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SAR EVALUATION REPORT

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

Date of Testing:
04/14/19 - 05/02/19
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
1M1904050055-01-R2.ZNF

FCC ID: **ZNFX420MM**

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

DUT Type: Portable Handset
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model: LM-X420MM
Additional Model(s): LMX420MM, X420MM

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	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.43	0.47	0.48	N/A
PCE	UMTS 850	826.40 - 846.60 MHz	0.42	0.40	0.43	N/A
PCE	UMTS 1750	1712.4 - 1752.6 MHz	0.49	0.98	0.98	2.49
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.27	0.38	0.51	N/A
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.51	0.77	0.77	2.95
PCE	LTE Band 71	665.5 - 695.5 MHz	0.23	0.41	0.41	N/A
PCE	LTE Band 12	699.7 - 715.3 MHz	0.33	0.44	0.44	N/A
PCE	LTE Band 26 (Cell)	814.7 - 848.3 MHz	0.37	0.36	0.42	N/A
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 66 (AWS)	1710.7 - 1779.3 MHz	0.44	0.82	0.82	2.60
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.44	0.75	0.81	2.97
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 7	2502.5 - 2567.5 MHz	0.41	0.53	0.90	2.94
PCE	LTE Band 41	2498.5 - 2687.5 MHz	0.28	0.20	0.53	N/A
DTS	2.4 GHz WLAN	2412 - 2462 MHz	1.25	0.79	0.79	N/A
NII	U-NII-1	5180 - 5240 MHz	N/A	N/A	0.49	N/A
NII	U-NII-2A	5260 - 5320 MHz	0.96	0.49	N/A	1.36
NII	U-NII-2C	5500 - 5720 MHz	0.97	0.48	N/A	1.28
NII	U-NII-3	5745 - 5825 MHz	1.05	0.56	0.56	N/A
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A	< 0.1	N/A	< 0.1
Simultaneous SAR per KDB 690783 D01v01r03:			1.58	1.57	1.59	3.99

Note: This revised Test Report (S/N: 1M1904050055-01-R2.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.8 of this report; for North American frequency bands only.

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

Randy Ortanez
President

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.

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 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 26 (Cell)	Voice/Data	814.7 - 848.3 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 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 7	Voice/Data	2502.5 - 2567.5 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 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
NFC	Data	13.56 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.

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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 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**	**26.7**	**26.7**	**26.2**	**25.7**
	Nominal	**32.2**	**32.2**	**31.7**	**30.2**	**28.7**	**26.2**	**26.2**	**25.7**	**25.2**
GSM/GPRS/EDGE 1900	Maximum	**31.2**	**31.2**	**29.2**	**27.2**	**25.7**	**26.2**	**26.2**	**25.2**	**25.2**
	Nominal	**30.7**	**30.7**	**28.7**	**26.7**	**25.2**	**25.7**	**25.7**	**24.7**	**24.7**

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	**24.4**	**24.4**	**24.4**
	Nominal	**23.9**	**23.9**	**23.9**
UMTS Band 2 (1900 MHz)	Maximum	**24.4**	**24.4**	**24.4**
	Nominal	**23.9**	**23.9**	**23.9**

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Mode / Band		Modulated Average (dBm)
LTE Band 71	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 12	Maximum	**25.2**
	Nominal	**24.7**
LTE Band 26 (Cell)	Maximum	**25.2**
	Nominal	**24.7**
LTE Band 5 (Cell)	Maximum	**25.2**
	Nominal	**24.7**
LTE Band 66 (AWS)	Maximum	**24.4**
	Nominal	**23.9**
LTE Band 4 (AWS)	Maximum	**24.4**
	Nominal	**23.9**
LTE Band 25 (PCS)	Maximum	**24.4**
	Nominal	**23.9**
LTE Band 2 (PCS)	Maximum	**24.4**
	Nominal	**23.9**
LTE Band 7	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 41 (PC3)	Maximum	**24.2**
	Nominal	**23.7**
LTE Band 41 (PC2)	Maximum	**27.2**
	Nominal	**26.7**

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Mode / Band		Modulated Average - Single Tx Chain (dBm)						
	Channel	1	2	3	4-6	7-9	10	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)
Bluetooth	Maximum	**9.0**
	Nominal	**8.0**
Bluetooth LE	Maximum	**0.0**
	Nominal	**-1.0**

Mode / Band		Modulated Average - Single Tx Chain (dBm)												
		20 MHz Bandwidth								40 MHz Bandwidth				80 MHz Bandwidth
	Channel	36	40-60	64	100	104-136	140-149	153-161	165	38	46-54	62-102	110-159	42-155
IEEE 802.11a (5 GHz)	Maximum	**17.5**	**18.0**	**17.5**	**16.0**	**17.5**	**17.5**	**18.5**	**17.5**					
	Nominal	**16.5**	**17.0**	**16.5**	**15.0**	**16.5**	**16.5**	**17.5**	**16.5**					
IEEE 802.11n (5 GHz)	Maximum	**14.5**	**16.0**	**15.0**	**13.5**	**15.5**	**15.5**	**16.5**	**15.5**	**13.5**	**15.5**	**13.5**	**15.5**	
	Nominal	**13.5**	**15.0**	**14.0**	**12.5**	**14.5**	**14.5**	**15.5**	**14.5**	**12.5**	**14.5**	**12.5**	**14.5**	
IEEE 802.11ac (5 GHz)	Maximum	**15.0**	**16.5**	**15.5**	**14.5**	**16.0**	**16.0**	**16.5**	**16.0**	**13.0**	**15.0**	**13.0**	**15.0**	**12.5**
	Nominal	**14.0**	**15.5**	**14.5**	**13.5**	**15.0**	**15.0**	**15.5**	**15.0**	**12.0**	**14.0**	**12.0**	**14.0**	**11.5**

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1.3.2 Reduced Output Power

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	*3GPP HSDPA*	*3GPP HSUPA*
UMTS Band 4 (1750 MHz)	Maximum	**22.9**	**22.9**	**22.9**
	Nominal	**22.4**	**22.4**	**22.4**
UMTS Band 2 (1900 MHz)	Maximum	**22.9**	**22.9**	**22.9**
	Nominal	**22.4**	**22.4**	**22.4**

Mode / Band		Modulated Average (dBm)
LTE Band 66 (AWS)	Maximum	**21.9**
	Nominal	**21.4**
LTE Band 4 (AWS)	Maximum	**21.9**
	Nominal	**21.4**
LTE Band 25 (PCS)	Maximum	**22.9**
	Nominal	**22.4**
LTE Band 2 (PCS)	Maximum	**22.9**
	Nominal	**22.4**
LTE Band 7	Maximum	**23.2**
	Nominal	**22.7**

Mode / Band		Modulated Average (dBm)						
	Channel	1	2	3	4-6	7-9	10	11
IEEE 802.11b (2.4 GHz)	Maximum	**18.0**						
	Nominal	**17.0**						
IEEE 802.11g (2.4 GHz)	Maximum	**13.0**	**15.0**	**17.0**	**17.5**	**16.5**	**14.5**	**12.5**
	Nominal	**12.0**	**14.0**	**16.0**	**16.5**	**15.5**	**13.5**	**11.5**
IEEE 802.11n (2.4 GHz)	Maximum	**13.0**	**15.0**	**17.0**	**17.5**	**16.5**	**14.5**	**12.5**
	Nominal	**12.0**	**14.0**	**16.0**	**16.5**	**15.5**	**13.5**	**11.5**

Mode / Band		Modulated Average - Single Tx Chain (dBm)												
		20 MHz Bandwidth								40 MHz Bandwidth				80 MHz Bandwidth
	Channel	36	40-60	64	100	104-136	140-149	153-161	165	38	46-54	62-102	110-159	42-155
IEEE 802.11a (5 GHz)	Maximum	**13.0**	**13.5**	**13.0**	**11.5**	**13.0**	**13.0**	**14.0**	**13.0**					
	Nominal	**12.0**	**12.5**	**12.0**	**10.5**	**12.0**	**12.0**	**13.0**	**12.0**					
IEEE 802.11n (5 GHz)	Maximum	**13.0**	**13.5**	**13.0**	**11.5**	**13.0**	**13.0**	**14.0**	**13.0**	**11.0**	**13.0**	**11.0**	**13.0**	
	Nominal	**12.0**	**12.5**	**12.0**	**10.5**	**12.0**	**12.0**	**13.0**	**12.0**	**10.0**	**12.0**	**10.0**	**12.0**	
IEEE 802.11ac (5 GHz)	Maximum	**12.0**	**12.5**	**12.0**	**11.0**	**12.0**	**12.0**	**13.0**	**12.0**	**10.5**	**12.5**	**10.5**	**12.5**	**12.5**
	Nominal	**11.0**	**11.5**	**11.0**	**10.0**	**11.0**	**11.0**	**12.0**	**11.0**	**9.5**	**11.5**	**9.5**	**11.5**	**11.5**

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1.4 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. A diagram showing the location of the device antennas can be found in Appendix F. 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
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 1750	Yes	Yes	No	Yes	No	Yes
GPRS 1900	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 26 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 66 (AWS)	Yes	Yes	No	Yes	No	Yes
LTE Band 25 (PCS)	Yes	Yes	No	Yes	No	Yes
LTE Band 7	Yes	Yes	No	Yes	Yes	Yes
LTE Band 41	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN	Yes	Yes	Yes	No	No	Yes
Bluetooth	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 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the device for this model. Therefore, all SAR tests were performed with the device which already incorporates the NFC antenna. A diagram showing the location of the NFC antenna can be found in Appendix F.

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1.6 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	GSM voice + 2.4 GHz WI-FI	Yes	Yes	N/A	Yes	
2	GSM voice + 5 GHz WI-FI	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
4	GSM voice + 2.4 GHz Bluetooth + 5GHz WI-FI	N/A	Yes	N/A	Yes	
5	UMTS + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes	
6	UMTS + 5 GHz WI-FI	Yes	Yes	Yes	Yes	
7	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
8	UMTS + 2.4 GHz Bluetooth + 5GHz WI-FI	N/A	Yes	N/A	Yes	
9	LTE + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes	
10	LTE + 5 GHz WI-FI	Yes	Yes	Yes	Yes	
11	LTE + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
12	LTE + 2.4 GHz Bluetooth + 5GHz WI-FI	N/A	Yes	N/A	Yes	
13	GPRS/EDGE + 2.4 GHz WI-FI	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
14	GPRS/EDGE + 5 GHz WI-FI	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
15	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	Yes*	N/A	Yes	* Pre-installed VOIP applications are considered
16	GPRS/EDGE + 2.4 GHz Bluetooth + 5GHz WI-FI	N/A	Yes*	N/A	Yes	* Pre-installed VOIP applications are considered

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

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1.7 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 2.4 GHz Bluetooth, U-NII-2A & U-NII-2C WIFI, only 2.4 GHz, UNII-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.

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

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

This device 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).

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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.

This device supports both Power Class 2 (PC2) and Power Class 3 (PC3) for LTE Band 41. Per May 2017 TCB Workshop Notes, SAR tests were performed with Power Class 3 (given the specific UL/DL limitations for Power Class 2). Additionally, SAR testing for the power class condition was evaluated for the highest configuration in Power Class 3 for each test configuration to confirm the results were scalable linearly (See Section 14.1).

This device supports 64QAM on the uplink for LTE Operations. Conducted powers for 64QAM configurations were measured per Section 5.1 of FCC KDB Publication 941225 D05v02r05. SAR was not required for 64QAM since the highest maximum output power for 64 QAM is ≤ ½ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg, per Section 5.2.4 of FCC KDB Publication 941225 D05v02r05.

1.8 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)
- May 2017 TCB Workshop Notes (LTE Band 41 Power Class 2/3)
- April 2018 TCB Workshop Notes (LTE Carrier Aggregation)

1.9 Device Serial Numbers

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

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2 LTE INFORMATION

LTE Information					
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 26 (Cell) (814.7 - 848.3 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 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
	LTE Band 7 (2502.5 - 2567.5 MHz)				
	LTE Band 41 (2498.5 - 2687.5 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 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 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 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High	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 26 (Cell): 1.4 MHz	814.7 (26697)		831.5 (26865)	848.3 (27033)	
LTE Band 26 (Cell): 3 MHz	815.5 (26705)		831.5 (26865)	847.5 (27025)	
LTE Band 26 (Cell): 5 MHz	816.5 (26715)		831.5 (26865)	846.5 (27015)	
LTE Band 26 (Cell): 10 MHz	819 (26740)		831.5 (26865)	844 (26990)	
LTE Band 26 (Cell): 15 MHz	821.5 (26765)		831.5 (26865)	841.5 (26965)	
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 25 (PCS): 1.4 MHz	1850.7 (26047)		1882.5 (26365)	1914.3 (26683)	
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)		1882.5 (26365)	1913.5 (26675)	
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)		1882.5 (26365)	1912.5 (26665)	
LTE Band 25 (PCS): 10 MHz	1855 (26090)		1882.5 (26365)	1910 (26640)	
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)		1882.5 (26365)	1907.5 (26615)	
LTE Band 25 (PCS): 20 MHz	1860 (26140)		1882.5 (26365)	1905 (26590)	
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)		1880 (18900)	1909.3 (19193)	
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)		1880 (18900)	1908.5 (19185)	
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)		1880 (18900)	1907.5 (19175)	
LTE Band 2 (PCS): 10 MHz	1855 (18650)		1880 (18900)	1905 (19150)	
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)		1880 (18900)	1902.5 (19125)	
LTE Band 2 (PCS): 20 MHz	1860 (18700)		1880 (18900)	1900 (19100)	
LTE Band 7: 5 MHz	2502.5 (20775)		2535 (21100)	2567.5 (21425)	
LTE Band 7: 10 MHz	2505 (20800)		2535 (21100)	2565 (21400)	
LTE Band 7: 15 MHz	2507.5 (20825)		2535 (21100)	2562.5 (21375)	
LTE Band 7: 20 MHz	2510 (20850)		2535 (21100)	2560 (21350)	
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
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 carrier aggregation feature as shown in Appendix H. 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, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

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3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

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

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

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4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

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

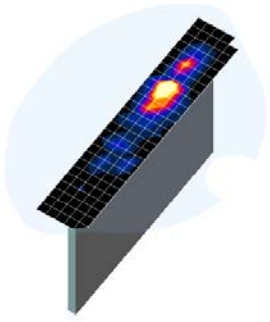

Figure 4-1
Sample SAR Area Scan

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

   a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).

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

   c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

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

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

*Also compliant to IEEE 1528-2013 Table 6

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5 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

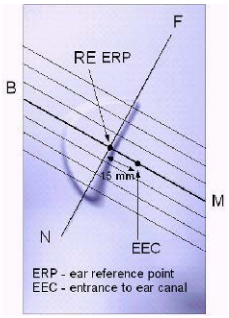

Figure 5-1
Close-Up Side view of ERP

5.2 HANDSET REFERENCE POINTS

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

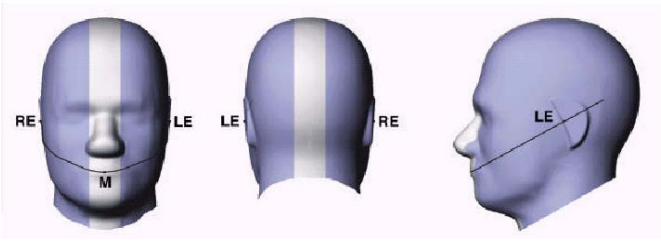

Figure 5-2
Front, back and side view of SAM Twin Phantom

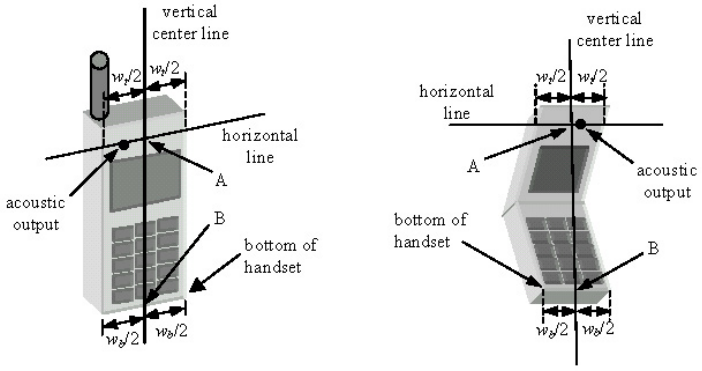

Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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6 TEST CONFIGURATION POSITIONS

6.1 Device Holder

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

6.2 Positioning for Cheek

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

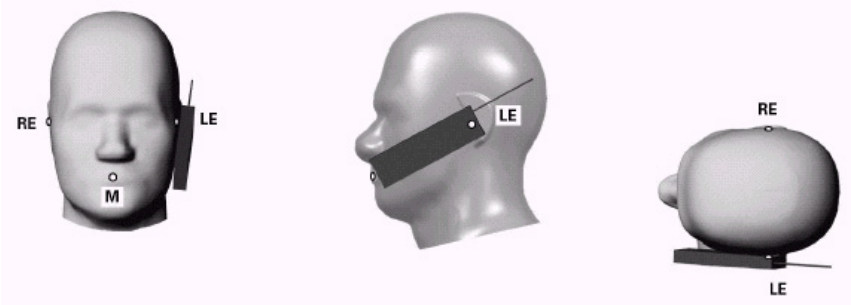

Figure 6-1 Front, Side and Top View of Cheek Position

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

6.3 Positioning for Ear / 15º Tilt

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

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

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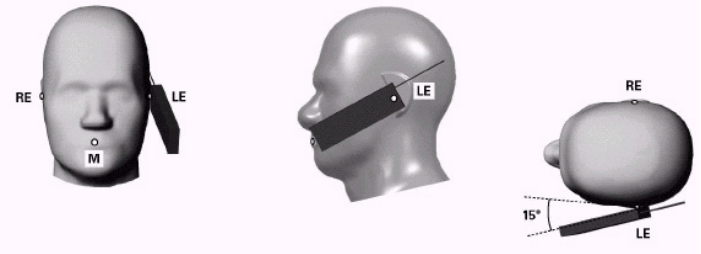

Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

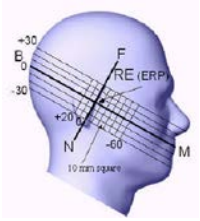

Figure 6-3
Side view w/ relevant markings

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

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

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

6.5 Body-Worn Accessory Configurations

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

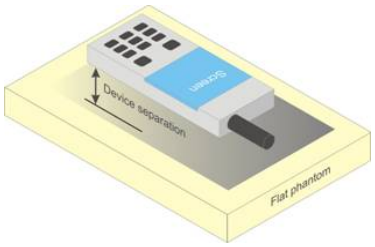

Figure 6-4
Sample Body-Worn Diagram

Accessories for Body-worn operation configurations are divided into two categories: those that do not contain metallic components and those that do contain metallic components. When multiple accessories that do not

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contain metallic components are supplied with the device, the device is tested with only the accessory that dictates the closest spacing to the body. Then multiple accessories that contain metallic components are tested with the device with each accessory. If multiple accessories share an identical metallic component (i.e. the same metallic belt-clip used with different holsters with no other metallic components) only the accessory that dictates the closest spacing to the body is tested.

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

6.6 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 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.

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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 Considerations

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 non-reduced 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.

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7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

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

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

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8 FCC MEASUREMENT PROCEDURES

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

8.1 Measured and Reported SAR

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

8.2 3G SAR Test Reduction Procedure

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

8.3 Procedures Used to Establish RF Signal for SAR

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

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

8.4 SAR Measurement Conditions for UMTS

8.4.1 Output Power Verification

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

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8.4.2 Head SAR Measurements

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

8.4.3 Body SAR Measurements

SAR for body exposure configurations is measured using the 12.2 kbps RMC with the TPC bits all "1s". The 3G SAR test reduction procedure is applied to other spreading codes and multiple $DPDCH_n$ 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.

8.4.4 SAR Measurements with Rel 5 HSDPA

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

8.4.5 SAR Measurements with Rel 6 HSUPA

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

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

8.5 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).

8.5.1 Spectrum Plots for RB Configurations

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

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8.5.2 MPR

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

8.5.3 A-MPR

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

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 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.

8.5.5 TDD

LTE TDD testing is performed using the SAR test guidance provided in FCC KDB 941225 D05v02r04. TDD is tested at the highest duty factor using UL-DL configuration 0 with special subframe configuration 6 and applying the FDD LTE procedures in KDB 941225 D05v02r04. SAR testing is performed using the extended cyclic prefix listed in 3GPP TS 36.211 Section 4.

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8.5.6 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.

8.6 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.

8.6.1 General Device Setup

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

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.

8.6.2 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.

8.6.3 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.

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8.6.4 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.

8.6.5 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.

8.6.6 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.

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8.6.7 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 8.6.6). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.8 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.

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9 RF CONDUCTED POWERS

9.1 GSM Conducted Powers

Table 9-1
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	32.44	32.41	31.82	**30.39**	28.88	26.69	26.58	26.18	25.48
	190	32.48	32.46	31.89	**30.46**	28.98	26.68	26.53	26.10	25.42
	251	32.50	32.53	31.94	**30.55**	28.96	26.68	26.56	26.13	25.44
GSM 1900	512	30.88	30.85	28.95	**26.94**	25.67	26.19	25.93	25.20	24.90
	661	30.87	30.82	28.87	**26.81**	25.51	26.18	25.81	25.09	24.78
	810	31.09	31.17	29.08	**26.73**	25.47	26.20	25.96	25.04	24.71

Calculated Maximum Frame-Averaged Output Power										
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 850	128	23.41	23.38	25.80	**26.13**	25.87	17.66	20.56	21.92	22.47
	190	23.45	23.43	25.87	**26.20**	25.97	17.65	20.51	21.84	22.41
	251	23.47	23.50	25.92	**26.29**	25.95	17.65	20.54	21.87	22.43
GSM 1900	512	21.85	21.82	22.93	**22.68**	22.66	17.16	19.91	20.94	21.89
	661	21.84	21.79	22.85	**22.55**	22.50	17.15	19.79	20.83	21.77
	810	22.06	22.14	23.06	**22.47**	22.46	17.17	19.94	20.78	21.70
GSM 850	**Frame Avg.Targets:**	23.17	23.17	25.68	**25.94**	25.69	17.17	20.18	21.44	22.19
GSM 1900		21.67	21.67	22.68	**22.44**	22.19	16.67	19.68	20.44	21.69

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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 9-1
Power Measurement Setup

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9.2 UMTS Conducted Powers

Table 9-2
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	25.20	25.19	25.20	24.30	24.36	24.15	24.19	24.17	24.31	-
99		12.2 kbps AMR	25.20	25.14	25.19	24.29	24.37	24.17	24.20	24.17	24.30	-
6	HSDPA	Subtest 1	25.11	25.16	25.15	24.40	24.34	24.40	24.32	24.32	24.40	0
6		Subtest 2	25.10	25.16	25.12	24.38	24.34	24.40	24.32	24.32	24.40	0
6		Subtest 3	24.55	24.67	24.65	23.85	23.83	23.82	23.78	23.74	23.71	0.5
6		Subtest 4	24.52	24.67	24.62	23.86	23.78	23.82	23.71	23.77	23.88	0.5
6	HSUPA	Subtest 1	24.52	24.68	24.64	23.59	23.50	23.51	23.33	23.10	23.28	0
6		Subtest 2	23.09	23.16	23.13	22.30	22.33	22.40	22.36	22.32	22.31	2
6		Subtest 3	24.02	24.14	24.13	23.38	23.33	23.37	23.27	23.28	23.31	1
6		Subtest 4	23.09	23.15	23.11	22.32	22.35	22.34	22.36	22.32	22.33	2
6		Subtest 5	24.99	25.20	25.20	24.37	24.30	24.35	24.32	24.32	24.40	0

Table 9-3
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	22.76	22.90	22.78	22.90	22.88	22.90	-
99		12.2 kbps AMR	22.89	22.76	22.78	22.89	22.87	22.90	-
6	HSDPA	Subtest 1	22.85	22.83	22.76	22.75	22.74	22.85	0
6		Subtest 2	22.81	22.79	22.75	22.79	22.69	22.86	0
6		Subtest 3	22.29	22.28	22.17	22.21	22.24	22.33	0.5
6		Subtest 4	22.30	22.26	22.18	22.23	22.18	22.32	0.5
6	HSUPA	Subtest 1	22.82	22.80	22.72	22.77	22.66	22.89	0
6		Subtest 2	20.81	20.78	20.69	20.75	20.63	20.85	2
6		Subtest 3	21.78	21.88	21.70	21.72	21.67	21.83	1
6		Subtest 4	20.75	20.82	20.67	20.74	20.63	20.84	2
6		Subtest 5	22.80	22.90	22.74	22.73	22.65	22.82	0

This device does not support DC-HSDPA.

Figure 9-2
Power Measurement Setup

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9.3 LTE Conducted Powers

9.3.1 LTE Band 71

Table 9-4
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	**24.44**	0	0
	1	50	24.17		0
	1	99	24.39		0
	50	0	23.17	0-1	1
	50	25	**23.20**		1
	50	50	23.19		1
	100	0	23.19		1
16QAM	1	0	23.65	0-1	1
	1	50	23.36		1
	1	99	23.59		1
	50	0	22.20	0-2	2
	50	25	22.16		2
	50	50	22.19		2
	100	0	22.18		2
64QAM	1	0	22.58	0-2	2
	1	50	22.13		2
	1	99	22.53		2
	50	0	21.24	0-3	3
	50	25	21.19		3
	50	50	21.17		3
	100	0	21.24		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.

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Table 9-5
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	24.43	0	0
	1	36	24.37		0
	1	74	24.44		0
	36	0	23.44	0-1	1
	36	18	23.19		1
	36	37	23.35		1
	75	0	23.39		1
16QAM	1	0	23.42	0-1	1
	1	36	23.34		1
	1	74	23.42		1
	36	0	22.40	0-2	2
	36	18	22.19		2
	36	37	22.40		2
	75	0	22.43		2
64QAM	1	0	22.31	0-2	2
	1	36	22.17		2
	1	74	22.48		2
	36	0	21.41	0-3	3
	36	18	21.36		3
	36	37	21.43		3
	75	0	21.35		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.

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Table 9-6
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	24.53	24.44	24.50	0	0
	1	25	24.44	24.23	24.60		0
	1	49	24.60	24.28	24.11		0
	25	0	23.33	23.36	23.19	0-1	1
	25	12	23.37	23.31	23.18		1
	25	25	23.29	23.28	23.24		1
	50	0	23.39	23.36	23.25		1
16QAM	1	0	23.23	23.51	23.35	0-1	1
	1	25	23.44	23.60	23.51		1
	1	49	23.24	23.22	23.31		1
	25	0	22.34	22.38	22.31	0-2	2
	25	12	22.40	22.36	22.25		2
	25	25	22.23	22.30	22.29		2
	50	0	22.33	22.32	22.23		2
64QAM	1	0	22.59	22.64	22.68	0-2	2
	1	25	22.52	22.70	22.59		2
	1	49	22.65	22.69	22.66		2
	25	0	21.62	21.48	21.33	0-3	3
	25	12	21.59	21.48	21.34		3
	25	25	21.65	21.57	21.35		3
	50	0	21.65	21.42	21.42		3

Table 9-7
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	24.62	24.44	24.57	0	0
	1	12	24.47	24.42	24.37		0
	1	24	24.70	24.40	24.42		0
	12	0	23.52	23.39	23.44	0-1	1
	12	6	23.62	23.42	23.59		1
	12	13	23.56	23.37	23.59		1
	25	0	23.38	23.33	23.28		1
16QAM	1	0	23.59	23.29	23.41	0-1	1
	1	12	23.70	23.31	23.51		1
	1	24	23.68	23.43	23.35		1
	12	0	22.51	22.49	22.25	0-2	2
	12	6	22.52	22.44	22.31		2
	12	13	22.49	22.30	22.26		2
	25	0	22.64	22.29	22.35		2
64QAM	1	0	22.70	22.41	22.65	0-2	2
	1	12	22.55	22.48	22.57		2
	1	24	22.67	22.45	22.69		2
	12	0	21.44	21.30	21.32	0-3	3
	12	6	21.51	21.31	21.27		3
	12	13	21.49	21.28	21.21		3
	25	0	21.45	21.40	21.34		3

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9.3.2 LTE Band 12

Table 9-8
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	**24.95**	0	0
	1	25	24.84		0
	1	49	24.86		0
	25	0	23.71	0-1	1
	25	12	**23.79**		1
	25	25	23.72		1
	50	0	23.74		1
16QAM	1	0	23.93	0-1	1
	1	25	23.82		1
	1	49	24.01		1
	25	0	22.90	0-2	2
	25	12	22.73		2
	25	25	22.76		2
	50	0	22.77		2
64QAM	1	0	23.01	0-2	2
	1	25	22.81		2
	1	49	22.96		2
	25	0	21.86	0-3	3
	25	12	21.85		3
	25	25	21.81		3
	50	0	21.72		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.

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Table 9-9
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	24.96	24.79	25.11	0	0
	1	12	24.62	24.99	24.98		0
	1	24	24.76	24.98	24.97		0
	12	0	23.98	23.95	24.13	0-1	1
	12	6	24.04	24.03	24.14		1
	12	13	23.87	24.03	24.12		1
	25	0	23.99	24.03	24.12		1
16QAM	1	0	24.06	24.02	24.20	0-1	1
	1	12	24.12	23.95	24.14		1
	1	24	24.19	23.90	24.19		1
	12	0	23.04	23.17	23.09	0-2	2
	12	6	23.09	23.17	23.09		2
	12	13	22.91	23.15	22.97		2
	25	0	22.95	23.04	23.18		2
64QAM	1	0	22.83	22.84	23.20	0-2	2
	1	12	22.86	22.75	23.19		2
	1	24	22.86	22.85	23.14		2
	12	0	21.80	21.70	22.09	0-3	3
	12	6	21.79	21.68	22.13		3
	12	13	21.82	21.73	22.07		3
	25	0	21.86	21.84	22.08		3

Table 9-10
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	24.88	25.03	24.94	0	0
	1	7	24.94	25.20	24.97		0
	1	14	24.65	25.19	24.94		0
	8	0	24.00	23.96	23.96	0-1	1
	8	4	23.98	23.98	24.10		1
	8	7	23.98	23.95	24.01		1
	15	0	24.05	23.99	24.03		1
16QAM	1	0	23.96	23.89	24.05	0-1	1
	1	7	23.93	24.19	24.20		1
	1	14	23.88	24.12	24.18		1
	8	0	23.18	23.11	23.03	0-2	2
	8	4	23.03	23.09	23.16		2
	8	7	23.06	23.07	23.09		2
	15	0	22.97	22.98	23.10		2
64QAM	1	0	22.88	22.78	23.06	0-2	2
	1	7	22.89	22.97	23.00		2
	1	14	22.75	22.82	22.84		2
	8	0	21.86	21.69	21.88	0-3	3
	8	4	21.82	21.74	21.78		3
	8	7	21.70	21.80	21.76		3
	15	0	21.68	21.67	21.69		3

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Table 9-11
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	24.95	25.18	24.97	0	0
	1	2	25.10	25.20	24.97		0
	1	5	24.96	25.19	24.91		0
	3	0	24.94	24.88	25.02		0
	3	2	24.96	24.87	25.13		0
	3	3	24.81	24.93	25.09		0
	6	0	23.90	23.91	24.03	0-1	1
16QAM	1	0	23.74	23.98	24.20	0-1	1
	1	2	23.80	24.04	24.18		1
	1	5	23.81	24.05	24.18		1
	3	0	23.95	24.10	23.94		1
	3	2	23.92	24.03	24.10		1
	3	3	23.84	23.90	23.97		1
	6	0	23.02	23.00	23.11	0-2	2
64QAM	1	0	23.07	22.86	22.91	0-2	2
	1	2	23.19	22.90	22.92		2
	1	5	23.11	22.93	22.89		2
	3	0	23.01	22.73	22.96		2
	3	2	23.01	22.74	22.99		2
	3	3	22.92	22.61	22.87		2
	6	0	21.93	21.83	21.91	0-3	3

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9.3.3 LTE Band 26 (Cell)

Table 9-12
LTE Band 26 (Cell) Conducted Powers - 15 MHz Bandwidth

LTE Band 26 (Cell) 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 26865 (831.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	24.97	0	0
	1	36	24.90		0
	1	74	**25.13**		0
	36	0	24.08	0-1	1
	36	18	24.17		1
	36	37	**24.19**		1
	75	0	24.15		1
16QAM	1	0	24.19	0-1	1
	1	36	24.16		1
	1	74	24.20		1
	36	0	23.11	0-2	2
	36	18	23.14		2
	36	37	23.15		2
	75	0	23.18		2
64QAM	1	0	23.19	0-2	2
	1	36	23.20		2
	1	74	23.18		2
	36	0	22.10	0-3	3
	36	18	22.13		3
	36	37	22.19		3
	75	0	22.14		3

Note: LTE Band 26 (Cell) 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.

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Table 9-13
LTE Band 26 (Cell) Conducted Powers - 10 MHz Bandwidth

LTE Band 26 (Cell) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26740 (819.0 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 26990 (844.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	25.01	24.93	24.86	0	0
	1	25	24.69	24.86	25.20		0
	1	49	24.70	24.74	24.68		0
	25	0	23.75	23.79	23.82	0-1	1
	25	12	23.69	23.81	23.82		1
	25	25	23.72	23.77	23.71		1
	50	0	23.76	23.77	23.82		1
16QAM	1	0	24.19	24.20	23.98	0-1	1
	1	25	23.88	24.12	24.07		1
	1	49	23.84	23.90	23.94		1
	25	0	22.84	22.80	22.92	0-2	2
	25	12	22.79	22.89	22.97		2
	25	25	22.76	22.88	22.79		2
	50	0	22.76	22.73	22.82		2
64QAM	1	0	22.91	23.20	23.11	0-2	2
	1	25	22.61	23.02	22.91		2
	1	49	22.83	23.19	22.98		2
	25	0	21.77	21.88	21.84	0-3	3
	25	12	21.77	21.89	21.81		3
	25	25	21.90	21.89	21.82		3
	50	0	21.72	21.91	21.90		3

Table 9-14
LTE Band 26 (Cell) Conducted Powers - 5 MHz Bandwidth

LTE Band 26 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26715 (816.5 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 27015 (846.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.71	24.54	24.86	0	0
	1	12	24.37	24.74	24.73		0
	1	24	24.51	24.73	24.72		0
	12	0	23.73	23.70	23.88	0-1	1
	12	6	23.79	23.78	23.89		1
	12	13	23.62	23.78	23.87		1
	25	0	23.74	23.78	23.87		1
16QAM	1	0	23.81	23.77	24.20	0-1	1
	1	12	23.87	23.70	24.09		1
	1	24	23.94	23.65	24.20		1
	12	0	22.79	22.92	22.84	0-2	2
	12	6	22.84	22.92	22.84		2
	12	13	22.66	22.90	22.72		2
	25	0	22.70	22.79	22.93		2
64QAM	1	0	23.02	22.90	22.77	0-2	2
	1	12	23.03	23.13	22.72		2
	1	24	23.08	22.85	22.81		2
	12	0	21.81	21.66	21.51	0-3	3
	12	6	21.73	21.72	21.54		3
	12	13	21.66	21.64	21.53		3
	25	0	21.68	21.80	21.69		3

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Table 9-15
LTE Band 26 (Cell) Conducted Powers - 3 MHz Bandwidth

LTE Band 26 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26705 (815.5 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 27025 (847.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	25.03	24.93	25.09	0	0
	1	7	25.09	25.20	25.12		0
	1	14	24.80	25.19	25.09		0
	8	0	24.15	23.86	24.11	0-1	1
	8	4	24.13	23.88	24.20		1
	8	7	24.13	23.85	24.16		1
	15	0	24.20	23.89	24.18		1
16QAM	1	0	24.11	23.79	24.20	0-1	1
	1	7	24.08	24.20	24.19		1
	1	14	24.03	24.02	23.73		1
	8	0	23.13	23.01	22.95	0-2	2
	8	4	23.18	22.99	22.97		2
	8	7	23.20	22.97	22.92		2
	15	0	23.12	22.88	22.91		2
64QAM	1	0	22.86	23.20	22.86	0-2	2
	1	7	22.74	23.19	23.02		2
	1	14	22.72	23.14	22.71		2
	8	0	21.86	21.79	21.76	0-3	3
	8	4	21.88	21.79	21.88		3
	8	7	21.79	21.84	21.82		3
	15	0	21.77	21.84	21.84		3

Table 9-16
LTE Band 26 (Cell) Conducted Powers -1.4 MHz Bandwidth

LTE Band 26 (Cell) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26697 (814.7 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 27033 (848.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	25.10	25.10	25.12	0	0
	1	2	25.20	25.20	25.12		0
	1	5	25.11	25.13	25.06		0
	3	0	25.09	25.03	25.17		0
	3	2	25.19	25.02	25.19		0
	3	3	24.96	25.08	25.14		0
	6	0	24.05	24.06	24.18	0-1	1
16QAM	1	0	23.89	24.13	24.20	0-1	1
	1	2	23.95	24.19	24.13		1
	1	5	23.96	24.20	24.15		1
	3	0	24.10	24.20	24.09		1
	3	2	24.07	24.18	24.15		1
	3	3	23.99	24.05	24.12		1
	6	0	23.17	23.15	23.20	0-2	2
64QAM	1	0	22.75	23.20	22.85	0-2	2
	1	2	22.78	23.19	22.87		2
	1	5	22.80	23.10	22.81		2
	3	0	22.70	23.03	23.04		2
	3	2	22.78	23.10	22.91		2
	3	3	22.71	23.20	22.96		2
	6	0	21.64	21.97	21.85	0-3	3

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9.3.4 LTE Band 66 (AWS)

Table 9-17
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	**24.14**	24.13	24.09	0	0
	1	50	24.02	24.09	23.86		0
	1	99	24.12	24.12	23.97		0
	50	0	**23.29**	23.27	23.25	0-1	1
	50	25	23.15	23.17	23.03		1
	50	50	23.14	23.20	23.09		1
	100	0	23.26	23.25	23.14		1
16QAM	1	0	23.28	23.40	23.39	0-1	1
	1	50	23.22	23.38	23.33		1
	1	99	23.26	23.40	23.35		1
	50	0	22.29	22.13	22.15	0-2	2
	50	25	22.14	22.12	22.02		2
	50	50	22.35	22.36	22.03		2
	100	0	22.27	22.34	22.15		2
64QAM	1	0	22.39	22.39	22.34	0-2	2
	1	50	22.08	22.23	22.37		2
	1	99	22.00	22.40	22.37		2
	50	0	21.32	21.20	21.31	0-3	3
	50	25	21.16	21.15	21.07		3
	50	50	21.31	21.27	21.05		3
	100	0	21.21	21.21	21.15		3

Table 9-18
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	24.34	24.35	24.40	0	0
	1	36	24.31	24.26	24.23		0
	1	74	24.22	24.19	23.99		0
	36	0	23.37	23.32	23.30	0-1	1
	36	18	23.31	23.32	23.24		1
	36	37	23.34	23.29	23.22		1
	75	0	23.37	23.21	23.16		1
16QAM	1	0	23.39	23.40	23.40	0-1	1
	1	36	23.40	23.33	23.24		1
	1	74	23.28	23.36	23.20		1
	36	0	22.40	22.27	22.40	0-2	2
	36	18	22.35	22.31	22.38		2
	36	37	22.36	22.31	22.28		2
	75	0	22.31	22.37	22.18		2
64QAM	1	0	22.30	22.23	22.11	0-2	2
	1	36	22.25	22.08	21.94		2
	1	74	22.26	22.22	22.13		2
	36	0	21.39	21.40	21.31	0-3	3
	36	18	21.37	21.39	21.31		3
	36	37	21.37	21.38	21.35		3
	75	0	21.32	21.39	21.21		3

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Table 9-19
LTE Band 66 (AWS) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132022 (1715.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132622 (1775.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.23	24.39	24.30	0	0
	1	25	24.21	24.40	24.26		0
	1	49	24.20	24.40	24.25		0
	25	0	23.33	23.35	23.27	0-1	1
	25	12	23.40	23.36	23.34		1
	25	25	23.40	23.31	23.33		1
	50	0	23.40	23.38	23.31		1
16QAM	1	0	23.05	23.05	23.01	0-1	1
	1	25	23.36	23.35	23.38		1
	1	49	23.35	23.35	23.40		1
	25	0	22.34	22.39	22.38	0-2	2
	25	12	22.30	22.39	22.30		2
	25	25	22.40	22.40	22.34		2
	50	0	22.37	22.37	22.31		2
64QAM	1	0	22.40	22.40	22.02	0-2	2
	1	25	22.04	22.36	21.91		2
	1	49	22.30	22.40	22.30		2
	25	0	21.40	21.34	21.40	0-3	3
	25	12	21.38	21.23	21.33		3
	25	25	21.36	21.28	21.40		3
	50	0	21.38	21.34	21.40		3

Table 9-20
LTE Band 66 (AWS) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 131997 (1712.5 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132647 (1777.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.31	24.40	24.30	0	0
	1	12	24.20	24.27	24.17		0
	1	24	24.22	23.97	23.98		0
	12	0	23.30	23.39	23.39	0-1	1
	12	6	23.38	23.40	23.32		1
	12	13	23.39	23.39	23.26		1
	25	0	23.35	23.34	23.33		1
16QAM	1	0	23.40	23.32	23.37	0-1	1
	1	12	23.35	23.36	23.34		1
	1	24	23.34	23.33	23.33		1
	12	0	22.33	22.31	22.28	0-2	2
	12	6	22.31	22.37	22.24		2
	12	13	22.25	22.38	22.17		2
	25	0	22.26	22.38	22.38		2
64QAM	1	0	22.39	22.39	22.01	0-2	2
	1	12	22.03	22.35	21.90		2
	1	24	22.29	22.39	22.29		2
	12	0	21.39	21.33	21.39	0-3	3
	12	6	21.37	21.22	21.32		3
	12	13	21.35	21.27	21.39		3
	25	0	21.37	21.33	21.39		3

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Table 9-21
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	24.23	24.34	24.24	0	0
	1	7	24.19	24.32	24.14		0
	1	14	24.11	24.20	24.10		0
	8	0	23.40	23.33	23.27	0-1	1
	8	4	23.40	23.40	23.30		1
	8	7	23.37	23.32	23.29		1
	15	0	23.33	23.26	23.25		1
16QAM	1	0	23.39	23.39	23.38	0-1	1
	1	7	23.38	23.37	23.35		1
	1	14	23.38	23.32	23.12		1
	8	0	22.39	22.30	22.39	0-2	2
	8	4	22.38	22.38	22.38		2
	8	7	22.35	22.29	22.36		2
	15	0	22.25	22.30	22.36		2
64QAM	1	0	22.37	22.37	21.99	0-2	2
	1	7	22.04	22.36	21.91		2
	1	14	22.27	22.37	22.27		2
	8	0	21.40	21.34	21.40	0-3	3
	8	4	21.35	21.20	21.30		3
	8	7	21.36	21.28	21.40		3
	15	0	21.35	21.31	21.37		3

Table 9-22
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	24.40	24.34	24.17	0	0
	1	2	24.40	24.34	24.22		0
	1	5	24.40	24.22	24.14		0
	3	0	24.40	24.35	24.29		0
	3	2	24.37	24.35	24.36		0
	3	3	24.30	24.25	24.31		0
	6	0	23.33	23.31	23.32	0-1	1
16QAM	1	0	23.34	23.40	23.40	0-1	1
	1	2	23.25	23.32	23.38		1
	1	5	23.35	23.39	23.39		1
	3	0	23.31	23.38	23.19		1
	3	2	23.40	23.40	23.25		1
	3	3	23.28	23.32	23.24		1
	6	0	22.39	22.34	22.31	0-2	2
64QAM	1	0	22.18	22.34	22.37	0-2	2
	1	2	22.19	22.23	22.35		2
	1	5	22.20	22.18	22.30		2
	3	0	22.23	22.21	22.25		2
	3	2	22.24	22.26	22.20		2
	3	3	22.20	22.30	22.21		2
	6	0	21.34	21.21	21.25	0-3	3

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Table 9-23
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	21.43	**21.55**	21.46	0	0
	1	50	21.45	21.50	21.41		0
	1	99	21.31	21.54	21.42		0
	50	0	21.44	**21.53**	21.41	0-1	0
	50	25	21.36	21.46	21.43		0
	50	50	21.34	21.48	21.32		0
	100	0	21.40	21.52	21.30		0
16QAM	1	0	21.70	21.90	21.66	0-1	0
	1	50	21.45	21.78	21.40		0
	1	99	21.69	21.89	21.63		0
	50	0	21.22	21.34	21.23	0-2	0
	50	25	21.22	21.30	21.06		0
	50	50	21.17	21.31	21.17		0
	100	0	21.22	21.36	21.19		0
64QAM	1	0	21.44	21.65	21.22	0-2	0
	1	50	21.24	21.41	21.30		0
	1	99	21.40	21.32	21.14		0
	50	0	20.69	20.85	20.79	0-3	0.5
	50	25	20.76	20.86	20.76		0.5
	50	50	20.73	20.89	20.77		0.5
	100	0	20.74	20.89	20.71		0.5

Table 9-24
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	21.54	21.62	21.35	0	0
	1	36	21.89	21.31	21.39		0
	1	74	21.43	21.43	21.20		0
	36	0	21.40	21.57	21.40	0-1	0
	36	18	21.37	21.46	21.28		0
	36	37	21.39	21.42	21.31		0
	75	0	21.43	21.52	21.26		0
16QAM	1	0	21.65	21.75	21.66	0-1	0
	1	36	21.67	21.67	21.56		0
	1	74	21.63	21.76	21.53		0
	36	0	21.13	21.33	21.22	0-2	0
	36	18	21.06	21.05	21.05		0
	36	37	21.05	21.08	20.95		0
	75	0	21.08	21.21	20.97		0
64QAM	1	0	21.29	21.40	21.37	0-2	0
	1	36	21.24	21.40	21.18		0
	1	74	21.37	21.33	21.05		0
	36	0	20.64	20.71	20.60	0-3	0.5
	36	18	20.54	20.58	20.48		0.5
	36	37	20.56	20.54	20.46		0.5
	75	0	20.53	20.59	20.40		0.5

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Table 9-25
LTE Band 66 (AWS) Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 132022 (1715.0 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132622 (1775.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	21.45	21.37	21.38	0	0
	1	25	21.46	21.43	21.27		0
	1	49	21.50	21.36	21.19		0
	25	0	21.53	21.65	21.56	0-1	0
	25	12	21.45	21.37	21.32		0
	25	25	21.34	21.37	21.24		0
	50	0	21.46	21.46	21.42		0
16QAM	1	0	21.63	21.70	21.42	0-1	0
	1	25	21.75	21.65	21.53		0
	1	49	21.61	21.45	21.60		0
	25	0	21.10	21.40	21.28	0-2	0
	25	12	21.08	21.07	21.07		0
	25	25	21.10	20.96	20.90		0
	50	0	21.09	21.06	21.10		0
64QAM	1	0	21.40	21.21	21.01	0-2	0
	1	25	21.32	21.40	21.10		0
	1	49	21.19	20.98	21.34		0
	25	0	20.67	20.50	20.75	0-3	0.5
	25	12	20.62	20.65	20.51		0.5
	25	25	20.60	20.47	20.56		0.5
	50	0	20.63	20.66	20.66		0.5

Table 9-26
LTE Band 66 (AWS) Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 131997 (1712.5 MHz)	Mid Channel 132322 (1745.0 MHz)	High Channel 132647 (1777.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	21.54	21.42	21.40	0	0
	1	12	21.44	21.34	21.20		0
	1	24	21.31	21.23	21.15		0
	12	0	21.46	21.38	21.46	0-1	0
	12	6	21.40	21.29	21.27		0
	12	13	21.39	21.32	21.24		0
	25	0	21.32	21.39	21.26		0
16QAM	1	0	21.82	21.77	21.65	0-1	0
	1	12	21.77	21.72	21.53		0
	1	24	21.51	21.70	21.46		0
	12	0	21.30	21.07	21.13	0-2	0
	12	6	21.11	21.09	21.05		0
	12	13	21.09	21.02	20.98		0
	25	0	21.11	21.06	21.07		0
64QAM	1	0	21.40	21.40	21.25	0-2	0
	1	12	21.25	20.93	21.10		0
	1	24	21.07	20.90	21.27		0
	12	0	20.58	20.56	20.57	0-3	0.5
	12	6	20.58	20.46	20.56		0.5
	12	13	20.60	20.42	20.40		0.5
	25	0	20.60	20.49	20.52		0.5

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Table 9-27
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	21.24	21.33	21.19	0	0
	1	7	21.28	21.20	20.99		0
	1	14	21.15	21.18	21.06		0
	8	0	21.24	21.30	21.21	0-1	0
	8	4	21.24	21.81	21.18		0
	8	7	21.26	21.69	21.14		0
	15	0	21.20	21.74	21.08		0
16QAM	1	0	21.64	21.85	21.60	0-1	0
	1	7	21.70	21.80	21.45		0
	1	14	21.69	21.38	21.37		0
	8	0	20.99	20.91	21.12	0-2	0
	8	4	20.95	20.88	21.11		0
	8	7	20.99	20.87	21.14		0
	15	0	20.92	20.88	21.16		0
64QAM	1	0	21.06	21.16	21.09	0-2	0
	1	7	21.18	21.17	21.07		0
	1	14	21.06	21.12	20.85		0
	8	0	20.40	20.63	20.35	0-3	0.5
	8	4	20.47	20.44	20.31		0.5
	8	7	20.44	20.55	20.24		0.5
	15	0	20.49	20.50	20.37		0.5

Table 9-28
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	21.31	21.17	21.09	0	0
	1	2	21.29	21.18	21.11		0
	1	5	21.30	21.13	21.08		0
	3	0	21.23	21.16	21.07		0
	3	2	21.28	21.22	21.16		0
	3	3	21.18	21.20	21.06		0
	6	0	21.23	21.16	21.11	0-1	0
16QAM	1	0	21.65	21.78	21.58	0-1	0
	1	2	21.50	21.69	21.38		0
	1	5	21.36	21.69	21.43		0
	3	0	21.28	21.30	21.10		0
	3	2	21.32	21.48	21.16		0
	3	3	21.35	21.48	21.04		0
	6	0	20.97	20.92	20.94	0-2	0
64QAM	1	0	21.08	21.15	20.98	0-2	0
	1	2	21.18	21.29	21.04		0
	1	5	21.08	21.21	21.00		0
	3	0	20.99	21.00	20.86		0
	3	2	20.99	21.09	20.96		0
	3	3	20.94	20.95	20.92		0
	6	0	20.48	20.48	20.40	0-3	0.5

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9.3.5 LTE Band 25 (PCS)

Table 9-29
LTE Band 25 (PCS) Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26140 (1860.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26590 (1905.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.32	24.07	**24.34**	0	0
	1	50	24.17	24.02	23.99		0
	1	99	24.16	24.09	24.23		0
	50	0	23.09	23.05	**23.17**	0-1	1
	50	25	23.02	23.03	23.05		1
	50	50	23.13	22.97	23.12		1
	100	0	23.10	23.01	23.16		1
16QAM	1	0	23.33	23.39	23.39	0-1	1
	1	50	23.27	23.21	23.38		1
	1	99	23.40	23.36	23.38		1
	50	0	22.11	22.09	22.10	0-2	2
	50	25	22.09	22.10	22.04		2
	50	50	22.17	22.08	22.10		2
	100	0	22.00	22.17	22.11		2
64QAM	1	0	22.34	22.35	22.40	0-2	2
	1	50	22.12	22.30	22.11		2
	1	99	22.25	22.29	22.34		2
	50	0	21.03	21.06	21.13	0-3	3
	50	25	20.95	20.93	21.08		3
	50	50	21.10	20.96	21.07		3
	100	0	20.98	21.02	21.12		3

Table 9-30
LTE Band 25 (PCS) Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26115 (1857.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26615 (1907.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.06	24.03	24.31	0	0
	1	36	24.03	24.13	24.19		0
	1	74	24.07	24.15	24.20		0
	36	0	23.21	23.19	23.22	0-1	1
	36	18	23.27	23.22	23.36		1
	36	37	23.33	23.28	23.40		1
	75	0	23.25	23.10	23.21		1
16QAM	1	0	23.25	23.36	23.32	0-1	1
	1	36	23.27	23.39	23.22		1
	1	74	23.21	23.33	22.98		1
	36	0	22.30	22.23	22.34	0-2	2
	36	18	22.34	22.30	22.25		2
	36	37	22.34	22.30	22.40		2
	75	0	22.24	22.21	22.16		2
64QAM	1	0	22.02	22.34	22.33	0-2	2
	1	36	21.67	22.31	22.30		2
	1	74	22.00	22.37	22.40		2
	36	0	21.05	21.10	21.00	0-3	3
	36	18	20.99	21.06	21.05		3
	36	37	21.07	21.09	21.16		3
	75	0	21.04	21.02	21.11		3

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Table 9-31
LTE Band 25 (PCS) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26090 (1855.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26640 (1910.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.31	24.15	24.34	0	0
	1	25	24.04	23.98	24.13		0
	1	49	24.03	23.94	24.17		0
	25	0	23.14	23.05	23.22	0-1	1
	25	12	23.18	23.03	23.20		1
	25	25	23.15	22.98	23.20		1
	50	0	23.18	23.05	23.27		1
16QAM	1	0	23.34	23.36	23.37	0-1	1
	1	25	23.25	23.30	23.40		1
	1	49	23.20	23.29	23.31		1
	25	0	22.28	22.10	22.32	0-2	2
	25	12	22.21	22.08	22.32		2
	25	25	22.16	22.02	22.29		2
	50	0	22.09	22.06	22.10		2
64QAM	1	0	21.89	22.31	22.40	0-2	2
	1	25	21.70	22.22	22.37		2
	1	49	21.94	22.38	22.34		2
	25	0	21.06	20.91	21.01	0-3	3
	25	12	21.02	20.95	20.97		3
	25	25	21.01	20.90	20.96		3
	50	0	21.07	20.99	20.94		3

Table 9-32
LTE Band 25 (PCS) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26065 (1852.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26665 (1912.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.40	24.15	24.28	0	0
	1	12	24.29	23.96	24.17		0
	1	24	24.16	23.93	23.98		0
	12	0	23.29	23.04	23.27	0-1	1
	12	6	23.29	23.03	23.25		1
	12	13	23.25	23.02	23.13		1
	25	0	23.30	23.03	23.24		1
16QAM	1	0	23.32	23.15	23.32	0-1	1
	1	12	23.32	23.01	23.06		1
	1	24	23.31	22.95	22.86		1
	12	0	22.32	22.16	22.11	0-2	2
	12	6	22.36	22.04	22.00		2
	12	13	22.30	22.05	21.93		2
	25	0	22.28	22.04	22.24		2
64QAM	1	0	22.36	22.26	22.38	0-2	2
	1	12	22.24	22.14	22.23		2
	1	24	22.15	22.15	22.34		2
	12	0	21.08	20.93	21.08	0-3	3
	12	6	21.07	20.94	21.03		3
	12	13	21.03	20.86	21.04		3
	25	0	21.02	21.12	20.89		3

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Table 9-33
LTE Band 25 (PCS) Maximum Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26055 (1851.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26675 (1913.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.23	24.06	24.25	0	0
	1	7	24.19	24.02	24.31		0
	1	14	24.09	23.92	24.15		0
	8	0	23.28	23.00	23.22	0-1	1
	8	4	23.24	22.99	23.23		1
	8	7	23.21	22.91	23.22		1
	15	0	23.19	23.00	23.19		1
16QAM	1	0	23.40	23.22	23.40	0-1	1
	1	7	23.27	23.21	23.32		1
	1	14	23.27	23.09	23.40		1
	8	0	22.40	22.19	22.24	0-2	2
	8	4	22.40	22.11	22.29		2
	8	7	22.36	22.06	22.24		2
	15	0	22.25	21.96	22.11		2
64QAM	1	0	22.38	22.24	22.20	0-2	2
	1	7	22.33	22.26	22.24		2
	1	14	22.30	22.14	22.19		2
	8	0	21.01	20.89	20.88	0-3	3
	8	4	21.00	20.88	20.91		3
	8	7	20.93	20.81	20.86		3
	15	0	20.99	20.86	20.93		3

