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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:
12/09/2018 – 01/14/2019
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
1M1811260212-01-R1.A3L

FCC ID: **A3LSMG9700**

APPLICANT: **SAMSUNG ELECTRONICS CO., LTD.**

DUT Type:	Portable Handset
Application Type:	Certification
FCC Rule Part(s):	CFR §2.1093
Model:	SM-G9700
Additional Model:	SM-G9708

Equipment Class	Band & Mode	Tx Frequency	SAR		
			1g Head (W/kg)	1g Body-Worn (W/kg)	1g Hotspot (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.20	0.32	0.63
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.18	0.58	1.25
PCE	UMTS 850	826.40 - 846.60 MHz	0.26	0.43	0.60
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.25	1.03	1.05
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.34	0.90	0.62
PCE	LTE Band 12	699.7 - 715.3 MHz	0.20	0.38	0.52
PCE	LTE Band 13	779.5 - 784.5 MHz	0.17	0.27	0.44
PCE	LTE Band 26 (Cell)	814.7 - 848.3 MHz	0.18	0.35	0.54
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	N/A	N/A	N/A
PCE	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.31	1.21	0.90
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	N/A	N/A	N/A
PCE	LTE Band 41	2498.5 - 2687.5 MHz	0.11	0.52	0.93
DTS	2.4 GHz WLAN	2412 - 2472 MHz	1.10	0.24	0.50
NII	U-NII-1	5180 - 5240 MHz	N/A	N/A	N/A
NII	U-NII-2A	5260 - 5320 MHz	0.15	0.11	N/A
NII	U-NII-2C	5500 - 5720 MHz	0.13	0.11	N/A
NII	U-NII-3	5745 - 5825 MHz	0.21	0.13	0.18
DSS/DTS	Bluetooth	2402 - 2480 MHz	1.11	0.12	0.26
Simultaneous SAR per KDB 690783 D01v01r03:			1.58	1.58	1.59

Note: This revised Test Report (S/N: 1M1811260212-01–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

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

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 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 single step power reduction mechanism for SAR compliance under portable hotspot conditions for some wireless modes and bands. All hotspot SAR evaluations for this device were performed at the maximum allowed output power when hotspot is enabled. Detailed descriptions of the power reduction mechanism are included in the operational description.

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

1.3 Nominal and Maximum Output Power Specifications

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

1.3.1 Maximum 2G/3G/4G 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	**34.0**	**34.0**	**32.5**	**30.5**	**28.5**	**28.0**	**26.0**	**24.0**	**23.0**
	Nominal	**33.0**	**33.0**	**31.5**	**29.5**	**27.5**	**27.0**	**25.0**	**23.0**	**22.0**
GSM/GPRS/EDGE 1900	Maximum	**31.0**	**31.0**	**29.5**	**27.5**	**25.5**	**27.0**	**25.0**	**23.0**	**22.0**
	Nominal	**30.0**	**30.0**	**28.5**	**26.5**	**24.5**	**26.0**	**24.0**	**22.0**	**21.0**

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA	*3GPP HSDPA*	*3GPP HSUPA*	*3GPP DC-HSDPA*
UMTS Band 5 (850 MHz)	Maximum	**25.5**	**24.5**	**24.5**	**24.5**
	Nominal	**24.5**	**23.5**	**23.5**	**23.5**
UMTS Band 2 (1900 MHz)	Maximum	**24.5**	**23.5**	**23.5**	**23.5**
	Nominal	**23.5**	**22.5**	**22.5**	**22.5**

Mode / Band		Modulated Average (dBm)
LTE Band 4 (AWS)	Maximum	**25.0**
	Nominal	**24.0**
LTE Band 12	Maximum	**25.5**
	Nominal	**24.5**
LTE Band 13	Maximum	**25.0**
	Nominal	**24.0**
LTE Band 26 (Cell)	Maximum	**25.5**
	Nominal	**24.5**
LTE Band 5 (Cell)	Maximum	**25.5**
	Nominal	**24.5**
LTE Band 25 (PCS)	Maximum	**24.5**
	Nominal	**23.5**
LTE Band 2 (PCS)	Maximum	**24.5**
	Nominal	**23.5**
LTE Band 41	Maximum	**25.0**
	Nominal	**24.0**

1.3.2 Reduced 2G/3G/4G Output Power

Mode / Band		Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slots	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*	*1 TX Slots*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*
GPRS/EDGE 1900	Maximum	**28.5**	**27.5**	**25.5**	**23.5**	**25.0**	**23.0**	**21.0**	**20.0**
	Nominal	**27.5**	**26.5**	**24.5**	**22.5**	**24.0**	**22.0**	**20.0**	**19.0**

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA	*3GPP HSDPA*	*3GPP HSUPA*	*3GPP DC-HSDPA*
UMTS Band 2 (1900 MHz)	Maximum	**19.5**	**18.5**	**18.5**	**18.5**
	Nominal	**18.5**	**17.5**	**17.5**	**17.5**

Mode / Band		Modulated Average (dBm)
LTE Band 4 (AWS)	Maximum	**21.0**
	Nominal	**20.0**
LTE Band 25 (PCS)	Maximum	**20.0**
	Nominal	**19.0**
LTE Band 2 (PCS)	Maximum	**20.0**
	Nominal	**19.0**
LTE Band 41	Maximum	**22.5**
	Nominal	**21.5**

1.3.3 Maximum Bluetooth and SISO/MIMO WLAN Output Power

Mode / Band		Modulated Average - Antenna 1 (dBm)						Mode / Band		Modulated Average - Antenna 2 (dBm)					
	Channel	1	2-10		11	12	13		Channel	1	2-10		11	12	13
IEEE 802.11b (2.4 GHz)	Maximum		**21.0**			**10.0**	**5.5**	IEEE 802.11b (2.4 GHz)	Maximum		**19.0**			**10.0**	**5.5**
	Nominal		**20.0**			**9.0**	**4.5**		Nominal		**18.0**			**9.0**	**4.5**
IEEE 802.11g (2.4 GHz)	Maximum		**18.5**		**16.0**	**10.0**	**5.5**	IEEE 802.11g (2.4 GHz)	Maximum		**18.5**		**16.0**	**10.0**	**5.5**
	Nominal		**17.5**		**15.0**	**9.0**	**4.5**		Nominal		**17.5**		**15.0**	**9.0**	**4.5**
IEEE 802.11n (2.4 GHz)	Maximum		**18.5**		**16.0**	**10.0**	**5.5**	IEEE 802.11n (2.4 GHz)	Maximum		**18.5**		**16.0**	**10.0**	**5.5**
	Nominal		**17.5**		**15.0**	**9.0**	**4.5**		Nominal		**17.5**		**15.0**	**9.0**	**4.5**
IEEE 802.11ax(SU) (2.4 GHz)	Maximum	**15.0**	**18.0**		**13.5**	**10.0**	**5.5**	IEEE 802.11ax(SU) (2.4 GHz)	Maximum	**15.0**	**18.0**		**13.5**	**10.0**	**5.5**
	Nominal	**14.0**	**17.0**		**12.5**	**9.0**	**4.5**		Nominal	**14.0**	**17.0**		**12.5**	**9.0**	**4.5**

Mode / Band		Modulated Average - SISO (dBm)																
		20 MHz Bandwidth					40 MHz Bandwidth					80 MHz Bandwidth						
	Channel	36	40-60	64	100	104-165	38	46-54	62	102	110-159	42	58	106	122-155			
IEEE 802.11a (5 GHz)	Maximum	**15.5**	**18.5**	**17.0**		**18.5**												
	Nominal	**14.5**	**17.5**	**16.0**		**17.5**												
IEEE 802.11n (5 GHz)	Maximum	**15.5**	**18.5**	**17.0**		**18.5**	**13.0**	**17.5**	**14.0**	**15.0**	**17.5**							
	Nominal	**14.5**	**17.5**	**16.0**		**17.5**	**12.0**	**16.5**	**13.0**	**14.0**	**16.5**							
IEEE 802.11ac (5 GHz)	Maximum	**15.5**	**18.5**	**17.0**		**18.5**	**13.0**	**17.5**	**14.0**	**15.0**	**17.5**	**12.5**	**13.0**	**12.5**	**16.5**			
	Nominal	**14.5**	**17.5**	**16.0**		**17.5**	**12.0**	**16.5**	**13.0**	**14.0**	**16.5**	**11.5**	**12.0**	**11.5**	**15.5**			
IEEE 802.11ax(SU) (5 GHz)	Maximum	**15.0**	**18.0**	**16.0**	**17.5**	**18.0**	**12.0**	**17.0**	**12.5**	**14.5**	**17.0**	**13.0**	**13.0**	**12.0**	**16.0**			
	Nominal	**14.0**	**17.0**	**15.0**	**16.5**	**17.0**	**11.0**	**16.0**	**11.5**	**13.5**	**16.0**	**12.0**	**12.0**	**11.0**	**15.0**			

Mode / Band		Modulated Average - MIMO (dBm)				
		20 MHz Bandwidth				
	Channel	1	2-10	11	12	13
IEEE 802.11g (2.4 GHz)	Maximum	21.5		19.0	13.0	8.5
	Nominal	20.5		18.0	12.0	7.5
IEEE 802.11n (2.4 GHz)	Maximum	21.5		19.0	13.0	8.5
	Nominal	20.5		18.0	12.0	7.5
IEEE 802.11ax(SU) (2.4 GHz)	Maximum	15.0	18.0	13.5	13.0	8.5
	Nominal	14.0	17.0	12.5	12.0	7.5

Mode / Band		Modulated Average - MIMO (dBm)														
		20 MHz Bandwidth					40 MHz Bandwidth					80 MHz Bandwidth				
	Channel	36	40-60	64	100	104-165	38	46-54	62	102	110-159	42	58	106	122 - 155	
IEEE 802.11a (5 GHz)	Maximum	15.5	21.5	17.0	21.5											
	Nominal	14.5	20.5	16.0	20.5											
IEEE 802.11n (5 GHz)	Maximum	15.5	21.5	17.0	21.5		13.0	20.5	14.0	15.0	20.5					
	Nominal	14.5	20.5	16.0	20.5		12.0	19.5	13.0	14.0	19.5					
IEEE 802.11ac (5 GHz)	Maximum	15.5	21.5	17.0	21.5		13.0	20.5	14.0	15.0	20.5	12.5	13.0	12.5	19.5	
	Nominal	14.5	20.5	16.0	20.5		12.0	19.5	13.0	14.0	19.5	11.5	12.0	11.5	18.5	
IEEE 802.11ax(SU) (5 GHz)	Maximum	15.0	18.0	16.0	17.5	18.0	12.0	17.0	12.5	14.5	17.0	13.0	13.0	12.0	16.0	
	Nominal	14.0	17.0	15.0	16.5	17.0	11.0	16.0	11.5	13.5	16.0	12.0	12.0	11.0	15.0	

Mode/Band		Modulated Average (dBm)
Bluetooth	Maximum	18.5
	Nominal	17.5
Bluetooth EDR	Maximum	12.5
	Nominal	11.5
Bluetooth LE (2Mbps)	Maximum	10.0
	Nominal	9.0
Bluetooth LE (1Mbps), 125/500Kbps	Maximum	9.0
	Nominal	8.0

Note: 802.11ax RU can be found in Appendix I

1.3.4 Reduced SISO/MIMO WLAN Output Power

Mode / Band		Modulated Average - SISO (dBm)				
	Channel	1	2-10	11	12	13
IEEE 802.11b (2.4 GHz)	Maximum	17.0			10.0	5.5
	Nominal	16.0			9.0	4.5
IEEE 802.11g (2.4 GHz)	Maximum	17.0		16.0	10.0	5.5
	Nominal	16.0		15.0	9.0	4.5
IEEE 802.11n (2.4 GHz)	Maximum	17.0		16.0	10.0	5.5
	Nominal	16.0		15.0	9.0	4.5
IEEE 802.11ax(SU) (2.4 GHz)	Maximum	15.0	17.0	13.5	10.0	5.5
	Nominal	14.0	16.0	12.5	9.0	4.5

Mode / Band		Modulated Average - SISO (dBm)								
		20 MHz Bandwidth	40 MHz Bandwidth					80 MHz Bandwidth		
	Channel	36 -165	38	46-54	62	102	110-159	42	58	106	122 - 155
IEEE 802.11a (5 GHz)	Maximum	14.0									
	Nominal	13.0									
IEEE 802.11n (5 GHz)	Maximum	14.0	13.0	14.0			14.0				
	Nominal	13.0	12.0	13.0			13.0				
IEEE 802.11ac (5 GHz)	Maximum	14.0	13.0	14.0			14.0	12.5	13.0	12.5	14.0
	Nominal	13.0	12.0	13.0			13.0	11.5	12.0	11.5	13.0
IEEE 802.11ax(SU) (5 GHz)	Maximum	14.0	12.0	14.0	12.5	14.0	14.0	13.0	13.0	12.0	14.0
	Nominal	13.0	11.0	13.0	11.5	13.0	13.0	12.0	12.0	11.0	13.0

Mode / Band		Modulated Average - MIMO (dBm)				
		20 MHz Bandwidth				
	Channel	1	2-10	11	12	13
IEEE 802.11g (2.4 GHz)	Maximum	20.0		19.0	13.0	8.5
	Nominal	19.0		18.0	12.0	7.5
IEEE 802.11n (2.4 GHz)	Maximum	20.0		19.0	13.0	8.5
	Nominal	19.0		18.0	12.0	7.5
IEEE 802.11ax(SU) (2.4 GHz)	Maximum	15.0	18.0	13.5	13.0	8.5
	Nominal	14.0	17.0	12.5	12.0	7.5

Mode / Band		Modulated Average - MIMO (dBm)														
		20 MHz Bandwidth					40 MHz Bandwidth					80 MHz Bandwidth				
	Channel	36	40-60	64	100 -165		38	46-54	62	102	110-159	42	58	106	122 - 155	
IEEE 802.11a (5 GHz)	Maximum	15.5	17.0													
	Nominal	14.5	16.0													
IEEE 802.11n (5 GHz)	Maximum	15.5	17.0				13.0	17.0	14.0	15.0	17.0					
	Nominal	14.5	16.0				12.0	16.0	13.0	14.0	16.0					
IEEE 802.11ac (5 GHz)	Maximum	15.5	17.0				13.0	17.0	14.0	15.0	17.0	12.5	13.0	12.5	17.0	
	Nominal	14.5	16.0				12.0	16.0	13.0	14.0	16.0	11.5	12.0	11.5	16.0	
IEEE 802.11ax(SU) (5 GHz)	Maximum	15.0	17.0	16.0	17.0		12.0	17.0	12.5	14.5	17.0	13.0	13.0	12.0	16.0	
	Nominal	14.0	16.0	15.0	16.0		11.0	16.0	11.5	13.5	16.0	12.0	12.0	11.0	15.0	

Note: 802.11ax RU can be found in Appendix I

1.3.5 Maximum Output Power During Conditions with Simultaneous 2.4 GHz WLAN and 5 GHz WLAN

Mode / Band		Modulated Average - SISO (dBm)					Modulated Average - MIMO (dBm)				
	Channel	1	2-10	11	12	13	1	2-10	11	12	13
IEEE 802.11b (2.4 GHz)	Maximum	17.0			10.0	5.5	N/A			13.0	8.5
	Nominal	16.0			9.0	4.5	N/A			12.0	7.5
IEEE 802.11g (2.4 GHz)	Maximum	17.0		16.0	10.0	5.5	20.0		19.0	13.0	8.5
	Nominal	16.0		15.0	9.0	4.5	19.0		18.0	12.0	7.5
IEEE 802.11n (2.4 GHz)	Maximum	17.0		16.0	10.0	5.5	20.0		19.0	13.0	8.5
	Nominal	16.0		15.0	9.0	4.5	19.0		18.0	12.0	7.5
IEEE 802.11ax(SU) (2.4 GHz)	Maximum	15.0	17.0	13.5	10.0	5.5	15.0	18.0	13.5	13.0	8.5
	Nominal	14.0	16.0	12.5	9.0	4.5	14.0	17.0	12.5	12.0	7.5

Mode / Band		Modulated Average - SISO (dBm)	Modulated Average - MIMO (dBm)			
		20 MHz Bandwidth	20 MHz Bandwidth			
	Channel	36 -165	36	40-60	64	100 -165
IEEE 802.11a (5 GHz)	Maximum	14.0	15.5	17.0		
	Nominal	13.0	14.5	16.0		
IEEE 802.11n (5 GHz)	Maximum	14.0	15.5	17.0		
	Nominal	13.0	14.5	16.0		
IEEE 802.11ac (5 GHz)	Maximum	14.0	15.5	17.0		
	Nominal	13.0	14.5	16.0		
IEEE 802.11ax(SU) (5 GHz)	Maximum	14.0	15.0	17.0	16.0	17.0
	Nominal	13.0	14.0	16.0	15.0	16.0

Mode / Band		Modulated Average - SISO (dBm)					Modulated Average - MIMO (dBm)				
		40 MHz Bandwidth					40 MHz Bandwidth				
	Channel	38	46-54	62	102	110-159	38	46-54	62	102	110-159
IEEE 802.11n (5 GHz)	Maximum	13.0	14.0	14.0	14.0	14.0	13.0	17.0	14.0	15.0	17.0
	Nominal	12.0	13.0	13.0	13.0	13.0	12.0	16.0	13.0	14.0	16.0
IEEE 802.11ac (5 GHz)	Maximum	13.0	14.0	14.0	14.0	14.0	13.0	17.0	14.0	15.0	17.0
	Nominal	12.0	13.0	13.0	13.0	13.0	12.0	16.0	13.0	14.0	16.0
IEEE 802.11ax(SU) (5 GHz)	Maximum	12.0	14.0	12.5	14.0	14.0	12.0	17.0	12.5	14.5	17.0
	Nominal	11.0	13.0	11.5	13.0	13.0	11.0	16.0	11.5	13.5	16.0

Mode / Band		Modulated Average - SISO (dBm)				Modulated Average - MIMO (dBm)			
		80 MHz Bandwidth				80 MHz Bandwidth			
	Channel	42	58	106	122 - 155	42	58	106	122 - 155
IEEE 802.11ac (5 GHz)	Maximum	**12.5**	**13.0**	**12.5**	**14.0**	**12.5**	**13.0**	**12.5**	**17.0**
	Nominal	**11.5**	**12.0**	**11.5**	**13.0**	**11.5**	**12.0**	**11.5**	**16.0**
IEEE 802.11ax(SU) (5 GHz)	Maximum	**13.0**		**12.0**	**14.0**	**13.0**		**12.0**	**16.0**
	Nominal	**12.0**		**11.0**	**13.0**	**12.0**		**11.0**	**15.0**

Note: 802.11ax RU can be found in Appendix I

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

Mode / Band		Modulated Average - Antenna 1 (dBm)					Modulated Average - MIMO (dBm)				
	Channel	1	2-10	11	12	13	1	2-10	11	12	13
IEEE 802.11b (2.4 GHz)	Maximum	**14.0**			**10.0**	**5.5**	N/A			**13.0**	**8.5**
	Nominal	**13.0**			**9.0**	**4.5**	N/A			**12.0**	**7.5**
IEEE 802.11g (2.4 GHz)	Maximum	**14.0**			**10.0**	**5.5**	**17.0**			**13.0**	**8.5**
	Nominal	**13.0**			**9.0**	**4.5**	**16.0**			**12.0**	**7.5**
IEEE 802.11n (2.4 GHz)	Maximum	**14.0**			**10.0**	**5.5**	**17.0**			**13.0**	**8.5**
	Nominal	**13.0**			**9.0**	**4.5**	**16.0**			**12.0**	**7.5**
IEEE 802.11ax(SU) (2.4 GHz)	Maximum	**14.0**		**13.5**	**10.0**	**5.5**	**15.0**	**17.0**	**13.5**	**13.0**	**8.5**
	Nominal	**13.0**		**12.5**	**9.0**	**4.5**	**14.0**	**16.0**	**12.5**	**12.0**	**7.5**

Mode / Band		Modulated Average - SISO (dBm)		Modulated Average - MIMO (dBm)			
		20 MHz Bandwidth		20 MHz Bandwidth			
	Channel	36 -165		36	40-60	64	100 -165
IEEE 802.11a (5 GHz)	Maximum	**14.0**		**15.5**	**17.0**		
	Nominal	**13.0**		**14.5**	**16.0**		
IEEE 802.11n (5 GHz)	Maximum	**14.0**		**15.5**	**17.0**		
	Nominal	**13.0**		**14.5**	**16.0**		
IEEE 802.11ac (5 GHz)	Maximum	**14.0**		**15.5**	**17.0**		
	Nominal	**13.0**		**14.5**	**16.0**		
IEEE 802.11ax(SU) (5 GHz)	Maximum	**14.0**		**15.0**	**17.0**	**16.0**	**17.0**
	Nominal	**13.0**		**14.0**	**16.0**	**15.0**	**16.0**

Mode / Band		Modulated Average - SISO (dBm)					Modulated Average - MIMO (dBm)				
		40 MHz Bandwidth					40 MHz Bandwidth				
	Channel	38	46-54	62	102	110-159	38	46-54	62	102	110-159
IEEE 802.11n (5 GHz)	Maximum	**13.0**	**14.0**	**14.0**	**14.0**	**14.0**	**13.0**	**17.0**	**14.0**	**15.0**	**17.0**
	Nominal	**12.0**	**13.0**	**13.0**	**13.0**	**13.0**	**12.0**	**16.0**	**13.0**	**14.0**	**16.0**
IEEE 802.11ac (5 GHz)	Maximum	**13.0**	**14.0**	**14.0**	**14.0**	**14.0**	**13.0**	**17.0**	**14.0**	**15.0**	**17.0**
	Nominal	**12.0**	**13.0**	**13.0**	**13.0**	**13.0**	**12.0**	**16.0**	**13.0**	**14.0**	**16.0**
IEEE 802.11ax(SU) (5 GHz)	Maximum	**12.0**	**14.0**	**12.5**	**14.0**	**14.0**	**12.0**	**17.0**	**12.5**	**14.5**	**17.0**
	Nominal	**11.0**	**13.0**	**11.5**	**13.0**	**13.0**	**11.0**	**16.0**	**11.5**	**13.5**	**16.0**

Mode / Band		Modulated Average - SISO (dBm)				Modulated Average - MIMO (dBm)			
		80 MHz Bandwidth				80 MHz Bandwidth			
	Channel	42	58	106	122 - 155	42	58	106	122 - 155
IEEE 802.11ac (5 GHz)	Maximum	**12.5**	**13.0**	**12.5**	**14.0**	**12.5**	**13.0**	**12.5**	**17.0**
	Nominal	**11.5**	**12.0**	**11.5**	**13.0**	**11.5**	**12.0**	**11.5**	**16.0**
IEEE 802.11ax(SU) (5 GHz)	Maximum	**13.0**		**12.0**	**14.0**	**13.0**		**12.0**	**16.0**
	Nominal	**12.0**		**11.0**	**13.0**	**12.0**		**11.0**	**15.0**

Note: 802.11ax RU can be found in Appendix I

1.4 DUT Antenna Locations

The overall dimensions of this device are > 9 x 5 cm. The overall diagonal dimension of the device is ≤160 mm and the diagonal display is ≤150 mm. A diagram showing the location of the device antennas can be found in Appendix F.

Table 1-1
Device Edges/Sides for SAR Testing

Device Sides/Edges 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 1900	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	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 25 (PCS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 41	Yes	Yes	No	Yes	No	Yes
2.4 GHz WLAN Ant 1	Yes	Yes	Yes	No	No	Yes
2.4 GHz WLAN Ant 2	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN Ant 1	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN Ant 2	Yes	Yes	Yes	No	No	Yes
Bluetooth	Yes	Yes	Yes	No	No	Yes

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

1.5 Near Field Communications (NFC) Antenna

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

1.6 Simultaneous Transmission Capabilities

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

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

Table 1-2
Simultaneous Transmission Scenarios

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

1. 2.4 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
2. All licensed modes share the same antenna path and cannot transmit simultaneously.
3. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
4. Per the manufacturer, WIFI Direct is 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. This device supports 2x2 MIMO Tx for WLAN 802.11a/g/n/ac/ax. 802.11a/g/n/ac/ax supports CDD and STBC and 802.11n/ac/ax additionally supports SDM. Each WLAN antenna can transmit independently or together when operating with MIMO.
6. This device supports VOLTE.
7. This device supports VoWIFI.
8. This device supports Bluetooth Tethering.

1.7 Miscellaneous SAR Test Considerations

(A) WIFI/BT

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.

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.

Per FCC Guidance, SAR testing was not required for 802.11ax when applying the initial test configuration Procedures of KDB 248227, with 802.11ax considered a higher order 802.11 mode.

This device supports IEEE 802.11ax with the following features:

a) Up to 80 MHz Bandwidth only
b) Up to 20 MHz Bandwidth only for 2.4 GHz
c) No aggregate channel configurations
d) 2 Tx antenna output
e) 1024 QAM is supported
f) TDWR and Band gap channels are supported for 5 GHz
g) 802.11ax MU-MIMO UL Operations are not supported

(B) Licensed Transmitter(s)

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

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

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

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

This device supports downlink 4x4 MIMO operations for some LTE Bands. Per May 2017 TCB Workshop Guidance, 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.

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

This device supports LTE Carrier Aggregation (CA) for LTE Band 41 with two component carriers in the uplink. SAR Measurements and conducted powers were evaluated per 2017 Fall TCB Workshop Notes.

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)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)
- May 2017 TCB Workshop Notes (LTE 4x4 Downlink MIMO)
- April 2018 TCB Workshop Notes (LTE Carrier Aggregation)

1.9 Device Serial Numbers

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

2 LTE INFORMATION

LTE Information					
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 12 (699.7 - 715.3 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 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
Channel Bandwidths	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 13: 5 MHz, 10 MHz				
	LTE Band 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 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 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High	High
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)		1732.5 (20175)	1754.3 (20393)	
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)		1732.5 (20175)	1753.5 (20385)	
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)		1732.5 (20175)	1752.5 (20375)	
LTE Band 4 (AWS): 10 MHz	1715 (20000)		1732.5 (20175)	1750 (20350)	
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)		1732.5 (20175)	1747.5 (20325)	
LTE Band 4 (AWS): 20 MHz	1720 (20050)		1732.5 (20175)	1745 (20300)	
LTE Band 12: 1.4 MHz	699.7 (23017)		707.5 (23095)	715.3 (23173)	
LTE Band 12: 3 MHz	700.5 (23025)		707.5 (23095)	714.5 (23165)	
LTE Band 12: 5 MHz	701.5 (23035)		707.5 (23095)	713.5 (23155)	
LTE Band 12: 10 MHz	704 (23060)		707.5 (23095)	711 (23130)	
LTE Band 13: 5 MHz	779.5 (23205)		782 (23230)	784.5 (23255)	
LTE Band 13: 10 MHz	N/A		782 (23230)	N/A	
LTE Band 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 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 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
UE Category	DL UE Cat 20 (QPSK, 16QAM, 64QAM, 256QAM), UL UE Cat 18 (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 14. It supports carrier aggregation, downlink MIMO features as shown in Section 9 and Appendix H. 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 14 Features are not supported: Relay, HetNet, Enhanced eICIC, MDH, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

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

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

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

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

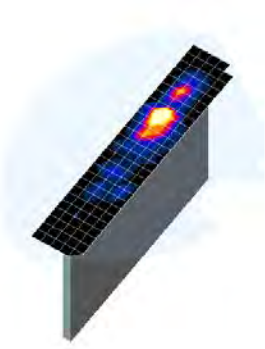

Figure 4-1
Sample SAR Area Scan

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

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

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

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

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

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

*Also compliant to IEEE 1528-2013 Table 6

5 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

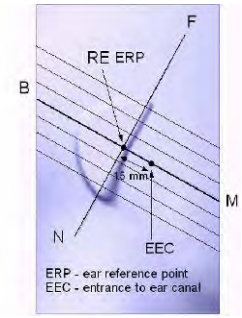

Figure 5-1
Close-Up Side view of ERP

5.2 HANDSET REFERENCE POINTS

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

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

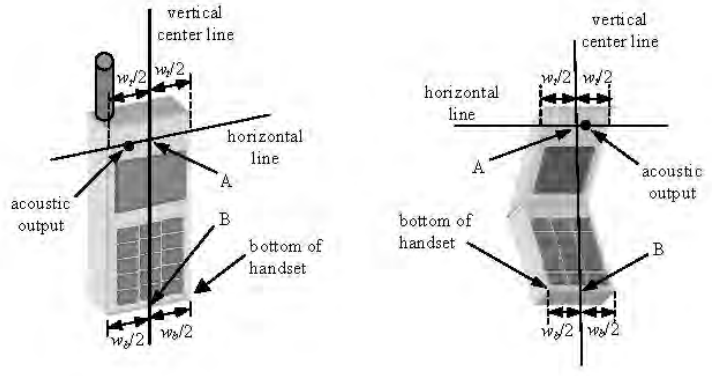

Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

6 TEST CONFIGURATION POSITIONS

6.1 Device Holder

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

6.2 Positioning for Cheek

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

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

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

6.3 Positioning for Ear / 15º Tilt

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

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

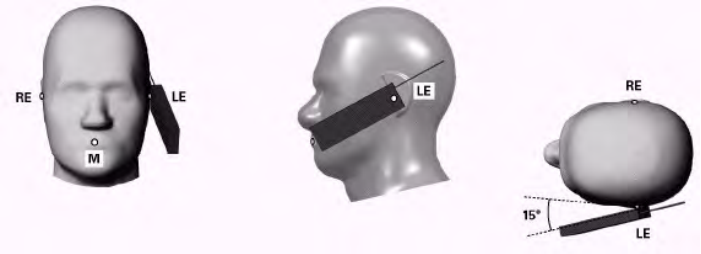

Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

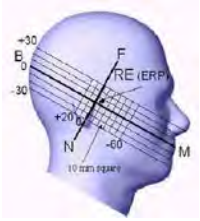

Figure 6-3
Side view w/ relevant markings

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

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

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

6.5 Body-Worn Accessory Configurations

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

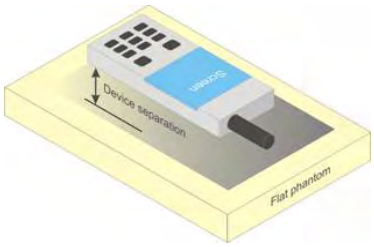

Figure 6-4
Sample Body-Worn Diagram

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

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

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

6.6 Extremity Exposure Configurations

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

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

6.7 Wireless Router Configurations

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

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

7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

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

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

8 FCC MEASUREMENT PROCEDURES

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

8.1 Measured and Reported SAR

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

8.2 3G SAR Test Reduction Procedure

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

8.3 Procedures Used to Establish RF Signal for SAR

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

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

8.4 SAR Measurement Conditions for 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.

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).

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 ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg.

8.5.5 TDD

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

8.5.6 Downlink Only Carrier Aggregation

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

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

8.6 SAR Testing with 802.11 Transmitters

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

8.6.1 General Device Setup

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

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

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

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

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

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

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. Per FCC Guidance, 802.11ax was considered a higher order 802.11 mode when compared to a/b/g/n/ac to apply KDB Publication 248227 Guidance. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

8.6.7 Initial Test Configuration Procedure

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

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

8.6.8 Subsequent Test Configuration Procedures

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

9 RF CONDUCTED POWERS

9.1 GSM Conducted Powers

Table 9-1
Maximum Conducted Power

Maximum Burst-Averaged Output Power										
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 850	128	32.18	32.35	31.34	**29.22**	27.49	26.83	25.26	23.08	21.82
	190	32.22	32.37	31.38	**29.13**	27.26	26.79	25.21	22.92	21.79
	251	32.27	32.41	31.31	**29.16**	27.13	26.90	25.42	23.20	22.16
GSM 1900	512	29.74	29.77	28.68	**26.66**	24.54	25.71	24.08	22.06	21.15
	661	30.04	29.92	28.90	**26.96**	24.93	25.92	24.44	22.49	21.47
	810	29.69	29.75	28.51	**26.54**	24.56	25.87	24.06	22.14	21.13

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	23.15	23.32	25.32	**24.96**	24.48	17.80	19.24	18.82	18.81
	190	23.19	23.34	25.36	**24.87**	24.25	17.76	19.19	18.66	18.78
	251	23.24	23.38	25.29	**24.90**	24.12	17.87	19.40	18.94	19.15
GSM 1900	512	20.71	20.74	22.66	**22.40**	21.53	16.68	18.06	17.80	18.14
	661	21.01	20.89	22.88	**22.70**	21.92	16.89	18.42	18.23	18.46
	810	20.66	20.72	22.49	**22.28**	21.55	16.84	18.04	17.88	18.12
GSM 850	**Frame Avg.Targets:**	23.97	23.97	25.48	**25.24**	24.49	17.97	18.98	18.74	18.99
GSM 1900		20.97	20.97	22.48	**22.24**	21.49	16.97	17.98	17.74	17.99

Table 9-2
Reduced Conducted Power

Maximum Burst-Averaged Output Power									
		GPRS/EDGE Data (GMSK)				*EDGE Data (8-PSK)*			
Band	**Channel**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 1900	512	28.18	26.98	**24.84**	22.79	24.65	22.55	20.55	19.55
	661	28.38	27.40	**25.06**	22.61	24.89	22.68	20.51	19.60
	810	27.82	26.58	**24.73**	22.74	24.51	22.50	20.61	19.58

Calculated Maximum Frame-Averaged Output Power									
		GPRS/EDGE Data (GMSK)				*EDGE Data (8-PSK)*			
Band	**Channel**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 1900	512	19.15	20.96	**20.58**	19.78	15.62	16.53	16.29	16.54
	661	19.35	21.38	**20.80**	19.60	15.86	16.66	16.25	16.59
	810	18.79	20.56	**20.47**	19.73	15.48	16.48	16.35	16.57
GSM 1900	**Frame Avg.Targets:**	18.47	20.48	**20.24**	19.49	16.97	17.98	17.74	17.99

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

9.2 UMTS Conducted Powers

Table 9-3
Maximum Conducted Power

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	24.41	24.35	24.40	23.47	23.83	23.32	-
99		12.2 kbps AMR	24.41	24.39	24.42	23.51	23.78	23.34	-
6	HSDPA	Subtest 1	24.01	23.96	23.97	22.55	22.86	22.32	0
6		Subtest 2	24.06	24.00	23.86	22.47	22.83	22.37	0
6		Subtest 3	23.40	23.46	23.44	22.13	22.25	21.92	0.5
6		Subtest 4	23.51	23.47	23.43	22.11	22.20	21.80	0.5
6	HSUPA	Subtest 1	24.07	23.93	23.95	22.46	22.81	22.34	0
6		Subtest 2	22.01	21.96	21.95	20.61	20.89	20.35	2
6		Subtest 3	23.02	22.92	23.01	21.46	21.84	21.40	1
6		Subtest 4	22.09	21.95	21.97	20.53	20.81	20.34	2
6		Subtest 5	24.10	24.08	23.96	22.56	22.82	22.16	0
8	DC-HSDPA	Subtest 1	24.06	23.99	23.96	22.61	22.73	22.32	0
8		Subtest 2	24.11	24.01	23.99	22.53	22.82	22.39	0
8		Subtest 3	23.57	23.40	23.49	22.07	22.23	21.85	0.5
8		Subtest 4	23.55	23.51	23.52	22.06	22.31	21.82	0.5

Table 9-4
Reduced Conducted Power

3GPP Release Version	Mode	3GPP 34.121 Subtest	PCS Band [dBm]			3GPP MPR [dB]
			9262	9400	9538	
99	WCDMA	12.2 kbps RMC	18.12	18.06	18.08	-
99		12.2 kbps AMR	18.13	18.07	18.11	-
6	HSDPA	Subtest 1	17.68	17.57	17.60	0
6		Subtest 2	17.57	17.63	17.57	0
6		Subtest 3	17.22	17.04	17.16	0.5
6		Subtest 4	17.13	17.12	17.16	0.5
6	HSUPA	Subtest 1	17.71	17.58	17.64	0
6		Subtest 2	15.67	15.76	15.71	2
6		Subtest 3	16.75	16.63	16.65	1
6		Subtest 4	15.72	15.63	15.65	2
6		Subtest 5	17.78	17.69	17.66	0
8	DC-HSDPA	Subtest 1	17.65	17.52	17.67	0
8		Subtest 2	17.68	17.65	17.67	0
8		Subtest 3	17.26	17.06	17.15	0.5
8		Subtest 4	17.21	17.07	17.14	0.5

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

Figure 9-2
Power Measurement Setup

9.3 LTE Conducted Powers

9.3.1 LTE Band 12

Table 9-5
LTE Band 12 Conducted Powers - 10 MHz Bandwidth

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23095 (707.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.29**	0	0
	1	25	24.17		0
	1	49	24.14		0
	25	0	**23.35**	0-1	1
	25	12	23.31		1
	25	25	23.20		1
	50	0	23.29		1
16QAM	1	0	23.47	0-1	1
	1	25	23.02		1
	1	49	23.54		1
	25	0	22.39	0-2	2
	25	12	22.19		2
	25	25	22.20		2
	50	0	22.25		2
64QAM	1	0	22.40	0-2	2
	1	25	22.16		2
	1	49	22.39		2
	25	0	21.40	0-3	3
	25	12	21.26		3
	25	25	21.14		3
	50	0	21.28		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 9-6
LTE Band 12 Conducted Powers - 5 MHz Bandwidth

LTE Band 12 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 23035 (701.5 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23155 (713.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.11	24.15	24.12	0	0
	1	12	24.18	24.23	24.22		0
	1	24	24.13	24.15	24.15		0
	12	0	23.29	23.32	23.30	0-1	1
	12	6	23.34	23.41	23.35		1
	12	13	23.27	23.32	23.33		1
	25	0	23.31	23.37	23.32		1
16QAM	1	0	23.39	23.42	23.28	0-1	1
	1	12	23.43	23.48	23.61		1
	1	24	23.35	23.37	23.48		1
	12	0	22.32	22.30	22.26	0-2	2
	12	6	22.40	22.36	22.35		2
	12	13	22.33	22.37	22.38		2
	25	0	22.30	22.33	22.31		2
64QAM	1	0	22.30	22.37	22.38	0-2	2
	1	12	22.37	22.73	22.53		2
	1	24	22.41	22.37	22.42		2
	12	0	21.26	21.33	21.34	0-3	3
	12	6	21.37	21.36	21.35		3
	12	13	21.35	21.47	21.39		3
	25	0	21.32	21.32	21.24		3

Table 9-7
LTE Band 12 Conducted Powers - 3 MHz Bandwidth

LTE Band 12 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 23025 (700.5 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23165 (714.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.09	24.18	24.17	0	0
	1	7	24.14	24.19	24.20		0
	1	14	24.15	24.17	24.23		0
	8	0	23.25	23.22	23.27	0-1	1
	8	4	23.32	23.37	23.31		1
	8	7	23.27	23.36	23.35		1
	15	0	23.31	23.42	23.34		1
16QAM	1	0	23.41	23.41	23.47	0-1	1
	1	7	23.37	23.49	23.52		1
	1	14	23.54	23.35	23.47		1
	8	0	22.33	22.47	22.32	0-2	2
	8	4	22.38	22.44	22.39		2
	8	7	22.35	22.37	22.42		2
	15	0	22.32	22.35	22.32		2
64QAM	1	0	22.36	22.50	22.40	0-2	2
	1	7	22.37	22.83	22.54		2
	1	14	22.41	22.52	22.48		2
	8	0	21.25	21.26	21.33	0-3	3
	8	4	21.33	21.33	21.33		3
	8	7	21.31	21.30	21.33		3
	15	0	21.33	21.35	21.34		3

Table 9-8
LTE Band 12 Conducted Powers -1.4 MHz Bandwidth

LTE Band 12 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 23017 (699.7 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23173 (715.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.06	24.05	24.04	0	0
	1	2	24.08	24.18	24.15		0
	1	5	24.07	24.11	24.13		0
	3	0	24.04	24.14	24.08		0
	3	2	24.11	24.16	24.10		0
	3	3	24.10	24.13	24.14		0
	6	0	23.14	23.25	23.19	0-1	1
16QAM	1	0	23.24	23.39	23.32	0-1	1
	1	2	23.67	23.48	23.48		1
	1	5	23.19	23.24	23.44		1
	3	0	23.17	23.31	23.24		1
	3	2	23.19	23.14	23.27		1
	3	3	23.17	23.30	23.28		1
	6	0	22.24	22.16	22.20	0-2	2
64QAM	1	0	22.33	22.26	22.33	0-2	2
	1	2	22.32	22.67	22.31		2
	1	5	22.26	22.38	22.30		2
	3	0	22.15	22.31	22.31		2
	3	2	22.29	22.37	22.31		2
	3	3	22.25	22.31	22.33		2
	6	0	21.27	21.27	21.21	0-3	3

9.3.2 LTE Band 13

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

LTE Band 13 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.22**	0	0
	1	25	23.84		0
	1	49	24.02		0
	25	0	**23.36**	0-1	1
	25	12	23.32		1
	25	25	23.24		1
	50	0	23.30		1
16QAM	1	0	23.47	0-1	1
	1	25	23.01		1
	1	49	23.37		1
	25	0	22.38	0-2	2
	25	12	22.36		2
	25	25	22.29		2
	50	0	22.28		2
64QAM	1	0	22.25	0-2	2
	1	25	22.08		2
	1	49	22.31		2
	25	0	21.36	0-3	3
	25	12	21.27		3
	25	25	21.23		3
	50	0	21.35		3

Table 9-10
LTE Band 13 Conducted Powers - 5 MHz Bandwidth

LTE Band 13 5 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	24.09	0	0
	1	12	24.11		0
	1	24	24.05		0
	12	0	23.28	0-1	1
	12	6	23.24		1
	12	13	23.22		1
	25	0	23.19		1
16QAM	1	0	23.37	0-1	1
	1	12	23.35		1
	1	24	23.29		1
	12	0	22.23	0-2	2
	12	6	22.25		2
	12	13	22.23		2
	25	0	22.18		2
64QAM	1	0	22.36	0-2	2
	1	12	22.34		2
	1	24	22.27		2
	12	0	21.32	0-3	3
	12	6	21.24		3
	12	13	21.15		3
	25	0	21.16		3

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

9.3.3 LTE Band 26 (Cell)

Table 9-11
LTE Band 26 (Cell) Conducted Powers - 15 MHz Bandwidth

LTE Band 26 (Cell) 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 26865 (831.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	24.23	0	0
	1	36	**24.27**		0
	1	74	24.07		0
	36	0	**23.45**	0-1	1
	36	18	23.35		1
	36	37	23.28		1
	75	0	23.35		1
16QAM	1	0	23.52	0-1	1
	1	36	23.53		1
	1	74	23.34		1
	36	0	22.37	0-2	2
	36	18	22.31		2
	36	37	22.23		2
	75	0	22.28		2
64QAM	1	0	22.54	0-2	2
	1	36	22.40		2
	1	74	22.33		2
	36	0	21.40	0-3	3
	36	18	21.36		3
	36	37	21.38		3
	75	0	21.30		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 9-12
LTE Band 26 (Cell) Conducted Powers - 10 MHz Bandwidth

LTE Band 26 (Cell) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26740 (819.0 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 26990 (844.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.79	24.12	24.13	0	0
	1	25	23.78	24.03	23.97		0
	1	49	23.89	23.98	23.48		0
	25	0	22.82	22.96	22.89	0-1	1
	25	12	22.95	23.10	23.05		1
	25	25	22.73	22.88	22.77		1
	50	0	22.79	22.94	22.86		1
16QAM	1	0	22.84	23.21	23.27	0-1	1
	1	25	22.90	23.21	23.13		1
	1	49	23.09	23.16	22.76		1
	25	0	21.80	21.94	21.91	0-2	2
	25	12	21.93	22.10	22.06		2
	25	25	21.68	21.83	21.79		2
	50	0	21.78	21.93	21.85		2
64QAM	1	0	21.91	22.34	22.33	0-2	2
	1	25	22.04	22.33	22.27		2
	1	49	22.24	22.23	22.04		2
	25	0	20.82	20.96	20.88	0-3	3
	25	12	20.98	21.10	21.07		3
	25	25	20.70	20.81	20.76		3
	50	0	20.77	20.81	20.84		3

Table 9-13
LTE Band 26 (Cell) Conducted Powers - 5 MHz Bandwidth

LTE Band 26 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26715 (816.5 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 27015 (846.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.63	23.81	23.77	0	0
	1	12	23.92	24.11	24.02		0
	1	24	23.72	23.82	23.46		0
	12	0	22.90	23.08	23.07	0-1	1
	12	6	23.06	23.16	23.15		1
	12	13	22.96	23.11	23.03		1
	25	0	22.97	23.09	23.01		1
16QAM	1	0	22.77	22.96	23.02	0-1	1
	1	12	23.04	23.30	23.23		1
	1	24	22.83	22.96	22.64		1
	12	0	21.93	22.09	22.03	0-2	2
	12	6	22.05	22.12	22.16		2
	12	13	21.94	22.06	22.02		2
	25	0	21.95	22.05	22.00		2
64QAM	1	0	21.86	22.14	22.11	0-2	2
	1	12	22.18	22.36	22.28		2
	1	24	21.95	22.12	21.80		2
	12	0	20.94	21.12	21.09	0-3	3
	12	6	21.10	21.24	21.21		3
	12	13	20.99	21.15	21.11		3
	25	0	20.96	21.08	21.03		3

Table 9-14
LTE Band 26 (Cell) Conducted Powers - 3 MHz Bandwidth

LTE Band 26 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26705 (815.5 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 27025 (847.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.63	23.98	23.99	0	0
	1	7	23.86	24.08	23.97		0
	1	14	23.85	24.00	23.54		0
	8	0	22.96	23.14	23.08	0-1	1
	8	4	23.01	23.22	23.12		1
	8	7	22.97	23.15	23.04		1
	15	0	23.04	23.16	23.08		1
16QAM	1	0	22.79	23.13	23.14	0-1	1
	1	7	23.07	23.20	23.14		1
	1	14	22.99	23.16	22.71		1
	8	0	21.94	22.12	22.10	0-2	2
	8	4	22.02	22.25	22.13		2
	8	7	21.98	22.13	22.09		2
	15	0	22.01	22.14	22.10		2
64QAM	1	0	21.83	22.30	22.26	0-2	2
	1	7	22.03	22.31	22.23		2
	1	14	22.10	22.26	21.88		2
	8	0	20.96	21.12	21.08	0-3	3
	8	4	21.09	21.21	21.09		3
	8	7	21.03	21.14	21.07		3
	15	0	21.01	21.10	21.08		3

Table 9-15
LTE Band 26 (Cell) Conducted Powers -1.4 MHz Bandwidth

LTE Band 26 (Cell) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26697 (814.7 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 27033 (848.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.63	23.89	23.86	0	0
	1	2	23.78	24.04	23.87		0
	1	5	23.74	23.93	23.53		0
	3	0	23.60	23.92	23.84		0
	3	2	23.72	24.02	23.68		0
	3	3	23.69	23.98	23.54		0
	6	0	22.90	23.05	22.96	0-1	1
16QAM	1	0	22.66	23.08	23.00	0-1	1
	1	2	22.85	23.20	23.03		1
	1	5	22.81	23.10	22.66		1
	3	0	22.68	23.07	22.96		1
	3	2	22.81	23.14	22.87		1
	3	3	22.83	23.07	22.73		1
	6	0	21.91	22.01	21.97	0-2	2
64QAM	1	0	21.76	22.20	22.14	0-2	2
	1	2	21.95	22.33	22.23		2
	1	5	21.93	22.25	21.86		2
	3	0	21.73	22.12	22.00		2
	3	2	21.87	22.20	22.05		2
	3	3	21.86	22.17	21.89		2
	6	0	20.89	21.03	20.95	0-3	3

9.3.4 LTE Band 4 (AWS)

Table 9-16
LTE Band 4 (AWS) Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 4 (AWS) 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20175 (1732.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.10**	0	0
	1	50	23.91		0
	1	99	23.88		0
	50	0	**23.13**	0-1	1
	50	25	23.06		1
	50	50	23.04		1
	100	0	23.08		1
16QAM	1	0	23.40	0-1	1
	1	50	23.23		1
	1	99	23.13		1
	50	0	22.06	0-2	2
	50	25	22.02		2
	50	50	21.93		2
	100	0	22.12		2
64QAM	1	0	22.32	0-2	2
	1	50	22.12		2
	1	99	21.80		2
	50	0	21.08	0-3	3
	50	25	21.01		3
	50	50	20.99		3
	100	0	21.06		3

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

Table 9-17
LTE Band 4 (AWS) Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 4 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20025 (1717.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20325 (1747.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.03	24.05	24.01	0	0
	1	36	23.96	23.99	23.86		0
	1	74	23.94	23.98	23.89		0
	36	0	23.21	23.20	23.09	0-1	1
	36	18	23.19	23.17	23.03		1
	36	37	23.11	23.09	23.02		1
	75	0	23.16	23.19	22.98		1
16QAM	1	0	23.33	23.29	23.33	0-1	1
	1	36	23.31	23.28	23.25		1
	1	74	23.34	23.22	23.21		1
	36	0	22.17	22.18	22.05	0-2	2
	36	18	22.15	22.14	22.05		2
	36	37	22.05	22.02	22.00		2
	75	0	22.10	22.14	22.03		2
64QAM	1	0	22.30	22.43	22.32	0-2	2
	1	36	22.22	22.32	22.22		2
	1	74	22.33	22.22	22.19		2
	36	0	21.34	21.19	21.06	0-3	3
	36	18	21.22	21.13	21.05		3
	36	37	21.08	21.10	21.02		3
	75	0	21.10	21.16	20.99		3

Table 9-18
LTE Band 4 (AWS) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 4 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20000 (1715.0 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20350 (1750.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.94	23.94	23.79	0	0
	1	25	23.77	23.79	23.65		0
	1	49	23.78	23.80	23.66		0
	25	0	22.90	22.98	22.81	0-1	1
	25	12	22.94	22.96	22.83		1
	25	25	22.83	22.92	22.75		1
	50	0	22.86	22.94	22.78		1
16QAM	1	0	23.19	23.23	23.05	0-1	1
	1	25	22.94	23.05	22.92		1
	1	49	23.04	23.14	23.05		1
	25	0	21.90	21.98	21.77	0-2	2
	25	12	21.86	21.90	21.82		2
	25	25	21.84	21.93	21.76		2
	50	0	21.79	21.89	21.74		2
64QAM	1	0	22.19	22.27	22.08	0-2	2
	1	25	21.98	22.07	21.94		2
	1	49	22.06	22.15	21.93		2
	25	0	20.87	20.94	20.88	0-3	3
	25	12	20.86	20.88	20.75		3
	25	25	20.86	20.90	20.71		3
	50	0	20.82	20.89	20.74		3

Table 9-19
LTE Band 4 (AWS) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 4 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 19975 (1712.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20375 (1752.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.75	23.85	23.77	0	0
	1	12	23.85	23.95	23.80		0
	1	24	23.79	23.87	23.71		0
	12	0	22.94	22.95	22.85	0-1	1
	12	6	22.98	23.06	22.91		1
	12	13	22.92	23.00	22.83		1
	25	0	22.94	22.95	22.86		1
16QAM	1	0	23.02	23.22	23.08	0-1	1
	1	12	23.14	23.26	23.05		1
	1	24	23.12	23.25	23.01		1
	12	0	21.91	21.99	21.87	0-2	2
	12	6	22.03	22.09	21.91		2
	12	13	21.93	22.05	21.87		2
	25	0	21.91	21.93	21.80		2
64QAM	1	0	22.02	22.10	21.99	0-2	2
	1	12	22.11	22.22	22.03		2
	1	24	22.03	22.07	21.95		2
	12	0	20.91	20.96	20.85	0-3	3
	12	6	20.96	20.97	20.88		3
	12	13	20.92	20.99	20.87		3
	25	0	20.89	20.90	20.81		3

Table 9-20
LTE Band 4 (AWS) Maximum Conducted Powers - 3 MHz Bandwidth

LTE Band 4 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 19965 (1711.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20385 (1753.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.76	23.97	23.81	0	0
	1	7	23.86	23.95	23.76		0
	1	14	23.84	23.88	23.77		0
	8	0	22.93	23.03	22.89	0-1	1
	8	4	22.98	23.04	22.89		1
	8	7	22.94	22.98	22.87		1
	15	0	22.96	23.01	22.85		1
16QAM	1	0	23.05	23.25	22.99	0-1	1
	1	7	23.07	23.15	22.98		1
	1	14	23.14	23.22	23.11		1
	8	0	21.93	22.11	21.90	0-2	2
	8	4	22.09	22.10	21.96		2
	8	7	22.00	22.05	21.93		2
	15	0	21.91	22.00	21.83		2
64QAM	1	0	21.96	22.06	22.03	0-2	2
	1	7	22.09	22.14	21.97		2
	1	14	22.04	22.18	22.04		2
	8	0	20.95	21.09	20.86	0-3	3
	8	4	21.00	21.05	20.89		3
	8	7	20.98	21.02	20.88		3
	15	0	20.98	21.01	20.85		3

Table 9-21
LTE Band 4 (AWS) Maximum Conducted Powers -1.4 MHz Bandwidth

LTE Band 4 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 19957 (1710.7 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20393 (1754.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.67	23.82	23.67	0	0
	1	2	23.83	23.94	23.78		0
	1	5	23.78	23.79	23.73		0
	3	0	23.69	23.80	23.67		0
	3	2	23.79	23.89	23.70		0
	3	3	23.67	23.76	23.65		0
	6	0	22.89	22.91	22.80	0-1	1
16QAM	1	0	23.01	23.13	22.94	0-1	1
	1	2	23.09	23.20	23.05		1
	1	5	23.00	23.16	22.97		1
	3	0	22.74	22.93	22.75		1
	3	2	22.82	22.97	22.83		1
	3	3	22.82	22.90	22.78		1
	6	0	21.89	21.98	21.75	0-2	2
64QAM	1	0	21.84	22.07	21.92	0-2	2
	1	2	22.05	22.18	21.99		2
	1	5	21.97	22.04	21.94		2
	3	0	21.80	21.93	21.79		2
	3	2	21.84	21.98	21.83		2
	3	3	21.81	21.91	21.80		2
	6	0	20.86	20.96	20.76	0-3	3

Table 9-22
LTE Band 4 (AWS) Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 4 (AWS) 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20175 (1732.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**20.94**	0	0
	1	50	20.75		0
	1	99	20.77		0
	50	0	**20.83**	0-1	0
	50	25	20.78		0
	50	50	20.81		0
	100	0	20.74		0
16QAM	1	0	21.00	0-1	0
	1	50	20.99		0
	1	99	20.90		0
	50	0	20.87	0-2	0
	50	25	20.84		0
	50	50	20.82		0
	100	0	20.84		0
64QAM	1	0	20.98	0-2	0
	1	50	20.91		0
	1	99	20.89		0
	50	0	20.88	0-3	0
	50	25	20.86		0
	50	50	20.78		0
	100	0	20.82		0

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

Table 9-23
LTE Band 4 (AWS) Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 4 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20025 (1717.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20325 (1747.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	20.47	20.63	20.52	0	0
	1	36	20.40	20.54	20.37		0
	1	74	20.46	20.44	20.41		0
	36	0	20.55	20.68	20.52	0-1	0
	36	18	20.58	20.65	20.58		0
	36	37	20.51	20.55	20.47		0
	75	0	20.59	20.68	20.50		0
16QAM	1	0	20.79	20.99	20.80	0-1	0
	1	36	20.82	20.78	20.74		0
	1	74	20.93	20.66	20.71		0
	36	0	20.58	20.67	20.53	0-2	0
	36	18	20.57	20.63	20.50		0
	36	37	20.55	20.54	20.45		0
	75	0	20.54	20.67	20.52		0
64QAM	1	0	20.59	20.81	20.63	0-2	0
	1	36	20.74	20.65	20.49		0
	1	74	20.76	20.60	20.51		0
	36	0	20.48	20.76	20.51	0-3	0
	36	18	20.59	20.63	20.52		0
	36	37	20.37	20.54	20.48		0
	75	0	20.57	20.61	20.51		0

Table 9-24
LTE Band 4 (AWS) Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 4 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 20000 (1715.0 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20350 (1750.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	20.39	20.45	20.24	0	0
	1	25	20.28	20.37	20.26		0
	1	49	20.24	20.31	20.14		0
	25	0	20.43	20.46	20.41	0-1	0
	25	12	20.46	20.48	20.38		0
	25	25	20.41	20.42	20.36		0
	50	0	20.41	20.49	20.37		0
16QAM	1	0	20.64	20.76	20.52	0-1	0
	1	25	20.60	20.68	20.54		0
	1	49	20.65	20.63	20.43		0
	25	0	20.45	20.43	20.32	0-2	0
	25	12	20.41	20.47	20.36		0
	25	25	20.38	20.43	20.31		0
	50	0	20.41	20.43	20.32		0
64QAM	1	0	20.53	20.61	20.39	0-2	0
	1	25	20.53	20.55	20.38		0
	1	49	20.38	20.41	20.47		0
	25	0	20.42	20.49	20.38	0-3	0
	25	12	20.47	20.49	20.36		0
	25	25	20.39	20.44	20.31		0
	50	0	20.42	20.48	20.34		0

Table 9-25
LTE Band 4 (AWS) Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 4 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 19975 (1712.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20375 (1752.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	20.26	20.39	20.25	0	0
	1	12	20.34	20.40	20.28		0
	1	24	20.29	20.39	20.19		0
	12	0	20.41	20.44	20.43	0-1	0
	12	6	20.52	20.58	20.41		0
	12	13	20.40	20.48	20.46		0
	25	0	20.49	20.46	20.45		0
16QAM	1	0	20.46	20.32	20.27	0-1	0
	1	12	20.65	20.65	20.60		0
	1	24	20.58	20.60	20.32		0
	12	0	20.43	20.45	20.50	0-2	0
	12	6	20.59	20.61	20.35		0
	12	13	20.47	20.52	20.39		0
	25	0	20.50	20.46	20.42		0
64QAM	1	0	20.42	20.80	20.50	0-2	0
	1	12	20.42	20.78	20.48		0
	1	24	20.46	20.29	20.45		0
	12	0	20.36	20.47	20.37	0-3	0
	12	6	20.54	20.57	20.38		0
	12	13	20.41	20.53	20.39		0
	25	0	20.44	20.46	20.41		0

Table 9-26
LTE Band 4 (AWS) Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 4 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 19965 (1711.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20385 (1753.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	20.30	20.34	20.34	0	0
	1	7	20.32	20.52	20.29		0
	1	14	20.36	20.49	20.31		0
	8	0	20.45	20.35	20.32	0-1	0
	8	4	20.48	20.53	20.30		0
	8	7	20.48	20.49	20.33		0
	15	0	20.51	20.48	20.35		0
16QAM	1	0	20.55	20.66	20.44	0-1	0
	1	7	20.30	20.52	20.41		0
	1	14	20.67	20.43	20.61		0
	8	0	20.51	20.47	20.32	0-2	0
	8	4	20.57	20.54	20.53		0
	8	7	20.53	20.62	20.43		0
	15	0	20.48	20.48	20.47		0
64QAM	1	0	20.55	20.61	20.54	0-2	0
	1	7	20.56	20.74	20.43		0
	1	14	20.56	20.82	20.66		0
	8	0	20.57	20.23	20.43	0-3	0
	8	4	20.49	20.48	20.42		0
	8	7	20.48	20.50	20.50		0
	15	0	20.49	20.52	20.45		0

Table 9-27
LTE Band 4 (AWS) Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 4 (AWS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 19957 (1710.7 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20393 (1754.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	20.24	20.31	20.23	0	0
	1	2	20.35	20.40	20.31		0
	1	5	20.27	20.40	20.23		0
	3	0	20.30	20.35	20.18		0
	3	2	20.33	20.44	20.22		0
	3	3	20.21	20.35	20.27		0
	6	0	20.39	20.48	20.48	0-1	0
16QAM	1	0	20.55	20.52	20.60	0-1	0
	1	2	20.51	20.62	20.57		0
	1	5	20.57	20.62	20.54		0
	3	0	20.39	20.46	20.35		0
	3	2	20.42	20.54	20.40		0
	3	3	20.41	20.46	20.31		0
	6	0	20.51	20.48	20.44	0-2	0
64QAM	1	0	20.36	20.59	20.51	0-2	0
	1	2	20.51	20.65	20.55		0
	1	5	20.46	20.53	20.36		0
	3	0	20.43	20.51	20.55		0
	3	2	20.52	20.57	20.38		0
	3	3	20.42	20.52	20.17		0
	6	0	20.39	20.46	20.32	0-3	0

9.3.5 LTE Band 25 (PCS)

Table 9-28
LTE Band 25 (PCS) Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26140 (1860.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26590 (1905.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.46	**23.62**	23.50	0	0
	1	50	23.13	23.28	23.17		0
	1	99	23.47	23.46	23.45		0
	50	0	22.63	**22.86**	22.67	0-1	1
	50	25	22.55	22.69	22.53		1
	50	50	22.50	22.67	22.52		1
	100	0	22.52	22.72	22.59		1
16QAM	1	0	22.85	22.82	22.81	0-1	1
	1	50	22.20	22.47	22.54		1
	1	99	22.82	22.79	22.75		1
	50	0	21.63	21.80	21.65	0-2	2
	50	25	21.56	21.72	21.58		2
	50	50	21.50	21.63	21.51		2
	100	0	21.54	21.75	21.59		2
64QAM	1	0	21.81	21.95	21.77	0-2	2
	1	50	21.25	21.50	21.27		2
	1	99	21.73	21.81	21.62		2
	50	0	20.61	20.82	20.64	0-3	3
	50	25	20.53	20.65	20.59		3
	50	50	20.41	20.68	20.51		3
	100	0	20.55	20.77	20.48		3

Table 9-29
LTE Band 25 (PCS) Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26115 (1857.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26615 (1907.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.54	23.96	23.83	0	0
	1	36	23.75	23.92	23.72		0
	1	74	23.37	23.84	23.70		0
	36	0	22.81	23.04	22.81	0-1	1
	36	18	22.93	22.88	22.91		1
	36	37	22.75	22.81	22.77		1
	75	0	22.79	22.91	22.82		1
16QAM	1	0	22.65	23.25	23.06	0-1	1
	1	36	22.88	23.15	22.97		1
	1	74	22.61	23.05	22.96		1
	36	0	21.81	21.90	21.86	0-2	2
	36	18	21.88	21.86	21.91		2
	36	37	21.75	21.81	21.74		2
	75	0	21.83	21.85	21.87		2
64QAM	1	0	22.03	22.45	22.24	0-2	2
	1	36	22.34	22.43	22.22		2
	1	74	21.94	22.41	22.23		2
	36	0	20.78	20.83	20.78	0-3	3
	36	18	20.88	20.94	20.90		3
	36	37	20.74	20.79	20.79		3
	75	0	20.65	20.88	20.76		3

Table 9-30
LTE Band 25 (PCS) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26090 (1855.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26640 (1910.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.00	23.10	23.58	0	0
	1	25	23.57	23.50	23.53		0
	1	49	23.25	23.00	23.56		0
	25	0	22.53	22.53	22.49	0-1	1
	25	12	22.66	22.70	22.66		1
	25	25	22.42	22.62	22.41		1
	50	0	22.44	22.48	22.46		1
16QAM	1	0	22.51	22.48	23.00	0-1	1
	1	25	22.77	23.00	22.85		1
	1	49	22.37	22.38	22.88		1
	25	0	21.55	21.56	21.57	0-2	2
	25	12	21.73	21.75	21.72		2
	25	25	21.48	21.49	21.53		2
	50	0	21.49	21.50	21.55		2
64QAM	1	0	21.36	21.73	21.98	0-2	2
	1	25	21.34	21.64	21.89		2
	1	49	21.32	21.59	21.95		2
	25	0	20.51	20.64	20.39	0-3	3
	25	12	20.68	20.81	20.61		3
	25	25	20.47	20.58	20.39		3
	50	0	20.44	20.52	20.40		3

Table 9-31
LTE Band 25 (PCS) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26065 (1852.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26665 (1912.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.58	23.38	23.70	0	0
	1	12	23.77	23.67	23.72		0
	1	24	23.52	23.45	23.76		0
	12	0	22.77	22.66	22.70	0-1	1
	12	6	22.83	22.74	22.76		1
	12	13	22.73	22.71	22.73		1
	25	0	22.70	22.66	22.66		1
16QAM	1	0	22.96	22.61	22.96	0-1	1
	1	12	23.13	22.89	22.94		1
	1	24	22.88	22.66	23.05		1
	12	0	21.79	21.70	21.72	0-2	2
	12	6	21.83	21.76	21.78		2
	12	13	21.75	21.73	21.72		2
	25	0	21.76	21.69	21.73		2
64QAM	1	0	21.57	21.74	21.57	0-2	2
	1	12	21.77	22.02	21.66		2
	1	24	21.52	21.74	21.64		2
	12	0	20.68	20.68	20.53	0-3	3
	12	6	20.72	20.77	20.67		3
	12	13	20.67	20.73	20.55		3
	25	0	20.70	20.61	20.59		3

Table 9-32
LTE Band 25 (PCS) Maximum Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26055 (1851.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26675 (1913.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.64	23.62	23.60	0	0
	1	7	23.68	23.63	23.65		0
	1	14	23.60	23.63	23.58		0
	8	0	22.78	22.71	22.79	0-1	1
	8	4	22.79	22.74	22.83		1
	8	7	22.76	22.73	22.76		1
	15	0	22.81	22.70	22.79		1
16QAM	1	0	22.81	23.16	22.97	0-1	1
	1	7	22.86	23.20	23.00		1
	1	14	22.77	23.13	22.93		1
	8	0	21.76	21.85	21.86	0-2	2
	8	4	21.80	21.84	21.83		2
	8	7	21.73	21.84	21.80		2
	15	0	21.82	21.76	21.83		2
64QAM	1	0	21.55	21.78	21.42	0-2	2
	1	7	21.59	21.88	21.48		2
	1	14	21.52	21.82	21.44		2
	8	0	20.64	20.66	20.71	0-3	3
	8	4	20.67	20.75	20.76		3
	8	7	20.63	20.68	20.69		3
	15	0	20.73	20.64	20.74		3

