



SAR EVALUATION REPORT

Applicant Name:

Samsung Electronics Co., Ltd.
129, Samsung-ro, Maetan dong,
Yeongtong-gu, Suwon-si
Gyeonggi-do, 16677, Korea

Date of Testing:

10/16/17 - 12/06/17

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

1M1710040265-01-R1.A3L

FCC ID:

A3LSMG965F

APPLICANT:

SAMSUNG ELECTRONICS CO., LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model:

SM-G965F

Additional Model(s):

SM-G965F/DS, SM-G965X

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1g Head (W/kg)	1g Body-Worn (W/kg)	1g Hotspot (W/kg)	10g Phabiet (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.18	0.22	0.59	N/A
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	< 0.1	0.23	0.93	N/A
PCE	UMTS 850	826.40 - 846.60 MHz	0.20	0.30	0.52	N/A
PCE	UMTS 1750	1712.4 - 1752.6 MHz	< 0.1	0.42	0.48	1.30
PCE	UMTS 1900	1852.4 - 1907.6 MHz	< 0.1	0.28	0.43	1.11
PCE	LTE Band 12	699.7 - 715.3 MHz	0.10	0.16	0.24	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	0.12	0.20	0.35	N/A
PCE	LTE Band 26 (Cell)	814.7 - 848.3 MHz	0.17	0.21	0.47	N/A
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.23	0.29	0.64	N/A
PCE	LTE Band 66 (AWS)	1710.7 - 1779.3 MHz	0.11	0.49	0.76	2.04
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	< 0.1	0.26	0.50	N/A
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 7	2502.5 - 2567.5 MHz	0.15	0.58	1.05	2.12
PCE	LTE Band 41	2498.5 - 2687.5 MHz	< 0.1	0.27	0.57	N/A
PCE	LTE Band 38	2572.5 - 2617.5 MHz	N/A	N/A	N/A	N/A
DTS	2.4 GHz WLAN	2412 - 2472 MHz	0.34	< 0.1	0.29	N/A
NI	U-NII-1	5180 - 5240 MHz	N/A	N/A	N/A	N/A
NI	U-NII-2A	5260 - 5320 MHz	0.28	0.13	N/A	0.85
NI	U-NII-2C	5500 - 5720 MHz	0.35	< 0.1	N/A	1.05
NI	U-NII-3	5745 - 5825 MHz	0.60	0.16	0.24	N/A
DSS/DTS	Bluetooth	2402 - 2480 MHz	0.28	< 0.1	< 0.1	N/A
Simultaneous SAR per KDB 690783 D01v01r03:			1.33	0.94	1.46	3.68

Note: This revised Test Report (S/N: 1M1710040265-01-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
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Data	699.7 - 715.3 MHz
LTE Band 17	Data	706.5 - 713.5 MHz
LTE Band 13	Data	779.5 - 784.5 MHz
LTE Band 26 (Cell)	Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Data	1850.7 - 1909.3 MHz
LTE Band 7	Data	2502.5 - 2567.5 MHz
LTE Band 41	Data	2498.5 - 2687.5 MHz
LTE Band 38	Data	2572.5 - 2617.5 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
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	33.5	33.5	31.5	30.0	29.0	28.0	26.0	24.5	23.5
	Nominal	33.0	33.0	31.0	29.5	28.5	27.5	25.5	24.0	23.0
GSM/GPRS/EDGE 1900	Maximum	30.5	30.5	27.5	26.5	25.0	26.5	24.5	23.0	21.5
	Nominal	30.0	30.0	27.0	26.0	24.5	26.0	24.0	22.5	21.0

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA	3GPP DC-HSDPA
UMTS Band 5 (850 MHz)	Maximum	25.0	24.0	24.0	24.0
	Nominal	24.5	23.5	23.5	23.5
UMTS Band 4 (1750 MHz)	Maximum	23.5	23.5	23.5	23.5
	Nominal	23.0	23.0	23.0	23.0
UMTS Band 2 (1900 MHz)	Maximum	23.5	23.5	23.5	23.5
	Nominal	23.0	23.0	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 26 (Cell)	Maximum	23.5
	Nominal	23.0
LTE Band 5 (Cell)	Maximum	25.0
	Nominal	24.5
LTE Band 66 (AWS)	Maximum	23.5
	Nominal	23.0
LTE Band 4 (AWS)	Maximum	23.5
	Nominal	23.0
LTE Band 25 (PCS)	Maximum	23.5
	Nominal	23.0
LTE Band 2 (PCS)	Maximum	23.5
	Nominal	23.0
LTE Band 7	Maximum	24.5
	Nominal	24.0
LTE Band 41	Maximum	24.0
	Nominal	23.5
LTE Band 38	Maximum	23.5
	Nominal	23.0

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1.3.2 Reduced PCE Output Power – Hotspot Mode Activated

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA	3GPP DC-HSDPA
UMTS Band 4 (1750 MHz)	Maximum	20.5	20.5	20.5	20.5
	Nominal	20.0	20.0	20.0	20.0
UMTS Band 2 (1900 MHz)	Maximum	21.0	21.0	21.0	21.0
	Nominal	20.5	20.5	20.5	20.5

Mode / Band		Modulated Average (dBm)
LTE Band 66 (AWS)	Maximum	20.5
	Nominal	20.0
LTE Band 4 (AWS)	Maximum	20.5
	Nominal	20.0
LTE Band 25 (PCS)	Maximum	21.0
	Nominal	20.5
LTE Band 2 (PCS)	Maximum	21.0
	Nominal	20.5
LTE Band 7	Maximum	21.5
	Nominal	21.0
LTE Band 41	Maximum	21.0
	Nominal	20.5
LTE Band 38	Maximum	20.5
	Nominal	20.0

1.3.3 Reduced PCE Output Power – Grip Sensor Activated

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA	3GPP DC-HSDPA
UMTS Band 4 (1750 MHz)	Maximum	20.5	20.5	20.5	20.5
	Nominal	20.0	20.0	20.0	20.0
UMTS Band 2 (1900 MHz)	Maximum	21.0	21.0	21.0	21.0
	Nominal	20.5	20.5	20.5	20.5

Mode / Band		Modulated Average (dBm)
LTE Band 66 (AWS)	Maximum	20.5
	Nominal	20.0
LTE Band 4 (AWS)	Maximum	20.5
	Nominal	20.0
LTE Band 7	Maximum	21.5
	Nominal	21.0

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1.3.4 Maximum Bluetooth and WLAN Output Power

Mode / Band		Modulated Average - Single Tx Chain (dBm)				
		Ch. 1	Ch. 2-10	Ch. 11	Ch. 12	Ch. 13
IEEE 802.11b (2.4 GHz)	Maximum	19.5			15.5	14.5
	Nominal	19.0			15.0	14.0
IEEE 802.11g (2.4 GHz)	Maximum	15.5	17.5	15.5	13.5	12.5
	Nominal	15.0	17.0	15.0	13.0	12.0
IEEE 802.11n (2.4 GHz)	Maximum	15.5	17.5	15.5	13.5	12.5
	Nominal	15.0	17.0	15.0	13.0	12.0

Mode / Band		Modulated Average - Single Tx Chain (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11a (5 GHz)	Maximum	18.5 (Ch. 36: 17.5)		
	Nominal	18.0 (Ch. 36: 17.0)		
IEEE 802.11n (5 GHz)	Maximum	18.5 (Ch. 36: 17.5)	16.5 (Ch. 38: 14.5)	
	Nominal	18.0 (Ch. 36: 17.0)	16.0 (Ch. 38: 14.0)	
IEEE 802.11ac (5 GHz)	Maximum	18.5 (Ch. 36: 17.5)	16.5 (Ch. 38: 14.5)	15.5 (Ch. 42: 14.5)
	Nominal	18.0 (Ch. 36: 17.0)	16.0 (Ch. 38: 14.0)	15.0 (Ch. 42: 14.0)

Mode / Band		Modulated Average - MIMO (dBm)				
		Ch. 1	Ch. 2-10	Ch. 11	Ch. 12	Ch. 13
IEEE 802.11g (2.4 GHz)	Maximum	17.5	20.5	18.5	16.5	15.5
	Nominal	17.0	20.0	18.0	16.0	15.0
IEEE 802.11n (2.4 GHz)	Maximum	17.5	20.5	18.5	16.5	15.5
	Nominal	17.0	20.0	18.0	16.0	15.0

Mode / Band		Modulated Average - MIMO (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11a (5 GHz)	Maximum	21.5 (Ch. 36: 20.5)		
	Nominal	21.0 (Ch. 36: 20.0)		
IEEE 802.11n (5 GHz)	Maximum	21.5 (Ch. 36: 20.5)	19.5 (Ch. 38: 17.5)	
	Nominal	21.0 (Ch. 36: 20.0)	19.0 (Ch. 38: 17.0)	
IEEE 802.11ac (5 GHz)	Maximum	21.5 (Ch. 36: 20.5)	19.5 (Ch. 38: 17.5)	18.5 (Ch. 42: 17.5)
	Nominal	21.0 (Ch. 36: 20.0)	19.0 (Ch. 38: 17.0)	18.0 (Ch. 42: 17.0)

Mode / Band		Modulated Average - Single Tx Chain (dBm)
Bluetooth (1 Mbps)	Maximum	18.0
	Nominal	17.5
Bluetooth (EDR)	Maximum	6.5
	Nominal	6.0
Bluetooth LE	Maximum	9.5
	Nominal	9.0

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1.3.5 Reduced WLAN Output Power

Mode / Band		Modulated Average - Single Tx Chain (dBm)				
		Ch. 1	Ch. 2-10	Ch. 11	Ch. 12	Ch. 13
IEEE 802.11b (2.4 GHz)	Maximum	16.5			15.5	14.5
	Nominal	16.0			15.0	14.0
IEEE 802.11g (2.4 GHz)	Maximum	15.5	16.5	15.5	13.5	12.5
	Nominal	15.0	16.0	15.0	13.0	12.0
IEEE 802.11n (2.4 GHz)	Maximum	15.5	16.5	15.5	13.5	12.5
	Nominal	15.0	16.0	15.0	13.0	12.0

Mode / Band		Modulated Average - Single Tx Chain (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11a (5 GHz)	Maximum	14.5		
	Nominal	14.0		
IEEE 802.11n (5 GHz)	Maximum	14.5	14.5	
	Nominal	14.0	14.0	
IEEE 802.11ac (5 GHz)	Maximum	14.5	14.5	14.5
	Nominal	14.0	14.0	14.0

Mode / Band		Modulated Average - MIMO (dBm)				
		Ch. 1	Ch. 2-10	Ch. 11	Ch. 12	Ch. 13
IEEE 802.11g (2.4 GHz)	Maximum	17.5	19.5	18.5	16.5	15.5
	Nominal	17.0	19.0	18.0	16.0	15.0
IEEE 802.11n (2.4 GHz)	Maximum	17.5	19.5	18.5	16.5	15.5
	Nominal	17.0	19.0	18.0	16.0	15.0

Mode / Band		Modulated Average - MIMO (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11a (5 GHz)	Maximum	17.5		
	Nominal	17.0		
IEEE 802.11n (5 GHz)	Maximum	17.5	17.5	
	Nominal	17.0	17.0	
IEEE 802.11ac (5 GHz)	Maximum	17.5	17.5	17.5
	Nominal	17.0	17.0	17.0

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1.3.6 Maximum 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)

A = 13.0 dBm

B = 13.0 dBm

2.4 GHz WLAN Channel 13 will operate with Single Tx target power of 12.0 dBm.
(Upper tolerance: target + 0.5 dB)

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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
UMTS 1750	Yes	Yes	No	Yes	Yes	Yes
UMTS 1900	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 13	Yes	Yes	No	Yes	Yes	Yes
LTE Band 26 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 66 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 25 (PCS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 7	Yes	Yes	No	Yes	Yes	Yes
LTE Band 41	Yes	Yes	No	Yes	Yes	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.

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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.

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-LFI	Yes	Yes	N/A	Yes	
2	GSM voice + 5 GHz W-LFI	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-LFI MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz W-LFI MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz W-LFI + 5 GHz W-LFI	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz W-LFI MIMO + 5 GHz W-LFI MIMO	Yes	Yes	N/A	Yes	
8	UMTS + 2.4 GHz W-LFI	Yes	Yes	Yes	Yes	
9	UMTS + 5 GHz W-LFI	Yes	Yes	Yes	Yes	
10	UMTS + 2.4 GHz Bluetooth	Yes [^]	Yes	Yes [^]	Yes	[^] Bluetooth Tethering is considered
11	UMTS + 2.4 GHz W-LFI MIMO	Yes	Yes	Yes	Yes	
12	UMTS + 5 GHz W-LFI MIMO	Yes	Yes	Yes	Yes	
13	UMTS + 2.4 GHz W-LFI + 5 GHz W-LFI	Yes	Yes	Yes	Yes	
14	UMTS + 2.4 GHz W-LFI MIMO + 5 GHz W-LFI MIMO	Yes	Yes	Yes	Yes	
15	LTE + 2.4 GHz W-LFI	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
16	LTE + 5 GHz W-LFI	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
17	LTE + 2.4 GHz Bluetooth	Yes [^]	Yes*	Yes [^]	Yes	* Pre-installed VOIP applications are considered [^] Bluetooth Tethering is considered
18	LTE + 2.4 GHz W-LFI MIMO	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
19	LTE + 5 GHz W-LFI MIMO	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
20	LTE + 2.4 GHz W-LFI + 5 GHz W-LFI	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
21	LTE + 2.4 GHz W-LFI MIMO + 5 GHz W-LFI MIMO	Yes*	Yes*	Yes	Yes	* Pre-installed VOIP applications are considered
22	GPRS/EDGE + 2.4 GHz W-LFI	N/A	N/A	Yes	Yes	
23	GPRS/EDGE + 5 GHz W-LFI	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-LFI MIMO	N/A	N/A	Yes	Yes	
26	GPRS/EDGE + 5 GHz W-LFI MIMO	N/A	N/A	Yes	Yes	
27	GPRS/EDGE + 2.4 GHz W-LFI + 5 GHz W-LFI	N/A	N/A	Yes	Yes	
28	GPRS/EDGE + 2.4 GHz W-LFI MIMO + 5 GHz W-LFI 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-NII2A, and U-NII2C 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.
7. This device supports VoWIFI.
8. This device supports Bluetooth Tethering.

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1.7 Miscellaneous SAR Test Considerations

(A) WIFI/BT

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

Since Wireless Router operations are not allowed by the chipset firmware using 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.

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-1, U-NII-2A & U-NII-2C WLAN, phablet SAR tests were performed. Phablet SAR was not evaluated for 2.4 GHz BT/WLAN and U-NII-3 WLAN operations since wireless router 1g SAR was < 1.2 W/kg.

This device supports channel 1-13 for 2.4 GHz WLAN. However, due to the reduced output power for channels 12 and 13, channels 1, 6, and 11 were considered for SAR testing per KDB 248227 D01v02r02.

(B) Licensed Transmitter(s)

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

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

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

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

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.

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

This device supports both LTE B66 (AWS) and LTE B4 (AWS). Since the supported frequency span for LTE B4 (AWS) falls completely within the supported frequency span for LTE B66 (AWS), both LTE bands have the same target power, and both LTE bands share the same transmission path, SAR was only assessed for LTE B66 (AWS).

This device supports both LTE B25 (PCS) and LTE B2 (PCS). Since the supported frequency span for LTE B2 (PCS) falls completely within the supported frequency span for LTE B25 (PCS), both LTE bands have the same target power, and both LTE bands share the same transmission path, SAR was only assessed for LTE B25 (PCS).

This device supports both LTE B41 and LTE B38. Since the supported frequency span for LTE B38 falls completely within the supported frequency span for LTE B41, and LTE Band 41 has a higher target power, and both LTE bands share the same transmission path, SAR was only assessed for LTE B41.

This device supports downlink 4x4 MIMO operations for LTE Band 4. Per May 2017 TCB Workshop Notes, SAR for downlink 4x4 MIMO was not needed since the maximum average output power in 4x4 downlink MIMO mode was not > 0.25 dB higher than the maximum output power with downlink 4x4 MIMO inactive.

1.8 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r04, D05Av01r02, D06v02r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D04v01r03 (Phablet Procedures)
- FCC KDB Publication 616217 D04v01r02 (Proximity Sensor)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)
- May 2017 TCB Workshop Notes (LTE 4x4 DL MIMO)

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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LTE Information					
FCC ID	A3LSMG965F				
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 26 (Cell) (814.7 - 848.3 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 66 (AWS) (1710.7 - 1779.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
	LTE Band 7 (2502.5 - 2567.5 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
	LTE Band 38 (2572.5 - 2617.5 MHz)				
Channel Bandwidths	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 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 66 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 38: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (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 26 (Cell): 1.4 MHz		814.7 (26697)	831.5 (26865)		848.3 (27033)
LTE Band 26 (Cell): 3 MHz		815.5 (26705)	831.5 (26865)		847.5 (27025)
LTE Band 26 (Cell): 5 MHz		816.5 (26715)	831.5 (26865)		846.5 (27015)
LTE Band 26 (Cell): 10 MHz		819 (26740)	831.5 (26865)		844 (26990)
LTE Band 26 (Cell): 15 MHz		821.5 (26765)	831.5 (26865)		841.5 (26965)
LTE Band 5 (Cell): 1.4 MHz		824.7 (20407)	836.5 (20525)		848.3 (20643)
LTE Band 5 (Cell): 3 MHz		825.5 (20415)	836.5 (20525)		847.5 (20635)
LTE Band 5 (Cell): 5 MHz		826.5 (20425)	836.5 (20525)		846.5 (20625)
LTE Band 5 (Cell): 10 MHz		829 (20450)	836.5 (20525)		844 (20600)
LTE Band 66 (AWS): 1.4 MHz		1710.7 (131979)	1745 (132322)		1779.3 (132665)
LTE Band 66 (AWS): 3 MHz		1711.5 (131987)	1745 (132322)		1778.5 (132657)
LTE Band 66 (AWS): 5 MHz		1712.5 (131997)	1745 (132322)		1777.5 (132647)
LTE Band 66 (AWS): 10 MHz		1715 (132022)	1745 (132322)		1775 (132622)
LTE Band 66 (AWS): 20 MHz		1717.5 (132047)	1745 (132322)		1772.5 (132597)
LTE Band 4 (AWS): 1.4 MHz		1720 (132072)	1745 (132322)		1770 (132572)
LTE Band 4 (AWS): 3 MHz		1710.7 (19957)	1732.5 (20175)		1754.3 (20393)
LTE Band 4 (AWS): 5 MHz		1711.5 (19965)	1732.5 (20175)		1753.5 (20385)
LTE Band 4 (AWS): 10 MHz		1712.5 (19975)	1732.5 (20175)		1752.5 (20375)
LTE Band 4 (AWS): 15 MHz		1715 (20000)	1732.5 (20175)		1750 (20350)
LTE Band 4 (AWS): 20 MHz		1717.5 (20025)	1732.5 (20175)		1747.5 (20325)
LTE Band 25 (PCS): 1.4 MHz		1850.7 (26047)	1882.5 (26365)		1914.3 (26683)
LTE Band 25 (PCS): 3 MHz		1851.5 (26055)	1882.5 (26365)		1913.5 (26675)
LTE Band 25 (PCS): 5 MHz		1852.5 (26065)	1882.5 (26365)		1912.5 (26665)
LTE Band 25 (PCS): 10 MHz		1855 (26090)	1882.5 (26365)		1910 (26640)
LTE Band 25 (PCS): 15 MHz		1857.5 (26115)	1882.5 (26365)		1907.5 (26615)
LTE Band 25 (PCS): 20 MHz		1860 (26140)	1882.5 (26365)		1905 (26590)
LTE Band 2 (PCS): 1.4 MHz		1850.7 (18607)	1880 (18900)		1909.3 (19193)
LTE Band 2 (PCS): 3 MHz		1851.5 (18615)	1880 (18900)		1908.5 (19185)
LTE Band 2 (PCS): 5 MHz		1852.5 (18625)	1880 (18900)		1907.5 (19175)
LTE Band 2 (PCS): 10 MHz		1855 (18650)	1880 (18900)		1905 (19150)
LTE Band 2 (PCS): 15 MHz		1857.5 (18675)	1880 (18900)		1902.5 (19125)
LTE Band 2 (PCS): 20 MHz		1860 (18700)	1880 (18900)		1900 (19100)
LTE Band 7: 5 MHz		2502.5 (20775)	2535 (21100)		2567.5 (21425)
LTE Band 7: 10 MHz		2505 (20800)	2535 (21100)		2565 (21400)
LTE Band 7: 15 MHz		2507.5 (20825)	2535 (21100)		2562.5 (21375)
LTE Band 7: 20 MHz		2510 (20850)	2535 (21100)		2560 (21350)
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 38: 5 MHz		2572.5 (37775)	2596 (38000)		2617.5 (38225)
LTE Band 38: 10 MHz		2575 (37800)	2596 (38000)		2615 (38200)
LTE Band 38: 15 MHz		2577.5 (37825)	2596 (38000)		2612.5 (38175)
LTE Band 38: 20 MHz		2580 (37850)	2596 (38000)		2610 (38150)
UE Category	DL UE Cat 16 (QPSK, 16QAM, 64QAM, 256QAM), UL UE Cat 5 (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 Carrier Aggregation Possible Combinations	The technical description includes all the possible carrier aggregation combinations				
LTE Additional Information	This device does not support full CA features on 3GPP Release 13. It supports carrier aggregation feature as shown in Section 9. All other uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC unless otherwise specified. The following LTE Release 13 Features are not supported: Relay, HetNet, Enhanced 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.

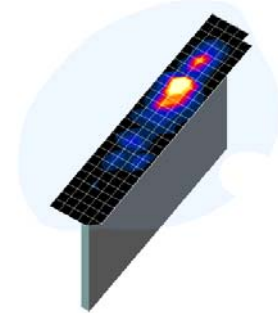


Figure 4-1
Sample SAR Area
Scan

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 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

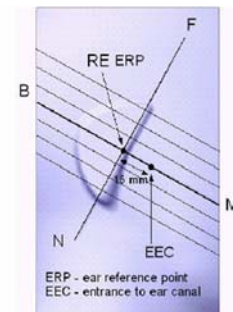


Figure 5-1
Close-Up Side view
of ERP

5.2 HANDSET REFERENCE POINTS

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



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

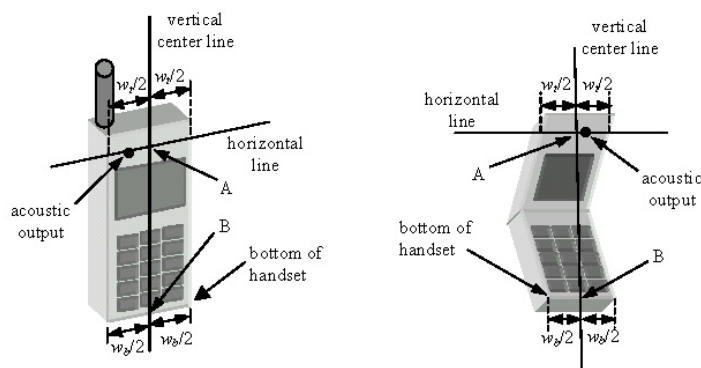


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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6 TEST CONFIGURATION POSITIONS

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.

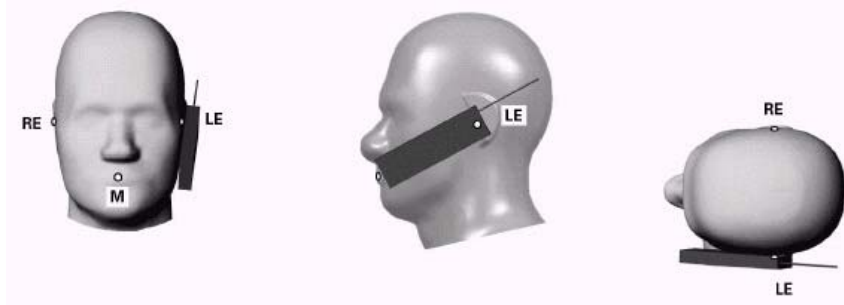


Figure 6-1 Front, Side and Top View of Cheek Position

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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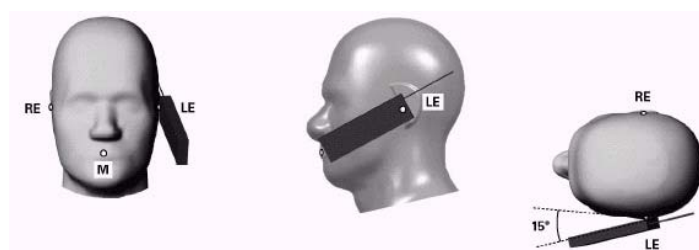


Figure 6-2 Front, Side and Top View of Ear/15° Tilt Position

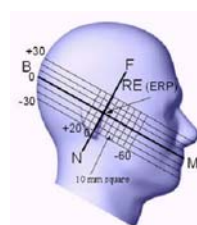


Figure 6-3 Side view w/ relevant markings

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.

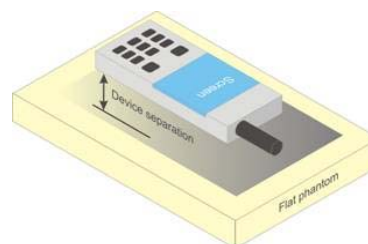


Figure 6-4 Sample Body-Worn Diagram

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.

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6.8 Phablet Configurations

For smart phones with a display diagonal dimension > 150 mm or an overall diagonal dimension > 160 mm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04v01r03 should be applied to evaluate SAR compliance. A device marketed as phablets, regardless of form factors and operating characteristics must be tested as a phablet to determine SAR compliance. In addition to the normally required head and body-worn accessory SAR test procedures required for handsets, the UMPC mini-tablet procedures must also be applied to test the SAR of all surfaces and edges with an antenna ≤ 25 mm from that surface or edge, in direct contact with the phantom, for 10g SAR. The UMPC mini-tablet 1g SAR at 5 mm is not required. When hotspot mode applies, 10g SAR is required only for the surfaces and edges with hotspot mode 1g SAR > 1.2 W/kg.

6.9 Additional Test Positions due to Proximity Conditions

This device uses a sensor to reduce voice and data powers in extremity (hand-held) use conditions.

When the sensor detects a user is touching the device on or near to the antenna the device reduces the maximum allowed output power. However, the proximity sensor is not active when the device is moved beyond the sensor triggering distance and the maximum output power is no longer limited. Therefore, an additional exposure condition is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a non-reduced output power level.

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

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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.

8.4.6 SAR Measurement Conditions for DC-HSDPA

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

8.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 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).

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8.5.1 Spectrum Plots for RB Configurations

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

8.5.2 MPR

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

8.5.3 A-MPR

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

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 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.

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.

8.5.6 Downlink Only Carrier Aggregation

Conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink

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carrier aggregation is inactive on the PCC. For every supported combination of downlink only carrier aggregation, additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band. Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

8.6 SAR Testing with 802.11 Transmitters

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

8.6.1 General Device Setup

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

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

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

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

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

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

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8.6.4 Initial Test Position Procedure

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

8.6.5 2.4 GHz SAR Test Requirements

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

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

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

8.6.6 OFDM Transmission Mode and SAR Test Channel Selection

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

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

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result is ≤ 1.2 W/kg or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 8.6.6). When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.8 Subsequent Test Configuration Procedures

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

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

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	32.98	33.18	31.31	29.41	28.23	26.90	24.55	23.40	22.35
	190	33.05	33.26	31.32	29.45	28.28	27.15	24.60	23.68	22.43
	251	33.06	33.18	31.33	29.47	28.19	26.98	24.76	23.37	22.46
GSM 1900	512	29.93	30.08	27.06	25.76	24.05	25.40	22.97	21.76	20.68
	661	30.08	30.10	27.32	26.16	24.39	25.62	23.67	22.08	21.15
	810	30.04	30.04	27.20	26.07	24.66	25.88	23.82	22.48	21.22

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	23.95	24.15	25.29	25.15	25.22	17.87	18.53	19.14	19.34
	190	24.02	24.23	25.30	25.19	25.27	18.12	18.58	19.42	19.42
	251	24.03	24.15	25.31	25.21	25.18	17.95	18.74	19.11	19.45
GSM 1900	512	20.90	21.05	21.04	21.50	21.04	16.37	16.95	17.50	17.67
	661	21.05	21.07	21.30	21.90	21.38	16.59	17.65	17.82	18.14
	810	21.01	21.01	21.18	21.81	21.65	16.85	17.80	18.22	18.21

GSM 850	Frame Avg.Targets:	23.97	23.97	24.98	25.24	25.49	18.47	19.48	19.74	19.99
GSM 1900		20.97	20.97	20.98	21.74	21.49	16.97	17.98	18.24	17.99

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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

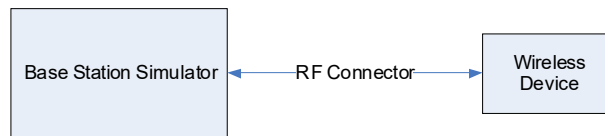


Figure 9-1
Power Measurement Setup

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9.2 UMTS Conducted Powers

Table 9-1
Maximum Conducted Power

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	24.61	24.33	24.19	23.20	22.73	23.14	22.94	23.47	23.49	-
99		12.2 kbps AMR	24.58	24.29	24.23	23.29	22.74	23.19	22.95	23.49	23.50	-
6	HSDPA	Subtest 1	23.09	22.98	23.00	23.26	22.78	23.23	23.03	23.50	23.34	0
6		Subtest 2	22.57	22.39	22.42	23.33	22.69	23.20	22.51	22.95	23.13	0
6		Subtest 3	21.99	21.92	21.88	22.37	21.76	22.22	21.98	22.46	22.60	0.5
6		Subtest 4	21.57	21.53	21.56	22.45	21.78	22.26	21.49	21.95	22.13	0.5
6	HSUPA	Subtest 1	22.06	22.01	22.00	21.84	21.31	21.72	22.21	22.48	22.62	0
6		Subtest 2	20.07	20.04	20.03	20.93	20.25	20.80	21.03	21.49	21.60	2
6		Subtest 3	21.04	21.01	21.00	21.90	21.33	21.72	22.00	22.35	22.63	1
6		Subtest 4	20.13	20.04	20.02	20.90	20.23	20.78	21.04	21.47	21.61	2
6		Subtest 5	23.10	23.00	22.97	23.40	22.81	23.24	23.11	23.49	23.50	0
8	DC-HSDPA	Subtest 1	23.12	22.81	23.06	23.35	22.86	22.99	23.00	23.48	23.50	0
8		Subtest 2	22.90	22.61	22.52	23.34	22.85	23.01	22.70	23.22	23.39	0
8		Subtest 3	21.12	21.10	21.00	21.83	21.38	21.55	21.26	21.70	21.86	0.5
8		Subtest 4	21.63	21.65	21.54	22.20	21.85	22.07	21.74	22.27	22.41	0.5

Table 9-2
Reduced Conducted Power

3GPP Release Version	Mode	3GPP 34.121 Subtest	AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	20.38	19.84	20.32	20.13	20.55	20.76	-
99		12.2 kbps AMR	20.44	19.86	20.31	20.18	20.70	20.78	-
6	HSDPA	Subtest 1	20.39	19.80	20.24	20.19	20.74	20.80	0
6		Subtest 2	20.33	19.75	20.18	20.18	20.71	20.77	0
6		Subtest 3	20.35	19.84	20.19	20.17	20.67	20.77	0.5
6		Subtest 4	20.35	19.77	20.19	20.19	20.71	20.78	0.5
6	HSUPA	Subtest 1	19.46	18.84	19.31	19.18	19.65	19.69	0
6		Subtest 2	19.46	18.90	19.32	19.20	19.67	19.72	2
6		Subtest 3	19.50	18.84	19.35	19.22	19.69	19.75	1
6		Subtest 4	19.47	18.86	19.33	20.10	20.59	20.64	2
6		Subtest 5	20.40	19.80	20.23	20.12	20.64	20.71	0
8	DC-HSDPA	Subtest 1	20.39	19.88	20.00	20.34	20.90	20.93	0
8		Subtest 2	20.38	19.87	19.98	20.33	20.85	20.94	0
8		Subtest 3	20.34	19.85	20.01	20.34	20.87	20.94	0.5
8		Subtest 4	20.34	19.84	20.01	20.34	20.88	20.92	0.5

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DC-HSDPA considerations

- 3GPP Specification 34.121-1 Release 8 Ver 8.10.0 was used for DC-HSDPA guidance
- H-Set 12 (QPSK) was confirmed to be used during DC-HSDPA measurements
- The DUT supports UE category 24 for HSDPA

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



Figure 9-2
Power Measurement Setup

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9.3 LTE Conducted Powers

9.3.1 LTE Band 12

Table 9-3
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	22.67	0	0
	1	25	22.86		0
	1	49	22.89		0
	25	0	21.80	0-1	1
	25	12	21.90		1
	25	25	21.89		1
	50	0	21.87		1
16QAM	1	0	21.89	0-1	1
	1	25	21.98		1
	1	49	22.04		1
	25	0	20.82	0-2	2
	25	12	20.90		2
	25	25	20.86		2
	50	0	20.87		2
64QAM	1	0	20.93	0-2	2
	1	25	21.02		2
	1	49	21.03		2
	25	0	19.87	0-3	3
	25	12	19.93		3
	25	25	19.88		3
	50	0	19.91		3

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

Table 9-4
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	22.49	22.58	22.55	0	0
	1	12	22.01	22.49	22.36		0
	1	24	22.60	22.80	22.67		0
	12	0	21.62	21.78	21.59	0-1	1
	12	6	21.58	21.72	21.60		1
	12	13	21.60	21.71	21.57		1
	25	0	21.57	21.66	21.55		1
16QAM	1	0	21.73	21.90	21.78	0-1	1
	1	12	21.27	21.29	21.21		1
	1	24	21.91	21.88	21.89		1
	12	0	20.64	20.83	20.64	0-2	2
	12	6	20.59	20.77	20.61		2
	12	13	20.60	20.76	20.62		2
	25	0	20.55	20.71	20.58		2
64QAM	1	0	20.79	21.21	20.83	0-2	2
	1	12	20.80	20.90	20.90		2
	1	24	20.97	21.12	20.99		2
	12	0	19.86	20.11	19.94	0-3	3
	12	6	19.88	20.10	19.95		3
	12	13	19.87	20.06	19.91		3
	25	0	19.84	20.04	19.89		3

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Table 9-5
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	22.57	22.70	22.73	0	0	
	1	7	22.15	22.56	22.01		0	
	1	14	22.66	22.78	22.57		0	
	8	0	21.62	21.72	21.63	0-1	1	
	8	4	21.53	21.70	21.61		1	
	8	7	21.65	21.66	21.70		1	
16QAM	15	0	21.58	21.76	21.66	0-1	1	
	1	0	21.94	22.03	21.90		0-1	1
	1	7	21.01	21.85	21.52			1
	1	14	22.01	22.10	21.85	0-2		1
	8	0	20.62	20.80	20.71		2	
	8	4	20.63	20.81	20.72		2	
64QAM	8	7	20.61	20.74	20.71	0-2	2	
	15	0	20.66	20.72	20.69		2	
	1	0	20.84	21.03	20.95		0-2	2
	1	7	20.69	20.85	20.67	2		
	1	14	20.82	20.94	20.84	0-3		2
	8	0	19.80	20.01	19.85		3	
8	4	19.86	20.04	19.89	3			
64QAM	8	7	19.83	20.00	19.90	0-3	3	
	15	0	19.80	19.92	19.81		3	

Table 9-6
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	22.73	22.82	22.85	0	0
	1	2	22.68	22.42	22.64		0
	1	5	22.58	22.72	22.73		0
	3	0	22.62	22.58	22.59		0
	3	2	22.66	22.51	22.57		0
	3	3	22.48	22.73	22.61		0
	6	0	21.63	21.76	21.59	0-1	1
16QAM	1	0	21.94	22.15	22.00	0-1	1
	1	2	21.83	22.04	21.73		1
	1	5	21.81	21.86	21.84		1
	3	0	21.50	21.73	21.65		1
	3	2	21.32	21.74	21.49		1
	3	3	21.46	21.72	21.68		1
	6	0	20.56	20.73	20.73	0-2	2
64QAM	1	0	20.76	20.92	20.88	0-2	2
	1	2	20.87	21.11	20.94		2
	1	5	20.83	20.93	20.90		2
	3	0	20.80	21.07	20.93		2
	3	2	20.79	20.95	20.83		2
	3	3	20.78	20.99	20.85		2
	6	0	19.75	19.91	19.80	0-3	3

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9.3.2

LTE Band 13

Table 9-7
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	22.59	0	0
	1	25	22.74		0
	1	49	22.76		0
	25	0	21.75	0-1	1
	25	12	21.80		1
	25	25	21.78		1
	50	0	21.77		1
16QAM	1	0	21.93	0-1	1
	1	25	21.87		1
	1	49	22.04		1
	25	0	20.75	0-2	2
	25	12	20.81		2
	25	25	20.78		2
	50	0	20.76		2
64QAM	1	0	20.93	0-2	2
	1	25	20.90		2
	1	49	21.06		2
	25	0	19.77	0-3	3
	25	12	19.80		3
	25	25	19.79		3
	50	0	19.80		3

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Table 9-8
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	22.57	0	0
	1	12	22.56		0
	1	24	22.68		0
	12	0	21.75	0-1	1
	12	6	21.67		1
	12	13	21.68		1
	25	0	21.65		1
16QAM	1	0	21.84	0-1	1
	1	12	21.94		1
	1	24	22.10		1
	12	0	20.74	0-2	2
	12	6	20.71		2
	12	13	20.68		2
	25	0	20.70		2
64QAM	1	0	20.72	0-2	2
	1	12	20.75		2
	1	24	20.82		2
	12	0	19.80	0-3	3
	12	6	19.77		3
	12	13	19.78		3
	25	0	19.76		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 26 (Cell)

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

LTE Band 26 (Cell) 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26865 (831.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	22.61	0	0
	1	36	22.75		0
	1	74	22.71		0
	36	0	21.74	0-1	1
	36	18	21.79		1
	36	37	21.74		1
	75	0	21.78		1
16QAM	1	0	21.93	0-1	1
	1	36	22.04		1
	1	74	22.06		1
	36	0	20.76	0-2	2
	36	18	20.80		2
	36	37	20.76		2
	75	0	20.81		2
64QAM	1	0	20.93	0-2	2
	1	36	21.04		2
	1	74	21.05		2
	36	0	19.78	0-3	3
	36	18	19.82		3
	36	37	19.79		3
	75	0	19.81		3

Note: LTE Band 26 (Cell) at 15 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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

LTE Band 26 (Cell) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26740 (819.0 MHz)	26865 (831.5 MHz)	26990 (844.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.51	22.62	22.71	0	0
	1	25	22.74	22.82	22.88		0
	1	49	22.68	22.73	22.80		0
	25	0	21.73	21.84	21.92	0-1	1
	25	12	21.81	21.91	21.97		1
	25	25	21.79	21.89	21.94		1
	50	0	21.86	21.93	22.00		1
16QAM	1	0	21.80	22.03	22.11	0-1	1
	1	25	22.07	22.15	22.21		1
	1	49	22.00	22.00	22.22		1
	25	0	20.74	20.84	20.95	0-2	2
	25	12	20.82	20.96	20.96		2
	25	25	20.78	20.93	20.93		2
	50	0	20.84	20.91	20.98		2
64QAM	1	0	20.53	20.89	20.82	0-2	2
	1	25	20.63	20.98	21.01		2
	1	49	20.66	20.94	21.03		2
	25	0	19.70	19.86	19.90	0-3	3
	25	12	19.75	19.88	19.94		3
	25	25	19.77	19.89	19.96		3
	50	0	19.82	19.90	19.97		3

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Table 9-11
LTE Band 26 (Cell) Conducted Powers - 5 MHz Bandwidth

LTE Band 26 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26715 (816.5 MHz)	26865 (831.5 MHz)	27015 (846.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.63	22.86	22.97	0	0
	1	12	22.57	22.64	22.85		0
	1	24	22.68	22.82	22.84		0
	12	0	21.88	21.95	22.02	0-1	1
	12	6	21.87	21.94	22.00		1
	12	13	21.85	21.92	21.97		1
	25	0	21.83	21.90	21.97		1
16QAM	1	0	21.92	21.74	21.94	0-1	1
	1	12	22.07	21.91	22.03		1
	1	24	22.00	21.93	21.84		1
	12	0	20.87	20.94	21.00	0-2	2
	12	6	20.86	20.93	20.99		2
	12	13	20.87	20.97	20.98		2
	25	0	20.79	20.89	20.94		2
64QAM	1	0	20.83	20.85	20.91	0-2	2
	1	12	20.82	20.69	20.79		2
	1	24	20.95	20.96	21.05		2
	12	0	19.85	19.92	20.09	0-3	3
	12	6	19.84	19.98	20.06		3
	12	13	19.82	19.96	20.07		3
	25	0	19.83	19.95	20.03		3

Table 9-12
LTE Band 26 (Cell) Conducted Powers - 3 MHz Bandwidth

LTE Band 26 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26705 (815.5 MHz)	26865 (831.5 MHz)	27025 (847.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.61	22.73	22.81	0	0
	1	7	22.48	22.53	22.67		0
	1	14	22.64	22.71	22.86		0
	8	0	21.82	21.90	21.97	0-1	1
	8	4	21.83	21.91	21.98		1
	8	7	21.81	21.89	21.96		1
	15	0	21.80	21.90	21.97		1
16QAM	1	0	22.04	22.19	22.17	0-1	1
	1	7	22.06	22.13	22.12		1
	1	14	22.07	22.09	22.02		1
	8	0	20.75	20.93	21.00	0-2	2
	8	4	20.77	20.90	21.02		2
	8	7	20.80	20.96	21.06		2
	15	0	20.77	20.85	20.96		2
64QAM	1	0	20.72	20.90	21.09	0-2	2
	1	7	20.70	20.53	20.81		2
	1	14	20.66	20.78	20.93		2
	8	0	19.82	19.83	19.93	0-3	3
	8	4	19.85	19.90	20.00		3
	8	7	19.83	19.84	19.97		3
	15	0	19.80	19.80	19.95		3

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Table 9-13
LTE Band 26 (Cell) Conducted Powers -1.4 MHz Bandwidth

LTE Band 26 (Cell) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26697 (814.7 MHz)	26865 (831.5 MHz)	27033 (848.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.74	22.79	22.88	0	0
	1	2	22.92	22.95	22.91		0
	1	5	22.71	22.73	22.82		0
	3	0	22.73	22.89	22.93		0
	3	2	22.89	22.99	22.95		0
	3	3	22.62	22.79	22.80		0
	6	0	21.76	21.85	21.81	0-1	1
16QAM	1	0	21.85	21.98	22.00	0-1	1
	1	2	21.47	21.61	21.78		1
	1	5	21.86	21.88	21.96		1
	3	0	21.83	21.91	21.99		1
	3	2	21.93	21.93	22.08		1
	3	3	21.87	21.91	22.03		1
	6	0	20.83	20.93	21.00	0-2	2
64QAM	1	0	20.95	20.85	20.90	0-2	2
	1	2	20.79	20.73	20.87		2
	1	5	20.91	20.89	20.94		2
	3	0	20.88	21.03	21.03		2
	3	2	20.89	20.94	20.95		2
	3	3	20.85	20.91	20.97		2
	6	0	19.81	19.92	19.97	0-3	3

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LTE Band 5 (Cell)

Table 9-14
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	23.34	0	0
	1	25	23.45		0
	1	49	23.43		0
	25	0	22.47	0-1	1
	25	12	22.53		1
	25	25	22.50		1
	50	0	22.52		1
16QAM	1	0	22.56	0-1	1
	1	25	22.54		1
	1	49	22.61		1
	25	0	21.46	0-2	2
	25	12	21.51		2
	25	25	21.50		2
	50	0	21.51		2
64QAM	1	0	21.58	0-2	2
	1	25	21.53		2
	1	49	21.61		2
	25	0	20.46	0-3	3
	25	12	20.53		3
	25	25	20.49		3
	50	0	20.52		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 9-15
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	23.45	23.33	23.46	0	0
	1	12	23.05	23.00	23.17		0
	1	24	23.56	23.46	23.57		0
	12	0	22.49	22.48	22.64	0-1	1
	12	6	22.46	22.43	22.53		1
	12	13	22.45	22.42	22.54		1
16QAM	25	0	22.47	22.43	22.53	0-1	1
	1	0	22.65	22.56	22.70		1
	1	12	22.40	22.00	22.05		1
	1	24	22.77	22.73	22.62	0-2	1
	12	0	21.48	21.54	21.61		2
	12	6	21.45	21.53	21.56		2
64QAM	12	13	21.44	21.51	21.57	0-2	2
	25	0	21.49	21.49	21.52		2
	1	0	21.48	21.70	21.69		0-2
	1	12	21.51	21.21	21.65	2	
	1	24	21.69	21.90	21.80	2	
	64QAM	12	0	20.62	20.40	20.73	0-3
12		6	20.68	20.38	20.76	3	
12		13	20.66	20.45	20.74	3	
25		0	20.60	20.42	20.77		3

Table 9-16
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	23.53	23.56	23.52	0	0
	1	7	23.00	23.52	23.27		0
	1	14	23.48	23.58	23.59		0
	8	0	22.46	22.56	22.56	0-1	1
	8	4	22.42	22.57	22.53		1
	8	7	22.53	22.50	22.60		1
16QAM	15	0	22.45	22.64	22.53	0-1	1
	1	0	22.96	22.57	22.80		1
	1	7	22.52	22.68	22.36		1
	1	14	22.77	22.74	22.83	0-2	1
	8	0	21.62	21.54	21.59		2
	8	4	21.61	21.56	21.63		2
64QAM	8	7	21.60	21.55	21.62	0-2	2
	15	0	21.53	21.53	21.59		2
	1	0	21.55	21.66	21.77	0-2	2
	1	7	21.27	21.44	21.41		2
	1	14	21.56	21.52	21.72		2
	64QAM	8	0	20.57	20.62	20.71	0-3
8		4	20.62	20.70	20.77	3	
8		7	20.59	20.68	20.74	3	
15		0	20.57	20.62	20.65	3	

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Table 9-17
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	23.59	23.73	23.65	0	0
	1	2	23.33	23.58	23.51		0
	1	5	23.50	23.64	23.49		0
	3	0	23.33	23.49	23.54		0
	3	2	23.30	23.44	23.58		0
	3	3	23.45	23.45	23.43		0
	6	0	22.54	22.52	22.53	0-1	1
16QAM	1	0	22.91	22.81	22.94	0-1	1
	1	2	22.86	22.50	22.68		1
	1	5	22.70	22.66	22.86		1
	3	0	22.47	22.49	22.53		1
	3	2	22.45	22.40	22.37		1
	3	3	22.51	22.51	22.44		1
	6	0	21.53	21.56	21.60	0-2	2
64QAM	1	0	21.43	21.85	21.77	0-2	2
	1	2	21.48	21.84	21.80		2
	1	5	21.47	21.80	21.79		2
	3	0	21.62	21.77	21.80		2
	3	2	21.56	21.70	21.68		2
	3	3	21.48	21.67	21.61		2
	6	0	20.65	20.61	20.60	0-3	3

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LTE Band 66 (AWS)

Table 9-18
LTE Band 66 (AWS) Conducted Powers - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.64	22.54	22.66	0	0
	1	50	22.84	22.69	22.78		0
	1	99	22.81	22.70	22.71		0
	50	0	21.70	21.64	21.67	0-1	1
	50	25	21.81	21.74	21.75		1
	50	50	21.69	21.63	21.70		1
	100	0	21.76	21.69	21.80		1
16QAM	1	0	21.88	21.82	21.97	0-1	1
	1	50	21.79	21.61	21.61		1
	1	99	22.10	21.98	21.92		1
	50	0	20.72	20.63	20.66	0-2	2
	50	25	20.80	20.70	20.74		2
	50	50	20.77	20.66	20.69		2
	100	0	20.87	20.76	20.83		2
64QAM	1	0	20.88	20.79	20.95	0-2	2
	1	50	20.91	20.70	20.73		2
	1	99	21.10	20.98	20.85		2
	50	0	19.76	19.64	19.69	0-3	3
	50	25	19.84	19.71	19.76		3
	50	50	19.80	19.66	19.70		3
	100	0	19.87	19.76	19.83		3

Table 9-19
LTE Band 66 (AWS) Conducted Powers - 15 MHz Bandwidth

LTE Band 66 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132047 (1717.5 MHz)	132322 (1745.0 MHz)	132597 (1772.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.61	22.51	22.41	0	0
	1	36	22.77	22.73	22.58		0
	1	74	22.67	22.65	22.47		0
	36	0	21.80	21.74	21.57	0-1	1
	36	18	21.83	21.76	21.58		1
	36	37	21.76	21.70	21.53		1
	75	0	21.86	21.78	21.59		1
16QAM	1	0	21.76	21.77	21.67	0-1	1
	1	36	22.10	22.11	21.83		1
	1	74	21.95	21.94	21.74		1
	36	0	20.78	20.80	20.53	0-2	2
	36	18	20.84	20.82	20.55		2
	36	37	20.78	20.76	20.49		2
	75	0	20.87	20.80	20.60		2
64QAM	1	0	20.76	20.94	20.76	0-2	2
	1	36	21.09	21.24	20.82		2
	1	74	21.00	21.11	20.74		2
	36	0	19.89	19.81	19.58	0-3	3
	36	18	19.95	19.85	19.59		3
	36	37	19.91	19.74	19.54		3
	75	0	19.92	19.82	19.64		3

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Table 9-20
LTE Band 66 (AWS) Conducted Powers - 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132022 (1715.0 MHz)	132322 (1745.0 MHz)	132622 (1775.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.58	22.29	22.29	0	0
	1	25	22.78	22.61	22.45		0
	1	49	22.67	22.49	22.30		0
	25	0	21.78	21.50	21.41	0-1	1
	25	12	21.84	21.55	21.45		1
	25	25	21.81	21.51	21.41		1
	50	0	21.79	21.54	21.47		1
16QAM	1	0	21.76	21.49	21.46	0-1	1
	1	25	21.73	21.43	21.51		1
	1	49	22.06	21.63	21.35		1
	25	0	20.85	20.52	20.43	0-2	2
	25	12	20.94	20.61	20.47		2
	25	25	20.93	20.59	20.44		2
	50	0	20.85	20.58	20.46		2
64QAM	1	0	20.88	20.57	20.44	0-2	2
	1	25	21.02	20.52	20.64		2
	1	49	21.04	20.50	20.65		2
	25	0	19.83	19.49	19.45	0-3	3
	25	12	19.93	19.56	19.50		3
	25	25	19.94	19.55	19.46		3
	50	0	19.82	19.56	19.47		3

Table 9-21
LTE Band 66 (AWS) Conducted Powers - 5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131997 (1712.5 MHz)	132322 (1745.0 MHz)	132647 (1777.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.64	22.29	22.25	0	0
	1	12	22.63	22.22	22.21		0
	1	24	22.70	22.31	22.25		0
	12	0	21.90	21.57	21.47	0-1	1
	12	6	21.91	21.55	21.46		1
	12	13	21.86	21.52	21.41		1
	25	0	21.87	21.54	21.43		1
16QAM	1	0	21.94	21.34	21.63	0-1	1
	1	12	21.96	21.71	21.73		1
	1	24	22.05	21.70	21.76		1
	12	0	20.90	20.51	20.47	0-2	2
	12	6	20.86	20.54	20.43		2
	12	13	20.87	20.52	20.44		2
	25	0	20.85	20.48	20.46		2
64QAM	1	0	20.72	20.49	20.60	0-2	2
	1	12	20.58	20.44	20.52		2
	1	24	20.76	20.63	20.63		2
	12	0	19.89	19.56	19.59	0-3	3
	12	6	19.88	19.60	19.56		3
	12	13	19.83	19.57	19.51		3
	25	0	19.90	19.58	19.49		3

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Table 9-22
LTE Band 66 (AWS) Conducted Powers - 3 MHz Bandwidth

LTE Band 66 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131987 (1711.5 MHz)	132322 (1745.0 MHz)	132657 (1778.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.63	22.44	22.29	0	0
	1	7	22.52	22.25	22.13		0
	1	14	22.60	22.36	22.24		0
	8	0	21.77	21.48	21.36	0-1	1
	8	4	21.72	21.44	21.31		1
	8	7	21.73	21.48	21.34		1
	15	0	21.70	21.42	21.27		1
16QAM	1	0	21.99	21.50	21.43	0-1	1
	1	7	22.03	21.35	21.50		1
	1	14	21.93	21.16	21.63		1
	8	0	20.78	20.43	20.36	0-2	2
	8	4	20.81	20.52	20.45		2
	8	7	20.80	20.50	20.42		2
	15	0	20.71	20.37	20.32		2
64QAM	1	0	20.92	20.45	20.50	0-2	2
	1	7	20.60	20.48	20.35		2
	1	14	20.84	20.57	20.46		2
	8	0	19.81	19.48	19.35	0-3	3
	8	4	19.80	19.54	19.44		3
	8	7	19.83	19.48	19.36		3
	15	0	19.74	19.38	19.31		3

Table 9-23
LTE Band 66 (AWS) Conducted Powers -1.4 MHz Bandwidth

LTE Band 66 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131979 (1710.7 MHz)	132322 (1745.0 MHz)	132665 (1779.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.60	22.43	22.32	0	0
	1	2	22.77	22.53	22.43		0
	1	5	22.59	22.24	22.24		0
	3	0	22.79	22.46	22.44		0
	3	2	22.73	22.49	22.43		0
	3	3	22.66	22.36	22.29		0
	6	0	21.64	21.37	21.27	0-1	1
16QAM	1	0	21.88	21.54	21.45	0-1	1
	1	2	21.83	21.49	21.50		1
	1	5	21.90	21.57	21.49		1
	3	0	21.90	21.34	21.56		1
	3	2	21.86	21.38	21.53		1
	3	3	21.85	21.40	21.54		1
	6	0	20.76	20.41	20.43	0-2	2
64QAM	1	0	20.84	20.33	20.59	0-2	2
	1	2	20.86	20.52	20.63		2
	1	5	20.82	20.47	20.57		2
	3	0	21.02	20.59	20.56		2
	3	2	20.92	20.47	20.49		2
	3	3	20.85	20.60	20.44		2
	6	0	19.87	19.47	19.49	0-3	3

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Table 9-24
LTE Band 66 (AWS) Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.94	19.91	20.01	0	0
	1	50	20.13	20.02	20.11		0
	1	99	20.10	20.01	20.03		0
	50	0	19.94	19.87	19.90	0-1	0
	50	25	19.99	19.96	20.10		0
	50	50	19.94	19.90	19.95		0
	100	0	20.07	20.01	20.09		0
16QAM	1	0	20.18	20.15	20.35	0-1	0
	1	50	20.31	20.17	20.21		0
	1	99	20.38	20.33	20.29		0
	50	0	19.99	19.90	19.95	0-2	0
	50	25	20.08	19.99	20.03		0
	50	50	20.02	19.95	19.98		0
	100	0	20.12	20.04	20.13		0
64QAM	1	0	20.25	20.18	20.27	0-2	0
	1	50	20.42	20.20	20.18		0
	1	99	20.44	20.33	20.17		0
	50	0	20.00	19.93	19.97	0-3	0
	50	25	20.08	20.02	20.05		0
	50	50	20.04	19.97	19.98		0
	100	0	20.13	20.04	20.14		0

Table 9-25
LTE Band 66 (AWS) Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 66 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132047 (1717.5 MHz)	132322 (1745.0 MHz)	132597 (1772.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.99	19.85	19.82	0	0
	1	36	20.12	19.96	19.95		0
	1	74	20.10	19.98	19.93		0
	36	0	20.14	19.89	19.92	0-1	0
	36	18	20.15	19.91	19.93		0
	36	37	20.07	19.86	19.87		0
	75	0	20.18	19.94	19.95		0
16QAM	1	0	19.93	20.05	20.19	0-1	0
	1	36	20.16	20.17	20.25		0
	1	74	20.23	20.30	20.27		0
	36	0	20.18	19.93	19.95	0-2	0
	36	18	20.19	19.98	19.96		0
	36	37	20.16	19.94	19.90		0
	75	0	20.25	19.95	20.02		0
64QAM	1	0	20.23	20.03	20.26	0-2	0
	1	36	20.42	20.21	20.27		0
	1	74	20.50	20.30	20.31		0
	36	0	20.17	19.95	19.96	0-3	0
	36	18	20.23	19.98	19.95		0
	36	37	20.19	19.95	19.91		0
	75	0	20.23	19.99	19.98		0

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Table 9-26
LTE Band 66 (AWS) Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132022 (1715.0 MHz)	132322 (1745.0 MHz)	132622 (1775.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.07	19.77	19.75	0	0
	1	25	20.18	19.87	19.83		0
	1	49	20.14	19.87	19.77		0
	25	0	20.19	19.88	19.82	0-1	0
	25	12	20.26	19.95	19.87		0
	25	25	20.25	19.93	19.84		0
	50	0	20.17	19.90	19.83		0
16QAM	1	0	20.33	19.99	20.04	0-1	0
	1	25	20.41	20.03	19.92		0
	1	49	20.50	20.19	20.11		0
	25	0	20.25	19.92	19.83	0-2	0
	25	12	20.34	19.99	19.86		0
	25	25	20.33	19.98	19.87		0
	50	0	20.24	19.93	19.86		0
64QAM	1	0	20.33	19.87	19.96	0-2	0
	1	25	20.41	19.93	20.02		0
	1	49	20.46	19.95	20.04		0
	25	0	20.25	19.89	19.83	0-3	0
	25	12	20.33	19.95	19.88		0
	25	25	20.34	19.94	19.85		0
	50	0	20.22	19.92	19.87		0

Table 9-27
LTE Band 66 (AWS) Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131997 (1712.5 MHz)	132322 (1745.0 MHz)	132647 (1777.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.12	19.81	19.73	0	0
	1	12	19.96	19.63	19.55		0
	1	24	20.21	19.80	19.74		0
	12	0	20.29	19.94	19.85	0-1	0
	12	6	20.30	19.93	19.86		0
	12	13	20.24	19.90	19.80		0
	25	0	20.27	19.93	19.83		0
16QAM	1	0	20.42	19.80	20.08	0-1	0
	1	12	20.39	19.91	20.05		0
	1	24	20.47	20.00	20.16		0
	12	0	20.32	19.92	19.87	0-2	0
	12	6	20.26	19.86	19.83		0
	12	13	20.29	19.85	19.87		0
	25	0	20.25	19.88	19.89		0
64QAM	1	0	20.39	20.06	20.05	0-2	0
	1	12	20.35	20.01	19.82		0
	1	24	20.50	20.18	20.13		0
	12	0	20.32	19.98	19.90	0-3	0
	12	6	20.29	19.93	19.89		0
	12	13	20.27	19.91	19.89		0
	25	0	20.28	19.99	19.85		0

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Table 9-28
LTE Band 66 (AWS) Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 66 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131987 (1711.5 MHz)	132322 (1745.0 MHz)	132657 (1778.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.21	19.83	19.68	0	0
	1	7	19.99	19.61	19.48		0
	1	14	20.20	19.85	19.64		0
	8	0	20.24	19.93	19.77	0-1	0
	8	4	20.17	19.88	19.78		0
	8	7	20.21	19.90	19.73		0
	15	0	20.18	19.85	19.72		0
16QAM	1	0	20.50	20.05	20.00	0-1	0
	1	7	20.34	19.96	19.91		0
	1	14	20.40	20.03	19.99		0
	8	0	20.26	19.95	19.79	0-2	0
	8	4	20.33	19.96	19.82		0
	8	7	20.36	20.01	19.83		0
	15	0	20.15	19.78	19.67		0
64QAM	1	0	20.50	20.12	19.96	0-2	0
	1	7	20.39	19.96	19.78		0
	1	14	20.43	19.99	19.90		0
	8	0	20.25	19.92	19.79	0-3	0
	8	4	20.31	19.98	19.78		0
	8	7	20.26	19.91	19.82		0
	15	0	20.14	19.83	19.72		0

Table 9-29
LTE Band 66 (AWS) Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 66 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131979 (1710.7 MHz)	132322 (1745.0 MHz)	132665 (1779.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.15	19.81	19.83	0	0
	1	2	20.17	19.82	19.77		0
	1	5	20.19	19.78	19.76		0
	3	0	20.23	19.96	19.85		0
	3	2	20.26	19.94	19.83		0
	3	3	20.20	19.87	19.72		0
	6	0	20.17	19.83	19.70		0-1
16QAM	1	0	20.50	20.04	20.08	0-1	0
	1	2	20.33	20.14	19.97		0
	1	5	20.39	20.26	20.06		0
	3	0	20.31	20.01	19.89		0
	3	2	20.30	19.99	19.86		0
	3	3	20.31	20.01	19.88		0
	6	0	20.25	19.90	19.90	0-2	0
64QAM	1	0	20.47	20.01	19.97	0-2	0
	1	2	20.36	19.88	20.02		0
	1	5	20.48	20.04	20.17		0
	3	0	20.37	20.11	20.04		0
	3	2	20.31	20.07	20.05		0
	3	3	20.30	20.03	19.99		0
	6	0	20.21	19.98	19.90	0-3	0

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LTE Band 25 (PCS)

Table 9-30
LTE Band 25 (PCS) Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26140 (1860.0 MHz)	26365 (1882.5 MHz)	26590 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.71	23.05	23.22	0	0
	1	50	22.83	23.14	23.41		0
	1	99	22.86	23.26	23.34		0
	50	0	21.82	22.16	22.36	0-1	1
	50	25	21.90	22.30	22.45		1
	50	50	21.83	22.26	22.43		1
	100	0	21.88	22.29	22.44		1
16QAM	1	0	21.94	22.28	22.40	0-1	1
	1	50	21.86	22.50	22.39		1
	1	99	22.07	22.44	22.50		1
	50	0	20.79	21.15	21.36	0-2	2
	50	25	20.88	21.26	21.45		2
	50	50	20.84	21.25	21.42		2
	100	0	20.85	21.27	21.47		2
64QAM	1	0	20.92	21.30	21.42	0-2	2
	1	50	20.98	21.36	21.43		2
	1	99	21.07	21.40	21.50		2
	50	0	19.78	20.15	20.34	0-3	3
	50	25	19.88	20.25	20.44		3
	50	50	19.83	20.24	20.41		3
	100	0	19.85	20.27	20.47		3

Table 9-31
LTE Band 25 (PCS) Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26115 (1857.5 MHz)	26365 (1882.5 MHz)	26615 (1907.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.63	23.12	23.14	0	0
	1	36	22.71	23.14	23.34		0
	1	74	22.72	23.17	23.32		0
	36	0	21.72	22.23	22.29	0-1	1
	36	18	21.75	22.26	22.31		1
	36	37	21.72	22.27	22.29		1
	75	0	21.77	22.29	22.34		1
16QAM	1	0	21.79	22.11	22.32	0-1	1
	1	36	21.83	22.24	22.43		1
	1	74	21.89	22.30	22.39		1
	36	0	20.66	21.18	21.25	0-2	2
	36	18	20.70	21.22	21.29		2
	36	37	20.63	21.17	21.24		2
	75	0	20.72	21.23	21.32		2
64QAM	1	0	20.73	21.40	21.15	0-2	2
	1	36	20.77	21.48	21.38		2
	1	74	20.88	21.49	21.50		2
	36	0	19.68	20.19	20.28	0-3	3
	36	18	19.74	20.24	20.32		3
	36	37	19.71	20.22	20.27		3
	75	0	19.75	20.21	20.33		3

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Table 9-32
LTE Band 25 (PCS) Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26090 (1855.0 MHz)	26365 (1882.5 MHz)	26640 (1910.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.64	23.07	23.16	0	0
	1	25	22.72	23.24	23.29		0
	1	49	22.71	23.23	23.26		0
	25	0	21.64	22.17	22.25	0-1	1
	25	12	21.67	22.23	22.31		1
	25	25	21.66	22.22	22.29		1
	50	0	21.71	22.25	22.32		1
16QAM	1	0	21.80	22.15	22.48	0-1	1
	1	25	21.28	22.08	22.17		1
	1	49	21.49	22.25	22.32		1
	25	0	20.61	21.17	21.30	0-2	2
	25	12	20.63	21.21	21.34		2
	25	25	20.58	21.20	21.32		2
	50	0	20.66	21.22	21.28		2
64QAM	1	0	20.86	21.27	21.31	0-2	2
	1	25	20.76	21.18	21.20		2
	1	49	20.79	21.40	21.38		2
	25	0	19.64	20.17	20.28	0-3	3
	25	12	19.68	20.22	20.33		3
	25	25	19.61	20.21	20.31		3
	50	0	19.72	20.20	20.29		3

Table 9-33
LTE Band 25 (PCS) Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26065 (1852.5 MHz)	26365 (1882.5 MHz)	26665 (1912.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.68	23.04	23.26	0	0
	1	12	22.53	22.94	23.19		0
	1	24	22.65	23.08	23.32		0
	12	0	21.79	22.23	22.43	0-1	1
	12	6	21.77	22.22	22.38		1
	12	13	21.74	22.20	22.39		1
	25	0	21.73	22.19	22.39		1
16QAM	1	0	22.07	22.44	22.47	0-1	1
	1	12	21.92	22.43	22.41		1
	1	24	21.96	22.49	22.50		1
	12	0	20.82	21.14	21.49	0-2	2
	12	6	20.81	21.19	21.47		2
	12	13	20.79	21.18	21.48		2
	25	0	20.76	21.12	21.39		2
64QAM	1	0	21.08	21.18	21.42	0-2	2
	1	12	20.85	21.09	21.20		2
	1	24	21.07	21.29	21.37		2
	12	0	19.86	20.24	20.47	0-3	3
	12	6	19.82	20.21	20.45		3
	12	13	19.79	20.20	20.44		3
	25	0	19.76	20.18	20.43		3

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Table 9-34
LTE Band 25 (PCS) Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26055 (1851.5 MHz)	26365 (1882.5 MHz)	26675 (1913.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.71	23.09	23.14	0	0
	1	7	22.49	22.93	22.98		0
	1	14	22.68	23.13	23.13		0
	8	0	21.71	22.22	22.25	0-1	1
	8	4	21.72	22.16	22.21		1
	8	7	21.73	22.21	22.22		1
	15	0	21.73	22.20	22.19		1
16QAM	1	0	22.09	22.41	22.38	0-1	1
	1	7	22.01	22.19	22.22		1
	1	14	22.06	22.24	22.36		1
	8	0	20.86	21.27	21.25	0-2	2
	8	4	20.90	21.33	21.28		2
	8	7	20.87	21.26	21.26		2
	15	0	20.73	21.19	21.27		2
64QAM	1	0	21.07	21.43	21.40	0-2	2
	1	7	20.91	21.18	21.02		2
	1	14	21.01	21.33	21.23		2
	8	0	19.71	20.14	20.20	0-3	3
	8	4	19.74	20.19	20.23		3
	8	7	19.81	20.18	20.26		3
	15	0	19.77	20.21	20.21		3

Table 9-35
LTE Band 25 (PCS) Conducted Powers -1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26047 (1850.7 MHz)	26365 (1882.5 MHz)	26683 (1914.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.52	23.16		0	0
	1	2	22.54	23.15	23.21		0
	1	5	22.47	23.08	23.15		0
	3	0	22.62	23.15	23.24		0
	3	2	22.67	23.17	23.23		0
	3	3	22.48	23.13	23.16		0
	6	0	21.60	22.12	22.20	0-1	1
16QAM	1	0	21.57	22.36	22.50	0-1	1
	1	2	21.36	22.24	22.38		1
	1	5	21.58	22.39	22.48		1
	3	0	21.53	22.34	22.29		1
	3	2	21.63	22.41	22.30		1
	3	3	21.59	22.30	22.30		1
	6	0	20.63	21.27	21.21	0-2	2
64QAM	1	0	20.82	21.50	21.32	0-2	2
	1	2	20.67	21.46	21.27		2
	1	5	20.72	21.49	21.42		2
	3	0	20.67	21.36	21.31		2
	3	2	20.56	21.29	21.25		2
	3	3	20.62	21.31	21.19		2
	6	0	19.64	20.32	20.36	0-3	3

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Table 9-36
LTE Band 25 (PCS) Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26140 (1860.0 MHz)	26365 (1882.5 MHz)	26590 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.89	20.31	20.37	0	0
	1	50	20.05	20.47	20.57		0
	1	99	20.00	20.50	20.55		0
	50	0	19.97	20.32	20.41	0-1	0
	50	25	20.03	20.44	20.57		0
	50	50	19.98	20.42	20.50		0
	100	0	20.03	20.46	20.52		0
16QAM	1	0	20.06	20.49	20.58	0-1	0
	1	50	19.89	20.29	20.40		0
	1	99	20.20	20.62	20.70		0
	50	0	19.94	20.30	20.43	0-2	0
	50	25	20.01	20.39	20.52		0
	50	50	19.99	20.38	20.51		0
	100	0	20.02	20.40	20.58		0
64QAM	1	0	20.14	20.38	20.59	0-2	0
	1	50	19.98	20.34	20.61		0
	1	99	20.22	20.53	20.70		0
	50	0	19.95	20.29	20.46	0-3	0.5
	50	25	20.03	20.41	20.42		0.5
	50	50	19.98	20.38	20.39		0.5
	100	0	20.02	20.41	20.45		0.5

