SAR EVALUATION REPORT

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

Date of Testing:
07/24/17 - 08/14/17
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
1M1707180223-01-R3.ZNF

FCC ID: ZNFLS998

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

DUT Type: Portable Handset
Application Type: Class II Permissive Change
FCC Rule Part(s): CFR §2.1093
Model: LG-LS998
Additional Model(s): LGLS998, LS998, LG-AS998, LGAS998, AS998

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)	10 gm Phablet (W/kg)
PCE	CDMA/EVDO BC10 (§90S)	817.90 - 823.10 MHz	0.21	0.87	0.87	N/A
PCE	CDMA/EVDO BC0 (§22H)	824.70 - 848.31 MHz	0.19	0.78	0.91	N/A
PCE	PCS CDMA/EVDO	1851.25 - 1908.75 MHz	0.22	0.57	0.57	N/A
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.14	0.52	0.51	N/A
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	< 0.1	0.27	0.33	N/A
PCE	UMTS 850	826.40 - 846.60 MHz	0.20	0.80	0.80	N/A
PCE	UMTS 1750	1712.4 - 1752.6 MHz	0.16	0.75	0.75	N/A
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.14	0.48	0.52	N/A
PCE	LTE Band 12	699.7 - 715.3 MHz	0.12	0.58	0.58	N/A
PCE	LTE Band 17	706.5 - 713.5 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 13	779.5 - 784.5 MHz	0.12	0.49	0.49	N/A
PCE	LTE Band 26 (Cell)	814.7 - 848.3 MHz	0.16	0.48	0.48	N/A
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.15	0.72	0.72	N/A
PCE	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.13	0.51	0.51	N/A
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 41	2498.5 - 2687.5 MHz	0.11	1.20	1.20	N/A
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.60	0.20	0.21	N/A
NII	U-NII-1	5180 - 5240 MHz	N/A	N/A	0.45	N/A
NII	U-NII-2A	5260 - 5320 MHz	0.58	0.50	N/A	1.30
NII	U-NII-2C	5500 - 5720 MHz	0.32	0.63	N/A	1.49
NII	U-NII-3	5745 - 5825 MHz	0.48	0.64	0.64	N/A
DSS/DTS	Bluetooth	2402 - 2480 MHz	0.19	< 0.1	< 0.1	N/A
Simultaneous SAR per KDB 690783 D01v01r03:			1.29	1.59	1.59	2.79

Note: This revised Test Report (S/N: 1M1707180223-01-R3.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

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

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

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.01

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T A B L E   O F   C O N T E N T S

1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
CDMA/EVDO BC10 (§90S)	Voice/Data	817.90 - 823.10 MHz
CDMA/EVDO BC0 (§22H)	Voice/Data	824.70 - 848.31 MHz
PCS CDMA/EVDO	Voice/Data	1851.25 - 1908.75 MHz
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Data	699.7 - 715.3 MHz
LTE Band 17	Data	706.5 - 713.5 MHz
LTE Band 13	Data	779.5 - 784.5 MHz
LTE Band 26 (Cell)	Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Data	1850.7 - 1909.3 MHz
LTE Band 41	Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2462 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

1.2 Power Reduction for SAR

This device uses 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 Power

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)		Burst Average 8-PSK (dBm)	
		1 TX Slot	*1 TX Slots*	*2 TX Slots*	*1 TX Slots*	*2 TX Slots*
GSM/GPRS/EDGE 850	Maximum	**34.2**	**34.2**	**30.0**	**27.0**	**27.0**
	Nominal	**33.7**	**33.7**	**29.5**	**26.5**	**26.5**
GSM/GPRS/EDGE 1900	Maximum	**31.7**	**31.7**	**27.5**	**26.0**	**26.0**
	Nominal	**31.2**	**31.2**	**27.0**	**25.5**	**25.5**

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	*3GPP HSDPA*	*3GPP HSUPA*
UMTS Band 5 (850 MHz)	Maximum	**25.5**	**25.5**	**25.5**
	Nominal	**25.0**	**25.0**	**25.0**
UMTS Band 4 (1750 MHz)	Maximum	**24.7**	**24.7**	**24.7**
	Nominal	**24.2**	**24.2**	**24.2**
UMTS Band 2 (1900 MHz)	Maximum	**24.7**	**24.7**	**24.7**
	Nominal	**24.2**	**24.2**	**24.2**

