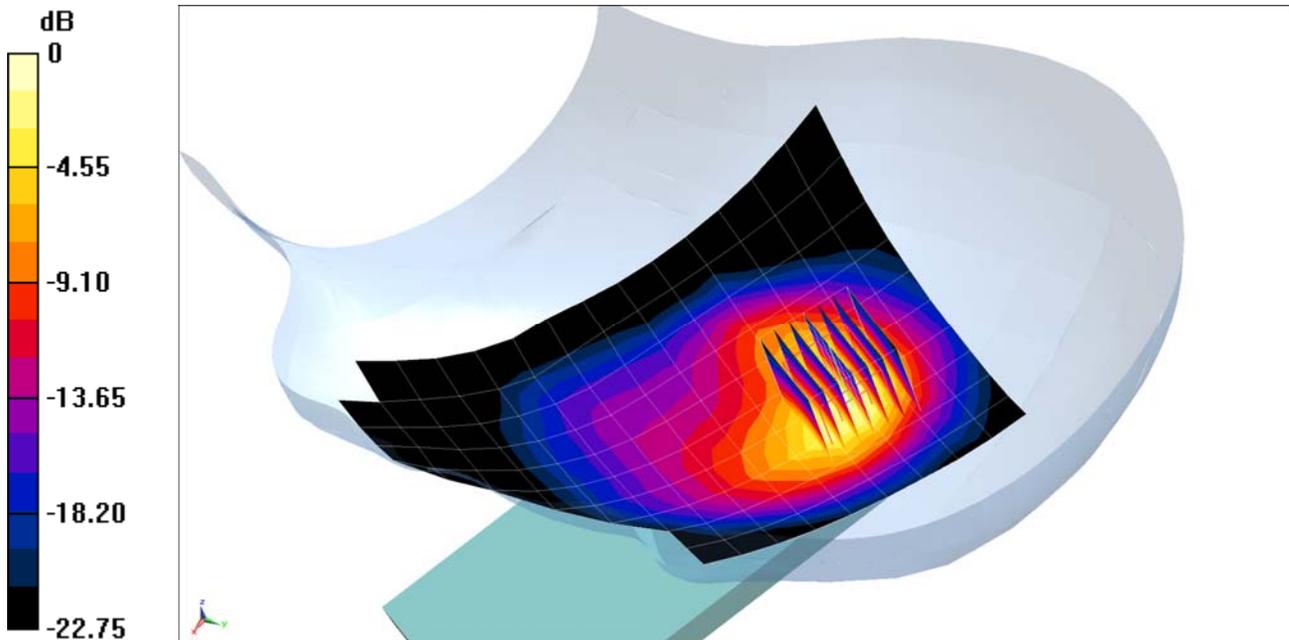
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Head Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 1.861 \text{ S/m}$ ;  $\epsilon_r = 39.652$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Left Section

Test Date: 03-27-2015; Ambient Temp: 24.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3332; ConvF(4.49, 4.49, 4.49); Calibrated: 9/18/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014  
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11b, Left Head, Tilt, Ch 06, 1 Mbps, Quick Cover Open**

**Area Scan (11x18x1):** Measurement grid:  $dx=12\text{mm}$ ,  $dy=12\text{mm}$   
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 14.123 V/m; Power Drift = -0.04 dB  
Peak SAR (extrapolated) = 0.790 W/kg  
**SAR(1 g) = 0.331 W/kg**



0 dB = 0.437 W/kg = -3.60 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFWD**

Communication System: UID 0, IEEE 802.11a; Frequency: 5260 MHz; Duty Cycle: 1:1

Medium: 5GHz Medium parameters used:

$f = 5260 \text{ MHz}$ ;  $\sigma = 4.649 \text{ S/m}$ ;  $\epsilon_r = 36.728$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 03-26-2015; Ambient Temp: 21.5°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN3920; ConvF(4.69, 4.69, 4.69); Calibrated: 12/12/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11a, 5.3 GHz, Right Head, Tilt, Ch 52, 6 Mbps, Standard Cover**

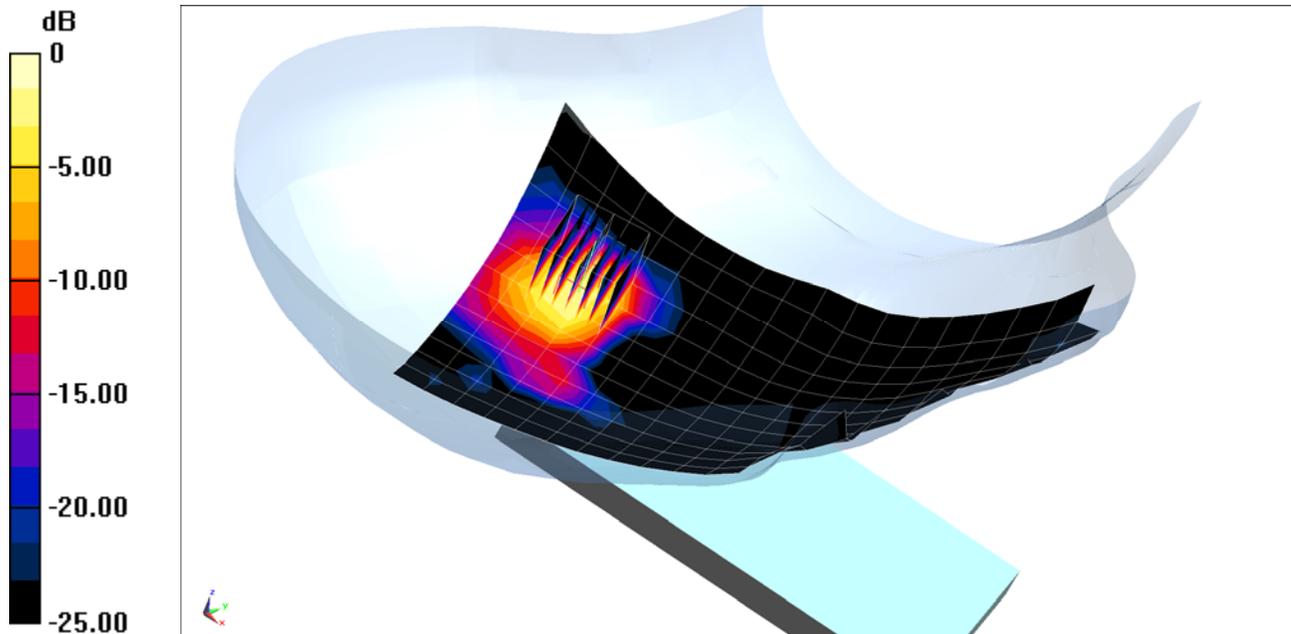
**Area Scan (13x20x1):** Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 10.118 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 1.46 W/kg

**SAR(1 g) = 0.447 W/kg**



0 dB = 0.978 W/kg = -0.10 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFWD**

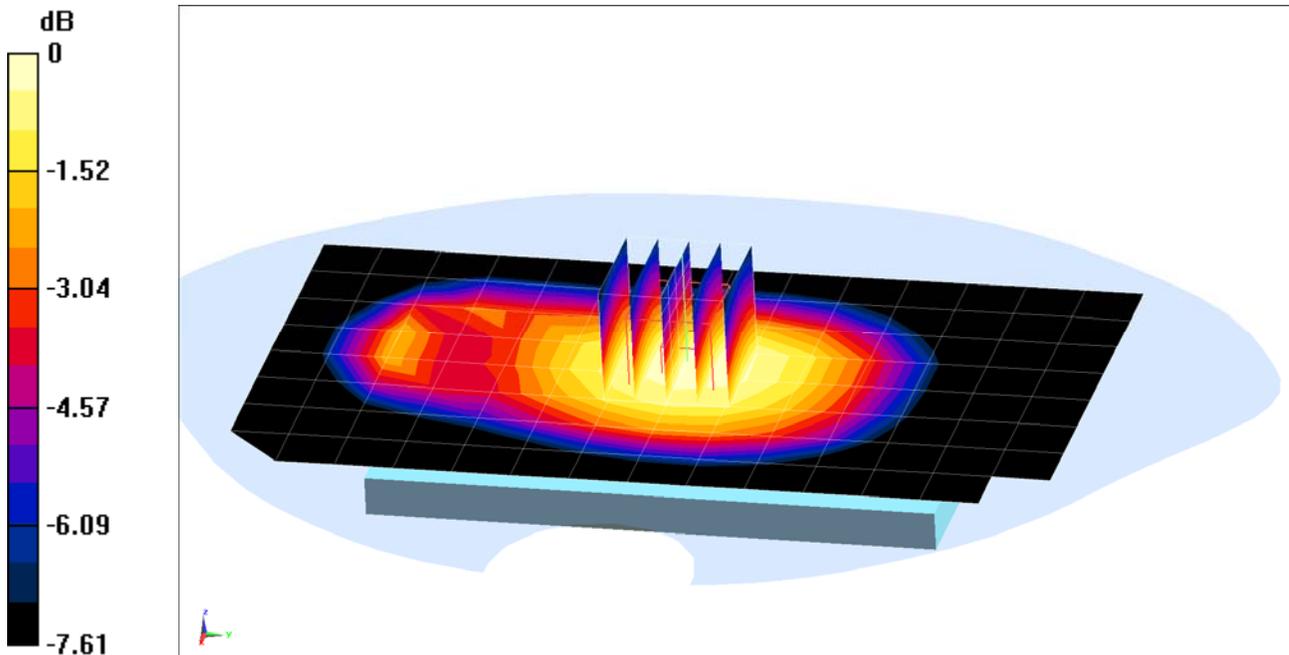
Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 824.2 MHz; Duty Cycle: 1:2.76  
Medium: 835 Body Medium parameters used (interpolated):  
 $f = 824.2 \text{ MHz}$ ;  $\sigma = 0.945 \text{ S/m}$ ;  $\epsilon_r = 53.994$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-16-2015; Ambient Temp: 24.4°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3333; ConvF(6.12, 6.12, 6.12); Calibrated: 10/24/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014  
Phantom: Sub TWIN SAM; Type: QD000P40CC; Serial: TP-1357  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: GPRS 850, Body SAR, Back side, Low.ch, 3 Tx Slots, Standard Cover**

**Area Scan (9x15x1):** Measurement grid: dx=15mm, dy=15mm  
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 28.707 V/m; Power Drift = 0.01 dB  
Peak SAR (extrapolated) = 0.940 W/kg  
**SAR(1 g) = 0.739 W/kg**



0 dB = 0.815 W/kg = -0.89 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

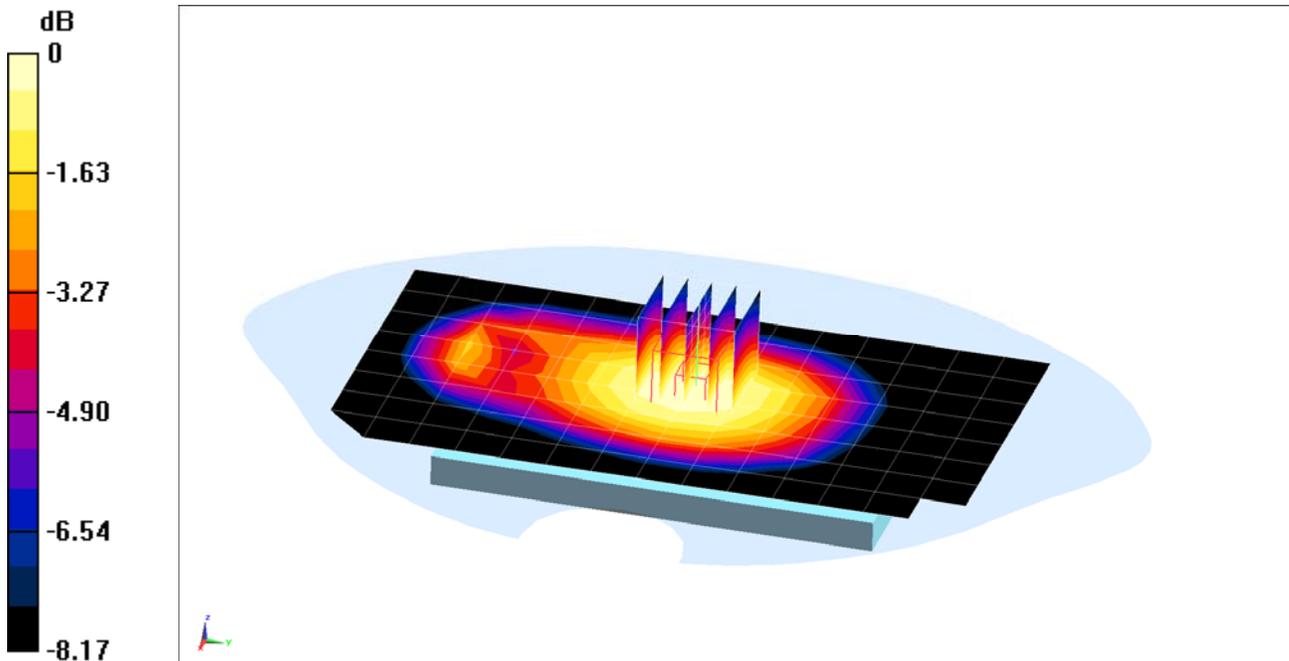
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1  
Medium: 835 Body Medium parameters used (interpolated):  
 $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.957 \text{ S/m}$ ;  $\epsilon_r = 53.872$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-16-2015; Ambient Temp: 24.4°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3333; ConvF(6.12, 6.12, 6.12); Calibrated: 10/24/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014  
Phantom: Sub TWIN SAM; Type: QD000P40CC; Serial: TP-1357  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 26.723 V/m; Power Drift = 0.01 dB  
Peak SAR (extrapolated) = 0.820 W/kg  
**SAR(1 g) = 0.650 W/kg**



# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

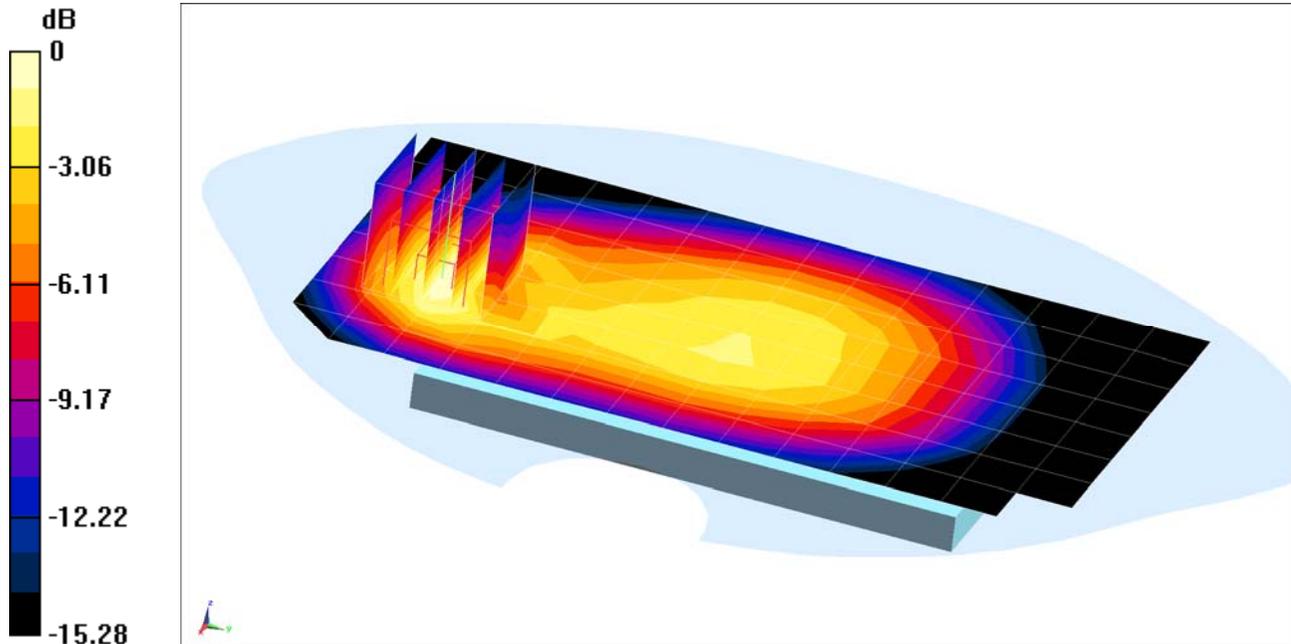
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1  
Medium: 835 Body Medium parameters used (interpolated):  
 $f = 836.6 \text{ MHz}$ ;  $\sigma = 0.957 \text{ S/m}$ ;  $\epsilon_r = 53.872$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-16-2015; Ambient Temp: 24.4°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3333; ConvF(6.12, 6.12, 6.12); Calibrated: 10/24/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014  
Phantom: Sub TWIN SAM; Type: QD000P40CC; Serial: TP-1357  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: UMTS 850, Body SAR, Front side, Mid.ch, Standard Cover**

**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 27.858 V/m; Power Drift = 0.02 dB  
Peak SAR (extrapolated) = 1.14 W/kg  
**SAR(1 g) = 0.655 W/kg**



0 dB = 0.823 W/kg = -0.85 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

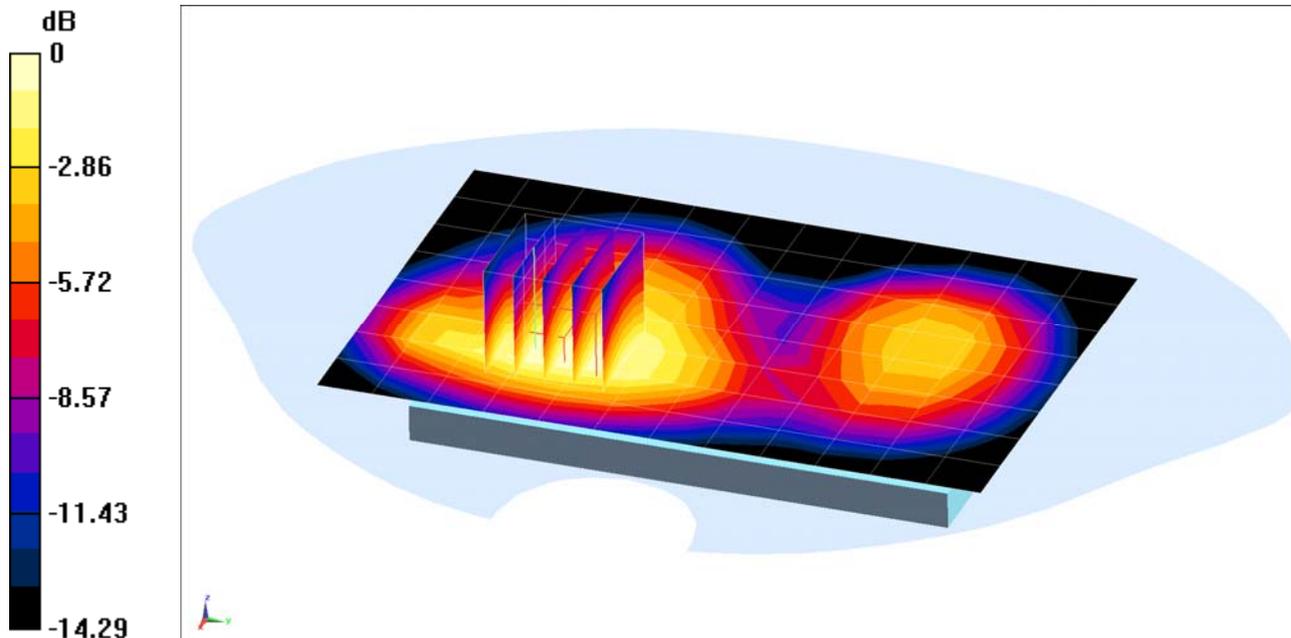
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1  
Medium: 1750 Body Medium parameters used (interpolated):  
 $f = 1732.4 \text{ MHz}$ ;  $\sigma = 1.457 \text{ S/m}$ ;  $\epsilon_r = 52.227$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.88, 4.88, 4.88); Calibrated: 9/18/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014  
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: AWS UMTS, Body SAR, Back side, Mid.ch, Quick Cover Closed**

**Area Scan (9x13x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 18.171 V/m; Power Drift = -0.04 dB  
Peak SAR (extrapolated) = 0.697 W/kg  
**SAR(1 g) = 0.472 W/kg**



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

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

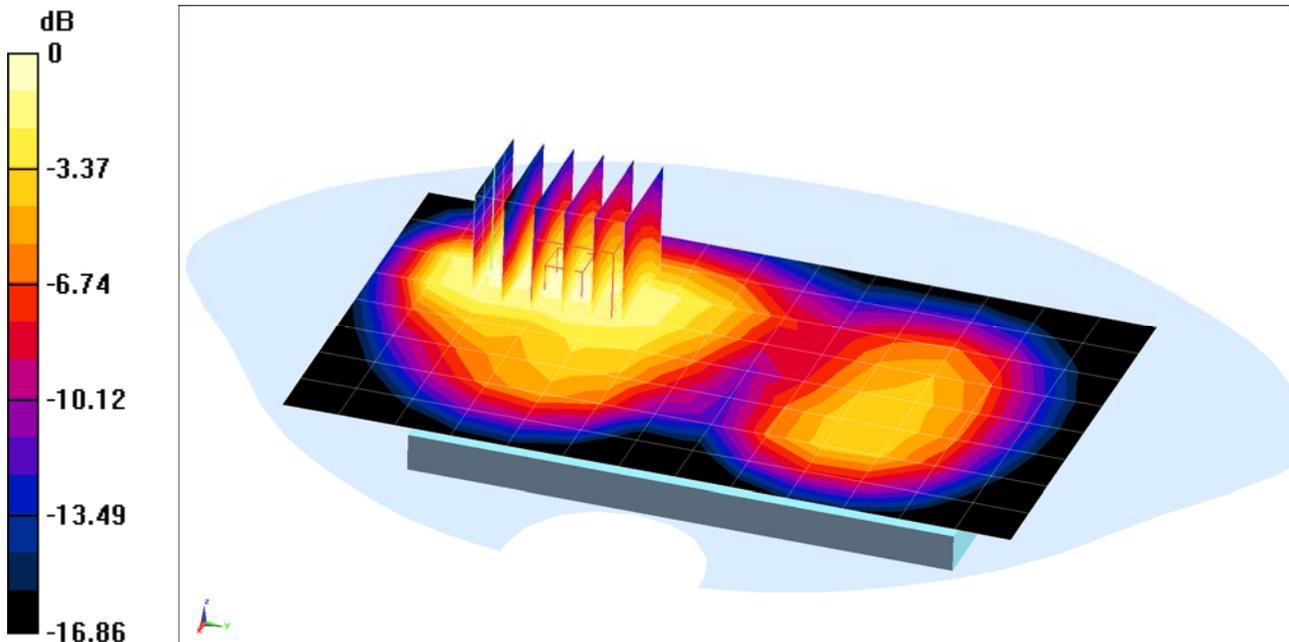
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1  
Medium: 1750 Body Medium parameters used (interpolated):  
 $f = 1732.4 \text{ MHz}$ ;  $\sigma = 1.457 \text{ S/m}$ ;  $\epsilon_r = 52.227$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.88, 4.88, 4.88); Calibrated: 9/18/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014  
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: AWS UMTS, Body SAR, Front side, Mid.ch, Standard Cover**

**Area Scan (9x14x1):** Measurement grid: dx=15mm, dy=15mm  
**Zoom Scan (5x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 19.463 V/m; Power Drift = -0.05 dB  
Peak SAR (extrapolated) = 0.876 W/kg  
**SAR(1 g) = 0.488 W/kg**



0 dB = 0.577 W/kg = -2.39 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFWD**

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.548 \text{ S/m}$ ;  $\epsilon_r = 52.312$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-30-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.0°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 3 Tx Slots, Quick Cover Closed**

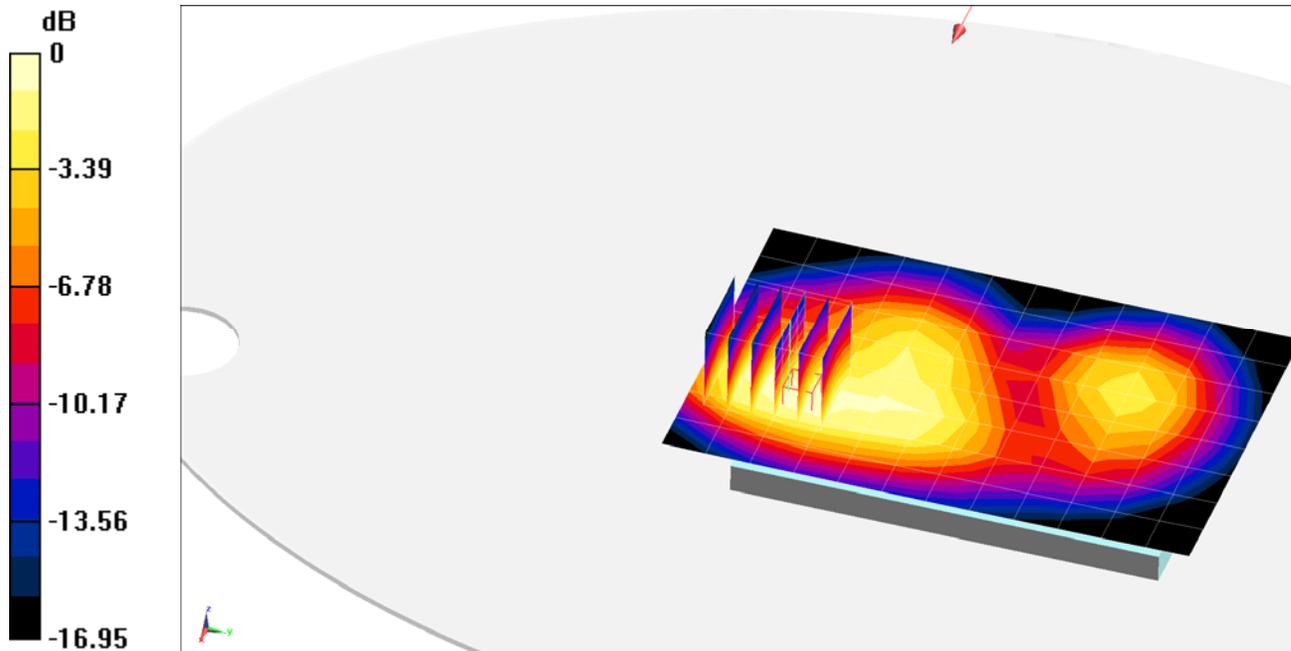
**Area Scan (9x13x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

**Zoom Scan (5x6x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Reference Value = 15.909 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.564 W/kg

**SAR(1 g) = 0.362 W/kg**



0 dB = 0.426 W/kg = -3.71 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFWD**

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.533 \text{ S/m}$ ;  $\epsilon_r = 51.949$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-16-2015; Ambient Temp: 23.6°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3332; ConvF(4.64, 4.64, 4.64); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: GPRS 1900, Body SAR, Front side, Mid.ch, 3 Tx Slots, Standard Cover**