Table 9-37
LTE Band 25 (PCS) Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26115 (1857.5 MHz)	26365 (1882.5 MHz)	26615 (1907.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.63	20.00	20.17	0	0
	1	36	19.68	20.11	20.26		0
	1	74	19.72	20.15	20.25		0
	36	0	19.66	20.13	20.29	0-1	0
	36	18	19.71	20.19	20.29		0
	36	37	19.66	20.20	20.30		0
	75	0	19.72	20.25	20.32		0
16QAM	1	0	19.83	20.21	20.19	0-1	0
	1	36	19.89	20.24	20.29		0
	1	74	19.97	20.36	20.28		0
	36	0	19.65	20.11	20.32	0-2	0
	36	18	19.67	20.17	20.34		0
	36	37	19.66	20.16	20.29		0
	75	0	19.69	20.24	20.32		0
64QAM	1	0	19.91	20.28	20.62	0-2	0
	1	36	19.78	20.31	20.72		0
	1	74	19.86	20.40	20.77		0
	36	0	19.68	20.20	20.30	0-3	0.5
	36	18	19.71	20.24	20.34		0.5
	36	37	19.68	20.22	20.29		0.5
	75	0	19.68	20.21	20.31		0.5

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Table 9-38
LTE Band 25 (PCS) Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26090 (1855.0 MHz)	26365 (1882.5 MHz)	26640 (1910.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.59	20.15	20.15	0	0
	1	25	19.64	20.29	20.31		0
	1	49	19.63	20.27	20.28		0
	25	0	19.64	20.19	20.31	0-1	0
	25	12	19.70	20.24	20.33		0
	25	25	19.70	20.25	20.33		0
	50	0	19.72	20.26	20.31		0
16QAM	1	0	19.84	20.42	20.33	0-1	0
	1	25	19.73	20.12	20.00		0
	1	49	19.82	20.45	20.35		0
	25	0	19.69	20.19	20.32	0-2	0
	25	12	19.72	20.25	20.39		0
	25	25	19.70	20.24	20.34		0
	50	0	19.74	20.26	20.32		0
64QAM	1	0	19.78	20.31	20.28	0-2	0
	1	25	19.69	20.27	20.29		0
	1	49	19.70	20.38	20.33		0
	25	0	19.65	20.21	20.39	0-3	0.5
	25	12	19.69	20.23	20.43		0.5
	25	25	19.65	20.24	20.41		0.5
	50	0	19.73	20.27	20.39		0.5

Table 9-39
LTE Band 25 (PCS) Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26065 (1852.5 MHz)	26365 (1882.5 MHz)	26665 (1912.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.69	20.13	20.30	0	0
	1	12	19.57	20.01	20.15		0
	1	24	19.76	20.22	20.33		0
	12	0	19.87	20.28	20.50	0-1	0
	12	6	19.86	20.27	20.47		0
	12	13	19.83	20.25	20.43		0
	25	0	19.83	20.26	20.45		0
16QAM	1	0	19.63	20.41	20.35	0-1	0
	1	12	19.70	20.56	20.34		0
	1	24	19.69	20.60	20.40		0
	12	0	19.89	20.32	20.48	0-2	0
	12	6	19.87	20.31	20.43		0
	12	13	19.87	20.28	20.45		0
	25	0	19.80	20.22	20.47		0
64QAM	1	0	19.80	20.29	20.56	0-2	0
	1	12	19.65	20.18	20.28		0
	1	24	19.74	20.29	20.50		0
	12	0	19.90	20.27	20.45	0-3	0.5
	12	6	19.88	20.29	20.43		0.5
	12	13	19.84	20.27	20.44		0.5
	25	0	19.84	20.27	20.49		0.5

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Table 9-40
LTE Band 25 (PCS) Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26055 (1851.5 MHz)	26365 (1882.5 MHz)	26675 (1913.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.73	20.19	20.23	0	0
	1	7	19.56	20.02	20.06		0
	1	14	19.73	20.20	20.23		0
	8	0	19.82	20.27	20.28	0-1	0
	8	4	19.79	20.23	20.21		0
	8	7	19.80	20.26	20.27		0
	15	0	19.79	20.26	20.24		0
16QAM	1	0	19.78	20.37	20.56	0-1	0
	1	7	19.71	20.50	20.43		0
	1	14	19.70	20.34	20.48		0
	8	0	19.82	20.40	20.21	0-2	0
	8	4	19.76	20.34	20.20		0
	8	7	19.80	20.41	20.29		0
	15	0	19.76	20.21	20.26		0
64QAM	1	0	19.96	20.60	20.65	0-2	0
	1	7	19.73	20.44	20.47		0
	1	14	19.82	20.55	20.52		0
	8	0	19.84	20.29	20.31	0-3	0.5
	8	4	19.86	20.34	20.34		0.5
	8	7	19.85	20.31	20.39		0.5
	15	0	19.80	20.27	20.32		0.5

Table 9-41
LTE Band 25 (PCS) Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26047 (1850.7 MHz)	26365 (1882.5 MHz)	26683 (1914.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	19.63	20.13	20.17	0	0
	1	2	19.65	20.15	20.20		0
	1	5	19.59	20.12	20.14		0
	3	0	19.69	20.20	20.33		0
	3	2	19.70	20.23	20.30		0
	3	3	19.61	20.21	20.19		0
	6	0	19.61	20.25	20.21	0-1	0
16QAM	1	0	19.93	20.33	20.12	0-1	0
	1	2	19.74	20.31	19.98		0
	1	5	20.05	20.52	20.10		0
	3	0	19.86	20.33	20.24		0
	3	2	19.83	20.31	20.20		0
	3	3	19.75	20.28	20.09		0
	6	0	19.77	20.17	20.29	0-2	0
64QAM	1	0	19.79	20.20	20.44	0-2	0
	1	2	19.80	20.30	20.45		0
	1	5	19.95	20.37	20.41		0
	3	0	19.87	20.49	20.43		0
	3	2	19.79	20.26	20.44		0
	3	3	19.75	20.34	20.41		0
	6	0	19.74	20.28	20.28	0-3	0.5

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LTE Band 7

Table 9-42
LTE Band 7 Conducted Powers - 20 MHz Bandwidth

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20850 (2510.0 MHz)	21100 (2535.0 MHz)	21350 (2560.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.01	23.09	23.13	0	0
	1	50	23.09	23.40	23.30		0
	1	99	23.05	23.55	23.11		0
	50	0	22.06	22.26	22.27	0-1	1
	50	25	22.12	22.44	22.37		1
	50	50	22.04	22.51	22.30		1
16QAM	100	0	22.20	22.50	22.47	0-1	1
	1	0	22.23	22.39	22.40		1
	1	50	22.11	22.42	22.22		1
	1	99	22.35	22.69	22.33	0-2	1
	50	0	21.07	21.30	21.25		2
	50	25	21.13	21.45	21.33		2
64QAM	50	50	21.08	21.50	21.25	0-2	2
	100	0	21.19	21.53	21.41		2
	1	0	21.31	21.46	21.45		0-2
	1	50	21.15	21.45	21.32	2	
	1	99	21.38	21.77	21.38	2	
	50	0	20.10	20.31	20.29	0-3	3
50	25	20.15	20.46	20.34	3		
50	50	20.09	20.51	20.26	3		
	100	0	20.23	20.55	20.42		3

Table 9-43
LTE Band 7 Conducted Powers - 15 MHz Bandwidth

LTE Band 7 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20825 (2507.5 MHz)	21100 (2535.0 MHz)	21375 (2562.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.92	23.09	23.13	0	0
	1	36	22.99	23.29	23.19		0
	1	74	22.89	23.43	23.11		0
	36	0	22.14	22.38	22.33	0-1	1
	36	18	22.12	22.46	22.32		1
	36	37	22.06	22.51	22.26		1
	75	0	22.18	22.52	22.37		1
16QAM	1	0	22.07	22.48	22.48	0-1	1
	1	36	22.18	22.66	22.49		1
	1	74	22.12	22.77	22.55		1
	36	0	21.13	21.45	21.36	0-2	2
	36	18	21.16	21.53	21.34		2
	36	37	21.09	21.52	21.24		2
	75	0	21.18	21.51	21.38		2
64QAM	1	0	21.26	21.37	21.40	0-2	2
	1	36	21.37	21.64	21.42		2
	1	74	21.32	21.84	21.35		2
	36	0	20.17	20.46	20.36	0-3	3
	36	18	20.16	20.51	20.34		3
	36	37	20.08	20.49	20.30		3
	75	0	20.17	20.48	20.33		3

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Table 9-44
LTE Band 7 Conducted Powers - 10 MHz Bandwidth

LTE Band 7 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20800 (2505.0 MHz)	21100 (2535.0 MHz)	21400 (2565.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.85	23.07	23.08	0	0
	1	25	22.98	23.26	23.17		0
	1	49	22.95	23.31	23.06		0
	25	0	22.07	22.35	22.23	0-1	1
	25	12	22.10	22.42	22.26		1
	25	25	22.03	22.43	22.21		1
16QAM	50	0	22.04	22.42	22.24		1
	1	0	21.86	22.47	22.35	0-1	1
	1	25	21.91	22.42	22.16		1
	1	49	22.08	22.68	22.32		1
	25	0	21.09	21.40	21.25	0-2	2
	25	12	21.12	21.49	21.32		2
	25	25	21.02	21.54	21.27		2
64QAM	50	0	21.06	21.42	21.24		2
	1	0	21.01	21.62	21.31	0-2	2
	1	25	20.99	21.76	21.34		2
	1	49	20.95	21.77	21.44		2
	25	0	20.16	20.46	20.28	0-3	3
	25	12	20.17	20.48	20.30		3
	25	25	20.10	20.47	20.27		3
	50	0	20.09	20.47	20.26		3

Table 9-45
LTE Band 7 Conducted Powers - 5 MHz Bandwidth

LTE Band 7 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20775 (2502.5 MHz)	21100 (2535.0 MHz)	21425 (2567.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	22.95	23.25	23.06	0	0
	1	12	22.91	23.24	23.02		0
	1	24	22.97	23.35	23.07		0
	12	0	22.16	22.40	22.36	0-1	1
	12	6	22.12	22.42	22.35		1
	12	13	22.06	22.41	22.30		1
16QAM	25	0	22.12	22.39	22.31		1
	1	0	22.32	22.34	22.33	0-1	1
	1	12	22.26	22.32	22.29		1
	1	24	22.31	22.42	22.38		1
	12	0	21.27	21.44	21.43	0-2	2
	12	6	21.22	21.46	21.39		2
12	13	21.17	21.46	21.34	2		
64QAM	25	0	21.15	21.38	21.36		2
	1	0	21.17	21.24	21.54	0-2	2
	1	12	21.05	21.61	21.44		2
	1	24	21.14	21.65	21.56		2
	12	0	20.20	20.51	20.43	0-3	3
	12	6	20.18	20.48	20.35		3
12	13	20.15	20.50	20.30	3		
	25	0	20.19	20.51	20.33		3

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Table 9-46
LTE Band 7 Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20850 (2510.0 MHz)	21100 (2535.0 MHz)	21350 (2560.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.64	20.64	20.75	0	0
	1	50	20.68	20.95	20.89		0
	1	99	20.61	21.10	20.82		0
	50	0	19.07	19.19	19.30	0-1	1
	50	25	19.13	19.37	19.39		1
	50	50	19.04	19.40	19.29		1
	100	0	19.15	19.39	19.38		1
16QAM	1	0	19.11	19.21	19.31	0-1	1
	1	50	18.92	19.25	19.17		1
	1	99	19.02	19.59	19.36		1
	50	0	18.02	18.16	18.25	0-2	2
	50	25	18.06	18.32	18.32		2
	50	50	17.99	18.36	18.23		2
	100	0	18.11	18.35	18.34		2
64QAM	1	0	18.22	18.19	18.33	0-2	2
	1	50	17.87	18.22	18.19		2
	1	99	18.08	18.62	18.43		2
	50	0	17.02	17.12	17.24	0-3	3
	50	25	17.06	17.30	17.31		3
	50	50	16.97	17.33	17.23		3
	100	0	17.08	17.32	17.35		3

Table 9-47
LTE Band 7 Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 7 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20825 (2507.5 MHz)	21100 (2535.0 MHz)	21375 (2562.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.77	20.63	20.94	0	0
	1	36	20.67	20.89	20.97		0
	1	74	20.57	21.02	20.89		0
	36	0	19.16	19.27	19.49	0-1	1
	36	18	19.15	19.35	19.48		1
	36	37	19.07	19.39	19.39		1
	75	0	19.15	19.36	19.48		1
16QAM	1	0	19.43	19.44	19.47	0-1	1
	1	36	19.24	19.51	19.59		1
	1	74	19.19	19.90	19.62		1
	36	0	18.08	18.23	18.45	0-2	2
	36	18	18.06	18.32	18.44		2
	36	37	17.99	18.35	18.36		2
	75	0	18.08	18.32	18.43		2
64QAM	1	0	18.28	18.27	18.45	0-2	2
	1	36	18.23	18.47	18.42		2
	1	74	18.20	18.68	18.46		2
	36	0	17.14	17.23	17.41	0-3	3
	36	18	17.12	17.36	17.40		3
	36	37	17.03	17.39	17.38		3
	75	0	17.05	17.31	17.42		3

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Table 9-48
LTE Band 7 Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 7 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20800 (2505.0 MHz)	21100 (2535.0 MHz)	21400 (2565.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.64	20.71	20.73	0	0
	1	25	20.72	20.92	20.80		0
	1	49	20.60	20.97	20.67		0
	25	0	19.04	19.26	19.19	0-1	1
	25	12	19.03	19.34	19.22		1
	25	25	18.98	19.36	19.17		1
	50	0	19.05	19.40	19.25		1
16QAM	1	0	18.86	19.48	19.43	0-1	1
	1	25	18.79	19.51	19.31		1
	1	49	18.87	19.67	19.35		1
	25	0	17.95	18.18	18.16	0-2	2
	25	12	17.97	18.28	18.17		2
	25	25	17.90	18.30	18.12		2
	50	0	18.01	18.39	18.25		2
64QAM	1	0	18.03	18.47	18.27	0-2	2
	1	25	18.16	18.63	18.29		2
	1	49	18.11	18.69	18.20		2
	25	0	17.08	17.26	17.17	0-3	3
	25	12	17.11	17.33	17.19		3
	25	25	17.04	17.35	17.14		3
	50	0	17.03	17.36	17.24		3

Table 9-49
LTE Band 7 Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 7 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20775 (2502.5 MHz)	21100 (2535.0 MHz)	21425 (2567.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.53	20.71	20.71	0	0
	1	12	20.36	20.59	20.56		0
	1	24	20.50	20.83	20.72		0
	12	0	19.11	19.34	19.29	0-1	1
	12	6	19.08	19.31	19.27		1
	12	13	19.05	19.33	19.21		1
	25	0	19.09	19.28	19.21		1
16QAM	1	0	18.92	19.32	19.29	0-1	1
	1	12	18.94	19.40	19.31		1
	1	24	18.93	19.44	19.29		1
	12	0	18.10	18.29	18.24	0-2	2
	12	6	18.07	18.25	18.23		2
	12	13	18.03	18.25	18.19		2
	25	0	18.00	18.20	18.13		2
64QAM	1	0	18.04	18.16	18.23	0-2	2
	1	12	18.02	18.15	18.26		2
	1	24	18.08	18.57	18.33		2
	12	0	16.99	17.28	17.22	0-3	3
	12	6	16.96	17.30	17.23		3
	12	13	17.02	17.31	17.20		3
	25	0	16.99	17.22	17.16		3

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9.3.8

LTE Band 41

Table 9-50
LTE Band 41 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	23.14	23.79	23.66	23.17	23.05	0	0
	1	50	22.94	23.59	23.41	22.85	22.74		0
	1	99	23.34	24.00	23.73	23.16	23.05		0
	50	0	22.28	22.90	22.74	22.22	22.07	0-1	1
	50	25	22.42	23.00	22.86	22.27	22.15		1
	50	50	22.41	22.99	22.80	22.18	22.10		1
	100	0	22.43	22.98	22.85	22.25	22.21		1
16QAM	1	0	22.18	22.86	22.71	22.21	22.10	0-1	1
	1	50	21.97	22.86	22.65	21.94	21.82		1
	1	99	22.38	23.00	22.92	22.26	22.15		1
	50	0	21.29	21.90	21.77	21.24	21.12	0-2	2
	50	25	21.43	21.99	21.88	21.29	21.19		2
	50	50	21.41	21.98	21.86	21.23	21.14		2
	100	0	21.46	22.00	21.93	21.34	21.27		2
64QAM	1	0	21.19	21.79	21.65	20.92	21.04	0-2	2
	1	50	20.98	21.72	21.55	20.73	20.75		2
	1	99	21.44	21.96	21.89	20.99	21.13		2
	50	0	20.27	20.89	20.74	20.16	20.10	0-3	3
	50	25	20.40	20.92	20.84	20.23	20.17		3
	50	50	20.39	20.94	20.82	20.16	20.14		3
	100	0	20.43	21.00	20.88	20.25	20.15		3

Table 9-51
LTE Band 41 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	23.26	23.87	23.71	23.17	23.16	0	0
	1	36	23.39	24.00	23.85	23.23	23.23		0
	1	74	23.34	23.97	23.79	23.08	23.16		0
	36	0	22.33	22.96	22.83	22.24	22.18	0-1	1
	36	18	22.36	22.97	22.82	22.22	22.19		1
	36	37	22.33	22.93	22.77	22.15	22.14		1
	75	0	22.38	23.00	22.85	22.24	22.22		1
16QAM	1	0	22.48	23.00	22.82	22.35	22.40	0-1	1
	1	36	22.52	22.99	22.93	22.41	22.47		1
	1	74	22.49	22.97	22.92	22.37	22.42		1
	36	0	21.34	21.98	21.83	21.22	21.18	0-2	2
	36	18	21.36	21.97	21.83	21.18	21.18		2
	36	37	21.32	21.93	21.79	21.09	21.14		2
	75	0	21.37	22.00	21.86	21.22	21.21		2
64QAM	1	0	21.24	21.87	21.68	20.97	21.07	0-2	2
	1	36	21.25	21.95	21.77	21.07	21.13		2
	1	74	21.28	21.94	21.73	21.06	21.14		2
	36	0	20.31	20.95	20.81	20.20	20.17	0-3	3
	36	18	20.33	20.94	20.80	20.19	20.17		3
	36	37	20.30	20.91	20.78	20.14	20.13		3
	75	0	20.29	20.95	20.83	20.17	20.17		3

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Table 9-52
LTE Band 41 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	23.29	23.88	23.64	23.15	23.13	0	0
	1	25	22.97	23.57	23.32	22.80	22.87		0
	1	49	23.27	23.92	23.65	23.10	23.12		0
	25	0	22.34	22.95	22.70	22.20	22.18	0-1	1
	25	12	22.37	22.98	22.72	22.22	22.22		1
	25	25	22.35	22.97	22.73	22.20	22.20		1
50	0	22.36	22.96	22.72	22.22	22.18	1		
16QAM	1	0	22.44	22.99	22.75	22.27	22.32	0-1	1
	1	25	22.46	22.99	22.80	22.36	22.36		1
	1	49	22.45	23.00	22.80	22.27	22.34		1
	25	0	21.27	21.90	21.61	21.11	21.13	0-2	2
	25	12	21.34	21.98	21.67	21.13	21.16		2
	25	25	21.32	21.96	21.66	21.13	21.14		2
50	0	21.40	21.98	21.74	21.25	21.22	2		
64QAM	1	0	21.00	21.80	21.59	21.00	21.05	0-2	2
	1	25	20.81	21.57	21.44	20.82	20.91		2
	1	49	21.05	21.85	21.66	21.09	21.06		2
	25	0	20.30	20.93	20.61	20.14	20.14	0-3	3
	25	12	20.31	20.95	20.64	20.14	20.16		3
	25	25	20.29	20.96	20.65	20.12	20.12		3
50	0	20.36	20.94	20.73	20.24	20.18	3		

Table 9-53
LTE Band 41 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	23.27	23.88	23.63	23.13	23.12	0	0
	1	12	23.21	23.77	23.55	23.00	23.04		0
	1	24	23.29	23.91	23.64	23.12	23.14		0
	12	0	22.40	23.00	22.76	22.25	22.25	0-1	1
	12	6	22.38	22.97	22.71	22.20	22.20		1
	12	13	22.37	22.97	22.72	22.19	22.20		1
	25	0	22.38	23.00	22.74	22.21	22.24		1
16QAM	1	0	22.44	23.00	22.87	22.32	22.30	0-1	1
	1	12	21.89	22.61	22.39	21.75	21.80		1
	1	24	22.49	22.99	22.89	22.30	22.35		1
	12	0	21.32	21.96	21.72	21.18	21.22	0-2	2
	12	6	21.30	21.91	21.68	21.13	21.12		2
	12	13	21.29	21.93	21.67	21.14	21.10		2
	25	0	21.34	21.94	21.66	21.14	21.16		2
64QAM	1	0	21.12	21.80	21.45	20.93	20.93	0-2	2
	1	12	20.58	21.40	20.90	20.47	20.55		2
	1	24	21.12	21.89	21.49	20.93	20.98		2
	12	0	20.33	20.94	20.71	20.19	20.18	0-3	3
	12	6	20.32	20.92	20.68	20.17	20.14		3
	12	13	20.29	20.91	20.64	20.13	20.14		3
	25	0	20.37	21.00	20.69	20.16	20.20		3

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Table 9-54
LTE Band 41 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	20.23	20.79	20.62	20.11	20.06	0	0
	1	50	19.96	20.55	20.36	19.77	19.73		0
	1	99	20.45	21.00	20.79	20.15	20.12		0
	50	0	20.29	20.86	20.70	20.19	20.08	0-1	0
	50	25	20.43	20.99	20.81	20.22	20.17		0
	50	50	20.38	20.98	20.75	20.14	20.11		0
	100	0	20.42	20.97	20.82	20.25	20.22		0
16QAM	1	0	20.40	20.79	20.65	20.14	20.19	0-1	0
	1	50	20.05	20.52	20.25	19.78	19.89		0
	1	99	20.55	20.97	20.89	20.28	20.23		0
	50	0	20.27	20.85	20.69	20.16	20.07	0-2	0
	50	25	20.40	20.97	20.79	20.24	20.15		0
	50	50	20.40	20.98	20.77	20.16	20.11		0
	100	0	20.43	21.00	20.84	20.26	20.25		0
64QAM	1	0	20.10	20.72	20.54	20.02	20.04	0-2	0
	1	50	19.98	20.74	20.42	19.95	19.85		0
	1	99	20.34	20.98	20.72	20.12	20.08		0
	50	0	20.24	20.83	20.70	20.14	20.06	0-3	0
	50	25	20.38	20.97	20.79	20.22	20.15		0
	50	50	20.37	20.96	20.75	20.15	20.11		0
	100	0	20.39	21.00	20.81	20.23	20.21		0

Table 9-55
LTE Band 41 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	20.35	20.89	20.66	20.20	20.20	0	0
	1	36	20.49	20.99	20.77	20.25	20.43		0
	1	74	20.42	21.00	20.75	20.18	20.22		0
	36	0	20.42	20.97	20.76	20.32	20.27	0-1	0
	36	18	20.47	20.99	20.77	20.30	20.28		0
	36	37	20.42	20.97	20.74	20.22	20.22		0
	75	0	20.45	21.00	20.79	20.30	20.29		0
16QAM	1	0	20.63	21.00	20.85	20.41	20.37	0-1	0
	1	36	20.62	20.98	20.93	20.47	20.47		0
	1	74	20.66	20.97	20.99	20.50	20.33		0
	36	0	20.41	21.00	20.74	20.27	20.26	0-2	0
	36	18	20.43	20.99	20.74	20.26	20.26		0
	36	37	20.40	20.98	20.71	20.19	20.21		0
	75	0	20.44	21.00	20.77	20.29	20.27		0
64QAM	1	0	20.13	20.97	20.45	20.13	20.00	0-2	0
	1	36	20.20	20.98	20.55	20.16	20.06		0
	1	74	20.28	20.97	20.57	20.15	20.07		0
	36	0	20.41	20.99	20.74	20.28	20.24	0-3	0
	36	18	20.41	21.00	20.75	20.27	20.25		0
	36	37	20.39	20.98	20.72	20.21	20.22		0
	75	0	20.43	20.99	20.77	20.28	20.27		0

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Table 9-56
LTE Band 41 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	20.34	20.92	20.66	20.18	20.17	0	0
	1	25	20.23	20.62	20.42	19.92	19.88		0
	1	49	20.39	20.97	20.70	20.18	20.13		0
	25	0	20.40	20.98	20.74	20.23	20.27	0-1	0
	25	12	20.46	20.99	20.73	20.27	20.21		0
	25	25	20.43	21.00	20.75	20.21	20.24		0
	50	0	20.47	20.97	20.84	20.33	20.29		0
16QAM	1	0	20.58	20.98	20.80	20.37	20.39	0-1	0
	1	25	20.67	20.97	20.97	20.48	20.51		0
	1	49	20.62	21.00	20.85	20.49	20.42		0
	25	0	20.33	20.96	20.66	20.17	20.20	0-2	0
	25	12	20.39	21.00	20.70	20.22	20.19		0
	25	25	20.38	20.98	20.69	20.19	20.22		0
	50	0	20.49	21.00	20.85	20.32	20.31		0
64QAM	1	0	20.07	20.81	20.58	20.01	20.01	0-2	0
	1	25	20.00	20.45	20.16	19.97	19.76		0
	1	49	20.16	20.82	20.49	19.99	19.92		0
	25	0	20.39	20.97	20.70	20.24	20.24	0-3	0
	25	12	20.45	21.00	20.69	20.30	20.23		0
	25	25	20.37	21.00	20.72	20.21	20.23		0
	50	0	20.47	20.96	20.80	20.31	20.29		0

Table 9-57
LTE Band 41 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	20.28	20.90	20.66	20.15	20.17	0	0
	1	12	20.14	20.81	20.52	19.97	20.07		0
	1	24	20.29	20.94	20.64	20.04	20.16		0
	12	0	20.43	20.97	20.80	20.30	20.28	0-1	0
	12	6	20.41	20.99	20.75	20.24	20.25		0
	12	13	20.39	20.98	20.75	20.23	20.23		0
	25	0	20.44	20.99	20.75	20.25	20.26		0
16QAM	1	0	20.58	20.98	20.81	20.28	20.33	0-1	0
	1	12	20.02	20.63	20.39	19.91	19.97		0
	1	24	20.24	20.98	20.91	20.37	20.35		0
	12	0	20.39	21.00	20.73	20.23	20.26	0-2	0
	12	6	20.40	20.99	20.67	20.16	20.11		0
	12	13	20.36	20.96	20.71	20.16	20.12		0
	25	0	20.37	21.00	20.68	20.18	20.19		0
64QAM	1	0	20.07	20.85	20.55	20.02	20.05	0-2	0
	1	12	19.58	20.23	20.04	19.48	19.71		0
	1	24	20.10	20.90	20.55	19.93	20.03		0
	12	0	20.42	20.97	20.73	20.25	20.35	0-3	0
	12	6	20.40	20.99	20.69	20.21	20.19		0
	12	13	20.37	20.98	20.71	20.19	20.18		0
	25	0	20.40	21.00	20.75	20.22	20.25		0

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9.3.9 LTE Carrier Aggregation Conducted Powers

Table 9-58
Two Component Carrier Maximum Conducted Powers

Combination	PCC									SCC				Power	
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Frequency [MHz]	SCC Band	SCC Bandwidth [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA 2A-2A	LTE B2	20	19100	1900	QPSK	1	50	1100	1980	LTE B2	20	700	1940	23.38	23.41
CA 2A-4A (2)	LTE B2	20	19100	1900	QPSK	1	50	1100	1980	LTE B4	20	2175	2132.5	23.25	23.41
CA 2A-12A (1)	LTE B2	20	19100	1900	QPSK	1	50	1100	1980	LTE B12	10	5095	737.5	23.21	23.41
CA 4A-4A	LTE B4	20	20050	1720	QPSK	1	50	2050	2120	LTE B4	20	2300	2145	22.97	22.84
CA 4C	LTE B4	20	20050	1720	QPSK	1	50	2050	2120	LTE B4	20	2248	2139.8	22.94	22.84
CA 2A-4A (2)	LTE B4	20	20050	1720	QPSK	1	50	2050	2120	LTE B2	20	900	1960	22.95	22.84
CA 4A-5A (1)	LTE B4	20	20050	1720	QPSK	1	50	2050	2120	LTE B5	10	2525	881.5	22.93	22.84
CA 4A-12A (2)	LTE B4	20	20050	1720	QPSK	1	50	2050	2120	LTE B12	10	5095	737.5	22.96	22.84
CA 4A-13A	LTE B4	20	20050	1720	QPSK	1	50	2050	2120	LTE B13	10	5230	751	22.94	22.84
CA 4A-17A	LTE B4	10	20000	1715	QPSK	1	25	2000	2115	LTE B17	10	5790	740	22.85	22.78
CA 66A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	67236	2190	22.80	22.84
CA 66B	LTE B66	10	132022	1715	QPSK	1	25	66486	2115	LTE B66	10	66585	2124.9	22.84	22.78
CA 66C	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	66734	2139.8	22.81	22.84
CA 12A-66A (2)	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B12	10	5095	737.5	22.81	22.84
CA 17A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B17	10	5790	740	22.85	22.84
CA 4A-13A	LTE B13	10	23230	782	QPSK	1	49	5230	751	LTE B4	20	2175	2132.5	22.80	22.76
CA 4A-5A (1)	LTE B5	5	20625	846.5	QPSK	1	24	2625	891.5	LTE B4	20	2175	2132.5	23.65	23.57
CA 12A-12A	LTE B12	5	23095	707.5	QPSK	1	24	5095	737.5	LTE B12	5	5035	731.5	22.87	22.80
CA 12B	LTE B12	5	23095	707.5	QPSK	1	24	5095	737.5	LTE B12	5	5047	732.7	22.86	22.80
CA 2A-12A (1)	LTE B12	10	23095	707.5	QPSK	1	49	5095	737.5	LTE B2	20	900	1960	22.90	22.89
CA 41A-41A (1)	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	41490	2680	23.95	24.00
CA 41C (1)	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	23.97	24.00

Table 9-59
Three Component Carrier Maximum Conducted Powers

Combination	PCC									SCC 1				SCC 2				Power	
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Frequency [MHz]	SCC Band	SCC Bandwidth [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	SCC Band	SCC Bandwidth [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	LTE Tx-Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (Power dBm)
CA 4A-12A-12A	LTE B4	20	20050	1720	QPSK	1	50	2050	2120	LTE B12	5	5095	737.5	LTE B12	5	5035	731.5	22.88	22.84
CA 4A-12B	LTE B4	20	20050	1720	QPSK	1	50	2050	2120	LTE B12	5	5095	737.5	LTE B12	5	5047	732.7	22.90	22.84
CA 12A-66A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	67236	2190	LTE B12	10	5095	737.5	22.70	22.84
CA 12A-66B	LTE B66	10	132022	1715	QPSK	1	25	66486	2115	LTE B66	10	66585	2124.9	LTE B12	10	5095	737.5	22.79	22.78
CA 12A-66C	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	66734	2139.8	LTE B12	10	5095	737.5	22.72	22.84
CA 17A-66A-66A	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	67236	2190	LTE B17	10	5790	740	22.69	22.84
CA 17A-66B	LTE B66	10	132022	1715	QPSK	1	25	66486	2115	LTE B66	10	66585	2124.9	LTE B17	10	5790	740	22.78	22.78
CA 17A-66C	LTE B66	20	132072	1720	QPSK	1	50	66536	2120	LTE B66	20	66734	2139.8	LTE B17	10	5790	740	22.70	22.84
CA 41A-41C	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	23.99	24.00
CA 41C-41A	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	41490	2680	24.00	24.00
CA 41D	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	23.93	24.00

Table 9-60
Four Component Carrier Maximum Conducted Powers

Combination	PCC									SCC 1			SCC 2			SCC 3			Power				
	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA 41A-41D	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	41094	2640.4	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	23.98	24.00
CA 41D-41A	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	LTE B41	20	41490	2680	23.99	24.00
CA 41C-41C	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	23.98	24.00
CA 41E	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	LTE B41	20	40779	2608.9	24.00	24.00

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Table 9-61
Two Component Carrier Reduced Conducted Powers

Combination	PCC								SCC				Power		
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Frequency [MHz]	SCC Band	SCC Bandwidth [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_2A-2A	LTE B2	15	19125	1902.5	64QAM	1	74	1125	1982.5	LTE B2	20	700	1940	20.86	20.77
CA_2A-4A (2)	LTE B2	15	19125	1902.5	64QAM	1	74	1125	1982.5	LTE B4	20	2175	2132.5	20.71	20.77
CA_2A-12A (1)	LTE B2	15	19125	1902.5	64QAM	1	74	1125	1982.5	LTE B12	10	5095	737.5	20.85	20.77
CA_4A-4A	LTE B4	15	20025	1717.5	64QAM	1	74	2025	2117.5	LTE B4	20	2300	2145	20.48	20.50
CA_4C	LTE B4	15	20025	1717.5	64QAM	1	74	2025	2117.5	LTE B4	20	2196	2134.6	20.41	20.50
CA_2A-4A (2)	LTE B4	15	20025	1717.5	64QAM	1	74	2025	2117.5	LTE B2	20	900	1960	20.45	20.50
CA_4A-5A (1)	LTE B4	15	20025	1717.5	64QAM	1	74	2025	2117.5	LTE B5	10	2525	881.5	20.50	20.50
CA_4A-12A (2)	LTE B4	15	20025	1717.5	64QAM	1	74	2025	2117.5	LTE B12	10	5095	737.5	20.47	20.50
CA_4A-13A	LTE B4	15	20025	1717.5	64QAM	1	74	2025	2117.5	LTE B13	10	5230	751	20.49	20.50
CA_4A-17A	LTE B4	10	20000	1715	16QAM	1	49	2000	2115	LTE B17	10	5790	740	20.44	20.50
CA_66A-66A	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B66	20	67236	2190	20.43	20.50
CA_66B	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B66	5	66604	2126.8	20.44	20.50
CA_66C	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B66	20	66682	2134.6	20.46	20.50
CA_12A-66A (2)	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B12	10	5095	737.5	20.50	20.50
CA_17A-66A	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B17	10	5790	740	20.49	20.50
CA_41A-41A (1)	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	41490	2680	20.92	21.00
CA_41C (1)	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	20.96	21.00

Table 9-62
Three Component Carrier Reduced Conducted Powers

Combination	PCC								SCC 1				SCC 2				Power		
	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Frequency [MHz]	SCC Band	SCC Bandwidth [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	SCC Band	SCC Bandwidth [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41A-41C	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	20.93	21.00
CA_41C-41A	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	41490	2680	20.92	21.00
CA_41D	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	20.92	21.00
CA_4A-12A-12A	LTE B4	15	20025	1717.5	64QAM	1	74	2025	2117.5	LTE B12	5	5095	737.5	LTE B12	5	5035	731.5	20.33	20.50
CA_4A-12B	LTE B4	15	20025	1717.5	64QAM	1	74	2025	2117.5	LTE B12	5	5095	737.5	LTE B12	5	5047	732.7	20.40	20.50
CA_12A-66A-66A	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B66	20	67236	2190	LTE B12	10	5095	737.5	20.42	20.50
CA_12A-66B	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B66	5	66604	2126.8	LTE B12	10	5095	737.5	20.41	20.50
CA_12A-66C	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B66	20	66682	2134.6	LTE B12	10	5095	737.5	20.38	20.50
CA_17A-66A-66A	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B66	20	67236	2190	LTE B17	10	5790	740	20.42	20.50
CA_17A-66B	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B66	5	66604	2126.8	LTE B17	10	5790	740	20.44	20.50
CA_17A-66C	LTE B66	15	132047	1717.5	64QAM	1	74	66511	2117.5	LTE B66	20	66682	2134.6	LTE B17	10	5790	740	20.43	20.50

Table 9-63
Four Component Carrier Reduced Conducted Powers

	PCC								SCC 1				SCC 2				SCC 3				Power		
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41A-41D	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	41094	2640.4	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	20.96	21.00
CA_41D-41A	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	LTE B41	20	41490	2680	20.95	21.00
CA_41C-41C	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	20.95	21.00
CA_41E	LTE B41	20	40185	2549.5	QPSK	1	99	40185	2549.5	LTE B41	20	40383	2569.3	LTE B41	20	40581	2589.1	LTE B41	20	40779	2608.9	20.92	21.00

Notes:

- The device only supports downlink Carrier Aggregation. Uplink Carrier Aggregation is not supported. For every supported combination of downlink carrier aggregation, power measurements were performed with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.
- All control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
- For downlink carrier aggregation combinations, PCC uplink channel was selected based on section C)3)b)ii) of KBD 941225 D05 V01r02. The downlink PCC channel was paired with the selected PCC uplink channel according to normal configurations without carrier aggregation. For inter-band CA, the SCC downlink channels were selected near the middle of their transmission bands. For contiguous intra-band CA, the downlink channel spacing between the component carriers was set to multiple of 300 kHz less than the nominal channel spacing defined in section 5.4.1A of 3GPP TS 36.521. For non-contiguous intra-band CA, the downlink channel spacing between the component carriers was set to be larger than the nominal channel spacing and provided maximum separation between the component carriers. All

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selected downlink channels remained fully within the downlink transmission band of the respective component carrier.

4. 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.

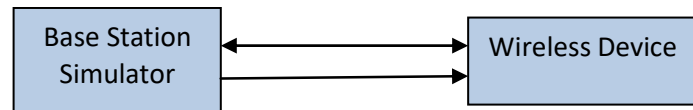


Figure 9-3
Power Measurement Setup

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9.4 WLAN Conducted Powers

Table 9-64
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
2412	1	18.37	14.66	15.47
2437	6	18.48	16.93	16.85
2462	11	19.36	15.36	15.26

Table 9-65
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
2412	1	19.20	15.48	15.11
2437	6	19.06	17.48	16.43
2462	11	19.37	14.74	14.71

Table 9-66
5 GHz WLAN Maximum Average RF Power – Ant 1

5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
5180	36	16.52	16.58	16.51
5200	40	16.54	16.52	16.58
5220	44	16.58	16.53	16.62
5240	48	16.53	16.51	16.67
5260	52	16.57	16.58	16.51
5280	56	16.58	16.64	16.52
5300	60	16.52	16.55	16.53
5320	64	16.51	16.78	16.52
5500	100	16.67	16.67	16.53
5600	120	16.55	16.72	16.76
5620	124	16.64	16.73	16.62
5720	144	16.62	16.53	16.51
5745	149	16.59	16.68	16.53
5785	157	16.54	16.60	16.59
5825	165	16.51	16.58	16.57

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Table 9-67
5 GHz WLAN Maximum Average RF Power – Ant 2

5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
5180	36	17.07	17.02	17.11
5200	40	17.36	17.12	17.21
5220	44	17.34	17.19	17.16
5240	48	17.29	17.24	17.34
5260	52	17.23	17.18	17.02
5280	56	17.37	16.97	17.06
5300	60	17.28	16.94	17.08
5320	64	17.13	17.15	17.17
5500	100	16.76	16.52	16.60
5600	120	16.69	16.54	16.78
5620	124	16.71	16.55	16.52
5720	144	16.56	16.58	16.57
5745	149	16.86	16.81	16.53
5785	157	16.73	16.67	16.75
5825	165	16.91	16.80	16.74

Table 9-68
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
2412	1	12.89	12.82
2437	6	12.65	12.94
2462	11	13.01	13.08

Table 9-69
2.4 GHz WLAN Reduced Average RF Power – Ant 1 (Held-to-ear)

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
2412	1	16.11	14.66	15.47
2437	6	15.60	16.45	16.38
2462	11	16.26	15.36	15.26

Table 9-70
2.4 GHz WLAN Reduced Average RF Power – Ant 2 (Held-to-ear)

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
2412	1	15.65	15.48	15.11
2437	6	15.89	15.55	15.51
2462	11	16.12	14.74	14.71

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Table 9-71
5 GHz WLAN Reduced Average RF Power – Ant 1 (Held-to-ear)

5GHz (80MHz) Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11ac
5210	42	14.26
5290	58	13.97
5530	106	14.37
5610	122	14.38
5690	138	14.19
5775	155	14.06

Table 9-72
5 GHz WLAN Reduced Average RF Power – Ant 2 (Held-to-ear)

5GHz (80MHz) Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode
		802.11ac
5210	42	14.08
5290	58	14.01
5530	106	13.94
5610	122	14.03
5690	138	13.87
5775	155	13.92

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.

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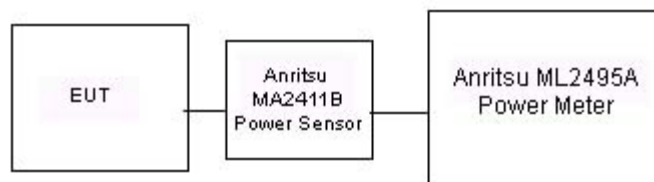


Figure 9-4

Power Measurement Setup for Bandwidths < 50 MHz

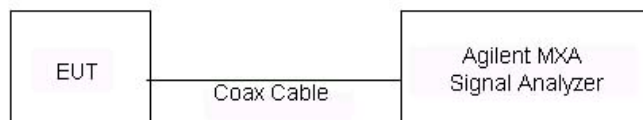


Figure 9-5

Power Measurement Setup for Bandwidths > 50 MHz

9.5 Bluetooth Conducted Powers

Table 9-73
Bluetooth Average RF Power

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	17.22	52.667
2441	1.0	39	17.68	58.561
2480	1.0	78	13.71	23.486
2402	2.0	0	5.88	3.874
2441	2.0	39	6.49	4.459
2480	2.0	78	4.75	2.985
2402	3.0	0	5.44	3.496
2441	3.0	39	5.96	3.945
2480	3.0	78	4.83	3.040

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

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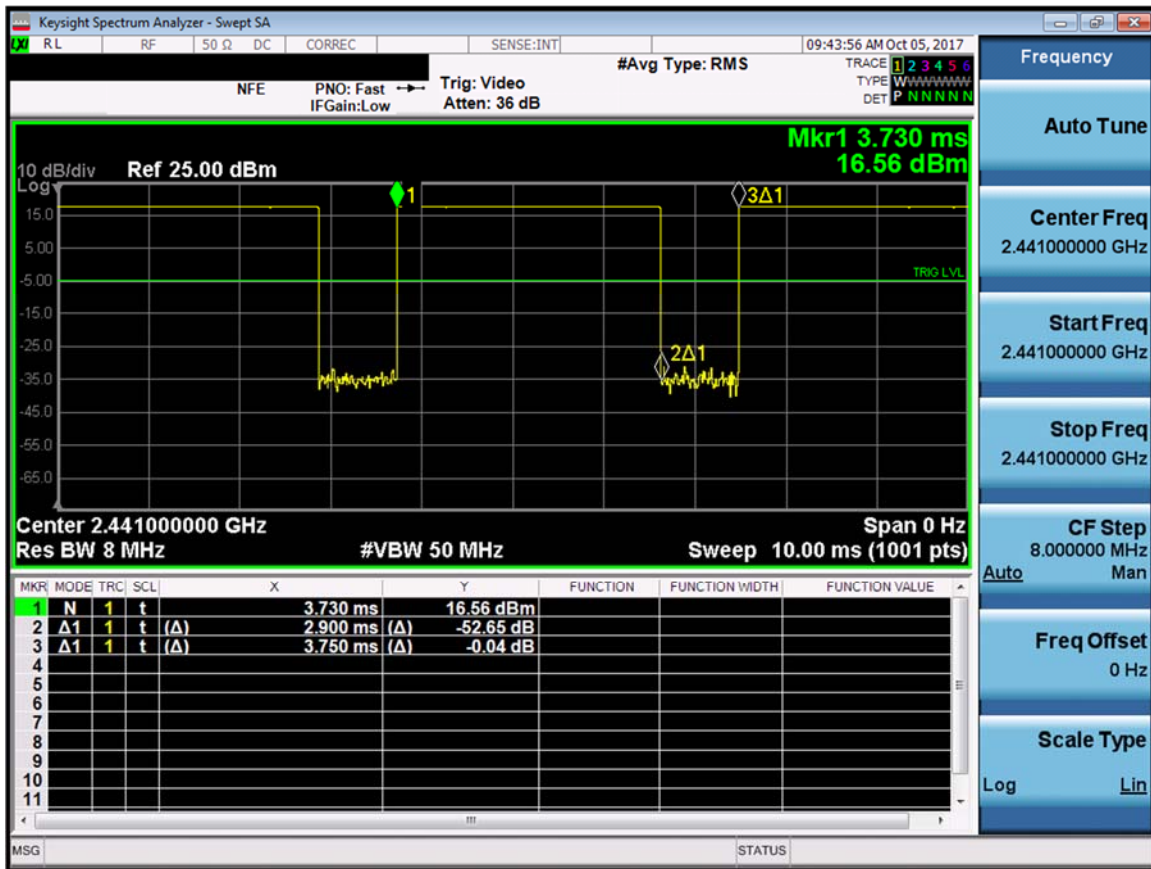


Figure 9-6
Bluetooth Transmission Plot

Equation 9-1
Bluetooth Duty Cycle Calculation

$$\text{Duty Cycle} = \frac{\text{Pulse Width}}{\text{Period}} * 100\% = \frac{2.900\text{ms}}{3.750\text{ms}} * 100\% = 77.3\%$$

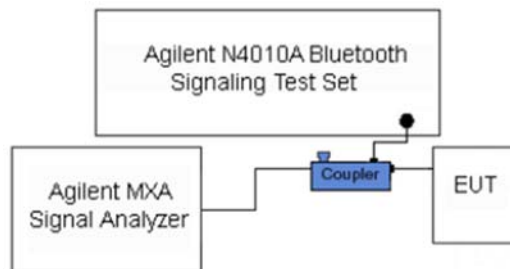


Figure 9-7
Power Measurement Setup

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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
10/18/2017	750H	20.8	700	0.848	42.369	0.889	42.201	-4.61%	0.40%
			710	0.857	42.227	0.890	42.149	-3.71%	0.19%
			740	0.884	41.819	0.893	41.994	-1.01%	-0.42%
			755	0.898	41.596	0.894	41.916	0.45%	-0.76%
			770	0.913	41.377	0.895	41.838	2.01%	-1.10%
			785	0.927	41.172	0.896	41.760	3.46%	-1.41%
10/16/2017	835H	21.2	820	0.883	41.042	0.899	41.578	-1.78%	-1.29%
			835	0.898	40.860	0.900	41.500	-0.22%	-1.54%
			850	0.912	40.678	0.916	41.500	-0.44%	-1.98%
10/19/2017	835H	21.4	820	0.878	41.332	0.899	41.578	-2.34%	-0.59%
			835	0.894	41.162	0.900	41.500	-0.67%	-0.81%
			850	0.909	40.967	0.916	41.500	-0.76%	-1.28%
10/23/2017	1750H	21.0	1710	1.343	39.959	1.348	40.142	-0.37%	-0.46%
			1750	1.384	39.785	1.371	40.079	0.95%	-0.73%
			1790	1.425	39.595	1.394	40.016	2.22%	-1.05%
10/21/2017	1900H	21.6	1850	1.400	39.972	1.400	40.000	0.00%	-0.07%
			1880	1.433	39.831	1.400	40.000	2.36%	-0.42%
			1910	1.467	39.700	1.400	40.000	4.79%	-0.75%
10/26/2017	2450H-2600H	22.9	2400	1.803	39.669	1.756	39.289	2.68%	0.97%
			2450	1.855	39.496	1.800	39.200	3.06%	0.76%
			2500	1.916	39.283	1.855	39.136	3.29%	0.38%
			2550	1.971	39.117	1.909	39.073	3.25%	0.11%
			2600	2.026	38.921	1.964	39.009	3.16%	-0.23%
10/30/2017	2600H	21.9	2500	1.925	38.785	1.855	39.136	3.77%	-0.90%
			2550	1.984	38.605	1.909	39.073	3.93%	-1.20%
			2600	2.038	38.401	1.964	39.009	3.77%	-1.56%
10/25/2017	5250H-5750H	21.2	5240	4.597	35.561	4.696	35.940	-2.11%	-1.05%
			5260	4.614	35.559	4.717	35.917	-2.18%	-1.00%
			5280	4.626	35.522	4.737	35.894	-2.34%	-1.04%
			5300	4.657	35.467	4.758	35.871	-2.12%	-1.13%
			5600	4.960	35.069	5.065	35.529	-2.07%	-1.29%
			5620	4.997	35.018	5.086	35.506	-1.75%	-1.37%
			5745	5.124	34.820	5.214	35.363	-1.73%	-1.54%
			5765	5.152	34.801	5.234	35.340	-1.57%	-1.53%
			5785	5.165	34.775	5.255	35.317	-1.71%	-1.53%

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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
10/25/2017	750B	21.1	700	0.929	56.261	0.959	55.726	-3.13%	0.96%
			710	0.938	56.151	0.960	55.687	-2.29%	0.83%
			740	0.968	55.847	0.963	55.570	0.52%	0.50%
			755	0.982	55.678	0.964	55.512	1.87%	0.30%
			770	0.996	55.514	0.965	55.453	3.21%	0.11%
			785	1.011	55.361	0.966	55.395	4.66%	-0.06%
10/18/2017	835B	21.1	820	0.944	53.087	0.969	55.258	-2.58%	-3.93%
			835	0.959	52.949	0.970	55.200	-1.13%	-4.08%
			850	0.975	52.797	0.988	55.154	-1.32%	-4.27%
10/23/2017	1750B	20.7	1710	1.481	51.583	1.463	53.537	1.23%	-3.65%
			1750	1.526	51.467	1.488	53.432	2.55%	-3.68%
			1790	1.571	51.357	1.514	53.326	3.76%	-3.69%
10/27/2017	1750B	21.3	1710	1.436	51.343	1.463	53.537	-1.85%	-4.10%
			1750	1.482	51.181	1.488	53.432	-0.40%	-4.21%
			1790	1.527	51.086	1.514	53.326	0.86%	-4.20%
10/18/2017	1900B	21.1	1850	1.526	52.394	1.520	53.300	0.39%	-1.70%
			1880	1.560	52.294	1.520	53.300	2.63%	-1.89%
			1910	1.595	52.199	1.520	53.300	4.93%	-2.07%
10/31/2017	1900B	21.2	1850	1.490	53.716	1.520	53.300	-1.97%	0.78%
			1880	1.525	53.644	1.520	53.300	0.33%	0.65%
			1910	1.559	53.544	1.520	53.300	2.57%	0.46%
10/23/2017	2450B-2600B	23.0	2400	1.953	52.131	1.902	52.767	2.68%	-1.21%
			2450	2.022	51.957	1.950	52.700	3.69%	-1.41%
			2500	2.092	51.768	2.021	52.636	3.51%	-1.65%
			2550	2.162	51.573	2.092	52.573	3.35%	-1.90%
			2600	2.234	51.384	2.163	52.509	3.28%	-2.14%
11/1/2017	2450B-2600B	22.3	2400	1.935	52.828	1.902	52.767	1.74%	0.12%
			2450	2.004	52.659	1.950	52.700	2.77%	-0.08%
			2500	2.071	52.460	2.021	52.636	2.47%	-0.33%
			2550	2.144	52.279	2.092	52.573	2.49%	-0.56%
			2600	2.211	52.087	2.163	52.509	2.22%	-0.80%
10/24/2017	5250B-5750B	21.5	5240	5.390	48.574	5.346	48.960	0.82%	-0.79%
			5260	5.421	48.485	5.369	48.933	0.97%	-0.92%
			5280	5.441	48.449	5.393	48.906	0.89%	-0.93%
			5500	5.759	48.023	5.650	48.607	1.93%	-1.20%
			5600	5.910	47.818	5.766	48.471	2.50%	-1.35%
			5745	6.129	47.560	5.936	48.275	3.25%	-1.48%
			5765	6.155	47.505	5.959	48.248	3.29%	-1.54%
			5785	6.183	47.474	5.982	48.220	3.36%	-1.55%
			5805	6.206	47.423	6.006	48.193	3.33%	-1.60%
			5825	6.247	47.383	6.029	48.166	3.62%	-1.63%

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} (%)
G	750	HEAD	10/18/2017	21.3	20.8	0.200	1054	3332	1.550	8.370	7.750	-7.41%
K	835	HEAD	10/16/2017	22.7	21.2	0.200	4d047	7406	1.930	9.130	9.650	5.70%
K	835	HEAD	10/19/2017	22.8	21.4	0.200	4d047	7406	1.870	9.130	9.350	2.41%
J	1750	HEAD	10/23/2017	22.7	21.0	0.100	1150	3209	3.620	36.100	36.200	0.28%
I	1900	HEAD	10/21/2017	20.7	20.7	0.100	5d080	3213	4.100	39.300	41.000	4.33%
G	2450	HEAD	10/26/2017	23.1	22.5	0.100	981	3332	5.450	52.800	54.500	3.22%
G	2600	HEAD	10/26/2017	23.1	22.5	0.100	1126	3332	5.650	56.400	56.500	0.18%
G	2600	HEAD	10/30/2017	21.7	20.7	0.100	1126	3332	6.030	56.400	60.300	6.91%
H	5250	HEAD	10/25/2017	22.8	21.2	0.050	1191	3914	3.840	78.900	76.800	-2.66%
H	5600	HEAD	10/25/2017	22.8	21.2	0.050	1191	3914	4.060	83.600	81.200	-2.87%
H	5750	HEAD	10/25/2017	22.8	21.2	0.050	1191	3914	3.710	79.100	74.200	-6.19%
I	750	BODY	10/25/2017	23.4	21.1	0.200	1003	3213	1.730	8.790	8.650	-1.59%
I	835	BODY	10/18/2017	21.7	21.1	0.200	4d133	3213	1.930	9.410	9.650	2.55%
K	1750	BODY	10/23/2017	22.1	20.7	0.100	1148	7406	3.690	37.000	36.900	-0.27%
J	1900	BODY	10/18/2017	22.3	21.1	0.100	5d080	3209	4.090	39.100	40.900	4.60%
E	2450	BODY	10/23/2017	21.0	22.5	0.100	981	3319	4.940	50.800	49.400	-2.76%
E	2450	BODY	11/01/2017	22.3	22.3	0.100	719	3319	4.840	50.100	48.400	-3.39%
E	2600	BODY	10/23/2017	21.0	22.5	0.100	1064	3319	5.610	54.700	56.100	2.56%
E	2600	BODY	11/01/2017	22.3	22.3	0.100	1064	3319	5.560	54.700	55.600	1.65%
D	5250	BODY	10/24/2017	22.5	21.5	0.050	1237	7308	3.750	76.900	75.000	-2.47%
D	5600	BODY	10/24/2017	22.5	21.5	0.050	1237	7308	3.810	78.500	76.200	-2.93%
D	5750	BODY	10/24/2017	22.5	21.5	0.050	1237	7308	3.540	77.100	70.800	-8.17%

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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} (%)
K	1750	BODY	10/27/2017	22.7	21.3	0.100	1150	7406	2.060	19.500	20.600	5.64%
H	1900	BODY	10/31/2017	22.8	21.2	0.100	5d148	7410	2.250	21.500	22.500	4.65%
E	2450	BODY	11/01/2017	22.3	22.3	0.100	719	3319	2.210	23.700	22.100	-6.75%
E	2600	BODY	11/01/2017	22.3	22.3	0.100	1064	3319	2.440	24.400	24.400	0.00%
D	5250	BODY	10/24/2017	22.5	21.5	0.050	1237	7308	1.050	21.500	21.000	-2.33%
D	5600	BODY	10/24/2017	22.5	21.5	0.050	1237	7308	1.050	22.100	21.000	-4.98%

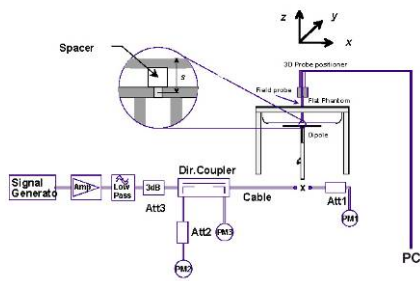


Figure 10-1
System Verification Setup Diagram



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	GSM 850	GSM	33.5	33.05	-0.06	Right	Cheek	04555	1:8.3	0.160	1.109	0.177	A1
836.60	190	GSM 850	GSM	33.5	33.05	0.04	Right	Tilt	04555	1:8.3	0.073	1.109	0.081	
836.60	190	GSM 850	GSM	33.5	33.05	0.03	Left	Cheek	04555	1:8.3	0.131	1.109	0.145	
836.60	190	GSM 850	GSM	33.5	33.05	-0.12	Left	Tilt	04555	1:8.3	0.066	1.109	0.073	
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	30.5	30.08	0.03	Right	Cheek	04C3F	1:8.3	0.044	1.102	0.048	
1880.00	661	GSM 1900	GSM	30.5	30.08	0.05	Right	Tilt	04C3F	1:8.3	0.024	1.102	0.026	
1880.00	661	GSM 1900	GSM	30.5	30.08	0.04	Left	Cheek	04C3F	1:8.3	0.056	1.102	0.062	A2
1880.00	661	GSM 1900	GSM	30.5	30.08	0.13	Left	Tilt	04C3F	1:8.3	0.015	1.102	0.017	
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]	Power Drift [dB]	Side	Test Position	Ant State	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	25.0	24.33	-0.01	Right	Cheek	1	0455B	1:1	0.175	1.167	0.204	A3
836.60	4183	UMTS 850	RMC	25.0	24.33	0.05	Right	Tilt	1	0455B	1:1	0.063	1.167	0.074	
836.60	4183	UMTS 850	RMC	25.0	24.33	0.01	Left	Cheek	1	0455B	1:1	0.125	1.167	0.146	
836.60	4183	UMTS 850	RMC	25.0	24.33	0.07	Left	Tilt	1	0455B	1:1	0.061	1.167	0.071	
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
UMTS 1750 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1732.40	1412	UMTS 1750	RMC	23.5	22.73	0.05	Right	Cheek	0453F	1:1	0.056	1.194	0.067	
1732.40	1412	UMTS 1750	RMC	23.5	22.73	-0.03	Right	Tilt	0453F	1:1	0.047	1.194	0.056	
1732.40	1412	UMTS 1750	RMC	23.5	22.73	0.05	Left	Cheek	0453F	1:1	0.075	1.194	0.090	A4
1732.40	1412	UMTS 1750	RMC	23.5	22.73	0.10	Left	Tilt	0453F	1:1	0.048	1.194	0.057	
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 11-5
UMTS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1907.60	9538	UMTS 1900	RMC	23.5	23.49	0.08	Right	Cheek	04C3F	1:1	0.050	1.002	0.050	
1907.60	9538	UMTS 1900	RMC	23.5	23.49	0.04	Right	Tilt	04C3F	1:1	0.031	1.002	0.031	
1907.60	9538	UMTS 1900	RMC	23.5	23.49	0.07	Left	Cheek	04C3F	1:1	0.065	1.002	0.065	A5
1907.60	9538	UMTS 1900	RMC	23.5	23.49	0.00	Left	Tilt	04C3F	1:1	0.018	1.002	0.018	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-6
LTE Band 12 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.	(W/kg)														(W/kg)			
707.50	23095	Mid	LTE Band 12	10	23.5	22.89	0.02	0	Right	Cheek	QPSK	1	49	04C3F	1:1	0.089	1.151	0.102	A6
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.13	1	Right	Cheek	QPSK	25	12	04C3F	1:1	0.069	1.148	0.079	
707.50	23095	Mid	LTE Band 12	10	23.5	22.89	0.03	0	Right	Tilt	QPSK	1	49	04C3F	1:1	0.045	1.151	0.052	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.07	1	Right	Tilt	QPSK	25	12	04C3F	1:1	0.034	1.148	0.039	
707.50	23095	Mid	LTE Band 12	10	23.5	22.89	0.18	0	Left	Cheek	QPSK	1	49	04C3F	1:1	0.072	1.151	0.083	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.11	1	Left	Cheek	QPSK	25	12	04C3F	1:1	0.053	1.148	0.061	
707.50	23095	Mid	LTE Band 12	10	23.5	22.89	0.06	0	Left	Tilt	QPSK	1	49	04C3F	1:1	0.069	1.151	0.079	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.11	1	Left	Tilt	QPSK	25	12	04C3F	1:1	0.053	1.148	0.061	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT																			
Spatial Peak									Head										
Uncontrolled Exposure/General Population									1.6 W/kg (mW/g) averaged over 1 gram										

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Table 11-7
LTE Band 13 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	0.01	0	Right	Cheek	QPSK	1	49	04C3F	1:1	0.097	1.186	0.115	A7
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	0.10	1	Right	Cheek	QPSK	25	12	04C3F	1:1	0.073	1.175	0.086	
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	0.13	0	Right	Tilt	QPSK	1	49	04C3F	1:1	0.038	1.186	0.045	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	0.09	1	Right	Tilt	QPSK	25	12	04C3F	1:1	0.027	1.175	0.032	
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	0.11	0	Left	Cheek	QPSK	1	49	04C3F	1:1	0.063	1.186	0.075	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	0.19	1	Left	Cheek	QPSK	25	12	04C3F	1:1	0.055	1.175	0.065	
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	0.14	0	Left	Tilt	QPSK	1	49	04C3F	1:1	0.038	1.186	0.045	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	0.19	1	Left	Tilt	QPSK	25	12	04C3F	1:1	0.040	1.175	0.047	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-8
LTE Band 26 (Cell) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	0.05	0	Right	Cheek	QPSK	1	36	04555	1:1	0.142	1.189	0.169	A8
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	0.03	1	Right	Cheek	QPSK	36	18	04555	1:1	0.108	1.178	0.127	
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	0.19	0	Right	Tilt	QPSK	1	36	04555	1:1	0.052	1.189	0.062	
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	0.15	1	Right	Tilt	QPSK	36	18	04555	1:1	0.039	1.178	0.046	
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	0.01	0	Left	Cheek	QPSK	1	36	04555	1:1	0.096	1.189	0.114	
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	0.11	1	Left	Cheek	QPSK	36	18	04555	1:1	0.073	1.178	0.086	
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	-0.09	0	Left	Tilt	QPSK	1	36	04555	1:1	0.071	1.189	0.084	
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	0.11	1	Left	Tilt	QPSK	36	18	04555	1:1	0.054	1.178	0.064	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-9
LTE Band 5 (Cell) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Ant State	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	0.06	0	Right	Cheek	1	QPSK	1	25	0455B	1:1	0.163	1.429	0.233	A9
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	-0.03	1	Right	Cheek	1	QPSK	25	12	0455B	1:1	0.111	1.403	0.156	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	-0.06	0	Right	Tilt	1	QPSK	1	25	0455B	1:1	0.047	1.429	0.067	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	-0.09	1	Right	Tilt	1	QPSK	25	12	0455B	1:1	0.033	1.403	0.046	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	0.01	0	Left	Cheek	1	QPSK	1	25	0455B	1:1	0.105	1.429	0.150	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	0.06	1	Left	Cheek	1	QPSK	25	12	0455B	1:1	0.076	1.403	0.107	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	0.16	0	Left	Tilt	1	QPSK	1	25	0455B	1:1	0.072	1.429	0.103	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	0.15	1	Left	Tilt	1	QPSK	25	12	0455B	1:1	0.049	1.403	0.069	
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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Table 11-10
LTE Band 66 (AWS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	0.01	0	Right	Cheek	QPSK	1	50	0453F	1:1	0.063	1.164	0.073	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	0.02	1	Right	Cheek	QPSK	50	25	0453F	1:1	0.058	1.172	0.068	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	-0.02	0	Right	Tilt	QPSK	1	50	0453F	1:1	0.048	1.164	0.056	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	0.09	1	Right	Tilt	QPSK	50	25	0453F	1:1	0.044	1.172	0.052	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	0.05	0	Left	Cheek	QPSK	1	50	0453F	1:1	0.096	1.164	0.112	A10
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	0.06	1	Left	Cheek	QPSK	50	25	0453F	1:1	0.086	1.172	0.101	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	0.01	0	Left	Tilt	QPSK	1	50	0453F	1:1	0.050	1.164	0.058	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	0.03	1	Left	Tilt	QPSK	50	25	0453F	1:1	0.044	1.172	0.052	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

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

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.41	0.01	0	Right	Cheek	QPSK	1	50	04C3F	1:1	0.038	1.021	0.039	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.45	0.04	1	Right	Cheek	QPSK	50	25	04C3F	1:1	0.034	1.012	0.034	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.41	0.09	0	Right	Tilt	QPSK	1	50	04C3F	1:1	0.024	1.021	0.025	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.45	0.14	1	Right	Tilt	QPSK	50	25	04C3F	1:1	0.021	1.012	0.021	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.41	0.18	0	Left	Cheek	QPSK	1	50	04C3F	1:1	0.056	1.021	0.057	A11
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.45	0.11	1	Left	Cheek	QPSK	50	25	04C3F	1:1	0.049	1.012	0.050	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.41	0.14	0	Left	Tilt	QPSK	1	50	04C3F	1:1	0.014	1.021	0.014	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.45	0.12	1	Left	Tilt	QPSK	50	25	04C3F	1:1	0.013	1.012	0.013	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-12
LTE Band 7 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.	(W/kg)														(W/kg)			
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	0.11	0	Right	Cheek	QPSK	1	99	04555	1:1	0.113	1.245	0.141	
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	0.17	1	Right	Cheek	QPSK	50	50	04555	1:1	0.079	1.256	0.099	
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	-0.03	0	Right	Tilt	QPSK	1	99	04555	1:1	0.119	1.245	0.148	A12
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	0.11	1	Right	Tilt	QPSK	50	50	04555	1:1	0.080	1.256	0.100	
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	0.16	0	Left	Cheek	QPSK	1	99	04555	1:1	0.112	1.245	0.139	
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	0.18	1	Left	Cheek	QPSK	50	50	04555	1:1	0.092	1.256	0.116	
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	-0.06	0	Left	Tilt	QPSK	1	99	04555	1:1	0.073	1.245	0.091	
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	0.16	1	Left	Tilt	QPSK	50	50	04555	1:1	0.049	1.256	0.062	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram									

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Table 11-13
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)		
2549.50	40185	Low-Mid	LTE Band 41	20	24.0	24.00	0.18	0	Right	Cheek	QPSK	1	99	0458B	1:1.58	0.033	1.000	0.033	
2549.50	40185	Low-Mid	LTE Band 41	20	23.0	23.00	0.13	1	Right	Cheek	QPSK	50	25	0458B	1:1.58	0.027	1.000	0.027	
2549.50	40185	Low-Mid	LTE Band 41	20	24.0	24.00	0.11	0	Right	Tilt	QPSK	1	99	0458B	1:1.58	0.038	1.000	0.038	
2549.50	40185	Low-Mid	LTE Band 41	20	23.0	23.00	0.17	1	Right	Tilt	QPSK	50	25	0458B	1:1.58	0.029	1.000	0.029	
2549.50	40185	Low-Mid	LTE Band 41	20	24.0	24.00	0.13	0	Left	Cheek	QPSK	1	99	0458B	1:1.58	0.043	1.000	0.043	A13
2549.50	40185	Low-Mid	LTE Band 41	20	23.0	23.00	0.14	1	Left	Cheek	QPSK	50	25	0458B	1:1.58	0.034	1.000	0.034	
2549.50	40185	Low-Mid	LTE Band 41	20	24.0	24.00	0.17	0	Left	Tilt	QPSK	1	99	0458B	1:1.58	0.026	1.000	0.026	
2549.50	40185	Low-Mid	LTE Band 41	20	23.0	23.00	0.14	1	Left	Tilt	QPSK	50	25	0458B	1:1.58	0.021	1.000	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 11-14
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	16.5	16.26	0.09	Right	Cheek	1	0458B	1	99.9	0.432	0.321	1.057	1.001	0.340	A14
2462	11	802.11b	DSSS	22	16.5	16.26	0.06	Right	Tilt	1	0458B	1	99.9	0.427	-	1.057	1.001	-	
2462	11	802.11b	DSSS	22	16.5	16.26	-0.18	Left	Cheek	1	0458B	1	99.9	0.166	-	1.057	1.001	-	
2462	11	802.11b	DSSS	22	16.5	16.26	0.13	Left	Tilt	1	0458B	1	99.9	0.194	-	1.057	1.001	-	
2462	11	802.11b	DSSS	22	16.5	16.12	-0.10	Right	Cheek	2	0458B	1	99.9	0.334	0.285	1.091	1.001	0.311	
2462	11	802.11b	DSSS	22	16.5	16.12	0.17	Right	Tilt	2	0458B	1	99.9	0.304	-	1.091	1.001	-	
2462	11	802.11b	DSSS	22	16.5	16.12	0.15	Left	Cheek	2	0458B	1	99.9	0.163	-	1.091	1.001	-	
2462	11	802.11b	DSSS	22	16.5	16.12	0.04	Left	Tilt	2	0458B	1	99.9	0.130	-	1.091	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										

