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

SAR EVALUATION REPORT

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

Date of Testing:
12/03/18 - 12/26/18
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
1M1811280213-01-R2.ZNF

FCC ID: ZNFL423DL

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

DUT Type: Portable Handset
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model: LG L423DL
Additional Model(s): LGL423DL, L423DL

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1g Head (W/kg)	1g Body-Worn (W/kg)	1g Hotspot (W/kg)	10g Phablet (W/kg)
PCE	Cell. CDMA/EVDO	824.70 - 848.31 MHz	0.32	0.38	0.45	N/A
PCE	PCS CDMA/EVDO	1851.25 - 1908.75 MHz	0.37	0.73	0.74	3.02
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.42	0.50	0.51	N/A
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.22	0.42	0.42	N/A
PCE	UMTS 850	826.40 - 846.60 MHz	0.30	0.44	0.50	N/A
PCE	UMTS 1750	1712.4 - 1752.6 MHz	0.47	1.10	1.10	3.17
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.49	0.79	0.79	3.10
PCE	LTE Band 71	665.5 - 695.5 MHz	0.26	0.37	0.37	N/A
PCE	LTE Band 12	699.7 - 715.3 MHz	0.34	0.48	0.50	N/A
PCE	LTE Band 13	779.5 - 784.5 MHz	0.27	0.35	0.40	N/A
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.27	0.32	0.34	N/A
PCE	LTE Band 66 (AWS)	1710.7 - 1779.3 MHz	0.44	0.86	0.86	3.09
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	0.43	0.69	0.69	3.20
DTS	2.4 GHz WLAN	2412 - 2462 MHz	1.08	0.85	0.85	N/A
NII	U-NII-1	5180 - 5240 MHz	N/A	N/A	0.90	N/A
NII	U-NII-2A	5260 - 5320 MHz	1.20	0.91	N/A	2.28
NII	U-NII-2C	5500 - 5720 MHz	1.19	1.30	N/A	0.92
NII	U-NII-3	5745 - 5825 MHz	0.91	0.95	0.95	N/A
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A	N/A	N/A	N/A
Simultaneous SAR per KDB 690783 D01v01r03:			1.57	1.58	1.59	3.95

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

Note: This revised Test Report (S/N: 1M1811280213-01–R2.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

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

TABLE OF CONTENTS

1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
Cell. CDMA/EVDO	Voice/Data	824.70 - 848.31 MHz
PCS CDMA/EVDO	Voice/Data	1851.25 - 1908.75 MHz
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 71	Voice/Data	665.5 - 695.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

This device uses a power reduction mechanism for SAR compliance. The power reduction mechanism is activated when the device is used in close proximity to the user's body. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device. Detailed descriptions of the power reduction mechanism are included in the operational description.

This device uses an independent fixed level power reduction mechanism for WLAN operations during voice or VoIP held to ear scenarios. Per FCC Guidance, the held-to-ear exposure conditions were evaluated at reduced power according to the head SAR positions described in IEEE 1528-2013. Detailed descriptions of the power reduction mechanism are included in the operational description.

1.3 Nominal and Maximum Output Power Specifications

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

1.3.1 Maximum PCE Output Power

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	*1 TX Slots*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*	*1 TX Slots*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*
GSM/GPRS/EDGE 850	Maximum	**32.7**	**32.7**	**32.2**	**30.7**	**29.2**	**27.7**	**27.2**	**26.7**	**26.2**
	Nominal	**32.2**	**32.2**	**31.7**	**30.2**	**28.7**	**27.2**	**26.7**	**26.2**	**25.7**
GSM/GPRS/EDGE 1900	Maximum	**31.2**	**31.2**	**29.2**	**27.2**	**25.7**	**26.7**	**26.2**	**25.7**	**25.7**
	Nominal	**30.7**	**30.7**	**28.7**	**26.7**	**25.2**	**26.2**	**25.7**	**25.2**	**25.2**

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	*3GPP HSDPA*	*3GPP HSUPA*
UMTS Band 5 (850 MHz)	Maximum	**25.2**	**25.2**	**25.2**
	Nominal	**24.7**	**24.7**	**24.7**
UMTS Band 4 (1750 MHz)	Maximum	**24.7**	**24.7**	**24.7**
	Nominal	**24.2**	**24.2**	**24.2**
UMTS Band 2 (1900 MHz)	Maximum	**24.4**	**24.4**	**24.4**
	Nominal	**23.9**	**23.9**	**23.9**

Mode / Band		Modulated Average (dBm)
Cell. CDMA/EVDO	Maximum	**25.2**
	Nominal	**24.7**
PCS CDMA/EVDO	Maximum	**24.4**
	Nominal	**23.9**

Mode / Band		Modulated Average (dBm)
LTE Band 71	Maximum	**25.2**
	Nominal	**24.7**
LTE Band 12	Maximum	**25.2**
	Nominal	**24.7**
LTE Band 13	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 5 (Cell)	Maximum	**25.2**
	Nominal	**24.7**
LTE Band 66 (AWS)	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 4 (AWS)	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 2 (PCS)	Maximum	**24.4**
	Nominal	**23.9**

1.3.2 Reduced PCE Output Power

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	*3GPP HSDPA*	*3GPP HSUPA*
UMTS Band 4 (1750 MHz)	Maximum	**23.5**	**23.5**	**23.5**
	Nominal	**23.0**	**23.0**	**23.0**
UMTS Band 2 (1900 MHz)	Maximum	**23.2**	**23.2**	**23.2**
	Nominal	**22.7**	**22.7**	**22.7**

Mode / Band		Modulated Average (dBm)
PCS CDMA/EVDO	Maximum	**22.9**
	Nominal	**22.4**

Mode / Band		Modulated Average (dBm)
LTE Band 66 (AWS)	Maximum	**23.5**
	Nominal	**23.0**
LTE Band 4 (AWS)	Maximum	**23.5**
	Nominal	**23.0**
LTE Band 2 (PCS)	Maximum	**23.2**
	Nominal	**22.7**

1.3.3 Maximum WLAN and Bluetooth Output Power

Mode / Band		Modulated Average (dBm)						
		Ch. 1	Ch. 2	Ch. 3	Ch. 4 - 6	Ch. 7 - 9	Ch. 10	Ch. 11
IEEE 802.11b (2.4 GHz)	Maximum	**22.5**						
	Nominal	**21.5**						
IEEE 802.11g (2.4 GHz)	Maximum	**17.5**	**19.5**	**21.5**	**22.0**	**21.0**	**19.0**	**17.0**
	Nominal	**16.5**	**18.5**	**20.5**	**21.0**	**20.0**	**18.0**	**16.0**
IEEE 802.11n (2.4 GHz)	Maximum	**16.5**	**18.5**	**20.5**	**21.0**	**20.0**	**18.0**	**16.0**
	Nominal	**15.5**	**17.5**	**19.5**	**20.0**	**19.0**	**17.0**	**15.0**

Mode / Band		Modulated Average (dBm)				
		20 MHz Bandwidth		40 MHz Bandwidth		80 MHz Bandwidth
		Ch.36, 64-149, 165	Ch. 40-60, 153-161	Ch.38, 62-102	Ch.46-54, 110 -159	Ch.42-155
IEEE 802.11a (5 GHz)	Maximum	**18.0**	**19.0**			
	Nominal	**17.0**	**18.0**			
IEEE 802.11n (5 GHz)	Maximum	**15.0**	**16.0**	**13.5**	**15.5**	
	Nominal	**14.0**	**15.0**	**12.5**	**14.5**	
IEEE 802.11ac (5 GHz)	Maximum	**15.0**	**16.0**	**13.0**	**15.0**	**12.5**
	Nominal	**14.0**	**15.0**	**12.0**	**14.0**	**11.5**

Mode / Band		Modulated Average (dBm)		
		Ch. 1	Ch. 2	Ch. 3
Bluetooth	Maximum	**9.0**		
	Nominal	**8.0**		
Bluetooth LE	Maximum	**0.0**		
	Nominal	**-1.0**		

1.3.4 Reduced WLAN Output Power (Held to Ear)

Mode / Band		Modulated Average (dBm)						
		Ch. 1	Ch. 2	Ch. 3	Ch. 4 - 6	Ch. 7 - 9	Ch. 10	Ch. 11
IEEE 802.11b (2.4 GHz)	Maximum	17.0						
	Nominal	16.0						
IEEE 802.11g (2.4 GHz)	Maximum	**12.0**	**14.0**	**16.0**	**16.5**	**15.5**	**13.5**	**11.5**
	Nominal	**11.0**	**13.0**	**15.0**	**15.5**	**14.5**	**12.5**	**10.5**
IEEE 802.11n (2.4 GHz)	Maximum	**12.0**	**14.0**	**16.0**	**16.5**	**15.5**	**13.5**	**11.5**
	Nominal	**11.0**	**13.0**	**15.0**	**15.5**	**14.5**	**12.5**	**10.5**

Mode / Band		Modulated Average (dBm)			
		20 MHz Bandwidth		40 MHz Bandwidth	
		Ch.36, 64-149, 165	Ch. 40-60, 153-161	Ch.38, 62-102	Ch.46-54, 110 - 159
IEEE 802.11a (5 GHz)	Maximum	**12.0**	**13.0**		
	Nominal	**11.0**	**12.0**		
IEEE 802.11n (5 GHz)	Maximum	**12.0**	**13.0**	**11.0**	**13.0**
	Nominal	**11.0**	**12.0**	**10.0**	**12.0**
IEEE 802.11ac (5 GHz)	Maximum	**12.0**	**13.0**	**11.0**	**13.0**
	Nominal	**11.0**	**12.0**	**10.0**	**12.0**

1.4 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. A diagram showing the location of the device antennas can be found in Appendix F. Since the diagonal dimension of this device is > 160 mm and <200 mm, it is considered a "phablet."

Table 1-1
Device Edges/Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
Cell. EVDO	Yes	Yes	No	Yes	Yes	Yes
PCS EVDO	Yes	Yes	No	Yes	No	Yes
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	No	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 1750	Yes	Yes	No	Yes	No	Yes
UMTS 1900	Yes	Yes	No	Yes	No	Yes
LTE Band 71	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 13	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 66 (AWS)	Yes	Yes	No	Yes	No	Yes
LTE Band 2 (PCS)	Yes	Yes	No	Yes	No	Yes
2.4 GHz WLAN	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN	Yes	Yes	Yes	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for wireless router SAR or phablet SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02r01 Section III and FCC KDB Publication 648474 D04v01r03. The distances between the transmit antennas and the edges of the device are included in the filing. When wireless router mode is enabled, U-NII-2A, U-NII-2C operations are disabled.

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be operating simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds.

This device contains multiple transmitters that may operate simultaneously, and therefore requires a simultaneous transmission analysis according to FCC KDB Publication 447498 D01v06 4.3.2 procedures.

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	1x CDMA voice + 2.4 GHz WI-FI	Yes	Yes	N/A	Yes	
2	1x CDMA voice + 5 GHz WI-FI	Yes	Yes	N/A	Yes	
3	1x CDMA voice + 2.4 GHz Bluetooth	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
4	GSM voice + 2.4 GHz WI-FI	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WI-FI	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz Bluetooth	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
7	UMTS + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes	
8	UMTS + 5 GHz WI-FI	Yes	Yes	Yes	Yes	
9	UMTS + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
10	LTE + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes	
11	LTE + 5 GHz WI-FI	Yes	Yes	Yes	Yes	
12	LTE + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
13	CDMA/EVDO data + 2.4 GHz WI-FI	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
14	CDMA/EVDO data + 5 GHz WI-FI	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
15	CDMA/EVDO data + 2.4 GHz Bluetooth	Yes*^	Yes*	Yes^	Yes	* Pre-installed VOIP applications are considered ^ Bluetooth Tethering is considered
16	GPRS/EDGE + 2.4 GHz WI-FI	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
17	GPRS/EDGE + 5 GHz WI-FI	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
18	GPRS/EDGE + 2.4 GHz Bluetooth	Yes*^	Yes*	Yes^	Yes	* Pre-installed VOIP applications are considered ^ Bluetooth Tethering is considered

1. 2.4 GHz WLAN, 5 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
2. All licensed modes share the same antenna path and cannot transmit simultaneously.
3. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
4. Per the manufacturer, WIFI Direct is expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.
5. 5 GHz Wireless Router is only supported for U-NII-1 and U-NII-3 by S/W, therefore U-NII2A, and U-NII2C were not evaluated for wireless router conditions.
6. This device supports VOLTE.
7. This device supports VOWIFI.
8. This device supports Bluetooth Tethering.

1.6 Miscellaneous SAR Test Considerations

(A) WIFI/BT

Since U-NII-1 and U-NII-2A bands have the same maximum output power and the highest reported SAR for U-NII-2A is less than 1.2 W/kg, SAR is not required for U-NII-1 band according to FCC KDB Publication 248227 D01v02r02.

Since Wireless Router operations are not allowed by the chipset firmware using U-NII-2A & U-NII-2C WIFI, only 2.4 GHz, U-NII-1 and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02r01.

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

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, head Bluetooth SAR was not required; [(8/5)* √2.480] = 2.5< 3.0. Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

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

Per KDB Publication 447498 D01v06, distance of 5mm was used to determine SAR test exclusion since the minimum test separation distance is < 5 mm.

Per FCC KDB 447498 D01v06, the 10g SAR exclusion threshold for distances <50mm is defined by the following equation:

$$\frac{Max\ Power\ of\ Channel\ (mW)}{Test\ Separation\ Dist\ (mm)} * \sqrt{Frequency(GHz)} \leq 7.5$$

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, phablet Bluetooth SAR was not required; [(8/ 5)* √2.480] = 2.5< 7.5. Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

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) TDWR and Band gap channels are supported

Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Phablet 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 U-NII-2A & U-NII-2C WLAN, phablet SAR tests were performed. Phablet SAR was not evaluated for Bluetooth, 2.4 GHz, U-NII-1, and U-NII-3 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 supports 64QAM on the uplink for LTE Operations. Conducted powers for 64QAM uplink configurations were measured per Section 5.1 of FCC KDB Publication 941225D05v02r05. SAR was not required for 64QAM since the highest maximum output power for 64QAM is ≤ ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45W/kg, per Section 5.2.4 of FCC KDB Publication 941225 D05v02r05.

This device is only capable of QPSK HSUPA in the uplink. Therefore, no additional SAR tests are required beyond that described for devices with HSUPA in KDB 941225 D01v03r01.

LTE SAR for the higher modulations and lower bandwidths were not tested since the maximum average output power of all required channels and configurations was not more than 0.5 dB higher than the highest bandwidth; and the reported LTE SAR for the highest bandwidth was less than 1.45 W/kg for all configurations according to FCC KDB 941225 D05v02r04.

CDMA 1X Advanced technology was not required for SAR since the maximum allowed output powers for 1x Advanced was not more than 0.25 dB higher than the maximum powers for 1x and the measured SAR in any 1x mode exposure conditions was not greater than 1.2 W/kg per FCC KDB Publication 941225 D01v03r01.

This device supports LTE Carrier Aggregation (CA) in the downlink only. All uplink communications are identical to Release 8 specifications. Per FCC KDB Publication 941225 D05A v01r02, SAR for LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive. The downlink carrier aggregation exclusion analysis can be found in Appendix H.

Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

Additional SAR tests for phablet SAR were evaluated per KDB 616217 Section 6 (See Section 6.9 for more information).

This device supports LTE capabilities with overlapping transmission frequency ranges. When the supported frequency range of an LTE Band falls completely within an LTE band with a larger transmission frequency range, both LTE bands have the same target power (or the band with the larger transmission frequency range has a higher target power), and both LTE bands share the same transmission path and signal characteristics, SAR was only assessed for the band with the larger transmission frequency range.

1.7 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r04, D05Av01r02, D06v02r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D04v01r03 (Phablet Procedures)
- FCC KDB Publication 616217 D04v01r02 (Proximity Sensor)

- October 2013 TCB Workshop Notes (GPRS Testing Considerations)
- April 2018 TCB Workshop Notes (LTE Carrier Aggregation)

1.8 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 11.

2 LTE INFORMATION

LTE Information			
FCC ID	**ZNFL423DL**		
Form Factor	Portable Handset		
Frequency Range of each LTE transmission band	LTE Band 71 (665.5 - 695.5 MHz)		
	LTE Band 12 (699.7 - 715.3 MHz)		
	LTE Band 13 (779.5 - 784.5 MHz)		
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)		
	LTE Band 66 (AWS) (1710.7 - 1779.3 MHz)		
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)		
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)		
Channel Bandwidths	LTE Band 71: 5 MHz, 10 MHz, 15 MHz, 20 MHz		
	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz		
	LTE Band 13: 5 MHz, 10 MHz		
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz		
	LTE Band 66 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 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		
Channel Numbers and Frequencies (MHz)	Low	Mid	High
LTE Band 71: 5 MHz	665.5 (133147)	680.5 (133297)	695.5 (133447)
LTE Band 71: 10 MHz	668 (133172)	680.5 (133297)	693 (133422)
LTE Band 71: 15 MHz	670.5 (133197)	680.5 (133297)	690.5 (133397)
LTE Band 71: 20 MHz	673 (133222)	680.5 (133297)	688 (133372)
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 13: 5 MHz	779.5 (23205)	782 (23230)	784.5 (23255)
LTE Band 13: 10 MHz	N/A	782 (23230)	N/A
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 66 (AWS): 1.4 MHz	1710.7 (131979)	1745 (132322)	1779.3 (132665)
LTE Band 66 (AWS): 3 MHz	1711.5 (131987)	1745 (132322)	1778.5 (132657)
LTE Band 66 (AWS): 5 MHz	1712.5 (131997)	1745 (132322)	1777.5 (132647)
LTE Band 66 (AWS): 10 MHz	1715 (132022)	1745 (132322)	1775 (132622)
LTE Band 66 (AWS): 15 MHz	1717.5 (132047)	1745 (132322)	1772.5 (132597)
LTE Band 66 (AWS): 20 MHz	1720 (132072)	1745 (132322)	1770 (132572)
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)
UE Category	DL UE Cat 6, UL UE Cat 5		
Modulations Supported in UL	QPSK, 16QAM, 64QAM		
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES		
A-MPR (Additional MPR) disabled for SAR Testing?	YES		
LTE Carrier Aggregation Possible Combinations	The technical description includes all the possible carrier aggregation combinations		
LTE Additional Information	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. The following LTE Release 10 Features are not supported: Relay, HetNet, Enhanced MIMO, eICIC, WIFI Offloading, MDH, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.		

3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

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

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

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

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

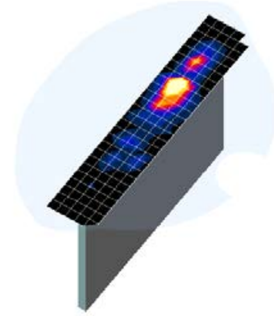


Figure 4-1
Sample SAR Area Scan

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
   b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the “Not a knot” condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

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

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

*Also compliant to IEEE 1528-2013 Table 6

5 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

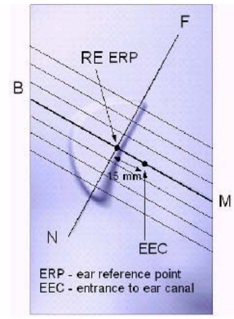


Figure 5-1
Close-Up Side view of ERP

5.2 HANDSET REFERENCE POINTS

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

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

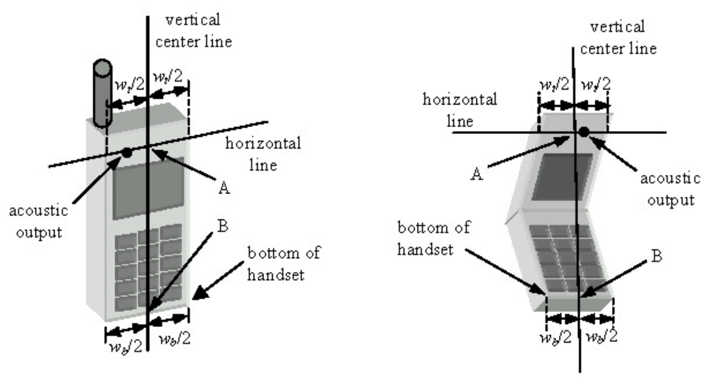


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

6 TEST CONFIGURATION POSITIONS

6.1 Device Holder

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

6.2 Positioning for Cheek

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

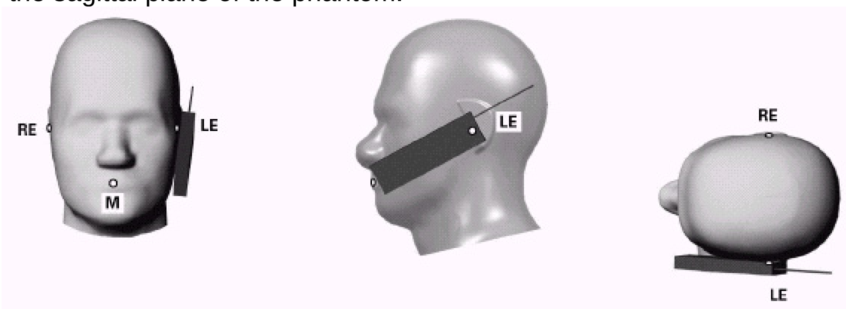


Figure 6-1 Front, Side and Top View of Cheek Position

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

6.3 Positioning for Ear / 15º Tilt

With the test device aligned in the "Cheek Position":

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

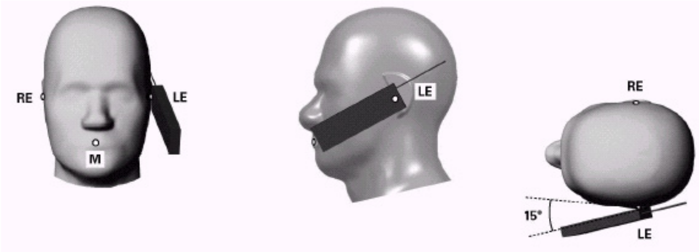


Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

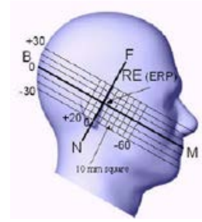


Figure 6-3
Side view w/ relevant markings

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

Antennas located near the bottom of a phone may require SAR measurements around the mouth and jaw regions of the SAM head phantom. This typically applies to clam-shell style phones that are generally longer in the unfolded normal use positions or to certain older style long rectangular phones. Per IEEE 1528-2013, a rotated SAM phantom is necessary to allow probe access to such regions. Both SAM heads of the TwinSAM-Chin20 are rotated 20 degrees around the NF line. Each head can be removed from the table for emptying and cleaning.

Under these circumstances, the following procedures apply, adopted from the FCC guidance on SAR handsets document FCC KDB Publication 648474 D04v01r03. The SAR required in these regions of SAM should be measured using a flat phantom. The phone should be positioned with a separation distance of 4 mm between the ear reference point (ERP) and the outer surface of the flat phantom shell. While maintaining this distance at the ERP location, the low (bottom) edge of the phone should be lowered from the phantom to establish the same separation distance between the peak SAR location identified by the truncated partial SAR distribution measured with the SAM phantom. The distance from the peak SAR location to the phone is determined by the straight line passing perpendicularly through the phantom surface. When it is not feasible to maintain 4 mm separation at the ERP while also establishing the required separation at the peak SAR location, the top edge of the phone will be allowed to touch the phantom with a separation < 4 mm at the ERP. The phone should not be tilted to the left or right while placed in this inclined position to the flat phantom.

6.5 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-4). Per FCC KDB Publication 648474 D04v01r03, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

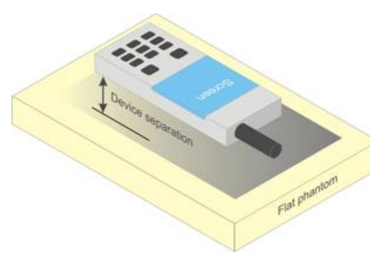


Figure 6-4
Sample Body-Worn Diagram

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not 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 1g body and 10g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D01v06 should be applied to determine SAR test requirements.

Per KDB Publication 447498 D01v06, Cell phones (handsets) are not normally designed to be used on extremities or operated in extremity only exposure conditions. The maximum output power levels of handsets generally do not require extremity SAR testing to show compliance. Therefore, extremity SAR was not evaluated for this device.

6.7 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02r01 where SAR test considerations for handsets (L x W ≥ 9 cm x 5 cm) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

When the user enables the personal wireless router functions for the handset, actual operations include simultaneous transmission of both the WIFI transmitter and another licensed transmitter. Both transmitters often do not transmit at the same transmitting frequency and thus cannot be evaluated for SAR under actual use conditions due to the limitations of the SAR assessment probes. Therefore, SAR must be evaluated for each frequency transmission and mode separately and spatially summed with the WIFI transmitter according to FCC KDB Publication 447498 D01v06 procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

6.8 Phablet Configurations

For smart phones with a display diagonal dimension > 150 mm or an overall diagonal dimension > 160 mm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04v01r03 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 <=25 mm from that surface or edge, in direct contact with the phantom, for 10g SAR. The UMPC mini-tablet 1g SAR at 5 mm is not required. When hotspot mode applies, 10g SAR is required only for the surfaces and edges with hotspot mode 1g SAR > 1.2 W/kg.

6.9 Proximity Sensor Consideration

This device uses a power reduction mechanism to reduce output powers in certain use conditions when the device is used close the user's body.

When the device's antenna is within a certain distance of the user, the sensor activates and reduces the maximum allowed output power. However, the sensor is not active when the device is moved beyond the sensor triggering distance and the maximum output power is no longer limited. Therefore, additional evaluation is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a nonreduced output power level. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device at these additional test positions. Sensor triggering distance summary data is included in Appendix G.

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

7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

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

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

8 FCC MEASUREMENT PROCEDURES

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

8.1 Measured and Reported SAR

Per FCC KDB Publication 447498 D01v06, when SAR is not measured at the maximum power level allowed for production units, the results must be scaled to the maximum tune-up tolerance limit according to the power applied to the individual channels tested to determine compliance. For simultaneous transmission, the measured aggregate SAR must be scaled according to the sum of the differences between the maximum tune-up tolerance and actual power used to test each transmitter. When SAR is measured at or scaled to the maximum tune-up tolerance limit, the results are referred to as *reported* SAR. The highest *reported* SAR results are identified on the grant of equipment authorization according to procedures in KDB 690783 D01v01r03.

8.2 3G SAR Test Reduction Procedure

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

8.3 Procedures Used to Establish RF Signal for SAR

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

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

8.4 SAR Measurement Conditions for CDMA2000

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

8.4.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by FCC KDB Publication 941225 D01v03r01 "3G SAR Measurement Procedures." Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in the "All Up" condition.

1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1, Table 8-1 parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH_0 and demodulation of RC 3,4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2, Table 8-2 was applied.

Table 8-1
Parameters for Max. Power for RC1

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

Table 8-2
Parameters for Max. Power for RC3

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

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

8.4.2 Head SAR Measurements

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

Head SAR is additionally evaluated using EVDO Rev. A to support compliance for VoIP operations. See Section 8.4.5 for EVDO Rev. A configuration parameters.

8.4.3 Body-worn SAR Measurements

SAR for body-worn exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. The 3G SAR test reduction procedure is applied to the multiple code channel configuration (FCH+SCHn), with FCH only as the primary mode. Otherwise, SAR is required for multiple code channel configuration (FCH + SCHn), with FCH at full rate and SCH0 enabled at 9600 bps, using the highest reported SAR configuration for FCH only. When multiple code channels are enabled, the transmitter output can shift by more than 0.5 dB and may lead to higher SAR drifts and SCH dropouts.

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

8.4.4 Body-worn SAR Measurements for EVDO Devices

For handsets with EVDO capabilities, the 3G SAR test reduction procedure is applied to EVDO Rev. 0 with 1x RTT RC3 as the primary mode to determine body-worn accessory test requirements. Otherwise, body-worn accessory SAR is required for Rev. 0, at 153.6 kbps, using the highest reported SAR configuration for body-worn accessory exposure in RC3.

The 3G SAR test reduction procedure is applied to Rev. A, with Rev. 0 as the primary mode to determine body-worn accessory SAR test requirements. When SAR is not required for Rev. 0, the 3G SAR test reduction is applied with 1x RTT RC3 as the primary mode.

When SAR is required for EVDO Rev. A, SAR is measured with a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations, using the highest reported SAR configuration for body-worn accessory exposure in Rev. 0 or 1x RTT RC3, as appropriate.

8.4.5 Body SAR Measurements for EVDO Hotspot

Hotspot Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0. The 3G SAR test reduction procedure is applied to Rev. A, Subtype 2 Physical layer configuration, with Rev. 0 as the primary mode; otherwise, SAR is measured for Rev. A using the highest reported SAR configuration for body-worn accessory exposure in Rev. 0. The AT is tested with a Reverse Data Channel rate of 153.6 kbps in Subtype 0/1 Physical Layer configurations; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer configurations.

For EVDO data devices that also support 1x RTT voice and/or data operations, the 3G SAR test reduction procedure is applied to 1x RTT RC3 and RC1 with EVDO Rev. 0 and Rev. A as the respective primary modes. Otherwise, the ‘Body-Worn Accessory SAR’ procedures in the ‘3GPP2 CDMA 2000 1x Handsets’ section are applied.

8.4.6 CDMA2000 1x Advanced

This device additionally supports 1x Advanced. Conducted powers are measured using SO75 with RC8 on the uplink and RC11 on the downlink per FCC KDB Publication 941225 D01v03r01. Smart blanking is disabled for all measurements. The EUT is configured with forward power control Mode 000 and reverse power control at 400 bps. Conducted powers are measured on an Agilent 8960 Series 10 Wireless Communications Test Set, Model E5515C using the CDMA2000 1x Advanced application, Option E1962B-410.

The 3G SAR test reduction procedure is applied to the 1x-Advanced transmission mode with 1x RTT RC3 as the primary mode. When SAR measurement is required, the 1x-Advanced power measurement configurations are used. The1x Advanced SAR procedures are applied separately to head, body-worn accessory and other exposure conditions.

8.5 SAR Measurement Conditions for UMTS

8.5.1 Output Power Verification

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

8.5.2 Head SAR Measurements

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

8.5.3 Body SAR Measurements

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

8.5.4 SAR Measurements with Rel 5 HSDPA

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

8.5.5 SAR Measurements with Rel 6 HSUPA

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

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

8.6 SAR Measurement Conditions for LTE

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

8.6.1 Spectrum Plots for RB Configurations

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

8.6.2 MPR

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

8.6.3 A-MPR

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

8.6.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
    i. The required channel and offset combination with the highest maximum output power is required for SAR.
    ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
    iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg.

8.6.5 Downlink Only Carrier Aggregation

Conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. 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 secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band. Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for downlink only carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

8.7 SAR Testing with 802.11 Transmitters

The normal network operating configurations of 802.11 transmitters are not suitable for SAR measurements. Unpredictable fluctuations in network traffic and antenna diversity conditions can introduce undesirable variations in SAR results. The SAR for these devices should be measured using chipset based test mode software to ensure the results are consistent and reliable. See KDB Publication 248227 D01v02r02 for more details.

8.7.1 General Device Setup

Chipset based test mode software is hardware dependent and generally varies among manufacturers. The device operating parameters established in test mode for SAR measurements must be identical to those programmed in production units, including output power levels, amplifier gain settings and other RF performance tuning parameters.

A periodic duty factor is required for current generation SAR systems to measure SAR. When 802.11 frame gaps are accounted for in the transmission, a maximum transmission duty factor of 92 - 96% is typically achievable in most test mode configurations. A minimum transmission duty factor of 85% is required to avoid certain hardware and device implementation issues related to wide range SAR scaling. The reported SAR is scaled to 100% transmission duty factor to determine compliance at the maximum tune-up tolerance limit.

8.7.2 U-NII-1 and U-NII-2A

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is > 1.2 W/kg. When different maximum output powers are specified for the bands, SAR measurement for the U-NII band with the lower maximum output power is not required unless the highest reported SAR for the U-NII band with the higher maximum output power, adjusted by the ratio of lower to higher specified maximum output power for the two bands, is > 1.2 W/kg. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.7.3 U-NII-2C and U-NII-3

The frequency range covered by U-NII-2C and U-NII-3 is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification. Unless band gap channels are permanently disabled, SAR must be considered for these channels. Each band is tested independently according to the normally required OFDM SAR measurement and probe calibration frequency points requirements.

8.7.4 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.7.5 2.4 GHz SAR Test Requirements

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

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

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

2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.7.6 OFDM Transmission Mode and SAR Test Channel Selection

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

8.7.7 Initial Test Configuration Procedure

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

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 8.7.6). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.7.8 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the subsequent test configurations are required. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

9 RF CONDUCTED POWERS

9.1 CDMA Conducted Powers

Table 9-1
Maximum Conducted Power

Band	Channel	Rule Part	Frequency	SO55 [dBm]	SO55 [dBm]	SO75 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC		MHz	RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	1013	22H	824.7	24.90	24.85	24.97	25.03	25.03	25.01	25.01
	384	22H	836.52	25.17	25.05	24.91	24.89	24.96	25.10	25.08
	777	22H	848.31	25.00	24.85	25.04	24.81	25.12	25.05	25.05
PCS	25	24E	1851.25	24.02	24.02	24.11	24.15	24.25	24.37	24.35
	600	24E	1880	24.26	24.38	24.39	24.09	24.18	24.36	24.33
	1175	24E	1908.75	24.01	24.06	24.28	24.17	24.21	24.32	24.32

Table 9-2
Reduced Conducted Power

Band	Channel	Rule Part	Frequency	SO55 [dBm]	SO55 [dBm]	SO75 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC		MHz	RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
PCS	25	24E	1851.25	22.75	22.75	22.75	22.88	22.71	22.76	22.82
	600	24E	1880	22.79	22.83	22.79	22.83	22.89	22.83	22.86
	1175	24E	1908.75	22.81	22.87	22.77	22.73	22.87	22.80	22.90

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

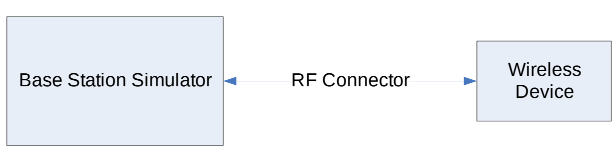


Figure 9-1
Power Measurement Setup

9.2 GSM Conducted Powers

Table 9-3
Maximum Conducted Power

Maximum Burst-Averaged Output Power										
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	32.48	32.46	32.00	**30.47**	29.16	27.49	27.10	26.70	26.17
	190	32.36	32.26	32.10	**30.56**	29.20	27.44	27.04	26.60	26.13
	251	32.40	32.39	32.18	**30.69**	29.20	27.37	27.02	26.58	26.16
GSM 1900	512	30.97	30.97	29.19	**27.05**	25.67	26.70	26.17	25.70	25.39
	661	31.18	31.18	29.18	**27.08**	25.70	26.69	26.17	25.70	25.34
	810	31.17	31.17	29.14	**27.08**	25.63	26.70	26.18	25.70	25.32

Calculated Maximum Frame-Averaged Output Power										
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	23.45	23.43	25.98	**26.21**	26.15	18.46	21.08	22.44	23.16
	190	23.33	23.23	26.08	**26.30**	26.19	18.41	21.02	22.34	23.12
	251	23.37	23.36	26.16	**26.43**	26.19	18.34	21.00	22.32	23.15
GSM 1900	512	21.94	21.94	23.17	**22.79**	22.66	17.67	20.15	21.44	22.38
	661	22.15	22.15	23.16	**22.82**	22.69	17.66	20.15	21.44	22.33
	810	22.14	22.14	23.12	**22.82**	22.62	17.67	20.16	21.44	22.31

GSM 850	**Frame Avg.Targets:**	23.17	23.17	25.68	**25.94**	25.69	18.17	20.68	21.94	22.69
GSM 1900		21.67	21.67	22.68	**22.44**	22.19	17.17	19.68	20.94	22.19

Note:
1. Both burst-averaged and calculated frame-averaged powers are included. Frame-averaged power was calculated from the measured burst-averaged power by converting the slot powers into linear units and calculating the energy over 8 timeslots.
2. GPRS/EDGE (GMSK) output powers were measured with coding scheme setting of 1 (CS1) on the base station simulator. CS1 was configured to measure GPRS output power measurements and SAR to ensure GMSK modulation in the signal. Our Investigation has shown that CS1 - CS4 settings do not have any impact on the output levels or modulation in the GPRS modes.
3. EDGE (8-PSK) output powers were measured with MCS7 on the base station simulator. MCS7 coding scheme was used to measure the output powers for EDGE since investigation has shown that choosing MCS7 coding scheme will ensure 8-PSK modulation. It has been shown that MCS levels that produce 8PSK modulation do not have an impact on output power.

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

Figure 9-2
Power Measurement Setup

9.3 UMTS Conducted Powers

Table 9-4
Maximum Conducted Power

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	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	24.95	25.09	25.13	24.60	24.51	24.35	24.28	24.18	24.21	-
99		12.2 kbps AMR	24.93	25.07	25.12	24.54	24.49	24.34	24.32	24.15	24.24	-
6	HSDPA	Subtest 1	24.89	25.13	25.20	24.67	24.69	24.55	24.33	24.31	24.30	0
6		Subtest 2	24.97	25.14	25.12	24.70	24.53	24.49	24.38	24.30	24.37	0
6		Subtest 3	24.47	24.64	24.70	24.14	24.17	24.00	23.88	23.77	23.90	0.5
6		Subtest 4	24.48	24.65	24.46	24.15	24.00	24.01	23.82	23.84	23.85	0.5
6	HSUPA	Subtest 1	24.94	25.09	24.91	24.36	24.33	24.11	23.88	23.80	23.91	0
6		Subtest 2	23.01	23.15	22.94	22.70	22.64	22.51	22.39	22.28	22.37	2
6		Subtest 3	23.94	24.14	23.91	23.65	23.65	23.50	23.40	23.33	23.38	1
6		Subtest 4	22.97	23.15	23.16	22.67	22.70	22.49	22.34	22.34	22.36	2
6		Subtest 5	25.03	25.17	25.19	24.60	24.70	24.52	24.40	24.37	24.32	0

Table 9-5
Reduced Conducted Power

3GPP Release Version	Mode	3GPP 34.121 Subtest	AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	23.43	23.23	22.99	23.03	22.88	22.87	-
99		12.2 kbps AMR	23.22	23.38	23.21	23.01	22.94	23.03	-
6	HSDPA	Subtest 1	23.46	23.47	23.37	23.13	23.09	23.04	0
6		Subtest 2	23.44	23.36	23.21	23.19	23.02	23.14	0
6		Subtest 3	22.95	22.94	22.79	22.70	22.55	22.68	0.5
6		Subtest 4	22.99	22.82	22.65	22.58	22.64	22.54	0.5
6	HSUPA	Subtest 1	23.10	22.96	22.91	22.50	22.63	22.53	0
6		Subtest 2	21.49	21.36	21.33	21.08	20.94	21.17	2
6		Subtest 3	22.50	22.36	22.28	22.20	22.19	22.17	1
6		Subtest 4	21.40	21.45	21.15	21.09	21.08	21.10	2
6		Subtest 5	23.36	23.37	23.31	23.05	23.13	23.16	0

This device does not support DC-HSDPA.

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

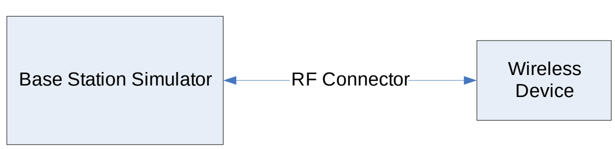


Figure 9-3
Power Measurement Setup

9.4 LTE Conducted Powers

9.4.1 LTE Band 71

Table 9-6
LTE Band 71 Conducted Powers - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	25.02	0	0
	1	50	**25.09**		0
	1	99	24.94		0
	50	0	24.09	0-1	1
	50	25	23.95		1
	50	50	**24.17**		1
	100	0	24.13		1
16QAM	1	0	24.04	0-1	1
	1	50	24.09		1
	1	99	24.03		1
	50	0	22.83	0-2	2
	50	25	23.18		2
	50	50	22.86		2
	100	0	23.18		2
64QAM	1	0	22.92	0-2	2
	1	50	22.91		2
	1	99	22.89		2
	50	0	22.06	0-3	3
	50	25	21.83		3
	50	50	21.88		3
	100	0	22.11		3

Note: LTE Band 71 at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

Table 9-7
LTE Band 71 Conducted Powers - 15 MHz Bandwidth

LTE Band 71 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 133297 (680.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	24.99	0	0
	1	36	24.99		0
	1	74	24.87		0
	36	0	24.15	0-1	1
	36	18	24.10		1
	36	37	24.02		1
	75	0	24.19		1
16QAM	1	0	23.97	0-1	1
	1	36	24.09		1
	1	74	23.93		1
	36	0	22.97	0-2	2
	36	18	22.88		2
	36	37	23.17		2
	75	0	23.05		2
64QAM	1	0	22.84	0-2	2
	1	36	23.06		2
	1	74	22.88		2
	36	0	22.01	0-3	3
	36	18	21.89		3
	36	37	21.97		3
	75	0	22.10		3

Note: LTE Band 71 at 15 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

Table 9-8
LTE Band 71 Conducted Powers - 10 MHz Bandwidth

LTE Band 71 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 133172 (668.0 MHz)	Mid Channel 133297 (680.5 MHz)	High Channel 133422 (693.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	25.13	24.86	24.97	0	0
	1	25	24.82	25.10	25.07		0
	1	49	24.85	25.17	25.03		0
	25	0	24.00	24.06	23.92	0-1	1
	25	12	23.99	23.99	23.92		1
	25	25	23.84	23.85	24.14		1
	50	0	24.09	23.82	23.84		1
16QAM	1	0	23.88	23.82	24.18	0-1	1
	1	25	23.89	23.86	24.16		1
	1	49	23.83	24.06	24.01		1
	25	0	23.01	22.93	22.86	0-2	2
	25	12	22.84	23.18	23.05		2
	25	25	23.06	23.03	22.84		2
	50	0	22.80	23.17	22.93		2
64QAM	1	0	23.06	23.11	22.87	0-2	2
	1	25	22.90	23.04	23.01		2
	1	49	22.84	23.11	22.92		2
	25	0	21.98	21.87	22.11	0-3	3
	25	12	21.89	21.96	21.91		3
	25	25	22.07	21.80	22.15		3
	50	0	22.14	22.09	21.81		3

Table 9-9
LTE Band 71 Conducted Powers - 5 MHz Bandwidth

LTE Band 71 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 133147 (665.5 MHz)	Mid Channel 133297 (680.5 MHz)	High Channel 133447 (695.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.91	25.14	24.93	0	0
	1	12	24.82	25.14	25.15		0
	1	24	24.95	25.02	24.81		0
	12	0	24.17	23.87	24.01	0-1	1
	12	6	24.01	23.93	23.86		1
	12	13	23.87	24.10	24.02		1
	25	0	23.84	24.13	24.02		1
16QAM	1	0	24.10	24.10	23.91	0-1	1
	1	12	24.03	24.08	23.97		1
	1	24	24.12	23.82	23.99		1
	12	0	23.17	22.92	22.96	0-2	2
	12	6	22.80	22.84	23.10		2
	12	13	23.00	22.94	23.11		2
	25	0	22.90	23.18	23.06		2
64QAM	1	0	22.86	22.97	22.94	0-2	2
	1	12	23.15	22.92	23.14		2
	1	24	22.91	22.89	22.91		2
	12	0	22.08	22.07	22.01	0-3	3
	12	6	22.12	21.87	21.87		3
	12	13	21.87	21.99	22.04		3
	25	0	22.12	21.84	22.16		3

9.4.2 LTE Band 12

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

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23095 (707.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.99**	0	0
	1	25	24.92		0
	1	49	24.59		0
	25	0	23.84	0-1	1
	25	12	**23.95**		1
	25	25	23.91		1
	50	0	23.92		1
16QAM	1	0	24.20	0-1	1
	1	25	23.94		1
	1	49	23.95		1
	25	0	22.94	0-2	2
	25	12	22.95		2
	25	25	22.93		2
	50	0	22.89		2
64QAM	1	0	23.02	0-2	2
	1	25	22.79		2
	1	49	22.86		2
	25	0	21.91	0-3	3
	25	12	21.94		3
	25	25	21.75		3
	50	0	21.77		3

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

Table 9-11
LTE Band 12 Conducted Powers - 5 MHz Bandwidth

LTE Band 12 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 23035 (701.5 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23155 (713.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.66	24.62	25.03	0	0
	1	12	24.88	24.71	25.08		0
	1	24	24.73	24.98	24.81		0
	12	0	23.79	23.71	23.99	0-1	1
	12	6	23.96	23.77	23.97		1
	12	13	23.79	23.80	24.03		1
	25	0	23.91	23.87	24.01		1
16QAM	1	0	23.78	23.72	24.19	0-1	1
	1	12	23.67	23.89	24.15		1
	1	24	23.29	23.74	24.20		1
	12	0	22.93	22.88	22.97	0-2	2
	12	6	22.93	22.90	22.97		2
	12	13	22.86	22.89	22.95		2
	25	0	22.82	22.91	23.01		2
64QAM	1	0	22.69	22.53	23.04	0-2	2
	1	12	22.54	22.66	22.96		2
	1	24	22.11	22.71	23.10		2
	12	0	21.77	21.81	21.86	0-3	3
	12	6	21.73	21.71	21.74		3
	12	13	21.64	21.65	21.74		3
	25	0	21.62	21.73	21.93		3

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

LTE Band 12 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 23025 (700.5 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23165 (714.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.79	24.65	25.14	0	0
	1	7	24.71	25.04	24.96		0
	1	14	24.64	25.03	24.81		0
	8	0	23.69	23.73	23.91	0-1	1
	8	4	23.71	23.89	23.87		1
	8	7	23.57	23.88	23.76		1
	15	0	23.63	23.83	23.90		1
16QAM	1	0	23.78	23.87	23.98	0-1	1
	1	7	24.20	23.99	23.94		1
	1	14	23.94	23.89	23.75		1
	8	0	22.93	22.87	23.08	0-2	2
	8	4	22.95	23.00	23.05		2
	8	7	22.78	22.92	22.95		2
	15	0	23.01	22.79	22.92		2
64QAM	1	0	22.72	22.76	22.74	0-2	2
	1	7	23.18	22.77	22.77		2
	1	14	22.84	22.80	22.52		2
	8	0	21.80	21.65	21.83	0-3	3
	8	4	21.84	21.78	22.01		3
	8	7	21.73	21.86	21.85		3
	15	0	21.93	21.59	21.76		3

Table 9-13
LTE Band 12 Conducted Powers -1.4 MHz Bandwidth

LTE Band 12 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 23017 (699.7 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23173 (715.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.93	24.74	24.80	0	0
	1	2	24.78	24.71	24.95		0
	1	5	24.71	24.66	24.65		0
	3	0	24.72	24.70	24.80		0
	3	2	24.90	24.60	24.93		0
	3	3	25.20	24.64	24.84		0
	6	0	23.79	23.76	23.74	0-1	1
16QAM	1	0	23.74	23.96	24.20	0-1	1
	1	2	24.05	24.04	24.20		1
	1	5	23.50	23.87	24.00		1
	3	0	24.00	23.79	23.66		1
	3	2	24.20	23.61	23.67		1
	3	3	23.81	23.88	23.79		1
	6	0	22.78	22.80	22.80	0-2	2
64QAM	1	0	22.62	22.89	22.97	0-2	2
	1	2	22.98	22.99	23.05		2
	1	5	22.44	22.66	22.94		2
	3	0	22.86	22.71	22.57		2
	3	2	23.12	22.58	22.58		2
	3	3	22.61	22.72	22.73		2
	6	0	21.66	21.74	21.56	0-3	3

9.4.3 LTE Band 13

Table 9-14
LTE Band 13 Conducted Powers - 10 MHz Bandwidth

LTE Band 13 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	24.63	0	0
	1	25	**24.70**		0
	1	49	24.30		0
	25	0	**23.47**	0-1	1
	25	12	23.37		1
	25	25	23.41		1
	50	0	23.20		1
16QAM	1	0	23.70	0-1	1
	1	25	23.51		1
	1	49	23.54		1
	25	0	22.60	0-2	2
	25	12	22.47		2
	25	25	22.50		2
	50	0	22.48		2
64QAM	1	0	22.51	0-2	2
	1	25	22.38		2
	1	49	22.35		2
	25	0	21.57	0-3	3
	25	12	21.30		3
	25	25	21.36		3
	50	0	21.33		3

Table 9-15
LTE Band 13 Conducted Powers - 5 MHz Bandwidth

LTE Band 13 5 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	24.41	0	0
	1	12	24.30		0
	1	24	24.54		0
	12	0	23.29	0-1	1
	12	6	23.30		1
	12	13	23.37		1
	25	0	23.36		1
16QAM	1	0	23.58	0-1	1
	1	12	23.39		1
	1	24	23.47		1
	12	0	22.45	0-2	2
	12	6	22.46		2
	12	13	22.52		2
	25	0	22.38		2
64QAM	1	0	22.40	0-2	2
	1	12	22.21		2
	1	24	22.26		2
	12	0	21.40	0-3	3
	12	6	21.24		3
	12	13	21.34		3
	25	0	21.27		3

Note: LTE Band 13 at 5 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

9.4.4 LTE Band 5 (Cell)

Table 9-16
LTE Band 5 (Cell) Conducted Powers - 10 MHz Bandwidth

LTE Band 5 (Cell) 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20525 (836.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	25.00	0	0
	1	25	**25.10**		0
	1	49	24.82		0
	25	0	23.87	0-1	1
	25	12	23.96		1
	25	25	**24.03**		1
	50	0	23.92		1
16QAM	1	0	24.20	0-1	1
	1	25	23.99		1
	1	49	24.00		1
	25	0	22.88	0-2	2
	25	12	22.95		2
	25	25	23.01		2
	50	0	22.96		2
64QAM	1	0	22.96	0-2	2
	1	25	22.85		2
	1	49	22.77		2
	25	0	21.84	0-3	3
	25	12	21.82		3
	25	25	21.95		3
	50	0	21.85		3

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

Table 9-17
LTE Band 5 (Cell) Conducted Powers - 5 MHz Bandwidth

LTE Band 5 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20425 (826.5 MHz)	Mid Channel 20525 (836.5 MHz)	High Channel 20625 (846.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.61	24.81	24.95	0	0
	1	12	24.77	24.77	24.77		0
	1	24	24.79	24.75	24.72		0
	12	0	23.85	23.86	23.92	0-1	1
	12	6	23.79	23.82	23.95		1
	12	13	23.90	23.76	23.88		1
	25	0	23.91	23.90	24.05		1
16QAM	1	0	23.84	23.85	24.20	0-1	1
	1	12	23.96	23.77	24.17		1
	1	24	23.97	23.79	24.19		1
	12	0	22.94	23.01	22.82	0-2	2
	12	6	22.89	22.98	22.90		2
	12	13	23.00	22.93	22.86		2
	25	0	22.94	22.92	22.92		2
64QAM	1	0	22.78	22.70	23.03	0-2	2
	1	12	22.72	22.62	23.12		2
	1	24	22.87	22.69	23.01		2
	12	0	21.83	21.89	21.75	0-3	3
	12	6	21.66	21.77	21.81		3
	12	13	21.87	21.73	21.84		3
	25	0	21.73	21.74	21.82		3

Table 9-18
LTE Band 5 (Cell) Conducted Powers - 3 MHz Bandwidth

LTE Band 5 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20415 (825.5 MHz)	Mid Channel 20525 (836.5 MHz)	High Channel 20635 (847.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.76	25.06	24.88	0	0
	1	7	25.10	24.81	25.20		0
	1	14	24.93	24.71	24.80		0
	8	0	23.94	23.86	23.87	0-1	1
	8	4	23.98	23.83	23.86		1
	8	7	23.94	23.81	23.82		1
	15	0	23.84	23.83	23.88		1
16QAM	1	0	23.94	23.96	24.20	0-1	1
	1	7	24.15	24.12	24.13		1
	1	14	24.02	23.97	24.18		1
	8	0	23.05	23.04	22.94	0-2	2
	8	4	23.00	23.02	23.06		2
	8	7	23.02	22.99	22.97		2
	15	0	22.82	22.81	23.02		2
64QAM	1	0	22.70	22.87	22.96	0-2	2
	1	7	22.99	22.89	23.00		2
	1	14	22.89	22.83	23.00		2
	8	0	21.95	22.01	21.79	0-3	3
	8	4	21.81	21.79	21.89		3
	8	7	21.97	21.76	21.82		3
	15	0	21.77	21.71	21.92		3

Table 9-19
LTE Band 5 (Cell) Conducted Powers -1.4 MHz Bandwidth

LTE Band 5 (Cell) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20407 (824.7 MHz)	Mid Channel 20525 (836.5 MHz)	High Channel 20643 (848.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.84	24.77	24.75	0	0
	1	2	24.70	24.85	24.77		0
	1	5	24.72	24.71	24.76		0
	3	0	24.82	24.92	24.87		0
	3	2	24.81	24.81	24.87		0
	3	3	24.77	24.84	24.89		0
	6	0	23.81	23.83	23.76	0-1	1
16QAM	1	0	23.72	23.96	23.94	0-1	1
	1	2	23.73	24.08	23.80		1
	1	5	23.62	23.96	23.88		1
	3	0	24.13	23.76	23.58		1
	3	2	24.17	23.88	23.67		1
	3	3	24.12	23.77	23.64		1
	6	0	22.85	22.92	22.76	0-2	2
64QAM	1	0	22.51	22.94	22.87	0-2	2
	1	2	22.55	23.06	22.66		2
	1	5	22.59	22.79	22.71		2
	3	0	23.10	22.56	22.54		2
	3	2	22.94	22.79	22.48		2
	3	3	22.98	22.68	22.52		2
	6	0	21.79	21.68	21.71	0-3	3

9.4.5 LTE Band 66 (AWS)

Table 9-20
LTE Band 66 (AWS) Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.31	24.27	24.28	0	0
	1	50	**24.70**	24.08	24.67		0
	1	99	24.66	24.42	24.39		0
	50	0	23.55	23.41	23.45	0-1	1
	50	25	23.59	23.58	23.42		1
	50	50	**23.63**	23.62	23.56		1
	100	0	23.60	23.48	23.44		1
16QAM	1	0	23.67	23.70	23.61	0-1	1
	1	50	23.56	23.65	23.62		1
	1	99	23.65	23.70	23.66		1
	50	0	22.49	22.44	22.40	0-2	2
	50	25	22.53	22.57	22.34		2
	50	50	22.59	22.60	22.52		2
	100	0	22.62	22.46	22.51		2
64QAM	1	0	22.49	22.69	22.55	0-2	2
	1	50	22.48	22.53	22.51		2
	1	99	22.53	22.59	22.64		2
	50	0	21.62	21.39	21.37	0-3	3
	50	25	21.65	21.33	21.09		3
	50	50	21.67	21.57	21.57		3
	100	0	21.63	21.20	21.61		3

Table 9-21
LTE Band 66 (AWS) Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 66 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132047 (1717.5 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132597 (1772.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.44	24.49	24.51	0	0
	1	36	24.37	24.26	24.43		0
	1	74	24.42	24.46	24.51		0
	36	0	23.57	23.50	23.49	0-1	1
	36	18	23.44	23.47	23.49		1
	36	37	23.45	23.41	23.38		1
	75	0	23.50	23.48	23.47		1
16QAM	1	0	23.69	23.67	23.63	0-1	1
	1	36	23.53	23.31	23.25		1
	1	74	23.70	23.53	23.16		1
	36	0	22.65	22.57	22.57	0-2	2
	36	18	22.58	22.38	22.48		2
	36	37	22.53	22.39	22.38		2
	75	0	22.59	22.50	22.46		2
64QAM	1	0	22.61	22.65	22.64	0-2	2
	1	36	22.50	22.35	22.26		2
	1	74	22.60	22.48	22.17		2
	36	0	21.56	21.40	21.65	0-3	3
	36	18	21.50	21.41	21.24		3
	36	37	21.58	21.22	21.22		3
	75	0	21.32	21.43	21.52		3

Table 9-22
LTE Band 66 (AWS) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132022 (1715.0 MHz)	132322 (1745.0 MHz)	132622 (1775.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.96	24.10	23.91	0	0
	1	25	24.30	24.30	24.60		0
	1	49	24.37	24.39	24.51		0
	25	0	23.48	23.60	23.55	0-1	1
	25	12	23.60	23.70	23.70		1
	25	25	23.66	23.64	23.64		1
	50	0	23.56	23.70	23.59		1
16QAM	1	0	23.06	23.19	23.14	0-1	1
	1	25	23.58	23.53	23.62		1
	1	49	23.53	23.62	23.57		1
	25	0	22.56	22.70	22.70	0-2	2
	25	12	22.70	22.64	22.66		2
	25	25	22.69	22.63	22.64		2
	50	0	22.55	22.68	22.64		2
64QAM	1	0	21.95	22.05	22.21	0-2	2
	1	25	22.28	22.62	22.42		2
	1	49	22.39	22.47	22.61		2
	25	0	21.63	21.65	21.66	0-3	3
	25	12	21.69	21.58	21.60		3
	25	25	21.70	21.68	21.51		3
	50	0	21.43	21.54	21.41		3

Table 9-23
LTE Band 66 (AWS) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131997 (1712.5 MHz)	132322 (1745.0 MHz)	132647 (1777.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.49	24.62	24.70	0	0
	1	12	24.19	24.61	24.26		0
	1	24	24.42	24.28	24.17		0
	12	0	23.57	23.52	23.70	0-1	1
	12	6	23.58	23.68	23.60		1
	12	13	23.54	23.56	23.56		1
	25	0	23.55	23.67	23.66		1
16QAM	1	0	23.63	23.52	23.60	0-1	1
	1	12	23.70	23.46	23.68		1
	1	24	23.70	23.65	23.53		1
	12	0	22.65	22.61	22.52	0-2	2
	12	6	22.62	22.64	22.43		2
	12	13	22.64	22.61	22.55		2
	25	0	22.57	22.62	22.66		2
64QAM	1	0	22.57	22.53	22.66	0-2	2
	1	12	22.68	22.53	22.65		2
	1	24	22.60	22.47	22.54		2
	12	0	21.65	21.50	21.47	0-3	3
	12	6	21.47	21.55	21.21		3
	12	13	21.39	21.59	21.27		3
	25	0	21.51	21.59	21.64		3

Table 9-24
LTE Band 66 (AWS) Maximum Conducted Powers - 3 MHz Bandwidth

LTE Band 66 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 131987 (1711.5 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132657 (1778.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.50	24.50	24.45	0	0
	1	7	24.22	24.10	24.31		0
	1	14	24.32	24.35	24.31		0
	8	0	23.57	23.57	23.53	0-1	1
	8	4	23.55	23.55	23.53		1
	8	7	23.48	23.64	23.52		1
	15	0	23.55	23.53	23.53		1
16QAM	1	0	23.69	23.65	23.65	0-1	1
	1	7	23.55	23.57	23.66		1
	1	14	23.52	23.51	23.43		1
	8	0	22.66	22.70	22.59	0-2	2
	8	4	22.62	22.68	22.67		2
	8	7	22.69	22.70	22.61		2
	15	0	22.65	22.54	22.60		2
64QAM	1	0	22.52	22.70	22.59	0-2	2
	1	7	22.41	22.50	22.60		2
	1	14	22.61	22.61	22.27		2
	8	0	21.65	21.68	21.44	0-3	3
	8	4	21.45	21.58	21.47		3
	8	7	21.43	21.67	21.55		3
	15	0	21.60	21.48	21.40		3

Table 9-25
LTE Band 66 (AWS) Maximum Conducted Powers -1.4 MHz Bandwidth

LTE Band 66 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 131979 (1710.7 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132665 (1779.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.50	24.62	24.68	0	0
	1	2	24.62	24.37	24.42		0
	1	5	24.40	24.63	24.38		0
	3	0	24.42	24.48	24.68		0
	3	2	24.43	24.53	24.57		0
	3	3	24.30	24.55	24.63		0
	6	0	23.41	23.59	23.67	0-1	1
16QAM	1	0	23.59	23.47	23.43	0-1	1
	1	2	23.29	23.65	23.41		1
	1	5	23.32	23.43	23.41		1
	3	0	23.36	23.41	23.40		1
	3	2	23.37	23.52	23.40		1
	3	3	23.30	23.31	23.27		1
	6	0	22.51	22.54	22.51	0-2	2
64QAM	1	0	22.42	22.37	22.40	0-2	2
	1	2	22.20	22.45	22.19		2
	1	5	22.26	22.52	22.33		2
	3	0	22.28	22.32	22.34		2
	3	2	22.24	22.43	22.51		2
	3	3	22.21	22.23	22.21		2
	6	0	21.38	21.39	21.54	0-3	3

Table 9-26
LTE Band 66 (AWS) Reduced Conducted Powers -20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132072 (1720.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132572 (1770.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.22	23.26	23.32	0	0
	1	50	23.27	23.32	23.21		0
	1	99	**23.45**	23.34	23.29		0
	50	0	23.37	23.30	23.32	0-1	0
	50	25	**23.50**	23.49	23.34		0
	50	50	23.45	23.21	23.24		0
	100	0	23.49	23.25	23.19		0
16QAM	1	0	23.18	23.21	23.33	0-1	0
	1	50	23.41	23.22	23.18		0
	1	99	23.37	23.46	23.43		0
	50	0	22.23	22.47	22.47	0-2	1
	50	25	22.47	22.37	22.45		1
	50	50	22.33	22.43	22.43		1
	100	0	22.37	22.20	22.27		1
64QAM	1	0	22.46	22.49	22.26	0-2	1
	1	50	22.45	22.41	22.43		1
	1	99	22.21	22.44	22.37		1
	50	0	21.28	21.26	21.20	0-3	2
	50	25	21.24	21.45	21.31		2
	50	50	21.37	21.36	21.17		2
	100	0	21.26	21.37	21.30		2

Table 9-27
LTE Band 66 (AWS) Reduced Conducted Powers -15 MHz Bandwidth

LTE Band 66 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132047 (1717.5 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132597 (1772.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.32	23.43	23.20	0	0
	1	36	23.50	23.33	23.35		0
	1	74	23.28	23.30	23.50		0
	36	0	23.47	23.40	23.28	0-1	0
	36	18	23.17	23.18	23.19		0
	36	37	23.18	23.21	23.37		0
	75	0	23.48	23.26	23.19		0
16QAM	1	0	23.48	23.21	23.47	0-1	0
	1	36	23.48	23.23	23.17		0
	1	74	23.44	23.27	23.42		0
	36	0	22.34	22.44	22.30	0-2	1
	36	18	22.31	22.25	22.41		1
	36	37	22.28	22.24	22.19		1
	75	0	22.22	22.35	22.40		1
64QAM	1	0	22.44	22.17	22.50	0-2	1
	1	36	22.28	22.29	22.23		1
	1	74	22.38	22.30	22.41		1
	36	0	21.28	21.31	21.26	0-3	2
	36	18	21.29	21.29	21.40		2
	36	37	21.25	21.18	21.38		2
	75	0	21.27	21.42	21.29		2