Table 9-33
LTE Band 25 (PCS) Maximum Conducted Powers -1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26047 (1850.7 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26683 (1914.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	23.64	23.71	23.55	0	0
	1	2	23.75	23.80	23.68		0
	1	5	23.63	23.70	23.57		0
	3	0	23.73	23.69	23.74		0
	3	2	23.79	23.75	23.79		0
	3	3	23.77	23.66	23.67		0
	6	0	22.73	22.66	22.79	0-1	1
16QAM	1	0	22.84	22.59	22.95	0-1	1
	1	2	22.94	22.66	23.01		1
	1	5	22.82	22.63	22.94		1
	3	0	22.78	22.75	22.65		1
	3	2	22.85	22.80	22.70		1
	3	3	22.76	22.74	22.67		1
	6	0	21.83	21.88	21.85	0-2	2
64QAM	1	0	21.95	21.45	21.46	0-2	2
	1	2	22.09	21.52	21.53		2
	1	5	21.91	21.41	21.49		2
	3	0	21.66	21.67	21.51		2
	3	2	21.67	21.73	21.58		2
	3	3	21.64	21.70	21.53		2
	6	0	20.57	20.52	20.53	0-3	3

Table 9-34
LTE Band 25 (PCS) Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26140 (1860.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26590 (1905.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.72	**19.73**	19.54	0	0
	1	50	19.15	19.45	18.89		0
	1	99	19.58	19.71	19.36		0
	50	0	19.75	**19.79**	19.66	0-1	0
	50	25	19.75	19.71	19.60		0
	50	50	19.69	19.75	19.60		0
	100	0	19.63	19.72	19.62		0
16QAM	1	0	20.00	19.97	19.69	0-1	0
	1	50	19.50	19.46	19.30		0
	1	99	19.92	19.92	19.85		0
	50	0	19.66	19.75	19.63	0-2	0
	50	25	19.75	19.71	19.62		0
	50	50	19.71	19.68	19.58		0
	100	0	19.67	19.75	19.59		0
64QAM	1	0	19.69	19.84	19.69	0-2	0
	1	50	19.24	19.32	19.38		0
	1	99	19.76	19.62	19.63		0
	50	0	19.52	19.66	19.55	0-3	0
	50	25	19.51	19.59	19.52		0
	50	50	19.42	19.51	19.48		0
	100	0	19.43	19.60	19.51		0

Table 9-35
LTE Band 25 (PCS) Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26115 (1857.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26615 (1907.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.68	19.62	19.64	0	0
	1	36	19.52	19.55	19.45		0
	1	74	19.53	19.56	19.58		0
	36	0	19.71	19.79	19.75	0-1	0
	36	18	19.68	19.74	19.68		0
	36	37	19.65	19.75	19.69		0
	75	0	19.68	19.76	19.73		0
16QAM	1	0	19.82	19.75	19.66	0-1	0
	1	36	19.65	19.62	19.63		0
	1	74	19.62	19.58	19.64		0
	36	0	19.66	19.72	19.73	0-2	0
	36	18	19.64	19.71	19.68		0
	36	37	19.60	19.70	19.66		0
	75	0	19.63	19.71	19.70		0
64QAM	1	0	19.94	19.90	19.87	0-2	0
	1	36	19.74	19.78	19.75		0
	1	74	19.74	19.73	19.81		0
	36	0	19.70	19.75	19.73	0-3	0
	36	18	19.65	19.77	19.75		0
	36	37	19.63	19.68	19.73		0
	75	0	19.64	19.71	19.75		0

Table 9-36
LTE Band 25 (PCS) Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26090 (1855.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26640 (1910.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.44	19.53	19.44	0	0
	1	25	19.42	19.47	19.01		0
	1	49	19.36	19.43	19.39		0
	25	0	19.55	19.60	19.57	0-1	0
	25	12	19.52	19.57	19.55		0
	25	25	19.50	19.56	19.57		0
	50	0	19.55	19.59	19.58		0
16QAM	1	0	19.53	19.58	19.47	0-1	0
	1	25	19.51	19.55	19.07		0
	1	49	19.44	19.45	19.45		0
	25	0	19.51	19.59	19.52	0-2	0
	25	12	19.49	19.56	19.53		0
	25	25	19.44	19.54	19.50		0
	50	0	19.47	19.56	19.53		0
64QAM	1	0	19.73	19.76	19.69	0-2	0
	1	25	19.66	19.69	19.32		0
	1	49	19.55	19.63	19.63		0
	25	0	19.46	19.61	19.56	0-3	0
	25	12	19.50	19.60	19.57		0
	25	25	19.47	19.59	19.51		0
	50	0	19.51	19.60	19.56		0

Table 9-37
LTE Band 25 (PCS) Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26065 (1852.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26665 (1912.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.44	19.41	19.46	0	0
	1	12	19.50	19.51	19.49		0
	1	24	19.42	19.46	19.50		0
	12	0	19.60	19.57	19.55	0-1	0
	12	6	19.62	19.62	19.58		0
	12	13	19.56	19.61	19.60		0
	25	0	19.61	19.56	19.55		0
16QAM	1	0	19.54	19.55	19.51	0-1	0
	1	12	19.61	19.61	19.57		0
	1	24	19.51	19.52	19.53		0
	12	0	19.56	19.54	19.52	0-2	0
	12	6	19.57	19.58	19.55		0
	12	13	19.53	19.61	19.56		0
	25	0	19.54	19.53	19.52		0
64QAM	1	0	19.69	19.66	19.68	0-2	0
	1	12	19.74	19.72	19.72		0
	1	24	19.63	19.65	19.70		0
	12	0	19.57	19.66	19.61	0-3	0
	12	6	19.66	19.65	19.65		0
	12	13	19.61	19.64	19.67		0
	25	0	19.58	19.57	19.56		0

Table 9-38
LTE Band 25 (PCS) Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26055 (1851.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26675 (1913.5 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.50	19.47	19.59	0	0
	1	7	19.51	19.49	19.51		0
	1	14	19.50	19.51	19.53		0
	8	0	19.59	19.57	19.54	0-1	0
	8	4	19.64	19.59	19.66		0
	8	7	19.58	19.59	19.68		0
	15	0	19.69	19.62	19.59		0
16QAM	1	0	19.65	19.59	19.70	0-1	0
	1	7	19.66	19.61	19.69		0
	1	14	19.63	19.67	19.69		0
	8	0	19.57	19.59	19.71	0-2	0
	8	4	19.58	19.64	19.67		0
	8	7	19.61	19.67	19.68		0
	15	0	19.63	19.62	19.71		0
64QAM	1	0	19.77	19.74	19.85	0-2	0
	1	7	19.80	19.77	19.82		0
	1	14	19.75	19.78	19.79		0
	8	0	19.57	19.61	19.68	0-3	0
	8	4	19.63	19.63	19.76		0
	8	7	19.61	19.67	19.71		0
	15	0	19.65	19.62	19.72		0

Table 9-39
LTE Band 25 (PCS) Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26047 (1850.7 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26683 (1914.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	19.44	19.52	19.48	0	0
	1	2	19.53	19.52	19.53		0
	1	5	19.43	19.43	19.51		0
	3	0	19.44	19.48	19.49		0
	3	2	19.48	19.51	19.51		0
	3	3	19.41	19.46	19.47		0
	6	0	19.58	19.61	19.61	0-1	0
16QAM	1	0	19.56	19.59	19.61	0-1	0
	1	2	19.64	19.61	19.64		0
	1	5	19.59	19.53	19.61		0
	3	0	19.58	19.54	19.57		0
	3	2	19.62	19.58	19.66		0
	3	3	19.49	19.56	19.59		0
	6	0	19.51	19.57	19.56	0-2	0
64QAM	1	0	19.72	19.71	19.76	0-2	0
	1	2	19.79	19.75	19.80		0
	1	5	19.74	19.68	19.75		0
	3	0	19.62	19.60	19.65		0
	3	2	19.68	19.67	19.69		0
	3	3	19.59	19.59	19.68		0
	6	0	19.53	19.57	19.53	0-3	0

9.3.6 LTE Band 41

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

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.89	23.90	23.09	23.16	23.02	0	0
	1	50	23.84	23.89	23.65	23.70	23.46		0
	1	99	**23.91**	23.88	23.01	23.05	23.00		0
	50	0	22.96	22.91	22.75	22.77	22.58	0-1	1
	50	25	**23.13**	23.08	22.89	22.92	22.66		1
	50	50	22.90	22.85	22.67	22.65	22.39		1
	100	0	22.87	22.87	22.70	22.71	22.45		1
16QAM	1	0	23.25	23.41	22.39	22.43	22.18	0-1	1
	1	50	23.12	23.34	22.87	22.89	22.74		1
	1	99	23.17	23.33	22.16	22.13	21.95		1
	50	0	21.95	21.93	21.76	21.78	21.58	0-2	2
	50	25	22.03	22.09	21.88	21.90	21.64		2
	50	50	21.81	21.83	21.63	21.63	21.41		2
	100	0	21.85	21.86	21.68	21.69	21.45		2
64QAM	1	0	21.80	21.96	20.97	21.03	20.98	0-2	2
	1	50	21.74	21.87	21.54	21.55	21.33		2
	1	99	21.78	21.85	20.95	20.93	20.77		2
	50	0	20.88	20.91	20.79	20.79	20.61	0-3	3
	50	25	21.03	21.07	20.86	20.89	20.65		3
	50	50	20.81	20.82	20.64	20.63	20.40		3
	100	0	20.85	20.90	20.71	20.71	20.48		3

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

LTE Band 41 15 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.35	23.73	23.49	23.86	23.65	0	0
	1	36	24.22	24.05	23.79	24.08	23.89		0
	1	74	24.24	23.63	23.41	23.67	23.48		0
	36	0	23.35	23.11	22.93	23.20	22.96	0-1	1
	36	18	23.45	23.22	22.92	23.27	23.05		1
	36	37	23.29	23.06	22.90	23.11	22.91		1
	75	0	23.34	23.12	22.93	23.15	22.94		1
16QAM	1	0	23.34	22.79	22.48	22.74	22.58	0-1	1
	1	36	23.20	23.05	22.73	23.00	22.82		1
	1	74	23.17	22.67	22.37	22.58	22.38		1
	36	0	22.27	22.03	21.85	22.04	21.89	0-2	2
	36	18	22.36	22.14	21.96	22.19	21.95		2
	36	37	22.24	22.00	21.83	22.05	21.82		2
	75	0	22.31	22.09	21.92	22.13	21.91		2
64QAM	1	0	22.20	21.66	21.32	21.61	21.43	0-2	2
	1	36	22.06	21.94	21.63	21.83	21.66		2
	1	74	22.04	21.55	21.27	21.42	21.26		2
	36	0	21.35	21.13	20.92	21.22	20.96	0-3	3
	36	18	21.41	21.20	21.04	21.10	21.03		3
	36	37	21.29	21.07	20.90	21.23	20.88		3
	75	0	21.32	21.09	20.94	21.11	20.93		3

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

LTE Band 41 10 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.09	23.18	23.11	23.31	23.12	0	0
	1	25	23.97	23.87	23.90	24.10	23.90		0
	1	49	24.01	23.07	23.14	23.23	23.02		0
	25	0	23.04	22.83	22.72	22.90	22.70	0-1	1
	25	12	23.22	23.03	22.92	23.08	22.88		1
	25	25	22.97	22.79	22.69	22.84	22.63		1
	50	0	23.05	22.85	22.75	22.90	22.70		1
16QAM	1	0	23.04	22.29	22.10	22.27	22.01	0-1	1
	1	25	23.02	22.98	22.82	22.99	22.78		1
	1	49	22.98	22.24	22.03	22.15	22.00		1
	25	0	22.08	21.85	21.75	21.90	21.72	0-2	2
	25	12	22.26	22.06	21.97	22.09	21.89		2
	25	25	22.01	21.81	21.73	21.84	21.65		2
	50	0	22.02	21.83	21.75	21.87	21.70		2
64QAM	1	0	21.96	21.11	21.26	21.11	20.98	0-2	2
	1	25	21.92	21.88	21.50	21.87	21.65		2
	1	49	21.87	21.07	21.13	21.71	21.05		2
	25	0	21.00	20.80	20.66	20.81	20.64	0-3	3
	25	12	21.17	20.97	20.88	21.02	20.84		3
	25	25	20.94	20.73	20.64	20.77	20.60		3
	50	0	20.84	20.86	20.76	20.91	20.74		3

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

LTE Band 41 5 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.32	24.01	23.76	24.05	23.85	0	0
	1	12	24.31	24.23	24.02	24.25	24.08		0
	1	24	24.28	23.88	23.79	23.96	23.86		0
	12	0	23.37	23.27	23.01	23.20	23.07	0-1	1
	12	6	23.49	23.39	22.96	23.34	23.16		1
	12	13	23.31	23.26	23.18	23.25	23.07		1
	25	0	23.33	23.23	23.05	23.20	23.06		1
16QAM	1	0	23.40	23.19	22.80	23.03	22.86	0-1	1
	1	12	23.42	23.34	22.94	23.25	23.07		1
	1	24	23.31	23.04	22.79	23.06	22.87		1
	12	0	22.29	22.19	21.96	22.12	22.08	0-2	2
	12	6	22.33	22.24	22.03	22.18	22.03		2
	12	13	22.23	22.13	21.97	22.10	21.98		2
	25	0	22.39	22.33	22.12	22.23	22.12		2
64QAM	1	0	22.07	21.85	21.53	21.67	21.65	0-2	2
	1	12	22.02	22.03	21.73	21.92	21.83		2
	1	24	22.00	21.82	21.58	21.72	21.57		2
	12	0	21.38	21.19	20.90	21.26	21.17	0-3	3
	12	6	21.45	21.24	21.14	21.24	21.09		3
	12	13	21.34	21.25	20.99	21.15	21.04		3
	25	0	21.34	21.22	20.96	21.27	21.01		3

Table 9-44
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	**21.62**	21.03	20.88	21.20	20.88	0	0
	1	50	21.25	20.85	20.90	21.00	20.92		0
	1	99	21.16	20.93	20.91	20.98	21.07		0
	50	0	21.45	21.06	20.90	21.16	21.10	0-1	0
	50	25	**21.51**	21.02	20.96	21.00	21.05		0
	50	50	21.47	21.05	20.94	20.87	21.06		0
	100	0	21.49	21.00	20.94	21.04	21.00		0
16QAM	1	0	21.70	21.45	21.02	21.11	20.98	0-1	0
	1	50	21.56	21.14	20.97	20.96	20.96		0
	1	99	21.62	21.17	20.93	20.77	21.16		0
	50	0	21.81	21.31	21.25	21.36	21.22	0-2	0
	50	25	21.83	21.33	21.25	21.29	21.25		0
	50	50	21.82	21.32	21.23	21.22	21.30		0
	100	0	21.84	21.30	21.25	21.31	21.27		0
64QAM	1	0	21.43	21.01	20.74	20.90	20.75	0-2	0
	1	50	21.32	20.83	20.72	20.71	20.74		0
	1	99	21.31	20.89	20.68	20.49	20.89		0
	50	0	21.46	20.94	20.88	20.85	20.94	0-3	0.5
	50	25	21.47	20.96	20.89	20.94	20.95		0.5
	50	50	21.38	20.82	20.79	20.85	20.97		0.5
	100	0	21.44	20.89	20.84	20.87	20.91		0.5

Table 9-45
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	21.64	21.12	21.19	21.20	21.05	0	0
	1	36	21.68	21.02	20.95	21.22	21.05		0
	1	74	21.52	21.09	20.98	20.96	21.27		0
	36	0	21.76	21.28	21.18	21.33	21.19	0-1	0
	36	18	21.85	21.31	21.19	21.27	21.31		0
	36	37	21.72	21.27	21.17	21.18	21.26		0
	75	0	21.81	21.26	21.23	21.24	21.26		0
16QAM	1	0	21.71	21.20	21.03	21.25	20.92	0-1	0
	1	36	21.60	21.16	20.95	21.02	21.01		0
	1	74	21.65	21.14	20.95	20.81	21.08		0
	36	0	21.68	21.20	21.07	21.22	21.13	0-2	0
	36	18	21.72	21.16	21.11	21.22	21.17		0
	36	37	21.73	21.15	21.15	21.14	21.19		0
	75	0	21.80	21.25	21.20	21.28	21.25		0
64QAM	1	0	21.45	20.94	20.77	20.92	20.75	0-2	0
	1	36	21.33	21.00	20.76	20.62	20.94		0
	1	74	21.35	20.77	20.78	20.66	20.90		0
	36	0	21.35	20.81	20.72	21.12	20.88	0-3	0.5
	36	18	21.38	20.95	20.82	20.90	20.86		0.5
	36	37	21.39	20.83	20.78	20.82	20.88		0.5
	75	0	21.44	20.89	20.81	20.91	20.88		0.5

Table 9-46
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	20.95	20.98	20.92	21.00	21.08	0	0
	1	25	20.94	21.05	20.95	21.05	21.10		0
	1	49	20.89	20.95	20.85	20.96	20.91		0
	25	0	21.11	21.22	21.08	21.19	21.25	0-1	0
	25	12	21.13	21.21	21.11	21.16	21.19		0
	25	25	21.05	21.15	21.04	21.11	21.15		0
	50	0	21.12	21.24	21.12	21.17	21.15		0
16QAM	1	0	20.95	21.18	21.02	21.03	21.09	0-1	0
	1	25	20.93	21.10	20.92	20.96	21.02		0
	1	49	20.84	21.11	20.89	20.94	20.94		0
	25	0	21.14	21.19	21.13	21.21	21.30	0-2	0
	25	12	21.06	21.22	21.07	21.25	21.23		0
	25	25	21.04	21.19	21.09	21.08	21.17		0
	50	0	21.10	21.25	21.14	21.18	20.75		0
64QAM	1	0	20.71	20.88	20.98	20.72	20.77	0-2	0
	1	25	20.48	20.87	20.91	20.69	20.62		0
	1	49	20.59	20.83	20.96	20.60	20.79		0
	25	0	20.69	20.65	21.10	20.82	20.76	0-3	0.5
	25	12	20.67	20.77	21.13	20.72	20.61		0.5
	25	25	20.63	20.77	21.06	20.69	20.70		0.5
	50	0	20.75	20.87	21.07	20.82	20.81		0.5

Table 9-47
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	20.94	21.08	20.91	21.05	21.04	0	0
	1	12	20.95	21.10	20.90	21.08	21.05		0
	1	24	20.98	20.98	20.95	21.07	21.10		0
	12	0	20.99	21.23	21.03	21.24	21.13	0-1	0
	12	6	21.11	21.21	21.11	21.18	21.14		0
	12	13	21.14	21.20	21.10	21.16	21.19		0
	25	0	21.12	21.25	21.10	21.19	21.15		0
16QAM	1	0	21.01	21.29	21.13	21.15	21.11	0-1	0
	1	12	20.98	21.25	20.97	21.03	21.07		0
	1	24	21.03	21.14	20.96	21.09	21.10		0
	12	0	21.02	21.16	20.96	21.01	21.08	0-2	0
	12	6	21.06	21.18	21.02	21.07	21.07		0
	12	13	21.03	21.41	21.01	21.12	21.15		0
	25	0	21.14	21.00	21.11	21.32	21.13		0
64QAM	1	0	20.66	20.99	20.68	20.82	20.78	0-2	0
	1	12	20.73	20.94	20.68	20.76	20.80		0
	1	24	20.74	20.95	20.76	20.86	20.84		0
	12	0	20.57	20.77	20.56	20.78	20.65	0-3	0.5
	12	6	20.62	20.81	20.63	20.77	20.70		0.5
	12	13	20.67	20.76	20.66	20.71	20.72		0.5
	25	0	20.70	20.86	20.69	20.80	20.72		0.5

9.3.7 LTE Uplink Carrier Aggregation Conducted Powers

Table 9-48
LTE Band 41 Maximum Uplink Carrier Aggregation Conducted Powers

	PCC							SCC							Power	
Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	LTE Tx.Power with UL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41C (1)	LTE B41	20	39750	2506.0	QPSK	1	99	LTE B41	20	39948	2525.8	QPSK	1	0	24.23	23.91

Table 9-49
LTE Band 41 Reduced Uplink Carrier Aggregation Conducted Powers

	PCC							SCC							Power	
Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL/DL) Channel	PCC (UL/DL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	SCC Band	SCC Bandwidth [MHz]	SCC (UL/DL) Channel	SCC (UL/DL) Frequency [MHz]	Modulation	SCC UL# RB	SCC UL RB Offset	LTE Tx.Power with UL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41C (1)	LTE B41	20	40185	2549.5	QPSK	50	0	LTE B41	20	39987	2529.7	QPSK	50	50	20.98	21.06

Notes:

1. This device supports uplink carrier aggregation for LTE CA_41C (1) with a maximum of two 20 MHz component carriers. For intraband contiguous carrier aggregation scenarios, 3GPP 36.101 Table 6.2.2A-1 specifies that the aggregate maximum allowed output power is equivalent to the single carrier scenario. 3GPP 36.101 6.2.3A allows for several dB of MPR to be applied when non-contiguous RB allocation is implemented. The conducted powers and MPR settings in this device are permanently implemented per the above 3GPP requirements.
2. Per FCC Guidance, the output power with uplink CA active was measured for the configuration with the highest reported SAR with single carrier for each exposure condition. The power was measured with wideband signal integration over both component carriers.

Figure 9-3
Power Measurement Setup

9.4 WLAN Conducted Powers

Table 9-50
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	802.11ax
		Average	Average	Average	Average
2412	1	20.39	18.23	18.09	14.88
2417	2	N/A	N/A	N/A	17.79
2437	6	20.29	18.14	18.03	17.73
2457	10	N/A	17.98	17.84	17.99
2462	11	**20.45**	15.77	15.73	13.33

Table 9-51
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	802.11ax
		Average	Average	Average	Average
2412	1	18.50	17.63	17.51	14.75
2417	2	N/A	N/A	N/A	17.10
2437	6	18.55	18.43	18.12	17.77
2457	10	N/A	17.91	18.38	17.48
2462	11	**18.69**	15.89	15.86	13.38

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

2.4GHz 802.11n Conducted Power [dBm]			
Freq [MHz]	Channel	ANT1	ANT2
2412	1	**16.43**	**16.66**
2437	6	16.53	16.41
2457	10	16.35	16.48
2462	11	15.89	15.86

Table 9-53
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	802.11ax
		Average	Average	Average	Average
5180	36	15.08	15.17	15.11	14.66
5200	40	18.43	18.11	18.11	17.90
5220	44	18.41	18.03	18.03	17.93
5240	48	18.45	18.15	18.13	17.89
5260	52	18.23	18.33	18.34	17.77
5280	56	**18.37**	18.46	18.46	17.89
5300	60	18.36	18.45	18.47	17.98
5320	64	16.79	16.75	16.87	15.73
5500	100	18.28	18.21	18.13	17.28
5600	120	18.30	18.42	18.49	17.98
5620	124	18.21	18.46	18.41	17.90
5720	144	**18.36**	18.49	18.48	17.74
5745	149	18.06	18.11	18.18	17.85
5785	157	**18.18**	18.26	18.17	17.94
5825	165	17.91	18.48	18.14	17.96

Table 9-54
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	802.11ax
		Average	Average	Average	Average
5180	36	15.25	15.35	15.20	14.68
5200	40	18.21	18.16	18.15	17.98
5220	44	18.25	18.27	18.31	17.89
5240	48	18.37	18.26	18.26	17.81
5260	52	18.24	18.22	18.21	17.61
5280	56	18.27	18.34	18.33	17.72
5300	60	**18.47**	18.43	18.39	17.74
5320	64	16.78	16.77	16.72	15.98
5500	100	18.19	18.43	18.11	17.12
5600	120	18.15	18.32	18.27	17.62
5620	124	18.39	18.29	18.25	17.65
5720	144	**18.44**	18.39	18.42	17.61
5745	149	18.20	18.25	18.18	17.91
5785	157	**18.38**	18.23	18.09	17.93
5825	165	18.21	18.26	18.14	17.98

Table 9-55
2.4 GHz WLAN Reduced Average RF Power – Ant 1

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	16.60	16.57	16.43
2437	6	16.61	16.45	16.53
2457	10	N/A	16.20	16.35
2462	11	**16.77**	15.77	15.89

Table 9-56
2.4 GHz WLAN Reduced Average RF Power – Ant 2

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	16.43	16.70	16.66
2437	6	16.43	16.59	16.41
2457	10	N/A	16.91	16.48
2462	11	**16.73**	15.89	15.86

Table 9-57
2.4 GHz WLAN Reduced Average RF Power - MIMO

2.4GHz 802.11n Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
2412	1	**16.43**	**16.66**	19.56
2437	6	16.53	16.41	19.48
2457	10	16.35	16.48	19.43
2462	11	15.89	15.86	18.89

Table 9-58
Reduced 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	13.82	13.50
2437	6	**13.81**	**13.74**
2462	11	13.53	13.73

Table 9-59
5 GHz WLAN Reduced Average RF Power – Ant 1

5GHz (40MHz) Conducted Power [dBm]			5GHz (80MHz) Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode	Freq [MHz]	Channel	IEEE Transmission Mode
		802.11n			802.11ac
		Average			Average
5190	38	12.71	5530	106	12.11
5230	46	13.79	5610	122	**13.98**
5270	54	13.88	5690	138	13.91
5310	62	**13.98**	5775	155	**13.77**

Table 9-60
5 GHz WLAN Reduced Average RF Power – Ant 2

5GHz (40MHz) Conducted Power [dBm]			5GHz (80MHz) Conducted Power [dBm]		
Freq [MHz]	Channel	IEEE Transmission Mode	Freq [MHz]	Channel	IEEE Transmission Mode
		802.11n			802.11ac
		Average			Average
5190	38	12.98	5530	106	12.41
5230	46	13.87	5610	122	**13.97**
5270	54	13.68	5690	138	13.94
5310	62	**13.80**	5775	155	**13.51**

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

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

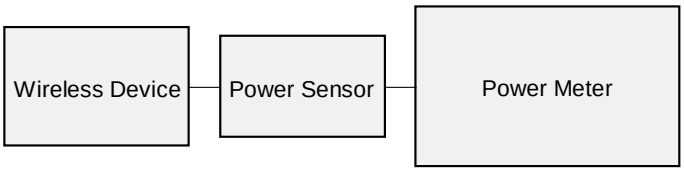

Figure 9-4
Power Measurement Setup

9.5 Bluetooth Conducted Powers

Table 9-61
Bluetooth Average RF Power

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	17.53	56.584
2441	1.0	39	**18.35**	68.376
2480	1.0	78	17.36	54.451
2402	2.0	0	11.71	14.818
2441	2.0	39	11.90	15.487
2480	2.0	78	11.87	15.385
2402	3.0	0	11.54	14.260
2441	3.0	39	11.99	15.816
2480	3.0	78	11.92	15.545

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

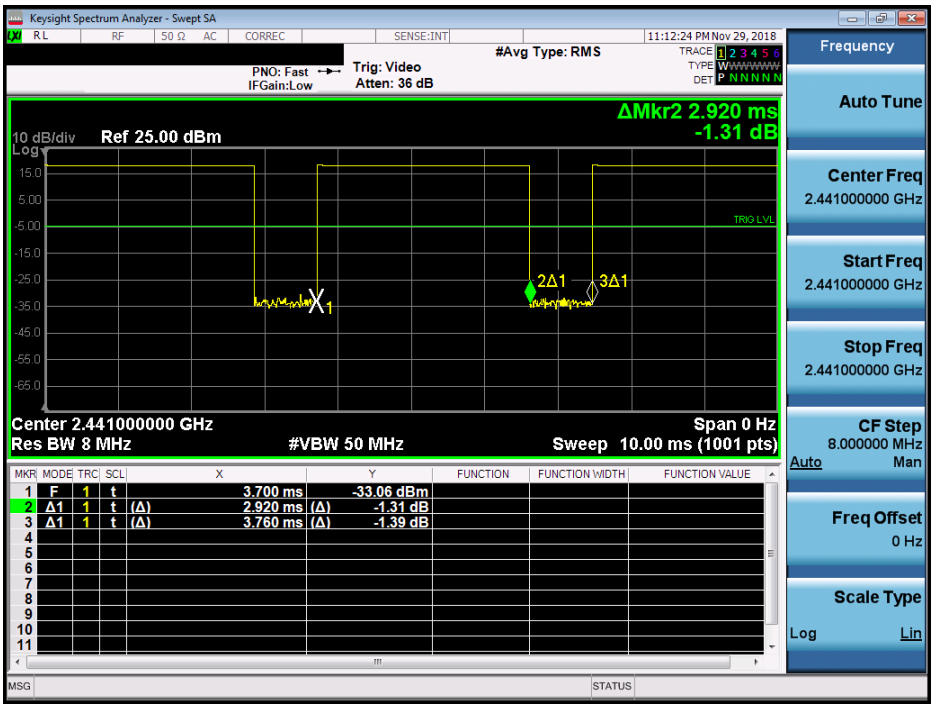

Figure 9-5
Bluetooth Transmission Plot

Equation 9-1
Bluetooth Duty Cycle Calculation

$$\boldsymbol{Duty\ Cycle} = \frac{\boldsymbol{Pulse\ Width}}{\boldsymbol{Period}} * \mathbf{100\%} = \frac{\mathbf{2.92}\boldsymbol{ms}}{\mathbf{3.76}\boldsymbol{ms}} * \mathbf{100\%} = \mathbf{77.7\%}$$

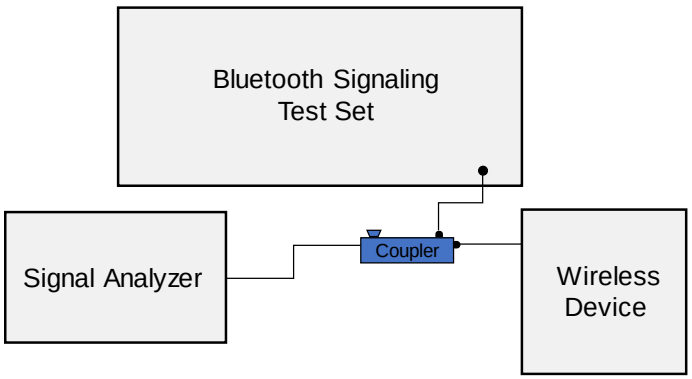

Figure 9-6
Power Measurement Setup

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
12/26/2018	750H	20.8	740	0.903	41.205	0.893	41.994	1.12%	-1.88%
			755	0.908	41.156	0.894	41.916	1.57%	-1.81%
			770	0.914	41.103	0.895	41.838	2.12%	-1.76%
			785	0.920	41.048	0.896	41.760	2.68%	-1.70%
			800	0.925	40.998	0.897	41.682	3.12%	-1.64%
1/14/2019	750H	21.6	700	0.886	42.796	0.889	42.201	-0.34%	1.41%
			710	0.889	42.750	0.890	42.149	-0.11%	1.43%
			725	0.895	42.714	0.891	42.071	0.45%	1.53%
			740	0.901	42.672	0.893	41.994	0.90%	1.61%
			755	0.907	42.628	0.894	41.916	1.45%	1.70%
12/24/2018	835H	20.6	820	0.884	40.725	0.899	41.578	-1.67%	-2.05%
			835	0.899	40.516	0.900	41.500	-0.11%	-2.37%
			850	0.914	40.317	0.916	41.500	-0.22%	-2.85%
12/25/2018	1750H	20.8	1710	1.356	39.031	1.348	40.142	0.59%	-2.77%
			1750	1.382	38.985	1.371	40.079	0.80%	-2.73%
			1790	1.405	38.885	1.394	40.016	0.79%	-2.83%
12/19/2018	1900H	21.5	1850	1.389	40.286	1.400	40.000	-0.79%	0.72%
			1880	1.419	40.172	1.400	40.000	1.36%	0.43%
			1910	1.450	40.036	1.400	40.000	3.57%	0.09%
12/14/2018	2450H	22.9	2400	1.792	38.414	1.756	39.289	2.05%	-2.23%
			2450	1.848	38.214	1.800	39.200	2.67%	-2.52%
			2500	1.906	38.032	1.855	39.136	2.75%	-2.82%
			2550	1.959	37.840	1.909	39.073	2.62%	-3.16%
12/17/2018	2450H	22.7	2400	1.805	38.467	1.756	39.289	2.79%	-2.09%
			2450	1.862	38.272	1.800	39.200	3.44%	-2.37%
			2500	1.914	38.094	1.855	39.136	3.18%	-2.66%
1/7/2019	2450H	20.8	2400	1.791	40.178	1.756	39.289	1.99%	2.26%
			2450	1.829	40.103	1.800	39.200	1.61%	2.30%
			2500	1.869	40.009	1.855	39.136	0.75%	2.23%
			2550	1.907	39.929	1.909	39.073	-0.10%	2.19%
12/09/2018	5200H-5800H	20.8	5240	4.565	35.120	4.696	35.940	-2.79%	-2.28%
			5260	4.578	35.058	4.717	35.917	-2.95%	-2.39%
			5280	4.620	35.021	4.737	35.894	-2.47%	-2.43%
			5300	4.639	35.016	4.758	35.871	-2.50%	-2.38%
			5320	4.640	34.974	4.778	35.849	-2.89%	-2.44%
			5500	4.847	34.791	4.963	35.643	-2.34%	-2.39%
			5520	4.865	34.759	4.983	35.620	-2.37%	-2.42%
			5540	4.879	34.709	5.004	35.597	-2.50%	-2.49%
			5560	4.907	34.683	5.024	35.574	-2.33%	-2.50%
			5580	4.938	34.674	5.045	35.551	-2.12%	-2.47%
			5600	4.951	34.651	5.065	35.529	-2.25%	-2.47%
			5620	4.963	34.590	5.086	35.506	-2.42%	-2.58%
			5640	4.989	34.538	5.106	35.483	-2.29%	-2.66%
			5660	4.996	34.523	5.127	35.460	-2.56%	-2.64%
			5680	5.018	34.510	5.147	35.437	-2.51%	-2.62%
			5700	5.051	34.460	5.168	35.414	-2.26%	-2.69%
			5745	5.085	34.353	5.214	35.363	-2.47%	-2.86%
			5765	5.117	34.349	5.234	35.340	-2.24%	-2.80%
			5785	5.140	34.336	5.255	35.317	-2.19%	-2.78%
			5800	5.147	34.287	5.270	35.300	-2.33%	-2.87%
			5805	5.153	34.270	5.275	35.294	-2.31%	-2.90%
			5825	5.182	34.259	5.296	35.271	-2.15%	-2.87%

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
12/21/2018	750B	20.9	700	0.938	54.466	0.959	55.726	-2.19%	-2.26%
			710	0.940	54.606	0.960	55.687	-2.08%	-1.94%
			740	0.950	54.428	0.963	55.570	-1.35%	-2.06%
			755	0.959	54.339	0.964	55.512	-0.52%	-2.11%
			770	0.965	54.305	0.965	55.453	0.00%	-2.07%
			785	0.969	54.197	0.966	55.395	0.31%	-2.16%
12/26/2018	835B	19.1	820	0.959	53.645	0.969	55.258	-1.03%	-2.92%
			835	0.965	53.598	0.970	55.200	-0.52%	-2.90%
			850	0.972	53.536	0.988	55.154	-1.62%	-2.93%
1/2/2019	1750B	21.5	1710	1.464	52.622	1.463	53.537	0.07%	-1.71%
			1750	1.512	52.517	1.488	53.432	1.61%	-1.71%
			1790	1.556	52.347	1.514	53.326	2.77%	-1.84%
12/17/2018	1900B	21.3	1850	1.518	53.609	1.520	53.300	-0.13%	0.58%
			1880	1.552	53.508	1.520	53.300	2.11%	0.39%
			1910	1.587	53.377	1.520	53.300	4.41%	0.14%
1/10/2019	1900B	22.5	1850	1.513	53.481	1.520	53.300	-0.46%	0.34%
			1880	1.550	53.385	1.520	53.300	1.97%	0.16%
			1910	1.588	53.273	1.520	53.300	4.47%	-0.05%
12/30/2018	2450B	23.8	2400	1.953	50.822	1.902	52.767	2.68%	-3.69%
			2450	2.007	50.738	1.950	52.700	2.92%	-3.72%
			2500	2.073	50.562	2.021	52.636	2.57%	-3.94%
			2550	2.126	50.475	2.092	52.573	1.63%	-3.99%
1/2/2019	2450B	23.0	2400	1.988	51.197	1.902	52.767	4.52%	-2.98%
			2450	2.043	51.083	1.950	52.700	4.77%	-3.07%
			2500	2.099	50.917	2.021	52.636	3.86%	-3.27%
			2550	2.161	50.776	2.092	52.573	3.30%	-3.42%
			2600	2.222	50.633	2.163	52.509	2.73%	-3.57%
			2650	2.282	50.486	2.234	52.445	2.15%	-3.74%
			2700	2.340	50.321	2.305	52.382	1.52%	-3.93%
1/2/2019	2450B	23.1	2400	1.941	52.795	1.902	52.767	2.05%	0.05%
			2450	2.011	52.581	1.950	52.700	3.13%	-0.23%
			2500	2.083	52.400	2.021	52.636	3.07%	-0.45%
			2550	2.149	52.249	2.092	52.573	2.72%	-0.62%
			2600	2.224	51.993	2.163	52.509	2.82%	-0.98%
			2650	2.281	51.865	2.234	52.445	2.10%	-1.11%
			2700	2.354	51.637	2.305	52.382	2.13%	-1.42%
01/10/2019	2450B	23.4	2400	1.980	51.430	1.902	52.767	4.10%	-2.53%
			2450	2.045	51.331	1.950	52.700	4.87%	-2.60%
			2500	2.103	51.148	2.021	52.636	4.06%	-2.83%
			2550	2.157	51.005	2.092	52.573	3.11%	-2.98%
12/26/2018	5200B-5800B	21.9	5240	5.403	47.944	5.346	48.960	1.07%	-2.08%
			5260	5.439	47.943	5.369	48.933	1.30%	-2.02%
			5280	5.466	47.832	5.393	48.906	1.35%	-2.20%
			5300	5.490	47.824	5.416	48.879	1.37%	-2.16%
			5320	5.519	47.811	5.439	48.851	1.47%	-2.13%
			5500	5.789	47.465	5.650	48.607	2.46%	-2.35%
			5520	5.807	47.430	5.673	48.580	2.36%	-2.37%
			5540	5.851	47.372	5.696	48.553	2.72%	-2.43%
			5560	5.877	47.365	5.720	48.526	2.74%	-2.39%
			5580	5.909	47.298	5.743	48.499	2.89%	-2.48%
			5600	5.939	47.285	5.766	48.471	3.00%	-2.45%
			5620	5.959	47.254	5.790	48.444	2.92%	-2.46%
			5640	5.989	47.225	5.813	48.417	3.03%	-2.46%
			5660	6.032	47.158	5.837	48.390	3.34%	-2.55%
			5680	6.071	47.118	5.860	48.363	3.60%	-2.57%
			5700	6.085	47.116	5.883	48.336	3.43%	-2.52%
			5745	6.147	47.016	5.936	48.275	3.55%	-2.61%
			5765	6.176	46.990	5.959	48.248	3.64%	-2.61%
			5785	6.219	46.931	5.982	48.220	3.96%	-2.67%
			5800	6.241	46.875	6.000	48.200	4.02%	-2.75%
			5805	6.243	46.872	6.006	48.193	3.95%	-2.74%
			5825	6.274	46.853	6.029	48.166	4.06%	-2.73%

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

10.2 Test System Verification

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

Table 10-3
System Verification Results – 1g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
M	750	HEAD	12/26/2018	22.5	19.8	0.200	1003	3287	1.670	8.280	8.350	0.85%
D	750	HEAD	01/14/2019	22.4	21.6	0.200	1003	7357	1.750	8.280	8.750	5.68%
G	835	HEAD	12/24/2018	21.5	20.6	0.200	4d047	7410	1.980	9.470	9.900	4.54%
M	1750	HEAD	12/25/2018	19.8	19.8	0.100	1148	3287	3.660	36.400	36.600	0.55%
H	1900	HEAD	12/19/2018	21.6	21.5	0.100	5d080	7409	4.110	39.800	41.100	3.27%
G	2450	HEAD	12/14/2018	22.0	22.0	0.100	981	7410	5.410	52.300	54.100	3.44%
G	2450	HEAD	12/17/2018	21.9	22.0	0.100	981	7410	5.250	52.300	52.500	0.38%
G	2450	HEAD	01/07/2019	21.7	20.8	0.100	981	7410	5.210	52.300	52.100	-0.38%
G	2600	HEAD	12/14/2018	22.0	22.0	0.100	1004	7410	5.880	55.900	58.800	5.19%
H	5250	HEAD	12/09/2018	21.1	20.9	0.050	1191	7409	3.700	78.900	74.000	-6.21%
H	5600	HEAD	12/09/2018	21.1	20.9	0.050	1191	7409	4.050	83.600	81.000	-3.11%
H	5750	HEAD	12/09/2018	21.1	20.9	0.050	1191	7409	3.820	79.100	76.400	-3.41%
I	750	BODY	12/21/2018	21.3	20.8	0.200	1054	7406	1.710	8.610	8.550	-0.70%
J	835	BODY	12/26/2018	19.9	19.1	0.200	4d133	3347	1.960	9.750	9.800	0.51%
D	1750	BODY	01/02/2019	22.3	21.5	0.100	1150	7357	3.710	36.600	37.100	1.37%
E	1900	BODY	12/17/2018	21.6	21.3	0.100	5d149	3332	3.840	39.400	38.400	-2.54%
M	1900	BODY	01/10/2019	23.0	20.8	0.100	5d148	3287	4.260	39.600	42.600	7.58%
K	2450	BODY	12/30/2018	21.9	22.5	0.100	797	3319	5.150	51.100	51.500	0.78%
K	2450	BODY	01/02/2019	22.1	22.6	0.100	981	3319	5.070	50.900	50.700	-0.39%
J	2450	BODY	01/02/2019	21.7	21.9	0.100	719	3347	4.940	50.100	49.400	-1.40%
K	2450	BODY	01/10/2019	22.7	21.7	0.100	719	3319	5.310	50.100	53.100	5.99%
K	2600	BODY	01/02/2019	22.1	22.6	0.100	1004	3319	5.640	54.800	56.400	2.92%
L	5250	BODY	12/26/2018	21.3	21.5	0.050	1191	7308	3.600	77.000	72.000	-6.49%
L	5600	BODY	12/26/2018	21.3	21.5	0.050	1191	7308	3.890	79.200	77.800	-1.77%
L	5750	BODY	12/26/2018	21.3	21.5	0.050	1191	7308	3.470	76.100	69.400	-8.80%

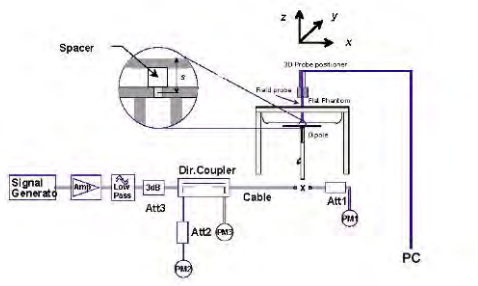

Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
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	34.0	32.22	-0.07	Right	Cheek	0539M	1:8.3	0.130	1.507	0.196	A1
836.60	190	GSM 850	GSM	34.0	32.22	0.13	Right	Tilt	0539M	1:8.3	0.063	1.507	0.095	
836.60	190	GSM 850	GSM	34.0	32.22	0.16	Left	Cheek	0539M	1:8.3	0.107	1.507	0.161	
836.60	190	GSM 850	GSM	34.0	32.22	-0.03	Left	Tilt	0539M	1:8.3	0.071	1.507	0.107	
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	31.0	30.04	0.10	Right	Cheek	0509M	1:8.3	0.092	1.247	0.115	
1880.00	661	GSM 1900	GSM	31.0	30.04	0.12	Right	Tilt	0509M	1:8.3	0.031	1.247	0.039	
1880.00	661	GSM 1900	GSM	31.0	30.04	0.01	Left	Cheek	0509M	1:8.3	0.146	1.247	0.182	A2
1880.00	661	GSM 1900	GSM	31.0	30.04	0.12	Left	Tilt	0509M	1:8.3	0.041	1.247	0.051	
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	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	25.5	24.35	0.01	Right	Cheek	0509M	1:1	0.198	1.303	0.258	A3
836.60	4183	UMTS 850	RMC	25.5	24.35	0.03	Right	Tilt	0509M	1:1	0.096	1.303	0.125	
836.60	4183	UMTS 850	RMC	25.5	24.35	0.04	Left	Cheek	0509M	1:1	0.140	1.303	0.182	
836.60	4183	UMTS 850	RMC	25.5	24.35	-0.01	Left	Tilt	0509M	1:1	0.095	1.303	0.124	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-4
UMTS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	24.5	23.83	0.12	Right	Cheek	0509M	1:1	0.149	1.167	0.174	
1880.00	9400	UMTS 1900	RMC	24.5	23.83	0.02	Right	Tilt	0509M	1:1	0.064	1.167	0.075	
1880.00	9400	UMTS 1900	RMC	24.5	23.83	0.07	Left	Cheek	0509M	1:1	0.217	1.167	0.253	A4
1880.00	9400	UMTS 1900	RMC	24.5	23.83	-0.08	Left	Tilt	0509M	1:1	0.063	1.167	0.074	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-5
LTE Band 12 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	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	2	25.5	24.29	0.02	0	Right	Cheek	QPSK	1	0	0554M	1:1	0.149	1.321	0.197	A5
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	0.05	1	Right	Cheek	QPSK	25	0	0554M	1:1	0.112	1.303	0.146	
707.50	23095	Mid	LTE Band 12	10	2	25.5	24.29	0.05	0	Right	Tilt	QPSK	1	0	0554M	1:1	0.097	1.321	0.128	
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	0.14	1	Right	Tilt	QPSK	25	0	0554M	1:1	0.078	1.303	0.102	
707.50	23095	Mid	LTE Band 12	10	2	25.5	24.29	0.07	0	Left	Cheek	QPSK	1	0	0554M	1:1	0.146	1.321	0.193	
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	0.08	1	Left	Cheek	QPSK	25	0	0554M	1:1	0.120	1.303	0.156	
707.50	23095	Mid	LTE Band 12	10	2	25.5	24.29	-0.09	0	Left	Tilt	QPSK	1	0	0554M	1:1	0.111	1.321	0.147	
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	0.07	1	Left	Tilt	QPSK	25	0	0554M	1:1	0.088	1.303	0.115	
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 13 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	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	8	25.0	24.22	0.06	0	Right	Cheek	QPSK	1	0	0509M	1:1	0.145	1.197	0.174	A6
782.00	23230	Mid	LTE Band 13	10	8	24.0	23.36	0.04	1	Right	Cheek	QPSK	25	0	0509M	1:1	0.115	1.159	0.133	
782.00	23230	Mid	LTE Band 13	10	8	25.0	24.22	0.00	0	Right	Tilt	QPSK	1	0	0509M	1:1	0.118	1.197	0.141	
782.00	23230	Mid	LTE Band 13	10	8	24.0	23.36	0.04	1	Right	Tilt	QPSK	25	0	0509M	1:1	0.092	1.159	0.107	
782.00	23230	Mid	LTE Band 13	10	8	25.0	24.22	0.19	0	Left	Cheek	QPSK	1	0	0509M	1:1	0.098	1.197	0.117	
782.00	23230	Mid	LTE Band 13	10	8	24.0	23.36	0.08	1	Left	Cheek	QPSK	25	0	0509M	1:1	0.082	1.159	0.095	
782.00	23230	Mid	LTE Band 13	10	8	25.0	24.22	-0.02	0	Left	Tilt	QPSK	1	0	0509M	1:1	0.115	1.197	0.138	
782.00	23230	Mid	LTE Band 13	10	8	24.0	23.36	0.12	1	Left	Tilt	QPSK	25	0	0509M	1:1	0.081	1.159	0.094	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram											

Table 11-7
LTE Band 26 (Cell) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	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	3	25.5	24.27	-0.05	0	Right	Cheek	QPSK	1	36	0509M	1:1	0.139	1.327	0.184	A7
831.50	26865	Mid	LTE Band 26 (Cell)	15	3	24.5	23.45	0.03	1	Right	Cheek	QPSK	36	0	0509M	1:1	0.118	1.274	0.150	
831.50	26865	Mid	LTE Band 26 (Cell)	15	3	25.5	24.27	0.13	0	Right	Tilt	QPSK	1	36	0509M	1:1	0.091	1.327	0.121	
831.50	26865	Mid	LTE Band 26 (Cell)	15	3	24.5	23.45	-0.03	1	Right	Tilt	QPSK	36	0	0509M	1:1	0.081	1.274	0.103	
831.50	26865	Mid	LTE Band 26 (Cell)	15	3	25.5	24.27	0.14	0	Left	Cheek	QPSK	1	36	0509M	1:1	0.107	1.327	0.142	
831.50	26865	Mid	LTE Band 26 (Cell)	15	3	24.5	23.45	-0.01	1	Left	Cheek	QPSK	36	0	0509M	1:1	0.089	1.274	0.113	
831.50	26865	Mid	LTE Band 26 (Cell)	15	3	25.5	24.27	0.02	0	Left	Tilt	QPSK	1	36	0509M	1:1	0.098	1.327	0.130	
831.50	26865	Mid	LTE Band 26 (Cell)	15	3	24.5	23.45	0.11	1	Left	Tilt	QPSK	36	0	0509M	1:1	0.083	1.274	0.106	
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 4 (AWS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	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)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	25.0	24.10	0.13	0	Right	Cheek	QPSK	1	0	0509M	1:1	0.136	1.230	0.167	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	24.0	23.13	0.00	1	Right	Cheek	QPSK	50	0	0509M	1:1	0.130	1.222	0.159	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	25.0	24.10	0.07	0	Right	Tilt	QPSK	1	0	0509M	1:1	0.107	1.230	0.132	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	24.0	23.13	0.05	1	Right	Tilt	QPSK	50	0	0509M	1:1	0.082	1.222	0.100	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	25.0	24.10	0.12	0	Left	Cheek	QPSK	1	0	0509M	1:1	0.272	1.230	**0.335**	A8
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	24.0	23.13	0.02	1	Left	Cheek	QPSK	50	0	0509M	1:1	0.227	1.222	0.277	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	25.0	24.10	0.05	0	Left	Tilt	QPSK	1	0	0509M	1:1	0.097	1.230	0.119	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	24.0	23.13	-0.01	1	Left	Tilt	QPSK	50	0	0509M	1:1	0.091	1.222	0.111	
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 25 (PCS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	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)	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	24.5	23.62	0.16	0	Right	Cheek	QPSK	1	0	0509M	1:1	0.141	1.225	0.173	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	23.5	22.86	0.06	1	Right	Cheek	QPSK	50	0	0509M	1:1	0.123	1.159	0.143	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	24.5	23.62	0.12	0	Right	Tilt	QPSK	1	0	0509M	1:1	0.062	1.225	0.076	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	23.5	22.86	0.05	1	Right	Tilt	QPSK	50	0	0509M	1:1	0.054	1.159	0.063	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	24.5	23.62	0.05	0	Left	Cheek	QPSK	1	0	0509M	1:1	0.252	1.225	0.309	A9
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	23.5	22.86	0.01	1	Left	Cheek	QPSK	50	0	0509M	1:1	0.189	1.159	0.219	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	24.5	23.62	0.01	0	Left	Tilt	QPSK	1	0	0509M	1:1	0.061	1.225	0.075	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	23.5	22.86	-0.11	1	Left	Tilt	QPSK	50	0	0509M	1:1	0.048	1.159	0.056	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population															Head 1.6 W/kg (mW/g) averaged over 1 gram					

Table 11-10
LTE Band 41 Head SAR

MEASUREMENT RESULTS																							
1 CC Uplink | 2 CC Uplink	Component Carrier	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)	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	25.0	23.91	-0.06	0	Right	Cheek	QPSK	1	99	0509M	1:1.58	0.089	1.285	0.114	A10
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	24.0	23.13	0.19	1	Right	Cheek	QPSK	50	25	0509M	1:1.58	0.079	1.222	0.097	
2 CC Uplink	PCC	2506.00	39750	Low	LTE Band 41	20	25.0	24.23	0.05	0	Right	Cheek	QPSK	1	99	0509M	1:1.58	0.088	1.194	0.105	
	SCC	2525.80	39948			20								1	0						
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	25.0	23.91	0.19	0	Right	Tilt	QPSK	1	99	0509M	1:1.58	0.078	1.285	0.100	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	24.0	23.13	0.12	1	Right	Tilt	QPSK	50	25	0509M	1:1.58	0.066	1.222	0.081	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	25.0	23.91	0.14	0	Left	Cheek	QPSK	1	99	0509M	1:1.58	0.073	1.285	0.094	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	24.0	23.13	0.09	1	Left	Cheek	QPSK	50	25	0509M	1:1.58	0.064	1.222	0.078	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	25.0	23.91	0.12	0	Left	Tilt	QPSK	1	99	0509M	1:1.58	0.047	1.285	0.060	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	24.0	23.13	0.16	1	Left	Tilt	QPSK	50	25	0509M	1:1.58	0.038	1.222	0.046	
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
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)	
2412	1	802.11b	DSSS	22	17.0	16.60	0.12	Right	Cheek	1	0591M	1	99.9	1.480	0.856	1.096	1.001	0.939	
2437	6	802.11b	DSSS	22	17.0	16.61	0.07	Right	Cheek	1	0591M	1	99.9	1.402	0.803	1.094	1.001	0.879	
2462	11	802.11b	DSSS	22	17.0	16.77	0.13	Right	Cheek	1	0591M	1	99.9	1.666	1.040	1.054	1.001	**1.097**	
2412	1	802.11b	DSSS	22	17.0	16.60	0.13	Right	Tilt	1	0591M	1	99.9	1.065	0.691	1.096	1.001	0.758	
2437	6	802.11b	DSSS	22	17.0	16.61	0.13	Right	Tilt	1	0591M	1	99.9	1.200	0.775	1.094	1.001	0.849	
2462	11	802.11b	DSSS	22	17.0	16.77	0.05	Right	Tilt	1	0591M	1	99.9	1.542	0.992	1.054	1.001	1.047	
2462	11	802.11b	DSSS	22	17.0	16.77	0.08	Left	Cheek	1	0591M	1	99.9	0.394	0.285	1.054	1.001	0.301	
2462	11	802.11b	DSSS	22	17.0	16.77	-0.01	Left	Tilt	1	0591M	1	99.9	0.413	0.285	1.054	1.001	0.301	
2462	11	802.11b	DSSS	22	17.0	16.73	0.13	Right	Cheek	2	0591M	1	99.9	0.327	0.281	1.064	1.001	0.299	
2462	11	802.11b	DSSS	22	17.0	16.73	0.04	Right	Tilt	2	0591M	1	99.9	0.365	0.323	1.064	1.001	0.344	
2462	11	802.11b	DSSS	22	17.0	16.73	0.16	Left	Cheek	2	0591M	1	99.9	0.138	0.115	1.064	1.001	0.122	
2462	11	802.11b	DSSS	22	17.0	16.73	0.16	Left	Tilt	2	0591M	1	99.9	0.228	-	1.064	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 11-12
2.4 GHz WLAN 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)			(W/kg)	
2437	6	802.11n	OFDM	20	14.0	13.81	14.0	13.74	0.18	Right	Cheek	MIMO	0591M	13	97.3	0.618	0.418	1.062	1.028	0.456	
2437	6	802.11n	OFDM	20	14.0	13.81	14.0	13.74	0.12	Right	Tilt	MIMO	0591M	13	97.3	0.531	0.390	1.062	1.028	0.426	
2437	6	802.11n	OFDM	20	14.0	13.81	14.0	13.74	0.17	Left	Cheek	MIMO	0591M	13	97.3	0.237	-	1.062	1.028	-	
2437	6	802.11n	OFDM	20	14.0	13.81	14.0	13.74	-0.13	Left	Tilt	MIMO	0591M	13	97.3	0.240	-	1.062	1.028	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Head 1.6 W/kg (mW/g) averaged over 1 gram										

Note: 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.

Table 11-13
DTS MIMO Head 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)			(W/kg)	
2412	1	802.11n	OFDM	20	17.0	16.43	17.0	16.66	0.12	Right	Cheek	MIMO	0591M	13	97.3	1.138	0.699	1.140	1.028	0.819	
2437	6	802.11n	OFDM	20	17.0	16.53	17.0	16.41	0.12	Right	Cheek	MIMO	0591M	13	97.3	1.520	0.876	1.146	1.028	1.032	
2457	10	802.11n	OFDM	20	17.0	16.35	17.0	16.48	0.12	Right	Cheek	MIMO	0591M	13	97.3	1.519	1.020	1.161	1.028	1.217	
2412	1	802.11n	OFDM	20	17.0	16.43	17.0	16.66	0.15	Right	Tilt	MIMO	0591M	13	97.3	0.851	0.582	1.140	1.028	0.682	
2437	6	802.11n	OFDM	20	17.0	16.53	17.0	16.41	-0.12	Right	Tilt	MIMO	0591M	13	97.3	0.952	0.674	1.146	1.028	0.794	
2457	10	802.11n	OFDM	20	17.0	16.35	17.0	16.48	0.13	Right	Tilt	MIMO	0591M	13	97.3	1.436	1.060	1.161	1.028	1.265	A11
2412	1	802.11n	OFDM	20	17.0	16.43	17.0	16.66	0.18	Left	Cheek	MIMO	0591M	13	97.3	0.343	0.239	1.140	1.028	0.280	
2412	1	802.11n	OFDM	20	17.0	16.43	17.0	16.66	-0.19	Left	Tilt	MIMO	0591M	13	97.3	0.332	-	1.140	1.028	-	
2457	10	802.11n	OFDM	20	17.0	16.35	17.0	16.48	0.11	Right	Tilt	MIMO	0591M	13	97.3	1.525	1.050	1.161	1.028	1.253	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram											

Note1: Blue entry represents variability measurement.
Note2: To achieve the 20.0 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 17.0 dBm.

Table 11-14
NII Head SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	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)	
5310	62	802.11n	OFDM	40	14.0	13.98	-0.15	Right	Cheek	1	0509M	13.5	97.2	0.278	0.143	1.005	1.029	0.148	
5310	62	802.11n	OFDM	40	14.0	13.98	0.16	Right	Tilt	1	0509M	13.5	97.2	0.218	-	1.005	1.029	-	
5310	62	802.11n	OFDM	40	14.0	13.98	0.12	Left	Cheek	1	0509M	13.5	97.2	0.080	-	1.005	1.029	-	
5310	62	802.11n	OFDM	40	14.0	13.98	0.14	Left	Tilt	1	0509M	13.5	97.2	0.110	-	1.005	1.029	-	
5310	62	802.11n	OFDM	40	14.0	13.80	0.04	Right	Cheek	2	0509M	13.5	97.2	0.049	0.016	1.047	1.029	0.017	
5310	62	802.11n	OFDM	40	14.0	13.80	0.14	Right	Tilt	2	0509M	13.5	97.2	0.040	-	1.047	1.029	-	
5310	62	802.11n	OFDM	40	14.0	13.80	0.19	Left	Cheek	2	0509M	13.5	97.2	0.026	-	1.047	1.029	-	
5310	62	802.11n	OFDM	40	14.0	13.80	0.12	Left	Tilt	2	0509M	13.5	97.2	0.040	-	1.047	1.029	-	
5610	122	802.11ac	OFDM	80	14.0	13.98	0.11	Right	Cheek	1	0509M	29.3	94.4	0.353	0.124	1.005	1.059	0.132	
5610	122	802.11ac	OFDM	80	14.0	13.98	0.11	Right	Tilt	1	0509M	29.3	94.4	0.268	-	1.005	1.059	-	
5610	122	802.11ac	OFDM	80	14.0	13.98	0.19	Left	Cheek	1	0509M	29.3	94.4	0.092	-	1.005	1.059	-	
5610	122	802.11ac	OFDM	80	14.0	13.98	0.19	Left	Tilt	1	0509M	29.3	94.4	0.088	-	1.005	1.059	-	
5610	122	802.11ac	OFDM	80	14.0	13.97	-0.11	Right	Cheek	2	0509M	29.3	94.5	0.025	-	1.007	1.058	-	
5610	122	802.11ac	OFDM	80	14.0	13.97	0.16	Right	Tilt	2	0509M	29.3	94.5	0.032	-	1.007	1.058	-	
5610	122	802.11ac	OFDM	80	14.0	13.97	0.19	Left	Cheek	2	0509M	29.3	94.5	0.027	-	1.007	1.058	-	
5610	122	802.11ac	OFDM	80	14.0	13.97	0.19	Left	Tilt	2	0509M	29.3	94.5	0.039	0.015	1.007	1.058	0.016	
5775	155	802.11ac	OFDM	80	14.0	13.77	-0.14	Right	Cheek	1	0509M	29.3	94.4	0.352	0.186	1.054	1.059	**0.208**	A12
5775	155	802.11ac	OFDM	80	14.0	13.77	-0.17	Right	Tilt	1	0509M	29.3	94.4	0.346	-	1.054	1.059	-	
5775	155	802.11ac	OFDM	80	14.0	13.77	-0.11	Left	Cheek	1	0509M	29.3	94.4	0.118	-	1.054	1.059	-	
5775	155	802.11ac	OFDM	80	14.0	13.77	0.18	Left	Tilt	1	0509M	29.3	94.4	0.120	-	1.054	1.059	-	
5775	155	802.11ac	OFDM	80	14.0	13.51	-0.13	Right	Cheek	2	0509M	29.3	94.5	0.038	-	1.119	1.058	-	
5775	155	802.11ac	OFDM	80	14.0	13.51	0.19	Right	Tilt	2	0509M	29.3	94.5	0.046	-	1.119	1.058	-	
5775	155	802.11ac	OFDM	80	14.0	13.51	0.19	Left	Cheek	2	0509M	29.3	94.5	0.043	-	1.119	1.058	-	
5775	155	802.11ac	OFDM	80	14.0	13.51	0.17	Left	Tilt	2	0509M	29.3	94.5	0.053	0.028	1.119	1.058	0.033	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-15
DSS Head SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2402.00	0	Bluetooth	FHSS	18.5	17.53	-0.04	Right	Cheek	0591M	1	77.7	0.559	1.250	1.287	0.899	
2441.00	39	Bluetooth	FHSS	18.5	18.35	0.17	Right	Cheek	0591M	1	77.7	0.783	1.035	1.287	1.043	A13
2480.00	78	Bluetooth	FHSS	18.5	17.36	-0.05	Right	Cheek	0591M	1	77.7	0.613	1.300	1.287	1.026	
2402.00	0	Bluetooth	FHSS	18.5	17.53	0.02	Right	Tilt	0591M	1	77.7	0.435	1.250	1.287	0.700	
2441.00	39	Bluetooth	FHSS	18.5	18.35	0.01	Right	Tilt	0591M	1	77.7	0.608	1.035	1.287	0.810	
2480.00	78	Bluetooth	FHSS	18.5	17.36	0.13	Right	Tilt	0591M	1	77.7	0.663	1.300	1.287	**1.109**	
2441.00	39	Bluetooth	FHSS	18.5	18.35	0.01	Left	Cheek	0591M	1	77.7	0.332	1.035	1.287	0.442	
2441.00	39	Bluetooth	FHSS	18.5	18.35	-0.12	Left	Tilt	0591M	1	77.7	0.249	1.035	1.287	0.332	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**							**Head** **1.6 W/kg (mW/g)** averaged over 1 gram									

11.2 Standalone Body-Worn SAR Data

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

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	34.0	32.22	-0.03	15 mm	0509M	1	1:8.3	back	0.212	1.507	0.319	A14
1880.00	661	GSM 1900	GSM	31.0	30.04	-0.12	15 mm	0612M	1	1:8.3	back	0.463	1.247	0.577	A16
836.60	4183	UMTS 850	RMC	25.5	24.35	0.01	15 mm	0509M	N/A	1:1	back	0.328	1.303	0.427	A18
1852.40	9262	UMTS 1900	RMC	24.5	23.47	-0.03	15 mm	0539M	N/A	1:1	back	0.808	1.268	1.025	
1880.00	9400	UMTS 1900	RMC	24.5	23.83	-0.01	15 mm	0539M	N/A	1:1	back	0.820	1.167	0.957	A20
1907.60	9538	UMTS 1900	RMC	24.5	23.32	0.01	15 mm	0539M	N/A	1:1	back	0.768	1.312	1.008	
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 11-17
LTE Body-Worn SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Headphone	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	2	25.5	24.29	0.00	0	N/A	0576M	QPSK	1	0	15 mm	back	1:1	0.290	1.321	0.383	A22
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	-0.01	1	N/A	0576M	QPSK	25	0	15 mm	back	1:1	0.236	1.303	0.308	
782.00	23230	Mid	LTE Band 13	10	4	25.0	24.22	-0.03	0	N/A	0612M	QPSK	1	0	15 mm	back	1:1	0.226	1.197	0.271	A24
782.00	23230	Mid	LTE Band 13	10	4	24.0	23.36	0.02	1	N/A	0612M	QPSK	25	0	15 mm	back	1:1	0.221	1.159	0.256	
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	25.5	24.27	0.04	0	N/A	0605M	QPSK	1	36	15 mm	back	1:1	0.263	1.327	0.349	A26
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	24.5	23.45	-0.03	1	N/A	0605M	QPSK	36	0	15 mm	back	1:1	0.207	1.274	0.264	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	25.0	24.10	0.04	0	N/A	0612M	QPSK	1	0	15 mm	back	1:1	0.731	1.230	0.899	A28
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	24.0	23.13	0.05	1	N/A	0612M	QPSK	50	0	15 mm	back	1:1	0.619	1.222	0.756	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	24.0	23.08	0.02	1	N/A	0612M	QPSK	100	0	15 mm	back	1:1	0.616	1.236	0.761	
1860.00	26140	Low	LTE Band 25 (PCS)	20	26	24.5	23.47	-0.01	0	N/A	0539M	QPSK	1	99	15 mm	back	1:1	0.953	1.268	**1.208**	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	24.5	23.62	0.01	0	N/A	0539M	QPSK	1	0	15 mm	back	1:1	0.964	1.225	1.181	A30
1905.00	26590	High	LTE Band 25 (PCS)	20	26	24.5	23.50	0.00	0	N/A	0539M	QPSK	1	0	15 mm	back	1:1	0.869	1.259	1.094	
1860.00	26140	Low	LTE Band 25 (PCS)	20	26	24.5	23.47	0.03	0	Headphone	0539M	QPSK	1	99	15 mm	back	1:1	0.573	1.268	0.730	
1860.00	26140	Low	LTE Band 25 (PCS)	20	26	23.5	22.63	0.01	1	N/A	0539M	QPSK	50	0	15 mm	back	1:1	0.794	1.222	0.970	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	23.5	22.86	0.01	1	N/A	0539M	QPSK	50	0	15 mm	back	1:1	0.756	1.159	0.876	
1905.00	26590	High	LTE Band 25 (PCS)	20	26	23.5	22.67	0.01	1	N/A	0539M	QPSK	50	0	15 mm	back	1:1	0.635	1.211	0.769	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	23.5	22.72	0.00	1	N/A	0539M	QPSK	100	0	15 mm	back	1:1	0.744	1.197	0.891	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population															Body 1.6 W/kg (mW/g) averaged over 1 gram						

Table 11-18
LTE Band 41 Body-Worn SAR

MEASUREMENT RESULTS																							
1 CC Uplink | 2 CC Uplink	Component Carrier	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) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
		MHz	Ch.																		
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	25.0	23.91	-0.02	0	0576M	QPSK	1	99	15 mm	back	1:1.58	0.396	1.285	0.509	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	24.0	23.13	-0.04	1	0576M	QPSK	50	25	15 mm	back	1:1.58	0.316	1.222	0.386	
2 CC Uplink	PCC	2506.00	39750	Low	LTE Band 41	20	25.0	24.23	-0.06	0	0576M	QPSK	1	99	15 mm	back	1:1.58	0.433	1.194	0.517	A32
	SCC	2525.80	39948			20							1	0							

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
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 W/kg	SAR (1g) (W/kg)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
2462	11	802.11b	DSSS	22	21.0	20.45	0.03	15 mm	1	0591M	1	back	99.9	0.268	0.208	1.135	1.001	0.236	A34
2462	11	802.11b	DSSS	22	19.0	18.69	0.13	15 mm	2	0591M	1	back	99.9	0.139	0.128	1.074	1.001	0.138	

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 11-20
2.4 GHz WLAN Body-Worn 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]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan W/kg	SAR (1g) (W/kg)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																				
2412	1	802.11n	OFDM	20	17.0	16.43	17.0	16.66	-0.08	15 mm	MIMO	0539M	13	back	97.3	0.124	0.076	1.140	1.028	0.089	

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: 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.