Table 11-15
DTS MIMO Head SAR for Conditions with 2.4 GHz and 5 GHz WLAN SAR

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]	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)		(Duty Cycle)	(W/kg)	
2462	11	802.11n	OFDM	20	13.5	13.01	13.5	13.08	0.17	Right	Cheek	MIMO	0455B	13	97.2	0.253	0.205	1.119	1.029	0.236	
2462	11	802.11n	OFDM	20	13.5	13.01	13.5	13.08	0.09	Right	Tilt	MIMO	0455B	13	97.2	0.211	-	1.119	1.029	-	
2462	11	802.11n	OFDM	20	13.5	13.01	13.5	13.08	0.19	Left	Cheek	MIMO	0455B	13	97.2	0.120	-	1.119	1.029	-	
2462	11	802.11n	OFDM	20	13.5	13.01	13.5	13.08	0.18	Left	Tilt	MIMO	0455B	13	97.2	0.101	-	1.119	1.029	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Head											
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 11-16
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	14.5	13.97	0.19	Right	Cheek	1	043CF	29.3	98.0	0.408	0.227	1.130	1.020	0.262	
5290	58	802.11ac	OFDM	80	14.5	13.97	0.18	Right	Tilt	1	043CF	29.3	98.0	0.316	-	1.130	1.020	-	
5290	58	802.11ac	OFDM	80	14.5	13.97	0.17	Left	Cheek	1	043CF	29.3	98.0	0.180	-	1.130	1.020	-	
5290	58	802.11ac	OFDM	80	14.5	13.97	0.11	Left	Tilt	1	043CF	29.3	98.0	0.178	-	1.130	1.020	-	
5290	58	802.11ac	OFDM	80	14.5	14.01	0.14	Right	Cheek	2	043CF	29.3	98.0	0.482	0.246	1.119	1.020	0.281	
5290	58	802.11ac	OFDM	80	14.5	14.01	0.12	Right	Tilt	2	043CF	29.3	98.0	0.421	-	1.119	1.020	-	
5290	58	802.11ac	OFDM	80	14.5	14.01	0.17	Left	Cheek	2	043CF	29.3	98.0	0.185	-	1.119	1.020	-	
5290	58	802.11ac	OFDM	80	14.5	14.01	0.13	Left	Tilt	2	043CF	29.3	98.0	0.158	-	1.119	1.020	-	
5610	122	802.11ac	OFDM	80	14.5	14.38	0.14	Right	Cheek	1	043CF	29.3	98.0	0.212	0.126	1.028	1.020	0.132	
5610	122	802.11ac	OFDM	80	14.5	14.38	0.16	Right	Tilt	1	043CF	29.3	98.0	0.160	-	1.028	1.020	-	
5610	122	802.11ac	OFDM	80	14.5	14.38	0.11	Left	Cheek	1	043CF	29.3	98.0	0.135	-	1.028	1.020	-	
5610	122	802.11ac	OFDM	80	14.5	14.38	0.18	Left	Tilt	1	043CF	29.3	98.0	0.091	-	1.028	1.020	-	
5610	122	802.11ac	OFDM	80	14.5	14.03	0.10	Right	Cheek	2	043CF	29.3	98.0	0.737	0.307	1.114	1.020	0.349	
5610	122	802.11ac	OFDM	80	14.5	14.03	0.18	Right	Tilt	2	043CF	29.3	98.0	0.538	-	1.114	1.020	-	
5610	122	802.11ac	OFDM	80	14.5	14.03	0.15	Left	Cheek	2	043CF	29.3	98.0	0.283	-	1.114	1.020	-	
5610	122	802.11ac	OFDM	80	14.5	14.03	0.10	Left	Tilt	2	043CF	29.3	98.0	0.200	-	1.114	1.020	-	
5775	155	802.11ac	OFDM	80	14.5	14.06	0.00	Right	Cheek	1	043CF	29.3	98.0	0.113	0.063	1.107	1.020	0.071	
5775	155	802.11ac	OFDM	80	14.5	14.06	0.10	Right	Tilt	1	043CF	29.3	98.0	0.084	-	1.107	1.020	-	
5775	155	802.11ac	OFDM	80	14.5	14.06	0.17	Left	Cheek	1	043CF	29.3	98.0	0.101	-	1.107	1.020	-	
5775	155	802.11ac	OFDM	80	14.5	14.06	0.12	Left	Tilt	1	043CF	29.3	98.0	0.067	-	1.107	1.020	-	
5775	155	802.11ac	OFDM	80	14.5	13.92	0.00	Right	Cheek	2	043CF	29.3	98.0	0.813	0.511	1.143	1.020	0.596	A15
5775	155	802.11ac	OFDM	80	14.5	13.92	0.00	Right	Tilt	2	043CF	29.3	98.0	0.566	0.360	1.143	1.020	0.420	
5775	155	802.11ac	OFDM	80	14.5	13.92	0.17	Left	Cheek	2	043CF	29.3	98.0	0.494	-	1.143	1.020	-	
5775	155	802.11ac	OFDM	80	14.5	13.92	0.17	Left	Tilt	2	043CF	29.3	98.0	0.347	-	1.143	1.020	-	
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 11-17
Bluetooth Head SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle %	Data Rate (Mbps)	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	18.0	17.68	0.03	Right	Cheek	0458B	77.3	1	0.201	1.076	1.294	0.280	A16
2441.00	39	Bluetooth	FHSS	18.0	17.68	0.06	Right	Tilt	0458B	77.3	1	0.161	1.076	1.294	0.224	
2441.00	39	Bluetooth	FHSS	18.0	17.68	0.05	Left	Cheek	0458B	77.3	1	0.092	1.076	1.294	0.128	
2441.00	39	Bluetooth	FHSS	18.0	17.68	0.16	Left	Tilt	0458B	77.3	1	0.049	1.076	1.294	0.068	
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 11-18
GSM/UMTS Body-Worn SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Ant State	Device Serial Number	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.5	33.05	-0.09	15 mm	N/A	0453F	1:8.3	back	0.202	1.109	0.224	A17
1880.00	661	GSM 1900	GSM	30.5	30.08	0.05	15 mm	N/A	04C3F	1:8.3	back	0.209	1.102	0.230	A19
836.60	4183	UMTS 850	RMC	25.0	24.33	-0.03	15 mm	1	04C3F	1:1	back	0.254	1.167	0.296	A21
1732.40	1412	UMTS 1750	RMC	23.5	22.73	-0.05	15 mm	N/A	0455B	1:1	back	0.355	1.194	0.424	A23
1907.60	9538	UMTS 1900	RMC	23.5	23.49	0.03	15 mm	N/A	04C3F	1:1	back	0.282	1.002	0.283	A25
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-19
LTE Body-Worn SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Ant State	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	22.89	0.00	0	N/A	0455B	QPSK	1	49	15 mm	back	1:1	0.140	1.151	0.161	A27
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.00	1	N/A	0455B	QPSK	25	12	15 mm	back	1:1	0.105	1.148	0.121	
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	0.01	0	N/A	0455B	QPSK	1	49	15 mm	back	1:1	0.166	1.186	0.197	A29
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	0.01	1	N/A	0455B	QPSK	25	12	15 mm	back	1:1	0.136	1.175	0.160	
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	0.01	0	N/A	0453F	QPSK	1	36	15 mm	back	1:1	0.176	1.189	0.209	A31
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	0.01	1	N/A	0453F	QPSK	36	18	15 mm	back	1:1	0.139	1.178	0.164	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	0.03	0	1	0453F	QPSK	1	25	15 mm	back	1:1	0.201	1.429	0.287	A33
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	-0.01	1	1	0453F	QPSK	25	12	15 mm	back	1:1	0.156	1.403	0.219	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	0.04	0	N/A	0453F	QPSK	1	50	15 mm	back	1:1	0.420	1.164	0.489	A35
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	-0.01	1	N/A	0453F	QPSK	50	25	15 mm	back	1:1	0.337	1.172	0.395	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.41	-0.02	0	N/A	04C3F	QPSK	1	50	15 mm	back	1:1	0.253	1.021	0.258	A37
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.45	0.05	1	N/A	04C3F	QPSK	50	25	15 mm	back	1:1	0.225	1.012	0.228	
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	0.03	0	N/A	04C3F	QPSK	1	99	15 mm	back	1:1	0.462	1.245	0.575	A39
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	0.02	1	N/A	04C3F	QPSK	50	50	15 mm	back	1:1	0.359	1.256	0.451	
2549.50	40185	Low-Mid	LTE Band 41	20	24.0	24.00	-0.06	0	N/A	04575	QPSK	1	99	15 mm	back	1:1.58	0.267	1.000	0.267	A41
2549.50	40185	Low-Mid	LTE Band 41	20	23.0	23.00	-0.06	1	N/A	04575	QPSK	50	25	15 mm	back	1:1.58	0.223	1.000	0.223	
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
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	19.5	19.36	-0.02	15 mm	1	0458B	1	back	99.9	0.106	0.089	1.033	1.001	0.092	A43
2462	11	802.11b	DSSS	22	19.5	19.37	0.11	15 mm	2	0458B	1	back	99.9	0.062	0.054	1.030	1.001	0.056	
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 11-21
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)	
5280	56	802.11a	OFDM	20	18.5	16.58	-0.04	15 mm	1	04555	6	back	99.7	0.095	0.032	1.556	1.003	0.050	
5280	56	802.11a	OFDM	20	18.5	17.37	0.17	15 mm	2	04555	6	back	99.7	0.226	0.103	1.297	1.003	0.134	
5500	100	802.11a	OFDM	20	18.5	16.67	0.18	15 mm	1	04555	6	back	99.7	0.056	0.016	1.524	1.003	0.024	
5500	100	802.11a	OFDM	20	18.5	16.76	-0.18	15 mm	2	04555	6	back	99.7	0.159	0.063	1.493	1.003	0.094	
5745	149	802.11a	OFDM	20	18.5	16.59	0.19	15 mm	1	04555	6	back	99.7	0.055	0.018	1.552	1.003	0.028	
5825	165	802.11a	OFDM	20	18.5	16.91	-0.14	15 mm	2	04555	6	back	99.7	0.270	0.112	1.442	1.003	0.162	A45
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 11-22
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	18.0	17.68	0.03	15 mm	04C3F	1	back	77.3	0.027	1.076	1.294	0.038	A47
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram								

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11.3 Standalone Hotspot SAR Data

Table 11-23
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Ant State	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
836.60	190	GSM 850	GPRS	29.0	28.28	0.03	10 mm	N/A	04C3F	4	1:2.076	back	0.498	1.180	0.588	A18
836.60	190	GSM 850	GPRS	29.0	28.28	0.02	10 mm	N/A	04C3F	4	1:2.076	front	0.368	1.180	0.434	
836.60	190	GSM 850	GPRS	29.0	28.28	-0.04	10 mm	N/A	04C3F	4	1:2.076	bottom	0.340	1.180	0.401	
836.60	190	GSM 850	GPRS	29.0	28.28	-0.02	10 mm	N/A	04C3F	4	1:2.076	right	0.297	1.180	0.350	
836.60	190	GSM 850	GPRS	29.0	28.28	0.00	10 mm	N/A	04C3F	4	1:2.076	left	0.058	1.180	0.068	
1880.00	661	GSM 1900	GPRS	26.5	26.16	0.01	10 mm	N/A	04C3F	3	1:2.76	back	0.428	1.081	0.463	
1880.00	661	GSM 1900	GPRS	26.5	26.16	0.04	10 mm	N/A	04C3F	3	1:2.76	front	0.329	1.081	0.356	
1850.20	512	GSM 1900	GPRS	26.5	25.76	0.03	10 mm	N/A	04C3F	3	1:2.76	bottom	0.787	1.186	0.933	A20
1880.00	661	GSM 1900	GPRS	26.5	26.16	-0.05	10 mm	N/A	04C3F	3	1:2.76	bottom	0.727	1.081	0.786	
1909.80	810	GSM 1900	GPRS	26.5	26.07	-0.05	10 mm	N/A	04C3F	3	1:2.76	bottom	0.767	1.104	0.847	
1880.00	661	GSM 1900	GPRS	26.5	26.16	-0.07	10 mm	N/A	04C3F	3	1:2.76	right	0.088	1.081	0.095	
1880.00	661	GSM 1900	GPRS	26.5	26.16	0.05	10 mm	N/A	04C3F	3	1:2.76	left	0.032	1.081	0.035	
836.60	4183	UMTS 850	RMC	25.0	24.33	0.00	10 mm	1	04C3F	N/A	1:1	back	0.449	1.167	0.524	A22
836.60	4183	UMTS 850	RMC	25.0	24.33	-0.04	10 mm	1	04C3F	N/A	1:1	front	0.398	1.167	0.464	
836.60	4183	UMTS 850	RMC	25.0	24.33	-0.01	10 mm	1	04C3F	N/A	1:1	bottom	0.300	1.167	0.350	
836.60	4183	UMTS 850	RMC	25.0	24.33	0.05	10 mm	1	04C3F	N/A	1:1	right	0.265	1.167	0.309	
836.60	4183	UMTS 850	RMC	25.0	24.33	0.08	10 mm	1	04C3F	N/A	1:1	left	0.073	1.167	0.085	
1712.40	1312	UMTS 1750	RMC	20.5	20.38	0.00	10 mm	N/A	0455B	N/A	1:1	back	0.278	1.028	0.286	
1712.40	1312	UMTS 1750	RMC	20.5	20.38	0.06	10 mm	N/A	0455B	N/A	1:1	front	0.233	1.028	0.240	
1712.40	1312	UMTS 1750	RMC	20.5	20.38	-0.06	10 mm	N/A	0455B	N/A	1:1	bottom	0.470	1.028	0.483	A24
1712.40	1312	UMTS 1750	RMC	20.5	20.38	0.15	10 mm	N/A	0455B	N/A	1:1	right	0.054	1.028	0.056	
1712.40	1312	UMTS 1750	RMC	20.5	20.38	0.03	10 mm	N/A	0455B	N/A	1:1	left	0.062	1.028	0.064	
1907.60	9538	UMTS 1900	RMC	21.0	20.76	-0.05	10 mm	N/A	04C3F	N/A	1:1	back	0.265	1.057	0.280	
1907.60	9538	UMTS 1900	RMC	21.0	20.76	-0.02	10 mm	N/A	04C3F	N/A	1:1	front	0.199	1.057	0.210	
1907.60	9538	UMTS 1900	RMC	21.0	20.76	-0.04	10 mm	N/A	04C3F	N/A	1:1	bottom	0.407	1.057	0.430	A26
1907.60	9538	UMTS 1900	RMC	21.0	20.76	-0.05	10 mm	N/A	04C3F	N/A	1:1	right	0.043	1.057	0.045	
1907.60	9538	UMTS 1900	RMC	21.0	20.76	0.17	10 mm	N/A	04C3F	N/A	1:1	left	0.011	1.057	0.012	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT							Body									
Spatial Peak							1.6 W/kg (mW/g)									
Uncontrolled Exposure/General Population							averaged over 1 gram									

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Table 11-24
LTE Band 12 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	23.5	22.89	-0.01	0	0455B	QPSK	1	49	10 mm	back	1:1	0.210	1.151	0.242	A28
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.00	1	0455B	QPSK	25	12	10 mm	back	1:1	0.158	1.148	0.181	
707.50	23095	Mid	LTE Band 12	10	23.5	22.89	-0.04	0	0455B	QPSK	1	49	10 mm	front	1:1	0.174	1.151	0.200	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.03	1	0455B	QPSK	25	12	10 mm	front	1:1	0.129	1.148	0.148	
707.50	23095	Mid	LTE Band 12	10	23.5	22.89	-0.05	0	0455B	QPSK	1	49	10 mm	bottom	1:1	0.157	1.151	0.181	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.04	1	0455B	QPSK	25	12	10 mm	bottom	1:1	0.120	1.148	0.138	
707.50	23095	Mid	LTE Band 12	10	23.5	22.89	-0.05	0	0455B	QPSK	1	49	10 mm	right	1:1	0.186	1.151	0.214	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	-0.02	1	0455B	QPSK	25	12	10 mm	right	1:1	0.146	1.148	0.168	
707.50	23095	Mid	LTE Band 12	10	23.5	22.89	0.00	0	0455B	QPSK	1	49	10 mm	left	1:1	0.081	1.151	0.093	
707.50	23095	Mid	LTE Band 12	10	22.5	21.90	0.03	1	0455B	QPSK	25	12	10 mm	left	1:1	0.061	1.148	0.070	
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 11-25
LTE Band 13 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)			
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	-0.01	0	0455B	QPSK	1	49	10 mm	back	1:1	0.294	1.186	0.349	A30
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	0.01	1	0455B	QPSK	25	12	10 mm	back	1:1	0.244	1.175	0.287	
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	0.00	0	0455B	QPSK	1	49	10 mm	front	1:1	0.224	1.186	0.266	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	-0.02	1	0455B	QPSK	25	12	10 mm	front	1:1	0.185	1.175	0.217	
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	-0.10	0	0455B	QPSK	1	49	10 mm	bottom	1:1	0.169	1.186	0.200	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	-0.03	1	0455B	QPSK	25	12	10 mm	bottom	1:1	0.143	1.175	0.168	
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	0.06	0	0455B	QPSK	1	49	10 mm	right	1:1	0.144	1.186	0.171	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	0.01	1	0455B	QPSK	25	12	10 mm	right	1:1	0.125	1.175	0.147	
782.00	23230	Mid	LTE Band 13	10	23.5	22.76	0.06	0	0455B	QPSK	1	49	10 mm	left	1:1	0.080	1.186	0.095	
782.00	23230	Mid	LTE Band 13	10	22.5	21.80	-0.02	1	0455B	QPSK	25	12	10 mm	left	1:1	0.062	1.175	0.073	
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 11-26
LTE Band 26 (Cell) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	0.00	0	0453F	QPSK	1	36	10 mm	back	1:1	0.392	1.189	0.466	A32
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	0.00	1	0453F	QPSK	36	18	10 mm	back	1:1	0.310	1.178	0.365	
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	0.02	0	0453F	QPSK	1	36	10 mm	front	1:1	0.330	1.189	0.392	
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	0.04	1	0453F	QPSK	36	18	10 mm	front	1:1	0.260	1.178	0.306	
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	-0.04	0	0453F	QPSK	1	36	10 mm	bottom	1:1	0.257	1.189	0.306	
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	-0.05	1	0453F	QPSK	36	18	10 mm	bottom	1:1	0.202	1.178	0.238	
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	0.01	0	0453F	QPSK	1	36	10 mm	right	1:1	0.209	1.189	0.249	
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	-0.01	1	0453F	QPSK	36	18	10 mm	right	1:1	0.163	1.178	0.192	
831.50	26865	Mid	LTE Band 26 (Cell)	15	23.5	22.75	0.03	0	0453F	QPSK	1	36	10 mm	left	1:1	0.039	1.189	0.046	
831.50	26865	Mid	LTE Band 26 (Cell)	15	22.5	21.79	-0.01	1	0453F	QPSK	36	18	10 mm	left	1:1	0.032	1.178	0.038	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

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Table 11-27
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Ant State	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.															(W/kg)		(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	-0.02	0	1	0453F	QPSK	1	25	10 mm	back	1:1	0.445	1.429	0.636	A34
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	-0.03	1	1	0453F	QPSK	25	12	10 mm	back	1:1	0.334	1.403	0.469	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	0.04	0	1	0453F	QPSK	1	25	10 mm	front	1:1	0.353	1.429	0.504	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	0.03	1	1	0453F	QPSK	25	12	10 mm	front	1:1	0.260	1.403	0.365	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	-0.04	0	1	0453F	QPSK	1	25	10 mm	bottom	1:1	0.326	1.429	0.466	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	-0.04	1	1	0453F	QPSK	25	12	10 mm	bottom	1:1	0.228	1.403	0.320	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	-0.03	0	1	0453F	QPSK	1	25	10 mm	right	1:1	0.241	1.429	0.344	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	0.02	1	1	0453F	QPSK	25	12	10 mm	right	1:1	0.173	1.403	0.243	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.0	23.45	0.00	0	1	0453F	QPSK	1	25	10 mm	left	1:1	0.060	1.429	0.086	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.0	22.53	-0.02	1	1	0453F	QPSK	25	12	10 mm	left	1:1	0.044	1.403	0.062	
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 11-28
LTE Band 66 (AWS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)		Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.														(W/kg)	(W/kg)			
1720.00	132072	Low	LTE Band 66 (AWS)	20	20.5	20.13	0.02	0	0453F	QPSK	1	50	10 mm	back	1:1	0.382	1.089	0.416	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.10	0.03	0	0453F	QPSK	50	25	10 mm	back	1:1	0.399	1.096	0.437	
1720.00	132072	Low	LTE Band 66 (AWS)	20	20.5	20.13	-0.04	0	0453F	QPSK	1	50	10 mm	front	1:1	0.381	1.089	0.415	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.10	-0.05	0	0453F	QPSK	50	25	10 mm	front	1:1	0.333	1.096	0.365	
1720.00	132072	Low	LTE Band 66 (AWS)	20	20.5	20.13	-0.01	0	0453F	QPSK	1	50	10 mm	bottom	1:1	0.601	1.089	0.654	
1720.00	132072	Low	LTE Band 66 (AWS)	20	20.5	19.99	0.00	0	0453F	QPSK	50	25	10 mm	bottom	1:1	0.607	1.125	0.683	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	20.5	19.96	-0.01	0	0453F	QPSK	50	25	10 mm	bottom	1:1	0.638	1.132	0.722	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.10	0.00	0	0453F	QPSK	50	25	10 mm	bottom	1:1	0.697	1.096	0.764	A36
1720.00	132072	Low	LTE Band 66 (AWS)	20	20.5	20.13	0.06	0	0453F	QPSK	1	50	10 mm	right	1:1	0.071	1.089	0.077	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.10	0.02	0	0453F	QPSK	50	25	10 mm	right	1:1	0.079	1.096	0.087	
1720.00	132072	Low	LTE Band 66 (AWS)	20	20.5	20.13	-0.04	0	0453F	QPSK	1	50	10 mm	left	1:1	0.088	1.089	0.096	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.10	0.05	0	0453F	QPSK	50	25	10 mm	left	1:1	0.073	1.096	0.080	
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 11-29
LTE Band 25 (PCS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)		Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.														(W/kg)	(W/kg)			
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	0.06	0	04C3F	QPSK	1	50	10 mm	back	1:1	0.252	1.104	0.278	
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	0.05	0	04C3F	QPSK	50	25	10 mm	back	1:1	0.283	1.104	0.312	
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	-0.01	0	04C3F	QPSK	1	50	10 mm	front	1:1	0.174	1.104	0.192	
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	0.03	0	04C3F	QPSK	50	25	10 mm	front	1:1	0.196	1.104	0.216	
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	-0.05	0	04C3F	QPSK	1	50	10 mm	bottom	1:1	0.413	1.104	0.456	
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	0.00	0	04C3F	QPSK	50	25	10 mm	bottom	1:1	0.448	1.104	0.495	A38
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	0.03	0	04C3F	QPSK	1	50	10 mm	right	1:1	0.045	1.104	0.050	
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	-0.05	0	04C3F	QPSK	50	25	10 mm	right	1:1	0.049	1.104	0.054	
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	0.15	0	04C3F	QPSK	1	50	10 mm	left	1:1	0.016	1.104	0.018	
1905.00	26590	High	LTE Band 25 (PCS)	20	21.0	20.57	-0.10	0	04C3F	QPSK	50	25	10 mm	left	1:1	0.017	1.104	0.019	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak										Body 1.6 W/kg (mW/g) averaged over 1 gram									
Uncontrolled Exposure/General Population																			

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Table 11-30
LTE Band 7 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
2535.00	21100	Mid	LTE Band 7	20	21.5	21.10	0.07	0	04C3F	QPSK	1	99	10 mm	back	1:1	0.347	1.096	0.380	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.40	0.05	1	04C3F	QPSK	50	50	10 mm	back	1:1	0.265	1.288	0.341	
2535.00	21100	Mid	LTE Band 7	20	21.5	21.10	0.02	0	04C3F	QPSK	1	99	10 mm	front	1:1	0.405	1.096	0.444	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.40	0.01	1	04C3F	QPSK	50	50	10 mm	front	1:1	0.313	1.288	0.403	
2510.00	20850	Low	LTE Band 7	20	21.5	20.68	-0.04	0	04C3F	QPSK	1	50	10 mm	bottom	1:1	0.814	1.208	0.983	
2535.00	21100	Mid	LTE Band 7	20	21.5	21.10	-0.06	0	04C3F	QPSK	1	99	10 mm	bottom	1:1	0.786	1.096	0.861	
2560.00	21350	High	LTE Band 7	20	21.5	20.89	-0.05	0	04C3F	QPSK	1	50	10 mm	bottom	1:1	0.903	1.151	1.039	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.40	-0.11	1	04C3F	QPSK	50	50	10 mm	bottom	1:1	0.585	1.288	0.753	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.39	-0.03	1	04C3F	QPSK	100	0	10 mm	bottom	1:1	0.646	1.291	0.834	
2535.00	21100	Mid	LTE Band 7	20	21.5	21.10	0.04	0	04C3F	QPSK	1	99	10 mm	right	1:1	0.088	1.096	0.096	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.40	0.00	1	04C3F	QPSK	50	50	10 mm	right	1:1	0.077	1.288	0.099	
2535.00	21100	Mid	LTE Band 7	20	21.5	21.10	-0.04	0	04C3F	QPSK	1	99	10 mm	left	1:1	0.252	1.096	0.276	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.40	0.00	1	04C3F	QPSK	50	50	10 mm	left	1:1	0.175	1.288	0.225	
2510.00	20850	Low	LTE Band 7	20	21.5	20.68	-0.06	0	04C3F	QPSK	1	50	10 mm	bottom	1:1	0.806	1.208	0.974	
2560.00	21350	High	LTE Band 7	20	21.5	20.89	-0.02	0	04C3F	QPSK	1	50	10 mm	bottom	1:1	0.911	1.151	1.049	A40
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

Note: Blue entries represent variability measurements.

Table 11-31
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)	
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	21.00	0.08	0	04575	QPSK	1	99	10 mm	back	1:1.58	0.299	1.000	0.299	
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	20.99	-0.10	0	04575	QPSK	50	25	10 mm	back	1:1.58	0.300	1.002	0.301	
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	21.00	0.05	0	04575	QPSK	1	99	10 mm	front	1:1.58	0.276	1.000	0.276	
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	20.99	0.04	0	04575	QPSK	50	25	10 mm	front	1:1.58	0.293	1.002	0.294	
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	21.00	-0.07	0	04575	QPSK	1	99	10 mm	bottom	1:1.58	0.560	1.000	0.560	
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	20.99	-0.11	0	04575	QPSK	50	25	10 mm	bottom	1:1.58	0.569	1.002	0.570	A42
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	21.00	0.02	0	04575	QPSK	1	99	10 mm	right	1:1.58	0.039	1.000	0.039	
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	20.99	-0.09	0	04575	QPSK	50	25	10 mm	right	1:1.58	0.043	1.002	0.043	
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	21.00	-0.03	0	04575	QPSK	1	99	10 mm	left	1:1.58	0.134	1.000	0.134	
2549.50	40185	Low-Mid	LTE Band 41	20	21.0	20.99	-0.18	0	04575	QPSK	50	25	10 mm	left	1:1.58	0.133	1.002	0.133	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT																			
Spatial Peak								Body											
Uncontrolled Exposure/General Population								1.6 W/kg (mW/g)											
								averaged over 1 gram											

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**Table 11-32
WLAN 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	19.5	19.36	0.19	10 mm	1	0458B	1	back	99.9	0.198	-	1.033	1.001	-	
2462	11	802.11b	DSSS	22	19.5	19.36	0.05	10 mm	1	0458B	1	front	99.9	0.125	-	1.033	1.001	-	
2462	11	802.11b	DSSS	22	19.5	19.36	0.14	10 mm	1	0458B	1	top	99.9	0.331	0.278	1.033	1.001	0.287	A44
2462	11	802.11b	DSSS	22	19.5	19.36	0.04	10 mm	1	0458B	1	left	99.9	0.083	-	1.033	1.001	-	
2462	11	802.11b	DSSS	22	19.5	19.37	-0.11	10 mm	2	0458B	1	back	99.9	0.115	-	1.030	1.001	-	
2462	11	802.11b	DSSS	22	19.5	19.37	-0.17	10 mm	2	0458B	1	front	99.9	0.118	0.112	1.030	1.001	0.115	
2462	11	802.11b	DSSS	22	19.5	19.37	0.11	10 mm	2	0458B	1	top	99.9	0.029	-	1.030	1.001	-	
2462	11	802.11b	DSSS	22	19.5	19.37	0.02	10 mm	2	0458B	1	left	99.9	0.069	-	1.030	1.001	-	
5745	149	802.11a	OFDM	20	18.5	16.59	-0.20	10 mm	1	04555	6	back	99.7	0.098	0.035	1.552	1.003	0.054	
5745	149	802.11a	OFDM	20	18.5	16.59	-0.18	10 mm	1	04555	6	front	99.7	0.061	-	1.552	1.003	-	
5745	149	802.11a	OFDM	20	18.5	16.59	0.00	10 mm	1	04555	6	top	99.7	0.044	-	1.552	1.003	-	
5745	149	802.11a	OFDM	20	18.5	16.59	0.10	10 mm	1	04555	6	left	99.7	0.036	-	1.552	1.003	-	
5825	165	802.11a	OFDM	20	18.5	16.91	0.03	10 mm	2	04555	6	back	99.7	0.417	0.166	1.442	1.003	0.240	A46
5825	165	802.11a	OFDM	20	18.5	16.91	0.12	10 mm	2	04555	6	front	99.7	0.217	-	1.442	1.003	-	
5825	165	802.11a	OFDM	20	18.5	16.91	-0.13	10 mm	2	04555	6	top	99.7	0.118	-	1.442	1.003	-	
5825	165	802.11a	OFDM	20	18.5	16.91	0.16	10 mm	2	04555	6	left	99.7	0.134	-	1.442	1.003	-	
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 11-33
Bluetooth 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	18.0	17.68	0.19	10 mm	04C3F	1	back	77.3	0.045	1.076	1.294	0.063	A48
2441	39	Bluetooth	FHSS	18.0	17.68	-0.08	10 mm	04C3F	1	front	77.3	0.043	1.076	1.294	0.060	
2441	39	Bluetooth	FHSS	18.0	17.68	-0.01	10 mm	04C3F	1	top	77.3	0.016	1.076	1.294	0.022	
2441	39	Bluetooth	FHSS	18.0	17.68	-0.06	10 mm	04C3F	1	left	77.3	0.024	1.076	1.294	0.033	
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 11-34
UMTS Phablet SAR Data

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Duty Cycle	Side	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1732.40	1412	UMTS 1750	RMC	23.5	22.73	-0.03	8 mm	04575	1:1	back	0.614	1.194	0.733	
1732.40	1412	UMTS 1750	RMC	23.5	22.73	-0.05	7 mm	04575	1:1	front	0.630	1.194	0.752	
1732.40	1412	UMTS 1750	RMC	23.5	22.73	-0.13	11 mm	04575	1:1	bottom	0.723	1.194	0.863	
1732.40	1412	UMTS 1750	RMC	23.5	22.73	-0.05	0 mm	04575	1:1	right	0.310	1.194	0.370	
1732.40	1412	UMTS 1750	RMC	23.5	22.73	-0.16	0 mm	04575	1:1	left	0.338	1.194	0.404	
1712.40	1312	UMTS 1750	RMC	20.5	20.38	0.00	0 mm	04555	1:1	back	0.893	1.028	0.918	
1712.40	1312	UMTS 1750	RMC	20.5	20.38	0.01	0 mm	04555	1:1	front	0.796	1.028	0.818	
1712.40	1312	UMTS 1750	RMC	20.5	20.38	-0.17	0 mm	04555	1:1	bottom	1.260	1.028	1.295	A49
1907.60	9538	UMTS 1900	RMC	23.5	23.49	0.00	8 mm	0455B	1:1	back	0.322	1.002	0.323	
1907.60	9538	UMTS 1900	RMC	23.5	23.49	-0.01	7 mm	0455B	1:1	front	0.296	1.002	0.297	
1907.60	9538	UMTS 1900	RMC	23.5	23.49	-0.02	11 mm	0455B	1:1	bottom	0.400	1.002	0.401	
1907.60	9538	UMTS 1900	RMC	23.5	23.49	-0.08	0 mm	0455B	1:1	right	0.094	1.002	0.094	
1907.60	9538	UMTS 1900	RMC	23.5	23.49	-0.05	0 mm	0455B	1:1	left	0.047	1.002	0.047	
1907.60	9538	UMTS 1900	RMC	21.0	20.76	-0.04	0 mm	0455B	1:1	back	0.897	1.057	0.948	
1907.60	9538	UMTS 1900	RMC	21.0	20.76	-0.06	0 mm	0455B	1:1	front	0.561	1.057	0.593	
1907.60	9538	UMTS 1900	RMC	21.0	20.76	-0.01	0 mm	0455B	1:1	bottom	1.050	1.057	1.110	A50
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 11-35
LTE Phablet SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maxum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.	(W/kg)														(W/kg)			
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	-0.01	0	04575	QPSK	1	50	8 mm	back	1:1	0.724	1.164	0.843	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	-0.08	1	04575	QPSK	50	25	8 mm	back	1:1	0.572	1.172	0.670	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	0.03	0	04575	QPSK	1	50	7 mm	front	1:1	0.634	1.164	0.738	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	-0.01	1	04575	QPSK	50	25	7 mm	front	1:1	0.499	1.172	0.585	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	-0.04	0	04575	QPSK	1	50	11 mm	bottom	1:1	0.728	1.164	0.847	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	-0.06	1	04575	QPSK	50	25	11 mm	bottom	1:1	0.581	1.172	0.681	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	-0.05	0	04575	QPSK	1	50	0 mm	right	1:1	0.300	1.164	0.349	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	-0.11	1	04575	QPSK	50	25	0 mm	right	1:1	0.237	1.172	0.278	
1720.00	132072	Low	LTE Band 66 (AWS)	20	23.5	22.84	-0.16	0	04575	QPSK	1	50	0 mm	left	1:1	0.365	1.164	0.425	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	21.81	-0.10	1	04575	QPSK	50	25	0 mm	left	1:1	0.306	1.172	0.359	
1720.00	132072	Low	LTE Band 66 (AWS)	20	20.5	20.13	-0.03	0	0458B	QPSK	1	50	0 mm	back	1:1	1.040	1.089	1.133	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.10	-0.01	0	0458B	QPSK	50	25	0 mm	back	1:1	0.914	1.096	1.002	
1720.00	132072	Low	LTE Band 66 (AWS)	20	20.5	20.13	-0.11	0	0458B	QPSK	1	50	0 mm	front	1:1	1.250	1.089	1.361	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.10	-0.11	0	0458B	QPSK	50	25	0 mm	front	1:1	1.130	1.096	1.238	
1720.00	132072	Low	LTE Band 66 (AWS)	20	20.5	20.13	0.00	0	0458B	QPSK	1	50	0 mm	bottom	1:1	1.870	1.089	2.036	A51
1745.00	132322	Mid	LTE Band 66 (AWS)	20	20.5	20.02	0.02	0	0458B	QPSK	1	50	0 mm	bottom	1:1	1.350	1.117	1.508	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.11	0.03	0	0458B	QPSK	1	50	0 mm	bottom	1:1	1.450	1.094	1.586	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.10	0.00	0	0458B	QPSK	50	25	0 mm	bottom	1:1	1.640	1.096	1.797	
1770.00	132572	High	LTE Band 66 (AWS)	20	20.5	20.09	-0.02	0	0458B	QPSK	100	0	0 mm	bottom	1:1	1.670	1.099	1.835	
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	-0.04	0	04C3F	QPSK	1	99	8 mm	back	1:1	0.553	1.245	0.688	
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	-0.02	1	04C3F	QPSK	50	50	8 mm	back	1:1	0.401	1.256	0.504	
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	0.09	0	04C3F	QPSK	1	99	7 mm	front	1:1	0.661	1.245	0.823	
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	-0.10	1	04C3F	QPSK	50	50	7 mm	front	1:1	0.474	1.256	0.595	
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	-0.03	0	04C3F	QPSK	1	99	11 mm	bottom	1:1	0.787	1.245	0.980	
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	-0.01	1	04C3F	QPSK	50	50	11 mm	bottom	1:1	0.549	1.256	0.690	
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	-0.12	0	04C3F	QPSK	1	99	0 mm	right	1:1	0.411	1.245	0.512	
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	-0.14	1	04C3F	QPSK	50	50	0 mm	right	1:1	0.304	1.256	0.382	
2535.00	21100	Mid	LTE Band 7	20	24.5	23.55	0.16	0	04C3F	QPSK	1	99	0 mm	left	1:1	1.070	1.245	1.332	
2535.00	21100	Mid	LTE Band 7	20	23.5	22.51	-0.13	1	04C3F	QPSK	50	50	0 mm	left	1:1	0.771	1.256	0.968	
2535.00	21100	Mid	LTE Band 7	20	21.5	21.10	0.01	0	04C3F	QPSK	1	99	0 mm	back	1:1	1.710	1.096	1.874	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.40	-0.01	1	04C3F	QPSK	50	50	0 mm	back	1:1	1.190	1.288	1.533	
2510.00	20850	Low	LTE Band 7	20	21.5	20.68	0.14	0	04C3F	QPSK	1	50	0 mm	front	1:1	1.560	1.208	1.884	
2535.00	21100	Mid	LTE Band 7	20	21.5	21.10	0.18	0	04C3F	QPSK	1	99	0 mm	front	1:1	1.930	1.096	2.115	A52
2560.00	21350	High	LTE Band 7	20	21.5	20.89	0.07	0	04C3F	QPSK	1	50	0 mm	front	1:1	1.560	1.151	1.796	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.40	0.19	1	04C3F	QPSK	50	50	0 mm	front	1:1	1.360	1.288	1.752	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.39	-0.14	1	04C3F	QPSK	100	0	0 mm	front	1:1	1.420	1.291	1.833	
2535.00	21100	Mid	LTE Band 7	20	21.5	21.10	-0.10	0	04C3F	QPSK	1	99	0 mm	bottom	1:1	1.800	1.096	1.973	
2535.00	21100	Mid	LTE Band 7	20	20.5	19.40	-0.14	1	04C3F	QPSK	50	50	0 mm	bottom	1:1	1.230	1.288	1.584	
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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**Table 11-36
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)	
5280	56	802.11a	OFDM	20	18.5	16.58	0.14	0 mm	1	04555	6	back	99.7	2.645	0.329	1.556	1.003	0.513	
5280	56	802.11a	OFDM	20	18.5	16.58	0.17	0 mm	1	04555	6	front	99.7	1.980	-	1.556	1.003	-	
5280	56	802.11a	OFDM	20	18.5	16.58	0.00	0 mm	1	04555	6	top	99.7	2.275	-	1.556	1.003	-	
5280	56	802.11a	OFDM	20	18.5	16.58	0.10	0 mm	1	04555	6	left	99.7	0.831	-	1.556	1.003	-	
5280	56	802.11a	OFDM	20	18.5	17.37	0.01	0 mm	2	04555	6	back	99.7	6.391	0.655	1.297	1.003	0.852	
5280	56	802.11a	OFDM	20	18.5	17.37	0.02	0 mm	2	04555	6	front	99.7	3.687	-	1.297	1.003	-	
5280	56	802.11a	OFDM	20	18.5	17.37	-0.19	0 mm	2	04555	6	top	99.7	4.355	-	1.297	1.003	-	
5280	56	802.11a	OFDM	20	18.5	17.37	0.12	0 mm	2	04555	6	left	99.7	0.754	-	1.297	1.003	-	
5500	100	802.11a	OFDM	20	18.5	16.67	0.19	0 mm	1	04555	6	back	99.7	2.194	0.294	1.524	1.003	0.449	
5500	100	802.11a	OFDM	20	18.5	16.67	0.10	0 mm	1	04555	6	front	99.7	1.146	-	1.524	1.003	-	
5500	100	802.11a	OFDM	20	18.5	16.67	-0.12	0 mm	1	04555	6	top	99.7	1.115	-	1.524	1.003	-	
5500	100	802.11a	OFDM	20	18.5	16.67	0.00	0 mm	1	04555	6	left	99.7	0.753	-	1.524	1.003	-	
5500	100	802.11a	OFDM	20	18.5	16.76	0.04	0 mm	2	04555	6	back	99.7	8.313	0.699	1.493	1.003	1.047	A53
5500	100	802.11a	OFDM	20	18.5	16.76	0.03	0 mm	2	04555	6	front	99.7	3.499	0.294	1.493	1.003	0.440	
5500	100	802.11a	OFDM	20	18.5	16.76	0.20	0 mm	2	04555	6	top	99.7	1.833	-	1.493	1.003	-	
5500	100	802.11a	OFDM	20	18.5	16.76	0.08	0 mm	2	04555	6	left	99.7	0.650	-	1.493	1.003	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population												Phablet 4.0 W/kg (mW/g) averaged over 10 grams							

11.5 SAR Test Notes

General Notes:

- 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.
- Batteries are fully charged at the beginning of the SAR measurements.
- Liquid tissue depth was at least 15.0 cm for all frequencies.
- 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.
- SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
- 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.
- 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.
- Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg for 1g and 2.0 W/kg for 1g. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
- 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).
- 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.

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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. 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.

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.

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- Per KDB Publication 941225 D05Av01r02, SAR for downlink only LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.

WLAN Notes:

- For held-to-ear, hotspot and phablet operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g evaluations, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
- 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.
- 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.
- 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.
- When the maximum reported 1g averaged SAR is ≤ 0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
- When 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.
- The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.

Bluetooth Notes

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

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12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

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

12.2 Simultaneous Transmission Procedures

This device contains transmitters that may operate simultaneously. Therefore simultaneous transmission analysis is required. Per FCC KDB Publication 447498 D01v06 4.3.2 and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1g SAR for all the simultaneous transmitting antennas in a specific 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.

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

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

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	0.177	0.340	0.311	0.517	0.488	0.828
	GSM 1900	0.062	0.340	0.311	0.402	0.373	0.713
	UMTS 850	0.204	0.340	0.311	0.544	0.515	0.855
	UMTS 1750	0.090	0.340	0.311	0.430	0.401	0.741
	UMTS 1900	0.065	0.340	0.311	0.405	0.376	0.716
	LTE Band 12	0.102	0.340	0.311	0.442	0.413	0.753
	LTE Band 13	0.115	0.340	0.311	0.455	0.426	0.766
	LTE Band 26 (Cell)	0.169	0.340	0.311	0.509	0.480	0.820
	LTE Band 5 (Cell)	0.233	0.340	0.311	0.573	0.544	0.884
	LTE Band 66 (AWS)	0.112	0.340	0.311	0.452	0.423	0.763
	LTE Band 25 (PCS)	0.057	0.340	0.311	0.397	0.368	0.708
	LTE Band 7	0.148	0.340	0.311	0.488	0.459	0.799
	LTE Band 41	0.043	0.340	0.311	0.383	0.354	0.694

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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	0.177	0.262	0.596	0.439	0.773	1.035
	GSM 1900	0.062	0.262	0.596	0.324	0.658	0.920
	UMTS 850	0.204	0.262	0.596	0.466	0.800	1.062
	UMTS 1750	0.090	0.262	0.596	0.352	0.686	0.948
	UMTS 1900	0.065	0.262	0.596	0.327	0.661	0.923
	LTE Band 12	0.102	0.262	0.596	0.364	0.698	0.960
	LTE Band 13	0.115	0.262	0.596	0.377	0.711	0.973
	LTE Band 26 (Cell)	0.169	0.262	0.596	0.431	0.765	1.027
	LTE Band 5 (Cell)	0.233	0.262	0.596	0.495	0.829	1.091
	LTE Band 66 (AWS)	0.112	0.262	0.596	0.374	0.708	0.970
	LTE Band 25 (PCS)	0.057	0.262	0.596	0.319	0.653	0.915
	LTE Band 7	0.148	0.262	0.596	0.410	0.744	1.006
	LTE Band 41	0.043	0.262	0.596	0.305	0.639	0.901

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 MIMO at 13 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
Head SAR	GSM 850	0.177	0.236	0.262	0.596	1.271
	GSM 1900	0.062	0.236	0.262	0.596	1.156
	UMTS 850	0.204	0.236	0.262	0.596	1.298
	UMTS 1750	0.090	0.236	0.262	0.596	1.184
	UMTS 1900	0.065	0.236	0.262	0.596	1.159
	LTE Band 12	0.102	0.236	0.262	0.596	1.196
	LTE Band 13	0.115	0.236	0.262	0.596	1.209
	LTE Band 26 (Cell)	0.169	0.236	0.262	0.596	1.263
	LTE Band 5 (Cell)	0.233	0.236	0.262	0.596	1.327
	LTE Band 66 (AWS)	0.112	0.236	0.262	0.596	1.206
	LTE Band 25 (PCS)	0.057	0.236	0.262	0.596	1.151
	LTE Band 7	0.148	0.236	0.262	0.596	1.242
	LTE Band 41	0.043	0.236	0.262	0.596	1.137

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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	0.177	0.280	0.457
	GSM 1900	0.062	0.280	0.342
	UMTS 850	0.204	0.280	0.484
	UMTS 1750	0.090	0.280	0.370
	UMTS 1900	0.065	0.280	0.345
	LTE Band 12	0.102	0.280	0.382
	LTE Band 13	0.115	0.280	0.395
	LTE Band 26 (Cell)	0.169	0.280	0.449
	LTE Band 5 (Cell)	0.233	0.280	0.513
	LTE Band 66 (AWS)	0.112	0.280	0.392
	LTE Band 25 (PCS)	0.057	0.280	0.337
	LTE Band 7	0.148	0.280	0.428
	LTE Band 41	0.043	0.280	0.323

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	0.224	0.092	0.056	0.316	0.280	0.372
	GSM 1900	0.230	0.092	0.056	0.322	0.286	0.378
	UMTS 850	0.296	0.092	0.056	0.388	0.352	0.444
	UMTS 1750	0.424	0.092	0.056	0.516	0.480	0.572
	UMTS 1900	0.283	0.092	0.056	0.375	0.339	0.431
	LTE Band 12	0.161	0.092	0.056	0.253	0.217	0.309
	LTE Band 13	0.197	0.092	0.056	0.289	0.253	0.345
	LTE Band 26 (Cell)	0.209	0.092	0.056	0.301	0.265	0.357
	LTE Band 5 (Cell)	0.287	0.092	0.056	0.379	0.343	0.435
	LTE Band 66 (AWS)	0.489	0.092	0.056	0.581	0.545	0.637
	LTE Band 25 (PCS)	0.258	0.092	0.056	0.350	0.314	0.406
	LTE Band 7	0.575	0.092	0.056	0.667	0.631	0.723
	LTE Band 41	0.267	0.092	0.056	0.359	0.323	0.415

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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	0.224	0.050	0.162	0.274	0.386	0.436
	GSM 1900	0.230	0.050	0.162	0.280	0.392	0.442
	UMTS 850	0.296	0.050	0.162	0.346	0.458	0.508
	UMTS 1750	0.424	0.050	0.162	0.474	0.586	0.636
	UMTS 1900	0.283	0.050	0.162	0.333	0.445	0.495
	LTE Band 12	0.161	0.050	0.162	0.211	0.323	0.373
	LTE Band 13	0.197	0.050	0.162	0.247	0.359	0.409
	LTE Band 26 (Cell)	0.209	0.050	0.162	0.259	0.371	0.421
	LTE Band 5 (Cell)	0.287	0.050	0.162	0.337	0.449	0.499
	LTE Band 66 (AWS)	0.489	0.050	0.162	0.539	0.651	0.701
	LTE Band 25 (PCS)	0.258	0.050	0.162	0.308	0.420	0.470
	LTE Band 7	0.575	0.050	0.162	0.625	0.737	0.787
	LTE Band 41	0.267	0.050	0.162	0.317	0.429	0.479

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	0.224	0.092	0.056	0.050	0.162	0.584
	GSM 1900	0.230	0.092	0.056	0.050	0.162	0.590
	UMTS 850	0.296	0.092	0.056	0.050	0.162	0.656
	UMTS 1750	0.424	0.092	0.056	0.050	0.162	0.784
	UMTS 1900	0.283	0.092	0.056	0.050	0.162	0.643
	LTE Band 12	0.161	0.092	0.056	0.050	0.162	0.521
	LTE Band 13	0.197	0.092	0.056	0.050	0.162	0.557
	LTE Band 26 (Cell)	0.209	0.092	0.056	0.050	0.162	0.569
	LTE Band 5 (Cell)	0.287	0.092	0.056	0.050	0.162	0.647
	LTE Band 66 (AWS)	0.489	0.092	0.056	0.050	0.162	0.849
	LTE Band 25 (PCS)	0.258	0.092	0.056	0.050	0.162	0.618
	LTE Band 7	0.575	0.092	0.056	0.050	0.162	0.935
	LTE Band 41	0.267	0.092	0.056	0.050	0.162	0.627

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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	0.224	0.038	0.262
	GSM 1900	0.230	0.038	0.268
	UMTS 850	0.296	0.038	0.334
	UMTS 1750	0.424	0.038	0.462
	UMTS 1900	0.283	0.038	0.321
	LTE Band 12	0.161	0.038	0.199
	LTE Band 13	0.197	0.038	0.235
	LTE Band 26 (Cell)	0.209	0.038	0.247
	LTE Band 5 (Cell)	0.287	0.038	0.325
	LTE Band 66 (AWS)	0.489	0.038	0.527
	LTE Band 25 (PCS)	0.258	0.038	0.296
	LTE Band 7	0.575	0.038	0.613
	LTE Band 41	0.267	0.038	0.305

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	0.588	0.287	0.115	0.875	0.703	0.990
	GPRS 1900	0.933	0.287	0.115	1.220	1.048	1.335
	UMTS 850	0.524	0.287	0.115	0.811	0.639	0.926
	UMTS 1750	0.483	0.287	0.115	0.770	0.598	0.885
	UMTS 1900	0.430	0.287	0.115	0.717	0.545	0.832
	LTE Band 12	0.242	0.287	0.115	0.529	0.357	0.644
	LTE Band 13	0.349	0.287	0.115	0.636	0.464	0.751
	LTE Band 26 (Cell)	0.466	0.287	0.115	0.753	0.581	0.868
	LTE Band 5 (Cell)	0.636	0.287	0.115	0.923	0.751	1.038
	LTE Band 66 (AWS)	0.764	0.287	0.115	1.051	0.879	1.166
	LTE Band 25 (PCS)	0.495	0.287	0.115	0.782	0.610	0.897
	LTE Band 7	1.049	0.287	0.115	1.336	1.164	1.451
	LTE Band 41	0.570	0.287	0.115	0.857	0.685	0.972

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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	0.588	0.054	0.240	0.642	0.828	0.882
	GPRS 1900	0.933	0.054	0.240	0.987	1.173	1.227
	UMTS 850	0.524	0.054	0.240	0.578	0.764	0.818
	UMTS 1750	0.483	0.054	0.240	0.537	0.723	0.777
	UMTS 1900	0.430	0.054	0.240	0.484	0.670	0.724
	LTE Band 12	0.242	0.054	0.240	0.296	0.482	0.536
	LTE Band 13	0.349	0.054	0.240	0.403	0.589	0.643
	LTE Band 26 (Cell)	0.466	0.054	0.240	0.520	0.706	0.760
	LTE Band 5 (Cell)	0.636	0.054	0.240	0.690	0.876	0.930
	LTE Band 66 (AWS)	0.764	0.054	0.240	0.818	1.004	1.058
	LTE Band 25 (PCS)	0.495	0.054	0.240	0.549	0.735	0.789
	LTE Band 7	1.049	0.054	0.240	1.103	1.289	1.343
	LTE Band 41	0.570	0.054	0.240	0.624	0.810	0.864

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 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
Hotspot SAR	GPRS 850	0.588	0.287	0.115	0.054	0.240	1.284
	GPRS 1900	0.933	0.287	0.115	0.054	0.240	See Table Below
	UMTS 850	0.524	0.287	0.115	0.054	0.240	1.220
	UMTS 1750	0.483	0.287	0.115	0.054	0.240	1.179
	UMTS 1900	0.430	0.287	0.115	0.054	0.240	1.126
	LTE Band 12	0.242	0.287	0.115	0.054	0.240	0.938
	LTE Band 13	0.349	0.287	0.115	0.054	0.240	1.045
	LTE Band 26 (Cell)	0.466	0.287	0.115	0.054	0.240	1.162
	LTE Band 5 (Cell)	0.636	0.287	0.115	0.054	0.240	1.332
	LTE Band 66 (AWS)	0.764	0.287	0.115	0.054	0.240	1.460
	LTE Band 25 (PCS)	0.495	0.287	0.115	0.054	0.240	1.191
	LTE Band 7	1.049	0.287	0.115	0.054	0.240	See Table Below
	LTE Band 41	0.570	0.287	0.115	0.054	0.240	1.266

Simult Tx	Configuration	GPRS 1900 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
Hotspot SAR	Back	0.463	0.287*	0.115*	0.054	0.240	1.159
	Front	0.356	0.287*	0.115	0.054*	0.240*	1.052
	Top	-	0.287	0.115*	0.054*	0.240*	0.696
	Bottom	0.933	-	-	-	-	0.933
	Right	0.095	-	-	-	-	0.095
	Left	0.035	0.287*	0.115*	0.054*	0.240*	0.731

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Simult Tx	Configuration	LTE Band 7 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
Hotspot SAR	Back	0.380	0.287*	0.115*	0.054	0.240	1.076
	Front	0.444	0.287*	0.115	0.054*	0.240*	1.140
	Top	-	0.287	0.115*	0.054*	0.240*	0.696
	Bottom	1.049	-	-	-	-	1.049
	Right	0.099	-	-	-	-	0.099
	Left	0.276	0.287*	0.115*	0.054*	0.240*	0.972

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	0.588	0.063	0.651
	GPRS 1900	0.933	0.063	0.996
	UMTS 850	0.524	0.063	0.587
	UMTS 1750	0.483	0.063	0.546
	UMTS 1900	0.430	0.063	0.493
	LTE Band 12	0.242	0.063	0.305
	LTE Band 13	0.349	0.063	0.412
	LTE Band 26 (Cell)	0.466	0.063	0.529
	LTE Band 5 (Cell)	0.636	0.063	0.699
	LTE Band 66 (AWS)	0.764	0.063	0.827
	LTE Band 25 (PCS)	0.495	0.063	0.558
	LTE Band 7	1.049	0.063	1.112
	LTE Band 41	0.570	0.063	0.633

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12.6 Phablet Simultaneous Transmission Analysis

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

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

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

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
Phablet SAR	UMTS 1750	1.295	0.513	1.047	1.808	2.342	2.855
	UMTS 1900	1.110	0.513	1.047	1.623	2.157	2.670
	LTE Band 66 (AWS)	2.036	0.513	1.047	2.549	3.083	3.596
	LTE Band 7	2.115	0.513	1.047	2.628	3.162	3.675

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

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

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

Table 13-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
2450	2510.00	20850	LTE Band 7, 20 MHz Bandwidth	QPSK, 1 RB, 50 RB Offset	bottom	10 mm	0.814	0.806	1.01	N/A	N/A	N/A	N/A
2600	2560.00	21350	LTE Band 7, 20 MHz Bandwidth	QPSK, 1 RB, 50 RB Offset	bottom	10 mm	0.903	0.911	1.01	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT						Body							
Spatial Peak						1.6 W/kg (mW/g)							
Uncontrolled Exposure/General Population						averaged over 1 gram							

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 25 tuner states were divided evenly among band, mode and exposure combinations so that at least one single point SAR measurement was measured among the configurations. 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. While inserting and removing the USB cable between single point SAR measurements, the device was ensured to capture the same physical point SAR that generated the highest SAR. The SAR probe remained stationary at the same position throughout the entire series of single point measurements for each combination.

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

**Table 14-1
Supplemental Head SAR Data**

Supplemental Head SAR Data			
UMTS 850		LTE Band 5	
RMC		QPSK, 10 MHz Bandwidth, 1 RB, 25 RB Offsets	
Test Position	Right Cheek	Test Position	Right Cheek
Frequency (MHz)	836.6	Frequency (MHz)	836.5
Channel	4183	Channel	20525
Measured 1g SAR (W/kg)	0.175	Measured 1g SAR (W/kg)	0.163
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-tune (State 1)	0.271	Auto-tune (State 1)	0.257
Default (State 1)	0.259	Default (State 1)	0.260
State 4	0.263	State 1	0.260
State 6	0.232	State 5	0.224
State 10	0.218	State 9	0.219
State 16	0.219	State 13	0.189
State 18	0.249	State 19	0.115
State 20	0.118	State 21	0.115
State 23	0.259	State 25	0.219

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Table 14-2
Supplemental Body SAR Data

Supplemental Body SAR Data			
UMTS 850		LTE Band 5	
RMC		QPSK, 10MHz Bandwidth, 1 RB, 25 RB Offsets	
Test Position	Back Side	Test Position	Back Side
Spacing	10 mm	Spacing	10 mm
Frequency (MHz)	836.6	Frequency (MHz)	836.5
Channel	4183	Channel	20525
Measured 1g SAR (W/kg)	0.449	Measured 1g SAR (W/kg)	0.445
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-tune (State 1)	0.649	Auto-tune (State 1)	0.628
Default (State 1)	0.648	Default (State 1)	0.626
State 2	0.553	State 4	0.629
State 3	0.651	State 7	0.629
State 12	0.293	State 8	0.553
State 14	0.590	State 11	0.290
State 20	0.293	State 15	0.564
State 22	0.411	State 17	0.553
State 24	0.590	State 21	0.271

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15 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
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	3/23/2017	Annual	3/23/2018	MY47270002
Agilent	E4438C	ESG Vector Signal Generator	3/24/2017	Annual	3/24/2018	MY45091346
Agilent	E4438C	ESG Vector Signal Generator	3/21/2017	Biennial	3/21/2019	MY45090700
Agilent	E4438C	ESG Vector Signal Generator	3/23/2017	Biennial	3/23/2019	MY42082659
Agilent	E4438C	ESG Vector Signal Generator	3/24/2017	Biennial	3/24/2019	MY42082385
Agilent	E5515C	Wireless Communications Test Set	1/29/2016	Biennial	1/29/2018	GB46310798
Agilent	E5515C	Wireless Communications Test Set	5/31/2017	Annual	5/31/2018	GB43304278
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/22/2017	Annual	3/22/2018	MY45470194
Agilent	N4010A	Wireless Connectivity Test Set	CBT	N/A	CBT	GB46170464
Agilent	N4010A	Wireless Connectivity Test Set	CBT	N/A	CBT	GB44450273
Agilent	N5182A	MXG Vector Signal Generator	2/28/2017	Annual	2/28/2018	MY47420800
Agilent	N9020A	MXA Signal Analyzer	12/28/2016	Annual	12/28/2017	US46470561
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433971
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433972
Anritsu	MA24106A	USB Power Sensor	3/20/2017	Annual	3/20/2018	1344555
Anritsu	MA24106A	USB Power Sensor	3/20/2017	Annual	3/20/2018	1349501
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	10/22/2017	Annual	10/22/2018	941001
Anritsu	ML2496A	Power Meter	3/28/2017	Annual	3/28/2018	1351001
Anritsu	MT8820C	Radio Communication Analyzer	11/4/2016	Annual	11/4/2017	620144418
Anritsu	MT8820C	Radio Communication Analyzer	12/8/2016	Annual	12/8/2017	6201300731
COMTECH	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M155A00 009
COMTECH	AR85729-5/579B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00 1002
Control Company	4352	Ultra Long Stem Thermometer	3/8/2016	Biennial	3/8/2018	160261729
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R897950903
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	13264162
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	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	836271/0079
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/10/2017	Annual	2/10/2018	162125
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	7/20/2017	Annual	7/20/2018	132885
Rohde & Schwarz	CMW500	Radio Communication Tester	8/2/2017	Annual	8/2/2018	116743
Rohde & Schwarz	CMW500	Radio Communication Tester	9/15/2017	Annual	9/15/2018	109366
Seekonk	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	22313
SPEAG	D1750V2	1750 MHz SAR Dipole	5/9/2017	Annual	5/9/2018	1148
SPEAG	D1750V2	1750 MHz SAR Dipole	7/14/2016	Biennial	7/14/2018	1150
SPEAG	D1900V2	1900 MHz SAR Dipole	2/9/2017	Annual	2/9/2018	5d148
SPEAG	D1900V2	1900 MHz SAR Dipole	7/8/2016	Biennial	7/8/2018	5d080
SPEAG	D2450V2	2450 MHz SAR Dipole	7/25/2016	Biennial	7/25/2018	981
SPEAG	D2450V2	2450 MHz SAR Dipole	8/17/2017	Annual	8/17/2018	719
SPEAG	D2600V2	2600 MHz SAR Dipole	6/7/2017	Annual	6/7/2018	1064
SPEAG	D2600V2	2600 MHz SAR Dipole	7/10/2017	Annual	7/10/2018	1126
SPEAG	D5GHzV2	5 GHz SAR Dipole	8/15/2017	Annual	8/15/2018	1237
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/21/2016	Biennial	9/21/2018	1191
SPEAG	D750V3	750 MHz SAR Dipole	1/11/2017	Annual	1/11/2018	1003
SPEAG	D750V3	750 MHz SAR Dipole	3/7/2017	Annual	3/7/2018	1054
SPEAG	D835V2	835 MHz SAR Dipole	7/11/2017	Annual	7/11/2018	4d133
SPEAG	D835V2	835 MHz SAR Dipole	7/13/2016	Biennial	7/13/2018	4d047
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/8/2017	Annual	3/8/2018	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2017	Annual	3/13/2018	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2017	Annual	4/11/2018	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/14/2017	Annual	6/14/2018	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/13/2017	Annual	7/13/2018	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/9/2017	Annual	8/9/2018	1323
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/10/2017	Annual	5/10/2018	1070
SPEAG	ES30V3	SAR Probe	2/10/2017	Annual	2/10/2018	3213
SPEAG	ES30V3	SAR Probe	3/14/2017	Annual	3/14/2018	3209
SPEAG	ES30V3	SAR Probe	3/14/2017	Annual	3/14/2018	3319
SPEAG	ES30V3	SAR Probe	8/14/2017	Annual	8/14/2018	3332
SPEAG	EX30V4	SAR Probe	2/13/2017	Annual	2/13/2018	3914
SPEAG	EX30V4	SAR Probe	4/18/2017	Annual	4/18/2018	7406
SPEAG	EX30V4	SAR Probe	7/17/2017	Annual	7/17/2018	7410
SPEAG	EX30V4	SAR Probe	8/16/2017	Annual	8/16/2018	7308

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. All equipment was used within its 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: A3LSMG965F; Type: Portable Handset; Serial: 04555

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.899 \text{ S/m}$; $\epsilon_r = 40.841$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-16-2017; Ambient Temp: 22.7°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

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

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

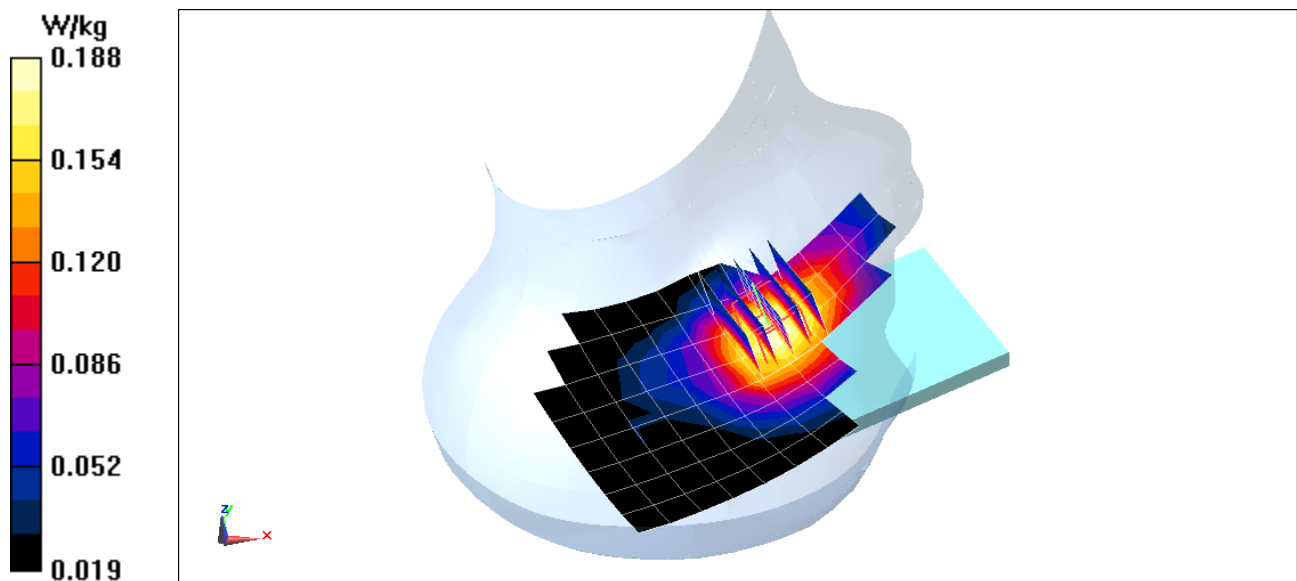
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.69 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.206 W/kg

SAR(1 g) = 0.160 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

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

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.433 \text{ S/m}$; $\epsilon_r = 39.831$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-21-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.7°C

Probe: ES3DV3 - SN3213; ConvF(5.29, 5.29, 5.29); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

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

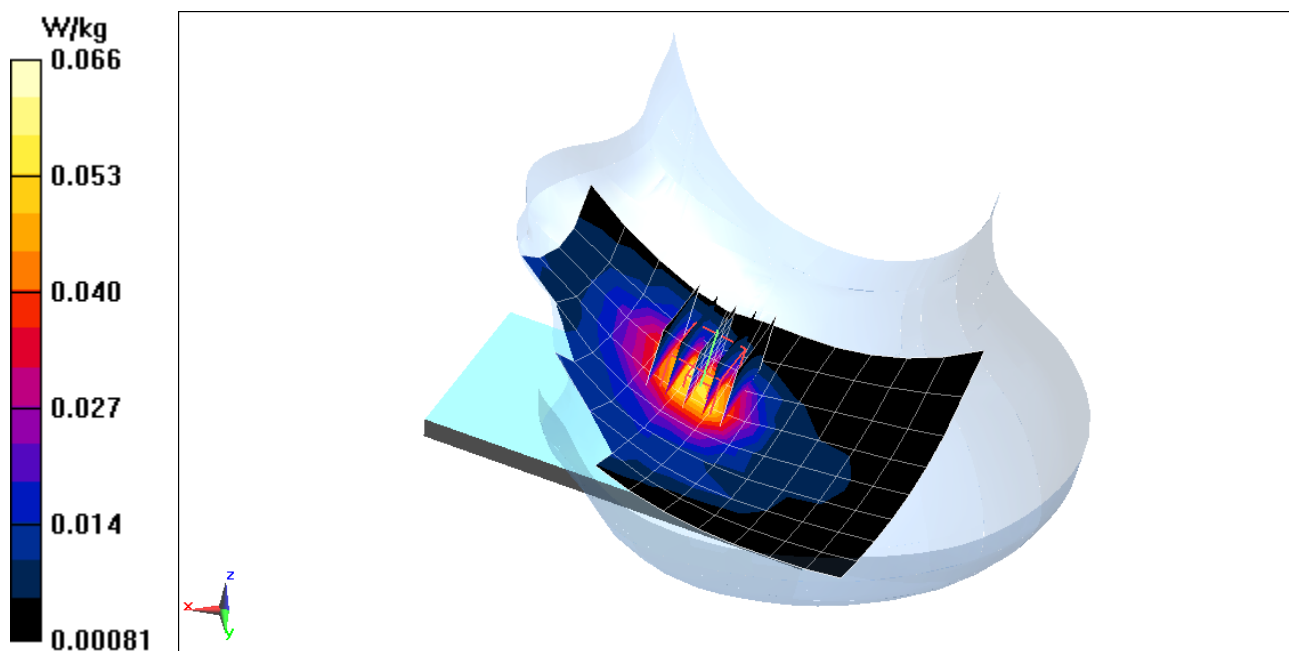
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 6.596 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.0860 W/kg

SAR(1 g) = 0.056 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0455B

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6$ MHz; $\sigma = 0.896$ S/m; $\epsilon_r = 41.141$; $\rho = 1000$ kg/m³

Phantom section: Right Section

Test Date: 10-19-2017; Ambient Temp: 22.8°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

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

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

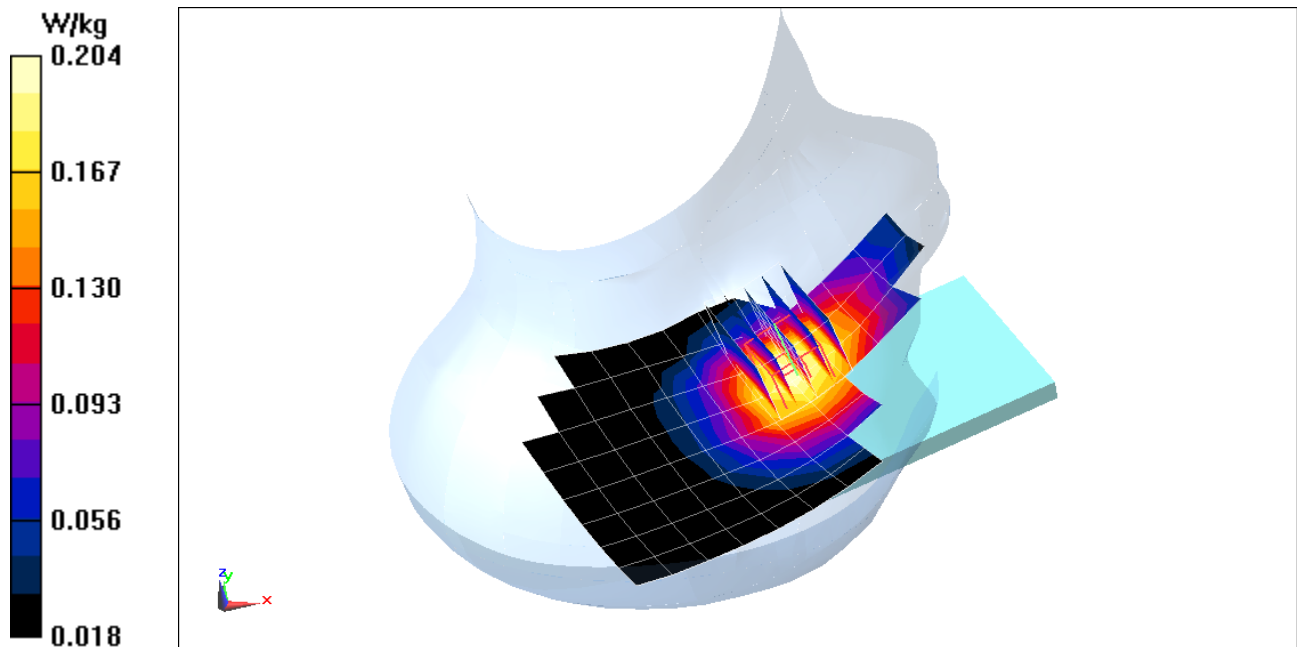
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.14 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.222 W/kg