Table 9-34
LTE Band 25 (PCS) Maximum Conducted Powers -1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26047 (1850.7 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26683 (1914.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.28	24.20	24.17	0	0
	1	2	24.26	24.15	24.14		0
	1	5	24.19	24.08	24.10		0
	3	0	24.19	24.11	24.05		0
	3	2	24.25	24.07	24.20		0
	3	3	24.20	24.09	24.10		0
	6	0	23.21	22.95	23.17	0-1	1
16QAM	1	0	23.05	23.26	23.36	0-1	1
	1	2	23.10	23.33	23.31		1
	1	5	23.04	23.18	23.25		1
	3	0	23.20	22.91	23.23		1
	3	2	23.25	22.95	23.23		1
	3	3	23.18	22.94	23.14		1
	6	0	22.31	22.02	22.35	0-2	2
64QAM	1	0	22.23	22.16	22.12	0-2	2
	1	2	22.28	22.19	22.15		2
	1	5	22.19	22.18	22.08		2
	3	0	22.09	21.88	21.94		2
	3	2	22.15	21.86	22.00		2
	3	3	22.06	21.89	22.01		2
	6	0	21.00	20.82	21.00	0-3	3

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Table 9-35
LTE Band 25 (PCS) Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26140 (1860.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26590 (1905.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.73	22.80	**22.84**	0	0
	1	50	22.52	22.50	22.63		0
	1	99	22.67	22.72	22.75		0
	50	0	22.75	22.73	**22.79**	0-1	0
	50	25	22.63	22.68	22.72		0
	50	50	22.68	22.70	22.73		0
	100	0	22.69	22.74	22.78		0
16QAM	1	0	22.72	22.73	22.76	0-1	0
	1	50	22.78	22.77	22.78		0
	1	99	22.63	22.71	22.62		0
	50	0	22.31	22.27	22.34	0-2	0.5
	50	25	22.16	22.23	22.28		0.5
	50	50	22.20	22.17	22.32		0.5
	100	0	22.21	22.24	22.38		0.5
64QAM	1	0	22.28	22.20	22.32	0-2	0.5
	1	50	22.17	22.19	22.16		0.5
	1	99	22.14	22.15	22.15		0.5
	50	0	21.29	21.20	21.32	0-3	1.5
	50	25	21.17	21.14	21.22		1.5
	50	50	21.19	21.15	21.33		1.5
	100	0	21.19	21.21	21.27		1.5

Table 9-36
LTE Band 25 (PCS) Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26115 (1857.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26615 (1907.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.87	22.87	22.79	0	0
	1	36	22.60	22.54	22.33		0
	1	74	22.60	22.69	22.30		0
	36	0	22.62	22.73	22.60	0-1	0
	36	18	22.55	22.54	22.56		0
	36	37	22.55	22.48	22.30		0
	75	0	22.55	22.49	22.77		0
16QAM	1	0	22.73	22.80	22.90	0-1	0
	1	36	22.32	22.37	22.76		0
	1	74	22.51	22.69	22.61		0
	36	0	22.31	22.33	22.34	0-2	0.5
	36	18	21.96	22.02	22.06		0.5
	36	37	22.04	22.01	22.07		0.5
	75	0	22.17	22.28	22.06		0.5
64QAM	1	0	22.27	22.30	22.40	0-2	0.5
	1	36	21.82	21.71	22.39		0.5
	1	74	22.14	22.07	22.40		0.5
	36	0	21.33	21.34	21.30	0-3	1.5
	36	18	21.05	21.07	21.03		1.5
	36	37	21.07	20.99	21.08		1.5
	75	0	21.16	21.04	21.20		1.5

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Table 9-37
LTE Band 25 (PCS) Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26090 (1855.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26640 (1910.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.52	22.43	22.58	0	0
	1	25	22.49	22.33	22.36		0
	1	49	22.53	22.35	22.44		0
	25	0	22.64	22.54	22.86	0-1	0
	25	12	22.52	22.46	22.67		0
	25	25	22.41	22.45	22.64		0
	50	0	22.67	22.53	22.72		0
16QAM	1	0	22.87	22.68	22.69	0-1	0
	1	25	22.77	22.55	22.49		0
	1	49	22.73	22.62	22.75		0
	25	0	22.21	22.30	22.28	0-2	0.5
	25	12	22.04	21.99	22.30		0.5
	25	25	21.87	22.02	22.00		0.5
	50	0	22.35	22.10	22.04		0.5
64QAM	1	0	22.20	22.05	22.13	0-2	0.5
	1	25	22.12	21.99	22.11		0.5
	1	49	22.03	22.20	22.00		0.5
	25	0	21.30	21.00	21.10	0-3	1.5
	25	12	21.05	21.01	21.12		1.5
	25	25	21.01	21.02	21.18		1.5
	50	0	21.19	21.04	21.10		1.5

Table 9-38
LTE Band 25 (PCS) Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26065 (1852.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26665 (1912.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.63	22.55	22.60	0	0
	1	12	22.56	22.38	22.35		0
	1	24	22.46	22.48	22.49		0
	12	0	22.66	22.84	22.66	0-1	0
	12	6	22.64	22.47	22.54		0
	12	13	22.60	22.37	22.56		0
	25	0	22.65	22.41	22.51		0
16QAM	1	0	22.88	22.77	22.86	0-1	0
	1	12	22.87	22.72	22.88		0
	1	24	22.65	22.63	22.50		0
	12	0	22.18	21.94	22.14	0-2	0.5
	12	6	22.12	21.99	22.04		0.5
	12	13	22.07	21.86	21.97		0.5
	25	0	22.14	21.99	22.13		0.5
64QAM	1	0	22.34	22.18	22.19	0-2	0.5
	1	12	22.27	22.39	22.15		0.5
	1	24	22.22	22.02	21.93		0.5
	12	0	21.15	21.01	21.19	0-3	1.5
	12	6	21.10	20.99	20.87		1.5
	12	13	21.20	20.88	20.93		1.5
	25	0	21.10	20.99	21.12		1.5

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Table 9-39
LTE Band 25 (PCS) Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26055 (1851.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26675 (1913.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.66	22.57	22.62	0	0
	1	7	22.63	22.59	22.71		0
	1	14	22.53	22.50	22.50		0
	8	0	22.58	22.69	22.63	0-1	0
	8	4	22.57	22.66	22.67		0
	8	7	22.53	22.57	22.64		0
	15	0	22.57	22.67	22.67		0
16QAM	1	0	22.79	22.82	22.80	0-1	0
	1	7	22.89	22.84	22.68		0
	1	14	22.82	22.72	22.59		0
	8	0	22.14	22.24	22.15	0-2	0.5
	8	4	22.09	22.18	22.21		0.5
	8	7	22.08	22.13	22.19		0.5
	15	0	22.09	22.16	22.19		0.5
64QAM	1	0	22.36	22.20	22.05	0-2	0.5
	1	7	22.26	22.39	22.26		0.5
	1	14	22.28	22.30	22.25		0.5
	8	0	21.10	21.22	21.11	0-3	1.5
	8	4	20.96	21.14	21.11		1.5
	8	7	21.02	21.12	21.03		1.5
	15	0	21.06	21.14	21.13		1.5

Table 9-40
LTE Band 25 (PCS) Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26047 (1850.7 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26683 (1914.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.60	22.43	22.56	0	0
	1	2	22.62	22.30	22.65		0
	1	5	22.51	22.42	22.52		0
	3	0	22.57	22.35	22.51		0
	3	2	22.60	22.30	22.56		0
	3	3	22.55	22.39	22.56		0
	6	0	22.57	22.32	22.48	0-1	0
16QAM	1	0	22.69	22.62	22.50	0-1	0
	1	2	22.64	22.66	22.39		0
	1	5	22.77	22.46	22.41		0
	3	0	22.68	22.39	22.51		0
	3	2	22.82	22.39	22.60		0
	3	3	22.71	22.44	22.54		0
	6	0	22.17	22.01	22.18	0-2	0.5
64QAM	1	0	22.36	21.88	22.22	0-2	0.5
	1	2	22.28	22.12	22.37		0.5
	1	5	22.32	22.07	22.13		0.5
	3	0	22.20	21.96	22.29		0.5
	3	2	22.23	22.09	22.30		0.5
	3	3	22.16	21.99	22.28		0.5
	6	0	21.05	20.97	21.00	0-3	1.5

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9.3.6 LTE Band 7

Table 9-41
LTE Band 7 Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20850 (2510.0 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21350 (2560.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.41	24.25	24.35	0	0
	1	50	24.44	23.96	24.43		0
	1	99	**24.50**	24.29	24.22		0
	50	0	**23.41**	23.19	23.10	0-1	1
	50	25	23.36	23.11	23.09		1
	50	50	23.24	23.18	23.05		1
	100	0	23.28	23.13	23.17		1
16QAM	1	0	23.69	23.50	23.50	0-1	1
	1	50	23.60	23.49	23.37		1
	1	99	23.53	23.70	23.16		1
	50	0	22.39	22.23	22.12	0-2	2
	50	25	22.38	22.12	22.08		2
	50	50	22.28	22.17	22.06		2
	100	0	22.38	22.11	22.08		2
64QAM	1	0	22.69	22.49	22.36	0-2	2
	1	50	22.54	22.46	22.21		2
	1	99	22.42	22.53	22.23		2
	50	0	21.41	21.21	21.14	0-3	3
	50	25	21.39	21.09	21.08		3
	50	50	21.24	21.15	21.04		3
	100	0	21.34	21.17	21.06		3

Table 9-42
LTE Band 7 Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 7 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20825 (2507.5 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21375 (2562.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.46	24.49	24.44	0	0
	1	36	24.37	24.29	24.16		0
	1	74	24.57	24.37	23.83		0
	36	0	23.49	23.50	23.36	0-1	1
	36	18	23.45	23.46	23.35		1
	36	37	23.47	23.39	23.42		1
	75	0	23.54	23.43	23.39		1
16QAM	1	0	23.55	23.58	23.63	0-1	1
	1	36	23.56	23.55	23.29		1
	1	74	23.66	23.60	23.02		1
	36	0	22.56	22.53	22.45	0-2	2
	36	18	22.49	22.52	22.44		2
	36	37	22.53	22.48	22.44		2
	75	0	22.54	22.53	22.34		2
64QAM	1	0	22.28	22.54	22.30	0-2	2
	1	36	22.60	22.31	22.15		2
	1	74	22.34	22.67	22.43		2
	36	0	21.16	21.10	21.00	0-3	3
	36	18	21.15	21.06	20.98		3
	36	37	21.19	21.09	21.03		3
	75	0	21.18	21.02	20.99		3

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Table 9-43
LTE Band 7 Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 7 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20800 (2505.0 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21400 (2565.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.60	24.66	24.50	0	0
	1	25	24.46	24.32	24.19		0
	1	49	24.48	24.28	24.29		0
	25	0	23.55	23.47	23.29	0-1	1
	25	12	23.54	23.30	23.28		1
	25	25	23.55	23.32	23.24		1
	50	0	23.62	23.35	23.31		1
16QAM	1	0	23.70	23.69	23.61	0-1	1
	1	25	23.65	23.58	23.54		1
	1	49	23.68	23.54	23.57		1
	25	0	22.67	22.53	22.41	0-2	2
	25	12	22.60	22.36	22.41		2
	25	25	22.54	22.37	22.30		2
	50	0	22.49	22.33	22.18		2
64QAM	1	0	22.30	22.20	22.13	0-2	2
	1	25	22.26	22.20	22.11		2
	1	49	22.41	22.10	22.02		2
	25	0	21.34	21.31	20.91	0-3	3
	25	12	21.35	21.13	21.00		3
	25	25	21.28	21.12	20.94		3
	50	0	21.30	21.22	20.89		3

Table 9-44
LTE Band 7 Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 7 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20775 (2502.5 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21425 (2567.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.58	24.54	24.29	0	0
	1	12	24.50	24.12	24.10		0
	1	24	24.50	23.82	24.13		0
	12	0	23.48	23.33	23.35	0-1	1
	12	6	23.38	23.35	23.26		1
	12	13	23.51	23.31	23.24		1
	25	0	23.43	23.32	23.28		1
16QAM	1	0	23.70	23.22	23.70	0-1	1
	1	12	23.42	23.00	23.29		1
	1	24	23.59	23.00	23.41		1
	12	0	22.54	22.42	22.19	0-2	2
	12	6	22.41	22.39	22.12		2
	12	13	22.54	22.39	22.09		2
	25	0	22.45	22.36	22.28		2
64QAM	1	0	22.31	22.49	22.50	0-2	2
	1	12	22.26	22.50	22.44		2
	1	24	22.23	22.47	22.23		2
	12	0	21.20	21.06	20.92	0-3	3
	12	6	21.09	21.09	20.96		3
	12	13	21.19	21.01	20.88		3
	25	0	21.23	20.97	20.79		3

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Table 9-45
LTE Band 7 Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20850 (2510.0 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21350 (2560.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.78	23.00	22.73	0	0
	1	50	22.61	22.79	22.47		0
	1	99	**23.02**	22.99	22.71		0
	50	0	**22.98**	22.77	22.44	0-1	0
	50	25	22.91	22.69	22.48		0
	50	50	22.81	22.75	22.38		0
	100	0	22.91	22.73	22.58		0
16QAM	1	0	23.05	22.91	22.64	0-1	0
	1	50	22.78	22.66	22.79		0
	1	99	22.94	23.20	22.89		0
	50	0	22.34	22.20	21.91	0-2	0.5
	50	25	22.31	22.16	21.96		0.5
	50	50	22.24	22.16	21.92		0.5
	100	0	22.34	22.13	21.90		0.5
64QAM	1	0	22.66	22.41	22.45	0-2	0.5
	1	50	22.55	22.40	22.45		0.5
	1	99	22.60	22.45	22.43		0.5
	50	0	21.33	21.01	20.86	0-3	1.5
	50	25	21.35	20.92	20.87		1.5
	50	50	21.27	21.00	20.80		1.5
	100	0	21.30	20.87	20.88		1.5

Table 9-46
LTE Band 7 Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 7 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20825 (2507.5 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21375 (2562.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.79	22.81	22.51	0	0
	1	36	22.78	22.58	22.35		0
	1	74	22.95	22.64	22.50		0
	36	0	22.78	22.76	22.29	0-1	0
	36	18	22.76	22.72	22.25		0
	36	37	22.76	22.67	22.25		0
	75	0	22.74	22.71	22.40		0
16QAM	1	0	22.98	22.80	22.71	0-1	0
	1	36	22.91	23.04	22.60		0
	1	74	23.09	23.02	22.77		0
	36	0	22.56	22.45	21.85	0-2	0.5
	36	18	22.31	22.22	21.71		0.5
	36	37	22.30	22.19	21.69		0.5
	75	0	22.30	22.16	21.81		0.5
64QAM	1	0	22.40	22.25	22.33	0-2	0.5
	1	36	22.34	22.11	22.24		0.5
	1	74	22.39	22.27	22.14		0.5
	36	0	21.13	20.90	21.08	0-3	1.5
	36	18	21.08	20.86	20.88		1.5
	36	37	21.16	20.80	20.83		1.5
	75	0	21.14	20.88	20.93		1.5

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Table 9-47
LTE Band 7 Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 7 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20800 (2505.0 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21400 (2565.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.68	22.72	22.50	0	0
	1	25	22.70	22.55	22.39		0
	1	49	22.69	22.59	22.40		0
	25	0	22.98	22.58	22.50	0-1	0
	25	12	22.85	22.39	22.36		0
	25	25	22.75	22.37	22.34		0
	50	0	22.89	22.51	22.41		0
16QAM	1	0	23.01	22.80	22.59	0-1	0
	1	25	23.13	22.59	22.70		0
	1	49	23.05	22.76	22.54		0
	25	0	22.35	22.08	22.05	0-2	0.5
	25	12	22.31	21.89	21.93		0.5
	25	25	22.31	21.85	21.82		0.5
	50	0	22.33	21.85	21.76		0.5
64QAM	1	0	22.43	22.25	22.26	0-2	0.5
	1	25	22.30	22.19	22.21		0.5
	1	49	22.14	22.30	22.15		0.5
	25	0	21.39	21.11	20.93	0-3	1.5
	25	12	21.29	20.91	20.83		1.5
	25	25	21.30	20.68	20.87		1.5
	50	0	21.33	20.97	20.86		1.5

Table 9-48
LTE Band 7 Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 7 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20775 (2502.5 MHz)	Mid Channel 21100 (2535.0 MHz)	High Channel 21425 (2567.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	22.69	22.56	22.46	0	0
	1	12	22.61	22.48	22.38		0
	1	24	22.41	22.41	22.30		0
	12	0	22.80	22.41	22.48	0-1	0
	12	6	22.64	22.36	22.32		0
	12	13	22.75	22.34	22.29		0
	25	0	22.78	22.41	22.38		0
16QAM	1	0	23.18	22.65	22.30	0-1	0
	1	12	23.05	22.66	22.07		0
	1	24	23.19	22.66	22.04		0
	12	0	22.31	21.94	22.38	0-2	0.5
	12	6	22.22	21.91	22.29		0.5
	12	13	22.28	21.90	22.27		0.5
	25	0	22.27	21.83	22.43		0.5
64QAM	1	0	22.46	22.27	22.17	0-2	0.5
	1	12	22.50	21.94	22.03		0.5
	1	24	22.59	21.95	22.12		0.5
	12	0	21.24	20.94	20.86	0-3	1.5
	12	6	21.23	20.86	20.83		1.5
	12	13	21.10	20.94	20.79		1.5
	25	0	21.30	20.87	20.85		1.5

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9.3.7 LTE Band 41

Table 9-49
LTE Band 41 PC3 Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.55	23.33	23.69	23.89	23.94	0	0
	1	50	23.32	23.24	23.67	23.87	23.62		0
	1	99	23.35	23.37	23.80	**24.17**	23.81		0
	50	0	23.10	23.01	22.85	23.05	22.85	0-1	1
	50	25	22.92	22.96	22.90	23.10	22.91		1
	50	50	23.05	22.99	22.87	**23.19**	22.81		1
	100	0	22.98	23.09	22.89	23.07	22.88		1
16QAM	1	0	23.18	23.17	22.81	22.99	23.13	0-1	1
	1	50	23.16	23.08	22.84	23.11	22.91		1
	1	99	23.01	23.19	22.93	23.19	23.04		1
	50	0	22.10	22.04	21.86	22.09	21.87	0-2	2
	50	25	21.99	21.98	21.95	22.10	21.93		2
	50	50	22.05	22.09	21.89	22.19	21.86		2
	100	0	22.10	22.05	21.99	22.07	21.88		2
64QAM	1	0	21.88	21.90	21.25	21.74	21.80	0-2	2
	1	50	21.64	21.68	21.28	21.81	21.57		2
	1	99	21.68	21.80	21.34	22.02	21.76		2
	50	0	21.08	21.02	20.90	21.10	20.83	0-3	3
	50	25	20.97	20.94	20.95	21.06	20.96		3
	50	50	21.02	21.00	20.92	21.16	20.92		3
	100	0	21.02	20.99	20.99	21.04	20.95		3

Table 9-50
LTE Band 41 PC3 Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.53	23.39	23.85	23.82	24.00	0	0
	1	36	23.40	23.31	23.70	23.74	23.96		0
	1	74	23.39	23.36	23.96	23.62	23.81		0
	36	0	22.63	22.61	23.08	22.87	22.98	0-1	1
	36	18	22.49	22.76	22.97	22.95	23.00		1
	36	37	22.55	22.60	22.99	22.89	22.95		1
	75	0	22.75	22.59	22.99	22.71	23.03		1
16QAM	1	0	22.75	22.90	23.11	23.06	23.18	0-1	1
	1	36	22.77	22.95	23.15	23.01	23.13		1
	1	74	22.69	22.99	23.17	22.99	23.17		1
	36	0	21.63	21.65	22.03	21.56	22.08	0-2	2
	36	18	21.63	21.67	22.06	21.74	22.00		2
	36	37	21.66	21.62	21.95	21.68	21.98		2
	75	0	21.51	21.57	22.08	21.76	22.06		2
64QAM	1	0	21.09	21.27	21.35	21.31	21.79	0-2	2
	1	36	21.04	21.13	21.43	21.46	21.41		2
	1	74	21.26	21.18	21.38	21.34	21.40		2
	36	0	20.65	20.63	21.03	20.62	20.95	0-3	3
	36	18	20.57	20.64	21.02	20.73	20.99		3
	36	37	20.56	20.65	20.98	20.79	20.94		3
	75	0	20.67	20.59	21.05	20.77	20.98		3

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Table 9-51
LTE Band 41 PC3 Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.71	23.43	23.91	23.91	23.90	0	0
	1	25	23.54	23.30	23.82	23.88	24.09		0
	1	49	23.48	23.39	23.93	24.02	23.97		0
	25	0	23.11	23.06	22.93	22.97	23.09	0-1	1
	25	12	23.10	22.93	22.91	22.91	23.01		1
	25	25	23.09	22.93	22.85	22.90	22.91		1
	50	0	23.08	22.92	22.89	22.87	23.04		1
16QAM	1	0	23.20	23.11	23.03	23.13	23.13	0-1	1
	1	25	23.18	22.97	22.98	23.13	23.06		1
	1	49	23.17	23.19	23.05	23.16	23.04		1
	25	0	22.09	21.97	21.84	21.90	21.98	0-2	2
	25	12	22.05	21.88	21.86	21.89	21.92		2
	25	25	21.99	21.87	21.80	21.87	21.91		2
	50	0	22.06	21.92	21.91	21.94	22.08		2
64QAM	1	0	21.96	21.55	21.35	21.52	21.43	0-2	2
	1	25	21.87	21.45	21.38	21.48	21.46		2
	1	49	21.86	21.59	21.37	21.54	21.39		2
	25	0	21.19	21.11	20.95	21.10	21.05	0-3	3
	25	12	21.14	21.01	21.01	21.01	21.10		3
	25	25	21.10	21.04	20.94	21.03	20.99		3
	50	0	21.09	20.90	20.92	20.89	20.96		3

Table 9-52
LTE Band 41 PC3 Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.77	23.43	24.01	24.03	23.91	0	0
	1	12	23.61	23.32	23.87	23.96	23.85		0
	1	24	23.56	23.33	23.89	23.85	23.79		0
	12	0	23.13	23.02	22.93	22.96	22.90	0-1	1
	12	6	23.03	22.93	22.89	22.93	22.89		1
	12	13	23.01	22.97	22.78	22.86	22.89		1
	25	0	23.08	22.90	22.87	22.91	22.93		1
16QAM	1	0	23.20	23.03	23.15	23.19	23.09	0-1	1
	1	12	23.08	23.01	23.02	22.96	23.06		1
	1	24	23.09	23.12	22.98	23.01	23.07		1
	12	0	22.13	22.02	21.92	21.95	21.86	0-2	2
	12	6	22.13	21.88	21.89	21.88	21.91		2
	12	13	22.17	21.96	21.84	21.83	21.89		2
	25	0	22.18	21.85	21.83	21.87	21.95		2
64QAM	1	0	21.93	21.62	21.53	21.54	21.41	0-2	2
	1	12	21.67	21.13	21.31	21.32	21.34		2
	1	24	21.70	21.43	21.40	21.39	21.50		2
	12	0	21.16	21.05	21.02	20.99	20.87	0-3	3
	12	6	21.13	20.95	20.93	20.97	20.94		3
	12	13	21.06	20.91	20.88	20.90	21.05		3
	25	0	21.15	20.97	20.98	20.97	21.01		3

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Table 9-53
LTE Band 41 PC2 Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	26.51	26.35	26.56	26.52	26.75	0	0
	1	50	26.49	26.25	26.60	26.64	26.46		0
	1	99	26.30	26.40	26.69	26.85	26.44		0
	50	0	25.91	25.75	25.69	26.15	25.94	0-1	1
	50	25	25.83	25.75	25.74	26.12	26.05		1
	50	50	25.82	25.77	25.67	26.20	25.92		1
	100	0	26.04	26.01	25.70	25.95	26.07		1
16QAM	1	0	26.20	26.19	25.61	25.95	26.17	0-1	1
	1	50	26.12	26.02	25.64	26.08	25.87		1
	1	99	25.96	26.20	25.84	26.20	25.92		1
	50	0	25.07	25.01	24.72	24.99	24.87	0-2	2
	50	25	24.91	24.96	24.86	24.98	24.96		2
	50	50	25.06	25.05	24.81	25.08	24.89		2
	100	0	25.09	25.10	24.79	25.03	24.94		2
64QAM	1	0	24.91	24.87	24.62	24.78	24.90	0-2	2
	1	50	24.42	24.67	24.74	24.85	24.68		2
	1	99	24.60	24.85	24.73	25.04	24.80		2
	50	0	24.11	24.06	23.77	24.01	23.93	0-3	3
	50	25	23.81	23.99	23.83	24.13	23.95		3
	50	50	24.09	24.07	23.77	24.20	23.82		3
	100	0	24.11	24.07	23.86	24.15	24.03		3

Table 9-54
LTE Band 41 PC2 Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	26.23	26.22	26.69	26.63	26.81	0	0
	1	36	26.10	26.07	26.74	26.57	26.51		0
	1	74	26.15	26.11	26.81	26.79	26.53		0
	36	0	25.89	25.81	25.97	25.85	25.93	0-1	1
	36	18	25.85	25.73	25.88	25.95	25.98		1
	36	37	25.91	25.66	25.90	26.03	25.93		1
	75	0	26.05	25.71	25.98	25.95	26.01		1
16QAM	1	0	26.04	25.94	26.11	26.08	26.11	0-1	1
	1	36	25.73	25.76	26.16	26.15	25.60		1
	1	74	25.67	26.01	26.18	26.04	25.99		1
	36	0	24.82	24.96	25.07	24.92	24.77	0-2	2
	36	18	24.87	24.97	25.11	24.86	24.81		2
	36	37	24.92	24.81	25.05	25.00	24.91		2
	75	0	25.06	24.88	25.07	25.12	25.06		2
64QAM	1	0	25.00	24.88	24.84	24.73	25.02	0-2	2
	1	36	24.86	24.63	24.86	24.76	24.69		2
	1	74	25.01	24.76	24.96	25.02	24.73		2
	36	0	24.08	23.90	24.15	23.97	24.01	0-3	3
	36	18	23.99	23.97	24.15	24.19	23.95		3
	36	37	24.02	23.87	24.17	24.12	24.12		3
	75	0	24.05	23.84	23.85	23.97	23.92		3

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Table 9-55
LTE Band 41 PC2 Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	26.54	26.28	27.01	26.90	26.96	0	0
	1	25	26.41	26.18	26.95	26.80	27.08		0
	1	49	26.35	26.19	26.88	26.85	26.73		0
	25	0	26.09	25.83	25.93	25.96	26.13	0-1	1
	25	12	25.87	25.74	25.82	25.95	26.04		1
	25	25	26.15	25.64	25.79	25.98	25.82		1
	50	0	26.16	25.76	25.96	26.03	26.10		1
16QAM	1	0	26.20	26.14	26.14	26.18	26.06	0-1	1
	1	25	26.14	26.02	26.17	26.17	26.03		1
	1	49	26.10	26.14	26.11	26.07	26.09		1
	25	0	25.18	25.01	24.96	25.06	24.98	0-2	2
	25	12	25.15	24.93	24.90	24.91	25.02		2
	25	25	25.11	24.93	24.86	24.95	24.96		2
	50	0	25.10	24.95	24.98	25.02	25.12		2
64QAM	1	0	25.13	24.79	24.73	24.85	24.75	0-2	2
	1	25	25.09	24.77	24.65	24.75	24.73		2
	1	49	25.06	24.63	24.83	24.80	24.71		2
	25	0	24.18	24.02	24.12	24.04	24.16	0-3	3
	25	12	24.20	24.07	23.99	24.20	24.20		3
	25	25	24.11	24.09	24.01	24.05	24.10		3
	50	0	24.01	23.97	23.97	23.81	23.96		3

Table 9-56
LTE Band 41 PC2 Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	26.54	26.20	27.05	26.94	27.03	0	0
	1	12	26.91	26.31	26.75	26.95	26.85		0
	1	24	26.59	26.20	26.79	26.88	26.90		0
	12	0	26.08	25.88	26.01	25.97	25.95	0-1	1
	12	6	26.05	25.85	25.82	25.73	25.85		1
	12	13	26.19	25.82	25.83	25.88	25.92		1
	25	0	26.12	25.86	25.87	25.91	25.95		1
16QAM	1	0	26.11	26.18	26.12	26.12	26.18	0-1	1
	1	12	26.16	26.13	26.13	26.13	26.12		1
	1	24	26.11	26.12	26.07	26.13	26.14		1
	12	0	25.19	25.06	25.03	25.09	24.96	0-2	2
	12	6	25.20	24.92	24.92	24.94	25.03		2
	12	13	25.18	24.91	24.87	24.86	24.96		2
	25	0	25.17	24.78	24.75	24.88	24.86		2
64QAM	1	0	25.01	24.71	24.81	24.86	24.76	0-2	2
	1	12	25.10	24.51	24.69	24.67	24.71		2
	1	24	24.88	24.62	24.60	24.73	24.66		2
	12	0	24.19	23.97	23.92	24.05	24.00	0-3	3
	12	6	24.11	23.89	23.87	24.01	24.06		3
	12	13	24.16	23.96	23.93	23.99	23.94		3
	25	0	24.14	24.00	23.98	24.06	24.05		3

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9.4 WLAN Conducted Powers

Table 9-57
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	21.94	16.84	15.83
2417	2	N/A	19.36	18.38
2422	3	N/A	21.29	20.23
2427	4	N/A	21.41	20.53
2437	6	22.27	21.53	20.51
2442	7	N/A	20.40	19.72
2452	9	N/A	20.41	19.51
2457	10	N/A	18.74	17.71
2462	11	22.21	16.81	15.59

Table 9-58
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	16.99	14.21	14.82
5200	40	17.94	15.45	15.77
5220	44	17.92	15.41	15.99
5240	48	17.95	15.21	15.97
5260	52	17.94	15.35	15.99
5280	56	17.96	15.03	15.96
5300	60	17.95	15.34	15.98
5320	64	17.10	14.45	14.94
5500	100	16.00	13.19	13.70
5520	104	17.11	14.76	15.38
5600	120	17.11	14.94	15.45
5620	124	17.34	14.99	15.50
5720	144	17.45	14.97	15.48
5745	149	17.50	15.00	15.41
5765	153	18.42	15.94	16.27
5785	157	18.47	15.91	16.24
5805	161	18.50	16.00	16.40
5825	165	17.49	14.98	15.50

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Table 9-59
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	17.40	12.58	12.28
2417	2	N/A	14.37	14.17
2422	3	N/A	16.43	16.23
2427	4	N/A	16.96	16.81
2437	6	17.30	17.03	16.62
2442	7	N/A	15.93	15.67
2452	9	N/A	15.67	15.76
2457	10	N/A	13.67	13.70
2462	11	17.31	11.72	11.74

Table 9-60
5 GHz WLAN Reduced 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	12.28	12.24	11.28
5200	40	13.15	13.19	12.15
5220	44	13.16	13.11	12.14
5240	48	13.28	13.23	12.16
5260	52	13.22	13.19	12.21
5280	56	13.19	13.18	12.15
5300	60	13.12	13.26	12.20
5320	64	12.36	12.31	11.43
5500	100	10.94	10.89	10.72
5520	104	12.28	12.21	11.99
5600	120	12.59	12.56	11.63
5620	124	12.53	12.52	11.55
5720	144	12.37	12.41	11.37
5745	149	12.34	12.37	11.42
5765	153	13.54	13.47	12.36
5785	157	13.67	13.59	12.54
5805	161	13.72	13.66	12.61
5825	165	12.42	12.47	11.43

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5GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5190	38	10.53	10.23
5230	46	12.33	12.01
5270	54	12.47	12.12
5310	62	10.62	10.32
5510	102	10.25	10.44
5550	110	12.67	12.36
5590	118	12.78	12.43
5630	126	12.74	12.40
5710	142	12.89	12.47
5755	151	12.73	12.44
5795	159	12.91	12.49

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.

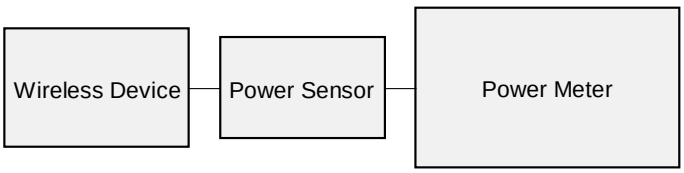

Figure 9-3
Power Measurement Setup

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9.5 Bluetooth Conducted Powers

Table 9-61
Bluetooth Average RF Power

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	7.26	5.321
2441	1.0	39	**8.61**	7.264
2480	1.0	78	7.74	5.939
2402	2.0	0	6.79	4.780
2441	2.0	39	7.95	6.235
2480	2.0	78	6.96	4.967
2402	3.0	0	6.80	4.789
2441	3.0	39	7.96	6.258
2480	3.0	78	6.98	4.990

Note: The bolded data rates and channel above were tested for SAR.

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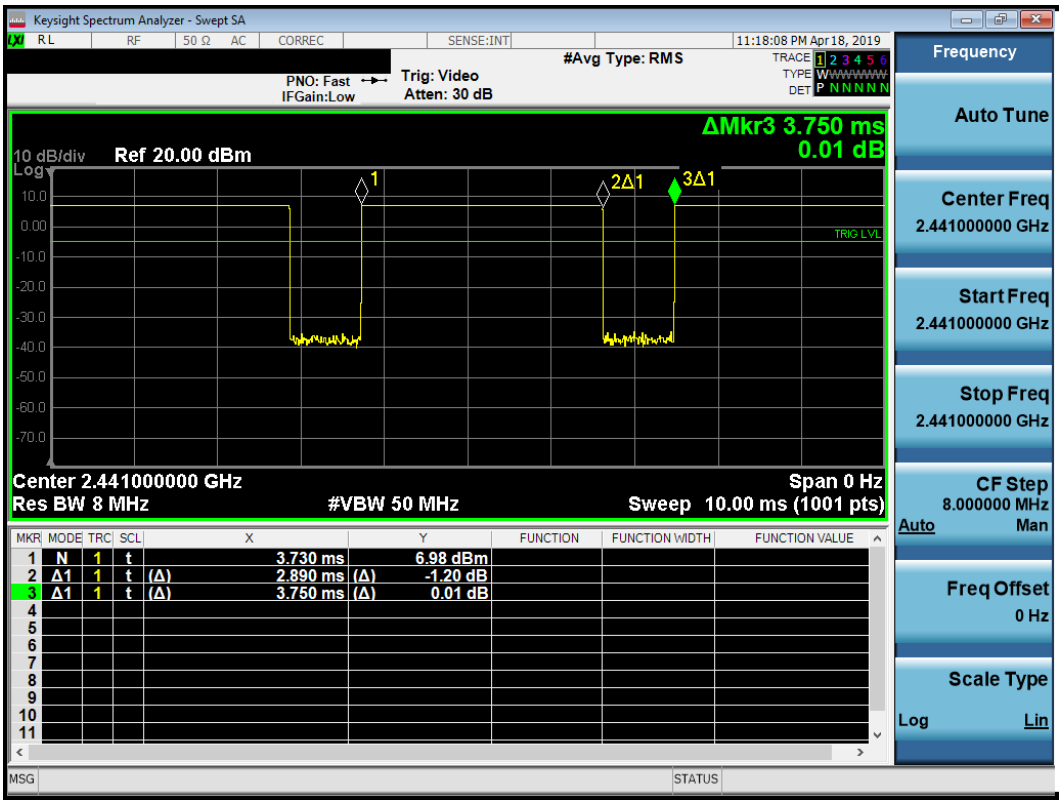

Figure 9-4
Bluetooth Transmission Plot

Equation 9-1
Bluetooth Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.890ms}{3.750ms} * 100\% = 77.1\%$$

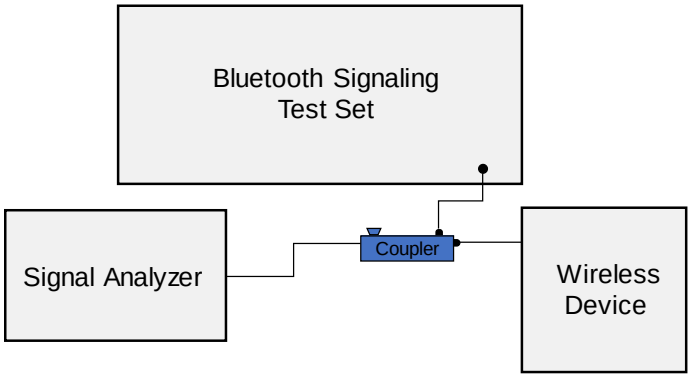

Figure 9-5
Power Measurement Setup

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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
4/22/2019	750H	21.5	680	0.881	40.775	0.888	42.305	-0.79%	-3.62%
			695	0.886	40.722	0.889	42.227	-0.34%	-3.56%
			700	0.888	40.708	0.889	42.201	-0.11%	-3.54%
			710	0.891	40.674	0.890	42.149	0.11%	-3.50%
			740	0.903	40.566	0.893	41.994	1.12%	-3.40%
			755	0.908	40.509	0.894	41.916	1.57%	-3.36%
4/15/2019	835H	20.6	820	0.915	41.988	0.899	41.578	1.78%	0.99%
			835	0.920	41.957	0.900	41.500	2.22%	1.10%
			850	0.925	41.929	0.916	41.500	0.98%	1.03%
4/15/2019	1750H	20.6	1710	1.328	39.562	1.348	40.142	-1.48%	-1.44%
			1750	1.353	39.507	1.371	40.079	-1.31%	-1.43%
			1790	1.378	39.433	1.394	40.016	-1.15%	-1.46%
4/17/2019	1900H	20.0	1850	1.382	38.962	1.400	40.000	-1.29%	-2.59%
			1880	1.402	38.932	1.400	40.000	0.14%	-2.67%
			1910	1.422	38.905	1.400	40.000	1.57%	-2.74%
4/19/2019	2450H	21.6	2400	1.766	37.416	1.756	39.289	0.57%	-4.77%
			2450	1.801	37.327	1.800	39.200	0.06%	-4.78%
			2500	1.840	37.273	1.855	39.136	-0.81%	-4.76%
			2550	1.876	37.183	1.909	39.073	-1.73%	-4.84%
4/21/2019	2450H	21.2	2400	1.780	38.742	1.756	39.289	1.37%	-1.39%
			2450	1.817	38.670	1.800	39.200	0.94%	-1.35%
			2500	1.852	38.572	1.855	39.136	-0.16%	-1.44%
			2550	1.897	38.490	1.909	39.073	-0.63%	-1.49%
			2600	1.935	38.428	1.964	39.009	-1.48%	-1.49%
			2650	1.973	38.321	2.018	38.945	-2.23%	-1.60%
04/15/2019	5200H-5800H	21.9	5240	4.612	35.754	4.696	35.940	-1.79%	-0.52%
			5260	4.634	35.706	4.717	35.917	-1.76%	-0.59%
			5280	4.659	35.671	4.737	35.894	-1.65%	-0.62%
			5300	4.682	35.646	4.758	35.871	-1.60%	-0.63%
			5320	4.705	35.613	4.778	35.849	-1.53%	-0.66%
			5500	4.903	35.280	4.963	35.643	-1.21%	-1.02%
			5520	4.931	35.249	4.983	35.620	-1.04%	-1.04%
			5540	4.955	35.214	5.004	35.597	-0.98%	-1.08%
			5560	4.977	35.173	5.024	35.574	-0.94%	-1.13%
			5580	4.999	35.141	5.045	35.551	-0.91%	-1.15%
			5600	5.019	35.104	5.065	35.529	-0.91%	-1.20%
			5620	5.049	35.058	5.086	35.506	-0.73%	-1.26%
			5640	5.073	35.026	5.106	35.483	-0.65%	-1.29%
			5660	5.093	34.989	5.127	35.460	-0.66%	-1.33%
			5680	5.116	34.968	5.147	35.437	-0.60%	-1.32%
			5700	5.139	34.931	5.168	35.414	-0.56%	-1.36%
			5745	5.195	34.832	5.214	35.363	-0.36%	-1.50%
			5765	5.216	34.817	5.234	35.340	-0.34%	-1.48%
			5785	5.238	34.785	5.255	35.317	-0.32%	-1.51%
			5800	5.253	34.751	5.270	35.300	-0.32%	-1.56%
			5805	5.258	34.740	5.275	35.294	-0.32%	-1.57%
			5825	5.283	34.694	5.296	35.271	-0.25%	-1.64%

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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
4/22/2019	750B	21.0	680	0.918	55.246	0.958	55.804	-4.18%	-1.00%
			695	0.924	55.211	0.959	55.745	-3.65%	-0.96%
			700	0.925	55.198	0.959	55.726	-3.55%	-0.95%
			710	0.929	55.176	0.960	55.687	-3.23%	-0.92%
			740	0.941	55.109	0.963	55.570	-2.28%	-0.83%
			755	0.946	55.075	0.964	55.512	-1.87%	-0.79%
4/16/2019	835B	22.6	820	0.982	54.505	0.969	55.258	1.34%	-1.36%
			835	0.988	54.474	0.970	55.200	1.86%	-1.32%
			850	0.994	54.443	0.988	55.154	0.61%	-1.29%
4/15/2019	1750B	21.5	1710	1.473	51.557	1.463	53.537	0.68%	-3.70%
			1750	1.519	51.409	1.488	53.432	2.08%	-3.79%
			1790	1.563	51.242	1.514	53.326	3.24%	-3.91%
4/22/2019	1750B	20.6	1710	1.479	52.362	1.463	53.537	1.09%	-2.19%
			1750	1.506	52.300	1.488	53.432	1.21%	-2.12%
			1790	1.533	52.223	1.514	53.326	1.25%	-2.07%
5/1/2019	1750B	21.9	1710	1.453	52.642	1.463	53.537	-0.68%	-1.67%
			1750	1.497	52.486	1.488	53.432	0.60%	-1.77%
			1790	1.540	52.312	1.514	53.326	1.72%	-1.90%
4/15/2019	1900B	22.8	1850	1.512	51.526	1.520	53.300	-0.53%	-3.33%
			1880	1.545	51.442	1.520	53.300	1.64%	-3.49%
			1910	1.579	51.346	1.520	53.300	3.88%	-3.67%
4/17/2019	1900B	23.7	1850	1.516	52.789	1.520	53.300	-0.26%	-0.96%
			1880	1.549	52.679	1.520	53.300	1.91%	-1.17%
			1910	1.584	52.587	1.520	53.300	4.21%	-1.34%
4/15/2019	2450B	22.4	2400	1.990	51.130	1.902	52.767	4.63%	-3.10%
			2450	2.046	50.998	1.950	52.700	4.92%	-3.23%
			2500	2.104	50.863	2.021	52.636	4.11%	-3.37%
			2550	2.164	50.719	2.092	52.573	3.44%	-3.53%
			2600	2.224	50.581	2.163	52.509	2.82%	-3.67%
			2650	2.284	50.430	2.234	52.445	2.24%	-3.84%
			2700	2.346	50.275	2.305	52.382	1.78%	-4.02%
4/18/2019	2450B	22.9	2400	1.910	51.097	1.902	52.767	0.42%	-3.16%
			2450	1.964	50.998	1.950	52.700	0.72%	-3.23%
			2500	2.022	50.872	2.021	52.636	0.05%	-3.35%
			2550	2.081	50.694	2.092	52.573	-0.53%	-3.57%
			2600	2.139	50.573	2.163	52.509	-1.11%	-3.69%
5/2/2019	2450B	20.8	2400	1.982	52.908	1.902	52.767	4.21%	0.27%
			2450	2.028	52.830	1.950	52.700	4.00%	0.25%
			2500	2.075	52.763	2.021	52.636	2.67%	0.24%
04/14/2019	5200B-5800B	22.0	5180	5.277	47.494	5.276	49.041	0.02%	-3.15%
			5200	5.310	47.457	5.299	49.014	0.21%	-3.18%
			5220	5.337	47.394	5.323	48.987	0.26%	-3.25%
			5240	5.369	47.350	5.346	48.960	0.43%	-3.29%
			5260	5.390	47.306	5.369	48.933	0.39%	-3.32%
			5280	5.418	47.296	5.393	48.906	0.46%	-3.29%
			5300	5.448	47.266	5.416	48.879	0.59%	-3.30%
			5320	5.475	47.222	5.439	48.851	0.66%	-3.33%
			5500	5.720	46.889	5.650	48.607	1.24%	-3.53%
			5520	5.750	46.841	5.673	48.580	1.36%	-3.58%
			5540	5.793	46.783	5.696	48.553	1.70%	-3.65%
			5560	5.822	46.735	5.720	48.526	1.78%	-3.69%
			5580	5.852	46.731	5.743	48.499	1.90%	-3.65%
			5600	5.876	46.696	5.766	48.471	1.91%	-3.66%
			5620	5.897	46.645	5.790	48.444	1.85%	-3.71%
			5640	5.933	46.589	5.813	48.417	2.06%	-3.78%
			5660	5.974	46.538	5.837	48.390	2.35%	-3.83%
			5680	6.003	46.517	5.860	48.363	2.44%	-3.82%
			5700	6.029	46.514	5.883	48.336	2.48%	-3.77%
			5745	6.097	46.410	5.936	48.275	2.71%	-3.86%
			5765	6.123	46.351	5.959	48.248	2.75%	-3.93%
			5785	6.159	46.306	5.982	48.220	2.96%	-3.97%
			5800	6.181	46.301	6.000	48.200	3.02%	-3.94%
			5805	6.187	46.300	6.006	48.193	3.01%	-3.93%
			5825	6.211	46.284	6.029	48.166	3.02%	-3.91%
04/30/2019	5200B-5800B	21.1	5240	5.462	47.558	5.346	48.960	2.17%	-2.86%
			5260	5.488	47.514	5.369	48.933	2.22%	-2.90%
			5280	5.512	47.489	5.393	48.906	2.21%	-2.90%
			5300	5.537	47.454	5.416	48.879	2.23%	-2.92%
			5320	5.571	47.391	5.439	48.851	2.43%	-2.99%
			5500	5.826	47.067	5.650	48.607	3.12%	-3.17%
			5520	5.857	47.030	5.673	48.580	3.24%	-3.19%
			5540	5.892	46.980	5.696	48.553	3.44%	-3.24%
			5560	5.931	46.938	5.720	48.526	3.69%	-3.27%
			5580	5.959	46.911	5.743	48.499	3.76%	-3.27%
			5600	5.984	46.873	5.766	48.471	3.78%	-3.30%
			5620	6.009	46.827	5.790	48.444	3.78%	-3.34%
			5640	6.044	46.779	5.813	48.417	3.97%	-3.38%
			5660	6.078	46.735	5.837	48.390	4.13%	-3.42%
			5680	6.112	46.706	5.860	48.363	4.30%	-3.43%
			5700	6.141	46.673	5.883	48.336	4.39%	-3.44%
			5745	6.203	46.579	5.936	48.275	4.50%	-3.51%
			5765	6.238	46.542	5.959	48.248	4.68%	-3.54%

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

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10.2 Test System Verification

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

Table 10-3
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)	$Deviation_{1g}$ (%)
H	750	HEAD	04/22/2019	22.3	21.5	0.200	1003	7409	1.720	8.280	8.600	3.86%
D	835	HEAD	04/15/2019	22.4	20.6	0.200	4d132	3914	1.950	9.590	9.750	1.67%
E	1750	HEAD	04/15/2019	21.6	20.6	0.100	1008	3589	3.670	36.200	36.700	1.38%
H	1900	HEAD	04/17/2019	23.9	20.0	0.100	5d080	7409	4.210	39.800	42.100	5.78%
E	2450	HEAD	04/19/2019	24.3	21.6	0.100	981	3589	5.230	52.300	52.300	0.00%
E	2450	HEAD	04/21/2019	23.7	21.5	0.100	981	3589	5.190	52.300	51.900	-0.76%
E	2600	HEAD	04/21/2019	23.7	21.5	0.100	1064	3589	5.740	57.000	57.400	0.70%
H	5250	HEAD	04/15/2019	23.0	21.9	0.050	1191	7409	4.110	78.900	82.200	4.18%
H	5600	HEAD	04/15/2019	23.0	21.9	0.050	1191	7409	4.230	83.600	84.600	1.20%
H	5750	HEAD	04/15/2019	23.0	21.9	0.050	1191	7409	4.070	79.100	81.400	2.91%
L	750	BODY	04/22/2019	21.9	20.5	0.200	1161	7308	1.630	8.430	8.150	-3.32%
J	835	BODY	04/16/2019	24.2	22.6	0.200	4d132	7488	1.880	9.670	9.400	-2.79%
J	1750	BODY	04/15/2019	22.5	21.5	0.100	1008	7488	3.940	37.400	39.400	5.35%
J	1750	BODY	04/22/2019	21.7	20.6	0.100	1148	7488	3.750	37.000	37.500	1.35%
G	1900	BODY	04/15/2019	20.3	22.8	0.100	5d149	7410	4.090	39.400	40.900	3.81%
G	1900	BODY	04/17/2019	21.1	22.1	0.100	5d149	7410	4.220	39.400	42.200	7.11%
K	2450	BODY	04/15/2019	22.5	22.3	0.100	797	7417	5.130	51.100	51.300	0.39%
K	2450	BODY	04/18/2019	22.3	21.9	0.100	797	7417	5.020	51.100	50.200	-1.76%
K	2600	BODY	04/15/2019	22.5	22.3	0.100	1071	7417	5.410	54.200	54.100	-0.18%
L	5250	BODY	04/14/2019	22.0	21.5	0.050	1057	7308	3.560	75.900	71.200	-6.19%
L	5750	BODY	04/14/2019	22.0	21.5	0.050	1057	7308	3.540	76.700	70.800	-7.69%

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Table 10-4
System Verification Results – 10g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR_{10g} (W/kg)	1 W Target SAR_{10g} (W/kg)	1 W Normalized SAR_{10g} (W/kg)	$Deviation_{10g}$ (%)
J	1750	BODY	04/22/2019	21.7	20.6	0.100	1148	7488	2.010	19.800	20.100	1.52%
D	1750	BODY	05/01/2019	22.3	21.9	0.100	1148	3914	2.010	19.800	20.100	1.52%
G	1900	BODY	04/15/2019	20.3	22.8	0.100	5d149	7410	2.080	20.700	20.800	0.48%
G	1900	BODY	04/17/2019	21.1	22.1	0.100	5d149	7410	2.180	20.700	21.800	5.31%
K	2450	BODY	04/18/2019	22.3	21.9	0.100	797	7417	2.300	24.200	23.000	-4.96%
K	2600	BODY	04/18/2019	22.3	21.9	0.100	1071	7417	2.290	24.500	22.900	-6.53%
L	2450	BODY	05/02/2019	22.6	20.8	0.100	719	7308	2.240	23.700	22.400	-5.49%
L	5250	BODY	04/30/2019	22.0	21.1	0.050	1057	7308	1.010	21.100	20.200	-4.27%
L	5750	BODY	04/30/2019	22.0	21.1	0.050	1057	7308	0.990	21.200	19.800	-6.60%

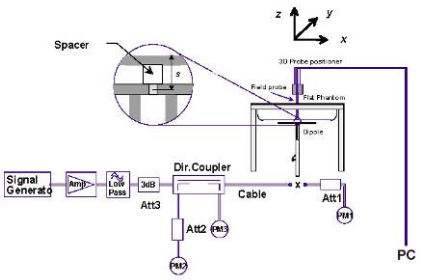

Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

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11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	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	32.48	0.09	Right	Cheek	00288	1	1:8.3	0.248	1.052	0.261	
836.60	190	GSM 850	GSM	32.7	32.48	0.06	Right	Tilt	00288	1	1:8.3	0.133	1.052	0.140	
836.60	190	GSM 850	GSM	32.7	32.48	0.12	Left	Cheek	00288	1	1:8.3	0.222	1.052	0.234	
836.60	190	GSM 850	GSM	32.7	32.48	0.01	Left	Tilt	00288	1	1:8.3	0.145	1.052	0.153	
836.60	190	GSM 850	GPRS	30.7	30.46	-0.07	Right	Cheek	00288	3	1:2.76	0.404	1.057	0.427	A1
836.60	190	GSM 850	GPRS	30.7	30.46	-0.04	Right	Tilt	00288	3	1:2.76	0.230	1.057	0.243	
836.60	190	GSM 850	GPRS	30.7	30.46	0.02	Left	Cheek	00288	3	1:2.76	0.380	1.057	0.402	
836.60	190	GSM 850	GPRS	30.7	30.46	0.03	Left	Tilt	00288	3	1:2.76	0.243	1.057	0.257	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-2
UMTS 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	25.2	25.19	0.00	Right	Cheek	00288	1:1	0.418	1.002	0.419	A2
836.60	4183	UMTS 850	RMC	25.2	25.19	0.02	Right	Tilt	00288	1:1	0.226	1.002	0.226	
836.60	4183	UMTS 850	RMC	25.2	25.19	0.07	Left	Cheek	00288	1:1	0.340	1.002	0.341	
836.60	4183	UMTS 850	RMC	25.2	25.19	0.00	Left	Tilt	00288	1:1	0.216	1.002	0.216	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

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Table 11-3
UMTS 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	24.4	24.36	-0.04	Right	Cheek	00288	1:1	0.297	1.009	0.300	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	0.04	Right	Tilt	00288	1:1	0.248	1.009	0.250	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	0.05	Left	Cheek	00288	1:1	0.485	1.009	0.489	A3
1732.40	1412	UMTS 1750	RMC	24.4	24.36	0.07	Left	Tilt	00288	1:1	0.206	1.009	0.208	
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	30.87	-0.06	Right	Cheek	00304	1	1:8.3	0.152	1.079	0.164	
1880.00	661	GSM 1900	GSM	31.2	30.87	0.04	Right	Tilt	00304	1	1:8.3	0.109	1.079	0.118	
1880.00	661	GSM 1900	GSM	31.2	30.87	0.09	Left	Cheek	00304	1	1:8.3	0.236	1.079	0.255	
1880.00	661	GSM 1900	GSM	31.2	30.87	-0.09	Left	Tilt	00304	1	1:8.3	0.085	1.079	0.092	
1880.00	661	GSM 1900	GPRS	27.2	26.81	0.03	Right	Cheek	00304	3	1:2.76	0.158	1.094	0.173	
1880.00	661	GSM 1900	GPRS	27.2	26.81	-0.07	Right	Tilt	00304	3	1:2.76	0.117	1.094	0.128	
1880.00	661	GSM 1900	GPRS	27.2	26.81	0.02	Left	Cheek	00304	3	1:2.76	0.245	1.094	0.268	A4
1880.00	661	GSM 1900	GPRS	27.2	26.81	0.06	Left	Tilt	00304	3	1:2.76	0.100	1.094	0.109	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-5
UMTS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	24.4	24.17	-0.07	Right	Cheek	00288	1:1	0.300	1.054	0.316	
1880.00	9400	UMTS 1900	RMC	24.4	24.17	-0.02	Right	Tilt	00288	1:1	0.178	1.054	0.188	
1880.00	9400	UMTS 1900	RMC	24.4	24.17	-0.05	Left	Cheek	00288	1:1	0.483	1.054	**0.509**	A5
1880.00	9400	UMTS 1900	RMC	24.4	24.17	0.09	Left	Tilt	00288	1:1	0.200	1.054	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							

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Table 11-6
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	24.7	24.44	-0.10	0	Right	Cheek	QPSK	1	0	00296	1:1	0.214	1.062	0.227	A6
680.50	133297	Mid	LTE Band 71	20	23.7	23.20	0.05	1	Right	Cheek	QPSK	50	25	00296	1:1	0.172	1.122	0.193	
680.50	133297	Mid	LTE Band 71	20	24.7	24.44	0.05	0	Right	Tilt	QPSK	1	0	00296	1:1	0.094	1.062	0.100	
680.50	133297	Mid	LTE Band 71	20	23.7	23.20	0.00	1	Right	Tilt	QPSK	50	25	00296	1:1	0.086	1.122	0.096	
680.50	133297	Mid	LTE Band 71	20	24.7	24.44	-0.09	0	Left	Cheek	QPSK	1	0	00296	1:1	0.176	1.062	0.187	
680.50	133297	Mid	LTE Band 71	20	23.7	23.20	0.01	1	Left	Cheek	QPSK	50	25	00296	1:1	0.153	1.122	0.172	
680.50	133297	Mid	LTE Band 71	20	24.7	24.44	-0.12	0	Left	Tilt	QPSK	1	0	00296	1:1	0.101	1.062	0.107	
680.50	133297	Mid	LTE Band 71	20	23.7	23.20	0.06	1	Left	Tilt	QPSK	50	25	00296	1:1	0.075	1.122	0.084	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-7
LTE Band 12 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	25.2	24.95	0.03	0	Right	Cheek	QPSK	1	0	00312	1:1	0.310	1.059	0.328	A7
707.50	23095	Mid	LTE Band 12	10	24.2	23.79	-0.01	1	Right	Cheek	QPSK	25	12	00312	1:1	0.265	1.099	0.291	
707.50	23095	Mid	LTE Band 12	10	25.2	24.95	-0.18	0	Right	Tilt	QPSK	1	0	00312	1:1	0.168	1.059	0.178	
707.50	23095	Mid	LTE Band 12	10	24.2	23.79	0.02	1	Right	Tilt	QPSK	25	12	00312	1:1	0.140	1.099	0.154	
707.50	23095	Mid	LTE Band 12	10	25.2	24.95	0.16	0	Left	Cheek	QPSK	1	0	00312	1:1	0.270	1.059	0.286	
707.50	23095	Mid	LTE Band 12	10	24.2	23.79	-0.06	1	Left	Cheek	QPSK	25	12	00312	1:1	0.213	1.099	0.234	
707.50	23095	Mid	LTE Band 12	10	25.2	24.95	0.04	0	Left	Tilt	QPSK	1	0	00312	1:1	0.152	1.059	0.161	
707.50	23095	Mid	LTE Band 12	10	24.2	23.79	0.04	1	Left	Tilt	QPSK	25	12	00312	1:1	0.119	1.099	0.131	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-8
LTE Band 26 (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)	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	-0.03	0	Right	Cheek	QPSK	1	74	00288	1:1	0.362	1.016	0.368	A8
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	0.00	1	Right	Cheek	QPSK	36	37	00288	1:1	0.280	1.002	0.281	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	0.09	0	Right	Tilt	QPSK	1	74	00288	1:1	0.183	1.016	0.186	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	-0.03	1	Right	Tilt	QPSK	36	37	00288	1:1	0.152	1.002	0.152	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	-0.02	0	Left	Cheek	QPSK	1	74	00288	1:1	0.356	1.016	0.362	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	0.08	1	Left	Cheek	QPSK	36	37	00288	1:1	0.240	1.002	0.240	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	-0.06	0	Left	Tilt	QPSK	1	74	00288	1:1	0.214	1.016	0.217	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	0.03	1	Left	Tilt	QPSK	36	37	00288	1:1	0.157	1.002	0.157	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-9
LTE Band 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) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	0.07	0	Right	Cheek	QPSK	1	0	00288	1:1	0.258	1.062	0.274	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.07	1	Right	Cheek	QPSK	50	0	00288	1:1	0.207	1.026	0.212	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	-0.10	0	Right	Tilt	QPSK	1	0	00288	1:1	0.137	1.062	0.145	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	-0.02	1	Right	Tilt	QPSK	50	0	00288	1:1	0.097	1.026	0.100	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	-0.04	0	Left	Cheek	QPSK	1	0	00288	1:1	0.416	1.062	0.442	A9
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.02	1	Left	Cheek	QPSK	50	0	00288	1:1	0.344	1.026	0.353	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	-0.01	0	Left	Tilt	QPSK	1	0	00288	1:1	0.271	1.062	0.288	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.06	1	Left	Tilt	QPSK	50	0	00288	1:1	0.219	1.026	0.225	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-10
LTE Band 25 (PCS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	-0.10	0	Right	Cheek	QPSK	1	0	00304	1:1	0.272	1.014	0.276	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.00	1	Right	Cheek	QPSK	50	0	00304	1:1	0.210	1.054	0.221	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	0.02	0	Right	Tilt	QPSK	1	0	00304	1:1	0.152	1.014	0.154	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.05	1	Right	Tilt	QPSK	50	0	00304	1:1	0.127	1.054	0.134	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	-0.20	0	Left	Cheek	QPSK	1	0	00304	1:1	0.436	1.014	0.442	A10
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.07	1	Left	Cheek	QPSK	50	0	00304	1:1	0.320	1.054	0.337	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	-0.03	0	Left	Tilt	QPSK	1	0	00304	1:1	0.213	1.014	0.216	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	-0.01	1	Left	Tilt	QPSK	50	0	00304	1:1	0.166	1.054	0.175	
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 7 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) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	-0.06	0	Right	Cheek	QPSK	1	99	00304	1:1	0.234	1.047	0.245	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	0.12	1	Right	Cheek	QPSK	50	0	00304	1:1	0.191	1.069	0.204	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	0.17	0	Right	Tilt	QPSK	1	99	00304	1:1	0.162	1.047	0.170	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	0.20	1	Right	Tilt	QPSK	50	0	00304	1:1	0.136	1.069	0.145	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	0.00	0	Left	Cheek	QPSK	1	99	00304	1:1	0.389	1.047	0.407	A11
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	-0.05	1	Left	Cheek	QPSK	50	0	00304	1:1	0.327	1.069	0.350	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	0.17	0	Left	Tilt	QPSK	1	99	00304	1:1	0.141	1.047	0.148	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	-0.05	1	Left	Tilt	QPSK	50	0	00304	1:1	0.105	1.069	0.112	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-12
LTE Band 41 Head SAR

MEASUREMENT RESULTS																					
Power Class	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)	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	0.14	0	Right	Cheek	QPSK	1	99	00304	1:1.58	0.097	1.007	0.098	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	0.15	1	Right	Cheek	QPSK	50	50	00304	1:1.58	0.085	1.002	0.085	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	0.16	0	Right	Tilt	QPSK	1	99	00304	1:1.58	0.118	1.007	0.119	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	0.13	1	Right	Tilt	QPSK	50	50	00304	1:1.58	0.100	1.002	0.100	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	0.13	0	Left	Cheek	QPSK	1	99	00304	1:1.58	0.202	1.007	0.203	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	-0.18	1	Left	Cheek	QPSK	50	50	00304	1:1.58	0.135	1.002	0.135	
Power Class 2	2636.50	41055	Mid-High	LTE Band 41	20	27.2	26.85	0.13	0	Left	Cheek	QPSK	1	99	00304	1:2.31	0.256	1.084	0.278	A12
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	-0.02	0	Left	Tilt	QPSK	1	99	00304	1:1.58	0.085	1.007	0.086	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	0.10	1	Left	Tilt	QPSK	50	50	00304	1:1.58	0.062	1.002	0.062	
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
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	18.0	17.40	0.19	Right	Cheek	00379	1	99.9	1.205	0.949	1.148	1.001	1.091	
2437	6	802.11b	DSSS	22	18.0	17.30	0.13	Right	Cheek	00379	1	99.9	1.730	1.060	1.175	1.001	**1.247**	A13
2462	11	802.11b	DSSS	22	18.0	17.31	0.13	Right	Cheek	00379	1	99.9	1.386	0.981	1.172	1.001	1.151	
2412	1	802.11b	DSSS	22	18.0	17.40	-0.01	Right	Tilt	00379	1	99.9	1.116	0.758	1.148	1.001	0.871	
2462	11	802.11b	DSSS	22	18.0	17.31	-0.11	Right	Tilt	00379	1	99.9	1.089	0.640	1.172	1.001	0.751	
2412	1	802.11b	DSSS	22	18.0	17.40	-0.16	Left	Cheek	00379	1	99.9	0.651	0.449	1.148	1.001	0.516	
2412	1	802.11b	DSSS	22	18.0	17.40	0.04	Left	Tilt	00379	1	99.9	0.614	-	1.148	1.001	-	
2437	6	802.11b	DSSS	22	18.0	17.30	0.09	Right	Cheek	00379	1	99.9	1.461	1.050	1.175	1.001	1.235	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population															Head 1.6 W/kg (mW/g) averaged over 1 gram			

Note: Blue entry represents variability measurement.