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 W/kg	SAR (1g) (W/kg)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
5280	56	802.11a	OFDM	20	18.5	18.37	0.12	15 mm	1	0509M	6	back	98.8	0.166	0.063	1.030	1.012	0.066	
5300	60	802.11a	OFDM	20	18.5	18.47	0.04	15 mm	2	0509M	6	back	98.8	0.241	0.108	1.007	1.012	0.110	
5720	144	802.11a	OFDM	20	18.5	18.36	0.01	15 mm	1	0509M	6	back	98.8	0.294	0.103	1.033	1.012	0.108	
5720	144	802.11a	OFDM	20	18.5	18.44	-0.16	15 mm	2	0509M	6	back	98.8	0.161	0.064	1.014	1.012	0.066	
5785	157	802.11a	OFDM	20	18.5	18.18	-0.17	15 mm	1	0509M	6	back	98.8	0.367	0.120	1.076	1.012	0.131	A36
5785	157	802.11a	OFDM	20	18.5	18.38	0.16	15 mm	2	0509M	6	back	98.8	0.194	0.075	1.028	1.012	0.078	

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

Table 11-22
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	18.5	18.35	0.04	15 mm	0591M	1	back	77.7	0.087	1.035	1.287	**0.116**	A38
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							**Body 1.6 W/kg (mW/g) averaged over 1 gram**									

11.3 Standalone 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	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
824.20	128	GSM 850	GPRS	30.5	29.22	-0.02	10 mm	0509M	3	1:2.76	back	0.383	1.343	0.514	
836.60	190	GSM 850	GPRS	30.5	29.13	-0.20	10 mm	0509M	3	1:2.76	back	0.439	1.371	0.602	
848.80	251	GSM 850	GPRS	30.5	29.16	-0.07	10 mm	0509M	3	1:2.76	back	0.459	1.361	0.625	A15
836.60	190	GSM 850	GPRS	30.5	29.13	-0.01	10 mm	0509M	3	1:2.76	front	0.335	1.371	0.459	
836.60	190	GSM 850	GPRS	30.5	29.13	0.13	10 mm	0509M	3	1:2.76	bottom	0.235	1.371	0.322	
836.60	190	GSM 850	GPRS	30.5	29.13	0.02	10 mm	0509M	3	1:2.76	right	0.311	1.371	0.426	
836.60	190	GSM 850	GPRS	30.5	29.13	-0.04	10 mm	0509M	3	1:2.76	left	0.145	1.371	0.199	
1880.00	661	GSM 1900	GPRS	25.5	25.06	-0.09	10 mm	0612M	3	1:2.76	back	0.689	1.107	0.763	
1880.00	661	GSM 1900	GPRS	25.5	25.06	-0.04	10 mm	0612M	3	1:2.76	front	0.520	1.107	0.576	
1850.20	512	GSM 1900	GPRS	25.5	24.84	0.00	10 mm	0612M	3	1:2.76	bottom	1.060	1.164	1.234	A17
1880.00	661	GSM 1900	GPRS	25.5	25.06	0.06	10 mm	0612M	3	1:2.76	bottom	0.918	1.107	1.016	
1909.80	810	GSM 1900	GPRS	25.5	24.73	-0.05	10 mm	0612M	3	1:2.76	bottom	1.050	1.194	**1.254**	
1880.00	661	GSM 1900	GPRS	25.5	25.06	-0.16	10 mm	0612M	3	1:2.76	right	0.072	1.107	0.080	
1880.00	661	GSM 1900	GPRS	25.5	25.06	-0.15	10 mm	0612M	3	1:2.76	left	0.092	1.107	0.102	
1850.20	512	GSM 1900	GPRS	25.5	24.84	0.15	10 mm	0612M	3	1:2.76	bottom	1.060	1.164	1.234	
836.60	4183	UMTS 850	RMC	25.5	24.35	0.02	10 mm	0509M	N/A	1:1	back	0.460	1.303	0.599	A19
836.60	4183	UMTS 850	RMC	25.5	24.35	-0.02	10 mm	0509M	N/A	1:1	front	0.348	1.303	0.453	
836.60	4183	UMTS 850	RMC	25.5	24.35	-0.05	10 mm	0509M	N/A	1:1	bottom	0.265	1.303	0.345	
836.60	4183	UMTS 850	RMC	25.5	24.35	0.02	10 mm	0509M	N/A	1:1	right	0.433	1.303	0.564	
836.60	4183	UMTS 850	RMC	25.5	24.35	-0.01	10 mm	0509M	N/A	1:1	left	0.183	1.303	0.238	
1852.40	9262	UMTS 1900	RMC	19.5	18.12	0.00	10 mm	0539M	N/A	1:1	back	0.610	1.374	0.838	
1880.00	9400	UMTS 1900	RMC	19.5	18.06	-0.10	10 mm	0539M	N/A	1:1	back	0.645	1.393	0.898	
1907.60	9538	UMTS 1900	RMC	19.5	18.08	-0.01	10 mm	0539M	N/A	1:1	back	0.578	1.387	0.802	
1880.00	9400	UMTS 1900	RMC	19.5	18.06	-0.03	10 mm	0539M	N/A	1:1	front	0.406	1.393	0.566	
1852.40	9262	UMTS 1900	RMC	19.5	18.12	-0.06	10 mm	0539M	N/A	1:1	bottom	0.765	1.374	1.051	A21
1880.00	9400	UMTS 1900	RMC	19.5	18.06	-0.04	10 mm	0539M	N/A	1:1	bottom	0.747	1.393	1.041	
1907.60	9538	UMTS 1900	RMC	19.5	18.08	-0.04	10 mm	0539M	N/A	1:1	bottom	0.760	1.387	1.054	
1880.00	9400	UMTS 1900	RMC	19.5	18.06	0.01	10 mm	0539M	N/A	1:1	right	0.071	1.393	0.099	
1880.00	9400	UMTS 1900	RMC	19.5	18.06	-0.08	10 mm	0539M	N/A	1:1	left	0.096	1.393	0.134	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**											**Body** **1.6 W/kg (mW/g)** averaged over 1 gram				

Note: Blue entry represents variability measurement.

Table 11-24
LTE Band 12 Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	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	2	25.5	24.29	-0.08	0	0576M	QPSK	1	0	10 mm	back	1:1	0.397	1.321	0.524	A23
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	-0.01	1	0576M	QPSK	25	0	10 mm	back	1:1	0.323	1.303	0.421	
707.50	23095	Mid	LTE Band 12	10	2	25.5	24.29	0.02	0	0576M	QPSK	1	0	10 mm	front	1:1	0.299	1.321	0.395	
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	-0.02	1	0576M	QPSK	25	0	10 mm	front	1:1	0.246	1.303	0.321	
707.50	23095	Mid	LTE Band 12	10	2	25.5	24.29	-0.01	0	0576M	QPSK	1	0	10 mm	bottom	1:1	0.196	1.321	0.259	
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	-0.04	1	0576M	QPSK	25	0	10 mm	bottom	1:1	0.160	1.303	0.208	
707.50	23095	Mid	LTE Band 12	10	2	25.5	24.29	0.02	0	0576M	QPSK	1	0	10 mm	right	1:1	0.226	1.321	0.299	
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	0.04	1	0576M	QPSK	25	0	10 mm	right	1:1	0.175	1.303	0.228	
707.50	23095	Mid	LTE Band 12	10	2	25.5	24.29	-0.01	0	0576M	QPSK	1	0	10 mm	left	1:1	0.206	1.321	0.272	
707.50	23095	Mid	LTE Band 12	10	2	24.5	23.35	0.01	1	0576M	QPSK	25	0	10 mm	left	1:1	0.167	1.303	0.218	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Body 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-25
LTE Band 13 Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	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	4	25.0	24.22	-0.03	0	0509M	QPSK	1	0	10 mm	back	1:1	0.368	1.197	0.440	A25
782.00	23230	Mid	LTE Band 13	10	4	24.0	23.36	0.01	1	0509M	QPSK	25	0	10 mm	back	1:1	0.326	1.159	0.378	
782.00	23230	Mid	LTE Band 13	10	4	25.0	24.22	-0.03	0	0509M	QPSK	1	0	10 mm	front	1:1	0.271	1.197	0.324	
782.00	23230	Mid	LTE Band 13	10	4	24.0	23.36	-0.02	1	0509M	QPSK	25	0	10 mm	front	1:1	0.242	1.159	0.280	
782.00	23230	Mid	LTE Band 13	10	4	25.0	24.22	-0.01	0	0509M	QPSK	1	0	10 mm	bottom	1:1	0.187	1.197	0.224	
782.00	23230	Mid	LTE Band 13	10	4	24.0	23.36	-0.03	1	0509M	QPSK	25	0	10 mm	bottom	1:1	0.154	1.159	0.178	
782.00	23230	Mid	LTE Band 13	10	4	25.0	24.22	0.01	0	0509M	QPSK	1	0	10 mm	right	1:1	0.148	1.197	0.177	
782.00	23230	Mid	LTE Band 13	10	4	24.0	23.36	0.00	1	0509M	QPSK	25	0	10 mm	right	1:1	0.137	1.159	0.159	
782.00	23230	Mid	LTE Band 13	10	4	25.0	24.22	0.02	0	0509M	QPSK	1	0	10 mm	left	1:1	0.133	1.197	0.159	
782.00	23230	Mid	LTE Band 13	10	4	24.0	23.36	0.01	1	0509M	QPSK	25	0	10 mm	left	1:1	0.123	1.159	0.143	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Body 1.6 W/kg (mW/g) averaged over 1 gram									

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

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																			
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	25.5	24.27	0.00	0	0605M	QPSK	1	36	10 mm	back	1:1	0.408	1.327	0.541	A27
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	24.5	23.45	0.01	1	0605M	QPSK	36	0	10 mm	back	1:1	0.321	1.274	0.409	
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	25.5	24.27	0.01	0	0605M	QPSK	1	36	10 mm	front	1:1	0.298	1.327	0.395	
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	24.5	23.45	0.04	1	0605M	QPSK	36	0	10 mm	front	1:1	0.239	1.274	0.304	
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	25.5	24.27	-0.12	0	0605M	QPSK	1	36	10 mm	bottom	1:1	0.212	1.327	0.281	
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	24.5	23.45	-0.04	1	0605M	QPSK	36	0	10 mm	bottom	1:1	0.175	1.274	0.223	
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	25.5	24.27	-0.12	0	0605M	QPSK	1	36	10 mm	right	1:1	0.233	1.327	0.309	
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	24.5	23.45	-0.05	1	0605M	QPSK	36	0	10 mm	right	1:1	0.193	1.274	0.246	
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	25.5	24.27	0.02	0	0605M	QPSK	1	36	10 mm	left	1:1	0.177	1.327	0.235	
831.50	26865	Mid	LTE Band 26 (Cell)	15	7	24.5	23.45	-0.05	1	0605M	QPSK	36	0	10 mm	left	1:1	0.142	1.274	0.181	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population															Body 1.6 W/kg (mW/g) averaged over 1 gram					

Table 11-27
LTE Band 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																			
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.94	0.01	0	0612M	QPSK	1	0	10 mm	back	1:1	0.473	1.014	0.480	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.83	-0.09	0	0612M	QPSK	50	0	10 mm	back	1:1	0.513	1.040	0.534	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.94	-0.09	0	0612M	QPSK	1	0	10 mm	front	1:1	0.329	1.014	0.334	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.83	-0.01	0	0612M	QPSK	50	0	10 mm	front	1:1	0.353	1.040	0.367	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.94	0.05	0	0612M	QPSK	1	0	10 mm	bottom	1:1	0.588	1.014	0.596	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.83	-0.03	0	0612M	QPSK	50	0	10 mm	bottom	1:1	0.596	1.040	0.620	A29
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.94	-0.19	0	0612M	QPSK	1	0	10 mm	right	1:1	0.042	1.014	0.043	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.83	0.03	0	0612M	QPSK	50	0	10 mm	right	1:1	0.048	1.040	0.050	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.94	0.04	0	0612M	QPSK	1	0	10 mm	left	1:1	0.094	1.014	0.095	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	45	21.0	20.83	-0.04	0	0612M	QPSK	50	0	10 mm	left	1:1	0.105	1.040	0.109	
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 11-28
LTE Band 25 (PCS) Hotspot SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Ant State	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)	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.73	0.01	0	0539M	QPSK	1	0	10 mm	back	1:1	0.694	1.064	0.738	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.79	0.00	0	0539M	QPSK	50	0	10 mm	back	1:1	0.709	1.050	0.744	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.73	0.01	0	0539M	QPSK	1	0	10 mm	front	1:1	0.469	1.064	0.499	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.79	0.01	0	0539M	QPSK	50	0	10 mm	front	1:1	0.477	1.050	0.501	
1860.00	26140	Low	LTE Band 25 (PCS)	20	26	20.0	19.72	0.03	0	0539M	QPSK	1	0	10 mm	bottom	1:1	0.815	1.067	0.870	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.73	0.02	0	0539M	QPSK	1	0	10 mm	bottom	1:1	0.812	1.064	0.864	
1905.00	26590	High	LTE Band 25 (PCS)	20	26	20.0	19.54	-0.01	0	0539M	QPSK	1	0	10 mm	bottom	1:1	0.807	1.112	0.897	
1860.00	26140	Low	LTE Band 25 (PCS)	20	26	20.0	19.75	-0.01	0	0539M	QPSK	50	0	10 mm	bottom	1:1	0.815	1.059	0.863	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.79	0.00	0	0539M	QPSK	50	0	10 mm	bottom	1:1	0.833	1.050	0.875	A31
1905.00	26590	High	LTE Band 25 (PCS)	20	26	20.0	19.66	-0.01	0	0539M	QPSK	50	0	10 mm	bottom	1:1	0.831	1.081	0.898	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.72	-0.01	0	0539M	QPSK	100	0	10 mm	bottom	1:1	0.823	1.067	0.878	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.73	0.03	0	0539M	QPSK	1	0	10 mm	right	1:1	0.072	1.064	0.077	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.79	-0.01	0	0539M	QPSK	50	0	10 mm	right	1:1	0.072	1.050	0.076	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.73	-0.03	0	0539M	QPSK	1	0	10 mm	left	1:1	0.104	1.064	0.111	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	26	20.0	19.79	-0.05	0	0539M	QPSK	50	0	10 mm	left	1:1	0.106	1.050	0.111	
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 11-29
LTE Band 41 Hotspot SAR

MEASUREMENT RESULTS																						
1 CC Uplink | 2 CC Uplink	Component Carrier	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)	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	22.5	21.62	-0.03	0	0576M	QPSK	1	0	10 mm	back	1:1.58	0.269	1.225	0.330	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	22.5	21.51	-0.03	0	0576M	QPSK	50	25	10 mm	back	1:1.58	0.274	1.256	0.344	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	22.5	21.62	-0.13	0	0576M	QPSK	1	0	10 mm	front	1:1.58	0.199	1.225	0.244	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	22.5	21.51	0.01	0	0576M	QPSK	50	25	10 mm	front	1:1.58	0.228	1.256	0.286	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	22.5	21.62	0.12	0	0576M	QPSK	1	0	10 mm	bottom	1:1.58	0.538	1.225	0.659	
1 CC Uplink	N/A	2549.50	40185	Low-Mid	LTE Band 41	20	22.5	21.03	-0.05	0	0576M	QPSK	1	0	10 mm	bottom	1:1.58	0.613	1.403	0.860	
1 CC Uplink	N/A	2593.00	40620	Mid	LTE Band 41	20	22.5	20.91	0.12	0	0576M	QPSK	1	99	10 mm	bottom	1:1.58	0.500	1.442	0.721	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	22.5	21.20	0.18	0	0576M	QPSK	1	0	10 mm	bottom	1:1.58	0.399	1.349	0.538	
1 CC Uplink	N/A	2680.00	41490	High	LTE Band 41	20	22.5	21.07	0.05	0	0576M	QPSK	1	99	10 mm	bottom	1:1.58	0.404	1.390	0.562	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	22.5	21.51	0.16	0	0576M	QPSK	50	25	10 mm	bottom	1:1.58	0.597	1.256	0.750	
1 CC Uplink	N/A	2549.50	40185	Low-Mid	LTE Band 41	20	22.5	21.06	-0.08	0	0576M	QPSK	50	0	10 mm	bottom	1:1.58	0.636	1.393	0.886	
1 CC Uplink	N/A	2593.00	40620	Mid	LTE Band 41	20	22.5	20.96	0.14	0	0576M	QPSK	50	25	10 mm	bottom	1:1.58	0.525	1.426	0.749	
1 CC Uplink	N/A	2636.50	41055	Mid-High	LTE Band 41	20	22.5	21.16	0.09	0	0576M	QPSK	50	0	10 mm	bottom	1:1.58	0.414	1.361	0.563	
1 CC Uplink	N/A	2680.00	41490	High	LTE Band 41	20	22.5	21.10	0.11	0	0576M	QPSK	50	0	10 mm	bottom	1:1.58	0.416	1.380	0.574	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	22.5	21.49	0.12	0	0576M	QPSK	100	0	10 mm	bottom	1:1.58	0.557	1.262	0.703	
2 CC Uplink	PCC	2549.50	40185	Low-Mid	LTE Band 41	20	22.5	20.98	0.12	0	0576M	QPSK	50	0	10 mm	bottom	1:1.58	0.655	1.419	0.929	A33
	SCC	2529.70	39987			20						QPSK	50	50							
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	22.5	21.62	0.11	0	0576M	QPSK	1	0	10 mm	left	1:1.58	0.179	1.225	0.219	
1 CC Uplink	N/A	2506.00	39750	Low	LTE Band 41	20	22.5	21.51	-0.04	0	0576M	QPSK	50	25	10 mm	left	1:1.58	0.143	1.256	0.180	
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 11-30
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 W/kg	SAR (1g) (W/kg)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
2462	11	802.11b	DSSS	22	21.0	20.45	-0.07	10 mm	1	0591M	1	back	99.9	0.562	0.410	1.135	1.001	0.466	
2462	11	802.11b	DSSS	22	21.0	20.45	-0.16	10 mm	1	0591M	1	front	99.9	0.420	-	1.135	1.001	-	
2462	11	802.11b	DSSS	22	21.0	20.45	0.01	10 mm	1	0591M	1	top	99.9	0.354	-	1.135	1.001	-	
2462	11	802.11b	DSSS	22	21.0	20.45	-0.06	10 mm	1	0591M	1	left	99.9	0.536	0.443	1.135	1.001	**0.503**	A35
2462	11	802.11b	DSSS	22	19.0	18.69	0.12	10 mm	2	0591M	1	back	99.9	0.254	0.209	1.074	1.001	0.225	
2462	11	802.11b	DSSS	22	19.0	18.69	0.13	10 mm	2	0591M	1	front	99.9	0.137	-	1.074	1.001	-	
2462	11	802.11b	DSSS	22	19.0	18.69	0.13	10 mm	2	0591M	1	top	99.9	0.334	0.271	1.074	1.001	0.291	
2462	11	802.11b	DSSS	22	19.0	18.69	-0.13	10 mm	2	0591M	1	left	99.9	0.031	-	1.074	1.001	-	
5785	157	802.11a	OFDM	20	18.5	18.18	0.09	10 mm	1	0509M	6	back	98.8	0.428	0.163	1.076	1.012	**0.177**	A37
5785	157	802.11a	OFDM	20	18.5	18.18	0.00	10 mm	1	0509M	6	front	98.8	0.114	-	1.076	1.012	-	
5785	157	802.11a	OFDM	20	18.5	18.18	0.19	10 mm	1	0509M	6	top	98.8	0.206	-	1.076	1.012	-	
5785	157	802.11a	OFDM	20	18.5	18.18	0.15	10 mm	1	0509M	6	left	98.8	0.369	-	1.076	1.012	-	
5785	157	802.11a	OFDM	20	18.5	18.38	0.06	10 mm	2	0509M	6	back	98.8	0.264	0.133	1.028	1.012	0.138	
5785	157	802.11a	OFDM	20	18.5	18.38	0.19	10 mm	2	0509M	6	front	98.8	0.033	-	1.028	1.012	-	
5785	157	802.11a	OFDM	20	18.5	18.38	-0.11	10 mm	2	0509M	6	top	98.8	0.112	-	1.028	1.012	-	
5785	157	802.11a	OFDM	20	18.5	18.38	0.12	10 mm	2	0509M	6	left	98.8	0.131	-	1.028	1.012	-	

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

Table 11-31
2.4 GHz WLAN Hotspot 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]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan W/kg	SAR (1g) (W/kg)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																				
2412	1	802.11n	OFDM	20	17.0	16.43	17.0	16.66	0.14	10 mm	MIMO	0539M	13	back	97.3	0.226	0.156	1.140	1.028	0.183	
2412	1	802.11n	OFDM	20	17.0	16.43	17.0	16.66	0.13	10 mm	MIMO	0539M	13	front	97.3	0.171	-	1.140	1.028	-	
2412	1	802.11n	OFDM	20	17.0	16.43	17.0	16.66	0.14	10 mm	MIMO	0539M	13	top	97.3	0.195	-	1.140	1.028	-	
2412	1	802.11n	OFDM	20	17.0	16.43	17.0	16.66	0.12	10 mm	MIMO	0539M	13	left	97.3	0.225	-	1.140	1.028	-	

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

Note: 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.

Table 11-32
DSS Hotspot SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	18.5	18.35	-0.03	10 mm	0591M	1	back	77.7	0.160	1.035	1.287	0.213	
2441	39	Bluetooth	FHSS	18.5	18.35	0.00	10 mm	0591M	1	front	77.7	0.157	1.035	1.287	0.209	
2441	39	Bluetooth	FHSS	18.5	18.35	-0.02	10 mm	0591M	1	top	77.7	0.112	1.035	1.287	0.149	
2441	39	Bluetooth	FHSS	18.5	18.35	-0.04	10 mm	0591M	1	left	77.7	0.192	1.035	1.287	**0.256**	A39
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**							**Body** **1.6 W/kg (mW/g)** averaged over 1 gram									

11.4 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 15 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. When the standalone reported body-worn SAR was > 1.2 W/kg, additional body-worn SAR evaluations using a headset cable was required.
8. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
10. 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.

GSM Test Notes:

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

UMTS Notes:

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

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 8.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC KDB Publication 447498 D01v06, when the reported LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg for 1g evaluations, testing at the other channels was required for such test configurations.
5. TDD LTE was tested per the guidance provided in FCC KDB Publication 941225 D05v02r04. Testing was performed using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Section 4, the duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.
6. Per KDB Publication 941225 D05Av01r02, SAR for downlink only LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.
7. For LTE Band 41, per FCC guidance, SAR was first measured with only a single carrier active in the uplink (carrier aggregation not active). For each exposure condition, the uplink CA scenario with two component carriers was additionally tested for the configuration with the highest SAR when carrier aggregation was not active. The SCC was configured with the closest available contiguous channel. The two component carriers were configured so the resource blocks are physically allocated side by side to achieve the maximum output power.

WLAN Notes:

1. For held-to-ear, and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g evaluations, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 8.6.5 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg for 1g evaluations. See Section 8.6.6 for more information.
4. Per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D01v06 by either evaluating the sum of the 1g SAR values of each antenna transmitting independently or making a SAR measurement with both antennas transmitting simultaneously. Please see Section 12 for complete analysis.
5. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
6. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The 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

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

12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

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

12.2 Simultaneous Transmission Procedures

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

12.3 Head SAR Simultaneous Transmission Analysis

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

Table 12-1
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
Head SAR	GSM 850	0.196	1.097	0.344	1.293	0.540
	GSM 1900	0.182	1.097	0.344	1.279	0.526
	UMTS 850	0.258	1.097	0.344	1.355	0.602
	UMTS 1900	0.253	1.097	0.344	1.350	0.597
	LTE Band 4 (AWS)	0.335	1.097	0.344	**1.432**	0.679
	LTE Band 12	0.197	1.097	0.344	1.294	0.541
	LTE Band 13	0.174	1.097	0.344	1.271	0.518
	LTE Band 26 (Cell)	0.184	1.097	0.344	1.281	0.528
	LTE Band 25 (PCS)	0.309	1.097	0.344	1.406	0.653
	LTE Band 41	0.114	1.097	0.344	1.211	0.458

Table 12-2
Simultaneous Transmission Scenario with 2.4 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)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	GSM 850	0.196	1.265	1.461
	GSM 1900	0.182	1.265	1.447
	UMTS 850	0.258	1.265	1.523
	UMTS 1900	0.253	1.265	1.518
	LTE Band 4 (AWS)	0.335	1.265	See Table Below
	LTE Band 12	0.197	1.265	1.462
	LTE Band 13	0.174	1.265	1.439
	LTE Band 26 (Cell)	0.184	1.265	1.449
	LTE Band 25 (PCS)	0.309	1.265	**1.574**
	LTE Band 41	0.114	1.265	1.379

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	2.4 GHz WLAN MIMO (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	Right Cheek	0.167	1.217	1.384
	Right Tilt	0.132	1.265	**1.397**
	Left Cheek	0.335	0.280	0.615
	Left Tilt	0.119	1.265*	1.384

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN 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	0.196	0.208	0.033	0.404	0.229	0.437
	GSM 1900	0.182	0.208	0.033	0.390	0.215	0.423
	UMTS 850	0.258	0.208	0.033	0.466	0.291	0.499
	UMTS 1900	0.253	0.208	0.033	0.461	0.286	0.494
	LTE Band 4 (AWS)	0.335	0.208	0.033	0.543	0.368	**0.576**
	LTE Band 12	0.197	0.208	0.033	0.405	0.230	0.438
	LTE Band 13	0.174	0.208	0.033	0.382	0.207	0.415
	LTE Band 26 (Cell)	0.184	0.208	0.033	0.392	0.217	0.425
	LTE Band 25 (PCS)	0.309	0.208	0.033	0.517	0.342	0.550
	LTE Band 41	0.114	0.208	0.033	0.322	0.147	0.355

Table 12-4
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	0.196	0.456	0.208	0.033	0.893
	GSM 1900	0.182	0.456	0.208	0.033	0.879
	UMTS 850	0.258	0.456	0.208	0.033	0.955
	UMTS 1900	0.253	0.456	0.208	0.033	0.950
	LTE Band 4 (AWS)	0.335	0.456	0.208	0.033	**1.032**
	LTE Band 12	0.197	0.456	0.208	0.033	0.894
	LTE Band 13	0.174	0.456	0.208	0.033	0.871
	LTE Band 26 (Cell)	0.184	0.456	0.208	0.033	0.881
	LTE Band 25 (PCS)	0.309	0.456	0.208	0.033	1.006
	LTE Band 41	0.114	0.456	0.208	0.033	0.811

Table 12-5
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	0.196	1.109	1.305
	GSM 1900	0.182	1.109	1.291
	UMTS 850	0.258	1.109	1.367
	UMTS 1900	0.253	1.109	1.362
	LTE Band 4 (AWS)	0.335	1.109	**1.444**
	LTE Band 12	0.197	1.109	1.306
	LTE Band 13	0.174	1.109	1.283
	LTE Band 26 (Cell)	0.184	1.109	1.293
	LTE Band 25 (PCS)	0.309	1.109	1.418
	LTE Band 41	0.114	1.109	1.223

Table 12-6
Simultaneous Transmission Scenario with Bluetooth and 5 GHz Ant 1 (Held to Ear)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Head SAR	GSM 850	0.196	1.109	0.208	1.513
	GSM 1900	0.182	1.109	0.208	1.499
	UMTS 850	0.258	1.109	0.208	**1.575**
	UMTS 1900	0.253	1.109	0.208	1.570
	LTE Band 4 (AWS)	0.335	1.109	0.208	See Table Below
	LTE Band 12	0.197	1.109	0.208	1.514
	LTE Band 13	0.174	1.109	0.208	1.491
	LTE Band 26 (Cell)	0.184	1.109	0.208	1.501
	LTE Band 25 (PCS)	0.309	1.109	0.208	See Table Below
	LTE Band 41	0.114	1.109	0.208	1.431

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Head SAR	Right Cheek	0.167	1.043	0.208	1.418
	Right Tilt	0.132	1.109	0.208*	**1.449**
	Left Cheek	0.335	0.442	0.208*	0.985
	Left Tilt	0.119	0.332	0.208*	0.659

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Head SAR	Right Cheek	0.173	1.043	0.208	**1.424**
	Right Tilt	0.076	1.109	0.208*	1.393
	Left Cheek	0.309	0.442	0.208*	0.959
	Left Tilt	0.075	0.332	0.208*	0.615

Table 12-7
Simultaneous Transmission Scenario with Bluetooth and 5 GHz WLAN Ant 2 (Held to Ear)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Head SAR	GSM 850	0.196	1.109	0.033	1.338
	GSM 1900	0.182	1.109	0.033	1.324
	UMTS 850	0.258	1.109	0.033	1.400
	UMTS 1900	0.253	1.109	0.033	1.395
	LTE Band 4 (AWS)	0.335	1.109	0.033	**1.477**
	LTE Band 12	0.197	1.109	0.033	1.339
	LTE Band 13	0.174	1.109	0.033	1.316
	LTE Band 26 (Cell)	0.184	1.109	0.033	1.326
	LTE Band 25 (PCS)	0.309	1.109	0.033	1.451
	LTE Band 41	0.114	1.109	0.033	1.256

Table 12-8
Simultaneous Transmission Scenario with Bluetooth and 5 GHz WLAN MIMO (Held to Ear)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth 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	0.196	1.109	0.208	0.033	1.546
	GSM 1900	0.182	1.109	0.208	0.033	1.532
	UMTS 850	0.258	1.109	0.208	0.033	See Table Below
	UMTS 1900	0.253	1.109	0.208	0.033	See Table Below
	LTE Band 4 (AWS)	0.335	1.109	0.208	0.033	See Table Below
	LTE Band 12	0.197	1.109	0.208	0.033	1.547
	LTE Band 13	0.174	1.109	0.208	0.033	1.524
	LTE Band 26 (Cell)	0.184	1.109	0.208	0.033	1.534
	LTE Band 25 (PCS)	0.309	1.109	0.208	0.033	See Table Below
	LTE Band 41	0.114	1.109	0.208	0.033	1.464

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	Bluetooth 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	Right Cheek	0.258	1.043	0.208	0.017	**1.526**
	Right Tilt	0.125	1.109	0.208*	0.033*	1.475
	Left Cheek	0.182	0.442	0.208*	0.033*	0.865
	Left Tilt	0.124	0.332	0.208*	0.033	0.697

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	Bluetooth 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	Right Cheek	0.174	1.043	0.208	0.017	**1.442**
	Right Tilt	0.075	1.109	0.208*	0.033*	1.425
	Left Cheek	0.253	0.442	0.208*	0.033*	0.936
	Left Tilt	0.074	0.332	0.208*	0.033	0.647

Simult Tx	Configuration	LTE Band 4 (AWS) SAR (W/kg)	Bluetooth 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	Right Cheek	0.167	1.043	0.208	0.017	1.435
	Right Tilt	0.132	1.109	0.208*	0.033*	**1.482**
	Left Cheek	0.335	0.442	0.208*	0.033*	1.018
	Left Tilt	0.119	0.332	0.208*	0.033	0.692

Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	Bluetooth 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	Right Cheek	0.173	1.043	0.208	0.017	**1.441**
	Right Tilt	0.076	1.109	0.208*	0.033*	1.426
	Left Cheek	0.309	0.442	0.208*	0.033*	0.992
	Left Tilt	0.075	0.332	0.208*	0.033	0.648

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-9
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	0.319	0.236	0.138	0.555	0.457	0.693
	GSM 1900	0.577	0.236	0.138	0.813	0.715	0.951
	UMTS 850	0.427	0.236	0.138	0.663	0.565	0.801
	UMTS 1900	1.025	0.236	0.138	1.261	1.163	1.399
	LTE Band 4 (AWS)	0.899	0.236	0.138	1.135	1.037	1.273
	LTE Band 12	0.383	0.236	0.138	0.619	0.521	0.757
	LTE Band 13	0.271	0.236	0.138	0.507	0.409	0.645
	LTE Band 26 (Cell)	0.349	0.236	0.138	0.585	0.487	0.723
	LTE Band 25 (PCS)	1.208	0.236	0.138	1.444	1.346	**1.582**
	LTE Band 41	0.517	0.236	0.138	0.753	0.655	0.891

Table 12-10
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	0.319	0.131	0.110	0.450	0.429	0.560
	GSM 1900	0.577	0.131	0.110	0.708	0.687	0.818
	UMTS 850	0.427	0.131	0.110	0.558	0.537	0.668
	UMTS 1900	1.025	0.131	0.110	1.156	1.135	1.266
	LTE Band 4 (AWS)	0.899	0.131	0.110	1.030	1.009	1.140
	LTE Band 12	0.383	0.131	0.110	0.514	0.493	0.624
	LTE Band 13	0.271	0.131	0.110	0.402	0.381	0.512
	LTE Band 26 (Cell)	0.349	0.131	0.110	0.480	0.459	0.590
	LTE Band 25 (PCS)	1.208	0.131	0.110	1.339	1.318	**1.449**
	LTE Band 41	0.517	0.131	0.110	0.648	0.627	0.758

Table 12-11
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 MIMO at 19 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
Body-Worn	GSM 850	0.319	0.089	0.131	0.110	0.649
	GSM 1900	0.577	0.089	0.131	0.110	0.907
	UMTS 850	0.427	0.089	0.131	0.110	0.757
	UMTS 1900	1.025	0.089	0.131	0.110	1.355
	LTE Band 4 (AWS)	0.899	0.089	0.131	0.110	1.229
	LTE Band 12	0.383	0.089	0.131	0.110	0.713
	LTE Band 13	0.271	0.089	0.131	0.110	0.601
	LTE Band 26 (Cell)	0.349	0.089	0.131	0.110	0.679
	LTE Band 25 (PCS)	1.208	0.089	0.131	0.110	**1.538**
	LTE Band 41	0.517	0.089	0.131	0.110	0.847

Table 12-12
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	0.319	0.116	0.435
	GSM 1900	0.577	0.116	0.693
	UMTS 850	0.427	0.116	0.543
	UMTS 1900	1.025	0.116	1.141
	LTE Band 4 (AWS)	0.899	0.116	1.015
	LTE Band 12	0.383	0.116	0.499
	LTE Band 13	0.271	0.116	0.387
	LTE Band 26 (Cell)	0.349	0.116	0.465
	LTE Band 25 (PCS)	1.208	0.116	**1.324**
	LTE Band 41	0.517	0.116	0.633

Table 12-13
Simultaneous Transmission Scenario with Bluetooth and 5 GHz WLAN Ant 1 (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Body-Worn	GSM 850	0.319	0.116	0.131	0.566
	GSM 1900	0.577	0.116	0.131	0.824
	UMTS 850	0.427	0.116	0.131	0.674
	UMTS 1900	1.025	0.116	0.131	1.272
	LTE Band 4 (AWS)	0.899	0.116	0.131	1.146
	LTE Band 12	0.383	0.116	0.131	0.630
	LTE Band 13	0.271	0.116	0.131	0.518
	LTE Band 26 (Cell)	0.349	0.116	0.131	0.596
	LTE Band 25 (PCS)	1.208	0.116	0.131	**1.455**
	LTE Band 41	0.517	0.116	0.131	0.764

Table 12-14
Simultaneous Transmission Scenario with Bluetooth and 5 GHz WLAN Ant 2 (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Body-Worn	GSM 850	0.319	0.116	0.110	0.545
	GSM 1900	0.577	0.116	0.110	0.803
	UMTS 850	0.427	0.116	0.110	0.653
	UMTS 1900	1.025	0.116	0.110	1.251
	LTE Band 4 (AWS)	0.899	0.116	0.110	1.125
	LTE Band 12	0.383	0.116	0.110	0.609
	LTE Band 13	0.271	0.116	0.110	0.497
	LTE Band 26 (Cell)	0.349	0.116	0.110	0.575
	LTE Band 25 (PCS)	1.208	0.116	0.110	**1.434**
	LTE Band 41	0.517	0.116	0.110	0.743

Table 12-15
Simultaneous Transmission Scenario with Bluetooth and 5 GHz WLAN MIMO (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth 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
Body-Worn	GSM 850	0.319	0.116	0.131	0.110	0.676
	GSM 1900	0.577	0.116	0.131	0.110	0.934
	UMTS 850	0.427	0.116	0.131	0.110	0.784
	UMTS 1900	1.025	0.116	0.131	0.110	1.382
	LTE Band 4 (AWS)	0.899	0.116	0.131	0.110	1.256
	LTE Band 12	0.383	0.116	0.131	0.110	0.740
	LTE Band 13	0.271	0.116	0.131	0.110	0.628
	LTE Band 26 (Cell)	0.349	0.116	0.131	0.110	0.706
	LTE Band 25 (PCS)	1.208	0.116	0.131	0.110	**1.565**
	LTE Band 41	0.517	0.116	0.131	0.110	0.874

12.5 Hotspot SAR Simultaneous Transmission Analysis

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

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

Table 12-16
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	0.625	0.503	0.291	1.128	0.916	1.419
	GPRS 1900	1.254	0.503	0.291	See Table Below	1.545	See Table Below
	UMTS 850	0.599	0.503	0.291	1.102	0.890	1.393
	UMTS 1900	1.054	0.503	0.291	**1.557**	1.345	See Table Below
	LTE Band 4 (AWS)	0.620	0.503	0.291	1.123	0.911	1.414
	LTE Band 12	0.524	0.503	0.291	1.027	0.815	1.318
	LTE Band 13	0.440	0.503	0.291	0.943	0.731	1.234
	LTE Band 26 (Cell)	0.541	0.503	0.291	1.044	0.832	1.335
	LTE Band 25 (PCS)	0.898	0.503	0.291	1.401	1.189	See Table Below
	LTE Band 41	0.929	0.503	0.291	1.432	1.220	See Table Below

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)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Hotspot SAR	Back	0.763	0.466	0.225	1.229	0.988	**1.454**
	Front	0.576	0.503*	0.291*	1.079	0.867	1.370
	Top	-	0.503*	0.291	0.503	0.291	0.794
	Bottom	1.254	-	-	1.254	1.254	1.254
	Right	0.080	-	-	0.080	0.080	0.080
	Left	0.102	0.503	0.291*	0.605	0.393	0.896

Simult Tx	Configuration	UMTS 1900 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	Back	0.898	0.466	0.225	1.364	1.123	**1.589**
	Front	0.566	0.503*	0.291*	1.069	0.857	1.360
	Top	-	0.503*	0.291	0.503	0.291	0.794
	Bottom	1.054	-	-	1.054	1.054	1.054
	Right	0.099	-	-	0.099	0.099	0.099
	Left	0.134	0.503	0.291*	0.637	0.425	0.928

Simult Tx	Configuration	LTE Band 25 (PCS) 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	Back	0.744	0.466	0.225	1.210	0.969	**1.435**
	Front	0.501	0.503*	0.291*	1.004	0.792	1.295
	Top	-	0.503*	0.291	0.503	0.291	0.794
	Bottom	0.898	-	-	0.898	0.898	0.898
	Right	0.077	-	-	0.077	0.077	0.077
	Left	0.111	0.503	0.291*	0.614	0.402	0.905

Simult Tx	Configuration	LTE Band 41 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	Back	0.344	0.466	0.225	0.810	0.569	1.035
	Front	0.286	0.503*	0.291*	0.789	0.577	**1.080**
	Top	-	0.503*	0.291	0.503	0.291	0.794
	Bottom	0.929	-	-	0.929	0.929	0.929
	Right	-	-	-	-	-	-
	Left	0.219	0.503	0.291*	0.722	0.510	1.013

Table 12-17
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	0.625	0.177	0.138	0.802	0.763	0.940
	GPRS 1900	1.254	0.177	0.138	1.431	1.392	**1.569**
	UMTS 850	0.599	0.177	0.138	0.776	0.737	0.914
	UMTS 1900	1.054	0.177	0.138	1.231	1.192	1.369
	LTE Band 4 (AWS)	0.620	0.177	0.138	0.797	0.758	0.935
	LTE Band 12	0.524	0.177	0.138	0.701	0.662	0.839
	LTE Band 13	0.440	0.177	0.138	0.617	0.578	0.755
	LTE Band 26 (Cell)	0.541	0.177	0.138	0.718	0.679	0.856
	LTE Band 25 (PCS)	0.898	0.177	0.138	1.075	1.036	1.213
	LTE Band 41	0.929	0.177	0.138	1.106	1.067	1.244

Table 12-18
Simultaneous Transmission Scenario with 2.4 GHz WLAN MIMO and 5 GHz WLAN MIMO (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN MIMO at 19 dBm SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	4	1+2+3+4
Hotspot SAR	GPRS 850	0.625	0.183	0.177	0.138	1.123
	GPRS 1900	1.254	0.183	0.177	0.138	See Table Below
	UMTS 850	0.599	0.183	0.177	0.138	1.097
	UMTS 1900	1.054	0.183	0.177	0.138	**1.552**
	LTE Band 4 (AWS)	0.620	0.183	0.177	0.138	1.118
	LTE Band 12	0.524	0.183	0.177	0.138	1.022
	LTE Band 13	0.440	0.183	0.177	0.138	0.938
	LTE Band 26 (Cell)	0.541	0.183	0.177	0.138	1.039
	LTE Band 25 (PCS)	0.898	0.183	0.177	0.138	1.396
	LTE Band 41	0.929	0.183	0.177	0.138	1.427

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	2.4 GHz WLAN MIMO at 19 dBm SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	4	1+2+3+4
Hotspot SAR	Back	0.763	0.183	0.177	0.138	**1.261**
	Front	0.576	0.183*	0.177*	0.138*	1.074
	Top	-	0.183*	0.177*	0.138*	0.498
	Bottom	1.254	-	-	-	1.254
	Right	0.080	-	-	-	0.080
	Left	0.102	0.183*	0.177*	0.138*	0.600

Table 12-19
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	0.625	0.256	0.881
	GPRS 1900	1.254	0.256	**1.510**
	UMTS 850	0.599	0.256	0.855
	UMTS 1900	1.054	0.256	1.310
	LTE Band 4 (AWS)	0.620	0.256	0.876
	LTE Band 12	0.524	0.256	0.780
	LTE Band 13	0.440	0.256	0.696
	LTE Band 26 (Cell)	0.541	0.256	0.797
	LTE Band 25 (PCS)	0.898	0.256	1.154
	LTE Band 41	0.929	0.256	1.185

Table 12-20
Simultaneous Transmission Scenario with Bluetooth and 5 GHz Ant 1 (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Hotspot SAR	GPRS 850	0.625	0.256	0.177	1.058
	GPRS 1900	1.254	0.256	0.177	See Table Below
	UMTS 850	0.599	0.256	0.177	1.032
	UMTS 1900	1.054	0.256	0.177	1.487
	LTE Band 4 (AWS)	0.620	0.256	0.177	1.053
	LTE Band 12	0.524	0.256	0.177	0.957
	LTE Band 13	0.440	0.256	0.177	0.873
	LTE Band 26 (Cell)	0.541	0.256	0.177	0.974
	LTE Band 25 (PCS)	0.898	0.256	0.177	1.331
	LTE Band 41	0.929	0.256	0.177	1.362

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Hotspot SAR	Back	0.763	0.213	0.177	1.153
	Front	0.576	0.209	0.177*	0.962
	Top	-	0.149	0.177*	0.326
	Bottom	1.254	-	-	**1.254**
	Right	0.080	-	-	0.080
	Left	0.102	0.256	0.177*	0.535

Table 12-21
Simultaneous Transmission Scenario with Bluetooth and 5 GHz Ant 2 (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Hotspot SAR	GPRS 850	0.625	0.256	0.138	1.019
	GPRS 1900	1.254	0.256	0.138	See Table Below
	UMTS 850	0.599	0.256	0.138	0.993
	UMTS 1900	1.054	0.256	0.138	1.448
	LTE Band 4 (AWS)	0.620	0.256	0.138	1.014
	LTE Band 12	0.524	0.256	0.138	0.918
	LTE Band 13	0.440	0.256	0.138	0.834
	LTE Band 26 (Cell)	0.541	0.256	0.138	0.935
	LTE Band 25 (PCS)	0.898	0.256	0.138	1.292
	LTE Band 41	0.929	0.256	0.138	1.323

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Hotspot SAR	Back	0.763	0.213	0.138	1.114
	Front	0.576	0.209	0.138*	0.923
	Top	-	0.149	0.138*	0.287
	Bottom	1.254	-	-	**1.254**
	Right	0.080	-	-	0.080
	Left	0.102	0.256	0.138*	0.496

Table 12-22
Simultaneous Transmission Scenario with Bluetooth and 5 GHz WLAN MIMO (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	4	1+2+3+4
Hotspot SAR	GPRS 850	0.625	0.256	0.177	0.138	1.196
	GPRS 1900	1.254	0.256	0.177	0.138	See Table Below
	UMTS 850	0.599	0.256	0.177	0.138	1.170
	UMTS 1900	1.054	0.256	0.177	0.138	See Table Below
	LTE Band 4 (AWS)	0.620	0.256	0.177	0.138	1.191
	LTE Band 12	0.524	0.256	0.177	0.138	1.095
	LTE Band 13	0.440	0.256	0.177	0.138	1.011
	LTE Band 26 (Cell)	0.541	0.256	0.177	0.138	1.112
	LTE Band 25 (PCS)	0.898	0.256	0.177	0.138	1.469
	LTE Band 41	0.929	0.256	0.177	0.138	1.500

Simult Tx	Configuration	GPRS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	4	1+2+3+4
Hotspot SAR	Back	0.763	0.213	0.177	0.138	**1.291**
	Front	0.576	0.209	0.177*	0.138*	1.100
	Top	-	0.149	0.177*	0.138*	0.464
	Bottom	1.254	-	-	-	1.254
	Right	0.080	-	-	-	0.080
	Left	0.102	0.256	0.177*	0.138*	0.673

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	4	1+2+3+4
Hotspot SAR	Back	0.898	0.213	0.177	0.138	**1.426**
	Front	0.566	0.209	0.177*	0.138*	1.090
	Top	-	0.149	0.177*	0.138*	0.464
	Bottom	1.054	-	-	-	1.054
	Right	0.099	-	-	-	0.099
	Left	0.134	0.256	0.177*	0.138*	0.705

12.6 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.

13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

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

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

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

Table 13-1
Head SAR Measurement Variability Results

HEAD VARIABILITY RESULTS															
Band	FREQUENCY		Mode/Band	Service	Side	Test Position	Data Rate (Mbps)	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.						(W/kg)	(W/kg)		(W/kg)		(W/kg)	
2450	2457.00	10	802.11n, 20 MHz Bandwidth	OFDM , MIMO	Right	Tilt	13	1.060	1.050	1.01	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population					Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 13-2
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS														
Band	FREQUENCY		Mode	Service	# of Time Slots	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)	
1900	1850.20	512	GSM 1900	GPRS	3	bottom	10 mm	1.060	1.060	1.00	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram							

13.2 Measurement Uncertainty

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

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 on the antenna characteristics, other than impedance matching.

To evaluate all the tuner states, the 60 tuner states were divided among the aggregate band, mode and exposure combinations so that each combination was evaluated for at least 20 tuner states and also so that at least 3 single point SAR measurements were made for every available tuner state. Single point time-sweep measurements were performed at the peak SAR location determined by the zoom scan of the configuration with the highest reported SAR for each combination. The tuner state was able to be established remotely so that the device was not moved for the entire series of single point SAR for the tuner states in each combination. The SAR probe remained stationary at the same position throughout the entire series of single point measurements for each combination. When the single point SAR or 1g SAR was > 1.2 W/kg for a particular band/mode/exposure condition, point SAR measurements were made for all 60 states.

Per FCC Guidance, all bands were treated independently.

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

Table 14-1
LTE Supplemental Head SAR Data

Supplemental Head SAR Data									
LTE Band 12		LTE Band 13		LTE Band 26		LTE Band 4		LTE Band 25	
QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 15MHz Bandwidth, 1 RB, 36 RB Offsets		QPSK, 20MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 20MHz Bandwidth, 1 RB, 0 RB Offsets	
Test Position	Right Cheek	Test Position	Right Cheek	Test Position	Right Cheek	Test Position	Left Cheek	Test Position	Left Cheek
Frequency (MHz)	707.50	Frequency (MHz)	782.00	Frequency (MHz)	831.50	Frequency (MHz)	1732.50	Frequency (MHz)	1882.50
Channel	23095	Channel	23230	Channel	26865	Channel	20175	Channel	26365
Measured 1g SAR (W/kg)	0.149	Measured 1g SAR (W/kg)	0.145	Measured 1g SAR (W/kg)	0.139	Measured 1g SAR (W/kg)	0.272	Measured 1g SAR (W/kg)	0.252
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-tune (State 2)	0.176	Auto-tune (State 8)	0.174	Auto-tune (State 3)	0.210	Auto-tune (State 45)	0.415	Auto-tune (State 26)	0.347
Default (State 1)	0.159	Default (State 1)	0.157	Default (State 1)	0.180	Default (State 1)	0.332	Default (State 1)	0.276
State 0	0.158	State 0	0.155	State 1	0.180	State 1	0.332	State 1	0.276
State 1	0.159	State 1	0.157	State 3	0.209	State 4	0.317	State 3	0.250
State 2	0.180	State 2	0.175	State 5	0.211	State 5	0.315	State 5	0.245
State 5	0.183	State 4	0.177	State 7	0.203	State 7	0.307	State 10	0.202
State 8	0.181	State 8	0.175	State 8	0.204	State 9	0.294	State 12	0.159
State 10	0.156	State 10	0.149	State 9	0.196	State 11	0.276	State 17	0.322
State 12	0.102	State 13	0.075	State 12	0.116	State 15	0.196	State 20	0.345
State 14	0.060	State 14	0.054	State 14	0.066	State 16	0.320	State 23	0.347
State 18	0.039	State 17	0.050	State 17	0.063	State 19	0.360	State 26	0.341
State 22	0.034	State 20	0.060	State 18	0.099	State 21	0.366	State 27	0.344
State 24	0.030	State 24	0.054	State 21	0.106	State 25	0.391	State 28	0.330
State 27	0.013	State 26	0.035	State 25	0.091	State 27	0.401	State 31	0.249
State 28	0.007	State 29	0.007	State 28	0.025	State 31	0.217	State 35	0.298
State 32	0.040	State 33	0.052	State 30	0.009	State 32	0.331	State 40	0.290
State 35	0.042	State 34	0.070	State 31	0.003	State 37	0.375	State 41	0.283
State 37	0.040	State 35	0.069	State 36	0.110	State 39	0.385	State 44	0.243
State 40	0.033	State 39	0.065	State 39	0.112	State 40	0.384	State 46	0.209
State 43	0.015	State 43	0.025	State 41	0.098	State 44	0.417	State 48	0.244
State 46	0.003	State 46	0.004	State 45	0.018	State 45	0.419	State 51	0.276
State 51	0.159	State 50	0.051	State 47	0.004	State 47	0.342	State 54	0.272
Satet 52	0.038	State 52	0.049	State 50	0.067	State 49	0.272	State 56	0.293
State 55	0.036	State 56	0.051	State 53	0.069	State 53	0.327	State 57	0.279
State 59	0.040	State 57	0.015	State 56	0.066	State 57	0.332	State 59	0.305

Table 14-2
LTE Supplemental Body SAR Data

Supplemental Body SAR Data									
LTE Band 12		LTE Band 13		LTE Band 26		LTE Band 4		LTE Band 25	
QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 10MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 15MHz Bandwidth, 1 RB, 36 RB Offsets		QPSK, 20MHz Bandwidth, 1 RB, 0 RB Offsets		QPSK, 20MHz Bandwidth, 1 RB, 99 RB Offsets	
Test Position	Back Side	Test Position	Back Side	Test Position	Back Side	Test Position	Back Side	Test Position	Back Side
Spacing	10 mm	Spacing	10 mm	Spacing	10 mm	Spacing	15 mm	Spacing	15 mm
Frequency (MHz)	707.50	Frequency (MHz)	782.00	Frequency (MHz)	831.50	Frequency (MHz)	1732.50	Frequency (MHz)	1860.00
Channel	23095	Channel	23230	Channel	26865	Channel	20175	Channel	26140
Measured 1g SAR (W/kg)	0.397	Measured 1g SAR (W/kg)	0.368	Measured 1g SAR (W/kg)	0.408	Measured 1g SAR (W/kg)	0.731	Measured 1g SAR (W/kg)	0.953
Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)		Average Value of Time Sweep (W/kg)	
Auto-tune (State 2)	0.480	Auto-tune (State 4)	0.418	Auto-tune (State 7)	0.458	Auto-tune (State 45)	0.819	Auto-tune (State 26)	1.069
Default (State 1)	0.442	Default (State 1)	0.400	Default (State 1)	0.357	Default (State 1)	0.678	Default (State 1)	0.719
State 0	0.437	State 0	0.397	State 1	0.357	State 1	0.678	State 0	0.728
State 1	0.442	State 1	0.400	State 3	0.437	State 2	0.672	State 1	0.719
State 2	0.484	State 2	0.425	State 6	0.455	State 4	0.675	State 3	0.066
State 4	0.481	State 4	0.430	State 7	0.460	State 8	0.656	State 6	0.618
State 6	0.467	State 9	0.340	State 8	0.462	State 12	0.575	State 9	0.581
State 8	0.456	State 13	0.132	State 11	0.364	State 14	0.522	State 11	0.516
State 9	0.417	State 16	0.165	State 14	0.213	State 19	0.677	State 13	0.423
State 12	0.229	State 19	0.233	State 17	0.124	State 20	0.694	State 15	0.312
State 13	0.182	State 21	0.231	State 18	0.194	State 22	0.710	State 18	0.898
State 15	0.086	State 25	0.155	State 22	0.209	State 24	0.713	State 21	0.919
State 16	0.120	State 26	0.111	State 23	0.204	State 28	0.659	State 24	0.948
State 20	0.120	State 28	0.045	State 26	0.120	State 29	0.596	State 26	1.032
State 23	0.101	State 30	0.021	State 27	0.082	State 33	0.654	State 29	1.034
State 24	0.096	State 32	0.175	State 29	0.032	State 34	0.723	State 30	0.987
State 27	0.042	State 36	0.240	State 34	0.208	State 37	0.736	State 33	0.772
State 32	0.128	State 39	0.218	State 37	0.220	State 40	0.754	State 38	0.792
State 34	0.134	State 41	0.167	State 38	0.221	State 42	0.797	State 42	0.777
State 36	0.129	State 45	0.035	State 42	0.134	State 45	0.787	State 45	0.736
State 38	0.116	State 48	0.397	State 44	0.053	State 49	0.522	State 47	0.632
State 43	0.046	State 49	0.163	State 50	0.131	State 51	0.668	State 48	0.647
State 46	0.013	State 52	0.167	State 52	0.127	State 53	0.652	State 54	0.705
State 54	0.440	State 55	0.163	State 55	0.123	State 55	0.562	State 58	0.827
State 57	0.443	State 58	0.168	State 58	0.128	State 59	0.658	State 59	0.771

15 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4432B	ESG-D Series Signal Generator	4/19/2018	Annual	4/19/2019	US40053896
Agilent	E5515C	Wireless Communications Test Set	1/29/2016	Triennial	1/29/2019	GB46310798
Agilent	E5515C	Wireless Communications Test Set	2/28/2018	Biennial	2/28/2020	GB41450275
Agilent	N9020A	MXA Signal Analyzer	1/24/2018	Annual	1/24/2019	US46470561
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Agilent	E5515C	Wireless Communications Test Set	2/7/2018	Triennial	2/7/2021	GB43304447
Agilent	8753ES	S-Parameter Network Analyzer	2/8/2018	Annual	2/8/2019	US39170122
Agilent	E4438C	ESG Vector Signal Generator	3/24/2017	Biennial	3/24/2019	MY42082385
Agilent	N5182A-506	MXG Vector Signal Generator	6/19/2018	Annual	6/19/2019	MY48180366
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433972
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433974
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/11/2018	Annual	9/11/2019	1091
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	MT8821C	Radio Communication Analyzer	11/6/2018	Annual	11/6/2019	6200901190
Anritsu	MA24106A	USB Power Sensor	6/5/2018	Annual	6/5/2019	1231538
Anritsu	MA24106A	USB Power Sensor	6/5/2018	Annual	6/5/2019	1231535
Anritsu	ML2496A	Power Meter	10/21/2018	Annual	10/21/2019	1138001
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1126066
Anritsu	MT8820C	Radio Communication Analyzer	6/27/2018	Annual	6/27/2019	6201240328
Anritsu	ML2496A	Power Meter	5/21/2018	Annual	5/21/2019	1351001
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/14/2017	Biennial	2/14/2019	170112507
Control Company	4040	Therm./ Clock/ Humidity Monitor	3/1/2017	Biennial	3/1/2019	170152009
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	AT/N6705B	DC Power Supply	N/A	N/A	N/A	MY53001315
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini Circuits	PWR-4GHS	USB Power Sensor	1/20/2018	Annual	1/20/2019	11710030063
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mitutoyo	CD-6"CSX	Digital Caliper	4/18/2018	Biennial	4/18/2020	13264165
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	4/18/2018	Annual	4/18/2019	1445
Rohde & Schwarz	CMU200	Base Station Simulator	5/18/2018	Annual	5/18/2019	109892
Rohde & Schwarz	CMW500	Radio Communication Tester	6/8/2018	Annual	6/8/2019	112347
Rohde & Schwarz	CMW500	Radio Communication Tester	7/5/2018	Annual	7/5/2019	106578
Rohde & Schwarz	CMW500	Radio Communication Tester	10/4/2018	Annual	10/4/2019	109366
Rohde & Schwarz	CMW500	Radio Communication Tester	8/10/2018	Annual	8/10/2019	116743
Agilent	E4440A	PSA Series Spectrum Analyzer	11/14/2018	Annual	11/14/2019	MY46186272
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	10/30/2018	Annual	10/30/2019	164948
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	7/11/2018	Annual	7/11/2019	N/A
Seekonk	NC-100	Torque Wrench (8" lb)	5/10/2018	Biennial	5/10/2020	21053
Seekonk	NC-100	Torque Wrench (8" lb)	5/23/2018	Biennial	5/23/2020	N/A
Seekonk	NC-100	Torque Wrench	7/11/2018	Annual	7/11/2019	N/A
Seekonk	NC-100	Torque Wrench	4/18/2018	Biennial	4/18/2020	N/A
SPEAG	EX3DV4	SAR Probe	5/22/2018	Annual	5/22/2019	7406
SPEAG	EX3DV4	SAR Probe	8/23/2018	Annual	8/23/2019	7308
SPEAG	ES3DV3	SAR Probe	10/22/2018	Annual	10/22/2019	3287
SPEAG	EX3DV4	SAR Probe	7/20/2018	Annual	7/20/2019	7410
SPEAG	EX3DV4	SAR Probe	6/25/2018	Annual	6/25/2019	7409
SPEAG	ES3DV3	SAR Probe	3/27/2018	Annual	3/27/2019	3347
SPEAG	ES3DV3	SAR Probe	8/22/2018	Annual	8/22/2019	3332
SPEAG	ES3DV3	SAR Probe	3/13/2018	Annual	3/13/2019	3319
SPEAG	EX3DV4	SAR Probe	4/18/2018	Annual	4/18/2019	7357
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/22/2018	Annual	5/22/2019	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/3/2018	Annual	10/3/2019	1558
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/18/2018	Annual	10/18/2019	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2018	Annual	2/9/2019	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/11/2018	Annual	7/11/2019	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/18/2018	Annual	6/18/2019	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/15/2018	Annual	2/15/2019	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/7/2018	Annual	3/7/2019	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2018	Annual	4/11/2019	1407
SPEAG	D750V3	750 MHz Dipole	1/15/2018	Annual	1/15/2019	1003
SPEAG	D750V3	750 MHz Dipole	3/7/2017	Biennial	3/7/2019	1054
SPEAG	D835V2	835 MHz SAR Dipole	10/19/2018	Annual	10/19/2019	4d047
SPEAG	D835V2	835 MHz SAR Dipole	10/19/2018	Annual	10/19/2019	4d133
SPEAG	D1750V2	1750 MHz SAR Dipole	5/9/2017	Biennial	5/9/2019	1148
SPEAG	D1750V2	1750 MHz SAR Dipole	10/22/2018	Annual	10/22/2019	1150
SPEAG	D1750V2	1900 MHz SAR Dipole	10/23/2018	Annual	10/23/2019	5d080
SPEAG	D1900V2	1900 MHz SAR Dipole	2/7/2018	Annual	2/7/2019	5d148
SPEAG	D1900V2	1900 MHz SAR Dipole	10/23/2018	Annual	10/23/2019	5d149
SPEAG	D2450V2	2450 MHz SAR Dipole	8/16/2018	Annual	8/16/2019	981
SPEAG	D2450V2	2450 MHz SAR Dipole	8/17/2018	Biennial	8/17/2019	719
SPEAG	D2450V2	2450 MHz SAR Dipole	9/11/2017	Biennial	9/11/2019	797
SPEAG	D2600V2	2600 MHz SAR Dipole	4/11/2018	Annual	4/11/2019	1004
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/21/2016	Triennial	9/21/2019	1191

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

Note 2: 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.