Mode / Band		Modulated Average (dBm)
CDMA/EVDO BC10 (§90S)	Maximum	**25.5**
	Nominal	**25.0**
CDMA/EVDO BC0 (§22H)	Maximum	**25.5**
	Nominal	**25.0**
PCS CDMA/EVDO	Maximum	**25.2**
	Nominal	**24.7**

Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	**25.5**
	Nominal	**25.0**
LTE Band 17	Maximum	**25.5**
	Nominal	**25.0**
LTE Band 13	Maximum	**25.5**
	Nominal	**25.0**
LTE Band 26 (Cell)	Maximum	**25.5**
	Nominal	**25.0**
LTE Band 5 (Cell)	Maximum	**25.5**
	Nominal	**25.0**
LTE Band 4 (AWS)	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 25 (PCS)	Maximum	**25.2**
	Nominal	**24.7**
LTE Band 2 (PCS)	Maximum	**25.2**
	Nominal	**24.7**
LTE Band 41 (PC3)	Maximum	**24.7**
	Nominal	**24.2**
LTE Band 41 HPUE (PC2)	Maximum	**27.0**
	Nominal	**26.5**

Mode / Band		Modulated Average - Single Tx Chain (dBm)						Modulated Average - MIMO (dBm)		
		Antenna 1			Antenna 2			MIMO		
		Ch 1-2	Ch 3-9	Ch 10-11	Ch 1-2	Ch 3-9	Ch 10-11	Ch 1-2	Ch 3-9	Ch 10-11
IEEE 802.11b (2.4 GHz)	Maximum	**19.0**			**18.5**			**21.7**		
	Nominal	**18.0**			**17.5**			**20.7**		
IEEE 802.11g (2.4 GHz)	Maximum	**17.5**	**18.0**	**16.0**	**17.5**	**18.0**	**16.0**	**20.5**	**21.0**	**19.0**
	Nominal	**16.5**	**17.0**	**15.0**	**16.5**	**17.0**	**15.0**	**19.5**	**20.0**	**18.0**
IEEE 802.11n (2.4 GHz)	Maximum	**16.5**	**17.0**	**15.0**	**16.5**	**17.0**	**15.0**	**19.5**	**20.0**	**18.0**
	Nominal	**15.5**	**16.0**	**14.0**	**15.5**	**16.0**	**14.0**	**18.5**	**19.0**	**17.0**
IEEE 802.11ac (2.4 GHz)	Maximum	**16.5**	**17.0**	**15.0**	**16.5**	**17.0**	**15.0**	**19.5**	**20.0**	**18.0**
	Nominal	**15.5**	**16.0**	**14.0**	**15.5**	**16.0**	**14.0**	**18.5**	**19.0**	**17.0**

Mode / Band		Modulated Average (dBm)
Bluetooth 1 Mbps	Maximum	**12.5**
	Nominal	**11.5**
Bluetooth 2 Mbps	Maximum	**12.0**
	Nominal	**11.0**
Bluetooth 3 Mbps	Maximum	**12.0**
	Nominal	**11.0**
Bluetooth LE	Maximum	**2.5**
	Nominal	**1.5**

Mode / Band		Modulated Average (dBm)		
		20 MHz Bandwidth		
		Antenna 1	Antenna 2	MIMO
IEEE 802.11a (5 GHz)	Maximum	**17.0**	**16.5**	**19.7**
	Nominal	**16.0**	**15.5**	**18.7**
IEEE 802.11n (5 GHz)	Maximum	**17.0**	**16.5**	**19.7**
	Nominal	**16.0**	**15.5**	**18.7**
IEEE 802.11ac (5 GHz)	Maximum	**17.0**	**16.5**	**19.7**
	Nominal	**16.0**	**15.5**	**18.7**