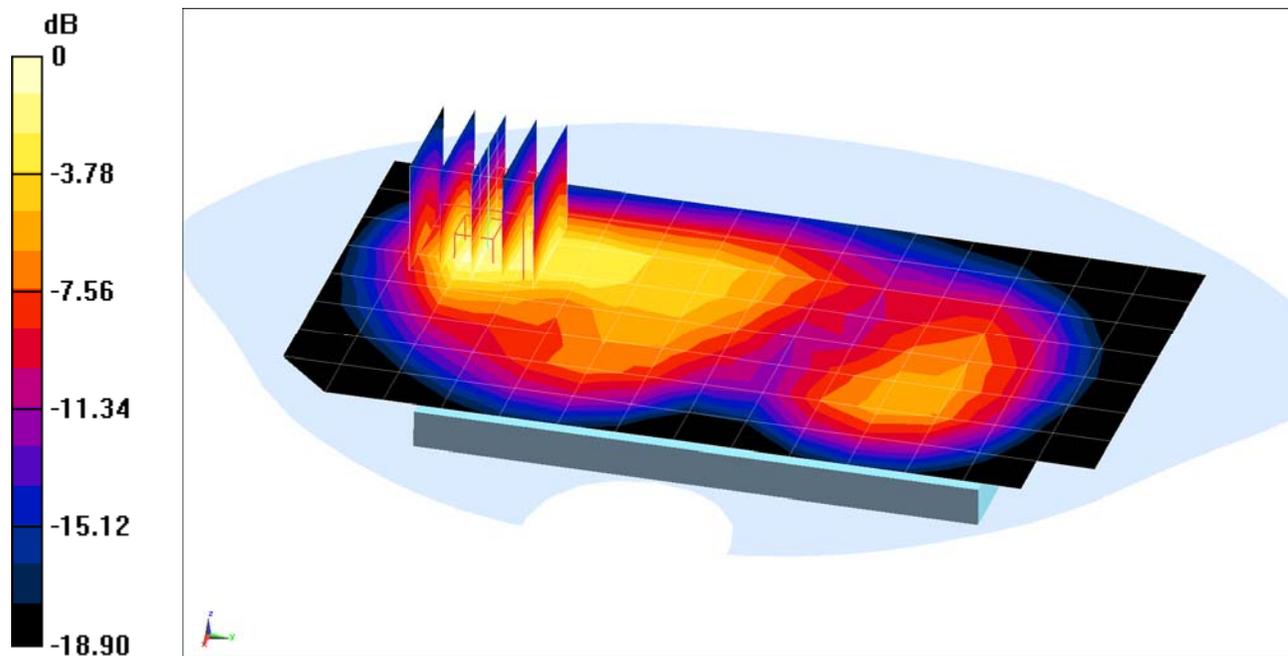
**Area Scan (9x15x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 20.149 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 1.09 W/kg

**SAR(1 g) = 0.574 W/kg**



0 dB = 0.747 W/kg = -1.27 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

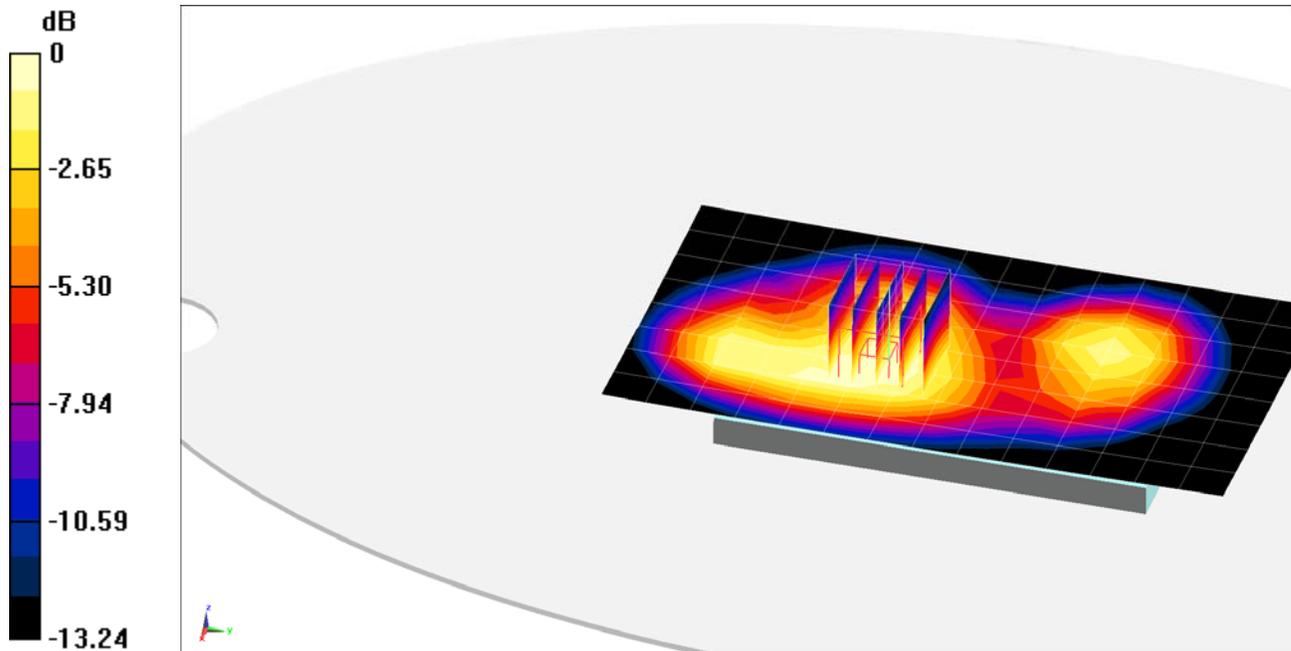
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium: 1900 Body Medium parameters used:  
 $f = 1880 \text{ MHz}$ ;  $\sigma = 1.537 \text{ S/m}$ ;  $\epsilon_r = 51.957$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 21.8°C; Tissue Temp: 21.5°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014  
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

**Area Scan (9x15x1):** Measurement grid: dx=15mm, dy=15mm  
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 18.966 V/m; Power Drift = -0.03 dB  
Peak SAR (extrapolated) = 0.749 W/kg  
**SAR(1 g) = 0.514 W/kg**



0 dB = 0.589 W/kg = -2.30 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

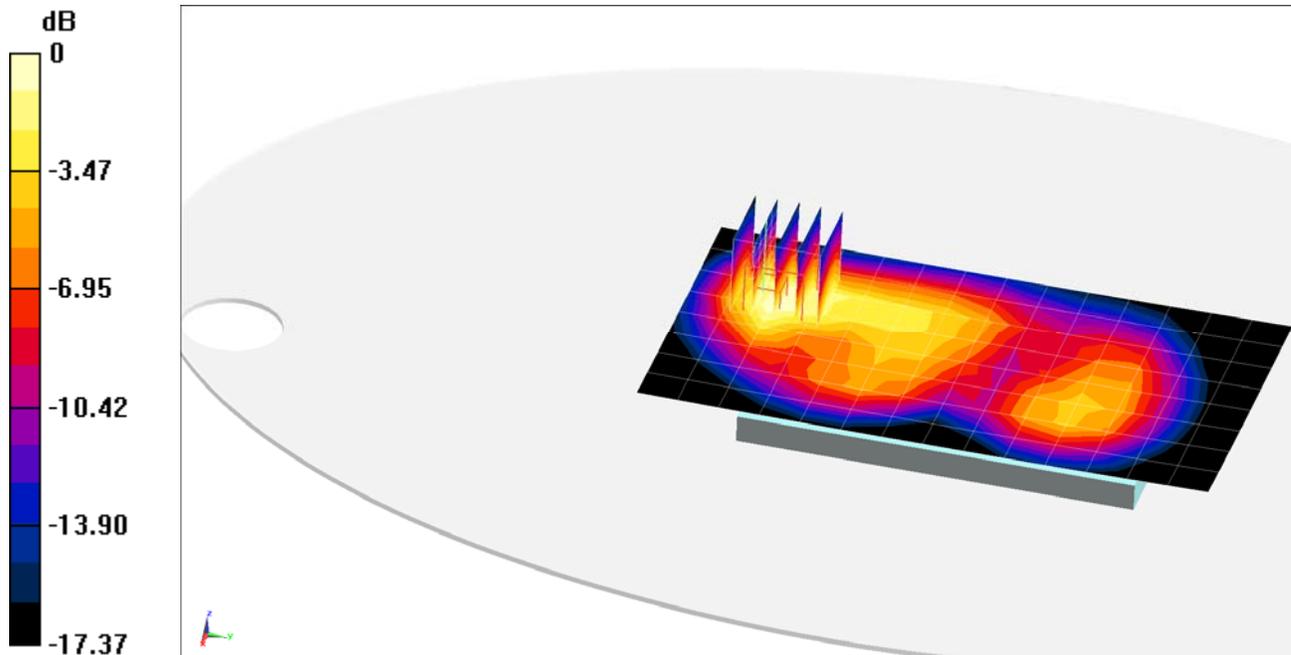
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1  
Medium: 1900 Body Medium parameters used:  
 $f = 1880 \text{ MHz}$ ;  $\sigma = 1.537 \text{ S/m}$ ;  $\epsilon_r = 51.957$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 21.8°C; Tissue Temp: 21.5°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014  
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: UMTS 1900, Body SAR, Front side, Mid.ch, Standard Cover**

**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 24.261 V/m; Power Drift = 0.00 dB  
Peak SAR (extrapolated) = 1.48 W/kg  
**SAR(1 g) = 0.789 W/kg**



0 dB = 0.977 W/kg = -0.10 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

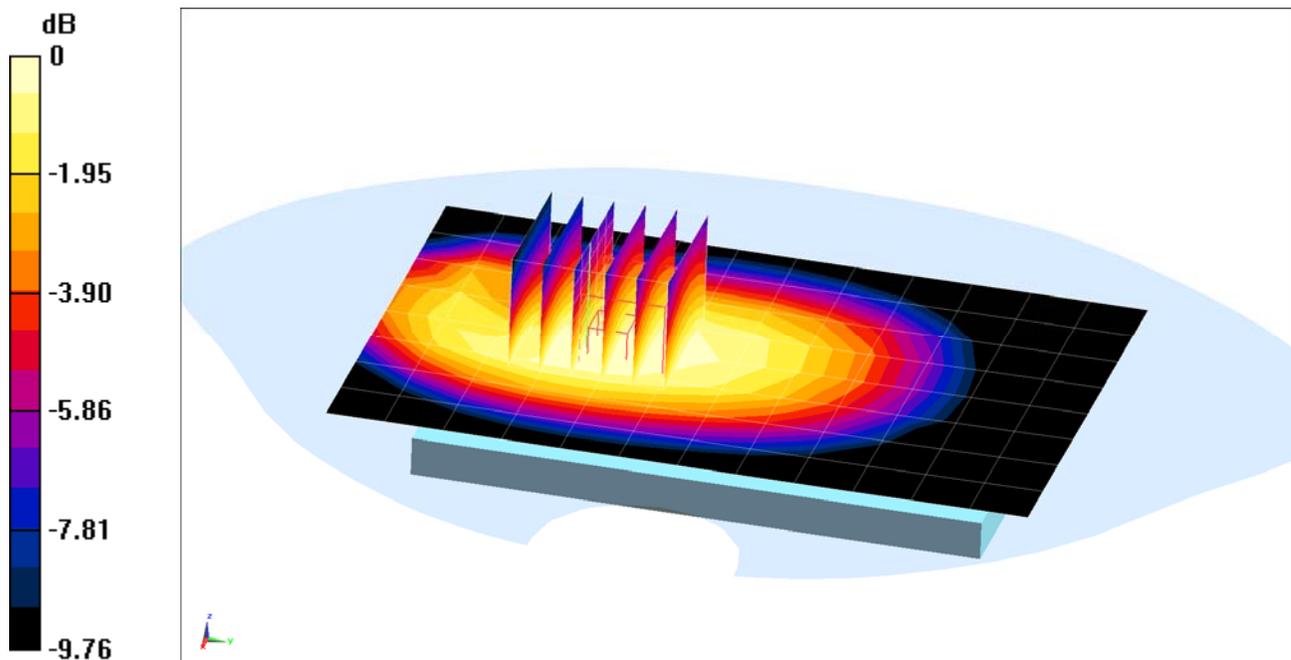
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1  
Medium: 750 Body Medium parameters used (interpolated):  
 $f = 707.5 \text{ MHz}$ ;  $\sigma = 0.934 \text{ S/m}$ ;  $\epsilon_r = 55.349$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-24-2015; Ambient Temp: 23.8°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3263; ConvF(6.19, 6.19, 6.19); Calibrated: 5/15/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn859; Calibrated: 5/14/2014  
Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

**Area Scan (9x13x1):** Measurement grid: dx=15mm, dy=15mm  
**Zoom Scan (6x6x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 23.658 V/m; Power Drift = 0.04 dB  
Peak SAR (extrapolated) = 0.632 W/kg  
**SAR(1 g) = 0.498 W/kg**



0 dB = 0.544 W/kg = -2.64 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

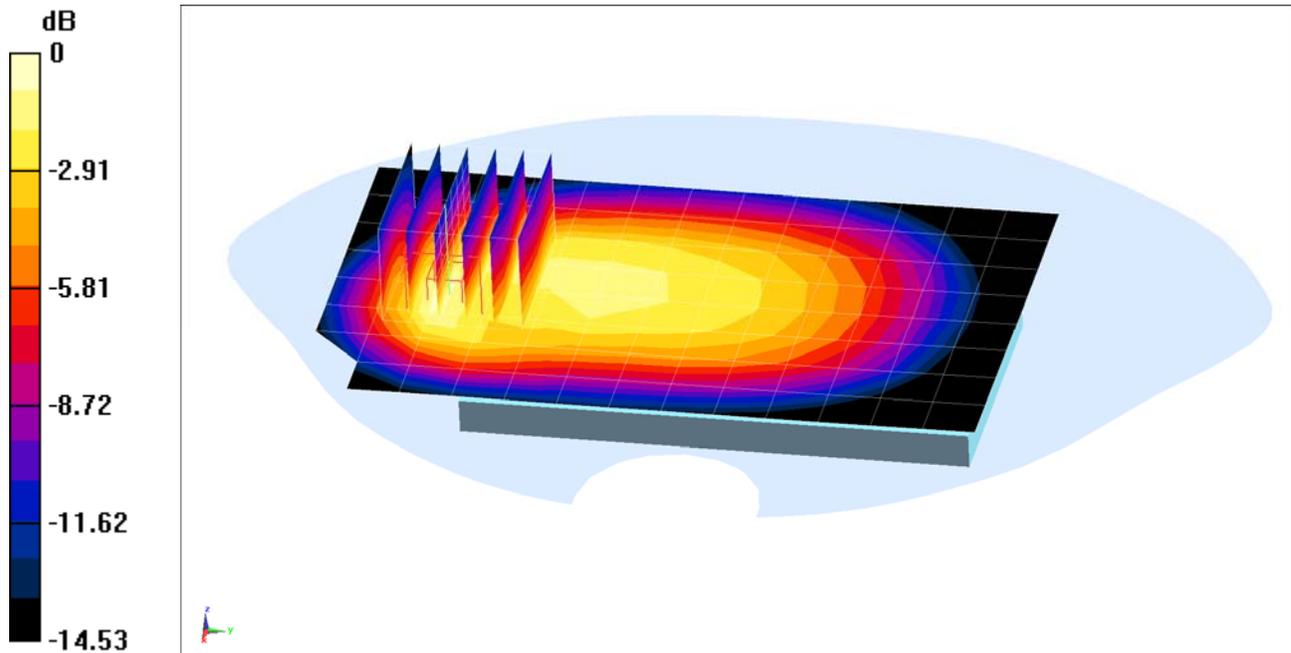
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1  
Medium: 750 Body Medium parameters used (interpolated):  
 $f = 707.5 \text{ MHz}$ ;  $\sigma = 0.934 \text{ S/m}$ ;  $\epsilon_r = 55.349$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-24-2015; Ambient Temp: 23.8°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3263; ConvF(6.19, 6.19, 6.19); Calibrated: 5/15/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn859; Calibrated: 5/14/2014  
Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 12, Body SAR, Front side, Mid.ch, Standard Cover  
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset**

**Area Scan (9x14x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (7x6x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 23.832 V/m; Power Drift = 0.00 dB  
Peak SAR (extrapolated) = 0.988 W/kg  
**SAR(1 g) = 0.558 W/kg**



0 dB = 0.695 W/kg = -1.58 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1  
Medium: 835 Body Medium parameters used (interpolated):  
 $f = 836.5 \text{ MHz}$ ;  $\sigma = 1.011 \text{ S/m}$ ;  $\epsilon_r = 54.518$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-18-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3288; ConvF(6.32, 6.32, 6.32); Calibrated: 9/24/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014  
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 5 (Cell.), Body SAR, Back Side, Mid.ch, Standard Cover  
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

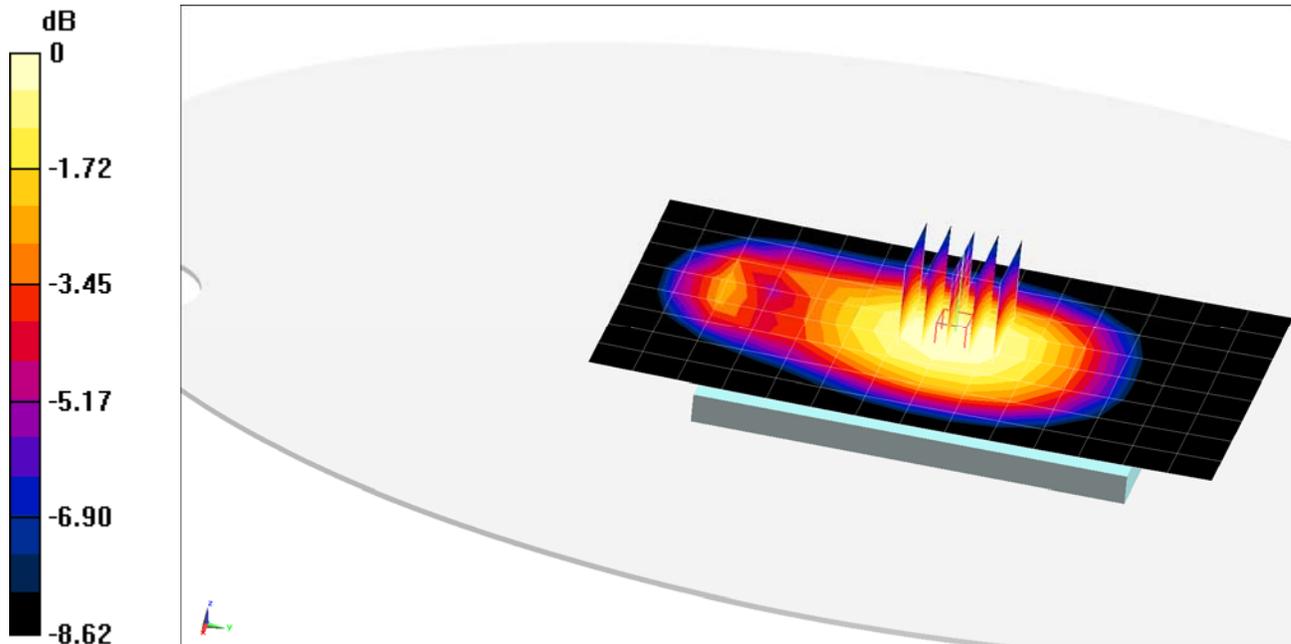
**Area Scan (9x15x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$

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

Reference Value = 23.651 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.669 W/kg

**SAR(1 g) = 0.526 W/kg**



0 dB = 0.578 W/kg = -2.38 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFF**

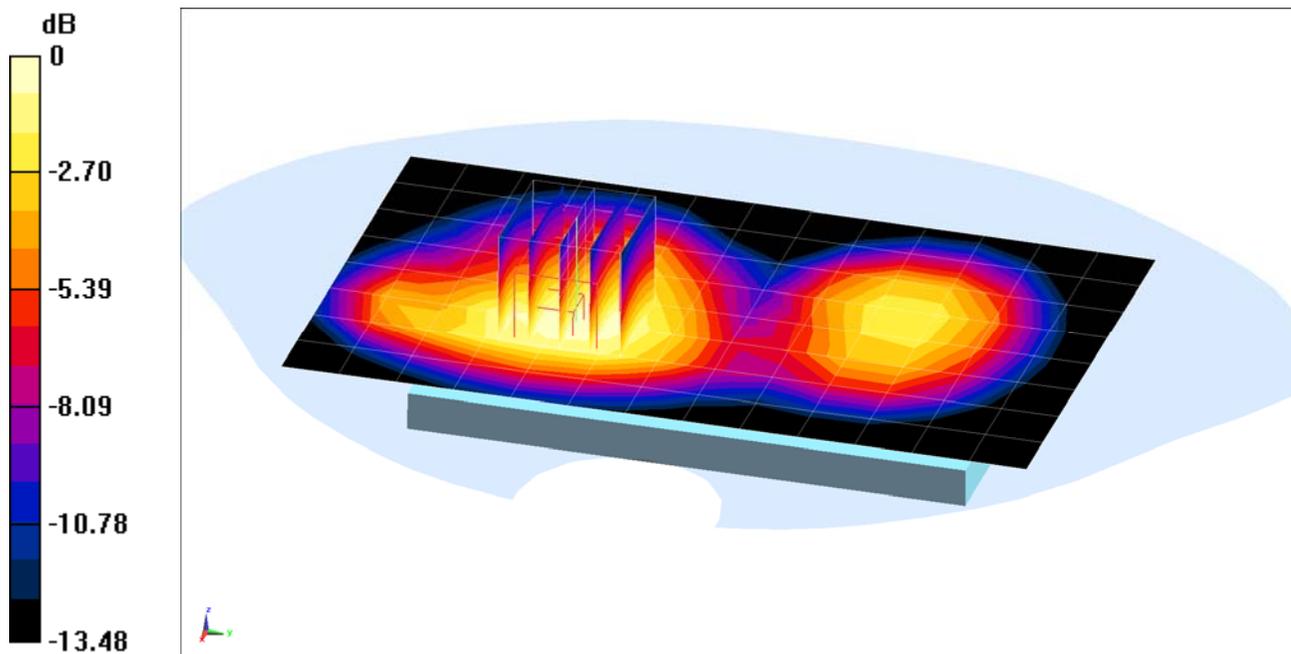
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium: 1750 Body Medium parameters used (interpolated):  
 $f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.457 \text{ S/m}$ ;  $\epsilon_r = 52.227$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.88, 4.88, 4.88); Calibrated: 9/18/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014  
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 4 (AWS), Body SAR, Back side, Mid.ch, Standard Cover**  
**20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

**Area Scan (9x14x1):** Measurement grid:  $dx=15\text{mm}$ ,  $dy=15\text{mm}$   
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 21.225 V/m; Power Drift = -0.12 dB  
Peak SAR (extrapolated) = 0.878 W/kg  
**SAR(1 g) = 0.599 W/kg**



0 dB = 0.680 W/kg = -1.67 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFF**

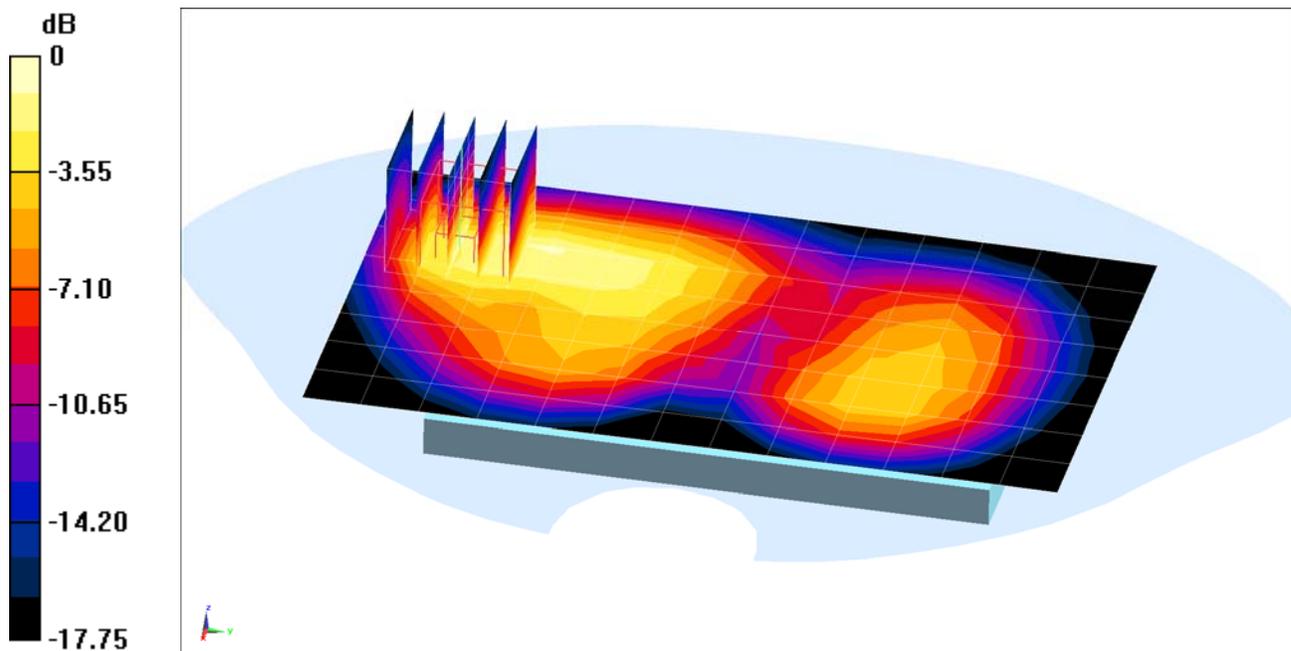
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1  
Medium: 1750 Body Medium parameters used (interpolated):  
 $f = 1732.5 \text{ MHz}$ ;  $\sigma = 1.457 \text{ S/m}$ ;  $\epsilon_r = 52.227$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.88, 4.88, 4.88); Calibrated: 9/18/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014  
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 4 (AWS), Body SAR, Front side, Mid.ch, Standard Cover,  
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

**Area Scan (9x14x1):** Measurement grid: dx=15mm, dy=15mm  
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm  
Reference Value = 24.046 V/m; Power Drift = -0.06 dB  
Peak SAR (extrapolated) = 1.33 W/kg  
**SAR(1 g) = 0.681 W/kg**



0 dB = 0.920 W/kg = -0.36 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.537 \text{ S/m}$ ;  $\epsilon_r = 51.957$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 21.8°C; Tissue Temp: 21.5°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 2 (PCS), Body SAR, Back side, Mid.ch, Standard Cover  
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

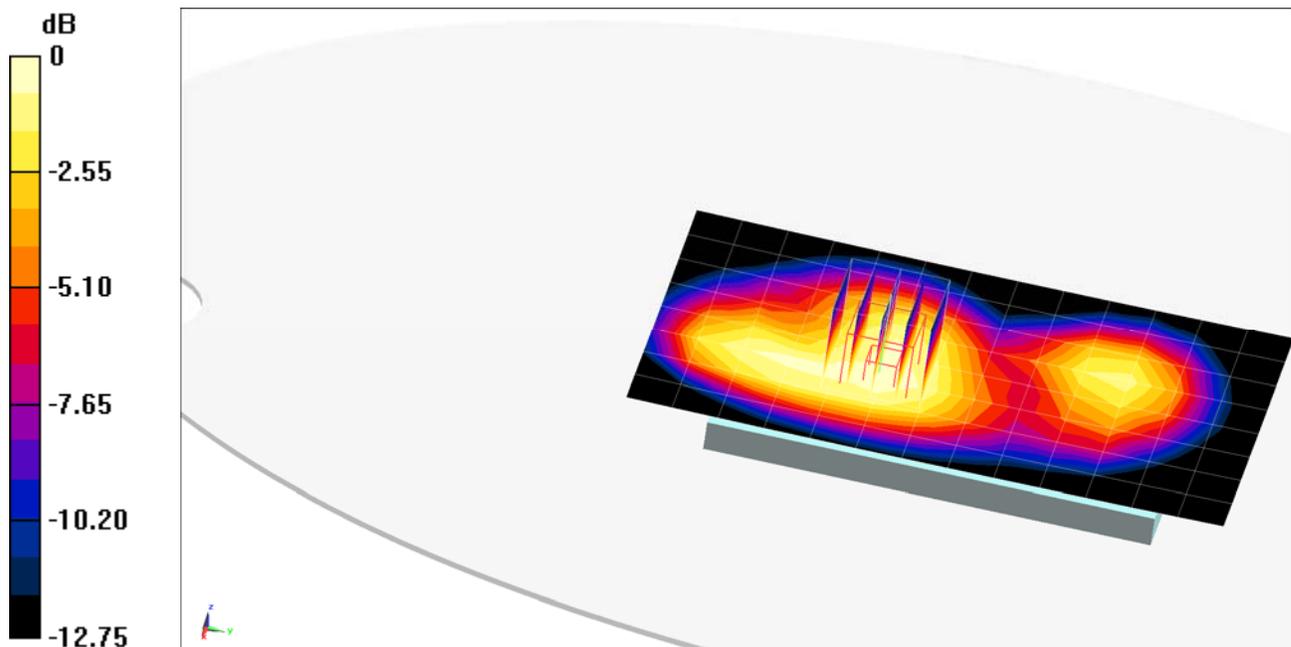
**Area Scan (9x14x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.790 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.702 W/kg