16 MEASUREMENT UNCERTAINTIES

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

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: A3LSMG9700; Type: Portable Handset; Serial: 0539M

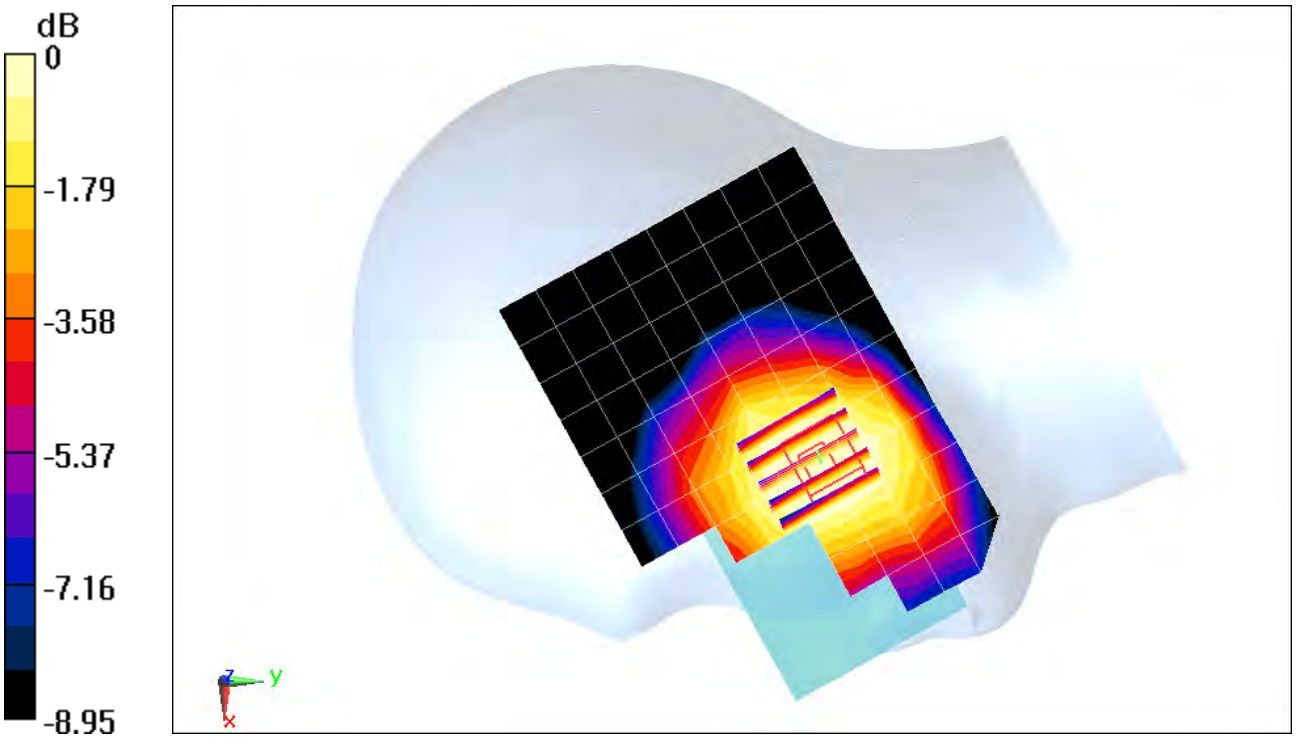
Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium: 835 Head Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.901$ S/m; $\varepsilon_r = 40.495$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 12-24-2018; Ambient Temp: 21.5°C; Tissue Temp: 20.6°C

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

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.15 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.155 W/kg
SAR(1 g) = 0.130 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

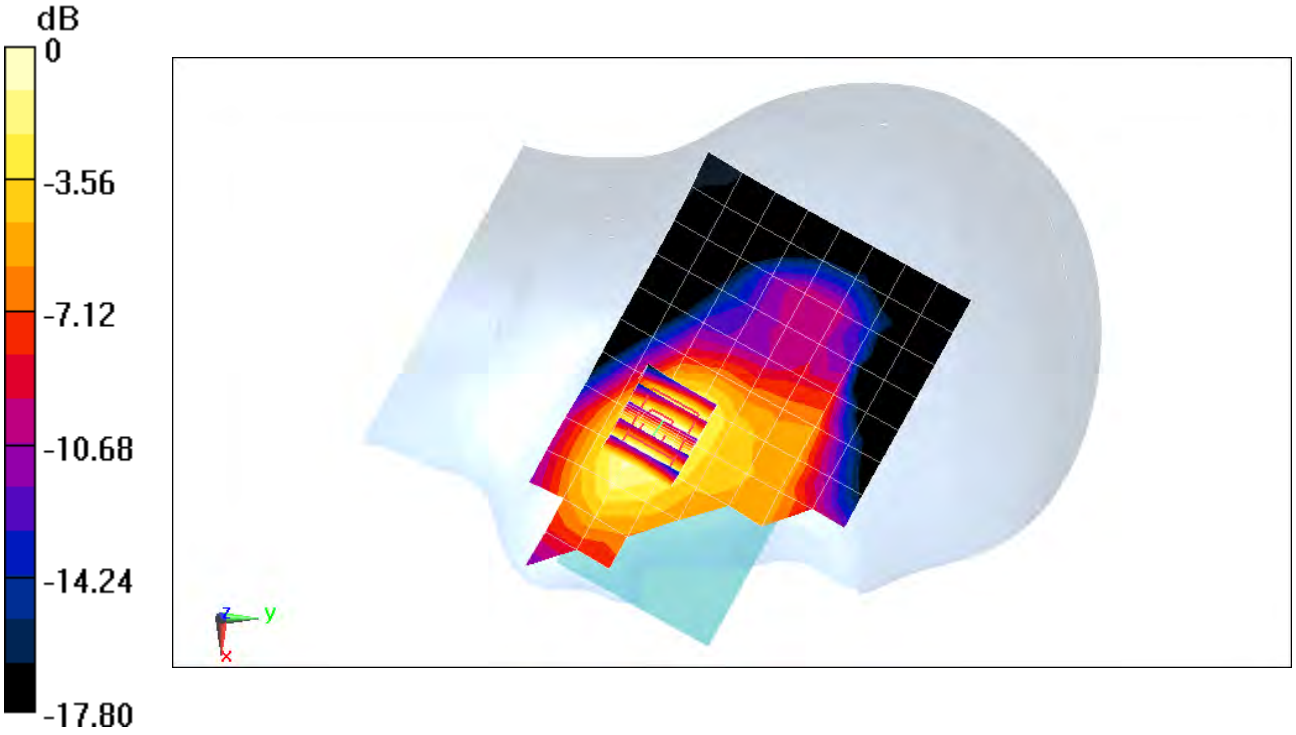
Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.419 S/m; ε_r = 40.172; ρ = 1000 kg/m^3
Phantom section: Left Section

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

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

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

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.51 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.230 W/kg
SAR(1 g) = 0.146 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

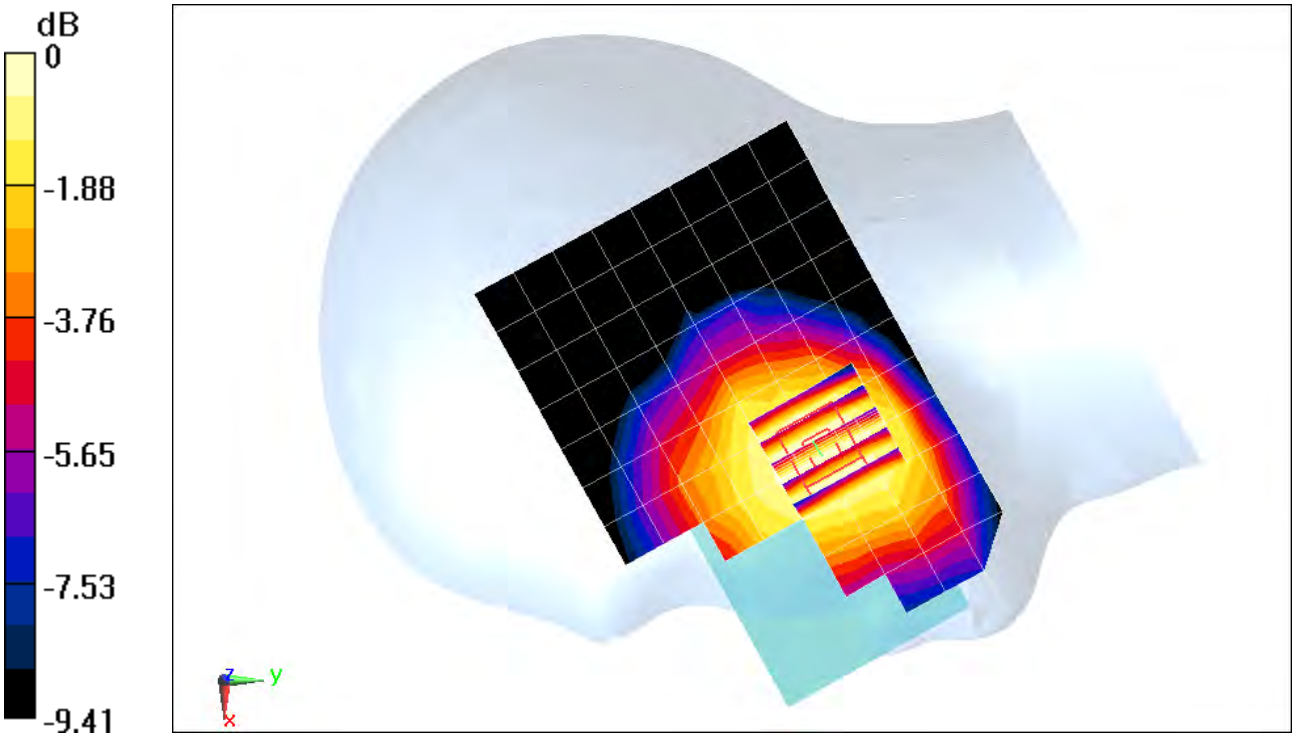
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.901 S/m; ε_r = 40.495; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-24-2018; Ambient Temp: 21.5°C; Tissue Temp: 20.6°C

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

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.07 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.240 W/kg
SAR(1 g) = 0.198 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

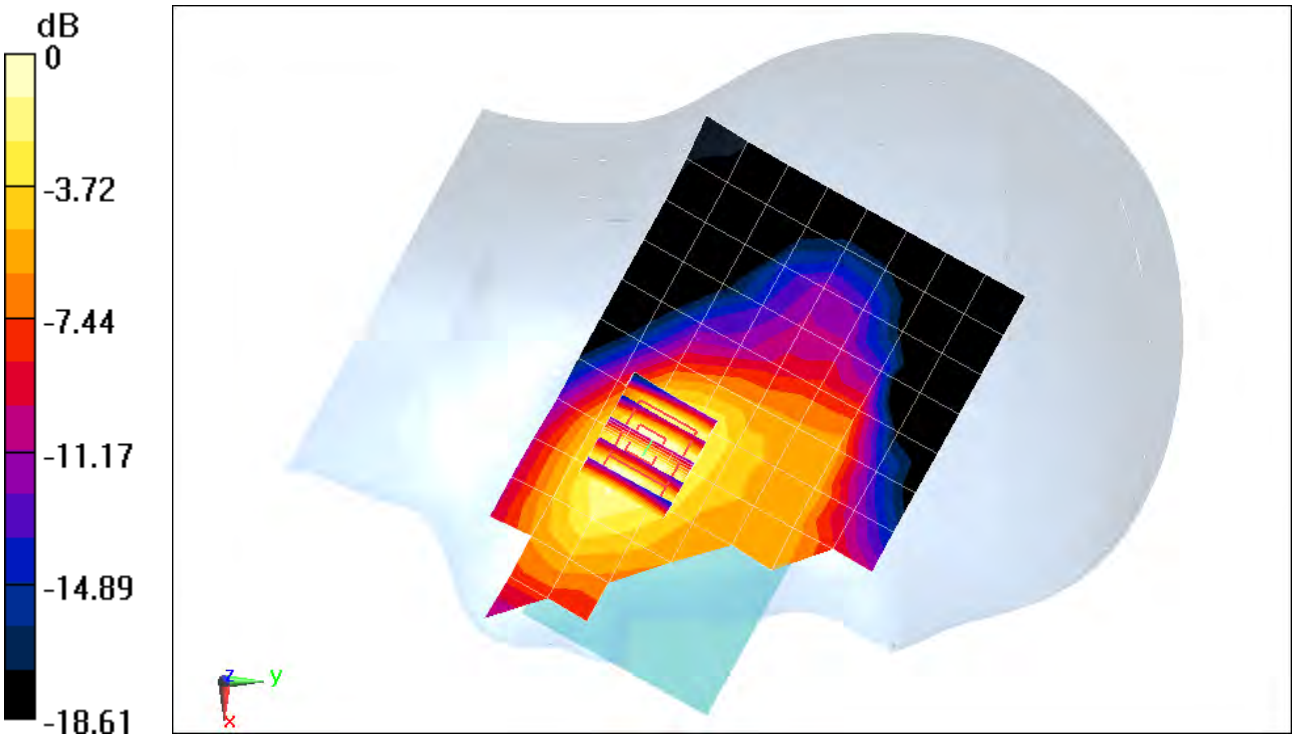
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.419 S/m; ε_r = 40.172; ρ = 1000 kg/m^3
Phantom section: Left Section

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

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

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

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.74 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.346 W/kg
SAR(1 g) = 0.217 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0554M

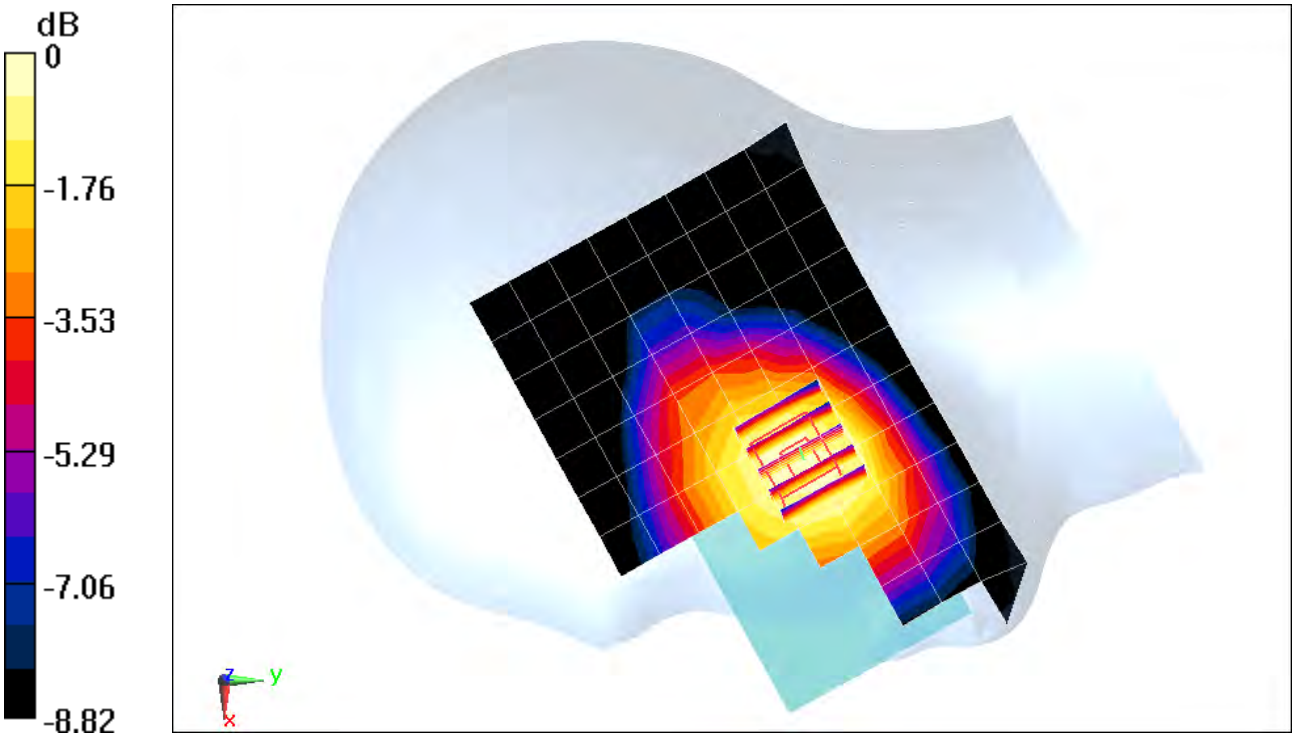
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.888 S/m; ε_r = 42.761; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 01-14-2019; Ambient Temp: 22.4°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN7357; ConvF(10.5, 10.5, 10.5) @ 707.5 MHz; Calibrated: 4/18/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2018
Phantom: SAM with CRP v5.0 Left; Type: QD000P40CD; Serial: 1687
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.99 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.183 W/kg
SAR(1 g) = 0.149 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

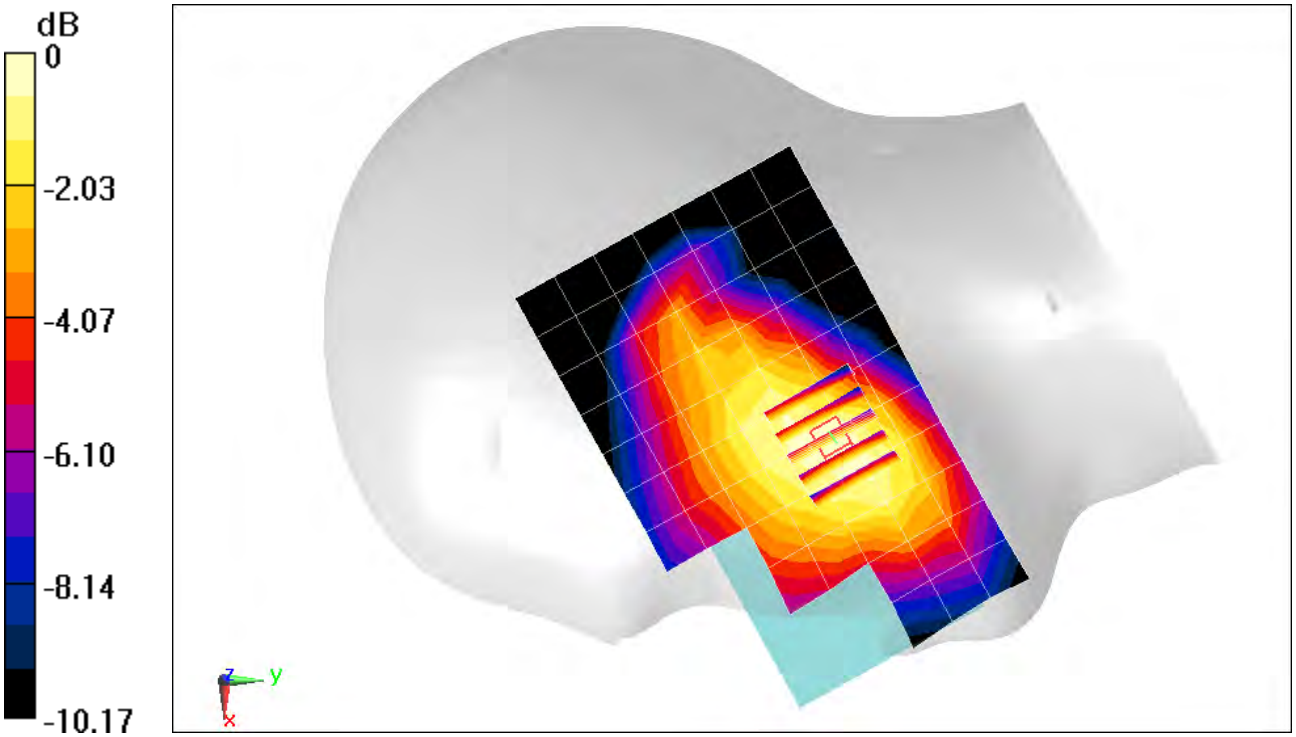
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 782 MHz; σ = 0.919 S/m; ε_r = 41.059; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-26-2018; Ambient Temp: 22.5°C; Tissue Temp: 19.8°C

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

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

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.41 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.181 W/kg
SAR(1 g) = 0.145 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

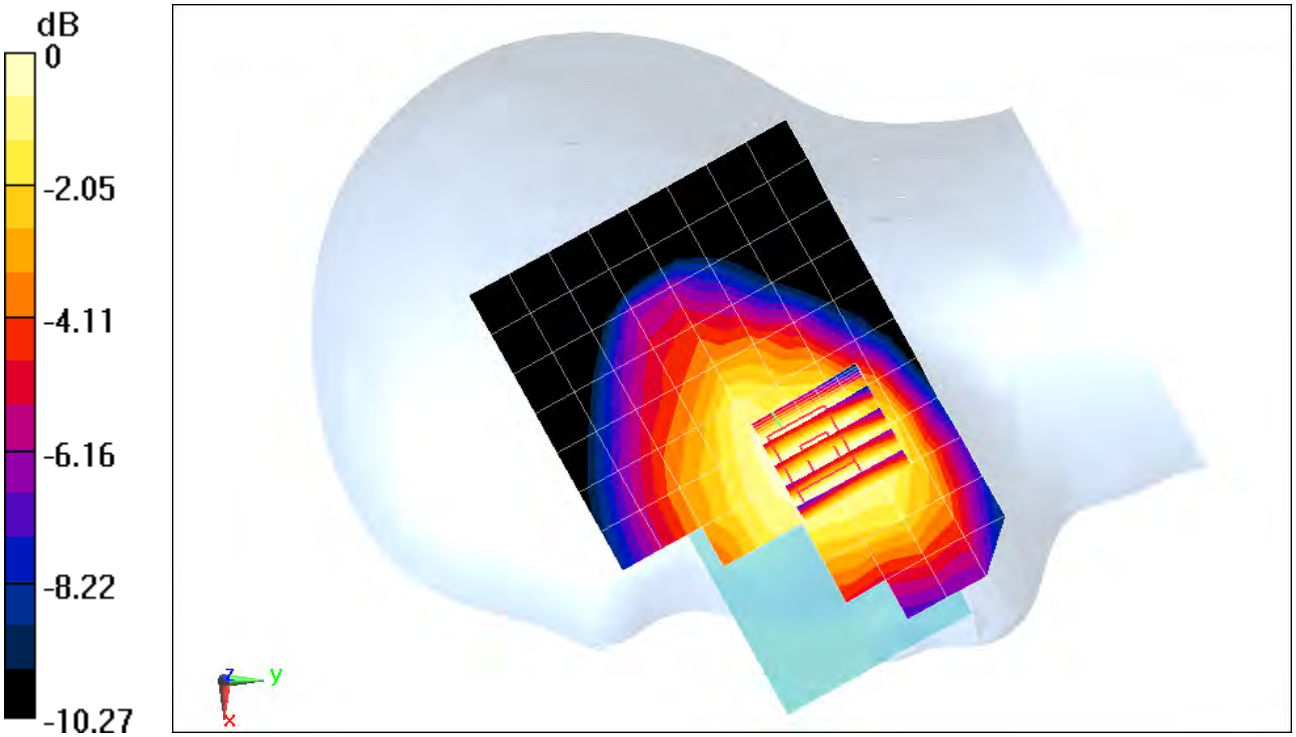
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 831.5 MHz; σ = 0.895 S/m; ε_r = 40.565; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-24-2018; Ambient Temp: 21.5°C; Tissue Temp: 20.6°C

Probe: EX3DV4 - SN7410; ConvF(9.81, 9.81, 9.81) @ 831.5 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.08 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.177 W/kg
SAR(1 g) = 0.139 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

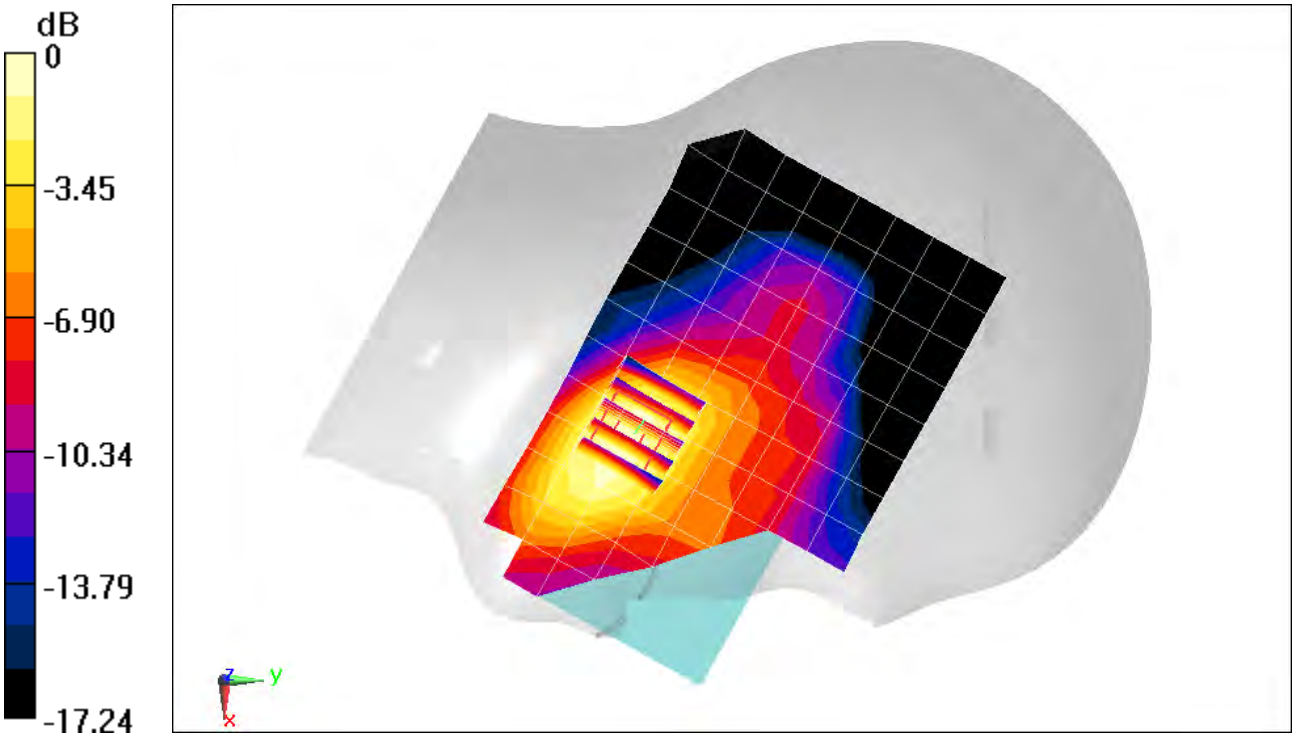
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.371$ S/m; $\varepsilon_r = 39.005$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

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

Probe: ES3DV3 - SN3287; ConvF(5.48, 5.48, 5.48) @ 1732.5 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.44 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 0.412 W/kg
SAR(1 g) = 0.272 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

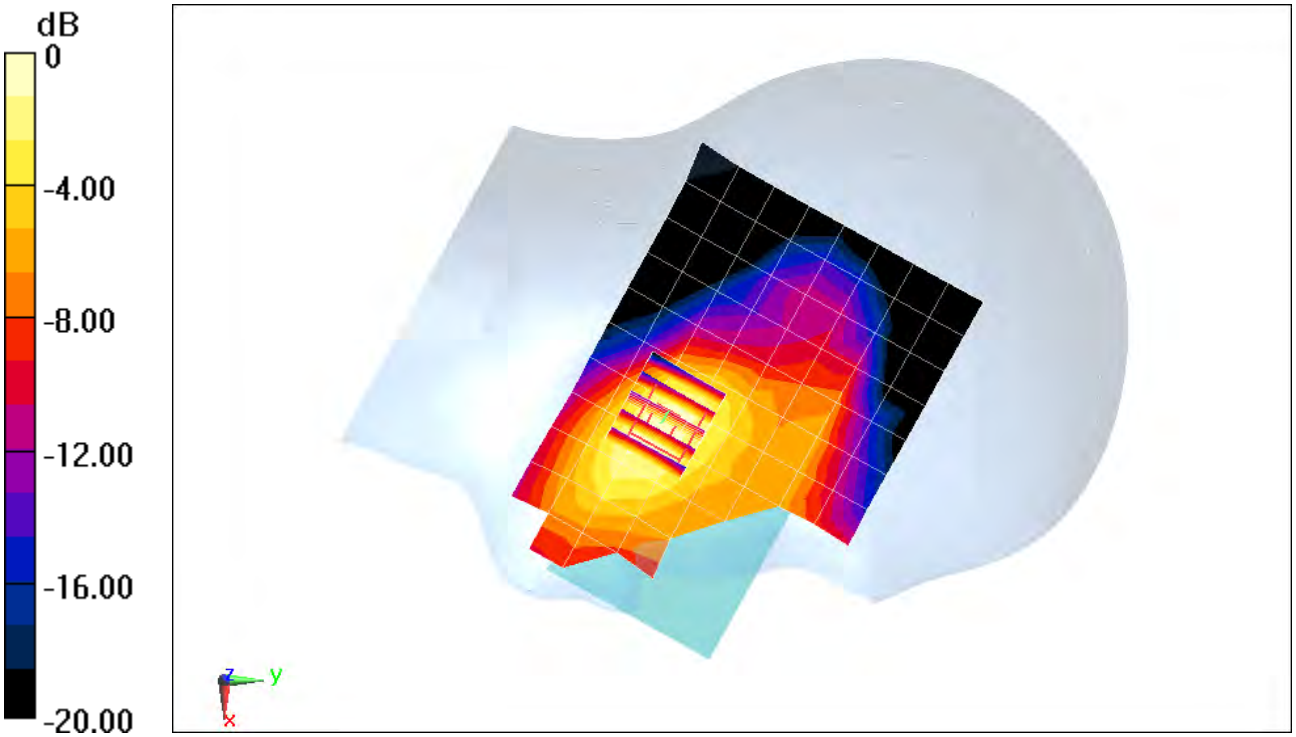
Communication System: UID 0, _LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
$f = 1882.5$ MHz; $\sigma = 1.422$ S/m; $\varepsilon_r = 40.161$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

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

Probe: EX3DV4 - SN7409; ConvF(8.05, 8.05, 8.05) @ 1882.5 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 25 (PCS), Left Head, Cheek, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.54 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.406 W/kg
SAR(1 g) = 0.252 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

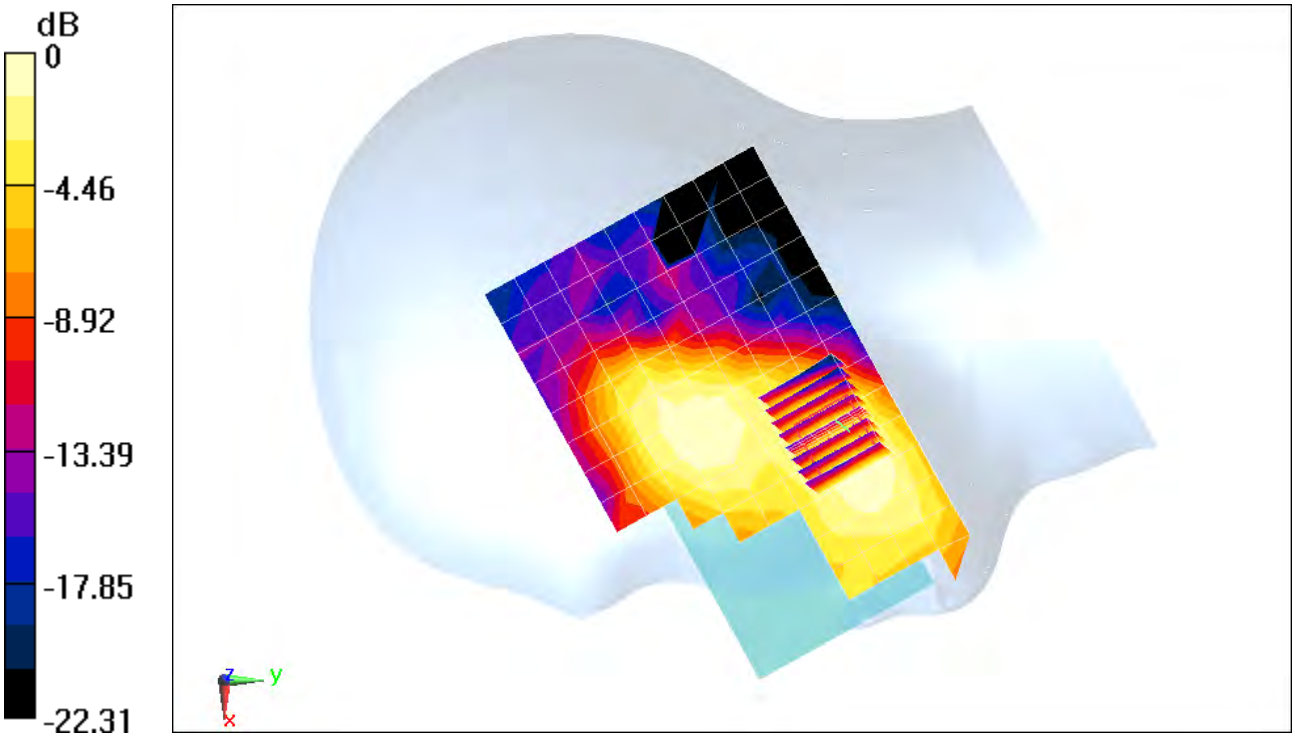
Communication System: UID 0, LTE Band 41; Frequency: 2506 MHz; Duty Cycle: 1:1.58
Medium: 2450 Head Medium parameters used (interpolated):
$f = 2506$ MHz; $\sigma = 1.912$ S/m; $\varepsilon_r = 38.009$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 12-14-2018; Ambient Temp: 22.0°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7410; ConvF(7.5, 7.5, 7.5) @ 2506 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 41, Right Head, Cheek, Low.ch,
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

Area Scan (10x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.831 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.160 W/kg
SAR(1 g) = 0.089 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0591M

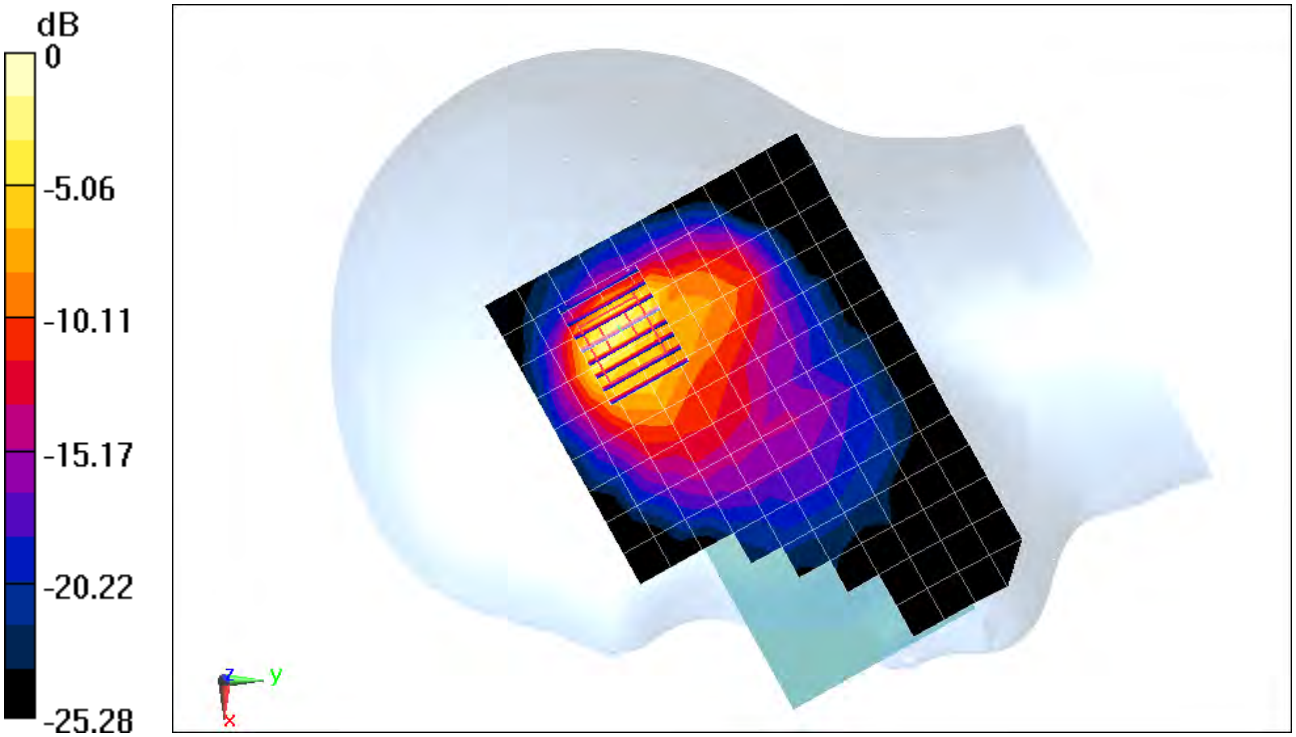
Communication System: UID 0, _IEEE 802.11n; Frequency: 2457 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2457 MHz; σ = 1.835 S/m; ε_r = 40.09; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date:01-07-2019; Ambient Temp: 21.7°C; Tissue Temp: 20.8°C

Probe: EX3DV4 - SN7410; ConvF(7.5, 7.5, 7.5) @ 2457 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11n, MIMO
22 MHz Bandwidth, Right Head, Tilt, Ch 10, 13 Mbps

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 12.25 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 2.87 W/kg
SAR(1 g) = 1.06 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

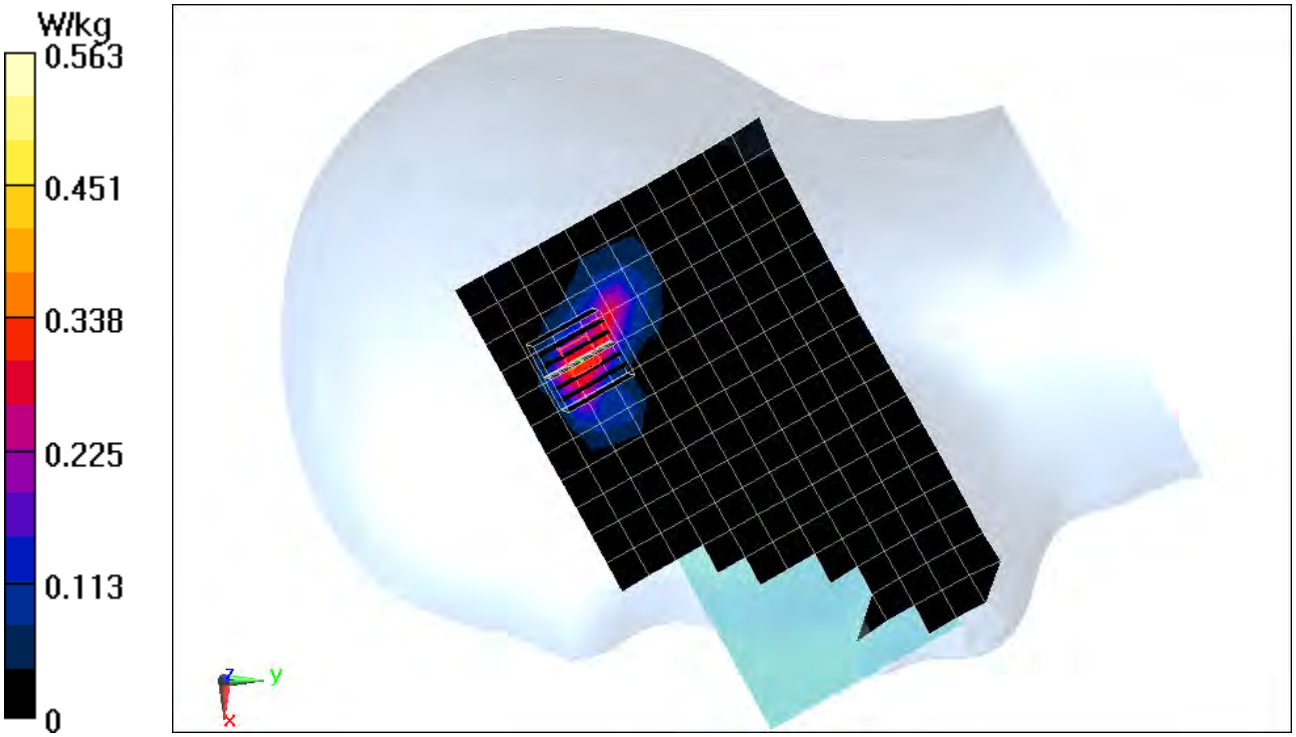
Communication System: UID 0, 802.11ac 5.2-5.8 GHz Band; Frequency: 5775 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
f = 5775 MHz; σ = 5.128 S/m; ε_r = 34.342; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 12-09-2018; Ambient Temp: 21.1°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7409; ConvF(4.82, 4.82, 4.82) @ 5775 MHz; Calibrated: 6/25/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 6/18/2018
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11ac, U-NII-3, Antenna 1,
80 MHz Bandwidth, Right Head, Cheek, Ch 155, 29.3 Mbps

Area Scan (12x22x1): 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 = 1.673 V/m; Power Drift = -0.14 dB
Peak SAR (extrapolated) = 1.11 W/kg
SAR(1 g) = 0.186 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0591M

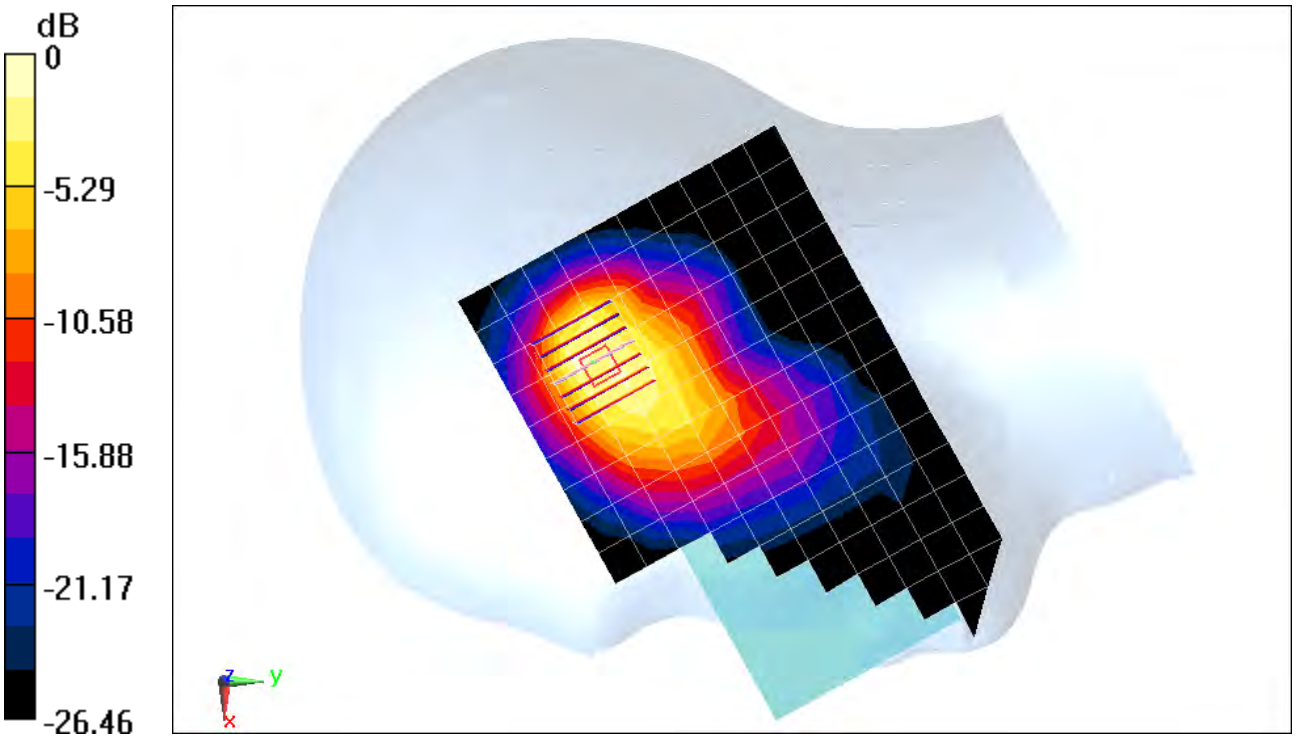
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.287
Medium: 2450 Head Medium parameters used (interpolated):
$f = 2441$ MHz; $\sigma = 1.852$ S/m; $\varepsilon_r = 38.307$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

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

Probe: EX3DV4 - SN7410; ConvF(7.5, 7.5, 7.5) @ 2441 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (11x19x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 21.73 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 1.77 W/kg
SAR(1 g) = 0.783 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

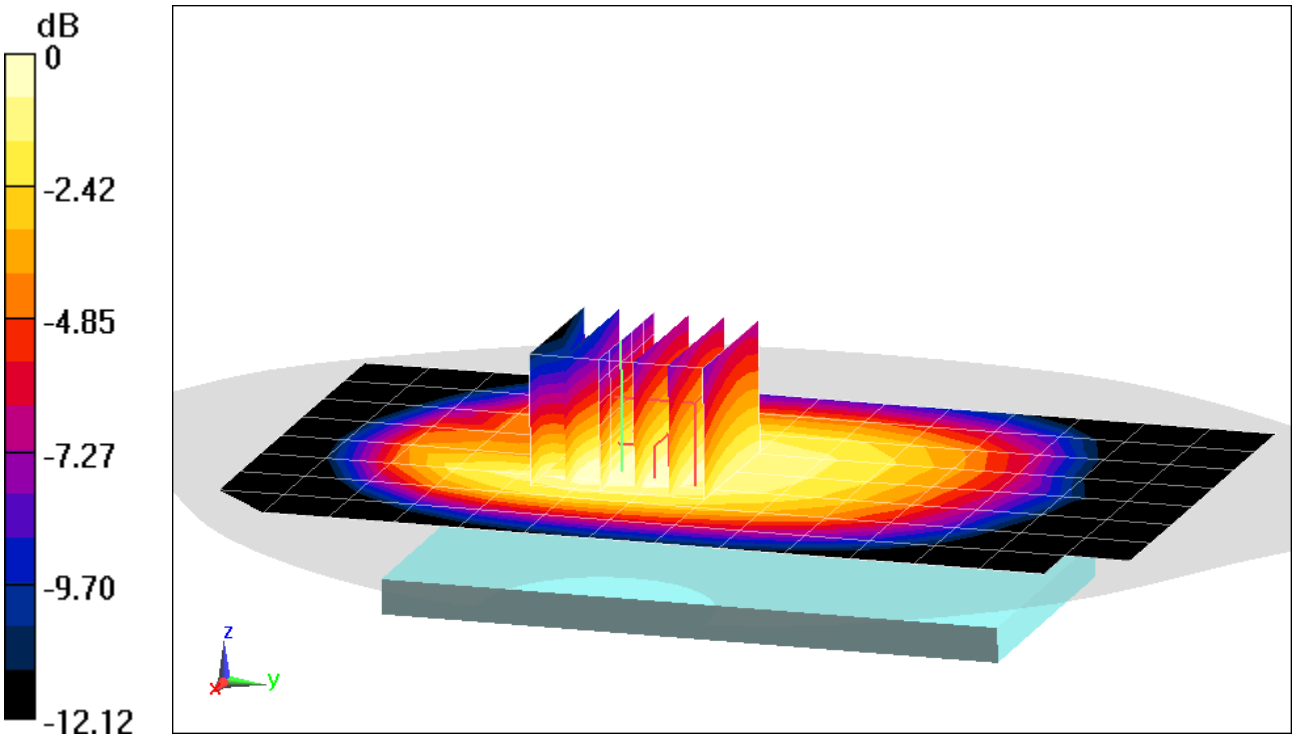
Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.966 S/m; ε_r = 53.591; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

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

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

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.36 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.282 W/kg
SAR(1 g) = 0.212 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

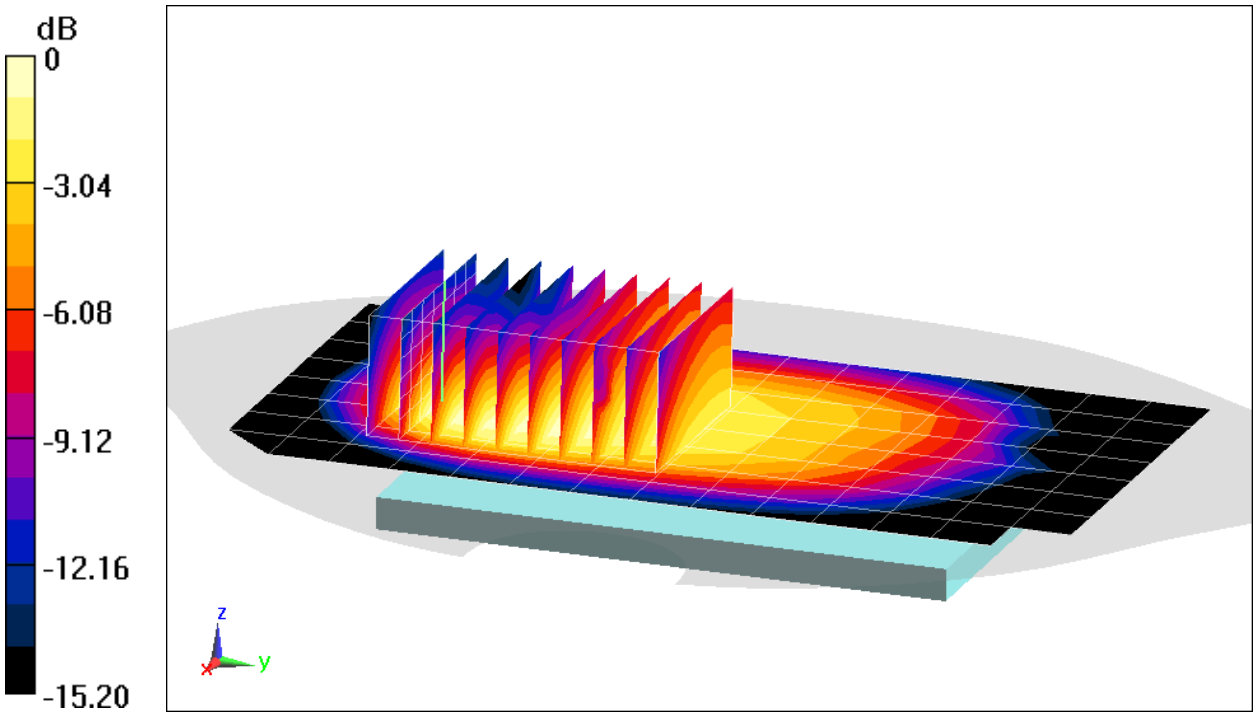
Communication System: UID 0, _GSM GPRS; 3 Tx slots; Frequency: 848.8 MHz; Duty Cycle: 1:2.76
Medium: 835 Body Medium parameters used (interpolated):
f = 848.8 MHz; σ = 0.971 S/m; ε_r = 53.541; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

Probe: ES3DV3 - SN3347; ConvF(6.37, 6.37, 6.37) @ 848.8 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (8x10x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.97 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.720 W/kg
SAR(1 g) = 0.459 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0612M

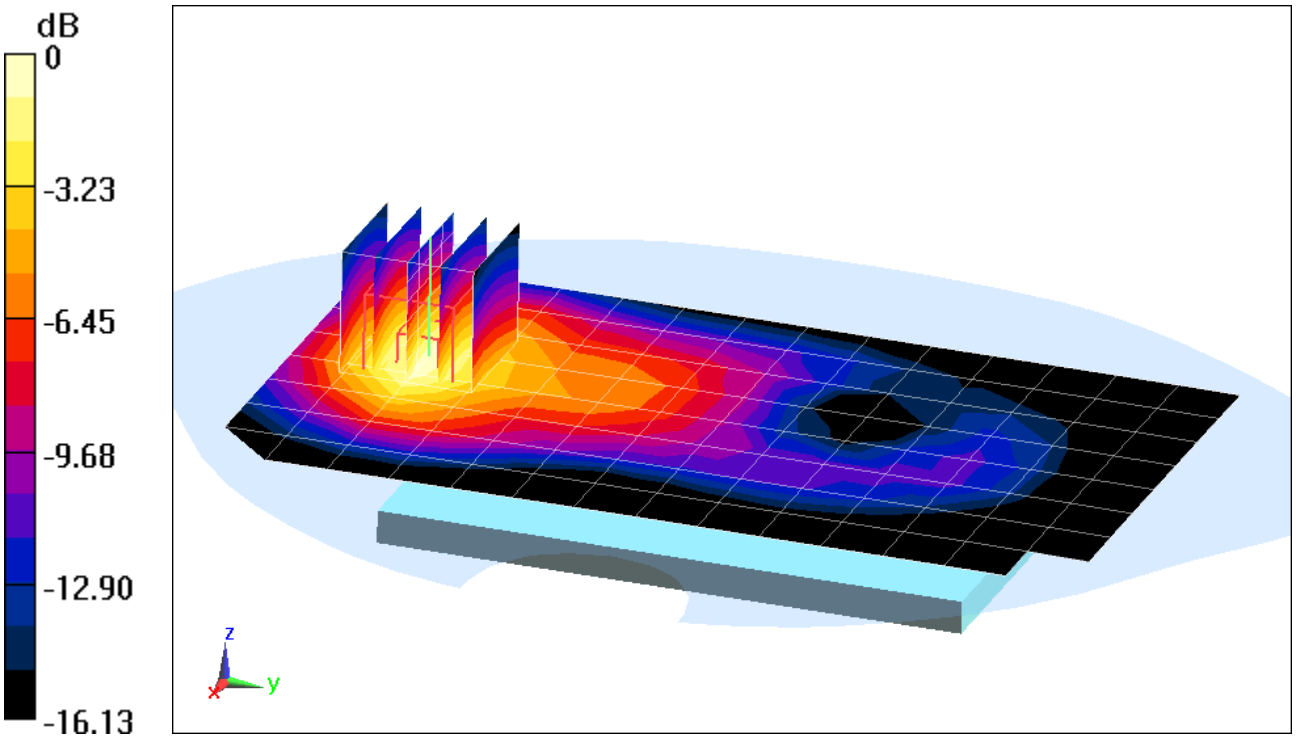
Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.552 S/m; ε_r = 53.508; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-17-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.3°C

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

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.80 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.730 W/kg
SAR(1 g) = 0.463 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0612M

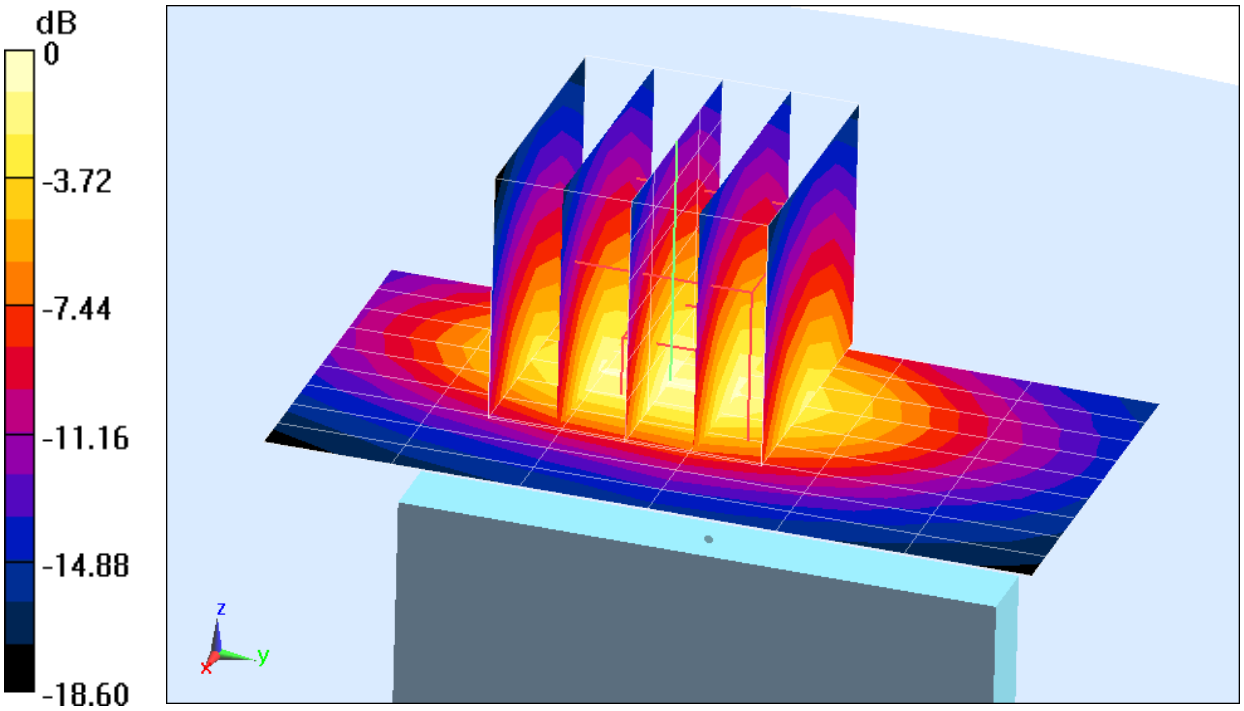
Communication System: UID 0, _GSM GPRS; 3 Tx slots; Frequency: 1850.2 MHz; Duty Cycle: 1:2.76
Medium: 1900 Body Medium parameters used (interpolated):
f = 1850.2 MHz; σ = 1.518 S/m; ε_r = 53.608; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1850.2 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (10x7x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.96 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.80 W/kg
SAR(1 g) = 1.06 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

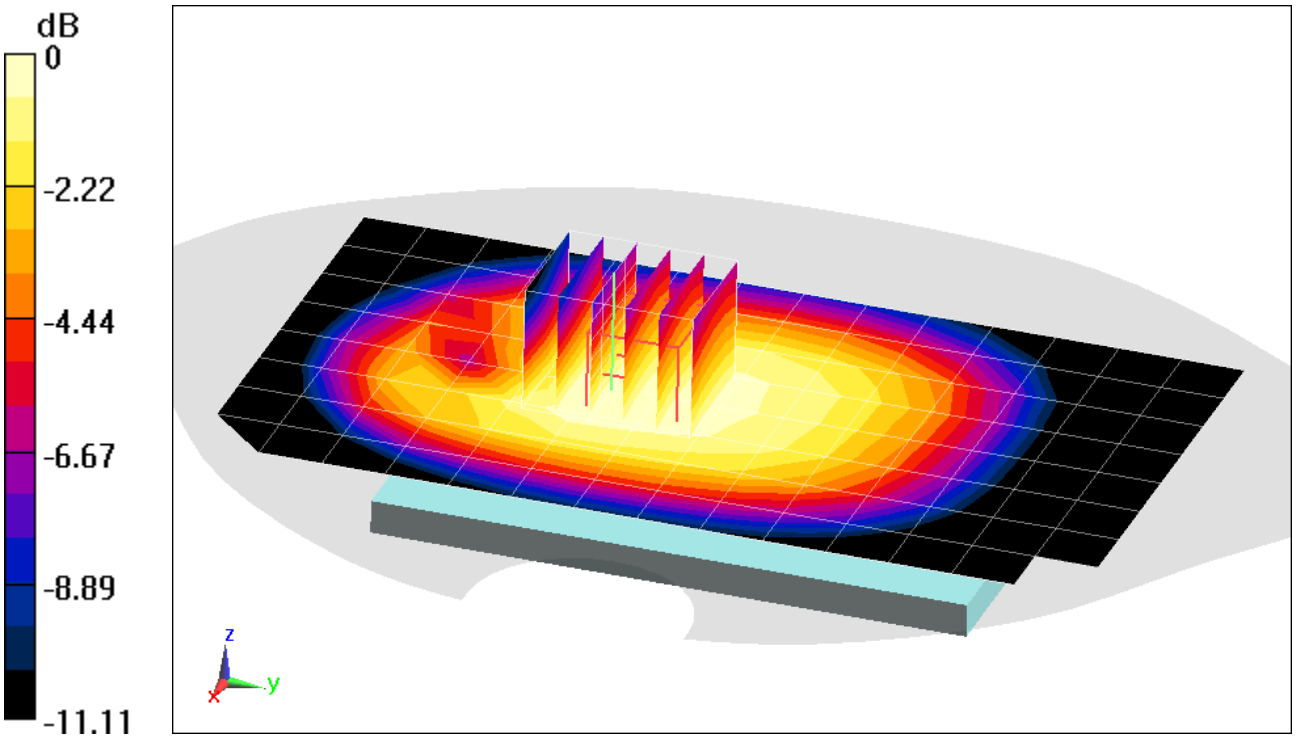
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.966 S/m; ε_r = 53.591; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

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

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

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.03 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.426 W/kg
SAR(1 g) = 0.328 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

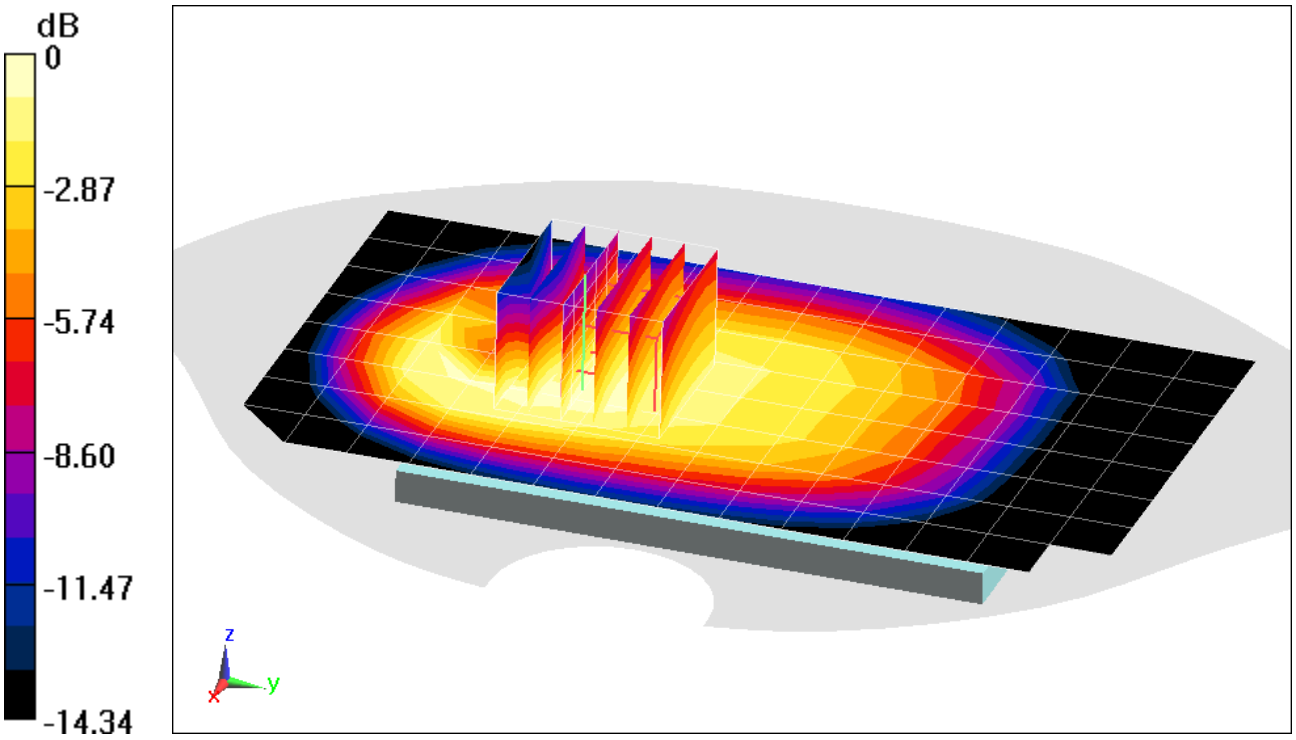
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.966 S/m; ε_r = 53.591; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

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

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.77 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.647 W/kg
SAR(1 g) = 0.460 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0539M

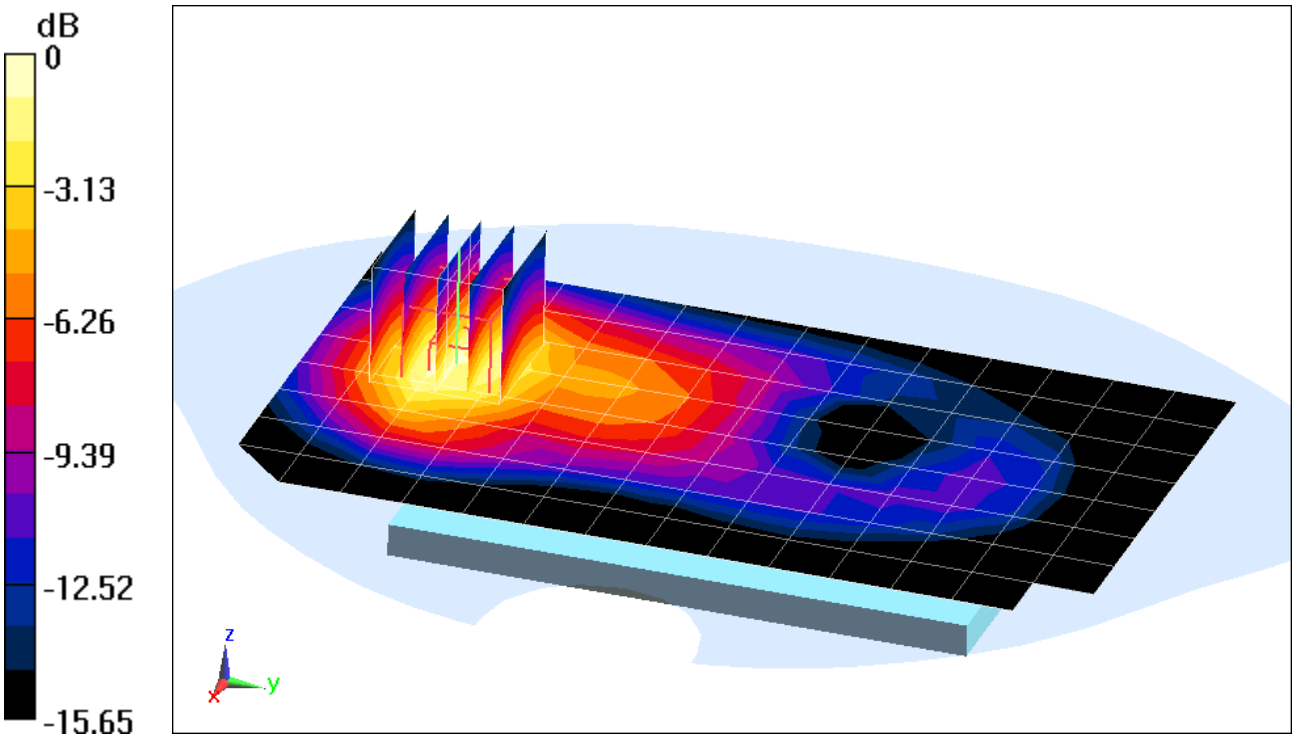
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.552 S/m; ε_r = 53.508; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-17-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.3°C

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

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.74 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.31 W/kg
SAR(1 g) = 0.820 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0539M