SAR(1 g) = 0.175 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0453F

Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.4$ MHz; $\sigma = 1.366$ S/m; $\epsilon_r = 39.862$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Test Date: 10-23-2017; Ambient Temp: 22.7°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(5.5, 5.5, 5.5); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM Right; Type: QD000P40CD; Serial: 1800

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

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

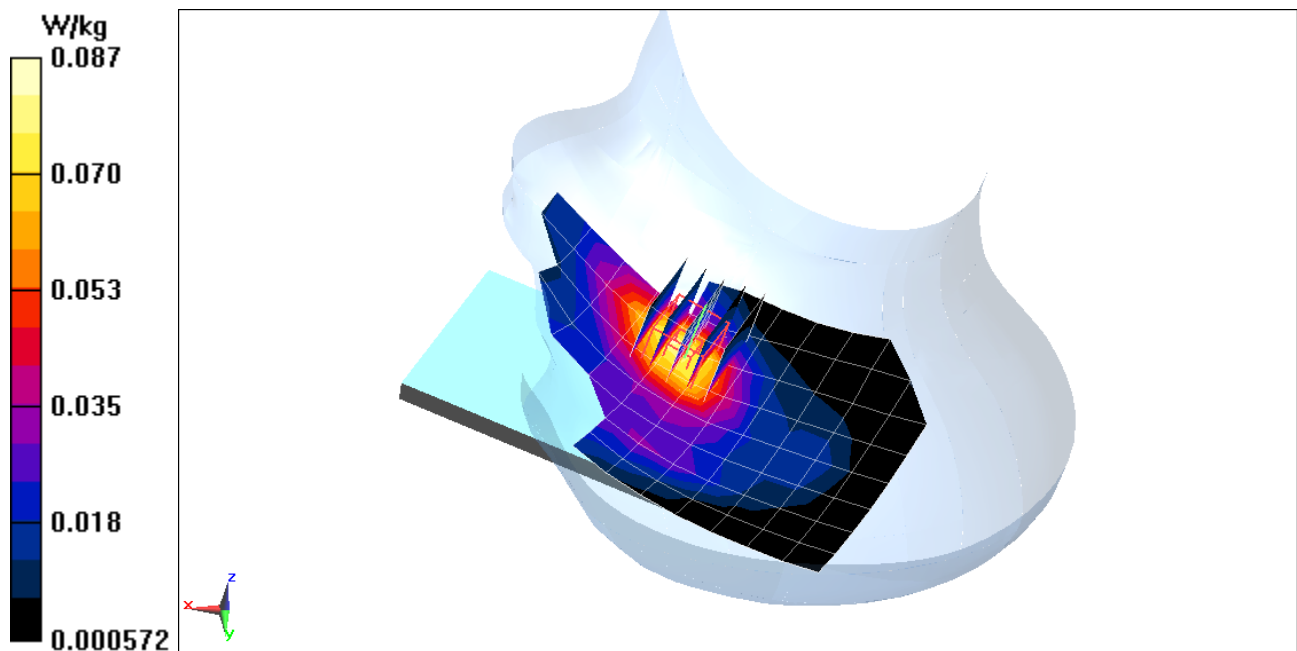
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 7.779 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.113 W/kg

SAR(1 g) = 0.075 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1907.6 \text{ MHz}$; $\sigma = 1.464 \text{ S/m}$; $\epsilon_r = 39.71$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-21-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.7°C

Probe: ES3DV3 - SN3213; ConvF(5.29, 5.29, 5.29); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

UMTS 1900, Left Head, Cheek, High.ch

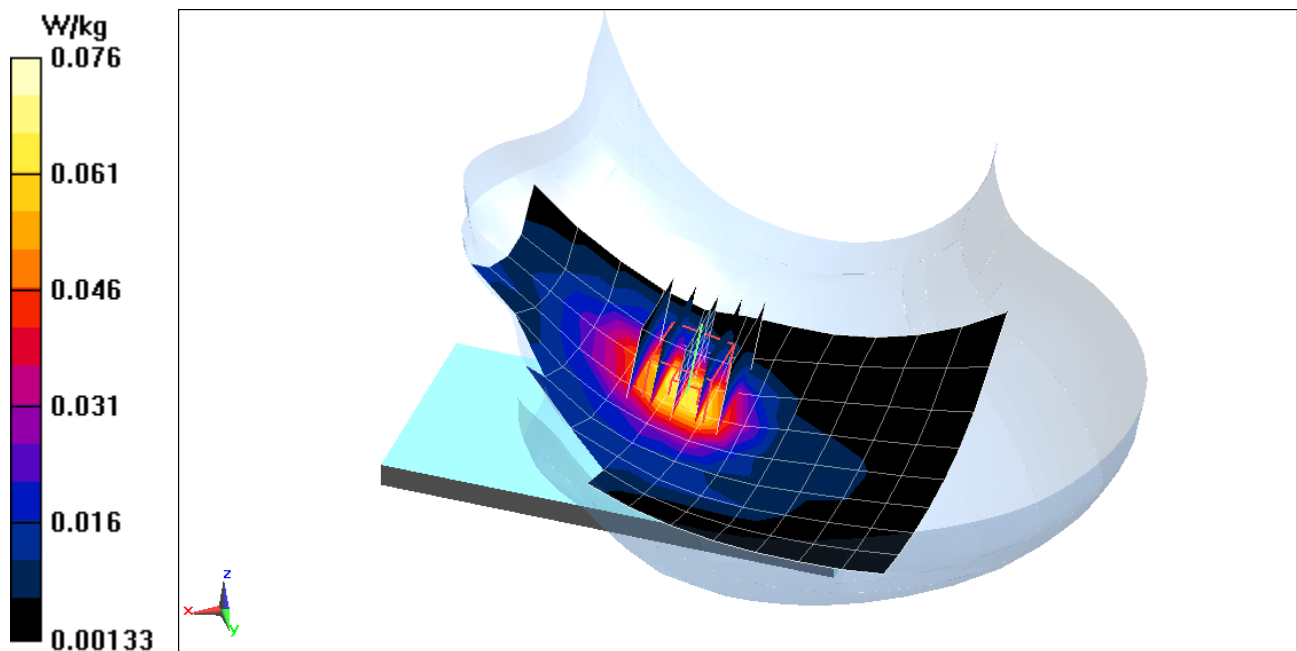
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 7.053 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 0.0980 W/kg

SAR(1 g) = 0.065 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.855 \text{ S/m}$; $\epsilon_r = 42.263$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-18-2017; Ambient Temp: 21.3°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3332; ConvF(6.81, 6.81, 6.81); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355

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, 49 RB Offset**

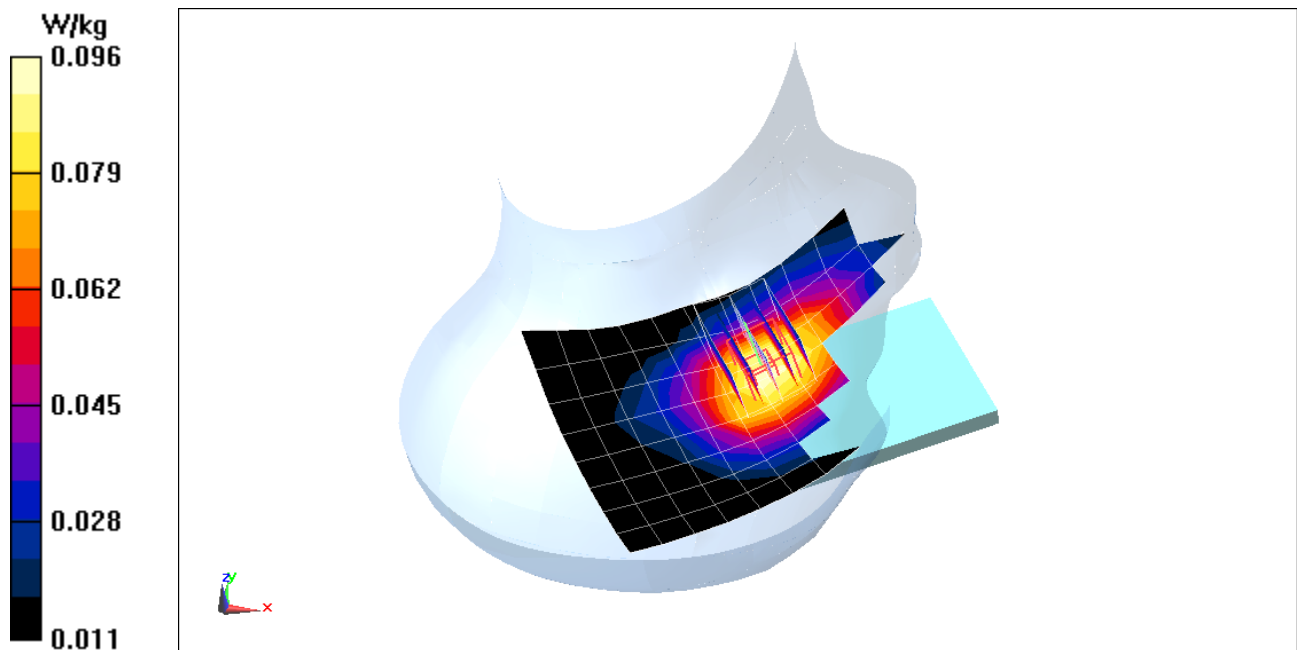
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.11 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.111 W/kg

SAR(1 g) = 0.089 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.924 \text{ S/m}$; $\epsilon_r = 41.213$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-18-2017; Ambient Temp: 21.3°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3332; ConvF(6.81, 6.81, 6.81); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355

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, 49 RB Offset**

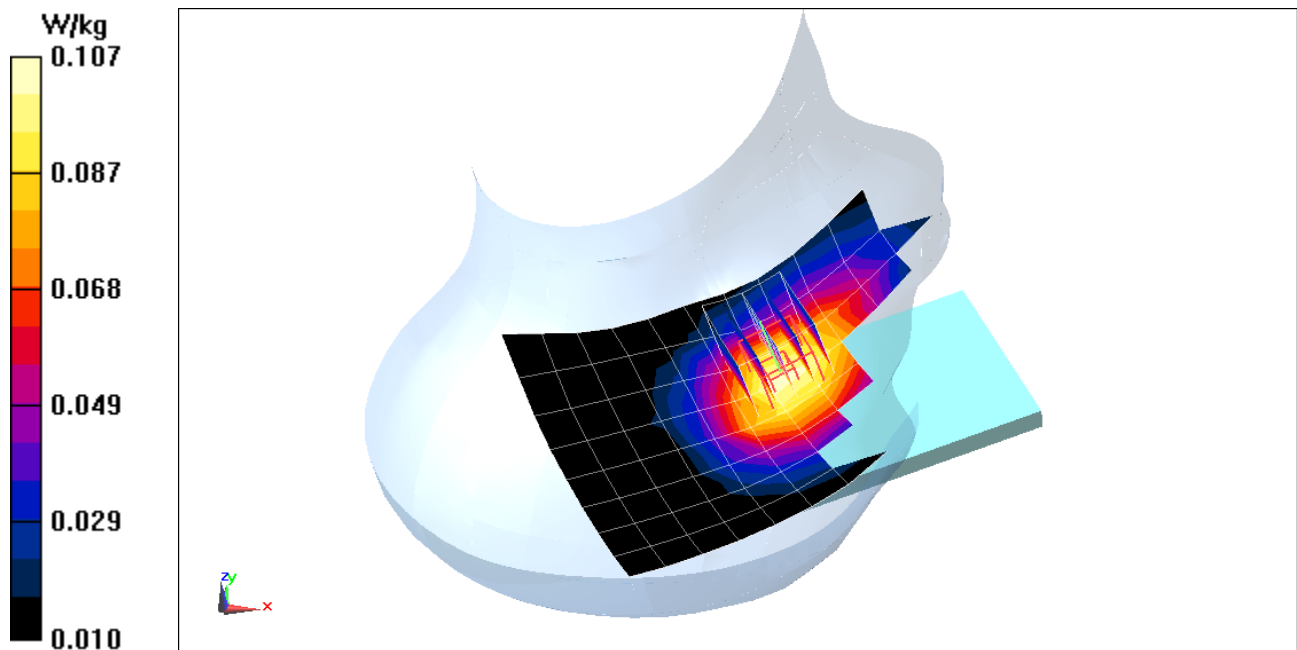
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.20 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.121 W/kg

SAR(1 g) = 0.097 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04555

Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 831.5 \text{ MHz}$; $\sigma = 0.895 \text{ S/m}$; $\epsilon_r = 40.902$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-16-2017; Ambient Temp: 22.7°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

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

**Mode: LTE Band 26 (Cell.), Right Head, Cheek, Mid.ch,
15 MHz Bandwidth, QPSK, 1 RB, 36 RB Offset**

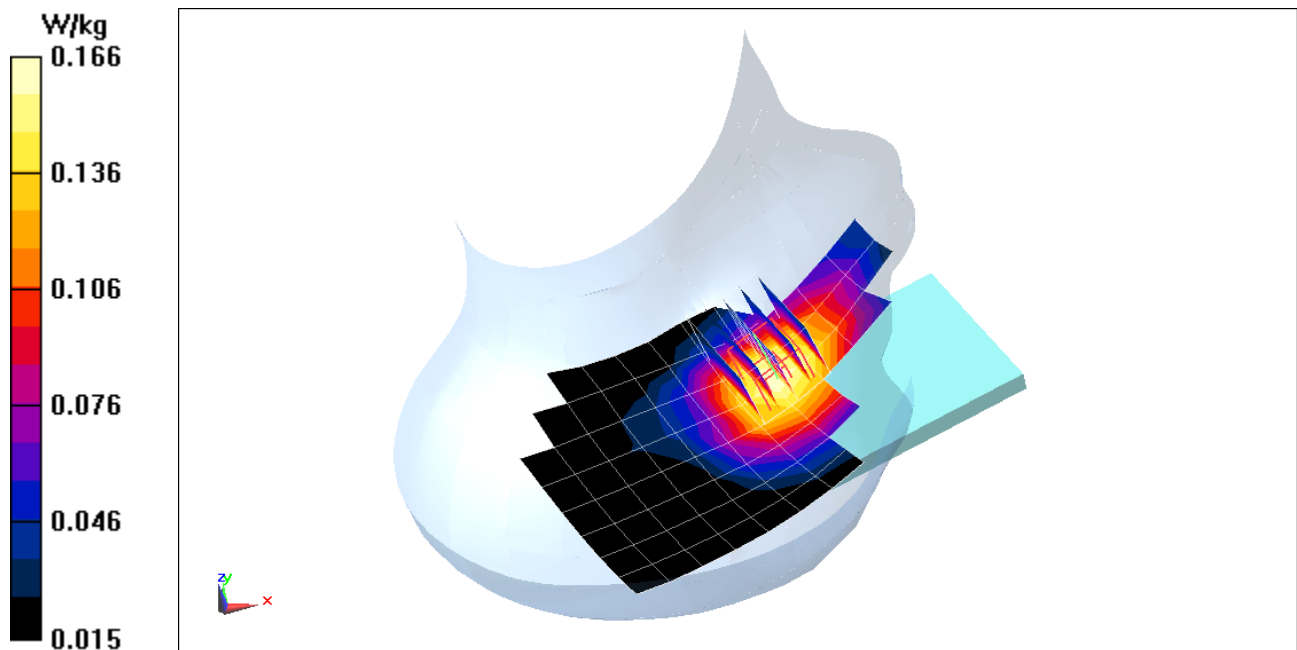
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.09 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.179 W/kg

SAR(1 g) = 0.142 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0455B

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 0.896 \text{ S/m}$; $\epsilon_r = 41.143$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-19-2017; Ambient Temp: 22.8°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

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, 25 RB Offset**

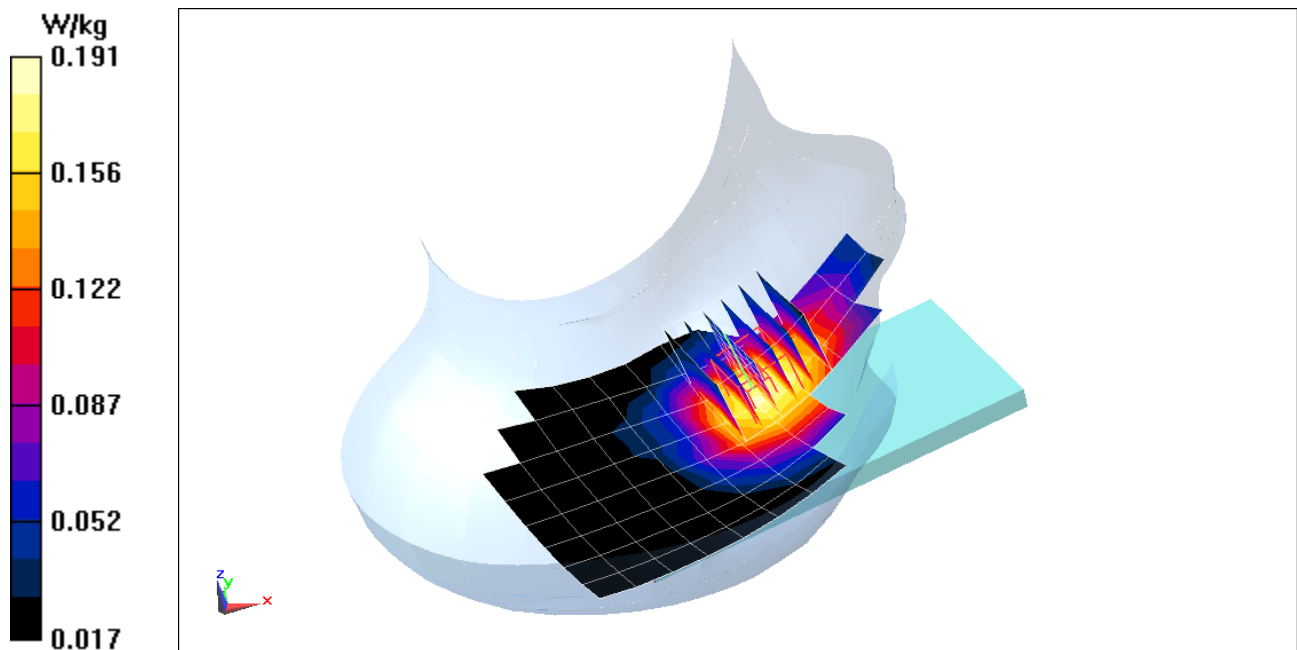
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 13.96 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.208 W/kg

SAR(1 g) = 0.163 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0453F

Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1720 MHz; Duty Cycle: 1:1

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1720 \text{ MHz}$; $\sigma = 1.353 \text{ S/m}$; $\epsilon_r = 39.915$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-23-2017; Ambient Temp: 22.7°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(5.5, 5.5, 5.5); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM Right; Type: QD000P40CD; Serial: 1800

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

**Mode: LTE Band 66 (AWS), Left Head, Cheek, Low.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

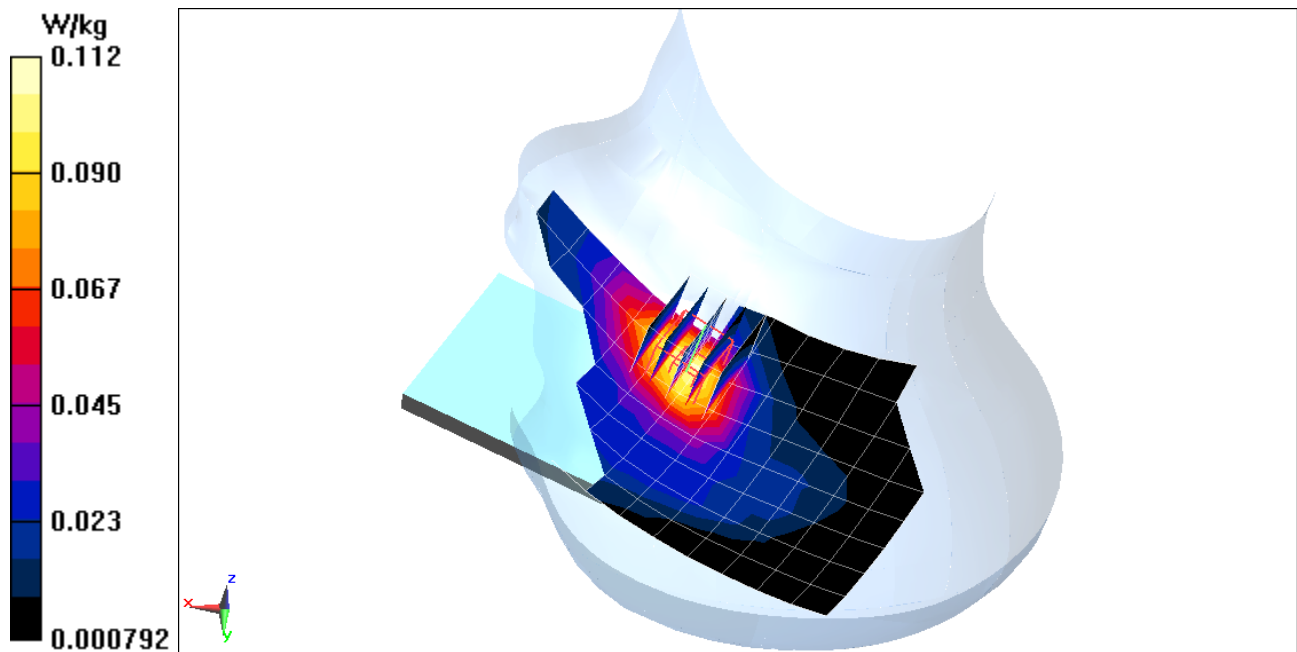
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 9.340 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.144 W/kg

SAR(1 g) = 0.096 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1905 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1905 \text{ MHz}$; $\sigma = 1.461 \text{ S/m}$; $\epsilon_r = 39.722$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 10-21-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.7°C

Probe: ES3DV3 - SN3213; ConvF(5.29, 5.29, 5.29); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

**Mode: LTE Band 25 (PCS), Left Head, Cheek, High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

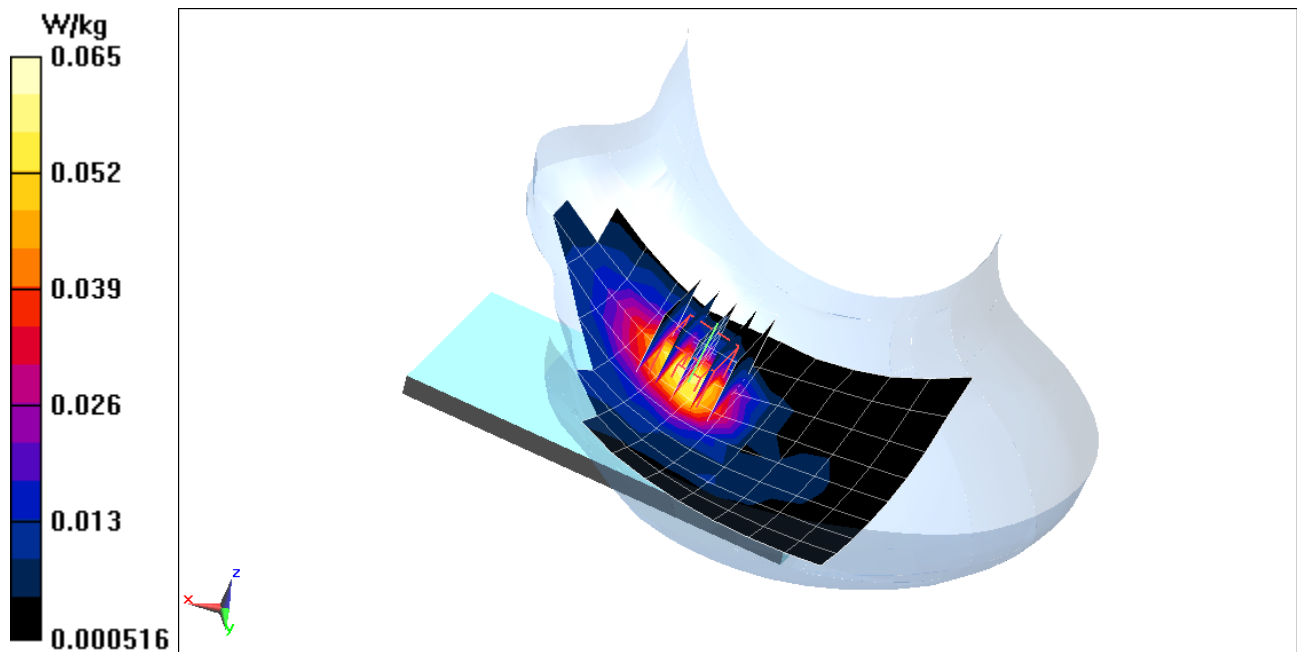
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 6.796 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 0.0840 W/kg

SAR(1 g) = 0.056 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04555

Communication System: UID 0, LTE Band 7; Frequency: 2535 MHz; Duty Cycle: 1:1

Medium: 2600 Head Medium parameters used (interpolated):

$f = 2535 \text{ MHz}$; $\sigma = 1.966 \text{ S/m}$; $\epsilon_r = 38.659$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-30-2017; Ambient Temp: 21.7°C; Tissue Temp: 20.7°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 7, Right Head, Tilt, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

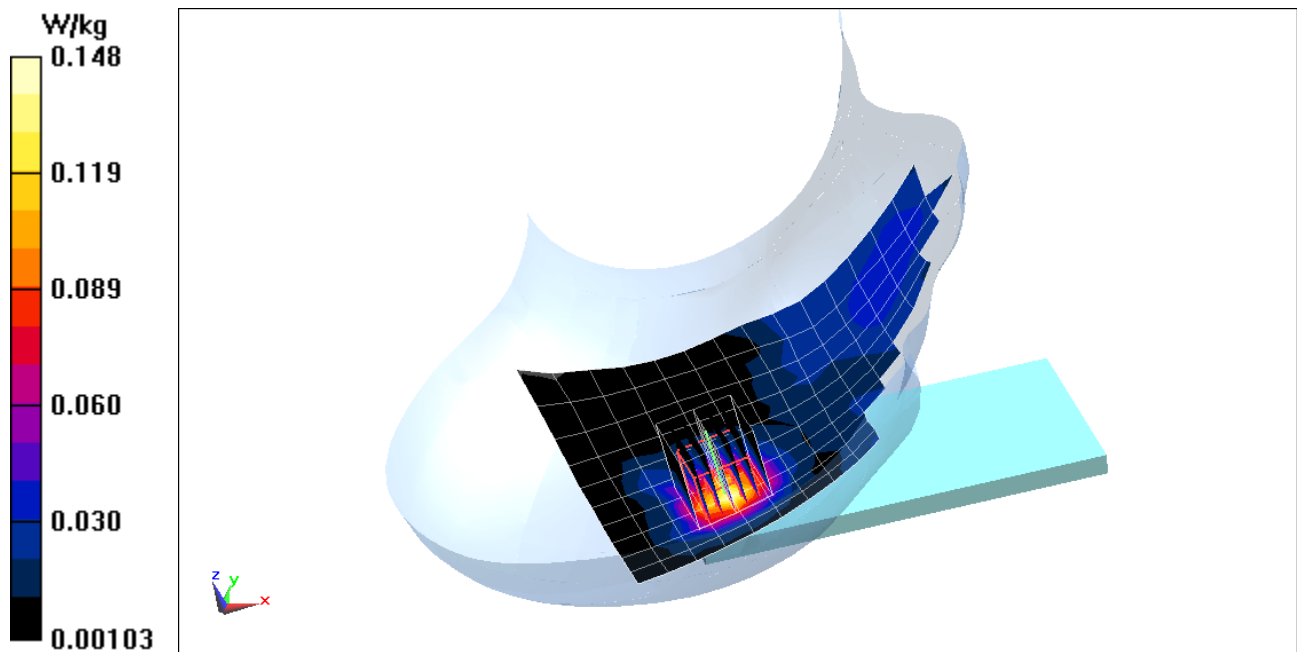
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 9.083 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.223 W/kg

SAR(1 g) = 0.119 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0458B

Communication System: UID 0, LTE Band 41; Frequency: 2549.5 MHz; Duty Cycle: 1:1.58

Medium: 2600 Head Medium parameters used:

$f = 2550$ MHz; $\sigma = 1.971$ S/m; $\epsilon_r = 39.117$; $\rho = 1000$ kg/m³

Phantom section: Left Section

Test Date: 10-26-2017; Ambient Temp: 23.1°C; Tissue Temp: 22.5°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, Left Head, Cheek, Low-Mid.ch, QPSK,
20 MHz Bandwidth, 1 RB, 99 RB Offset**

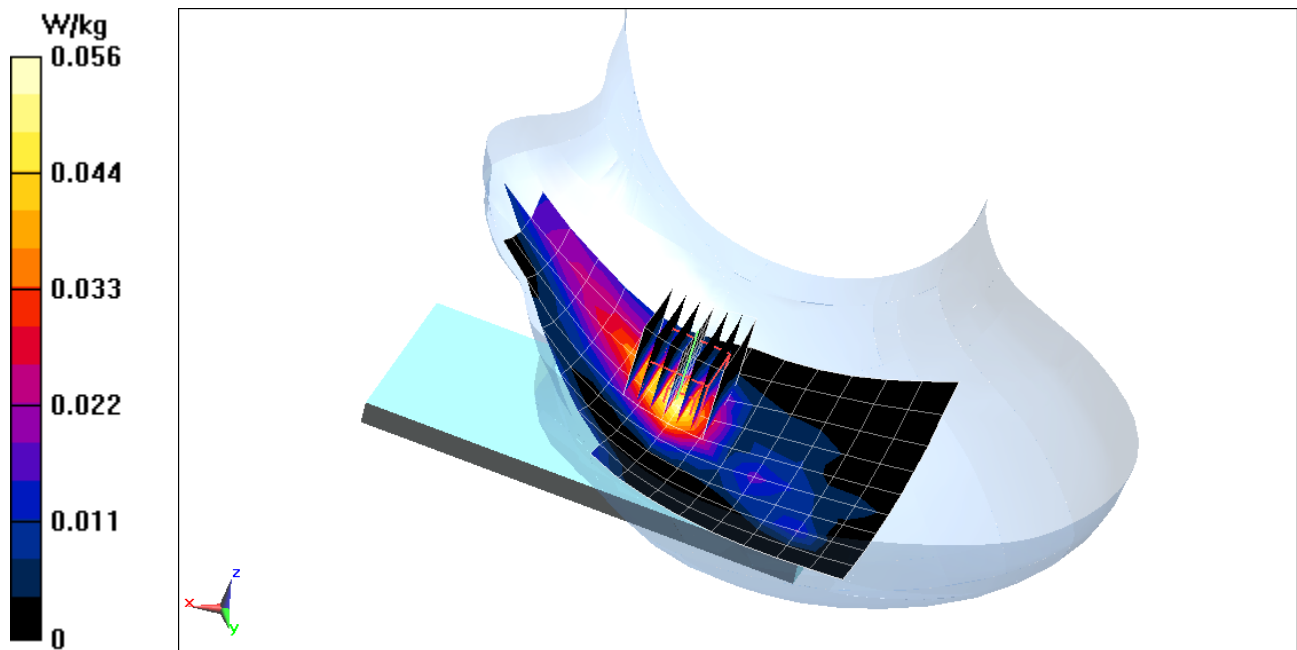
Area Scan (10x17x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 5.342 V/m; Power Drift = 0.13 dB

Peak SAR (extrapolated) = 0.0860 W/kg

SAR(1 g) = 0.043 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0458B

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

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 1.87 \text{ S/m}$; $\epsilon_r = 39.445$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-26-2017; Ambient Temp: 23.1°C; Tissue Temp: 22.5°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, 22 MHz Bandwidth, Right Head, Cheek, Ch 11, 1 Mbps, Antenna 1

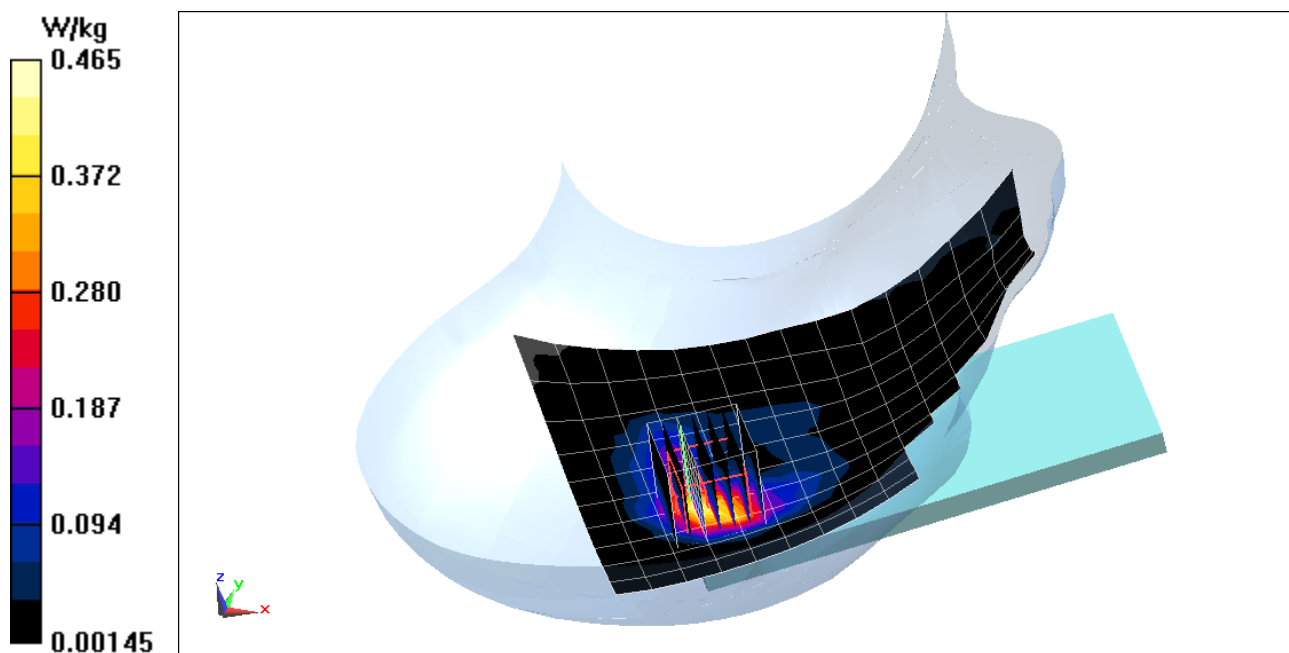
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 11.75 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.865 W/kg

SAR(1 g) = 0.321 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 043CF

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

Medium: 5 GHz Medium parameters used (interpolated):

$f = 5775 \text{ MHz}$; $\sigma = 5.158 \text{ S/m}$; $\epsilon_r = 34.788$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-25-2017; Ambient Temp: 22.8°C; Tissue Temp: 21.2°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 (Left); Type: SAM; Serial: 1715

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

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

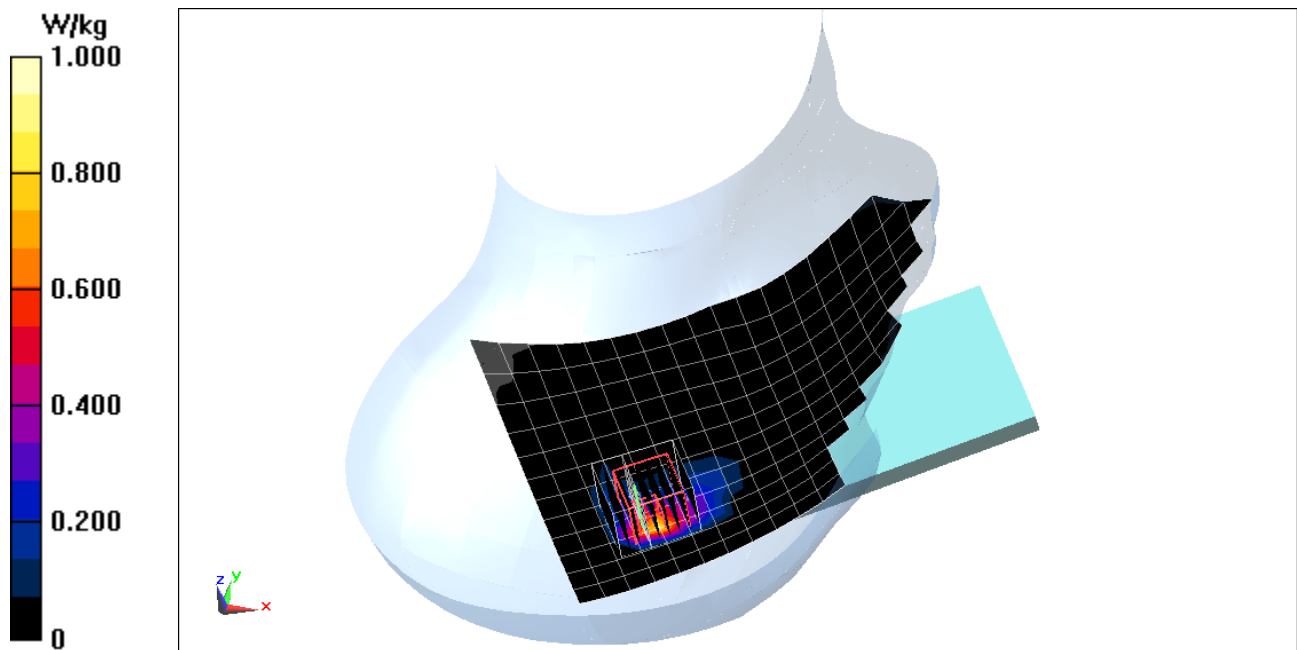
Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (8x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Reference Value = 0 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.07 W/kg

SAR(1 g) = 0.511 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0458B

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.294

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 1.846 \text{ S/m}$; $\epsilon_r = 39.527$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 10-26-2017; Ambient Temp: 23.1°C; Tissue Temp: 22.5°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: Bluetooth, Right Head, Cheek, Ch 39, 1 Mbps

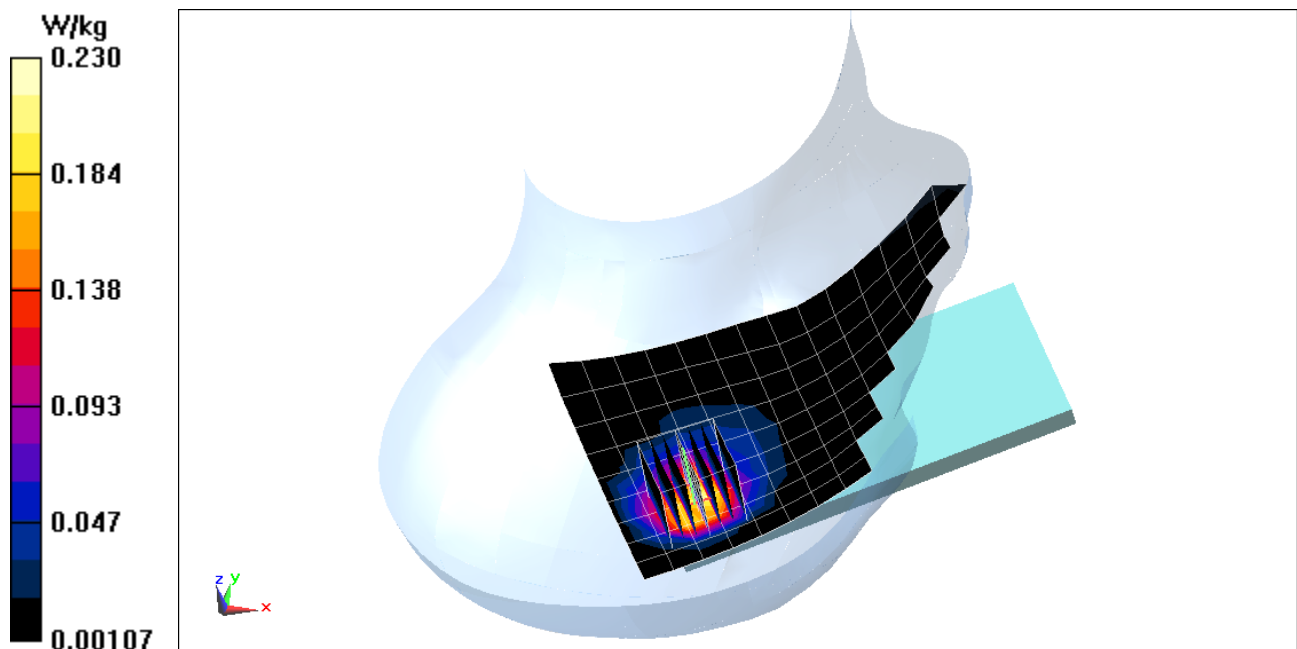
Area Scan (10x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 11.13 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.451 W/kg

SAR(1 g) = 0.201 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0453F

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.961 \text{ S/m}$; $\epsilon_r = 52.933$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-18-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

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

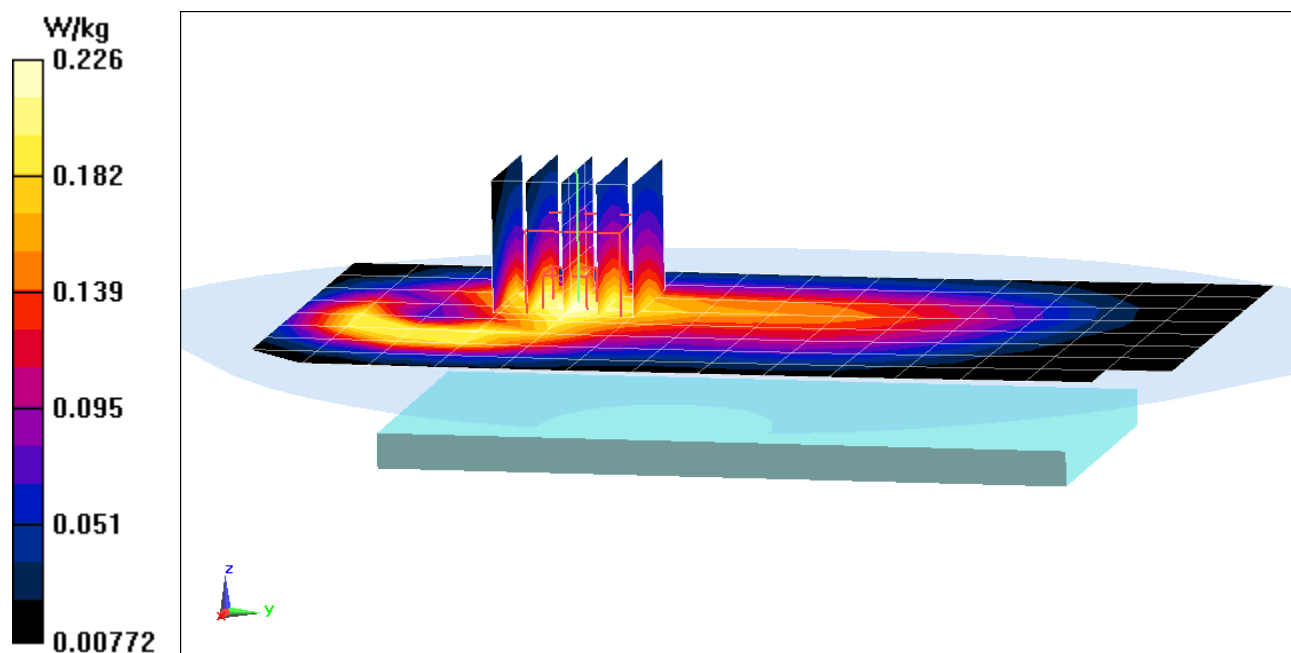
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.16 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 0.268 W/kg

SAR(1 g) = 0.202 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, _GSM GPRS; 4 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.076

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6$ MHz; $\sigma = 0.961$ S/m; $\epsilon_r = 52.933$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-18-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 4 Tx Slots

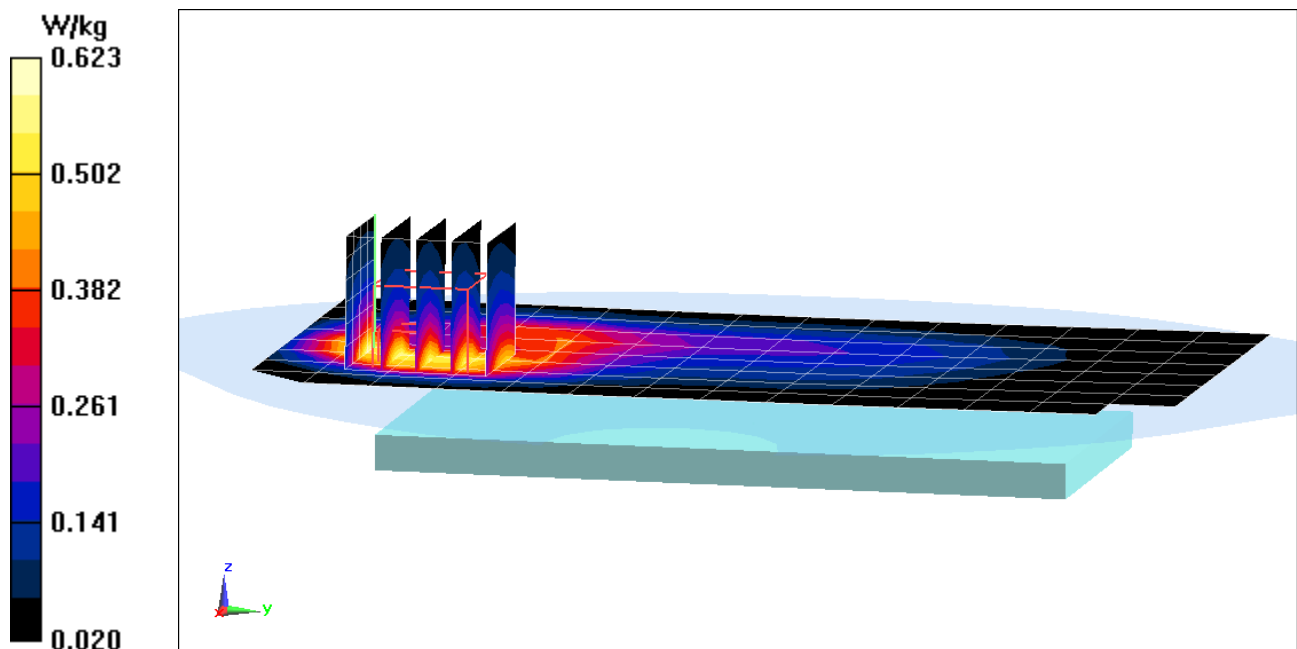
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 23.87 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.873 W/kg

SAR(1 g) = 0.498 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.56 \text{ S/m}$; $\epsilon_r = 52.294$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-18-2017; Ambient Temp: 22.3°C; Tissue Temp: 21.1°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: SAM Left; Type: QD000P40CD; Serial: 1692

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

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

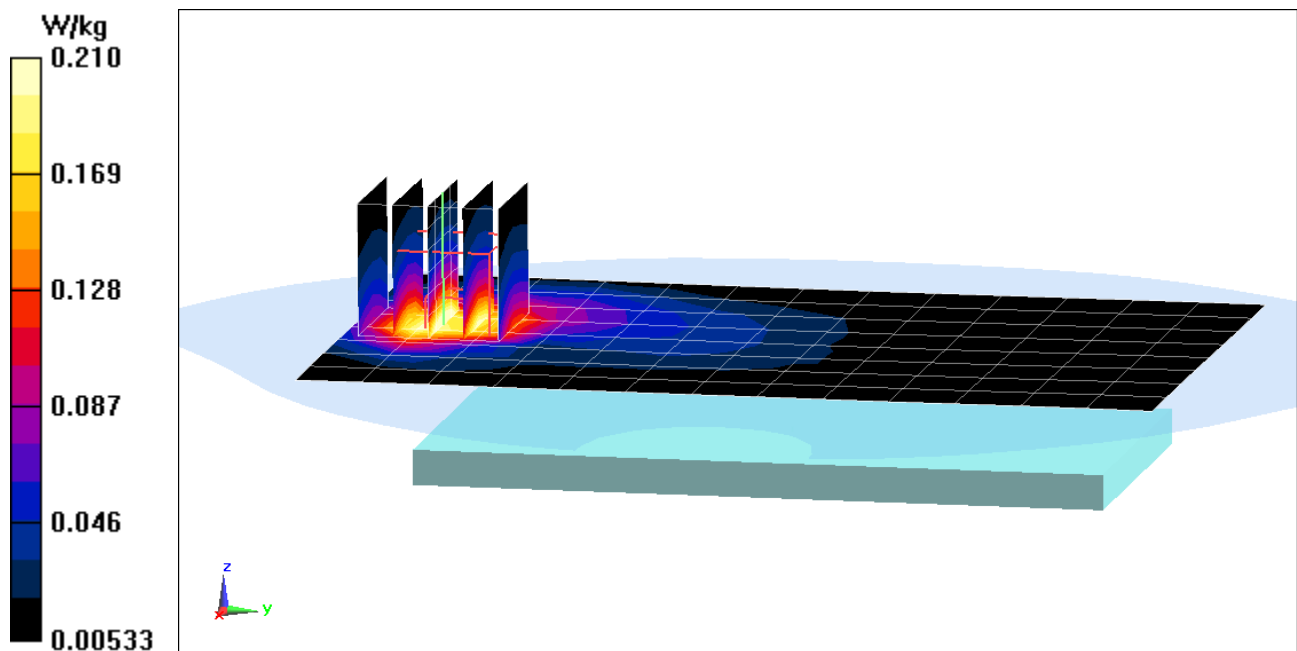
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.33 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.334 W/kg

SAR(1 g) = 0.209 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 1850.2 MHz; Duty Cycle: 1:2.76

Medium: 1900 Body Medium parameters used:

$f = 1850.2 \text{ MHz}$; $\sigma = 1.526 \text{ S/m}$; $\epsilon_r = 52.393$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-18-2017; Ambient Temp: 22.3°C; Tissue Temp: 21.1°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: SAM Left; Type: QD000P40CD; Serial: 1692

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

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

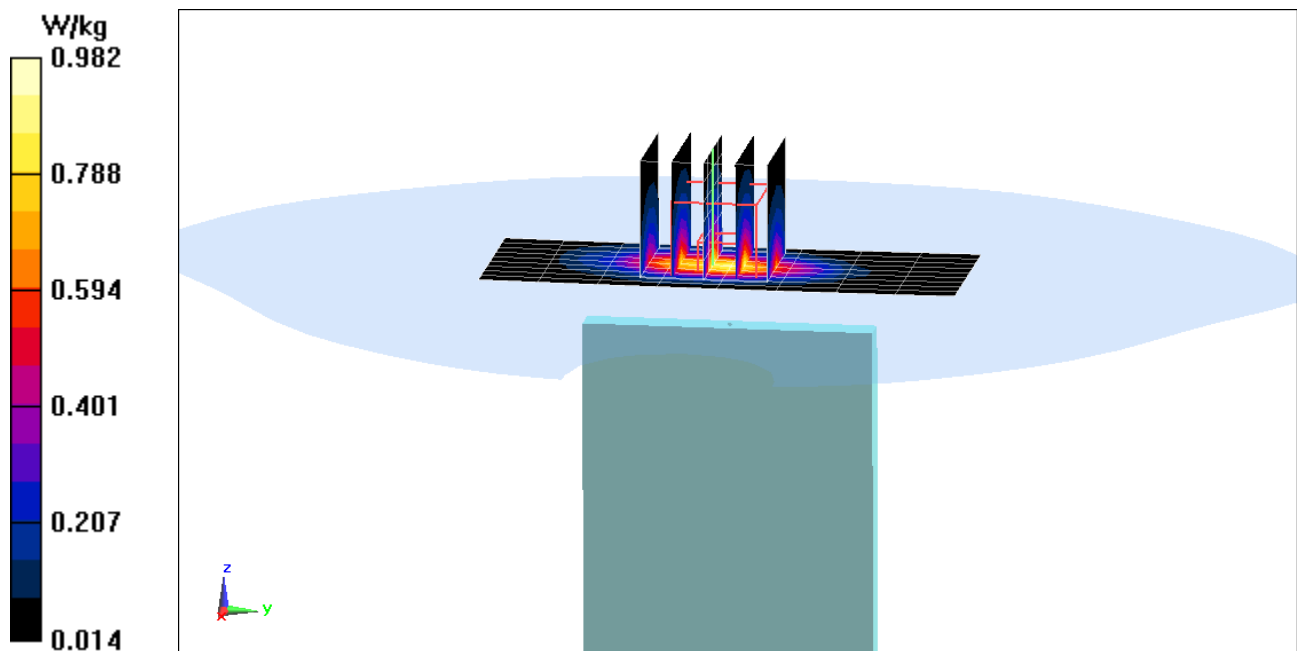
Area Scan (10x9x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 24.65 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 1.32 W/kg

SAR(1 g) = 0.787 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.961 \text{ S/m}$; $\epsilon_r = 52.933$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-18-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

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

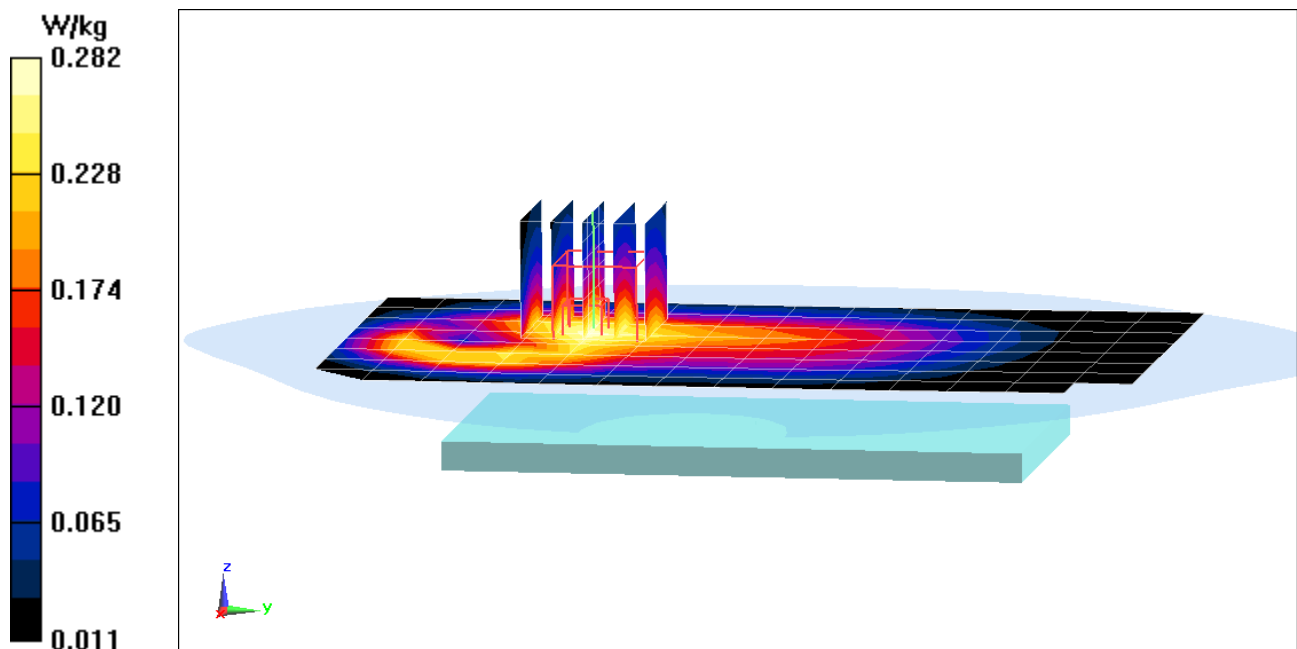
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 16.90 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.333 W/kg

SAR(1 g) = 0.254 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.961 \text{ S/m}$; $\epsilon_r = 52.933$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-18-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

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

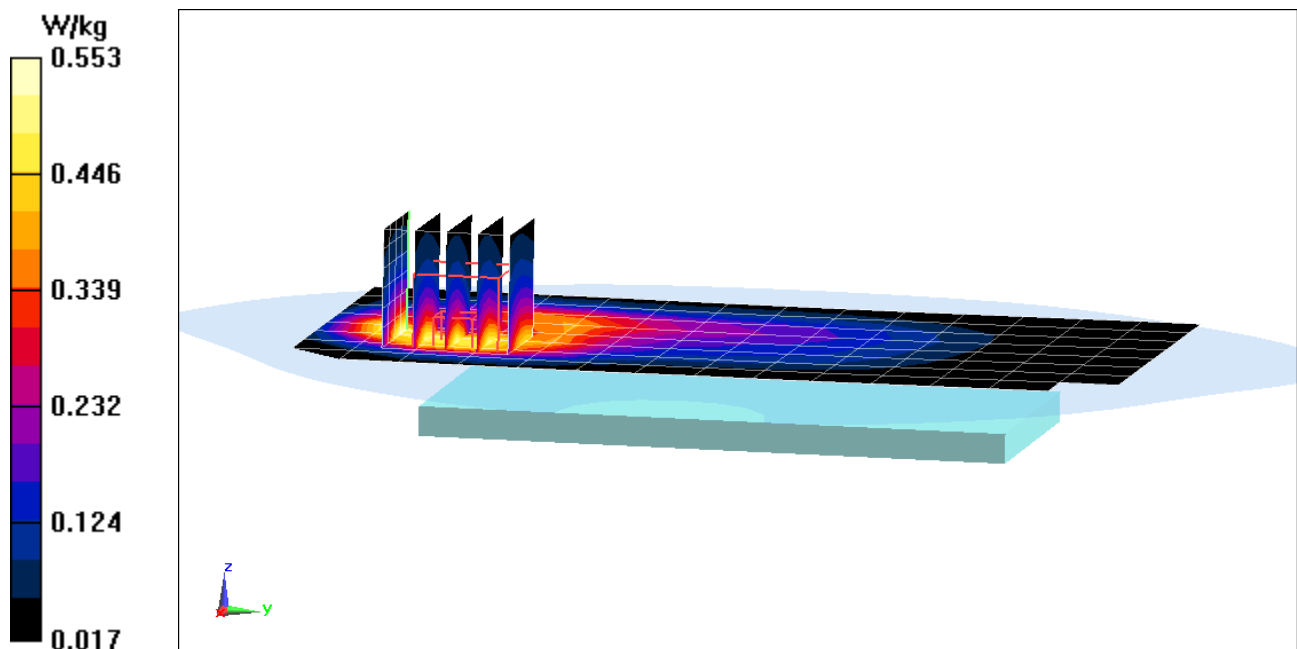
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.74 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.793 W/kg

SAR(1 g) = 0.449 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0455B

Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.4 \text{ MHz}$; $\sigma = 1.506 \text{ S/m}$; $\epsilon_r = 51.518$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-23-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.7°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

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

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

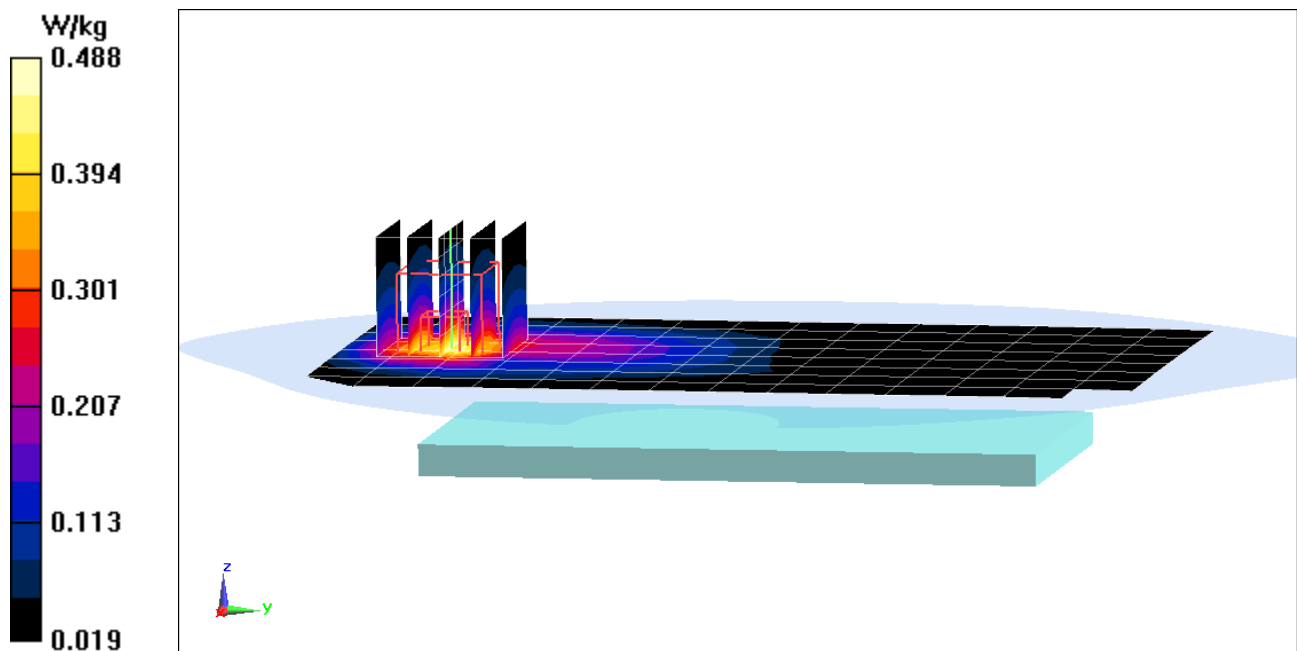
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.93 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.562 W/kg

SAR(1 g) = 0.355 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0455B

Communication System: UID 0, UMTS; Frequency: 1712.4 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1712.4 \text{ MHz}$; $\sigma = 1.484 \text{ S/m}$; $\epsilon_r = 51.576$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-23-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.7°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

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

Mode: UMTS 1750, Body SAR, Bottom Edge, Low.ch

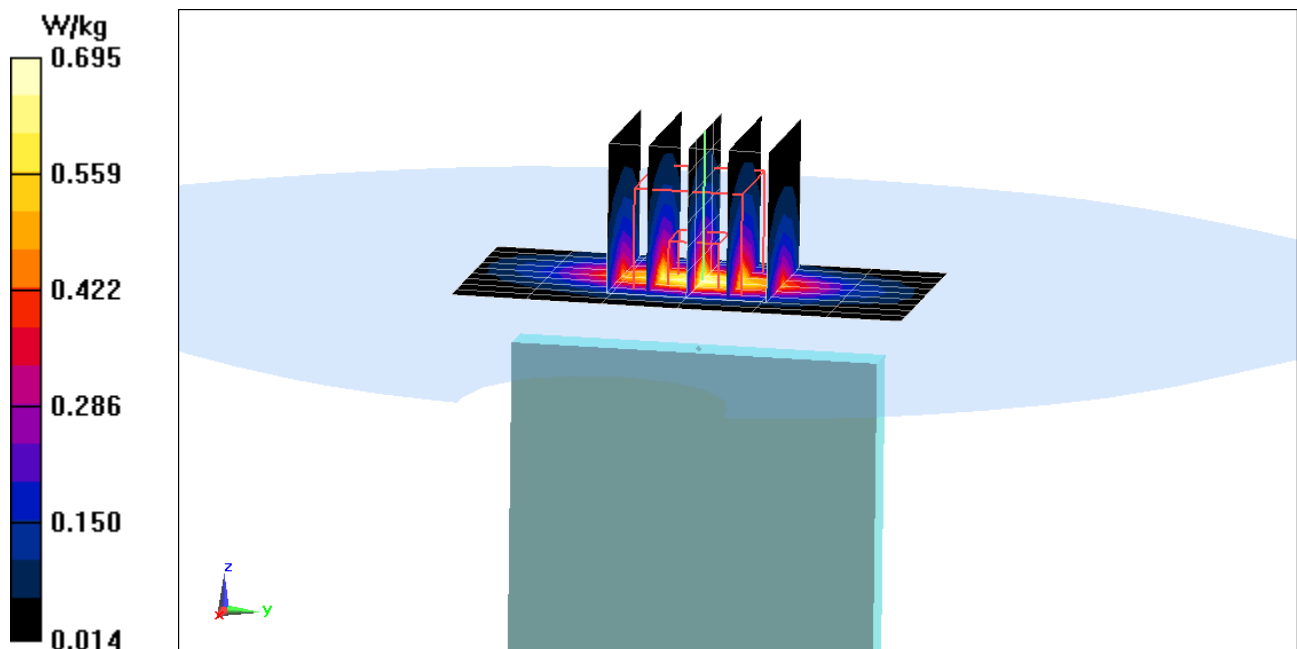
Area Scan (10x7x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 18.82 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.809 W/kg

SAR(1 g) = 0.470 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1907.6 \text{ MHz}$; $\sigma = 1.592 \text{ S/m}$; $\epsilon_r = 52.207$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-18-2017; Ambient Temp: 22.3°C; Tissue Temp: 21.1°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: SAM Left; Type: QD000P40CD; Serial: 1692

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

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

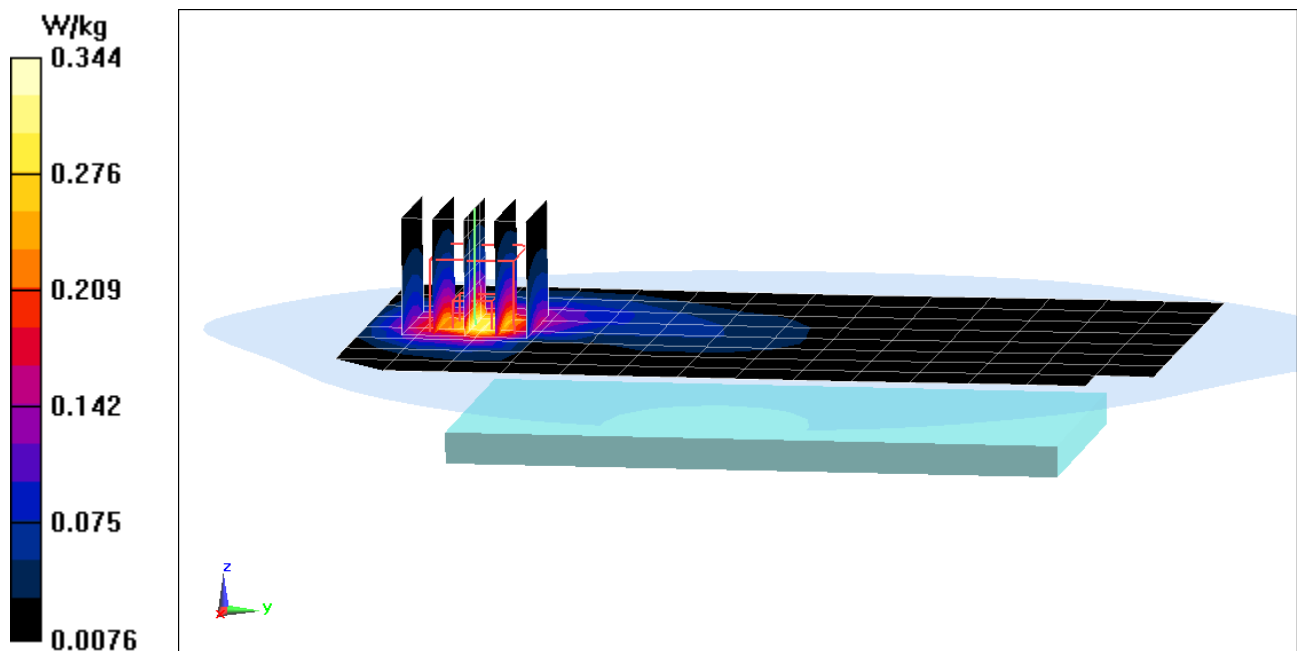
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 14.29 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.457 W/kg

SAR(1 g) = 0.282 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1907.6 \text{ MHz}$; $\sigma = 1.592 \text{ S/m}$; $\epsilon_r = 52.207$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-18-2017; Ambient Temp: 22.3°C; Tissue Temp: 21.1°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: SAM Left; Type: QD000P40CD; Serial: 1692