**SAR(1 g) = 0.486 W/kg**



0 dB = 0.559 W/kg = -2.53 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$ ;  $\sigma = 1.537 \text{ S/m}$ ;  $\epsilon_r = 51.957$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 21.8°C; Tissue Temp: 21.5°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 2 (PCS), Body SAR, Front side, Mid.ch, Standard Cover  
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

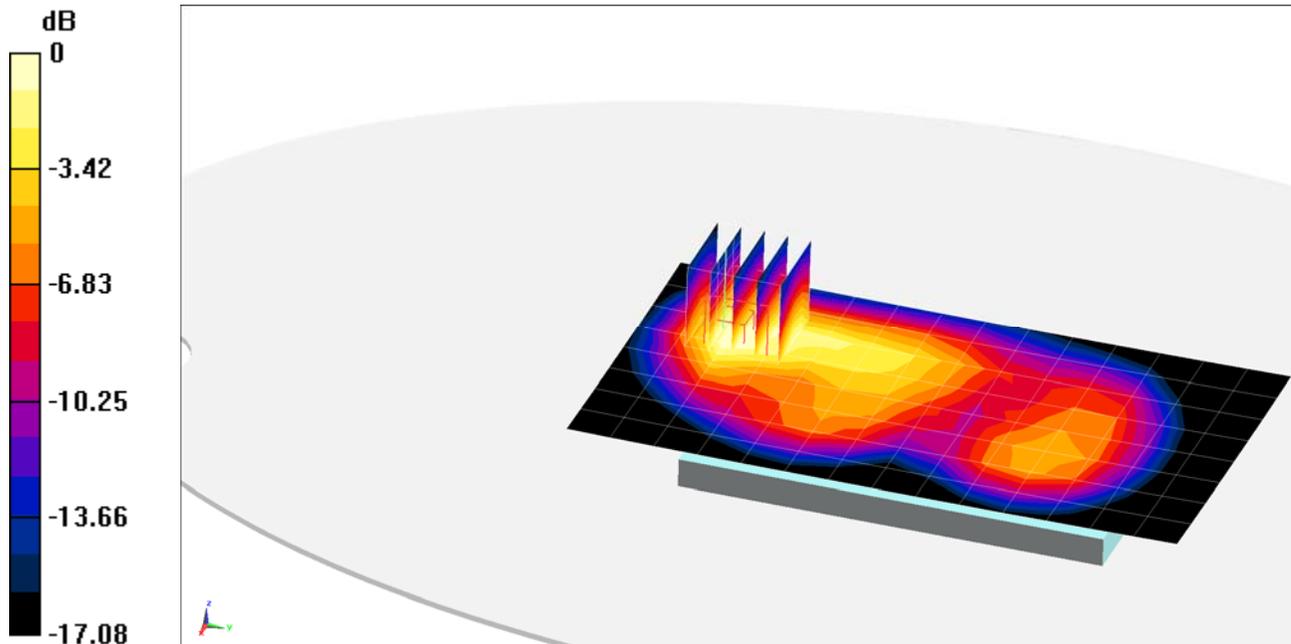
**Area Scan (9x15x1):** Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 23.725 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 1.57 W/kg

**SAR(1 g) = 0.837 W/kg**



0 dB = 1.01 W/kg = 0.04 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

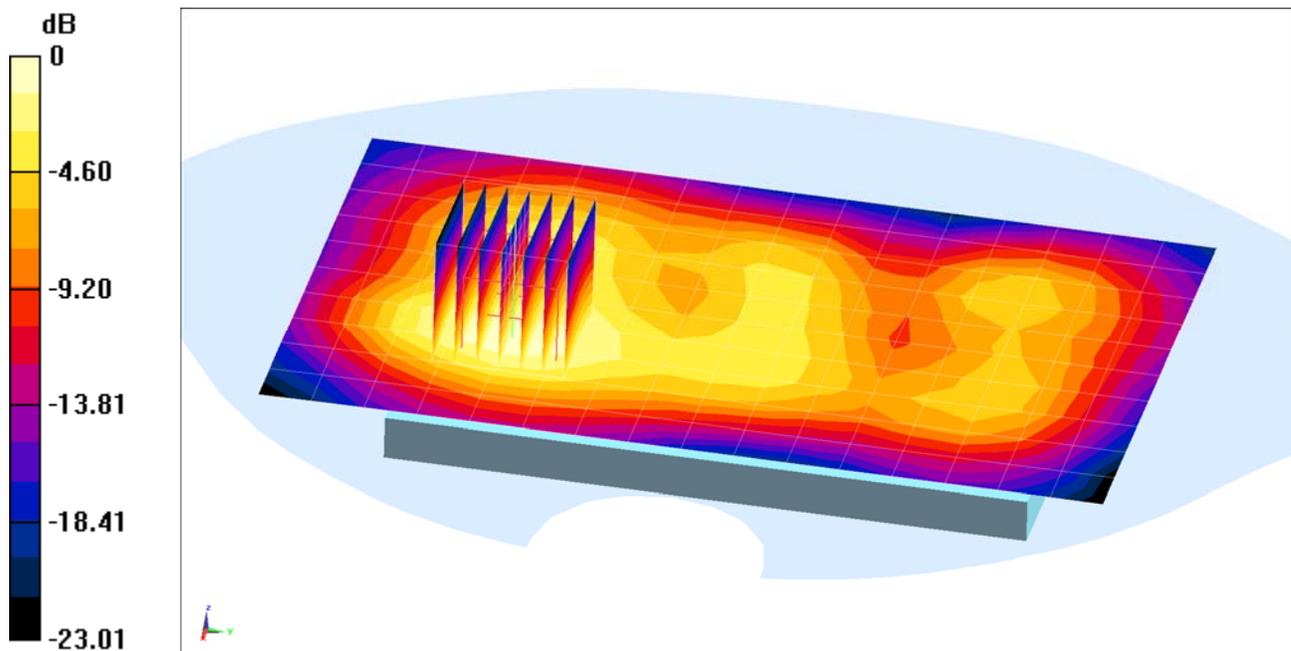
Communication System: UID 0, LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1  
Medium: 2450 Body Medium parameters used (interpolated):  
 $f = 2510 \text{ MHz}$ ;  $\sigma = 2.104 \text{ S/m}$ ;  $\epsilon_r = 50.563$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-17-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3213; ConvF(4.37, 4.37, 4.37); Calibrated: 1/20/2015;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015  
Phantom: SAM Front; Type: SAM; Serial: 1686  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 7, Body SAR, Back side, Low.ch, Standard Cover  
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

**Area Scan (11x17x1):** Measurement grid: dx=12mm, dy=12mm  
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 12.143 V/m; Power Drift = 0.05 dB  
Peak SAR (extrapolated) = 0.581 W/kg  
**SAR(1 g) = 0.284 W/kg**



0 dB = 0.356 W/kg = -4.49 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFP**

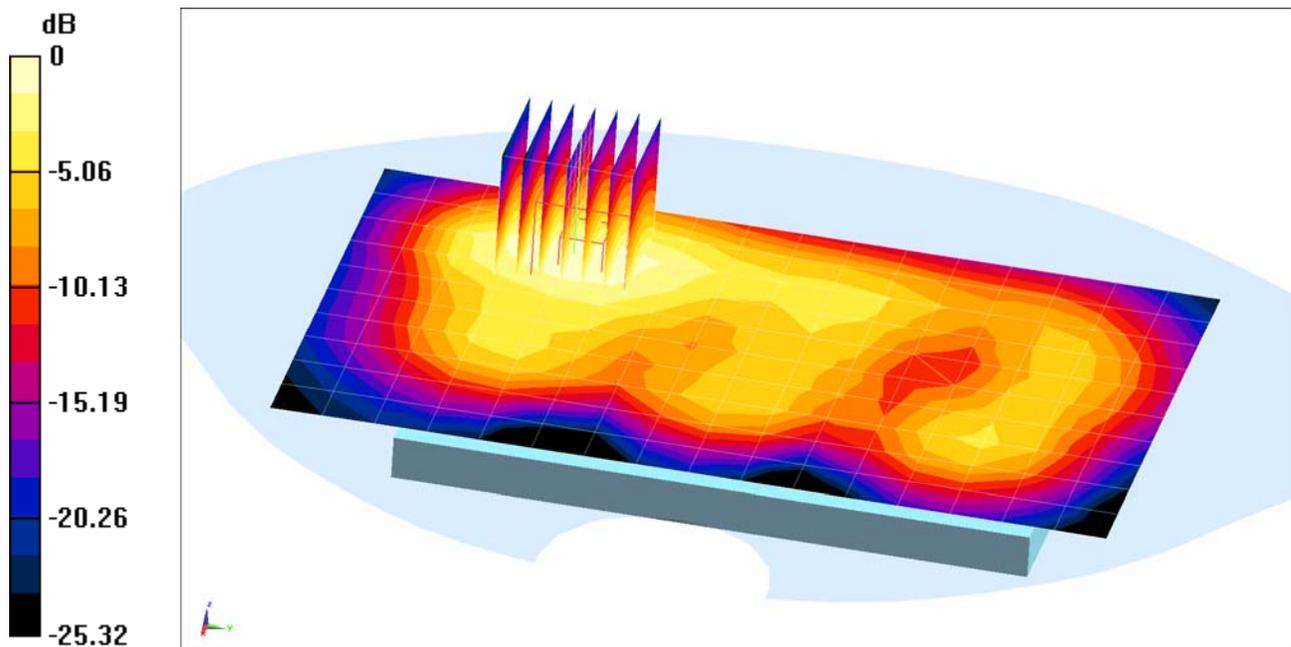
Communication System: UID 0, LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1  
Medium: 2450 Body Medium parameters used (interpolated):  
 $f = 2510 \text{ MHz}$ ;  $\sigma = 2.104 \text{ S/m}$ ;  $\epsilon_r = 50.563$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-17-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3213; ConvF(4.37, 4.37, 4.37); Calibrated: 1/20/2015  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015  
Phantom: SAM Front; Type: SAM; Serial: 1686  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 7, Body SAR, Front side, Low.ch, Standard Cover  
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

**Area Scan (11x17x1):** Measurement grid:  $dx=12\text{mm}$ ,  $dy=12\text{mm}$   
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid:  $dx=5\text{mm}$ ,  $dy=5\text{mm}$ ,  $dz=5\text{mm}$   
Reference Value = 13.483 V/m; Power Drift = -0.06 dB  
Peak SAR (extrapolated) = 0.667 W/kg  
**SAR(1 g) = 0.343 W/kg**



0 dB = 0.433 W/kg = -3.64 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFFC**

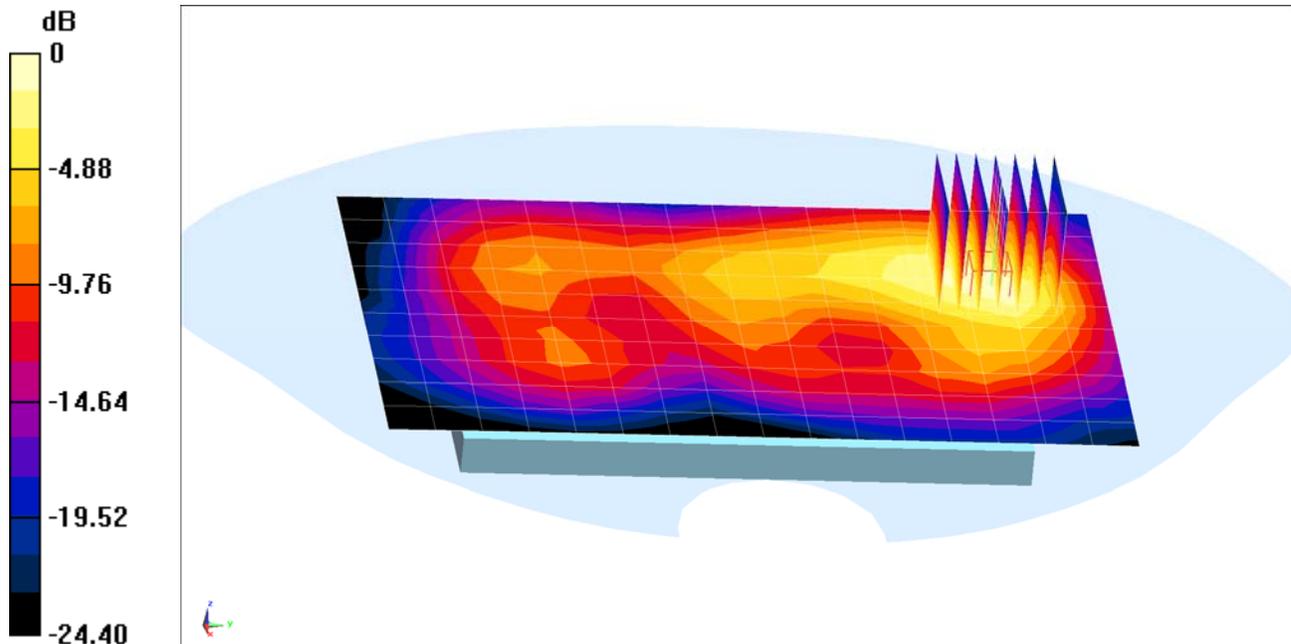
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1  
Medium: 2450 Body Medium parameters used (interpolated):  
 $f = 2437 \text{ MHz}$ ;  $\sigma = 2.009 \text{ S/m}$ ;  $\epsilon_r = 50.848$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-17-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3213; ConvF(4.37, 4.37, 4.37); Calibrated: 1/20/2015;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1407; Calibrated: 1/19/2015  
Phantom: SAM Front; Type: SAM; Serial: 1686  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11b, Body SAR, Back Side, Ch 6, 1 Mbps, Standard Cover**

**Area Scan (11x17x1):** Measurement grid: dx=12mm, dy=12mm  
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm  
Reference Value = 11.808 V/m; Power Drift = -0.04 dB  
Peak SAR (extrapolated) = 0.518 W/kg  
**SAR(1 g) = 0.245 W/kg**



0 dB = 0.318 W/kg = -4.98 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFWD**

Communication System: UID 0, IEEE 802.11a; Frequency: 5260 MHz; Duty Cycle: 1:1

Medium: 5GHz Body Medium parameters used:

$f = 5260 \text{ MHz}$ ;  $\sigma = 5.475 \text{ S/m}$ ;  $\epsilon_r = 47.984$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3914; ConvF(4.33, 4.33, 4.33); Calibrated: 2/10/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/31/2014

Phantom: SAM Sub ; Type: QD000P40CC; Serial: TP:1357

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11a, 5.3 GHz, Body SAR, Back Side, Ch 52, 6 Mbps, Quick Cover Closed**

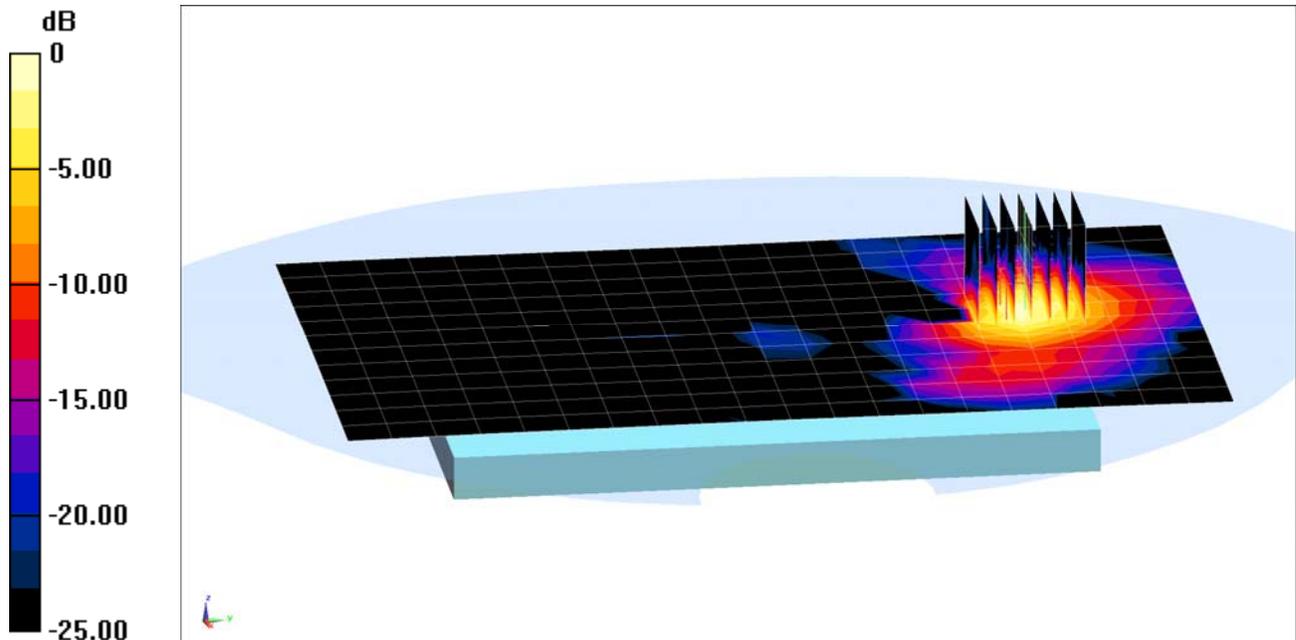
**Area Scan (13x21x1):** Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 6.435 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.959 W/kg

**SAR(1 g) = 0.239 W/kg**



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

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFWD**

Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5825 MHz; Duty Cycle: 1:1

Medium: 5GHz Body Medium parameters used:

$f = 5825 \text{ MHz}$ ;  $\sigma = 6.192 \text{ S/m}$ ;  $\epsilon_r = 47.018$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3914; ConvF(4.01, 4.01, 4.01); Calibrated: 2/10/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/31/2014

Phantom: SAM Sub ; Type: QD000P40CC; Serial: TP:1357

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11a, 5.8 GHz, Body SAR, Top Edge, Ch 165, 6 Mbps, Standard Cover**

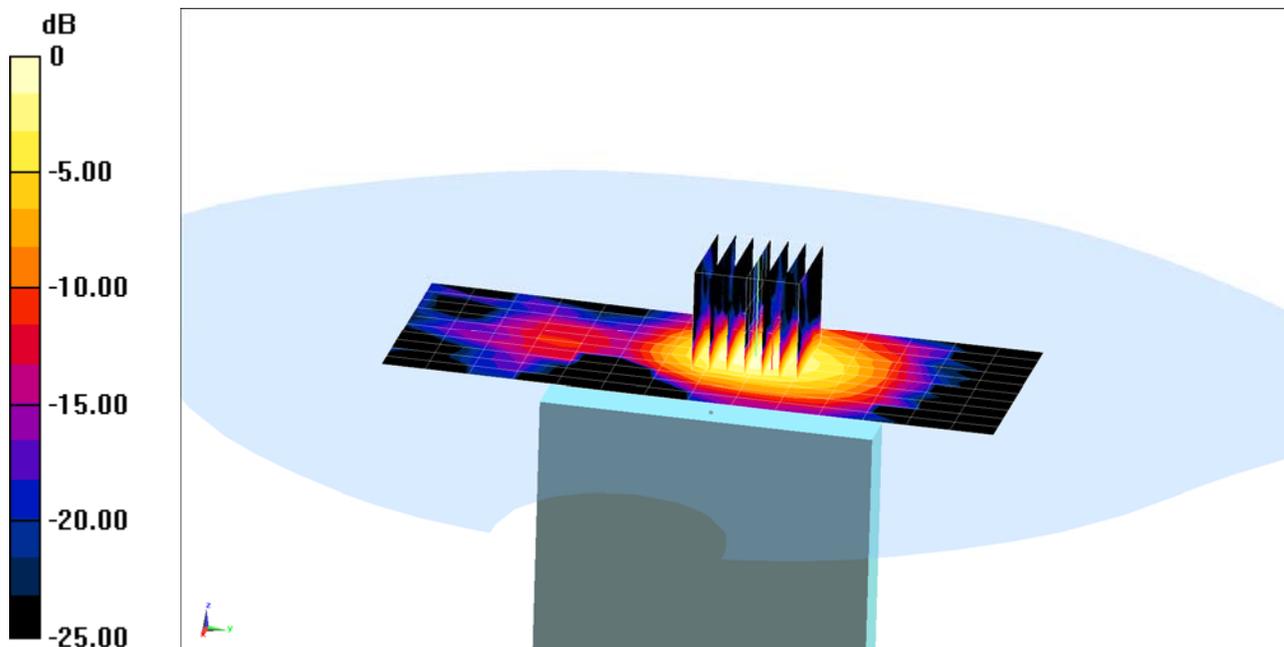
**Area Scan (11x15x1):** Measurement grid: dx=5mm, dy=10mm

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

Reference Value = 4.278 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.470 W/kg

**SAR(1 g) = 0.108 W/kg**



0 dB = 0.271 W/kg = -5.67 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: ZNFH811; Type: Portable Handset; Serial: 1TFWD**

Communication System: UID 0, IEEE 802.11a; Frequency: 5260 MHz; Duty Cycle: 1:1

Medium: 5GHz Body Medium parameters used:

$f = 5260 \text{ MHz}$ ;  $\sigma = 5.475 \text{ S/m}$ ;  $\epsilon_r = 47.984$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 03-23-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3914; ConvF(4.33, 4.33, 4.33); Calibrated: 2/10/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/31/2014

Phantom: SAM Sub ; Type: QD000P40CC; Serial: TP:1357

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11a, 5.3 GHz, Extremity SAR, Top Edge, Ch 52, 6 Mbps, Standard Cover**

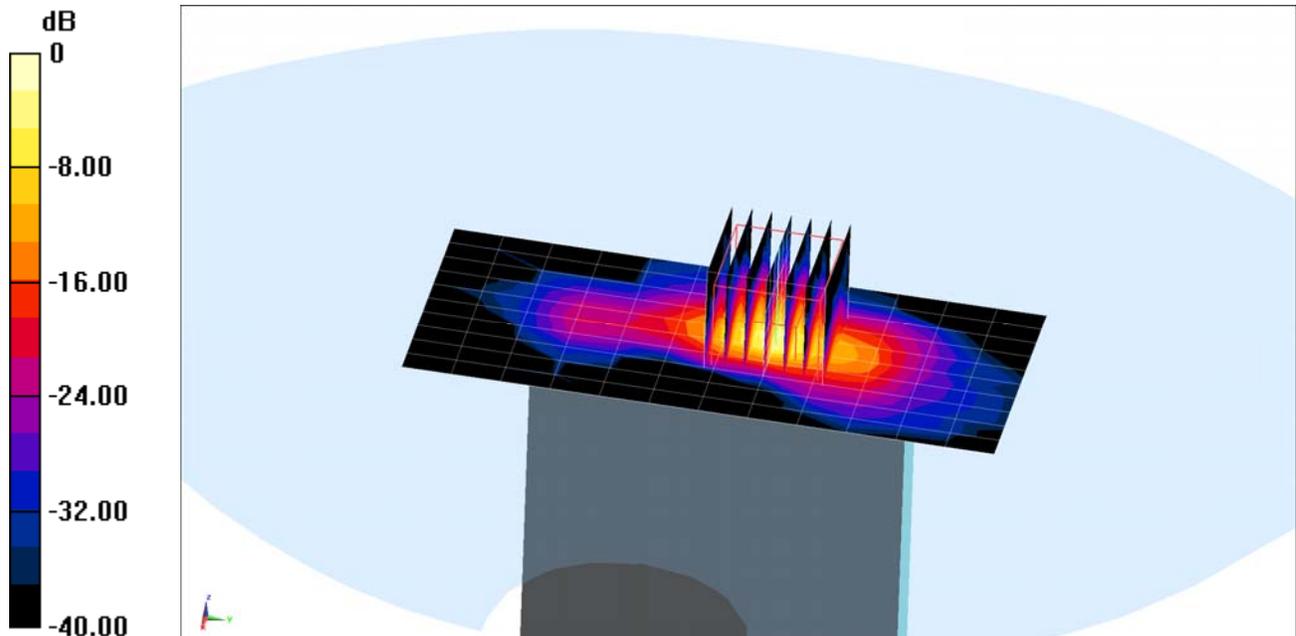
**Area Scan (11x13x1):** Measurement grid: dx=5mm, dy=10mm

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

Reference Value = 25.990 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 17.1 W/kg

**SAR(10 g) = 0.459 W/kg**



0 dB = 9.31 W/kg = 9.69 dBW/kg

## APPENDIX B: SYSTEM VERIFICATION

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$ ;  $\sigma = 0.907 \text{ S/m}$ ;  $\epsilon_r = 40.97$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-25-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.9°C

Probe: ES3DV2 - SN3022; ConvF(6.39, 6.39, 6.39); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 750 MHz System Verification

**Area Scan (7x15x1):** Measurement grid: dx=15mm, dy=15mm

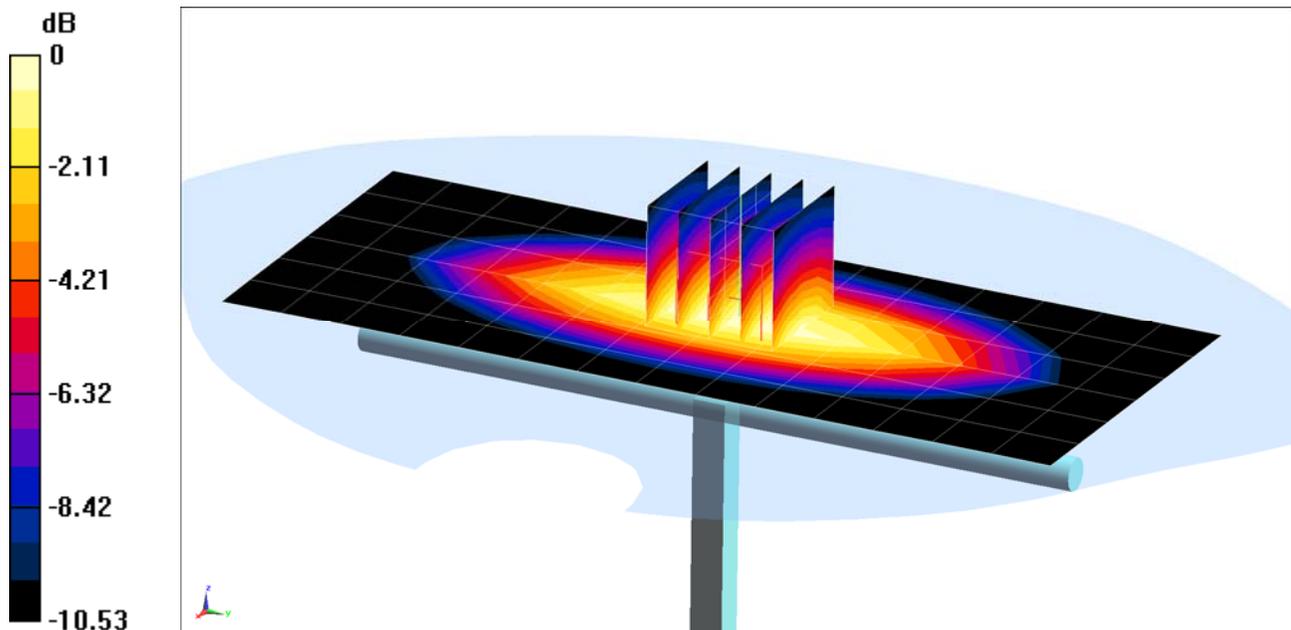
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.27 W/kg