Mode / Band		Modulated Average - Single Tx Chain (dBm)								Modulated Average - MIMO (dBm)			
		40 MHz Bandwidth											
		Antenna 1				Antenna 2				MIMO			
		Ch 38	Ch 46, 54	Ch 62, 102	Ch 110 - 159	Ch 38	Ch 46, 54	Ch 62, 102	Ch 110 - 159	Ch 38	Ch 46, 54	Ch 62, 102	Ch 110 - 159
IEEE 802.11n (5 GHz)	Maximum	**14.0**	**16.0**	**14.0**	**16.0**	**13.5**	**15.5**	**13.5**	**15.5**	**16.7**	**18.7**	**16.7**	**18.7**
	Nominal	**13.0**	**15.0**	**13.0**	**15.0**	**12.5**	**14.5**	**12.5**	**14.5**	**15.7**	**17.7**	**15.7**	**17.7**
IEEE 802.11ac (5 GHz)	Maximum	**14.0**	**16.0**	**14.0**	**16.0**	**13.5**	**15.5**	**13.5**	**15.5**	**16.7**	**18.7**	**16.7**	**18.7**
	Nominal	**13.0**	**15.0**	**13.0**	**15.0**	**12.5**	**14.5**	**12.5**	**14.5**	**15.7**	**17.7**	**15.7**	**17.7**

Mode / Band		Modulated Average - Single Tx Chain (dBm)						Modulated Average - MIMO (dBm)		
		80 MHz Bandwidth								
		Antenna 1			Antenna 2			MIMO		
		Ch 42	Ch 58	Ch 106 - 155	Ch 42	Ch 58	Ch 106 - 155	Ch 42	Ch 58	Ch 106 - 155
IEEE 802.11ac (5 GHz)	Maximum	**13.0**	**11.0**	**13.0**	**12.5**	**10.5**	**12.5**	**15.7**	**13.7**	**15.7**
	Nominal	**12.0**	**10.0**	**12.0**	**11.5**	**9.5**	**11.5**	**14.7**	**12.7**	**14.7**

1.3.2 Reduced Power

Mode / Band		Modulated Average - Single Tx Chain (dBm)						Modulated Average - MIMO (dBm)		
		Antenna 1			Antenna 2			MIMO		
		Ch 1-2	Ch 3-9	Ch 10-11	Ch 1-2	Ch 3-9	Ch 10-11	Ch 1-2	Ch 3-9	Ch 10-11
IEEE 802.11b (2.4 GHz)	Maximum	**17.0**			**17.0**			**20.0**		
	Nominal	**16.0**			**16.0**			**19.0**		
IEEE 802.11g (2.4 GHz)	Maximum	**17.0**	**17.0**	**16.0**	**17.0**	**17.0**	**16.0**	**20.0**	**20.0**	**19.0**
	Nominal	**16.0**	**16.0**	**15.0**	**16.0**	**16.0**	**15.0**	**19.0**	**19.0**	**18.0**
IEEE 802.11n (2.4 GHz)	Maximum	**16.5**	**17.0**	**15.0**	**16.5**	**17.0**	**15.0**	**19.5**	**20.0**	**18.0**
	Nominal	**15.5**	**16.0**	**14.0**	**15.5**	**16.0**	**14.0**	**18.5**	**19.0**	**17.0**
IEEE 802.11ac (2.4 GHz)	Maximum	**16.5**	**17.0**	**15.0**	**16.5**	**17.0**	**15.0**	**19.5**	**20.0**	**18.0**
	Nominal	**15.5**	**16.0**	**14.0**	**15.5**	**16.0**	**14.0**	**18.5**	**19.0**	**17.0**

1.4 DUT Antenna Locations

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

Table 1-1
Device Edges/Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
EVDO BC10 (§90S)	Yes	Yes	No	Yes	Yes	Yes
EVDO BC0 (§22H)	Yes	Yes	No	Yes	Yes	Yes
PCS EVDO	Yes	Yes	No	Yes	No	Yes
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	No	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 1750	Yes	Yes	No	Yes	No	Yes
UMTS 1900	Yes	Yes	No	Yes	No	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 4 (AWS)	Yes	Yes	No	Yes	No	Yes
LTE Band 25 (PCS)	Yes	Yes	No	Yes	No	Yes
LTE Band 41	Yes	Yes	No	Yes	No	Yes
2.4 GHz WLAN Ant 1	Yes	Yes	Yes	No	No	Yes
2.4 GHz WLAN Ant 2	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN Ant 1	Yes	Yes	Yes	No	No	Yes
5 GHz WLAN Ant 2	Yes	Yes	Yes	No	No	Yes
Bluetooth	Yes	Yes	Yes	No	No	Yes

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

1.5 Near Field Communications (NFC) Antenna

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

1.6 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D01v06, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-1 and are color-coded to indicate communication modes which share the same path. Modes which share the same transmission path cannot transmit simultaneously with one another.