Table 9-28
LTE Band 66 (AWS) Reduced Conducted Powers -10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132022 (1715.0 MHz)	132322 (1745.0 MHz)	132622 (1775.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.35	23.26	23.24	0	0
	1	25	23.21	23.29	23.25		0
	1	49	23.17	23.29	23.37		0
	25	0	23.34	23.37	23.19	0-1	0
	25	12	23.43	23.45	23.44		0
	25	25	23.30	23.33	23.24		0
	50	0	23.37	23.34	23.27		0
16QAM	1	0	23.21	23.39	23.29	0-1	0
	1	25	23.47	23.31	23.20		0
	1	49	23.35	23.34	23.40		0
	25	0	22.25	22.38	22.30	0-2	1
	25	12	22.24	22.26	22.47		1
	25	25	22.32	22.21	22.30		1
	50	0	22.17	22.44	22.25		1
64QAM	1	0	22.27	22.36	22.19	0-2	1
	1	25	22.23	22.50	22.27		1
	1	49	22.39	22.44	22.48		1
	25	0	21.26	21.23	21.49	0-3	2
	25	12	21.17	21.44	21.19		2
	25	25	21.35	21.19	21.19		2
	50	0	21.41	21.46	21.38		2

Table 9-29
LTE Band 66 (AWS) Reduced Conducted Powers -5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131997 (1712.5 MHz)	132322 (1745.0 MHz)	132647 (1777.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.43	23.24	23.25	0	0
	1	12	23.40	23.48	23.45		0
	1	24	23.21	23.42	23.27		0
	12	0	23.36	23.38	23.36	0-1	0
	12	6	23.42	23.27	23.49		0
	12	13	23.47	23.41	23.48		0
	25	0	23.45	23.31	23.41		0
16QAM	1	0	23.39	23.23	23.49	0-1	0
	1	12	23.30	23.25	23.28		0
	1	24	23.27	23.48	23.28		0
	12	0	22.28	22.25	22.35	0-2	1
	12	6	22.46	22.32	22.47		1
	12	13	22.29	22.24	22.38		1
	25	0	22.45	22.49	22.39		1
64QAM	1	0	22.28	22.34	22.28	0-2	1
	1	12	22.18	22.24	22.21		1
	1	24	22.26	22.38	22.31		1
	12	0	21.27	21.19	21.42	0-3	2
	12	6	21.33	21.42	21.22		2
	12	13	21.39	21.41	21.32		2
	25	0	21.35	21.47	21.23		2

Table 9-30
LTE Band 66 (AWS) Reduced Conducted Powers -3 MHz Bandwidth

LTE Band 66 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 131987 (1711.5 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132657 (1778.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.24	23.42	23.47	0	0
	1	7	23.20	23.32	23.33		0
	1	14	23.39	23.38	23.43		0
	8	0	23.34	23.38	23.46	0-1	0
	8	4	23.48	23.19	23.17		0
	8	7	23.35	23.35	23.44		0
	15	0	23.30	23.46	23.20		0
16QAM	1	0	23.25	23.20	23.17	0-1	0
	1	7	23.40	23.20	23.48		0
	1	14	23.49	23.49	23.22		0
	8	0	22.36	22.32	22.42	0-2	1
	8	4	22.40	22.38	22.30		1
	8	7	22.33	22.41	22.50		1
	15	0	22.42	22.22	22.24		1
64QAM	1	0	22.20	22.21	22.40	0-2	1
	1	7	22.39	22.21	22.44		1
	1	14	22.26	22.24	22.41		1
	8	0	21.32	21.27	21.48	0-3	2
	8	4	21.44	21.39	21.37		2
	8	7	21.41	21.17	21.26		2
	15	0	21.37	21.47	21.31		2

Table 9-31
LTE Band 66 (AWS) Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 66 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 131979 (1710.7 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132665 (1779.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.49	23.40	23.18	0	0
	1	2	23.50	23.42	23.20		0
	1	5	23.18	23.32	23.22		0
	3	0	23.29	23.44	23.47		0
	3	2	23.30	23.22	23.34		0
	3	3	23.22	23.24	23.39		0
	6	0	23.41	23.20	23.20	0-1	0
16QAM	1	0	23.40	23.19	23.23	0-1	0
	1	2	23.49	23.33	23.21		0
	1	5	23.47	23.22	23.44		0
	3	0	23.48	23.18	23.24		0
	3	2	23.47	23.35	23.28		0
	3	3	23.38	23.32	23.25		0
	6	0	22.45	22.30	22.28	0-2	1
64QAM	1	0	22.40	22.27	22.40	0-2	1
	1	2	22.32	22.20	22.27		1
	1	5	22.27	22.17	22.44		1
	3	0	22.41	22.28	22.17		1
	3	2	22.19	22.39	22.44		1
	3	3	22.23	22.24	22.42		1
	6	0	21.17	21.21	21.29	0-3	2

9.4.6 LTE Band 2 (PCS)

Table 9-32
LTE Band 2 (PCS) Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 2 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 18700 (1860.0 MHz)	Mid Channel 18900 (1880.0 MHz)	High Channel 19100 (1900.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.82	23.96	**24.09**	0	0
	1	50	23.72	23.52	23.84		0
	1	99	23.93	23.78	23.88		0
	50	0	22.89	22.87	**22.91**	0-1	1
	50	25	22.91	22.89	22.89		1
	50	50	22.88	22.80	22.90		1
	100	0	22.89	22.87	22.90		1
16QAM	1	0	23.31	23.40	23.38	0-1	1
	1	50	23.30	23.09	23.19		1
	1	99	23.24	23.29	23.21		1
	50	0	21.91	21.96	21.85	0-2	2
	50	25	21.90	21.97	21.91		2
	50	50	21.92	21.85	21.88		2
	100	0	21.91	21.91	22.01		2
64QAM	1	0	22.31	22.30	22.39	0-2	2
	1	50	22.32	21.92	22.19		2
	1	99	22.04	22.09	22.14		2
	50	0	20.99	21.01	20.60	0-3	3
	50	25	20.80	20.83	20.79		3
	50	50	20.75	20.68	20.89		3
	100	0	20.89	20.89	20.94		3

Table 9-33
LTE Band 2 (PCS) Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 2 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 18675 (1857.5 MHz)	Mid Channel 18900 (1880.0 MHz)	High Channel 19125 (1902.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.90	24.35	24.03	0	0
	1	36	23.76	23.62	23.82		0
	1	74	24.25	23.90	23.95		0
	36	0	22.88	22.87	22.94	0-1	1
	36	18	22.84	22.94	22.97		1
	36	37	22.91	22.90	22.98		1
	75	0	22.92	22.84	22.85		1
16QAM	1	0	23.35	23.29	23.03	0-1	1
	1	36	23.09	22.92	22.74		1
	1	74	23.38	23.17	23.05		1
	36	0	21.98	21.84	21.94	0-2	2
	36	18	21.94	21.90	21.95		2
	36	37	21.94	21.89	21.93		2
	75	0	21.90	21.85	21.87		2
64QAM	1	0	22.40	22.15	21.89	0-2	2
	1	36	21.89	21.65	21.64		2
	1	74	22.30	22.26	22.10		2
	36	0	20.83	20.62	20.86	0-3	3
	36	18	20.99	20.93	21.08		3
	36	37	20.91	20.93	20.74		3
	75	0	20.91	20.78	20.72		3

Table 9-34
LTE Band 2 (PCS) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 2 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 18650 (1855.0 MHz)	Mid Channel 18900 (1880.0 MHz)	High Channel 19150 (1905.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.18	23.83	24.23	0	0
	1	25	23.79	23.82	23.77		0
	1	49	24.09	23.99	24.05		0
	25	0	22.99	22.71	23.08	0-1	1
	25	12	23.00	22.87	23.05		1
	25	25	23.09	22.89	23.08		1
	50	0	22.97	22.90	23.25		1
16QAM	1	0	23.33	22.90	23.14	0-1	1
	1	25	23.29	22.78	22.79		1
	1	49	23.29	22.82	23.04		1
	25	0	22.02	21.91	22.16	0-2	2
	25	12	21.99	22.02	22.19		2
	25	25	22.03	21.99	22.12		2
	50	0	21.97	21.92	22.15		2
64QAM	1	0	22.19	21.97	22.01	0-2	2
	1	25	22.17	21.63	21.79		2
	1	49	22.09	21.72	22.23		2
	25	0	21.04	20.66	21.11	0-3	3
	25	12	21.01	21.15	21.33		3
	25	25	20.88	21.18	20.99		3
	50	0	20.99	20.69	21.01		3

Table 9-35
LTE Band 2 (PCS) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 2 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 18625 (1852.5 MHz)	Mid Channel 18900 (1880.0 MHz)	High Channel 19175 (1907.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.74	23.61	23.95	0	0
	1	12	24.11	23.61	23.91		0
	1	24	23.56	23.51	23.73		0
	12	0	23.04	22.77	22.97	0-1	1
	12	6	22.90	22.81	22.92		1
	12	13	22.87	22.78	22.83		1
	25	0	22.92	22.76	23.01		1
16QAM	1	0	23.40	22.99	23.11	0-1	1
	1	12	23.26	22.61	23.02		1
	1	24	23.37	22.83	23.01		1
	12	0	22.32	21.81	22.00	0-2	2
	12	6	22.21	21.81	22.04		2
	12	13	22.10	21.90	21.95		2
	25	0	22.06	21.83	22.00		2
64QAM	1	0	22.40	21.91	21.99	0-2	2
	1	12	22.16	21.32	22.04		2
	1	24	22.22	21.88	21.91		2
	12	0	21.23	20.61	21.07	0-3	3
	12	6	21.32	20.70	21.19		3
	12	13	20.93	20.72	20.83		3
	25	0	21.14	20.87	20.84		3

Table 9-36
LTE Band 2 (PCS) Maximum Conducted Powers - 3 MHz Bandwidth

LTE Band 2 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 18615 (1851.5 MHz)	Mid Channel 18900 (1880.0 MHz)	High Channel 19185 (1908.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.77	24.19	24.05	0	0
	1	7	24.16	23.61	23.94		0
	1	14	23.66	23.57	23.73		0
	8	0	22.98	22.79	22.94	0-1	1
	8	4	22.89	22.70	22.98		1
	8	7	22.79	22.76	22.95		1
	15	0	22.94	22.73	22.96		1
16QAM	1	0	23.00	22.94	22.83	0-1	1
	1	7	23.06	22.54	22.84		1
	1	14	22.97	22.56	22.68		1
	8	0	21.90	21.96	22.08	0-2	2
	8	4	22.01	21.83	21.99		2
	8	7	22.03	21.79	21.96		2
	15	0	21.88	21.67	21.98		2
64QAM	1	0	21.86	21.77	21.73	0-2	2
	1	7	22.00	21.40	21.66		2
	1	14	21.86	21.47	21.59		2
	8	0	20.84	20.98	21.09	0-3	3
	8	4	21.08	20.85	21.01		3
	8	7	21.04	20.69	20.94		3
	15	0	20.97	20.49	20.95		3

Table 9-37
LTE Band 2 (PCS) Maximum Conducted Powers -1.4 MHz Bandwidth

LTE Band 2 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 18607 (1850.7 MHz)	Mid Channel 18900 (1880.0 MHz)	High Channel 19193 (1909.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.75	23.54	23.82	0	0
	1	2	23.74	23.50	23.91		0
	1	5	23.72	23.53	24.20		0
	3	0	23.70	23.62	23.98		0
	3	2	23.98	24.13	24.06		0
	3	3	23.92	23.55	23.99		0
	6	0	22.90	22.66	22.86	0-1	1
16QAM	1	0	23.39	22.99	22.91	0-1	1
	1	2	22.96	22.49	22.88		1
	1	5	22.99	22.56	22.78		1
	3	0	23.30	22.83	22.84		1
	3	2	22.92	22.89	22.96		1
	3	3	22.85	22.72	22.85		1
	6	0	21.70	21.87	22.04	0-2	2
64QAM	1	0	22.22	21.81	21.94	0-2	2
	1	2	21.92	21.45	21.91		2
	1	5	21.80	21.62	21.64		2
	3	0	22.35	21.70	21.64		2
	3	2	22.00	21.92	21.86		2
	3	3	21.77	21.84	21.81		2
	6	0	20.60	20.67	21.13	0-3	3

Table 9-38
LTE Band 2 (PCS) Reduced Conducted Powers -20 MHz Bandwidth

LTE Band 2 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18700 (1860.0 MHz)	18900 (1880.0 MHz)	19100 (1900.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.89	22.98	23.14	0	0
	1	50	23.01	22.87	22.98		0
	1	99	22.95	**23.19**	22.89		0
	50	0	23.11	**23.20**	22.93	0-1	0
	50	25	23.12	22.90	23.15		0
	50	50	23.11	22.90	22.96		0
	100	0	22.92	23.02	22.94		0
16QAM	1	0	22.87	23.06	23.13	0-1	0
	1	50	23.12	22.97	23.06		0
	1	99	23.10	23.07	22.97		0
	50	0	22.00	22.04	22.06	0-2	1
	50	25	22.16	21.92	22.09		1
	50	50	21.92	22.00	22.05		1
	100	0	22.03	22.10	22.14		1
64QAM	1	0	22.15	22.17	22.16	0-2	1
	1	50	22.15	21.92	22.18		1
	1	99	22.10	21.92	22.00		1
	50	0	20.97	20.93	21.02	0-3	2
	50	25	20.96	20.97	20.87		2
	50	50	21.00	21.15	21.18		2
	100	0	21.00	21.19	20.96		2

Table 9-39
LTE Band 2 (PCS) Reduced Conducted Powers -15 MHz Bandwidth

LTE Band 2 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18675 (1857.5 MHz)	18900 (1880.0 MHz)	19125 (1902.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.95	23.15	22.99	0	0
	1	36	23.08	23.10	22.89		0
	1	74	23.06	23.15	22.90		0
	36	0	22.95	23.14	23.09	0-1	0
	36	18	23.09	23.09	22.87		0
	36	37	23.08	23.12	23.10		0
	75	0	22.91	23.19	23.07		0
16QAM	1	0	23.14	22.99	22.87	0-1	0
	1	36	23.17	23.14	22.91		0
	1	74	22.93	23.12	23.11		0
	36	0	22.16	22.10	21.88	0-2	1
	36	18	22.05	22.18	22.01		1
	36	37	22.12	22.08	21.92		1
	75	0	21.90	22.04	22.16		1
64QAM	1	0	21.94	21.95	22.03	0-2	1
	1	36	22.15	22.14	22.02		1
	1	74	22.16	21.97	21.90		1
	36	0	20.89	21.08	21.11	0-3	2
	36	18	21.17	21.20	21.11		2
	36	37	21.01	20.95	21.16		2
	75	0	21.18	21.16	20.99		2

Table 9-40
LTE Band 2 (PCS) Reduced Conducted Powers -10 MHz Bandwidth

LTE Band 2 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18650 (1855.0 MHz)	18900 (1880.0 MHz)	19150 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.93	23.06	22.95	0	0
	1	25	23.13	22.99	22.92		0
	1	49	23.18	23.08	23.10		0
	25	0	23.16	23.11	22.96	0-1	0
	25	12	23.08	23.00	22.95		0
	25	25	22.87	23.02	22.95		0
	50	0	23.15	22.90	22.87		0
16QAM	1	0	23.00	23.15	22.92	0-1	0
	1	25	23.07	23.00	23.08		0
	1	49	22.98	23.08	22.99		0
	25	0	22.02	21.87	22.17	0-2	1
	25	12	22.09	21.94	21.95		1
	25	25	22.10	21.94	22.18		1
	50	0	22.06	22.11	21.89		1
64QAM	1	0	22.06	22.02	22.16	0-2	1
	1	25	22.08	22.07	21.94		1
	1	49	21.87	22.17	22.12		1
	25	0	20.94	21.13	21.06	0-3	2
	25	12	20.87	21.16	21.18		2
	25	25	20.99	20.95	20.99		2
	50	0	20.89	20.91	20.94		2

Table 9-41
LTE Band 2 (PCS) Reduced Conducted Powers -5 MHz Bandwidth

LTE Band 2 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18625 (1852.5 MHz)	18900 (1880.0 MHz)	19175 (1907.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.97	23.09	23.14	0	0
	1	12	23.13	23.06	23.07		0
	1	24	23.13	23.11	22.87		0
	12	0	22.93	23.14	23.01	0-1	0
	12	6	22.88	23.01	23.19		0
	12	13	23.11	22.93	22.89		0
	25	0	22.91	23.07	23.17		0
16QAM	1	0	22.95	23.02	22.88	0-1	0
	1	12	22.96	23.11	23.16		0
	1	24	22.98	23.16	23.13		0
	12	0	21.99	22.03	22.01	0-2	1
	12	6	21.92	22.19	21.93		1
	12	13	22.09	22.12	22.13		1
	25	0	22.14	22.19	21.95		1
64QAM	1	0	22.05	22.18	21.99	0-2	1
	1	12	22.12	22.02	21.98		1
	1	24	22.00	22.17	21.93		1
	12	0	21.01	21.05	21.13	0-3	2
	12	6	20.93	21.09	21.00		2
	12	13	20.93	20.96	20.91		2
	25	0	21.01	21.01	21.16		2

Table 9-42
LTE Band 2 (PCS) Reduced Conducted Powers -3 MHz Bandwidth

LTE Band 2 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18615 (1851.5 MHz)	18900 (1880.0 MHz)	19185 (1908.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.98	23.01	23.00	0	0
	1	7	23.07	23.08	22.93		0
	1	14	23.02	23.17	22.87		0
	8	0	23.15	23.10	22.94	0-1	0
	8	4	22.93	22.92	23.05		0
	8	7	23.05	22.92	23.00		0
	15	0	22.92	23.13	23.17		0
16QAM	1	0	22.98	22.95	22.88	0-1	0
	1	7	23.04	22.97	23.08		0
	1	14	23.04	22.95	23.16		0
	8	0	21.89	22.13	22.03	0-2	1
	8	4	21.92	22.14	22.13		1
	8	7	21.87	21.93	21.96		1
	15	0	21.98	21.98	22.08		1
64QAM	1	0	22.05	22.02	21.92	0-2	1
	1	7	22.16	22.09	21.90		1
	1	14	21.88	21.94	21.90		1
	8	0	20.93	21.10	20.99	0-3	2
	8	4	20.96	21.19	21.14		2
	8	7	21.05	21.04	21.04		2
	15	0	21.09	21.00	20.93		2

Table 9-43
LTE Band 2 (PCS) Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 2 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18607 (1850.7 MHz)	18900 (1880.0 MHz)	19193 (1909.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.99	23.12	23.05	0	0
	1	2	23.00	23.02	23.20		0
	1	5	23.00	22.98	22.90		0
	3	0	23.06	23.03	23.16		0
	3	2	22.97	23.06	23.07		0
	3	3	23.19	23.09	23.19		0
	6	0	23.13	22.91	23.17	0-1	0
16QAM	1	0	22.96	22.93	23.04	0-1	0
	1	2	23.08	23.19	23.00		0
	1	5	23.06	22.95	23.00		0
	3	0	23.13	22.90	23.14		0
	3	2	22.90	22.97	23.17		0
	3	3	23.07	22.98	22.98		0
	6	0	22.16	22.00	21.96	0-2	1
64QAM	1	0	22.16	22.12	22.06	0-2	1
	1	2	21.97	21.98	21.90		1
	1	5	22.12	21.93	21.99		1
	3	0	21.91	22.11	21.87		1
	3	2	22.01	21.96	22.14		1
	3	3	21.92	22.00	22.12		1
	6	0	21.05	20.99	21.03	0-3	2

9.5 WLAN Conducted Powers

Table 9-44
2.4 GHz WLAN Maximum Average RF Power

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	21.53	16.77	15.80
2437	6	**21.78**	21.02	20.10
2462	11	21.77	16.28	15.44

Table 9-45
5 GHz WLAN Maximum Average RF Power

5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
		Average	Average	Average
5180	36	17.59	14.80	14.87
5200	40	**18.12**	15.70	15.70
5220	44	18.11	15.70	15.63
5240	48	18.07	15.70	15.52
5260	52	**18.08**	15.75	15.80
5280	56	18.07	15.76	15.70
5300	60	18.03	15.74	15.76
5320	64	17.51	14.96	14.86
5500	100	17.39	14.96	14.95
5600	120	17.35	14.89	14.72
5620	124	17.44	14.77	14.76
5720	144	**17.56**	14.96	14.95
5745	149	17.38	14.96	14.91
5765	153	18.27	15.65	15.53
5785	157	18.37	15.58	15.56
5805	161	**18.40**	15.79	15.56
5825	165	17.59	14.93	14.99

Table 9-46
2.4 GHz WLAN Reduced Average RF Power

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	**16.30**	11.81	11.63
2437	6	16.28	16.35	16.12
2462	11	16.11	11.28	11.05

Table 9-47
5 GHz WLAN Reduced Average RF Power

5GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5190	38	10.34	10.00
5230	46	**12.20**	11.90
5270	54	**12.26**	11.90
5310	62	10.25	9.99
5510	102	10.35	10.01
5550	110	12.02	11.68
5590	118	12.01	11.70
5630	126	12.09	11.88
5710	142	**12.21**	11.51
5755	151	12.08	11.67
5795	159	**12.20**	11.90

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

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

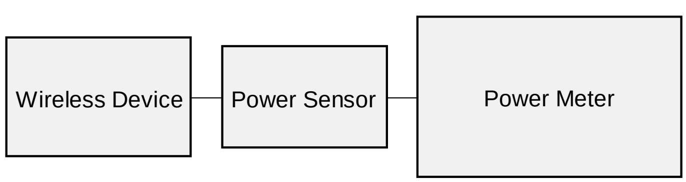


Figure 9-4
Power Measurement Setup

10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Tissue Properties - Head

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (˚C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
12/19/2018	750H	19.8	680	0.853	42.604	0.888	42.305	-3.94%	0.71%
			695	0.858	42.538	0.889	42.227	-3.49%	0.74%
			700	0.860	42.519	0.889	42.201	-3.26%	0.75%
			710	0.863	42.476	0.890	42.149	-3.03%	0.78%
			725	0.869	42.415	0.891	42.071	-2.47%	0.82%
			740	0.874	42.354	0.893	41.994	-2.13%	0.86%
			755	0.880	42.310	0.894	41.916	-1.57%	0.94%
			770	0.886	42.279	0.895	41.838	-1.01%	1.05%
			785	0.891	42.245	0.896	41.760	-0.56%	1.16%
12/19/2018	835H	21.9	820	0.914	43.153	0.899	41.578	1.67%	3.79%
			835	0.929	42.966	0.900	41.500	3.22%	3.53%
			850	0.944	42.786	0.916	41.500	3.06%	3.10%
12/25/2018	1750H	20.8	1710	1.356	39.031	1.348	40.142	0.59%	-2.77%
			1750	1.382	38.985	1.371	40.079	0.80%	-2.73%
			1790	1.405	38.885	1.394	40.016	0.79%	-2.83%
12/3/2018	1900H	20.5	1850	1.409	39.007	1.400	40.000	0.64%	-2.48%
			1880	1.430	38.983	1.400	40.000	2.14%	-2.54%
			1910	1.448	38.944	1.400	40.000	3.43%	-2.64%
12/19/2018	1900H	21.5	1850	1.389	40.286	1.400	40.000	-0.79%	0.72%
			1880	1.419	40.172	1.400	40.000	1.36%	0.43%
			1910	1.450	40.036	1.400	40.000	3.57%	0.09%
12/17/2018	2450H	22.7	2400	1.805	38.467	1.756	39.289	2.79%	-2.09%
			2450	1.862	38.272	1.800	39.200	3.44%	-2.37%
			2500	1.914	38.094	1.855	39.136	3.18%	-2.66%
12/24/2018	2450H	23.2	2400	1.740	38.538	1.756	39.289	-0.91%	-1.91%
			2450	1.797	38.399	1.800	39.200	-0.17%	-2.04%
			2500	1.850	38.191	1.855	39.136	-0.27%	-2.41%
12/16/2018	5200H-5800H	20.2	5180	4.474	34.895	4.635	36.009	-3.47%	-3.09%
			5200	4.488	34.893	4.655	35.986	-3.59%	-3.04%
			5220	4.508	34.872	4.676	35.963	-3.59%	-3.03%
			5240	4.522	34.819	4.696	35.940	-3.71%	-3.12%
			5260	4.548	34.762	4.717	35.917	-3.58%	-3.22%
			5280	4.579	34.735	4.737	35.894	-3.34%	-3.23%
			5300	4.588	34.730	4.758	35.871	-3.57%	-3.18%
			5320	4.604	34.685	4.778	35.849	-3.64%	-3.25%
			5500	4.793	34.499	4.963	35.643	-3.43%	-3.21%
			5520	4.807	34.457	4.983	35.620	-3.53%	-3.27%
			5540	4.830	34.428	5.004	35.597	-3.48%	-3.28%
			5560	4.852	34.376	5.024	35.574	-3.42%	-3.37%
			5580	4.878	34.372	5.045	35.551	-3.31%	-3.32%
			5600	4.892	34.355	5.065	35.529	-3.42%	-3.30%
			5620	4.912	34.299	5.086	35.506	-3.42%	-3.40%
			5640	4.939	34.259	5.106	35.483	-3.27%	-3.45%
			5660	4.961	34.254	5.127	35.460	-3.24%	-3.40%
			5680	4.964	34.236	5.147	35.437	-3.56%	-3.39%
			5700	4.992	34.191	5.168	35.414	-3.41%	-3.45%
			5745	5.049	34.102	5.214	35.363	-3.16%	-3.57%
			5765	5.072	34.067	5.234	35.340	-3.10%	-3.60%
			5785	5.085	34.058	5.255	35.317	-3.24%	-3.56%
			5800	5.098	34.034	5.270	35.300	-3.26%	-3.59%
			5805	5.099	34.004	5.275	35.294	-3.34%	-3.66%
			5825	5.123	33.988	5.296	35.271	-3.27%	-3.64%
12/26/2018	5250H	20.2	5180	4.524	35.417	4.635	36.009	-2.39%	-1.64%
			5200	4.544	35.353	4.655	35.986	-2.38%	-1.76%
			5220	4.563	35.361	4.676	35.963	-2.42%	-1.67%
			5240	4.582	35.294	4.696	35.940	-2.43%	-1.80%
			5260	4.604	35.320	4.717	35.917	-2.40%	-1.66%
			5280	4.629	35.233	4.737	35.894	-2.28%	-1.84%
			5300	4.656	35.211	4.758	35.871	-2.14%	-1.84%
			5320	4.672	35.215	4.778	35.849	-2.22%	-1.77%

Table 10-2
Measured Tissue Properties - Body

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (˚C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
12/5/2018	750B	21.0	695	0.918	55.345	0.959	55.745	-4.28%	-0.72%
			700	0.920	55.335	0.959	55.726	-4.07%	-0.70%
			710	0.923	55.312	0.960	55.687	-3.85%	-0.67%
			720	0.927	55.297	0.961	55.648	-3.54%	-0.63%
			740	0.935	55.270	0.963	55.570	-2.91%	-0.54%
			755	0.940	55.228	0.964	55.512	-2.49%	-0.51%
			770	0.946	55.197	0.965	55.453	-1.97%	-0.46%
			785	0.952	55.152	0.966	55.395	-1.45%	-0.44%
12/12/2018	750B	20.2	680	0.930	54.889	0.958	55.804	-2.92%	-1.64%
			695	0.934	54.856	0.959	55.745	-2.61%	-1.59%
			700	0.936	54.839	0.959	55.726	-2.40%	-1.59%
			740	0.952	54.738	0.963	55.570	-1.14%	-1.50%
			755	0.958	54.693	0.964	55.512	-0.62%	-1.48%
12/5/2018	835B	21.0	820	0.966	55.068	0.969	55.258	-0.31%	-0.34%
			835	0.972	55.035	0.970	55.200	0.21%	-0.30%
			850	0.979	54.997	0.988	55.154	-0.91%	-0.28%
12/7/2018	835B	19.2	820	0.932	54.852	0.969	55.258	-3.82%	-0.73%
			835	0.936	54.810	0.970	55.200	-3.51%	-0.71%
			850	0.941	54.750	0.988	55.154	-4.76%	-0.73%
12/11/2018	835B	20.6	820	0.968	54.697	0.969	55.258	-0.10%	-1.02%
			835	0.974	54.661	0.970	55.200	0.41%	-0.98%
			850	0.980	54.621	0.988	55.154	-0.81%	-0.97%
12/26/2018	835B	19.1	820	0.959	53.645	0.969	55.258	-1.03%	-2.92%
			835	0.965	53.598	0.970	55.200	-0.52%	-2.90%
			850	0.972	53.536	0.988	55.154	-1.62%	-2.93%
12/10/2018	1750B	20.4	1710	1.419	53.778	1.463	53.537	-3.01%	0.45%
			1750	1.443	53.745	1.488	53.432	-3.02%	0.59%
			1790	1.472	53.694	1.514	53.326	-2.77%	0.69%
12/26/2018	1750B	21.1	1710	1.483	52.686	1.463	53.537	1.37%	-1.59%
			1750	1.531	52.512	1.488	53.432	2.89%	-1.72%
			1790	1.574	52.325	1.514	53.326	3.96%	-1.88%
12/5/2018	1900B	23.5	1850	1.517	51.165	1.520	53.300	-0.20%	-4.01%
			1880	1.550	51.085	1.520	53.300	1.97%	-4.16%
			1910	1.583	50.992	1.520	53.300	4.14%	-4.33%
12/9/2018	1900B	22.4	1850	1.505	52.898	1.520	53.300	-0.99%	-0.75%
			1880	1.542	52.822	1.520	53.300	1.45%	-0.90%
			1910	1.576	52.692	1.520	53.300	3.68%	-1.14%
12/19/2018	1900B	22.3	1850	1.518	53.708	1.520	53.300	-0.13%	0.77%
			1880	1.551	53.602	1.520	53.300	2.04%	0.57%
			1910	1.584	53.462	1.520	53.300	4.21%	0.30%
12/12/2018	2450B	23.0	2400	1.981	51.864	1.902	52.767	4.15%	-1.71%
			2450	2.038	51.736	1.950	52.700	4.51%	-1.83%
			2500	2.099	51.550	2.021	52.636	3.86%	-2.06%

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (˚C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ε	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ε	% dev σ	% dev ε
12/17/2018	5200B-5800B	22.3	5180	5.310	47.947	5.276	49.041	0.64%	-2.23%
			5200	5.346	47.915	5.299	49.014	0.89%	-2.24%
			5220	5.375	47.898	5.323	48.987	0.98%	-2.22%
			5240	5.410	47.871	5.346	48.960	1.20%	-2.22%
			5260	5.416	47.835	5.369	48.933	0.88%	-2.24%
			5280	5.465	47.761	5.393	48.906	1.34%	-2.34%
			5300	5.502	47.755	5.416	48.879	1.59%	-2.30%
			5320	5.508	47.681	5.439	48.851	1.27%	-2.40%
			5500	5.775	47.404	5.650	48.607	2.21%	-2.47%
			5520	5.801	47.337	5.673	48.580	2.26%	-2.56%
			5540	5.832	47.276	5.696	48.553	2.39%	-2.63%
			5560	5.869	47.256	5.720	48.526	2.60%	-2.62%
			5580	5.894	47.228	5.743	48.499	2.63%	-2.62%
			5600	5.910	47.181	5.766	48.471	2.50%	-2.66%
			5620	5.940	47.144	5.790	48.444	2.59%	-2.68%
			5640	5.975	47.077	5.813	48.417	2.79%	-2.77%
			5660	6.008	47.073	5.837	48.390	2.93%	-2.72%
			5680	6.036	47.060	5.860	48.363	3.00%	-2.69%
			5700	6.070	46.976	5.883	48.336	3.18%	-2.81%
			5745	6.137	46.835	5.936	48.275	3.39%	-2.98%
			5765	6.168	46.829	5.959	48.248	3.51%	-2.94%
			5785	6.190	46.823	5.982	48.220	3.48%	-2.90%
12/26/2018	5200B-5800B	21.9	5180	5.315	48.067	5.276	49.041	0.74%	-1.99%
			5200	5.346	48.007	5.299	49.014	0.89%	-2.05%
			5220	5.370	48.002	5.323	48.987	0.88%	-2.01%
			5240	5.403	47.944	5.346	48.960	1.07%	-2.08%
			5260	5.439	47.943	5.369	48.933	1.30%	-2.02%
			5280	5.466	47.832	5.393	48.906	1.35%	-2.20%
			5300	5.490	47.824	5.416	48.879	1.37%	-2.16%
			5320	5.519	47.811	5.439	48.851	1.47%	-2.13%
			5500	5.789	47.465	5.650	48.607	2.46%	-2.35%
			5520	5.807	47.430	5.673	48.580	2.36%	-2.37%
			5540	5.851	47.372	5.696	48.553	2.72%	-2.43%
			5560	5.877	47.365	5.720	48.526	2.74%	-2.39%
			5580	5.909	47.298	5.743	48.499	2.89%	-2.48%
			5600	5.939	47.285	5.766	48.471	3.00%	-2.45%
			5620	5.959	47.254	5.790	48.444	2.92%	-2.46%
			5640	5.989	47.225	5.813	48.417	3.03%	-2.46%
			5660	6.032	47.158	5.837	48.390	3.34%	-2.55%
			5680	6.071	47.118	5.860	48.363	3.60%	-2.57%
			5700	6.085	47.116	5.883	48.336	3.43%	-2.52%
			5745	6.147	47.016	5.936	48.275	3.55%	-2.61%
			5765	6.176	46.990	5.959	48.248	3.64%	-2.61%
			5785	6.219	46.931	5.982	48.220	3.96%	-2.67%

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

10.2 Test System Verification

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

Table 10-3
System Verification Results – 1g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
M	750	HEAD	12/19/2018	21.3	19.8	0.200	1054	3287	1.730	8.370	8.650	3.35%
G	835	HEAD	12/19/2018	23.0	22.1	0.200	4d047	7410	2.040	9.470	10.200	7.71%
M	1750	HEAD	12/25/2018	19.8	19.8	0.100	1148	3287	3.660	36.400	36.600	0.55%
M	1900	HEAD	12/03/2018	21.7	20.5	0.100	5d148	3287	4.200	40.100	42.000	4.74%
H	1900	HEAD	12/19/2018	21.6	21.5	0.100	5d080	7409	4.110	39.800	41.100	3.27%
G	2450	HEAD	12/17/2018	21.9	22.0	0.100	981	7410	5.250	52.300	52.500	0.38%
I	2450	HEAD	12/24/2018	20.1	23.2	0.100	719	7406	5.260	51.900	52.600	1.35%
H	5250	HEAD	12/16/2018	20.8	20.4	0.050	1191	7409	3.890	78.900	77.800	-1.39%
H	5600	HEAD	12/16/2018	20.8	20.4	0.050	1191	7409	3.970	83.600	79.400	-5.02%
H	5750	HEAD	12/16/2018	20.8	20.4	0.050	1191	7409	3.930	79.100	78.600	-0.63%
H	5250	HEAD	12/26/2018	20.5	20.2	0.050	1057	7409	3.870	79.200	77.400	-2.27%
I	750	BODY	12/05/2018	22.2	20.6	0.200	1003	7406	1.730	8.580	8.650	0.82%
L	750	BODY	12/12/2018	21.8	20.2	0.200	1003	7308	1.650	8.580	8.250	-3.85%
I	835	BODY	12/05/2018	22.2	20.6	0.200	4d047	7406	1.970	9.710	9.850	1.44%
J	835	BODY	12/07/2018	19.5	19.2	0.200	4d047	3347	1.980	9.710	9.900	1.96%
I	835	BODY	12/11/2018	22.3	21.0	0.200	4d132	7406	1.980	9.710	9.900	1.96%
J	835	BODY	12/26/2018	19.9	19.1	0.200	4d133	3347	1.960	9.750	9.800	0.51%
J	1750	BODY	12/10/2018	19.9	20.4	0.100	1150	3347	3.610	36.600	36.100	-1.37%
D	1750	BODY	12/26/2018	22.8	21.1	0.100	1148	7357	3.880	37.000	38.800	4.86%
E	1900	BODY	12/05/2018	24.5	23.3	0.100	5d148	3332	4.150	39.600	41.500	4.80%
E	1900	BODY	12/09/2018	21.6	21.1	0.100	5d148	3332	4.140	39.600	41.400	4.55%
K	2450	BODY	12/12/2018	22.7	22.8	0.100	719	3319	5.340	50.100	53.400	6.59%
L	5250	BODY	12/17/2018	23.0	20.6	0.050	1237	7308	3.630	75.600	72.600	-3.97%
L	5600	BODY	12/17/2018	23.0	20.6	0.050	1237	7308	3.830	78.500	76.600	-2.42%
L	5750	BODY	12/17/2018	23.0	20.6	0.050	1237	7308	3.490	75.900	69.800	-8.04%

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)	Source SN	Probe SN	Measured SAR_{10g} (W/kg)	1 W Target SAR_{10g} (W/kg)	1 W Normalized SAR_{10g} (W/kg)	$Deviation_{10g}$ (%)
D	1750	BODY	12/21/2018	22.8	21.7	0.100	1150	7357	2.030	19.400	20.300	4.64%
E	1900	BODY	12/19/2018	21.6	22.3	0.100	5d148	3332	2.000	20.900	20.000	-4.31%
L	5250	BODY	12/26/2018	21.3	21.5	0.050	1191	7308	1.000	21.600	20.000	-7.41%
L	5600	BODY	12/26/2018	21.3	21.5	0.050	1191	7308	1.070	22.200	21.400	-3.60%
L	5750	BODY	12/26/2018	21.3	21.5	0.050	1191	7308	0.976	21.200	19.520	-7.92%

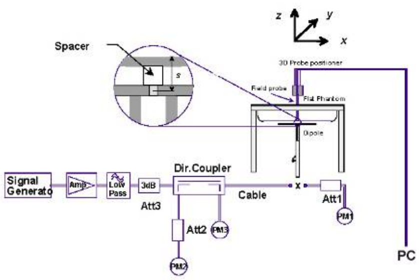


Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
Cell. CDMA Head SAR

MEASUREMENT RESULTS													
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.52	384	Cell. CDMA	RC3 / SO55	25.2	25.05	0.01	Right	Cheek	11225	1:1	0.299	1.035	0.309	
836.52	384	Cell. CDMA	RC3 / SO55	25.2	25.05	0.13	Right	Tilt	11225	1:1	0.149	1.035	0.154	
836.52	384	Cell. CDMA	RC3 / SO55	25.2	25.05	0.05	Left	Cheek	11225	1:1	0.261	1.035	0.270	
836.52	384	Cell. CDMA	RC3 / SO55	25.2	25.05	0.02	Left	Tilt	11225	1:1	0.154	1.035	0.159	
836.52	384	Cell. CDMA	EVDO Rev. A	25.2	25.08	-0.09	Right	Cheek	11225	1:1	0.306	1.028	0.315	A1
836.52	384	Cell. CDMA	EVDO Rev. A	25.2	25.08	0.05	Right	Tilt	11225	1:1	0.143	1.028	0.147	
836.52	384	Cell. CDMA	EVDO Rev. A	25.2	25.08	0.17	Left	Cheek	11225	1:1	0.242	1.028	0.249	
836.52	384	Cell. CDMA	EVDO Rev. A	25.2	25.08	0.13	Left	Tilt	11225	1:1	0.135	1.028	0.139	
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
PCS CDMA Head SAR

MEASUREMENT RESULTS													
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	600	PCS CDMA	RC3 / SO55	24.4	24.38	0.08	Right	Cheek	11233	1:1	0.265	1.005	0.266	
1880.00	600	PCS CDMA	RC3 / SO55	24.4	24.38	0.10	Right	Tilt	11233	1:1	0.144	1.005	0.145	
1880.00	600	PCS CDMA	RC3 / SO55	24.4	24.38	0.04	Left	Cheek	11233	1:1	0.371	1.005	0.373	A2
1880.00	600	PCS CDMA	RC3 / SO55	24.4	24.38	0.13	Left	Tilt	11233	1:1	0.148	1.005	0.149	
1880.00	600	PCS CDMA	EVDO Rev. A	24.4	24.33	0.04	Right	Cheek	11233	1:1	0.247	1.016	0.251	
1880.00	600	PCS CDMA	EVDO Rev. A	24.4	24.33	0.07	Right	Tilt	11233	1:1	0.122	1.016	0.124	
1880.00	600	PCS CDMA	EVDO Rev. A	24.4	24.33	0.09	Left	Cheek	11233	1:1	0.368	1.016	0.374	
1880.00	600	PCS CDMA	EVDO Rev. A	24.4	24.33	0.08	Left	Tilt	11233	1:1	0.147	1.016	0.149	
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
GSM 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	32.7	32.36	0.05	Right	Cheek	11217	1	1:8.3	0.299	1.081	0.323	
836.60	190	GSM 850	GSM	32.7	32.36	-0.13	Right	Tilt	11217	1	1:8.3	0.133	1.081	0.144	
836.60	190	GSM 850	GSM	32.7	32.36	0.01	Left	Cheek	11217	1	1:8.3	0.258	1.081	0.279	
836.60	190	GSM 850	GSM	32.7	32.36	-0.01	Left	Tilt	11217	1	1:8.3	0.151	1.081	0.163	
836.60	190	GSM 850	GPRS	30.7	30.56	-0.12	Right	Cheek	11217	3	1:2.76	0.402	1.033	0.415	A3
836.60	190	GSM 850	GPRS	30.7	30.56	0.13	Right	Tilt	11217	3	1:2.76	0.168	1.033	0.174	
836.60	190	GSM 850	GPRS	30.7	30.56	0.16	Left	Cheek	11217	3	1:2.76	0.336	1.033	0.347	
836.60	190	GSM 850	GPRS	30.7	30.56	-0.07	Left	Tilt	11217	3	1:2.76	0.204	1.033	0.211	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-4
GSM 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	31.2	31.18	-0.01	Right	Cheek	11233	1	1:8.3	0.153	1.005	0.154	
1880.00	661	GSM 1900	GSM	31.2	31.18	0.11	Right	Tilt	11233	1	1:8.3	0.071	1.005	0.071	
1880.00	661	GSM 1900	GSM	31.2	31.18	0.01	Left	Cheek	11233	1	1:8.3	0.223	1.005	0.224	A4
1880.00	661	GSM 1900	GSM	31.2	31.18	0.02	Left	Tilt	11233	1	1:8.3	0.089	1.005	0.089	
1880.00	661	GSM 1900	GPRS	27.2	27.08	0.10	Right	Cheek	11233	3	1:2.76	0.152	1.028	0.156	
1880.00	661	GSM 1900	GPRS	27.2	27.08	-0.01	Right	Tilt	11233	3	1:2.76	0.080	1.028	0.082	
1880.00	661	GSM 1900	GPRS	27.2	27.08	0.13	Left	Cheek	11233	3	1:2.76	0.208	1.028	0.214	
1880.00	661	GSM 1900	GPRS	27.2	27.08	0.19	Left	Tilt	11233	3	1:2.76	0.089	1.028	0.091	
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 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	25.2	25.09	0.03	Right	Cheek	11225	1:1	0.294	1.026	0.302	A5
836.60	4183	UMTS 850	RMC	25.2	25.09	0.06	Right	Tilt	11225	1:1	0.140	1.026	0.144	
836.60	4183	UMTS 850	RMC	25.2	25.09	0.04	Left	Cheek	11225	1:1	0.246	1.026	0.252	
836.60	4183	UMTS 850	RMC	25.2	25.09	-0.08	Left	Tilt	11225	1:1	0.147	1.026	0.151	
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
UMTS 1750 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1732.40	1412	UMTS 1750	RMC	24.7	24.51	-0.01	Right	Cheek	11233	1:1	0.259	1.045	0.271	
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.19	Right	Tilt	11233	1:1	0.329	1.045	0.344	
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.00	Left	Cheek	11233	1:1	0.447	1.045	0.467	A6
1732.40	1412	UMTS 1750	RMC	24.7	24.51	-0.04	Left	Tilt	11233	1:1	0.267	1.045	0.279	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-7
UMTS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	0.17	Right	Cheek	11209	1:1	0.316	1.052	0.332	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	0.11	Right	Tilt	11209	1:1	0.140	1.052	0.147	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	0.16	Left	Cheek	11209	1:1	0.461	1.052	**0.485**	A7
1880.00	9400	UMTS 1900	RMC	24.4	24.18	0.00	Left	Tilt	11209	1:1	0.194	1.052	0.204	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-8
LTE Band 71 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	-0.21	0	Right	Cheek	QPSK	1	50	11233	1:1	0.251	1.026	0.258	A8
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	-0.04	1	Right	Cheek	QPSK	50	50	11233	1:1	0.201	1.007	0.202	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	-0.12	0	Right	Tilt	QPSK	1	50	11233	1:1	0.135	1.026	0.139	
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	0.04	1	Right	Tilt	QPSK	50	50	11233	1:1	0.110	1.007	0.111	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	0.00	0	Left	Cheek	QPSK	1	50	11233	1:1	0.196	1.026	0.201	
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	0.06	1	Left	Cheek	QPSK	50	50	11233	1:1	0.156	1.007	0.157	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	0.10	0	Left	Tilt	QPSK	1	50	11233	1:1	0.110	1.026	0.113	
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	0.01	1	Left	Tilt	QPSK	50	50	11233	1:1	0.086	1.007	0.087	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-9
LTE Band 12 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	0.12	0	Right	Cheek	QPSK	1	0	11225	1:1	0.319	1.050	0.335	A9
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	0.09	1	Right	Cheek	QPSK	25	12	11225	1:1	0.242	1.059	0.256	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	-0.09	0	Right	Tilt	QPSK	1	0	11225	1:1	0.187	1.050	0.196	
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	0.12	1	Right	Tilt	QPSK	25	12	11225	1:1	0.159	1.059	0.168	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	-0.17	0	Left	Cheek	QPSK	1	0	11225	1:1	0.271	1.050	0.285	
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	0.11	1	Left	Cheek	QPSK	25	12	11225	1:1	0.203	1.059	0.215	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	-0.06	0	Left	Tilt	QPSK	1	0	11225	1:1	0.187	1.050	0.196	
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	-0.04	1	Left	Tilt	QPSK	25	12	11225	1:1	0.153	1.059	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 11-10
LTE Band 13 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	-0.12	0	Right	Cheek	QPSK	1	25	11225	1:1	0.268	1.000	0.268	A10
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	-0.07	1	Right	Cheek	QPSK	25	0	11225	1:1	0.207	1.054	0.218	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	0.01	0	Right	Tilt	QPSK	1	25	11225	1:1	0.147	1.000	0.147	
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	0.13	1	Right	Tilt	QPSK	25	0	11225	1:1	0.119	1.054	0.125	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	-0.13	0	Left	Cheek	QPSK	1	25	11225	1:1	0.196	1.000	0.196	
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	-0.10	1	Left	Cheek	QPSK	25	0	11225	1:1	0.162	1.054	0.171	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	-0.08	0	Left	Tilt	QPSK	1	25	11225	1:1	0.153	1.000	0.153	
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	-0.04	1	Left	Tilt	QPSK	25	0	11225	1:1	0.116	1.054	0.122	
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
LTE Band 5 (Cell) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	0.11	0	Right	Cheek	QPSK	1	25	11225	1:1	0.268	1.023	0.274	A11
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	0.10	1	Right	Cheek	QPSK	25	25	11225	1:1	0.237	1.040	0.246	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	0.14	0	Right	Tilt	QPSK	1	25	11225	1:1	0.135	1.023	0.138	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	-0.03	1	Right	Tilt	QPSK	25	25	11225	1:1	0.117	1.040	0.122	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	0.12	0	Left	Cheek	QPSK	1	25	11225	1:1	0.229	1.023	0.234	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	-0.05	1	Left	Cheek	QPSK	25	25	11225	1:1	0.184	1.040	0.191	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	-0.14	0	Left	Tilt	QPSK	1	25	11225	1:1	0.123	1.023	0.126	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	0.10	1	Left	Tilt	QPSK	25	25	11225	1:1	0.100	1.040	0.104	
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 11-12
LTE Band 66 (AWS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.13	0	Right	Cheek	QPSK	1	50	11209	1:1	0.266	1.000	0.266	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	0.05	1	Right	Cheek	QPSK	50	50	11209	1:1	0.218	1.016	0.221	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.13	0	Right	Tilt	QPSK	1	50	11209	1:1	0.358	1.000	0.358	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	0.03	1	Right	Tilt	QPSK	50	50	11209	1:1	0.253	1.016	0.257	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.14	0	Left	Cheek	QPSK	1	50	11209	1:1	0.444	1.000	0.444	A12
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	0.06	1	Left	Cheek	QPSK	50	50	11209	1:1	0.369	1.016	0.375	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.13	0	Left	Tilt	QPSK	1	50	11209	1:1	0.280	1.000	0.280	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	0.06	1	Left	Tilt	QPSK	50	50	11209	1:1	0.222	1.016	0.226	
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 11-13
LTE Band 2 (PCS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	-0.09	0	Right	Cheek	QPSK	1	0	11225	1:1	0.256	1.074	0.275	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	0.08	1	Right	Cheek	QPSK	50	0	11225	1:1	0.203	1.119	0.227	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	0.04	0	Right	Tilt	QPSK	1	0	11225	1:1	0.140	1.074	0.150	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	0.13	1	Right	Tilt	QPSK	50	0	11225	1:1	0.104	1.119	0.116	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	0.03	0	Left	Cheek	QPSK	1	0	11225	1:1	0.398	1.074	0.427	A13
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	0.03	1	Left	Cheek	QPSK	50	0	11225	1:1	0.305	1.119	0.341	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	0.09	0	Left	Tilt	QPSK	1	0	11225	1:1	0.161	1.074	0.173	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	0.02	1	Left	Tilt	QPSK	50	0	11225	1:1	0.125	1.119	0.140	
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 11-14
DTS Head SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2412	1	802.11b	DSSS	22	17.0	16.30	0.12	Right	Cheek	11399	1	99.9	1.507	0.918	1.175	1.001	**1.080**	A14
2437	6	802.11b	DSSS	22	17.0	16.28	0.12	Right	Cheek	11399	1	99.9	1.305	0.824	1.180	1.001	0.973	
2462	11	802.11b	DSSS	22	17.0	16.11	0.13	Right	Cheek	11399	1	99.9	1.178	0.749	1.227	1.001	0.920	
2412	1	802.11b	DSSS	22	17.0	16.30	-0.07	Right	Tilt	11399	1	99.9	1.057	0.622	1.175	1.001	0.732	
2412	1	802.11b	DSSS	22	17.0	16.30	-0.02	Left	Cheek	11399	1	99.9	0.636	-	1.175	1.001	-	
2412	1	802.11b	DSSS	22	17.0	16.30	0.12	Left	Tilt	11399	1	99.9	0.627	-	1.175	1.001	-	
2412	1	802.11b	DSSS	22	17.0	16.30	0.19	Right	Cheek	11399	1	99.9	1.440	0.866	1.175	1.001	1.019	
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 data

Table 11-15
NII Head SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
5270	54	802.11n	OFDM	40	13.0	12.26	0.14	Right	Cheek	11399	13.5	98.4	1.732	0.994	1.186	1.016	**1.198**	A15
5310	62	802.11n	OFDM	40	11.0	10.25	0.01	Right	Cheek	11399	13.5	98.4	1.753	0.982	1.189	1.016	1.186	
5270	54	802.11n	OFDM	40	13.0	12.26	0.13	Right	Tilt	11399	13.5	98.4	1.536	0.655	1.186	1.016	0.789	
5310	62	802.11n	OFDM	40	11.0	10.25	0.16	Right	Tilt	11399	13.5	98.4	1.135	0.678	1.189	1.016	0.819	
5270	54	802.11n	OFDM	40	13.0	12.26	-0.13	Left	Cheek	11399	13.5	98.4	1.358	0.504	1.186	1.016	0.607	
5270	54	802.11n	OFDM	40	13.0	12.26	0.16	Left	Tilt	11399	13.5	98.4	1.164	-	1.186	1.016	-	
5270	54	802.11n	OFDM	40	13.0	12.26	0.12	Right	Cheek	11399	13.5	98.4	1.914	0.990	1.186	1.016	1.193	
5550	110	802.11n	OFDM	40	13.0	12.02	0.15	Right	Cheek	11399	13.5	98.4	1.078	0.908	1.253	1.016	1.156	
5630	126	802.11n	OFDM	40	13.0	12.09	0.13	Right	Cheek	11399	13.5	98.4	2.005	0.949	1.233	1.016	1.189	
5710	142	802.11n	OFDM	40	13.0	12.21	0.14	Right	Cheek	11399	13.5	98.4	1.754	0.932	1.199	1.016	1.135	
5550	110	802.11n	OFDM	40	13.0	12.02	0.18	Right	Tilt	11399	13.5	98.4	0.830	0.486	1.253	1.016	0.619	
5630	126	802.11n	OFDM	40	13.0	12.09	0.12	Right	Tilt	11399	13.5	98.4	1.210	0.689	1.233	1.016	0.863	
5710	142	802.11n	OFDM	40	13.0	12.21	0.18	Right	Tilt	11399	13.5	98.4	1.281	0.698	1.199	1.016	0.850	
5710	142	802.11n	OFDM	40	13.0	12.21	0.18	Left	Cheek	11399	13.5	98.4	0.961	0.526	1.199	1.016	0.641	
5710	142	802.11n	OFDM	40	13.0	12.21	-0.19	Left	Tilt	11399	13.5	98.4	1.129	0.509	1.199	1.016	0.620	
5755	151	802.11n	OFDM	40	13.0	12.08	0.12	Right	Cheek	11399	13.5	98.4	1.525	0.723	1.236	1.016	0.908	
5795	159	802.11n	OFDM	40	13.0	12.20	0.19	Right	Cheek	11399	13.5	98.4	0.839	0.441	1.202	1.016	0.539	
5795	159	802.11n	OFDM	40	13.0	12.20	0.17	Right	Tilt	11399	13.5	98.4	1.209	0.550	1.202	1.016	0.672	
5795	159	802.11n	OFDM	40	13.0	12.20	0.15	Left	Cheek	11399	13.5	98.4	0.799	0.434	1.202	1.016	0.530	
5795	159	802.11n	OFDM	40	13.0	12.20	0.18	Left	Tilt	11399	13.5	98.4	0.941	-	1.202	1.016	-	
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 data

11.2 Standalone Body-Worn SAR Data

Table 11-16
GSM/UMTS/CDMA Body-Worn SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.52	384	Cell. CDMA	TDSO / SO32	25.2	24.96	0.01	10 mm	11217	N/A	1:1	back	0.355	1.057	0.375	A16
1851.25	25	PCS CDMA	TDSO / SO32	24.4	24.25	-0.10	10 mm	11233	N/A	1:1	back	0.693	1.035	0.717	
1880.00	600	PCS CDMA	TDSO / SO32	24.4	24.18	-0.01	10 mm	11233	N/A	1:1	back	0.695	1.052	0.731	A18
1908.75	1175	PCS CDMA	TDSO / SO32	24.4	24.21	0.17	10 mm	11233	N/A	1:1	back	0.620	1.045	0.648	
836.60	190	GSM 850	GSM	32.7	32.36	-0.02	10 mm	11217	1	1:8.3	back	0.372	1.081	0.402	
836.60	190	GSM 850	GPRS	30.7	30.56	-0.01	10 mm	11217	3	1:2.76	back	0.488	1.033	0.504	A20
1880.00	661	GSM 1900	GSM	31.2	31.18	-0.07	10 mm	11233	1	1:8.3	back	0.400	1.005	0.402	
1880.00	661	GSM 1900	GPRS	27.2	27.08	-0.05	10 mm	11233	3	1:2.76	back	0.404	1.028	0.415	A22
836.60	4183	UMTS 850	RMC	25.2	25.09	-0.01	10 mm	11217	N/A	1:1	back	0.425	1.026	0.436	A23
1712.40	1312	UMTS 1750	RMC	24.7	24.60	0.02	10 mm	11225	N/A	1:1	back	1.070	1.023	**1.095**	A25
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.06	10 mm	11225	N/A	1:1	back	0.943	1.045	0.985	
1752.60	1513	UMTS 1750	RMC	24.7	24.35	0.04	10 mm	11225	N/A	1:1	back	0.909	1.084	0.985	
1712.40	1312	UMTS 1750	RMC	24.7	24.60	0.00	10 mm	11225	N/A	1:1	back	1.070	1.023	**1.095**	
1852.40	9262	UMTS 1900	RMC	24.4	24.28	-0.02	10 mm	11217	N/A	1:1	back	0.638	1.028	0.656	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	-0.01	10 mm	11217	N/A	1:1	back	0.646	1.052	0.680	
1907.60	9538	UMTS 1900	RMC	24.4	24.21	0.03	10 mm	11217	N/A	1:1	back	0.760	1.045	0.794	A26
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							**Body 1.6 W/kg (mW/g)** averaged over 1 gram								

Note: Blue entry represents variability data

Table 11-17
LTE Body-Worn SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	-0.16	0	11233	QPSK	1	50	10 mm	back	1:1	0.365	1.026	0.374	A27
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	-0.17	1	11233	QPSK	50	50	10 mm	back	1:1	0.289	1.007	0.291	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	0.13	0	11225	QPSK	1	0	10 mm	back	1:1	0.458	1.050	0.481	A28
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	0.05	1	11225	QPSK	25	12	10 mm	back	1:1	0.342	1.059	0.362	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	-0.01	0	11225	QPSK	1	25	10 mm	back	1:1	0.346	1.000	0.346	A30
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	-0.05	1	11225	QPSK	25	0	10 mm	back	1:1	0.298	1.054	0.314	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	-0.03	0	11233	QPSK	1	25	10 mm	back	1:1	0.311	1.023	0.318	A32
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	0.01	1	11233	QPSK	25	25	10 mm	back	1:1	0.254	1.040	0.264	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.07	0	11209	QPSK	1	50	10 mm	back	1:1	0.828	1.000	0.828	A34
1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.7	24.42	-0.01	0	11209	QPSK	1	99	10 mm	back	1:1	0.809	1.067	0.863	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.7	24.67	0.01	0	11209	QPSK	1	50	10 mm	back	1:1	0.770	1.007	0.775	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	0.00	1	11209	QPSK	50	50	10 mm	back	1:1	0.670	1.016	0.681	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.60	0.02	1	11209	QPSK	100	0	10 mm	back	1:1	0.688	1.023	0.704	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.4	23.93	-0.04	0	11233	QPSK	1	99	10 mm	back	1:1	0.622	1.114	0.693	A35
1880.00	18900	Mid	LTE Band 2 (PCS)	20	24.4	23.96	0.00	0	11233	QPSK	1	0	10 mm	back	1:1	0.613	1.107	0.679	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	-0.06	0	11233	QPSK	1	0	10 mm	back	1:1	0.576	1.074	0.619	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	0.05	1	11233	QPSK	50	0	10 mm	back	1:1	0.463	1.119	0.518	
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 11-18
DTS Body-Worn SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2412	1	802.11b	DSSS	22	22.5	21.53	-0.05	10 mm	11381	1	back	99.9	0.800	0.677	1.250	1.001	**0.847**	A36
2437	6	802.11b	DSSS	22	22.5	21.78	-0.01	10 mm	11381	1	back	99.9	0.697	0.561	1.180	1.001	0.663	
2462	11	802.11b	DSSS	22	22.5	21.77	0.01	10 mm	11381	1	back	99.9	0.735	0.663	1.183	1.001	0.785	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-19
NII Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Headphone Config	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5260	52	802.11a	OFDM	20	19.0	18.08	-0.01	10 mm	N/A	11399	6	back	99.2	1.601	0.728	1.236	1.008	0.907	
5280	56	802.11a	OFDM	20	19.0	18.07	0.01	10 mm	N/A	11399	6	back	99.2	1.611	0.705	1.239	1.008	0.880	
5500	100	802.11a	OFDM	20	18.0	17.39	0.03	10 mm	N/A	11399	6	back	99.2	2.267	0.996	1.151	1.008	1.156	
5620	124	802.11a	OFDM	20	18.0	17.44	-0.05	10 mm	N/A	11399	6	back	99.2	2.551	1.130	1.138	1.008	**1.296**	A37
5720	144	802.11a	OFDM	20	18.0	17.56	-0.04	10 mm	N/A	11399	6	back	99.2	2.112	1.060	1.107	1.008	1.183	
5620	124	802.11a	OFDM	20	18.0	17.42	0.10	10 mm	Headphone	11399	6	back	99.2	1.436	0.682	1.143	1.008	0.786	
5765	153	802.11a	OFDM	20	19.0	18.27	-0.02	10 mm	N/A	11399	6	back	99.2	1.627	0.673	1.183	1.008	0.803	
5785	157	802.11a	OFDM	20	19.0	18.37	-0.03	10 mm	N/A	11399	6	back	99.2	1.752	0.728	1.156	1.008	0.848	
5805	161	802.11a	OFDM	20	19.0	18.40	0.04	10 mm	N/A	11399	6	back	99.2	1.986	0.817	1.148	1.008	0.945	
5620	124	802.11a	OFDM	20	18.0	17.44	-0.06	10 mm	N/A	11399	6	back	99.2	2.623	1.060	1.138	1.008	1.216	
5720	144	802.11a	OFDM	20	18.0	17.56	0.00	10 mm	N/A	11399	6	back	99.2	2.182	0.922	1.107	1.008	1.029	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

Note: Blue entry represents variability data

11.3 Standalone Hotspot SAR Data

Table 11-20
GPRS/UMTS/CDMA Hotspot SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.52	384	Cell. CDMA	EVDO Rev. 0	25.2	25.10	-0.01	10 mm	11217	N/A	1:1	back	0.369	1.023	0.377	
836.52	384	Cell. CDMA	EVDO Rev. 0	25.2	25.10	-0.01	10 mm	11217	N/A	1:1	front	0.334	1.023	0.342	
836.52	384	Cell. CDMA	EVDO Rev. 0	25.2	25.10	-0.01	10 mm	11217	N/A	1:1	bottom	0.186	1.023	0.190	
836.52	384	Cell. CDMA	EVDO Rev. 0	25.2	25.10	0.00	10 mm	11217	N/A	1:1	right	0.444	1.023	0.454	A17
836.52	384	Cell. CDMA	EVDO Rev. 0	25.2	25.10	-0.01	10 mm	11217	N/A	1:1	left	0.241	1.023	0.247	
1851.25	25	PCS CDMA	EVDO Rev. 0	24.4	24.37	0.09	10 mm	11233	N/A	1:1	back	0.735	1.007	0.740	A19
1880.00	600	PCS CDMA	EVDO Rev. 0	24.4	24.36	0.01	10 mm	11233	N/A	1:1	back	0.713	1.009	0.719	
1908.75	1175	PCS CDMA	EVDO Rev. 0	24.4	24.32	-0.04	10 mm	11233	N/A	1:1	back	0.643	1.019	0.655	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.4	24.36	-0.05	10 mm	11233	N/A	1:1	front	0.620	1.009	0.626	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.4	24.36	-0.08	10 mm	11233	N/A	1:1	bottom	0.339	1.009	0.342	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.4	24.36	0.02	10 mm	11233	N/A	1:1	left	0.554	1.009	0.559	
836.60	190	GSM 850	GPRS	30.7	30.56	-0.01	10 mm	11217	3	1:2.76	back	0.488	1.033	0.504	
836.60	190	GSM 850	GPRS	30.7	30.56	0.00	10 mm	11225	3	1:2.76	front	0.439	1.033	0.453	
836.60	190	GSM 850	GPRS	30.7	30.56	-0.10	10 mm	11225	3	1:2.76	bottom	0.180	1.033	0.186	
836.60	190	GSM 850	GPRS	30.7	30.56	-0.01	10 mm	11217	3	1:2.76	right	0.494	1.033	0.510	A21
836.60	190	GSM 850	GPRS	30.7	30.56	-0.07	10 mm	11225	3	1:2.76	left	0.259	1.033	0.268	
1880.00	661	GSM 1900	GPRS	27.2	27.08	-0.05	10 mm	11233	3	1:2.76	back	0.404	1.028	0.415	A22
1880.00	661	GSM 1900	GPRS	27.2	27.08	-0.03	10 mm	11233	3	1:2.76	front	0.341	1.028	0.351	
1880.00	661	GSM 1900	GPRS	27.2	27.08	0.03	10 mm	11233	3	1:2.76	bottom	0.170	1.028	0.175	
1880.00	661	GSM 1900	GPRS	27.2	27.08	0.02	10 mm	11233	3	1:2.76	left	0.331	1.028	0.340	
836.60	4183	UMTS 850	RMC	25.2	25.09	-0.01	10 mm	11217	N/A	1:1	back	0.425	1.026	0.436	
836.60	4183	UMTS 850	RMC	25.2	25.09	0.01	10 mm	11217	N/A	1:1	front	0.399	1.026	0.409	
836.60	4183	UMTS 850	RMC	25.2	25.09	0.00	10 mm	11217	N/A	1:1	bottom	0.224	1.026	0.230	
836.60	4183	UMTS 850	RMC	25.2	25.09	0.02	10 mm	11217	N/A	1:1	right	0.485	1.026	0.498	A24
836.60	4183	UMTS 850	RMC	25.2	25.09	-0.01	10 mm	11217	N/A	1:1	left	0.233	1.026	0.239	
1712.40	1312	UMTS 1750	RMC	24.7	24.60	0.02	10 mm	11225	N/A	1:1	back	1.070	1.023	**1.095**	A25
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.06	10 mm	11225	N/A	1:1	back	0.943	1.045	0.985	
1752.60	1513	UMTS 1750	RMC	24.7	24.35	0.04	10 mm	11225	N/A	1:1	back	0.909	1.084	0.985	
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.07	10 mm	11225	N/A	1:1	front	0.680	1.045	0.711	
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.07	10 mm	11225	N/A	1:1	bottom	0.407	1.045	0.425	
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.01	10 mm	11225	N/A	1:1	left	0.647	1.045	0.676	
1712.40	1312	UMTS 1750	RMC	24.7	24.60	0.00	10 mm	11225	N/A	1:1	back	1.070	1.023	**1.095**	
1852.40	9262	UMTS 1900	RMC	24.4	24.28	-0.02	10 mm	11217	N/A	1:1	back	0.638	1.028	0.656	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	-0.01	10 mm	11217	N/A	1:1	back	0.646	1.052	0.680	
1907.60	9538	UMTS 1900	RMC	24.4	24.21	0.03	10 mm	11217	N/A	1:1	back	0.760	1.045	0.794	A26
1880.00	9400	UMTS 1900	RMC	24.4	24.18	0.00	10 mm	11217	N/A	1:1	front	0.575	1.052	0.605	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	-0.04	10 mm	11217	N/A	1:1	bottom	0.336	1.052	0.353	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	0.00	10 mm	11217	N/A	1:1	left	0.565	1.052	0.594	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**							**Body** **1.6 W/kg (mW/g)** averaged over 1 gram								