**SAR(1 g) = 0.856 W/kg**

Deviation(1 g) = 5.81%



0 dB = 1.00 W/kg = 0.00 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$ ;  $\sigma = 0.911 \text{ S/m}$ ;  $\epsilon_r = 41.496$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-17-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(6.18, 6.18, 6.18); Calibrated: 8/19/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/12/2014

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 835 MHz System Verification

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

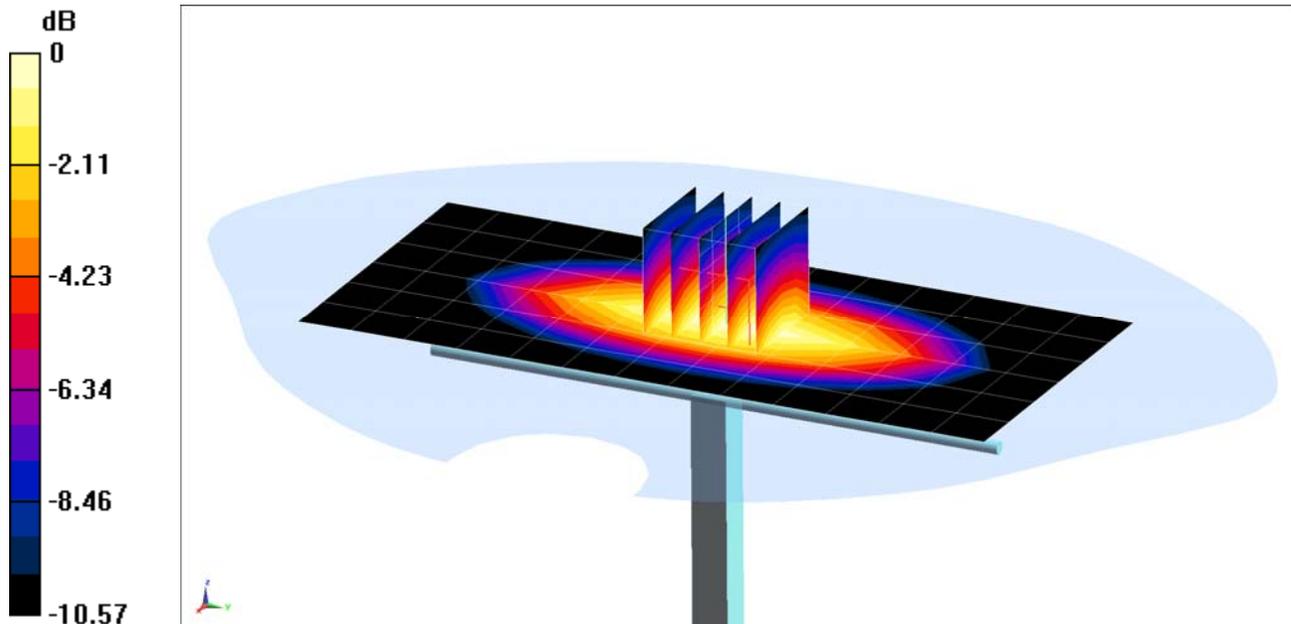
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid:  $dx=8\text{mm}$ ,  $dy=8\text{mm}$ ,  $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.37 W/kg

**SAR(1 g) = 0.927 W/kg**

Deviation(1 g) = 0.54%



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

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.409 \text{ S/m}$ ;  $\epsilon_r = 38.615$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 22.3°C; Tissue Temp: 20.4°C

Probe: ES3DV3 - SN3334; ConvF(5.21, 5.21, 5.21); Calibrated: 12/16/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 12/12/2014

Phantom: Sub Twin Sam v5.0; Type: QD000P40CD; Serial: TP:1626

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 1750 MHz System Verification

**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm

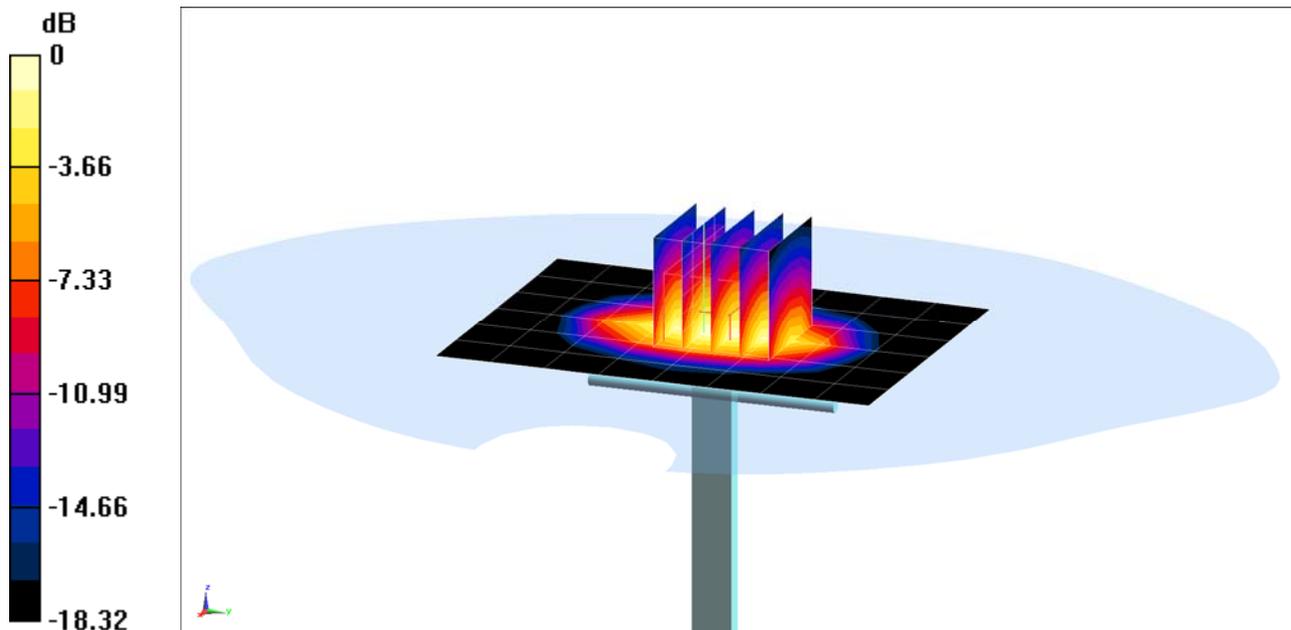
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.05 W/kg

**SAR(1 g) = 3.86 W/kg**

Deviation(1 g) = 6.63%



0 dB = 4.81 W/kg = 6.82 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900$  MHz;  $\sigma = 1.404$  S/m;  $\epsilon_r = 39.495$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-26-2015; Ambient Temp: 23.9°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3333; ConvF(5.11, 5.11, 5.11); Calibrated: 10/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 10/23/2014

Phantom: Main TWIN SAM; Type: QD000P40CC; Serial: TP-1406

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 1900 MHz System Verification

**Area Scan (7x10x1):** Measurement grid: dx=15mm, dy=15mm

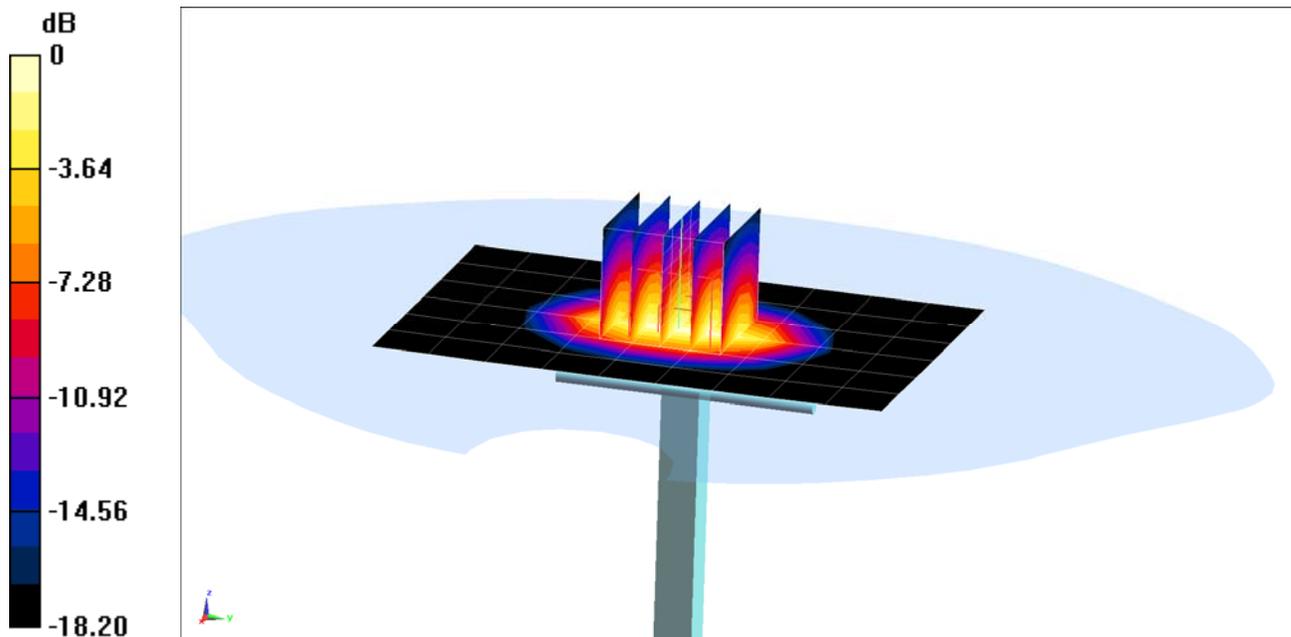
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.31 W/kg

**SAR(1 g) = 3.99 W/kg**

Deviation(1 g) = -1.72%



0 dB = 5.13 W/kg = 7.10 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Head Medium parameters used:

$f = 2450$  MHz;  $\sigma = 1.876$  S/m;  $\epsilon_r = 39.599$ ;  $\rho = 1000$  kg/m<sup>3</sup>

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-27-2015; Ambient Temp: 24.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3332; ConvF(4.49, 4.49, 4.49); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 2450 MHz System Verification

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

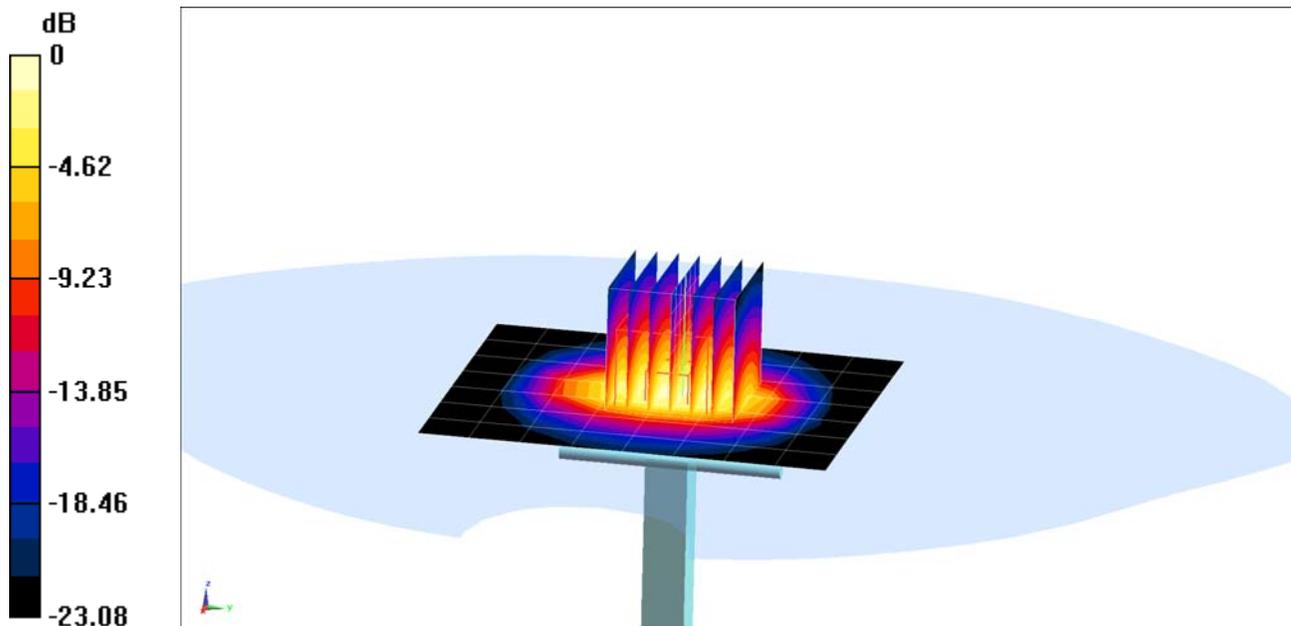
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 11.4 W/kg

**SAR(1 g) = 5.39 W/kg**

Deviation(1 g) = 3.45%



0 dB = 7.05 W/kg = 8.48 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5GHz Medium parameters used:

$f = 5200 \text{ MHz}$ ;  $\sigma = 4.582 \text{ S/m}$ ;  $\epsilon_r = 36.798$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-26-2015; Ambient Temp: 21.4°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN3920; ConvF(4.87, 4.87, 4.87); Calibrated: 12/12/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5200 MHz System Verification

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

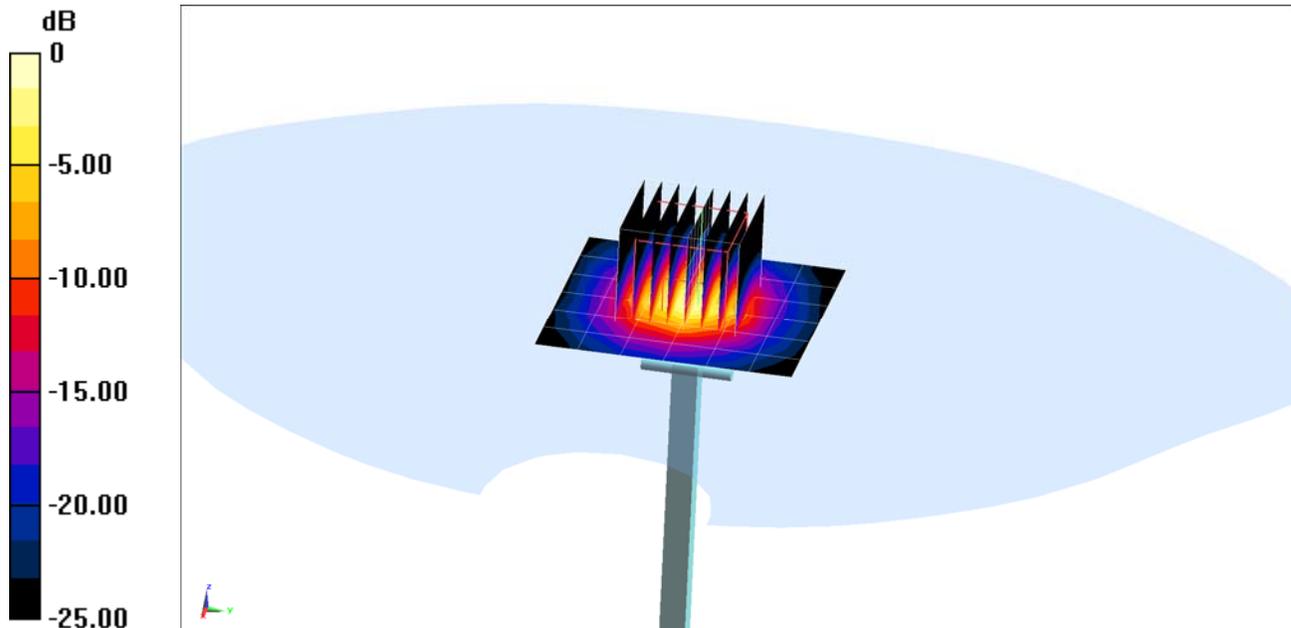
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 14.9 W/kg

**SAR(1 g) = 3.71 W/kg**

Deviation(1 g) = -8.96%



0 dB = 8.45 W/kg = 9.27 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5GHz Medium parameters used:

$f = 5300 \text{ MHz}$ ;  $\sigma = 4.691 \text{ S/m}$ ;  $\epsilon_r = 36.654$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-26-2015; Ambient Temp: 21.5°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN3920; ConvF(4.69, 4.69, 4.69); Calibrated: 12/12/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5300 MHz System Verification

**Area Scan (7x8x1):** Measurement grid: dx=10mm, dy=10mm

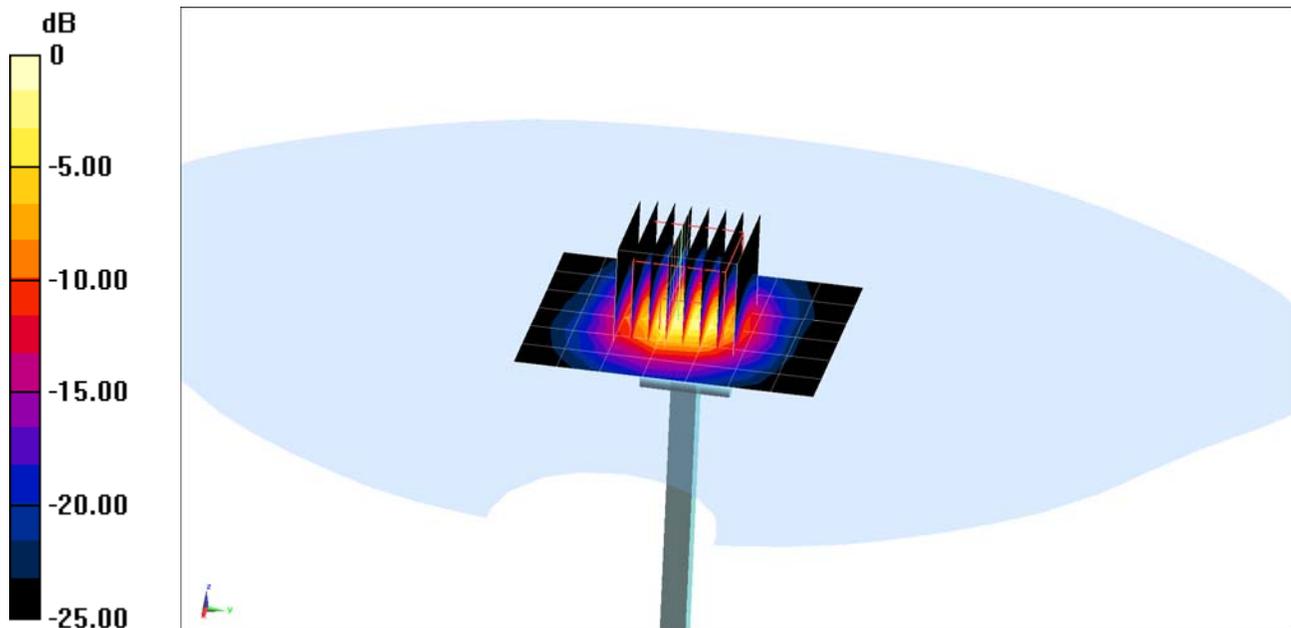
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 16.8 W/kg

**SAR(1 g) = 4.06 W/kg**

Deviation(1 g) = -4.13%



0 dB = 9.34 W/kg = 9.70 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5GHz Medium parameters used:

$f = 5500 \text{ MHz}$ ;  $\sigma = 4.868 \text{ S/m}$ ;  $\epsilon_r = 36.398$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-26-2015; Ambient Temp: 21.6°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN3920; ConvF(4.44, 4.44, 4.44); Calibrated: 12/12/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5500 MHz System Verification

**Area Scan (7x7x1):** 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 = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 16.4 W/kg

**SAR(1 g) = 3.87 W/kg**

Deviation(1 g) = -8.19%



0 dB = 9.10 W/kg = 9.59 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5GHz Medium parameters used:

$f = 5600 \text{ MHz}$ ;  $\sigma = 4.987 \text{ S/m}$ ;  $\epsilon_r = 36.259$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-26-2015; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN3920; ConvF(4.35, 4.35, 4.35); Calibrated: 12/12/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5600 MHz System Verification

**Area Scan (7x7x1):** 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 = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 17.0 W/kg

**SAR(1 g) = 3.95 W/kg**

Deviation(1 g) = -5.73%



0 dB = 9.38 W/kg = 9.72 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5GHz Medium parameters used:

$f = 5800 \text{ MHz}$ ;  $\sigma = 5.201 \text{ S/m}$ ;  $\epsilon_r = 35.955$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-26-2015; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN3920; ConvF(4.27, 4.27, 4.27); Calibrated: 12/12/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

Phantom: SAM, Left; Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5800 MHz System Verification

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

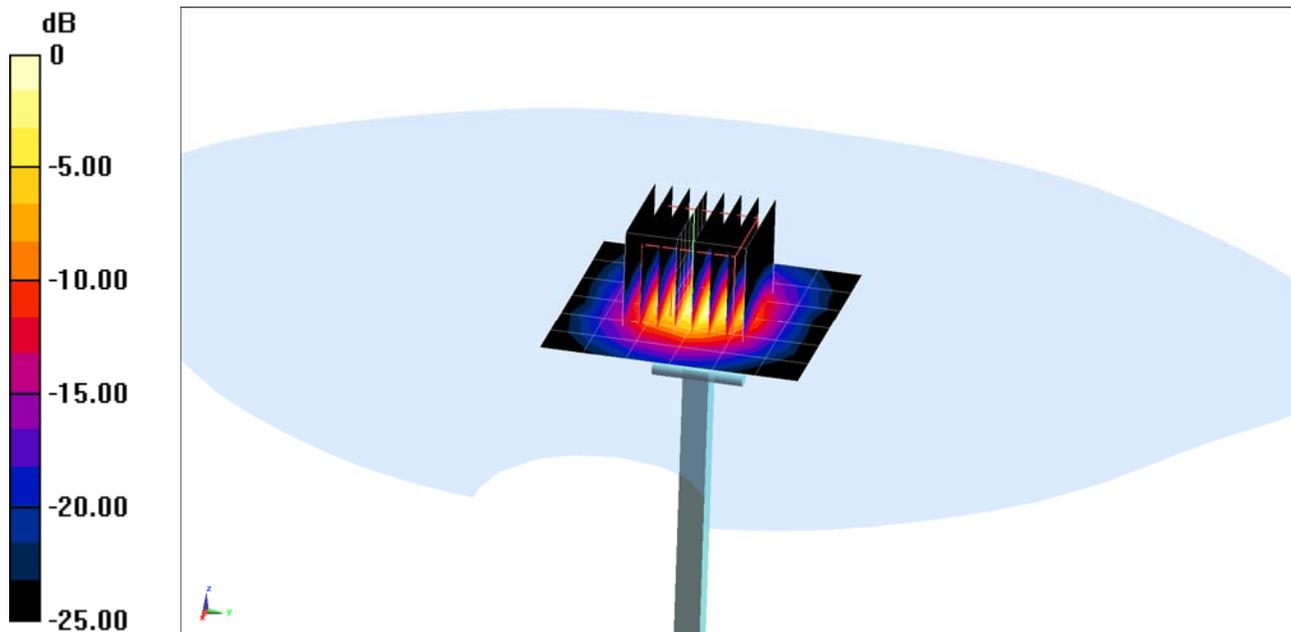
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid:  $dx=4\text{mm}$ ,  $dy=4\text{mm}$ ,  $dz=1.4\text{mm}$ ; Graded Ratio: 1.4

Input Power = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 17.9 W/kg

**SAR(1 g) = 3.99 W/kg**

Deviation(1 g) = -1.60%



0 dB = 9.57 W/kg = 9.81 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$ ;  $\sigma = 0.973 \text{ S/m}$ ;  $\epsilon_r = 54.927$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-24-2015; Ambient Temp: 23.8°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3263; ConvF(6.19, 6.19, 6.19); Calibrated: 5/15/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/14/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 750 MHz System Verification

**Area Scan (7x15x1):** Measurement grid: dx=15mm, dy=15mm

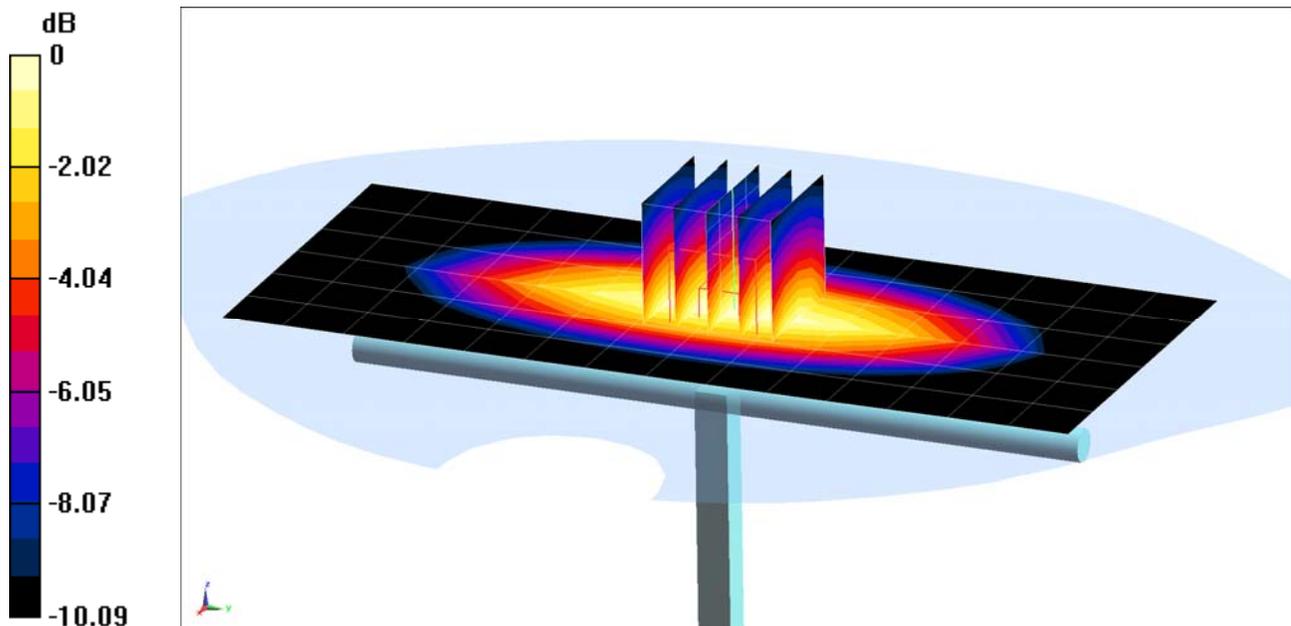
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.35 W/kg

**SAR(1 g) = 0.916 W/kg**

Deviation(1 g) = 8.27%



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

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$ ;  $\sigma = 0.955 \text{ S/m}$ ;  $\epsilon_r = 53.888$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-16-2015; Ambient Temp: 24.4°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3333; ConvF(6.12, 6.12, 6.12); Calibrated: 10/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 10/23/2014

Phantom: Sub TWIN SAM; Type: QD000P40CC; Serial: TP-1357

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 835 MHz System Verification