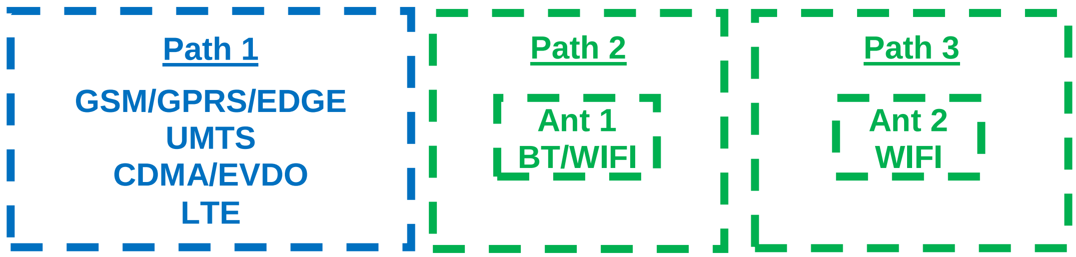

Figure 1-1
Simultaneous Transmission Paths

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

Table 1-2
Simultaneous Transmission Scenarios

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

1. All licensed modes share the same antenna path and cannot transmit simultaneously.
2. 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.
3. Per the manufacturer, WIFI Direct is expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Simultaneous transmission scenarios involving WIFI direct are included in the above table.
4. 5 GHz Wireless Router is only supported for the U-NII-1 and U-NII-3 by S/W, therefore U-NII2A, and U-NII2C were not evaluated for wireless router conditions.
5. This device supports 2x2 MIMO Tx for WLAN. 802.11a/b/g/n/ac modes support CDD and 802.11n/ac modes additionally support SDM.
6. This device supports VOWIFI.

1.7 Miscellaneous SAR Test Considerations

(A) WIFI/BT

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

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

This device supports IEEE 802.11ac with the following features:

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

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

(B) Licensed Transmitter(s)

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

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

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

CDMA 1X Advanced technology was not required for SAR since the maximum allowed output powers for 1x Advanced was not more than 0.25 dB higher than the maximum powers for 1x and the measured SAR in any 1x mode exposure conditions was not greater than 1.2 W/kg per FCC KDB Publication 941225 D01v03r01.

This device supports LTE Carrier Aggregation (CA) in the downlink. 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.

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

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

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

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

This device supports both LTE B26 (Cell) and LTE B5 (Cell). Since the supported frequency span for LTE B5 (Cell) falls completely within the supported frequency span for LTE B26 (Cell), both LTE bands have the same target power, and both LTE bands share the same transmission path, SAR was only assessed for LTE B26 (Cell).

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

1.8 Guidance Applied

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

1.9 Device Serial Numbers

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

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number	Phablet Serial Number
CDMA/EVDO BC10 (§90S)	01555/01569	01555	01555	N/A
CDMA/EVDO BC0 (§22H)	01555/01569	01555	01555	N/A
PCS CDMA/EVDO	01556	01555	01555	N/A
GSM/GPRS/EDGE 850	01556	01556	01556	N/A
GSM/GPRS/EDGE 1900	01556	01556	01556	N/A
UMTS 850	01556	01556	01556	N/A
UMTS 1750	01556	01556	01556	N/A
UMTS 1900	01556	01556	01556	N/A
LTE Band 12	01559	01557	01557	N/A
LTE Band 13	01559	01557	01557	N/A
LTE Band 26 (Cell)	01558	01558	01558	N/A
LTE Band 4 (AWS)	01558	01560	01560	N/A
LTE Band 25 (PCS)	01558	01559	01559	N/A
LTE Band 41	01559	01559	01559	N/A
2.4 GHz WLAN	01585	01586	01586	N/A
5 GHz WLAN	01585	01586	01586	01586
Bluetooth	01585	01586	01586	N/A