Note: Blue entry represents variability data

Table 11-21
LTE Band 71 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	-0.16	0	11233	QPSK	1	50	10 mm	back	1:1	0.365	1.026	0.374	A27
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	-0.17	1	11233	QPSK	50	50	10 mm	back	1:1	0.289	1.007	0.291	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	0.03	0	11233	QPSK	1	50	10 mm	front	1:1	0.294	1.026	0.302	
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	-0.09	1	11233	QPSK	50	50	10 mm	front	1:1	0.240	1.007	0.242	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	0.05	0	11233	QPSK	1	50	10 mm	bottom	1:1	0.132	1.026	0.135	
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	0.01	1	11233	QPSK	50	50	10 mm	bottom	1:1	0.109	1.007	0.110	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	0.03	0	11233	QPSK	1	50	10 mm	right	1:1	0.281	1.026	0.288	
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	-0.06	1	11233	QPSK	50	50	10 mm	right	1:1	0.231	1.007	0.233	
680.50	133297	Mid	LTE Band 71	20	25.2	25.09	0.11	0	11233	QPSK	1	50	10 mm	left	1:1	0.199	1.026	0.204	
680.50	133297	Mid	LTE Band 71	20	24.2	24.17	0.06	1	11233	QPSK	50	50	10 mm	left	1:1	0.164	1.007	0.165	
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 12 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	0.13	0	11225	QPSK	1	0	10 mm	back	1:1	0.458	1.050	0.481	
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	0.05	1	11225	QPSK	25	12	10 mm	back	1:1	0.342	1.059	0.362	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	-0.05	0	11225	QPSK	1	0	10 mm	front	1:1	0.393	1.050	0.413	
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	-0.03	1	11225	QPSK	25	12	10 mm	front	1:1	0.300	1.059	0.318	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	0.12	0	11225	QPSK	1	0	10 mm	bottom	1:1	0.138	1.050	0.145	
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	0.13	1	11225	QPSK	25	12	10 mm	bottom	1:1	0.108	1.059	0.114	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	-0.01	0	11225	QPSK	1	0	10 mm	right	1:1	0.478	1.050	0.502	A29
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	-0.05	1	11225	QPSK	25	12	10 mm	right	1:1	0.341	1.059	0.361	
707.50	23095	Mid	LTE Band 12	10	25.2	24.99	-0.14	0	11225	QPSK	1	0	10 mm	left	1:1	0.312	1.050	0.328	
707.50	23095	Mid	LTE Band 12	10	24.2	23.95	0.02	1	11225	QPSK	25	12	10 mm	left	1:1	0.225	1.059	0.238	
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
LTE Band 13 Hotspot SAR

FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	-0.01	0	11225	QPSK	1	25	10 mm	back	1:1	0.346	1.000	0.346	
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	-0.05	1	11225	QPSK	25	0	10 mm	back	1:1	0.298	1.054	0.314	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	0.03	0	11225	QPSK	1	25	10 mm	front	1:1	0.246	1.000	0.246	
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	0.02	1	11225	QPSK	25	0	10 mm	front	1:1	0.207	1.054	0.218	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	-0.04	0	11225	QPSK	1	25	10 mm	bottom	1:1	0.166	1.000	0.166	
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	0.14	1	11225	QPSK	25	0	10 mm	bottom	1:1	0.143	1.054	0.151	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	0.08	0	11225	QPSK	1	25	10 mm	right	1:1	0.398	1.000	0.398	A31
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	0.10	1	11225	QPSK	25	0	10 mm	right	1:1	0.349	1.054	0.368	
782.00	23230	Mid	LTE Band 13	10	24.7	24.70	-0.05	0	11225	QPSK	1	25	10 mm	left	1:1	0.208	1.000	0.208	
782.00	23230	Mid	LTE Band 13	10	23.7	23.47	0.09	1	11225	QPSK	25	0	10 mm	left	1:1	0.174	1.054	0.183	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population	Body 1.6 W/kg (mW/g) averaged over 1 gram

Table 11-24
LTE Band 5 (Cell) Hotspot SAR

FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	-0.03	0	11233	QPSK	1	25	10 mm	back	1:1	0.311	1.023	0.318	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	0.01	1	11233	QPSK	25	25	10 mm	back	1:1	0.254	1.040	0.264	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	0.00	0	11233	QPSK	1	25	10 mm	front	1:1	0.281	1.023	0.287	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	0.00	1	11233	QPSK	25	25	10 mm	front	1:1	0.234	1.040	0.243	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	-0.05	0	11233	QPSK	1	25	10 mm	bottom	1:1	0.176	1.023	0.180	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	-0.08	1	11233	QPSK	25	25	10 mm	bottom	1:1	0.141	1.040	0.147	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	0.01	0	11233	QPSK	1	25	10 mm	right	1:1	0.336	1.023	0.344	A33
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	0.10	1	11233	QPSK	25	25	10 mm	right	1:1	0.277	1.040	0.288	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.2	25.10	0.06	0	11233	QPSK	1	25	10 mm	left	1:1	0.149	1.023	0.152	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.2	24.03	0.07	1	11233	QPSK	25	25	10 mm	left	1:1	0.127	1.040	0.132	

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 11-25
LTE Band 66 (AWS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.07	0	11209	QPSK	1	50	10 mm	back	1:1	0.828	1.000	0.828	A34
1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.7	24.42	-0.01	0	11209	QPSK	1	99	10 mm	back	1:1	0.809	1.067	0.863	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.7	24.67	0.01	0	11209	QPSK	1	50	10 mm	back	1:1	0.770	1.007	0.775	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	0.00	1	11209	QPSK	50	50	10 mm	back	1:1	0.670	1.016	0.681	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.60	0.02	1	11209	QPSK	100	0	10 mm	back	1:1	0.688	1.023	0.704	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.07	0	11209	QPSK	1	50	10 mm	front	1:1	0.570	1.000	0.570	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	0.02	1	11209	QPSK	50	50	10 mm	front	1:1	0.453	1.016	0.460	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.01	0	11209	QPSK	1	50	10 mm	bottom	1:1	0.373	1.000	0.373	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	-0.02	1	11209	QPSK	50	50	10 mm	bottom	1:1	0.285	1.016	0.290	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	-0.08	0	11209	QPSK	1	50	10 mm	left	1:1	0.595	1.000	0.595	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	-0.01	1	11209	QPSK	50	50	10 mm	left	1:1	0.476	1.016	0.484	
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 11-26
LTE Band 2 (PCS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.4	23.93	-0.04	0	11233	QPSK	1	99	10 mm	back	1:1	0.622	1.114	0.693	A35
1880.00	18900	Mid	LTE Band 2 (PCS)	20	24.4	23.96	0.00	0	11233	QPSK	1	0	10 mm	back	1:1	0.613	1.107	0.679	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	-0.06	0	11233	QPSK	1	0	10 mm	back	1:1	0.576	1.074	0.619	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	0.05	1	11233	QPSK	50	0	10 mm	back	1:1	0.463	1.119	0.518	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	0.13	0	11233	QPSK	1	0	10 mm	front	1:1	0.517	1.074	0.555	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	0.06	1	11233	QPSK	50	0	10 mm	front	1:1	0.411	1.119	0.460	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	-0.02	0	11233	QPSK	1	0	10 mm	bottom	1:1	0.289	1.074	0.310	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	-0.03	1	11233	QPSK	50	0	10 mm	bottom	1:1	0.225	1.119	0.252	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	0.03	0	11233	QPSK	1	0	10 mm	left	1:1	0.494	1.074	0.531	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	-0.04	1	11233	QPSK	50	0	10 mm	left	1:1	0.388	1.119	0.434	
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 11-27
WLAN Hotspot SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2412	1	802.11b	DSSS	22	22.5	21.53	-0.05	10 mm	11381	1	back	99.9	0.800	0.677	1.250	1.001	**0.847**	A36
2437	6	802.11b	DSSS	22	22.5	21.78	-0.01	10 mm	11381	1	back	99.9	0.697	0.561	1.180	1.001	0.663	
2462	11	802.11b	DSSS	22	22.5	21.77	0.01	10 mm	11381	1	back	99.9	0.753	0.663	1.183	1.001	0.785	
2412	1	802.11b	DSSS	22	22.5	21.53	0.06	10 mm	11381	1	front	99.9	0.781	0.630	1.250	1.001	0.788	
2437	6	802.11b	DSSS	22	22.5	21.78	-0.10	10 mm	11381	1	front	99.9	0.715	0.611	1.180	1.001	0.722	
2462	11	802.11b	DSSS	22	22.5	21.77	0.01	10 mm	11381	1	front	99.9	0.752	0.598	1.183	1.001	0.708	
2437	6	802.11b	DSSS	22	22.5	21.78	-0.05	10 mm	11381	1	top	99.9	0.470	-	1.180	1.001	-	
2437	6	802.11b	DSSS	22	22.5	21.78	0.10	10 mm	11381	1	left	99.9	0.625	0.390	1.180	1.001	0.461	
5200	40	802.11a	OFDM	20	19.0	18.12	-0.04	10 mm	11399	6	back	99.2	1.634	0.699	1.225	1.008	0.863	
5220	44	802.11a	OFDM	20	19.0	18.11	0.19	10 mm	11399	6	back	99.2	1.584	0.708	1.227	1.008	0.876	
5200	40	802.11a	OFDM	20	19.0	18.12	0.11	10 mm	11399	6	front	99.2	1.208	0.589	1.225	1.008	0.727	
5200	40	802.11a	OFDM	20	19.0	18.12	-0.06	10 mm	11399	6	top	99.2	1.475	0.726	1.225	1.008	0.896	
5220	44	802.11a	OFDM	20	19.0	18.11	0.03	10 mm	11399	6	top	99.2	1.445	0.675	1.227	1.008	0.835	
5200	40	802.11a	OFDM	20	19.0	18.12	-0.14	10 mm	11399	6	left	99.2	0.604	0.284	1.225	1.008	0.351	
5765	153	802.11a	OFDM	20	19.0	18.27	-0.02	10 mm	11399	6	back	99.2	1.627	0.673	1.183	1.008	0.803	
5785	157	802.11a	OFDM	20	19.0	18.37	-0.03	10 mm	11399	6	back	99.2	1.752	0.728	1.156	1.008	0.848	
5805	161	802.11a	OFDM	20	19.0	18.40	0.04	10 mm	11399	6	back	99.2	1.986	0.817	1.148	1.008	**0.945**	A38
5805	161	802.11a	OFDM	20	19.0	18.40	-0.16	10 mm	11399	6	front	99.2	1.167	-	1.148	1.008	-	
5805	161	802.11a	OFDM	20	19.0	18.40	-0.14	10 mm	11399	6	top	99.2	1.269	0.588	1.148	1.008	0.680	
5805	161	802.11a	OFDM	20	19.0	18.40	0.17	10 mm	11399	6	left	99.2	0.713	0.321	1.148	1.008	0.371	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	Body
Spatial Peak	1.6 W/kg (mW/g)
Uncontrolled Exposure/General Population	averaged over 1 gram

11.4 Standalone Phablet SAR Data

Table 11-28
UMTS/CDMA Phablet SAR Data

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Duty Cycle	Side	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1851.25	25	PCS CDMA	EVDO Rev. 0	24.4	24.37	0.03	2 mm	11233	1:1	back	2.000	1.007	2.014	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.4	24.36	0.00	2 mm	11233	1:1	back	2.040	1.009	2.058	
1908.75	1175	PCS CDMA	EVDO Rev. 0	24.4	24.32	0.03	2 mm	11233	1:1	back	2.090	1.019	2.130	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.4	24.36	0.14	4 mm	11233	1:1	front	0.886	1.009	0.894	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.4	24.36	-0.03	4 mm	11233	1:1	bottom	0.684	1.009	0.690	
1851.25	25	PCS CDMA	EVDO Rev. 0	24.4	24.37	-0.07	0 mm	11233	1:1	left	2.070	1.007	2.084	
1880.00	600	PCS CDMA	EVDO Rev. 0	24.4	24.36	-0.05	0 mm	11233	1:1	left	2.050	1.009	2.068	
1908.75	1175	PCS CDMA	EVDO Rev. 0	24.4	24.32	0.00	0 mm	11233	1:1	left	2.130	1.019	2.170	
1851.25	25	PCS CDMA	EVDO Rev. 0	22.9	22.76	0.01	0 mm	11225	1:1	back	2.810	1.033	2.903	
1880.00	600	PCS CDMA	EVDO Rev. 0	22.9	22.83	-0.03	0 mm	11225	1:1	back	2.840	1.016	2.885	
1908.75	1175	PCS CDMA	EVDO Rev. 0	22.9	22.80	0.04	0 mm	11225	1:1	back	2.950	1.023	3.018	A39
1851.25	25	PCS CDMA	EVDO Rev. 0	22.9	22.76	-0.12	0 mm	11225	1:1	front	2.570	1.033	2.655	
1880.00	600	PCS CDMA	EVDO Rev. 0	22.9	22.83	-0.10	0 mm	11225	1:1	front	2.650	1.016	2.692	
1908.75	1175	PCS CDMA	EVDO Rev. 0	22.9	22.80	-0.10	0 mm	11225	1:1	front	2.760	1.023	2.823	
1880.00	600	PCS CDMA	EVDO Rev. 0	22.9	22.83	-0.05	0 mm	11225	1:1	bottom	1.070	1.016	1.087	
1712.40	1312	UMTS 1750	RMC	24.7	24.60	-0.03	2 mm	11209	1:1	back	2.200	1.023	2.251	
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.07	2 mm	11209	1:1	back	2.230	1.045	2.330	
1752.60	1513	UMTS 1750	RMC	24.7	24.35	0.00	2 mm	11209	1:1	back	2.130	1.084	2.309	
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.15	4 mm	11209	1:1	front	1.140	1.045	1.191	
1732.40	1412	UMTS 1750	RMC	24.7	24.51	0.01	4 mm	11209	1:1	bottom	0.697	1.045	0.728	
1712.40	1312	UMTS 1750	RMC	24.7	24.60	0.12	0 mm	11209	1:1	left	2.990	1.023	3.059	A40
1732.40	1412	UMTS 1750	RMC	24.7	24.51	-0.12	0 mm	11209	1:1	left	2.910	1.045	3.041	
1752.60	1513	UMTS 1750	RMC	24.7	24.35	0.02	0 mm	11209	1:1	left	2.920	1.084	3.165	
1712.40	1312	UMTS 1750	RMC	23.5	23.43	-0.13	0 mm	11209	1:1	back	2.190	1.016	2.225	
1732.40	1412	UMTS 1750	RMC	23.5	23.23	-0.13	0 mm	11209	1:1	back	2.230	1.064	2.373	
1752.60	1513	UMTS 1750	RMC	23.5	22.99	0.01	0 mm	11209	1:1	back	2.110	1.125	2.374	
1712.40	1312	UMTS 1750	RMC	23.5	23.43	0.13	0 mm	11209	1:1	front	2.040	1.016	2.073	
1732.40	1412	UMTS 1750	RMC	23.5	23.23	0.15	0 mm	11209	1:1	front	2.110	1.064	2.245	
1752.60	1513	UMTS 1750	RMC	23.5	22.99	0.02	0 mm	11209	1:1	front	2.070	1.125	2.329	
1732.40	1412	UMTS 1750	RMC	23.5	23.23	0.12	0 mm	11209	1:1	bottom	1.410	1.064	1.500	
1712.40	1312	UMTS 1750	RMC	24.7	24.60	-0.12	0 mm	11209	1:1	left	2.920	1.023	2.987	
1852.40	9262	UMTS 1900	RMC	24.4	24.28	-0.02	2 mm	11233	1:1	back	2.120	1.028	2.179	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	-0.05	2 mm	11233	1:1	back	2.150	1.052	2.262	
1907.60	9538	UMTS 1900	RMC	24.4	24.21	0.12	2 mm	11233	1:1	back	2.260	1.045	2.362	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	-0.10	4 mm	11233	1:1	front	1.140	1.052	1.199	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	-0.07	4 mm	11233	1:1	bottom	0.621	1.052	0.653	
1852.40	9262	UMTS 1900	RMC	24.4	24.28	-0.01	0 mm	11233	1:1	left	2.710	1.028	2.786	
1880.00	9400	UMTS 1900	RMC	24.4	24.18	0.03	0 mm	11233	1:1	left	2.580	1.052	2.714	
1907.60	9538	UMTS 1900	RMC	24.4	24.21	0.09	0 mm	11233	1:1	left	2.960	1.045	3.093	A41
1852.40	9262	UMTS 1900	RMC	23.2	23.03	-0.03	0 mm	11233	1:1	back	2.680	1.040	2.787	
1880.00	9400	UMTS 1900	RMC	23.2	22.88	0.00	0 mm	11233	1:1	back	2.590	1.076	2.787	
1907.60	9538	UMTS 1900	RMC	23.2	22.87	0.02	0 mm	11233	1:1	back	2.870	1.079	3.097	
1852.40	9262	UMTS 1900	RMC	23.2	23.03	-0.18	0 mm	11233	1:1	front	2.510	1.040	2.610	
1880.00	9400	UMTS 1900	RMC	23.2	22.88	-0.18	0 mm	11233	1:1	front	2.450	1.076	2.636	
1907.60	9538	UMTS 1900	RMC	23.2	22.87	-0.19	0 mm	11233	1:1	front	2.730	1.079	2.946	
1880.00	9400	UMTS 1900	RMC	23.2	22.88	-0.04	0 mm	11233	1:1	bottom	1.070	1.076	1.151	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Phablet 4.0 W/kg (mW/g) averaged over 10 grams							

Note: Blue entry represents variability data

Table 11-29
LTE Phablet SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.02	0	11209	QPSK	1	50	2 mm	back	1:1	1.970	1.000	1.970	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	-0.14	1	11209	QPSK	50	50	2 mm	back	1:1	1.570	1.016	1.595	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.15	0	11209	QPSK	1	50	4 mm	front	1:1	1.190	1.000	1.190	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	0.13	1	11209	QPSK	50	50	4 mm	front	1:1	0.940	1.016	0.955	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	0.12	0	11209	QPSK	1	50	4 mm	bottom	1:1	0.632	1.000	0.632	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	-0.06	1	11209	QPSK	50	50	4 mm	bottom	1:1	0.499	1.016	0.507	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.70	-0.17	0	11209	QPSK	1	50	0 mm	left	1:1	2.680	1.000	2.680	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.7	24.42	0.20	0	11209	QPSK	1	99	0 mm	left	1:1	2.900	1.067	3.094	A42
1770.00	132572	High	LTE Band 66 (AWS)	20	24.7	24.67	0.16	0	11209	QPSK	1	50	0 mm	left	1:1	2.740	1.007	2.759	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.63	-0.10	1	11209	QPSK	50	50	0 mm	left	1:1	2.160	1.016	2.195	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.7	23.62	-0.10	1	11209	QPSK	50	50	0 mm	left	1:1	2.190	1.019	2.232	
1770.00	132572	High	LTE Band 66 (AWS)	20	23.7	23.56	-0.13	1	11209	QPSK	50	50	0 mm	left	1:1	2.210	1.033	2.283	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.7	23.60	-0.18	1	11209	QPSK	100	0	0 mm	left	1:1	2.140	1.023	2.189	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	23.45	0.06	0	11233	QPSK	1	99	0 mm	back	1:1	2.180	1.012	2.206	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.5	23.34	-0.05	0	11233	QPSK	1	99	0 mm	back	1:1	2.200	1.038	2.284	
1770.00	132572	High	LTE Band 66 (AWS)	20	23.5	23.32	0.02	0	11233	QPSK	1	0	0 mm	back	1:1	2.180	1.042	2.272	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	23.50	0.01	0	11233	QPSK	50	25	0 mm	back	1:1	2.150	1.000	2.150	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.5	23.49	-0.17	0	11233	QPSK	50	25	0 mm	back	1:1	2.120	1.002	2.124	
1770.00	132572	High	LTE Band 66 (AWS)	20	23.5	23.34	0.06	0	11233	QPSK	50	25	0 mm	back	1:1	2.110	1.038	2.190	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	23.49	-0.08	0	11233	QPSK	100	0	0 mm	back	1:1	2.060	1.002	2.064	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	23.45	0.13	0	11233	QPSK	1	99	0 mm	front	1:1	2.180	1.012	2.206	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.5	23.34	0.15	0	11233	QPSK	1	99	0 mm	front	1:1	2.190	1.038	2.273	
1770.00	132572	High	LTE Band 66 (AWS)	20	23.5	23.32	0.13	0	11233	QPSK	1	0	0 mm	front	1:1	2.090	1.042	2.178	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	23.50	0.13	0	11233	QPSK	50	25	0 mm	front	1:1	2.030	1.000	2.030	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.5	23.49	0.15	0	11233	QPSK	50	25	0 mm	front	1:1	2.200	1.002	2.204	
1770.00	132572	High	LTE Band 66 (AWS)	20	23.5	23.34	0.13	0	11233	QPSK	50	25	0 mm	front	1:1	2.280	1.038	2.367	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	23.49	0.13	0	11233	QPSK	100	0	0 mm	front	1:1	2.000	1.002	2.004	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	23.45	0.01	0	11233	QPSK	1	99	0 mm	bottom	1:1	1.770	1.012	1.791	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	23.50	0.08	0	11233	QPSK	50	25	0 mm	bottom	1:1	1.470	1.000	1.470	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.4	23.93	0.20	0	11217	QPSK	1	99	2 mm	back	1:1	2.020	1.114	2.250	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	24.4	23.96	-0.12	0	11217	QPSK	1	0	2 mm	back	1:1	2.000	1.107	2.214	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	0.07	0	11217	QPSK	1	0	2 mm	back	1:1	1.910	1.074	2.051	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	0.02	1	11217	QPSK	50	0	2 mm	back	1:1	1.470	1.119	1.645	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.90	0.02	1	11217	QPSK	100	0	2 mm	back	1:1	1.660	1.122	1.863	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	-0.03	0	11217	QPSK	1	0	4 mm	front	1:1	1.030	1.074	1.106	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	-0.12	1	11217	QPSK	50	0	4 mm	front	1:1	0.823	1.119	0.921	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	-0.10	0	11217	QPSK	1	0	4 mm	bottom	1:1	0.686	1.074	0.737	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	0.04	1	11217	QPSK	50	0	4 mm	bottom	1:1	0.534	1.119	0.598	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.4	23.93	0.00	0	11217	QPSK	1	99	0 mm	left	1:1	2.870	1.114	**3.197**	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	24.4	23.96	-0.08	0	11217	QPSK	1	0	0 mm	left	1:1	2.740	1.107	3.033	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.4	24.09	0.14	0	11217	QPSK	1	0	0 mm	left	1:1	2.790	1.074	2.996	
1860.00	18700	Low	LTE Band 2 (PCS)	20	23.4	22.91	0.01	1	11217	QPSK	50	25	0 mm	left	1:1	2.080	1.119	2.328	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.4	22.89	0.01	1	11217	QPSK	50	25	0 mm	left	1:1	2.070	1.125	2.329	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.91	-0.08	1	11217	QPSK	50	0	0 mm	left	1:1	2.110	1.119	2.361	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.4	22.90	-0.08	1	0	QPSK	100	0	0 mm	left	1:1	2.260	1.122	2.536	
1860.00	18700	Low	LTE Band 2 (PCS)	20	23.2	23.01	0.01	0	11217	QPSK	1	50	0 mm	back	1:1	2.610	1.045	2.727	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.2	23.19	-0.05	0	11217	QPSK	1	99	0 mm	back	1:1	2.870	1.002	2.876	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	23.14	-0.21	0	11217	QPSK	1	0	0 mm	back	1:1	3.020	1.014	3.062	A43
1860.00	18700	Low	LTE Band 2 (PCS)	20	23.2	23.12	-0.02	0	11217	QPSK	50	25	0 mm	back	1:1	2.710	1.019	2.761	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.2	23.20	-0.05	0	11217	QPSK	50	0	0 mm	back	1:1	2.810	1.000	2.810	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	23.15	-0.06	0	11217	QPSK	50	25	0 mm	back	1:1	2.870	1.012	2.904	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.2	23.02	-0.03	0	11217	QPSK	100	0	0 mm	back	1:1	2.880	1.042	3.001	
1860.00	18700	Low	LTE Band 2 (PCS)	20	23.2	23.01	-0.03	0	11217	QPSK	1	50	0 mm	front	1:1	2.250	1.045	2.351	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.2	23.19	0.15	0	11217	QPSK	1	99	0 mm	front	1:1	2.540	1.002	2.545	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	23.14	0.17	0	11217	QPSK	1	0	0 mm	front	1:1	2.640	1.014	2.677	
1860.00	18700	Low	LTE Band 2 (PCS)	20	23.2	23.12	-0.02	0	11217	QPSK	50	25	0 mm	front	1:1	2.390	1.019	2.435	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.2	23.20	0.13	0	11217	QPSK	50	0	0 mm	front	1:1	2.460	1.000	2.460	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	23.15	0.03	0	11217	QPSK	50	25	0 mm	front	1:1	2.540	1.012	2.570	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.2	23.02	0.04	0	11217	QPSK	100	0	0 mm	front	1:1	2.510	1.042	2.615	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.2	23.19	-0.01	0	11217	QPSK	1	99	0 mm	bottom	1:1	1.050	1.002	1.052	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	23.2	23.20	0.02	0	11217	QPSK	50	0	0 mm	bottom	1:1	0.999	1.000	0.999	
1900.00	19100	High	LTE Band 2 (PCS)	20	23.2	23.14	-0.02	0	11217	QPSK	1	0	0 mm	back	1:1	2.860	1.014	2.900	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Phablet 4.0 W/kg (mW/g) averaged over 10 grams											

Note: Blue entry represents variability data

Table 11-30
WLAN Phablet SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (10g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (10g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5260	52	802.11a	OFDM	20	19.0	18.08	-0.05	0 mm	1	11381	6	back	99.2	20.559	1.830	1.236	1.008	2.280	A44
5280	56	802.11a	OFDM	20	19.0	18.07	-0.10	0 mm	1	11381	6	back	99.2	24.978	1.780	1.239	1.008	2.223	
5300	60	802.11a	OFDM	20	19.0	18.03	-0.06	0 mm	1	11381	6	back	99.2	19.779	1.640	1.250	1.008	2.066	
5260	52	802.11a	OFDM	20	19.0	18.08	-0.12	0 mm	1	11381	6	front	99.2	8.940	1.270	1.236	1.008	1.582	
5260	52	802.11a	OFDM	20	19.0	18.08	0.06	0 mm	1	11381	6	top	99.2	7.313	-	1.236	1.008	-	
5260	52	802.11a	OFDM	20	19.0	18.08	-0.07	0 mm	1	11381	6	left	99.2	4.509	0.565	1.236	1.008	0.704	
5720	144	802.11a	OFDM	20	18.0	17.56	0.13	0 mm	1	11381	6	back	99.2	10.570	0.820	1.107	1.008	0.915	
5720	144	802.11a	OFDM	20	18.0	17.56	0.00	0 mm	1	11381	6	front	99.2	7.285	-	1.107	1.008	-	
5720	144	802.11a	OFDM	20	18.0	17.56	-0.18	0 mm	1	11381	6	top	99.2	4.893	-	1.107	1.008	-	
5720	144	802.11a	OFDM	20	18.0	17.56	-0.12	0 mm	1	11381	6	left	99.2	2.719	0.328	1.107	1.008	0.366	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Phablet 4.0 W/kg (mW/g) averaged over 10 grams									

11.5 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was > 1.2 W/kg, additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
10. Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.
11. Additional SAR tests for phablet SAR were evaluated per KDB 616217 Section 6 (See Section 6.9 for more information).
12. Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds below.
13. This device utilizes power reduction for some wireless modes and technologies, as outlined in Section 1.3. The maximum output power allowed for each transmitter and exposure condition was evaluated for SAR compliance based on expected use conditions and simultaneous transmission scenarios.

GSM Test Notes:

1. Body-Worn accessory testing is typically associated with voice operations. Therefore, GSM voice was evaluated for body-worn SAR.
2. Justification for reduced test configurations per KDB Publication 941225 D01v03r01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g evaluations then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.
4. GPRS was additionally evaluated for head and body-worn exposure conditions to address possible VoIP scenarios.

CDMA Notes:

1. Head SAR for CDMA2000 mode was tested under RC3/SO55 per FCC KDB Publication 941225 D01v03r01.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. EVDO Rev0 and RevA and TDSO / SO32 FCH+SCH SAR tests were not required per the 3G SAR Test Reduction Procedure in FCC KDB Publication 941225 D01v03r01.
3. CDMA Wireless Router SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 according to KDB 941225 D01v03r01 procedures for data devices. Wireless Router SAR tests for Subtype 2 of Rev.A and 1x RTT configurations were not required per the 3G SAR Test Reduction Policy in KDB Publication 941225 D01v03r01.
4. Head SAR was additionally evaluated using EVDO Rev. A to determine compliance for VoIP operations.
5. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g evaluations then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.
6. CDMA 1X Advanced technology was not required for SAR since the maximum allowed output powers for 1X Advanced was not more than 0.25 dB higher than the maximum powers for 1X.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03r01. AMR and HSPA SAR was not required per the 3G Test Reduction Procedure in KDB Publication 941225 D01v03r01.
2. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g evaluations then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 8.6.4.

2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per KDB Publication 941225 D05Av01r02, SAR for downlink only LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.

WLAN Notes:

1. For held-to-ear, hotspot, and phablet operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g evaluations, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 8.7.5 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg for 1g evaluations. See Section 8.7.6 for more information.
4. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
5. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.

12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

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

12.2 Simultaneous Transmission Procedures

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

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

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

When standalone SAR is not required to be measured, per FCC KDB 447498 D01v06 4.3.2 b), the following equation must be used to estimate the standalone 10g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated SAR} = \frac{\sqrt{f(GHz)}}{18.75} * \frac{\text{(Max Power of channel, mW)}}{\text{Min. Separation Distance, mm}}$$

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Head)	Estimated SAR (Head)	Separation Distance (1g Body)	Estimated SAR (1g Body)	Separation Distance (Phablet)	Estimated SAR (Phablet)
	[MHz]	[dBm]	[mm]	[W/kg]	[mm]	[W/kg]	[mm]	[W/kg]
Bluetooth	2480	9.00	5	0.336	10	0.168	5	0.134

Note: Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

12.3 Head SAR Simultaneous Transmission Analysis

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Cell. CDMA/EVDO	0.315	1.080	1.395
	PCS CDMA/EVDO	0.374	1.080	1.454
	GSM/GPRS 850	0.415	1.080	1.495
	GSM/GPRS 1900	0.224	1.080	1.304
	UMTS 850	0.302	1.080	1.382
	UMTS 1750	0.467	1.080	1.547
	UMTS 1900	0.485	1.080	**1.565**
	LTE Band 71	0.258	1.080	1.338
	LTE Band 12	0.335	1.080	1.415
	LTE Band 13	0.268	1.080	1.348
	LTE Band 5 (Cell)	0.274	1.080	1.354
	LTE Band 66 (AWS)	0.444	1.080	1.524
	LTE Band 2 (PCS)	0.427	1.080	1.507

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Cell. CDMA/EVDO	0.315	1.198	1.513
	PCS CDMA/EVDO	0.374	1.198	**1.572**
	GSM/GPRS 850	0.415	1.198	See Table Below
	GSM/GPRS 1900	0.224	1.198	1.422
	UMTS 850	0.302	1.198	1.500
	UMTS 1750	0.467	1.198	See Table Below
	UMTS 1900	0.485	1.198	See Table Below
	LTE Band 71	0.258	1.198	1.456
	LTE Band 12	0.335	1.198	1.533
	LTE Band 13	0.268	1.198	1.466
	LTE Band 5 (Cell)	0.274	1.198	1.472
	LTE Band 66 (AWS)	0.444	1.198	See Table Below
	LTE Band 2 (PCS)	0.427	1.198	See Table Below

Simult Tx	Configuration	GSM 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Right Cheek	0.323	1.198	**1.521**
	Right Tilt	0.144	0.863	1.007
	Left Cheek	0.279	0.641	0.920
	Left Tilt	0.163	0.620	0.783

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Head SAR	Right Cheek	0.415	1.198	See Note 1	0.03
	Right Tilt	0.174	0.863	**1.037**	N/A
	Left Cheek	0.347	0.641	0.988	N/A
	Left Tilt	0.211	0.620	0.831	N/A

Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Right Cheek	0.271	1.198	**1.469**
	Right Tilt	0.344	0.863	1.207
	Left Cheek	0.467	0.641	1.108
	Left Tilt	0.279	0.620	0.899

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Right Cheek	0.332	1.198	**1.530**
	Right Tilt	0.147	0.863	1.010
	Left Cheek	0.485	0.641	1.126
	Left Tilt	0.204	0.620	0.824

Simult Tx	Configuration	LTE Band 66 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Right Cheek	0.266	1.198	**1.464**
	Right Tilt	0.358	0.863	1.221
	Left Cheek	0.444	0.641	1.085
	Left Tilt	0.280	0.620	0.900

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Right Cheek	0.275	1.198	**1.473**
	Right Tilt	0.150	0.863	1.013
	Left Cheek	0.427	0.641	1.068
	Left Tilt	0.173	0.620	0.793

Note 1: No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was not greater than 0.04 per FCC KDB 447498 D01v06. See Section 12.7 for detailed SPLS ratio analysis.

Table 12-4
Simultaneous Transmission Scenario with Bluetooth (Held to Ear)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Cell. CDMA/EVDO	0.315	0.336	0.651
	PCS CDMA/EVDO	0.374	0.336	0.710
	GSM/GPRS 850	0.415	0.336	0.751
	GSM/GPRS 1900	0.224	0.336	0.560
	UMTS 850	0.302	0.336	0.638
	UMTS 1750	0.467	0.336	0.803
	UMTS 1900	0.485	0.336	**0.821**
	LTE Band 71	0.258	0.336	0.594
	LTE Band 12	0.335	0.336	0.671
	LTE Band 13	0.268	0.336	0.604
	LTE Band 5 (Cell)	0.274	0.336	0.610
	LTE Band 66 (AWS)	0.444	0.336	0.780
	LTE Band 2 (PCS)	0.427	0.336	0.763

Note: Bluetooth SAR was not required to be measured per FCC KDB Publication 447498 D01v06. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-5
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Body-Worn	Cell. CDMA	0.375	0.847	1.222	N/A
	PCS CDMA	0.731	0.847	**1.578**	N/A
	GSM/GPRS 850	0.504	0.847	1.351	N/A
	GSM/GPRS 1900	0.415	0.847	1.262	N/A
	UMTS 850	0.436	0.847	1.283	N/A
	UMTS 1750	1.095	0.847	See Note 1	0.02
	UMTS 1900	0.794	0.847	See Note 1	0.02
	LTE Band 71	0.374	0.847	1.221	N/A
	LTE Band 12	0.481	0.847	1.328	N/A
	LTE Band 13	0.346	0.847	1.193	N/A
	LTE Band 5 (Cell)	0.318	0.847	1.165	N/A
	LTE Band 66 (AWS)	0.863	0.847	See Note 1	0.02
	LTE Band 2 (PCS)	0.693	0.847	1.540	N/A

Note 1: No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was not greater than 0.04 per FCC KDB 447498 D01v06. See Section 12.7 for detailed SPLS ratio analysis.

Table 12-6
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Body-Worn	Cell. CDMA	0.375	1.296	See Note 1	0.02
	PCS CDMA	0.731	1.296	See Note 1	0.02
	GSM/GPRS 850	0.504	1.296	See Note 1	0.03
	GSM/GPRS 1900	0.415	1.296	See Note 1	0.02
	UMTS 850	0.436	1.296	See Note 1	0.03
	UMTS 1750	1.095	1.296	See Note 1	0.03
	UMTS 1900	0.794	1.296	See Note 1	0.02
	LTE Band 71	0.374	1.296	See Note 1	0.02
	LTE Band 12	0.481	1.296	See Note 1	0.02
	LTE Band 13	0.346	1.296	See Note 1	0.03
	LTE Band 5 (Cell)	0.318	1.296	See Note 1	0.03
	LTE Band 66 (AWS)	0.863	1.296	See Note 1	0.03
	LTE Band 2 (PCS)	0.693	1.296	See Note 1	0.02

Note 1: No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was not greater than 0.04 per FCC KDB 447498 D01v06. See Section 12.7 for detailed SPLS ratio analysis.

Table 12-7
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body-Worn	Cell. CDMA	0.375	0.168	0.543
	PCS CDMA	0.731	0.168	0.899
	GSM/GPRS 850	0.504	0.168	0.672
	GSM/GPRS 1900	0.415	0.168	0.583
	UMTS 850	0.436	0.168	0.604
	UMTS 1750	1.095	0.168	**1.263**
	UMTS 1900	0.794	0.168	0.962
	LTE Band 71	0.374	0.168	0.542
	LTE Band 12	0.481	0.168	0.649
	LTE Band 13	0.346	0.168	0.514
	LTE Band 5 (Cell)	0.318	0.168	0.486
	LTE Band 66 (AWS)	0.863	0.168	1.031
	LTE Band 2 (PCS)	0.693	0.168	0.861

Note: Bluetooth SAR was not required to be measured per FCC KDB Publication 447498 D01v06. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

12.5 Hotspot SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06v02r01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR ("-").

(*) For test positions that were not required to be evaluated for WLAN SAR per FCC KDB publication 248227, the worst case WLAN SAR result for the applicable exposure conditions was used for simultaneous transmission analysis.

Table 12-8
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Hotspot SAR	Cell. EVDO	0.454	0.847	1.301
	PCS EVDO	0.740	0.847	**1.587**
	GPRS 850	0.510	0.847	1.357
	GPRS 1900	0.415	0.847	1.262
	UMTS 850	0.498	0.847	1.345
	UMTS 1750	1.095	0.847	See Table Below
	UMTS 1900	0.794	0.847	See Table Below
	LTE Band 71	0.374	0.847	1.221
	LTE Band 12	0.502	0.847	1.349
	LTE Band 13	0.398	0.847	1.245
	LTE Band 5 (Cell)	0.344	0.847	1.191
	LTE Band 66 (AWS)	0.863	0.847	See Table Below
	LTE Band 2 (PCS)	0.693	0.847	1.540

Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	1.095	0.847	See Note 1	0.02
	Front	0.711	0.788	**1.499**	N/A
	Top	-	0.847*	0.847	N/A
	Bottom	0.425	-	0.425	N/A
	Right	-	-	-	N/A
	Left	0.676	0.461	1.137	N/A

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	0.794	0.847	See Note 1	0.02
	Front	0.605	0.788	**1.393**	N/A
	Top	-	0.847*	0.847	N/A
	Bottom	0.353	-	0.353	N/A
	Right	-	-	-	N/A
	Left	0.594	0.461	1.055	N/A

Simult Tx	Configuration	LTE Band 66 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	0.863	0.847	See Note 1	0.02
	Front	0.570	0.788	**1.358**	N/A
	Top	-	0.847*	0.847	N/A
	Bottom	0.373	-	0.373	N/A
	Right	-	-	-	N/A
	Left	0.595	0.461	1.056	N/A

Note 1: No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was not greater than 0.04 per FCC KDB 447498 D01v06. See Section 12.7 for detailed SPLS ratio analysis.

Table 12-9
Simultaneous Transmission Scenario with 5 GHz WLAN (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Hotspot SAR	Cell. EVDO	0.454	0.945	1.399
	PCS EVDO	0.740	0.945	See Table Below
	GPRS 850	0.510	0.945	**1.455**
	GPRS 1900	0.415	0.945	1.360
	UMTS 850	0.498	0.945	1.443
	UMTS 1750	1.095	0.945	See Table Below
	UMTS 1900	0.794	0.945	See Table Below
	LTE Band 71	0.374	0.945	1.319
	LTE Band 12	0.502	0.945	1.447
	LTE Band 13	0.398	0.945	1.343
	LTE Band 5 (Cell)	0.344	0.945	1.289
	LTE Band 66 (AWS)	0.863	0.945	See Table Below
	LTE Band 2 (PCS)	0.693	0.945	See Table Below

Simult Tx	Configuration	PCS EVDO SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	0.740	0.945	See Note 1	0.02
	Front	0.626	0.727	**1.353**	N/A
	Top	-	0.896	0.896	N/A
	Bottom	0.342	-	0.342	N/A
	Right	-	-	-	N/A
	Left	0.559	0.371	0.930	N/A

Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	1.095	0.945	See Note 1	0.02
	Front	0.711	0.727	**1.438**	N/A
	Top	-	0.896	0.896	N/A
	Bottom	0.425	-	0.425	N/A
	Right	-	-	-	N/A
	Left	0.676	0.371	1.047	N/A

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	0.794	0.945	See Note 1	0.02
	Front	0.605	0.727	**1.332**	N/A
	Top	-	0.896	0.896	N/A
	Bottom	0.353	-	0.353	N/A
	Right	-	-	-	N/A
	Left	0.594	0.371	0.965	N/A

Simult Tx	Configuration	LTE Band 66 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	0.863	0.945	See Note 1	0.02
	Front	0.570	0.727	**1.297**	N/A
	Top	-	0.896	0.896	N/A
	Bottom	0.373	-	0.373	N/A
	Right	-	-	-	N/A
	Left	0.595	0.371	0.966	N/A

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	0.693	0.945	See Note 1	0.02
	Front	0.555	0.727	**1.282**	N/A
	Top	-	0.896	0.896	N/A
	Bottom	0.310	-	0.310	N/A
	Right	-	-	-	N/A
	Left	0.531	0.371	0.902	N/A

Note 1: No evaluation was performed to determine the aggregate 1g SAR for these configurations as the SPLS ratio between the antenna pairs was not greater than 0.04 per FCC KDB 447498 D01v06. See Section 12.7 for detailed SPLS ratio analysis.

Table 12-10
Simultaneous Transmission Scenario with Bluetooth (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Hotspot SAR	Cell. EVDO	0.454	0.168	0.622
	PCS EVDO	0.740	0.168	0.908
	GPRS 850	0.510	0.168	0.678
	GPRS 1900	0.415	0.168	0.583
	UMTS 850	0.498	0.168	0.666
	UMTS 1750	1.095	0.168	**1.263**
	UMTS 1900	0.794	0.168	0.962
	LTE Band 71	0.374	0.168	0.542
	LTE Band 12	0.502	0.168	0.670
	LTE Band 13	0.398	0.168	0.566
	LTE Band 5 (Cell)	0.344	0.168	0.512
	LTE Band 66 (AWS)	0.863	0.168	1.031
	LTE Band 2 (PCS)	0.693	0.168	0.861

Note: Bluetooth SAR was not required to be measured per FCC KDB Publication 447498 D01v06. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

12.6 Phablet Simultaneous Transmission Analysis

Per FCC KDB Publication 941225 D06v02r01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR ("-").

(*) For test positions that were not required to be evaluated for WLAN SAR per FCC KDB publication 248227, the worst case WLAN SAR result for the applicable exposure conditions was used for simultaneous transmission analysis.

Per FCC KDB Publication 648474 D04 Handset SAR, Phablet SAR tests were not required if wireless router 1g SAR (scaled to the maximum output power, including tolerance) < 1.2 W/kg. Therefore, no further analysis beyond the tables included in this section was required to determine that possible simultaneous transmission scenarios would not exceed the SAR limit.

For SAR summation, the highest reported SAR across all test distances was used as the most conservative evaluation for simultaneous transmission analysis for each device edge.

Table 12-11
Simultaneous Transmission Scenario with 5 GHz WLAN (Phablet)

Simult Tx	Configuration	PCS EVDO SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Phablet SAR	Back	3.018	2.280	See Note 1	0.10
	Front	2.823	1.582	See Note 1	0.07
	Top	-	2.280*	2.280	N/A
	Bottom	1.087	-	1.087	N/A
	Right	-	-	0.000	N/A
	Left	2.170	0.704	**2.874**	N/A

Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Phablet SAR	Back	2.374	2.280	See Note 1	0.08
	Front	2.329	1.582	**3.911**	N/A
	Top	-	2.280*	2.280	N/A
	Bottom	1.500	-	1.500	N/A
	Right	-	-	0.000	N/A
	Left	3.165	0.704	3.869	N/A

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Phablet SAR	Back	3.097	2.280	See Note 1	0.10
	Front	2.946	1.582	See Note 1	0.07
	Top	-	2.280*	2.280	N/A
	Bottom	1.151	-	1.151	N/A
	Right	-	-	0.000	N/A
	Left	3.093	0.704	**3.797**	N/A

Simult Tx	Configuration	LTE Band 66 (AWS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Phablet SAR	Back	2.284	2.280	See Note 1	0.10
	Front	2.367	1.582	**3.949**	N/A
	Top	-	2.280*	2.280	N/A
	Bottom	1.791	-	1.791	N/A
	Right	-	-	0.000	N/A
	Left	3.094	0.704	3.798	N/A

Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Phablet SAR	Back	3.062	2.280	See Note 1	0.10
	Front	2.677	1.582	See Note 1	0.07
	Top	-	2.280*	2.280	N/A
	Bottom	1.052	-	1.052	N/A
	Right	-	-	0.000	N/A
	Left	3.197	0.704	**3.901**	N/A

Note 1: No evaluation was performed to determine the aggregate 10g SAR for these configurations as the SPLS ratio between the antenna pairs was not greater than 0.10 per FCC KDB 447498 D01v06. See Section 12.7 for detailed SPLS ratio analysis.

12.7 SPLSR Evaluation and Analysis

Per FCC KDB Publication 447498 D01v06, when the sum of the standalone transmitters is more than 1.6 W/kg for 1g or more than 4.0 W/kg for 10g, the SAR sum to peak locations can be analyzed to determine SAR distribution overlaps. When the SAR peak to location ratio (shown below) for each pair of antennas is ≤ 0.04 for 1g and ≤ 0.10 for 10g, simultaneous SAR evaluation is not required. The distance between the transmitters was calculated using the following formula.

$$\text{Head Distance}_{Tx1-Tx2} = R_i = \sqrt{(x_1 - x_2)^2 + (y_1 - y_2)^2 + (z_1 - z_2)^2}$$

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

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

12.7.1 Head SAR Right Cheek SPLSR Evaluation and Analysis

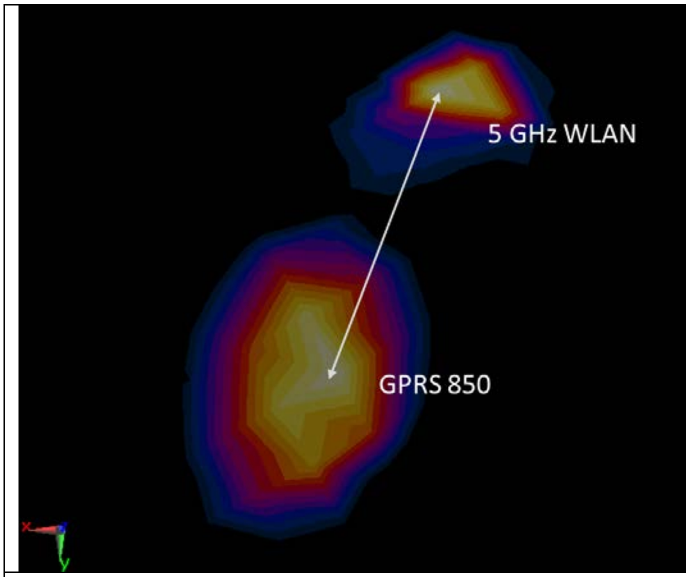
Table 12-12
Peak SAR Locations for Head Right Cheek

Mode/Band	x (mm)	y (mm)	z (mm)	Reported SAR (W/kg)
5 GHz WLAN	10.15	-333.06	-175.23	1.198
GPRS 850	42.91	-270.31	-175.22	0.415

Table 12-13
Head Right Cheek SAR to Peak Location Separation Ratio Calculations

Antenna Pair		Standalone SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio	Plot Number
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$	
GPRS 850	5 GHz WLAN	0.415	1.198	1.613	70.79	0.03	1

Table 12-14
Head Right Cheek SAR to Peak Location Separation Ratio Plots



1

12.7.2 Body-Worn Back Side SPLSR Evaluation and Analysis

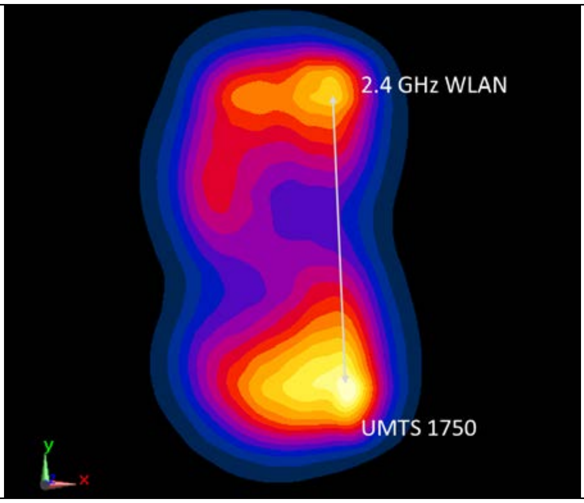
Table 12-15
Peak SAR Locations for Body-Worn Back Side

Mode/Band	x (mm)	y (mm)	Reported SAR (W/kg)
2.4 GHz WLAN	-4.60	62.40	0.847
5 GHz WLAN	4.00	69.00	1.296
Cell. CDMA	-13.00	-70.50	0.375
PCS CDMA	-32.00	-54.00	0.731
GSM/GPRS 850	-35.50	1.50	0.504
GSM/GPRS 1900	-32.00	-54.00	0.415
UMTS 850	-45.00	3.00	0.436
UMTS 1750	0.50	-57.00	1.095
UMTS 1900	8.50	-65.00	0.794
LTE Band 71	-18.00	-38.50	0.374
LTE Band 12	-28.00	-30.00	0.481
LTE Band 13	-37.00	0.00	0.346
LTE Band 5 (Cell)	-35.50	10.50	0.318
LTE Band 66 (AWS)	-1.00	-54.00	0.863
LTE Band 2 (PCS)	-32.00	-46.00	0.693

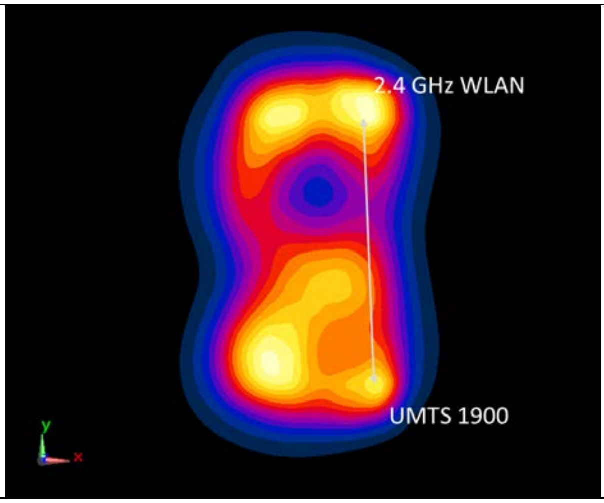
Table 12-16
Body-Worn Back Side SAR to Peak Location Separation Ratio Calculations

Antenna Pair		Standalone SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio	Plot Number
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$	
UMTS 1750	2.4 GHz WLAN	1.095	0.847	1.942	119.51	0.02	1
UMTS 1900	2.4 GHz WLAN	0.794	0.847	1.641	128.07	0.02	2
LTE Band 66 (AWS)	2.4 GHz WLAN	0.863	0.847	1.710	116.46	0.02	3
Cell. CDMA	5 GHz WLAN	0.375	1.296	1.671	140.53	0.02	4
PCS CDMA	5 GHz WLAN	0.731	1.296	2.027	128.16	0.02	5
GSM/GPRS 850	5 GHz WLAN	0.504	1.296	1.800	78.21	0.03	6
GSM/GPRS 1900	5 GHz WLAN	0.415	1.296	1.711	128.16	0.02	7
UMTS 850	5 GHz WLAN	0.436	1.296	1.732	82.20	0.03	8
UMTS 1750	5 GHz WLAN	1.095	1.296	2.391	126.05	0.03	9
UMTS 1900	5 GHz WLAN	0.794	1.296	2.090	134.08	0.02	10
LTE Band 71	5 GHz WLAN	0.374	1.296	1.670	109.73	0.02	11
LTE Band 12	5 GHz WLAN	0.481	1.296	1.777	104.04	0.02	12
LTE Band 13	5 GHz WLAN	0.346	1.296	1.642	80.26	0.03	13
LTE Band 5 (Cell)	5 GHz WLAN	0.318	1.296	1.614	70.59	0.03	14
LTE Band 66 (AWS)	5 GHz WLAN	0.863	1.296	2.159	123.10	0.03	15
LTE Band 2 (PCS)	5 GHz WLAN	0.693	1.296	1.989	120.50	0.02	16

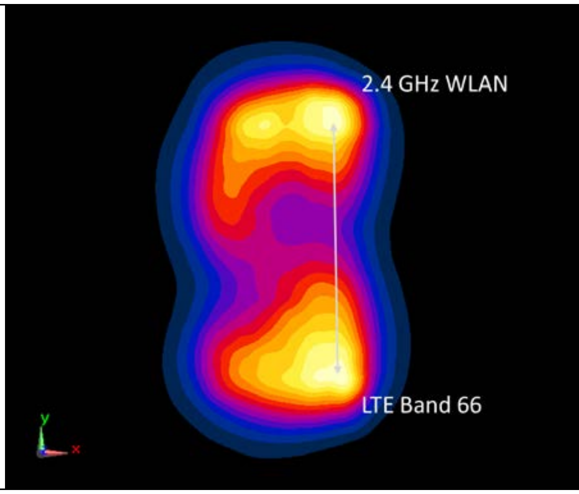
Table 12-17
Body-Worn Back Side SAR to Peak Location Separation Ratio Plots



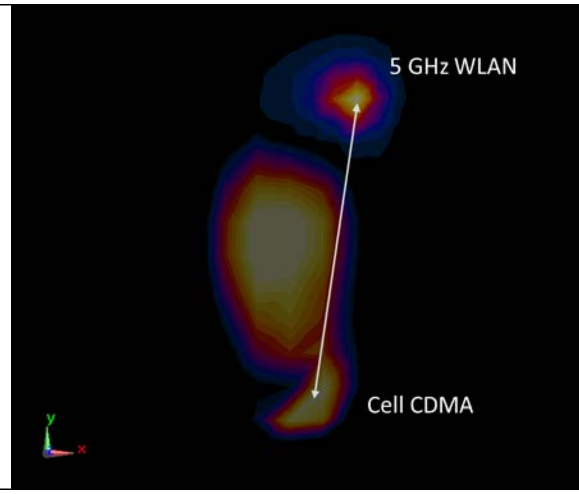
1



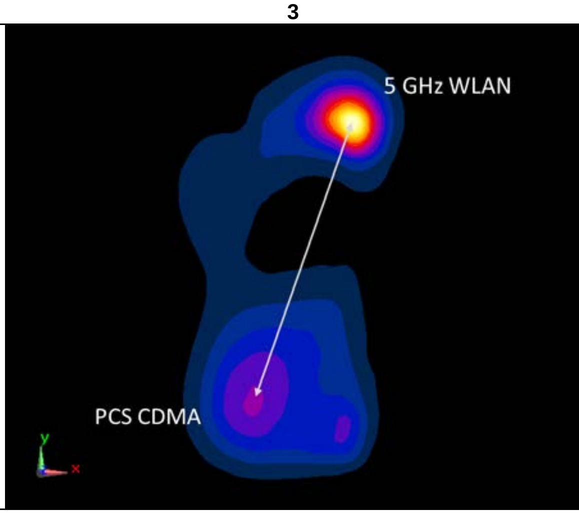
2


2.4 GHz WLAN
LTE Band 66

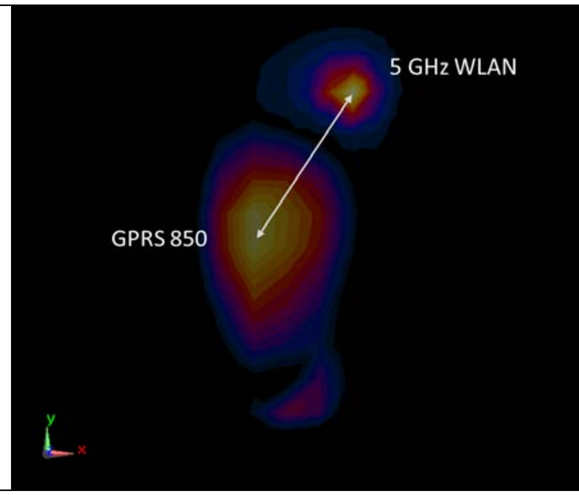
3


5 GHz WLAN
Cell CDMA

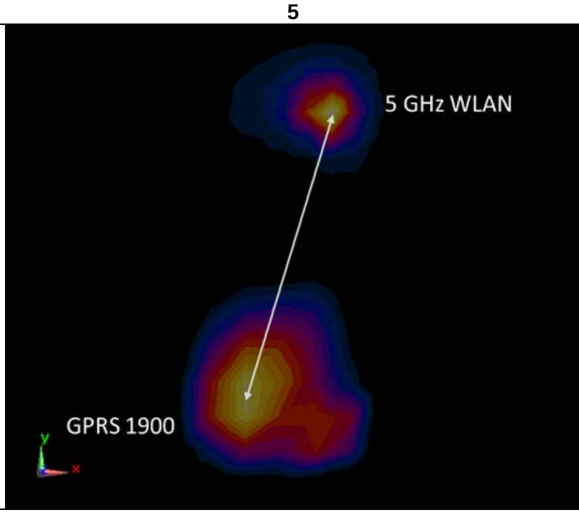
4


5 GHz WLAN
PCS CDMA

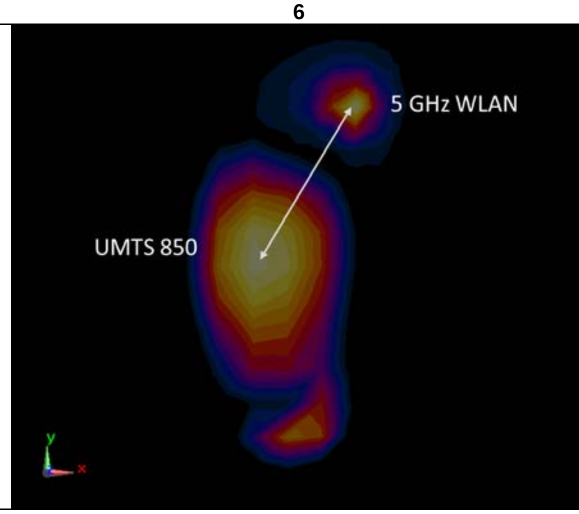
5


5 GHz WLAN
GPRS 850

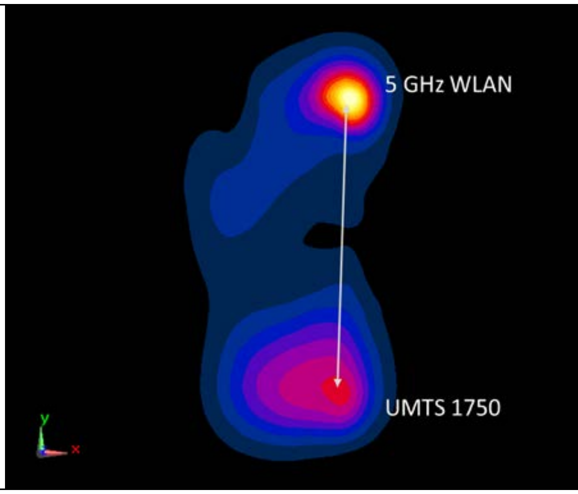
6


5 GHz WLAN
GPRS 1900

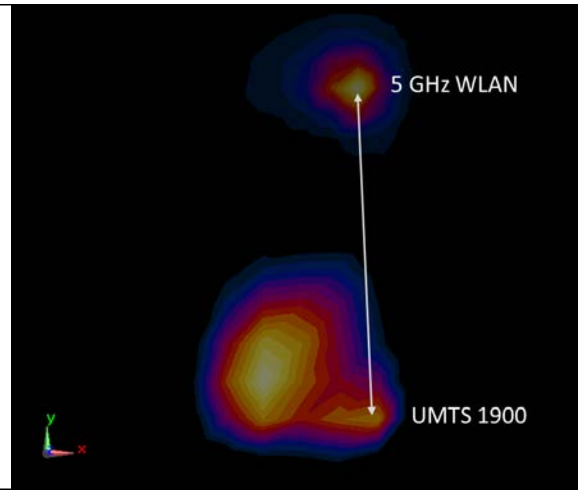
7


5 GHz WLAN
UMTS 850

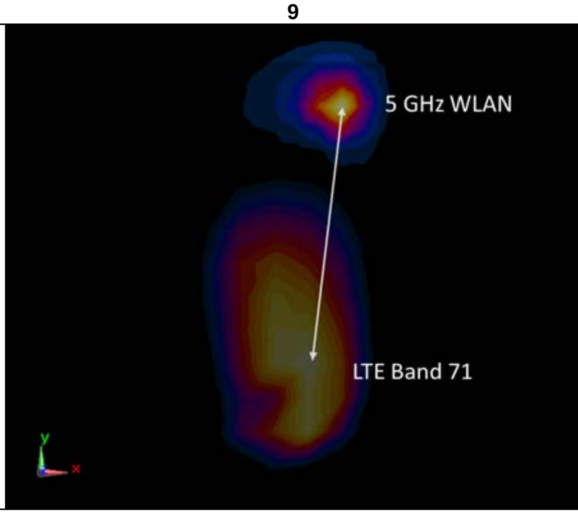
8



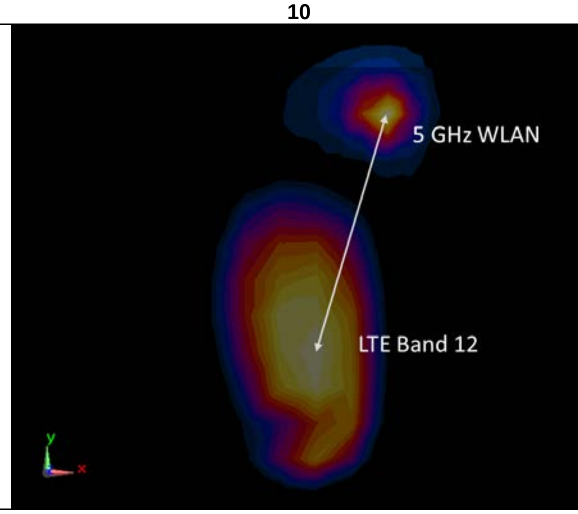
9



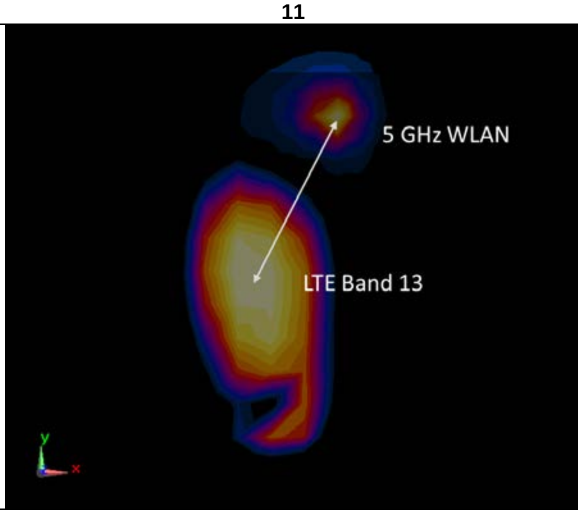
10



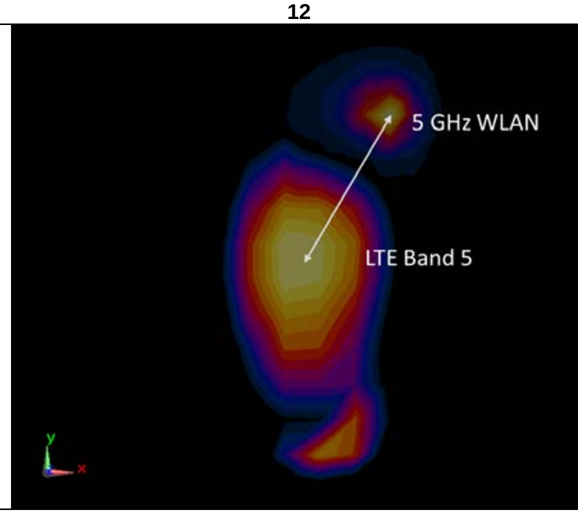
11



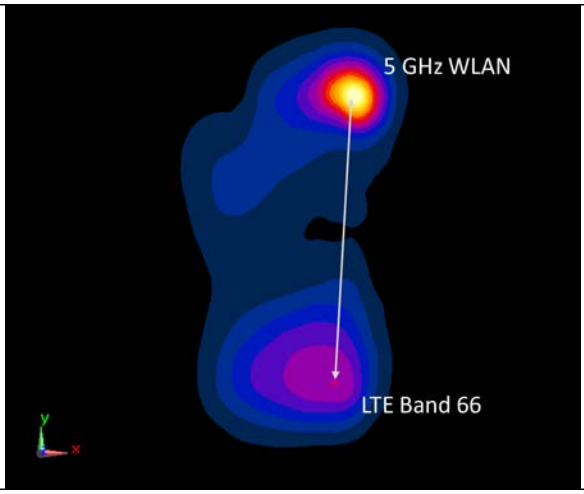
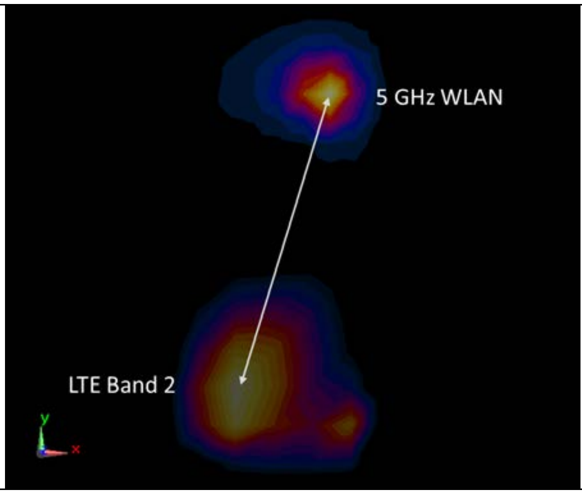
12