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Table 11-14
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)	
5260	52	802.11a	OFDM	20	13.5	13.22	0.19	Right	Cheek	00387	6	99.2	1.432	0.836	1.067	1.008	0.899	
5280	56	802.11a	OFDM	20	13.5	13.19	0.12	Right	Cheek	00387	6	99.2	1.775	0.888	1.074	1.008	0.961	
5300	60	802.11a	OFDM	20	13.5	13.12	0.14	Right	Cheek	00387	6	99.2	1.599	0.815	1.091	1.008	0.896	
5260	52	802.11a	OFDM	20	13.5	13.22	0.12	Right	Tilt	00387	6	99.2	0.985	0.577	1.067	1.008	0.621	
5260	52	802.11a	OFDM	20	13.5	13.22	-0.13	Left	Cheek	00387	6	99.2	0.720	-	1.067	1.008	-	
5260	52	802.11a	OFDM	20	13.5	13.22	0.07	Left	Tilt	00387	6	99.2	0.679	-	1.067	1.008	-	
5280	56	802.11a	OFDM	20	13.5	13.19	0.11	Right	Cheek	00387	6	99.2	1.646	0.798	1.074	1.008	0.864	
5590	118	802.11n	OFDM	40	13.0	12.78	0.16	Right	Cheek	00387	13.5	98.6	2.133	0.910	1.052	1.014	0.971	
5710	142	802.11n	OFDM	40	13.0	12.89	0.18	Right	Cheek	00387	13.5	98.6	2.321	0.926	1.026	1.014	0.963	
5710	142	802.11n	OFDM	40	13.0	12.89	0.11	Right	Tilt	00387	13.5	98.6	1.483	0.682	1.026	1.014	0.710	
5710	142	802.11n	OFDM	40	13.0	12.89	-0.14	Left	Cheek	00387	13.5	98.6	1.264	-	1.026	1.014	-	
5710	142	802.11n	OFDM	40	13.0	12.89	0.00	Left	Tilt	00387	13.5	98.6	1.142	-	1.026	1.014	-	
5590	118	802.11n	OFDM	40	13.0	12.78	0.19	Right	Cheek	00387	13.5	98.6	1.754	0.831	1.052	1.014	0.886	
5785	157	802.11a	OFDM	20	14.0	13.67	0.14	Right	Cheek	00387	6	99.2	1.859	0.890	1.079	1.008	0.968	
5805	161	802.11a	OFDM	20	14.0	13.72	0.11	Right	Cheek	00387	6	99.2	1.847	0.980	1.067	1.008	**1.054**	A14
5805	161	802.11a	OFDM	20	14.0	13.72	0.12	Right	Tilt	00387	6	99.2	1.557	0.719	1.067	1.008	0.773	
5805	161	802.11a	OFDM	20	14.0	13.72	-0.10	Left	Cheek	00387	6	99.2	1.386	-	1.067	1.008	-	
5805	161	802.11a	OFDM	20	14.0	13.72	-0.15	Left	Tilt	00387	6	99.2	1.331	-	1.067	1.008	-	
5805	161	802.11a	OFDM	20	14.0	13.72	0.16	Right	Cheek	00387	6	99.2	1.881	0.844	1.067	1.008	0.908	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**								**Head** **1.6 W/kg (mW/g)** averaged over 1 gram										

Note: Blue entry represents variability measurement.

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11.2 Standalone Body-Worn SAR Data

Table 11-15
GSM/UMTS Body-Worn SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	32.7	32.48	0.01	10 mm	00304	1	1:8.3	back	0.243	1.052	0.256	
836.60	190	GSM 850	GPRS	30.7	30.46	0.01	10 mm	00304	3	1:2.76	back	0.441	1.057	0.466	A15
836.60	4183	UMTS 850	RMC	25.2	25.19	0.01	10 mm	00304	N/A	1:1	back	0.403	1.002	0.404	A17
1712.40	1312	UMTS 1750	RMC	24.4	24.30	-0.16	10 mm	00304	N/A	1:1	back	0.823	1.023	0.842	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	-0.07	10 mm	00304	N/A	1:1	back	0.919	1.009	0.927	
1752.60	1513	UMTS 1750	RMC	24.4	24.15	-0.10	10 mm	00304	N/A	1:1	back	0.921	1.059	**0.975**	A19
1752.60	1513	UMTS 1750	RMC	24.4	24.15	0.04	10 mm	00304	N/A	1:1	back	0.842	1.059	0.892	
1880.00	661	GSM 1900	GSM	31.2	30.87	-0.05	10 mm	00296	1	1:8.3	back	0.315	1.079	0.340	
1880.00	661	GSM 1900	GPRS	27.2	26.81	-0.06	10 mm	00296	3	1:2.76	back	0.347	1.094	0.380	A20
1852.40	9262	UMTS 1900	RMC	24.4	24.19	-0.01	10 mm	00296	N/A	1:1	back	0.732	1.050	0.769	A22
1880.00	9400	UMTS 1900	RMC	24.4	24.17	0.05	10 mm	00296	N/A	1:1	back	0.662	1.054	0.698	
1907.60	9538	UMTS 1900	RMC	24.4	24.31	0.05	10 mm	00296	N/A	1:1	back	0.670	1.021	0.684	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**												**Body** **1.6 W/kg (mW/g)** averaged over 1 gram			

Note: Blue entry represents variability measurement.

Table 11-16
LTE Body-Worn SAR

MEASUREMENT RESULTS																					
Power Class	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)	
N/A	680.50	133297	Mid	LTE Band 71	20	24.7	24.44	-0.16	0	00288	QPSK	1	0	10 mm	back	1:1	0.384	1.062	0.408	A24
N/A	680.50	133297	Mid	LTE Band 71	20	23.7	23.20	-0.18	1	00288	QPSK	50	25	10 mm	back	1:1	0.304	1.122	0.341	
N/A	707.50	23095	Mid	LTE Band 12	10	25.2	24.95	-0.04	0	00288	QPSK	1	0	10 mm	back	1:1	0.415	1.059	0.439	A25
N/A	707.50	23095	Mid	LTE Band 12	10	24.2	23.79	-0.07	1	00288	QPSK	25	12	10 mm	back	1:1	0.364	1.099	0.400	
N/A	831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	-0.07	0	00304	QPSK	1	74	10 mm	back	1:1	0.355	1.016	0.361	A26
N/A	831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	-0.05	1	00304	QPSK	36	37	10 mm	back	1:1	0.255	1.002	0.256	
N/A	1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	-0.03	0	00296	QPSK	1	0	10 mm	back	1:1	0.697	1.062	0.740	
N/A	1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.4	24.13	-0.03	0	00296	QPSK	1	0	10 mm	back	1:1	0.761	1.064	0.810	
N/A	1770.00	132572	High	LTE Band 66 (AWS)	20	24.4	24.09	0.00	0	00296	QPSK	1	0	10 mm	back	1:1	0.765	1.074	0.822	A28
N/A	1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.01	1	00296	QPSK	50	0	10 mm	back	1:1	0.587	1.026	0.602	
N/A	1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.26	0.02	1	00296	QPSK	100	0	10 mm	back	1:1	0.598	1.033	0.618	
N/A	1860.00	26140	Low	LTE Band 25 (PCS)	20	24.4	24.32	0.05	0	00296	QPSK	1	0	10 mm	back	1:1	0.738	1.019	0.752	A29
N/A	1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.4	24.09	0.00	0	00296	QPSK	1	99	10 mm	back	1:1	0.556	1.074	0.597	
N/A	1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	-0.06	0	00296	QPSK	1	0	10 mm	back	1:1	0.645	1.014	0.654	
N/A	1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.00	1	00296	QPSK	50	0	10 mm	back	1:1	0.502	1.054	0.529	
N/A	2510.00	20850	Low	LTE Band 7	20	24.7	24.50	-0.19	0	00312	QPSK	1	99	10 mm	back	1:1	0.506	1.047	0.530	A31
N/A	2510.00	20850	Low	LTE Band 7	20	23.7	23.41	0.15	1	00312	QPSK	50	0	10 mm	back	1:1	0.411	1.069	0.439	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	0.07	0	00312	QPSK	1	99	10 mm	back	1:1.58	0.159	1.007	0.160	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	0.14	1	00312	QPSK	50	50	10 mm	back	1:1.58	0.144	1.002	0.144	
Power Class 2	2636.50	41055	Mid-High	LTE Band 41	20	27.2	26.85	-0.11	0	00312	QPSK	1	99	10 mm	back	1:2.31	0.187	1.084	0.203	A33
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**																**Body** **1.6 W/kg (mW/g)** averaged over 1 gram				

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Table 11-17
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	21.94	0.12	10 mm	00387	1	back	99.9	0.952	0.645	1.138	1.001	0.735	
2437	6	802.11b	DSSS	22	22.5	22.27	0.08	10 mm	00387	1	back	99.9	1.101	0.700	1.054	1.001	0.739	
2462	11	802.11b	DSSS	22	22.5	22.21	-0.03	10 mm	00387	1	back	99.9	1.198	0.736	1.069	1.001	**0.788**	A35
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
NII 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)	
5280	56	802.11a	OFDM	20	18.0	17.96	0.08	10 mm	00379	6	back	99.2	1.075	0.481	1.009	1.008	0.489	
5720	144	802.11a	OFDM	20	17.5	17.45	-0.02	10 mm	00379	6	back	99.2	1.054	0.473	1.012	1.008	0.483	
5805	161	802.11a	OFDM	20	18.5	18.50	0.05	10 mm	00379	6	back	99.2	1.366	0.558	1.000	1.008	**0.562**	A36
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
DSS Body-Worn SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	9.0	8.61	0.10	10 mm	00379	1	back	77.1	0.020	1.093	1.297	**0.028**	A37
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**							**Body** **1.6 W/kg (mW/g)** averaged over 1 gram									

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11.3 Standalone Hotspot SAR Data

Table 11-20
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GPRS	30.7	30.46	0.01	10 mm	00304	3	1:2.76	back	0.441	1.057	0.466	
836.60	190	GSM 850	GPRS	30.7	30.46	0.04	10 mm	00304	3	1:2.76	front	0.428	1.057	0.452	
836.60	190	GSM 850	GPRS	30.7	30.46	-0.10	10 mm	00304	3	1:2.76	bottom	0.227	1.057	0.240	
836.60	190	GSM 850	GPRS	30.7	30.46	-0.18	10 mm	00304	3	1:2.76	right	0.454	1.057	0.480	A16
836.60	190	GSM 850	GPRS	30.7	30.46	-0.12	10 mm	00304	3	1:2.76	left	0.206	1.057	0.218	
836.60	4183	UMTS 850	RMC	25.2	25.19	0.01	10 mm	00304	N/A	1:1	back	0.403	1.002	0.404	
836.60	4183	UMTS 850	RMC	25.2	25.19	-0.12	10 mm	00304	N/A	1:1	front	0.377	1.002	0.378	
836.60	4183	UMTS 850	RMC	25.2	25.19	-0.02	10 mm	00304	N/A	1:1	bottom	0.213	1.002	0.213	
836.60	4183	UMTS 850	RMC	25.2	25.19	-0.05	10 mm	00304	N/A	1:1	right	0.430	1.002	0.431	A18
836.60	4183	UMTS 850	RMC	25.2	25.19	0.12	10 mm	00304	N/A	1:1	left	0.196	1.002	0.196	
1712.40	1312	UMTS 1750	RMC	24.4	24.30	-0.16	10 mm	00304	N/A	1:1	back	0.823	1.023	0.842	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	-0.07	10 mm	00304	N/A	1:1	back	0.919	1.009	0.927	
1752.60	1513	UMTS 1750	RMC	24.4	24.15	-0.10	10 mm	00304	N/A	1:1	back	0.921	1.059	**0.975**	A19
1732.40	1412	UMTS 1750	RMC	24.4	24.36	-0.04	10 mm	00304	N/A	1:1	front	0.699	1.009	0.705	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	-0.01	10 mm	00304	N/A	1:1	bottom	0.409	1.009	0.413	
1712.40	1312	UMTS 1750	RMC	24.4	24.30	-0.03	10 mm	00304	N/A	1:1	left	0.689	1.023	0.705	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	-0.02	10 mm	00304	N/A	1:1	left	0.808	1.009	0.815	
1752.60	1513	UMTS 1750	RMC	24.4	24.15	0.01	10 mm	00304	N/A	1:1	left	0.806	1.059	0.854	
1752.60	1513	UMTS 1750	RMC	24.4	24.15	0.04	10 mm	00304	N/A	1:1	back	0.842	1.059	0.892	
1880.00	661	GSM 1900	GPRS	27.2	26.81	-0.06	10 mm	00296	3	1:2.76	back	0.347	1.094	0.380	
1880.00	661	GSM 1900	GPRS	27.2	26.81	0.03	10 mm	00296	3	1:2.76	front	0.465	1.094	0.509	A21
1880.00	661	GSM 1900	GPRS	27.2	26.81	-0.15	10 mm	00296	3	1:2.76	bottom	0.313	1.094	0.342	
1880.00	661	GSM 1900	GPRS	27.2	26.81	0.08	10 mm	00296	3	1:2.76	left	0.407	1.094	0.445	
1852.40	9262	UMTS 1900	RMC	24.4	24.19	-0.01	10 mm	00296	N/A	1:1	back	0.732	1.050	0.769	
1880.00	9400	UMTS 1900	RMC	24.4	24.17	0.05	10 mm	00296	N/A	1:1	back	0.662	1.054	0.698	
1907.60	9538	UMTS 1900	RMC	24.4	24.31	0.05	10 mm	00296	N/A	1:1	back	0.670	1.021	0.684	
1852.40	9262	UMTS 1900	RMC	24.4	24.19	0.04	10 mm	00296	N/A	1:1	front	0.707	1.050	0.742	
1880.00	9400	UMTS 1900	RMC	24.4	24.17	0.02	10 mm	00296	N/A	1:1	front	0.679	1.054	0.716	
1907.60	9538	UMTS 1900	RMC	24.4	24.31	0.07	10 mm	00296	N/A	1:1	front	0.750	1.021	0.766	A23
1880.00	9400	UMTS 1900	RMC	24.4	24.17	0.04	10 mm	00296	N/A	1:1	bottom	0.588	1.054	0.620	
1880.00	9400	UMTS 1900	RMC	24.4	24.17	-0.03	10 mm	00296	N/A	1:1	left	0.608	1.054	0.641	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**							**Body** **1.6 W/kg (mW/g)** averaged over 1 gram								

Note: Blue entry represents variability measurement.

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Table 11-21
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	24.7	24.44	-0.16	0	00288	QPSK	1	0	10 mm	back	1:1	0.384	1.062	0.408	A24
680.50	133297	Mid	LTE Band 71	20	23.7	23.20	-0.18	1	00288	QPSK	50	25	10 mm	back	1:1	0.304	1.122	0.341	
680.50	133297	Mid	LTE Band 71	20	24.7	24.44	0.08	0	00288	QPSK	1	0	10 mm	front	1:1	0.321	1.062	0.341	
680.50	133297	Mid	LTE Band 71	20	23.7	23.20	0.07	1	00288	QPSK	50	25	10 mm	front	1:1	0.264	1.122	0.296	
680.50	133297	Mid	LTE Band 71	20	24.7	24.44	-0.10	0	00288	QPSK	1	0	10 mm	bottom	1:1	0.134	1.062	0.142	
680.50	133297	Mid	LTE Band 71	20	23.7	23.20	-0.13	1	00288	QPSK	50	25	10 mm	bottom	1:1	0.116	1.122	0.130	
680.50	133297	Mid	LTE Band 71	20	24.7	24.44	-0.05	0	00288	QPSK	1	0	10 mm	right	1:1	0.261	1.062	0.277	
680.50	133297	Mid	LTE Band 71	20	23.7	23.20	-0.02	1	00288	QPSK	50	25	10 mm	right	1:1	0.223	1.122	0.250	
680.50	133297	Mid	LTE Band 71	20	24.7	24.44	-0.09	0	00288	QPSK	1	0	10 mm	left	1:1	0.185	1.062	0.196	
680.50	133297	Mid	LTE Band 71	20	23.7	23.20	-0.10	1	00288	QPSK	50	25	10 mm	left	1:1	0.169	1.122	0.190	
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	24.95	-0.04	0	00288	QPSK	1	0	10 mm	back	1:1	0.415	1.059	0.439	A25
707.50	23095	Mid	LTE Band 12	10	24.2	23.79	-0.07	1	00288	QPSK	25	12	10 mm	back	1:1	0.364	1.099	0.400	
707.50	23095	Mid	LTE Band 12	10	25.2	24.95	0.00	0	00288	QPSK	1	0	10 mm	front	1:1	0.370	1.059	0.392	
707.50	23095	Mid	LTE Band 12	10	24.2	23.79	0.06	1	00288	QPSK	25	12	10 mm	front	1:1	0.317	1.099	0.348	
707.50	23095	Mid	LTE Band 12	10	25.2	24.95	-0.03	0	00288	QPSK	1	0	10 mm	bottom	1:1	0.193	1.059	0.204	
707.50	23095	Mid	LTE Band 12	10	24.2	23.79	-0.12	1	00288	QPSK	25	12	10 mm	bottom	1:1	0.143	1.099	0.157	
707.50	23095	Mid	LTE Band 12	10	25.2	24.95	-0.16	0	00288	QPSK	1	0	10 mm	right	1:1	0.404	1.059	0.428	
707.50	23095	Mid	LTE Band 12	10	24.2	23.79	-0.13	1	00288	QPSK	25	12	10 mm	right	1:1	0.332	1.099	0.365	
707.50	23095	Mid	LTE Band 12	10	25.2	24.95	-0.03	0	00288	QPSK	1	0	10 mm	left	1:1	0.252	1.059	0.267	
707.50	23095	Mid	LTE Band 12	10	24.2	23.79	-0.05	1	00288	QPSK	25	12	10 mm	left	1:1	0.223	1.099	0.245	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram									

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Table 11-23
LTE Band 26 (Cell) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	-0.07	0	00304	QPSK	1	74	10 mm	back	1:1	0.355	1.016	0.361	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	-0.05	1	00304	QPSK	36	37	10 mm	back	1:1	0.255	1.002	0.256	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	-0.07	0	00304	QPSK	1	74	10 mm	front	1:1	0.270	1.016	0.274	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	-0.03	1	00304	QPSK	36	37	10 mm	front	1:1	0.181	1.002	0.181	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	-0.06	0	00304	QPSK	1	74	10 mm	bottom	1:1	0.210	1.016	0.213	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	0.07	1	00304	QPSK	36	37	10 mm	bottom	1:1	0.142	1.002	0.142	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	-0.06	0	00304	QPSK	1	74	10 mm	right	1:1	0.408	1.016	0.415	A27
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	0.01	1	00304	QPSK	36	37	10 mm	right	1:1	0.281	1.002	0.282	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.13	-0.03	0	00304	QPSK	1	74	10 mm	left	1:1	0.186	1.016	0.189	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.19	0.01	1	00304	QPSK	36	37	10 mm	left	1:1	0.135	1.002	0.135	
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 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	24.4	24.14	-0.03	0	00296	QPSK	1	0	10 mm	back	1:1	0.697	1.062	0.740	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.4	24.13	-0.03	0	00296	QPSK	1	0	10 mm	back	1:1	0.761	1.064	0.810	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.4	24.09	0.00	0	00296	QPSK	1	0	10 mm	back	1:1	0.765	1.074	0.822	A28
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.01	1	00296	QPSK	50	0	10 mm	back	1:1	0.587	1.026	0.602	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.26	0.02	1	00296	QPSK	100	0	10 mm	back	1:1	0.598	1.033	0.618	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	0.12	0	00296	QPSK	1	0	10 mm	front	1:1	0.652	1.062	0.692	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.09	1	00296	QPSK	50	0	10 mm	front	1:1	0.477	1.026	0.489	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	-0.02	0	00296	QPSK	1	0	10 mm	bottom	1:1	0.333	1.062	0.354	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	-0.03	1	00296	QPSK	50	0	10 mm	bottom	1:1	0.237	1.026	0.243	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	0.01	0	00296	QPSK	1	0	10 mm	left	1:1	0.633	1.062	0.672	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.00	1	00296	QPSK	50	0	10 mm	left	1:1	0.538	1.026	0.552	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-25
LTE Band 25 (PCS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1860.00	26140	Low	LTE Band 25 (PCS)	20	24.4	24.32	0.05	0	00296	QPSK	1	0	10 mm	back	1:1	0.738	1.019	0.752	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.4	24.09	0.00	0	00296	QPSK	1	99	10 mm	back	1:1	0.556	1.074	0.597	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	-0.06	0	00296	QPSK	1	0	10 mm	back	1:1	0.645	1.014	0.654	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.00	1	00296	QPSK	50	0	10 mm	back	1:1	0.502	1.054	0.529	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	-0.01	0	00296	QPSK	1	0	10 mm	front	1:1	0.679	1.014	0.689	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.04	1	00296	QPSK	50	0	10 mm	front	1:1	0.550	1.054	0.580	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	-0.17	0	00296	QPSK	1	0	10 mm	bottom	1:1	0.567	1.014	0.575	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	-0.02	1	00296	QPSK	50	0	10 mm	bottom	1:1	0.440	1.054	0.464	
1860.00	26140	Low	LTE Band 25 (PCS)	20	24.4	24.32	0.02	0	00296	QPSK	1	0	10 mm	left	1:1	0.790	1.019	0.805	A30
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.4	24.09	0.02	0	00296	QPSK	1	99	10 mm	left	1:1	0.630	1.074	0.677	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	0.02	0	00296	QPSK	1	0	10 mm	left	1:1	0.716	1.014	0.726	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.06	1	00296	QPSK	50	0	10 mm	left	1:1	0.558	1.054	0.588	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.16	0.11	1	00296	QPSK	100	0	10 mm	left	1:1	0.564	1.057	0.596	
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 7 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)	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	-0.19	0	00312	QPSK	1	99	10 mm	back	1:1	0.506	1.047	0.530	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	0.15	1	00312	QPSK	50	0	10 mm	back	1:1	0.411	1.069	0.439	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	0.07	0	00312	QPSK	1	99	10 mm	front	1:1	0.858	1.047	0.898	A32
2535.00	21100	Mid	LTE Band 7	20	24.7	24.29	0.00	0	00312	QPSK	1	99	10 mm	front	1:1	0.740	1.099	0.813	
2560.00	21350	High	LTE Band 7	20	24.7	24.43	0.20	0	00312	QPSK	1	50	10 mm	front	1:1	0.771	1.064	0.820	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	0.06	1	00312	QPSK	50	0	10 mm	front	1:1	0.814	1.069	0.870	
2535.00	21100	Mid	LTE Band 7	20	23.7	23.19	-0.07	1	00312	QPSK	50	0	10 mm	front	1:1	0.681	1.125	0.766	
2560.00	21350	High	LTE Band 7	20	23.7	23.10	0.10	1	00312	QPSK	50	0	10 mm	front	1:1	0.642	1.148	0.737	
2510.00	20850	Low	LTE Band 7	20	23.7	23.28	-0.19	1	00312	QPSK	100	0	10 mm	front	1:1	0.783	1.102	0.863	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	-0.06	0	00312	QPSK	1	99	10 mm	bottom	1:1	0.539	1.047	0.564	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	0.05	1	00312	QPSK	50	0	10 mm	bottom	1:1	0.493	1.069	0.527	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	0.19	0	00312	QPSK	1	99	10 mm	right	1:1	0.144	1.047	0.151	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	0.06	1	00312	QPSK	50	0	10 mm	right	1:1	0.123	1.069	0.131	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	-0.15	0	00312	QPSK	1	99	10 mm	left	1:1	0.400	1.047	0.419	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	-0.02	1	00312	QPSK	50	0	10 mm	left	1:1	0.330	1.069	0.353	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

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Table 11-27
LTE Band 41 Hotspot SAR

MEASUREMENT RESULTS																					
Power Class	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)	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	0.07	0	00312	QPSK	1	99	10 mm	back	1:1.58	0.159	1.007	0.160	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	0.14	1	00312	QPSK	50	50	10 mm	back	1:1.58	0.144	1.002	0.144	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	-0.02	0	00312	QPSK	1	99	10 mm	front	1:1.58	0.387	1.007	0.390	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	0.06	1	00312	QPSK	50	50	10 mm	front	1:1.58	0.348	1.002	0.349	
Power Class 2	2636.50	41055	Mid-High	LTE Band 41	20	27.2	26.85	0.04	0	00312	QPSK	1	99	10 mm	front	1:2.31	0.492	1.084	0.533	A34
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	0.06	0	00312	QPSK	1	99	10 mm	bottom	1:1.58	0.177	1.007	0.178	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	0.09	1	00312	QPSK	50	50	10 mm	bottom	1:1.58	0.163	1.002	0.163	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	0.10	0	00312	QPSK	1	99	10 mm	right	1:1.58	0.035	1.007	0.035	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	0.14	1	00312	QPSK	50	50	10 mm	right	1:1.58	0.025	1.002	0.025	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	24.2	24.17	0.05	0	00312	QPSK	1	99	10 mm	left	1:1.58	0.204	1.007	0.205	
Power Class 3	2636.50	41055	Mid-High	LTE Band 41	20	23.2	23.19	0.05	1	00312	QPSK	50	50	10 mm	left	1:1.58	0.184	1.002	0.184	

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

Table 11-28
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	21.94	0.12	10 mm	00387	1	back	99.9	0.952	0.645	1.138	1.001	0.735	
2437	6	802.11b	DSSS	22	22.5	22.27	0.08	10 mm	00387	1	back	99.9	1.101	0.700	1.054	1.001	0.739	
2462	11	802.11b	DSSS	22	22.5	22.21	-0.03	10 mm	00387	1	back	99.9	1.198	0.736	1.069	1.001	**0.788**	A35
2437	6	802.11b	DSSS	22	22.5	22.27	0.08	10 mm	00387	1	front	99.9	0.618	0.411	1.054	1.001	0.434	
2437	6	802.11b	DSSS	22	22.5	22.27	0.10	10 mm	00387	1	top	99.9	0.378	-	1.054	1.001	-	
2437	6	802.11b	DSSS	22	22.5	22.27	0.03	10 mm	00387	1	left	99.9	0.574	0.382	1.054	1.001	0.403	
5240	48	802.11a	OFDM	20	18.0	17.95	-0.02	10 mm	00379	6	back	99.2	1.083	0.481	1.012	1.008	0.491	
5240	48	802.11a	OFDM	20	18.0	17.95	-0.13	10 mm	00379	6	front	99.2	0.650	-	1.012	1.008	-	
5240	48	802.11a	OFDM	20	18.0	17.95	-0.11	10 mm	00379	6	top	99.2	0.700	0.311	1.012	1.008	0.317	
5240	48	802.11a	OFDM	20	18.0	17.95	0.17	10 mm	00379	6	left	99.2	0.415	-	1.012	1.008	-	
5805	161	802.11a	OFDM	20	18.5	18.50	0.05	10 mm	00379	6	back	99.2	1.366	0.558	1.000	1.008	**0.562**	A36
5805	161	802.11a	OFDM	20	18.5	18.50	-0.06	10 mm	00379	6	front	99.2	0.867	-	1.000	1.008	-	
5805	161	802.11a	OFDM	20	18.5	18.50	-0.03	10 mm	00379	6	top	99.2	1.046	0.442	1.000	1.008	0.446	
5805	161	802.11a	OFDM	20	18.5	18.50	-0.11	10 mm	00379	6	left	99.2	0.667	-	1.000	1.008	-	

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

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11.4 Standalone Phablet SAR Data

Table 11-29
UMTS 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)	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	0.02	3 mm	00312	1:1	back	1.780	1.009	1.796	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	0.21	3 mm	00312	1:1	front	1.410	1.009	1.423	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	-0.03	4 mm	00312	1:1	bottom	0.575	1.009	0.580	
1712.40	1312	UMTS 1750	RMC	24.4	24.30	-0.03	0 mm	00312	1:1	left	2.000	1.023	2.046	
1732.40	1412	UMTS 1750	RMC	24.4	24.36	0.08	0 mm	00312	1:1	left	2.110	1.009	2.129	
1752.60	1513	UMTS 1750	RMC	24.4	24.15	-0.15	0 mm	00312	1:1	left	2.070	1.059	2.192	
1712.40	1312	UMTS 1750	RMC	22.9	22.76	0.01	0 mm	00312	1:1	back	2.360	1.033	2.438	
1732.40	1412	UMTS 1750	RMC	22.9	22.90	0.01	0 mm	00312	1:1	back	2.480	1.000	2.480	A38
1752.60	1513	UMTS 1750	RMC	22.9	22.78	0.00	0 mm	00312	1:1	back	2.420	1.028	2.488	
1712.40	1312	UMTS 1750	RMC	22.9	22.76	0.18	0 mm	00312	1:1	front	2.180	1.033	2.252	
1732.40	1412	UMTS 1750	RMC	22.9	22.90	0.16	0 mm	00312	1:1	front	2.290	1.000	2.290	
1752.60	1513	UMTS 1750	RMC	22.9	22.78	0.16	0 mm	00312	1:1	front	2.250	1.028	2.313	
1732.40	1412	UMTS 1750	RMC	22.9	22.90	-0.05	0 mm	00312	1:1	bottom	1.230	1.000	1.230	
1732.40	1412	UMTS 1750	RMC	22.9	22.90	-0.16	0 mm	00312	1:1	back	2.290	1.000	2.290	
1880.00	9400	UMTS 1900	RMC	24.4	24.17	-0.03	3 mm	00296	1:1	back	1.390	1.054	1.465	
1880.00	9400	UMTS 1900	RMC	24.4	24.17	0.15	3 mm	00296	1:1	front	1.780	1.054	1.876	
1880.00	9400	UMTS 1900	RMC	24.4	24.17	0.01	4 mm	00296	1:1	bottom	0.926	1.054	0.976	
1852.40	9262	UMTS 1900	RMC	24.4	24.19	-0.11	0 mm	00296	1:1	left	2.810	1.050	2.951	A39
1880.00	9400	UMTS 1900	RMC	24.4	24.17	-0.04	0 mm	00296	1:1	left	2.650	1.054	2.793	
1907.60	9538	UMTS 1900	RMC	24.4	24.31	0.17	0 mm	00296	1:1	left	2.770	1.021	2.828	
1852.40	9262	UMTS 1900	RMC	22.9	22.90	-0.12	0 mm	00296	1:1	back	2.380	1.000	2.380	
1880.00	9400	UMTS 1900	RMC	22.9	22.88	0.10	0 mm	00296	1:1	back	2.220	1.005	2.231	
1907.60	9538	UMTS 1900	RMC	22.9	22.90	-0.16	0 mm	00296	1:1	back	2.310	1.000	2.310	
1852.40	9262	UMTS 1900	RMC	22.9	22.90	0.13	0 mm	00296	1:1	front	2.560	1.000	2.560	
1880.00	9400	UMTS 1900	RMC	22.9	22.88	0.11	0 mm	00296	1:1	front	2.440	1.005	2.452	
1907.60	9538	UMTS 1900	RMC	22.9	22.90	0.12	0 mm	00296	1:1	front	2.520	1.000	2.520	
1880.00	9400	UMTS 1900	RMC	22.9	22.88	-0.08	0 mm	00296	1:1	bottom	1.400	1.005	1.407	
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 measurement.

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Table 11-30
LTE Band 66 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	24.4	24.14	0.02	0	00312	QPSK	1	0	3 mm	back	1:1	1.510	1.062	1.604	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.03	1	00312	QPSK	50	0	3 mm	back	1:1	1.270	1.026	1.303	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	0.12	0	00312	QPSK	1	0	3 mm	front	1:1	1.260	1.062	1.338	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.19	1	00312	QPSK	50	0	3 mm	front	1:1	1.080	1.026	1.108	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	0.01	0	00312	QPSK	1	0	4 mm	bottom	1:1	0.558	1.062	0.593	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	-0.01	1	00312	QPSK	50	0	4 mm	bottom	1:1	0.468	1.026	0.480	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.4	24.14	-0.01	0	00312	QPSK	1	0	0 mm	left	1:1	2.060	1.062	2.188	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.4	24.13	0.04	0	00312	QPSK	1	0	0 mm	left	1:1	2.180	1.064	2.320	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.4	24.09	-0.01	0	00312	QPSK	1	0	0 mm	left	1:1	2.190	1.074	2.352	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.29	0.00	1	00312	QPSK	50	0	0 mm	left	1:1	1.730	1.026	1.775	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.4	23.26	0.00	1	00312	QPSK	100	0	0 mm	left	1:1	1.760	1.033	1.818	
1720.00	132072	Low	LTE Band 66 (AWS)	20	21.9	21.45	0.01	0	00312	QPSK	1	50	0 mm	back	1:1	2.140	1.109	2.373	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	21.9	21.55	-0.01	0	00312	QPSK	1	0	0 mm	back	1:1	2.340	1.084	2.537	
1770.00	132572	High	LTE Band 66 (AWS)	20	21.9	21.46	-0.03	0	00312	QPSK	1	0	0 mm	back	1:1	2.350	1.107	2.601	A40
1720.00	132072	Low	LTE Band 66 (AWS)	20	21.9	21.44	-0.01	0	00312	QPSK	50	0	0 mm	back	1:1	2.270	1.112	2.524	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	21.9	21.53	0.05	0	00312	QPSK	50	0	0 mm	back	1:1	2.350	1.089	2.559	
1770.00	132572	High	LTE Band 66 (AWS)	20	21.9	21.43	0.00	0	00312	QPSK	50	25	0 mm	back	1:1	2.320	1.114	2.584	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	21.9	21.52	-0.01	0	00312	QPSK	100	0	0 mm	back	1:1	2.350	1.091	2.564	
1720.00	132072	Low	LTE Band 66 (AWS)	20	21.9	21.45	0.12	0	00312	QPSK	1	50	0 mm	front	1:1	1.960	1.109	2.174	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	21.9	21.55	0.11	0	00312	QPSK	1	0	0 mm	front	1:1	2.090	1.084	2.266	
1770.00	132572	High	LTE Band 66 (AWS)	20	21.9	21.46	0.17	0	00312	QPSK	1	0	0 mm	front	1:1	2.080	1.107	2.303	
1720.00	132072	Low	LTE Band 66 (AWS)	20	21.9	21.44	0.14	0	00312	QPSK	50	0	0 mm	front	1:1	1.960	1.112	2.180	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	21.9	21.53	0.10	0	00312	QPSK	50	0	0 mm	front	1:1	2.090	1.089	2.276	
1770.00	132572	High	LTE Band 66 (AWS)	20	21.9	21.43	-0.06	0	00312	QPSK	50	25	0 mm	front	1:1	2.120	1.114	2.362	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	21.9	21.52	0.11	0	00312	QPSK	100	0	0 mm	front	1:1	2.070	1.091	2.258	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	21.9	21.55	-0.14	0	00312	QPSK	1	0	0 mm	bottom	1:1	1.250	1.084	1.355	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	21.9	21.53	-0.17	0	00312	QPSK	50	0	0 mm	bottom	1:1	1.250	1.089	1.361	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population																Phablet 4.0 W/kg (mW/g) averaged over 10 grams			

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Table 11-31
LTE Band 25 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)	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	-0.08	0	00296	QPSK	1	0	3 mm	back	1:1	1.240	1.014	1.257	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	-0.02	1	00296	QPSK	50	0	3 mm	back	1:1	0.977	1.054	1.030	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	0.15	0	00296	QPSK	1	0	3 mm	front	1:1	1.490	1.014	1.511	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.15	1	00296	QPSK	50	0	3 mm	front	1:1	1.190	1.054	1.254	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	0.17	0	00296	QPSK	1	0	4 mm	bottom	1:1	0.967	1.014	0.981	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.01	1	00296	QPSK	50	0	4 mm	bottom	1:1	0.697	1.054	0.735	
1860.00	26140	Low	LTE Band 25 (PCS)	20	24.4	24.32	0.12	0	00296	QPSK	1	0	0 mm	left	1:1	2.910	1.019	**2.965**	A41
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.4	24.09	0.20	0	00296	QPSK	1	99	0 mm	left	1:1	2.590	1.074	2.782	
1905.00	26590	High	LTE Band 25 (PCS)	20	24.4	24.34	-0.06	0	00296	QPSK	1	0	0 mm	left	1:1	2.770	1.014	2.809	
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.4	23.13	0.16	1	00296	QPSK	50	50	0 mm	left	1:1	2.290	1.064	2.437	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.4	23.05	0.20	1	00296	QPSK	50	0	0 mm	left	1:1	2.260	1.084	2.450	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.17	0.12	1	00296	QPSK	50	0	0 mm	left	1:1	2.270	1.054	2.393	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.4	23.16	0.13	1	00296	QPSK	100	0	0 mm	left	1:1	2.270	1.057	2.399	
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.9	22.73	0.02	0	00296	QPSK	1	0	0 mm	back	1:1	2.170	1.040	2.257	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.9	22.80	0.00	0	00296	QPSK	1	0	0 mm	back	1:1	2.110	1.023	2.159	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.9	22.84	0.00	0	00296	QPSK	1	0	0 mm	back	1:1	2.100	1.014	2.129	
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.9	22.75	0.01	0	00296	QPSK	50	0	0 mm	back	1:1	2.190	1.035	2.267	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.9	22.73	0.00	0	00296	QPSK	50	0	0 mm	back	1:1	2.120	1.040	2.205	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.9	22.79	0.04	0	00296	QPSK	50	0	0 mm	back	1:1	2.140	1.026	2.196	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.9	22.78	-0.05	0	00296	QPSK	100	0	0 mm	back	1:1	2.160	1.028	2.220	
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.9	22.73	0.19	0	00296	QPSK	1	0	0 mm	front	1:1	2.430	1.040	2.527	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.9	22.80	0.20	0	00296	QPSK	1	0	0 mm	front	1:1	2.390	1.023	2.445	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.9	22.84	0.19	0	00296	QPSK	1	0	0 mm	front	1:1	2.410	1.014	2.444	
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.9	22.75	0.14	0	00296	QPSK	50	0	0 mm	front	1:1	2.490	1.035	2.577	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.9	22.73	0.16	0	00296	QPSK	50	0	0 mm	front	1:1	2.420	1.040	2.517	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.9	22.79	0.17	0	00296	QPSK	50	0	0 mm	front	1:1	2.460	1.026	2.524	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.9	22.78	0.18	0	00296	QPSK	100	0	0 mm	front	1:1	2.440	1.028	2.508	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.9	22.84	-0.06	0	00296	QPSK	1	0	0 mm	bottom	1:1	1.390	1.014	1.409	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.9	22.79	-0.06	0	00296	QPSK	50	0	0 mm	bottom	1:1	1.370	1.026	1.406	
1860.00	26140	Low	LTE Band 25 (PCS)	20	24.4	24.32	-0.05	0	00296	QPSK	1	0	0 mm	left	1:1	2.760	1.019	2.812	
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 measurement.

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Table 11-32
LTE Band 7 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)	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	0.15	0	00312	QPSK	1	99	3 mm	back	1:1	0.643	1.047	0.673	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	0.12	1	00312	QPSK	50	0	3 mm	back	1:1	0.541	1.069	0.578	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	0.06	0	00312	QPSK	1	99	3 mm	front	1:1	1.310	1.047	1.372	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	-0.02	1	00312	QPSK	50	0	3 mm	front	1:1	1.130	1.069	1.208	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	-0.06	0	00312	QPSK	1	99	4 mm	bottom	1:1	0.743	1.047	0.778	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	-0.09	1	00312	QPSK	50	0	4 mm	bottom	1:1	0.632	1.069	0.676	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	-0.17	0	00312	QPSK	1	99	0 mm	right	1:1	0.278	1.047	0.291	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	0.18	1	00312	QPSK	50	0	0 mm	right	1:1	0.247	1.069	0.264	
2510.00	20850	Low	LTE Band 7	20	24.7	24.50	-0.01	0	00312	QPSK	1	99	0 mm	left	1:1	1.300	1.047	1.361	
2510.00	20850	Low	LTE Band 7	20	23.7	23.41	-0.10	1	00312	QPSK	50	0	0 mm	left	1:1	1.050	1.069	1.122	
2510.00	20850	Low	LTE Band 7	20	23.2	23.02	-0.11	0	00312	QPSK	1	99	0 mm	back	1:1	1.760	1.042	1.834	
2510.00	20850	Low	LTE Band 7	20	23.2	22.98	-0.18	0	00312	QPSK	50	0	0 mm	back	1:1	1.680	1.052	1.767	
2510.00	20850	Low	LTE Band 7	20	23.2	23.02	0.08	0	00312	QPSK	1	99	0 mm	front	1:1	2.770	1.042	2.886	
2535.00	21100	Mid	LTE Band 7	20	23.2	23.00	0.06	0	00312	QPSK	1	0	0 mm	front	1:1	2.620	1.047	2.743	
2560.00	21350	High	LTE Band 7	20	23.2	22.73	0.07	0	00312	QPSK	1	0	0 mm	front	1:1	2.550	1.114	2.841	
2510.00	20850	Low	LTE Band 7	20	23.2	22.98	0.10	0	00312	QPSK	50	0	0 mm	front	1:1	2.790	1.052	2.935	A42
2535.00	21100	Mid	LTE Band 7	20	23.2	22.77	0.08	0	00312	QPSK	50	0	0 mm	front	1:1	2.500	1.104	2.760	
2560.00	21350	High	LTE Band 7	20	23.2	22.48	0.13	0	00312	QPSK	50	25	0 mm	front	1:1	2.400	1.180	2.832	
2510.00	20850	Low	LTE Band 7	20	23.2	22.91	0.05	0	00312	QPSK	100	0	0 mm	front	1:1	2.700	1.069	2.886	
2510.00	20850	Low	LTE Band 7	20	23.2	23.02	0.02	0	00312	QPSK	1	99	0 mm	bottom	1:1	0.915	1.042	0.953	
2510.00	20850	Low	LTE Band 7	20	23.2	22.98	-0.02	0	00312	QPSK	50	0	0 mm	bottom	1:1	0.901	1.052	0.948	
2510.00	20850	Low	LTE Band 7	20	23.2	22.98	0.11	0	00312	QPSK	50	0	0 mm	front	1:1	2.790	1.052	2.935	
2535.00	21100	Mid	LTE Band 7	20	23.2	23.00	0.11	0	00312	QPSK	1	0	0 mm	front	1:1	2.760	1.047	2.890	
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 measurement.

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Table 11-33
WLAN Phablet 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 (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	18.0	17.94	0.03	0 mm	00379	6	back	99.2	18.747	1.330	1.014	1.008	**1.359**	A43
5280	56	802.11a	OFDM	20	18.0	17.96	-0.02	0 mm	00379	6	back	99.2	15.052	1.290	1.009	1.008	1.312	
5300	60	802.11a	OFDM	20	18.0	17.95	-0.13	0 mm	00379	6	back	99.2	14.068	1.260	1.012	1.008	1.285	
5280	56	802.11a	OFDM	20	18.0	17.96	0.14	0 mm	00379	6	front	99.2	8.816	1.000	1.009	1.008	1.017	
5280	56	802.11a	OFDM	20	18.0	17.96	-0.21	0 mm	00379	6	top	99.2	6.218	-	1.009	1.008	-	
5280	56	802.11a	OFDM	20	18.0	17.96	0.04	0 mm	00379	6	left	99.2	4.023	0.456	1.009	1.008	0.464	
5720	144	802.11a	OFDM	20	17.5	17.45	0.14	0 mm	00379	6	back	99.2	21.964	1.250	1.012	1.008	1.275	
5720	144	802.11a	OFDM	20	17.5	17.45	0.10	0 mm	00379	6	front	99.2	7.745	0.961	1.012	1.008	0.980	
5720	144	802.11a	OFDM	20	17.5	17.45	-0.19	0 mm	00379	6	top	99.2	4.952	-	1.012	1.008	-	
5720	144	802.11a	OFDM	20	17.5	17.45	0.05	0 mm	00379	6	left	99.2	3.017	0.402	1.012	1.008	0.410	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**	**Phablet** **4.0 W/kg (mW/g)** averaged over 10 grams

Table 11-34
DSS Phablet SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (10g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (10g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	9.0	8.61	-0.04	0 mm	00379	1	back	77.1	0.024	1.093	1.297	0.034	
2441	39	Bluetooth	FHSS	9.0	8.61	0.09	0 mm	00379	1	front	77.1	0.028	1.093	1.297	**0.040**	A44
2441	39	Bluetooth	FHSS	9.0	8.61	0.20	0 mm	00379	1	top	77.1	0.009	1.093	1.297	0.013	
2441	39	Bluetooth	FHSS	9.0	8.61	-0.18	0 mm	00379	1	left	77.1	0.018	1.093	1.297	0.026	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**	**Phablet** **4.0 W/kg (mW/g)** averaged over 10 grams

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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, no additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg for 1g SAR or 2.0 W/kg for 10g SAR. 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. Additional SAR tests for phablet SAR were evaluated per KDB 616217 Section 6 (See Section 6.9 for more information).
11. Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds below.
12. 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.

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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 8.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 and MCC=001 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC KDB Publication 447498 D01v06, when the reported LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg for 1g evaluations, testing at the other channels was required for such test configurations.
5. TDD LTE was tested per the guidance provided in FCC KDB Publication 941225 D05v02r04. Testing was performed using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Section 4, the duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.
6. 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.
7. This device supports Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operations is 43.3 % using UL-DL configuration 1. Per FCC Guidance, all SAR tests were performed using Power Class 3. SAR with power class 2 at the available duty factor was additionally performed for the power class 3 configuration with the highest SAR configuration for each exposure conditions. Please see Section 14 for linearity results.

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 8.6.5 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 8.6.6 for more information.

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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.
6. When 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

Bluetooth Notes

1. Bluetooth SAR was measured with the device connected to a call box with hopping disabled with DH5 operation and Tx Tests test mode type. Per October 2016 TCB Workshop Notes, the reported SAR was scaled to the 100% transmission duty factor to determine compliance. See Section 9.5 for the time domain plot and calculation for the duty factor of the device.

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12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

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

12.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore, simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 4.3.2 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 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.

(*) 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 941225 D06v02r01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR (“-“).