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

UMTS 1900, Body SAR, Bottom Edge, High.ch

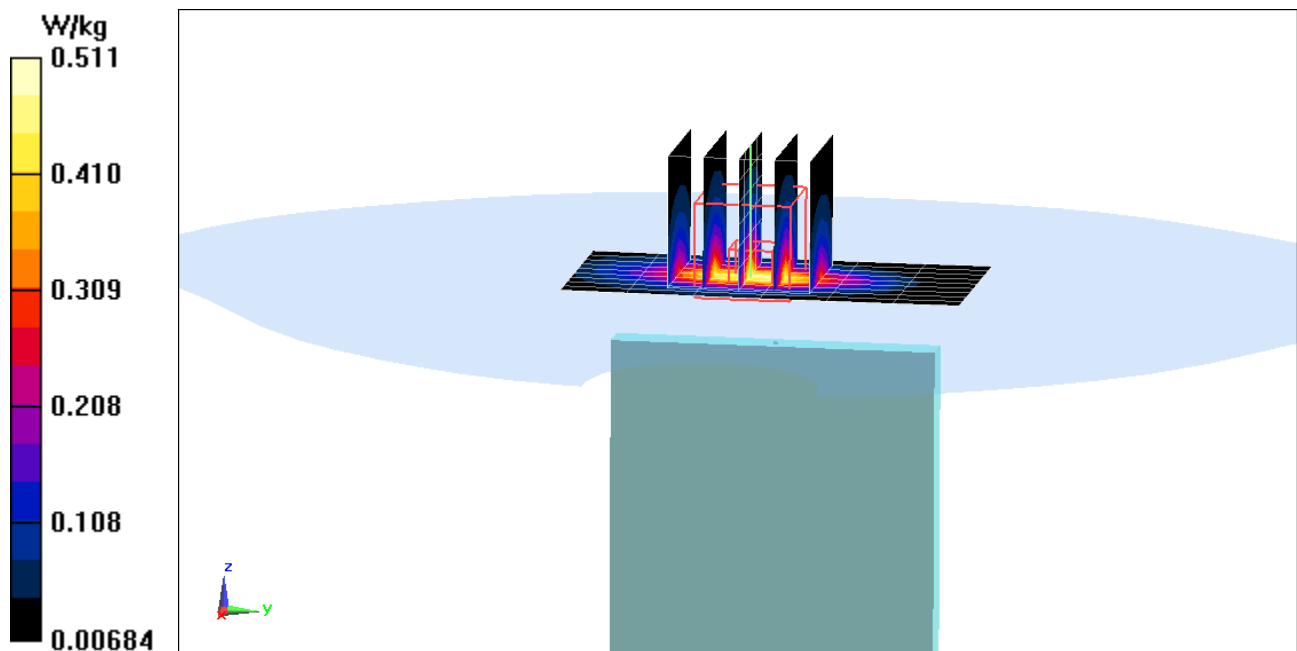
Area Scan (10x7x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.41 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.702 W/kg

SAR(1 g) = 0.407 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0455B

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.936 \text{ S/m}$; $\epsilon_r = 56.179$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-25-2017; Ambient Temp: 23.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.38, 6.38, 6.38); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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, 49 RB Offset**

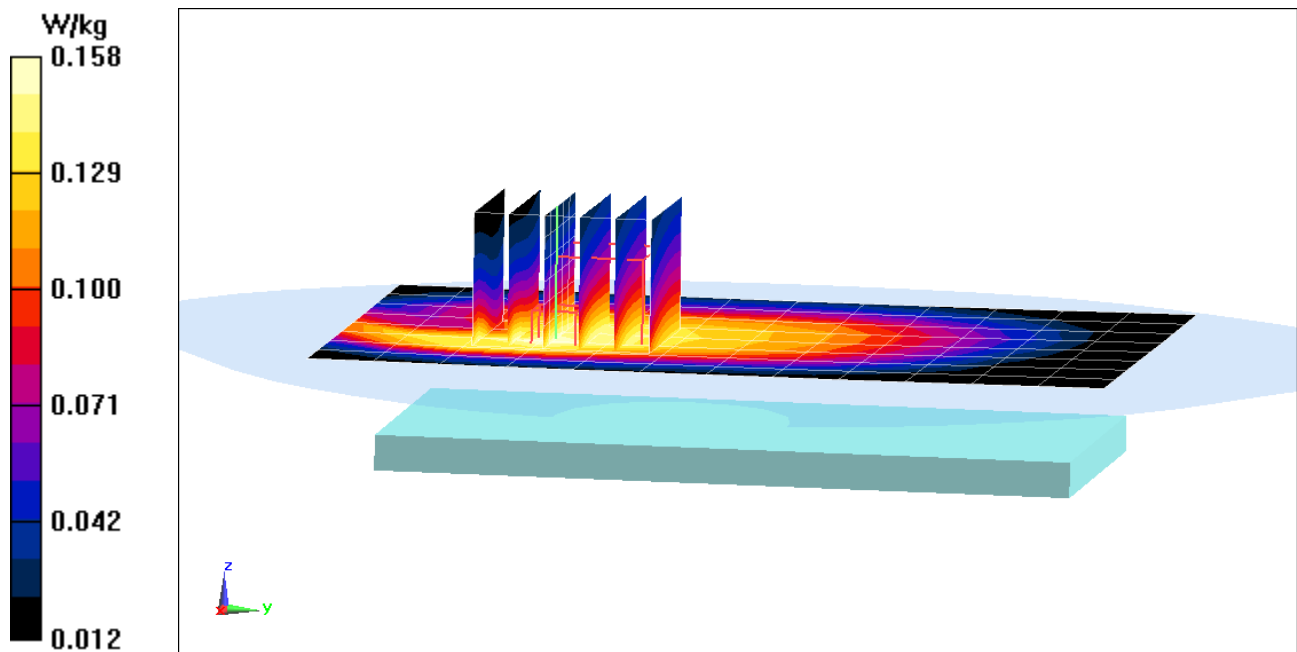
Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 12.71 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.195 W/kg

SAR(1 g) = 0.140 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0455B

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.936 \text{ S/m}$; $\epsilon_r = 56.179$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-25-2017; Ambient Temp: 23.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.38, 6.38, 6.38); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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, 49 RB Offset**

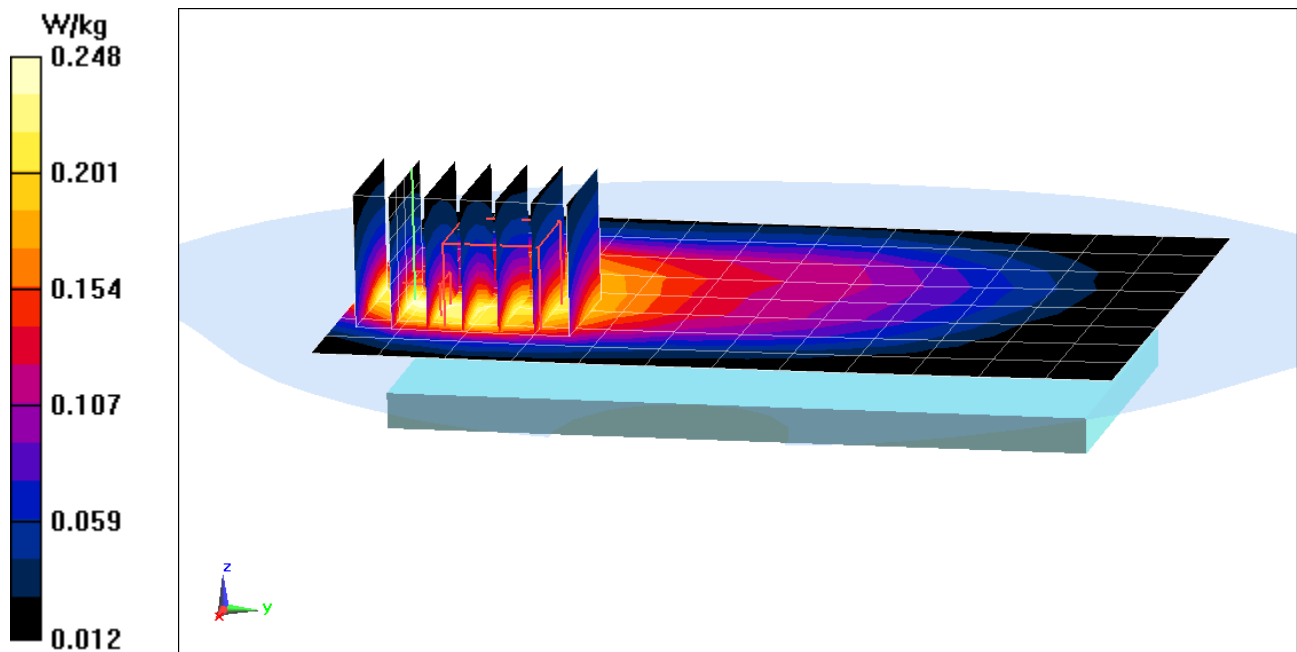
Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (5x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.73 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.345 W/kg

SAR(1 g) = 0.210 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0455B

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 1.008 \text{ S/m}$; $\epsilon_r = 55.392$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-25-2017; Ambient Temp: 23.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.38, 6.38, 6.38); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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, 49 RB Offset**

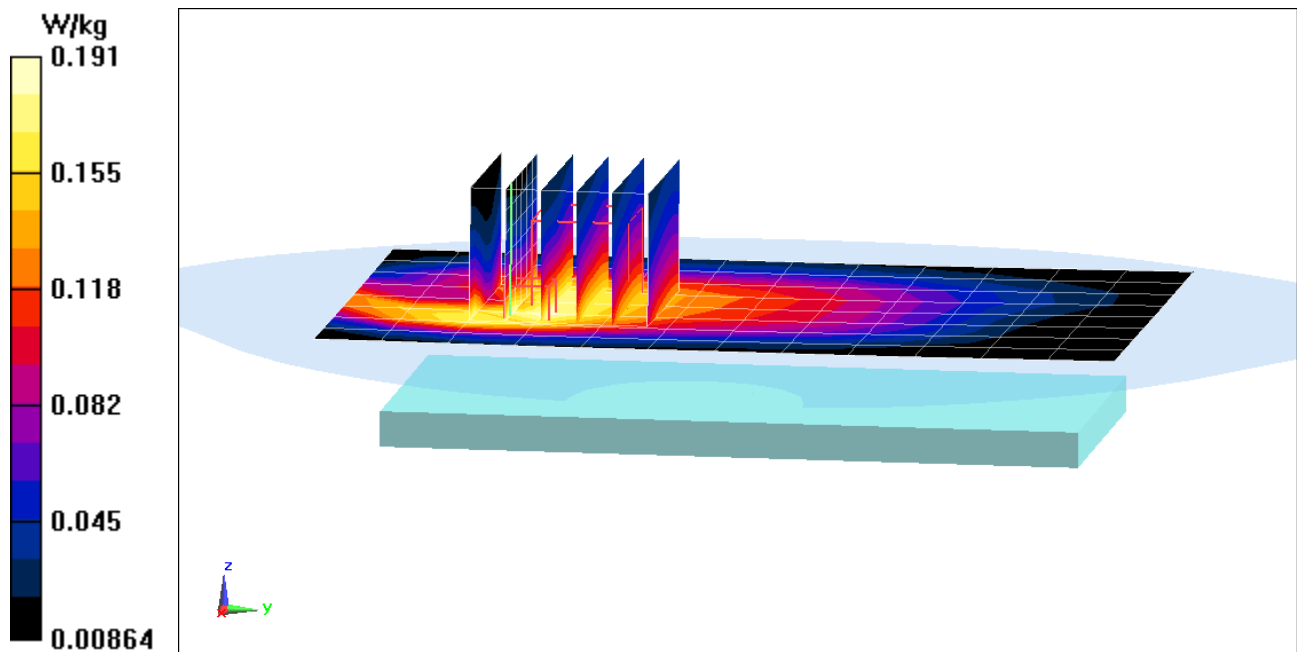
Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (7x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 13.27 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.248 W/kg

SAR(1 g) = 0.166 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0455B

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 1.008 \text{ S/m}$; $\epsilon_r = 55.392$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-25-2017; Ambient Temp: 23.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.38, 6.38, 6.38); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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, 49 RB Offset**

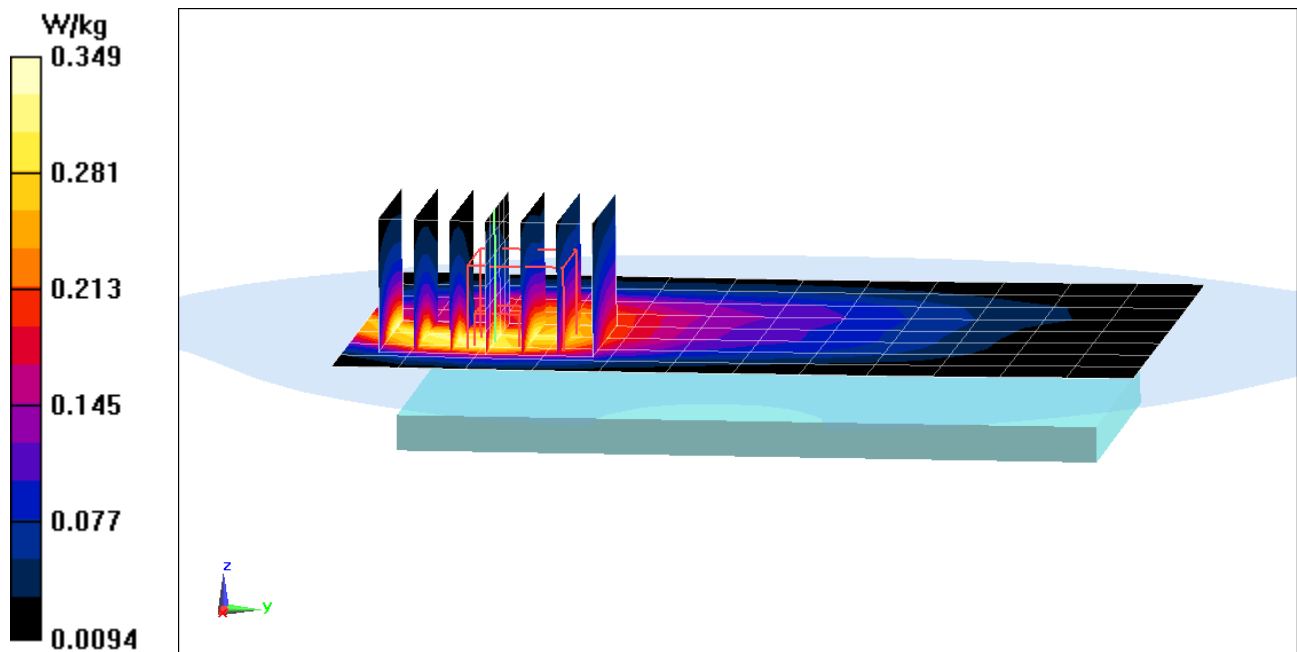
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.63 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.501 W/kg

SAR(1 g) = 0.294 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0453F

Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 831.5 \text{ MHz}$; $\sigma = 0.956 \text{ S/m}$; $\epsilon_r = 52.981$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-18-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

**Mode: LTE Band 26 (Cell.), Body SAR, Back side, Mid.ch,
15 MHz Bandwidth, QPSK, 1 RB, 36 RB Offset**

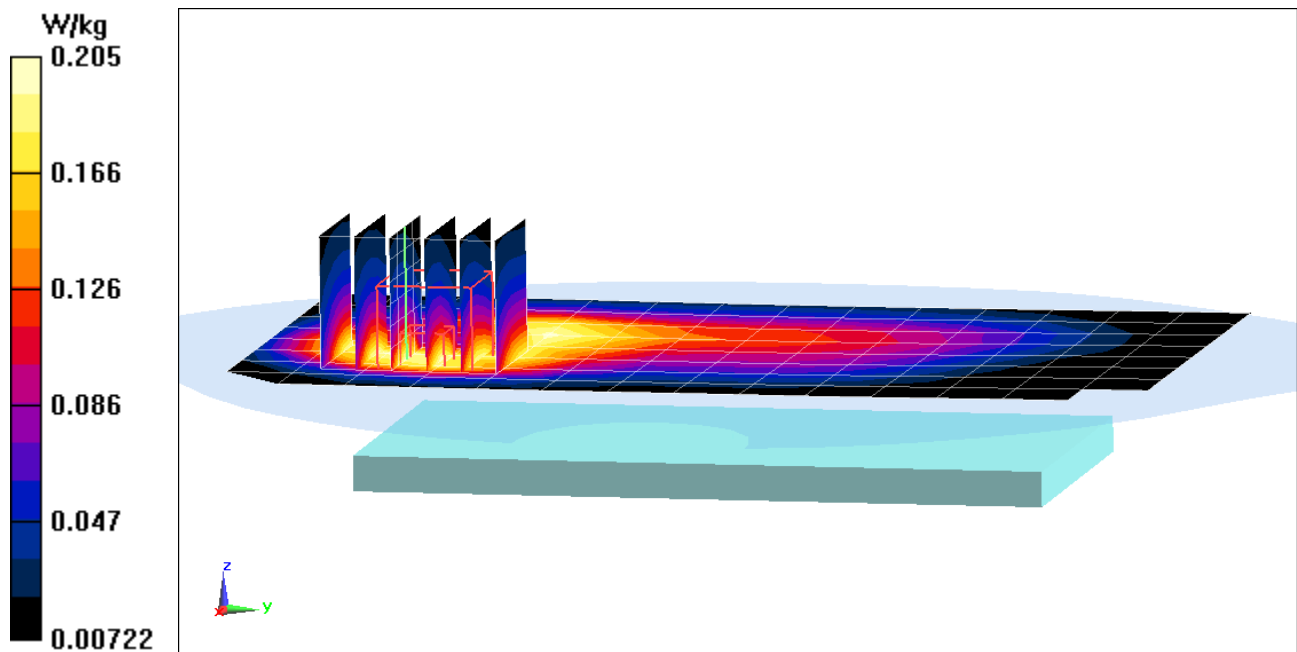
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.25 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.268 W/kg

SAR(1 g) = 0.176 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0453F

Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 831.5 \text{ MHz}$; $\sigma = 0.956 \text{ S/m}$; $\epsilon_r = 52.981$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-18-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

**Mode: LTE Band 26 (Cell.), Body SAR, Back side, Mid.ch,
15 MHz Bandwidth, QPSK, 1 RB, 36 RB Offset**

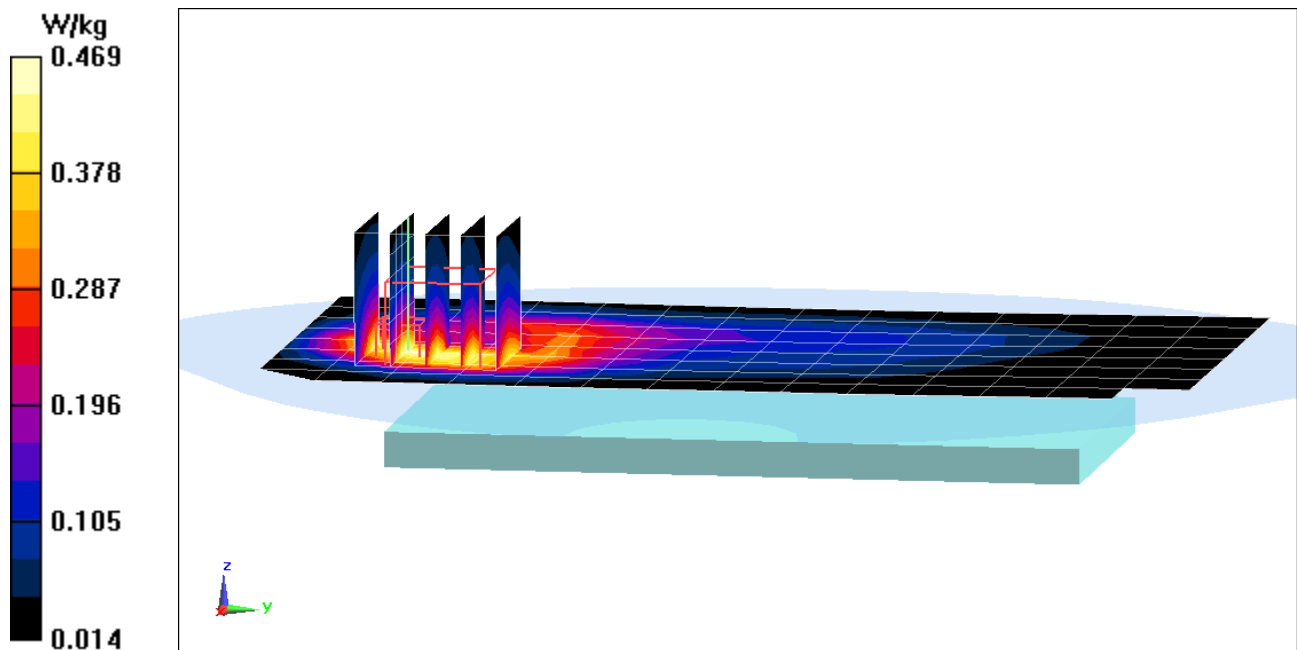
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.19 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.659 W/kg

SAR(1 g) = 0.392 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0453F

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; $\sigma = 0.961$ S/m; $\epsilon_r = 52.934$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-18-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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, 25 RB Offset**

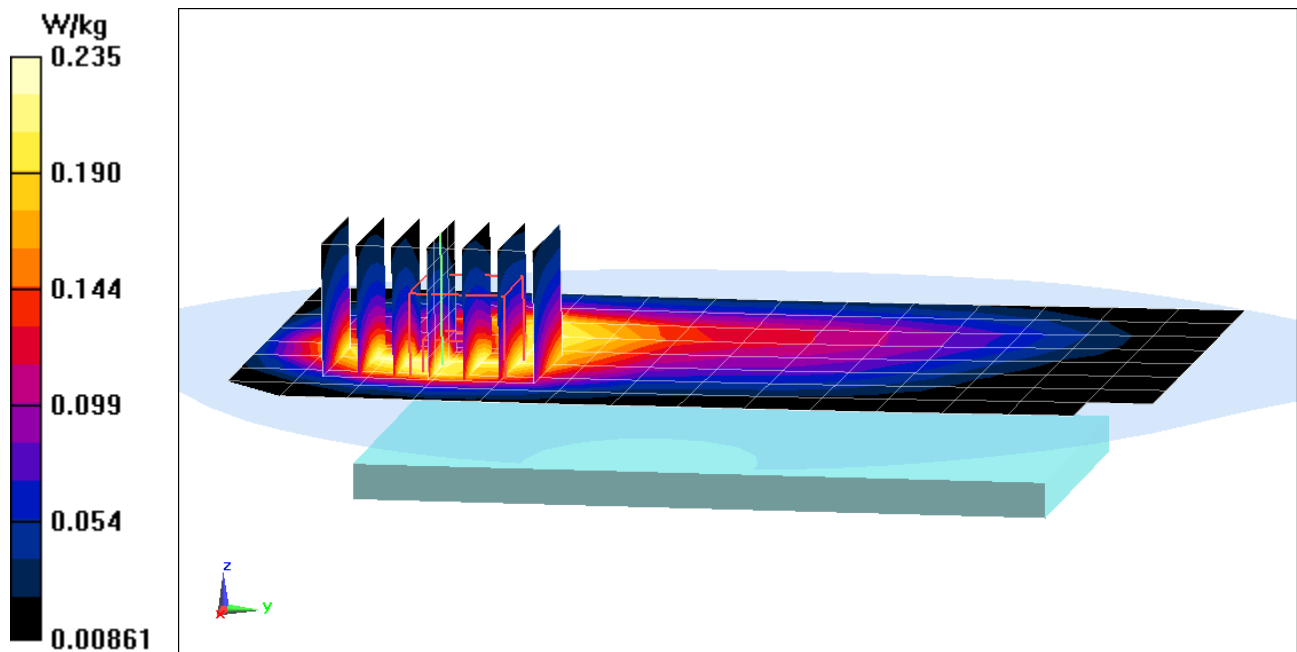
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (5x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 15.08 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.303 W/kg

SAR(1 g) = 0.201 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0453F

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; $\sigma = 0.961$ S/m; $\epsilon_r = 52.934$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-18-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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, 25 RB Offset**

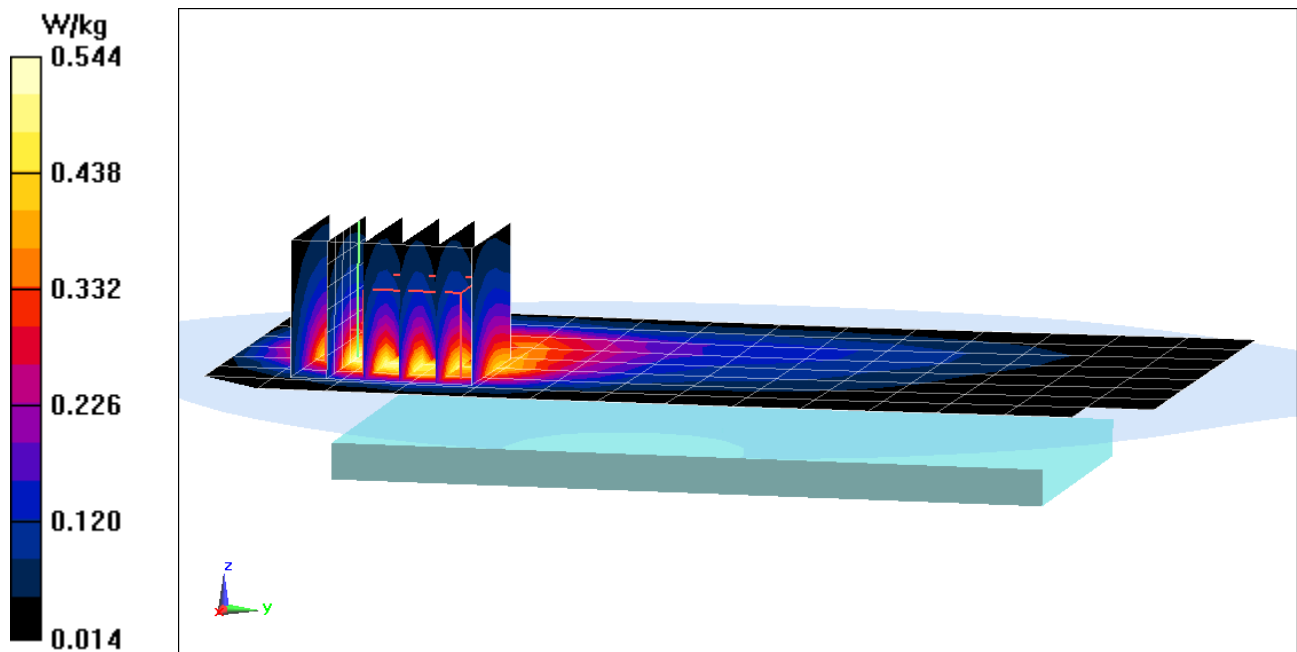
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 22.47 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.747 W/kg

SAR(1 g) = 0.445 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0453F

Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1720 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1720 \text{ MHz}$; $\sigma = 1.492 \text{ S/m}$; $\epsilon_r = 51.554$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-23-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.7°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

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

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

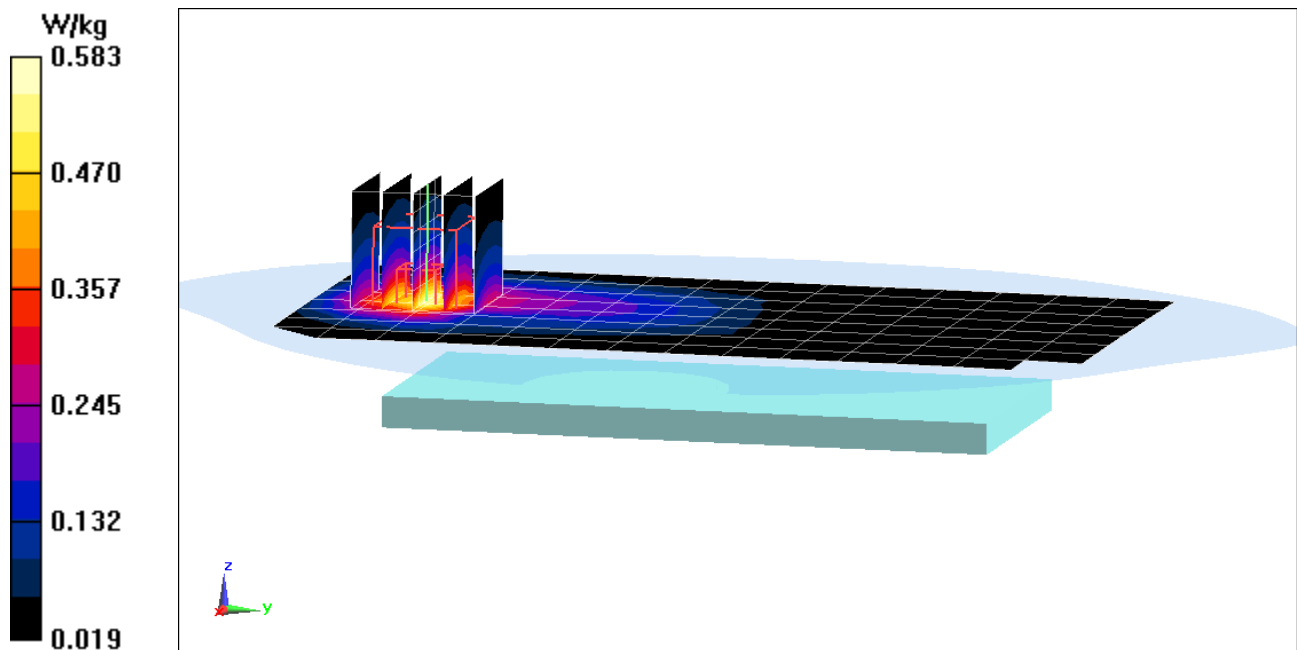
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 17.44 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.671 W/kg

SAR(1 g) = 0.420 W/kg.



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0453F

Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1770 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1770 \text{ MHz}$; $\sigma = 1.549 \text{ S/m}$; $\epsilon_r = 51.412$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-23-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.7°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

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

**Mode: LTE Band 66 (AWS), Body SAR, Bottom Edge, High.ch,
20 MHz Bandwidth, QPSK, 50 RB, 25 RB Offset**

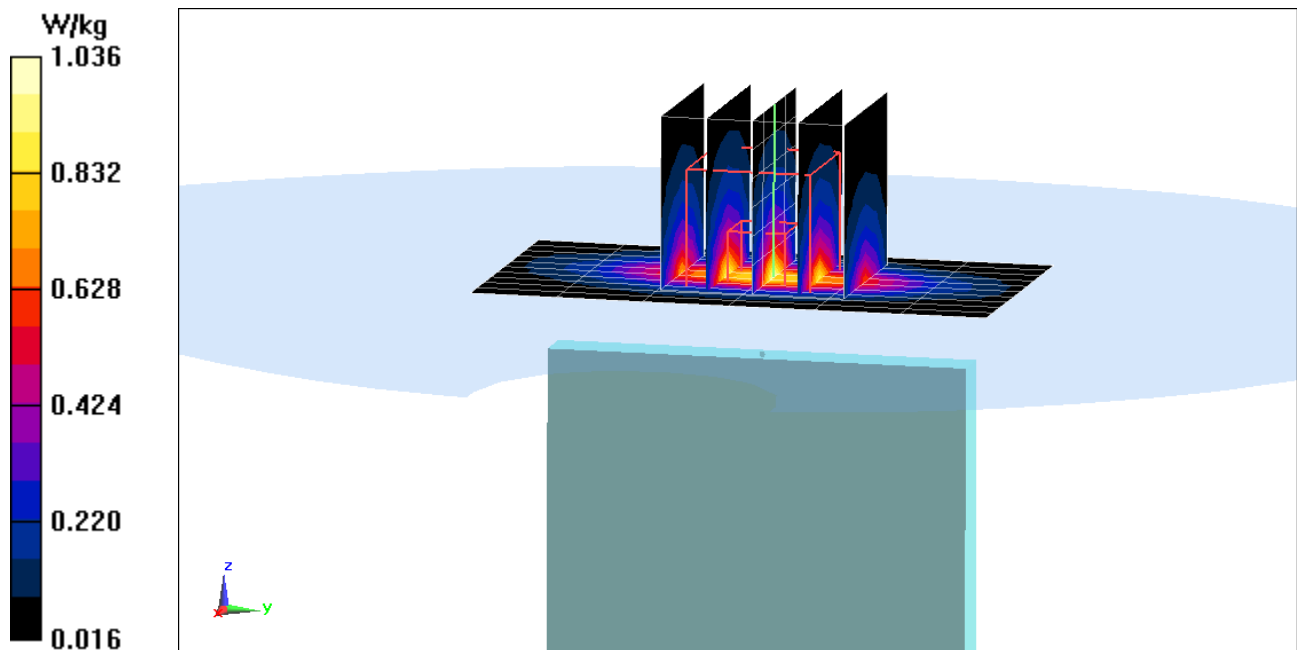
Area Scan (11x7x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 22.38 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 1.22 W/kg

SAR(1 g) = 0.697 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1905 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1905 \text{ MHz}$; $\sigma = 1.589 \text{ S/m}$; $\epsilon_r = 52.215$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-18-2017; Ambient Temp: 22.3°C; Tissue Temp: 21.1°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: SAM Left; Type: QD000P40CD; Serial: 1692

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

**Mode: LTE Band 25 (PCS), Body SAR, Back side, High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

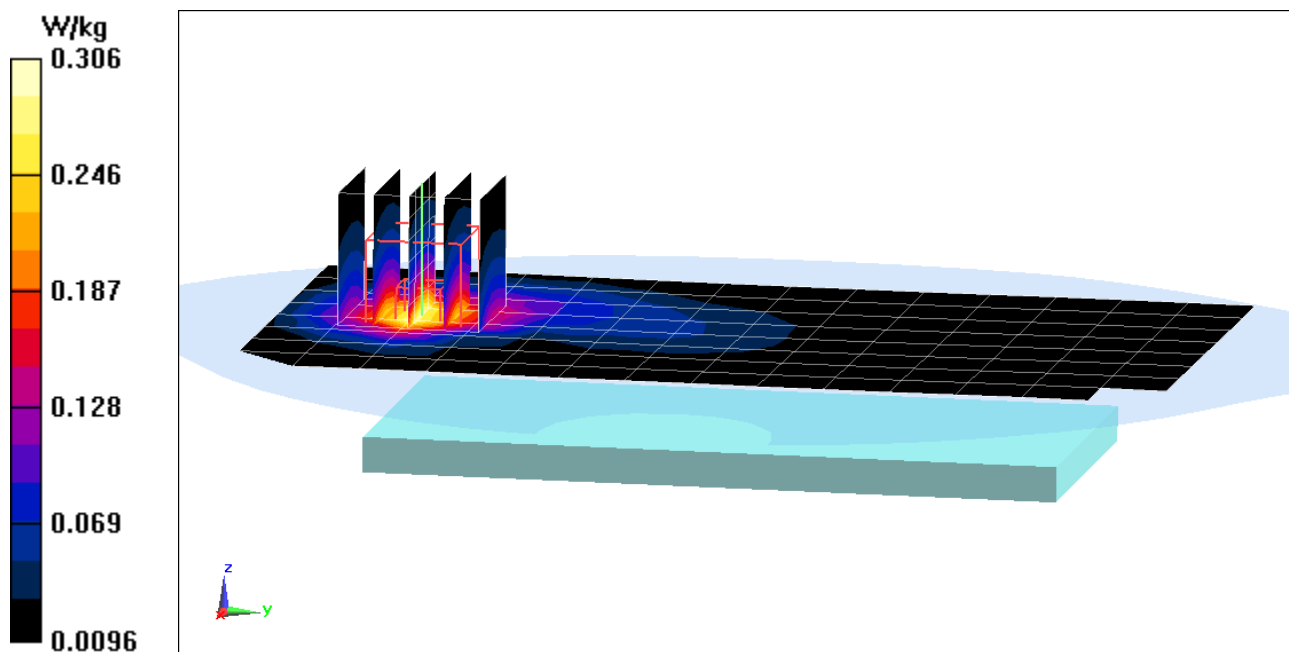
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.60 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.403 W/kg

SAR(1 g) = 0.253 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1905 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1905 \text{ MHz}$; $\sigma = 1.589 \text{ S/m}$; $\epsilon_r = 52.215$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-18-2017; Ambient Temp: 22.3°C; Tissue Temp: 21.1°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: SAM Left; Type: QD000P40CD; Serial: 1692

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

**Mode: LTE Band 25 (PCS), Body SAR, Bottom Edge, High.ch,
20 MHz Bandwidth, QPSK, 50 RB, 25 RB Offset**

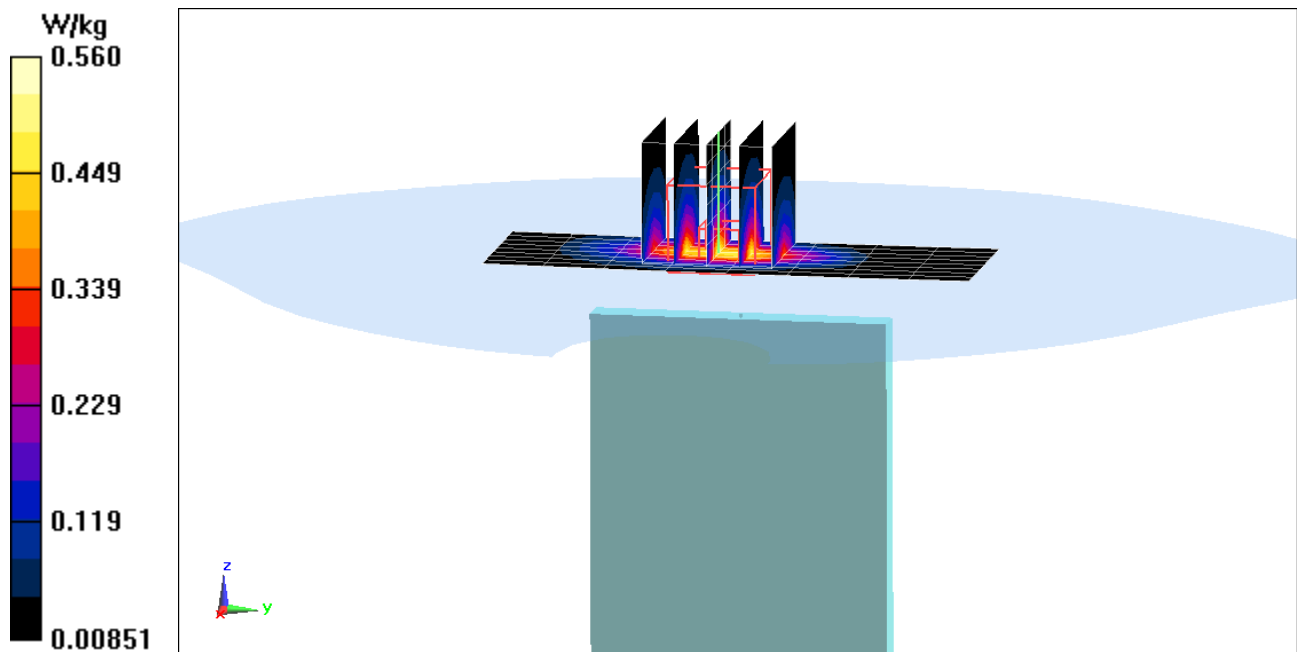
Area Scan (9x9x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 18.20 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.766 W/kg

SAR(1 g) = 0.448 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, LTE Band 7; Frequency: 2535 MHz; Duty Cycle: 1:1

Medium: 2600 Body Medium parameters used (interpolated):

$f = 2535 \text{ MHz}$; $\sigma = 2.141 \text{ S/m}$; $\epsilon_r = 51.631$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-23-2017; Ambient Temp: 21.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.18, 4.18, 4.18); 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 7, Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

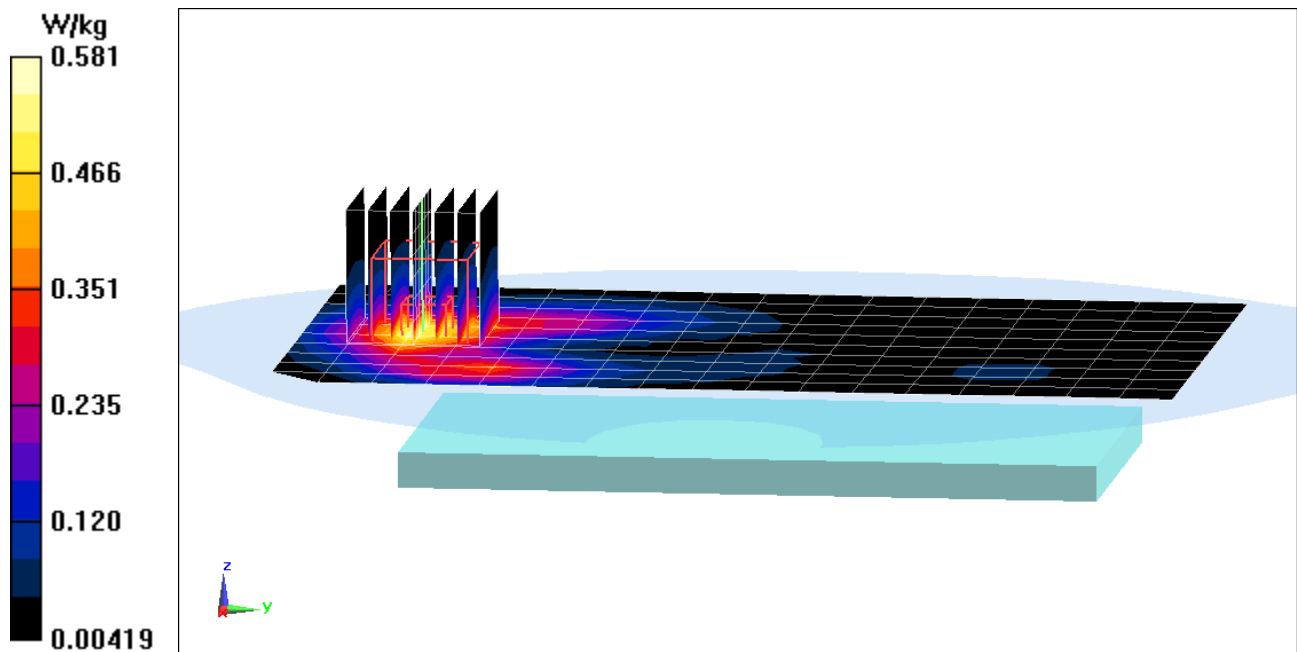
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 15.72 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.881 W/kg

SAR(1 g) = 0.462 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, LTE Band 7; Frequency: 2560 MHz; Duty Cycle: 1:1

Medium: 2600 Body Medium parameters used (interpolated):

$f = 2560$ MHz; $\sigma = 2.157$ S/m; $\epsilon_r = 52.241$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-01-2017; Ambient Temp: 22.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3319; ConvF(4.18, 4.18, 4.18); 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 7, Body SAR, Bottom Edge, High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

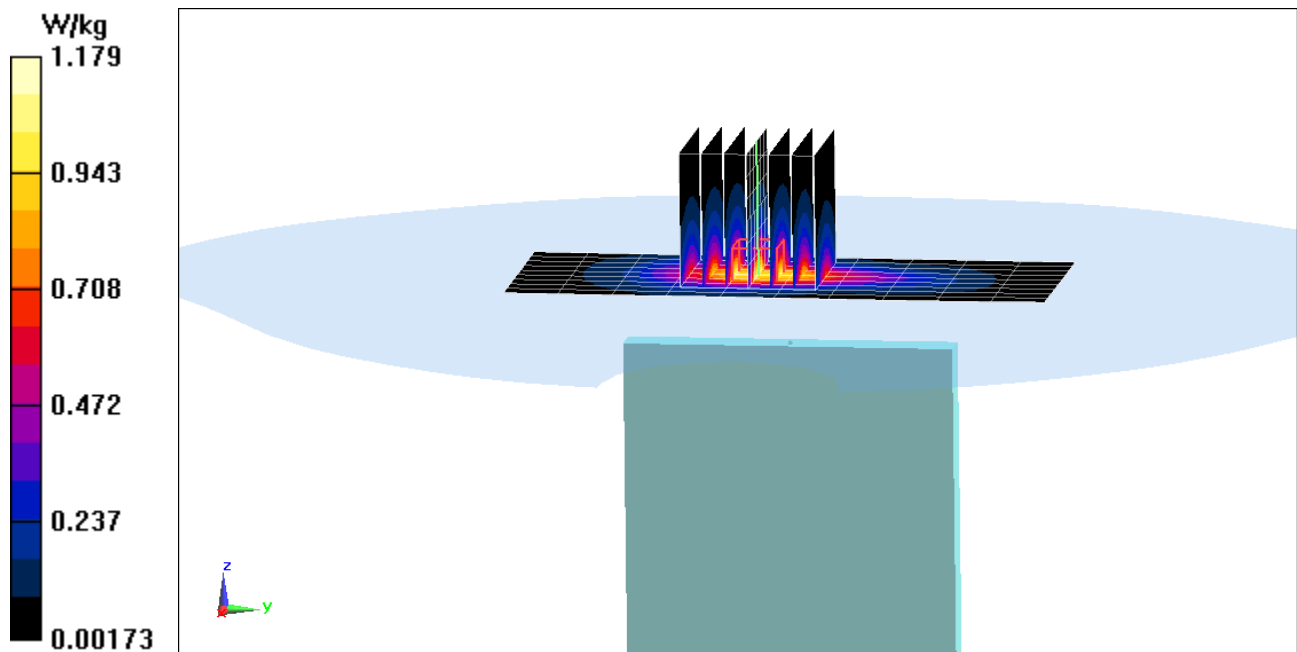
Area Scan (10x11x1): Measurement grid: dx=5mm, dy=12mm

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

Reference Value = 22.34 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.81 W/kg

SAR(1 g) = 0.911 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04575

Communication System: UID 0, LTE Band 41; Frequency: 2549.5 MHz; Duty Cycle: 1:1.58

Medium: 2600 Body Medium parameters used:

$f = 2550 \text{ MHz}$; $\sigma = 2.144 \text{ S/m}$; $\epsilon_r = 52.279$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 11-01-2017; Ambient Temp: 22.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3319; ConvF(4.18, 4.18, 4.18); 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 41, Body SAR, Back side, Low-Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

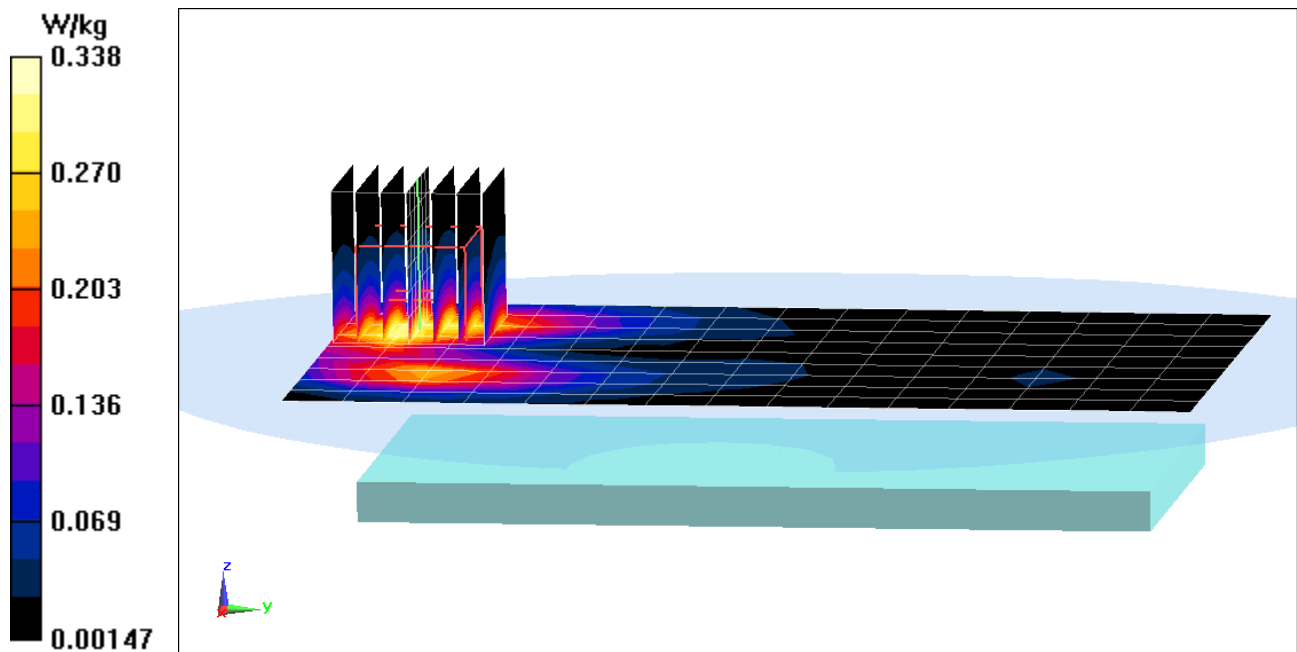
Area Scan (10x16x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 12.06 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.511 W/kg

SAR(1 g) = 0.267 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04575

Communication System: UID 0, LTE Band 41; Frequency: 2549.5 MHz; Duty Cycle: 1:1.58

Medium: 2600 Body Medium parameters used:

$f = 2550$ MHz; $\sigma = 2.144$ S/m; $\epsilon_r = 52.279$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-01-2017; Ambient Temp: 22.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3319; ConvF(4.18, 4.18, 4.18); 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 41, Body SAR, Bottom Edge, Low-Mid.ch,
20 MHz Bandwidth, QPSK, 50 RB, 25 RB Offset**

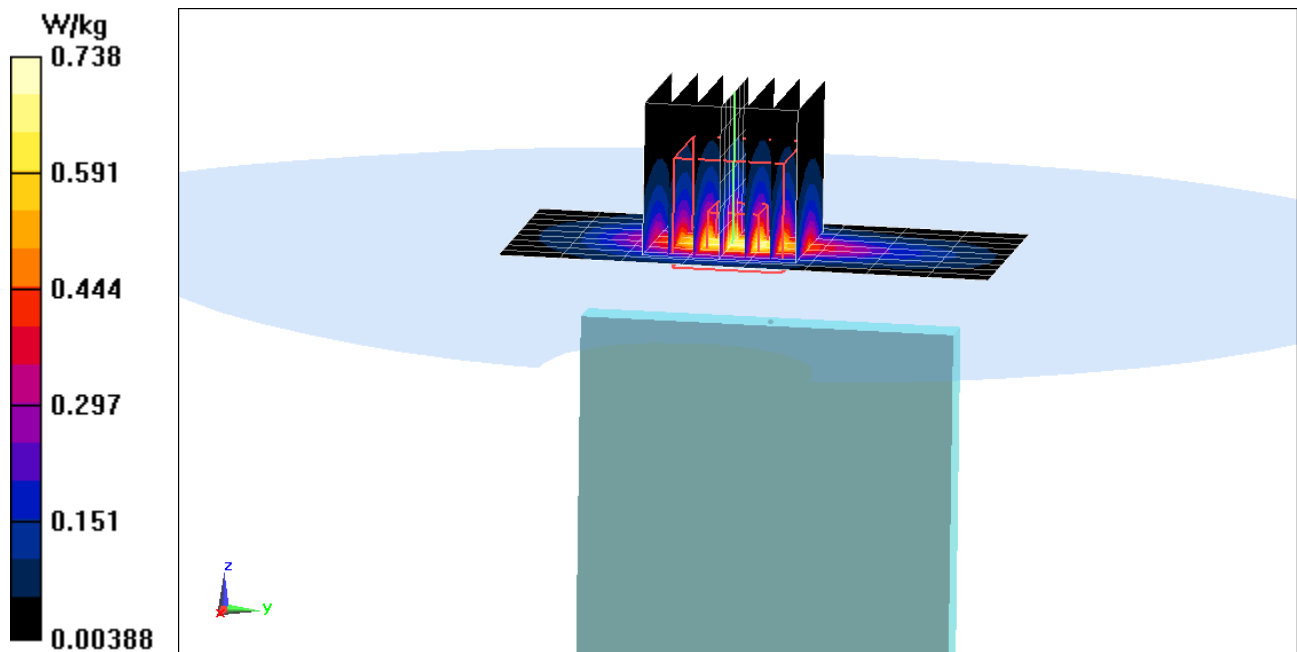
Area Scan (10x9x1): Measurement grid: dx=5mm, dy=12mm

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

Reference Value = 17.72 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.13 W/kg

SAR(1 g) = 0.569 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0458B

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

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 2.039 \text{ S/m}$; $\epsilon_r = 51.912$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-23-2017; Ambient Temp: 21.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.42, 4.42, 4.42); 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: IEEE 802.11b, 22 MHz Bandwidth, Body SAR, Ch 11, 1 Mbps, Back Side, Antenna 1

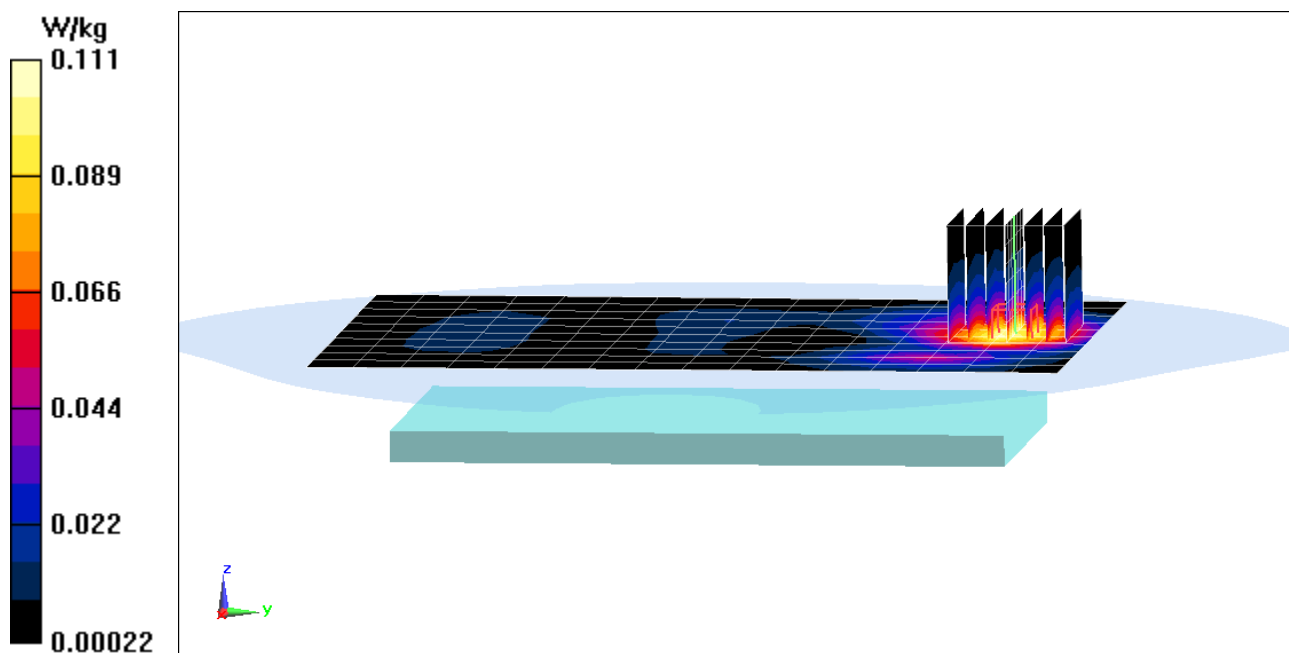
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 7.094 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.166 W/kg

SAR(1 g) = 0.089 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0458B

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

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 2.039 \text{ S/m}$; $\epsilon_r = 51.912$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-23-2017; Ambient Temp: 21.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.42, 4.42, 4.42); 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: IEEE 802.11b, 22 MHz Bandwidth, Body SAR, Ch 11, 1 Mbps, Top Edge, Antenna 1

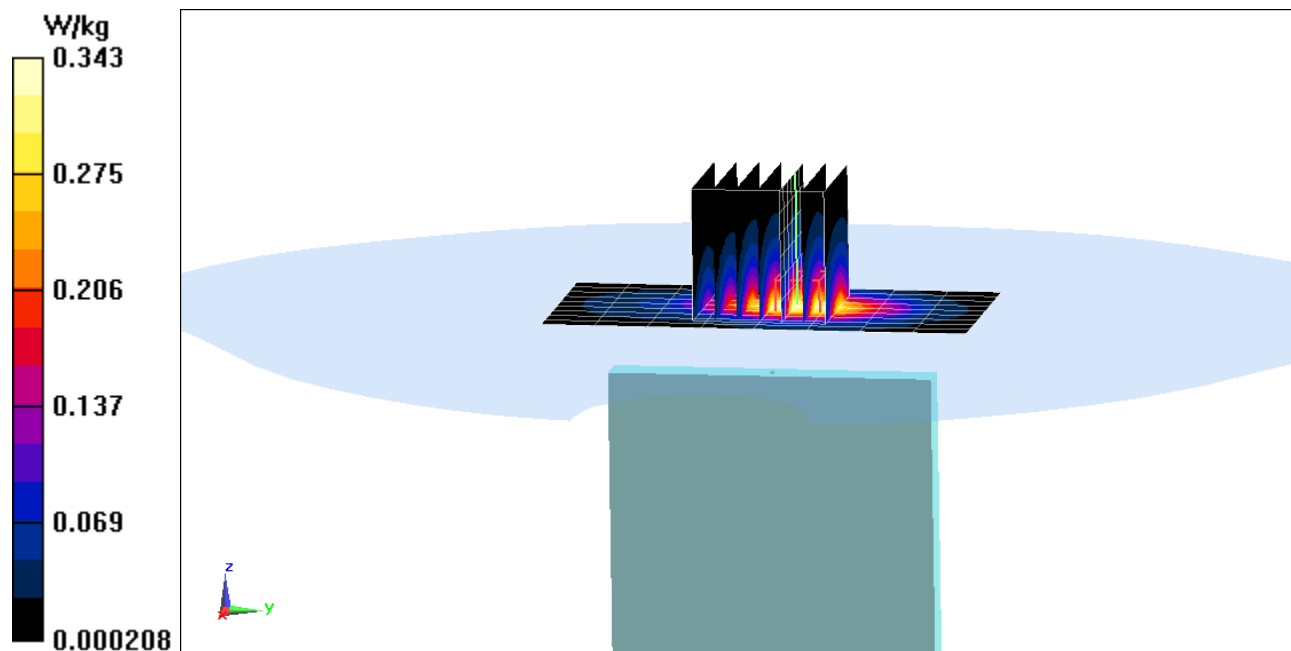
Area Scan (10x9x1): Measurement grid: $dx=5\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 11.82 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.553 W/kg

SAR(1 g) = 0.278 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04555

Communication System: UID 0, IEEE 802.11a; Frequency: 5825 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5825 \text{ MHz}$; $\sigma = 6.247 \text{ S/m}$; $\epsilon_r = 47.383$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-24-2017; Ambient Temp: 22.5°C; Tissue Temp: 21.5°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 802.11a, UNII-3, 20 MHz Bandwidth, Body SAR,
Ch 165, 6 Mbps, Back Side, Antenna 2**

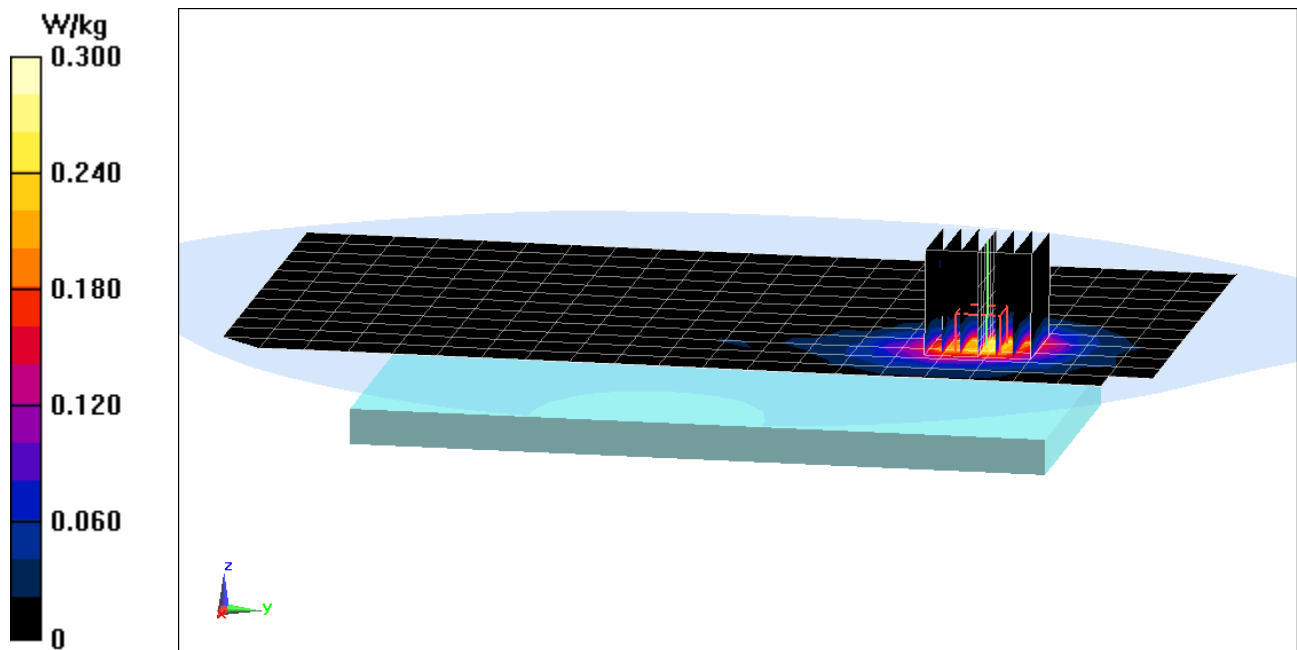
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 4.435 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 0.504 W/kg

SAR(1 g) = 0.112 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04555

Communication System: UID 0, IEEE 802.11a; Frequency: 5825 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5825 \text{ MHz}$; $\sigma = 6.247 \text{ S/m}$; $\epsilon_r = 47.383$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-24-2017; Ambient Temp: 22.5°C; Tissue Temp: 21.5°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 802.11a, UNII-3, 20 MHz Bandwidth, Body SAR,
Ch 165, 6 Mbps, Back Side, Antenna 2**

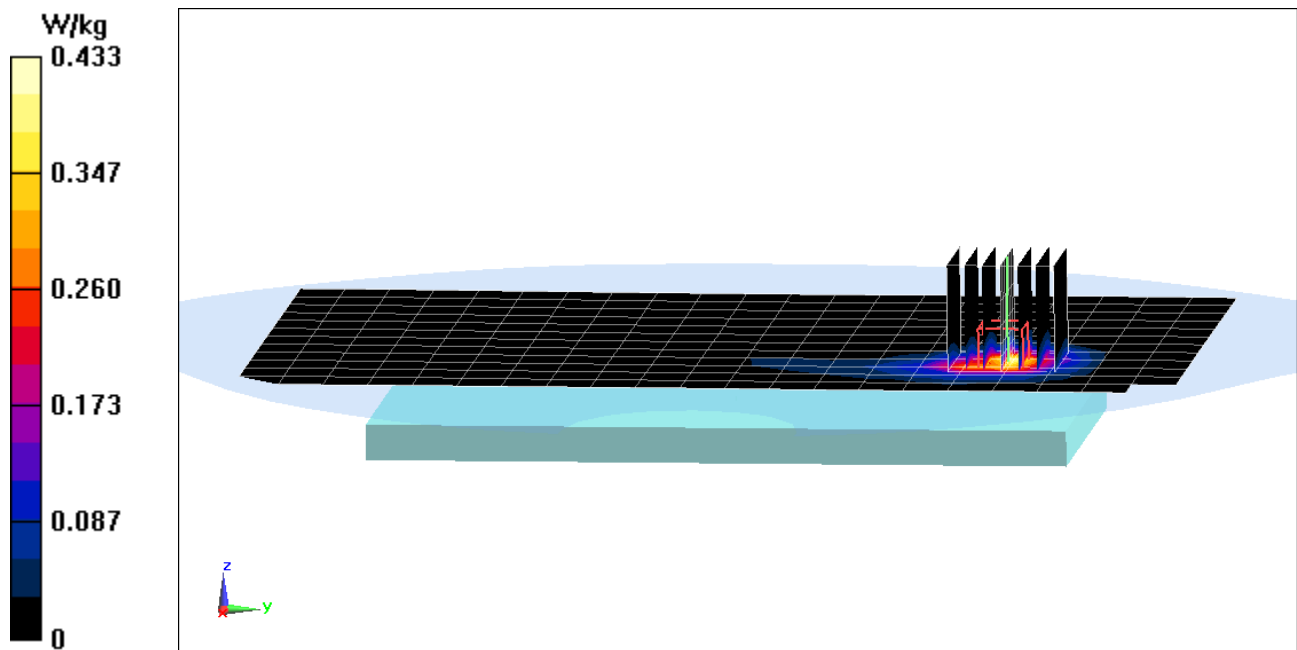
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 5.359 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.831 W/kg

SAR(1 g) = 0.166 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.294

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 2.01 \text{ S/m}$; $\epsilon_r = 51.988$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-23-2017; Ambient Temp: 21.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.42, 4.42, 4.42); 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, Body SAR, Ch 39, 1 Mbps, Back Side

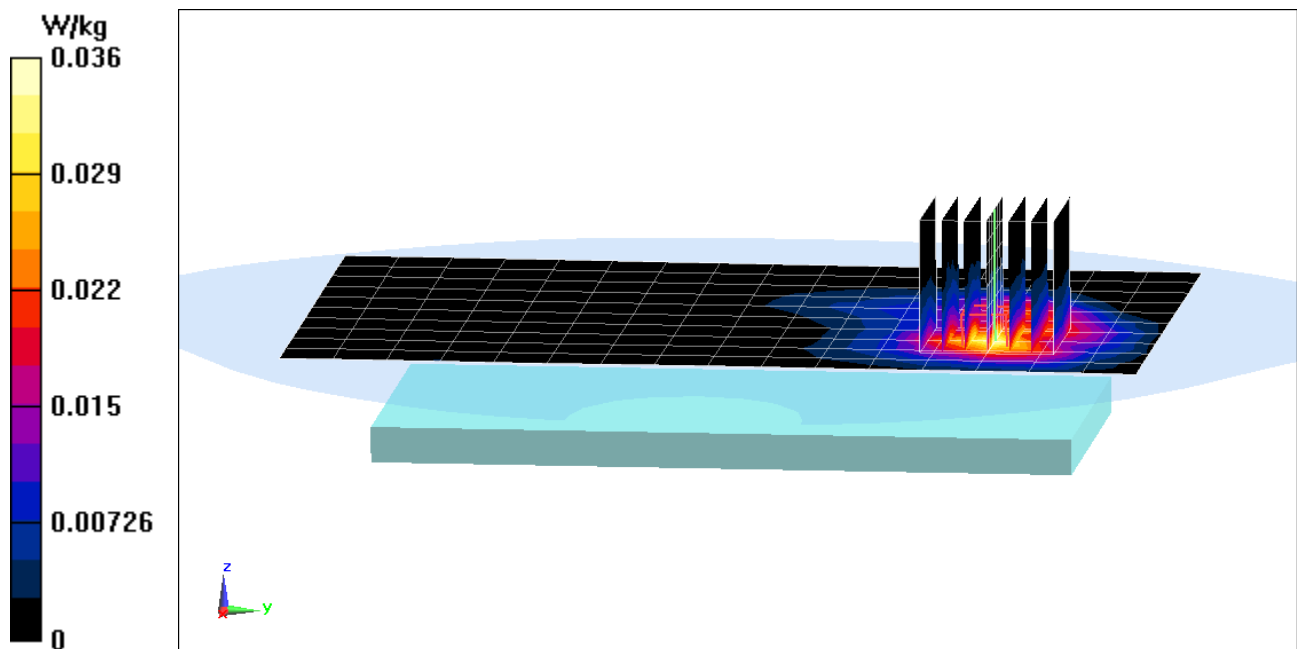
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 3.952 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.0590 W/kg

SAR(1 g) = 0.027 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.294

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 2.01 \text{ S/m}$; $\epsilon_r = 51.988$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-23-2017; Ambient Temp: 21.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.42, 4.42, 4.42); 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, Body SAR, Ch 39, 1 Mbps, Back Side

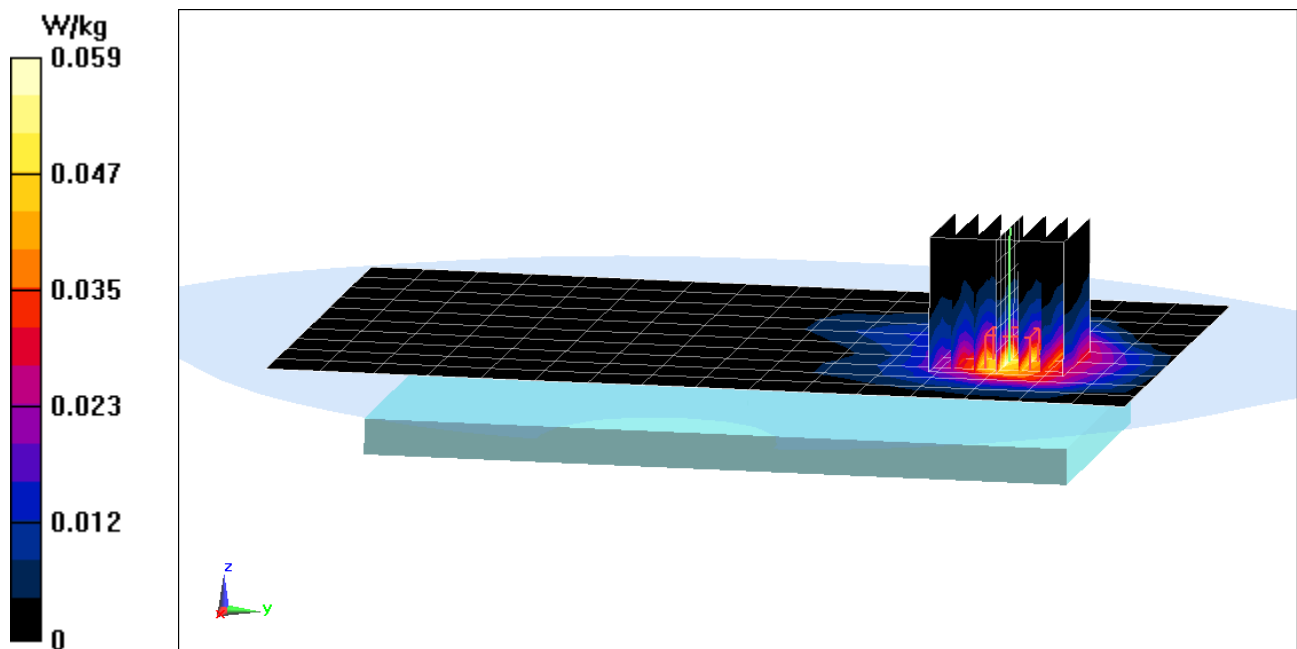
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 5.098 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.0950 W/kg