13



14

	
15	**16**

12.7.3 Hotspot Back Side SPLSR Evaluation and Analysis

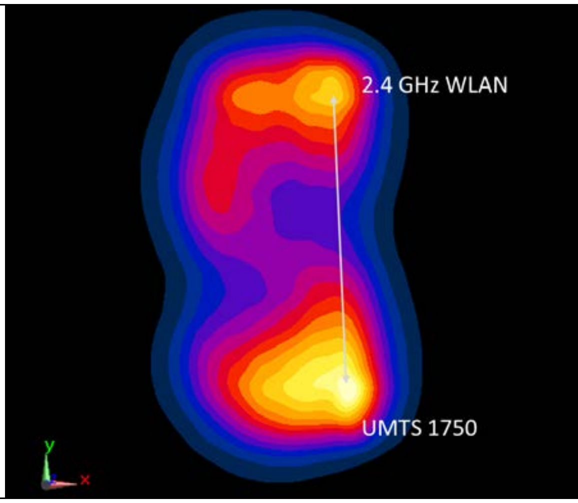
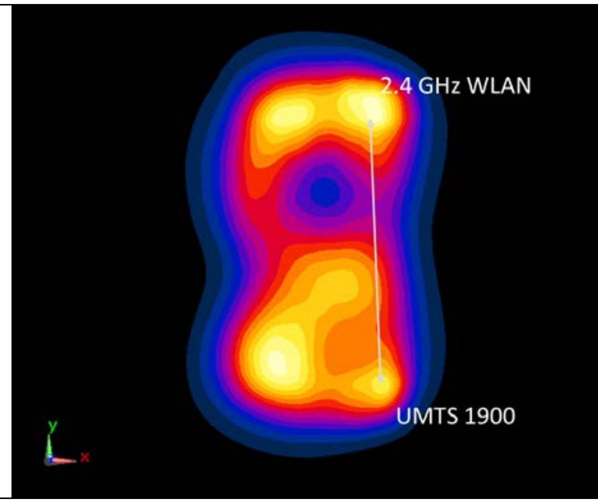
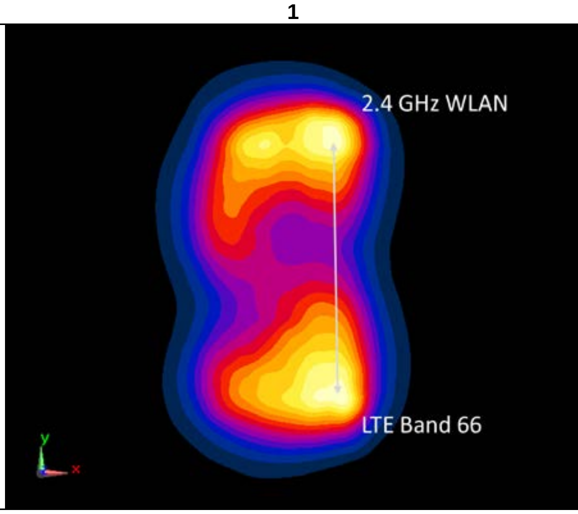
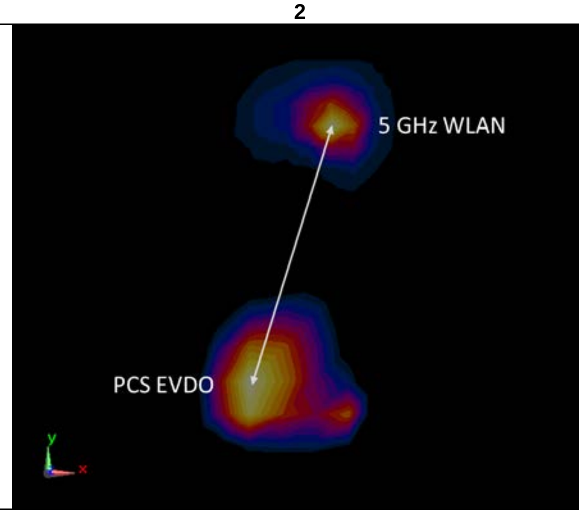
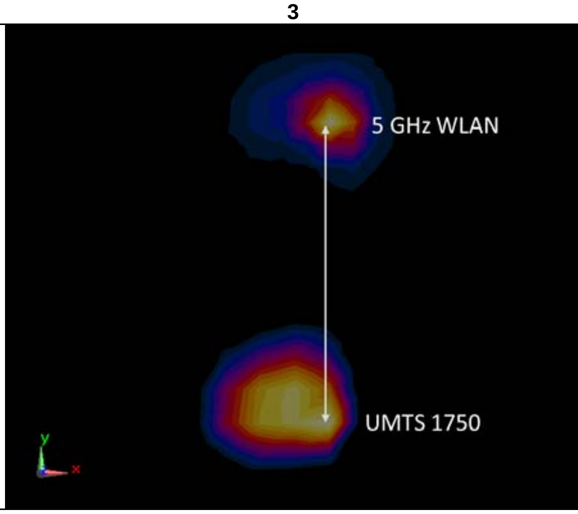
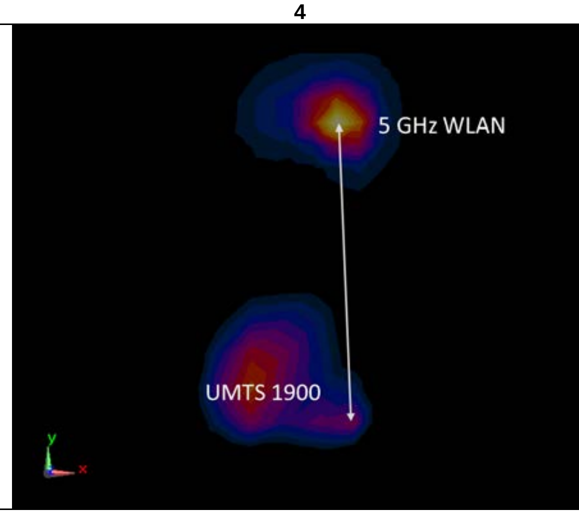
Table 12-18
Peak SAR Locations for Hotspot Back Side

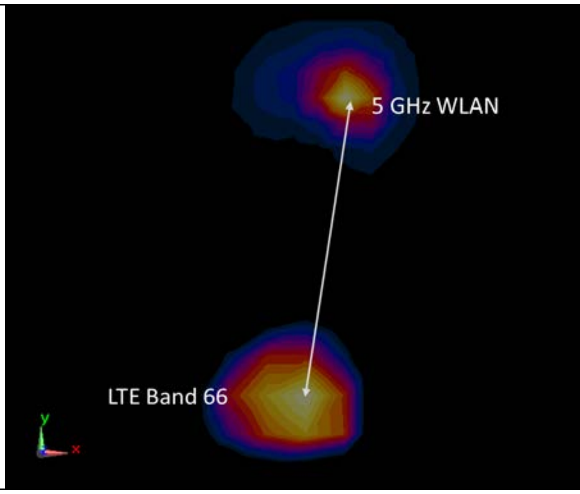
Mode/Band	x (mm)	y (mm)	Reported SAR (W/kg)
2.4 GHz WLAN	-4.60	62.40	0.847
5 GHz WLAN	4.00	71.00	0.945
PCS CDMA (EVDO)	-30.50	-54.00	0.740
UMTS 1750	0.50	-57.00	1.095
UMTS 1900	8.50	-65.00	0.794
LTE Band 66 (AWS)	-1.00	-54.00	0.863
LTE Band 2 (PCS)	-32.00	-46.00	0.693

Table 12-19
Hotspot Back Side SAR to Peak Location Separation Ratio Calculations

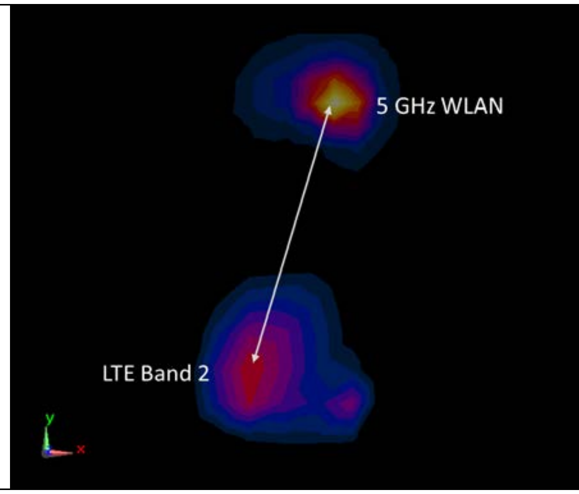
Antenna Pair		Standalone SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio	Plot Number
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$	
UMTS 1750	2.4 GHz WLAN	1.095	0.847	1.942	119.51	0.02	1
UMTS 1900	2.4 GHz WLAN	0.794	0.847	1.641	128.07	0.02	2
LTE Band 66 (AWS)	2.4 GHz WLAN	0.863	0.847	1.710	116.46	0.02	3
PCS CDMA (EVDO)	5 GHz WLAN	0.740	0.945	1.685	129.67	0.02	4
UMTS 1750	5 GHz WLAN	1.095	0.945	2.040	128.05	0.02	5
UMTS 1900	5 GHz WLAN	0.794	0.945	1.739	136.07	0.02	6
LTE Band 66 (AWS)	5 GHz WLAN	0.863	0.945	1.808	125.10	0.02	7
LTE Band 2 (PCS)	5 GHz WLAN	0.693	0.945	1.638	122.41	0.02	8

Table 12-20
Hotspot Back Side SAR to Peak Location Separation Ratio Plots

	
1	2
	
3	4
	
5	6



7



8

12.7.4 Phablet Back Side SPLSR Evaluation and Analysis

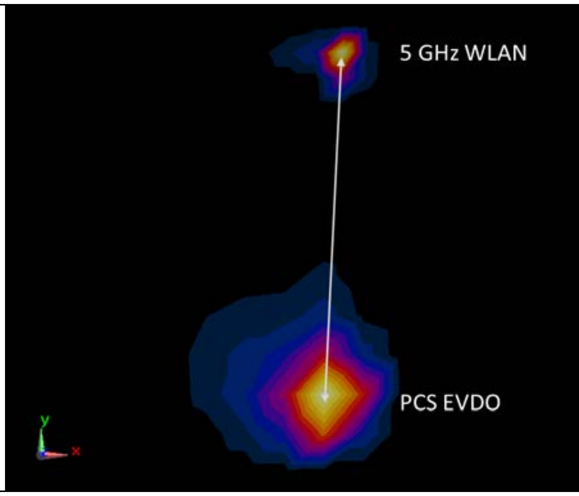
Table 12-21
Peak SAR Locations for Phablet Back Side

Mode/Band	x (mm)	y (mm)	Reported SAR (W/kg)
5 GHz WLAN	5.00	65.00	2.280
PCS EVDO	1.00	-59.50	3.018
UMTS 1750	8.50	-60.00	2.374
UMTS 1900	5.50	-60.00	3.097
LTE Band 66 (AWS)	8.50	-66.00	2.284
LTE Band 2 (PCS)	7.00	-60.00	3.062

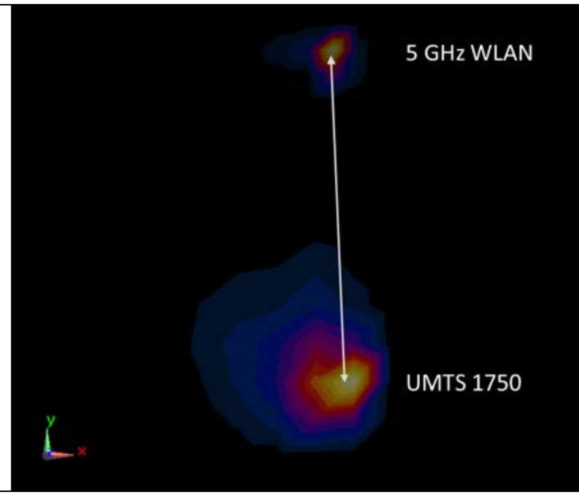
Table 12-22
Phablet Back Side SAR to Peak Location Separation Ratio Calculations

Antenna Pair		Standalone SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio	Plot Number
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$	
PCS EVDO	5 GHZ WLAN	3.018	2.280	5.298	124.56	0.10	1
UMTS 1750	5 GHZ WLAN	2.374	2.280	4.654	125.05	0.08	2
UMTS 1900	5 GHZ WLAN	3.097	2.280	5.377	125.00	0.10	3
LTE Band 66 (AWS)	5 GHZ WLAN	2.284	2.280	4.564	131.05	0.07	4
LTE Band 2 (PCS)	5 GHZ WLAN	3.062	2.280	5.342	125.02	0.10	5

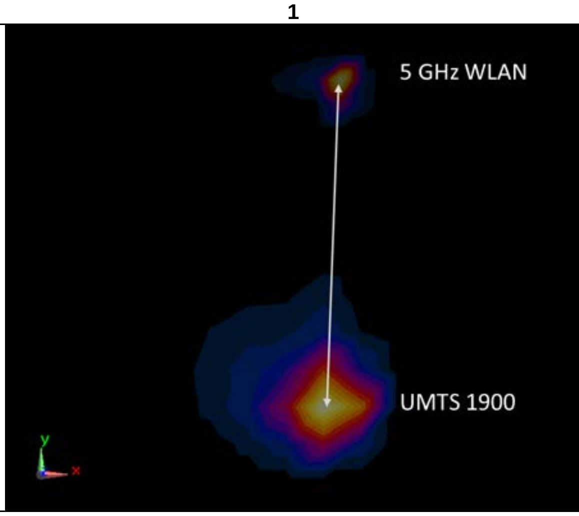
Table 12-23
Phablet Back Side SAR to Peak Location Separation Ratio Plots



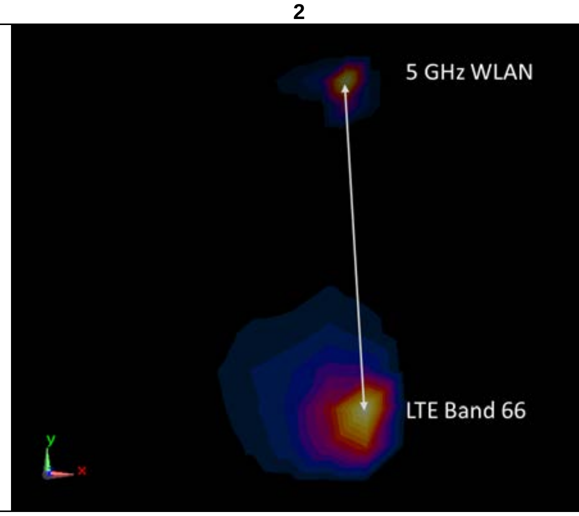
1



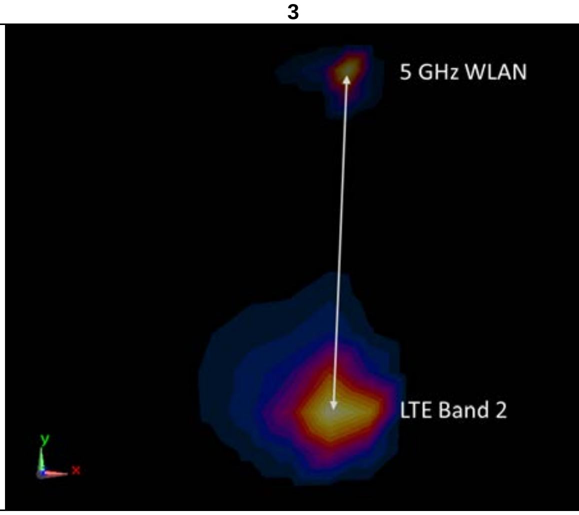
2



3



4



5

12.7.5 Phablet Front Side SPLSR Evaluation and Analysis

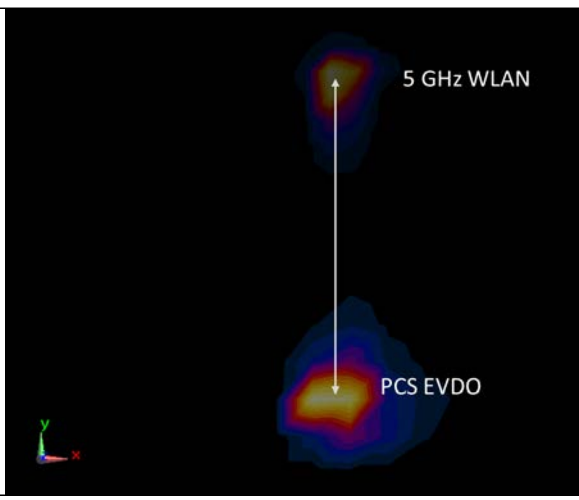
Table 12-24
Peak SAR Locations for Phablet Front Side

Mode/Band	x (mm)	y (mm)	Reported SAR (W/kg)
5 GHz WLAN	-52.00	67.00	1.582
PCS EVDO	-56.00	-60.00	2.823
UMTS 1900	-57.50	-68.00	2.946
LTE Band 2 (PCS)	-53.00	-63.00	2.677

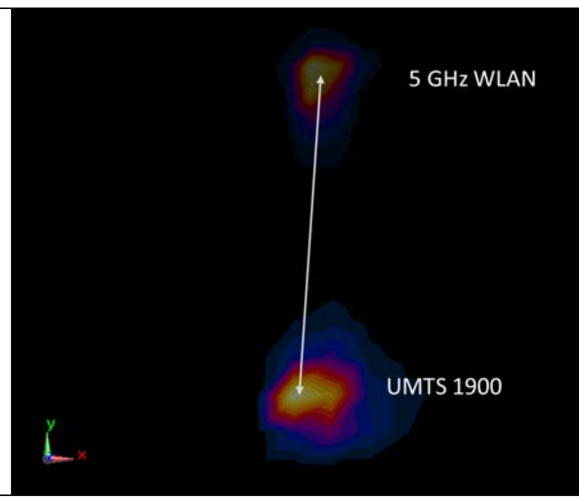
Table 12-25
Phablet Front Side SAR to Peak Location Separation Ratio Calculations

Antenna Pair		Standalone SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio	Plot Number
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$	
PCS EVDO	5 GHz WLAN	2.823	1.582	4.405	127.06	0.07	1
UMTS 1900	5 GHz WLAN	2.946	1.582	4.528	135.11	0.07	2
LTE Band 2 (PCS)	5 GHz WLAN	2.677	1.582	4.259	130.00	0.07	3

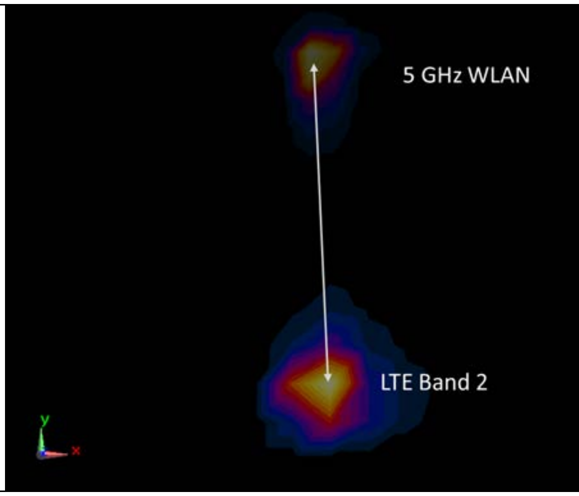
Table 12-26
Phablet Front Side SAR to Peak Location Separation Ratio Plots



1



2



3

12.8 Simultaneous Transmission Conclusion

The above numerical summed SAR results and SPLSR analysis are sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528- 2013 Section 6.3.4.1.

13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01r04, SAR measurement variability was assessed for each frequency band, which was determined by the SAR probe calibration point and tissue-equivalent medium used for the device measurements. When both head and body tissue-equivalent media were required for SAR measurements in a frequency band, the variability measurement procedures were applied to the tissue medium with the highest measured SAR, using the highest measured SAR configuration for that tissue-equivalent medium. These additional measurements were repeated after the completion of all measurements requiring the same head or body tissue-equivalent medium in a frequency band. The test device was returned to ambient conditions (normal room temperature) with the battery fully charged before it was re-mounted on the device holder for the repeated measurement(s) to minimize any unexpected variations in the repeated results.

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

1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg (~ 10% from the 1g SAR limit).
3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20.
4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg
5) When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

Table 13-1
Head SAR Measurement Variability Results

HEAD VARIABILITY RESULTS														
Band	FREQUENCY		Mode/Band	Service	Side	Test Position	Data Rate (Mbps)	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)	
2450	2412.00	1	802.11b, 22 MHz Bandwidth	DSSS	Right	Cheek	1	0.918	0.866	1.06	N/A	N/A	N/A	N/A
5250	5270.00	54	802.11n, 40 MHz Bandwidth	OFDM	Right	Cheek	13.5	0.994	0.990	1.00	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									

Table 13-2
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS														
Band	FREQUENCY		Mode	Service	Data Rate (Mbps)	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.						(W/kg)	(W/kg)		(W/kg)		(W/kg)	
1750	1712.40	1312	UMTS 1750	RMC	N/A	back	10 mm	1.070	1.070	1.00	N/A	N/A	N/A	N/A
5600	5620.00	124	802.11a, 20 MHz Bandwidth	OFDM	6	back	10 mm	1.130	1.060	1.07	N/A	N/A	N/A	N/A
5750	5720.00	144	802.11a, 20 MHz Bandwidth	OFDM	6	back	10 mm	1.060	0.922	1.15	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 13-3
Phablet SAR Measurement Variability Results

PHABLET VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Side	Spacing	Measured SAR (10g)	1st Repeated SAR (10g)	Ratio	2nd Repeated SAR (10g)	Ratio	3rd Repeated SAR (10g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
1750	1712.40	1312	UMTS 1750	RMC	left	0 mm	2.990	2.920	1.02	N/A	N/A	N/A	N/A
1900	1900.00	19100	LTE Band 2 (PCS), 20 MHz Bandwidth	QPSK, 1 RB, 0 RB Offset	back	0 mm	3.020	2.860	1.06	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Phablet 4.0 W/kg (mW/g) averaged over 10 grams							

13.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for 1g and <3.75 W/kg for 10g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4432B	ESG-D Series Signal Generator	4/19/2018	Annual	4/19/2019	US40053896
Agilent	E5515C	Wireless Communications Test Set	1/29/2016	Triennial	1/29/2019	GB46310798
Agilent	E5515C	Wireless Communications Test Set	2/28/2018	Biennial	2/28/2020	GB41450275
Agilent	N9020A	MXA Signal Analyzer	1/24/2018	Annual	1/24/2019	US46470561
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Agilent	E5515C	Wireless Communications Test Set	2/7/2018	Triennial	2/7/2021	GB43304447
Agilent	8753ES	S-Parameter Network Analyzer	2/8/2018	Annual	2/8/2019	US39170122
Agilent	N5182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
Agilent	E4438C	ESG Vector Signal Generator	3/24/2017	Biennial	3/24/2019	MY42082385
Agilent	N5182A-506	MXG Vector Signal Generator	6/19/2018	Annual	6/19/2019	MY48180366
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433972
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433974
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/11/2018	Annual	9/11/2019	1091
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	MT8821C	Radio Communication Analyzer	11/6/2018	Annual	11/6/2019	6200901190
Anritsu	MA24106A	USB Power Sensor	6/5/2018	Annual	6/5/2019	1231538
Anritsu	MA24106A	USB Power Sensor	6/5/2018	Annual	6/5/2019	1231535
Anritsu	ML2496A	Power Meter	10/21/2018	Annual	10/21/2019	1138001
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1126066
Anritsu	MT8820C	Radio Communication Analyzer	6/27/2018	Annual	6/27/2019	6201240328
Anritsu	ML2496A	Power Meter	5/21/2018	Annual	5/21/2019	1351001
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4040	Therm./ Clock/ Humidity Monitor	1/8/2018	Annual	1/8/2019	160473909
Control Company	4352	Ultra Long Stem Thermometer	1/8/2018	Annual	1/8/2019	160508097
Control Company	4352	Ultra Long Stem Thermometer	1/8/2018	Annual	1/8/2019	160508122
Control Company	4040	Therm./ Clock/ Humidity Monitor	1/8/2018	Annual	1/8/2019	160574418
Control Company	4352	Ultra Long Stem Thermometer	2/14/2017	Biennial	2/14/2019	170112507
Control Company	4040	Therm./ Clock/ Humidity Monitor	3/1/2017	Biennial	3/1/2019	170152009
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	AT/N6705B	DC Power Supply	N/A	N/A	N/A	MY53001315
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini Circuits	PWR-4GHS	USB Power Sensor	1/20/2018	Annual	1/20/2019	11710030063
Mini Circuits	PWR-4GHS	USB Power Sensor	1/22/2018	Annual	1/22/2019	11710030062
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	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	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mitutoyo	CD-6"CSX	Digital Caliper	4/18/2018	Biennial	4/18/2020	13264165
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	4/18/2018	Annual	4/18/2019	N/A
Pasternack	NC-100	Torque Wrench	5/23/2018	Biennial	5/23/2020	N/A
Pasternack	NC-100	Torque Wrench	4/18/2018	Annual	4/18/2019	1445
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	5/18/2018	Annual	5/18/2019	109892
Rohde & Schwarz	CMW500	Radio Communication Tester	6/8/2018	Annual	6/8/2019	112347
Rohde & Schwarz	CMW500	Radio Communication Tester	7/5/2018	Annual	7/5/2019	106578
Rohde & Schwarz	CMW500	Radio Communication Tester	10/4/2018	Annual	10/4/2019	109366
Rohde & Schwarz	CMW500	Radio Communication Tester	8/10/2018	Annual	8/10/2019	116743
Agilent	E4440A	PSA Series Spectrum Analyzer	11/14/2018	Annual	11/14/2019	MY46186272
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/30/2018	Annual	10/30/2019	164948
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	7/11/2018	Annual	7/11/2019	N/A
Seekonk	NC-100	Torque Wrench (8" lb)	5/10/2018	Biennial	5/10/2020	21053
Seekonk	NC-100	Torque Wrench (8" lb)	5/23/2018	Biennial	5/23/2020	N/A
Seekonk	NC-100	Torque Wrench	7/11/2018	Annual	7/11/2019	N/A
Seekonk	NC-100	Torque Wrench	4/18/2018	Biennial	4/18/2020	N/A
SPEAG	EX3DV4	SAR Probe	5/22/2018	Annual	5/22/2019	7406
SPEAG	EX3DV4	SAR Probe	8/23/2018	Annual	8/23/2019	7308
SPEAG	ES3DV3	SAR Probe	10/22/2018	Annual	10/22/2019	3287
SPEAG	EX3DV4	SAR Probe	7/20/2018	Annual	7/20/2019	7410
SPEAG	EX3DV4	SAR Probe	6/25/2018	Annual	6/25/2019	7409
SPEAG	ES3DV3	SAR Probe	3/27/2018	Annual	3/27/2019	3347
SPEAG	ES3DV3	SAR Probe	8/22/2018	Annual	8/22/2019	3332
SPEAG	ES3DV3	SAR Probe	3/13/2018	Annual	3/13/2019	3319
SPEAG	EX3DV4	SAR Probe	4/18/2018	Annual	4/18/2019	7357
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/22/2018	Annual	5/22/2019	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/3/2018	Annual	10/3/2019	1558
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/18/2018	Annual	10/18/2019	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2018	Annual	2/9/2019	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/11/2018	Annual	7/11/2019	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/18/2018	Annual	6/18/2019	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/15/2018	Annual	2/15/2019	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/7/2018	Annual	3/7/2019	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2018	Annual	4/11/2019	1407
SPEAG	D750V3	750 MHz Dipole	1/15/2018	Annual	1/15/2019	1003
SPEAG	D750V3	750 MHz Dipole	3/7/2017	Biennial	3/7/2019	1054
SPEAG	D835V2	835 MHz SAR Dipole	1/15/2018	Annual	1/15/2019	4d132
SPEAG	D835V2	835 MHz SAR Dipole	10/19/2018	Annual	10/19/2019	4d047
SPEAG	D835V2	835 MHz SAR Dipole	10/19/2018	Annual	10/19/2019	4d133
SPEAG	D1750V2	1750 MHz SAR Dipole	5/9/2017	Biennial	5/9/2019	1148
SPEAG	D1750V2	1750 MHz SAR Dipole	10/22/2018	Annual	10/22/2019	1150
SPEAG	D1750V2	1900 MHz SAR Dipole	10/23/2018	Annual	10/23/2019	5d080
SPEAG	D1900V2	1900 MHz SAR Dipole	2/7/2018	Annual	2/7/2019	5d148
SPEAG	D2450V2	2450 MHz SAR Dipole	8/16/2018	Annual	8/16/2019	981
SPEAG	D2450V2	2450 MHz SAR Dipole	8/17/2018	Biennial	8/17/2019	719
SPEAG	D5GHzV2	5 GHz SAR Dipole	8/10/2018	Annual	8/10/2019	1237
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/21/2016	Triennial	9/21/2019	1191
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/16/2018	Annual	1/16/2019	1057

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.

15 MEASUREMENT UNCERTAINTIES

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

16 CONCLUSION

16.1 Measurement Conclusion

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

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

17 REFERENCES

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

[20] IEC 62209-1, Measurement procedure for the assessment of specific absorption rate of human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Part 1: Devices used next to the ear (Frequency range of 300 MHz to 6 GHz), July 2016.

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

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

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

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

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

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

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

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

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

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

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

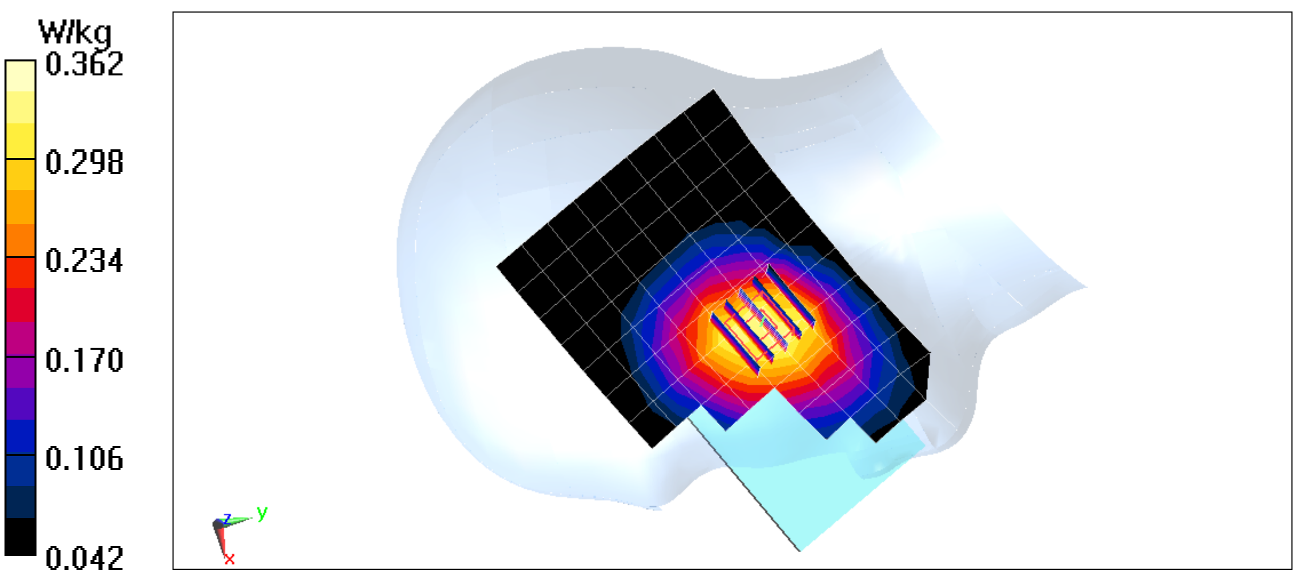
Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.52 MHz; σ = 0.931 S/m; ε_r = 42.948; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-19-2018; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410; ConvF(9.81, 9.81, 9.81) @ 836.52 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: Cell. EVDO Rev. A, Rule Part 22H, Right Head, Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.71 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.388 W/kg
SAR(1 g) = 0.306 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

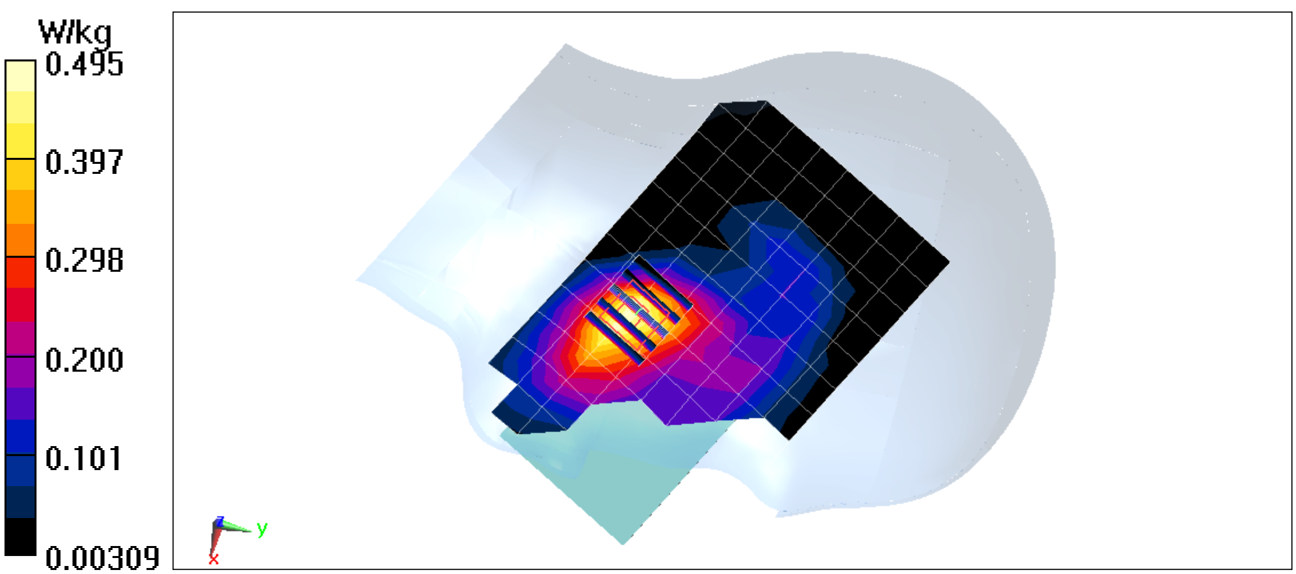
Communication System: UID 0, PCS CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.419 S/m; ε_r = 40.172; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 12-19-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(8.05, 8.05, 8.05) @ 1880 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.81 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.605 W/kg
SAR(1 g) = 0.371 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11217

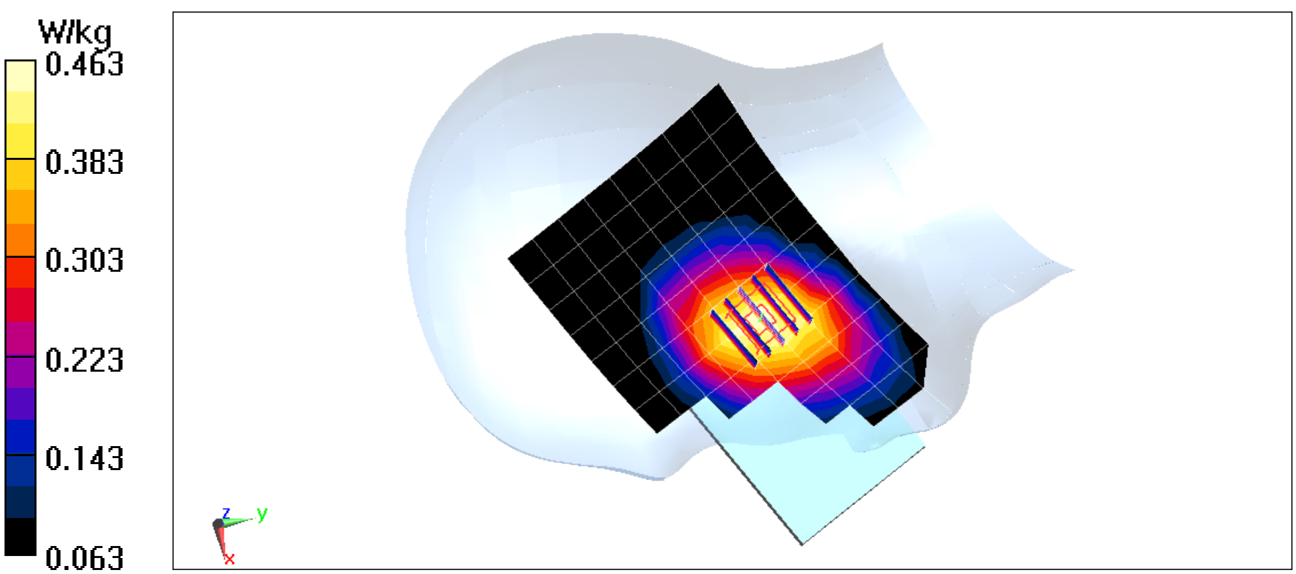
Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.931 S/m; ε_r = 42.947; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-19-2018; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410; ConvF(9.81, 9.81, 9.81) @ 836.6 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.69 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.490 W/kg
SAR(1 g) = 0.402 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

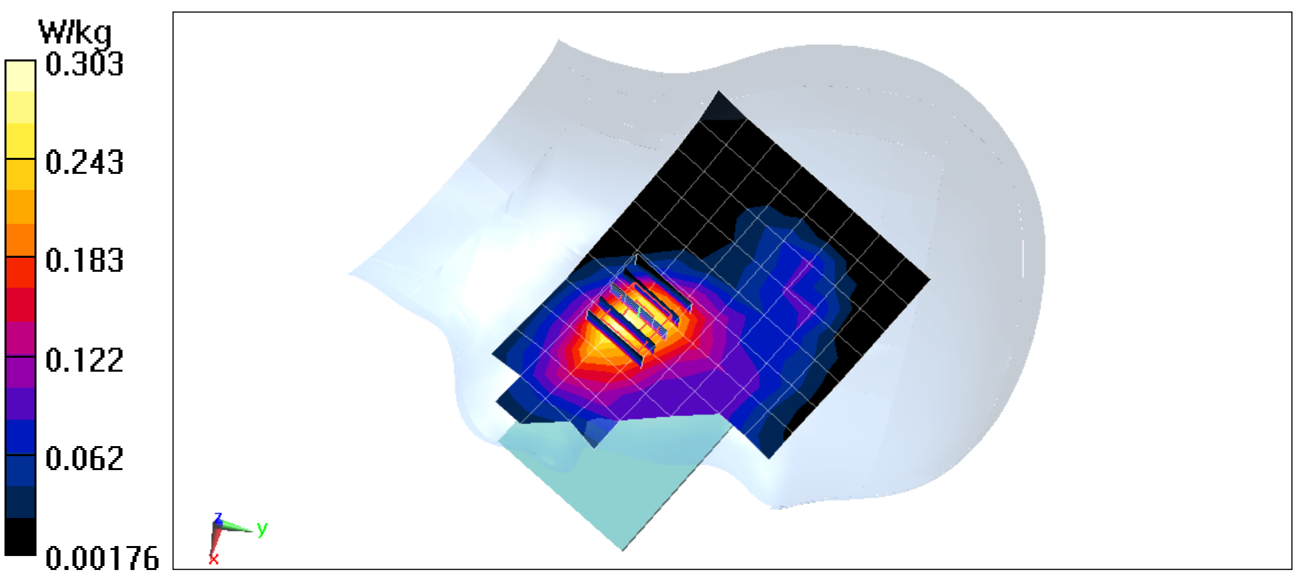
Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.419 S/m; ε_r = 40.172; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 12-19-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(8.05, 8.05, 8.05) @ 1880 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.95 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.360 W/kg
SAR(1 g) = 0.223 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

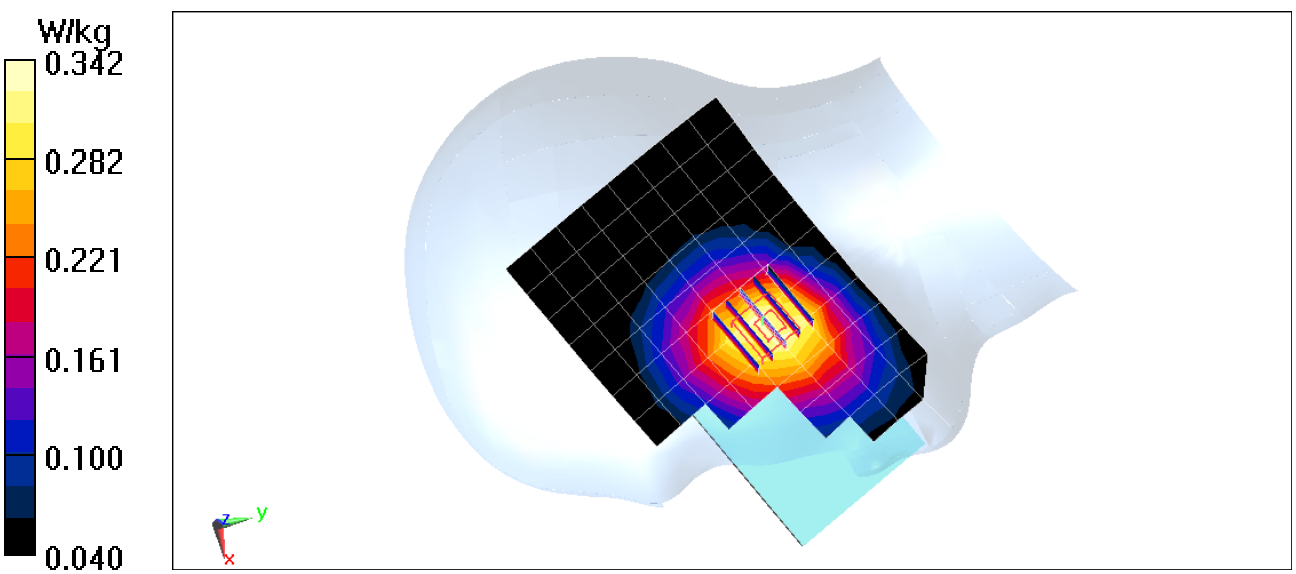
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.931 S/m; ε_r = 42.947; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-19-2018; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410; ConvF(9.81, 9.81, 9.81) @ 836.6 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.20 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.374 W/kg
SAR(1 g) = 0.294 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

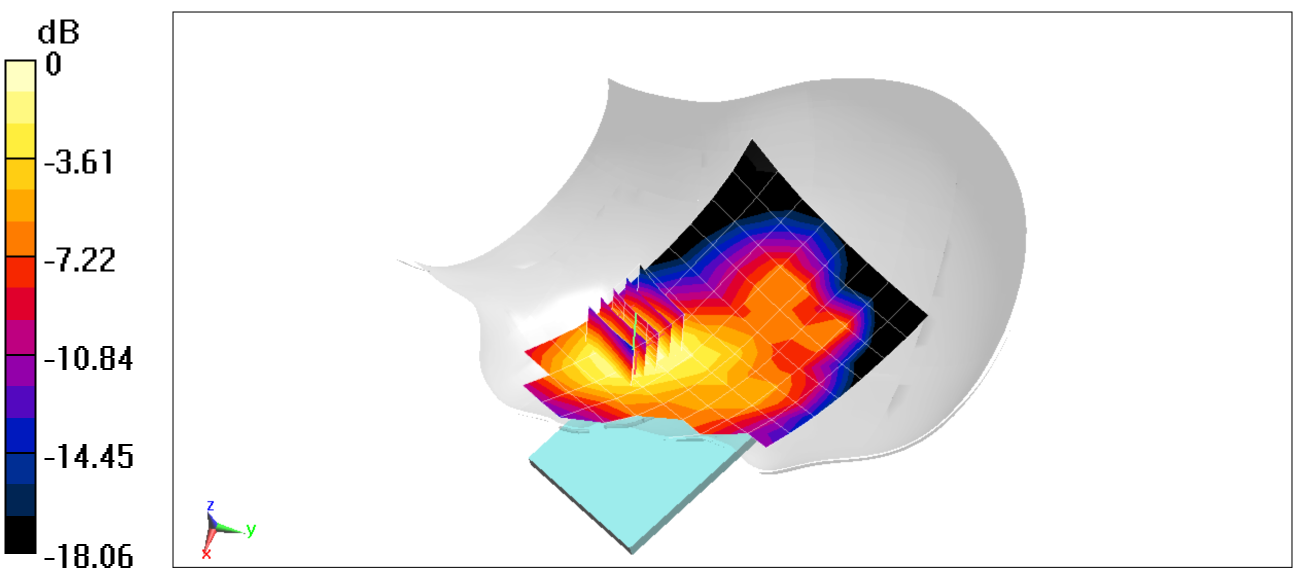
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.371 S/m; ε_r = 39.005; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 12-25-2018; Ambient Temp: 19.8°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(5.48, 5.48, 5.48) @ 1732.4 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: UMTS 1750, Left Head, Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.92 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.688 W/kg
SAR(1 g) = 0.447 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11209

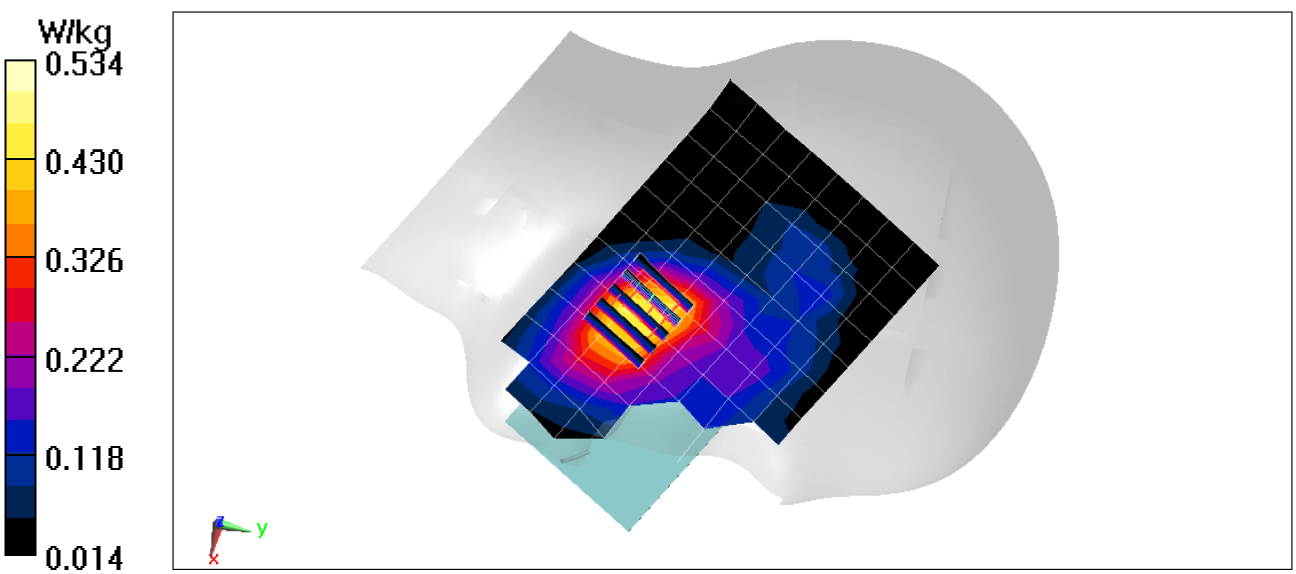
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1880 MHz; σ = 1.43 S/m; ε_r = 38.983; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 12-03-2018; Ambient Temp: 21.7°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3287; ConvF(5.24, 5.24, 5.24) @ 1880 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.42 V/m; Power Drift = 0.16 dB
Peak SAR (extrapolated) = 0.734 W/kg
SAR(1 g) = 0.461 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

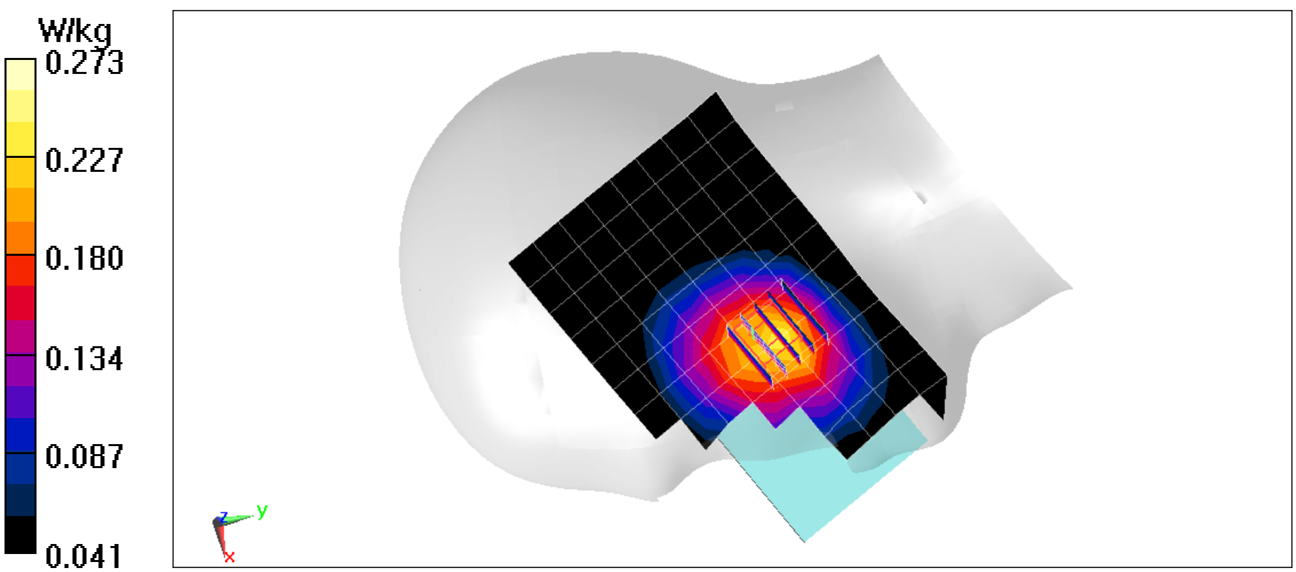
Communication System: UID 0, LTE Band 71; Frequency: 680.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 680.5 MHz; σ = 0.853 S/m; ε_r = 42.602; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-19-2018; Ambient Temp: 21.3°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(6.76, 6.76, 6.76) @ 680.5 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 71, Right Head, Cheek, Mid.ch,
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 = 18.14 V/m; Power Drift = -0.21 dB
Peak SAR (extrapolated) = 0.304 W/kg
SAR(1 g) = 0.251 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

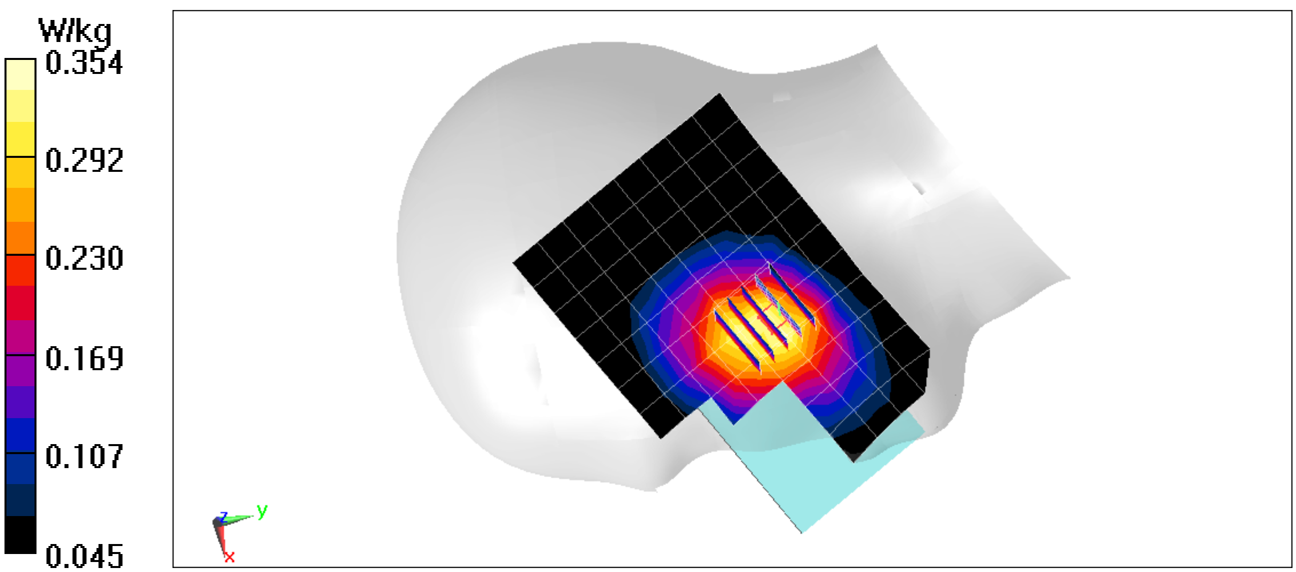
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.862 S/m; ε_r = 42.487; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-19-2018; Ambient Temp: 21.3°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(6.76, 6.76, 6.76) @ 707.5 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 12, Right Head, Cheek, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 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 = 20.24 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.407 W/kg
SAR(1 g) = 0.319 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

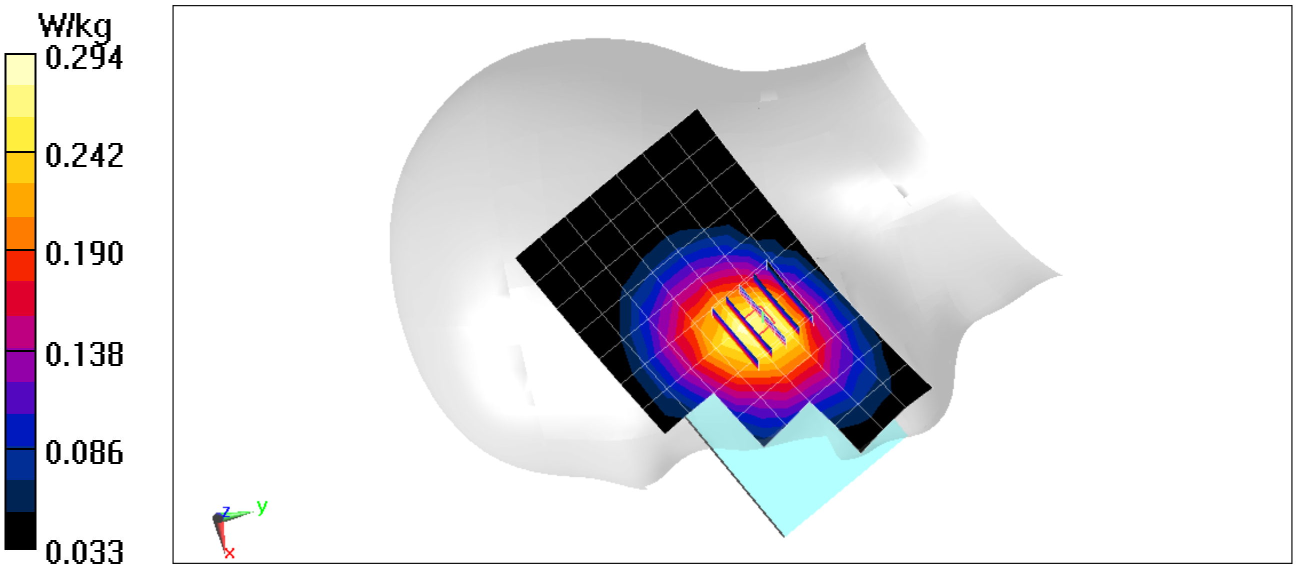
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 782 MHz; σ = 0.89 S/m; ε_r = 42.252; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-19-2018; Ambient Temp: 21.3°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(6.76, 6.76, 6.76) @ 782 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 13, Right Head, Cheek, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.56 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.347 W/kg
SAR(1 g) = 0.268 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

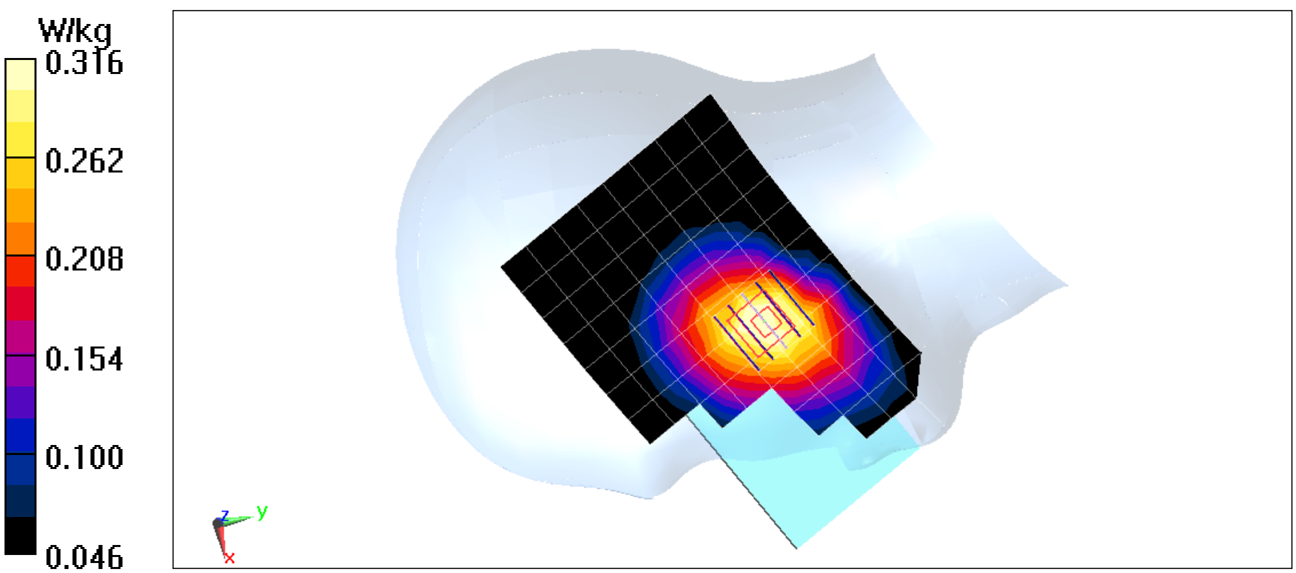
Communication System: UID 0, LTE Band 5 (Cell.); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.931 S/m; ε_r = 42.948; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-19-2018; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410; ConvF(9.81, 9.81, 9.81) @ 836.5 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 5 (Cell.), Right Head, Cheek, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 25 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 = 17.85 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 0.336 W/kg
SAR(1 g) = 0.268 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11209