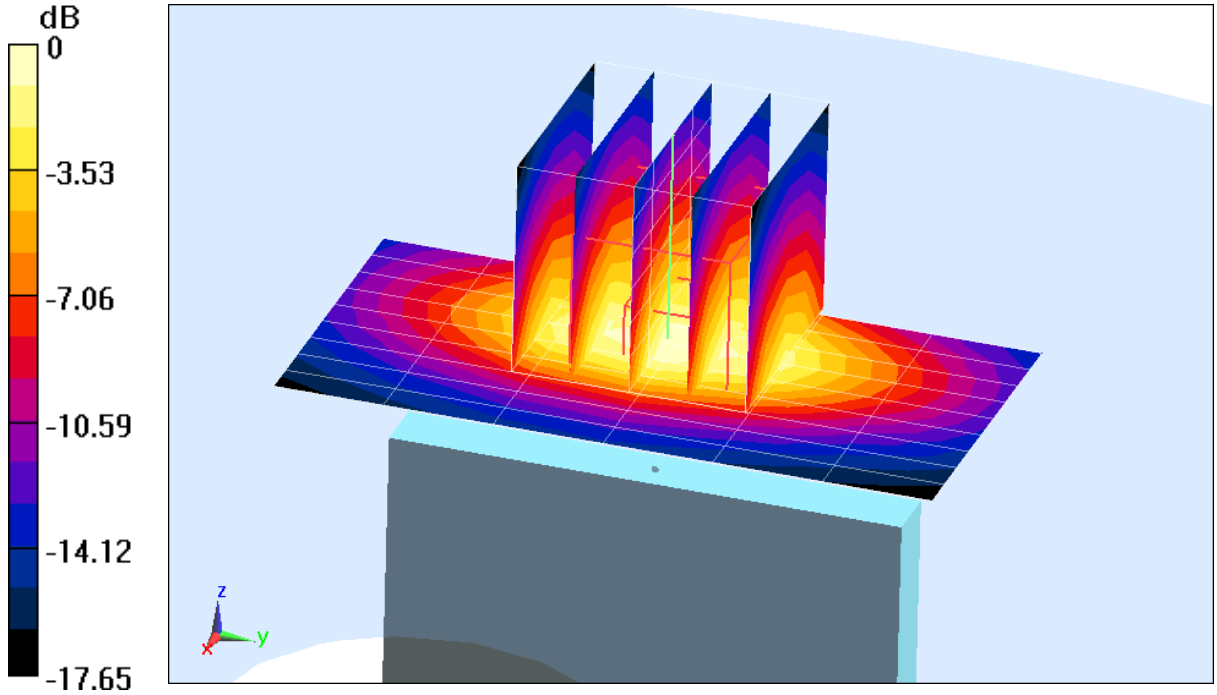
Communication System: UID 0, UMTS; Frequency: 1852.4 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1852.4 MHz; σ = 1.521 S/m; ε_r = 53.601; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1852.4 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (10x7x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.41 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.29 W/kg
SAR(1 g) = 0.765 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0576M

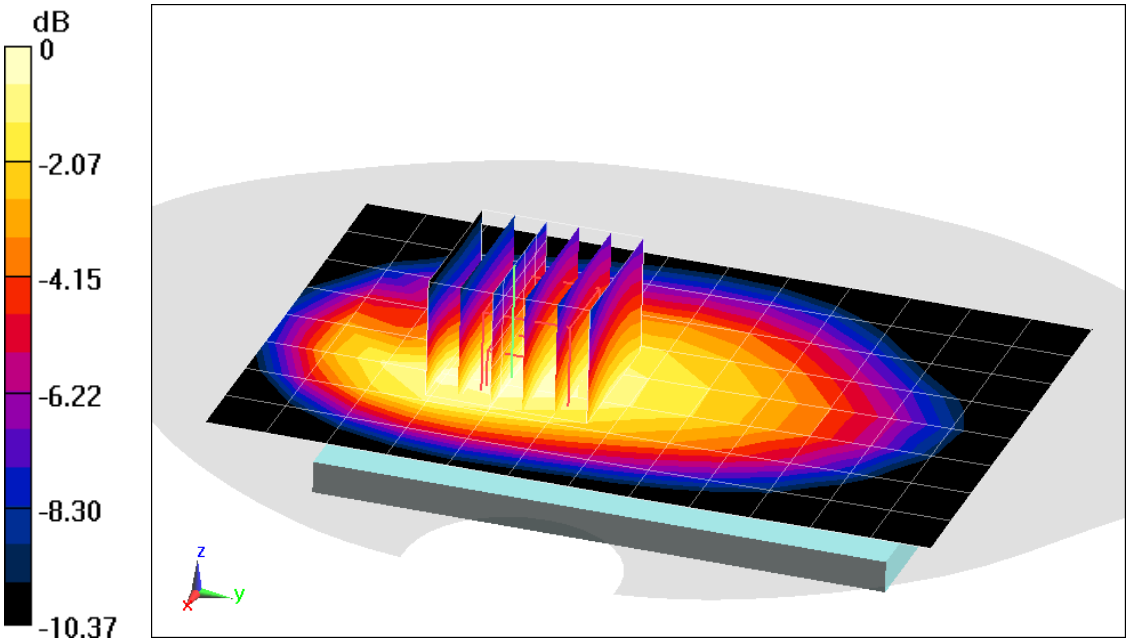
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.94 S/m; ε_r = 54.571; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-21-2018; Ambient Temp: 21.3°C; Tissue Temp: 20.8°C

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

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

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 17.95 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.415 W/kg
SAR(1 g) = 0.290 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0576M

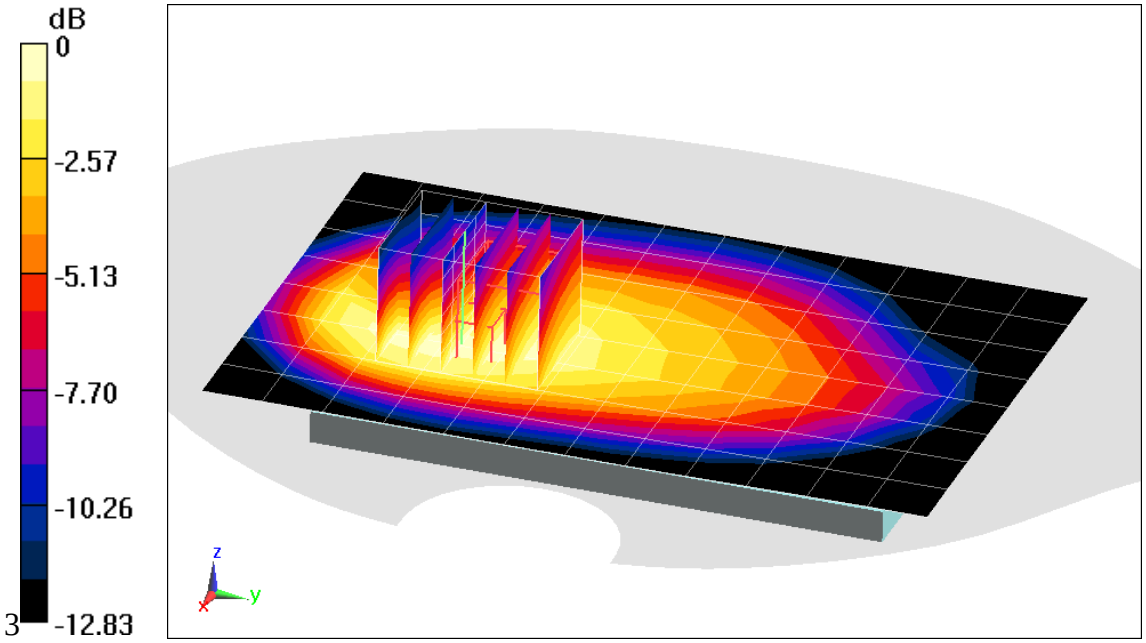
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.94 S/m; ε_r = 54.571; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-21-2018; Ambient Temp: 21.3°C; Tissue Temp: 20.8°C

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

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

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.00 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.611 W/kg
SAR(1 g) = 0.397 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0612M

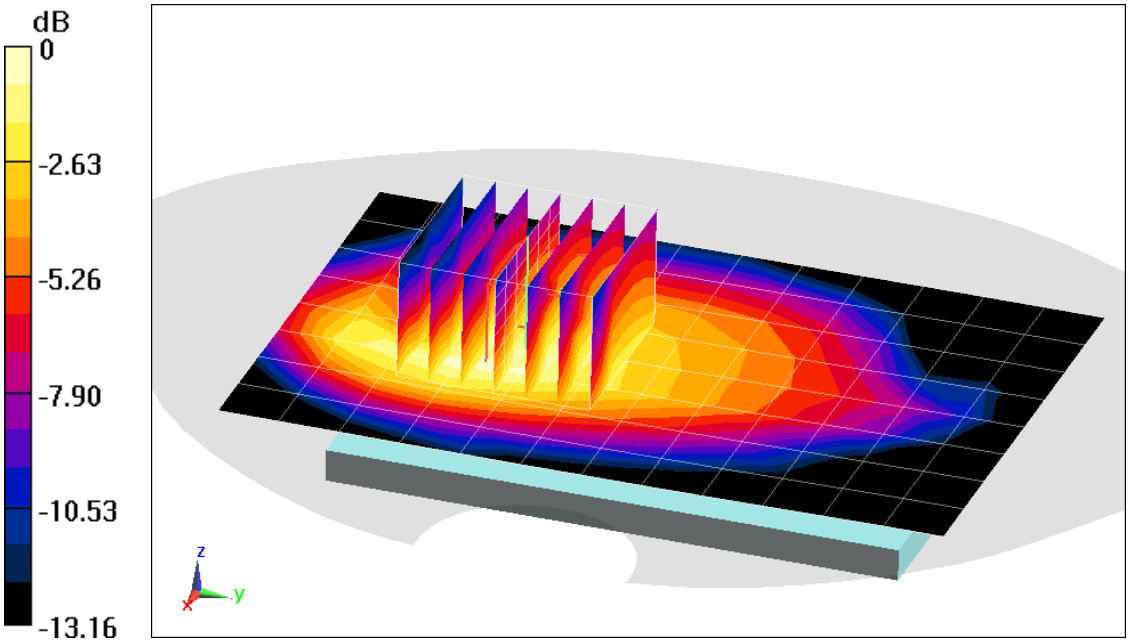
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 782 MHz; σ = 0.968 S/m; ε_r = 54.219; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-21-2018; Ambient Temp: 21.3°C; Tissue Temp: 20.8°C

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

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

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.15 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.323 W/kg
SAR(1 g) = 0.226 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

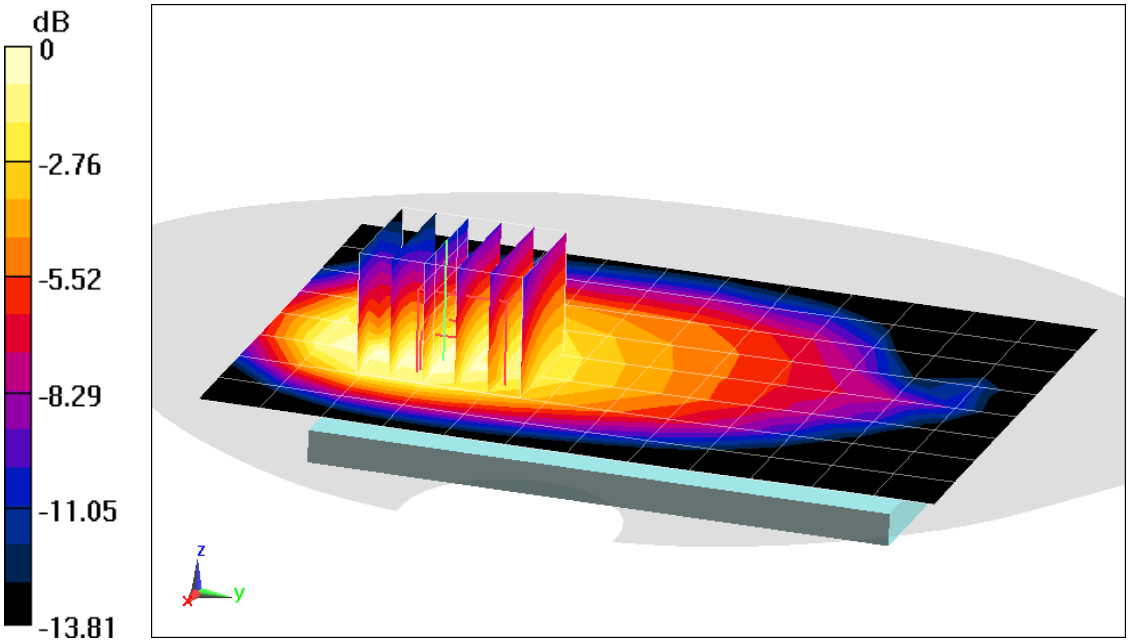
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 782 MHz; σ = 0.968 S/m; ε_r = 54.219; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-21-2018; Ambient Temp: 21.3°C; Tissue Temp: 20.8°C

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

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

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.10 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.606 W/kg
SAR(1 g) = 0.368 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0605M

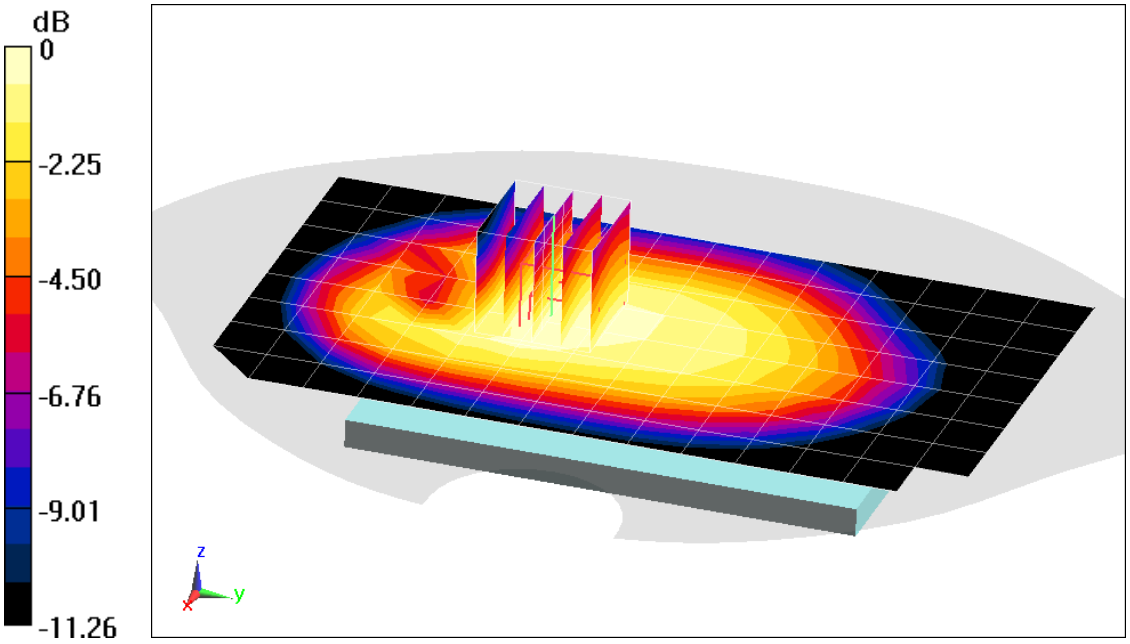
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 831.5 MHz; σ = 0.964 S/m; ε_r = 53.609; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

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

Probe: ES3DV3 - SN3347; ConvF(6.37, 6.37, 6.37) @ 831.5 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 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 = 17.05 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.344 W/kg
SAR(1 g) = 0.263 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0605M

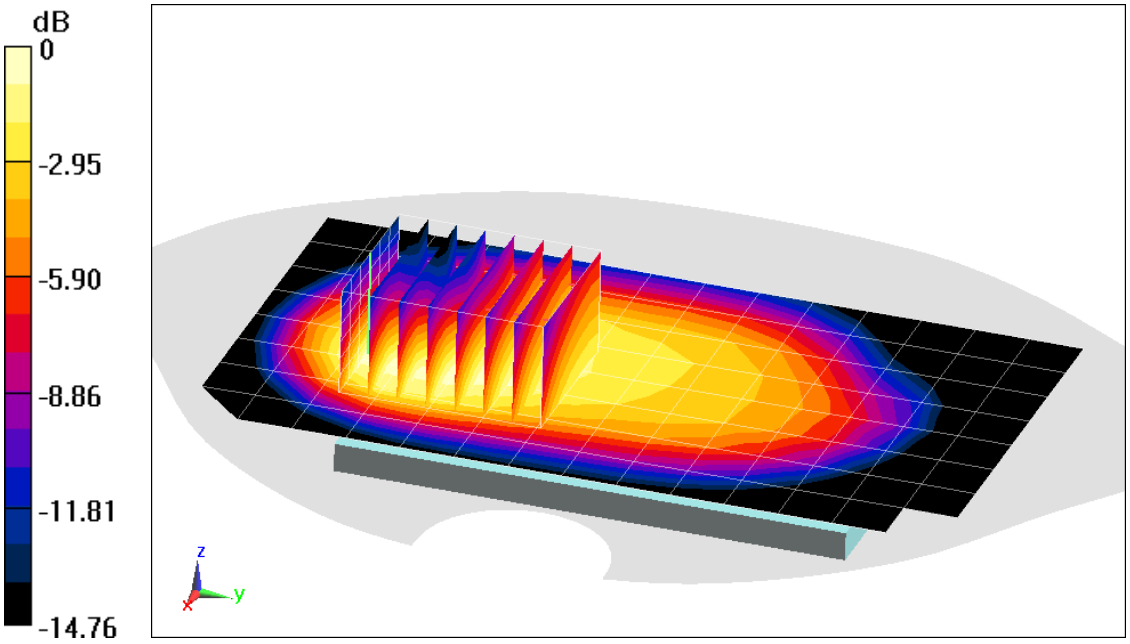
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 831.5 MHz; σ = 0.964 S/m; ε_r = 53.609; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

Probe: ES3DV3 - SN3347; ConvF(6.37, 6.37, 6.37) @ 831.5 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 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 (7x8x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.07 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.698 W/kg
SAR(1 g) = 0.408 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0612M

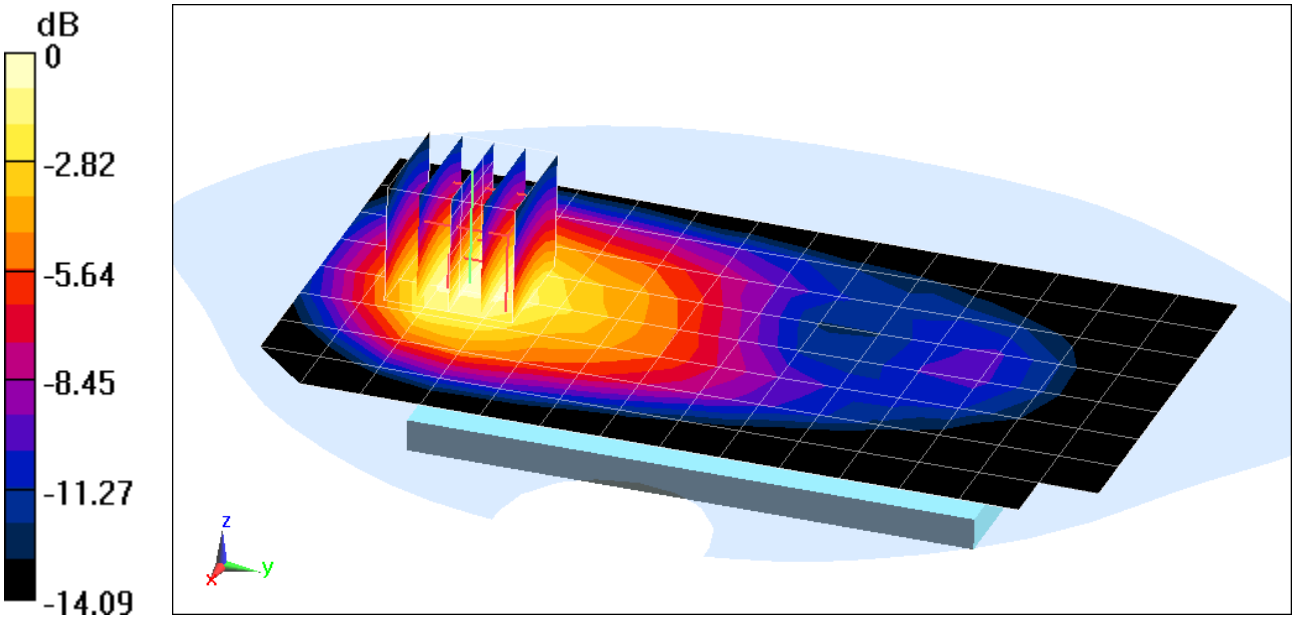
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.491 S/m; ε_r = 52.563; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-02-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7357; ConvF(8.43, 8.43, 8.43) @ 1732.5 MHz; Calibrated: 4/18/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2018
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.93 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.14 W/kg
SAR(1 g) = 0.731 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0612M

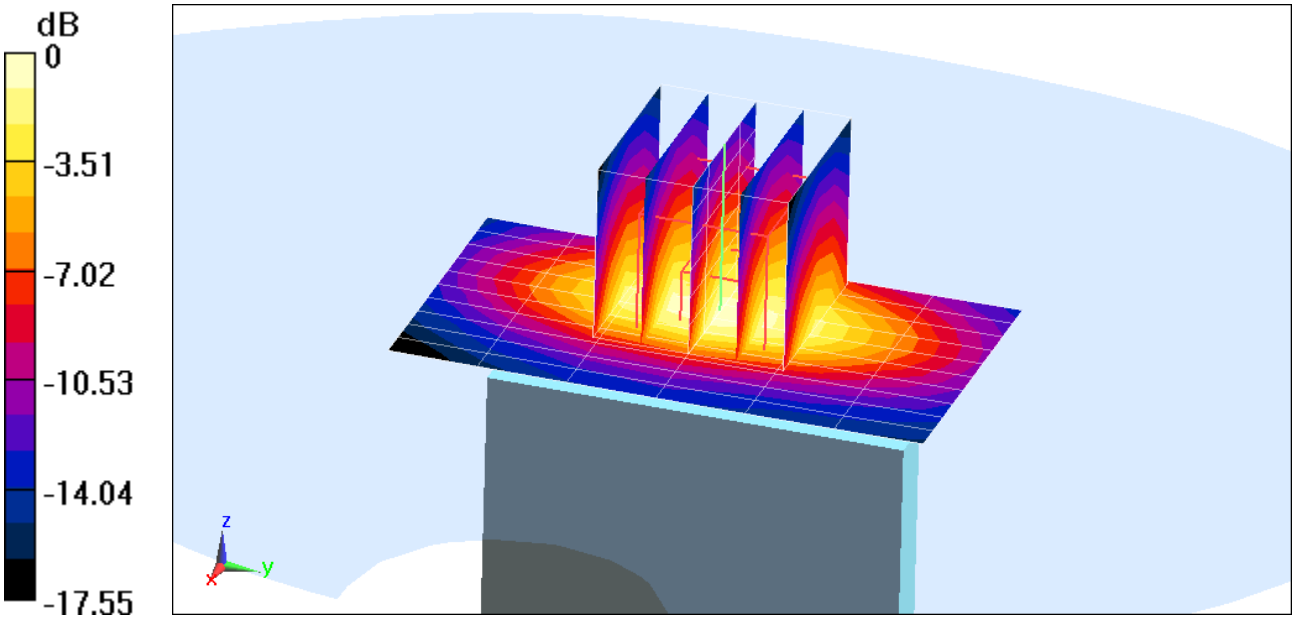
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.491$ S/m; $\varepsilon_r = 52.563$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-02-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7357; ConvF(8.43, 8.43, 8.43) @ 1732.5 MHz; Calibrated: 4/18/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2018
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 4 (AWS), Body SAR, Bottom Edge, Mid.ch,
20 MHz Bandwidth, QPSK, 50 RB, 0 RB Offset

Area Scan (11x7x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.17 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 1.02 W/kg
SAR(1 g) = 0.596 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0539M

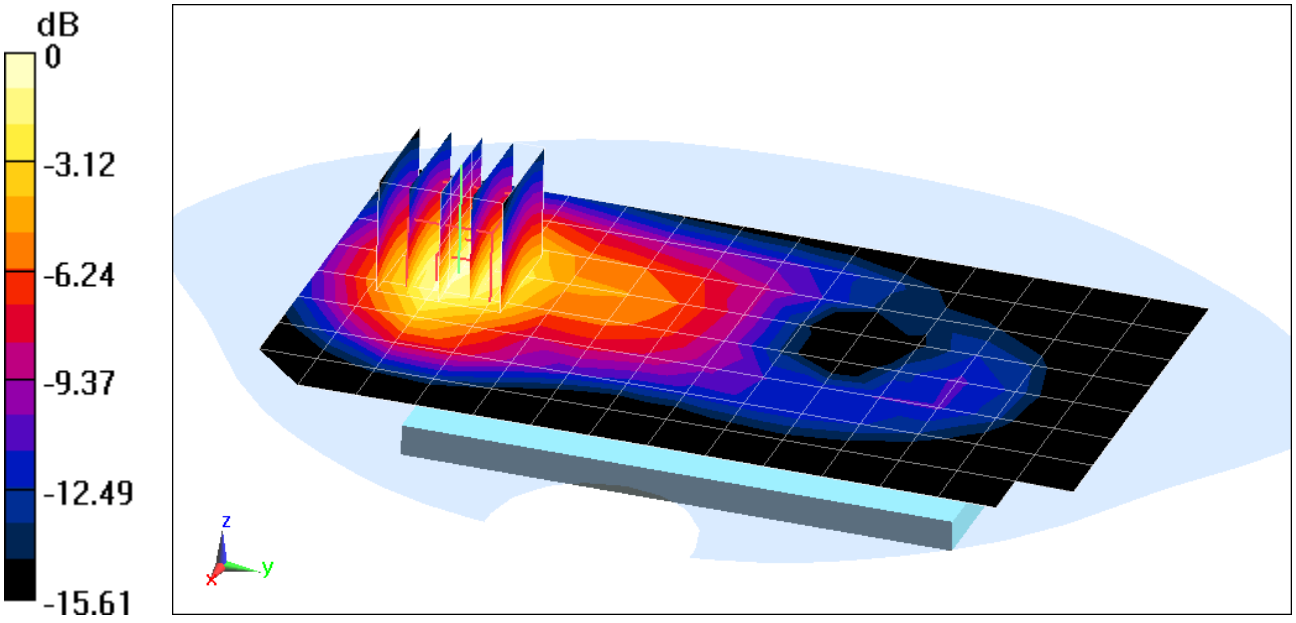
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1882.5 MHz; σ = 1.555 S/m; ε_r = 53.497; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-17-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1882.5 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 26.73 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.54 W/kg
SAR(1 g) = 0.964 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0539M

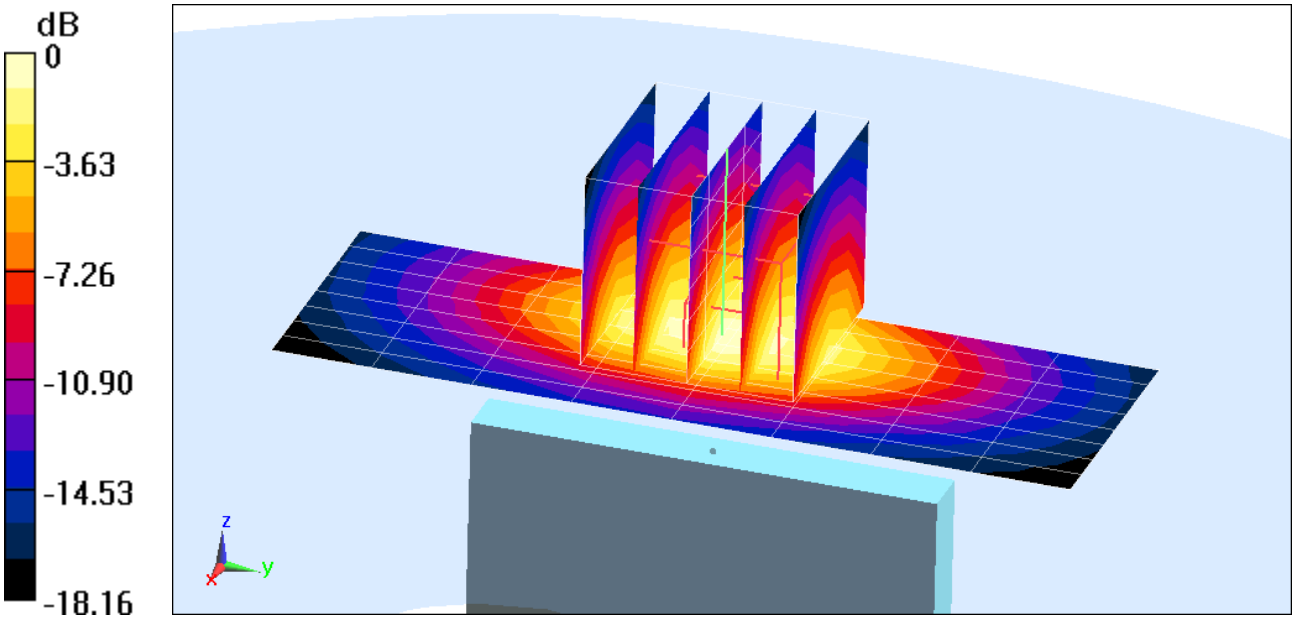
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1882.5 MHz; σ = 1.555 S/m; ε_r = 53.497; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.3°C

Probe: ES3DV3 - SN3332; ConvF(4.77, 4.77, 4.77) @ 1882.5 MHz; Calibrated: 8/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2018
Phantom: SAM V5.0 Right; Type: QD000P40CD; Serial: 1647
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 25 (PCS), Body SAR, Bottom Edge, Mid.ch,
20 MHz Bandwidth, QPSK, 50 RB, 0 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 = 25.18 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.42 W/kg
SAR(1 g) = 0.833 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0576M

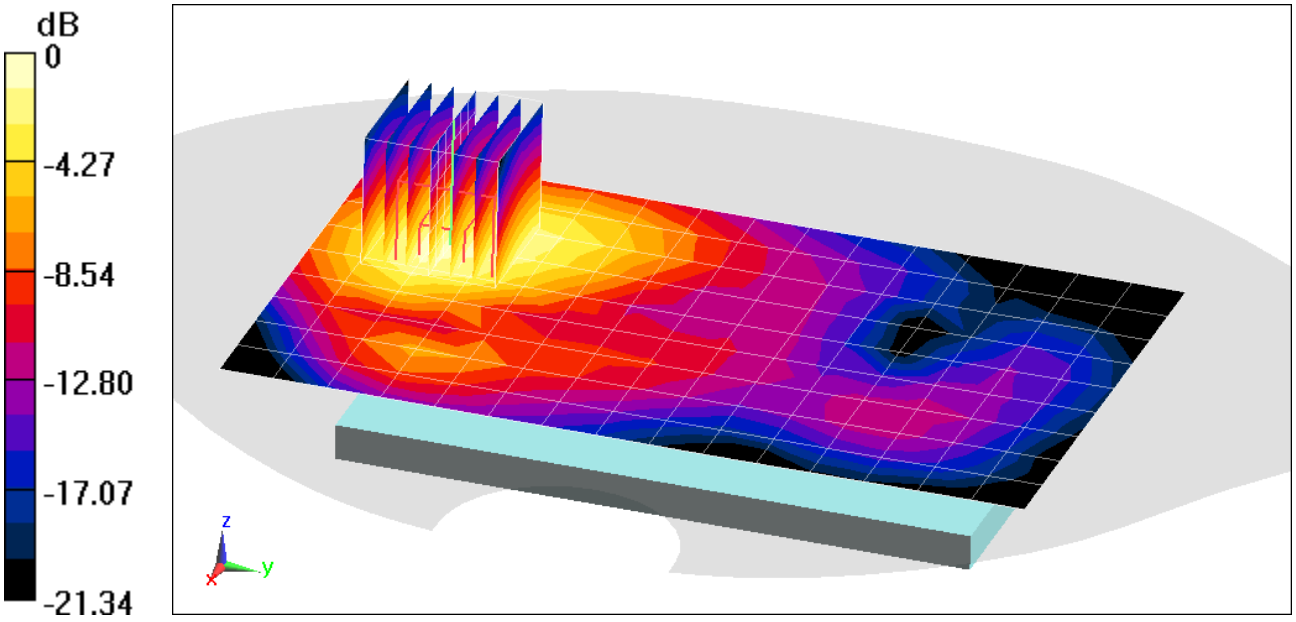
Communication System: UID 0, LTE Band 41 (Class 3); Frequency: 2506 MHz; Duty Cycle: 1:1.58
Medium: 2450 Body Medium parameters used (interpolated):
f = 2506 MHz; σ = 2.106 S/m; ε_r = 50.9; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-02-2019; Ambient Temp: 22.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3319; ConvF(4.51, 4.51, 4.51) @ 2506 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 41 ULCA, Body SAR, Back side, Low.ch,
PCC: 20 MHz Bandwidth, QPSK, Ch.39750, 1 RB, 99 RB Offset
SCC: 20 MHz Bandwidth, QPSK, Ch.39948, 1 RB, 0 RB Offset

Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.31 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.791 W/kg
SAR(1 g) = 0.433 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0576M

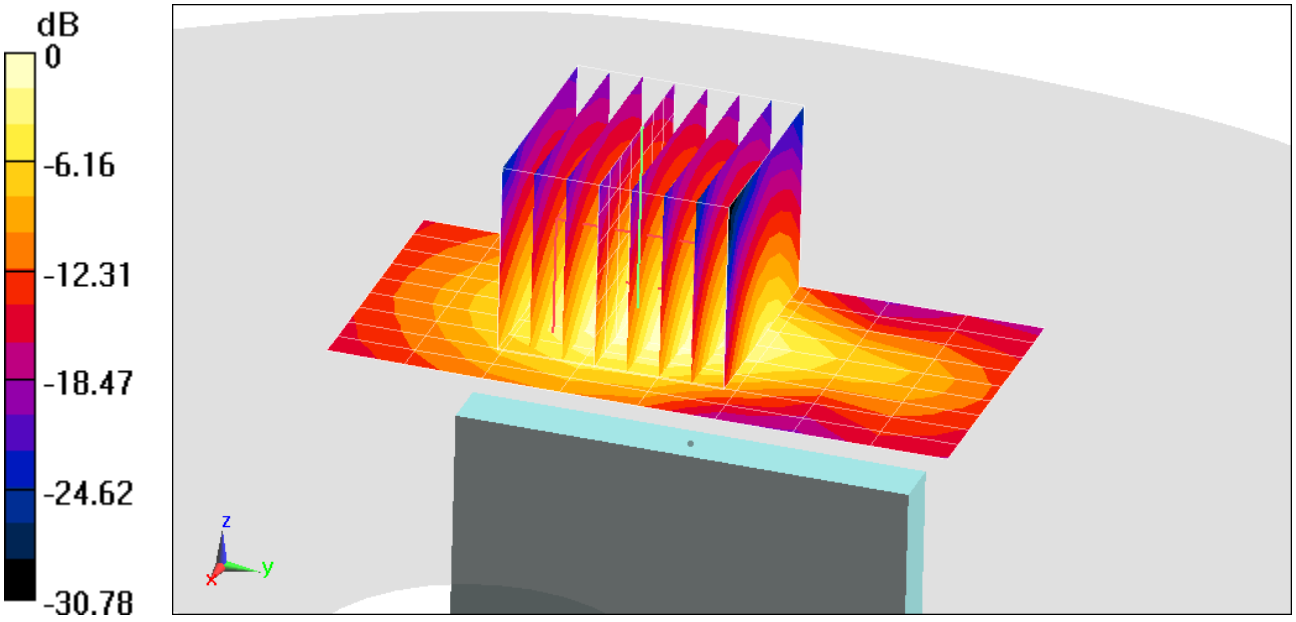
Communication System: UID 0, LTE Band 41 (Class 3); Frequency: 2549.5 MHz; Duty Cycle: 1:1.58
Medium: 2450 Body Medium parameters used:
f = 2550 MHz; σ = 2.161 S/m; ε_r = 50.776; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-02-2019; Ambient Temp: 22.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3319; ConvF(4.33, 4.33, 4.33) @ 2549.5 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: LTE Band 41 ULCA, Body SAR, Bottom Edge, Low-Mid.ch,
PCC: 20 MHz Bandwidth, QPSK, Ch.40185, 50 RB, 0 RB Offset
SCC: 20 MHz Bandwidth, QPSK, Ch.39987, 50 RB, 50 RB Offset

Area Scan (10x9x1): Measurement grid: dx=5mm, dy=12mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 17.66 V/m; Power Drift = 0.12 dB
Peak SAR (extrapolated) = 1.32 W/kg
SAR(1 g) = 0.655 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0591M

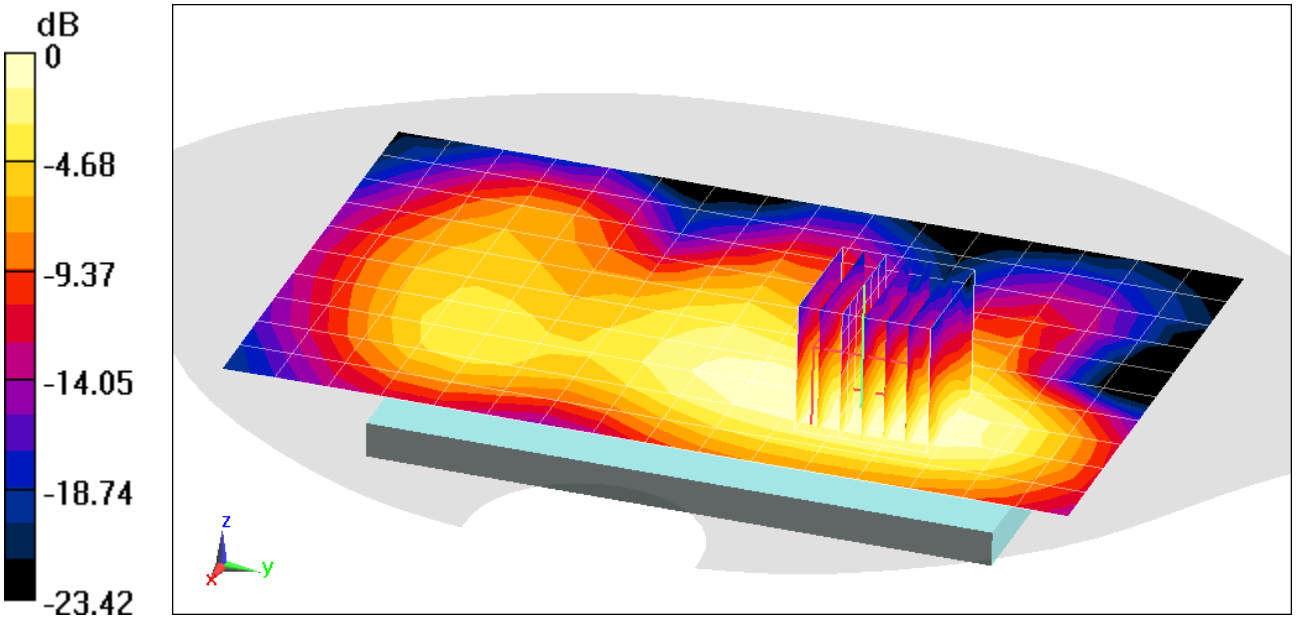
Communication System: UID 0, _IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2462 MHz; σ = 2.023 S/m; ε_r = 50.696; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-30-2018; Ambient Temp: 21.9°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.51, 4.51, 4.51) @ 2462 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11b, Antenna 1,
22 MHz Bandwidth, Body SAR, Ch 11, 1 Mbps, Back Side

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 11.23 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.413 W/kg
SAR(1 g) = 0.208 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0591M

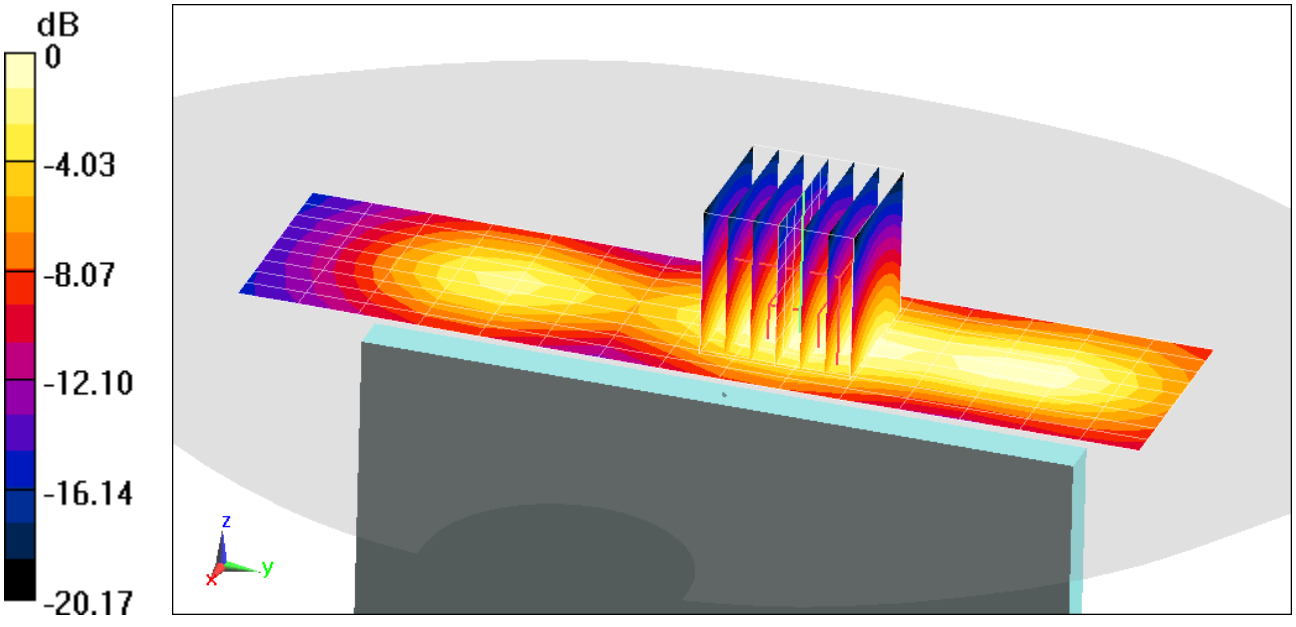
Communication System: UID 0, _IEEE 802.11b; Frequency: 2462 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2462 MHz; σ = 2.023 S/m; ε_r = 50.696; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-30-2018; Ambient Temp: 21.9°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.51, 4.51, 4.51) @ 2462 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11b, Antenna 1,
22 MHz Bandwidth, Body SAR, Ch 11, 1 Mbps, Left Edge

Area Scan (10x16x1): Measurement grid: dx=5mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 15.34 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.853 W/kg
SAR(1 g) = 0.443 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

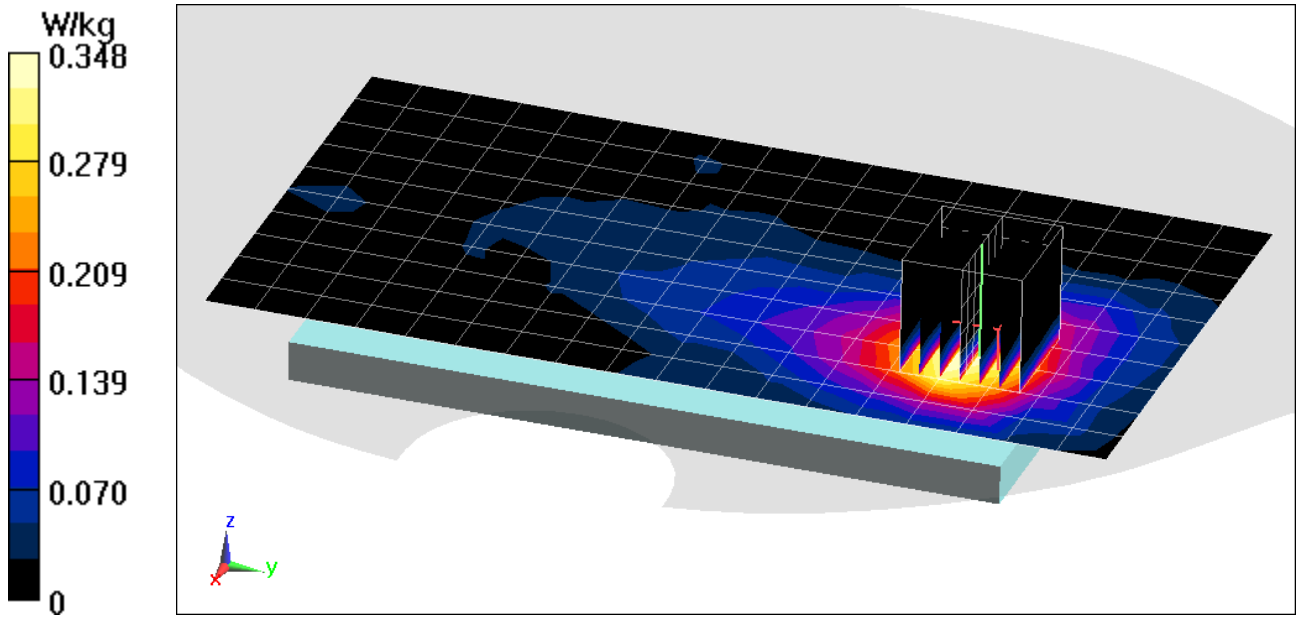
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5785 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5785 MHz; σ = 6.219 S/m; ε_r = 46.931; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

Probe: EX3DV4 - SN7308; ConvF(4.18, 4.18, 4.18) @ 5785 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11a, UNII-3, Antenna 1,
20 MHz Bandwidth, Body SAR, Ch 157, 6 Mbps, Back Side

Area Scan (11x19x1): 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 = 4.945 V/m; Power Drift = -0.17 dB
Peak SAR (extrapolated) = 0.474 W/kg
SAR(1 g) = 0.120 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0509M

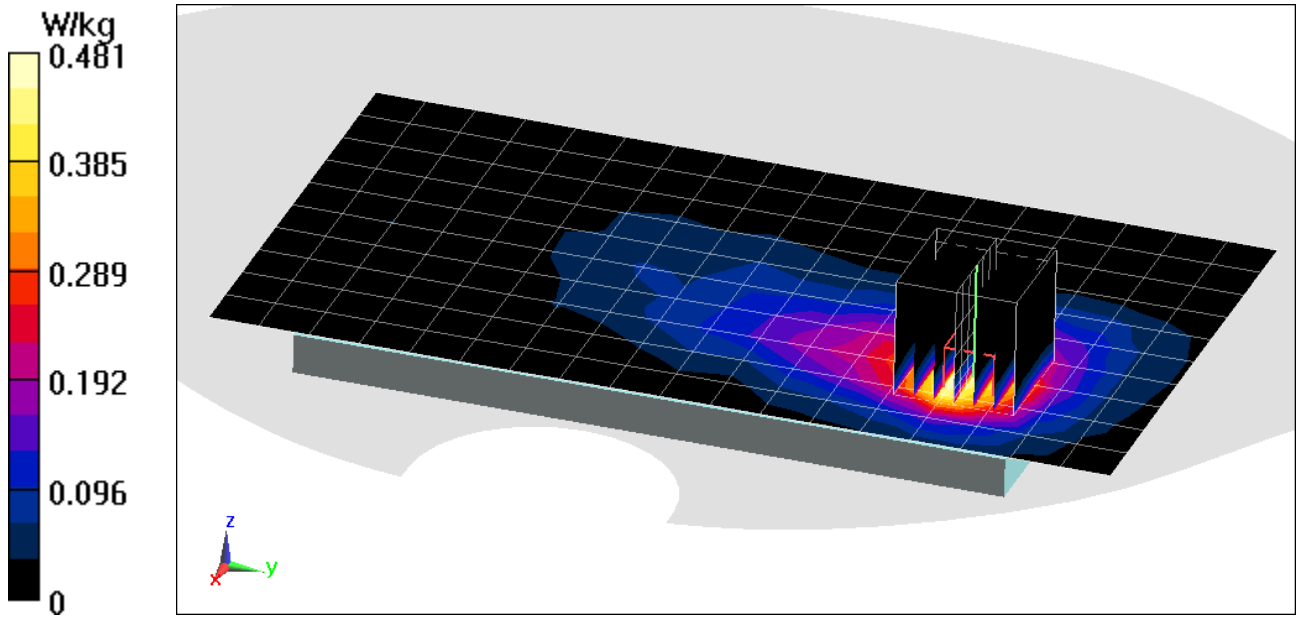
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5785 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5785 MHz; σ = 6.219 S/m; ε_r = 46.931; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

Probe: EX3DV4 - SN7308; ConvF(4.18, 4.18, 4.18) @ 5785 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

Mode: IEEE 802.11a, UNII-3, Antenna 1,
20 MHz Bandwidth, Body SAR, Ch 157, 6 Mbps, Back Side

Area Scan 2 (11x19x1): 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 = 5.615 V/m; Power Drift = 0.09 dB
Peak SAR (extrapolated) = 0.576 W/kg
SAR(1 g) = 0.163 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0591M

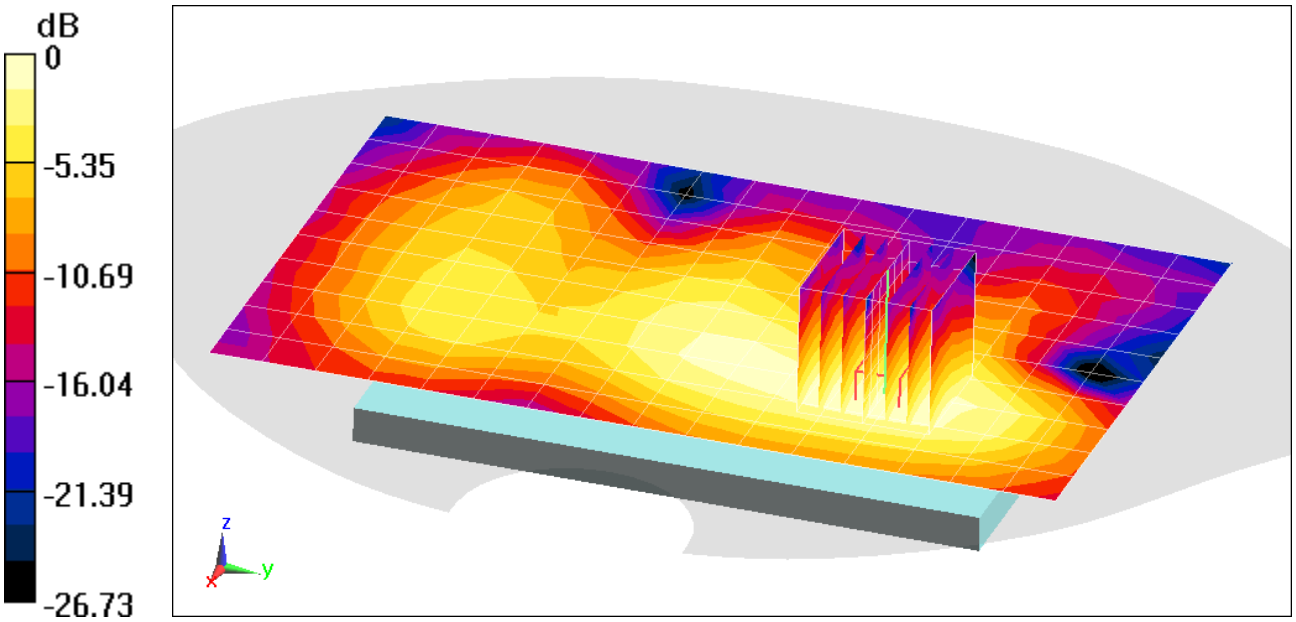
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.287
Medium: 2450 Body Medium parameters used (interpolated):
f = 2441 MHz; σ = 1.998 S/m; ε_r = 52.62; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-02-2019; Ambient Temp: 21.7°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3347; ConvF(4.64, 4.64, 4.64) @ 2441 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.865 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.166 W/kg
SAR(1 g) = 0.087 W/kg



DUT: A3LSMG9700; Type: Portable Handset; Serial: 0591M

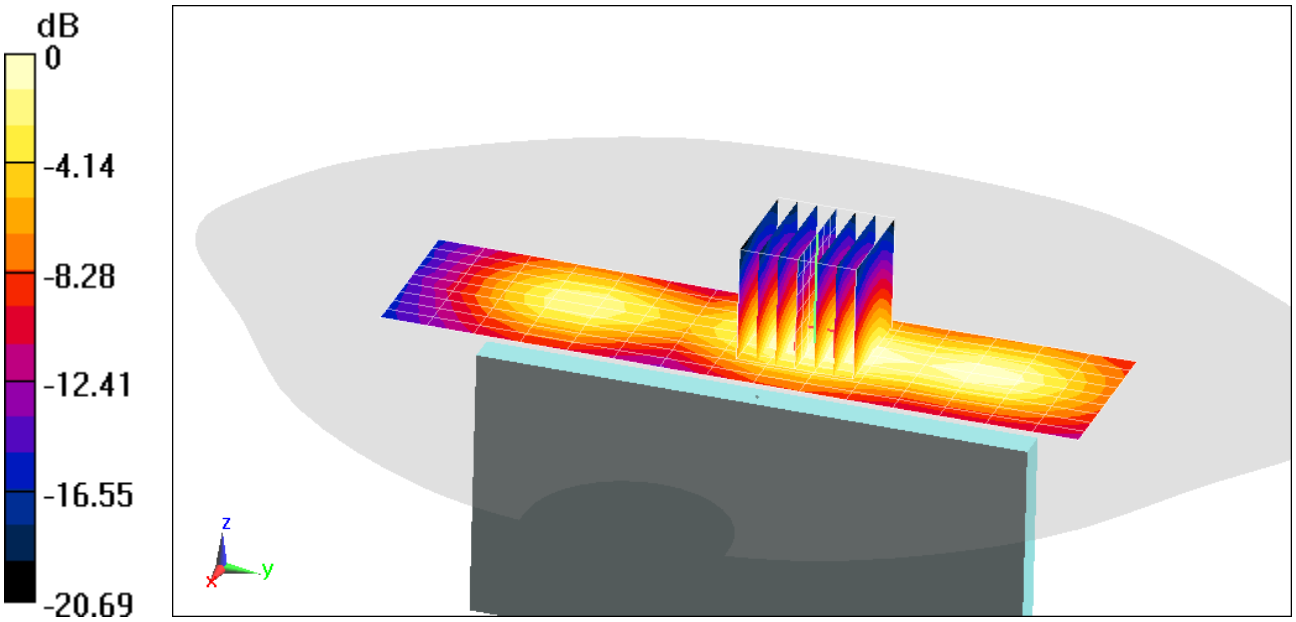
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.287
Medium: 2450 Body Medium parameters used (interpolated):
f = 2441 MHz; σ = 1.998 S/m; ε_r = 52.62; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-02-2019; Ambient Temp: 21.7°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3347; ConvF(4.64, 4.64, 4.64) @ 2441 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

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

Area Scan (10x16x1): Measurement grid: dx=5mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.45 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.383 W/kg
SAR(1 g) = 0.192 W/kg



APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

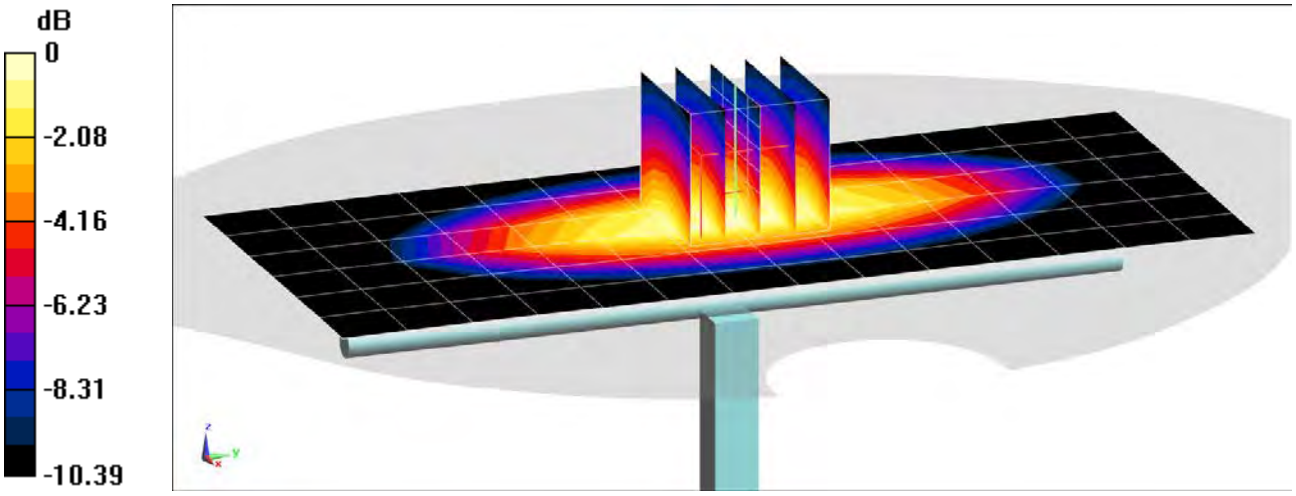
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head; Medium parameters used (interpolated):
f = 750 MHz; σ = 0.906 S/m; ε_r = 41.172; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-26-2018; Ambient Temp: 22.5°C; Tissue Temp: 19.8°C

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

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.52 W/kg
SAR(1 g) = 1.67 W/kg
Deviation(1 g) = 0.85%



0 dB = 1.96 W/kg = 2.92 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

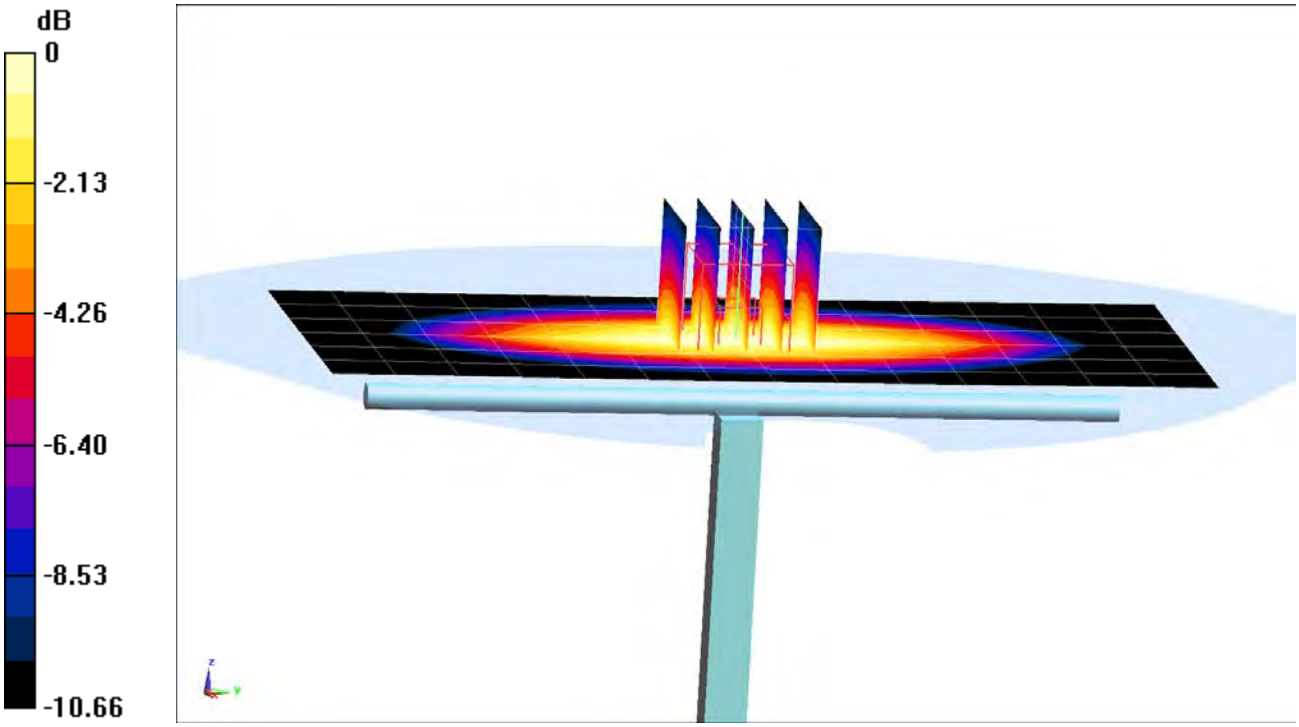
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 750 MHz; σ = 0.905 S/m; ε_r = 42.643; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 01-14-2019; Ambient Temp: 22.4°C; Tissue Temp: 21.6°C

Probe: EX3DV4 - SN7357; ConvF(10.5, 10.5, 10.5) @ 750 MHz; Calibrated: 4/18/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2018
Phantom: SAM with CRP v5.0 Left; Type: QD000P40CD; Serial: 1687
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.71 W/kg
SAR(1 g) = 1.75 W/kg
Deviation(1 g) = 5.68%



0 dB = 2.37 W/kg = 3.75 dBW/kg

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

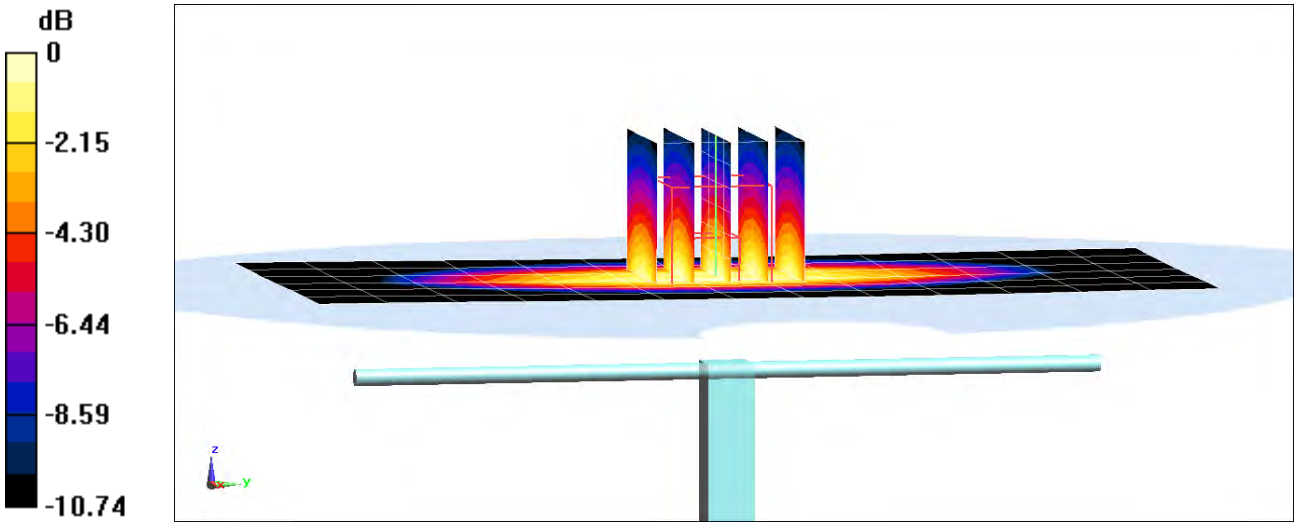
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.899 S/m; ε_r = 40.516; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-24-2018; Ambient Temp: 21.5°C; Tissue Temp: 20.6°C

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

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 3.01 W/kg
SAR(1 g) = 1.98 W/kg
Deviation(1 g) = 4.54%



0 dB = 2.66 W/kg = 4.25 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

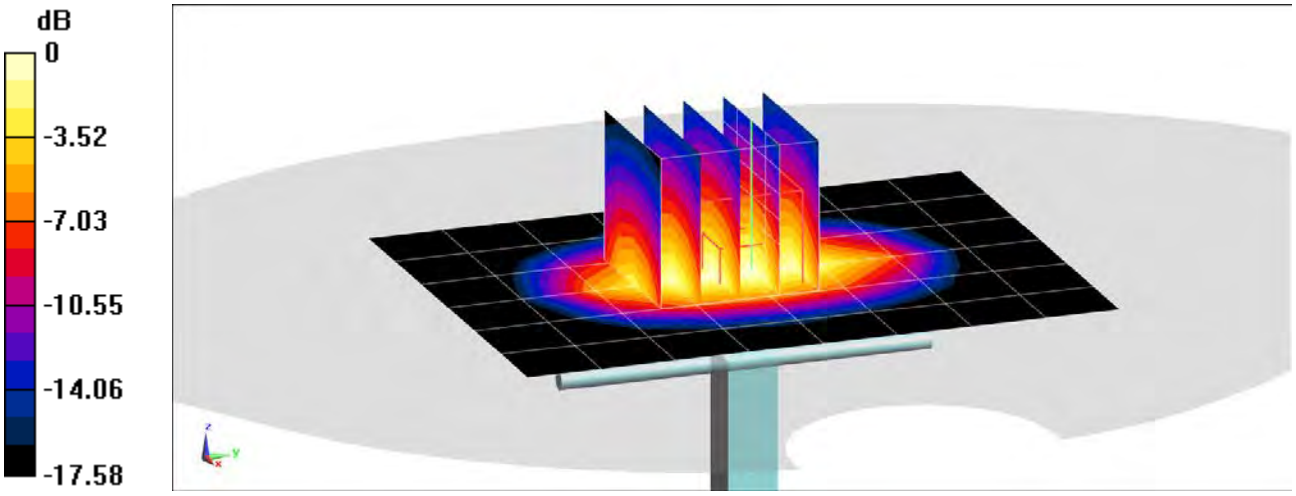
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head; Medium parameters used:
f = 1750 MHz; σ = 1.382 S/m; ε_r = 38.985; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