SAR(1 g) = 0.045 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04555

Communication System: UID 0, UMTS; Frequency: 1712.4 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1712.4 \text{ MHz}$; $\sigma = 1.439 \text{ S/m}$; $\epsilon_r = 51.333$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 10-27-2017; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

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

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

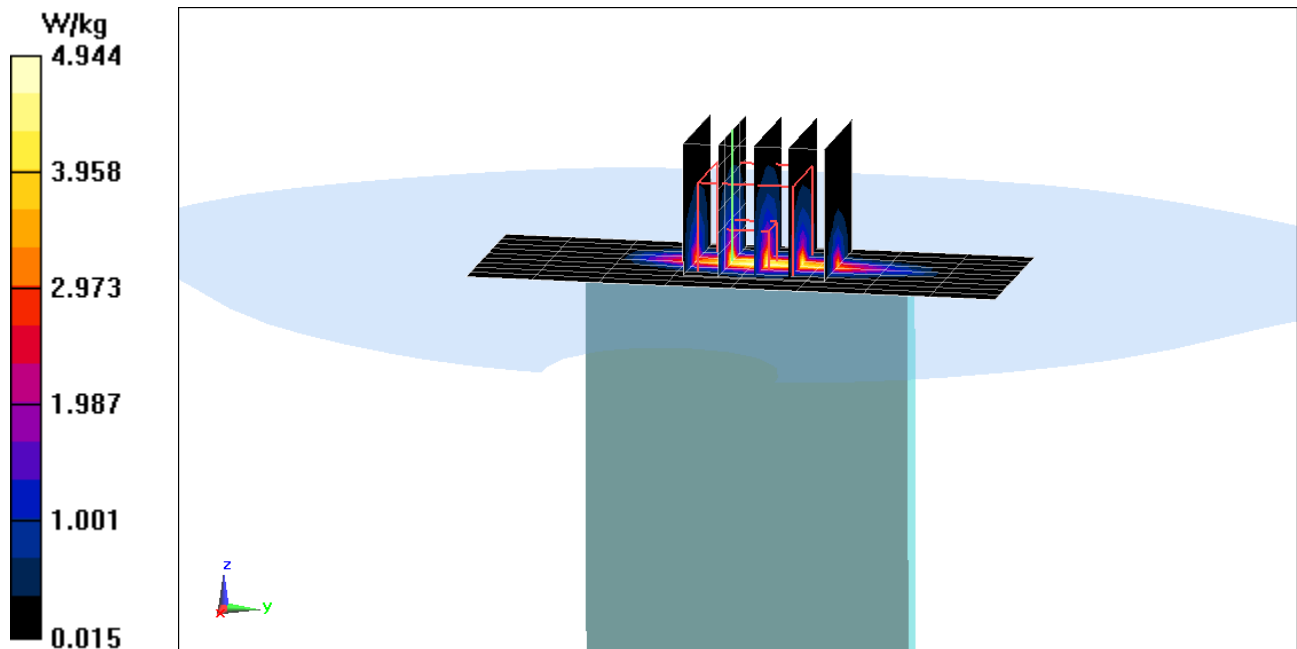
Area Scan (10x9x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 47.33 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 5.99 W/kg

SAR(10 g) = 1.26 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0455B

Communication System: UID 0, UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1907.6 \text{ MHz}$; $\sigma = 1.556 \text{ S/m}$; $\epsilon_r = 53.552$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 10-31-2017; Ambient Temp: 22.8°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7410; ConvF(7.98, 7.98, 7.98); Calibrated: 7/17/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 7/13/2017

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: UMTS 1900, Phablet SAR, Bottom Edge, High.ch

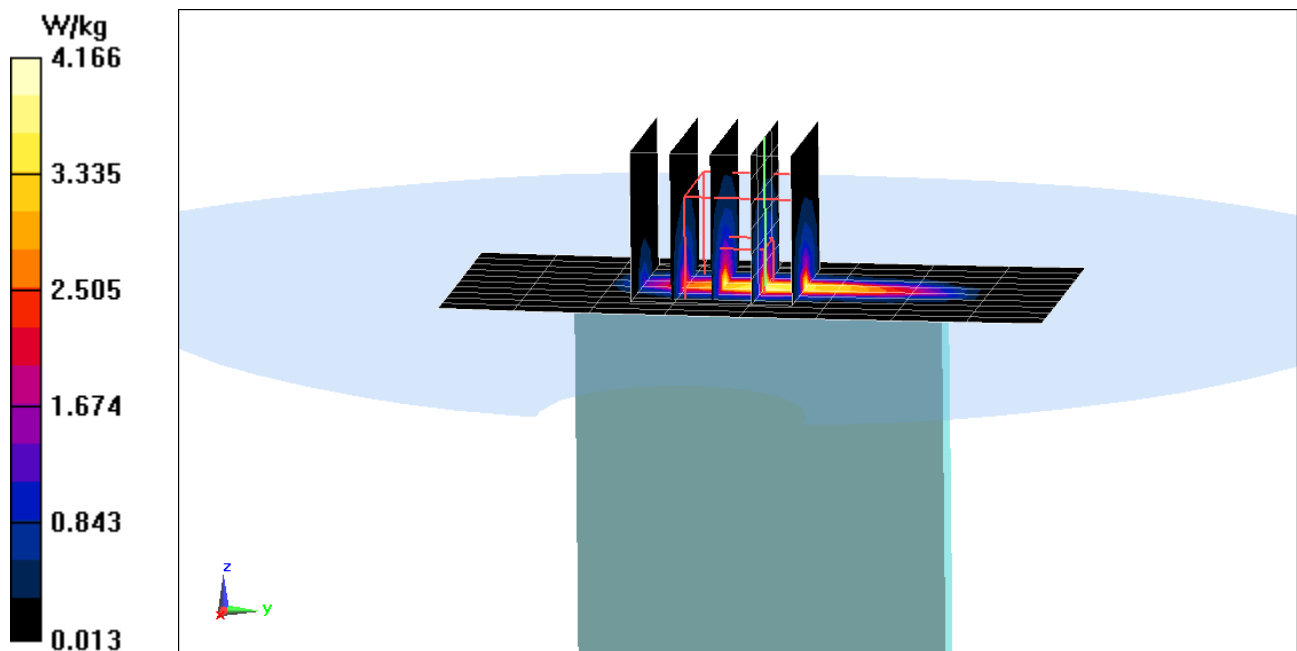
Area Scan (11x9x1): Measurement grid: $dx=5\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 42.29 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 5.01 W/kg

SAR(10 g) = 1.05 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 0458B

Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1720 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1720 \text{ MHz}$; $\sigma = 1.448 \text{ S/m}$; $\epsilon_r = 51.303$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 10-27-2017; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

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

**Mode: LTE Band 66 (AWS), Phablet SAR, Bottom Edge, Low.ch,
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset**

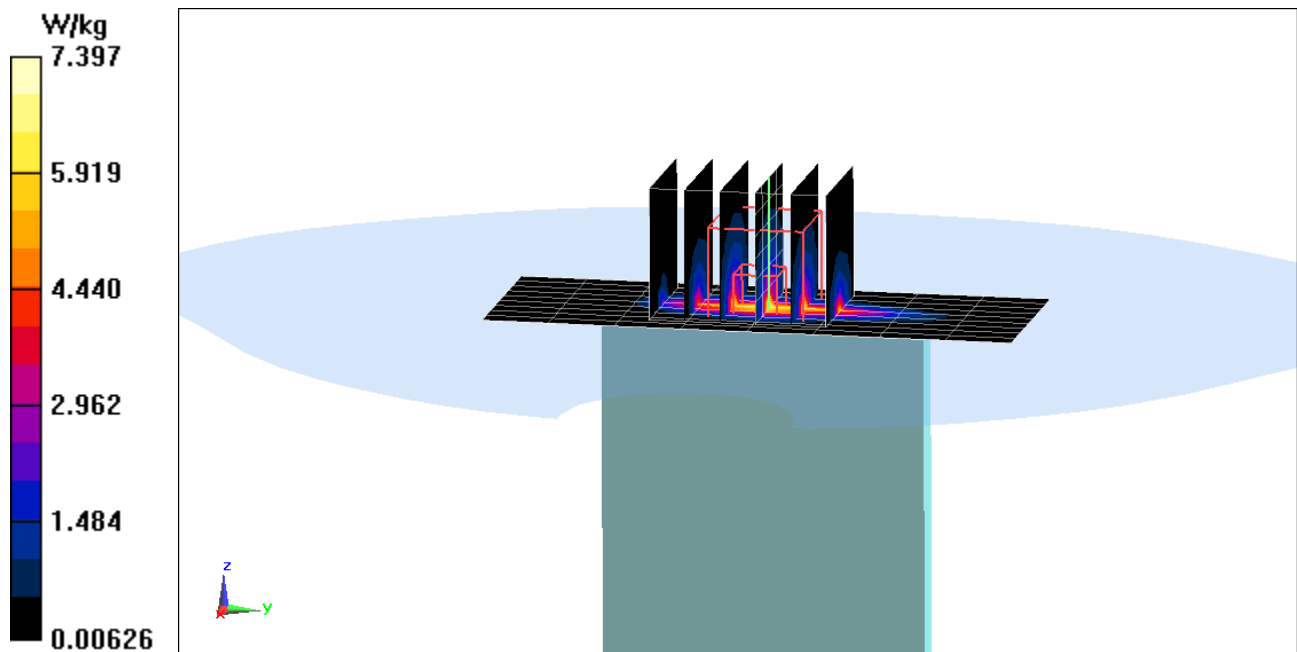
Area Scan (10x9x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 55.85 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 8.83 W/kg

SAR(10 g) = 1.87 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04C3F

Communication System: UID 0, LTE Band 7; Frequency: 2535 MHz; Duty Cycle: 1:1

Medium: 2600 Body Medium parameters used (interpolated):

$f = 2535 \text{ MHz}$; $\sigma = 2.122 \text{ S/m}$; $\epsilon_r = 52.333$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 11-01-2017; Ambient Temp: 22.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3319; ConvF(4.18, 4.18, 4.18); 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 7, Phablet SAR, Front side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset**

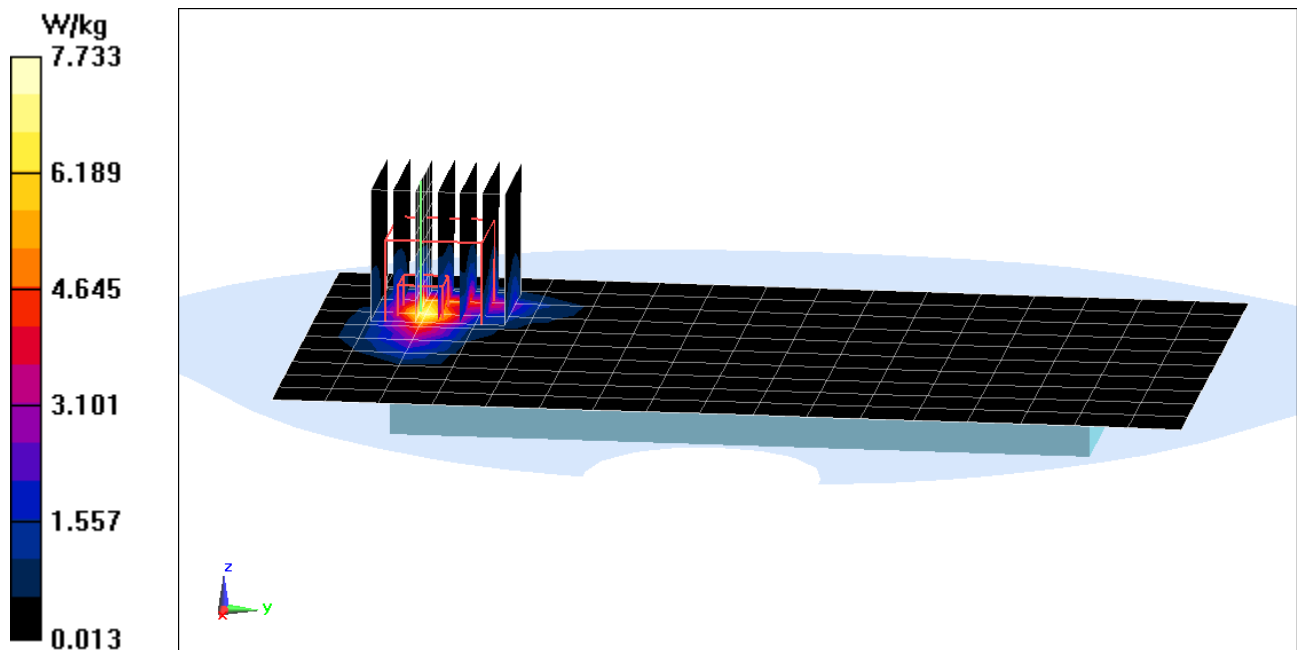
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 46.73 V/m; Power Drift = 0.18 dB

Peak SAR (extrapolated) = 14.9 W/kg

SAR(10 g) = 1.93 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMG965F; Type: Portable Handset; Serial: 04555

Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5500 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.759 \text{ S/m}$; $\epsilon_r = 48.023$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 10-24-2017; Ambient Temp: 22.5°C; Tissue Temp: 21.5°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)

**Mode: IEEE 802.11a, U-NII-2C, 20 MHz Bandwidth, Phablet SAR,
Ch 100, 6 Mbps, Back Side, Antenna 2**

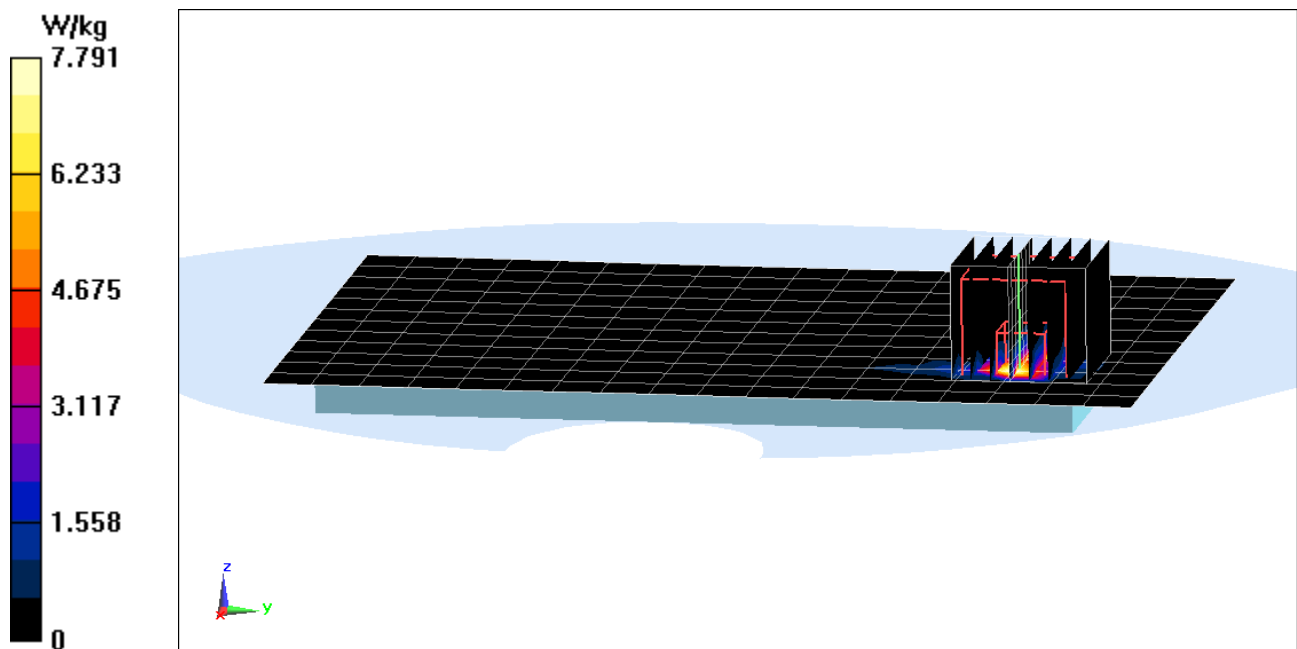
Area Scan (13x19x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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 = 23.19 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 19.9 W/kg

SAR(10 g) = 0.699 W/kg



APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.893 \text{ S/m}$; $\epsilon_r = 41.67$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-18-2017; Ambient Temp: 21.3°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3332; ConvF(6.81, 6.81, 6.81); Calibrated: 8/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355

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

750 MHz System Verification at 23.0 dBm (200 mW)

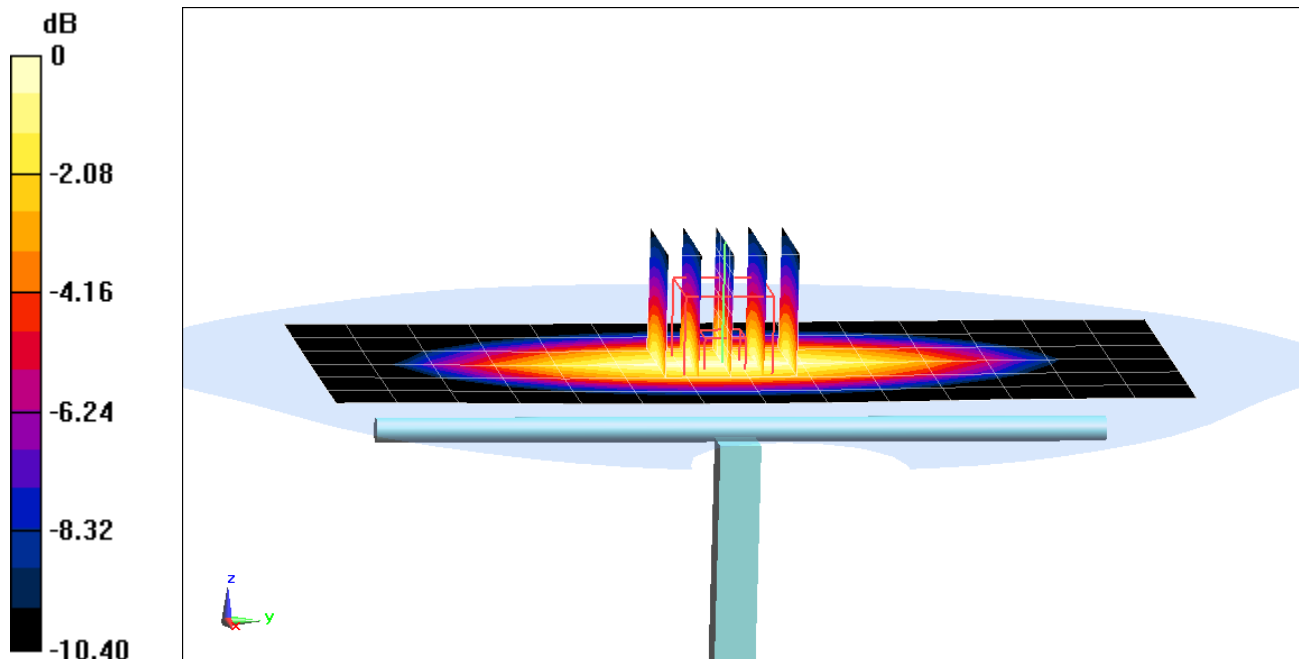
Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.26 W/kg

SAR(1 g) = 1.55 W/kg

Deviation(1 g) = -7.41%



0 dB = 1.81 W/kg = 2.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.898 \text{ S/m}$; $\epsilon_r = 40.86$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-16-2017; Ambient Temp: 22.7°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Right; Type: QD000P40CD; Serial: TP:7535

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

835 MHz System Verification at 23.0 dBm (200 mW)

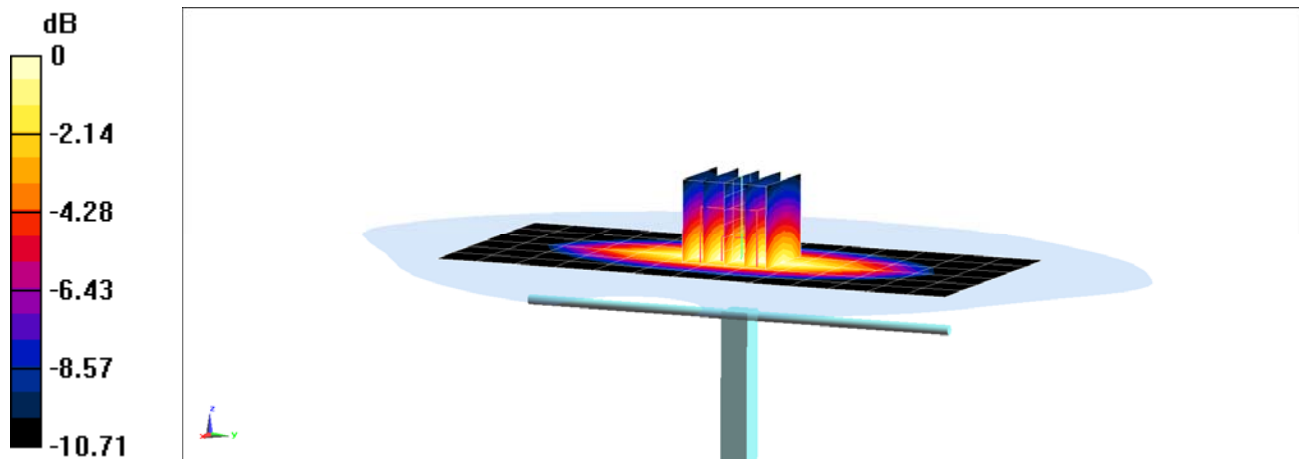
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 2.91 W/kg

SAR(1 g) = 1.93 W/kg

Deviation(1 g) = 5.70%



0 dB = 2.58 W/kg = 4.12 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1750 Head Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.384 \text{ S/m}$; $\epsilon_r = 39.785$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-23-2017; Ambient Temp: 22.7°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(5.5, 5.5, 5.5); Calibrated: 3/14/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

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

Phantom: SAM Right; Type: QD000P40CD; Serial: 1800

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

1750 MHz System Verification at 20.0 dBm (100 mW)

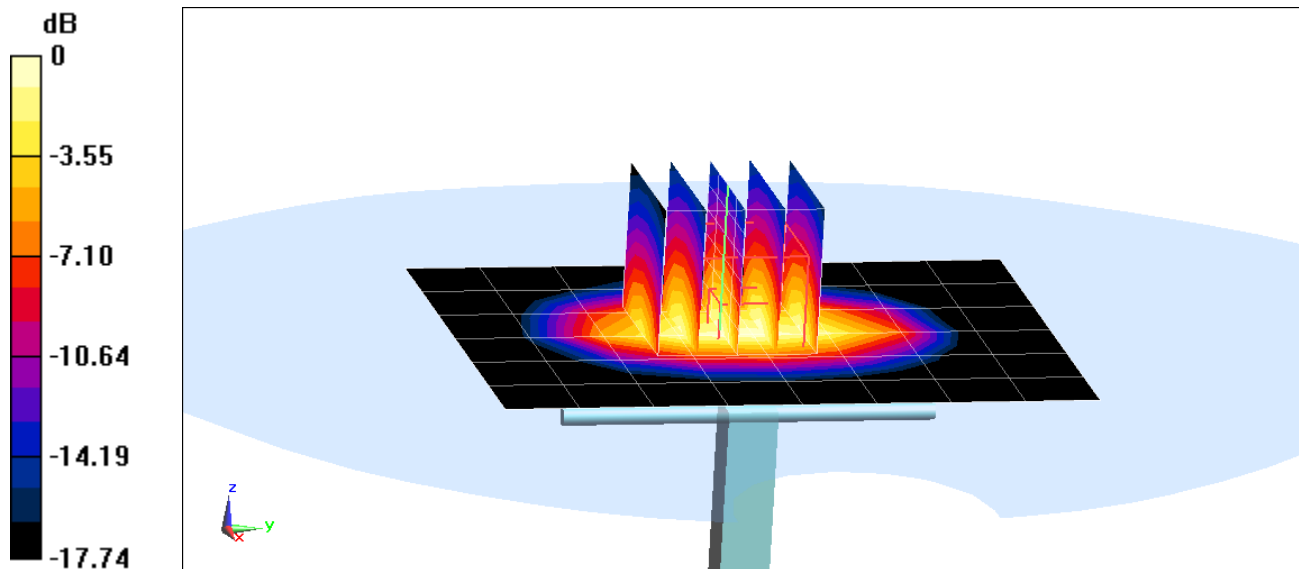
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 6.56 W/kg

SAR(1 g) = 3.62 W/kg

Deviation(1 g) = 0.28%



PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.456 \text{ S/m}$; $\epsilon_r = 39.744$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-21-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.7°C

Probe: ES3DV3 - SN3213; ConvF(5.29, 5.29, 5.29); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

1900 MHz System Verification at 20.0 dBm (100 mW)

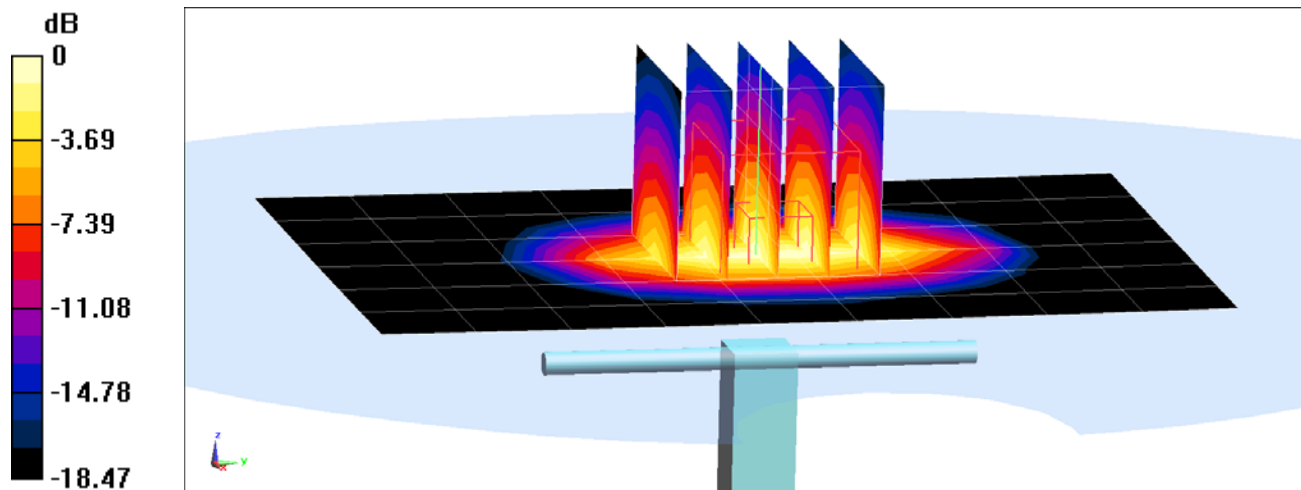
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 7.60 W/kg

SAR(1 g) = 4.10 W/kg

Deviation(1 g) = 4.33%



0 dB = 5.19 W/kg = 7.15 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Head Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.855 \text{ S/m}$; $\epsilon_r = 39.496$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-26-2017; Ambient Temp: 23.1°C; Tissue Temp: 22.5°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)

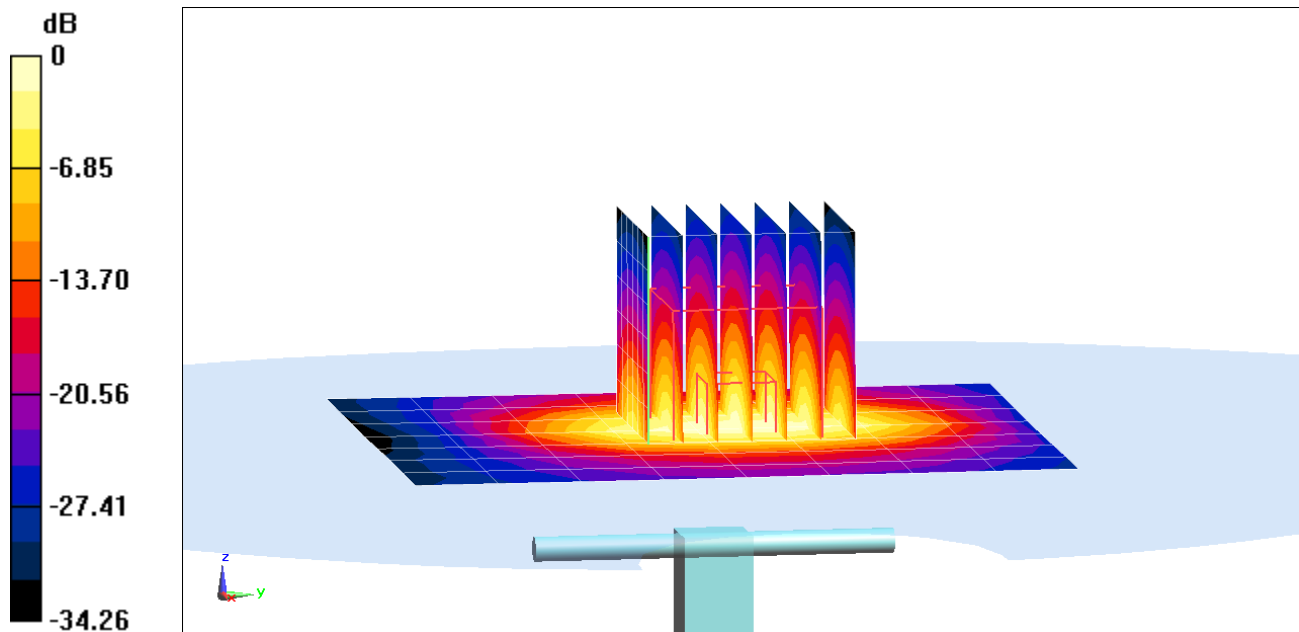
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 11.1 W/kg

SAR(1 g) = 5.45 W/kg

Deviation(1 g) = 3.22%



0 dB = 6.52 W/kg = 8.14 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: 2600 Head Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 2.038 \text{ S/m}$; $\epsilon_r = 38.401$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-30-2017; Ambient Temp: 21.7°C; Tissue Temp: 20.7°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)

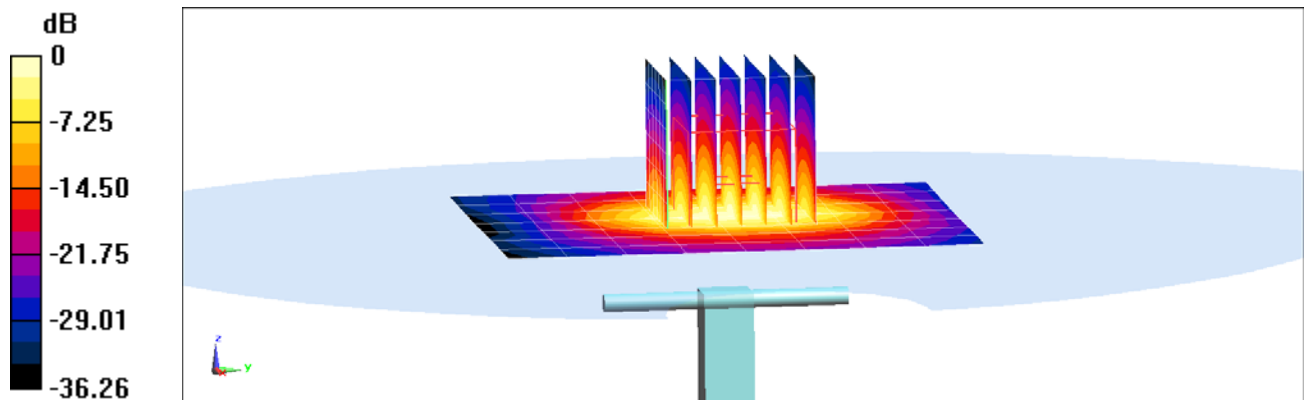
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 13.6 W/kg

SAR(1 g) = 6.03 W/kg

Deviation(1 g) = 6.91%



0 dB = 7.62 W/kg = 8.82 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium: 5 GHz Medium parameters used (interpolated):

$f = 5250 \text{ MHz}$; $\sigma = 4.606 \text{ S/m}$; $\epsilon_r = 35.56$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-25-2017; Ambient Temp: 22.8°C; Tissue Temp: 21.2°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 (Left); Type: SAM; Serial: 1715

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

5250 MHz System Verification at 17.0 dBm (50 mW)

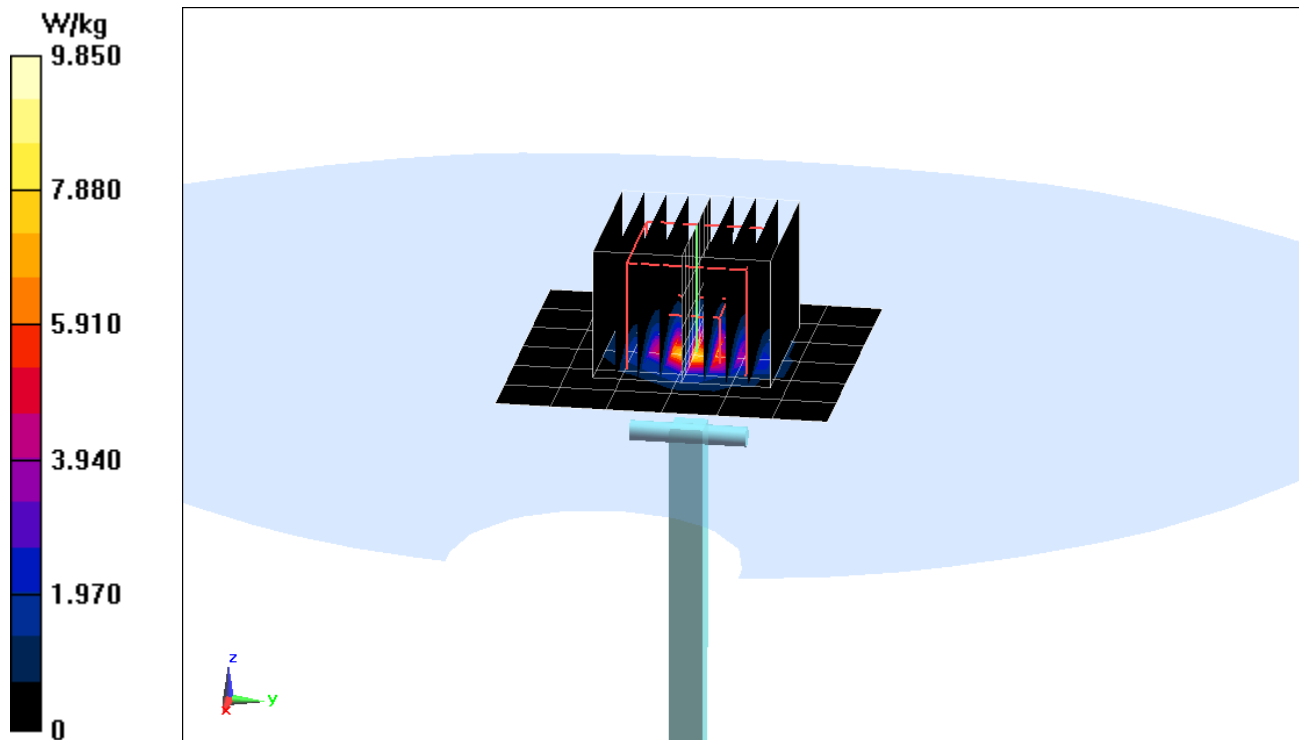
Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 3.84 W/kg

Deviation(1 g) = -2.66%



PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 5 GHz Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 4.96 \text{ S/m}$; $\epsilon_r = 35.069$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-25-2017; Ambient Temp: 22.8°C; Tissue Temp: 21.2°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 (Left); Type: SAM; Serial: 1715

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

5600 MHz System Verification at 17.0 dBm (50 mW)

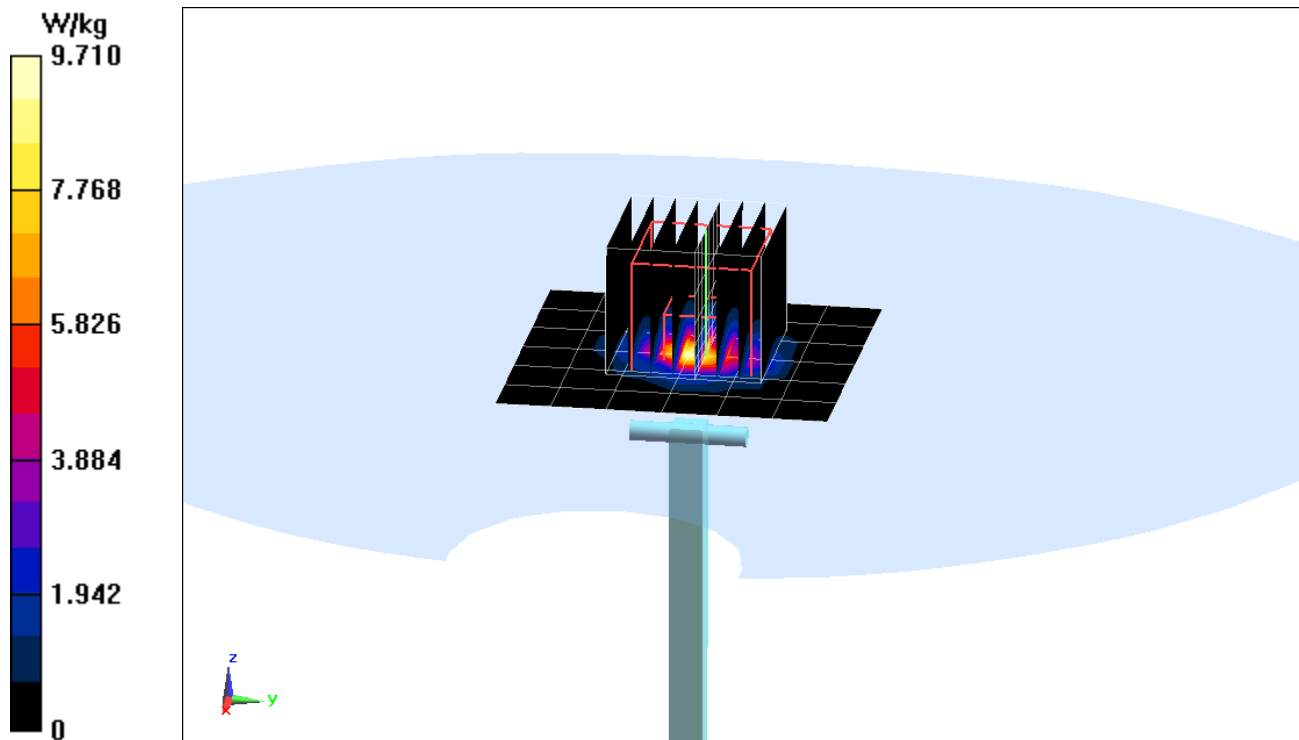
Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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) = 17.7 W/kg

SAR(1 g) = 4.06 W/kg

Deviation(1 g) = -2.87%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1

Medium: 5 GHz Medium parameters used (interpolated):

$f = 5750 \text{ MHz}$; $\sigma = 5.131 \text{ S/m}$; $\epsilon_r = 34.815$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-25-2017; Ambient Temp: 22.8°C; Tissue Temp: 21.2°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 (Left); Type: SAM; Serial: 1715

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

5750 MHz System Verification at 17.0 dBm (50 mW)

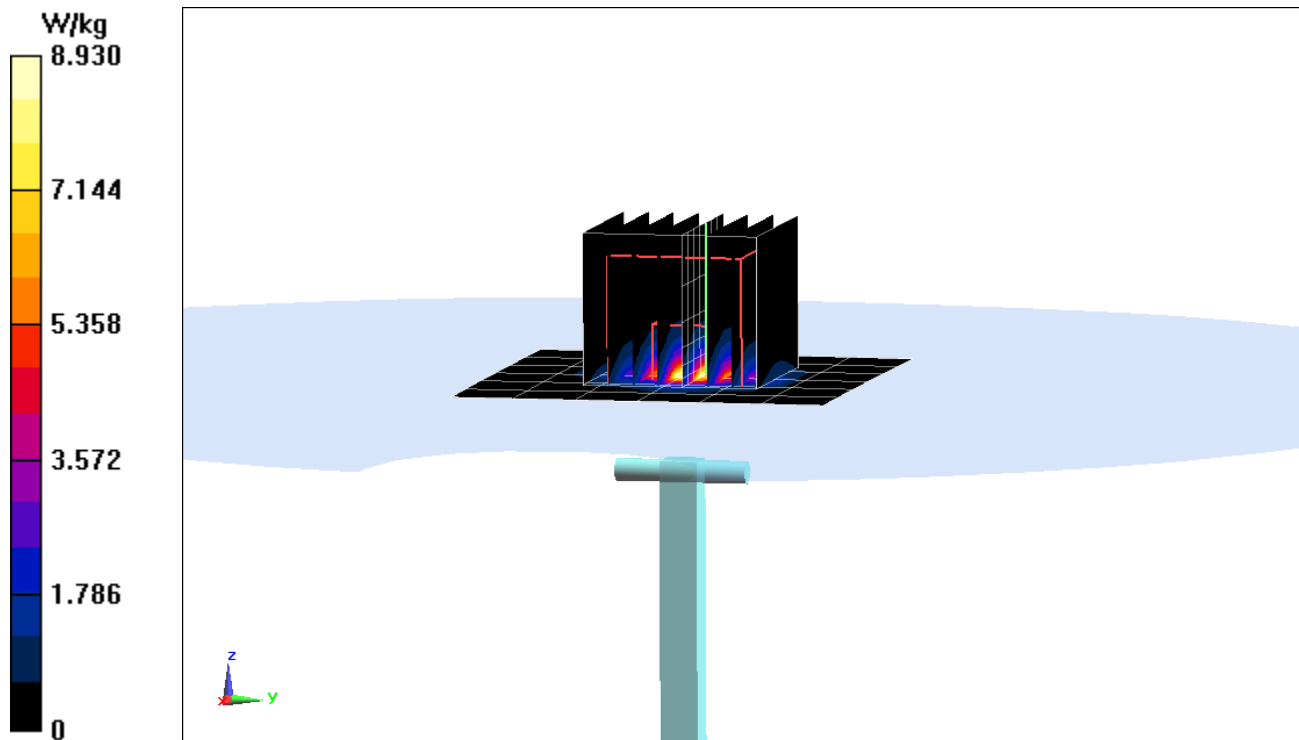
Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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) = 16.5 W/kg

SAR(1 g) = 3.71 W/kg

Deviation(1 g) = -6.19%



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):

$f = 750 \text{ MHz}$; $\sigma = 0.977 \text{ S/m}$; $\epsilon_r = 55.734$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-25-2017; Ambient Temp: 23.4°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.38, 6.38, 6.38); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

750 MHz System Verification at 23.0 dBm (200 mW)

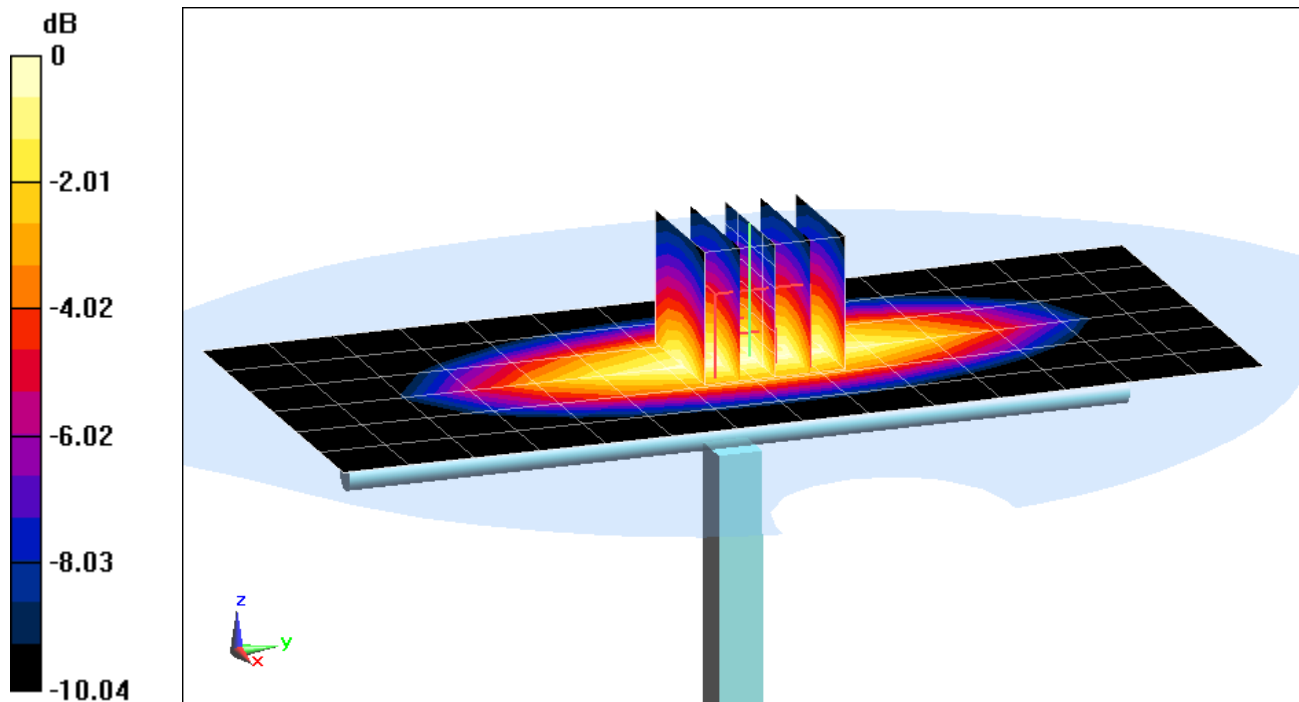
Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.54 W/kg

SAR(1 g) = 1.73 W/kg

Deviation(1 g) = -1.59%



0 dB = 2.02 W/kg = 3.05 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.959 \text{ S/m}$; $\epsilon_r = 52.949$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 10-18-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1272; Calibrated: 2/9/2017

Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758

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

835 MHz System Verification at 23.0 dBm (200 mW)

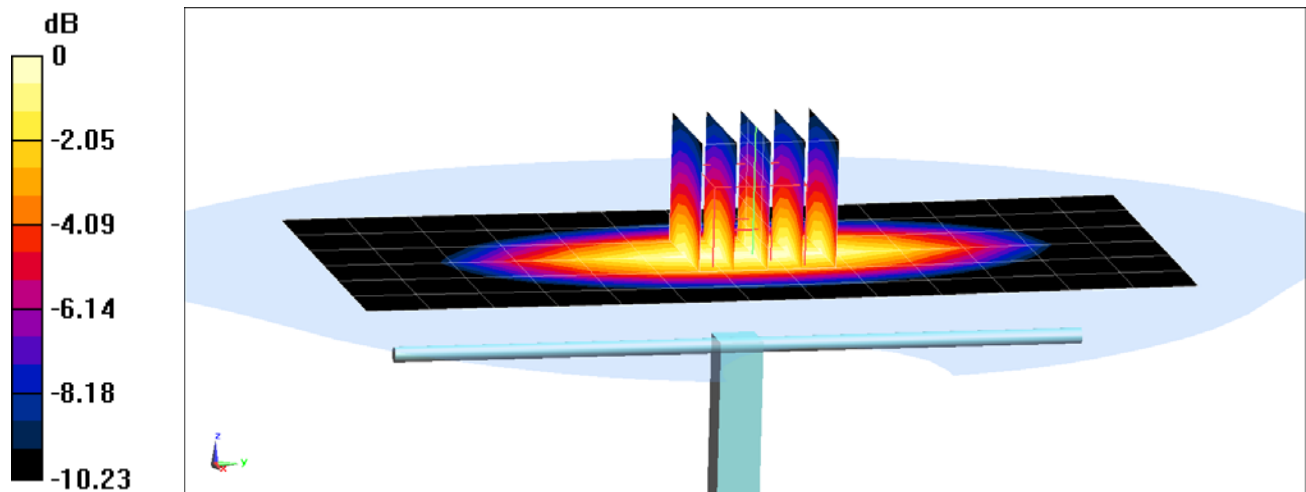
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.82 W/kg

SAR(1 g) = 1.93 W/kg

Deviation(1 g) = 2.55%



0 dB = 2.25 W/kg = 3.52 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:

$f = 1750 \text{ MHz}$; $\sigma = 1.526 \text{ S/m}$; $\epsilon_r = 51.467$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-23-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.7°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

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

1750 MHz System Verification at 20.0 dBm (100 mW)

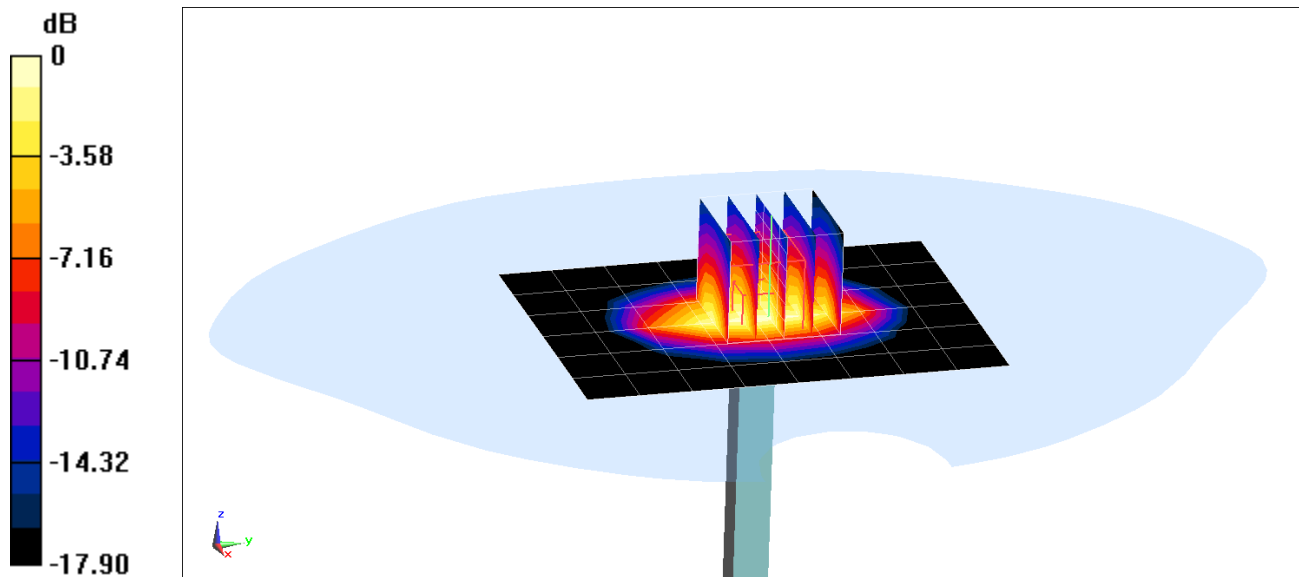
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 6.70 W/kg

SAR(1 g) = 3.69 W/kg

Deviation(1 g) = -0.27%



0 dB = 5.59 W/kg = 7.47 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.482 \text{ S/m}$; $\epsilon_r = 51.181$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-27-2017; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: SAM Left; Type: QD000P40CC; Serial: TP: 1375

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

1750 MHz System Verification at 20.0 dBm (100 mW)

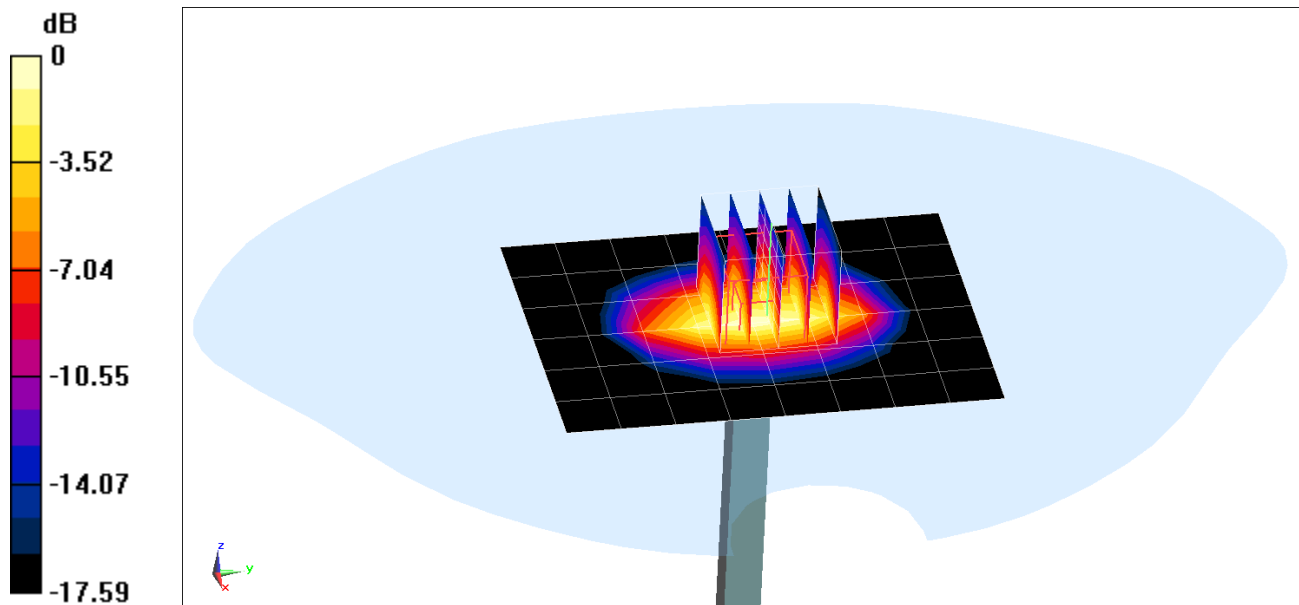
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.18 W/kg

SAR(10 g) = 2.06 W/kg

Deviation(10 g) = 5.64%



0 dB = 5.95 W/kg = 7.75 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.583 \text{ S/m}$; $\epsilon_r = 52.231$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-18-2017; Ambient Temp: 22.3°C; Tissue Temp: 21.1°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: SAM Left; Type: QD000P40CD; Serial: 1692

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

1900 MHz System Verification at 20.0 dBm (100 mW)

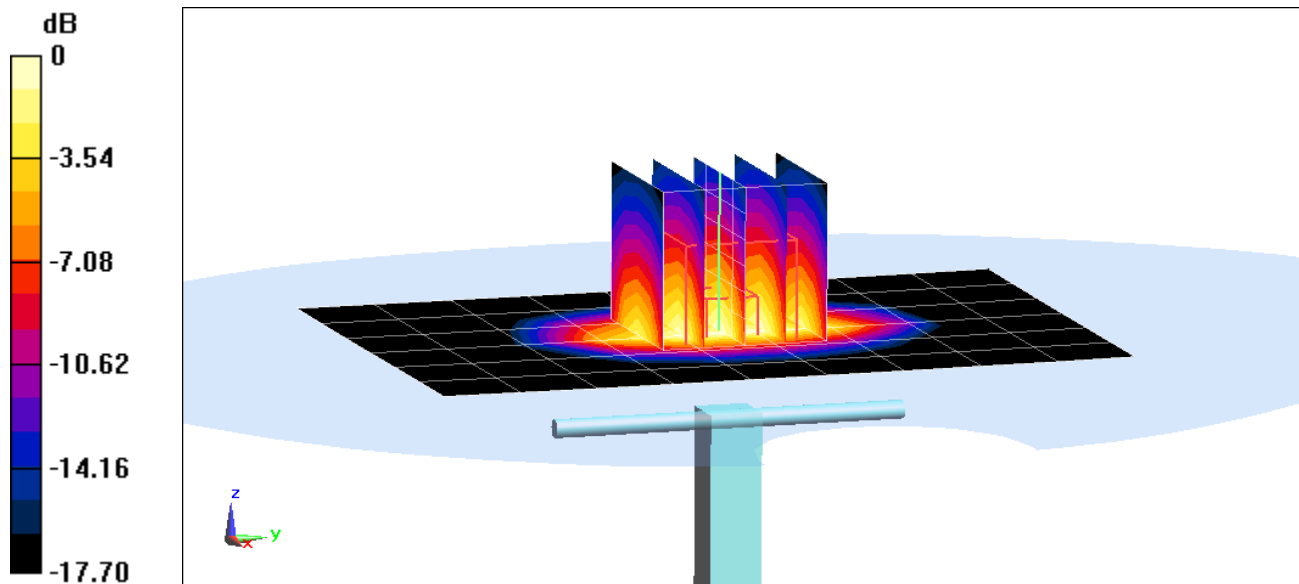
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 7.34 W/kg

SAR(1 g) = 4.09 W/kg

Deviation(1 g) = 4.60%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.548 \text{ S/m}$; $\epsilon_r = 53.577$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-31-2017; Ambient Temp: 22.8°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7410; ConvF(7.98, 7.98, 7.98); Calibrated: 7/17/2017;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 7/13/2017

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)

1900 MHz System Verification at 20.0 dBm (100 mW)

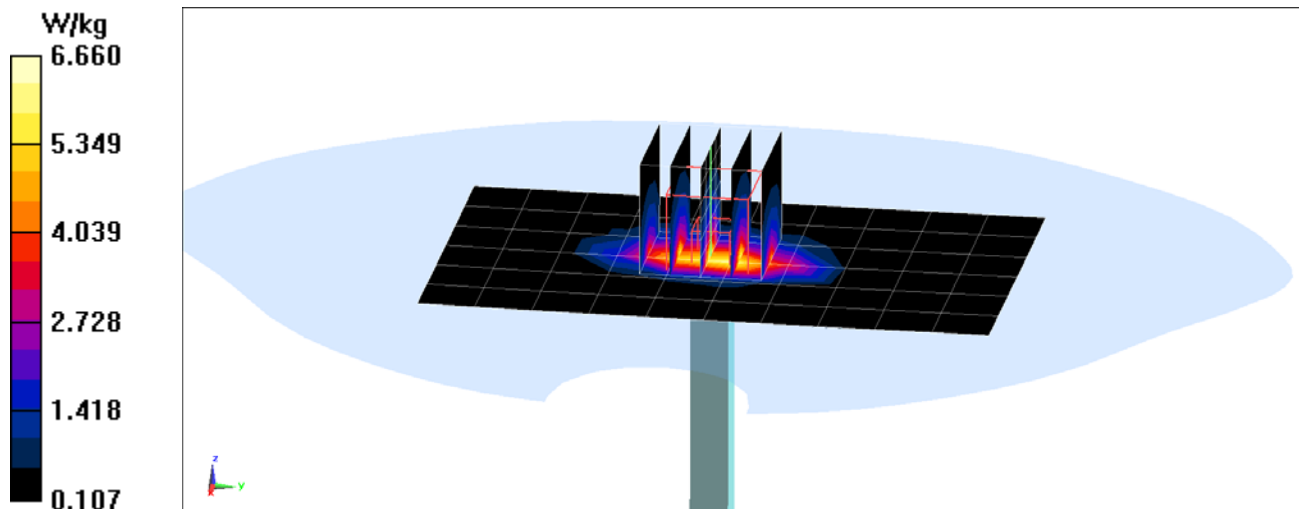
Area Scan (7x11x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 7.75 W/kg

SAR(10 g) = 2.25 W/kg

Deviation(10 g) = 4.65%



PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.022 \text{ S/m}$; $\epsilon_r = 51.957$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-23-2017; Ambient Temp: 21.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.42, 4.42, 4.42); 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)

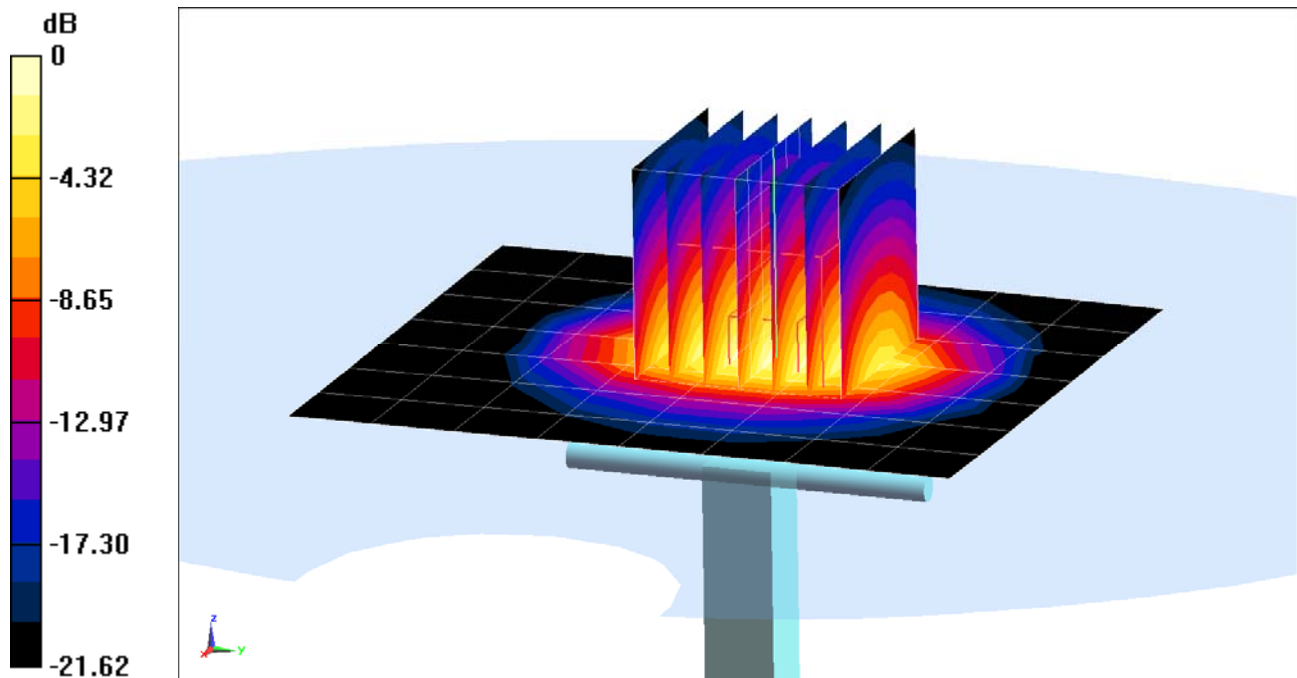
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 10.2 W/kg

SAR(1 g) = 4.94 W/kg

Deviation(1 g) = -2.76%



0 dB = 6.41 W/kg = 8.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.004 \text{ S/m}$; $\epsilon_r = 52.659$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-01-2017; Ambient Temp: 22.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3319; ConvF(4.42, 4.42, 4.42); 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)

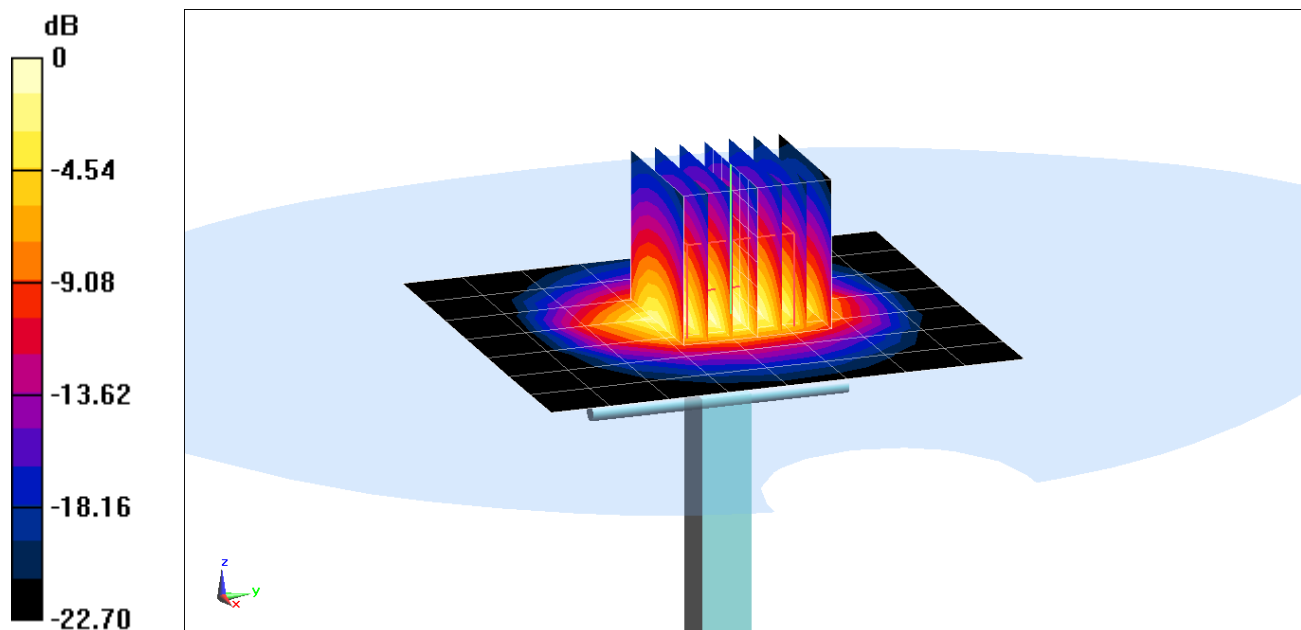
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 10.1 W/kg

SAR(1 g) = 4.84 W/kg; SAR(10 g) = 2.21 W/kg

Deviation(1 g) = -3.39%; Deviation(10 g) = -6.75%



0 dB = 6.34 W/kg = 8.02 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: 2600 Body Medium parameters used:

$f = 2600$ MHz; $\sigma = 2.234$ S/m; $\epsilon_r = 51.384$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-23-2017; Ambient Temp: 21.0°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.18, 4.18, 4.18); 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)

2600 MHz System Verification at 20.0 dBm (100 mW)

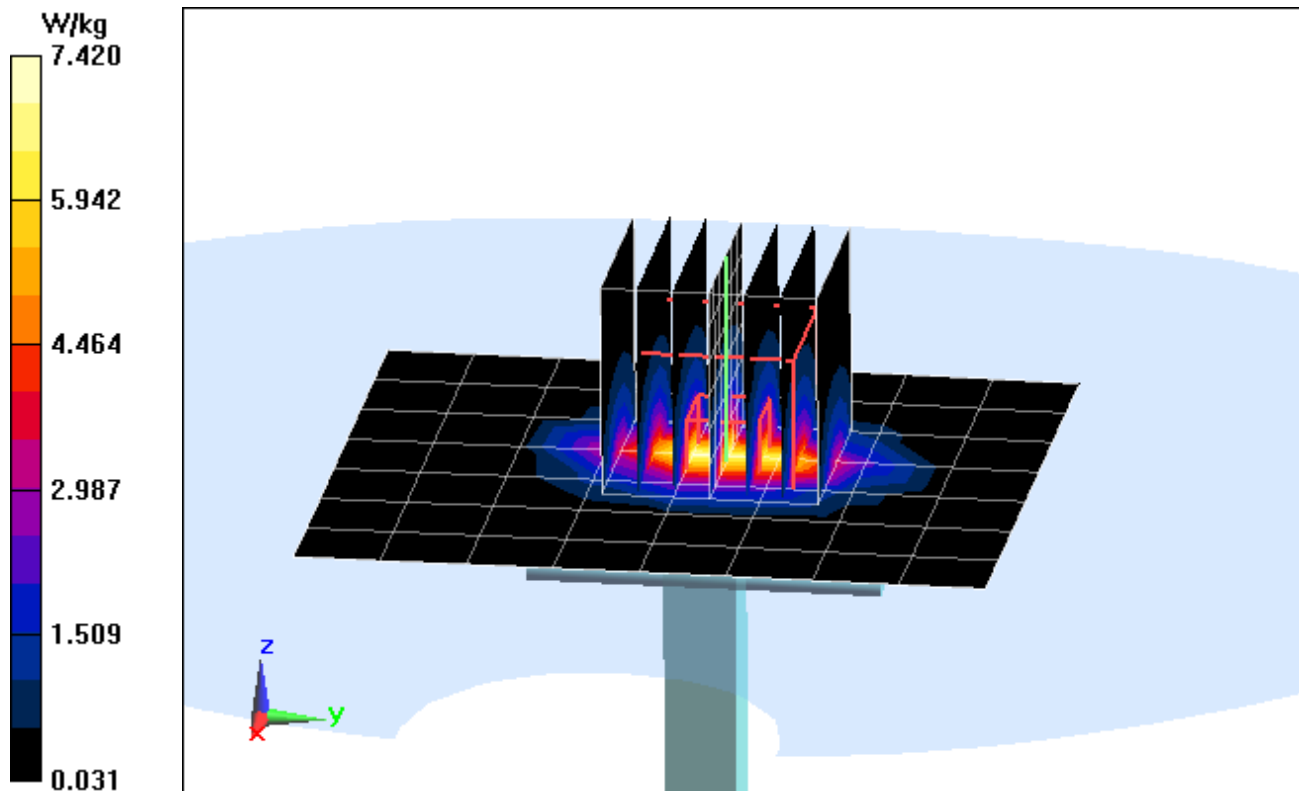
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 12.2 W/kg