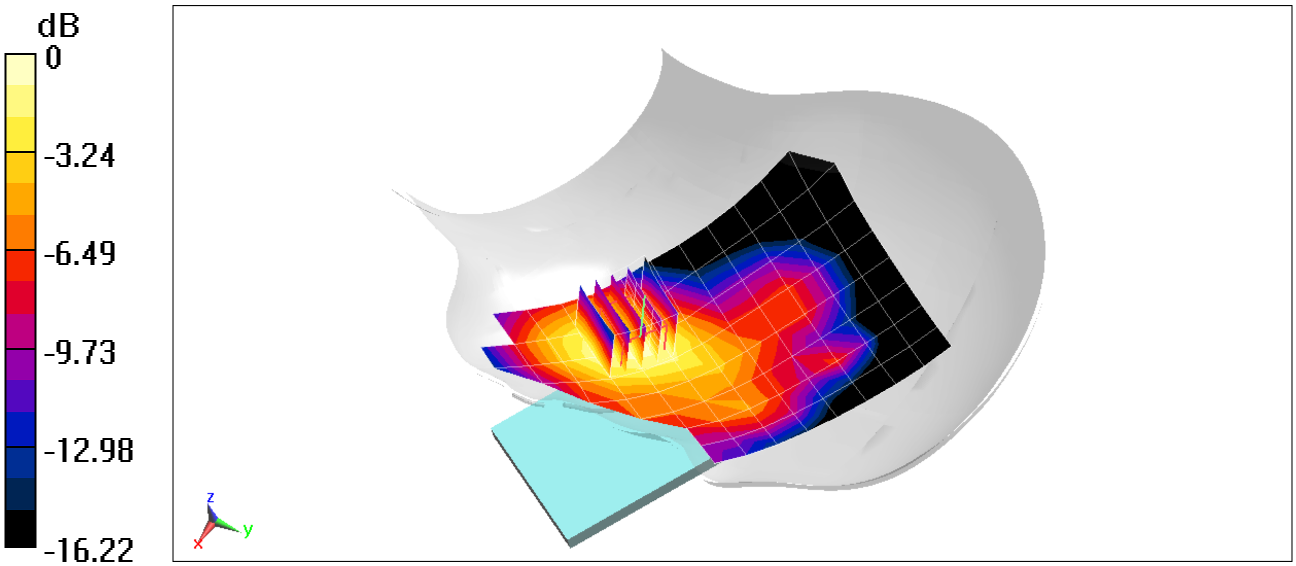
Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1720 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1720 MHz; σ = 1.363 S/m; ε_r = 39.02; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 12-25-2018; Ambient Temp: 19.8°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(5.48, 5.48, 5.48) @ 1720 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 66 (AWS), Left Head, Cheek, Low.ch,
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 = 19.71 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.637 W/kg
SAR(1 g) = 0.444 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

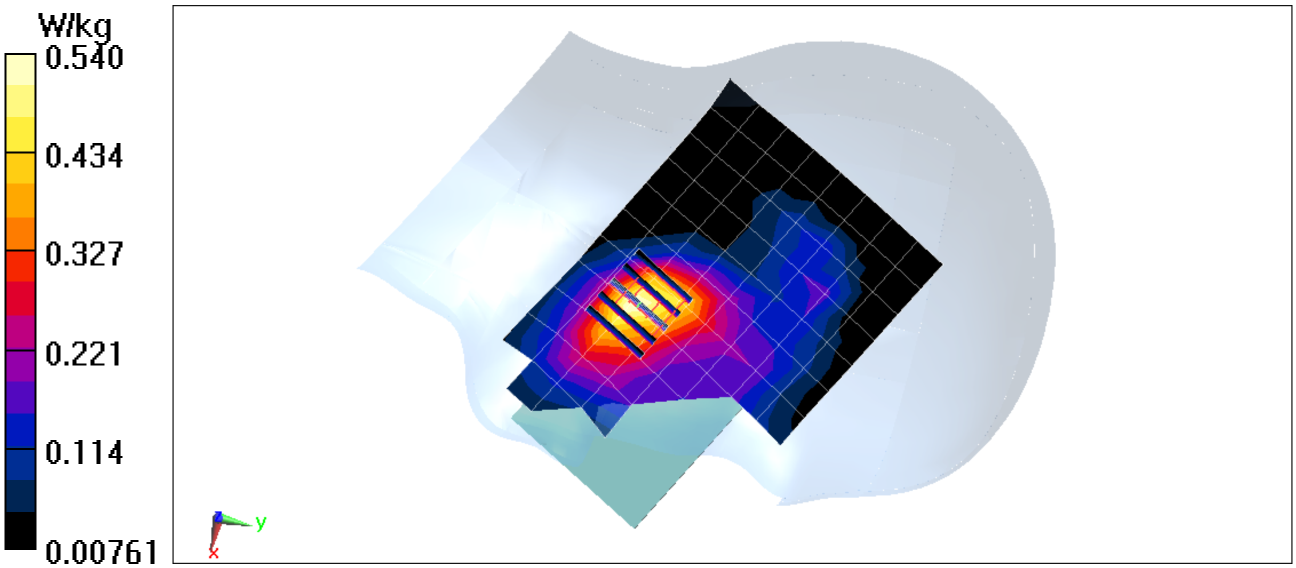
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.44 S/m; ε_r = 40.081; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 12-19-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(8.05, 8.05, 8.05) @ 1900 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 2 (PCS), Left Head, Cheek, High.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.00 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.635 W/kg
SAR(1 g) = 0.398 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11399

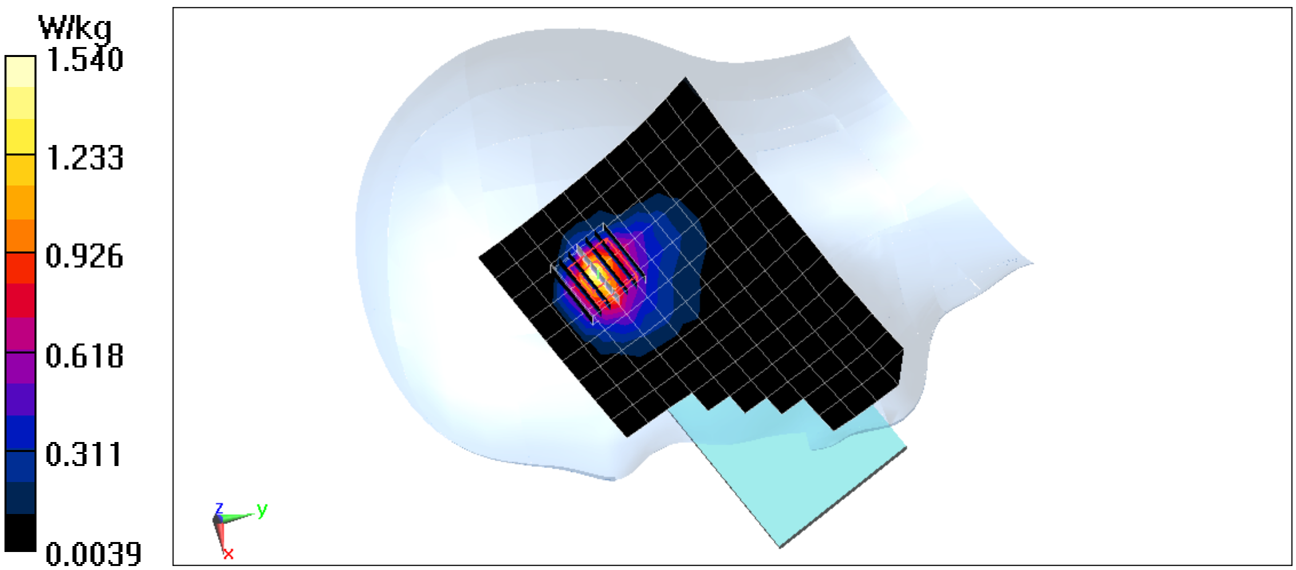
Communication System: UID 0, _IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.819 S/m; ε_r = 38.42; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-17-2018; Ambient Temp: 21.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7410; ConvF(7.5, 7.5, 7.5) @ 2412 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.11 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 2.13 W/kg
SAR(1 g) = 0.918 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11399

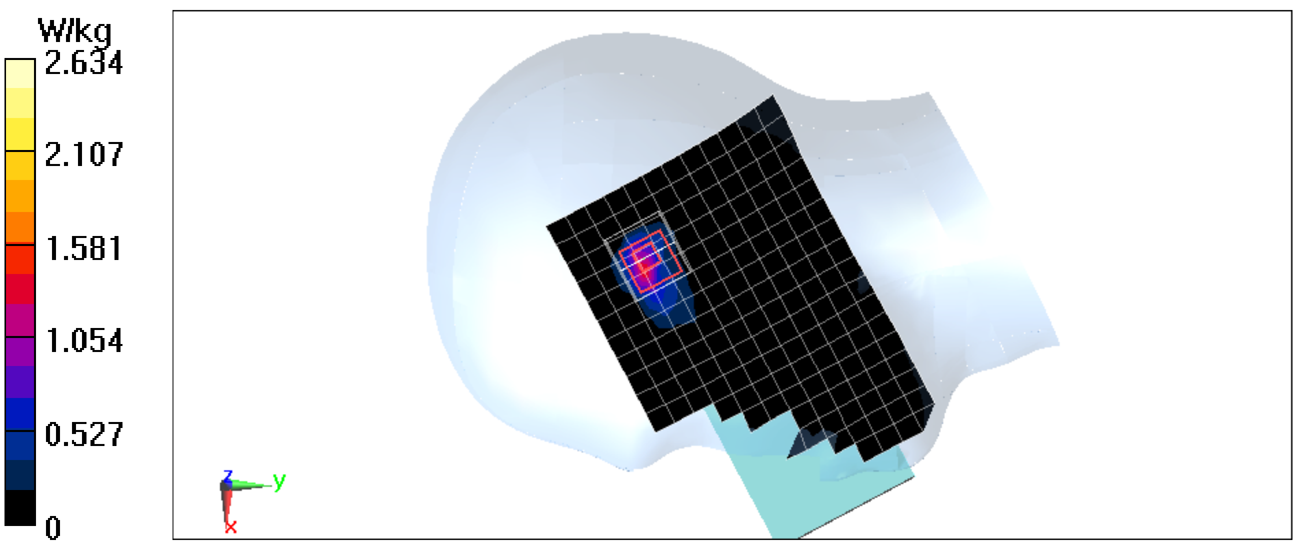
Communication System: UID 0, 802.11n 5.2-5.8 GHz Band; Frequency: 5270 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
$f = 5270$ MHz; $\sigma = 4.564$ S/m; $\varepsilon_r = 34.749$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 12-16-2018; Ambient Temp: 20.8°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7409; ConvF(5.2, 5.2, 5.2) @ 5270 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11n, U-NII-2A, 40 MHz Bandwidth, Right Head, Cheek, Ch 54, 13.5 Mbps

Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 3.561 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 4.34 W/kg
SAR(1 g) = 0.994 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11217

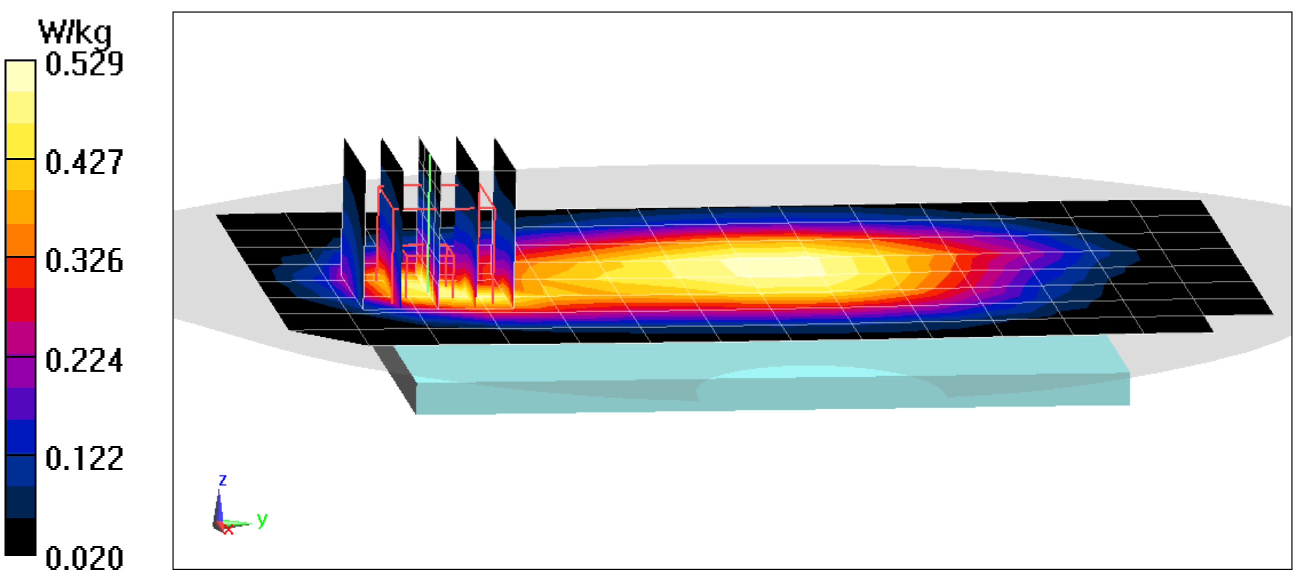
Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.52 MHz; σ = 0.975 S/m; ε_r = 54.657; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-11-2018; Ambient Temp: 22.3°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7406; ConvF(9.61, 9.61, 9.61) @ 836.52 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.87 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.643 W/kg
SAR(1 g) = 0.355 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11217

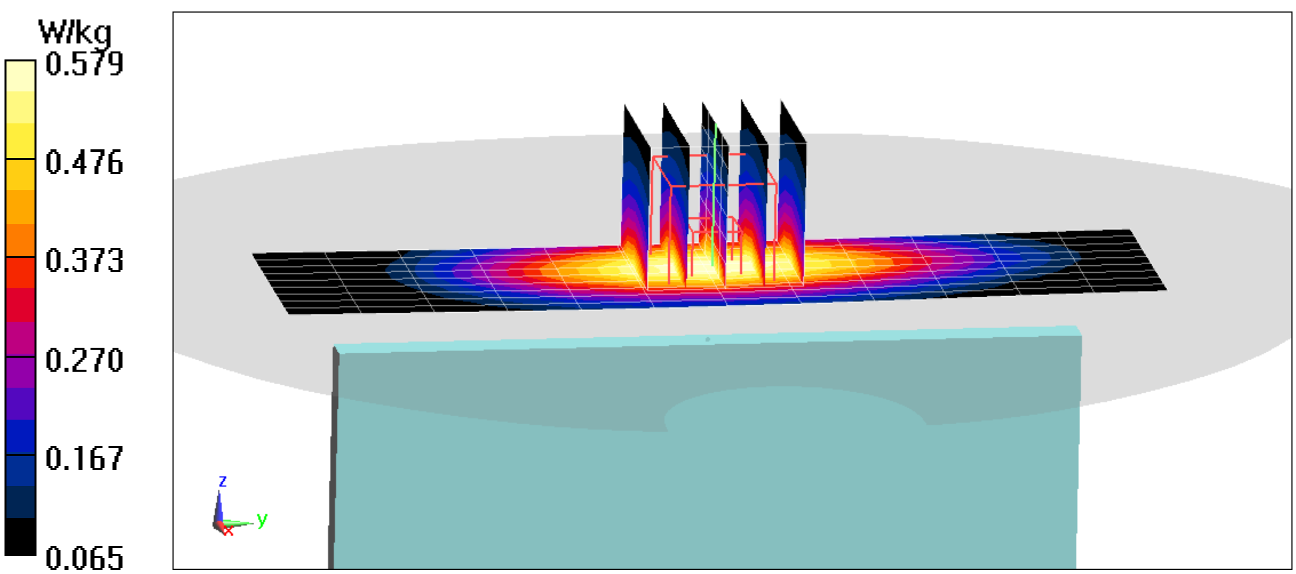
Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.52 MHz; σ = 0.975 S/m; ε_r = 54.657; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-11-2018; Ambient Temp: 22.3°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7406; ConvF(9.61, 9.61, 9.61) @ 836.52 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: Cell. EVDO, Body SAR, Right Edge, Mid.ch

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.82 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.659 W/kg
SAR(1 g) = 0.444 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

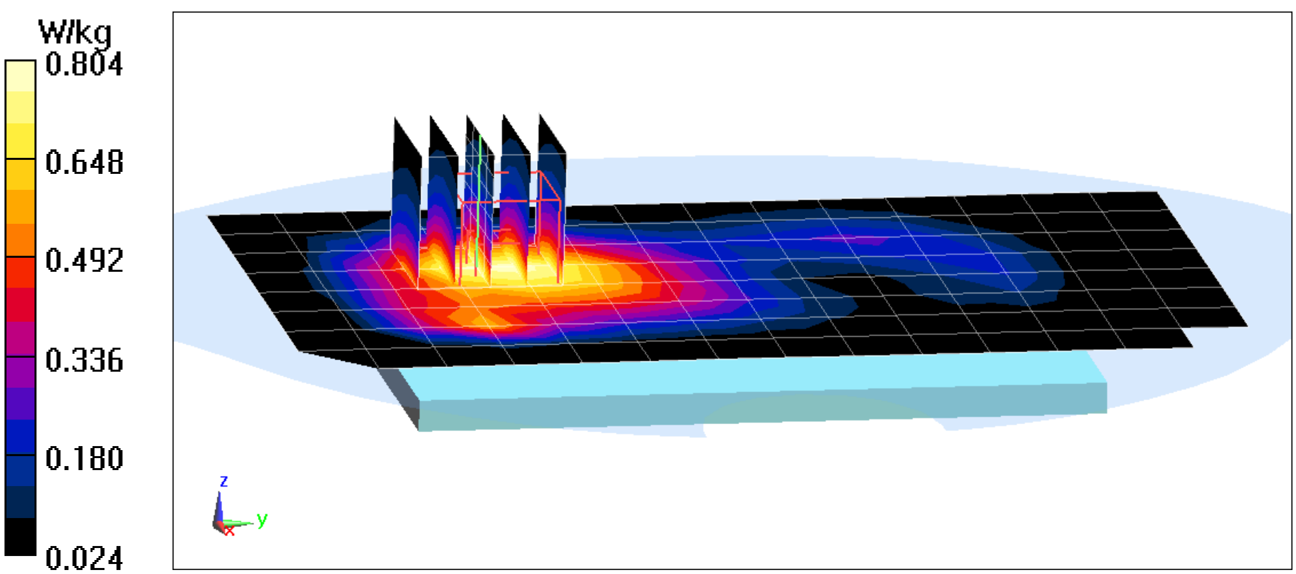
Communication System: UID 0, CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.542 S/m; ε_r = 52.822; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-09-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1880 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.39 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.695 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

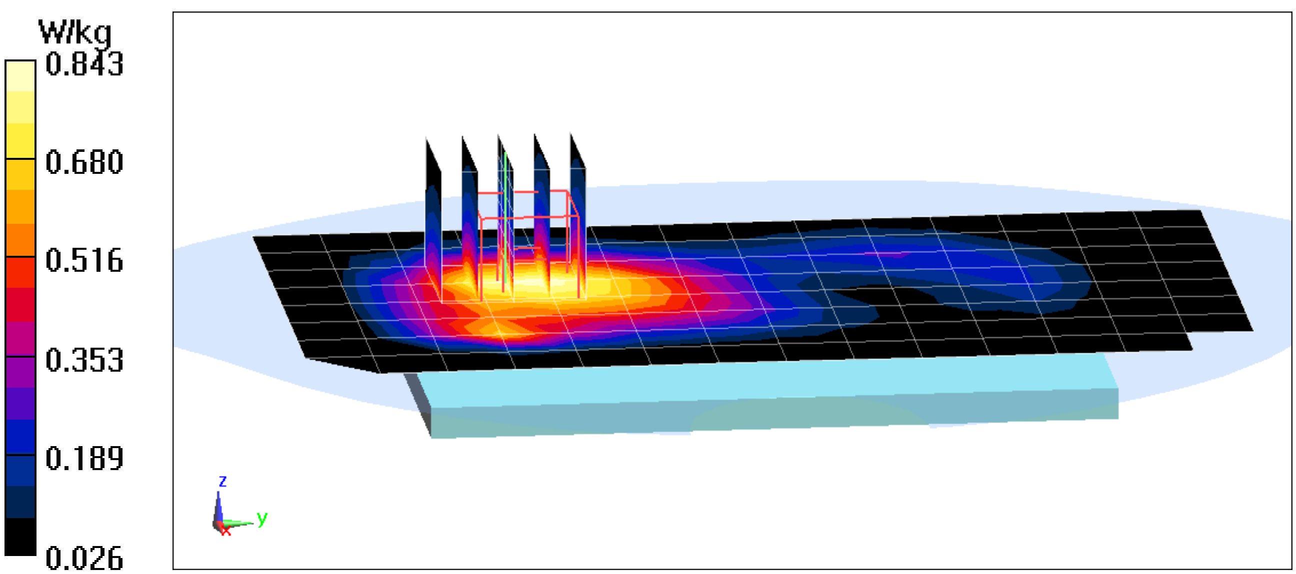
Communication System: UID 0, CDMA; Frequency: 1851.25 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1851.25 MHz; σ = 1.507 S/m; ε_r = 52.895; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-09-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1851.25 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: PCS EVDO, Body SAR, Back side, Low.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.00 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 1.08 W/kg
SAR(1 g) = 0.735 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11217

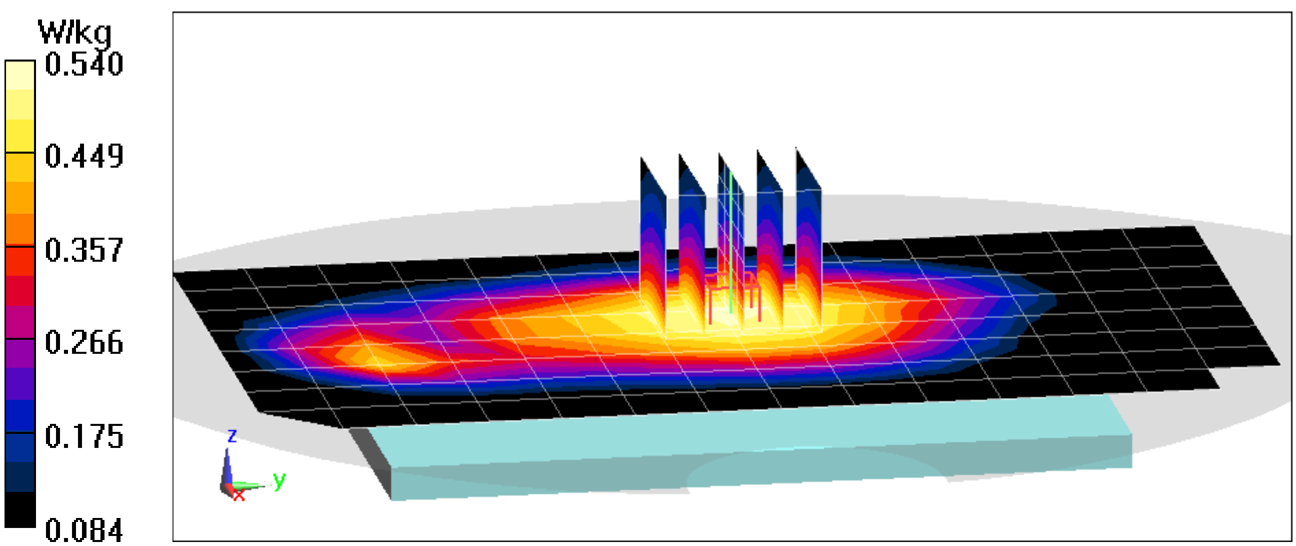
Communication System: UID 0, _GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.966 S/m; ε_r = 53.591; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2018; Ambient Temp: 19.9°C; Tissue Temp: 19.1°C

Probe: ES3DV3 - SN3347; ConvF(6.37, 6.37, 6.37) @ 836.6 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 3 Tx Slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.07 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.627 W/kg
SAR(1 g) = 0.488 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11217

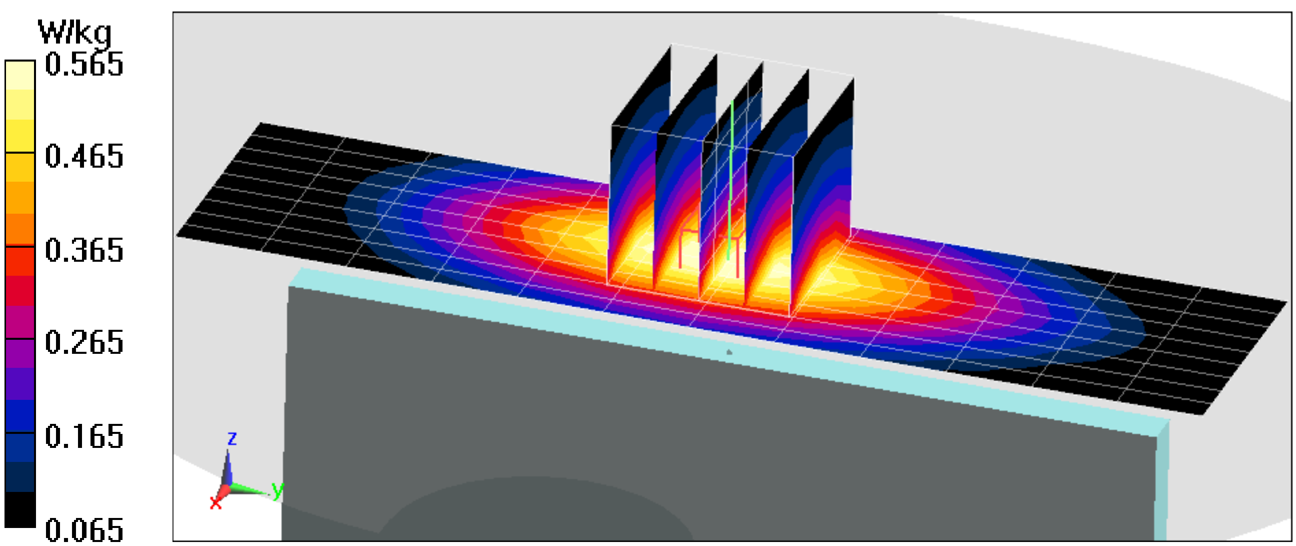
Communication System: UID 0, _GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.966 S/m; ε_r = 53.591; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2018; Ambient Temp: 19.9°C; Tissue Temp: 19.1°C

Probe: ES3DV3 - SN3347; ConvF(6.37, 6.37, 6.37) @ 836.6 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.69 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.695 W/kg
SAR(1 g) = 0.494 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

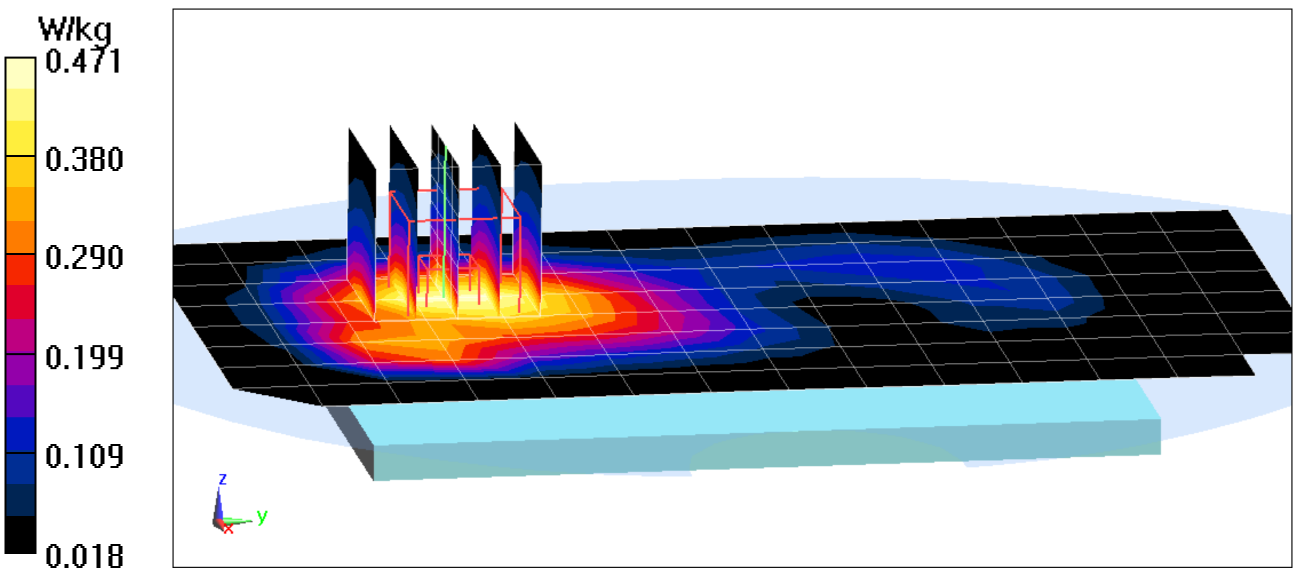
Communication System: UID 0, _GSM GPRS; 3 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.76
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.542 S/m; ε_r = 52.822; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-09-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1880 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.13 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.610 W/kg
SAR(1 g) = 0.404 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11217

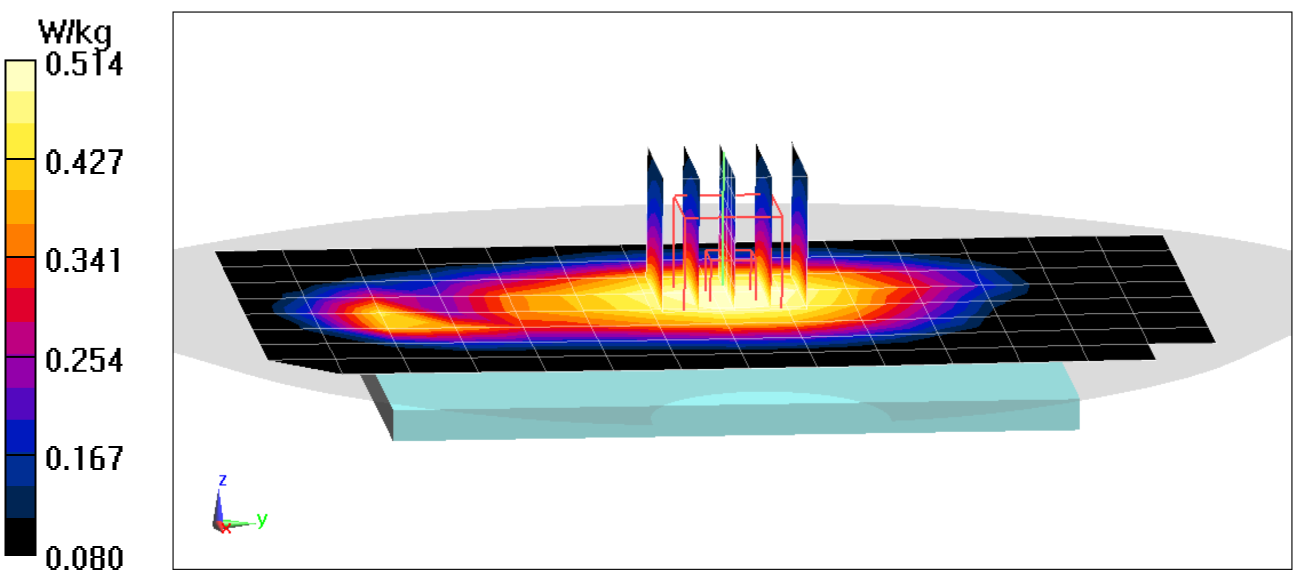
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.973 S/m; ε_r = 55.031; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-05-2018; Ambient Temp: 22.2°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7406; ConvF(9.61, 9.61, 9.61) @ 836.6 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.19 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.574 W/kg
SAR(1 g) = 0.425 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11217

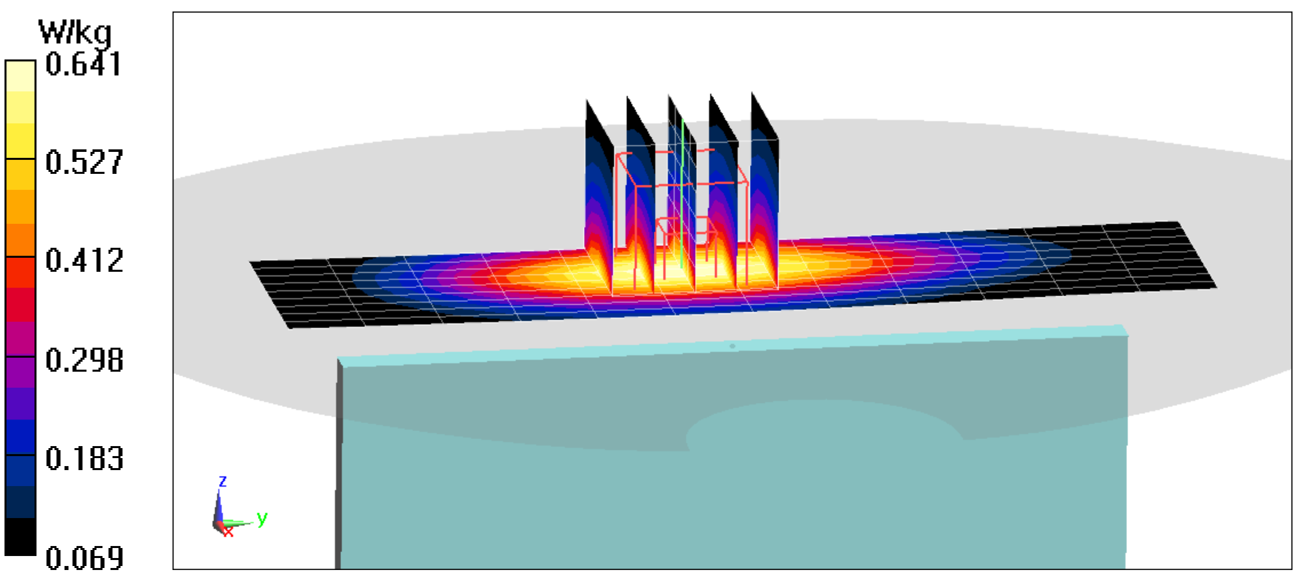
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.973 S/m; ε_r = 55.031; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-05-2018; Ambient Temp: 22.2°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7406; ConvF(9.61, 9.61, 9.61) @ 836.6 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.80 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.730 W/kg
SAR(1 g) = 0.485 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

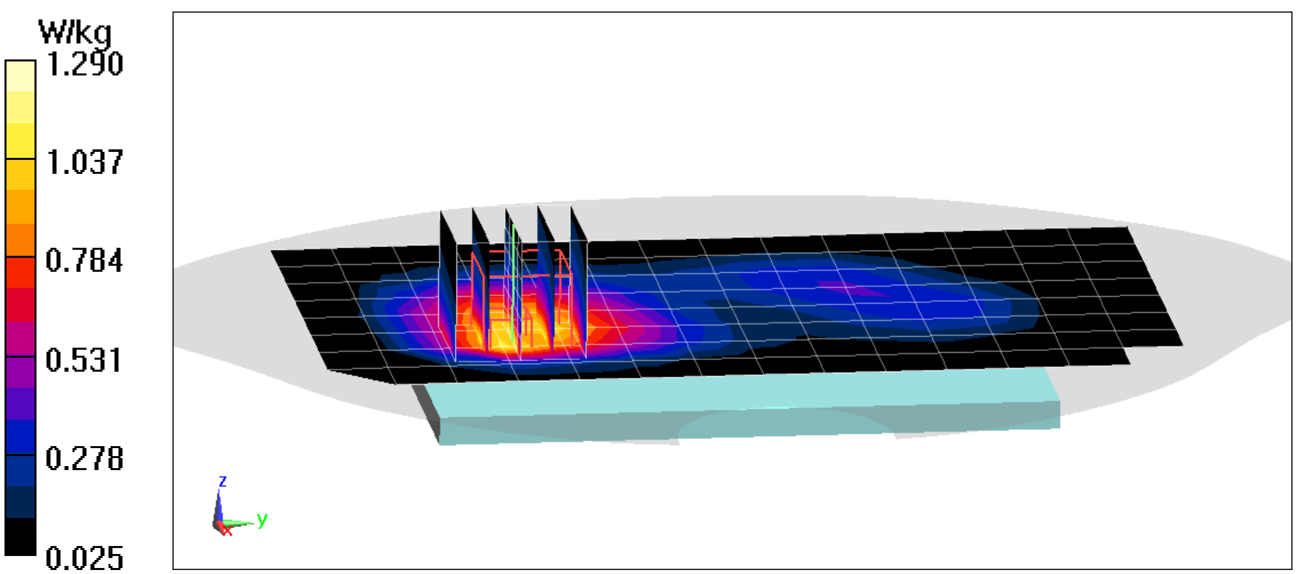
Communication System: UID 0, UMTS; Frequency: 1712.4 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1712.4 MHz; σ = 1.42 S/m; ε_r = 53.776; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-10-2018; Ambient Temp: 19.9°C; Tissue Temp: 20.4°C

Probe: ES3DV3 - SN3347; ConvF(5.17, 5.17, 5.17) @ 1712.4 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: UMTS 1750, Body SAR, Back side, Low.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.26 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.79 W/kg
SAR(1 g) = 1.07 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11217

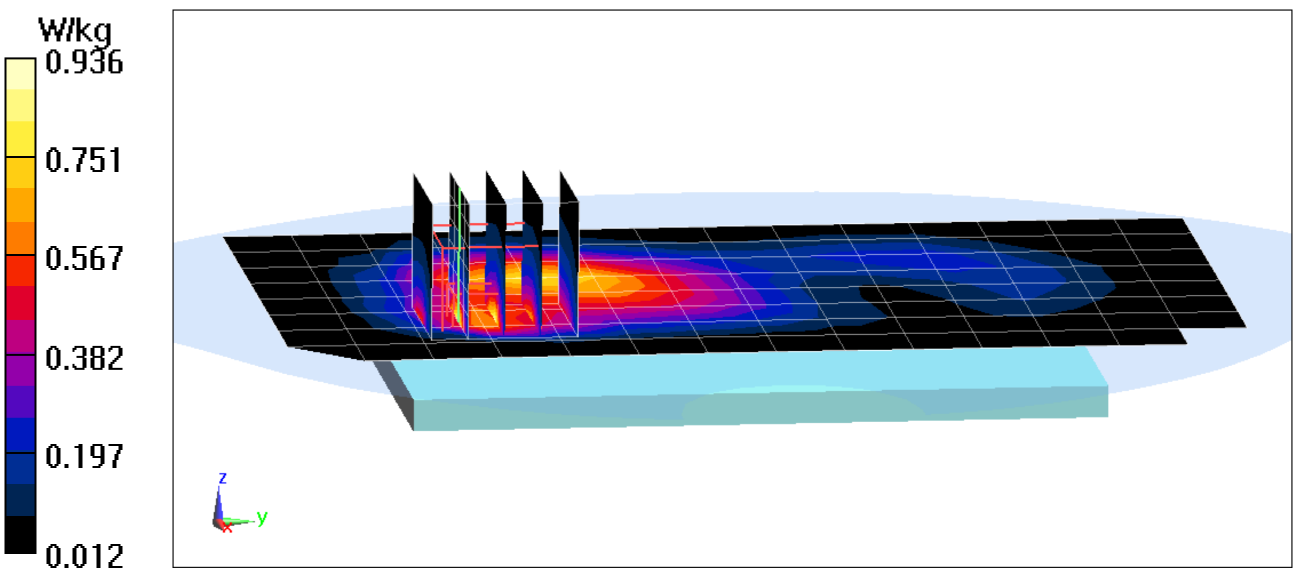
Communication System: UID 0, UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1907.6 MHz; σ = 1.58 S/m; ε_r = 50.999; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-05-2018; Ambient Temp: 24.5°C; Tissue Temp: 23.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1907.6 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.17 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 1.46 W/kg
SAR(1 g) = 0.760 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

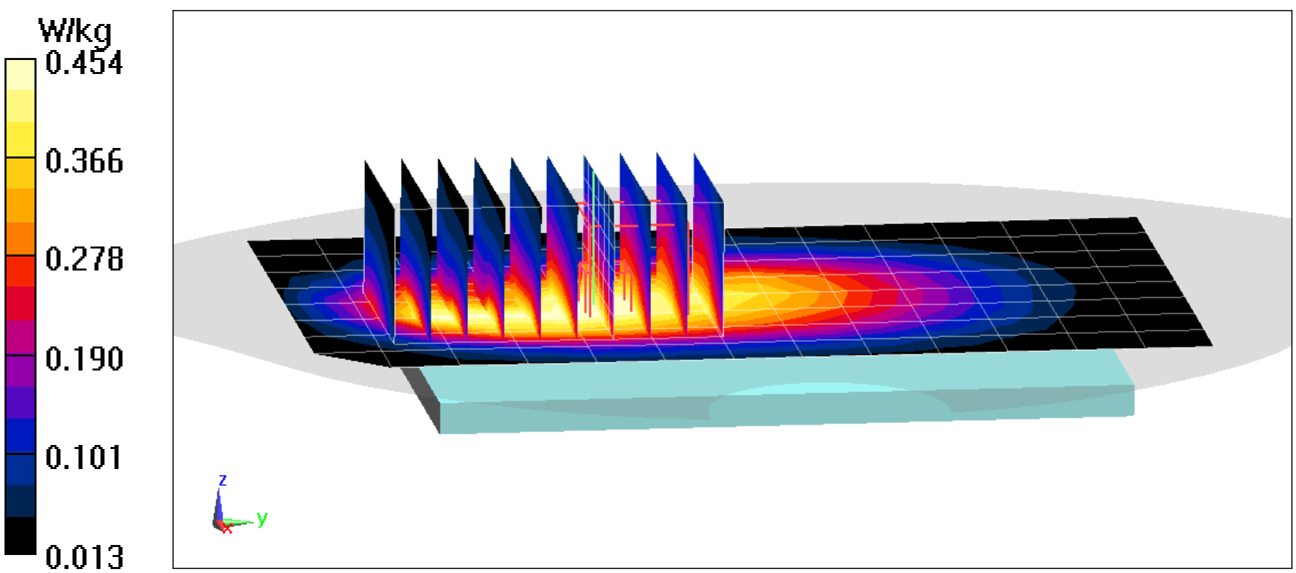
Communication System: UID 0, LTE Band 71; Frequency: 680.5 MHz; Duty Cycle: 1:1
Medium: 750 MHz Body Medium parameters used (interpolated):
$f = 680.5$ MHz; $\sigma = 0.93$ S/m; $\varepsilon_r = 54.888$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-12-2018; Ambient Temp: 21.8°C; Tissue Temp: 20.2°C

Probe: EX3DV4 - SN7308; ConvF(10.38, 10.38, 10.38) @ 680.5 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 71, Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x10x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.85 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 0.533 W/kg
SAR(1 g) = 0.365 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

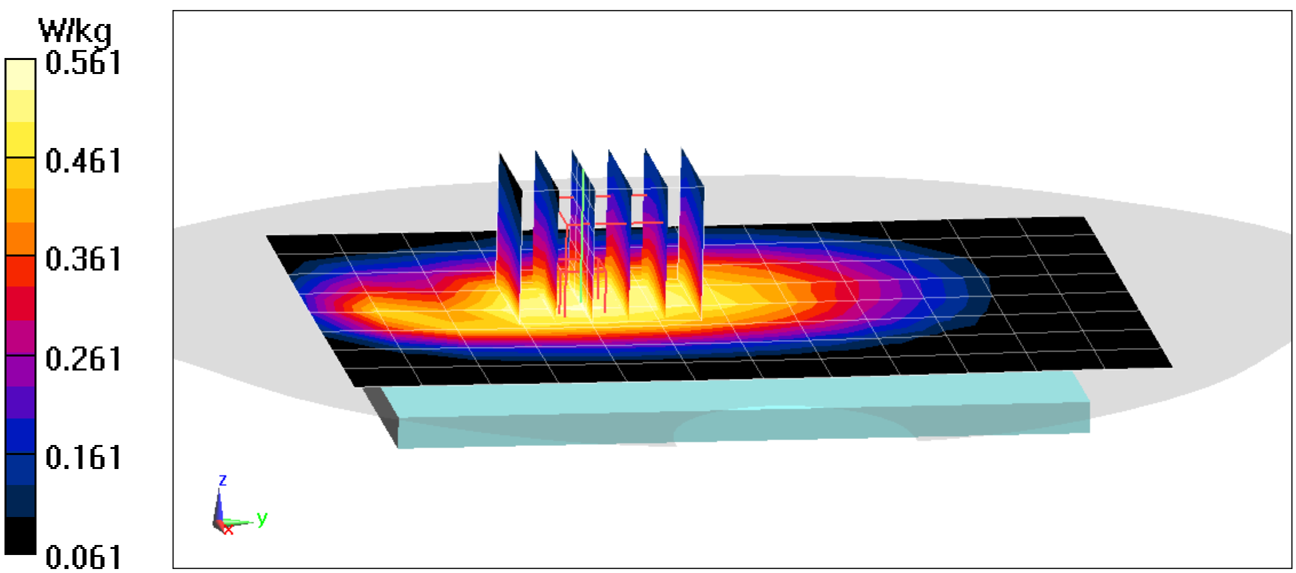
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.922 S/m; ε_r = 55.318; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-05-2018; Ambient Temp: 22.2°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7406; ConvF(9.91, 9.91, 9.91) @ 707.5 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 12, Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.25 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.629 W/kg
SAR(1 g) = 0.458 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

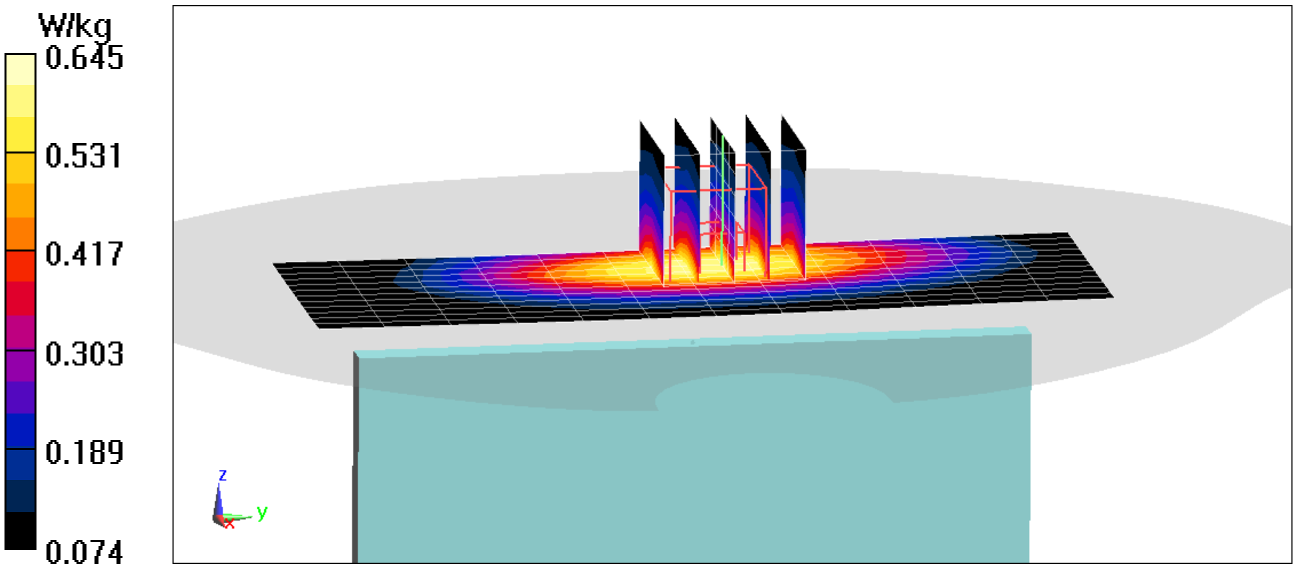
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.922 S/m; ε_r = 55.318; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-05-2018; Ambient Temp: 22.2°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7406; ConvF(9.91, 9.91, 9.91) @ 707.5 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 12, Body SAR, Right Edge, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (13x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.10 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.727 W/kg
SAR(1 g) = 0.478 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

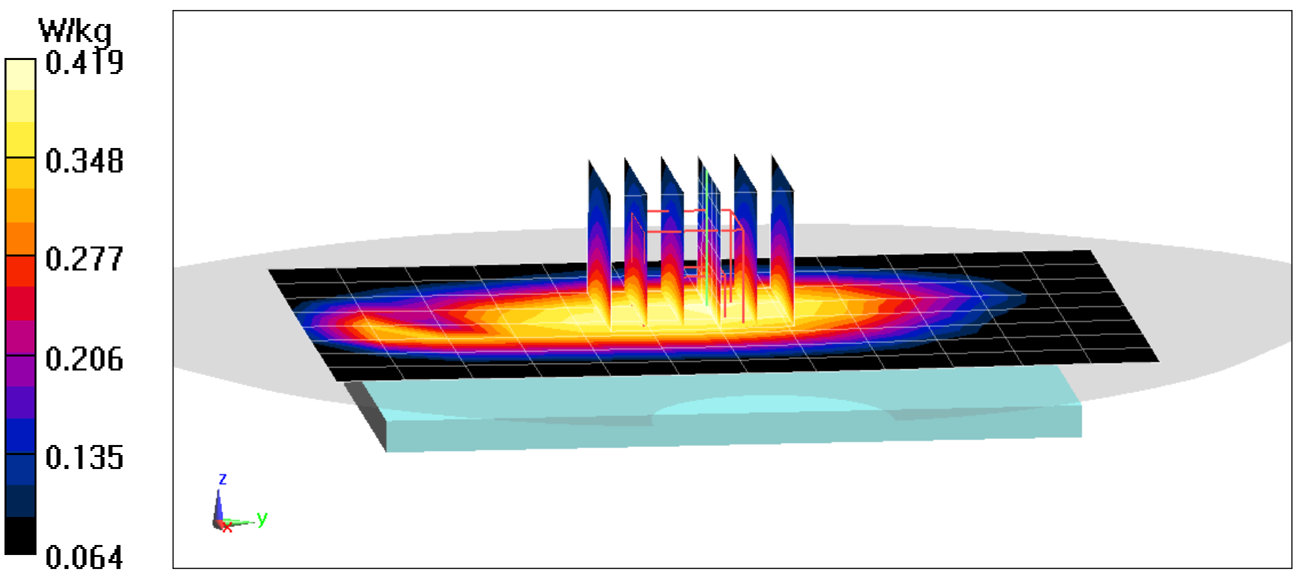
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
$f = 782$ MHz; $\sigma = 0.951$ S/m; $\varepsilon_r = 55.161$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-05-2018; Ambient Temp: 22.2°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7406; ConvF(9.91, 9.91, 9.91) @ 782 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 13, Body SAR, Back side, Mid.ch,
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 = 19.21 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.461 W/kg
SAR(1 g) = 0.346 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

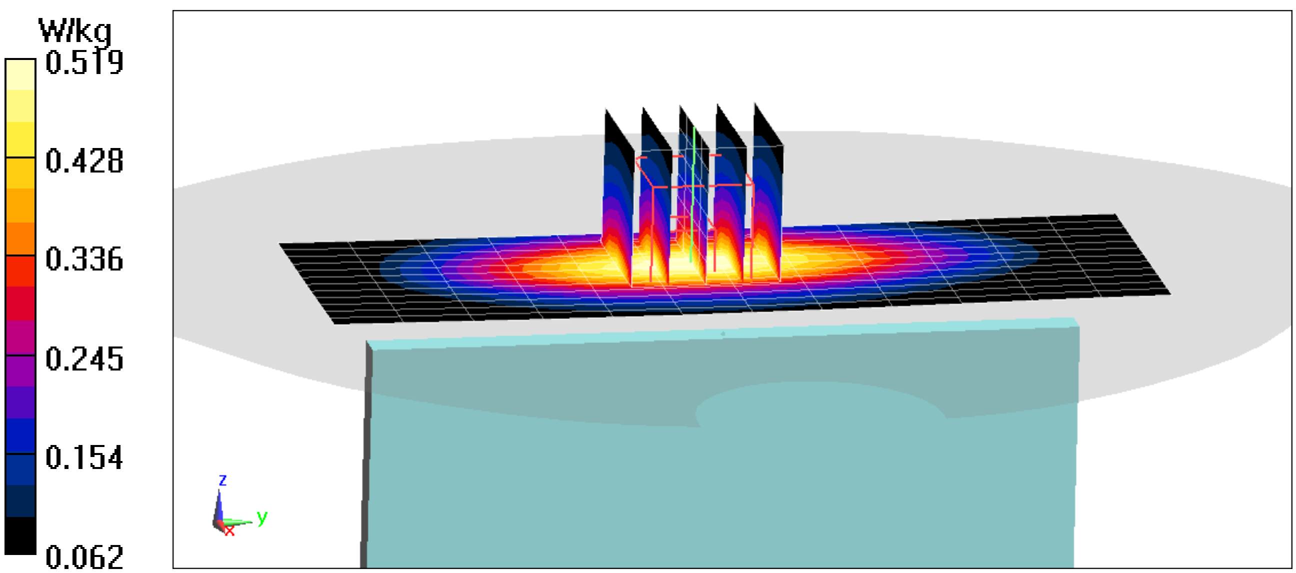
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 782 MHz; σ = 0.951 S/m; ε_r = 55.161; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-05-2018; Ambient Temp: 22.2°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7406; ConvF(9.91, 9.91, 9.91) @ 782 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 13, Body SAR, Right Edge, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (13x13x1): Measurement grid: dx=5mm, dy=15mm
/Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.72 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.589 W/kg
SAR(1 g) = 0.398 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

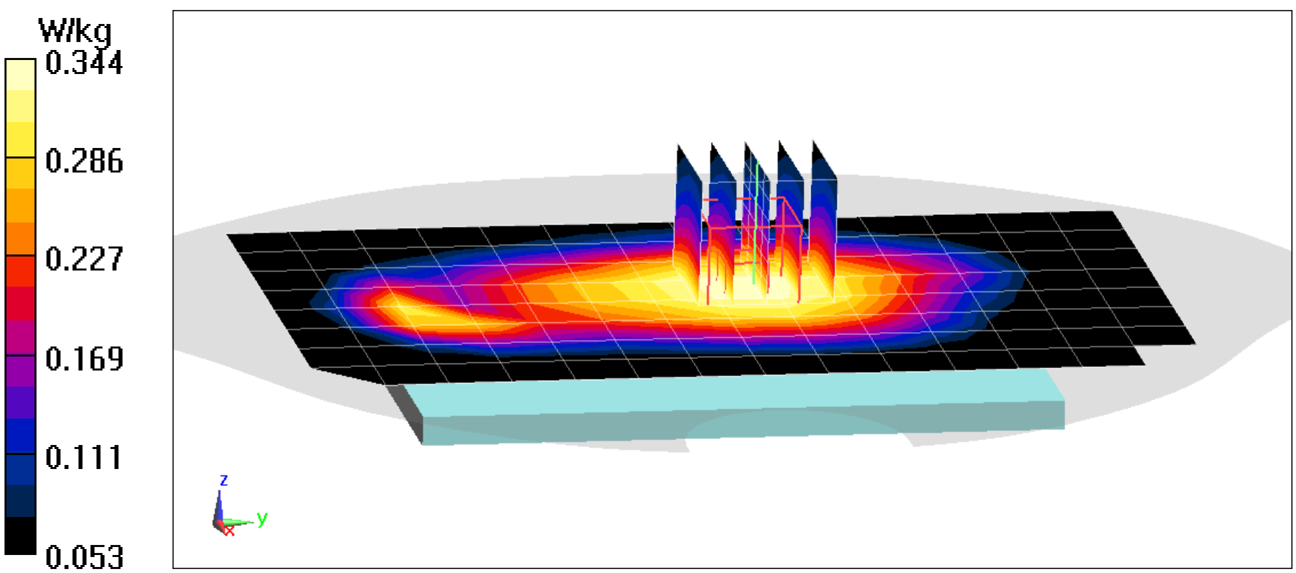
Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.936 S/m; ε_r = 54.804; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2018; Ambient Temp: 19.5°C; Tissue Temp: 19.2°C

Probe: ES3DV3 - SN3347; ConvF(6.37, 6.37, 6.37) @ 836.5 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 5 (Cell.), Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 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 = 18.81 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.401 W/kg
SAR(1 g) = 0.311 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

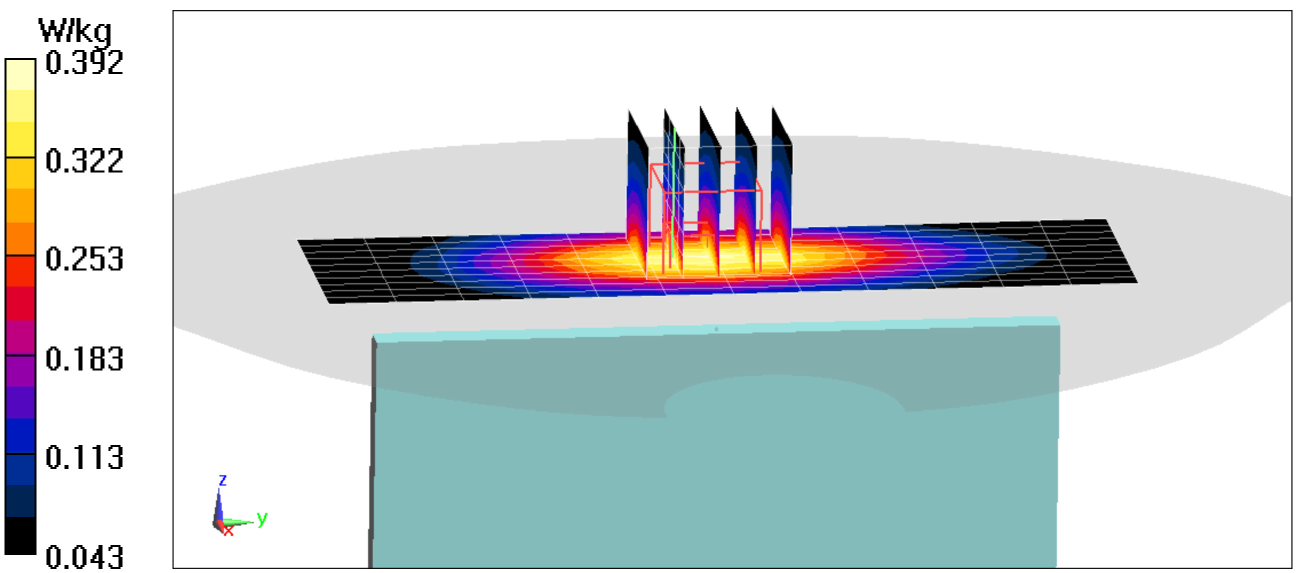
Communication System: UID 0, LTE Band 5 (Cell.); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.5 MHz; σ = 0.936 S/m; ε_r = 54.804; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2018; Ambient Temp: 19.5°C; Tissue Temp: 19.2°C

Probe: ES3DV3 - SN3347; ConvF(6.37, 6.37, 6.37) @ 836.5 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 5 (Cell.), Body SAR, Right Edge, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (11x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.53 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.488 W/kg
SAR(1 g) = 0.336 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11209

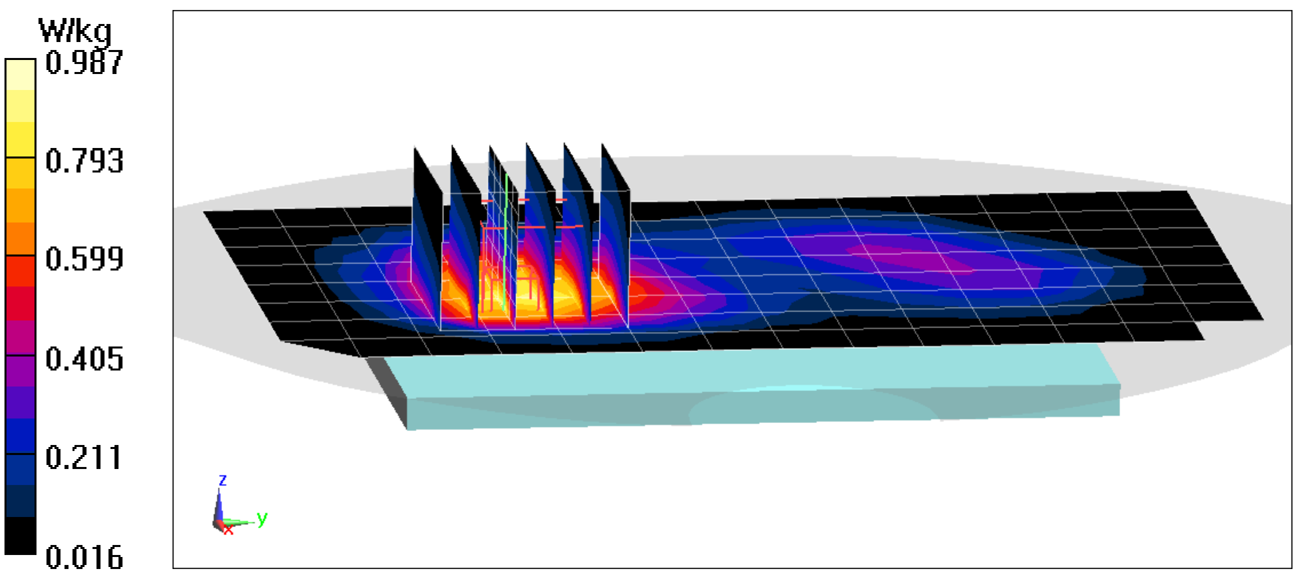
Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1720 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1720 MHz; σ = 1.425 S/m; ε_r = 53.77; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-10-2018; Ambient Temp: 19.9 °C; Tissue Temp: 20.4°C

Probe: ES3DV3 - SN3347; ConvF(5.17, 5.17, 5.17) @ 1720 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 66 (AWS), Body SAR, Back side, Low.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.11 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.35 W/kg
SAR(1 g) = 0.828 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

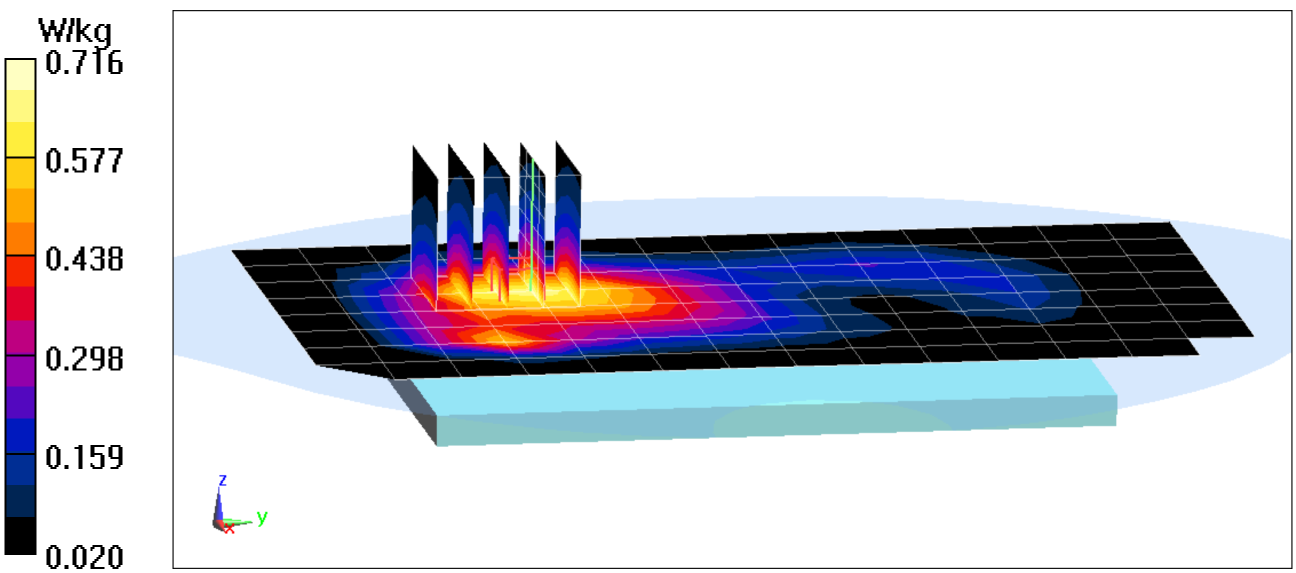
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.517 S/m; ε_r = 52.873; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-09-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1860 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 2 (PCS), Body SAR, Back side, Low.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 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 = 21.42 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.913 W/kg
SAR(1 g) = 0.622 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11381