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

1750 MHz System Verification at 20.0 dBm (100 mW)

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



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

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

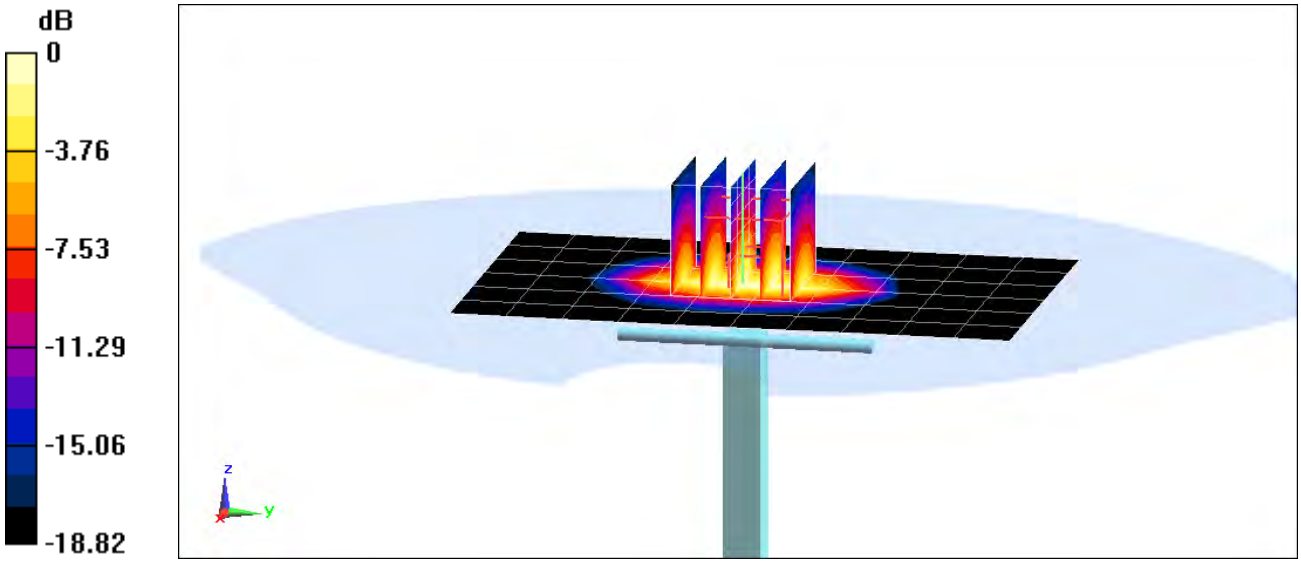
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.44 S/m; ε_r = 40.081; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

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

1900 MHz System Verification at 20.0 dBm (100 mW)

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



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

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

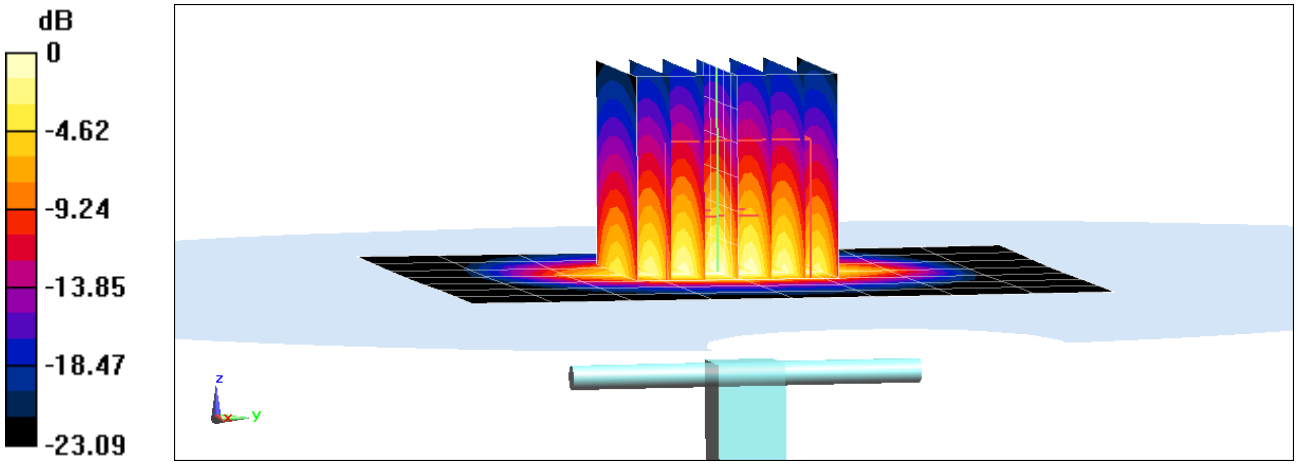
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.848 S/m; ε_r = 38.214; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-14-2018; Ambient Temp: 22.0°C; Tissue Temp: 22.0°C

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

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.5 W/kg
SAR(1 g) = 5.41 W/kg
Deviation(1 g) = 3.44%



0 dB = 9.23 W/kg = 9.65 dBW/kg

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

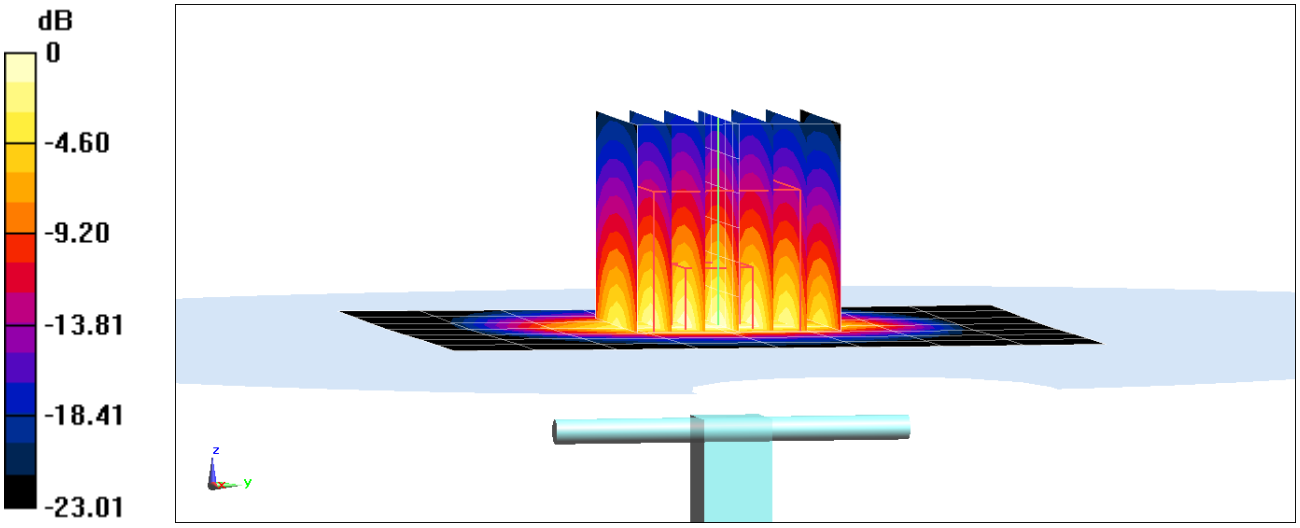
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.862 S/m; ε_r = 38.272; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

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

2450 MHz System Verification at 20.0 dBm (100 mW)

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



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

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

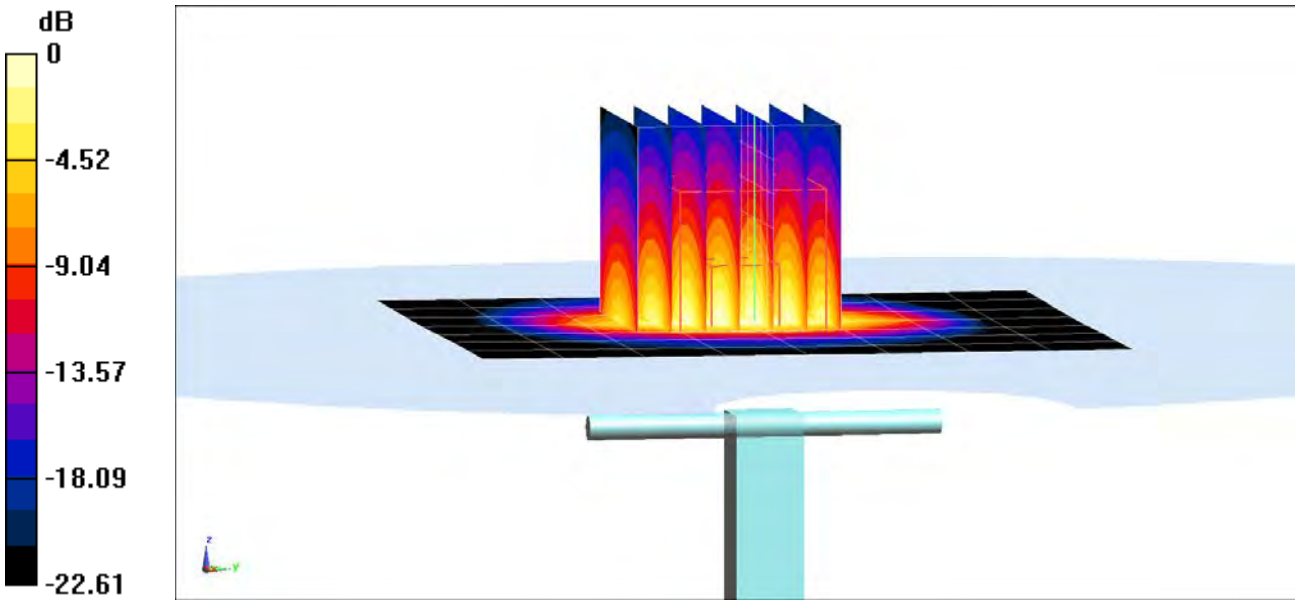
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.829 S/m; ε_r = 40.103; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date:01-07-2019; Ambient Temp: 21.7°C; Tissue Temp: 20.8°C

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

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 10.8 W/kg
SAR(1 g) = 5.21 W/kg
Deviation(1 g) = -0.38%



0 dB = 8.65 W/kg = 9.37 dBW/kg

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1004

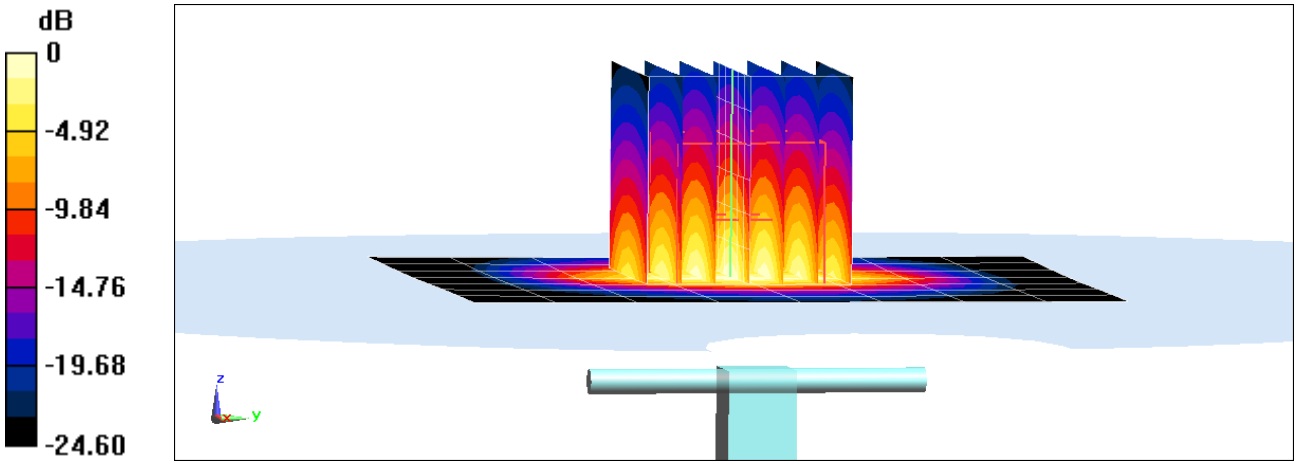
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2600 MHz; σ = 2.016 S/m; ε_r = 37.63; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-14-2018; Ambient Temp: 22.0°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7410; ConvF(7.24, 7.24, 7.24) @ 2600 MHz; Calibrated: 7/20/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1322; Calibrated: 7/11/2018
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2600 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 13.1 W/kg
SAR(1 g) = 5.88 W/kg
Deviation(1 g) = 5.19%



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

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

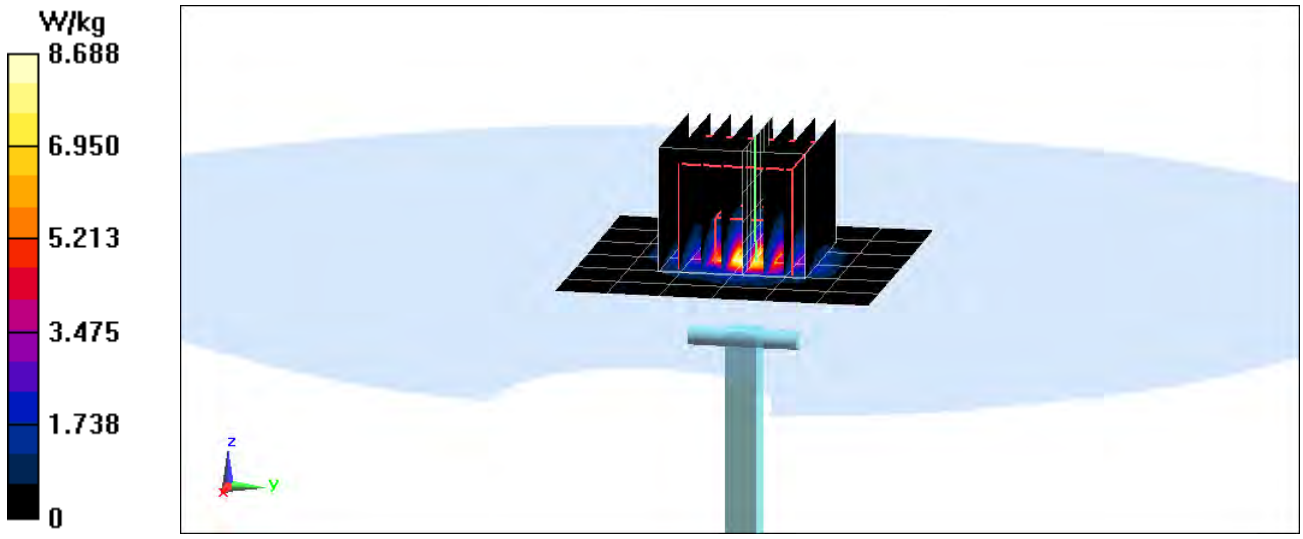
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
$f = 5250$ MHz; $\sigma = 4.571$ S/m; $\varepsilon_r = 35.089$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-09-2018; Ambient Temp: 21.1°C; Tissue Temp: 20.9°C

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

5250 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 15.6 W/kg
SAR(1 g) = 3.7 W/kg
Deviation(1 g) = -6.21%



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

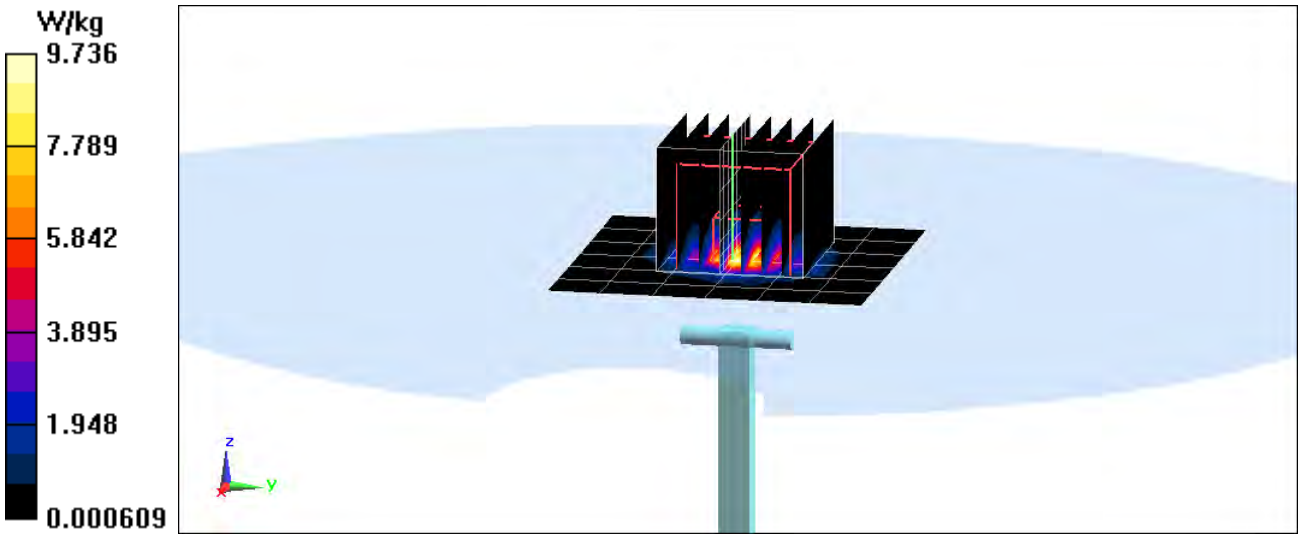
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used:
f = 5600 MHz; σ = 4.951 S/m; ε_r = 34.651; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-09-2018; Ambient Temp: 21.1°C; Tissue Temp: 20.9°C

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

5600 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 4.05 W/kg
Deviation(1 g) = -3.11%



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

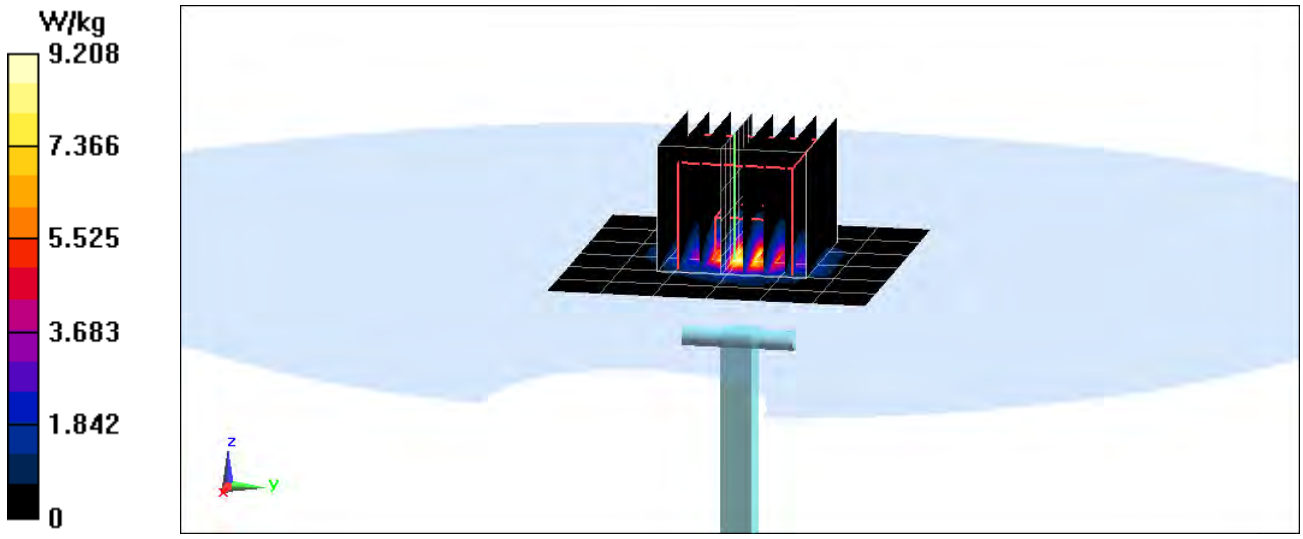
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
f = 5750 MHz; σ = 5.093 S/m; ε_r = 34.352; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-09-2018; Ambient Temp: 21.1°C; Tissue Temp: 20.9°C

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

5750 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 3.82 W/kg
Deviation(1 g) = -3.41%



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

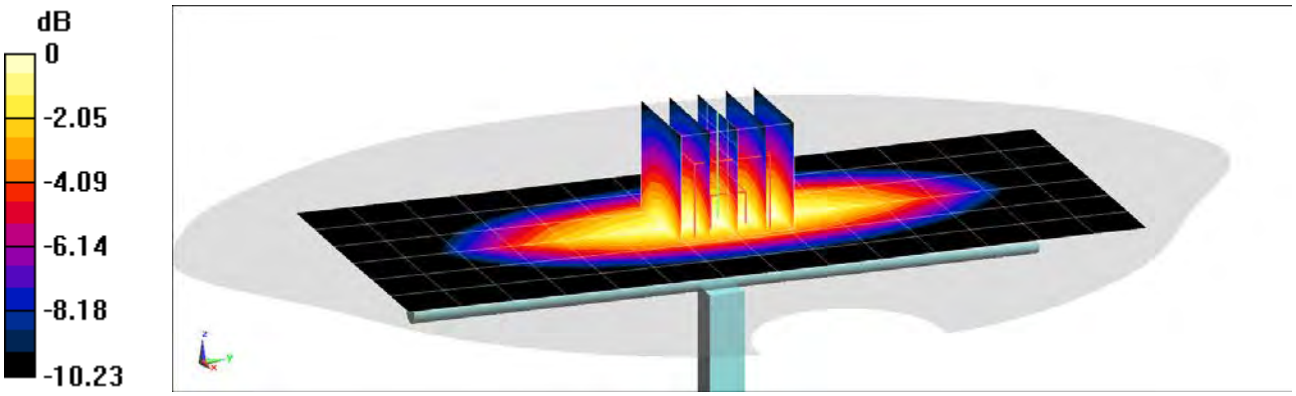
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body; Medium parameters used (interpolated):
f = 750 MHz; σ = 0.956 S/m; ε_r = 54.369; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-21-2018; Ambient Temp: 21.3°C; Tissue Temp: 20.8°C

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

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.57 W/kg
SAR(1 g) = 1.71 W/kg
Deviation(1 g) = -0.70%



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

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

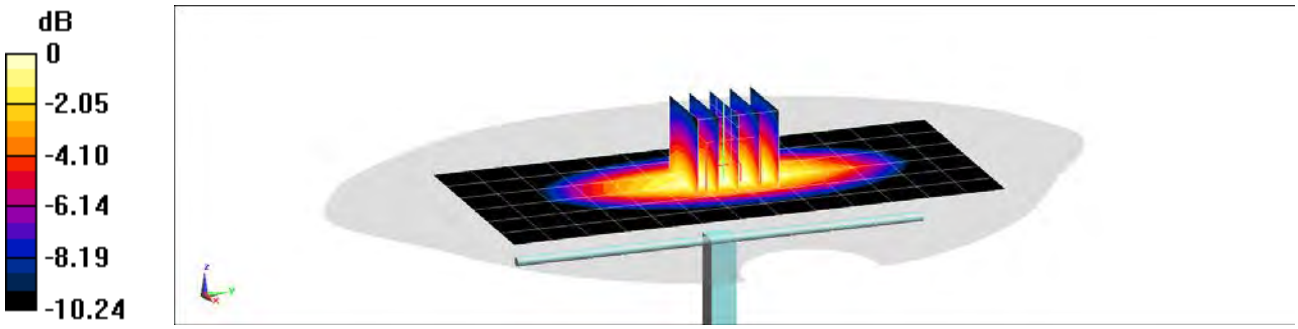
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.965 S/m; ε_r = 53.598; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

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

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

835 MHz System Verification at 23.0 dBm (200 mW)

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



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

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

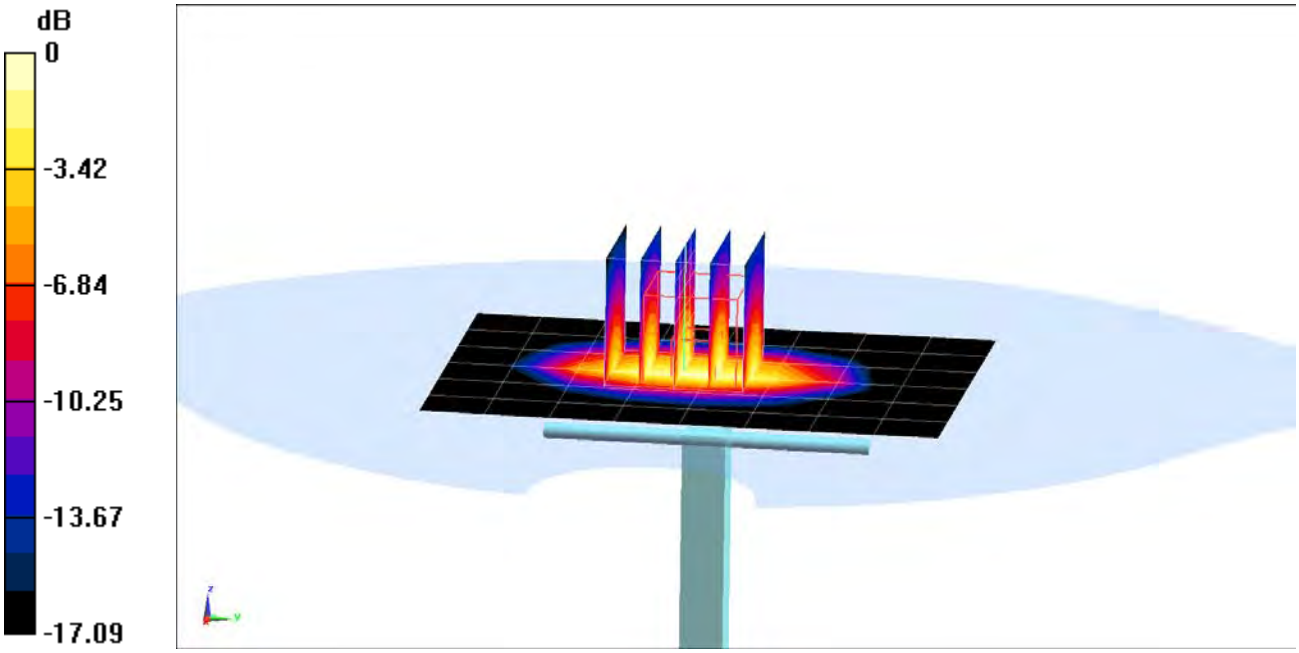
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.512 S/m; ε_r = 52.517; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-02-2019; Ambient Temp: 22.3°C; Tissue Temp: 21.5°C

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

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.70 W/kg
SAR(1 g) = 3.71 W/kg
Deviation(1 g) = 1.37%



0 dB = 5.64 W/kg = 7.51 dBW/kg

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

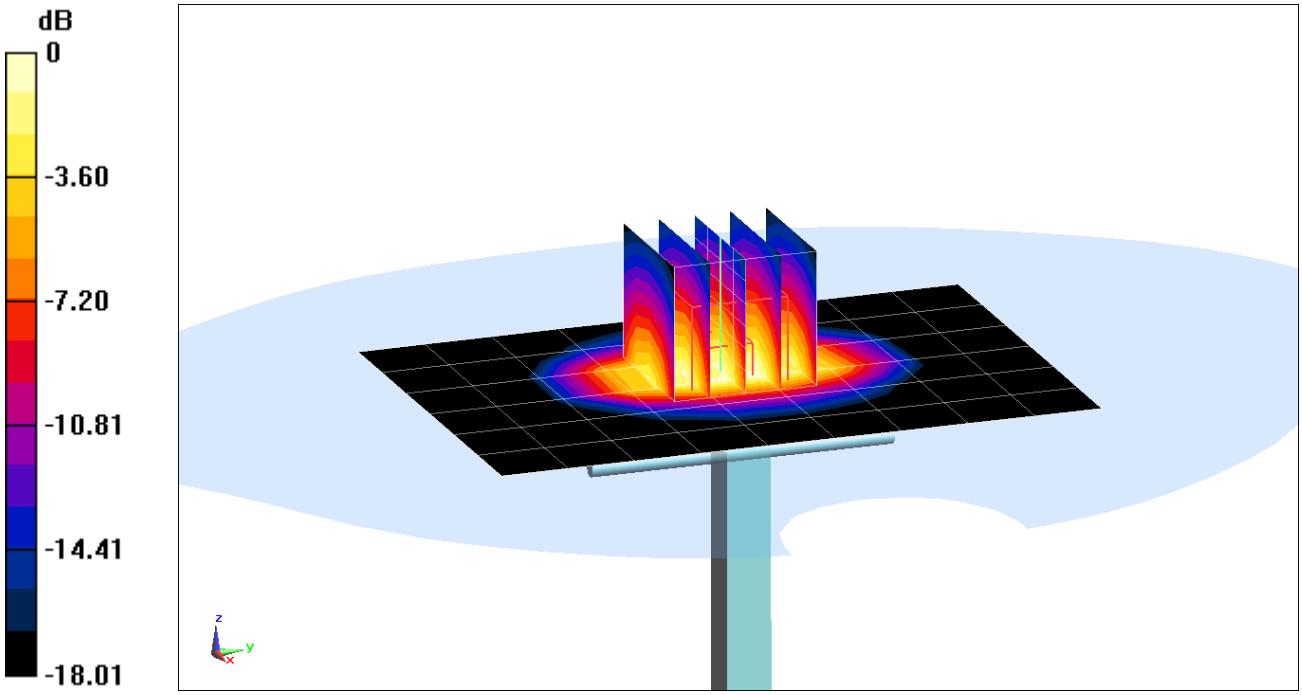
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.575 S/m; ε_r = 53.421; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2018; Ambient Temp: 21.6°C; Tissue Temp: 21.3°C

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

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.90 W/kg
SAR(1 g) = 3.84 W/kg
Deviation(1 g) = -2.54%



0 dB = 4.87 W/kg = 6.88 dBW/kg

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

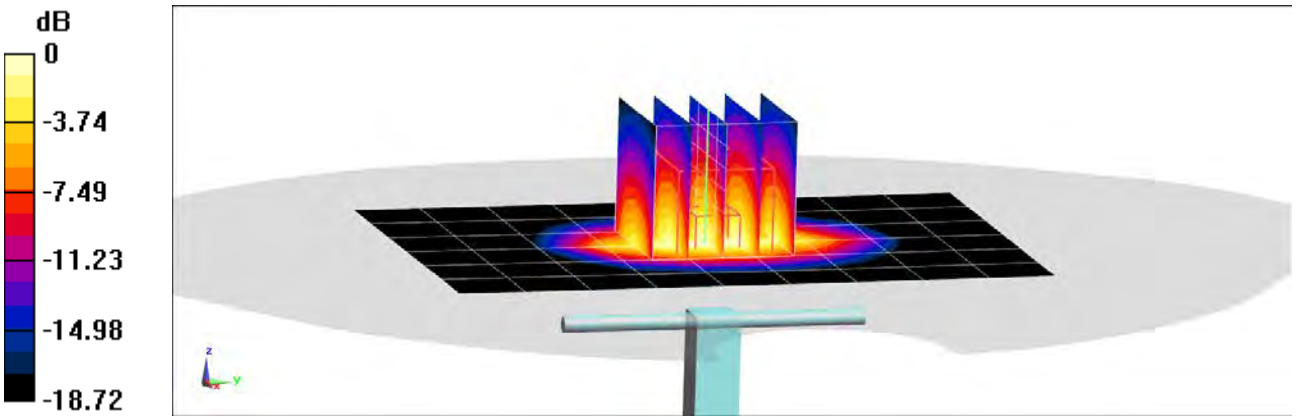
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body; Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.575 S/m; ε_r = 53.31; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-10-2019; Ambient Temp: 23.0°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3287; ConvF(4.83, 4.83, 4.83) @ 1900 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.87 W/kg
SAR(1 g) = 4.26 W/kg
Deviation(1 g) = 7.58%



0 dB = 5.39 W/kg = 7.32 dBW/kg

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

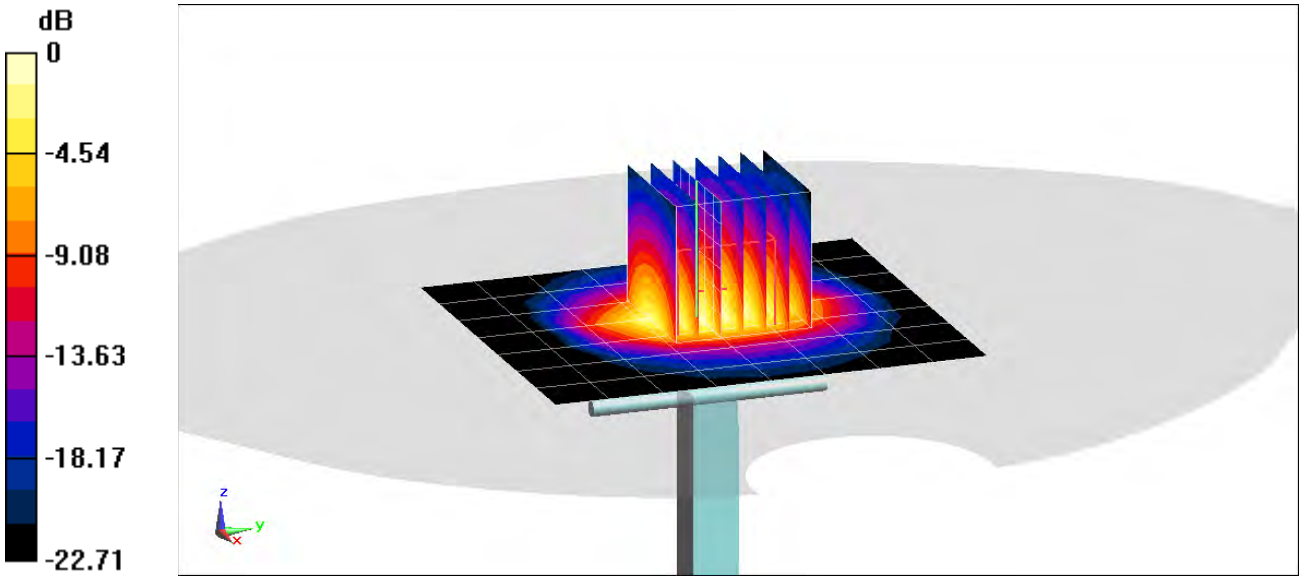
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.007 S/m; ε_r = 50.738; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-30-2018; Ambient Temp: 21.9°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3319; ConvF(4.51, 4.51, 4.51) @ 2450 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 10.9 W/kg
SAR(1 g) = 5.15 W/kg
Deviation(1 g) = 0.78%



0 dB = 6.75 W/kg = 8.29 dBW/kg

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

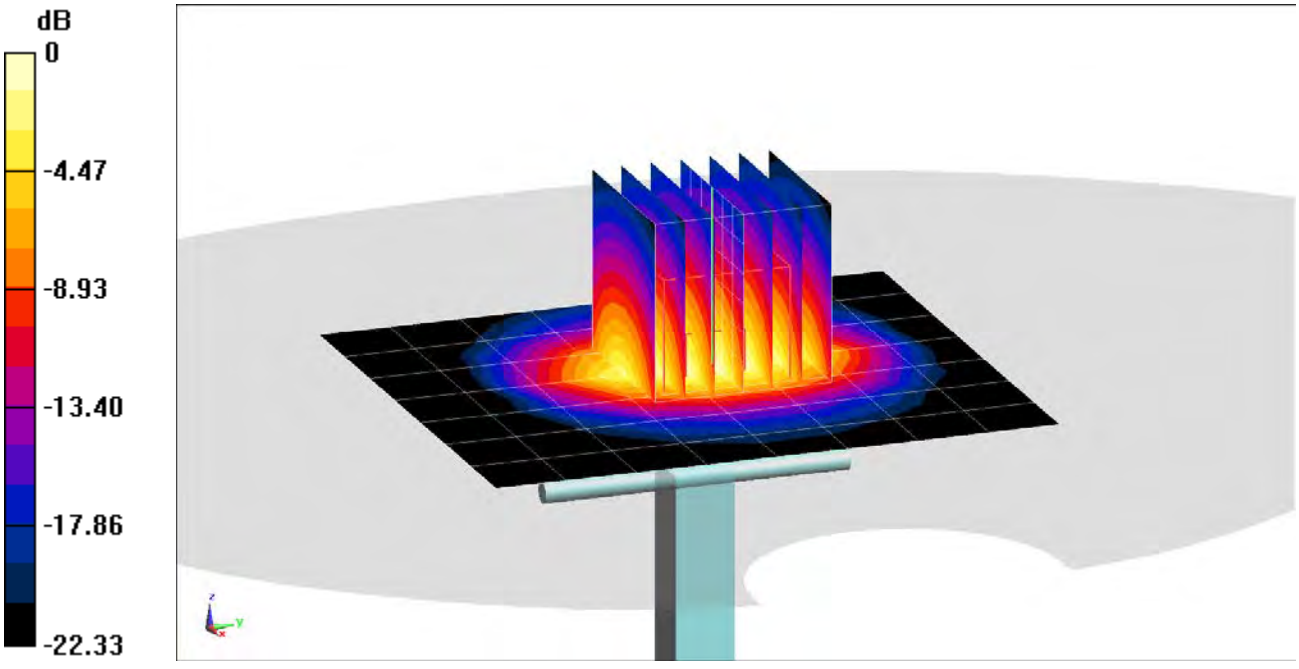
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.043 S/m; ε_r = 51.083; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-02-2019; Ambient Temp: 22.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3319; ConvF(4.51, 4.51, 4.51) @ 2450 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 10.6 W/kg
SAR(1 g) = 5.07 W/kg
Deviation(1 g) = -0.39%



0 dB = 6.71 W/kg = 8.27 dBW/kg

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

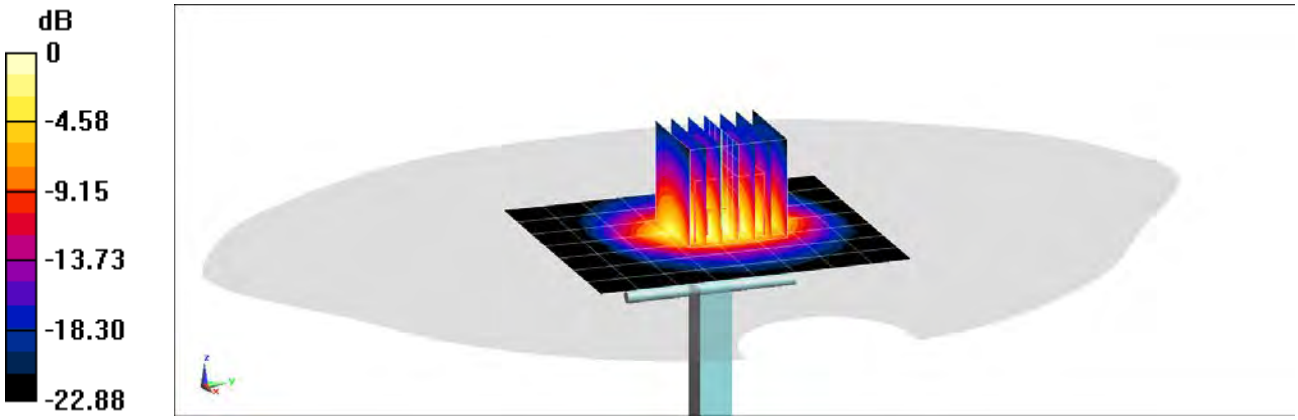
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.011 S/m; ε_r = 52.581; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-02-2019; Ambient Temp: 21.7°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3347; ConvF(4.64, 4.64, 4.64) @ 2450 MHz; Calibrated: 3/27/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/15/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 10.7 W/kg
SAR(1 g) = 4.94 W/kg
Deviation(1 g) = -1.40%



0 dB = 6.56 W/kg = 8.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

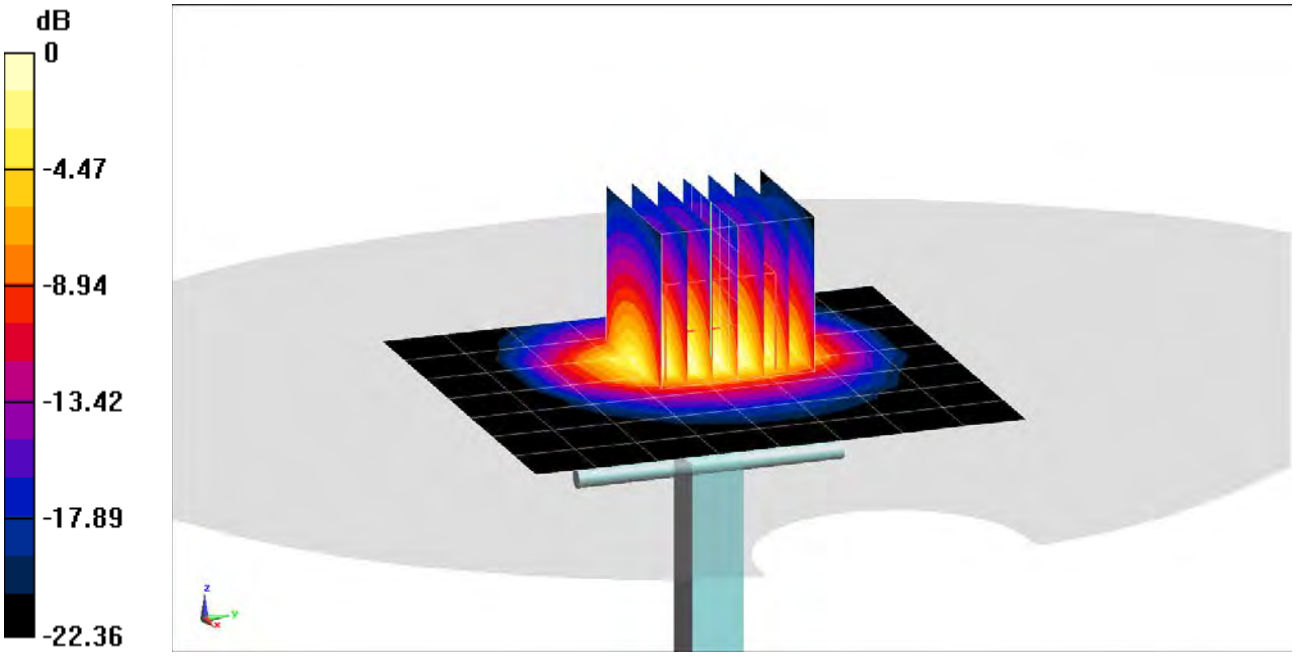
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.045 S/m; ε_r = 51.331; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-10-2019; Ambient Temp: 22.7°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3319; ConvF(4.51, 4.51, 4.51) @ 2450 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.1 W/kg
SAR(1 g) = 5.31 W/kg
Deviation(1 g) = 5.99%



0 dB = 7.05 W/kg = 8.48 dBW/kg

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1004

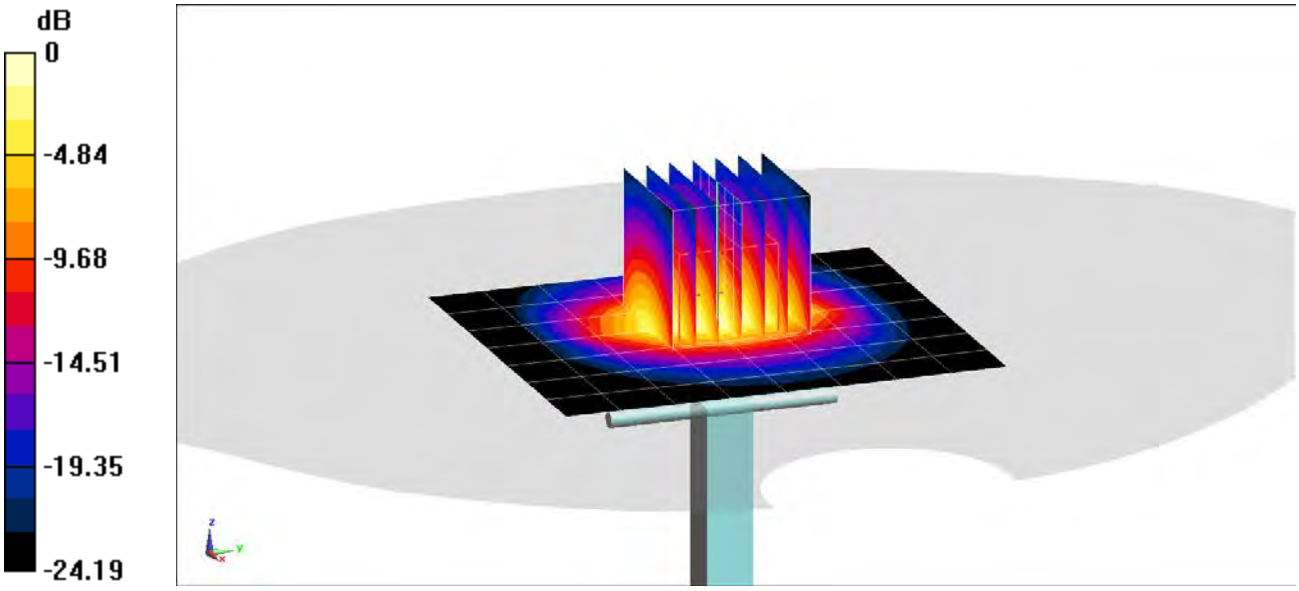
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2600 MHz; σ = 2.222 S/m; ε_r = 50.633; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 01-02-2019; Ambient Temp: 22.1°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3319; ConvF(4.33, 4.33, 4.33) @ 2600 MHz; Calibrated: 3/13/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/7/2018
Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7450)

2600 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 12.4 W/kg
SAR(1 g) = 5.64 W/kg
Deviation(1 g) = 2.92%



0 dB = 7.47 W/kg = 8.73 dBW/kg

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

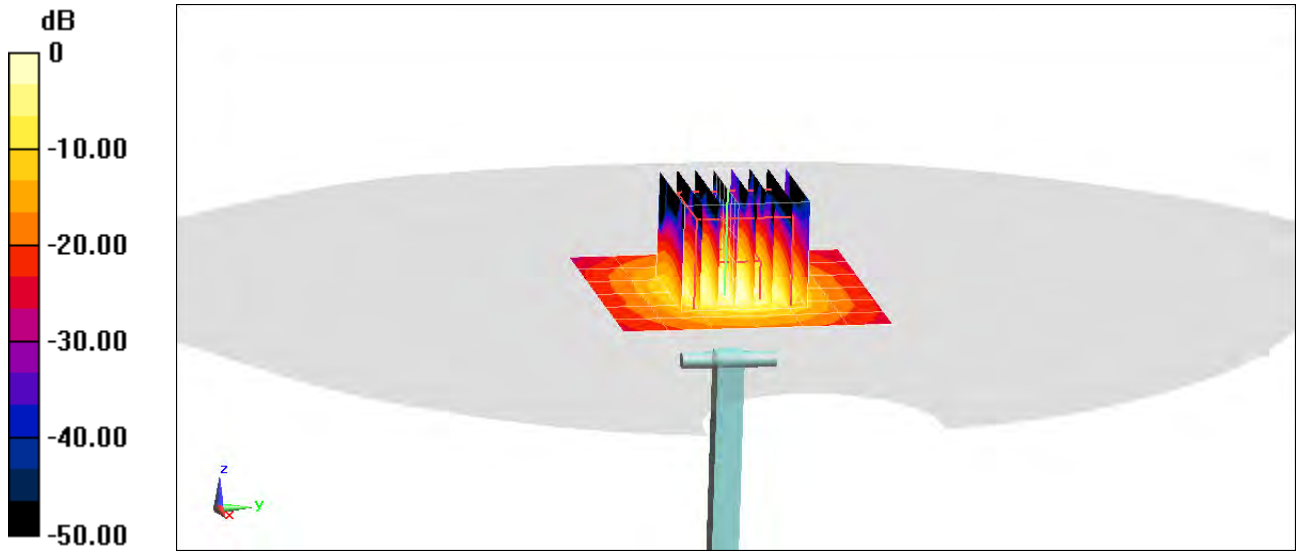
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5250 MHz; σ = 5.421 S/m; ε_r = 47.944; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

Probe: EX3DV4 - SN7308; ConvF(4.48, 4.48, 4.48) @ 5250 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

5250 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 14.6 W/kg
SAR(1 g) = 3.6 W/kg
Deviation(1 g) = -6.49%



0 dB = 8.56 W/kg = 9.32 dBW/kg

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

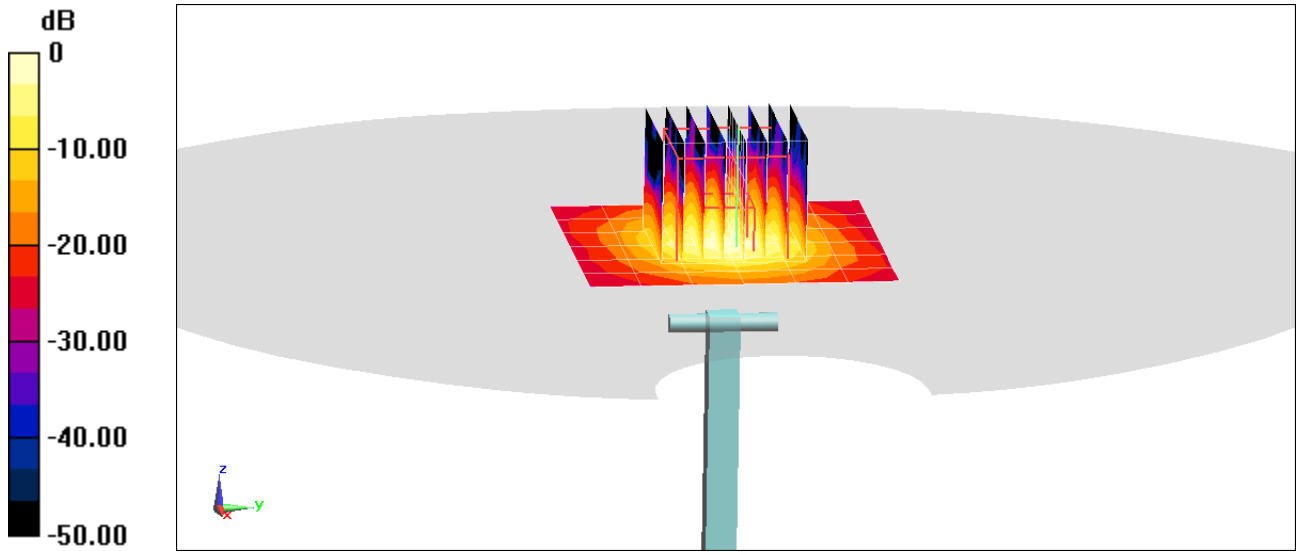
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5600 MHz; σ = 5.939 S/m; ε_r = 47.285; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

Probe: EX3DV4 - SN7308; ConvF(4, 4, 4) @ 5600 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

5600 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 17.5 W/kg
SAR(1 g) = 3.89 W/kg
Deviation(1 g) = -1.77%



0 dB = 9.63 W/kg = 9.84 dBW/kg

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

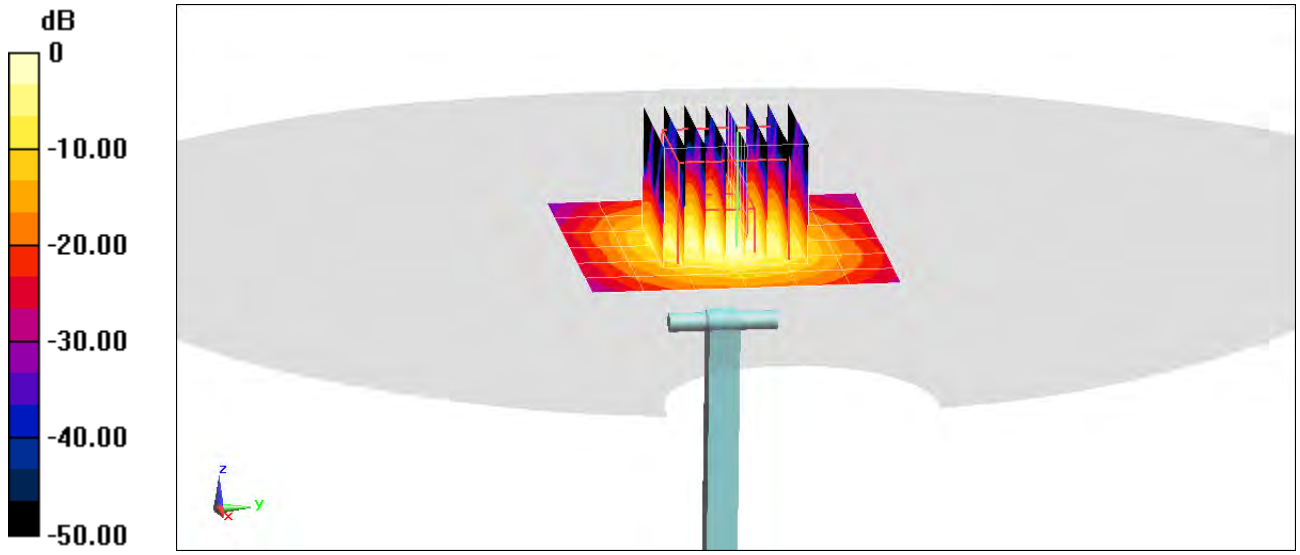
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5750 MHz; σ = 6.154 S/m; ε_r = 47.01; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

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

Probe: EX3DV4 - SN7308; ConvF(4.18, 4.18, 4.18) @ 5750 MHz; Calibrated: 8/23/2018
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1558; Calibrated: 10/3/2018
Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7450)

5750 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 16.1 W/kg
SAR(1 g) = 3.47 W/kg
Deviation(1 g) = -8.80%



0 dB = 8.59 W/kg = 9.34 dBW/kg

APPENDIX C: PROBE CALIBRATION

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D750V3-1003_Jan18

CALIBRATION CERTIFICATE

Object D750V3 - SN:1003

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

Calibration date: January 15, 2018

BN
01-25-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Leif Klysner	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 15, 2018

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.28 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.42 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.0 ± 6 %	0.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.58 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.71 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.8 Ω - 2.1 jΩ
Return Loss	- 27.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.2 Ω - 6.2 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

DASY system configuration, as far as not given on page 1 and 3.

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L

SAR result with SAM Head (Top)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**7.94 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.32 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.22 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.52 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Neck)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.06 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.52 W/kg ± 16.9 % (k=2)**

SAR result with SAM Head (Ear)

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.67 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.70 W/kg ± 17.5 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**4.60 W/kg ± 16.9 % (k=2)**

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

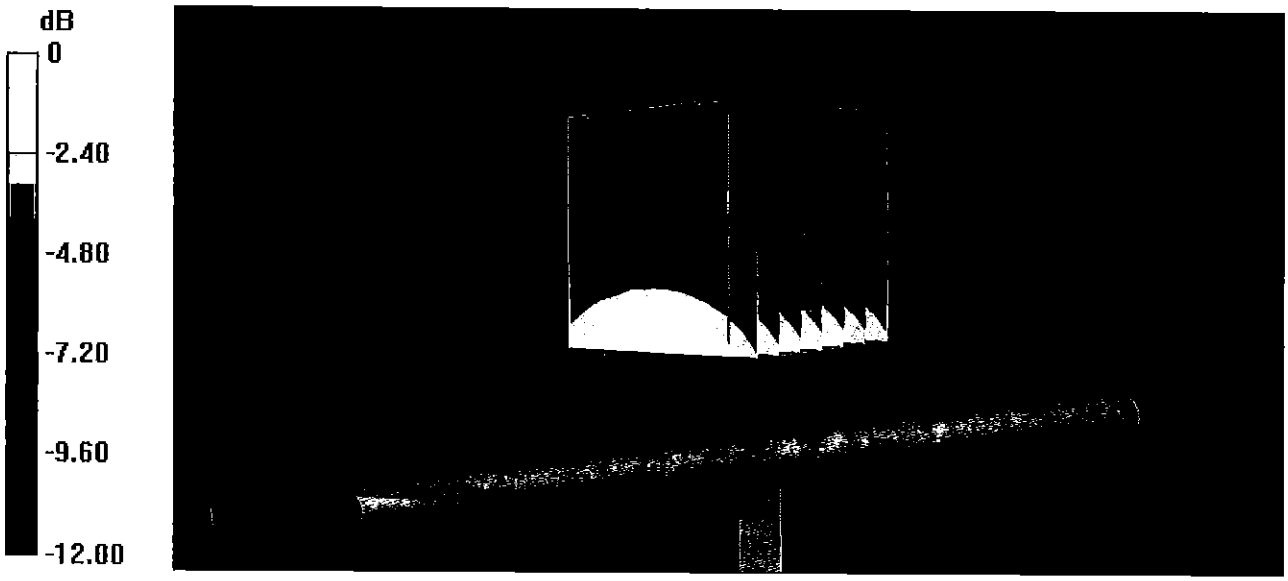
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

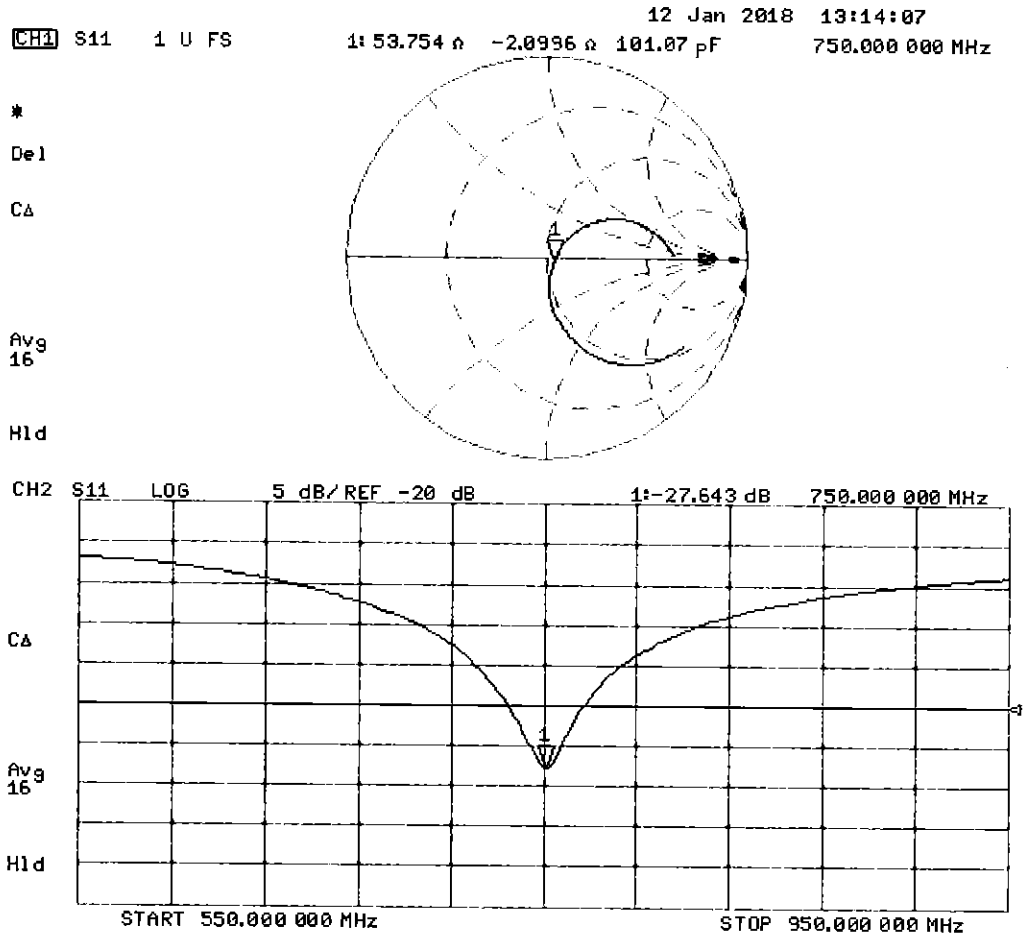
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.11 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.15 W/kg
SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 W/kg
Maximum value of SAR (measured) = 2.80 W/kg



0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Head TSL



Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

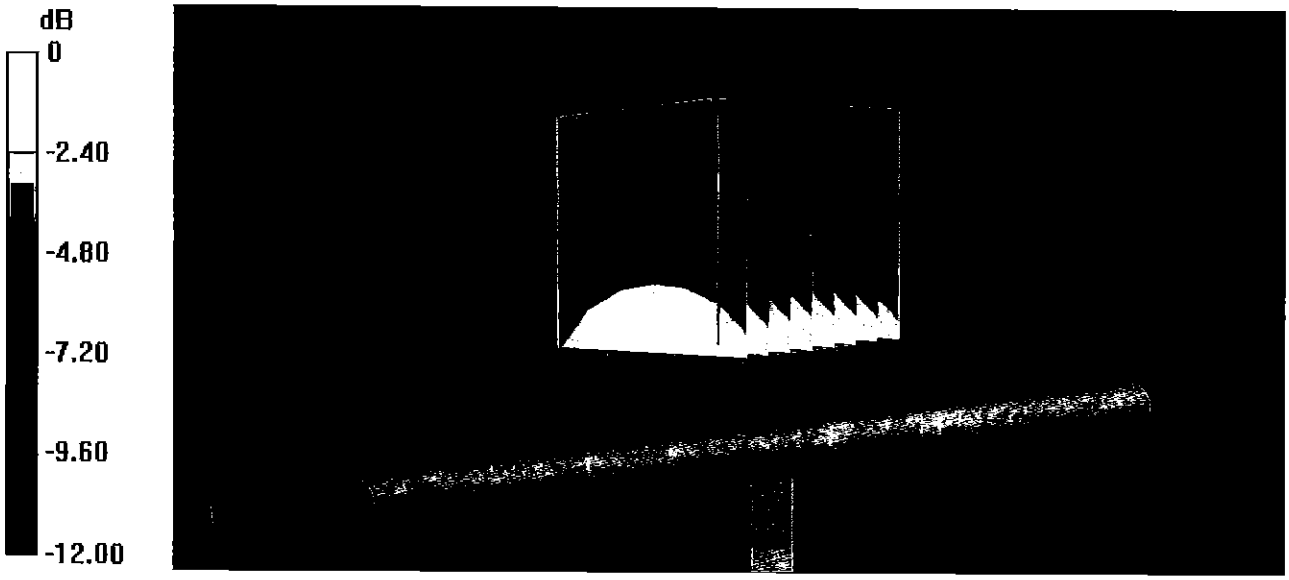
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 55; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

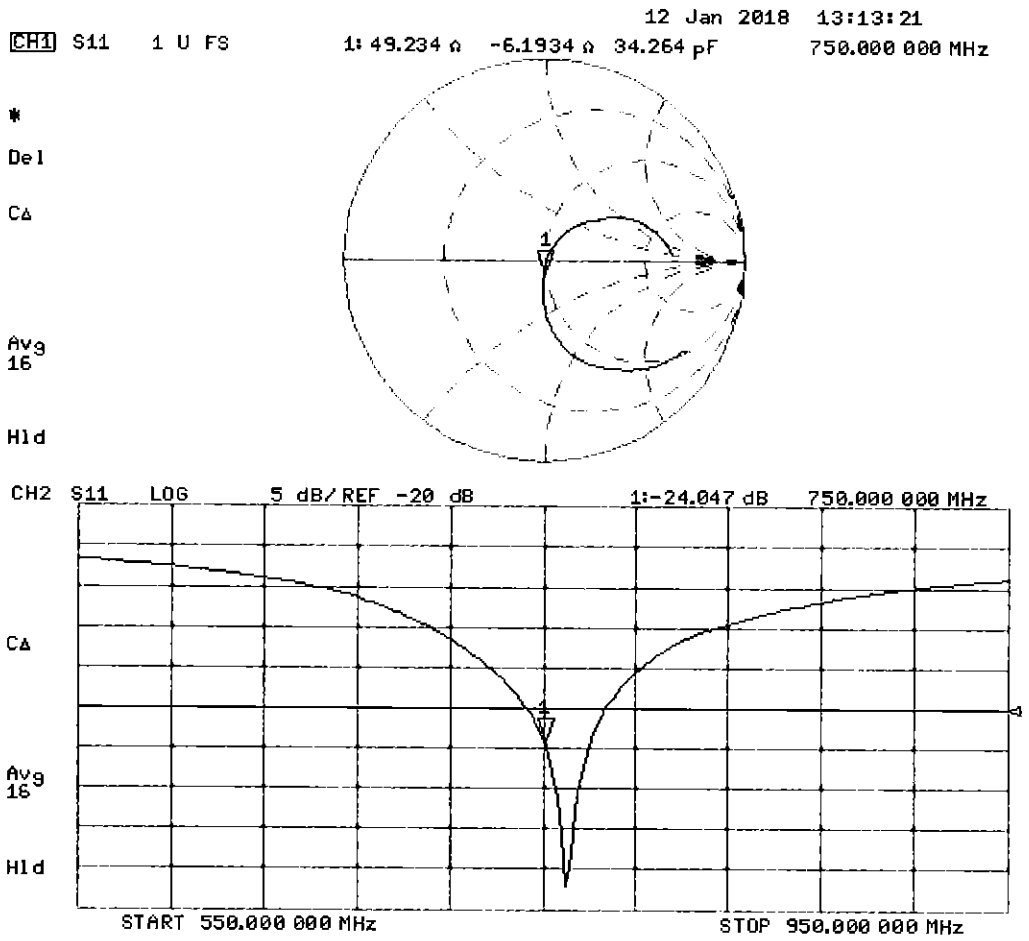
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x8x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.31 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.17 W/kg
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.43 W/kg
Maximum value of SAR (measured) = 2.83 W/kg



0 dB = 2.83 W/kg = 4.52 dBW/kg

Impedance Measurement Plot for Body TSL



Date: 15.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.9 S/m; ε_r = 44.2; ρ = 1000 kg/m^3
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