SAR(1 g) = 5.61 W/kg

Deviation(1 g) = 2.56%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: 2600 Body Medium parameters used:

$f = 2600$ MHz; $\sigma = 2.211$ S/m; $\epsilon_r = 52.087$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 11-01-2017; Ambient Temp: 22.3°C; Tissue Temp: 22.3°C

Probe: ES3DV3 - SN3319; ConvF(4.18, 4.18, 4.18); 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)

2600 MHz System Verification at 20.0 dBm (100 mW)

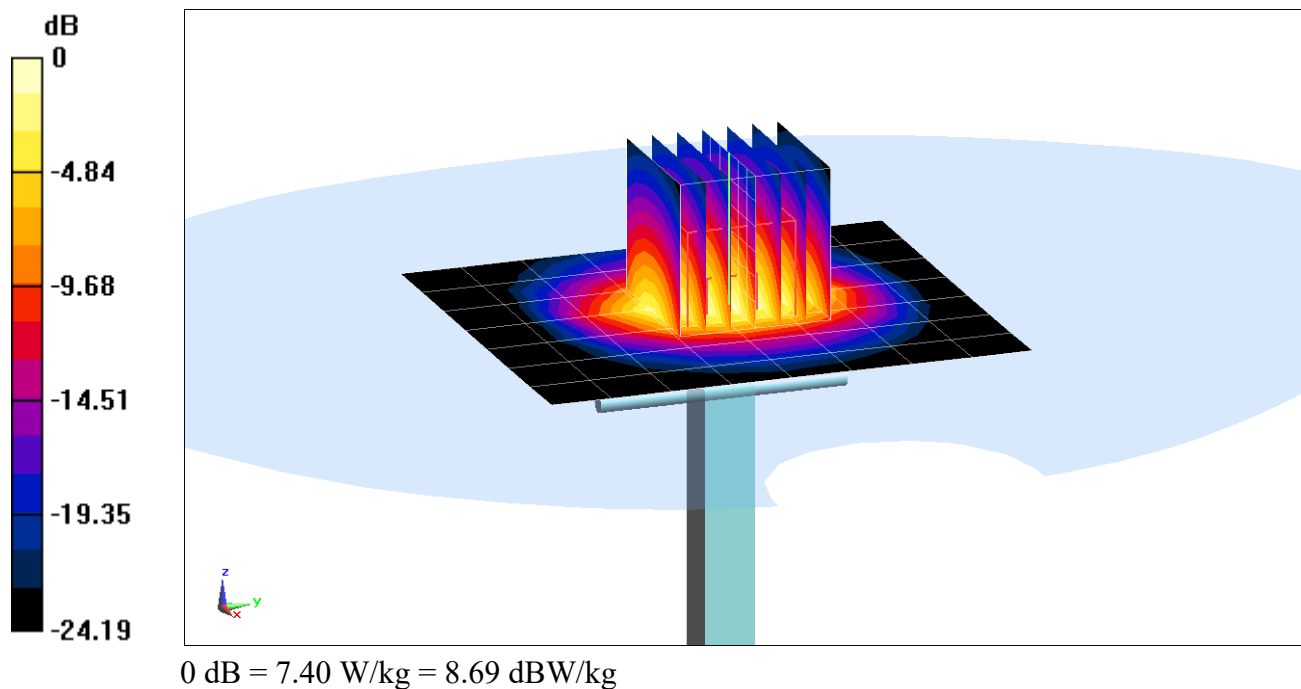
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 12.2 W/kg

SAR(1 g) = 5.56 W/kg; SAR(10 g) = 2.44 W/kg

Deviation(1 g) = 1.65%; Deviation(10 g) = 0.00%



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: 5 GHz Body Medium parameters used (interpolated):

$f = 5250 \text{ MHz}$; $\sigma = 5.405 \text{ S/m}$; $\epsilon_r = 48.529$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-24-2017; Ambient Temp: 22.5°C; Tissue Temp: 21.5°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)

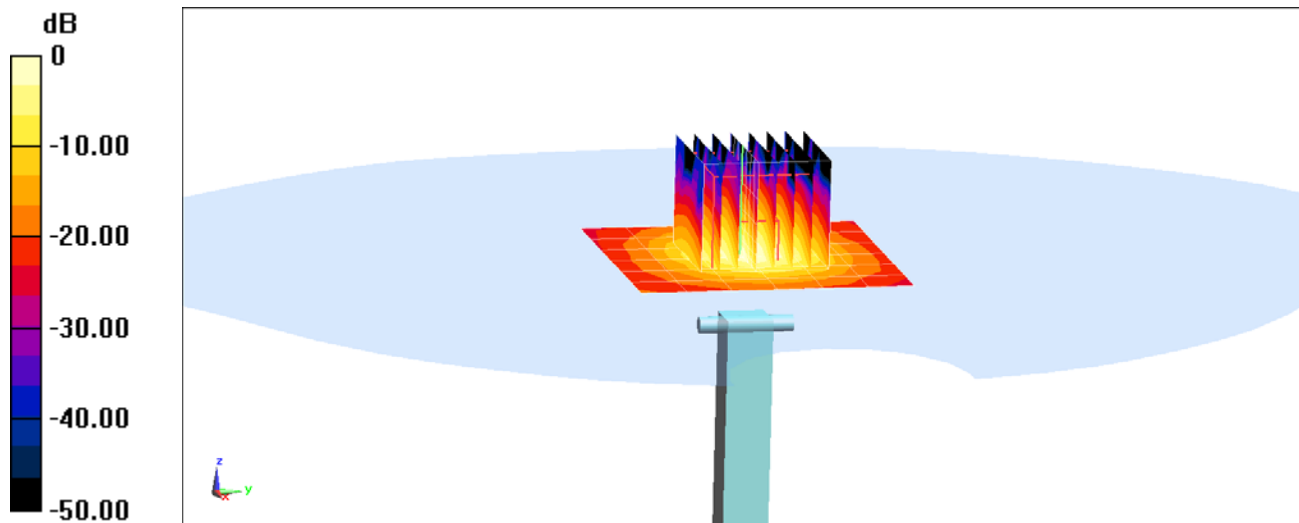
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

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

Peak SAR (extrapolated) = 17.0 W/kg

SAR(1 g) = 3.75 W/kg; SAR(10 g) = 1.05 W/kg

Deviation(1 g) = -2.47%; Deviation(10 g) = -2.33%



0 dB = 8.92 W/kg = 9.50 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

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

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.91 \text{ S/m}$; $\epsilon_r = 47.818$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-24-2017; Ambient Temp: 22.5°C; Tissue Temp: 21.5°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)

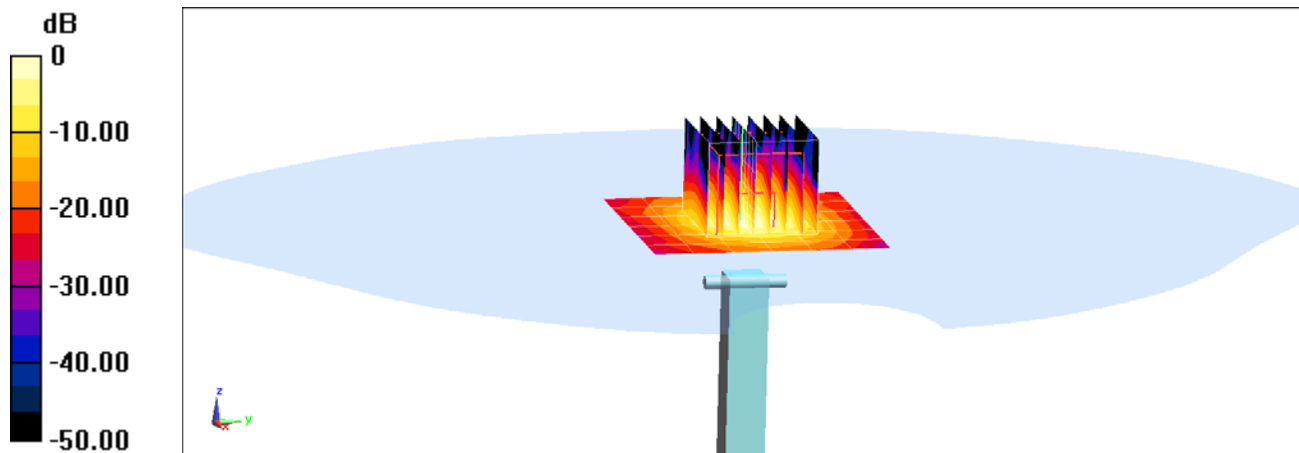
Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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) = 18.5 W/kg

SAR(1 g) = 3.81 W/kg; SAR(10 g) = 1.05 W/kg

Deviation(1 g) = -2.93%; Deviation(10 g) = -4.98%



0 dB = 9.27 W/kg = 9.67 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1

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

$f = 5750 \text{ MHz}$; $\sigma = 6.135 \text{ S/m}$; $\epsilon_r = 47.546$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 10-24-2017; Ambient Temp: 22.5°C; Tissue Temp: 21.5°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)

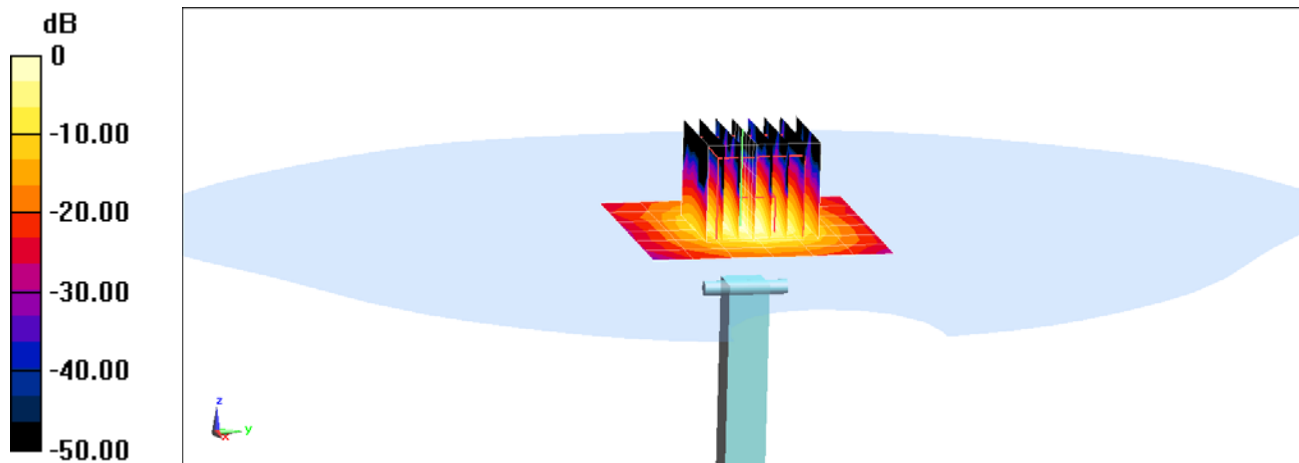
Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

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) = 17.8 W/kg

SAR(1 g) = 3.54 W/kg

Deviation(1 g) = -8.17%



0 dB = 8.70 W/kg = 9.40 dBW/kg

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: **D750V3-1054_Mar17**

CALIBRATION CERTIFICATE

Object **D750V3 - SN:1054**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

BNV

03-27-2017

Calibration date: **March 07, 2017**

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	04-Jan-17 (No. DAE4-601_Jan17)	Jan-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by: **Johannes Kurikka** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Technical Manager

Signature

[Signature]

[Signature]

Issued: March 14, 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	V52.8.8
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	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.37 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	1.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.50 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.6 $\pm$ 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	2.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.61 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	1.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.68 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	54.7 Ω - 0.7 j Ω
Return Loss	- 26.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.7 Ω - 3.6 j Ω
Return Loss	- 28.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.033 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 08, 2011

DASY5 Validation Report for Head TSL

Date: 07.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW ; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.91 \text{ S/m}$; $\epsilon_r = 40.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.17, 10.17, 10.17); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

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

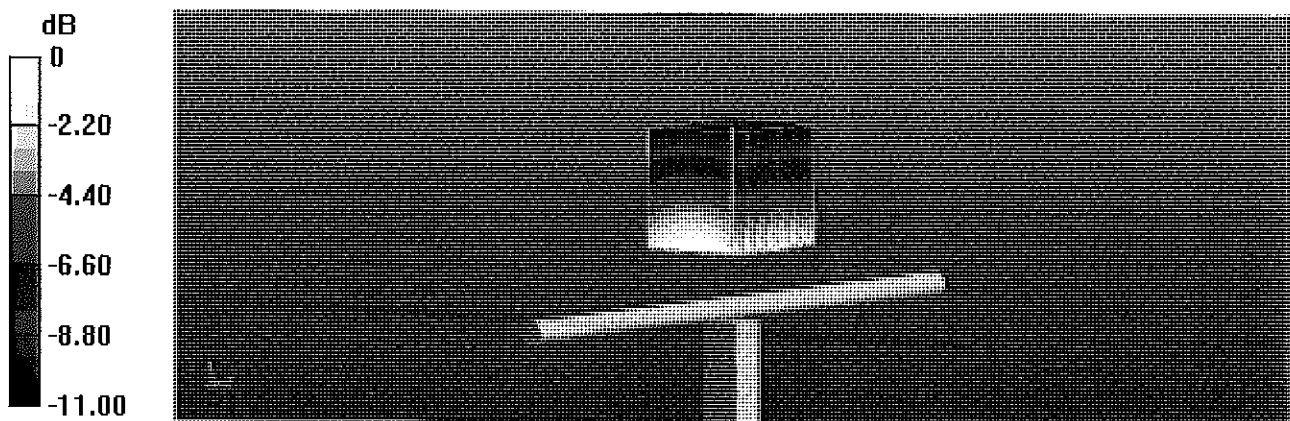
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 59.71 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.21 W/kg

SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.4 W/kg

Maximum value of SAR (measured) = 2.85 W/kg

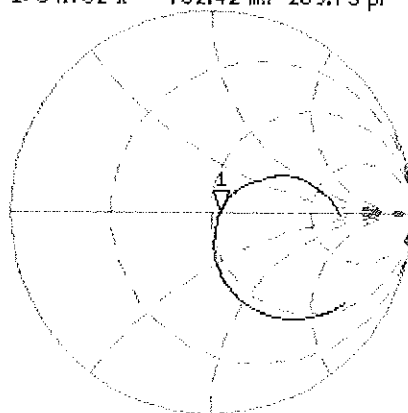


0 dB = 2.85 W/kg = 4.55 dBW/kg

Impedance Measurement Plot for Head TSL

7 Mar 2017 12:25:14
 CH1 S11 1 U FS 1: 54.732 Ω -732.42 m Ω 289.73 pF 750.000 000 MHz

*
 Del
 CA



Avg
 16

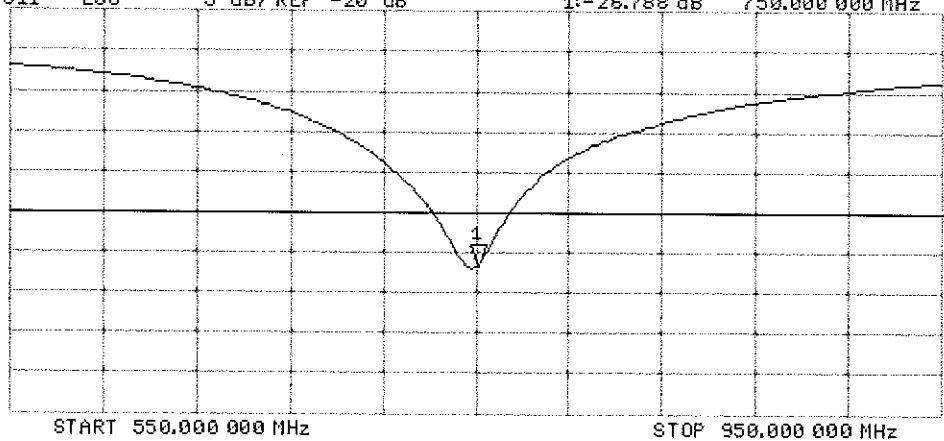
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-26.788 dB 750.000 000 MHz

CA

Avg
 16

H1d



DASY5 Validation Report for Body TSL

Date: 07.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW ; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.99 \text{ S/m}$; $\epsilon_r = 54.6$; $\rho = 1000 \text{ kg/m}^3$

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: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

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

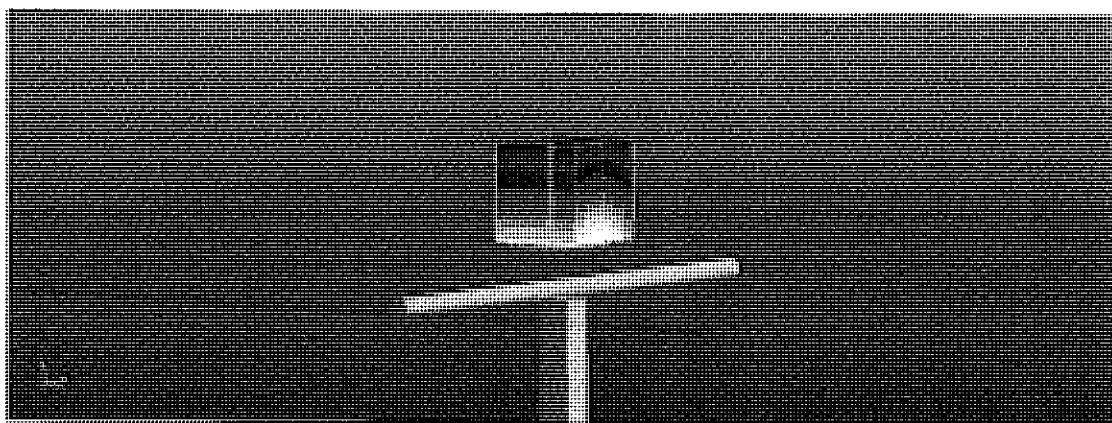
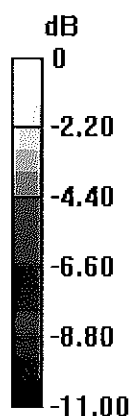
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 57.88 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.31 W/kg

SAR(1 g) = 2.21 W/kg; SAR(10 g) = 1.45 W/kg

Maximum value of SAR (measured) = 2.94 W/kg

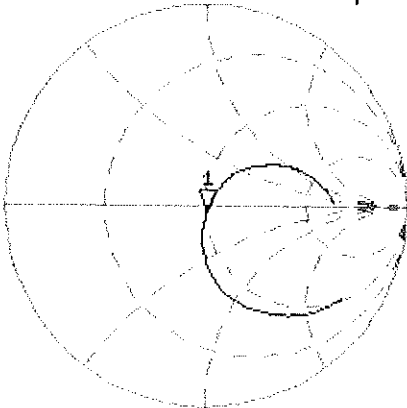


0 dB = 2.94 W/kg = 4.68 dBW/kg

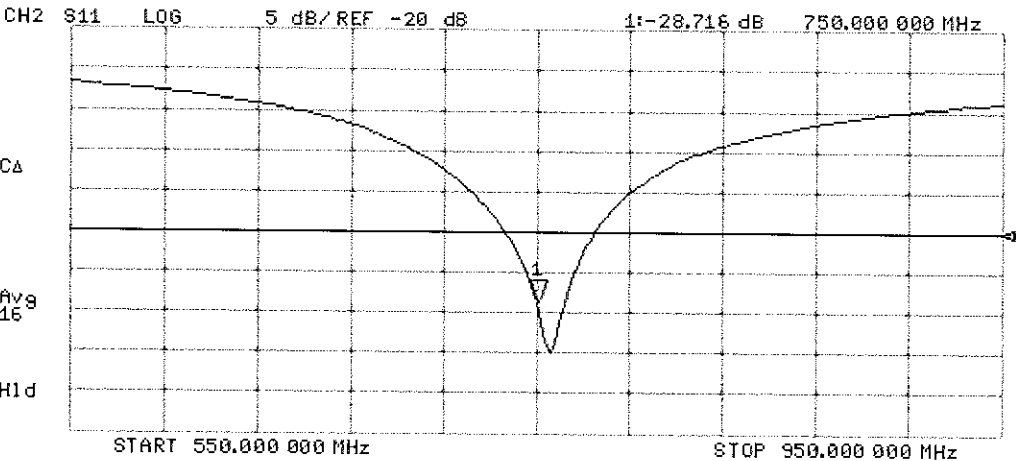
Impedance Measurement Plot for Body TSL

7 Mar 2017 11:51:37
CH1 S11 1 U FS 1: 50.666 Ω -3.6309 Ω 58.445 pF 750.000 000 MHz

*
De1
CA



Avg
16
H1d





Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D835V2-4d047_Jul16**

CALIBRATION CERTIFICATE

Object **D835V2 - SN:4d047**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **July 13, 2016**

BNV
7/16/2016

Extended
7/2017
SCV

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: **Jeton Kastrati** Name: **Jeton Kastrati** 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)

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
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	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	40.6 $\pm$ 6 %	0.94 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.13 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.53 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.95 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	54.9 $\pm$ 6 %	1.01 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	9.57 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	1.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.24 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 - 5.9 j Ω
Return Loss	- 24.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.8 Ω - 8.2 j Ω
Return Loss	- 20.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	None ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 16, 2006

DASY5 Validation Report for Head TSL

Date: 13.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.94 \text{ S/m}$; $\epsilon_r = 40.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.72, 9.72, 9.72); 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:

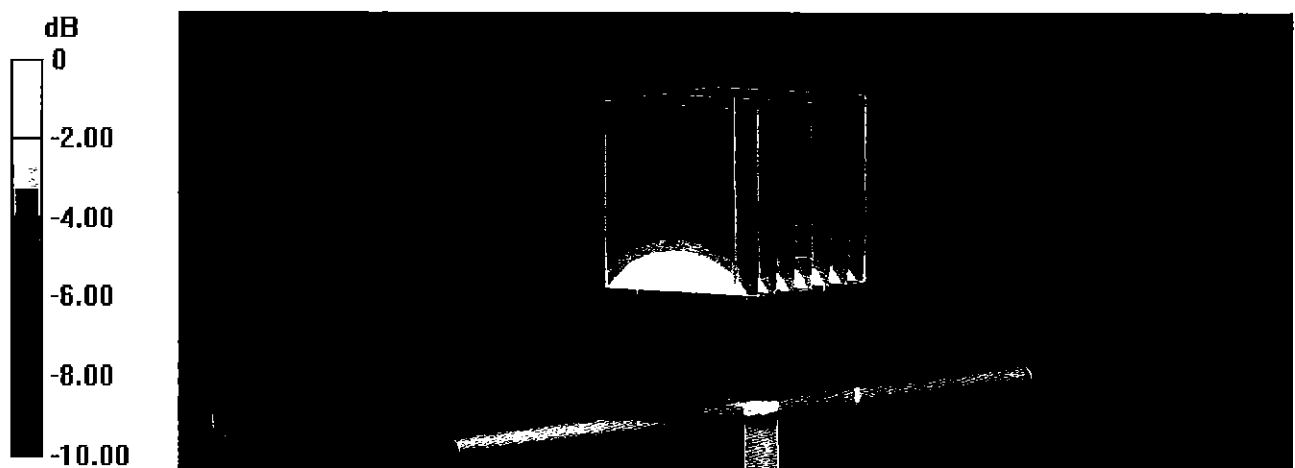
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 60.98 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.56 W/kg

SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.53 W/kg

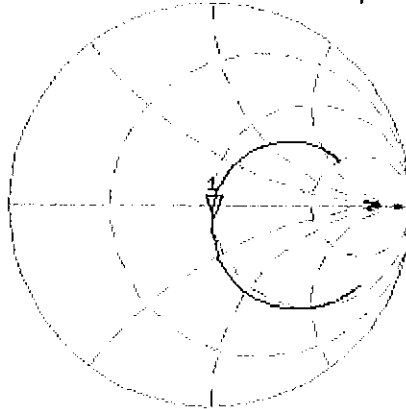
Maximum value of SAR (measured) = 3.17 W/kg



Impedance Measurement Plot for Head TSL

13 Jul 2016 12:00:27
 CH1 S11 1 U FS 1: 49.820 Ω -5.9316 Ω 32.134 pF 835.000 000 MHz

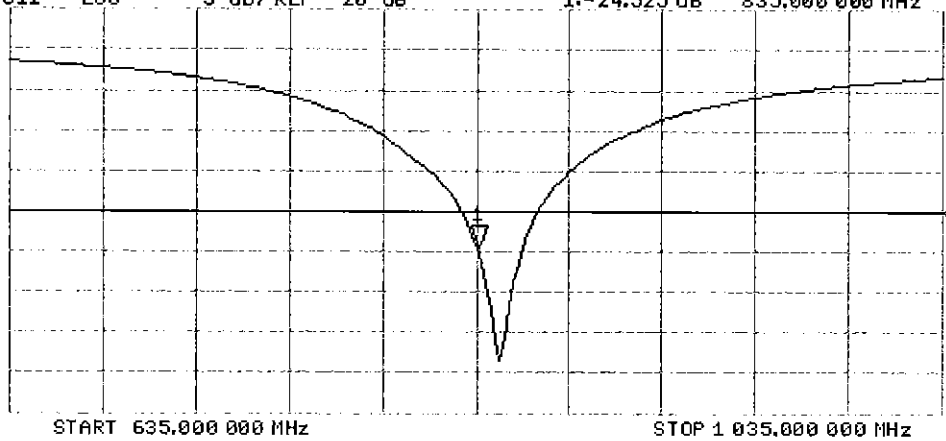
*
 Del
 CA



Avg
 16
 H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-24.525 dB 835.000 000 MHz

CA
 Avg
 16
 H1d



DASY5 Validation Report for Body TSL

Date: 13.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 1.01$ S/m; $\epsilon_r = 54.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.73, 9.73, 9.73); 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=5mm, dy=5mm, dz=5mm

Reference Value = 59.88 V/m; Power Drift = -0.01 dB

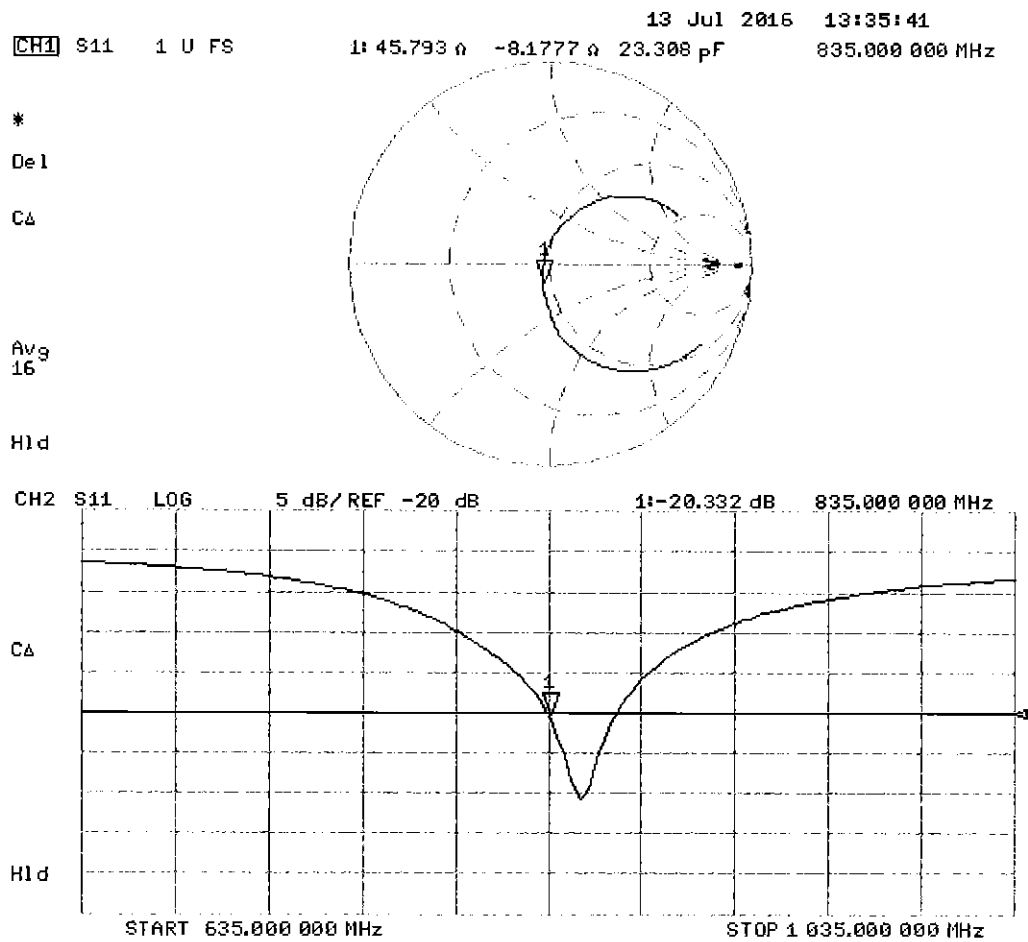
Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.6 W/kg

Maximum value of SAR (measured) = 3.27 W/kg



Impedance Measurement Plot for Body TSL



Certification of Calibration

Object D835V2 – SN: 4d047

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Calibration date: July 13, 2017

Description: SAR Validation Dipole at 835 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	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
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

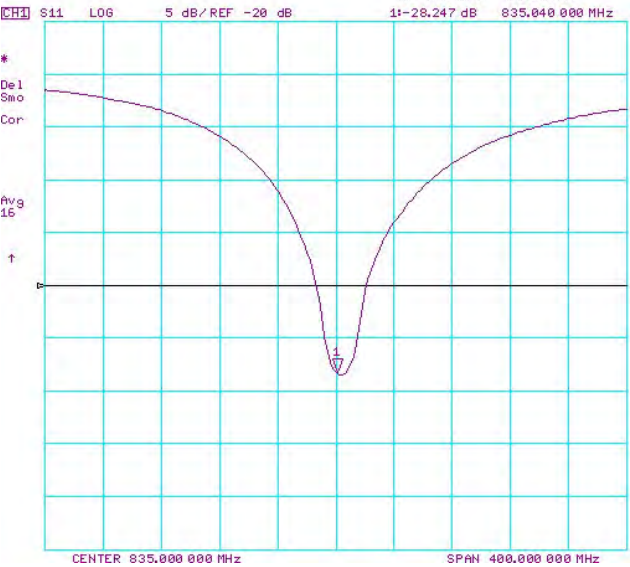
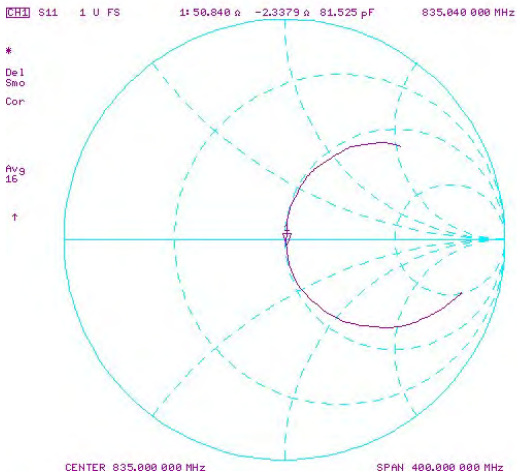
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

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.

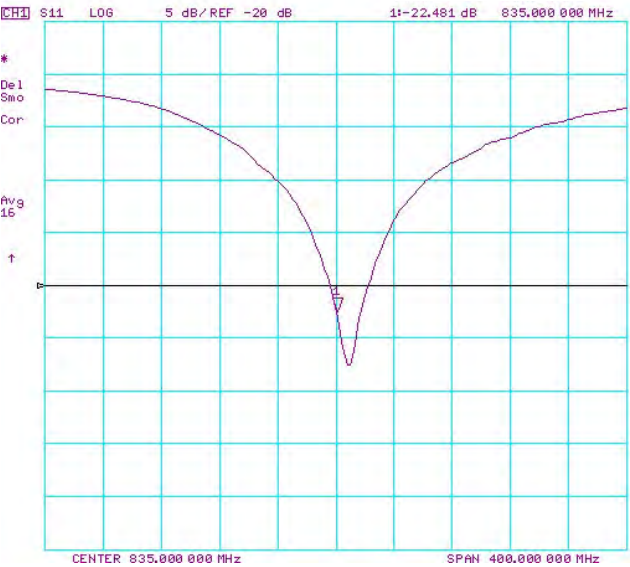
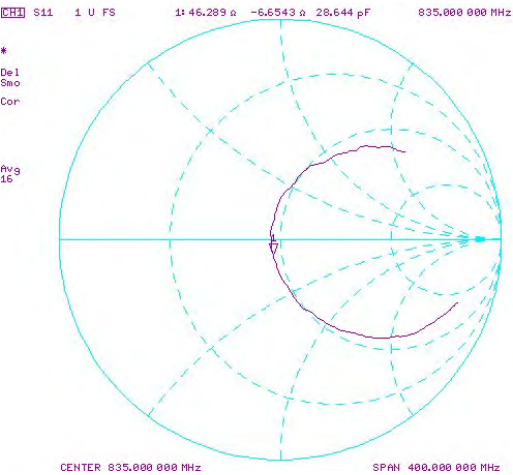
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

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	7/13/2017	0	1.83	1.95	6.79%	1.19	1.28	7.56%	49.8	50.8	1	-5.9	-2.3	3.6	-24.5	-26.2	-15.10%	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	7/13/2017	0	1.91	1.99	3.97%	1.25	1.31	4.97%	45.8	46.3	0.5	-8.2	-6.7	1.5	-20.3	-22.5	-10.80%	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: **D1750V2-1150_Jul16**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1150**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **July 14, 2016**

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** **Function**
Jeton Kastrati **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Signature

[Handwritten signatures]

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

Issued: July 14, 2016



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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, "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	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	38.8 $\pm$ 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	9.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.1 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.80 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.2 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.4 $\pm$ 6 %	1.48 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	36.5 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	4.85 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	19.5 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	$50.9 \Omega + 0.4 j\Omega$
Return Loss	- 40.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$46.4 \Omega - 0.5 j\Omega$
Return Loss	- 28.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.218 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	April 10, 2015

DASY5 Validation Report for Head TSL

Date: 14.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.36$ S/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.46, 8.46, 8.46); 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:

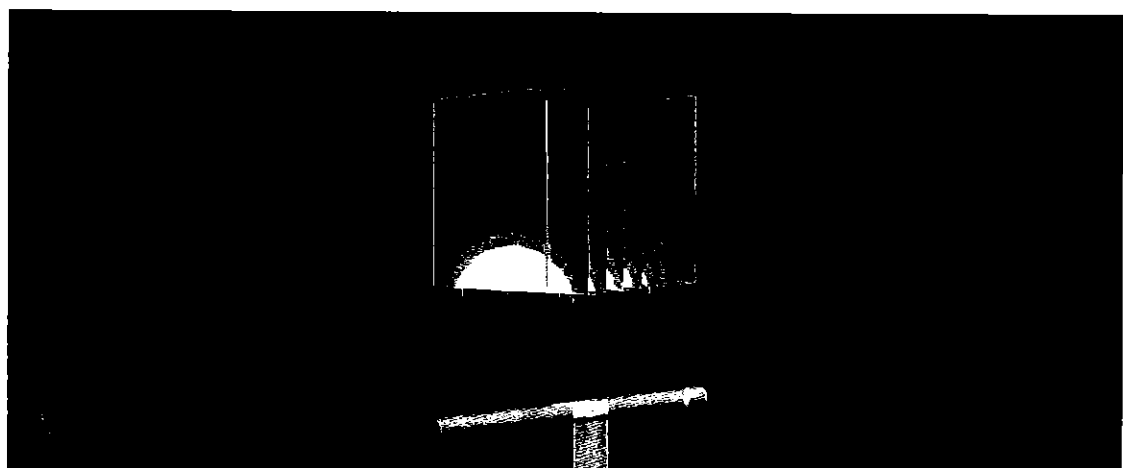
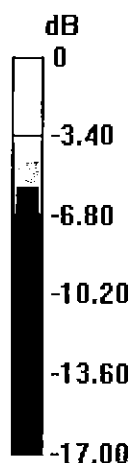
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 104.4 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 16.6 W/kg

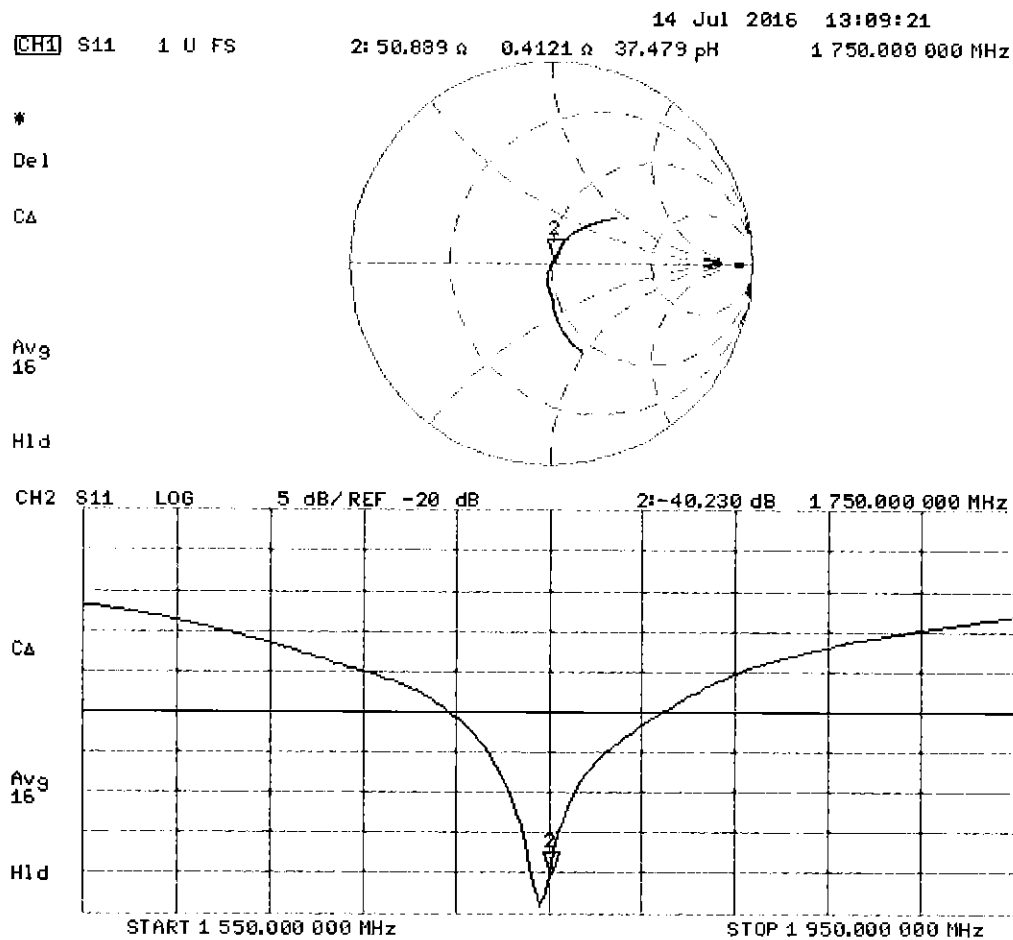
SAR(1 g) = 9.06 W/kg; SAR(10 g) = 4.8 W/kg

Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 14.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.48$ S/m; $\epsilon_r = 53.4$; $\rho = 1000$ 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: 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:

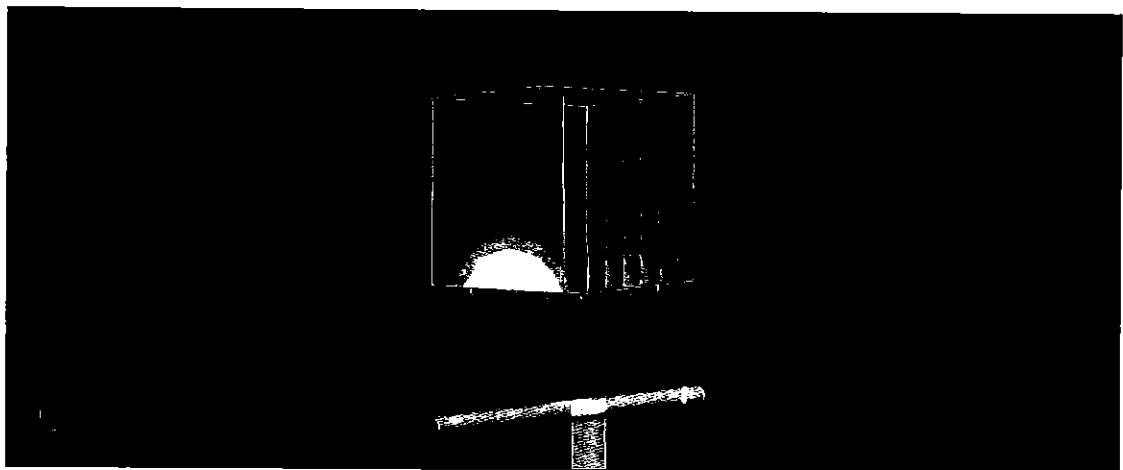
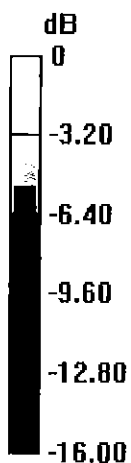
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 100.4 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 16.0 W/kg

SAR(1 g) = 9.09 W/kg; SAR(10 g) = 4.85 W/kg

Maximum value of SAR (measured) = 13.7 W/kg

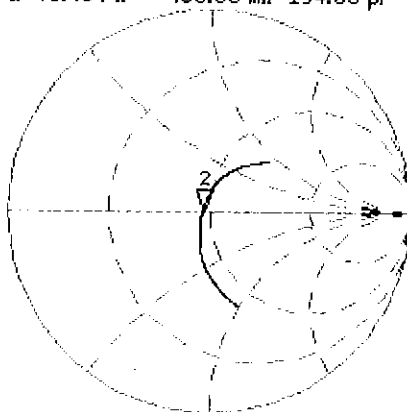


0 dB = 13.7 W/kg = 11.37 dBW/kg

Impedance Measurement Plot for Body TSL

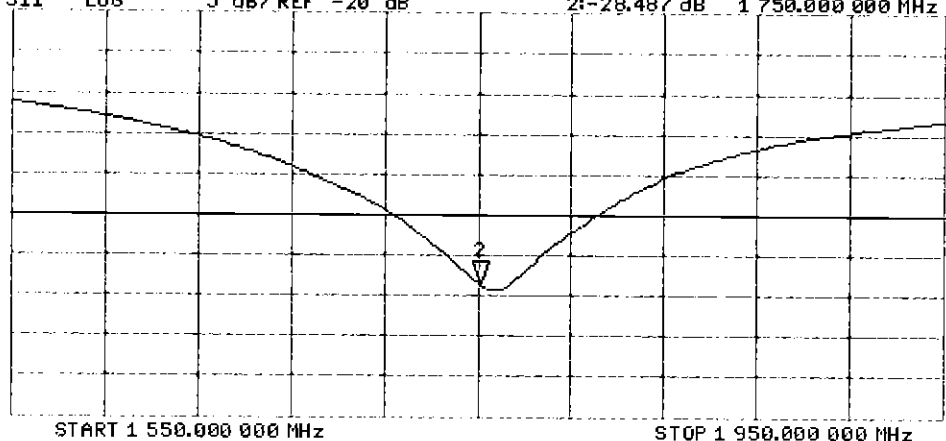
14 Jul 2016 13:08:43
 CH1 S11 1 U FS 2: 46.404 Ω -466.80 m Ω 194.83 pF 1 750.000 000 MHz

*
 Del
 CA
 Avg
 16
 H1d



CH2 S11 LOG 5 dB/REF -20 dB 2:-28.487 dB 1 750.000 000 MHz

CA
 Avg
 16
 H1d



Certification of Calibration

Object D1750V2 – SN: 1150

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Calibration date: July 07, 2017

Description: SAR Validation Dipole at 1750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Amplifier Research	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	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
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	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

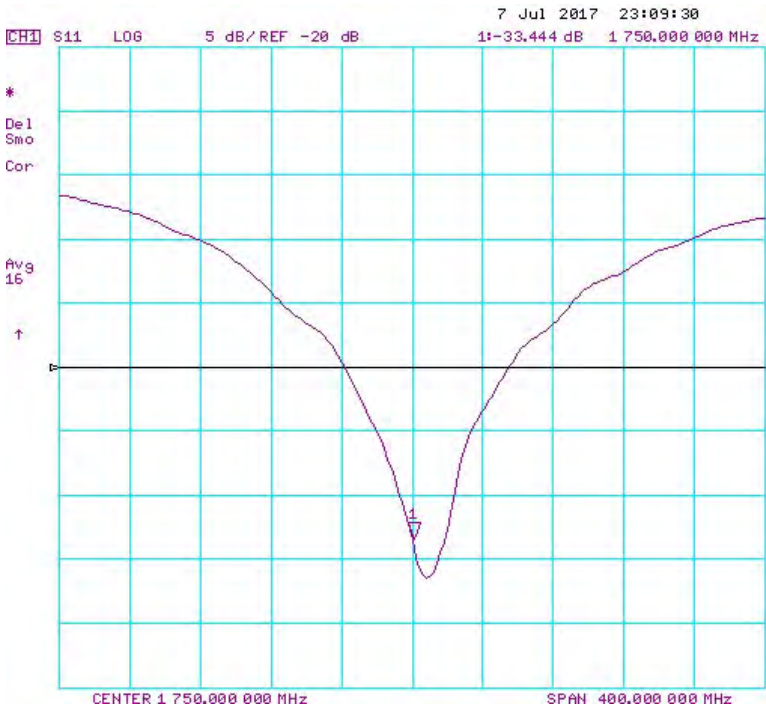
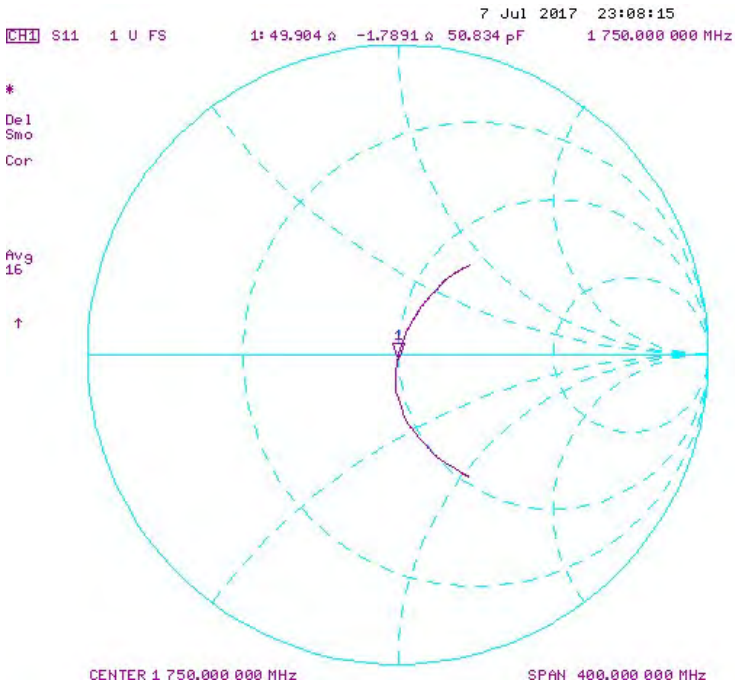
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

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.

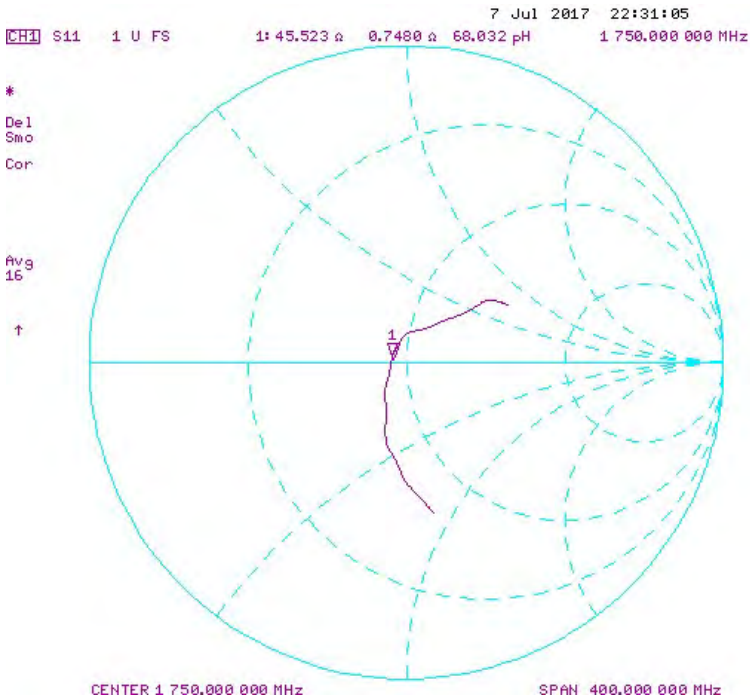
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

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
7/14/2016	7/7/2017	1.218	3.61	3.57	-1.11%	1.92	1.88	-2.08%	50.9	49.9	1	0.4	-1.8	2.1	-40.2	-33.4	16.90%	PASS
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
7/14/2016	7/7/2017	1.218	3.65	3.68	0.82%	1.95	1.97	1.03%	46.4	45.5	0.9	-0.5	0.7	1.2	-28.5	-23.6	17.20%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





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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: **Jeton Kastrati** Name: **Jeton Kastrati** 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.



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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, "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
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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	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:

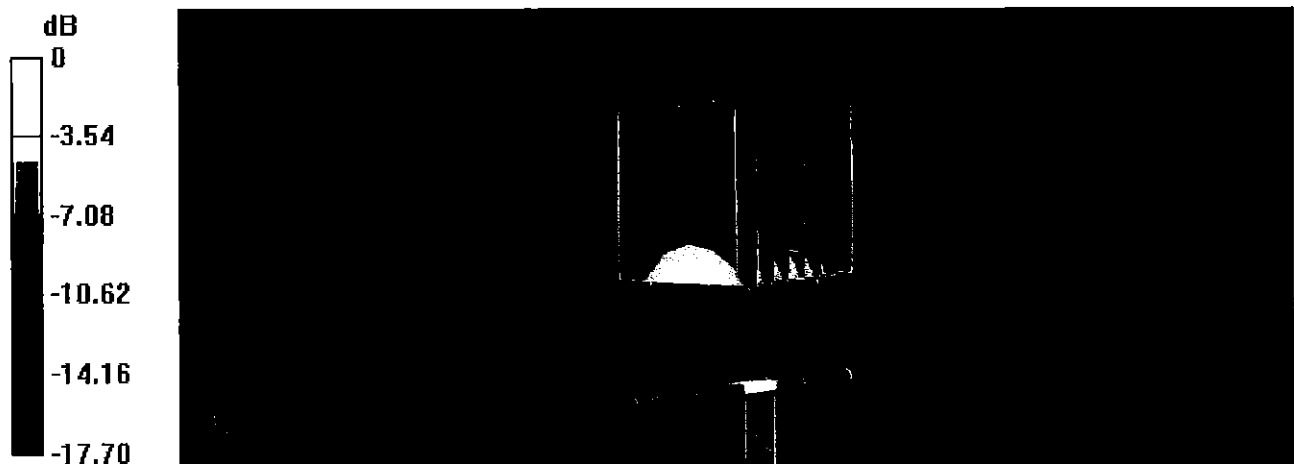
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

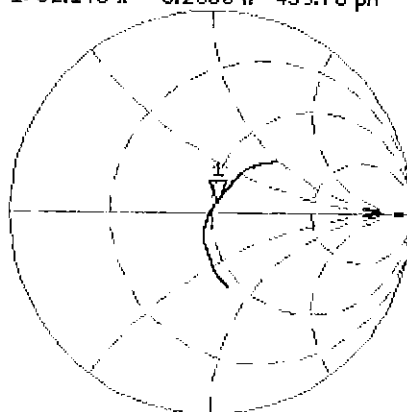


0 dB = 15.0 W/kg = 11.76 dBW/kg

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

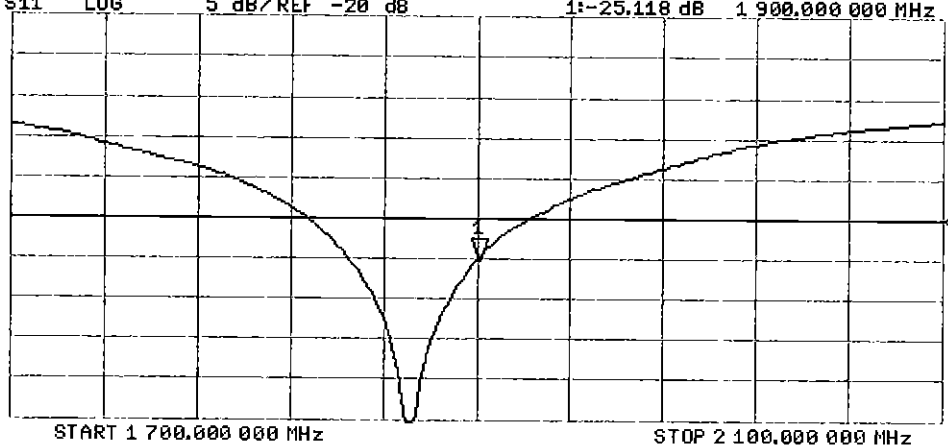
H1d

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

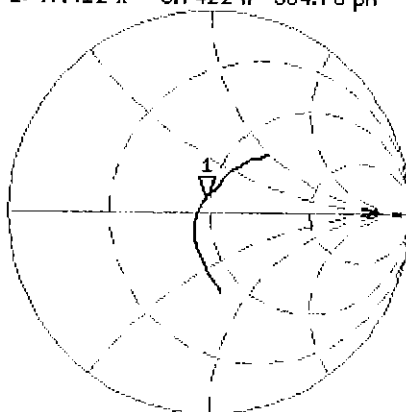


0 dB = 14.7 W/kg = 11.67 dBW/kg

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 μH 1 900.000 000 MHz

*
 Del
 Cor



Avg
 16

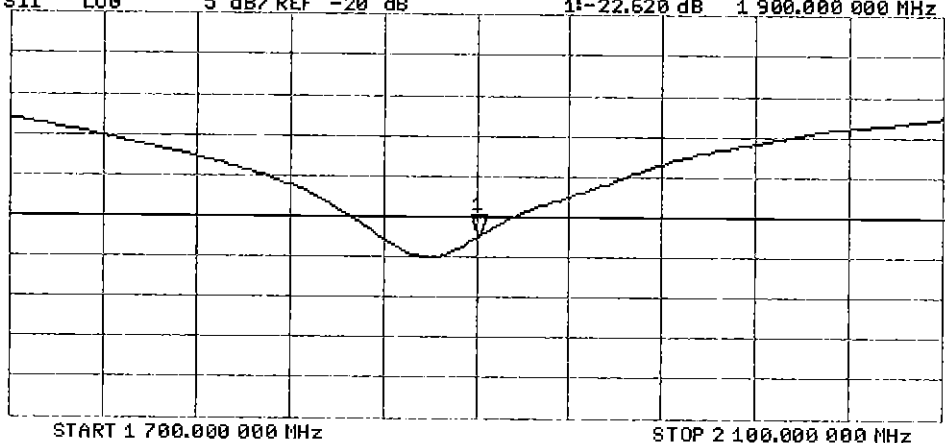
H1d

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

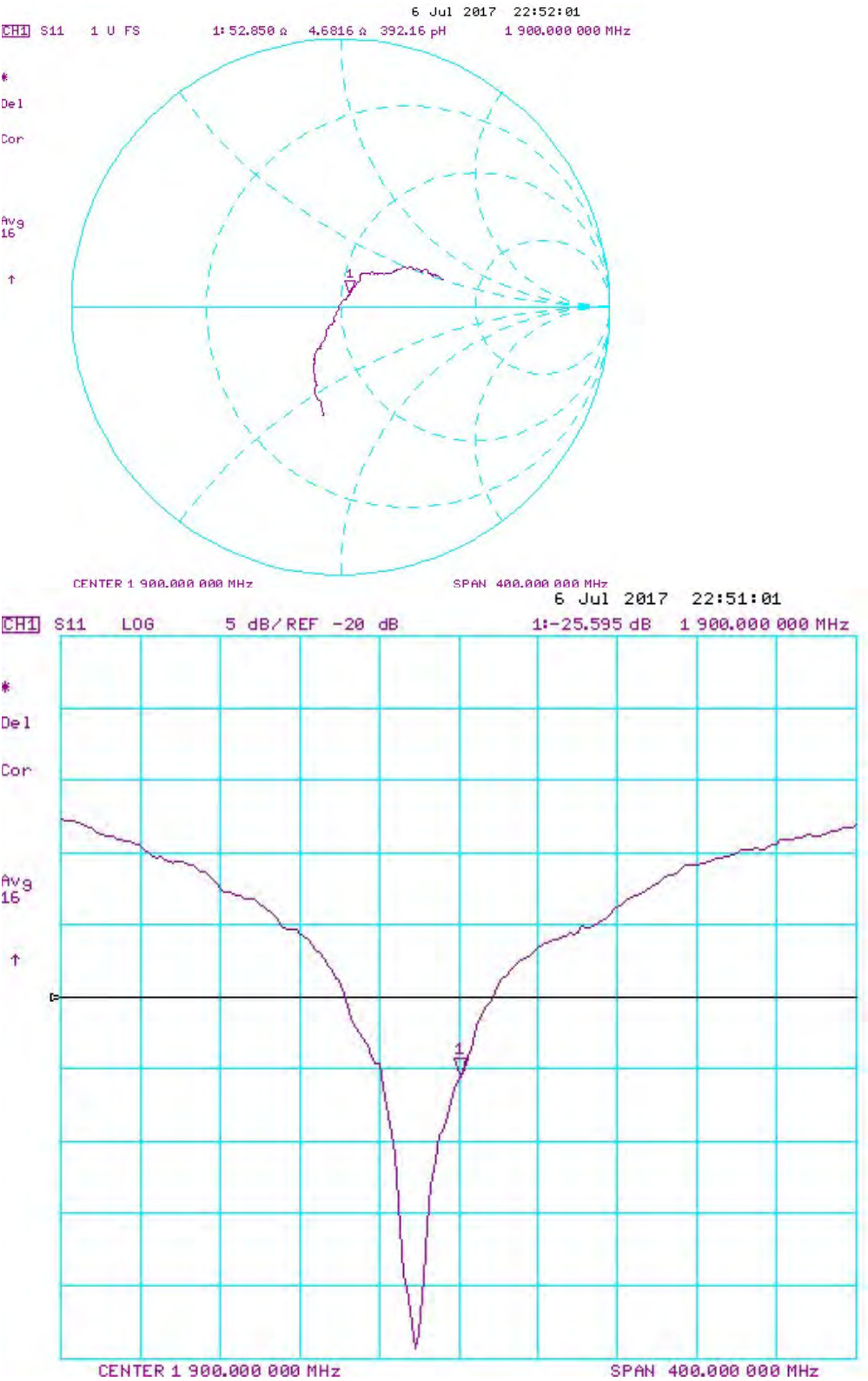
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

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.

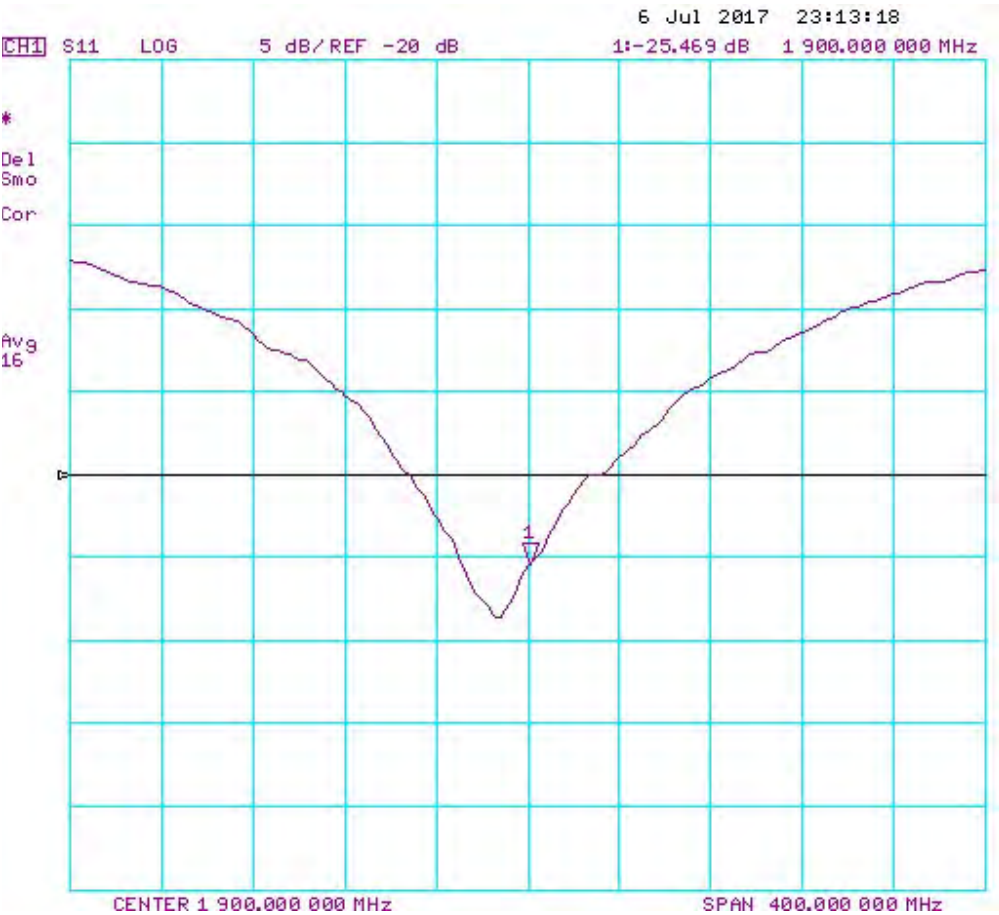
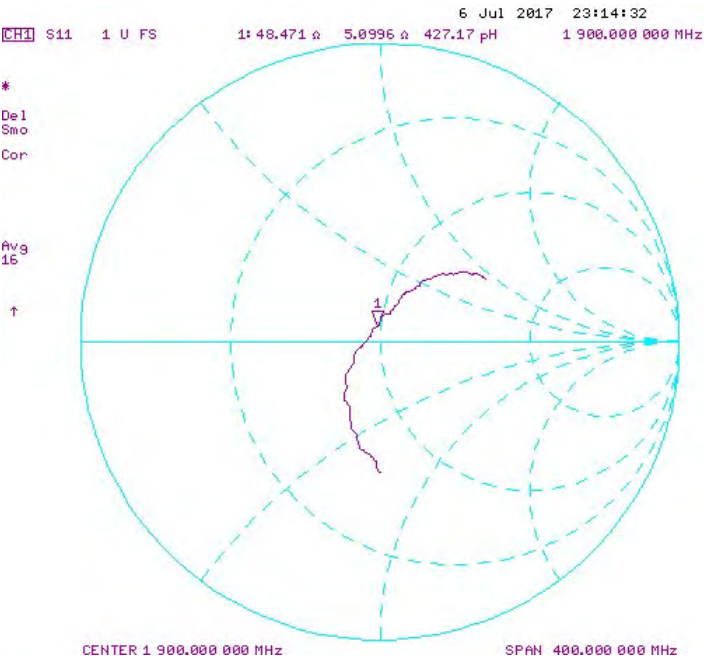
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

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





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: **D2450V2-981_Jul16**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN:981**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: **July 25, 2016**

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: **Michael Weber** **Laboratory Technician**

Signature

M. Weber

Approved by: **Katja Pokovic** **Technical Manager**

K. Pokovic

Issued: July 27, 2016

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

✓ PTH
8/9/16
Extended
7/20/17
SCV ✓



Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA
Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

- e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	38.0 $\pm$ 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 cm ³ (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	52.8 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	6.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.7 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	51.8 $\pm$ 6 %	2.03 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	13.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	50.8 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	6.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.8 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	$53.2 \Omega + 3.4 j\Omega$
Return Loss	- 26.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$50.2 \Omega + 4.5 j\Omega$
Return Loss	- 27.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.162 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 30, 2014

DASY5 Validation Report for Head TSL

Date: 13.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.86$ S/m; $\epsilon_r = 38$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.72, 7.72, 7.72); 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:

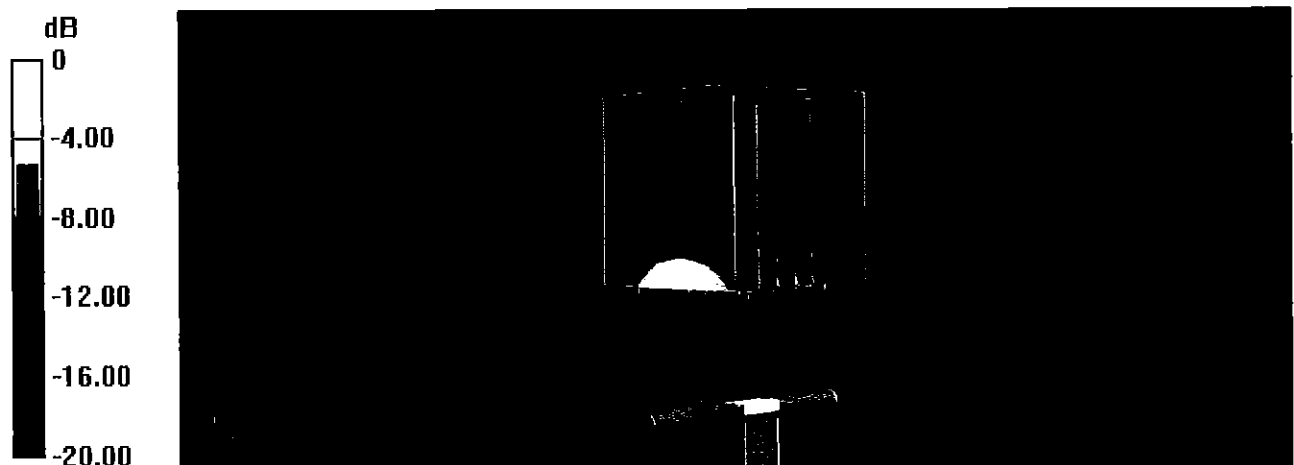
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 115.8 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 27.4 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.26 W/kg

Maximum value of SAR (measured) = 22.5 W/kg

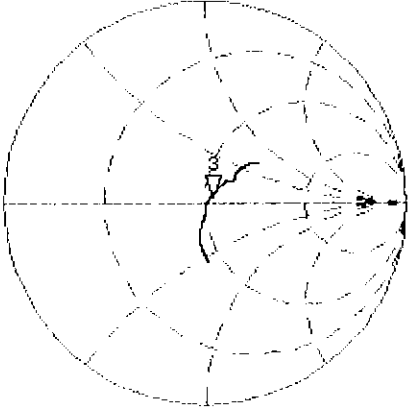


0 dB = 22.5 W/kg = 13.52 dBW/kg

Impedance Measurement Plot for Head TSL

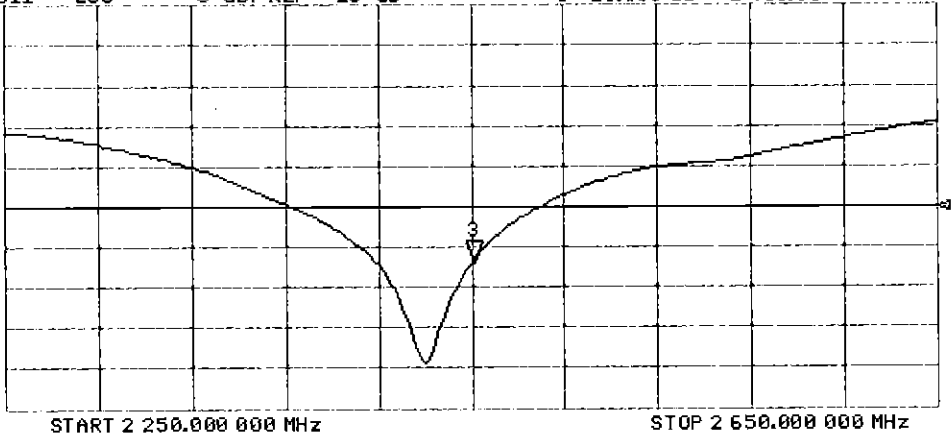
13 Jul 2016 12:53:29
CH1 S11 1 U FS 3: 53.234 Ω 3.3633 Ω 218.48 μ H 2 450.000 000 MHz

*
De1
CA
Avg
16
H1d



CH2 S11 LOG 5 dB/REF -20 dB 3:-26.900 dB 2 450.000 000 MHz

CA
Avg
16
H1d



DASY5 Validation Report for Body TSL

Date: 25.07.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.03$ S/m; $\epsilon_r = 51.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.79, 7.79, 7.79); 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 = 107.1 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 26.0 W/kg

SAR(1 g) = 13 W/kg; SAR(10 g) = 6.04 W/kg

Maximum value of SAR (measured) = 21.4 W/kg

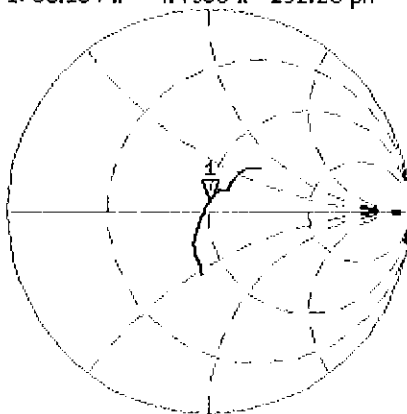


0 dB = 21.4 W/kg = 13.30 dBW/kg

Impedance Measurement Plot for Body TSL

25 Jul 2016 10:03:11
 CH1 S11 1 U FS 1: 50.184 Ω 4.4980 Ω 292.20 pH 2 450.000 000 MHz

*
 De1
 CA

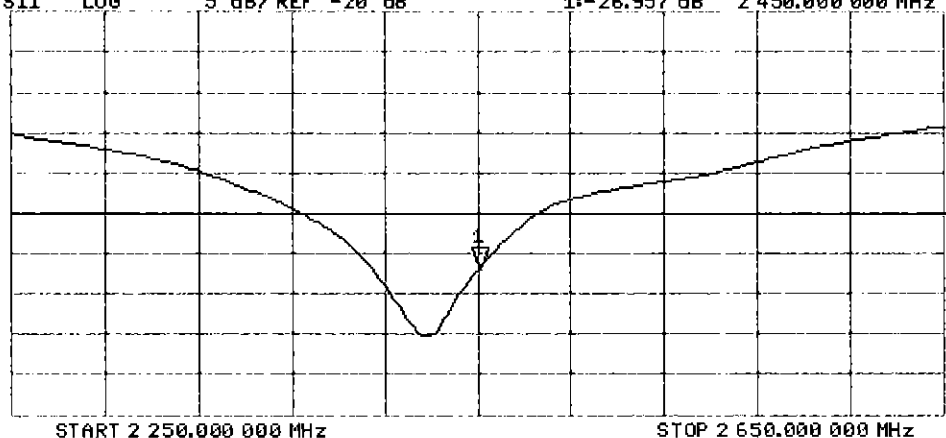


Avg
 16
 H1 d

CH2 S11 LOG 5 dB/ REF -20 dB 1: -26.957 dB 2 450.000 000 MHz

CA

H1 d



Certification of Calibration

Object D2450V2 – SN: 981

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Calibration date: July 24, 2017

Description: SAR Validation Dipole at 2450 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	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
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	9/14/2016	Annual	9/14/2017	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	1272
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/10/2017	Annual	5/10/2018	1070
SPEAG	ES3DV3	SAR Probe	9/19/2016	Annual	9/19/2017	3287
SPEAG	ES3DV3	SAR Probe	2/10/2017	Annual	2/10/2018	3213
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

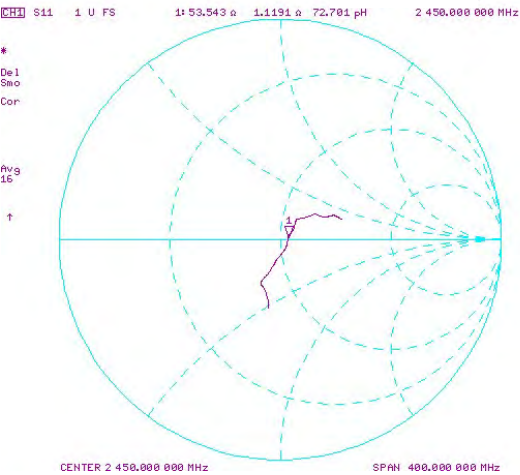
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

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.