2 LTE INFORMATION

LTE Information					
FCC ID	**ZNFLS998**				
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)				
	LTE Band 17 (706.5 - 713.5 MHz)				
	LTE Band 13 (779.5 - 784.5 MHz)				
	LTE Band 26 (Cell) (814.7 - 848.3 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 17: 5 MHz, 10 MHz				
	LTE Band 13: 5 MHz, 10 MHz				
	LTE Band 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High	High
LTE Band 12: 1.4 MHz	699.7 (23017)		707.5 (23095)	715.3 (23173)	
LTE Band 12: 3 MHz	700.5 (23025)		707.5 (23095)	714.5 (23165)	
LTE Band 12: 5 MHz	701.5 (23035)		707.5 (23095)	713.5 (23155)	
LTE Band 12: 10 MHz	704 (23060)		707.5 (23095)	711 (23130)	
LTE Band 17: 5 MHz	706.5 (23755)		710 (23790)	713.5 (23825)	
LTE Band 17: 10 MHz	709 (23780)		710 (23790)	711 (23800)	
LTE Band 13: 5 MHz	779.5 (23205)		782 (23230)	784.5 (23255)	
LTE Band 13: 10 MHz	N/A		782 (23230)	N/A	
LTE Band 26 (Cell): 1.4 MHz	814.7 (26697)		831.5 (26865)	848.3 (27033)	
LTE Band 26 (Cell): 3 MHz	815.5 (26705)		831.5 (26865)	847.5 (27025)	
LTE Band 26 (Cell): 5 MHz	816.5 (26715)		831.5 (26865)	846.5 (27015)	
LTE Band 26 (Cell): 10 MHz	819 (26740)		831.5 (26865)	844 (26990)	
LTE Band 26 (Cell): 15 MHz	821.5 (26765)		831.5 (26865)	841.5 (26965)	
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)		836.5 (20525)	848.3 (20643)	
LTE Band 5 (Cell): 3 MHz	825.5 (20415)		836.5 (20525)	847.5 (20635)	
LTE Band 5 (Cell): 5 MHz	826.5 (20425)		836.5 (20525)	846.5 (20625)	
LTE Band 5 (Cell): 10 MHz	829 (20450)		836.5 (20525)	844 (20600)	
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)		1732.5 (20175)	1754.3 (20393)	
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)		1732.5 (20175)	1753.5 (20385)	
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)		1732.5 (20175)	1752.5 (20375)	
LTE Band 4 (AWS): 10 MHz	1715 (20000)		1732.5 (20175)	1750 (20350)	
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)		1732.5 (20175)	1747.5 (20325)	
LTE Band 4 (AWS): 20 MHz	1720 (20050)		1732.5 (20175)	1745 (20300)	
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)		1882.5 (26365)	1914.3 (26683)	
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)		1882.5 (26365)	1913.5 (26675)	
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)		1882.5 (26365)	1912.5 (26665)	
LTE Band 25 (PCS): 10 MHz	1855 (26090)		1882.5 (26365)	1910 (26640)	
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)		1882.5 (26365)	1907.5 (26615)	
LTE Band 25 (PCS): 20 MHz	1860 (26140)		1882.5 (26365)	1905 (26590)	
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)		1880 (18900)	1909.3 (19193)	
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)		1880 (18900)	1908.5 (19185)	
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)		1880 (18900)	1907.5 (19175)	
LTE Band 2 (PCS): 10 MHz	1855 (18650)		1880 (18900)	1905 (19150)	
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)		1880 (18900)	1902.5 (19125)	
LTE Band 2 (PCS): 20 MHz	1860 (18700)		1880 (18900)	1900 (19100)	
LTE Band 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	12				
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 features on 3GGP Release 11. It supports carrier aggregation and 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 11 features are not supported: Relay, HetNet, Enhanced eICIC, WIFI Offloading, 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:

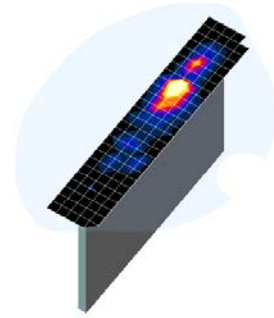

Figure 4-1
Sample SAR Area Scan

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*Δz_{zoom}(n-1)	≥ 30
2-3 GHz	≤ 12	≤ 5	≤ 5	≤ 4	≤ 1.5*Δz_{zoom}(n-1)	≥ 30
3-4 GHz	≤ 12	≤ 5	≤ 4	≤ 3	≤ 1.5*Δz_{zoom}(n-1)	≥ 28
4-5 GHz	≤ 10	≤ 4	≤ 3	≤ 2.5	≤ 1.5*Δz_{zoom}(n-1)	≥ 25
5-6 GHz	≤ 10	≤ 4	≤ 2	≤ 2	≤ 1.5*Δz_{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].