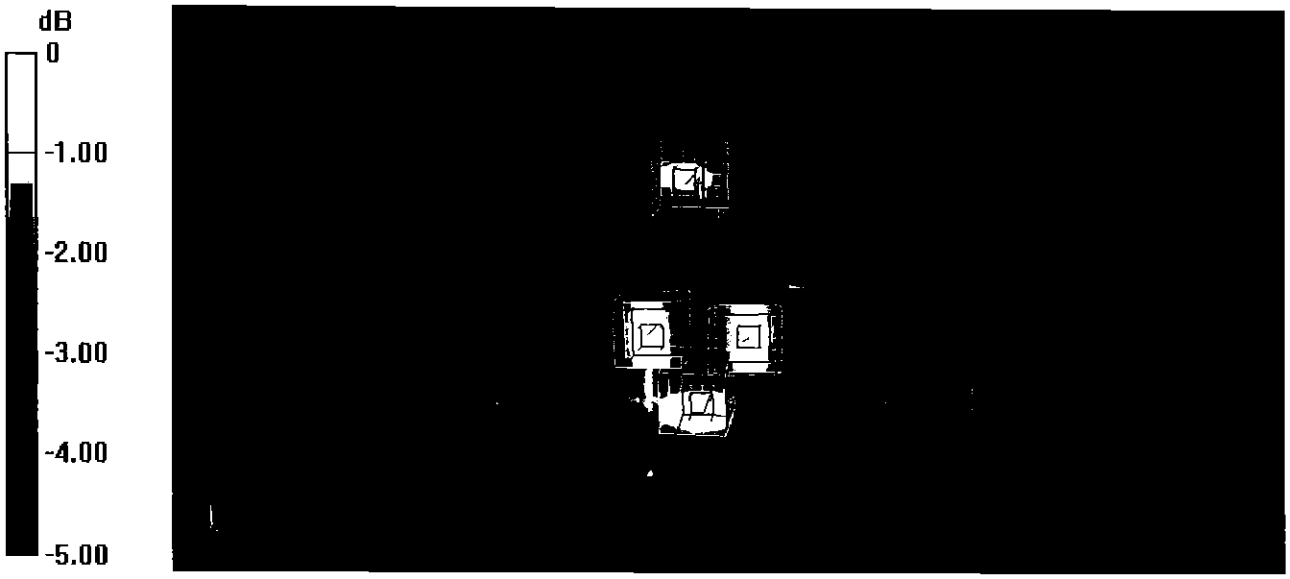
- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

SAM Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.79 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 2.89 W/kg
SAR(1 g) = 1.98 W/kg; SAR(10 g) = 1.33 W/kg
Maximum value of SAR (measured) = 2.58 W/kg

SAM Head/Mouth/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.85 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.94 W/kg
SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.38 W/kg
Maximum value of SAR (measured) = 2.62 W/kg

SAM Head/Neck/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 56.29 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 2.78 W/kg
SAR(1 g) = 2.01 W/kg; SAR(10 g) = 1.38 W/kg
Maximum value of SAR (measured) = 2.56 W/kg

SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 51.01 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 2.31 W/kg
SAR(1 g) = 1.67 W/kg; SAR(10 g) = 1.15 W/kg
Maximum value of SAR (measured) = 2.11 W/kg



0 dB = 2.58 W/kg = 4.12 dBW/kg

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1054_Mar17**

CALIBRATION CERTIFICATE

Object	D750V3 - SN:1054
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	March 07, 2017

BNV 03-27-2017

BNV 04-04-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	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-18)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Johannes Kurikka	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 14, 2017

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.9 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.37 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.50 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.6 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.21 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.61 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.68 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.7 Ω - 0.7 jΩ
Return Loss	- 26.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.7 Ω - 3.6 jΩ
Return Loss	- 28.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.033 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 08, 2011

DASY5 Validation Report for Head TSL

Date: 07.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

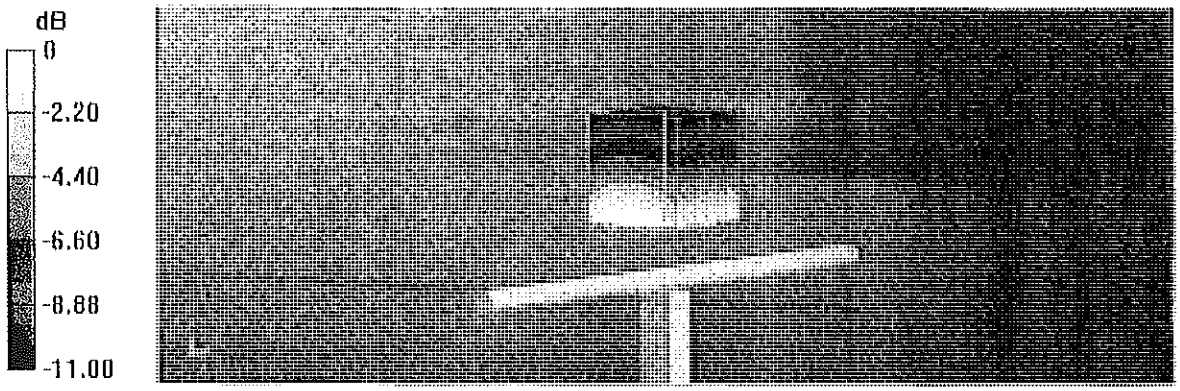
Communication System: UID 0 - CW ; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.91 S/m; ε_r = 40.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.17, 10.17, 10.17); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

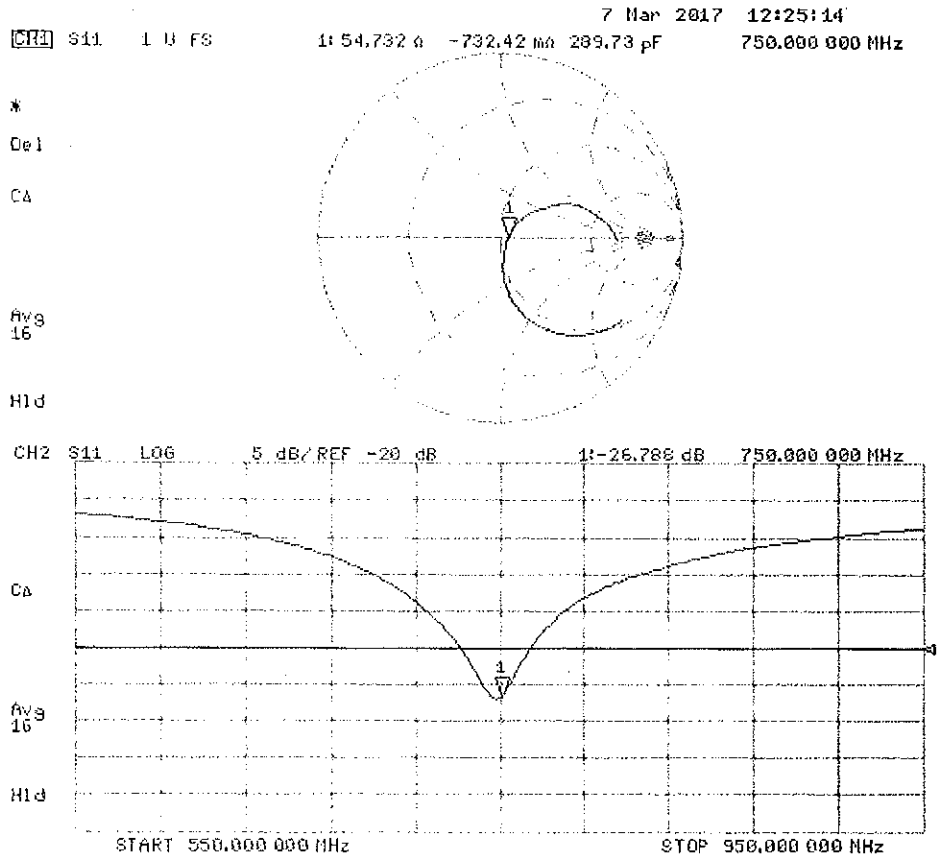
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.71 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 3.21 W/kg
SAR(1 g) = 2.14 W/kg; SAR(10 g) = 1.4 W/kg
Maximum value of SAR (measured) = 2.85 W/kg



0 dB = 2.85 W/kg = 4.55 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

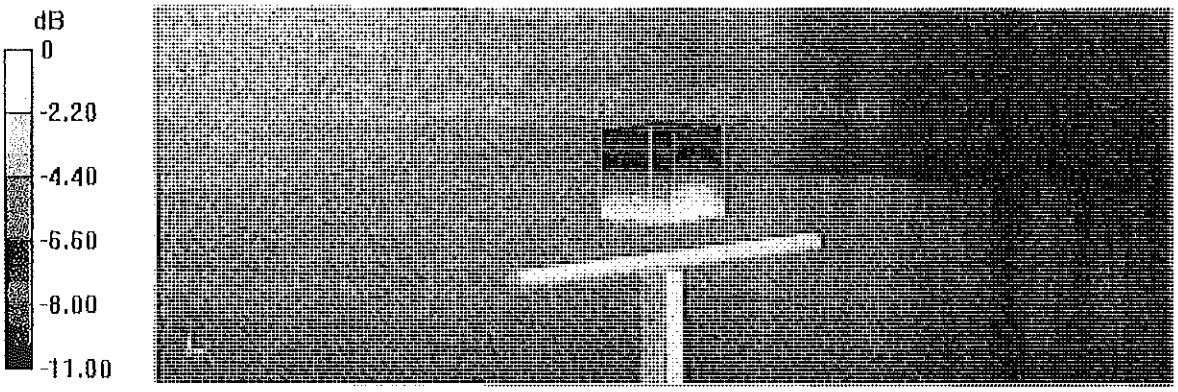
Communication System: UID 0 - CW ; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.99 S/m; ε_r = 54.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.99, 9.99, 9.99); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7331)

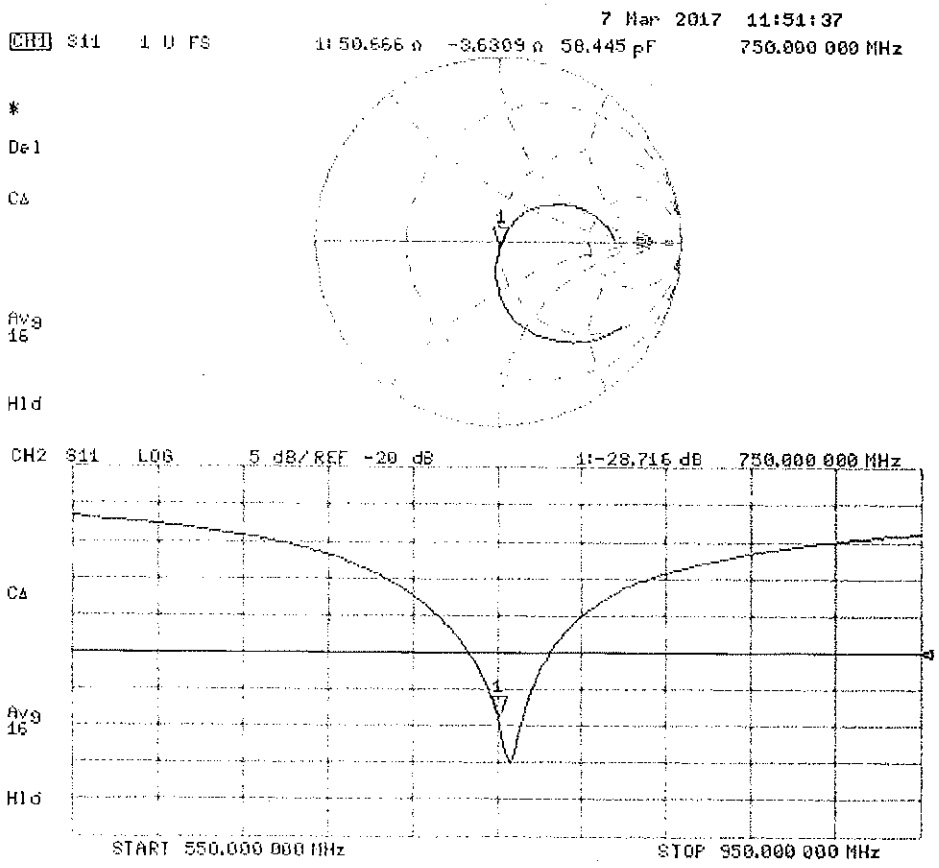
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.88 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.31 W/kg
SAR(1 g) = 2.21 W/kg; SAR(10 g) = 1.45 W/kg
Maximum value of SAR (measured) = 2.94 W/kg



0 dB = 2.94 W/kg = 4.68 dBW/kg

Impedance Measurement Plot for Body TSL



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

Certification of Calibration

Object	D750V3 – SN:1054
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	March 07, 2018
Description:	SAR Validation Dipole at 750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	8/3/2017	Annual	8/3/2018	MY40000670
Agilent	N5182A	MXG Vector Signal Generator	1/24/2018	Annual	1/24/2019	MY47420651
Amplifier Research	1S51G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	10/16/2017	Annual	10/16/2018	1126066
Anritsu	ML2495A	Power Meter	10/22/2017	Annual	10/22/2018	1328004
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	1/22/2018	Annual	1/22/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/13/2017	Annual	7/13/2018	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/21/2017	Annual	6/21/2018	1333
SPEAG	EX3DV4	SAR Probe	7/17/2017	Annual	7/17/2018	7410
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287

Measurement Uncertainty = ±23% (k=2)

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

DIPOLE CALIBRATION EXTENSION

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

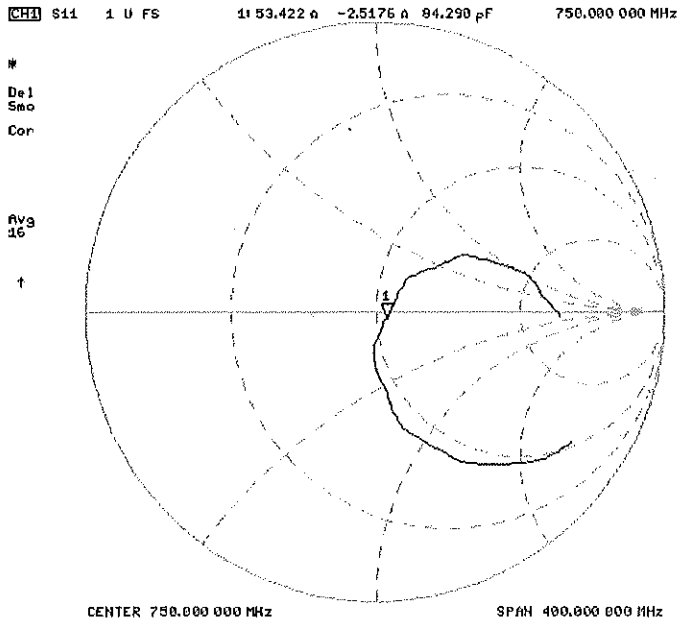
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

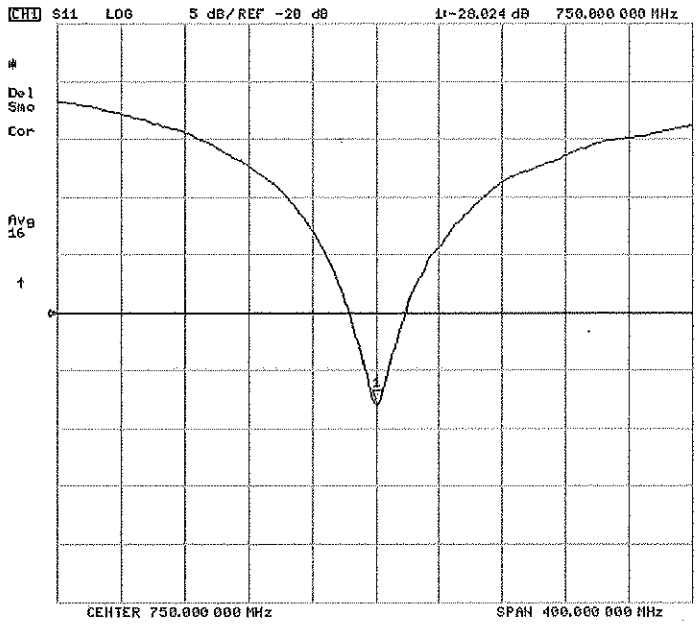
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
3/7/2017	3/7/2018	1.033	1.67	1.70	1.55%	1.10	1.11	0.91%	54.7	53.4	1.3	-0.7	-2.5	1.8	-26.8	-28.0	-4.60%	PASS

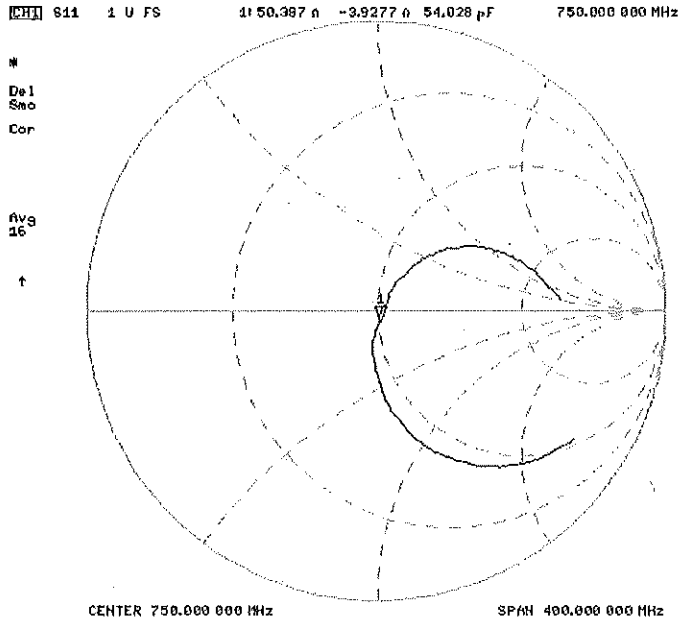
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
3/7/2017	3/7/2018	1.033	1.72	1.70	-1.28%	1.14	1.12	-1.41%	50.7	50.4	0.3	-3.6	-3.9	0.3	-28.7	-28.5	0.60%	PASS

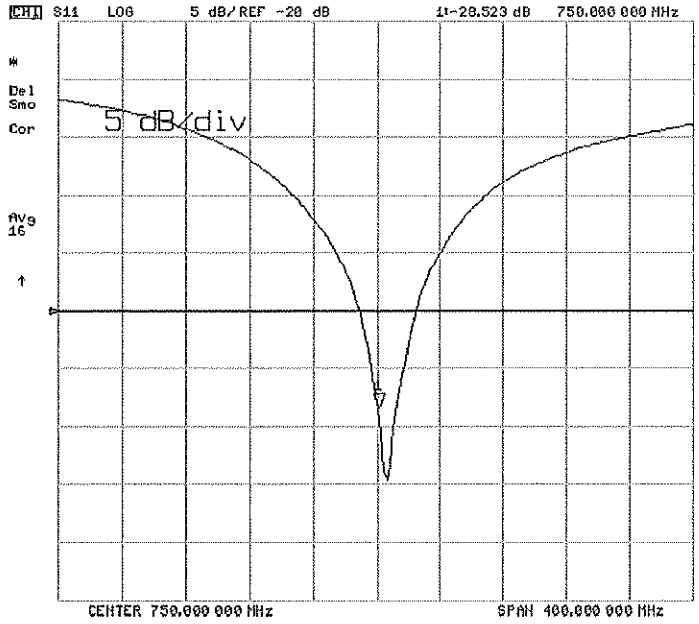
Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL





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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client PC Test

Certificate No: D835V2-4d047_Oct18

CALIBRATION CERTIFICATE

Object: D835V2 - SN:4d047

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

Calibration date: October 19, 2018

BN ✓
10-30-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 22, 2018

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.47 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.55 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.14 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.9 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.71 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.36 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.0 Ω - 0.5 jΩ
Return Loss	- 39.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.6 Ω - 4.1 jΩ
Return Loss	- 24.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.387 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	August 16, 2006

DASY5 Validation Report for Head TSL

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

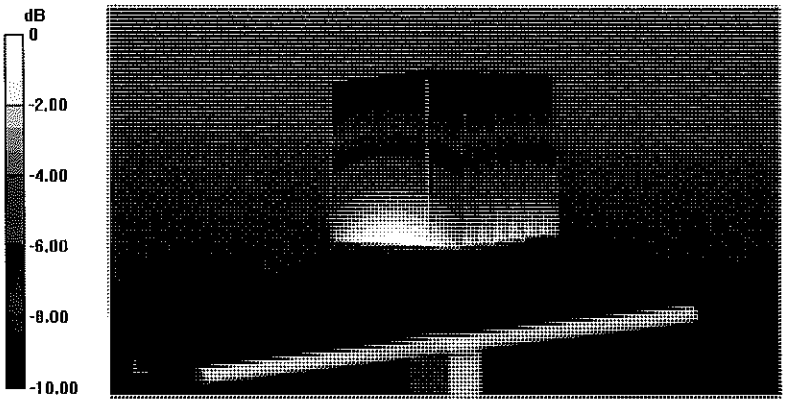
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.91 S/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

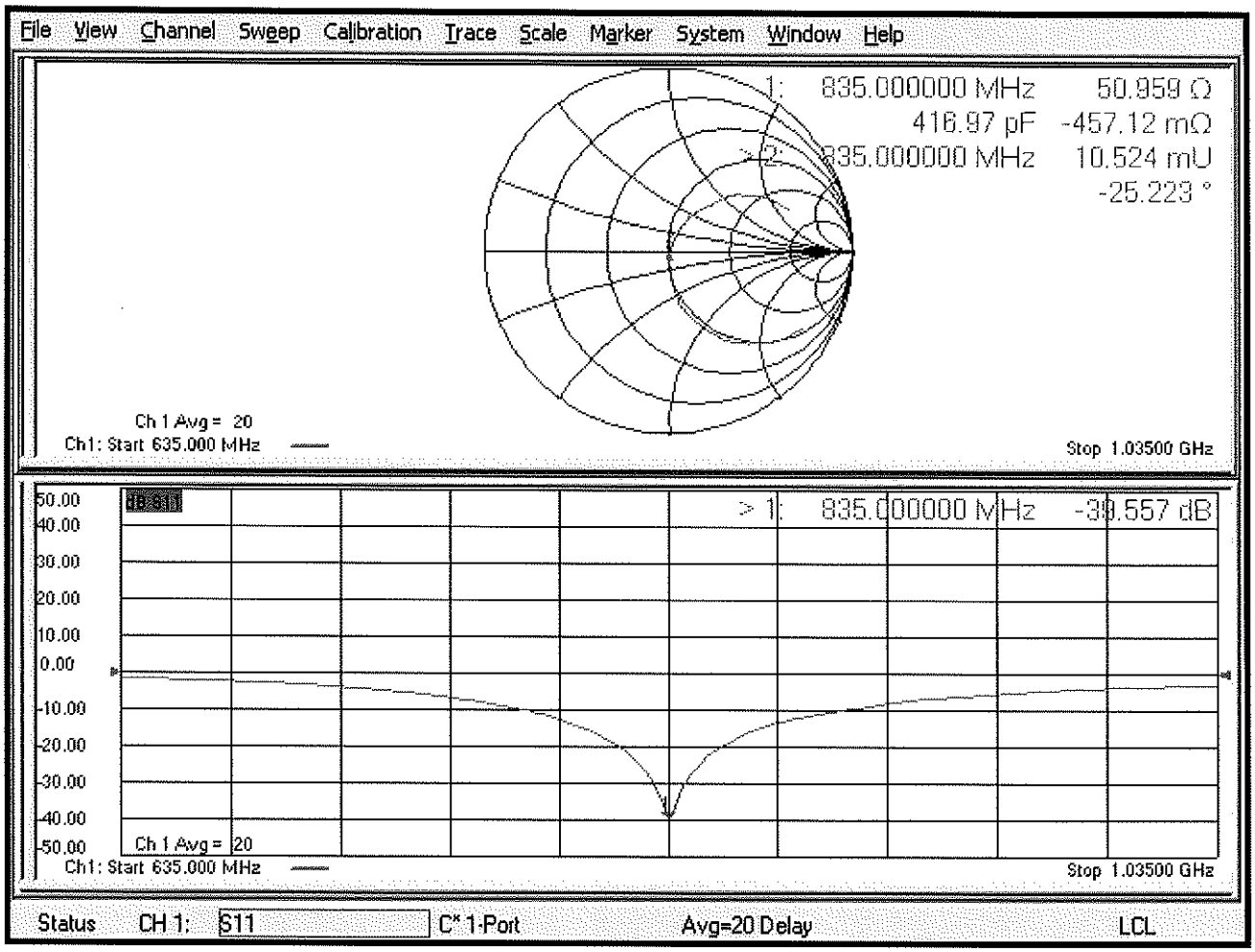
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.84 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.55 W/kg
Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

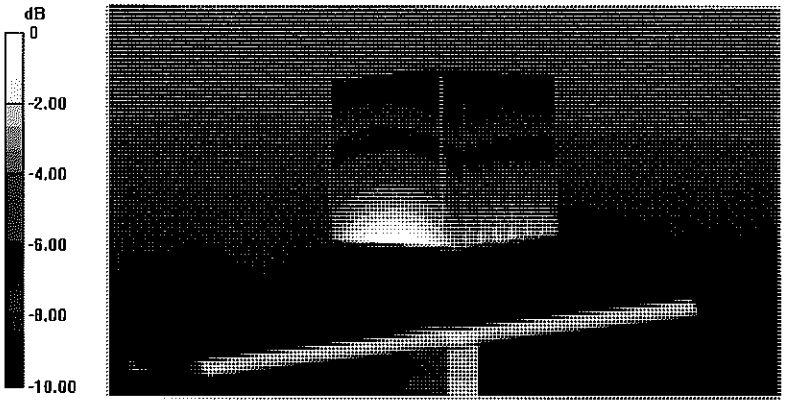
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.98 S/m; ε_r = 54.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

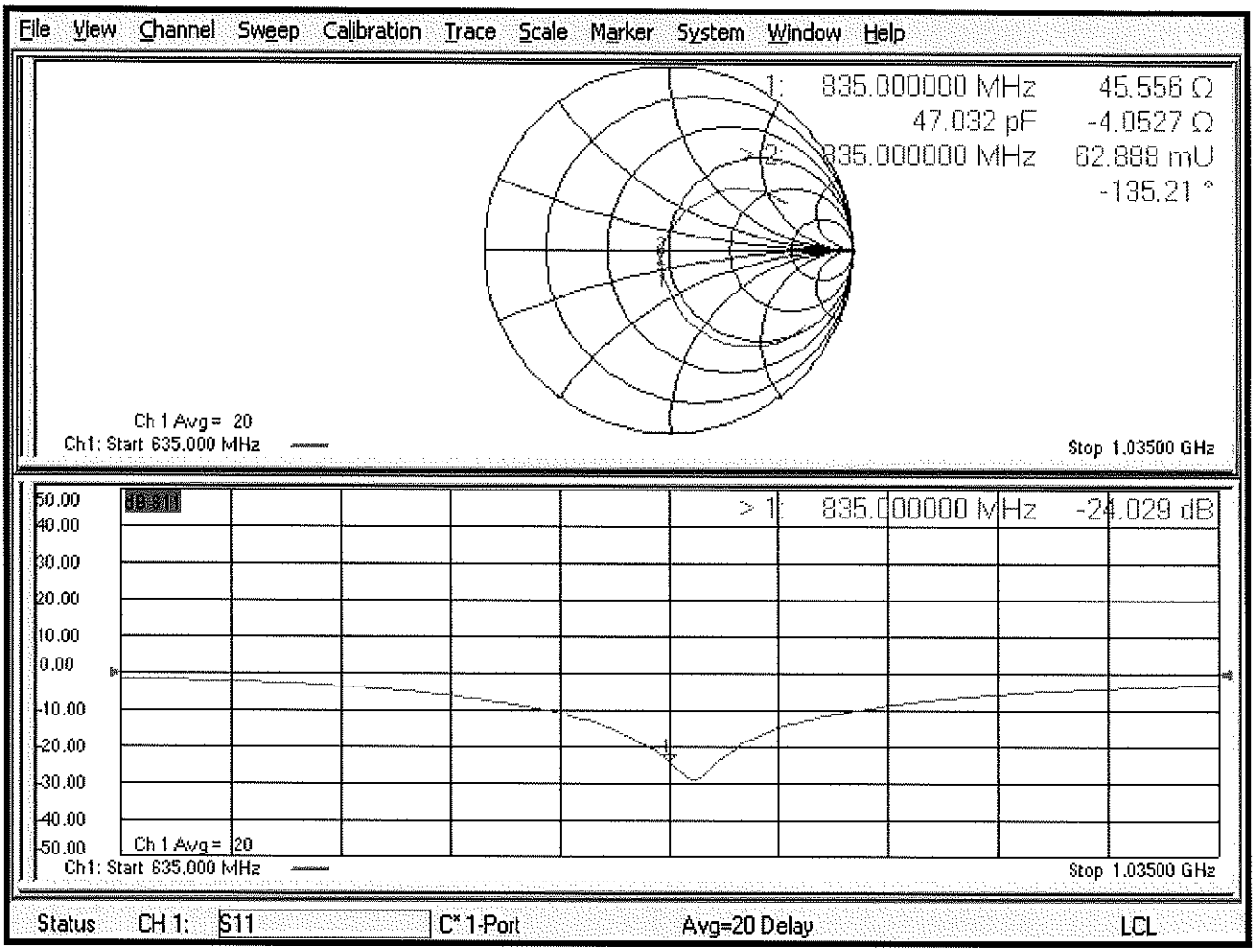
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.27 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.68 W/kg
SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D835V2-4d133_Oct18

CALIBRATION CERTIFICATE

Object: D835V2 - SN:4d133

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

BN ✓
10/30/2018

Calibration date: October 19, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 22, 2018

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	0.91 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.43 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.10 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.9 ± 6 %	0.98 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.75 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.40 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.6 Ω - 2.4 jΩ
Return Loss	- 32.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.0 Ω - 6.7 jΩ
Return Loss	- 21.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.397 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 19.10.2018

Test Laboratory: The name of your organization

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

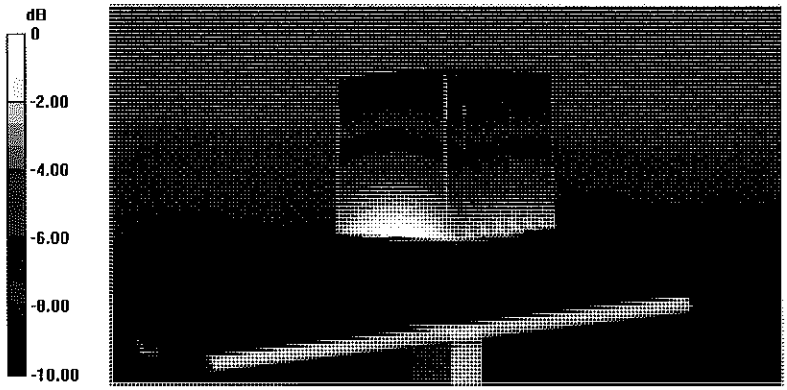
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.91 S/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

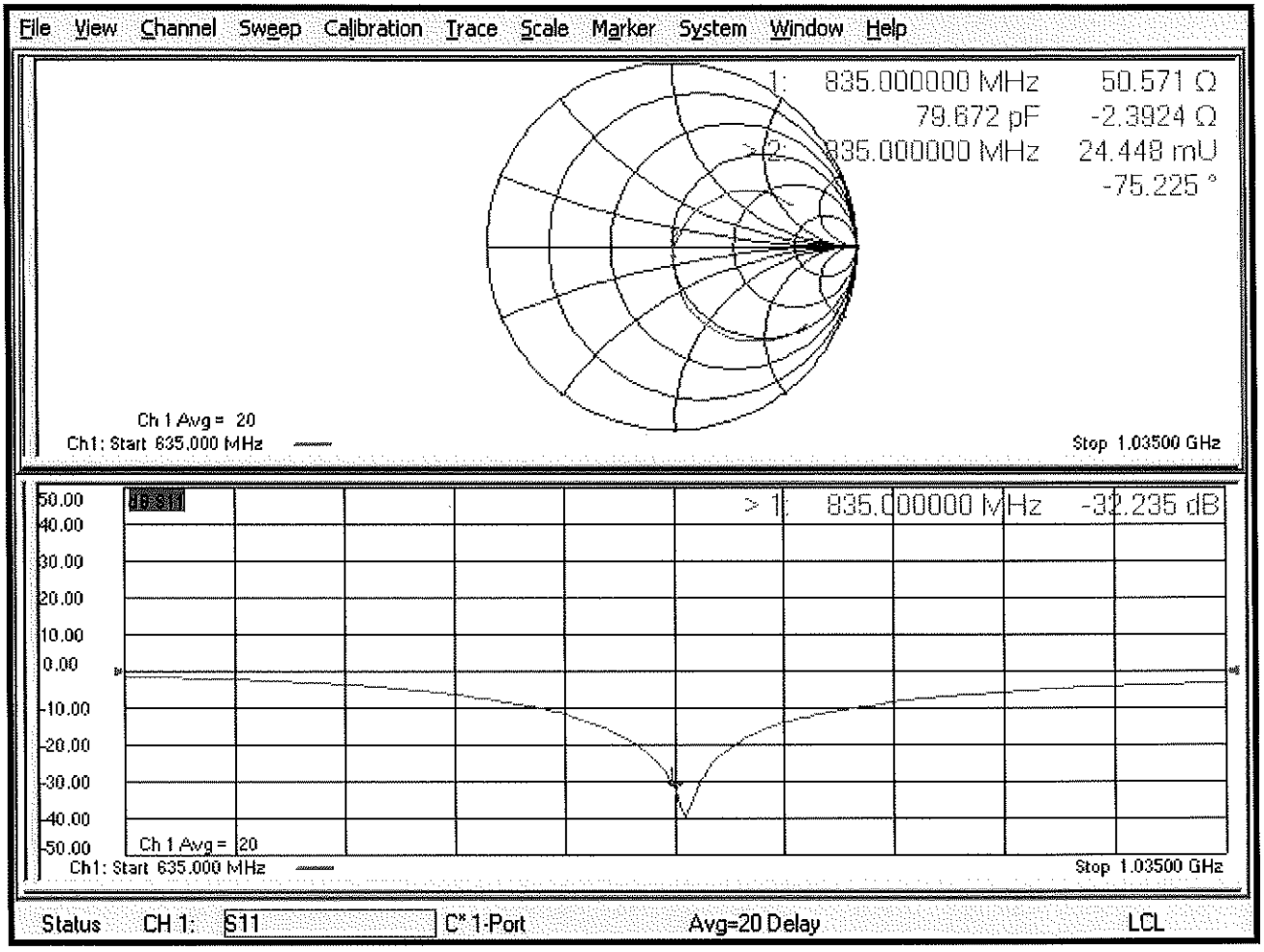
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 63.02 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.68 W/kg
SAR(1 g) = 2.39 W/kg; SAR(10 g) = 1.54 W/kg
Maximum value of SAR (measured) = 3.24 W/kg



0 dB = 3.24 W/kg = 5.11 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

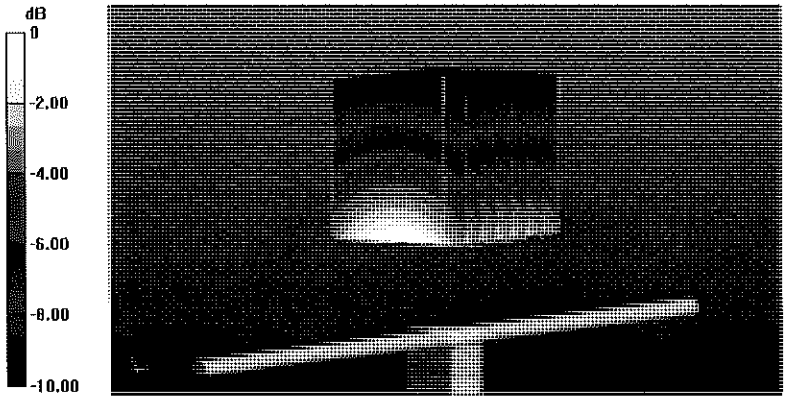
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.98 S/m; ε_r = 54.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

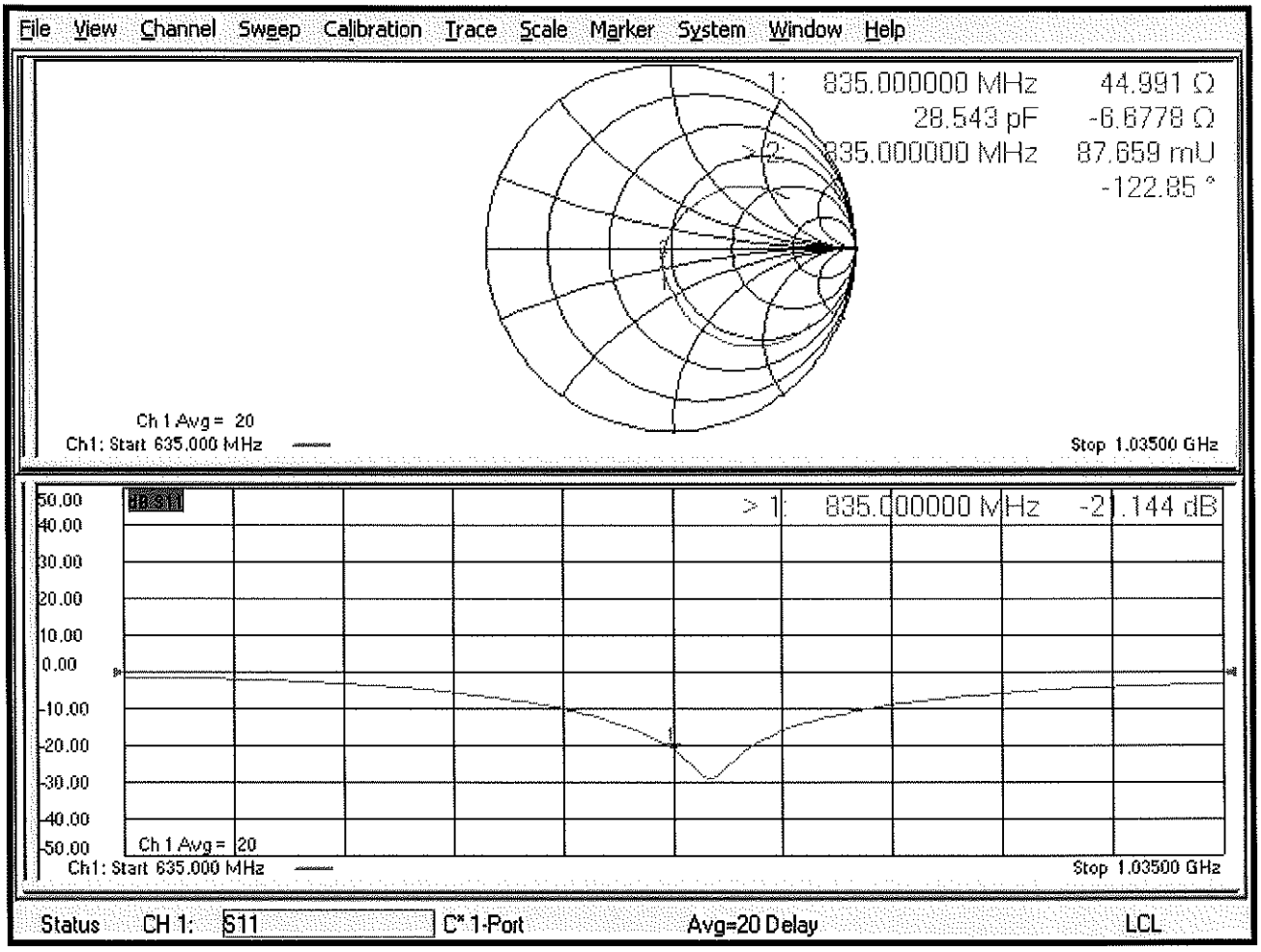
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.61 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.61 W/kg
Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Impedance Measurement Plot for Body TSL



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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

BN ✓
05-23-2017

Calibration date: May 09, 2017

BN ✓
05-09-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 11, 2017

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Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.3 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.7 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**37.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.93 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.8 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 0.7 jΩ
Return Loss	- 42.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.7 Ω - 0.5 jΩ
Return Loss	- 26.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.223 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 30, 2014

DASY5 Validation Report for Head TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

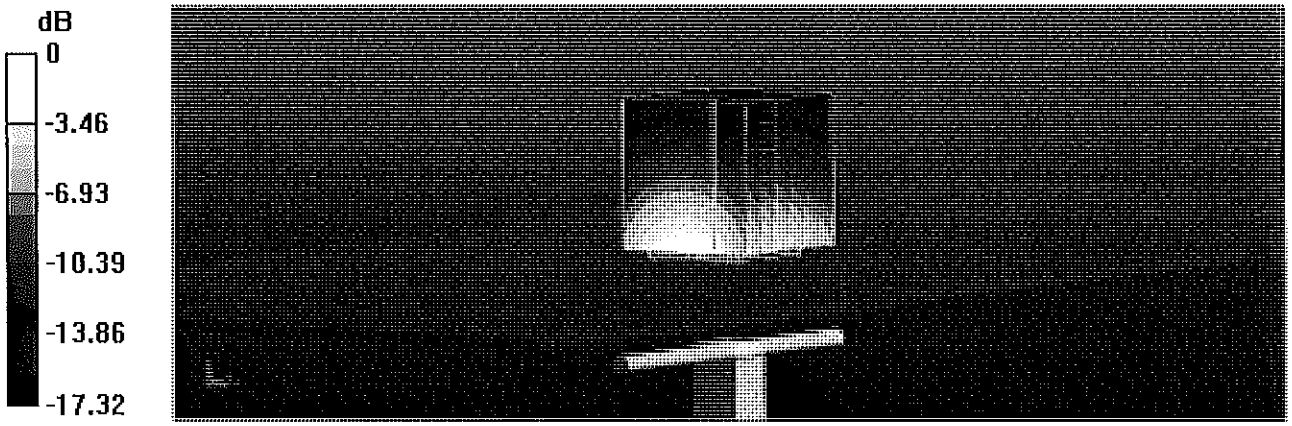
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.46, 8.46, 8.46); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

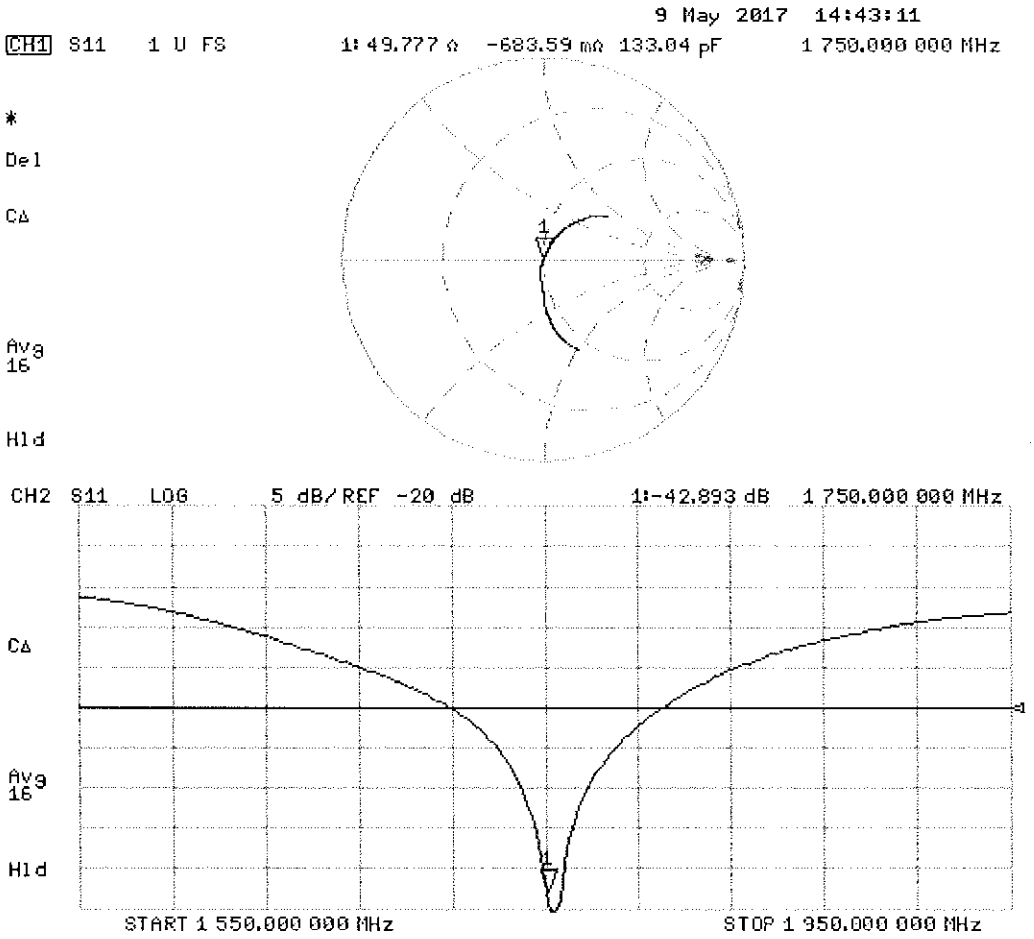
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.4 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 16.5 W/kg
SAR(1 g) = 9.11 W/kg; SAR(10 g) = 4.83 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

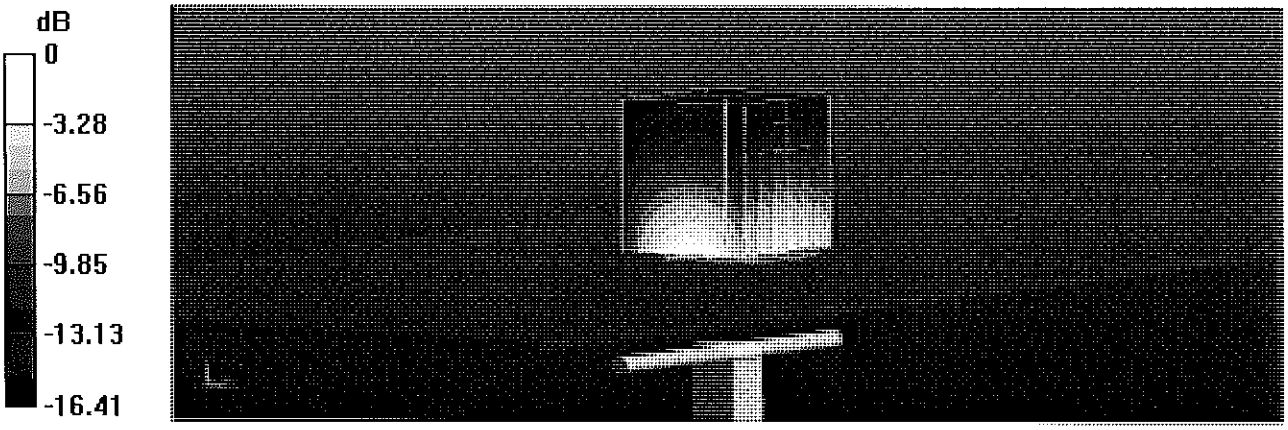
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.47 S/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(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)

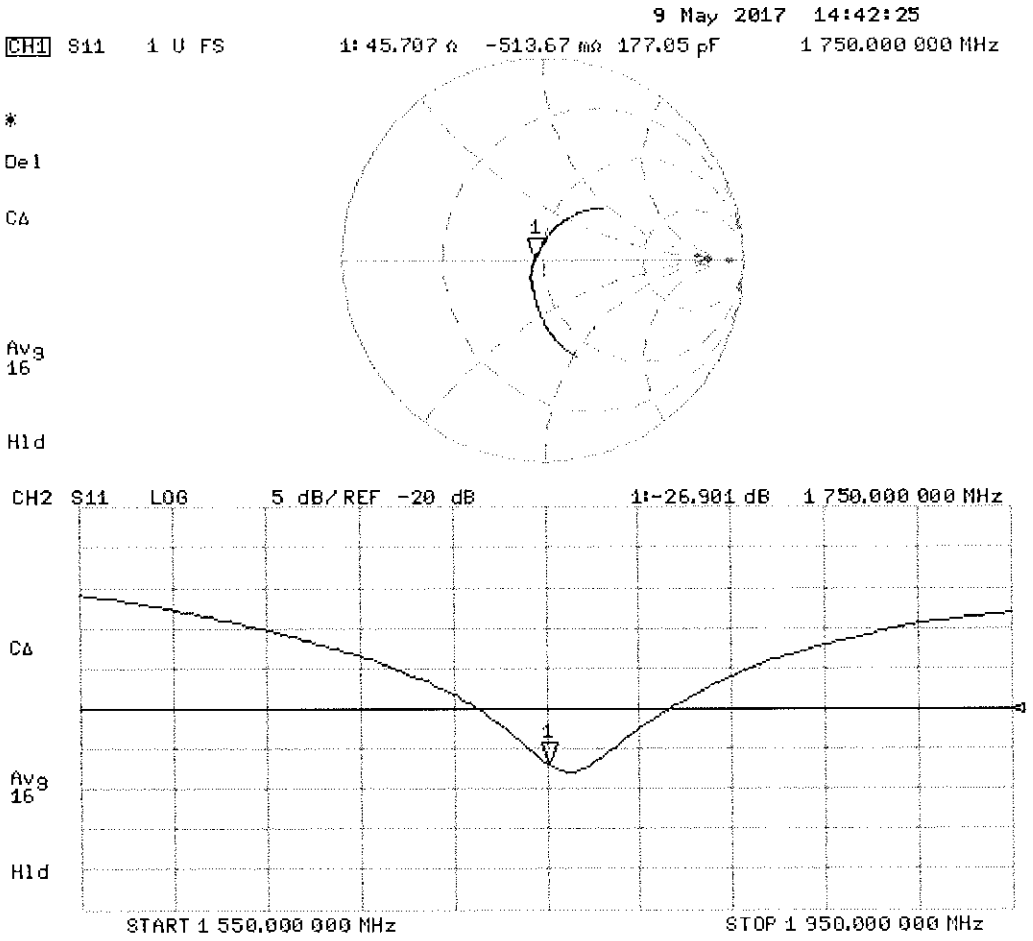
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



Certification of Calibration

Object	D1750V2 – SN: 1148
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	May 09, 2018
Description:	SAR Validation Dipole at 1750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2018	Annual	2/9/2019	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/21/2017	Annual	6/21/2018	1333
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/12/2017	Annual	9/12/2018	1091
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287
SPEAG	ES3DV3	SAR Probe	2/13/2018	Annual	2/13/2019	3213
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1339018
Agilent	N5182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Pasternack	NC-100	Torque Wrench	4/18/2018	Annual	4/18/2019	1445
Anritsu	ML2495A	Power Meter	10/22/2017	Annual	10/22/2018	941001

Measurement Uncertainty = ±23% (k=2)

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

DIPOLE CALIBRATION EXTENSION

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

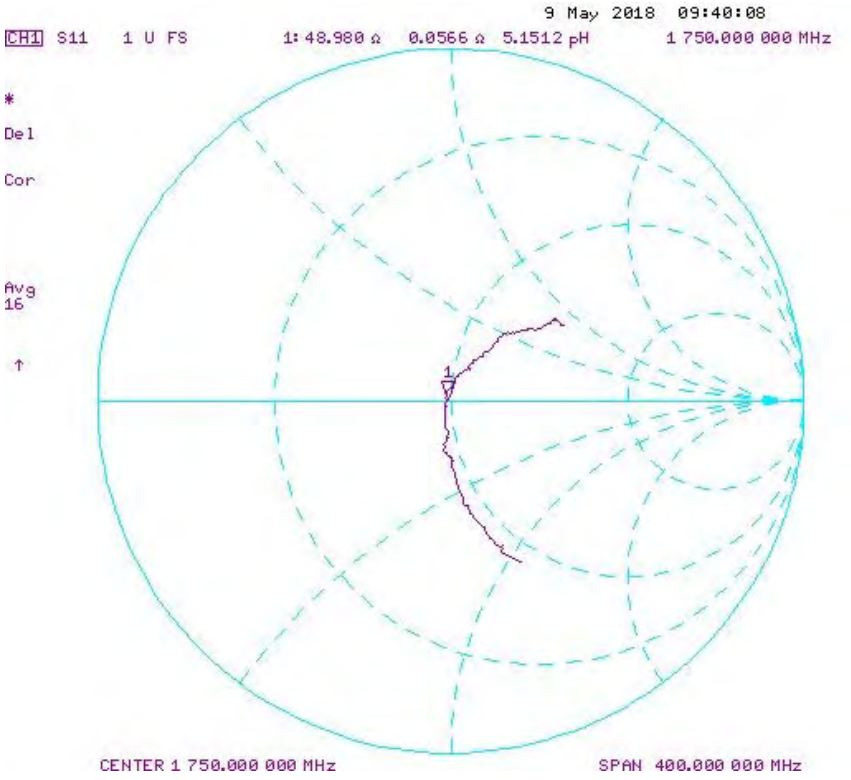
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

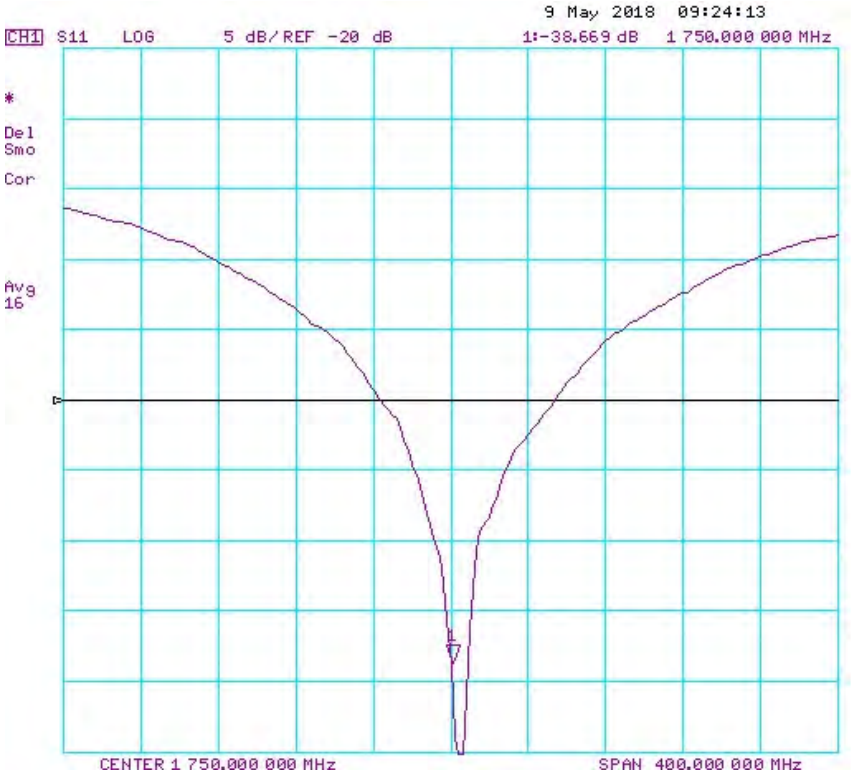
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5/9/2017	5/9/2018	1.223	3.64	3.59	-1.37%	1.93	1.91	-1.04%	49.8	49.0	0.8	-0.7	0.1	0.8	-42.9	-38.7	9.90%	PASS

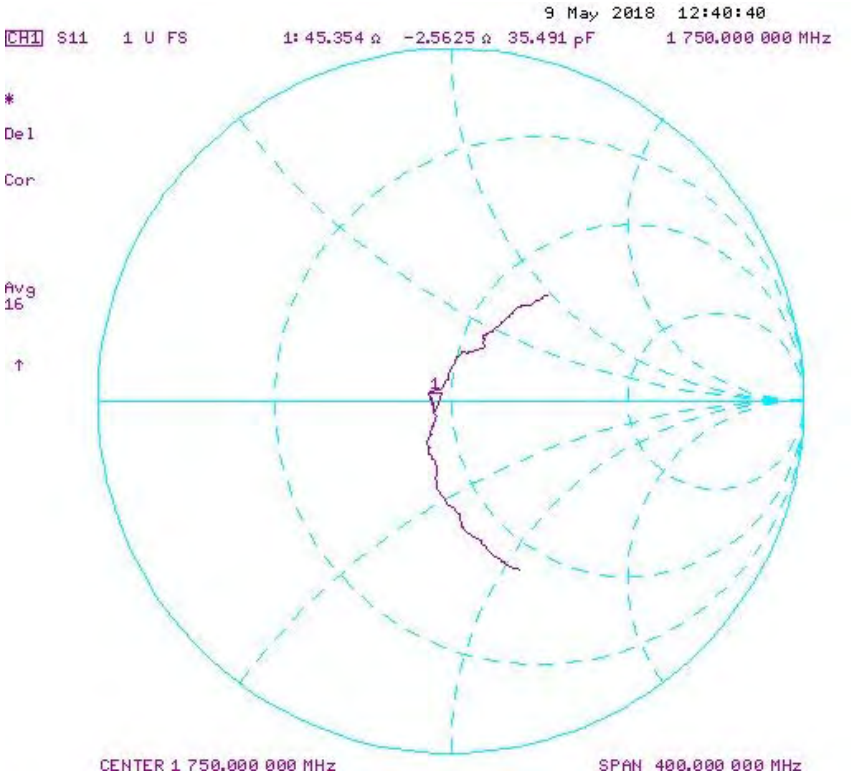
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5/9/2017	5/9/2018	1.223	3.7	3.88	4.86%	1.98	2.06	4.04%	45.7	45.4	0.3	-0.5	-2.6	2.1	-26.9	-25.0	7.20%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL



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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: SCS 0108

Client PC Test

Certificate No: D1750V2-1150_Oct18

CALIBRATION CERTIFICATE

Object D1750V2 - SN:1150

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

BN✓
10/30/2018

Calibration date: October 22, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 22, 2018

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	38.8 ± 6 %	1.33 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.2 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.5 ± 6 %	1.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**36.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.82 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.4 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9 Ω - 0.4 jΩ
Return Loss	- 40.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6 Ω - 0.1 jΩ
Return Loss	- 29.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.217 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	April 10, 2015

DASY5 Validation Report for Head TSL

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

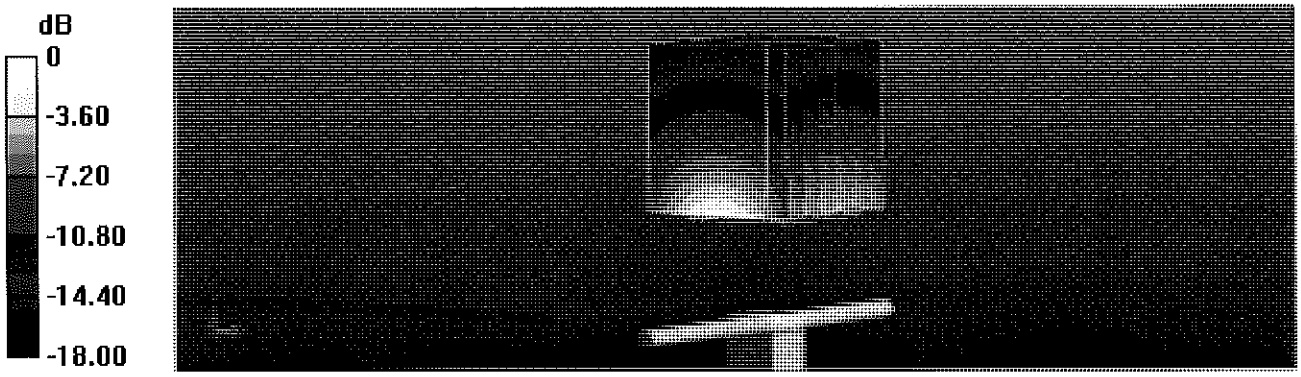
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.33 S/m; ε_r = 38.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

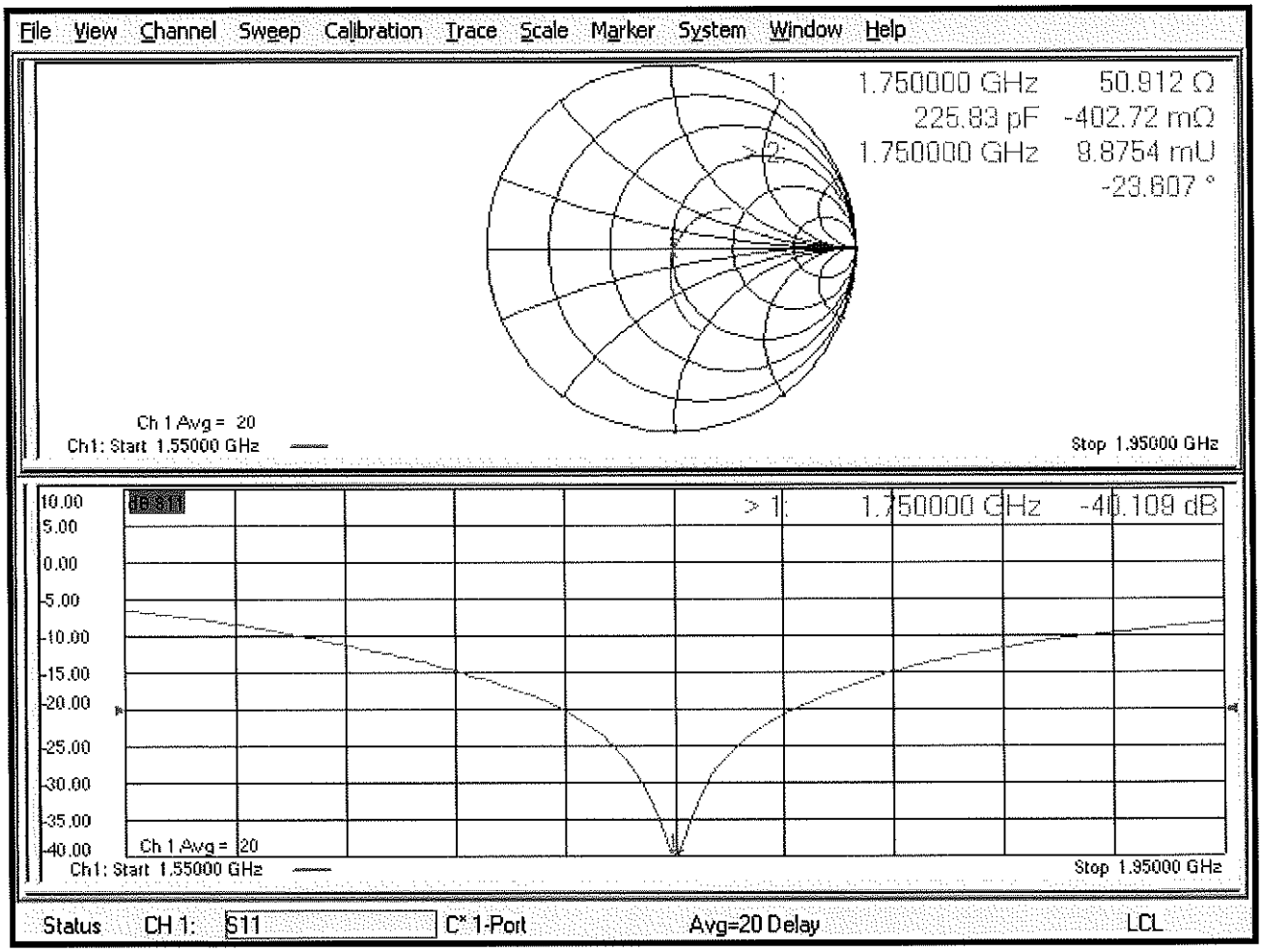
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 108.1 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 9.02 W/kg; SAR(10 g) = 4.76 W/kg
Maximum value of SAR (measured) = 14.0 W/kg



0 dB = 14.0 W/kg = 11.46 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

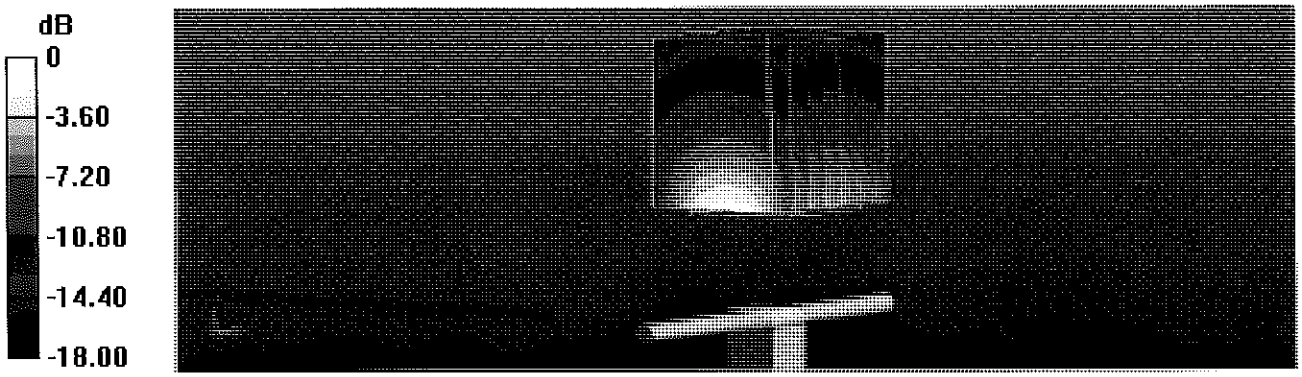
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.46 S/m; ε_r = 53.5; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.35, 8.35, 8.35) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