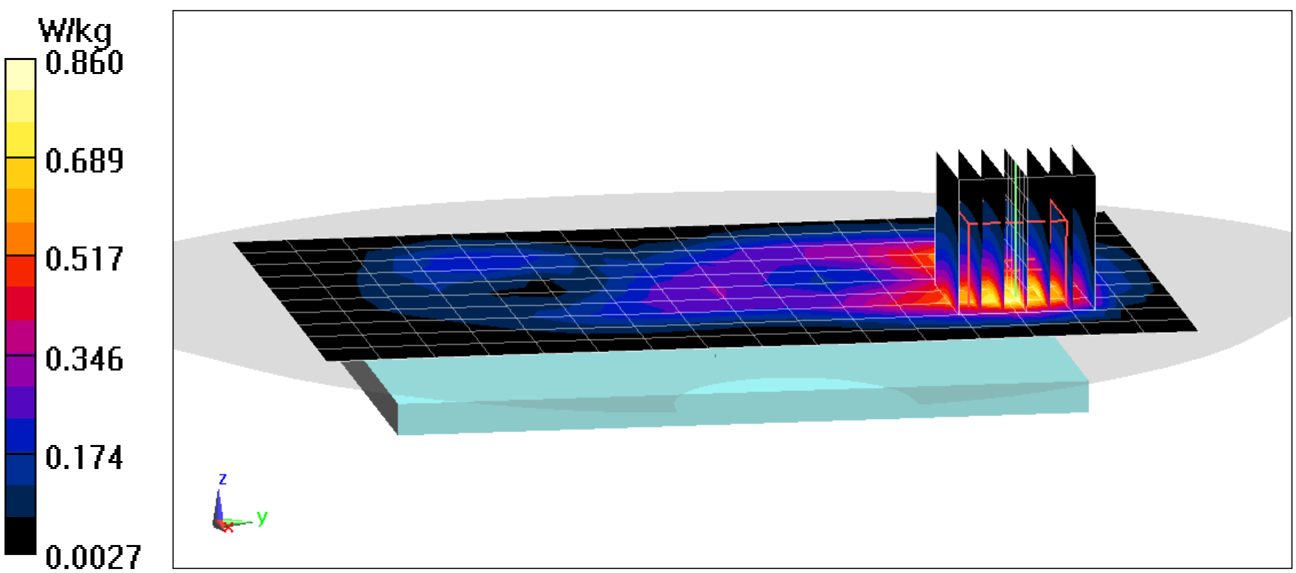
Communication System: UID 0, _IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.995 S/m; ε_r = 51.833; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-12-2018; Ambient Temp: 22.7°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3319; ConvF(4.51, 4.51, 4.51) @ 2412 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 19.79 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.39 W/kg
SAR(1 g) = 0.677 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11399

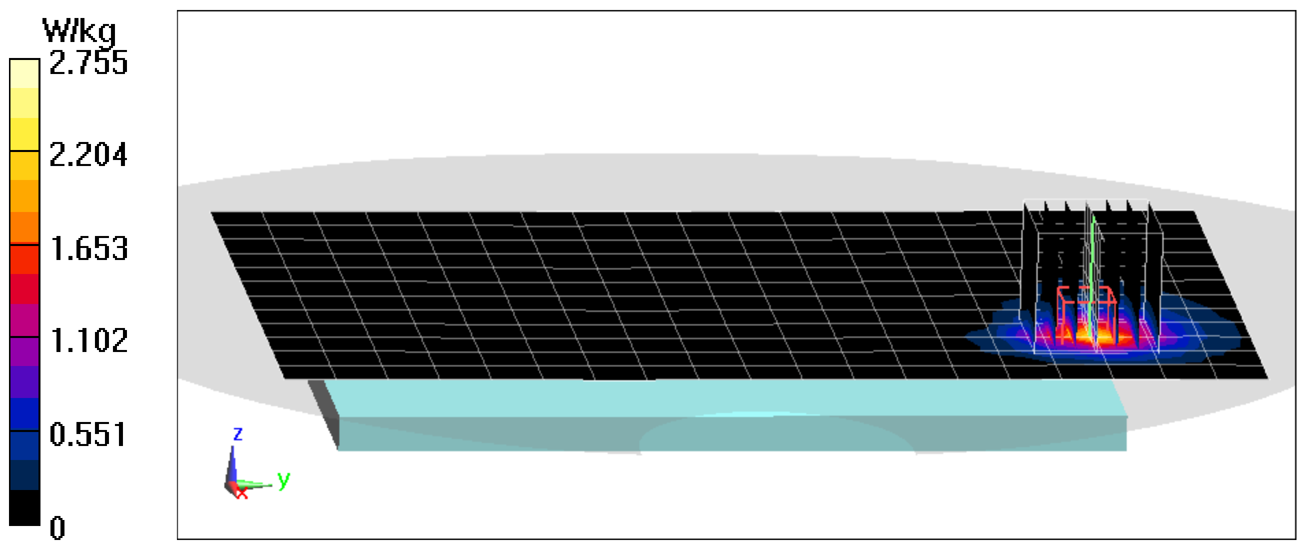
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5620 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5620 MHz; σ = 5.94 S/m; ε_r = 47.144; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 23.0°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7308; ConvF(4, 4, 4) @ 5620 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11a, UNII-2C, 20 MHz Bandwidth, Body SAR, Ch 124, 6 Mbps, Back Side

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 = 14.32 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 4.80 W/kg
SAR(1 g) = 1.13 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11399

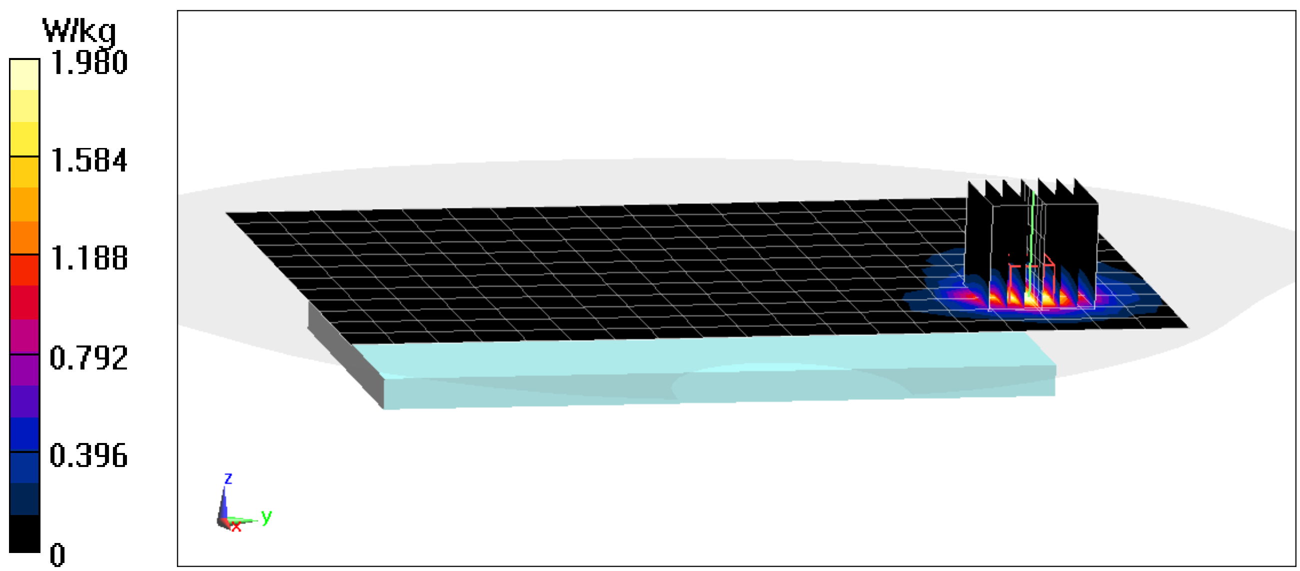
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5805 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5805 MHz; σ = 6.227 S/m; ε_r = 46.757; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 23.0°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7308; ConvF(4.18, 4.18, 4.18) @ 5805 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11a, UNII-3, 20 MHz Bandwidth, Body SAR, Ch 161, 6 Mbps, Back Side

Area Scan (9x9x1): 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 = 11.65 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 0.817 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11225

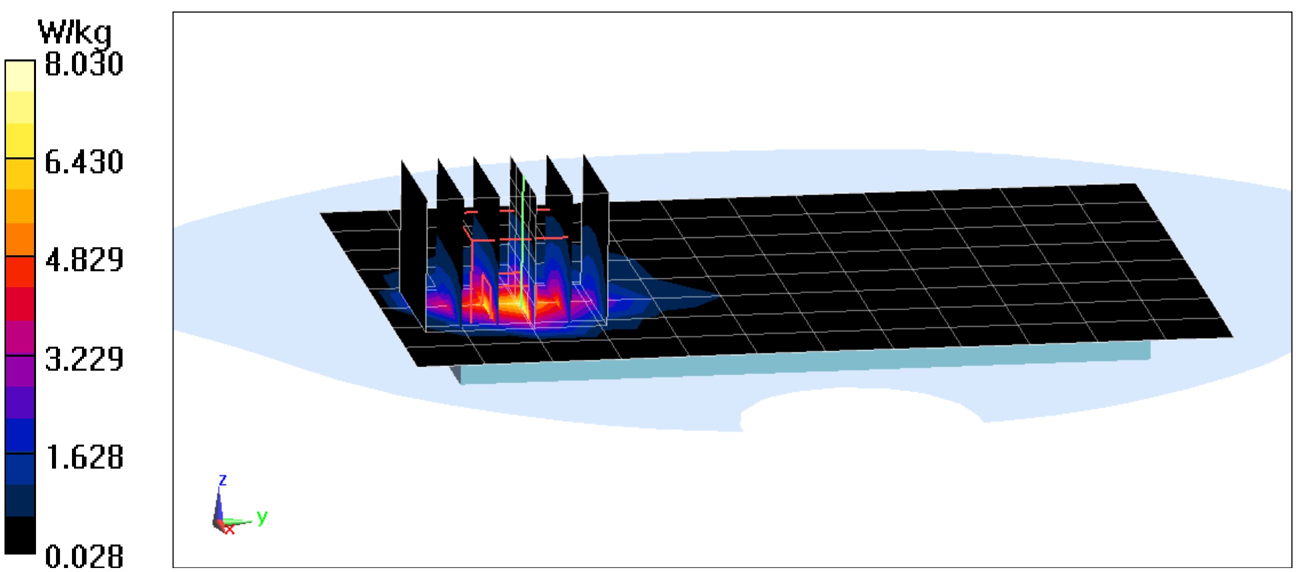
Communication System: UID 0, CDMA; Frequency: 1908.75 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1908.75 MHz; σ = 1.583 S/m; ε_r = 53.468; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-19-2018; Ambient Temp: 21.6°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1908.75 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: PCS EVDO, Phablet SAR, Back side, High.ch

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 63.92 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 15.2 W/kg
SAR(10 g) = 2.95 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11209

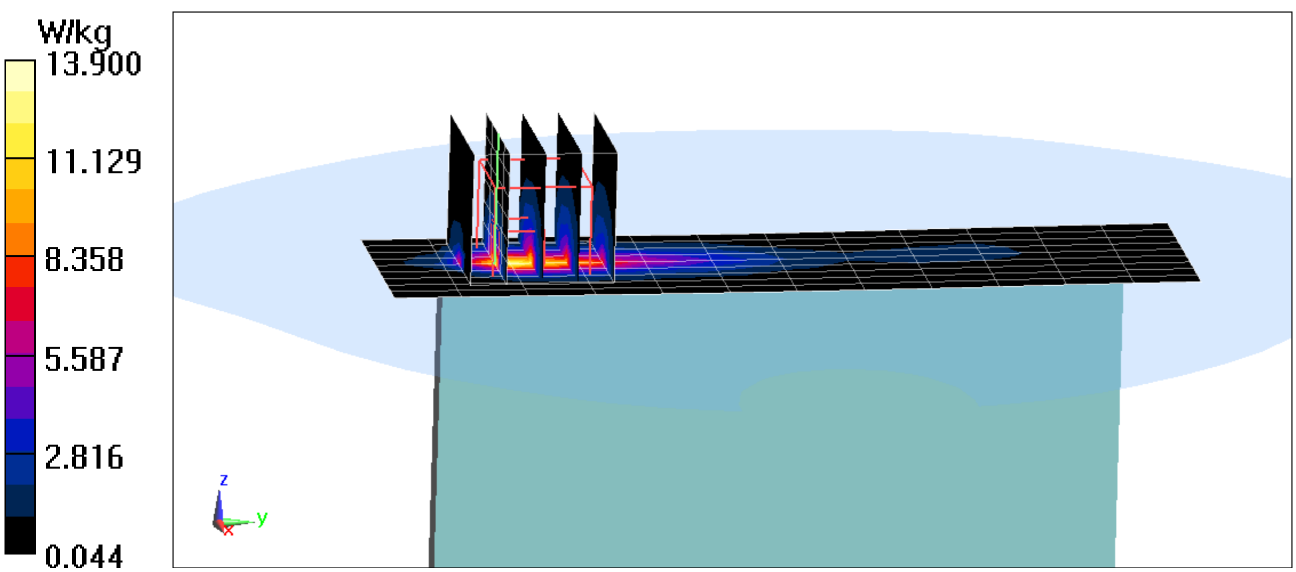
Communication System: UID 0, UMTS; Frequency: 1712.4 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1712.4 MHz; σ = 1.456 S/m; ε_r = 52.277; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-21-2018; Ambient Temp: 22.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN7357; ConvF(8.43, 8.43, 8.43) @ 1712.4 MHz; Calibrated: 4/18/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2018
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: UMTS 1750, Phablet SAR, Left Edge, Low.ch

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 71.60 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 18.9 W/kg
SAR(10 g) = 2.99 W/kg



DUT: ZNFL423DL; Type: Portable Handset; Serial: 11233

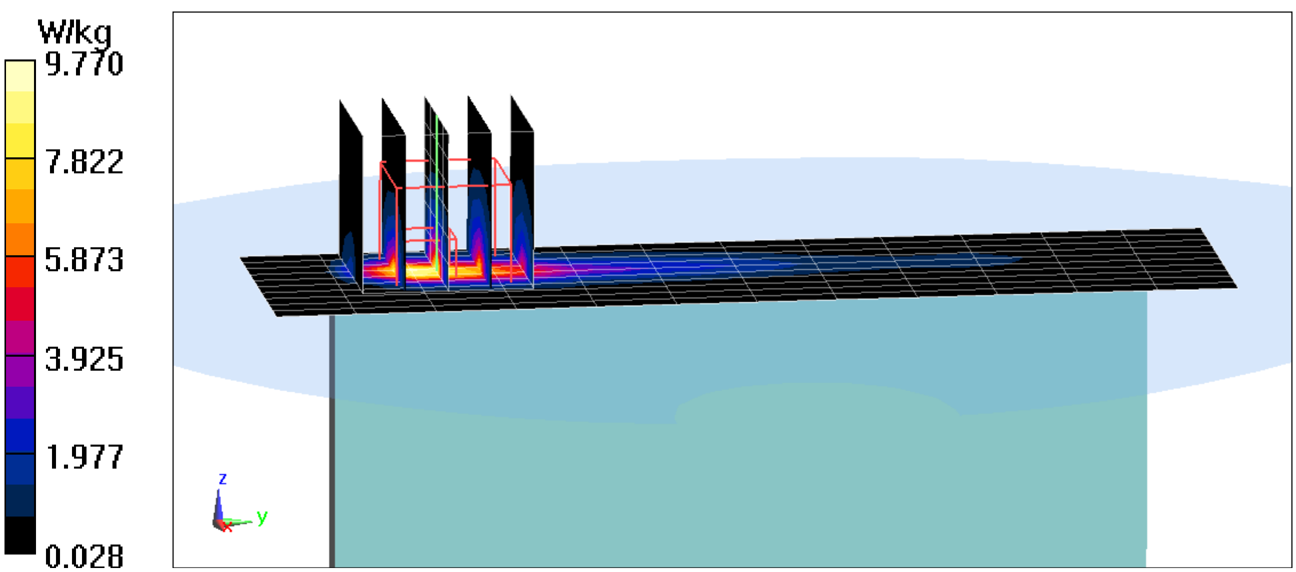
Communication System: UID 0, _UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1907.6 MHz; σ = 1.581 S/m; ε_r = 53.473; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-19-2018; Ambient Temp: 21.6°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1907.6 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: UMTS 1900, Phablet SAR, Left Edge, High.ch

Area Scan (11x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 73.91 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 19.0 W/kg
SAR(10 g) = 2.96 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11209

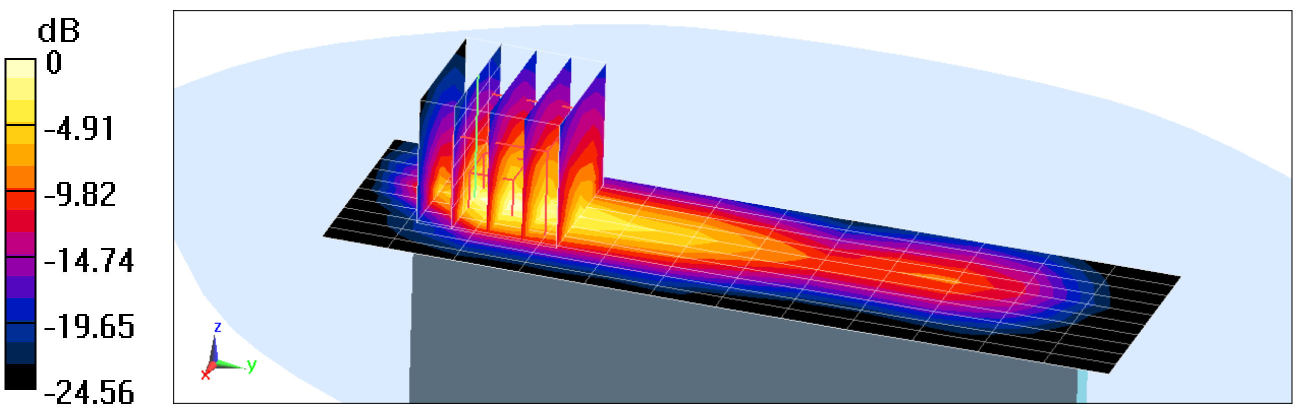
Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1745 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1745 MHz; σ = 1.493 S/m; ε_r = 52.158; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-21-2018; Ambient Temp: 22.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN7357; ConvF(8.43, 8.43, 8.43) @ 1745 MHz; Calibrated: 4/18/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2018
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 66 (AWS), Phablet SAR, Left Edge, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

Area Scan (11x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 73.65 V/m; Power Drift = 0.20 dB
Peak SAR (extrapolated) = 19.1 W/kg
SAR(10 g) = 2.9 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11217

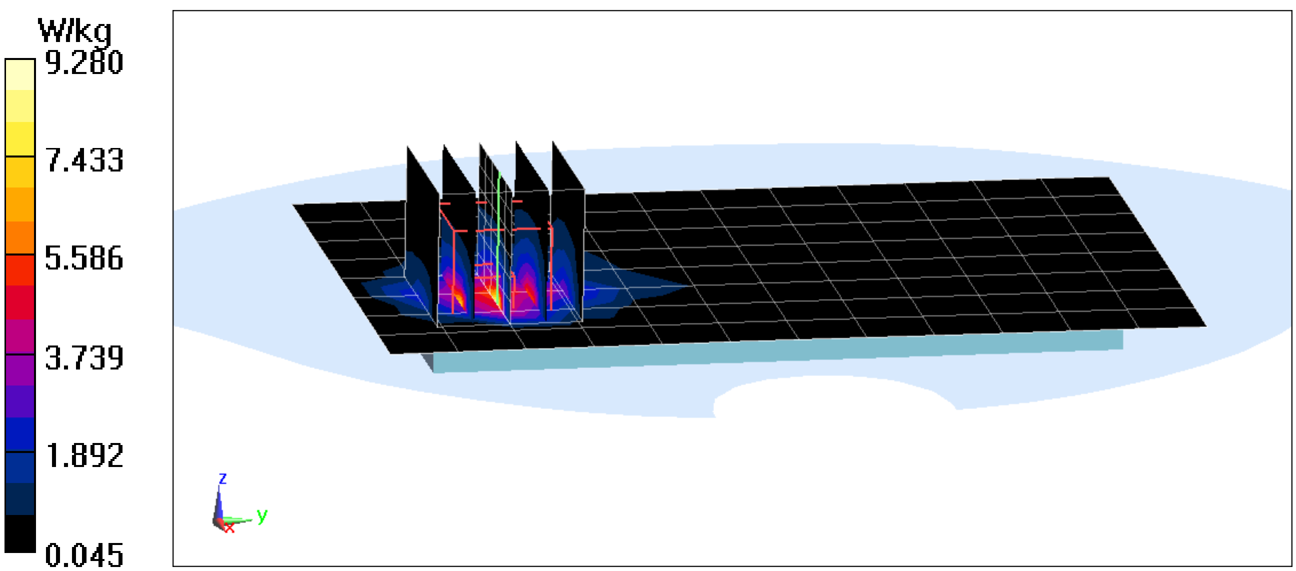
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.573 S/m; ε_r = 53.509; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-19-2018; Ambient Temp: 21.6°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1900 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 72.46 V/m; Power Drift = -0.21 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(10 g) = 3.02 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFL423DL; Type: Portable Handset; Serial: 11381

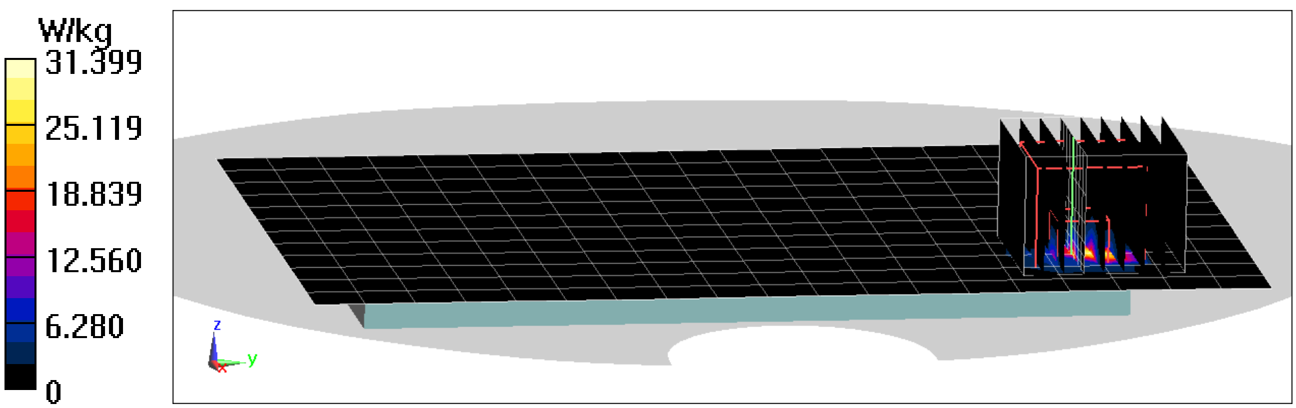
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5260 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5260 MHz; σ = 5.439 S/m; ε_r = 47.943; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-26-2018; Ambient Temp: 21.3°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7308; ConvF(4.48, 4.48, 4.48) @ 5260 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11a, U-NII-2A, 20 MHz Bandwidth, Phablet SAR, Ch 52, 6 Mbps, Back Side

Area Scan (9x9x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 44.96 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 64.5 W/kg
SAR(10 g) = 1.83 W/kg



APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

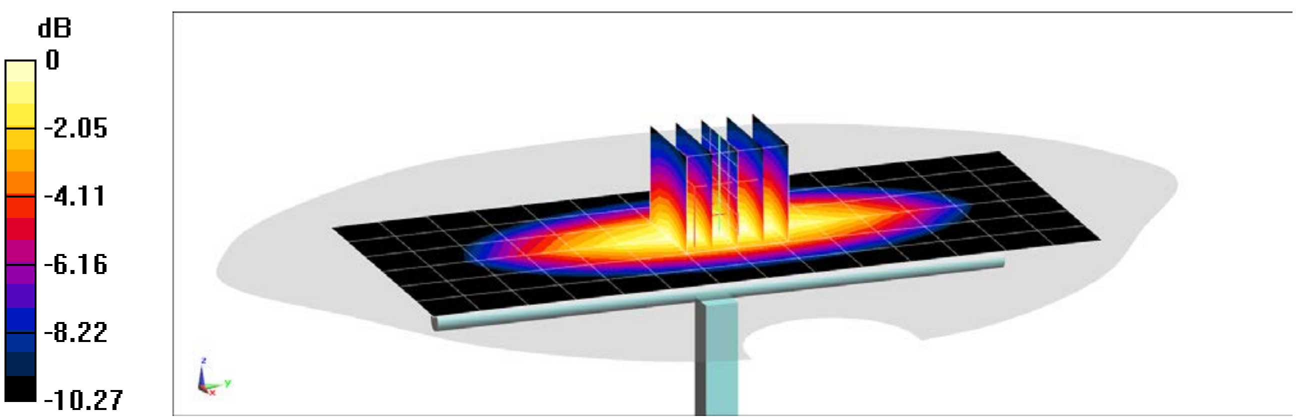
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head; Medium parameters used (interpolated):
f = 750 MHz; σ = 0.878 S/m; ε_r = 42.325; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-19-2018; Ambient Temp: 21.3°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(6.76, 6.76, 6.76) @ 750 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.59 W/kg
SAR(1 g) = 1.73 W/kg
Deviation(1 g) = 3.35%



0 dB = 2.03 W/kg = 3.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

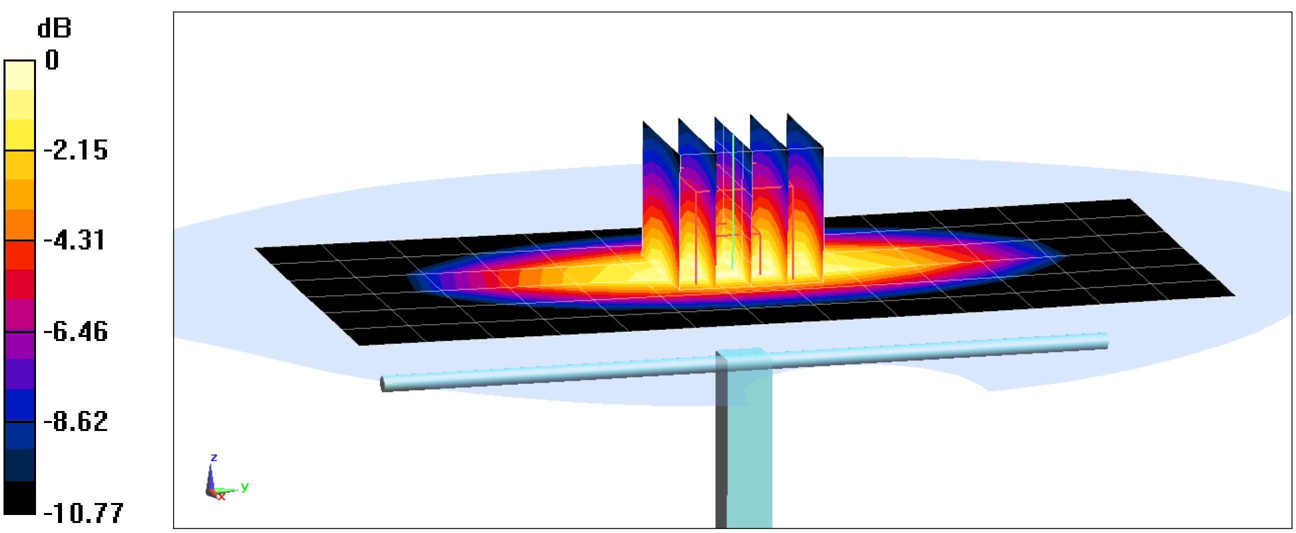
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; $\sigma = 0.929$ S/m; $\varepsilon_r = 42.966$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-19-2018; Ambient Temp: 23.0°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410; ConvF(9.81, 9.81, 9.81) @ 835 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 3.05 W/kg
SAR(1 g) = 2.04 W/kg
Deviation(1 g) = 7.71%



0 dB = 2.71 W/kg = 4.33 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

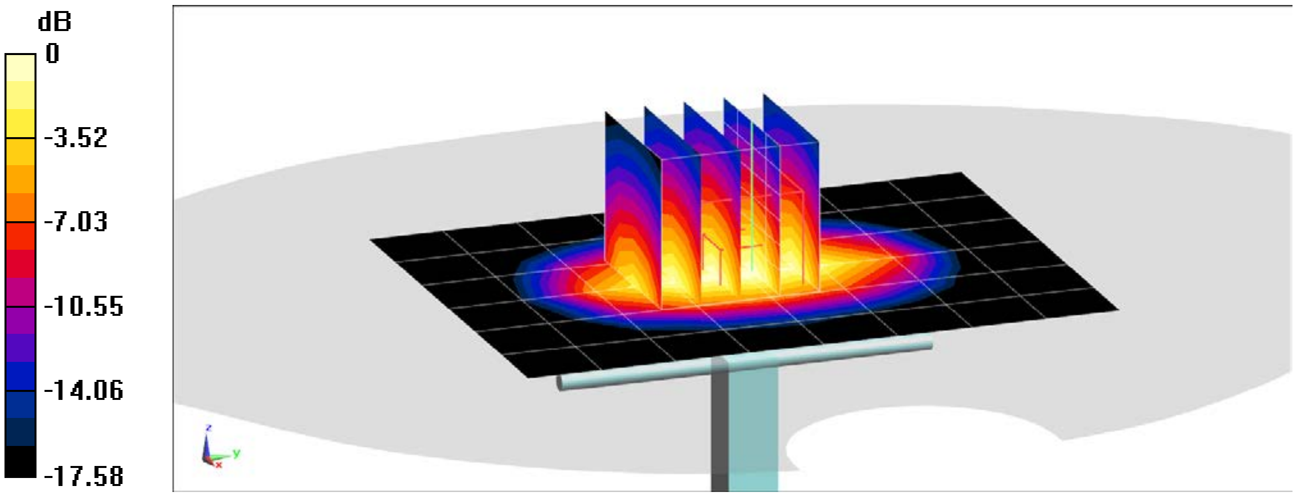
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head; Medium parameters used:
f = 1750 MHz; σ = 1.382 S/m; ε_r = 38.985; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-25-2018; Ambient Temp: 19.8°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(5.48, 5.48, 5.48) @ 1750 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.60 W/kg
SAR(1 g) = 3.66 W/kg
Deviation(1 g) = 0.55%



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

PCTEST ENGINEERING LABORATORY, INC.

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

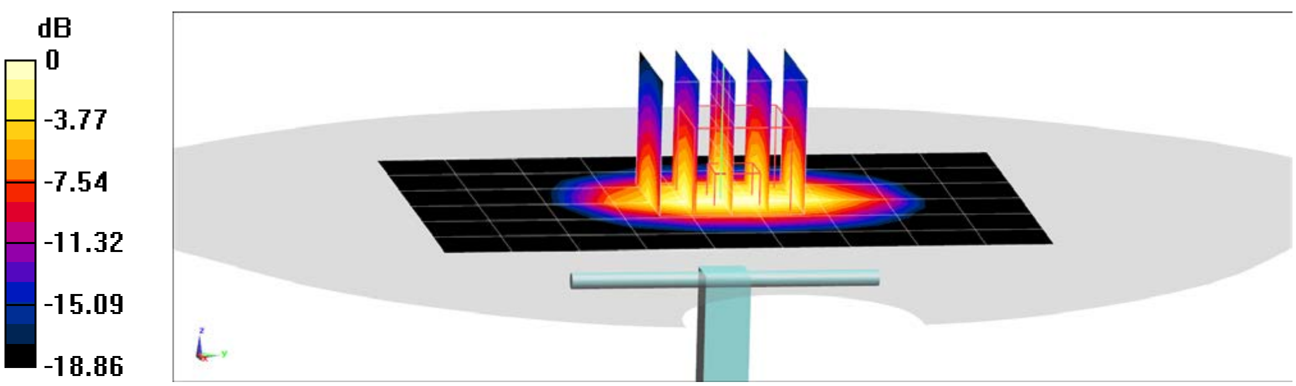
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head; Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.442 S/m; ε_r = 38.957; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-03-2018; Ambient Temp: 21.7°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3287; ConvF(5.24, 5.24, 5.24) @ 1900 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.65 W/kg
SAR(1 g) = 4.2 W/kg
Deviation(1 g) = 4.74%



0 dB = 5.21 W/kg = 7.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

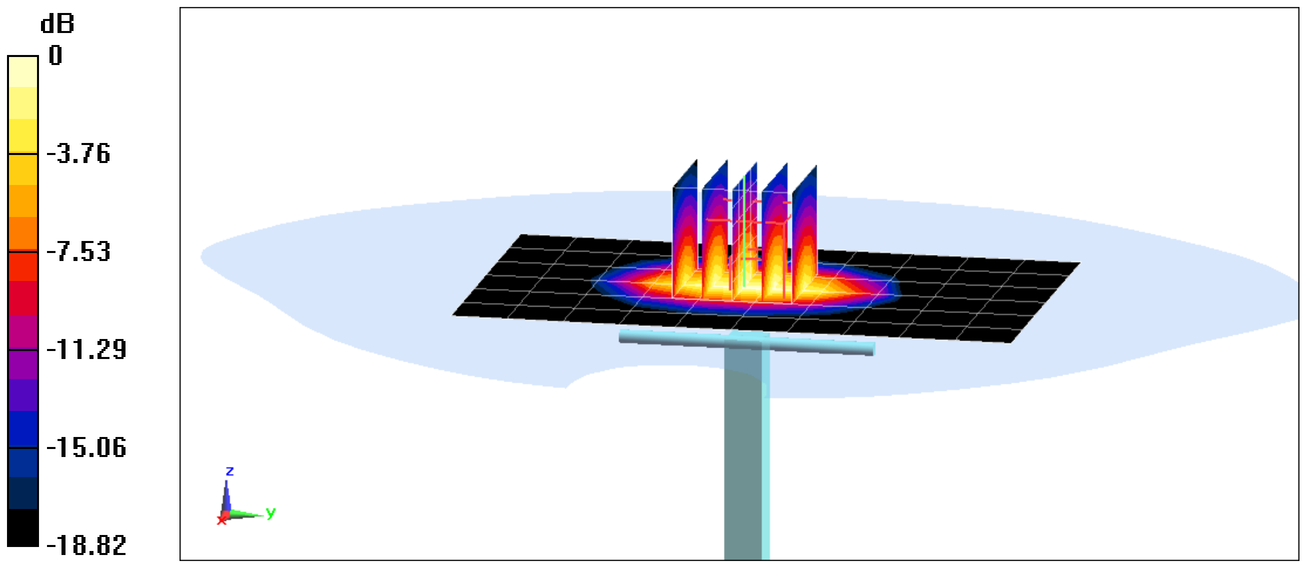
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
$f = 1900$ MHz; $\sigma = 1.44$ S/m; $\varepsilon_r = 40.081$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-19-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(8.05, 8.05, 8.05) @ 1900 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.87 W/kg
SAR(1 g) = 4.11 W/kg
Deviation(1 g) = 3.27%



0 dB = 6.50 W/kg = 8.13 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

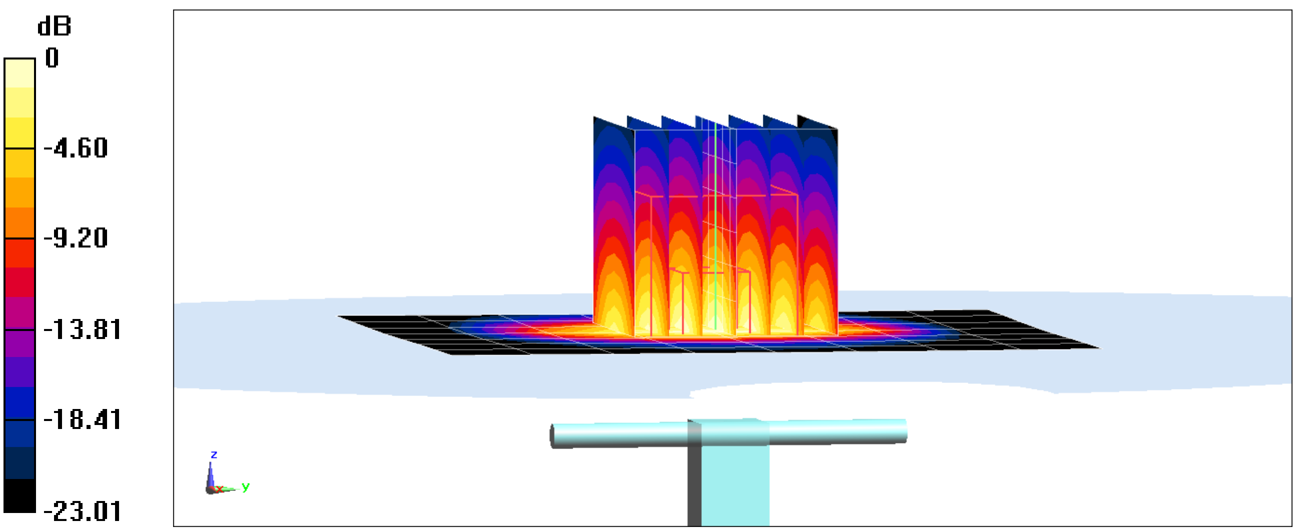
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.862 S/m; ε_r = 38.272; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 21.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7410; ConvF(7.5, 7.5, 7.5) @ 2450 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.2 W/kg
SAR(1 g) = 5.25 W/kg
Deviation(1 g) = 0.38%



0 dB = 8.96 W/kg = 9.52 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

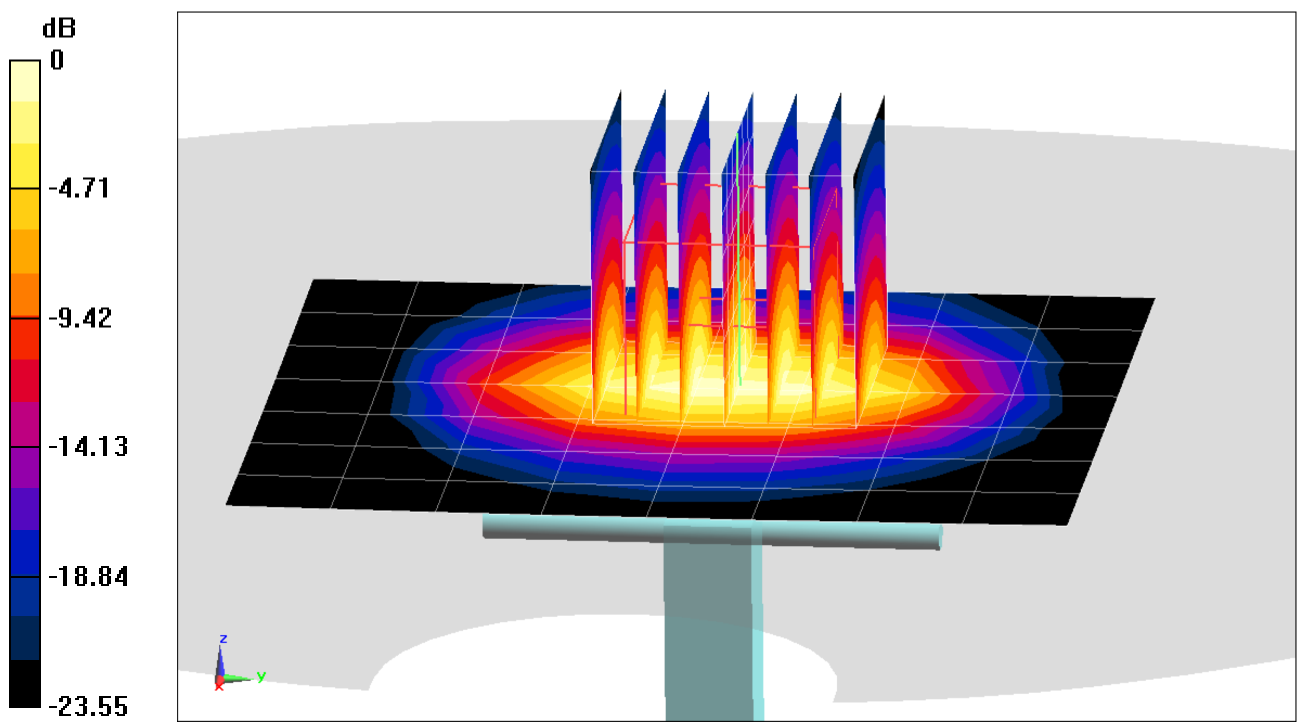
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head; Medium parameters used:
$f = 2450$ MHz; $\sigma = 1.797$ S/m; $\varepsilon_r = 38.399$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-24-2018; Ambient Temp: 20.1°C; Tissue Temp: 23.2°C

Probe: EX3DV4 - SN7406; ConvF(7.54, 7.54, 7.54) @ 2450 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.5 W/kg
SAR(1 g) = 5.26 W/kg
Deviation(1 g) = 1.35%



0 dB = 9.39 W/kg = 9.73 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1191

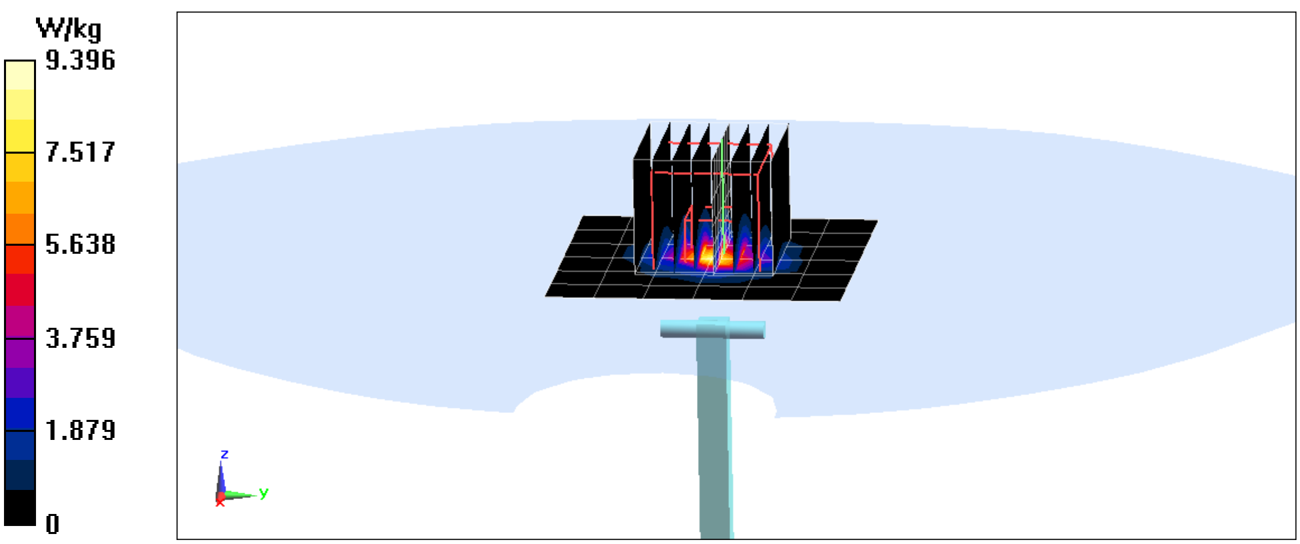
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
f = 5250 MHz; σ = 4.535 S/m; ε_r = 34.791; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-16-2018; Ambient Temp: 20.8°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7409; ConvF(5.2, 5.2, 5.2) @ 5250 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

5250 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 16.0 W/kg
SAR(1 g) = 3.89 W/kg
Deviation(1 g) = -1.39%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057

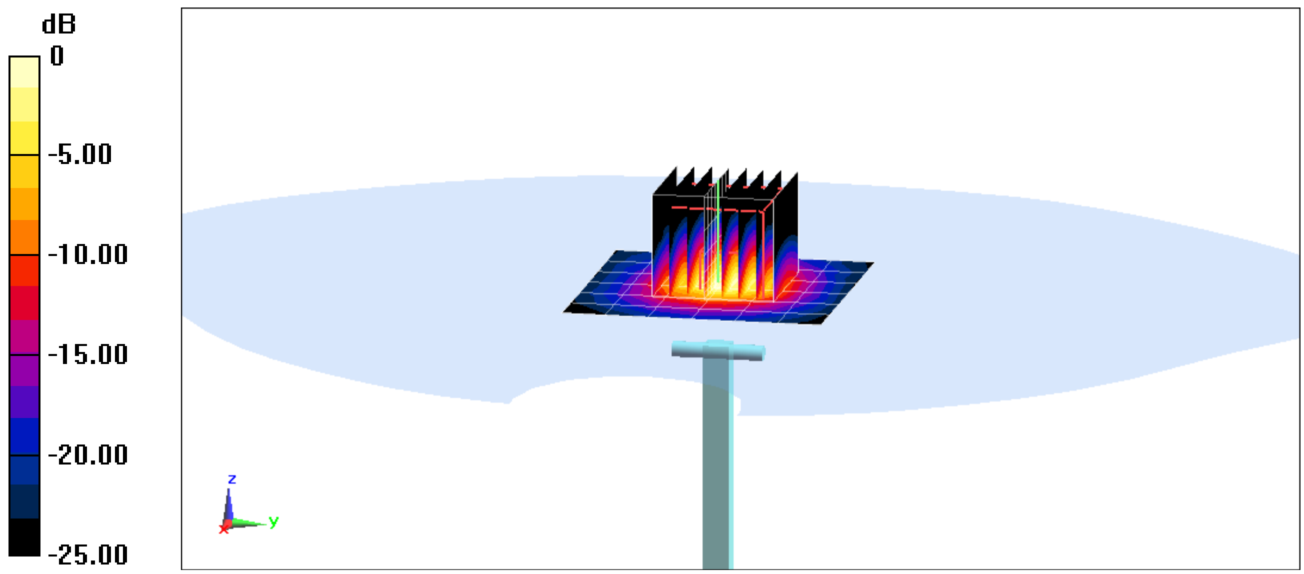
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
f = 5250 MHz; σ = 4.593 S/m; ε_r = 35.307; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2018; Ambient Temp: 20.5°C; Tissue Temp: 20.2°C

Probe: EX3DV4 - SN7409; ConvF(5.2, 5.2, 5.2) @ 5250 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

5250 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 3.87 W/kg
Deviation(1 g) = -2.27%



0 dB = 9.09 W/kg = 9.59 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1191

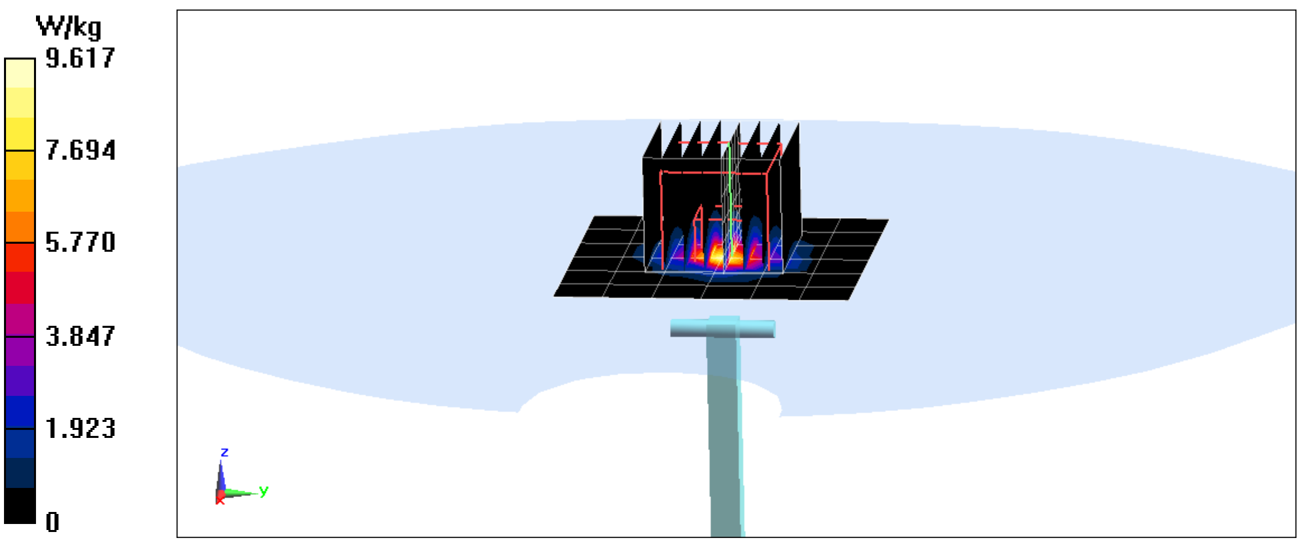
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used:
f = 5600 MHz; σ = 4.892 S/m; ε_r = 34.355; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-16-2018; Ambient Temp: 20.8°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7409; ConvF(4.77, 4.77, 4.77) @ 5600 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

5600 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 17.7 W/kg
SAR(1 g) = 3.97 W/kg
Deviation(1 g) = -5.02%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1191

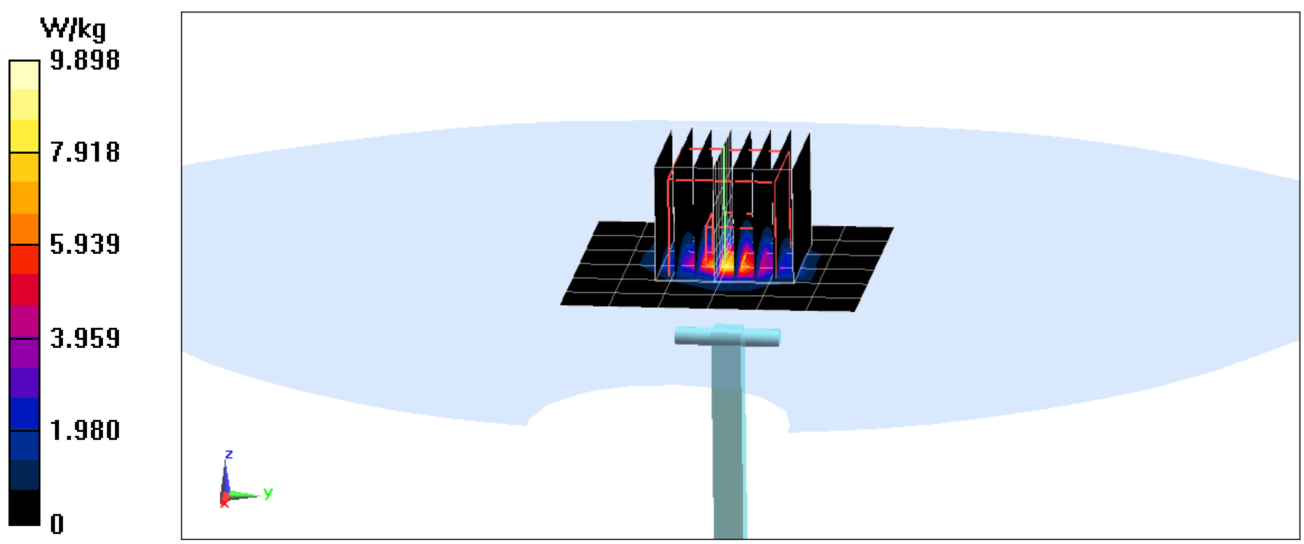
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
f = 5750 MHz; σ = 5.055 S/m; ε_r = 34.093; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-16-2018; Ambient Temp: 20.8°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7409; ConvF(4.82, 4.82, 4.82) @ 5750 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

5750 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 18.4 W/kg
SAR(1 g) = 3.93 W/kg
Deviation(1 g) = -0.63%



PCTEST ENGINEERING LABORATORY, INC.

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

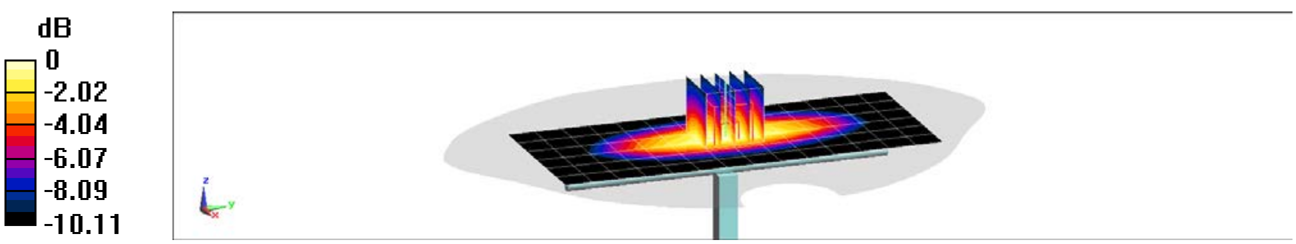
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 835 Body; Medium parameters used (interpolated):
f = 750 MHz; σ = 0.938 S/m; ε_r = 55.242; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-05-2018; Ambient Temp: 22.2°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7406; ConvF(9.91, 9.91, 9.91) @ 750 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.59 W/kg
SAR(1 g) = 1.73 W/kg
Deviation(1 g) = 0.82%



0 dB = 2.30 W/kg = 3.62 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

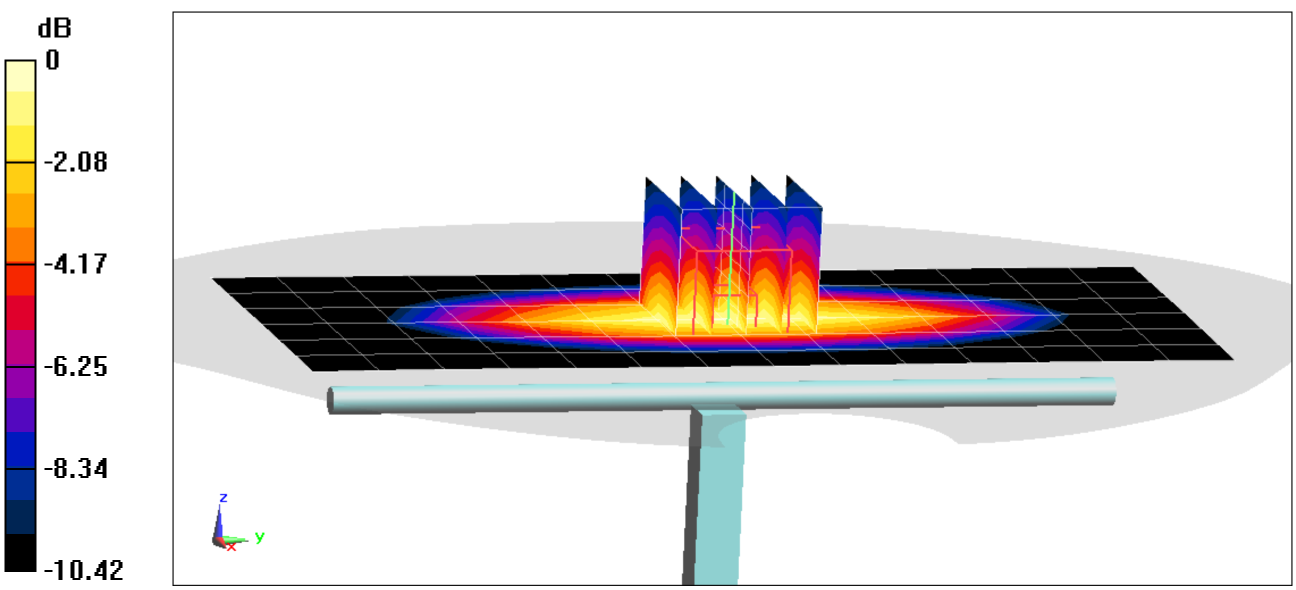
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 MHz Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.956 S/m; ε_r = 54.708; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-12-2018; Ambient Temp: 21.8°C; Tissue Temp: 20.2°C

Probe: EX3DV4 - SN7308; ConvF(10.38, 10.38, 10.38) @ 750 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.50 W/kg
SAR(1 g) = 1.65 W/kg
Deviation(1 g) = -3.85%



0 dB = 2.11 W/kg = 3.24 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

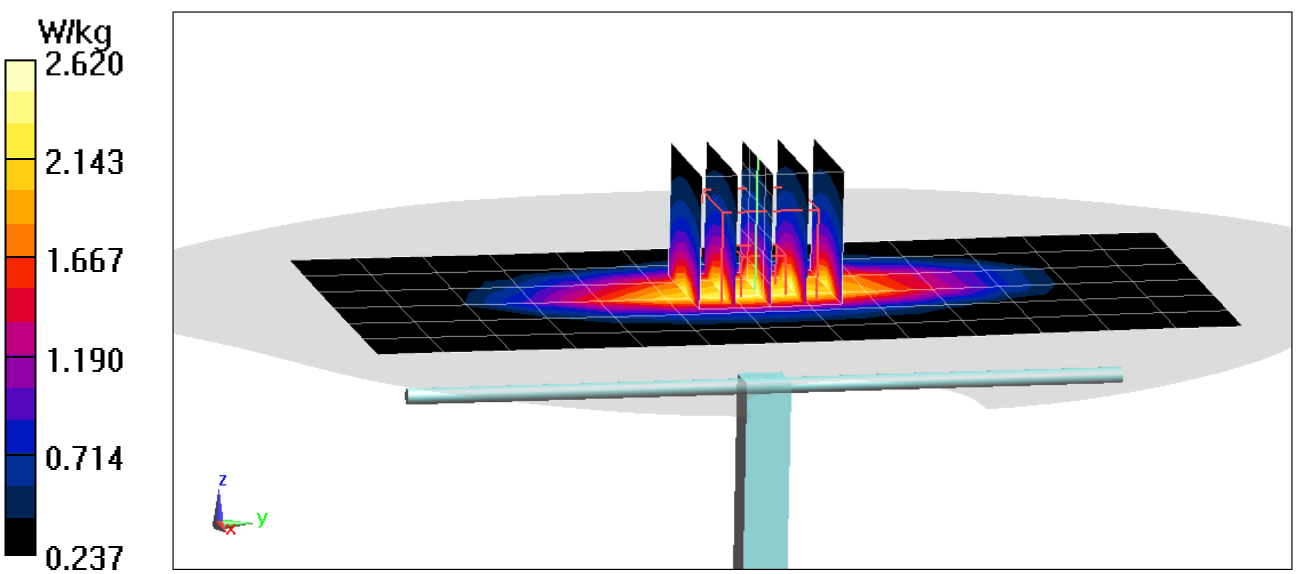
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.972 S/m; ε_r = 55.035; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-05-2018; Ambient Temp: 22.2°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7406; ConvF(9.61, 9.61, 9.61) @ 835 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.93 W/kg
SAR(1 g) = 1.97 W/kg
Deviation(1 g) = 1.44%



PCTEST ENGINEERING LABORATORY, INC.

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

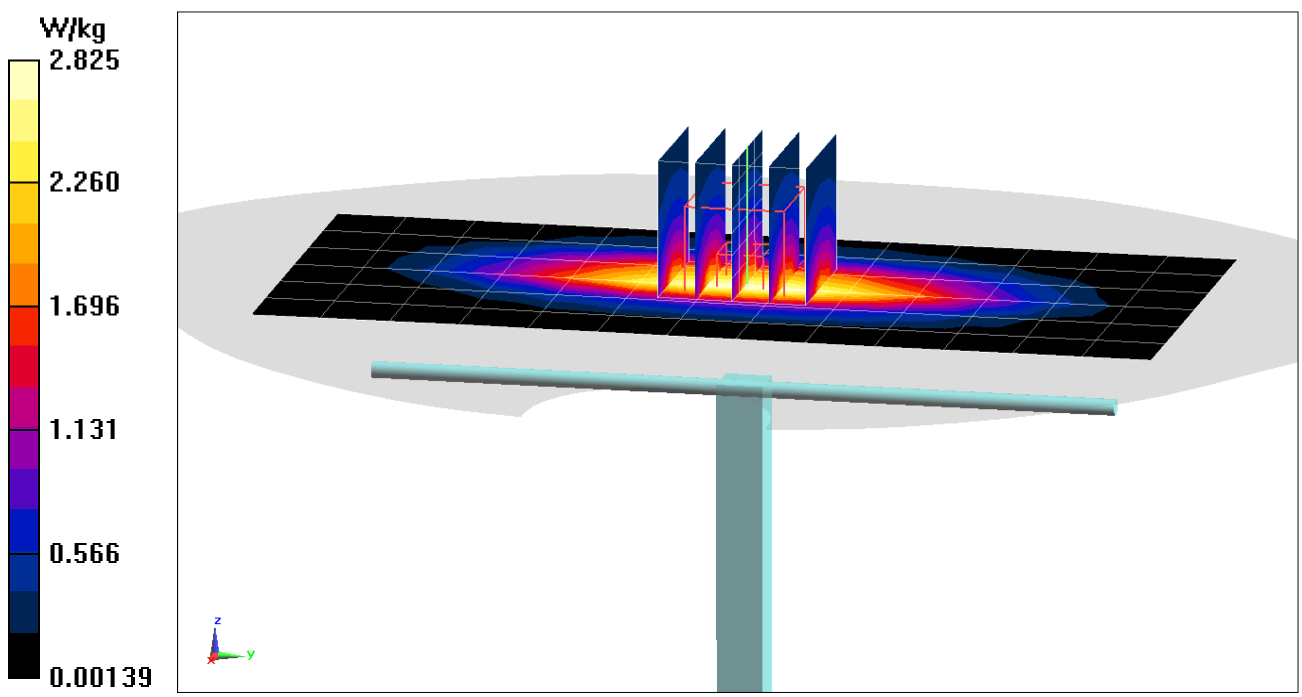
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; $\sigma = 0.936$ S/m; $\varepsilon_r = 54.81$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-07-2018; Ambient Temp: 19.5 °C; Tissue Temp: 19.2°C

Probe: ES3DV3 - SN3347; ConvF(6.37, 6.37, 6.37) @ 835 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 3.14 W/kg
SAR(1 g) = 1.98 W/kg
Deviation(1 g) = 1.96%



PCTEST ENGINEERING LABORATORY, INC.