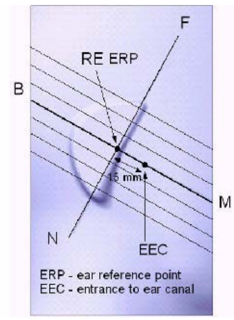

Figure 5-1
Close-Up Side view of ERP

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

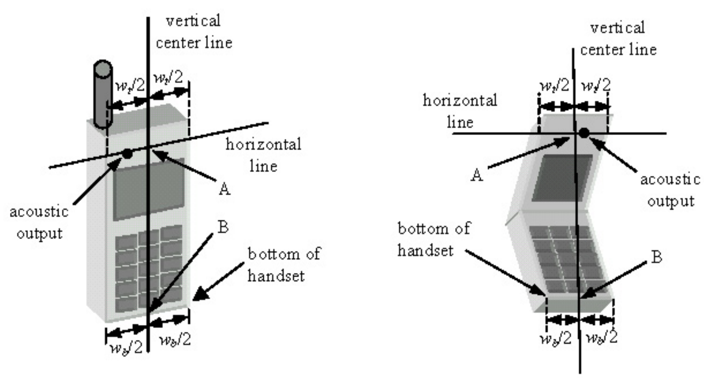

Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

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 $\varepsilon = 3$ and loss tangent $\delta = 0.02$.

6.2 Positioning for Cheek

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

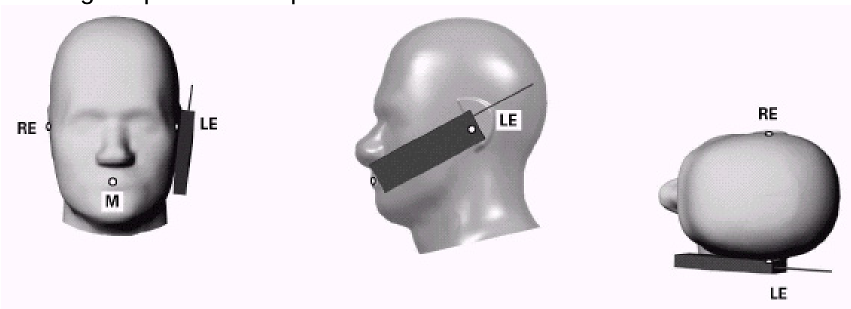

Figure 6-1 Front, Side and Top View of Cheek Position

2. The handset was translated towards the phantom along the line passing through RE & LE until the handset touches the pinna.
3. While maintaining the handset in this plane, the handset was rotated around the LE-RE line until the vertical centerline was in the reference plane.
4. The phone was then rotated around the vertical centerline until the phone (horizontal line) was symmetrical 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).

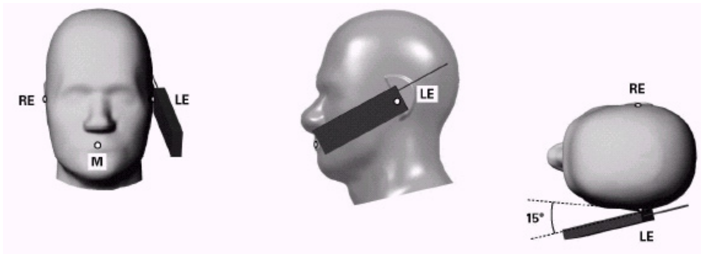

Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

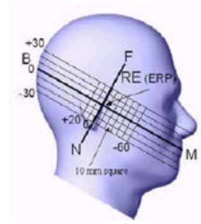

Figure 6-3
Side view w/ relevant markings

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

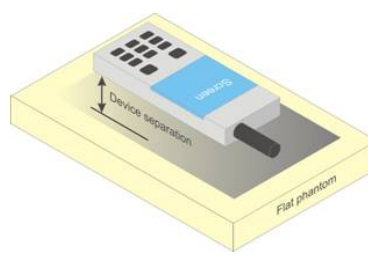

Figure 6-4
Sample Body-Worn Diagram

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.