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

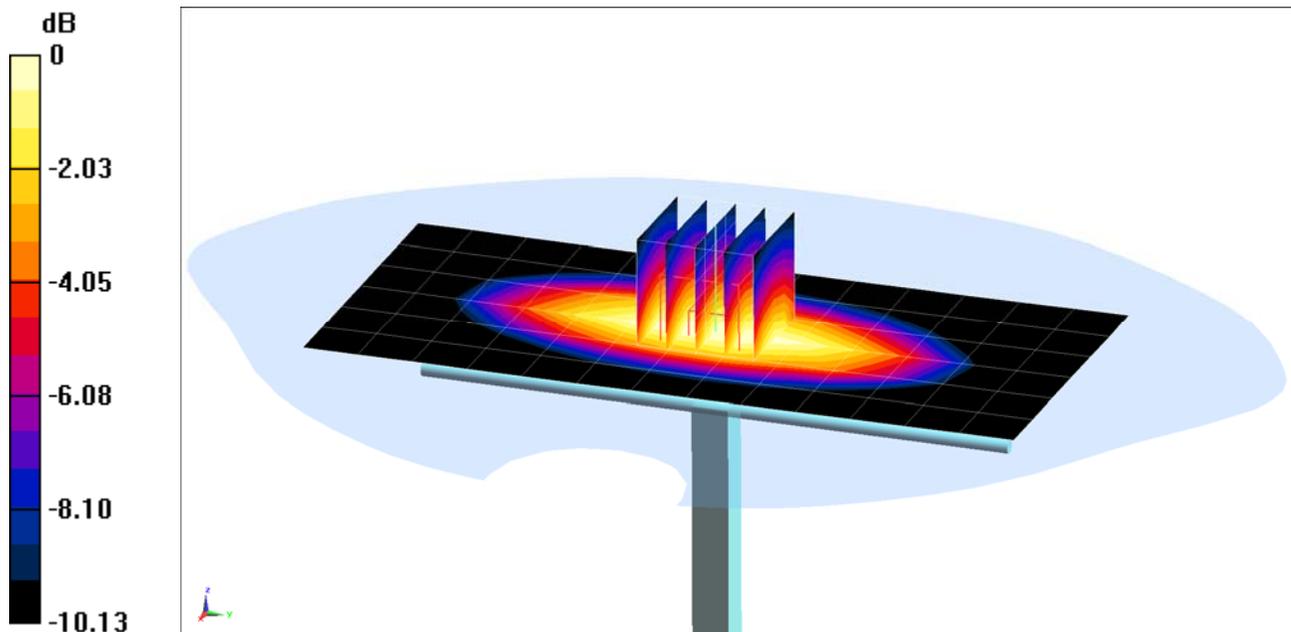
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.40 W/kg

**SAR(1 g) = 0.961 W/kg**

Deviation(1 g) = 5.14%



0 dB = 1.12 W/kg = 0.49 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$ ;  $\sigma = 1.01 \text{ S/m}$ ;  $\epsilon_r = 54.531$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 03-18-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3288; ConvF(6.32, 6.32, 6.32); Calibrated: 9/24/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 9/18/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 835 MHz System Verification

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

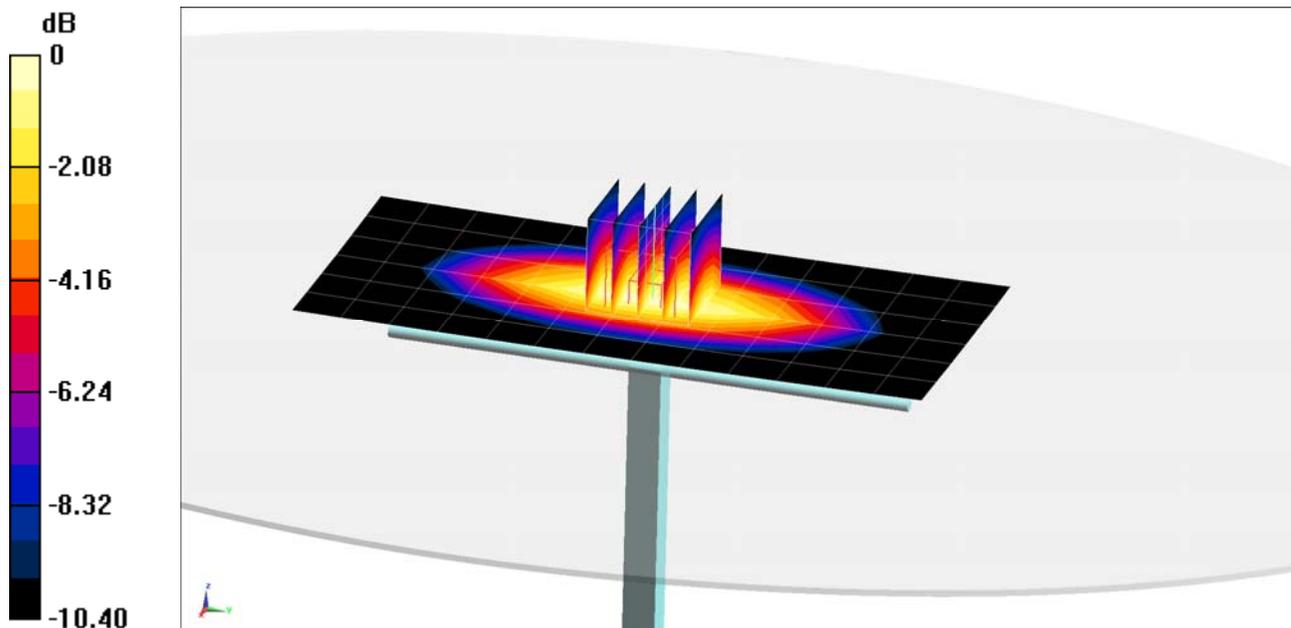
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.49 W/kg

**SAR(1 g) = 1.01 W/kg**

Deviation(1 g) = 8.14%



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

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1008**

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

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$ ;  $\sigma = 1.477 \text{ S/m}$ ;  $\epsilon_r = 52.15$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 22.4°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.88, 4.88, 4.88); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 1750 MHz System Verification

**Area Scan (7x9x1):** Measurement grid: dx=15mm, dy=15mm

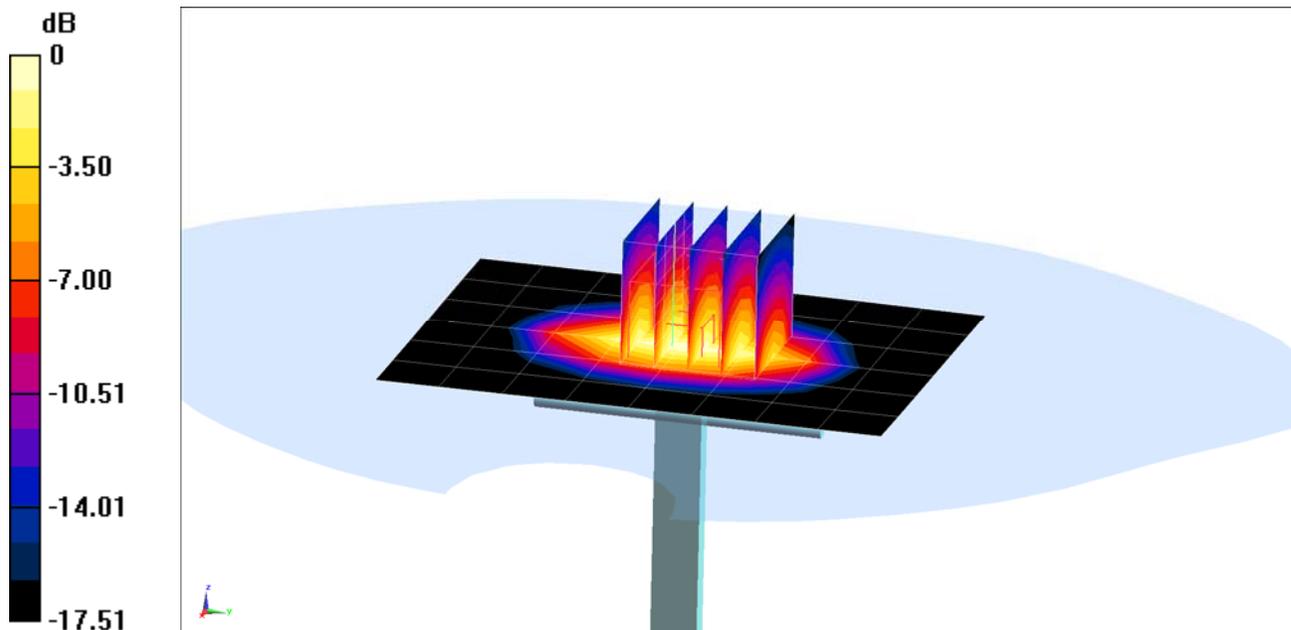
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 6.16 W/kg

**SAR(1 g) = 3.52 W/kg**

Deviation(1 g) = -6.38%



0 dB = 4.37 W/kg = 6.40 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$ ;  $\sigma = 1.557 \text{ S/m}$ ;  $\epsilon_r = 51.858$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-16-2015; Ambient Temp: 23.6°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3332; ConvF(4.64, 4.64, 4.64); Calibrated: 9/18/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2014

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 1900 MHz System Verification

**Area Scan (7x10x1):** Measurement grid: dx=15mm, dy=15mm

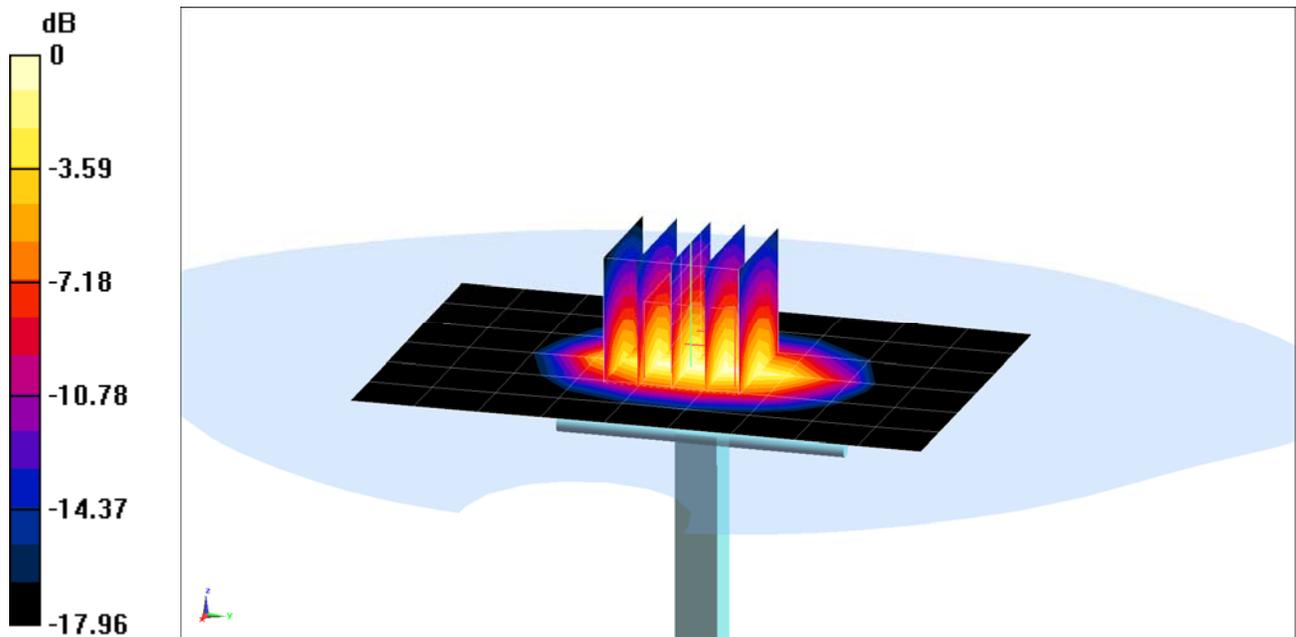
**Zoom Scan (5x5x7)/Cube 0:** Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.55 W/kg

**SAR(1 g) = 4.28 W/kg**

Deviation(1 g) = 5.94%



0 dB = 5.35 W/kg = 7.28 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

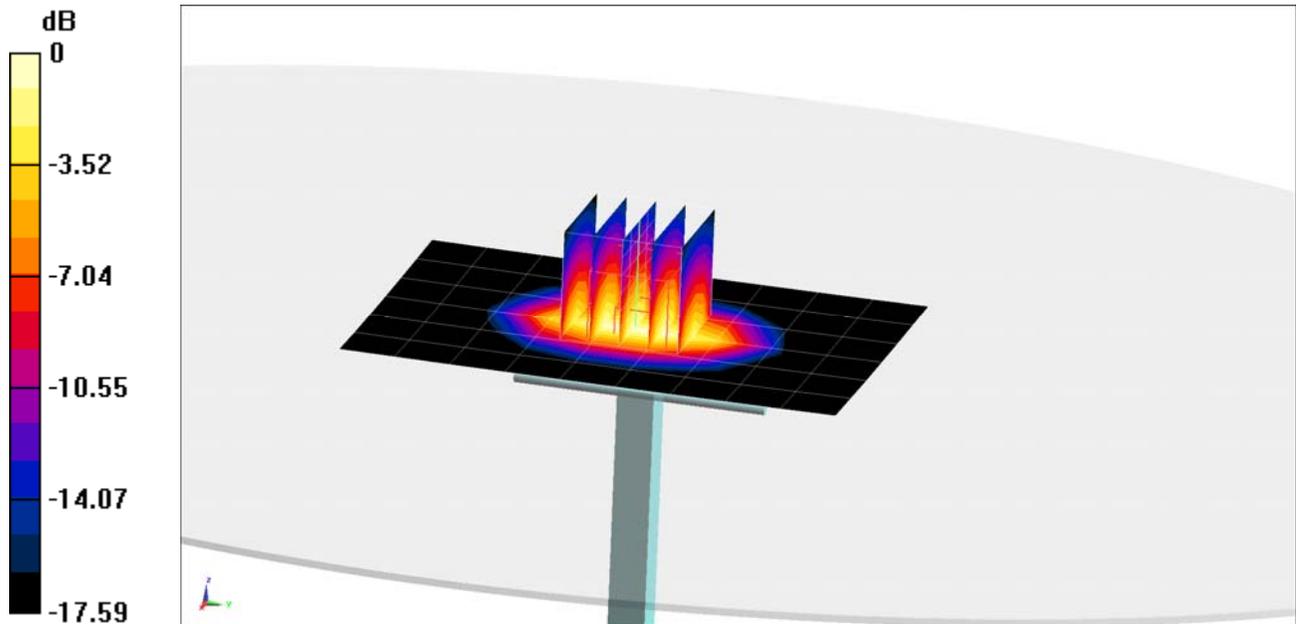
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium: 1900 Body Medium parameters used (interpolated):  
 $f = 1900 \text{ MHz}$ ;  $\sigma = 1.562 \text{ S/m}$ ;  $\epsilon_r = 51.867$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 21.8°C; Tissue Temp: 21.5°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014  
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 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) = 7.54 W/kg  
**SAR(1 g) = 4.31 W/kg**  
Deviation(1 g) = 6.16%



0 dB = 5.45 W/kg = 7.36 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

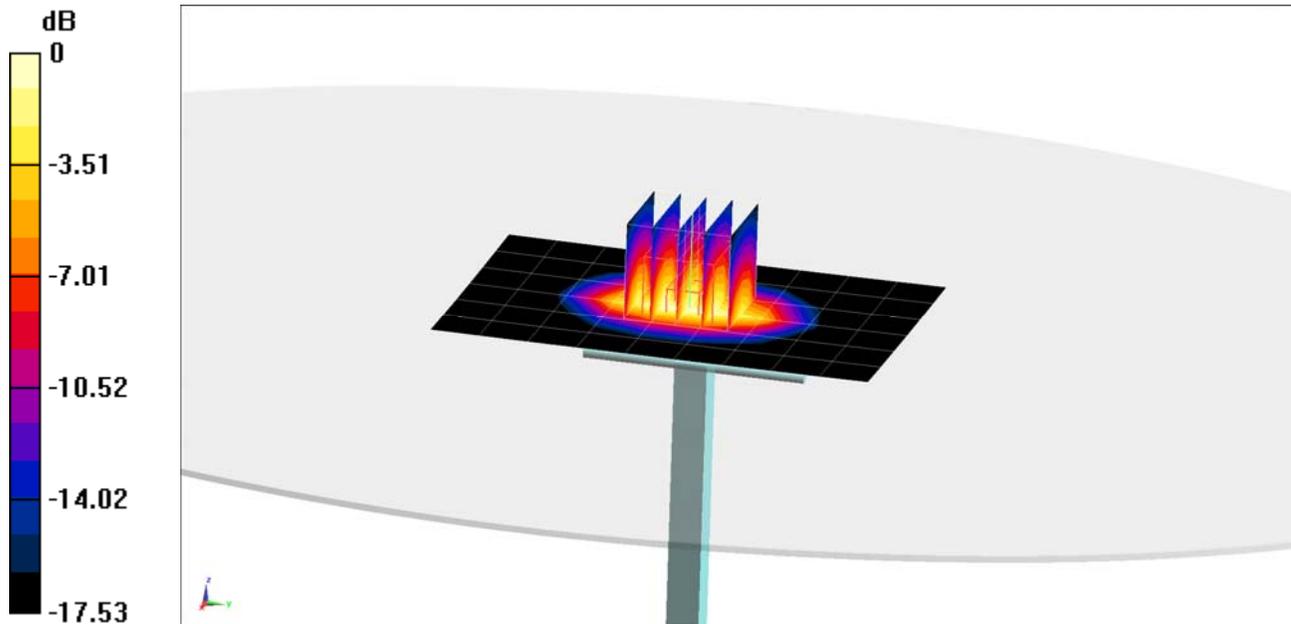
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1  
Medium: 1900 Body Medium parameters used (interpolated):  
 $f = 1900 \text{ MHz}$ ;  $\sigma = 1.574 \text{ S/m}$ ;  $\epsilon_r = 52.231$ ;  $\rho = 1000 \text{ kg/m}^3$   
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-30-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.0°C

Probe: ES3DV2 - SN3022; ConvF(4.49, 4.49, 4.49); Calibrated: 8/19/2014;  
Sensor-Surface: 3mm (Mechanical Surface Detection)  
Electronics: DAE4 Sn1322; Calibrated: 8/12/2014  
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226  
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 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) = 7.59 W/kg  
**SAR(1 g) = 4.32 W/kg**  
Deviation (1 g) = 6.93%



0 dB = 5.48 W/kg = 7.39 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$ ;  $\sigma = 2.028 \text{ S/m}$ ;  $\epsilon_r = 50.797$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-17-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3213; ConvF(4.37, 4.37, 4.37); Calibrated: 1/20/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 1/19/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 2450 MHz System Verification

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

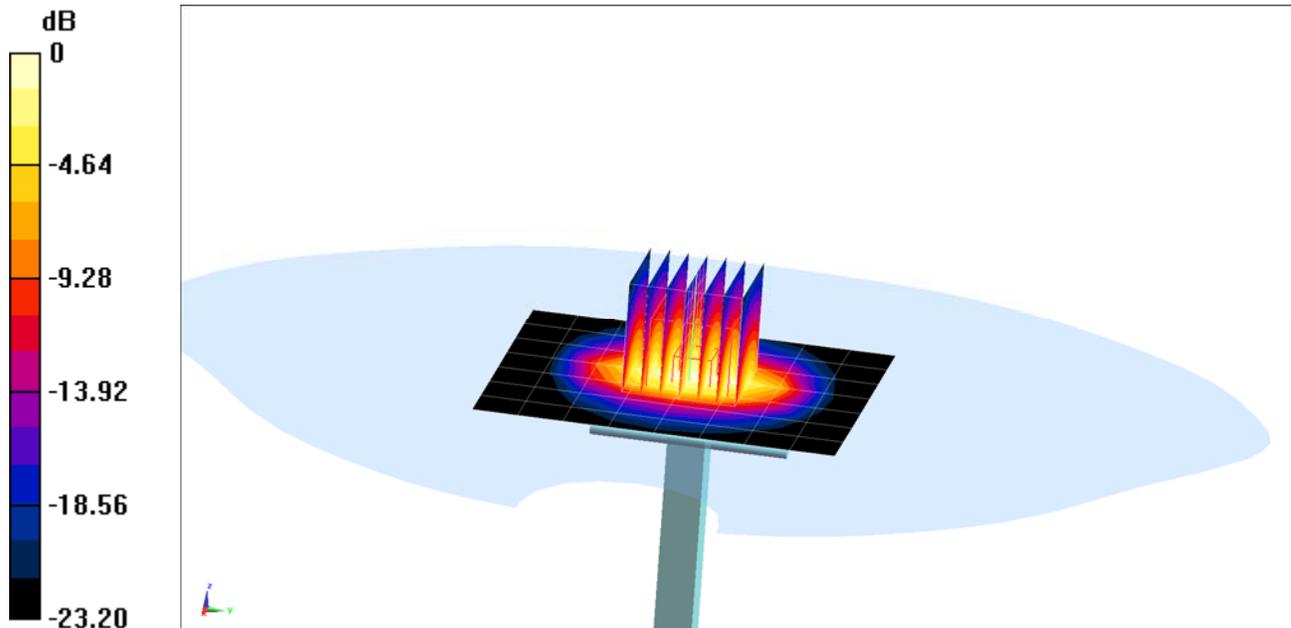
**Zoom Scan (7x7x7)/Cube 0:** Measurement grid: dx=5mm, dy=5mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 11.5 W/kg

**SAR(1 g) = 5.29 W/kg**

Deviation(1 g) = 2.12%



0 dB = 6.74 W/kg = 8.29 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1191**

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

Medium: 5GHz Body Medium parameters used:

$f = 5200 \text{ MHz}$ ;  $\sigma = 5.395 \text{ S/m}$ ;  $\epsilon_r = 48.053$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3914; ConvF(4.5, 4.5, 4.5); Calibrated: 2/10/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/31/2014

Phantom: SAM Sub ; Type: QD000P40CC; Serial: TP:1357

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5200 MHz System Verification

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

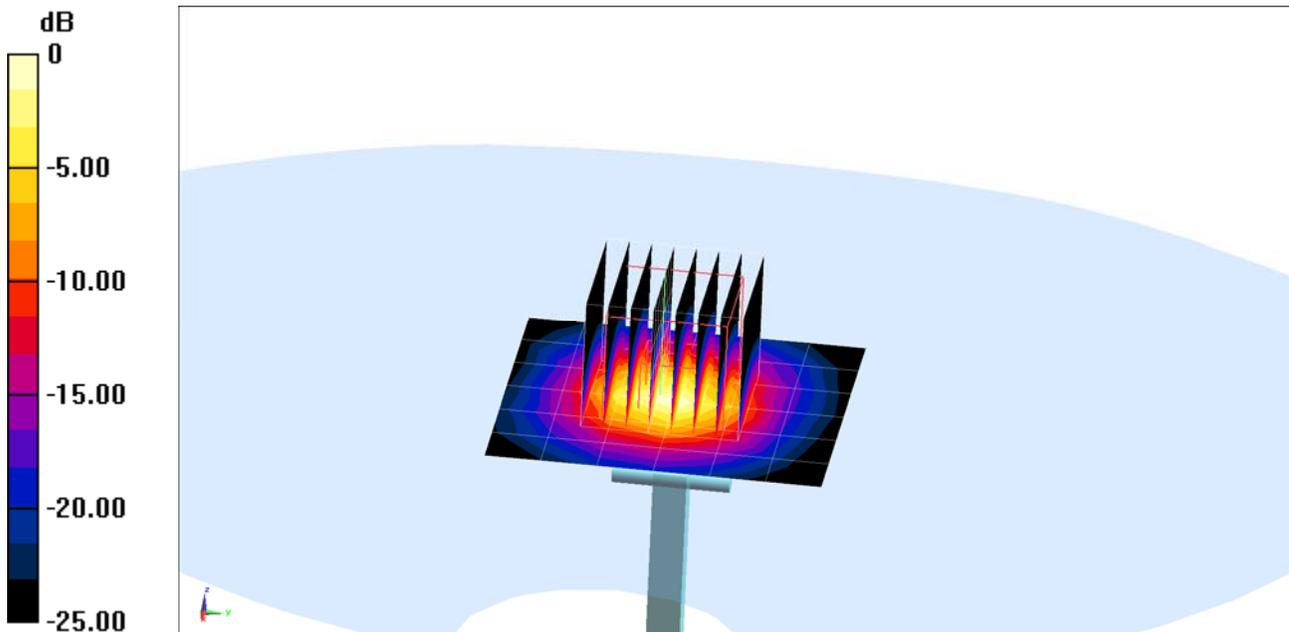
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 16.2 W/kg

**SAR(1 g) = 3.86 W/kg; SAR(10 g) = 1.07 W/kg**

Deviation(1 g) = -0.77%; Deviation(10 g) = -0.93%



0 dB = 9.30 W/kg = 9.68 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1191**

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

Medium: 5GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$ ;  $\sigma = 5.499 \text{ S/m}$ ;  $\epsilon_r = 47.886$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3914; ConvF(4.33, 4.33, 4.33); Calibrated: 2/10/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/31/2014

Phantom: SAM Sub ; Type: QD000P40CC; Serial: TP:1357

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5300 MHz System Verification

**Area Scan (7x8x1):** Measurement grid: dx=10mm, dy=10mm

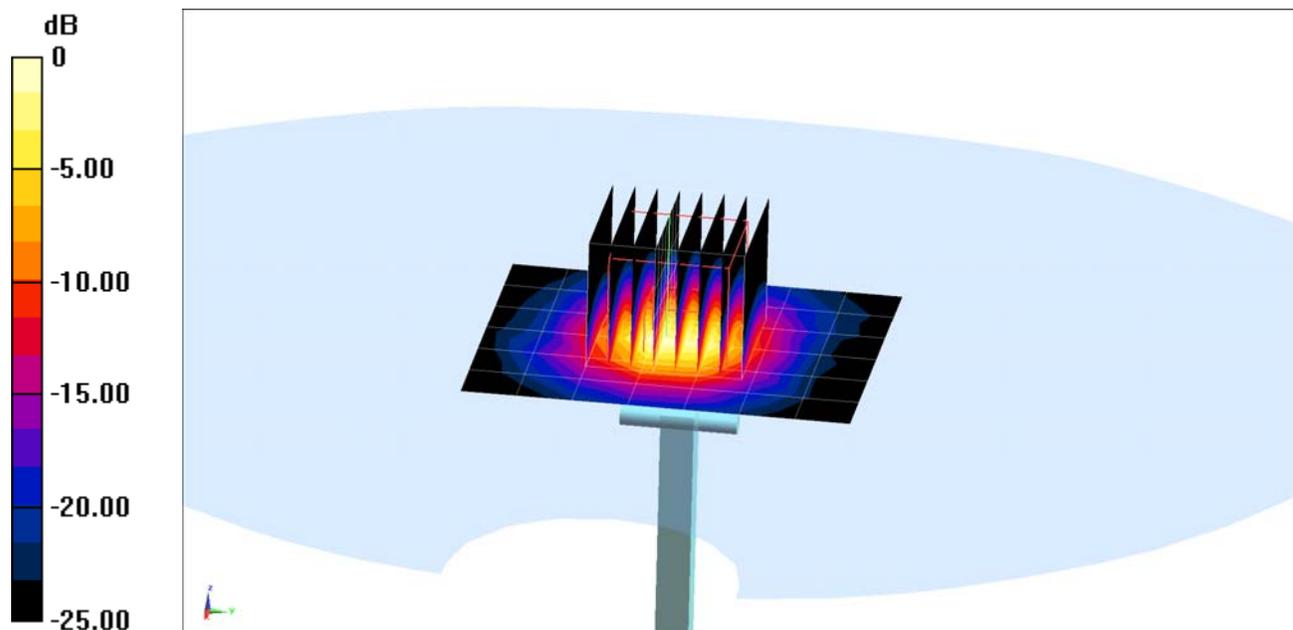
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 17.5 W/kg

**SAR(1 g) = 4.05 W/kg; SAR(10 g) = 1.11 W/kg**

Deviation(1 g) = 1.38%; Deviation(10 g) = -0.45%



0 dB = 9.67 W/kg = 9.85 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1191**

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

Medium: 5GHz Body Medium parameters used:

$f = 5500 \text{ MHz}$ ;  $\sigma = 5.716 \text{ S/m}$ ;  $\epsilon_r = 47.553$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3914; ConvF(3.91, 3.91, 3.91); Calibrated: 2/10/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/31/2014

Phantom: SAM Sub ; Type: QD000P40CC; Serial: TP:1357

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5500 MHz System Verification