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

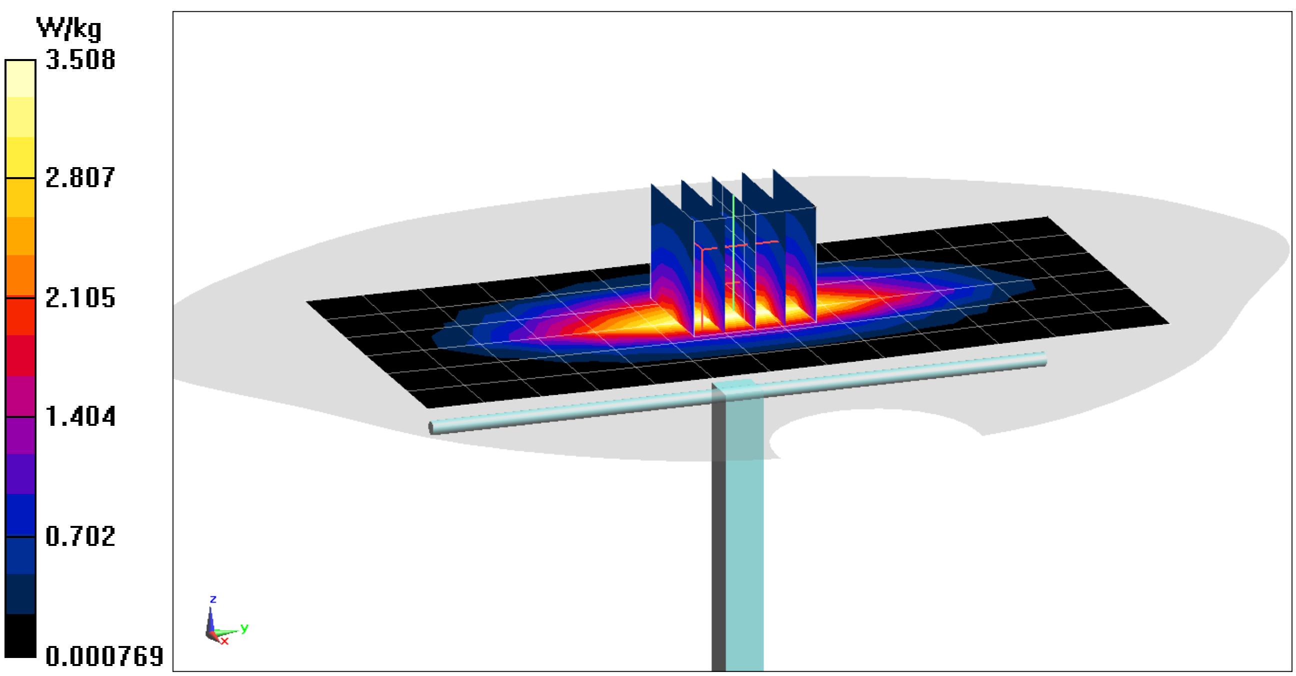
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body; Medium parameters used:
f = 835 MHz; σ = 0.974 S/m; ε_r = 54.661; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-11-2018; Ambient Temp: 22.3°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7406; ConvF(9.61, 9.61, 9.61) @ 835 MHz; Calibrated: 5/22/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2018
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.99 W/kg
SAR(1 g) = 1.98 W/kg
Deviation(1 g) = 1.96%



PCTEST ENGINEERING LABORATORY, INC.

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

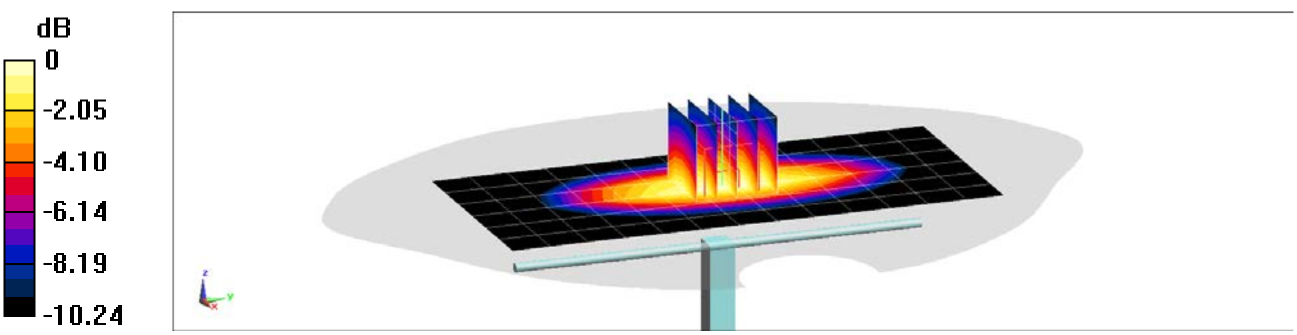
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.965 S/m; ε_r = 53.598; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-26-2018; Ambient Temp: 19.9°C; Tissue Temp: 19.1°C

Probe: ES3DV3 - SN3347; ConvF(6.37, 6.37, 6.37) @ 835 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.85 W/kg
SAR(1 g) = 1.96 W/kg
Deviation(1 g) = 0.51%



0 dB = 2.28 W/kg = 3.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1150

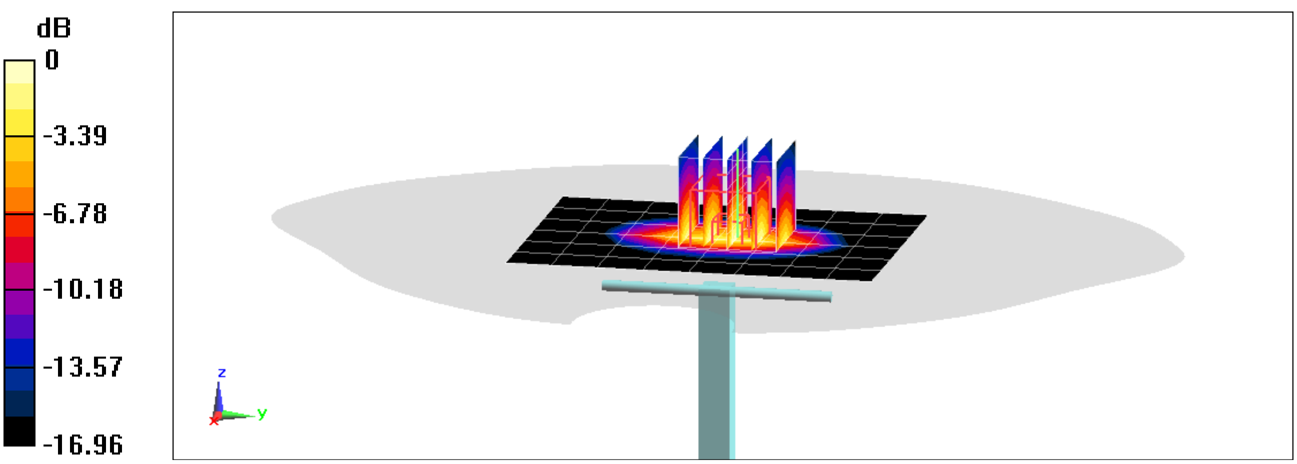
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.443 S/m; ε_r = 53.745; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-10-2018; Ambient Temp: 19.9 C; Tissue Temp: 20.4°C

Probe: ES3DV3 - SN3347; ConvF(5.17, 5.17, 5.17) @ 1750 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.28 W/kg
SAR(1 g) = 3.61 W/kg
Deviation(1 g) = -1.37%



0 dB = 4.39 W/kg = 6.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1150

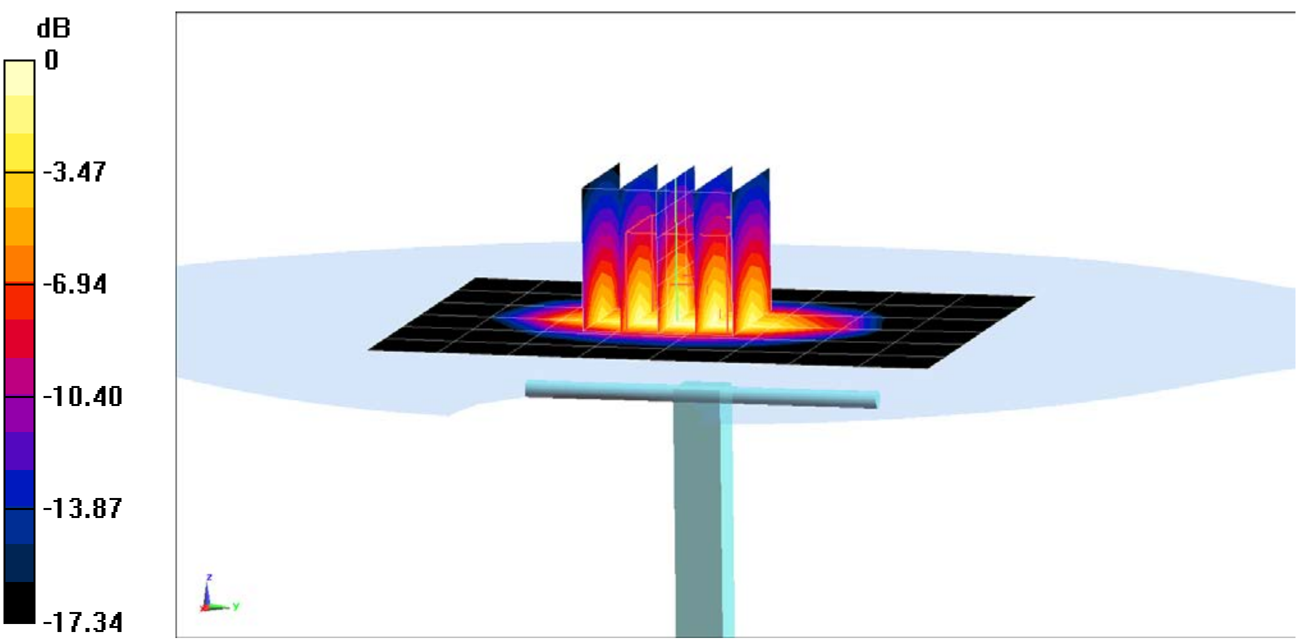
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.499 S/m; ε_r = 52.14; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-21-2018; Ambient Temp: 22.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN7357; ConvF(8.43, 8.43, 8.43) @ 1750 MHz; Calibrated: 4/18/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2018
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.05 W/kg
SAR(10 g) = 2.03 W/kg
Deviation(10 g) = 4.64%



0 dB = 5.92 W/kg = 7.72 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

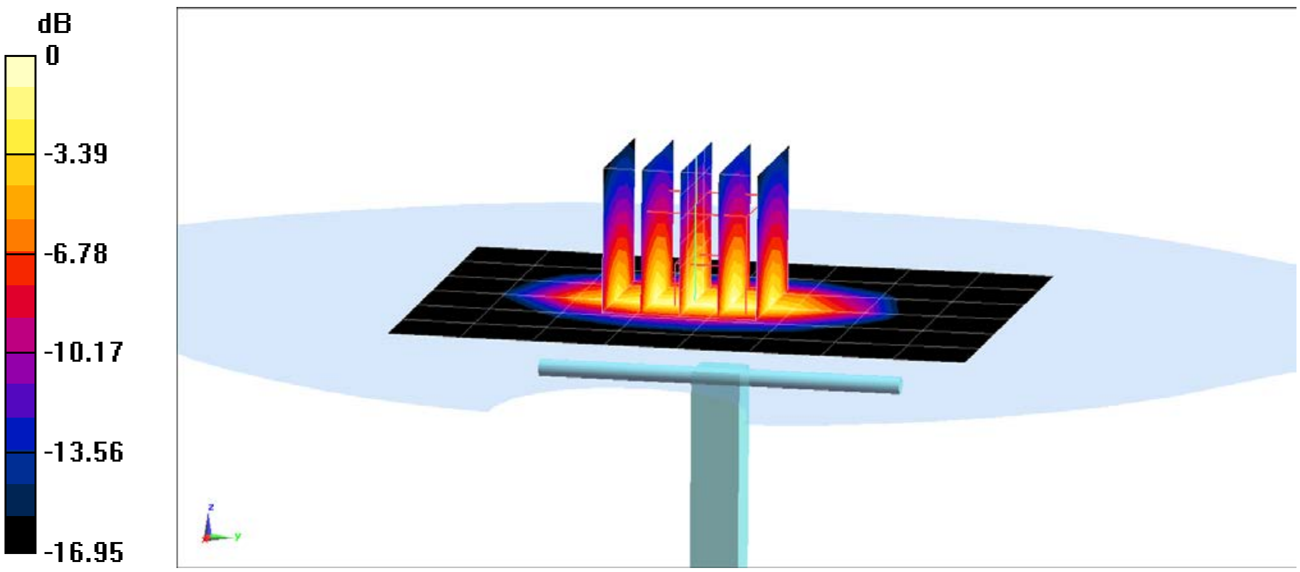
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.531 S/m; ε_r = 52.512; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2018; Ambient Temp: 22.8°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7357; ConvF(8.43, 8.43, 8.43) @ 1750 MHz; Calibrated: 4/18/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2018
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.00 W/kg
SAR(1 g) = 3.88 W/kg
Deviation(1 g) = 4.86%



0 dB = 5.92 W/kg = 7.72 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

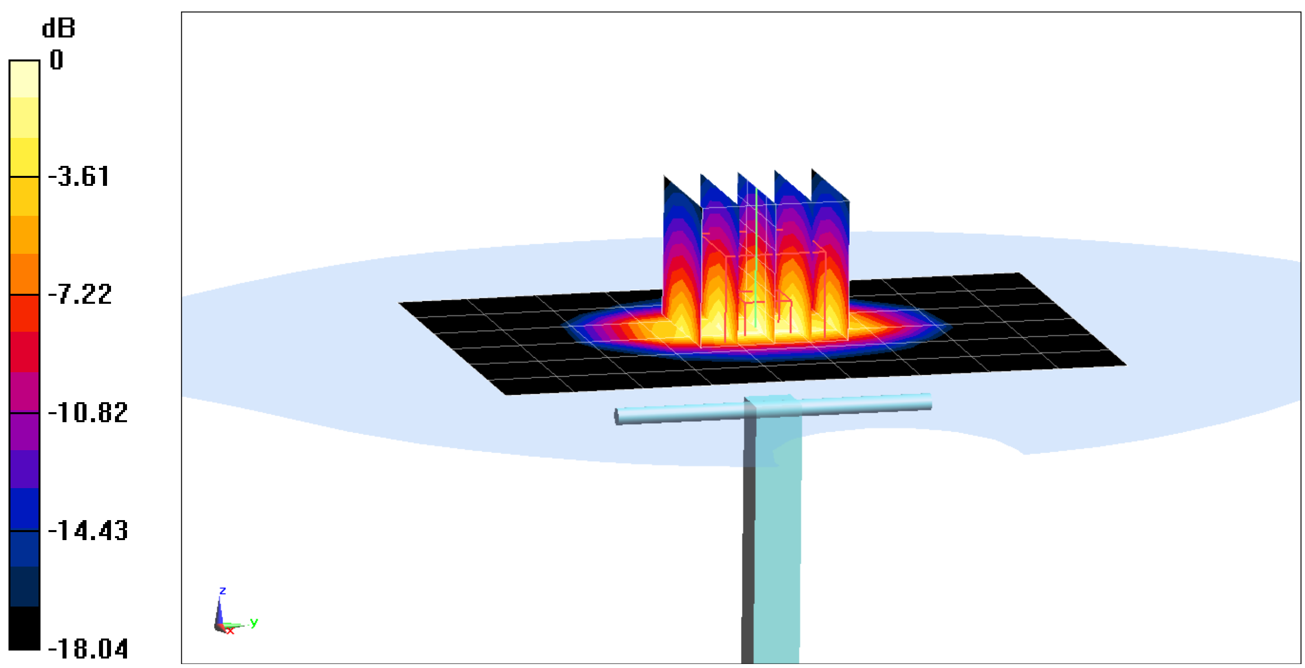
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.572 S/m; ε_r = 51.023; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-05-2018; Ambient Temp: 24.5°C; Tissue Temp: 23.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1900 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.40 W/kg
SAR(1 g) = 4.15 W/kg
Deviation(1 g) = 4.80%



0 dB = 5.18 W/kg = 7.14 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

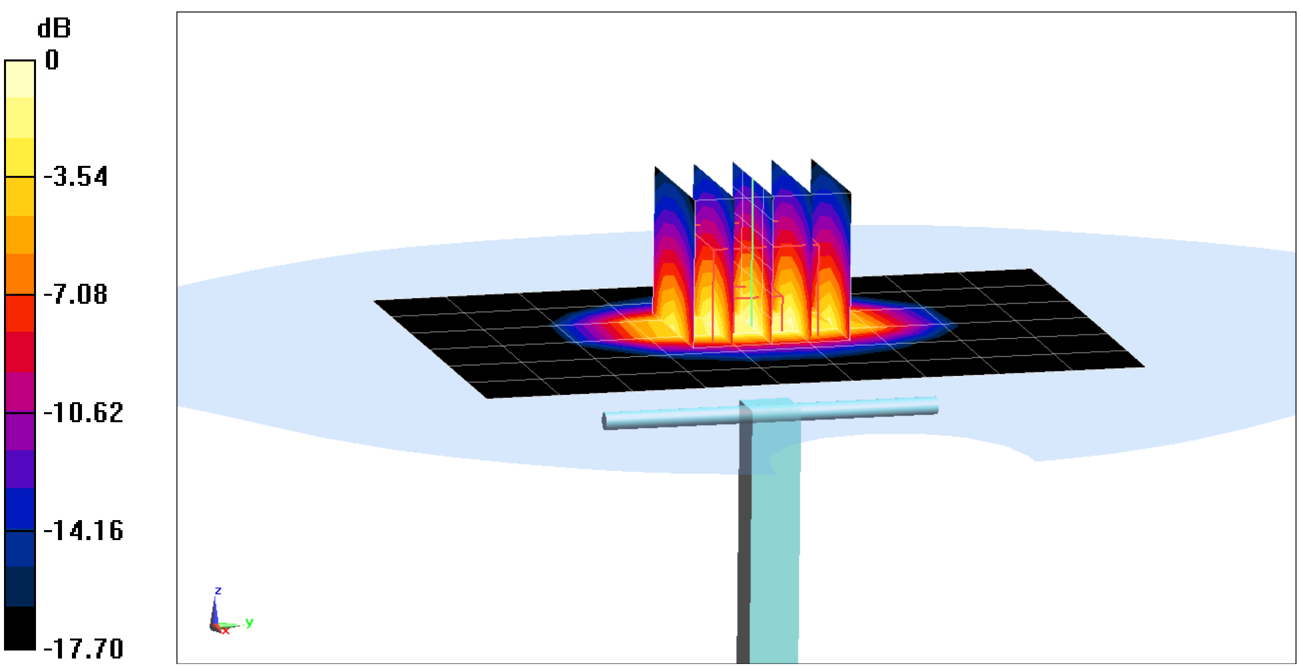
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.565 S/m; ε_r = 52.735; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-09-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1900 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.36 W/kg
SAR(1 g) = 4.14 W/kg
Deviation(1 g) = 4.55%



0 dB = 5.29 W/kg = 7.23 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

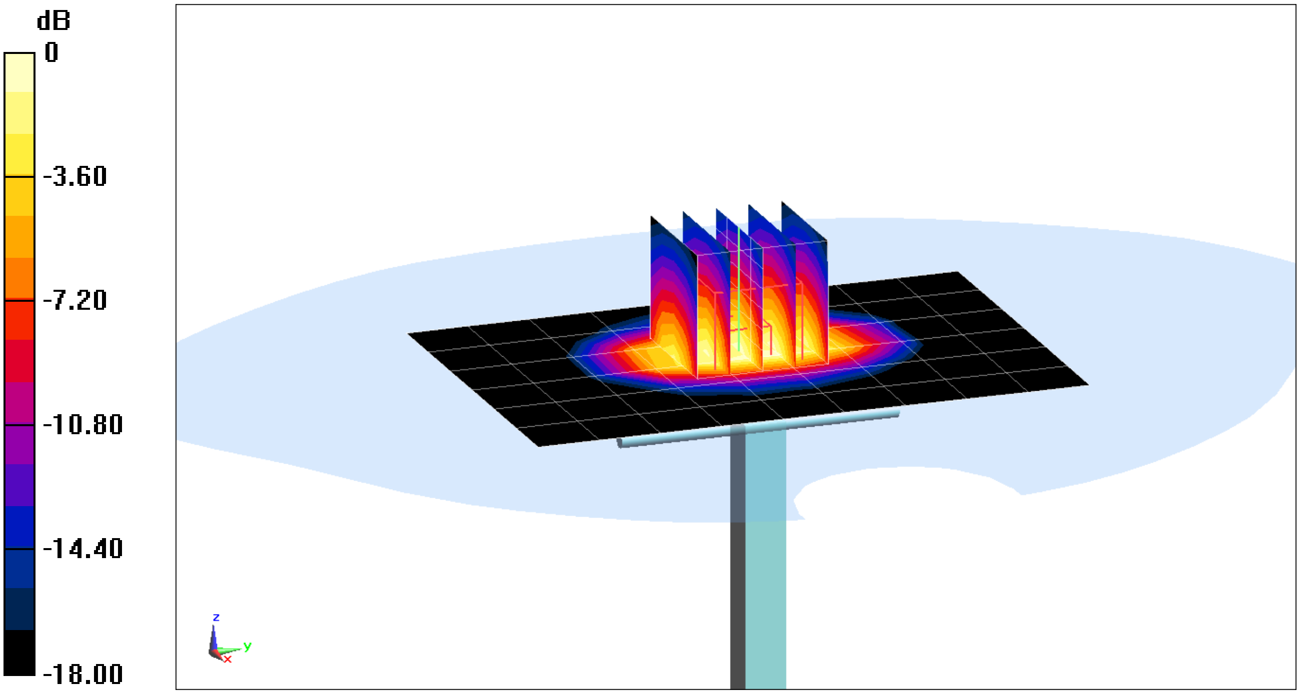
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.573 S/m; ε_r = 53.509; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-19-2018; Ambient Temp: 21.6°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1900 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.87 W/kg
SAR(10 g) = 2 W/kg
Deviation(10 g) = -4.31%



0 dB = 4.91 W/kg = 6.91 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

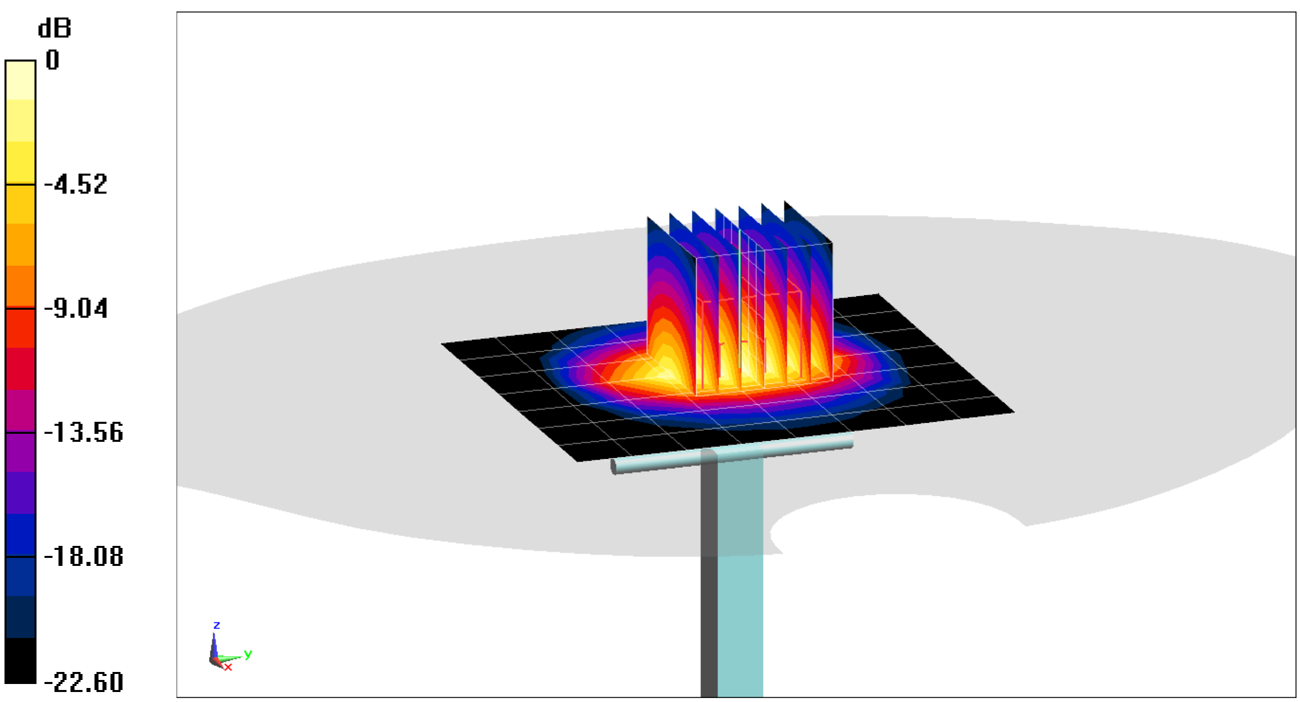
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.038 S/m; ε_r = 51.736; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-12-2018; Ambient Temp: 22.7°C; Tissue Temp: 22.8°C

Probe: ES3DV3 - SN3319; ConvF(4.51, 4.51, 4.51) @ 2450 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.3 W/kg
SAR(1 g) = 5.34 W/kg
Deviation(1 g) = 6.59%



0 dB = 7.13 W/kg = 8.53 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

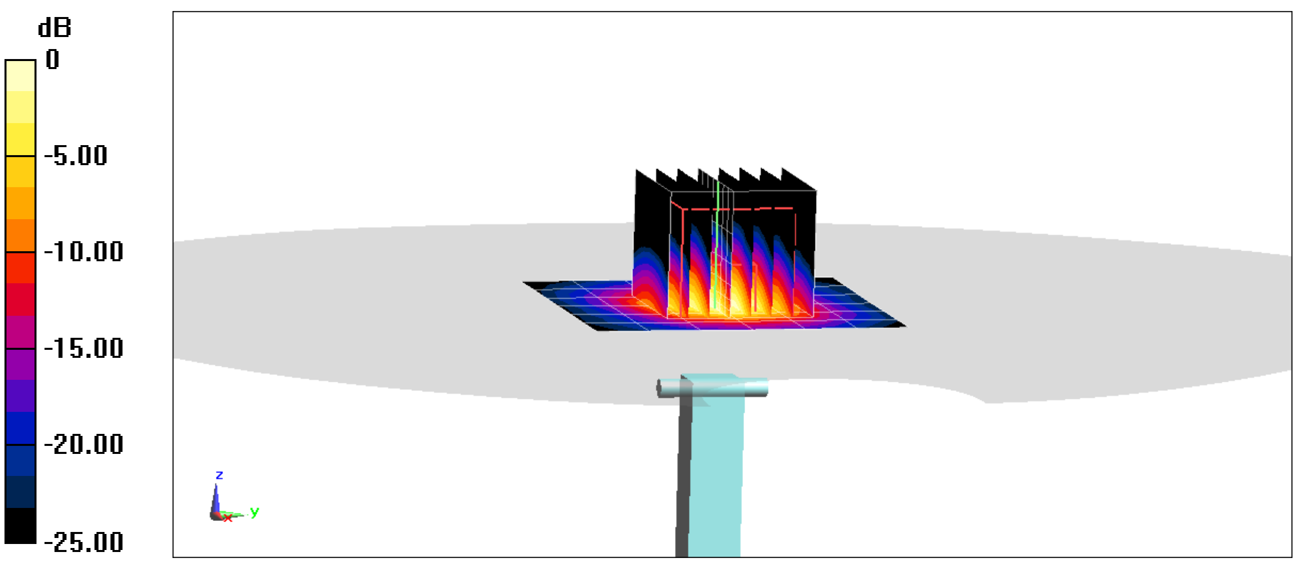
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used (interpolated):
f = 5250 MHz; σ = 5.413 S/m; ε_r = 47.853; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 23.0°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7308; ConvF(4.48, 4.48, 4.48) @ 5250 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

5250 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 15.0 W/kg
SAR(1 g) = 3.63 W/kg
Deviation(1 g) = -3.97%



0 dB = 8.44 W/kg = 9.26 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

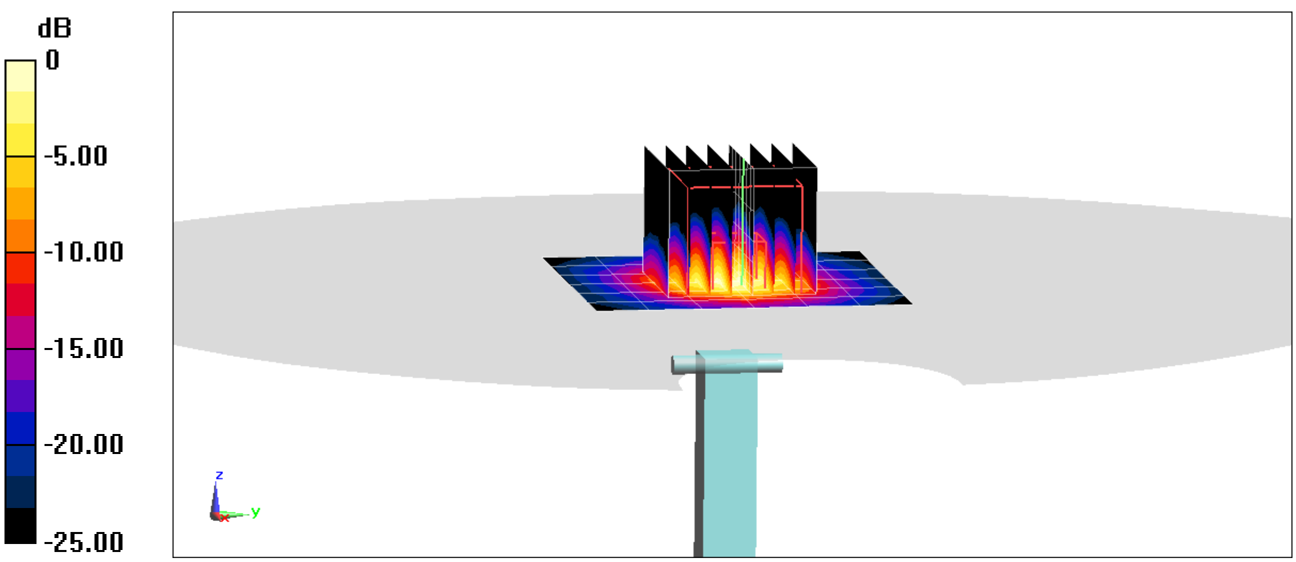
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used:
f = 5600 MHz; σ = 5.91 S/m; ε_r = 47.181; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 23.0°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7308; ConvF(4, 4, 4) @ 5600 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

5600 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 17.6 W/kg
SAR(1 g) = 3.83 W/kg
Deviation(1 g) = -2.42%



0 dB = 9.66 W/kg = 9.85 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

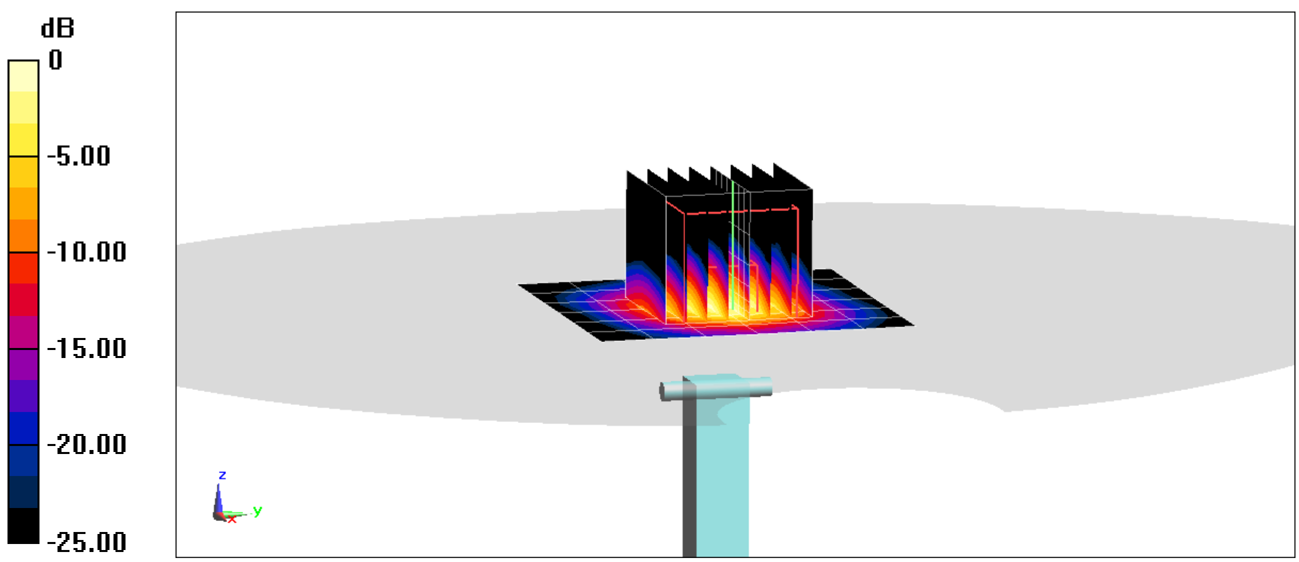
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used (interpolated):
f = 5750 MHz; σ = 6.145 S/m; ε_r = 46.834; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 23.0°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7308; ConvF(4.18, 4.18, 4.18) @ 5750 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

5750 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 3.49 W/kg
Deviation(1 g) = -8.04%



0 dB = 8.91 W/kg = 9.50 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1191

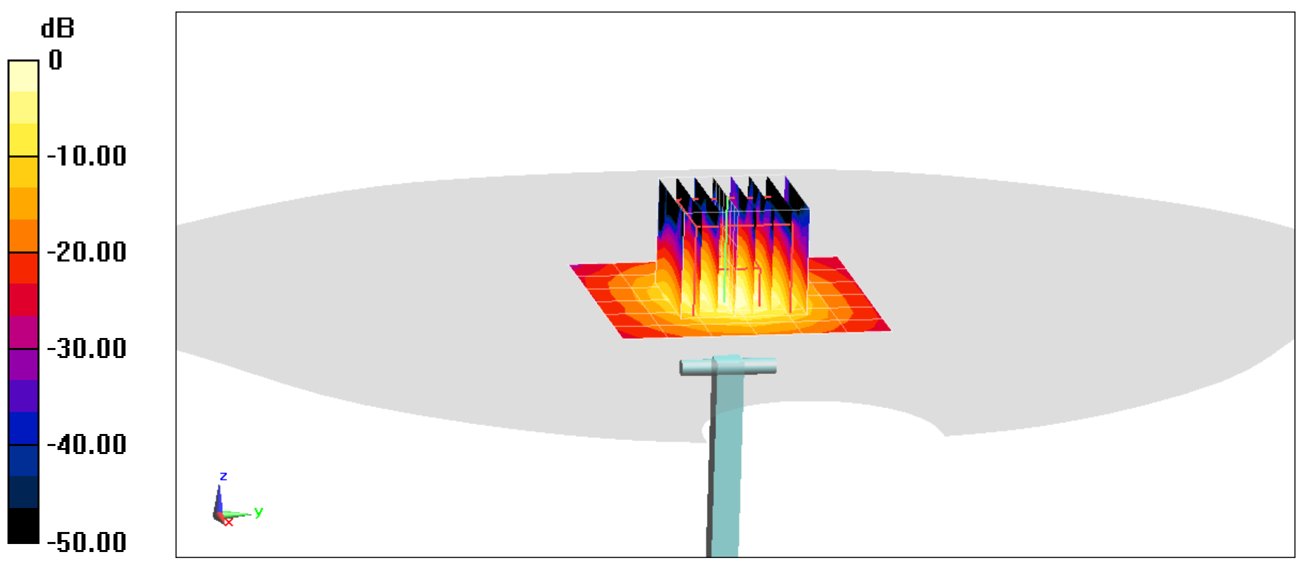
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
$f = 5250$ MHz; $\sigma = 5.421$ S/m; $\varepsilon_r = 47.944$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2018; Ambient Temp: 21.3°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7308; ConvF(4.48, 4.48, 4.48) @ 5250 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

5250 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 14.6 W/kg
SAR(10 g) = 1 W/kg
Deviation(10 g) = -7.41%



0 dB = 8.56 W/kg = 9.32 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1191

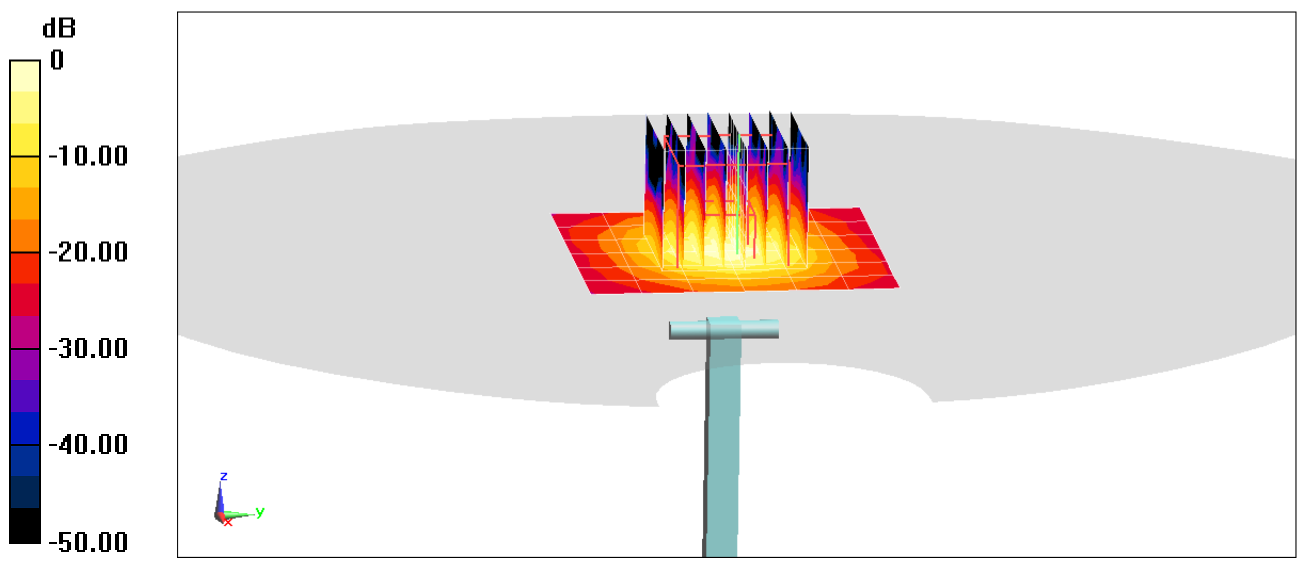
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5600 MHz; σ = 5.939 S/m; ε_r = 47.285; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2018; Ambient Temp: 21.3°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7308; ConvF(4, 4, 4) @ 5600 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

5600 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 17.5 W/kg
SAR(10 g) = 1.07 W/kg
Deviation(10 g) = -3.60%



0 dB = 9.63 W/kg = 9.84 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1191

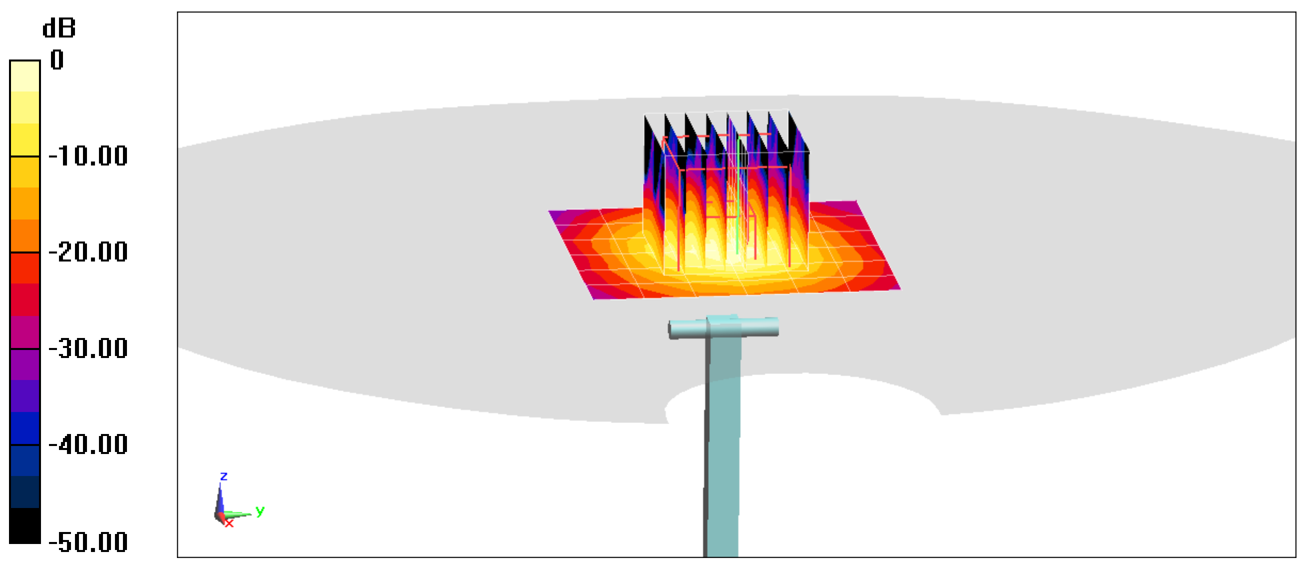
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5750 MHz; σ = 6.154 S/m; ε_r = 47.01; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-26-2018; Ambient Temp: 21.3°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7308; ConvF(4.18, 4.18, 4.18) @ 5750 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

5750 MHz System Verification at 17.0 dBm (50 mW)

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
Peak SAR (extrapolated) = 16.1 W/kg
SAR(10 g) = 0.976 W/kg
Deviation(10 g) = -7.92%



0 dB = 8.59 W/kg = 9.34 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
Servizio svizzero di taratura
S Swiss Calibration Service

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1003_Jan18**

CALIBRATION CERTIFICATE

Object D750V3 - SN:1003

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

Calibration date: January 15, 2018

BN
01-25-2018

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 NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

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

Issued: January 15, 2018

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.28 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.42 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.0 ± 6 %	0.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.58 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.71 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.8 Ω - 2.1 jΩ
Return Loss	- 27.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.2 Ω - 6.2 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L

SAR result with SAM Head (Top)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**7.94 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.32 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.22 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.52 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Neck)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.06 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.52 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Ear)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.67 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.70 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**4.60 W/kg ± 16.9 % (k=2)**

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

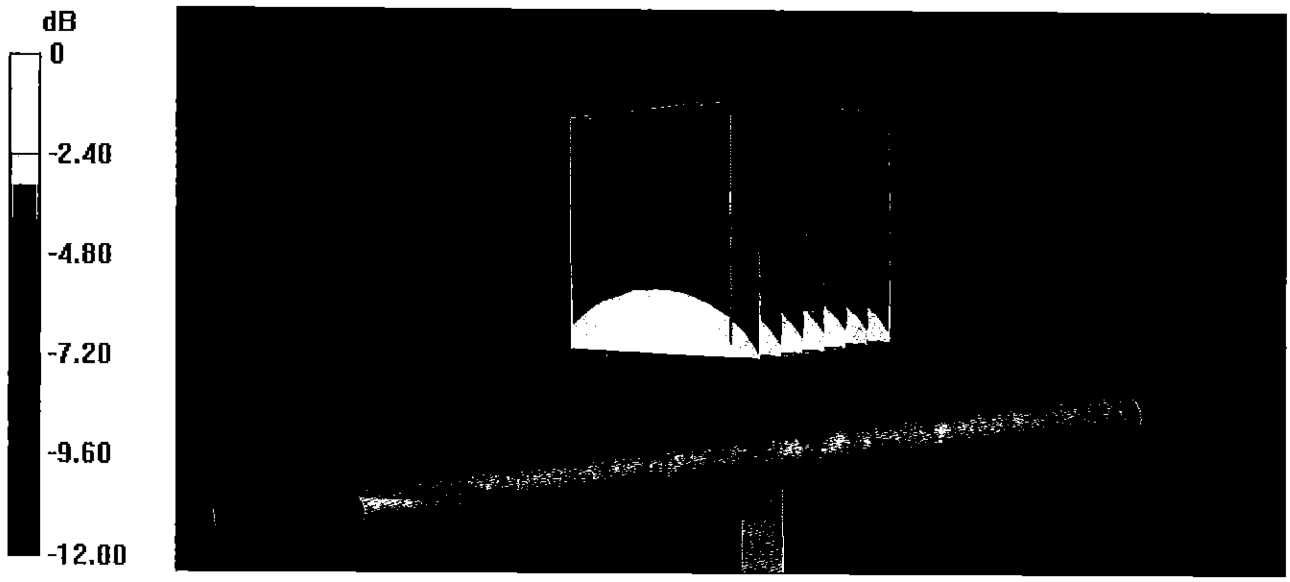
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

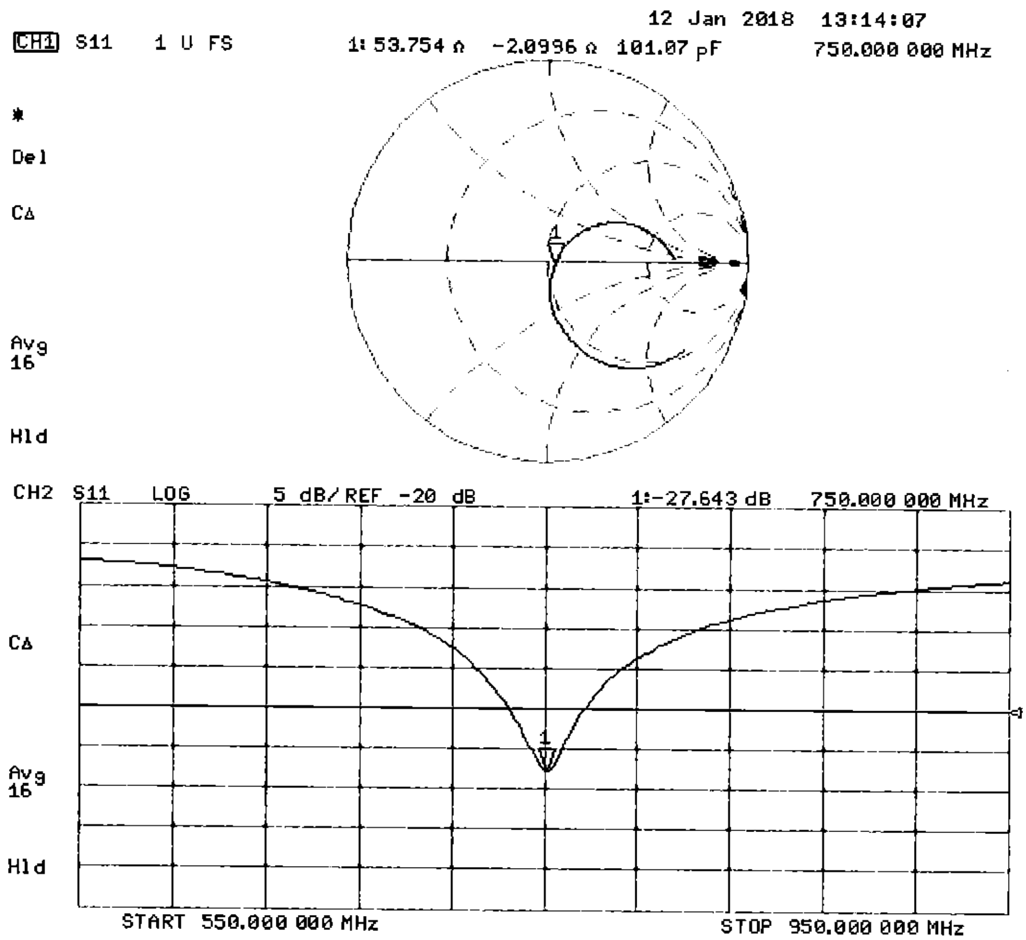
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.11 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.15 W/kg
SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 W/kg
Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

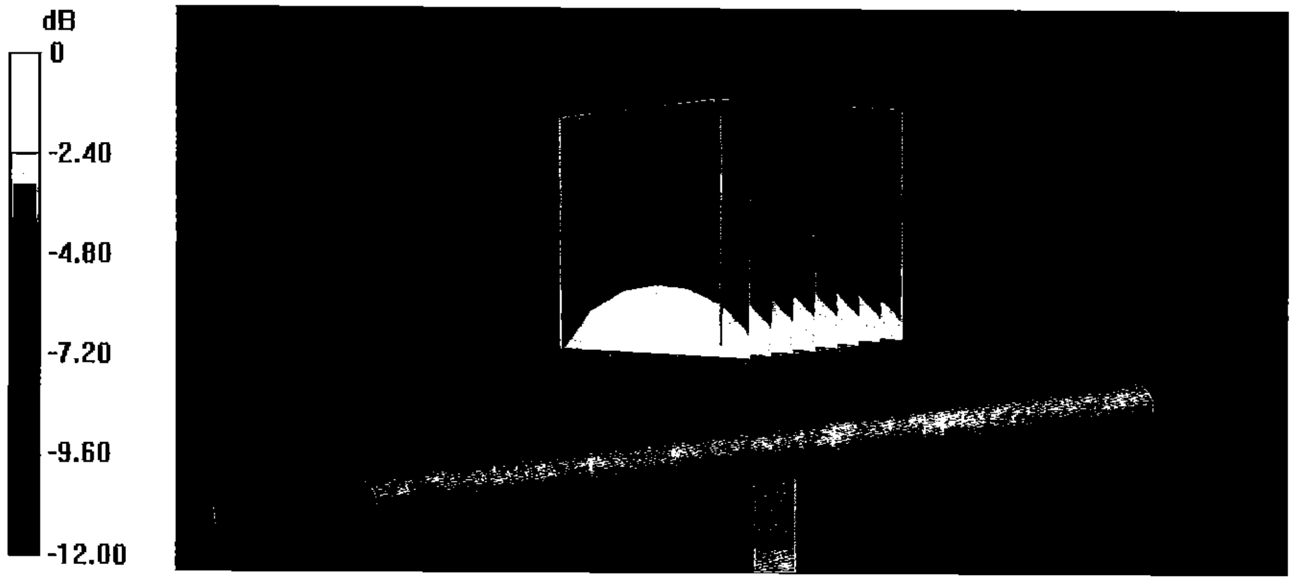
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.96$ S/m; $\varepsilon_r = 55$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

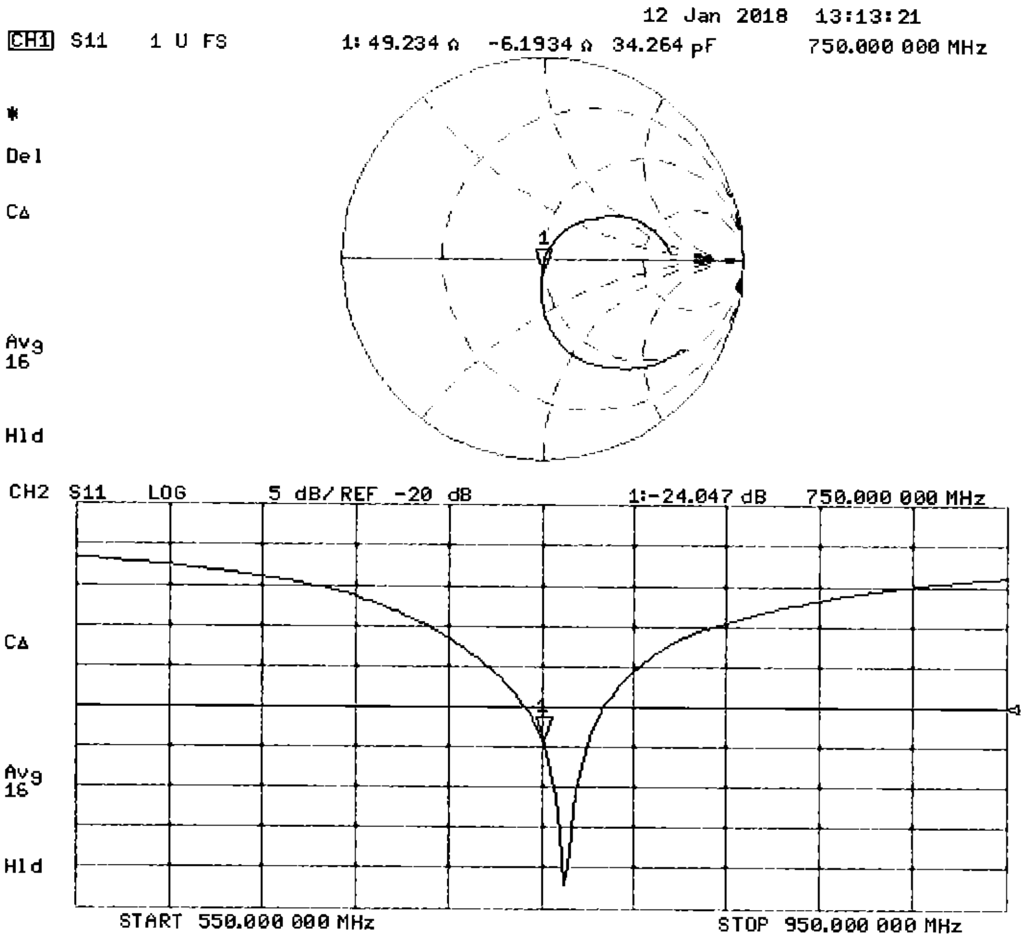
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x8x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.31 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.17 W/kg
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.43 W/kg
Maximum value of SAR (measured) = 2.83 W/kg



0 dB = 2.83 W/kg = 4.52 dBW/kg

Impedance Measurement Plot for Body TSL



Date: 15.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 44.2; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

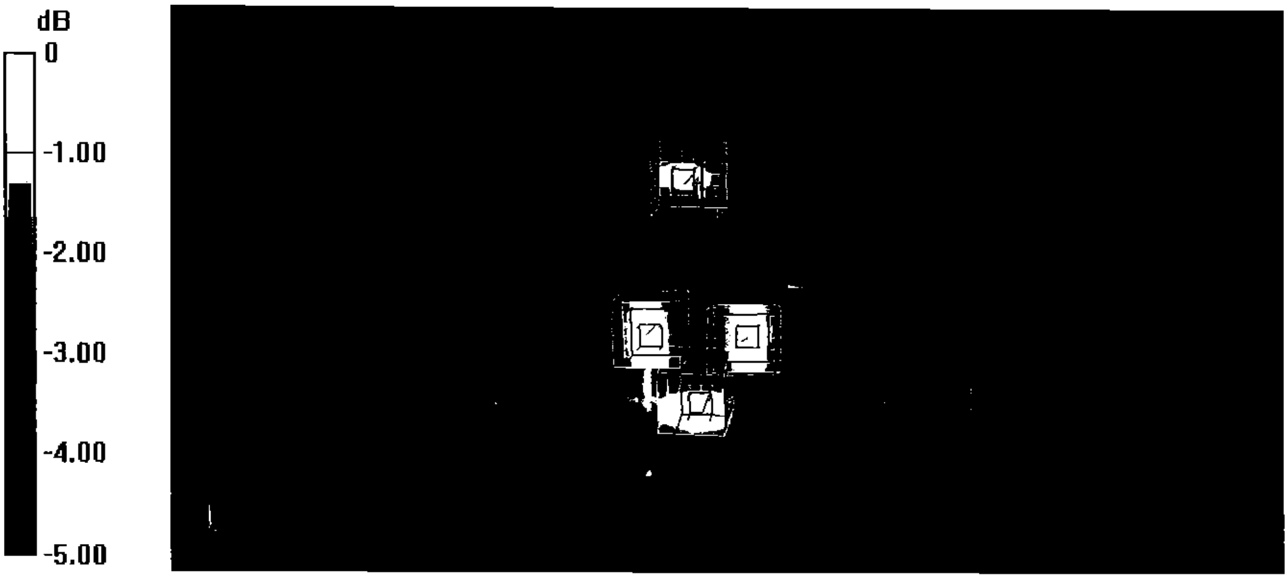
- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

SAM Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.79 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 2.89 W/kg
SAR(1 g) = 1.98 W/kg; SAR(10 g) = 1.33 W/kg
Maximum value of SAR (measured) = 2.58 W/kg

SAM Head/Mouth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.85 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.94 W/kg
SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.38 W/kg
Maximum value of SAR (measured) = 2.62 W/kg

SAM Head/Neck/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.29 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 2.78 W/kg
SAR(1 g) = 2.01 W/kg; SAR(10 g) = 1.38 W/kg
Maximum value of SAR (measured) = 2.56 W/kg

SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.01 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 2.31 W/kg
SAR(1 g) = 1.67 W/kg; SAR(10 g) = 1.15 W/kg
Maximum value of SAR (measured) = 2.11 W/kg



0 dB = 2.58 W/kg = 4.12 dBW/kg

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

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

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1054_Mar17**

CALIBRATION CERTIFICATE

Object D750V3 - SN:1054

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

BN✓
03-27-2017

BN✓
04-04-2018

Calibration date: March 07, 2017

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 NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	04-Jan-17 (No. DAE4-601_Jan17)	Jan-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Johannes Kurikka	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 14, 2017

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

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

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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.37 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.60 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.6 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.61 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.68 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.7 Ω - 0.7 jΩ
Return Loss	- 26.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.7 Ω - 3.6 jΩ
Return Loss	- 28.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.033 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 08, 2011

DASY5 Validation Report for Head TSL

Date: 07.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

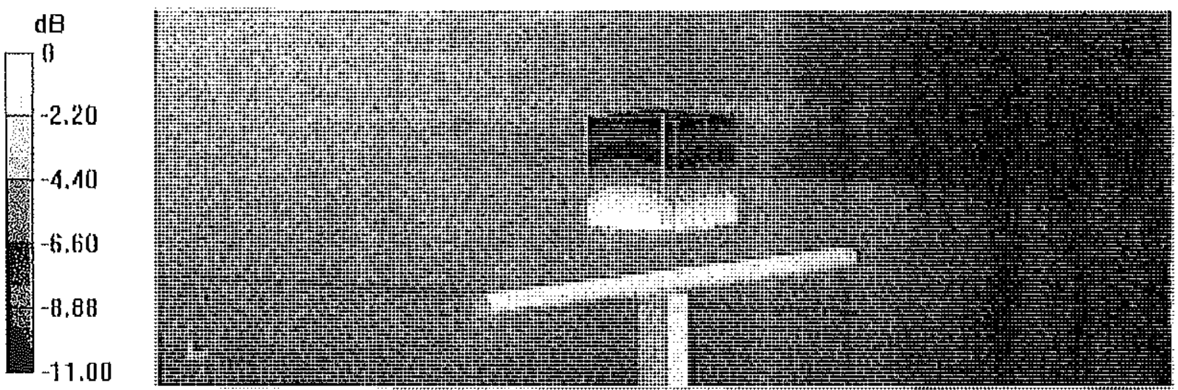
Communication System: UID 0 - CW ; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.91 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.17, 10.17, 10.17); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

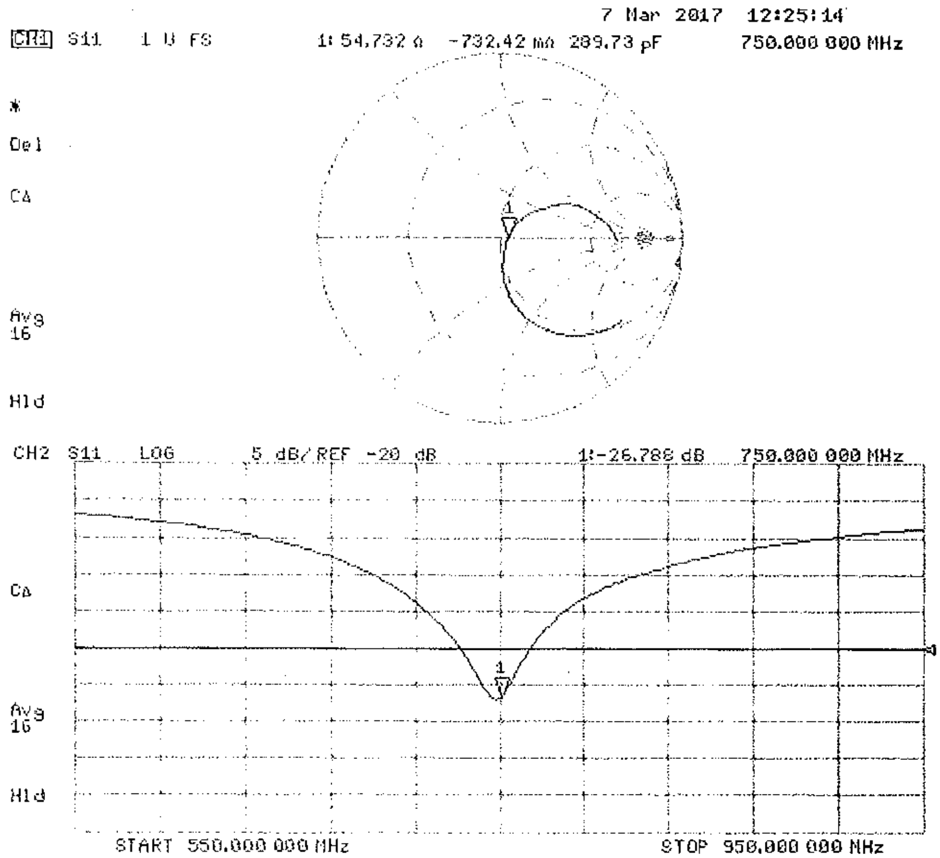
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.71 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.21 W/kg
SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.4 W/kg
Maximum value of SAR (measured) = 2.85 W/kg



0 dB = 2.85 W/kg = 4.55 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

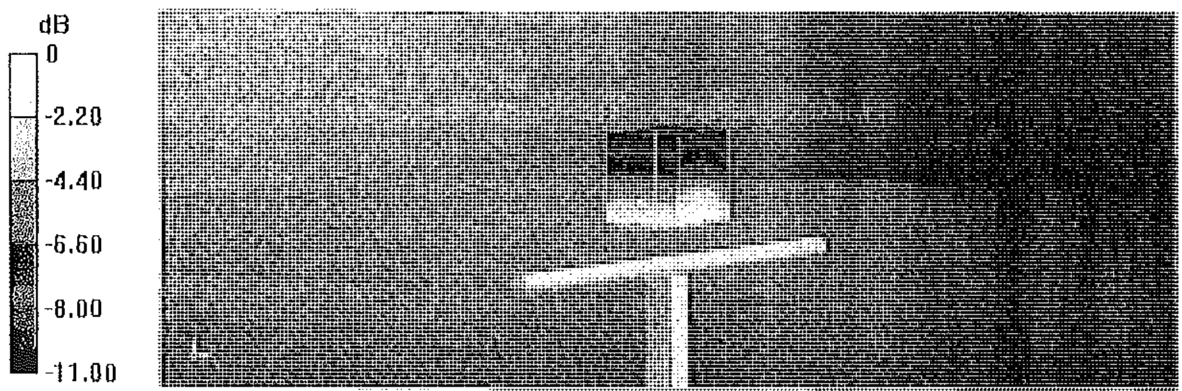
Communication System: UID 0 - CW ; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.99$ S/m; $\varepsilon_r = 54.6$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.99, 9.99, 9.99); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