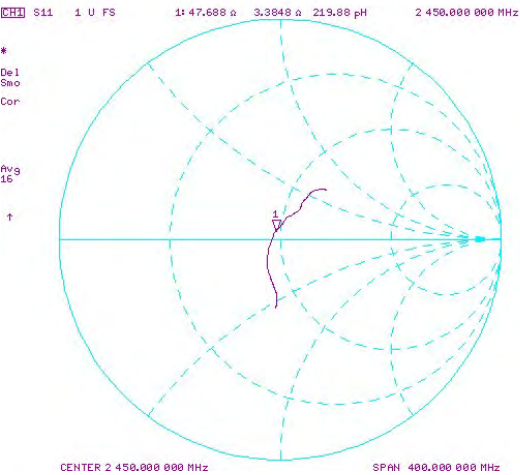
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

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
7/25/2016	7/24/2017	1.162	5.28	5.57	5.49%	2.47	2.56	3.64%	53.2	53.5	0.3	3.4	1.1	2.3	-26.9	-27.6	-2.60%	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
7/25/2016	7/24/2017	1.162	5.08	5.34	5.12%	2.38	2.39	0.42%	50.2	47.7	2.5	4.5	3.4	1.1	-27.0	-27.6	-2.20%	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: **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** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Signature

[Handwritten signatures]

Issued: July 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, "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:

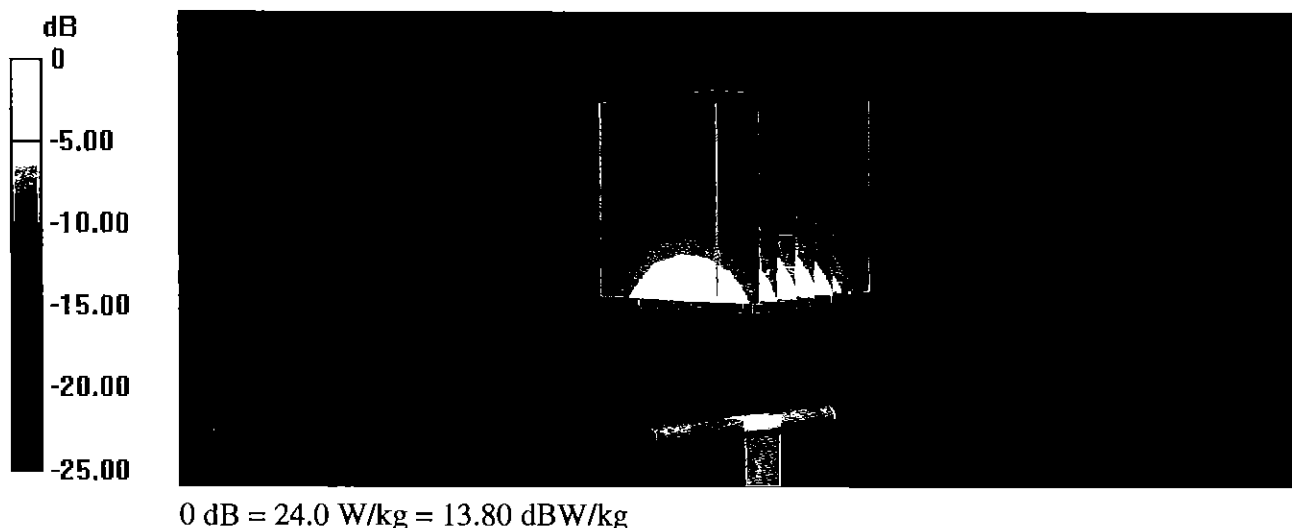
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

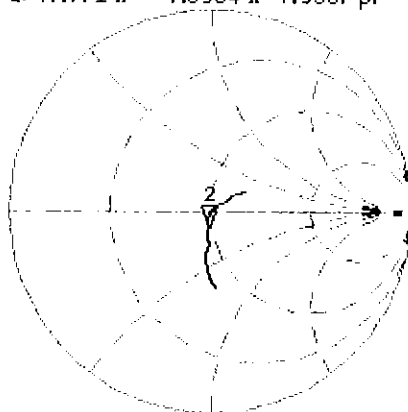
Maximum value of SAR (measured) = 24.0 W/kg



Impedance Measurement Plot for Head TSL

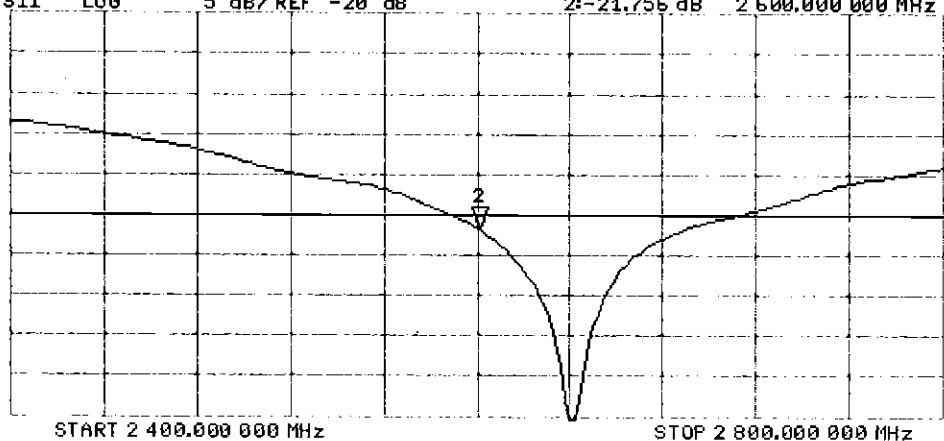
10 Jul 2017 14:28:06
 CH1 S11 1 U FS 2: 47.771 Ω -7.6934 Ω 7.9567 pF 2 600.000 000 MHz

*
 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:

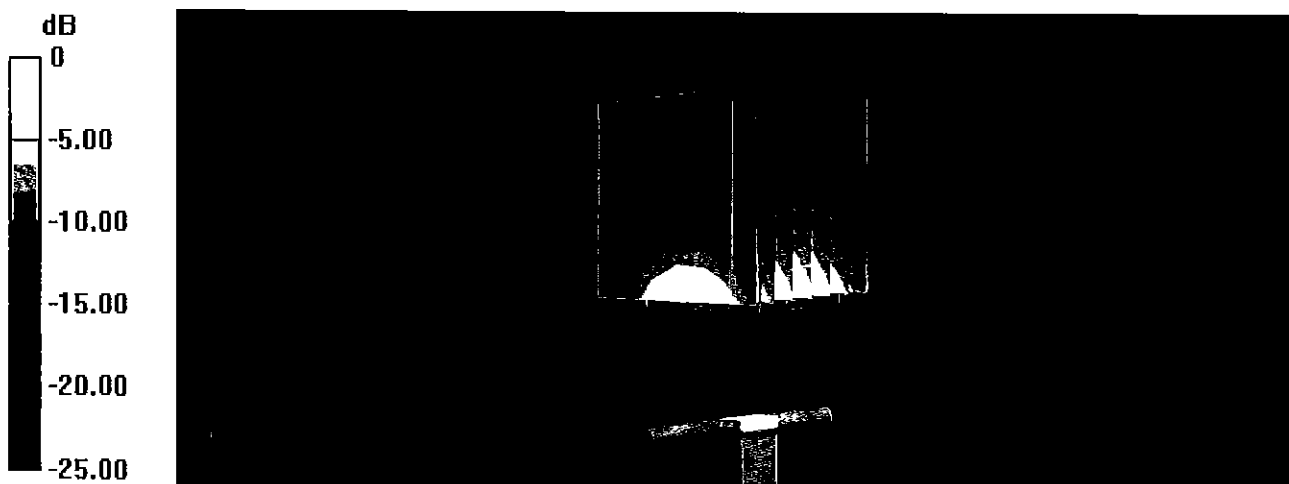
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

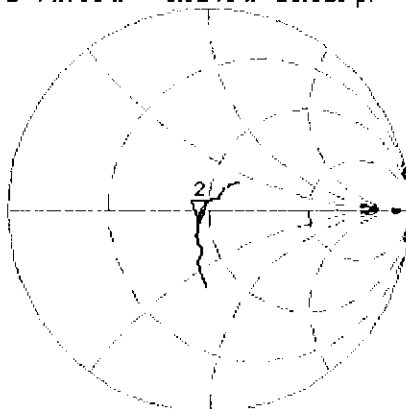


0 dB = 22.2 W/kg = 13.46 dBW/kg

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

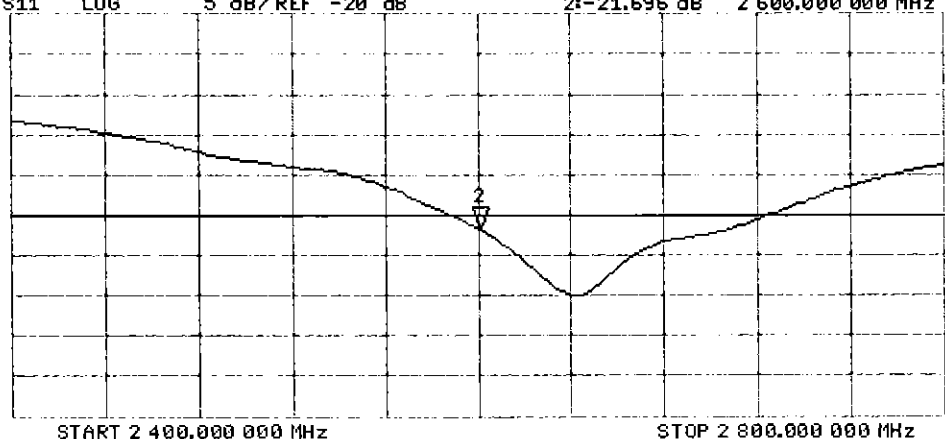
H1d

CH2 S11 LOG 5 dB/REF -20 dB 2: -21.696 dB 2 600.000 000 MHz

CA

Avg
 16

H1d



START 2 400.000 000 MHz

STOP 2 800.000 000 MHz



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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D5GHzV2-1191_Sep16**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1191**

Calibration procedure(s) **QA CAL-22.v2**
Calibration procedure for dipole validation kits between 3-6 GHz

BNV
09-28-2016

Calibration date: **September 21, 2016**

Extended
09/2017
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: 3503	30-Jun-16 (No. EX3-3503_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: **Leif Klysner** *Leif Klysner*
 Name: **Leif Klysner** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** *Katja Pokovic*
 Name: **Katja Pokovic** Technical Manager

Signature

Issued: September 22, 2016

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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 62209-2, "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 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	34.5 $\pm$ 6 %	4.59 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	7.96 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	78.9 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.6 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	34.0 ± 6 %	4.93 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	83.6 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (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	23.8 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	33.8 ± 6 %	5.08 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.99 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.27 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.4 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	47.4 ± 6 %	5.52 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	7.74 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	77.0 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	21.6 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	46.8 ± 6 %	6.00 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	7.96 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	79.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.24 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.2 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	46.5 ± 6 %	6.21 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	7.65 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 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	55.7 Ω - 4.3 j Ω
Return Loss	- 23.4 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	58.3 Ω - 3.2 j Ω
Return Loss	- 21.8 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	58.1 Ω + 4.8 j Ω
Return Loss	- 21.2 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	56.1 Ω - 3.7 j Ω
Return Loss	- 23.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	58.9 Ω - 1.7 j Ω
Return Loss	- 21.7 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	59.5 Ω + 6.9 j Ω
Return Loss	- 19.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.204 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 28, 2003

DASY5 Validation Report for Head TSL

Date: 21.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1191

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: $f = 5250$ MHz; $\sigma = 4.59$ S/m; $\epsilon_r = 34.5$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 4.93$ S/m; $\epsilon_r = 34$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5750$ MHz; $\sigma = 5.08$ S/m; $\epsilon_r = 33.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.42, 5.42, 5.42); Calibrated: 30.06.2016, ConvF(4.89, 4.89, 4.89); Calibrated: 30.06.2016, ConvF(4.85, 4.85, 4.85); Calibrated: 30.06.2016;
- 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=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 = 68.49 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.29 W/kg

Maximum value of SAR (measured) = 18.2 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 = 69.34 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 32.9 W/kg

SAR(1 g) = 8.45 W/kg; SAR(10 g) = 2.41 W/kg

Maximum value of SAR (measured) = 20.0 W/kg

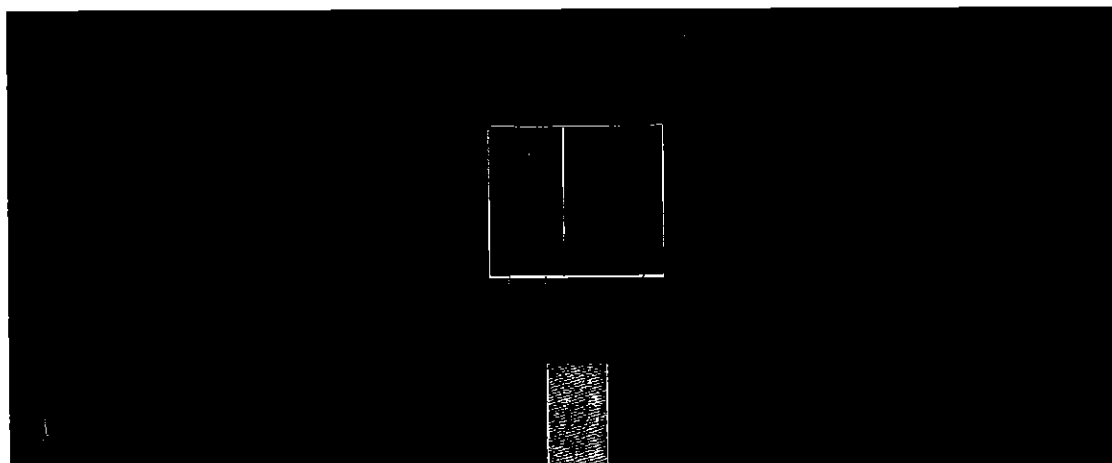
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.15 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 32.3 W/kg

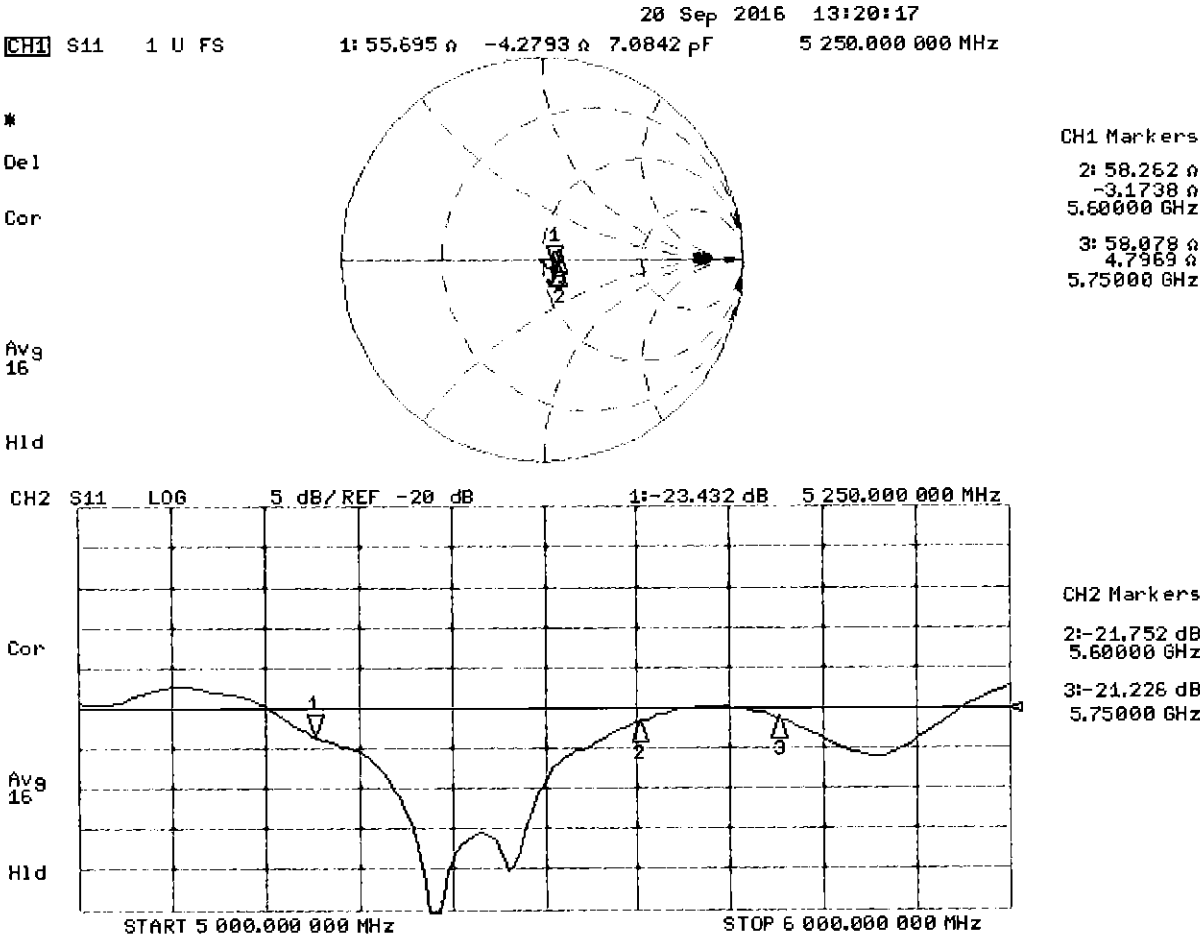
SAR(1 g) = 7.99 W/kg; SAR(10 g) = 2.27 W/kg

Maximum value of SAR (measured) = 19.3 W/kg



0 dB = 18.2 W/kg = 12.60 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 20.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1191

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: $f = 5250$ MHz; $\sigma = 5.52$ S/m; $\epsilon_r = 47.4$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5600$ MHz; $\sigma = 6$ S/m; $\epsilon_r = 46.8$; $\rho = 1000$ kg/m³, Medium parameters used: $f = 5750$ MHz; $\sigma = 6.21$ S/m; $\epsilon_r = 46.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.85, 4.85, 4.85); Calibrated: 30.06.2016, ConvF(4.35, 4.35, 4.35); Calibrated: 30.06.2016, ConvF(4.3, 4.3, 4.3); Calibrated: 30.06.2016;
- 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=100mW, dist=10mm, f=5250MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 66.49 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 29.1 W/kg

SAR(1 g) = 7.74 W/kg; SAR(10 g) = 2.17 W/kg

Maximum value of SAR (measured) = 17.7 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 = 65.85 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 32.5 W/kg

SAR(1 g) = 7.96 W/kg; SAR(10 g) = 2.24 W/kg

Maximum value of SAR (measured) = 18.8 W/kg

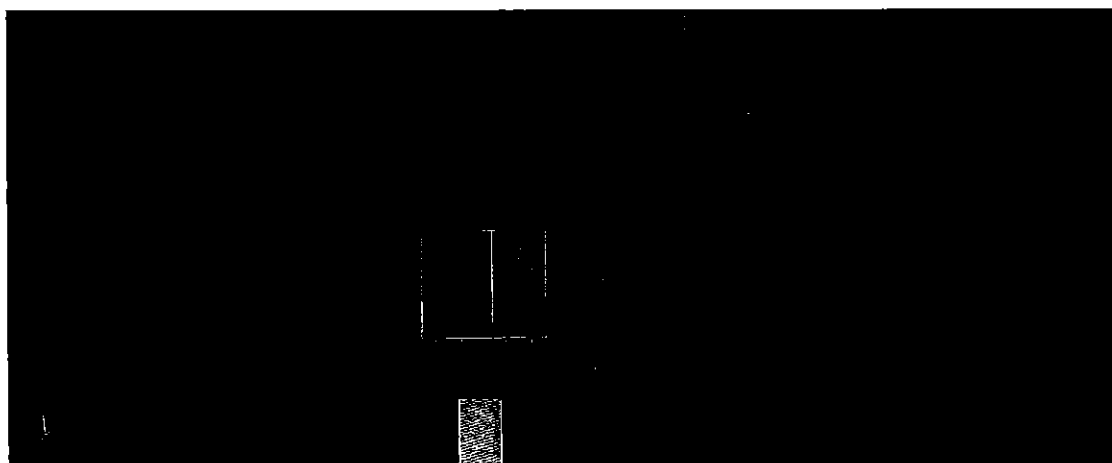
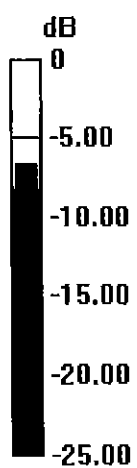
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.21 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 32.7 W/kg

SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.14 W/kg

Maximum value of SAR (measured) = 18.5 W/kg

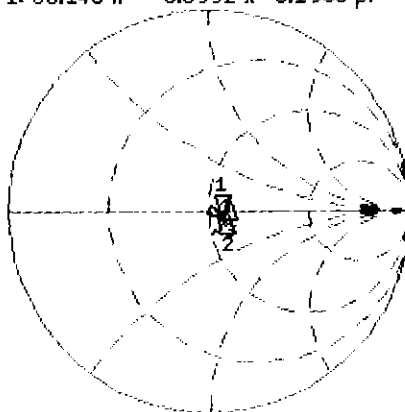


0 dB = 17.7 W/kg = 12.48 dBW/kg

Impedance Measurement Plot for Body TSL

20 Sep 2016 13:19:13
 CH1 S11 1 U FS 1: 56.143 Ω -3.6992 Ω 8.1950 pF 5 250.000 000 MHz

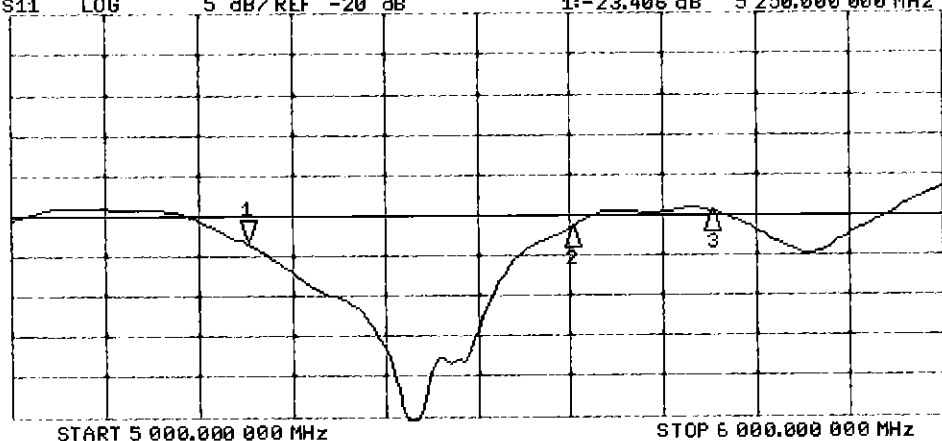
*
 Del
 Cor
 Avg
 16
 H1d



CH1 Markers
 2: 58.887 Ω
 -1.6504 Ω
 5.60000 GHz
 3: 59.510 Ω
 6.9121 Ω
 5.75000 GHz

CH2 S11 LOG 5 dB/REF -20 dB 1: -23.406 dB 5 250.000 000 MHz

Cor
 Avg
 16
 H1d



CH2 Markers
 2: -21.616 dB
 5.60000 GHz
 3: -19.400 dB
 5.75000 GHz

Certification of Calibration

Object D5GHzV2 – SN: 1191

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

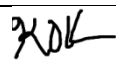
Extension Calibration date: 9/19/2017

Description: SAR Validation Dipole at 5250, 5600, and 5750 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	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
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	DAK-3.5	Dielectric Assessment Kit	5/10/2017	Annual	5/10/2018	1070
SPEAG	EX3DV4	SAR Probe	1/13/2017	Annual	1/13/2018	3589
SPEAG	EX3DV4	SAR Probe	2/13/2017	Annual	2/13/2018	3914
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/16/2017	Annual	1/16/2018	1466
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	665
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
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A

Measurement Uncertainty = $\pm 23\%$ (k=2)

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

DIPOLE CALIBRATION EXTENSION

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

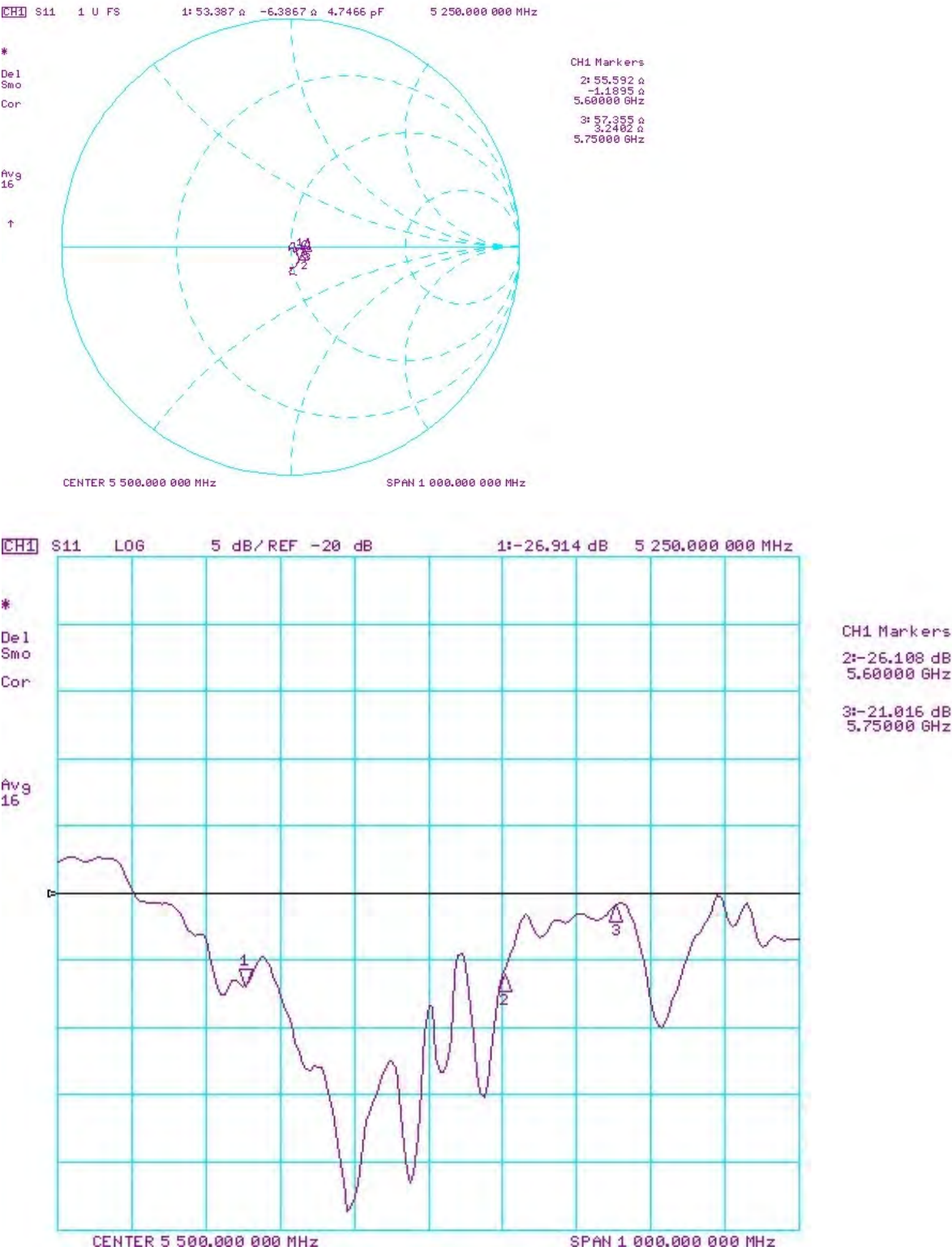
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

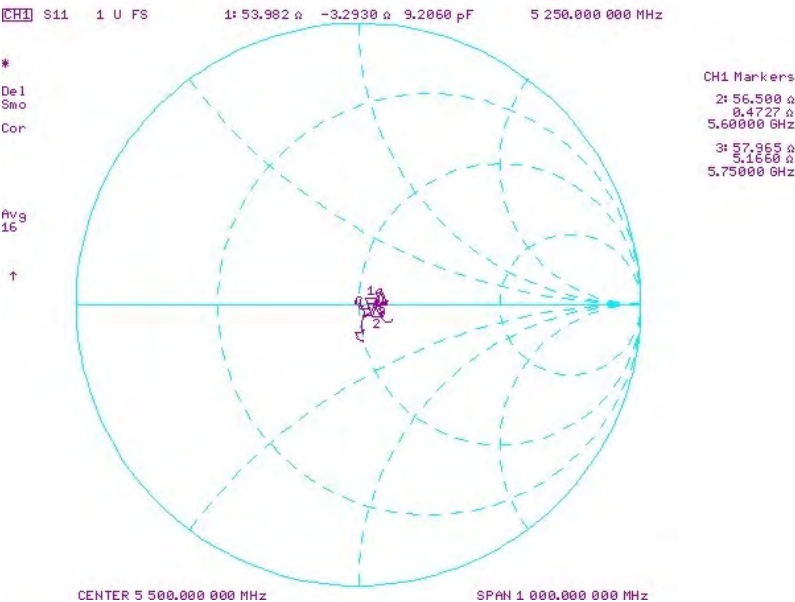
Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (10 W/kg @ 17.0 dBm)	Measured Head SAR (10g W/kg @ 17.0 dBm)	Deviation 1g (%)	Certificate SAR Target Head (10g W/kg @ 17.0 dBm)	Measured Head SAR (10g W/kg @ 17.0 dBm)	Deviation 10g (%)	Certificate 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
6250	9/21/2016	9/19/2017	1.204	3.95	3.70	-6.21%	1.13	1.05	-7.08%	55.7	53.4	2.3	-4.3	-6.4	2.1	-23.4	-26.9	-15.00%	PASS
5600	9/21/2016	9/19/2017	1.204	4.18	4.03	-3.59%	1.19	1.13	-5.04%	58.3	55.6	2.7	-3.2	-1.2	2.0	-21.8	-26.1	-19.80%	PASS
8750	9/21/2016	9/19/2017	1.204	3.96	3.94	-0.38%	1.12	1.10	-1.79%	58.1	57.4	0.7	4.8	3.2	1.6	-21.2	-21.0	0.90%	PASS

Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (10 W/kg @ 17.0 dBm)	Measured Body SAR (10g W/kg @ 17.0 dBm)	Deviation 1g (%)	Certificate SAR Target Body (10g W/kg @ 17.0 dBm)	Measured Body SAR (10g W/kg @ 17.0 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
6250	9/21/2016	9/19/2017	1.204	3.85	3.80	-1.30%	1.08	1.06	-1.85%	55.1	54.0	2.1	-3.7	-3.3	0.4	-23.4	-26.0	-11.10%	PASS
5600	9/21/2016	9/19/2017	1.204	3.96	4.06	2.53%	1.11	1.13	1.80%	58.9	56.5	2.4	-1.7	0.5	2.2	-21.7	-24.5	-12.80%	PASS
8750	9/21/2016	9/19/2017	1.204	3.81	3.66	-3.81%	1.06	1.02	-3.77%	59.5	58.0	1.5	6.9	5.2	1.7	-19.4	-21.1	-8.70%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





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

Client **PC Test**

Certificate No: **D750V3-1003_Jan17**

CALIBRATION CERTIFICATE

Object **D750V3 - SN:1003**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

BNV
01/26/2017

Calibration date: **January 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	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	04-Jan-17 (No. DAE4-601_Jan17)	Jan-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by: **Jeton Kastrati** Name Function
Laboratory Technician

Signature
[Signature]

Approved by: **Katja Pokovic** Technical Manager

Issued: January 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	V52.8.8
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	41.6 $\pm$ 6 %	0.89 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	8.39 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	1.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.43 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.2 $\pm$ 6 %	0.96 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	2.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.79 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	1.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.78 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	54.3 Ω - 1.4 j Ω
Return Loss	- 27.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.4 Ω - 6.0 j Ω
Return Loss	- 24.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 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

DASY5 Validation Report for Head TSL

Date: 11.01.2017

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: $f = 750 \text{ MHz}$; $\sigma = 0.89 \text{ S/m}$; $\epsilon_r = 41.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.17, 10.17, 10.17); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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

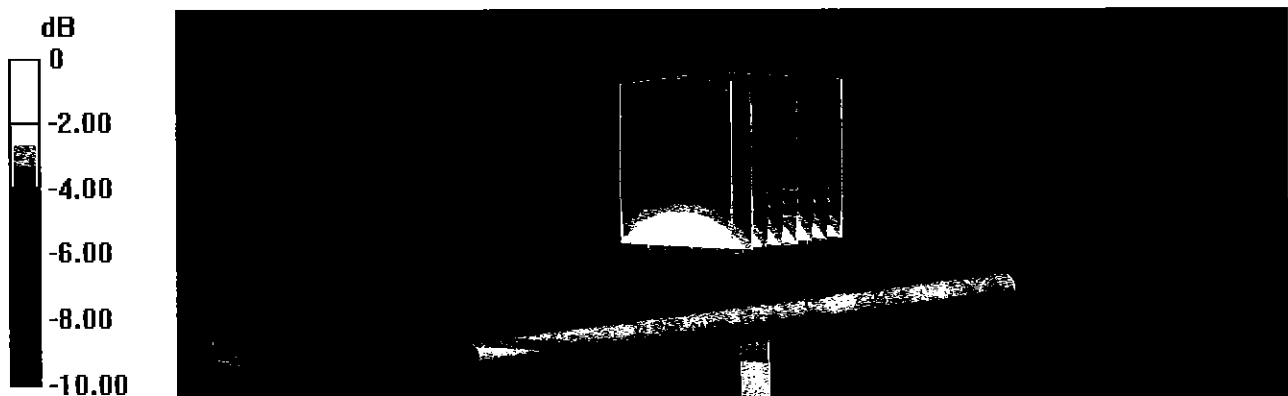
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 59.38 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.20 W/kg

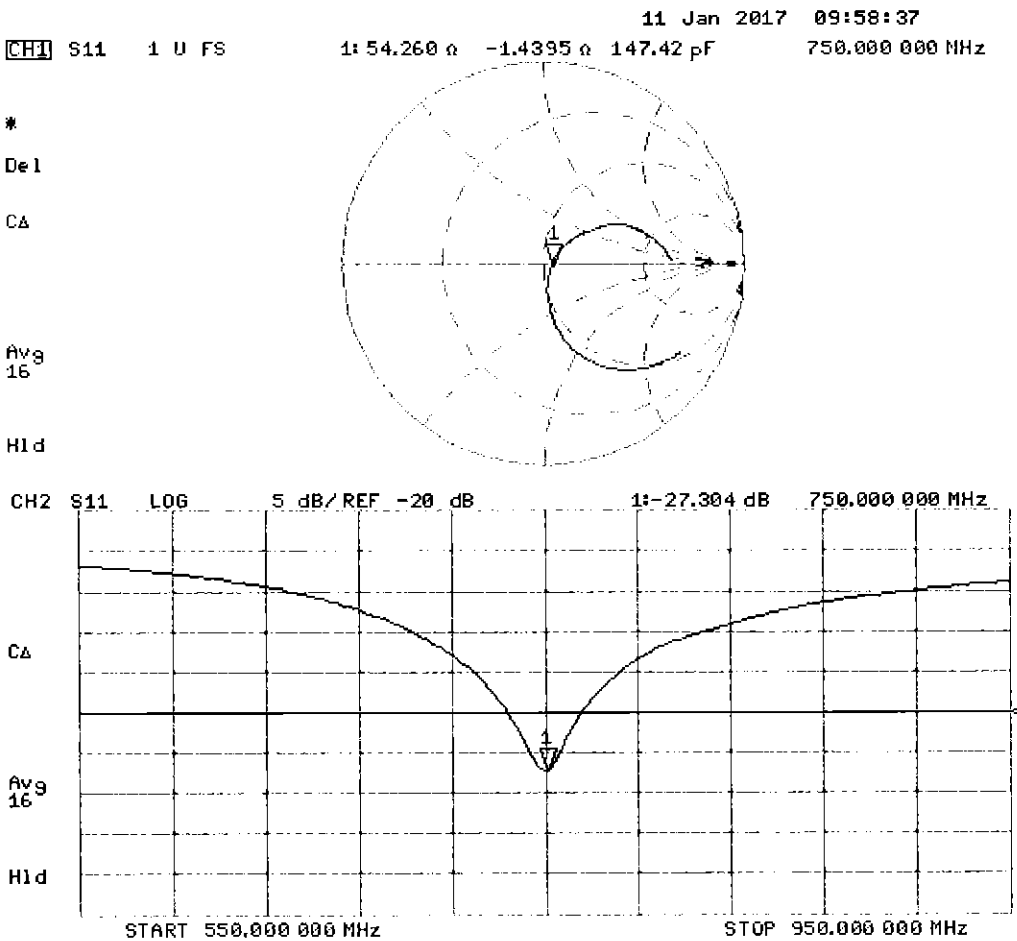
SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.36 W/kg

Maximum value of SAR (measured) = 2.82 W/kg



0 dB = 2.82 W/kg = 4.50 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.01.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750$ MHz; $\sigma = 0.96$ S/m; $\epsilon_r = 54.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.99, 9.99, 9.99); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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

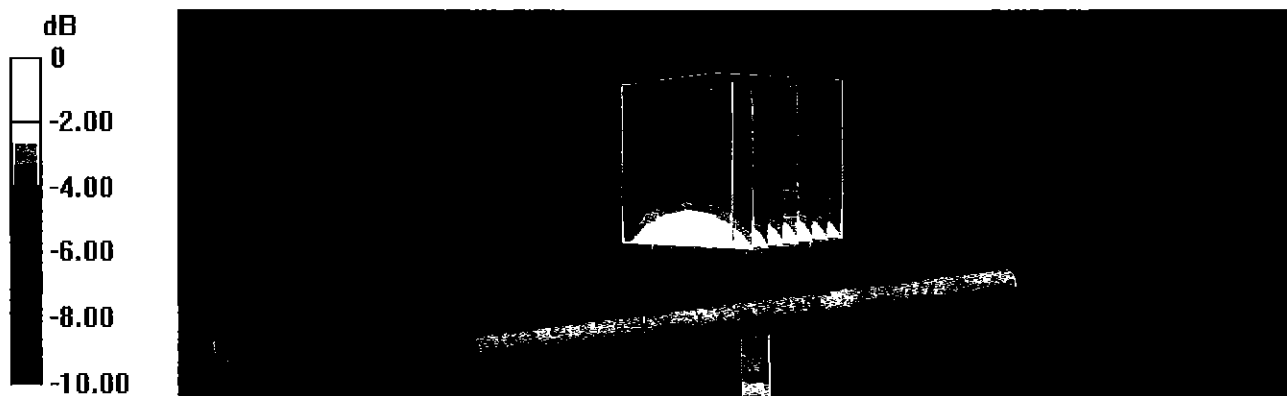
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 58.22 V/m; Power Drift = -0.02 dB

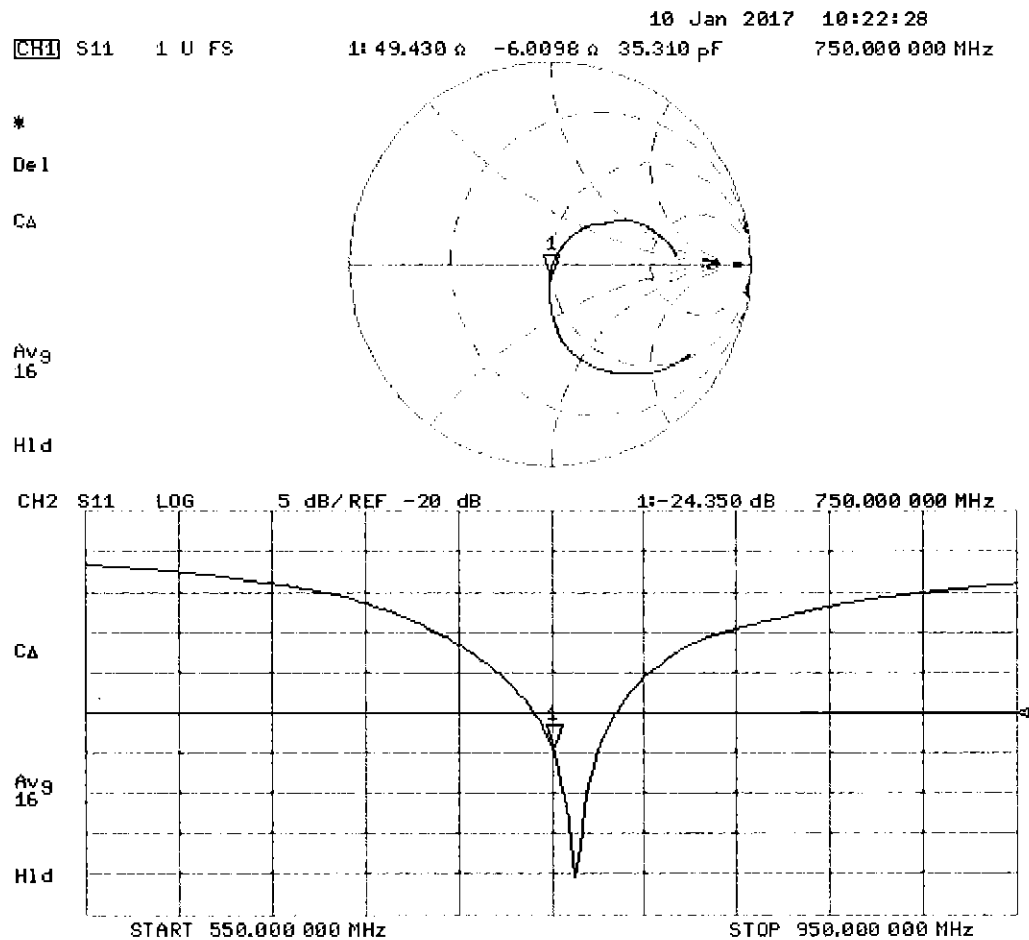
Peak SAR (extrapolated) = 3.40 W/kg

SAR(1 g) = 2.21 W/kg; SAR(10 g) = 1.45 W/kg

Maximum value of SAR (measured) = 2.98 W/kg



Impedance Measurement Plot for Body TSL





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

Client **PC Test**

Certificate No: **D835V2-4d133_Jul17**

CALIBRATION CERTIFICATE

Object **D835V2 - SN:4d133**

*PN ✓
8/3/2017*

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

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 ± 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: **Johannes Kurikka** Function: **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** Technical Manager

[Signature]

Issued: July 12, 2017

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



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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 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	40.8 $\pm$ 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	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.52 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	1.54 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 %	1.01 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	2.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.41 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	1.58 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.16 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	51.0 Ω - 2.9 j Ω
Return Loss	- 30.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.7 Ω - 6.8 j Ω
Return Loss	- 22.2 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	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 11.07.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.91$ S/m; $\epsilon_r = 40.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.07, 10.07, 10.07); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- 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 = 62.84 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 3.74 W/kg

SAR(1 g) = 2.41 W/kg; SAR(10 g) = 1.54 W/kg

Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Impedance Measurement Plot for Head TSL

11 Jul 2017 13:58:45

CH1 S11 1 U FS

1: 50.998 Ω -2.8750 Ω 66.297 pF

835.000 000 MHz

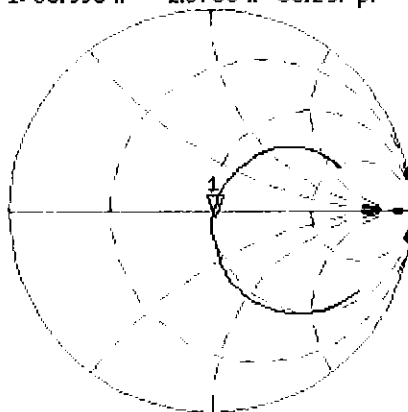
✻

De l

C_Δ

Av 9
16

PH



CH2 S11 LOG

LOG

5 dB/REF -20 dB

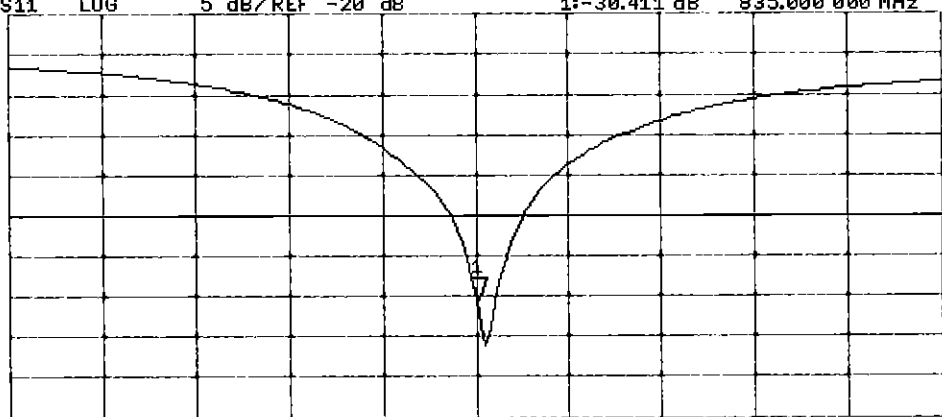
1:-30.411 dB.

835.000 000 MHz

 C_{Δ}

Aug
16

H1d



START 635.000 000 MHz

STOP 1 035.000 000 MHz

DASY5 Validation Report for Body TSL

Date: 11.07.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 1.01$ 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(10.2, 10.2, 10.2); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- 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 (7x7x7)/Cube 0:

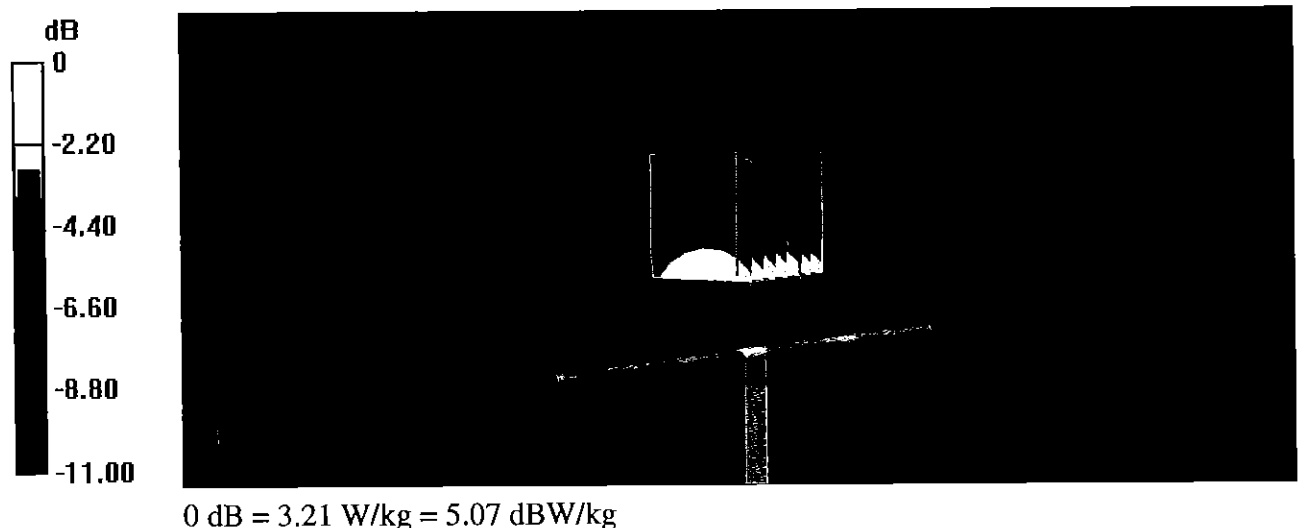
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.25 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.43 W/kg; SAR(10 g) = 1.58 W/kg

Maximum value of SAR (measured) = 3.21 W/kg



Impedance Measurement Plot for Body TSL

11 Jul 2017 13:57:15
[CH1] S11 1 U FS 1: 46.736 Ω -6.7871 Ω 28.083 pF 835.000 000 MHz

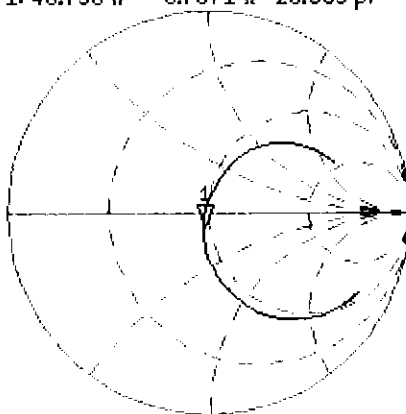
*

De1

CA

Avg
16

H1d

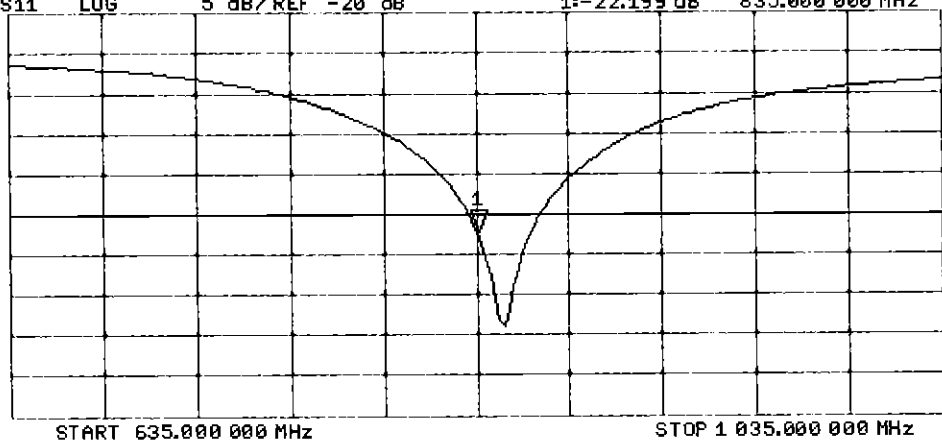


CH2 S11 LOG 5 dB/REF -20 dB 1:-22.199 dB 835.000 000 MHz

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: **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)

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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, "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:

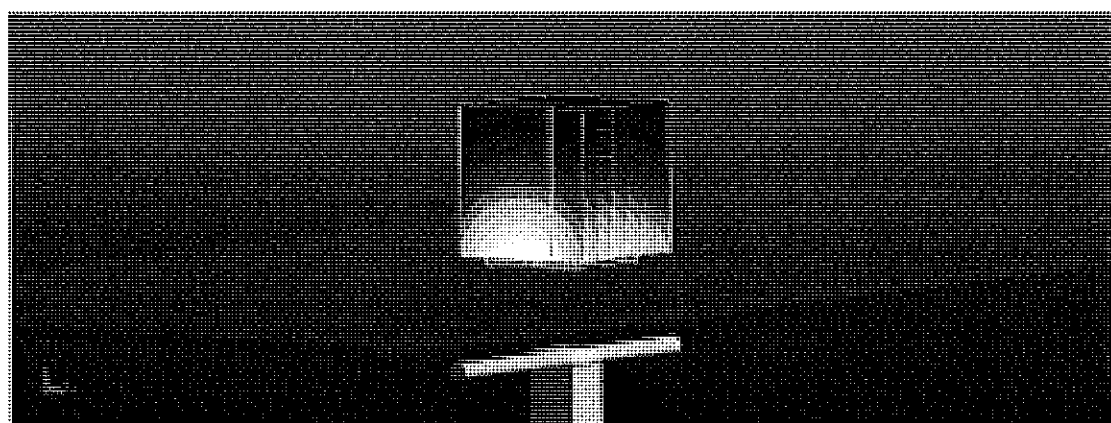
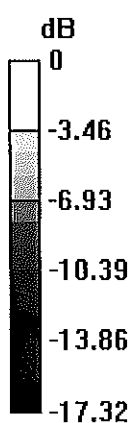
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

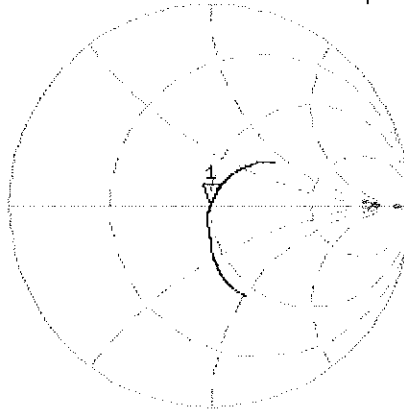
9 May 2017 14:43:11
[CH1] S11 1 U FS 1: 49.777 Ω -683.59 m Ω 133.04 pF 1 750.000 000 MHz

*
De1

CA

AVG
16

H1d

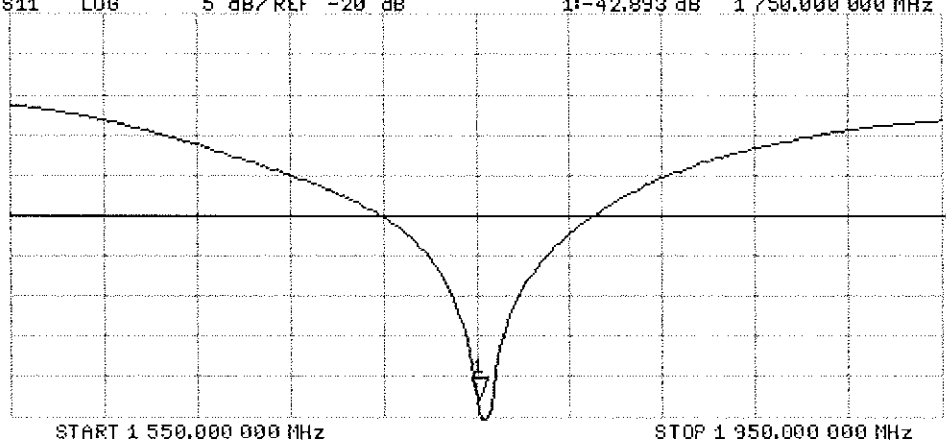


CH2 S11 LOG 5 dB/REF -20 dB 1: -42.893 dB 1 750.000 000 MHz

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:

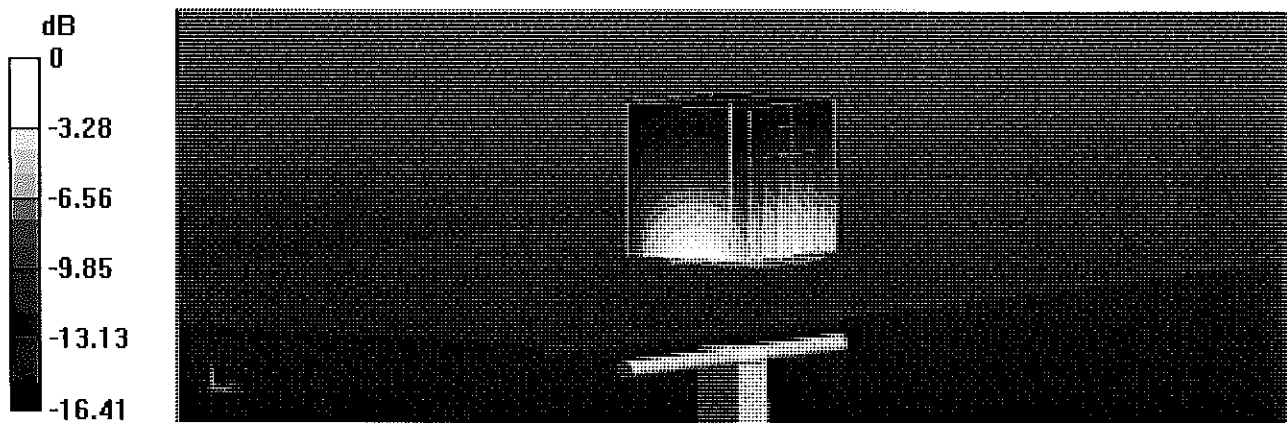
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

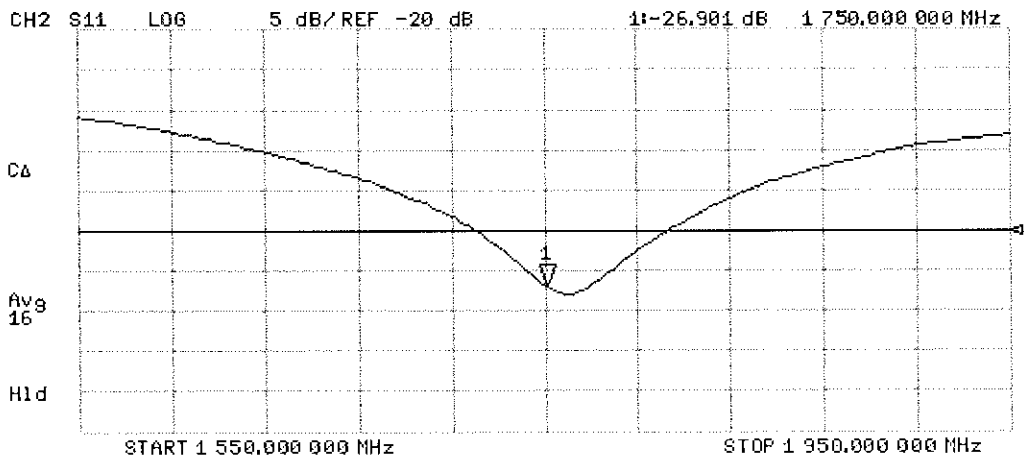
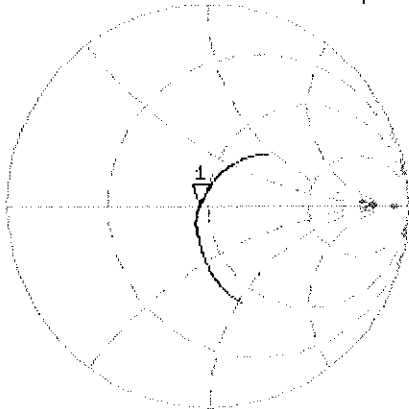


0 dB = 13.1 W/kg = 11.17 dBW/kg

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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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2450V2-719_Aug17**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN:719**

Calibration procedure(s) **QA CAL-05.v9**
Calibration procedure for dipole validation kits above 700 MHz

PN ✓
8/27/17

Calibration date: **August 17, 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: **Michael Weber** **Laboratory Technician**

Approved by: **Katja Pokovic** **Technical Manager**

Signature

[Signature of Michael Weber]
[Signature of Katja Pokovic]

Issued: August 17, 2017

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



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Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "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	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	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.9 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.3 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.9 $\pm$ 6 %	2.03 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	50.1 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.7 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	55.7 Ω + 7.0 j Ω
Return Loss	- 21.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.4 Ω + 8.1 j Ω
Return Loss	- 21.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 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	September 10, 2002

DASY5 Validation Report for Head TSL

Date: 17.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

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:

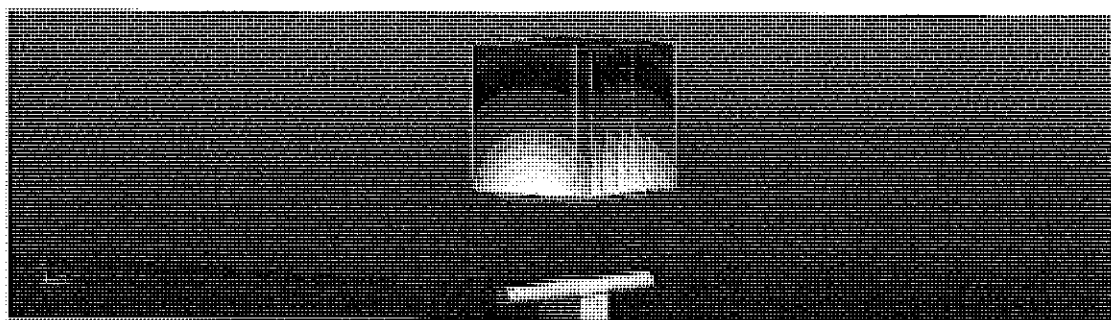
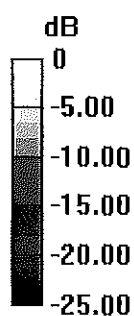
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 112.8 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 26.9 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.15 W/kg

Maximum value of SAR (measured) = 21.6 W/kg

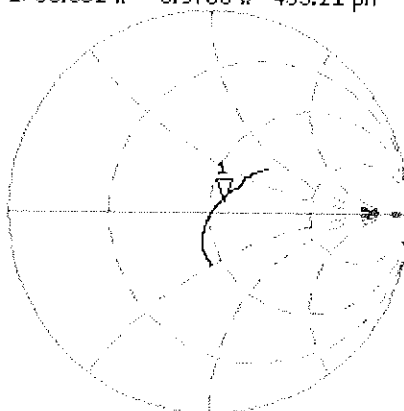


0 dB = 21.6 W/kg = 13.34 dBW/kg

Impedance Measurement Plot for Head TSL

17 Aug 2017 12:38:03
 CH1 S11 1 U FS 1: 55.682 Ω 6.9766 Ω 453.21 μH 2 450.000 000 MHz

*
 Del
 CA



Avg
 16

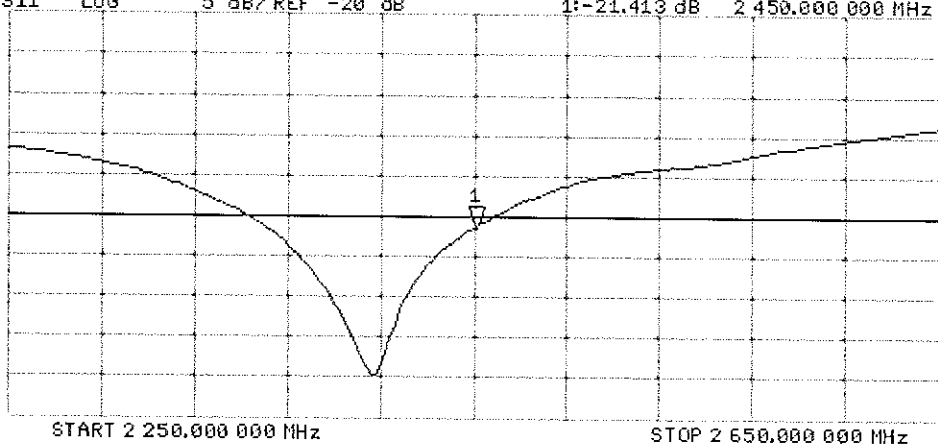
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.413 dB 2 450.000 000 MHz

CA

Avg
 16

H1d



DASY5 Validation Report for Body TSL

Date: 17.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.03$ 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:

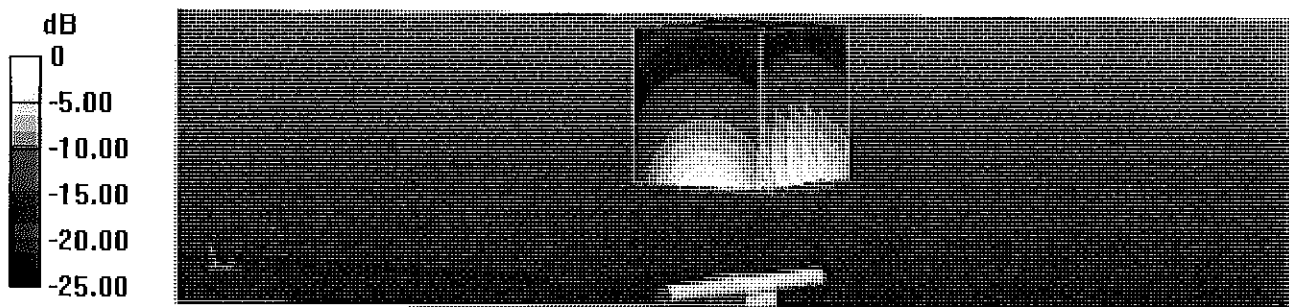
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.0 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 25.2 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 6 W/kg

Maximum value of SAR (measured) = 19.8 W/kg

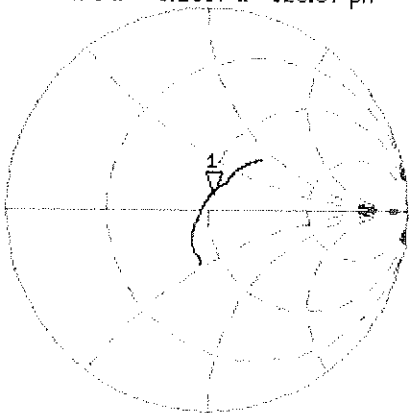


0 dB = 19.8 W/kg = 12.97 dBW/kg

Impedance Measurement Plot for Body TSL

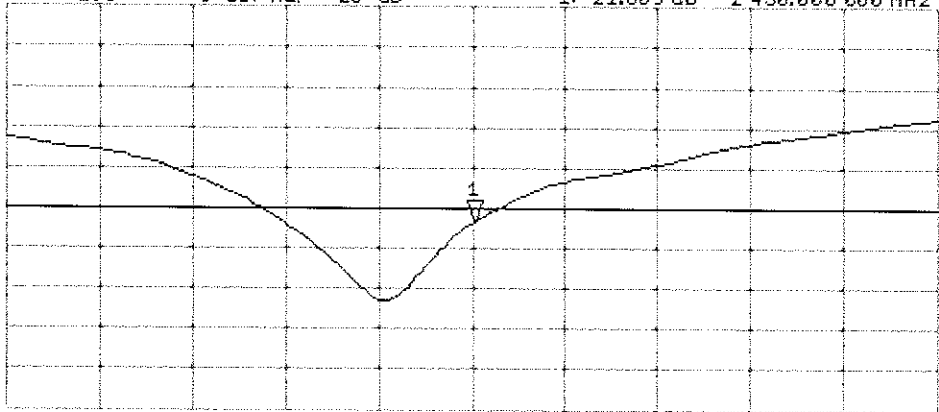
17 Aug 2017 12:37:27
[CH1] S11 1 U FS 1: 51.379 Ω 8.1367 Ω 528.57 μ H 2 450.000 000 MHz

*
De1
C4
Avg
16
H1d



CH2 S11 LOG 5 dB/REF -20 dB 1:-21.809 dB 2 450.000 000 MHz

C4
Avg
16
H1d



START 2 250.000 000 MHz STOP 2 650.000 000 MHz