



SAR EVALUATION REPORT

Applicant Name:

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Gyeonggi-do 443-742, Korea

Date of Testing:

07/28/14 - 08/30/14

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

OY1407281548.A3L

FCC ID:

A3LSMN910A

APPLICANT:

SAMSUNG ELECTRONICS, CO. LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

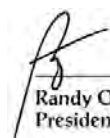
Model(s):

SM-N910A

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)	10 gm Extremity (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.10	0.44	0.54	
PCE	UMTS 850	826.40 - 846.60 MHz	0.13	0.54	0.63	
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	< 0.1	0.26	0.69	
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.19	0.37	1.00	3.22
PCE	LTE Band 12	699.7 - 715.3 MHz	0.15	0.39	0.45	
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.11	0.42	0.51	
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.26	0.41	0.61	
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	0.15	0.42	0.78	3.29
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.67	0.14	0.14	
DTS	5.8 GHz WLAN	5745 - 5825 MHz	< 0.1	0.22	0.46	
NII	5.2 GHz WLAN	5180 - 5240 MHz	0.16	0.11		0.35
NII	5.3 GHz WLAN	5260 - 5320 MHz	0.14	0.12		0.37
NII	5.5 GHz WLAN	5500 - 5700 MHz	0.10	0.37		0.68
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A			
Simultaneous SAR per KDB 690783 D01v01r03:			0.83	1.07	1.10	3.29

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.9 of this report; for North American frequency bands only.

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


Randy Ortanez
President



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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
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 17	Voice/Data	706.5 MHz - 713.5 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
5.8 GHz WLAN	Data	5745 - 5825 MHz
5.2 GHz WLAN	Data	5180 - 5240 MHz
5.3 GHz WLAN	Data	5260 - 5320 MHz
5.5 GHz WLAN	Data	5500 - 5700 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
ANT+	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

The device utilizes power reduction under some portable hotspot conditions for SAR compliance. There is power reduction for UMTS Band 2, LTE Band 4, and LTE Band 2. There is no power reduction for GSM/GPRS/EDGE 850, GSM/GPRS/EDGE 1900, UMTS Band 5, LTE Band 12/17, LTE Band 5, and WLAN modes. The reduced powers were confirmed via conducted power measurements at the RF port (See Section 9). Detailed description of the hotspot power reduction mechanism is included in the operational description.

1.3 Nominal and Maximum Output Power Specifications

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

1.3.1 Maximum Power

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)		Burst Average 8-PSK (dBm)	
		1 TX	1 TX	2 TX	1 TX	2 TX
		Slot	Slots	Slots	Slots	Slots
GSM/GPRS/EDGE 850	Maximum	34.0	34.0	31.5	27.5	27.0
	Nominal	33.5	33.5	31.0	27.0	26.5
GSM/GPRS/EDGE 1900	Maximum	30.5	30.5	29.0	27.0	26.5
	Nominal	30.0	30.0	28.5	26.5	26.0

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Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6
UMTS Band 5 (850 MHz)	Maximum	24.5	23.0	22.5
	Nominal	24.0	22.5	22.0
UMTS Band 2 (1900 MHz)	Maximum	23.0	21.5	21.5
	Nominal	22.5	21.0	21.0

Mode / Band		Modulated Average (dBm)
LTE Band 12/17	Maximum	25.0
	Nominal	24.5
LTE Band 5 (Cell)	Maximum	25.0
	Nominal	24.5
LTE Band 4 (AWS)	Maximum	23.0
	Nominal	22.5
LTE Band 2 (PCS)	Maximum	23.5
	Nominal	23.0

Mode / Band		Modulated Average (dBm)
SISO IEEE 802.11b (2.4 GHz)	Maximum	15.5
	Nominal	15.0
SISO IEEE 802.11g (2.4 GHz)	Maximum	14.5
	Nominal	14.0
SISO IEEE 802.11n (2.4 GHz)	Maximum	13.5
	Nominal	13.0
MIMO IEEE 802.11n (2.4 GHz)	Maximum	15.5
	Nominal	15.0
SISO IEEE 802.11a (5 GHz)	Maximum	12.5
	Nominal	12.0
SISO IEEE 802.11n (5 GHz - 20 MHz Bandwidth)	Maximum	12.5
	Nominal	12.0
MIMO IEEE 802.11n (5 GHz - 20 MHz Bandwidth)	Maximum	15.5
	Nominal	15.0
SISO IEEE 802.11n (5 GHz - 40 MHz Bandwidth)	Maximum	9.5
	Nominal	9.0
MIMO IEEE 802.11n (5 GHz - 40 MHz Bandwidth)	Maximum	12.5
	Nominal	12.0
SISO IEEE 802.11ac (5 GHz - 80 MHz Bandwidth)	Maximum	10.5
	Nominal	10.0
MIMO IEEE 802.11ac (5 GHz - 80 MHz Bandwidth)	Maximum	13.5
	Nominal	13.0
Bluetooth	Maximum	12.0
	Nominal	11.5
Bluetooth LE	Maximum	8.0
	Nominal	7.5

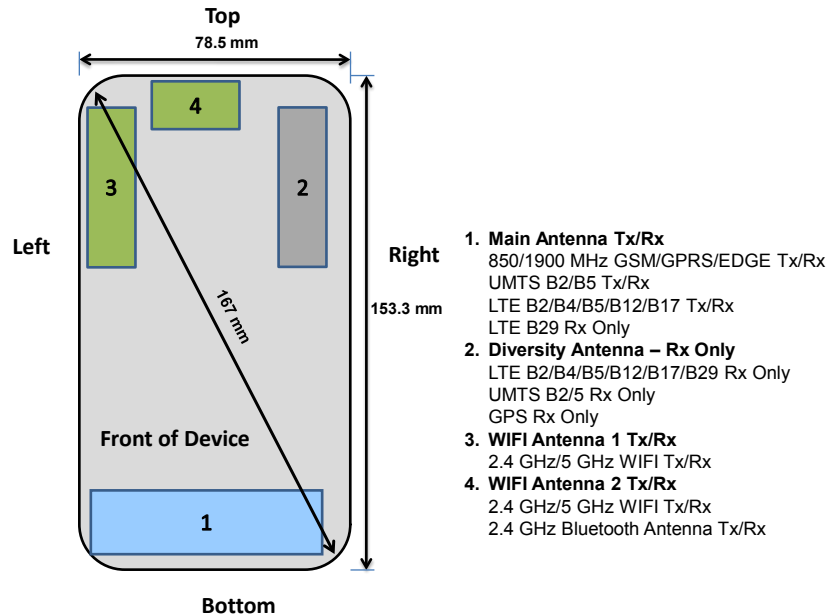
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1.3.2 Reduced Power

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA Rel 99	3GPP HSDPA Rel 5	3GPP HSUPA Rel 6
UMTS Band 2 (1900 MHz)	Maximum	22.0	20.5	20.5
	Nominal	21.5	20.0	20.0

Mode / Band		Modulated Average (dBm)
LTE Band 4	Maximum	21.0
	Nominal	20.5
LTE Band 2	Maximum	21.5
	Nominal	21.0

1.4 DUT Antenna Locations



Note: Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC Filing. Since the diagonal dimension of this device is >160 mm and <200 mm, it is considered a “phablet.”

Figure 1-1
DUT Antenna Locations

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Table 1-1
Sides for SAR Testing for Mobile Hotspot and Extremity Exposure Conditions

Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
UMTS 1900	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 2 (PCS)	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN Ant. 1 & MIMO	Yes	Yes	Yes	No	No	Yes
2.4 GHz WLAN Ant. 2	Yes	Yes	Yes	No	No	No
5 GHz WLAN Ant. 1 & MIMO	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN Ant. 2	Yes	Yes	Yes	No	No	No

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR or Extremity SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v01 guidance, page 2 and FCC KDB 648474 D04v01r01. The distances between the transmit antennas and the edges of the device are included in the filing. When wireless router mode is enabled, 5.2-5.7 GHz WLAN operations are disabled. Therefore, 5.8 GHz WLAN refers to mobile hotspot testing sides and 5.2-5.7 GHz WLAN refers to extremity testing sides.

1.5 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the standard battery. The SAR tests were performed with the standard battery (model: EB-BN910BBU).

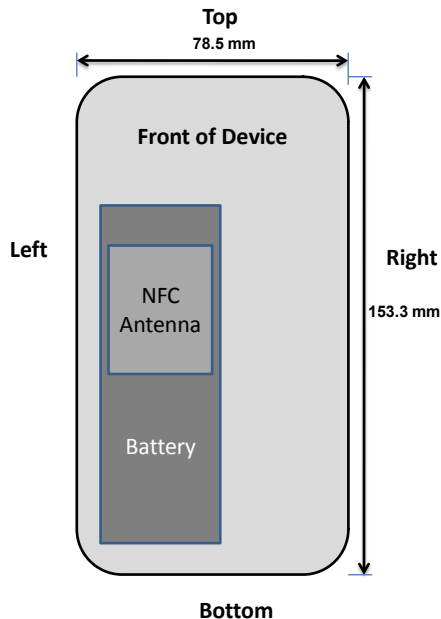


Figure 1-2
NFC Antenna Locations

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1.6 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-3 and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.



Figure 1-3
Simultaneous Transmission Paths

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

Table 1-2
Simultaneous Transmission Scenarios

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

- 2.4 GHz WLAN, 5 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
- All licensed modes share the same antenna path and cannot transmit simultaneously.
- When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
- Per the manufacturer, WIFI Direct is not 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 GHz Wireless Router is only supported for the 5.8 GHz Band by S/W, therefore 5.2-5.7 GHz Bands were not evaluated for wireless router conditions.
- This device supports 2x2 MIMO Tx for WLAN 802.11n/ac. Each WLAN antenna can transmit independently or together when operating with MIMO.

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1.7 SAR Test Exclusions Applied

(A) WIFI/BT

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

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

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, body-worn Bluetooth SAR was not required; $[(16/10) * \sqrt{2.480}] = 2.5 < 3.0$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

Per FCC KDB 447498 D01v05, the 10g SAR exclusion threshold for distances <50mm is defined by the following equation:

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, extremity Bluetooth SAR was not required; $[(16/5) * \sqrt{2.480}] = 5 < 7.5$. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

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

This device supports IEEE 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only
- b) No aggregate channel configurations
- c) 1 Tx antenna output
- d) 256 QAM is supported
- e) No new 5 GHz channels

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

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(B) Licensed Transmitter(s)

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

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

This device supports both LTE B12 and LTE B17. Since the supported frequency span for LTE B17 falls completely within the supported frequency span for LTE B12, both LTE bands have the same target power, and both LTE bands share the same transmission path, SAR was only assessed for LTE B12.

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

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

Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Therefore, extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Extremity SAR was evaluated for UMTS B2 bottom edge and LTE B2 bottom edge. These configurations had a wireless router 1g SAR >1.2 W/kg when scaled up to the maximum output power tolerances.

1.8 Wireless Charging Battery Cover

This DUT may be used with a standard battery cover or with an optional wireless charging battery cover. Per FCC KDB Publication 648474 D03, SAR was measured using the standard battery cover and then repeated with the wireless charging battery cover for the configuration with the highest measured SAR for each wireless technology, frequency band, operating mode, and exposure condition. Since reported SAR did not exceed 1.2 W/kg, additional testing with the wireless charging battery cover was not required.

1.9 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01v02, D03v01, D05v02r03, D05Av01, D06v01r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v01r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r03, D02v01r01 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D03-D04 (Phablet Procedures, Wireless Charging Cover)
- April 2013 TCB Workshop Notes (IEEE 802.11ac)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)

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1.10 Device Serial Numbers

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

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number	Extremity Serial Number
GSM/GPRS/EDGE 850	F16AC	F16AC	F16AC	-
UMTS 850	F19B6	F19B6	F19B6	-
GSM/GPRS/EDGE 1900	F19AC	F16AC	F16AC	-
UMTS 1900	F19B6	01FC4	01FC4	01FBB
LTE Band 12	024DF	024DF	024DF	-
LTE Band 5 (Cell)	F19B1	F19B1	F19B1	-
LTE Band 4 (AWS)	F1668	F1668	01A30	-
LTE Band 2 (PCS)	F19AC	01FC4	01FC4	01FBB
2.4 GHz WLAN Ant. 1	015D8	015D8	015D8	-
2.4 GHz WLAN Ant. 2 & MIMO	01FC3	015D8	015D8	-
5 GHz WLAN	015D8	015D8	015D8	015D7

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LTE INFORMATION

LTE Information									
FCC ID	A3LSMN910A								
Form	Portable Handset								
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)								
	LTE Band 17 (706.5 - 713.5 MHz)								
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)								
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)								
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)								
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz								
	LTE Band 17: 5 MHz, 10 MHz								
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz								
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz								
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz								
Channel Numbers and Frequencies (MHz)	Low	Mid	High						
LTE Band 12: 1.4 MHz	699.7 (23017)	707.5 (23095)	715.3 (23173)						
LTE Band 12: 3 MHz	700.5 (23025)	707.5 (23095)	714.5 (23165)						
LTE Band 12: 5 MHz	701.5 (23035)	707.5 (23095)	713.5 (23155)						
LTE Band 12: 10 MHz	704 (23060)	707.5 (23095)	711 (23130)						
LTE Band 17: 5 MHz	706.5 (23755)	710 (23790)	713.5 (23825)						
LTE Band 17: 10 MHz	709 (23780)	710 (23790)	711 (23800)						
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)	836.5 (20525)	848.3 (20643)						
LTE Band 5 (Cell): 3 MHz	825.5 (20415)	836.5 (20525)	847.5 (20635)						
LTE Band 5 (Cell): 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)						
LTE Band 5 (Cell): 10 MHz	829 (20450)	836.5 (20525)	844 (20600)						
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)	1732.5 (20175)	1754.3 (20393)						
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)	1732.5 (20175)	1753.5 (20385)						
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)	1732.5 (20175)	1752.5 (20375)						
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)						
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)	1732.5 (20175)	1747.5 (20325)						
LTE Band 4 (AWS): 20 MHz	1720 (20050)	1732.5 (20175)	1745 (20300)						
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)	1880 (18900)	1909.3 (19193)						
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)	1880 (18900)	1908.5 (19185)						
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)						
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)						
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)	1880 (18900)	1902.5 (19125)						
LTE Band 2 (PCS): 20 MHz	1860 (18700)	1880 (18900)	1900 (19100)						
UE Category	4								
Modulations Supported in UL	QPSK, 16QAM								
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES								
A-MPR (Additional MPR) disabled for SAR Testing?	YES								
LTE Carrier Aggregation Possible Combinations	LTE B2 (PCC) + LTE B17 (SCG)	LTE B2 (PCC) + LTE B29 (SCG)	LTE B2 (PCC) + LTE B5 (SCG)	LTE B4 (PCC) + LTE B17 (SCG)	LTE B4 (PCC) + LTE B29 (SCG)	LTE B4 (PCC) + LTE B5 (SCG)	LTE B17 (PCC) + LTE B2 (SCG)	LTE B5 (PCC) + LTE B2 (SCG)	LTE B5 (PCC) + LTE B4 (SCG)
	5MHz (B2)+5MHz (B17)	5MHz (B2)+5MHz (B29)	5MHz (B2)+5MHz (B5)	5MHz (B4)+5MHz (B17)	5MHz (B4)+5MHz (B29)	5MHz (B4)+5MHz (B5)	5MHz (B17)+5MHz (B2)	5MHz (B5)+5MHz (B2)	5MHz (B5)+5MHz (B4)
	5MHz (B2)+10MHz (B17)	5MHz (B2)+10MHz (B29)	5MHz (B2)+10MHz (B5)	5MHz (B4)+10MHz (B17)	5MHz (B4)+10MHz (B29)	5MHz (B4)+10MHz (B5)	5MHz (B17)+10MHz (B2)	5MHz (B5)+10MHz (B2)	5MHz (B5)+10MHz (B4)
	10MHz (B2)+5MHz (B17)	10MHz (B2)+5MHz (B29)	10MHz (B2)+5MHz (B5)	10MHz (B4)+5MHz (B17)	10MHz (B4)+5MHz (B29)	10MHz (B4)+5MHz (B5)	10MHz (B17)+5MHz (B2)	10MHz (B5)+5MHz (B2)	10MHz (B5)+5MHz (B4)
	10MHz (B2)+10MHz (B17)	10MHz (B2)+10MHz (B29)	10MHz (B2)+10MHz (B5)	10MHz (B4)+10MHz (B17)	10MHz (B4)+10MHz (B29)	10MHz (B4)+10MHz (B5)	10MHz (B17)+10MHz (B2)	10MHz (B5)+10MHz (B2)	10MHz (B5)+10MHz (B4)
LTE Carrier Aggregation Additional Information	This device does not support full CA features on 3GPP Release 10. It supports a maximum of 2 carriers in the downlink with a total maximum bandwidth of 10 MHz of the spectrum. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. Due to carrier capability, only the combinations listed above are supported. The following LTE Release 10 Features are not supported: Relay, HetNet, Enhanced MIMO, eIC, WiFi Offloading, MDR, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.								

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3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

- σ = conductivity of the tissue-simulating material (S/m)
- ρ = mass density of the tissue-simulating material (kg/m³)
- E = Total RMS electric field strength (V/m)

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

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4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

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

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

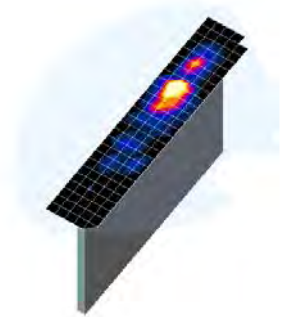


Figure 4-1
Sample SAR Area
Scan

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

Frequency	Maximum Area Scan Resolution (mm) (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		
				$\Delta z_{\text{zoom}}(n)$	$\Delta z_{\text{zoom}}(1)^*$	
≤2 GHz	≤15	≤8	≤5	≤4	≤1.5* $\Delta z_{\text{zoom}}(n-1)$	≥30
2-3 GHz	≤12	≤5	≤5	≤4	≤1.5* $\Delta z_{\text{zoom}}(n-1)$	≥30
3-4 GHz	≤12	≤5	≤4	≤3	≤1.5* $\Delta z_{\text{zoom}}(n-1)$	≥28
4-5 GHz	≤10	≤4	≤3	≤2.5	≤1.5* $\Delta z_{\text{zoom}}(n-1)$	≥25
5-6 GHz	≤10	≤4	≤2	≤2	≤1.5* $\Delta z_{\text{zoom}}(n-1)$	≥22

*Also compliant to IEEE 1528-2013 Table 6

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5

DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

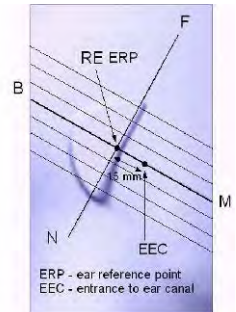


Figure 5-1
Close-Up Side view
of ERP

5.2 HANDSET REFERENCE POINTS

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



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

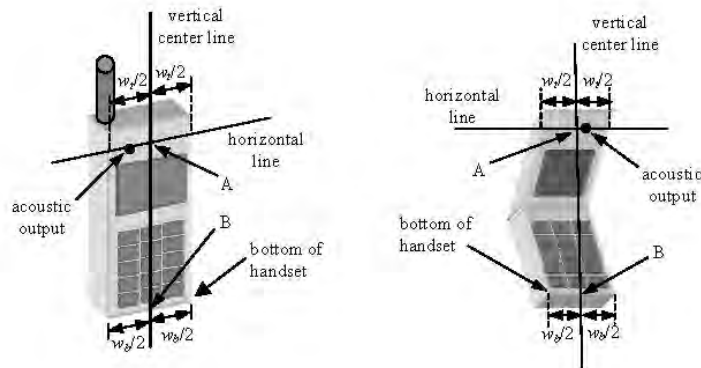


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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6 TEST CONFIGURATION POSITIONS FOR HANDSETS

6.1 Device Holder

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

6.2 Positioning for Cheek

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

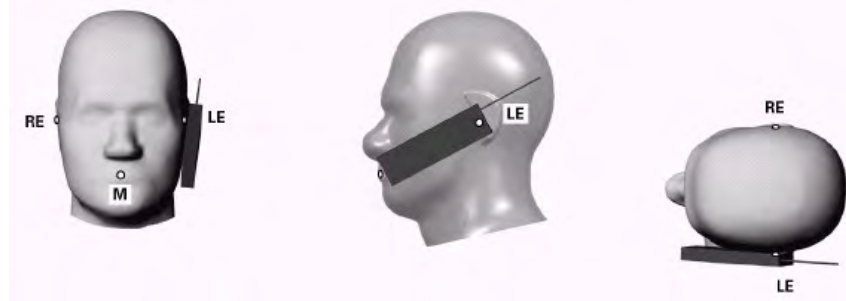


Figure 6-1 Front, Side and Top View of Cheek Position

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

6.3 Positioning for Ear / 15° Tilt

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

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

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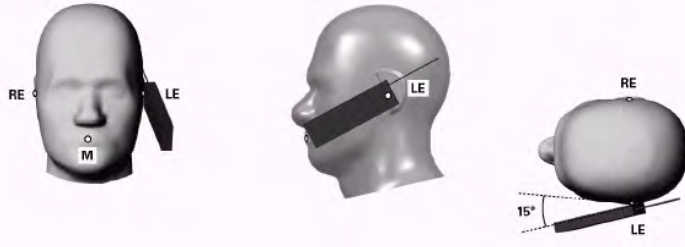


Figure 6-2 Front, Side and Top View of Ear/15° Tilt Position

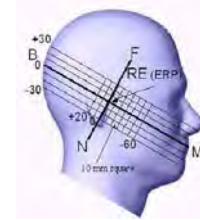


Figure 6-3 Side view w/ relevant markings

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 D04_v01. 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 D04v01, 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 D01v05 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.

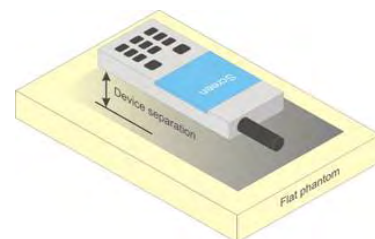


Figure 6-4 Sample Body-Worn Diagram

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

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

6.6 Extremity Exposure Configurations

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

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

6.7 Wireless Router Configurations

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

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

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SAR measurements were evaluated for a single transmission frequency RF signal at a time. The device utilizes power reduction under some portable hotspot conditions for SAR compliance.

There is mobile hotspot power reduction for UMTS Band 2, LTE Band 4, and LTE Band 2. There is no power reduction for GSM/GPRS/EDGE 850, GSM/GPRS/EDGE 1900, UMTS Band 5, LTE Band 12/17, LTE Band 5, and WLAN modes. The reduced powers were confirmed via conducted power measurements at the RF port (See Section 9). Detailed description of the hotspot power reduction mechanism is included in the operational description.

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7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

HUMAN EXPOSURE LIMITS		
	UNCONTROLLED ENVIRONMENT <i>General Population</i> (W/kg) or (mW/g)	CONTROLLED ENVIRONMENT <i>Occupational</i> (W/kg) or (mW/g)
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 were performed using a base station simulator under digital average power.

8.1 Measured and Reported SAR

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

8.2 Procedures Used to Establish RF Signal for SAR

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

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

8.3 SAR Measurement Conditions for UMTS

8.3.1 Output Power Verification

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

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

8.3.2 Head SAR Measurements for Handsets

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all "1s". SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

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8.3.3 Body SAR Measurements

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

8.3.4 SAR Measurements for Handsets with Rel 5 HSDPA

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

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

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

Note 1: Δ_{ACK} , Δ_{NACK} and $\Delta_{CQI} = 8 \Leftrightarrow A_{hs} = \beta_{hs}/\beta_c = 30/15 \Leftrightarrow \beta_{hs} = 30/15 * \beta_c$.
Note 2: For the HS-DPCCH power mask requirement test in clause 5.2C, 5.7A, and the Error Vector Magnitude (EVM) with HS-DPCCH test in clause 5.13.1A, and HSDPA EVM with phase discontinuity in clause 5.13.1AA, Δ_{ACK} and $\Delta_{NACK} = 8$ ($A_{hs} = 30/15$) with $\beta_{hs} = 30/15 * \beta_c$, and $\Delta_{CQI} = 7$ ($A_{hs} = 24/15$) with $\beta_{hs} = 24/15 * \beta_c$.
Note 3: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH and HS-DPCCH the MPR is based on the relative CM difference. This is applicable for only UEs that support HSDPA in release 6 and later releases.

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

8.3.5 SAR Measurements for Handsets with Rel 6 HSUPA

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

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

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

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

Note 2: CM = 1 for $\beta_c/\beta_d = 12/15$, $\beta_{hs}/\beta_c = 24/15$. For all other combinations of DPDCH, DPCCH, HS-DPCCH, E-DPDCH and E-DPCCH the MPR is based on the relative CM difference.

Note 3: For subtest 1 the β_c/β_d ratio of 11/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 10/15$ and $\beta_d = 15/15$.

Note 4: For subtest 5 the β_c/β_d ratio of 15/15 for the TFC during the measurement period (TF1, TF0) is achieved by setting the signaled gain factors for the reference TFC (TF1, TF1) to $\beta_c = 14/15$ and $\beta_d = 15/15$.

Note 5: Testing UE using E-DPDCH Physical Layer category 1 Sub-test 3 is not required according to TS 25.306 Table 5.1g.

Note 6: β_{ed} can not be set directly; it is set by Absolute Grant Value.

8.4 SAR Measurement Conditions for LTE

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

8.4.1 Spectrum Plots for RB Configurations

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

8.4.2 MPR

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

8.4.3 A-MPR

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

8.4.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r01:

- Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
 - The required channel and offset combination with the highest maximum output power is required for SAR.
 - 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.
 - 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.
- 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.

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- 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.

8.4.5 Carrier Aggregation

LTE Carrier Aggregation (CA) measurements were made in accordance to 3GPP TS 36.521-1 V10.4.0 (2012-12). The RRC connection is only handled by one cell, the Primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds the Secondary component carrier (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to release 8 specifications on the PCC. Additional output powers were measured using two carriers in the downlink for the release 8 configurations with the highest output power among all channels, RB configurations and bandwidths for each uplink band. Per FCC Guidance, no SAR measurements were required.

8.5 SAR Testing with 802.11 Transmitters

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

8.5.1 General Device Setup

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

8.5.2 Frequency Channel Configurations [24]

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

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

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

8.5.3 MIMO SAR considerations

Per KDB 248227, SAR for MIMO was measured with both transmitting simultaneously and was evaluated independently of SISO operation. For 2.4 and 5 GHz MIMO, 802.11n 20 MHz BW was evaluated. Other IEEE 802.11 modes and bandwidths were not investigated for MIMO operations since the maximum allowed output power (including tolerance) was not higher for these modes.

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9 RF CONDUCTED POWERS

9.1 GSM Conducted Powers

		Maximum Burst-Averaged Output Power				
		Voice	GPRS/EDGE Data (GMSK)		EDGE Data (8-PSK)	
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot
GSM 850	128	32.81	32.88	31.26	27.30	26.58
	190	33.10	33.21	31.44	27.31	26.65
	251	32.96	33.10	31.22	27.23	26.53
GSM 1900	512	30.48	30.48	28.57	26.39	26.34
	661	30.50	30.37	28.52	26.22	26.12
	810	30.45	30.50	28.61	26.18	26.10
		Calculated Maximum Frame-Averaged Output Power				
		Voice	GPRS/EDGE Data (GMSK)		EDGE Data (8-PSK)	
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot
GSM 850	128	23.78	23.85	25.24	18.27	20.56
	190	24.07	24.18	25.42	18.28	20.63
	251	23.93	24.07	25.20	18.20	20.51
GSM 1900	512	21.45	21.45	22.55	17.36	20.32
	661	21.47	21.34	22.50	17.19	20.10
	810	21.42	21.47	22.59	17.15	20.08
GSM 850	Frame	24.47	24.47	24.98	17.97	20.48
GSM 1900	Avg. Targets:	20.97	20.97	22.48	17.47	19.98

Note:

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

GSM Class: B
GPRS Multislot class: 10 (Max 2 Tx uplink slots)
EDGE Multislot class: 10 (Max 2 Tx uplink slots)
DTM Multislot Class: N/A



Figure 9-1
Power Measurement Setup

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9.2 UMTS Conducted Powers

Maximum UMTS Average RF Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	23.96	24.08	23.94	22.33	22.30	22.68	-
99		12.2 kbps AMR	23.94	24.06	23.92	22.12	22.14	22.52	-
6	HSDPA	Subtest 1	21.85	21.96	21.84	21.15	21.18	21.23	0
6		Subtest 2	21.86	21.95	21.86	21.43	21.32	21.36	0
6		Subtest 3	21.47	21.45	21.38	21.30	21.42	21.47	0.5
6		Subtest 4	21.48	21.45	21.40	21.12	21.08	21.36	0.5
6	HSUPA	Subtest 1	21.13	20.95	20.91	20.64	21.10	21.50	0
6		Subtest 2	18.94	18.93	18.80	21.23	21.22	21.40	2
6		Subtest 3	20.78	20.74	20.64	21.43	21.26	21.39	1
6		Subtest 4	21.42	21.45	21.34	20.96	20.92	20.98	2
6		Subtest 5	21.90	21.97	21.91	21.42	21.38	21.35	0

Reduced UMTS Average RF Conducted Powers
(Representing Hotspot Mode)

3GPP Release Version	Mode	3GPP 34.121 Subtest	PCS Band [dBm]			3GPP MPR [dB]
			9262	9400	9538	
99	WCDMA	12.2 kbps RMC	21.97	21.80	22.00	-
99		12.2 kbps AMR	21.92	21.78	21.93	-
6	HSDPA	Subtest 1	20.12	20.06	20.37	0
6		Subtest 2	19.33	19.00	19.04	0
6		Subtest 3	18.13	18.64	18.12	0.5
6		Subtest 4	18.00	18.21	18.16	0.5
6	HSUPA	Subtest 1	20.08	20.03	19.52	0
6		Subtest 2	19.07	19.86	19.95	2
6		Subtest 3	20.05	20.00	20.31	1
6		Subtest 4	19.09	19.42	19.55	2
6		Subtest 5	20.17	20.21	20.41	0

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

This device does not support DC-HSDPA.

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



Figure 9-2
Power Measurement Setup

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9.3 LTE Conducted Powers

9.3.1 LTE Band 12

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	707.5	23095	10	QPSK	1	0	24.75	0	0
	707.5	23095	10	QPSK	1	25	24.68	0	0
	707.5	23095	10	QPSK	1	49	24.70	0	0
	707.5	23095	10	QPSK	25	0	23.66	0-1	1
	707.5	23095	10	QPSK	25	12	23.65	0-1	1
	707.5	23095	10	QPSK	25	25	23.60	0-1	1
	707.5	23095	10	QPSK	50	0	23.62	0-1	1
	707.5	23095	10	16QAM	1	0	23.61	0-1	1
	707.5	23095	10	16QAM	1	25	23.76	0-1	1
	707.5	23095	10	16QAM	1	49	23.69	0-1	1
	707.5	23095	10	16QAM	25	0	22.67	0-2	2
	707.5	23095	10	16QAM	25	12	22.75	0-2	2
	707.5	23095	10	16QAM	25	25	22.69	0-2	2
	707.5	23095	10	16QAM	50	0	22.81	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	701.5	23035	5	QPSK	1	0	24.73	0	0
	701.5	23035	5	QPSK	1	12	24.72	0	0
	701.5	23035	5	QPSK	1	24	24.68	0	0
	701.5	23035	5	QPSK	12	0	23.66	0-1	1
	701.5	23035	5	QPSK	12	6	23.63	0-1	1
	701.5	23035	5	QPSK	12	13	23.74	0-1	1
	701.5	23035	5	QPSK	25	0	23.67	0-1	1
	701.5	23035	5	16-QAM	1	0	23.84	0-1	1
	701.5	23035	5	16-QAM	1	12	23.71	0-1	1
	701.5	23035	5	16-QAM	1	24	23.88	0-1	1
	701.5	23035	5	16-QAM	12	0	22.71	0-2	2
	701.5	23035	5	16-QAM	12	6	22.73	0-2	2
	701.5	23035	5	16-QAM	12	13	22.80	0-2	2
	701.5	23035	5	16-QAM	25	0	22.77	0-2	2
Mid	707.5	23095	5	QPSK	1	0	24.72	0	0
	707.5	23095	5	QPSK	1	12	24.74	0	0
	707.5	23095	5	QPSK	1	24	24.66	0	0
	707.5	23095	5	QPSK	12	0	23.68	0-1	1
	707.5	23095	5	QPSK	12	6	23.63	0-1	1
	707.5	23095	5	QPSK	12	13	23.72	0-1	1
	707.5	23095	5	QPSK	25	0	23.69	0-1	1
	707.5	23095	5	16-QAM	1	0	23.78	0-1	1
	707.5	23095	5	16-QAM	1	12	23.78	0-1	1
	707.5	23095	5	16-QAM	1	24	23.64	0-1	1
	707.5	23095	5	16-QAM	12	0	22.75	0-2	2
	707.5	23095	5	16-QAM	12	6	22.74	0-2	2
	707.5	23095	5	16-QAM	12	13	22.60	0-2	2
	707.5	23095	5	16-QAM	25	0	22.78	0-2	2
High	713.5	23155	5	QPSK	1	0	24.46	0	0
	713.5	23155	5	QPSK	1	12	24.54	0	0
	713.5	23155	5	QPSK	1	24	24.55	0	0
	713.5	23155	5	QPSK	12	0	23.50	0-1	1
	713.5	23155	5	QPSK	12	6	23.54	0-1	1
	713.5	23155	5	QPSK	12	13	23.52	0-1	1
	713.5	23155	5	QPSK	25	0	23.54	0-1	1
	713.5	23155	5	16-QAM	1	0	23.68	0-1	1
	713.5	23155	5	16-QAM	1	12	23.64	0-1	1
	713.5	23155	5	16-QAM	1	24	23.38	0-1	1
	713.5	23155	5	16-QAM	12	0	22.57	0-2	2
	713.5	23155	5	16-QAM	12	6	22.46	0-2	2
	713.5	23155	5	16-QAM	12	13	22.56	0-2	2
	713.5	23155	5	16-QAM	25	0	22.53	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	700.5	23025	3	QPSK	1	0	24.72	0	0
	700.5	23025	3	QPSK	1	7	24.72	0	0
	700.5	23025	3	QPSK	1	14	24.74	0	0
	700.5	23025	3	QPSK	8	0	23.76	0-1	1
	700.5	23025	3	QPSK	8	4	23.68	0-1	1
	700.5	23025	3	QPSK	8	7	23.64	0-1	1
	700.5	23025	3	QPSK	15	0	23.75	0-1	1
	700.5	23025	3	16-QAM	1	0	23.50	0-1	1
	700.5	23025	3	16-QAM	1	7	23.53	0-1	1
	700.5	23025	3	16-QAM	1	14	23.70	0-1	1
	700.5	23025	3	16-QAM	8	0	22.78	0-2	2
	700.5	23025	3	16-QAM	8	4	22.69	0-2	2
	700.5	23025	3	16-QAM	8	7	22.76	0-2	2
	700.5	23025	3	16-QAM	15	0	22.74	0-2	2
	700.5	23025	3	16-QAM	15	0	22.74	0-2	2
Mid	707.5	23095	3	QPSK	1	0	24.73	0	0
	707.5	23095	3	QPSK	1	7	24.69	0	0
	707.5	23095	3	QPSK	1	14	24.53	0	0
	707.5	23095	3	QPSK	8	0	23.84	0-1	1
	707.5	23095	3	QPSK	8	4	23.66	0-1	1
	707.5	23095	3	QPSK	8	7	23.64	0-1	1
	707.5	23095	3	QPSK	15	0	23.63	0-1	1
	707.5	23095	3	16-QAM	1	0	23.53	0-1	1
	707.5	23095	3	16-QAM	1	7	23.58	0-1	1
	707.5	23095	3	16-QAM	1	14	23.60	0-1	1
	707.5	23095	3	16-QAM	8	0	22.67	0-2	2
	707.5	23095	3	16-QAM	8	4	22.75	0-2	2
	707.5	23095	3	16-QAM	8	7	22.81	0-2	2
	707.5	23095	3	16-QAM	15	0	22.70	0-2	2
	707.5	23095	3	16-QAM	15	0	22.70	0-2	2
High	714.5	23165	3	QPSK	1	0	24.53	0	0
	714.5	23165	3	QPSK	1	7	24.40	0	0
	714.5	23165	3	QPSK	1	14	24.53	0	0
	714.5	23165	3	QPSK	8	0	23.51	0-1	1
	714.5	23165	3	QPSK	8	4	23.52	0-1	1
	714.5	23165	3	QPSK	8	7	23.49	0-1	1
	714.5	23165	3	QPSK	15	0	23.48	0-1	1
	714.5	23165	3	16-QAM	1	0	23.84	0-1	1
	714.5	23165	3	16-QAM	1	7	23.76	0-1	1
	714.5	23165	3	16-QAM	1	14	23.79	0-1	1
	714.5	23165	3	16-QAM	8	0	22.44	0-2	2
	714.5	23165	3	16-QAM	8	4	22.45	0-2	2
	714.5	23165	3	16-QAM	8	7	22.50	0-2	2
	714.5	23165	3	16-QAM	15	0	22.54	0-2	2
	714.5	23165	3	16-QAM	15	0	22.54	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	699.7	23017	1.4	QPSK	1	0	24.73	0	0
	699.7	23017	1.4	QPSK	1	2	24.69	0	0
	699.7	23017	1.4	QPSK	1	5	24.62	0	0
	699.7	23017	1.4	QPSK	3	0	24.71	0	0
	699.7	23017	1.4	QPSK	3	2	24.73	0	0
	699.7	23017	1.4	QPSK	3	3	24.71	0	0
	699.7	23017	1.4	QPSK	6	0	23.73	0-1	1
	699.7	23017	1.4	16-QAM	1	0	23.75	0-1	1
	699.7	23017	1.4	16-QAM	1	2	23.46	0-1	1
	699.7	23017	1.4	16-QAM	1	5	23.58	0-1	1
	699.7	23017	1.4	16-QAM	3	0	23.59	0-1	1
	699.7	23017	1.4	16-QAM	3	2	23.71	0-1	1
	699.7	23017	1.4	16-QAM	3	3	23.52	0-1	1
	699.7	23017	1.4	16-QAM	6	0	22.67	0-2	2
	699.7	23017	1.4	16-QAM	6	0	22.67	0-2	2
Mid	707.5	23095	1.4	QPSK	1	0	24.74	0	0
	707.5	23095	1.4	QPSK	1	2	24.70	0	0
	707.5	23095	1.4	QPSK	1	5	24.71	0	0
	707.5	23095	1.4	QPSK	3	0	24.70	0	0
	707.5	23095	1.4	QPSK	3	2	24.68	0	0
	707.5	23095	1.4	QPSK	3	3	24.69	0	0
	707.5	23095	1.4	QPSK	6	0	23.72	0-1	1
	707.5	23095	1.4	16-QAM	1	0	23.72	0-1	1
	707.5	23095	1.4	16-QAM	1	2	23.65	0-1	1
	707.5	23095	1.4	16-QAM	1	5	23.61	0-1	1
	707.5	23095	1.4	16-QAM	3	0	23.68	0-1	1
	707.5	23095	1.4	16-QAM	3	2	23.70	0-1	1
	707.5	23095	1.4	16-QAM	3	3	23.81	0-1	1
	707.5	23095	1.4	16-QAM	6	0	22.89	0-2	2
	707.5	23095	1.4	16-QAM	6	0	22.89	0-2	2
High	715.3	23173	1.4	QPSK	1	0	24.55	0	0
	715.3	23173	1.4	QPSK	1	2	24.63	0	0
	715.3	23173	1.4	QPSK	1	5	24.62	0	0
	715.3	23173	1.4	QPSK	3	0	24.48	0	0
	715.3	23173	1.4	QPSK	3	2	24.51	0	0
	715.3	23173	1.4	QPSK	3	3	24.46	0	0
	715.3	23173	1.4	QPSK	6	0	23.48	0-1	1
	715.3	23173	1.4	16-QAM	1	0	23.57	0-1	1
	715.3	23173	1.4	16-QAM	1	2	23.65	0-1	1
	715.3	23173	1.4	16-QAM	1	5	23.61	0-1	1
	715.3	23173	1.4	16-QAM	3	0	23.50	0-1	1
	715.3	23173	1.4	16-QAM	3	2	23.59	0-1	1
	715.3	23173	1.4	16-QAM	3	3	23.54	0-1	1
	715.3	23173	1.4	16-QAM	6	0	22.68	0-2	2
	715.3	23173	1.4	16-QAM	6	0	22.68	0-2	2

9.3.2 LTE Band 5 (Cell)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	20525	10	QPSK	1	0	24.18	0	0
	836.5	20525	10	QPSK	1	25	24.14	0	0
	836.5	20525	10	QPSK	1	49	24.22	0	0
	836.5	20525	10	QPSK	25	0	23.10	0-1	1
	836.5	20525	10	QPSK	25	12	23.08	0-1	1
	836.5	20525	10	QPSK	25	25	23.11	0-1	1
	836.5	20525	10	QPSK	50	0	23.10	0-1	1
	836.5	20525	10	16QAM	1	0	22.98	0-1	1
	836.5	20525	10	16QAM	1	25	22.92	0-1	1
	836.5	20525	10	16QAM	1	49	23.05	0-1	1
	836.5	20525	10	16QAM	25	0	22.21	0-2	2
	836.5	20525	10	16QAM	25	12	22.20	0-2	2
	836.5	20525	10	16QAM	25	25	22.14	0-2	2
	836.5	20525	10	16QAM	50	0	22.14	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	826.5	20425	5	QPSK	1	0	24.19	0	0
	826.5	20425	5	QPSK	1	12	24.20	0	0
	826.5	20425	5	QPSK	1	24	24.21	0	0
	826.5	20425	5	QPSK	12	0	23.12	0-1	1
	826.5	20425	5	QPSK	12	6	23.09	0-1	1
	826.5	20425	5	QPSK	12	13	23.12	0-1	1
	826.5	20425	5	QPSK	25	0	23.11	0-1	1
	826.5	20425	5	16-QAM	1	0	22.96	0-1	1
	826.5	20425	5	16-QAM	1	12	23.08	0-1	1
	826.5	20425	5	16-QAM	1	24	23.09	0-1	1
	826.5	20425	5	16-QAM	12	0	22.23	0-2	2
	826.5	20425	5	16-QAM	12	6	22.25	0-2	2
	826.5	20425	5	16-QAM	12	13	22.24	0-2	2
	826.5	20425	5	16-QAM	25	0	22.24	0-2	2
Mid	836.5	20525	5	QPSK	1	0	24.21	0	0
	836.5	20525	5	QPSK	1	12	24.17	0	0
	836.5	20525	5	QPSK	1	24	24.18	0	0
	836.5	20525	5	QPSK	12	0	23.08	0-1	1
	836.5	20525	5	QPSK	12	6	23.04	0-1	1
	836.5	20525	5	QPSK	12	13	23.01	0-1	1
	836.5	20525	5	QPSK	25	0	23.07	0-1	1
	836.5	20525	5	16-QAM	1	0	23.03	0-1	1
	836.5	20525	5	16-QAM	1	12	22.90	0-1	1
	836.5	20525	5	16-QAM	1	24	22.91	0-1	1
	836.5	20525	5	16-QAM	12	0	22.19	0-2	2
	836.5	20525	5	16-QAM	12	6	22.18	0-2	2
	836.5	20525	5	16-QAM	12	13	22.04	0-2	2
	836.5	20525	5	16-QAM	25	0	22.16	0-2	2
High	846.5	20625	5	QPSK	1	0	24.20	0	0
	846.5	20625	5	QPSK	1	12	24.21	0	0
	846.5	20625	5	QPSK	1	24	24.20	0	0
	846.5	20625	5	QPSK	12	0	23.04	0-1	1
	846.5	20625	5	QPSK	12	6	22.98	0-1	1
	846.5	20625	5	QPSK	12	13	23.02	0-1	1
	846.5	20625	5	QPSK	25	0	23.04	0-1	1
	846.5	20625	5	16-QAM	1	0	22.98	0-1	1
	846.5	20625	5	16-QAM	1	12	22.94	0-1	1
	846.5	20625	5	16-QAM	1	24	22.93	0-1	1
	846.5	20625	5	16-QAM	12	0	22.15	0-2	2
	846.5	20625	5	16-QAM	12	6	22.09	0-2	2
	846.5	20625	5	16-QAM	12	13	22.15	0-2	2
	846.5	20625	5	16-QAM	25	0	22.09	0-2	2

FCC ID: A3LSMN910A	 PCTEST Engineering Laboratory, Inc.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1407281548.A3L	Test Dates: 07/28/14 - 08/30/14	DUT Type: Portable Handset		Page 29 of 88

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	825.5	20415	3	QPSK	1	0	24.14	0	0
	825.5	20415	3	QPSK	1	7	24.19	0	0
	825.5	20415	3	QPSK	1	14	24.16	0	0
	825.5	20415	3	QPSK	8	0	23.11	0-1	1
	825.5	20415	3	QPSK	8	4	23.12	0-1	1
	825.5	20415	3	QPSK	8	7	23.15	0-1	1
	825.5	20415	3	QPSK	15	0	23.17	0-1	1
	825.5	20415	3	16-QAM	1	0	22.97	0-1	1
	825.5	20415	3	16-QAM	1	7	23.06	0-1	1
	825.5	20415	3	16-QAM	1	14	23.13	0-1	1
	825.5	20415	3	16-QAM	8	0	22.20	0-2	2
	825.5	20415	3	16-QAM	8	4	22.22	0-2	2
	825.5	20415	3	16-QAM	8	7	22.20	0-2	2
	825.5	20415	3	16-QAM	15	0	22.14	0-2	2
	836.5	20525	3	QPSK	1	0	24.21	0	0
Mid	836.5	20525	3	QPSK	1	7	24.18	0	0
	836.5	20525	3	QPSK	1	14	24.21	0	0
	836.5	20525	3	QPSK	8	0	23.09	0-1	1
	836.5	20525	3	QPSK	8	4	22.96	0-1	1
	836.5	20525	3	QPSK	8	7	22.99	0-1	1
	836.5	20525	3	QPSK	15	0	23.12	0-1	1
	836.5	20525	3	16-QAM	1	0	23.07	0-1	1
	836.5	20525	3	16-QAM	1	7	22.92	0-1	1
	836.5	20525	3	16-QAM	1	14	23.00	0-1	1
	836.5	20525	3	16-QAM	8	0	22.21	0-2	2
	836.5	20525	3	16-QAM	8	4	22.12	0-2	2
	836.5	20525	3	16-QAM	8	7	22.06	0-2	2
	836.5	20525	3	16-QAM	15	0	22.19	0-2	2
	847.5	20635	3	QPSK	1	0	24.21	0	0
	847.5	20635	3	QPSK	1	7	24.20	0	0
High	847.5	20635	3	QPSK	1	14	24.21	0	0
	847.5	20635	3	QPSK	8	0	23.02	0-1	1
	847.5	20635	3	QPSK	8	4	22.98	0-1	1
	847.5	20635	3	QPSK	8	7	23.04	0-1	1
	847.5	20635	3	QPSK	15	0	23.04	0-1	1
	847.5	20635	3	16-QAM	1	0	22.98	0-1	1
	847.5	20635	3	16-QAM	1	7	22.92	0-1	1
	847.5	20635	3	16-QAM	1	14	22.95	0-1	1
	847.5	20635	3	16-QAM	8	0	22.11	0-2	2
	847.5	20635	3	16-QAM	8	4	22.12	0-2	2
	847.5	20635	3	16-QAM	8	7	22.10	0-2	2
	847.5	20635	3	16-QAM	15	0	22.08	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	824.7	20407	1.4	QPSK	1	0	24.16	0	0
	824.7	20407	1.4	QPSK	1	2	24.19	0	0
	824.7	20407	1.4	QPSK	1	5	24.20	0	0
	824.7	20407	1.4	QPSK	3	0	24.08	0	0
	824.7	20407	1.4	QPSK	3	2	24.15	0	0
	824.7	20407	1.4	QPSK	3	3	24.19	0	0
	824.7	20407	1.4	QPSK	6	0	23.17	0-1	1
	824.7	20407	1.4	16-QAM	1	0	23.02	0-1	1
	824.7	20407	1.4	16-QAM	1	2	23.04	0-1	1
	824.7	20407	1.4	16-QAM	1	5	23.16	0-1	1
	824.7	20407	1.4	16-QAM	3	0	23.01	0-1	1
	824.7	20407	1.4	16-QAM	3	2	23.07	0-1	1
	824.7	20407	1.4	16-QAM	3	3	23.10	0-1	1
	824.7	20407	1.4	16-QAM	6	0	22.09	0-2	2
	836.5	20525	1.4	QPSK	1	0	24.16	0	0
Mid	836.5	20525	1.4	QPSK	1	2	24.12	0	0
	836.5	20525	1.4	QPSK	1	5	24.17	0	0
	836.5	20525	1.4	QPSK	3	0	24.06	0	0
	836.5	20525	1.4	QPSK	3	2	24.00	0	0
	836.5	20525	1.4	QPSK	3	3	24.07	0	0
	836.5	20525	1.4	QPSK	6	0	23.02	0-1	1
	836.5	20525	1.4	16-QAM	1	0	23.00	0-1	1
	836.5	20525	1.4	16-QAM	1	2	22.97	0-1	1
	836.5	20525	1.4	16-QAM	1	5	23.02	0-1	1
	836.5	20525	1.4	16-QAM	3	0	22.96	0-1	1
	836.5	20525	1.4	16-QAM	3	2	22.95	0-1	1
	836.5	20525	1.4	16-QAM	3	3	23.01	0-1	1
	836.5	20525	1.4	16-QAM	6	0	22.00	0-2	2
	848.3	20643	1.4	QPSK	1	0	24.21	0	0
	848.3	20643	1.4	QPSK	1	2	24.12	0	0
High	848.3	20643	1.4	QPSK	1	5	24.21	0	0
	848.3	20643	1.4	QPSK	3	0	24.09	0	0
	848.3	20643	1.4	QPSK	3	2	24.10	0	0
	848.3	20643	1.4	QPSK	3	3	24.06	0	0
	848.3	20643	1.4	QPSK	6	0	23.03	0-1	1
	848.3	20643	1.4	16-QAM	1	0	23.03	0-1	1
	848.3	20643	1.4	16-QAM	1	2	23.03	0-1	1
	848.3	20643	1.4	16-QAM	1	5	23.01	0-1	1
	848.3	20643	1.4	16-QAM	3	0	22.99	0-1	1
	848.3	20643	1.4	16-QAM	3	2	22.94	0-1	1
	848.3	20643	1.4	16-QAM	3	3	23.05	0-1	1
	848.3	20643	1.4	16-QAM	6	0	22.03	0-2	2

9.3.3 LTE Band 4 (AWS)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	1732.5	20175	20	QPSK	1	0	22.69	0	0
	1732.5	20175	20	QPSK	1	50	22.68	0	0
	1732.5	20175	20	QPSK	1	99	22.72	0	0
	1732.5	20175	20	QPSK	50	0	21.59	0-1	1
	1732.5	20175	20	QPSK	50	25	21.65	0-1	1
	1732.5	20175	20	QPSK	50	50	21.64	0-1	1
	1732.5	20175	20	QPSK	100	0	21.62	0-1	1
	1732.5	20175	20	16QAM	1	0	21.67	0-1	1
	1732.5	20175	20	16QAM	1	50	21.68	0-1	1
	1732.5	20175	20	16QAM	1	99	21.73	0-1	1
	1732.5	20175	20	16QAM	50	0	20.62	0-2	2
	1732.5	20175	20	16QAM	50	25	20.57	0-2	2
	1732.5	20175	20	16QAM	50	50	20.67	0-2	2
	1732.5	20175	20	16QAM	100	0	20.60	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1717.5	20025	15	QPSK	1	0	22.98	0	0
	1717.5	20025	15	QPSK	1	36	22.88	0	0
	1717.5	20025	15	QPSK	1	74	22.80	0	0
	1717.5	20025	15	QPSK	36	0	21.87	0-1	1
	1717.5	20025	15	QPSK	36	18	21.74	0-1	1
	1717.5	20025	15	QPSK	36	37	21.78	0-1	1
	1717.5	20025	15	QPSK	75	0	21.87	0-1	1
	1717.5	20025	15	16QAM	1	0	21.96	0-1	1
	1717.5	20025	15	16QAM	1	36	21.92	0-1	1
	1717.5	20025	15	16QAM	1	74	21.86	0-1	1
	1717.5	20025	15	16QAM	36	0	20.81	0-2	2
	1717.5	20025	15	16QAM	36	18	20.72	0-2	2
	1717.5	20025	15	16QAM	36	37	20.69	0-2	2
	1717.5	20025	15	16QAM	75	0	20.80	0-2	2
	1732.5	20175	15	QPSK	1	0	22.65	0	0
	1732.5	20175	15	QPSK	1	36	22.68	0	0
	1732.5	20175	15	QPSK	1	74	22.71	0	0
Mid	1732.5	20175	15	QPSK	36	0	21.61	0-1	1
	1732.5	20175	15	QPSK	36	18	21.62	0-1	1
	1732.5	20175	15	QPSK	36	37	21.59	0-1	1
	1732.5	20175	15	QPSK	75	0	21.68	0-1	1
	1732.5	20175	15	16QAM	1	0	21.40	0-1	1
	1732.5	20175	15	16QAM	1	36	21.38	0-1	1
	1732.5	20175	15	16QAM	1	74	21.46	0-1	1
	1732.5	20175	15	16QAM	36	0	20.52	0-2	2
	1732.5	20175	15	16QAM	36	18	20.54	0-2	2
	1732.5	20175	15	16QAM	36	37	20.50	0-2	2
	1732.5	20175	15	16QAM	75	0	20.61	0-2	2
High	1747.5	20325	15	QPSK	1	0	22.69	0	0
	1747.5	20325	15	QPSK	1	36	22.70	0	0
	1747.5	20325	15	QPSK	1	74	22.61	0	0
	1747.5	20325	15	QPSK	36	0	21.64	0-1	1
	1747.5	20325	15	QPSK	36	18	21.65	0-1	1
	1747.5	20325	15	QPSK	36	37	21.63	0-1	1
	1747.5	20325	15	QPSK	75	0	21.71	0-1	1
	1747.5	20325	15	16QAM	1	0	21.75	0-1	1
	1747.5	20325	15	16QAM	1	36	21.79	0-1	1
	1747.5	20325	15	16QAM	1	74	21.65	0-1	1
	1747.5	20325	15	16QAM	36	0	20.60	0-2	2
	1747.5	20325	15	16QAM	36	18	20.63	0-2	2
	1747.5	20325	15	16QAM	36	37	20.68	0-2	2
	1747.5	20325	15	16QAM	75	0	20.69	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1715	20000	10	QPSK	1	0	22.88	0	0
	1715	20000	10	QPSK	1	25	22.83	0	0
	1715	20000	10	QPSK	1	49	22.87	0	0
	1715	20000	10	QPSK	25	0	21.77	-0.1	1
	1715	20000	10	QPSK	25	12	21.79	-0.1	1
	1715	20000	10	QPSK	25	25	21.75	-0.1	1
	1715	20000	10	QPSK	50	0	21.82	-0.1	1
	1715	20000	10	16QAM	1	0	21.66	-0.1	1
	1715	20000	10	16QAM	1	25	21.52	-0.1	1
	1715	20000	10	16QAM	1	49	21.53	-0.1	1
	1715	20000	10	16QAM	25	0	20.90	-0.2	2
	1715	20000	10	16QAM	25	12	20.92	-0.2	2
	1715	20000	10	16QAM	25	25	20.77	-0.2	2
	1715	20000	10	16QAM	50	0	20.84	-0.2	2
	1732.5	20175	10	QPSK	1	0	22.68	0	0
	1732.5	20175	10	QPSK	1	25	22.67	0	0
	1732.5	20175	10	QPSK	1	49	22.60	0	0
Mid	1732.5	20175	10	QPSK	25	0	21.60	-0.1	1
	1732.5	20175	10	QPSK	25	12	21.58	-0.1	1
	1732.5	20175	10	QPSK	25	25	21.59	-0.1	1
	1732.5	20175	10	QPSK	50	0	21.62	-0.1	1
	1732.5	20175	10	16QAM	1	0	21.45	-0.1	1
	1732.5	20175	10	16QAM	1	25	21.40	-0.1	1
	1732.5	20175	10	16QAM	1	49	21.32	-0.1	1
	1732.5	20175	10	16QAM	25	0	20.52	-0.2	2
	1732.5	20175	10	16QAM	25	12	20.53	-0.2	2
	1732.5	20175	10	16QAM	25	25	20.54	-0.2	2
	1732.5	20175	10	16QAM	50	0	20.62	-0.2	2
High	1750	20350	10	QPSK	1	0	22.74	0	0
	1750	20350	10	QPSK	1	25	22.61	0	0
	1750	20350	10	QPSK	1	49	22.57	0	0
	1750	20350	10	QPSK	25	0	21.58	-0.1	1
	1750	20350	10	QPSK	25	12	21.62	-0.1	1
	1750	20350	10	QPSK	25	25	21.52	-0.1	1
	1750	20350	10	QPSK	50	0	21.63	-0.1	1
	1750	20350	10	16QAM	1	0	21.76	-0.1	1
	1750	20350	10	16QAM	1	25	21.66	-0.1	1
	1750	20350	10	16QAM	1	49	21.65	-0.1	1
	1750	20350	10	16QAM	25	0	20.56	-0.2	2
	1750	20350	10	16QAM	25	12	20.63	-0.2	2
	1750	20350	10	16QAM	25	25	20.51	-0.2	2
	1750	20350	10	16QAM	50	0	20.57	-0.2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1712.5	19975	5	QPSK	1	0	22.78	0	0
	1712.5	19975	5	QPSK	1	12	22.73	0	0
	1712.5	19975	5	QPSK	1	24	22.87	0	0
	1712.5	19975	5	QPSK	12	0	21.82	-0.1	1
	1712.5	19975	5	QPSK	12	6	21.79	-0.1	1
	1712.5	19975	5	QPSK	12	13	21.81	-0.1	1
	1712.5	19975	5	QPSK	25	0	21.83	-0.1	1
	1712.5	19975	5	16-QAM	1	0	21.65	-0.1	1
	1712.5	19975	5	16-QAM	1	12	21.63	-0.1	1
	1712.5	19975	5	16-QAM	1	24	21.65	-0.1	1
	1712.5	19975	5	16-QAM	12	0	20.88	-0.2	2
	1712.5	19975	5	16-QAM	12	6	20.82	-0.2	2
	1712.5	19975	5	16-QAM	12	13	20.84	-0.2	2
	1712.5	19975	5	16-QAM	25	0	20.93	-0.2	2
Mid	1732.5	20175	5	QPSK	1	0	22.68	0	0
	1732.5	20175	5	QPSK	1	12	22.71	0	0
	1732.5	20175	5	QPSK	1	24	22.70	0	0
	1732.5	20175	5	QPSK	12	0	21.63	-0.1	1
	1732.5	20175	5	QPSK	12	6	21.62	-0.1	1
	1732.5	20175	5	QPSK	12	13	21.58	-0.1	1
	1732.5	20175	5	QPSK	25	0	21.55	-0.1	1
	1732.5	20175	5	16-QAM	1	0	21.40	-0.1	1
	1732.5	20175	5	16-QAM	1	12	21.38	-0.1	1
	1732.5	20175	5	16-QAM	1	24	21.41	-0.1	1
	1732.5	20175	5	16-QAM	12	0	20.63	-0.2	2
	1732.5	20175	5	16-QAM	12	6	20.60	-0.2	2
	1732.5	20175	5	16-QAM	12	13	20.63	-0.2	2
	1732.5	20175	5	16-QAM	25	0	20.65	-0.2	2
High	1752.5	20375	5	QPSK	1	0	22.56	0	0
	1752.5	20375	5	QPSK	1	12	22.56	0	0
	1752.5	20375	5	QPSK	1	24	22.53	0	0
	1752.5	20375	5	QPSK	12	0	21.59	-0.1	1
	1752.5	20375	5	QPSK	12	6	21.54	-0.1	1
	1752.5	20375	5	QPSK	12	13	21.53	-0.1	1
	1752.5	20375	5	QPSK	25	0	21.52	-0.1	1
	1752.5	20375	5	16-QAM	1	0	21.90	-0.1	1
	1752.5	20375	5	16-QAM	1	12	21.88	-0.1	1
	1752.5	20375	5	16-QAM	1	24	21.82	-0.1	1
	1752.5	20375	5	16-QAM	12	0	20.55	-0.2	2
	1752.5	20375	5	16-QAM	12	6	20.49	-0.2	2
	1752.5	20375	5	16-QAM	12	13	20.42	-0.2	2
	1752.5	20375	5	16-QAM	25	0	20.49	-0.2	2

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

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1711.5	19965	3	QPSK	1	0	22.87	0
	1711.5	19965	3	QPSK	1	7	22.85	0
	1711.5	19965	3	QPSK	1	14	22.87	0
	1711.5	19965	3	QPSK	8	0	21.82	0-1
	1711.5	19965	3	QPSK	8	4	21.78	0-1
	1711.5	19965	3	QPSK	8	7	21.78	0-1
	1711.5	19965	3	QPSK	15	0	21.82	0-1
	1711.5	19965	3	16-QAM	1	0	22.00	0-1
	1711.5	19965	3	16-QAM	1	7	21.97	0-1
	1711.5	19965	3	16-QAM	1	14	22.00	0-1
	1711.5	19965	3	16-QAM	8	0	20.86	0-2
	1711.5	19965	3	16-QAM	8	4	20.85	0-2
	1711.5	19965	3	16-QAM	8	7	20.90	0-2
	1711.5	19965	3	16-QAM	15	0	20.89	0-2
	1711.5	19965	3	16-QAM	15	0	20.89	0-2
Mid	1732.5	20175	3	QPSK	1	0	22.66	0
	1732.5	20175	3	QPSK	1	7	22.65	0
	1732.5	20175	3	QPSK	1	14	22.67	0
	1732.5	20175	3	QPSK	8	0	21.61	0-1
	1732.5	20175	3	QPSK	8	4	21.59	0-1
	1732.5	20175	3	QPSK	8	7	21.62	0-1
	1732.5	20175	3	QPSK	15	0	21.62	0-1
	1732.5	20175	3	16-QAM	1	0	21.42	0-1
	1732.5	20175	3	16-QAM	1	7	21.39	0-1
	1732.5	20175	3	16-QAM	1	14	21.45	0-1
	1732.5	20175	3	16-QAM	8	0	20.55	0-2
	1732.5	20175	3	16-QAM	8	4	20.57	0-2
	1732.5	20175	3	16-QAM	8	7	20.59	0-2
	1732.5	20175	3	16-QAM	8	7	20.59	0-2
	1732.5	20175	3	16-QAM	15	0	20.60	0-2
High	1753.5	20385	3	QPSK	1	0	22.69	0
	1753.5	20385	3	QPSK	1	7	22.51	0
	1753.5	20385	3	QPSK	1	14	22.60	0
	1753.5	20385	3	QPSK	8	0	21.59	0-1
	1753.5	20385	3	QPSK	8	4	21.52	0-1
	1753.5	20385	3	QPSK	8	7	21.55	0-1
	1753.5	20385	3	QPSK	15	0	21.52	0-1
	1753.5	20385	3	16-QAM	1	0	21.41	0-1
	1753.5	20385	3	16-QAM	1	7	21.28	0-1
	1753.5	20385	3	16-QAM	1	14	21.34	0-1
	1753.5	20385	3	16-QAM	8	0	20.59	0-2
	1753.5	20385	3	16-QAM	8	4	20.45	0-2
	1753.5	20385	3	16-QAM	8	7	20.48	0-2
	1753.5	20385	3	16-QAM	8	7	20.48	0-2
	1753.5	20385	3	16-QAM	15	0	20.47	0-2
	1753.5	20385	3	16-QAM	15	0	20.47	0-2

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

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1710.7	19957	1.4	QPSK	1	0	22.81	0
	1710.7	19957	1.4	QPSK	1	2	22.84	0
	1710.7	19957	1.4	QPSK	1	5	22.87	0
	1710.7	19957	1.4	QPSK	3	0	22.87	0
	1710.7	19957	1.4	QPSK	3	2	22.88	0
	1710.7	19957	1.4	QPSK	3	3	22.82	0
	1710.7	19957	1.4	QPSK	6	0	21.80	0-1
	1710.7	19957	1.4	16-QAM	1	0	21.85	0-1
	1710.7	19957	1.4	16-QAM	1	2	21.78	0-1
	1710.7	19957	1.4	16-QAM	1	5	21.87	0-1
	1710.7	19957	1.4	16-QAM	3	0	21.70	0-1
	1710.7	19957	1.4	16-QAM	3	2	21.77	0-1
	1710.7	19957	1.4	16-QAM	3	3	21.72	0-1
	1710.7	19957	1.4	16-QAM	6	0	20.86	0-2
	1710.7	19957	1.4	16-QAM	6	0	20.86	0-2
Mid	1732.5	20175	1.4	QPSK	1	0	22.86	0
	1732.5	20175	1.4	QPSK	1	2	22.84	0
	1732.5	20175	1.4	QPSK	1	5	22.80	0
	1732.5	20175	1.4	QPSK	3	0	22.74	0
	1732.5	20175	1.4	QPSK	3	2	22.71	0
	1732.5	20175	1.4	QPSK	3	3	22.75	0
	1732.5	20175	1.4	QPSK	6	0	21.69	0-1
	1732.5	20175	1.4	16-QAM	1	0	21.73	0-1
	1732.5	20175	1.4	16-QAM	1	2	21.67	0-1
	1732.5	20175	1.4	16-QAM	1	5	21.73	0-1
	1732.5	20175	1.4	16-QAM	3	0	21.58	0-1
	1732.5	20175	1.4	16-QAM	3	2	21.56	0-1
	1732.5	20175	1.4	16-QAM	3	3	21.59	0-1
	1732.5	20175	1.4	16-QAM	6	0	20.65	0-2
	1732.5	20175	1.4	16-QAM	6	0	20.65	0-2
High	1754.3	20393	1.4	QPSK	1	0	22.78	0
	1754.3	20393	1.4	QPSK	1	2	22.70	0
	1754.3	20393	1.4	QPSK	1	5	22.78	0
	1754.3	20393	1.4	QPSK	3	0	22.59	0
	1754.3	20393	1.4	QPSK	3	2	22.62	0
	1754.3	20393	1.4	QPSK	3	3	22.64	0
	1754.3	20393	1.4	QPSK	6	0	21.56	0-1
	1754.3	20393	1.4	16-QAM	1	0	21.58	0-1
	1754.3	20393	1.4	16-QAM	1	2	21.56	0-1
	1754.3	20393	1.4	16-QAM	1	5	21.59	0-1
	1754.3	20393	1.4	16-QAM	3	0	21.47	0-1
	1754.3	20393	1.4	16-QAM	3	2	21.42	0-1
	1754.3	20393	1.4	16-QAM	3	3	21.49	0-1
	1754.3	20393	1.4	16-QAM	6	0	20.54	0-2
	1754.3	20393	1.4	16-QAM	6	0	20.54	0-2
	1754.3	20393	1.4	16-QAM	6	0	20.54	0-2