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

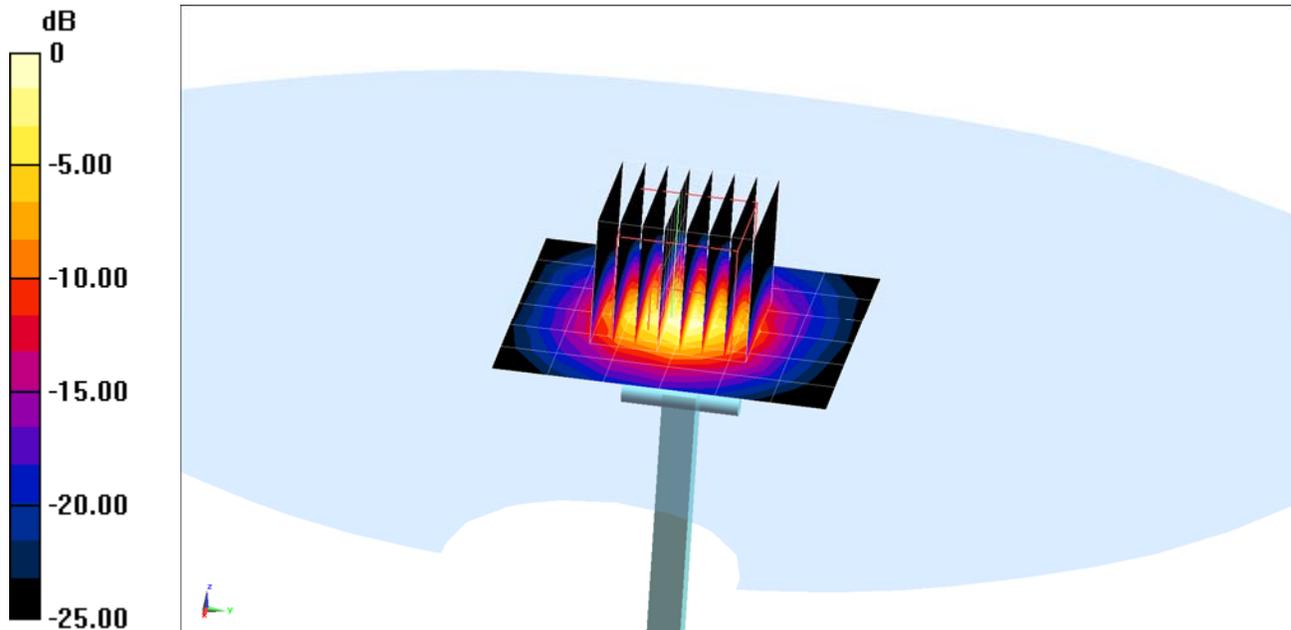
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 17.9 W/kg

**SAR(1 g) = 4.09 W/kg; SAR(10 g) = 1.13 W/kg**

Deviation(1 g) = -1.56%; Deviation(10 g) = -1.74%



0 dB = 9.75 W/kg = 9.89 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1191**

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

Medium: 5GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$ ;  $\sigma = 5.841 \text{ S/m}$ ;  $\epsilon_r = 47.378$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 22.5°C; Tissue Temp: 20.5°C

Probe: EX3DV4 - SN3914; ConvF(3.89, 3.89, 3.89); Calibrated: 2/10/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/31/2014

Phantom: SAM Sub ; Type: QD000P40CC; Serial: TP:1357

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5600 MHz System Verification

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

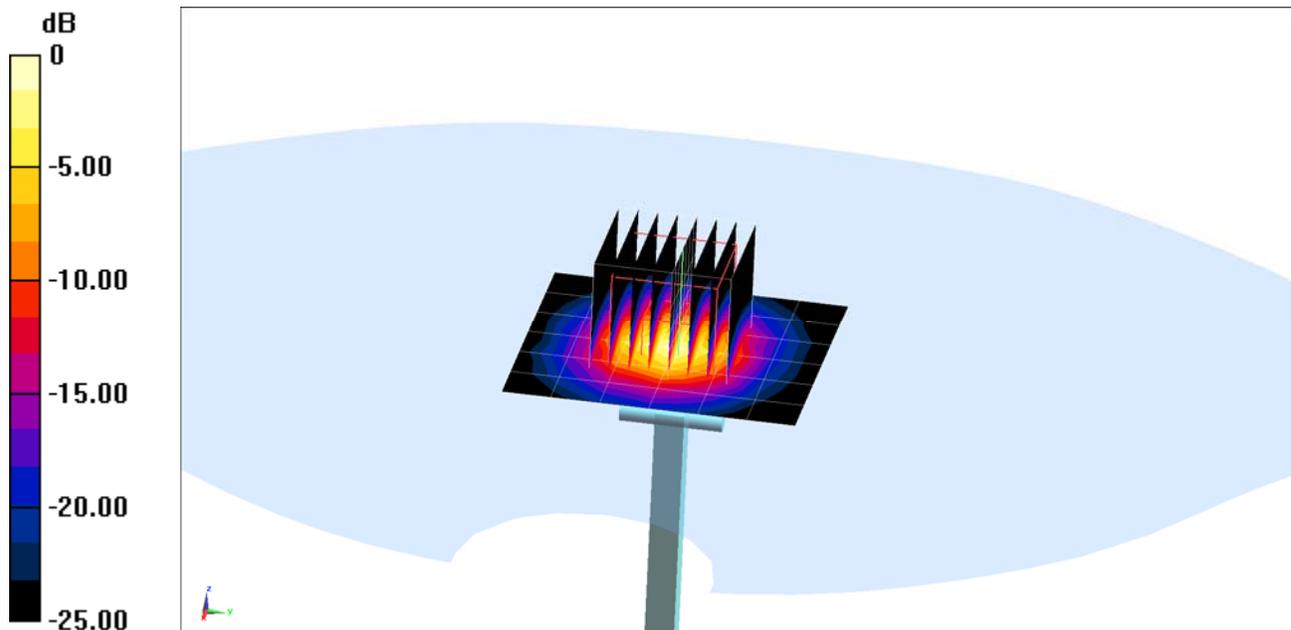
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 18.2 W/kg

**SAR(1 g) = 4.05 W/kg; SAR(10 g) = 1.11 W/kg**

Deviation(1 g) = -3.69%; Deviation(10 g) = -4.72%



0 dB = 9.81 W/kg = 9.92 dBW/kg

# PCTEST ENGINEERING LABORATORY, INC.

**DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1191**

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

Medium: 5GHz Body Medium parameters used:

$f = 5800 \text{ MHz}$ ;  $\sigma = 6.149 \text{ S/m}$ ;  $\epsilon_r = 47.074$ ;  $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 03-23-2015; Ambient Temp: 23.4°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN3914; ConvF(4.01, 4.01, 4.01); Calibrated: 2/10/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/31/2014

Phantom: SAM Sub ; Type: QD000P40CC; Serial: TP:1357

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

## 5800 MHz System Verification

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

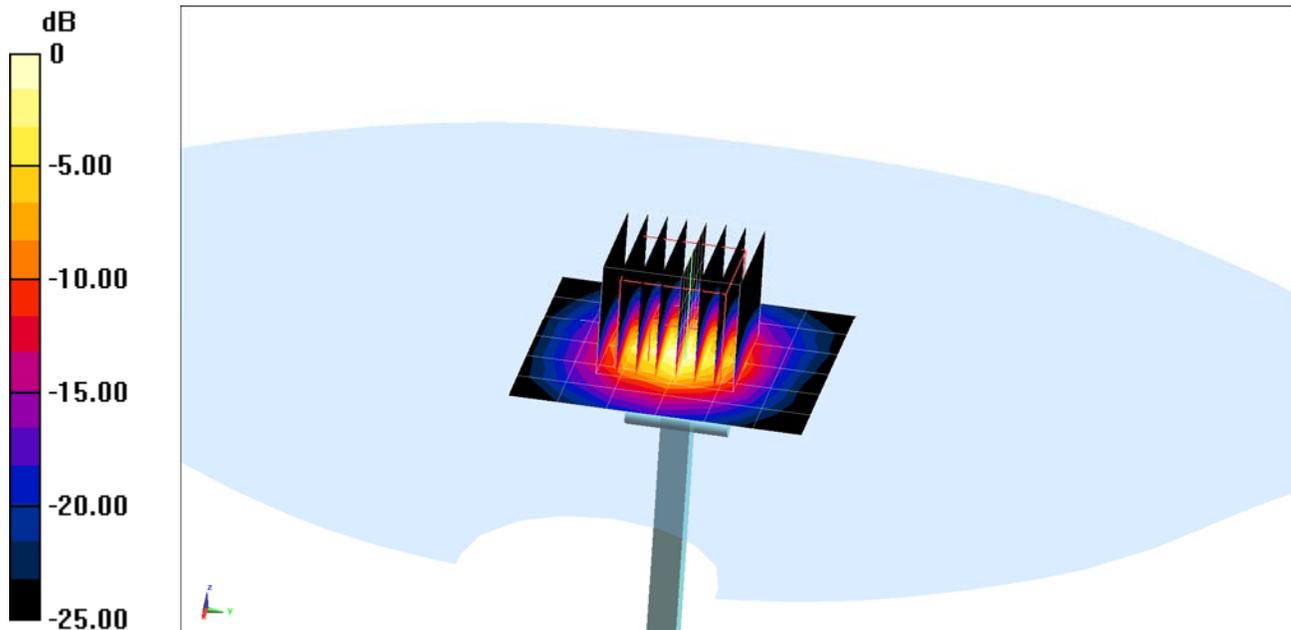
**Zoom Scan (8x8x7)/Cube 0:** Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 17.0 dBm (50 mW)

Peak SAR (extrapolated) = 17.7 W/kg

**SAR(1 g) = 3.8 W/kg**

Deviation(1 g) = -2.56%



0 dB = 9.51 W/kg = 9.78 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  
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: **ES3-3022\_Aug14/2**

**CALIBRATION CERTIFICATE (Replacement of No: ES3-3022\_Aug14)**

Object **ES3DV2 - SN:3022**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6  
Calibration procedure for dosimetric E-field probes** CC  
D/M/14

Calibration date: **August 19, 2014**

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 E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by:	Name <b>Jeton Kastrali</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function <b>Technical Manager</b>	

Issued: November 3, 2014

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



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

Accreditation No.: **SCS 108**

### Glossary:

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- 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

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>; A, B, C, D** are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV2

## SN:3022

Manufactured: April 15, 2003  
Calibrated: August 19, 2014

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

## DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	1.00	1.04	0.96	$\pm 10.1 \%$
DCP (mV) <sup>B</sup>	103.0	96.3	101.6	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	181.8	$\pm 2.7 \%$
		Y	0.0	0.0	1.0		183.0	
		Z	0.0	0.0	1.0		192.3	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	2.51	63.1	12.7	10.00	42.6	$\pm 1.9 \%$
		Y	2.62	63.1	12.9		42.7	
		Z	3.12	65.7	13.6		40.4	
10011- CAB	UMTS-FDD (WCDMA)	X	3.33	67.8	19.2	2.91	145.9	$\pm 0.9 \%$
		Y	3.13	64.9	16.9		147.4	
		Z	3.20	66.4	18.2		139.6	
10012- CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.05	70.1	19.8	1.87	147.2	$\pm 0.9 \%$
		Y	2.62	65.1	16.2		147.4	
		Z	2.85	68.2	18.4		141.7	
10013- CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.10	70.9	23.6	9.46	143.9	$\pm 3.0 \%$
		Y	11.04	70.2	22.9		144.2	
		Z	10.77	70.2	23.1		134.7	
10021- DAB	GSM-FDD (TDMA, GMSK)	X	19.66	99.7	28.6	9.39	126.0	$\pm 1.9 \%$
		Y	11.04	89.6	25.5		138.9	
		Z	10.45	88.8	24.9		137.5	
10023- DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	20.19	99.6	28.5	9.57	142.0	$\pm 2.5 \%$
		Y	10.53	88.4	25.0		145.5	
		Z	15.52	96.5	27.8		147.6	
10024- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	31.93	99.6	25.2	6.56	149.5	$\pm 1.9 \%$
		Y	12.70	87.9	22.2		148.0	
		Z	27.00	99.8	25.7		135.3	
10027- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	38.32	99.8	23.8	4.80	148.1	$\pm 2.2 \%$
		Y	9.80	83.2	19.3		138.8	
		Z	31.96	99.9	24.2		128.9	
10028- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	40.03	99.5	22.8	3.55	130.5	$\pm 2.2 \%$
		Y	40.27	99.6	23.0		148.1	
		Z	43.09	99.7	22.5		140.1	
10032- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	38.93	99.4	20.4	1.16	146.7	$\pm 1.9 \%$
		Y	32.83	92.5	17.9		139.2	
		Z	31.94	99.5	20.8		133.1	
10039- CAB	CDMA2000 (1xRTT, RC1)	X	4.66	66.8	19.3	4.57	144.5	$\pm 1.2 \%$
		Y	4.56	65.3	17.9		137.2	
		Z	4.52	66.1	18.7		131.7	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.82	66.0	18.7	3.97	140.3	±0.9 %
		Y	3.77	64.5	17.3		133.6	
		Z	3.79	65.7	18.4		128.2	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.40	66.2	18.5	3.98	130.9	±1.2 %
		Y	4.39	65.0	17.4		131.1	
		Z	4.47	66.3	18.4		140.0	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.30	67.3	19.8	5.67	137.4	±1.7 %
		Y	6.25	66.3	18.9		135.9	
		Z	6.36	67.4	19.7		147.5	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.14	66.8	19.6	5.80	134.6	±1.7 %
		Y	6.17	66.1	18.9		133.9	
		Z	6.24	67.0	19.7		144.5	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 6 MHz, QPSK)	X	5.82	66.3	19.4	5.75	131.2	±1.7 %
		Y	5.82	65.4	18.6		130.3	
		Z	5.91	66.5	19.4		140.4	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.00	68.5	21.2	8.10	124.3	±2.5 %
		Y	9.89	67.9	20.6		124.0	
		Z	10.05	68.6	21.2		133.2	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.01	68.6	21.2	8.07	125.8	±2.5 %
		Y	9.91	67.9	20.7		125.8	
		Z	10.09	68.8	21.3		134.7	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.69	75.5	26.4	9.28	144.7	±3.3 %
		Y	9.09	72.7	24.6		143.2	
		Z	8.54	72.0	24.5		124.8	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.82	66.2	19.4	5.75	131.3	±1.9 %
		Y	6.06	66.3	19.1		149.2	
		Z	5.91	66.5	19.4		140.7	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.27	66.9	19.7	5.82	136.5	±1.4 %
		Y	6.19	65.8	18.7		128.4	
		Z	6.33	67.0	19.6		145.4	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.81	66.4	19.7	5.73	134.8	±1.7 %
		Y	4.92	66.1	19.1		149.9	
		Z	4.78	66.4	19.6		141.2	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	7.83	76.6	27.2	9.21	131.4	±3.5 %
		Y	7.54	74.5	25.8		147.8	
		Z	7.71	76.7	27.4		145.3	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.90	66.9	20.0	5.72	147.6	±1.4 %
		Y	4.90	66.0	19.1		148.0	
		Z	4.78	66.4	19.6		141.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.90	66.9	20.0	5.72	148.1	±1.4 %
		Y	4.89	65.9	19.0		146.9	
		Z	4.80	66.5	19.7		142.1	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.80	68.7	21.4	8.09	135.1	±2.7 %
		Y	9.78	68.2	20.9		135.5	
		Z	9.70	68.5	21.2		130.2	

10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.79	68.7	21.4	8.10	136.4	±2.7 %
		Y	9.81	68.3	20.9		138.0	
		Z	9.72	68.6	21.3		132.8	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.68	68.6	21.3	8.03	136.0	±2.7 %
		Y	9.74	68.3	21.0		137.4	
		Z	9.62	68.5	21.2		132.6	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.20	69.1	21.5	8.06	143.4	±2.5 %
		Y	9.91	60.0	20.7		125.8	
		Z	10.27	69.4	21.6		148.4	
10225-CAB	UMTS-FDD (HSPA+)	X	6.87	66.9	19.6	5.97	139.5	±1.9 %
		Y	7.04	66.9	19.3		149.3	
		Z	6.89	67.0	19.5		143.5	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.66	75.9	26.9	9.21	126.1	±3.0 %
		Y	7.17	73.1	25.1		132.1	
		Z	7.18	74.6	26.3		128.0	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.58	73.1	25.3	9.24	127.6	±3.3 %
		Y	8.22	71.0	23.7		126.9	
		Z	8.83	74.3	26.0		149.8	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.69	75.5	26.5	9.30	143.8	±3.3 %
		Y	8.88	72.0	24.2		135.2	
		Z	8.83	72.9	25.1		131.3	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.87	67.0	19.2	4.87	141.2	±1.4 %
		Y	5.77	65.8	18.1		136.0	
		Z	5.71	66.3	18.6		132.7	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.44	67.2	19.2	3.96	147.3	±0.9 %
		Y	4.29	65.3	17.6		139.2	
		Z	4.31	66.3	18.5		139.6	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.60	67.1	19.1	3.46	137.8	±0.7 %
		Y	3.44	64.8	17.2		129.6	
		Z	3.48	66.2	18.4		130.5	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.50	66.9	18.9	3.39	139.5	±0.7 %
		Y	3.38	64.8	17.2		132.0	
		Z	3.48	66.5	18.5		133.1	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.12	66.7	19.6	5.81	133.3	±1.9 %
		Y	6.35	66.7	19.3		149.3	
		Z	6.17	66.8	19.5		132.7	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.72	67.4	20.0	6.06	138.7	±1.7 %
		Y	6.63	66.3	19.1		131.4	
		Z	6.72	67.3	19.9		138.7	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	2.90	69.9	19.8	1.71	146.4	±0.5 %
		Y	2.54	65.2	16.5		139.3	
		Z	2.75	68.1	18.5		146.4	
10316-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.12	69.3	21.9	8.36	142.9	±3.0 %
		Y	10.01	68.5	21.3		135.2	
		Z	10.11	69.3	21.9		141.7	

10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.59	68.2	19.0	3.76	126.7	±0.7 %
		Y	4.59	67.2	18.0		142.4	
		Z	4.64	68.5	19.0		143.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.64	68.8	19.3	3.77	147.1	±0.9 %
		Y	4.47	67.1	17.9		139.6	
		Z	4.54	68.4	18.9		147.2	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.66	69.0	19.4	1.54	145.8	±0.5 %
		Y	2.40	64.8	16.2		140.0	
		Z	2.62	67.8	18.4		147.2	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.97	69.1	21.7	8.23	142.0	±3.0 %
		Y	10.08	68.9	21.4		145.8	
		Z	10.01	69.2	21.8		143.3	

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%.

<sup>^</sup> The uncertainties of Norm X, Y, Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 8 and 9).

<sup>^</sup> Numerical linearization parameter: uncertainty not required.

<sup>^</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>g</sup>	Depth <sup>g</sup> (mm)	Unct. (k=2)
750	41.9	0.89	6.39	6.39	6.39	0.20	2.24	± 12.0 %
835	41.5	0.90	6.18	6.18	6.18	0.23	1.98	± 12.0 %
1750	40.1	1.37	5.04	5.04	5.04	0.51	1.35	± 12.0 %
1900	40.0	1.40	4.85	4.85	4.85	0.38	1.66	± 12.0 %
2450	39.2	1.80	4.31	4.31	4.31	0.66	1.28	± 12.0 %
2600	39.0	1.96	4.13	4.13	4.13	0.76	1.28	± 12.0 %

<sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>g</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

### Calibration Parameter Determined in Body Tissue Simulating Media

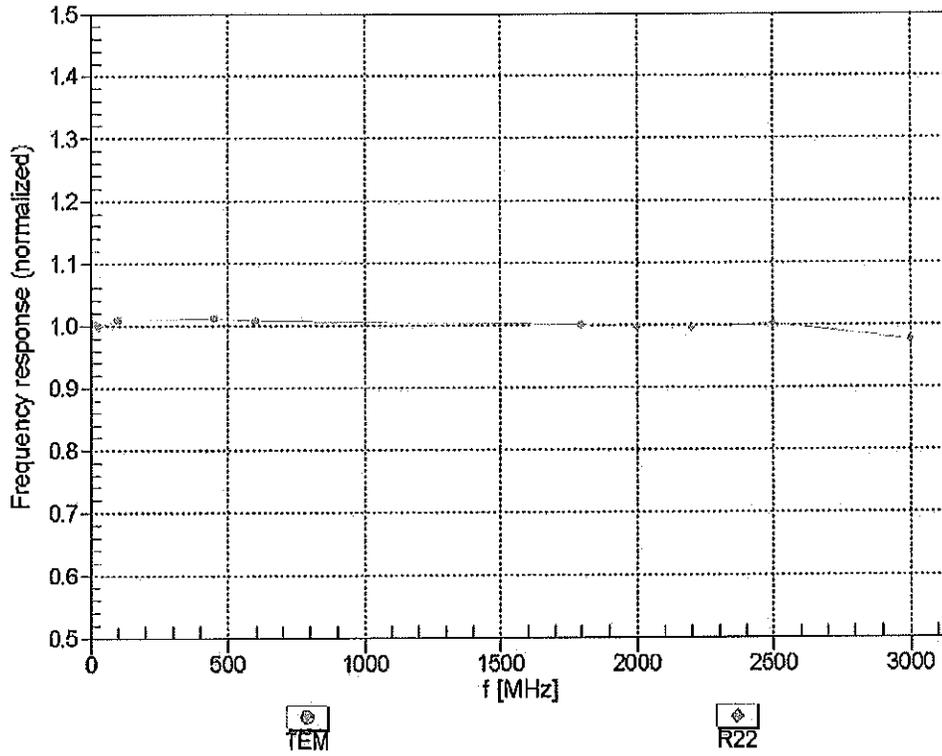
f (MHz) <sup>c</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>g</sup>	Depth <sup>g</sup> (mm)	Unct. (k=2)
450	56.7	0.94	6.78	6.78	6.78	0.12	1.30	± 13.3 %
600	56.1	0.95	6.72	6.72	6.72	0.05	1.20	± 13.3 %
750	55.5	0.96	6.02	6.02	6.02	0.23	2.05	± 12.0 %
835	55.2	0.97	5.98	5.98	5.98	0.29	1.85	± 12.0 %
1750	53.4	1.49	4.70	4.70	4.70	0.66	1.25	± 12.0 %
1900	53.3	1.52	4.49	4.49	4.49	0.33	2.02	± 12.0 %
2450	52.7	1.95	4.05	4.05	4.05	0.80	1.01	± 12.0 %
2600	52.5	2.16	3.94	3.94	3.94	0.68	1.03	± 12.0 %

<sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>g</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

### Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)

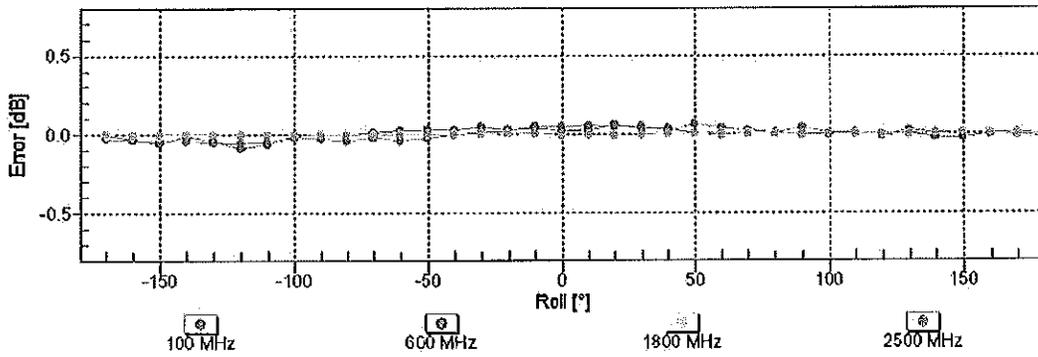
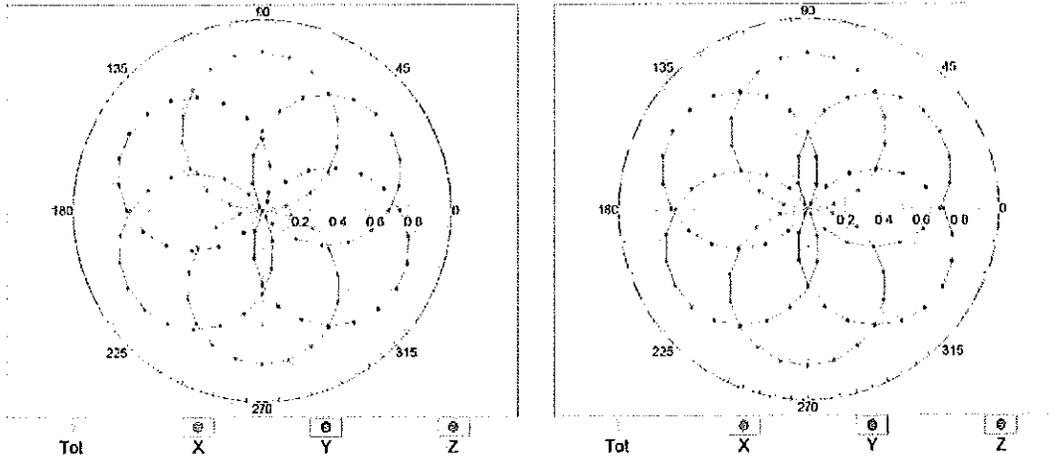


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

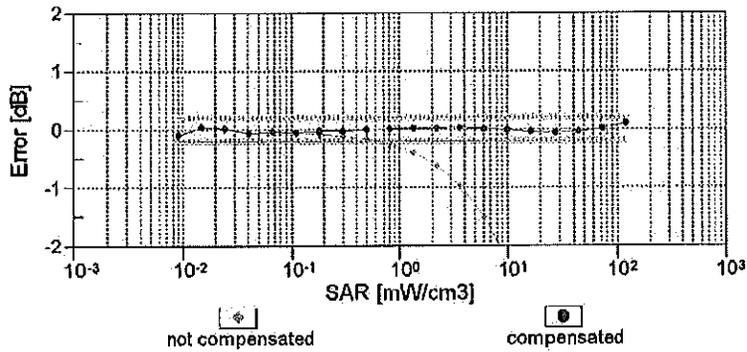
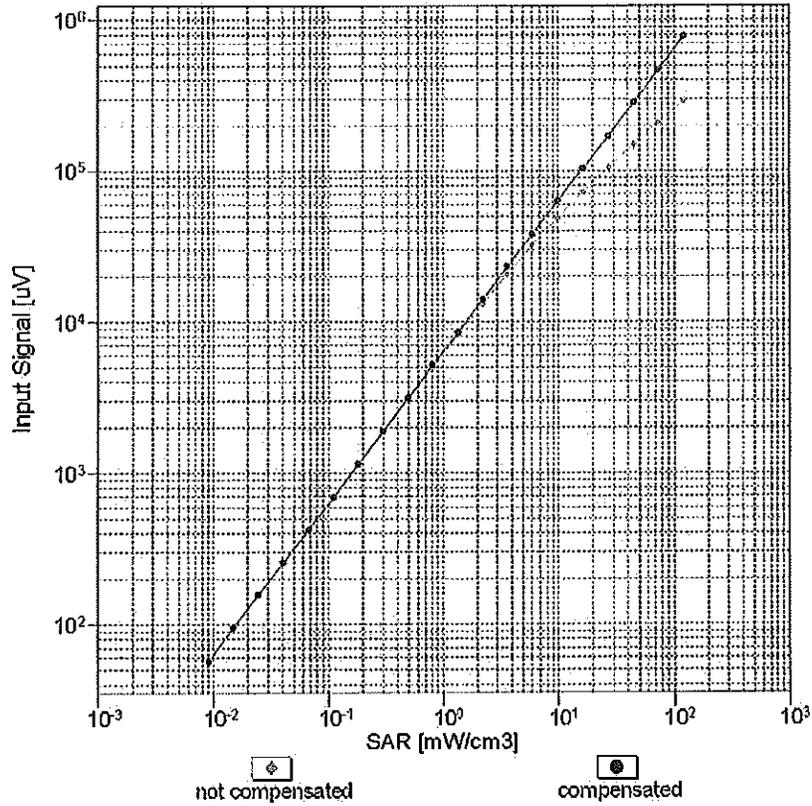
f=600 MHz,TEM

f=1800 MHz,R22



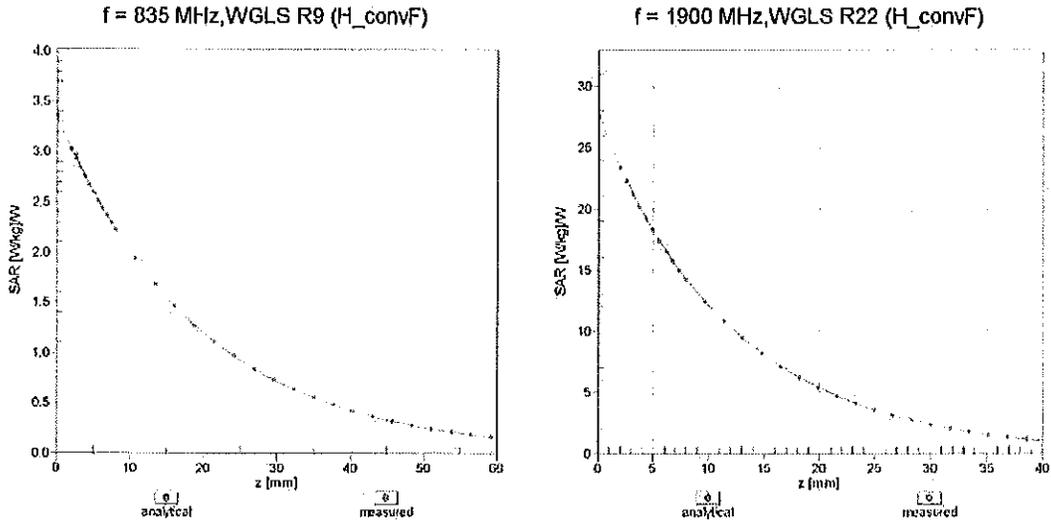
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