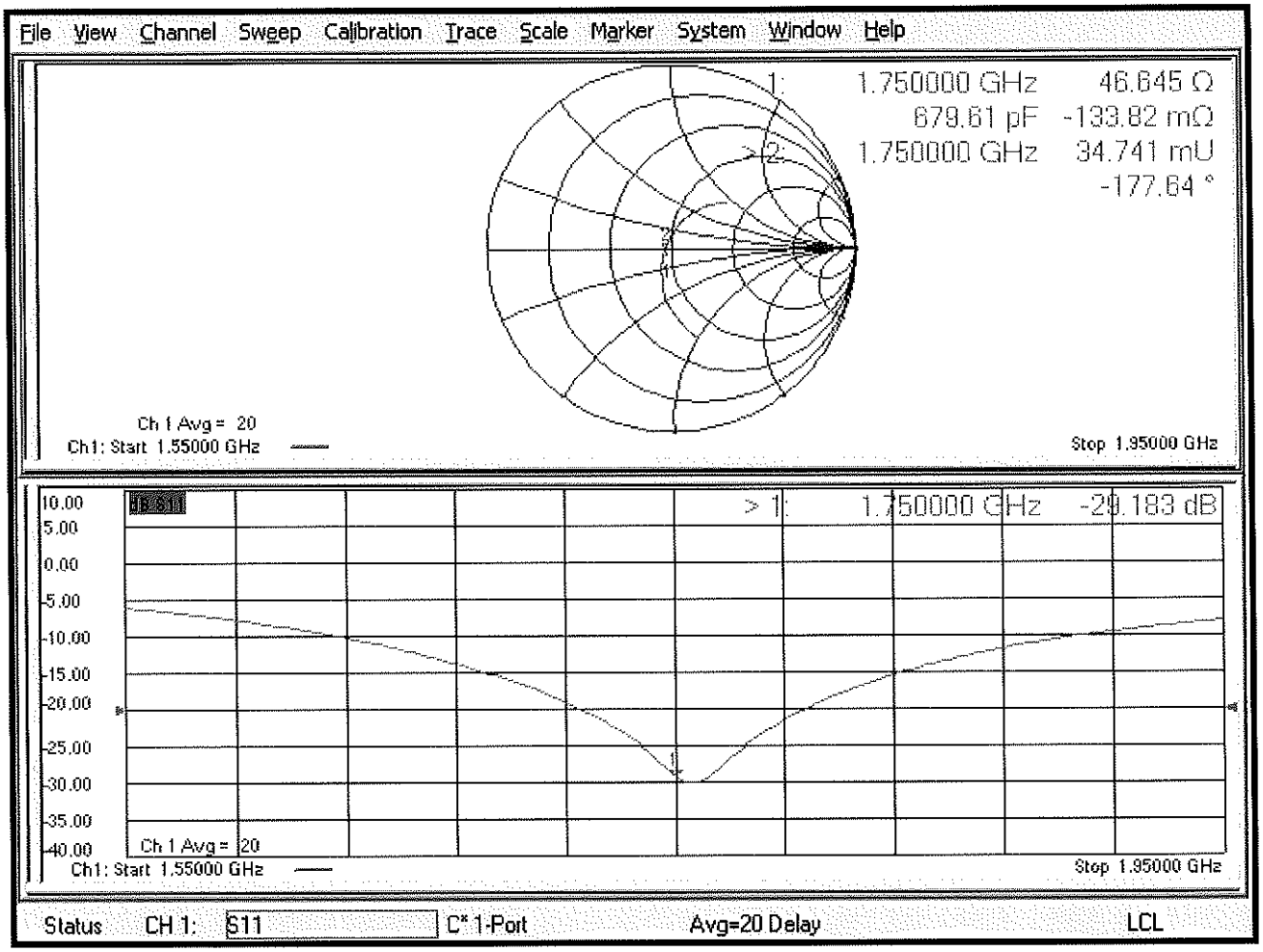
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.1 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 16.0 W/kg
SAR(1 g) = 9.04 W/kg; SAR(10 g) = 4.82 W/kg
Maximum value of SAR (measured) = 13.6 W/kg



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

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
Schmid & Partner
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S Schweizerischer Kalibrierdienst
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S Servizio svizzero di taratura
S Swiss Calibration Service

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

Accreditation No.: SCS 0108

Client PC Test

Certificate No: D1900V2-5d080_Oct18

CALIBRATION CERTIFICATE

Object: D1900V2 - SN:5d080

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

Calibration date: October 23, 2018

BN ✓
10-30-2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 23, 2018

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.3 ± 6 %	1.40 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.8 W/kg ± 17.0 % (k=2)**

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

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.6 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5 Ω + 7.9 jΩ
Return Loss	- 21.8 dB

Antenna Parameters with Body TSL

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

General Antenna Parameters and Design

Electrical Delay (one direction)	1.193 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 28, 2006

DASY5 Validation Report for Head TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

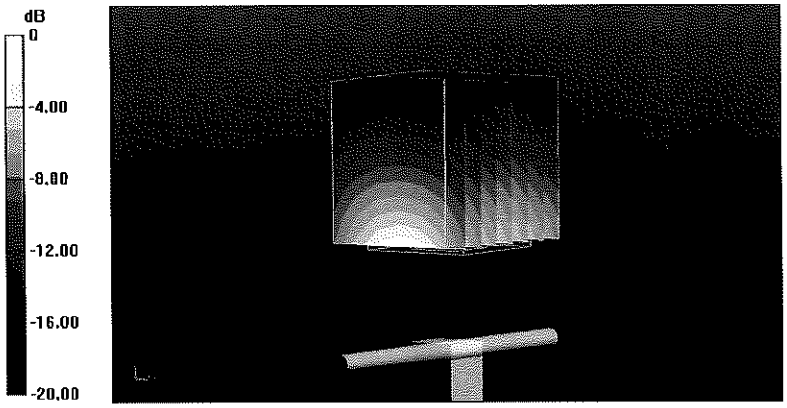
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.4 S/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

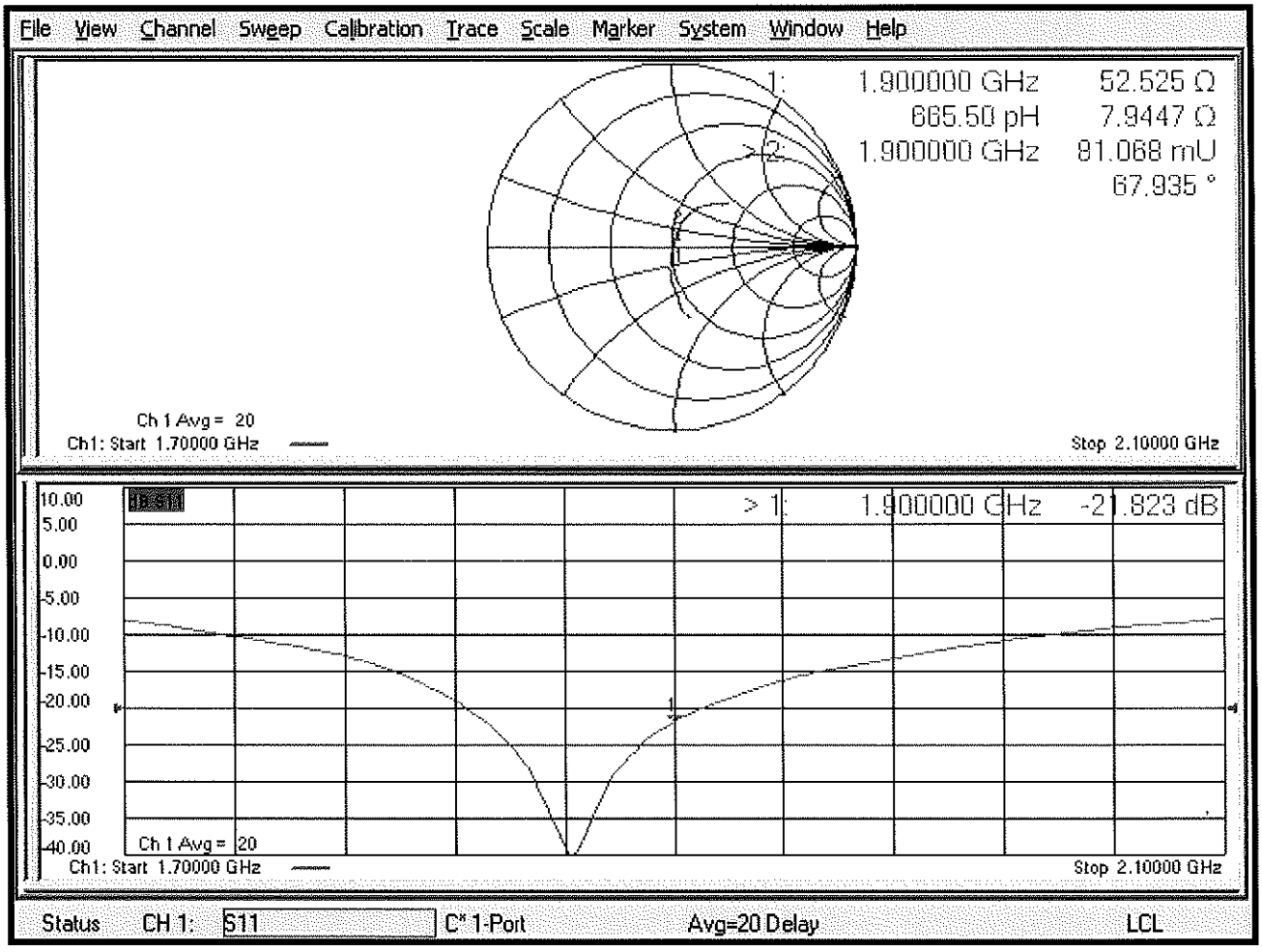
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

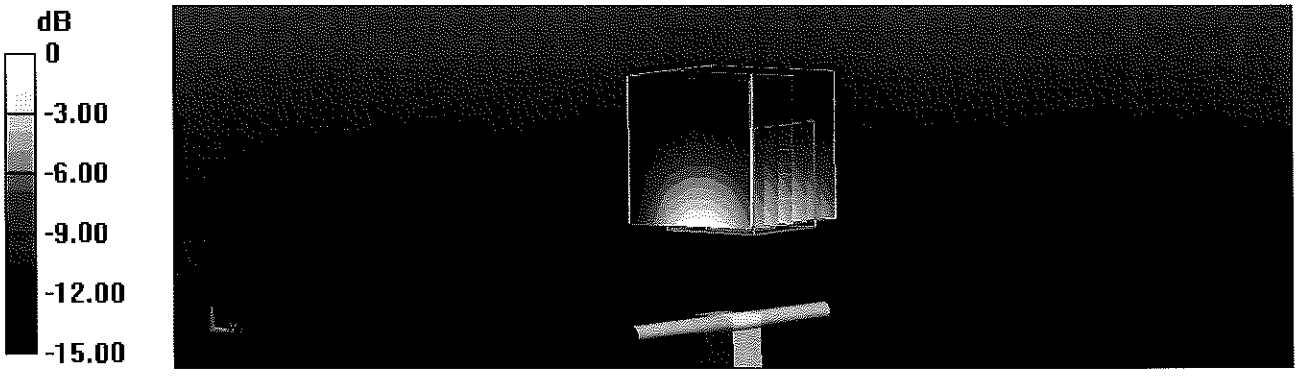
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.47 S/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

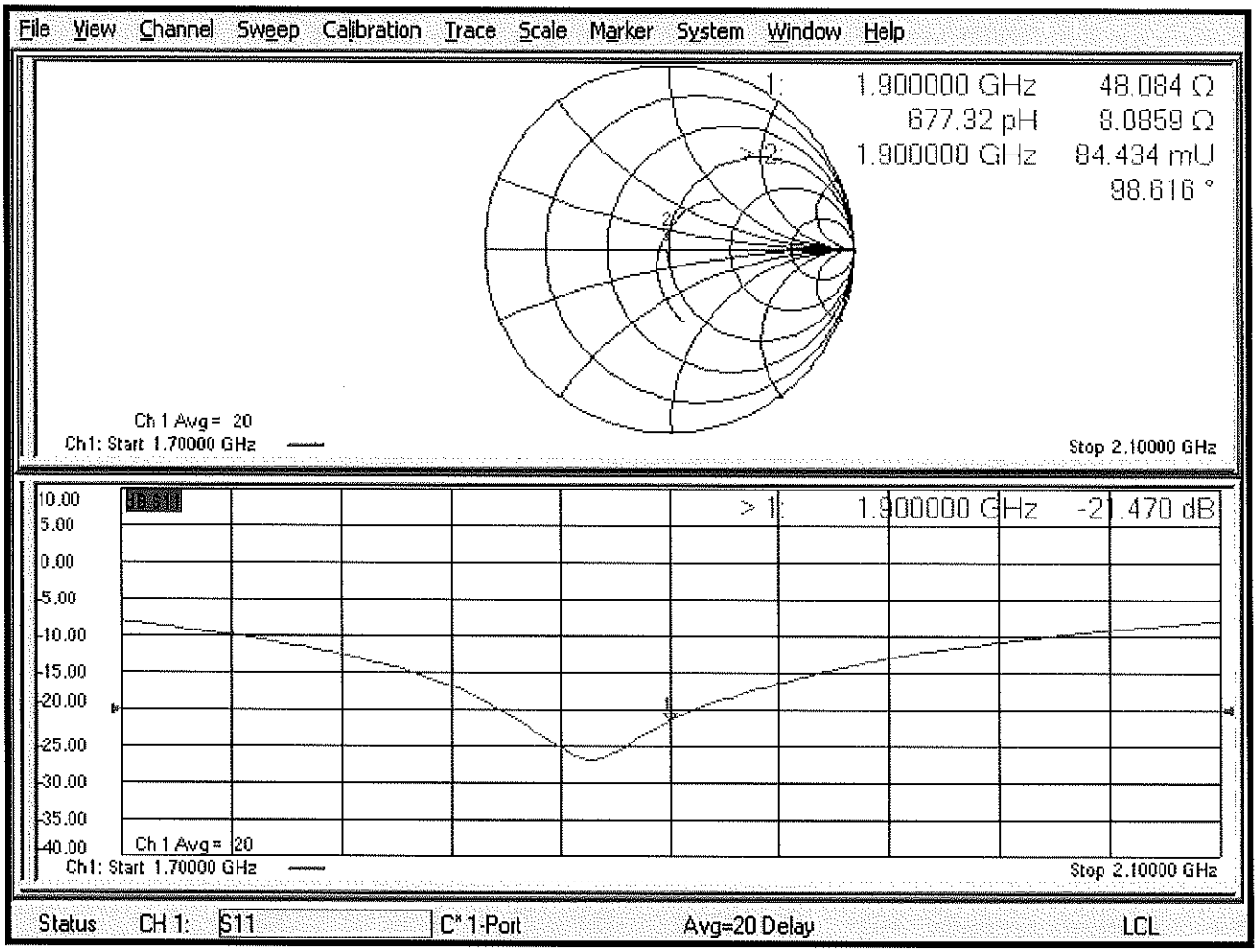
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D1900V2-5d148_Feb18

CALIBRATION CERTIFICATE

Object D1900V2 - SN:5d148

Calibration procedure(s) QA CAL-05.v9
Calibration procedure for dipole validation kits above 700 MHz

BN ✓ 03-02-2018

Calibration date: February 07, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 7, 2018

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Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.7 ± 6 %	1.39 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.95 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**40.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**21.0 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	55.2 ± 6 %	1.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.1 Ω + 5.8 jΩ
Return Loss	- 24.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.8 Ω + 6.5 jΩ
Return Loss	- 23.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.199 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 07.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

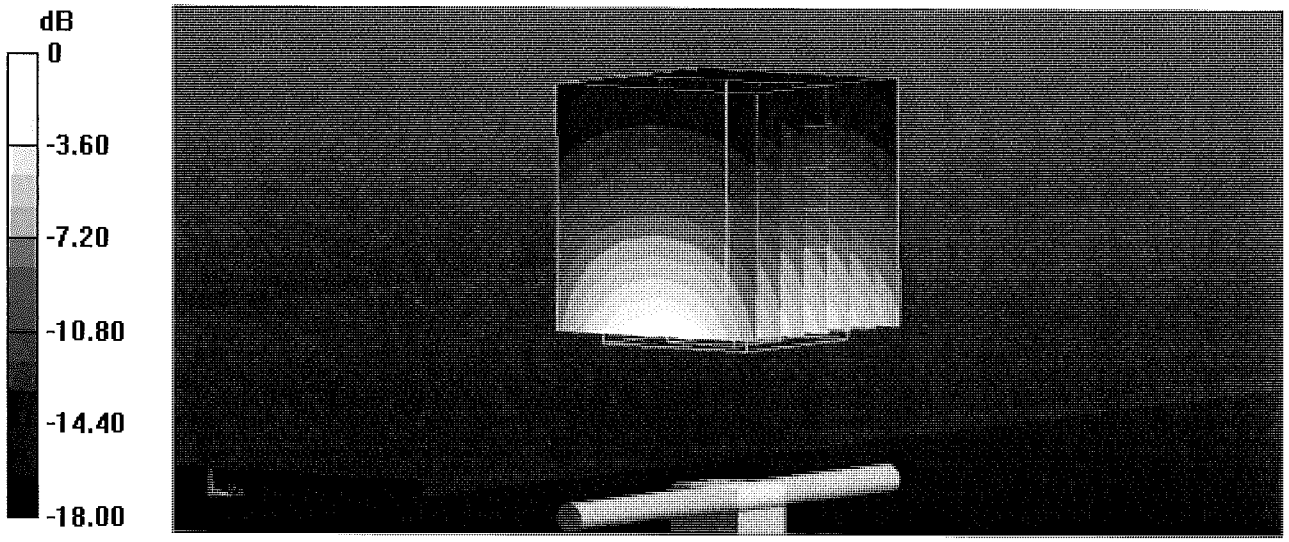
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.39 S/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

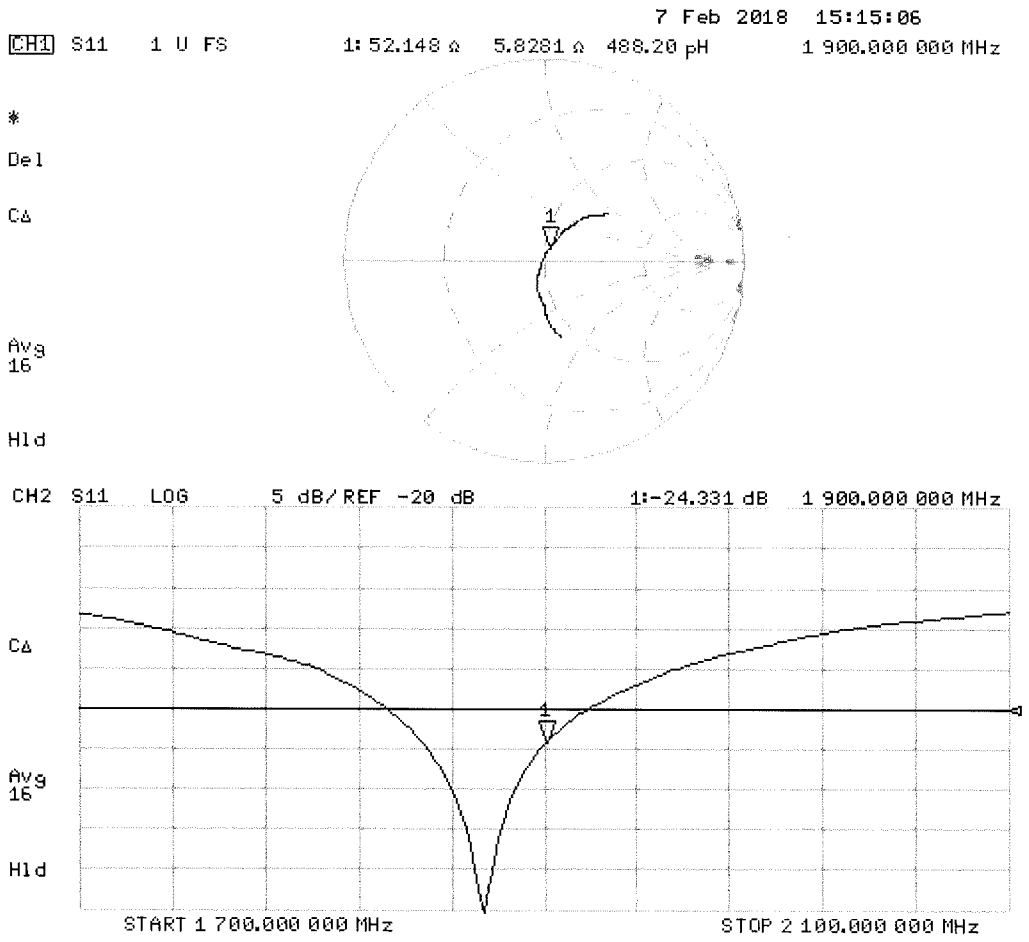
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 109.6 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 9.95 W/kg; SAR(10 g) = 5.22 W/kg
Maximum value of SAR (measured) = 15.3 W/kg



0 dB = 15.3 W/kg = 11.85 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.02.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

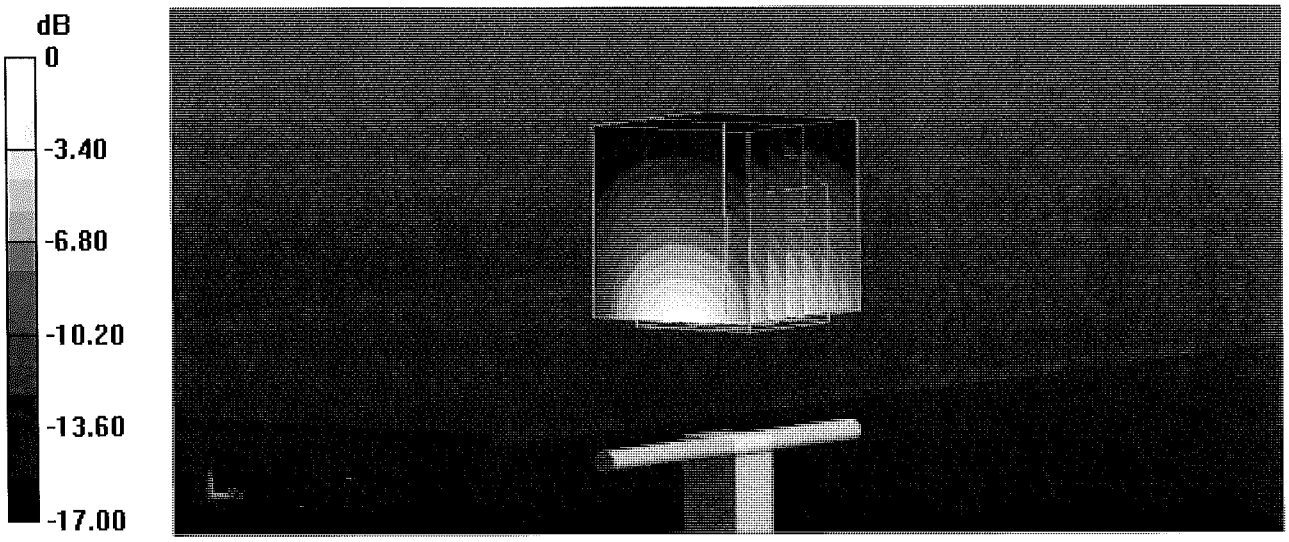
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.48 S/m; ε_r = 55.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

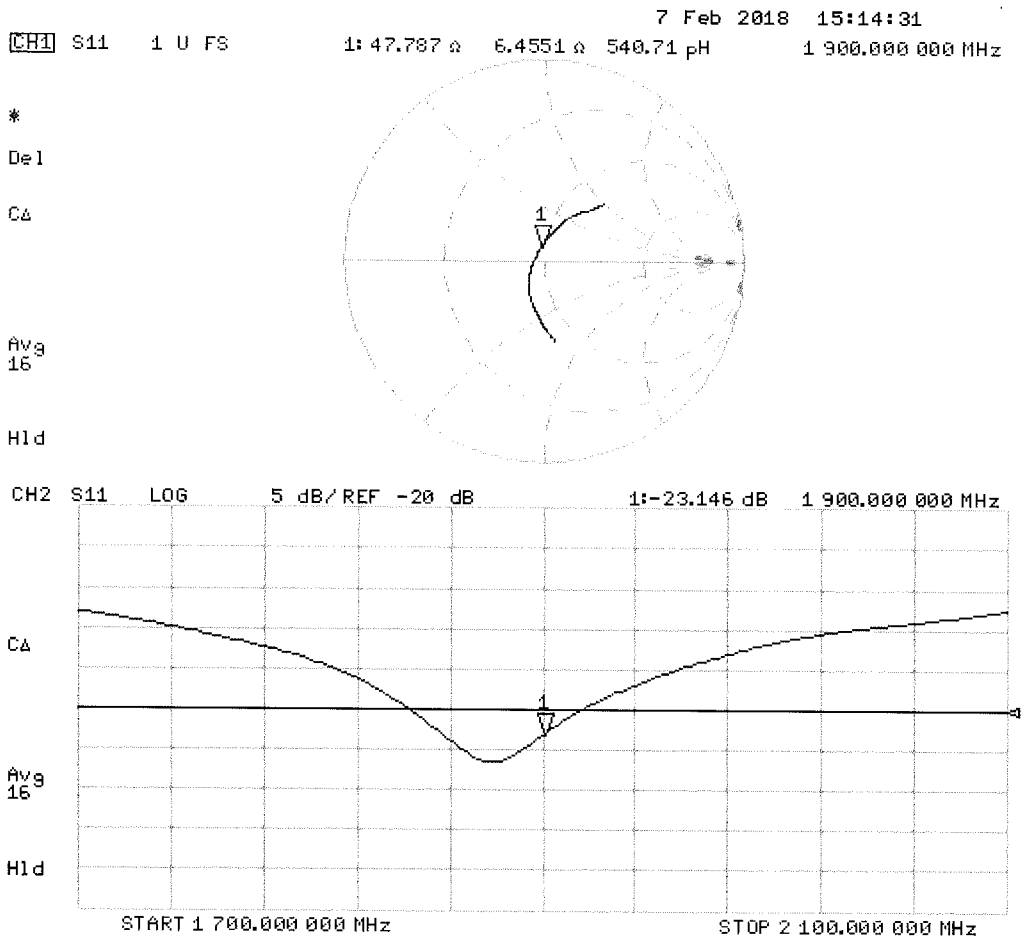
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.0 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 17.2 W/kg
SAR(1 g) = 9.68 W/kg; SAR(10 g) = 5.14 W/kg
Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client PC Test

Certificate No: D1900V2-5d149_Oct18

CALIBRATION CERTIFICATE

Object D1900V2 - SN:5d149

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

BNV
10-30-2018

Calibration date: October 23, 2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: October 23, 2018

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.3 ± 6 %	1.40 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.80 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.5 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	52.9 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.7 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.9 Ω + 6.3 jΩ
Return Loss	- 23.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.5 Ω + 8.2 jΩ
Return Loss	- 21.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.193 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 11, 2011

DASY5 Validation Report for Head TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

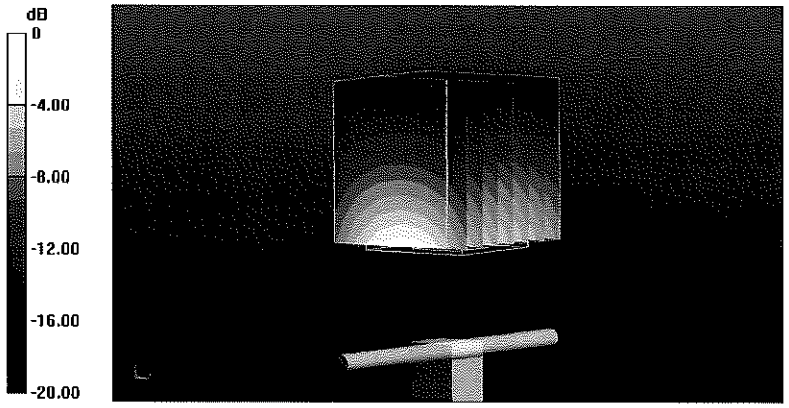
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.4 S/m; ε_r = 40.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

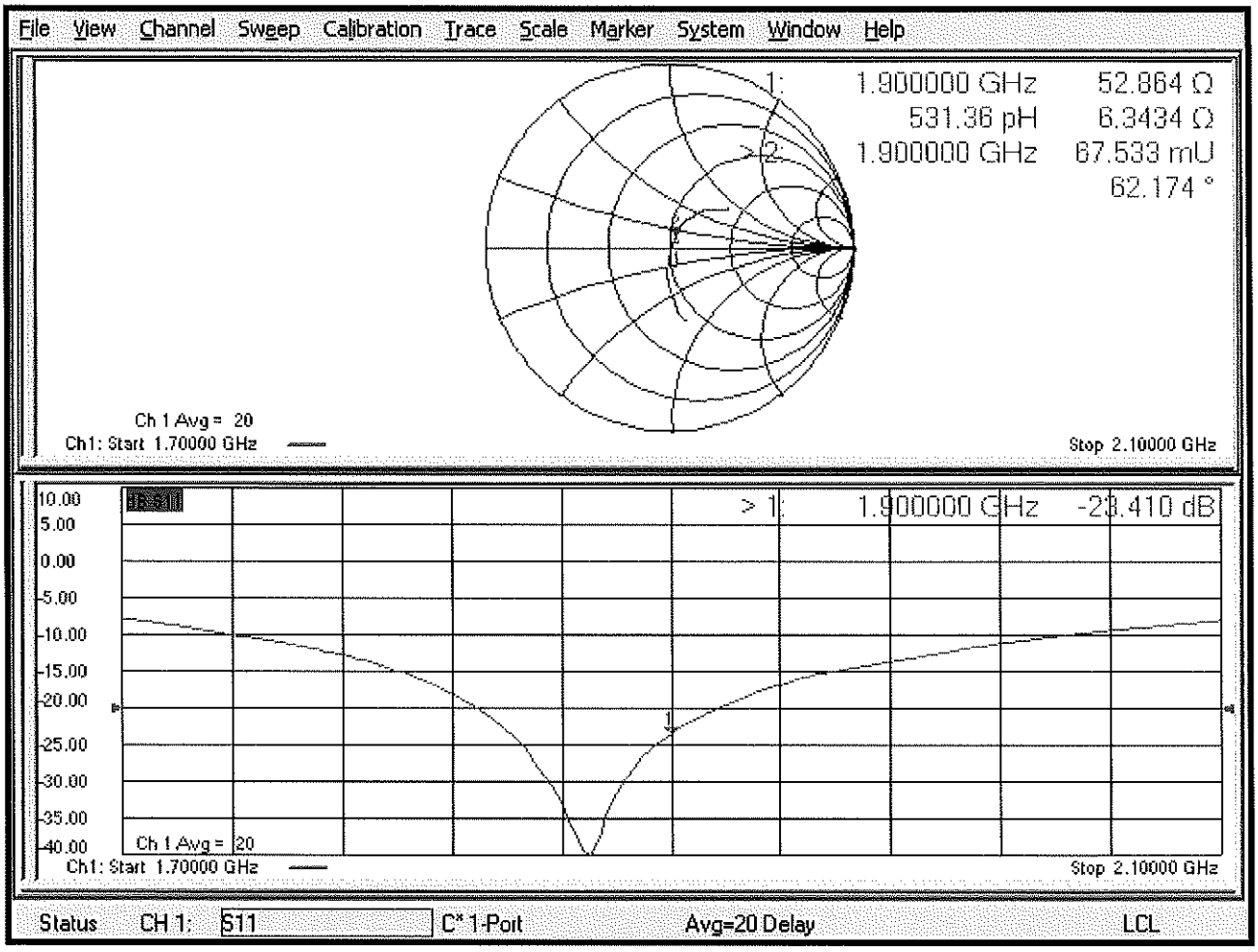
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 110.0 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 9.8 W/kg; SAR(10 g) = 5.11 W/kg
Maximum value of SAR (measured) = 15.4 W/kg



0 dB = 15.4 W/kg = 11.88 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

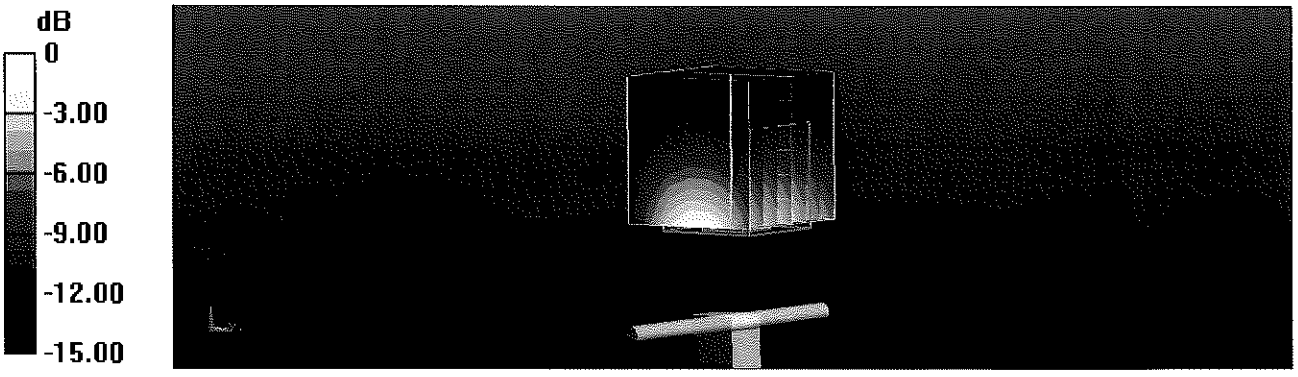
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.47 S/m; ε_r = 52.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

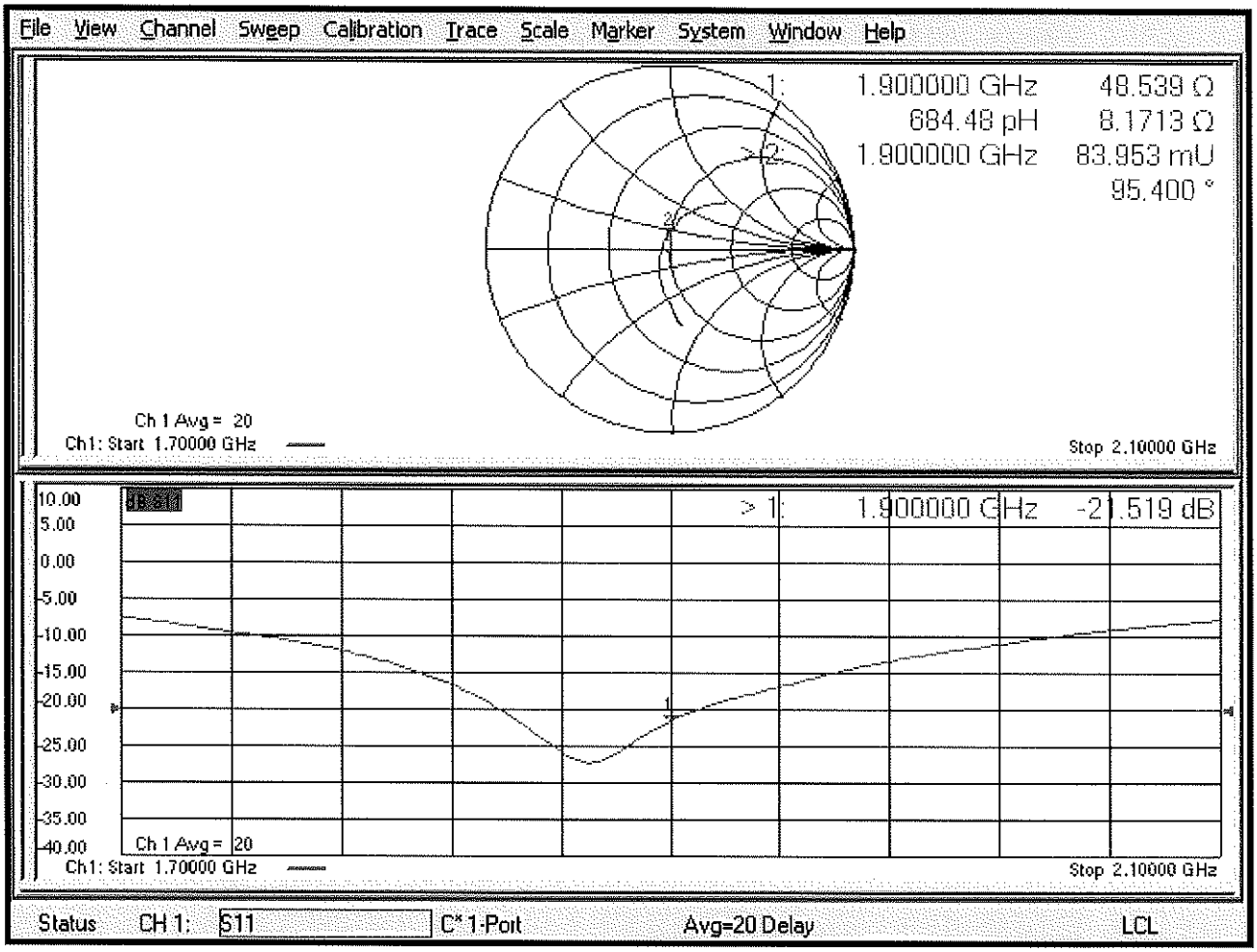
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.1 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 17.5 W/kg
SAR(1 g) = 9.68 W/kg; SAR(10 g) = 5.11 W/kg
Maximum value of SAR (measured) = 14.2 W/kg



0 dB = 14.2 W/kg = 11.52 dBW/kg

Impedance Measurement Plot for Body TSL



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

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C Service suisse d'étalonnage
S Servizio svizzero di taratura
S Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
The Swiss Accreditation Service is one of the signatories to the EA Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test** Certificate No: **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

PM ✓ 8/27/17
Extended ✓ BN ✓ 7/19/2018

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 ± 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

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 17, 2017

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

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

Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.9 W/kg ± 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 ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.9 ± 6 %	2.03 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.1 W/kg ± 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 ± 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 jΩ
Return Loss	- 21.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.4 Ω + 8.1 jΩ
Return Loss	- 21.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 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 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

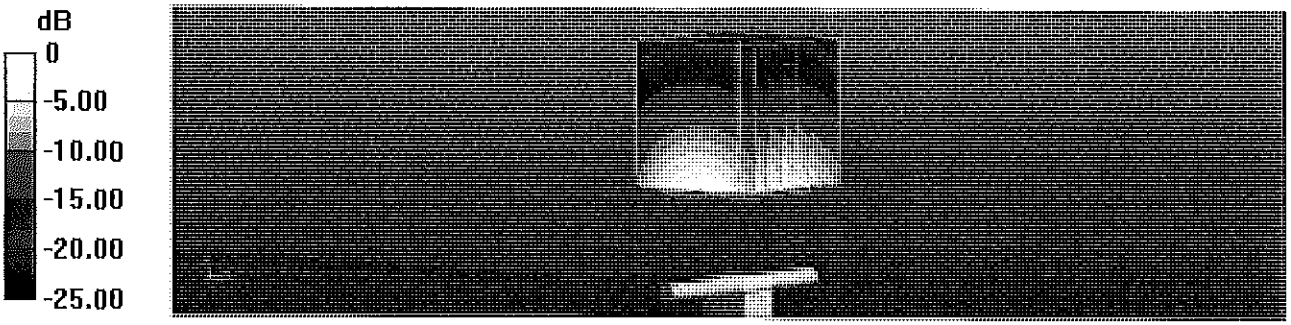
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 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)

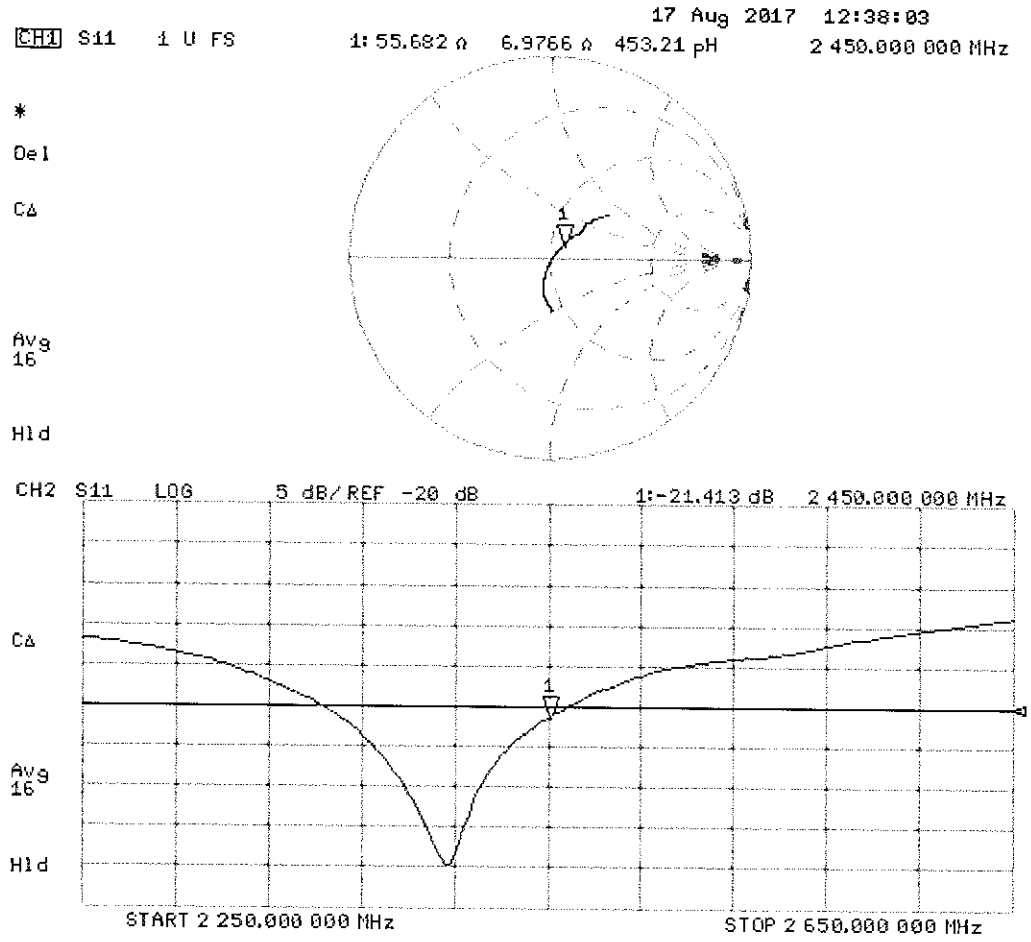
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



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

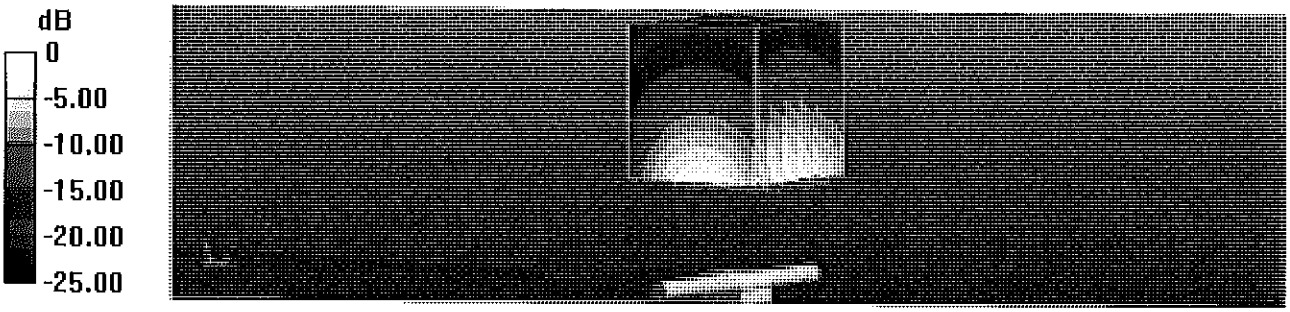
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.03 S/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.1, 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)

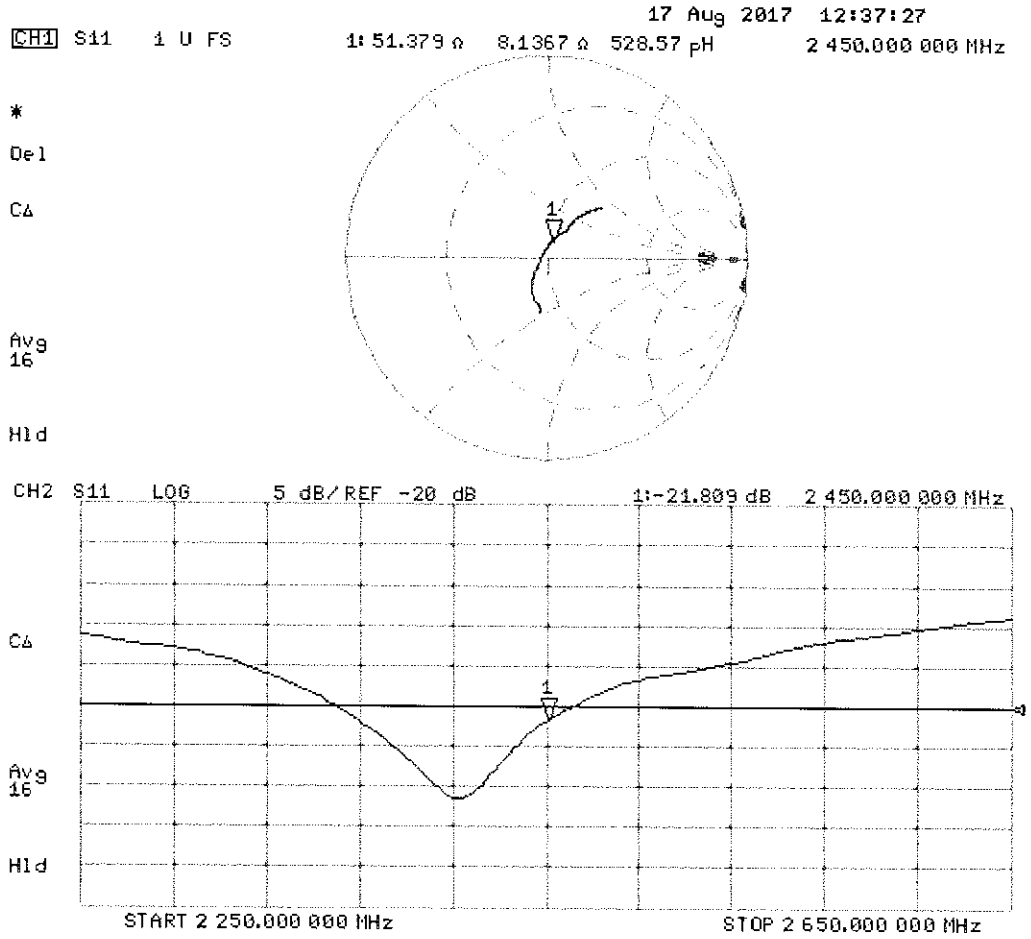
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

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



Certification of Calibration

Object D2450V2 – SN: 719

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: 07/18/2018

Description: SAR Validation Dipole at 2450 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4438C	ESG Vector Signal Generator	3/24/2017	Biennial	3/24/2019	MY42082385
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	ML2495A	Power Meter	11/28/2017	Annual	11/28/2018	1039008
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	11/15/2017	Annual	11/15/2018	1339007
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/7/2018	Annual	3/7/2019	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/9/2017	Annual	8/9/2018	1323
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/12/2017	Annual	9/12/2018	1091
SPEAG	ES3DV3	SAR Probe	3/13/2018	Annual	3/13/2019	3319
SPEAG	ES3DV3	SAR Probe	8/14/2017	Annual	8/14/2018	3332

Measurement Uncertainty = ±23% (k=2)

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

DIPOLE CALIBRATION EXTENSION

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

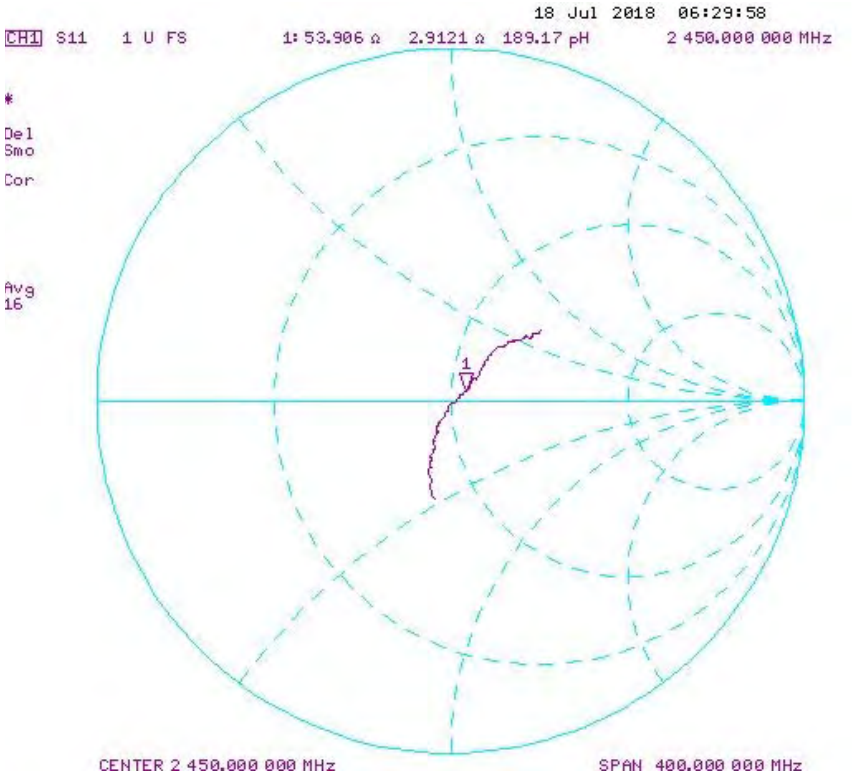
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

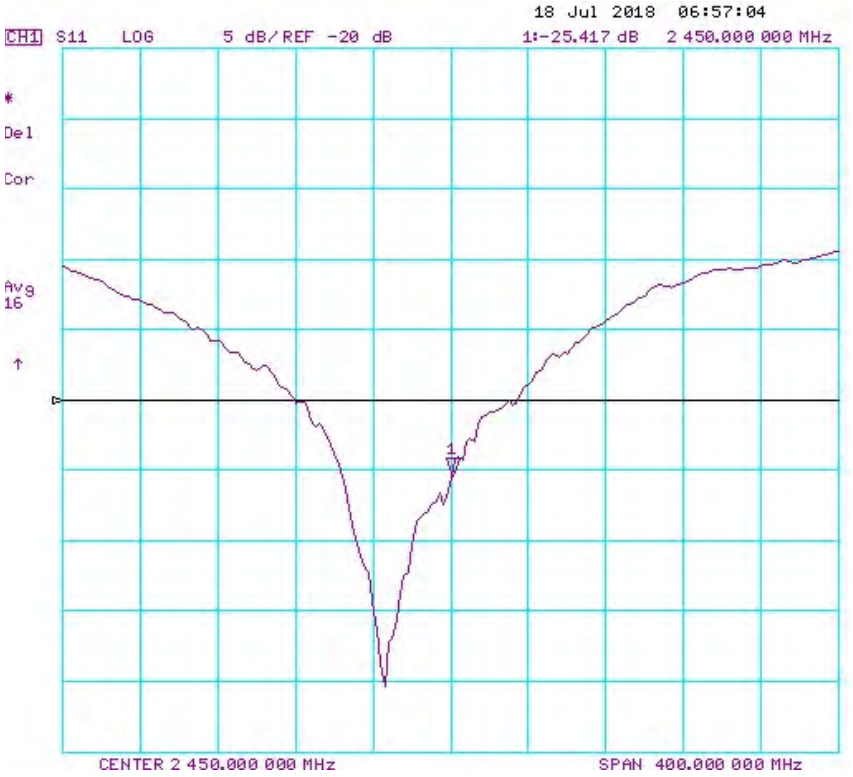
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 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
8/17/2017	7/18/2018	1.150	5.19	5.46	5.20%	2.43	2.51	3.29%	55.7	53.9	1.8	7.0	2.9	4.1	-21.4	-25.4	-18.70%	PASS

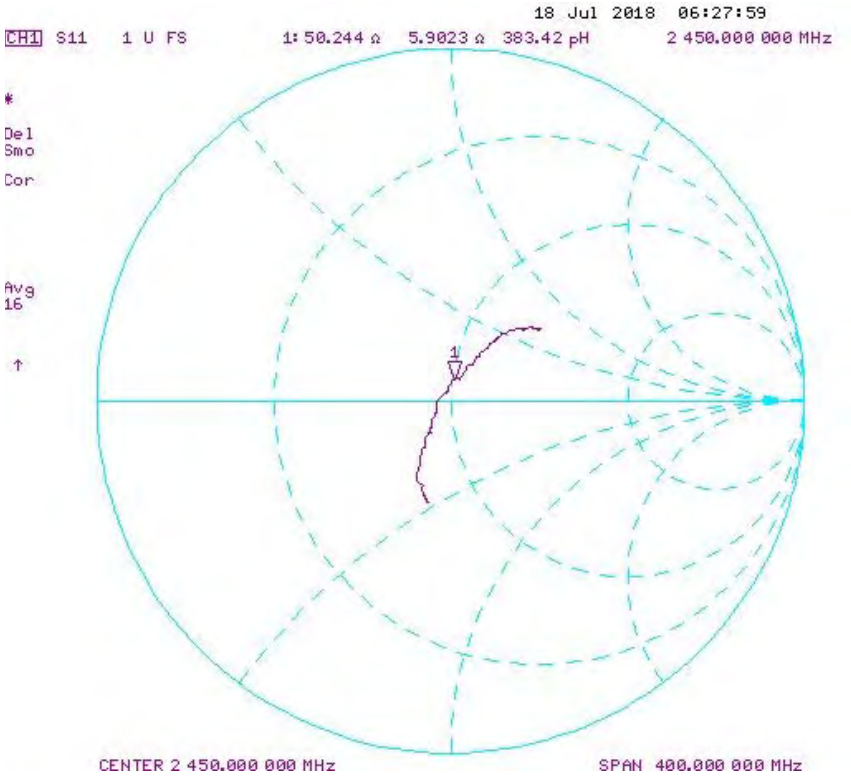
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance 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
8/17/2017	7/18/2018	1.150	5.01	5.19	3.59%	2.37	2.38	0.42%	51.4	50.2	1.2	8.1	5.9	2.2	-21.8	-24.6	-12.80%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL





Impedance & Return-Loss Measurement Plot for Body TSL



Calibration Laboratory of
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Accredited by the Swiss Accreditation Service (SAS)
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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D2450V2-797_Sep17

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:797
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 11, 2017

SCV 10/03/2017

Extended PMV 9/20/2018

This calibration certificate documents the traceability to national standards, which realize the physical units of measurements (SI).
The measurements and the uncertainties with confidence probability are given on the following pages and are part of the certificate.

All calibrations have been conducted in the closed laboratory facility: environment temperature (22 ± 3)°C and humidity < 70%.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 08327	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-08	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 11, 2017

Glossary:

TSL	tissue simulating liquid
ConvF	sensitivity in TSL / NORM x,y,z
N/A	not applicable or not measured

Calibration is Performed According to the Following Standards:

a) IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
b) IEC 62209-1, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
c) IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
d) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

- *Measurement Conditions:* Further details are available from the Validation Report at the end of the certificate. All figures stated in the certificate are valid at the frequency indicated.
- *Antenna Parameters with TSL:* The dipole is mounted with the spacer to position its feed point exactly below the center marking of the flat phantom section, with the arms oriented parallel to the body axis.
- *Feed Point Impedance and Return Loss:* These parameters are measured with the dipole positioned under the liquid filled phantom. The impedance stated is transformed from the measurement at the SMA connector to the feed point. The Return Loss ensures low reflected power. No uncertainty required.
- *Electrical Delay:* One-way delay between the SMA connector and the antenna feed point. No uncertainty required.
- *SAR measured:* SAR measured at the stated antenna input power.
- *SAR normalized:* SAR as measured, normalized to an input power of 1 W at the antenna connector.
- *SAR for nominal TSL parameters:* The measured TSL parameters are used to calculate the nominal SAR result.

The reported uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k=2, which for a normal distribution corresponds to a coverage probability of approximately 95%.

Measurement Conditions

DASY system configuration, as far as not given on page 1.

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.8 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.9 ± 6 %	2.04 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.2 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.8 Ω + 7.4 jΩ
Return Loss	- 21.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7 Ω + 9.1 jΩ
Return Loss	- 20.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 24, 2006

DASY5 Validation Report for Head TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

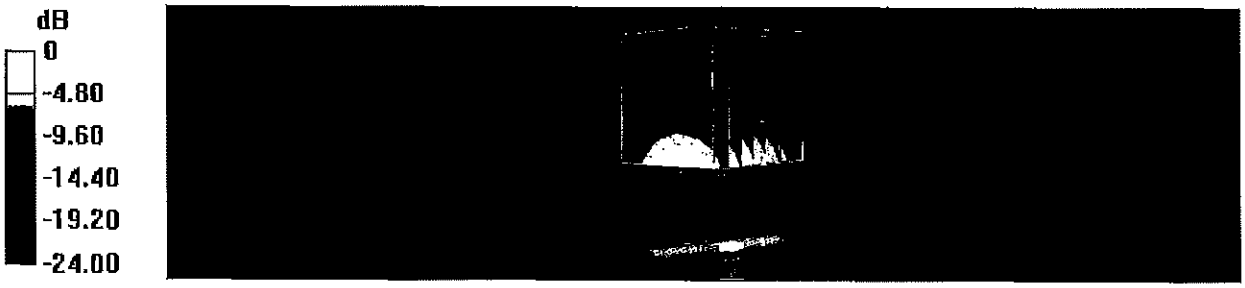
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

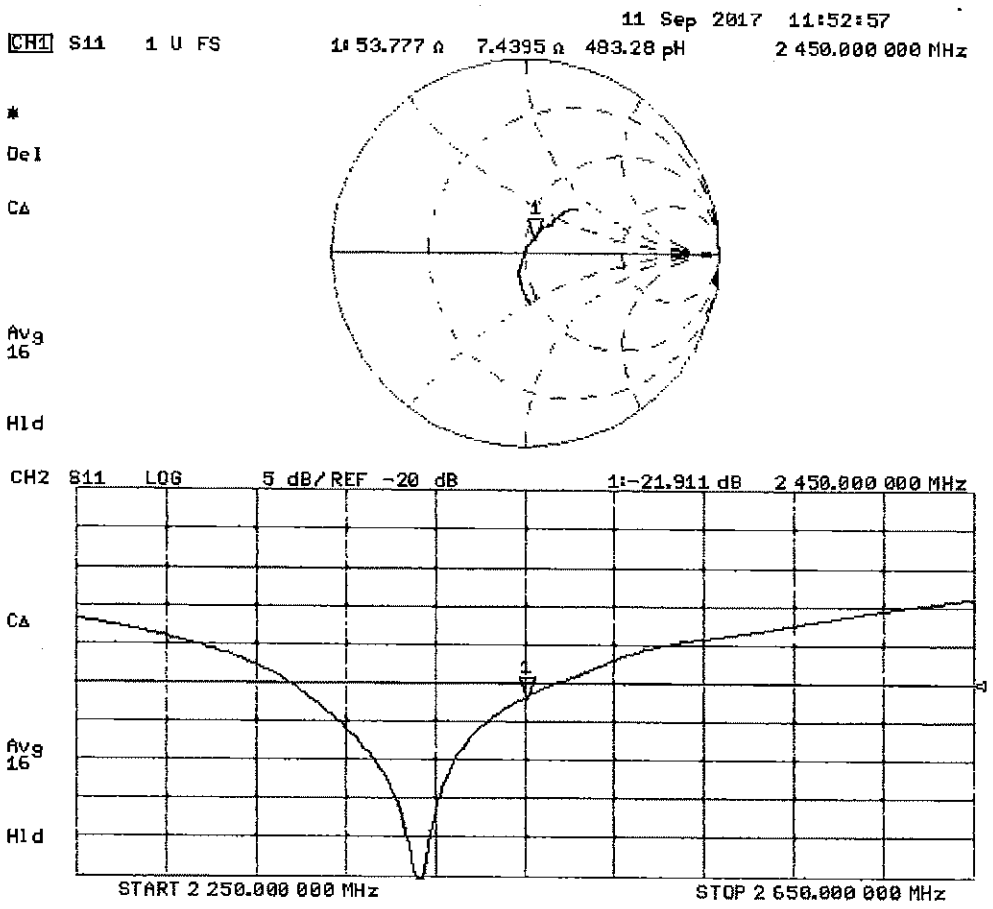
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.5 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 26.9 W/kg
SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.28 W/kg
Maximum value of SAR (measured) = 21.6 W/kg



0 dB = 21.6 W/kg = 13.34 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

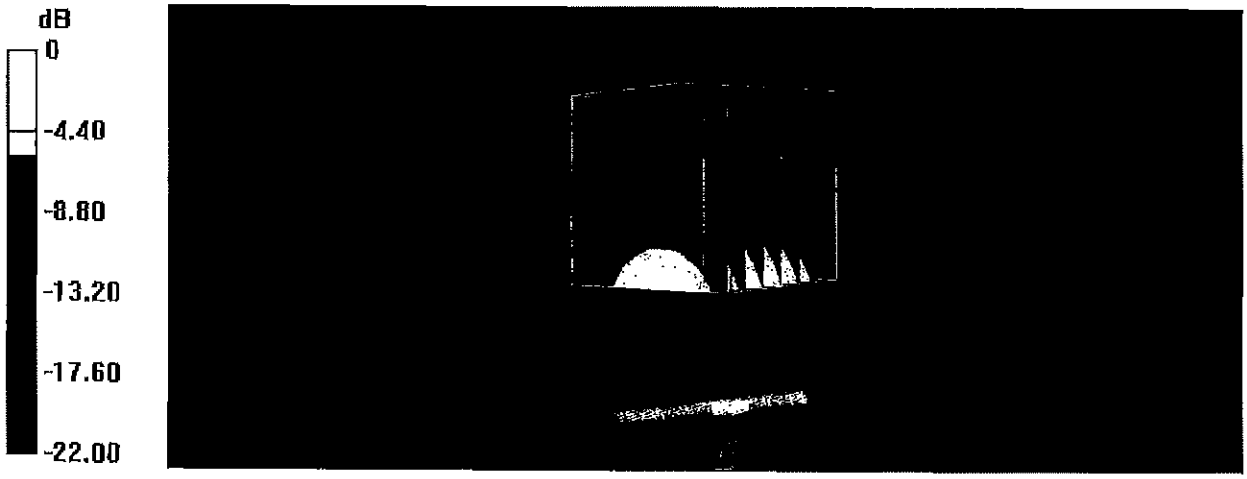
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.04 S/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.1, 8.1, 8.1); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

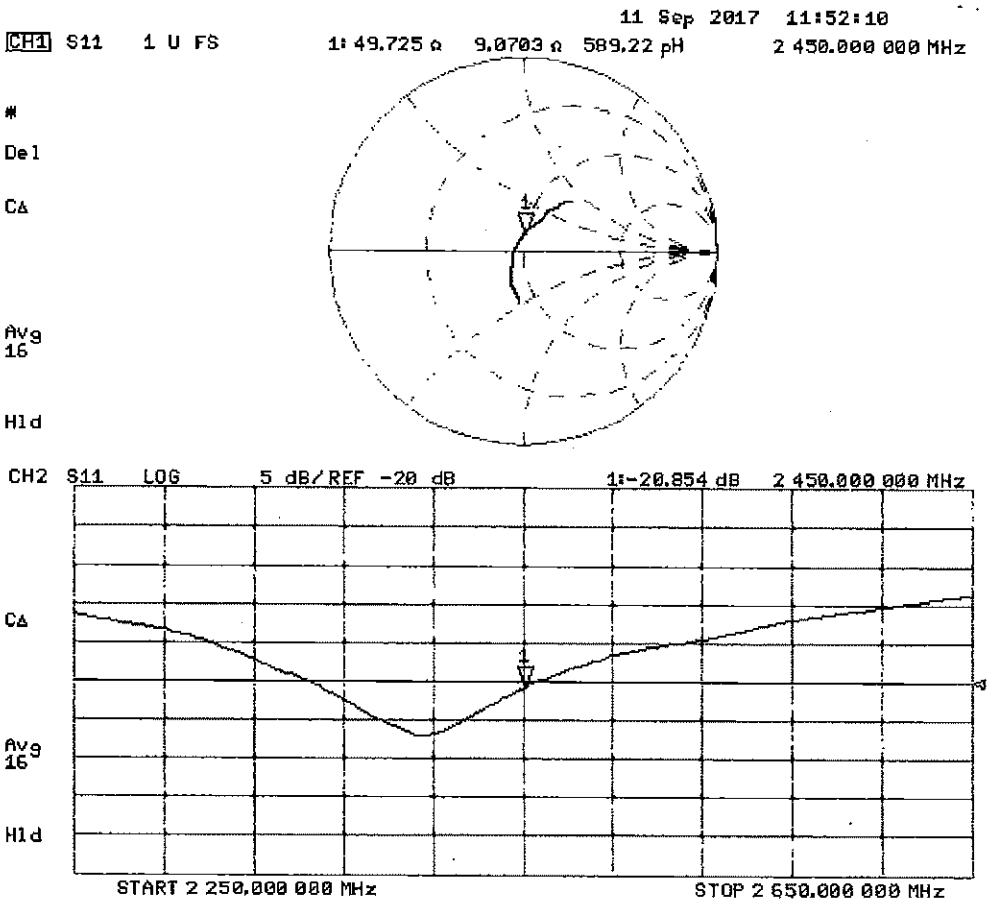
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.4 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 25.6 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.14 W/kg
Maximum value of SAR (measured) = 20.3 W/kg



0 dB = 20.3 W/kg = 13.07 dBW/kg

Impedance Measurement Plot for Body TSL



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Certification of Calibration

Object	D2450V2 – SN: 797
Calibration procedure(s)	Procedure for Calibration Extension for SAR Dipoles.
Extended Calibration date:	September 11, 2018
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	15S1G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Agilent	8753ES	S-Parameter Vector Network Analyzer	8/30/2018	Annual	8/30/2019	MY40003841
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	5/15/2018	Annual	5/15/2019	1070
SPEAG	EX3DV4	SAR Probe	7/20/2018	Annual	7/20/2019	7410
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/11/2018	Annual	7/11/2019	1322
SPEAG	ES3DV3	SAR Probe	3/13/2018	Annual	3/13/2019	3319
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/7/2018	Annual	3/7/2019	1368
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1339018
Anritsu	ML2495A	Power Meter	10/22/2017	Annual	10/22/2018	1328004
Agilent	N5182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
Seekonk	NC-100	Torque Wrench	7/11/2018	Annual	7/11/2019	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

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

Measurement Uncertainty = ±23% (k=2)

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