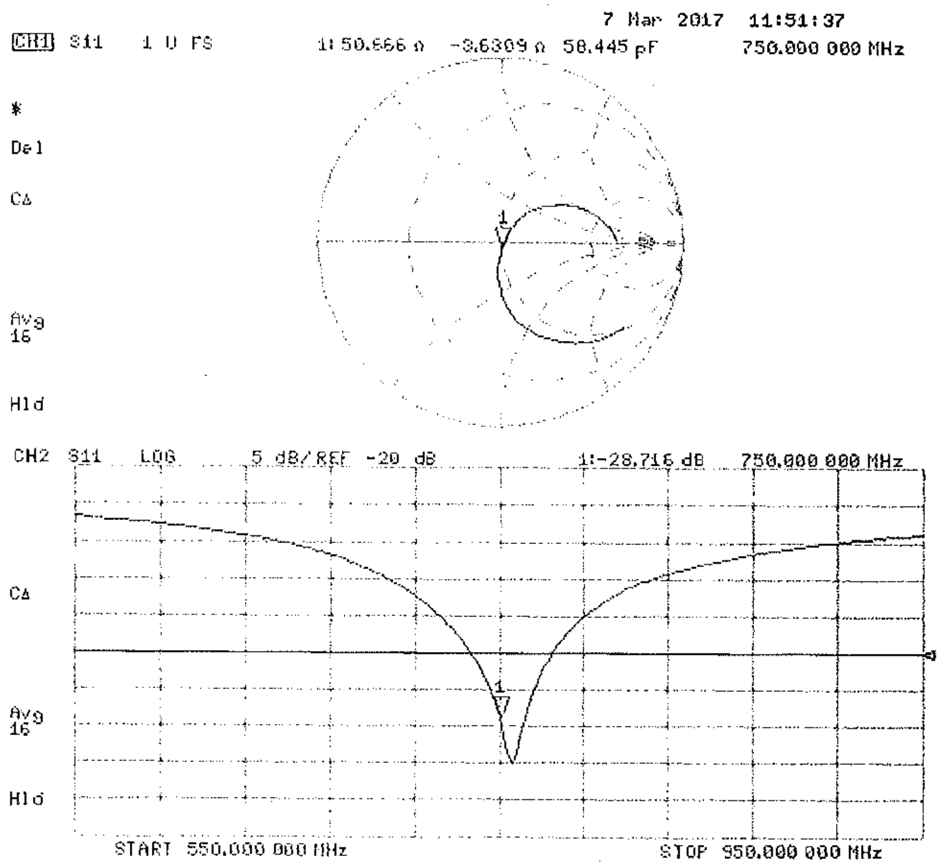
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.88 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.31 W/kg
SAR(1 g) = 2.21 W/kg; SAR(10 g) = 1.45 W/kg
Maximum value of SAR (measured) = 2.94 W/kg



0 dB = 2.94 W/kg = 4.68 dBW/kg

Impedance Measurement Plot for Body TSL



Certification of Calibration

Object	D750V3 – SN:1054
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	March 07, 2018
Description:	SAR Validation Dipole at 750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	8/3/2017	Annual	8/3/2018	MY40000670
Agilent	N5182A	MXG Vector Signal Generator	1/24/2018	Annual	1/24/2019	MY47420651
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	10/16/2017	Annual	10/16/2018	1126066
Anritsu	ML2495A	Power Meter	10/22/2017	Annual	10/22/2018	1328004
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	1/22/2018	Annual	1/22/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/13/2017	Annual	7/13/2018	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/21/2017	Annual	6/21/2018	1333
SPEAG	EX3DV4	SAR Probe	7/17/2017	Annual	7/17/2018	7410
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Test Engineer	BRODIE HALBFOSTER
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	KOK

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

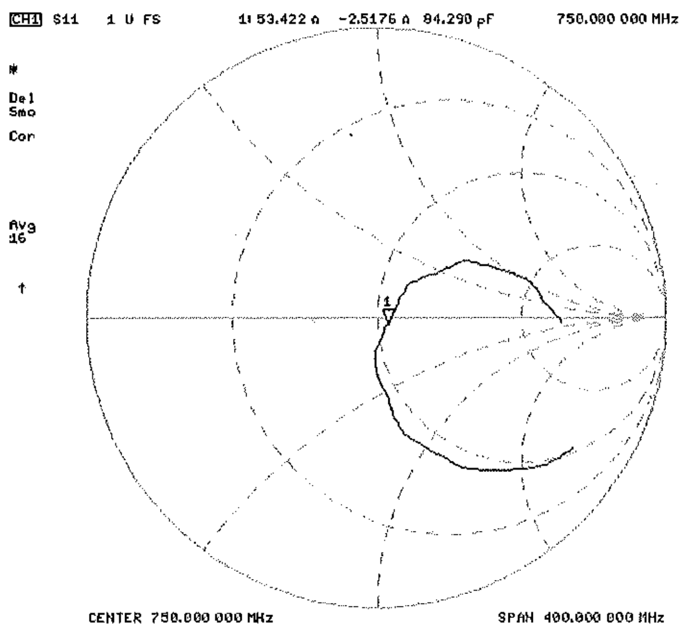
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

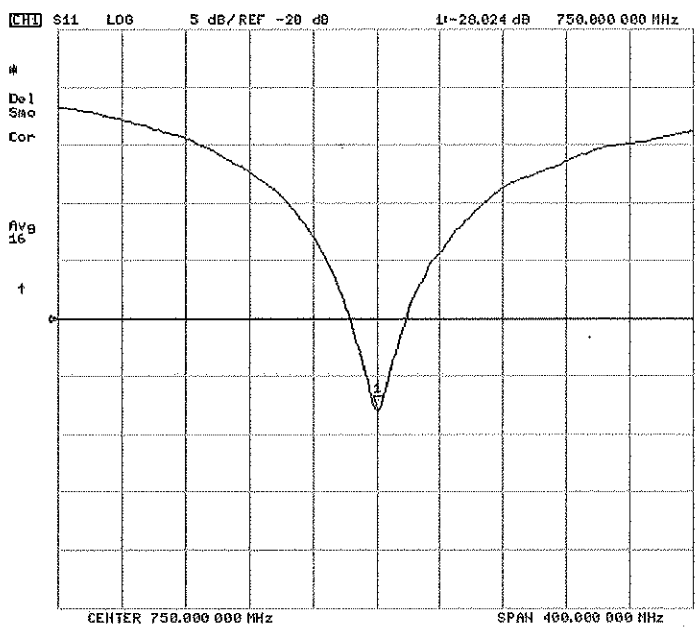
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
3/7/2017	3/7/2018	1.033	1.67	1.70	1.56%	1.10	1.11	0.91%	54.7	53.4	1.3	-0.7	-2.5	1.8	-26.8	-28.0	-4.60%	PASS

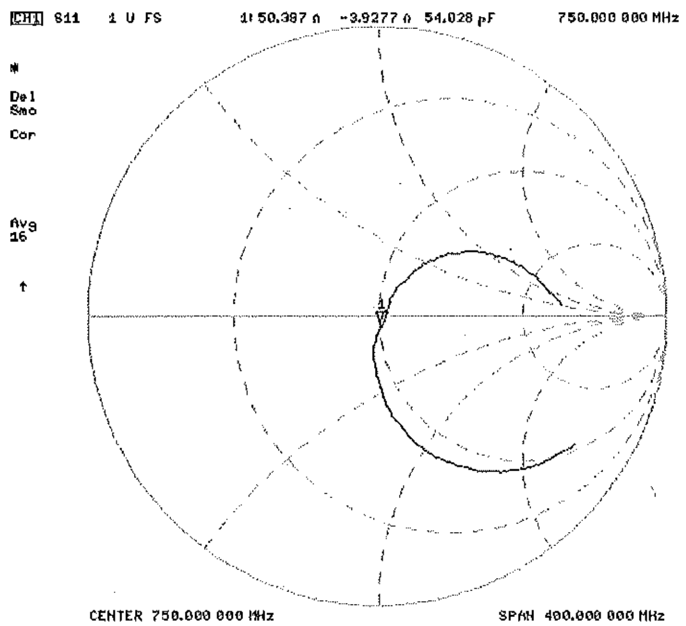
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
3/7/2017	3/7/2018	1.033	1.72	1.70	-1.20%	1.14	1.12	-1.41%	50.7	50.4	0.3	-3.6	-3.9	0.3	-28.7	-28.5	0.60%	PASS

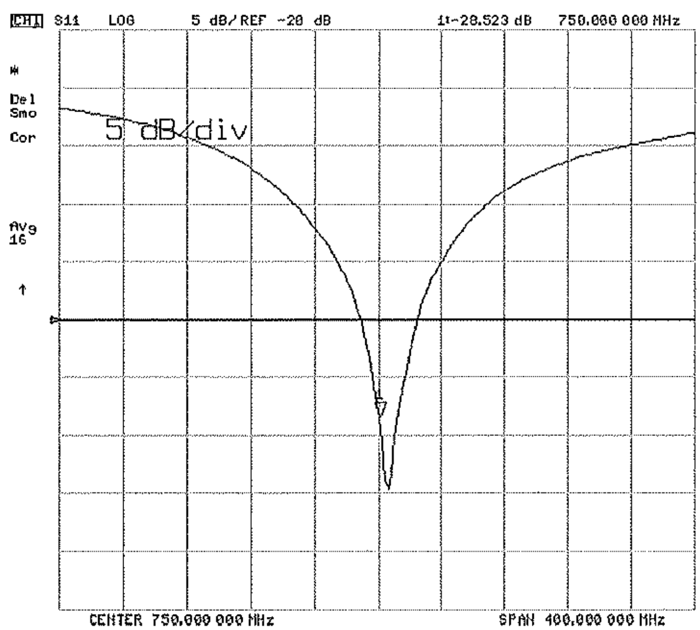
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





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

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

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D835V2-4d132_Jan18**

CALIBRATION CERTIFICATE

Object	D835V2 - SN:4d132
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 15, 2018

BN✓
01-25-2018

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 NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

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

Issued: January 15, 2018

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.7 ± 6 %	0.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.36 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.10 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.8 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.71 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.39 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω - 2.9 jΩ
Return Loss	- 29.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 5.7 jΩ
Return Loss	- 23.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L

SAR result with SAM Head (Top)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.41 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.21 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.69 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.64 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.45 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Neck)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.22 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.25 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Ear)

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.03 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**7.96 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.39 W/kg ± 16.9 % (k=2)**

DASY5 Validation Report for Head TSL

Date: 08.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

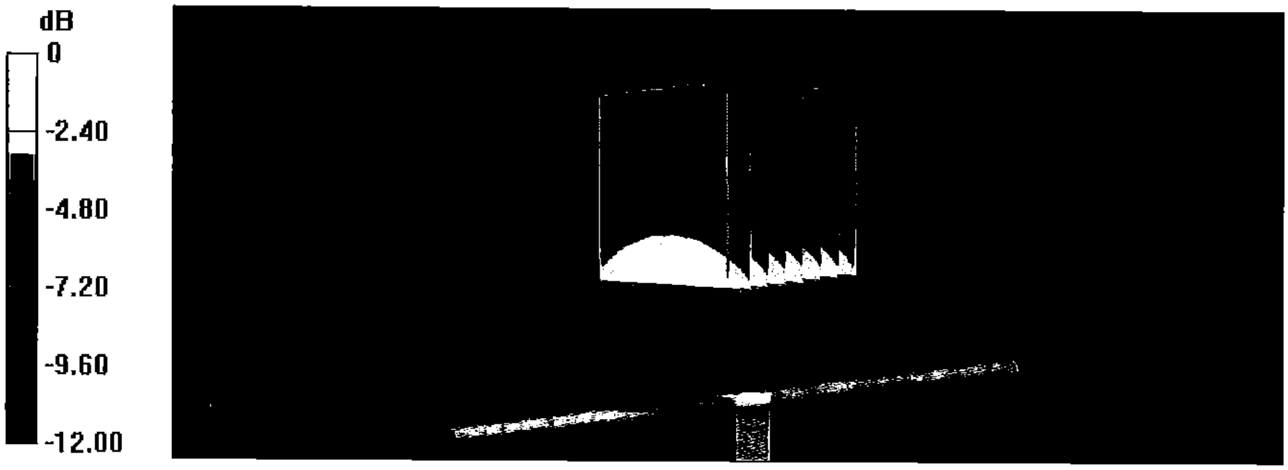
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

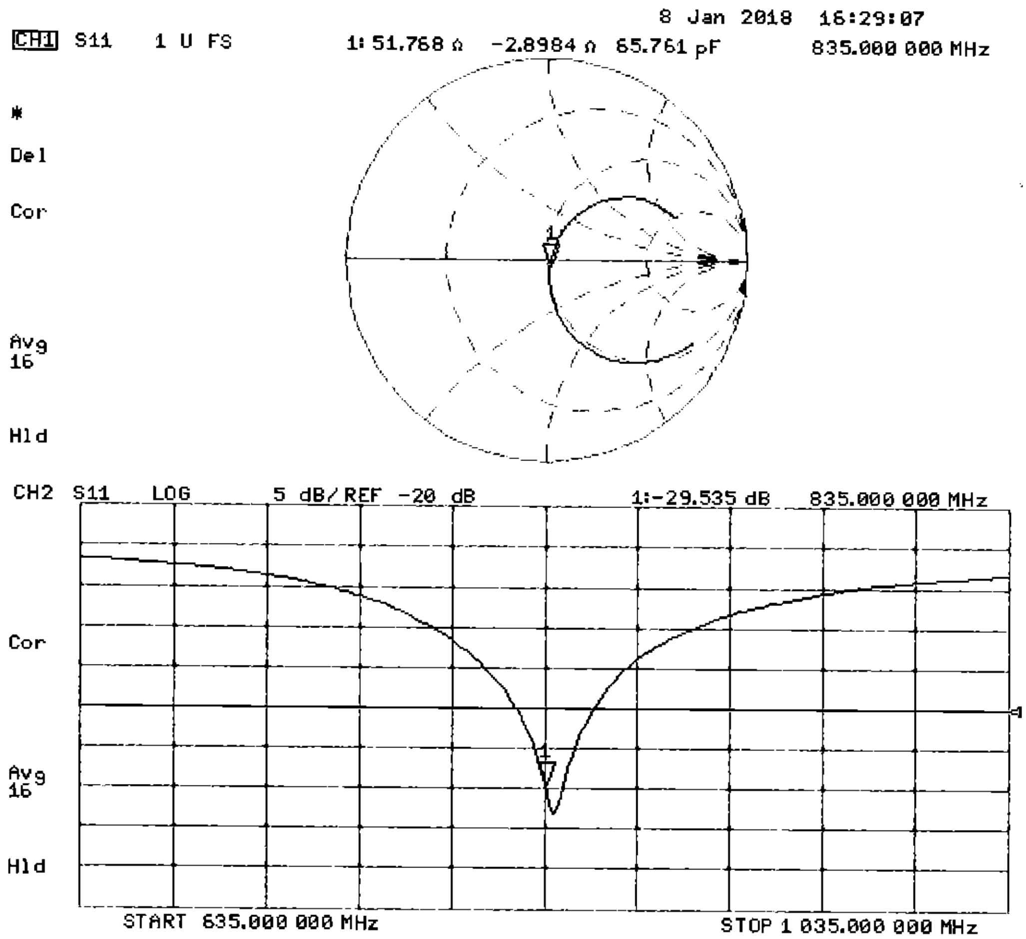
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.23 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 3.22 W/kg



0 dB = 3.22 W/kg = 5.08 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

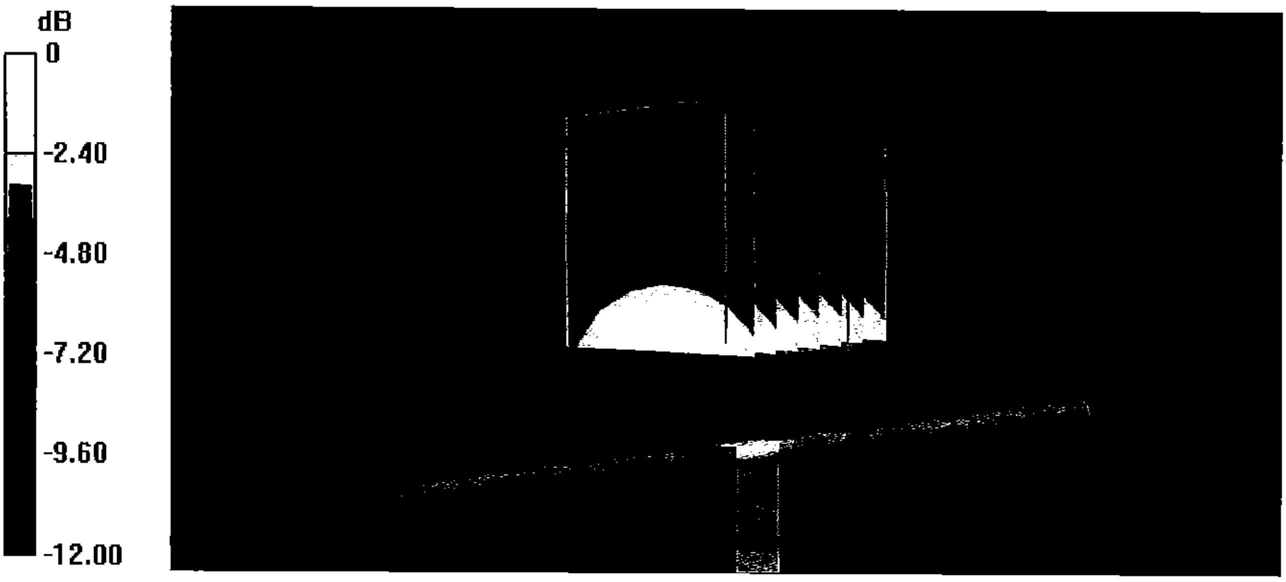
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 54.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

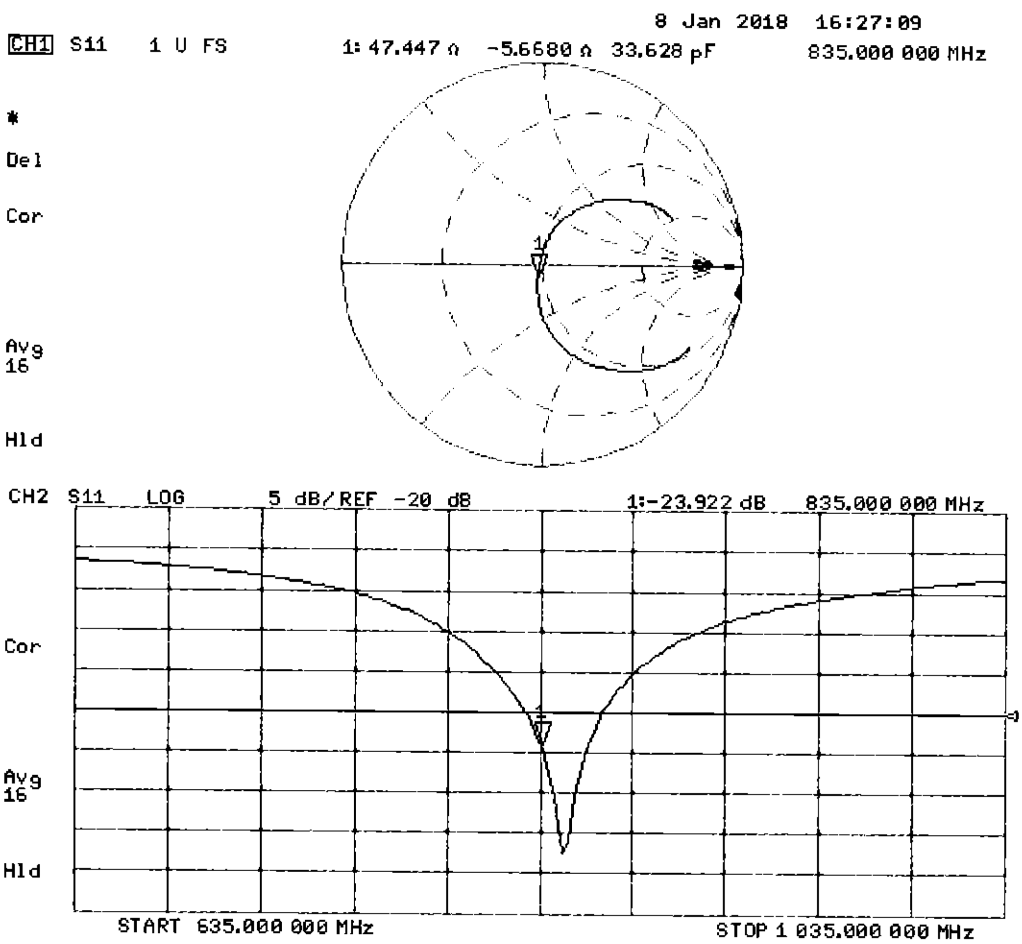
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.55 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 3.66 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.62 W/kg
Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 15.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 44.1; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

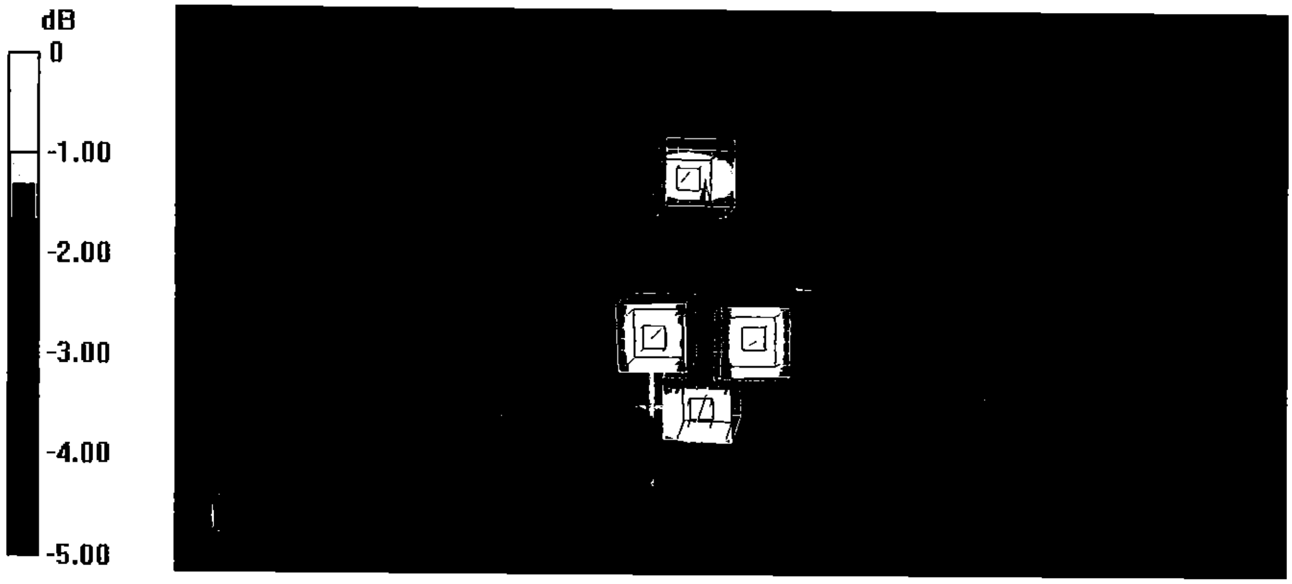
- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

SAM Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.00 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.56 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 3.16 W/kg

SAM Head/Mouth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.99 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.65 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.64 W/kg
Maximum value of SAR (measured) = 3.19 W/kg

SAM Head/Neck/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.20 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 3.33 W/kg
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.59 W/kg
Maximum value of SAR (measured) = 3.04 W/kg

SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.03 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 2.90 W/kg
SAR(1 g) = 2.03 W/kg; SAR(10 g) = 1.37 W/kg
Maximum value of SAR (measured) = 2.61 W/kg



0 dB = 2.61 W/kg = 4.17 dBW/kg

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 0108

Client **PC Test**

Certificate No: D835V2-4d047_Oct18

CALIBRATION CERTIFICATE

Object: D835V2 - SN:4d047

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

BN ✓
10-30-2018

Calibration date: October 19, 2018

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 NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 22, 2018

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.47 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.14 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.9 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.71 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.36 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$51.0\ \Omega - 0.5\ j\Omega$
Return Loss	- 39.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$45.6\ \Omega - 4.1\ j\Omega$
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.387 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 16, 2006

DASY5 Validation Report for Head TSL

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

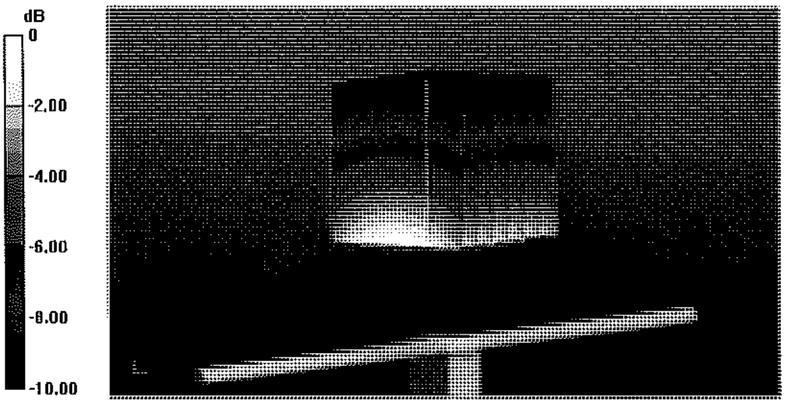
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma = 0.91$ S/m; $\varepsilon_r = 40.6$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

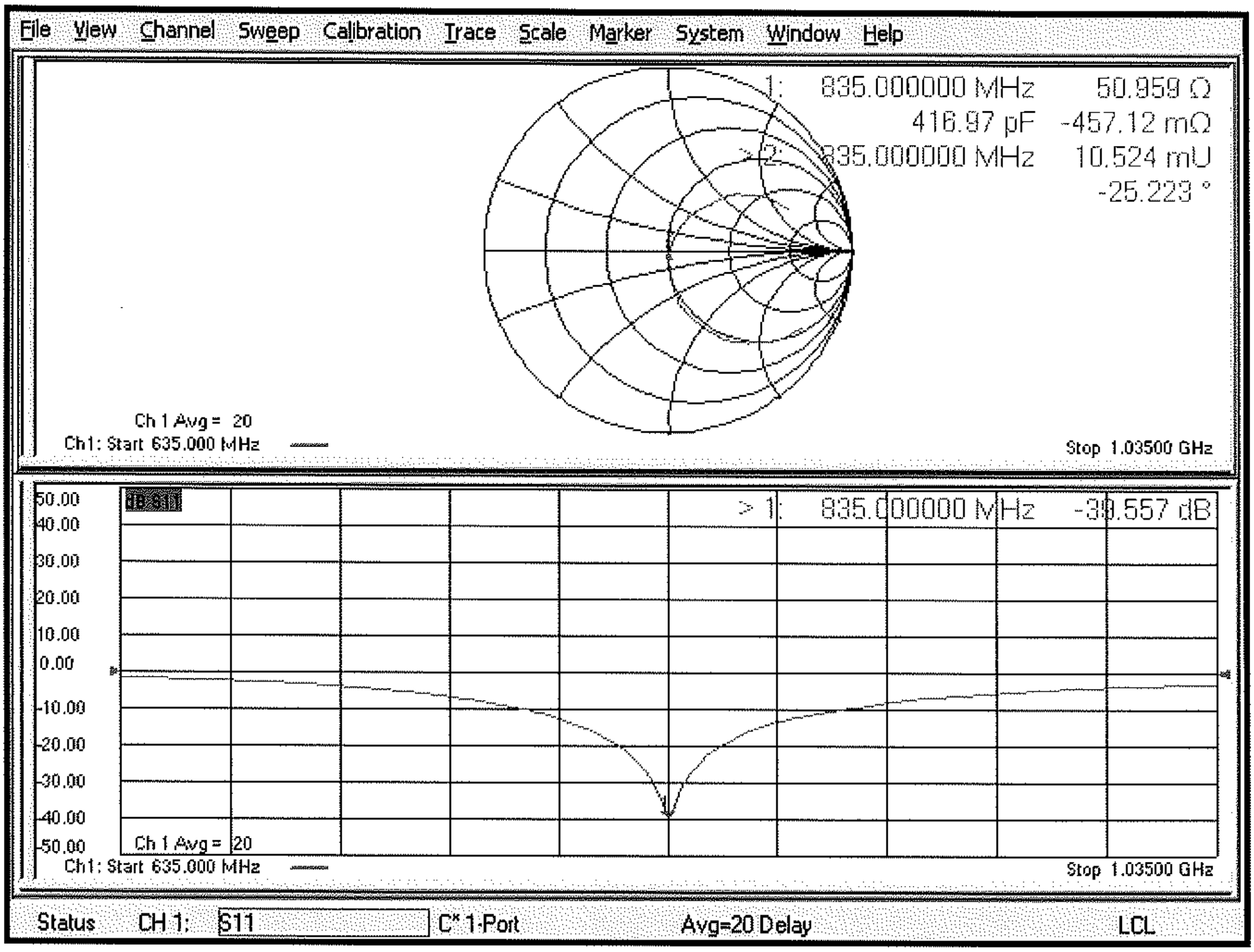
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.84 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

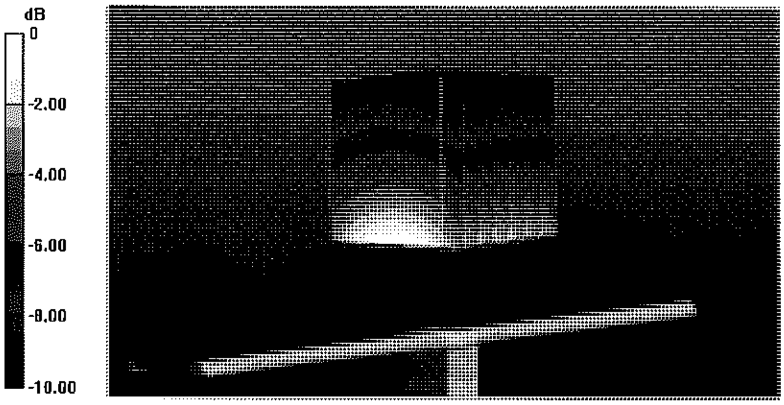
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.98 S/m; ε_r = 54.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

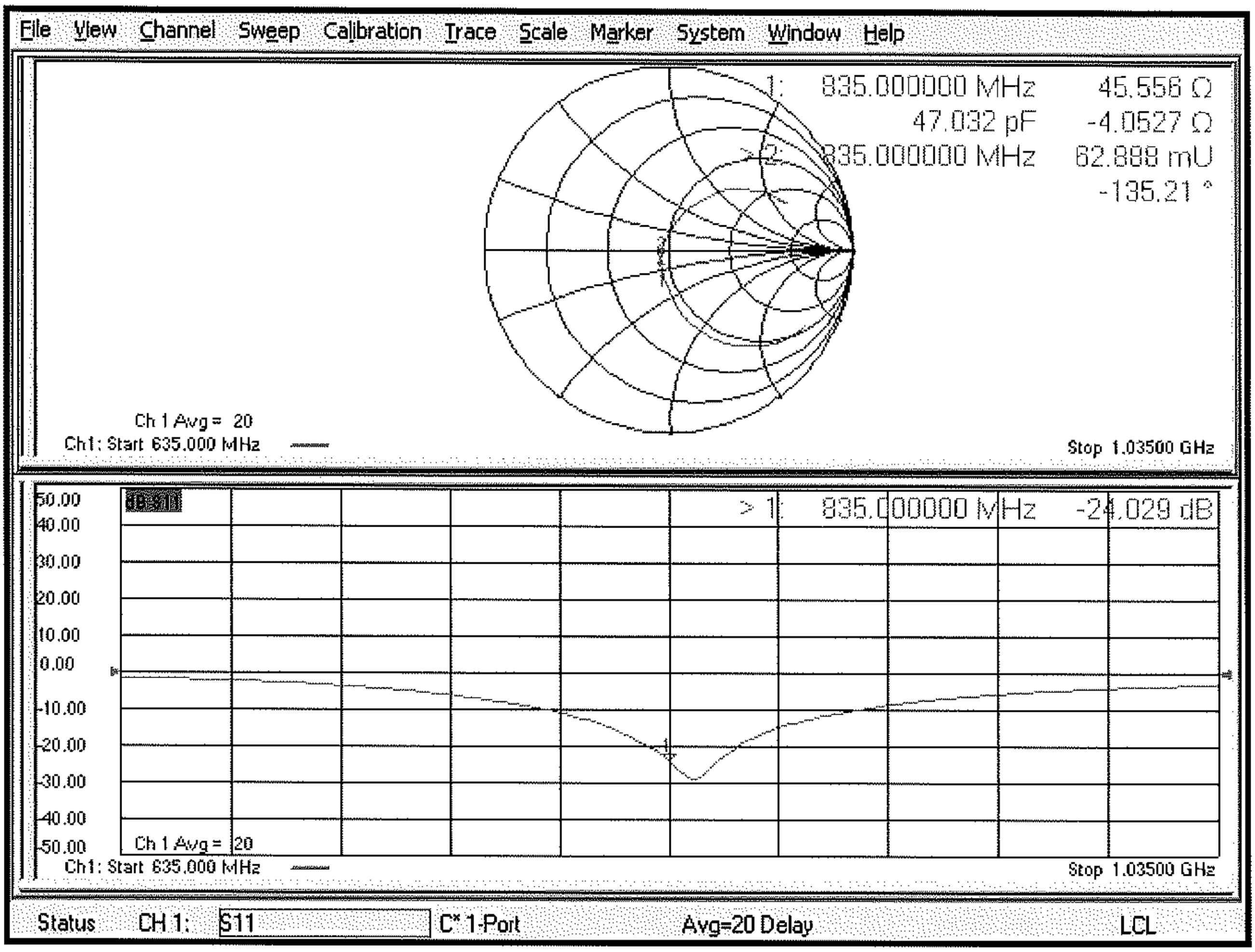
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.27 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.68 W/kg
SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D835V2-4d133_Oct18

CALIBRATION CERTIFICATE

Object	D835V2 - SN:4d133
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	October 19, 2018

BN ✓
10/30/2018

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 NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 22, 2018

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.43 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.10 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.9 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.75 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.40 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6 Ω - 2.4 jΩ
Return Loss	- 32.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.0 Ω - 6.7 jΩ
Return Loss	- 21.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.397 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 19.10.2018

Test Laboratory: The name of your organization

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

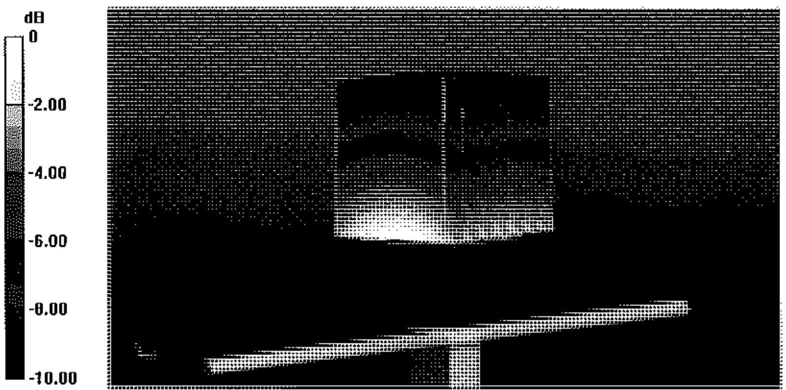
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.91 S/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

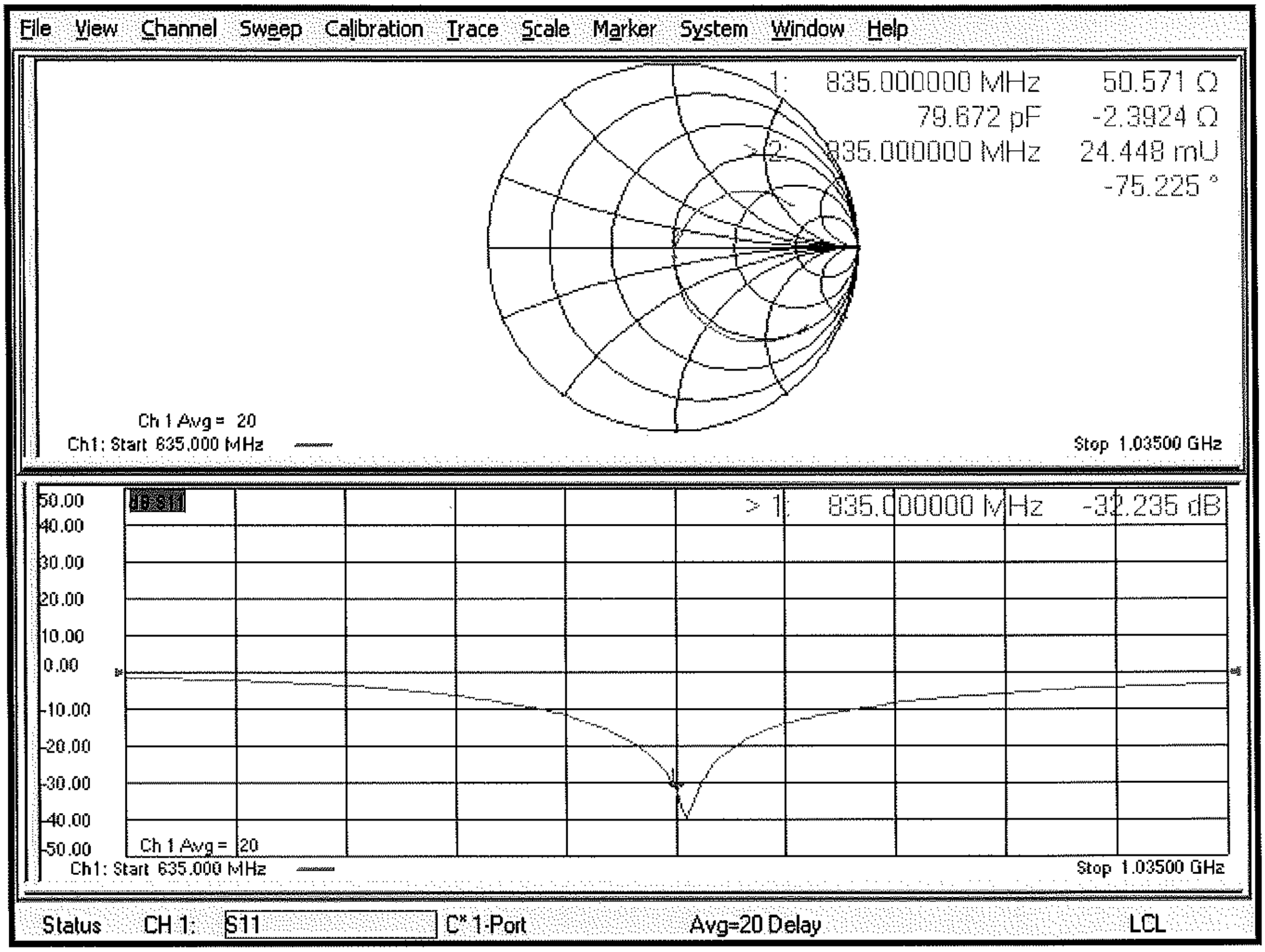
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.02 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.68 W/kg
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.54 W/kg
Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

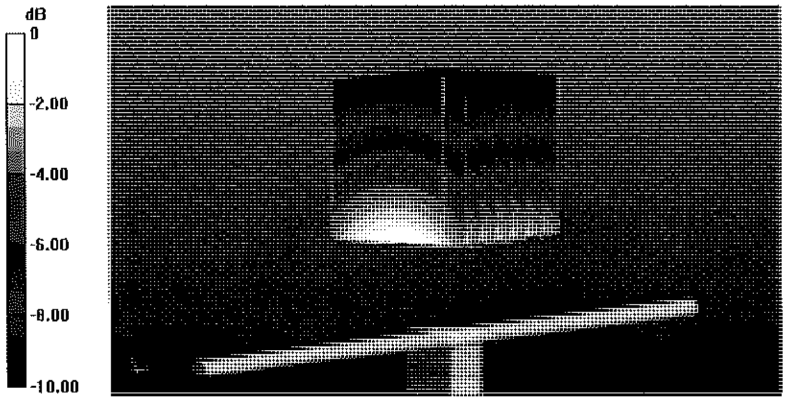
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.98 S/m; ε_r = 54.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

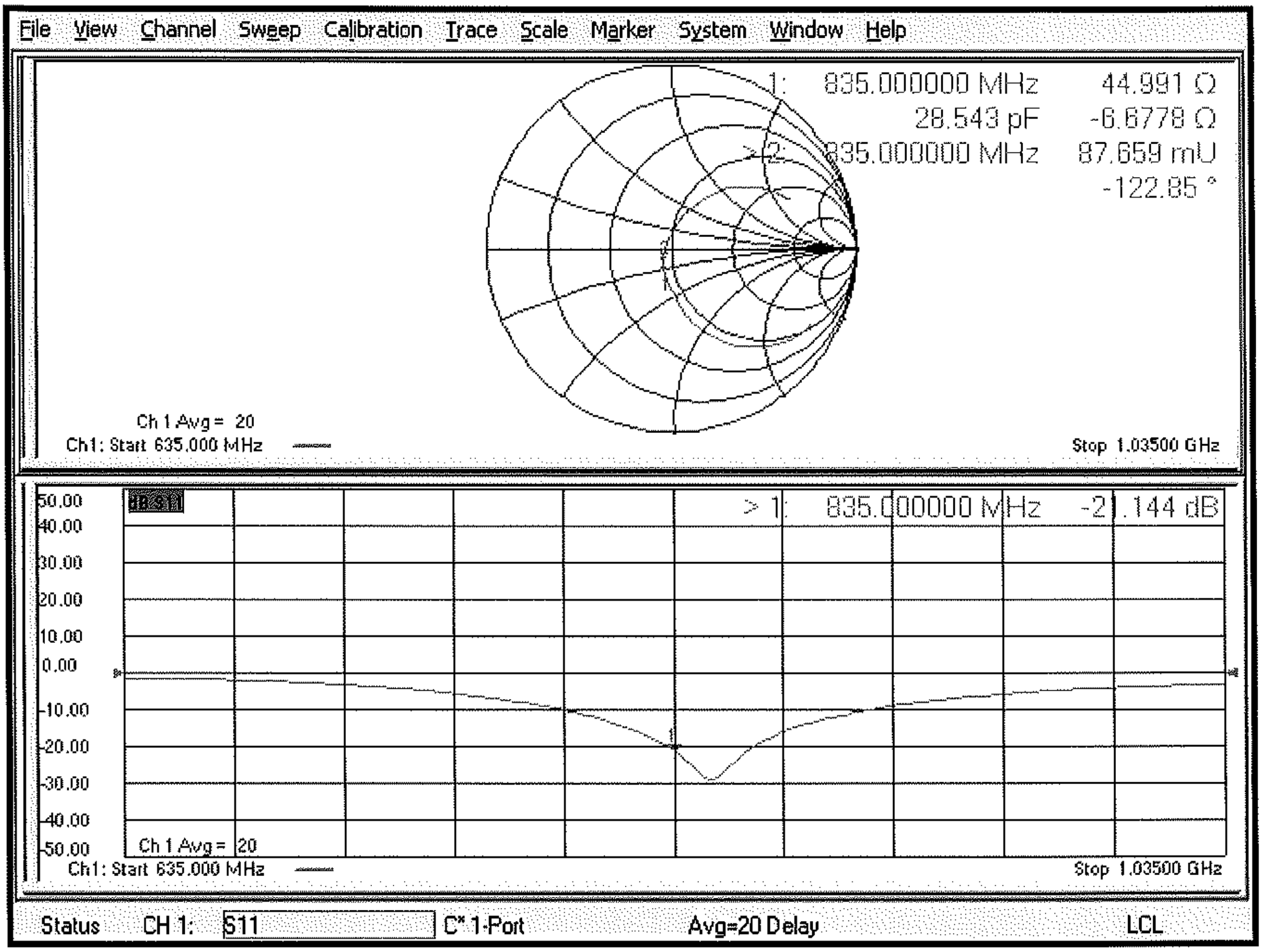
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.61 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.61 W/kg
Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1750V2-1148_May17**

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1148
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 09, 2017

BN ✓
05-23-2017
BN ✓
05-09-2018

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 NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

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

Issued: May 11, 2017

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.7 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.93 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.8 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 0.7 jΩ
Return Loss	- 42.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.7 Ω - 0.5 jΩ
Return Loss	- 26.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.223 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 30, 2014

DASY5 Validation Report for Head TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

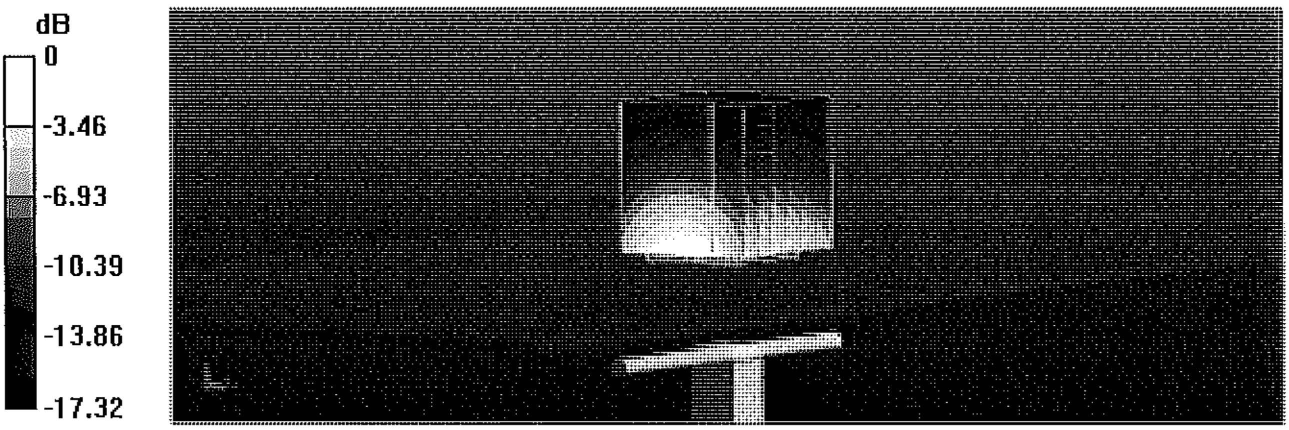
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.46, 8.46, 8.46); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

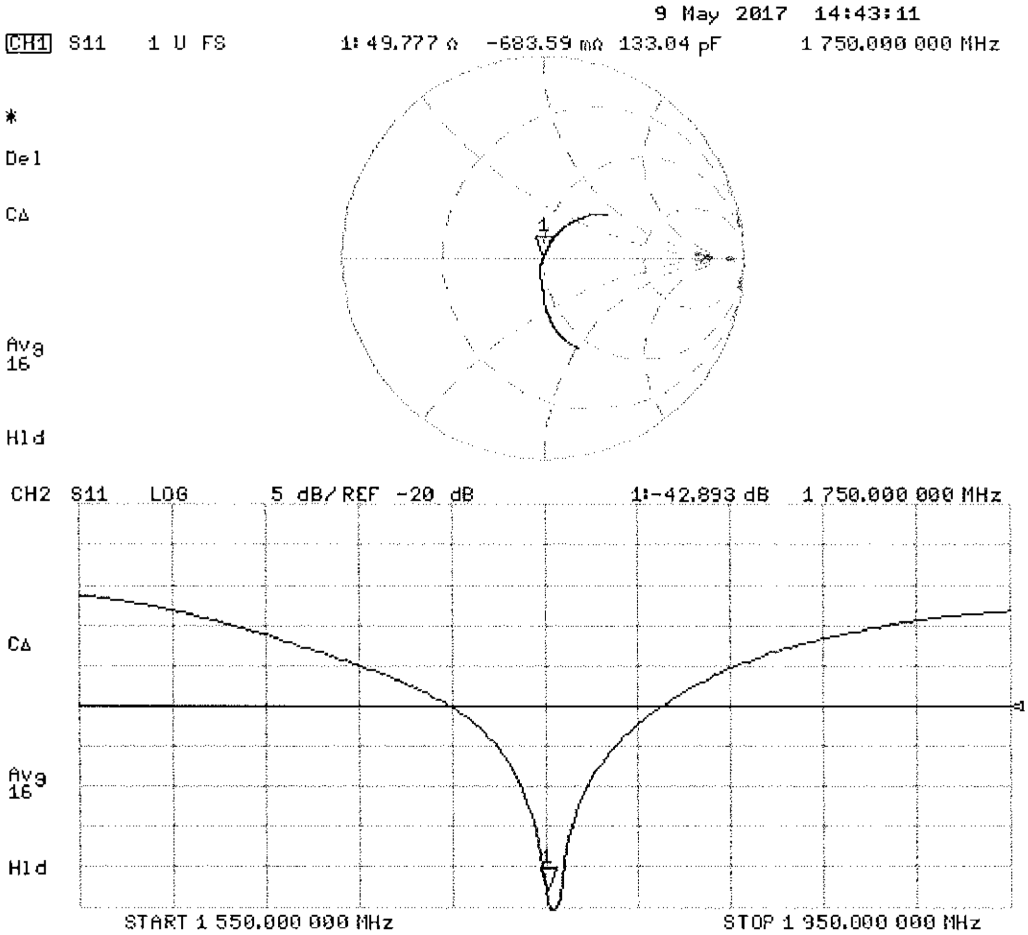
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.4 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 16.5 W/kg
SAR(1 g) = 9.11 W/kg; SAR(10 g) = 4.83 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

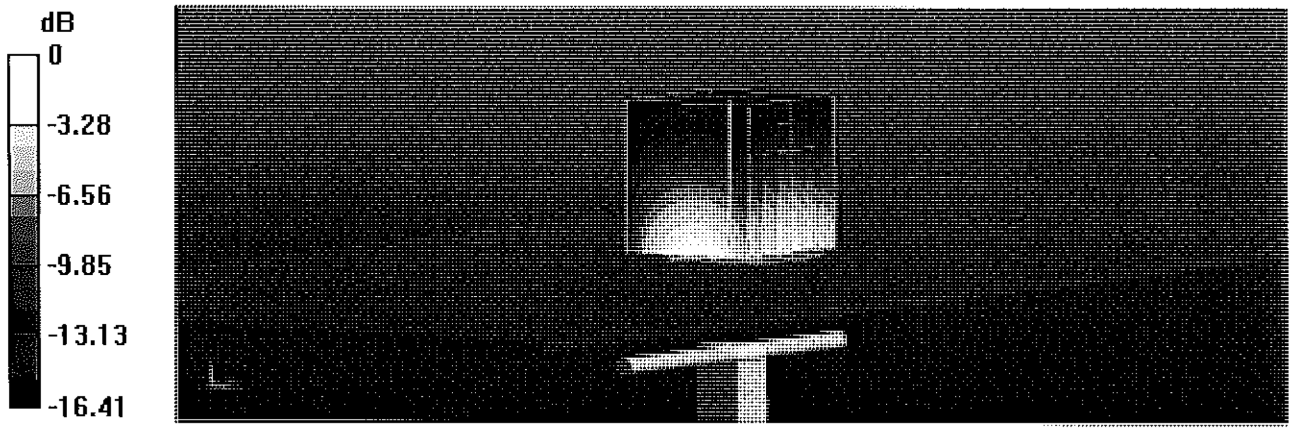
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma = 1.47$ S/m; $\varepsilon_r = 53.7$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.25, 8.25, 8.25); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

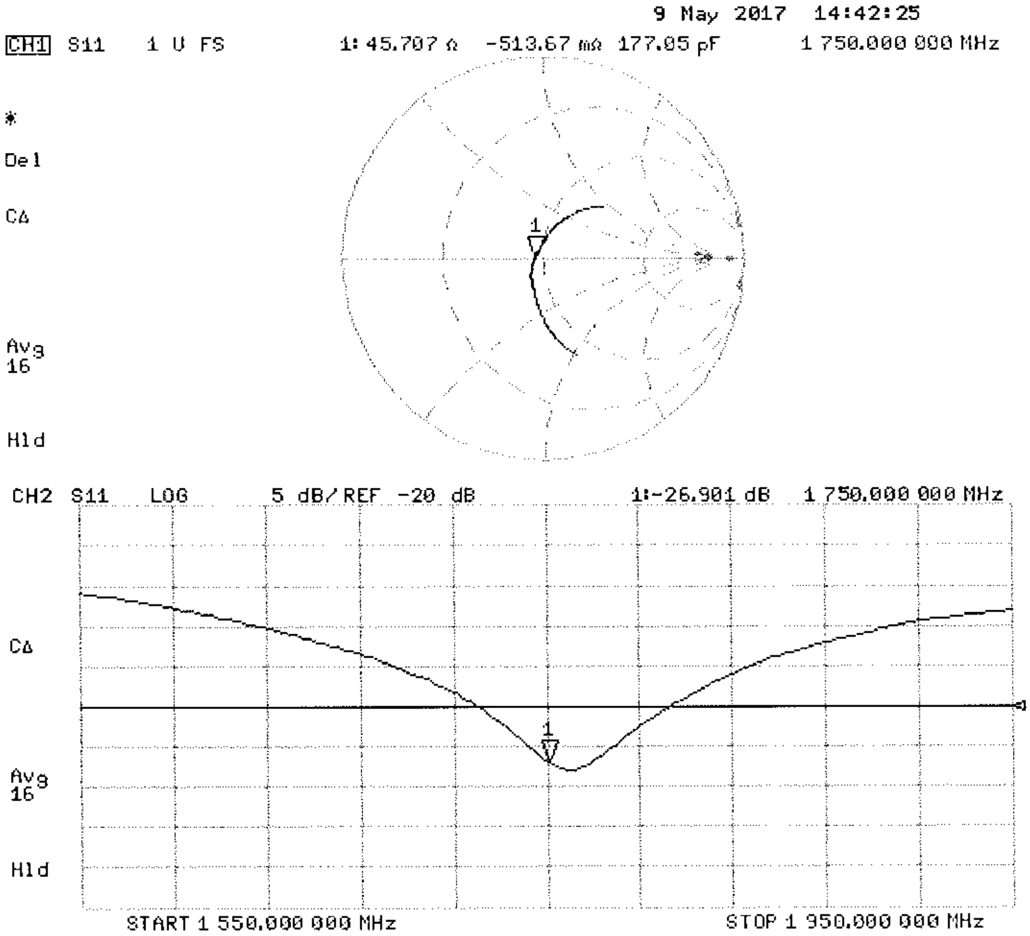
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.49 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 15.9 W/kg
SAR(1 g) = 9.17 W/kg; SAR(10 g) = 4.93 W/kg
Maximum value of SAR (measured) = 13.1 W/kg



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

Impedance Measurement Plot for Body TSL



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

Certification of Calibration

Object D1750V2 – SN: 1148

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: May 09, 2018

Description: SAR Validation Dipole at 1750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2018	Annual	2/9/2019	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/21/2017	Annual	6/21/2018	1333
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/12/2017	Annual	9/12/2018	1091
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287
SPEAG	ES3DV3	SAR Probe	2/13/2018	Annual	2/13/2019	3213
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1339018
Agilent	N5182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Pasternack	NC-100	Torque Wrench	4/18/2018	Annual	4/18/2019	1445
Anritsu	ML2495A	Power Meter	10/22/2017	Annual	10/22/2018	941001

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Test Engineer	BRODIE HALBFOSTER
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	KOK

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

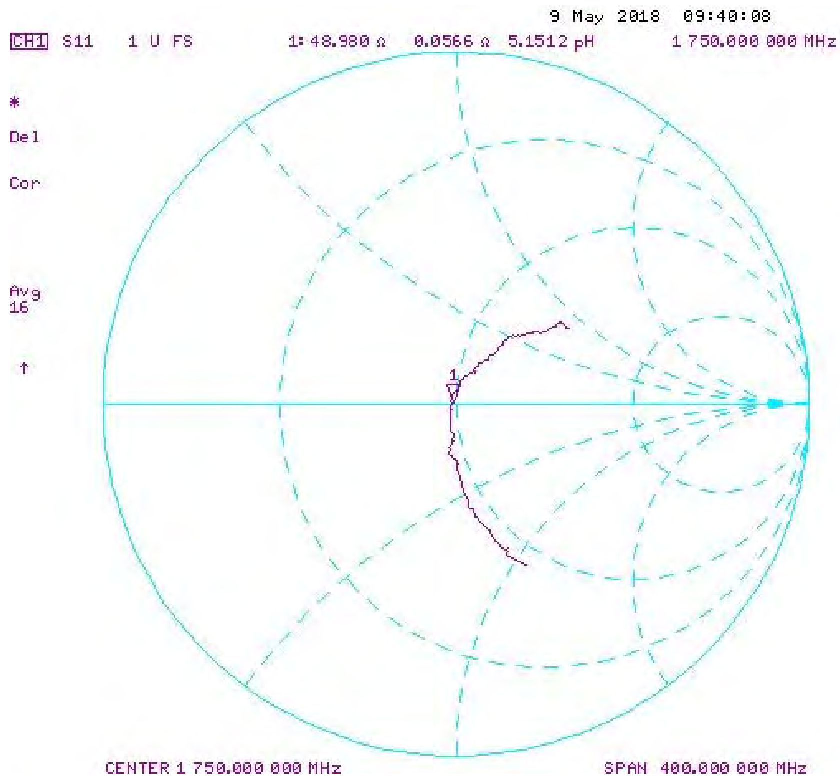
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

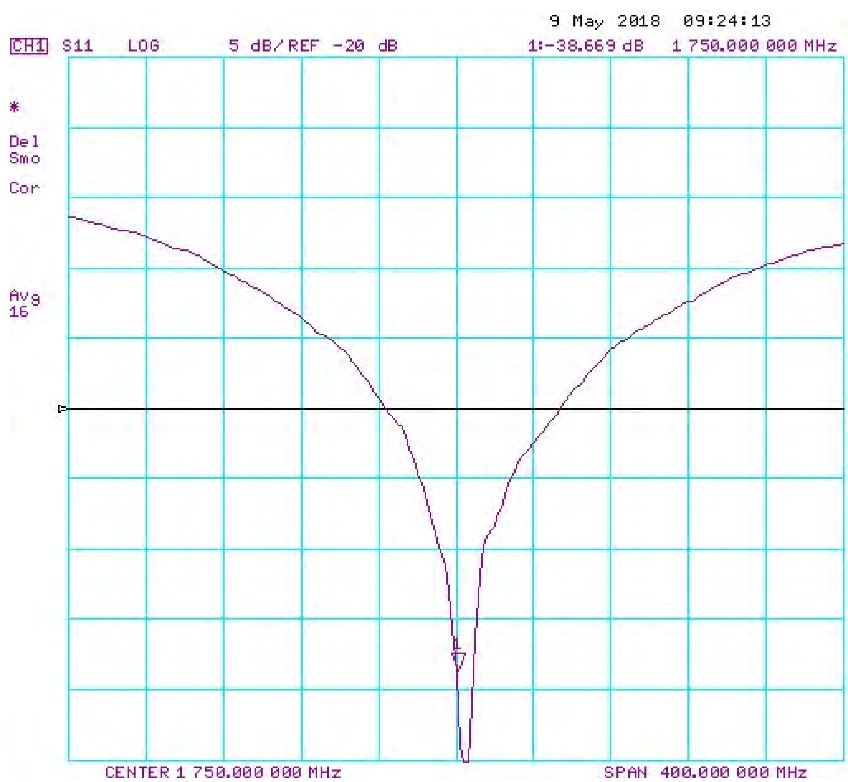
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5/9/2017	5/9/2018	1.223	3.64	3.59	-1.37%	1.93	1.91	-1.04%	49.8	49.0	0.8	-0.7	0.1	0.8	-42.9	-38.7	9.90%	PASS

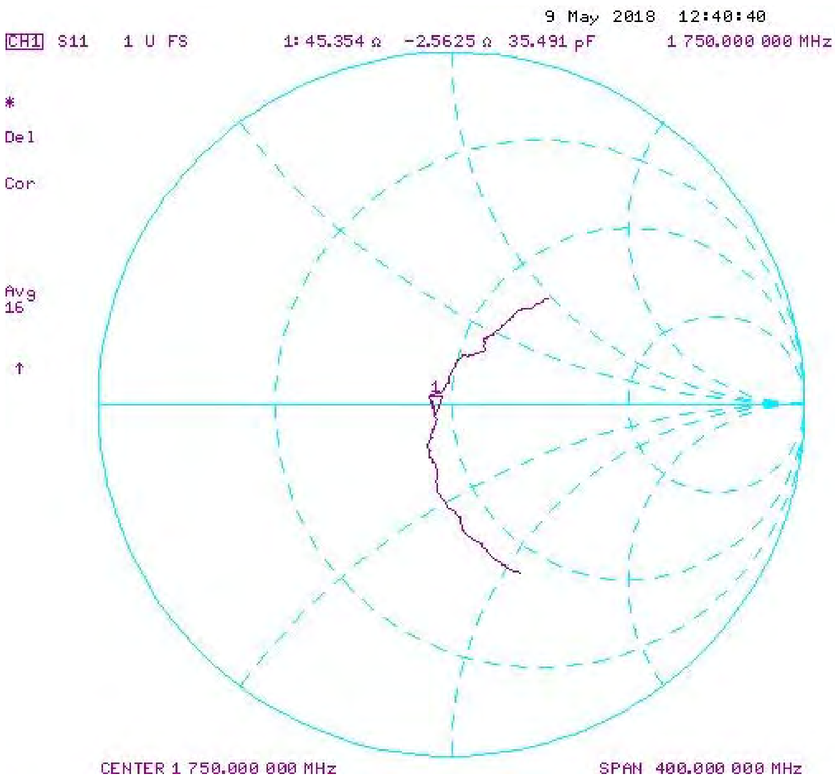
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5/9/2017	5/9/2018	1.223	3.7	3.88	4.86%	1.98	2.06	4.04%	45.7	45.4	0.3	-0.5	-2.6	2.1	-26.9	-25.0	7.20%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL



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

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

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

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D1750V2-1150_Oct18

CALIBRATION CERTIFICATE

Object: D1750V2 - SN:1150

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

BN✓
10/30/2018

Calibration date: October 22, 2018

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 NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 22, 2018

Glossary:

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

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.8 ± 6 %	1.33 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.2 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.5 ± 6 %	1.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**36.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.82 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.4 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9 Ω - 0.4 jΩ
Return Loss	- 40.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6 Ω - 0.1 jΩ
Return Loss	- 29.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.217 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	April 10, 2015

DASY5 Validation Report for Head TSL

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1150

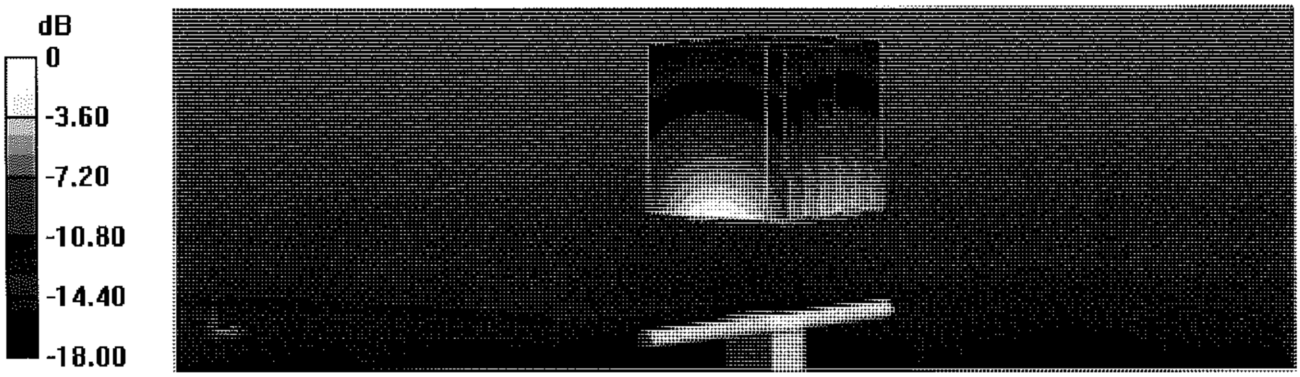
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.33 S/m; ε_r = 38.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 108.1 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 9.02 W/kg; SAR(10 g) = 4.76 W/kg
Maximum value of SAR (measured) = 14.0 W/kg



0 dB = 14.0 W/kg = 11.46 dBW/kg