### Dynamic Range $f(SAR_{head})$ (TEM cell, $f_{eval}=1900$ MHz)

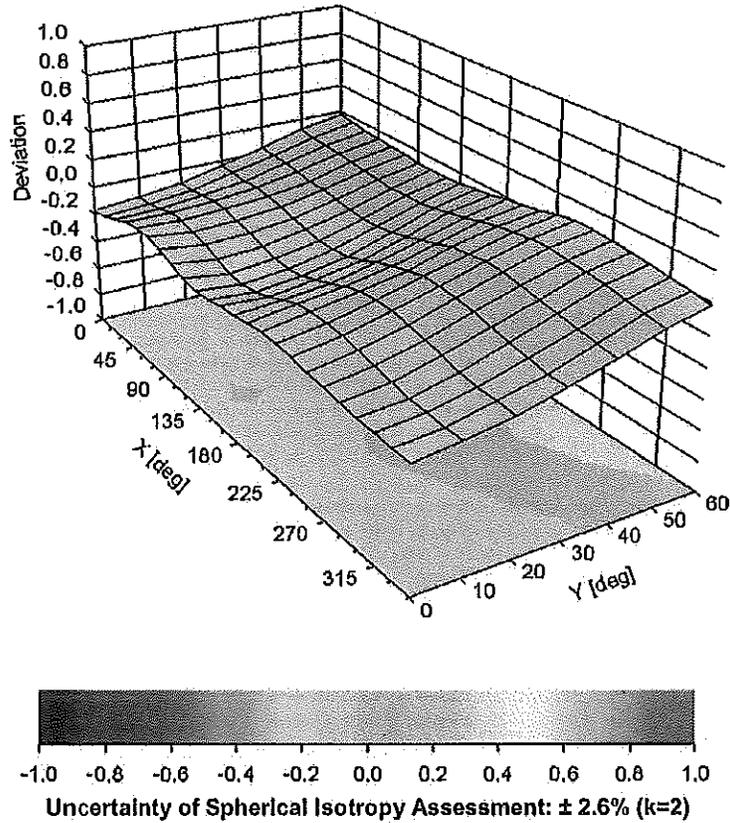


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  (k=2)

### Conversion Factor Assessment



### Deviation from Isotropy in Liquid Error ( $\phi, \theta$ ), f = 900 MHz



**DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022****Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-80,3
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm



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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 0108**

Client **PC Test**

Certificate No: **ES3-3213\_Jan15**

**CALIBRATION CERTIFICATE**

Object **ES3DV3 - SN:3213**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6  
Calibration procedure for dosimetric E-field probes**

CC  
1/30/15

Calibration date: **January 20, 2015**

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 E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

Calibrated by:	Name <b>Israe Elnaouq</b>	Function <b>Laboratory Technician</b>	Signature 
Approved by:	Name <b>Katja Pokovic</b>	Function <b>Technical Manager</b>	Signature 

Issued: January 22, 2015

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



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Accreditation No.: **SCS 0108**

**Glossary:**

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization θ	θ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., θ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

**Calibration is Performed According to the Following Standards:**

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- 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

**Methods Applied and Interpretation of Parameters:**

- *NORM<sub>x,y,z</sub>*: Assessed for E-field polarization θ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). *NORM<sub>x,y,z</sub>* are only intermediate values, i.e., the uncertainties of *NORM<sub>x,y,z</sub>* does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)<sub>x,y,z</sub>* = *NORM<sub>x,y,z</sub>* \* *frequency\_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCP<sub>x,y,z</sub>*: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR*: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *A<sub>x,y,z</sub>*; *B<sub>x,y,z</sub>*; *C<sub>x,y,z</sub>*; *D<sub>x,y,z</sub>*; *VR<sub>x,y,z</sub>*; *A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF* and *Boundary Effect Parameters*: Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORM<sub>x,y,z</sub>* \* *ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORM<sub>x</sub>* (no uncertainty required).

# Probe ES3DV3

## SN:3213

Manufactured: October 14, 2008  
Calibrated: January 20, 2015

Calibrated for DASY/EASY Systems  
(Note: non-compatible with DASY2 system!)

# DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

## Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu V/(V/m)^2$ ) <sup>A</sup>	1.49	1.37	1.34	$\pm 10.1\%$
DCP (mV) <sup>B</sup>	99.9	101.8	101.4	

## Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	169.8	$\pm 3.8\%$
		Y	0.0	0.0	1.0		215.4	
		Z	0.0	0.0	1.0		214.5	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	1.84	57.8	10.2	10.00	47.4	$\pm 1.9\%$
		Y	1.82	58.6	10.3		44.3	
		Z	1.65	57.3	9.2		44.2	
10011-CAB	UMTS-FDD (WCDMA)	X	3.32	66.8	18.5	2.91	135.8	$\pm 0.5\%$
		Y	3.18	66.4	18.2		127.9	
		Z	3.21	66.5	18.2		128.1	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.90	68.1	18.4	1.87	137.2	$\pm 0.7\%$
		Y	2.97	69.2	19.0		130.1	
		Z	2.80	68.0	18.4		129.9	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.40	71.2	23.7	9.46	135.1	$\pm 3.8\%$
		Y	11.25	71.3	23.9		124.2	
		Z	10.96	70.3	23.2		124.8	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	18.25	96.6	27.2	9.39	140.4	$\pm 1.7\%$
		Y	21.48	99.9	28.2		133.3	
		Z	11.76	89.4	24.5		127.3	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	13.12	91.7	26.0	9.57	126.4	$\pm 1.9\%$
		Y	17.05	95.2	26.6		127.3	
		Z	8.91	85.2	23.3		118.8	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	34.78	100.0	25.2	6.56	116.4	$\pm 1.7\%$
		Y	33.37	99.5	24.8		111.7	
		Z	34.11	99.5	24.6		110.5	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	37.18	99.7	24.0	4.80	131.2	$\pm 1.7\%$
		Y	44.91	99.8	23.3		127.4	
		Z	41.51	99.7	23.2		125.0	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	48.95	99.5	22.4	3.55	140.9	$\pm 1.7\%$
		Y	67.41	99.8	21.5		137.8	
		Z	56.45	100.0	21.9		135.0	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	20.23	99.3	22.1	1.16	111.3	$\pm 1.2\%$
		Y	32.72	99.5	20.6		109.6	
		Z	48.57	100.0	20.0		108.8	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.60	67.9	20.0	5.67	144.6	$\pm 1.2\%$
		Y	6.55	68.2	20.2		142.7	
		Z	6.50	67.8	19.9		141.5	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	10.34	75.7	26.2	9.29	133.2	±2.5 %
		Y	10.31	76.5	26.9		128.2	
		Z	9.74	74.5	25.6		127.1	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.50	67.6	20.0	5.80	142.8	±1.2 %
		Y	6.41	67.7	20.1		140.3	
		Z	6.41	67.6	19.9		140.2	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.36	69.2	21.6	8.07	132.8	±2.7 %
		Y	10.42	69.7	21.9		131.4	
		Z	10.22	69.1	21.4		130.0	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.65	74.6	25.8	9.28	127.9	±2.5 %
		Y	9.66	75.6	26.7		123.7	
		Z	9.14	73.6	25.3		122.7	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.14	66.9	19.6	5.75	139.3	±1.4 %
		Y	6.08	67.2	19.9		138.5	
		Z	6.05	66.9	19.6		137.3	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.58	67.5	19.9	5.82	144.3	±1.4 %
		Y	6.54	67.8	20.1		143.7	
		Z	6.50	67.5	19.8		142.1	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.93	66.1	19.3	5.73	120.6	±0.9 %
		Y	4.93	66.7	19.8		120.9	
		Z	4.85	66.3	19.5		118.9	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.93	79.5	28.6	9.21	140.8	±2.5 %
		Y	9.60	82.9	30.6		139.9	
		Z	8.30	78.2	27.9		136.6	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.90	66.0	19.3	5.72	118.8	±0.9 %
		Y	4.93	66.8	19.8		120.2	
		Z	4.81	66.1	19.3		116.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.92	66.1	19.3	5.72	119.0	±0.9 %
		Y	4.92	66.6	19.8		120.5	
		Z	4.77	65.8	19.2		115.8	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.93	68.7	21.4	8.10	125.0	±2.5 %
		Y	10.06	69.4	21.9		128.3	
		Z	9.78	68.5	21.2		120.5	
10225-CAB	UMTS-FDD (HSPA+)	X	6.66	65.7	18.8	5.97	106.5	±0.9 %
		Y	6.81	66.6	19.3		112.3	
		Z	6.64	66.0	18.9		108.0	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.91	79.4	28.5	9.21	141.4	±2.2 %
		Y	9.39	82.3	30.4		146.7	
		Z	8.40	78.5	28.2		141.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.84	73.3	25.2	9.24	119.1	±2.7 %
		Y	8.94	74.6	26.3		118.6	
		Z	8.39	72.4	24.7		114.0	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.62	74.6	25.8	9.30	126.2	±2.7 %
		Y	9.77	76.0	26.9		126.1	
		Z	9.10	73.4	25.2		121.4	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.43	66.4	18.5	3.96	132.5	±0.7 %
		Y	4.37	66.6	18.6		134.1	
		Z	4.40	66.7	18.6		130.5	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.63	66.4	18.4	3.46	122.5	±0.5 %
		Y	3.54	66.5	18.5		124.9	
		Z	3.55	66.3	18.3		121.4	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.49	65.9	18.1	3.39	125.1	±0.5 %
		Y	3.52	66.7	18.6		126.1	
		Z	3.51	66.5	18.4		123.8	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.49	67.6	19.9	5.81	143.1	±1.4 %
		Y	6.49	68.0	20.3		142.3	
		Z	6.42	67.6	19.9		144.3	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.06	68.1	20.2	6.06	147.6	±1.7 %
		Y	7.09	68.7	20.7		148.2	
		Z	7.03	68.3	20.4		149.8	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.66	67.4	18.4	3.76	135.3	±0.5 %
		Y	4.69	68.1	18.7		134.9	
		Z	4.72	68.2	18.7		136.5	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.58	67.4	18.3	3.77	133.4	±0.5 %
		Y	4.68	68.4	18.9		132.8	
		Z	4.58	67.9	18.5		135.4	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.41	65.7	17.2	1.54	131.4	±0.7 %
		Y	2.42	66.4	17.7		131.3	
		Z	2.59	67.7	18.2		134.1	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.06	68.9	21.5	8.23	127.6	±2.7 %
		Y	10.12	69.5	22.0		126.3	
		Z	10.04	69.1	21.7		129.7	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the E<sup>2</sup>-field uncertainty inside TSL (see Pages 7 and 8).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>c</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>G</sup> (mm)	Unct. (k=2)
750	41.9	0.89	6.45	6.45	6.45	0.57	1.37	± 12.0 %
835	41.5	0.90	6.26	6.26	6.26	0.65	1.26	± 12.0 %
1750	40.1	1.37	5.22	5.22	5.22	0.47	1.47	± 12.0 %
1900	40.0	1.40	5.06	5.06	5.06	0.80	1.14	± 12.0 %
2450	39.2	1.80	4.54	4.54	4.54	0.78	1.22	± 12.0 %
2600	39.0	1.96	4.33	4.33	4.33	0.80	1.28	± 12.0 %

<sup>c</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

### Calibration Parameter Determined in Body Tissue Simulating Media

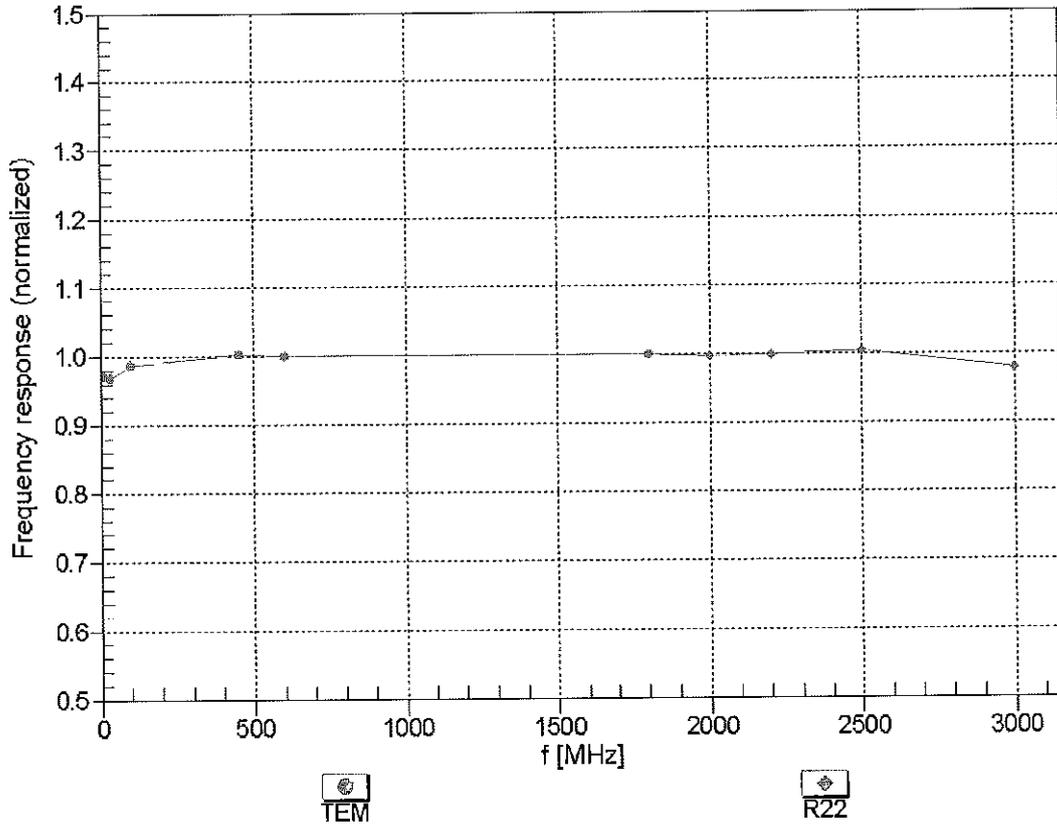
f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth <sup>G</sup> (mm)	Unct. (k=2)
750	55.5	0.96	6.11	6.11	6.11	0.71	1.24	± 12.0 %
835	55.2	0.97	6.07	6.07	6.07	0.35	1.86	± 12.0 %
1750	53.4	1.49	4.93	4.93	4.93	0.51	1.47	± 12.0 %
1900	53.3	1.52	4.72	4.72	4.72	0.80	1.20	± 12.0 %
2450	52.7	1.95	4.37	4.37	4.37	0.71	1.12	± 12.0 %
2600	52.5	2.16	4.20	4.20	4.20	0.66	0.95	± 12.0 %

<sup>C</sup> Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

### Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)

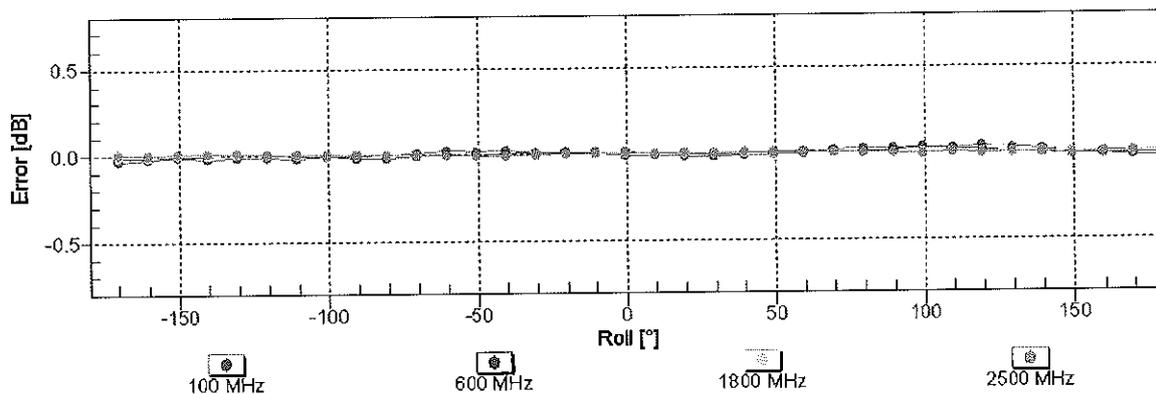
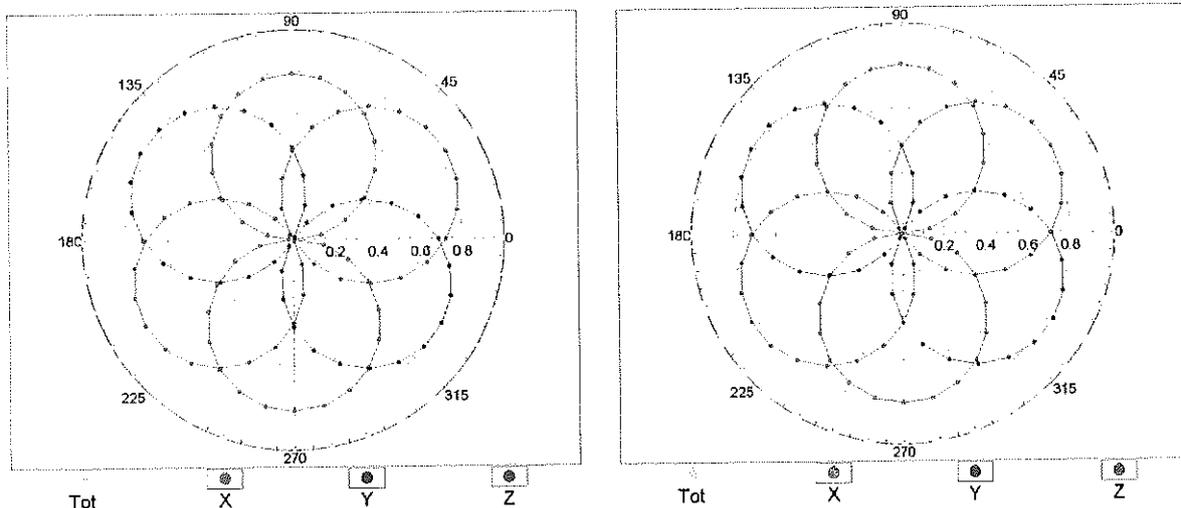


Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

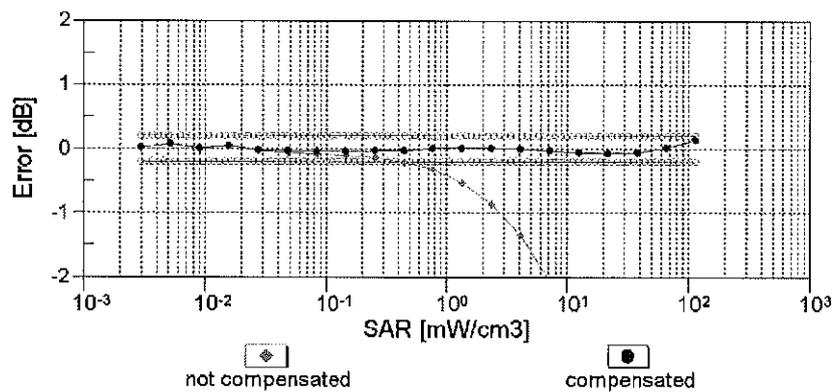
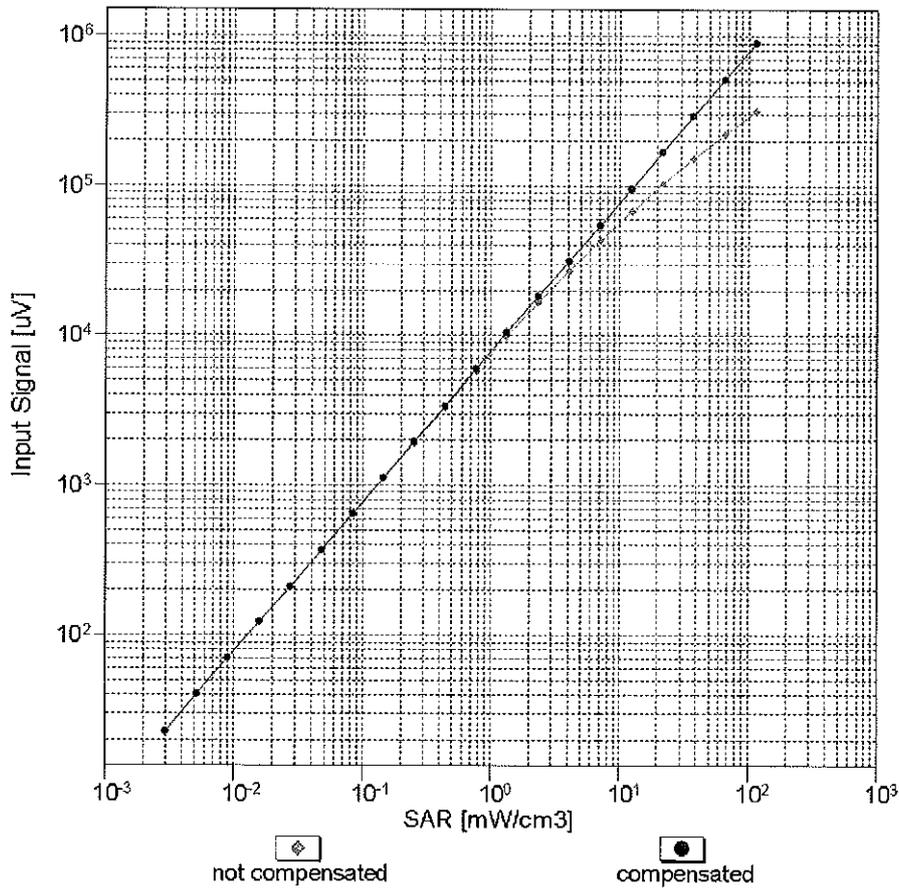
f=600 MHz, TEM

f=1800 MHz, R22



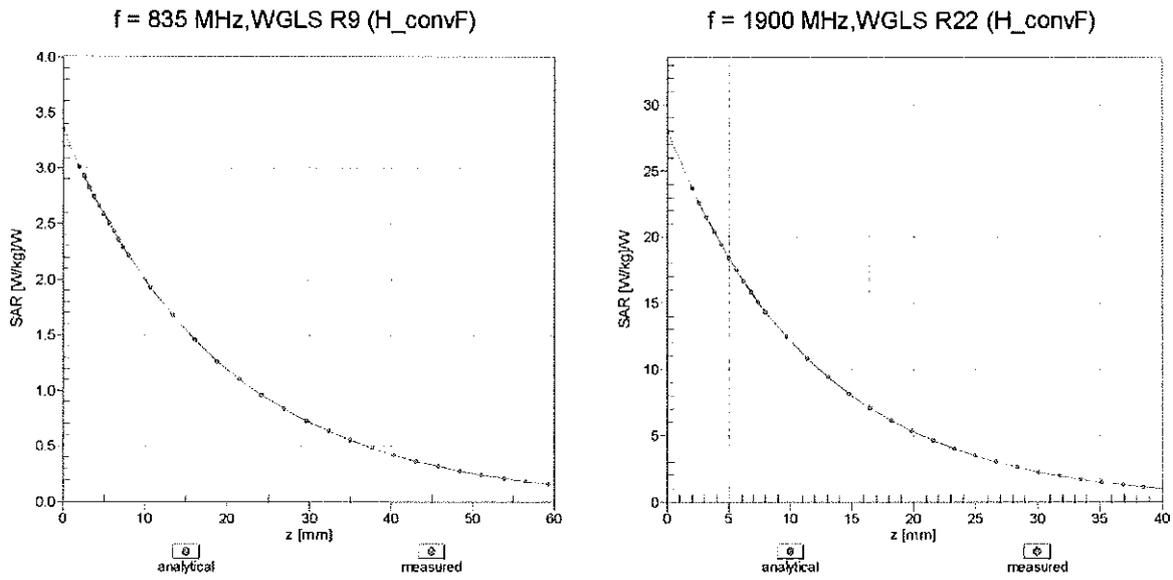
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

### Dynamic Range $f(SAR_{head})$ (TEM cell , $f_{eval}= 1900$ MHz)

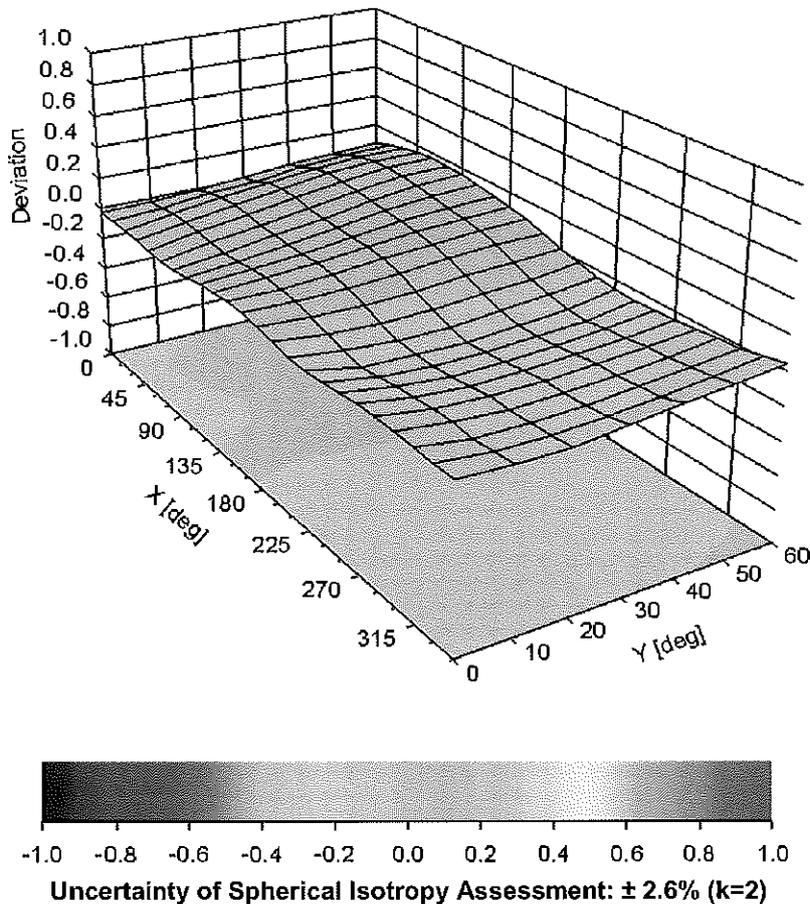


**Uncertainty of Linearity Assessment: ± 0.6% (k=2)**

# Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \theta$ ), f = 900 MHz



## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-70.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm



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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: **ES3-3263\_May14**

## CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3263**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6  
Calibration procedure for dosimetric E-field probes**

*OCV*  
*7/17/14*

Calibration date: **May 15, 2014**

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 E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	
			Issued: May 15, 2014

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

### Glossary:

TSL	tissue simulating liquid
NORM <sub>x,y,z</sub>	sensitivity in free space
ConvF	sensitivity in TSL / NORM <sub>x,y,z</sub>
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization $\varphi$	$\varphi$ rotation around probe axis
Polarization $\vartheta$	$\vartheta$ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

### Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- 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

### Methods Applied and Interpretation of Parameters:

- NORM<sub>x,y,z</sub>**: Assessed for E-field polarization  $\vartheta = 0$  ( $f \leq 900$  MHz in TEM-cell;  $f > 1800$  MHz: R22 waveguide). NORM<sub>x,y,z</sub> are only intermediate values, i.e., the uncertainties of NORM<sub>x,y,z</sub> does not affect the E<sup>2</sup>-field uncertainty inside TSL (see below ConvF).
- NORM(f)<sub>x,y,z</sub>** = NORM<sub>x,y,z</sub> \* frequency\_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP<sub>x,y,z</sub>**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A<sub>x,y,z</sub>; B<sub>x,y,z</sub>; C<sub>x,y,z</sub>; D<sub>x,y,z</sub>; VR<sub>x,y,z</sub>**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for  $f \leq 800$  MHz) and inside waveguide using analytical field distributions based on power measurements for  $f > 800$  MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM<sub>x,y,z</sub> \* ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from  $\pm 50$  MHz to  $\pm 100$  MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM<sub>x</sub> (no uncertainty required).