Table 9-15
Reduced LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	1732.5	20175	20	QPSK	1	0	20.97	0	0
	1732.5	20175	20	QPSK	1	50	20.94	0	0
	1732.5	20175	20	QPSK	1	99	20.81	0	0
	1732.5	20175	20	QPSK	50	0	20.96	0	0
	1732.5	20175	20	QPSK	50	25	20.90	0	0
	1732.5	20175	20	QPSK	50	50	20.88	0	0
	1732.5	20175	20	QPSK	100	0	20.89	0	0
	1732.5	20175	20	16QAM	1	0	20.81	0	0
	1732.5	20175	20	16QAM	1	50	20.77	0	0
	1732.5	20175	20	16QAM	1	99	20.69	0	0
	1732.5	20175	20	16QAM	50	0	20.91	0	0
	1732.5	20175	20	16QAM	50	25	20.93	0	0
	1732.5	20175	20	16QAM	50	50	20.90	0	0
	1732.5	20175	20	16QAM	100	0	20.98	0	0

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

Table 9-16
Reduced LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1717.5	20025	15	QPSK	1	0	20.77	0	0
	1717.5	20025	15	QPSK	1	36	20.80	0	0
	1717.5	20025	15	QPSK	1	74	20.76	0	0
	1717.5	20025	15	QPSK	36	0	20.65	0	0
	1717.5	20025	15	QPSK	36	18	20.87	0	0
	1717.5	20025	15	QPSK	36	37	20.99	0	0
	1717.5	20025	15	QPSK	75	0	20.92	0	0
	1717.5	20025	15	16QAM	1	0	20.93	0	0
	1717.5	20025	15	16QAM	1	36	20.78	0	0
	1717.5	20025	15	16QAM	1	74	20.93	0	0
	1717.5	20025	15	16QAM	36	0	20.88	0	0
	1717.5	20025	15	16QAM	36	18	20.67	0	0
Mid	1717.5	20025	15	16QAM	36	37	20.70	0	0
	1717.5	20025	15	16QAM	75	0	20.92	0	0
	1732.5	20175	15	QPSK	1	0	20.83	0	0
	1732.5	20175	15	QPSK	1	36	20.83	0	0
	1732.5	20175	15	QPSK	1	74	20.69	0	0
	1732.5	20175	15	QPSK	36	0	20.65	0	0
	1732.5	20175	15	QPSK	36	18	20.82	0	0
	1732.5	20175	15	QPSK	36	37	20.74	0	0
	1732.5	20175	15	QPSK	75	0	20.73	0	0
	1732.5	20175	15	16QAM	1	0	20.68	0	0
	1732.5	20175	15	16QAM	1	36	20.91	0	0
	1732.5	20175	15	16QAM	1	74	20.73	0	0
High	1732.5	20175	15	16QAM	36	0	20.71	0	0
	1732.5	20175	15	16QAM	36	18	20.77	0	0
	1732.5	20175	15	16QAM	36	37	20.92	0	0
	1732.5	20175	15	16QAM	75	0	20.87	0	0
	1747.5	20325	15	QPSK	1	0	20.97	0	0
	1747.5	20325	15	QPSK	1	36	20.83	0	0
	1747.5	20325	15	QPSK	1	74	20.94	0	0
	1747.5	20325	15	QPSK	36	0	20.68	0	0
	1747.5	20325	15	QPSK	36	18	20.86	0	0
	1747.5	20325	15	QPSK	36	37	20.99	0	0
	1747.5	20325	15	QPSK	75	0	21.00	0	0
	1747.5	20325	15	16QAM	1	0	21.00	0	0
	1747.5	20325	15	16QAM	1	36	20.77	0	0
	1747.5	20325	15	16QAM	1	74	20.93	0	0
	1747.5	20325	15	16QAM	36	0	20.82	0	0
	1747.5	20325	15	16QAM	36	18	20.71	0	0
	1747.5	20325	15	16QAM	36	37	20.86	0	0
	1747.5	20325	15	16QAM	75	0	20.94	0	0

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Document S/N: OY1407281548.A3L	Test Dates: 07/28/14 - 08/30/14	DUT Type: Portable Handset
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Table 9-17
Reduced LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1715	20000	10	QPSK	1	0	20.83	0	0
	1715	20000	10	QPSK	1	25	20.76	0	0
	1715	20000	10	QPSK	1	49	20.70	0	0
	1715	20000	10	QPSK	25	0	20.94	0	0
	1715	20000	10	QPSK	25	12	20.95	0	0
	1715	20000	10	QPSK	25	25	20.93	0	0
	1715	20000	10	QPSK	50	0	20.72	0	0
	1715	20000	10	16QAM	1	0	20.78	0	0
	1715	20000	10	16QAM	1	25	20.99	0	0
	1715	20000	10	16QAM	1	49	20.73	0	0
	1715	20000	10	16QAM	25	0	20.99	0	0
	1715	20000	10	16QAM	25	12	20.98	0	0
	1715	20000	10	16QAM	25	25	20.84	0	0
	1715	20000	10	16QAM	50	0	20.74	0	0
	1732.5	20175	10	QPSK	1	0	21.00	0	0
Mid	1732.5	20175	10	QPSK	1	25	20.73	0	0
	1732.5	20175	10	QPSK	1	49	20.95	0	0
	1732.5	20175	10	QPSK	25	0	20.93	0	0
	1732.5	20175	10	QPSK	25	12	21.00	0	0
	1732.5	20175	10	QPSK	25	25	20.89	0	0
	1732.5	20175	10	QPSK	50	0	20.81	0	0
	1732.5	20175	10	16QAM	1	0	20.91	0	0
	1732.5	20175	10	16QAM	1	25	20.67	0	0
	1732.5	20175	10	16QAM	1	49	20.67	0	0
	1732.5	20175	10	16QAM	25	0	20.89	0	0
	1732.5	20175	10	16QAM	25	12	20.83	0	0
	1732.5	20175	10	16QAM	25	25	20.92	0	0
	1732.5	20175	10	16QAM	50	0	20.71	0	0
	1750	20350	10	QPSK	1	0	20.79	0	0
	1750	20350	10	QPSK	1	25	20.70	0	0
	1750	20350	10	QPSK	1	49	20.73	0	0
High	1750	20350	10	QPSK	25	0	20.82	0	0
	1750	20350	10	QPSK	25	12	20.87	0	0
	1750	20350	10	QPSK	25	25	20.73	0	0
	1750	20350	10	QPSK	50	0	20.96	0	0
	1750	20350	10	16QAM	1	0	20.98	0	0
	1750	20350	10	16QAM	1	25	20.68	0	0
	1750	20350	10	16QAM	1	49	20.73	0	0
	1750	20350	10	16QAM	25	0	20.97	0	0
	1750	20350	10	16QAM	25	12	20.86	0	0
	1750	20350	10	16QAM	25	25	20.77	0	0
	1750	20350	10	16QAM	50	0	20.95	0	0

Table 9-18
Reduced LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1712.5	19975	5	QPSK	1	0	20.83	0	0
	1712.5	19975	5	QPSK	1	12	20.85	0	0
	1712.5	19975	5	QPSK	1	24	20.85	0	0
	1712.5	19975	5	QPSK	12	0	20.93	0	0
	1712.5	19975	5	QPSK	12	6	20.90	0	0
	1712.5	19975	5	QPSK	12	13	20.73	0	0
	1712.5	19975	5	QPSK	25	0	20.92	0	0
	1712.5	19975	5	16-QAM	1	0	20.84	0	0
	1712.5	19975	5	16-QAM	1	12	21.00	0	0
	1712.5	19975	5	16-QAM	1	24	20.76	0	0
	1712.5	19975	5	16-QAM	12	0	20.66	0	0
	1712.5	19975	5	16-QAM	12	6	20.88	0	0
	1712.5	19975	5	16-QAM	12	13	20.85	0	0
	1712.5	19975	5	16-QAM	25	0	20.89	0	0
	1732.5	20175	5	QPSK	1	0	20.80	0	0
Mid	1732.5	20175	5	QPSK	1	12	20.94	0	0
	1732.5	20175	5	QPSK	1	24	20.94	0	0
	1732.5	20175	5	QPSK	12	0	20.90	0	0
	1732.5	20175	5	QPSK	12	6	20.77	0	0
	1732.5	20175	5	QPSK	12	13	20.92	0	0
	1732.5	20175	5	QPSK	25	0	20.93	0	0
	1732.5	20175	5	16-QAM	1	0	20.75	0	0
	1732.5	20175	5	16-QAM	1	12	20.71	0	0
	1732.5	20175	5	16-QAM	1	24	20.95	0	0
	1732.5	20175	5	16-QAM	12	0	20.86	0	0
	1732.5	20175	5	16-QAM	12	6	20.88	0	0
	1732.5	20175	5	16-QAM	12	13	20.66	0	0
	1732.5	20175	5	16-QAM	25	0	20.68	0	0
	1752.5	20375	5	QPSK	1	0	20.85	0	0
	1752.5	20375	5	QPSK	1	12	20.91	0	0
High	1752.5	20375	5	QPSK	1	24	20.69	0	0
	1752.5	20375	5	QPSK	12	0	20.87	0	0
	1752.5	20375	5	QPSK	12	6	20.79	0	0
	1752.5	20375	5	QPSK	12	13	20.81	0	0
	1752.5	20375	5	QPSK	25	0	20.94	0	0
	1752.5	20375	5	16-QAM	1	0	20.77	0	0
	1752.5	20375	5	16-QAM	1	12	20.90	0	0
	1752.5	20375	5	16-QAM	1	24	20.79	0	0
	1752.5	20375	5	16-QAM	12	0	20.82	0	0
	1752.5	20375	5	16-QAM	12	6	20.87	0	0
	1752.5	20375	5	16-QAM	12	13	20.75	0	0
	1752.5	20375	5	16-QAM	25	0	20.88	0	0

Table 9-19
Reduced LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth
(Representing Hotspot Mode)

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1711.5	19965	3	QPSK	1	0	20.87	0
	1711.5	19965	3	QPSK	1	7	20.90	0
	1711.5	19965	3	QPSK	1	14	20.87	0
	1711.5	19965	3	QPSK	8	0	20.81	0
	1711.5	19965	3	QPSK	8	4	20.73	0
	1711.5	19965	3	QPSK	8	7	20.74	0
	1711.5	19965	3	QPSK	15	0	20.84	0
	1711.5	19965	3	16-QAM	1	0	20.86	0
	1711.5	19965	3	16-QAM	1	7	20.84	0
	1711.5	19965	3	16-QAM	1	14	20.78	0
	1711.5	19965	3	16-QAM	8	0	20.67	0
	1711.5	19965	3	16-QAM	8	4	20.86	0
	1711.5	19965	3	16-QAM	8	7	20.98	0
	1711.5	19965	3	16-QAM	15	0	20.92	0
	1732.5	20175	3	QPSK	1	0	20.94	0
	1732.5	20175	3	QPSK	1	7	20.71	0
	1732.5	20175	3	QPSK	1	14	20.93	0
Mid	1732.5	20175	3	QPSK	8	0	20.84	0
	1732.5	20175	3	QPSK	8	4	20.95	0
	1732.5	20175	3	QPSK	8	7	20.82	0
	1732.5	20175	3	QPSK	15	0	20.97	0
	1732.5	20175	3	16-QAM	1	0	20.78	0
	1732.5	20175	3	16-QAM	1	7	20.69	0
	1732.5	20175	3	16-QAM	1	14	20.79	0
	1732.5	20175	3	16-QAM	8	0	20.77	0
	1732.5	20175	3	16-QAM	8	4	20.94	0
	1732.5	20175	3	16-QAM	8	7	20.81	0
	1732.5	20175	3	16-QAM	15	0	20.86	0
	1753.5	20385	3	QPSK	1	0	20.83	0
	1753.5	20385	3	QPSK	1	7	20.84	0
	1753.5	20385	3	QPSK	1	14	20.88	0
	1753.5	20385	3	QPSK	8	0	20.73	0
	1753.5	20385	3	QPSK	8	4	20.91	0
	1753.5	20385	3	QPSK	8	7	20.70	0
	1753.5	20385	3	QPSK	15	0	20.88	0
	1753.5	20385	3	16-QAM	1	0	20.94	0
High	1753.5	20385	3	16-QAM	1	7	20.93	0
	1753.5	20385	3	16-QAM	1	14	20.71	0
	1753.5	20385	3	16-QAM	8	0	20.67	0
	1753.5	20385	3	16-QAM	8	4	20.73	0
	1753.5	20385	3	16-QAM	8	7	20.93	0
	1753.5	20385	3	16-QAM	15	0	20.74	0

Table 9-20
Reduced LTE Band 4 (AWS) Conducted Powers - 1.4 MHz Bandwidth
(Representing Hotspot Mode)

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1710.7	19957	1.4	QPSK	1	0	20.72	0
	1710.7	19957	1.4	QPSK	1	2	20.87	0
	1710.7	19957	1.4	QPSK	1	5	20.70	0
	1710.7	19957	1.4	QPSK	3	0	20.93	0
	1710.7	19957	1.4	QPSK	3	2	20.86	0
	1710.7	19957	1.4	QPSK	3	3	20.94	0
	1710.7	19957	1.4	QPSK	6	0	20.76	0
	1710.7	19957	1.4	16-QAM	1	0	20.69	0
	1710.7	19957	1.4	16-QAM	1	2	20.98	0
	1710.7	19957	1.4	16-QAM	1	5	20.86	0
	1710.7	19957	1.4	16-QAM	3	0	20.87	0
	1710.7	19957	1.4	16-QAM	3	2	20.68	0
	1710.7	19957	1.4	16-QAM	3	3	20.93	0
	1710.7	19957	1.4	16-QAM	6	0	20.93	0
	1732.5	20175	1.4	QPSK	1	0	20.93	0
	1732.5	20175	1.4	QPSK	1	2	20.93	0
	1732.5	20175	1.4	QPSK	1	5	20.80	0
Mid	1732.5	20175	1.4	QPSK	3	0	20.96	0
	1732.5	20175	1.4	QPSK	3	2	20.98	0
	1732.5	20175	1.4	QPSK	3	3	20.86	0
	1732.5	20175	1.4	QPSK	6	0	20.90	0
	1732.5	20175	1.4	16-QAM	1	0	20.84	0
	1732.5	20175	1.4	16-QAM	1	2	20.77	0
	1732.5	20175	1.4	16-QAM	1	5	20.98	0
	1732.5	20175	1.4	16-QAM	3	0	21.00	0
	1732.5	20175	1.4	16-QAM	3	2	20.71	0
	1732.5	20175	1.4	16-QAM	3	3	20.98	0
	1732.5	20175	1.4	16-QAM	6	0	20.93	0
	1754.3	20393	1.4	QPSK	1	0	20.80	0
	1754.3	20393	1.4	QPSK	1	2	20.84	0
	1754.3	20393	1.4	QPSK	1	5	20.88	0
	1754.3	20393	1.4	QPSK	3	0	20.77	0
	1754.3	20393	1.4	QPSK	3	2	20.65	0
	1754.3	20393	1.4	QPSK	3	3	20.91	0
	1754.3	20393	1.4	QPSK	6	0	20.80	0
High	1754.3	20393	1.4	16-QAM	1	0	20.86	0
	1754.3	20393	1.4	16-QAM	1	2	20.83	0
	1754.3	20393	1.4	16-QAM	1	5	20.76	0
	1754.3	20393	1.4	16-QAM	3	0	20.73	0
	1754.3	20393	1.4	16-QAM	3	2	20.82	0
	1754.3	20393	1.4	16-QAM	3	3	20.75	0
	1754.3	20393	1.4	16-QAM	6	0	20.77	0

9.3.4 LTE Band 2 (PCS)

Table 9-21
Maximum LTE Band 2 (PCS) Conducted Powers - 20 MHz Bandwidth

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	18700	20	QPSK	1	0	22.99	0
	1860	18700	20	QPSK	1	50	23.01	0
	1860	18700	20	QPSK	1	99	23.02	0
	1860	18700	20	QPSK	50	0	22.06	-0.1
	1860	18700	20	QPSK	50	25	22.17	-0.1
	1860	18700	20	QPSK	50	50	22.22	-0.1
	1860	18700	20	QPSK	100	0	22.13	-0.1
	1860	18700	20	16QAM	1	0	22.44	-0.1
	1860	18700	20	16QAM	1	50	22.46	-0.1
	1860	18700	20	16QAM	1	99	22.46	-0.1
	1860	18700	20	16QAM	50	0	21.08	-0.2
	1860	18700	20	16QAM	50	25	21.15	-0.2
	1860	18700	20	16QAM	50	50	21.23	-0.2
	1860	18700	20	16QAM	100	0	21.22	-0.2
	1880.0	18900	20	QPSK	1	0	23.10	0
	1880.0	18900	20	QPSK	1	50	23.17	0
Mid	1880.0	18900	20	QPSK	1	99	23.31	0
	1880.0	18900	20	QPSK	50	0	22.11	-0.1
	1880.0	18900	20	QPSK	50	25	22.21	-0.1
	1880.0	18900	20	QPSK	50	50	22.22	-0.1
	1880.0	18900	20	QPSK	100	0	22.21	-0.1
	1880.0	18900	20	16QAM	1	0	22.05	-0.1
	1880.0	18900	20	16QAM	1	50	22.10	-0.1
	1880.0	18900	20	16QAM	1	99	22.04	-0.1
	1880.0	18900	20	16QAM	50	0	21.18	-0.2
	1880.0	18900	20	16QAM	50	25	21.13	-0.2
	1880.0	18900	20	16QAM	50	50	21.32	-0.2
	1880.0	18900	20	16QAM	100	0	21.20	-0.2
	1900	19100	20	QPSK	1	0	23.23	0
	1900	19100	20	QPSK	1	50	23.33	0
	1900	19100	20	QPSK	1	99	23.41	0
	1900	19100	20	QPSK	50	0	22.19	-0.1
High	1900	19100	20	QPSK	50	25	22.30	-0.1
	1900	19100	20	QPSK	50	50	22.33	-0.1
	1900	19100	20	QPSK	100	0	22.30	-0.1
	1900	19100	20	16QAM	1	0	22.49	-0.1
	1900	19100	20	16QAM	1	50	22.47	-0.1
	1900	19100	20	16QAM	1	99	22.50	-0.1
	1900	19100	20	16QAM	50	0	21.21	-0.2
	1900	19100	20	16QAM	50	25	21.35	-0.2
	1900	19100	20	16QAM	50	50	21.25	-0.2
	1900	19100	20	16QAM	100	0	21.35	-0.2

Table 9-22
Maximum LTE Band 2 (PCS) Conducted Powers - 15 MHz Bandwidth

Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	18675	15	QPSK	1	0	23.29	0
	1857.5	18675	15	QPSK	1	36	23.20	0
	1857.5	18675	15	QPSK	1	74	23.20	0
	1857.5	18675	15	QPSK	36	0	22.07	-0.1
	1857.5	18675	15	QPSK	36	18	22.12	-0.1
	1857.5	18675	15	QPSK	36	37	22.10	-0.1
	1857.5	18675	15	QPSK	75	0	22.13	-0.1
	1857.5	18675	15	16QAM	1	0	21.93	-0.1
	1857.5	18675	15	16QAM	1	36	22.04	-0.1
	1857.5	18675	15	16QAM	1	74	22.07	-0.1
	1857.5	18675	15	16QAM	36	0	21.02	-0.2
	1857.5	18675	15	16QAM	36	18	21.03	-0.2
	1857.5	18675	15	16QAM	36	37	21.04	-0.2
	1857.5	18675	15	16QAM	75	0	21.13	-0.2
	1880.0	18900	15	QPSK	1	0	23.21	0
	1880.0	18900	15	QPSK	1	36	23.29	0
Mid	1880.0	18900	15	QPSK	1	74	23.35	0
	1880.0	18900	15	QPSK	36	0	22.27	-0.1
	1880.0	18900	15	QPSK	36	18	22.28	-0.1
	1880.0	18900	15	QPSK	36	37	22.34	-0.1
	1880.0	18900	15	QPSK	75	0	22.29	-0.1
	1880.0	18900	15	16QAM	1	0	22.02	-0.1
	1880.0	18900	15	16QAM	1	36	22.06	-0.1
	1880.0	18900	15	16QAM	1	74	22.05	-0.1
	1880.0	18900	15	16QAM	36	0	21.06	-0.2
	1880.0	18900	15	16QAM	36	18	21.08	-0.2
	1880.0	18900	15	16QAM	36	37	21.20	-0.2
	1880.0	18900	15	16QAM	75	0	21.22	-0.2
	1902.5	19125	15	QPSK	1	0	23.37	0
	1902.5	19125	15	QPSK	1	36	23.14	0
	1902.5	19125	15	QPSK	1	74	23.11	0
High	1902.5	19125	15	QPSK	36	0	22.27	-0.1
	1902.5	19125	15	QPSK	36	18	22.34	-0.1
	1902.5	19125	15	QPSK	36	37	22.01	-0.1
	1902.5	19125	15	QPSK	75	0	22.25	-0.1
	1902.5	19125	15	16QAM	1	0	22.49	-0.1
	1902.5	19125	15	16QAM	1	36	22.50	-0.1
	1902.5	19125	15	16QAM	1	74	22.09	-0.1
	1902.5	19125	15	16QAM	36	0	21.23	-0.2
	1902.5	19125	15	16QAM	36	18	21.25	-0.2
	1902.5	19125	15	16QAM	36	37	21.13	-0.2
	1902.5	19125	15	16QAM	75	0	21.26	-0.2

Table 9-23
Maximum LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	18650	10	QPSK	1	0	23.22	0	0
	1855	18650	10	QPSK	1	25	23.20	0	0
	1855	18650	10	QPSK	1	49	23.25	0	0
	1855	18650	10	QPSK	25	0	22.24	0-1	1
	1855	18650	10	QPSK	25	12	22.23	0-1	1
	1855	18650	10	QPSK	25	25	22.30	0-1	1
	1855	18650	10	QPSK	50	0	22.32	0-1	1
	1855	18650	10	16QAM	1	0	22.05	0-1	1
	1855	18650	10	16QAM	1	25	22.00	0-1	1
	1855	18650	10	16QAM	1	49	22.09	0-1	1
	1855	18650	10	16QAM	25	0	21.29	0-2	2
	1855	18650	10	16QAM	25	12	21.26	0-2	2
	1855	18650	10	16QAM	25	25	21.30	0-2	2
	1855	18650	10	16QAM	50	0	21.26	0-2	2
Mid	1880.0	18900	10	QPSK	1	0	23.14	0	0
	1880.0	18900	10	QPSK	1	25	23.21	0	0
	1880.0	18900	10	QPSK	1	49	23.20	0	0
	1880.0	18900	10	QPSK	25	0	22.13	0-1	1
	1880.0	18900	10	QPSK	25	12	22.14	0-1	1
	1880.0	18900	10	QPSK	25	25	22.25	0-1	1
	1880.0	18900	10	QPSK	50	0	22.23	0-1	1
	1880.0	18900	10	16QAM	1	0	22.06	0-1	1
	1880.0	18900	10	16QAM	1	25	22.08	0-1	1
	1880.0	18900	10	16QAM	1	49	22.01	0-1	1
	1880.0	18900	10	16QAM	25	0	21.15	0-2	2
	1880.0	18900	10	16QAM	25	12	21.23	0-2	2
	1880.0	18900	10	16QAM	25	25	21.25	0-2	2
	1880.0	18900	10	16QAM	50	0	21.17	0-2	2
High	1905	19150	10	QPSK	1	0	23.31	0	0
	1905	19150	10	QPSK	1	25	23.24	0	0
	1905	19150	10	QPSK	1	49	23.10	0	0
	1905	19150	10	QPSK	25	0	22.20	0-1	1
	1905	19150	10	QPSK	25	12	22.18	0-1	1
	1905	19150	10	QPSK	25	25	22.22	0-1	1
	1905	19150	10	QPSK	50	0	22.21	0-1	1
	1905	19150	10	16QAM	1	0	22.41	0-1	1
	1905	19150	10	16QAM	1	25	22.37	0-1	1
	1905	19150	10	16QAM	1	49	22.38	0-1	1
	1905	19150	10	16QAM	25	0	21.22	0-2	2
	1905	19150	10	16QAM	25	12	21.25	0-2	2
	1905	19150	10	16QAM	25	25	21.31	0-2	2
	1905	19150	10	16QAM	50	0	21.23	0-2	2

Table 9-24
Maximum LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	18625	5	QPSK	1	0	23.26	0	0
	1852.5	18625	5	QPSK	1	12	23.27	0	0
	1852.5	18625	5	QPSK	1	24	23.25	0	0
	1852.5	18625	5	QPSK	12	0	22.28	0-1	1
	1852.5	18625	5	QPSK	12	6	22.20	0-1	1
	1852.5	18625	5	QPSK	12	13	22.19	0-1	1
	1852.5	18625	5	QPSK	25	0	22.21	0-1	1
	1852.5	18625	5	16-QAM	1	0	22.23	0-1	1
	1852.5	18625	5	16-QAM	1	12	22.21	0-1	1
	1852.5	18625	5	16-QAM	1	24	22.25	0-1	1
	1852.5	18625	5	16-QAM	12	0	21.12	0-2	2
	1852.5	18625	5	16-QAM	12	6	21.13	0-2	2
	1852.5	18625	5	16-QAM	12	13	21.15	0-2	2
	1852.5	18625	5	16-QAM	25	0	21.24	0-2	2
Mid	1880.0	18900	5	QPSK	1	0	23.14	0	0
	1880.0	18900	5	QPSK	1	12	23.27	0	0
	1880.0	18900	5	QPSK	1	24	23.29	0	0
	1880.0	18900	5	QPSK	12	0	22.28	0-1	1
	1880.0	18900	5	QPSK	12	6	22.35	0-1	1
	1880.0	18900	5	QPSK	12	13	22.32	0-1	1
	1880.0	18900	5	QPSK	25	0	22.19	0-1	1
	1880.0	18900	5	16-QAM	1	0	22.09	0-1	1
	1880.0	18900	5	16-QAM	1	12	22.25	0-1	1
	1880.0	18900	5	16-QAM	1	24	22.26	0-1	1
	1880.0	18900	5	16-QAM	12	0	21.36	0-2	2
	1880.0	18900	5	16-QAM	12	6	21.21	0-2	2
	1880.0	18900	5	16-QAM	12	13	21.35	0-2	2
	1880.0	18900	5	16-QAM	25	0	21.29	0-2	2
High	1907.5	19175	5	QPSK	1	0	23.11	0	0
	1907.5	19175	5	QPSK	1	12	23.10	0	0
	1907.5	19175	5	QPSK	1	24	23.12	0	0
	1907.5	19175	5	QPSK	12	0	22.13	0-1	1
	1907.5	19175	5	QPSK	12	6	22.13	0-1	1
	1907.5	19175	5	QPSK	12	13	22.14	0-1	1
	1907.5	19175	5	QPSK	25	0	22.12	0-1	1
	1907.5	19175	5	16-QAM	1	0	22.15	0-1	1
	1907.5	19175	5	16-QAM	1	12	22.14	0-1	1
	1907.5	19175	5	16-QAM	1	24	22.16	0-1	1
	1907.5	19175	5	16-QAM	12	0	21.15	0-2	2
	1907.5	19175	5	16-QAM	12	6	21.17	0-2	2
	1907.5	19175	5	16-QAM	12	13	21.14	0-2	2
	1907.5	19175	5	16-QAM	25	0	21.11	0-2	2

Table 9-25
Maximum LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	18615	3	QPSK	1	0	23.00	0	0
	1851.5	18615	3	QPSK	1	7	22.94	0	0
	1851.5	18615	3	QPSK	1	14	22.97	0	0
	1851.5	18615	3	QPSK	8	0	21.88	0-1	1
	1851.5	18615	3	QPSK	8	4	21.88	0-1	1
	1851.5	18615	3	QPSK	8	7	21.93	0-1	1
	1851.5	18615	3	QPSK	15	0	21.87	0-1	1
	1851.5	18615	3	16-QAM	1	0	21.90	0-1	1
	1851.5	18615	3	16-QAM	1	7	21.90	0-1	1
	1851.5	18615	3	16-QAM	1	14	21.87	0-1	1
	1851.5	18615	3	16-QAM	8	0	20.82	0-2	2
	1851.5	18615	3	16-QAM	8	4	20.74	0-2	2
	1851.5	18615	3	16-QAM	8	7	20.73	0-2	2
	1851.5	18615	3	16-QAM	15	0	20.83	0-2	2
	1880.0	18900	3	QPSK	1	0	23.05	0	0
Mid	1880.0	18900	3	QPSK	1	7	23.23	0	0
	1880.0	18900	3	QPSK	1	14	23.24	0	0
	1880.0	18900	3	QPSK	8	0	21.98	0-1	1
	1880.0	18900	3	QPSK	8	4	22.02	0-1	1
	1880.0	18900	3	QPSK	8	7	22.02	0-1	1
	1880.0	18900	3	QPSK	15	0	22.06	0-1	1
	1880.0	18900	3	16-QAM	1	0	22.17	0-1	1
	1880.0	18900	3	16-QAM	1	7	22.17	0-1	1
	1880.0	18900	3	16-QAM	1	14	22.15	0-1	1
	1880.0	18900	3	16-QAM	8	0	20.94	0-2	2
	1880.0	18900	3	16-QAM	8	4	20.93	0-2	2
	1880.0	18900	3	16-QAM	8	7	20.92	0-2	2
	1880.0	18900	3	16-QAM	15	0	20.94	0-2	2
	1908.5	19185	3	QPSK	1	0	23.22	0	0
	1908.5	19185	3	QPSK	1	7	23.21	0	0
High	1908.5	19185	3	QPSK	1	14	23.20	0	0
	1908.5	19185	3	QPSK	8	0	22.22	0-1	1
	1908.5	19185	3	QPSK	8	4	22.27	0-1	1
	1908.5	19185	3	QPSK	8	7	22.20	0-1	1
	1908.5	19185	3	QPSK	15	0	22.23	0-1	1
	1908.5	19185	3	16-QAM	1	0	22.23	0-1	1
	1908.5	19185	3	16-QAM	1	7	22.34	0-1	1
	1908.5	19185	3	16-QAM	1	14	22.22	0-1	1
	1908.5	19185	3	16-QAM	8	0	21.20	0-2	2
	1908.5	19185	3	16-QAM	8	4	21.21	0-2	2
	1908.5	19185	3	16-QAM	8	7	21.23	0-2	2
	1908.5	19185	3	16-QAM	15	0	21.23	0-2	2

Table 9-26
Maximum LTE Band 2 (PCS) Conducted Powers -1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	18607	1.4	QPSK	1	0	23.24	0	0
	1850.7	18607	1.4	QPSK	1	2	23.19	0	0
	1850.7	18607	1.4	QPSK	1	5	23.10	0	0
	1850.7	18607	1.4	QPSK	3	0	23.29	0	0
	1850.7	18607	1.4	QPSK	3	2	23.29	0	0
	1850.7	18607	1.4	QPSK	3	3	23.30	0	0
	1850.7	18607	1.4	QPSK	6	0	22.43	0-1	1
	1850.7	18607	1.4	16-QAM	1	0	22.29	0-1	1
	1850.7	18607	1.4	16-QAM	1	2	22.19	0-1	1
	1850.7	18607	1.4	16-QAM	1	5	22.24	0-1	1
	1850.7	18607	1.4	16-QAM	3	0	22.32	0-1	1
	1850.7	18607	1.4	16-QAM	3	2	22.35	0-1	1
	1850.7	18607	1.4	16-QAM	3	3	22.34	0-1	1
	1850.7	18607	1.4	16-QAM	6	0	21.45	0-2	2
Mid	1880.0	18900	1.4	QPSK	1	0	23.13	0	0
	1880.0	18900	1.4	QPSK	1	2	23.25	0	0
	1880.0	18900	1.4	QPSK	1	5	23.18	0	0
	1880.0	18900	1.4	QPSK	3	0	23.23	0	0
	1880.0	18900	1.4	QPSK	3	2	23.27	0	0
	1880.0	18900	1.4	QPSK	3	3	23.23	0	0
	1880.0	18900	1.4	QPSK	6	0	22.20	0-1	1
	1880.0	18900	1.4	16-QAM	1	0	22.06	0-1	1
	1880.0	18900	1.4	16-QAM	1	2	22.11	0-1	1
	1880.0	18900	1.4	16-QAM	1	5	22.16	0-1	1
	1880.0	18900	1.4	16-QAM	3	0	22.15	0-1	1
	1880.0	18900	1.4	16-QAM	3	2	22.16	0-1	1
	1880.0	18900	1.4	16-QAM	3	3	22.19	0-1	1
	1880.0	18900	1.4	16-QAM	6	0	21.12	0-2	2
High	1909.3	19193	1.4	QPSK	1	0	23.20	0	0
	1909.3	19193	1.4	QPSK	1	2	23.24	0	0
	1909.3	19193	1.4	QPSK	1	5	23.20	0	0
	1909.3	19193	1.4	QPSK	3	0	23.20	0	0
	1909.3	19193	1.4	QPSK	3	2	23.21	0	0
	1909.3	19193	1.4	QPSK	3	3	23.22	0	0
	1909.3	19193	1.4	QPSK	6	0	22.23	0-1	1
	1909.3	19193	1.4	16-QAM	1	0	22.24	0-1	1
	1909.3	19193	1.4	16-QAM	1	2	22.23	0-1	1
	1909.3	19193	1.4	16-QAM	1	5	22.20	0-1	1
	1909.3	19193	1.4	16-QAM	3	0	22.22	0-1	1
	1909.3	19193	1.4	16-QAM	3	2	22.28	0-1	1
	1909.3	19193	1.4	16-QAM	3	3	22.24	0-1	1
	1909.3	19193	1.4	16-QAM	6	0	21.22	0-2	2

Table 9-27
Reduced LTE Band 2 (PCS) Conducted Powers - 20 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	18700	20	QPSK	1	0	21.36	0	0
	1860	18700	20	QPSK	1	50	21.33	0	0
	1860	18700	20	QPSK	1	99	21.42	0	0
	1860	18700	20	QPSK	50	0	21.36	0	0
	1860	18700	20	QPSK	50	25	21.32	0	0
	1860	18700	20	QPSK	50	50	21.43	0	0
	1860	18700	20	QPSK	100	0	21.38	0	0
	1860	18700	20	16QAM	1	0	21.38	0	0
	1860	18700	20	16QAM	1	50	21.39	0	0
	1860	18700	20	16QAM	1	99	21.30	0	0
	1860	18700	20	16QAM	50	0	21.39	0	0
	1860	18700	20	16QAM	50	25	21.49	0	0
	1860	18700	20	16QAM	50	50	21.43	0	0
	1860	18700	20	16QAM	100	0	21.44	0	0
	1880.0	18900	20	QPSK	1	0	21.38	0	0
	1880.0	18900	20	QPSK	1	50	21.39	0	0
Mid	1880.0	18900	20	QPSK	1	99	21.40	0	0
	1880.0	18900	20	QPSK	50	0	21.44	0	0
	1880.0	18900	20	QPSK	50	25	21.42	0	0
	1880.0	18900	20	QPSK	50	50	21.43	0	0
	1880.0	18900	20	QPSK	100	0	21.44	0	0
	1880.0	18900	20	16QAM	1	0	21.39	0	0
	1880.0	18900	20	16QAM	1	50	21.49	0	0
	1880.0	18900	20	16QAM	1	99	21.47	0	0
	1880.0	18900	20	16QAM	50	0	21.38	0	0
	1880.0	18900	20	16QAM	50	25	21.45	0	0
	1880.0	18900	20	16QAM	50	50	21.46	0	0
	1880.0	18900	20	16QAM	100	0	21.45	0	0
	1900	19100	20	QPSK	1	0	21.44	0	0
	1900	19100	20	QPSK	1	50	21.41	0	0
	1900	19100	20	QPSK	1	99	21.49	0	0
	1900	19100	20	QPSK	50	0	21.42	0	0
High	1900	19100	20	QPSK	50	25	21.43	0	0
	1900	19100	20	QPSK	50	50	21.50	0	0
	1900	19100	20	QPSK	100	0	21.48	0	0
	1900	19100	20	16QAM	1	0	21.47	0	0
	1900	19100	20	16QAM	1	50	21.46	0	0
	1900	19100	20	16QAM	1	99	21.50	0	0
	1900	19100	20	16QAM	50	0	21.36	0	0
	1900	19100	20	16QAM	50	25	21.31	0	0
	1900	19100	20	16QAM	50	50	21.47	0	0
	1900	19100	20	16QAM	100	0	21.45	0	0

Table 9-28
Reduced LTE Band 2 (PCS) Conducted Powers - 15 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	18675	15	QPSK	1	0	21.46	0	0
	1857.5	18675	15	QPSK	1	36	21.43	0	0
	1857.5	18675	15	QPSK	1	74	21.47	0	0
	1857.5	18675	15	QPSK	36	0	21.43	0	0
	1857.5	18675	15	QPSK	36	18	21.49	0	0
	1857.5	18675	15	QPSK	36	37	21.46	0	0
	1857.5	18675	15	QPSK	75	0	21.41	0	0
	1857.5	18675	15	16QAM	1	0	21.36	0	0
	1857.5	18675	15	16QAM	1	36	21.34	0	0
	1857.5	18675	15	16QAM	1	74	21.47	0	0
	1857.5	18675	15	16QAM	36	0	21.44	0	0
	1857.5	18675	15	16QAM	36	18	21.42	0	0
	1857.5	18675	15	16QAM	36	37	21.45	0	0
	1857.5	18675	15	16QAM	75	0	21.43	0	0
	1880.0	18900	15	QPSK	1	0	21.49	0	0
	1880.0	18900	15	QPSK	1	36	21.50	0	0
Mid	1880.0	18900	15	QPSK	1	74	21.47	0	0
	1880.0	18900	15	QPSK	36	0	21.43	0	0
	1880.0	18900	15	QPSK	36	18	21.46	0	0
	1880.0	18900	15	QPSK	36	37	21.43	0	0
	1880.0	18900	15	QPSK	75	0	21.48	0	0
	1880.0	18900	15	16QAM	1	0	21.42	0	0
	1880.0	18900	15	16QAM	1	36	21.44	0	0
	1880.0	18900	15	16QAM	1	74	21.47	0	0
	1880.0	18900	15	16QAM	36	0	21.43	0	0
	1880.0	18900	15	16QAM	36	18	21.49	0	0
	1880.0	18900	15	16QAM	36	37	21.50	0	0
	1880.0	18900	15	16QAM	75	0	21.45	0	0
	1902.5	19125	15	QPSK	1	0	21.43	0	0
	1902.5	19125	15	QPSK	1	36	21.42	0	0
	1902.5	19125	15	QPSK	1	74	21.46	0	0
	1902.5	19125	15	QPSK	36	0	21.44	0	0
High	1902.5	19125	15	QPSK	36	18	21.41	0	0
	1902.5	19125	15	QPSK	36	37	21.46	0	0
	1902.5	19125	15	QPSK	75	0	21.48	0	0
	1902.5	19125	15	16QAM	1	0	21.47	0	0
	1902.5	19125	15	16QAM	1	36	21.46	0	0
	1902.5	19125	15	16QAM	1	74	21.43	0	0
	1902.5	19125	15	16QAM	36	0	21.50	0	0
	1902.5	19125	15	16QAM	36	18	21.37	0	0
	1902.5	19125	15	16QAM	36	37	21.35	0	0
	1902.5	19125	15	16QAM	75	0	21.43	0	0

Table 9-29
Reduced LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	18650	10	QPSK	1	0	21.42	0	0
	1855	18650	10	QPSK	1	25	21.48	0	0
	1855	18650	10	QPSK	1	49	21.49	0	0
	1855	18650	10	QPSK	25	0	21.37	0	0
	1855	18650	10	QPSK	25	12	21.48	0	0
	1855	18650	10	QPSK	25	25	21.43	0	0
	1855	18650	10	QPSK	50	0	21.45	0	0
	1855	18650	10	16QAM	1	0	21.49	0	0
	1855	18650	10	16QAM	1	25	21.48	0	0
	1855	18650	10	16QAM	1	49	21.47	0	0
	1855	18650	10	16QAM	25	0	21.43	0	0
	1855	18650	10	16QAM	25	12	21.48	0	0
	1855	18650	10	16QAM	25	25	21.42	0	0
	1855	18650	10	16QAM	50	0	21.43	0	0
	1880.0	18900	10	QPSK	1	0	21.49	0	0
Mid	1880.0	18900	10	QPSK	1	25	21.48	0	0
	1880.0	18900	10	QPSK	1	49	21.50	0	0
	1880.0	18900	10	QPSK	25	0	21.46	0	0
	1880.0	18900	10	QPSK	25	12	21.42	0	0
	1880.0	18900	10	QPSK	25	25	21.44	0	0
	1880.0	18900	10	QPSK	50	0	21.43	0	0
	1880.0	18900	10	16QAM	1	0	21.42	0	0
	1880.0	18900	10	16QAM	1	25	21.41	0	0
	1880.0	18900	10	16QAM	1	49	21.48	0	0
	1880.0	18900	10	16QAM	25	0	21.39	0	0
	1880.0	18900	10	16QAM	25	12	21.38	0	0
	1880.0	18900	10	16QAM	25	25	21.43	0	0
	1880.0	18900	10	16QAM	50	0	21.46	0	0
	1905	19150	10	QPSK	1	0	21.50	0	0
	1905	19150	10	QPSK	1	25	21.47	0	0
High	1905	19150	10	QPSK	1	49	21.46	0	0
	1905	19150	10	QPSK	25	0	21.43	0	0
	1905	19150	10	QPSK	25	12	21.48	0	0
	1905	19150	10	QPSK	25	25	21.45	0	0
	1905	19150	10	QPSK	50	0	21.47	0	0
	1905	19150	10	16QAM	1	0	21.41	0	0
	1905	19150	10	16QAM	1	25	21.44	0	0
	1905	19150	10	16QAM	1	49	21.37	0	0
	1905	19150	10	16QAM	25	0	21.38	0	0
	1905	19150	10	16QAM	25	12	21.42	0	0
	1905	19150	10	16QAM	25	25	21.45	0	0
	1905	19150	10	16QAM	50	0	21.43	0	0

Table 9-30
Reduced LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	18625	5	QPSK	1	0	21.41	0	0
	1852.5	18625	5	QPSK	1	12	21.45	0	0
	1852.5	18625	5	QPSK	1	24	21.47	0	0
	1852.5	18625	5	QPSK	12	0	21.46	0	0
	1852.5	18625	5	QPSK	12	6	21.39	0	0
	1852.5	18625	5	QPSK	12	13	21.48	0	0
	1852.5	18625	5	QPSK	25	0	21.42	0	0
	1852.5	18625	5	16-QAM	1	0	21.50	0	0
	1852.5	18625	5	16-QAM	1	12	21.49	0	0
	1852.5	18625	5	16-QAM	1	24	21.43	0	0
	1852.5	18625	5	16-QAM	12	0	21.44	0	0
	1852.5	18625	5	16-QAM	12	6	21.37	0	0
	1852.5	18625	5	16-QAM	12	13	21.38	0	0
	1852.5	18625	5	16-QAM	25	0	21.42	0	0
	1880.0	18900	5	QPSK	1	0	21.43	0	0
Mid	1880.0	18900	5	QPSK	1	12	21.44	0	0
	1880.0	18900	5	QPSK	1	24	21.49	0	0
	1880.0	18900	5	QPSK	12	0	21.50	0	0
	1880.0	18900	5	QPSK	12	6	21.46	0	0
	1880.0	18900	5	QPSK	12	13	21.44	0	0
	1880.0	18900	5	QPSK	25	0	21.43	0	0
	1880.0	18900	5	16-QAM	1	0	21.47	0	0
	1880.0	18900	5	16-QAM	1	12	21.42	0	0
	1880.0	18900	5	16-QAM	1	24	21.49	0	0
	1880.0	18900	5	16-QAM	12	0	21.46	0	0
	1880.0	18900	5	16-QAM	12	6	21.42	0	0
	1880.0	18900	5	16-QAM	12	13	21.47	0	0
	1880.0	18900	5	16-QAM	25	0	21.48	0	0
	1907.5	19175	5	QPSK	1	0	21.36	0	0
	1907.5	19175	5	QPSK	1	12	21.49	0	0
High	1907.5	19175	5	QPSK	1	24	21.47	0	0
	1907.5	19175	5	QPSK	12	0	21.44	0	0
	1907.5	19175	5	QPSK	12	6	21.46	0	0
	1907.5	19175	5	QPSK	12	13	21.41	0	0
	1907.5	19175	5	QPSK	25	0	21.44	0	0
	1907.5	19175	5	16-QAM	1	0	21.45	0	0
	1907.5	19175	5	16-QAM	1	12	21.39	0	0
	1907.5	19175	5	16-QAM	1	24	21.43	0	0
	1907.5	19175	5	16-QAM	12	0	21.47	0	0
	1907.5	19175	5	16-QAM	12	6	21.42	0	0
	1907.5	19175	5	16-QAM	12	13	21.48	0	0
	1907.5	19175	5	16-QAM	25	0	21.49	0	0

Table 9-31
Reduced LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	18615	3	QPSK	1	0	21.46	0	0
	1851.5	18615	3	QPSK	1	7	21.42	0	0
	1851.5	18615	3	QPSK	1	14	21.45	0	0
	1851.5	18615	3	QPSK	8	0	21.35	0	0
	1851.5	18615	3	QPSK	8	4	21.33	0	0
	1851.5	18615	3	QPSK	8	7	21.37	0	0
	1851.5	18615	3	QPSK	15	0	21.38	0	0
	1851.5	18615	3	16-QAM	1	0	21.45	0	0
	1851.5	18615	3	16-QAM	1	7	21.42	0	0
	1851.5	18615	3	16-QAM	1	14	21.47	0	0
	1851.5	18615	3	16-QAM	8	0	21.40	0	0
	1851.5	18615	3	16-QAM	8	4	21.37	0	0
	1851.5	18615	3	16-QAM	8	7	21.41	0	0
	1851.5	18615	3	16-QAM	15	0	21.39	0	0
	1880.0	18900	3	QPSK	1	0	21.50	0	0
	1880.0	18900	3	QPSK	1	7	21.48	0	0
Mid	1880.0	18900	3	QPSK	1	14	21.46	0	0
	1880.0	18900	3	QPSK	8	0	21.49	0	0
	1880.0	18900	3	QPSK	8	4	21.47	0	0
	1880.0	18900	3	QPSK	8	7	21.44	0	0
	1880.0	18900	3	QPSK	15	0	21.48	0	0
	1880.0	18900	3	16-QAM	1	0	21.42	0	0
	1880.0	18900	3	16-QAM	1	7	21.46	0	0
	1880.0	18900	3	16-QAM	1	14	21.37	0	0
	1880.0	18900	3	16-QAM	8	0	21.50	0	0
	1880.0	18900	3	16-QAM	8	4	21.43	0	0
	1880.0	18900	3	16-QAM	8	7	21.42	0	0
	1880.0	18900	3	16-QAM	15	0	21.44	0	0
	1908.5	19185	3	QPSK	1	0	21.49	0	0
	1908.5	19185	3	QPSK	1	7	21.46	0	0
	1908.5	19185	3	QPSK	1	14	21.49	0	0
	1908.5	19185	3	QPSK	8	0	21.47	0	0
High	1908.5	19185	3	QPSK	8	4	21.42	0	0
	1908.5	19185	3	QPSK	8	7	21.45	0	0
	1908.5	19185	3	QPSK	15	0	21.46	0	0
	1908.5	19185	3	16-QAM	1	0	21.47	0	0
	1908.5	19185	3	16-QAM	1	7	21.45	0	0
	1908.5	19185	3	16-QAM	1	14	21.44	0	0
	1908.5	19185	3	16-QAM	8	0	21.47	0	0
	1908.5	19185	3	16-QAM	8	4	21.43	0	0
	1908.5	19185	3	16-QAM	8	7	21.46	0	0
	1908.5	19185	3	16-QAM	15	0	21.42	0	0

Table 9-32
Reduced LTE Band 2 (PCS) Conducted Powers - 1.4 MHz Bandwidth
(Representing Hotspot Mode)

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	18607	1.4	QPSK	1	0	21.48	0	0
	1850.7	18607	1.4	QPSK	1	2	21.50	0	0
	1850.7	18607	1.4	QPSK	1	5	21.47	0	0
	1850.7	18607	1.4	QPSK	3	0	21.45	0	0
	1850.7	18607	1.4	QPSK	3	2	21.43	0	0
	1850.7	18607	1.4	QPSK	3	3	21.44	0	0
	1850.7	18607	1.4	QPSK	6	0	21.43	0	0
	1850.7	18607	1.4	16-QAM	1	0	21.24	0	0
	1850.7	18607	1.4	16-QAM	1	2	21.22	0	0
	1850.7	18607	1.4	16-QAM	1	5	21.23	0	0
	1850.7	18607	1.4	16-QAM	3	0	21.42	0	0
	1850.7	18607	1.4	16-QAM	3	2	21.40	0	0
	1850.7	18607	1.4	16-QAM	3	3	21.48	0	0
	1850.7	18607	1.4	16-QAM	6	0	21.42	0	0
	1880.0	18900	1.4	QPSK	1	0	21.46	0	0
	1880.0	18900	1.4	QPSK	1	2	21.45	0	0
Mid	1880.0	18900	1.4	QPSK	1	5	21.47	0	0
	1880.0	18900	1.4	QPSK	3	0	21.40	0	0
	1880.0	18900	1.4	QPSK	3	2	21.43	0	0
	1880.0	18900	1.4	QPSK	3	3	21.50	0	0
	1880.0	18900	1.4	QPSK	6	0	21.48	0	0
	1880.0	18900	1.4	16-QAM	1	0	21.40	0	0
	1880.0	18900	1.4	16-QAM	1	2	21.34	0	0
	1880.0	18900	1.4	16-QAM	1	5	21.35	0	0
	1880.0	18900	1.4	16-QAM	3	0	21.45	0	0
	1880.0	18900	1.4	16-QAM	3	2	21.49	0	0
	1880.0	18900	1.4	16-QAM	3	3	21.44	0	0
	1880.0	18900	1.4	16-QAM	6	0	21.47	0	0
	1909.3	19193	1.4	QPSK	1	0	21.47	0	0
	1909.3	19193	1.4	QPSK	1	2	21.48	0	0
	1909.3	19193	1.4	QPSK	1	5	21.46	0	0
	1909.3	19193	1.4	QPSK	3	0	21.43	0	0
High	1909.3	19193	1.4	QPSK	3	2	21.42	0	0
	1909.3	19193	1.4	QPSK	3	3	21.48	0	0
	1909.3	19193	1.4	QPSK	6	0	21.43	0	0
	1909.3	19193	1.4	16-QAM	1	0	21.49	0	0
	1909.3	19193	1.4	16-QAM	1	2	21.47	0	0
	1909.3	19193	1.4	16-QAM	1	5	21.48	0	0
	1909.3	19193	1.4	16-QAM	3	0	21.48	0	0
	1909.3	19193	1.4	16-QAM	3	2	21.40	0	0
	1909.3	19193	1.4	16-QAM	3	3	21.42	0	0
	1909.3	19193	1.4	16-QAM	6	0	21.44	0	0

9.3.5 LTE Carrier Aggregation Conducted Powers

Table 9-33

Maximum LTE Carrier Aggregation Conducted Powers–Band 2 (PCC)+Band 17 (SCC) 10 MHz BW

Band 2 (PCC) + Band 17 (SCC), 10 MHz				
1905 MHz / ch.19150 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B2 Rel. 8 Tx.Power (dBm)
	1	0	23.06	23.31

Table 9-34

Maximum LTE Carrier Aggregation Conducted Powers–Band 2 (PCC)+Band 29 (SCC) 10 MHz BW

Band 2 (PCC) + Band 29 (SCC), 10 MHz				
1905 MHz / ch.19150 + 722.5 MHz / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B2 Rel. 8 Tx.Power (dBm)
	1	0	22.94	23.31

Table 9-35

Maximum LTE Carrier Aggregation Conducted Powers–Band 2 (PCC)+Band 5 (SCC) 10 MHz BW

Band 2 (PCC) + Band 5 (SCC), 10 MHz				
1905 MHz / ch.19150 + 881.5 MHz / ch.2525	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B2 Rel. 8 Tx.Power (dBm)
	1	0	22.96	23.31

Table 9-36

Maximum LTE Carrier Aggregation Conducted Powers–Band 4 (PCC)+Band 17 (SCC) 10 MHz BW

Band 4 (PCC) + Band 17 (SCC), 10 MHz				
1715 MHz / ch.20000 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B4 Rel. 8 Tx.Power (dBm)
	1	0	22.93	22.88

Table 9-37

Maximum LTE Carrier Aggregation Conducted Powers–Band 4 (PCC)+Band 29 (SCC) 10 MHz BW

Band 4 (PCC) + Band 29 (SCC), 10 MHz				
1715 MHz / ch.20000 + 722.5 MHz / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B4 Rel. 8 Tx.Power (dBm)
	1	0	22.71	22.88

Table 9-38

Maximum LTE Carrier Aggregation Conducted Powers–Band 4 (PCC)+Band 5 (SCC) 10 MHz BW

Band 4 (PCC) + Band 5 (SCC), 10 MHz				
1715 MHz / ch.20000 + 881.5 MHz / ch. 2525	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B4 Rel. 8 Tx.Power (dBm)
	1	0	22.82	22.88

Table 9-39

Maximum LTE Carrier Aggregation Conducted Powers–Band 17 (PCC)+Band 2 (SCC) 10 MHz BW

Band 17 (PCC) + Band 2 (SCC), 10 MHz				
710 MHz / ch.23790 + 1960 MHz / ch.900	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B12 Rel. 8 Tx.Power (dBm)
	1	0	24.74	24.75

Table 9-40

Maximum LTE Carrier Aggregation Conducted Powers–Band 5 (PCC)+Band 2 (SCC) 10 MHz BW

Band 5 (PCC) + Band 2 (SCC), 10 MHz				
836.5 MHz / ch.20525 + 1960 MHz / ch.900	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B5 Rel. 8 Tx.Power (dBm)
	1	49	24.14	24.22

Table 9-41

Maximum LTE Carrier Aggregation Conducted Powers–Band 5 (PCC)+Band 4 (SCC) 10 MHz BW

Band 5 (PCC) + Band 4 (SCC), 10 MHz				
836.5 MHz / ch.20525 + 2132.5 MHz / ch.2175	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B5 Rel. 8 Tx.Power (dBm)
	1	49	24.21	24.22

Table 9-42

Reduced LTE Carrier Aggregation Conducted Powers–Band 2 (PCC)+Band 17 (SCC) 10 MHz BW

Band 2 (PCC) + Band 17 (SCC), 10 MHz				
1880 MHz / ch.18900 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B2 Rel. 8 Tx.Power (dBm)
	1	49	21.26	21.50

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Table 9-43

Reduced LTE Carrier Aggregation Conducted Powers–Band 2 (PCC)+Band 29 (SCC) 10 MHz BW

Band 2 (PCC) + Band 29 (SCC), 10 MHz				
1880 MHz / ch.18900 + 722.5 MHz / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B2 Rel. 8 Tx.Power (dBm)
	1	49	21.11	21.50

Table 9-44

Reduced LTE Carrier Aggregation Conducted Powers–Band 2 (PCC)+Band 5 (SCC) 10 MHz BW

Band 2 (PCC) + Band 5 (SCC), 10 MHz				
1880 MHz / ch.18900 + 881.5 MHz / ch.2525	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B2 Rel. 8 Tx.Power (dBm)
	1	49	21.19	21.50

Table 9-45

Reduced LTE Carrier Aggregation Conducted Powers–Band 4 (PCC)+Band 17 (SCC) 10 MHz BW

Band 4 (PCC) + Band 17 (SCC), 10 MHz				
1732.5 MHz / ch.20175 + 740 MHz / ch. 5790	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B4 Rel. 8 Tx.Power (dBm)
	1	0	20.96	21.00

Table 9-46

Reduced LTE Carrier Aggregation Conducted Powers–Band 4 (PCC)+Band 29 (SCC) 10 MHz BW

Band 4 (PCC) + Band 29 (SCC), 10 MHz				
1732.5 MHz / ch.20175 + 722.5 MHz / ch. 9715	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B4 Rel. 8 Tx.Power (dBm)
	1	0	20.88	21.00

Table 9-47

Reduced LTE Carrier Aggregation Conducted Powers–Band 4 (PCC)+Band 5 (SCC) 10 MHz BW

Band 4 (PCC) + Band 5 (SCC), 10 MHz				
1732.5 MHz / ch.20175 + 881.5 MHz / ch. 2525	PCC UL# RB	PCC UL RB Offset	LTE Rel 10 Tx.Power (dBm)	LTE B4 Rel. 8 Tx.Power (dBm)
	1	0	20.91	21.00

Notes:

1. The device does not support all Rel. 10 Carrier Aggregation features due to modem chipset limitation.
2. The device only supports downlink Carrier Aggregation. Uplink Carrier Aggregation is not supported. Power measurements were performed with two DL carriers for the Release 8 configuration that had the highest output power (across all bandwidths, channels and RB Configurations) for each band.
3. This device only supports inter-band CA with 2 carriers (B2+B12, B2+B29, B2+B5, B4+B12, B4+B29, B4+B5, B12+B2, B5+B2, B5+B4) with a maximum of 10 MHz of spectrum.
4. All control and acknowledge data is sent on uplink channels that operate identical to release 8 specifications.

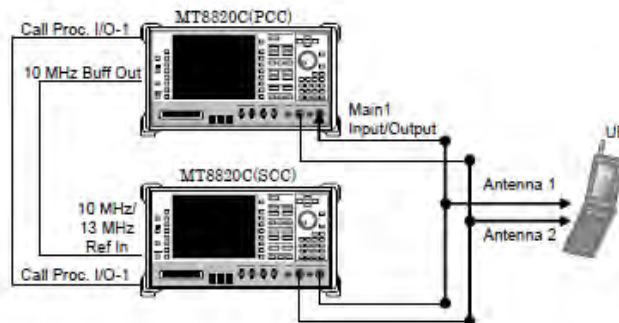


Figure 9-3
Power Measurement Setup

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9.4 WLAN Conducted Powers

Table 9-48
SISO IEEE 802.11b Average RF Power- Antenna 1

Mode	Freq [MHz]	Channel	802.11b Conducted Power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1*	15.28	15.38	14.36	15.03
802.11b	2437	6*	15.10	15.15	14.85	15.36
802.11b	2462	11*	15.30	15.26	15.36	15.18

Table 9-49
SISO IEEE 802.11b Average RF Power- Antenna 2

Mode	Freq [MHz]	Channel	802.11b Conducted Power [dBm]			
			Data Rate [Mbps]			
			1	2	5.5	11
802.11b	2412	1*	14.44	14.81	14.79	14.94
802.11b	2437	6*	14.30	14.58	14.63	14.58
802.11b	2462	11*	14.80	14.84	14.86	14.78

Table 9-50
SISO IEEE 802.11g Average RF Power- Antenna 1

Mode	Freq [MHz]	Channel	802.11g Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	13.53	13.45	13.52	13.57	14.12	13.74	13.66	14.02
802.11g	2437	6	13.22	13.17	13.16	13.26	13.84	13.41	13.32	13.71
802.11g	2462	11	13.45	13.37	13.47	13.56	14.03	13.62	13.56	13.98

Table 9-51
SISO IEEE 802.11g Average RF Power- Antenna 2

Mode	Freq [MHz]	Channel	802.11g Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11g	2412	1	13.18	12.95	13.05	13.16	13.66	13.25	13.35	13.60
802.11g	2437	6	12.97	12.90	13.00	13.09	13.47	13.24	13.17	13.50
802.11g	2462	11	13.38	13.32	13.36	13.32	13.83	13.46	13.58	13.92

Table 9-52
SISO IEEE 802.11n Average RF Power- Antenna 1

Mode	Freq [MHz]	Channel	802.11n (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	12.20	12.25	12.20	12.24	12.45	12.47	12.30	12.45
802.11n	2437	6	12.27	12.27	12.26	12.31	12.46	12.47	12.36	12.41
802.11n	2462	11	12.34	12.29	12.43	12.37	12.49	12.41	12.49	12.47

Table 9-53
SISO IEEE 802.11n Average RF Power- Antenna 2

Mode	Freq [MHz]	Channel	802.11n (2.4GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	2412	1	12.26	12.28	12.30	12.45	12.37	12.44	12.54	12.47
802.11n	2437	6	12.09	12.20	12.16	12.42	12.24	12.53	12.45	12.57
802.11n	2462	11	12.32	12.36	12.41	12.56	12.69	12.66	12.72	12.63

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Table 9-54
MIMO IEEE 802.11n Average RF Power

802.11n (2.4 GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			13
802.11n	2412	1	15.24
802.11n	2437	6	15.19
802.11n	2462	11	15.34

Table 9-55
SISO IEEE 802.11a Average RF Power-Antenna 1

Mode	Freq [MHz]	Channel	802.11a Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36*	11.50	11.75	11.63	11.61	11.70	11.67	11.65	11.82
802.11a	5200	40	11.50	11.67	11.60	11.53	11.69	11.67	11.63	11.80
802.11a	5220	44	11.51	11.72	11.52	11.52	11.76	11.75	11.64	11.77
802.11a	5240	48*	11.59	11.69	11.58	11.76	11.75	11.68	11.75	11.80
802.11a	5260	52*	11.71	11.92	11.81	11.83	11.92	12.03	11.84	12.05
802.11a	5280	56	11.87	11.86	11.85	11.84	11.97	12.07	12.03	12.13
802.11a	5300	60	11.91	11.88	11.80	11.86	11.98	11.97	11.96	12.11
802.11a	5320	64*	11.94	12.03	11.87	11.76	12.07	12.00	12.02	12.15
802.11a	5500	100	11.86	11.91	11.85	11.88	12.03	12.02	12.10	12.10
802.11a	5520	104*	11.92	11.96	11.90	11.92	12.14	12.02	12.11	12.07
802.11a	5540	108	11.89	12.11	11.99	11.88	12.10	12.03	12.17	12.14
802.11a	5560	112	11.99	12.06	12.02	11.86	12.18	12.07	12.20	12.11
802.11a	5580	116*	12.00	12.09	11.98	11.98	12.23	12.08	12.23	12.18
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5660	132	11.91	12.02	12.03	11.98	12.07	12.09	12.16	12.23
802.11a	5680	136*	11.98	12.16	11.98	11.91	12.12	12.04	12.22	12.16
802.11a	5700	140	11.82	12.03	11.98	11.96	12.12	12.05	11.94	12.10
802.11a	5745	149*	11.82	11.81	11.70	11.75	11.94	11.82	11.95	11.83
802.11a	5765	153	11.81	11.77	11.71	11.64	11.87	11.82	12.01	11.90
802.11a	5785	157*	11.85	11.68	11.54	11.59	11.79	11.67	12.05	11.78
802.11a	5805	161	11.73	11.62	11.63	11.56	11.75	11.62	12.08	11.70
802.11a	5825	165*	11.88	11.49	11.50	11.49	11.74	11.67	12.03	11.68

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

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

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Table 9-56
SISO IEEE 802.11a Average RF Power-Antenna 2

Mode	Freq [MHz]	Channel	802.11a Conducted Power [dBm]							
			Data Rate [Mbps]							
			6	9	12	18	24	36	48	54
802.11a	5180	36*	11.75	11.79	11.83	11.87	11.91	12.02	12.01	12.10
802.11a	5200	40	11.92	11.75	11.71	11.84	12.11	12.13	12.12	12.12
802.11a	5220	44	11.75	11.81	11.76	11.75	11.92	12.06	11.88	12.07
802.11a	5240	48*	11.59	11.54	11.63	11.63	11.72	12.02	11.97	11.92
802.11a	5260	52*	11.54	11.55	11.34	11.44	11.68	11.73	11.74	11.74
802.11a	5280	56	11.37	11.33	11.36	11.36	11.52	11.53	11.68	11.72
802.11a	5300	60	11.24	11.38	11.23	11.29	11.31	11.50	11.59	11.55
802.11a	5320	64*	11.23	11.07	11.18	11.18	11.44	11.56	11.36	11.51
802.11a	5500	100	11.40	11.38	11.30	11.25	11.90	11.64	11.74	11.84
802.11a	5520	104*	11.45	11.48	11.45	11.56	11.91	11.71	11.64	12.06
802.11a	5540	108	11.53	11.15	11.19	11.41	11.96	11.66	11.58	11.98
802.11a	5560	112	11.49	11.37	11.22	11.38	11.80	11.55	11.63	11.93
802.11a	5580	116*	11.41	11.25	11.25	11.47	11.95	11.72	11.39	11.94
802.11a	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11a	5660	132	11.54	11.35	11.32	11.62	11.95	11.54	11.71	11.91
802.11a	5680	136*	11.68	11.33	11.54	11.40	12.09	11.49	11.77	12.10
802.11a	5700	140	11.92	11.49	11.43	11.49	12.02	11.86	11.89	12.12
802.11a	5745	149*	12.24	12.05	12.25	12.22	12.45	12.33	12.44	12.46
802.11a	5765	153	12.41	12.14	12.11	12.26	12.37	12.49	12.37	12.37
802.11a	5785	157*	12.31	12.09	12.04	12.21	12.46	12.48	12.49	12.37
802.11a	5805	161	12.14	12.06	12.13	12.31	12.26	12.40	12.41	12.44
802.11a	5825	165*	12.18	12.05	12.07	12.22	12.33	12.46	12.46	12.48

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

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

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Table 9-57
SISO IEEE 802.11n Average RF Power – 20 MHz Bandwidth- Antenna 1

Mode	Freq [MHz]	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	11.57	11.53	11.52	11.69	11.82	11.72	11.83	11.82
802.11n	5200	40	11.47	11.59	11.58	11.61	11.71	11.73	11.79	11.80
802.11n	5220	44	11.43	11.51	11.47	11.49	11.58	11.56	11.83	11.71
802.11n	5240	48	11.51	11.62	11.48	11.83	11.73	11.65	11.75	11.76
802.11n	5260	52	11.61	11.69	11.69	12.11	12.05	11.76	12.14	11.83
802.11n	5280	56	11.66	11.69	11.67	12.04	12.15	11.77	12.17	12.05
802.11n	5300	60	11.76	11.70	11.74	12.18	12.08	11.93	12.02	12.01
802.11n	5320	64	11.69	11.79	11.72	12.14	12.15	11.87	12.17	12.11
802.11n	5500	100	11.78	11.68	11.68	12.13	12.07	12.10	12.17	12.07
802.11n	5520	104	11.79	11.87	11.83	12.04	12.15	12.12	12.22	12.10
802.11n	5540	108	11.82	11.78	11.78	12.13	12.11	12.13	12.21	12.18
802.11n	5560	112	11.86	11.87	11.82	12.18	12.17	12.20	12.14	12.14
802.11n	5580	116	11.93	11.93	11.81	12.13	12.08	12.22	12.21	12.15
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	11.96	11.94	11.89	12.04	12.19	12.19	12.23	12.17
802.11n	5680	136	11.87	11.86	11.79	12.23	12.15	12.21	12.19	12.16
802.11n	5700	140	11.85	11.86	11.90	12.17	12.18	12.23	12.22	12.18
802.11n	5745	149	11.92	11.58	11.63	11.87	11.89	11.94	11.88	11.92
802.11n	5765	153	11.58	11.58	11.59	11.89	11.88	11.91	11.82	11.85
802.11n	5785	157	11.50	11.50	11.51	11.91	11.77	11.83	11.80	11.83
802.11n	5805	161	11.47	11.50	11.46	11.71	11.86	11.76	11.78	11.83
802.11n	5825	165	11.33	11.37	11.40	11.78	11.70	11.81	11.72	11.72

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Table 9-58
SISO IEEE 802.11n Average RF Power – 20 MHz Bandwidth- Antenna 2

Mode	Freq [MHz]	Channel	20MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			6.5	13	19.5	26	39	52	58.5	65
802.11n	5180	36	11.96	11.94	11.87	12.02	12.07	12.05	12.08	12.07
802.11n	5200	40	11.96	11.78	11.99	12.06	12.13	12.00	12.06	12.11
802.11n	5220	44	11.86	11.86	11.97	12.03	12.09	12.04	12.10	12.15
802.11n	5240	48	11.83	11.83	11.92	11.94	12.11	11.91	12.10	12.13
802.11n	5260	52	11.56	11.50	11.53	11.68	11.76	11.74	11.69	11.71
802.11n	5280	56	11.67	11.63	11.57	11.69	11.76	11.72	11.72	11.71
802.11n	5300	60	11.55	11.54	11.51	11.76	11.74	11.70	11.67	11.71
802.11n	5320	64	11.47	11.51	11.42	11.66	11.61	11.62	11.56	11.59
802.11n	5500	100	11.24	11.28	11.29	11.81	11.56	11.59	11.44	11.65
802.11n	5520	104	11.38	11.30	11.31	11.68	11.55	11.63	11.72	11.63
802.11n	5540	108	11.38	11.41	11.39	11.59	11.63	11.66	11.73	11.56
802.11n	5560	112	11.32	11.51	11.20	11.68	11.63	11.52	11.57	11.63
802.11n	5580	116	11.54	11.42	11.45	11.54	11.71	11.54	11.57	11.48
802.11n	5600	120	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5620	124	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5640	128	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5660	132	11.52	11.45	11.46	11.79	11.78	11.79	11.86	11.73
802.11n	5680	136	11.70	11.61	11.63	11.74	11.88	11.87	11.78	11.74
802.11n	5700	140	11.51	11.40	11.49	11.77	11.82	11.73	11.67	11.61
802.11n	5745	149	11.75	11.30	11.12	11.61	11.66	11.71	11.50	11.58
802.11n	5765	153	11.32	11.32	11.15	11.67	11.61	11.52	11.57	11.56
802.11n	5785	157	11.22	11.30	11.11	11.59	11.52	11.53	11.48	11.55
802.11n	5805	161	11.29	11.22	11.18	11.51	11.49	11.49	11.52	11.66
802.11n	5825	165	11.23	11.28	11.17	11.54	11.51	11.50	11.47	11.60

Table 9-59
MIMO IEEE 802.11n Average RF Power – 20 MHz Bandwidth

20MHz BW 802.11n (5GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			13
802.11n	5180	36	14.78
802.11n	5200	40	14.73
802.11n	5220	44	14.66
802.11n	5240	48	14.68
802.11n	5260	52	14.60
802.11n	5280	56	14.67
802.11n	5300	60	14.67
802.11n	5320	64	14.59
802.11n	5500	100	14.53
802.11n	5520	104	14.60
802.11n	5540	108	14.62
802.11n	5560	112	14.61
802.11n	5580	116	14.75
802.11n	5600	120	N/A
802.11n	5620	124	N/A
802.11n	5640	128	N/A
802.11n	5660	132	14.75
802.11n	5680	136	14.80
802.11n	5700	140	14.69
802.11n	5745	149	14.85
802.11n	5765	153	14.46
802.11n	5785	157	14.38
802.11n	5805	161	14.39
802.11n	5825	165	14.29

Table 9-60
SISO IEEE 802.11n Average RF Power – 40 MHz Bandwidth- Antenna 1

Mode	Freq [MHz]	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	9.19	8.95	9.14	9.48	9.38	9.25	9.34	9.41
802.11n	5230	46	9.09	9.20	9.21	9.44	9.14	9.32	9.43	9.18
802.11n	5270	54	9.07	9.30	9.07	9.22	9.31	9.38	9.40	9.36
802.11n	5310	62	9.03	9.09	9.32	9.45	9.46	9.46	9.42	9.42
802.11n	5510	102	9.47	9.30	9.27	9.37	9.37	9.37	9.49	9.19
802.11n	5550	110	9.35	9.45	9.49	9.49	9.47	9.43	9.30	9.36
802.11n	5590	118	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5630	126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5670	134	9.48	9.20	9.32	9.47	9.41	9.45	9.48	9.22
802.11n	5755	151	9.25	9.21	9.17	9.24	9.16	9.21	9.15	9.16
802.11n	5795	159	9.06	9.02	9.14	9.21	9.30	9.28	9.27	9.19

Table 9-61
SISO IEEE 802.11n Average RF Power – 40 MHz Bandwidth- Antenna 2

Mode	Freq [MHz]	Channel	40MHz BW 802.11n (5GHz) Conducted Power [dBm]							
			Data Rate [Mbps]							
			13.5	27	40.5	54	81	108	121.5	135
802.11n	5190	38	9.29	9.26	9.41	9.40	9.41	9.26	9.35	9.24
802.11n	5230	46	9.27	9.34	9.15	9.49	9.32	9.40	9.19	9.27
802.11n	5270	54	8.94	8.96	8.93	9.34	9.19	9.17	9.31	9.22
802.11n	5310	62	8.73	8.99	8.82	8.90	9.11	9.10	9.21	9.22
802.11n	5510	102	8.80	8.93	8.75	8.99	9.27	9.14	9.43	9.21
802.11n	5550	110	8.80	9.02	8.88	8.95	9.06	9.02	9.30	9.26
802.11n	5590	118	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5630	126	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
802.11n	5670	134	8.77	9.04	9.05	9.17	9.25	9.22	9.35	9.28
802.11n	5755	151	8.58	8.81	8.64	8.63	8.88	9.07	9.14	8.83
802.11n	5795	159	8.72	8.56	8.52	8.92	8.74	8.88	8.82	9.08

Table 9-62
MIMO IEEE 802.11n Average RF Power – 40 MHz Bandwidth

Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			27
802.11n	5190	38	12.25
802.11n	5230	46	12.19
802.11n	5270	54	12.02
802.11n	5310	62	11.89
802.11n	5510	102	12.16
802.11n	5550	110	12.09
802.11n	5590	118	N/A
802.11n	5630	126	N/A
802.11n	5670	134	12.15
802.11n	5755	151	11.94
802.11n	5795	159	11.90

Table 9-63
SISO IEEE 802.11ac Average RF Power – 80 MHz Bandwidth- Antenna 1

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3	58.5	87.8	117	175.5	234	263.3	292.5	351	390
802.11ac	5210	42	9.88	9.71	9.61	9.99	10.07	9.94	9.89	9.95	10.04	10.02
802.11ac	5290	58	9.96	9.71	9.65	10.10	10.10	10.01	9.92	10.04	10.13	10.15
802.11ac	5530	106	9.92	9.98	9.95	10.01	10.13	9.93	9.87	9.97	10.06	10.05
802.11ac	5775	155	9.62	9.71	9.58	9.74	9.85	9.70	9.65	9.76	9.74	9.75

Table 9-64
SISO IEEE 802.11ac Average RF Power – 80 MHz Bandwidth- Antenna 2

Mode	Freq [MHz]	Channel	80MHz BW 802.11ac (5GHz) Conducted Power [dBm]									
			Data Rate [Mbps]									
			29.3	58.5	87.8	117	175.5	234	263.3	292.5	351	390
802.11ac	5210	42	10.04	9.95	9.98	10.17	10.24	10.15	10.26	10.12	10.21	10.19
802.11ac	5290	58	9.59	9.54	9.60	9.77	9.76	9.64	9.80	9.61	9.79	9.71
802.11ac	5530	106	9.50	9.43	9.55	9.59	9.72	9.72	9.68	9.71	9.66	9.62
802.11ac	5775	155	10.31	10.42	10.33	10.40	10.49	10.40	10.49	10.31	10.46	10.41

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Table 9-65
MIMO IEEE 802.11ac Average RF Power – 80 MHz Bandwidth

802.11ac (5 GHz) Conducted Power [dBm]			
Mode	Freq [MHz]	Channel	Data Rate [Mbps]
			58.5
802.11ac	5210	42	12.97
802.11ac	5290	58	12.79
802.11ac	5530	106	12.72
802.11ac	5775	155	12.99

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

- For 2.4 GHz SISO operations, highest average RF output power channel for the lowest data rate for IEEE 802.11b were selected for SAR evaluation. Other IEEE 802.11 SISO modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
- For 5 GHz SISO operations, highest average RF output power channel for the lowest data rate for IEEE 802.11a were selected for SAR evaluation. Other IEEE 802.11 SISO modes (including 802.11n 20 MHz and 40 MHz) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
- Full SAR tests for all SISO IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac in SISO mode was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
- For MIMO 2.4 GHz and 5 GHz operations, the highest average RF output power channel for the lowest data rate for IEEE 802.11n (20 MHz bandwidth) was selected for SAR evaluation. Other IEEE 802.11 modes and bandwidths were not investigated for MIMO operations since the maximum allowed output power (including tolerance) was not higher for these modes.
- The individual spectra for each 2x2 MIMO WIFI Antenna were summed mathematically in linear power units for the MIMO output power measurements.
- When the maximum extrapolated peak SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, SAR testing on other channels is not required. Otherwise, the other default (or corresponding required) test channels were additionally tested using the lowest data rate.
- The bolded data rate and channel above were tested for SAR.

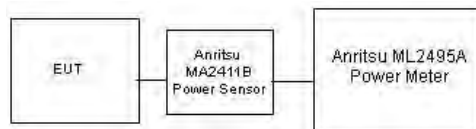


Figure 9-4
Power Measurement Setup for Bandwidths < 50 MHz

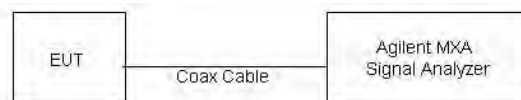


Figure 9-5
Power Measurement Setup for Bandwidths > 50 MHz

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10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Head Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
08/28/2014	750H	22.3	695	0.861	41.466	0.889	42.227	-3.15%	-1.80%
			710	0.875	41.252	0.890	42.149	-1.69%	-2.13%
			725	0.888	41.051	0.891	42.071	-0.34%	-2.42%
			740	0.902	40.841	0.893	41.994	1.01%	-2.75%
			755	0.915	40.641	0.894	41.916	2.35%	-3.04%
08/01/2014	835H	22.7	820	0.913	42.603	0.899	41.578	1.56%	2.47%
			835	0.926	42.383	0.900	41.500	2.89%	2.13%
			850	0.944	42.180	0.916	41.500	3.06%	1.64%
07/31/2014	1750H	20.8	1710	1.371	40.263	1.348	40.142	1.71%	0.30%
			1750	1.412	40.058	1.371	40.079	2.99%	-0.05%
			1790	1.451	39.858	1.394	40.016	4.09%	-0.39%
08/02/2014	1900H	22.9	1850	1.353	40.369	1.400	40.000	-3.36%	0.92%
			1880	1.381	40.233	1.400	40.000	-1.36%	0.58%
			1910	1.408	40.090	1.400	40.000	0.57%	0.23%
08/28/2014	2450H	22.2	2401	1.795	38.318	1.756	39.287	2.22%	-2.47%
			2450	1.861	38.157	1.800	39.200	3.39%	-2.66%
			2499	1.906	37.915	1.853	39.138	2.86%	-3.12%
08/12/2014	5200H-5800H	22.8	5180	4.700	35.571	4.635	36.009	1.40%	-1.22%
			5200	4.724	35.490	4.655	35.986	1.48%	-1.38%
			5220	4.766	35.472	4.676	35.963	1.92%	-1.37%
			5240	4.800	35.467	4.696	35.940	2.21%	-1.32%
			5260	4.825	35.471	4.717	35.917	2.29%	-1.24%
			5280	4.830	35.454	4.737	35.894	1.96%	-1.23%
			5300	4.826	35.388	4.758	35.871	1.43%	-1.35%
			5320	4.850	35.358	4.778	35.849	1.51%	-1.37%
			5500	5.059	35.124	4.963	35.643	1.93%	-1.46%
			5520	5.078	35.101	4.983	35.620	1.91%	-1.46%
			5540	5.076	35.089	5.004	35.597	1.44%	-1.43%
			5580	5.090	34.981	5.045	35.551	0.89%	-1.60%
			5600	5.129	34.965	5.065	35.529	1.26%	-1.59%
			5680	5.205	34.890	5.147	35.437	1.13%	-1.54%
			5700	5.219	34.819	5.168	35.414	0.99%	-1.68%
			5745	5.306	34.780	5.214	35.363	1.76%	-1.65%
			5765	5.335	34.765	5.234	35.340	1.93%	-1.63%
			5785	5.340	34.778	5.255	35.317	1.62%	-1.53%
			5800	5.343	34.693	5.270	35.300	1.39%	-1.72%
			5825	5.358	34.622	5.296	35.271	1.17%	-1.84%

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Table 10-2
Measured Body Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
08/30/2014	750B	23.6	695	0.924	55.696	0.959	55.745	-3.65%	-0.09%
			710	0.939	55.568	0.960	55.687	-2.19%	-0.21%
			725	0.953	55.412	0.961	55.629	-0.83%	-0.39%
			740	0.965	55.306	0.963	55.570	0.21%	-0.48%
			755	0.979	55.186	0.964	55.512	1.56%	-0.59%
07/28/2014	835B	23.0	820	0.985	54.321	0.969	55.258	1.65%	-1.70%
			835	1.000	54.176	0.970	55.200	3.09%	-1.86%
			850	1.014	54.021	0.988	55.154	2.63%	-2.05%
07/30/2014	835B	22.9	820	0.989	53.972	0.969	55.258	2.06%	-2.33%
			835	1.003	53.840	0.970	55.200	3.40%	-2.46%
			850	1.017	53.741	0.988	55.154	2.94%	-2.56%
08/26/2014	1750B	22.0	1710	1.423	52.200	1.463	53.537	-2.73%	-2.50%
			1750	1.465	52.006	1.488	53.432	-1.55%	-2.67%
			1790	1.506	51.860	1.514	53.326	-0.53%	-2.75%
07/28/2014	1900B	23.6	1850	1.506	51.145	1.520	53.300	-0.92%	-4.04%
			1880	1.537	50.998	1.520	53.300	1.12%	-4.32%
			1910	1.577	50.879	1.520	53.300	3.75%	-4.54%
08/28/2014	1900B	22.1	1850	1.466	52.100	1.520	53.300	-3.55%	-2.25%
			1880	1.502	52.007	1.520	53.300	-1.18%	-2.43%
			1910	1.536	51.906	1.520	53.300	1.05%	-2.62%
08/07/2014	2450B	22.9	2401	1.839	51.034	1.903	52.765	-3.36%	-3.28%
			2450	1.903	50.849	1.950	52.700	-2.41%	-3.51%
			2499	1.969	50.697	2.019	52.638	-2.48%	-3.69%
			5180	5.353	47.869	5.276	49.041	1.46%	-2.39%
			5200	5.365	47.684	5.299	49.014	1.25%	-2.71%
08/11/2014	5200B-5800B	20.7	5220	5.415	47.736	5.323	48.987	1.73%	-2.55%
			5240	5.425	47.793	5.346	48.960	1.48%	-2.38%
			5260	5.447	47.871	5.369	48.933	1.45%	-2.17%
			5280	5.478	47.828	5.393	48.906	1.58%	-2.20%
			5300	5.483	47.707	5.416	48.879	1.24%	-2.40%
			5320	5.524	47.617	5.439	48.851	1.56%	-2.53%
			5500	5.726	47.237	5.650	48.607	1.35%	-2.82%
			5520	5.732	47.156	5.673	48.580	1.04%	-2.93%
			5540	5.755	46.979	5.696	48.553	1.04%	-3.24%
			5580	5.838	46.840	5.743	48.499	1.65%	-3.42%
			5600	5.861	46.839	5.766	48.471	1.65%	-3.37%
			5680	5.917	46.318	5.860	48.363	0.97%	-4.23%
			5700	5.978	46.386	5.883	48.336	1.61%	-4.03%
			5745	5.988	46.411	5.936	48.275	0.88%	-3.86%
			5765	5.997	46.229	5.959	48.248	0.64%	-4.18%
			5785	6.021	45.999	5.982	48.220	0.65%	-4.61%
			5800	6.062	45.948	6.000	48.200	1.03%	-4.67%
			5805	6.093	45.915	6.006	48.193	1.45%	-4.73%
			5825	6.138	46.091	6.029	48.166	1.81%	-4.31%
08/13/2014	5200B-5800B	24.0	5180	5.237	48.386	5.276	49.041	-0.74%	-1.34%
			5200	5.262	48.246	5.299	49.014	-0.70%	-1.57%
			5220	5.299	48.228	5.323	48.987	-0.45%	-1.55%
			5240	5.344	48.146	5.346	48.960	-0.04%	-1.66%
			5260	5.397	48.132	5.369	48.933	0.52%	-1.64%
			5280	5.416	48.124	5.393	48.906	0.43%	-1.60%
			5300	5.427	48.087	5.416	48.879	0.20%	-1.62%
			5320	5.450	47.979	5.439	48.851	0.20%	-1.79%
			5500	5.733	47.550	5.650	48.607	1.47%	-2.17%
			5520	5.773	47.507	5.673	48.580	1.76%	-2.21%
			5540	5.795	47.517	5.696	48.553	1.74%	-2.13%
			5580	5.835	47.398	5.743	48.499	1.60%	-2.27%
			5600	5.871	47.349	5.766	48.471	1.82%	-2.31%
			5680	5.999	47.173	5.860	48.363	2.37%	-2.46%
			5700	6.018	47.133	5.883	48.336	2.29%	-2.49%
			5745	6.114	47.032	5.936	48.275	3.00%	-2.57%
			5800	6.186	46.881	6.000	48.200	3.10%	-2.74%

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

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10.2 Test System Verification

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

Table 10-3
System Verification Results

System Verification												
TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR _{1g} (W/kg)	1 W Target SAR _{1g} (W/kg)	1 W Normalized SAR _{1g} (W/kg)	Deviation _{1g} (%)
D	750	HEAD	08/28/2014	23.2	22.3	0.100	1003	3263	0.863	8.370	8.630	3.11%
J	835	HEAD	08/01/2014	24.1	22.7	0.100	4d119	3332	0.893	9.220	8.930	-3.15%
C	1750	HEAD	07/31/2014	20.8	20.8	0.100	1051	3213	3.610	36.200	36.100	-0.28%
C	1900	HEAD	08/02/2014	21.5	22.9	0.100	5d148	3213	4.070	40.700	40.700	0.00%
G	2450	HEAD	08/28/2014	24.1	22.2	0.100	797	3258	4.820	51.800	48.200	-6.95%
E	5200	HEAD	08/12/2014	24.2	22.8	0.100	1057	3914	7.570	78.000	75.700	-2.95%
E	5300	HEAD	08/12/2014	24.2	22.9	0.100	1057	3914	8.180	83.000	81.800	-1.45%
E	5500	HEAD	08/12/2014	24.3	22.9	0.100	1057	3914	7.920	84.300	79.200	-6.05%
E	5600	HEAD	08/12/2014	24.2	22.9	0.100	1057	3914	8.500	83.500	85.000	1.80%
E	5800	HEAD	08/12/2014	24.2	22.9	0.100	1057	3914	7.700	79.300	77.000	-2.90%
B	750	BODY	08/30/2014	23.7	23.5	0.100	1046	3288	0.829	8.540	8.290	-2.93%
D	835	BODY	07/28/2014	24.4	23.0	0.100	4d119	3022	1.000	9.340	10.000	7.07%
J	835	BODY	07/30/2014	23.6	23.0	0.100	4d119	3332	1.010	9.340	10.100	8.14%
J	1750	BODY	08/26/2014	21.5	21.8	0.100	1008	3332	4.020	37.600	40.200	6.91%
B	1900	BODY	07/28/2014	23.8	23.6	0.100	5d148	3288	4.050	39.300	40.500	3.05%
H	1900	BODY	08/28/2014	23.5	22.1	0.100	5d141	3319	3.920	40.600	39.200	-3.45%
H	2450	BODY	08/07/2014	23.9	23.0	0.100	797	3319	5.240	49.400	52.400	6.07%
A	5200	BODY	08/11/2014	22.4	21.3	0.100	1007	3920	7.510	72.600	75.100	3.44%
A	5300	BODY	08/11/2014	22.4	21.3	0.100	1007	3920	7.720	74.700	77.200	3.35%
A	5500	BODY	08/11/2014	22.4	21.3	0.100	1007	3920	7.810	75.900	78.100	2.90%
A	5600	BODY	08/11/2014	22.4	21.3	0.100	1007	3920	7.660	77.300	76.600	-0.91%
A	5800	BODY	08/11/2014	22.4	21.3	0.100	1007	3920	7.230	72.900	72.300	-0.82%
I	5800	BODY	08/13/2014	24.4	24.0	0.100	1057	3589	7.350	74.300	73.500	-1.08%

System Verification												
TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR _{10g} (W/kg)	1 W Target SAR _{10g} (W/kg)	1 W Normalized SAR _{10g} (W/kg)	Deviation _{10g} (%)
H	1900	BODY	08/28/2014	23.5	22.1	0.100	5d141	3319	2.090	21.600	20.900	-3.24%
I	5200	BODY	08/13/2014	24.4	24.0	0.100	1057	3589	2.250	21.000	22.500	7.14%
I	5300	BODY	08/13/2014	24.4	24.1	0.100	1057	3589	2.330	21.500	23.300	8.37%
I	5500	BODY	08/13/2014	24.3	23.9	0.100	1057	3589	2.300	22.000	23.000	4.55%
I	5600	BODY	08/13/2014	24.2	23.9	0.100	1057	3589	2.240	22.200	22.400	0.90%

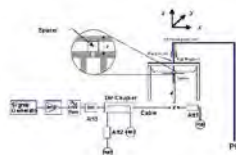


Figure 10-1
System Verification Setup Diagram



Figure 10-2
System Verification Setup Photo

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11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	34.0	33.10	-0.06	Right	Cheek	Standard	F16AC	1:8.3	0.035	1.230	0.043	
836.60	190	GSM 850	GSM	34.0	33.10	0.12	Right	Tilt	Standard	F16AC	1:8.3	0.017	1.230	0.021	
836.60	190	GSM 850	GSM	34.0	33.10	0.08	Left	Cheek	Standard	F16AC	1:8.3	0.072	1.230	0.089	
836.60	190	GSM 850	GSM	34.0	33.10	0.08	Left	Cheek	Wireless Charging Cover	F16AC	1:8.3	0.081	1.230	0.100	A1
836.60	190	GSM 850	GSM	34.0	33.10	-0.05	Left	Tilt	Standard	F16AC	1:8.3	0.024	1.230	0.030	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-2
UMTS 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	24.5	24.08	0.00	Right	Cheek	Standard	F19B6	1:1	0.048	1.102	0.053	
836.60	4183	UMTS 850	RMC	24.5	24.08	0.13	Right	Tilt	Standard	F19B6	1:1	0.025	1.102	0.028	
836.60	4183	UMTS 850	RMC	24.5	24.08	0.04	Left	Cheek	Standard	F19B6	1:1	0.098	1.102	0.108	
836.60	4183	UMTS 850	RMC	24.5	24.08	-0.08	Left	Cheek	Wireless Charging Cover	F19B6	1:1	0.120	1.102	0.132	A2
836.60	4183	UMTS 850	RMC	24.5	24.08	-0.04	Left	Tilt	Standard	F19B6	1:1	0.032	1.102	0.035	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-3
GSM 1900 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.5	30.50	0.03	Right	Cheek	Standard	F19AC	1:8.3	0.037	1.000	0.037	
1880.00	661	GSM 1900	GSM	30.5	30.50	0.02	Right	Tilt	Standard	F19AC	1:8.3	0.034	1.000	0.034	
1880.00	661	GSM 1900	GSM	30.5	30.50	0.09	Left	Cheek	Standard	F19AC	1:8.3	0.058	1.000	0.058	A3
1880.00	661	GSM 1900	GSM	30.5	30.50	0.13	Left	Cheek	Wireless Charging Cover	F19AC	1:8.3	0.051	1.000	0.051	
1880.00	661	GSM 1900	GSM	30.5	30.50	0.09	Left	Tilt	Standard	F19AC	1:8.3	0.032	1.000	0.032	
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
UMTS 1900 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Cover Type	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	23.0	22.30	-0.10	Right	Cheek	Standard	F19B6	1:1	0.086	1.175	0.101	
1880.00	9400	UMTS 1900	RMC	23.0	22.30	0.01	Right	Tilt	Standard	F19B6	1:1	0.082	1.175	0.096	
1880.00	9400	UMTS 1900	RMC	23.0	22.30	0.19	Left	Cheek	Standard	F19B6	1:1	0.164	1.175	0.193	A4
1880.00	9400	UMTS 1900	RMC	23.0	22.30	0.12	Left	Cheek	Wireless Charging Cover	F19B6	1:1	0.128	1.175	0.150	
1880.00	9400	UMTS 1900	RMC	23.0	22.30	-0.05	Left	Tilt	Standard	F19B6	1:1	0.056	1.175	0.066	
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 11-5
LTE Band 12 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	0.10	0	Right	Cheek	QPSK	1	0	024DF	1:1	0.145	1.059	0.154	A5
707.50	23095	Mid	LTE Band 12	10	Wireless Charging Cover	25.0	24.75	-0.02	0	Right	Cheek	QPSK	1	0	024DF	1:1	0.133	1.059	0.141	
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	0.08	1	Right	Cheek	QPSK	25	0	024DF	1:1	0.122	1.081	0.132	
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	-0.03	0	Right	Tilt	QPSK	1	0	024DF	1:1	0.057	1.059	0.060	
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	0.03	1	Right	Tilt	QPSK	25	0	024DF	1:1	0.039	1.081	0.042	
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	0.19	0	Left	Cheek	QPSK	1	0	024DF	1:1	0.118	1.059	0.125	
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	0.10	1	Left	Cheek	QPSK	25	0	024DF	1:1	0.104	1.081	0.112	
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	0.17	0	Left	Tilt	QPSK	1	0	024DF	1:1	0.067	1.059	0.071	
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	0.13	1	Left	Tilt	QPSK	25	0	024DF	1:1	0.049	1.081	0.053	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Head										
Spatial Peak										1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population										averaged over 1 gram										

Table 11-6
LTE Band 5 (Cell) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	0.12	0	Right	Cheek	QPSK	1	49	F19B1	1:1	0.032	1.197	0.038	A6
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	0.20	1	Right	Cheek	QPSK	25	25	F19B1	1:1	0.025	1.227	0.031	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	0.13	0	Right	Tilt	QPSK	1	49	F19B1	1:1	0.018	1.197	0.022	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	0.19	1	Right	Tilt	QPSK	25	25	F19B1	1:1	0.014	1.227	0.017	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	0.03	0	Left	Cheek	QPSK	1	49	F19B1	1:1	0.072	1.197	0.086	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Wireless Charging Cover	25.0	24.22	-0.14	0	Left	Cheek	QPSK	1	49	F19B1	1:1	0.093	1.197	0.111	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	0.02	1	Left	Cheek	QPSK	25	25	F19B1	1:1	0.057	1.227	0.070	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	0.11	0	Left	Tilt	QPSK	1	49	F19B1	1:1	0.023	1.197	0.028	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	0.08	1	Left	Tilt	QPSK	25	25	F19B1	1:1	0.017	1.227	0.021	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-7
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.72	-0.03	0	Right	Cheek	QPSK	1	99	F1668	1:1	0.118	1.067	0.126	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.65	0.10	1	Right	Cheek	QPSK	50	25	F1668	1:1	0.094	1.084	0.102	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.72	0.07	0	Right	Tilt	QPSK	1	99	F1668	1:1	0.107	1.067	0.114	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.65	0.06	1	Right	Tilt	QPSK	50	25	F1668	1:1	0.087	1.084	0.094	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.72	-0.02	0	Left	Cheek	QPSK	1	99	F1668	1:1	0.246	1.067	0.262	A7
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Wireless Charging Cover	23.0	22.72	0.16	0	Left	Cheek	QPSK	1	99	F1668	1:1	0.238	1.067	0.254	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.65	0.05	1	Left	Cheek	QPSK	50	25	F1668	1:1	0.201	1.084	0.218	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.72	-0.02	0	Left	Tilt	QPSK	1	99	F1668	1:1	0.114	1.067	0.122	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.65	-0.01	1	Left	Tilt	QPSK	50	25	F1668	1:1	0.087	1.084	0.094	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Head 1.6 W/kg (mW/g) averaged over 1 gram								

Table 11-8
LTE Band 2 (PCS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	23.5	23.41	-0.03	0	Right	Cheek	QPSK	1	99	F19AC	1:1	0.096	1.021	0.098	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	22.5	22.33	-0.02	1	Right	Cheek	QPSK	50	50	F19AC	1:1	0.068	1.040	0.071	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	23.5	23.41	0.02	0	Right	Tilt	QPSK	1	99	F19AC	1:1	0.094	1.021	0.096	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	22.5	22.33	-0.03	1	Right	Tilt	QPSK	50	50	F19AC	1:1	0.072	1.040	0.075	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	23.5	23.41	0.07	0	Left	Cheek	QPSK	1	99	F19AC	1:1	0.145	1.021	0.148	A8
1900.00	19100	High	LTE Band 2 (PCS)	20	Wireless Charging Cover	23.5	23.41	0.07	0	Left	Cheek	QPSK	1	99	F19AC	1:1	0.130	1.021	0.133	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	22.5	22.33	0.07	1	Left	Cheek	QPSK	50	50	F19AC	1:1	0.120	1.040	0.125	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	23.5	23.41	-0.02	0	Left	Tilt	QPSK	1	99	F19AC	1:1	0.082	1.021	0.084	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	22.5	22.33	-0.01	1	Left	Tilt	QPSK	50	50	F19AC	1:1	0.063	1.040	0.066	
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
DTS Head SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Cover Type	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.16	Right	Cheek	1	Standard	015D8	1	1:1	0.314	1.047	0.329	
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.06	Right	Tilt	1	Standard	015D8	1	1:1	0.206	1.047	0.216	
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.12	Left	Cheek	1	Standard	015D8	1	1:1	0.166	1.047	0.174	
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.12	Left	Tilt	1	Standard	015D8	1	1:1	0.090	1.047	0.094	
2462	11	IEEE 802.11b	DSSS	15.5	14.80	-0.05	Right	Cheek	2	Standard	01FC3	1	1:1	0.573	1.175	0.673	A9
2462	11	IEEE 802.11b	DSSS	15.5	14.80	0.02	Right	Cheek	2	Wireless Charging Cover	01FC3	1	1:1	0.544	1.175	0.639	
2462	11	IEEE 802.11b	DSSS	15.5	14.80	0.07	Right	Tilt	2	Standard	01FC3	1	1:1	0.330	1.175	0.388	
2462	11	IEEE 802.11b	DSSS	15.5	14.80	0.05	Left	Cheek	2	Standard	01FC3	1	1:1	0.442	1.175	0.519	
2462	11	IEEE 802.11b	DSSS	15.5	14.80	0.08	Left	Tilt	2	Standard	01FC3	1	1:1	0.312	1.175	0.367	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	-0.10	Right	Cheek	MIMO	Standard	01FC3	13	1:1	0.405	1.038	0.420	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	-0.12	Right	Cheek	MIMO	Wireless Charging Cover	01FC3	13	1:1	0.400	1.038	0.415	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.09	Right	Tilt	MIMO	Standard	01FC3	13	1:1	0.301	1.038	0.312	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.04	Left	Cheek	MIMO	Standard	01FC3	13	1:1	0.280	1.038	0.291	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.16	Left	Tilt	MIMO	Standard	01FC3	13	1:1	0.183	1.038	0.190	
5825	165	IEEE 802.11a	OFDM	12.5	11.88	0.11	Right	Cheek	1	Standard	015D8	6	1:1	0.074	1.153	0.085	
5775	155	IEEE 802.11ac	OFDM	10.5	9.62	0.16	Right	Cheek	1	Standard	015D8	29.3	1:1	0.045	1.225	0.055	
5825	165	IEEE 802.11a	OFDM	12.5	11.88	0.17	Right	Tilt	1	Standard	015D8	6	1:1	0.038	1.153	0.044	
5825	165	IEEE 802.11a	OFDM	12.5	11.88	-0.15	Left	Cheek	1	Standard	015D8	6	1:1	0.035	1.153	0.040	
5825	165	IEEE 802.11a	OFDM	12.5	11.88	0.19	Left	Tilt	1	Standard	015D8	6	1:1	0.000	1.153	0.000	
5765	153	IEEE 802.11a	OFDM	12.5	12.41	-0.08	Right	Cheek	2	Standard	015D8	6	1:1	0.025	1.021	0.026	
5765	153	IEEE 802.11a	OFDM	12.5	12.41	0.16	Right	Tilt	2	Standard	015D8	6	1:1	0.034	1.021	0.035	
5765	153	IEEE 802.11a	OFDM	12.5	12.41	0.13	Left	Cheek	2	Standard	015D8	6	1:1	0.039	1.021	0.040	
5775	155	IEEE 802.11ac	OFDM	10.5	10.31	-0.12	Left	Cheek	2	Standard	015D8	29.3	1:1	0.012	1.045	0.013	
5765	153	IEEE 802.11a	OFDM	12.5	12.41	0.07	Left	Tilt	2	Standard	015D8	6	1:1	0.035	1.021	0.036	
5745	149	IEEE 802.11n	OFDM	15.5	14.85	0.12	Right	Cheek	MIMO	Standard	015D8	13	1:1	0.169	1.161	0.196	A10
5745	149	IEEE 802.11n	OFDM	15.5	14.85	0.14	Right	Tilt	MIMO	Standard	015D8	13	1:1	0.080	1.161	0.093	
5745	149	IEEE 802.11n	OFDM	15.5	14.85	-0.16	Left	Cheek	MIMO	Standard	015D8	13	1:1	0.029	1.161	0.034	
5745	149	IEEE 802.11n	OFDM	15.5	14.85	0.12	Left	Tilt	MIMO	Standard	015D8	13	1:1	0.029	1.161	0.034	
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**Table 11-10
NII Head SAR**

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Cover Type	Device Serial Number	Data Rate (Mbps)	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
5240	48	IEEE 802.11a	OFDM	12.5	11.59	-0.12	Right	Cheek	1	Standard	015D8	6	1:1	0.019	1.233	0.023	
5210	42	IEEE 802.11ac	OFDM	10.5	9.88	0.10	Right	Cheek	1	Standard	015D8	29.3	1:1	0.010	1.153	0.012	
5240	48	IEEE 802.11a	OFDM	12.5	11.59	0.16	Right	Tilt	1	Standard	015D8	6	1:1	0.007	1.233	0.009	
5240	48	IEEE 802.11a	OFDM	12.5	11.59	0.19	Left	Cheek	1	Standard	015D8	6	1:1	0.000	1.233	0.000	
5240	48	IEEE 802.11a	OFDM	12.5	11.59	0.10	Left	Tilt	1	Standard	015D8	6	1:1	0.000	1.233	0.000	
5320	64	IEEE 802.11a	OFDM	12.5	11.94	-0.14	Right	Cheek	1	Standard	015D8	6	1:1	0.015	1.138	0.017	
5290	58	IEEE 802.11ac	OFDM	10.5	9.96	-0.12	Right	Cheek	1	Standard	015D8	29.3	1:1	0.016	1.132	0.018	
5320	64	IEEE 802.11a	OFDM	12.5	11.94	0.14	Right	Tilt	1	Standard	015D8	6	1:1	0.011	1.138	0.013	
5320	64	IEEE 802.11a	OFDM	12.5	11.94	0.10	Left	Cheek	1	Standard	015D8	6	1:1	0.000	1.138	0.000	
5320	64	IEEE 802.11a	OFDM	12.5	11.94	0.19	Left	Tilt	1	Standard	015D8	6	1:1	0.000	1.138	0.000	
5580	116	IEEE 802.11a	OFDM	12.5	12.00	-0.03	Right	Cheek	1	Standard	015D8	6	1:1	0.086	1.122	0.096	
5530	106	IEEE 802.11ac	OFDM	10.5	9.92	0.13	Right	Cheek	1	Standard	015D8	29.3	1:1	0.033	1.143	0.038	
5580	116	IEEE 802.11a	OFDM	12.5	12.00	0.11	Right	Tilt	1	Standard	015D8	6	1:1	0.043	1.122	0.048	
5580	116	IEEE 802.11a	OFDM	12.5	12.00	0.12	Left	Cheek	1	Standard	015D8	6	1:1	0.035	1.122	0.039	
5580	116	IEEE 802.11a	OFDM	12.5	12.00	0.10	Left	Tilt	1	Standard	015D8	6	1:1	0.000	1.122	0.000	
5200	40	IEEE 802.11a	OFDM	12.5	11.92	0.16	Right	Cheek	2	Standard	015D8	6	1:1	0.096	1.143	0.110	
5200	40	IEEE 802.11a	OFDM	12.5	11.92	0.11	Right	Tilt	2	Standard	015D8	6	1:1	0.073	1.143	0.083	
5200	40	IEEE 802.11a	OFDM	12.5	11.92	0.13	Left	Cheek	2	Standard	015D8	6	1:1	0.139	1.143	0.159	
5200	40	IEEE 802.11a	OFDM	12.5	11.92	0.12	Left	Cheek	2	Wireless Charging Cover	015D8	6	1:1	0.140	1.143	0.160	
5210	42	IEEE 802.11ac	OFDM	10.5	10.04	0.14	Left	Cheek	2	Standard	015D8	29.3	1:1	0.058	1.112	0.064	
5200	40	IEEE 802.11a	OFDM	12.5	11.92	0.13	Left	Tilt	2	Standard	015D8	6	1:1	0.118	1.143	0.135	
5260	52	IEEE 802.11a	OFDM	12.5	11.54	0.18	Right	Cheek	2	Standard	015D8	6	1:1	0.075	1.247	0.094	
5260	52	IEEE 802.11a	OFDM	12.5	11.54	0.14	Right	Tilt	2	Standard	015D8	6	1:1	0.062	1.247	0.077	
5260	52	IEEE 802.11a	OFDM	12.5	11.54	0.12	Left	Cheek	2	Standard	015D8	6	1:1	0.115	1.247	0.143	
5290	58	IEEE 802.11ac	OFDM	10.5	9.59	0.14	Left	Cheek	2	Standard	015D8	29.3	1:1	0.046	1.233	0.057	
5260	52	IEEE 802.11a	OFDM	12.5	11.54	-0.02	Left	Tilt	2	Standard	015D8	6	1:1	0.097	1.247	0.121	
5700	140	IEEE 802.11a	OFDM	12.5	11.92	-0.15	Right	Cheek	2	Standard	015D8	6	1:1	0.026	1.143	0.030	
5700	140	IEEE 802.11a	OFDM	12.5	11.92	0.15	Right	Tilt	2	Standard	015D8	6	1:1	0.037	1.143	0.042	
5700	140	IEEE 802.11a	OFDM	12.5	11.92	0.13	Left	Cheek	2	Standard	015D8	6	1:1	0.050	1.143	0.057	
5530	106	IEEE 802.11ac	OFDM	10.5	9.50	0.14	Left	Cheek	2	Standard	015D8	29.3	1:1	0.032	1.259	0.040	
5700	140	IEEE 802.11a	OFDM	12.5	11.92	0.16	Left	Tilt	2	Standard	015D8	6	1:1	0.046	1.143	0.053	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	0.12	Right	Cheek	MIMO	Standard	015D8	13	1:1	0.011	1.180	0.013	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	0.16	Right	Tilt	MIMO	Standard	015D8	13	1:1	0.005	1.180	0.006	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	-0.19	Left	Cheek	MIMO	Standard	015D8	13	1:1	0.106	1.180	0.125	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	0.17	Left	Tilt	MIMO	Standard	015D8	13	1:1	0.085	1.180	0.100	
5280	56	IEEE 802.11n	OFDM	15.5	14.67	0.21	Right	Cheek	MIMO	Standard	015D8	13	1:1	0.039	1.211	0.047	
5280	56	IEEE 802.11n	OFDM	15.5	14.67	0.12	Right	Tilt	MIMO	Standard	015D8	13	1:1	0.018	1.211	0.022	
5280	56	IEEE 802.11n	OFDM	15.5	14.67	0.10	Left	Cheek	MIMO	Standard	015D8	13	1:1	0.076	1.211	0.092	
5280	56	IEEE 802.11n	OFDM	15.5	14.67	0.10	Left	Tilt	MIMO	Standard	015D8	13	1:1	0.061	1.211	0.074	
5680	136	IEEE 802.11n	OFDM	15.5	14.80	0.13	Right	Cheek	MIMO	Standard	015D8	13	1:1	0.187	1.175	0.220	
5680	136	IEEE 802.11n	OFDM	15.5	14.80	0.08	Right	Cheek	MIMO	Wireless Charging Cover	015D8	13	1:1	0.212	1.175	0.249	A11
5680	136	IEEE 802.11n	OFDM	15.5	14.80	0.16	Right	Tilt	MIMO	Standard	015D8	13	1:1	0.122	1.175	0.143	
5680	136	IEEE 802.11n	OFDM	15.5	14.80	-0.13	Left	Cheek	MIMO	Standard	015D8	13	1:1	0.035	1.175	0.041	
5680	136	IEEE 802.11n	OFDM	15.5	14.80	0.12	Left	Tilt	MIMO	Standard	015D8	13	1:1	0.037	1.175	0.043	
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11.2 Standalone Body-Worn SAR Data

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

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	34.0	33.10	0.03	10 mm	Standard	F16AC	1	1:8.3	back	0.359	1.230	0.442	A12
836.60	190	GSM 850	GSM	34.0	33.10	-0.07	10 mm	Wireless Charging Cover	F16AC	1	1:8.3	back	0.277	1.230	0.341	
836.60	4183	UMTS 850	RMC	24.5	24.08	0.12	10 mm	Standard	F19B6	N/A	1:1	back	0.487	1.102	0.537	A14
836.60	4183	UMTS 850	RMC	24.5	24.08	0.02	10 mm	Wireless Charging Cover	F19B6	N/A	1:1	back	0.436	1.102	0.480	
1880.00	661	GSM 1900	GSM	30.5	30.50	-0.12	10 mm	Standard	F16AC	1	1:8.3	back	0.256	1.000	0.256	A16
1880.00	661	GSM 1900	GSM	30.5	30.50	-0.14	10 mm	Wireless Charging Cover	F16AC	1	1:8.3	back	0.203	1.000	0.203	
1880.00	9400	UMTS 1900	RMC	23.0	22.30	0.05	15 mm	Standard	01FC4	N/A	1:1	back	0.317	1.175	0.372	A18
1880.00	9400	UMTS 1900	RMC	23.0	22.30	0.05	15 mm	Wireless Charging Cover	01FC4	N/A	1:1	back	0.289	1.175	0.340	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-12
LTE Body-Worn SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	0.00	0	024DF	QPSK	1	0	10 mm	back	1:1	0.367	1.059	0.389	A20
707.50	23095	Mid	LTE Band 12	10	Wireless Charging Cover	25.0	24.75	0.02	0	024DF	QPSK	1	0	10 mm	back	1:1	0.268	1.059	0.284	
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	0.01	1	024DF	QPSK	25	0	10 mm	back	1:1	0.302	1.081	0.326	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	0.02	0	F19B1	QPSK	1	49	10 mm	back	1:1	0.351	1.197	0.420	A22
836.50	20525	Mid	LTE Band 5 (Cell)	10	Wireless Charging Cover	25.0	24.22	-0.01	0	F19B1	QPSK	1	49	10 mm	back	1:1	0.324	1.197	0.388	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	-0.04	1	F19B1	QPSK	25	25	10 mm	back	1:1	0.279	1.227	0.342	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	23.0	22.72	-0.08	0	F1668	QPSK	1	99	15 mm	back	1:1	0.382	1.067	0.408	A24
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Wireless Charging Cover	23.0	22.72	0.05	0	F1668	QPSK	1	99	15 mm	back	1:1	0.321	1.067	0.343	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	22.0	21.65	-0.09	1	F1668	QPSK	50	25	15 mm	back	1:1	0.283	1.084	0.307	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	23.5	23.41	0.12	0	01FC4	QPSK	1	99	15 mm	back	1:1	0.413	1.021	0.422	A26
1900.00	19100	High	LTE Band 2 (PCS)	20	Wireless Charging Cover	23.5	23.41	0.13	0	01FC4	QPSK	1	99	15 mm	back	1:1	0.363	1.021	0.371	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	22.5	22.33	0.12	1	01FC4	QPSK	50	50	15 mm	back	1:1	0.304	1.040	0.316	
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 11-13
DTS Body-Worn SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.06	10 mm	1	Standard	015D8	1	back	1:1	0.128	1.047	0.134	A28
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.18	10 mm	1	Wireless Charging Cover	015D8	1	back	1:1	0.086	1.047	0.090	
2462	11	IEEE 802.11b	DSSS	15.5	14.80	0.08	10 mm	2	Standard	015D8	1	back	1:1	0.118	1.175	0.139	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.19	10 mm	MIMO	Standard	015D8	13	back	1:1	0.060	1.038	0.062	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.12	10 mm	MIMO	Wireless Charging Cover	015D8	13	back	1:1	0.045	1.038	0.047	
5825	165	IEEE 802.11a	OFDM	12.5	11.88	0.15	10 mm	1	Standard	015D8	6	back	1:1	0.048	1.153	0.055	
5775	155	IEEE 802.11ac	OFDM	10.5	9.62	0.12	10 mm	1	Standard	015D8	29.3	back	1:1	0.030	1.225	0.037	
5765	153	IEEE 802.11a	OFDM	12.5	12.41	-0.13	10 mm	2	Standard	015D8	6	back	1:1	0.214	1.021	0.218	
5775	155	IEEE 802.11ac	OFDM	10.5	10.31	-0.12	10 mm	2	Standard	015D8	29.3	back	1:1	0.092	1.045	0.096	
5745	149	IEEE 802.11n	OFDM	15.5	14.85	-0.13	10 mm	MIMO	Standard	015D8	13	back	1:1	0.292	1.161	0.369	A29
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 11-14
NII Body-Worn SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
5240	48	IEEE 802.11a	OFDM	12.5	11.59	0.16	10 mm	1	Standard	015D8	6	back	1:1	0.022	1.233	0.027	
5210	42	IEEE 802.11ac	OFDM	10.5	9.88	0.15	10 mm	1	Standard	015D8	29.3	back	1:1	0.019	1.153	0.022	
5320	64	IEEE 802.11a	OFDM	12.5	11.94	0.10	10 mm	1	Standard	015D8	6	back	1:1	0.026	1.138	0.030	
5290	58	IEEE 802.11ac	OFDM	10.5	9.96	0.12	10 mm	1	Standard	015D8	29.3	back	1:1	0.018	1.132	0.020	
5580	116	IEEE 802.11a	OFDM	12.5	12.00	0.17	10 mm	1	Standard	015D8	6	back	1:1	0.046	1.122	0.052	
5530	106	IEEE 802.11ac	OFDM	10.5	9.92	0.16	10 mm	1	Standard	015D8	29.3	back	1:1	0.025	1.143	0.029	
5200	40	IEEE 802.11a	OFDM	12.5	11.92	-0.14	10 mm	2	Standard	015D8	6	back	1:1	0.092	1.143	0.105	
5210	42	IEEE 802.11ac	OFDM	10.5	10.04	-0.16	10 mm	2	Standard	015D8	29.3	back	1:1	0.059	1.112	0.066	
5260	52	IEEE 802.11a	OFDM	12.5	11.54	-0.04	10 mm	2	Standard	015D8	6	back	1:1	0.092	1.247	0.115	
5290	58	IEEE 802.11ac	OFDM	10.5	9.59	-0.13	10 mm	2	Standard	015D8	29.3	back	1:1	0.063	1.233	0.078	
5700	140	IEEE 802.11a	OFDM	12.5	11.92	-0.10	10 mm	2	Standard	015D8	6	back	1:1	0.272	1.143	0.311	
5700	140	IEEE 802.11a	OFDM	12.5	11.92	-0.12	10 mm	2	Wireless Charging Cover	015D8	6	back	1:1	0.321	1.143	0.367	
5530	106	IEEE 802.11ac	OFDM	10.5	9.50	-0.19	10 mm	2	Standard	015D8	29.3	back	1:1	0.157	1.259	0.198	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	-0.14	10 mm	MIMO	Standard	015D8	13	back	1:1	0.127	1.180	0.150	
5280	56	IEEE 802.11n	OFDM	15.5	14.67	-0.17	10 mm	MIMO	Standard	015D8	13	back	1:1	0.147	1.211	0.178	
5540	108	IEEE 802.11n	OFDM	15.5	14.62	-0.12	10 mm	MIMO	Standard	015D8	13	back	1:1	0.385	1.225	0.472	
5580	116	IEEE 802.11n	OFDM	15.5	14.75	-0.15	10 mm	MIMO	Standard	015D8	13	back	1:1	0.428	1.189	0.509	
5680	136	IEEE 802.11n	OFDM	15.5	14.80	-0.12	10 mm	MIMO	Standard	015D8	13	back	1:1	0.454	1.175	0.533	A31
5680	136	IEEE 802.11n	OFDM	15.5	14.80	-0.10	10 mm	MIMO	Wireless Charging Cover	015D8	13	back	1:1	0.325	1.175	0.382	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram										

11.3 Standalone Wireless Router SAR Data

Table 11-15
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #
Mhz	Ch.															
836.60	190	GSM 850	GPRS	31.5	31.44	-0.02	10 mm	Standard	F16AC	2	1:4.15	back	0.438	1.014	0.444	
836.60	190	GSM 850	GPRS	31.5	31.44	0.09	10 mm	Standard	F16AC	2	1:4.15	front	0.490	1.014	0.497	
836.60	190	GSM 850	GPRS	31.5	31.44	0.03	10 mm	Wireless Charging Cover	F16AC	2	1:4.15	front	0.529	1.014	0.536	A13
836.60	190	GSM 850	GPRS	31.5	31.44	-0.07	10 mm	Standard	F16AC	2	1:4.15	bottom	0.183	1.014	0.186	
836.60	190	GSM 850	GPRS	31.5	31.44	0.14	10 mm	Standard	F16AC	2	1:4.15	right	0.035	1.014	0.035	
836.60	190	GSM 850	GPRS	31.5	31.44	-0.03	10 mm	Standard	F16AC	2	1:4.15	left	0.177	1.014	0.179	
836.60	4183	UMTS 850	RMC	24.5	24.08	0.12	10 mm	Standard	F19B6	N/A	1:1	back	0.487	1.102	0.537	
836.60	4183	UMTS 850	RMC	24.5	24.08	0.02	10 mm	Standard	F19B6	N/A	1:1	front	0.546	1.102	0.602	
836.60	4183	UMTS 850	RMC	24.5	24.08	-0.01	10 mm	Wireless Charging Cover	F19B6	N/A	1:1	front	0.569	1.102	0.627	A15
836.60	4183	UMTS 850	RMC	24.5	24.08	-0.06	10 mm	Standard	F19B6	N/A	1:1	bottom	0.221	1.102	0.244	
836.60	4183	UMTS 850	RMC	24.5	24.08	0.20	10 mm	Standard	F19B6	N/A	1:1	right	0.245	1.102	0.270	
836.60	4183	UMTS 850	RMC	24.5	24.08	-0.09	10 mm	Standard	F19B6	N/A	1:1	left	0.191	1.102	0.210	
1880.00	661	GSM 1900	GPRS	29.0	28.52	-0.05	10 mm	Standard	F16AC	2	1:4.15	back	0.372	1.117	0.416	
1880.00	661	GSM 1900	GPRS	29.0	28.52	0.13	10 mm	Standard	F16AC	2	1:4.15	front	0.474	1.117	0.529	
1880.00	661	GSM 1900	GPRS	29.0	28.52	0.00	10 mm	Standard	F16AC	2	1:4.15	bottom	0.619	1.117	0.691	A17
1880.00	661	GSM 1900	GPRS	29.0	28.52	0.09	10 mm	Wireless Charging Cover	F16AC	2	1:4.15	bottom	0.439	1.117	0.490	
1880.00	661	GSM 1900	GPRS	29.0	28.52	0.06	10 mm	Standard	F16AC	2	1:4.15	right	0.142	1.117	0.159	
1880.00	661	GSM 1900	GPRS	29.0	28.52	-0.06	10 mm	Standard	F16AC	2	1:4.15	left	0.105	1.117	0.117	
1880.00	9400	UMTS 1900	RMC	22.0	21.80	-0.01	10 mm	Standard	01FC4	N/A	1:1	back	0.450	1.047	0.471	
1880.00	9400	UMTS 1900	RMC	22.0	21.80	-0.01	10 mm	Standard	01FC4	N/A	1:1	front	0.645	1.047	0.675	
1852.40	9262	UMTS 1900	RMC	22.0	21.97	-0.01	10 mm	Standard	01FC4	N/A	1:1	bottom	0.988	1.007	0.995	A19
1880.00	9400	UMTS 1900	RMC	22.0	21.80	-0.01	10 mm	Standard	01FC4	N/A	1:1	bottom	0.890	1.047	0.932	
1907.60	9538	UMTS 1900	RMC	22.0	22.00	-0.11	10 mm	Standard	01FC4	N/A	1:1	bottom	0.885	1.000	0.885	
1852.40	9262	UMTS 1900	RMC	22.0	21.97	-0.05	10 mm	Wireless Charging Cover	01FC4	N/A	1:1	bottom	0.905	1.007	0.911	
1880.00	9400	UMTS 1900	RMC	22.0	21.80	0.00	10 mm	Standard	01FC4	N/A	1:1	right	0.111	1.047	0.116	
1880.00	9400	UMTS 1900	RMC	22.0	21.80	-0.02	10 mm	Standard	01FC4	N/A	1:1	left	0.163	1.047	0.171	
1852.40	9262	UMTS 1900	RMC	22.0	21.97	0.03	10 mm	Standard	01FC4	N/A	1:1	bottom	0.984	1.007	0.991	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram									

Blue entry represents variability testing.

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Table 11-16
LTE Band 12 Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.					(W/kg)	(W/kg)													
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	0.00	0	024DF	QPSK	1	0	10 mm	back	1:1	0.367	1.059	0.389	A21
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	0.01	1	024DF	QPSK	25	0	10 mm	back	1:1	0.302	1.081	0.326	
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	-0.01	0	024DF	QPSK	1	0	10 mm	front	1:1	0.408	1.059	0.432	
707.50	23095	Mid	LTE Band 12	10	Wireless Charging Cover	25.0	24.75	0.02	0	024DF	QPSK	1	0	10 mm	front	1:1	0.424	1.059	0.449	
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	0.02	1	024DF	QPSK	25	0	10 mm	front	1:1	0.330	1.081	0.357	
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	-0.03	0	024DF	QPSK	1	0	10 mm	bottom	1:1	0.263	1.059	0.279	
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	0.01	1	024DF	QPSK	25	0	10 mm	bottom	1:1	0.240	1.081	0.259	
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	0.04	0	024DF	QPSK	1	0	10 mm	right	1:1	0.312	1.059	0.330	
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	-0.10	1	024DF	QPSK	25	0	10 mm	right	1:1	0.228	1.081	0.246	
707.50	23095	Mid	LTE Band 12	10	Standard	25.0	24.75	-0.04	0	024DF	QPSK	1	0	10 mm	left	1:1	0.214	1.059	0.227	
707.50	23095	Mid	LTE Band 12	10	Standard	24.0	23.66	-0.04	1	024DF	QPSK	25	0	10 mm	left	1:1	0.132	1.081	0.143	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak									Body 1.6 W/kg (mW/g) averaged over 1 gram											
Uncontrolled Exposure/General Population																				

Table 11-17
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.																			
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	0.02	0	F19B1	QPSK	1	49	10 mm	back	1:1	0.351	1.197	0.420	A23
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	-0.04	1	F19B1	QPSK	25	25	10 mm	back	1:1	0.279	1.227	0.342	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	-0.04	0	F19B1	QPSK	1	49	10 mm	front	1:1	0.376	1.197	0.450	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Wireless Charging Cover	25.0	24.22	0.04	0	F19B1	QPSK	1	49	10 mm	front	1:1	0.427	1.197	0.511	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	0.00	1	F19B1	QPSK	25	25	10 mm	front	1:1	0.297	1.227	0.364	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	0.00	0	F19B1	QPSK	1	49	10 mm	bottom	1:1	0.128	1.197	0.153	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	0.00	1	F19B1	QPSK	25	25	10 mm	bottom	1:1	0.104	1.227	0.128	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	0.12	0	F19B1	QPSK	1	49	10 mm	right	1:1	0.324	1.197	0.388	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	0.13	1	F19B1	QPSK	25	25	10 mm	right	1:1	0.248	1.227	0.304	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	25.0	24.22	-0.05	0	F19B1	QPSK	1	49	10 mm	left	1:1	0.149	1.197	0.178	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Standard	24.0	23.11	0.04	1	F19B1	QPSK	25	25	10 mm	left	1:1	0.117	1.227	0.144	
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
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Scaled SAR (1g) (W/kg)	Plot #	
MHz	Ch.																			
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.97	-0.04	0	01A30	QPSK	1	0	10 mm	back	1:1	0.402	1.007	0.405	A25
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.96	-0.12	0	01A30	QPSK	50	0	10 mm	back	1:1	0.396	1.009	0.400	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.97	0.03	0	01A30	QPSK	1	0	10 mm	front	1:1	0.604	1.007	0.608	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Wireless Charging Cover	21.0	20.97	0.06	0	01A30	QPSK	1	0	10 mm	front	1:1	0.515	1.007	0.519	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.96	-0.01	0	01A30	QPSK	50	0	10 mm	front	1:1	0.583	1.009	0.588	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.97	0.02	0	01A30	QPSK	1	0	10 mm	bottom	1:1	0.588	1.007	0.592	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.96	0.01	0	01A30	QPSK	50	0	10 mm	bottom	1:1	0.574	1.009	0.579	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.97	0.05	0	01A30	QPSK	1	0	10 mm	right	1:1	0.106	1.007	0.107	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.96	-0.16	0	01A30	QPSK	50	0	10 mm	right	1:1	0.104	1.009	0.105	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.97	0.06	0	01A30	QPSK	1	0	10 mm	left	1:1	0.171	1.007	0.172	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Standard	21.0	20.96	0.01	0	01A30	QPSK	50	0	10 mm	left	1:1	0.164	1.009	0.165	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-19
LTE Band 2 (PCS) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.49	0.01	0	01FC4	QPSK	1	99	10 mm	back	1:1	0.418	1.002	0.419	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.50	0.04	0	01FC4	QPSK	50	50	10 mm	back	1:1	0.406	1.000	0.406	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.49	0.00	0	01FC4	QPSK	1	99	10 mm	front	1:1	0.571	1.002	0.572	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.50	0.00	0	01FC4	QPSK	50	50	10 mm	front	1:1	0.559	1.000	0.559	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.49	-0.06	0	01FC4	QPSK	1	99	10 mm	bottom	1:1	0.770	1.002	0.772	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.50	-0.01	0	01FC4	QPSK	50	50	10 mm	bottom	1:1	0.782	1.000	0.782	A27
1900.00	19100	High	LTE Band 2 (PCS)	20	Wireless Charging Cover	21.5	21.50	0.09	0	01FC4	QPSK	50	50	10 mm	bottom	1:1	0.766	1.000	0.766	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.49	-0.04	0	01FC4	QPSK	1	99	10 mm	right	1:1	0.143	1.002	0.143	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.50	-0.08	0	01FC4	QPSK	50	50	10 mm	right	1:1	0.138	1.000	0.138	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.49	-0.01	0	01FC4	QPSK	1	99	10 mm	left	1:1	0.074	1.002	0.074	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	21.5	21.50	-0.05	0	01FC4	QPSK	50	50	10 mm	left	1:1	0.078	1.000	0.078	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak										Body 1.6 W/kg (mW/g) averaged over 1 gram										
Uncontrolled Exposure/General Population																				

Table 11-20
WLAN Hotspot SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.06	10 mm	1	Standard	015D8	1	back	1:1	0.128	1.047	0.134	A28
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.18	10 mm	1	Wireless Charging Cover	015D8	1	back	1:1	0.086	1.047	0.090	
2462	11	IEEE 802.11b	DSSS	15.5	15.30	-0.09	10 mm	1	Standard	015D8	1	front	1:1	0.067	1.047	0.070	
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.10	10 mm	1	Standard	015D8	1	top	1:1	0.025	1.047	0.026	
2462	11	IEEE 802.11b	DSSS	15.5	15.30	0.12	10 mm	1	Standard	015D8	1	left	1:1	0.046	1.047	0.048	
2462	11	IEEE 802.11b	DSSS	15.5	14.80	0.08	10 mm	2	Standard	015D8	1	back	1:1	0.118	1.175	0.139	
2462	11	IEEE 802.11b	DSSS	15.5	14.80	-0.15	10 mm	2	Standard	015D8	1	front	1:1	0.064	1.175	0.075	
2462	11	IEEE 802.11b	DSSS	15.5	14.80	-0.12	10 mm	2	Standard	015D8	1	top	1:1	0.052	1.175	0.061	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.19	10 mm	MIMO	Standard	015D8	13	back	1:1	0.060	1.038	0.062	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.12	10 mm	MIMO	Wireless Charging Cover	015D8	13	back	1:1	0.045	1.038	0.047	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.12	10 mm	MIMO	Standard	015D8	13	front	1:1	0.038	1.038	0.039	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.18	10 mm	MIMO	Standard	015D8	13	top	1:1	0.018	1.038	0.019	
2462	11	IEEE 802.11n	OFDM	15.5	15.34	0.13	10 mm	MIMO	Standard	015D8	13	left	1:1	0.017	1.038	0.018	
5825	165	IEEE 802.11a	OFDM	12.5	11.88	0.15	10 mm	1	Standard	015D8	6	back	1:1	0.048	1.153	0.055	
5775	155	IEEE 802.11ac	OFDM	10.5	9.62	0.12	10 mm	1	Standard	015D8	29.3	back	1:1	0.030	1.225	0.037	
5825	165	IEEE 802.11a	OFDM	12.5	11.88	0.12	10 mm	1	Standard	015D8	6	front	1:1	0.011	1.153	0.013	
5825	165	IEEE 802.11a	OFDM	12.5	11.88	0.13	10 mm	1	Standard	015D8	6	top	1:1	0.020	1.153	0.023	
5825	165	IEEE 802.11a	OFDM	12.5	11.88	0.14	10 mm	1	Standard	015D8	6	left	1:1	0.022	1.153	0.025	
5765	153	IEEE 802.11a	OFDM	12.5	12.41	-0.13	10 mm	2	Standard	015D8	6	back	1:1	0.214	1.021	0.218	
5765	153	IEEE 802.11a	OFDM	12.5	12.41	-0.13	10 mm	2	Wireless Charging Cover	015D8	6	back	1:1	0.453	1.021	0.463	
5775	155	IEEE 802.11ac	OFDM	10.5	10.31	-0.12	10 mm	2	Standard	015D8	29.3	back	1:1	0.092	1.045	0.096	
5765	153	IEEE 802.11a	OFDM	12.5	12.41	-0.15	10 mm	2	Standard	015D8	6	front	1:1	0.030	1.021	0.031	
5765	153	IEEE 802.11a	OFDM	12.5	12.41	0.12	10 mm	2	Standard	015D8	6	top	1:1	0.058	1.021	0.059	
5745	149	IEEE 802.11n	OFDM	15.5	14.85	-0.13	10 mm	MIMO	Standard	015D8	13	back	1:1	0.292	1.161	0.339	
5745	149	IEEE 802.11n	OFDM	15.5	14.85	0.14	10 mm	MIMO	Wireless Charging Cover	015D8	13	back	1:1	0.482	1.161	0.560	A30
5745	149	IEEE 802.11n	OFDM	15.5	14.85	-0.15	10 mm	MIMO	Standard	015D8	13	front	1:1	0.023	1.161	0.027	
5745	149	IEEE 802.11n	OFDM	15.5	14.85	-0.13	10 mm	MIMO	Standard	015D8	13	top	1:1	0.136	1.161	0.158	
5745	149	IEEE 802.11n	OFDM	15.5	14.85	0.19	10 mm	MIMO	Standard	015D8	13	left	1:1	0.076	1.161	0.088	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram										

11.4 Standalone Extremity SAR Data

Table 11-21
UMTS Extremity SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Cover Type	Device Serial Number	Duty Cycle	Side	SAR (10g)	Scaling Factor	Scaled SAR (10g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1852.40	9262	UMTS 1900	RMC	23.0	22.33	-0.14	0 mm	Standard	01FBB	1:1	bottom	2.550	1.167	2.976	
1880.00	9400	UMTS 1900	RMC	23.0	22.30	-0.11	0 mm	Standard	01FBB	1:1	bottom	2.720	1.175	3.196	
1907.60	9538	UMTS 1900	RMC	23.0	22.68	-0.13	0 mm	Standard	01FBB	1:1	bottom	2.950	1.076	3.174	
1907.60	9538	UMTS 1900	RMC	23.0	22.68	0.01	0 mm	Wireless Charging Cover	01FBB	1:1	bottom	2.990	1.076	3.217	A32
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Extremity 4.0 W/kg (mW/g) averaged over 10 grams								

Please note that the following 10g SAR data was measured for configurations where 1g hotspot SAR scaled up to the maximum output power tolerances exceeded a 1g SAR level of 1.2 W/kg.

Table 11-22
LTE Extremity SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Cover Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (10g) (W/kg)	Scaling Factor	Scaled SAR (10g) (W/kg)	Plot #	
MHz	Ch.																			
1860.00	18700	Low	LTE Band 2 (PCS)	20	Standard	23.5	23.02	-0.01	0	01FBB	QPSK	1	99	0 mm	bottom	1:1	2.830	1.117	3.161	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.5	23.31	-0.06	0	01FBB	QPSK	1	99	0 mm	bottom	1:1	3.150	1.045	3.292	A33
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Wireless Charging Cover	23.5	23.31	-0.04	0	01FBB	QPSK	1	99	0 mm	bottom	1:1	3.070	1.045	3.208	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	23.5	23.41	-0.13	0	01FBB	QPSK	1	99	0 mm	bottom	1:1	3.110	1.021	3.175	
1860.00	18700	Low	LTE Band 2 (PCS)	20	Standard	22.5	22.22	-0.13	1	01FBB	QPSK	50	50	0 mm	bottom	1:1	2.170	1.067	2.315	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	22.5	22.22	-0.03	1	01FBB	QPSK	50	50	0 mm	bottom	1:1	2.270	1.067	2.422	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	22.5	22.33	-0.07	1	01FBB	QPSK	50	50	0 mm	bottom	1:1	2.270	1.040	2.361	
1900.00	19100	High	LTE Band 2 (PCS)	20	Standard	22.5	22.30	-0.13	1	01FBB	QPSK	100	0	0 mm	bottom	1:1	2.350	1.047	2.460	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	Standard	23.5	23.31	0.01	0	01FBB	QPSK	1	99	0 mm	bottom	1:1	2.950	1.045	3.083	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Extremity 4.0 W/kg (mW/g) averaged over 10 grams											

Please note that the following 10g SAR data was measured for configurations where 1g hotspot SAR scaled up to the maximum output power tolerances exceeded a 1g SAR level of 1.2 W/kg.

Blue entry represents variability testing.

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Table 11-23
WLAN Extremity SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Cover Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (10g)	Scaling Factor	Scaled SAR (10g) (W/kg)	Plot #
MHz	Ch.													(W/kg)			
5240	48	IEEE 802.11a	OFDM	12.5	11.59	0.12	0 mm	1	Standard	015D7	6	back	1:1	0.100	1.233	0.123	
5210	42	IEEE 802.11ac	OFDM	10.5	9.88	0.12	0 mm	1	Standard	015D7	29.3	back	1:1	0.069	1.153	0.080	
5240	48	IEEE 802.11a	OFDM	12.5	11.59	0.12	0 mm	1	Standard	015D7	6	front	1:1	0.042	1.233	0.052	
5240	48	IEEE 802.11a	OFDM	12.5	11.59	0.19	0 mm	1	Standard	015D7	6	top	1:1	0.029	1.233	0.036	
5240	48	IEEE 802.11a	OFDM	12.5	11.59	-0.17	0 mm	1	Standard	015D7	6	left	1:1	0.058	1.233	0.072	
5320	64	IEEE 802.11a	OFDM	12.5	11.94	0.06	0 mm	1	Standard	015D7	6	back	1:1	0.105	1.138	0.119	
5290	58	IEEE 802.11ac	OFDM	10.5	9.96	0.13	0 mm	1	Standard	015D7	29.3	back	1:1	0.057	1.132	0.065	
5320	64	IEEE 802.11a	OFDM	12.5	11.94	0.16	0 mm	1	Standard	015D7	6	front	1:1	0.046	1.138	0.052	
5320	64	IEEE 802.11a	OFDM	12.5	11.94	0.14	0 mm	1	Standard	015D7	6	top	1:1	0.005	1.138	0.006	
5320	64	IEEE 802.11a	OFDM	12.5	11.94	-0.03	0 mm	1	Standard	015D7	6	left	1:1	0.099	1.138	0.113	
5580	116	IEEE 802.11a	OFDM	12.5	12.00	0.04	0 mm	1	Standard	015D7	6	back	1:1	0.136	1.122	0.153	
5580	116	IEEE 802.11a	OFDM	12.5	12.00	0.16	0 mm	1	Standard	015D7	6	front	1:1	0.046	1.122	0.052	
5580	116	IEEE 802.11a	OFDM	12.5	12.00	0.10	0 mm	1	Standard	015D7	6	top	1:1	0.004	1.122	0.004	
5580	116	IEEE 802.11a	OFDM	12.5	12.00	-0.13	0 mm	1	Standard	015D7	6	left	1:1	0.194	1.122	0.218	
5530	106	IEEE 802.11ac	OFDM	10.5	9.92	0.14	0 mm	1	Standard	015D7	29.3	left	1:1	0.191	1.143	0.218	
5200	40	IEEE 802.11a	OFDM	12.5	11.92	0.08	0 mm	2	Standard	015D7	6	back	1:1	0.305	1.143	0.349	
5210	42	IEEE 802.11ac	OFDM	10.5	10.04	-0.12	0 mm	2	Standard	015D7	29.3	back	1:1	0.176	1.112	0.196	
5200	40	IEEE 802.11a	OFDM	12.5	11.92	0.16	0 mm	2	Standard	015D7	6	front	1:1	0.068	1.143	0.078	
5200	40	IEEE 802.11a	OFDM	12.5	11.92	-0.02	0 mm	2	Standard	015D7	6	top	1:1	0.106	1.143	0.121	
5260	52	IEEE 802.11a	OFDM	12.5	11.54	-0.10	0 mm	2	Standard	015D7	6	back	1:1	0.297	1.247	0.370	
5290	58	IEEE 802.11ac	OFDM	10.5	9.59	-0.18	0 mm	2	Standard	015D7	29.3	back	1:1	0.164	1.233	0.202	
5260	52	IEEE 802.11a	OFDM	12.5	11.54	0.17	0 mm	2	Standard	015D7	6	front	1:1	0.050	1.247	0.062	
5260	52	IEEE 802.11a	OFDM	12.5	11.54	0.14	0 mm	2	Standard	015D7	6	top	1:1	0.099	1.247	0.123	
5700	140	IEEE 802.11a	OFDM	12.5	11.92	0.15	0 mm	2	Standard	015D7	6	back	1:1	0.595	1.143	0.680	A34
5700	140	IEEE 802.11a	OFDM	12.5	11.92	-0.13	0 mm	2	Wireless Charging Cover	015D7	6	back	1:1	0.500	1.143	0.572	
5530	106	IEEE 802.11ac	OFDM	10.5	9.50	-0.12	0 mm	2	Standard	015D7	29.3	back	1:1	0.225	1.259	0.283	
5700	140	IEEE 802.11a	OFDM	12.5	11.92	0.16	0 mm	2	Standard	015D7	6	front	1:1	0.047	1.143	0.054	
5700	140	IEEE 802.11a	OFDM	12.5	11.92	0.20	0 mm	2	Standard	015D7	6	top	1:1	0.136	1.143	0.155	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	0.12	0 mm	MIMO	Standard	015D7	13	back	1:1	0.304	1.180	0.359	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	0.03	0 mm	MIMO	Wireless Charging Cover	015D7	13	back	1:1	0.243	1.180	0.287	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	0.12	0 mm	MIMO	Standard	015D7	13	front	1:1	0.096	1.180	0.113	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	0.05	0 mm	MIMO	Standard	015D7	13	top	1:1	0.102	1.180	0.120	
5180	36	IEEE 802.11n	OFDM	15.5	14.78	-0.02	0 mm	MIMO	Standard	015D7	13	left	1:1	0.066	1.180	0.078	
5280	56	IEEE 802.11n	OFDM	15.5	14.67	0.12	0 mm	MIMO	Standard	015D7	13	back	1:1	0.303	1.211	0.367	
5280	56	IEEE 802.11n	OFDM	15.5	14.67	0.13	0 mm	MIMO	Standard	015D7	13	front	1:1	0.072	1.211	0.087	
5280	56	IEEE 802.11n	OFDM	15.5	14.67	0.13	0 mm	MIMO	Standard	015D7	13	top	1:1	0.090	1.211	0.109	
5280	56	IEEE 802.11n	OFDM	15.5	14.67	0.14	0 mm	MIMO	Standard	015D7	13	left	1:1	0.084	1.211	0.102	
5680	136	IEEE 802.11n	OFDM	15.5	14.80	0.18	0 mm	MIMO	Standard	015D7	13	back	1:1	0.285	1.175	0.335	
5680	136	IEEE 802.11n	OFDM	15.5	14.80	0.12	0 mm	MIMO	Standard	015D7	13	front	1:1	0.070	1.175	0.082	
5680	136	IEEE 802.11n	OFDM	15.5	14.80	0.15	0 mm	MIMO	Standard	015D7	13	top	1:1	0.134	1.175	0.157	
5680	136	IEEE 802.11n	OFDM	15.5	14.80	0.15	0 mm	MIMO	Standard	015D7	13	left	1:1	0.181	1.175	0.213	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Extremity 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 1528-2003, and FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 15 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. A test separation distance of 10 mm for body-worn SAR was also used for GSM 850/1900, UMTS Band 5, LTE Bands 17/5, and 2.4/5 GHz WLAN as it is more conservative.
7. Per FCC KDB Publication 648474 D04v01, 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 D01 v01, variability SAR tests were performed when the measured 1 gram SAR results for a frequency band were greater than 0.8 W/kg or when the measured 10 gram SAR results for a frequency band were greater than 2.0 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v01, 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. This device utilizes power reduction for UMTS Band 2 and LTE Bands 4/2 under some portable hotspot conditions for SAR compliance. Therefore, these wireless router configurations were tested at reduced output power levels.
11. Per FCC KDB Publication 648474 D04v01r01, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg when scaled up to the maximum output power tolerances.
12. Per FCC KDB Publication 648474 D03, SAR was measured using the standard battery cover and then repeated with the wireless charging battery cover for the configuration with the highest measured SAR for each wireless technology, frequency band, operating mode, and exposure condition. Since reported 1 gram SAR did not exceed 1.2 W/kg, additional testing with the wireless charging battery cover was not required.

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 D03v01 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated 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 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel was used.

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UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v02. HSPA SAR was not required since the average output power of the HSPA subtests was not more than 0.25 dB higher than the RMC level and SAR was less than 1.2 W/kg.
2. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel was used.
3. This device applies power reduction for UMTS B2 when Hotspot is ON. Therefore, UMTS B2 was evaluated at hotspot reduced power levels. There is no power reduction applied to UMTS B5.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r01. The general test procedures used for testing can be found in Section 8.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC Guidance, LTE CA SAR was not needed for testing since the data sent by uplink on the uplink physical channels does not change between Rel. 8 and Rel. 10.
5. This device applies power reduction for LTE Bands 4 and 2 modes when Hotspot is ON. Therefore, LTE Bands 4 and 2 modes were evaluated at hotspot reduced power levels. There is no power reduction applied to LTE Bands 17 and 5.

WLAN Notes:

1. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for 2.4 GHz WIFI SISO operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11b. Other SISO IEEE 802.11 modes (including 802.11g/n) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11b mode.
2. Justification for reduced test configurations for WIFI channels per KDB Publication 248227 D01v01r02 and October 2012 FCC/TCB Meeting Notes for SISO 5 GHz WIFI operations: Highest average RF output power channel for the lowest data rate was selected for SAR evaluation in 802.11a. Other IEEE SISO 802.11 modes (including 802.11n 20 MHz and 40 MHz bandwidths) were not investigated since the average output powers over all channels and data rates were not more than 0.25 dB higher than the tested channel in the lowest data rate of IEEE 802.11a mode.
3. Per April 2013 TCB Workshop notes, full SISO SAR tests for all IEEE 802.11ac configurations were not required because the average output power was not more than 0.25 dB higher than IEEE 802.11a mode. IEEE 802.11ac SISO was evaluated for the highest IEEE 802.11a position in each 5 GHz band and exposure condition.
4. When Hotspot is enabled, 5.2-5.7 GHz bands are disabled. Therefore no 5.2 – 5.7 GHz WIFI Wireless Router SAR Data was required.
5. Per KDB 248227, SAR for MIMO was measured with both transmitting simultaneously and was evaluated in dependently of SISO operation. For 2.4 GHz MIMO, 802.11n was evaluated. For 5 GHz MIMO, 802.11n 20 MHz BW was evaluated.
6. WIFI transmission was verified using an uncalibrated spectrum analyzer.
7. When the maximum extrapolated peak 1g SAR of the zoom scan for the maximum output channel is <1.6 W/kg and the reported 1g averaged SAR is <0.8 W/kg, 1g SAR testing on other default channels was required. Testing on other default channels was not required for 10 g Extremity SAR, since the reported 10g averaged SAR is <2.0 W/kg.

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12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

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

12.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB 447498 D01v05 IV.C.1.iii and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific physical test configuration is ≤ 1.6 W/kg. When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05 4.3.2.2), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated 1g SAR} = \frac{\sqrt{f(\text{GHz})}}{7.5} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$

$$\text{Estimated 10g SAR} = \frac{\sqrt{f(\text{GHz})}}{18.75} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2480	12.00	15	0.224

Notes:

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

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12.3 Head SAR Simultaneous Transmission Analysis

Table 12-2
Simultaneous Transmission Scenario with 2.4 GHz WLAN Ant 1 (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.043	0.329	0.372	Head SAR	Right Cheek	0.053	0.329	0.382
	Right Tilt	0.021	0.216	0.237		Right Tilt	0.028	0.216	0.244
	Left Cheek	0.100	0.174	0.274		Left Cheek	0.132	0.174	0.306
	Left Tilt	0.030	0.094	0.124		Left Tilt	0.035	0.094	0.129
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.037	0.329	0.366	Head SAR	Right Cheek	0.101	0.329	0.430
	Right Tilt	0.034	0.216	0.250		Right Tilt	0.096	0.216	0.312
	Left Cheek	0.058	0.174	0.232		Left Cheek	0.193	0.174	0.367
	Left Tilt	0.032	0.094	0.126		Left Tilt	0.066	0.094	0.160
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.154	0.329	0.483	Head SAR	Right Cheek	0.038	0.329	0.367
	Right Tilt	0.060	0.216	0.276		Right Tilt	0.022	0.216	0.238
	Left Cheek	0.125	0.174	0.299		Left Cheek	0.111	0.174	0.285
	Left Tilt	0.071	0.094	0.165		Left Tilt	0.028	0.094	0.122
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.126	0.329	0.455	Head SAR	Right Cheek	0.098	0.329	0.427
	Right Tilt	0.114	0.216	0.330		Right Tilt	0.096	0.216	0.312
	Left Cheek	0.262	0.174	0.436		Left Cheek	0.148	0.174	0.322
	Left Tilt	0.122	0.094	0.216		Left Tilt	0.084	0.094	0.178

Table 12-3
Simultaneous Transmission Scenario with 2.4 GHz WLAN Ant 2 (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.043	0.673	0.716	Head SAR	Right Cheek	0.053	0.673	0.726
	Right Tilt	0.021	0.388	0.409		Right Tilt	0.028	0.388	0.416
	Left Cheek	0.100	0.519	0.619		Left Cheek	0.132	0.519	0.651
	Left Tilt	0.030	0.367	0.397		Left Tilt	0.035	0.367	0.402
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.037	0.673	0.710	Head SAR	Right Cheek	0.101	0.673	0.774
	Right Tilt	0.034	0.388	0.422		Right Tilt	0.096	0.388	0.484
	Left Cheek	0.058	0.519	0.577		Left Cheek	0.193	0.519	0.712
	Left Tilt	0.032	0.367	0.399		Left Tilt	0.066	0.367	0.433

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Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.154	0.673	0.827	Head SAR	Right Cheek	0.038	0.673	0.711
	Right Tilt	0.060	0.388	0.448		Right Tilt	0.022	0.388	0.410
	Left Cheek	0.125	0.519	0.644		Left Cheek	0.111	0.519	0.630
	Left Tilt	0.071	0.367	0.438		Left Tilt	0.028	0.367	0.395
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.126	0.673	0.799	Head SAR	Right Cheek	0.098	0.673	0.771
	Right Tilt	0.114	0.388	0.502		Right Tilt	0.096	0.388	0.484
	Left Cheek	0.262	0.519	0.781		Left Cheek	0.148	0.519	0.667
	Left Tilt	0.122	0.367	0.489		Left Tilt	0.084	0.367	0.451

Table 12-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	2.4 GHz WLAN MIMO SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN MIMO SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.043	0.420	0.463	Head SAR	Right Cheek	0.053	0.420	0.473
	Right Tilt	0.021	0.312	0.333		Right Tilt	0.028	0.312	0.340
	Left Cheek	0.100	0.291	0.391		Left Cheek	0.132	0.291	0.423
	Left Tilt	0.030	0.190	0.220		Left Tilt	0.035	0.190	0.225
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.037	0.420	0.457	Head SAR	Right Cheek	0.101	0.420	0.521
	Right Tilt	0.034	0.312	0.346		Right Tilt	0.096	0.312	0.408
	Left Cheek	0.058	0.291	0.349		Left Cheek	0.193	0.291	0.484
	Left Tilt	0.032	0.190	0.222		Left Tilt	0.066	0.190	0.256
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN MIMO SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN MIMO SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.154	0.420	0.574	Head SAR	Right Cheek	0.038	0.420	0.458
	Right Tilt	0.060	0.312	0.372		Right Tilt	0.022	0.312	0.334
	Left Cheek	0.125	0.291	0.416		Left Cheek	0.111	0.291	0.402
	Left Tilt	0.071	0.190	0.261		Left Tilt	0.028	0.190	0.218
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN MIMO SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN MIMO SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.126	0.420	0.546	Head SAR	Right Cheek	0.098	0.420	0.518
	Right Tilt	0.114	0.312	0.426		Right Tilt	0.096	0.312	0.408
	Left Cheek	0.262	0.291	0.553		Left Cheek	0.148	0.291	0.439
	Left Tilt	0.122	0.190	0.312		Left Tilt	0.084	0.190	0.274

Table 12-5
Simultaneous Transmission Scenario with 5 GHz WLAN Ant 1 (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	5 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.043	0.096	0.139	Head SAR	Right Cheek	0.053	0.096	0.149
	Right Tilt	0.021	0.048	0.069		Right Tilt	0.028	0.048	0.076
	Left Cheek	0.100	0.040	0.140		Left Cheek	0.132	0.040	0.172
	Left Tilt	0.030	0.000	0.030		Left Tilt	0.035	0.000	0.035
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.037	0.096	0.133	Head SAR	Right Cheek	0.101	0.096	0.197
	Right Tilt	0.034	0.048	0.082		Right Tilt	0.096	0.048	0.144
	Left Cheek	0.058	0.040	0.098		Left Cheek	0.193	0.040	0.233
	Left Tilt	0.032	0.000	0.032		Left Tilt	0.066	0.000	0.066
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.154	0.096	0.250	Head SAR	Right Cheek	0.038	0.096	0.134
	Right Tilt	0.060	0.048	0.108		Right Tilt	0.022	0.048	0.070
	Left Cheek	0.125	0.040	0.165		Left Cheek	0.111	0.040	0.151
	Left Tilt	0.071	0.000	0.071		Left Tilt	0.028	0.000	0.028
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN Ant 1 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.126	0.096	0.222	Head SAR	Right Cheek	0.098	0.096	0.194
	Right Tilt	0.114	0.048	0.162		Right Tilt	0.096	0.048	0.144
	Left Cheek	0.262	0.040	0.302		Left Cheek	0.148	0.040	0.188
	Left Tilt	0.122	0.000	0.122		Left Tilt	0.084	0.000	0.084

Table 12-6
Simultaneous Transmission Scenario with 5 GHz WLAN Ant 2 (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	5 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.043	0.110	0.153	Head SAR	Right Cheek	0.053	0.110	0.163
	Right Tilt	0.021	0.083	0.104		Right Tilt	0.028	0.083	0.111
	Left Cheek	0.100	0.160	0.260		Left Cheek	0.132	0.160	0.292
	Left Tilt	0.030	0.135	0.165		Left Tilt	0.035	0.135	0.170
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.037	0.110	0.147	Head SAR	Right Cheek	0.101	0.110	0.211
	Right Tilt	0.034	0.083	0.117		Right Tilt	0.096	0.083	0.179
	Left Cheek	0.058	0.160	0.218		Left Cheek	0.193	0.160	0.353
	Left Tilt	0.032	0.135	0.167		Left Tilt	0.066	0.135	0.201

Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.154	0.110	0.264	Head SAR	Right Cheek	0.038	0.110	0.148
	Right Tilt	0.060	0.083	0.143		Right Tilt	0.022	0.083	0.105
	Left Cheek	0.125	0.160	0.285		Left Cheek	0.111	0.160	0.271
	Left Tilt	0.071	0.135	0.206		Left Tilt	0.028	0.135	0.163
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN Ant 2 SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.126	0.110	0.236	Head SAR	Right Cheek	0.098	0.110	0.208
	Right Tilt	0.114	0.083	0.197		Right Tilt	0.096	0.083	0.179
	Left Cheek	0.262	0.160	0.422		Left Cheek	0.148	0.160	0.308
	Left Tilt	0.122	0.135	0.257		Left Tilt	0.084	0.135	0.219

Table 12-7
Simultaneous Transmission Scenario with 5 GHz WLAN MIMO (Held to Ear)

Simult Tx	Configuration	GSM 850 SAR (W/kg)	5 GHz WLAN MIMO SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN MIMO SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.043	0.249	0.292	Head SAR	Right Cheek	0.053	0.249	0.302
	Right Tilt	0.021	0.143	0.164		Right Tilt	0.028	0.143	0.171
	Left Cheek	0.100	0.125	0.225		Left Cheek	0.132	0.125	0.257
	Left Tilt	0.030	0.100	0.130		Left Tilt	0.035	0.100	0.135
Simult Tx	Configuration	GSM 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.037	0.249	0.286	Head SAR	Right Cheek	0.101	0.249	0.350
	Right Tilt	0.034	0.143	0.177		Right Tilt	0.096	0.143	0.239
	Left Cheek	0.058	0.125	0.183		Left Cheek	0.193	0.125	0.318
	Left Tilt	0.032	0.100	0.132		Left Tilt	0.066	0.100	0.166
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN MIMO SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN MIMO SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.154	0.249	0.403	Head SAR	Right Cheek	0.038	0.249	0.287
	Right Tilt	0.060	0.143	0.203		Right Tilt	0.022	0.143	0.165
	Left Cheek	0.125	0.125	0.250		Left Cheek	0.111	0.125	0.236
	Left Tilt	0.071	0.100	0.171		Left Tilt	0.028	0.100	0.128
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN MIMO SAR	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN MIMO SAR	Σ SAR (W/kg)
Head SAR	Right Cheek	0.126	0.249	0.375	Head SAR	Right Cheek	0.098	0.249	0.347
	Right Tilt	0.114	0.143	0.257		Right Tilt	0.096	0.143	0.239
	Left Cheek	0.262	0.125	0.387		Left Cheek	0.148	0.125	0.273
	Left Tilt	0.122	0.100	0.222		Left Tilt	0.084	0.100	0.184

12.4 Body-Worn Simultaneous Transmission Analysis

Note:

1. For SAR summation for body-worn back side at 15 mm, GSM850/1900, UMTS 850, and LTE Band 17/5 SAR values for 1.0 cm were used since the 1.0 cm test distance was more conservative. "<" denotes that the 1.0 cm GSM850/1900, UMTS 850, and LTE Band 17/5 SAR values were used for summation purposes.
2. For SAR summations for body-worn back side at 15 mm, WLAN SAR values for 1.0 cm were used since the 1.0 cm test distance for WLAN was more conservative. "<" denotes that the 1.0 cm WLAN SAR values were used for summation purposes.

Table 12-8
Simultaneous Transmission Scenario with 2.4 GHz Ant 1 WLAN (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	< 0.442	< 0.134	< 0.576
Back Side	UMTS 850	< 0.537	< 0.134	< 0.671
Back Side	GSM 1900	< 0.256	< 0.134	< 0.390
Back Side	UMTS 1900	0.372	< 0.134	< 0.506
Back Side	LTE Band 12	< 0.389	< 0.134	< 0.523
Back Side	LTE Band 5 (Cell)	< 0.420	< 0.134	< 0.554
Back Side	LTE Band 4 (AWS)	0.408	< 0.134	< 0.542
Back Side	LTE Band 2 (PCS)	0.422	< 0.134	< 0.556

Table 12-9
Simultaneous Transmission Scenario with 2.4 GHz WLAN Ant 2 (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	< 0.442	< 0.139	< 0.581
Back Side	UMTS 850	< 0.537	< 0.139	< 0.676
Back Side	GSM 1900	< 0.256	< 0.139	< 0.395
Back Side	UMTS 1900	0.372	< 0.139	< 0.511
Back Side	LTE Band 12	< 0.389	< 0.139	< 0.528
Back Side	LTE Band 5 (Cell)	< 0.420	< 0.139	< 0.559
Back Side	LTE Band 4 (AWS)	0.408	< 0.139	< 0.547
Back Side	LTE Band 2 (PCS)	0.422	< 0.139	< 0.561

Table 12-10
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	< 0.442	< 0.062	< 0.504
Back Side	UMTS 850	< 0.537	< 0.062	< 0.599
Back Side	GSM 1900	< 0.256	< 0.062	< 0.318
Back Side	UMTS 1900	0.372	< 0.062	< 0.434
Back Side	LTE Band 12	< 0.389	< 0.062	< 0.451
Back Side	LTE Band 5 (Cell)	< 0.420	< 0.062	< 0.482
Back Side	LTE Band 4 (AWS)	0.408	< 0.062	< 0.470
Back Side	LTE Band 2 (PCS)	0.422	< 0.062	< 0.484

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Table 12-11
Simultaneous Transmission Scenario with 5 GHz WLAN Ant 1 (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	< 0.442	< 0.055	< 0.497
Back Side	UMTS 850	< 0.537	< 0.055	< 0.592
Back Side	GSM 1900	< 0.256	< 0.055	< 0.311
Back Side	UMTS 1900	0.372	< 0.055	< 0.427
Back Side	LTE Band 12	< 0.389	< 0.055	< 0.444
Back Side	LTE Band 5 (Cell)	< 0.420	< 0.055	< 0.475
Back Side	LTE Band 4 (AWS)	0.408	< 0.055	< 0.463
Back Side	LTE Band 2 (PCS)	0.422	< 0.055	< 0.477

Table 12-12
Simultaneous Transmission Scenario with 5 GHz WLAN Ant 2 (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	< 0.442	< 0.367	< 0.809
Back Side	UMTS 850	< 0.537	< 0.367	< 0.904
Back Side	GSM 1900	< 0.256	< 0.367	< 0.623
Back Side	UMTS 1900	0.372	< 0.367	< 0.739
Back Side	LTE Band 12	< 0.389	< 0.367	< 0.756
Back Side	LTE Band 5 (Cell)	< 0.420	< 0.367	< 0.787
Back Side	LTE Band 4 (AWS)	0.408	< 0.367	< 0.775
Back Side	LTE Band 2 (PCS)	0.422	< 0.367	< 0.789

Table 12-13
Simultaneous Transmission Scenario with 5 GHz WLAN MIMO (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	< 0.442	< 0.533	< 0.975
Back Side	UMTS 850	< 0.537	< 0.533	< 1.070
Back Side	GSM 1900	< 0.256	< 0.533	< 0.789
Back Side	UMTS 1900	0.372	< 0.533	< 0.905
Back Side	LTE Band 12	< 0.389	< 0.533	< 0.922
Back Side	LTE Band 5 (Cell)	< 0.420	< 0.533	< 0.953
Back Side	LTE Band 4 (AWS)	0.408	< 0.533	< 0.941
Back Side	LTE Band 2 (PCS)	0.422	< 0.533	< 0.955

Table 12-14
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.5 cm)

Configuration	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Back Side	GSM 850	< 0.442	0.224	< 0.666
Back Side	UMTS 850	< 0.537	0.224	< 0.761
Back Side	GSM 1900	< 0.256	0.224	< 0.480
Back Side	UMTS 1900	0.372	0.224	0.596
Back Side	LTE Band 12	< 0.389	0.224	< 0.613
Back Side	LTE Band 5 (Cell)	< 0.420	0.224	< 0.644
Back Side	LTE Band 4 (AWS)	0.408	0.224	0.632
Back Side	LTE Band 2 (PCS)	0.422	0.224	0.646

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

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12.5 Hotspot SAR Simultaneous Transmission Analysis

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

Table 12-15
Simultaneous Transmission Scenario (2.4 GHz Ant 1 Hotspot at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.444	0.134	0.578	Body SAR	Back	0.537	0.134	0.671
	Front	0.536	0.070	0.606		Front	0.627	0.070	0.697
	Top	-	0.026	0.026		Top	-	0.026	0.026
	Bottom	0.186	-	0.186		Bottom	0.244	-	0.244
	Right	0.035	-	0.035		Right	0.270	-	0.270
	Left	0.179	0.048	0.227		Left	0.210	0.048	0.258
Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.416	0.134	0.550	Body SAR	Back	0.471	0.134	0.605
	Front	0.529	0.070	0.599		Front	0.675	0.070	0.745
	Top	-	0.026	0.026		Top	-	0.026	0.026
	Bottom	0.691	-	0.691		Bottom	0.995	-	0.995
	Right	0.159	-	0.159		Right	0.116	-	0.116
	Left	0.117	0.048	0.165		Left	0.171	0.048	0.219
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.389	0.134	0.523	Body SAR	Back	0.420	0.134	0.554
	Front	0.449	0.070	0.519		Front	0.511	0.070	0.581
	Top	-	0.026	0.026		Top	-	0.026	0.026
	Bottom	0.279	-	0.279		Bottom	0.153	-	0.153
	Right	0.330	-	0.330		Right	0.388	-	0.388
	Left	0.227	0.048	0.275		Left	0.178	0.048	0.226
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.405	0.134	0.539	Body SAR	Back	0.419	0.134	0.553
	Front	0.608	0.070	0.678		Front	0.572	0.070	0.642
	Top	-	0.026	0.026		Top	-	0.026	0.026
	Bottom	0.592	-	0.592		Bottom	0.782	-	0.782
	Right	0.107	-	0.107		Right	0.143	-	0.143
	Left	0.172	0.048	0.220		Left	0.078	0.048	0.126

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Table 12-16
Simultaneous Transmission Scenario (2.4 GHz WLAN Ant 2 at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.444	0.139	0.583	Body SAR	Back	0.537	0.139	0.676
	Front	0.536	0.075	0.611		Front	0.627	0.075	0.702
	Top	-	0.061	0.061		Top	-	0.061	0.061
	Bottom	0.186	-	0.186		Bottom	0.244	-	0.244
	Right	0.035	-	0.035		Right	0.270	-	0.270
	Left	0.179	-	0.179		Left	0.210	-	0.210
Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.416	0.139	0.555	Body SAR	Back	0.471	0.139	0.610
	Front	0.529	0.075	0.604		Front	0.675	0.075	0.750
	Top	-	0.061	0.061		Top	-	0.061	0.061
	Bottom	0.691	-	0.691		Bottom	0.995	-	0.995
	Right	0.159	-	0.159		Right	0.116	-	0.116
	Left	0.117	-	0.117		Left	0.171	-	0.171
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.389	0.139	0.528	Body SAR	Back	0.420	0.139	0.559
	Front	0.449	0.075	0.524		Front	0.511	0.075	0.586
	Top	-	0.061	0.061		Top	-	0.061	0.061
	Bottom	0.279	-	0.279		Bottom	0.153	-	0.153
	Right	0.330	-	0.330		Right	0.388	-	0.388
	Left	0.227	-	0.227		Left	0.178	-	0.178
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.405	0.139	0.544	Body SAR	Back	0.419	0.139	0.558
	Front	0.608	0.075	0.683		Front	0.572	0.075	0.647
	Top	-	0.061	0.061		Top	-	0.061	0.061
	Bottom	0.592	-	0.592		Bottom	0.782	-	0.782
	Right	0.107	-	0.107		Right	0.143	-	0.143
	Left	0.172	-	0.172		Left	0.078	-	0.078

Table 12-17
Simultaneous Transmission Scenario (2.4 GHz WLAN MIMO at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.444	0.062	0.506	Body SAR	Back	0.537	0.062	0.599
	Front	0.536	0.039	0.575		Front	0.627	0.039	0.666
	Top	-	0.019	0.019		Top	-	0.019	0.019
	Bottom	0.186	-	0.186		Bottom	0.244	-	0.244
	Right	0.035	-	0.035		Right	0.270	-	0.270
	Left	0.179	0.018	0.197		Left	0.210	0.018	0.228
Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.416	0.062	0.478	Body SAR	Back	0.471	0.062	0.533
	Front	0.529	0.039	0.568		Front	0.675	0.039	0.714
	Top	-	0.019	0.019		Top	-	0.019	0.019
	Bottom	0.691	-	0.691		Bottom	0.995	-	0.995
	Right	0.159	-	0.159		Right	0.116	-	0.116
	Left	0.117	0.018	0.135		Left	0.171	0.018	0.189
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.389	0.062	0.451	Body SAR	Back	0.420	0.062	0.482
	Front	0.449	0.039	0.488		Front	0.511	0.039	0.550
	Top	-	0.019	0.019		Top	-	0.019	0.019
	Bottom	0.279	-	0.279		Bottom	0.153	-	0.153
	Right	0.330	-	0.330		Right	0.388	-	0.388
	Left	0.227	0.018	0.245		Left	0.178	0.018	0.196
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.405	0.062	0.467	Body SAR	Back	0.419	0.062	0.481
	Front	0.608	0.039	0.647		Front	0.572	0.039	0.611
	Top	-	0.019	0.019		Top	-	0.019	0.019
	Bottom	0.592	-	0.592		Bottom	0.782	-	0.782
	Right	0.107	-	0.107		Right	0.143	-	0.143
	Left	0.172	0.018	0.190		Left	0.078	0.018	0.096

Table 12-18
Simultaneous Transmission Scenario (5 GHz WLAN Ant 1 at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.444	0.055	0.499	Body SAR	Back	0.537	0.055	0.592
	Front	0.536	0.013	0.549		Front	0.627	0.013	0.640
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.186	-	0.186		Bottom	0.244	-	0.244
	Right	0.035	-	0.035		Right	0.270	-	0.270
	Left	0.179	0.025	0.204		Left	0.210	0.025	0.235
Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.416	0.055	0.471	Body SAR	Back	0.471	0.055	0.526
	Front	0.529	0.013	0.542		Front	0.675	0.013	0.688
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.691	-	0.691		Bottom	0.995	-	0.995
	Right	0.159	-	0.159		Right	0.116	-	0.116
	Left	0.117	0.025	0.142		Left	0.171	0.025	0.196
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.389	0.055	0.444	Body SAR	Back	0.420	0.055	0.475
	Front	0.449	0.013	0.462		Front	0.511	0.013	0.524
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.279	-	0.279		Bottom	0.153	-	0.153
	Right	0.330	-	0.330		Right	0.388	-	0.388
	Left	0.227	0.025	0.252		Left	0.178	0.025	0.203
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.405	0.055	0.460	Body SAR	Back	0.419	0.055	0.474
	Front	0.608	0.013	0.621		Front	0.572	0.013	0.585
	Top	-	0.023	0.023		Top	-	0.023	0.023
	Bottom	0.592	-	0.592		Bottom	0.782	-	0.782
	Right	0.107	-	0.107		Right	0.143	-	0.143
	Left	0.172	0.025	0.197		Left	0.078	0.025	0.103

Table 12-19
Simultaneous Transmission Scenario (5 GHz WLAN Ant 2 at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.444	0.463	0.907	Body SAR	Back	0.537	0.463	1.000
	Front	0.536	0.031	0.567		Front	0.627	0.031	0.658
	Top	-	0.059	0.059		Top	-	0.059	0.059
	Bottom	0.186	-	0.186		Bottom	0.244	-	0.244
	Right	0.035	-	0.035		Right	0.270	-	0.270
	Left	0.179	-	0.179		Left	0.210	-	0.210
Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.416	0.463	0.879	Body SAR	Back	0.471	0.463	0.934
	Front	0.529	0.031	0.560		Front	0.675	0.031	0.706
	Top	-	0.059	0.059		Top	-	0.059	0.059
	Bottom	0.691	-	0.691		Bottom	0.995	-	0.995
	Right	0.159	-	0.159		Right	0.116	-	0.116
	Left	0.117	-	0.117		Left	0.171	-	0.171
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.389	0.463	0.852	Body SAR	Back	0.420	0.463	0.883
	Front	0.449	0.031	0.480		Front	0.511	0.031	0.542
	Top	-	0.059	0.059		Top	-	0.059	0.059
	Bottom	0.279	-	0.279		Bottom	0.153	-	0.153
	Right	0.330	-	0.330		Right	0.388	-	0.388
	Left	0.227	-	0.227		Left	0.178	-	0.178
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.405	0.463	0.868	Body SAR	Back	0.419	0.463	0.882
	Front	0.608	0.031	0.639		Front	0.572	0.031	0.603
	Top	-	0.059	0.059		Top	-	0.059	0.059
	Bottom	0.592	-	0.592		Bottom	0.782	-	0.782
	Right	0.107	-	0.107		Right	0.143	-	0.143
	Left	0.172	-	0.172		Left	0.078	-	0.078

Table 12-20
Simultaneous Transmission Scenario (5 GHz WLAN MIMO at 1.0 cm)

Simult Tx	Configuration	GPRS 850 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.444	0.560	1.004	Body SAR	Back	0.537	0.560	1.097
	Front	0.536	0.027	0.563		Front	0.627	0.027	0.654
	Top	-	0.158	0.158		Top	-	0.158	0.158
	Bottom	0.186	-	0.186		Bottom	0.244	-	0.244
	Right	0.035	-	0.035		Right	0.270	-	0.270
	Left	0.179	0.088	0.267		Left	0.210	0.088	0.298
Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.416	0.560	0.976	Body SAR	Back	0.471	0.560	1.031
	Front	0.529	0.027	0.556		Front	0.675	0.027	0.702
	Top	-	0.158	0.158		Top	-	0.158	0.158
	Bottom	0.691	-	0.691		Bottom	0.995	-	0.995
	Right	0.159	-	0.159		Right	0.116	-	0.116
	Left	0.117	0.088	0.205		Left	0.171	0.088	0.259
Simult Tx	Configuration	LTE Band 12 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 5 (Cell) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.389	0.560	0.949	Body SAR	Back	0.420	0.560	0.980
	Front	0.449	0.027	0.476		Front	0.511	0.027	0.538
	Top	-	0.158	0.158		Top	-	0.158	0.158
	Bottom	0.279	-	0.279		Bottom	0.153	-	0.153
	Right	0.330	-	0.330		Right	0.388	-	0.388
	Left	0.227	0.088	0.315		Left	0.178	0.088	0.266
Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 2 (PCS) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
Body SAR	Back	0.405	0.560	0.965	Body SAR	Back	0.419	0.560	0.979
	Front	0.608	0.027	0.635		Front	0.572	0.027	0.599
	Top	-	0.158	0.158		Top	-	0.158	0.158
	Bottom	0.592	-	0.592		Bottom	0.782	-	0.782
	Right	0.107	-	0.107		Right	0.143	-	0.143
	Left	0.172	0.088	0.260		Left	0.078	0.088	0.166

12.6 Extremity SAR Simultaneous Transmission Analysis

Per FCC KDB Publication 648474 D04 Handset SAR v01r01, the devices edges with antennas more than 2.5 cm from edge are not required to be evaluated for SAR ("–").

Table 12-21
Simultaneous Transmission Scenario (Bluetooth Extremity 10 gram SAR at 0 mm)

Configuration	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
Bottom Edge	UMTS 1900	3.217	-	3.217
Bottom Edge	LTE Band 2 (PCS)	3.292	-	3.292

Note: Per FCC KDB Publication 941225 D06v01, Bluetooth SAR is not required to be evaluated for Bottom Edge SAR ("–") since the antenna is greater than 2.5 cm from the edge.

Table 12-22
Simultaneous Transmission Scenario (2.4 GHz WLAN Extremity 10 gram SAR at 0 mm)

Configuration	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Bottom Edge	UMTS 1900	3.217	-	3.217
Bottom Edge	LTE Band 2 (PCS)	3.292	-	3.292

Note: Per FCC KDB Publication 941225 D06v01, 2.4 GHz WLAN SAR is not required to be evaluated for Bottom Edge SAR ("–") since the antenna is greater than 2.5 cm from the edge.

Table 12-23
Simultaneous Transmission Scenario (5 GHz WLAN Extremity 10 gram SAR at 0 mm)

Configuration	Mode	3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Bottom Edge	UMTS 1900	3.217	-	3.217
Bottom Edge	LTE Band 2 (PCS)	3.292	-	3.292

Note: Per FCC KDB Publication 941225 D06v01, 5 GHz WLAN SAR is not required to be evaluated for Bottom Edge SAR ("–") since the antenna is greater than 2.5 cm from the edge.

For configurations and operating modes not required for extremity exposure conditions per FCC KDB 648474, no further analysis was required to determine that possible simultaneous scenarios would not exceed the SAR limit.

12.7 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v05 and IEEE 1528-2013 Section 6.3.4.1.2.

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13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

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

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

- 1) When the original highest measured SAR is ≥ 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 ($\sim 10\%$ from the 1-g SAR limit).
- 3) A third repeated measurement was performed only if the original, first or second repeated measurement was ≥ 1.5 W/kg and the ratio of largest to smallest SAR for the original, first and second repeated measurements is > 1.20 .
- 4) Repeated measurements are not required when the original highest measured SAR is < 0.80 W/kg
- 5) 10 g Extremity SAR measurement variability analysis applies a factor of 2.5 to the procedures outlined above.

Table 13-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Cover Type	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)
	MHz	Ch.						(W/kg)	(W/kg)		(W/kg)		(W/kg)
1900	1852.40	9262	UMTS 1900	RMC	Standard	bottom	10 mm	0.988	0.984	1.00	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram						

Table 13-2
Extremity SAR Measurement Variability Results

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Cover Type	Side	Spacing	Measured SAR (10g)	1st Repeated SAR (10g)	Ratio	2nd Repeated SAR (10g)	Ratio	3rd Repeated SAR (10g)
	MHz	Ch.						(W/kg)	(W/kg)		(W/kg)		(W/kg)
1900	1880.00	18900	LTE Band 2 (PCS)	QPSK, 1 RB, 99 RB Offset	Standard	bottom	0 mm	3.150	2.950	1.07	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Extremity 4.0 W/kg (mW/g) averaged over 10 grams						

13.2 Measurement Uncertainty

The measured SAR was < 1.5 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01, the extended measurement uncertainty analysis per IEEE 1528-2003 was not required.

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14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8648D	(9kHz-4GHz) Signal Generator	4/15/2014	Annual	4/15/2015	3629000687
Agilent	8753ES	S-Parameter Network Analyzer	10/29/2013	Annual	10/29/2014	US39170122
Agilent	8753ES	S-Parameter Network Analyzer	5/22/2014	Annual	5/22/2015	US39170118
Agilent	E4438C	ESG Vector Signal Generator	4/25/2014	Annual	4/25/2015	MY42082385
Agilent	E4438C	ESG Vector Signal Generator	4/1/2014	Annual	4/1/2015	MY47270002
Agilent	E5515C	Wireless Communications Test Set	3/28/2014	Annual	3/28/2015	GB42230325
Agilent	E5515C	Wireless Communications Test Set	3/28/2014	Annual	3/28/2015	GB44400860
Agilent	E8257D	(250kHz-20GHz) Signal Generator	4/15/2014	Annual	4/15/2015	MY45470194
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420800
Agilent	N5182A	MXG Vector Signal Generator	4/15/2014	Annual	4/15/2015	MY47420651
Agilent	N9202A	MXA Signal Analyzer	10/29/2013	Annual	10/29/2014	US46470561
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433977
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433978
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1349514
Anritsu	MA24106A	USB Power Sensor	1/3/2014	Annual	1/3/2015	1344554
Anritsu	MA2411B	Pulse Power Sensor	3/25/2014	Annual	3/25/2015	1207470
Anritsu	MA2411B	Pulse Power Sensor	2/3/2014	Annual	2/3/2015	1339018
Anritsu	MA2481A	Power Sensor	10/30/2013	Annual	10/30/2014	5605
Anritsu	ML2469A	Power Meter	3/14/2014	Annual	3/14/2015	1306009
Anritsu	ML2495A	Power Meter	10/31/2013	Annual	10/31/2014	1039008
Anritsu	MT8820C	Radio Communication Analyzer	12/12/2013	Annual	12/12/2014	6201300731
Anritsu	MT8820C	Radio Communication Analyzer	5/6/2014	Annual	5/6/2015	620144419
COMTECH	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M155A00-009
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Control Company	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	12201488
Control Company	61220-416	Long-Stem Thermometer	4/29/2014	Biennial	4/29/2016	111331323
Fisher Scientific	15-077-960	Digital Thermometer	11/6/2012	Biennial	11/6/2014	122640025
Fisher Scientific	S407993	Long Stem Thermometer	11/4/2013	Biennial	11/4/2015	130671821
Fisher Scientific	S97611	Thermometer	4/12/2013	Biennial	4/12/2015	130219304
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/30/2013	Annual	10/30/2014	1833460
Gigatronics	8651A	Universal Power Meter	10/30/2013	Annual	10/30/2014	8650319
MCL	BW-NEW5+	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
MiniCircuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
MiniCircuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
MiniCircuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
MiniCircuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	6/6/2014	Annual	6/6/2015	109892
Rohde & Schwarz	CMW500	Radio Communication Tester	4/18/2014	Annual	4/18/2015	101699
Rohde & Schwarz	CMW500	Radio Communication Tester	4/15/2014	Annual	4/15/2015	102060
Rohde & Schwarz	NRV	Dual Channel Power Meter	10/12/2012	Biennial	10/12/2014	101695
Rohde & Schwarz	NRV5	Single Channel Power Meter	10/31/2013	Annual	10/31/2014	835360/0079
Rohde & Schwarz	NRV-Z32	Peak Power Sensor	10/12/2012	Biennial	10/12/2014	836019/013
Rohde & Schwarz	SME06	Signal Generator	10/30/2013	Annual	10/30/2014	832026
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	22313
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
SPEAG	D1750V2	1750 MHz SAR Dipole	4/10/2014	Annual	4/10/2015	1051
SPEAG	D1765V2	1765 MHz SAR Dipole	5/7/2014	Annual	5/7/2015	1008
SPEAG	D1900V2	1900 MHz SAR Dipole	4/9/2014	Annual	4/9/2015	5d141
SPEAG	D1900V2	1900 MHz SAR Dipole	2/27/2014	Annual	2/27/2015	5d148
SPEAG	D2450V2	2450 MHz SAR Dipole	1/21/2014	Annual	1/21/2015	797
SPEAG	D5GHV2	5 GHz SAR Dipole	9/23/2013	Annual	9/23/2014	1007
SPEAG	D5GHV2	5 GHz SAR Dipole	1/27/2014	Annual	1/27/2015	1057
SPEAG	D750V3	750 MHz Dipole	1/20/2014	Annual	1/20/2015	1003
SPEAG	D750V3	750 MHz Dipole	2/27/2014	Annual	2/27/2015	1046
SPEAG	D835V2	835 MHz SAR Dipole	4/7/2014	Annual	4/7/2015	4d119
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/26/2014	Annual	2/26/2015	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	12/12/2013	Annual	12/12/2014	649
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/14/2014	Annual	5/14/2015	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/17/2013	Annual	9/17/2014	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/19/2013	Annual	11/19/2014	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/21/2013	Annual	8/21/2014	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2014	Annual	3/17/2015	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/17/2014	Annual	3/17/2015	1364
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2014	Annual	4/11/2015	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/18/2013	Annual	11/18/2014	1407
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/6/2014	Annual	5/6/2015	1070
SPEAG	DAK-3.5	Dielectric Assessment Kit	11/13/2013	Annual	11/13/2014	1091
SPEAG	ES3DV2	SAR Probe	8/22/2013	Annual	8/22/2014	3022
SPEAG	ES3DV3	SAR Probe	4/11/2014	Annual	4/11/2015	3213
SPEAG	ES3DV3	SAR Probe	2/25/2014	Annual	2/25/2015	3258
SPEAG	ES3DV3	SAR Probe	5/15/2014	Annual	5/15/2015	3263
SPEAG	ES3DV3	SAR Probe	9/23/2013	Annual	9/23/2014	3288
SPEAG	ES3DV3	SAR Probe	4/17/2014	Annual	4/17/2015	3319
SPEAG	ES3DV3	SAR Probe	11/25/2013	Annual	11/25/2014	3332
SPEAG	EX3DV4	SAR Probe	1/29/2014	Annual	1/29/2015	3589
SPEAG	EX3DV4	SAR Probe	12/18/2013	Annual	12/18/2014	3920
SPEAG	EX3DV4	SAR Probe	10/23/2013	Annual	10/23/2014	3914
Tektronix	RSA6114A	Real Time Spectrum Analyzer	4/16/2014	Annual	4/16/2015	8010177

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

All calibrated equipments are used within their calibration period.

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15 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

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

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

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Applicable for frequencies up to 6 GHz.

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

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

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16 CONCLUSION

16.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F16AC

Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.928 \text{ S/m}$; $\epsilon_r = 42.361$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-01-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3332; ConvF(6.29, 6.29, 6.29); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

Mode: GSM 850, Left Head, Cheek, Mid.ch, Wireless Charging Cover

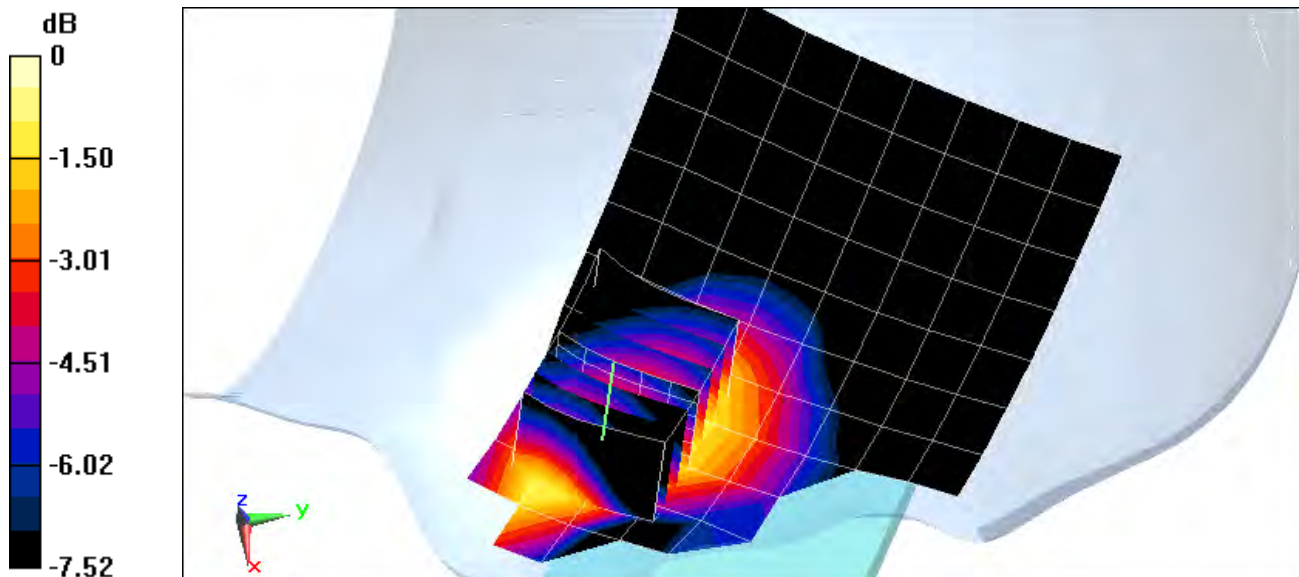
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x7x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 9.574 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.101 W/kg

SAR(1 g) = 0.081 W/kg



0 dB = 0.0885 W/kg = -10.53 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F19B6

Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.928 \text{ S/m}$; $\epsilon_r = 42.361$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-01-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3332; ConvF(6.29, 6.29, 6.29); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

Mode: UMTS 850, Left Head, Cheek, Mid.ch, Wireless Charging Cover

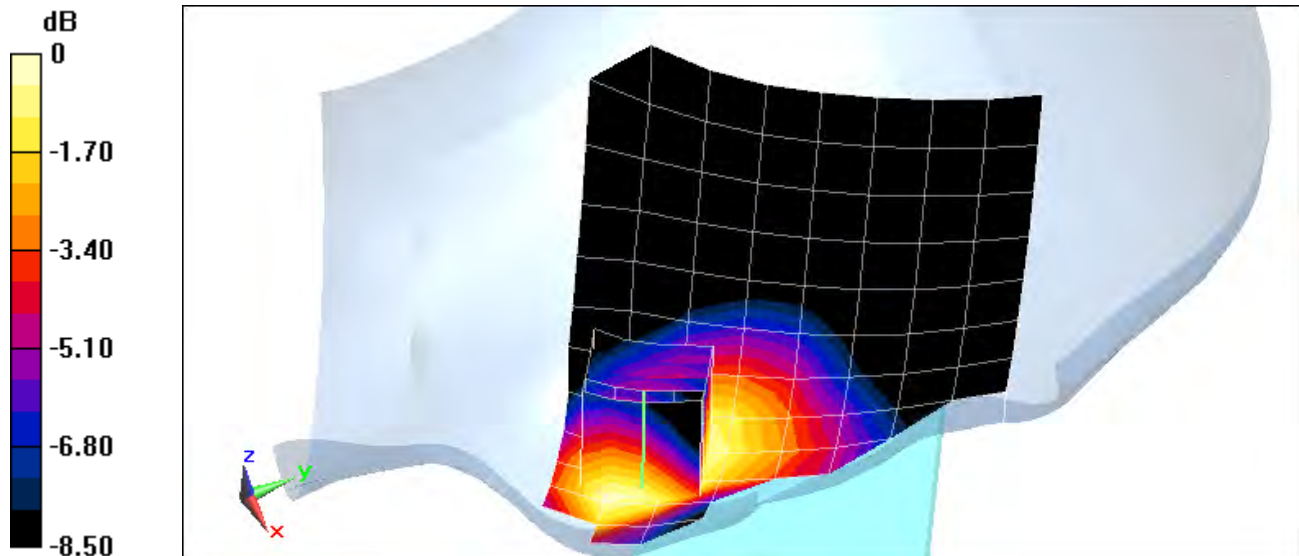
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.589 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.149 W/kg

SAR(1 g) = 0.120 W/kg



0 dB = 0.131 W/kg = -8.83 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F19AC

Communication System: UID 0, GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.381 \text{ S/m}$; $\epsilon_r = 40.233$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-02-2014; Ambient Temp: 21.5°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.99, 4.99, 4.99); Calibrated: 4/11/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 3/17/2014

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

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

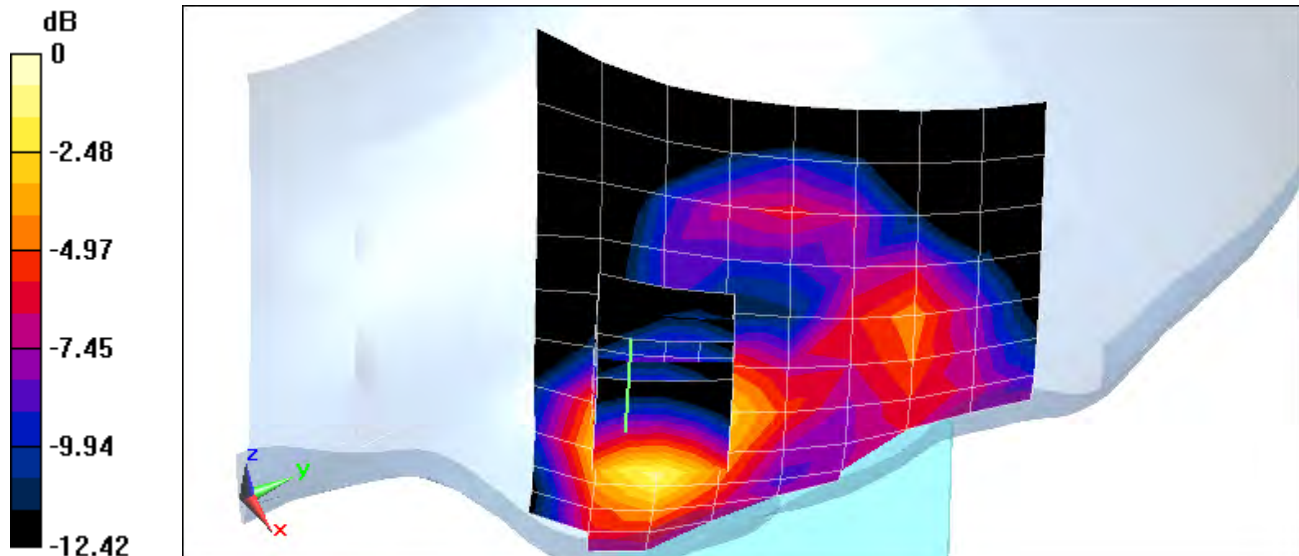
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 6.480 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.0950 W/kg

SAR(1 g) = 0.058 W/kg



0 dB = 0.0686 W/kg = -11.64 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F19B6

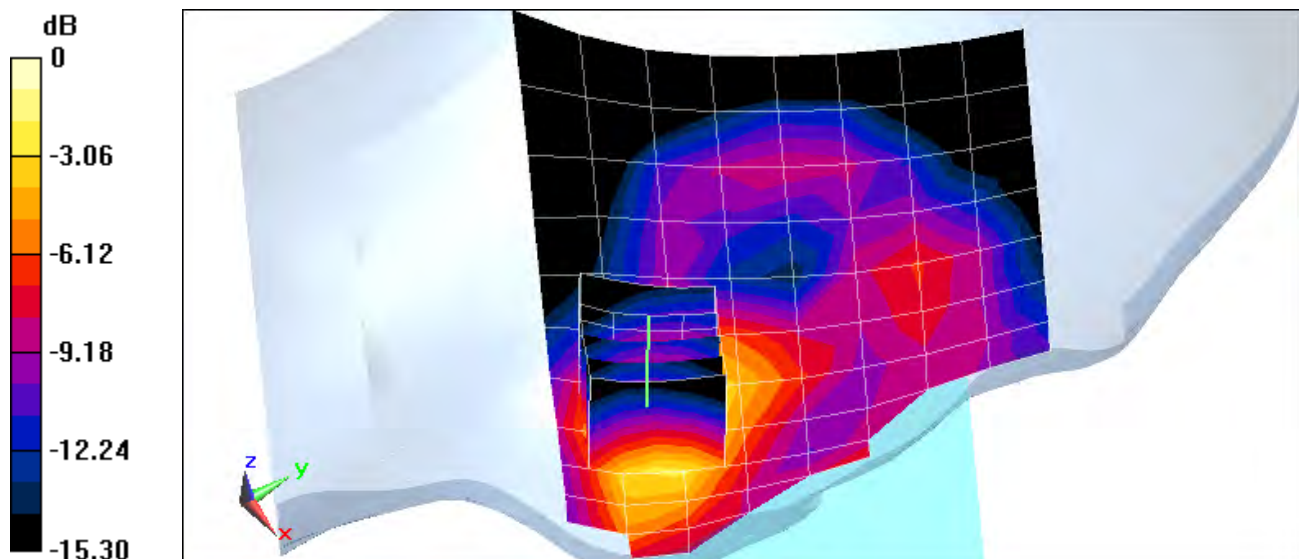
Communication System: UID 0, UMTS 1900; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
 $f = 1880 \text{ MHz}$; $\sigma = 1.381 \text{ S/m}$; $\epsilon_r = 40.233$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section

Test Date: 08-02-2014; Ambient Temp: 21.5°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.99, 4.99, 4.99); Calibrated: 4/11/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 3/17/2014
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 9.880 V/m; Power Drift = 0.19 dB
Peak SAR (extrapolated) = 0.287 W/kg
SAR(1 g) = 0.164 W/kg



0 dB = 0.206 W/kg = -6.86 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 024DF

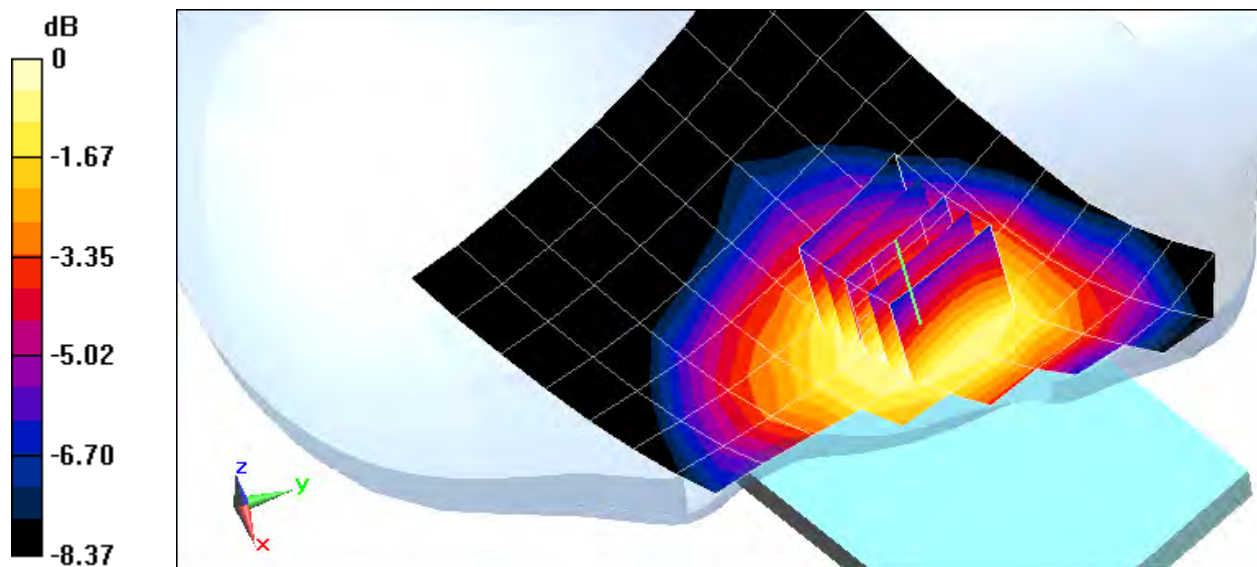
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
 $f = 707.5 \text{ MHz}$; $\sigma = 0.873 \text{ S/m}$; $\epsilon_r = 41.288$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section

Test Date: 08-28-2014; Ambient Temp: 23.2°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3263; ConvF(6.42, 6.42, 6.42); Calibrated: 5/15/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/14/2014
Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 12, Right Head, Cheek, Mid.ch, Standard Cover,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 13.608 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.177 W/kg
SAR(1 g) = 0.145 W/kg



0 dB = 0.159 W/kg = -7.99 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F19B1

Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.5$ MHz; $\sigma = 0.928$ S/m; $\epsilon_r = 42.363$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Test Date: 08-01-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3332; ConvF(6.29, 6.29, 6.29); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

**Mode: LTE Band 5 (Cell), Left Head, Cheek, Mid.ch, Wireless Charging Cover,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

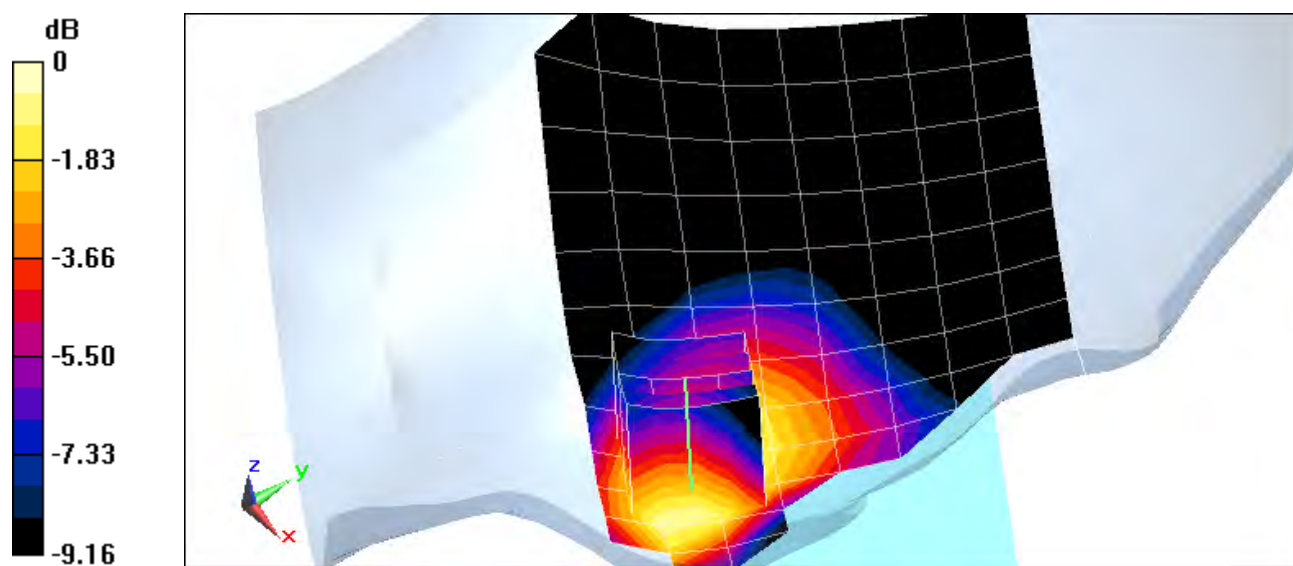
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 10.599 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.115 W/kg

SAR(1 g) = 0.093 W/kg



0 dB = 0.103 W/kg = -9.87 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F1668

Communication System: UID 0, LTE RF; Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
 $f = 1732.5 \text{ MHz}$; $\sigma = 1.394 \text{ S/m}$; $\epsilon_r = 40.148$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section

Test Date: 07-31-2014; Ambient Temp: 20.8°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3213; ConvF(5.18, 5.18, 5.18); Calibrated: 4/11/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 3/17/2014
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

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

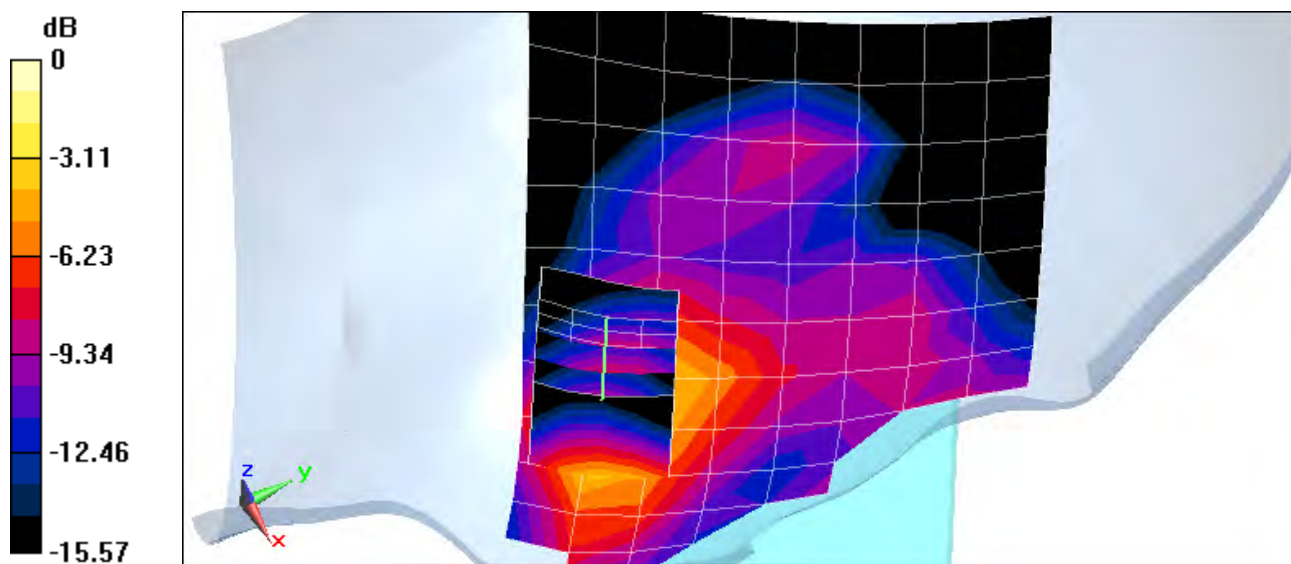
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.948 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.409 W/kg

SAR(1 g) = 0.246 W/kg



0 dB = 0.298 W/kg = -5.26 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F19AC

Communication System: UID 0, LTE PCS20 Mhz; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.399 \text{ S/m}$; $\epsilon_r = 40.138$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-02-2014; Ambient Temp: 21.5°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.99, 4.99, 4.99); Calibrated: 4/11/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 3/17/2014

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1114

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 2 (PCS), Left Head, Cheek, High.Ch, Standard Cover,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

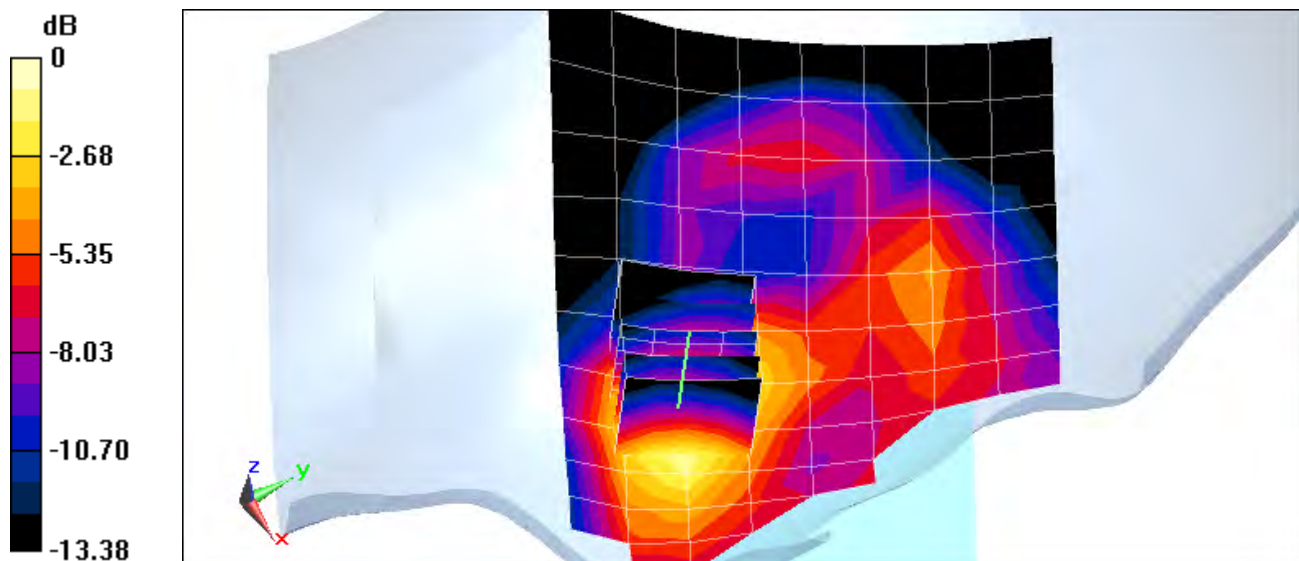
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 10.900 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.235 W/kg

SAR(1 g) = 0.145 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 01FC3

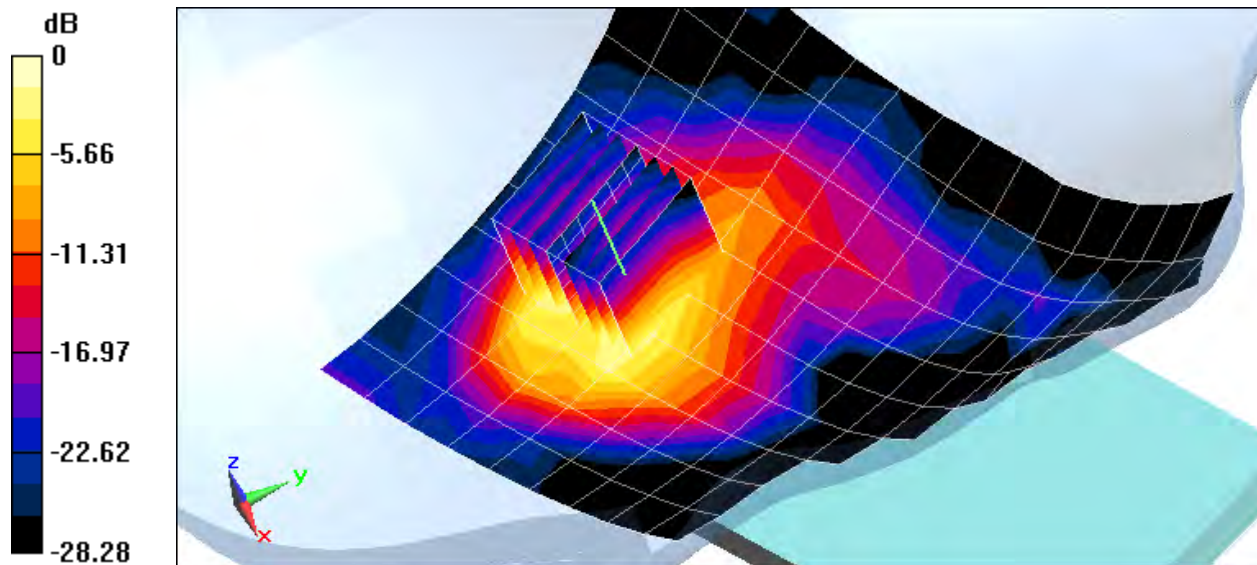
Communication System: UID 0, IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
 $f = 2462 \text{ MHz}$; $\sigma = 1.872 \text{ S/m}$; $\epsilon_r = 38.098$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section

Test Date: 08-28-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3258; ConvF(4.52, 4.52, 4.52); Calibrated: 2/25/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/26/2014
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11b, Right Head, Cheek, Ch 11, 1 Mbps,
Antenna 2, Standard Cover**

Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$
Reference Value = 20.063 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.48 W/kg
SAR(1 g) = 0.573 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 015D8

Communication System: UID 0, IEEE 802.11n (0); Frequency: 5745 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
 $f = 5745 \text{ MHz}$; $\sigma = 5.306 \text{ S/m}$; $\epsilon_r = 34.78$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Right Section

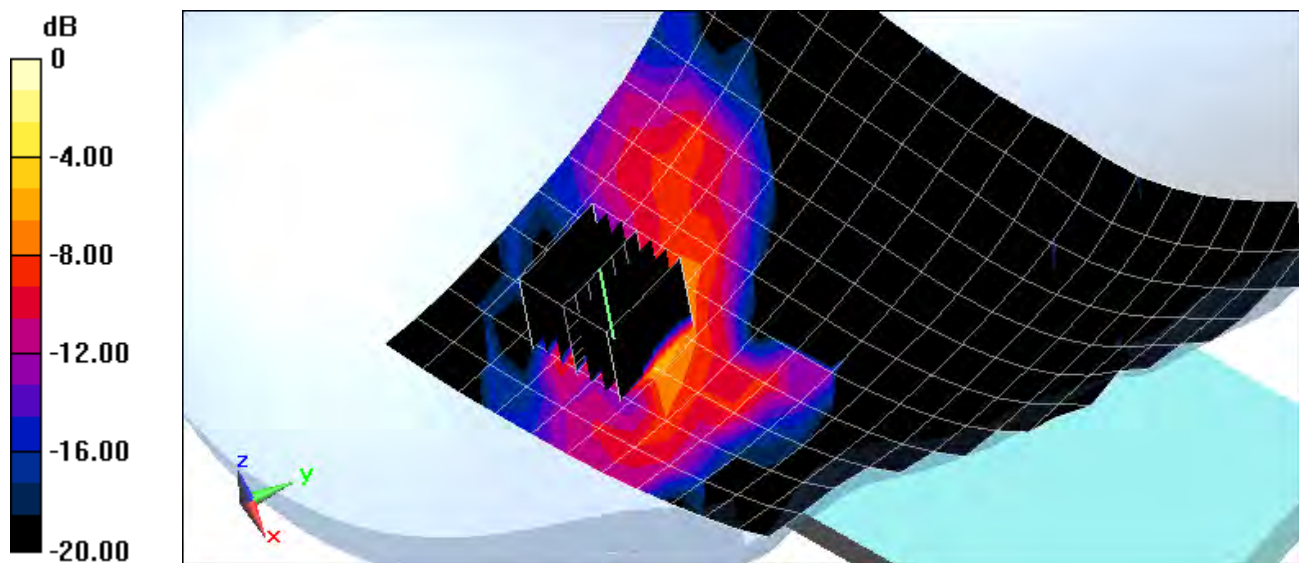
Test Date: 08-12-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.9°C

Probe: EX3DV4 - SN3914; ConvF(4.52, 4.52, 4.52); Calibrated: 10/23/2013;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 11/19/2013
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11n, 5.8 GHz, Right Head, Cheek, Ch 149, 13 Mbps,
MIMO, Standard Cover**

Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4
Reference Value = 2.082 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.840 W/kg
SAR(1 g) = 0.169 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 015D8

Communication System: UID 0, IEEE 802.11n (0); Frequency: 5680 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5680 \text{ MHz}$; $\sigma = 5.205 \text{ S/m}$; $\epsilon_r = 34.89$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 08-12-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.9°C

Probe: EX3DV4 - SN3914; ConvF(4.37, 4.37, 4.37); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

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

**Mode: IEEE 802.11n, 5.5 GHz, Right Head, Cheek, Ch 136, 13 Mbps,
MIMO, Wireless Charging Cover**

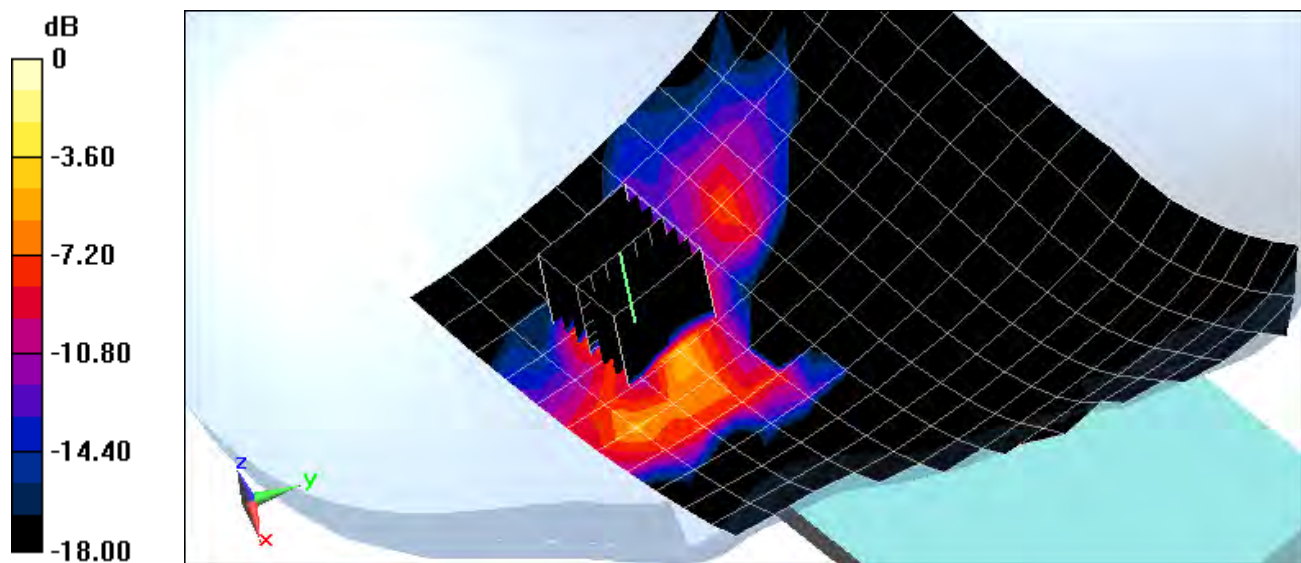
Area Scan (13x19x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Reference Value = 7.391 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.966 W/kg

SAR(1 g) = 0.212 W/kg



0 dB = 0.603 W/kg = -2.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F16AC

Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 53.829$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2014; Ambient Temp: 23.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

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

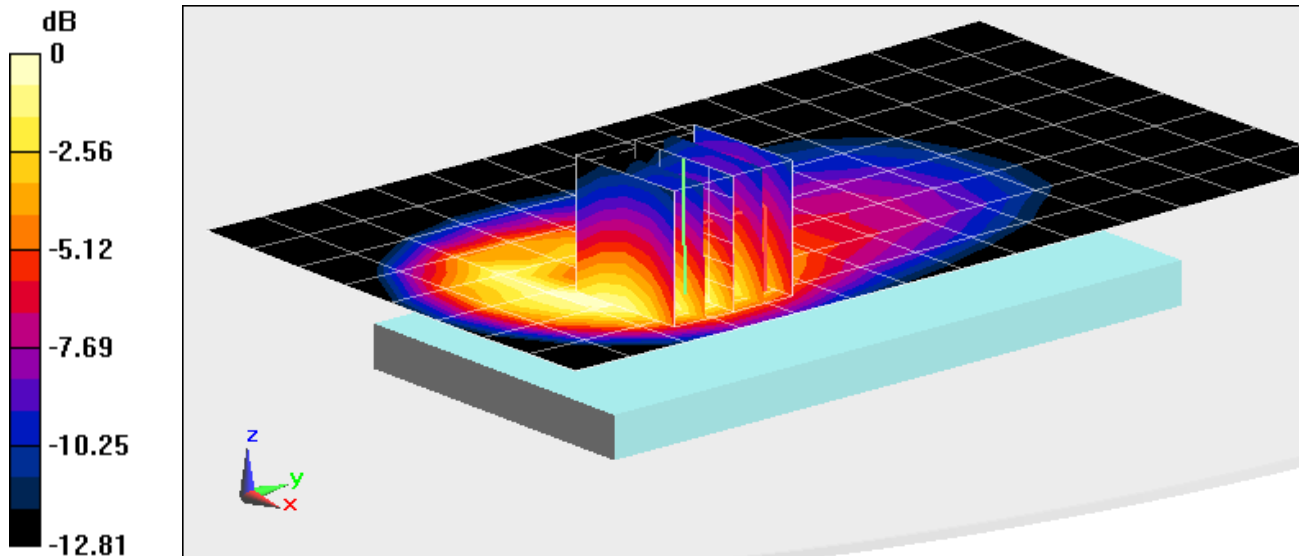
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 19.132 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.562 W/kg

SAR(1 g) = 0.359 W/kg



0 dB = 0.420 W/kg = -3.77 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F16AC

Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:4.15

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 53.829$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2014; Ambient Temp: 23.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

**Mode: GPRS 850, Body SAR, Front side, Mid.ch, 2 Tx Slots,
Wireless Charging Cover**

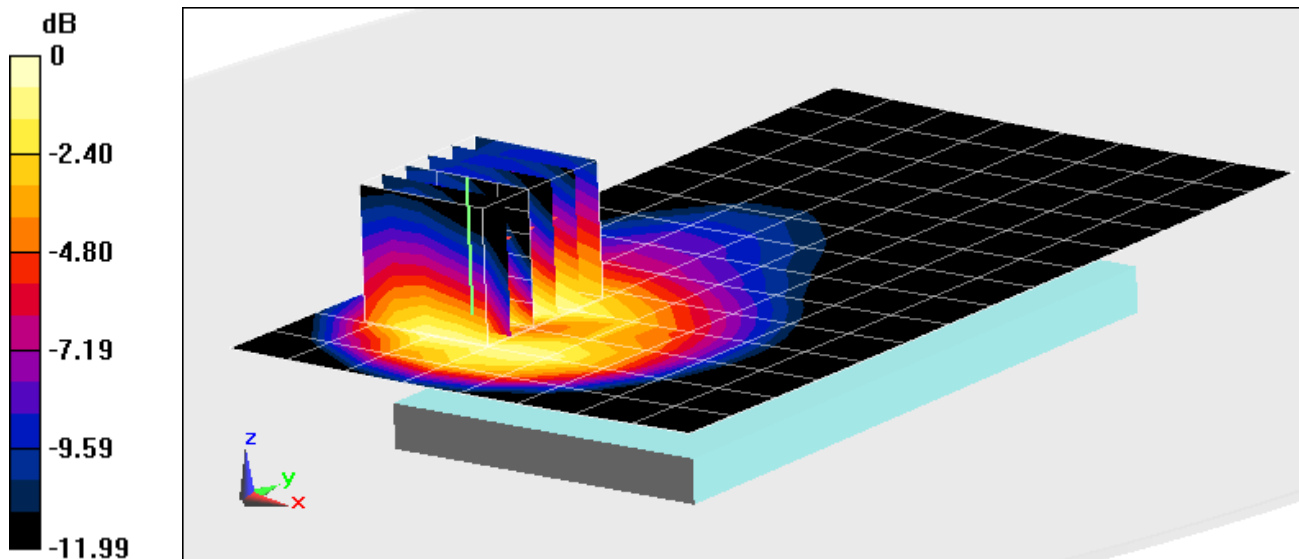
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 23.578 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.816 W/kg

SAR(1 g) = 0.529 W/kg



0 dB = 0.619 W/kg = -2.08 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F19B6

Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 53.829$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2014; Ambient Temp: 23.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

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

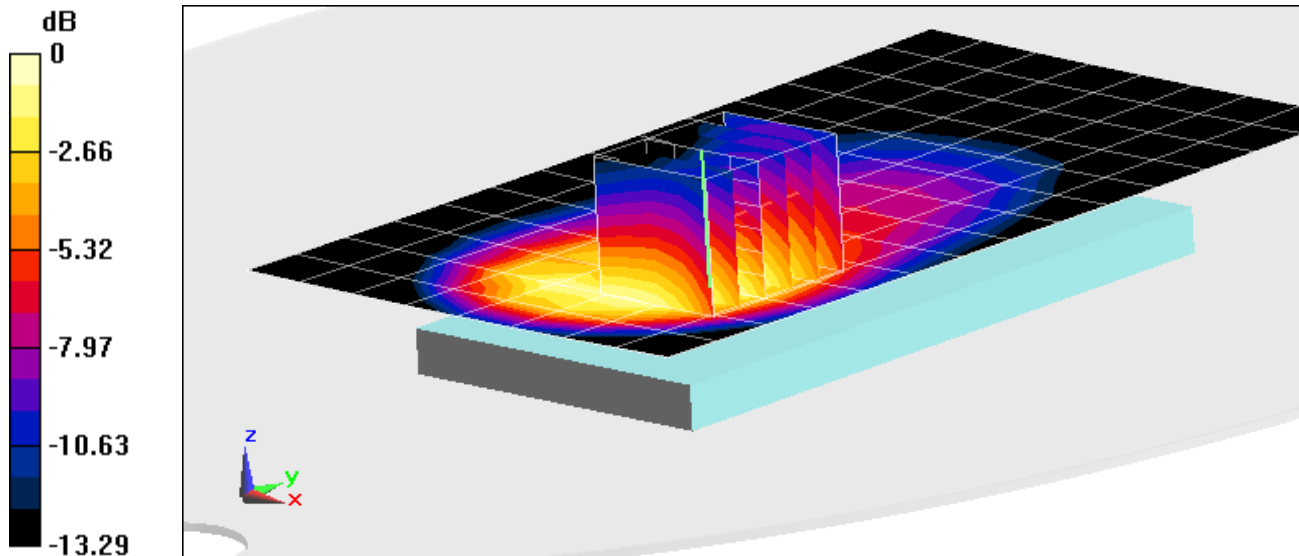
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.935 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.775 W/kg

SAR(1 g) = 0.487 W/kg



0 dB = 0.579 W/kg = -2.37 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F19B6

Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 53.829$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2014; Ambient Temp: 23.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

Mode: UMTS 850, Body SAR, Front side, Mid.ch, Wireless Charging Cover

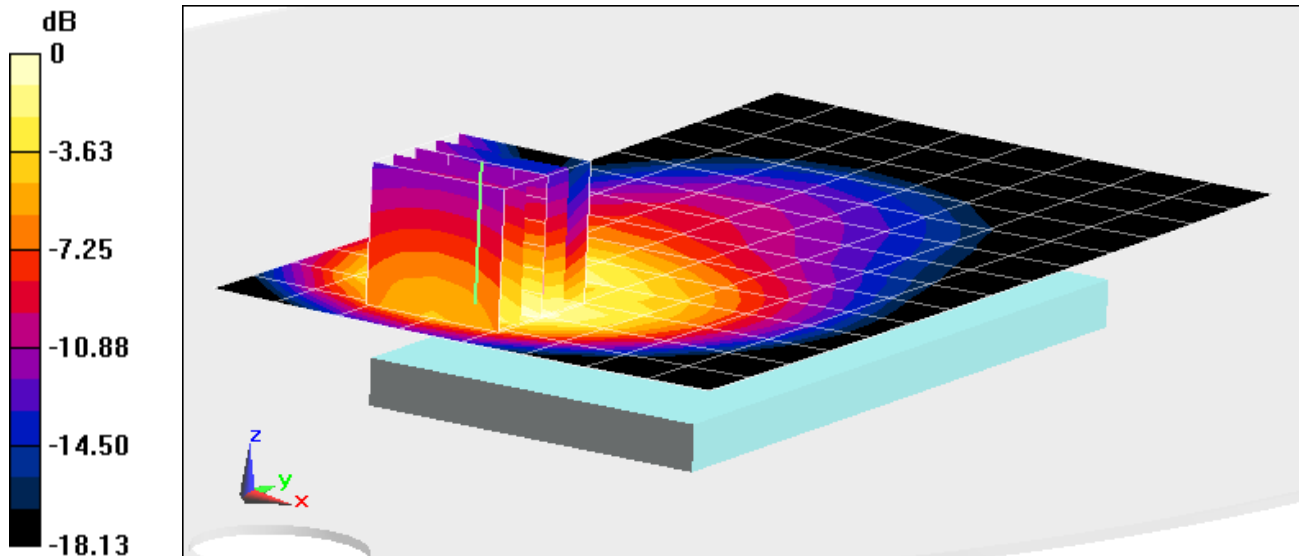
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 25.042 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.975 W/kg

SAR(1 g) = 0.569 W/kg



0 dB = 0.716 W/kg = -1.45 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F16AC

Communication System: UID 0, GSM1900; Frequency: 1880 MHz; Duty Cycle: 1:8.3

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.537 \text{ S/m}$; $\epsilon_r = 50.998$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3288; ConvF(4.82, 4.82, 4.82); Calibrated: 9/23/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2013

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

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

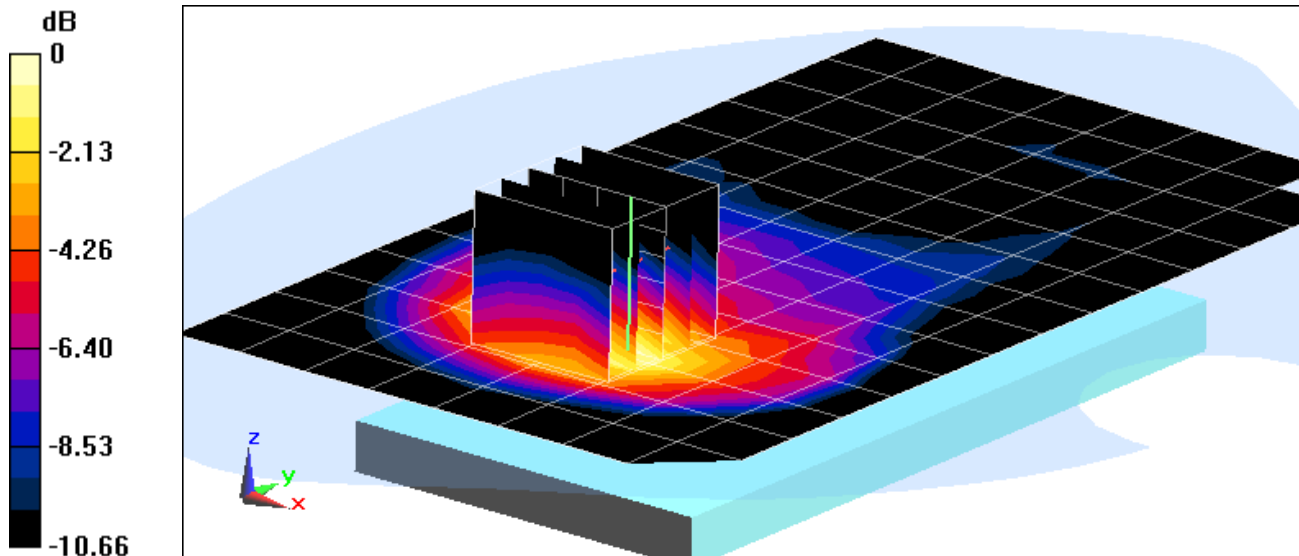
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.680 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 0.423 W/kg

SAR(1 g) = 0.256 W/kg



0 dB = 0.304 W/kg = -5.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F16AC

Communication System: UID 0, GSM1900 GPRS; 2 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:4.15

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.537 \text{ S/m}$; $\epsilon_r = 50.998$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3288; ConvF(4.82, 4.82, 4.82); Calibrated: 9/23/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2013

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 1900, Body SAR, Bottom Edge, Mid.ch, 2 Tx Slots, Standard Cover

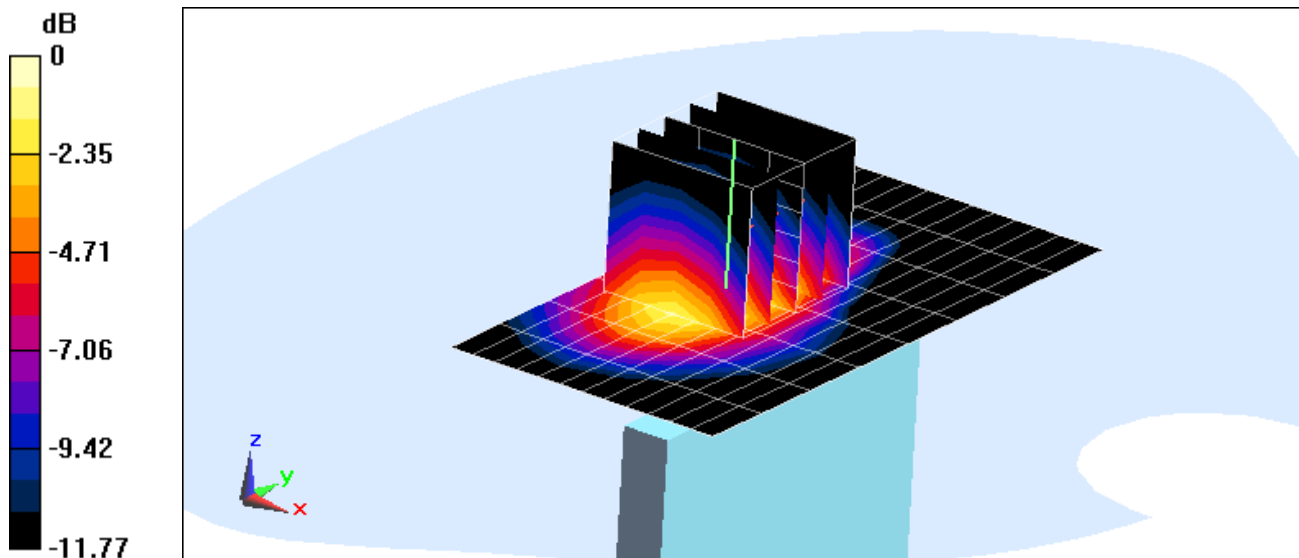
Area Scan (13x9x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.610 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 1.00 W/kg

SAR(1 g) = 0.619 W/kg



0 dB = 0.757 W/kg = -1.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 01FC4

Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
 $f = 1880 \text{ MHz}$; $\sigma = 1.502 \text{ S/m}$; $\epsilon_r = 52.007$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-28-2014; Ambient Temp: 23.5°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.67, 4.67, 4.67); Calibrated: 4/17/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

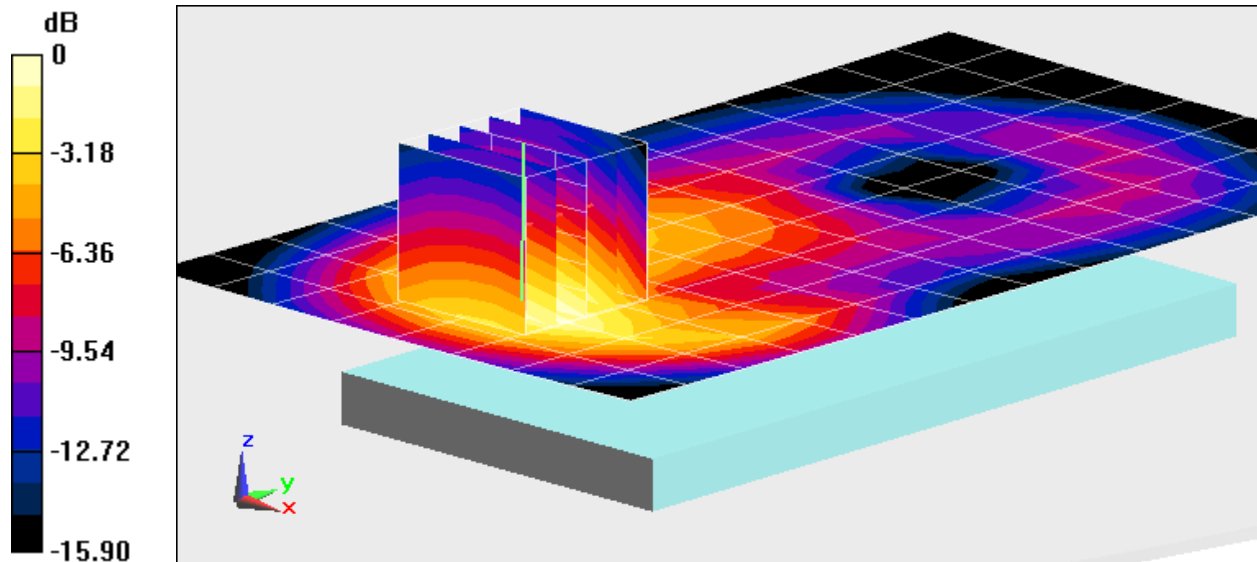
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 7.310 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.483 W/kg

SAR(1 g) = 0.317 W/kg



0 dB = 0.375 W/kg = -4.26 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 01FC4

Communication System: UID 0, UMTS; Frequency: 1852.4 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
 $f = 1852.4 \text{ MHz}$; $\sigma = 1.469 \text{ S/m}$; $\epsilon_r = 52.093$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-28-2014; Ambient Temp: 23.5°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.67, 4.67, 4.67); Calibrated: 4/17/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: UMTS 1900, Body SAR, Bottom Edge, Low.ch, Standard Cover

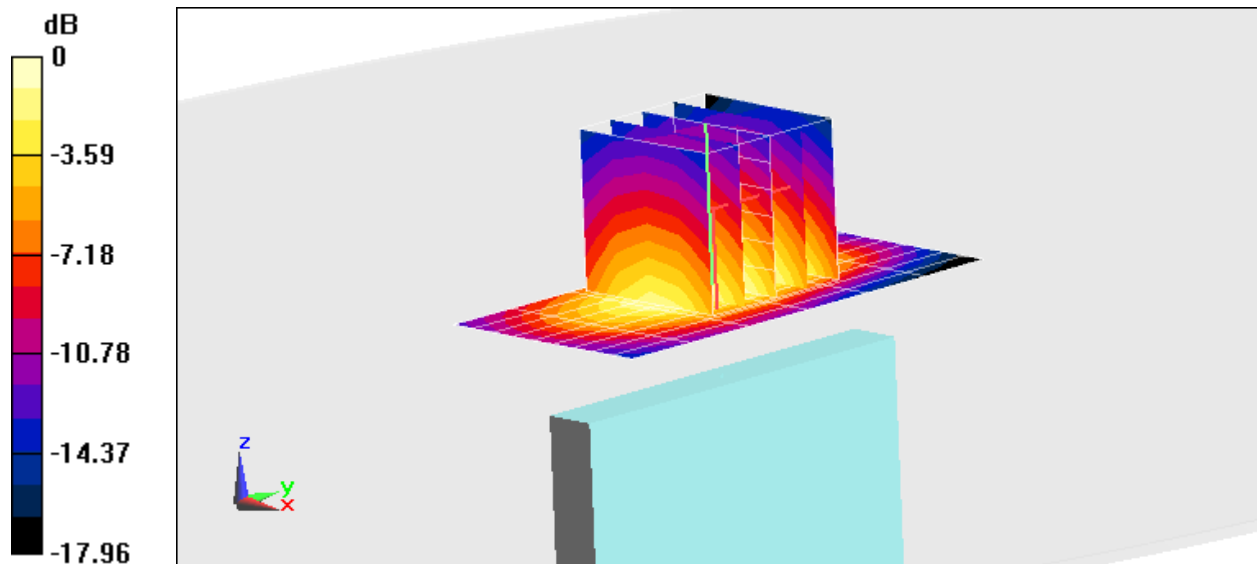
Area Scan (10x7x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 27.830 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.61 W/kg

SAR(1 g) = 0.988 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 024DF

Communication System: UID 0, LTE BAND 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
 $f = 707.5 \text{ MHz}$; $\sigma = 0.936 \text{ S/m}$; $\epsilon_r = 55.589$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-30-2014; Ambient Temp: 23.7°C; Tissue Temp: 23.5°C

Probe: ES3DV3 - SN3288; ConvF(6.25, 6.25, 6.25); Calibrated: 9/23/2013;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2013
Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

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

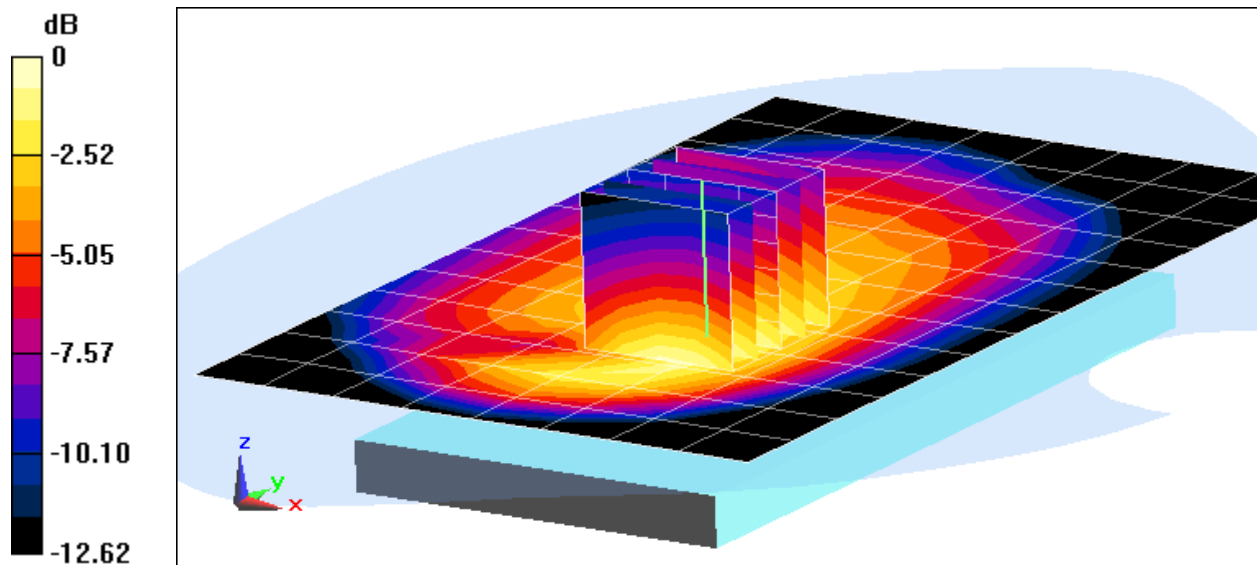
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.804 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.533 W/kg

SAR(1 g) = 0.367 W/kg



0 dB = 0.424 W/kg = -3.73 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 024DF

Communication System: UID 0, LTE BAND 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated) :
 $f = 707.5 \text{ MHz}$; $\sigma = 0.936 \text{ S/m}$; $\epsilon_r = 55.589$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.0 cm

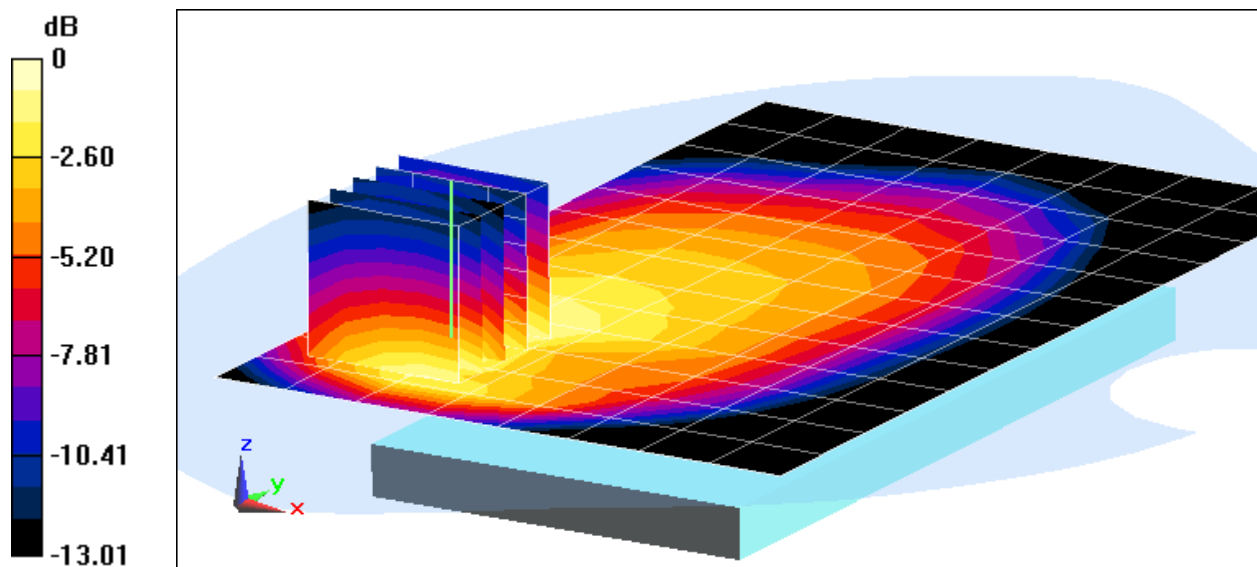
Test Date: 08-30-2014; Ambient Temp: 23.7°C; Tissue Temp: 23.5°C

Probe: ES3DV3 - SN3288; ConvF(6.25, 6.25, 6.25); Calibrated: 9/23/2013;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2013
Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626
Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 12, Body SAR, Front side, Mid.ch, Wireless Charging
Cover, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$
Reference Value = 21.263 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.676 W/kg
SAR(1 g) = 0.424 W/kg



0 dB = 0.500 W/kg = -3.01 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F19B1

Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5$ MHz; $\sigma = 1.001$ S/m; $\epsilon_r = 54.16$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646

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

**Mode: LTE Band 5 (Cell.), Body SAR, Back side, Mid.ch, Standard Cover,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

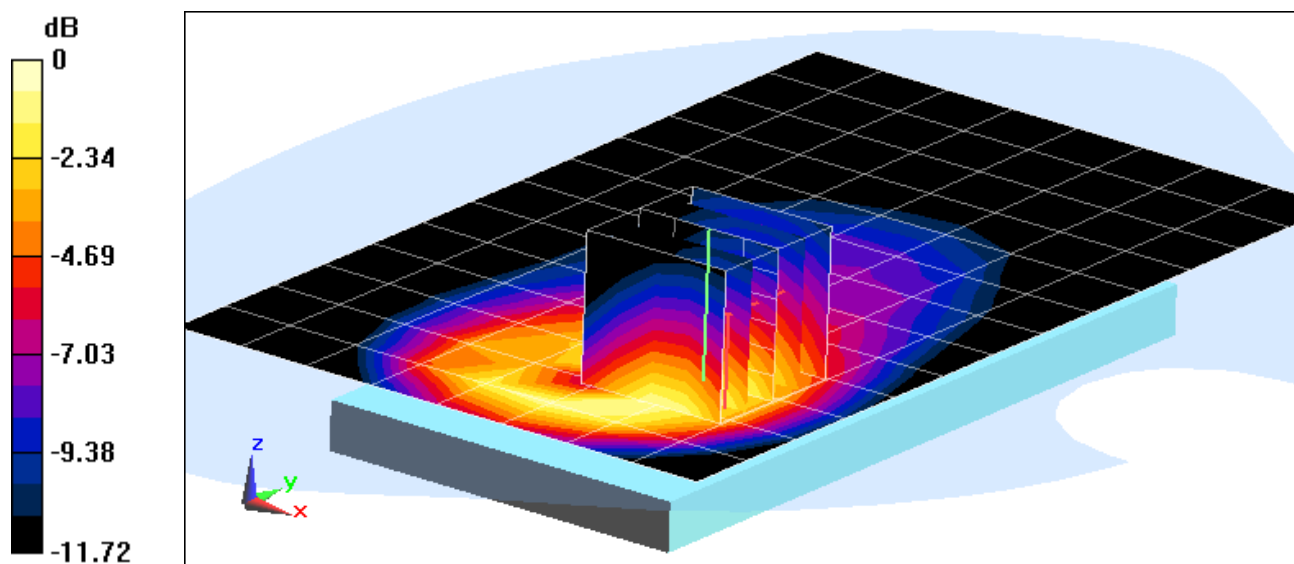
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 19.804 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.551 W/kg

SAR(1 g) = 0.351 W/kg



0 dB = 0.419 W/kg = -3.78 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F19B1

Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 1.004 \text{ S/m}$; $\epsilon_r = 53.83$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-30-2014; Ambient Temp: 23.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

**Mode: LTE Band 5 (Cell.), Body SAR, Front side, Mid.ch, Wireless Charging Cover,
10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset**

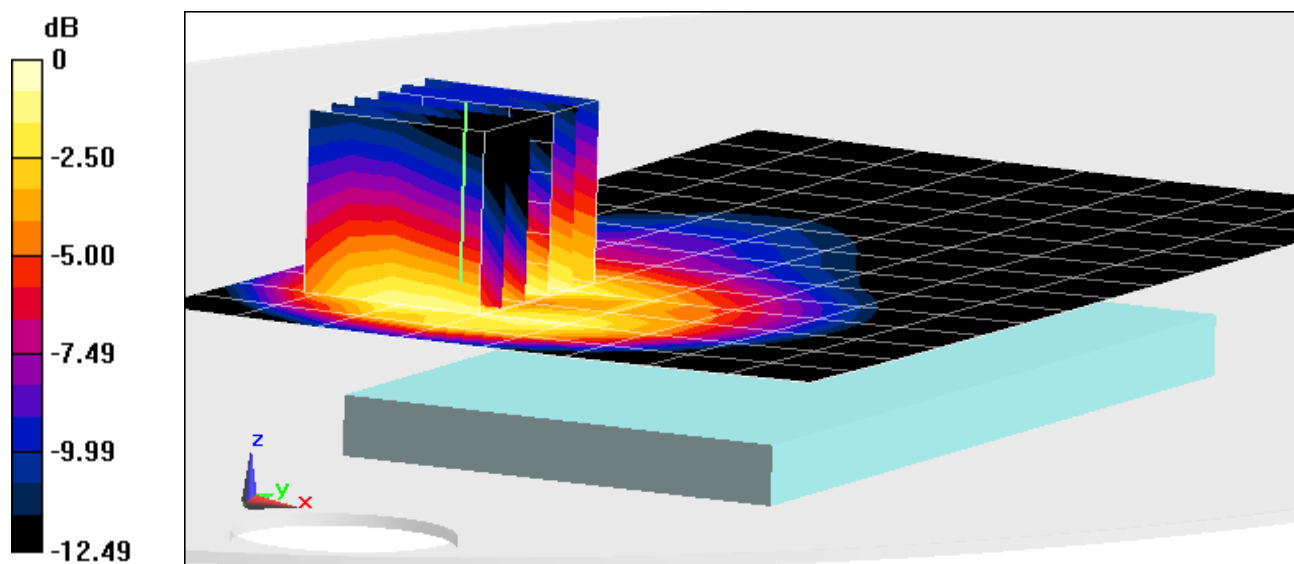
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.381 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.656 W/kg

SAR(1 g) = 0.427 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: F1668

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
 $f = 1732.5 \text{ MHz}$; $\sigma = 1.447 \text{ S/m}$; $\epsilon_r = 52.091$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-26-2014; Ambient Temp: 21.5°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.93, 4.93, 4.93); Calibrated: 11/25/2013;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 11/18/2013
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

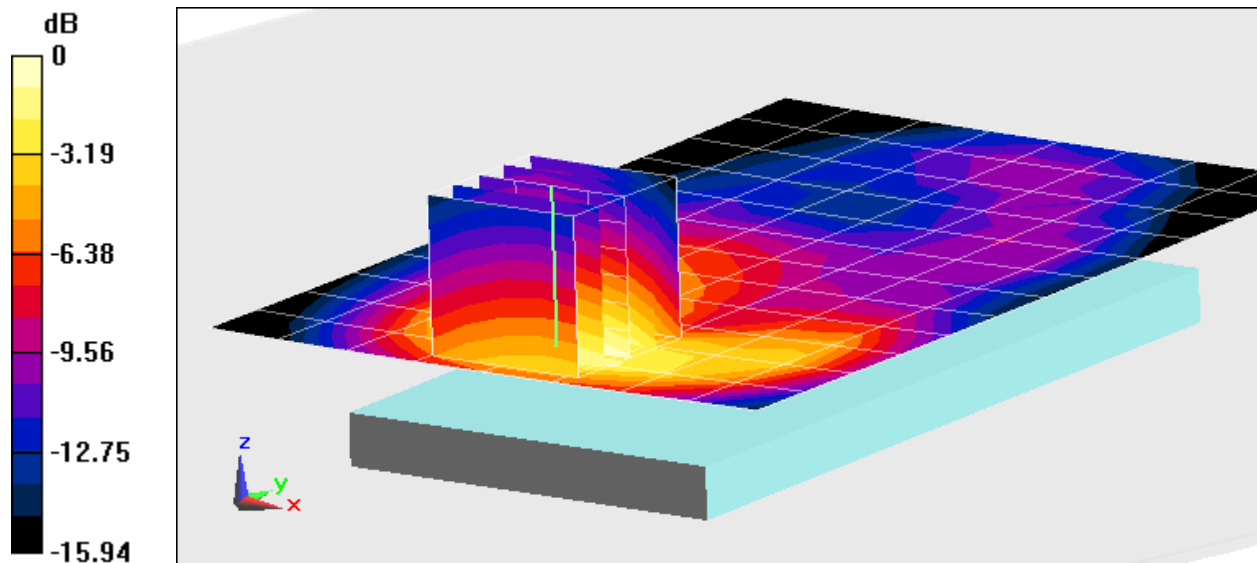
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.235 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 0.588 W/kg

SAR(1 g) = 0.382 W/kg



0 dB = 0.440 W/kg = -3.57 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 01A30

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
 $f = 1732.5 \text{ MHz}$; $\sigma = 1.447 \text{ S/m}$; $\epsilon_r = 52.091$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-26-2014; Ambient Temp: 21.5°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.93, 4.93, 4.93); Calibrated: 11/25/2013;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 11/18/2013
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 4 (AWS), Body SAR, Front side, Mid.ch, Standard Cover,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

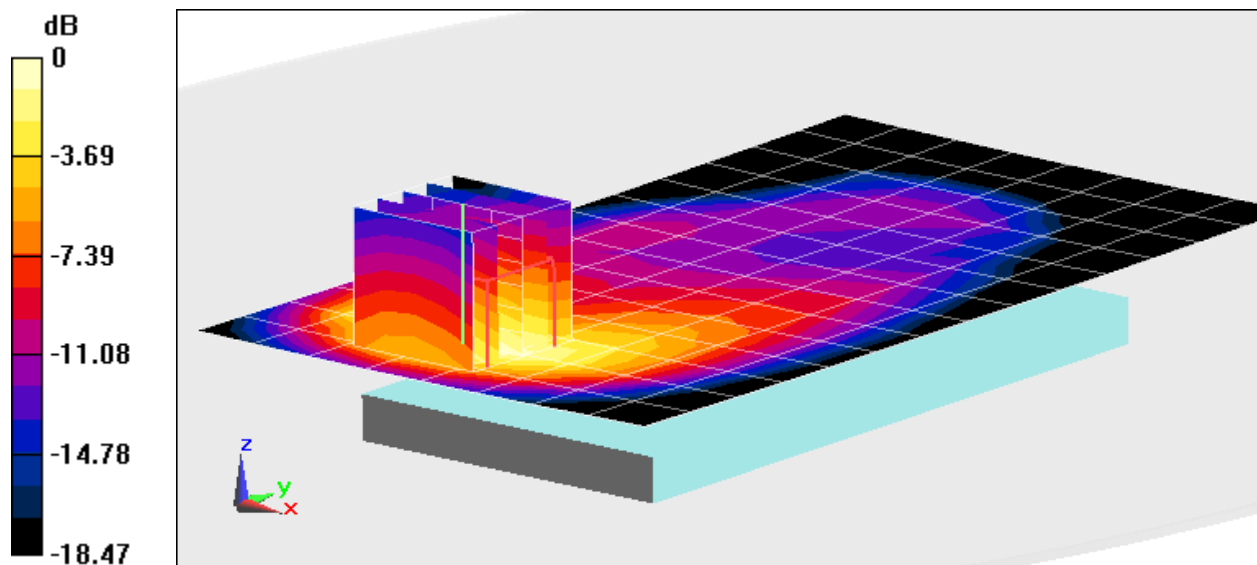
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.827 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.983 W/kg

SAR(1 g) = 0.604 W/kg



0 dB = 0.735 W/kg = -1.34 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 01FC4

Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
 $f = 1900 \text{ MHz}$; $\sigma = 1.525 \text{ S/m}$; $\epsilon_r = 51.94$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-28-2014; Ambient Temp: 23.5°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.67, 4.67, 4.67); Calibrated: 4/17/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 2 (PCS), Body SAR, Back side, High.ch, Standard Cover,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

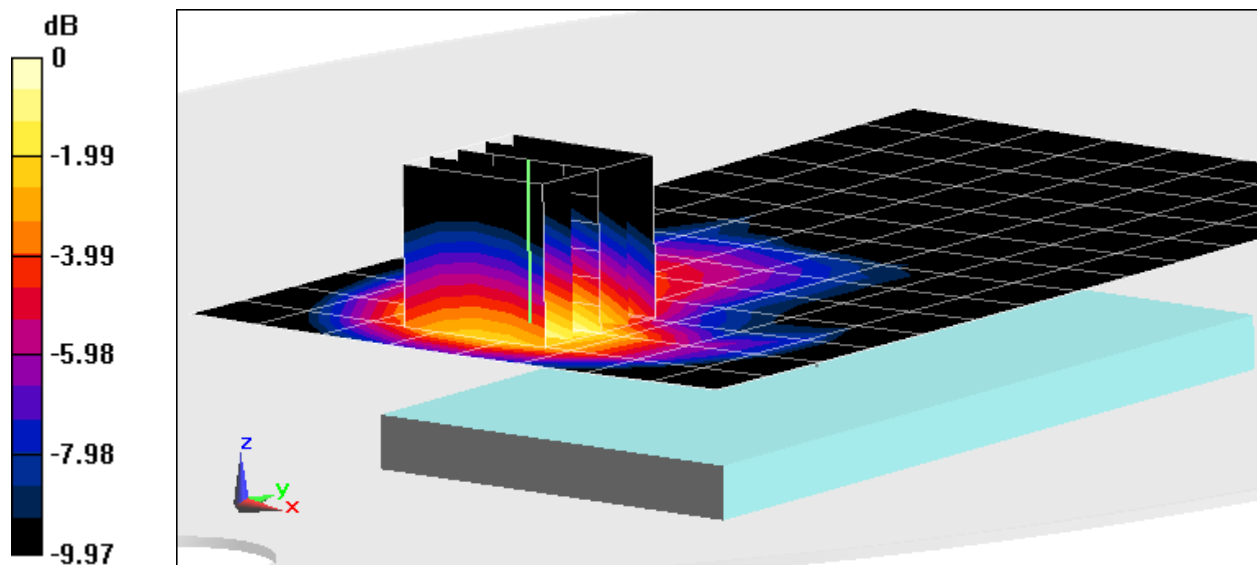
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 6.622 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.629 W/kg

SAR(1 g) = 0.413 W/kg



0 dB = 0.485 W/kg = -3.14 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 01FC4

Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.525 \text{ S/m}$; $\epsilon_r = 51.94$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-28-2014; Ambient Temp: 23.5°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.67, 4.67, 4.67); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

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

**Mode: LTE Band 2 (PCS), Body SAR, Bottom Edge, High.ch, Standard Cover,
20 MHz Bandwidth, QPSK, 50 RB, 50 RB Offset**

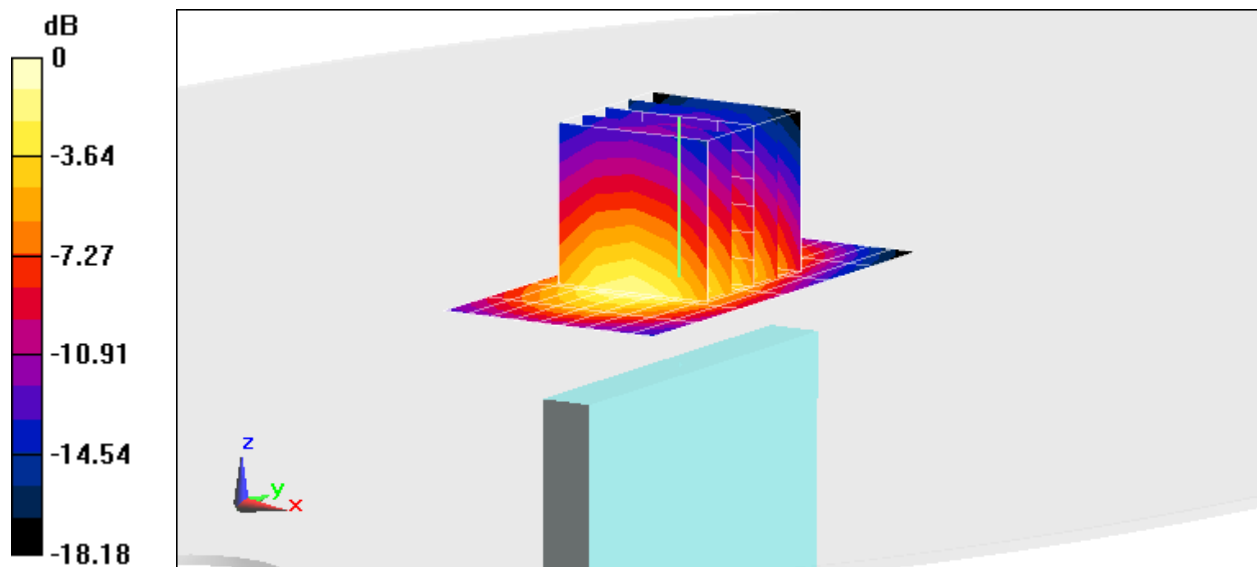
Area Scan (10x7x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 24.478 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.28 W/kg

SAR(1 g) = 0.782 W/kg



0 dB = 0.965 W/kg = -0.15 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 015D8

Communication System: UID 0, IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 1.919 \text{ S/m}$; $\epsilon_r = 50.812$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-07-2014; Ambient Temp: 23.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3319; ConvF(4.24, 4.24, 4.24); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

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

**Mode: IEEE 802.11b, Body SAR, Ch 11, 1 Mbps, Back Side,
Antenna 1, Standard Cover**

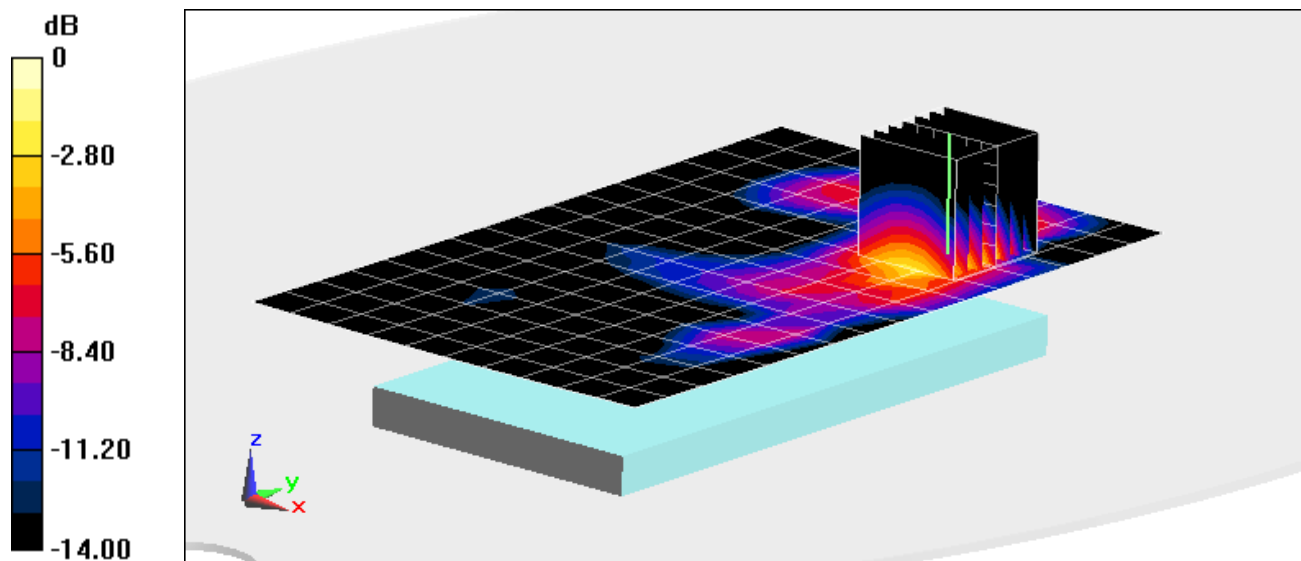
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 8.728 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.270 W/kg

SAR(1 g) = 0.128 W/kg



0 dB = 0.161 W/kg = -7.93 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 015D8

Communication System: UID 0, IEEE 802.11n 5.2-5.8 GHz Band; Frequency: 5745 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5745 \text{ MHz}$; $\sigma = 5.988 \text{ S/m}$; $\epsilon_r = 46.411$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-11-2014; Ambient Temp: 22.4°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3920; ConvF(4, 4, 4); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

**Mode: IEEE 802.11n, 5.8 GHz, Body SAR, Ch 149, 13 Mbps, Back Side,
MIMO, Standard Cover**

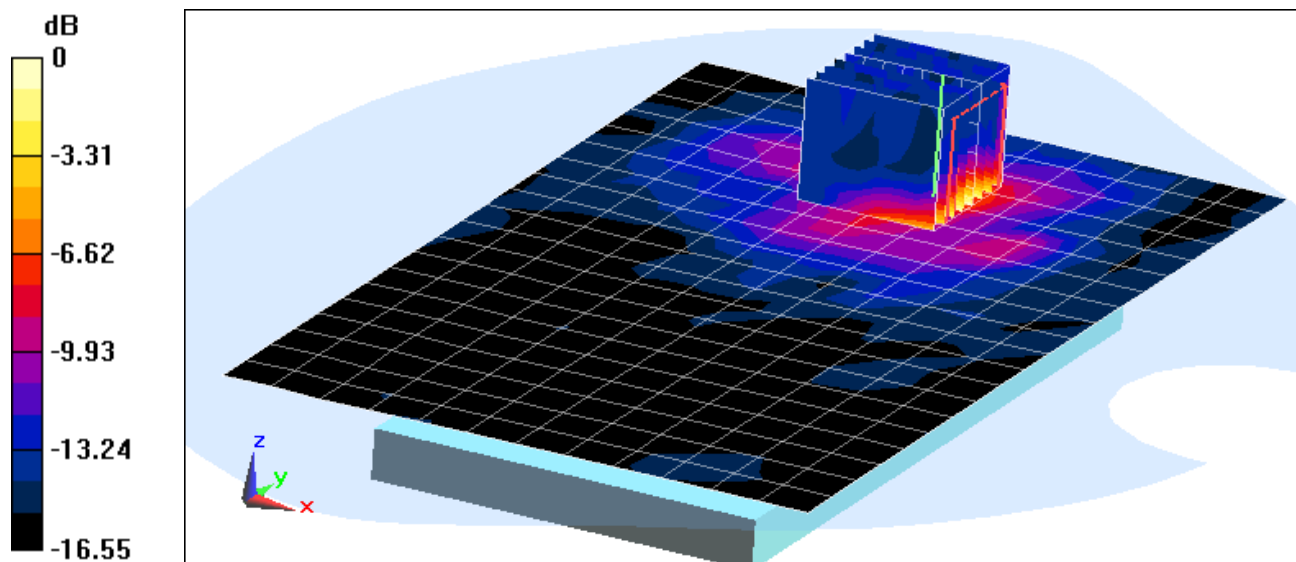
Area Scan (13x21x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Reference Value = 5.652 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 1.44 W/kg

SAR(1 g) = 0.292 W/kg



0 dB = 0.652 W/kg = -1.86 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 015D8

Communication System: UID 0, IEEE 802.11n (0); Frequency: 5745 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5745 \text{ MHz}$; $\sigma = 6.114 \text{ S/m}$; $\epsilon_r = 47.032$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-13-2014; Ambient Temp: 24.4°C; Tissue Temp: 24.0°C

Probe: EX3DV4 - SN3589; ConvF(3.97, 3.97, 3.97); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: IEEE 802.11n, 5.8 GHz, Body SAR, Ch 149, 13 Mbps, Back Side,
MIMO, Wireless Charging Cover**

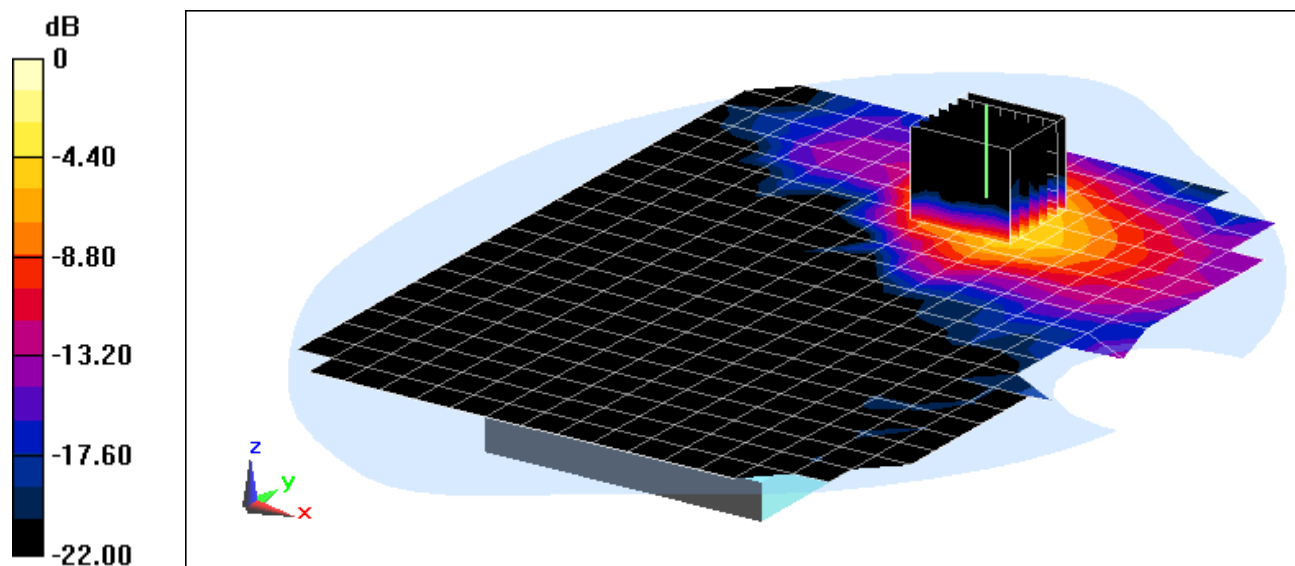
Area Scan (17x22x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Reference Value = 7.354 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 2.21 W/kg

SAR(1 g) = 0.482 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 015D8

Communication System: UID 0, IEEE 802.11a 5.2-5.8 GHz Band; Frequency: 5680 MHz, Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5680 \text{ MHz}$; $\sigma = 5.917 \text{ S/m}$; $\epsilon_r = 46.318$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-11-2014; Ambient Temp: 22.4°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3920; ConvF(3.62, 3.62, 3.62); Calibrated: 12/18/2013,

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11n, 5.5 GHz, Body SAR, Ch 136, 13 Mbps, Back Side, MIMO, Standard Cover

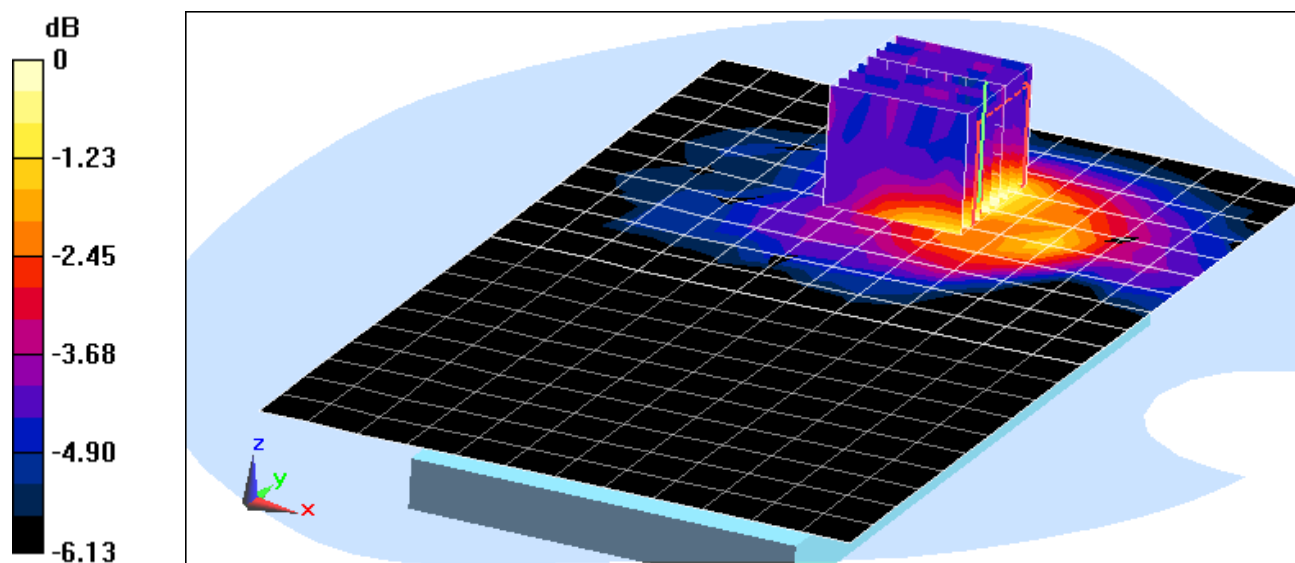
Area Scan (13x21x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 7.062 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 2.06 W/kg

SAR(1 g) = 0.454 W/kg



0 dB = 0.718 W/kg = -1.44 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 01FBB

Communication System: UID 0, UMTS (0); Frequency: 1907.6 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used(interpolated):
 $f = 1907.6 \text{ MHz}$; $\sigma = 1.533 \text{ S/m}$; $\epsilon_r = 51.914$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 08-28-2014; Ambient Temp: 23.5°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.67, 4.67, 4.67); Calibrated: 4/17/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 4/11/2014
Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: UMTS 1900, Extremity SAR, Bottom Edge, High.ch, Wireless Charging Cover

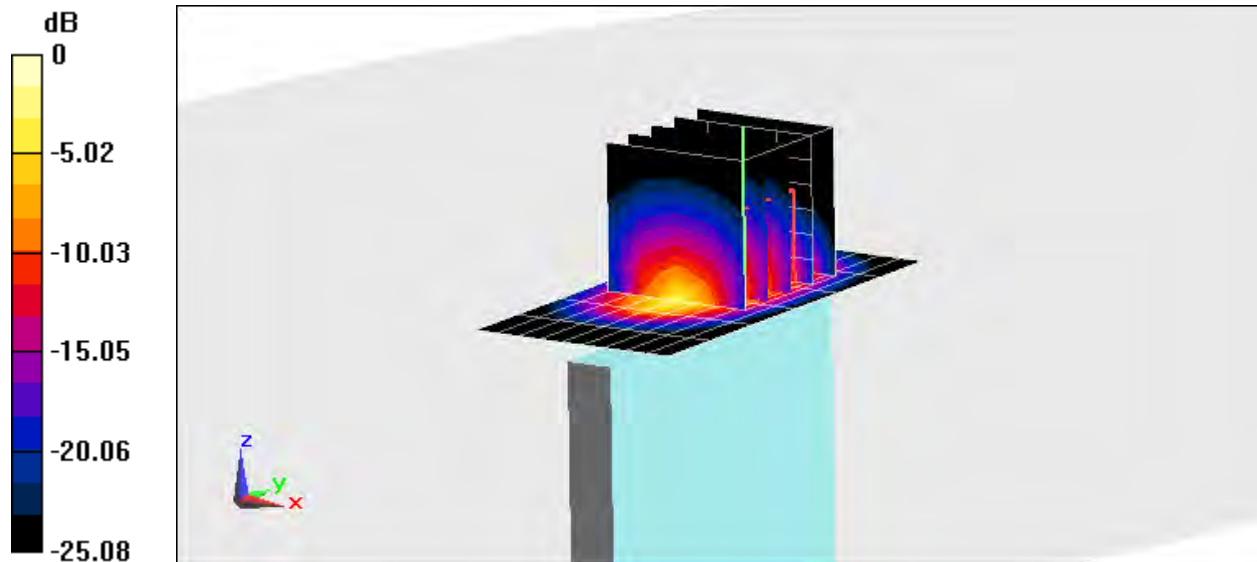
Area Scan (10x7x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 70.664 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 15.0 W/kg

SAR(10 g) = 2.990 W/kg



0 dB = 9.59 W/kg = 9.82 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 01FBB

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.502 \text{ S/m}$; $\epsilon_r = 52.007$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 08-28-2014; Ambient Temp: 23.5°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.67, 4.67, 4.67); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

Measurement SW: DASY52, Version 52.8 (6); SEMCAD X Version 14.6.10 (7331)

**Mode: LTE Band 2 (PCS), Extremity SAR, Bottom Edge, Mid.ch, Standard Cover,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

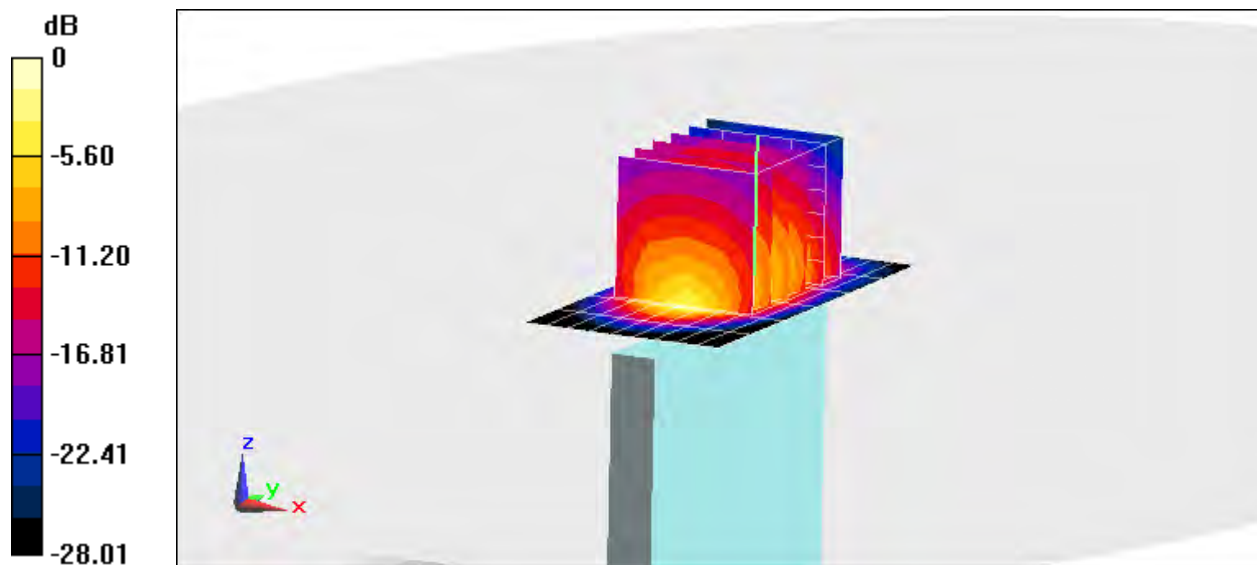
Area Scan (10x7x1): Measurement grid: dx=5mm, dy=15mm

Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 74.685 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 14.6 W/kg

SAR(10 g) = 3.15 W/kg



0 dB = 9.91 W/kg = 9.96 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN910A; Type: Portable Handset; Serial: 015D7

Communication System: UID 0, IEEE 802.11a (0); Frequency: 5700 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5700 \text{ MHz}$; $\sigma = 6.018 \text{ S/m}$; $\epsilon_r = 47.133$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 08-13-2014; Ambient Temp: 24.2°C; Tissue Temp: 23.9°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

**Mode: IEEE 802.11a, 5.5 GHz, Extremity SAR, Ch 140, 6 Mbps, Back Side,
Antenna 2, Standard Cover**

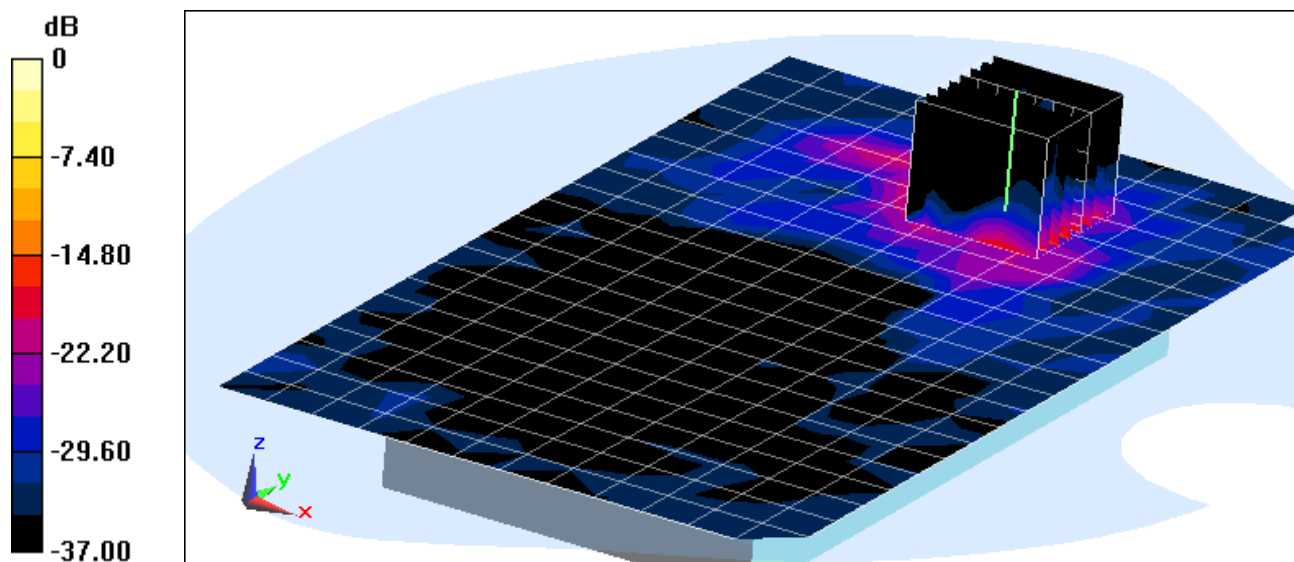
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 24.200 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 32.0 W/kg

SAR(10 g) = 0.595 W/kg



0 dB = 14.5 W/kg = 11.61 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.911 \text{ S/m}$; $\epsilon_r = 40.708$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-28-2014; Ambient Temp: 23.2°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3263; ConvF(6.42, 6.42, 6.42); Calibrated: 5/15/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

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

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

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

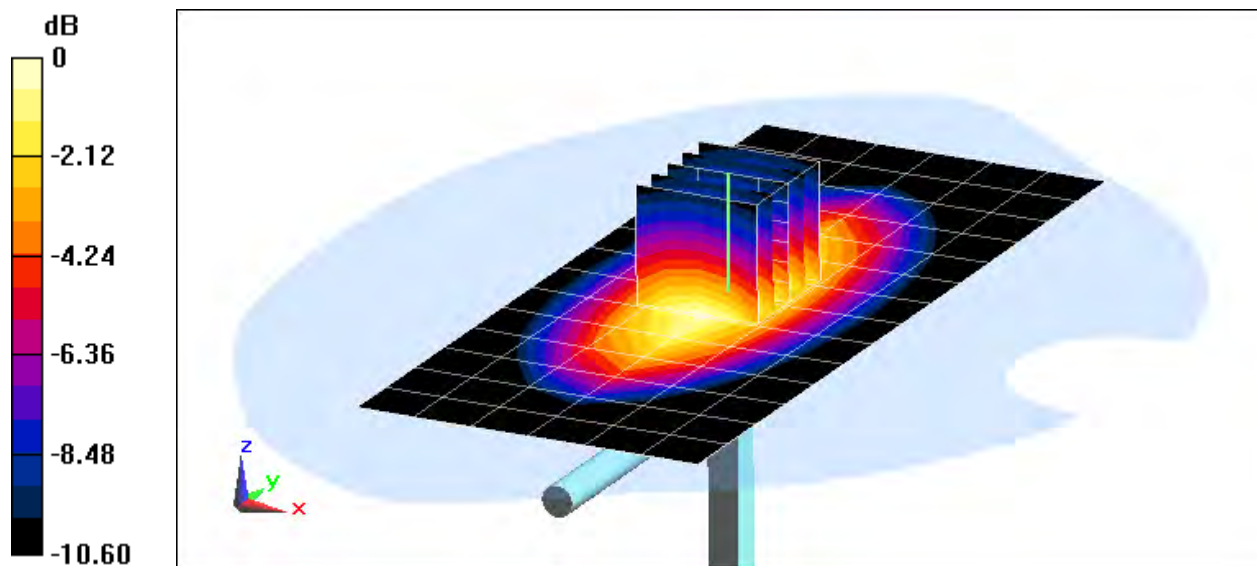
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.32 W/kg

SAR(1 g) = 0.863 W/kg

Deviation = 3.11%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.926 \text{ S/m}$; $\epsilon_r = 42.383$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-01-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3332; ConvF(6.29, 6.29, 6.29); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

835 MHz System Verification

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

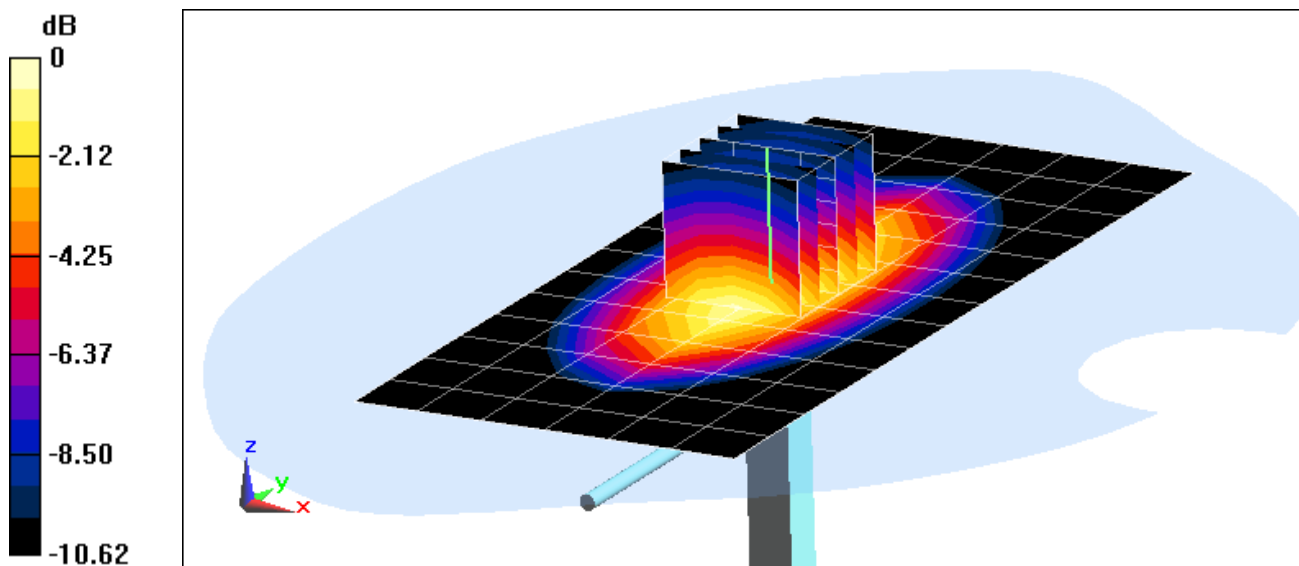
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.33 W/kg

SAR(1 g) = 0.893 W/kg

Deviation: -3.15%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.412 \text{ S/m}$; $\epsilon_r = 40.058$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2014; Ambient Temp: 20.8°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3213; ConvF(5.18, 5.18, 5.18); Calibrated: 4/11/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 3/17/2014

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification

Area Scan (6x8x1): Measurement grid: dx=15mm, dy=15mm

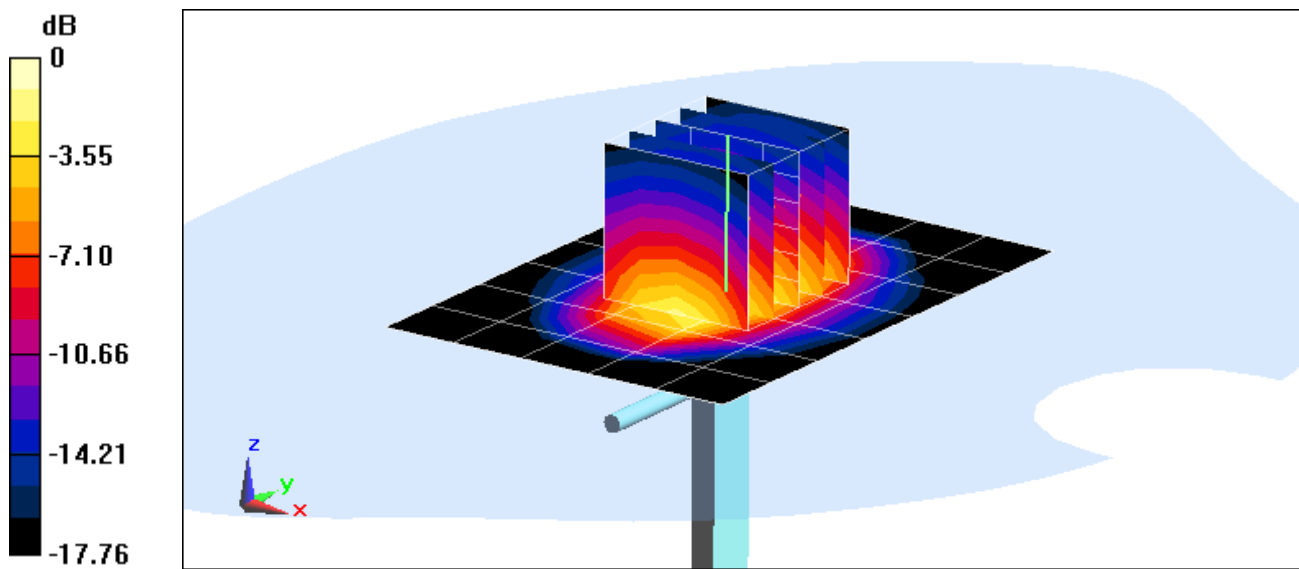
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 6.61 W/kg

SAR(1 g) = 3.61 W/kg

Deviation: -0.28%



0 dB = 4.56 W/kg = 6.59 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.399 \text{ S/m}$; $\epsilon_r = 40.138$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-02-2014; Ambient Temp: 21.5°C; Tissue Temp: 22.9°C

Probe: ES3DV3 - SN3213; ConvF(4.99, 4.99, 4.99); Calibrated: 4/11/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1364; Calibrated: 3/17/2014

Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

1900MHz System Verification

Area Scan (5x7x1): Measurement grid: dx=15mm, dy=15mm

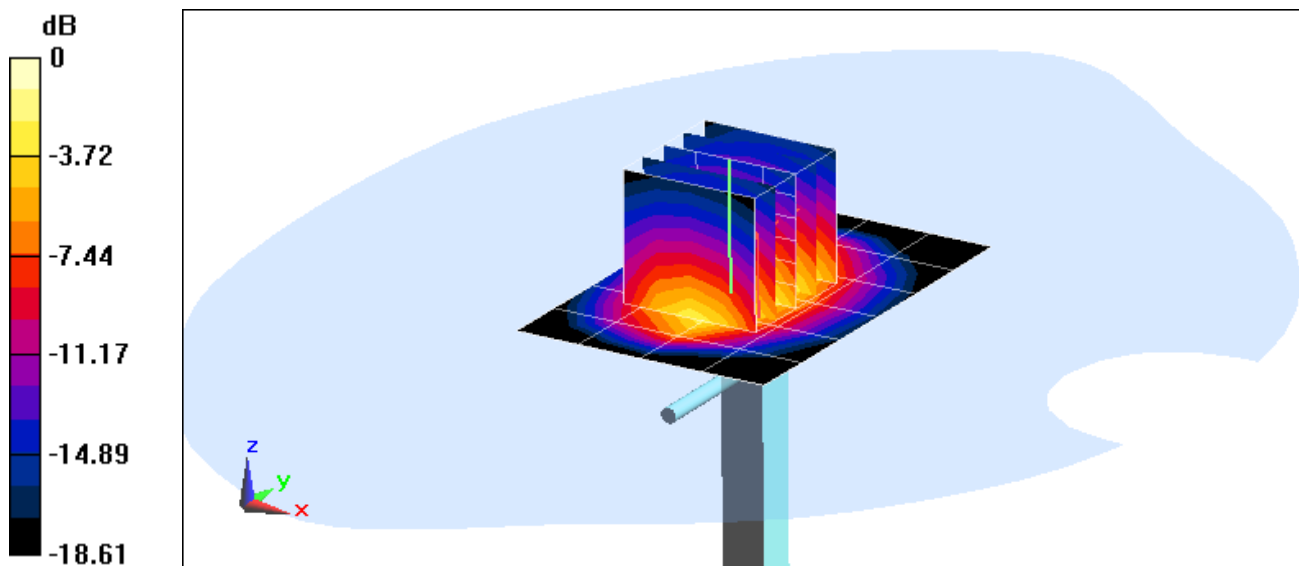
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 7.51 W/kg

SAR(1 g) = 4.07 W/kg

Deviation: 0.00%



0 dB = 5.12 W/kg = 7.09 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Head Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.861 \text{ S/m}$; $\epsilon_r = 38.157$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-28-2014; Ambient Temp: 24.1°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3258; ConvF(4.52, 4.52, 4.52); Calibrated: 2/25/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/26/2014

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

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

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

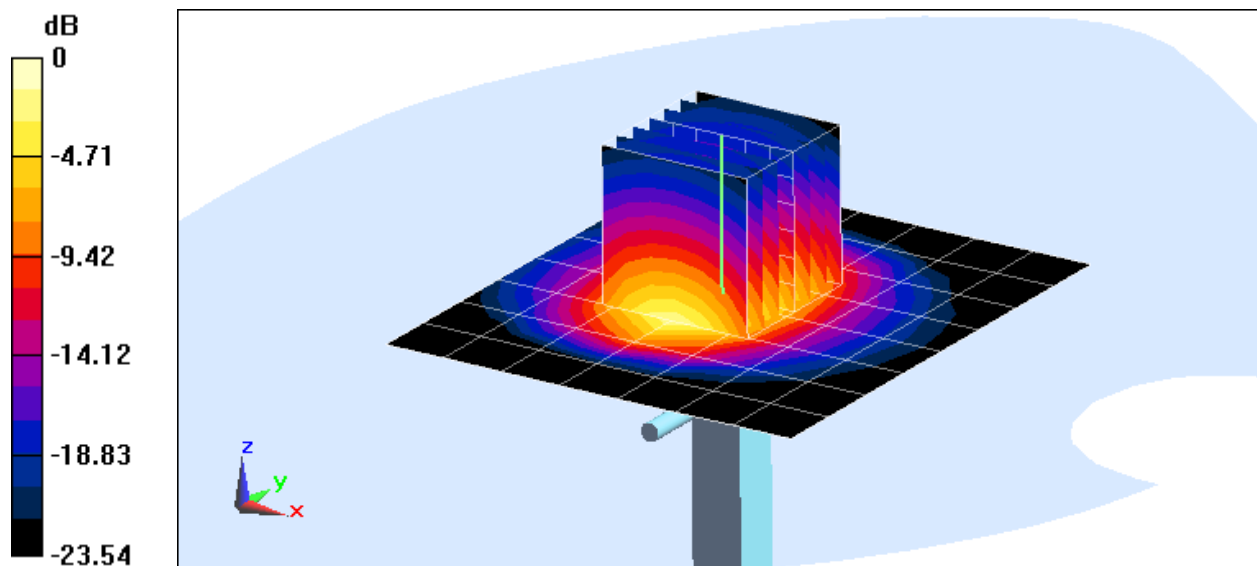
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 10.3 W/kg

SAR(1 g) = 4.82 W/kg

Deviation = -6.95%



0 dB = 6.36 W/kg = 8.03 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Head Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 4.724 \text{ S/m}$; $\epsilon_r = 35.49$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.8°C

Probe: EX3DV4 - SN3914; ConvF(4.99, 4.99, 4.99); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

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

5200 MHz System Verification

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

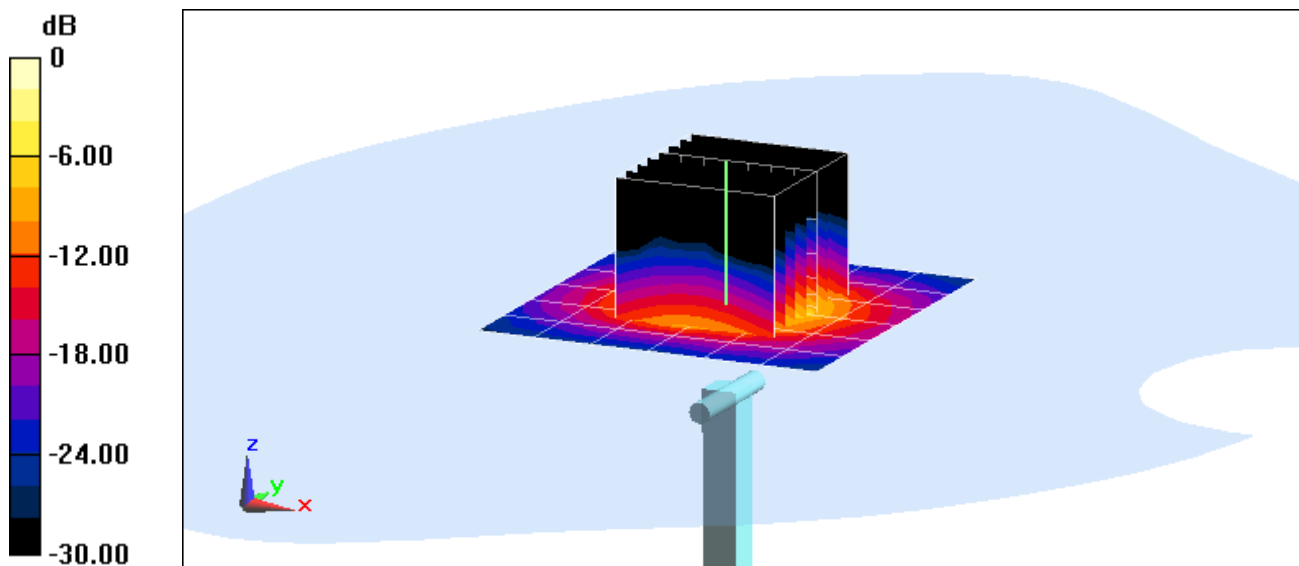
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 31.6 W/kg

SAR(1 g) = 7.57 W/kg

Deviation: -2.95%



0 dB = 17.6 W/kg = 12.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Head Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 4.826 \text{ S/m}$; $\epsilon_r = 35.388$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.9°C

Probe: EX3DV4 - SN3914; ConvF(4.82, 4.82, 4.82); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

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

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

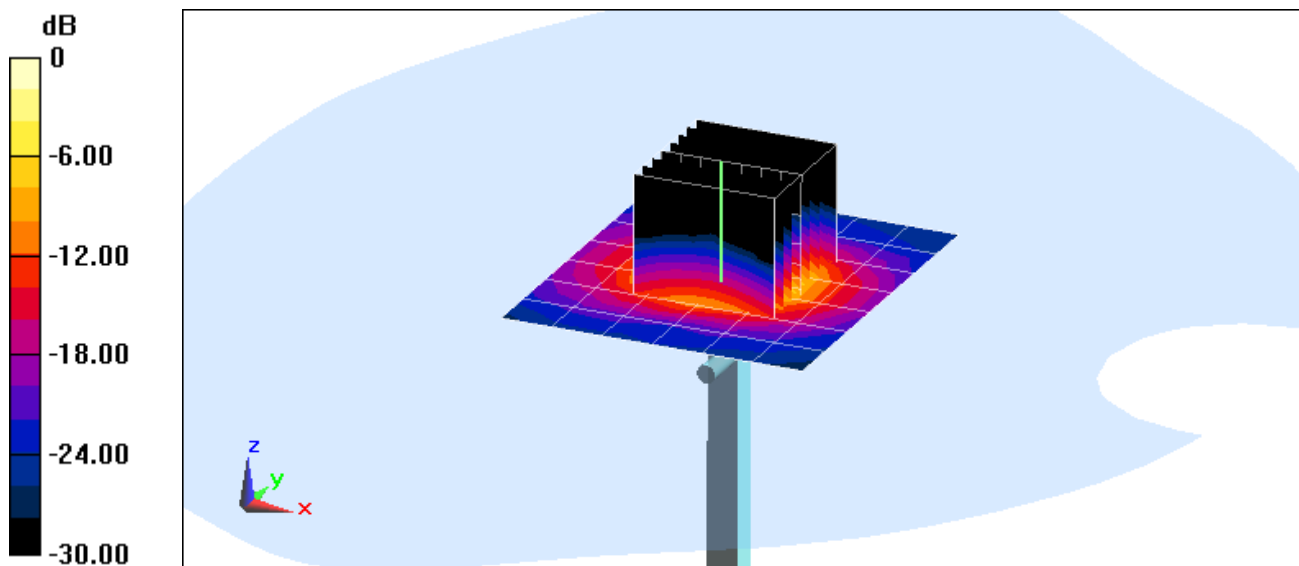
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 35.5 W/kg

SAR(1 g) = 8.18 W/kg

Deviation: -1.45%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Head Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.059 \text{ S/m}$; $\epsilon_r = 35.124$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2014; Ambient Temp: 24.3°C; Tissue Temp: 22.9°C

Probe: EX3DV4 - SN3914; ConvF(4.55, 4.55, 4.55); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

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

5500 MHz System Verification

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

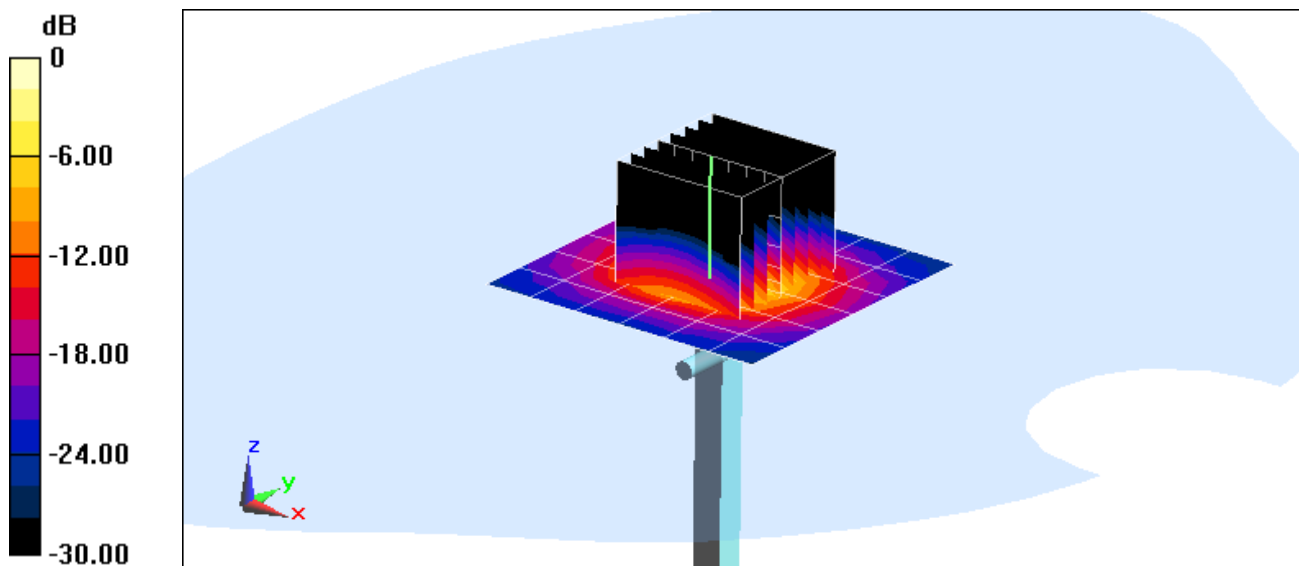
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 34.8 W/kg

SAR(1 g) = 7.92 W/kg

Deviation: -6.05%



0 dB = 18.9 W/kg = 12.76 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0 - n/a, CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.129 \text{ S/m}$; $\epsilon_r = 34.965$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.9°C

Probe: EX3DV4 - SN3914; ConvF(4.37, 4.37, 4.37); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

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

5600 MHz System Verification

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

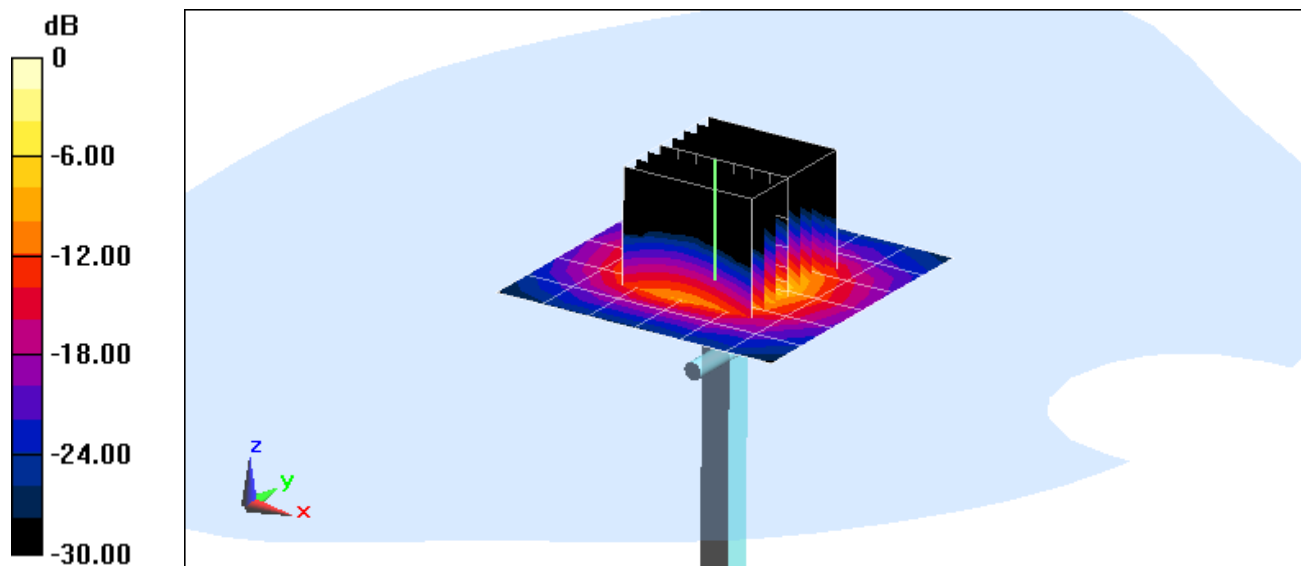
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 38.1 W/kg

SAR(1 g) = 8.5 W/kg

Deviation: 1.80%



0 dB = 20.6 W/kg = 13.14 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Head Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 5.343 \text{ S/m}$; $\epsilon_r = 34.693$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2014; Ambient Temp: 24.2°C; Tissue Temp: 22.9°C

Probe: EX3DV4 - SN3914; ConvF(4.52, 4.52, 4.52); Calibrated: 10/23/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 11/19/2013

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

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

5800 MHz System Verification

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

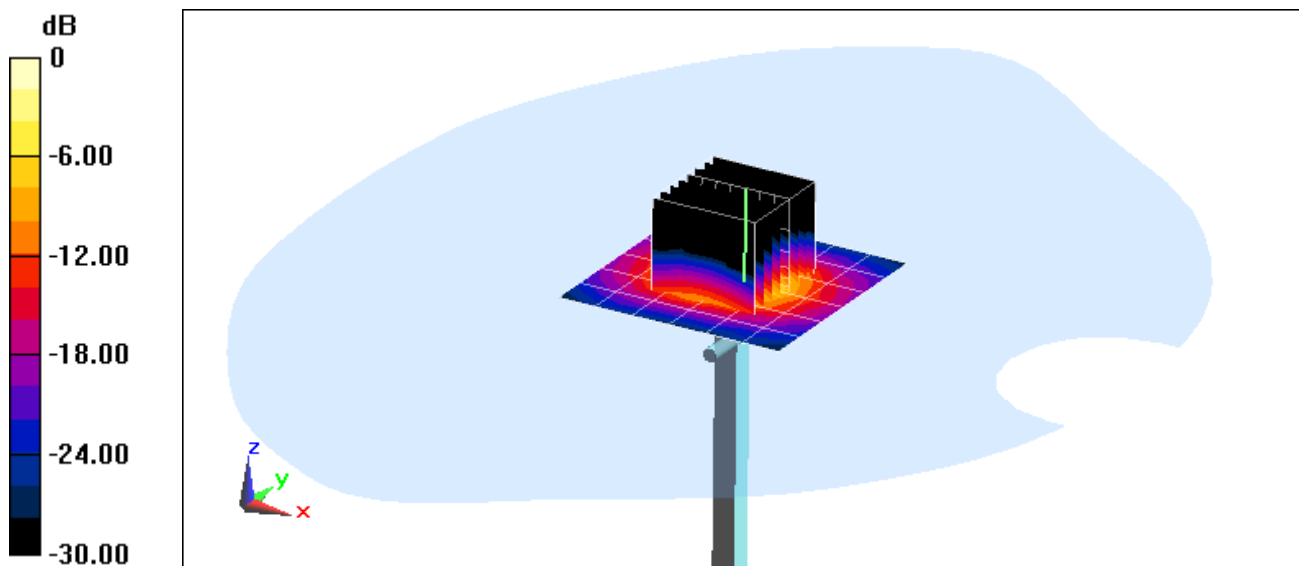
Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 36.2 W/kg

SAR(1 g) = 7.7 W/kg

Deviation: -2.90%



0 dB = 19.0 W/kg = 12.79 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1046

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.974 \text{ S/m}$; $\epsilon_r = 55.226$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-30-2014; Ambient Temp: 23.7°C; Tissue Temp: 23.5°C

Probe: ES3DV3 - SN3288; ConvF(6.25, 6.25, 6.25); Calibrated: 9/23/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2013

Phantom: SAM Sub Dasy B; Type: SAM 5.0; Serial: TP-1626

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

750MHz System Verification

Area Scan (7x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

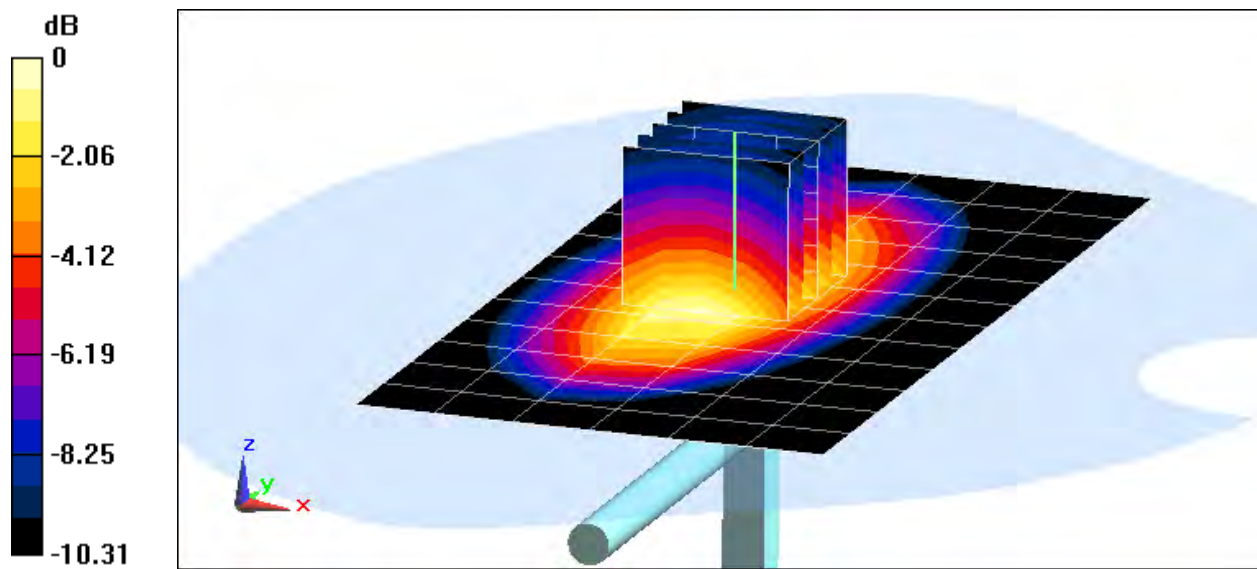
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 1.21 W/kg

SAR(1 g) = 0.829 W/kg

Deviation = -2.93%



0 dB = 0.959 W/kg = -0.18 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 1 \text{ S/m}$; $\epsilon_r = 54.176$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-28-2014; Ambient Temp: 24.4°C; Tissue Temp: 23.0°C

Probe: ES3DV2 - SN3022; ConvF(5.91, 5.91, 5.91); Calibrated: 8/22/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/21/2013

Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646

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

835 MHz System Verification

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

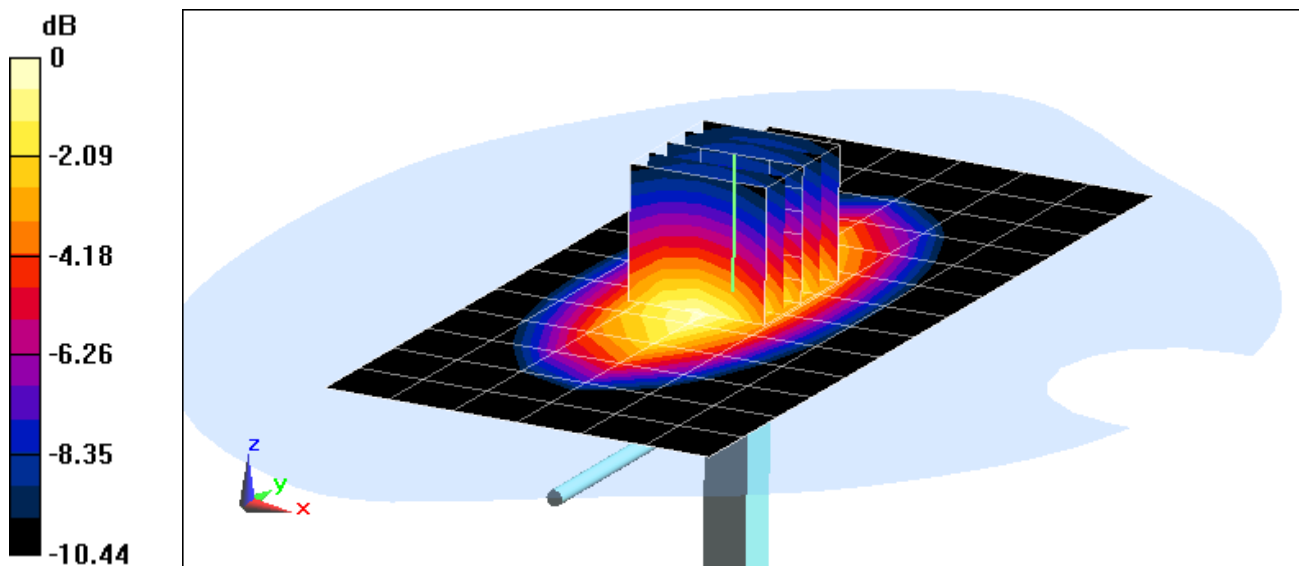
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.45 W/kg

SAR(1 g) = 1 W/kg

Deviation: 7.07%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 1.003 \text{ S/m}$; $\epsilon_r = 53.84$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-30-2014; Ambient Temp: 23.6°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3332; ConvF(6.08, 6.08, 6.08); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

835 MHz System Verification

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

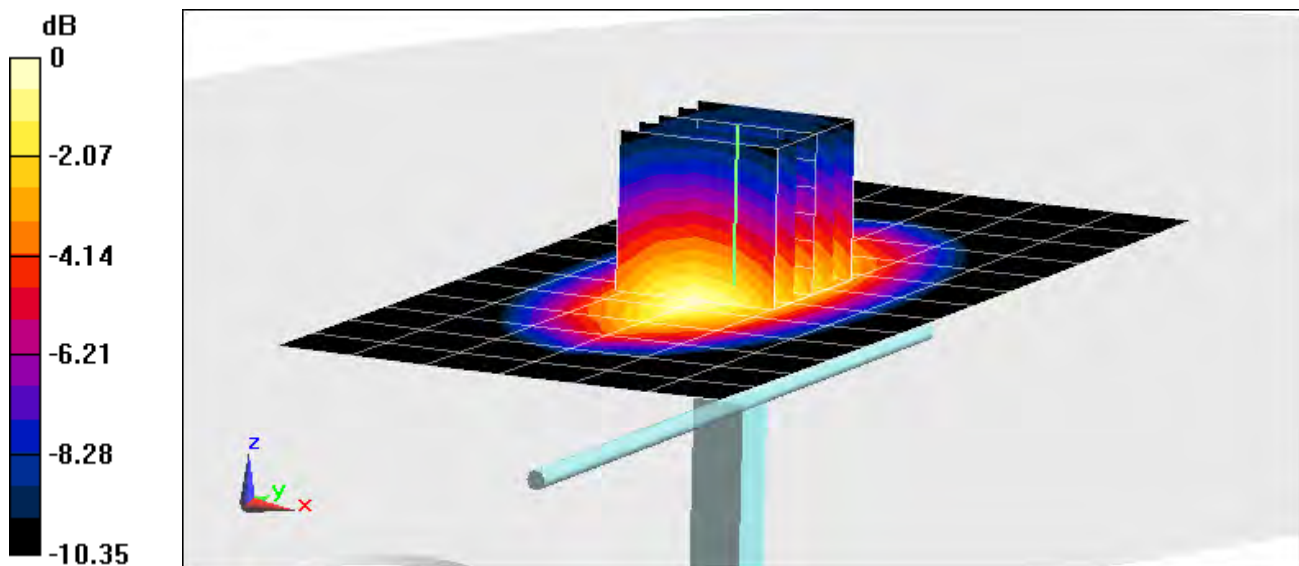
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 1.01 W/kg

Deviation: 8.14%



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

PCTEST ENGINEERING LABORATORY, INC.

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:

$f = 1750 \text{ MHz}$; $\sigma = 1.465 \text{ S/m}$; $\epsilon_r = 52.006$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-26-2014; Ambient Temp: 21.5°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3332; ConvF(4.93, 4.93, 4.93); Calibrated: 11/25/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 11/18/2013

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

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

1750 MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

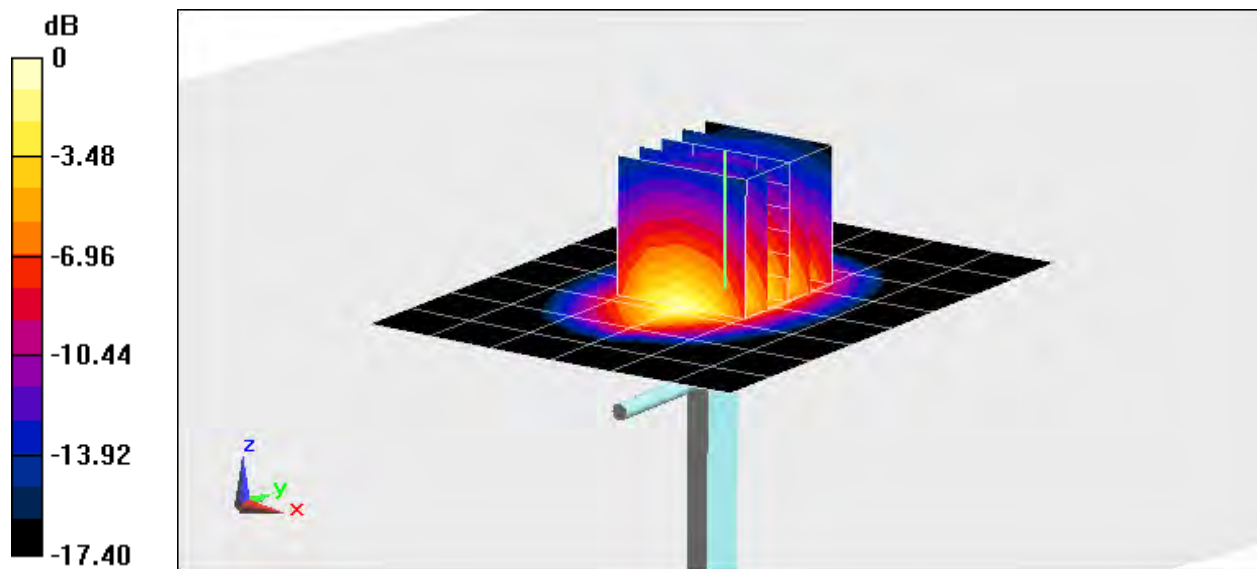
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.03 W/kg

SAR(1 g) = 4.02 W/kg

Deviation = 6.91%



0 dB = 4.90 W/kg = 6.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.564 \text{ S/m}$; $\epsilon_r = 50.919$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-28-2014; Ambient Temp: 23.8°C; Tissue Temp: 23.6°C

Probe: ES3DV3 - SN3288; ConvF(4.82, 4.82, 4.82); Calibrated: 9/23/2013;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 9/17/2013

Phantom: SAM with CRP; Type: SAM; Serial: TP1375

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

1900MHz System Verification

Area Scan (5x7x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

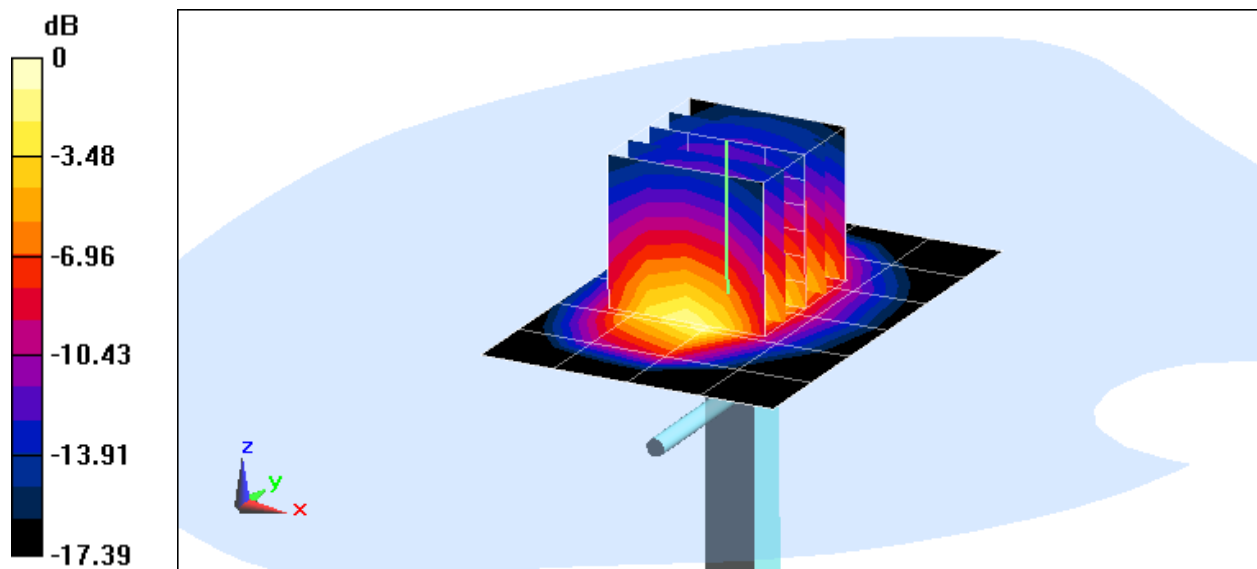
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 7.08 W/kg

SAR(1 g) = 4.05 W/kg

Deviation = 3.05%



0 dB = 5.02 W/kg = 7.01 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.525 \text{ S/m}$; $\epsilon_r = 51.94$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-28-2014; Ambient Temp: 23.5°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3319; ConvF(4.67, 4.67, 4.67); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

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

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

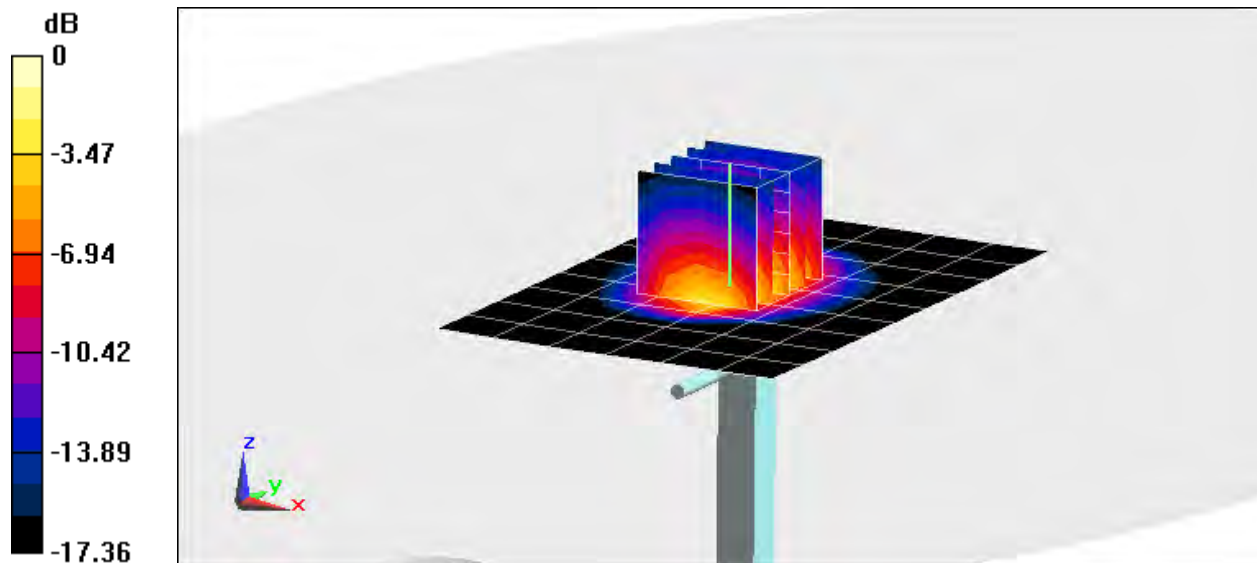
Zoom Scan (5x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 6.80 W/kg

SAR(1 g) = 3.92 W/kg; SAR(10 g) = 2.09 W/kg

Deviation (1g) = -3.45%; Deviation (10 g) = -3.24%



0 dB = 4.84 W/kg = 6.85 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.903 \text{ S/m}$; $\epsilon_r = 50.849$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-07-2014; Ambient Temp: 23.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3319; ConvF(4.24, 4.24, 4.24); Calibrated: 4/17/2014;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 4/11/2014

Phantom: ELI left; Type: QDOVA002AA; Serial: TP:1202

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

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

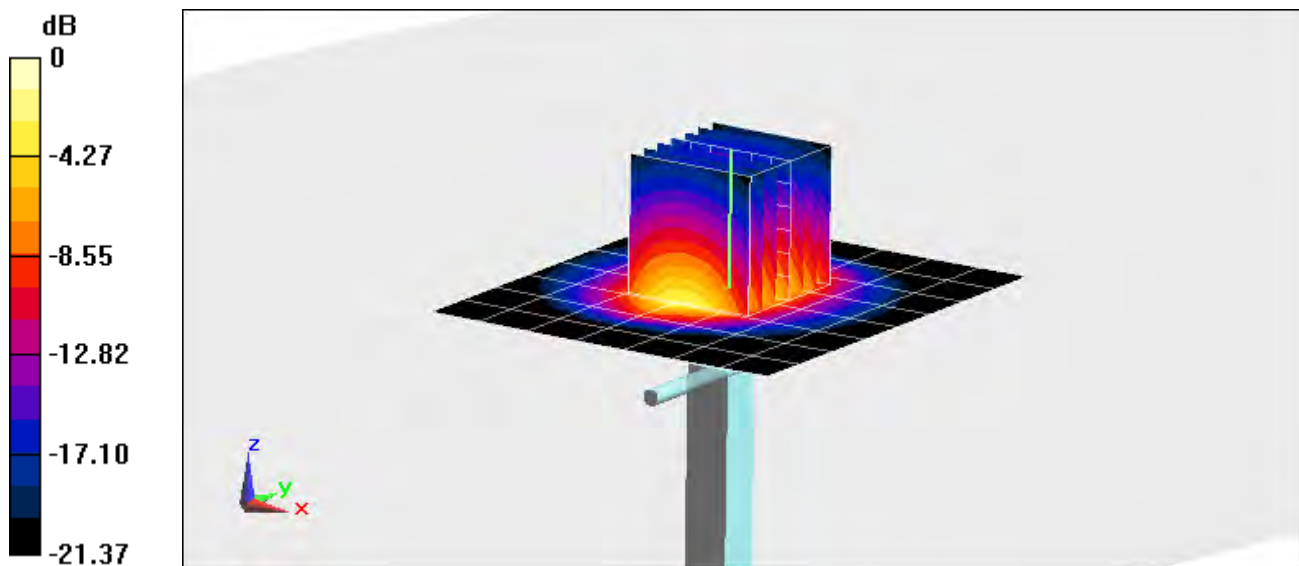
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Input Power = 20.0 dBm (100 mW)

Peak SAR (extrapolated) = 11.0 W/kg

SAR(1 g) = 5.24 W/kg

Deviation: 6.07%



0 dB = 6.87 W/kg = 8.37 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5200 MHz; Type: D5GHzV2; Serial: 1007

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

Medium: 5 GHz Body Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 5.365 \text{ S/m}$; $\epsilon_r = 47.684$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-11-2014; Ambient Temp: 22.4°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3920; ConvF(4.23, 4.23, 4.23); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

5200MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

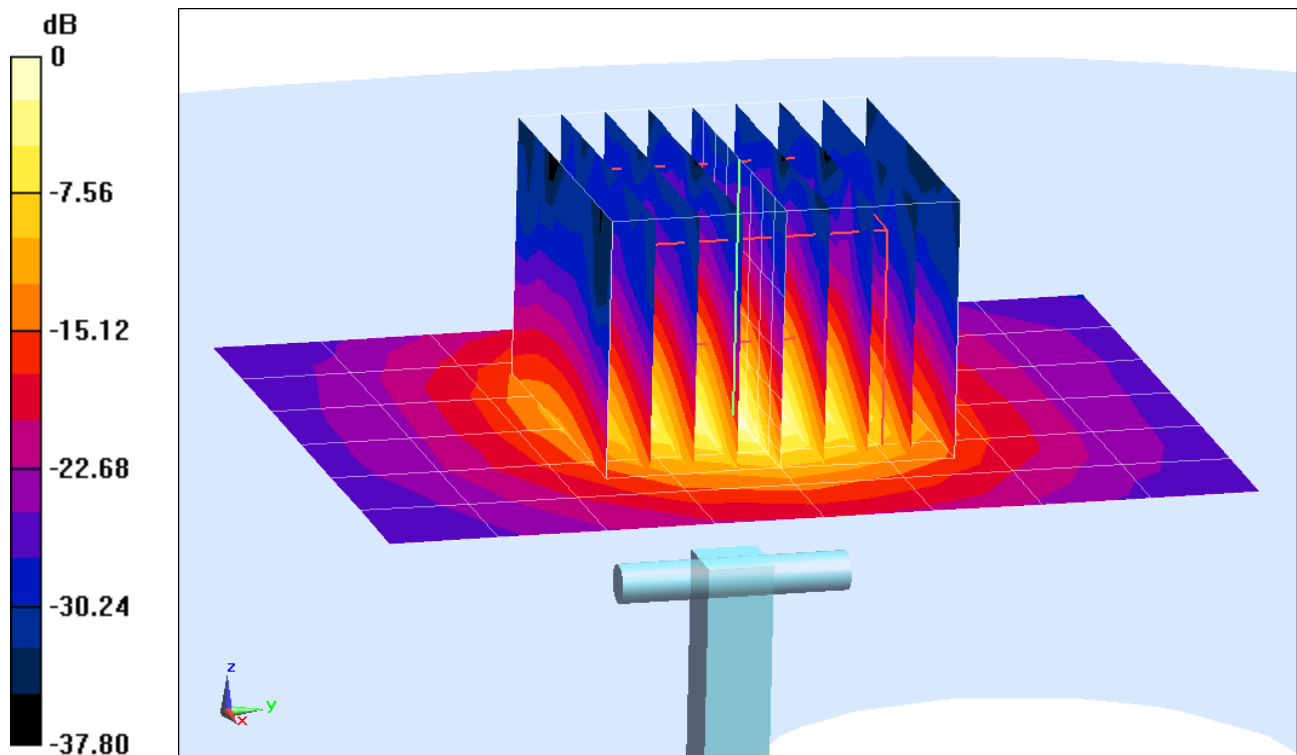
Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 7.51 W/kg

Deviation = 3.44%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5200 \text{ MHz}$; $\sigma = 5.262 \text{ S/m}$; $\epsilon_r = 48.246$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-13-2014; Ambient Temp: 24.4°C; Tissue Temp: 24.0°C

Probe: EX3DV4 - SN3589; ConvF(4.19, 4.19, 4.19); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

5200 MHz System Verification

Area Scan (7x8x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

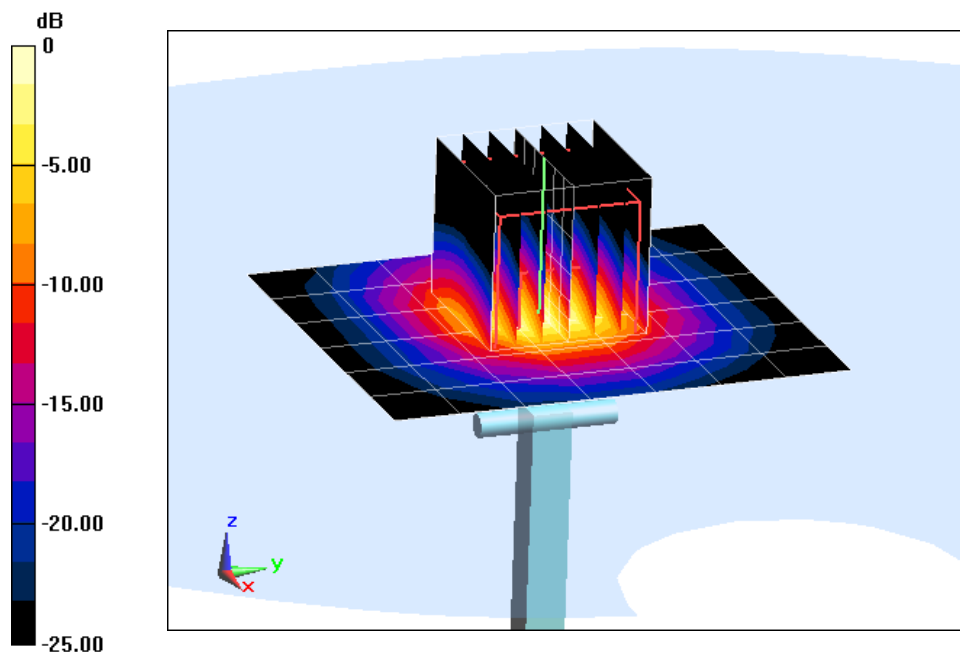
Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 33.8 W/kg

SAR(10 g) = 2.25 W/kg

Deviation (10 g) = 7.14%



0 dB = 20.3 W/kg = 13.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1007

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

Medium: 5 GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.483 \text{ S/m}$; $\epsilon_r = 47.707$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-11-2014; Ambient Temp: 22.4°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3920; ConvF(4.11, 4.11, 4.11); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

5300MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

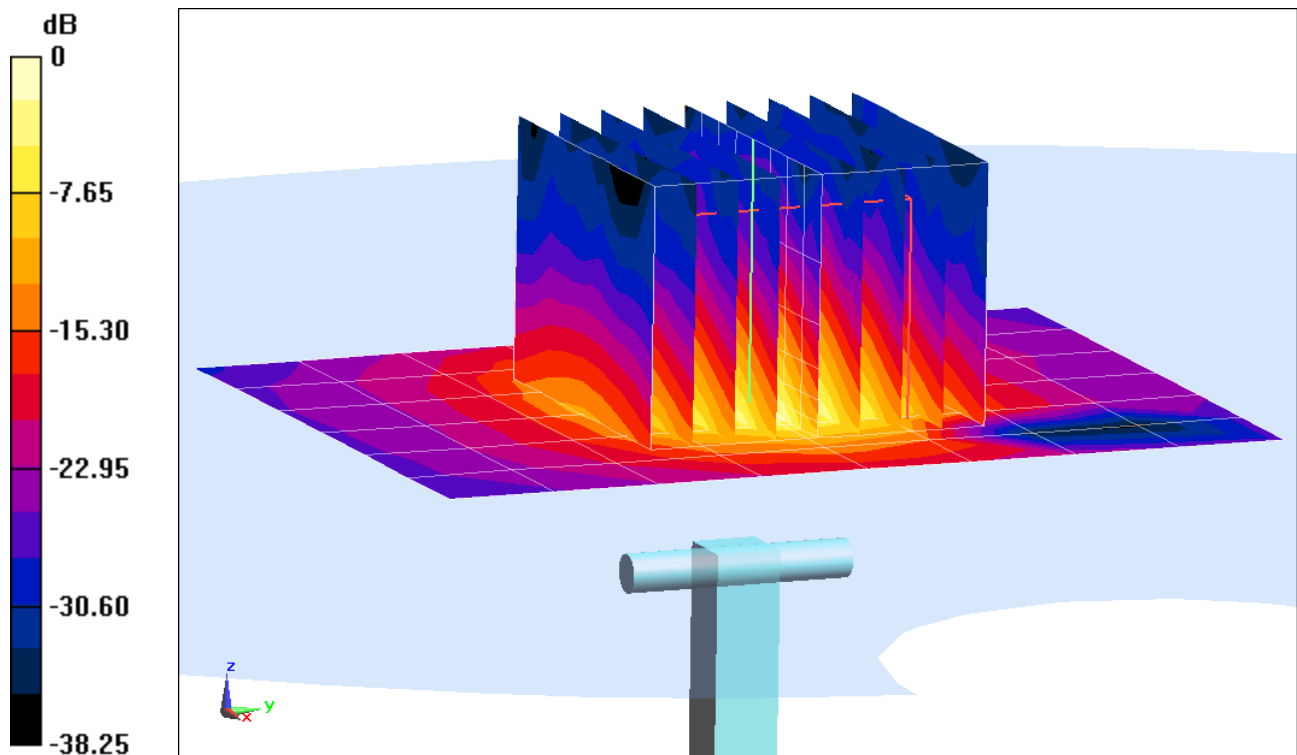
Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 7.72 W/kg

Deviation = 3.35%



0 dB = 18.9 W/kg = 12.76 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.427 \text{ S/m}$; $\epsilon_r = 48.087$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 08-13-2014; Ambient Temp: 24.4°C; Tissue Temp: 24.1°C

Probe: EX3DV4 - SN3589; ConvF(3.98, 3.98, 3.98); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

5300 MHz System Verification

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

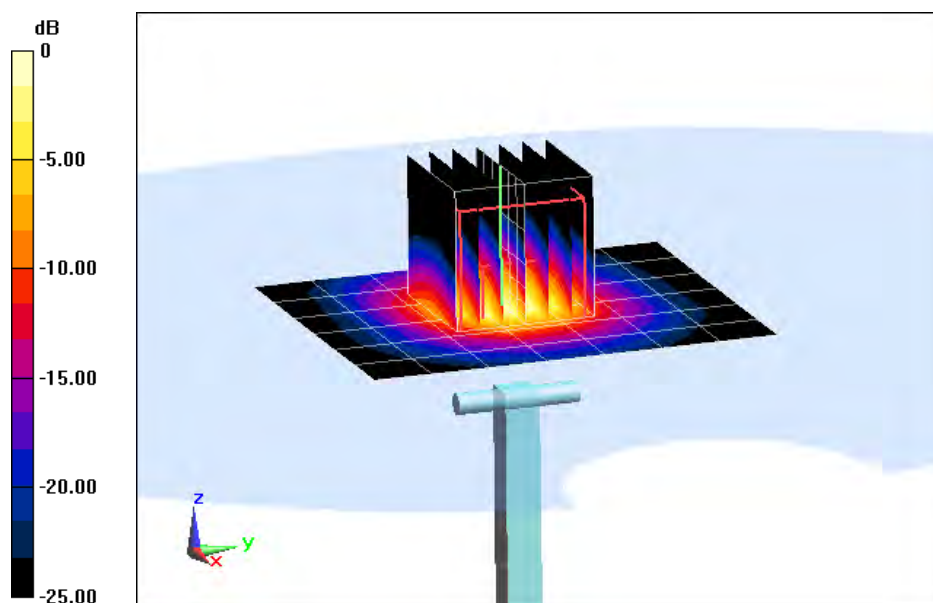
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 36.4 W/kg

SAR(10 g) = 2.33 W/kg

Deviation (10 g) = 8.37%



0 dB = 21.5 W/kg = 13.32 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1007

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

Medium: 5 GHz Body Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.726 \text{ S/m}$; $\epsilon_r = 47.237$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-11-2014; Ambient Temp: 22.4°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3920; ConvF(3.8, 3.8, 3.8); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

5500MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

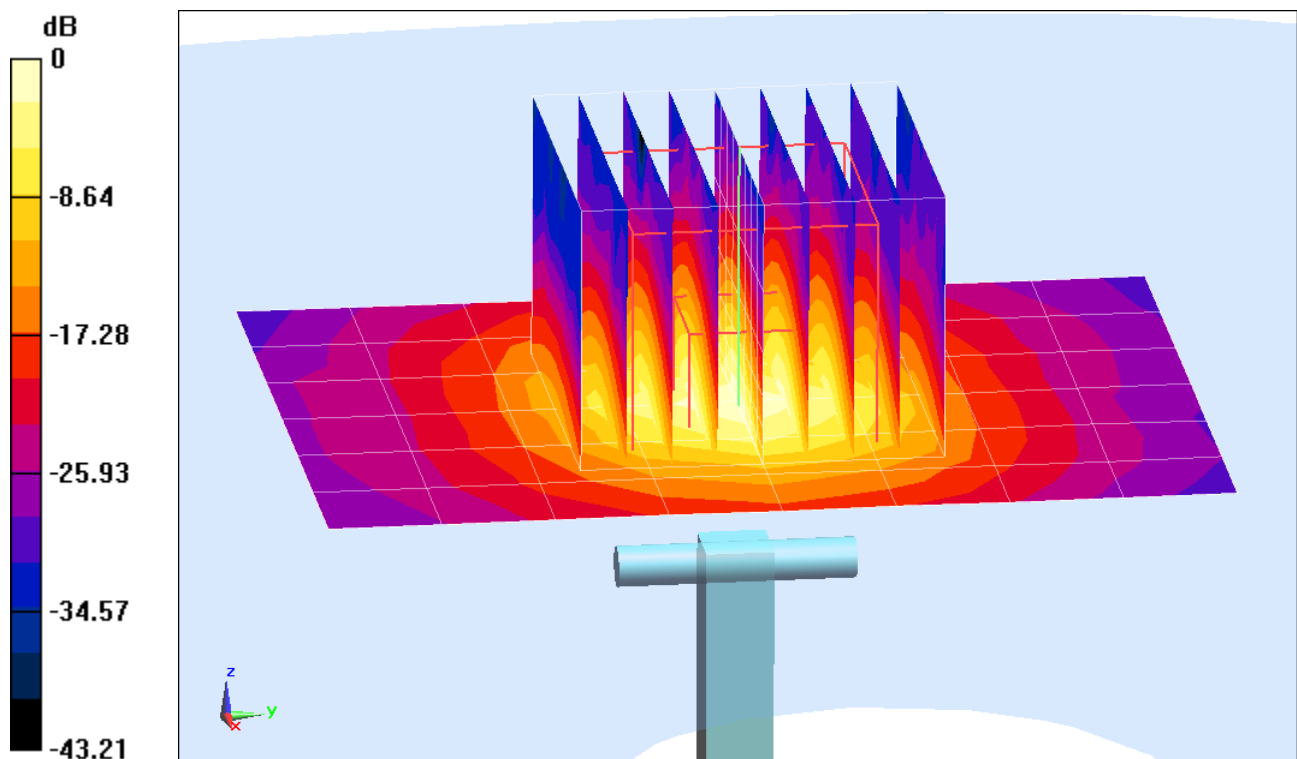
Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 30.7 W/kg

SAR(1 g) = 7.81 W/kg

Deviation = 2.90%



0 dB = 19.8 W/kg = 12.97 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.733 \text{ S/m}$; $\epsilon_r = 47.55$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-13-2014; Ambient Temp: 24.3°C; Tissue Temp: 23.9°C

Probe: EX3DV4 - SN3589; ConvF(3.76, 3.76, 3.76); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

5500 MHz System Verification

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

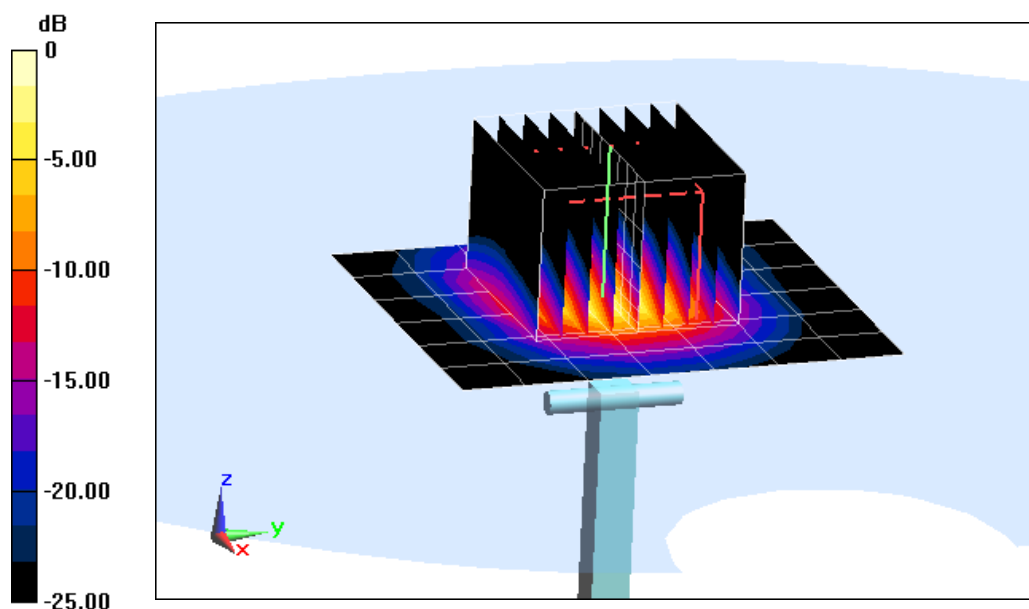
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 37.5 W/kg

SAR(10 g) = 2.3 W/kg

Deviation (10 g) = 4.55%



0 dB = 21.7 W/kg = 13.36 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5600 MHz; Type: D5GHzV2; Serial: 1007

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

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.861 \text{ S/m}$; $\epsilon_r = 46.839$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-11-2014; Ambient Temp: 22.4°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3920; ConvF(3.62, 3.62, 3.62); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

5600MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

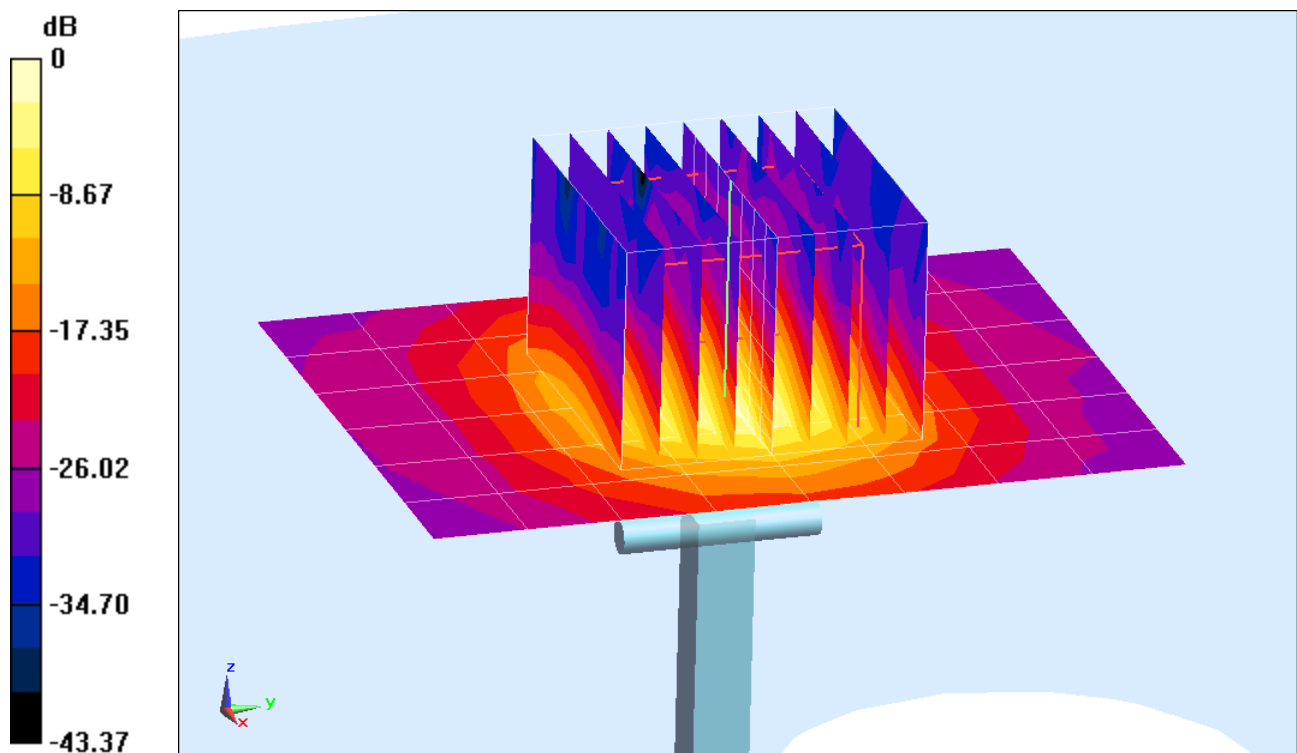
Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 32.1 W/kg

SAR(1 g) = 7.66 W/kg

Deviation = -0.91%



0 dB = 19.6 W/kg = 12.92 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.871 \text{ S/m}$; $\epsilon_r = 47.349$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-13-2014; Ambient Temp: 24.2°C; Tissue Temp: 23.9°C

Probe: EX3DV4 - SN3589; ConvF(3.81, 3.81, 3.81); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

5600 MHz System Verification

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

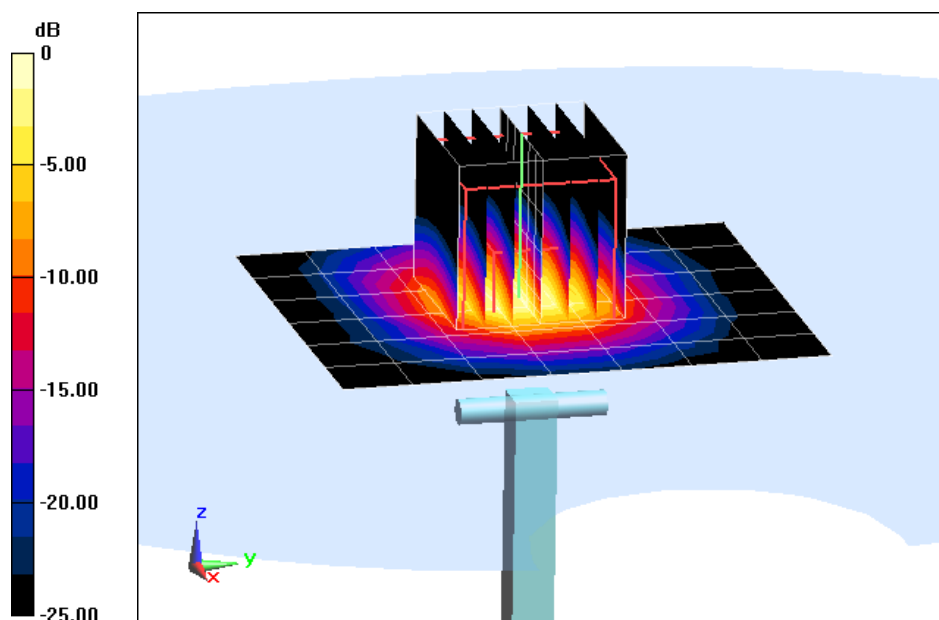
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 40.4 W/kg

SAR(10 g) = 2.24 W/kg

Deviation (10 g) = 0.90%



0 dB = 21.6 W/kg = 13.34 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1007

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

Medium: 5 GHz Body Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 6.062 \text{ S/m}$; $\epsilon_r = 45.948$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-11-2014; Ambient Temp: 22.4°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3920; ConvF(4, 4, 4); Calibrated: 12/18/2013;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn649; Calibrated: 12/12/2013

Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1357

Measurement SW: DASY4, Version 4.7 (80); SEMCAD X Version 14.6.10 (7331)

5800MHz System Verification

Area Scan (7x9x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

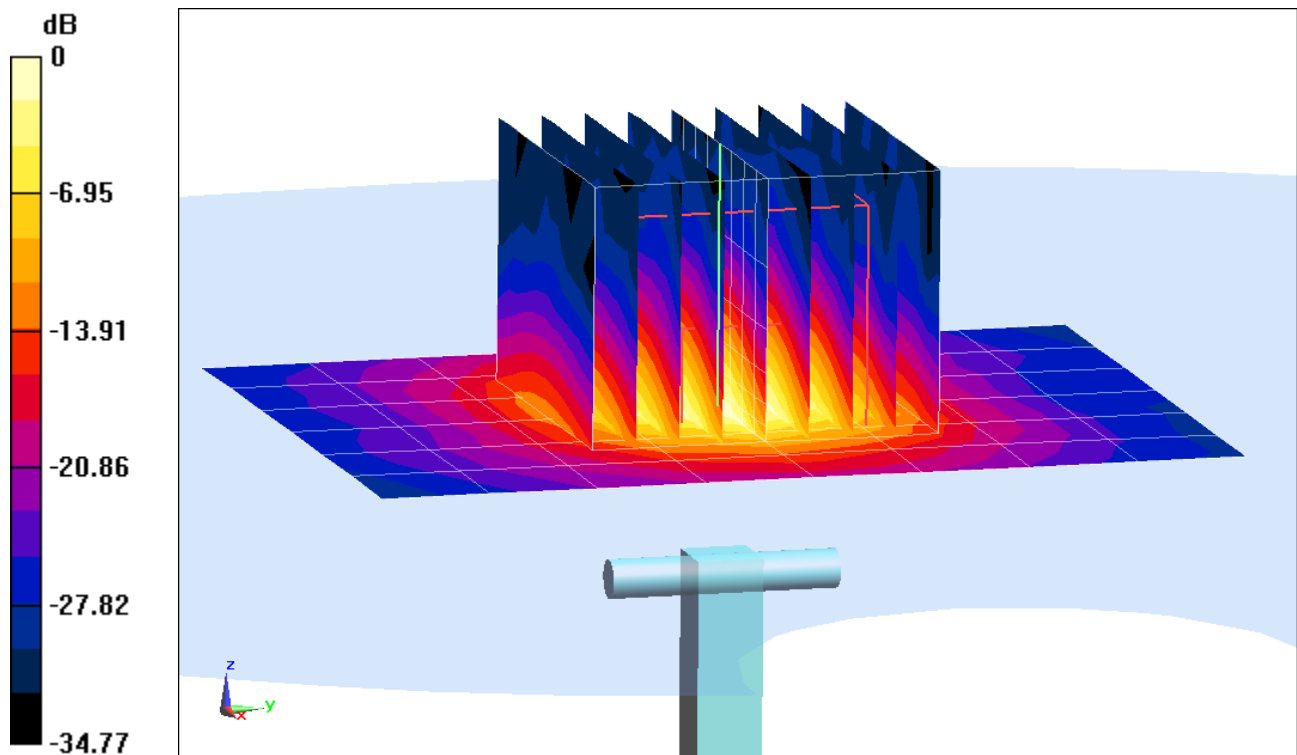
Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 35.4 W/kg

SAR(1 g) = 7.23 W/kg

Deviation = -0.82%



0 dB = 18.7 W/kg = 12.72 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 6.186 \text{ S/m}$; $\epsilon_r = 46.881$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 08-13-2014; Ambient Temp: 24.4°C; Tissue Temp: 24.0°C

Probe: EX3DV4 - SN3589; ConvF(3.97, 3.97, 3.97); Calibrated: 1/29/2014;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 3/17/2014

Phantom: SAM front; Type: QD000P40CD; Serial: TP:1759

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

5800 MHz System Verification

Area Scan (7x8x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

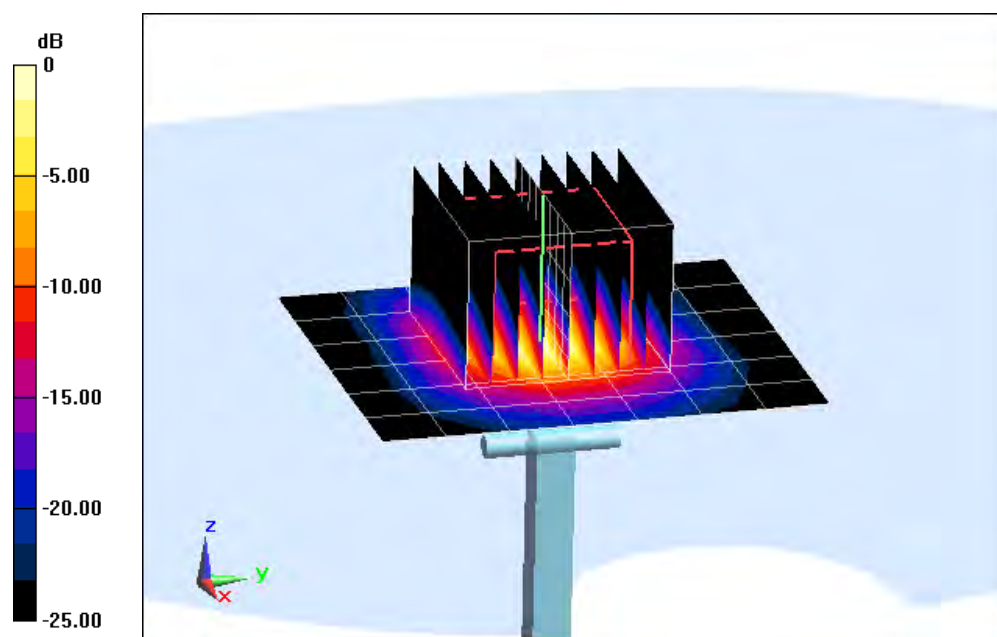
Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Input Power = 20 dBm (100 mW)

Peak SAR (extrapolated) = 35.8 W/kg

SAR(1 g) = 7.35 W/kg

Deviation (1 g) = -1.08%



APPENDIX C: PROBE CALIBRATION



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Client **PC Test**

Certificate No: **D750V3-1046_Feb14**

CALIBRATION CERTIFICATE

Object **D750V3 - SN: 1046**

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

CC✓
3/6/14

Calibration date: **February 27, 2014**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Jeton Kastrati** Function: **Laboratory Technician** Signature:

Approved by: **Katja Pokovic** Technical Manager

Issued: February 27, 2014

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

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:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 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 $\pm$ 0.2) °C	40.7 $\pm$ 6 %	0.90 mho/m $\pm$ 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	8.27 W/kg $\pm$ 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 $\pm$ 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 $\pm$ 0.2) °C	54.2 $\pm$ 6 %	0.98 mho/m $\pm$ 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	2.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.54 W/kg $\pm$ 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	5.63 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$56.4 \Omega + 2.1 j\Omega$
Return Loss	- 24.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$50.8 \Omega - 2.0 j\Omega$
Return Loss	- 33.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.032 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 02, 2011

DASY5 Validation Report for Head TSL

Date: 21.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1046

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750$ MHz; $\sigma = 0.9$ S/m; $\epsilon_r = 40.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.37, 6.37, 6.37); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

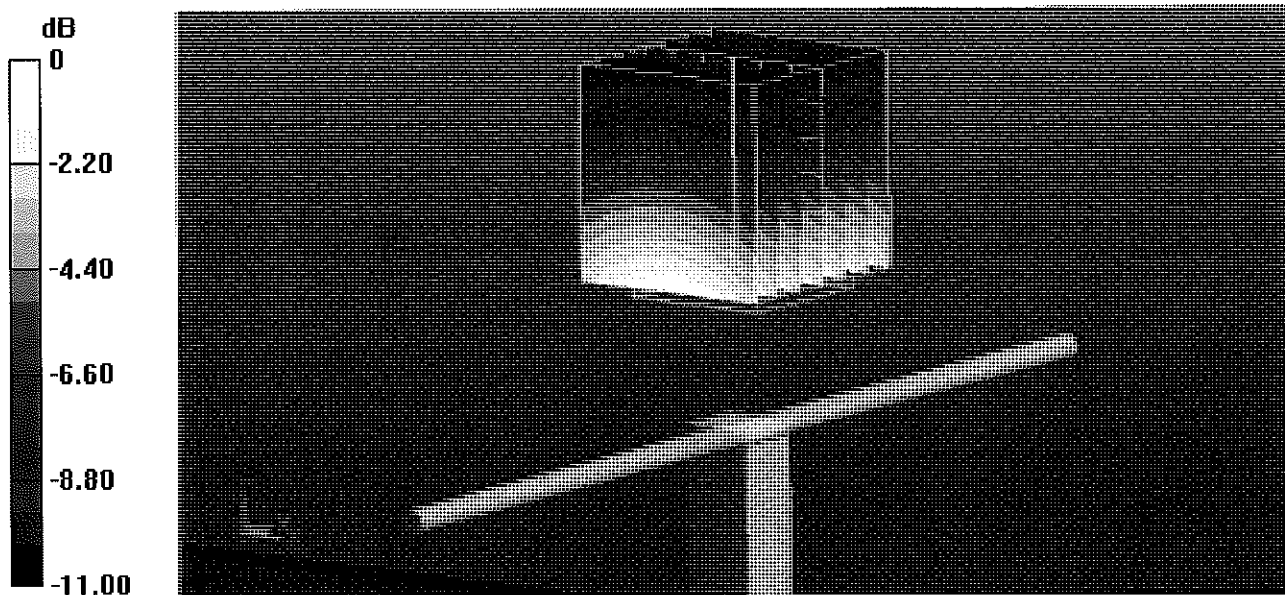
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.936 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.17 W/kg

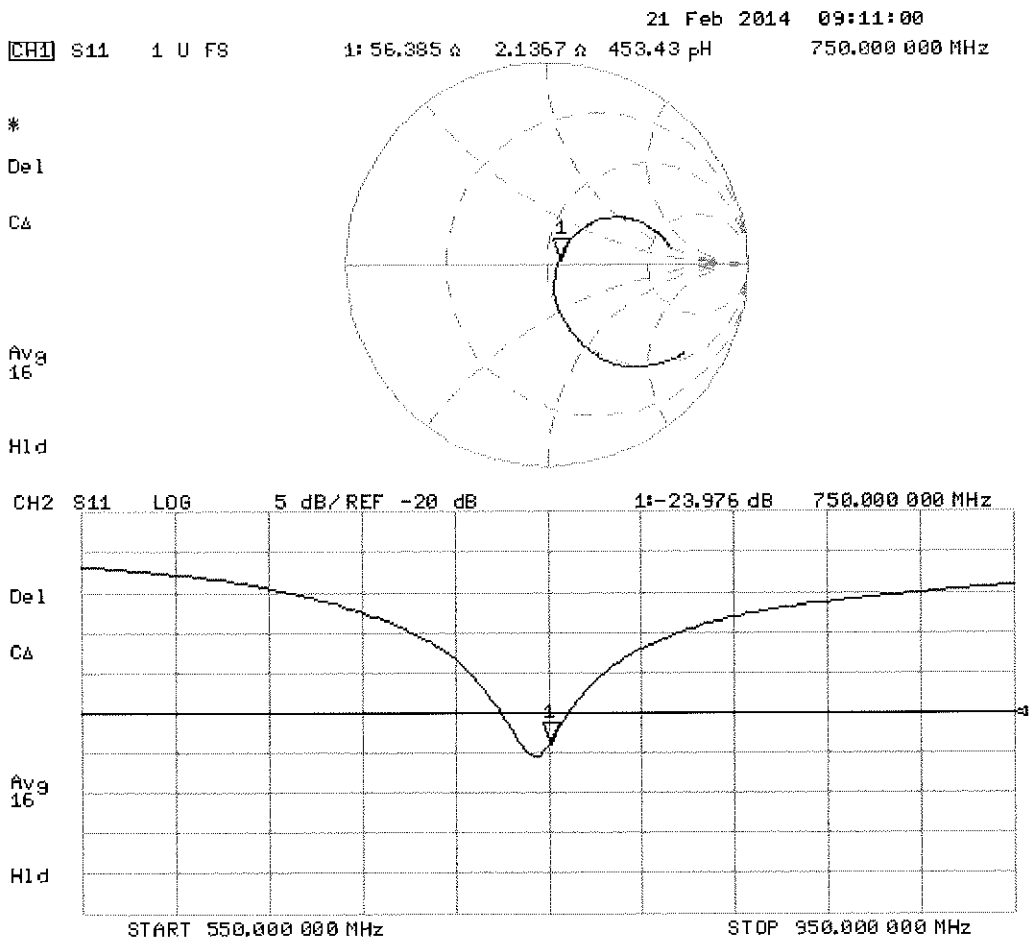
SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.46 W/kg



0 dB = 2.46 W/kg = 3.91 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 27.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN: 1046

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.98 \text{ S/m}$; $\epsilon_r = 54.2$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.13, 6.13, 6.13); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

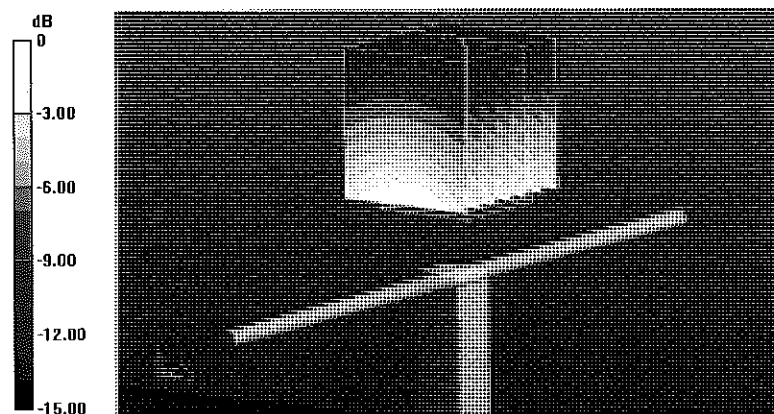
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 52.721 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.20 W/kg

SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.43 W/kg

Maximum value of SAR (measured) = 2.54 W/kg



0 dB = 2.54 W/kg = 4.05 dBW/kg

Impedance Measurement Plot for Body TSL

27 Feb 2014 10:22:29
CH1 S11 1 U FS 1: 50.007 Ω -1.9805 Ω 107.15 pF 750.000 000 MHz

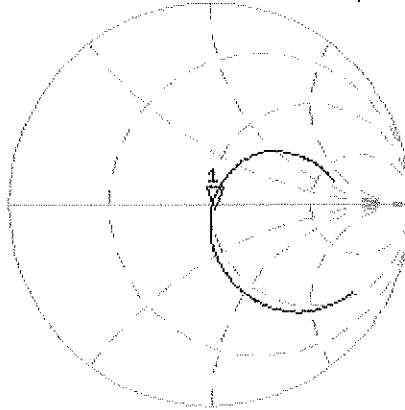
*

De1

Cor

Avg
16

H1d

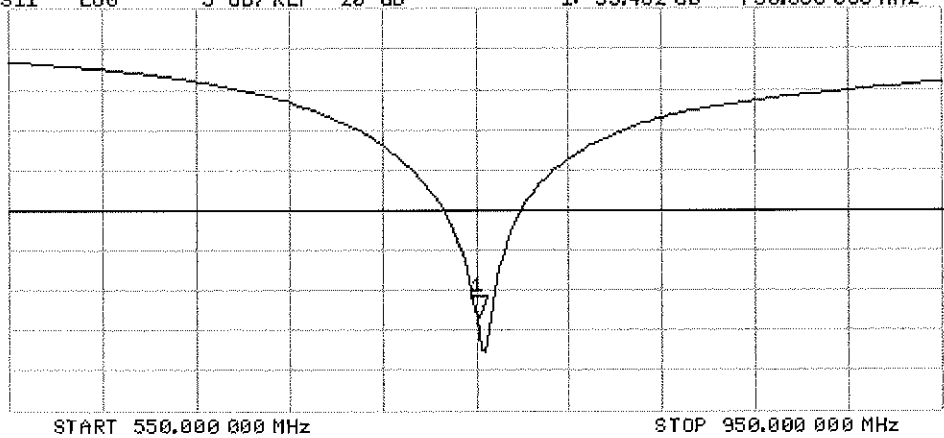


CH2 S11 LOG 5 dB/REF -20 dB 1: -33.462 dB 750.000 000 MHz

Cor

Avg
16

H1d





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D750V3-1003_Jan14**

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 20, 2014**

CC
21/14 ✓

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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Israe El-Naouq** **Laboratory Technician**

Signature

Israe El-Naouq

Approved by: **Katja Pokovic** **Technical Manager**

Katja Pokovic

Issued: January 21, 2014

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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

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:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz $\pm$ 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 $\pm$ 0.2) °C	40.8 $\pm$ 6 %	0.92 mho/m $\pm$ 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	2.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.37 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.46 W/kg $\pm$ 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 $\pm$ 0.2) °C	54.0 $\pm$ 6 %	0.98 mho/m $\pm$ 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	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.77 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.78 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.7 Ω - 0.2 j Ω
Return Loss	- 27.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.5 Ω - 2.6 j Ω
Return Loss	- 31.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

DASY5 Validation Report for Head TSL

Date: 20.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750$ MHz; $\sigma = 0.92$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.37, 6.37, 6.37); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

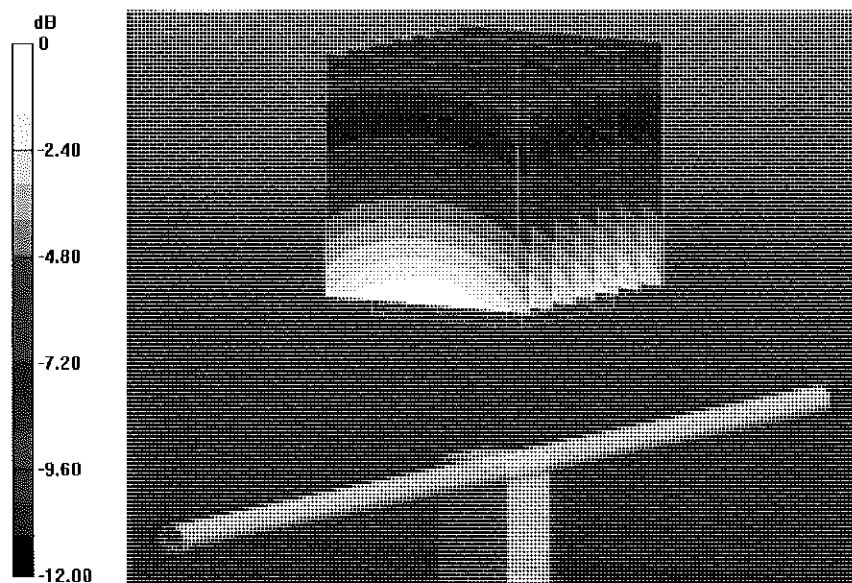
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 53.711 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.27 W/kg

SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.4 W/kg

Maximum value of SAR (measured) = 2.51 W/kg

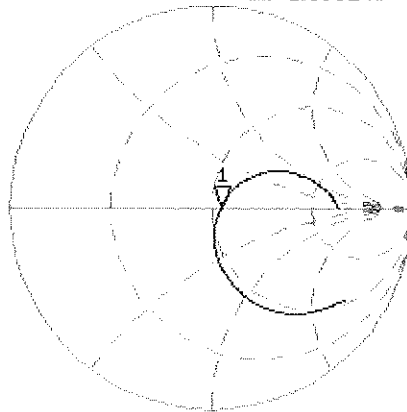


0 dB = 2.51 W/kg = 4.00 dBW/kg

Impedance Measurement Plot for Head TSL

20 Jan 2014 16:36:06
 CH1 S11 1 U FS 1: 54.678 Ω -156.25 m Ω 1.3581 nF 750.000 000 MHz

*
 Del
 CA



Avg
 16

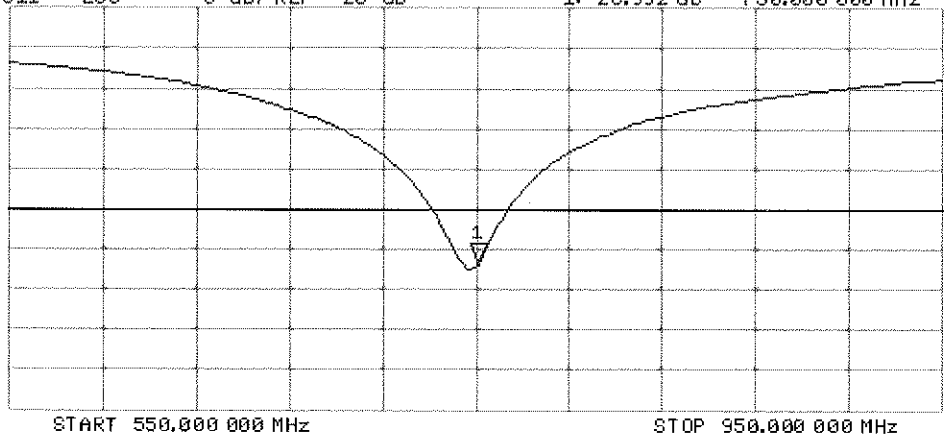
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -26.992 dB 750.000 000 MHz

CA

Avg
 16

H1d



DASY5 Validation Report for Body TSL

Date: 20.01.2014

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: $f = 750 \text{ MHz}$; $\sigma = 0.98 \text{ S/m}$; $\epsilon_r = 54$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.13, 6.13, 6.13); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

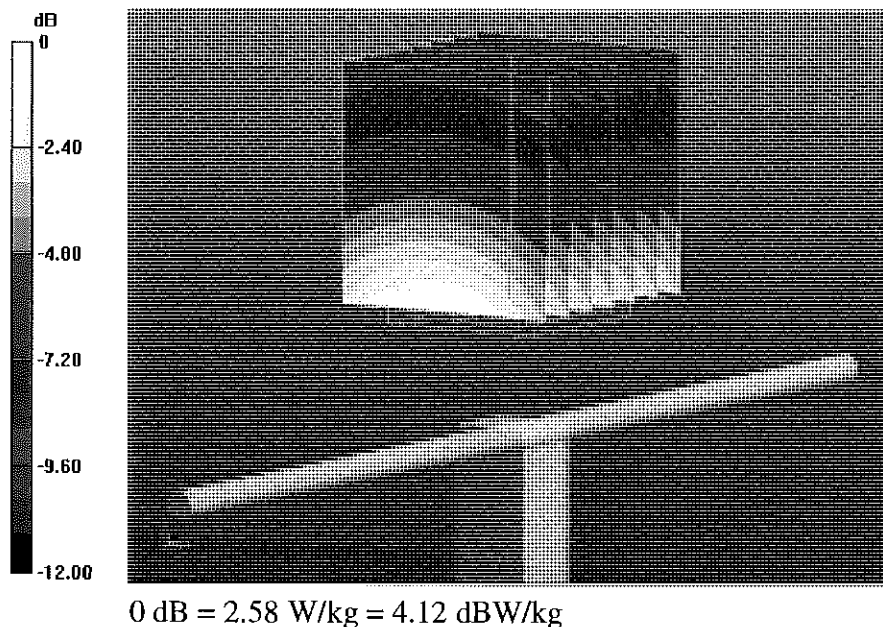
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 53.082 V/m; Power Drift = 0.03 dB

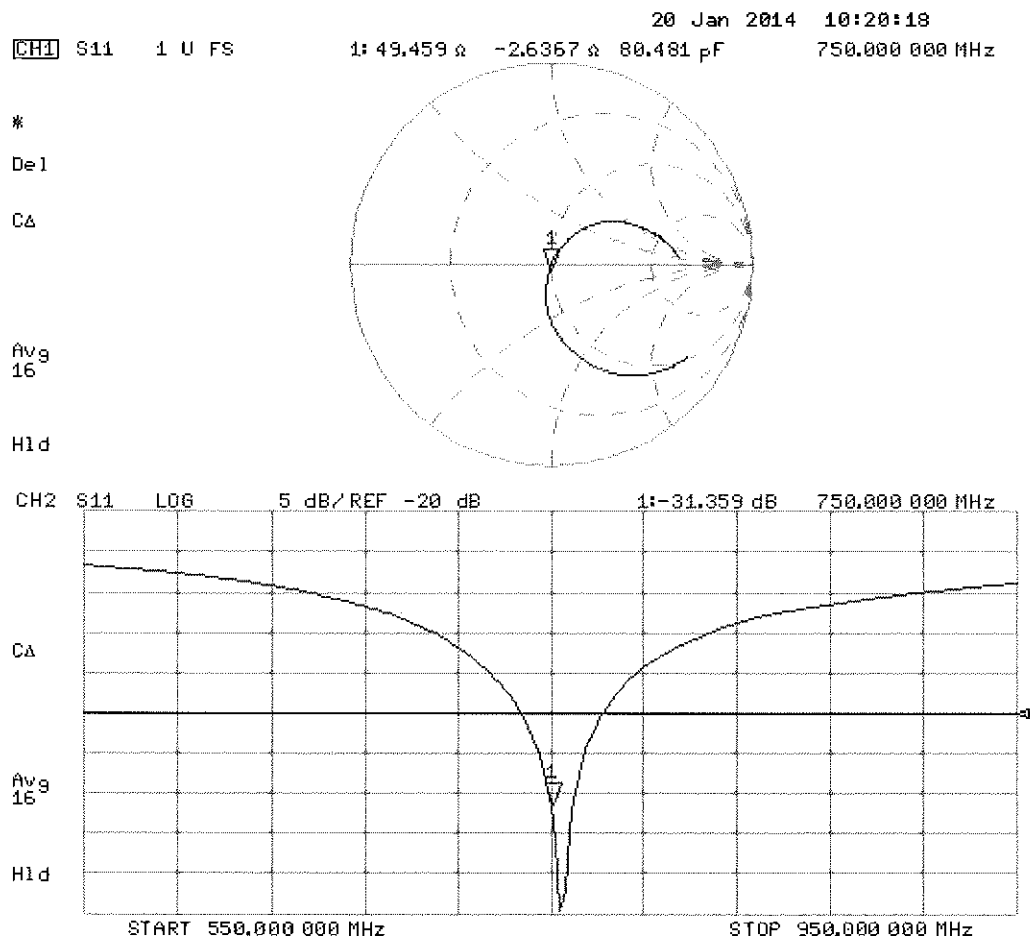
Peak SAR (extrapolated) = 3.31 W/kg

SAR(1 g) = 2.24 W/kg; SAR(10 g) = 1.47 W/kg

Maximum value of SAR (measured) = 2.58 W/kg



Impedance Measurement Plot for Body TSL





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D835V2-4d119_Apr14**

CALIBRATION CERTIFICATE

Object **D835V2 - SN: 4d119**

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

CCV
4/25/14

Calibration date: **April 07, 2014**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Name** **Function** **Signature**
Leif Klysner **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Issued: April 9, 2014

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



Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 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 $\pm$ 0.2) °C	41.6 $\pm$ 6 %	0.94 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.22 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.97 W/kg $\pm$ 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 $\pm$ 0.2) °C	53.6 $\pm$ 6 %	1.02 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.34 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.15 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.2 Ω - 1.6 j Ω
Return Loss	- 34.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.3 Ω - 4.5 j Ω
Return Loss	- 24.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 29, 2010

DASY5 Validation Report for Head TSL

Date: 07.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d119

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.94$ S/m; $\epsilon_r = 41.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.22, 6.22, 6.22); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

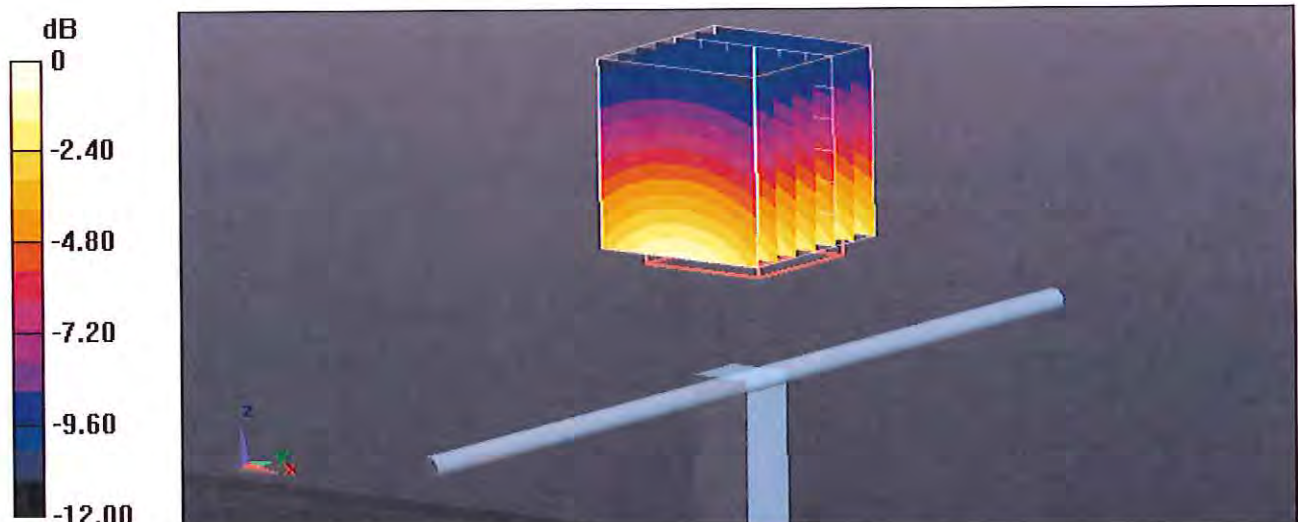
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 56.289 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.59 W/kg

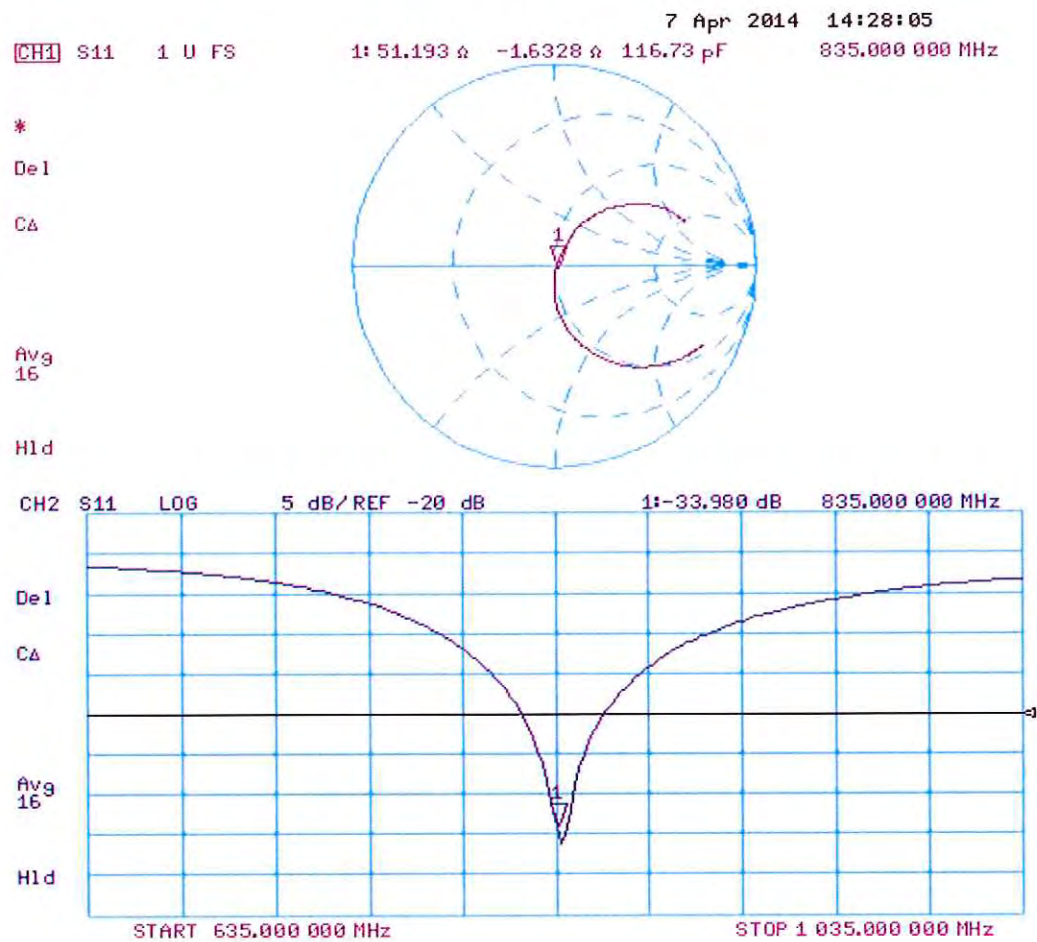
SAR(1 g) = 2.38 W/kg; SAR(10 g) = 1.53 W/kg

Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN: 4d119

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 1.02$ S/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(6.09, 6.09, 6.09); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

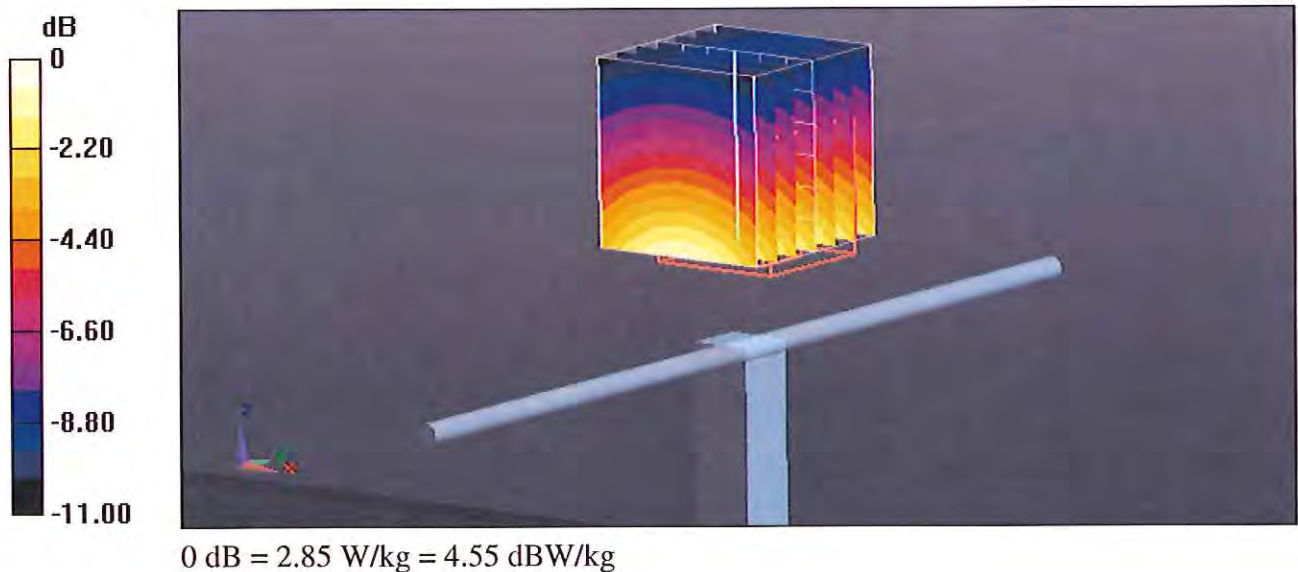
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 54.594 V/m; Power Drift = -0.01 dB

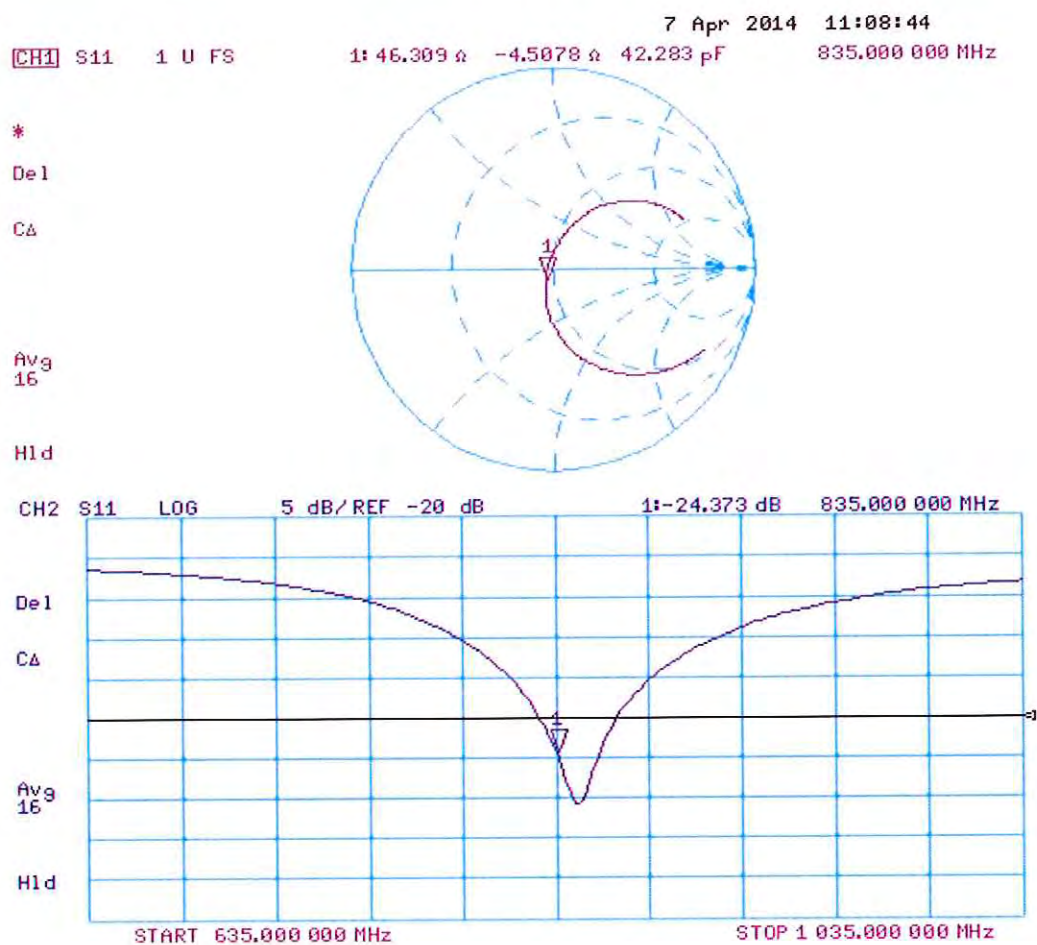
Peak SAR (extrapolated) = 3.61 W/kg

SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.59 W/kg

Maximum value of SAR (measured) = 2.85 W/kg



Impedance Measurement Plot for Body TSL





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1750V2-1051_Apr14**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN: 1051**

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

Calibration date: **April 10, 2014**

✓
KOK
5/7/14

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Israe El-Naouq** Name: **Israe El-Naouq** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager**

Signature

Israe El-Naouq
Katja Pokovic

Issued: April 10, 2014

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz $\pm$ 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 $\pm$ 0.2) °C	39.1 $\pm$ 6 %	1.35 mho/m $\pm$ 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	9.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.2 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.79 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.2 W/kg $\pm$ 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 $\pm$ 0.2) °C	52.0 $\pm$ 6 %	1.48 mho/m $\pm$ 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	9.37 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	37.4 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.1 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.7 Ω + 0.4 j Ω
Return Loss	- 41.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω + 0.8 j Ω
Return Loss	- 29.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.222 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	February 19, 2010

DASY5 Validation Report for Head TSL

Date: 10.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.35$ S/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.23, 5.23, 5.23); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

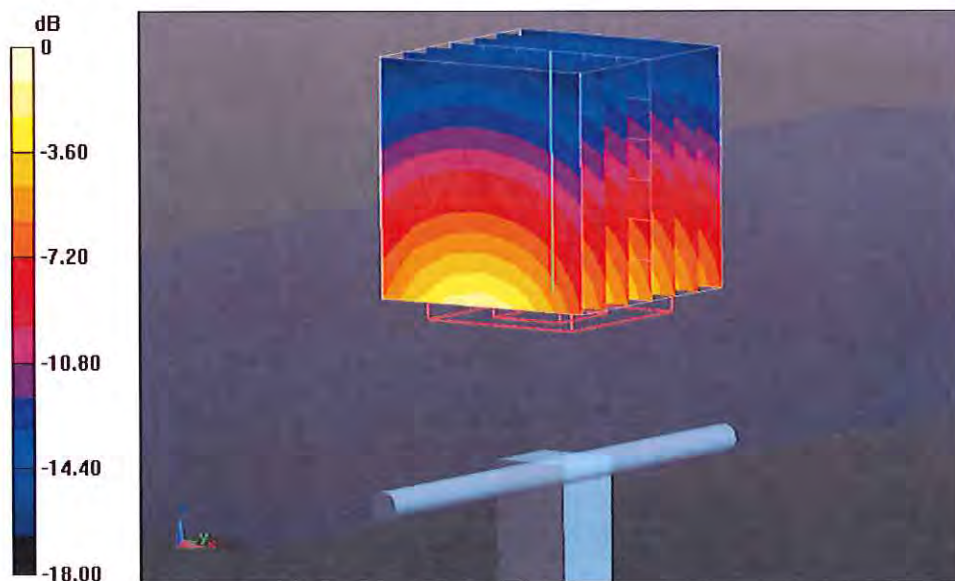
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.631 V/m; Power Drift = 0.00 dB

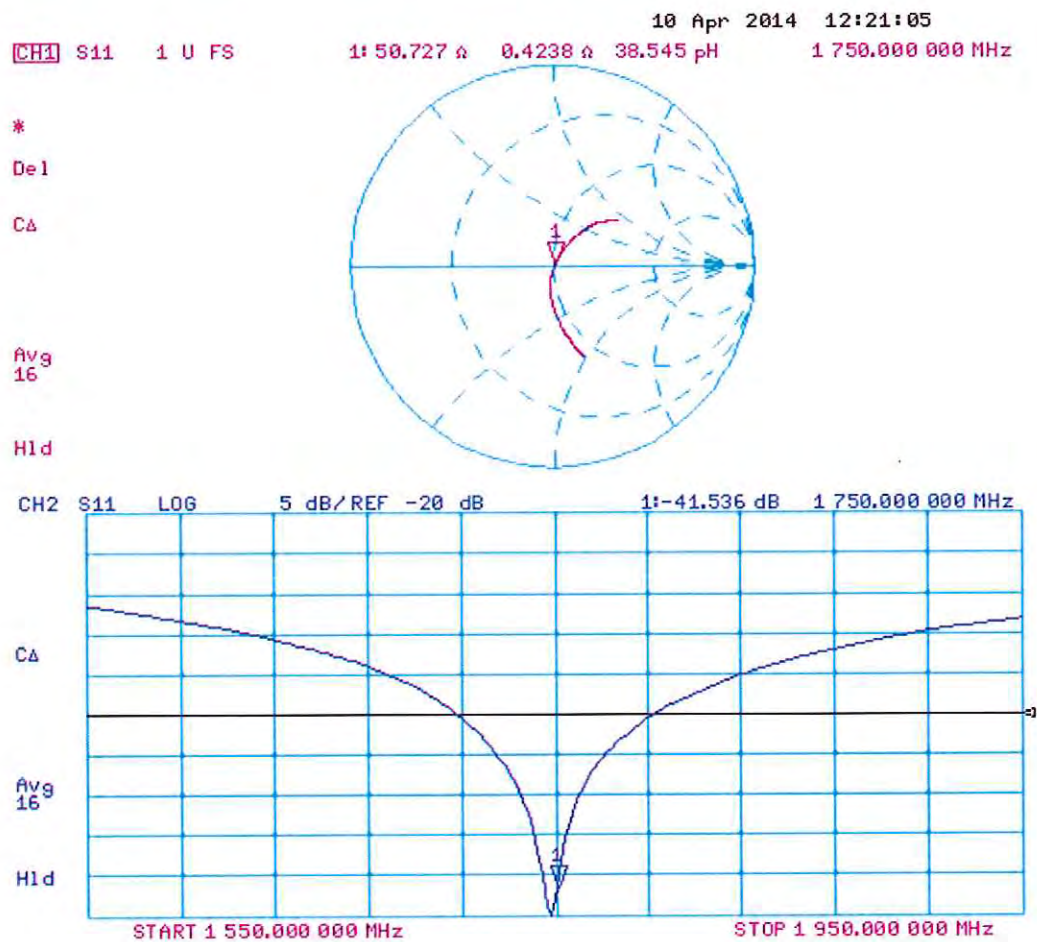
Peak SAR (extrapolated) = 16.2 W/kg

SAR(1 g) = 9.02 W/kg; SAR(10 g) = 4.79 W/kg

Maximum value of SAR (measured) = 11.3 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.48$ S/m; $\epsilon_r = 52$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.89, 4.89, 4.89); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

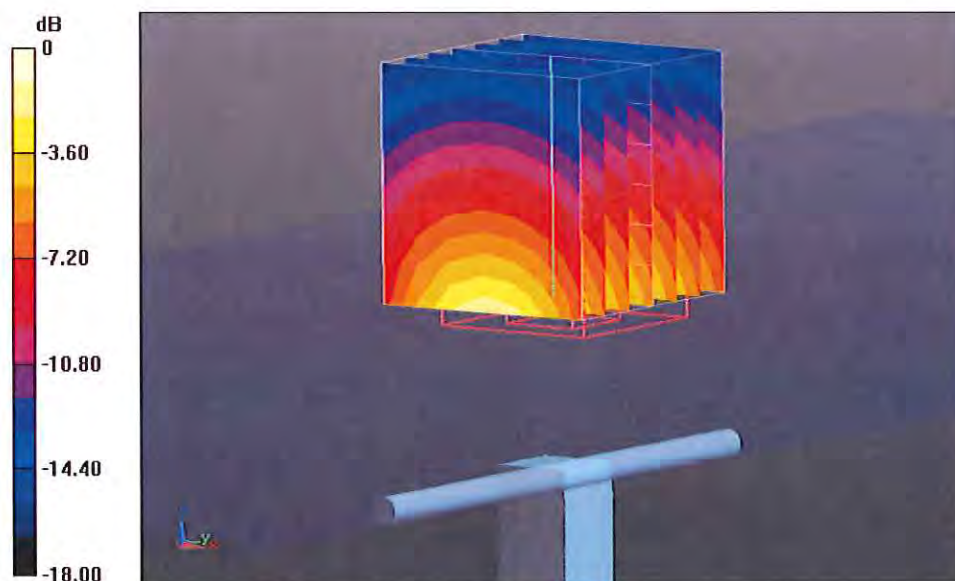
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.321 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 16.1 W/kg

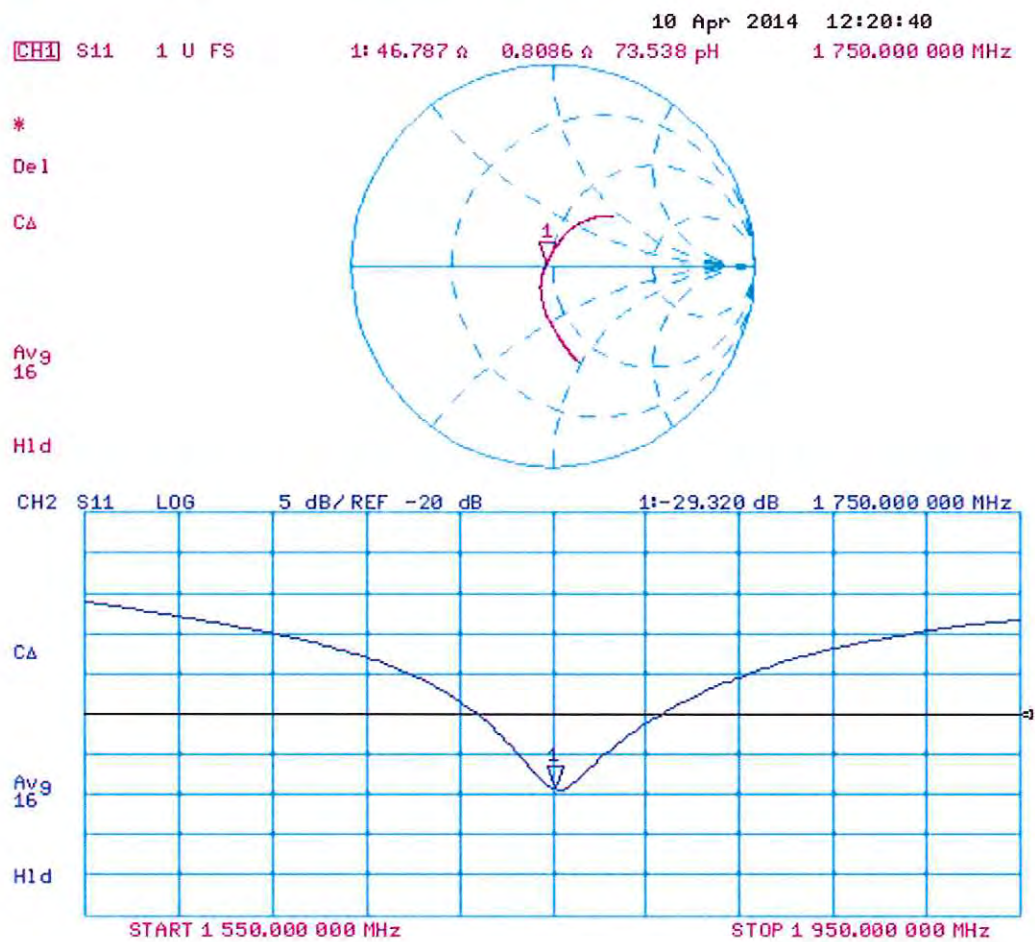
SAR(1 g) = 9.37 W/kg; SAR(10 g) = 5.04 W/kg

Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg

Impedance Measurement Plot for Body TSL





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1765V2-1008_May14**

CALIBRATION CERTIFICATE

Object **D1765V2 - SN: 1008**

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

CCV
6/2/14

Calibration date: **May 07, 2014**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	30-Apr-14 (No. DAE4-601_Apr14)	Apr-15
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: Name **Jeton Kastrati** Function **Laboratory Technician** Signature

Approved by: **Katja Pokovic** Technical Manager

Issued: May 12, 2014

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz $\pm$ 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 $\pm$ 0.2) °C	39.0 $\pm$ 6 %	1.36 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.9 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.87 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.5 W/kg $\pm$ 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 $\pm$ 0.2) °C	52.2 $\pm$ 6 %	1.48 mho/m $\pm$ 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	9.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	37.6 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.02 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.1 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.7 Ω - 6.1 j Ω
Return Loss	- 23.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	43.7 Ω - 6.4 j Ω
Return Loss	- 20.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.211 ns
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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

DASY5 Validation Report for Head TSL

Date: 07.05.2014

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; $\sigma = 1.36$ S/m; $\epsilon_r = 39$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.23, 5.23, 5.23); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

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

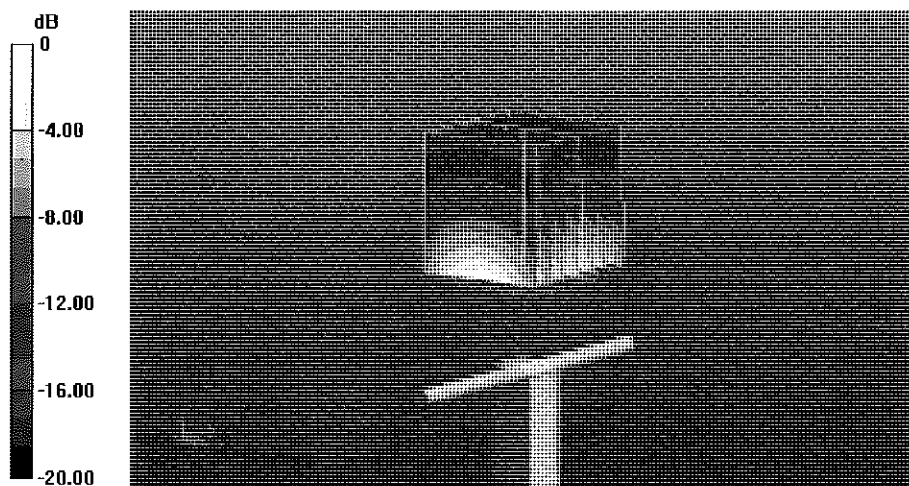
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 96.06 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.7 W/kg

SAR(1 g) = 9.23 W/kg; SAR(10 g) = 4.87 W/kg

Maximum value of SAR (measured) = 11.7 W/kg

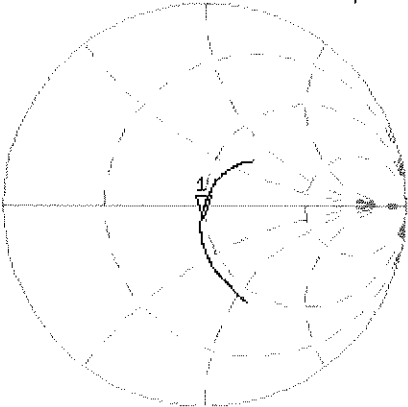


0 dB = 11.7 W/kg = 10.68 dBW/kg

Impedance Measurement Plot for Head TSL

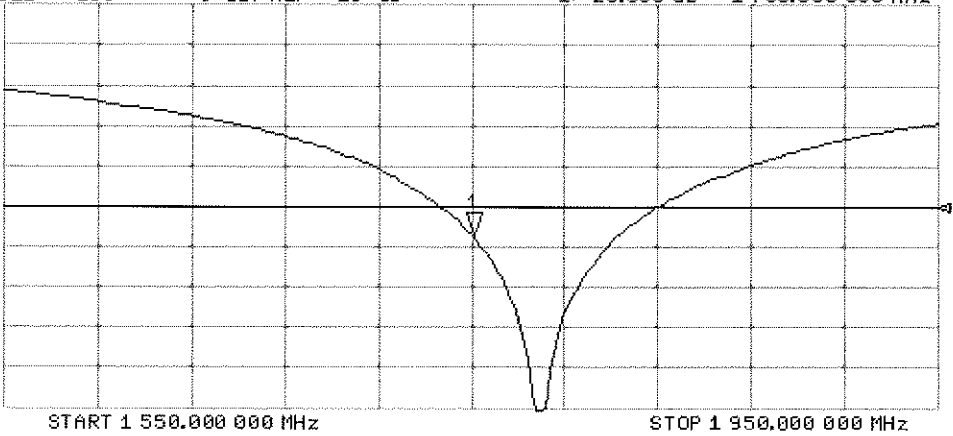
7 May 2014 09:22:36
[CH1] S11 1 U FS 1: 47.709 Ω -6.0566 Ω 15.016 pF 1 750.000 000 MHz

*
De1
CA
Avg
16
H1d



CH2 S11 LOG 5 dB/REF -20 dB 1:-23.588 dB 1 750.000 000 MHz

CA
Avg
16
H1d



DASY5 Validation Report for Body TSL

Date: 07.05.2014

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; $\sigma = 1.48$ S/m; $\epsilon_r = 52.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.89, 4.89, 4.89); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2014
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

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

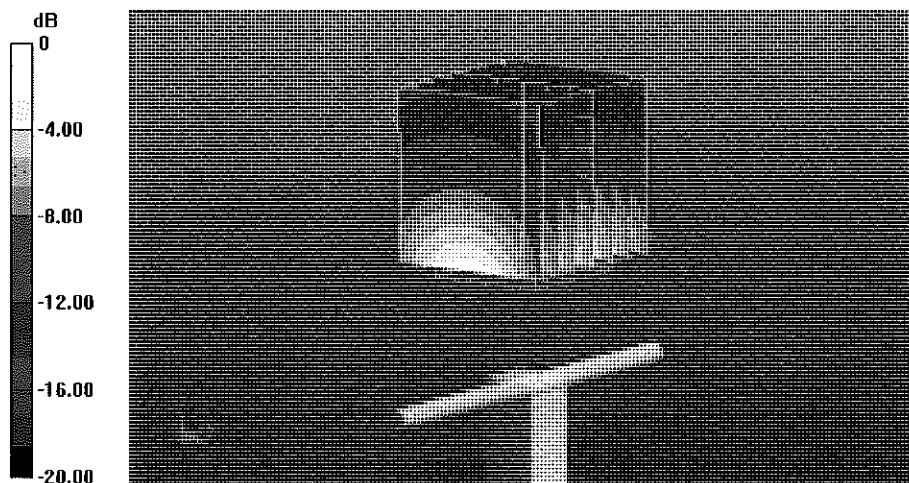
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.01 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 16.3 W/kg

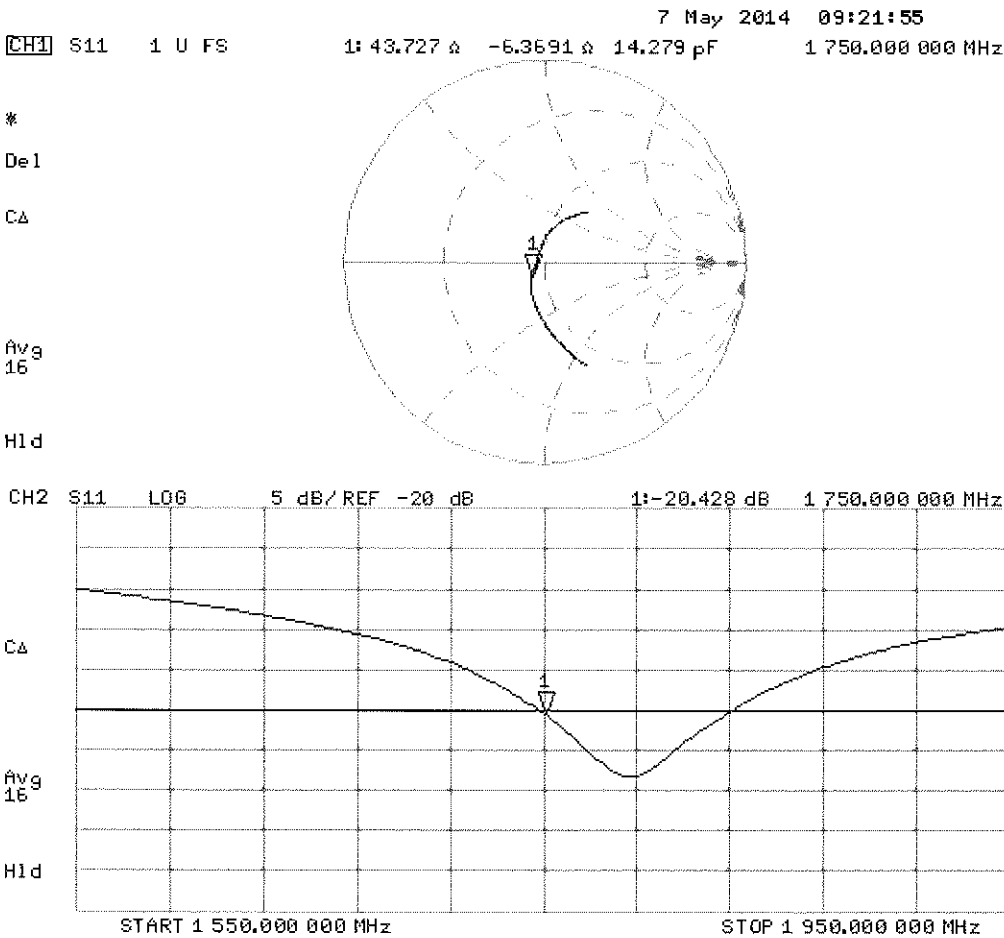
SAR(1 g) = 9.41 W/kg; SAR(10 g) = 5.02 W/kg

Maximum value of SAR (measured) = 11.8 W/kg



0 dB = 11.8 W/kg = 10.72 dBW/kg

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D1900V2-5d141_Apr14**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d141**

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

Calibration date: **April 09, 2014**

✓
KOK
5/7/14

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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	03-Apr-14 (No. 217-01918)	Apr-15
Type-N mismatch combination	SN: 5047.2 / 06327	03-Apr-14 (No. 217-01921)	Apr-15
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Claudio Leubler** Name: **Claudio Leubler** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager**

Signature

[Handwritten signatures]

Issued: April 9, 2014

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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:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
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 $\pm$ 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 $\pm$ 0.2) °C	39.1 $\pm$ 6 %	1.36 mho/m $\pm$ 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	9.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.1 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.8 W/kg $\pm$ 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 $\pm$ 0.2) °C	52.4 $\pm$ 6 %	1.52 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	10.2 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.6 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.6 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.8 \Omega + 5.5 j\Omega$
Return Loss	- 24.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.8 \Omega + 6.3 j\Omega$
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 09.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d141

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.36$ S/m; $\epsilon_r = 39.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

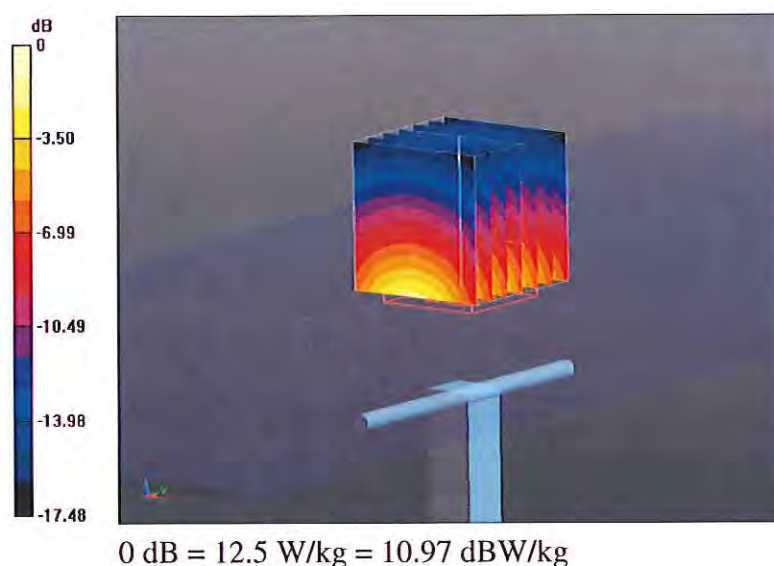
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.080 V/m; Power Drift = 0.01 dB

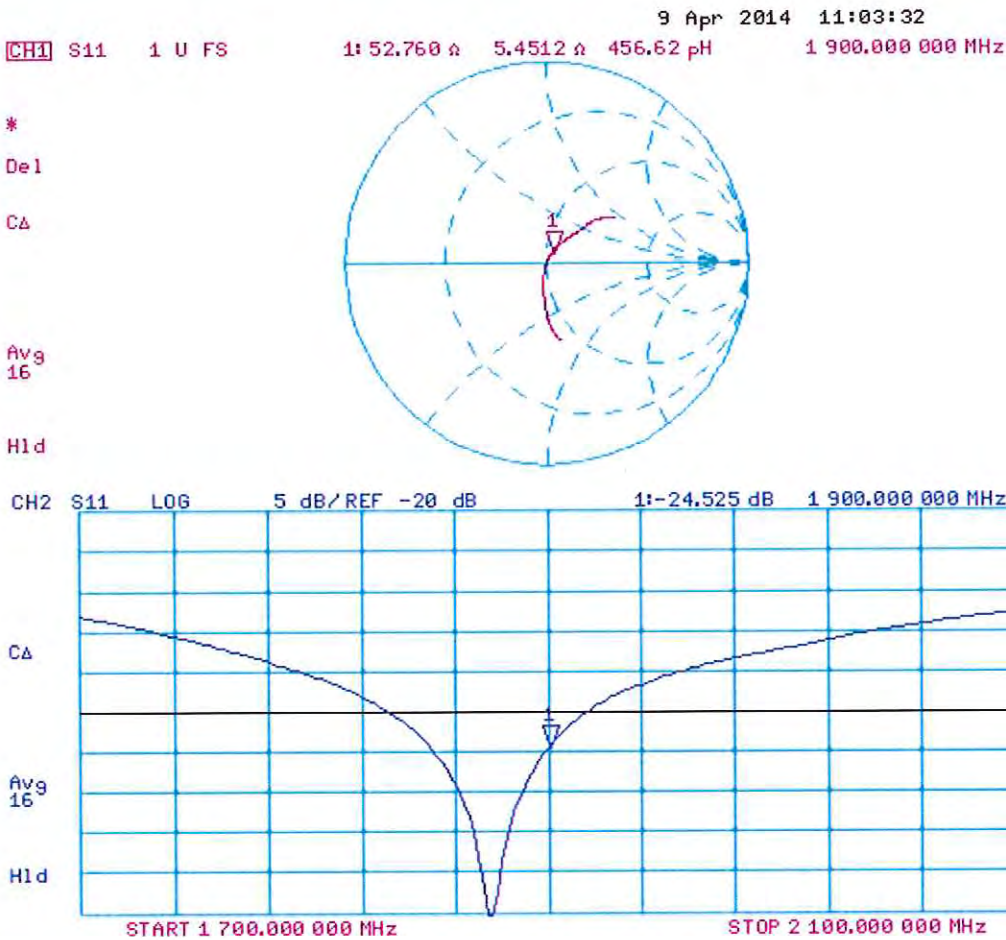
Peak SAR (extrapolated) = 18.2 W/kg

SAR(1 g) = 9.91 W/kg; SAR(10 g) = 5.17 W/kg

Maximum value of SAR (measured) = 12.5 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.04.2014

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN: 5d141

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.52$ S/m; $\epsilon_r = 52.4$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

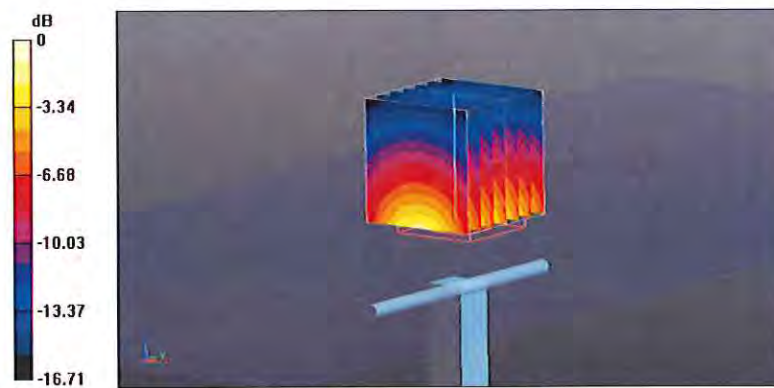
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 95.820 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 17.9 W/kg

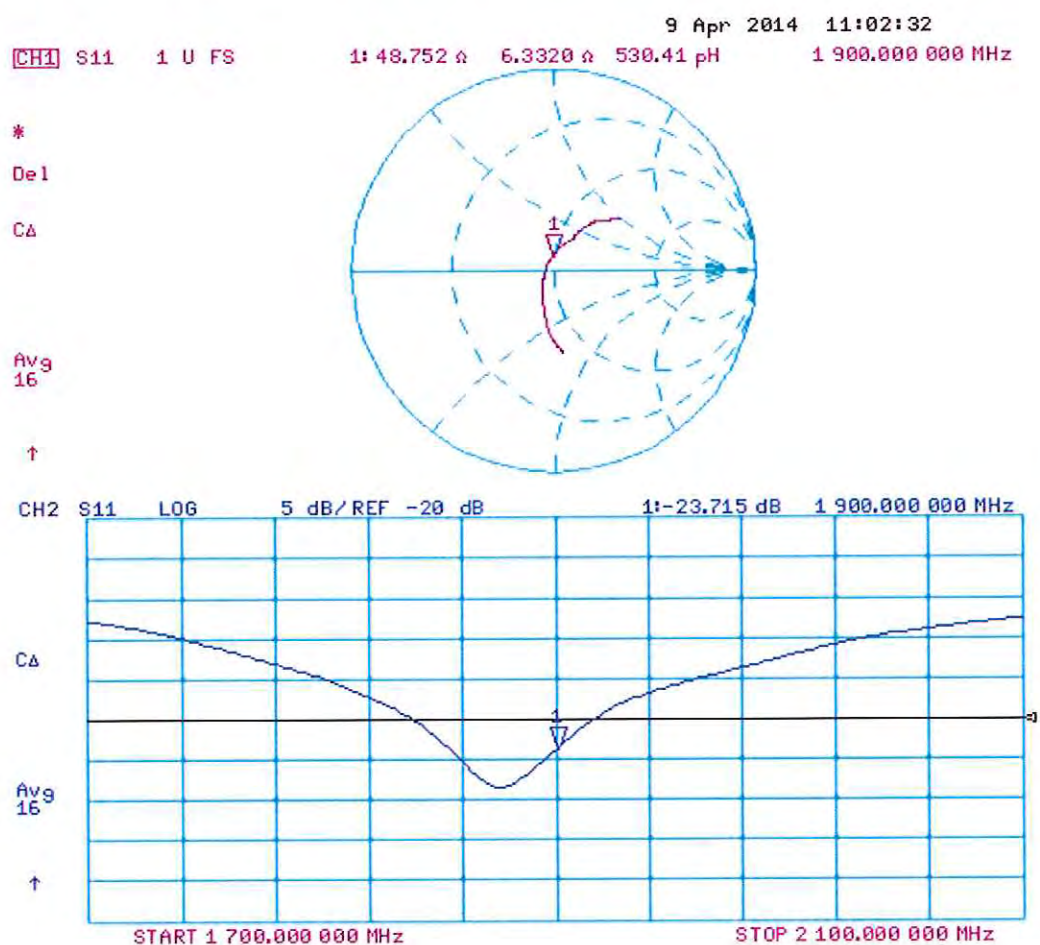
SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.41 W/kg

Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.11 dBW/kg

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 108**

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Client **PC Test**

Certificate No: **D1900V2-5d148_Feb14**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN: 5d148**

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

Calibration date: **February 27, 2014**

CCV
3/1/2014

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Jeton Kastrati** Name **Laboratory Technician** Function **Signature**

Approved by: **Katja Pokovic** Technical Manager

Issued: February 27, 2014

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Accreditation No.: **SCS 108**

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

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:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
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 $\pm$ 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 $\pm$ 0.2) °C	38.9 $\pm$ 6 %	1.39 mho/m $\pm$ 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	10.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	40.7 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.2 W/kg $\pm$ 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 $\pm$ 0.2) °C	52.8 $\pm$ 6 %	1.49 mho/m $\pm$ 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	9.73 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	39.3 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.7 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.5 \Omega + 5.5 j\Omega$
Return Loss	- 24.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.0 \Omega + 6.7 j\Omega$
Return Loss	- 23.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.197 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 27.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ S/m; $\epsilon_r = 38.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(5.06, 5.06, 5.06); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

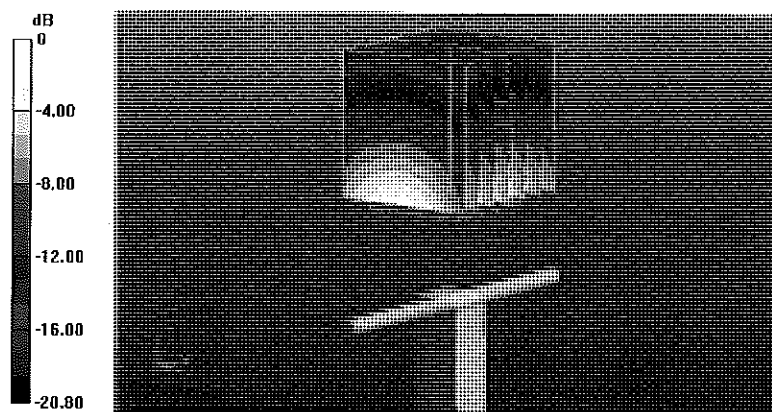
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 98.796 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 18.9 W/kg

SAR(1 g) = 10.2 W/kg; SAR(10 g) = 5.31 W/kg

Maximum value of SAR (measured) = 12.8 W/kg

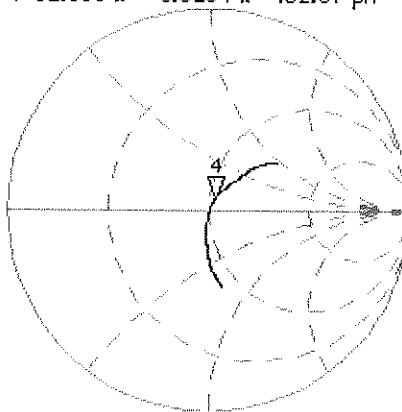


0 dB = 12.8 W/kg = 11.07 dBW/kg

Impedance Measurement Plot for Head TSL

27 Feb 2014 09:42:31
 [CH1] S11 1 U FS 4: 52.533 Δ 5.5234 Δ 462.67 pH 1 900.000 000 MHz

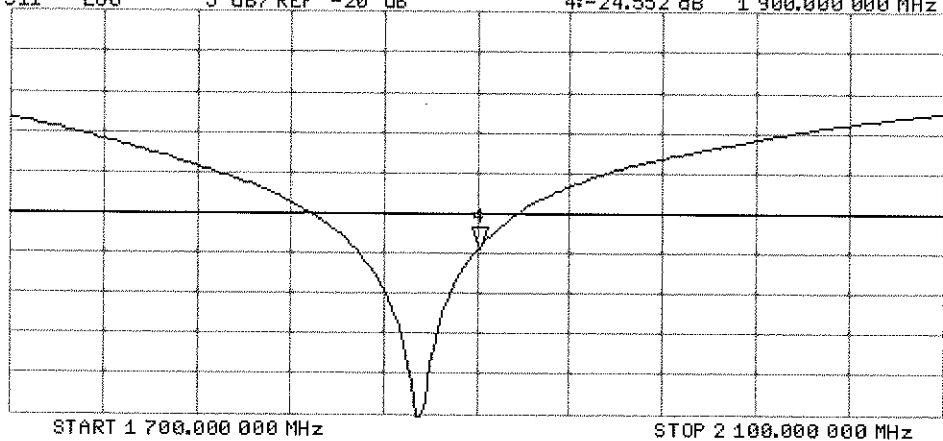
*
 De1
 CA



AVG
 16
 H1d

CH2 S11 LOG 5 dB/REF -20 dB 4:-24.552 dB 1 900.000 000 MHz

CA
 AVG
 16
 H1d



DASY5 Validation Report for Body TSL

Date: 27.02.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.49$ S/m; $\epsilon_r = 52.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

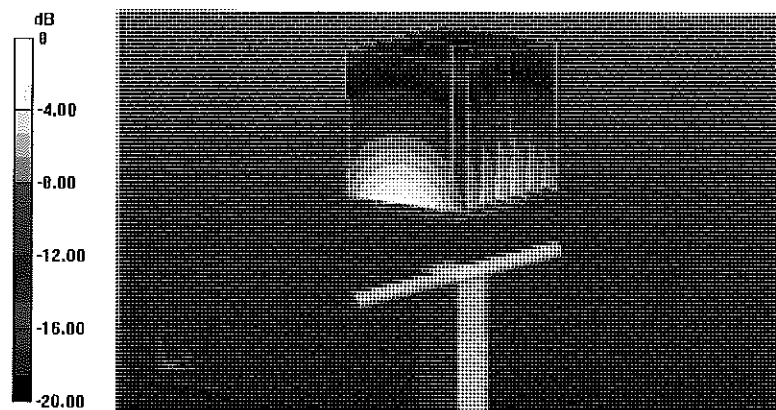
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 94.520 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 17.0 W/kg

SAR(1 g) = 9.73 W/kg; SAR(10 g) = 5.15 W/kg

Maximum value of SAR (measured) = 12.2 W/kg

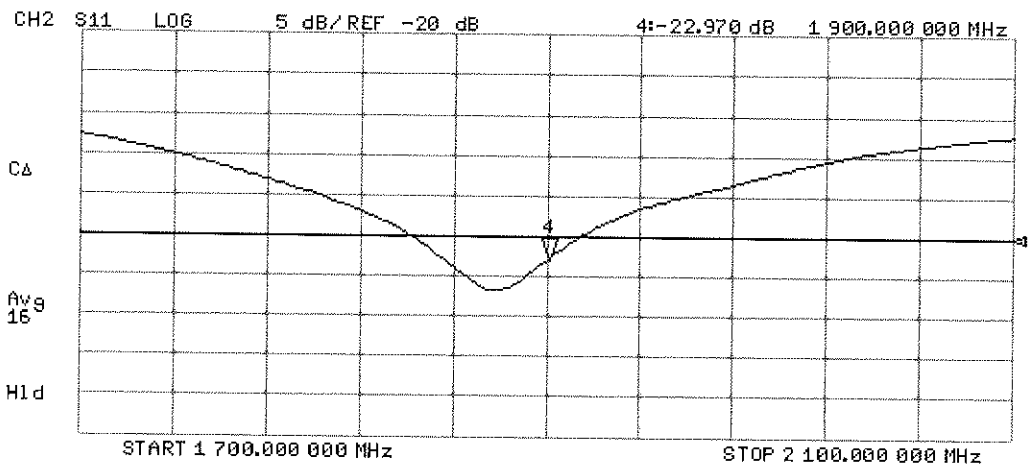
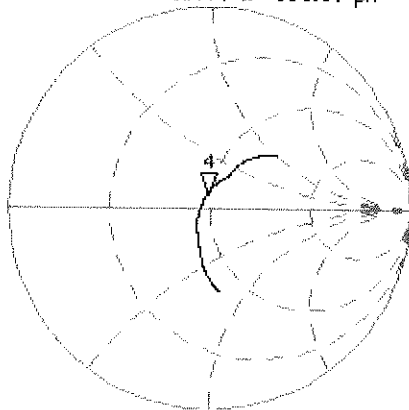


0 dB = 12.2 W/kg = 10.86 dBW/kg

Impedance Measurement Plot for Body TSL

CH1 S11 1 U FS 4: 47.971 Ω 6.6777 Ω 559.37 pF 1 900.000 000 MHz 27 Feb 2014 09:42:04

*
De1
CA
Avg
16
H1d





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Accreditation No.: **SCS 108**

Client **PC Test**

Certificate No: **D2450V2-797_Jan14**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN: 797**

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

Calibration date: **January 21, 2014**

CC ✓
2/5/14

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.

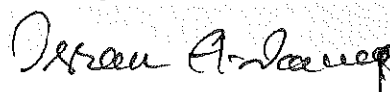
All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe ES3DV3	SN: 3205	30-Dec-13 (No. ES3-3205_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Israe El-Naouq** Name: **Israe El-Naouq** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Technical Manager

Signature: 


Issued: January 21, 2014

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Accreditation No.: **SCS 108**

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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:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 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 $\pm$ 0.2) °C	38.7 $\pm$ 6 %	1.86 mho/m $\pm$ 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	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.3 W/kg $\pm$ 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 $\pm$ 0.2) °C	51.3 $\pm$ 6 %	2.04 mho/m $\pm$ 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	12.7 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	49.4 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.86 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.1 W/kg $\pm$ 16.5 % (k=2)

Appendix

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.5 \Omega + 3.2 j\Omega$
Return Loss	- 26.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$50.0 \Omega + 4.9 j\Omega$
Return Loss	- 26.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.151 ns
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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 24, 2006

DASY5 Validation Report for Head TSL

Date: 21.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.86$ S/m; $\epsilon_r = 38.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

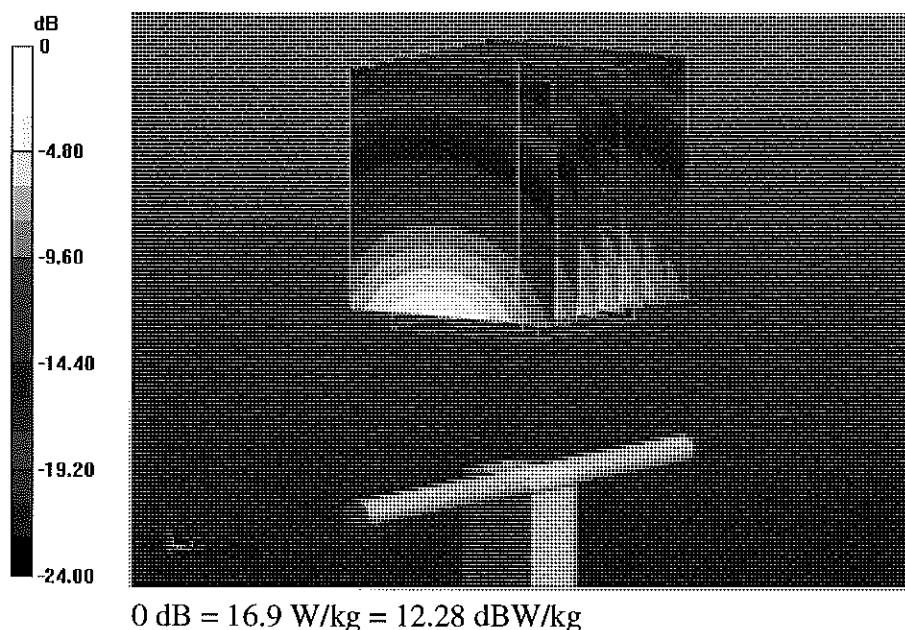
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.151 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 27.5 W/kg

SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.13 W/kg

Maximum value of SAR (measured) = 16.9 W/kg



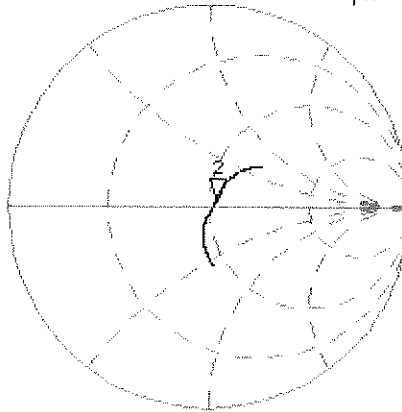
Impedance Measurement Plot for Head TSL

21 Jan 2014 11:31:52
 [CH1] S11 1 U FS 2: 53.512 $\angle$ 3.2285 $\angle$ 209.73 pH 2 450.000 000 MHz

*
 Del
 CA

Avg
 16

H1d

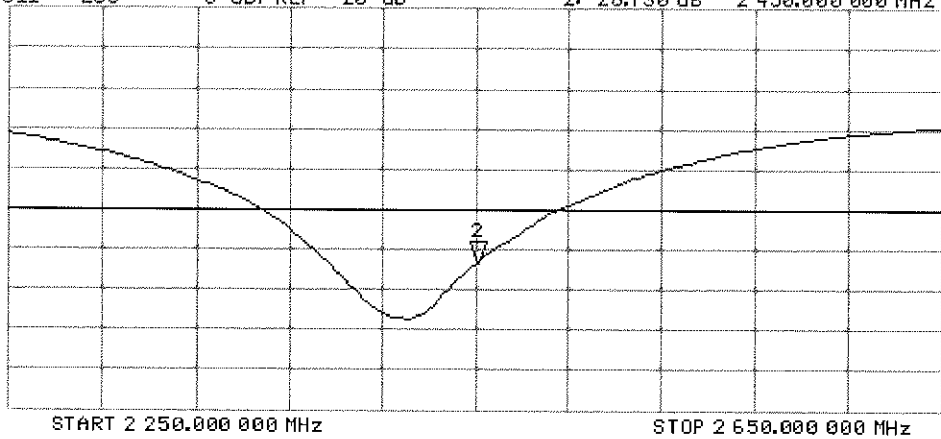


CH2 S11 LOG 5 dB/REF -20 dB 2:-26.730 dB 2 450.000 000 MHz

CA

Avg
 16

H1d



DASY5 Validation Report for Body TSL

Date: 21.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.04$ S/m; $\epsilon_r = 51.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: ES3DV3 - SN3205; ConvF(4.35, 4.35, 4.35); Calibrated: 30.12.2013;
- Sensor-Surface: 3mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

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

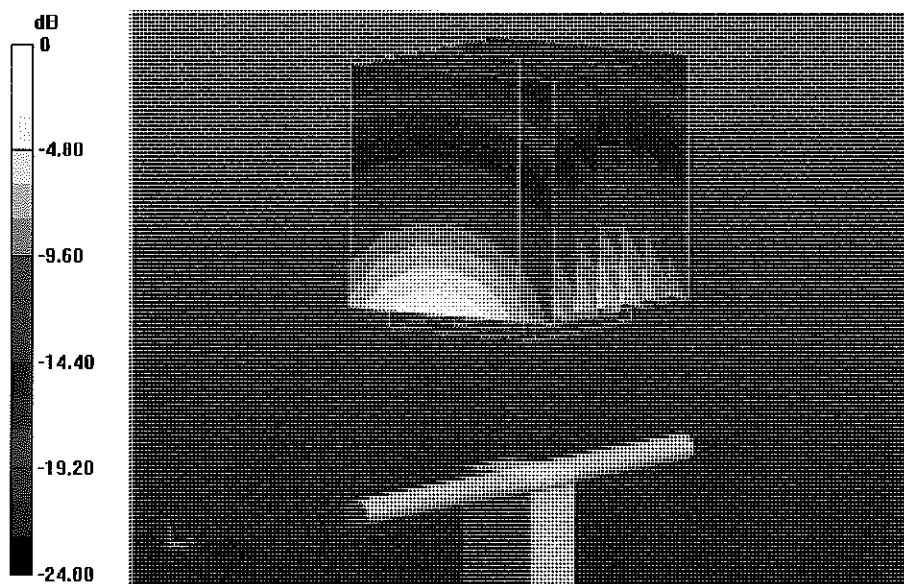
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 93.709 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 26.4 W/kg

SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.86 W/kg

Maximum value of SAR (measured) = 16.8 W/kg

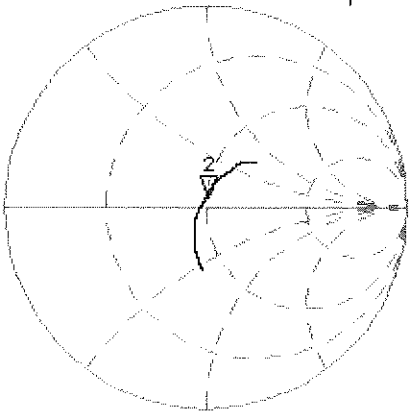


0 dB = 16.8 W/kg = 12.25 dBW/kg

Impedance Measurement Plot for Body TSL

21 Jan 2014 11:31:29
CH1 S11 1 U FS 2: 49.994 Ω 4.9258 Ω 319.98 μH 2 450.000 000 MHz

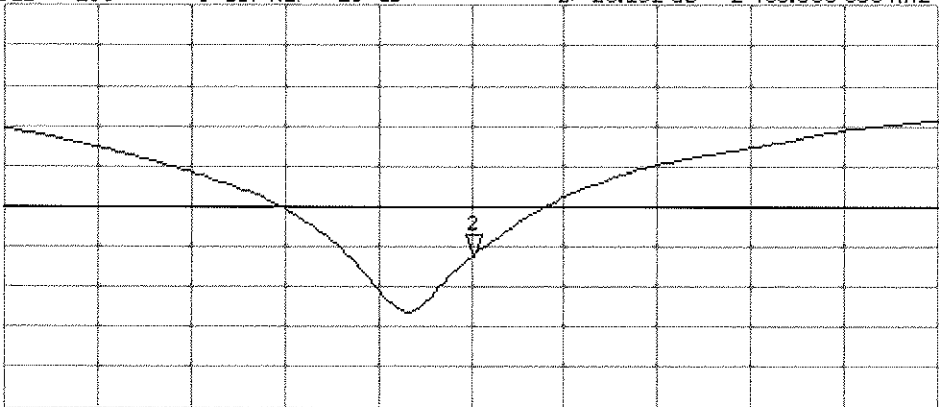
*
Del
CA



Avg
16
H1d

CH2 S11 LOG 5 dB/REF -20 dB 2:-26.162 dB 2 450.000 000 MHz

CA
Avg
16
H1d



START 2 250.000 000 MHz STOP 2 450.000 000 MHz



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Accreditation No.: **SCS 108**

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Client **PC Test**

Certificate No: **D5GHzV2-1007_Sep13/2**

CALIBRATION CERTIFICATE (Replacement of No: D5GHzV2-1007_Sep13)

Object **D5GHzV2 - SN: 1007**

Calibration procedure(s) **QA CAL-22.v2**
 Calibration procedure for dipole validation kits between 3-6 GHz

CC✓
 10/15/13

Calibration date: **September 23, 2013**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	01-Nov-12 (No. 217-01640)	Oct-13
Power sensor HP 8481A	US37292783	01-Nov-12 (No. 217-01640)	Oct-13
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe EX3DV4	SN: 3503	28-Dec-12 (No. EX3-3503_Dec12)	Dec-13
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power sensor HP 8481A	MY41092317	18-Oct-02 (in house check Oct-11)	In house check: Oct-13
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-11)	In house check: Oct-13
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-12)	In house check: Oct-13

Calibrated by: **Leif Klysner** Function: **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** Technical Manager

Issued: October 4, 2013

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Accreditation No.: **SCS 108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
- b) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
- c) 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

Additional Documentation:

- d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz $\pm$ 1 MHz 5300 MHz $\pm$ 1 MHz 5500 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	35.8 $\pm$ 6 %	4.48 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.77 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	77.5 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.2 W/kg $\pm$ 19.5 % (k=2)

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.6 ± 6 %	4.62 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.2 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.9 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.4 ± 6 %	4.76 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.17 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.1 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.2 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.03 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.0 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.7 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.0 ± 6 %	5.07 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.78 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	77.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.20 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	21.9 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.3 ± 6 %	5.36 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.28 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	72.6 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.03 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.2 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.1 ± 6 %	5.56 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.49 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.8 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.8 ± 6 %	5.75 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.6 ± 6 %	5.88 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.75 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.5 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	6.17 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.31 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	72.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.02 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.1 W/kg ± 19.5 % (k=2)

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	52.4 Ω - 11.0 j Ω
Return Loss	- 19.2 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	56.8 Ω - 4.4 j Ω
Return Loss	- 22.3 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	48.8 Ω - 5.4 j Ω
Return Loss	- 25.1 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	57.3 Ω - 8.7 j Ω
Return Loss	- 19.5 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	56.9 Ω + 1.6 j Ω
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	53.1 Ω - 10.3 j Ω
Return Loss	- 19.7 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	54.3 Ω - 1.5 j Ω
Return Loss	- 27.2 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	49.7 Ω - 3.6 j Ω
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	58.2 Ω - 5.2 j Ω
Return Loss	- 20.9 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	58.7 Ω + 3.9 j Ω
Return Loss	- 21.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.201 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 28, 2003

DASY5 Validation Report for Head TSL

Date: 23.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1007

Communication System: UID 0 - CW ; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.48$ S/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 4.62$ S/m; $\epsilon_r = 35.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 4.76$ S/m; $\epsilon_r = 35.4$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 4.86$ S/m; $\epsilon_r = 35.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.07$ S/m; $\epsilon_r = 35$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.41, 5.41, 5.41); Calibrated: 28.12.2012, ConvF(5.1, 5.1, 5.1); Calibrated: 28.12.2012, ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.76, 4.76, 4.76); Calibrated: 28.12.2012, ConvF(4.81, 4.81, 4.81); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.505 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 28.1 W/kg

SAR(1 g) = 7.77 W/kg; SAR(10 g) = 2.23 W/kg

Maximum value of SAR (measured) = 18.1 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.817 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 29.7 W/kg

SAR(1 g) = 8.04 W/kg; SAR(10 g) = 2.3 W/kg

Maximum value of SAR (measured) = 18.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.029 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 32.0 W/kg

SAR(1 g) = 8.17 W/kg; SAR(10 g) = 2.32 W/kg

Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.403 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 31.3 W/kg

SAR(1 g) = 8.03 W/kg; SAR(10 g) = 2.28 W/kg

Maximum value of SAR (measured) = 19.3 W/kg

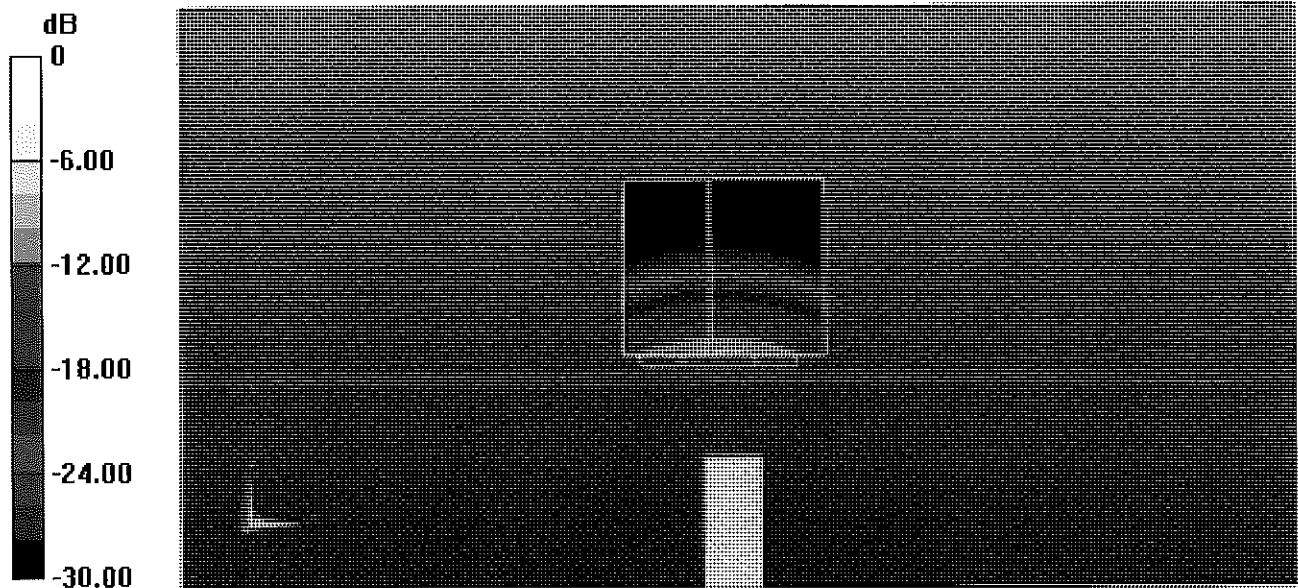
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 60.987 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 31.9 W/kg

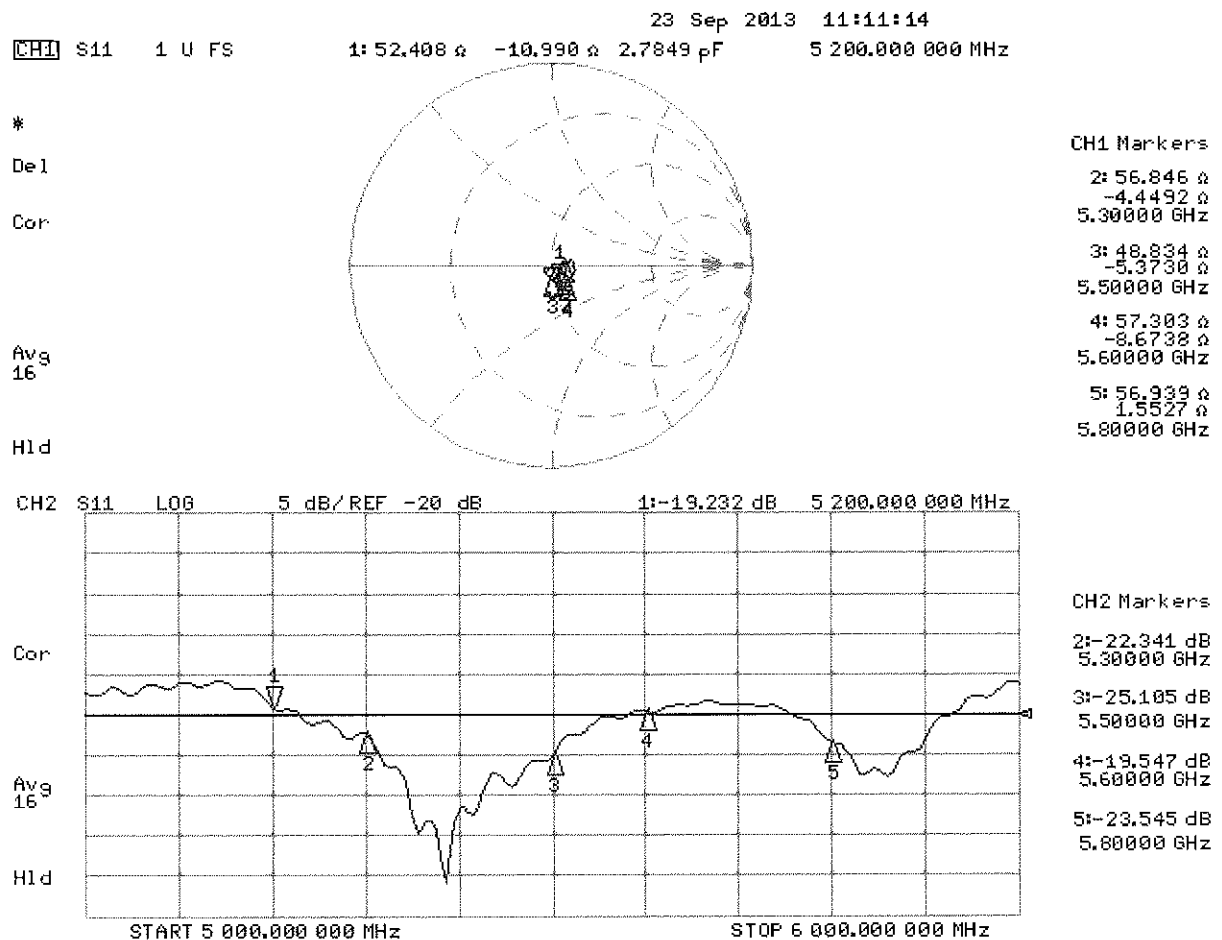
SAR(1 g) = 7.78 W/kg; SAR(10 g) = 2.2 W/kg

Maximum value of SAR (measured) = 19.0 W/kg



0 dB = 19.0 W/kg = 12.79 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.09.2013

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1007

Communication System: UID 0 - CW ; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.36$ S/m; $\epsilon_r = 48.3$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 5.56$ S/m; $\epsilon_r = 48.1$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 5.75$ S/m; $\epsilon_r = 47.8$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.88$ S/m; $\epsilon_r = 47.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.17$ S/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.91, 4.91, 4.91); Calibrated: 28.12.2012, ConvF(4.67, 4.67, 4.67); Calibrated: 28.12.2012, ConvF(4.43, 4.43, 4.43); Calibrated: 28.12.2012, ConvF(4.22, 4.22, 4.22); Calibrated: 28.12.2012, ConvF(4.38, 4.38, 4.38); Calibrated: 28.12.2012;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.606 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 7.28 W/kg; SAR(10 g) = 2.03 W/kg

Maximum value of SAR (measured) = 17.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.305 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 30.3 W/kg

SAR(1 g) = 7.49 W/kg; SAR(10 g) = 2.09 W/kg

Maximum value of SAR (measured) = 17.8 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.471 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 32.4 W/kg

SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.11 W/kg

Maximum value of SAR (measured) = 18.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.333 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 33.8 W/kg

SAR(1 g) = 7.75 W/kg; SAR(10 g) = 2.16 W/kg

Maximum value of SAR (measured) = 19.1 W/kg

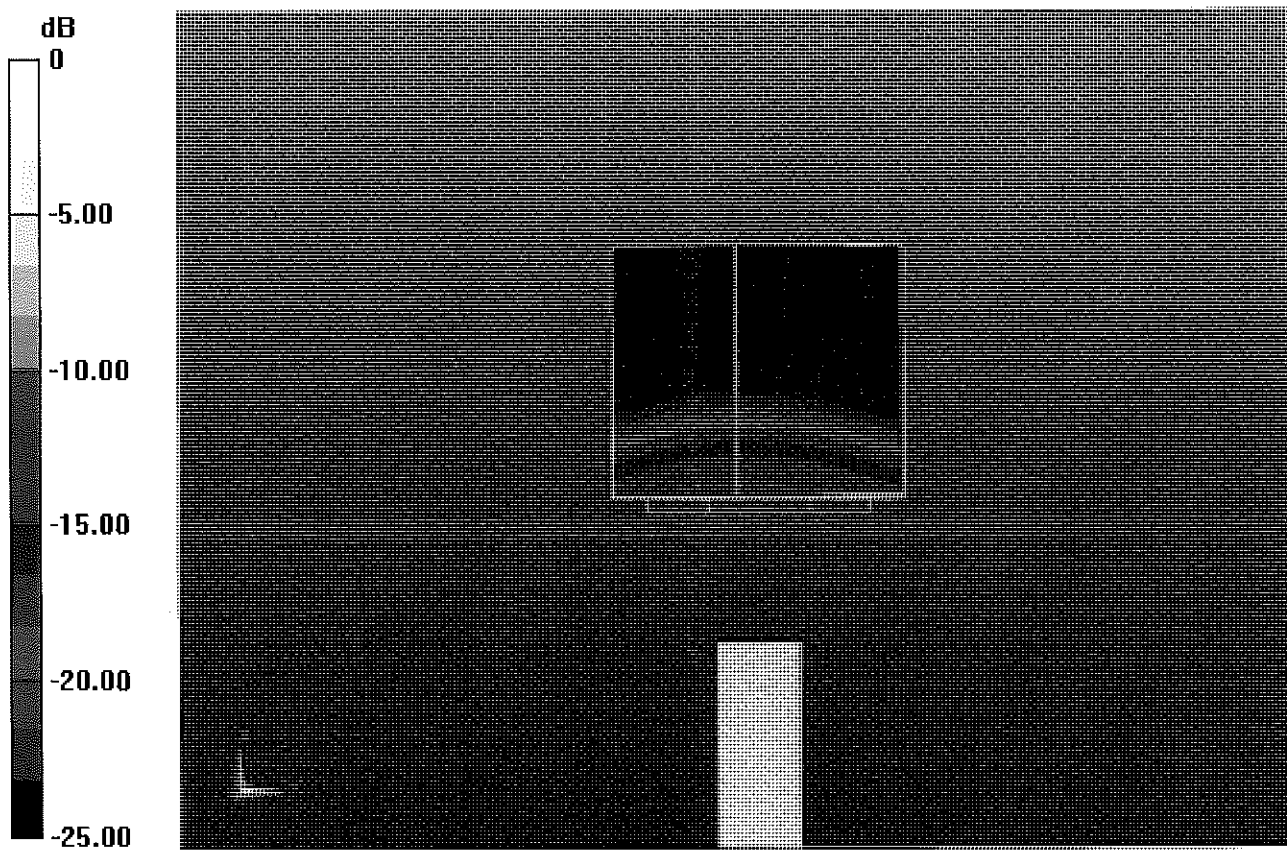
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 55.389 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 34.1 W/kg

SAR(1 g) = 7.31 W/kg; SAR(10 g) = 2.02 W/kg

Maximum value of SAR (measured) = 18.3 W/kg



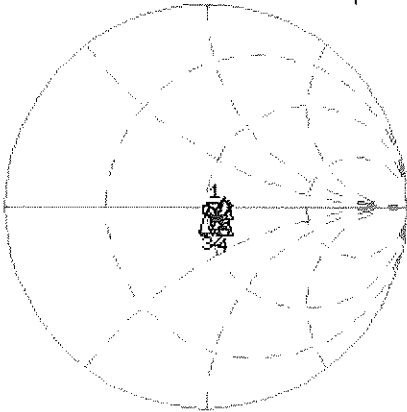
Impedance Measurement Plot for Body TSL

19 Sep 2013 15:38:51
[CH1] S11 1 U FS 1: 53.098 Ω -10.264 Ω 2.9820 pF 5 200.000 000 MHz

*
De1
Cor

Avg
0

H1d



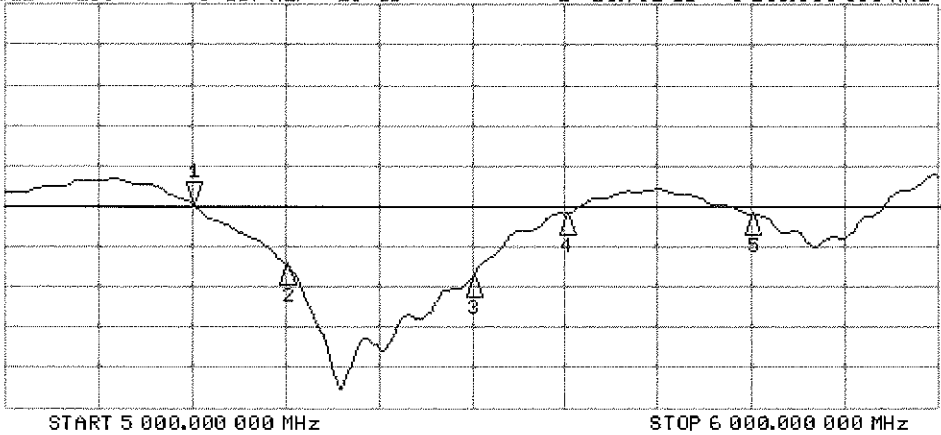
CH1 Markers
2: 54.285 Ω
-1.5293 Ω
5.30000 GHz
3: 49.717 Ω
-3.6367 Ω
5.50000 GHz
4: 58.225 Ω
-5.2344 Ω
5.60000 GHz
5: 58.725 Ω
3.9121 Ω
5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1:-19.701 dB 5 200.000 000 MHz

Cor

Avg
0

H1d



CH2 Markers
2:-27.201 dB
5.30000 GHz
3:-28.741 dB
5.50000 GHz
4:-20.917 dB
5.60000 GHz
5:-21.121 dB
5.80000 GHz



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 108**

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

Client **PC Test**

Certificate No: **D5GHzV2-1057_Jan14**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN: 1057**

Calibration procedure(s) **QA CAL-22.v2**
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: **January 27, 2014**

CC
2/5/14 ✓

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 $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter EPM-442A	GB37480704	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	US37292783	09-Oct-13 (No. 217-01827)	Oct-14
Power sensor HP 8481A	MY41092317	09-Oct-13 (No. 217-01828)	Oct-14
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-13 (No. 217-01736)	Apr-14
Type-N mismatch combination	SN: 5047.3 / 06327	04-Apr-13 (No. 217-01739)	Apr-14
Reference Probe EX3DV4	SN: 3503	30-Dec-13 (No. EX3-3503_Dec13)	Dec-14
DAE4	SN: 601	25-Apr-13 (No. DAE4-601_Apr13)	Apr-14
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
RF generator R&S SMT-06	100005	04-Aug-99 (in house check Oct-13)	In house check: Oct-16
Network Analyzer HP 8753E	US37390585 S4206	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

Calibrated by: **Israe El-Naouq** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Signature

Israe El-Naouq
Katja Pokovic

Issued: January 27, 2014

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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:

- IEC 62209-2, "Evaluation of Human Exposure to Radio Frequency Fields from Handheld and Body-Mounted Wireless Communication Devices in the Frequency Range of 30 MHz to 6 GHz: Human models, Instrumentation, and Procedures"; Part 2: "Procedure to determine the Specific Absorption Rate (SAR) for including accessories and multiple transmitters", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"
- 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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.7
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz $\pm$ 1 MHz 5300 MHz $\pm$ 1 MHz 5500 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 1 MHz	

Head TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	36.0	4.66 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	35.0 $\pm$ 6 %	4.45 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5200 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	78.0 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.3 W/kg $\pm$ 19.5 % (k=2)

Head TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.76 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	4.54 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5300 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	83.0 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.8 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.6	4.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.6 ± 6 %	4.74 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.50 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	84.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.0 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.5 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	83.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.8 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.3	5.27 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	5.07 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5800 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.6 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	5.44 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5300 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.42 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.57 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5300 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.79 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.4 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.5 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5500 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.6	5.65 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.8 ± 6 %	5.84 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5500 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.96 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	79.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	80.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.2 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	6.23 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.48 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	74.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.4 W/kg ± 19.5 % (k=2)

Appendix

Antenna Parameters with Head TSL at 5200 MHz

Impedance, transformed to feed point	43.1 Ω - 4.6 j Ω
Return Loss	- 21.0 dB

Antenna Parameters with Head TSL at 5300 MHz

Impedance, transformed to feed point	46.5 Ω - 1.3 j Ω
Return Loss	- 28.1 dB

Antenna Parameters with Head TSL at 5500 MHz

Impedance, transformed to feed point	46.2 Ω - 2.5 j Ω
Return Loss	- 26.4 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	48.9 Ω - 5.7 j Ω
Return Loss	- 24.6 dB

Antenna Parameters with Head TSL at 5800 MHz

Impedance, transformed to feed point	48.7 Ω - 3.1 j Ω
Return Loss	- 29.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.4 Ω - 7.7 j Ω
Return Loss	- 22.2 dB

Antenna Parameters with Body TSL at 5300 MHz

Impedance, transformed to feed point	49.6 Ω - 3.0 j Ω
Return Loss	- 30.3 dB

Antenna Parameters with Body TSL at 5500 MHz

Impedance, transformed to feed point	50.8 Ω - 3.9 j Ω
Return Loss	- 28.0 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	55.4 Ω - 2.5 j Ω
Return Loss	- 25.0 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	52.3 Ω - 0.7 j Ω
Return Loss	- 32.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.186 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 27, 2006

DASY5 Validation Report for Head TSL

Date: 27.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.45$ S/m; $\epsilon_r = 35$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 4.54$ S/m; $\epsilon_r = 34.9$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 4.74$ S/m; $\epsilon_r = 34.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 4.86$ S/m; $\epsilon_r = 34.5$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 5.07$ S/m; $\epsilon_r = 34.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.52, 5.52, 5.52); Calibrated: 30.12.2013, ConvF(5.2, 5.2, 5.2); Calibrated: 30.12.2013, ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.86, 4.86, 4.86); Calibrated: 30.12.2013, ConvF(4.91, 4.91, 4.91); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.497 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 28.2 W/kg

SAR(1 g) = 7.85 W/kg; SAR(10 g) = 2.25 W/kg

Maximum value of SAR (measured) = 18.6 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.444 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 31.2 W/kg

SAR(1 g) = 8.36 W/kg; SAR(10 g) = 2.4 W/kg

Maximum value of SAR (measured) = 20.1 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.807 V/m; Power Drift = 0.07 dB

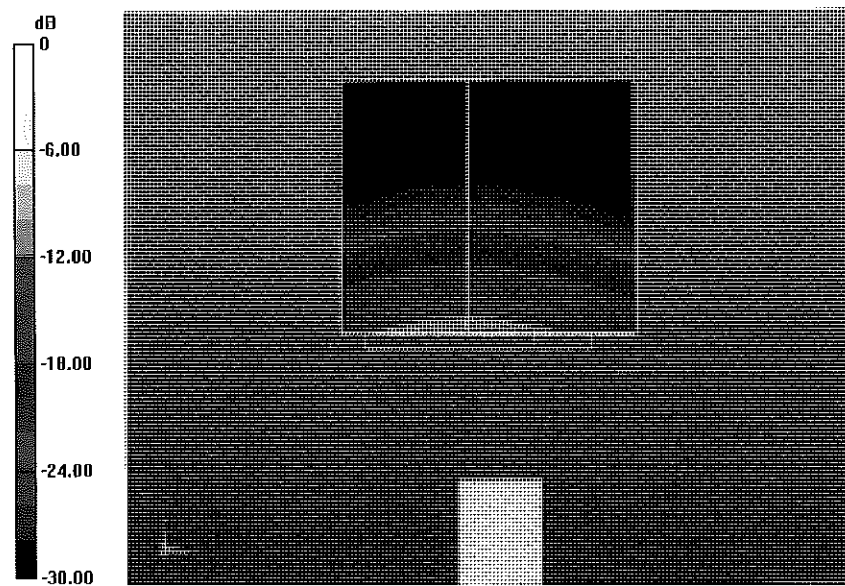
Peak SAR (extrapolated) = 33.0 W/kg

SAR(1 g) = 8.5 W/kg; SAR(10 g) = 2.42 W/kg

Maximum value of SAR (measured) = 20.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.194 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 33.2 W/kg
SAR(1 g) = 8.42 W/kg; SAR(10 g) = 2.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 60.646 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 8 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 19.9 W/kg

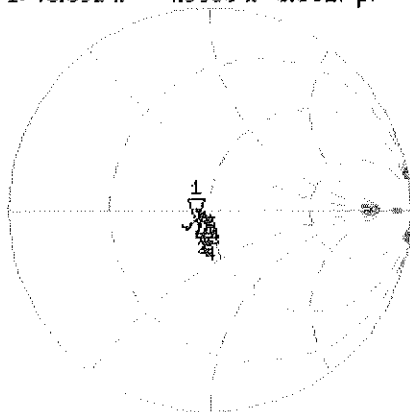


0 dB = 19.9 W/kg = 12.99 dBW/kg

Impedance Measurement Plot for Head TSL

27 Jan 2014 17:12:04
 CH1 S11 1 U FS 1: 43.092 Ω -4.5938 Ω 6.6627 pF 5 200.000 000 MHz

*
 Del
 Cor
 Avg
 16
 H1d

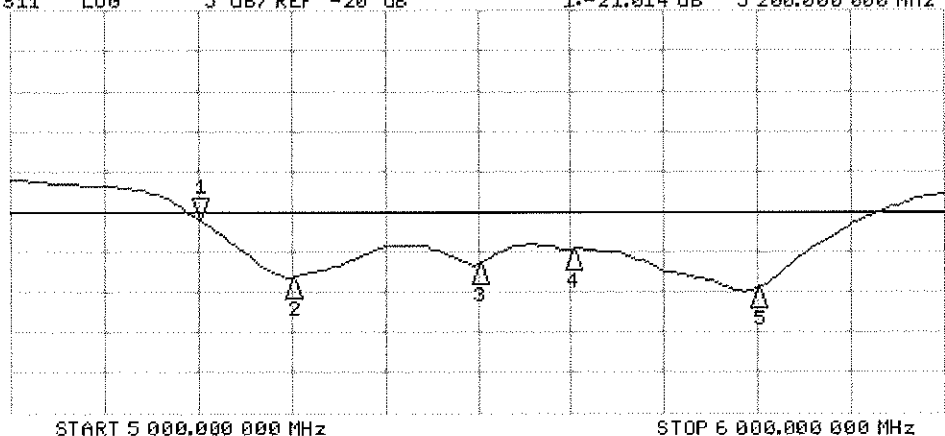


CH1 Markers

2: 46.475 Ω
 -1.3496 Ω
 5.30000 GHz
 3: 46.150 Ω
 -2.5078 Ω
 5.50000 GHz
 4: 48.900 Ω
 -5.6932 Ω
 5.60000 GHz
 5: 48.734 Ω
 -3.0762 Ω
 5.80000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.014 dB 5 200.000 000 MHz

Del
 Cor
 Avg
 16
 H1d



CH2 Markers

2: -28.145 dB
 5.30000 GHz
 3: -26.415 dB
 5.50000 GHz
 4: -24.640 dB
 5.60000 GHz
 5: -29.464 dB
 5.80000 GHz

DASY5 Validation Report for Body TSL

Date: 24.01.2014

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5300 MHz, Frequency: 5500 MHz, Frequency: 5600 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.44$ S/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5300$ MHz; $\sigma = 5.57$ S/m; $\epsilon_r = 47.2$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5500$ MHz; $\sigma = 5.84$ S/m; $\epsilon_r = 46.8$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 5.98$ S/m; $\epsilon_r = 46.6$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5800$ MHz; $\sigma = 6.23$ S/m; $\epsilon_r = 46.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.01, 5.01, 5.01); Calibrated: 30.12.2013, ConvF(4.76, 4.76, 4.76); Calibrated: 30.12.2013, ConvF(4.52, 4.52, 4.52); Calibrated: 30.12.2013, ConvF(4.3, 4.3, 4.3); Calibrated: 30.12.2013, ConvF(4.47, 4.47, 4.47); Calibrated: 30.12.2013;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 25.04.2013
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.7(1137); SEMCAD X 14.6.10(7164)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.809 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 30.1 W/kg

SAR(1 g) = 7.58 W/kg; SAR(10 g) = 2.12 W/kg

Maximum value of SAR (measured) = 18.2 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5300 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.585 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 32.2 W/kg

SAR(1 g) = 7.79 W/kg; SAR(10 g) = 2.17 W/kg

Maximum value of SAR (measured) = 19.1 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5500 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 58.364 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 34.4 W/kg

SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.22 W/kg

Maximum value of SAR (measured) = 19.4 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 57.864 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 35.8 W/kg

SAR(1 g) = 8.07 W/kg; SAR(10 g) = 2.24 W/kg

Maximum value of SAR (measured) = 19.8 W/kg

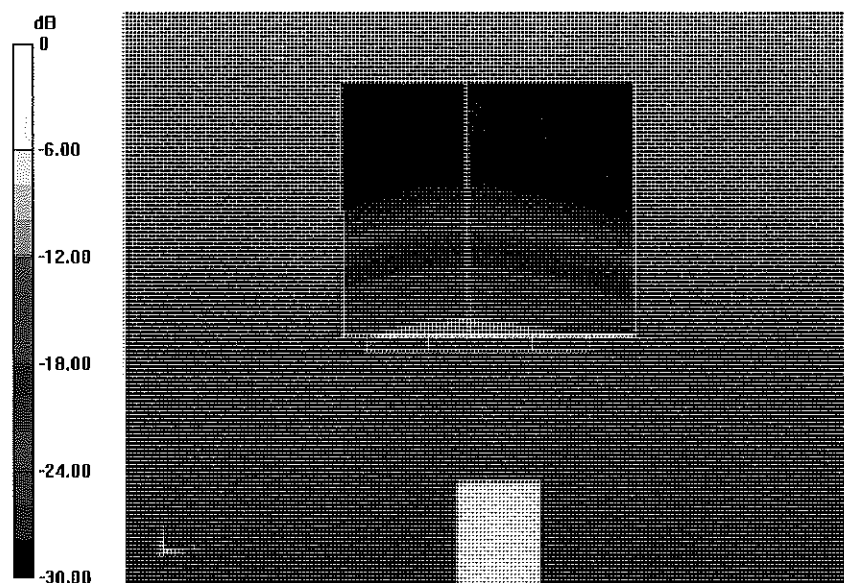
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 54.817 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 35.1 W/kg

SAR(1 g) = 7.48 W/kg; SAR(10 g) = 2.06 W/kg

Maximum value of SAR (measured) = 18.8 W/kg

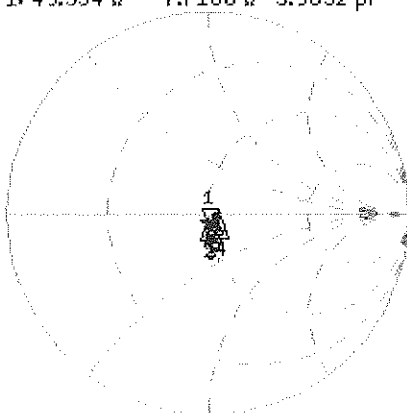


0 dB = 18.8 W/kg = 12.74 dBW/kg

Impedance Measurement Plot for Body TSL

24 Jan 2014 15:50:22
CH1 S11 1 U FS 1: 49.354 Ω -7.7188 Ω 3.9652 pF 5 200.000 000 MHz

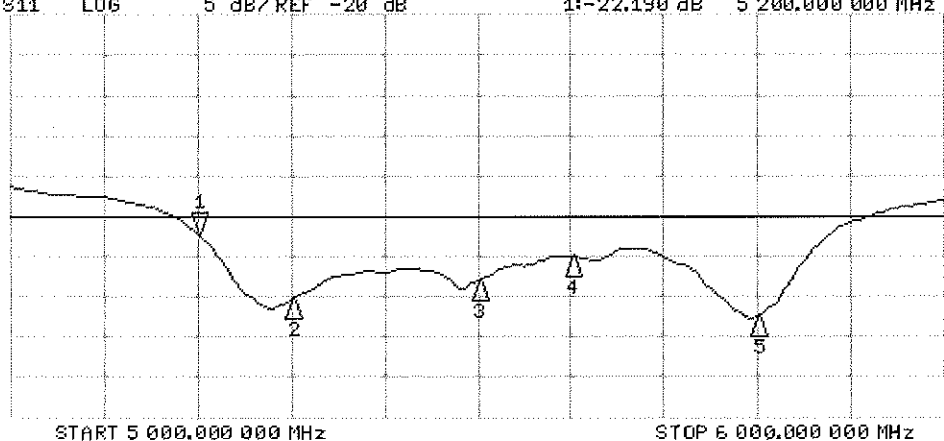
*
 Del
 Cor
 Avg
 16
 H1d



CH1 Markers
 2: 49.559 Ω
 -3.0176 Ω
 5.30000 GHz
 3: 50.793 Ω
 -3.9160 Ω
 5.50000 GHz
 4: 55.393 Ω
 -2.5176 Ω
 5.60000 GHz
 5: 52.320 Ω
 -716.80 m Ω
 5.80000 GHz

CH2 S11 L06 5 dB/REF -20 dB 1:-22.190 dB 5 200.000 000 MHz

Cor
 Avg
 16
 H1d



CH2 Markers
 2:-30.277 dB
 5.30000 GHz
 3:-28.039 dB
 5.50000 GHz
 4:-24.960 dB
 5.60000 GHz
 5:-32.401 dB
 5.80000 GHz