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12.3 Head SAR Simultaneous Transmission Analysis

Table 12-1
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	GSM/GPRS 850	0.427	1.247	See Table Below
	UMTS 850	0.419	1.247	See Table Below
	UMTS 1750	0.489	1.247	See Table Below
	GSM/GPRS 1900	0.268	1.247	1.515
	UMTS 1900	0.509	1.247	See Table Below
	LTE Band 71	0.227	1.247	1.474
	LTE Band 12	0.328	1.247	**1.575**
	LTE Band 26 (Cell)	0.368	1.247	See Table Below
	LTE Band 66 (AWS)	0.442	1.247	See Table Below
	LTE Band 25 (PCS)	0.442	1.247	See Table Below
	LTE Band 7	0.407	1.247	See Table Below
	LTE Band 41	0.278	1.247	1.525

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2			1	2	1+2	1+2
Head SAR	Right Cheek	0.261	1.247	**1.508**	Head SAR	Right Cheek	0.427	1.247	See Note 1	0.03
	Right Tilt	0.140	0.871	1.011		Right Tilt	0.243	0.871	1.114	N/A
	Left Cheek	0.234	0.516	0.750		Left Cheek	0.402	0.516	0.918	N/A
	Left Tilt	0.153	1.247*	1.400		Left Tilt	0.257	1.247*	**1.504**	N/A

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR	Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2	1+2			1	2	1+2
Head SAR	Right Cheek	0.419	1.247	See Note 1	0.03	Head SAR	Right Cheek	0.300	1.247	**1.547**
	Right Tilt	0.226	0.871	1.097	N/A		Right Tilt	0.250	0.871	1.121
	Left Cheek	0.341	0.516	0.857	N/A		Left Cheek	0.489	0.516	1.005
	Left Tilt	0.216	1.247*	**1.463**	N/A		Left Tilt	0.208	1.247*	1.455

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 26 (Cell) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2			1	2	1+2	1+2
Head SAR	Right Cheek	0.316	1.247	**1.563**	Head SAR	Right Cheek	0.368	1.247	See Note 1	0.03
	Right Tilt	0.188	0.871	1.059		Right Tilt	0.186	0.871	1.057	N/A
	Left Cheek	0.509	0.516	1.025		Left Cheek	0.362	0.516	0.878	N/A
	Left Tilt	0.211	1.247*	1.458		Left Tilt	0.217	1.247*	**1.464**	N/A

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Simult Tx	Configuration	LTE Band 66 (AWS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Right Cheek	0.274	1.247	1.521
	Right Tilt	0.145	0.871	1.016
	Left Cheek	0.442	0.516	0.958
	Left Tilt	0.288	1.247*	**1.535**

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Right Cheek	0.276	1.247	**1.523**
	Right Tilt	0.154	0.871	1.025
	Left Cheek	0.442	0.516	0.958
	Left Tilt	0.216	1.247*	1.463

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Right Cheek	0.245	1.247	**1.492**
	Right Tilt	0.170	0.871	1.041
	Left Cheek	0.407	0.516	0.923
	Left Tilt	0.148	1.247*	1.395

Table 12-2
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	GSM/GPRS 850	0.427	1.054	1.481
	UMTS 850	0.419	1.054	1.473
	UMTS 1750	0.489	1.054	1.543
	GSM/GPRS 1900	0.268	1.054	1.322
	UMTS 1900	0.509	1.054	**1.563**
	LTE Band 71	0.227	1.054	1.281
	LTE Band 12	0.328	1.054	1.382
	LTE Band 26 (Cell)	0.368	1.054	1.422
	LTE Band 66 (AWS)	0.442	1.054	1.496
	LTE Band 25 (PCS)	0.442	1.054	1.496
	LTE Band 7	0.407	1.054	1.461
	LTE Band 41	0.278	1.054	1.332

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

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12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-3
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	GSM/GPRS 850	0.466	0.788	1.254	N/A
	UMTS 850	0.404	0.788	1.192	N/A
	UMTS 1750	0.975	0.788	See Note 1	0.02
	GSM/GPRS 1900	0.380	0.788	1.168	N/A
	UMTS 1900	0.769	0.788	**1.557**	N/A
	LTE Band 71	0.408	0.788	1.196	N/A
	LTE Band 12	0.439	0.788	1.227	N/A
	LTE Band 26 (Cell)	0.361	0.788	1.149	N/A
	LTE Band 66 (AWS)	0.822	0.788	See Note 1	0.02
	LTE Band 25 (PCS)	0.752	0.788	1.540	N/A
	LTE Band 7	0.530	0.788	1.318	N/A
	LTE Band 41	0.203	0.788	0.991	N/A

Table 12-4
Simultaneous Transmission Scenario with Bluetooth and 5GHz WLAN (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Body-Worn	GSM/GPRS 850	0.466	0.028	0.562	0.494	1.028	1.056
	UMTS 850	0.404	0.028	0.562	0.432	0.966	0.994
	UMTS 1750	0.975	0.028	0.562	1.003	1.537	**1.565**
	GSM/GPRS 1900	0.380	0.028	0.562	0.408	0.942	0.970
	UMTS 1900	0.769	0.028	0.562	0.797	1.331	1.359
	LTE Band 71	0.408	0.028	0.562	0.436	0.970	0.998
	LTE Band 12	0.439	0.028	0.562	0.467	1.001	1.029
	LTE Band 26 (Cell)	0.361	0.028	0.562	0.389	0.923	0.951
	LTE Band 66 (AWS)	0.822	0.028	0.562	0.850	1.384	1.412
	LTE Band 25 (PCS)	0.752	0.028	0.562	0.780	1.314	1.342
	LTE Band 7	0.530	0.028	0.562	0.558	1.092	1.120
	LTE Band 41	0.203	0.028	0.562	0.231	0.765	0.793

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

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12.5 Hotspot SAR Simultaneous Transmission Analysis

Table 12-5
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	GPRS 850	0.480	0.788	1.268
	UMTS 850	0.431	0.788	1.219
	UMTS 1750	0.975	0.788	See Table Below
	GPRS 1900	0.509	0.788	1.297
	UMTS 1900	0.769	0.788	1.557
	LTE Band 71	0.408	0.788	1.196
	LTE Band 12	0.439	0.788	1.227
	LTE Band 26 (Cell)	0.415	0.788	1.203
	LTE Band 66 (AWS)	0.822	0.788	See Table Below
	LTE Band 25 (PCS)	0.805	0.788	**1.593**
	LTE Band 7	0.898	0.788	See Table Below
	LTE Band 41	0.533	0.788	1.321

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	0.975	0.788	See Note 1	0.02
	Front	0.705	0.434	1.139	N/A
	Top	-	0.788*	0.788	N/A
	Bottom	0.413	-	0.413	N/A
	Left	0.854	0.403	**1.257**	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	0.822	0.788	See Note 1	0.02
	Front	0.692	0.434	**1.126**	N/A
	Top	-	0.788*	0.788	N/A
	Bottom	0.354	-	0.354	N/A
	Left	0.672	0.403	1.075	N/A

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Hotspot SAR	Back	0.530	0.788	1.318
	Front	0.898	0.434	**1.332**
	Top	-	0.788*	0.788
	Bottom	0.564	-	0.564
	Right	0.151	-	0.151
	Left	0.419	0.403	0.822

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Table 12-6
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	GPRS 850	0.480	0.562	1.042
	UMTS 850	0.431	0.562	0.993
	UMTS 1750	0.975	0.562	**1.537**
	GPRS 1900	0.509	0.562	1.071
	UMTS 1900	0.769	0.562	1.331
	LTE Band 71	0.408	0.562	0.970
	LTE Band 12	0.439	0.562	1.001
	LTE Band 26 (Cell)	0.415	0.562	0.977
	LTE Band 66 (AWS)	0.822	0.562	1.384
	LTE Band 25 (PCS)	0.805	0.562	1.367
	LTE Band 7	0.898	0.562	1.460
	LTE Band 41	0.533	0.562	1.095

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12.6 Phablet 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 12-7
Simultaneous Transmission Scenario with Bluetooth and 5 GHz WLAN (Phablet)

Simult Tx	Configuration	UMTS 1750 SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)			Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3			1	2	3	1+2	1+3	1+2+3
Phablet SAR	Back	2.488	0.034	1.359	2.522	3.847	**3.881**	Phablet SAR	Back	2.380	0.034	1.359	2.414	3.739	**3.773**
	Front	2.313	0.040	1.017	2.353	3.330	3.370		Front	2.560	0.040	1.017	2.600	3.577	3.617
	Top	-	0.013	1.359*	0.013	1.359	1.372		Top	-	0.013	1.359*	0.013	1.359	1.372
	Bottom	1.230	-	-	1.230	1.230	1.230		Bottom	1.407	-	-	1.407	1.407	1.407
	Left	2.192	0.026	0.464	2.218	2.656	2.682		Left	2.951	0.026	0.464	2.977	3.415	3.441

Simult Tx	Configuration	LTE Band 66 (AWS) SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)			Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3			1	2	3	1+2	1+3	1+2+3
Phablet SAR	Back	2.601	0.034	1.359	2.635	3.960	**3.994**	Phablet SAR	Back	2.267	0.034	1.359	2.301	3.626	**3.660**
	Front	2.362	0.040	1.017	2.402	3.379	3.419		Front	2.577	0.040	1.017	2.617	3.594	3.634
	Top	-	0.013	1.359*	0.013	1.359	1.372		Top	-	0.013	1.359*	0.013	1.359	1.372
	Bottom	1.361	-	-	1.361	1.361	1.361		Bottom	1.409	-	-	1.409	1.409	1.409
	Left	2.352	0.026	0.464	2.378	2.816	2.842		Left	2.965	0.026	0.464	2.991	3.429	3.455

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Phablet SAR	Back	1.834	0.034	1.359	1.868	3.193	3.227
	Front	2.935	0.040	1.017	2.975	3.952	**3.992**
	Top	-	0.013	1.359*	0.013	1.359	1.372
	Bottom	0.953	-	-	0.953	0.953	0.953
	Right	0.291	-	-	0.291	0.291	0.291
	Left	1.361	0.026	0.464	1.387	1.825	1.851

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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 and 4 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.

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

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

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

12.7.1 Right Cheek SPLSR Evaluation and Analysis

Table 12-8
Peak SAR Locations for Right Cheek

Mode/Band	x (mm)	y (mm)	z (mm)
2.4 GHz WLAN	5.95	-332.37	-173.47
GPRS 850	42.11	-263.13	-175.97
UMTS 850	46.86	-268.07	-175.72
LTE Band 26 (Cell)	40.04	-262.56	-175.92

Table 12-9
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}	$(a+b)^{1.5}/D_{a-b}$	
2.4 GHz WLAN	GPRS 850	1.247	0.427	1.674	78.15	0.03	1
2.4 GHz WLAN	UMTS 850	1.247	0.419	1.666	76.24	0.03	2
2.4 GHz WLAN	LTE Band 26 (Cell)	1.247	0.368	1.615	77.73	0.03	3

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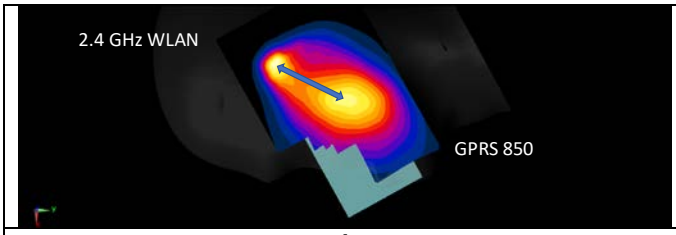
Table 12-10
Right Cheek SAR to Peak Location Separation Ratio Plots



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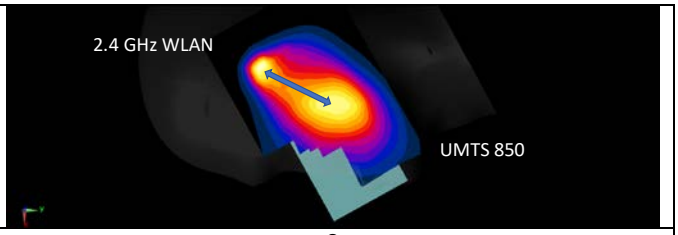
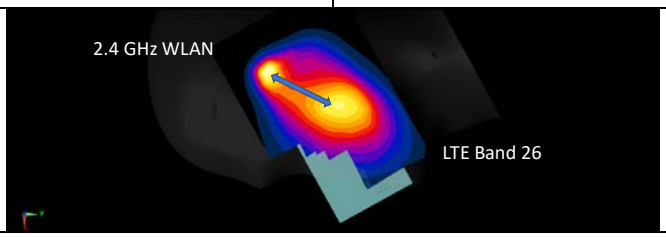


2



3

12.7.2 Body Back Side SPLSR Evaluation and Analysis

Table 12-11
Peak SAR Locations for Body Back Side

Mode/Band	x (mm)	y (mm)
2.4 GHz WLAN	2.60	54.00
UMTS 1750	10.00	-57.00
LTE Band 66 (AWS)	-1.00	-54.00

Table 12-12
Body 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}	$(a+b)^{1.5}/D_{a-b}$	
2.4 GHz WLAN	UMTS 1750	0.788	0.975	1.763	111.25	0.02	1
2.4 GHz WLAN	LTE Band 66 (AWS)	0.788	0.822	1.610	108.06	0.02	2

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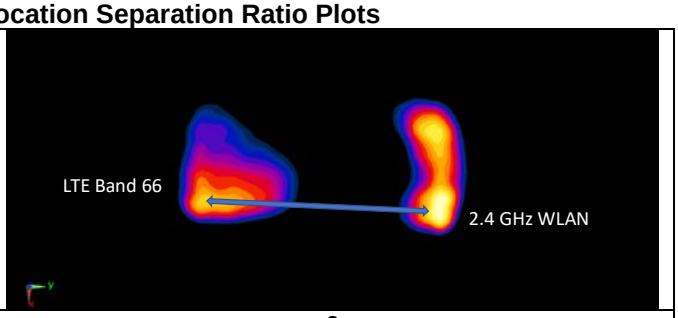
Table 12-13
Body Back Side SAR to Peak Location Separation Ratio Plots

	
1	2

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.

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13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

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

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

1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was 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	2437.00	6	802.11b, 22 MHz Bandwidth	DSSS	Right	Cheek	1	1.060	1.050	1.01	N/A	N/A	N/A	N/A
5250	5280.00	56	802.11a, 20 MHz Bandwidth	OFDM	Right	Cheek	6	0.888	0.798	1.11	N/A	N/A	N/A	N/A
5600	5590.00	118	802.11n, 40 MHz Bandwidth	OFDM	Right	Cheek	13.5	0.910	0.831	1.10	N/A	N/A	N/A	N/A
5750	5805.00	161	802.11a, 20 MHz Bandwidth	OFDM	Right	Cheek	6	0.980	0.844	1.16	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	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	1752.60	1513	UMTS 1750	RMC	back	10 mm	0.921	0.842	1.09	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								

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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	1732.40	1412	UMTS 1750	RMC	back	0 mm	2.480	2.290	1.08	N/A	N/A	N/A	N/A
1900	1860.00	26140	LTE Band 25 (PCS), 20 MHz Bandwidth	QPSK, 1 RB, 0 RB Offset	left	0 mm	2.910	2.760	1.05	N/A	N/A	N/A	N/A
2450	2510.00	20850	LTE Band 7, 20 MHz Bandwidth	QPSK, 50 RB, 0 RB Offset	front	0 mm	2.790	2.790	1.00	N/A	N/A	N/A	N/A
2600	2535.00	21100	LTE Band 7, 20 MHz Bandwidth	QPSK, 1 RB, 0 RB Offset	front	0 mm	2.620	2.760	1.05	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.

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14 ADDITIONAL TESTING PER FCC GUIDANCE

14.1 LTE Band 41 Power Class 2 and Power Class 3 Linearity

This device supports Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operations is 43.3 % using UL-DL configuration 1. Per May 2017 TCB Workshop Notes based on the device behavior, all SAR tests were performed using Power Class 3. SAR with Power Class 2 at the highest power and available duty factor was additionally performed for the Power Class 3 configuration with the highest SAR for each exposure condition. The linearity between the Power Class 2 and Power Class 3 SAR results and the respective frame averaged powers was calculated to determine that the results were linear. Per May 2017 TCB Workshop, no additional SAR measurements were required since the linearity between power classes was < 10% and all reported SAR values were < 1.4 W/kg for 1g and < 3.5 W/kg for 10g.

LTE Band 41 SAR testing with power class 2 at the highest power and available duty factor was additionally performed for the power class 3 configuration with the highest SAR for each exposure condition.

Table 14-1
LTE Band 41 Head Linearity Data

	LTE Band 41 PC3	LTE Band 41 PC2
Maximum Allowed Output Power (dBm)	24.2	27.2
Measured Output Power (dBm)	24.17	26.85
Measured SAR (W/kg)	0.202	0.256
Measured Power (mW)	261.22	484.17
Duty Cycle	63.3%	43.3%
Frame Averaged Output Power (mW)	165.35	209.65
% deviation from expected linearity		-0.05%

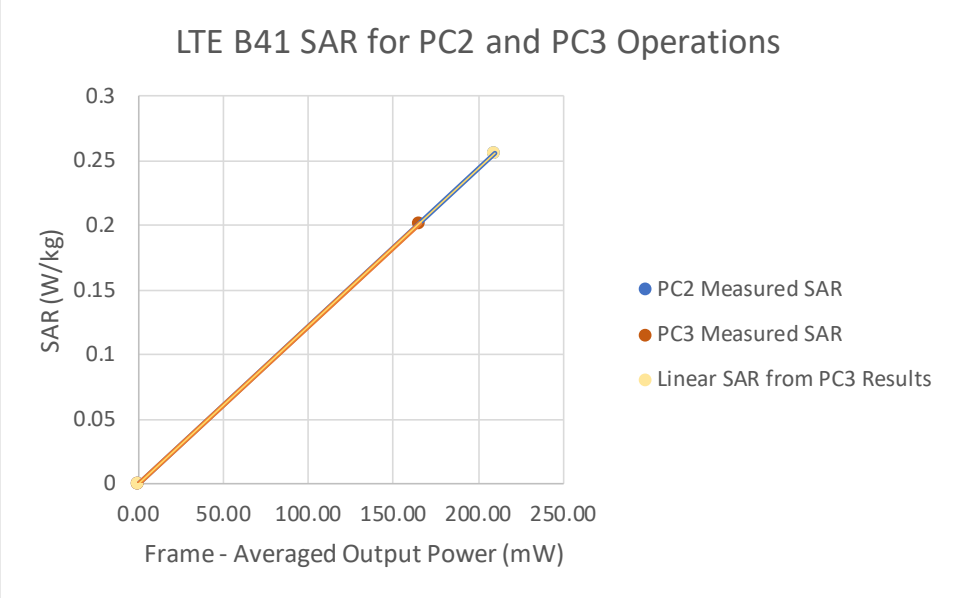

Figure 14-1
LTE Band 41 Head Linearity

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Table 14-2
LTE Band 41 Body-Worn Linearity Data

	LTE Band 41 PC3	LTE Band 41 PC2
Maximum Allowed Output Power (dBm)	24.2	27.2
Measured Output Power (dBm)	24.17	26.85
Measured SAR (W/kg)	0.159	0.187
Measured Power (mW)	261.22	484.17
Duty Cycle	63.3%	43.3%
Frame Averaged Output Power (mW)	165.35	209.65
% deviation from expected linearity		-7.24%

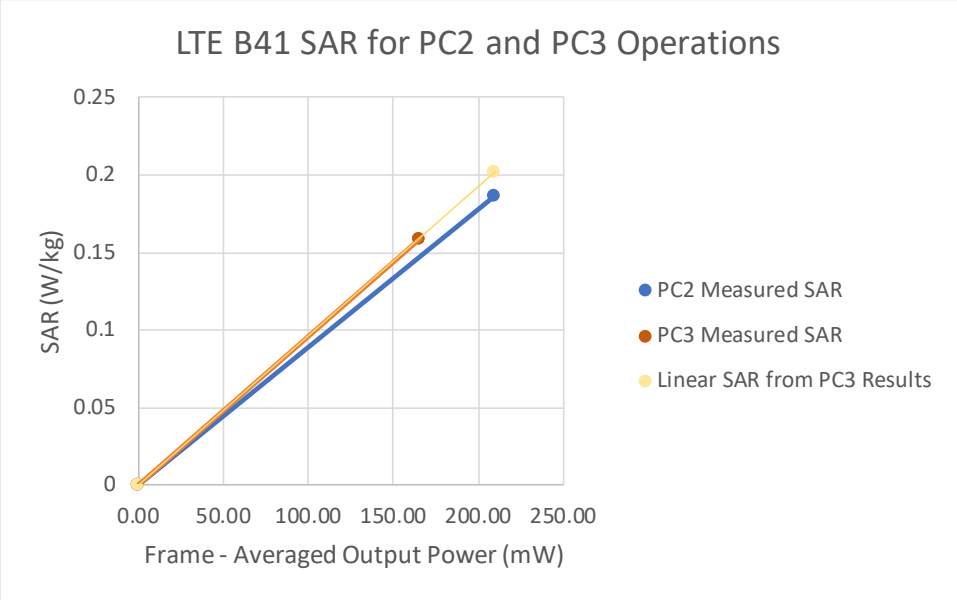

Figure 14-2
LTE Band 41 Body-Worn Linearity

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Table 14-3
LTE Band 41 Hotspot Linearity Data

	LTE Band 41 PC3	LTE Band 41 PC2
Maximum Allowed Output Power (dBm)	24.2	27.2
Measured Output Power (dBm)	24.17	26.85
Measured SAR (W/kg)	0.387	0.492
Measured Power (mW)	261.22	484.17
Duty Cycle	63.3%	43.3%
Frame Averaged Output Power (mW)	165.35	209.65
% deviation from expected linearity		0.27%

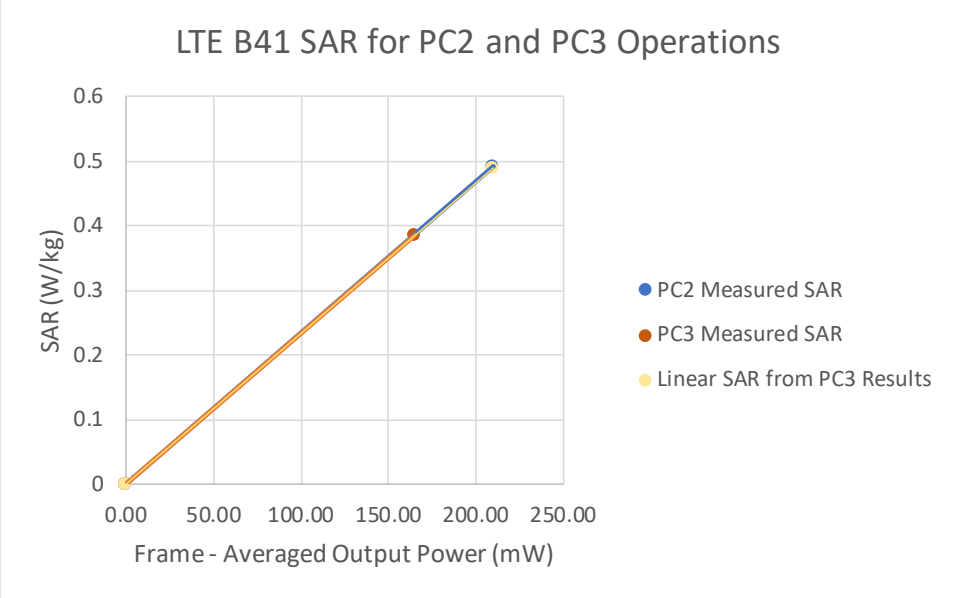

Figure 14-3
LTE Band 41 Hotspot Linearity

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15 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753E	(30kHz-6GHz) Network Analyzer	9/28/2018	Annual	9/28/2019	JP38020182
Agilent	E5515C	Wireless Communications Test Set	2/28/2018	Biennial	2/28/2020	GB41450275
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB44450273
Agilent	E5515C	Wireless Communications Test Set	2/7/2018	Triennial	2/7/2021	GB43304447
Agilent	E5515C	Wireless Communications Test Set	5/22/2018	Biennial	5/22/2020	GB43193563
Agilent	8753ES	S-Parameter Network Analyzer	3/11/2019	Annual	3/11/2020	US39170122
Agilent	N5182A	MXG Vector Signal Generator	11/28/2018	Annual	11/28/2019	MY47420603
Agilent	E4438C	ESG Vector Signal Generator	3/11/2019	Biennial	3/11/2021	MY45090700
Agilent	8753ES	S-Parameter Network Analyzer	10/2/2018	Annual	10/2/2019	US39170118
Agilent	E4440A	PSA Series Spectrum Analyzer	11/14/2018	Annual	11/14/2019	MY46186272
Agilent	8753ES	S-Parameter Vector Network Analyzer	8/30/2018	Annual	8/30/2019	MY40003841
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
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	ML2495A	Power Meter	11/20/2018	Annual	11/20/2019	1039008
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	MA24106A	USB Power Sensor	1/31/2019	Annual	1/31/2020	1244524
Anritsu	ML2496A	Power Meter	10/21/2018	Annual	10/21/2019	1138001
Anritsu	MT8820C	Radio Communication Analyzer	6/27/2018	Annual	6/27/2019	6201240328
Anritsu	MT8820C	Radio Communication Analyzer	3/29/2019	Annual	3/29/2020	6201300731
Anritsu	MT8821C	Radio Communication Analyzer	7/26/2018	Annual	7/26/2019	6201144418
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339007
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339008
Anritsu	MT8821C	Radio Communication Analyzer	7/24/2018	Annual	7/24/2019	6201664756
Anritsu	MT8862A	Wireless Connectivity Test Set	7/3/2018	Annual	7/3/2019	6261782395
Control Company	4040	Therm./ Clock/ Humidity Monitor	1/8/2019	Annual	1/8/2020	160473909
Control Company	4040	Therm./ Clock/ Humidity Monitor	1/8/2019	Annual	1/8/2020	160574418
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330144
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330174
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
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
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	11/1/2017	Biennial	11/1/2019	N/A
Pasternack	NC-100	Torque Wrench	5/23/2018	Biennial	5/23/2020	N/A
Rohde & Schwarz	CMW500	Radio Communication Tester	11/14/2018	Annual	11/14/2019	100976
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	Wideband Radio Communication Tester	1/30/2019	Annual	1/30/2020	162125
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/30/2018	Annual	10/30/2019	164948
Rohde & Schwarz	CMU200	Base Station Simulator	5/18/2018	Annual	5/18/2019	109892
SPEAG	D750V3	750 MHz SAR Dipole	1/15/2018	Biennial	1/15/2020	1003
SPEAG	D835V2	835 MHz SAR Dipole	1/22/2019	Annual	1/22/2020	4d132
SPEAG	D1765V2	1765 MHz SAR Dipole	5/23/2018	Annual	5/23/2019	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	10/23/2018	Annual	10/23/2019	5d080
SPEAG	D2450V2	2450 MHz SAR Dipole	8/16/2018	Annual	8/16/2019	981
SPEAG	D2600V2	2600 MHz SAR Dipole	6/7/2017	Biennial	6/7/2019	1064
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/21/2016	Triennial	9/21/2019	1191
SPEAG	D750V3	750 MHz SAR Dipole	10/19/2018	Annual	10/19/2019	1161
SPEAG	D1750V2	1750 MHz SAR Dipole	5/9/2017	Biennial	5/9/2019	1148
SPEAG	D1900V2	1900 MHz SAR Dipole	10/23/2018	Annual	10/23/2019	5d149
SPEAG	D2450V2	2450 MHz SAR Dipole	9/11/2017	Biennial	9/11/2019	797
SPEAG	D2600V2	2600 MHz SAR Dipole	9/13/2016	Triennial	9/13/2019	1071
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/16/2018	Biennial	1/16/2020	1057
SPEAG	D2450V2	2450 MHz SAR Dipole	8/17/2017	Biennial	8/17/2019	719
SPEAG	EX3DV4	SAR Probe	6/25/2018	Annual	6/25/2019	7409
SPEAG	EX3DV4	SAR Probe	2/19/2019	Annual	2/19/2020	3914
SPEAG	EX3DV4	SAR Probe	1/25/2019	Annual	1/25/2020	3589
SPEAG	EX3DV4	SAR Probe	8/23/2018	Annual	8/23/2019	7308
SPEAG	EX3DV4	SAR Probe	1/24/2019	Annual	1/24/2020	7488
SPEAG	EX3DV4	SAR Probe	7/20/2018	Annual	7/20/2019	7410
SPEAG	EX3DV4	SAR Probe	2/19/2019	Annual	2/19/2020	7417
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/18/2018	Annual	6/18/2019	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/14/2019	Annual	2/14/2020	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/22/2018	Annual	8/22/2019	1450
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/3/2018	Annual	10/3/2019	1558
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/15/2019	Annual	1/15/2020	1530
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/11/2018	Annual	7/11/2019	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/13/2019	Annual	2/13/2020	665
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/15/2018	Annual	5/15/2019	1070

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

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16 MEASUREMENT UNCERTAINTIES

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

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17 CONCLUSION

17.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

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PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00288

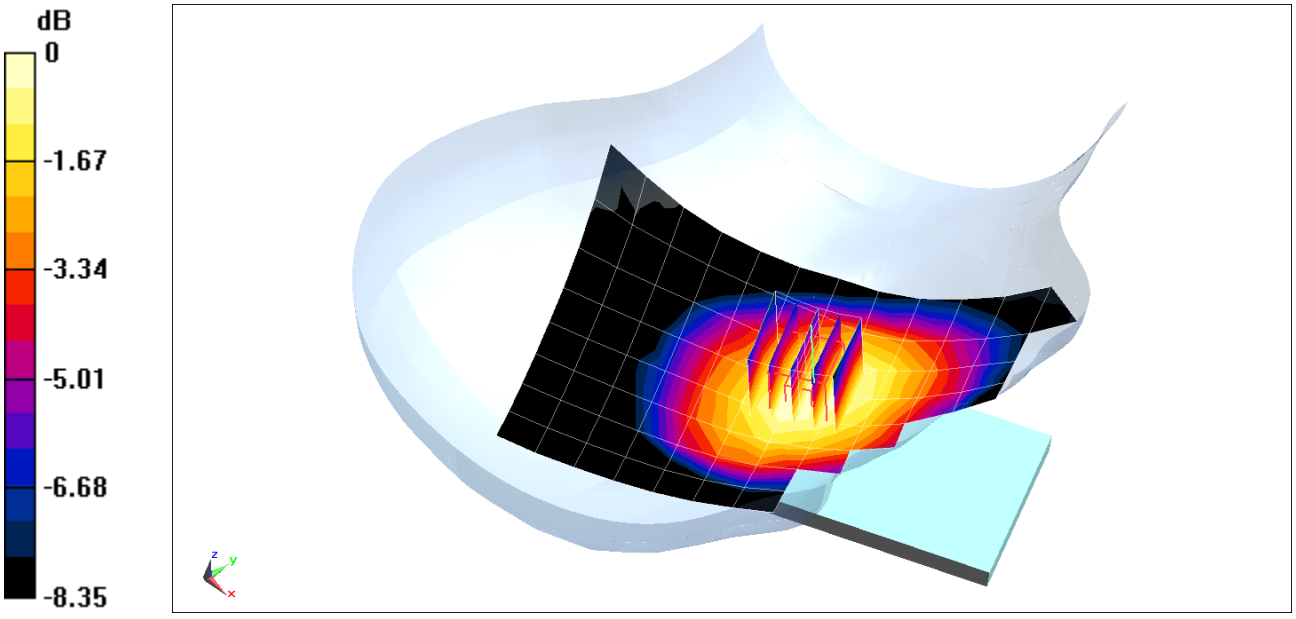
Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.921 S/m; ε_r = 41.954; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 04-15-2019; Ambient Temp: 22.4°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN3914; ConvF(9.5, 9.5, 9.5) @ 836.6 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Left For Head SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1687
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 = 21.50 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.522 W/kg
SAR(1 g) = 0.404 W/kg



0 dB = 0.479 W/kg = -3.20 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00288

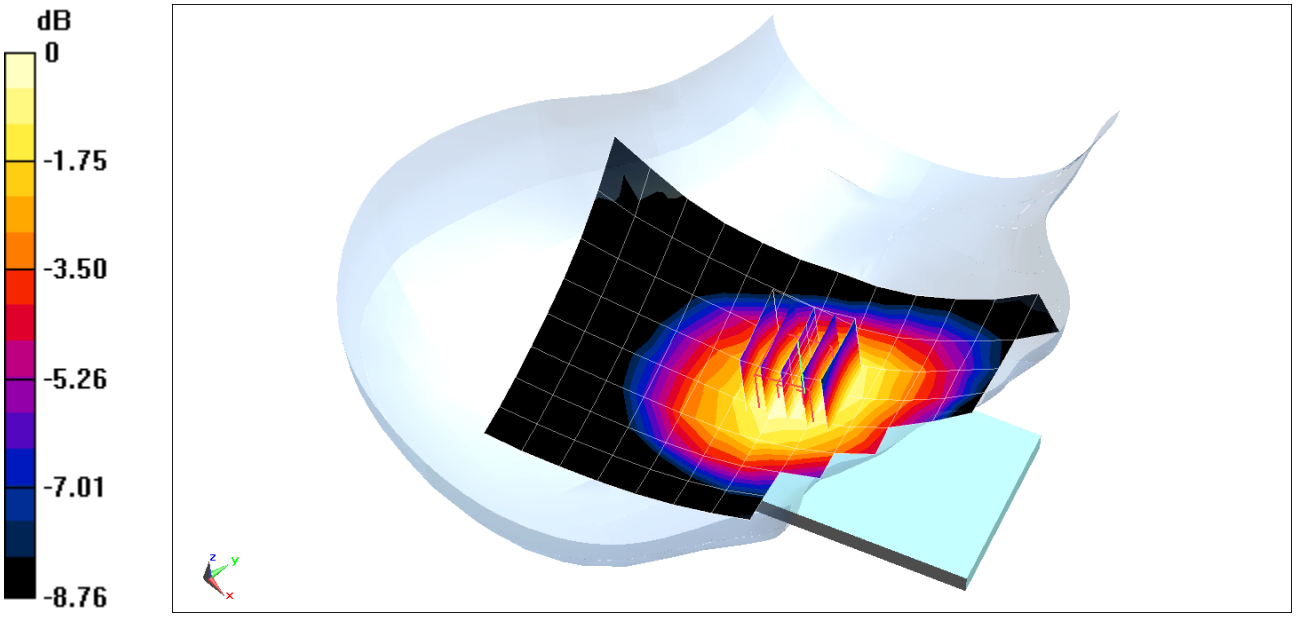
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.921 S/m; ε_r = 41.954; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 04-15-2019; Ambient Temp: 22.4°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN3914; ConvF(9.5, 9.5, 9.5) @ 836.6 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Left For Head SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1687
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 = 21.83 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.536 W/kg
SAR(1 g) = 0.418 W/kg



0 dB = 0.489 W/kg = -3.11 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00288

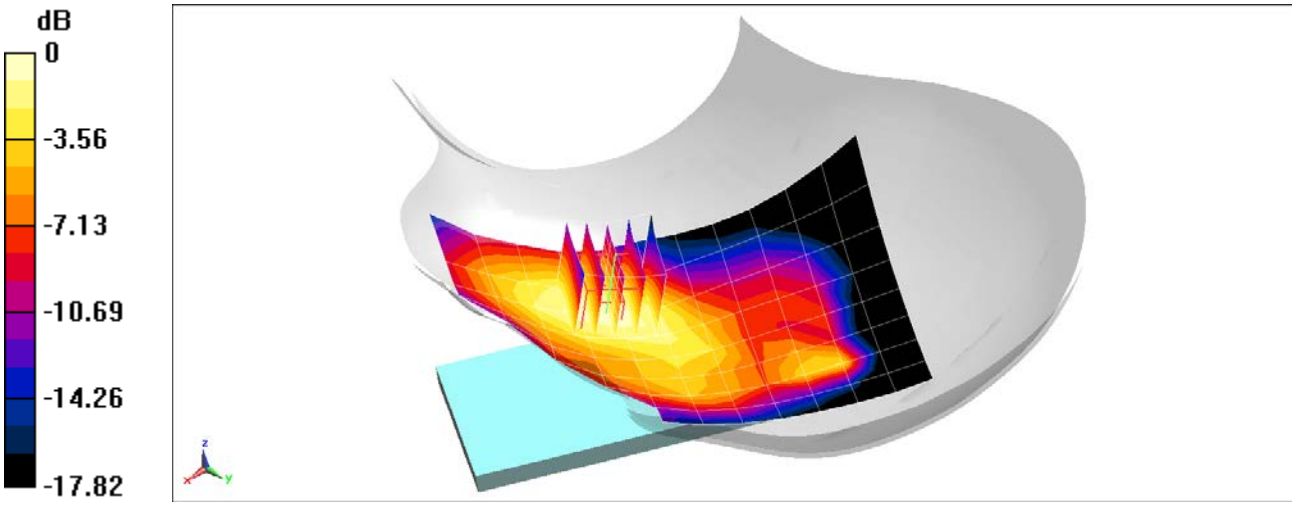
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.342 S/m; ε_r = 39.531; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 04-15-2019; Ambient Temp: 21.6°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN3589; ConvF(7.31, 7.31, 7.31) @ 1732.4 MHz; Calibrated: 1/25/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1450; Calibrated: 8/22/2018
Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647
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 = 19.77 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.750 W/kg
SAR(1 g) = 0.485 W/kg



0 dB = 0.655 W/kg = -1.84 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

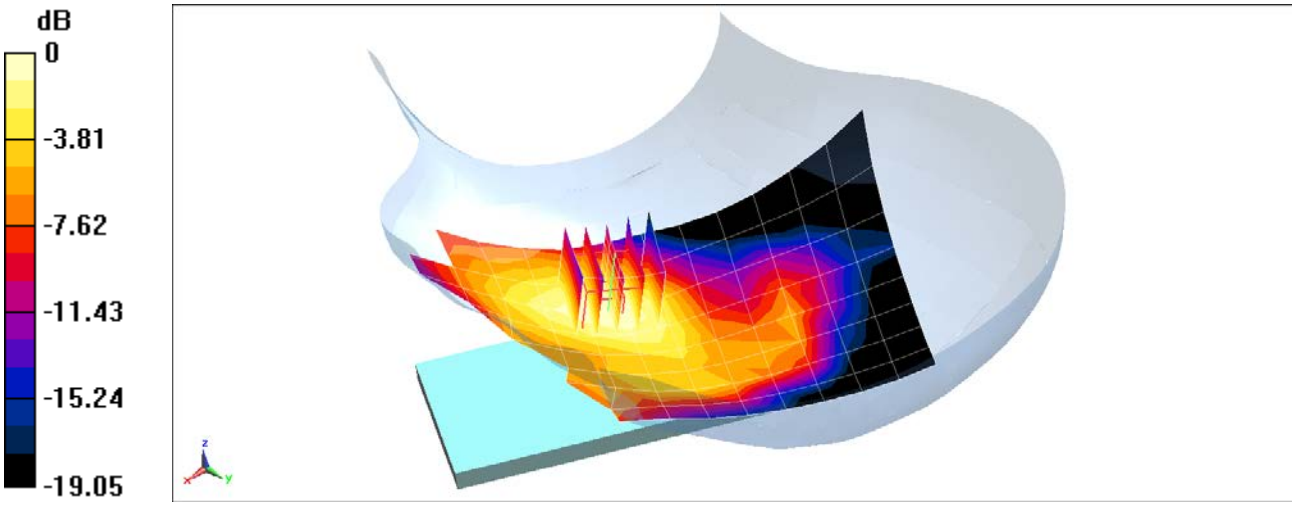
Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.76
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.402 S/m; ε_r = 38.932; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 04-17-2019; Ambient Temp: 23.9°C; Tissue Temp: 20.0°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 v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: GPRS 1900, Left 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 = 13.71 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.390 W/kg
SAR(1 g) = 0.245 W/kg



0 dB = 0.320 W/kg = -4.95 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00288

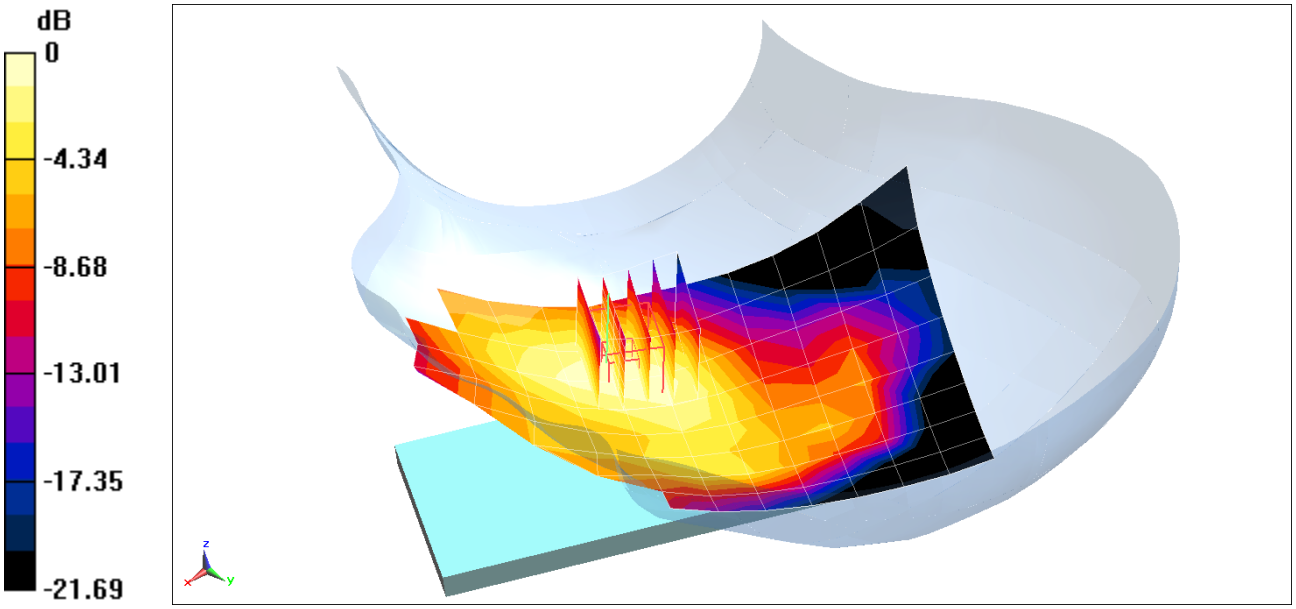
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.402 S/m; ε_r = 38.932; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 04-17-2019; Ambient Temp: 23.9°C; Tissue Temp: 20.0°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 v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
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 = 19.12 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.754 W/kg
SAR(1 g) = 0.483 W/kg



0 dB = 0.634 W/kg = -1.98 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

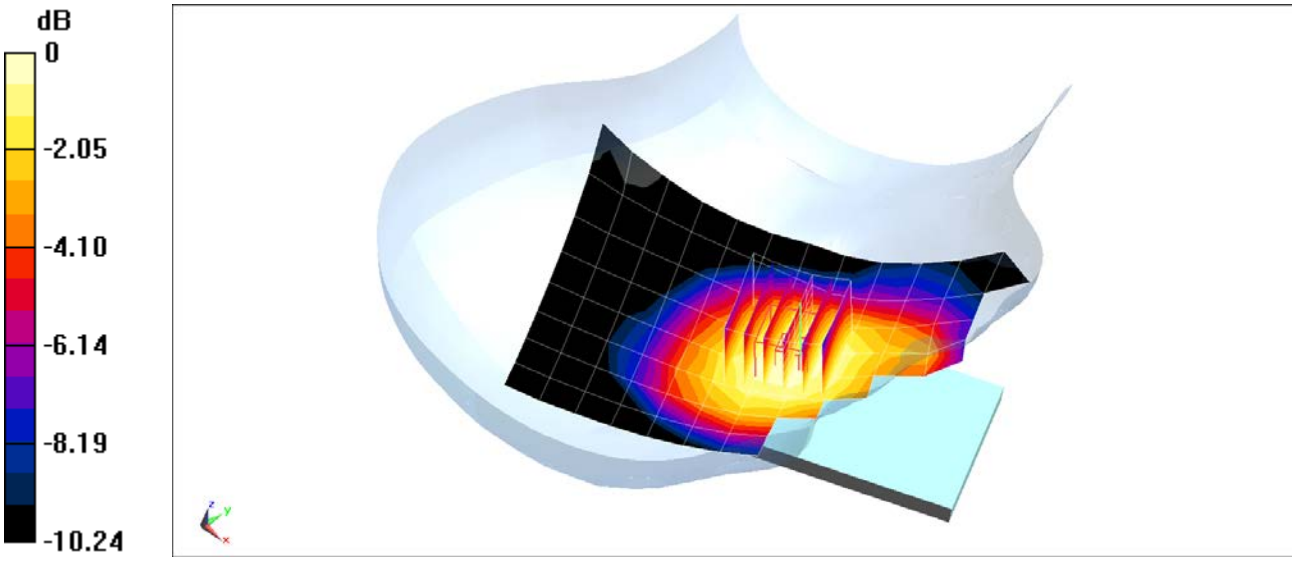
Communication System: UID 0, LTE Band 71; Frequency: 680.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 680.5 MHz; σ = 0.881 S/m; ε_r = 40.773; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 04-22-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(9.91, 9.91, 9.91) @ 680.5 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM 30 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: LTE Band 71, Right Head, Cheek, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.30 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.266 W/kg
SAR(1 g) = 0.214 W/kg



0 dB = 0.250 W/kg = -6.02 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00312

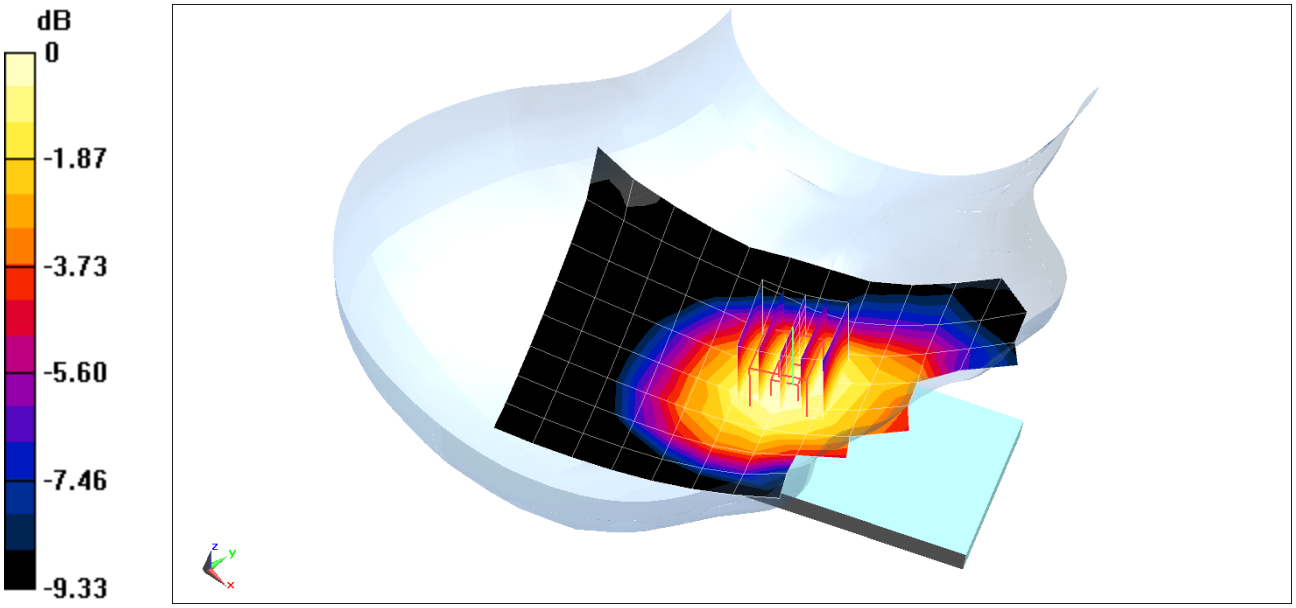
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.89 S/m; ε_r = 40.682; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 04-22-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(9.91, 9.91, 9.91) @ 707.5 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM 30 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: 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 = 19.67 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.393 W/kg
SAR(1 g) = 0.310 W/kg



0 dB = 0.364 W/kg = -4.39 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00288

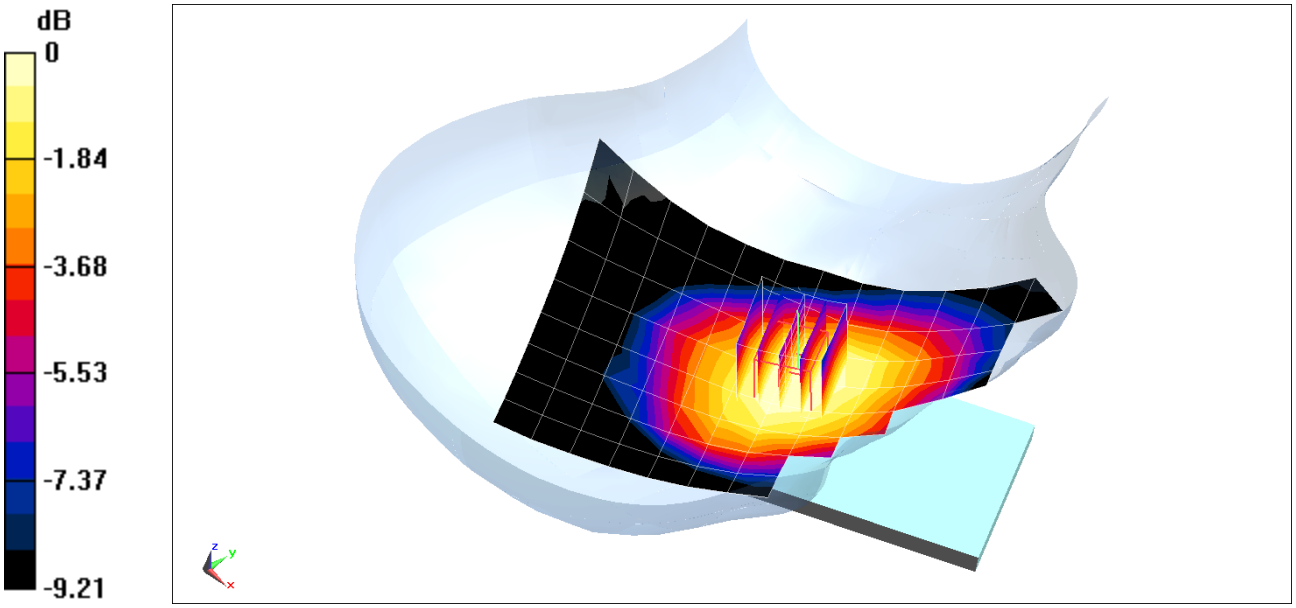
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 831.5 MHz; σ = 0.919 S/m; ε_r = 41.964; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 04-15-2019; Ambient Temp: 22.4°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN3914; ConvF(9.5, 9.5, 9.5) @ 831.5 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Left For Head SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1687
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 26 (Cell.), Right Head, Cheek, Mid.ch,
15 MHz Bandwidth, QPSK, 1 RB, 74 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 = 20.92 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.469 W/kg
SAR(1 g) = 0.362 W/kg



0 dB = 0.431 W/kg = -3.66 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00288

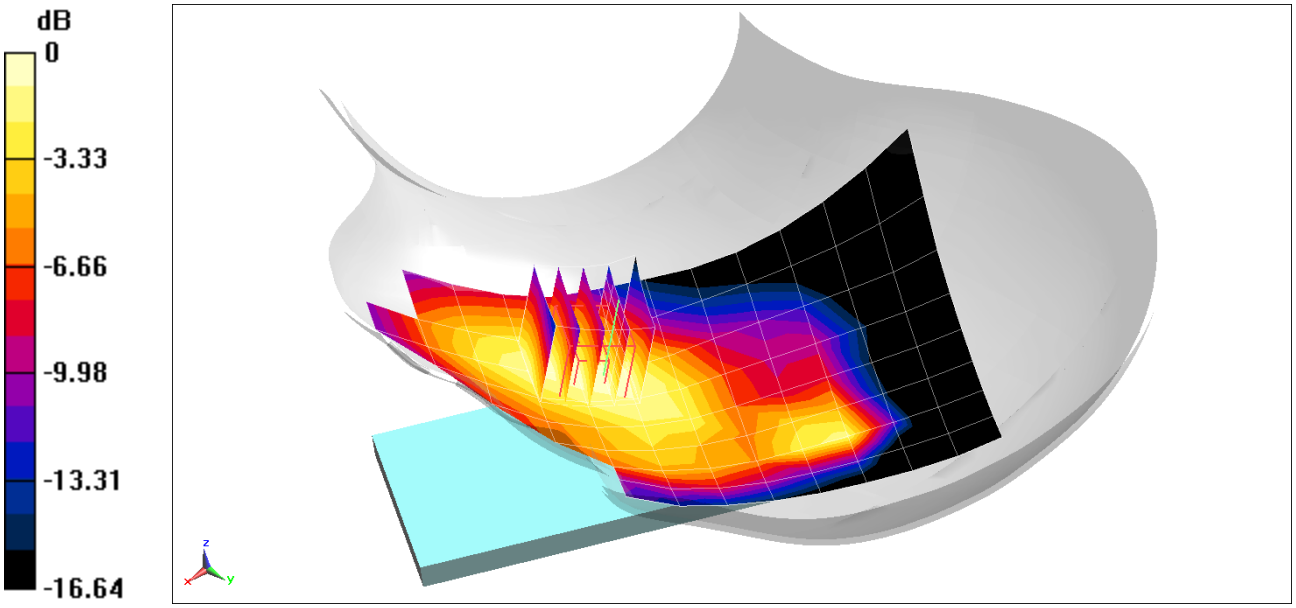
Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1720 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
$f = 1720$ MHz; $\sigma = 1.334$ S/m; $\varepsilon_r = 39.548$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

Test Date: 04-15-2019; Ambient Temp: 21.6°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN3589; ConvF(7.31, 7.31, 7.31) @ 1720 MHz; Calibrated: 1/25/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1450; Calibrated: 8/22/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1647
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, 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 = 19.07 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.647 W/kg
SAR(1 g) = 0.416 W/kg



0 dB = 0.551 W/kg = -2.59 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

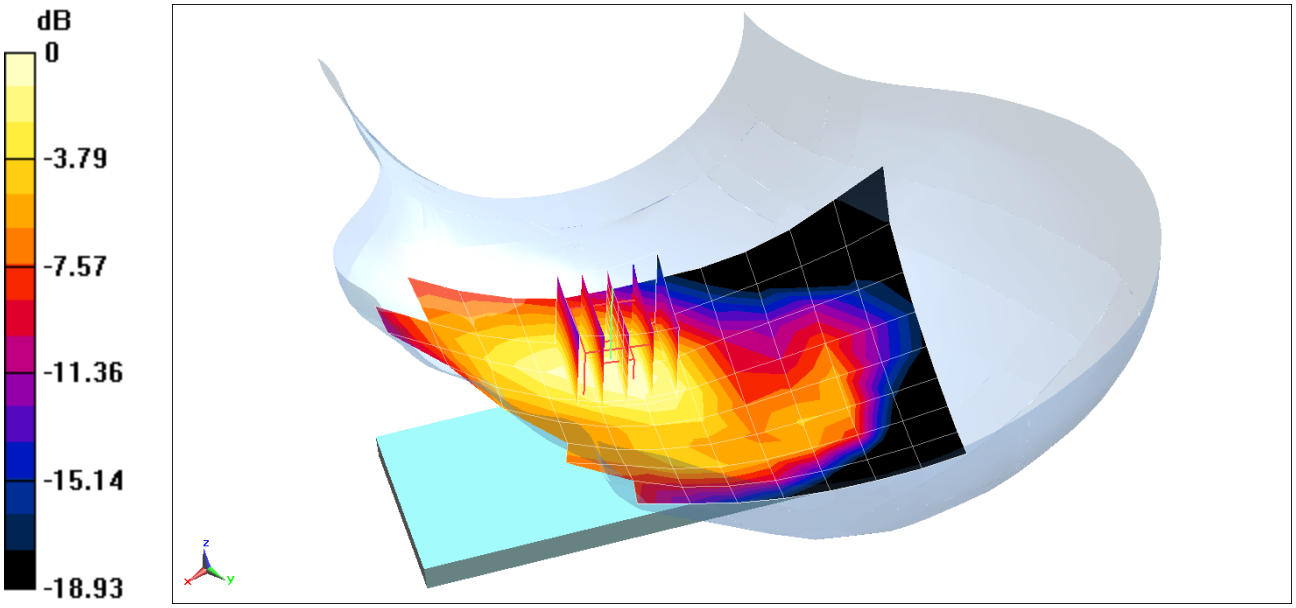
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1905 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
$f = 1905$ MHz; $\sigma = 1.419$ S/m; $\varepsilon_r = 38.91$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

Test Date: 04-17-2019; Ambient Temp: 23.9°C; Tissue Temp: 20.0°C

Probe: EX3DV4 - SN7409; ConvF(8.05, 8.05, 8.05) @ 1905 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: LTE Band 25 (PCS), Left Head, Cheek, High.ch,
20 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 = 19.30 V/m; Power Drift = -0.20 dB
Peak SAR (extrapolated) = 0.704 W/kg
SAR(1 g) = 0.436 W/kg



0 dB = 0.575 W/kg = -2.40 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

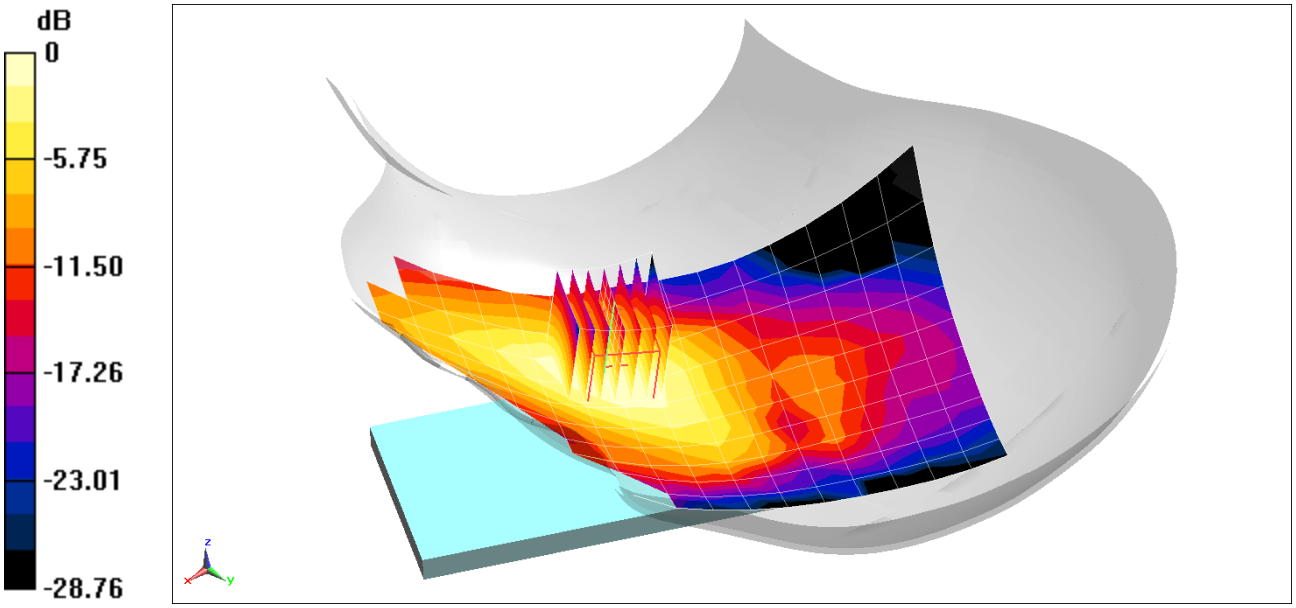
Communication System: UID 0, _LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
$f = 2510$ MHz; $\sigma = 1.847$ S/m; $\varepsilon_r = 37.255$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

Test Date: 04-19-2019; Ambient Temp: 24.3°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(6.46, 6.46, 6.46) @ 2510 MHz; Calibrated: 1/25/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1450; Calibrated: 8/22/2018
Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 7, Left Head, Cheek, Low.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.24 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.700 W/kg
SAR(1 g) = 0.389 W/kg



0 dB = 0.580 W/kg = -2.37 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

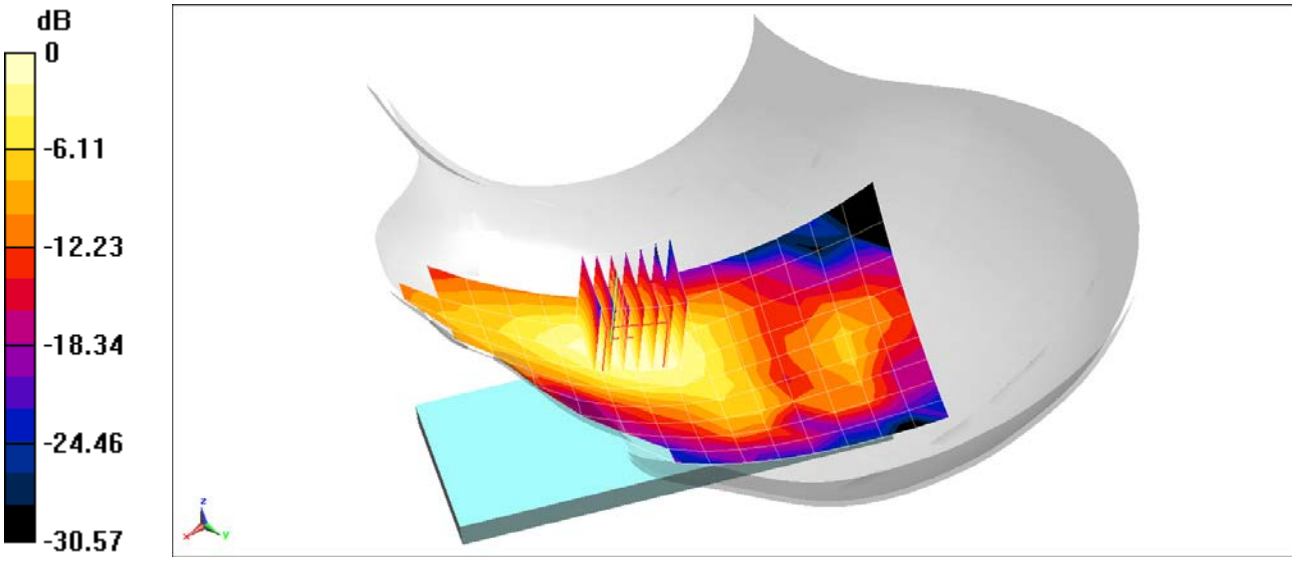
Communication System: UID 0, _LTE Band 41 (Class 2); Frequency: 2636.5 MHz; Duty Cycle: 1:2.31
Medium: 2450 Head Medium parameters used (interpolated):
f = 2636.5 MHz; σ = 1.963 S/m; ε_r = 38.35; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 04-21-2019; Ambient Temp: 23.7°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN3589; ConvF(6.25, 6.25, 6.25) @ 2636.5 MHz; Calibrated: 1/25/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1450; Calibrated: 8/22/2018
Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 41 PC2, Left Head, Cheek, Mid-High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

Area Scan (10x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.82 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.495 W/kg
SAR(1 g) = 0.256 W/kg



0 dB = 0.389 W/kg = -4.10 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00379

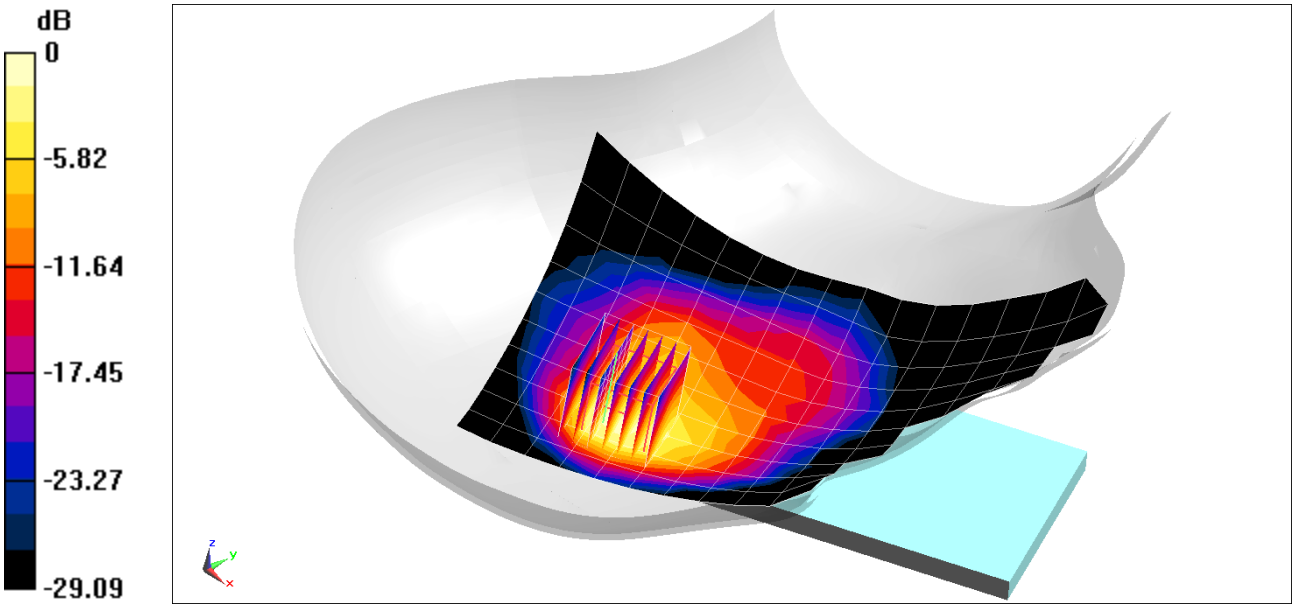
Communication System: UID 0, _IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.807 S/m; ε_r = 38.689; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 04-21-2019; Ambient Temp: 23.7°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN3589; ConvF(6.46, 6.46, 6.46) @ 2437 MHz; Calibrated: 1/25/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1450; Calibrated: 8/22/2018
Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647
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 6, 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 = 13.43 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 2.44 W/kg
SAR(1 g) = 1.06 W/kg



0 dB = 1.79 W/kg = 2.53 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00387

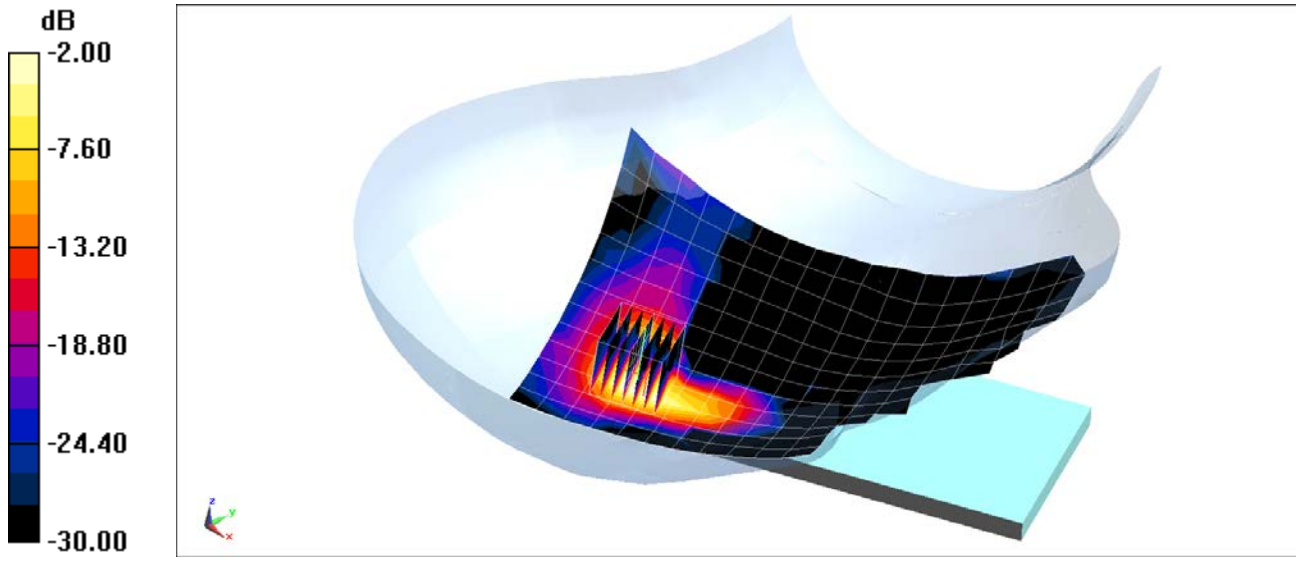
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5805 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used:
f = 5805 MHz; σ = 5.258 S/m; ε_r = 34.74; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 04-15-2019; Ambient Temp: 23.0°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7409; ConvF(4.82, 4.82, 4.82) @ 5805 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 802.11a, U-NII-3, 20 MHz Bandwidth,
Right Head, Cheek, Ch 161, 6 Mbps

Area Scan (13x21x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 5.246 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 4.99 W/kg
SAR(1 g) = 0.980 W/kg



0 dB = 2.63 W/kg = 4.20 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

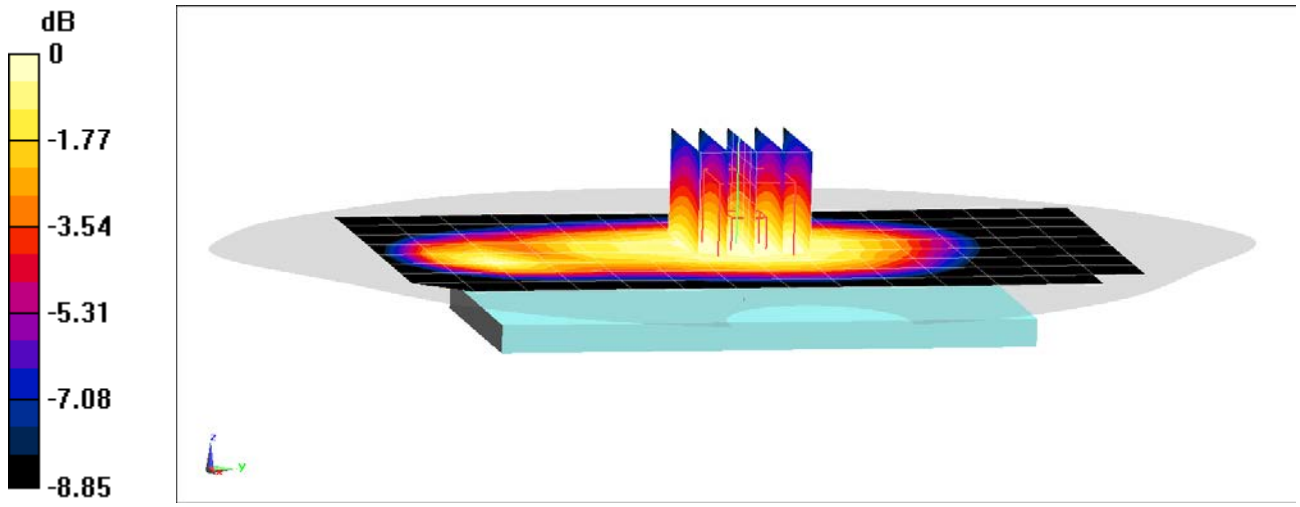
Communication System: UID 0, _GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76
Medium: 835 Body Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.989$ S/m; $\varepsilon_r = 54.471$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-16-2019; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7488; ConvF(11.03, 11.03, 11.03) @ 836.6 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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 (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.46 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.601 W/kg
SAR(1 g) = 0.441 W/kg



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

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

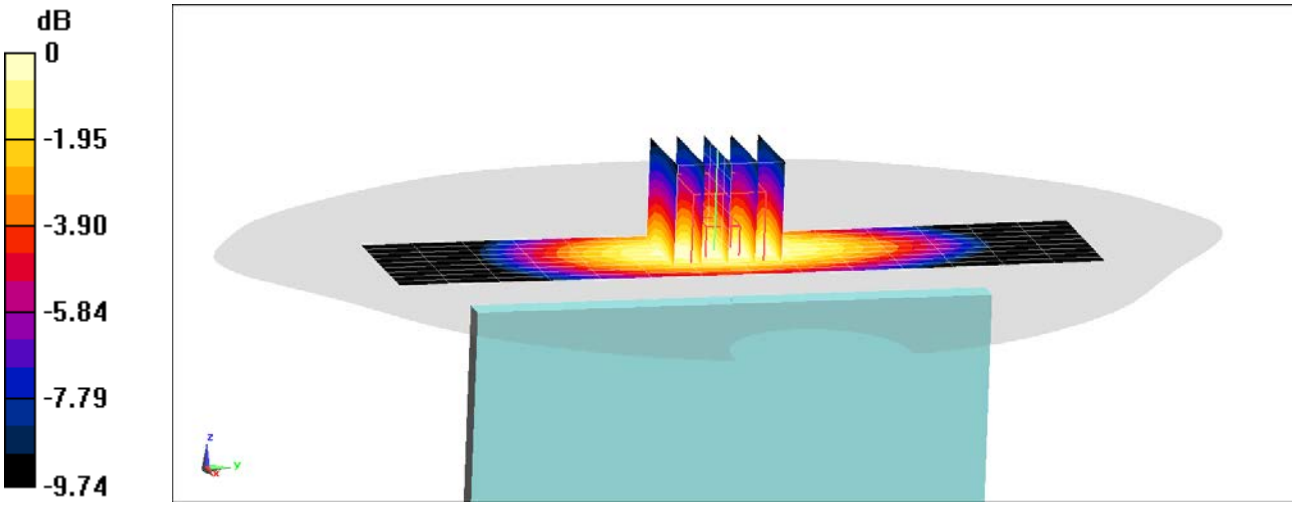
Communication System: UID 0, _GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76
Medium: 835 Body Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.989$ S/m; $\varepsilon_r = 54.471$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-16-2019; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7488; ConvF(11.03, 11.03, 11.03) @ 836.6 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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 (10x15x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.29 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.678 W/kg
SAR(1 g) = 0.454 W/kg



0 dB = 0.597 W/kg = -2.24 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

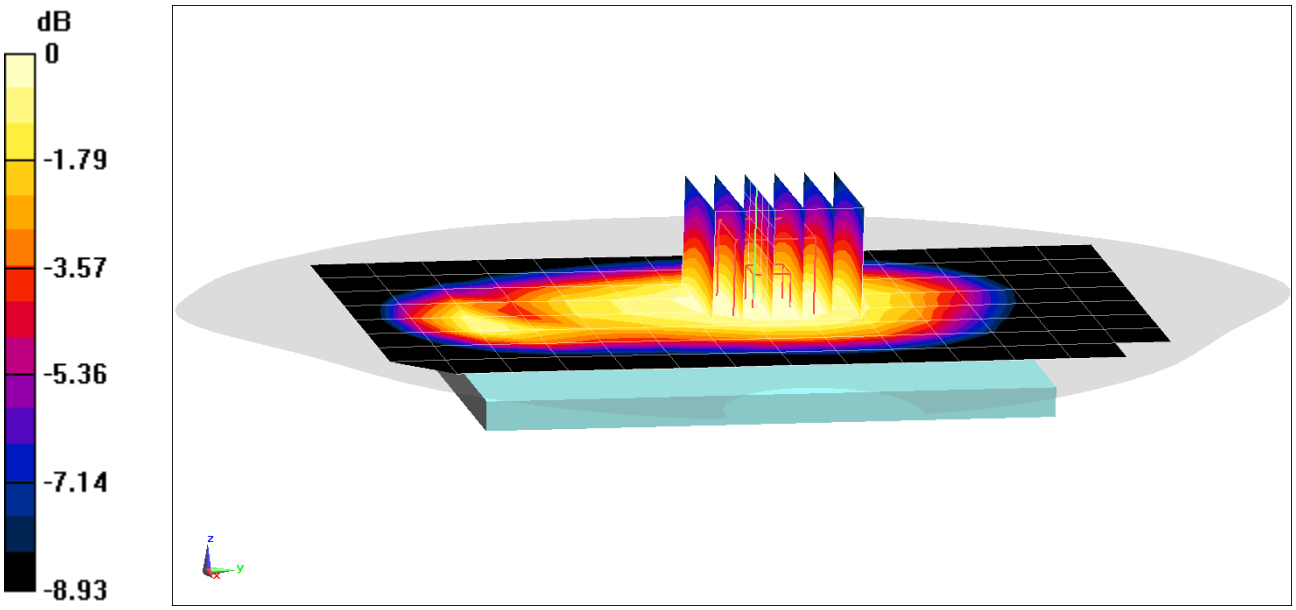
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.989 S/m; ε_r = 54.471; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-16-2019; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7488; ConvF(11.03, 11.03, 11.03) @ 836.6 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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 850, Body SAR, Back side, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.47 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.546 W/kg
SAR(1 g) = 0.403 W/kg



0 dB = 0.495 W/kg = -3.05 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

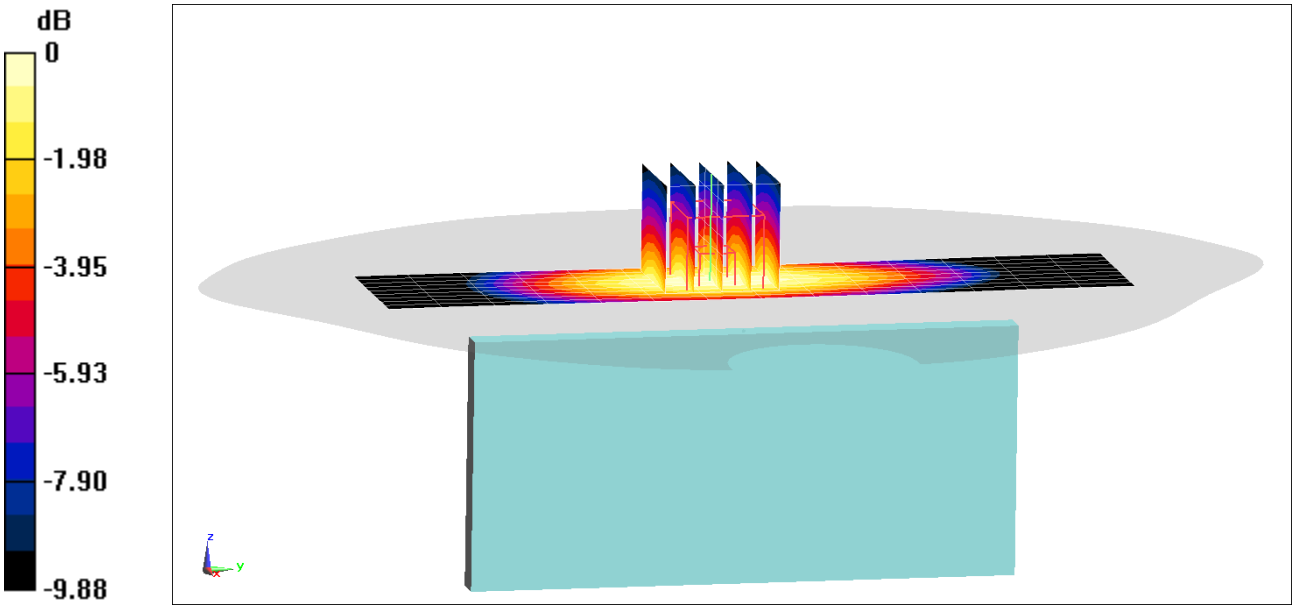
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.989$ S/m; $\varepsilon_r = 54.471$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-16-2019; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7488; ConvF(11.03, 11.03, 11.03) @ 836.6 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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 850, Body SAR, Right Edge, Mid.ch

Area Scan (10x15x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.45 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.652 W/kg
SAR(1 g) = 0.430 W/kg



0 dB = 0.574 W/kg = -2.41 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

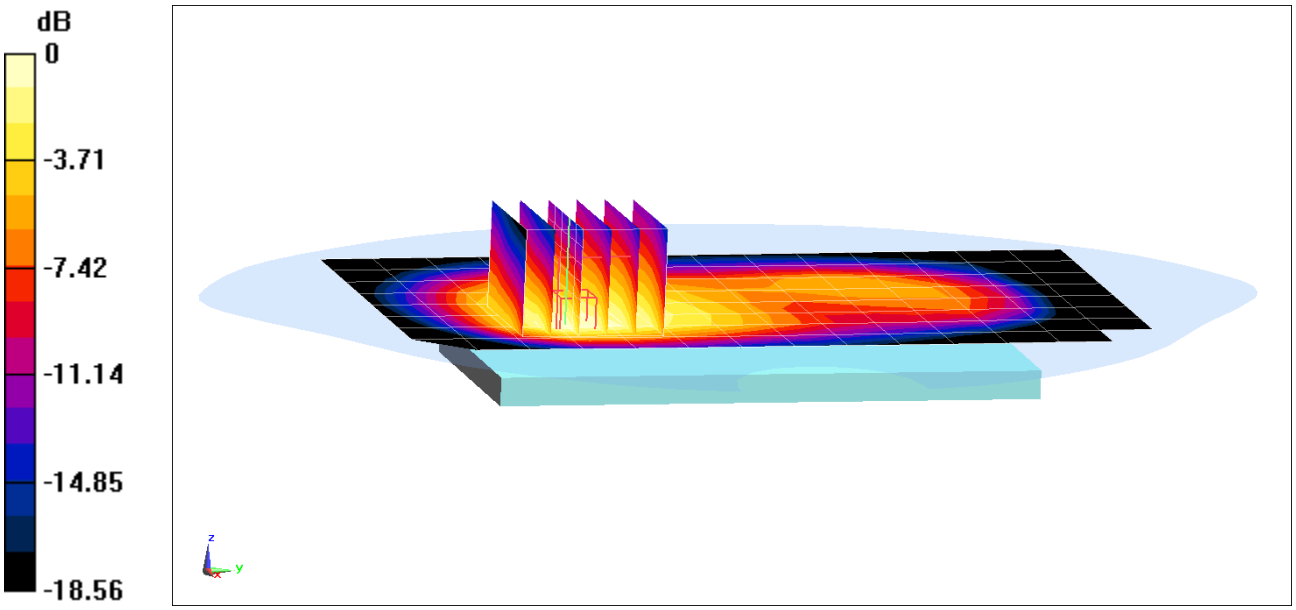
Communication System: UID 0, _UMTS; Frequency: 1752.6 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1752.6 MHz; σ = 1.522 S/m; ε_r = 51.398; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 22.5°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7488; ConvF(8.68, 8.68, 8.68) @ 1752.6 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.55 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 1.59 W/kg
SAR(1 g) = 0.921 W/kg



0 dB = 1.34 W/kg = 1.27 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

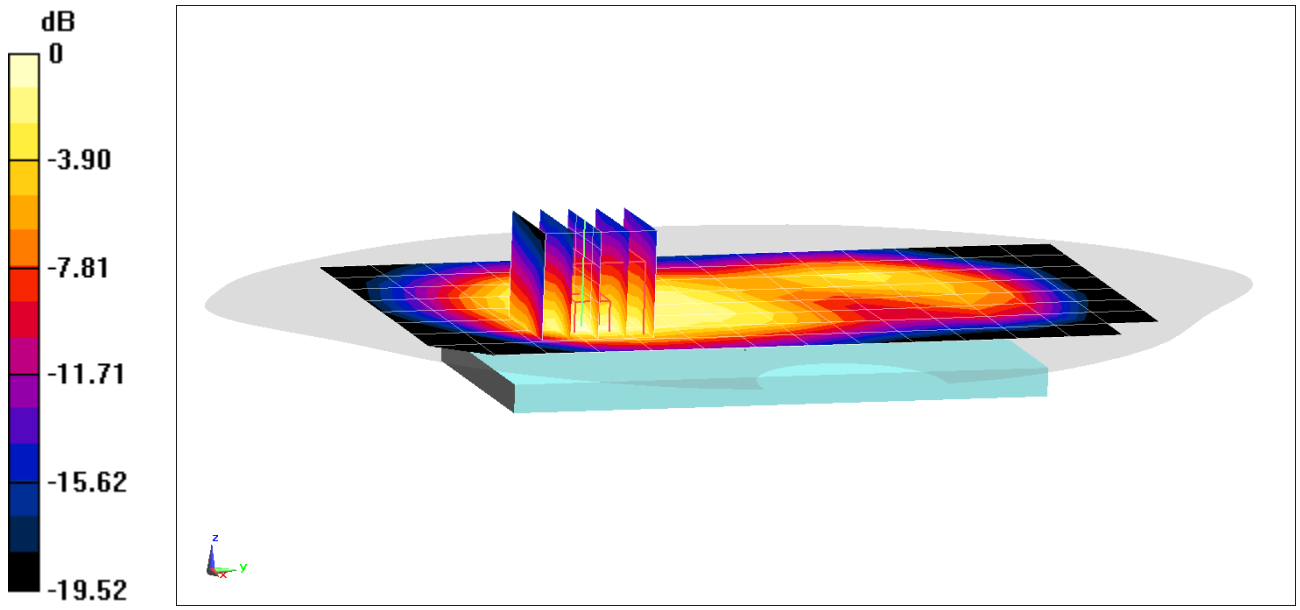
Communication System: UID 0, _GSM GPRS; 3 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.76
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.545 S/m; ε_r = 51.442; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN7410; ConvF(7.78, 7.78, 7.78) @ 1880 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
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 = 15.87 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.655 W/kg
SAR(1 g) = 0.347 W/kg



0 dB = 0.545 W/kg = -2.64 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

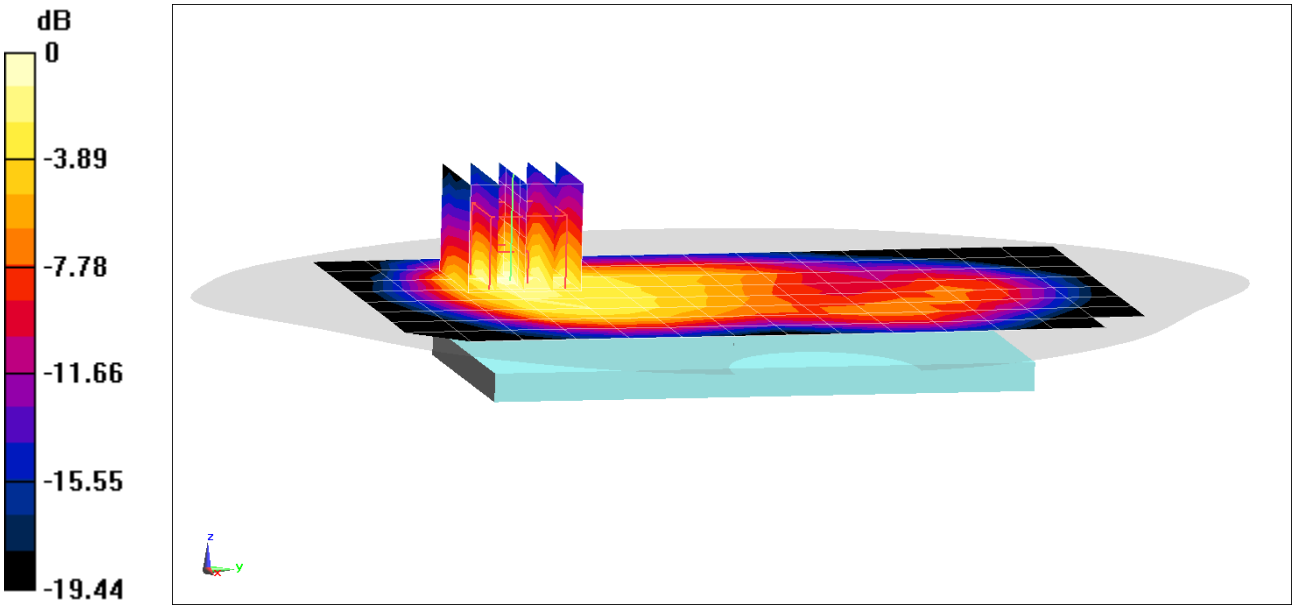
Communication System: UID 0, _GSM GPRS; 3 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.76
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.545 S/m; ε_r = 51.442; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN7410; ConvF(7.78, 7.78, 7.78) @ 1880 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: GPRS 1900, Body SAR, Front 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 = 18.31 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.841 W/kg
SAR(1 g) = 0.465 W/kg



0 dB = 0.700 W/kg = -1.55 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

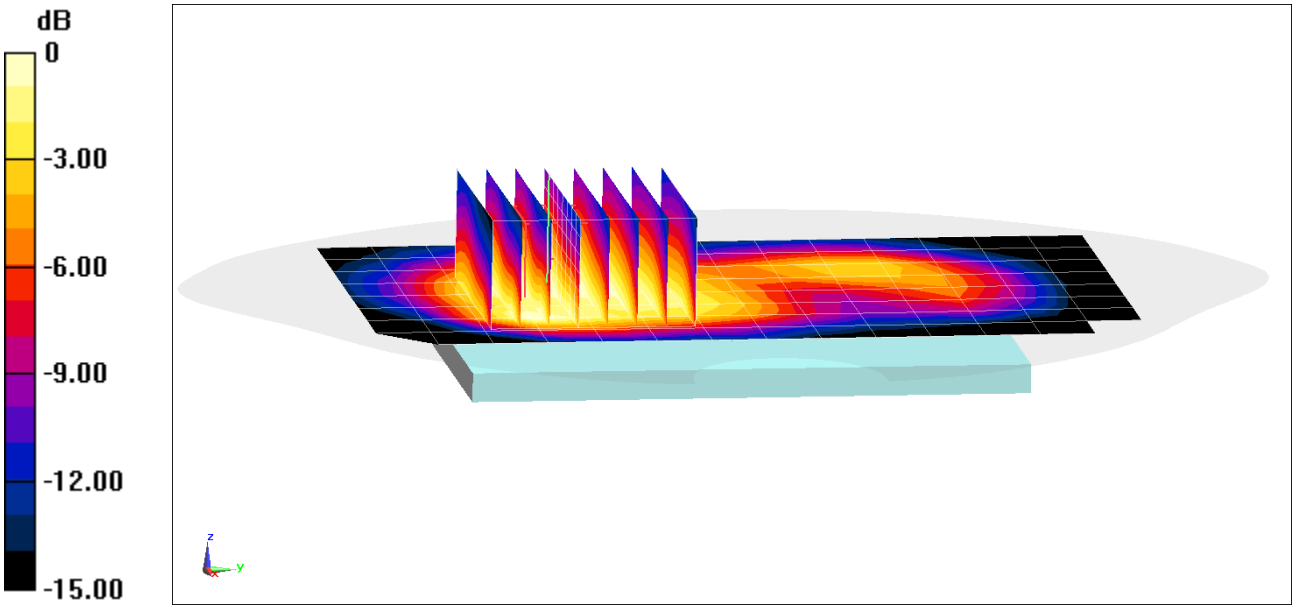
Communication System: UID 0, UMTS; Frequency: 1852.4 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1852.4 MHz; σ = 1.519 S/m; ε_r = 52.78; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-17-2019; Ambient Temp: 21.1°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410; ConvF(7.78, 7.78, 7.78) @ 1852.4 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (9x8x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.38 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.732 W/kg



0 dB = 0.917 W/kg = -0.38 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

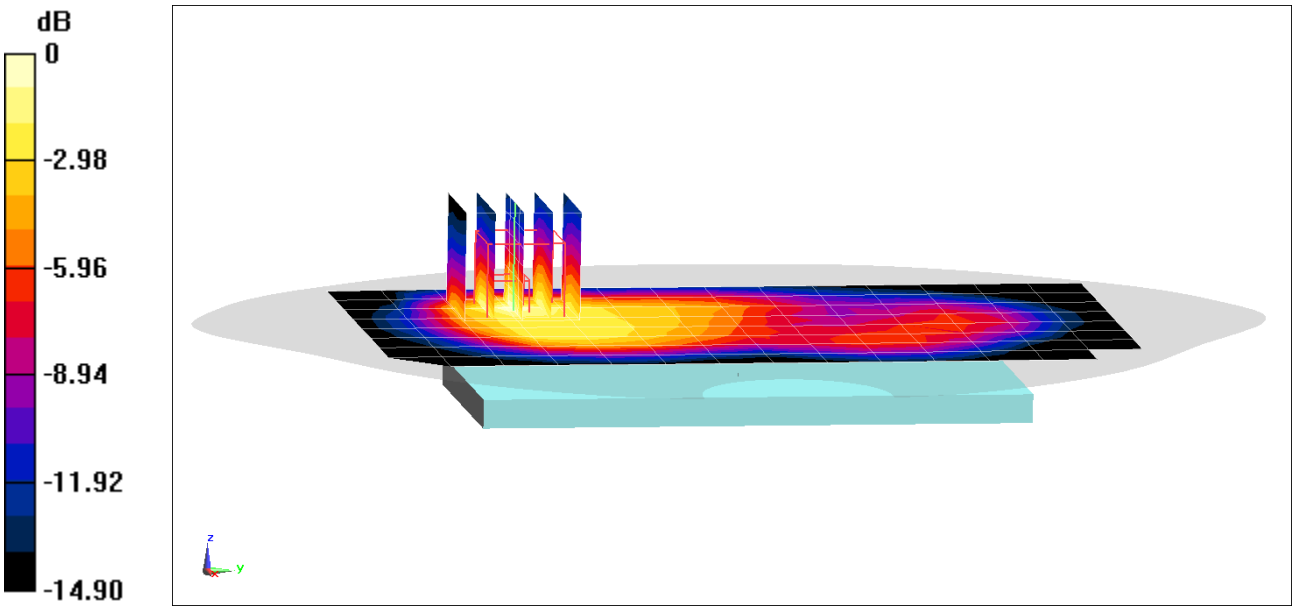
Communication System: UID 0, UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1907.6 MHz; σ = 1.576 S/m; ε_r = 51.354; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN7410; ConvF(7.78, 7.78, 7.78) @ 1907.6 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: UMTS 1900, Body SAR, Front 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 = 22.80 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.35 W/kg
SAR(1 g) = 0.750 W/kg



0 dB = 1.09 W/kg = 0.37 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00288

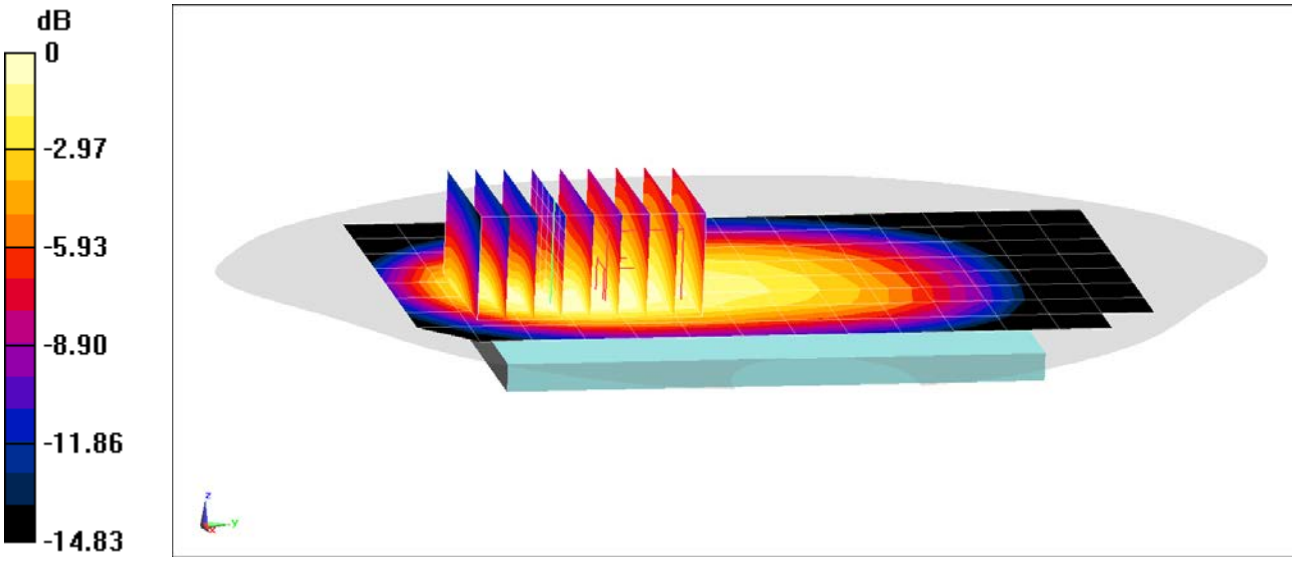
Communication System: UID 0, LTE Band 71; Frequency: 680.5 MHz; Duty Cycle: 1:1
Medium: 750MHz Body Medium parameters used (interpolated):
$f = 680.5$ MHz; $\sigma = 0.918$ S/m; $\varepsilon_r = 55.245$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-22-2019; Ambient Temp: 21.9°C; Tissue Temp: 20.5°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, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x9x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.97 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 0.599 W/kg
SAR(1 g) = 0.384 W/kg



0 dB = 0.503 W/kg = -2.98 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00288

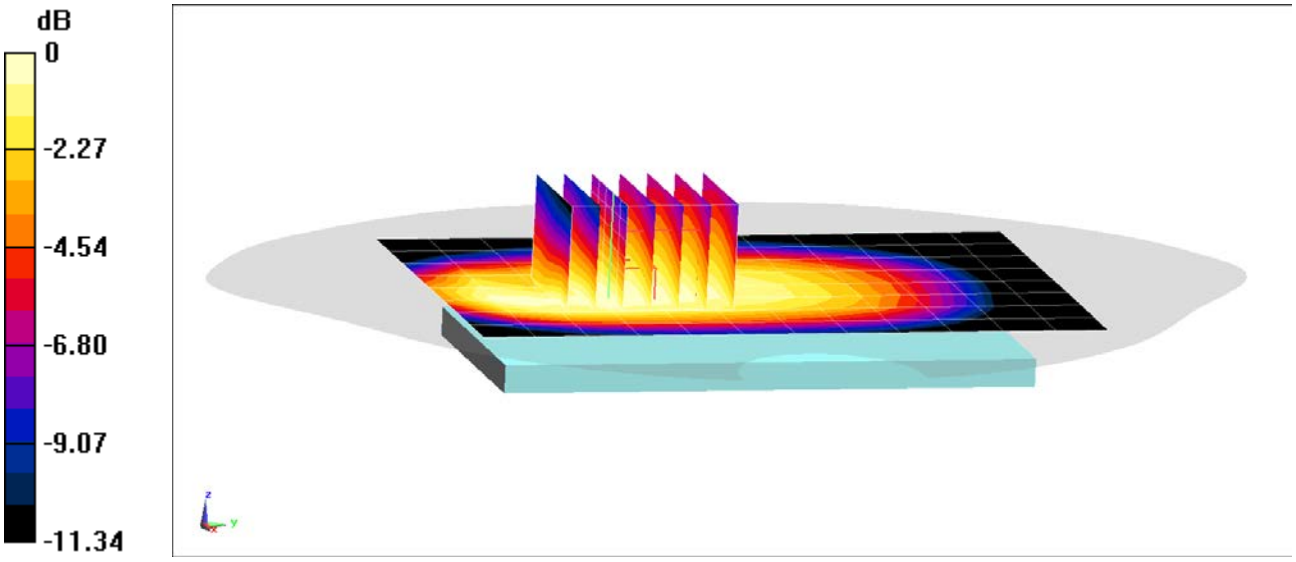
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750MHz Body Medium parameters used (interpolated):
$f = 707.5$ MHz; $\sigma = 0.928$ S/m; $\varepsilon_r = 55.182$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-22-2019; Ambient Temp: 21.9°C; Tissue Temp: 20.5°C

Probe: EX3DV4 - SN7308; ConvF(10.38, 10.38, 10.38) @ 707.5 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 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 (6x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.33 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.585 W/kg
SAR(1 g) = 0.415 W/kg



0 dB = 0.510 W/kg = -2.92 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

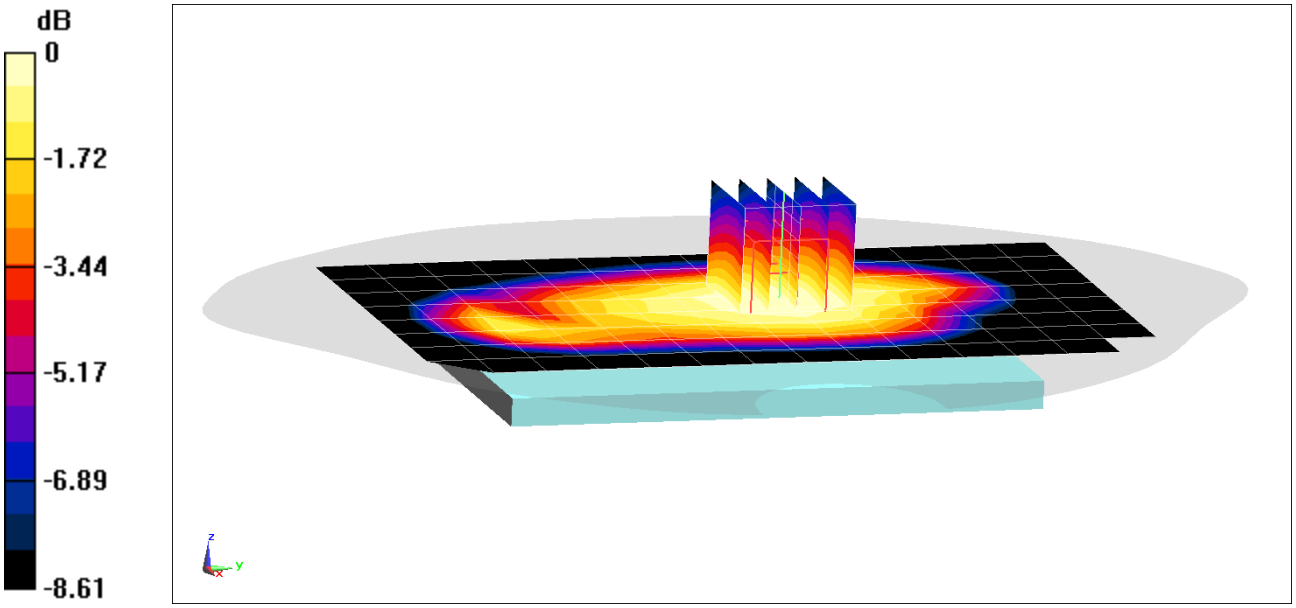
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 831.5 MHz; σ = 0.987 S/m; ε_r = 54.481; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-16-2019; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7488; ConvF(11.03, 11.03, 11.03) @ 831.5 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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 26 (Cell.), Body SAR, Back side, Mid.ch,
15 MHz Bandwidth, QPSK, 1 RB, 74 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 = 19.24 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.484 W/kg
SAR(1 g) = 0.355 W/kg



0 dB = 0.438 W/kg = -3.59 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00304

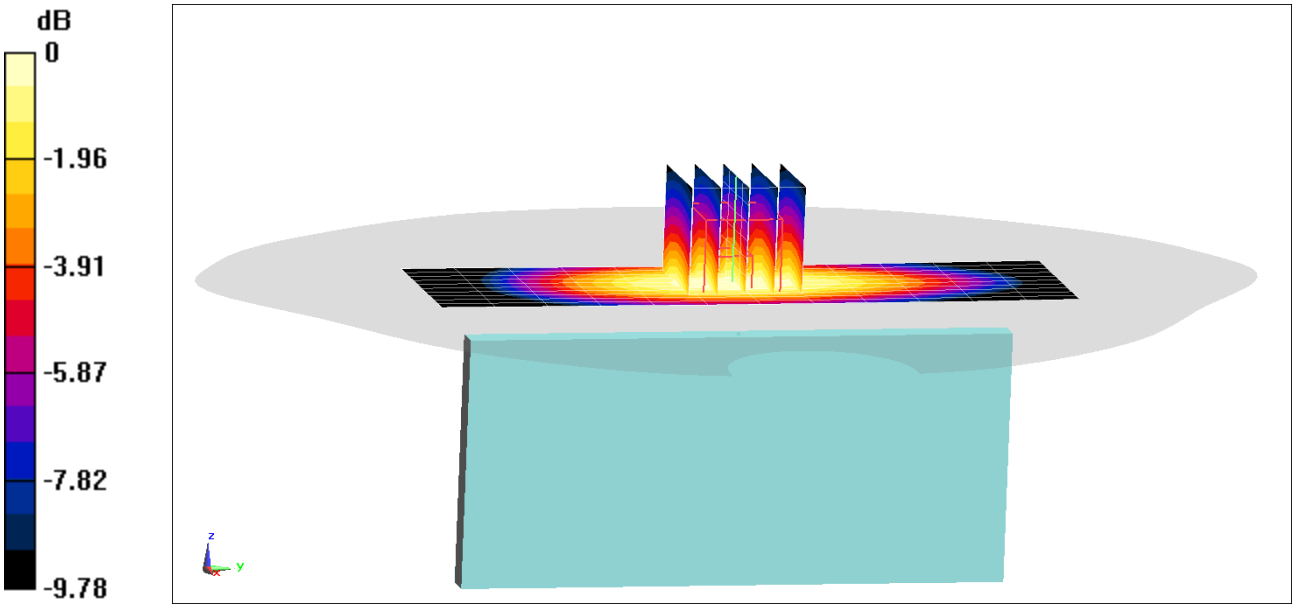
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
$f = 831.5$ MHz; $\sigma = 0.987$ S/m; $\varepsilon_r = 54.481$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-16-2019; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7488; ConvF(11.03, 11.03, 11.03) @ 831.5 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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 26 (Cell.), Body SAR, Right Edge, Mid.ch,
15 MHz Bandwidth, QPSK, 1 RB, 74 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 = 20.85 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.614 W/kg
SAR(1 g) = 0.408 W/kg



0 dB = 0.538 W/kg = -2.69 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

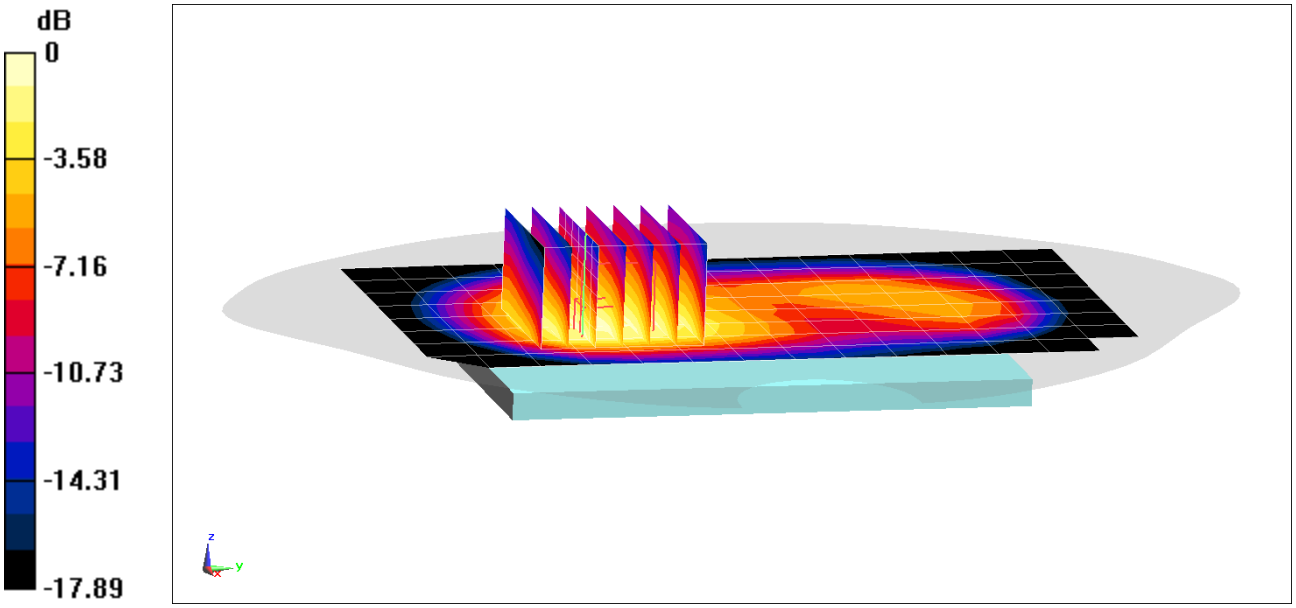
Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1770 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
$f = 1770$ MHz; $\sigma = 1.52$ S/m; $\varepsilon_r = 52.26$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-22-2019; Ambient Temp: 21.7°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7488; ConvF(8.68, 8.68, 8.68) @ 1770 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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, High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.98 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.765 W/kg



0 dB = 1.09 W/kg = 0.37 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

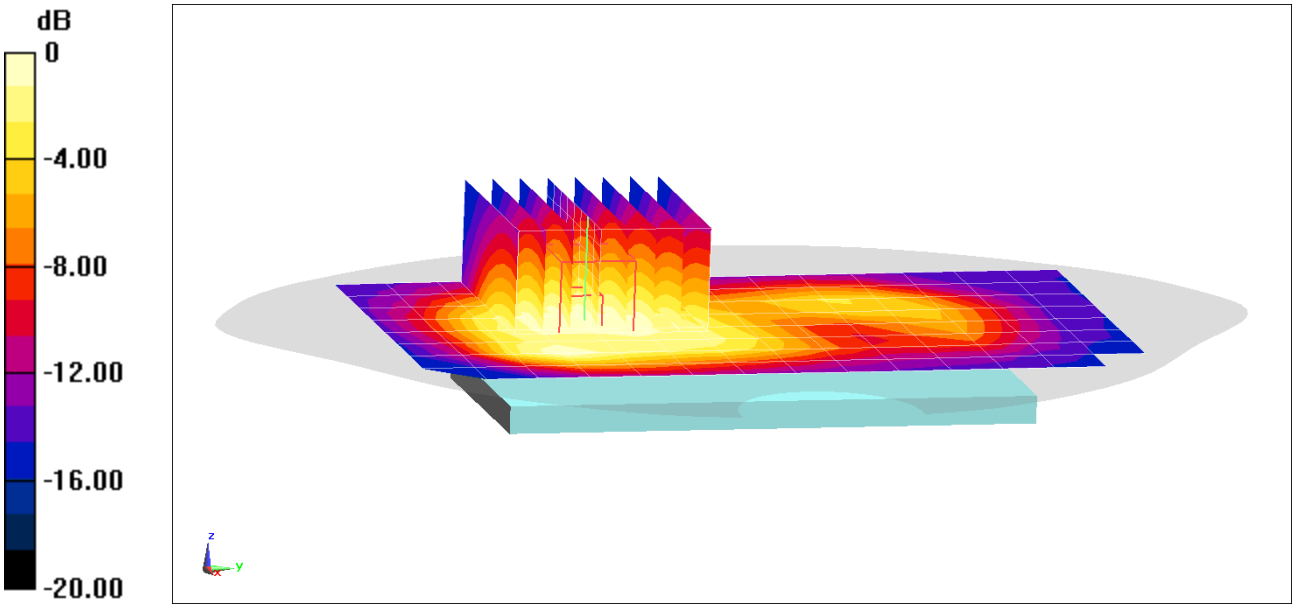
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.527 S/m; ε_r = 52.752; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-17-2019; Ambient Temp: 21.1°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410; ConvF(7.78, 7.78, 7.78) @ 1860 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (9x8x7)/Cube 1: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.34 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.738 W/kg



0 dB = 0.944 W/kg = -0.25 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

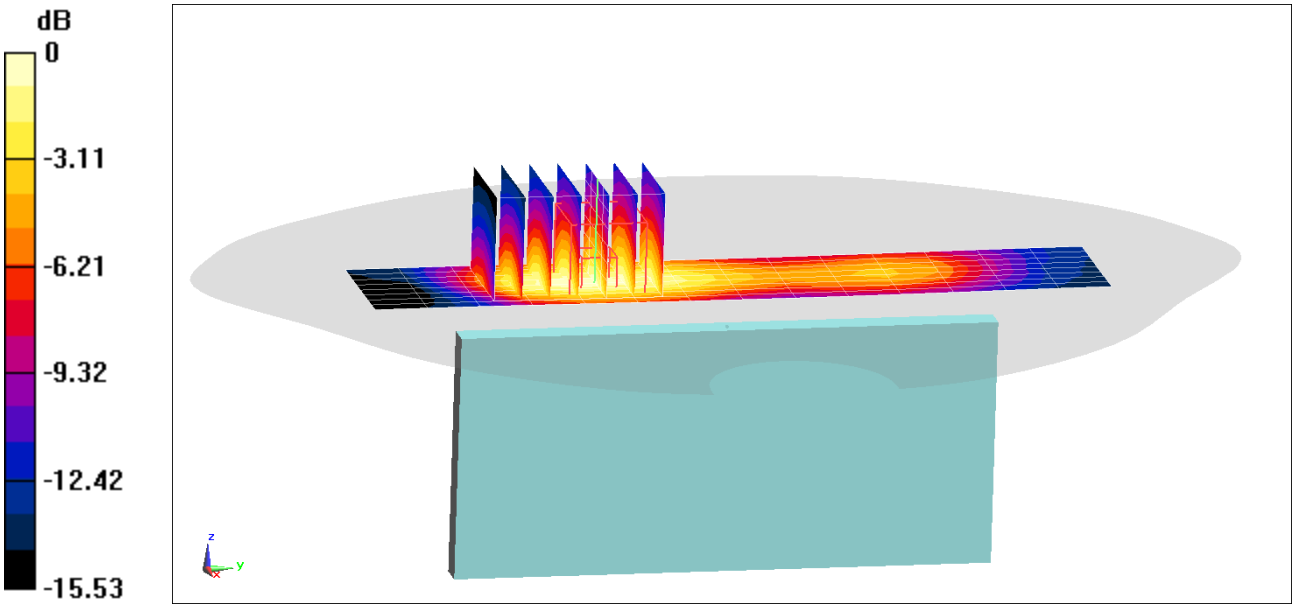
Communication System: UID 0, _LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.527 S/m; ε_r = 52.752; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-17-2019; Ambient Temp: 21.1°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410, ConvF(7.78, 7.78, 7.78) @ 1860 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 25 (PCS), Body SAR, Left Edge, Low.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.36 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.30 W/kg
SAR(1 g) = 0.790 W/kg



0 dB = 1.13 W/kg = 0.53 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00312

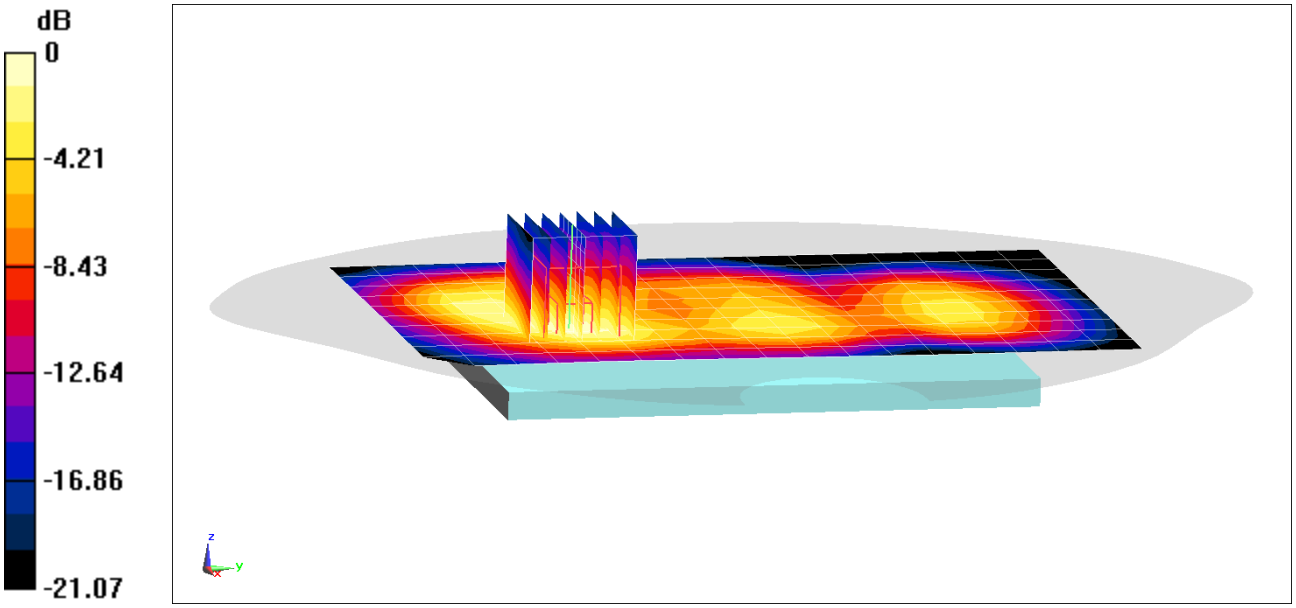
Communication System: UID 0, LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
$f = 2510$ MHz; $\sigma = 2.116$ S/m; $\varepsilon_r = 50.834$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2510 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 7, Body SAR, Back side, Low.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 16.87 V/m; Power Drift = -0.19 dB
Peak SAR (extrapolated) = 0.983 W/kg
SAR(1 g) = 0.506 W/kg



0 dB = 0.790 W/kg = -1.02 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00312

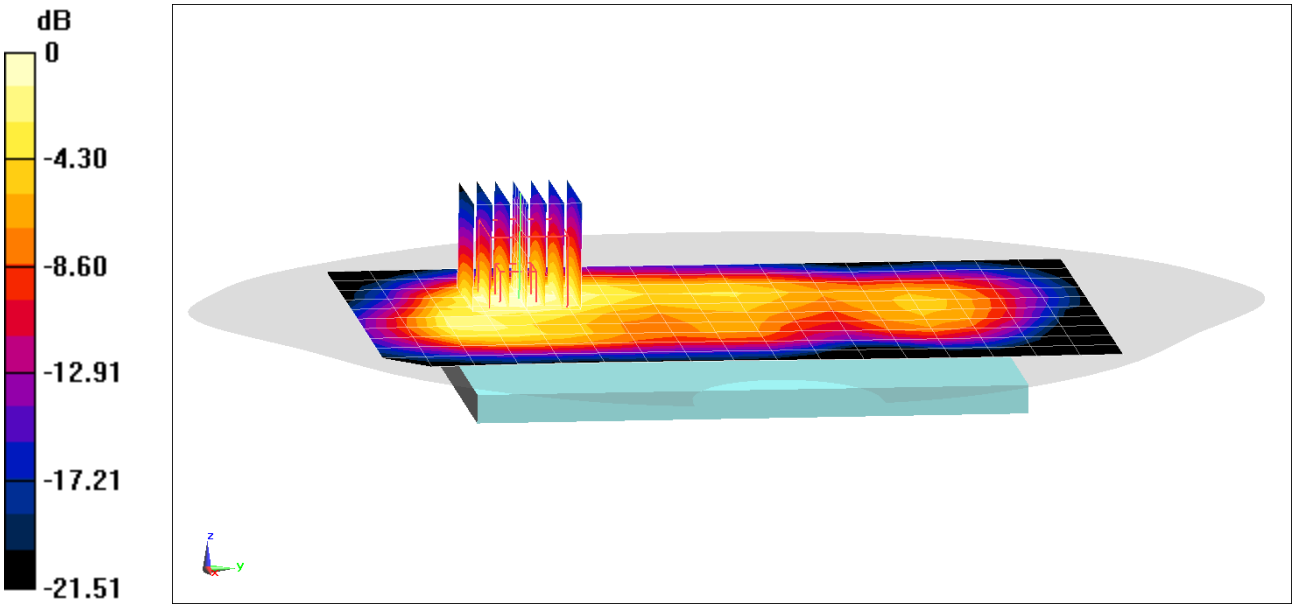
Communication System: UID 0, _LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
$f = 2510$ MHz; $\sigma = 2.116$ S/m; $\varepsilon_r = 50.834$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2510 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 7, Body SAR, Front side, Low.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.05 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.67 W/kg
SAR(1 g) = 0.858 W/kg



0 dB = 1.33 W/kg = 1.24 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00312

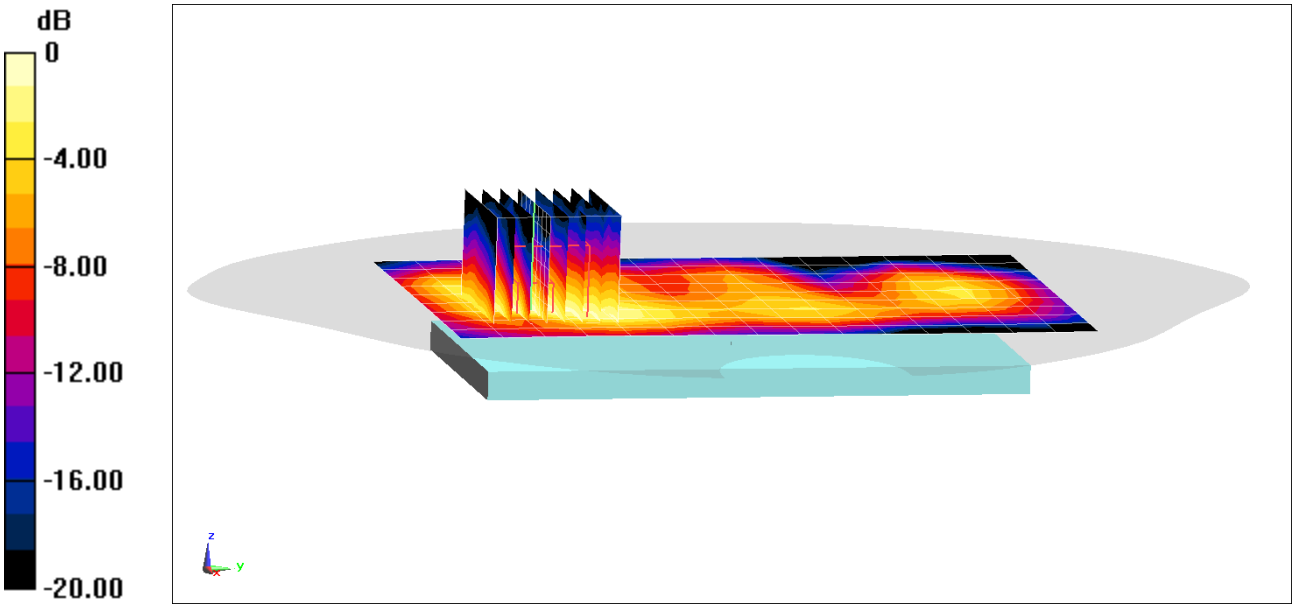
Communication System: UID 0, _LTE Band 41 (Class 2); Frequency: 2636.5 MHz; Duty Cycle: 1:2.31
Medium: 2450 Body Medium parameters used (interpolated):
f = 2636.5 MHz; σ = 2.268 S/m; ε_r = 50.471; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2636.5 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 41 PC2, Body SAR, Back side, Mid-High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (9x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.51 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 0.402 W/kg
SAR(1 g) = 0.187 W/kg



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

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00312

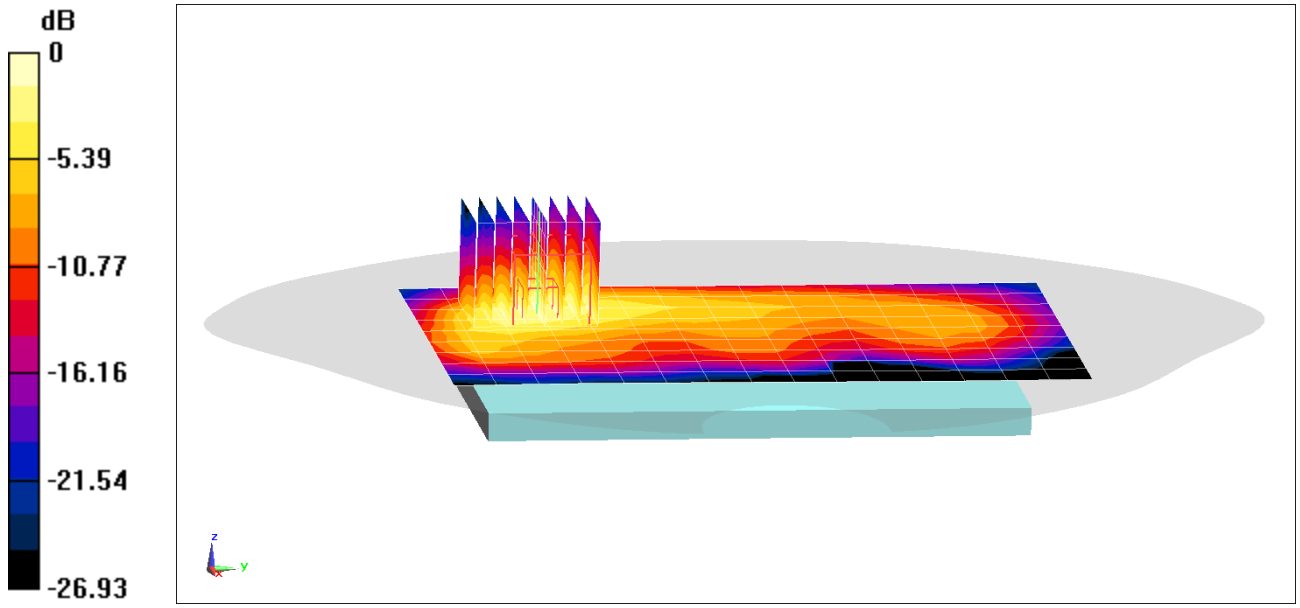
Communication System: UID 0, _LTE Band 41 (Class 2); Frequency: 2636.5 MHz; Duty Cycle: 1:2.31
Medium: 2450 Body Medium parameters used (interpolated):
f = 2636.5 MHz; σ = 2.268 S/m; ε_r = 50.471; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2636.5 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 41 PC2, Body SAR, Front side, Mid-High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 14.99 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.05 W/kg
SAR(1 g) = 0.492 W/kg



0 dB = 0.808 W/kg = -0.93 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00387

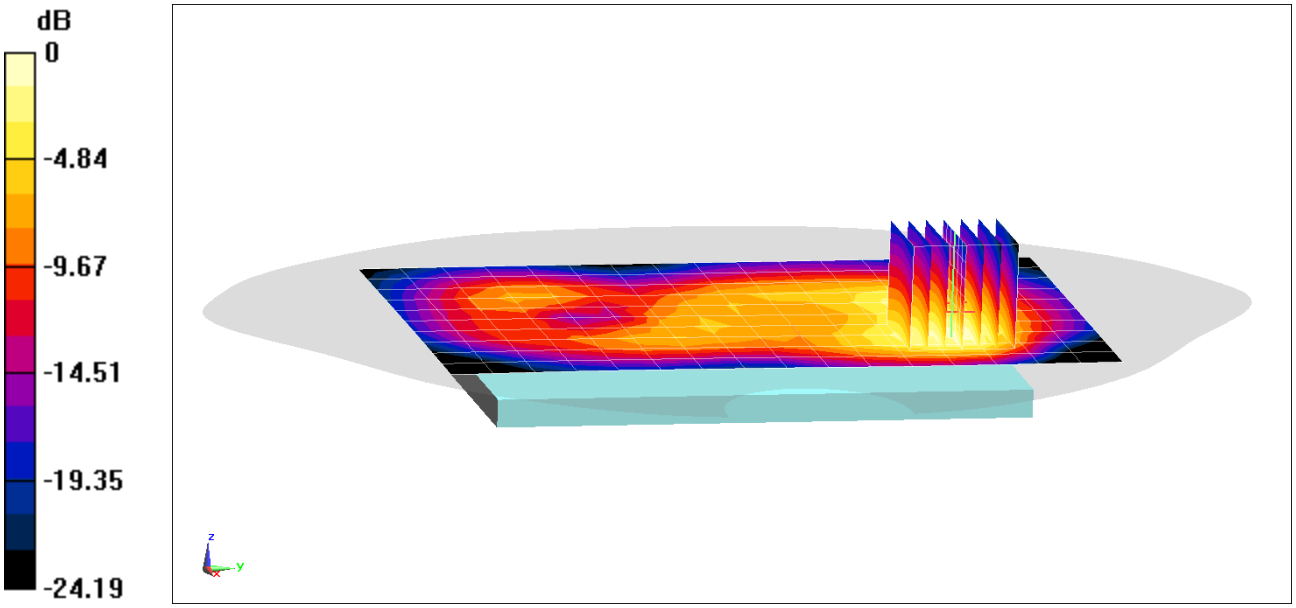
Communication System: UID 0, _IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2462 MHz; σ = 1.978 S/m; ε_r = 50.968; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-18-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2462 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11b, 22 MHz Bandwidth,
Body SAR, Ch 11, 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 = 20.24 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.56 W/kg
SAR(1 g) = 0.736 W/kg



0 dB = 1.21 W/kg = 0.83 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00379

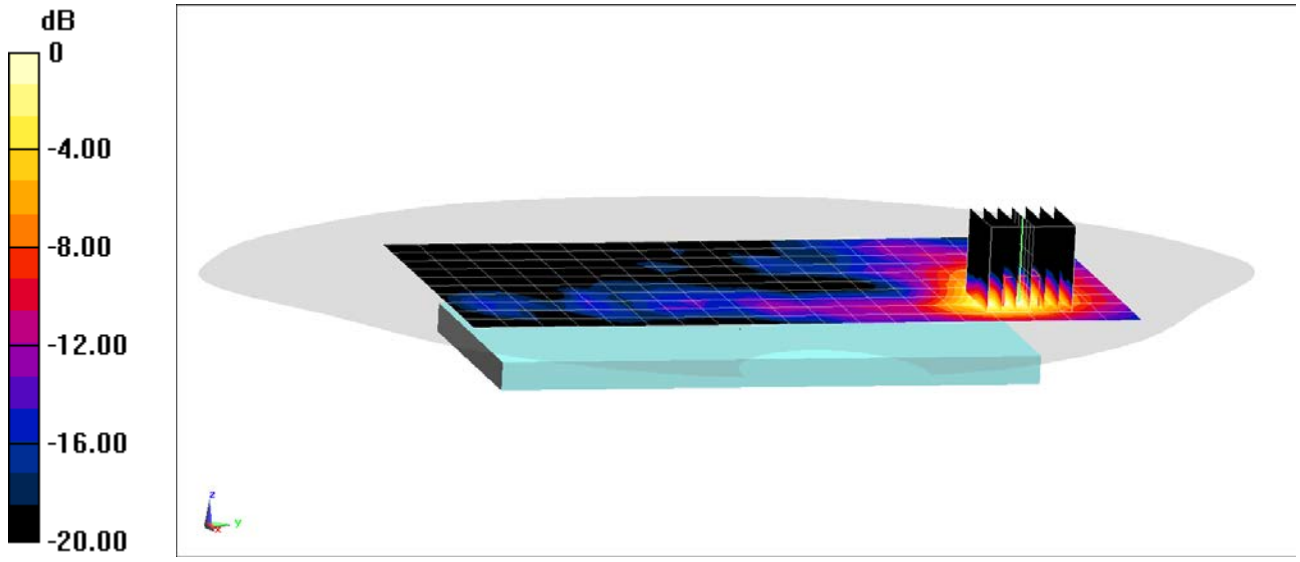
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5805 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5805 MHz; σ = 6.187 S/m; ε_r = 46.3; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-14-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.5°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, U-NII-3, 20 MHz Bandwidth,
Body SAR, Ch 161, 6 Mbps, Back Side

Area Scan (11x20x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 7.383 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 2.38 W/kg
SAR(1 g) = 0.558 W/kg



0 dB = 1.38 W/kg = 1.40 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00379

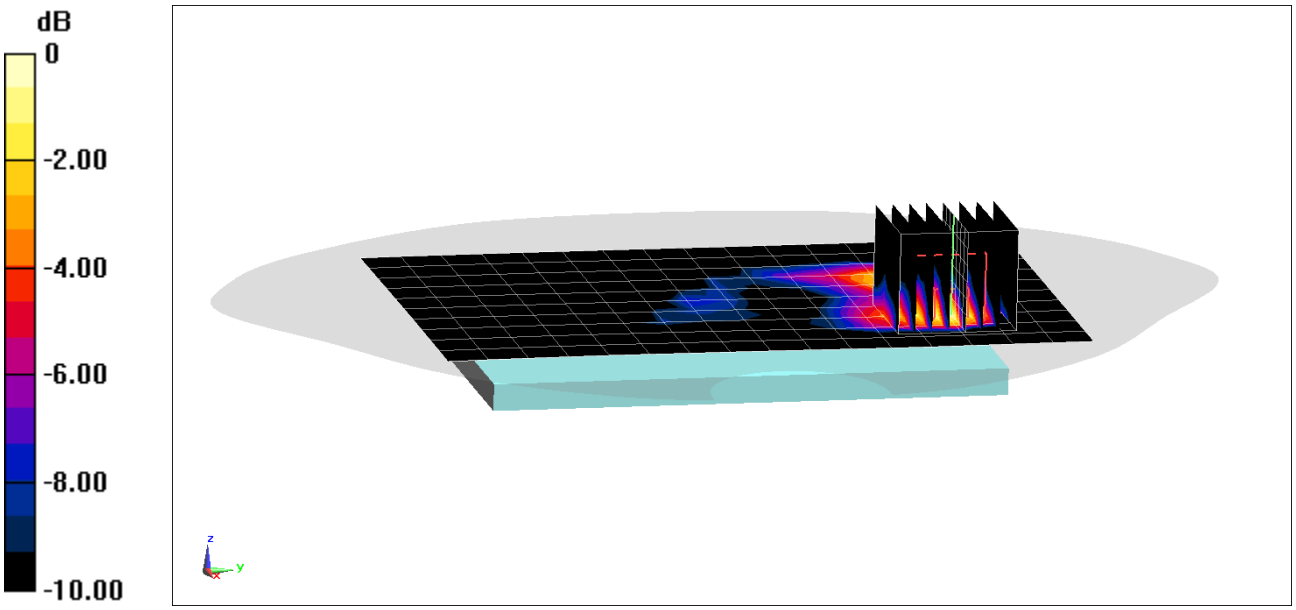
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.297
Medium: 2450 Body Medium parameters used (interpolated):
f = 2441 MHz; σ = 1.954 S/m; ε_r = 51.016; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-18-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2441 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 3.113 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.0440 W/kg
SAR(1 g) = 0.020 W/kg



0 dB = 0.0336 W/kg = -14.74 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00312

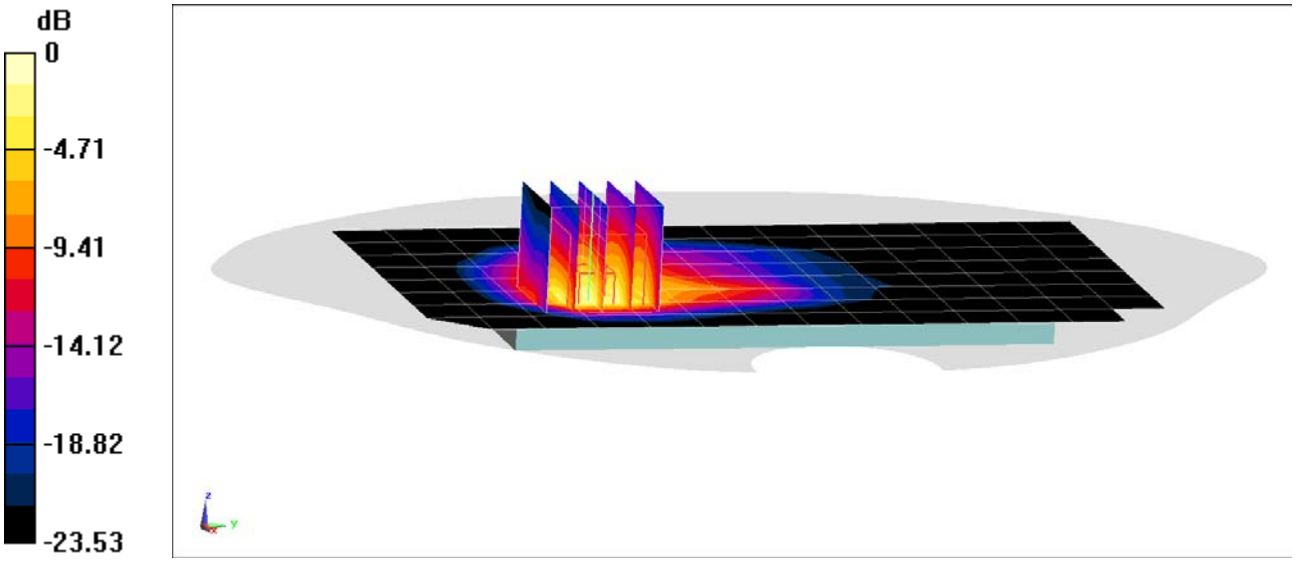
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.494 S/m; ε_r = 52.327; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-22-2019; Ambient Temp: 21.7°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7488; ConvF(8.68, 8.68, 8.68) @ 1732.4 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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, Phablet 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 = 63.58 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 12.5 W/kg
SAR(10 g) = 2.48 W/kg



0 dB = 9.69 W/kg = 9.86 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

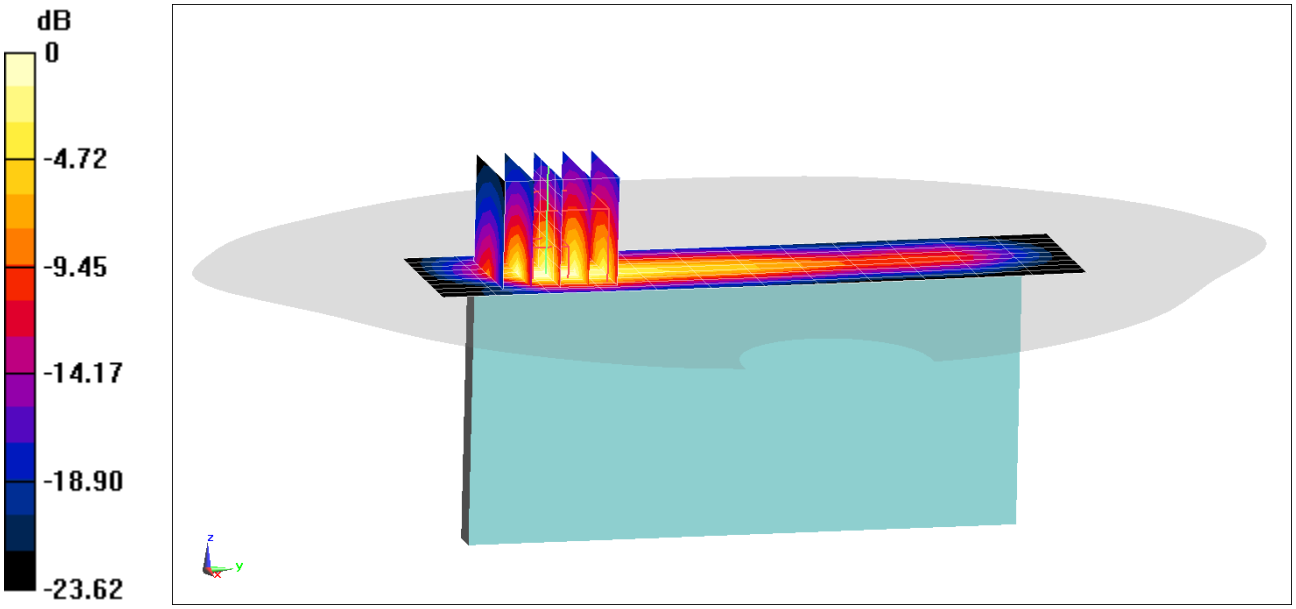
Communication System: UID 0, _UMTS; Frequency: 1852.4 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
$f = 1852.4$ MHz; $\sigma = 1.515$ S/m; $\varepsilon_r = 51.519$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-15-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN7410; ConvF(7.78, 7.78, 7.78) @ 1852.4 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: UMTS 1900, 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 = 70.47 V/m; Power Drift = -0.11 dB
Peak SAR (extrapolated) = 16.5 W/kg
SAR(10 g) = 2.81 W/kg



0 dB = 11.6 W/kg = 10.64 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00312

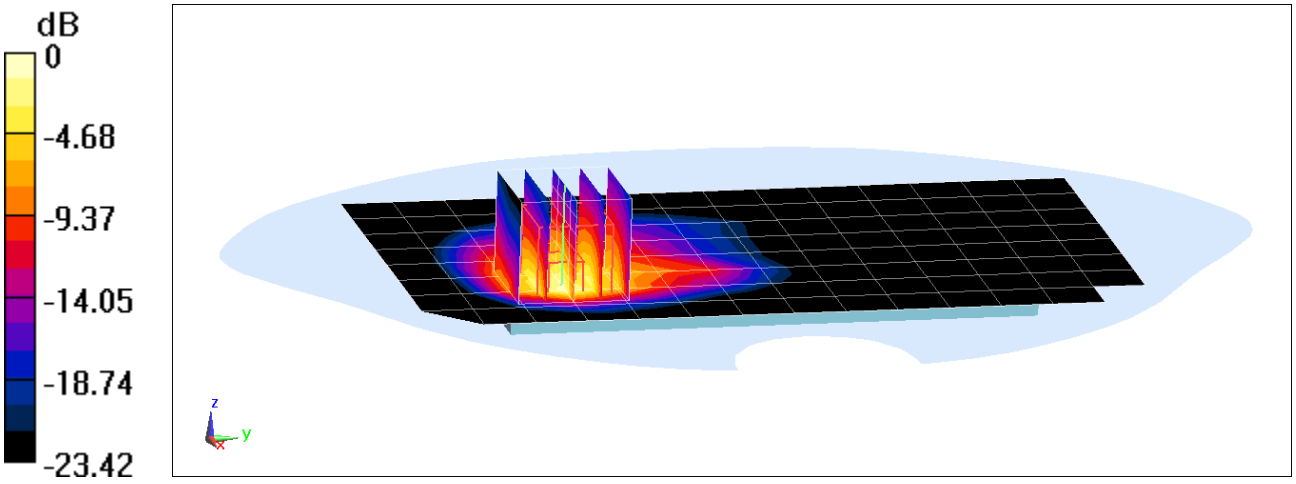
Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1770 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
$f = 1770$ MHz; $\sigma = 1.519$ S/m; $\varepsilon_r = 52.399$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 05-01-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN3914; ConvF(7.89, 7.89, 7.89) @ 1770 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
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, Back side, 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 = 62.32 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 11.8 W/kg
SAR(10 g) = 2.35 W/kg



0 dB = 9.20 W/kg = 9.64 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00296

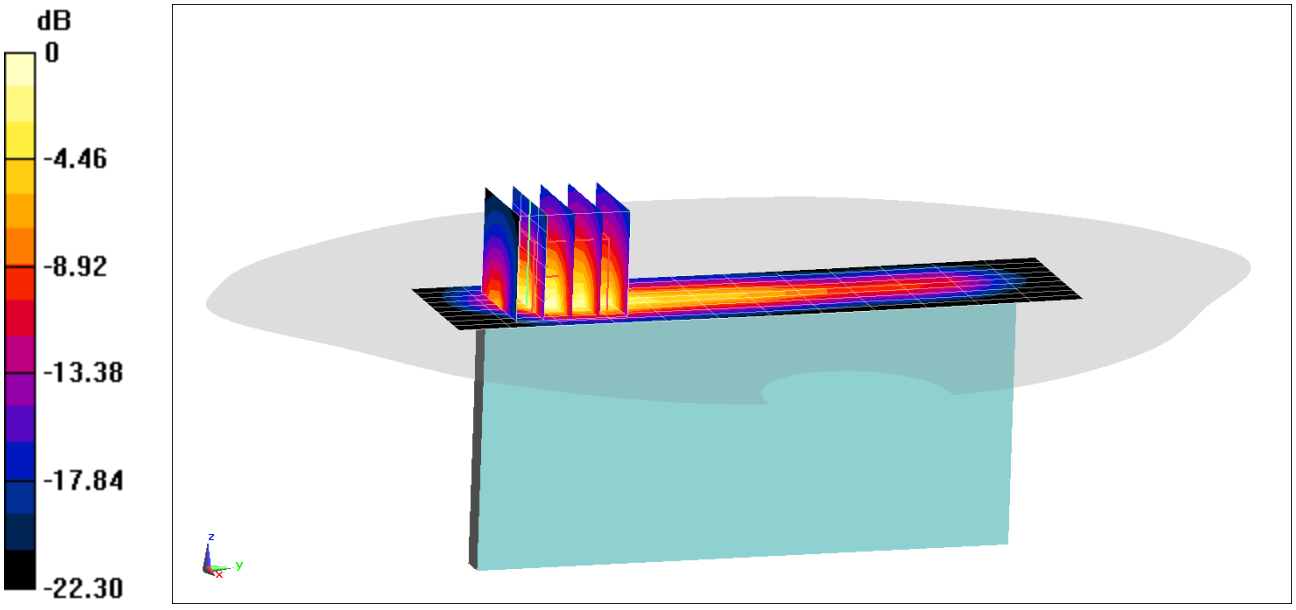
Communication System: UID 0, _LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.527 S/m; ε_r = 52.752; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-17-2019; Ambient Temp: 21.1°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410; ConvF(7.78, 7.78, 7.78) @ 1860 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 25 (PCS), Phablet SAR, Left Edge, Low.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 68.86 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(10 g) = 2.91 W/kg



0 dB = 11.1 W/kg = 10.45 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00312

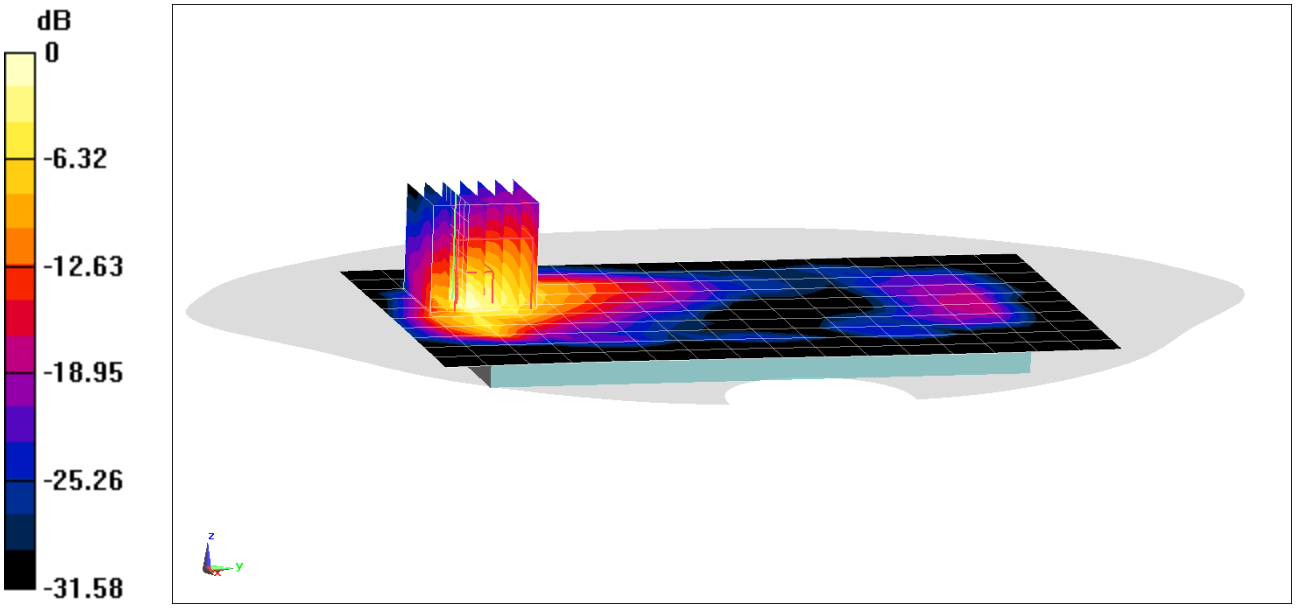
Communication System: UID 0, _LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
$f = 2510$ MHz; $\sigma = 2.034$ S/m; $\varepsilon_r = 50.836$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-18-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2510 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 7, Phablet SAR, Front side, Low.ch,
20 MHz Bandwidth, QPSK, 50 RB, 0 RB Offset

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.02 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 24.7 W/kg
SAR(10 g) = 2.79 W/kg



0 dB = 13.6 W/kg = 11.34 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00379

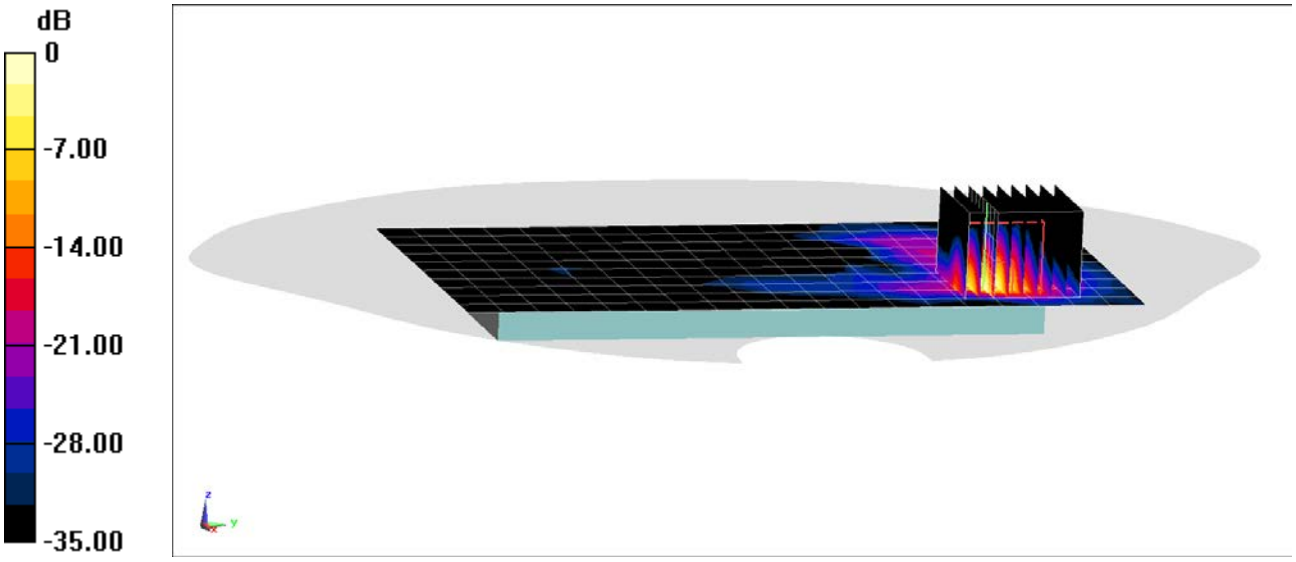
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5260 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5260 MHz; σ = 5.488 S/m; ε_r = 47.514; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 04-30-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.1°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 (8x8x1): 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 = 40.34 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 46.7 W/kg
SAR(10 g) = 1.33 W/kg



0 dB = 37.2 W/kg = 15.71 dBW/kg

DUT: ZNFX420MM; Type: Portable Handset; Serial: 00379

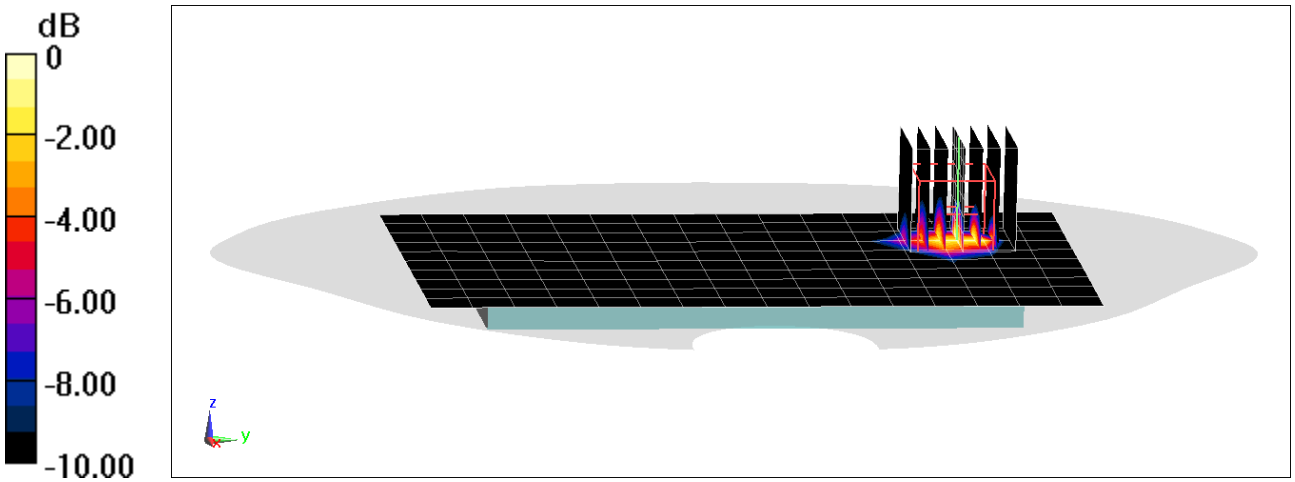
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.297
Medium: 2450 Body Medium parameters used (interpolated):
f = 2441 MHz; σ = 2.02 S/m; ε_r = 52.844; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 05-02-2019; Ambient Temp: 22.6°C; Tissue Temp: 20.8°C

Probe: EX3DV4 - SN7308; ConvF(7.57, 7.57, 7.57) @ 2441 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: Bluetooth, Phablet SAR, Ch 39, 1 Mbps, Front 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 = 6.459 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.181 W/kg
SAR(10 g) = 0.028 W/kg



0 dB = 0.133 W/kg = -8.76 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

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PCTEST ENGINEERING LABORATORY, INC.

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

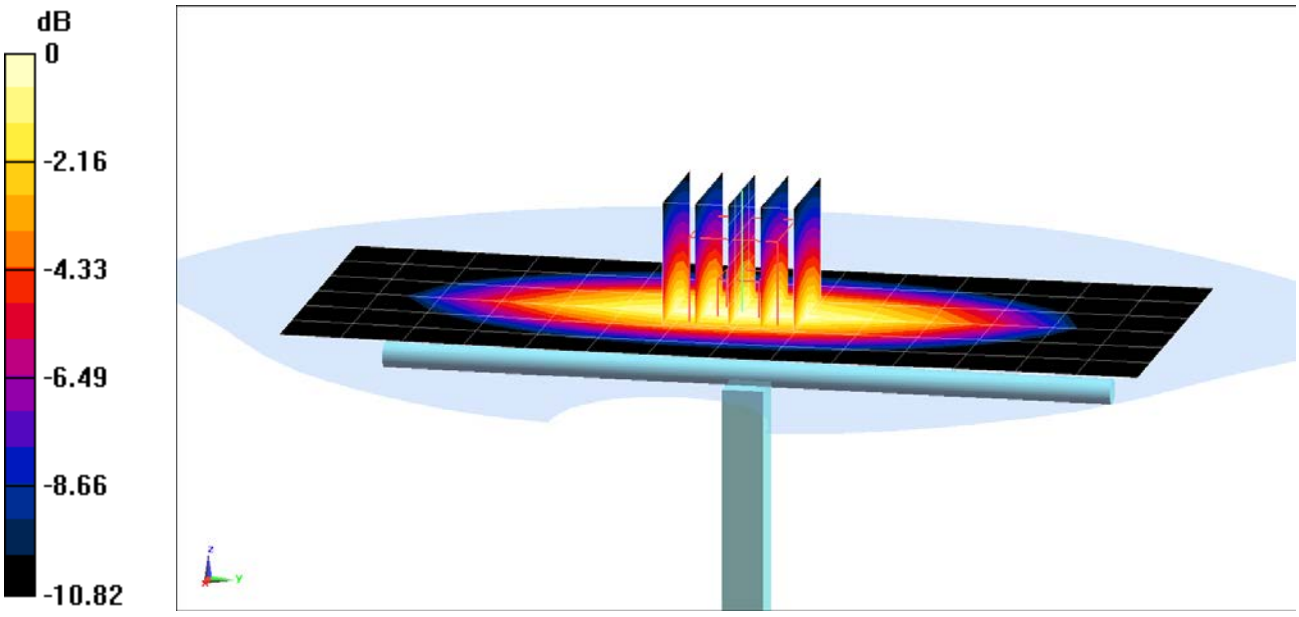
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head; Medium parameters used (interpolated):
$f = 750$ MHz; $\sigma = 0.906$ S/m; $\varepsilon_r = 40.528$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 04-22-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(9.91, 9.91, 9.91) @ 750 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM 30 with CRP v5.0 right; Type: QD000P40CD; Serial: TP:1759
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) = 2.70 W/kg
SAR(1 g) = 1.72 W/kg
Deviation(1 g) = 3.86%



0 dB = 2.35 W/kg = 3.71 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

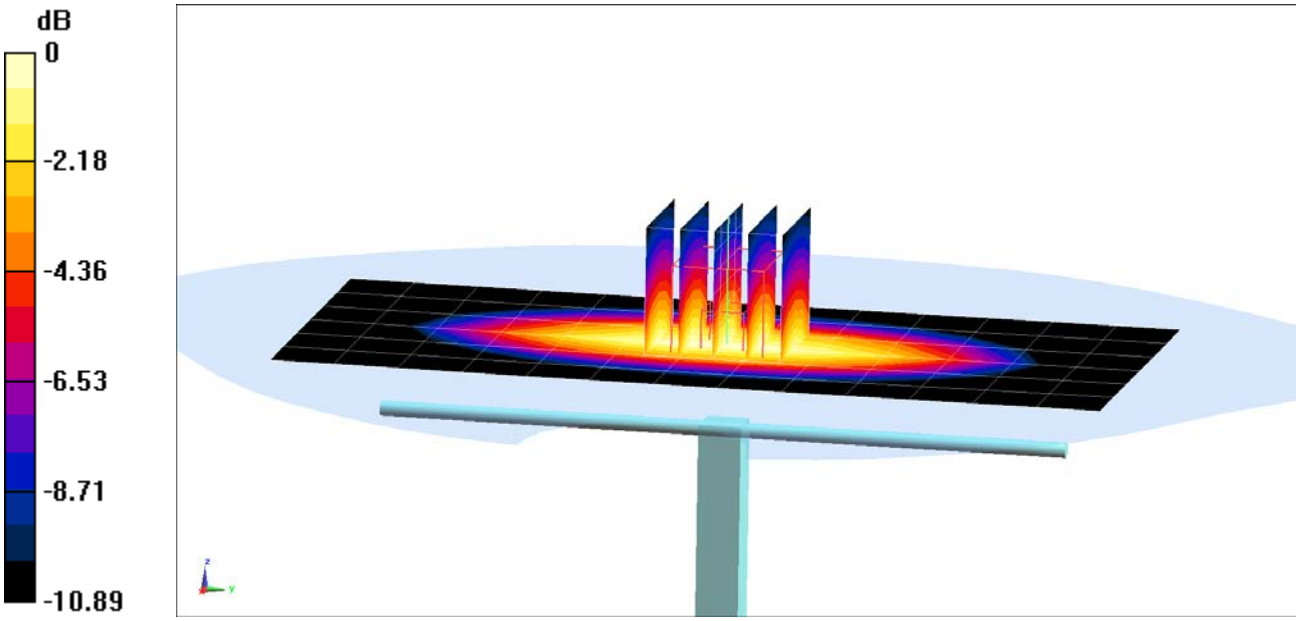
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.92 S/m; ε_r = 41.957; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 04-15-2019; Ambient Temp: 22.4°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN3914; ConvF(9.5, 9.5, 9.5) @ 835 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Left For Head SAM with CRP v5.0; Type: QD000P40CD; Serial: TP:1687
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) = 2.97 W/kg
SAR(1 g) = 1.95 W/kg
Deviation(1 g) = 1.67%



0 dB = 2.63 W/kg = 4.20 dBW/kg

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

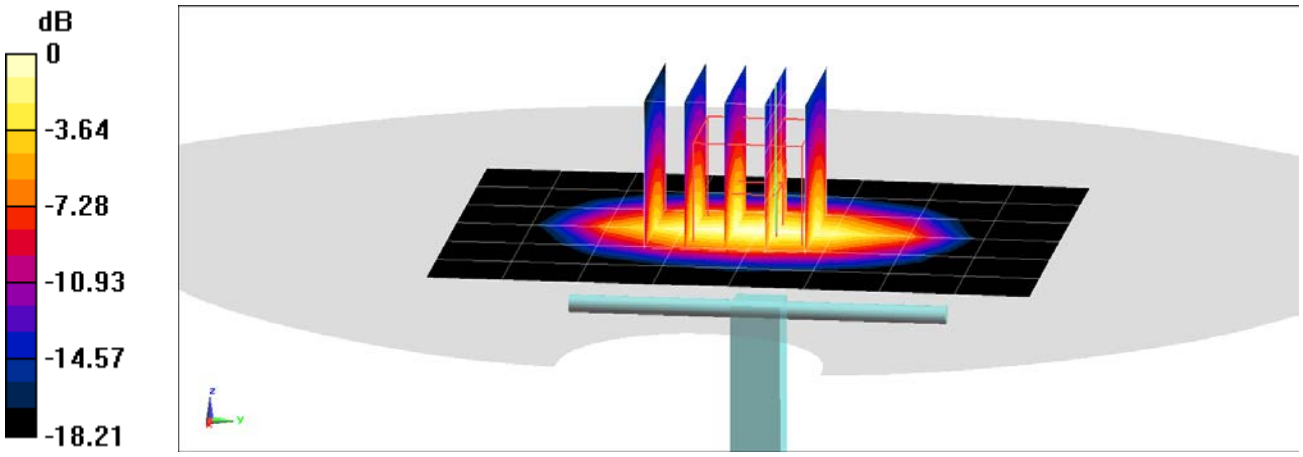
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used:
f = 1750 MHz; σ = 1.353 S/m; ε_r = 39.507; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 21.6°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN3589; ConvF(7.31, 7.31, 7.31) @ 1750 MHz; Calibrated: 1/25/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1450; Calibrated: 8/22/2018
Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647
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) = 6.86 W/kg
SAR(1 g) = 3.67 W/kg
Deviation(1 g) = 1.38%



0 dB = 5.61 W/kg = 7.49 dBW/kg

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

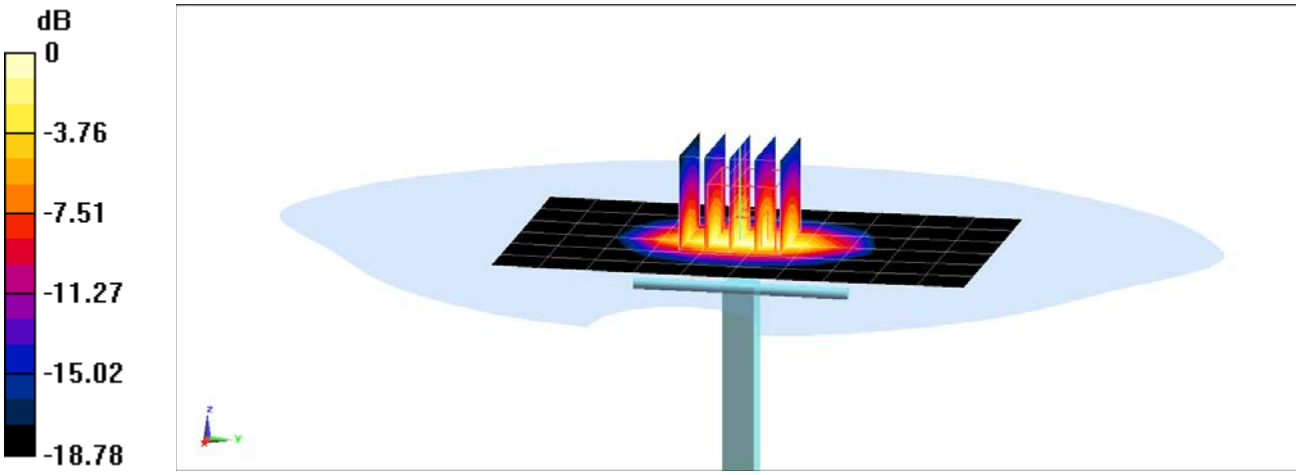
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.415 S/m; ε_r = 38.914; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-17-2019; Ambient Temp: 23.9°C; Tissue Temp: 20.0°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 v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
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) = 8.09 W/kg
SAR(1 g) = 4.21 W/kg;
Deviation(1 g) = 5.78%



0 dB = 6.64 W/kg = 8.22 dBW/kg

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

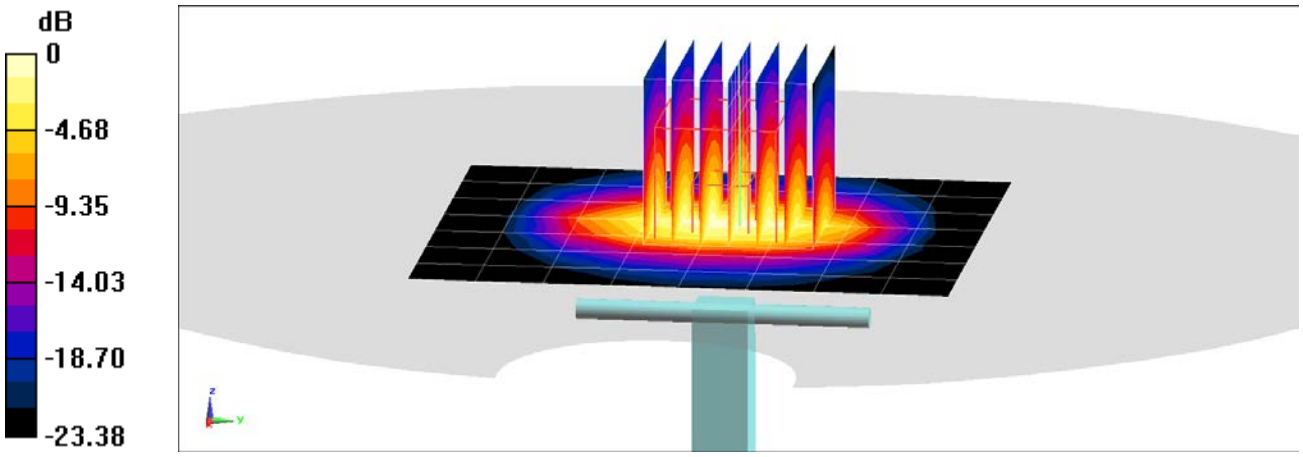
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.801 S/m; ε_r = 37.327; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-19-2019; Ambient Temp: 24.3°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN3589; ConvF(6.46, 6.46, 6.46) @ 2450 MHz; Calibrated: 1/25/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1450; Calibrated: 8/22/2018
Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647
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) = 11.4 W/kg
SAR(1 g) = 5.23 W/kg
Deviation(1 g) = 0.00%



0 dB = 8.85 W/kg = 9.47 dBW/kg

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

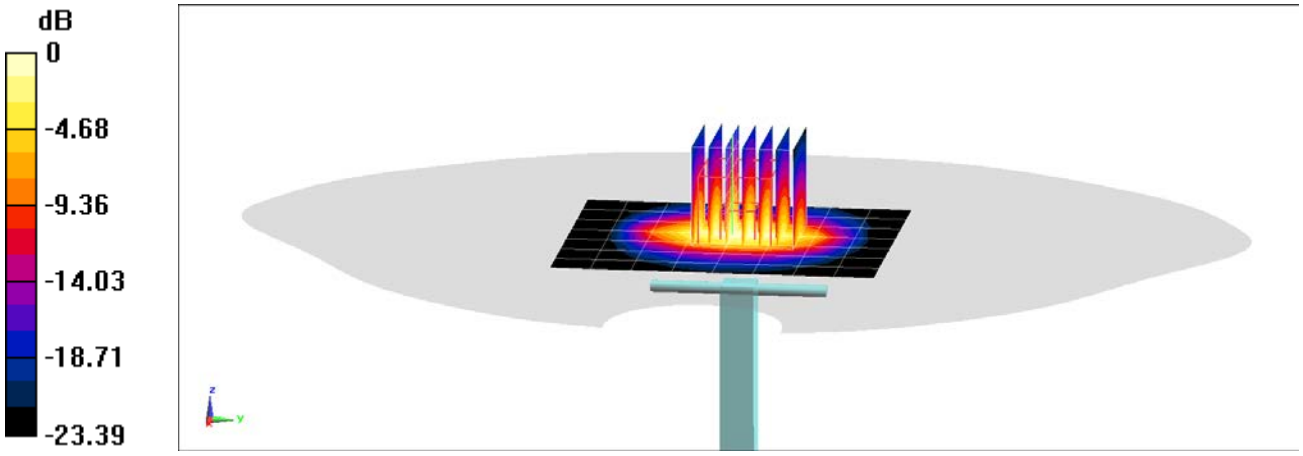
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.817 S/m; ε_r = 38.67; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-21-2019; Ambient Temp: 23.7°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN3589; ConvF(6.46, 6.46, 6.46) @ 2450 MHz; Calibrated: 1/25/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1450; Calibrated: 8/22/2018
Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647
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) = 5.19 W/kg
Deviation(1 g) = -0.76%



0 dB = 8.91 W/kg = 9.50 dBW/kg

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1064

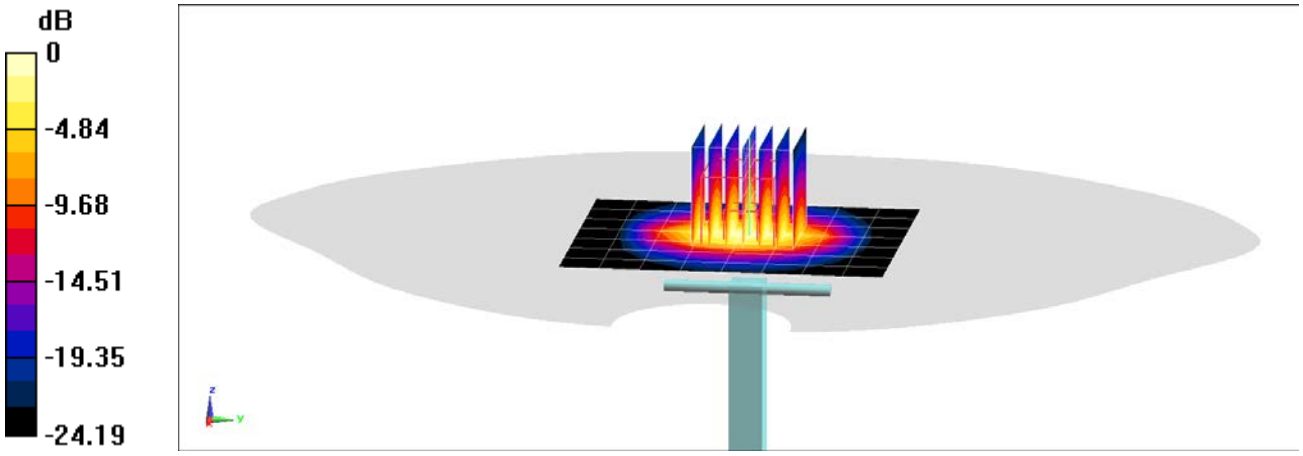
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2600 MHz; σ = 1.935 S/m; ε_r = 38.428; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-21-2019; Ambient Temp: 23.7°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN3589; ConvF(6.25, 6.25, 6.25) @ 2600 MHz; Calibrated: 1/25/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1450; Calibrated: 8/22/2018
Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2600 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) = 13.0 W/kg
SAR(1 g) = 5.74 W/kg
Deviation(1 g) = 0.70%



0 dB = 10.0 W/kg = 10.00 dBW/kg

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

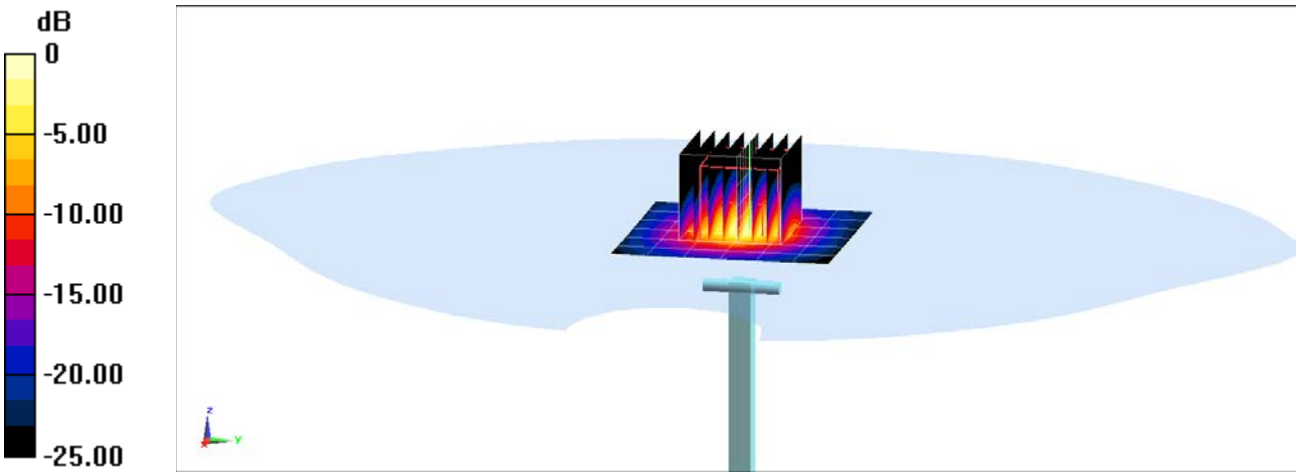
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
f = 5250 MHz; σ = 4.623 S/m; ε_r = 35.73; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 23.0°C; Tissue Temp: 21.9°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) = 16.4 W/kg
SAR(1 g) = 4.11 W/kg
Deviation(1 g) = 4.18%



0 dB = 10.0 W/kg = 10.00 dBW/kg

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

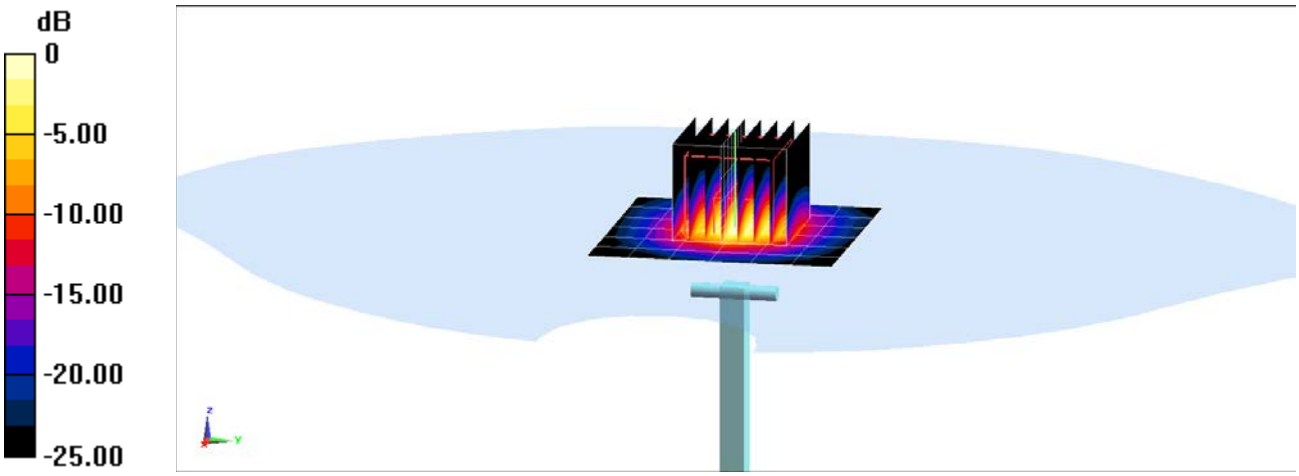
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used:
f = 5600 MHz; σ = 5.019 S/m; ε_r = 35.104; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 23.0°C; Tissue Temp: 21.9°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) = 18.5 W/kg
SAR(1 g) = 4.23 W/kg
Deviation(1 g) = 1.20%



0 dB = 10.4 W/kg = 10.17 dBW/kg

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

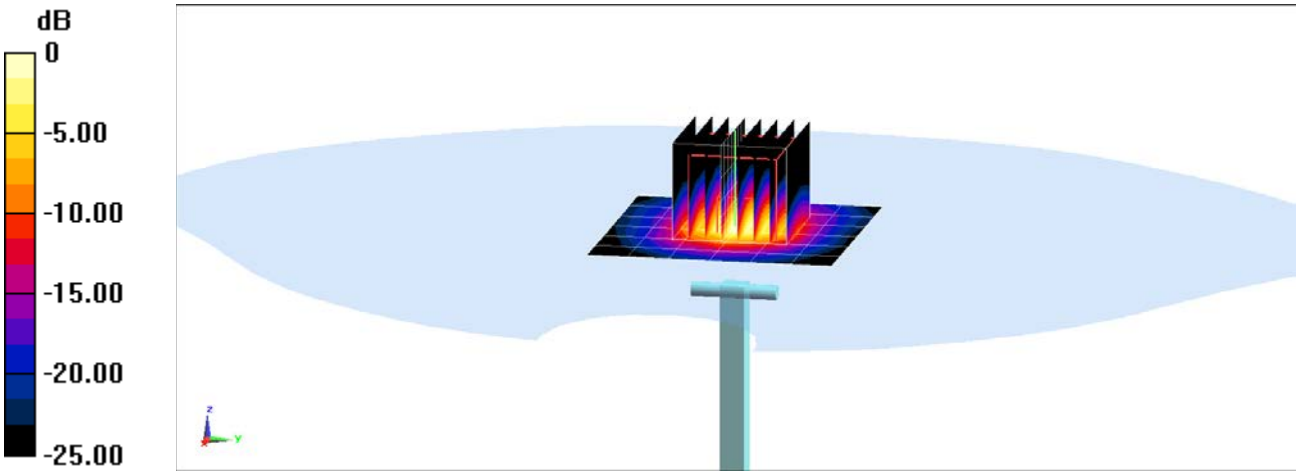
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
f = 5750 MHz; σ = 5.2 S/m; ε_r = 34.828; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 23.0°C; Tissue Temp: 21.9°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) = 18.3 W/kg
SAR(1 g) = 4.07 W/kg
Deviation(1 g) = 2.91%



0 dB = 10.0 W/kg = 10.00 dBW/kg

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1161

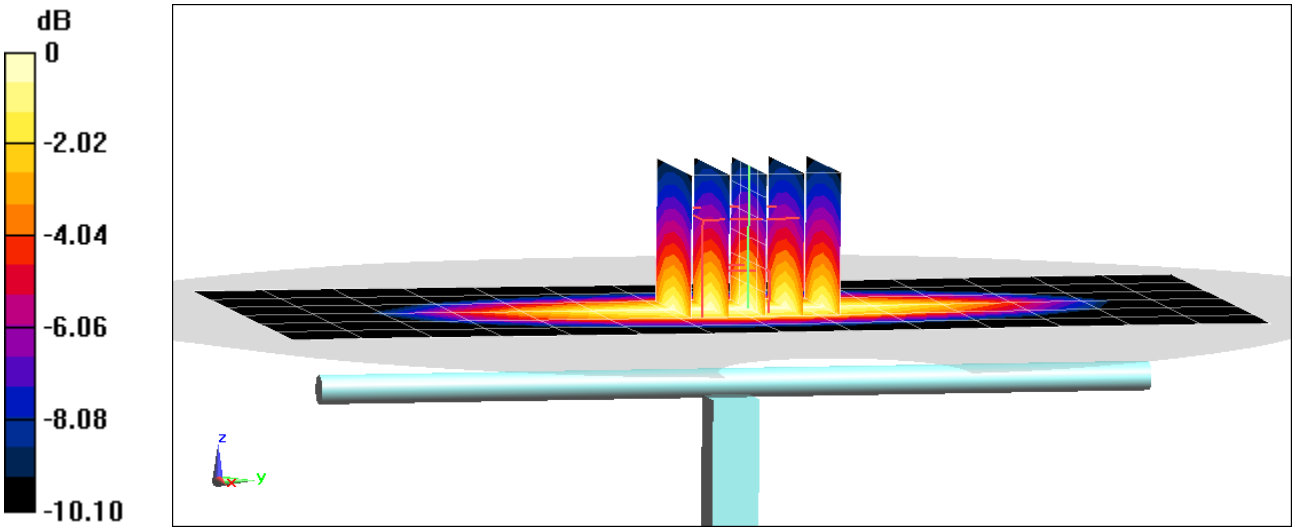
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750MHz Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.944 S/m; ε_r = 55.086; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 04-22-2019; Ambient Temp: 21.9°C; Tissue Temp: 20.5°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) = 2.45 W/kg
SAR(1 g) = 1.63 W/kg
Deviation(1 g) = -3.32%



0 dB = 2.17 W/kg = 3.36 dBW/kg

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

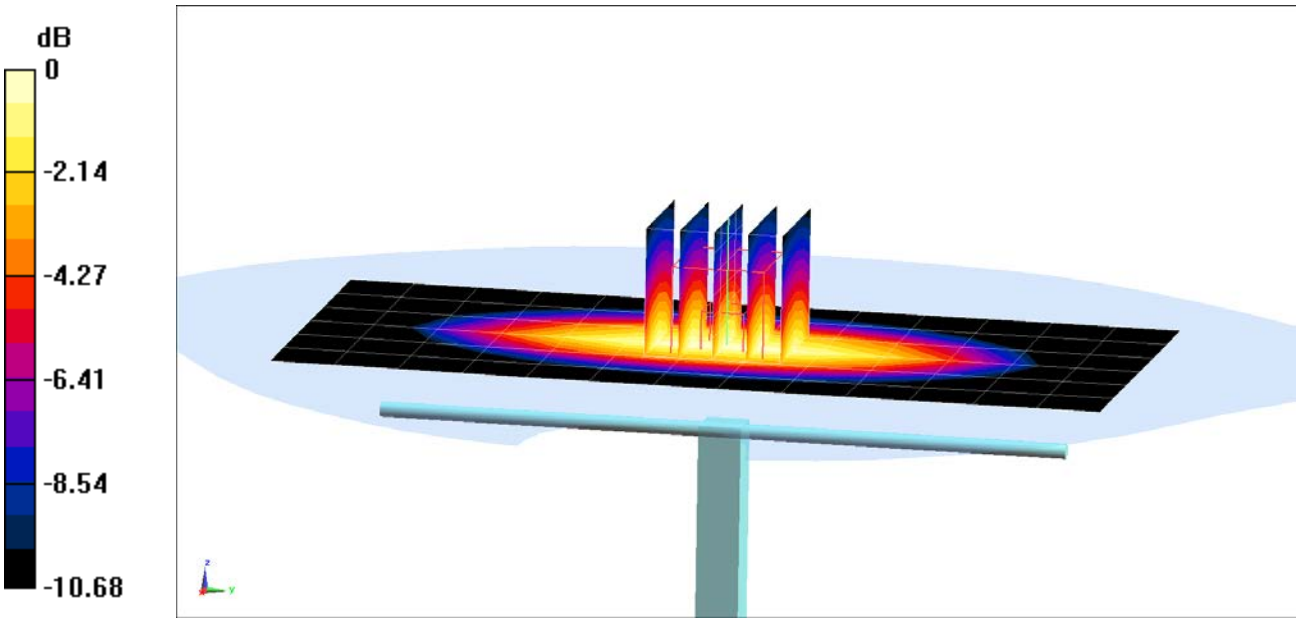
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.988 S/m; ε_r = 54.474; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 04-16-2019; Ambient Temp: 24.2°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7488; ConvF(11.03, 11.03, 11.03) @ 835 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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) = 2.90 W/kg
SAR(1 g) = 1.88 W/kg
Deviation(1 g) = -2.79%



0 dB = 2.53 W/kg = 4.03 dBW/kg

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

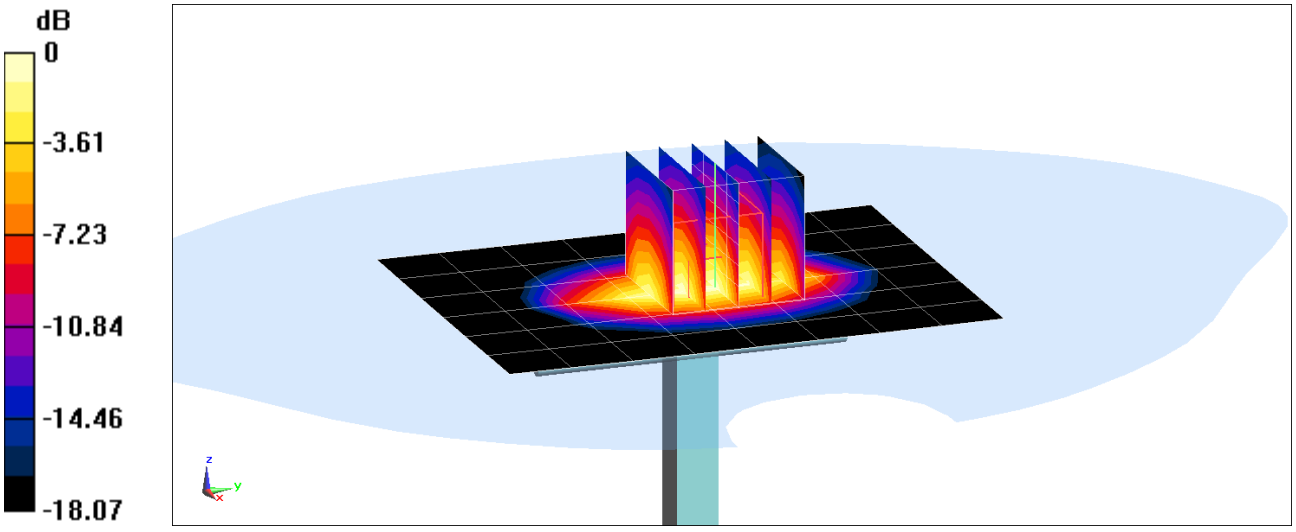
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.519 S/m; ε_r = 51.409; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 22.5°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7488; ConvF(8.68, 8.68, 8.68) @ 1750 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375
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) = 7.22 W/kg
SAR(1 g) = 3.94 W/kg
Deviation(1 g) = 5.35%



0 dB = 6.03 W/kg = 7.80 dBW/kg

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

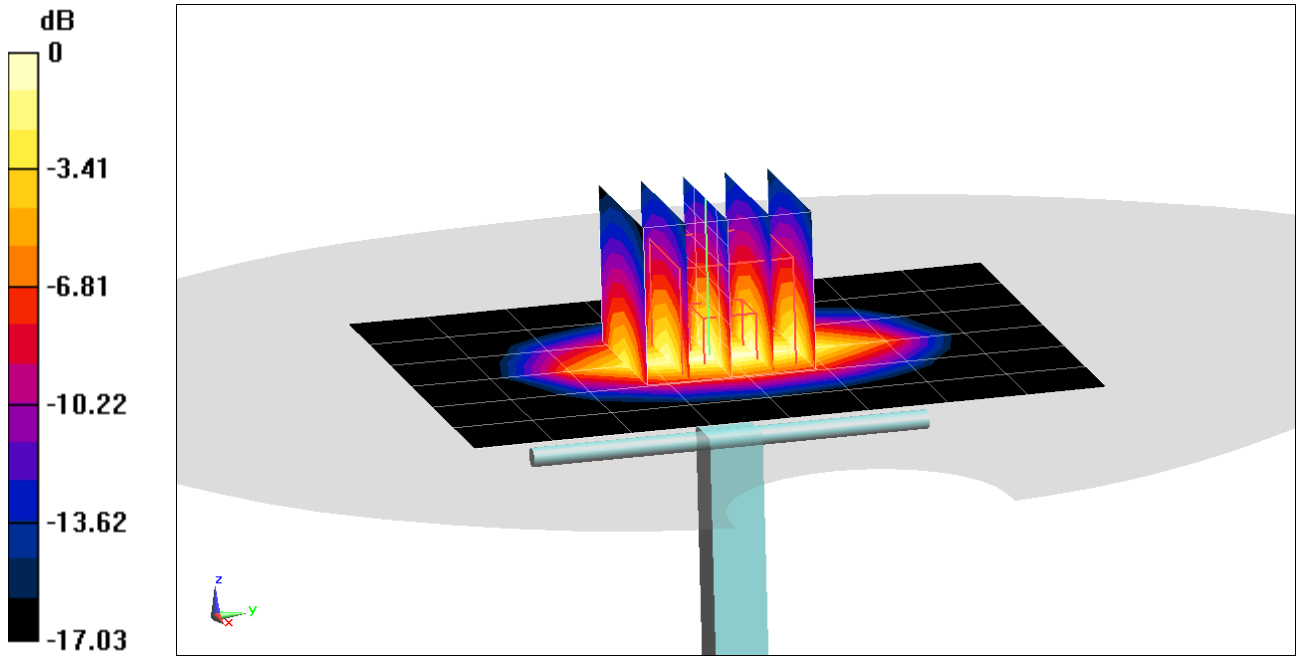
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.506 S/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-22-2019; Ambient Temp: 21.7°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7488; ConvF(8.68, 8.68, 8.68) @ 1750 MHz; Calibrated: 1/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1530; Calibrated: 1/15/2019
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) = 6.66 W/kg
SAR(1 g) = 3.75 W/kg; SAR(10 g) = 2.01 W/kg
Deviation(1 g) = 1.35%; Deviation(10 g) = 1.52%



0 dB = 5.60 W/kg = 7.48 dBW/kg

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

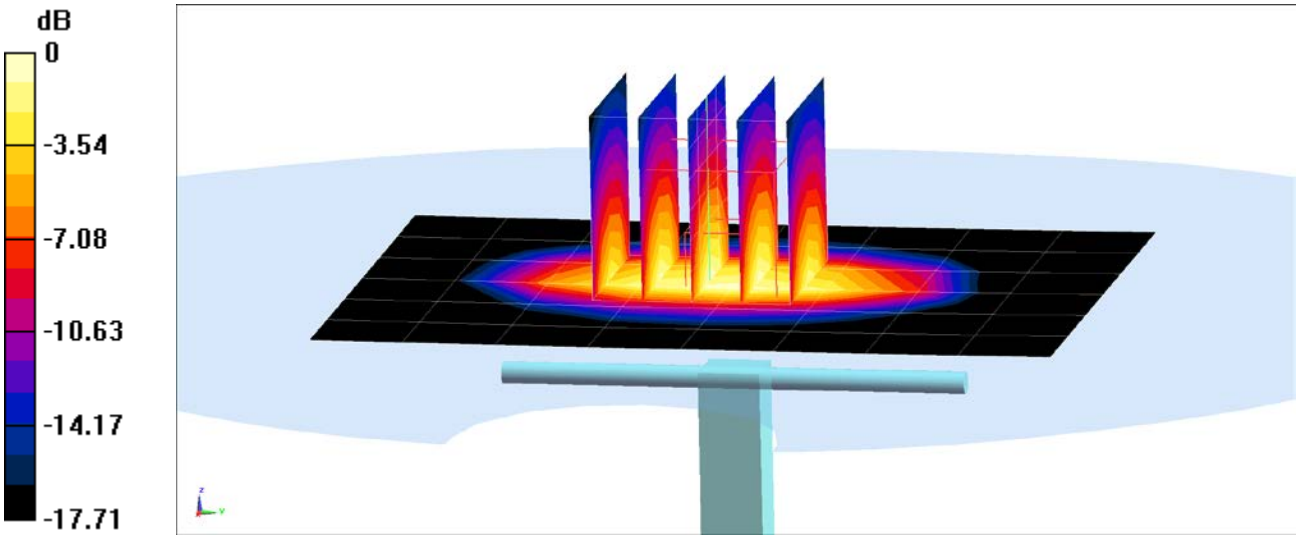
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.497 S/m; ε_r = 52.486; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-01-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN3914; ConvF(7.89, 7.89, 7.89) @ 1750 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
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) = 7.07 W/kg
SAR(10 g) = 2.01 W/kg
Deviation(10 g) = 1.52%



0 dB = 5.85 W/kg = 7.67 dBW/kg

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

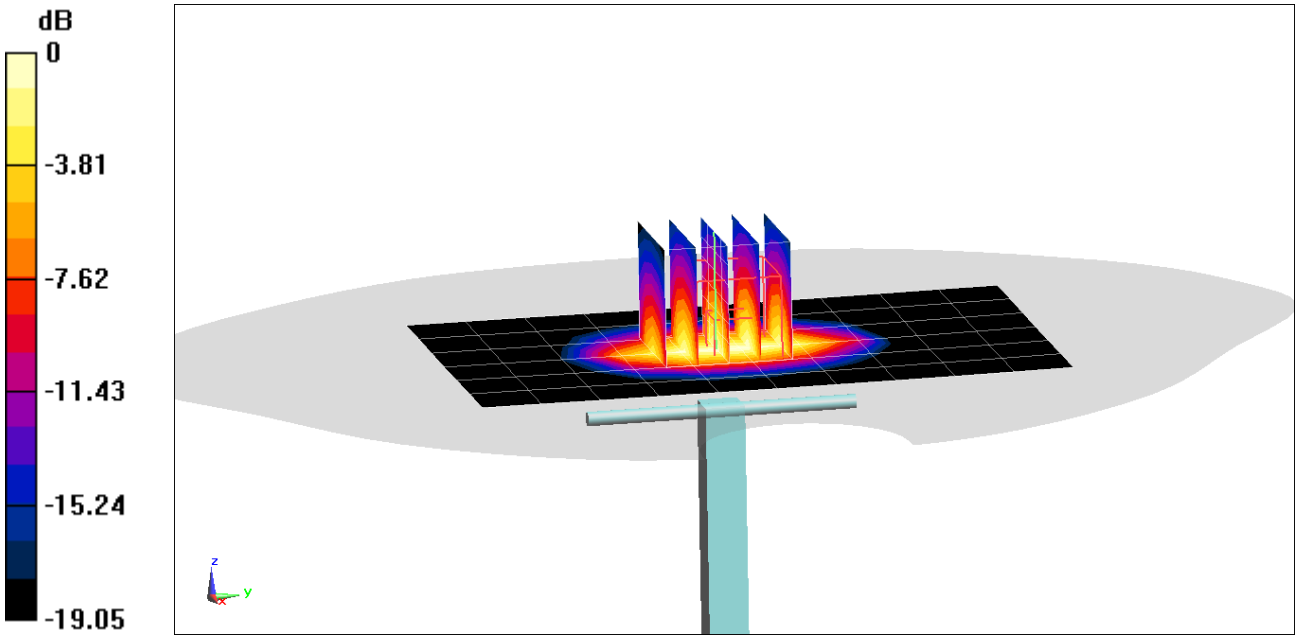
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.568 S/m; ε_r = 51.378; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN7410; ConvF(7.78, 7.78, 7.78) @ 1900 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
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) = 7.70 W/kg
SAR(1 g) = 4.09 W/kg; SAR(10 g) = 2.08 W/kg
Deviation(1 g) = 3.81%; Deviation(10 g) = 0.48%



0 dB = 6.35 W/kg = 8.03 dBW/kg

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

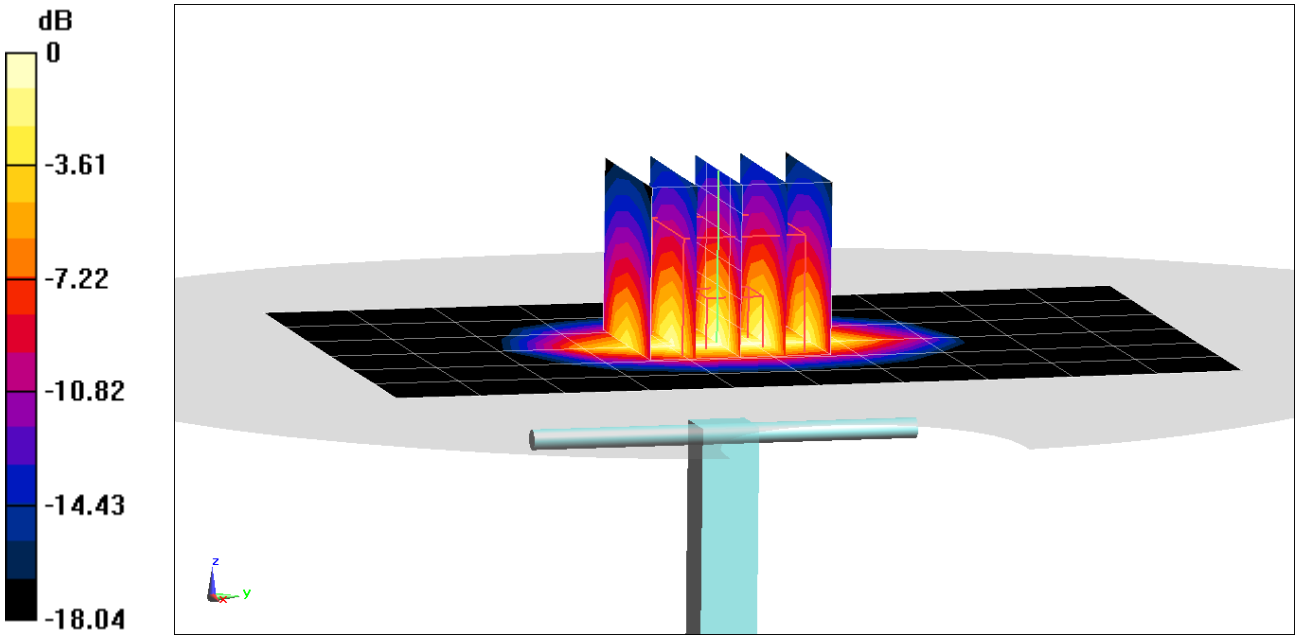
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.572 S/m; ε_r = 52.618; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-17-2019; Ambient Temp: 21.1°C; Tissue Temp: 22.1°C

Probe: EX3DV4 - SN7410; ConvF(7.78, 7.78, 7.78) @ 1900 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: Front 30; Type: QD 000 P40 CD; Serial: 1686
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) = 7.71 W/kg
SAR(1 g) = 4.22 W/kg; SAR(10 g) = 2.18 W/kg
Deviation(1 g) = 7.11%; Deviation(10 g) = 5.31%



0 dB = 6.54 W/kg = 8.16 dBW/kg

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

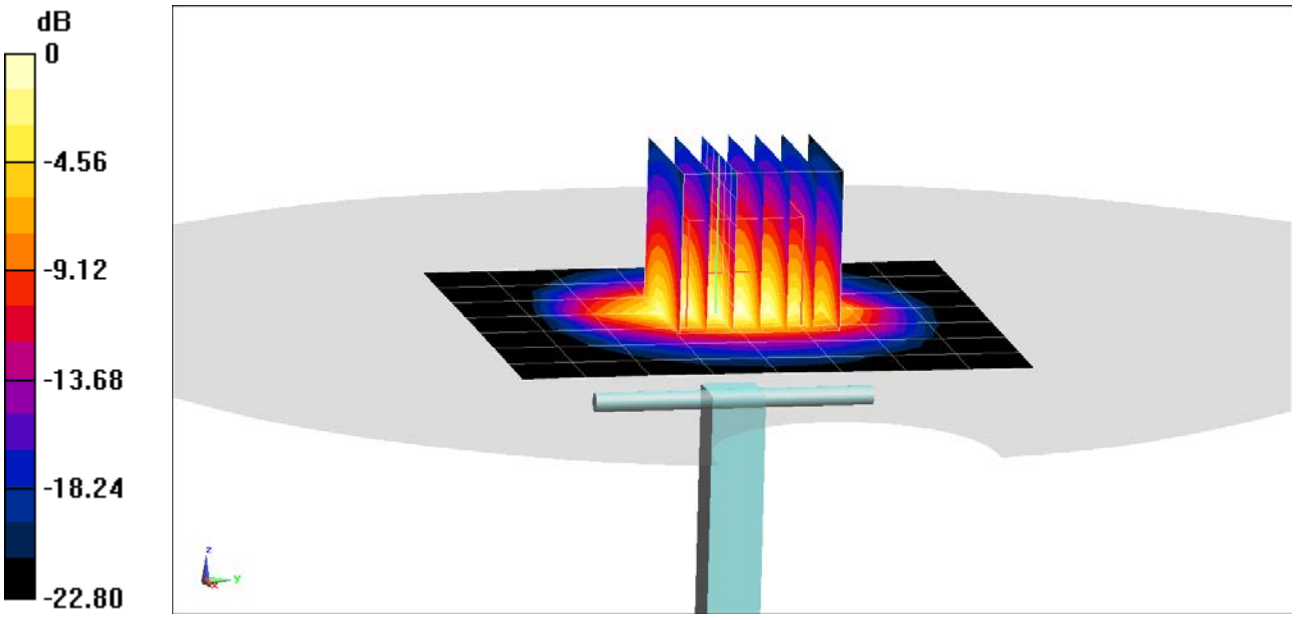
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2450 MHz; σ = 2.046 S/m; ε_r = 50.998; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2450 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
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) = 10.8 W/kg
SAR(1 g) = 5.13 W/kg
Deviation(1 g) = 0.39%



0 dB = 8.48 W/kg = 9.28 dBW/kg

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

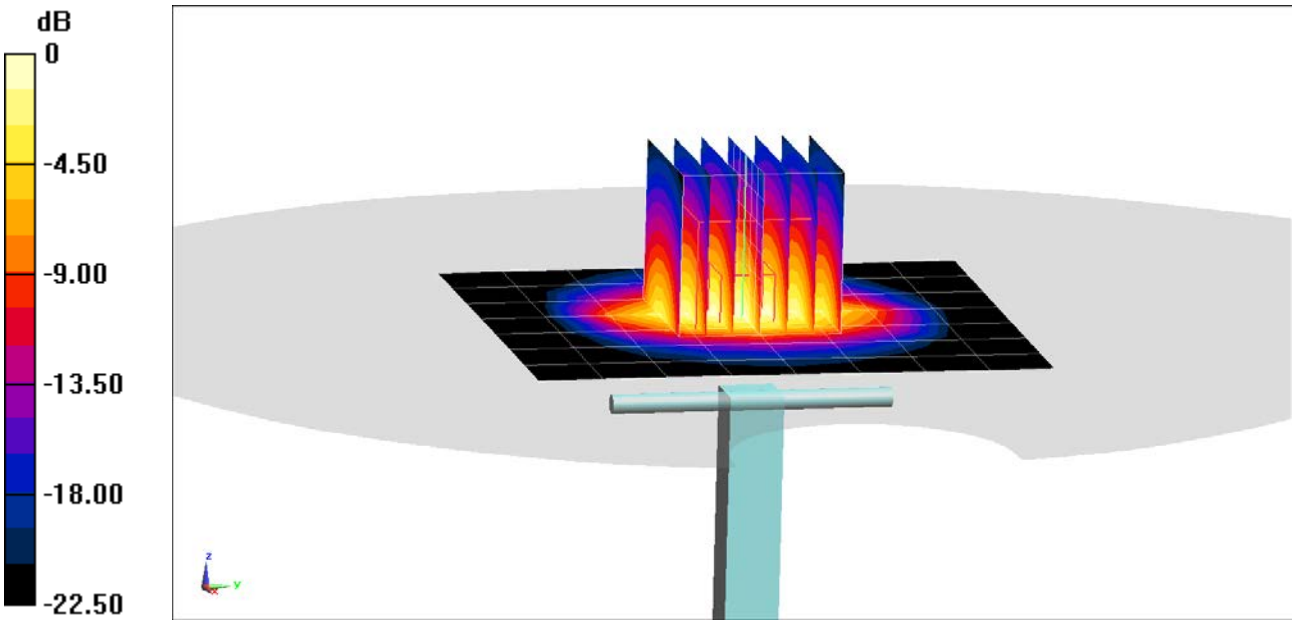
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2450 MHz; σ = 1.964 S/m; ε_r = 50.998; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-18-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2450 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
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) = 10.5 W/kg
SAR(1 g) = 5.02 W/kg; SAR(10 g) = 2.3 W/kg
Deviation(1 g) = -1.76%; Deviation(10 g) = -4.96%



0 dB = 8.39 W/kg = 9.24 dBW/kg

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

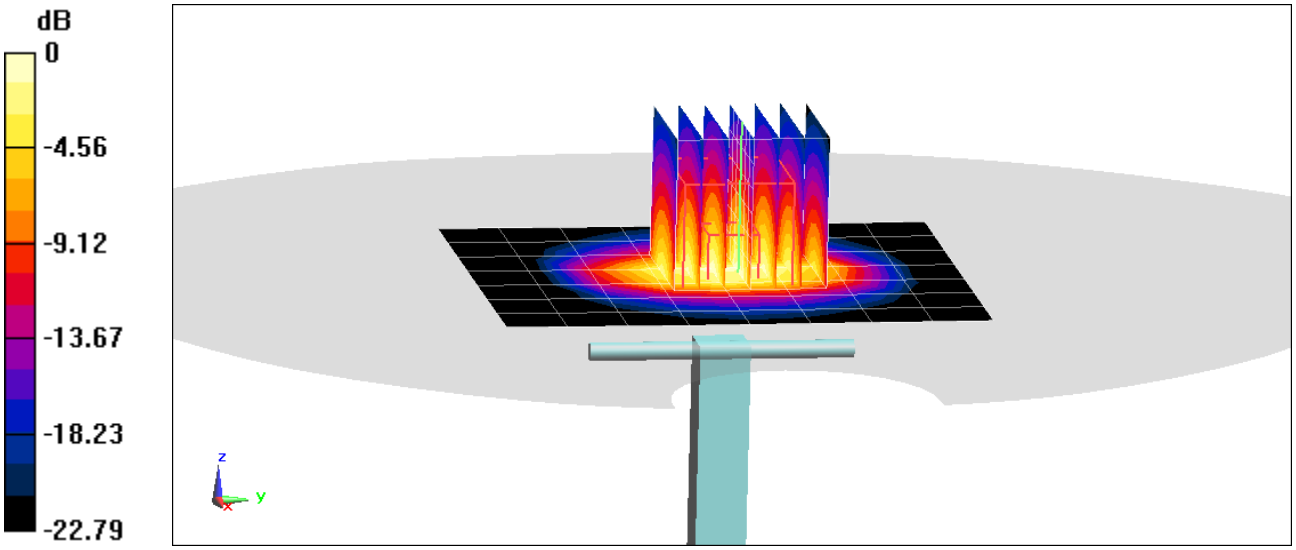
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.028 S/m; ε_r = 52.83; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 05-02-2019; Ambient Temp: 22.6°C; Tissue Temp: 20.8°C

Probe: EX3DV4 - SN7308; ConvF(7.57, 7.57, 7.57) @ 2450 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)

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) = 10.1 W/kg
SAR(10 g) = 2.24 W/kg
Deviation(10 g) = -5.49%



0 dB = 8.10 W/kg = 9.08 dBW/kg

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1071

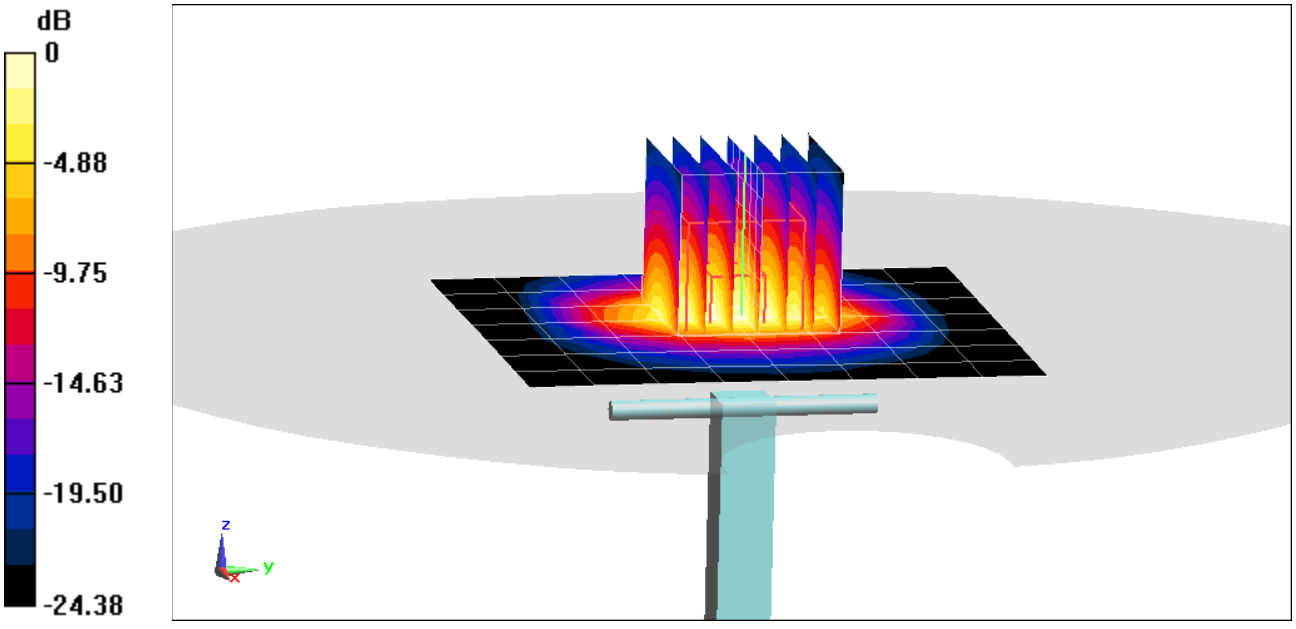
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2600 MHz; σ = 2.224 S/m; ε_r = 50.581; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-15-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2600 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2600 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) = 11.9 W/kg
SAR(1 g) = 5.41 W/kg
Deviation(1 g) = -0.18%



0 dB = 9.36 W/kg = 9.71 dBW/kg

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DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1071

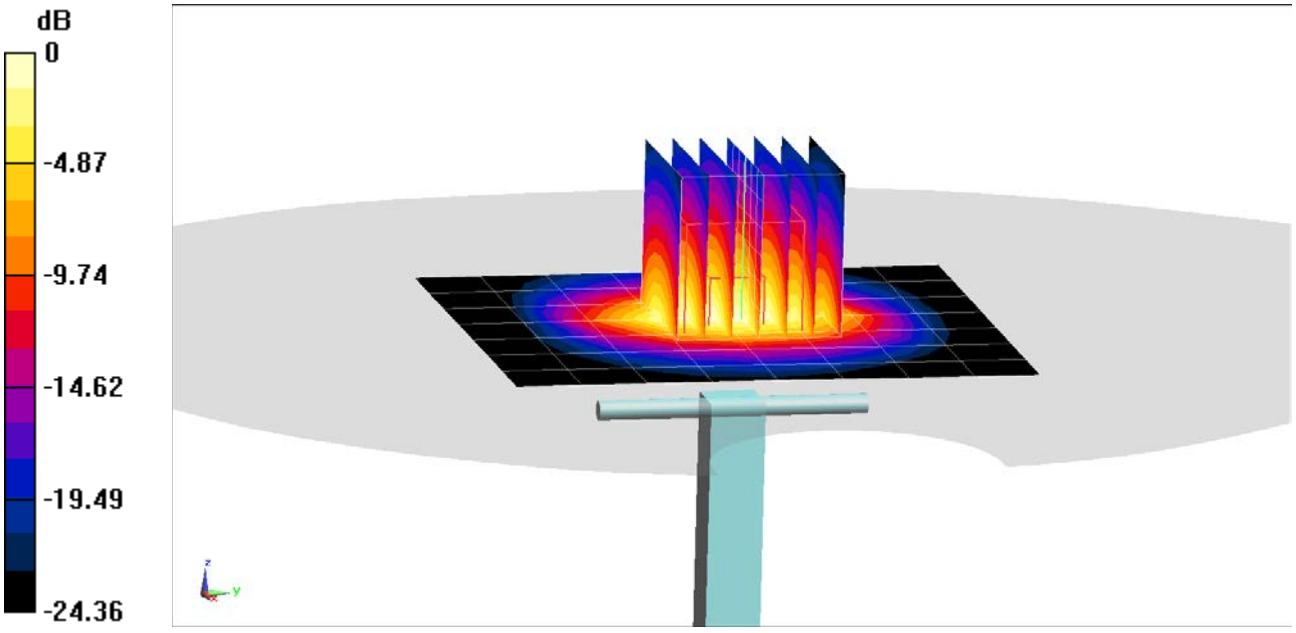
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 2450 Body; Medium parameters used:
f = 2600 MHz; σ = 2.139 S/m; ε_r = 50.573; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-18-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2600 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/13/2019
Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2600 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) = 11.4 W/kg
SAR(10 g) = 2.29 W/kg
Deviation(10 g) = -6.53%



0 dB = 8.88 W/kg = 9.48 dBW/kg

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

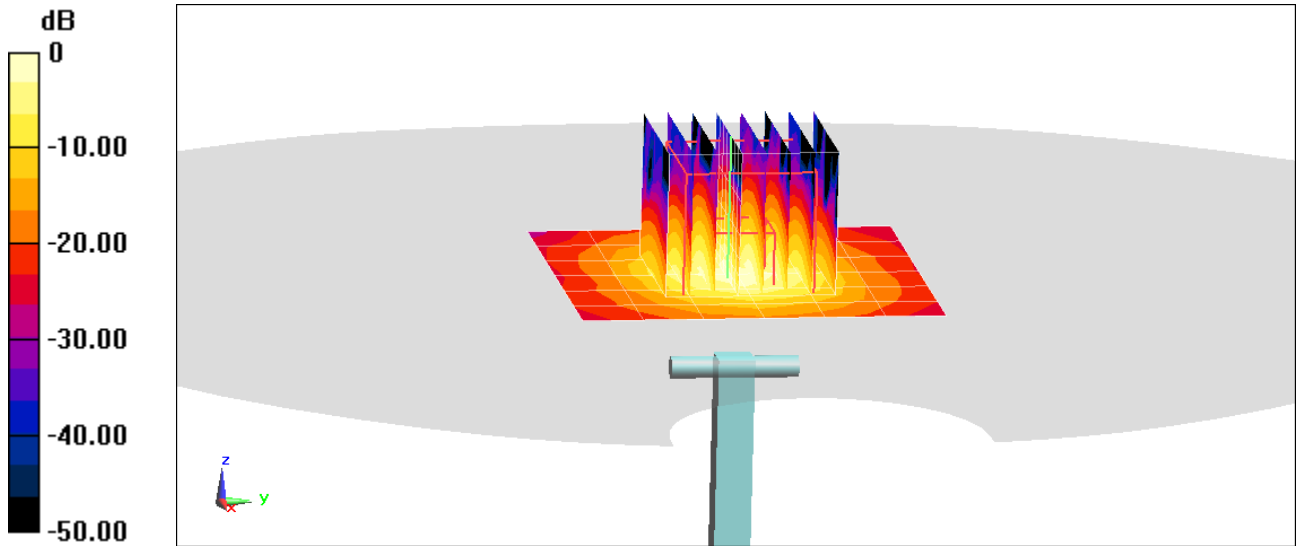
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5250 MHz; σ = 5.38 S/m; ε_r = 47.328; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-14-2019; Ambient Temp: 22.0°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) = 14.5 W/kg
SAR(1 g) = 3.56 W/kg
Deviation(1 g) = -6.19%



0 dB = 8.55 W/kg = 9.32 dBW/kg

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

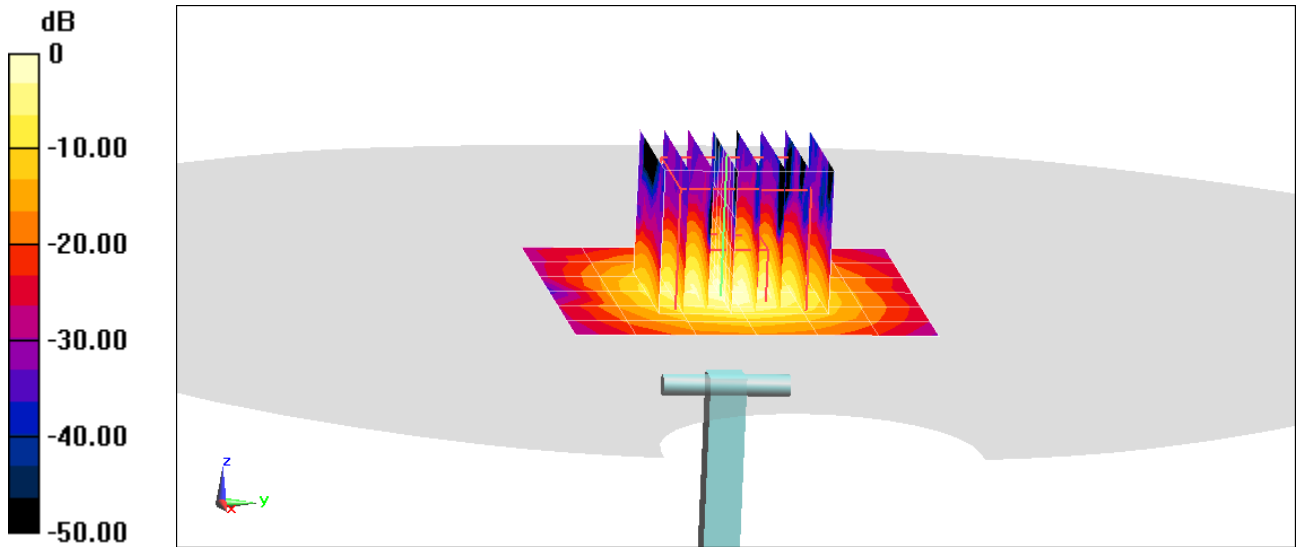
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5750 MHz; σ = 6.103 S/m; ε_r = 46.395; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-14-2019; Ambient Temp: 22.0°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) = 16.6 W/kg
SAR(1 g) = 3.54 W/kg
Deviation(1 g) = -7.69%



0 dB = 8.88 W/kg = 9.48 dBW/kg

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

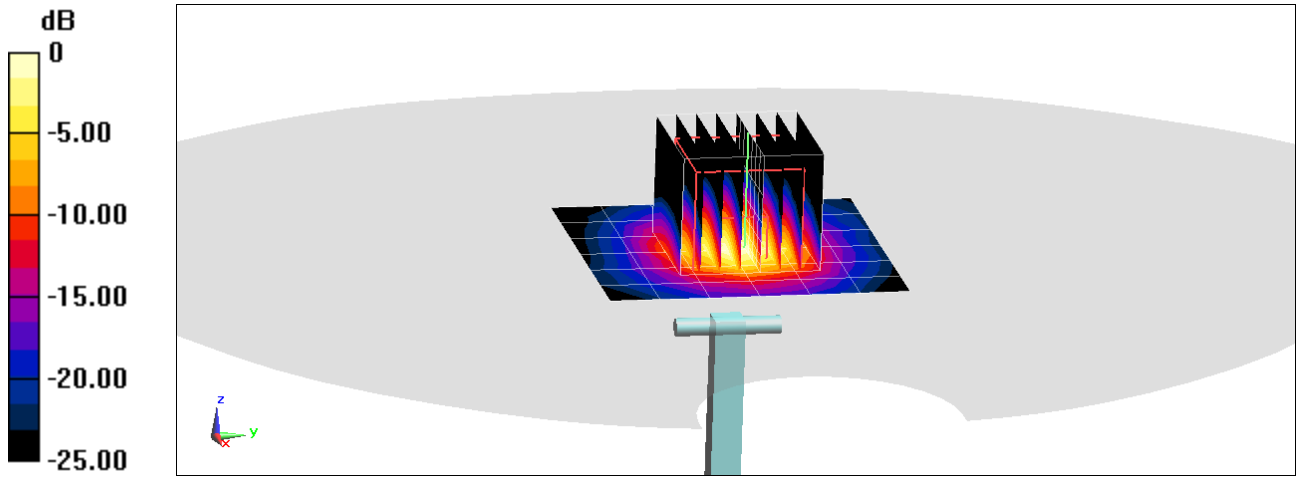
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5250 MHz; σ = 5.475 S/m; ε_r = 47.536; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-30-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.1°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) = 14.7 W/kg
SAR(10 g) = 1.01 W/kg
Deviation(10 g) = -4.27%



0 dB = 8.67 W/kg = 9.38 dBW/kg

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

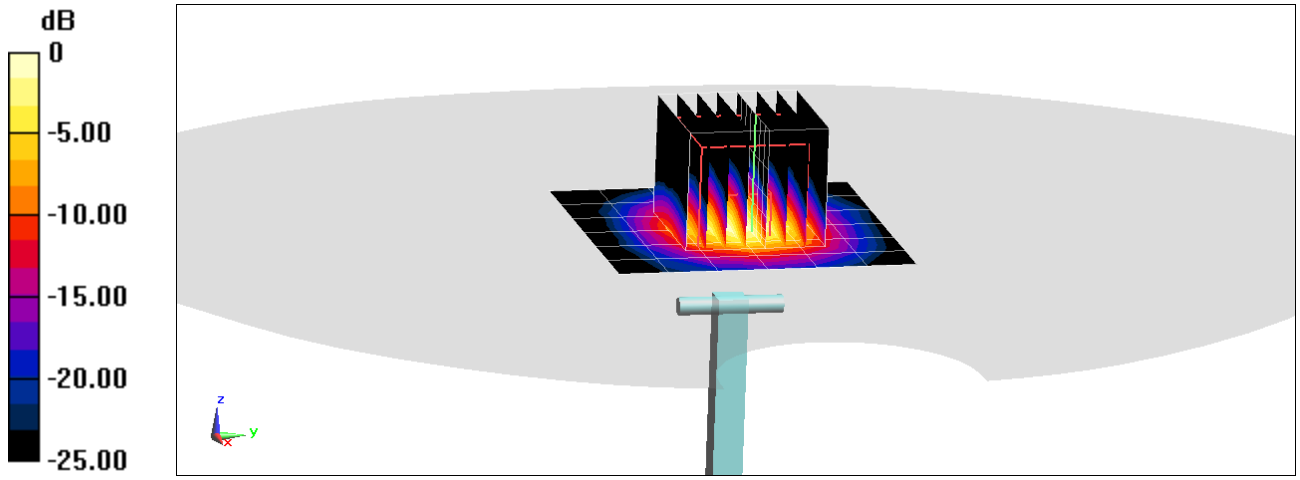
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5750 MHz; σ = 6.212 S/m; ε_r = 46.57; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 04-30-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.1°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) = 15.9 W/kg
SAR(10 g) = 0.990 W/kg
Deviation(10 g) = -6.60%



0 dB = 8.62 W/kg = 9.36 dBW/kg

APPENDIX C: PROBE CALIBRATION

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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**

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. BN ✓
02/06/2019

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

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

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 cm³ (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 cm³ (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 cm³ (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 cm³ (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 cm³ (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 cm³ (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 cm³ (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 cm³ (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 cm³ (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 cm³ (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 cm³ (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 cm³ (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

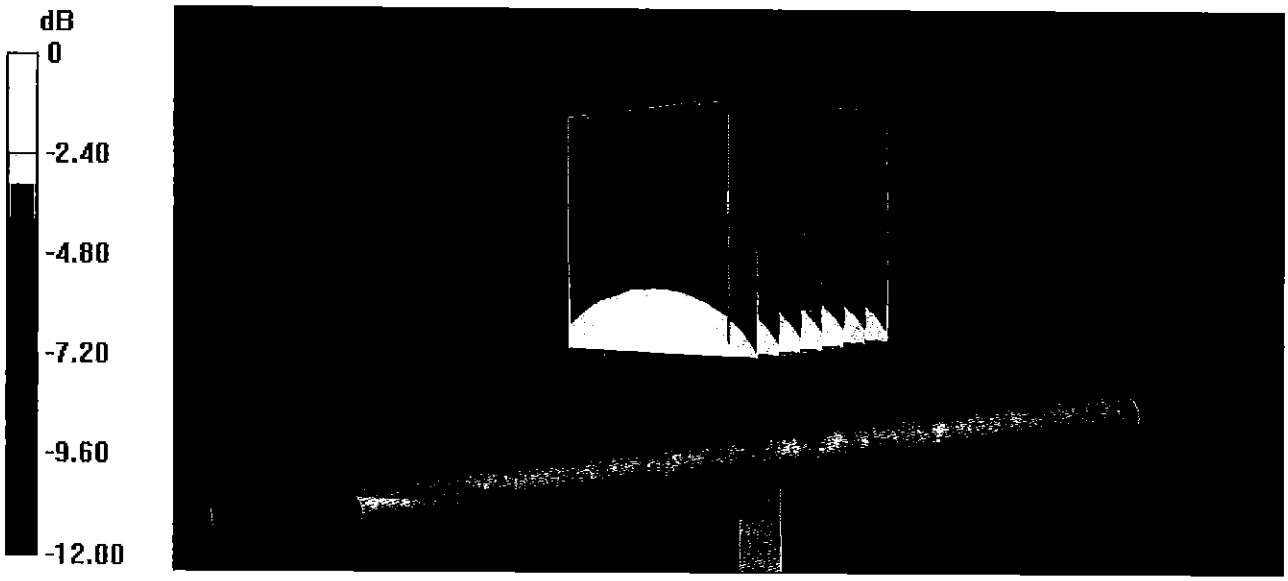
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

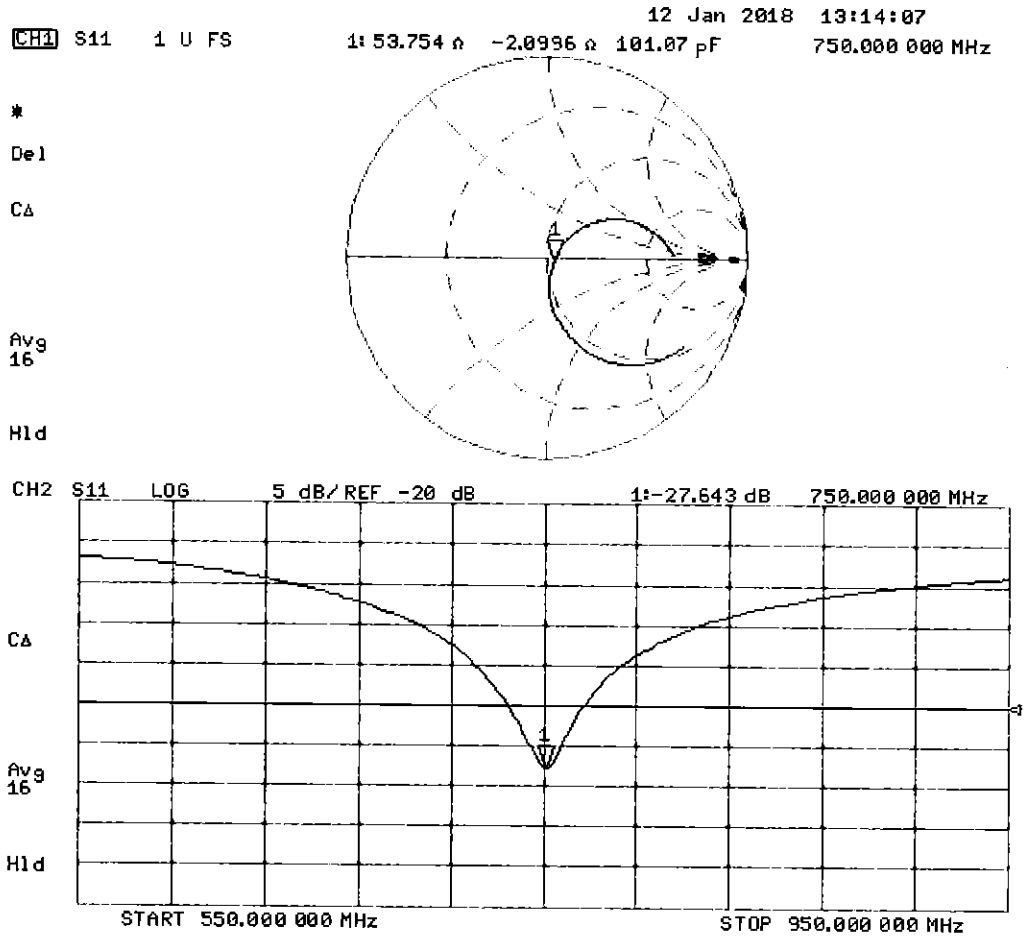
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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



Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

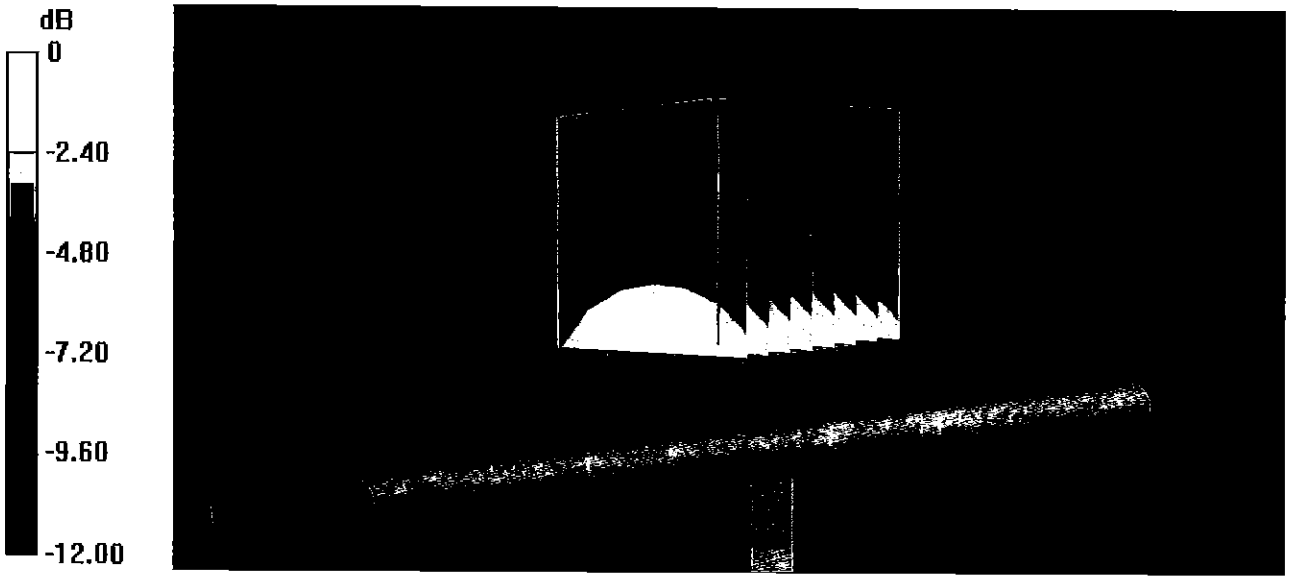
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 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)

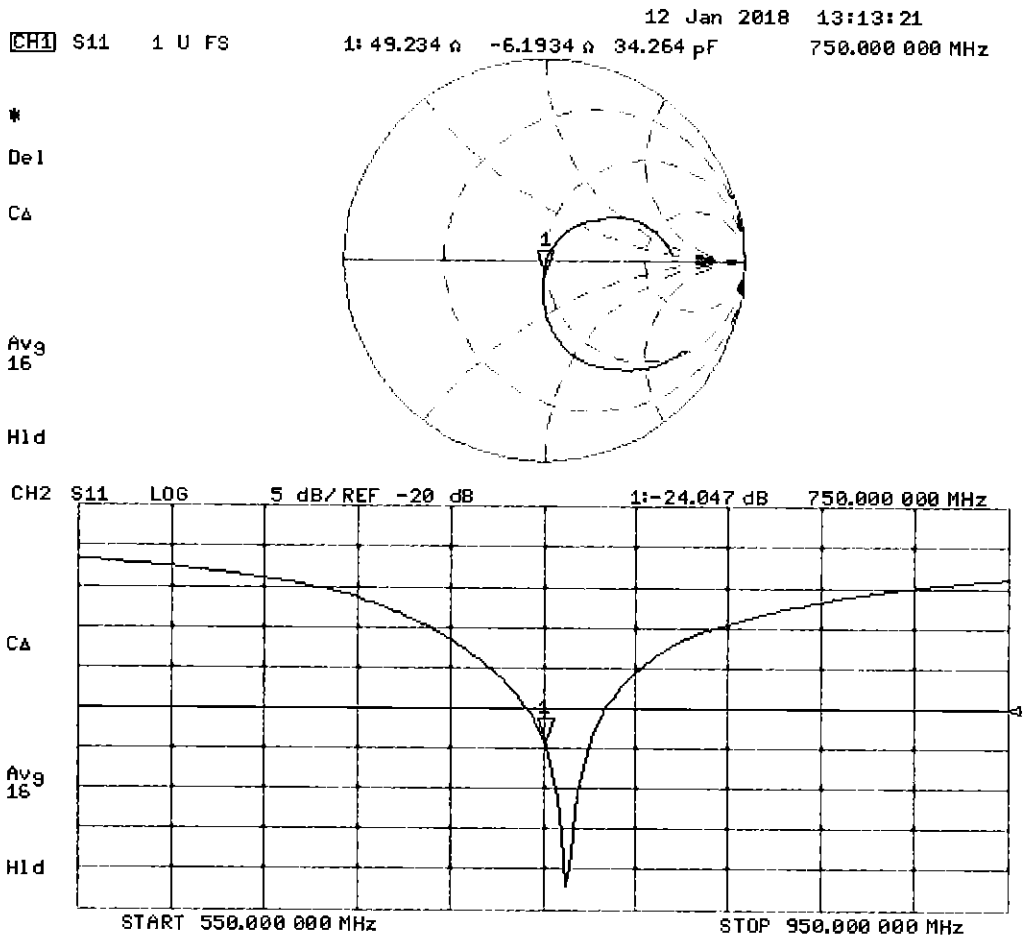
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x8x7)/Cube 0:

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:

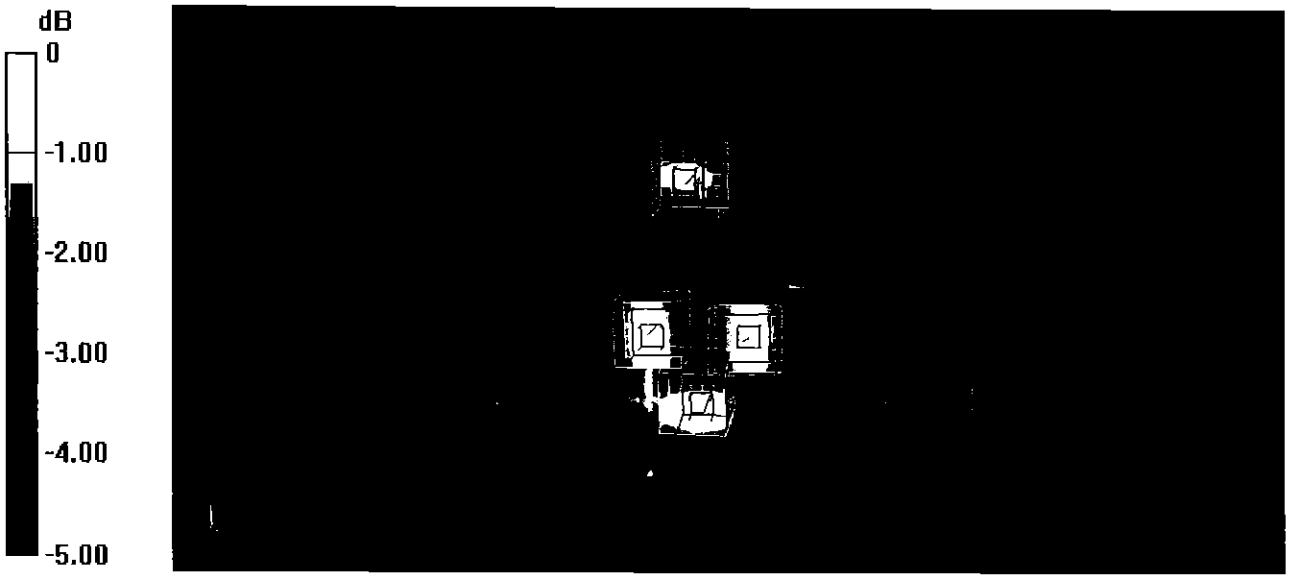
- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

Certification of Calibration

Object	D750V3 – SN: 1003
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extension Calibration date:	1/15/2019
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	2/8/2018	Annual	2/8/2019	US39170122
Agilent	N5182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
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	3/2/2018	Annual	3/2/2019	1339018
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
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
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	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	7/11/2018	Annual	7/11/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/3/2018	Annual	10/3/2019	1558
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/18/2018	Annual	6/18/2019	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/11/2018	Annual	9/11/2019	1091
SPEAG	EX3DV4	SAR Probe	8/23/2018	Annual	8/23/2019	7308
SPEAG	EX3DV4	SAR Probe	6/25/2018	Annual	6/25/2019	7409

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halbfoster	Test Engineer	BRODIE HALBFOSTER
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	

DIPOLE CALIBRATION EXTENSION

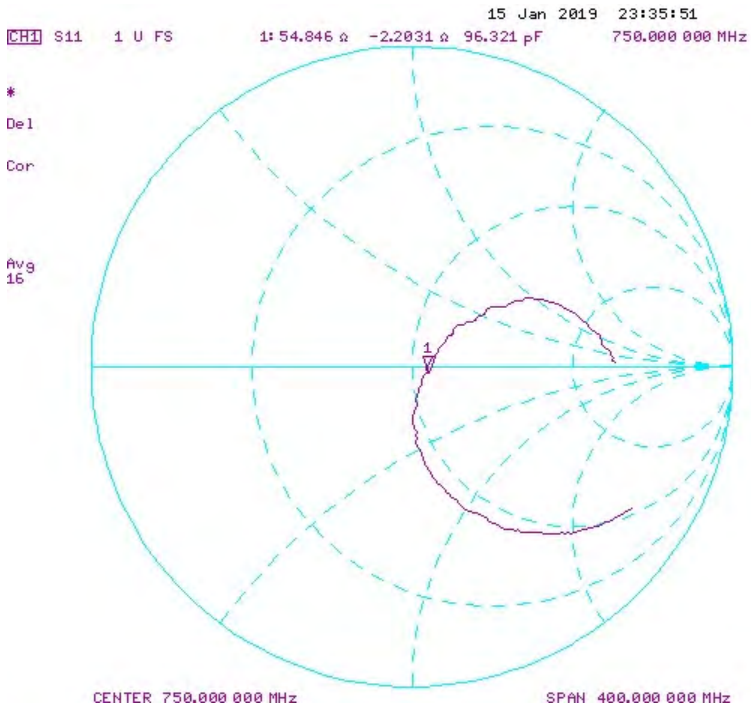
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

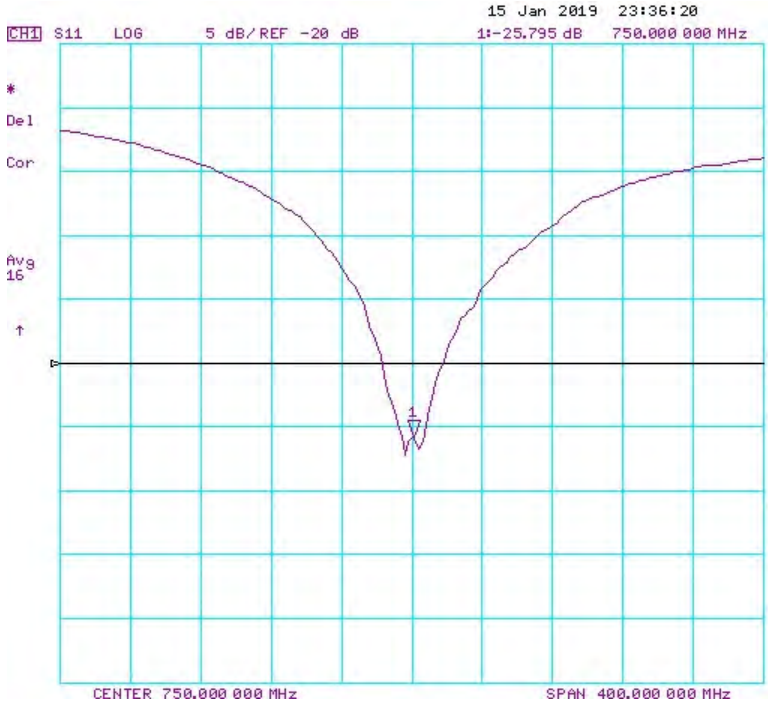
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does 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:

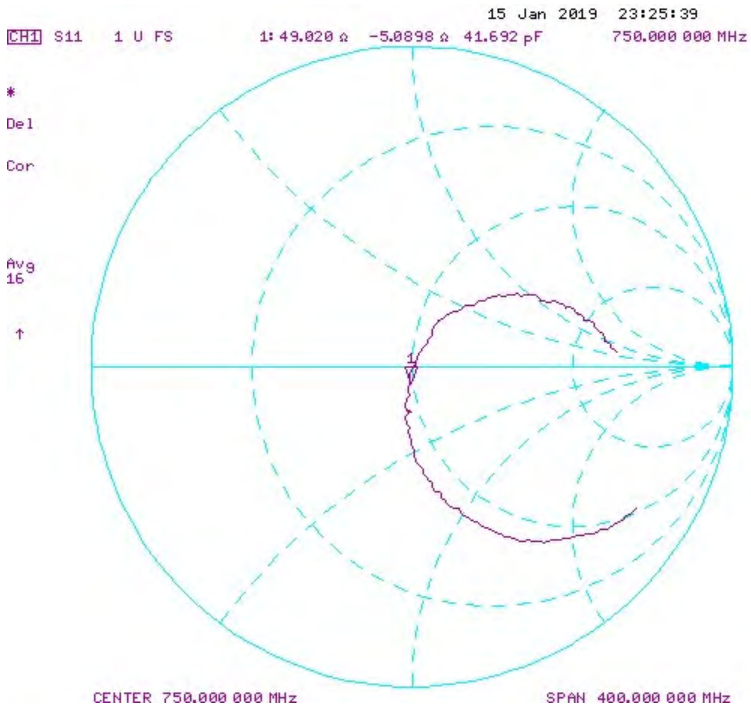
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance 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
1/15/2018	1/15/2019	1.043	1.656	1.75	5.68%	1.08	1.15	6.09%	53.8	54.8	1	-2.1	-2.2	0.1	-27.6	-25.8	6.50%	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
1/15/2018	1/15/2019	1.043	1.716	1.84	7.23%	1.14	1.23	7.71%	49.2	49	0.2	-6.2	-5.1	1.1	-24	-25.6	-6.80%	PASS

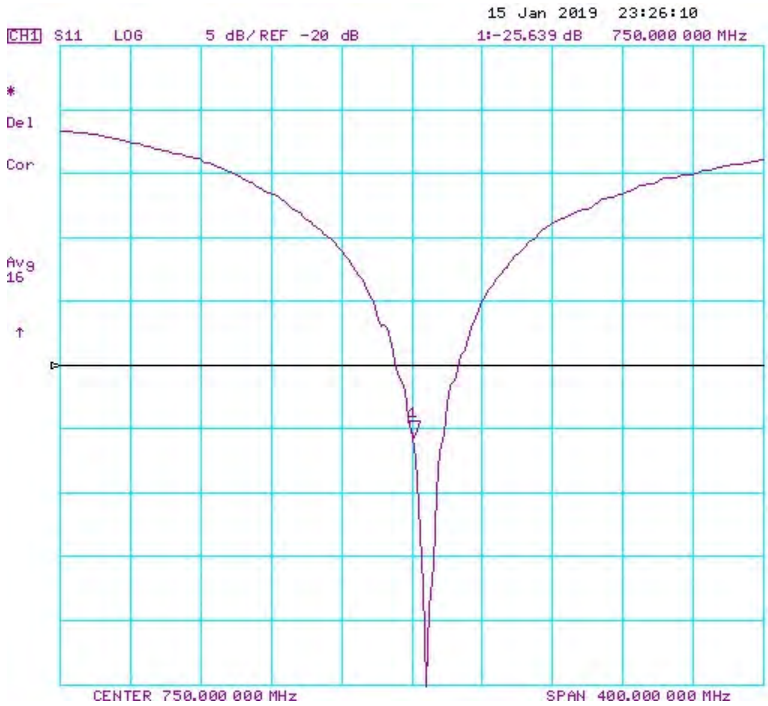
Impedance & Return-Loss Measurement Plot for Head TSL





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
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

Client **PC Test** **Certificate No: D835V2-4d132_Jan19**

CALIBRATION CERTIFICATE

Object D835V2 - SN:4d132

Calibration procedure(s) QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

BN ✓ 02/06/2019

Calibration date: January 22, 2019

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	31-Dec-18 (No. EX3-7349_Dec18)	Dec-19
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:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 22, 2019

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

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 = 5.0 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	41.3 ± 6 %	0.92 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	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.59 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (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	**6.23 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	54.6 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (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	**9.67 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (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	**6.35 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	49.6 Ω - 3.6 jΩ
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 6.2 jΩ
Return Loss	- 23.2 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

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 cm³ (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	**9.38 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.26 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm³ (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	**9.86 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.65 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.58 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Neck)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.42 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.38 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Ear)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.06 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.42 W/kg ± 16.9 % (k=2)**

DASY5 Validation Report for Head TSL

Date: 17.01.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

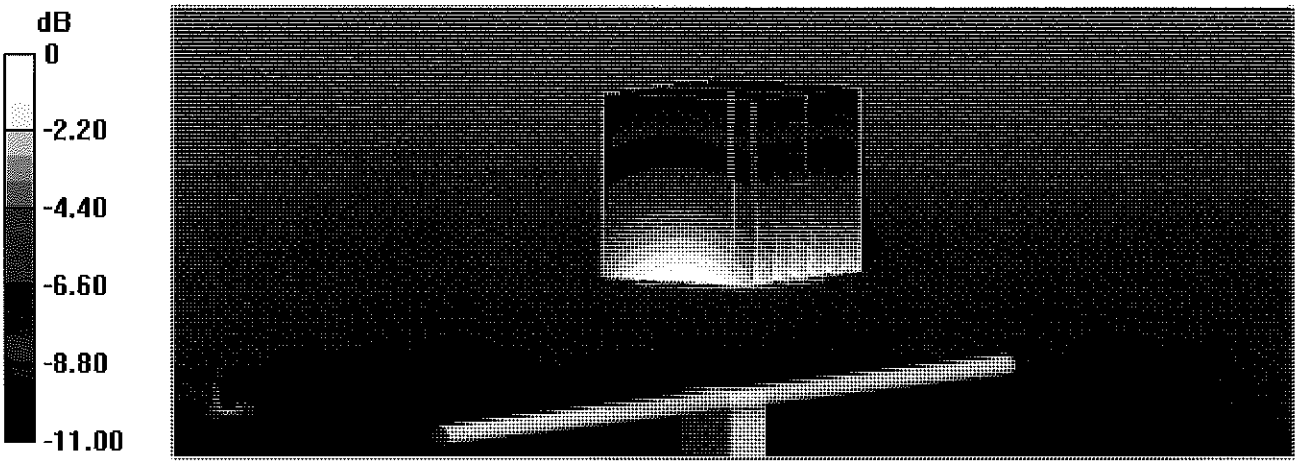
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; ε_r = 41.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10, 10, 10) @ 835 MHz; Calibrated: 31.12.2018
- 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)

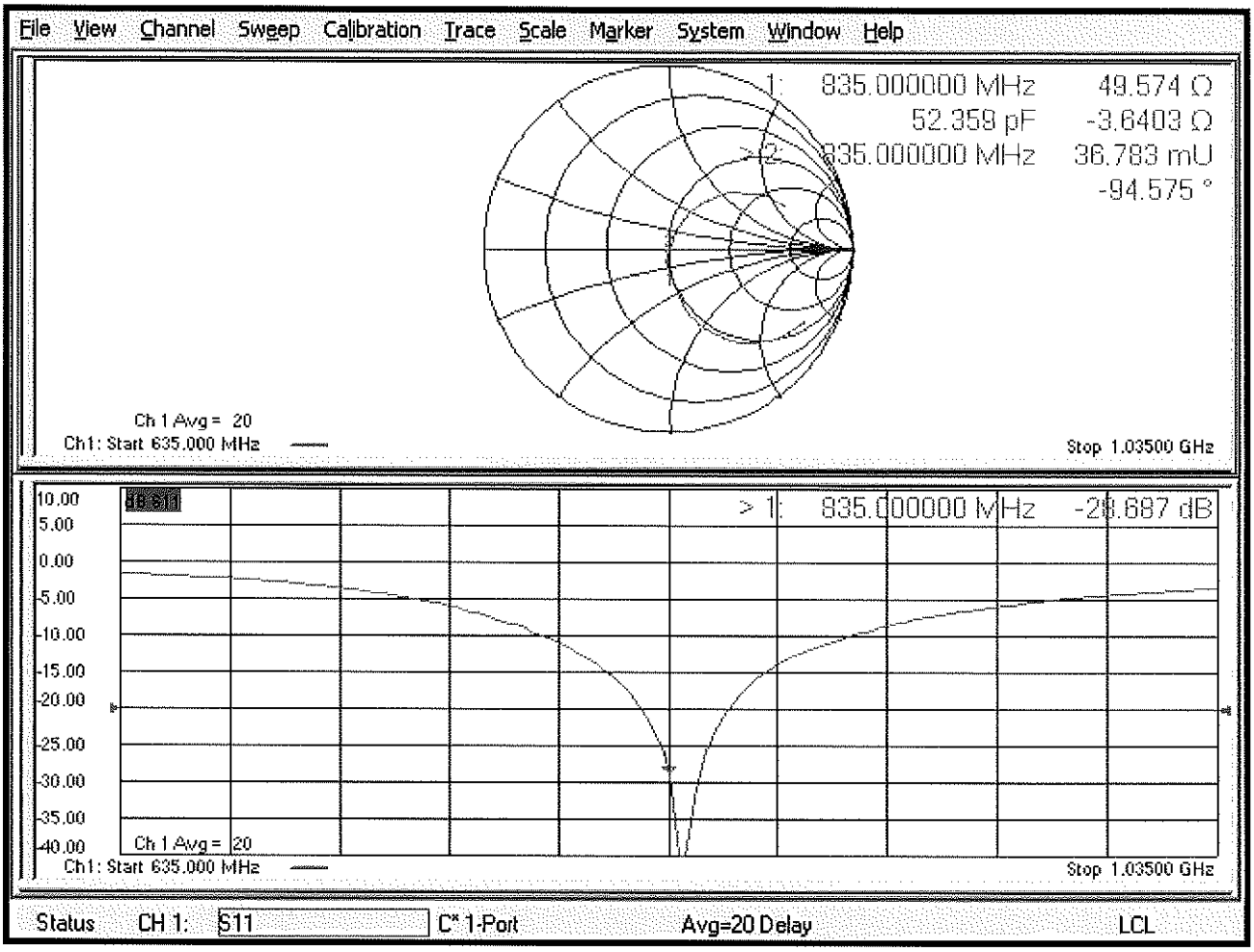
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 34.24 V/m; Power Drift = -0.00 dB
Peak SAR (extrapolated) = 3.73 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.58 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 Head TSL



DASY5 Validation Report for Body TSL

Date: 17.01.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

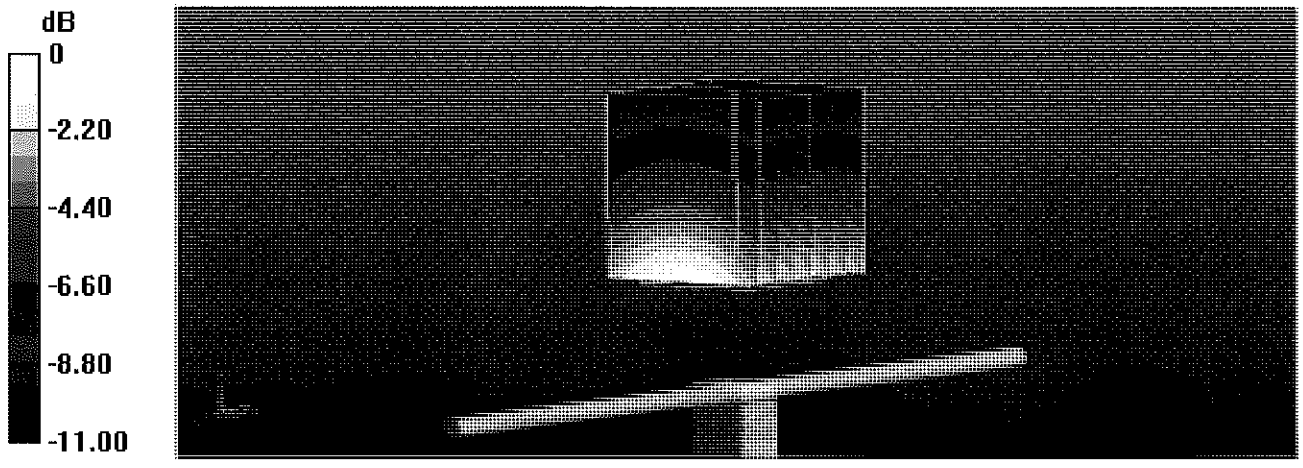
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 54.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.15, 10.15, 10.15) @ 835 MHz; Calibrated: 31.12.2018
- 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)

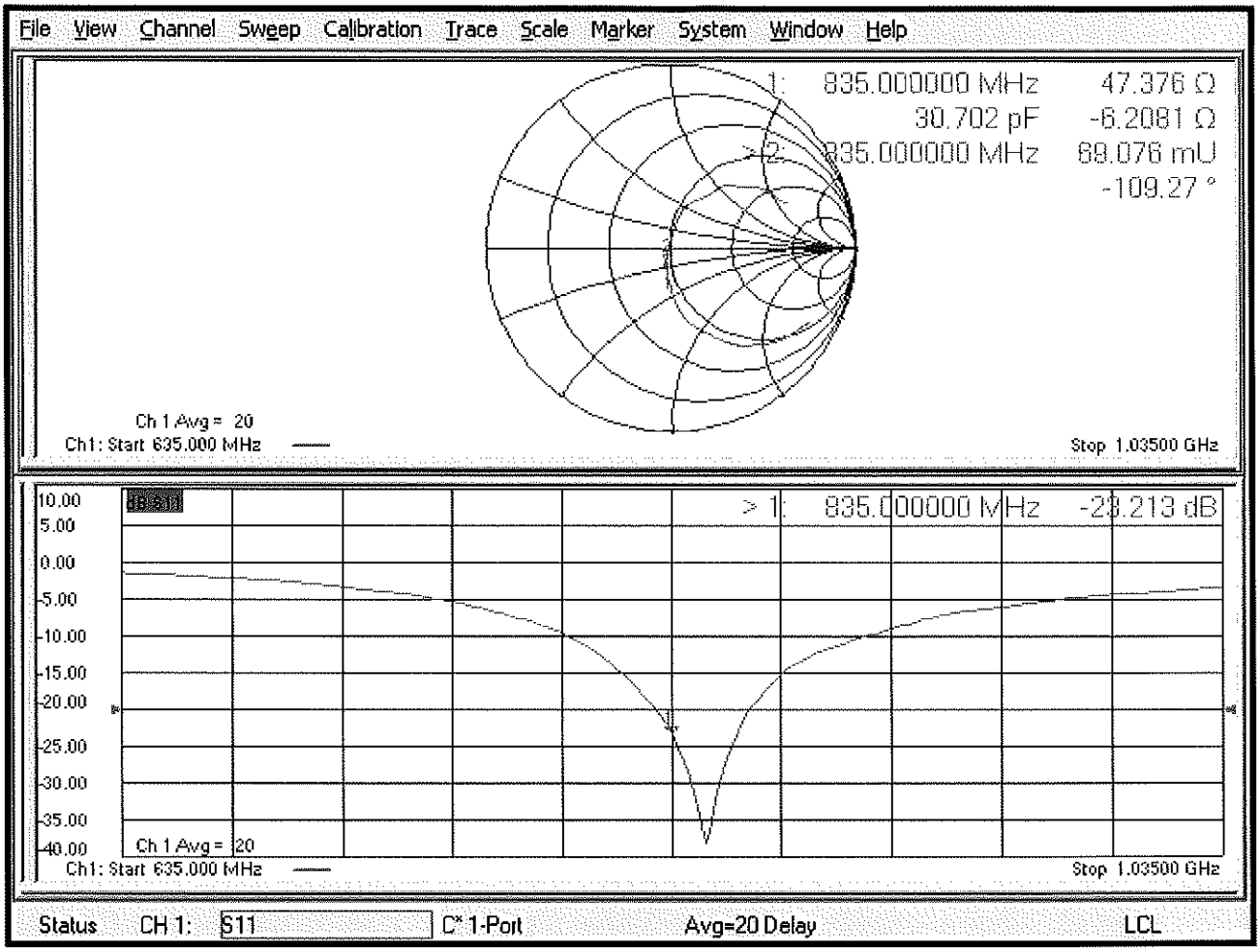
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.32 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.61 W/kg
Maximum value of SAR (measured) = 3.26 W/kg



0 dB = 3.26 W/kg = 5.13 dBW/kg

Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 22.01.2019

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 = 44.4; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

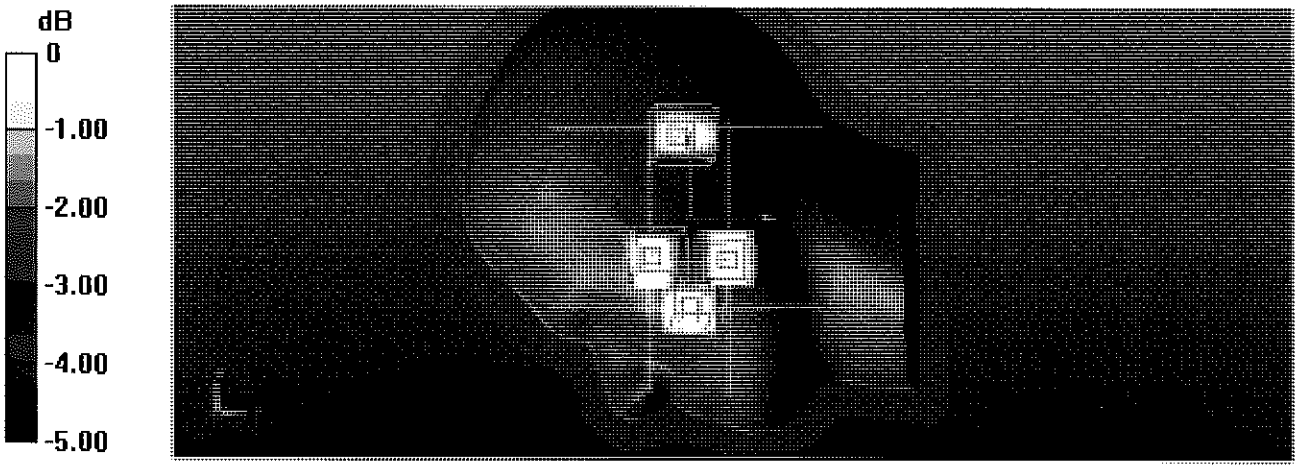
- Probe: EX3DV4 - SN7349; ConvF(10, 10, 10) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: SAM Head
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

SAM/Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.32 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.51 W/kg
SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.57 W/kg
Maximum value of SAR (measured) = 3.12 W/kg

SAM/Head/Mouth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.25 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.67 W/kg
SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.65 W/kg
Maximum value of SAR (measured) = 3.24 W/kg

SAM/Head/Neck/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.69 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 3.43 W/kg
SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.08 W/kg

SAM/Head/Ear/Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 55.79 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 2.94 W/kg
SAR(1 g) = 2.02 W/kg; SAR(10 g) = 1.36 W/kg
Maximum value of SAR (measured) = 2.62 W/kg



0 dB = 2.62 W/kg = 4.18 dBW/kg

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

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

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D1765V2-1008_May18

CALIBRATION CERTIFICATE

Object: D1765V2 - SN:1008

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

BN ✓ 7/16/2018

Calibration date: May 23, 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	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:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 23, 2018

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

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Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
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	V52.10.1
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	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 %	1.34 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	8.94 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.71 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.0 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	53.2 ± 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	9.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.92 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.9 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	47.7 Ω - 6.5 jΩ
Return Loss	- 23.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.3 Ω - 6.0 jΩ
Return Loss	- 20.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.210 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 06, 2005

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 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**37.4 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.95 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.9 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**38.2 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.4 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Neck)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**37.4 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.2 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Ear)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	7.12 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**28.7 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**16.1 W/kg ± 16.9 % (k=2)**

DASY5 Validation Report for Head TSL

Date: 15.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN:1008

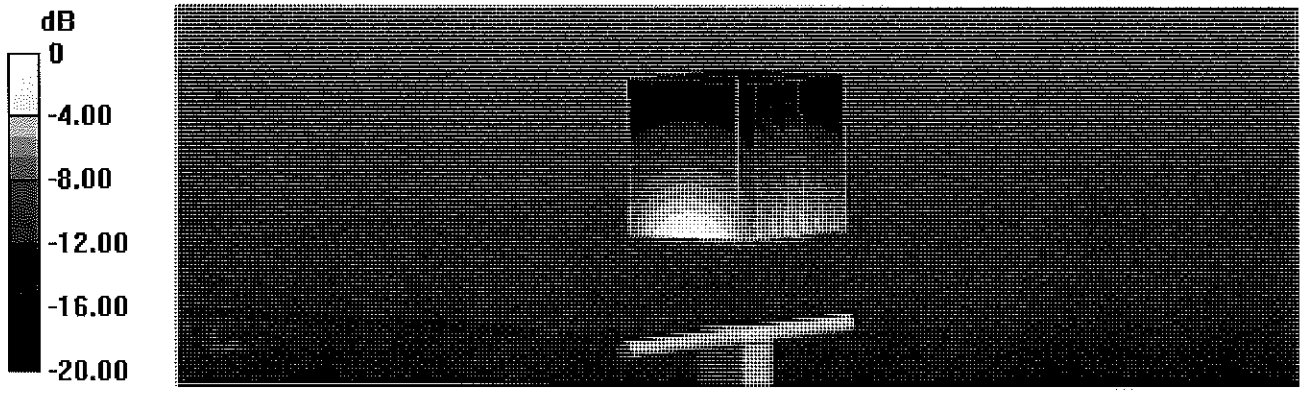
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.34 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

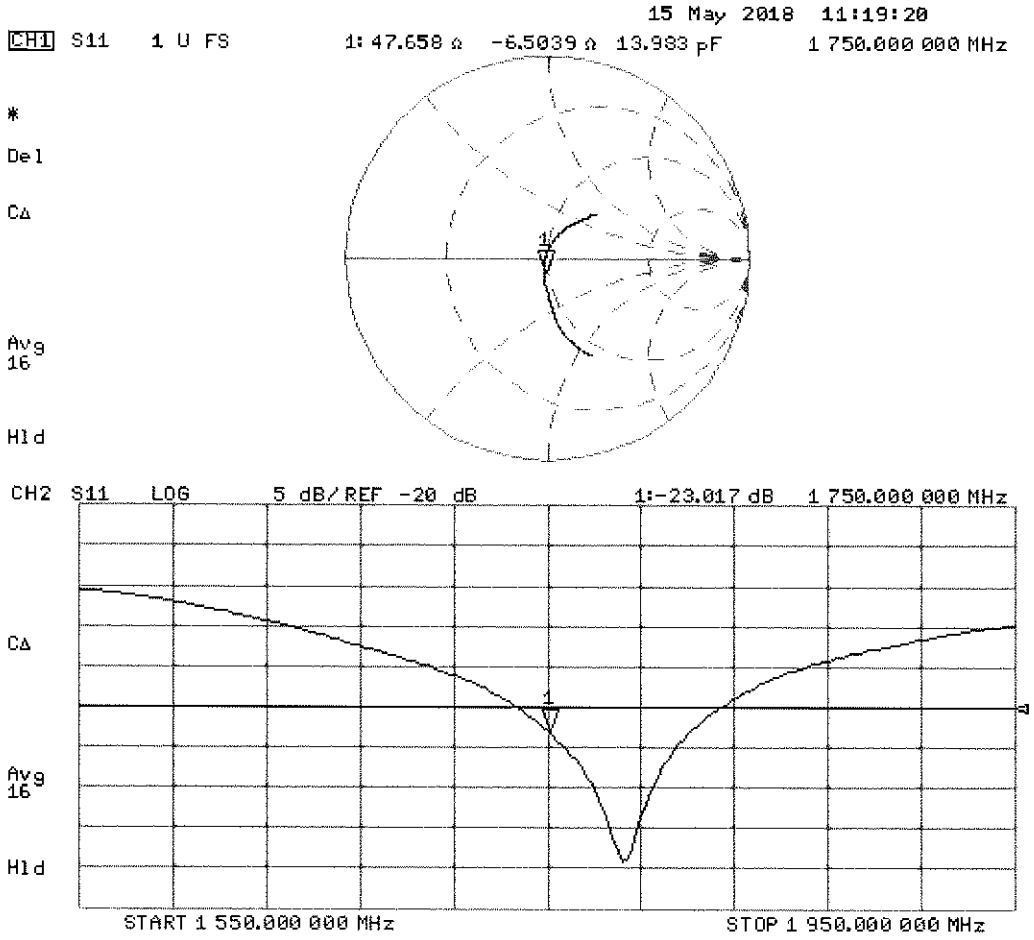
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.6 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 16.4 W/kg
SAR(1 g) = 8.94 W/kg; SAR(10 g) = 4.71 W/kg
Maximum value of SAR (measured) = 13.8 W/kg



0 dB = 13.8 W/kg = 11.40 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 15.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN:1008

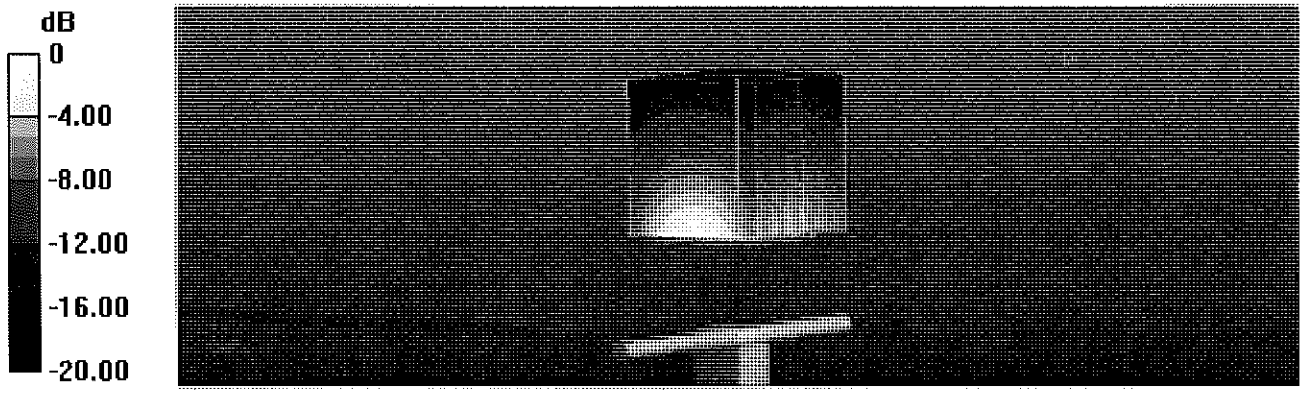
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.46 S/m; ε_r = 53.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.35, 8.35, 8.35) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

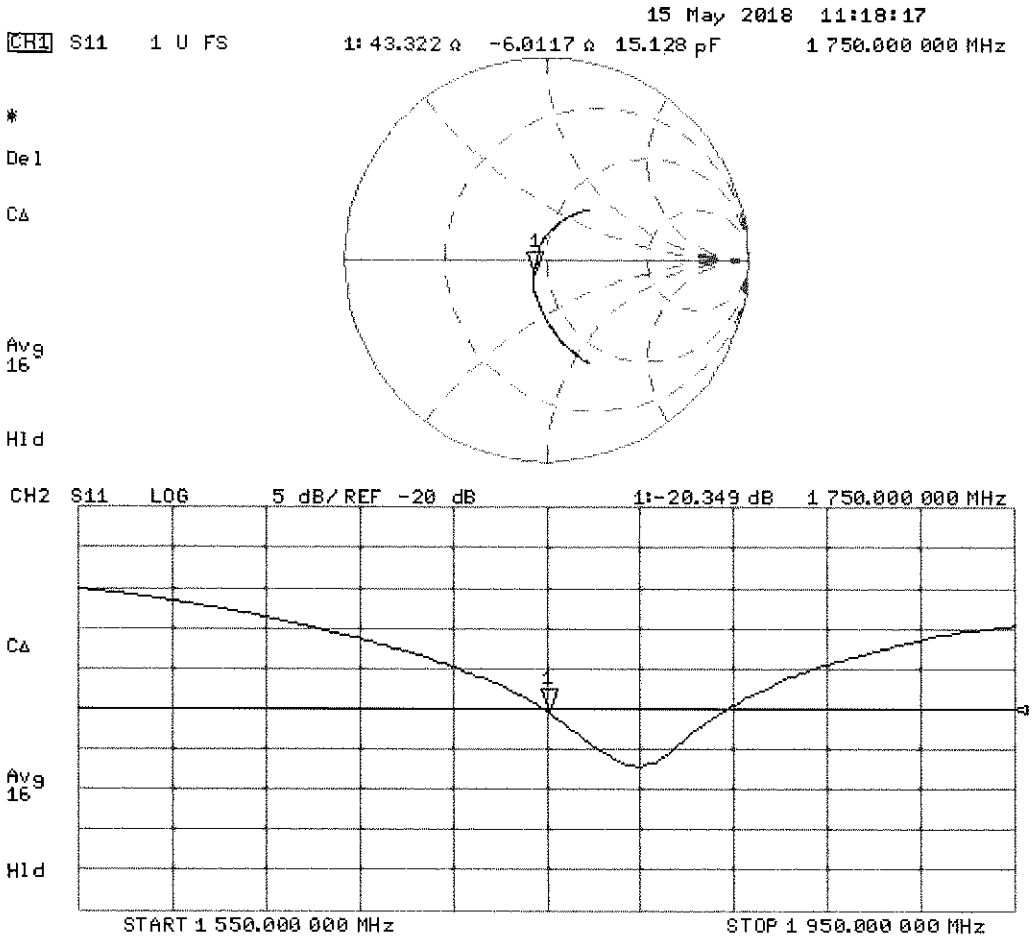
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.4 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 16.1 W/kg
SAR(1 g) = 9.21 W/kg; SAR(10 g) = 4.92 W/kg
Maximum value of SAR (measured) = 13.7 W/kg



0 dB = 13.7 W/kg = 11.37 dBW/kg

Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 23.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1765 MHz; Type: D1765V2; Serial: D1765V2 - SN:1008

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.37 S/m; ε_r = 41.8; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

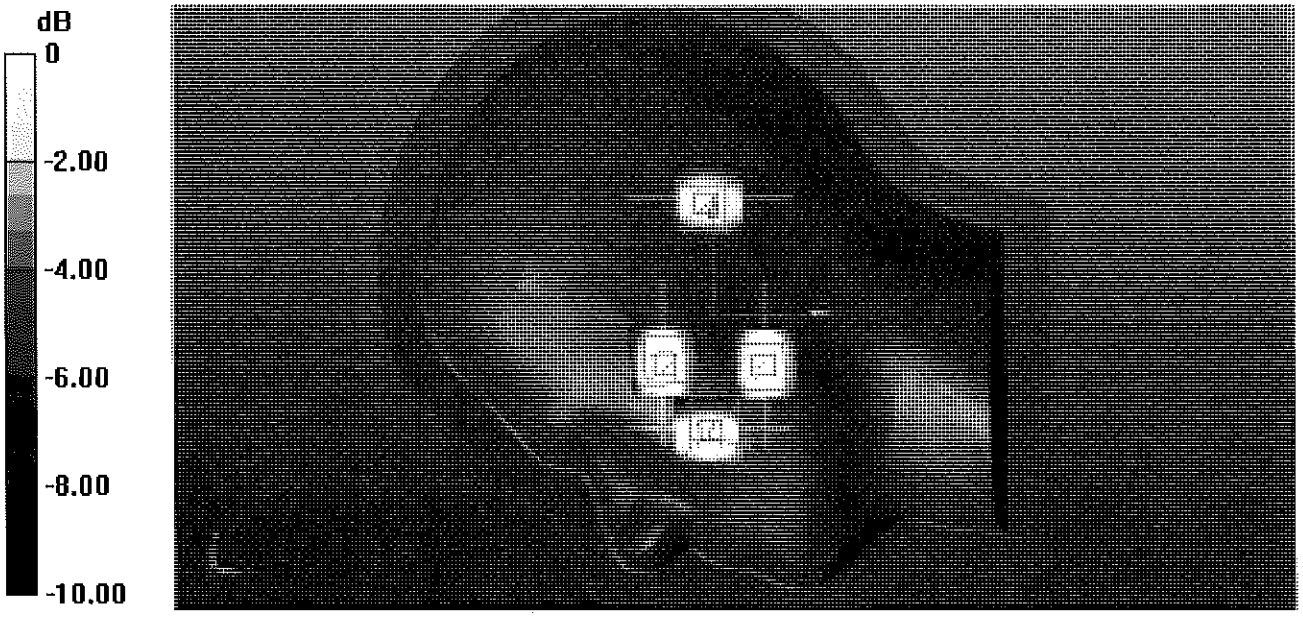
- Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

SAM/Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.8 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 16.4 W/kg
SAR(1 g) = 9.26 W/kg; SAR(10 g) = 4.95 W/kg
Maximum value of SAR (measured) = 13.9 W/kg

SAM/Head/Mouth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.2 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 16.6 W/kg
SAR(1 g) = 9.47 W/kg; SAR(10 g) = 5.06 W/kg
Maximum value of SAR (measured) = 13.7 W/kg

SAM/Head/Neck/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.7 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 9.26 W/kg; SAR(10 g) = 5.02 W/kg
Maximum value of SAR (measured) = 13.8 W/kg

SAM/Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 90.46 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 11.8 W/kg
SAR(1 g) = 7.12 W/kg; SAR(10 g) = 4.01 W/kg
Maximum value of SAR (measured) = 10.3 W/kg



0 dB = 10.3 W/kg = 10.13 dBW/kg

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Accreditation No.: SCS 0108

Client PC Test

Certificate No: D1900V2-5d080_Oct18

CALIBRATION CERTIFICATE

Object: D1900V2 - SN:5d080

Calibration procedure(s): QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: October 23, 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:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 23, 2018

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

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	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.3 ± 6 %	1.40 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	9.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.7 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 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	9.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 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	52.5 Ω + 7.9 jΩ
Return Loss	- 21.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.1 Ω + 8.1 jΩ
Return Loss	- 21.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.193 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 28, 2006

DASY5 Validation Report for Head TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

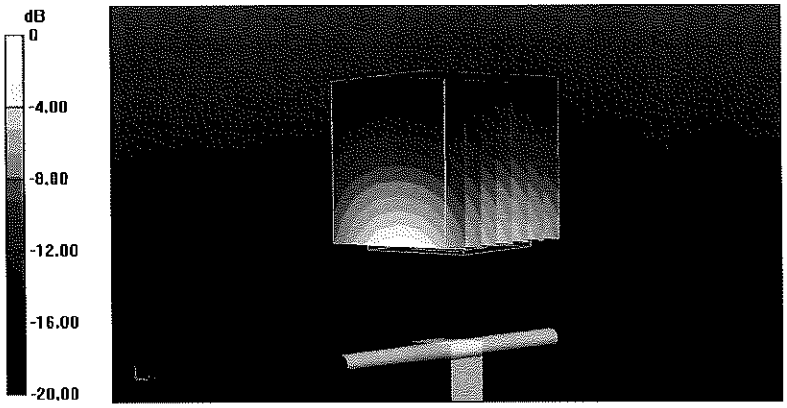
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.4 S/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 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)

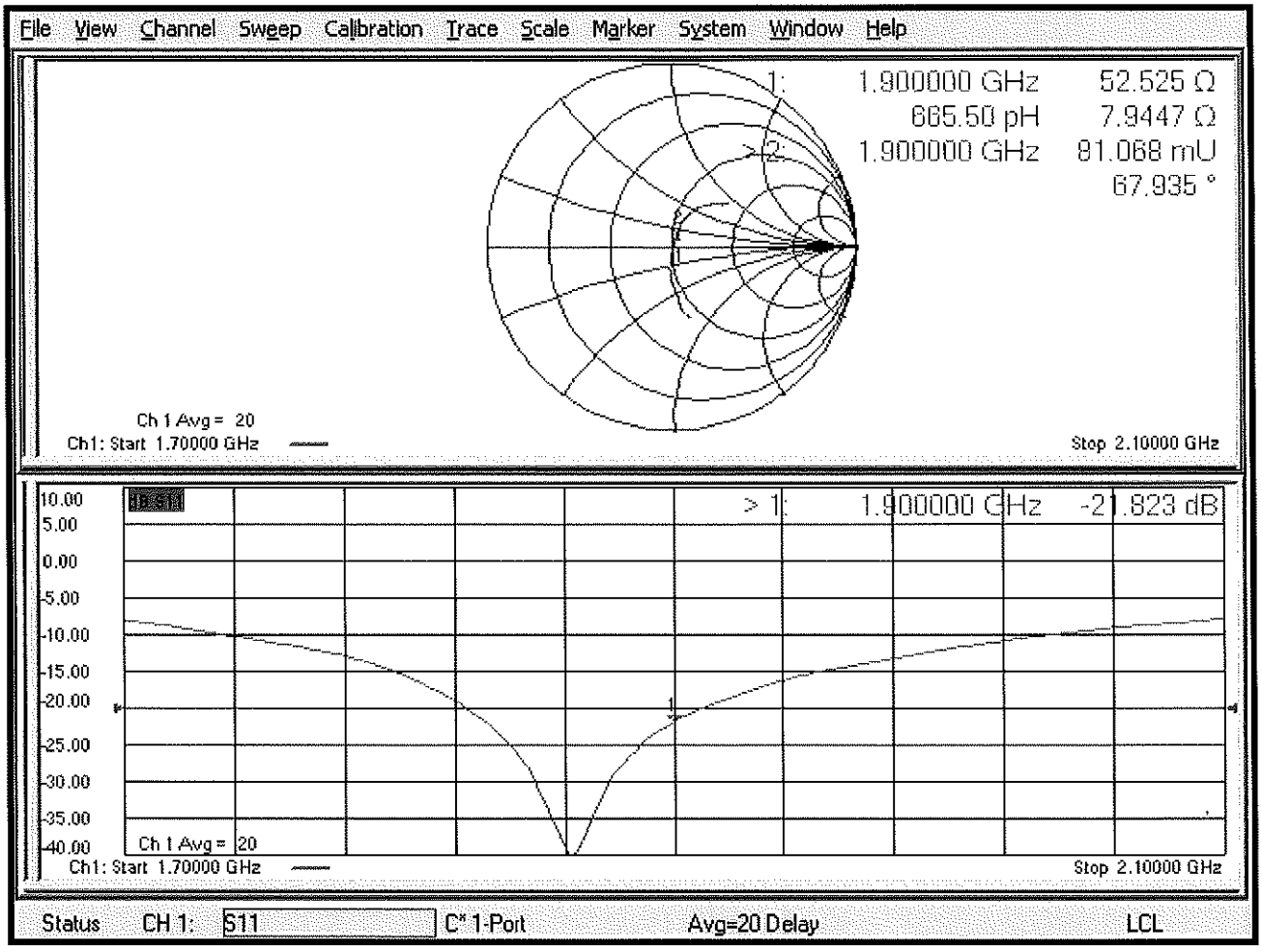
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 110.0 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 18.7 W/kg
SAR(1 g) = 9.93 W/kg; SAR(10 g) = 5.18 W/kg
Maximum value of SAR (measured) = 15.6 W/kg



0 dB = 15.6 W/kg = 11.93 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

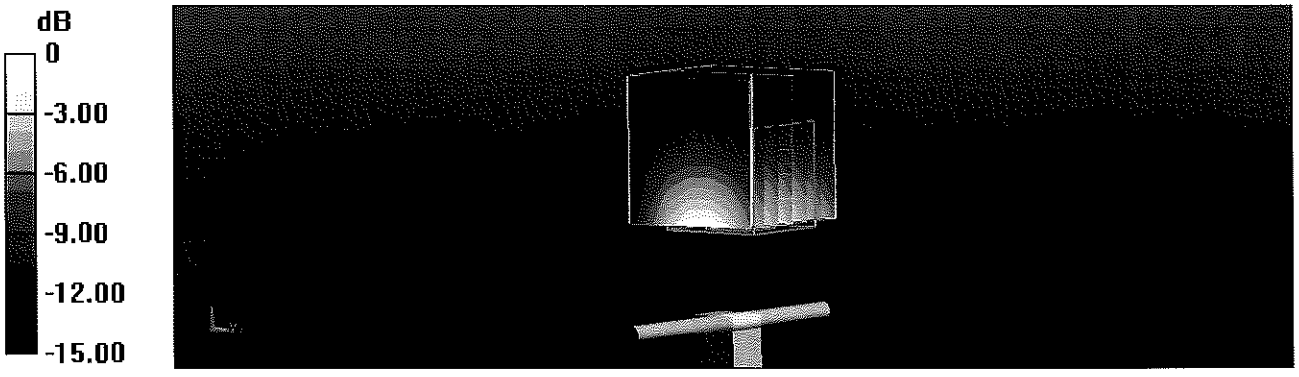
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.47 S/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

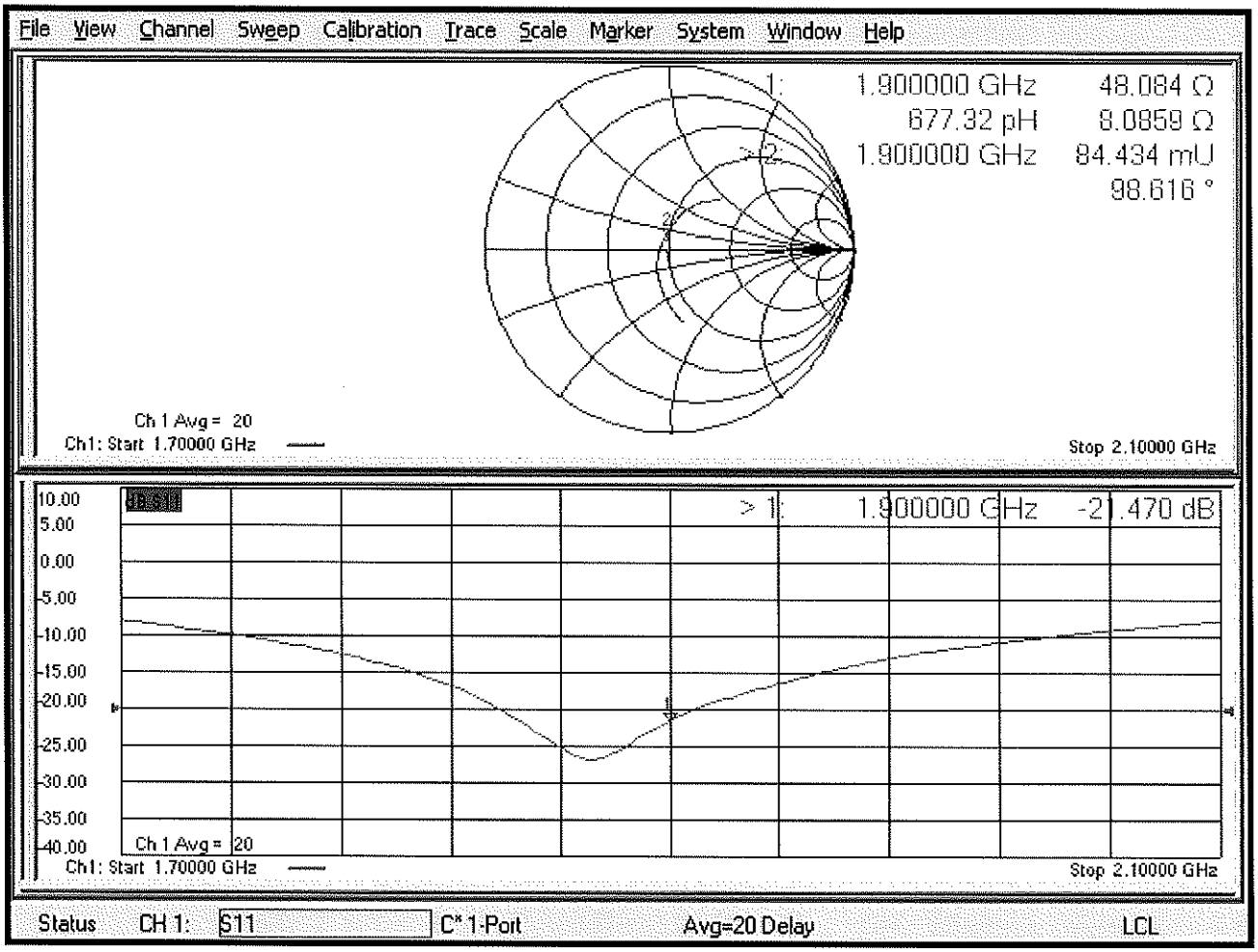
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 99.86 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 17.3 W/kg
SAR(1 g) = 9.62 W/kg; SAR(10 g) = 5.09 W/kg
Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D2450V2-981_Aug18

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:981
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 16, 2018

BN ✓
09-06/2018

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	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 Agilent E8358A	SN: US41080477	31-Mar-14 (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: August 23, 2018

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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, "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	V52.10.1
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	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.7 ± 6 %	1.86 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	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.4 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	2.02 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	13.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.2 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	55.0 Ω + 2.3 jΩ
Return Loss	- 25.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.2 Ω + 4.7 jΩ
Return Loss	- 26.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.162 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	December 30, 2014

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 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.6 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**54.0 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.2 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.6 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**54.0 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.3 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Neck)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	12.9 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.2 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.4 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Ear)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	8.74 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**34.7 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**17.5 W/kg ± 16.9 % (k=2)**

Date: 13.08.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 37.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.88, 7.88, 7.88) @ 2450 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

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 = 116.6 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 26.7 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.2 W/kg
Maximum value of SAR (measured) = 22.1 W/kg

0 dB = 22.1 W/kg = 13.44 dBW/kg