# Probe ES3DV3

## SN:3263

Manufactured: January 25, 2010  
Calibrated: May 15, 2014

Calibrated for DASYS/EASY Systems  
(Note: non-compatible with DASYS2 system!)

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

### Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ( $\mu\text{V}/(\text{V}/\text{m})^2$ ) <sup>A</sup>	1.21	1.24	1.13	$\pm 10.1\%$
DCP (mV) <sup>B</sup>	103.8	102.3	104.7	

### Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc <sup>E</sup> (k=2)
0	CW	X	0.0	0.0	1.0	0.00	156.3	$\pm 3.5\%$
		Y	0.0	0.0	1.0		203.1	
		Z	0.0	0.0	1.0		197.2	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	2.33	59.4	10.8	10.00	46.4	$\pm 1.4\%$
		Y	4.39	63.4	13.6		50.8	
		Z	1.35	55.5	7.8		39.6	
10011- CAB	UMTS-FDD (WCDMA)	X	3.49	68.2	19.1	2.91	126.7	$\pm 0.7\%$
		Y	3.28	66.9	18.5		120.7	
		Z	2.74	63.1	15.1		113.5	
10012- CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.51	72.0	20.3	1.87	127.9	$\pm 0.7\%$
		Y	3.21	69.4	18.8		124.1	
		Z	1.93	60.6	12.6		113.3	
10013- CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.30	70.8	23.3	9.46	125.2	$\pm 2.5\%$
		Y	12.42	72.7	24.4		129.4	
		Z	10.03	67.8	21.1		105.5	
10021- DAB	GSM-FDD (TDMA, GMSK)	X	24.45	99.1	27.6	9.39	141.4	$\pm 1.4\%$
		Y	29.93	99.5	29.0		124.5	
		Z	4.53	73.0	18.1		111.6	
10023- DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	25.10	99.7	27.9	9.57	134.2	$\pm 1.9\%$
		Y	24.85	96.1	28.0		120.2	
		Z	5.99	76.5	19.1		142.5	
10024- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	24.34	93.0	23.0	6.56	117.1	$\pm 1.4\%$
		Y	26.49	92.6	24.2		148.7	
		Z	4.00	69.6	13.8		136.6	
10027- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	51.24	99.9	23.5	4.80	131.1	$\pm 1.9\%$
		Y	56.83	99.5	24.3		101.8	
		Z	1.70	61.4	9.1		107.7	
10028- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	60.12	99.6	22.2	3.55	138.7	$\pm 1.9\%$
		Y	64.73	99.9	23.4		105.5	
		Z	1.13	58.4	6.0		116.0	
10032- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	77.27	99.6	19.6	1.16	149.5	$\pm 2.5\%$
		Y	60.44	99.7	21.0		109.4	
		Z	0.34	55.9	2.9		131.4	
10039- CAB	CDMA2000 (1xRTT, RC1)	X	4.79	66.8	19.0	4.57	124.5	$\pm 0.9\%$
		Y	4.85	66.4	18.8		125.6	
		Z	4.06	63.4	16.1		108.1	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.93	66.1	18.5	3.97	119.8	±0.7 %
		Y	3.90	65.5	18.2		120.1	
		Z	3.29	62.4	15.3		108.5	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.68	66.9	18.7	3.98	131.2	±0.7 %
		Y	4.64	66.6	18.6		130.5	
		Z	4.15	64.5	16.5		118.8	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.61	68.1	20.0	5.67	137.5	±1.7 %
		Y	6.70	68.4	20.2		137.7	
		Z	5.90	65.6	17.9		124.0	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.44	67.5	19.8	5.80	135.1	±1.7 %
		Y	6.60	68.0	20.1		135.4	
		Z	5.75	64.9	17.6		121.8	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.14	67.1	19.7	5.75	131.6	±1.2 %
		Y	6.28	67.4	19.9		132.7	
		Z	5.62	65.5	18.2		118.4	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.18	68.8	21.2	8.10	124.3	±1.9 %
		Y	10.60	69.7	21.8		126.2	
		Z	9.38	67.0	19.8		108.4	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.23	68.9	21.3	8.07	125.0	±1.9 %
		Y	10.56	69.6	21.7		127.1	
		Z	9.37	67.1	19.8		109.1	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	10.23	75.7	26.0	9.28	125.0	±2.7 %
		Y	14.60	83.3	29.5		147.3	
		Z	8.05	69.7	22.3		106.3	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.12	67.0	19.6	5.75	131.6	±1.4 %
		Y	6.28	67.4	19.9		132.4	
		Z	5.49	64.7	17.4		117.9	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.57	67.5	19.8	5.82	136.0	±1.4 %
		Y	6.71	67.9	20.1		137.1	
		Z	5.89	65.2	17.8		122.4	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.82	66.0	19.3	5.73	113.5	±1.4 %
		Y	5.12	66.3	19.4		116.6	
		Z	4.75	65.9	18.3		142.7	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	9.53	80.6	28.6	9.21	136.5	±2.2 %
		Y	11.32	81.6	28.8		109.2	
		Z	6.84	72.0	23.8		117.3	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.86	66.2	19.4	5.72	112.9	±1.2 %
		Y	5.10	66.2	19.4		115.9	
		Z	4.55	64.9	17.8		137.7	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.81	66.0	19.2	5.72	111.6	±1.2 %
		Y	5.13	66.4	19.5		116.1	
		Z	4.70	65.7	18.3		137.1	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.80	68.3	21.0	8.09	117.2	±2.2 %
		Y	10.23	69.1	21.6		121.5	
		Z	9.85	68.9	20.8		148.4	

10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.81	68.4	21.1	8.10	117.7	±2.2 %
		Y	10.23	69.2	21.6		121.7	
		Z	9.87	69.0	20.9		149.9	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.71	68.3	21.0	8.03	117.8	±2.2 %
		Y	10.12	69.1	21.6		121.0	
		Z	8.90	66.6	19.6		104.1	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.14	68.7	21.2	8.06	122.3	±1.9 %
		Y	10.52	69.5	21.7		125.4	
		Z	9.28	66.8	19.6		108.5	
10225-CAB	UMTS-FDD (HSPA+)	X	7.25	67.8	19.9	5.97	146.3	±1.7 %
		Y	7.32	67.5	19.8		149.3	
		Z	6.52	65.7	18.0		130.7	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	9.55	80.7	28.7	9.21	137.2	±2.5 %
		Y	11.34	81.7	28.9		109.9	
		Z	6.98	72.5	24.0		119.5	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.26	74.1	25.3	9.24	115.6	±3.3 %
		Y	13.72	82.5	29.3		137.9	
		Z	8.83	73.3	24.4		144.1	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	10.06	75.2	25.8	9.30	122.9	±2.7 %
		Y	14.69	83.4	29.6		147.6	
		Z	8.02	69.6	22.3		103.4	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	6.08	67.2	19.0	4.87	140.2	±1.2 %
		Y	6.23	67.5	19.2		143.5	
		Z	5.52	65.4	17.4		125.1	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.44	66.7	18.7	3.96	122.1	±0.7 %
		Y	4.39	66.3	18.5		124.4	
		Z	3.83	63.7	16.0		114.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.64	66.7	18.6	3.46	115.7	±0.7 %
		Y	3.60	66.0	18.2		118.0	
		Z	3.17	64.2	16.3		108.4	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.62	67.0	18.8	3.39	116.9	±0.9 %
		Y	3.54	66.1	18.2		119.1	
		Z	3.24	64.2	15.8		145.6	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.43	67.5	19.8	5.81	132.0	±1.4 %
		Y	6.60	68.0	20.1		134.9	
		Z	5.81	65.4	18.0		115.0	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.04	68.1	20.2	6.06	137.5	±1.4 %
		Y	7.19	68.6	20.5		140.3	
		Z	6.26	65.7	18.2		119.6	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	3.05	70.0	19.4	1.71	121.7	±0.7 %
		Y	2.91	68.7	18.7		123.4	
		Z	1.83	60.2	12.3		108.4	
10316-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.05	68.7	21.4	8.36	117.3	±1.9 %
		Y	10.57	69.7	22.0		122.8	
		Z	9.11	66.5	19.7		103.1	

10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.81	68.3	18.8	3.76	125.8	±0.7 %
		Y	4.65	66.5	18.1		130.8	
		Z	3.98	64.7	16.0		114.7	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.91	69.1	19.2	3.77	123.3	±0.7 %
		Y	4.60	66.6	18.1		128.5	
		Z	3.73	64.0	15.4		112.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.78	69.0	19.0	1.54	121.9	±0.7 %
		Y	2.46	66.8	17.9		122.5	
		Z	1.83	60.9	13.0		112.4	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.88	68.4	21.2	8.23	116.6	±1.7 %
		Y	10.29	69.2	21.7		121.5	
		Z	9.25	67.3	20.2		103.4	

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%.

<sup>A</sup> The uncertainties of NormX,Y,Z do not affect the  $E^2$ -field uncertainty inside TSL (see Pages 8 and 9).

<sup>B</sup> Numerical linearization parameter: uncertainty not required.

<sup>E</sup> Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

### Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth (mm) <sup>G</sup>	Unct. (k=2)
750	41.9	0.89	6.42	6.42	6.42	0.72	1.18	± 12.0 %
835	41.5	0.90	6.23	6.23	6.23	0.27	2.02	± 12.0 %
1750	40.1	1.37	5.41	5.41	5.41	0.74	1.23	± 12.0 %
1900	40.0	1.40	5.08	5.08	5.08	0.80	1.16	± 12.0 %
2450	39.2	1.80	4.47	4.47	4.47	0.80	1.22	± 12.0 %
2600	39.0	1.96	4.33	4.33	4.33	0.66	1.41	± 12.0 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

### Calibration Parameter Determined in Body Tissue Simulating Media

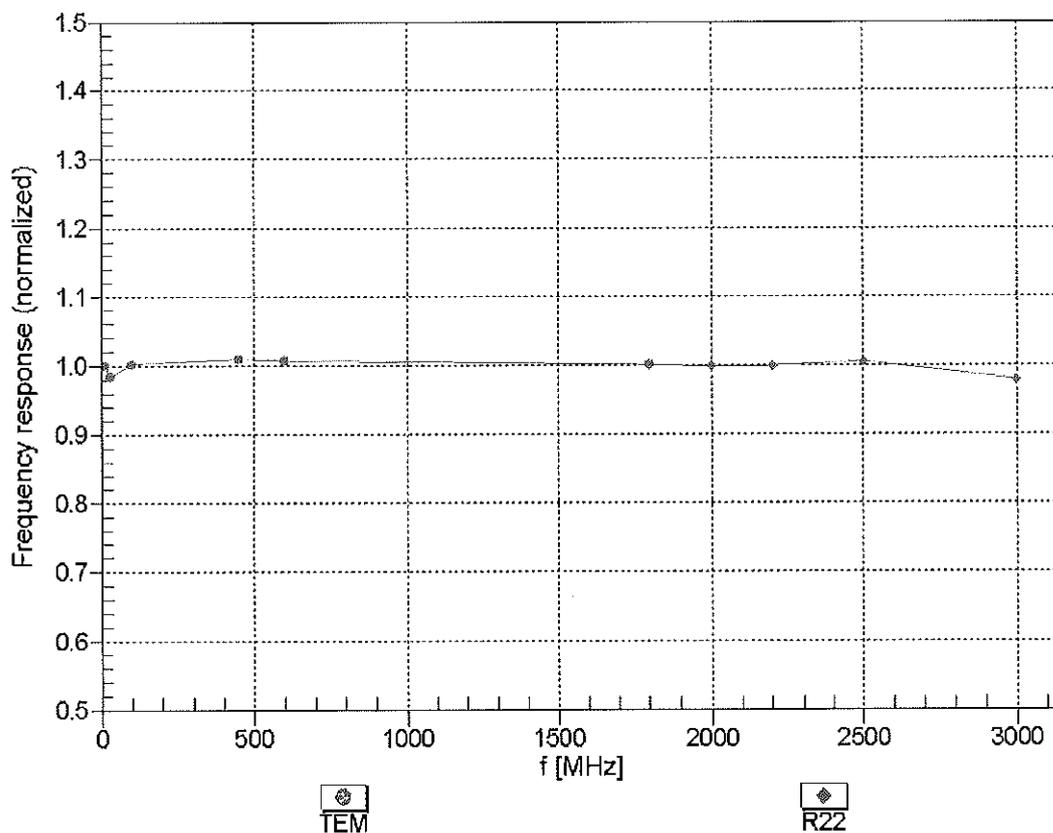
f (MHz) <sup>C</sup>	Relative Permittivity <sup>F</sup>	Conductivity (S/m) <sup>F</sup>	ConvF X	ConvF Y	ConvF Z	Alpha <sup>G</sup>	Depth (mm) <sup>G</sup>	Unct. (k=2)
750	55.5	0.96	6.19	6.19	6.19	0.52	1.41	± 12.0 %
835	55.2	0.97	6.16	6.16	6.16	0.68	1.28	± 12.0 %
1750	53.4	1.49	4.98	4.98	4.98	0.38	1.91	± 12.0 %
1900	53.3	1.52	4.78	4.78	4.78	0.66	1.35	± 12.0 %
2450	52.7	1.95	4.27	4.27	4.27	0.72	1.13	± 12.0 %
2600	52.5	2.16	4.11	4.11	4.11	0.74	1.07	± 12.0 %

<sup>C</sup> Frequency validity of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band.

<sup>F</sup> At frequencies below 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters ( $\epsilon$  and  $\sigma$ ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

<sup>G</sup> Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

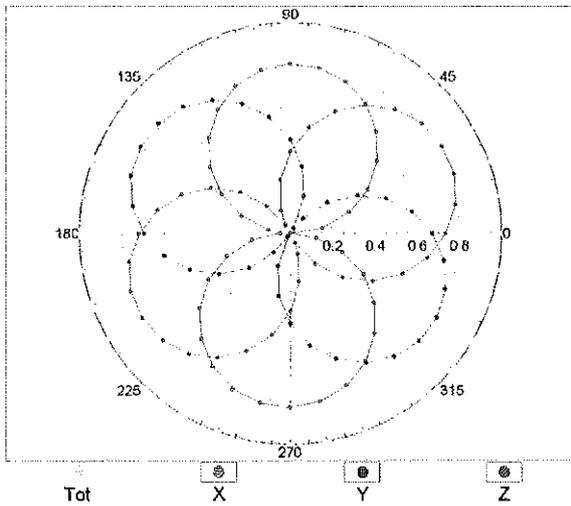
### Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



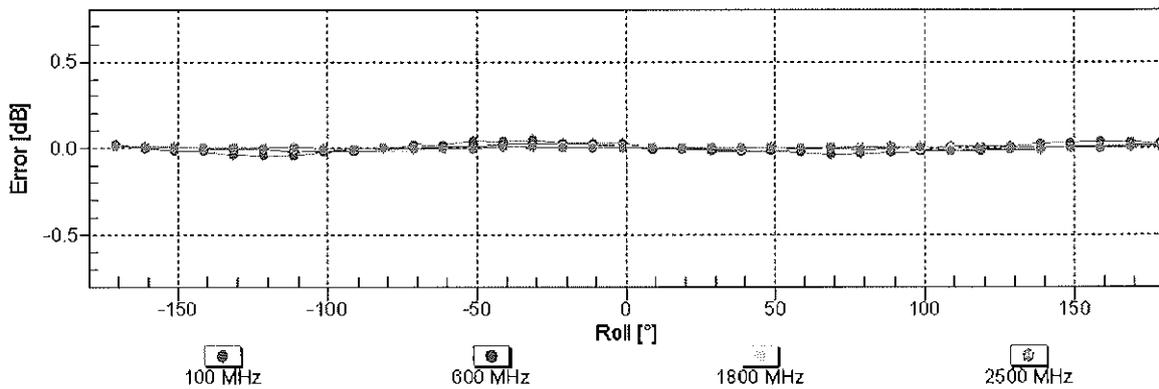
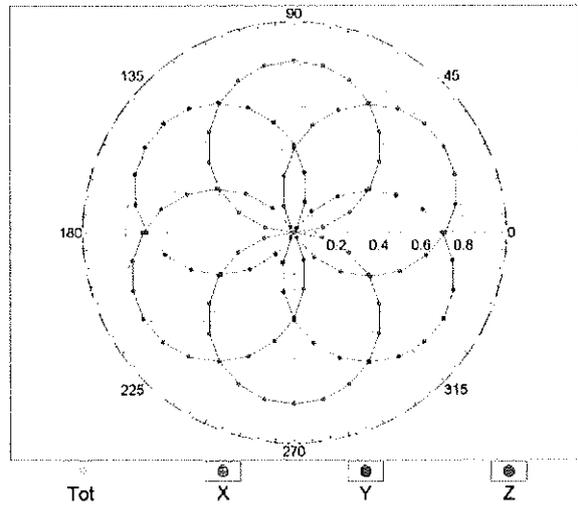
Uncertainty of Frequency Response of E-field:  $\pm 6.3\%$  (k=2)

### Receiving Pattern ( $\phi$ ), $\theta = 0^\circ$

f=600 MHz,TEM

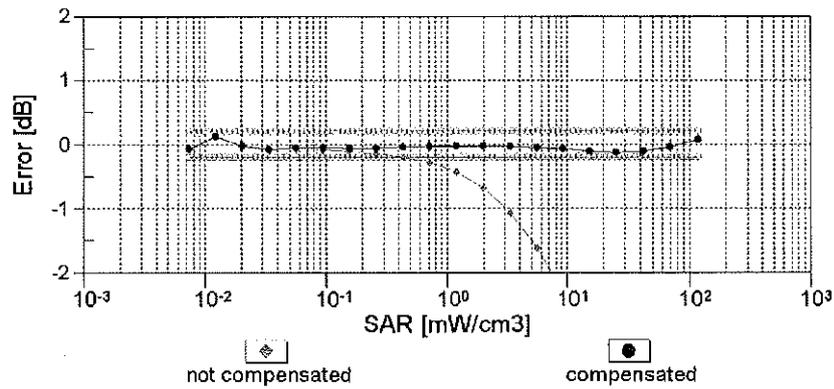
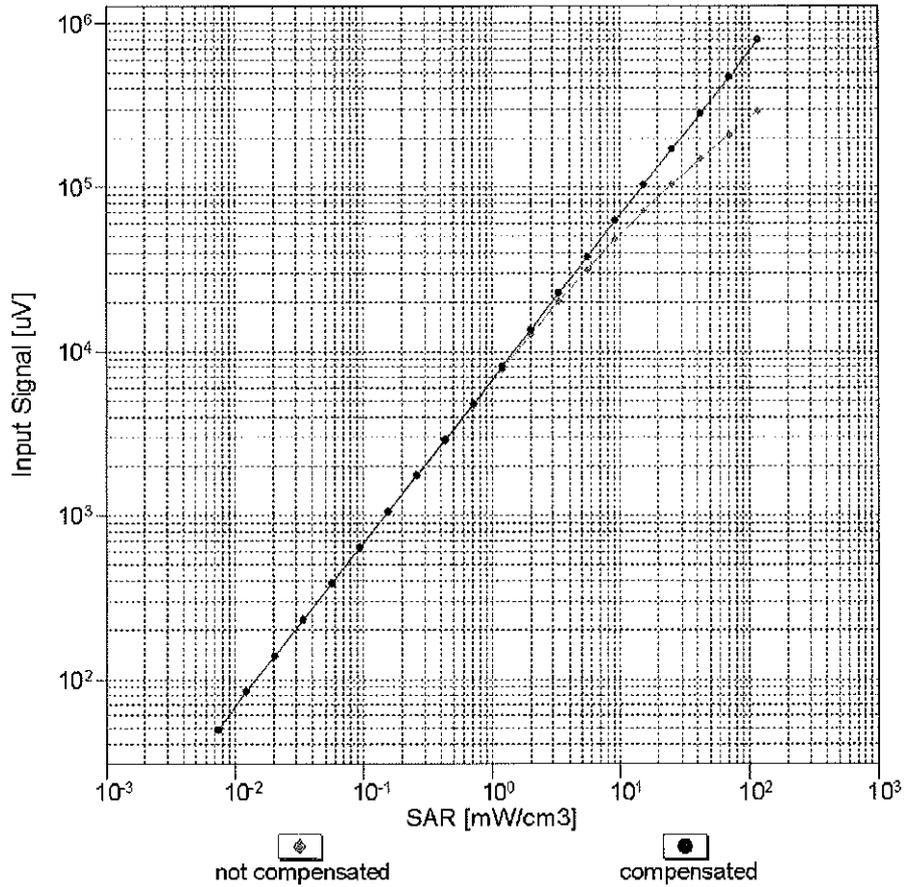


f=1800 MHz,R22



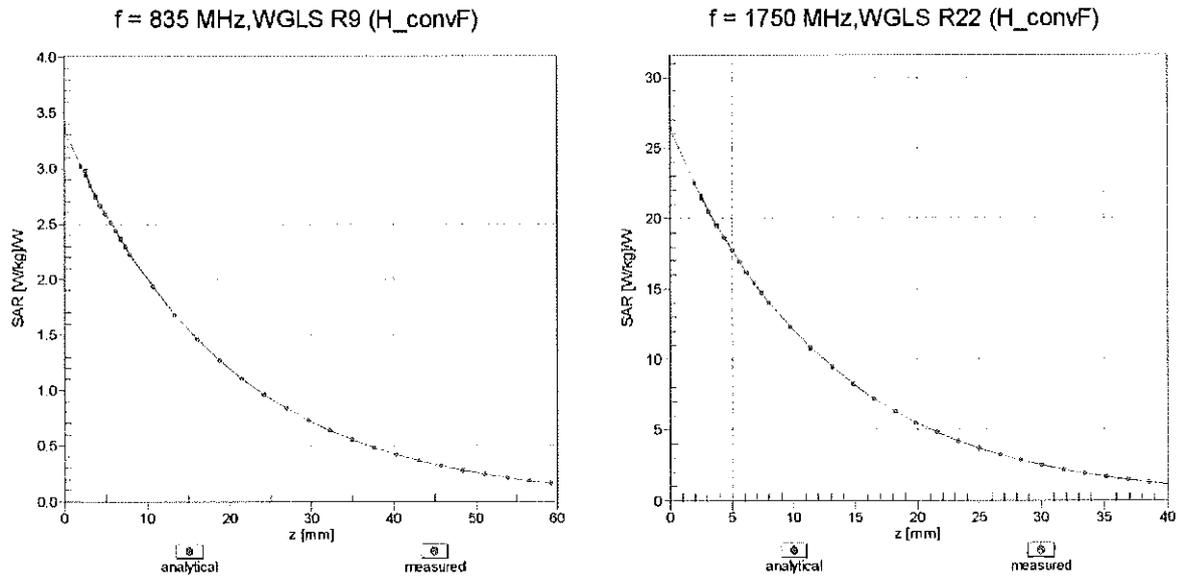
Uncertainty of Axial Isotropy Assessment:  $\pm 0.5\%$  (k=2)

### Dynamic Range $f(\text{SAR}_{\text{head}})$ (TEM cell , $f_{\text{eval}}= 1900 \text{ MHz}$ )

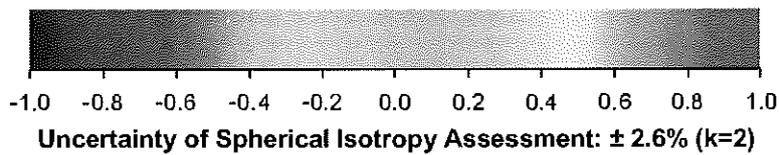
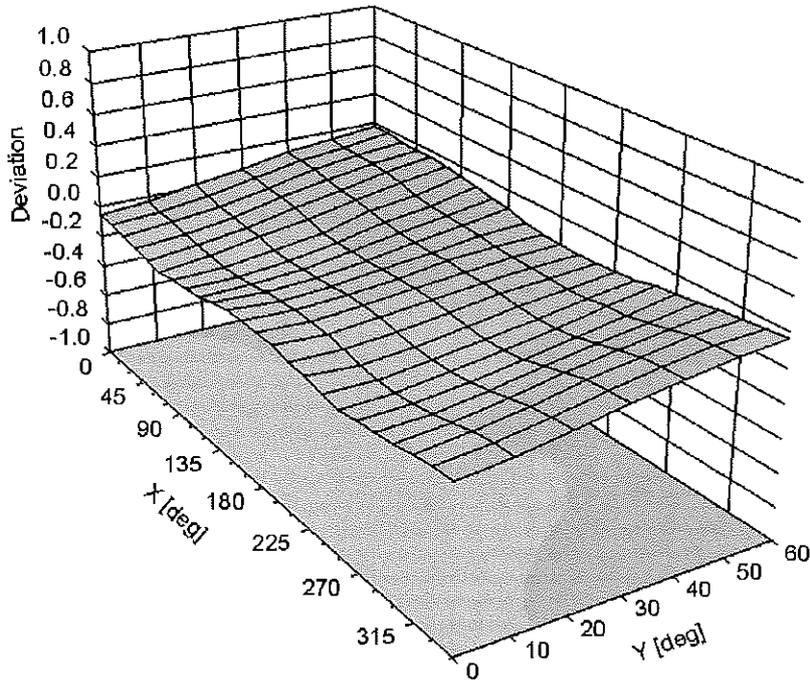


Uncertainty of Linearity Assessment:  $\pm 0.6\%$  ( $k=2$ )

# Conversion Factor Assessment



## Deviation from Isotropy in Liquid Error ( $\phi, \vartheta$ ), f = 900 MHz



## DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

### Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-111.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm