



SAR EVALUATION REPORT

Applicant Name:

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Gyeonggi-do, 16677, Korea

Date of Testing:

01/22/18 – 02/12/18

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

1M1801230009-01-R1.A3L

FCC ID:

A3LSC03K

APPLICANT:

SAMSUNG ELECTRONICS CO., LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model:

SC-03K

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1g Head (W/kg)	1g Body-Worn (W/kg)	1g Hotspot (W/kg)	10g Phablet (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.17	0.32	0.72	N/A
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	< 0.1	0.29	0.74	N/A
PCE	UMTS 850	826.40 - 846.60 MHz	0.23	0.39	0.63	N/A
PCE	LTE Band 12	699.7 - 715.3 MHz	< 0.1	0.20	0.34	N/A
PCE	LTE Band 17	706.5 - 713.5 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 13	779.5 - 784.5 MHz	< 0.1	0.15	0.28	N/A
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.16	0.27	0.50	N/A
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.17	0.79	0.57	1.71
PCE	LTE Band 41	2498.5 - 2687.5 MHz	< 0.1	0.25	0.59	1.37
DTS	2.4 GHz WLAN	2412 - 2472 MHz	0.26	0.13	0.34	N/A
NII	U-NII-1	5180 - 5240 MHz	N/A	N/A	N/A	N/A
NII	U-NII-2A	5260 - 5320 MHz	0.25	0.18	N/A	0.88
NII	U-NII-2C	5500 - 5720 MHz	0.26	0.13	N/A	0.67
NII	U-NII-3	5745 - 5825 MHz	0.45	0.21	0.32	N/A
DSS/DTS	Bluetooth	2402 - 2480 MHz	0.80	< 0.1	0.10	N/A
Simultaneous SAR per KDB 690783 D01v01r03:			1.07	1.33	1.33	3.36

Note: This revised Test Report (S/N: 1M1801230009-01-R1.A3L) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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

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


Randy Ortanez
President



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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
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 17	Voice/Data	706.5 - 713.5 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 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 41	Voice/Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Data	2412 - 2472 MHz
U-NII-1	Data	5180 - 5240 MHz
U-NII-2A	Data	5260 - 5320 MHz
U-NII-2C	Data	5500 - 5720 MHz
U-NII-3	Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
ANT+	Data	2402 - 2480 MHz
MST	Data	555 Hz - 8.33 kHz

1.2 Power Reduction for SAR

This device utilizes a power reduction mechanism for some wireless modes and bands for SAR compliance under portable hotspot conditions and under some conditions when the device is being used in close proximity to the user's hand. All hotspot SAR evaluations for this device were performed at the maximum allowed output power when hotspot is enabled. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device when being used in phablet use conditions. Detailed descriptions of the power reduction mechanism are included in the operational description.

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

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1.3 Nominal and Maximum Output Power Specifications

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

1.3.1 Maximum PCE Output Power

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
GSM/GPRS/EDGE 850	Maximum	32.7	32.7	31.0	29.5	27.5	27.5	25.5	23.5	21.5
	Nominal	32.2	32.2	30.5	29.0	27.0	27.0	25.0	23.0	21.0
GSM/GPRS/EDGE 1900	Maximum	30.0	30.0	28.0	26.1	25.0	26.1	25.0	23.0	21.0
	Nominal	29.5	29.5	27.5	25.6	24.5	25.6	24.5	22.5	20.5

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA
UMTS Band 5 (850 MHz)	Maximum	24.5	23.5	23.5
	Nominal	24.0	23.0	23.0

Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	23.5
	Nominal	23.0
LTE Band 17	Maximum	23.5
	Nominal	23.0
LTE Band 13	Maximum	23.5
	Nominal	23.0
LTE Band 5 (Cell)	Maximum	23.5
	Nominal	23.0
LTE Band 4 (AWS)	Maximum	23.5
	Nominal	23.0
LTE Band 41	Maximum	25.0
	Nominal	24.5

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1.3.2 Hotspot Reduced PCE Output Power

Mode / Band		Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
GSM/GPRS/EDGE 1900	Maximum	28.0	26.5	24.5	22.5	25.0	24.0	22.0	20.5
	Nominal	27.5	26.0	24.0	22.0	24.5	23.5	21.5	20.0

Mode / Band		Modulated Average (dBm)
LTE Band 4 (AWS)	Maximum	19.5
	Nominal	19.0
LTE Band 41	Maximum	23.0
	Nominal	22.5

1.3.3 Grip Reduced PCE Output Power

Mode / Band		Modulated Average (dBm)
LTE Band 4 (AWS)	Maximum	20.0
	Nominal	19.5
LTE Band 41	Maximum	24.0
	Nominal	23.5

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1.3.4 Maximum WLAN and Bluetooth Output Power

Mode / Band		Modulated Average - Antenna 1 Single Tx Chain (dBm)			
		Ch. 1	Ch. 2-11	Ch. 12	Ch. 13
IEEE 802.11b (2.4 GHz)	Maximum	20.5	20.5	19.5	16.5
	Nominal	20.0	20.0	19.0	16.0
IEEE 802.11g (2.4 GHz)	Maximum	16.5	17.5	16.5	14.5
	Nominal	16.0	17.0	16.0	14.0
IEEE 802.11n (2.4 GHz)	Maximum	16.5	17.5	16.5	14.5
	Nominal	16.0	17.0	16.0	14.0

Mode / Band		Modulated Average - Antenna 2 Single Tx Chain (dBm)			
		Ch. 1	Ch. 2-11	Ch. 12	Ch. 13
IEEE 802.11b (2.4 GHz)	Maximum	20.5	20.5	18.5	15.5
	Nominal	20.0	20.0	18.0	15.0
IEEE 802.11g (2.4 GHz)	Maximum	16.5	17.5	14.5	11.5
	Nominal	16.0	17.0	14.0	11.0
IEEE 802.11n (2.4 GHz)	Maximum	16.5	17.5	14.5	11.5
	Nominal	16.0	17.0	14.0	11.0

Mode / Band		Modulated Average - Single Tx Chain (dBm)					
		20 MHz Bandwidth	40 MHz Bandwidth		80 MHz Bandwidth		
		Ch. 36-165	Ch. 62	Ch. 38-54, Ch. 102-159	Ch. 58	Ch. 106	Ch. 42, Ch. 122-155
IEEE 802.11a (5 GHz)	Maximum	17.5					
	Nominal	17.0					
IEEE 802.11n (5 GHz)	Maximum	17.5	16.0	17.5			
	Nominal	17.0	15.5	17.0			
IEEE 802.11ac (5 GHz)	Maximum	17.5	16.0	17.5	15.5	15.5	17.5
	Nominal	17.0	15.5	17.0	15.0	15.0	17.0

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Mode / Band		Modulated Average - MIMO (dBm)			
		20 MHz Bandwidth			
		Ch. 1, Ch. 11	Ch. 2-10	Ch. 12	Ch. 13
IEEE 802.11g (2.4 GHz)	Maximum	18.5	20.5	16.5	14.5
	Nominal	18.0	20.0	16.0	14.0
IEEE 802.11n (2.4 GHz)	Maximum	18.5	20.5	16.5	14.5
	Nominal	18.0	20.0	16.0	14.0

Mode / Band		Modulated Average - MIMO (dBm)					
		20 MHz Bandwidth	40 MHz Bandwidth			80 MHz Bandwidth	
		Ch. 36-165	Ch. 38, 102	Ch. 62	Ch. 46-54, 110-159	Ch. 42-106	Ch. 122-155
IEEE 802.11a (5 GHz)	Maximum	20.5					
	Nominal	20.0					
IEEE 802.11n (5 GHz)	Maximum	20.5	19.5	18.5	20.5		
	Nominal	20.0	19.0	18.0	20.0		
IEEE 802.11ac (5 GHz)	Maximum	20.5	19.5	18.5	20.5	18.5	20.5
	Nominal	20.0	19.0	18.0	20.0	18.0	20.0

Mode / Band		Modulated Average - Single Tx Chain (dBm)
Bluetooth	Maximum	13.5
	Nominal	13.0
Bluetooth (EDR)	Maximum	7.0
	Nominal	6.5
Bluetooth LE	Maximum	9.0
	Nominal	8.5

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1.3.5 Reduced WLAN Output Power (Held-to-Ear)

Mode / Band		Modulated Average - Antenna 1 Single Tx Chain (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	13.5
	Nominal	13.0
IEEE 802.11g (2.4 GHz)	Maximum	13.5
	Nominal	13.0
IEEE 802.11n (2.4 GHz)	Maximum	13.5
	Nominal	13.0

Mode / Band		Modulated Average - Antenna 2 Single Tx Chain (dBm)	
		Ch. 1-12	Ch. 13
IEEE 802.11b (2.4 GHz)	Maximum	13.5	13.5
	Nominal	13.0	13.0
IEEE 802.11g (2.4 GHz)	Maximum	13.5	11.5
	Nominal	13.0	11.0
IEEE 802.11n (2.4 GHz)	Maximum	13.5	11.5
	Nominal	13.0	11.0

Mode / Band		Modulated Average - Single Tx Chain (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11a (5 GHz)	Maximum	12.5		
	Nominal	12.0		
IEEE 802.11n (5 GHz)	Maximum	12.5	12.5	
	Nominal	12.0	12.0	
IEEE 802.11ac (5 GHz)	Maximum	12.5	12.5	12.5
	Nominal	12.0	12.0	12.0

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Mode / Band		Modulated Average - MIMO (dBm)	
		20 MHz Bandwidth	
		Ch. 1-12	Ch. 13
IEEE 802.11g (2.4 GHz)	Maximum	16.5	14.5
	Nominal	16.0	14.0
IEEE 802.11n (2.4 GHz)	Maximum	16.5	14.5
	Nominal	16.0	14.0

Mode / Band		Modulated Average - MIMO (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11a (5 GHz)	Maximum	15.5		
	Nominal	15.0		
IEEE 802.11n (5 GHz)	Maximum	15.5	15.5	
	Nominal	15.0	15.0	
IEEE 802.11ac (5 GHz)	Maximum	15.5	15.5	15.5
	Nominal	15.0	15.0	15.0

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1.3.6 Output Power During Conditions with Simultaneous 2.4 GHz WLAN and 5 GHz WLAN

	# Tx	5 GHz WIFI [dBm]		2.4 GHz WIFI [dBm]		802.11 Modes
		Ant1	Ant2	Ant1	Ant2	
2.4 GHz + 5 GHz	2	A	-	-	B	2.4 GHz: b,g,n 5 GHz: a,n,ac
	2	-	A	B	-	
	2	A	-	B	-	
	2	-	A	-	B	
	3	A	A	B	-	2.4 GHz: b, g, n 5 GHz: n, ac, a (CDD + STBC only)
	3	A	A	-	B	
	3	A	-	B	B	2.4 GHz: n, g (CDD + STBC only) 5 GHz: a, n, ac
	3	-	A	B	B	
	4	A	A	B	B	2.4 GHz: n, g (CDD + STBC only) 5 GHz: n, ac, a (CDD + STBC only)

Maximum Output Power

A = 13.0 dBm B = 16.0 dBm

2.4 GHz WLAN Channels 1 and 11 will operate with Single Tx target powers of 15.0 dBm

2.4 GHz WLAN Channel 12 will not operate with Single Tx target powers over 13.0 dBm

2.4 GHz WLAN Channel 13 will not operate with Single Tx target powers over 11.0 dBm
(Upper tolerance: target+0.5dB)

Reduced Output Power (Held-to-Ear)

A = 12.0 dBm B = 13.0 dBm

2.4 GHz WLAN Channel 12 will not operate with Single Tx target powers over 13.0 dBm

2.4 GHz WLAN Channel 13 will not operate with Single Tx target powers over 11.0 dBm
(Upper tolerance: target+0.5dB)

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1.4 DUT Antenna Locations

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

Table 1-1
Device Edges/Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 13	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 41	Yes	Yes	No	Yes	No	Yes
2.4 GHz WLAN Ant 1	Yes	Yes	Yes	No	No	Yes
2.4 GHz WLAN Ant 2	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN Ant 1	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN Ant 2	Yes	Yes	Yes	No	No	Yes
Bluetooth	Yes	Yes	Yes	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for wireless router SAR or phablet SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02r01 Section III and FCC KDB Publication 648474 D04v01r03. The distances between the transmit antennas and the edges of the device are included in the filing. When wireless router mode is enabled, U-NII-1, U-NII-2A, U-NII-2C operations are disabled.

1.5 Near Field Communications (NFC) Antenna

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

1.6 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, 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.

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

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Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz W-Fi	Yes	Yes	N/A	Yes	
2	GSM voice + 5 GHz W-Fi	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz Bluetooth	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
4	GSM voice + 2.4 GHz W-Fi MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz W-Fi MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz W-Fi + 5 GHz W-Fi	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz W-Fi MIMO + 5 GHz W-Fi MIMO	Yes	Yes	N/A	Yes	
8	UMTS + 2.4 GHz W-Fi	Yes	Yes	Yes	Yes	
9	UMTS + 5 GHz W-Fi	Yes	Yes	Yes	Yes	
10	UMTS + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
11	UMTS + 2.4 GHz W-Fi MIMO	Yes	Yes	Yes	Yes	
12	UMTS + 5 GHz W-Fi MIMO	Yes	Yes	Yes	Yes	
13	UMTS + 2.4 GHz W-Fi + 5 GHz W-Fi	Yes	Yes	Yes	Yes	
14	UMTS + 2.4 GHz W-Fi MIMO + 5 GHz W-Fi MIMO	Yes	Yes	Yes	Yes	
15	LTE + 2.4 GHz W-Fi	Yes	Yes	Yes	Yes	
16	LTE + 5 GHz W-Fi	Yes	Yes	Yes	Yes	
17	LTE + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
18	LTE + 2.4 GHz W-Fi MIMO	Yes	Yes	Yes	Yes	
19	LTE + 5 GHz W-Fi MIMO	Yes	Yes	Yes	Yes	
20	LTE + 2.4 GHz W-Fi + 5 GHz W-Fi	Yes	Yes	Yes	Yes	
21	LTE + 2.4 GHz W-Fi MIMO + 5 GHz W-Fi MIMO	Yes	Yes	Yes	Yes	
22	GPRS/EDGE + 2.4 GHz W-Fi	N/A	N/A	Yes	Yes	
23	GPRS/EDGE + 5 GHz W-Fi	N/A	N/A	Yes	Yes	
24	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
25	GPRS/EDGE + 2.4 GHz W-Fi MIMO	N/A	N/A	Yes	Yes	
26	GPRS/EDGE + 5 GHz W-Fi MIMO	N/A	N/A	Yes	Yes	
27	GPRS/EDGE + 2.4 GHz W-Fi + 5 GHz W-Fi	N/A	N/A	Yes	Yes	
28	GPRS/EDGE + 2.4 GHz W-Fi MIMO + 5 GHz W-Fi MIMO	N/A	N/A	Yes	Yes	

1. Bluetooth cannot transmit simultaneously with WLAN.
2. All licensed modes share the same antenna path and cannot transmit simultaneously.
3. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
4. Per the manufacturer, WIFI Direct is 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. 5 GHz Wireless Router is only supported for the U-NII-3 by S/W, therefore U-NII-1, U-NII-2A, and U-NII-2C were not evaluated for wireless router conditions.
6. This device supports 2x2 MIMO Tx for WLAN. 802.11a/g/n/ac supports CDD and STBC and 802.11n/ac additionally supports SDM. Each WLAN antenna can transmit independently or together when operating with MIMO.
7. This device supports VoLTE.
8. This device supports Bluetooth tethering.

1.7 Miscellaneous SAR Test Considerations

(A) WIFI/BT

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

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

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This device supports IEEE 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only
- b) No aggregate channel configurations
- c) 2 Tx antenna output
- d) 256 QAM is supported
- e) TDWR and Band gap channels are supported

Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg. Because wireless router operations are not supported for U-NII-2A & U-NII-2C WLAN, phablet SAR tests were performed. Phablet SAR was not evaluated for 2.4 GHz WLAN, U-NII-3 WLAN, and Bluetooth operations since wireless router 1g SAR was < 1.2 W/kg.

(B) Licensed Transmitter(s)

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

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

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

This device supports 64QAM on the uplink and 256QAM on the downlink for LTE Operations. Conducted powers for 64QAM uplink configurations were measured per Section 5.1 of FCC KDB Publication 941225 D05v02r05. SAR was not required for 64QAM since the highest maximum output power for 64 QAM is $\leq \frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg, per Section 5.2.4 of FCC KDB Publication 941225 D05v02r05.

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

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

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1.8 Guidance Applied

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

1.9 Device Serial Numbers

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

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2 LTE INFORMATION

LTE Information					
FCC ID	A3LSC03K				
Form Factor	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 13 (779.5 - 784.5 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
Channel Bandwidths	LTE Band 41 (2498.5 - 2687.5 MHz)				
	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 17: 5 MHz, 10 MHz				
	LTE Band 13: 5 MHz, 10 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
Channel Numbers and Frequencies (MHz)	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	Low	Low-Mid	Mid	Mid-High	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 13: 5 MHz	779.5 (23205)	782 (23230)	784.5 (23255)		
LTE Band 13: 10 MHz	N/A	782 (23230)	N/A		
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)	836.5 (20525)	848.3 (20643)		
LTE Band 5 (Cell): 3 MHz	825.5 (20415)	836.5 (20525)	847.5 (20635)		
LTE Band 5 (Cell): 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)		
LTE Band 5 (Cell): 10 MHz	829 (20450)	836.5 (20525)	844 (20600)		
LTE Band 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 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
UE Category	DL UE Cat 18 (QPSK, 16QAM, 64QAM, 256QAM), UL UE Cat 13 (QPSK, 16QAM, 64QAM)				
Modulations Supported in UL	QPSK, 16QAM, 64QAM				
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES				
A-MPR (Additional MPR) disabled for SAR Testing?	YES				
LTE Additional Information	This device does not support full CA features on 3GPP Release 14. All uplink communications are identical to the Release 8 Specifications. The following LTE Release 14 features are not supported: Carrier Aggregation, Relay, HetNet, Enhanced MIMO, eICIC, WiFi Offloading, MDH, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

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3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

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

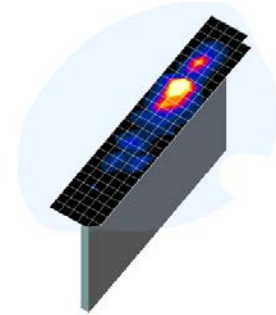


Figure 4-1
Sample SAR Area Scan

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

Frequency	Maximum Area Scan Resolution (mm) ($\Delta x_{\text{area}}, \Delta y_{\text{area}}$)	Maximum Zoom Scan Resolution (mm) ($\Delta x_{\text{zoom}}, \Delta y_{\text{zoom}}$)	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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5.1 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].

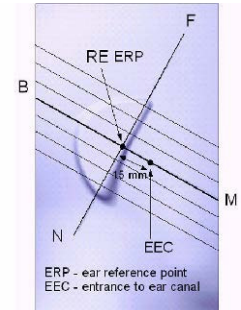


Figure 5-1
Close-Up Side view
of ERP

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

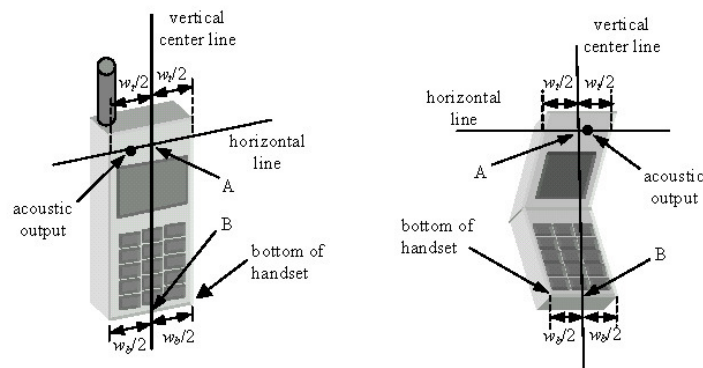


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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6 TEST CONFIGURATION POSITIONS

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.

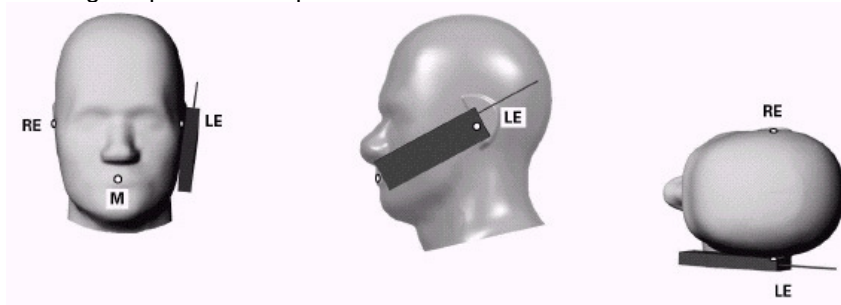


Figure 6-1 Front, Side and Top View of Cheek Position

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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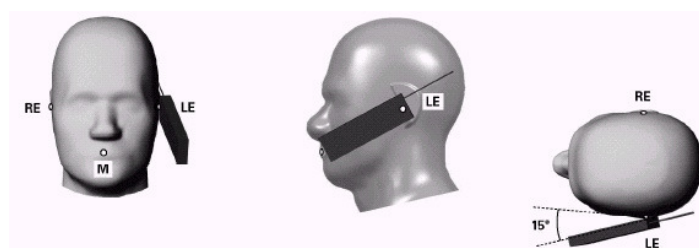


Figure 6-2 Front, Side and Top View of Ear/15° Tilt Position

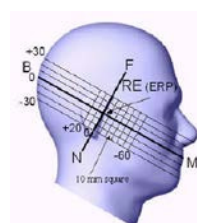


Figure 6-3 Side view w/ relevant markings

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

6.5 Body-Worn Accessory Configurations

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

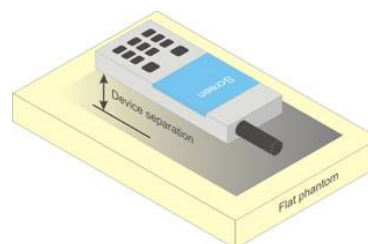


Figure 6-4 Sample Body-Worn Diagram

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

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

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

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

6.6 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. The 1g body and 10g extremity SAR Exclusion Thresholds found in KDB Publication 447498 D01v06 should be applied to determine SAR test requirements.

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

6.7 Wireless Router Configurations

Some battery-operated handsets have the capability to transmit and receive user data through simultaneous transmission of WIFI simultaneously with a separate licensed transmitter. The FCC has provided guidance in FCC KDB Publication 941225 D06v02r01 where SAR test considerations for handsets ($L \times W \geq 9 \text{ cm} \times 5 \text{ cm}$) 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 D01v06 procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

6.8 Phablet Configurations

For smart phones with a display diagonal dimension > 150 mm or an overall diagonal dimension > 160 mm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that

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support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04v01r03 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worn accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna ≤ 25 mm from that surface or edge, in direct contact with the phantom, for 10g SAR. The UMPC mini-tablet 1g SAR at 5 mm is not required. When hotspot mode applies, 10g SAR is required only for the surfaces and edges with hotspot mode 1g SAR > 1.2 W/kg.

6.9 Proximity Sensor Considerations

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

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

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

8.1 Measured and Reported SAR

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

8.2 3G SAR Test Reduction Procedure

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

8.3 Procedures Used to Establish RF Signal for SAR

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

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

8.4 SAR Measurement Conditions for UMTS

8.4.1 Output Power Verification

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

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8.4.2 Head SAR Measurements

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

8.4.3 Body SAR Measurements

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

8.4.4 SAR Measurements with Rel 5 HSDPA

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

8.4.5 SAR Measurements with Rel 6 HSUPA

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

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

8.5 SAR Measurement Conditions for LTE

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

8.5.1 Spectrum Plots for RB Configurations

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

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8.5.2 MPR

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

8.5.3 A-MPR

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

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

- a. Per Section 5.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
 - i. The required channel and offset combination with the highest maximum output power is required for SAR.
 - ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
 - iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
- b. Per Section 5.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 5.2.1.
- c. Per Section 5.2.3, QPSK SAR is not required for the 100% allocation when the highest maximum output power for the 100% allocation is less than the highest maximum output power of the 1 RB and 50% RB allocations and the reported SAR for the 1 RB and 50% RB allocations is < 0.8 W/kg.
- d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to $\frac{1}{2}$ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is < 1.45 W/kg.
- e. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above

8.5.5 TDD

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

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8.6 SAR Testing with 802.11 Transmitters

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

8.6.1 General Device Setup

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

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

8.6.2 U-NII-1 and U-NII-2A

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

8.6.3 U-NII-2C and U-NII-3

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

8.6.4 Initial Test Position Procedure

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

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8.6.5 2.4 GHz SAR Test Requirements

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

- 1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg, no further SAR testing is required for 802.11b DSSS in that exposure configuration.
- 2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

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

8.6.6 OFDM Transmission Mode and SAR Test Channel Selection

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

8.6.7 Initial Test Configuration Procedure

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

When the reported SAR is ≤ 0.8 W/kg, no additional measurements on other test channels are required. Otherwise, SAR is evaluated using the subsequent highest average RF output channel until the reported SAR result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 8.6.6). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.8 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg, no additional SAR tests for the

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subsequent test configurations are required. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.9 MIMO SAR considerations

Per KDB Publication 248227 D01v02r02, the simultaneous SAR provisions in KDB Publication 447498 D01v06 should be applied to determine simultaneous transmission SAR test exclusion for WIFI MIMO. If the sum of 1g single transmission chain SAR measurements is <1.6 W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

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9 RF CONDUCTED POWERS

9.1 GSM Conducted Powers

Table 9-1
Maximum Conducted Power

Maximum Burst-Averaged Output Power										
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	32.35	32.38	30.34	28.84	26.64	26.95	24.89	22.73	20.88
	190	32.23	32.22	30.78	29.31	26.86	27.09	24.85	23.08	21.11
	251	32.54	32.56	30.74	29.15	26.94	27.14	24.95	22.86	20.98
GSM 1900	512	29.80	29.84	27.66	25.67	24.16	25.81	24.58	22.49	20.58
	661	29.48	29.53	27.53	25.56	24.39	25.39	24.34	22.25	20.20
	810	29.57	29.67	27.62	25.51	24.40	25.56	24.42	22.48	20.33

Calculated Maximum Frame-Averaged Output Power										
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 850	128	23.32	23.35	24.32	24.58	23.63	17.92	18.87	18.47	17.87
	190	23.20	23.19	24.76	25.05	23.85	18.06	18.83	18.82	18.10
	251	23.51	23.53	24.72	24.89	23.93	18.11	18.93	18.60	17.97
GSM 1900	512	20.77	20.81	21.64	21.41	21.15	16.78	18.56	18.23	17.57
	661	20.45	20.50	21.51	21.30	21.38	16.36	18.32	17.99	17.19
	810	20.54	20.64	21.60	21.25	21.39	16.53	18.40	18.22	17.32

GSM 850	Frame Avg.Targets:	23.17	23.17	24.48	24.74	23.99	17.97	18.98	18.74	17.99
GSM 1900		20.47	20.47	21.48	21.34	21.49	16.57	18.48	18.24	17.49

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Table 9-2
Hotspot Reduced Conducted Power

Maximum Burst-Averaged Output Power									
		GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 1900	512	26.53	24.65	22.65	20.74	24.98	23.88	21.64	19.83
	661	26.56	24.69	22.58	20.68	24.94	23.63	21.51	19.68
	810	26.74	24.77	22.73	20.86	25.00	23.89	21.61	19.85

Calculated Maximum Frame-Averaged Output Power									
		GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	GPRS [dBm] 3 Tx Slot	GPRS [dBm] 4 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot	EDGE [dBm] 3 Tx Slot	EDGE [dBm] 4 Tx Slot
GSM 1900	512	17.50	18.63	18.39	17.73	15.95	17.86	17.38	16.82
	661	17.53	18.67	18.32	17.67	15.91	17.61	17.25	16.67
	810	17.71	18.75	18.47	17.85	15.97	17.87	17.35	16.84

GSM 1900	Frame Avg.Targets:	18.47	19.98	19.74	18.99	15.47	17.48	17.24	16.99
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Note:

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

GSM Class: B
GPRS Multislot class: 33 (Max 4 Tx uplink slots)
EDGE Multislot class: 33 (Max 4 Tx uplink slots)
DTM Multislot Class: N/A



Figure 9-1
Power Measurement Setup

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9.2 UMTS Conducted Powers

Table 9-3
Maximum Conducted Power

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	
99	WCDMA	12.2 kbps RMC	24.12	24.17	24.19	-
99		12.2 kbps AMR	24.12	24.18	24.11	-
6	HSDPA	Subtest 1	22.92	23.02	23.07	0
6		Subtest 2	22.93	23.03	23.06	0
6		Subtest 3	22.44	22.50	22.53	0.5
6		Subtest 4	22.44	22.51	22.54	0.5
6	HSUPA	Subtest 1	22.74	23.02	23.07	0
6		Subtest 2	20.93	21.01	21.07	2
6		Subtest 3	21.90	21.99	22.03	1
6		Subtest 4	20.92	20.99	21.01	2
6		Subtest 5	22.94	23.01	23.05	0

This device does not support DC-HSDPA.



Figure 9-2
Power Measurement Setup

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9.3 LTE Conducted Powers

9.3.1 LTE Band 12

Table 9-4
LTE Band 12 Conducted Powers - 10 MHz Bandwidth

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23095 (707.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.16	0	0
	1	25	23.12		0
	1	49	23.01		0
	25	0	22.26	0-1	1
	25	12	22.23		1
	25	25	22.14		1
	50	0	22.19		1
16QAM	1	0	22.28	0-1	1
	1	25	22.33		1
	1	49	22.17		1
	25	0	21.33	0-2	2
	25	12	21.31		2
	25	25	21.26		2
	50	0	21.32		2
64QAM	1	0	21.32	0-2	2
	1	25	21.37		2
	1	49	21.26		2
	25	0	20.36	0-3	3
	25	12	20.32		3
	25	25	20.27		3
	50	0	20.32		3

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

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

LTE Band 12 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23035 (701.5 MHz)	23095 (707.5 MHz)	23155 (713.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.02	23.06	23.06	0	0
	1	12	23.06	23.11	23.05		0
	1	24	23.05	23.05	23.01		0
	12	0	22.16	22.17	22.04	0-1	1
	12	6	22.16	22.20	22.15		1
	12	13	22.13	22.13	22.06		1
	25	0	22.16	22.18	22.05		1
16QAM	1	0	22.37	22.41	22.32	0-1	1
	1	12	22.33	22.37	22.31		1
	1	24	22.35	22.34	22.26		1
	12	0	21.23	21.29	21.14	0-2	2
	12	6	21.23	21.32	21.25		2
	12	13	21.19	21.23	21.19		2
	25	0	21.17	21.25	21.06		2
64QAM	1	0	21.30	21.32	21.31	0-2	2
	1	12	21.31	21.39	21.29		2
	1	24	21.25	21.31	21.21		2
	12	0	20.26	20.29	20.20	0-3	3
	12	6	20.18	20.33	20.25		3
	12	13	20.22	20.24	20.16		3
	25	0	20.22	20.28	20.09		3

Table 9-6
LTE Band 12 Conducted Powers - 3 MHz Bandwidth

LTE Band 12 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23025 (700.5 MHz)	23095 (707.5 MHz)	23165 (714.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.99	23.13	23.10	0	0
	1	7	23.07	23.21	23.14		0
	1	14	23.08	23.06	23.00		0
	8	0	22.00	22.16	22.07	0-1	1
	8	4	22.02	22.20	22.10		1
	8	7	22.13	22.15	22.08		1
	15	0	22.15	22.17	22.10		1
16QAM	1	0	22.36	22.39	22.34	0-1	1
	1	7	22.34	22.49	22.43		1
	1	14	22.33	22.38	22.26		1
	8	0	21.13	21.28	21.22	0-2	2
	8	4	21.13	21.35	21.25		2
	8	7	21.25	21.26	21.24		2
	15	0	21.18	21.25	21.16		2
64QAM	1	0	21.32	21.41	21.33	0-2	2
	1	7	21.30	21.46	21.42		2
	1	14	21.28	21.38	21.26		2
	8	0	20.15	20.28	20.22	0-3	3
	8	4	20.14	20.30	20.25		3
	8	7	20.24	20.28	20.20		3
	15	0	20.24	20.29	20.18		3

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Table 9-7
LTE Band 12 Conducted Powers -1.4 MHz Bandwidth

LTE Band 12 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23017 (699.7 MHz)	23095 (707.5 MHz)	23173 (715.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.88	23.03	22.94	0	0
	1	2	22.97	23.08	23.00		0
	1	5	22.90	23.02	22.92		0
	3	0	22.94	23.07	22.95		0
	3	2	22.97	23.12	23.00		0
	3	3	22.91	23.04	22.96		0
	6	0	21.95	22.06	22.01	0-1	1
16QAM	1	0	22.19	22.39	22.24	0-1	1
	1	2	22.32	22.37	22.27		1
	1	5	22.18	22.34	22.23		1
	3	0	22.10	22.20	22.18		1
	3	2	22.15	22.27	22.13		1
	3	3	22.07	22.21	22.11		1
	6	0	21.15	21.21	21.13	0-2	2
64QAM	1	0	21.24	21.30	21.21	0-2	2
	1	2	21.22	21.36	21.25		2
	1	5	21.12	21.25	21.17		2
	3	0	21.15	21.27	21.17		2
	3	2	21.19	21.29	21.19		2
	3	3	21.13	21.25	21.13		2
	6	0	20.05	20.20	20.07	0-3	3

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9.3.2 LTE Band 13

Table 9-8
LTE Band 13 Conducted Powers - 10 MHz Bandwidth

LTE Band 13 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	22.73	0	0
	1	25	22.69		0
	1	49	22.56		0
	25	0	21.80	0-1	1
	25	12	21.70		1
	25	25	21.59		1
	50	0	21.67		1
16QAM	1	0	21.73	0-1	1
	1	25	21.77		1
	1	49	21.69		1
	25	0	20.76	0-2	2
	25	12	20.73		2
	25	25	20.69		2
	50	0	20.72		2
64QAM	1	0	20.79	0-2	2
	1	25	20.75		2
	1	49	20.70		2
	25	0	19.80	0-3	3
	25	12	19.73		3
	25	25	19.68		3
	50	0	19.73		3

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

LTE Band 13 5 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	22.68	0	0
	1	12	22.62		0
	1	24	22.59		0
	12	0	21.62	0-1	1
	12	6	21.69		1
	12	13	21.64		1
	25	0	21.66		1
16QAM	1	0	22.09	0-1	1
	1	12	21.90		1
	1	24	21.84		1
	12	0	20.77	0-2	2
	12	6	20.79		2
	12	13	20.74		2
	25	0	20.71		2
64QAM	1	0	20.96	0-2	2
	1	12	20.87		2
	1	24	20.87		2
	12	0	19.83	0-3	3
	12	6	19.80		3
	12	13	19.78		3
	25	0	19.77		3

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

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9.3.3 LTE Band 5 (Cell)

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

LTE Band 5 (Cell) 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20525 (836.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.17	0	0
	1	25	23.15		0
	1	49	23.13		0
	25	0	22.28	0-1	1
	25	12	22.23		1
	25	25	22.16		1
	50	0	22.19		1
16QAM	1	0	22.29	0-1	1
	1	25	22.28		1
	1	49	22.33		1
	25	0	21.32	0-2	2
	25	12	21.31		2
	25	25	21.22		2
	50	0	21.29		2
64QAM	1	0	21.34	0-2	2
	1	25	21.26		2
	1	49	21.32		2
	25	0	20.36	0-3	3
	25	12	20.32		3
	25	25	20.22		3
	50	0	20.26		3

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

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Table 9-11
LTE Band 5 (Cell) Conducted Powers - 5 MHz Bandwidth

LTE Band 5 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20425 (826.5 MHz)	20525 (836.5 MHz)	20625 (846.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.96	23.19	23.08	0	0
	1	12	22.99	23.14	23.07		0
	1	24	23.07	23.23	23.05		0
	12	0	22.08	22.21	22.02	0-1	1
	12	6	22.03	22.24	22.18		1
	12	13	22.10	22.15	22.11		1
	25	0	22.03	22.22	22.03		1
16QAM	1	0	22.27	22.49	22.32	0-1	1
	1	12	22.34	22.45	22.46		1
	1	24	22.30	22.41	22.32		1
	12	0	21.12	21.36	21.19	0-2	2
	12	6	21.15	21.37	21.25		2
	12	13	21.20	21.28	21.18		2
	25	0	21.40	21.27	21.10		2
64QAM	1	0	21.19	21.46	21.35	0-2	2
	1	12	21.20	21.39	21.25		2
	1	24	21.28	21.50	21.22		2
	12	0	20.17	20.39	20.19	0-3	3
	12	6	20.20	20.35	20.33		3
	12	13	20.25	20.32	20.22		3
	25	0	20.12	20.29	20.12		3

Table 9-12
LTE Band 5 (Cell) Conducted Powers - 3 MHz Bandwidth

LTE Band 5 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20415 (825.5 MHz)	20525 (836.5 MHz)	20635 (847.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.93	23.19	23.12	0	0
	1	7	23.07	23.28	23.14		0
	1	14	22.98	23.12	23.04		0
	8	0	22.02	22.19	22.14	0-1	1
	8	4	22.03	22.24	22.12		1
	8	7	22.00	22.17	22.09		1
	15	0	22.01	22.23	22.11		1
16QAM	1	0	22.25	22.49	22.41	0-1	1
	1	7	22.33	22.34	22.48		1
	1	14	22.26	22.46	22.33		1
	8	0	21.50	21.31	21.22	0-2	2
	8	4	21.16	21.33	21.21		2
	8	7	21.11	21.33	21.18		2
	15	0	21.07	21.28	21.20		2
64QAM	1	0	21.16	21.42	21.40	0-2	2
	1	7	21.30	21.50	21.37		2
	1	14	21.22	21.40	21.23		2
	8	0	20.17	20.35	20.28	0-3	3
	8	4	20.15	20.36	20.25		3
	8	7	20.12	20.34	20.24		3
	15	0	20.09	20.31	20.20		3

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Table 9-13
LTE Band 5 (Cell) Conducted Powers -1.4 MHz Bandwidth

LTE Band 5 (Cell) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20407 (824.7 MHz)	20525 (836.5 MHz)	20643 (848.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.74	23.09	23.04	0	0
	1	2	22.81	23.18	23.07		0
	1	5	22.70	23.04	22.96		0
	3	0	22.77	23.13	23.06		0
	3	2	22.82	23.16	23.03		0
	3	3	22.75	23.11	22.99		0
	6	0	21.76	22.14	22.02	0-1	1
16QAM	1	0	22.06	22.46	22.31	0-1	1
	1	2	22.08	22.48	22.34		1
	1	5	22.00	22.39	22.25		1
	3	0	21.97	22.32	22.22		1
	3	2	21.97	22.33	22.19		1
	3	3	21.90	22.27	22.15		1
	6	0	20.91	21.28	21.11	0-2	2
64QAM	1	0	20.97	21.36	21.21	0-2	2
	1	2	21.02	21.40	21.31		2
	1	5	20.95	21.36	21.23		2
	3	0	20.94	21.34	21.20		2
	3	2	20.99	21.35	21.23		2
	3	3	20.95	21.33	21.19		2
	6	0	19.86	20.22	20.11	0-3	3

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9.3.4 LTE Band 4 (AWS)

Table 9-14
LTE Band 4 (AWS) Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 4 (AWS) 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20175 (1732.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	22.79	0	0
	1	50	22.52		0
	1	99	22.59		0
	50	0	21.58	0-1	1
	50	25	21.60		1
	50	50	21.66		1
	100	0	21.63		1
16QAM	1	0	21.89	0-1	1
	1	50	21.72		1
	1	99	21.74		1
	50	0	20.67	0-2	2
	50	25	20.69		2
	50	50	20.73		2
	100	0	20.69		2
64QAM	1	0	20.98	0-2	2
	1	50	20.74		2
	1	99	20.69		2
	50	0	19.71	0-3	3
	50	25	19.70		3
	50	50	19.75		3
	100	0	19.69		3

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

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

LTE Band 4 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20025 (1717.5 MHz)	20175 (1732.5 MHz)	20325 (1747.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.09	22.78	22.72	0	0
	1	36	22.83	22.63	22.55		0
	1	74	22.85	22.60	22.38		0
	36	0	21.97	21.59	21.65	0-1	1
	36	18	21.88	21.61	21.56		1
	36	37	21.77	21.67	21.51		1
	75	0	21.86	21.62	21.53		1
16QAM	1	0	22.18	22.15	22.08	0-1	1
	1	36	21.92	21.91	21.80		1
	1	74	22.03	21.90	21.94		1
	36	0	21.07	20.68	20.74	0-2	2
	36	18	20.95	20.72	20.63		2
	36	37	20.97	20.74	20.60		2
	75	0	20.91	20.73	20.65		2
64QAM	1	0	21.26	21.00	21.03	0-2	2
	1	36	21.05	20.84	20.85		2
	1	74	21.07	20.83	20.60		2
	36	0	20.03	19.70	19.81	0-3	3
	36	18	20.02	19.74	19.68		3
	36	37	19.83	19.75	19.68		3
	75	0	19.95	19.71	19.66		3

Table 9-16
LTE Band 4 (AWS) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 4 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20000 (1715.0 MHz)	20175 (1732.5 MHz)	20350 (1750.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.01	22.72	22.59	0	0
	1	25	22.91	22.56	22.54		0
	1	49	22.80	22.46	22.27		0
	25	0	21.92	21.58	21.57	0-1	1
	25	12	21.85	21.60	21.53		1
	25	25	21.88	21.60	21.54		1
	50	0	21.80	21.61	21.59		1
16QAM	1	0	22.20	21.97	21.88	0-1	1
	1	25	22.18	21.83	21.85		1
	1	49	22.11	21.81	21.66		1
	25	0	21.01	20.71	20.68	0-2	2
	25	12	20.97	20.67	20.63		2
	25	25	20.87	20.66	20.64		2
	50	0	20.89	20.70	20.64		2
64QAM	1	0	21.22	20.93	20.79	0-2	2
	1	25	21.11	20.85	20.86		2
	1	49	21.10	20.82	20.64		2
	25	0	20.01	19.77	19.70	0-3	3
	25	12	19.96	19.69	19.68		3
	25	25	19.97	19.74	19.61		3
	50	0	19.94	19.70	19.67		3

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Table 9-17
LTE Band 4 (AWS) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 4 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19975 (1712.5 MHz)	20175 (1732.5 MHz)	20375 (1752.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.98	22.56	22.62	0	0
	1	12	22.85	22.51	22.37		0
	1	24	22.89	22.61	22.38		0
	12	0	21.88	21.60	21.58	0-1	1
	12	6	21.89	21.59	21.47		1
	12	13	21.96	21.56	21.43		1
	25	0	21.90	21.58	21.53		1
16QAM	1	0	22.21	21.96	21.92	0-1	1
	1	12	22.08	21.87	21.64		1
	1	24	22.15	21.91	21.82		1
	12	0	21.03	20.71	20.65	0-2	2
	12	6	21.01	20.67	20.60		2
	12	13	21.02	20.69	20.53		2
	25	0	20.94	20.70	20.63		2
64QAM	1	0	21.19	20.97	20.88	0-2	2
	1	12	21.10	20.82	20.70		2
	1	24	21.03	20.78	20.58		2
	12	0	20.03	19.71	19.67	0-3	3
	12	6	20.05	19.71	19.61		3
	12	13	20.04	19.70	19.64		3
	25	0	19.96	19.67	19.64		3

Table 9-18
LTE Band 4 (AWS) Maximum Conducted Powers - 3 MHz Bandwidth

LTE Band 4 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19965 (1711.5 MHz)	20175 (1732.5 MHz)	20385 (1753.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.93	22.57	22.44	0	0
	1	7	23.04	22.68	22.50		0
	1	14	22.80	22.56	22.43		0
	8	0	21.97	21.54	21.41	0-1	1
	8	4	21.86	21.57	21.44		1
	8	7	21.86	21.55	21.38		1
	15	0	21.83	21.55	21.47		1
16QAM	1	0	22.20	21.89	21.85	0-1	1
	1	7	22.23	21.92	21.87		1
	1	14	22.11	21.88	21.71		1
	8	0	21.05	20.70	20.55	0-2	2
	8	4	20.99	20.69	20.64		2
	8	7	20.96	20.65	20.56		2
	15	0	20.93	20.61	20.52		2
64QAM	1	0	21.18	20.78	20.69	0-2	2
	1	7	21.26	20.92	20.78		2
	1	14	21.08	20.85	20.61		2
	8	0	20.06	19.66	19.58	0-3	3
	8	4	19.99	19.69	19.59		3
	8	7	19.95	19.66	19.51		3
	15	0	19.94	19.64	19.57		3

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Table 9-19
LTE Band 4 (AWS) Maximum Conducted Powers -1.4 MHz Bandwidth

LTE Band 4 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19957 (1710.7 MHz)	20175 (1732.5 MHz)	20393 (1754.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.82	22.47	22.34	0	0
	1	2	22.94	22.48	22.35		0
	1	5	22.93	22.45	22.33		0
	3	0	22.86	22.50	22.34		0
	3	2	22.89	22.49	22.37		0
	3	3	22.85	22.51	22.33		0
	6	0	21.90	21.48	21.42	0-1	1
16QAM	1	0	22.10	21.77	21.62	0-1	1
	1	2	22.16	21.94	21.73		1
	1	5	22.13	21.80	21.67		1
	3	0	21.98	21.70	21.54		1
	3	2	22.09	21.68	21.58		1
	3	3	22.01	21.65	21.57		1
	6	0	21.04	20.65	20.55	0-2	2
64QAM	1	0	21.12	20.81	20.72	0-2	2
	1	2	21.11	20.82	20.61		2
	1	5	21.13	20.75	20.59		2
	3	0	21.09	20.70	20.62		2
	3	2	21.10	20.71	20.64		2
	3	3	21.05	20.68	20.58		2
	6	0	19.99	19.56	19.48	0-3	3

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

LTE Band 4 (AWS) 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20175 (1732.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	19.37	0	0
	1	50	19.31		0
	1	99	19.41		0
	50	0	19.34	0-1	0
	50	25	19.40		0
	50	50	19.45		0
	100	0	19.39		0
16QAM	1	0	19.44	0-1	0
	1	50	19.49		0
	1	99	19.50		0
	50	0	19.28	0-2	0
	50	25	19.37		0
	50	50	19.44		0
	100	0	19.35		0
64QAM	1	0	19.41	0-2	0
	1	50	19.39		0
	1	99	19.47		0
	50	0	19.25	0-3	0
	50	25	19.30		0
	50	50	19.38		0
	100	0	19.29		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.

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Table 9-21
LTE Band 4 (AWS) Hotspot Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 4 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20025 (1717.5 MHz)	20175 (1732.5 MHz)	20325 (1747.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.41	19.32	19.31	0	0
	1	36	19.26	19.25	19.13		0
	1	74	19.24	19.27	19.08		0
	36	0	19.31	19.28	19.27	0-1	0
	36	18	19.34	19.33	19.22		0
	36	37	19.22	19.35	19.19		0
	75	0	19.21	19.36	19.20		0
16QAM	1	0	19.49	19.48	19.47	0-1	0
	1	36	19.39	19.41	19.29		0
	1	74	19.42	19.49	19.28		0
	36	0	19.36	19.38	19.42	0-2	0
	36	18	19.42	19.40	19.32		0
	36	37	19.29	19.39	19.30		0
	75	0	19.27	19.38	19.30		0
64QAM	1	0	19.50	19.47	19.46	0-2	0
	1	36	19.46	19.41	19.25		0
	1	74	19.41	19.43	19.20		0
	36	0	19.40	19.38	19.37	0-3	0
	36	18	19.42	19.39	19.21		0
	36	37	19.32	19.41	19.24		0
	75	0	19.32	19.39	19.20		0

Table 9-22
LTE Band 4 (AWS) Hotspot Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 4 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20000 (1715.0 MHz)	20175 (1732.5 MHz)	20350 (1750.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.34	19.28	19.25	0	0
	1	25	19.26	19.30	19.18		0
	1	49	19.27	19.24	19.06		0
	25	0	19.34	19.35	19.29	0-1	0
	25	12	19.36	19.37	19.24		0
	25	25	19.34	19.36	19.30		0
	50	0	19.36	19.35	19.27		0
16QAM	1	0	19.49	19.48	19.39	0-1	0
	1	25	19.43	19.49	19.40		0
	1	49	19.48	19.38	19.26		0
	25	0	19.38	19.44	19.33	0-2	0
	25	12	19.40	19.45	19.32		0
	25	25	19.34	19.47	19.34		0
	50	0	19.38	19.42	19.36		0
64QAM	1	0	19.47	19.49	19.42	0-2	0
	1	25	19.44	19.47	19.38		0
	1	49	19.42	19.45	19.27		0
	25	0	19.41	19.43	19.34	0-3	0
	25	12	19.43	19.42	19.31		0
	25	25	19.45	19.43	19.32		0
	50	0	19.41	19.41	19.32		0

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Table 9-23
LTE Band 4 (AWS) Hotspot Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 4 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19975 (1712.5 MHz)	20175 (1732.5 MHz)	20375 (1752.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.31	19.29	19.23	0	0
	1	12	19.31	19.26	19.06		0
	1	24	19.28	19.32	19.10		0
	12	0	19.38	19.33	19.26	0-1	0
	12	6	19.37	19.35	19.15		0
	12	13	19.31	19.32	19.17		0
	25	0	19.27	19.35	19.24		0
16QAM	1	0	19.48	19.44	19.36	0-1	0
	1	12	19.47	19.45	19.22		0
	1	24	19.44	19.46	19.27		0
	12	0	19.41	19.39	19.29	0-2	0
	12	6	19.43	19.42	19.24		0
	12	13	19.36	19.40	19.20		0
	25	0	19.32	19.39	19.32		0
64QAM	1	0	19.48	19.46	19.31	0-2	0
	1	12	19.45	19.42	19.28		0
	1	24	19.43	19.48	19.30		0
	12	0	19.46	19.41	19.31	0-3	0
	12	6	19.50	19.44	19.23		0
	12	13	19.38	19.39	19.25		0
	25	0	19.39	19.40	19.35		0

Table 9-24
LTE Band 4 (AWS) Hotspot Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 4 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19965 (1711.5 MHz)	20175 (1732.5 MHz)	20385 (1753.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.41	19.31	19.16	0	0
	1	7	19.48	19.44	19.24		0
	1	14	19.36	19.37	19.18		0
	8	0	19.44	19.34	19.18	0-1	0
	8	4	19.45	19.39	19.20		0
	8	7	19.42	19.36	19.22		0
	15	0	19.42	19.40	19.20		0
16QAM	1	0	19.50	19.47	19.31	0-1	0
	1	7	19.48	19.49	19.42		0
	1	14	19.47	19.47	19.33		0
	8	0	19.46	19.46	19.28	0-2	0
	8	4	19.49	19.48	19.32		0
	8	7	19.48	19.43	19.29		0
	15	0	19.49	19.46	19.27		0
64QAM	1	0	19.45	19.47	19.38	0-2	0
	1	7	19.49	19.44	19.42		0
	1	14	19.46	19.48	19.32		0
	8	0	19.44	19.46	19.23	0-3	0
	8	4	19.46	19.44	19.26		0
	8	7	19.48	19.39	19.27		0
	15	0	19.45	19.45	19.26		0

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Table 9-25
LTE Band 4 (AWS) Hotspot Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 4 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19957 (1710.7 MHz)	20175 (1732.5 MHz)	20393 (1754.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.20	19.19	19.00	0	0
	1	2	19.31	19.27	19.10		0
	1	5	19.23	19.20	19.03		0
	3	0	19.25	19.26	19.05		0
	3	2	19.29	19.28	19.07		0
	3	3	19.28	19.22	19.14		0
	6	0	19.26	19.25	19.09	0-1	0
16QAM	1	0	19.33	19.30	19.24	0-1	0
	1	2	19.35	19.36	19.22		0
	1	5	19.38	19.38	19.21		0
	3	0	19.38	19.37	19.19		0
	3	2	19.40	19.38	19.22		0
	3	3	19.36	19.24	19.18		0
	6	0	19.37	19.34	19.19	0-2	0
64QAM	1	0	19.43	19.41	19.19	0-2	0
	1	2	19.45	19.38	19.27		0
	1	5	19.41	19.43	19.23		0
	3	0	19.39	19.40	19.24		0
	3	2	19.46	19.38	19.31		0
	3	3	19.44	19.39	19.26		0
	6	0	19.38	19.36	19.19	0-3	0

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Table 9-26
LTE Band 4 (AWS) Grip Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 4 (AWS) 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20175 (1732.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	19.74	0	0
	1	50	19.71		0
	1	99	19.79		0
	50	0	19.76	0-1	0
	50	25	19.78		0
	50	50	19.83		0
	100	0	19.77		0
16QAM	1	0	19.99	0-1	0
	1	50	19.93		0
	1	99	20.00		0
	50	0	19.81	0-2	0
	50	25	19.83		0
	50	50	19.92		0
	100	0	19.85		0
64QAM	1	0	19.86	0-2	0
	1	50	19.91		0
	1	99	19.96		0
	50	0	19.77	0-3	0
	50	25	19.83		0
	50	50	19.90		0
	100	0	19.83		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.

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Table 9-27
LTE Band 4 (AWS) Grip Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 4 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20025 (1717.5 MHz)	20175 (1732.5 MHz)	20325 (1747.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.76	19.74	19.65	0	0
	1	36	19.61	19.62	19.42		0
	1	74	19.60	19.63	19.38		0
	36	0	19.65	19.68	19.63	0-1	0
	36	18	19.69	19.71	19.55		0
	36	37	19.56	19.73	19.53		0
	75	0	19.56	19.67	19.50		0
16QAM	1	0	19.86	19.90	19.84	0-1	0
	1	36	19.75	19.74	19.62		0
	1	74	19.73	19.75	19.54		0
	36	0	19.71	19.73	19.74	0-2	0
	36	18	19.74	19.78	19.60		0
	36	37	19.64	19.75	19.59		0
	75	0	19.63	19.77	19.57		0
64QAM	1	0	19.88	19.90	19.88	0-2	0
	1	36	19.76	19.78	19.63		0
	1	74	19.77	19.80	19.55		0
	36	0	19.72	19.70	19.72	0-3	0
	36	18	19.73	19.76	19.59		0
	36	37	19.65	19.77	19.59		0
	75	0	19.64	19.75	19.60		0

Table 9-28
LTE Band 4 (AWS) Grip Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 4 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20000 (1715.0 MHz)	20175 (1732.5 MHz)	20350 (1750.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.71	19.59	19.51	0	0
	1	25	19.60	19.58	19.48		0
	1	49	19.65	19.59	19.41		0
	25	0	19.69	19.66	19.58	0-1	0
	25	12	19.70	19.68	19.55		0
	25	25	19.65	19.69	19.53		0
	50	0	19.69	19.63	19.56		0
16QAM	1	0	19.80	19.74	19.66	0-1	0
	1	25	19.77	19.76	19.60		0
	1	49	19.76	19.68	19.48		0
	25	0	19.74	19.71	19.70	0-2	0
	25	12	19.74	19.77	19.59		0
	25	25	19.68	19.75	19.60		0
	50	0	19.71	19.76	19.61		0
64QAM	1	0	19.91	19.74	19.77	0-2	0
	1	25	19.71	19.77	19.67		0
	1	49	19.83	19.72	19.46		0
	25	0	19.72	19.72	19.63	0-3	0
	25	12	19.76	19.76	19.65		0
	25	25	19.75	19.78	19.64		0
	50	0	19.77	19.75	19.65		0

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Table 9-29
LTE Band 4 (AWS) Grip Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 4 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19975 (1712.5 MHz)	20175 (1732.5 MHz)	20375 (1752.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.67	19.70	19.53	0	0
	1	12	19.65	19.64	19.39		0
	1	24	19.59	19.68	19.42		0
	12	0	19.74	19.69	19.57	0-1	0
	12	6	19.74	19.71	19.50		0
	12	13	19.61	19.73	19.47		0
	25	0	19.59	19.69	19.57		0
16QAM	1	0	19.81	19.79	19.69	0-1	0
	1	12	19.82	19.78	19.60		0
	1	24	19.75	19.82	19.52		0
	12	0	19.79	19.72	19.67	0-2	0
	12	6	19.78	19.77	19.55		0
	12	13	19.66	19.79	19.54		0
	25	0	19.68	19.75	19.63		0
64QAM	1	0	19.86	19.83	19.73	0-2	0
	1	12	19.82	19.82	19.55		0
	1	24	19.74	19.89	19.57		0
	12	0	19.80	19.78	19.67	0-3	0
	12	6	19.79	19.74	19.56		0
	12	13	19.71	19.79	19.53		0
	25	0	19.68	19.74	19.64		0

Table 9-30
LTE Band 4 (AWS) Grip Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 4 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19965 (1711.5 MHz)	20175 (1732.5 MHz)	20385 (1753.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.48	19.61	19.46	0	0
	1	7	19.53	19.74	19.53		0
	1	14	19.46	19.63	19.42		0
	8	0	19.50	19.61	19.46	0-1	0
	8	4	19.49	19.67	19.51		0
	8	7	19.51	19.65	19.46		0
	15	0	19.50	19.66	19.47		0
16QAM	1	0	19.58	19.79	19.64	0-1	0
	1	7	19.76	19.88	19.68		0
	1	14	19.63	19.75	19.69		0
	8	0	19.54	19.76	19.56	0-2	0
	8	4	19.62	19.80	19.61		0
	8	7	19.61	19.77	19.54		0
	15	0	19.60	19.75	19.60		0
64QAM	1	0	19.66	19.79	19.59	0-2	0
	1	7	19.70	19.92	19.67		0
	1	14	19.65	19.86	19.59		0
	8	0	19.56	19.72	19.51	0-3	0
	8	4	19.60	19.77	19.56		0
	8	7	19.57	19.79	19.52		0
	15	0	19.56	19.77	19.50		0

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Table 9-31
LTE Band 4 (AWS) Grip Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 4 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19957 (1710.7 MHz)	20175 (1732.5 MHz)	20393 (1754.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.55	19.61	19.47	0	0
	1	2	19.67	19.68	19.49		0
	1	5	19.68	19.72	19.44		0
	3	0	19.60	19.66	19.46		0
	3	2	19.59	19.70	19.51		0
	3	3	19.66	19.71	19.46		0
	6	0	19.66	19.69	19.48	0-1	0
16QAM	1	0	19.69	19.81	19.59	0-1	0
	1	2	19.72	19.84	19.62		0
	1	5	19.81	19.79	19.67		0
	3	0	19.79	19.82	19.56		0
	3	2	19.75	19.80	19.72		0
	3	3	19.66	19.81	19.61		0
	6	0	19.74	19.80	19.60	0-2	0
64QAM	1	0	19.84	19.80	19.59	0-2	0
	1	2	19.89	19.86	19.58		0
	1	5	19.87	19.94	19.56		0
	3	0	19.88	19.84	19.60		0
	3	2	19.91	19.89	19.70		0
	3	3	19.89	19.83	19.64		0
	6	0	19.79	19.77	19.57	0-3	0

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9.3.5 LTE Band 41

Table 9-32
LTE Band 41 Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.41	24.71	24.92	24.73	24.83	0	0
	1	50	24.17	24.47	24.60	24.45	24.64		0
	1	99	24.07	24.46	24.52	24.48	24.56		0
	50	0	23.36	23.64	23.85	23.65	23.74	0-1	1
	50	25	23.28	23.56	23.76	23.53	23.67		1
	50	50	23.20	23.49	23.60	23.46	23.58		1
	100	0	23.29	23.58	23.72	23.52	23.71		1
16QAM	1	0	23.67	23.84	24.00	23.92	23.96	0-1	1
	1	50	23.46	23.72	23.90	23.70	23.84		1
	1	99	23.38	23.69	23.86	23.74	23.80		1
	50	0	22.48	22.76	22.95	22.74	22.88	0-2	2
	50	25	22.38	22.66	22.85	22.65	22.81		2
	50	50	22.33	22.58	22.71	22.49	22.75		2
	100	0	22.41	22.67	22.84	22.64	22.77		2
64QAM	1	0	22.50	22.72	22.97	22.73	22.92	0-2	2
	1	50	22.31	22.50	22.65	22.45	22.71		2
	1	99	22.17	22.48	22.57	22.44	22.61		2
	50	0	21.48	21.74	21.96	21.75	21.92	0-3	3
	50	25	21.41	21.68	21.85	21.64	21.83		3
	50	50	21.34	21.59	21.72	21.55	21.78		3
	100	0	21.38	21.62	21.83	21.60	21.79		3

Table 9-33
LTE Band 41 Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.41	24.84	24.76	24.89	24.96	0	0
	1	36	24.29	24.65	24.58	24.68	24.80		0
	1	74	24.29	24.62	24.56	24.71	24.71		0
	36	0	23.40	23.76	23.78	23.81	23.93	0-1	1
	36	18	23.39	23.72	23.67	23.78	23.87		1
	36	37	23.36	23.65	23.59	23.73	23.77		1
	75	0	23.37	23.66	23.66	23.74	23.91		1
16QAM	1	0	23.62	23.99	23.91	24.00	23.95	0-1	1
	1	36	23.45	23.82	23.76	23.86	23.85		1
	1	74	23.46	23.80	23.74	23.89	23.80		1
	36	0	22.54	22.88	22.84	22.94	22.99	0-2	2
	36	18	22.51	22.81	22.78	22.87	22.92		2
	36	37	22.49	22.76	22.67	22.80	22.84		2
	75	0	22.46	22.80	22.75	22.86	22.95		2
64QAM	1	0	22.24	22.62	22.62	22.66	22.84	0-2	2
	1	36	22.09	22.44	22.38	22.47	22.57		2
	1	74	22.10	22.48	22.39	22.55	22.51		2
	36	0	21.52	21.89	21.82	21.89	22.00	0-3	3
	36	18	21.47	21.83	21.75	21.84	21.98		3
	36	37	21.46	21.72	21.65	21.76	21.86		3
	75	0	21.50	21.83	21.77	21.86	21.91		3

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Table 9-34
LTE Band 41 Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.35	24.79	24.70	24.78	24.90	0	0
	1	25	24.31	24.64	24.59	24.69	24.76		0
	1	49	24.25	24.63	24.62	24.75	24.73		0
	25	0	23.36	23.71	23.70	23.77	23.80	0-1	1
	25	12	23.36	23.68	23.68	23.74	23.80		1
	25	25	23.33	23.66	23.57	23.69	23.72		1
16QAM	50	0	23.38	23.70	23.68	23.75	23.80	1	
	1	0	23.55	23.98	23.91	23.95	24.00	0-1	1
	1	25	23.49	23.82	23.77	23.86	23.93		1
	1	49	23.48	23.85	23.75	23.93	23.92		1
	25	0	22.40	22.78	22.74	22.79	22.87	0-2	2
	25	12	22.41	22.72	22.70	22.76	22.82		2
25	25	22.37	22.68	22.61	22.70	22.75	2		
64QAM	50	0	22.48	22.79	22.78	22.86	22.90	2	
	1	0	22.18	22.52	22.55	22.64	22.68	0-2	2
	1	25	22.14	22.44	22.40	22.48	22.55		2
	1	49	22.08	22.45	22.41	22.52	22.50		2
	25	0	21.53	21.89	21.86	21.95	22.00	0-3	3
	25	12	21.52	21.89	21.85	21.93	21.90		3
25	25	21.49	21.80	21.76	21.82	21.89	3		
	50	0	21.47	21.78	21.76	21.88	21.88	3	

Table 9-35
LTE Band 41 Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.32	24.67	24.60	24.68	24.91	0	0
	1	12	24.32	24.63	24.59	24.59	24.86		0
	1	24	24.24	24.55	24.48	24.58	24.78		0
	12	0	23.36	23.66	23.68	23.76	23.86	0-1	1
	12	6	23.34	23.70	23.64	23.76	23.87		1
	12	13	23.31	23.64	23.58	23.72	23.82		1
	25	0	23.33	23.67	23.62	23.73	23.88		1
16QAM	1	0	23.52	23.84	23.84	23.90	24.00	0-1	1
	1	12	23.48	23.81	23.78	23.86	23.99		1
	1	24	23.43	23.79	23.73	23.80	23.99		1
	12	0	22.43	22.85	22.79	22.87	23.00	0-2	2
	12	6	22.45	22.83	22.77	22.86	22.95		2
	12	13	22.46	22.75	22.72	22.81	22.99		2
	25	0	22.37	22.72	22.69	22.75	22.92		2
64QAM	1	0	22.12	22.45	22.43	22.49	22.66	0-2	2
	1	12	22.09	22.42	22.39	22.47	22.67		2
	1	24	22.08	22.37	22.35	22.41	22.63		2
	12	0	21.51	21.87	21.79	21.90	21.95	0-3	3
	12	6	21.49	21.84	21.82	21.88	21.96		3
	12	13	21.47	21.71	21.76	21.86	21.89		3
	25	0	21.50	21.81	21.76	21.85	21.96		3

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Table 9-36
LTE Band 41 Hotspot Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	22.45	22.77	22.79	22.71	22.70	0	0
	1	50	22.22	22.52	22.54	22.54	22.54		0
	1	99	22.14	22.51	22.42	22.46	22.51		0
	50	0	22.39	22.66	22.76	22.65	22.70	0-1	0
	50	25	22.29	22.60	22.68	22.58	22.65		0
	50	50	22.23	22.51	22.59	22.61	22.56		0
100	0	22.31	22.62	22.69	22.60	22.66	0		
16QAM	1	0	22.58	22.93	22.96	22.90	22.87	0-1	0
	1	50	22.36	22.67	22.71	22.72	22.72		0
	1	99	22.32	22.62	22.55	22.66	22.71		0
	50	0	22.51	22.79	22.88	22.76	22.80	0-2	0
	50	25	22.44	22.72	22.77	22.69	22.74		0
	50	50	22.36	22.63	22.69	22.64	22.68		0
100	0	22.46	22.74	22.82	22.70	22.76	0		
64QAM	1	0	22.23	22.50	22.66	22.55	22.53	0-2	0
	1	50	22.01	22.29	22.39	22.38	22.36		0
	1	99	21.89	22.34	22.24	22.27	22.32		0
	50	0	21.52	21.80	21.93	21.76	21.79	0-3	1
	50	25	21.43	21.74	21.78	21.69	21.78		1
	50	50	21.36	21.61	21.69	21.68	21.67		1
100	0	21.44	21.70	21.79	21.67	21.74	1		

Table 9-37
LTE Band 41 Hotspot Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	22.23	22.64	22.82	22.64	22.62	0	0
	1	36	22.09	22.49	22.63	22.52	22.51		0
	1	74	22.08	22.51	22.50	22.43	22.46		0
	36	0	22.21	22.59	22.76	22.62	22.62	0-1	0
	36	18	22.21	22.57	22.69	22.65	22.61		0
	36	37	22.13	22.50	22.62	22.56	22.57		0
75	0	22.17	22.54	22.68	22.52	22.57	0		
16QAM	1	0	22.47	22.91	22.97	22.94	22.93	0-1	0
	1	36	22.46	22.80	22.81	22.82	22.81		0
	1	74	22.38	22.83	22.71	22.74	22.75		0
	36	0	22.31	22.64	22.83	22.66	22.68	0-2	0
	36	18	22.31	22.61	22.79	22.70	22.69		0
	36	37	22.27	22.59	22.68	22.61	22.64		0
75	0	22.32	22.64	22.71	22.64	22.67	0		
64QAM	1	0	22.30	22.60	22.79	22.55	22.65	0-2	0
	1	36	22.19	22.50	22.58	22.53	22.52		0
	1	74	22.16	22.59	22.45	22.43	22.49		0
	36	0	21.37	21.70	21.76	21.57	21.69	0-3	1
	36	18	21.34	21.62	21.73	21.58	21.67		1
	36	37	21.31	21.58	21.62	21.52	21.59		1
75	0	21.38	21.67	21.74	21.60	21.71	1		

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Table 9-38
LTE Band 41 Hotspot Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	22.26	22.60	22.64	22.43	22.64	0	0
	1	25	22.16	22.54	22.51	22.42	22.54		0
	1	49	22.14	22.46	22.41	22.39	22.55		0
	25	0	22.22	22.59	22.61	22.40	22.63	0-1	0
	25	12	22.23	22.57	22.59	22.46	22.61		0
	25	25	22.19	22.53	22.52	22.39	22.59		0
50	0	22.24	22.60	22.60	22.38	22.62	0		
16QAM	1	0	22.53	22.90	22.87	22.72	22.96	0-1	0
	1	25	22.47	22.83	22.78	22.73	22.86		0
	1	49	22.48	22.80	22.68	22.64	22.85		0
	25	0	22.30	22.64	22.67	22.46	22.69	0-2	0
	25	12	22.27	22.65	22.64	22.49	22.68		0
	25	25	22.21	22.55	22.58	22.43	22.66		0
50	0	22.35	22.71	22.69	22.49	22.74	0		
64QAM	1	0	22.29	22.63	22.71	22.49	22.79	0-2	0
	1	25	22.19	22.54	22.59	22.48	22.67		0
	1	49	22.16	22.50	22.50	22.38	22.63		0
	25	0	21.39	21.72	21.78	21.57	21.85	0-3	1
	25	12	21.40	21.73	21.75	21.61	21.84		1
	25	25	21.35	21.66	21.67	21.54	21.80		1
50	0	21.37	21.69	21.68	21.49	21.73	1		

Table 9-39
LTE Band 41 Hotspot Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	22.23	22.57	22.54	22.40	22.48	0	0
	1	12	22.24	22.54	22.51	22.38	22.47		0
	1	24	22.17	22.53	22.43	22.31	22.42		0
	12	0	22.26	22.59	22.57	22.40	22.50	0-1	0
	12	6	22.27	22.64	22.56	22.43	22.54		0
	12	13	22.25	22.58	22.48	22.38	22.52		0
25	0	22.21	22.58	22.52	22.41	22.56	0		
16QAM	1	0	22.54	22.86	22.78	22.69	22.80	0-1	0
	1	12	22.55	22.84	22.74	22.66	22.77		0
	1	24	22.49	22.80	22.66	22.62	22.72		0
	12	0	22.36	22.64	22.63	22.47	22.60	0-2	0
	12	6	22.37	22.70	22.64	22.48	22.58		0
	12	13	22.28	22.61	22.55	22.42	22.57		0
25	0	22.30	22.59	22.57	22.39	22.55	0		
64QAM	1	0	22.26	22.51	22.60	22.44	22.45	0-2	0
	1	12	22.28	22.55	22.58	22.43	22.46		0
	1	24	22.23	22.50	22.51	22.38	22.40		0
	12	0	21.42	21.72	21.69	21.52	21.61	0-3	1
	12	6	21.41	21.70	21.70	21.51	21.64		1
	12	13	21.37	21.65	21.66	21.45	21.62		1
25	0	21.41	21.69	21.69	21.51	21.61	1		

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Table 9-40
LTE Band 41 Grip Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.41	23.74	23.86	23.71	23.75	0	0
	1	50	23.22	23.49	23.58	23.56	23.57		0
	1	99	23.12	23.50	23.45	23.47	23.52		0
	50	0	23.39	23.69	23.77	23.66	23.70	0-1	0
	50	25	23.31	23.61	23.68	23.58	23.68		0
	50	50	23.25	23.52	23.57	23.55	23.59		0
	100	0	23.36	23.64	23.71	23.57	23.66	0	
16QAM	1	0	23.63	23.94	23.97	23.90	23.94	0-1	0
	1	50	23.41	23.69	23.78	23.76	23.76		0
	1	99	23.31	23.73	23.65	23.67	23.71		0
	50	0	22.52	22.81	22.89	22.76	22.83	0-2	1
	50	25	22.43	22.71	22.78	22.68	22.78		1
	50	50	22.37	22.64	22.67	22.67	22.70		1
	100	0	22.46	22.73	22.84	22.71	22.79	1	
64QAM	1	0	22.24	22.54	22.72	22.51	22.54	0-2	1
	1	50	22.02	22.29	22.40	22.37	22.38		1
	1	99	21.91	22.33	22.26	22.28	22.33		1
	50	0	21.51	21.81	21.90	21.78	21.86	0-3	2
	50	25	21.44	21.72	21.84	21.68	21.78		2
	50	50	21.37	21.64	21.67	21.67	21.74		2
	100	0	21.45	21.71	21.79	21.69	21.76	2	

Table 9-41
LTE Band 41 Grip Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.46	23.73	23.89	23.71	23.71	0	0
	1	36	23.33	23.61	23.67	23.62	23.60		0
	1	74	23.30	23.67	23.55	23.54	23.55		0
	36	0	23.46	23.75	23.84	23.74	23.74	0-1	0
	36	18	23.43	23.71	23.78	23.79	23.71		0
	36	37	23.38	23.68	23.69	23.72	23.63		0
	75	0	23.40	23.68	23.73	23.65	23.66		0
16QAM	1	0	23.78	23.96	24.00	23.81	23.94	0-1	0
	1	36	23.63	23.90	23.96	23.74	23.88		0
	1	74	23.57	23.95	23.91	23.66	23.83		0
	36	0	22.51	22.82	22.90	22.65	22.74	0-2	1
	36	18	22.55	22.80	22.87	22.66	22.73		1
	36	37	22.47	22.72	22.74	22.69	22.67		1
	75	0	22.51	22.78	22.84	22.67	22.71		1
64QAM	1	0	22.49	22.77	22.90	22.65	22.72	0-2	1
	1	36	22.35	22.64	22.71	22.58	22.62		1
	1	74	22.34	22.74	22.60	22.56	22.55		1
	36	0	21.56	21.82	21.88	21.64	21.77	0-3	2
	36	18	21.54	21.78	21.83	21.68	21.73		2
	36	37	21.48	21.73	21.74	21.63	21.69		2
	75	0	21.55	21.81	21.85	21.62	21.74		2

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Table 9-42
LTE Band 41 Grip Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.44	23.69	23.75	23.57	23.79	0	0
	1	25	23.41	23.64	23.64	23.57	23.68		0
	1	49	23.35	23.58	23.56	23.49	23.72		0
	25	0	23.44	23.74	23.76	23.57	23.77	0-1	0
	25	12	23.40	23.69	23.71	23.61	23.74		0
	25	25	23.36	23.62	23.61	23.55	23.69		0
16QAM	50	0	23.43	23.66	23.73	23.54	23.76	0	
	1	0	23.71	23.89	23.96	23.89	23.93	0-1	0
	1	25	23.68	23.83	23.90	23.91	23.89		0
	1	49	23.57	23.78	23.82	23.84	23.88		0
	25	0	22.47	22.74	22.78	22.62	22.78	0-2	1
	25	12	22.45	22.75	22.80	22.67	22.76		1
25	25	22.40	22.68	22.71	22.61	22.71	1		
64QAM	50	0	22.51	22.80	22.80	22.66	22.83	1	
	1	0	22.45	22.74	22.84	22.63	22.82	0-2	1
	1	25	22.37	22.65	22.74	22.64	22.71		1
	1	49	22.31	22.59	22.65	22.56	22.69		1
	25	0	21.58	21.82	21.90	21.66	21.89	0-3	2
	25	12	21.54	21.84	21.86	21.78	21.90		2
25	25	21.52	21.80	21.76	21.72	21.85	2		
	50	0	21.48	21.79	21.86	21.65	21.83	2	

Table 9-43
LTE Band 41 Grip Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.35	23.64	23.68	23.58	23.70	0	0
	1	12	23.37	23.63	23.68	23.57	23.72		0
	1	24	23.28	23.59	23.61	23.52	23.63		0
	12	0	23.37	23.65	23.71	23.63	23.74	0-1	0
	12	6	23.35	23.66	23.75	23.61	23.77		0
	12	13	23.36	23.63	23.65	23.56	23.73		0
	25	0	23.34	23.64	23.72	23.58	23.75		0
16QAM	1	0	23.64	23.92	23.98	23.89	23.93	0-1	0
	1	12	23.62	23.90	23.96	23.84	23.92		0
	1	24	23.56	23.86	23.93	23.74	23.86		0
	12	0	22.45	22.72	22.80	22.70	22.83	0-2	1
	12	6	22.47	22.76	22.81	22.71	22.81		1
	12	13	22.43	22.73	22.73	22.66	22.79		1
	25	0	22.42	22.70	22.72	22.64	22.76		1
64QAM	1	0	22.37	22.64	22.76	22.66	22.77	0-2	1
	1	12	22.36	22.64	22.75	22.64	22.75		1
	1	24	22.31	22.59	22.67	22.60	22.73		1
	12	0	21.53	21.79	21.87	21.78	21.86	0-3	2
	12	6	21.51	21.77	21.84	21.76	21.87		2
	12	13	21.49	21.76	21.86	21.72	21.81		2
	25	0	21.53	21.82	21.88	21.74	21.88		2

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9.4 WLAN Conducted Powers

Table 9-44
2.4 GHz WLAN Maximum Average RF Power – Ant 1

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	19.80	16.41	16.23
2437	6	19.98	16.62	16.56
2462	11	20.07	16.56	16.60

Table 9-45
2.4 GHz WLAN Maximum Average RF Power – Ant 2

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	20.41	15.47	15.47
2437	6	20.32	16.84	16.79
2462	11	19.33	17.20	17.05

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Table 9-46
5 GHz WLAN Maximum Average RF Power – Ant 1

5GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5190	38	16.74	16.67
5230	46	16.82	16.73
5270	54	16.73	16.66
5310	62	15.92	15.94
5510	102	17.13	17.11
5590	118	17.13	17.13
5630	126	17.10	17.06
5710	142	16.97	17.02
5755	151	17.14	17.17
5795	159	17.15	17.08

5GHz (80MHz) Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11ac
		Average
5210	42	16.76
5290	58	15.02
5530	106	15.24
5610	122	17.22
5690	138	16.94
5775	155	17.03

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Table 9-47
5 GHz WLAN Maximum Average RF Power – Ant 2

5GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5190	38	17.19	17.21
5230	46	17.35	17.32
5270	54	17.45	17.38
5310	62	15.55	15.69
5510	102	16.90	16.81
5590	118	16.99	16.95
5630	126	17.11	17.02
5710	142	16.99	16.88
5755	151	16.83	16.83
5795	159	16.89	16.79

5GHz (80MHz) Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11ac
		Average
5210	42	17.22
5290	58	14.73
5530	106	15.21
5610	122	17.18
5690	138	17.22
5775	155	16.84

Table 9-48
2.4 GHz WLAN Reduced Average RF Power (Held-to-Ear) – Ant 1

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	12.96	13.36	13.32
2437	6	12.91	12.58	13.46
2462	11	13.41	12.75	12.88

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Table 9-49
2.4 GHz WLAN Reduced Average RF Power (Held-to-Ear) – Ant 2

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	13.30	12.66	12.48
2437	6	12.83	13.33	13.21
2462	11	12.93	13.24	13.18

Table 9-50
5 GHz WLAN Reduced Average RF Power (Held-to-Ear) – Ant 1

5GHz (80MHz) Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11ac
		Average
5210	42	12.04
5290	58	11.94
5530	106	12.21
5610	122	12.33
5690	138	12.34
5775	155	12.27

Table 9-51
5 GHz WLAN Reduced Average RF Power (Held-to-Ear) – Ant 2

5GHz (80MHz) Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11ac
		Average
5210	42	12.26
5290	58	12.21
5530	106	12.27
5610	122	12.14
5690	138	12.43
5775	155	12.27

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Table 9-52
Maximum Output Powers During Conditions with 2.4 GHz and 5 GHz WLAN

2.4GHz 802.11n Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
2417	2	15.33	15.50	18.43
2437	6	15.38	15.83	18.62
2457	10	15.65	16.18	18.93

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

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

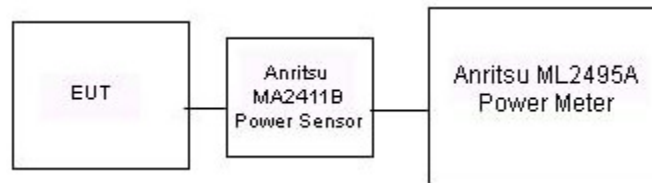


Figure 9-3
Power Measurement Setup for Bandwidths < 50 MHz

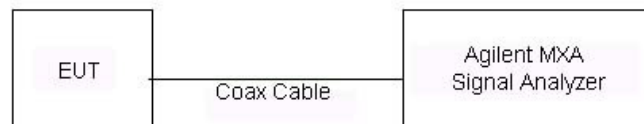


Figure 9-4
Power Measurement Setup for Bandwidths > 50 MHz

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9.5 Bluetooth Conducted Powers

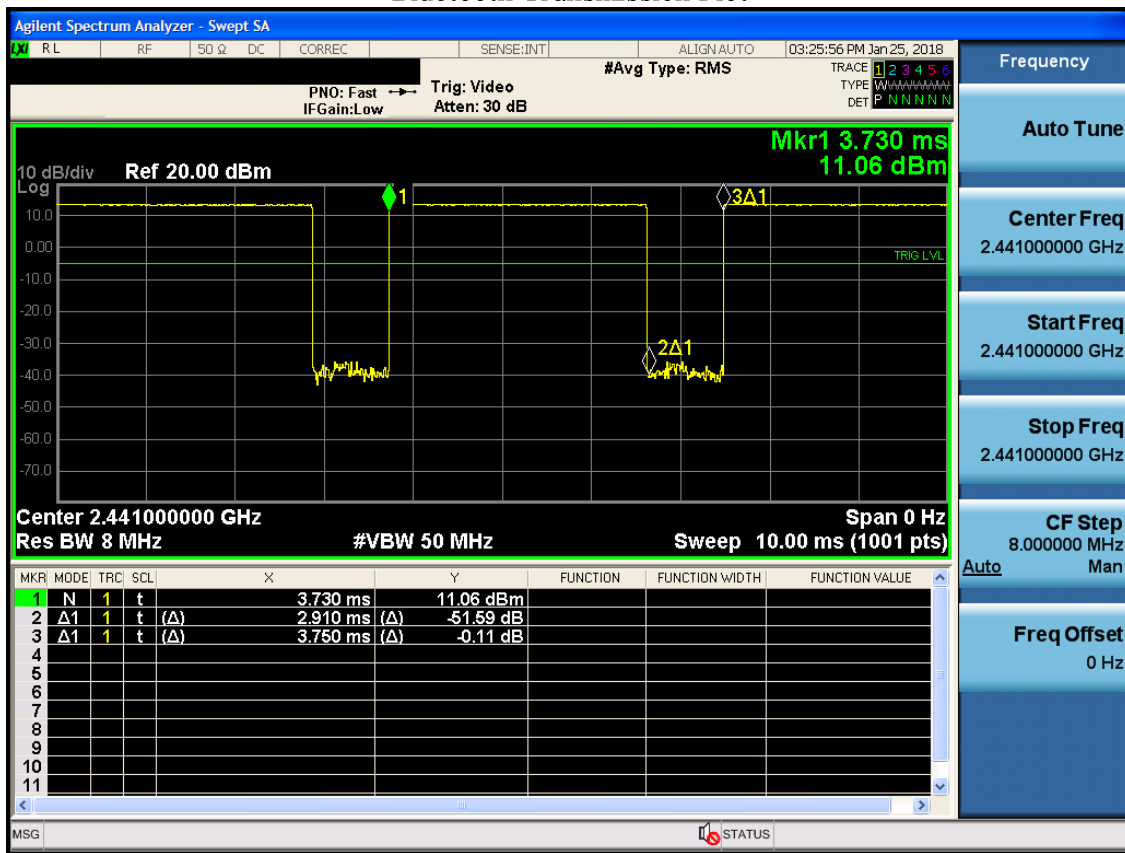
Table 9-53
Bluetooth Average RF Power

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	11.01	12.616
2441	1.0	39	13.36	21.677
2480	1.0	78	12.79	19.003
2402	2.0	0	3.71	2.348
2441	2.0	39	6.01	3.987
2480	2.0	78	6.24	4.212
2402	3.0	0	3.90	2.455
2441	3.0	39	6.32	4.285
2480	3.0	78	6.65	4.628

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

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Figure 9-5
Bluetooth Transmission Plot



Equation 9-1
Bluetooth Duty Cycle Calculation

$$\text{Duty Cycle} = \frac{\text{Pulse Width}}{\text{Period}} * 100\% = \frac{2.91\text{ms}}{3.75\text{ms}} * 100\% = 77.6\%$$

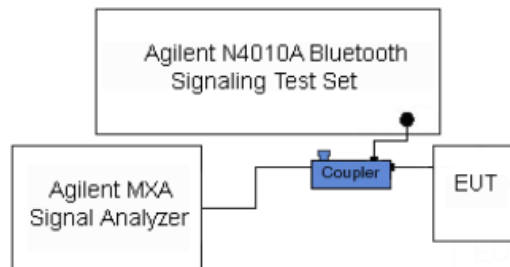


Figure 9-6
Power Measurement Setup

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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
1/23/2018	750H	21.5	700	0.880	40.429	0.889	42.201	-1.01%	-4.20%
			710	0.884	40.456	0.890	42.149	-0.67%	-4.02%
			740	0.893	40.350	0.893	41.994	0.00%	-3.91%
			755	0.898	40.404	0.894	41.916	0.45%	-3.61%
			770	0.904	40.373	0.895	41.838	1.01%	-3.50%
1/26/2018	835H	21.5	785	0.909	40.234	0.896	41.760	1.45%	-3.65%
			820	0.891	42.109	0.899	41.578	-0.89%	1.28%
			835	0.906	41.934	0.900	41.500	0.67%	1.05%
1/22/2018	1750H	21.3	850	0.919	41.745	0.916	41.500	0.33%	0.59%
			1710	1.374	38.891	1.348	40.142	1.93%	-3.12%
			1750	1.417	38.678	1.371	40.079	3.36%	-3.50%
2/5/2018	1900H	21.0	1790	1.458	38.463	1.394	40.016	4.59%	-3.88%
			1850	1.399	40.672	1.400	40.000	-0.07%	1.68%
			1880	1.429	40.526	1.400	40.000	2.07%	1.32%
1/31/2018	2400H-2600H	23.0	1910	1.459	40.401	1.400	40.000	4.21%	1.00%
			2400	1.815	39.366	1.756	39.289	3.36%	0.20%
			2450	1.873	39.204	1.800	39.200	4.06%	0.01%
			2500	1.927	38.998	1.855	39.136	3.88%	-0.35%
			2550	1.985	38.816	1.909	39.073	3.98%	-0.66%
2/7/2018	2450H	21.6	2600	2.042	38.625	1.964	39.009	3.97%	-0.98%
			2400	1.777	38.048	1.756	39.289	1.20%	-3.16%
			2450	1.833	37.880	1.800	39.200	1.83%	-3.37%
01/23/2018	5200H-5800H	21.8	2500	1.887	37.689	1.855	39.136	1.73%	-3.70%
			5240	4.508	35.092	4.696	35.940	-4.00%	-2.36%
			5260	4.522	35.008	4.717	35.917	-4.13%	-2.53%
			5280	4.545	34.938	4.737	35.894	-4.05%	-2.66%
			5300	4.560	34.967	4.758	35.871	-4.16%	-2.52%
			5320	4.562	34.917	4.778	35.849	-4.52%	-2.60%
			5600	4.859	34.577	5.065	35.529	-4.07%	-2.68%
			5680	4.935	34.435	5.147	35.437	-4.12%	-2.83%
			5700	4.968	34.389	5.168	35.414	-3.87%	-2.89%
			5745	5.018	34.339	5.214	35.363	-3.76%	-2.90%
			5765	5.032	34.328	5.234	35.340	-3.86%	-2.86%
			5785	5.037	34.291	5.255	35.317	-4.15%	-2.91%

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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
1/28/2018	750B	21.4	700	0.914	53.701	0.959	55.726	-4.69%	-3.63%
			710	0.923	53.593	0.960	55.687	-3.85%	-3.76%
			740	0.951	53.224	0.963	55.570	-1.25%	-4.22%
			755	0.967	53.057	0.964	55.512	0.31%	-4.42%
			770	0.984	52.975	0.965	55.453	1.97%	-4.47%
1/29/2018	835B	21.2	785	0.999	52.710	0.966	55.395	3.42%	-4.85%
			820	0.957	54.649	0.969	55.258	-1.24%	-1.10%
			835	0.972	54.502	0.970	55.200	0.21%	-1.26%
1/30/2018	1750B	22.4	850	0.988	54.367	0.988	55.154	0.00%	-1.43%
			1710	1.427	51.568	1.463	53.537	-2.46%	-3.68%
			1750	1.471	51.414	1.488	53.432	-1.14%	-3.78%
1/24/2018	1900B	22.6	1790	1.512	51.291	1.514	53.326	-0.13%	-3.82%
			1850	1.508	52.590	1.520	53.300	-0.79%	-1.33%
			1880	1.540	52.514	1.520	53.300	1.32%	-1.47%
1/31/2018	2450B	21.0	1910	1.575	52.429	1.520	53.300	3.62%	-1.63%
			2400	1.991	51.179	1.902	52.767	4.68%	-3.01%
			2450	2.047	51.078	1.950	52.700	4.97%	-3.08%
2/5/2018	2450B	22.2	2500	2.104	50.946	2.021	52.636	4.11%	-3.21%
			2400	1.969	51.043	1.902	52.767	3.52%	-3.27%
			2450	2.025	50.948	1.950	52.700	3.85%	-3.32%
2/8/2018	2400B-2600B	21.2	2500	2.084	50.749	2.021	52.636	3.12%	-3.58%
			2400	1.987	50.708	1.902	52.767	4.47%	-3.90%
			2450	2.044	50.559	1.950	52.700	4.82%	-4.06%
			2500	2.105	50.390	2.021	52.636	4.16%	-4.27%
2/12/2018	2600B	22.9	2550	2.163	50.243	2.092	52.573	3.39%	-4.43%
			2600	2.222	50.077	2.163	52.509	2.73%	-4.63%
			2500	2.079	51.391	2.021	52.636	2.87%	-2.37%
01/29/2018	5200B-5800B	21.7	2550	2.139	51.265	2.092	52.573	2.25%	-2.49%
			2600	2.197	51.077	2.163	52.509	1.57%	-2.73%
			5240	5.484	47.502	5.346	48.960	2.58%	-2.98%
			5260	5.503	47.497	5.369	48.933	2.50%	-2.93%
			5280	5.526	47.466	5.393	48.906	2.47%	-2.94%
			5600	5.943	46.926	5.766	48.471	3.07%	-3.19%
			5620	5.996	46.830	5.790	48.444	3.56%	-3.33%
			5640	6.025	46.828	5.813	48.417	3.65%	-3.28%
			5660	6.047	46.803	5.837	48.390	3.60%	-3.28%
			5680	6.071	46.779	5.860	48.363	3.60%	-3.28%
			5700	6.094	46.757	5.883	48.336	3.59%	-3.27%
			5745	6.161	46.668	5.936	48.275	3.79%	-3.33%
			5765	6.190	46.651	5.959	48.248	3.88%	-3.31%
			5785	6.213	46.651	5.982	48.220	3.86%	-3.25%

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

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10.2 Test System Verification

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

Table 10-3
System Verification Results – 1g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR _{1g} (W/kg)	1 W Target SAR _{1g} (W/kg)	1 W Normalized SAR _{1g} (W/kg)	Deviation _{1g} (%)
K	750	HEAD	01/23/2018	21.5	21.5	0.200	1161	7406	1.610	8.170	8.050	-1.47%
E	835	HEAD	01/26/2018	23.2	21.4	0.200	4d132	3319	1.780	9.360	8.900	-4.91%
D	1750	HEAD	01/22/2018	21.2	21.0	0.100	1148	3318	3.750	36.400	37.500	3.02%
J	1900	HEAD	02/05/2018	21.3	21.0	0.100	5d149	3209	3.830	39.600	38.300	-3.28%
G	2450	HEAD	01/31/2018	23.3	21.2	0.100	797	3332	5.570	52.700	55.700	5.69%
E	2450	HEAD	02/07/2018	20.6	21.6	0.100	797	3319	5.140	52.700	51.400	-2.47%
G	2600	HEAD	01/31/2018	23.3	21.2	0.100	1126	3332	5.610	56.400	56.100	-0.53%
H	5250	HEAD	01/23/2018	22.8	21.7	0.050	1237	3914	4.020	80.700	80.400	-0.37%
H	5600	HEAD	01/23/2018	22.8	21.7	0.050	1237	3914	4.240	82.500	84.800	2.79%
H	5750	HEAD	01/23/2018	22.8	21.7	0.050	1237	3914	4.020	80.200	80.400	0.25%
G	750	BODY	01/28/2018	21.1	21.4	0.200	1003	3332	1.630	8.580	8.150	-5.01%
J	835	BODY	01/29/2018	20.7	21.2	0.200	4d132	3209	2.020	9.710	10.100	4.02%
E	1750	BODY	01/30/2018	24.0	22.4	0.100	1148	3319	3.580	37.000	35.800	-3.24%
J	1900	BODY	01/24/2018	22.3	20.9	0.100	5d080	3209	3.960	39.100	39.600	1.28%
K	2450	BODY	01/31/2018	22.5	21.0	0.100	797	7406	5.240	51.100	52.400	2.54%
K	2450	BODY	02/05/2018	21.9	20.9	0.100	797	7406	5.370	51.100	53.700	5.09%
K	2450	BODY	02/08/2018	21.0	19.8	0.100	797	7406	5.310	51.100	53.100	3.91%
K	2600	BODY	02/08/2018	21.0	19.8	0.100	1126	7406	5.590	54.300	55.900	2.95%
D	5250	BODY	01/29/2018	21.4	21.0	0.050	1057	7308	3.510	75.900	70.200	-7.51%
D	5600	BODY	01/29/2018	21.4	21.0	0.050	1057	7308	3.920	79.900	78.400	-1.88%
D	5750	BODY	01/29/2018	21.4	21.0	0.050	1057	7308	3.570	76.700	71.400	-6.91%

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Table 10-4
System Verification Results – 10g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR _{10g} (W/kg)	1 W Target SAR _{10g} (W/kg)	1 W Normalized SAR _{10g} (W/kg)	Deviation _{10g} (%)
E	1750	BODY	01/30/2018	24.0	22.4	0.100	1148	3319	1.930	19.800	19.300	-2.53%
K	2600	BODY	02/12/2018	22.4	21.9	0.100	1126	7406	2.510	24.400	25.100	2.87%
D	5250	BODY	01/29/2018	21.4	21.0	0.050	1057	7308	0.980	21.100	19.600	-7.11%
D	5600	BODY	01/29/2018	21.4	21.0	0.050	1057	7308	1.080	22.300	21.600	-3.14%
D	5750	BODY	01/29/2018	21.4	21.0	0.050	1057	7308	0.995	21.200	19.900	-6.13%

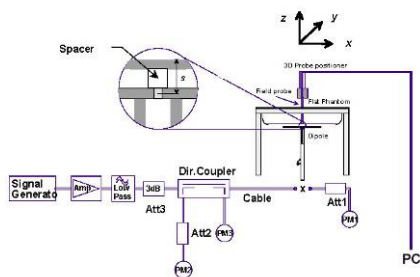


Figure 10-1
System Verification Setup Diagram



Figure 10-2
System Verification Setup Photo

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11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	190	GSM850	GSM	32.7	32.23	0.10	Right	Cheek	9CD55	1:8.3	0.152	1.114	0.169	A1
836.60	190	GSM850	GSM	32.7	32.23	0.03	Right	Tilt	9CD55	1:8.3	0.070	1.114	0.078	
836.60	190	GSM850	GSM	32.7	32.23	0.01	Left	Cheek	9CD55	1:8.3	0.104	1.114	0.116	
836.60	190	GSM850	GSM	32.7	32.23	0.19	Left	Tilt	9CD55	1:8.3	0.063	1.114	0.070	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-2
GSM 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.0	29.48	0.15	Right	Cheek	9CDE8	1:8.3	0.037	1.127	0.042	
1880.00	661	GSM 1900	GSM	30.0	29.48	0.21	Right	Tilt	9CDE8	1:8.3	0.023	1.127	0.026	
1880.00	661	GSM 1900	GSM	30.0	29.48	0.15	Left	Cheek	9CDE8	1:8.3	0.046	1.127	0.052	A2
1880.00	661	GSM 1900	GSM	30.0	29.48	0.18	Left	Tilt	9CDE8	1:8.3	0.019	1.127	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 11-3
UMTS 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	24.5	24.17	2	0.03	Right	Cheek	9CD55	1:1	0.211	1.079	0.228	A3
836.60	4183	UMTS 850	RMC	24.5	24.17	2	0.03	Right	Tilt	9CD55	1:1	0.106	1.079	0.114	
836.60	4183	UMTS 850	RMC	24.5	24.17	2	0.06	Left	Cheek	9CD55	1:1	0.146	1.079	0.158	
836.60	4183	UMTS 850	RMC	24.5	24.17	2	0.13	Left	Tilt	9CD55	1:1	0.094	1.079	0.101	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram						

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Table 11-4
LTE Band 12 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.	(W/kg)															(W/kg)			
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	17	0.19	0	Right	Cheek	QPSK	1	0	9CDB7	1:1	0.077	1.081	0.083	A4
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	17	0.09	1	Right	Cheek	QPSK	25	0	9CDB7	1:1	0.065	1.057	0.069	
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	17	0.14	0	Right	Tilt	QPSK	1	0	9CDB7	1:1	0.044	1.081	0.048	
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	17	0.10	1	Right	Tilt	QPSK	25	0	9CDB7	1:1	0.038	1.057	0.040	
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	17	0.18	0	Left	Cheek	QPSK	1	0	9CDB7	1:1	0.063	1.081	0.068	
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	17	0.21	1	Left	Cheek	QPSK	25	0	9CDB7	1:1	0.055	1.057	0.058	
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	17	0.09	0	Left	Tilt	QPSK	1	0	9CDB7	1:1	0.055	1.081	0.059	
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	17	0.15	1	Left	Tilt	QPSK	25	0	9CDB7	1:1	0.047	1.057	0.050	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-5
LTE Band 13 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	77	0.17	0	Right	Cheek	QPSK	1	0	9CDB7	1:1	0.065	1.194	0.078	A5
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	77	0.14	1	Right	Cheek	QPSK	25	0	9CDB7	1:1	0.052	1.175	0.061	
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	77	0.13	0	Right	Tilt	QPSK	1	0	9CDB7	1:1	0.025	1.194	0.030	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	77	-0.11	1	Right	Tilt	QPSK	25	0	9CDB7	1:1	0.022	1.175	0.026	
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	77	0.12	0	Left	Cheek	QPSK	1	0	9CDB7	1:1	0.044	1.194	0.053	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	77	0.19	1	Left	Cheek	QPSK	25	0	9CDB7	1:1	0.035	1.175	0.041	
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	77	0.13	0	Left	Tilt	QPSK	1	0	9CDB7	1:1	0.026	1.194	0.031	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	77	0.19	1	Left	Tilt	QPSK	25	0	9CDB7	1:1	0.019	1.175	0.022	
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]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	1	0.03	0	Right	Cheek	QPSK	1	0	9CD55	1:1	0.148	1.079	0.160	A6
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	1	0.10	1	Right	Cheek	QPSK	25	0	9CD55	1:1	0.129	1.052	0.136	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	1	0.17	0	Right	Tilt	QPSK	1	0	9CD55	1:1	0.060	1.079	0.065	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	1	0.07	1	Right	Tilt	QPSK	25	0	9CD55	1:1	0.052	1.052	0.055	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	1	0.02	0	Left	Cheek	QPSK	1	0	9CD55	1:1	0.115	1.079	0.124	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	1	0.07	1	Left	Cheek	QPSK	25	0	9CD55	1:1	0.090	1.052	0.095	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	1	0.09	0	Left	Tilt	QPSK	1	0	9CD55	1:1	0.098	1.079	0.106	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	1	0.15	1	Left	Tilt	QPSK	25	0	9CD55	1:1	0.078	1.052	0.082	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram										

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

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR(1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.	(W/kg)															(W/kg)			
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	42	-0.01	0	Right	Cheek	QPSK	1	0	9CDB7	1:1	0.122	1.178	0.144	A7
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	42	0.04	1	Right	Cheek	QPSK	50	50	9CDB7	1:1	0.082	1.213	0.099	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	42	-0.10	0	Right	Tilt	QPSK	1	0	9CDB7	1:1	0.108	1.178	0.127	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	42	0.09	1	Right	Tilt	QPSK	50	50	9CDB7	1:1	0.077	1.213	0.093	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	42	0.03	0	Left	Cheek	QPSK	1	0	9CDB7	1:1	0.141	1.178	0.166	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	42	-0.12	1	Left	Cheek	QPSK	50	50	9CDB7	1:1	0.115	1.213	0.139	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	42	0.00	0	Left	Tilt	QPSK	1	0	9CDB7	1:1	0.123	1.178	0.145	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	42	-0.12	1	Left	Tilt	QPSK	50	50	9CDB7	1:1	0.091	1.213	0.110	
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 41 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.	(W/kg)														(W/kg)			
2593.00	40620	Mid	LTE Band 41	20	25.0	24.92	0.19	0	Right	Cheek	QPSK	1	0	9CD55	1:1.58	0.074	1.019	0.075	A8
2593.00	40620	Mid	LTE Band 41	20	24.0	23.85	0.12	1	Right	Cheek	QPSK	50	0	9CD55	1:1.58	0.054	1.035	0.056	
2593.00	40620	Mid	LTE Band 41	20	25.0	24.92	-0.01	0	Right	Tilt	QPSK	1	0	9CD55	1:1.58	0.069	1.019	0.070	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.85	0.03	1	Right	Tilt	QPSK	50	0	9CD55	1:1.58	0.048	1.035	0.050	
2593.00	40620	Mid	LTE Band 41	20	25.0	24.92	0.02	0	Left	Cheek	QPSK	1	0	9CD55	1:1.58	0.073	1.019	0.074	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.85	0.15	1	Left	Cheek	QPSK	50	0	9CD55	1:1.58	0.058	1.035	0.060	
2593.00	40620	Mid	LTE Band 41	20	25.0	24.92	0.10	0	Left	Tilt	QPSK	1	0	9CD55	1:1.58	0.045	1.019	0.046	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.85	0.19	1	Left	Tilt	QPSK	50	0	9CD55	1:1.58	0.032	1.035	0.033	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-9
DTS Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2462	11	802.11b	DSSS	22	13.5	13.41	0.21	Right	Cheek	1	9CE0D	1	99.9	0.148	-	1.021	1.001	-	
2462	11	802.11b	DSSS	22	13.5	13.41	0.17	Right	Tilt	1	9CE0D	1	99.9	0.159	0.103	1.021	1.001	0.105	
2462	11	802.11b	DSSS	22	13.5	13.41	0.18	Left	Cheek	1	9CE0D	1	99.9	0.077	-	1.021	1.001	-	
2462	11	802.11b	DSSS	22	13.5	13.41	0.17	Left	Tilt	1	9CE0D	1	99.9	0.068	-	1.021	1.001	-	
2412	1	802.11b	DSSS	22	13.5	13.30	-0.07	Right	Cheek	2	9CE0D	1	99.9	0.388	-	1.047	1.001	-	
2412	1	802.11b	DSSS	22	13.5	13.30	0.14	Right	Tilt	2	9CE0D	1	99.9	0.415	0.251	1.047	1.001	0.263	A9
2412	1	802.11b	DSSS	22	13.5	13.30	-0.21	Left	Cheek	2	9CE0D	1	99.9	0.220	-	1.047	1.001	-	
2412	1	802.11b	DSSS	22	13.5	13.30	0.17	Left	Tilt	2	9CE0D	1	99.9	0.183	-	1.047	1.001	-	
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 11-10
NII Head SAR**

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5290	58	802.11ac	OFDM	80	12.5	11.94	0.17	Right	Cheek	1	9CD21	29.3	94.6	0.100	0.024	1.138	1.057	0.029	
5290	58	802.11ac	OFDM	80	12.5	11.94	0.21	Right	Tilt	1	9CD21	29.3	94.6	0.074	-	1.138	1.057	-	
5290	58	802.11ac	OFDM	80	12.5	11.94	0.13	Left	Cheek	1	9CD21	29.3	94.6	0.048	-	1.138	1.057	-	
5290	58	802.11ac	OFDM	80	12.5	11.94	0.18	Left	Tilt	1	9CD21	29.3	94.6	0.045	-	1.138	1.057	-	
5290	58	802.11ac	OFDM	80	12.5	12.21	0.19	Right	Cheek	2	9CD21	29.3	94.6	0.573	0.225	1.069	1.057	0.254	
5290	58	802.11ac	OFDM	80	12.5	12.21	0.19	Right	Tilt	2	9CD21	29.3	94.6	0.462	-	1.069	1.057	-	
5290	58	802.11ac	OFDM	80	12.5	12.21	0.17	Left	Cheek	2	9CD21	29.3	94.6	0.188	-	1.069	1.057	-	
5290	58	802.11ac	OFDM	80	12.5	12.21	0.21	Left	Tilt	2	9CD21	29.3	94.6	0.146	-	1.069	1.057	-	
5690	138	802.11ac	OFDM	80	12.5	12.34	0.19	Right	Cheek	1	9CD21	29.3	94.6	0.051	-	1.038	1.057	-	
5690	138	802.11ac	OFDM	80	12.5	12.34	0.19	Right	Tilt	1	9CD21	29.3	94.6	0.062	0.021	1.038	1.057	0.023	
5690	138	802.11ac	OFDM	80	12.5	12.34	-0.15	Left	Cheek	1	9CD21	29.3	94.6	0.010	-	1.038	1.057	-	
5690	138	802.11ac	OFDM	80	12.5	12.34	-0.12	Left	Tilt	1	9CD21	29.3	94.6	0.010	-	1.038	1.057	-	
5690	138	802.11ac	OFDM	80	12.5	12.43	0.12	Right	Cheek	2	9CD21	29.3	94.6	0.655	0.243	1.016	1.057	0.261	
5690	138	802.11ac	OFDM	80	12.5	12.43	0.19	Right	Tilt	2	9CD21	29.3	94.6	0.487	-	1.016	1.057	-	
5690	138	802.11ac	OFDM	80	12.5	12.43	0.19	Left	Cheek	2	9CD21	29.3	94.6	0.233	-	1.016	1.057	-	
5690	138	802.11ac	OFDM	80	12.5	12.43	0.16	Left	Tilt	2	9CD21	29.3	94.6	0.153	-	1.016	1.057	-	
5775	155	802.11ac	OFDM	80	12.5	12.27	0.19	Right	Cheek	1	9CD21	29.3	94.6	0.030	0.014	1.054	1.057	0.016	
5775	155	802.11ac	OFDM	80	12.5	12.27	0.20	Right	Tilt	1	9CD21	29.3	94.6	0.029	-	1.054	1.057	-	
5775	155	802.11ac	OFDM	80	12.5	12.27	0.19	Left	Cheek	1	9CD21	29.3	94.6	0.010	-	1.054	1.057	-	
5775	155	802.11ac	OFDM	80	12.5	12.27	0.13	Left	Tilt	1	9CD21	29.3	94.6	0.016	-	1.054	1.057	-	
5775	155	802.11ac	OFDM	80	12.5	12.27	0.19	Right	Cheek	2	9CD21	29.3	94.6	0.930	0.399	1.054	1.057	0.445	A10
5775	155	802.11ac	OFDM	80	12.5	12.27	0.19	Right	Tilt	2	9CD21	29.3	94.6	0.729	0.265	1.054	1.057	0.295	
5775	155	802.11ac	OFDM	80	12.5	12.27	0.20	Left	Cheek	2	9CD21	29.3	94.6	0.477	-	1.054	1.057	-	
5775	155	802.11ac	OFDM	80	12.5	12.27	0.14	Left	Tilt	2	9CD21	29.3	94.6	0.294	-	1.054	1.057	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram											

**Table 11-11
DSS Head SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle %	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441.00	39	Bluetooth	FHSS	13.5	13.36	0.14	Right	Cheek	9CE10	1	77.6	0.598	1.033	1.289	0.796	A11
2441.00	39	Bluetooth	FHSS	13.5	13.36	0.14	Right	Tilt	9CE10	1	77.6	0.470	1.033	1.289	0.626	
2441.00	39	Bluetooth	FHSS	13.5	13.36	-0.04	Left	Cheek	9CE10	1	77.6	0.289	1.033	1.289	0.385	
2441.00	39	Bluetooth	FHSS	13.5	13.36	-0.05	Left	Tilt	9CE10	1	77.6	0.195	1.033	1.289	0.260	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT							Head									
Spatial Peak							1.6 W/kg (mW/g)									
Uncontrolled Exposure/General Population							averaged over 1 gram									

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11.2 Standalone Body-Worn SAR Data

Table 11-12
GSM/UMTS Body-Worn SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	32.7	32.23	N/A	0.05	15 mm	9CDE8	1	1:8.3	back	0.285	1.114	0.317	A12
1880.00	661	GSM 1900	GSM	30.0	29.48	N/A	-0.04	15 mm	9CE10	1	1:8.3	back	0.256	1.127	0.289	A14
836.60	4183	UMTS 850	RMC	24.5	24.17	18	-0.07	15 mm	9CDE8	N/A	1:1	back	0.357	1.079	0.385	A16
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body								
Spatial Peak								1.6 W/kg (mW/g)								
Uncontrolled Exposure/General Population								averaged over 1 gram								

Table 11-13
LTE Body-Worn SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	65	0.00	0	9CDE8	QPSK	1	0	15 mm	back	1:1	0.185	1.081	0.200	A18
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	65	-0.03	1	9CDE8	QPSK	25	0	15 mm	back	1:1	0.151	1.057	0.160	
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	1	0.02	0	9CDE8	QPSK	1	0	15 mm	back	1:1	0.124	1.194	0.148	A20
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	1	-0.02	1	9CDE8	QPSK	25	0	15 mm	back	1:1	0.097	1.175	0.114	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	69	-0.01	0	9CDB7	QPSK	1	0	15 mm	back	1:1	0.247	1.079	0.267	A22
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	69	-0.01	1	9CDB7	QPSK	25	0	15 mm	back	1:1	0.204	1.052	0.215	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	46	-0.05	0	9CDB7	QPSK	1	0	15 mm	back	1:1	0.670	1.178	0.789	A24
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	46	-0.01	1	9CDB7	QPSK	50	50	15 mm	back	1:1	0.485	1.213	0.588	
2593.00	40620	Mid	LTE Band 41	20	25.0	24.92	N/A	0.06	0	9CE0D	QPSK	1	0	15 mm	back	1:1.58	0.243	1.019	0.248	A26
2593.00	40620	Mid	LTE Band 41	20	24.0	23.85	N/A	0.01	1	9CE0D	QPSK	50	0	15 mm	back	1:1.58	0.194	1.035	0.201	
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 11-14
DTS Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR(1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2462	11	802.11b	DSSS	22	20.5	20.07	0.19	15 mm	1	9CD21	1	back	99.9	0.103	0.068	1.104	1.001	0.075	
2412	1	802.11b	DSSS	22	20.5	20.41	0.06	15 mm	2	9CD21	1	back	99.9	0.177	0.124	1.021	1.001	0.127	A28
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

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Table 11-15
NII Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5270	54	802.11n	OFDM	40	17.5	16.73	-0.13	15 mm	1	9CD11	13.5	back	97.2	0.259	0.104	1.194	1.029	0.128	
5270	54	802.11n	OFDM	40	17.5	17.45	0.03	15 mm	2	9CD11	13.5	back	97.3	0.388	0.168	1.012	1.028	0.175	
5610	122	802.11ac	OFDM	80	17.5	17.22	0.14	15 mm	1	9CD11	29.3	back	94.6	0.149	0.053	1.067	1.057	0.060	
5690	138	802.11ac	OFDM	80	17.5	17.22	0.08	15 mm	2	9CD11	29.3	back	94.6	0.262	0.118	1.067	1.057	0.133	
5775	155	802.11ac	OFDM	80	17.5	17.03	-0.13	15 mm	1	9CD11	29.3	back	94.6	0.079	0.026	1.114	1.057	0.031	
5775	155	802.11ac	OFDM	80	17.5	16.84	0.07	15 mm	2	9CD11	29.3	back	94.6	0.394	0.173	1.164	1.057	0.213	A30
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

Table 11-16
DSS Body-Worn SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	13.5	13.36	0.09	15 mm	9CDCB	1	back	77.6	0.028	1.033	1.289	0.037	A32
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body								
Spatial Peak																
Uncontrolled Exposure/General Population								1.6 W/kg (mW/g)								
								averaged over 1 gram								

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11.3 Standalone Hotspot SAR Data

Table 11-17
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
824.20	128	GSM 850	GPRS	29.5	28.84	N/A	-0.10	10 mm	9CDE8	3	1:2.76	back	0.527	1.164	0.613	
836.60	190	GSM 850	GPRS	29.5	29.31	N/A	0.12	10 mm	9CDE8	3	1:2.76	back	0.632	1.045	0.660	
848.80	251	GSM 850	GPRS	29.5	29.15	N/A	-0.18	10 mm	9CDE8	3	1:2.76	back	0.668	1.084	0.724	A13
836.60	190	GSM 850	GPRS	29.5	29.31	N/A	-0.05	10 mm	9CDE8	3	1:2.76	front	0.519	1.045	0.542	
836.60	190	GSM 850	GPRS	29.5	29.31	N/A	-0.09	10 mm	9CDE8	3	1:2.76	bottom	0.314	1.045	0.328	
836.60	190	GSM 850	GPRS	29.5	29.31	N/A	0.00	10 mm	9CDE8	3	1:2.76	right	0.314	1.045	0.328	
836.60	190	GSM 850	GPRS	29.5	29.31	N/A	-0.06	10 mm	9CDE8	3	1:2.76	left	0.099	1.045	0.103	
1880.00	661	GSM 1900	GPRS	24.5	22.58	N/A	-0.02	10 mm	9CE10	3	1:2.76	back	0.233	1.556	0.363	
1880.00	661	GSM 1900	GPRS	24.5	22.58	N/A	0.02	10 mm	9CE10	3	1:2.76	front	0.191	1.556	0.297	
1850.20	512	GSM 1900	GPRS	24.5	22.65	N/A	0.03	10 mm	9CE10	3	1:2.76	bottom	0.365	1.531	0.559	
1880.00	661	GSM 1900	GPRS	24.5	22.58	N/A	0.03	10 mm	9CE10	3	1:2.76	bottom	0.392	1.556	0.610	
1909.80	810	GSM 1900	GPRS	24.5	22.73	N/A	0.00	10 mm	9CE10	3	1:2.76	bottom	0.493	1.503	0.741	A15
1880.00	661	GSM 1900	GPRS	24.5	22.58	N/A	-0.04	10 mm	9CE10	3	1:2.76	right	0.041	1.556	0.064	
1880.00	661	GSM 1900	GPRS	24.5	22.58	N/A	0.12	10 mm	9CE10	3	1:2.76	left	0.028	1.556	0.044	
826.40	4132	UMTS 850	RMC	24.5	24.12	18	-0.09	10 mm	9CDE8	N/A	1:1	back	0.518	1.091	0.565	
836.60	4183	UMTS 850	RMC	24.5	24.17	18	-0.07	10 mm	9CDE8	N/A	1:1	back	0.567	1.079	0.612	
846.60	4233	UMTS 850	RMC	24.5	24.19	18	-0.11	10 mm	9CDE8	N/A	1:1	back	0.585	1.074	0.628	A17
836.60	4183	UMTS 850	RMC	24.5	24.17	18	-0.02	10 mm	9CDE8	N/A	1:1	front	0.507	1.079	0.547	
836.60	4183	UMTS 850	RMC	24.5	24.17	18	-0.12	10 mm	9CDE8	N/A	1:1	bottom	0.370	1.079	0.399	
836.60	4183	UMTS 850	RMC	24.5	24.17	18	0.01	10 mm	9CDE8	N/A	1:1	right	0.308	1.079	0.332	
836.60	4183	UMTS 850	RMC	24.5	24.17	18	-0.04	10 mm	9CDE8	N/A	1:1	left	0.077	1.079	0.083	
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 12 Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Muxmum Allow Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	65	-0.02	0	9CDE8	QPSK	1	0	10 mm	back	1:1	0.315	1.081	0.341	A19
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	65	0.00	1	9CDE8	QPSK	25	0	10 mm	back	1:1	0.267	1.057	0.282	
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	65	0.04	0	9CDE8	QPSK	1	0	10 mm	front	1:1	0.252	1.081	0.272	
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	65	0.02	1	9CDE8	QPSK	25	0	10 mm	front	1:1	0.209	1.057	0.221	
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	65	-0.03	0	9CDE8	QPSK	1	0	10 mm	bottom	1:1	0.189	1.081	0.204	
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	65	-0.02	1	9CDE8	QPSK	25	0	10 mm	bottom	1:1	0.154	1.057	0.163	
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	65	-0.05	0	9CDE8	QPSK	1	0	10 mm	right	1:1	0.262	1.081	0.283	
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	65	-0.04	1	9CDE8	QPSK	25	0	10 mm	right	1:1	0.202	1.057	0.214	
707.50	23095	Mid	LTE Band 12	10	23.5	23.16	65	-0.04	0	9CDE8	QPSK	1	0	10 mm	left	1:1	0.100	1.081	0.108	
707.50	23095	Mid	LTE Band 12	10	22.5	22.26	65	0.12	1	9CDE8	QPSK	25	0	10 mm	left	1:1	0.066	1.057	0.070	
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 13 Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	1	0.00	0	9CDE8	QPSK	1	0	10 mm	back	1:1	0.238	1.194	0.284	A21
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	1	-0.03	1	9CDE8	QPSK	25	0	10 mm	back	1:1	0.186	1.175	0.219	
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	1	0.02	0	9CDE8	QPSK	1	0	10 mm	front	1:1	0.196	1.194	0.234	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	1	0.01	1	9CDE8	QPSK	25	0	10 mm	front	1:1	0.159	1.175	0.187	
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	1	0.01	0	9CDE8	QPSK	1	0	10 mm	bottom	1:1	0.147	1.194	0.176	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	1	-0.03	1	9CDE8	QPSK	25	0	10 mm	bottom	1:1	0.117	1.175	0.137	
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	1	0.00	0	9CDE8	QPSK	1	0	10 mm	right	1:1	0.111	1.194	0.133	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	1	0.00	1	9CDE8	QPSK	25	0	10 mm	right	1:1	0.081	1.175	0.095	
782.00	23230	Mid	LTE Band 13	10	23.5	22.73	1	0.06	0	9CDE8	QPSK	1	0	10 mm	left	1:1	0.030	1.194	0.036	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	1	-0.03	1	9CDE8	QPSK	25	0	10 mm	left	1:1	0.024	1.175	0.028	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT									Body											
Spatial Peak									1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population									averaged over 1 gram											

Table 11-20
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	69	-0.06	0	9CDB7	QPSK	1	0	10 mm	back	1:1	0.459	1.079	0.495	A23
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	69	-0.04	1	9CDB7	QPSK	25	0	10 mm	back	1:1	0.383	1.052	0.403	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	69	-0.04	0	9CDB7	QPSK	1	0	10 mm	front	1:1	0.399	1.079	0.431	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	69	0.05	1	9CDB7	QPSK	25	0	10 mm	front	1:1	0.333	1.052	0.350	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	69	-0.05	0	9CDB7	QPSK	1	0	10 mm	bottom	1:1	0.274	1.079	0.296	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	69	-0.09	1	9CDB7	QPSK	25	0	10 mm	bottom	1:1	0.225	1.052	0.237	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	69	0.00	0	9CDB7	QPSK	1	0	10 mm	right	1:1	0.261	1.079	0.282	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	69	-0.02	1	9CDB7	QPSK	25	0	10 mm	right	1:1	0.210	1.052	0.221	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	23.17	69	-0.01	0	9CDB7	QPSK	1	0	10 mm	left	1:1	0.051	1.079	0.055	
836.50	20525	Mid	LTE Band 5 (Cell)	10	22.5	22.28	69	0.09	1	9CDB7	QPSK	25	0	10 mm	left	1:1	0.035	1.052	0.037	
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 11-21
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allow Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.	(W/kg)															(W/kg)			
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.41	46	0.00	0	9CDB7	QPSK	1	99	10 mm	back	1:1	0.473	1.021	0.483	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.45	46	0.01	0	9CDB7	QPSK	50	50	10 mm	back	1:1	0.482	1.012	0.488	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.41	46	0.03	0	9CDB7	QPSK	1	99	10 mm	front	1:1	0.382	1.021	0.390	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.45	46	0.05	0	9CDB7	QPSK	50	50	10 mm	front	1:1	0.387	1.012	0.392	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.41	46	-0.07	0	9CDB7	QPSK	1	99	10 mm	bottom	1:1	0.546	1.021	0.557	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.45	46	0.02	0	9CDB7	QPSK	50	50	10 mm	bottom	1:1	0.562	1.012	0.569	A25
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.41	46	0.03	0	9CDB7	QPSK	1	99	10 mm	right	1:1	0.063	1.021	0.064	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.45	46	0.00	0	9CDB7	QPSK	50	50	10 mm	right	1:1	0.062	1.012	0.063	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.41	46	0.08	0	9CDB7	QPSK	1	99	10 mm	left	1:1	0.079	1.021	0.081	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	19.5	19.45	46	0.02	0	9CDB7	QPSK	50	50	10 mm	left	1:1	0.084	1.012	0.085	
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 11-22
LTE Band 41 Hotspot SAR**

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
2593.00	40620	Mid	LTE Band 41	20	23.0	22.79	0.07	0	9CE0D	QPSK	1	0	10 mm	back	1:1.58	0.251	1.050	0.264	
2593.00	40620	Mid	LTE Band 41	20	23.0	22.76	0.02	0	9CE0D	QPSK	50	0	10 mm	back	1:1.58	0.250	1.057	0.264	
2593.00	40620	Mid	LTE Band 41	20	23.0	22.79	0.04	0	9CE0D	QPSK	1	0	10 mm	front	1:1.58	0.303	1.050	0.318	
2593.00	40620	Mid	LTE Band 41	20	23.0	22.76	0.05	0	9CE0D	QPSK	50	0	10 mm	front	1:1.58	0.304	1.057	0.321	
2593.00	40620	Mid	LTE Band 41	20	23.0	22.79	-0.04	0	9CE0D	QPSK	1	0	10 mm	bottom	1:1.58	0.561	1.050	0.589	
2593.00	40620	Mid	LTE Band 41	20	23.0	22.76	-0.02	0	9CE0D	QPSK	50	0	10 mm	bottom	1:1.58	0.562	1.057	0.594	A27
2593.00	40620	Mid	LTE Band 41	20	23.0	22.79	-0.04	0	9CE0D	QPSK	1	0	10 mm	left	1:1.58	0.249	1.050	0.261	
2593.00	40620	Mid	LTE Band 41	20	23.0	22.76	0.02	0	9CE0D	QPSK	50	0	10 mm	left	1:1.58	0.237	1.057	0.251	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

**Table 11-23
WLAN SISO Hotspot SAR**

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2462	11	802.11b	DSSS	22	20.5	20.07	0.16	10 mm	1	9CD21	1	back	99.9	0.200	-	1.104	1.001	-	
2462	11	802.11b	DSSS	22	20.5	20.07	0.11	10 mm	1	9CD21	1	front	99.9	0.092	-	1.104	1.001	-	
2462	11	802.11b	DSSS	22	20.5	20.07	0.07	10 mm	1	9CD21	1	top	99.9	0.283	0.188	1.104	1.001	0.208	
2462	11	802.11b	DSSS	22	20.5	20.07	0.17	10 mm	1	9CD21	1	left	99.9	0.084	-	1.104	1.001	-	
2412	1	802.11b	DSSS	22	20.5	20.41	0.12	10 mm	2	9CD21	1	back	99.9	0.439	0.337	1.021	1.001	0.344	A29
2412	1	802.11b	DSSS	22	20.5	20.41	0.15	10 mm	2	9CD21	1	front	99.9	0.332	-	1.021	1.001	-	
2412	1	802.11b	DSSS	22	20.5	20.41	0.02	10 mm	2	9CD21	1	top	99.9	0.408	-	1.021	1.001	-	
2412	1	802.11b	DSSS	22	20.5	20.41	0.03	10 mm	2	9CD21	1	left	99.9	0.334	-	1.021	1.001	-	
5775	155	802.11ac	OFDM	80	17.5	17.03	-0.16	10 mm	1	9CD11	29.3	back	94.6	0.145	0.056	1.114	1.057	0.066	
5775	155	802.11ac	OFDM	80	17.5	17.03	0.19	10 mm	1	9CD11	29.3	front	94.6	0.023	-	1.114	1.057	-	
5775	155	802.11ac	OFDM	80	17.5	17.03	-0.14	10 mm	1	9CD11	29.3	top	94.6	0.087	-	1.114	1.057	-	
5775	155	802.11ac	OFDM	80	17.5	17.03	0.19	10 mm	1	9CD11	29.3	left	94.6	0.022	-	1.114	1.057	-	
5775	155	802.11ac	OFDM	80	17.5	16.84	0.00	10 mm	2	9CD11	29.3	back	94.6	0.569	0.259	1.164	1.057	0.319	A31
5775	155	802.11ac	OFDM	80	17.5	16.84	0.12	10 mm	2	9CD11	29.3	front	94.6	0.248	-	1.164	1.057	-	
5775	155	802.11ac	OFDM	80	17.5	16.84	-0.20	10 mm	2	9CD11	29.3	top	94.6	0.215	-	1.164	1.057	-	
5775	155	802.11ac	OFDM	80	17.5	16.84	0.21	10 mm	2	9CD11	29.3	left	94.6	0.210	-	1.164	1.057	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

**Table 11-24
DTS MIMO Hotspot SAR for Conditions with 2.4 GHz and 5 GHz WLAN**

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR(1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															W/kg	(W/kg)			(W/kg)	
2457	10	802.11n	OFDM	20	16.5	15.65	16.5	16.18	0.18	10 mm	MIMO	9CD21	13	back	97.2	0.230	-	1.216	1.029	-	
2457	10	802.11n	OFDM	20	16.5	15.65	16.5	16.18	0.21	10 mm	MIMO	9CD21	13	front	97.2	0.144	-	1.216	1.029	-	
2457	10	802.11n	OFDM	20	16.5	15.65	16.5	16.18	-0.19	10 mm	MIMO	9CD21	13	top	97.2	0.264	0.163	1.216	1.029	0.204	
2457	10	802.11n	OFDM	20	16.5	15.65	16.5	16.18	0.13	10 mm	MIMO	9CD21	13	left	97.2	0.108	-	1.216	1.029	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT											Body										
Spatial Peak											1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population											averaged over 1 gram										

DTS MIMO was additionally evaluated at the maximum allowed output power during operations with simultaneous 2.4 GHz and 5 GHz WLAN. 5 GHz WIFI was not transmitting during the above evaluations.

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**Table 11-25
DSS Hotspot SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	13.5	13.36	0.06	10 mm	9CDCB	1	back	77.6	0.069	1.033	1.289	0.092	
2441	39	Bluetooth	FHSS	13.5	13.36	0.01	10 mm	9CDCB	1	front	77.6	0.072	1.033	1.289	0.096	
2441	39	Bluetooth	FHSS	13.5	13.36	0.08	10 mm	9CDCB	1	top	77.6	0.076	1.033	1.289	0.101	A33
2441	39	Bluetooth	FHSS	13.5	13.36	0.09	10 mm	9CDCB	1	left	77.6	0.060	1.033	1.289	0.080	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram									

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11.4 Standalone Phablet SAR Data

Table 11-26
LTE Phablet SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Ant State	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	46	-0.02	0	9CDB7	QPSK	1	0	10 mm	back	1:1	0.616	1.178	0.726	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	46	-0.02	1	9CDB7	QPSK	50	50	10 mm	back	1:1	0.478	1.213	0.580	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	46	-0.07	0	9CDB7	QPSK	1	0	7 mm	front	1:1	0.704	1.178	0.829	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	46	-0.13	1	9CDB7	QPSK	50	50	7 mm	front	1:1	0.569	1.213	0.690	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	46	-0.04	0	9CDB7	QPSK	1	0	11 mm	bottom	1:1	0.665	1.178	0.783	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	46	-0.07	1	9CDB7	QPSK	50	50	11 mm	bottom	1:1	0.502	1.213	0.609	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	46	-0.17	0	9CDB7	QPSK	1	0	0 mm	right	1:1	0.356	1.178	0.419	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	46	0.21	1	9CDB7	QPSK	50	50	0 mm	right	1:1	0.277	1.213	0.336	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.5	22.79	46	-0.06	0	9CDB7	QPSK	1	0	0 mm	left	1:1	0.418	1.178	0.492	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	21.66	46	-0.07	1	9CDB7	QPSK	50	50	0 mm	left	1:1	0.341	1.213	0.414	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	19.79	46	0.02	0	9CDB7	QPSK	1	99	0 mm	back	1:1	1.360	1.050	1.428	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	19.83	46	0.00	0	9CDB7	QPSK	50	50	0 mm	back	1:1	1.400	1.040	1.456	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	19.79	46	0.02	0	9CDB7	QPSK	1	99	0 mm	front	1:1	1.130	1.050	1.187	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	19.83	46	0.10	0	9CDB7	QPSK	50	50	0 mm	front	1:1	1.170	1.040	1.217	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	19.79	46	-0.01	0	9CDB7	QPSK	1	99	0 mm	bottom	1:1	1.550	1.050	1.628	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	20.0	19.83	46	-0.05	0	9CDB7	QPSK	50	50	0 mm	bottom	1:1	1.640	1.040	1.706	A34
2593.00	40620	Mid	LTE Band 41	20	25.0	24.92	N/A	0.11	0	9CE0D	QPSK	1	0	10 mm	back	1:1.58	0.182	1.019	0.185	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.85	N/A	0.00	1	9CE0D	QPSK	50	0	10 mm	back	1:1.58	0.143	1.035	0.148	
2593.00	40620	Mid	LTE Band 41	20	25.0	24.92	N/A	0.02	0	9CE0D	QPSK	1	0	7 mm	front	1:1.58	0.344	1.019	0.351	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.85	N/A	0.00	1	9CE0D	QPSK	50	0	7 mm	front	1:1.58	0.274	1.035	0.284	
2593.00	40620	Mid	LTE Band 41	20	25.0	24.92	N/A	-0.05	0	9CD55	QPSK	1	0	11 mm	bottom	1:1.58	0.416	1.019	0.424	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.85	N/A	-0.01	1	9CD55	QPSK	50	0	11 mm	bottom	1:1.58	0.330	1.035	0.342	
2593.00	40620	Mid	LTE Band 41	20	25.0	24.92	N/A	-0.16	0	9CE0D	QPSK	1	0	0 mm	left	1:1.58	0.696	1.019	0.709	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.85	N/A	-0.13	1	9CE0D	QPSK	50	0	0 mm	left	1:1.58	0.562	1.035	0.582	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.86	N/A	-0.13	0	9CE0D	QPSK	1	0	0 mm	back	1:1.58	1.260	1.033	1.302	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.77	N/A	-0.13	0	9CE0D	QPSK	50	0	0 mm	back	1:1.58	1.170	1.054	1.233	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.86	N/A	-0.14	0	9CE0D	QPSK	1	0	0 mm	front	1:1.58	1.330	1.033	1.374	A35
2593.00	40620	Mid	LTE Band 41	20	24.0	23.77	N/A	-0.09	0	9CE0D	QPSK	50	0	0 mm	front	1:1.58	1.300	1.054	1.370	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.86	N/A	-0.20	0	9CE0D	QPSK	1	0	0 mm	bottom	1:1.58	1.180	1.033	1.219	
2593.00	40620	Mid	LTE Band 41	20	24.0	23.77	N/A	-0.17	0	9CE0D	QPSK	50	0	0 mm	bottom	1:1.58	1.150	1.054	1.212	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Phablet 4.0 W/kg (mW/g) averaged over 10 grams											

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Table 11-27
WLAN Phablet SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (10g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (10g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5270	54	802.11n	OFDM	40	17.5	16.73	0.03	0 mm	1	9CD11	13.5	back	97.2	7.468	0.717	1.194	1.029	0.881	
5270	54	802.11n	OFDM	40	17.5	16.73	0.16	0 mm	1	9CD11	13.5	front	97.2	1.151	-	1.194	1.029	-	
5270	54	802.11n	OFDM	40	17.5	16.73	-0.19	0 mm	1	9CD11	13.5	top	97.2	1.671	-	1.194	1.029	-	
5270	54	802.11n	OFDM	40	17.5	16.73	0.20	0 mm	1	9CD11	13.5	left	97.2	0.148	-	1.194	1.029	-	
5270	54	802.11n	OFDM	40	17.5	17.45	0.09	0 mm	2	9CD11	13.5	back	97.3	4.886	-	1.012	1.028	-	
5270	54	802.11n	OFDM	40	17.5	17.45	0.16	0 mm	2	9CD11	13.5	front	97.3	6.168	0.738	1.012	1.028	0.768	A36
5270	54	802.11n	OFDM	40	17.5	17.45	-0.19	0 mm	2	9CD11	13.5	top	97.3	2.587	-	1.012	1.028	-	
5270	54	802.11n	OFDM	40	17.5	17.45	0.19	0 mm	2	9CD11	13.5	left	97.3	1.059	-	1.012	1.028	-	
5610	122	802.11ac	OFDM	80	17.5	17.22	0.01	0 mm	1	9CD11	29.3	back	94.6	3.000	0.533	1.067	1.057	0.601	
5610	122	802.11ac	OFDM	80	17.5	17.22	0.12	0 mm	1	9CD11	29.3	front	94.6	0.631	-	1.067	1.057	-	
5610	122	802.11ac	OFDM	80	17.5	17.22	0.00	0 mm	1	9CD11	29.3	top	94.6	1.186	-	1.067	1.057	-	
5610	122	802.11ac	OFDM	80	17.5	17.22	0.15	0 mm	1	9CD11	29.3	left	94.6	0.084	-	1.067	1.057	-	
5690	138	802.11ac	OFDM	80	17.5	17.22	0.01	0 mm	2	9CD11	29.3	back	94.6	7.165	-	1.067	1.057	-	
5690	138	802.11ac	OFDM	80	17.5	17.22	0.10	0 mm	2	9CD11	29.3	front	94.6	7.368	0.591	1.067	1.057	0.667	
5690	138	802.11ac	OFDM	80	17.5	17.22	-0.15	0 mm	2	9CD11	29.3	top	94.6	3.240	-	1.067	1.057	-	
5690	138	802.11ac	OFDM	80	17.5	17.22	0.16	0 mm	2	9CD11	29.3	left	94.6	1.180	-	1.067	1.057	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT												Phablet							
Spatial Peak												4.0 W/kg (mW/g)							
Uncontrolled Exposure/General Population												averaged over 10 grams							

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11.5 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 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.
7. Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB Publication 865664 D01v01r04, variability SAR tests were not required since measured SAR results for all frequency bands were less than 0.8 W/kg. Please see Section 13 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
10. Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.
11. This device supports dynamic antenna tuning for some bands. Per FCC Guidance, SAR was measured according to the normally required SAR measurement configurations with tuner active. The auto-tune state determined by the device was verified before and after each SAR measurement and is listed in tables above. Please see Section 14 for supplemental data.
12. This device utilizes power reduction for some wireless modes and technologies, as outlined in Section 1.3. The maximum output power allowed for each transmitter and exposure condition was evaluated for SAR compliance based on expected use conditions and simultaneous transmission scenarios.
13. Additional SAR tests for phablet SAR were evaluated per KDB 616217 Section 6 (See Section 6.9 for more information).
14. Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds below.

GSM Test Notes:

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

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 8.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC KDB Publication 447498 D01v06, when the reported (scaled) for LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg for 1g evaluations, testing at the other channels was required for such test configurations.
5. TDD LTE was tested per the guidance provided in FCC KDB Publication 941225 D05v02r04. Testing was performed using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Section 4, the duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.

WLAN Notes:

1. For held-to-ear and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g evaluations, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 8.6.5 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg for 1g evaluations. See Section 8.6.6 for more information.
4. Per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D01v06 by either evaluating the sum of the 1g SAR values of each antenna transmitting independently or making a SAR measurement with both antennas transmitting simultaneously. Please see Section 12 for complete analysis.
5. When the maximum reported 1g averaged SAR is ≤ 0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.2 W/kg for 1g evaluations or all test channels were measured.
6. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The

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reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.

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

Bluetooth Notes

1. Bluetooth SAR was measured with the device connected to a call box with hopping disabled with DH5 operation and Tx Tests test mode type. Per October 2016 TCB Workshop Notes, the reported SAR was scaled to the 100% transmission duty factor to determine compliance. See Section 0 for the time domain plot and calculation for the duty factor of the device.
2. Head and hotspot Bluetooth SAR were evaluated for BT BR tethering applications.

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12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

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

12.2 Simultaneous Transmission Procedures

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

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12.3 Head SAR Simultaneous Transmission Analysis

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Head SAR	GSM 850	0.169	0.105	0.263	0.274	0.432	0.537
	GSM 1900	0.052	0.105	0.263	0.157	0.315	0.420
	UMTS 850	0.228	0.105	0.263	0.333	0.491	0.596
	LTE Band 12	0.083	0.105	0.263	0.188	0.346	0.451
	LTE Band 13	0.078	0.105	0.263	0.183	0.341	0.446
	LTE Band 5 (Cell)	0.160	0.105	0.263	0.265	0.423	0.528
	LTE Band 4 (AWS)	0.166	0.105	0.263	0.271	0.429	0.534
	LTE Band 41	0.075	0.105	0.263	0.180	0.338	0.443

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Head SAR	GSM 850	0.169	0.029	0.445	0.198	0.614	0.643
	GSM 1900	0.052	0.029	0.445	0.081	0.497	0.526
	UMTS 850	0.228	0.029	0.445	0.257	0.673	0.702
	LTE Band 12	0.083	0.029	0.445	0.112	0.528	0.557
	LTE Band 13	0.078	0.029	0.445	0.107	0.523	0.552
	LTE Band 5 (Cell)	0.160	0.029	0.445	0.189	0.605	0.634
	LTE Band 4 (AWS)	0.166	0.029	0.445	0.195	0.611	0.640
	LTE Band 41	0.075	0.029	0.445	0.104	0.520	0.549

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Table 12-3
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO and 5 GHz WLAN MIMO (Held to Ear)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	4	5	1+2+3+4+5
Head SAR	GSM 850	0.169	0.105	0.263	0.029	0.445	1.011
	GSM 1900	0.052	0.105	0.263	0.029	0.445	0.894
	UMTS 850	0.228	0.105	0.263	0.029	0.445	1.070
	LTE Band 12	0.083	0.105	0.263	0.029	0.445	0.925
	LTE Band 13	0.078	0.105	0.263	0.029	0.445	0.920
	LTE Band 5 (Cell)	0.160	0.105	0.263	0.029	0.445	1.002
	LTE Band 4 (AWS)	0.166	0.105	0.263	0.029	0.445	1.008
	LTE Band 41	0.075	0.105	0.263	0.029	0.445	0.917

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	GSM 850	0.169	0.796	0.965
	GSM 1900	0.052	0.796	0.848
	UMTS 850	0.228	0.796	1.024
	LTE Band 12	0.083	0.796	0.879
	LTE Band 13	0.078	0.796	0.874
	LTE Band 5 (Cell)	0.160	0.796	0.956
	LTE Band 4 (AWS)	0.166	0.796	0.962
	LTE Band 41	0.075	0.796	0.871

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12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-5
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Body-Worn	GSM 850	0.317	0.075	0.127	0.392	0.444	0.519
	GSM 1900	0.289	0.075	0.127	0.364	0.416	0.491
	UMTS 850	0.385	0.075	0.127	0.460	0.512	0.587
	LTE Band 12	0.200	0.075	0.127	0.275	0.327	0.402
	LTE Band 13	0.148	0.075	0.127	0.223	0.275	0.350
	LTE Band 5 (Cell)	0.267	0.075	0.127	0.342	0.394	0.469
	LTE Band 4 (AWS)	0.789	0.075	0.127	0.864	0.916	0.991
	LTE Band 41	0.248	0.075	0.127	0.323	0.375	0.450

Table 12-6
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Body-Worn	GSM 850	0.317	0.128	0.213	0.445	0.530	0.658
	GSM 1900	0.289	0.128	0.213	0.417	0.502	0.630
	UMTS 850	0.385	0.128	0.213	0.513	0.598	0.726
	LTE Band 12	0.200	0.128	0.213	0.328	0.413	0.541
	LTE Band 13	0.148	0.128	0.213	0.276	0.361	0.489
	LTE Band 5 (Cell)	0.267	0.128	0.213	0.395	0.480	0.608
	LTE Band 4 (AWS)	0.789	0.128	0.213	0.917	1.002	1.130
	LTE Band 41	0.248	0.128	0.213	0.376	0.461	0.589

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Table 12-7
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO and 5 GHz WLAN MIMO (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	4	5	1+2+3+4+5
Body-Worn	GSM 850	0.317	0.075	0.127	0.128	0.213	0.860
	GSM 1900	0.289	0.075	0.127	0.128	0.213	0.832
	UMTS 850	0.385	0.075	0.127	0.128	0.213	0.928
	LTE Band 12	0.200	0.075	0.127	0.128	0.213	0.743
	LTE Band 13	0.148	0.075	0.127	0.128	0.213	0.691
	LTE Band 5 (Cell)	0.267	0.075	0.127	0.128	0.213	0.810
	LTE Band 4 (AWS)	0.789	0.075	0.127	0.128	0.213	1.332
	LTE Band 41	0.248	0.075	0.127	0.128	0.213	0.791

Table 12-8
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body-Worn	GSM 850	0.317	0.037	0.354
	GSM 1900	0.289	0.037	0.326
	UMTS 850	0.385	0.037	0.422
	LTE Band 12	0.200	0.037	0.237
	LTE Band 13	0.148	0.037	0.185
	LTE Band 5 (Cell)	0.267	0.037	0.304
	LTE Band 4 (AWS)	0.789	0.037	0.826
	LTE Band 41	0.248	0.037	0.285

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12.5 Hotspot SAR Simultaneous Transmission Analysis

Table 12-9
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Hotspot SAR	GPRS 850	0.724	0.208	0.344	0.932	1.068	1.276
	GPRS 1900	0.741	0.208	0.344	0.949	1.085	1.293
	UMTS 850	0.628	0.208	0.344	0.836	0.972	1.180
	LTE Band 12	0.341	0.208	0.344	0.549	0.685	0.893
	LTE Band 13	0.284	0.208	0.344	0.492	0.628	0.836
	LTE Band 5 (Cell)	0.495	0.208	0.344	0.703	0.839	1.047
	LTE Band 4 (AWS)	0.569	0.208	0.344	0.777	0.913	1.121
	LTE Band 41	0.594	0.208	0.344	0.802	0.938	1.146

Table 12-10
Simultaneous Transmission Scenario with 5 GHz WLAN (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Hotspot SAR	GPRS 850	0.724	0.066	0.319	0.790	1.043	1.109
	GPRS 1900	0.741	0.066	0.319	0.807	1.060	1.126
	UMTS 850	0.628	0.066	0.319	0.694	0.947	1.013
	LTE Band 12	0.341	0.066	0.319	0.407	0.660	0.726
	LTE Band 13	0.284	0.066	0.319	0.350	0.603	0.669
	LTE Band 5 (Cell)	0.495	0.066	0.319	0.561	0.814	0.880
	LTE Band 4 (AWS)	0.569	0.066	0.319	0.635	0.888	0.954
	LTE Band 41	0.594	0.066	0.319	0.660	0.913	0.979

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Table 12-11
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO and 5 GHz WLAN MIMO (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN MIMO at 16 dBm SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	4	1+2+3+4
Hotspot SAR	GPRS 850	0.724	0.204	0.066	0.319	1.313
	GPRS 1900	0.741	0.204	0.066	0.319	1.330
	UMTS 850	0.628	0.204	0.066	0.319	1.217
	LTE Band 12	0.341	0.204	0.066	0.319	0.930
	LTE Band 13	0.284	0.204	0.066	0.319	0.873
	LTE Band 5 (Cell)	0.495	0.204	0.066	0.319	1.084
	LTE Band 4 (AWS)	0.569	0.204	0.066	0.319	1.158
	LTE Band 41	0.594	0.204	0.066	0.319	1.183

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Hotspot SAR	GPRS 850	0.724	0.101	0.825
	GPRS 1900	0.741	0.101	0.842
	UMTS 850	0.628	0.101	0.729
	LTE Band 12	0.341	0.101	0.442
	LTE Band 13	0.284	0.101	0.385
	LTE Band 5 (Cell)	0.495	0.101	0.596
	LTE Band 4 (AWS)	0.569	0.101	0.670
	LTE Band 41	0.594	0.101	0.695

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12.6 Phablet Simultaneous Transmission Analysis

Table 12-13
Simultaneous Transmission Scenario with 5 GHz WLAN (Phablet at 0.0 cm)

Exposure Condition	Mode	4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Phablet SAR	LTE Band 4 (AWS)	1.706	0.881	0.768	2.587	2.474	3.355
	LTE Band 41	1.374	0.881	0.768	2.255	2.142	3.023

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 D01v06 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 D01v01r04, SAR measurement variability was not assessed for each frequency band since all measured SAR values are < 0.8 W/kg for 1g SAR and < 2.0 W/kg for 10g SAR.

13.2 Measurement Uncertainty

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

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14 ADDITIONAL TESTING PER FCC GUIDANCE

14.1 Tuner Testing

The following test procedures were followed to demonstrate that the SAR results in Section 11 represented the appropriate SAR test conditions. For bands with dynamic tuning implemented, SAR was measured according to the required FCC SAR test procedures with the dynamic tuner active to allow the device to automatically tune to the antenna state for the respective RF exposure test configurations. Additional single point SAR time-sweep measurements were evaluated for other tuner states to determine that the other tuner configurations would result in equivalent or lower SAR values. The additional tuner hardware has no influence to the antenna characteristics, other than impedance matching.

To evaluate all of the tuner states, the 80 tuner states were divided among the aggregate band, mode and exposure combinations so that each combination was evaluated for at least 20 tuner states and also so that at least 3 single point SAR measurements were made for every available tuner state. Single point time-sweep measurements were performed at the peak SAR location determined by the zoom scan of the configuration with the highest reported SAR for each combination. The tuner state was able to be established remotely so that the device was not moved for the entire series of single point SAR for the tuner states in each combination. The SAR probe remained stationary at the same position throughout the entire series of single point measurements for each combination. When the single point SAR or 1g SAR was > 1.2 W/kg for a particular band/mode/exposure condition, point SAR measurements were made for all 80 states.

Per FCC Guidance, several bands/modes were combined to be treated as a single aggregate band. LTE bands 12/17 and 13 were considered as an aggregated band to select single point measurement configurations. The wireless configuration and exposure condition combinations were divided evenly among the three bands (i.e., the number of required single point measurements (at least 20) apply to the aggregated band). All other bands were treated independently.

The operational description contains more information about the design and implementation of the dynamic antenna tuning.

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Table 14-1
UMTS Supplemental Head SAR Data

Supplemental Head SAR Data	
UMTS Band 5	
RMC	
Test Position	Right Cheek
Frequency (MHz)	836.6
Channel	4183
Measured 1g SAR (W/kg)	0.211
Average Value of Time Sweep (W/kg)	
Auto-tune (State 2)	0.259
Default (State 2)	0.249
State 0	0.245
State 2	0.249
State 5	0.243
State 9	0.208
State 15	0.04
State 18	0.240
State 22	0.224
State 25	0.195
State 28	0.103
State 29	0.083
State 33	0.122
State 35	0.125
State 38	0.113
State 40	0.102
State 43	0.044
State 48	0.126
State 49	0.127
State 53	0.127
State 58	0.069
State 62	0.013
State 63	0.007
State 68	0.245
State 71	0.127
State 76	0.245

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Table 14-2
LTE Supplemental Head SAR Data

Supplemental Head SAR Data							
LTE Band 12		LTE Band 13		LTE Band 5		LTE Band 4	
QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 20MHz Bandwidth, 1 RB, 0 RB Offsets	
Test Position	Right Cheek	Test Position	Right Cheek	Test Position	Right Cheek	Test Position	Left Cheek
Frequency (MHz)	707.5	Frequency (MHz)	782	Frequency (MHz)	836.5	Frequency (MHz)	1732.5
Channel	23095	Channel	23230	Channel	20525	Channel	20175
Measured 1g SAR (W/kg)	0.077	Measured 1g SAR (W/kg)	0.065	Measured 1g SAR (W/kg)	0.148	Measured 1g SAR (W/kg)	0.141
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-tune (State 17)	0.088	Auto-tune (State 77)	0.067	Auto-tune (State 1)	0.172	Auto-tune (State 42)	0.198
Default (State 1)	0.087	Default (State 1)	0.064	Default (State 2)	0.169	Default (State 34)	0.176
State 1	0.087	State 0	0.064	State 1	0.171	State 0	0.159
State 2	0.088	State 3	0.059	State 3	0.166	State 4	0.147
State 7	0.084	State 6	0.060	State 6	0.161	State 5	0.142
State 10	0.068	State 8	0.046	State 9	0.142	State 11	0.114
State 12	0.045	State 12	0.012	State 10	0.126	State 15	0.066
State 15	0.019	State 16	0.067	State 13	0.066	State 19	0.108
State 17	0.086	State 20	0.060	State 19	0.166	State 21	0.109
State 22	0.077	State 24	0.048	State 23	0.152	State 25	0.095
State 25	0.064	State 29	0.008	State 24	0.151	State 26	0.087
State 27	0.047	State 32	0.034	State 26	0.120	State 31	0.041
State 30	0.023	State 35	0.030	State 30	0.049	State 37	0.179
State 34	0.032	State 39	0.023	State 37	0.084	State 39	0.176
State 36	0.033	State 42	0.011	State 41	0.059	State 42	0.186
State 38	0.024	State 44	0.004	State 44	0.022	State 43	0.191
State 40	0.018	State 48	0.035	State 46	0.011	State 46	0.188
State 45	0.001	State 51	0.030	State 51	0.089	State 49	0.176
State 50	0.032	State 55	0.024	State 54	0.081	State 52	0.176
State 54	0.024	State 60	0.005	State 58	0.049	State 53	0.182
State 57	0.012	State 63	0.001	State 64	0.166	State 56	0.176
State 60	0.003	State 67	0.034	State 66	0.081	State 59	0.169
State 62	0.001	State 70	0.034	State 69	0.168	State 61	0.160
State 68	0.079	State 73	0.065	State 72	0.166	State 65	0.106
State 70	0.026	State 75	0.035	State 75	0.085	State 66	0.156
State 78	0.026	State 77	0.068	State 79	0.087	State 72	0.153

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Table 14-3
UMTS Supplemental Body SAR Data

Supplemental Body SAR Data	
UMTS Band 5	
RMC	
Test Position	Back
Spacing	10 mm
Frequency (MHz)	846.6
Channel	4233
Measured 1g SAR (W/kg)	0.585
Average Value of Time Sweep (W/kg)	
Auto-tune (State 18)	0.749
Default (State 2)	0.743
State 4	0.729
State 7	0.670
State 11	0.392
State 14	0.158
State 16	0.744
State 17	0.752
State 18	0.762
State 19	0.756
State 24	0.676
State 27	0.414
State 31	0.113
State 34	0.357
State 39	0.29
State 42	0.171
State 45	0.064
State 47	0.029
State 49	0.374
State 52	0.353
State 55	0.302
State 62	0.048
State 70	0.359
State 73	0.738
State 77	0.747
State 79	0.373

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Table 14-4
LTE Supplemental Body SAR Data

Supplemental Body SAR Data							
LTE Band 12		LTE Band 13		LTE Band 5		LTE Band 4	
QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 20MHz Bandwidth, 1 RB, 0 RB Offsets	
Test Position	Back	Test Position	Back	Test Position	Back	Test Position	Back
Spacing	10 mm	Spacing	10 mm	Spacing	10 mm	Spacing	15 mm
Frequency (MHz)	707.5	Frequency (MHz)	782	Frequency (MHz)	836.5	Frequency (MHz)	1732.5
Channel	23095	Channel	23230	Channel	20525	Channel	20175
Measured 1g SAR (W/kg)	0.315	Measured 1g SAR (W/kg)	0.238	Measured 1g SAR (W/kg)	0.459	Measured 1g SAR (W/kg)	0.670
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-tune (State 65)	0.439	Auto-tune (State 1)	0.304	Auto-tune (State 69)	0.555	Auto-tune (State 46)	0.99
Default (State 1)	0.454	Default (State 1)	0.294	Default (State 2)	0.572	Default (State 34)	0.805
State 5	0.392	State 1	0.294	State 2	0.572	State 4	0.817
State 7	0.346	State 3	0.289	State 8	0.552	State 8	0.835
State 10	0.248	State 6	0.250	State 9	0.525	State 14	0.443
State 13	0.135	State 11	0.106	State 12	0.336	State 16	0.625
State 21	0.339	State 13	0.052	State 14	0.212	State 20	0.561
State 23	0.300	State 21	0.294	State 17	0.543	State 22	0.535
State 28	0.138	State 23	0.250	State 18	0.558	State 28	0.366
State 31	0.065	State 27	0.113	State 20	0.553	State 32	0.757
State 33	0.214	State 30	0.04	State 26	0.456	State 34	0.805
State 41	0.103	State 33	0.153	State 29	0.274	State 36	0.825
State 43	0.059	State 35	0.142	State 32	0.228	State 37	0.828
State 45	0.031	State 41	0.083	State 36	0.235	State 38	0.838
State 47	0.015	State 44	0.03	State 47	0.02	State 40	0.844
State 52	0.225	State 48	0.157	State 50	0.258	State 46	1.003
State 55	0.163	State 51	0.144	State 54	0.229	State 50	0.842
State 57	0.111	State 53	0.137	State 56	0.21	State 56	0.855
State 59	0.064	State 58	0.064	State 57	0.172	State 59	0.862
State 61	0.034	State 61	0.023	State 60	0.066	State 63	0.791
State 64	0.457	State 67	0.155	State 64	0.527	State 65	0.55
State 65	0.444	State 71	0.157	State 67	0.236	State 68	0.8
State 66	0.211	State 72	0.283	State 69	0.577	State 71	0.830
State 69	0.446	State 74	0.153	State 74	0.226	State 74	0.726
State 73	0.443	State 76	0.292	State 75	0.237	State 76	0.803
State 77	0.443	State 78	0.154	State 78	0.229	State 79	0.835

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15 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Vector Network Analyzer	8/17/2017	Annual	8/17/2018	MY40003841
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Agilent	E4432B	ESG-D Series Signal Generator	3/24/2017	Annual	3/24/2018	US40053896
Agilent	E4438C	ESG Vector Signal Generator	3/24/2017	Biennial	3/24/2019	MY42082385
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/22/2017	Annual	3/22/2018	MY45470194
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB44450273
Agilent	N5182A	MXG Vector Signal Generator	2/28/2017	Annual	2/28/2018	MY47420800
Agilent	N9020A	MXA Signal Analyzer	1/24/2018	Annual	1/24/2019	US46470561
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433976
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433978
Anritsu	MA24106A	USB Power Sensor	6/7/2017	Annual	6/7/2018	1231535
Anritsu	MA24106A	USB Power Sensor	6/7/2017	Annual	6/7/2018	1231538
Anritsu	MA24106A	USB Power Sensor	6/7/2017	Annual	6/7/2018	1244512
Anritsu	MA2411B	Pulse Power Sensor	10/16/2017	Annual	10/16/2018	1207470
Anritsu	ML2495A	Power Meter	10/22/2017	Annual	10/22/2018	941001
Anritsu	MT8821C	Radio Communication Analyzer	7/25/2017	Annual	7/25/2018	6201664756
COMTECH	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M155400-009
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
Control Company	4040	Therm./Clock/Humidity Monitor	3/1/2017	Biennial	3/1/2019	170152009
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330171
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330174
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mitutoyo	CD-6°CSX	Digital Caliper	3/2/2016	Biennial	3/2/2018	13264165
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	NC-100	Torque Wrench	3/8/2017	Annual	3/8/2018	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	4/11/2017	Annual	4/11/2018	836371/0079
Rohde & Schwarz	CMW500	Radio Communication Tester	3/29/2017	Annual	3/29/2018	128633
Seekonk	NC-100	Torque Wrench (8" lb)	8/30/2016	Biennial	8/30/2018	N/A
SPEAG	D750V3	750 MHz SAR Dipole	7/13/2016	Biennial	7/13/2018	1161
SPEAG	D835V2	835 MHz SAR Dipole	1/15/2018	Annual	1/15/2019	40132
SPEAG	D1750V2	1750 MHz SAR Dipole	5/9/2017	Annual	5/9/2018	1148
SPEAG	D1900V2	1900 MHz SAR Dipole	7/11/2017	Annual	7/11/2018	50149
SPEAG	D2450V2	2450 MHz SAR Dipole	9/11/2017	Annual	9/11/2018	797
SPEAG	D2600V2	2600 MHz SAR Dipole	7/10/2017	Annual	7/10/2018	1126
SPEAG	D6GHzV2	5 GHz SAR Dipole	8/15/2017	Annual	8/15/2018	1237
SPEAG	D750V3	750 MHz SAR Dipole	1/15/2018	Annual	1/15/2019	1003
SPEAG	D1900V2	1900 MHz SAR Dipole	7/8/2016	Biennial	7/8/2018	50080
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/16/2018	Annual	1/16/2019	1057
SPEAG	EX3DV4	SAR Probe	4/18/2017	Annual	4/18/2018	7406
SPEAG	ES3DV3	SAR Probe	3/14/2017	Annual	3/14/2018	3319
SPEAG	ES3DV3	SAR Probe	3/14/2017	Annual	3/14/2018	3209
SPEAG	ES3DV3	SAR Probe	9/22/2017	Annual	9/22/2018	3318
SPEAG	ES3DV3	SAR Probe	8/14/2017	Annual	8/14/2018	3332
SPEAG	EX3DV4	SAR Probe	2/13/2017	Annual	2/13/2018	3914
SPEAG	EX3DV4	SAR Probe	8/16/2017	Annual	8/16/2018	7308
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2017	Annual	4/11/2018	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/8/2017	Annual	3/8/2018	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/14/2017	Annual	6/14/2018	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2017	Annual	3/13/2018	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/9/2017	Annual	8/9/2018	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	665
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/10/2017	Annual	5/10/2018	1070

Note:

1. 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.
2. Each equipment item was used solely within its respective calibration period.

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16 MEASUREMENT UNCERTAINTIES

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

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17 CONCLUSION

17.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD55

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6$ MHz; $\sigma = 0.907$ S/m; $\epsilon_r = 41.914$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 01-26-2018; Ambient Temp: 23.2°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3319; ConvF(6.46, 6.46, 6.46); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

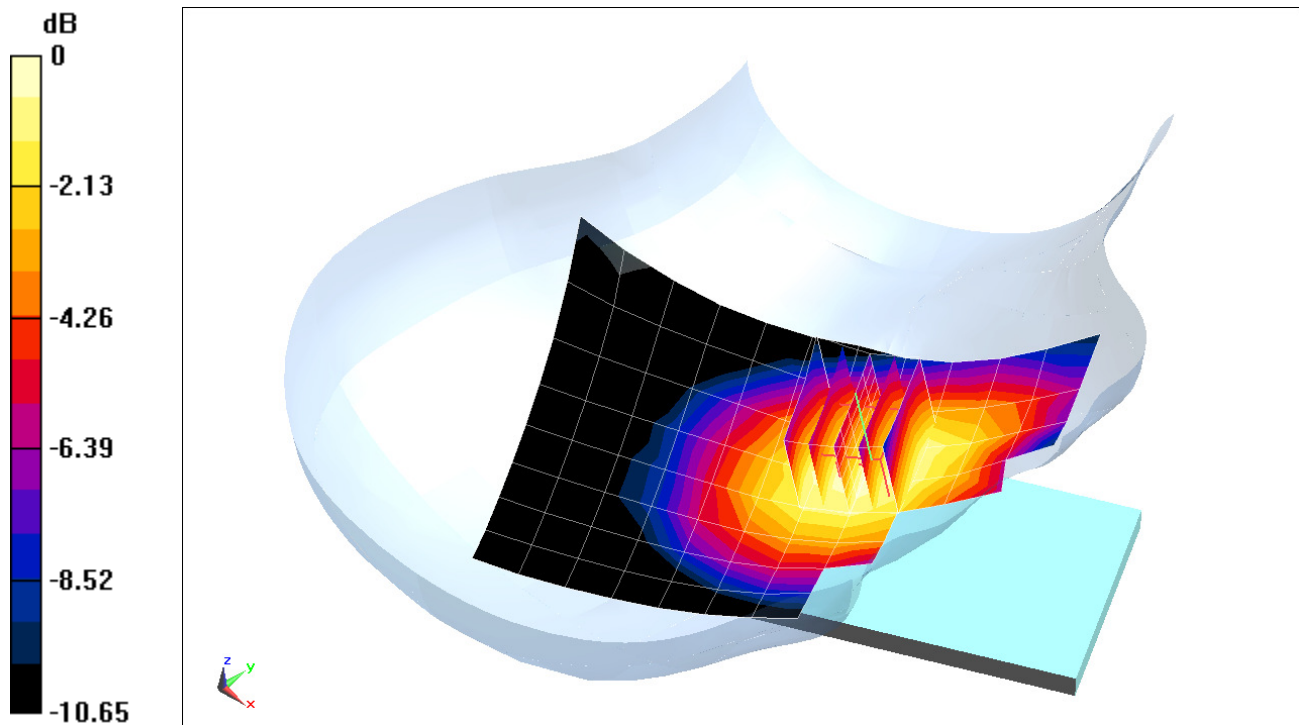
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.38 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.196 W/kg

SAR(1 g) = 0.152 W/kg



0 dB = 0.166 W/kg = -7.80 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDE8

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

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.429 \text{ S/m}$; $\epsilon_r = 40.526$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 02-05-2018; Ambient Temp: 21.3°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(5.31, 5.31, 5.31); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

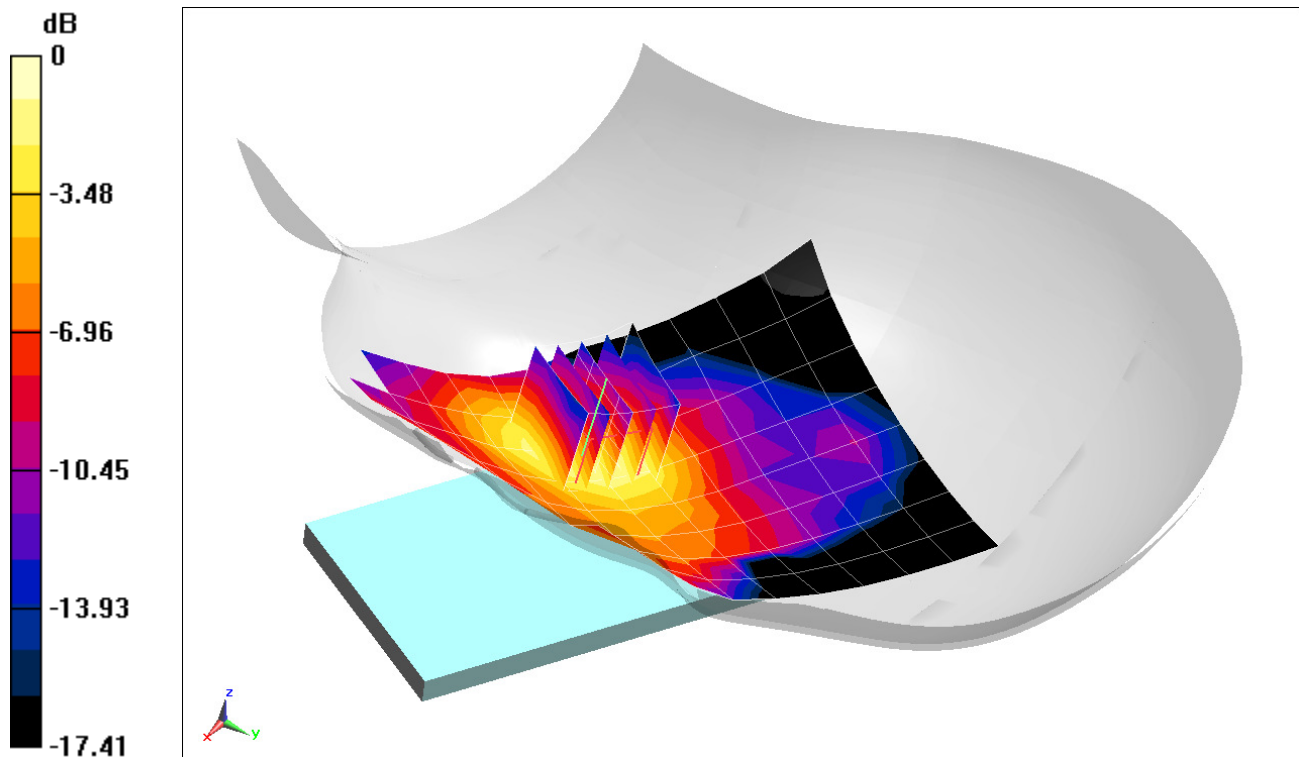
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 5.995 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.0710 W/kg

SAR(1 g) = 0.046 W/kg



0 dB = 0.0543 W/kg = -12.65 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD55

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.907 \text{ S/m}$; $\epsilon_r = 41.914$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 01-26-2018; Ambient Temp: 23.2°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3319; ConvF(6.46, 6.46, 6.46); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

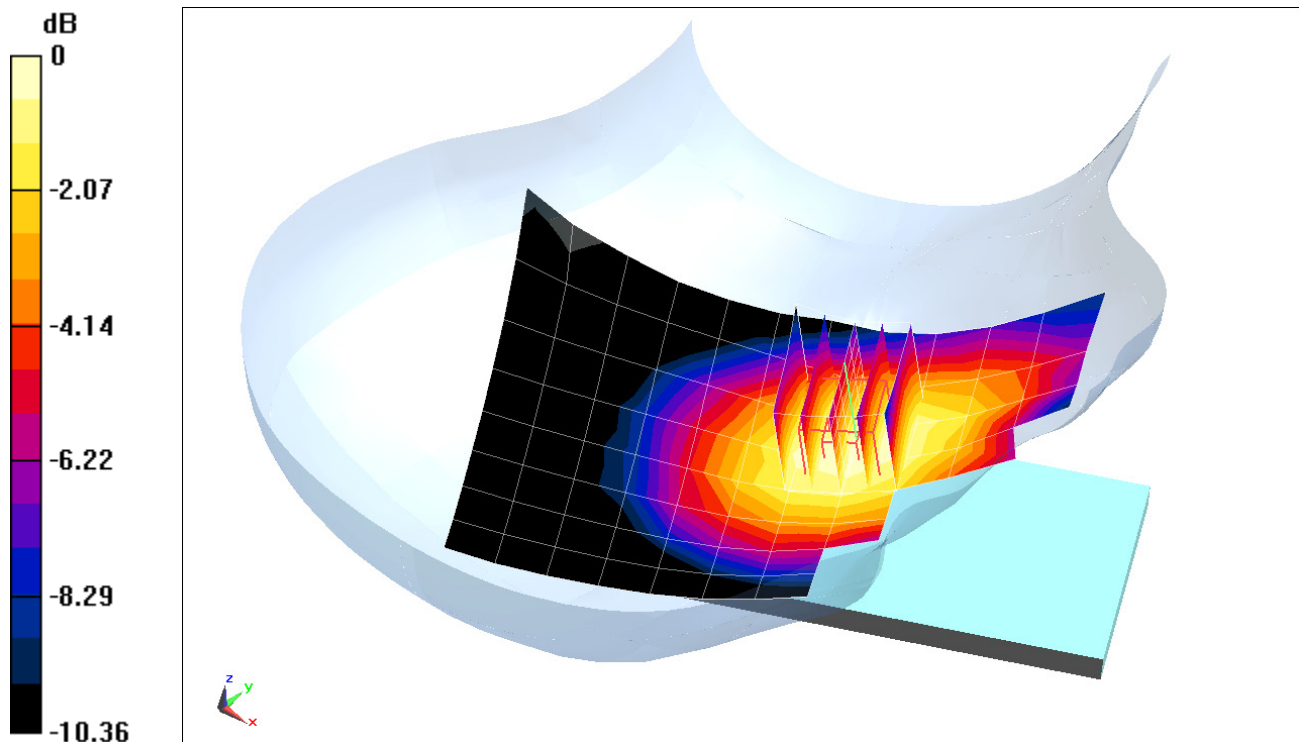
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x5x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 15.75 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.272 W/kg

SAR(1 g) = 0.211 W/kg



0 dB = 0.229 W/kg = -6.40 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDB7

Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium: 750 Head Medium parameters used (interpolated):

$f = 707.5$ MHz; $\sigma = 0.883$ S/m; $\epsilon_r = 40.449$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 01-23-2018; Ambient Temp: 21.5°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(10.26, 10.26, 10.26); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

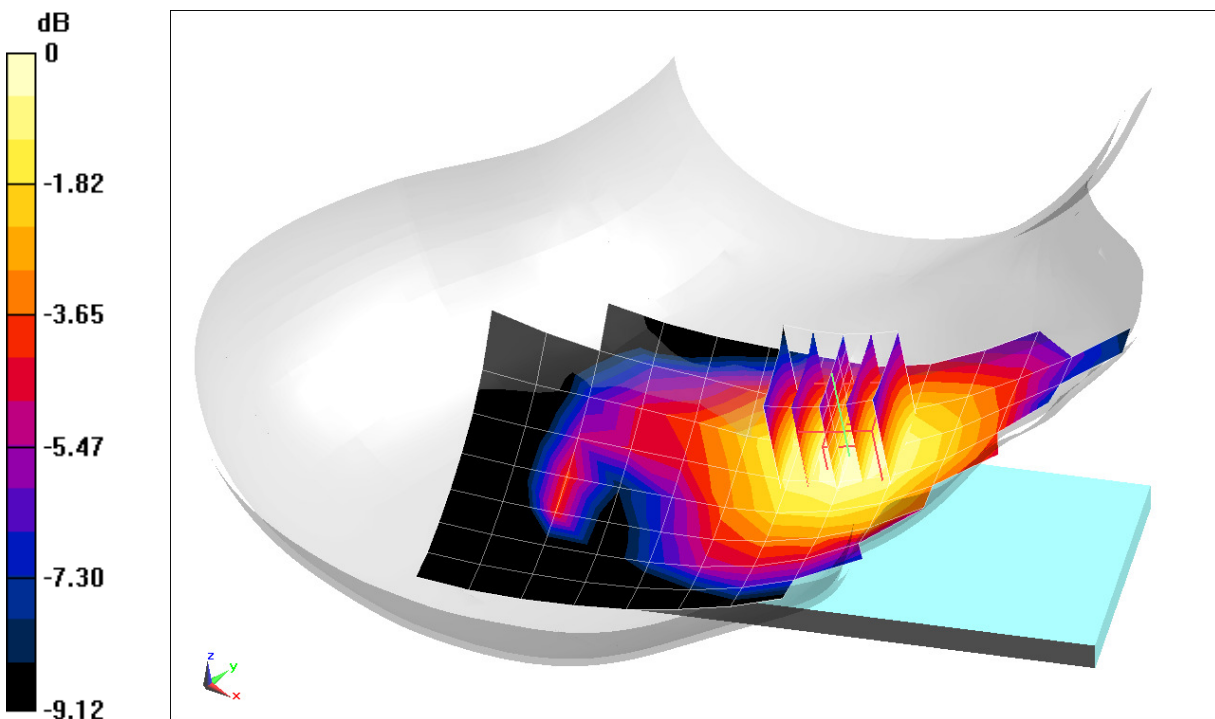
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 9.789 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.0990 W/kg

SAR(1 g) = 0.077 W/kg



0 dB = 0.0919 W/kg = -10.37 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDB7

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Head Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.908 \text{ S/m}$; $\epsilon_r = 40.262$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 01-23-2018; Ambient Temp: 21.5°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(10.26, 10.26, 10.26); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 13, Right Head, Cheek, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

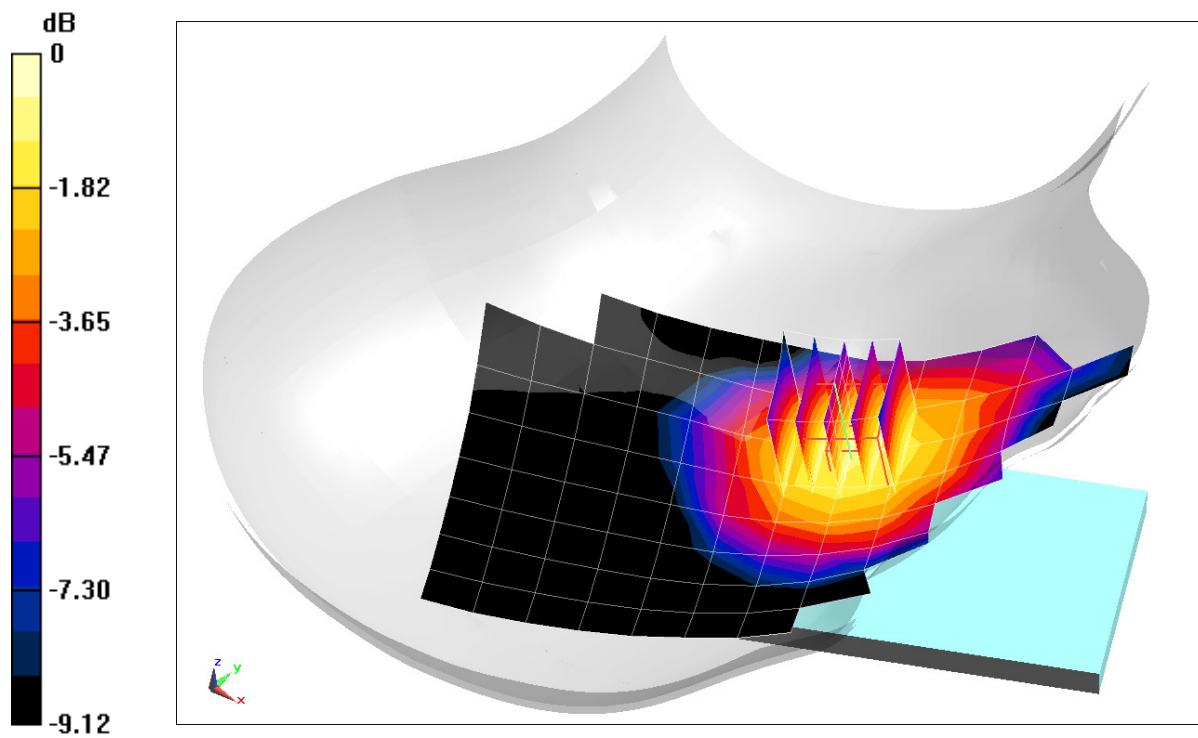
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 8.007 V/m; Power Drift = 0.17 dB

Peak SAR (extrapolated) = 0.0820 W/kg

SAR(1 g) = 0.065 W/kg



0 dB = 0.0759 W/kg = -11.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD55

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.5$ MHz; $\sigma = 0.907$ S/m; $\epsilon_r = 41.915$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 01-26-2018; Ambient Temp: 23.2°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3319; ConvF(6.46, 6.46, 6.46); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

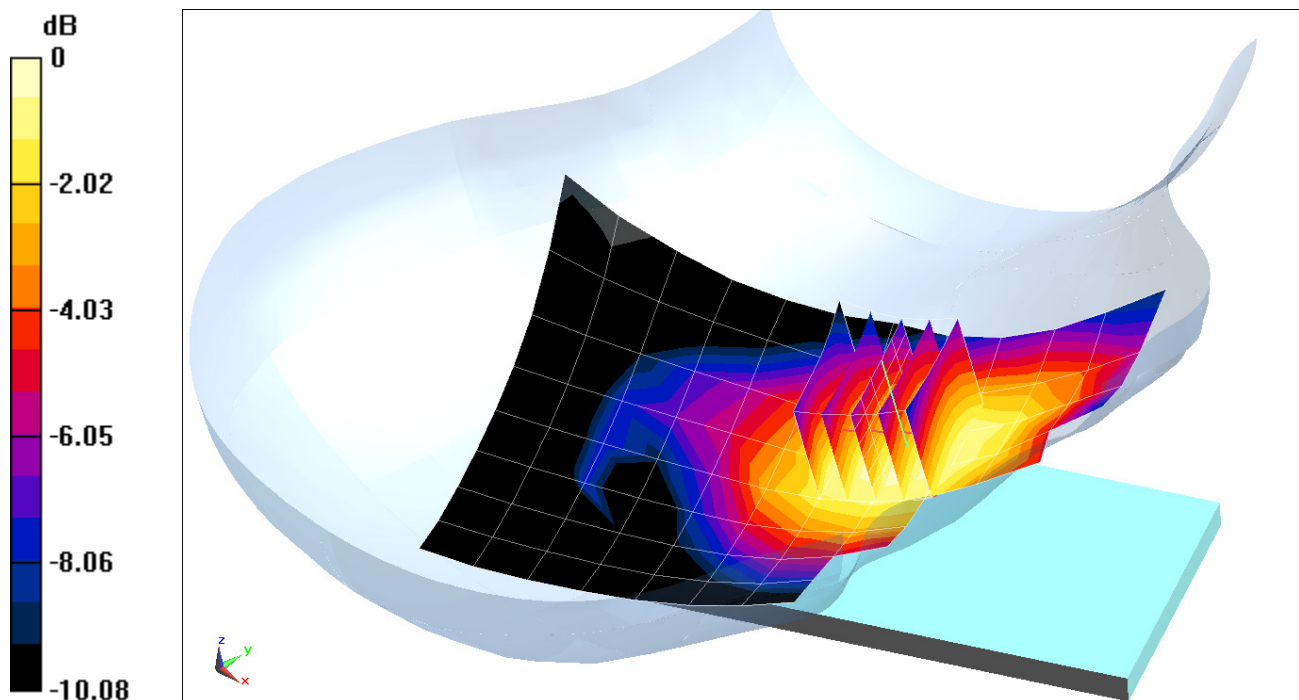
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.77 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.191 W/kg

SAR(1 g) = 0.148 W/kg



0 dB = 0.162 W/kg = -7.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDB7

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.398 \text{ S/m}$; $\epsilon_r = 38.771$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 01-22-2018; Ambient Temp: 21.2°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3318; ConvF(5.5, 5.5, 5.5); Calibrated: 9/22/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/14/2017

Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 4 (AWS), Left Head, Cheek, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

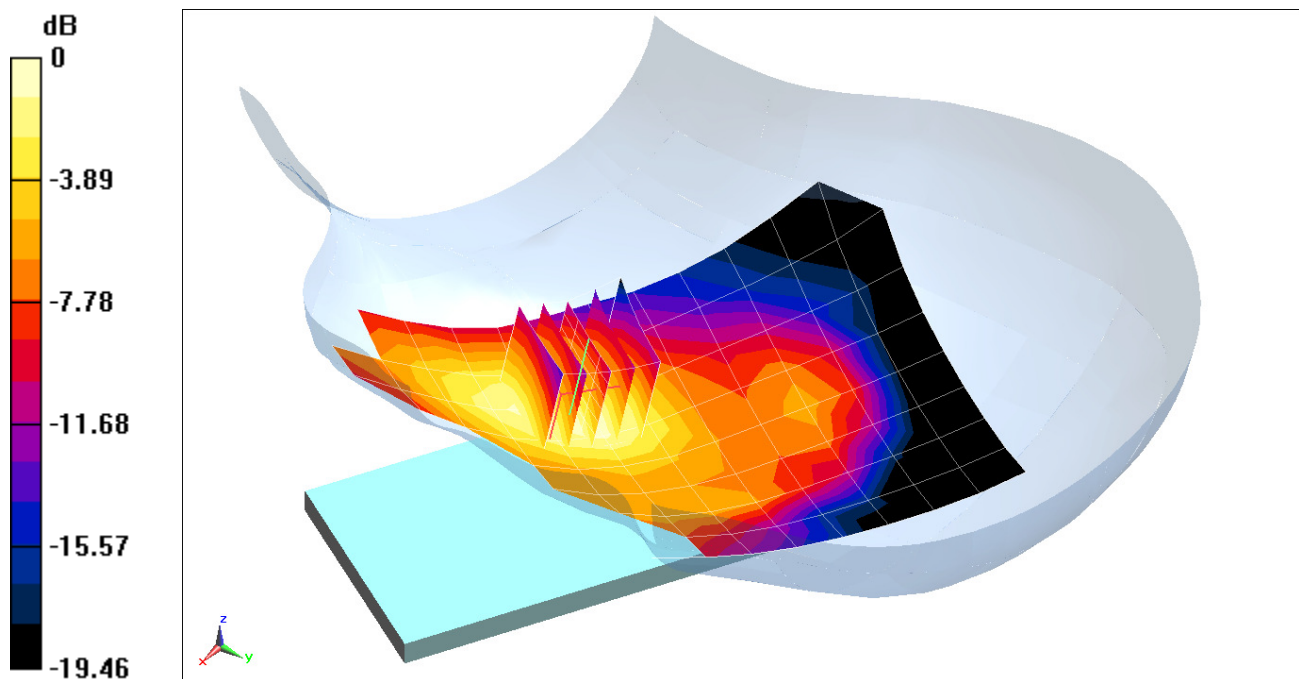
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.27 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.210 W/kg

SAR(1 g) = 0.141 W/kg



0 dB = 0.164 W/kg = -7.85 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD55

Communication System: UID 0, LTE Band 41; Frequency: 2593 MHz; Duty Cycle: 1:1.58

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$; $\sigma = 2.034 \text{ S/m}$; $\epsilon_r = 38.652$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 01-31-2018; Ambient Temp: 23.3°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(4.56, 4.56, 4.56); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 8/9/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 41, Right Head, Cheek, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

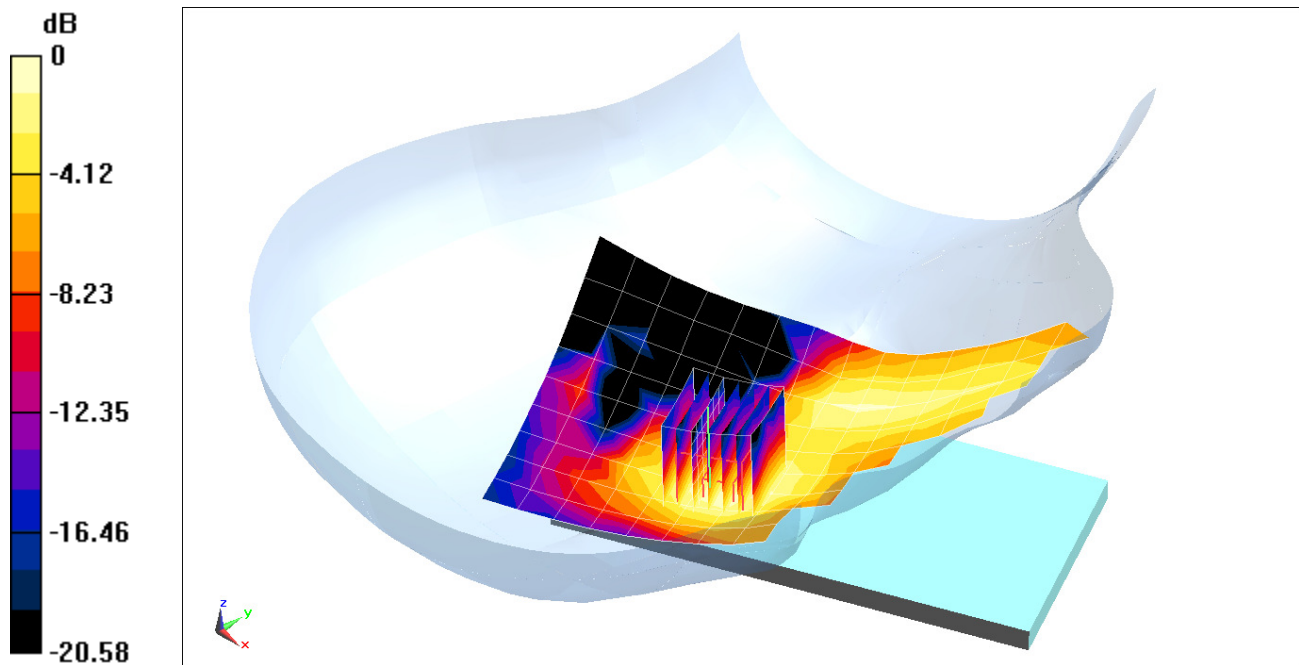
Area Scan (10x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 6.844 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.137 W/kg

SAR(1 g) = 0.074 W/kg



0 dB = 0.0919 W/kg = -10.37 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CE0D

Communication System: UID 0, _IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.829 \text{ S/m}$; $\epsilon_r = 39.327$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 01-31-2018; Ambient Temp: 23.3°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(4.68, 4.68, 4.68); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 8/9/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: IEEE 802.11b, Antenna 2, 22 MHz Bandwidth,
Right Head, Tilt, Ch 1, 1 Mbps**

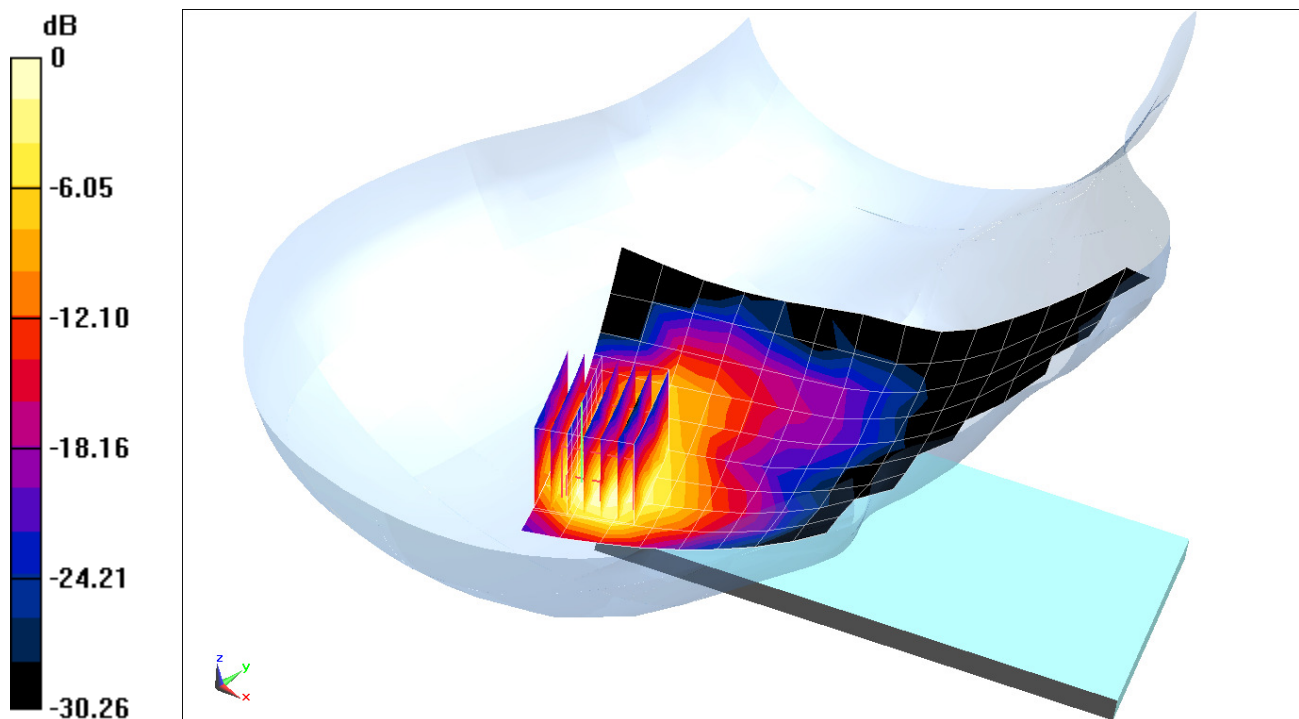
Area Scan (10x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 7.317 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.711 W/kg

SAR(1 g) = 0.251 W/kg



0 dB = 0.400 W/kg = -3.98 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD21

Communication System: UID 0, 802.11ac 5.2-5.8 GHz Band; Frequency: 5775 MHz; Duty Cycle: 1:1

Medium: 5GHz Head Medium parameters used (interpolated):

$f = 5775 \text{ MHz}$; $\sigma = 5.034 \text{ S/m}$; $\epsilon_r = 34.31$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 01-23-2018; Ambient Temp: 22.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN3914; ConvF(4.91, 4.91, 4.91); Calibrated: 2/13/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/9/2017

Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

**Mode: IEEE 802.11ac, Antenna 2, U-NII-3, 80 MHz Bandwidth,
Right Head, Cheek, Ch 155, 29.3 Mbps**

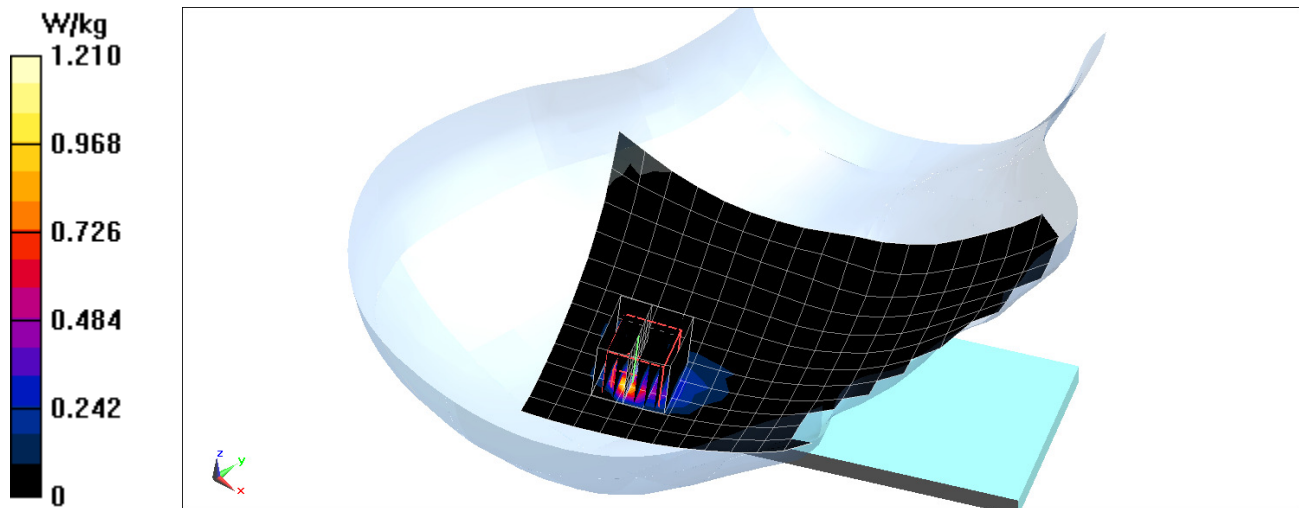
Area Scan (13x11x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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 = 0.919 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 2.19 W/kg

SAR(1 g) = 0.399 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CE10

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.289

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 1.823 \text{ S/m}$; $\epsilon_r = 37.91$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 02-07-2018; Ambient Temp: 20.6°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3319; ConvF(4.6, 4.6, 4.6); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

Mode: Bluetooth, Right Head, Cheek, Ch 39, 1Mbps

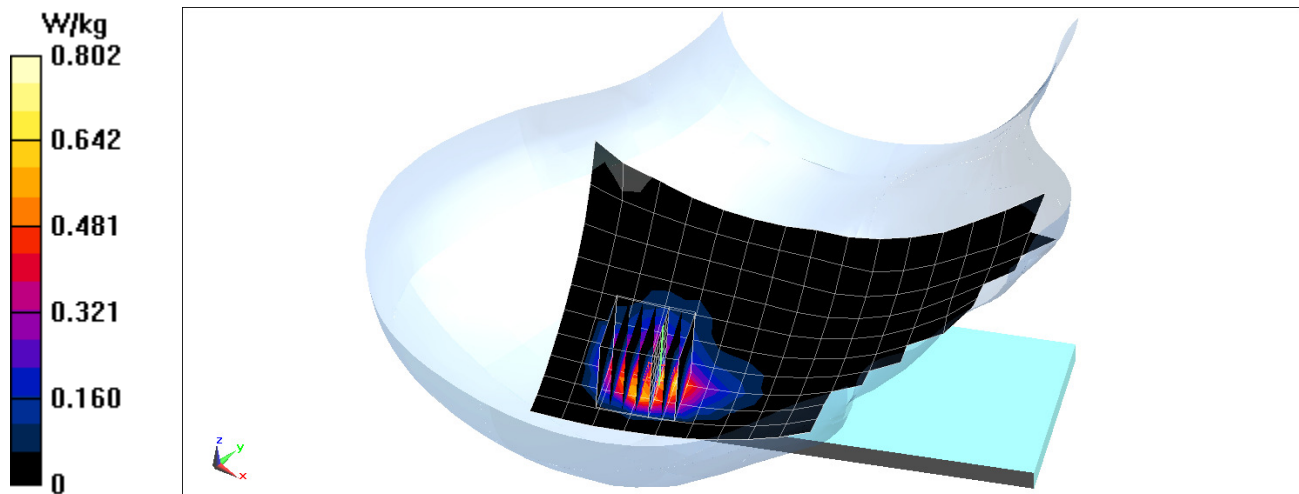
Area Scan (11x19x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 18.62 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 0.598 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDE8

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.974 \text{ S/m}$; $\epsilon_r = 54.488$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-29-2018; Ambient Temp: 20.7°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(6.36, 6.36, 6.36); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

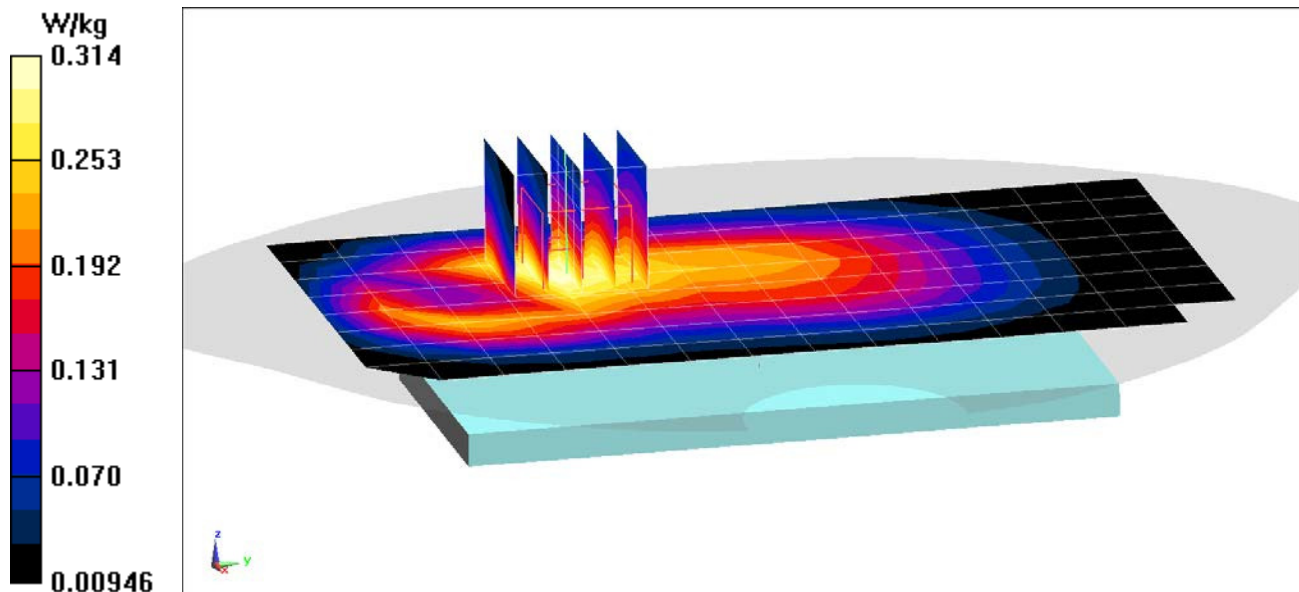
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.70 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.373 W/kg

SAR(1 g) = 0.285 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDE8

Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 848.8 MHz; Duty Cycle: 1:2.76

Medium: 835 Body Medium parameters used (interpolated):

$f = 848.8 \text{ MHz}$; $\sigma = 0.987 \text{ S/m}$; $\epsilon_r = 54.378$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-29-2018; Ambient Temp: 20.7°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(6.36, 6.36, 6.36); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

GPRS 850, Body SAR, Back side, High.ch, 3 Tx Slots

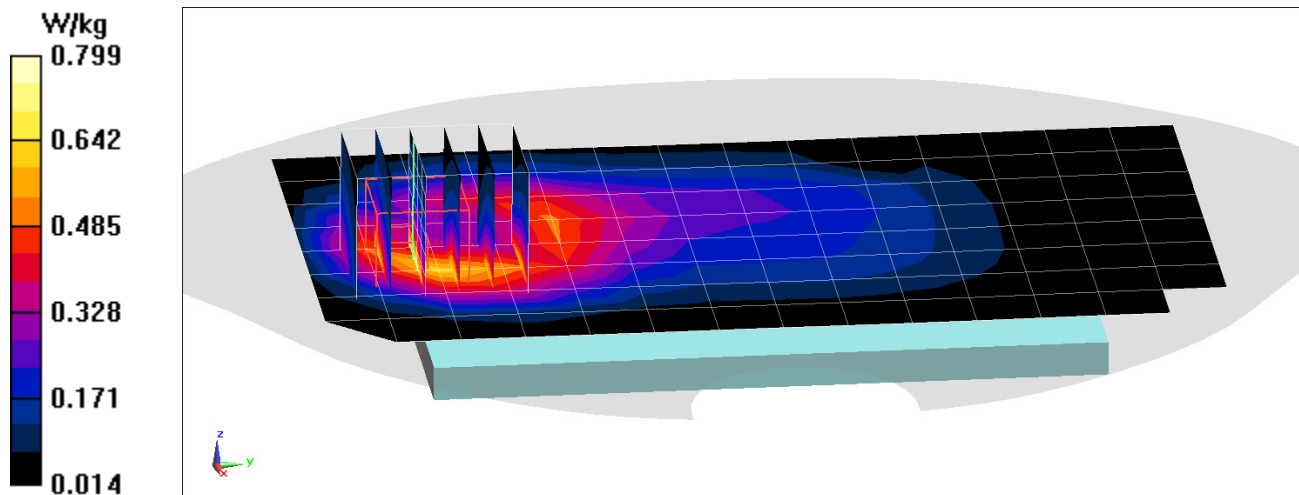
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 25.85 V/m; Power Drift = -0.18 dB

Peak SAR (extrapolated) = 1.10 W/kg

SAR(1 g) = 0.668 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CE10

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.54 \text{ S/m}$; $\epsilon_r = 52.514$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-24-2018; Ambient Temp: 22.3°C; Tissue Temp: 20.9°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

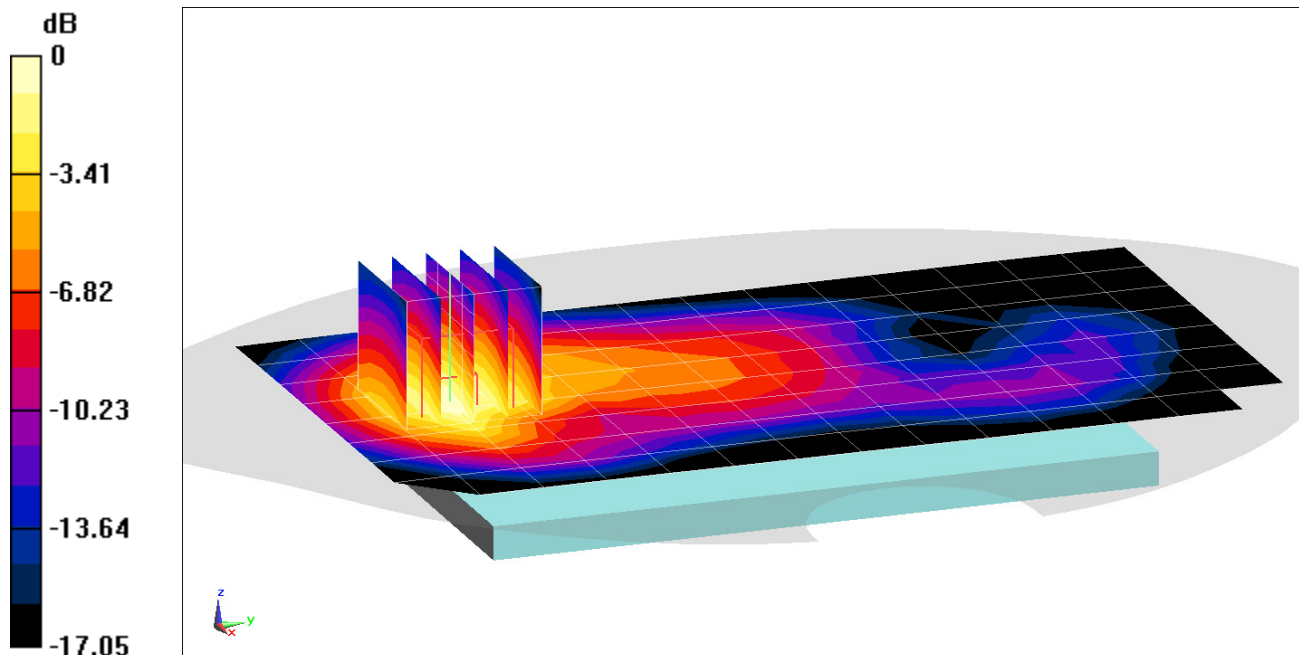
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.86 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.405 W/kg

SAR(1 g) = 0.256 W/kg



0 dB = 0.307 W/kg = -5.13 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CE10

Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 1909.8 MHz; Duty Cycle: 1:2.76

Medium: 1900 Body Medium parameters used:

$f = 1910 \text{ MHz}$; $\sigma = 1.575 \text{ S/m}$; $\epsilon_r = 52.429$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-24-2018; Ambient Temp: 22.3°C; Tissue Temp: 20.9°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

Mode: GPRS 1900, Body SAR, Bottom Edge, High.ch, 3 Tx Slots

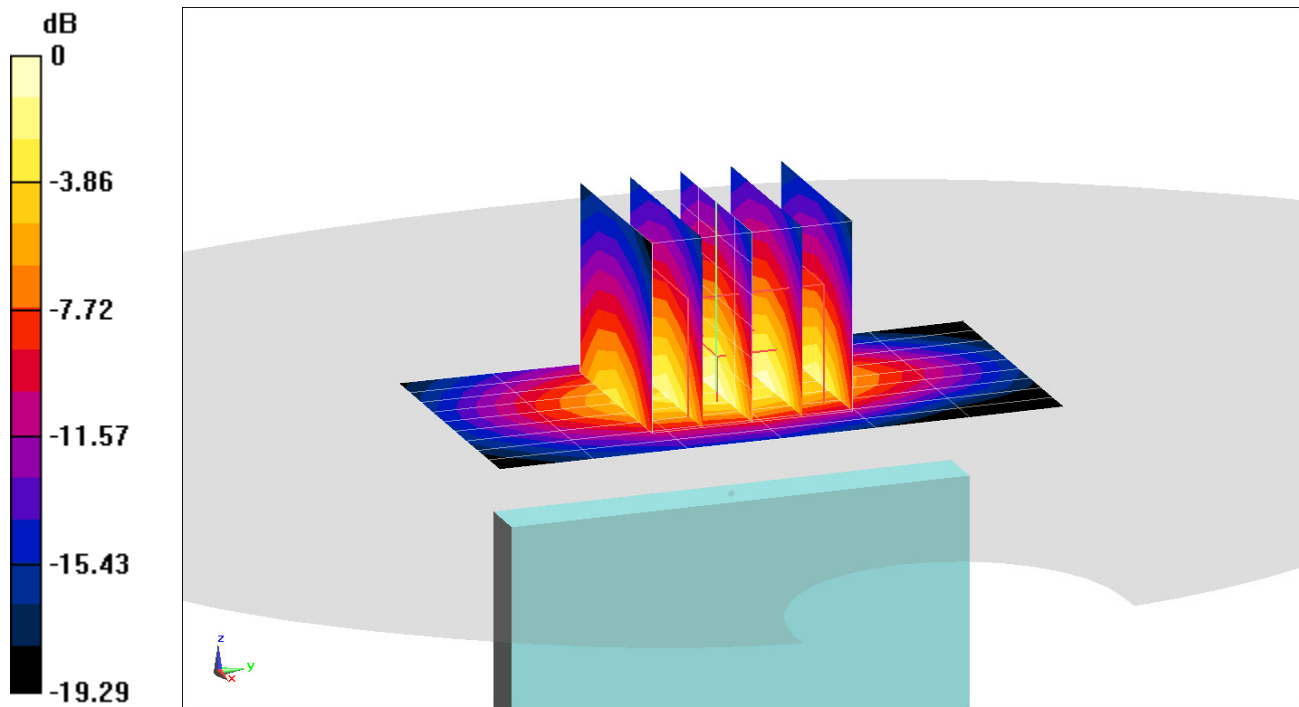
Area Scan (10x7x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 19.14 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.857 W/kg

SAR(1 g) = 0.493 W/kg



0 dB = 0.604 W/kg = -2.19 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDE8

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.974 \text{ S/m}$; $\epsilon_r = 54.488$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-29-2018; Ambient Temp: 20.7°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(6.36, 6.36, 6.36); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

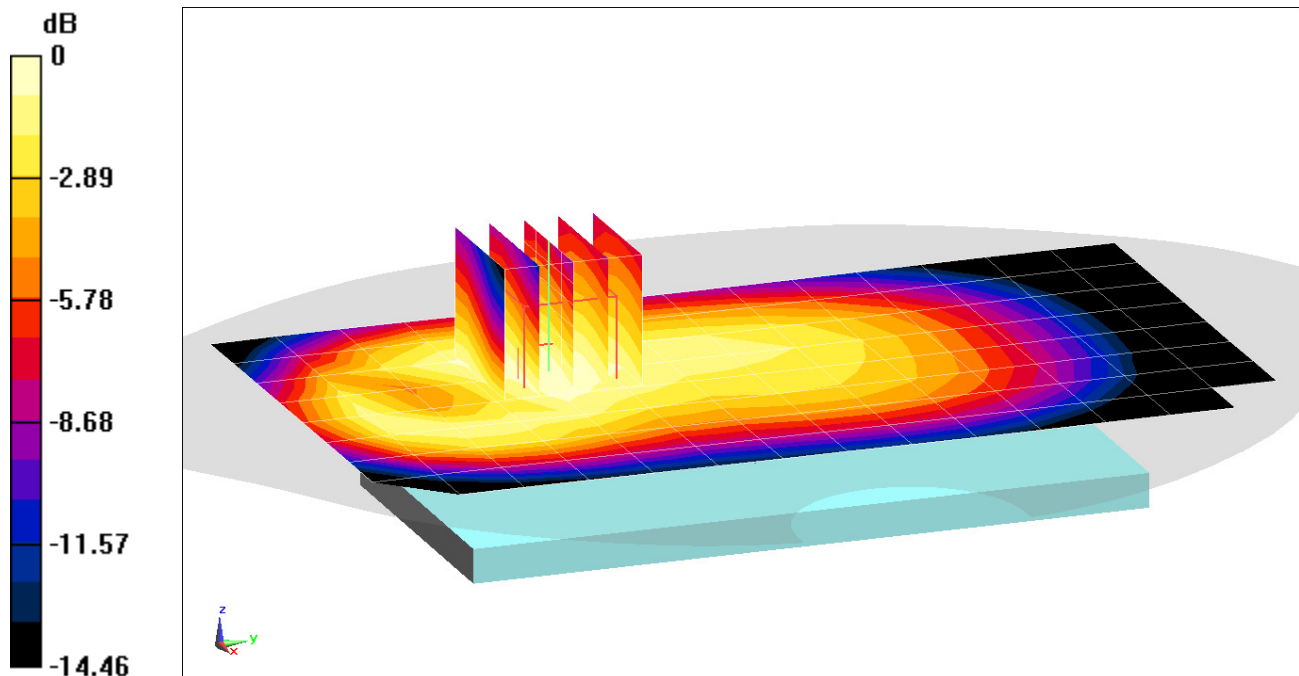
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 19.82 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.469 W/kg

SAR(1 g) = 0.357 W/kg



0 dB = 0.391 W/kg = -4.08 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDE8

Communication System: UID 0, UMTS; Frequency: 846.6 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 846.6 \text{ MHz}$; $\sigma = 0.984 \text{ S/m}$; $\epsilon_r = 54.398$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-29-2018; Ambient Temp: 20.7°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(6.36, 6.36, 6.36); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

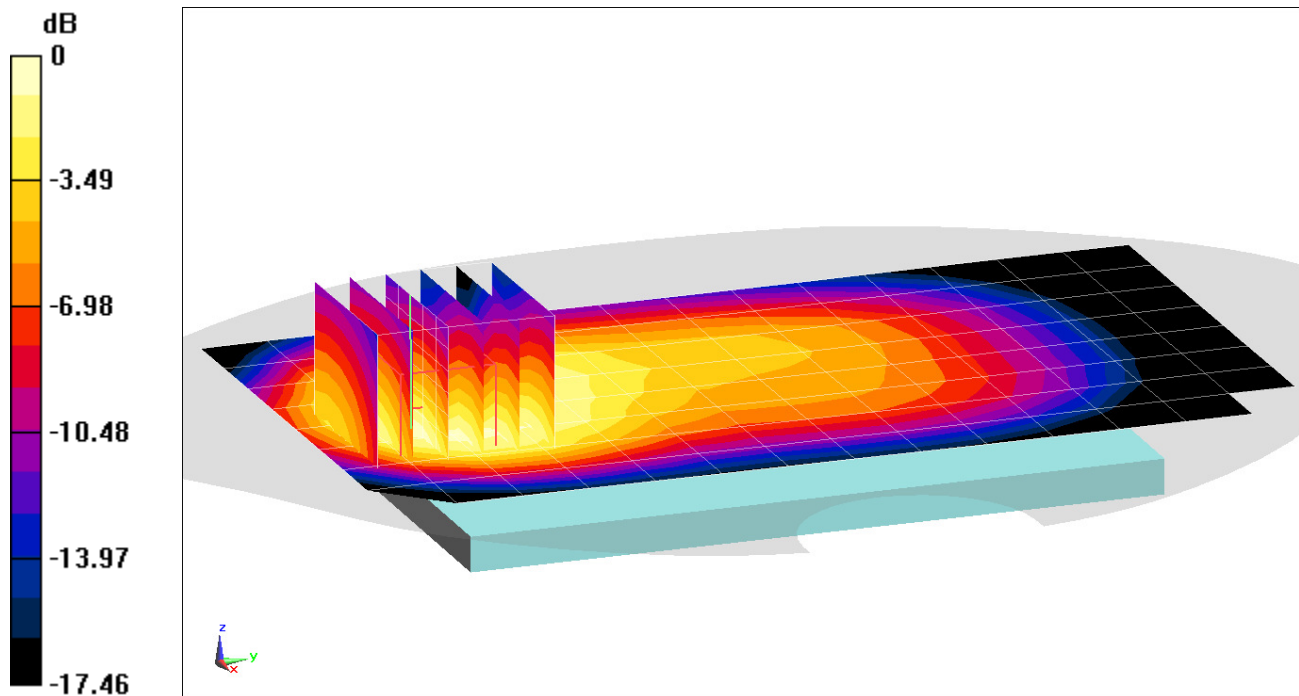
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x6x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 24.55 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 0.975 W/kg

SAR(1 g) = 0.585 W/kg



0 dB = 0.704 W/kg = -1.52 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDE8

Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.921 \text{ S/m}$; $\epsilon_r = 53.62$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-28-2018; Ambient Temp: 21.1°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3332; ConvF(6.54, 6.54, 6.54); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 8/9/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

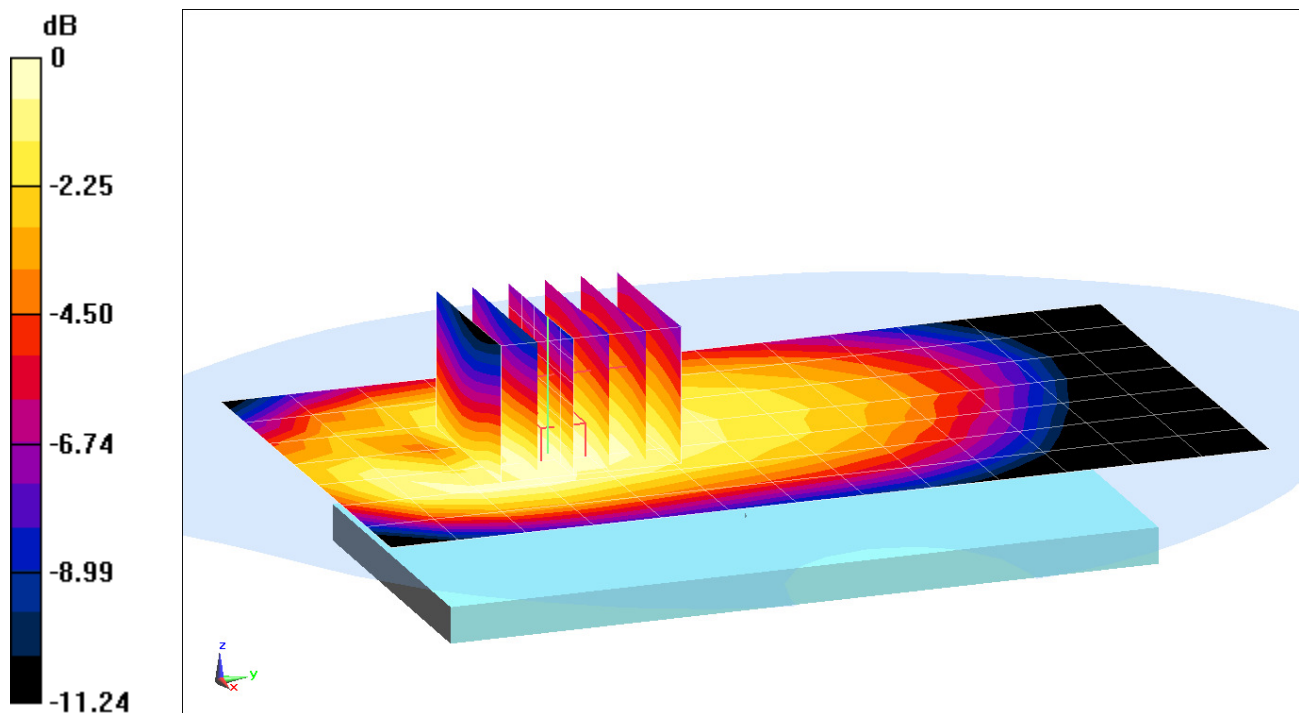
Area Scan (8x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x6x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 14.75 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.251 W/kg

SAR(1 g) = 0.185 W/kg



0 dB = 0.207 W/kg = -6.84 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDE8

Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.921 \text{ S/m}$; $\epsilon_r = 53.62$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-28-2018; Ambient Temp: 21.1°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3332; ConvF(6.54, 6.54, 6.54); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 8/9/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

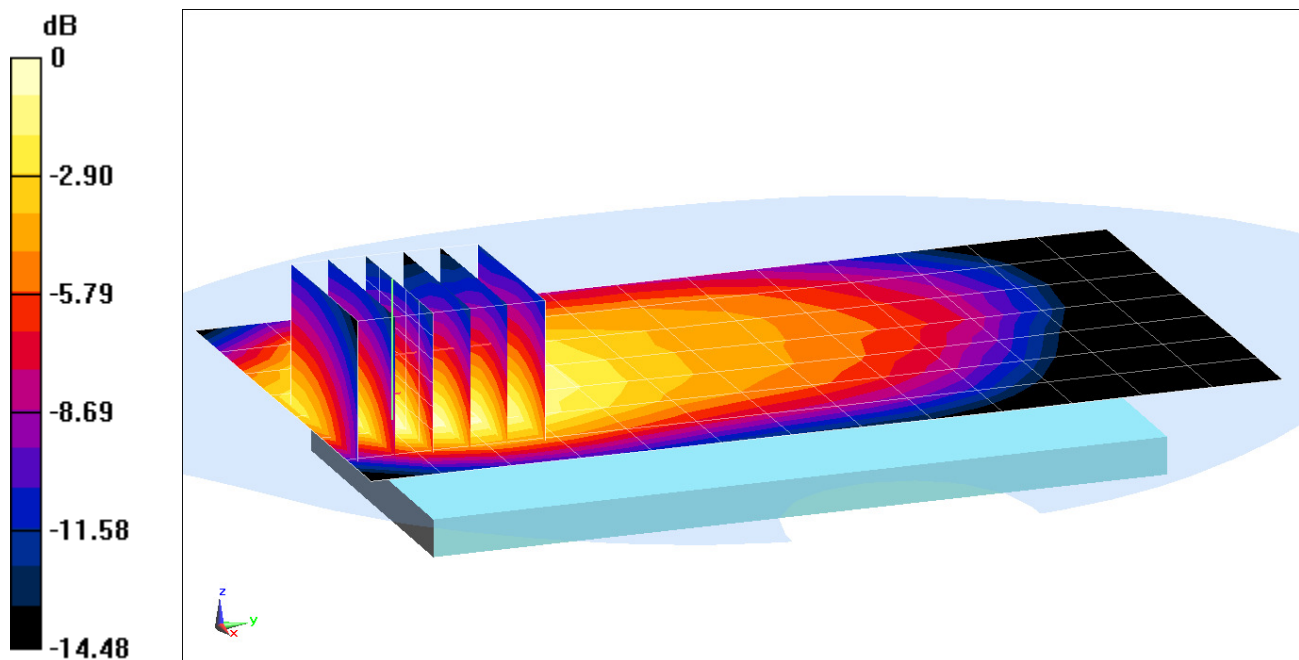
Area Scan (8x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

Zoom Scan (6x6x7)/Cube 0: Measurement grid: $dx=8\text{mm}$, $dy=8\text{mm}$, $dz=5\text{mm}$

Reference Value = 19.65 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.534 W/kg

SAR(1 g) = 0.315 W/kg



0 dB = 0.385 W/kg = -4.15 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDE8

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.996 \text{ S/m}$; $\epsilon_r = 52.763$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-28-2018; Ambient Temp: 21.1°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3332; ConvF(6.54, 6.54, 6.54); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 8/9/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 13, Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

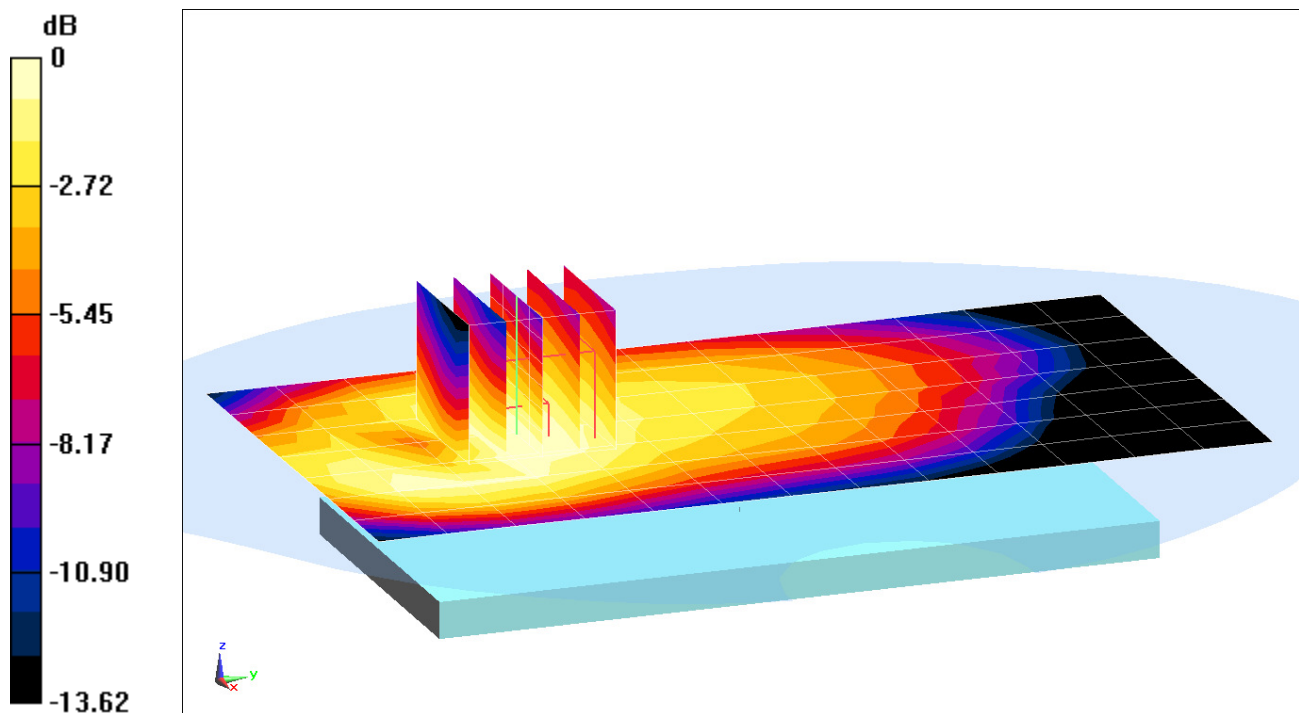
Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 11.67 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.168 W/kg

SAR(1 g) = 0.124 W/kg



0 dB = 0.139 W/kg = -8.57 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDE8

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1

Medium: 750 Body Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.996 \text{ S/m}$; $\epsilon_r = 52.763$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-28-2018; Ambient Temp: 21.1°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3332; ConvF(6.54, 6.54, 6.54); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 8/9/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 13, Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

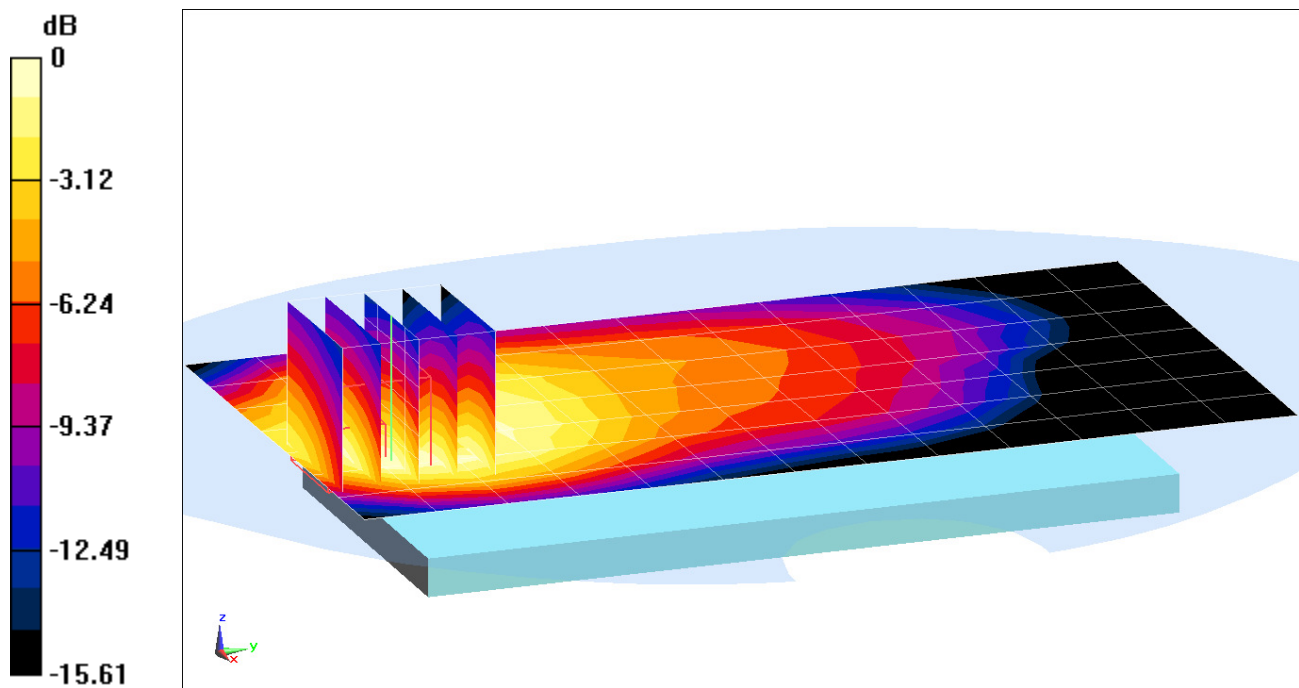
Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 16.27 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.403 W/kg

SAR(1 g) = 0.238 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDB7

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 0.974 \text{ S/m}$; $\epsilon_r = 54.489$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-29-2018; Ambient Temp: 20.7°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(6.36, 6.36, 6.36); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

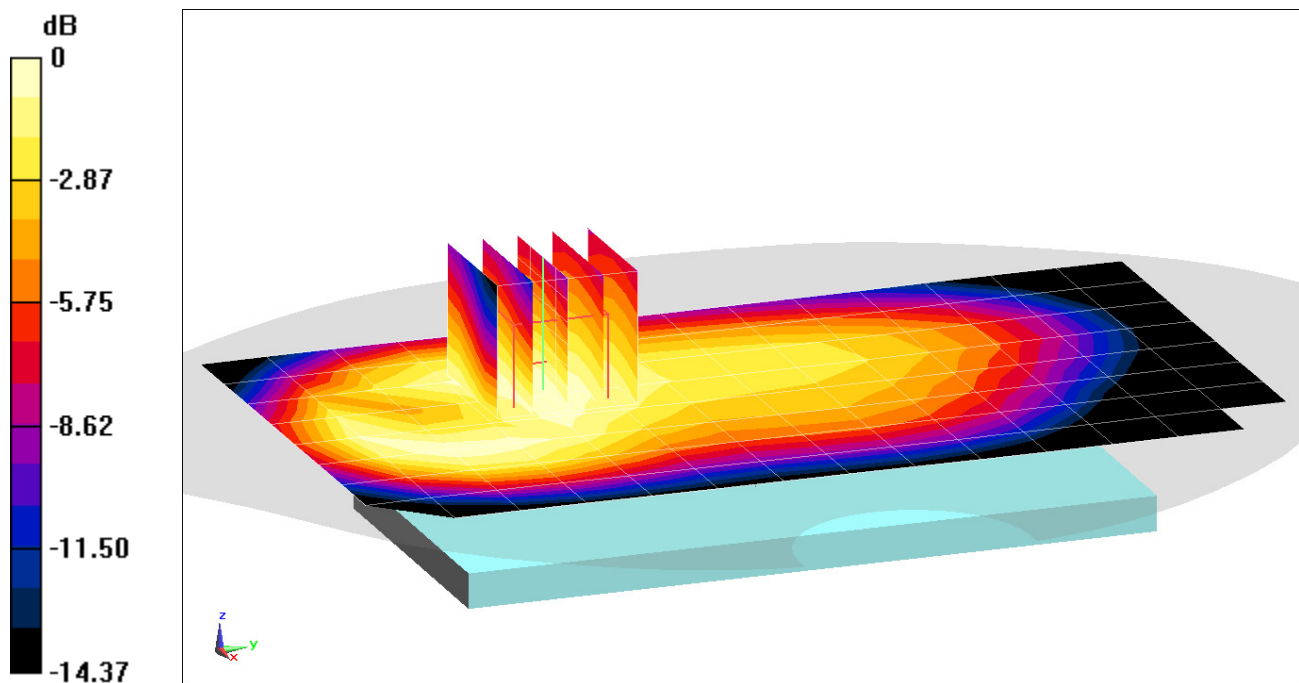
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 16.54 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.329 W/kg

SAR(1 g) = 0.247 W/kg



0 dB = 0.272 W/kg = -5.65 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDB7

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; $\sigma = 0.974$ S/m; $\epsilon_r = 54.489$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-29-2018; Ambient Temp: 20.7°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(6.36, 6.36, 6.36); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

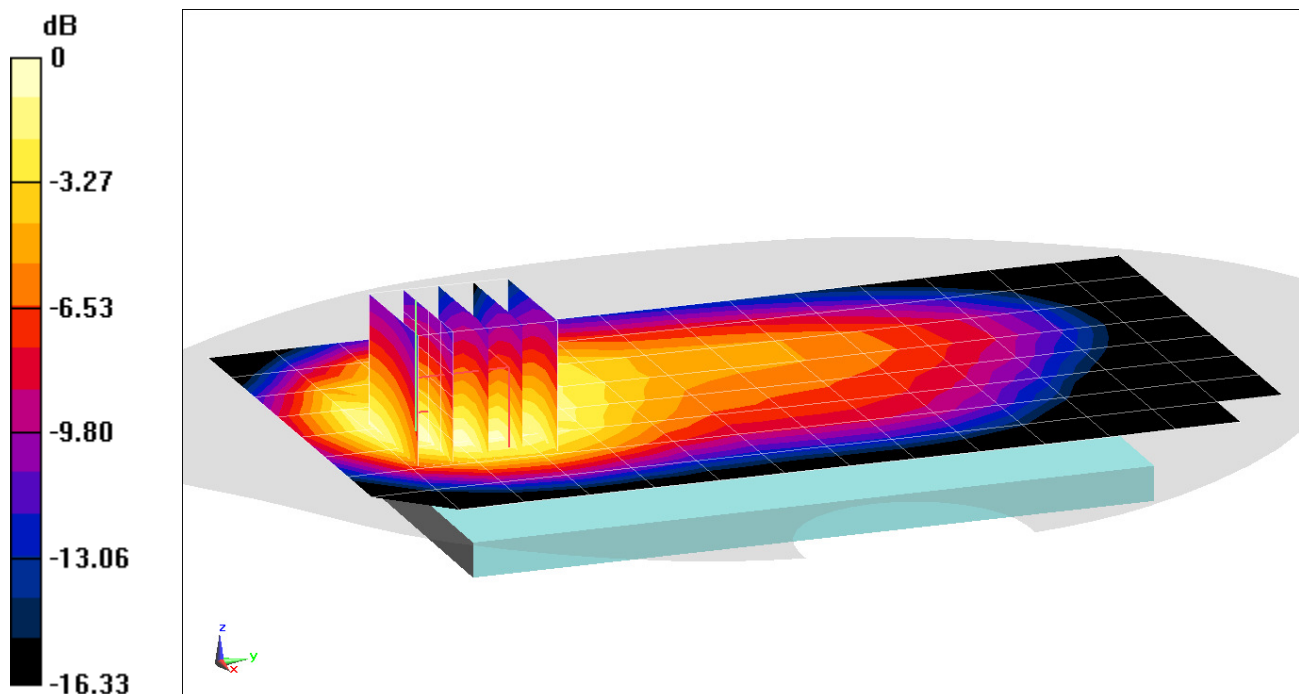
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 22.34 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.764 W/kg

SAR(1 g) = 0.459 W/kg



0 dB = 0.556 W/kg = -2.55 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDB7

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.452 \text{ S/m}$; $\epsilon_r = 51.481$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-30-2018; Ambient Temp: 24.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3319; ConvF(5.07, 5.07, 5.07); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

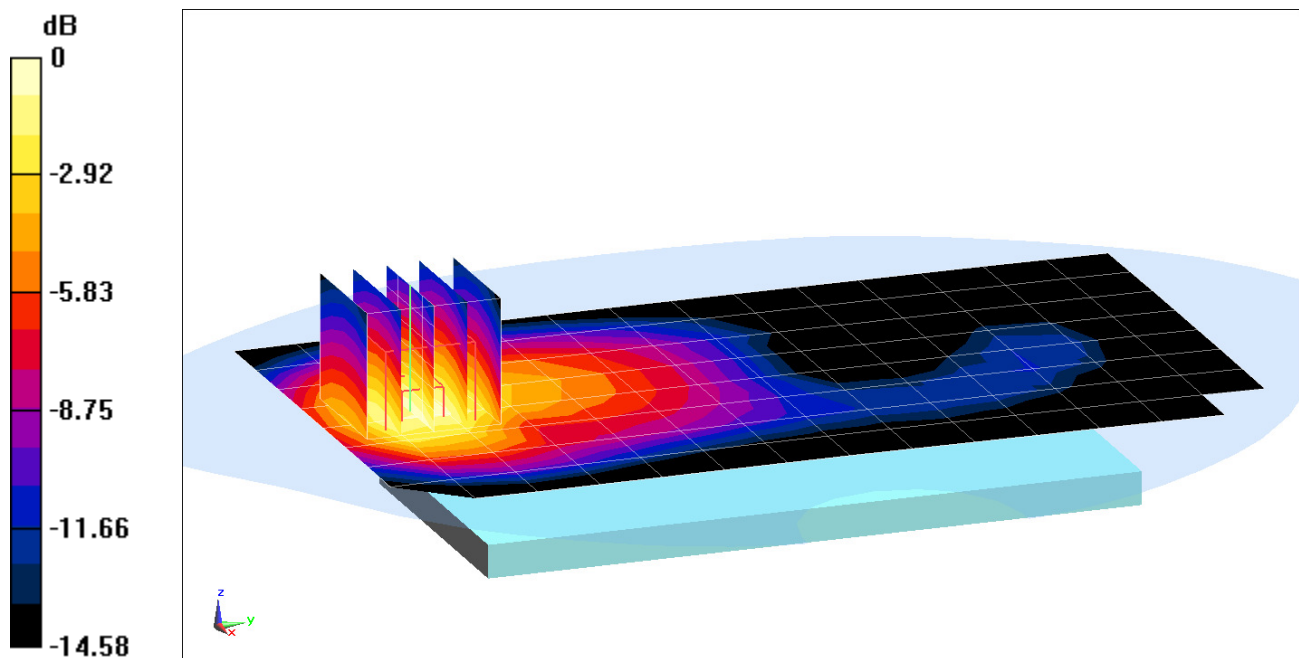
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 23.02 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 1.00 W/kg

SAR(1 g) = 0.670 W/kg



0 dB = 0.792 W/kg = -1.01 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDB7

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.452 \text{ S/m}$; $\epsilon_r = 51.481$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-30-2018; Ambient Temp: 24.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3319; ConvF(5.07, 5.07, 5.07); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 4 (AWS), Body SAR, Bottom Edge, Mid.ch,
20 MHz Bandwidth, QPSK, 50 RB, 50 RB Offset**

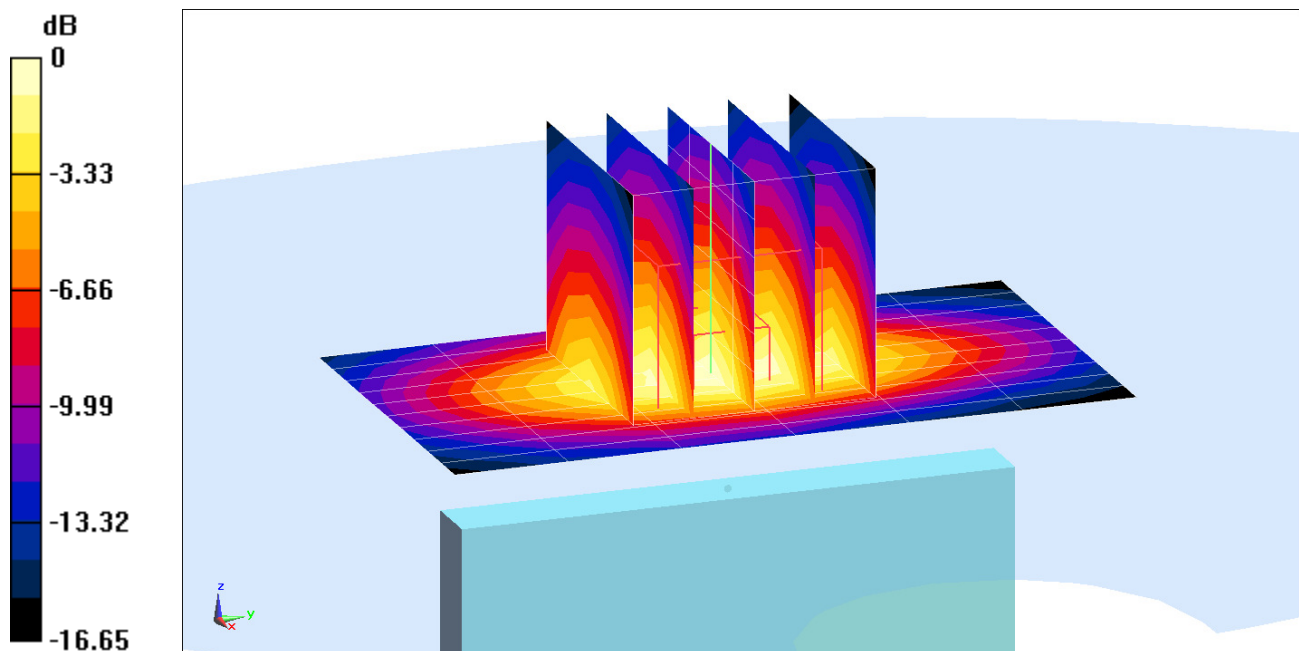
Area Scan (11x7x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 21.28 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.917 W/kg

SAR(1 g) = 0.562 W/kg



0 dB = 0.691 W/kg = -1.61 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CE0D

Communication System: UID 0, LTE Band 41; Frequency: 2593 MHz; Duty Cycle: 1:1.58

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$; $\sigma = 2.214 \text{ S/m}$; $\epsilon_r = 50.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-08-2018; Ambient Temp: 21.0°C; Tissue Temp: 19.8°C

Probe: EX3DV4 - SN7406; ConvF(7.31, 7.31, 7.31); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 41, Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

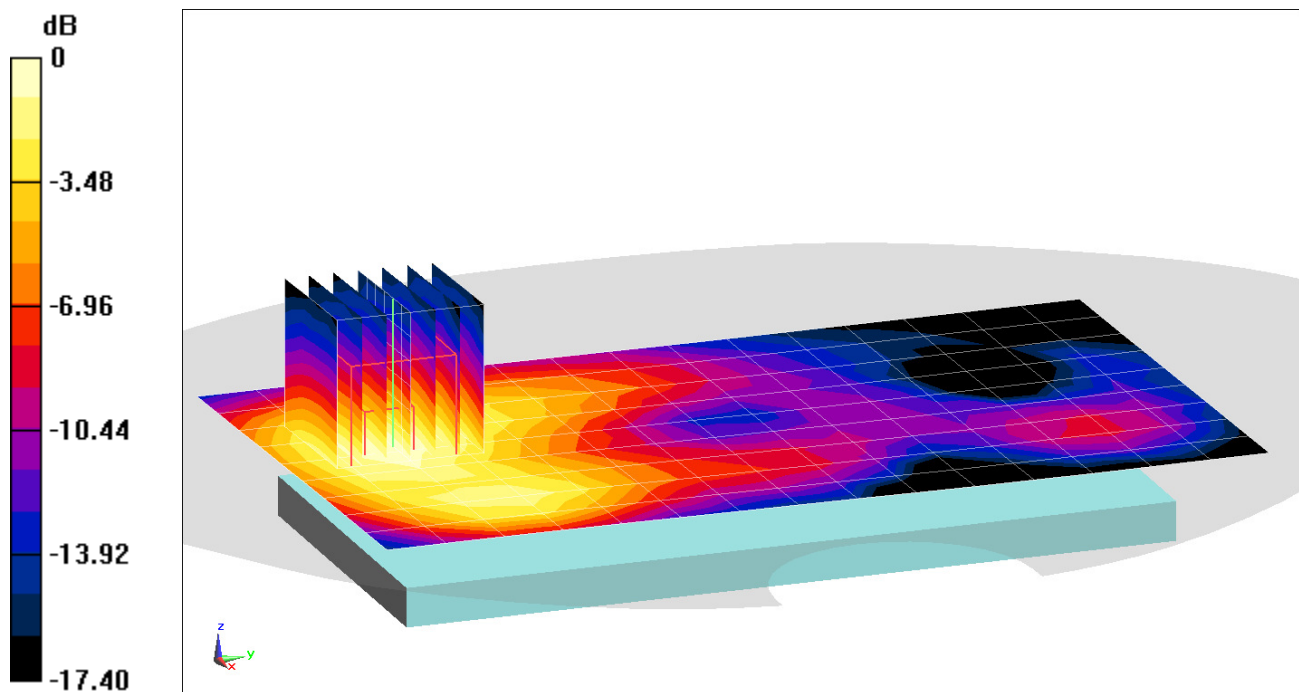
Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 10.73 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.461 W/kg

SAR(1 g) = 0.243 W/kg



0 dB = 0.369 W/kg = -4.33 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CE0D

Communication System: UID 0, LTE Band 41; Frequency: 2593 MHz; Duty Cycle: 1:1.58

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$; $\sigma = 2.214 \text{ S/m}$; $\epsilon_r = 50.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-08-2018; Ambient Temp: 21.0°C; Tissue Temp: 19.8°C

Probe: EX3DV4 - SN7406; ConvF(7.31, 7.31, 7.31); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 41, Body SAR, Bottom Edge, Mid.ch,
20 MHz Bandwidth, QPSK, 50 RB, 0 RB Offset**

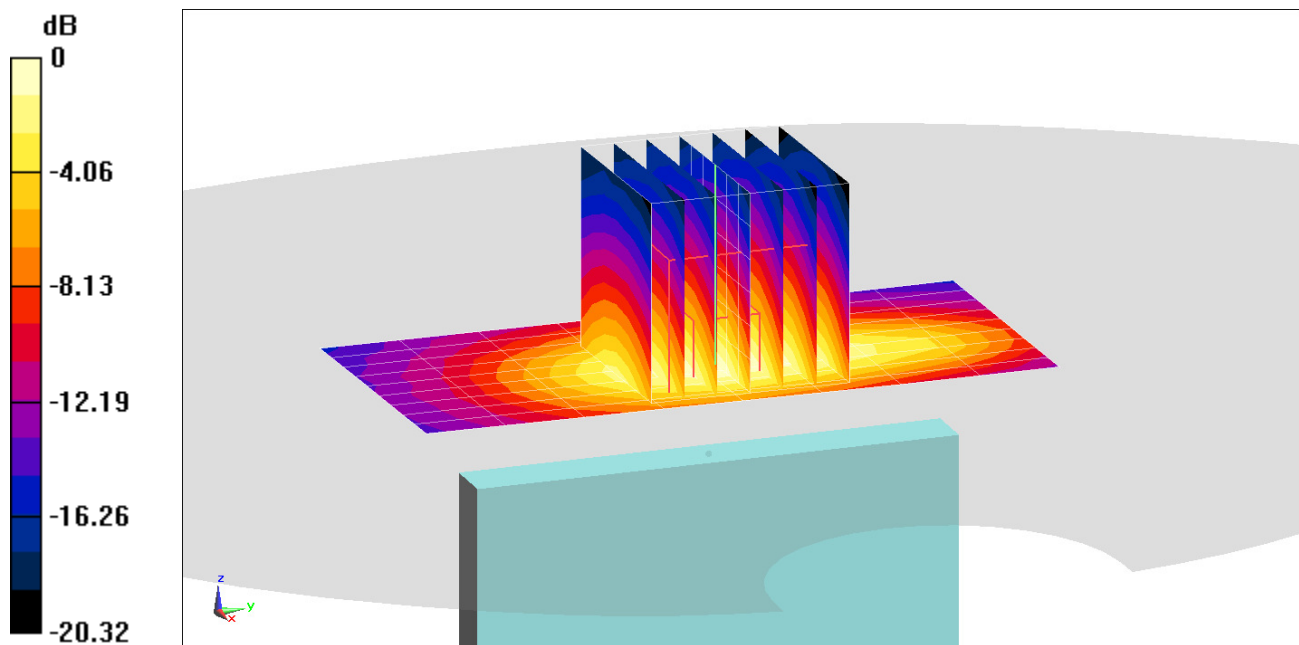
Area Scan (10x9x1): Measurement grid: dx=5mm, dy=12mm

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

Reference Value = 16.81 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.14 W/kg

SAR(1 g) = 0.562 W/kg



0 dB = 0.914 W/kg = -0.39 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD21

Communication System: UID 0, IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 2.004 \text{ S/m}$; $\epsilon_r = 51.155$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-31-2018; Ambient Temp: 22.5°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7406; ConvF(7.6, 7.6, 7.6); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: IEEE 802.11b, Antenna 2, 22 MHz Bandwidth,
Body SAR, Ch 1, 1 Mbps, Back Side**

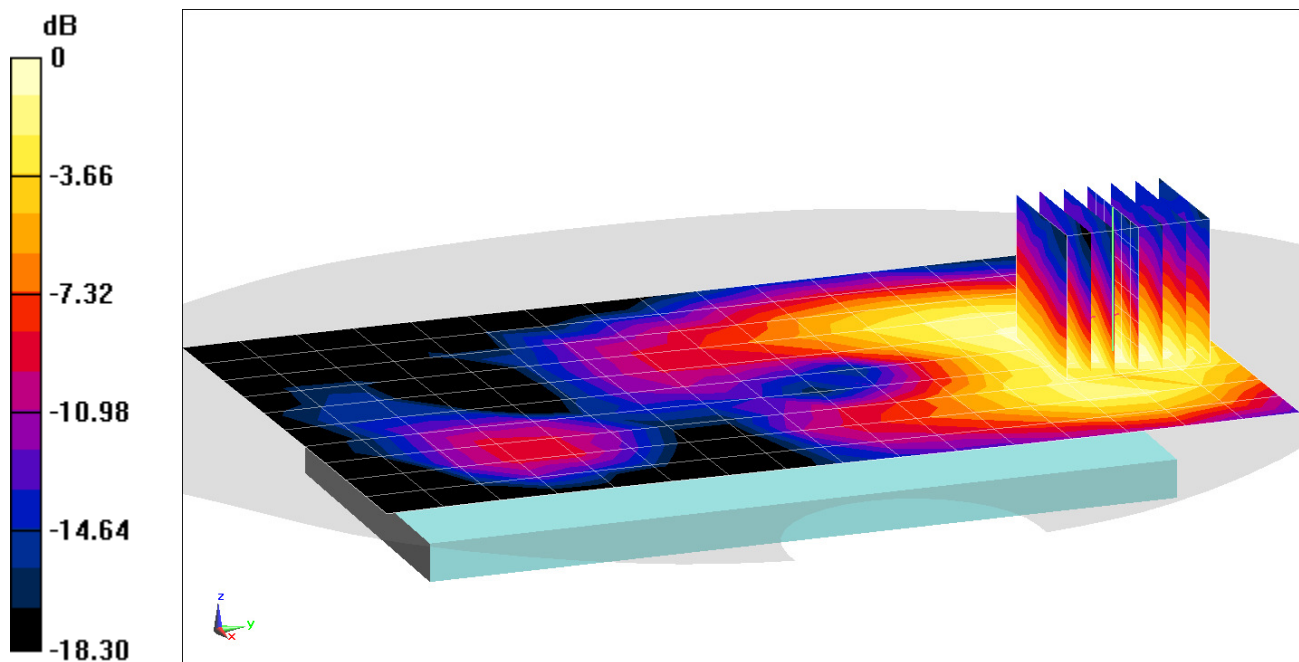
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 8.239 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.231 W/kg

SAR(1 g) = 0.124 W/kg



0 dB = 0.190 W/kg = -7.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD21

Communication System: UID 0, IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 2.004 \text{ S/m}$; $\epsilon_r = 51.155$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-31-2018; Ambient Temp: 22.5°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7406; ConvF(7.6, 7.6, 7.6); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: IEEE 802.11b, Antenna 2, 22 MHz Bandwidth,
Body SAR, Ch 1, 1 Mbps, Back Side**

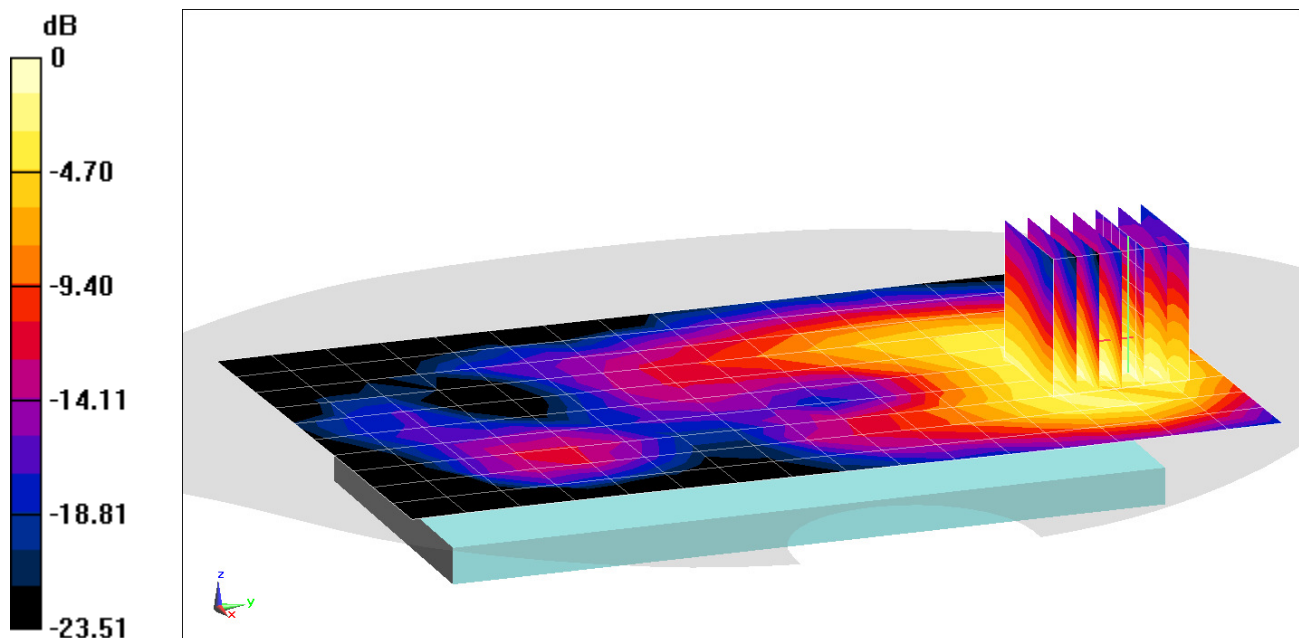
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 2.904 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.670 W/kg

SAR(1 g) = 0.337 W/kg



0 dB = 0.532 W/kg = -2.74 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD11

Communication System: UID 0, 802.11ac 5.2-5.8 GHz Band; Frequency: 5775 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used (interpolated):

$f = 5775 \text{ MHz}$; $\sigma = 6.202 \text{ S/m}$; $\epsilon_r = 46.651$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-29-2018; Ambient Temp: 21.4°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7308; ConvF(4.5, 4.5, 4.5); Calibrated: 8/16/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/14/2017

Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: IEEE 802.11ac, Antenna 2, UNII-3, 80 MHz Bandwidth,
Body SAR, Ch 155, 29.3 Mbps, Back Side**

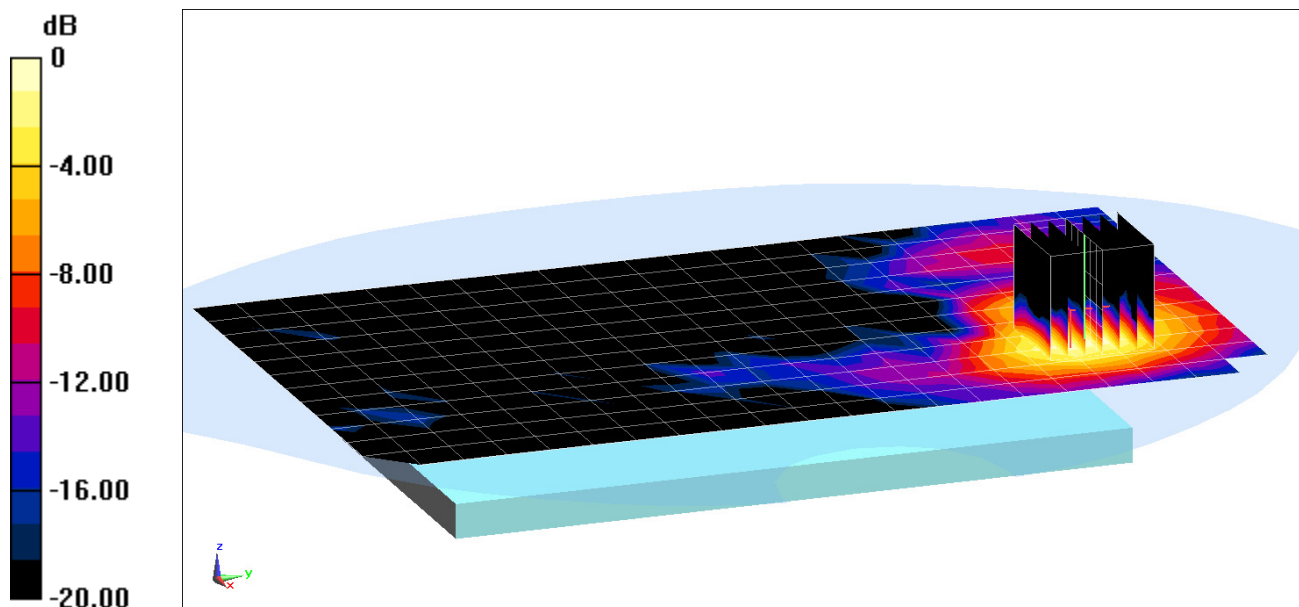
Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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 = 5.252 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.815 W/kg

SAR(1 g) = 0.173 W/kg



0 dB = 0.416 W/kg = -3.81 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD11

Communication System: UID 0, 802.11ac 5.2-5.8 GHz Band; Frequency: 5775 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used (interpolated):

$f = 5775 \text{ MHz}$; $\sigma = 6.202 \text{ S/m}$; $\epsilon_r = 46.651$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-29-2018; Ambient Temp: 21.4°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7308; ConvF(4.5, 4.5, 4.5); Calibrated: 8/16/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/14/2017

Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: IEEE 802.11ac, Antenna 2, UNII-3, 80 MHz Bandwidth,
Body SAR, Ch 155, 29.3 Mbps, Back Side**

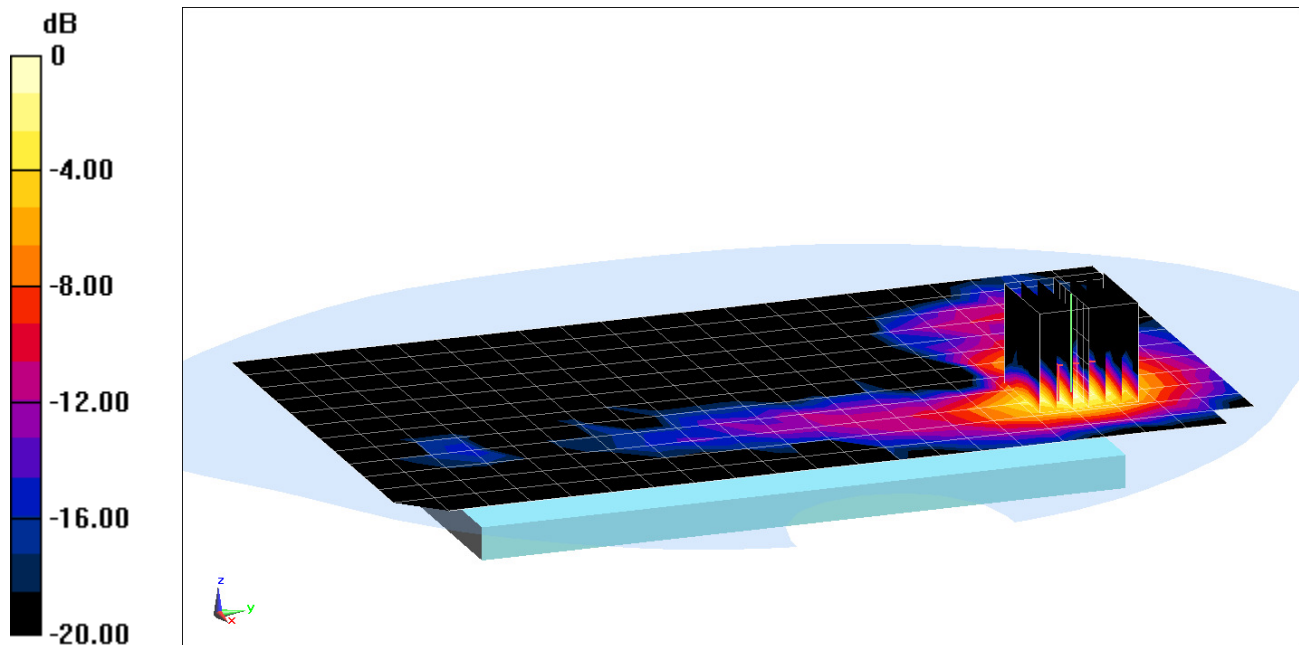
Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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 = 6.551 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 1.21 W/kg

SAR(1 g) = 0.259 W/kg



0 dB = 0.643 W/kg = -1.92 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDCB

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.289

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 2.015 \text{ S/m}$; $\epsilon_r = 50.965$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 02-05-2018; Ambient Temp: 21.9°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7406; ConvF(7.6, 7.6, 7.6); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

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

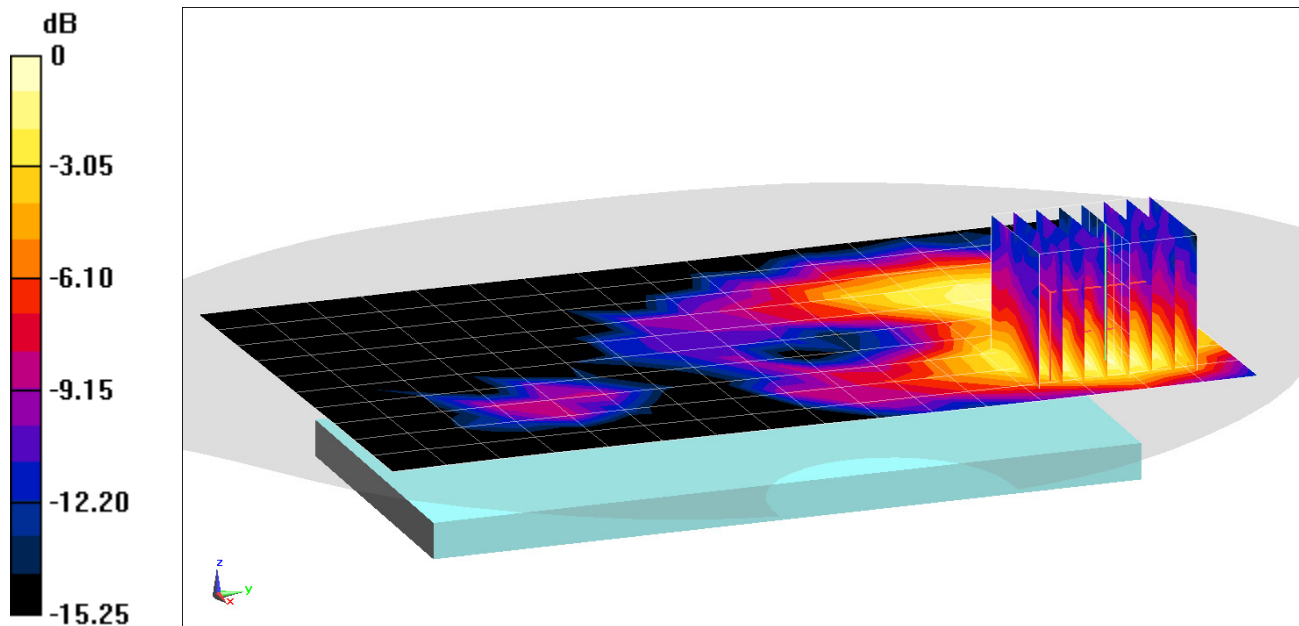
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Zoom Scan (7x8x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 3.947 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.0570 W/kg

SAR(1 g) = 0.028 W/kg



0 dB = 0.0443 W/kg = -13.54 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDCB

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.29033

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 2.015 \text{ S/m}$; $\epsilon_r = 50.965$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-05-2018; Ambient Temp: 21.9°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7406; ConvF(7.6, 7.6, 7.6); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: Bluetooth, Body SAR, Ch 39, 1 Mbps, Top Edge

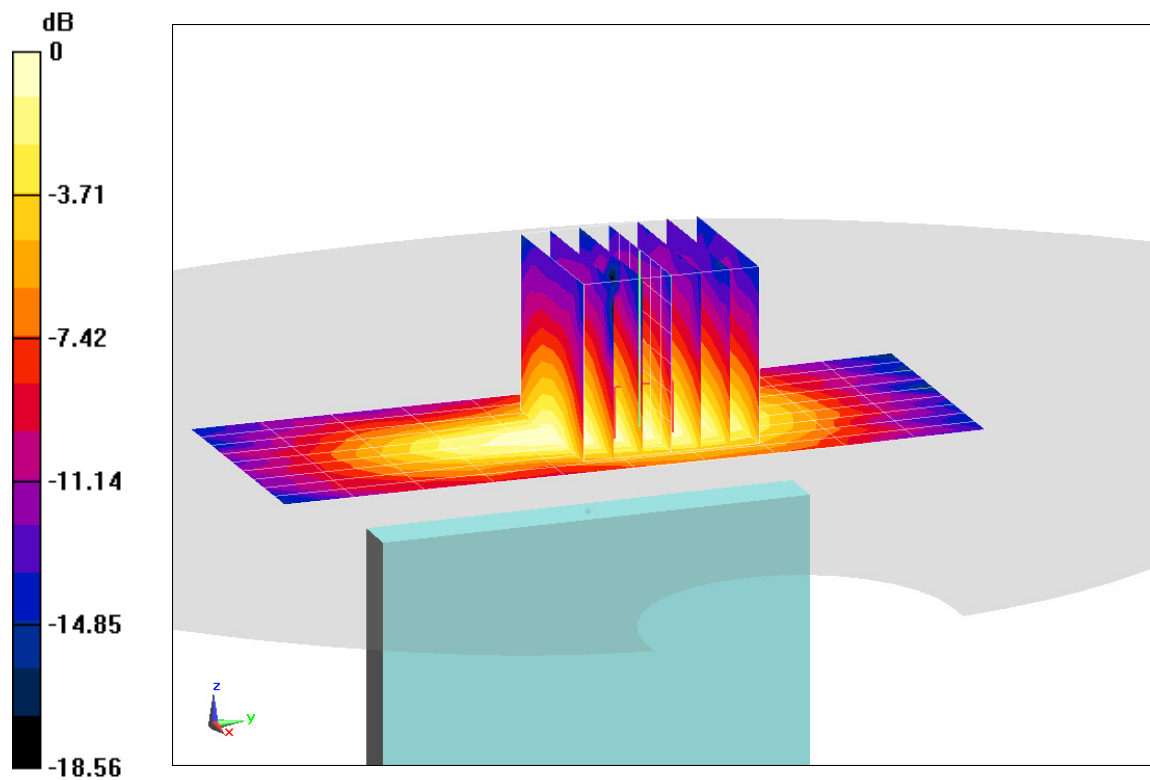
Area Scan (10x11x1): Measurement grid: $dx=5\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 6.419 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.137 W/kg

SAR(1 g) = 0.076 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CDB7

Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.452 \text{ S/m}$; $\epsilon_r = 51.481$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-30-2018; Ambient Temp: 24.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3319; ConvF(5.07, 5.07, 5.07); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 4 (AWS), Phablet SAR, Bottom Edge,
Mid.ch, 20 MHz Bandwidth, QPSK, 50 RB, 50 RB Offset**

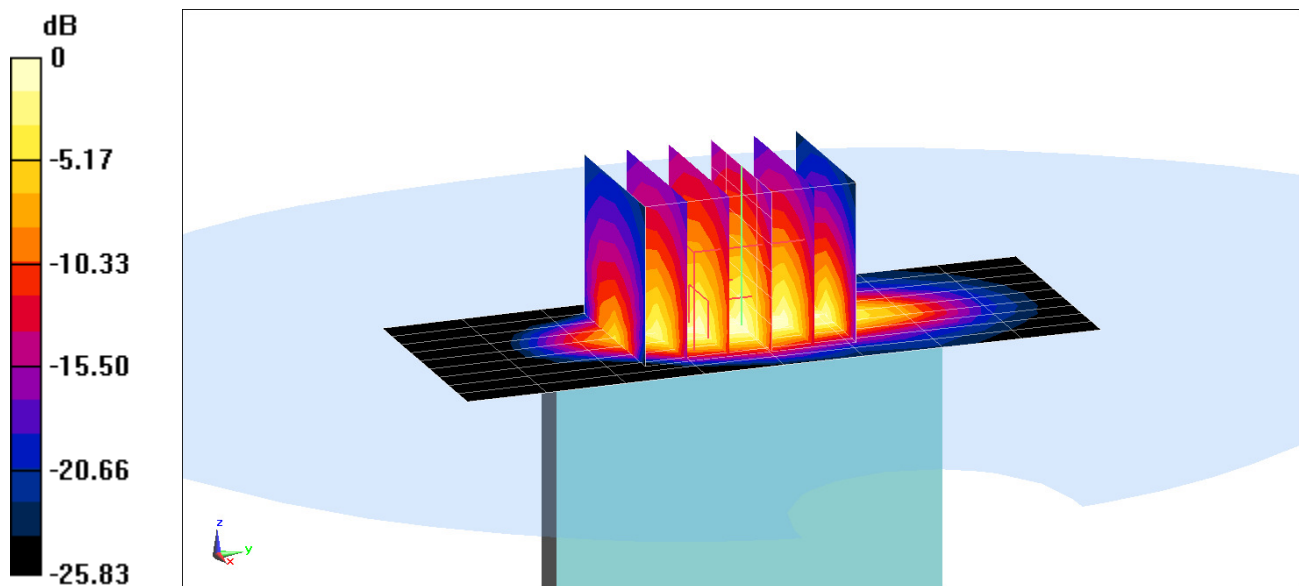
Area Scan (10x9x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 54.08 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 7.01 W/kg

SAR(10 g) = 1.64 W/kg



0 dB = 4.86 W/kg = 6.87 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CE0D

Communication System: UID 0, LTE Band 41; Frequency: 2593 MHz; Duty Cycle: 1:1.58

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$; $\sigma = 2.189 \text{ S/m}$; $\epsilon_r = 51.103$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 02-12-2018; Ambient Temp: 22.4°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7406; ConvF(7.31, 7.31, 7.31); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: LTE Band 41, Phablet SAR, Front side,
Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

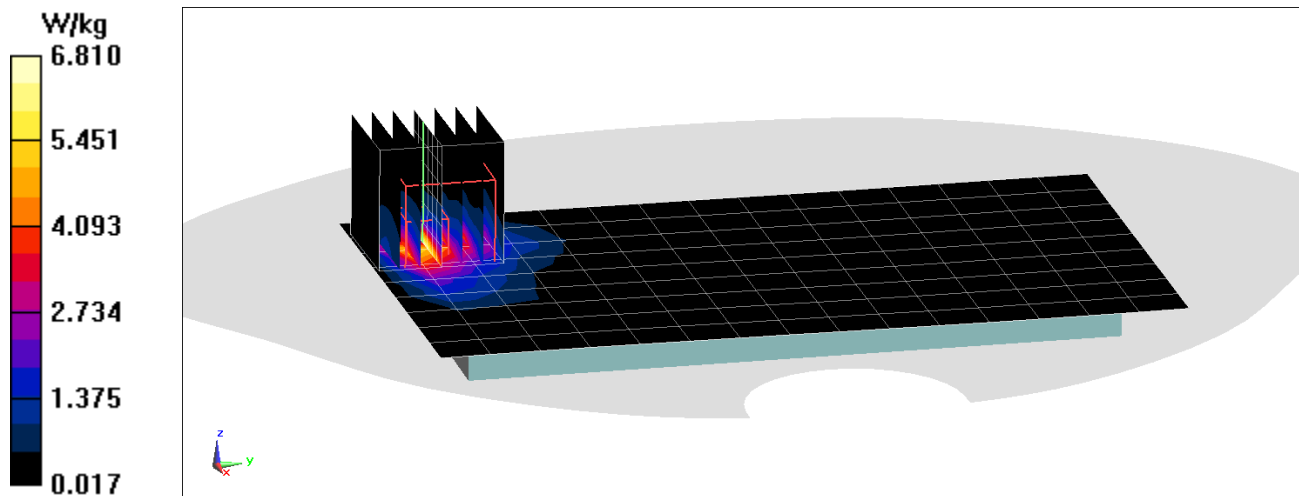
Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 39.80 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 9.90 W/kg

SAR(10 g) = 1.33 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSC03K; Type: Portable Handset; Serial: 9CD11

Communication System: UID 0, IEEE 802.11n; Frequency: 5270 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used (interpolated):

$f = 5270 \text{ MHz}$; $\sigma = 5.515 \text{ S/m}$; $\epsilon_r = 47.482$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 01-29-2018; Ambient Temp: 21.4°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7308; ConvF(4.84, 4.84, 4.84); Calibrated: 8/16/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/14/2017

Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

**Mode: IEEE 802.11n, Antenna 2, UNII-2A, 40 MHz Bandwidth,
Phablet SAR, Ch 54, 13.5 Mbps, Front Side**

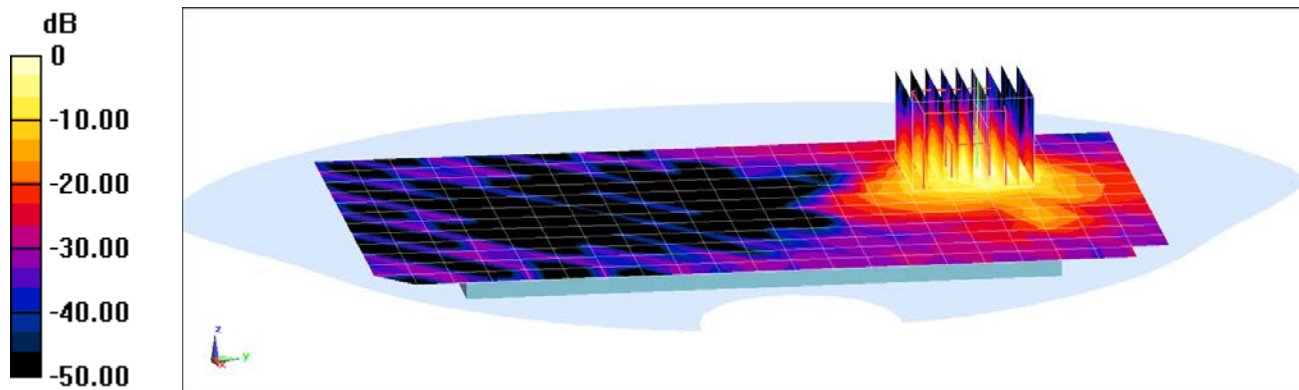
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Reference Value = 12.17 V/m; Power Drift = 0.16 dB

Peak SAR (extrapolated) = 20.8 W/kg

SAR(10 g) = 0.738 W/kg



0 dB = 7.53 W/kg = 8.77 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.896 \text{ S/m}$; $\epsilon_r = 40.386$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-23-2018; Ambient Temp: 21.5°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(10.26, 10.26, 10.26); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

750 MHz System Verification at 23.0 dBm (200 mW)

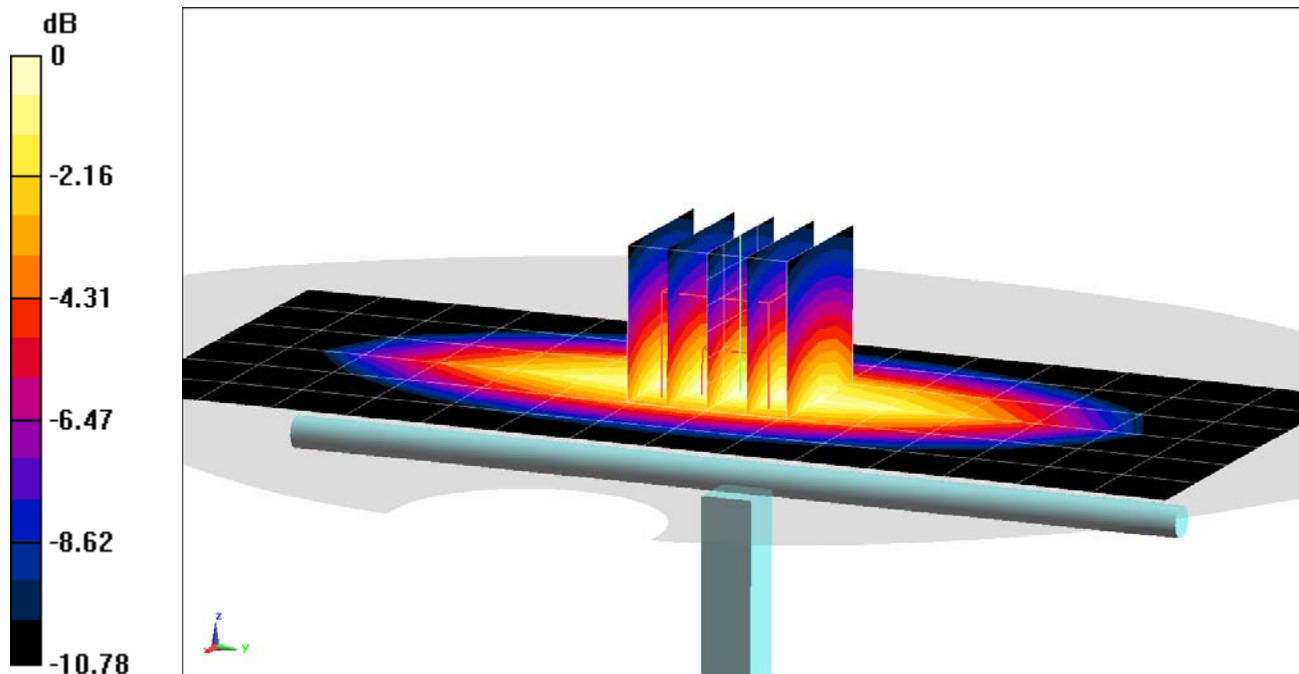
Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.48 W/kg

SAR(1 g) = 1.61 W/kg

Deviation(1 g) = -1.47%



0 dB = 2.18 W/kg = 3.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.906 \text{ S/m}$; $\epsilon_r = 41.934$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-26-2018; Ambient Temp: 23.2°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3319; ConvF(6.46, 6.46, 6.46); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

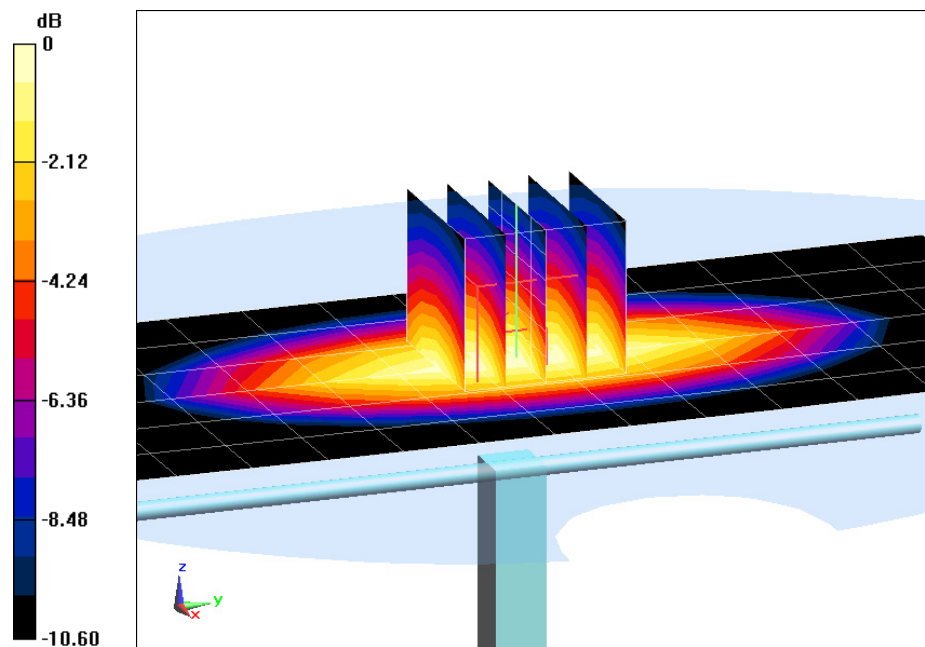
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.63 W/kg

SAR(1 g) = 1.78 W/kg

Deviation(1 g) = -4.91%



0 dB = 2.09 W/kg = 3.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.417 \text{ S/m}$; $\epsilon_r = 38.678$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-22-2018; Ambient Temp: 21.2°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3318; ConvF(5.5, 5.5, 5.5); Calibrated: 9/22/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/14/2017

Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

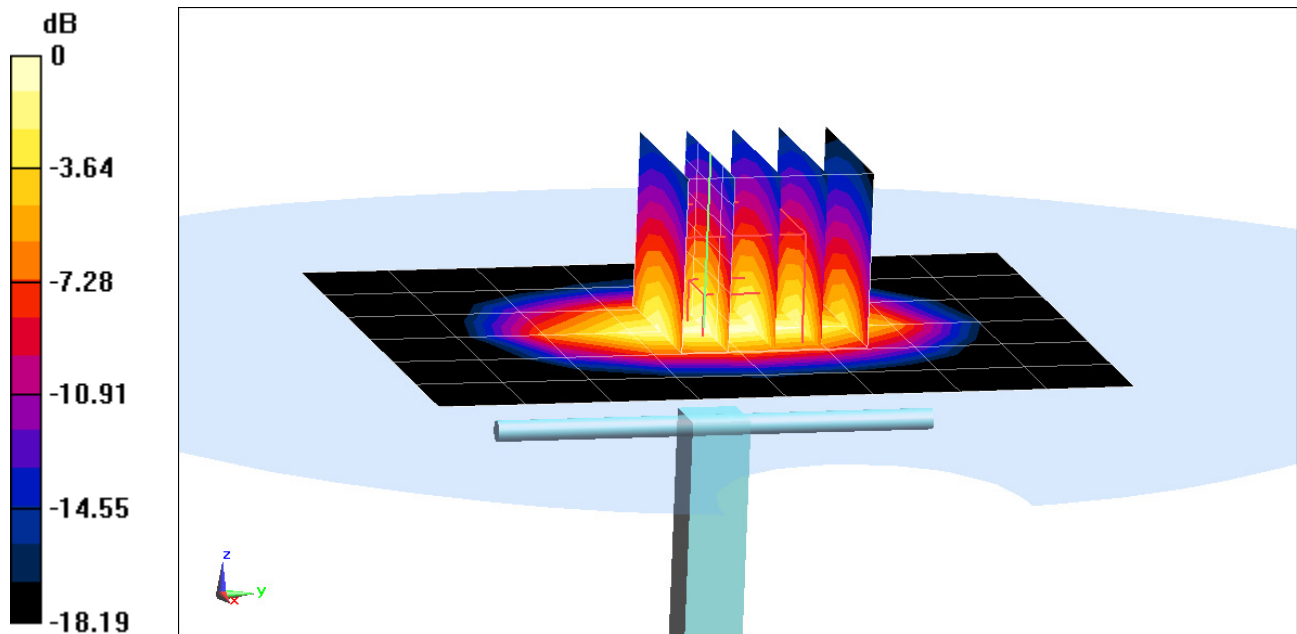
Area Scan (7x9x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 6.81 W/kg

SAR(1 g) = 3.75 W/kg

Deviation(1 g) = 3.02%



0 dB = 4.69 W/kg = 6.71 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.449 \text{ S/m}$; $\epsilon_r = 40.443$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-05-2018; Ambient Temp: 21.3°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(5.31, 5.31, 5.31); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

1900 MHz System Verification at 20.0 dBm (100 mW)

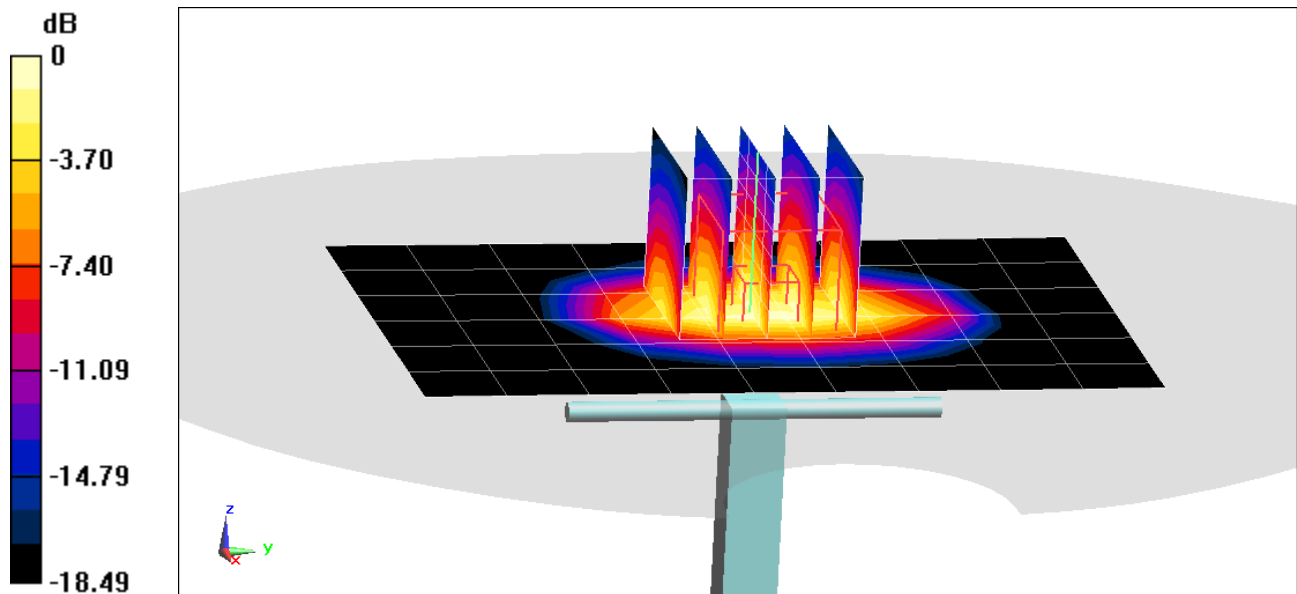
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 7.06 W/kg

SAR(1 g) = 3.83 W/kg

Deviation(1 g) = -3.28%



0 dB = 4.83 W/kg = 6.84 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:

$f = 2450 \text{ MHz}$; $\sigma = 1.873 \text{ S/m}$; $\epsilon_r = 39.204$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-31-2018; Ambient Temp: 23.3°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(4.68, 4.68, 4.68); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 8/9/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

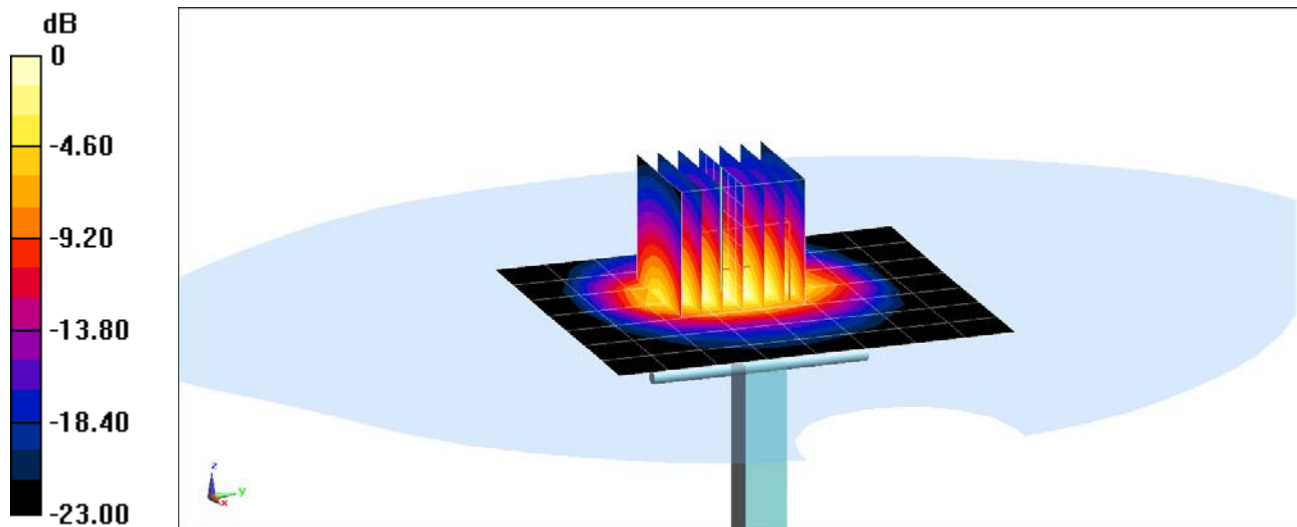
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 11.5 W/kg

SAR(1 g) = 5.57 W/kg

Deviation(1 g) = 5.69%



0 dB = 7.38 W/kg = 8.68 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:

$f = 2450 \text{ MHz}$; $\sigma = 1.833 \text{ S/m}$; $\epsilon_r = 37.88$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-07-2018; Ambient Temp: 20.6°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3319; ConvF(4.6, 4.6, 4.6); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

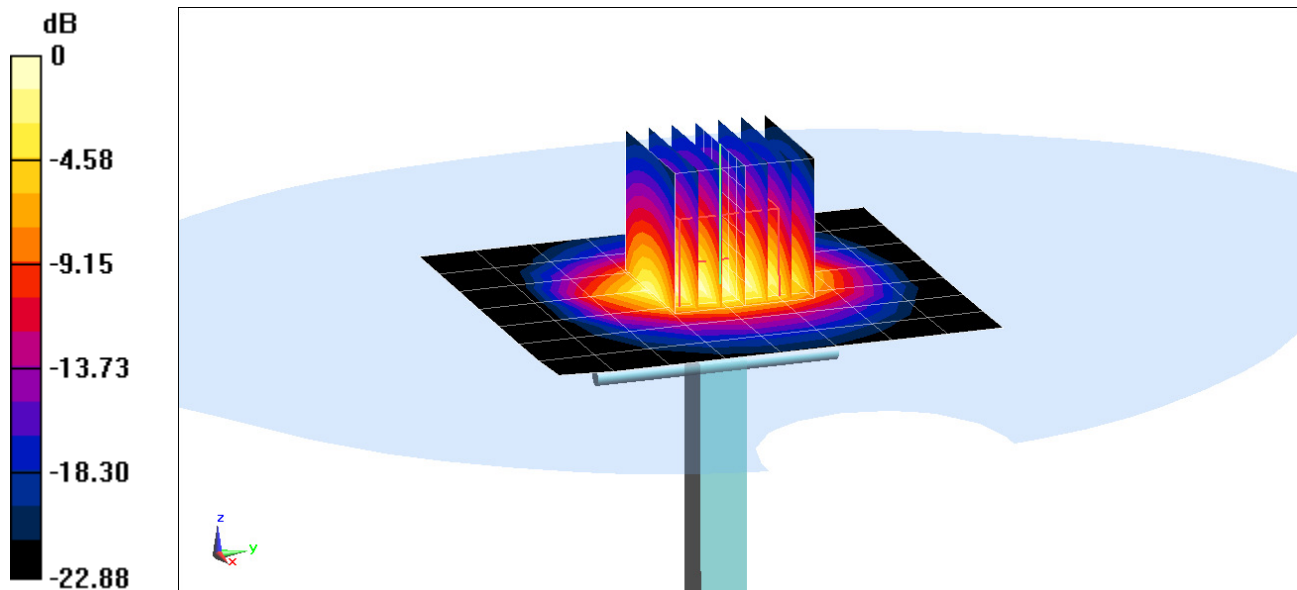
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 10.8 W/kg

SAR(1 g) = 5.14 W/kg

Deviation(1 g) = -2.47%



0 dB = 6.75 W/kg = 8.29 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1126

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: 2450 Head Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 2.042 \text{ S/m}$; $\epsilon_r = 38.625$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-31-2018; Ambient Temp: 23.3°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3332; ConvF(4.56, 4.56, 4.56); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 8/9/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

2600 MHz System Verification at 20.0 dBm (100 mW)

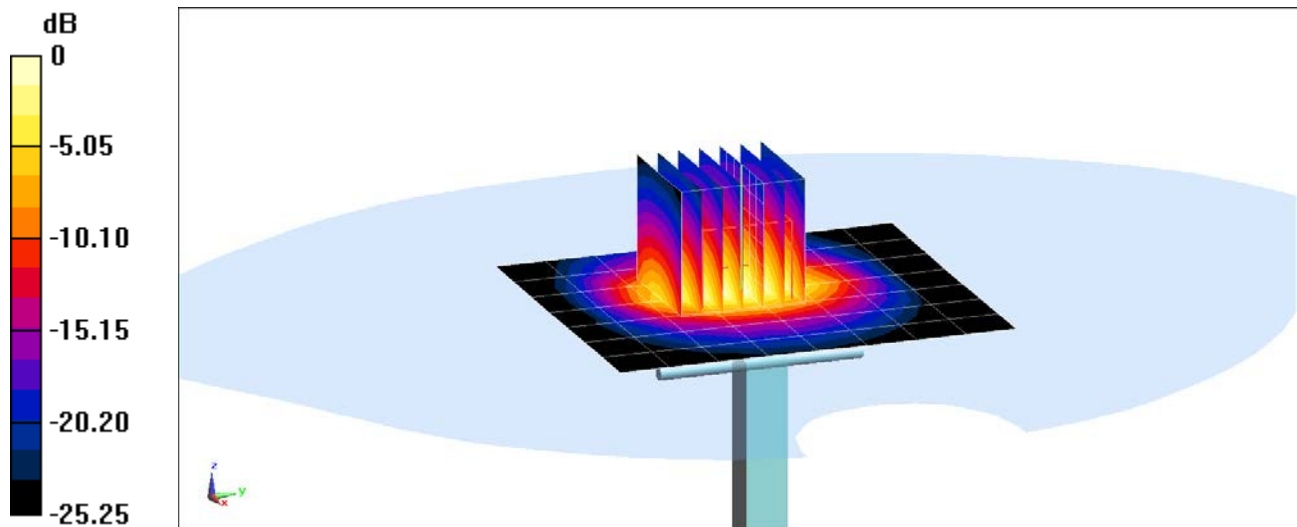
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 12.4 W/kg

SAR(1 g) = 5.61 W/kg

Deviation(1 g) = -0.53%



0 dB = 7.39 W/kg = 8.69 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium: 5GHz Head Medium parameters used (interpolated):

$f = 5250 \text{ MHz}$; $\sigma = 4.515 \text{ S/m}$; $\epsilon_r = 35.05$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-23-2018; Ambient Temp: 22.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN3914; ConvF(5.49, 5.49, 5.49); Calibrated: 2/13/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/9/2017

Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5250 MHz System Verification at 17.0 dBm (50 mW)

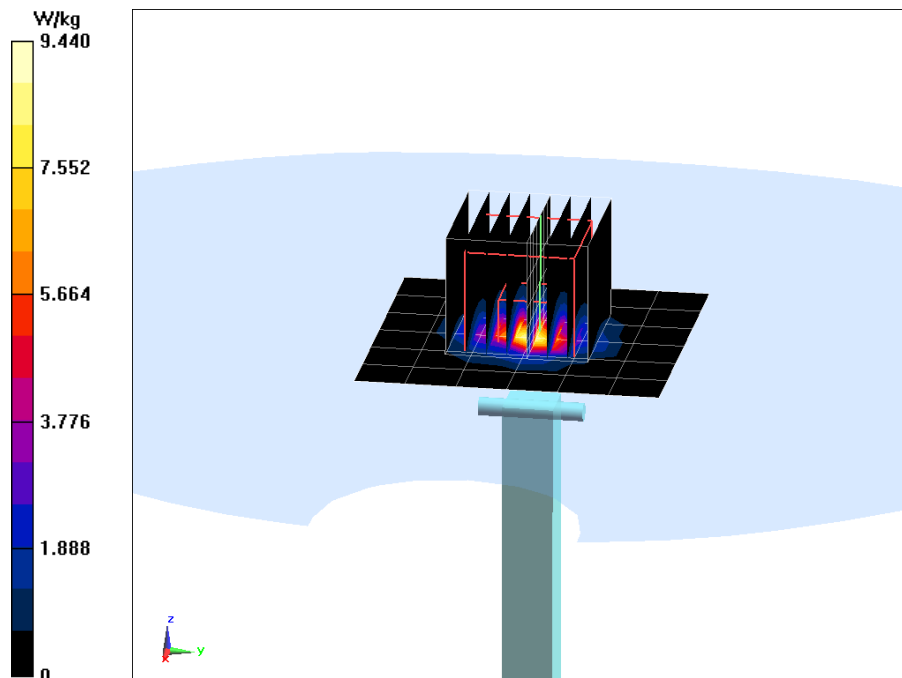
Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Peak SAR (extrapolated) = 17.4 W/kg

SAR(1 g) = 4.02 W/kg

Deviation(1 g) = -0.37%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

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

Medium: 5GHz Head Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 4.859 \text{ S/m}$; $\epsilon_r = 34.577$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-23-2018; Ambient Temp: 22.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN3914; ConvF(4.94, 4.94, 4.94); Calibrated: 2/13/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/9/2017

Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5600 MHz System Verification at 17.0 dBm (50 mW)

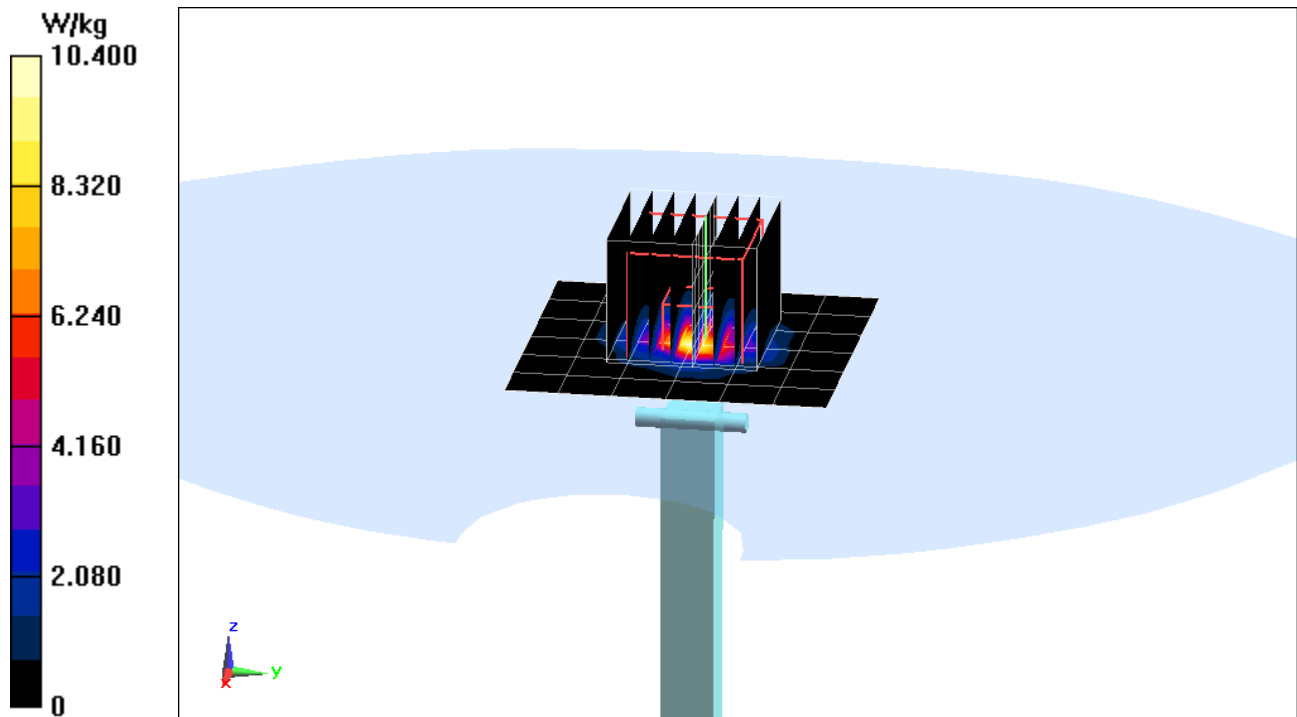
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

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

Peak SAR (extrapolated) = 18.6 W/kg

SAR(1 g) = 4.24 W/kg

Deviation(1 g) = 2.79%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1

Medium: 5GHz Head Medium parameters used (interpolated):

$f = 5750 \text{ MHz}$; $\sigma = 5.021 \text{ S/m}$; $\epsilon_r = 34.336$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-23-2018; Ambient Temp: 22.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN3914; ConvF(4.91, 4.91, 4.91); Calibrated: 2/13/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/9/2017

Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5750 MHz System Verification at 17.0 dBm (50 mW)

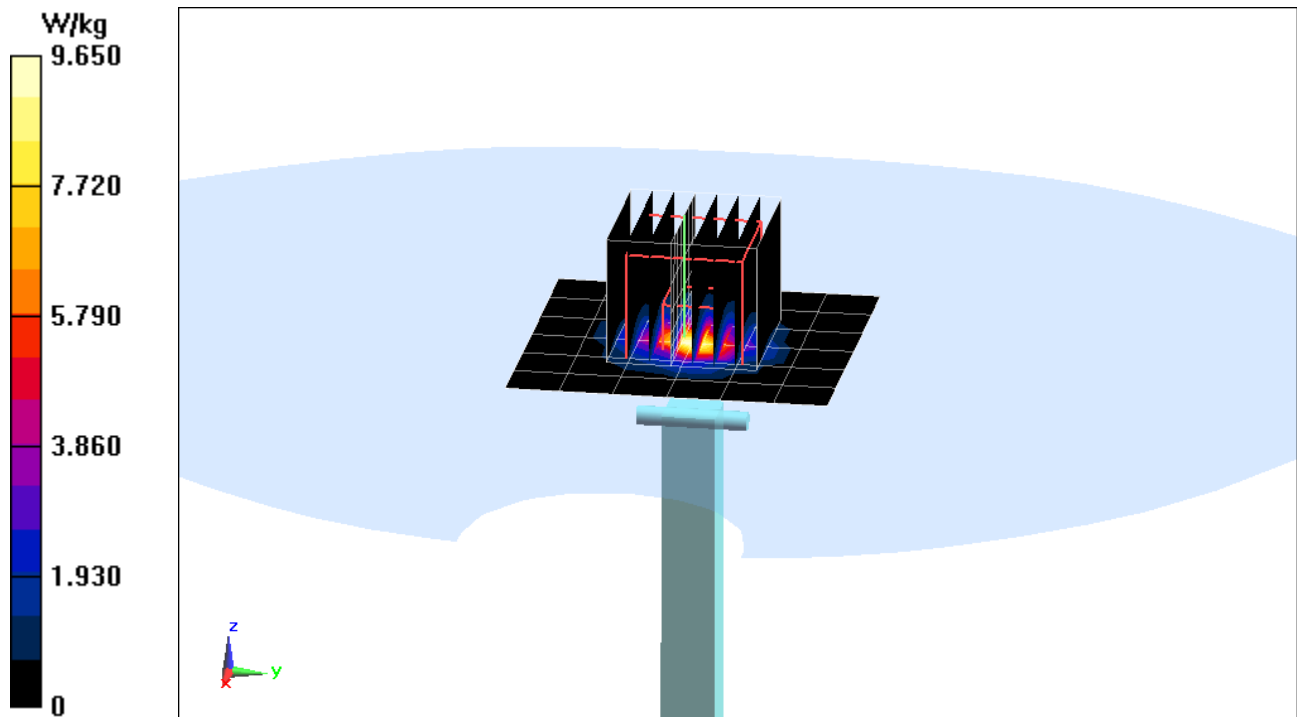
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

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

Peak SAR (extrapolated) = 18.8 W/kg

SAR(1 g) = 4.02 W/kg

Deviation(1 g) = 0.25%



PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Body; Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.962 \text{ S/m}$; $\epsilon_r = 53.113$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-28-2018; Ambient Temp: 21.1°C; Tissue Temp: 21.4°C

Probe: ES3DV3 - SN3332; ConvF(6.54, 6.54, 6.54); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 8/9/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

750 MHz System Verification at 23.0 dBm (200 mW)

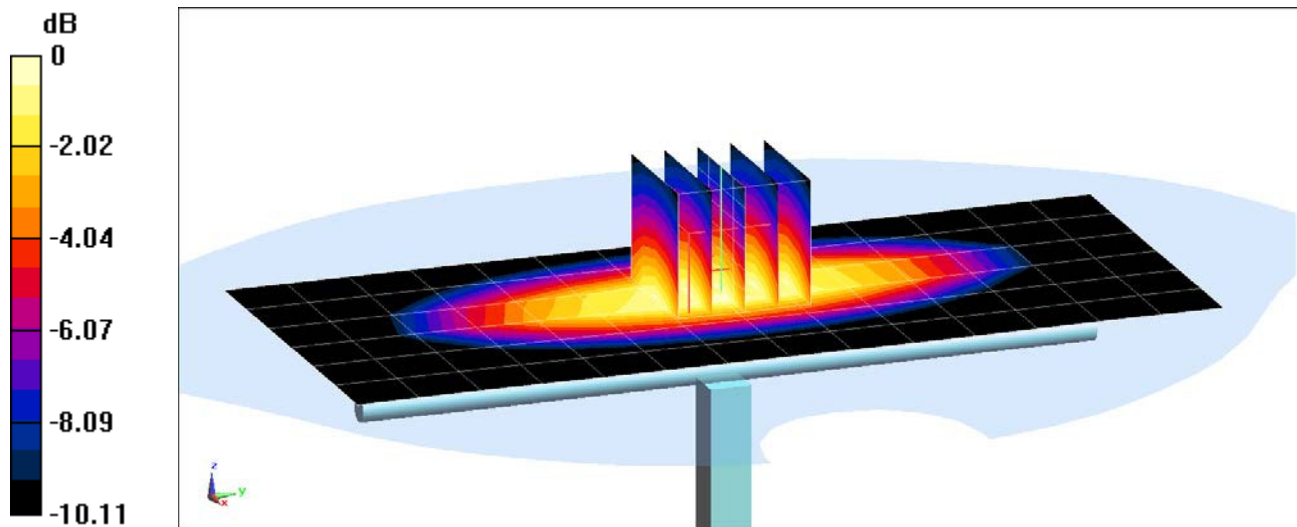
Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.36 W/kg

SAR(1 g) = 1.63 W/kg

Deviation(1 g) = -5.01%



0 dB = 1.90 W/kg = 2.79 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.972 \text{ S/m}$; $\epsilon_r = 54.502$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-29-2018; Ambient Temp: 20.7°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3209; ConvF(6.36, 6.36, 6.36); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

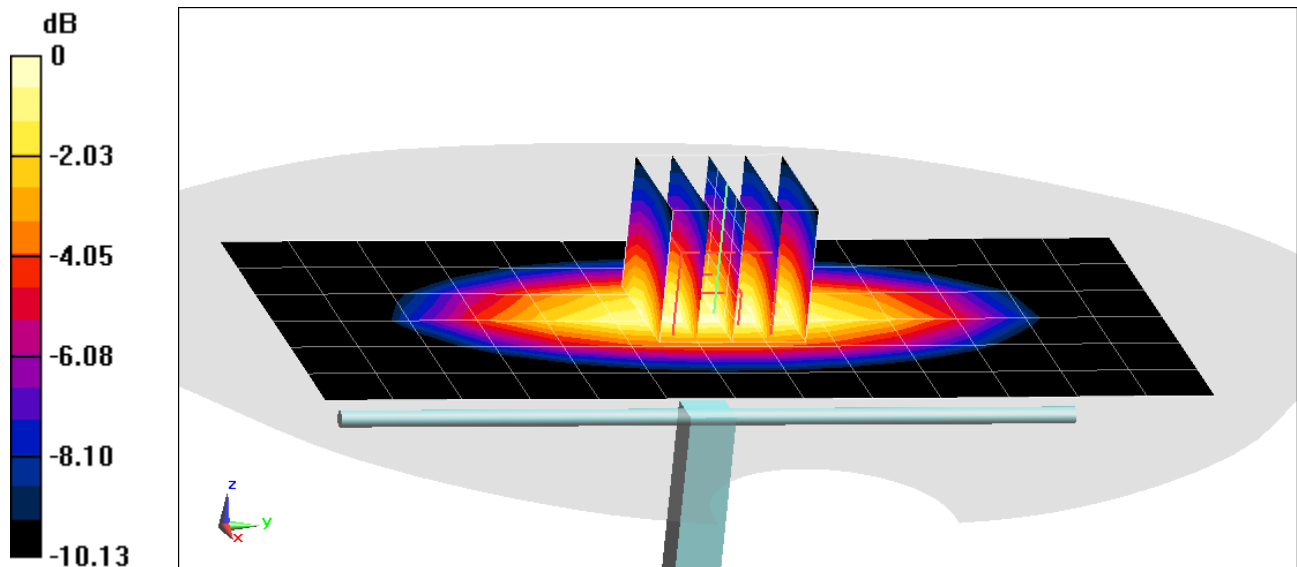
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.92 W/kg

SAR(1 g) = 2.02 W/kg

Deviation(1 g) = 4.02%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.471 \text{ S/m}$; $\epsilon_r = 51.414$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-30-2018; Ambient Temp: 24.0°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3319; ConvF(5.07, 5.07, 5.07); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/8/2017

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

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

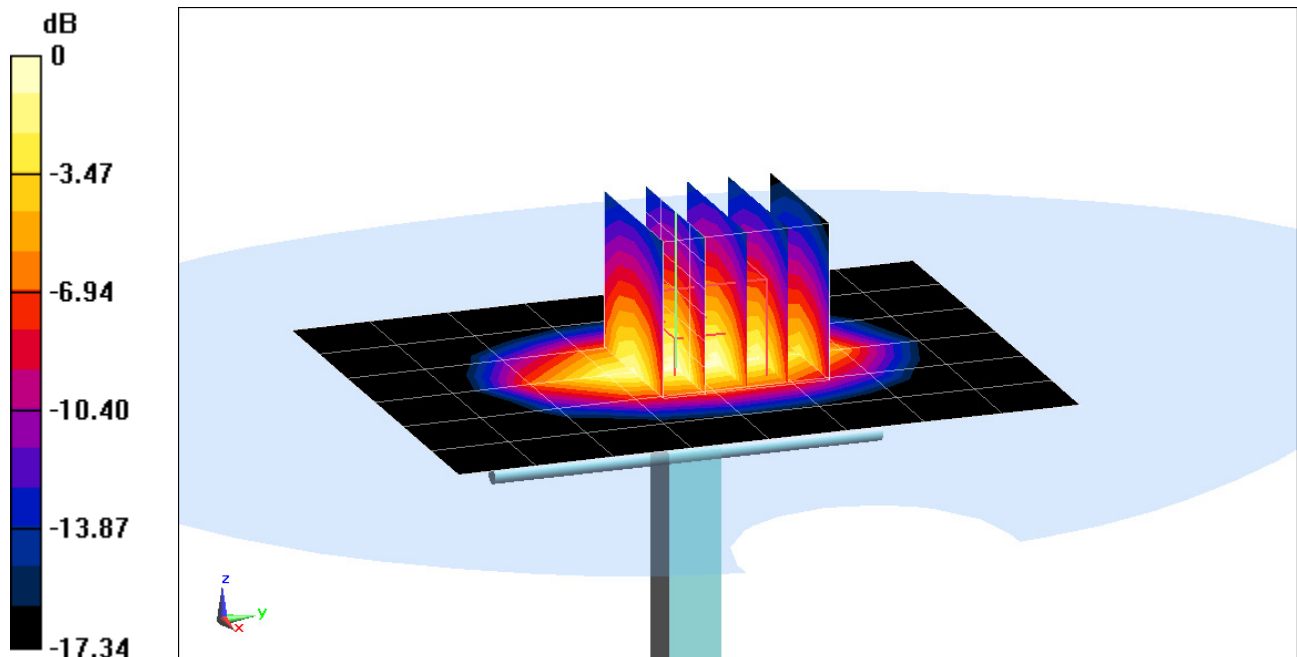
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 6.17 W/kg

SAR(1 g) = 3.58 W/kg; SAR(10 g) = 1.93 W/kg

Deviation(1 g) = -3.24%; Deviation(10 g) = -2.53%



0 dB = 4.42 W/kg = 6.45 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.563 \text{ S/m}$; $\epsilon_r = 52.457$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-24-2018; Ambient Temp: 22.3°C; Tissue Temp: 20.9°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 3/13/2017

Phantom: Twin-SAM V5.0 Right; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

1900 MHz System Verification at 20.0 dBm (100 mW)

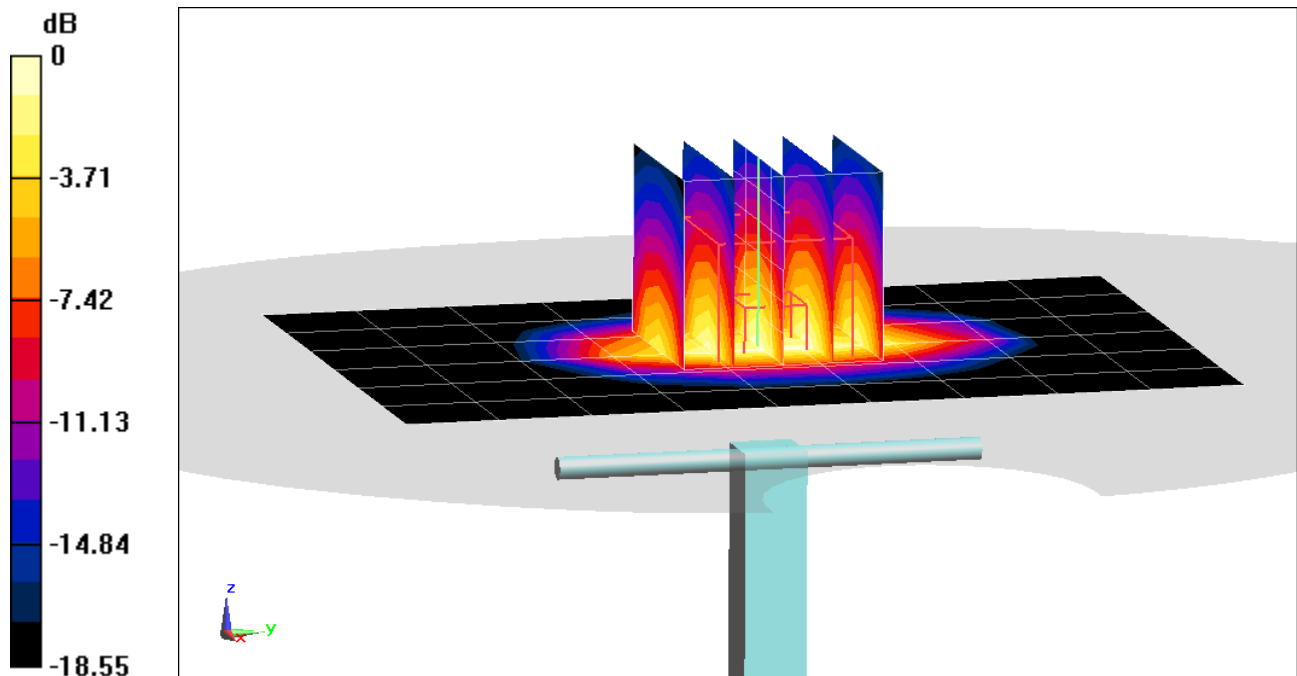
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 7.16 W/kg

SAR(1 g) = 3.96 W/kg

Deviation(1 g) = 1.28%



0 dB = 5.02 W/kg = 7.01 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:

$f = 2450 \text{ MHz}$; $\sigma = 2.025 \text{ S/m}$; $\epsilon_r = 50.948$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-05-2018; Ambient Temp: 21.9°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7406; ConvF(7.6, 7.6, 7.6); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

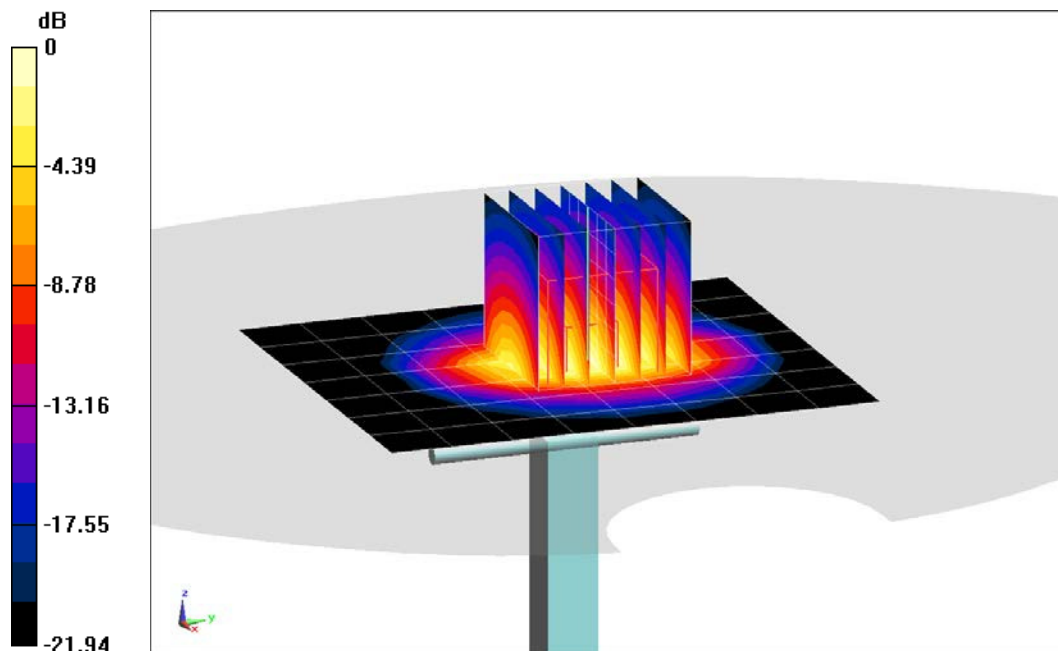
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 11.4 W/kg

SAR(1 g) = 5.37 W/kg

Deviation(1 g) = 5.09%



0 dB = 9.15 W/kg = 9.61 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1126

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used:

$f = 2600$ MHz; $\sigma = 2.222$ S/m; $\epsilon_r = 50.077$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-08-2018; Ambient Temp: 21.0°C; Tissue Temp: 19.8°C

Probe: EX3DV4 - SN7406; ConvF(7.31, 7.31, 7.31); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

2600 MHz System Verification at 20.0 dBm (100 mW)

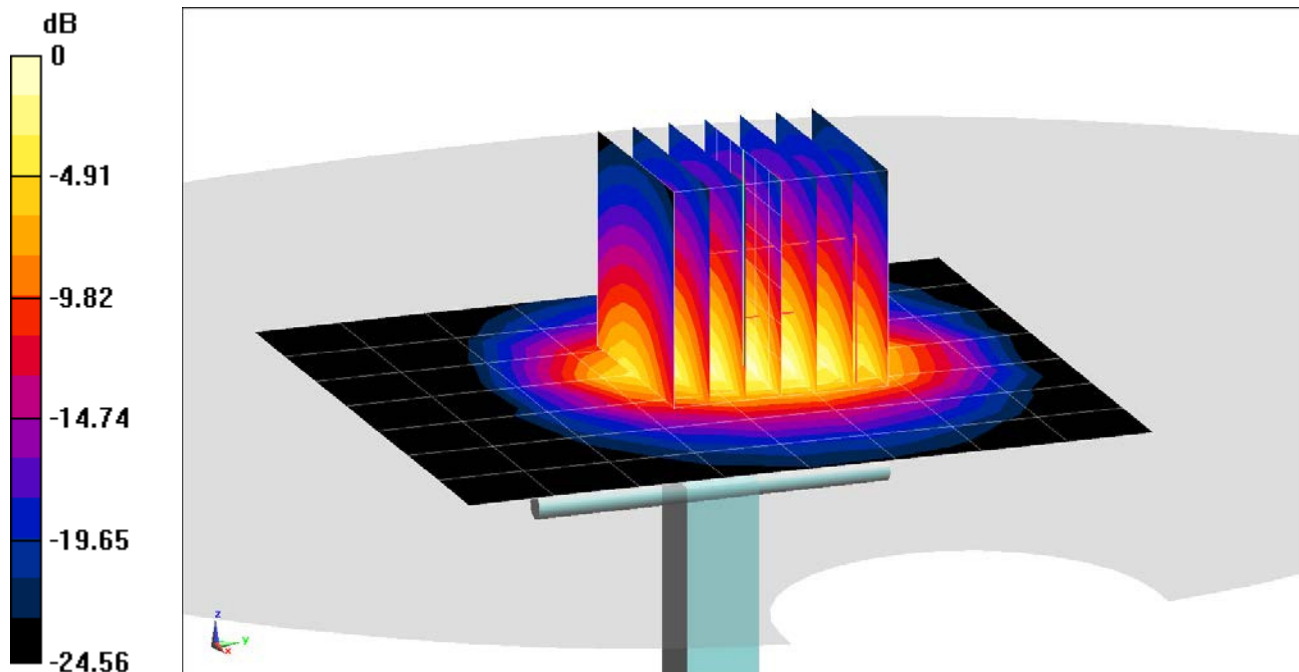
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 12.4 W/kg

SAR(1 g) = 5.59 W/kg

Deviation(1 g) = 2.95%



0 dB = 9.75 W/kg = 9.89 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1126

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 2.197 \text{ S/m}$; $\epsilon_r = 51.077$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 02-12-2018; Ambient Temp: 22.4°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7406; ConvF(7.31, 7.31, 7.31); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/11/2017

Phantom: Right Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1797

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

2600 MHz System Verification at 20.0 dBm (100 mW)

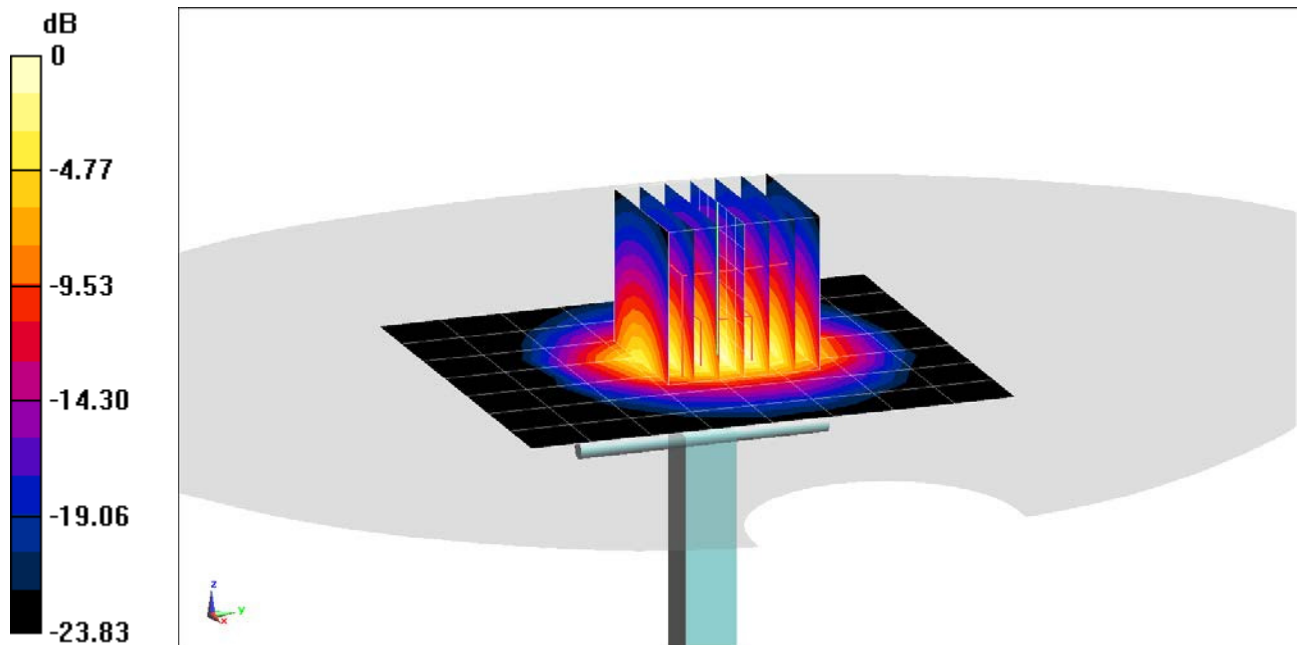
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 12.8 W/kg

SAR(10 g) = 2.51 W/kg

Deviation(10 g) = 2.87%



0 dB = 10.1 W/kg = 10.04 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used (interpolated):

$f = 5250 \text{ MHz}$; $\sigma = 5.493 \text{ S/m}$; $\epsilon_r = 47.499$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-29-2018; Ambient Temp: 21.4°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7308; ConvF(4.84, 4.84, 4.84); Calibrated: 8/16/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/14/2017

Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

5250 MHz System Verification at 17.0 dBm (50 mW)

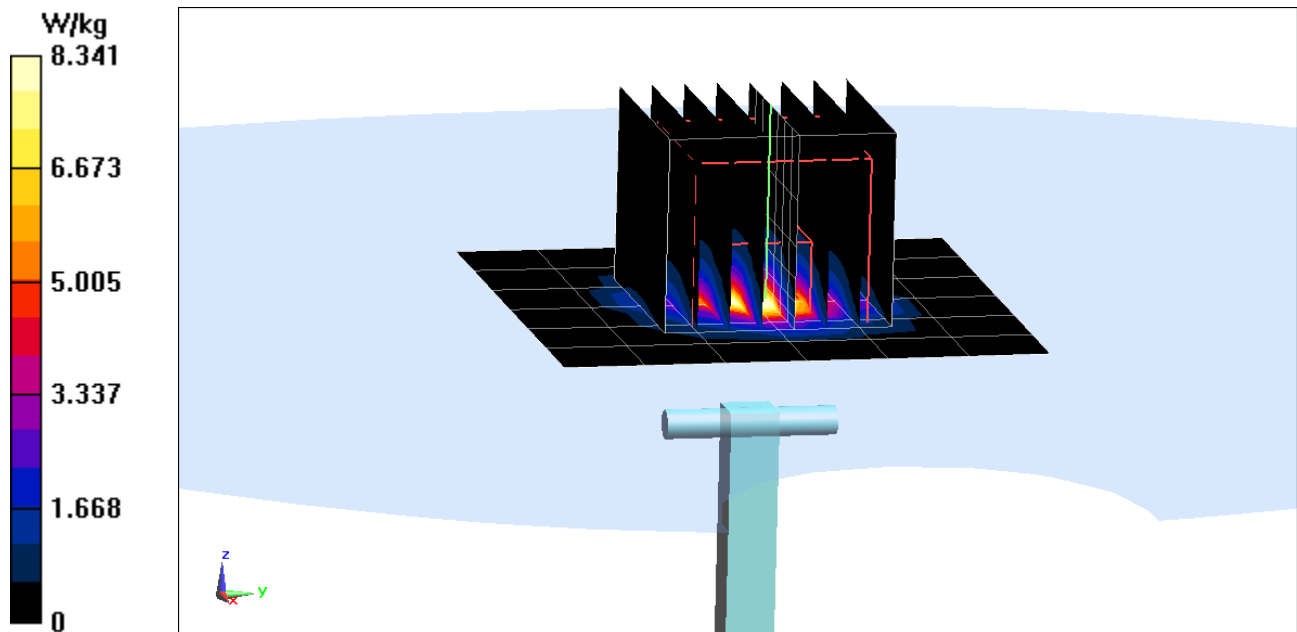
Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Peak SAR (extrapolated) = 16.0 W/kg

SAR(1 g) = 3.51 W/kg; SAR(10 g) = 0.980 W/kg

Deviation(1 g) = -7.51%; Deviation(10 g) = -7.11%



PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.943 \text{ S/m}$; $\epsilon_r = 46.926$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-29-2018; Ambient Temp: 21.4°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7308; ConvF(4.23, 4.23, 4.23); Calibrated: 8/16/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/14/2017

Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646

Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5600 MHz System Verification at 17.0 dBm (50 mW)

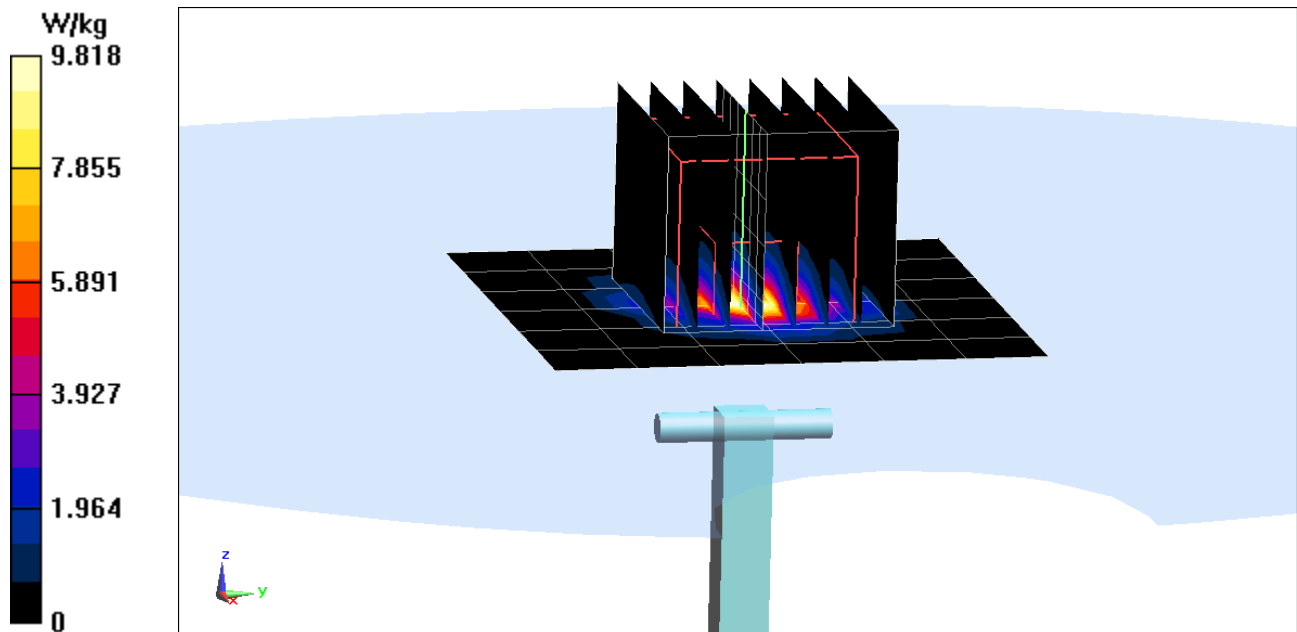
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

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

Peak SAR (extrapolated) = 19.4 W/kg

SAR(1 g) = 3.92 W/kg; SAR(10 g) = 1.08 W/kg

Deviation(1 g) = -1.88%; Deviation(10 g) = -3.14%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used (interpolated):

$f = 5750 \text{ MHz}$; $\sigma = 6.168 \text{ S/m}$; $\epsilon_r = 46.664$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-29-2018; Ambient Temp: 21.4°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7308; ConvF(4.5, 4.5, 4.5); Calibrated: 8/16/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/14/2017

Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646

Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

5750 MHz System Verification at 17.0 dBm (50 mW)

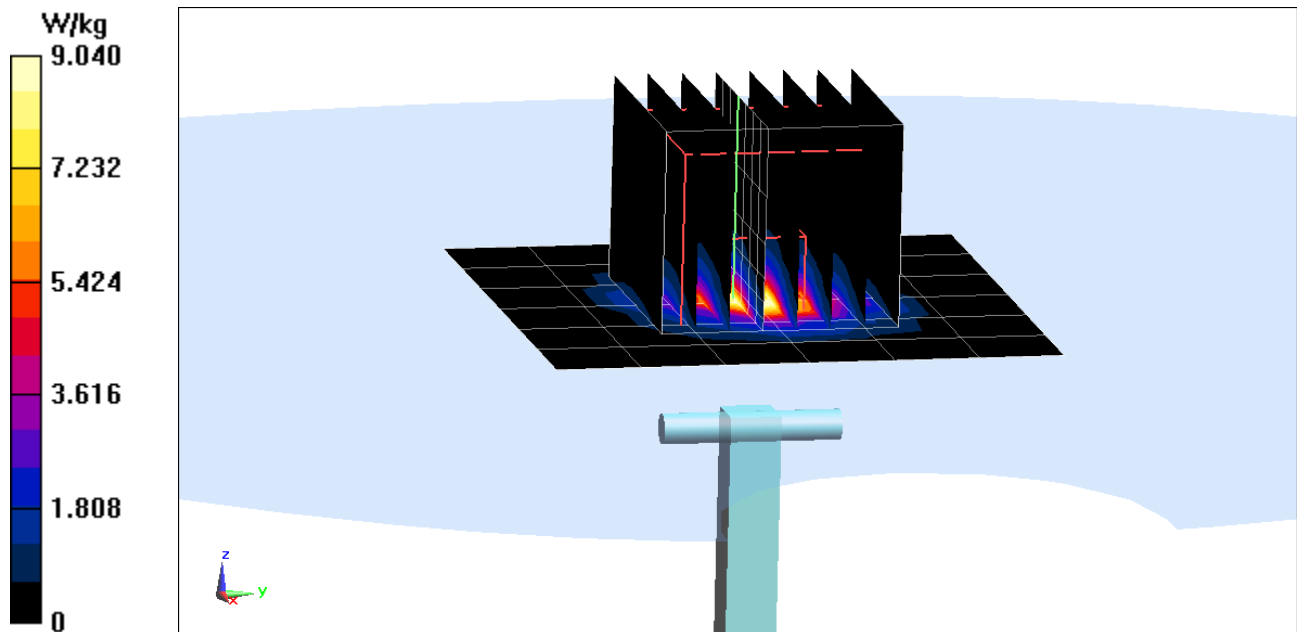
Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 3.57 W/kg; SAR(10 g) = 0.995 W/kg

Deviation(1 g) = -6.91%; Deviation(10 g) = -6.13%



APPENDIX C: PROBE CALIBRATION



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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1161_Jul16**

CALIBRATION CERTIFICATE

Object **D750V3 - SN:1161**

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

Calibration date: **July 13, 2016**

✓ PM
8/9/16
Extended
7/20/17
SC ✓

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	15-Jun-16 (No. EX3-7349_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

Calibrated by: **Claudio Leubler** Name: **Claudio Leubler** Function: **Laboratory Technician** Signature:

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager** Signature:

Issued: July 13, 2016

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 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- 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	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	40.9 $\pm$ 6 %	0.91 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	2.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.17 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	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.39 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	55.1 $\pm$ 6 %	0.99 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	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.43 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	1.41 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.53 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.6 Ω - 0.9 j Ω
Return Loss	- 25.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.2 Ω - 4.0 j Ω
Return Loss	- 28.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.033 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 19, 2015

DASY5 Validation Report for Head TSL

Date: 13.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.91 \text{ S/m}$; $\epsilon_r = 40.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.07, 10.07, 10.07); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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

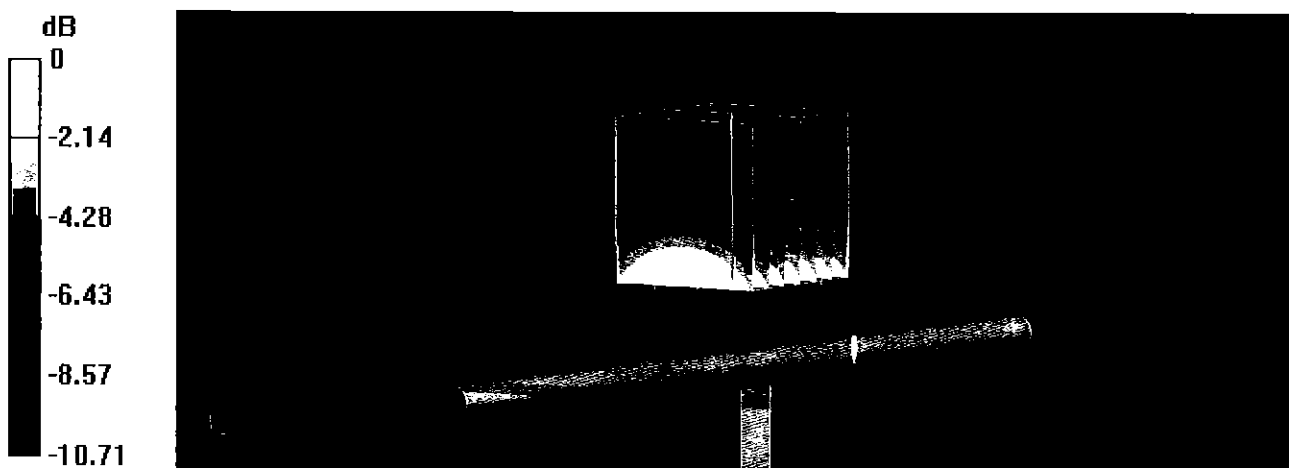
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 58.07 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.13 W/kg

SAR(1 g) = 2.09 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.80 W/kg

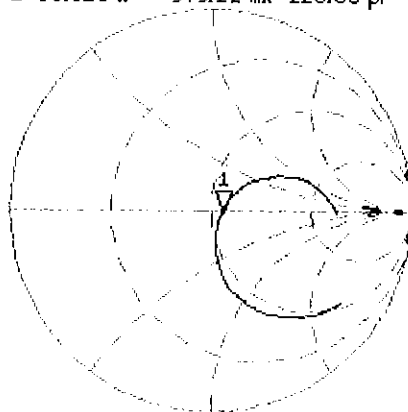


0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Head TSL

13 Jul 2016 09:55:53
 [CH1] S11 1 U FS 1: 55.615 Ω -949.22 m Ω 223.56 pF 750.000 000 MHz

*
 De1
 CA



Avg
 16

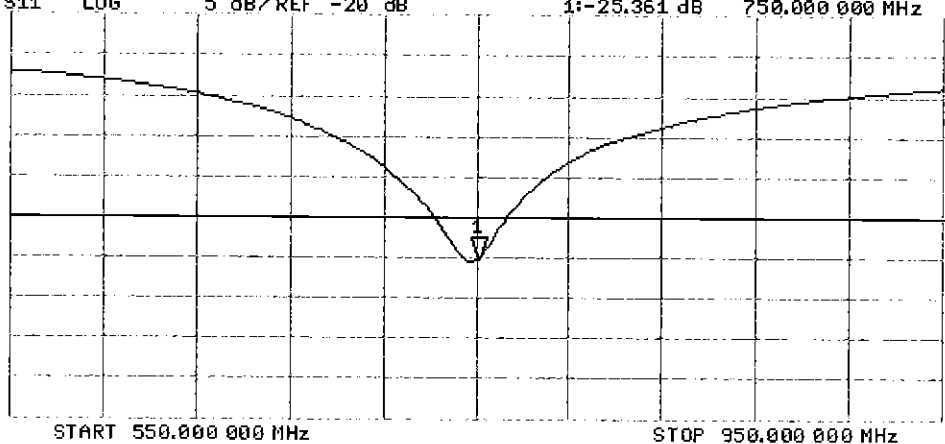
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-25.361 dB 750.000 000 MHz

CA

Avg
 16

H1d



DASY5 Validation Report for Body TSL

Date: 13.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.99 \text{ S/m}$; $\epsilon_r = 55.1$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.99, 9.99, 9.99); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 4.9L; Type: QD000P49AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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 = 56.33 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.22 W/kg

SAR(1 g) = 2.16 W/kg; SAR(10 g) = 1.41 W/kg

Maximum value of SAR (measured) = 2.87 W/kg

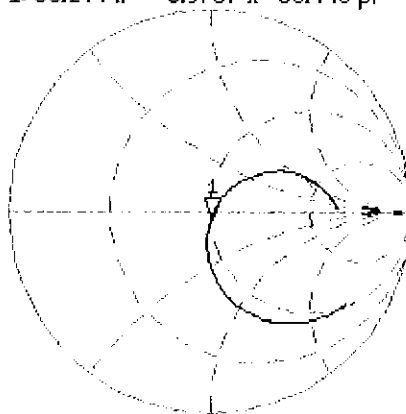


0 dB = 2.87 W/kg = 4.58 dBW/kg

Impedance Measurement Plot for Body TSL

13 Jul 2016 13:16:34
 [CH1] S11 1 U FS 1: 50.244 Ω -3.9707 Ω 53.443 pF 750.000 000 MHz

*
 Del
 CA

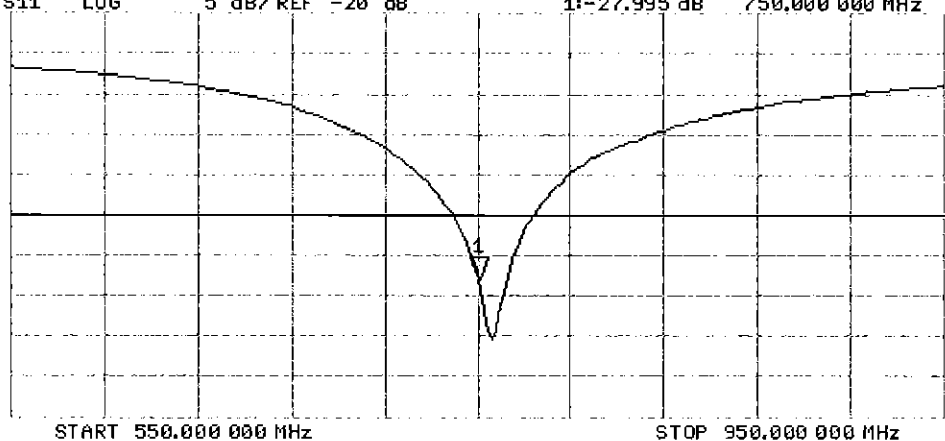


Avg
 16

H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-27.995 dB 750.000 000 MHz

CA



H1d

Certification of Calibration

Object D750V3 – SN: 1161

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Calibration date: July 12, 2017

Description: SAR Validation Dipole at 750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
Agilent	8753ES	S-Parameter Network Analyzer	10/26/2016	Annual	10/26/2017	US39170118
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/8/2017	Annual	3/8/2018	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/14/2017	Annual	6/14/2018	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/10/2017	Annual	5/10/2018	1070
SPEAG	ES3DV3	SAR Probe	11/15/2016	Annual	11/15/2017	3334
SPEAG	ES3DV3	SAR Probe	3/14/2017	Annual	3/14/2018	3319
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1207364
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1339018
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Agilent	N5182A	MXG Vector Signal Generator	2/28/2017	Annual	2/28/2018	MY47420800
Seekonk	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A

Measurement Uncertainty = $\pm 23\%$ (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halfoster	Test Engineer	<i>BRODIE HALFOSTER</i>
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	<i>KOK</i>

DIPOLE CALIBRATION EXTENSION

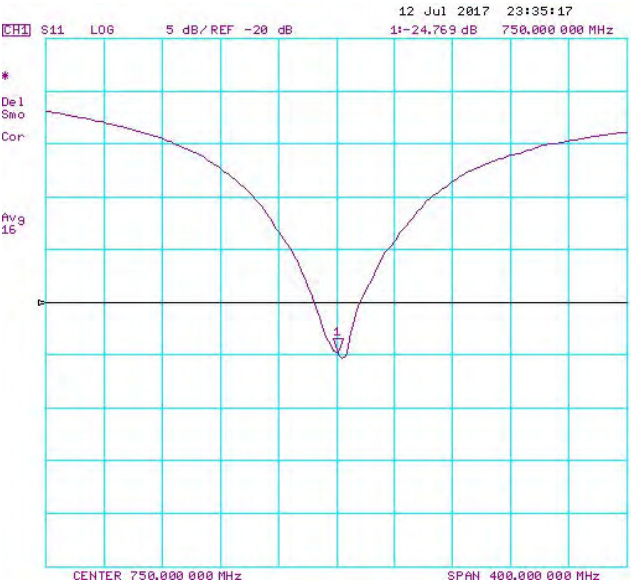
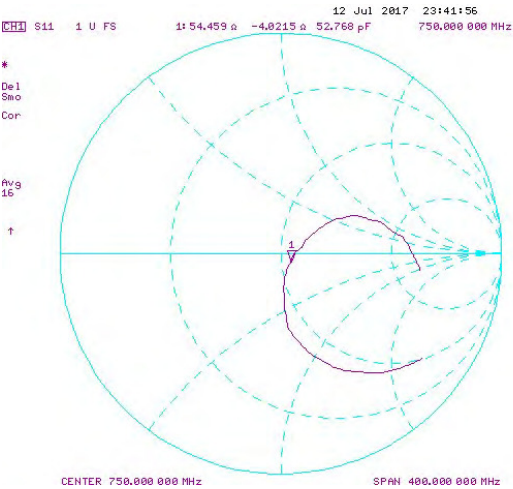
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

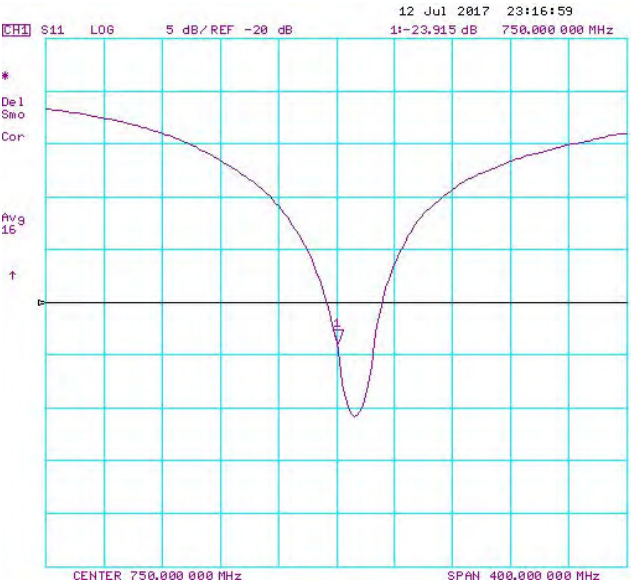
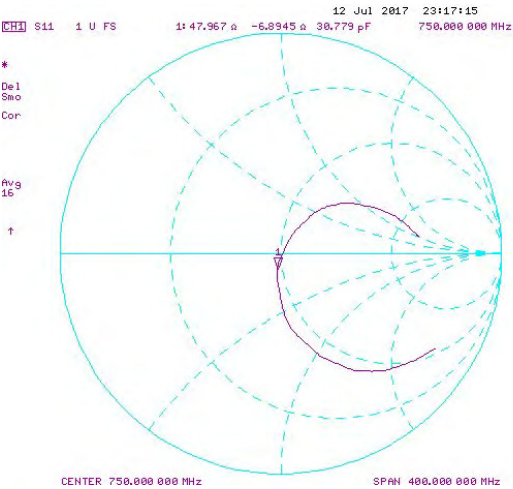
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
7/13/2016	7/12/2017	1.033	1.63	1.65	0.98%	1.08	1.09	1.11%	55.6	54.5	1.1	-0.9	-4.0	3.1	-25.4	-24.8	2.40%	PASS
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
7/13/2016	7/12/2017	1.033	1.69	1.75	3.60%	1.11	1.17	5.79%	50.2	48.0	2.2	-4.0	-6.9	2.9	-28.0	-23.9	14.60%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D835V2-4d132_Jan18**

CALIBRATION CERTIFICATE

Object **D835V2 - SN:4d132**

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

Calibration date: **January 15, 2018**

BNV
01-25-2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

Calibrated by: **Leif Klysner** Name: **Leif Klysner** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature
Leif Klysner
Katja Pokovic

Issued: January 15, 2018

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- 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	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	835 MHz $\pm$ 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	40.7 $\pm$ 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 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.36 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.10 W/kg $\pm$ 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	54.8 $\pm$ 6 %	0.99 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	2.47 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.71 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	1.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.39 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.8 Ω - 2.9 j Ω
Return Loss	- 29.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 5.7 j Ω
Return Loss	- 23.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.41 W/kg $\pm$ 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.21 W/kg $\pm$ 16.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.69 W/kg $\pm$ 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.64 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.45 W/kg $\pm$ 16.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.22 W/kg $\pm$ 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.59 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.25 W/kg $\pm$ 16.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.03 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	7.96 W/kg $\pm$ 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.39 W/kg $\pm$ 16.9 % (k=2)

DASY5 Validation Report for Head TSL

Date: 08.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.92 \text{ S/m}$; $\epsilon_r = 40.7$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 63.23 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 3.64 W/kg

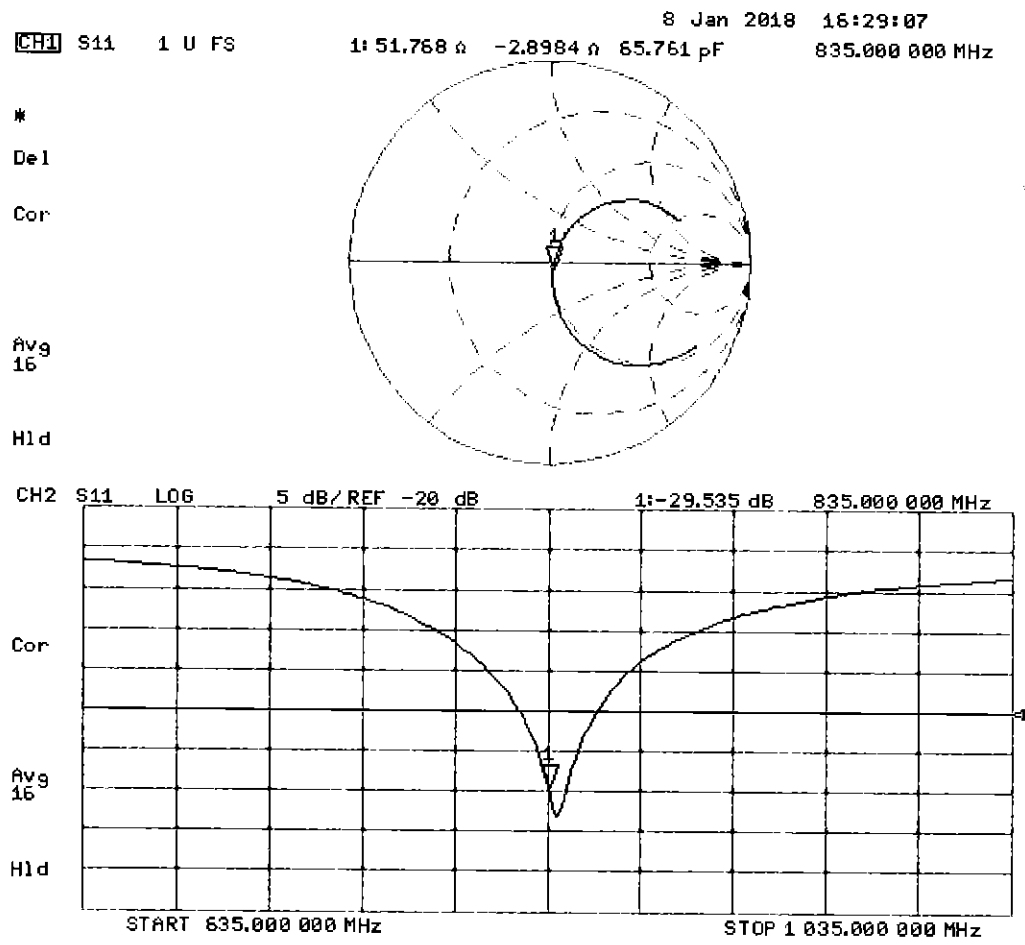
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.55 W/kg

Maximum value of SAR (measured) = 3.22 W/kg



0 dB = 3.22 W/kg = 5.08 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.99$ S/m; $\epsilon_r = 54.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

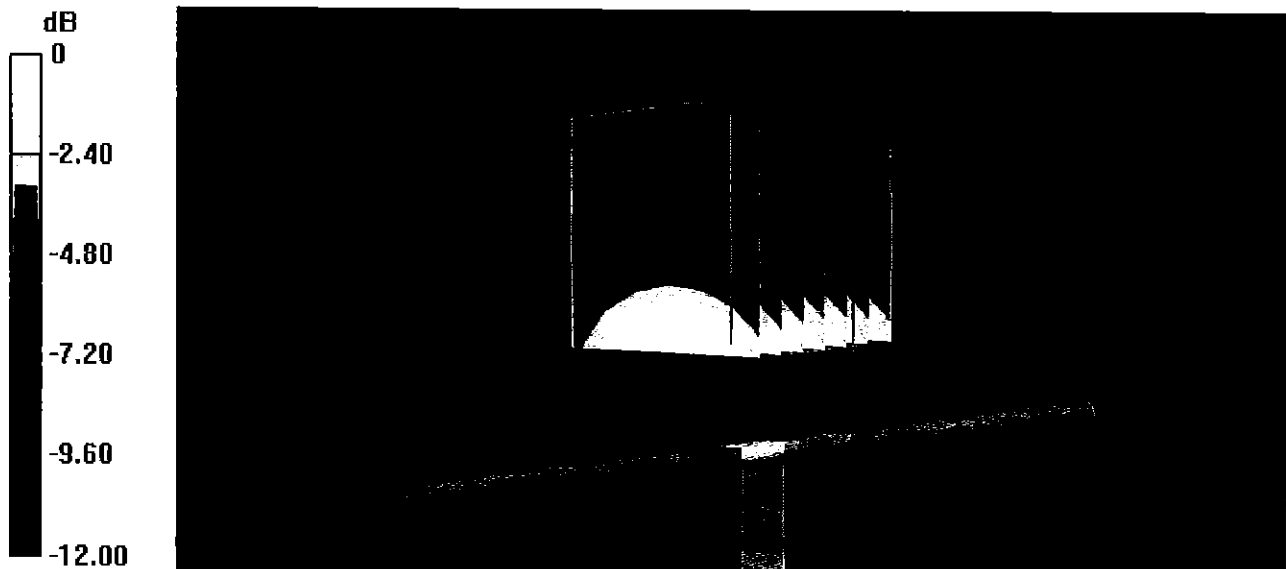
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 60.55 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 3.66 W/kg

SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.62 W/kg

Maximum value of SAR (measured) = 3.24 W/kg

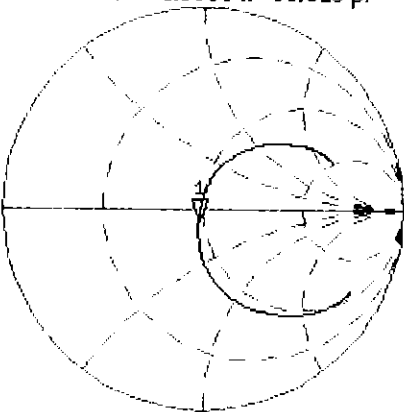


0 dB = 3.24 W/kg = 5.11 dBW/kg

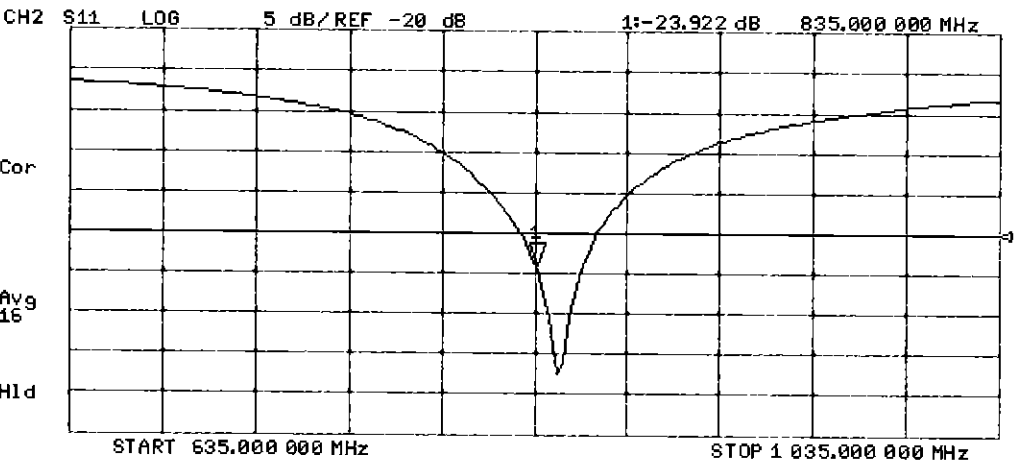
Impedance Measurement Plot for Body TSL

8 Jan 2018 16:27:09
CH1 S11 1 U FS 1: 47.447 Ω -5.6680 Ω 33.628 pF 835.000 000 MHz

*
De1
Cor



Avg
16
H1d



DASY5 Validation Report for SAM Head

Date: 15.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.94 \text{ S/m}$; $\epsilon_r = 44.1$; $\rho = 1000 \text{ kg/m}^3$

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

Reference Value = 61.00 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.56 W/kg

SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.58 W/kg

Maximum value of SAR (measured) = 3.16 W/kg

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

Reference Value = 60.99 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 3.65 W/kg

SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.64 W/kg

Maximum value of SAR (measured) = 3.19 W/kg

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

Reference Value = 59.20 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 3.33 W/kg

SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.59 W/kg

Maximum value of SAR (measured) = 3.04 W/kg

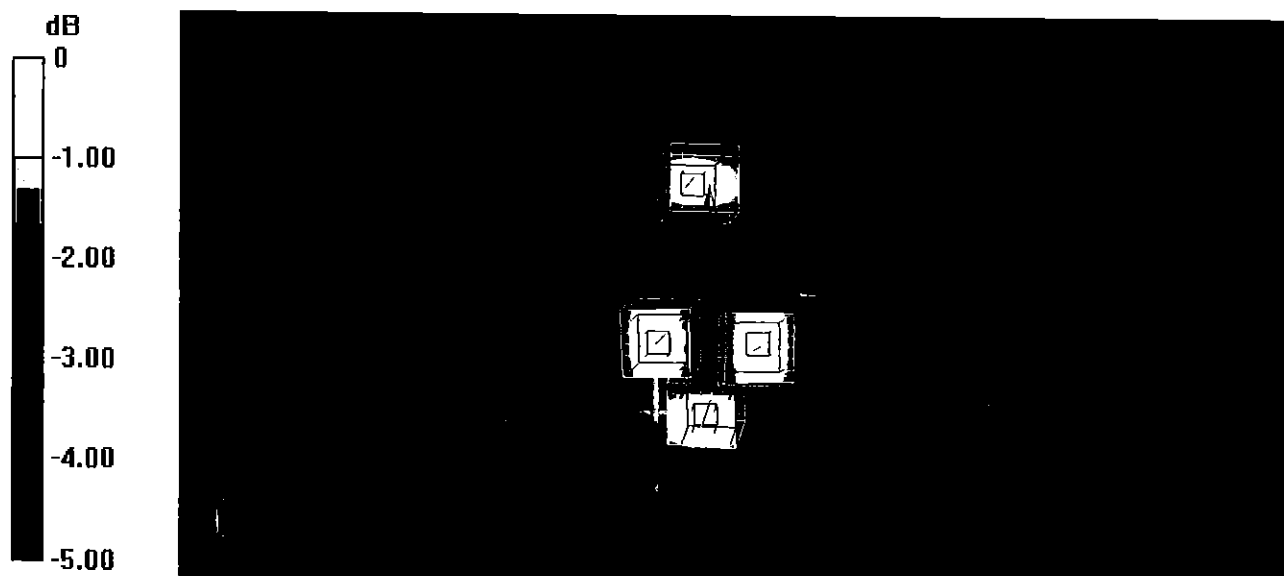
SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.03 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 2.90 W/kg

SAR(1 g) = 2.03 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.61 W/kg



0 dB = 2.61 W/kg = 4.17 dBW/kg



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1750V2-1148_May17**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1148**

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

Calibration date: **May 09, 2017**

BN ✓
05-23-2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by: **Claudio Leubler** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

Issued: May 11, 2017

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 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- 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	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz $\pm$ 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 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.4 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.3 W/kg $\pm$ 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	53.7 $\pm$ 6 %	1.47 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	9.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	37.0 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	4.93 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	19.8 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 0.7 j Ω
Return Loss	- 42.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.7 Ω - 0.5 j Ω
Return Loss	- 26.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.223 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 30, 2014

DASY5 Validation Report for Head TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.36$ S/m; $\epsilon_r = 39$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.46, 8.46, 8.46); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

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

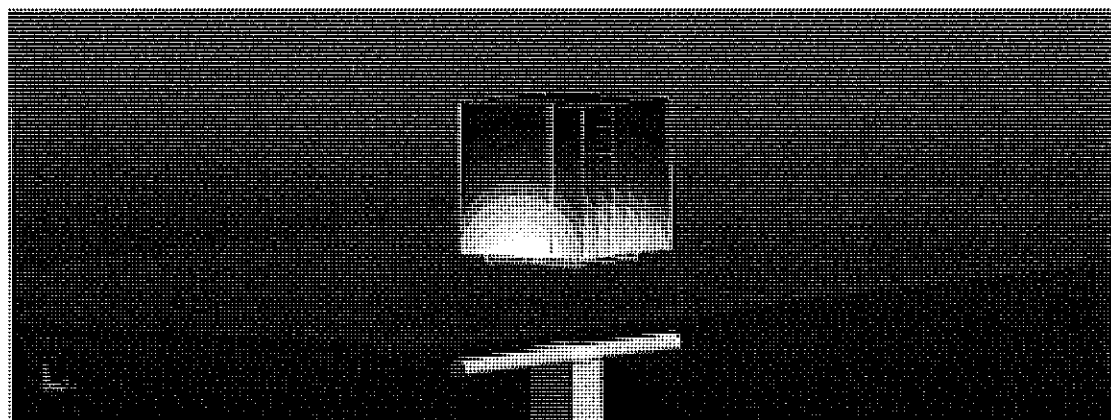
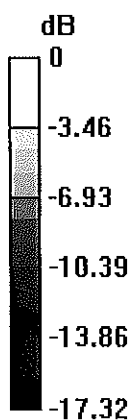
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.4 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 16.5 W/kg

SAR(1 g) = 9.11 W/kg; SAR(10 g) = 4.83 W/kg

Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

Impedance Measurement Plot for Head TSL

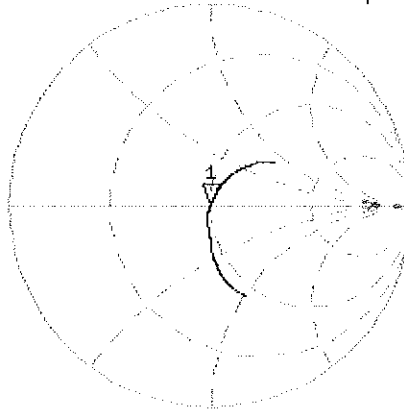
9 May 2017 14:43:11
[CH1] S11 1 U FS 1: 49.777 Ω -683.59 m Ω 133.04 pF 1 750.000 000 MHz

*
De1

CA

AVG
16

H1d

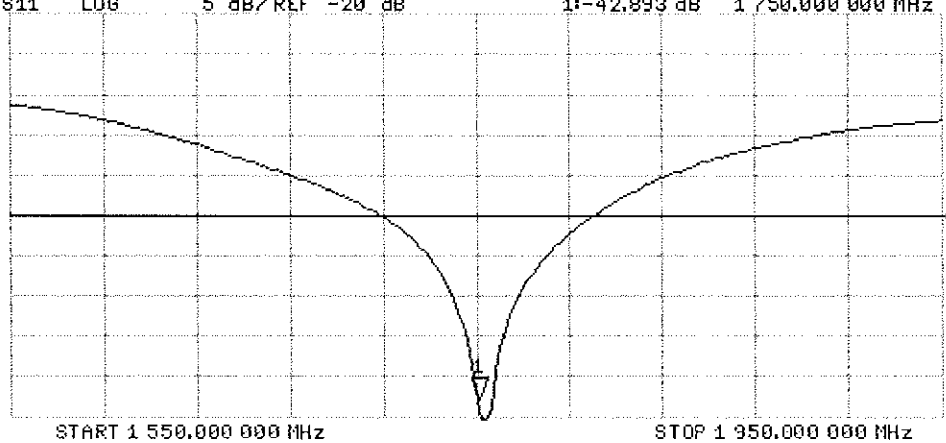


CH2 S11 LOG 5 dB/REF -20 dB 1: -42.893 dB 1 750.000 000 MHz

CA

AVG
16

H1d



DASY5 Validation Report for Body TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.47$ S/m; $\epsilon_r = 53.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.25, 8.25, 8.25); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

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

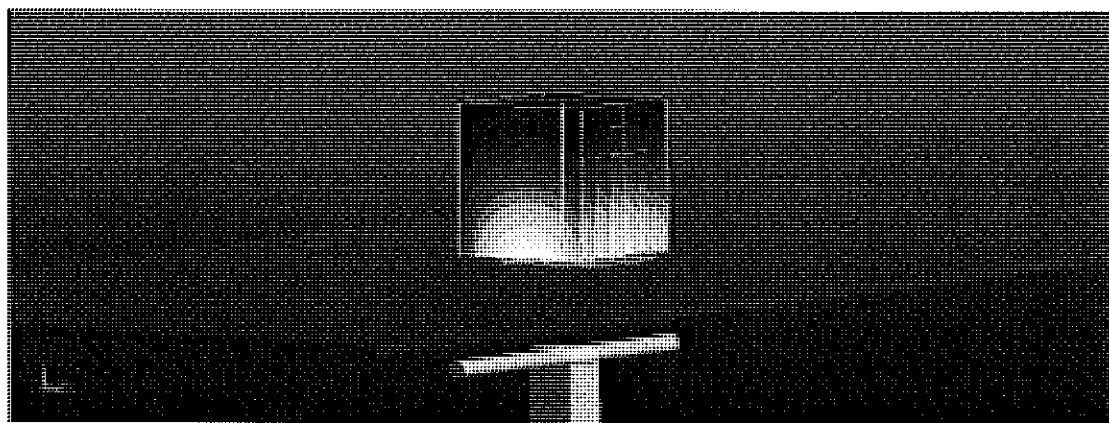
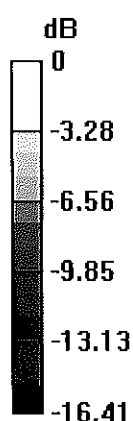
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.49 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 15.9 W/kg

SAR(1 g) = 9.17 W/kg; SAR(10 g) = 4.93 W/kg

Maximum value of SAR (measured) = 13.1 W/kg

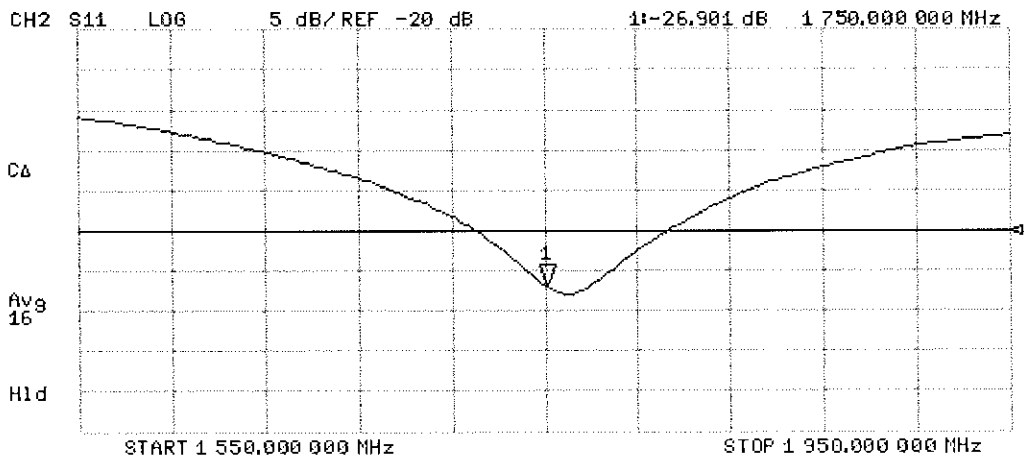
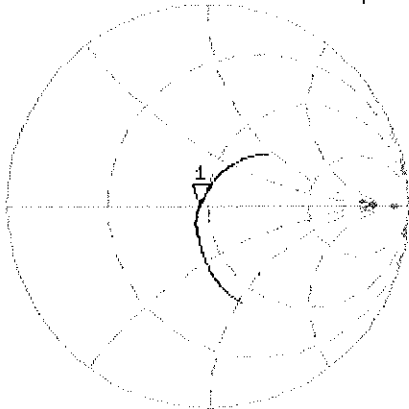


0 dB = 13.1 W/kg = 11.17 dBW/kg

Impedance Measurement Plot for Body TSL

9 May 2017 14:42:25
[CH1] S11 1 U FS 1: 45.707 Ω -513.67 $m\Omega$ 177.05 pF 1 750.000 000 MHz

*
De1
CA
Avg
16
H1d





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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1900V2-5d149_Jul17**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d149**

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

BN
8/3/2017

Calibration date: **July 11, 2017**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-May-17 (No. EX3-7349_May17)	May-18
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by:	Name Johannes Kurikka	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 12, 2017

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 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- 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	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	40.7 $\pm$ 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	9.82 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.6 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	54.1 $\pm$ 6 %	1.50 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	9.92 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	40.1 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	5.28 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.3 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.0 \Omega + 5.3 j\Omega$
Return Loss	- 25.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$48.4 \Omega + 7.3 j\Omega$
Return Loss	- 22.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.196 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: 11.07.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.39$ S/m; $\epsilon_r = 40.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

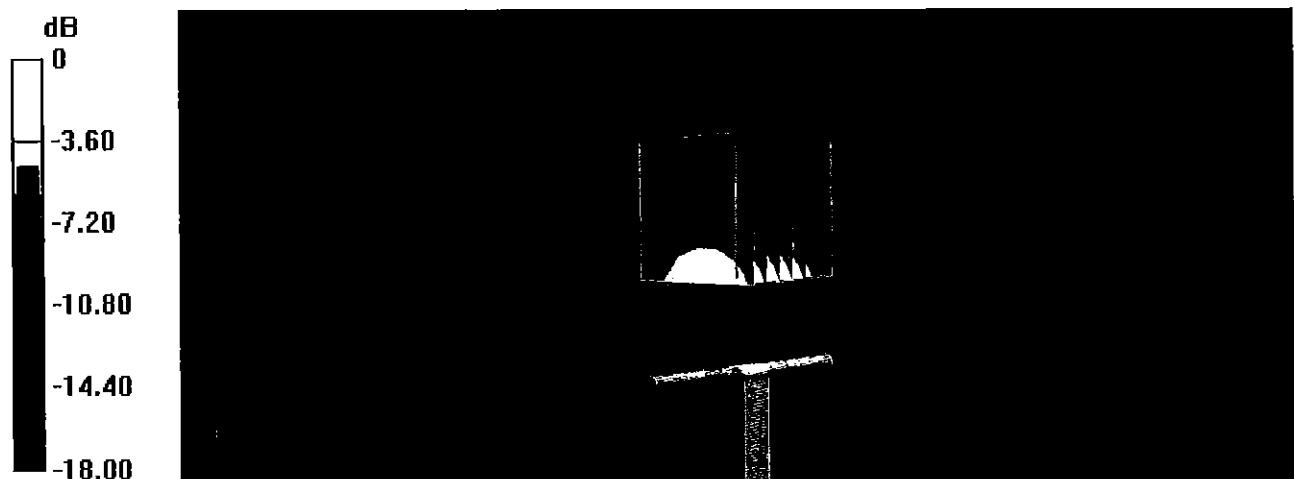
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.6 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 18.3 W/kg

SAR(1 g) = 9.82 W/kg; SAR(10 g) = 5.17 W/kg

Maximum value of SAR (measured) = 14.7 W/kg

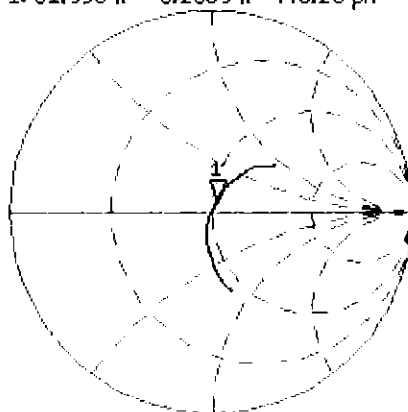


0 dB = 14.7 W/kg = 11.67 dBW/kg

Impedance Measurement Plot for Head TSL

11 Jul 2017 11:24:34
 CH1 S11 1 U FS 1: 51.996 Ω 5.2559 Ω 440.26 μH 1 900.000 000 MHz

*
 Del
 CA



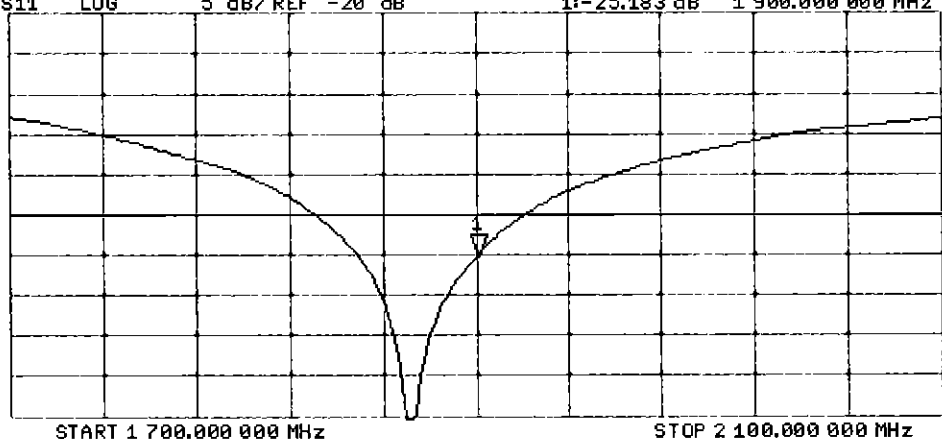
Avg
 16
 H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-25.183 dB 1 900.000 000 MHz

CA

Avg
 16

H1d



DASY5 Validation Report for Body TSL

Date: 11.07.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.5$ S/m; $\epsilon_r = 54.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.2, 8.2, 8.2); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

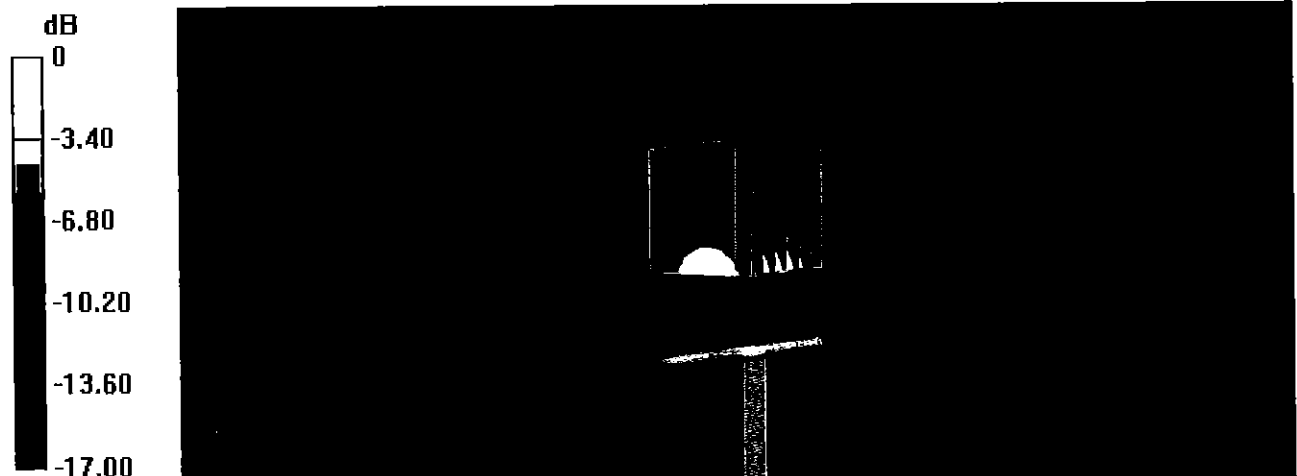
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.4 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 17.5 W/kg

SAR(1 g) = 9.92 W/kg; SAR(10 g) = 5.28 W/kg

Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

Impedance Measurement Plot for Body TSL

11 Jul 2017 11:23:21
CH1 S11 1 U FS 1: 48.350 Ω 7.2578 Ω 607.96 pH 1 900.000 000 MHz

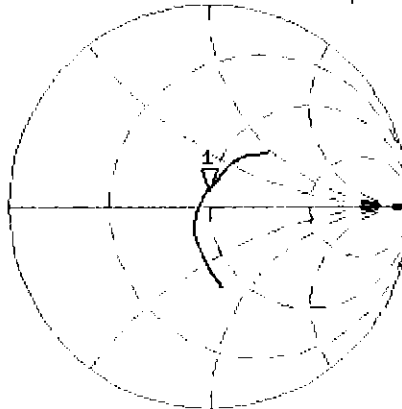
*

De1

CA

Avg
16

H1d

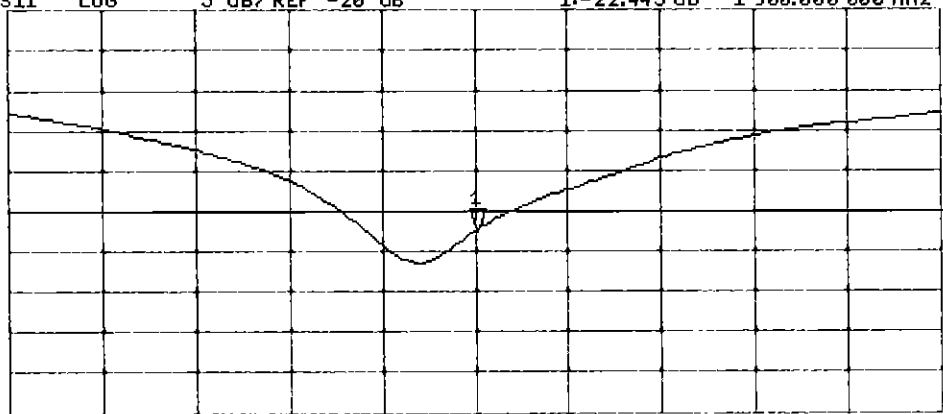


CH2 S11 LOG 5 dB/REF -20 dB 1:-22.445 dB 1 900.000 000 MHz

CA

Avg
16

H1d



START 1 700.000 000 MHz

STOP 2 100.000 000 MHz



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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2450V2-797_Sep17**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN:797**

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

SC ✓
 10/03/2017

Calibration date: **September 11, 2017**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-May-17 (No. EX3-7349_May17)	May-18
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by: **Michael Weber** **Function**
Laboratory Technician

Approved by: **Katja Pokovic** **Technical Manager**

Signature

Issued: September 11, 2017

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 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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	37.8 $\pm$ 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	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.7 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.8 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.9 $\pm$ 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	13.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	51.1 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.2 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.8 \Omega + 7.4 j\Omega$
Return Loss	- 21.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$49.7 \Omega + 9.1 j\Omega$
Return Loss	- 20.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 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 24, 2006

DASY5 Validation Report for Head TSL

Date: 11.09.2017

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; $\epsilon_r = 37.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

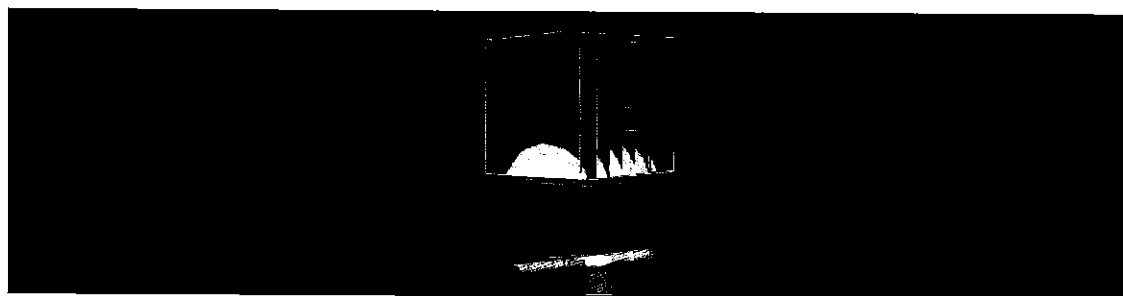
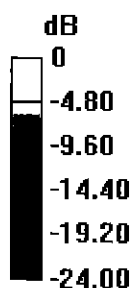
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 113.5 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 26.9 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.28 W/kg

Maximum value of SAR (measured) = 21.6 W/kg

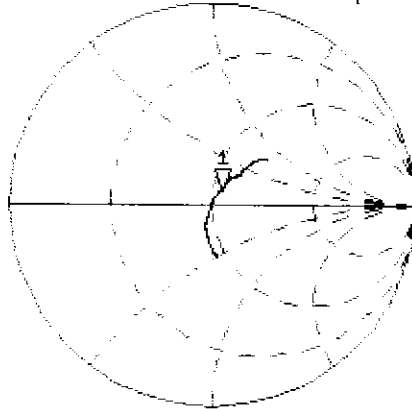


0 dB = 21.6 W/kg = 13.34 dBW/kg

Impedance Measurement Plot for Head TSL

11 Sep 2017 11:52:57
CH1 S11 1 U FS 1: 53.777 Ω 7.4395 Ω 483.28 μH 2 450.000 000 MHz

*
De1
CA



Avg
16

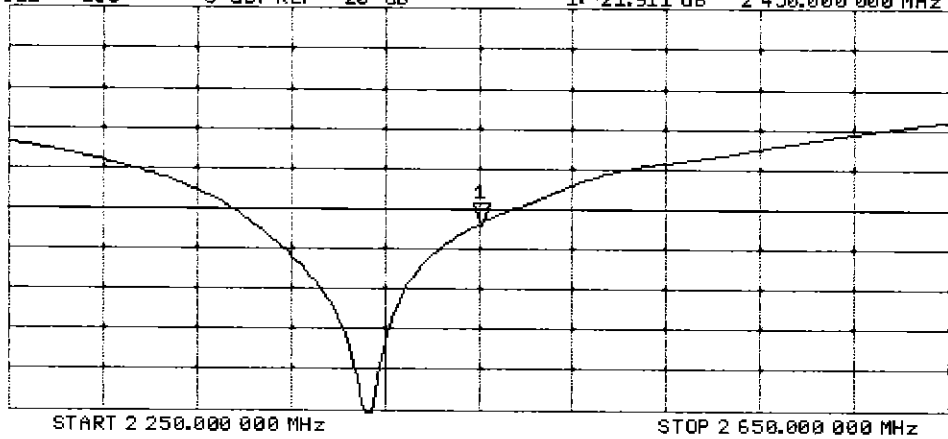
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.911 dB 2 450.000 000 MHz

CA

Avg
16

H1d



DASY5 Validation Report for Body TSL

Date: 11.09.2017

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; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.1, 8.1, 8.1); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

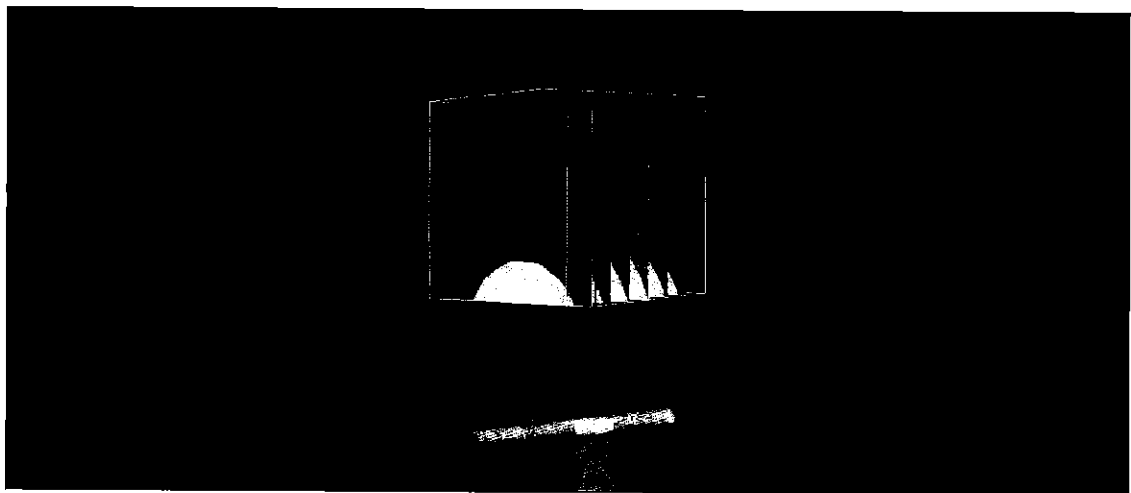
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.4 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 25.6 W/kg

SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.14 W/kg

Maximum value of SAR (measured) = 20.3 W/kg

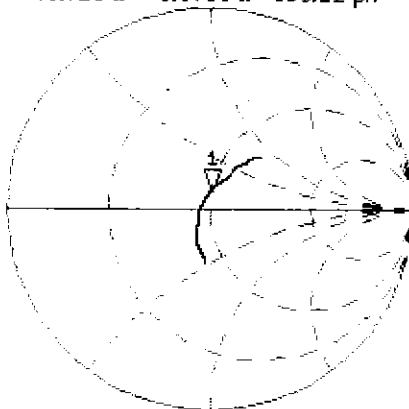


0 dB = 20.3 W/kg = 13.07 dBW/kg

Impedance Measurement Plot for Body TSL

11 Sep 2017 11:52:10
CH1 S11 1 U FS 1: 49.725 Ω 9.0703 Ω 589.22 pH 2 450.000 000 MHz

*
Del
CA



Avg
16

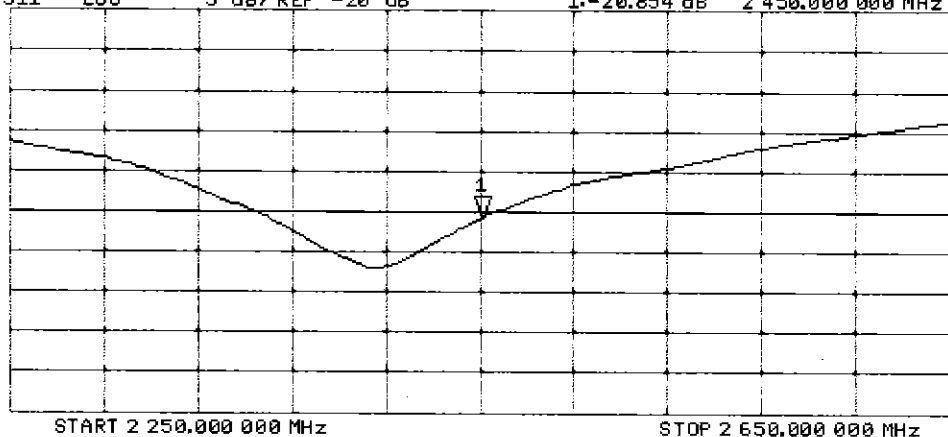
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -20.854 dB 2 450.000 000 MHz

CA

Avg
16

H1d





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2600V2-1126_Jul17**

CALIBRATION CERTIFICATE

Object **D2600V2 - SN:1126**

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

BNV
 8/3/2017

Calibration date: **July 10, 2017**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-May-17 (No. EX3-7349_May17)	May-18
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by: **Jeton Kastrati**

Name
 Function
Laboratory Technician

Signature

Approved by: **Katja Pokovic**

Technical Manager

Issued: July 11, 2017

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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- 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	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	37.2 $\pm$ 6 %	2.04 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	14.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	56.4 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	6.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.2 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	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.6 $\pm$ 6 %	2.22 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	13.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	54.3 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	6.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.4 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.8 Ω - 7.7 j Ω
Return Loss	- 21.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.8 Ω - 5.8 j Ω
Return Loss	- 21.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.154 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 22, 2015

DASY5 Validation Report for Head TSL

Date: 10.07.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1126

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.04$ S/m; $\epsilon_r = 37.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.96, 7.96, 7.96); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

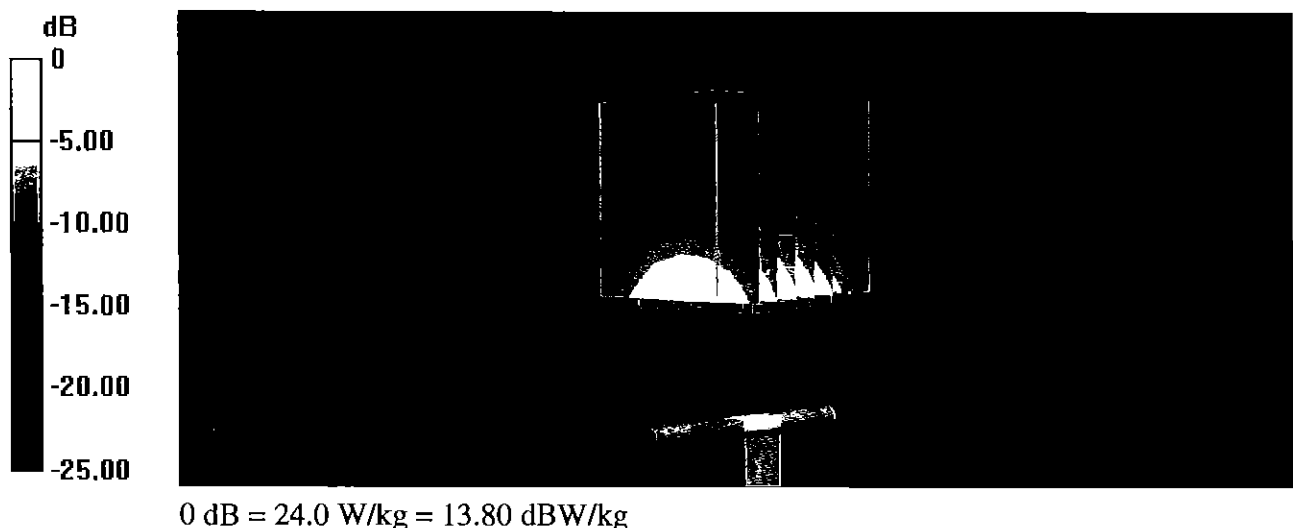
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 113.2 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 31.3 W/kg

SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.4 W/kg

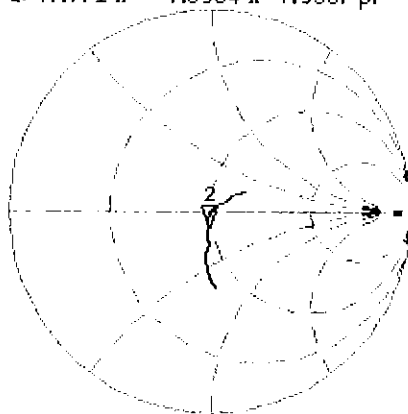
Maximum value of SAR (measured) = 24.0 W/kg



Impedance Measurement Plot for Head TSL

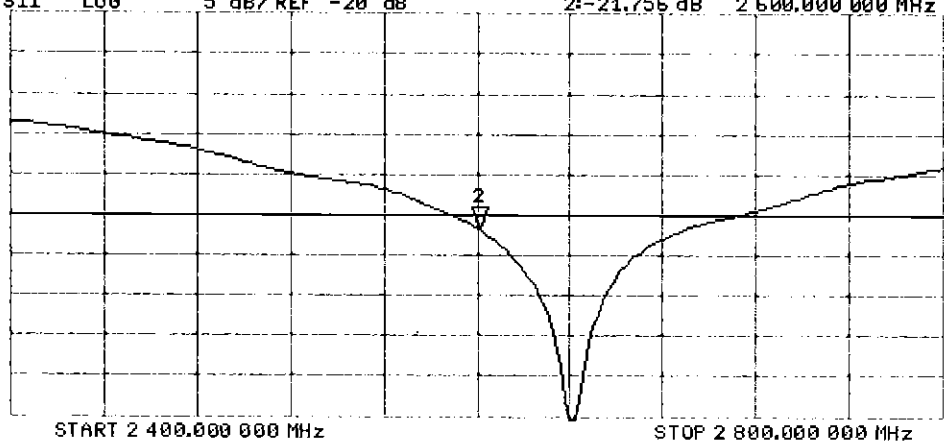
10 Jul 2017 14:28:06
 CH1 S11 1 U FS 2: 47.771 Ω -7.6934 Ω 7.9567 pF 2 600.000 000 MHz

*
 De1
 CA
 Avg
 16
 H1d



CH2 S11 LOG 5 dB/REF -20 dB 2:-21.756 dB 2 600.000 000 MHz

CA
 Avg
 16
 H1d



DASY5 Validation Report for Body TSL

Date: 10.07.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1126

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.22$ S/m; $\epsilon_r = 51.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.94, 7.94, 7.94); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

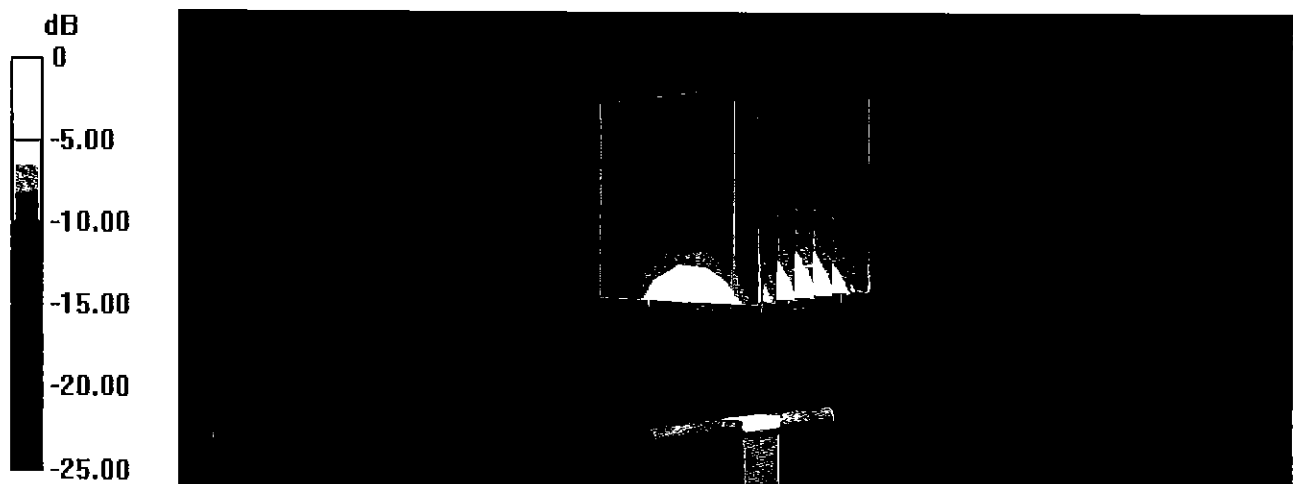
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.8 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 28.9 W/kg

SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.16 W/kg

Maximum value of SAR (measured) = 22.2 W/kg

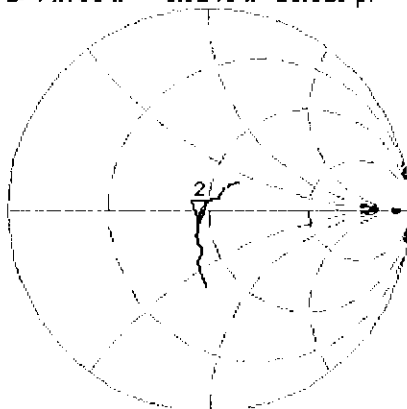


0 dB = 22.2 W/kg = 13.46 dBW/kg

Impedance Measurement Plot for Body TSL

10 Jul 2017 14:27:30
 CH1 S11 1 U FS 2: 44.785 Ω -5.8145 Ω 10.528 pF 2 600.000 000 MHz

*
 Del
 CA



Avg
 16

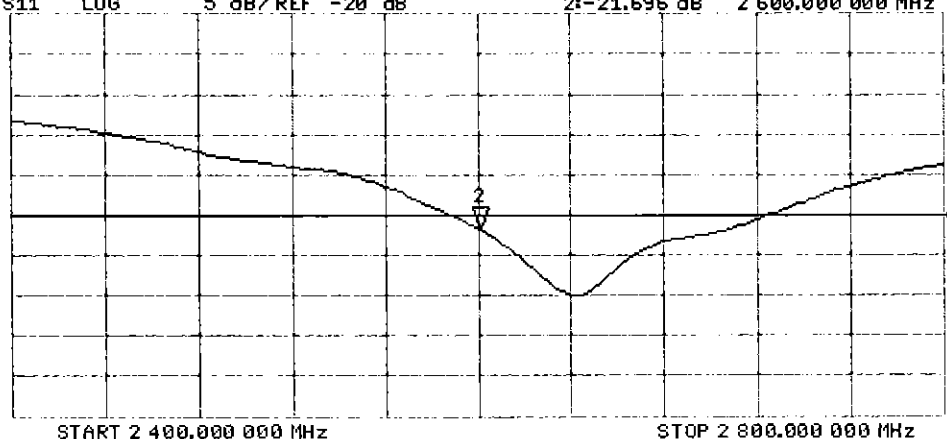
H1d

CH2 S11 LOG 5 dB/REF -20 dB 2:-21.696 dB 2 600.000 000 MHz

CA

Avg
 16

H1d





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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D5GHzV2-1237_Aug17**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1237**

Calibration procedure(s) **QA CAL-22.v2**
Calibration procedure for dipole validation kits between 3-6 GHz

PMV
 8/27/17

Calibration date: **August 15, 2017**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 3503	31-Dec-16 (No. EX3-3503_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by: **Johannes Kurikka** Function: **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** Technical Manager

[Signature]

Issued: August 16, 2017

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- 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	V52.10.0
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	5250 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5750 MHz $\pm$ 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	34.7 $\pm$ 6 %	4.49 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.7 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.0 W/kg $\pm$ 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	34.2 ± 6 %	4.84 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.5 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.5 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.0 ± 6 %	4.99 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.8 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.0 ± 6 %	5.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm ³ (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	76.9 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 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	46.4 ± 6 %	5.93 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	78.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.23 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.1 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	6.13 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.77 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.16 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.4 W/kg ± 19.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	49.9 Ω - 5.3 j Ω
Return Loss	- 25.5 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	51.9 Ω + 2.3 j Ω
Return Loss	- 30.7 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	55.6 Ω - 0.5 j Ω
Return Loss	- 25.5 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	46.9 Ω - 4.2 j Ω
Return Loss	- 25.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	50.2 Ω + 3.0 j Ω
Return Loss	- 30.4 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	53.4 Ω + 0.2 j Ω
Return Loss	- 29.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.194 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	May 04, 2015

DASY5 Validation Report for Head TSL

Date: 15.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1237

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: $f = 5250$ MHz; $\sigma = 4.49$ S/m; $\epsilon_r = 34.7$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5600$ MHz; $\sigma = 4.84$ S/m; $\epsilon_r = 34.2$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5750$ MHz; $\sigma = 4.99$ S/m; $\epsilon_r = 34$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.58, 5.58, 5.58); Calibrated: 31.12.2016, ConvF(5.09, 5.09, 5.09); Calibrated: 31.12.2016, ConvF(5.02, 5.02, 5.02); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 70.08 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 30.6 W/kg

SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.33 W/kg

Maximum value of SAR (measured) = 19.2 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 = 70.04 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 32.7 W/kg

SAR(1 g) = 8.33 W/kg; SAR(10 g) = 2.38 W/kg

Maximum value of SAR (measured) = 19.8 W/kg

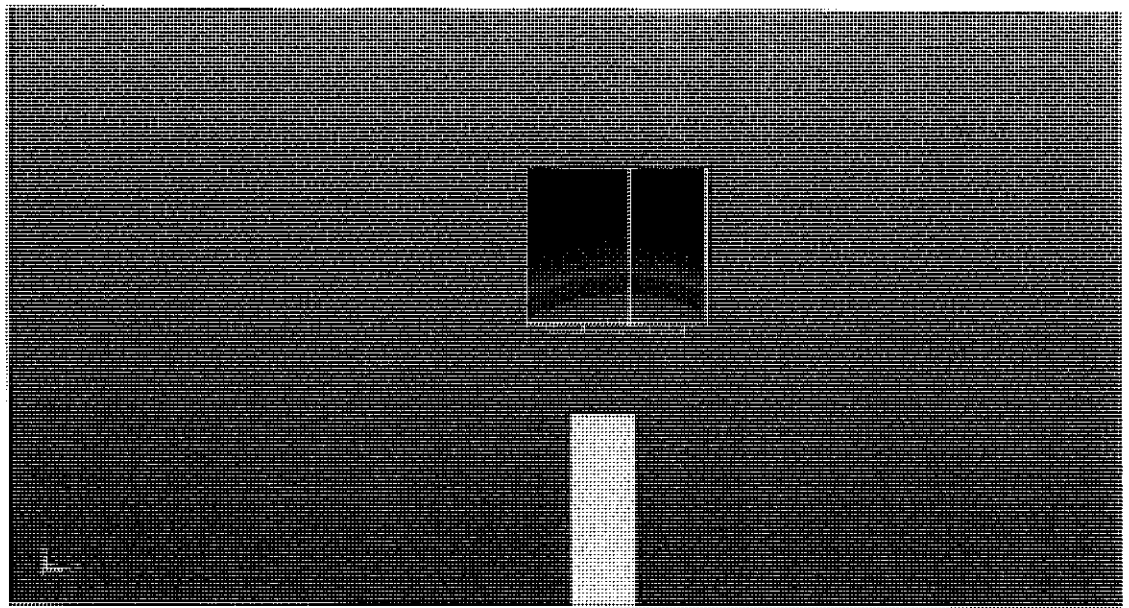
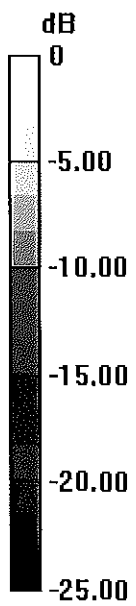
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 69.11 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 32.4 W/kg

SAR(1 g) = 8.1 W/kg; SAR(10 g) = 2.31 W/kg

Maximum value of SAR (measured) = 19.6 W/kg

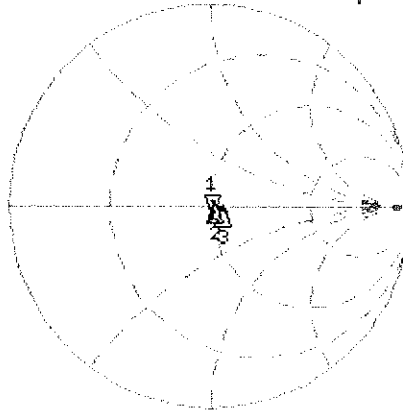


0 dB = 19.2 W/kg = 12.83 dBW/kg

Impedance Measurement Plot for Head TSL

9 Aug 2017 12:04:29
 CH1 S11 1 U FS 1: 49.920 Ω -5.3223 Ω 5.6959 pF 5 250.000 000 MHz

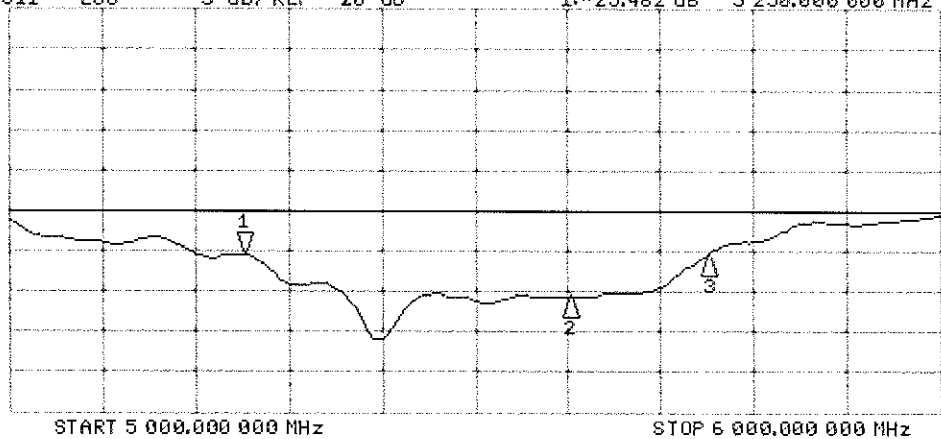
*
 Del
 Cor
 Avg
 16
 H1d



CH1 Markers
 2: 51.904 Ω
 2.3008 Ω
 5.60000 GHz
 3: 55.609 Ω
 -492.19 m Ω
 5.75000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -25.482 dB 5 250.000 000 MHz

Cor
 Avg
 16
 H1d



CH2 Markers
 2: -30.654 dB
 5.60000 GHz
 3: -25.460 dB
 5.75000 GHz

DASY5 Validation Report for Body TSL

Date: 08.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN: 1237

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: $f = 5250$ MHz; $\sigma = 5.46$ S/m; $\epsilon_r = 47$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5600$ MHz; $\sigma = 5.93$ S/m; $\epsilon_r = 46.4$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5750$ MHz; $\sigma = 6.13$ S/m; $\epsilon_r = 46.2$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.14, 5.14, 5.14); Calibrated: 31.12.2016, ConvF(4.57, 4.57, 4.57); Calibrated: 31.12.2016, ConvF(4.51, 4.51, 4.51); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.87 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 29.9 W/kg

SAR(1 g) = 7.75 W/kg; SAR(10 g) = 2.17 W/kg

Maximum value of SAR (measured) = 18.4 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 = 65.11 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 33.0 W/kg

SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.23 W/kg

Maximum value of SAR (measured) = 19.3 W/kg

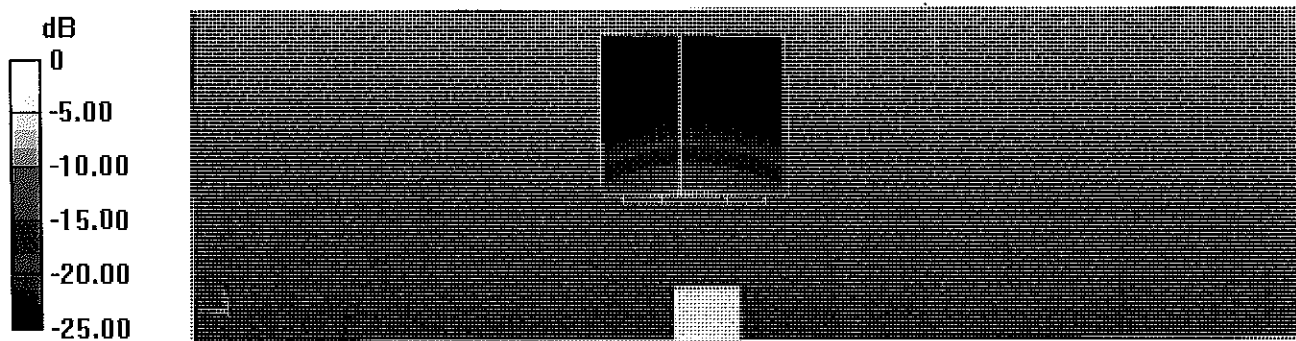
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 63.64 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 33.8 W/kg

SAR(1 g) = 7.77 W/kg; SAR(10 g) = 2.16 W/kg

Maximum value of SAR (measured) = 19.1 W/kg

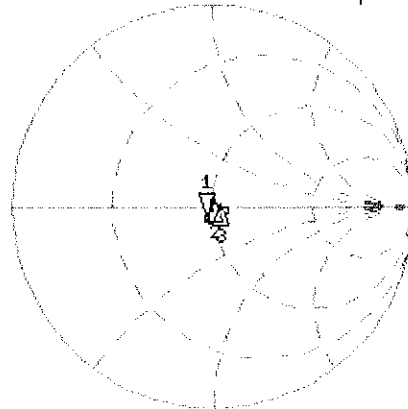


0 dB = 18.4 W/kg = 12.65 dBW/kg

Impedance Measurement Plot for Body TSL

8 Aug 2017 15:23:50
 CH1 S11 1 U FS 1: 46.885 Ω -4.1973 Ω 7.2226 pF 5 250.000 000 MHz

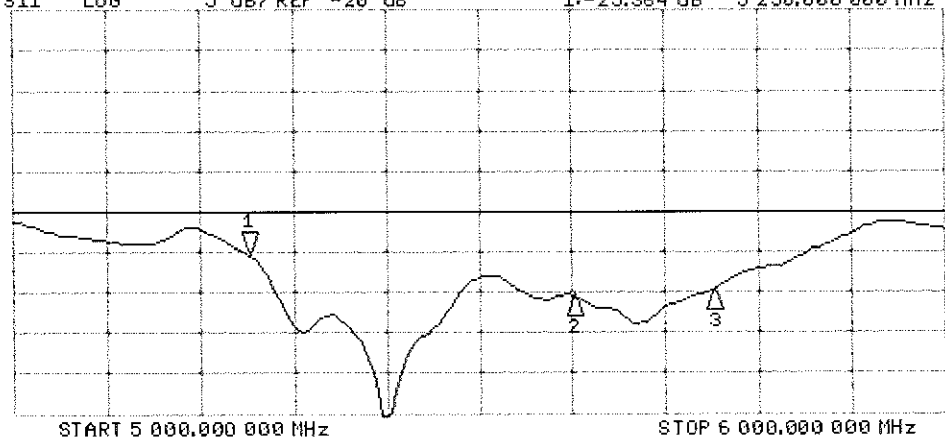
*
 De1
 Cor
 Avg
 16
 H1d



CH1 Markers
 2: 50.184 Ω
 3: 0.215 Ω
 5.60000 GHz
 3: 53.363 Ω
 0.1719 Ω
 5.75000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -25.364 dB 5 250.000 000 MHz

Cor
 Avg
 16
 H1d



CH2 Markers
 2: -30.389 dB
 5.60000 GHz
 3: -29.742 dB
 5.75000 GHz



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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1003_Jan18**

CALIBRATION CERTIFICATE

Object **D750V3 - SN:1003**

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

Calibration date: **January 15, 2018**

BN
01-25-2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

Calibrated by: **Leif Klysner** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

Leif Klysner

Katja Pokovic

Issued: January 15, 2018

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

Calibration Laboratory of

Schmid & Partner

Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland



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

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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- 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	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	750 MHz $\pm$ 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	40.9 $\pm$ 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 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.28 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.42 W/kg $\pm$ 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	55.0 $\pm$ 6 %	0.96 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	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.58 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	1.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.71 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.8 Ω - 2.1 j Ω
Return Loss	- 27.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.2 Ω - 6.2 j Ω
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 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 21, 2009

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	7.94 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.32 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.22 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.52 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.06 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.52 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.67 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.70 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	4.60 W/kg ± 16.9 % (k=2)

DASY5 Validation Report for Head TSL

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.9 \text{ S/m}$; $\epsilon_r = 40.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

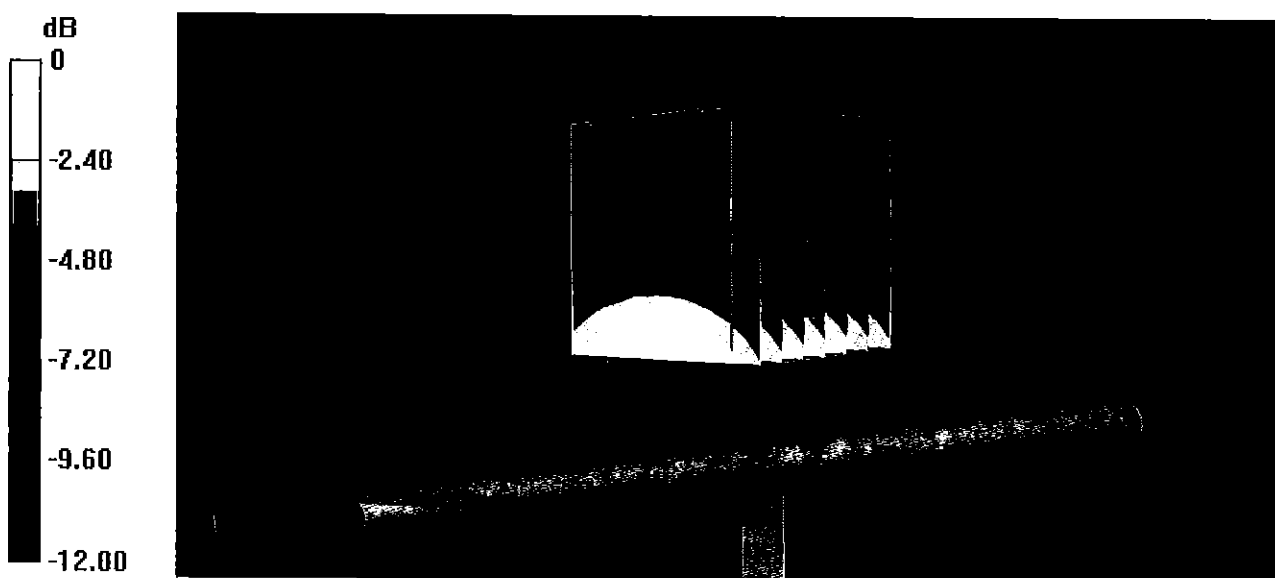
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.11 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 3.15 W/kg

SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.80 W/kg

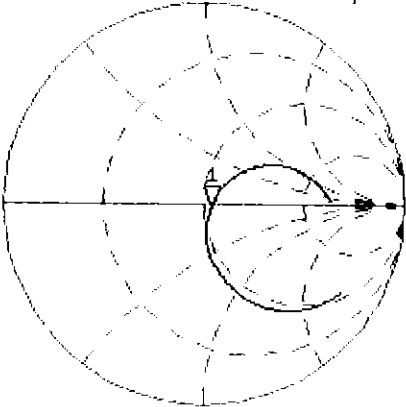


0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Head TSL

12 Jan 2018 13:14:07
CH1 S11 1 U FS 1: 53.754 Ω -2.0996 Ω 101.07 pF 750.000 000 MHz

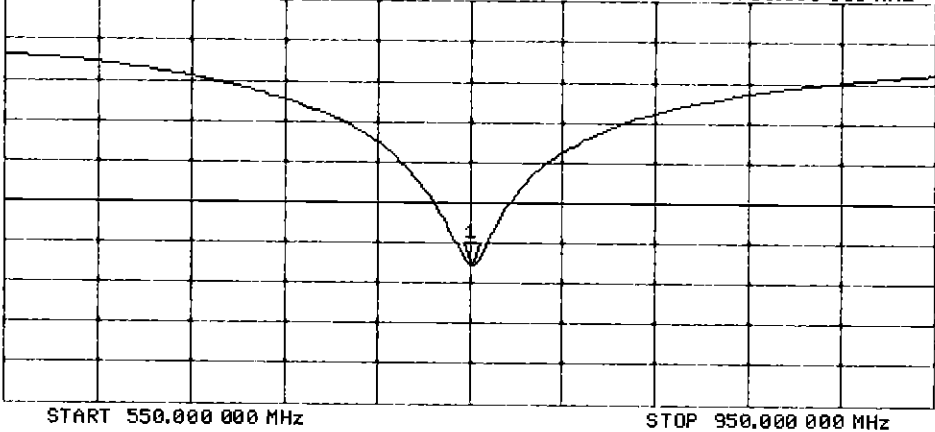
*
De1
CA



Avg
16
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-27.643 dB 750.000 000 MHz

CA
Avg
16
H1d



DASY5 Validation Report for Body TSL

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.96 \text{ S/m}$; $\epsilon_r = 55$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

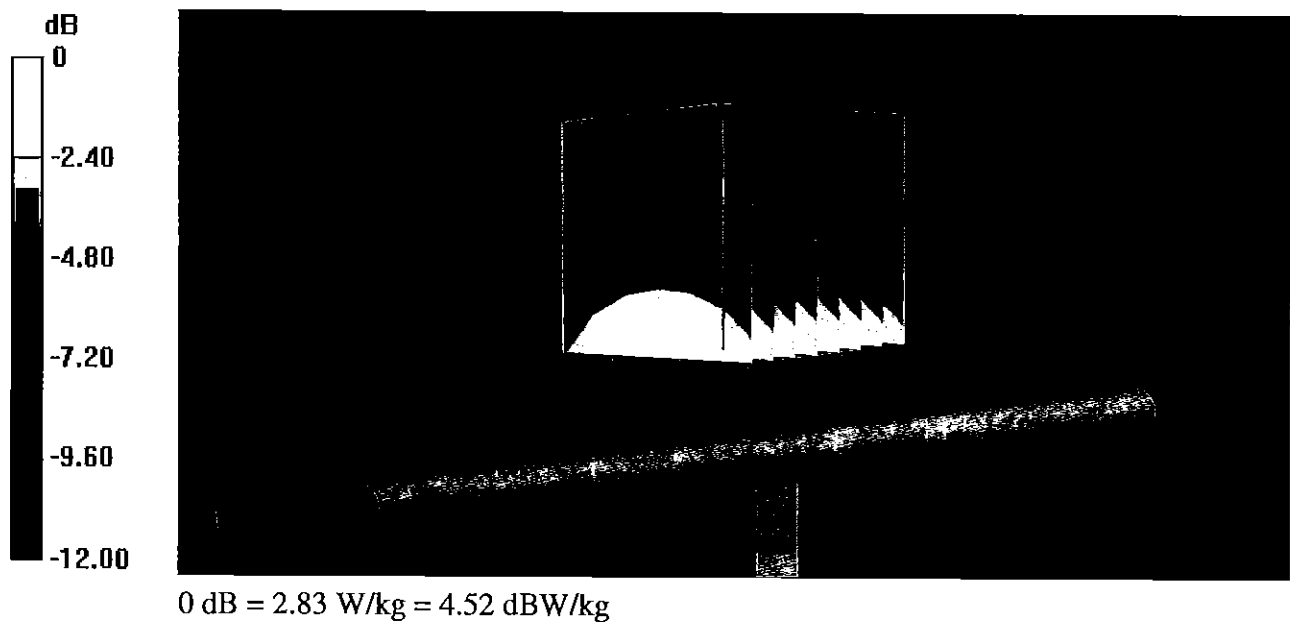
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 57.31 V/m; Power Drift = -0.01 dB

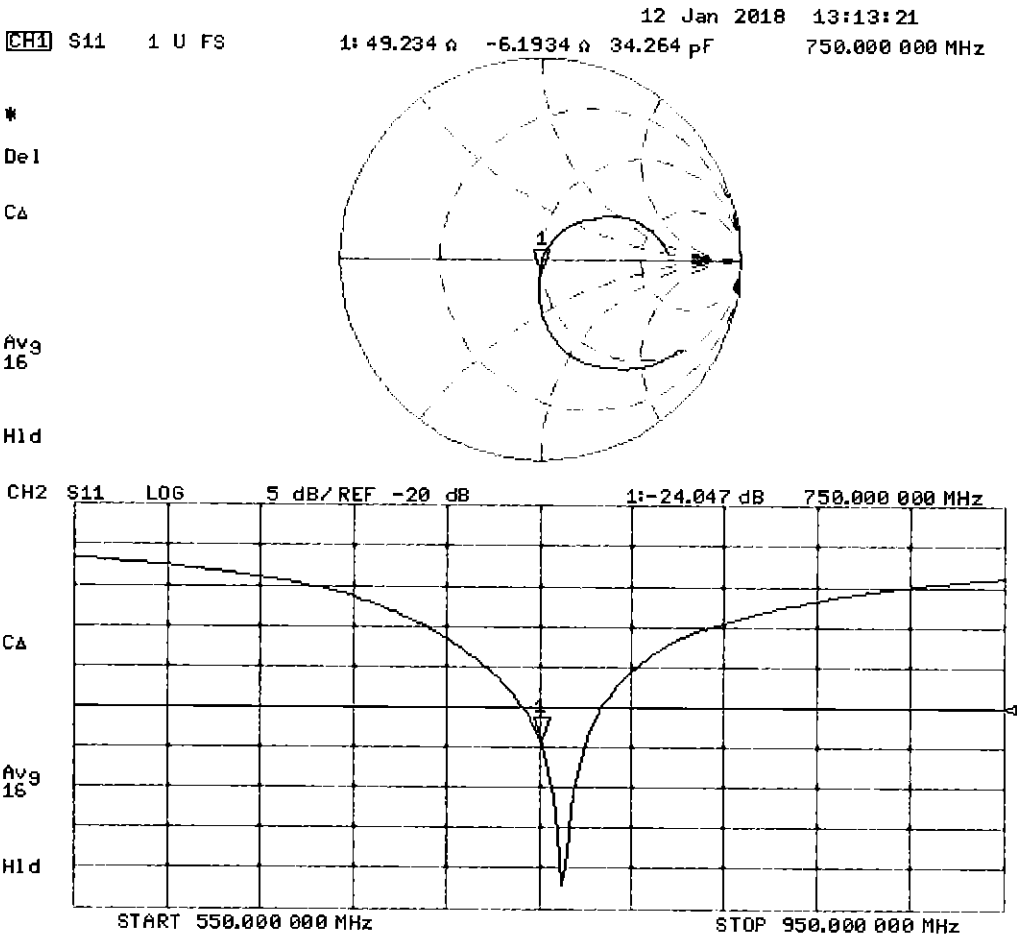
Peak SAR (extrapolated) = 3.17 W/kg

SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.43 W/kg

Maximum value of SAR (measured) = 2.83 W/kg



Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 15.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.9 \text{ S/m}$; $\epsilon_r = 44.2$; $\rho = 1000 \text{ kg/m}^3$

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

Reference Value = 56.79 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 2.89 W/kg

SAR(1 g) = 1.98 W/kg; SAR(10 g) = 1.33 W/kg

Maximum value of SAR (measured) = 2.58 W/kg

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

Reference Value = 56.85 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 2.94 W/kg

SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (measured) = 2.62 W/kg

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

Reference Value = 56.29 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 2.78 W/kg

SAR(1 g) = 2.01 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (measured) = 2.56 W/kg

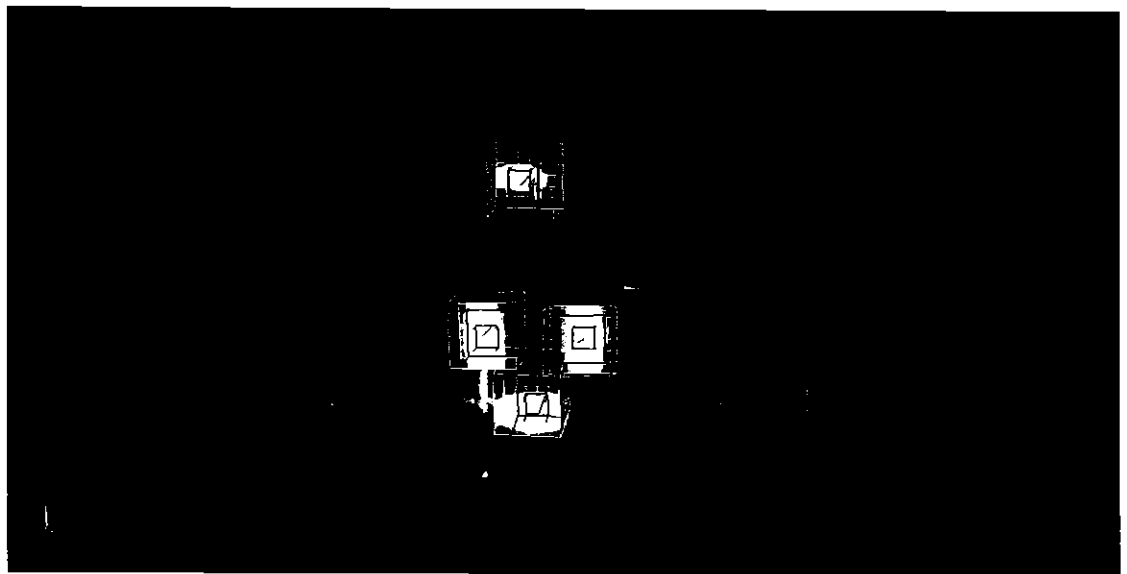
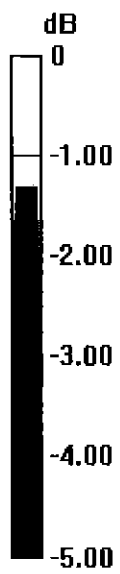
SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 51.01 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 2.31 W/kg

SAR(1 g) = 1.67 W/kg; SAR(10 g) = 1.15 W/kg

Maximum value of SAR (measured) = 2.11 W/kg



0 dB = 2.58 W/kg = 4.12 dBW/kg



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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1900V2-5d080_Jul16**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d080**

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

Calibration date: **July 08, 2016**

BN ✓
7/16/2016
Extended
7/20/17
SC ✓

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	15-Jun-16 (No. EX3-7349_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

Calibrated by:	Name Jeton Kastrati	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	

Issued: July 13, 2016

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 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- 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	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	39.8 $\pm$ 6 %	1.38 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	9.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.3 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	5.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.5 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	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.7 $\pm$ 6 %	1.51 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	9.75 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	39.1 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	5.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.7 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$52.1 \Omega + 5.3 j\Omega$
Return Loss	- 25.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$47.4 \Omega + 6.8 j\Omega$
Return Loss	- 22.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.192 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 28, 2006

DASY5 Validation Report for Head TSL

Date: 08.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.38$ S/m; $\epsilon_r = 39.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.99, 7.99, 7.99); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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

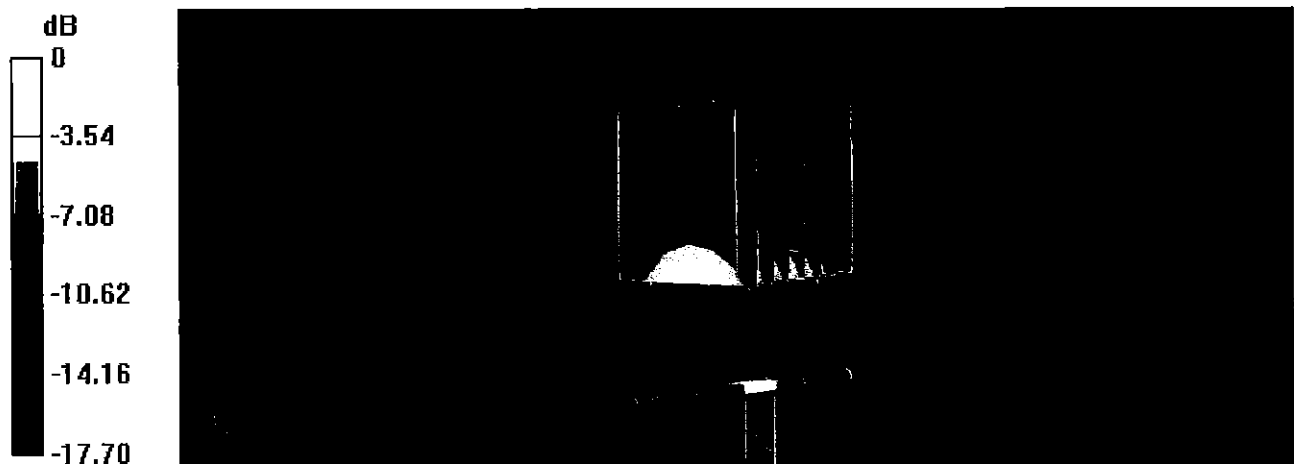
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 106.6 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 18.4 W/kg

SAR(1 g) = 9.76 W/kg; SAR(10 g) = 5.1 W/kg

Maximum value of SAR (measured) = 15.0 W/kg



0 dB = 15.0 W/kg = 11.76 dBW/kg

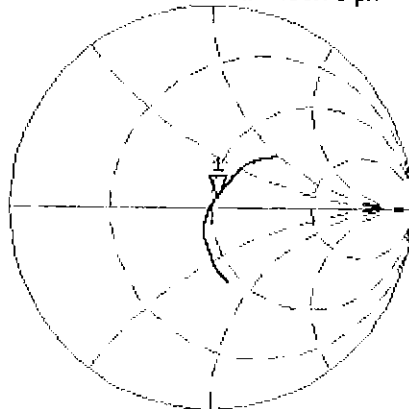
Impedance Measurement Plot for Head TSL

8 Jul 2016 16:18:04
CH1 S11 1 U FS 1: 52.143 Ω 5.2500 Ω 439.78 μH 1 900.000 000 MHz

*
Del
Cor

Avg
16

H1d

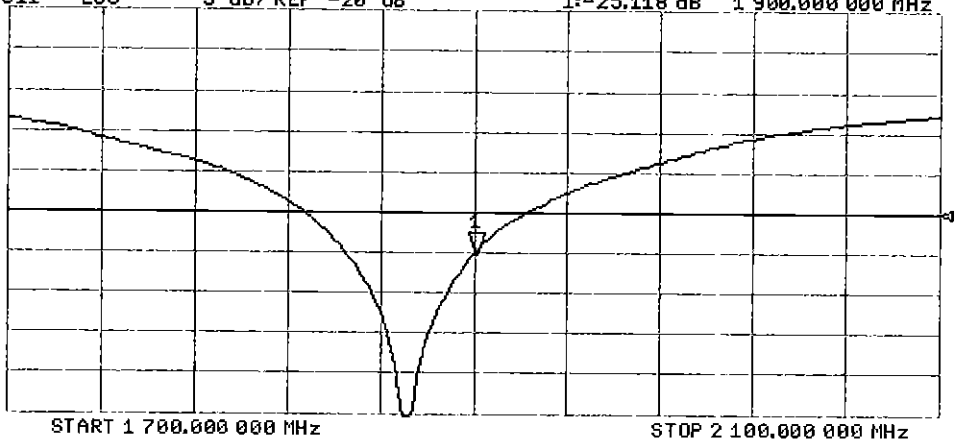


CH2 S11 LOG 5 dB/REF -20 dB 1:-25.118 dB 1 900.000 000 MHz

Cor

Avg
16

H1d



DASY5 Validation Report for Body TSL

Date: 08.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.51$ S/m; $\epsilon_r = 52.7$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.03, 8.03, 8.03); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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 = 103.1 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 17.1 W/kg

SAR(1 g) = 9.75 W/kg; SAR(10 g) = 5.17 W/kg

Maximum value of SAR (measured) = 14.7 W/kg

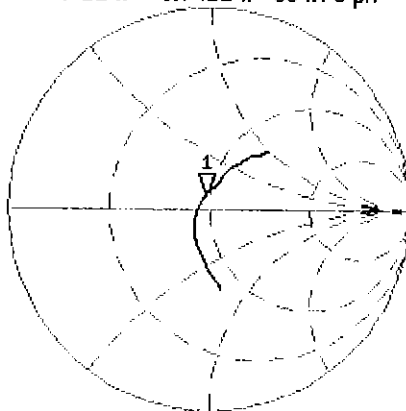


0 dB = 14.7 W/kg = 11.67 dBW/kg

Impedance Measurement Plot for Body TSL

8 Jul 2016 16:16:56
 CH1 S11 1 U FS 1: 47.412 Ω 6.7422 Ω 564.78 μ H 1 900.000 000 MHz

*
 Del
 Cor



Avg
 16

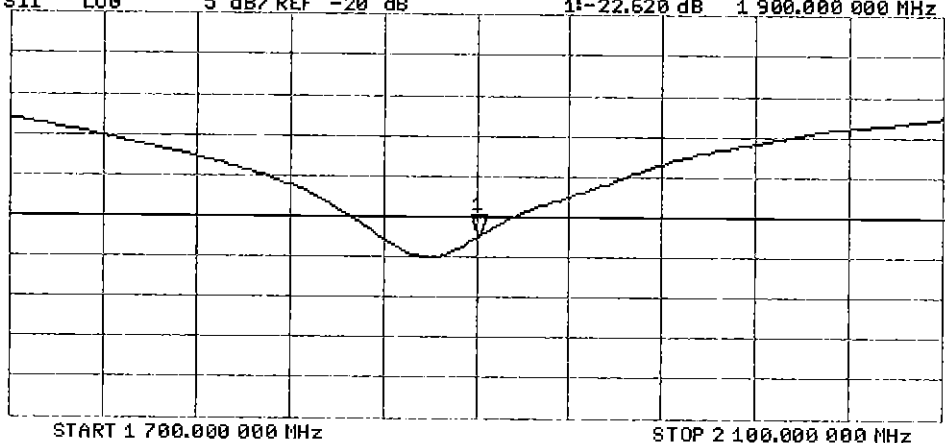
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-22.620 dB 1 900.000 000 MHz

Cor

Avg
 16

H1d



Certification of Calibration

Object D1900V2 – SN: 5d080

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Calibration date: July 06, 2017

Description: SAR Validation Dipole at 1900 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
Agilent	8753ES	S-Parameter Network Analyzer	10/26/2016	Annual	10/26/2017	US39170118
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2017	Annual	3/13/2018	1415
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/10/2017	Annual	5/10/2018	1070
SPEAG	ES3DV3	SAR Probe	3/14/2017	Annual	3/14/2018	3209
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1207364
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1339018
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Agilent	N5182A	MXG Vector Signal Generator	2/28/2017	Annual	2/28/2018	MY47420800
Seekonk	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A

Measurement Uncertainty = $\pm 23\%$ ($k=2$)

	Name	Function	Signature
Calibrated By:	Brodie Halfoster	Test Engineer	<i>BRODIE HALFOSTER</i>
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	<i>KOK</i>

DIPOLE CALIBRATION EXTENSION

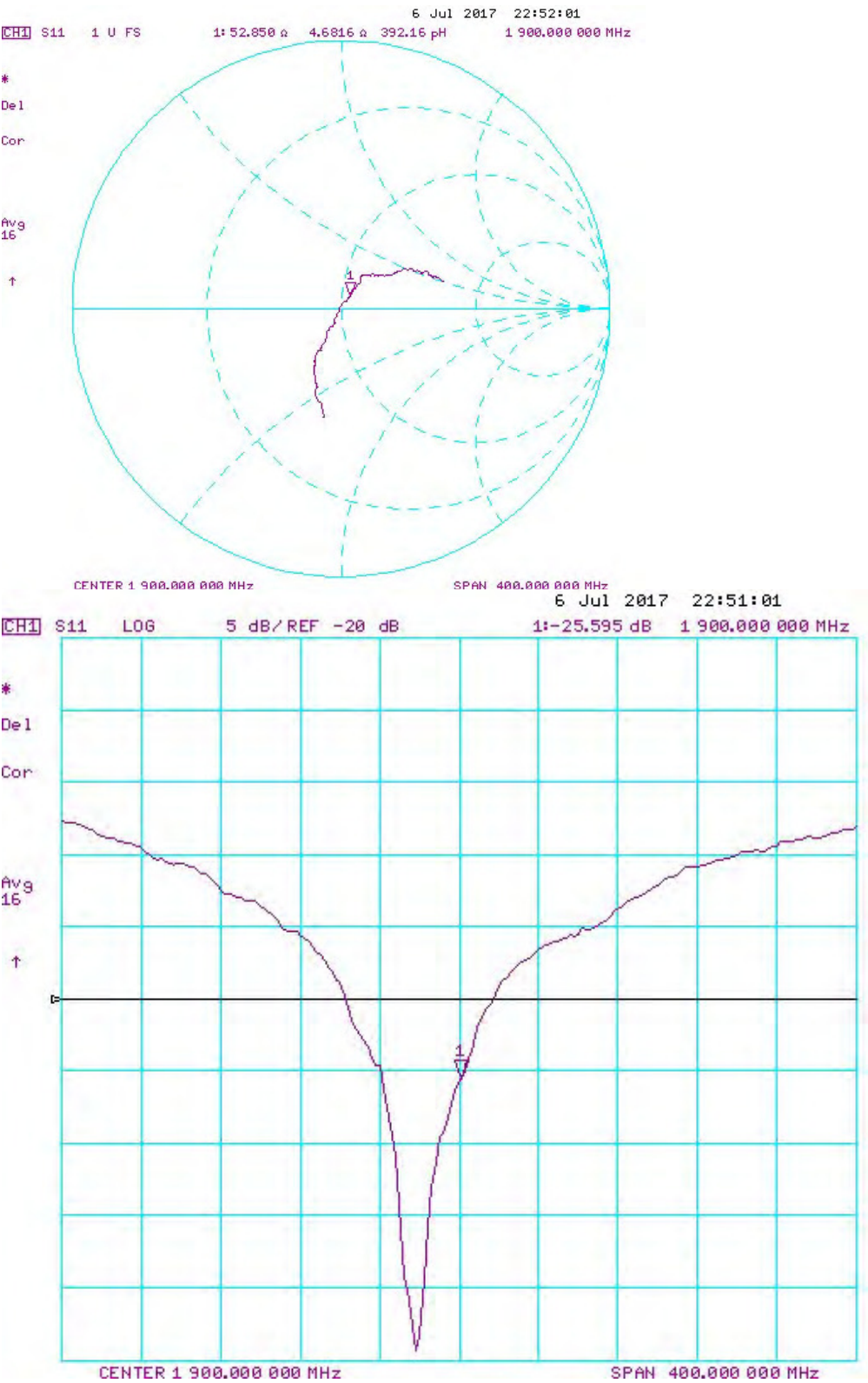
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

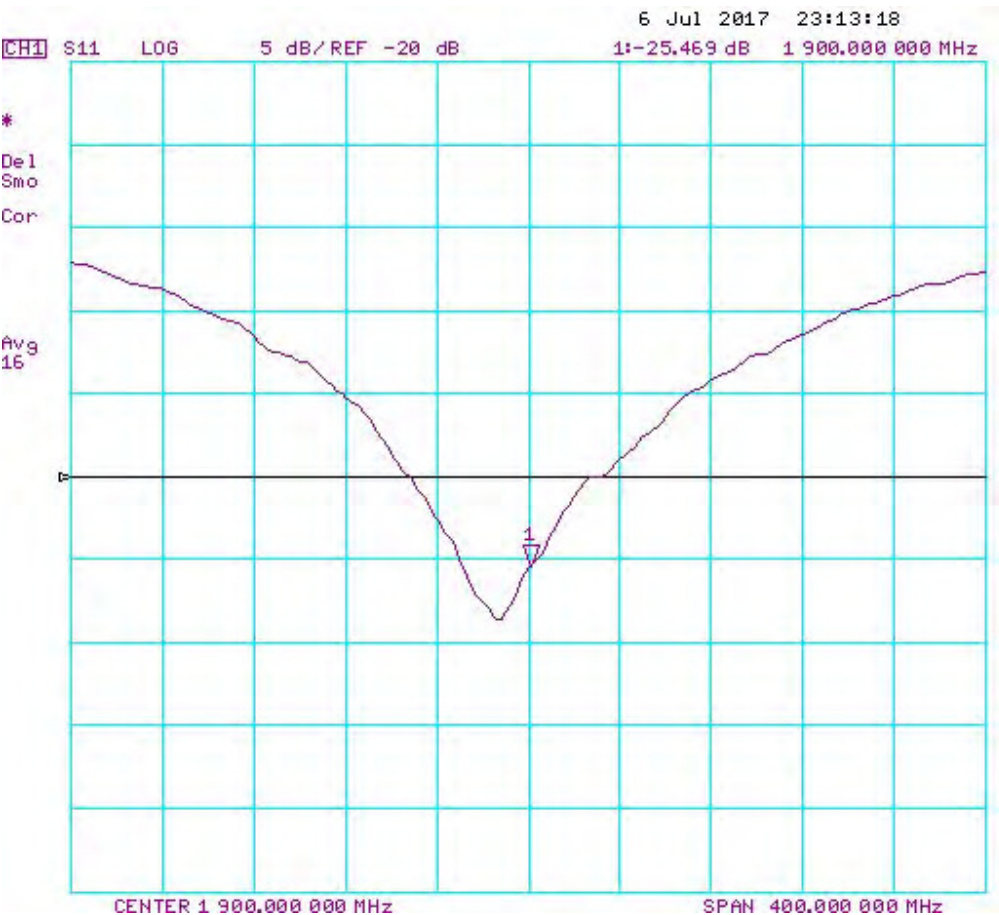
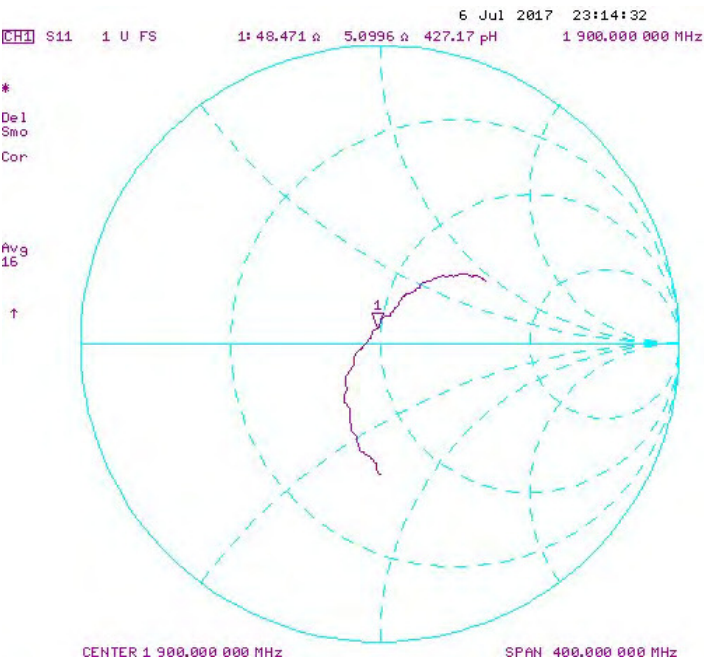
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
7/8/2016	7/6/2017	1.192	3.93	3.86	-1.78%	2.05	2	-2.44%	52.1	52.9	0.8	5.3	4.7	0.6	-25.1	-25.6	-2.00%	PASS
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
7/8/2016	7/6/2017	1.192	3.91	4.05	3.58%	2.07	2.11	1.93%	47.4	48.5	1.1	6.8	5.1	1.7	-22.6	-25.5	-12.80%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D5GHzV2-1057_Jan18**

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 16, 2018**

BN ✓
 01-25-2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 3503	30-Dec-17 (No. EX3-3503_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

Calibrated by: **Leif Klysner** Name: **Leif Klysner** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

Issued: January 18, 2018

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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- 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	V52.10.0
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 5250 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5750 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	36.2 $\pm$ 6 %	4.55 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.2 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.8 W/kg $\pm$ 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	35.8 ± 6 %	4.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	84.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (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	24.0 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	5.06 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (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	23.0 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 %	5.41 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	7.36 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	73.1 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)

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.1 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 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	79.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.3 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	6.15 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.72 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 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	46.2 ± 6 %	6.22 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	7.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.1 W/kg ± 19.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	50.0 Ω - 5.5 j Ω
Return Loss	- 25.2 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.7 Ω - 2.1 j Ω
Return Loss	- 26.2 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	52.7 Ω + 0.0 j Ω
Return Loss	- 31.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.3 Ω - 6.7 j Ω
Return Loss	- 23.4 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	48.4 Ω - 3.9 j Ω
Return Loss	- 27.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	55.3 Ω - 1.6 j Ω
Return Loss	- 25.6 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	52.6 Ω + 1.1 j Ω
Return Loss	- 31.2 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	51.8 Ω - 0.4 j Ω
Return Loss	- 34.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 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	November 27, 2006

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions (f=5200 MHz)

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.6 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.6 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	85.6 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.7 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.6 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.7 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	5.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.7 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	1.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	17.7 W/kg ± 19.9 % (k=2)

Measurement Conditions (f=5800 MHz)

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	86.3 W/kg $\pm$ 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.1 W/kg $\pm$ 19.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.88 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	88.9 W/kg $\pm$ 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.4 W/kg $\pm$ 19.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	83.4 W/kg $\pm$ 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.5 W/kg $\pm$ 19.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	5.68 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	56.8 W/kg $\pm$ 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	1.89 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	18.9 W/kg $\pm$ 19.9 % (k=2)

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: $f = 5250$ MHz; $\sigma = 4.55$ S/m; $\epsilon_r = 36.2$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5600$ MHz; $\sigma = 4.9$ S/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5750$ MHz; $\sigma = 5.06$ S/m; $\epsilon_r = 35.5$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

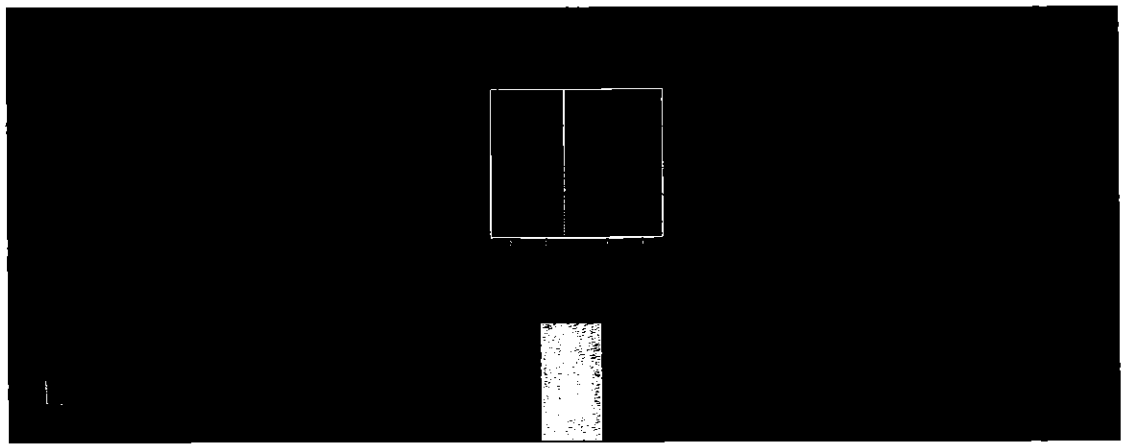
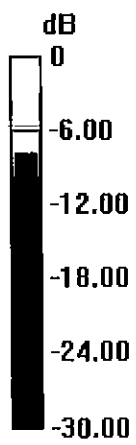
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2017, ConvF(5.05, 5.05, 5.05); Calibrated: 30.12.2017, ConvF(4.98, 4.98, 4.98); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 - modified; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.54 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 17.7 W/kg

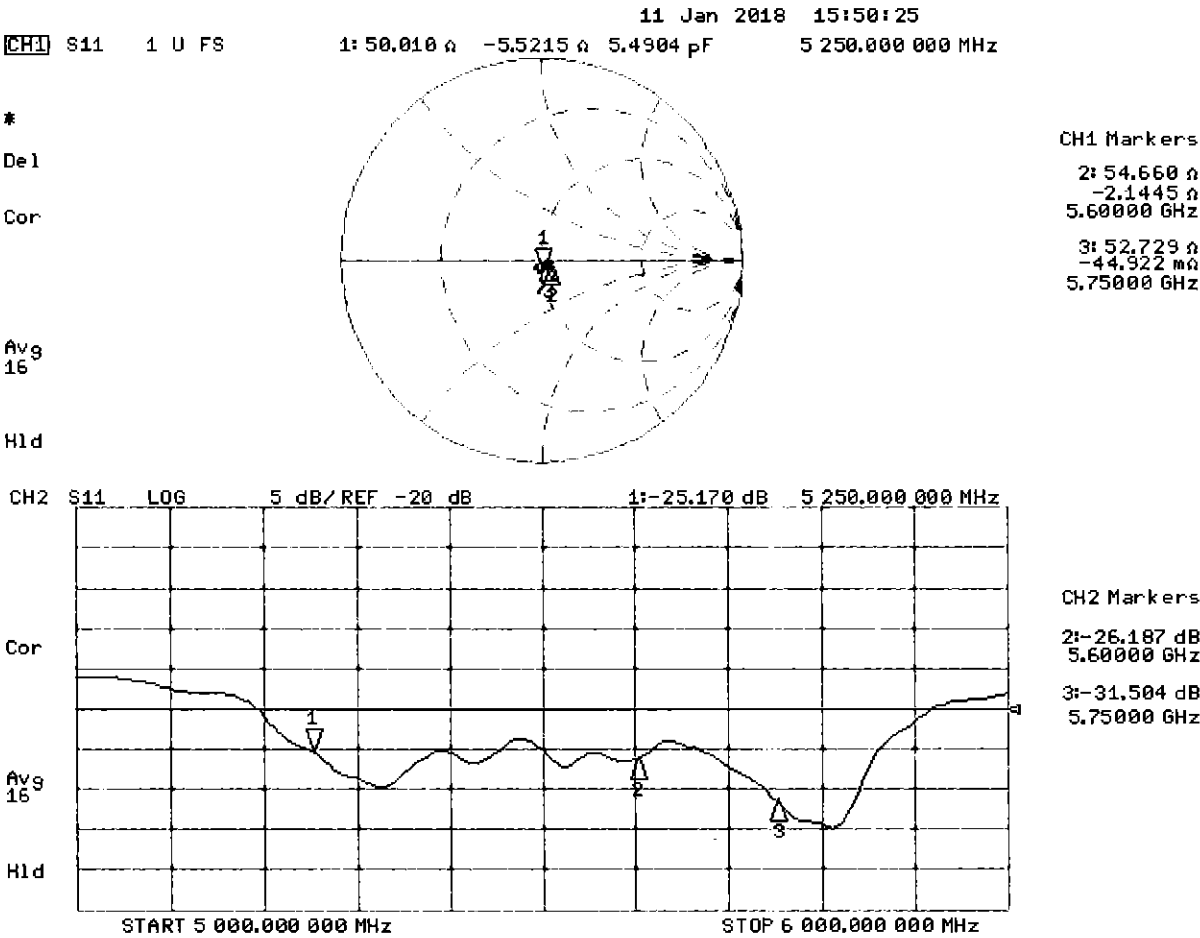
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.77 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 32.2 W/kg
SAR(1 g) = 8.41 W/kg; SAR(10 g) = 2.4 W/kg
Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.93 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 18.9 W/kg



0 dB = 18.9 W/kg = 12.76 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.41$ S/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5250$ MHz; $\sigma = 5.48$ S/m; $\epsilon_r = 47.2$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.94$ S/m; $\epsilon_r = 46.6$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5750$ MHz; $\sigma = 6.15$ S/m; $\epsilon_r = 46.3$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.22$ S/m; $\epsilon_r = 46.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.35, 5.35, 5.35); Calibrated: 30.12.2017, ConvF(5.26, 5.26, 5.26); Calibrated: 30.12.2017, ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2017, ConvF(4.57, 4.57, 4.57); Calibrated: 30.12.2017, ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 64.05 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 7.36 W/kg; SAR(10 g) = 2.06 W/kg

Maximum value of SAR (measured) = 17.1 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.53 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 29.4 W/kg

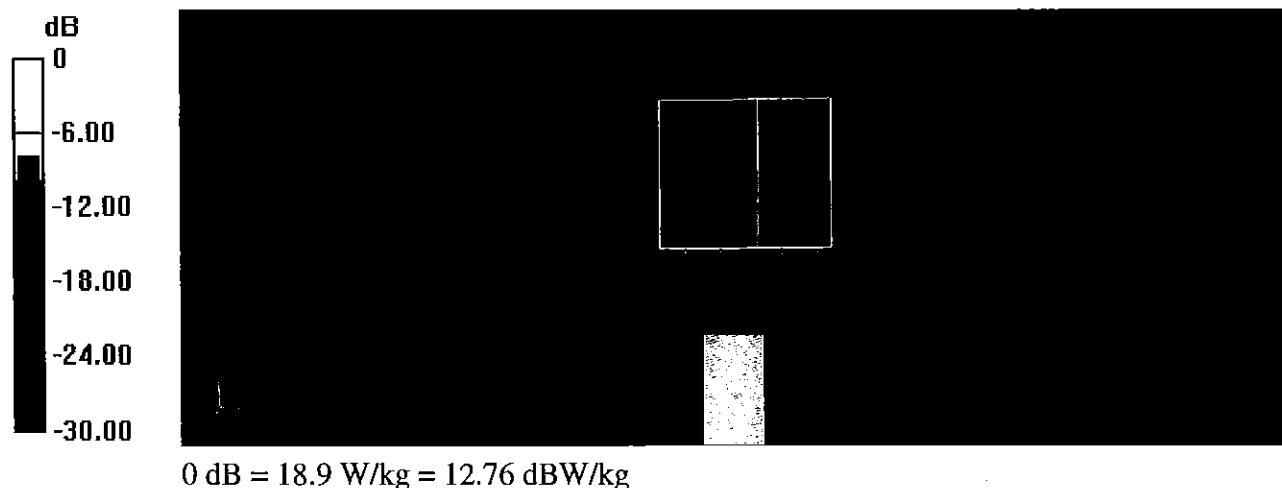
SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.13 W/kg

Maximum value of SAR (measured) = 17.9 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 = 65.09 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 34.0 W/kg
SAR(1 g) = 8.05 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 19.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.45 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 18.9 W/kg

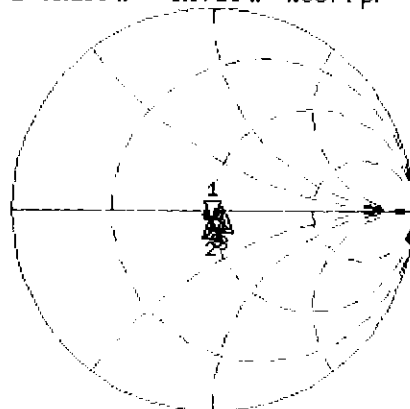
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.14 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 33.3 W/kg
SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.13 W/kg



Impedance Measurement Plot for Body TSL

10 Jan 2018 17:45:41
 CH1 S11 1 U FS 1: 49.266 Ω -6.6719 Ω 4.5874 pF 5 200.000 000 MHz

*
 Del
 Cor
 Avg
 16
 H1d

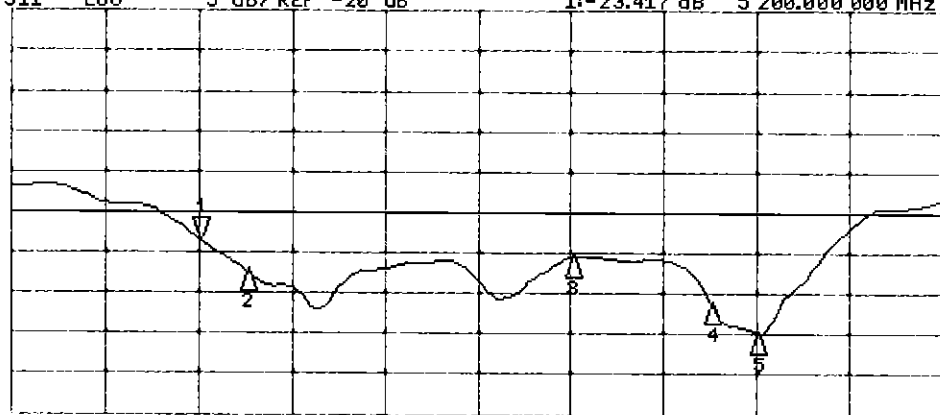


CH1 Markers

2: 48.449 Ω
 -3.9297 Ω
 5.25000 GHz
 3: 55.279 Ω
 -1.5723 Ω
 5.60000 GHz
 4: 52.627 Ω
 1.0625 Ω
 5.75000 GHz
 5: 51.801 Ω
 -375.00 m Ω
 5.80000 GHz

CH2 S11 LOG 5 dB/ REF -20 dB 1: -23.417 dB 5 200.000 000 MHz

Cor
 Avg
 16
 H1d



CH2 Markers

2: -27.356 dB
 5.25000 GHz
 3: -25.621 dB
 5.60000 GHz
 4: -31.162 dB
 5.75000 GHz
 5: -34.851 dB
 5.80000 GHz

START 5 000.000 000 MHz

STOP 5 800.000 000 MHz

DASY5 Validation Report for SAM Head

Date: 16.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.59$ S/m; $\epsilon_r = 36.5$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5800$ MHz; $\sigma = 5.28$ S/m; $\epsilon_r = 35.4$; $\rho = 1000$ kg/m³

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.75, 5.75, 5.75); Calibrated: 30.12.2017, ConvF(4.96, 4.96, 4.96); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

SAM Head/Top - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 72.99 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 30.6 W/kg

SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.35 W/kg

Maximum value of SAR (measured) = 19.7 W/kg

SAM Head/Top - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 73.00 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 36.5 W/kg

SAR(1 g) = 8.62 W/kg; SAR(10 g) = 2.41 W/kg

Maximum value of SAR (measured) = 21.9 W/kg

SAM Head/Mouth - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 72.79 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 8.54 W/kg; SAR(10 g) = 2.37 W/kg

Maximum value of SAR (measured) = 20.7 W/kg

SAM Head/Mouth - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 71.69 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 34.9 W/kg

SAR(1 g) = 8.88 W/kg; SAR(10 g) = 2.44 W/kg

Maximum value of SAR (measured) = 23.0 W/kg

SAM Head/Neck - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 72.48 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 27.9 W/kg

SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.37 W/kg

Maximum value of SAR (measured) = 19.3 W/kg

SAM Head/Neck - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 72.90 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 33.4 W/kg

SAR(1 g) = 8.33 W/kg; SAR(10 g) = 2.35 W/kg

Maximum value of SAR (measured) = 21.8 W/kg

SAM Head/Ear - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 54.68 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 5.16 W/kg; SAR(10 g) = 1.76 W/kg

Maximum value of SAR (measured) = 11.1 W/kg

SAM Head/Ear - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 56.96 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 21.2 W/kg

SAR(1 g) = 5.68 W/kg; SAR(10 g) = 1.89 W/kg

Maximum value of SAR (measured) = 13.8 W/kg



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



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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **EX3-7406_Apr17**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:7406**

Calibration procedure(s) **QA CAL-01.v9, QA CAL-12.v9, QA CAL-23.v5, QA CAL-25.v6**
Calibration procedure for dosimetric E-field probes

Calibration date: **April 18, 2017**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02525)	Apr-18
Reference 20 dB Attenuator	SN: S5277 (20x)	07-Apr-17 (No. 217-02528)	Apr-18
Reference Probe ES3DV2	SN: 3013	31-Dec-16 (No. ES3-3013_Dec16)	Dec-17
DAE4	SN: 660	7-Dec-16 (No. DAE4-660_Dec16)	Dec-17
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-16)	In house check: Jun-18
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-16)	In house check: Jun-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by:	Name Michael Weber	Function Laboratory Technician	Signature 
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature 
			Issued: April 18, 2017
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 0108**

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
NORM _{x,y,z}	sensitivity in free space
ConvF	sensitivity in TSL / NORM _{x,y,z}
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: In a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).

Probe EX3DV4

SN:7406

Manufactured: November 24, 2015
Calibrated: April 18, 2017

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7406

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.47	0.42	0.45	± 10.1 %
DCP (mV) ^B	99.5	98.3	95.1	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	138.9	±2.5 %
		Y	0.0	0.0	1.0		129.6	
		Z	0.0	0.0	1.0		128.2	

Note: For details on UID parameters see Appendix.

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $\text{ms}\cdot\text{V}^{-2}$	T2 $\text{ms}\cdot\text{V}^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	48.83	366.9	36.13	15.06	1.101	4.968	0.251	0.437	1.003
Y	19.57	145.7	35.6	3.888	0.704	4.934	0	0.021	1.004
Z	45.42	343.9	36.58	10.69	0.846	4.98	0	0.36	1.004

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%.

^A The uncertainties of Norm X,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 5 and 6).

^B Numerical linearization parameter: uncertainty not required.

^E Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7406

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^f	Conductivity (S/m) ^f	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^g (mm)	Unc (k=2)
600	42.7	0.88	10.42	10.42	10.42	0.10	1.20	± 13.3 %
750	41.9	0.89	10.26	10.26	10.26	0.52	0.80	± 12.0 %
835	41.5	0.90	9.97	9.97	9.97	0.53	0.81	± 12.0 %
1750	40.1	1.37	8.88	8.88	8.88	0.42	0.80	± 12.0 %
1900	40.0	1.40	8.40	8.40	8.40	0.26	0.87	± 12.0 %
2300	39.5	1.67	8.04	8.04	8.04	0.25	0.80	± 12.0 %
2450	39.2	1.80	7.68	7.68	7.68	0.38	0.80	± 12.0 %
2600	39.0	1.96	7.44	7.44	7.44	0.40	0.83	± 12.0 %

^c Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^f At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^g Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7406

Calibration Parameter Determined in Body Tissue Simulating Media

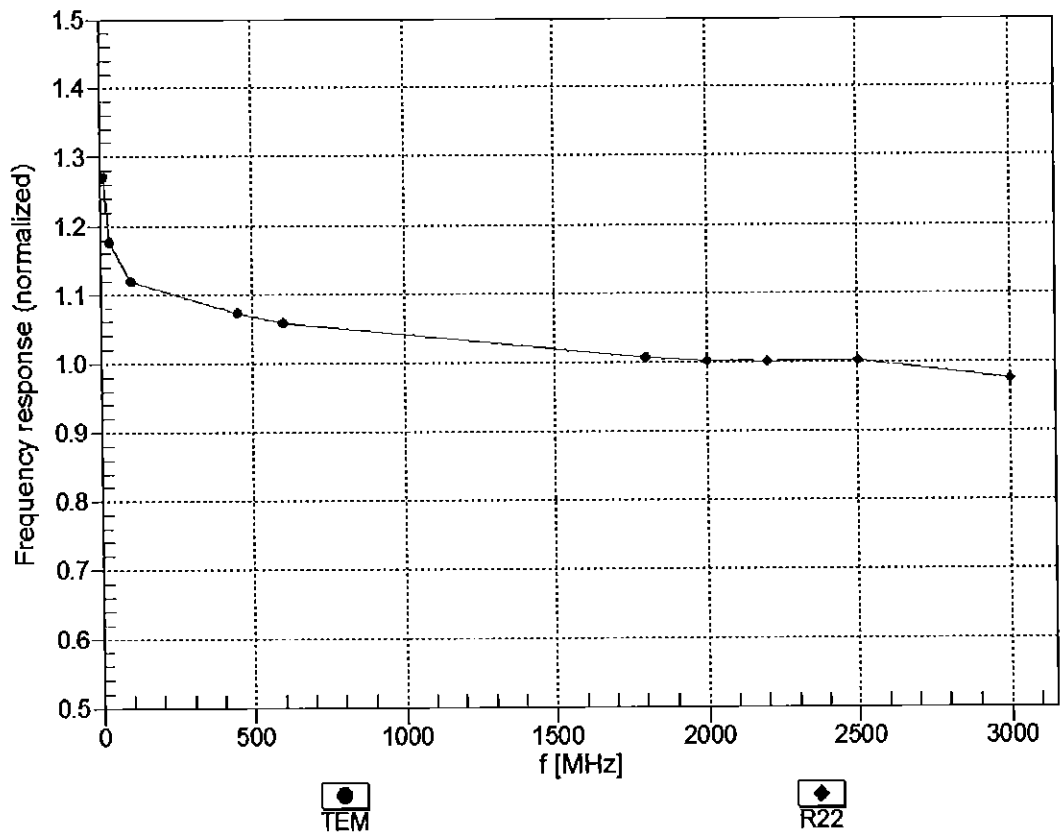
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
600	56.1	0.95	10.82	10.82	10.82	0.10	1.20	± 13.3 %
750	55.5	0.96	9.90	9.90	9.90	0.51	0.83	± 12.0 %
835	55.2	0.97	9.77	9.77	9.77	0.46	0.80	± 12.0 %
1750	53.4	1.49	8.08	8.08	8.08	0.41	0.85	± 12.0 %
1900	53.3	1.52	7.81	7.81	7.81	0.44	0.80	± 12.0 %
2300	52.9	1.81	7.65	7.65	7.65	0.38	0.84	± 12.0 %
2450	52.7	1.95	7.60	7.60	7.60	0.33	0.89	± 12.0 %
2600	52.5	2.16	7.31	7.31	7.31	0.31	0.94	± 12.0 %

^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

^F At frequencies below 3 GHz, the validity of tissue parameters (ϵ and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ϵ and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

^G Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

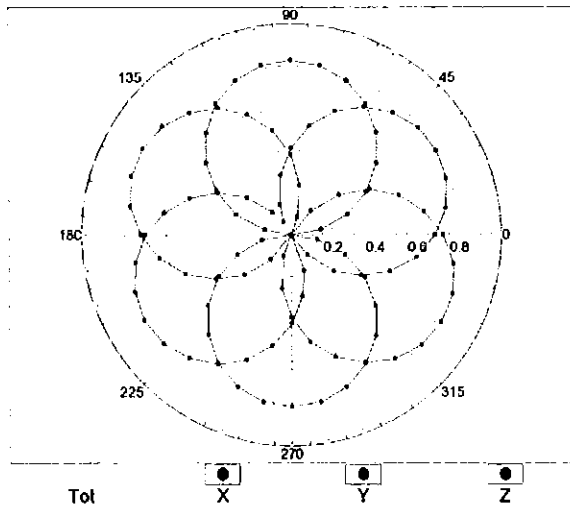
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



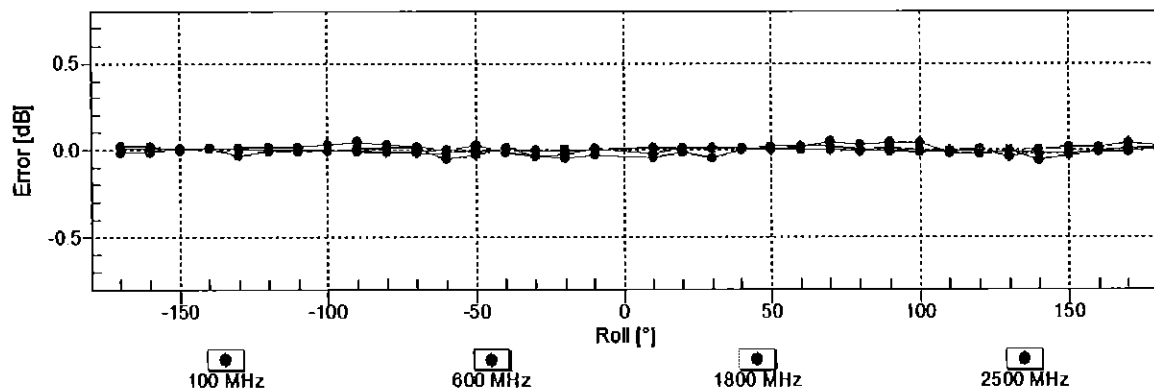
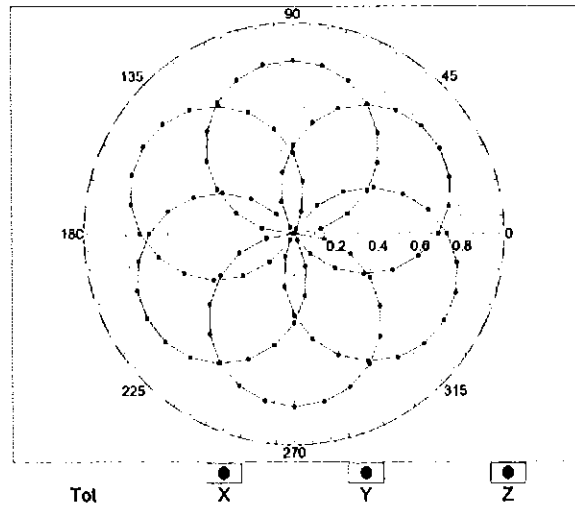
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

Receiving Pattern (ϕ), $\vartheta = 0^\circ$

f=600 MHz, TEM



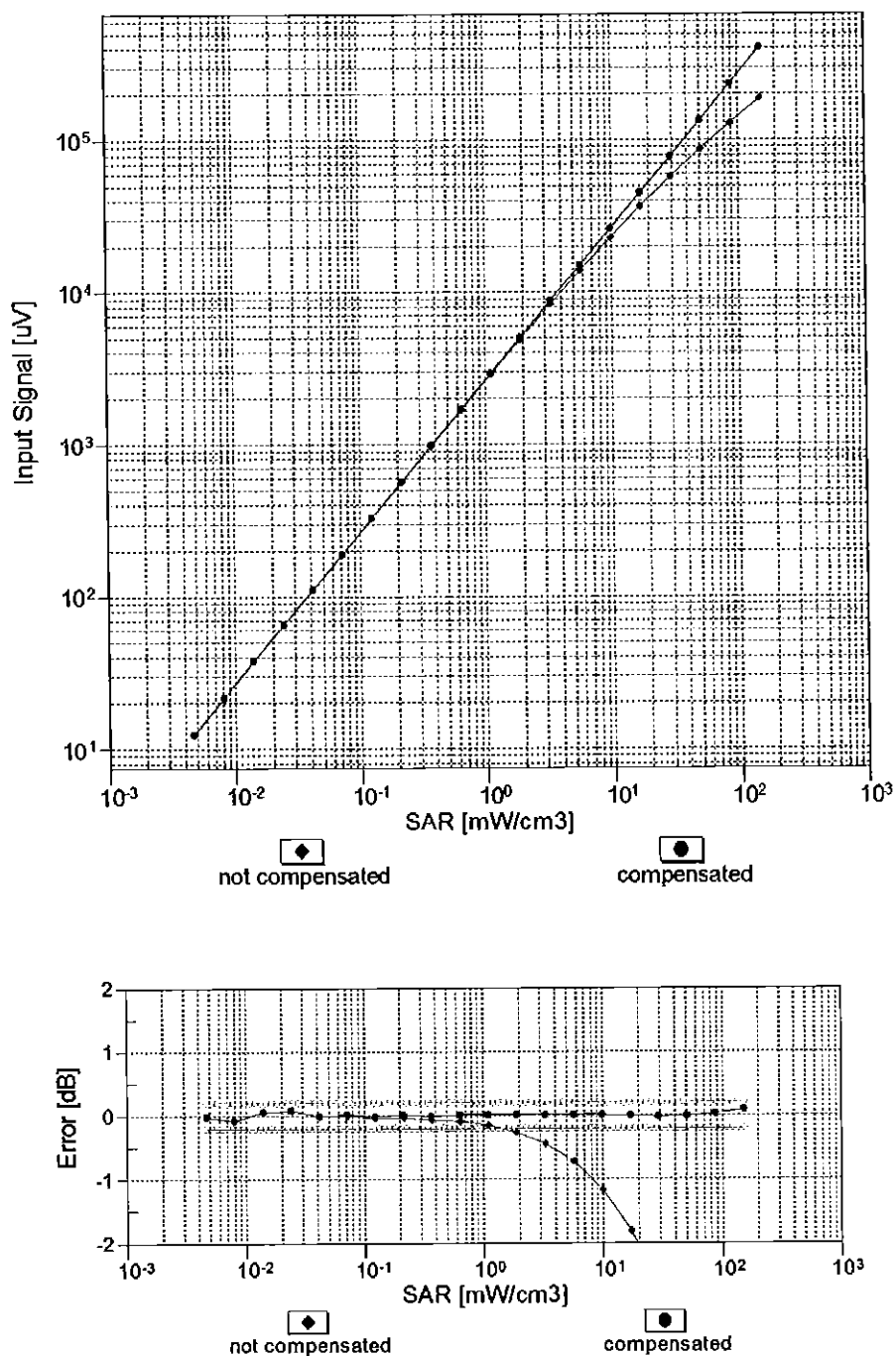
f=1800 MHz, R22



Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

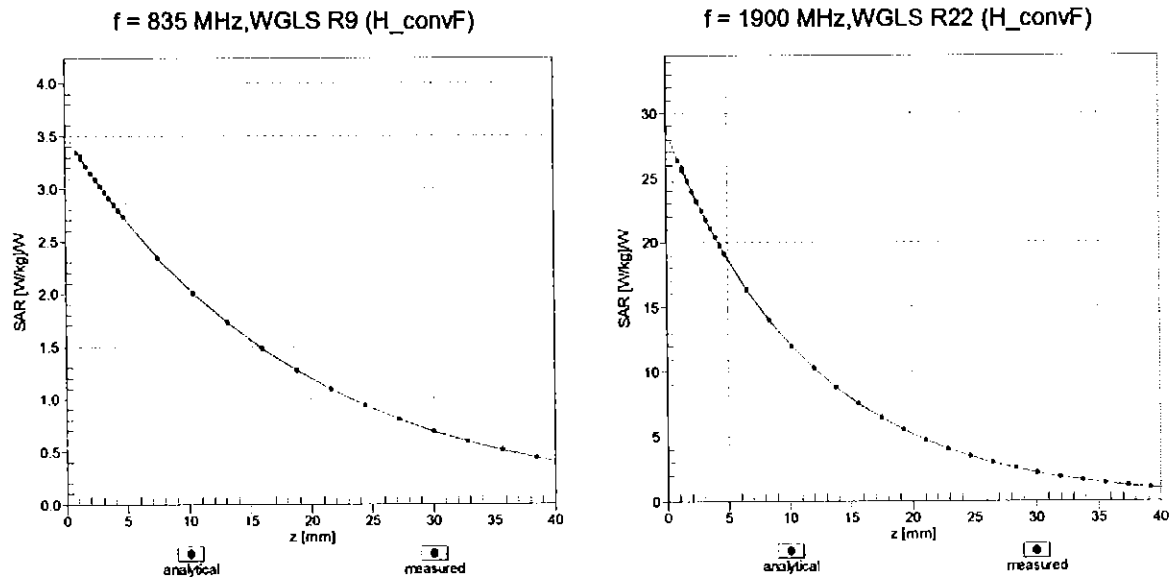
Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)



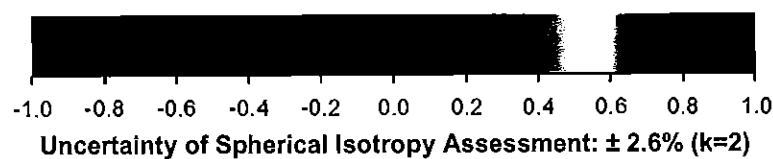
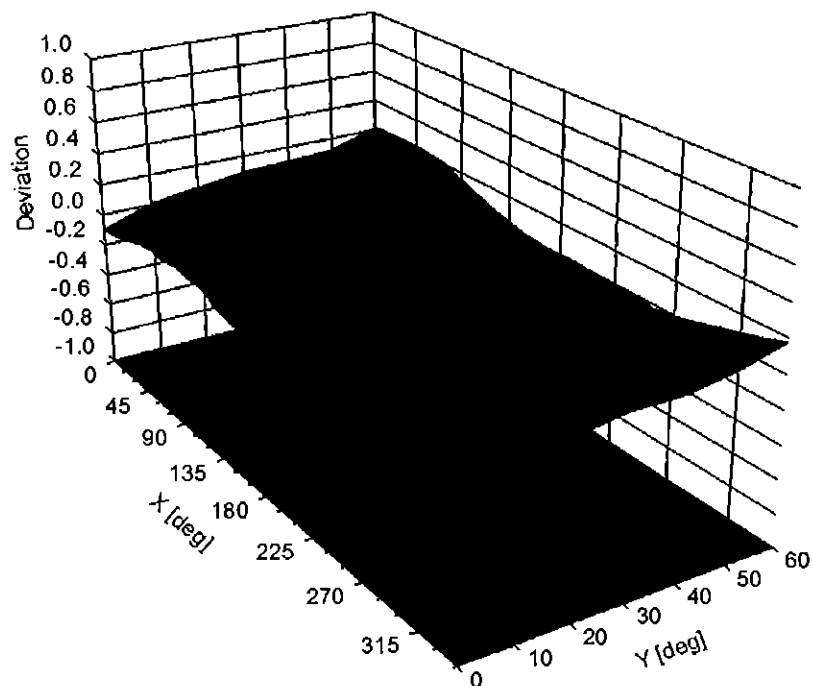
Uncertainty of Linearity Assessment: $\pm 0.6\%$ (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: EX3DV4 - SN:7406

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	0
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Appendix: Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Max Unc ^E (k=2)
0	CW	X	0.00	0.00	1.00	0.00	138.9	$\pm 2.5 \%$
		Y	0.00	0.00	1.00		129.6	
		Z	0.00	0.00	1.00		128.2	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	2.73	66.22	10.89	10.00	20.0	$\pm 9.6 \%$
		Y	2.50	65.91	10.39		20.0	
		Z	2.53	65.90	10.54		20.0	
10011- CAB	UMTS-FDD (WCDMA)	X	1.16	69.53	16.71	0.00	150.0	$\pm 9.6 \%$
		Y	1.55	76.79	19.47		150.0	
		Z	1.09	68.24	15.96		150.0	
10012- CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	1.21	64.38	15.70	0.41	150.0	$\pm 9.6 \%$
		Y	1.20	65.37	16.13		150.0	
		Z	1.18	63.82	15.33		150.0	
10013- CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	4.87	66.56	16.98	1.46	150.0	$\pm 9.6 \%$
		Y	4.34	67.27	16.96		150.0	
		Z	4.83	66.50	16.95		150.0	
10021- DAC	GSM-FDD (TDMA, GMSK)	X	9.99	82.36	18.50	9.39	50.0	$\pm 9.6 \%$
		Y	13.63	85.86	18.88		50.0	
		Z	18.22	90.00	20.60		50.0	
10023- DAC	GPRS-FDD (TDMA, GMSK, TN 0)	X	8.49	80.16	17.78	9.57	50.0	$\pm 9.6 \%$
		Y	7.32	78.16	16.31		50.0	
		Z	12.47	85.19	19.17		50.0	
10024- DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	18.19	89.55	19.31	6.56	60.0	$\pm 9.6 \%$
		Y	100.00	107.67	23.01		60.0	
		Z	100.00	108.36	23.76		60.0	
10025- DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	X	5.54	75.78	27.74	12.57	50.0	$\pm 9.6 \%$
		Y	8.76	92.32	36.08		50.0	
		Z	4.44	70.37	25.26		50.0	
10026- DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	9.90	90.96	31.21	9.56	60.0	$\pm 9.6 \%$
		Y	5.70	81.99	28.84		60.0	
		Z	7.85	86.95	30.11		60.0	
10027- DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	100.00	106.69	22.59	4.80	80.0	$\pm 9.6 \%$
		Y	100.00	110.45	23.34		80.0	
		Z	100.00	108.23	22.93		80.0	
10028- DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	100.00	107.01	22.11	3.55	100.0	$\pm 9.6 \%$
		Y	100.00	117.41	25.54		100.0	
		Z	100.00	109.42	22.79		100.0	
10029- DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	6.41	81.80	26.70	7.80	80.0	$\pm 9.6 \%$
		Y	3.86	73.74	24.21		80.0	
		Z	5.17	78.18	25.56		80.0	
10030- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	X	13.75	86.21	17.68	5.30	70.0	$\pm 9.6 \%$
		Y	8.41	82.76	15.88		70.0	
		Z	100.00	106.60	22.49		70.0	
10031- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	X	100.00	106.42	20.68	1.88	100.0	$\pm 9.6 \%$
		Y	100.00	120.98	25.51		100.0	
		Z	100.00	108.89	21.35		100.0	

10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	100.00	113.18	22.62	1.17	100.0	± 9.6 %
		Y	100.00	160.14	39.75		100.0	
		Z	100.00	117.70	24.05		100.0	
10033-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	X	6.02	81.27	20.17	5.30	70.0	± 9.6 %
		Y	2.18	67.67	12.00		70.0	
		Z	5.24	80.63	20.08		70.0	
10034-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	X	2.82	75.11	17.10	1.88	100.0	± 9.6 %
		Y	0.75	61.82	7.32		100.0	
		Z	2.29	73.13	16.28		100.0	
10035-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	X	2.17	73.18	16.32	1.17	100.0	± 9.6 %
		Y	0.59	61.24	6.75		100.0	
		Z	1.79	71.19	15.39		100.0	
10036-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	X	7.12	83.90	21.15	5.30	70.0	± 9.6 %
		Y	2.26	68.25	12.32		70.0	
		Z	6.24	83.43	21.13		70.0	
10037-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	X	2.66	74.41	16.79	1.88	100.0	± 9.6 %
		Y	0.71	61.41	7.10		100.0	
		Z	2.15	72.41	15.96		100.0	
10038-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	X	2.20	73.62	16.61	1.17	100.0	± 9.6 %
		Y	0.60	61.36	6.93		100.0	
		Z	1.80	71.51	15.64		100.0	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	2.76	78.09	18.48	0.00	150.0	± 9.6 %
		Y	0.37	60.00	5.64		150.0	
		Z	2.22	74.97	16.93		150.0	
10042-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	X	7.43	78.80	16.12	7.78	50.0	± 9.6 %
		Y	8.26	80.71	16.15		50.0	
		Z	12.01	84.59	17.75		50.0	
10044-CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	X	0.00	100.49	0.10	0.00	150.0	± 9.6 %
		Y	0.04	60.00	50.13		150.0	
		Z	0.00	96.59	0.05		150.0	
10048-CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	X	6.27	73.35	16.78	13.80	25.0	± 9.6 %
		Y	5.47	69.78	14.42		25.0	
		Z	7.09	74.59	16.89		25.0	
10049-CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	X	6.62	76.07	16.59	10.79	40.0	± 9.6 %
		Y	5.50	73.13	14.63		40.0	
		Z	7.47	77.74	16.92		40.0	
10056-CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	X	8.73	81.97	20.70	9.03	50.0	± 9.6 %
		Y	5.30	74.02	15.71		50.0	
		Z	9.70	84.35	21.49		50.0	
10058-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	4.93	77.02	24.10	6.55	100.0	± 9.6 %
		Y	3.18	70.36	21.96		100.0	
		Z	4.10	73.99	23.08		100.0	
10059-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	X	1.26	65.49	16.19	0.61	110.0	± 9.6 %
		Y	1.20	65.95	16.36		110.0	
		Z	1.20	64.67	15.74		110.0	
10060-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	X	13.21	104.87	27.26	1.30	110.0	± 9.6 %
		Y	4.90	96.93	26.57		110.0	
		Z	4.52	91.43	23.95		110.0	

10061-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	X	2.92	78.86	20.97	2.04	110.0	± 9.6 %
		Y	1.70	73.25	19.05		110.0	
		Z	2.19	75.27	19.88		110.0	
10062-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	4.70	66.68	16.55	0.49	100.0	± 9.6 %
		Y	4.18	67.42	16.56		100.0	
		Z	4.65	66.61	16.51		100.0	
10063-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	X	4.70	66.73	16.62	0.72	100.0	± 9.6 %
		Y	4.18	67.49	16.63		100.0	
		Z	4.66	66.66	16.57		100.0	
10064-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	X	4.99	66.98	16.82	0.86	100.0	± 9.6 %
		Y	4.36	67.60	16.75		100.0	
		Z	4.94	66.90	16.78		100.0	
10065-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	X	4.85	66.84	16.87	1.21	100.0	± 9.6 %
		Y	4.23	67.25	16.71		100.0	
		Z	4.80	66.75	16.83		100.0	
10066-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	X	4.86	66.83	16.99	1.46	100.0	± 9.6 %
		Y	4.21	67.08	16.71		100.0	
		Z	4.80	66.72	16.95		100.0	
10067-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	X	5.14	66.93	17.36	2.04	100.0	± 9.6 %
		Y	4.40	67.10	16.99		100.0	
		Z	5.08	66.86	17.34		100.0	
10068-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	X	5.19	66.98	17.55	2.55	100.0	± 9.6 %
		Y	4.52	67.37	17.35		100.0	
		Z	5.12	66.84	17.50		100.0	
10069-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	X	5.27	66.95	17.72	2.67	100.0	± 9.6 %
		Y	4.52	67.17	17.38		100.0	
		Z	5.20	66.85	17.69		100.0	
10071-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	X	4.96	66.60	17.22	1.99	100.0	± 9.6 %
		Y	4.44	67.29	17.20		100.0	
		Z	4.91	66.53	17.19		100.0	
10072-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	X	4.94	66.90	17.40	2.30	100.0	± 9.6 %
		Y	4.35	67.27	17.25		100.0	
		Z	4.87	66.79	17.36		100.0	
10073-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	X	4.99	67.03	17.67	2.83	100.0	± 9.6 %
		Y	4.41	67.49	17.58		100.0	
		Z	4.92	66.90	17.63		100.0	
10074-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	X	4.97	66.91	17.78	3.30	100.0	± 9.6 %
		Y	4.49	67.70	17.84		100.0	
		Z	4.90	66.77	17.74		100.0	
10075-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	X	5.02	67.05	18.08	3.82	90.0	± 9.6 %
		Y	4.55	67.83	18.12		90.0	
		Z	4.94	66.85	18.01		90.0	
10076-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	X	5.03	66.84	18.17	4.15	90.0	± 9.6 %
		Y	4.61	67.72	18.28		90.0	
		Z	4.95	66.65	18.12		90.0	
10077-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	X	5.06	66.90	18.26	4.30	90.0	± 9.6 %
		Y	4.65	67.85	18.42		90.0	
		Z	4.98	66.71	18.21		90.0	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	1.05	69.26	14.55	0.00	150.0	± 9.6 %
		Y	0.28	60.00	5.33		150.0	
		Z	0.92	67.44	13.36		150.0	
10082-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	X	0.71	58.22	3.69	4.77	80.0	± 9.6 %
		Y	0.41	56.78	1.87		80.0	
		Z	0.54	57.53	2.88		80.0	
10090-DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	X	17.35	89.03	19.19	6.56	60.0	± 9.6 %
		Y	100.00	107.61	23.00		60.0	
		Z	100.00	108.37	23.77		60.0	
10097-CAB	UMTS-FDD (HSDPA)	X	1.96	68.94	16.57	0.00	150.0	± 9.6 %
		Y	2.57	76.20	18.23		150.0	
		Z	1.90	68.41	16.17		150.0	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	1.92	68.91	16.54	0.00	150.0	± 9.6 %
		Y	2.54	76.26	18.30		150.0	
		Z	1.86	68.36	16.14		150.0	
10099-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	X	9.94	91.01	31.21	9.56	60.0	± 9.6 %
		Y	5.73	82.09	28.86		60.0	
		Z	7.90	87.03	30.13		60.0	
10100-CAC	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	3.32	71.40	17.37	0.00	150.0	± 9.6 %
		Y	2.95	71.83	18.07		150.0	
		Z	3.20	70.72	17.06		150.0	
10101-CAC	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	3.33	67.99	16.32	0.00	150.0	± 9.6 %
		Y	3.00	68.42	16.63		150.0	
		Z	3.27	67.68	16.15		150.0	
10102-CAC	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	3.43	67.94	16.40	0.00	150.0	± 9.6 %
		Y	3.10	68.46	16.71		150.0	
		Z	3.37	67.66	16.24		150.0	
10103-CAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.02	73.90	19.30	3.98	65.0	± 9.6 %
		Y	4.68	73.18	19.41		65.0	
		Z	5.62	73.49	19.33		65.0	
10104-CAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	6.42	73.34	19.91	3.98	65.0	± 9.6 %
		Y	4.72	70.79	18.81		65.0	
		Z	5.88	72.35	19.63		65.0	
10105-CAC	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	6.34	73.01	20.09	3.98	65.0	± 9.6 %
		Y	4.65	70.25	18.83		65.0	
		Z	5.51	70.92	19.28		65.0	
10108-CAD	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	2.90	70.63	17.22	0.00	150.0	± 9.6 %
		Y	2.58	72.09	18.15		150.0	
		Z	2.79	69.99	16.90		150.0	
10109-CAD	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	2.99	67.94	16.29	0.00	150.0	± 9.6 %
		Y	2.69	69.27	16.60		150.0	
		Z	2.93	67.61	16.08		150.0	
10110-CAD	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	2.37	69.82	16.91	0.00	150.0	± 9.6 %
		Y	2.17	72.66	17.66		150.0	
		Z	2.27	69.17	16.53		150.0	
10111-CAD	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	2.75	69.14	16.80	0.00	150.0	± 9.6 %
		Y	2.72	72.65	17.00		150.0	
		Z	2.68	68.77	16.52		150.0	

10112-CAD	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	3.11	67.90	16.33	0.00	150.0	± 9.6 %
		Y	2.81	69.41	16.67		150.0	
		Z	3.05	67.61	16.14		150.0	
10113-CAD	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	2.91	69.24	16.90	0.00	150.0	± 9.6 %
		Y	2.80	72.45	16.91		150.0	
		Z	2.83	68.91	16.64		150.0	
10114-CAB	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	5.18	67.36	16.63	0.00	150.0	± 9.6 %
		Y	4.69	67.54	16.80		150.0	
		Z	5.15	67.30	16.59		150.0	
10115-CAB	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	X	5.48	67.50	16.70	0.00	150.0	± 9.6 %
		Y	4.94	67.76	16.85		150.0	
		Z	5.42	67.37	16.64		150.0	
10116-CAB	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	X	5.28	67.57	16.65	0.00	150.0	± 9.6 %
		Y	4.76	67.79	16.84		150.0	
		Z	5.24	67.47	16.61		150.0	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	5.14	67.22	16.57	0.00	150.0	± 9.6 %
		Y	4.68	67.44	16.77		150.0	
		Z	5.11	67.13	16.53		150.0	
10118-CAB	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	X	5.56	67.71	16.81	0.00	150.0	± 9.6 %
		Y	4.92	67.65	16.80		150.0	
		Z	5.51	67.59	16.75		150.0	
10119-CAB	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	X	5.26	67.51	16.64	0.00	150.0	± 9.6 %
		Y	4.75	67.71	16.81		150.0	
		Z	5.23	67.43	16.60		150.0	
10140-CAC	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	3.47	67.94	16.32	0.00	150.0	± 9.6 %
		Y	3.08	68.53	16.60		150.0	
		Z	3.41	67.65	16.15		150.0	
10141-CAC	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	3.59	68.02	16.48	0.00	150.0	± 9.6 %
		Y	3.23	68.87	16.85		150.0	
		Z	3.53	67.77	16.33		150.0	
10142-CAD	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	2.17	70.14	16.75	0.00	150.0	± 9.6 %
		Y	1.93	72.39	15.85		150.0	
		Z	2.06	69.38	16.26		150.0	
10143-CAD	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	2.69	70.39	16.77	0.00	150.0	± 9.6 %
		Y	1.77	67.88	12.65		150.0	
		Z	2.58	69.83	16.31		150.0	
10144-CAD	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	2.37	67.50	14.86	0.00	150.0	± 9.6 %
		Y	1.24	63.02	9.52		150.0	
		Z	2.27	66.99	14.42		150.0	
10145-CAD	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	1.43	67.32	13.24	0.00	150.0	± 9.6 %
		Y	0.41	60.00	4.04		150.0	
		Z	1.25	65.61	11.99		150.0	
10146-CAD	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	1.83	65.71	11.47	0.00	150.0	± 9.6 %
		Y	19.01	355.37	40.53		150.0	
		Z	1.52	64.01	10.27		150.0	
10147-CAD	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	2.14	67.65	12.55	0.00	150.0	± 9.6 %
		Y	123.11	63.95	2.67		150.0	
		Z	1.70	65.34	11.08		150.0	

10149-CAC	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	3.00	68.01	16.34	0.00	150.0	± 9.6 %
		Y	2.71	69.38	16.67		150.0	
		Z	2.94	67.68	16.14		150.0	
10150-CAC	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	3.12	67.96	16.38	0.00	150.0	± 9.6 %
		Y	2.83	69.51	16.73		150.0	
		Z	3.06	67.68	16.19		150.0	
10151-CAC	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.55	76.73	20.51	3.98	65.0	± 9.6 %
		Y	4.65	75.11	19.92		65.0	
		Z	5.91	75.87	20.37		65.0	
10152-CAC	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	5.92	73.14	19.51	3.98	65.0	± 9.6 %
		Y	4.14	70.22	17.64		65.0	
		Z	5.38	72.11	19.20		65.0	
10153-CAC	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	6.32	74.15	20.32	3.98	65.0	± 9.6 %
		Y	4.49	71.52	18.62		65.0	
		Z	5.75	73.14	20.03		65.0	
10154-CAD	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	2.44	70.37	17.23	0.00	150.0	± 9.6 %
		Y	2.24	73.24	17.96		150.0	
		Z	2.32	69.67	16.83		150.0	
10155-CAD	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	2.75	69.15	16.81	0.00	150.0	± 9.6 %
		Y	2.75	72.83	17.10		150.0	
		Z	2.68	68.79	16.53		150.0	
10156-CAD	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	2.05	70.60	16.74	0.00	150.0	± 9.6 %
		Y	1.46	69.42	13.50		150.0	
		Z	1.92	69.63	16.11		150.0	
10157-CAD	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	2.25	68.47	15.12	0.00	150.0	± 9.6 %
		Y	0.93	61.53	7.91		150.0	
		Z	2.13	67.76	14.53		150.0	
10158-CAD	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	2.91	69.31	16.96	0.00	150.0	± 9.6 %
		Y	2.84	72.68	17.03		150.0	
		Z	2.84	68.99	16.70		150.0	
10159-CAD	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	2.39	69.07	15.47	0.00	150.0	± 9.6 %
		Y	0.94	61.44	7.84		150.0	
		Z	2.25	68.30	14.85		150.0	
10160-CAC	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	2.87	69.48	16.90	0.00	150.0	± 9.6 %
		Y	2.53	71.06	17.44		150.0	
		Z	2.80	69.08	16.66		150.0	
10161-CAC	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	3.02	67.94	16.33	0.00	150.0	± 9.6 %
		Y	2.72	69.68	16.46		150.0	
		Z	2.96	67.65	16.13		150.0	
10162-CAC	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	3.13	68.07	16.43	0.00	150.0	± 9.6 %
		Y	2.84	70.03	16.63		150.0	
		Z	3.07	67.81	16.24		150.0	
10166-CAD	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	3.48	69.00	18.84	3.01	150.0	± 9.6 %
		Y	2.37	66.02	18.17		150.0	
		Z	3.30	68.39	18.62		150.0	
10167-CAD	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	4.17	71.58	19.19	3.01	150.0	± 9.6 %
		Y	2.29	67.15	18.12		150.0	
		Z	3.79	70.56	18.83		150.0	

10168-CAD	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	4.66	74.00	20.63	3.01	150.0	± 9.6 %
		Y	2.48	69.25	19.67		150.0	
		Z	4.22	72.96	20.30		150.0	
10169-CAC	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	2.83	68.21	18.52	3.01	150.0	± 9.6 %
		Y	1.98	64.24	17.28		150.0	
		Z	2.57	66.84	17.97		150.0	
10170-CAC	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	3.78	73.87	20.84	3.01	150.0	± 9.6 %
		Y	1.95	66.56	18.68		150.0	
		Z	3.16	71.49	20.02		150.0	
10171-AAC	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	3.08	69.63	17.94	3.01	150.0	± 9.6 %
		Y	1.72	64.21	16.34		150.0	
		Z	2.64	67.80	17.26		150.0	
10172-CAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.42	80.62	23.60	6.02	65.0	± 9.6 %
		Y	2.15	69.85	20.42		65.0	
		Z	4.45	78.76	23.36		65.0	
10173-CAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	8.97	86.28	23.79	6.02	65.0	± 9.6 %
		Y	2.26	72.00	19.72		65.0	
		Z	6.61	83.59	23.38		65.0	
10174-CAC	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	7.82	83.09	22.18	6.02	65.0	± 9.6 %
		Y	1.97	69.58	18.06		65.0	
		Z	5.22	78.89	21.15		65.0	
10175-CAD	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	2.79	67.90	18.26	3.01	150.0	± 9.6 %
		Y	1.97	64.07	17.08		150.0	
		Z	2.54	66.56	17.72		150.0	
10176-CAD	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	3.78	73.89	20.85	3.01	150.0	± 9.6 %
		Y	1.95	66.57	18.69		150.0	
		Z	3.16	71.52	20.03		150.0	
10177-CAF	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	2.82	68.06	18.36	3.01	150.0	± 9.6 %
		Y	1.98	64.12	17.12		150.0	
		Z	2.56	66.70	17.81		150.0	
10178-CAD	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	3.74	73.65	20.71	3.01	150.0	± 9.6 %
		Y	1.95	66.53	18.65		150.0	
		Z	3.13	71.32	19.91		150.0	
10179-CAD	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	3.39	71.59	19.23	3.01	150.0	± 9.6 %
		Y	1.82	65.39	17.45		150.0	
		Z	2.87	69.52	18.50		150.0	
10180-CAD	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	3.08	69.55	17.88	3.01	150.0	± 9.6 %
		Y	1.72	64.21	16.33		150.0	
		Z	2.64	67.75	17.21		150.0	
10181-CAC	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	2.81	68.04	18.35	3.01	150.0	± 9.6 %
		Y	1.97	64.11	17.12		150.0	
		Z	2.56	66.68	17.80		150.0	
10182-CAC	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	3.73	73.62	20.70	3.01	150.0	± 9.6 %
		Y	1.95	66.51	18.64		150.0	
		Z	3.13	71.29	19.90		150.0	
10183-AAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	3.07	69.53	17.87	3.01	150.0	± 9.6 %
		Y	1.72	64.19	16.32		150.0	
		Z	2.64	67.72	17.20		150.0	

10184-CAD	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	2.82	68.08	18.37	3.01	150.0	± 9.6 %
		Y	1.98	64.13	17.13		150.0	
		Z	2.56	66.72	17.83		150.0	
10185-CAD	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	3.75	73.70	20.74	3.01	150.0	± 9.6 %
		Y	1.96	66.56	18.67		150.0	
		Z	3.14	71.36	19.94		150.0	
10186-AAD	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	3.09	69.60	17.91	3.01	150.0	± 9.6 %
		Y	1.73	64.23	16.35		150.0	
		Z	2.65	67.78	17.23		150.0	
10187-CAD	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	2.83	68.13	18.43	3.01	150.0	± 9.6 %
		Y	1.99	64.22	17.23		150.0	
		Z	2.57	66.77	17.89		150.0	
10188-CAD	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	3.88	74.41	21.15	3.01	150.0	± 9.6 %
		Y	1.98	66.86	18.93		150.0	
		Z	3.23	71.97	20.32		150.0	
10189-AAD	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	3.15	70.02	18.19	3.01	150.0	± 9.6 %
		Y	1.74	64.44	16.55		150.0	
		Z	2.70	68.15	17.50		150.0	
10193-CAB	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	4.57	66.79	16.35	0.00	150.0	± 9.6 %
		Y	4.14	67.99	16.59		150.0	
		Z	4.54	66.72	16.28		150.0	
10194-CAB	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	X	4.75	67.11	16.47	0.00	150.0	± 9.6 %
		Y	4.22	68.00	16.68		150.0	
		Z	4.70	67.02	16.41		150.0	
10195-CAB	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	X	4.79	67.14	16.49	0.00	150.0	± 9.6 %
		Y	4.23	67.92	16.65		150.0	
		Z	4.74	67.05	16.43		150.0	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	4.58	66.86	16.37	0.00	150.0	± 9.6 %
		Y	4.11	67.92	16.54		150.0	
		Z	4.54	66.78	16.30		150.0	
10197-CAB	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	X	4.76	67.13	16.48	0.00	150.0	± 9.6 %
		Y	4.23	68.00	16.69		150.0	
		Z	4.71	67.04	16.42		150.0	
10198-CAB	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	X	4.79	67.15	16.50	0.00	150.0	± 9.6 %
		Y	4.22	67.91	16.64		150.0	
		Z	4.74	67.07	16.44		150.0	
10219-CAB	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	4.53	66.88	16.34	0.00	150.0	± 9.6 %
		Y	4.08	68.06	16.58		150.0	
		Z	4.49	66.80	16.27		150.0	
10220-CAB	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	X	4.76	67.10	16.47	0.00	150.0	± 9.6 %
		Y	4.22	67.96	16.67		150.0	
		Z	4.71	67.01	16.41		150.0	
10221-CAB	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	X	4.80	67.08	16.48	0.00	150.0	± 9.6 %
		Y	4.25	67.92	16.65		150.0	
		Z	4.75	67.00	16.42		150.0	
10222-CAB	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	5.12	67.23	16.57	0.00	150.0	± 9.6 %
		Y	4.67	67.48	16.77		150.0	
		Z	5.09	67.14	16.52		150.0	

10223-CAB	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	X	5.42	67.42	16.68	0.00	150.0	± 9.6 %
		Y	4.85	67.57	16.77		150.0	
		Z	5.40	67.40	16.67		150.0	
10224-CAB	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	X	5.17	67.35	16.56	0.00	150.0	± 9.6 %
		Y	4.71	67.68	16.79		150.0	
		Z	5.13	67.25	16.51		150.0	
10225-CAB	UMTS-FDD (HSPA+)	X	2.87	66.58	15.73	0.00	150.0	± 9.6 %
		Y	2.38	67.09	13.98		150.0	
		Z	2.82	66.38	15.50		150.0	
10226-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	9.50	87.34	24.24	6.02	65.0	± 9.6 %
		Y	2.34	72.67	20.10		65.0	
		Z	6.98	84.60	23.83		65.0	
10227-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	8.72	84.77	22.80	6.02	65.0	± 9.6 %
		Y	2.21	71.55	18.95		65.0	
		Z	6.78	83.00	22.65		65.0	
10228-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	7.70	87.24	26.02	6.02	65.0	± 9.6 %
		Y	2.35	71.63	21.26		65.0	
		Z	5.43	82.72	24.92		65.0	
10229-CAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	9.03	86.38	23.83	6.02	65.0	± 9.6 %
		Y	2.27	72.06	19.75		65.0	
		Z	6.67	83.69	23.42		65.0	
10230-CAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	8.29	83.90	22.43	6.02	65.0	± 9.6 %
		Y	2.13	70.90	18.60		65.0	
		Z	6.44	82.12	22.26		65.0	
10231-CAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	7.38	86.38	25.64	6.02	65.0	± 9.6 %
		Y	2.30	71.12	20.95		65.0	
		Z	5.24	81.97	24.56		65.0	
10232-CAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	9.02	86.36	23.83	6.02	65.0	± 9.6 %
		Y	2.27	72.05	19.75		65.0	
		Z	6.65	83.67	23.41		65.0	
10233-CAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	8.28	83.89	22.42	6.02	65.0	± 9.6 %
		Y	2.13	70.87	18.59		65.0	
		Z	6.43	82.09	22.25		65.0	
10234-CAC	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	7.10	85.54	25.23	6.02	65.0	± 9.6 %
		Y	2.26	70.79	20.68		65.0	
		Z	5.08	81.30	24.19		65.0	
10235-CAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	9.02	86.38	23.84	6.02	65.0	± 9.6 %
		Y	2.27	72.05	19.76		65.0	
		Z	6.65	83.69	23.42		65.0	
10236-CAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	8.34	83.99	22.45	6.02	65.0	± 9.6 %
		Y	2.15	70.97	18.63		65.0	
		Z	6.48	82.21	22.28		65.0	
10237-CAC	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.38	86.43	25.66	6.02	65.0	± 9.6 %
		Y	2.30	71.11	20.95		65.0	
		Z	5.24	82.00	24.57		65.0	
10238-CAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	9.00	86.33	23.82	6.02	65.0	± 9.6 %
		Y	2.26	72.03	19.74		65.0	
		Z	6.63	83.64	23.40		65.0	

10239-CAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	8.25	83.86	22.41	6.02	65.0	± 9.6 %
		Y	2.13	70.85	18.59		65.0	
		Z	6.41	82.06	22.24		65.0	
10240-CAC	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	7.36	86.38	25.64	6.02	65.0	± 9.6 %
		Y	2.30	71.11	20.95		65.0	
		Z	5.22	81.96	24.56		65.0	
10241-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	7.65	78.90	23.86	6.98	65.0	± 9.6 %
		Y	4.15	74.63	23.03		65.0	
		Z	6.65	77.23	23.41		65.0	
10242-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	7.40	78.25	23.51	6.98	65.0	± 9.6 %
		Y	3.84	73.21	22.33		65.0	
		Z	6.07	75.38	22.52		65.0	
10243-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	6.13	75.50	23.22	6.98	65.0	± 9.6 %
		Y	3.68	71.24	22.18		65.0	
		Z	5.17	72.72	22.17		65.0	
10244-CAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	4.96	71.78	16.23	3.98	65.0	± 9.6 %
		Y	1.47	60.59	6.86		65.0	
		Z	4.27	70.57	15.63		65.0	
10245-CAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	4.90	71.39	16.01	3.98	65.0	± 9.6 %
		Y	1.47	60.48	6.73		65.0	
		Z	4.22	70.14	15.39		65.0	
10246-CAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	4.94	75.03	17.94	3.98	65.0	± 9.6 %
		Y	1.46	62.04	8.51		65.0	
		Z	4.23	73.72	17.40		65.0	
10247-CAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	4.94	72.43	17.57	3.98	65.0	± 9.6 %
		Y	2.10	63.24	9.90		65.0	
		Z	4.38	71.34	17.07		65.0	
10248-CAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	4.96	72.03	17.39	3.98	65.0	± 9.6 %
		Y	2.10	62.93	9.72		65.0	
		Z	4.40	70.92	16.87		65.0	
10249-CAC	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	6.07	78.35	20.13	3.98	65.0	± 9.6 %
		Y	2.33	67.19	12.94		65.0	
		Z	5.28	77.21	19.80		65.0	
10250-CAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	5.95	75.24	20.37	3.98	65.0	± 9.6 %
		Y	3.82	70.93	16.95		65.0	
		Z	5.33	74.14	20.02		65.0	
10251-CAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	5.69	73.28	19.20	3.98	65.0	± 9.6 %
		Y	3.45	68.36	15.25		65.0	
		Z	5.13	72.25	18.83		65.0	
10252-CAC	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.58	78.88	21.28	3.98	65.0	± 9.6 %
		Y	4.11	75.12	18.99		65.0	
		Z	5.80	77.80	21.07		65.0	
10253-CAC	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	5.80	72.65	19.29	3.98	65.0	± 9.6 %
		Y	4.01	69.64	16.98		65.0	
		Z	5.29	71.67	18.98		65.0	
10254-CAC	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	6.17	73.58	20.02	3.98	65.0	± 9.6 %
		Y	4.31	70.68	17.76		65.0	
		Z	5.63	72.60	19.71		65.0	

10255-CAC	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.29	76.23	20.52	3.98	65.0	± 9.6 %
		Y	4.41	74.27	19.43		65.0	
		Z	5.67	75.30	20.34		65.0	
10256-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	3.88	68.28	13.63	3.98	65.0	± 9.6 %
		Y	1.05	58.86	4.54		65.0	
		Z	3.28	66.95	12.85		65.0	
10257-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	3.85	67.85	13.35	3.98	65.0	± 9.6 %
		Y	1.05	58.75	4.36		65.0	
		Z	3.25	66.51	12.54		65.0	
10258-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	3.78	70.85	15.35	3.98	65.0	± 9.6 %
		Y	1.11	60.00	5.99		65.0	
		Z	3.18	69.35	14.58		65.0	
10259-CAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	5.33	73.49	18.59	3.98	65.0	± 9.6 %
		Y	2.60	65.55	12.14		65.0	
		Z	4.76	72.43	18.16		65.0	
10260-CAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	5.38	73.29	18.52	3.98	65.0	± 9.6 %
		Y	2.62	65.36	12.01		65.0	
		Z	4.80	72.23	18.08		65.0	
10261-CAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	6.02	77.89	20.37	3.98	65.0	± 9.6 %
		Y	2.87	69.70	14.96		65.0	
		Z	5.26	76.76	20.06		65.0	
10262-CAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	5.94	75.19	20.32	3.98	65.0	± 9.6 %
		Y	3.80	70.83	16.88		65.0	
		Z	5.32	74.09	19.98		65.0	
10263-CAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	5.68	73.26	19.19	3.98	65.0	± 9.6 %
		Y	3.45	68.35	15.24		65.0	
		Z	5.12	72.23	18.82		65.0	
10264-CAC	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.52	78.70	21.19	3.98	65.0	± 9.6 %
		Y	4.06	74.89	18.86		65.0	
		Z	5.75	77.62	20.97		65.0	
10265-CAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	5.92	73.14	19.52	3.98	65.0	± 9.6 %
		Y	4.14	70.23	17.64		65.0	
		Z	5.38	72.12	19.20		65.0	
10266-CAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	6.31	74.13	20.31	3.98	65.0	± 9.6 %
		Y	4.49	71.50	18.60		65.0	
		Z	5.75	73.12	20.02		65.0	
10267-CAC	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.54	76.70	20.49	3.98	65.0	± 9.6 %
		Y	4.64	75.05	19.89		65.0	
		Z	5.90	75.83	20.35		65.0	
10268-CAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	6.58	73.24	19.99	3.98	65.0	± 9.6 %
		Y	4.89	71.06	18.92		65.0	
		Z	6.05	72.29	19.72		65.0	
10269-CAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	6.56	72.88	19.90	3.98	65.0	± 9.6 %
		Y	4.96	70.94	18.86		65.0	
		Z	6.05	71.95	19.63		65.0	
10270-CAC	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.52	74.64	19.85	3.98	65.0	± 9.6 %
		Y	4.97	73.67	19.72		65.0	
		Z	5.98	73.87	19.71		65.0	

10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	2.66	67.03	15.70	0.00	150.0	± 9.6 %
		Y	2.34	68.55	14.63		150.0	
		Z	2.62	66.83	15.48		150.0	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	1.75	69.41	16.56	0.00	150.0	± 9.6 %
		Y	2.02	74.91	18.12		150.0	
		Z	1.67	68.59	16.06		150.0	
10277-CAA	PHS (QPSK)	X	2.57	62.13	7.82	9.03	50.0	± 9.6 %
		Y	1.60	59.68	4.94		50.0	
		Z	2.26	61.44	7.11		50.0	
10278-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.5)	X	4.26	69.41	14.02	9.03	50.0	± 9.6 %
		Y	2.29	61.84	7.55		50.0	
		Z	3.87	68.64	13.41		50.0	
10279-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.38)	X	4.37	69.66	14.18	9.03	50.0	± 9.6 %
		Y	2.31	61.88	7.61		50.0	
		Z	3.97	68.90	13.58		50.0	
10290-AAB	CDMA2000, RC1, SO55, Full Rate	X	1.85	72.31	15.88	0.00	150.0	± 9.6 %
		Y	0.36	60.00	5.29		150.0	
		Z	1.58	70.17	14.63		150.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	1.02	68.88	14.36	0.00	150.0	± 9.6 %
		Y	0.28	60.00	5.31		150.0	
		Z	0.90	67.15	13.20		150.0	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	1.80	77.95	18.61	0.00	150.0	± 9.6 %
		Y	0.38	62.69	7.21		150.0	
		Z	1.39	74.03	16.69		150.0	
10293-AAB	CDMA2000, RC3, SO3, Full Rate	X	5.83	95.82	25.10	0.00	150.0	± 9.6 %
		Y	100.00	107.50	20.43		150.0	
		Z	3.54	87.74	22.15		150.0	
10295-AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	X	7.34	78.85	20.80	9.03	50.0	± 9.6 %
		Y	17.07	85.10	19.02		50.0	
		Z	7.80	80.40	21.29		50.0	
10297-AAB	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	2.92	70.76	17.30	0.00	150.0	± 9.6 %
		Y	2.60	72.27	18.25		150.0	
		Z	2.80	70.10	16.98		150.0	
10298-AAC	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	1.81	69.98	15.49	0.00	150.0	± 9.6 %
		Y	0.52	60.00	6.04		150.0	
		Z	1.63	68.52	14.51		150.0	
10299-AAC	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	2.47	68.97	14.03	0.00	150.0	± 9.6 %
		Y	0.58	60.00	4.73		150.0	
		Z	2.10	67.38	13.05		150.0	
10300-AAC	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	1.87	64.64	11.20	0.00	150.0	± 9.6 %
		Y	0.56	60.00	4.04		150.0	
		Z	1.64	63.62	10.41		150.0	
10301-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)	X	4.64	64.99	17.32	4.17	50.0	± 9.6 %
		Y	3.97	66.09	16.87		50.0	
		Z	4.63	65.19	17.38		50.0	
10302-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL symbols)	X	5.19	65.93	18.20	4.96	50.0	± 9.6 %
		Y	4.41	66.55	17.60		50.0	
		Z	5.08	65.68	18.02		50.0	

10303-AAA	IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)	X	4.95	65.59	18.05	4.96	50.0	± 9.6 %
		Y	4.26	66.62	17.49		50.0	
		Z	4.83	65.30	17.84		50.0	
10304-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)	X	4.75	65.47	17.56	4.17	50.0	± 9.6 %
		Y	4.05	66.34	16.93		50.0	
		Z	4.65	65.23	17.38		50.0	
10305-AAA	IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15 symbols)	X	4.49	67.73	19.78	6.02	35.0	± 9.6 %
		Y	3.71	67.28	16.67		35.0	
		Z	4.28	66.94	19.23		35.0	
10306-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18 symbols)	X	4.75	66.48	19.22	6.02	35.0	± 9.6 %
		Y	4.04	67.06	17.49		35.0	
		Z	4.60	65.99	18.86		35.0	
10307-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18 symbols)	X	4.67	66.74	19.24	6.02	35.0	± 9.6 %
		Y	3.93	66.99	17.33		35.0	
		Z	4.50	66.15	18.83		35.0	
10308-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)	X	4.65	66.96	19.39	6.02	35.0	± 9.6 %
		Y	3.96	67.42	17.62		35.0	
		Z	4.47	66.34	18.96		35.0	
10309-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18 symbols)	X	4.80	66.69	19.36	6.02	35.0	± 9.6 %
		Y	4.07	67.23	17.68		35.0	
		Z	4.64	66.17	18.98		35.0	
10310-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18 symbols)	X	4.70	66.58	19.22	6.02	35.0	± 9.6 %
		Y	4.03	67.27	17.61		35.0	
		Z	4.55	66.06	18.84		35.0	
10311-AAB	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	3.29	69.98	16.90	0.00	150.0	± 9.6 %
		Y	2.90	70.63	17.62		150.0	
		Z	3.17	69.35	16.60		150.0	
10313-AAA	iDEN 1:3	X	3.28	70.39	14.65	6.99	70.0	± 9.6 %
		Y	2.53	71.17	15.80		70.0	
		Z	2.85	70.12	14.78		70.0	
10314-AAA	iDEN 1:6	X	4.28	75.46	19.37	10.00	30.0	± 9.6 %
		Y	4.79	80.62	22.06		30.0	
		Z	4.09	76.26	19.99		30.0	
10315-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	1.12	64.41	15.77	0.17	150.0	± 9.6 %
		Y	1.15	65.92	16.47		150.0	
		Z	1.10	63.89	15.39		150.0	
10316-AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	4.61	66.72	16.37	0.17	150.0	± 9.6 %
		Y	4.09	67.47	16.39		150.0	
		Z	4.56	66.65	16.32		150.0	
10317-AAB	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	4.61	66.72	16.37	0.17	150.0	± 9.6 %
		Y	4.09	67.47	16.39		150.0	
		Z	4.56	66.65	16.32		150.0	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	4.74	67.15	16.46	0.00	150.0	± 9.6 %
		Y	4.09	67.65	16.48		150.0	
		Z	4.69	67.06	16.40		150.0	
10401-AAC	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	X	5.44	67.31	16.60	0.00	150.0	± 9.6 %
		Y	4.84	67.31	16.60		150.0	
		Z	5.42	67.27	16.57		150.0	

10402-AAC	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	5.69	67.61	16.60	0.00	150.0	± 9.6 %
		Y	5.24	67.76	16.80		150.0	
		Z	5.65	67.50	16.56		150.0	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	1.85	72.31	15.88	0.00	115.0	± 9.6 %
		Y	0.36	60.00	5.29		115.0	
		Z	1.58	70.17	14.63		115.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	1.85	72.31	15.88	0.00	115.0	± 9.6 %
		Y	0.36	60.00	5.29		115.0	
		Z	1.58	70.17	14.63		115.0	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	53.12	115.17	29.24	0.00	100.0	± 9.6 %
		Y	100.00	124.65	27.76		100.0	
		Z	28.83	109.13	27.97		100.0	
10410-AAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.68	83.50	19.17	3.23	80.0	± 9.6 %
		Y	1.37	73.33	16.57		80.0	
		Z	5.13	82.70	19.33		80.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	1.04	63.68	15.36	0.00	150.0	± 9.6 %
		Y	1.11	65.66	16.32		150.0	
		Z	1.04	63.32	15.03		150.0	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	4.58	66.83	16.42	0.00	150.0	± 9.6 %
		Y	4.11	67.78	16.58		150.0	
		Z	4.54	66.76	16.35		150.0	
10417-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	4.58	66.83	16.42	0.00	150.0	± 9.6 %
		Y	4.11	67.78	16.58		150.0	
		Z	4.54	66.76	16.35		150.0	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preamble)	X	4.57	67.00	16.44	0.00	150.0	± 9.6 %
		Y	4.09	68.01	16.69		150.0	
		Z	4.53	66.93	16.39		150.0	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preamble)	X	4.59	66.94	16.44	0.00	150.0	± 9.6 %
		Y	4.11	67.93	16.65		150.0	
		Z	4.55	66.87	16.38		150.0	
10422-AAA	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	X	4.71	66.93	16.45	0.00	150.0	± 9.6 %
		Y	4.19	67.82	16.64		150.0	
		Z	4.66	66.86	16.39		150.0	
10423-AAA	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	X	4.87	67.25	16.56	0.00	150.0	± 9.6 %
		Y	4.27	68.04	16.70		150.0	
		Z	4.82	67.16	16.50		150.0	
10424-AAA	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	X	4.79	67.20	16.54	0.00	150.0	± 9.6 %
		Y	4.21	67.94	16.67		150.0	
		Z	4.74	67.12	16.47		150.0	
10425-AAA	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	X	5.39	67.48	16.69	0.00	150.0	± 9.6 %
		Y	4.86	67.72	16.85		150.0	
		Z	5.35	67.38	16.64		150.0	
10426-AAA	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	X	5.40	67.51	16.70	0.00	150.0	± 9.6 %
		Y	4.89	67.85	16.91		150.0	
		Z	5.37	67.47	16.68		150.0	

10427-AAA	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	5.41	67.49	16.68	0.00	150.0	± 9.6 %
		Y	4.87	67.71	16.83		150.0	
		Z	5.37	67.41	16.64		150.0	
10430-AAA	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	X	4.48	71.93	18.89	0.00	150.0	± 9.6 %
		Y	5.16	77.88	19.19		150.0	
		Z	4.43	71.96	18.79		150.0	
10431-AAA	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	X	4.27	67.46	16.46	0.00	150.0	± 9.6 %
		Y	3.63	68.54	16.11		150.0	
		Z	4.21	67.36	16.35		150.0	
10432-AAA	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	X	4.56	67.28	16.50	0.00	150.0	± 9.6 %
		Y	3.98	68.25	16.55		150.0	
		Z	4.51	67.19	16.43		150.0	
10433-AAA	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	X	4.81	67.24	16.56	0.00	150.0	± 9.6 %
		Y	4.24	68.00	16.70		150.0	
		Z	4.76	67.15	16.49		150.0	
10434-AAA	W-CDMA (BS Test Model 1, 64 DPCH)	X	4.67	73.09	18.99	0.00	150.0	± 9.6 %
		Y	4.20	74.62	16.81		150.0	
		Z	4.61	73.09	18.84		150.0	
10435-AAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.37	82.80	18.90	3.23	80.0	± 9.6 %
		Y	1.33	72.76	16.26		80.0	
		Z	4.91	82.00	19.05		80.0	
10447-AAA	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.58	67.63	15.88	0.00	150.0	± 9.6 %
		Y	2.52	66.35	12.95		150.0	
		Z	3.50	67.43	15.64		150.0	
10448-AAA	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	X	4.11	67.25	16.33	0.00	150.0	± 9.6 %
		Y	3.54	68.41	16.05		150.0	
		Z	4.05	67.14	16.22		150.0	
10449-AAA	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	X	4.38	67.12	16.41	0.00	150.0	± 9.6 %
		Y	3.87	68.13	16.50		150.0	
		Z	4.33	67.03	16.33		150.0	
10450-AAA	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.57	67.02	16.42	0.00	150.0	± 9.6 %
		Y	4.09	67.80	16.59		150.0	
		Z	4.53	66.93	16.35		150.0	
10451-AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	X	3.49	67.88	15.53	0.00	150.0	± 9.6 %
		Y	2.00	64.08	10.79		150.0	
		Z	3.38	67.58	15.21		150.0	
10456-AAA	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)	X	6.26	68.00	16.81	0.00	150.0	± 9.6 %
		Y	6.16	68.95	17.43		150.0	
		Z	6.24	67.94	16.79		150.0	
10457-AAA	UMTS-FDD (DC-HSDPA)	X	3.82	65.46	16.13	0.00	150.0	± 9.6 %
		Y	3.61	66.92	16.42		150.0	
		Z	3.81	65.40	16.06		150.0	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	3.29	67.12	14.89	0.00	150.0	± 9.6 %
		Y	1.44	60.53	7.42		150.0	
		Z	3.18	66.78	14.49		150.0	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	4.43	65.51	15.86	0.00	150.0	± 9.6 %
		Y	2.62	61.35	10.29		150.0	
		Z	4.37	65.53	15.72		150.0	