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

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

6.6 Extremity Exposure Configurations

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

6.8 Phablet Configurations

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

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7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

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

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

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 CDMA2000

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

8.4.1 Output Power Verification

See 3GPP2 C.S0011/TIA-98-E as recommended by FCC KDB Publication 941225 D01v03r01 “3G SAR Measurement Procedures.” Maximum output power is verified on the High, Middle and Low channels according to procedures in section 4.4.5.2 of 3GPP2 C.S0011/TIA-98-E. SO55 tests were measured with power control bits in the “All Up” condition.

1. If the mobile station (MS) supports Reverse TCH RC 1 and Forward TCH RC 1, set up a call using Fundamental Channel Test Mode 1 (RC=1/1) with 9600 bps data rate only.
2. Under RC1, C.S0011 Table 4.4.5.2-1, Table 8-1 parameters were applied.
3. If the MS supports the RC 3 Reverse FCH, RC3 Reverse SCH_0 and demodulation of RC 3,4, or 5, set up a call using Supplemental Channel Test Mode 3 (RC 3/3) with 9600 bps Fundamental Channel and 9600 bps SCH0 data rate.
4. Under RC3, C.S0011 Table 4.4.5.2-2, Table 8-2 was applied.

Table 8-1
Parameters for Max. Power for RC1

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-104
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

Table 8-2
Parameters for Max. Power for RC3

Parameter	Units	Value
$\hat{I}_{or}$	dBm/1.23 MHz	-86
$\frac{\text{Pilot } E_c}{I_{or}}$	dB	-7
$\frac{\text{Traffic } E_c}{I_{or}}$	dB	-7.4

5. FCHs were configured at full rate for maximum SAR with “All Up” power control bits.

8.4.2 Head SAR Measurements

SAR for next to the ear head exposure is measured in RC3 with the handset configured to transmit at fullrate in SO55. The 3G SAR test reduction procedure is applied to RC1 with RC3 as the primary mode; otherwise, SAR is required for the channel with maximum measured output in RC1 using the head exposure configuration that results in the highest reported SAR in RC3.

Head SAR is additionally evaluated using EVDO Rev. A to support compliance for VoIP operations. See Section 8.4.5 for EVDO Rev. A configuration parameters.

8.4.3 Body-worn SAR Measurements

SAR for body-worn exposure configurations is measured in RC3 with the DUT configured to transmit at full rate on FCH with all other code channels disabled using TDSO / SO32. The 3G SAR test reduction procedure is applied to the multiple code channel configuration (FCH+SCHn), with FCH only as the primary mode. Otherwise, SAR is required for multiple code channel configuration (FCH + SCHn), with FCH at full rate and SCH0 enabled at 9600 bps, using the highest reported SAR configuration for FCH only. When multiple code channels are enabled, the transmitter output can shift by more than 0.5 dB and may lead to higher SAR drifts and SCH dropouts.

The 3G SAR test reduction procedure is applied to body-worn accessory SAR in RC1 with RC3 as the primary mode. Otherwise, SAR is required for RC1, with SO55 and full rate, using the highest reported SAR configuration for body-worn accessory exposure in RC3.

8.4.4 Body-worn SAR Measurements for EVDO Devices

For handsets with Ev-Do capabilities, the 3G SAR test reduction procedure is applied to Ev-Do Rev. 0 with 1x RTT RC3 as the primary mode to determine body-worn accessory test requirements. Otherwise, body-worn accessory SAR is required for Rev. 0, at 153.6 kbps, using the highest reported SAR configuration for body-worn accessory exposure in RC3.

The 3G SAR test reduction procedure is applied to Rev. A, with Rev. 0 as the primary mode to determine body-worn accessory SAR test requirements. When SAR is not required for Rev. 0, the 3G SAR test reduction is applied with 1x RTT RC3 as the primary mode.

When SAR is required for EVDO Rev. A, SAR is measured with a Reverse Data Channel payload size of 4096 bits and a Termination Target of 16 slots defined for Subtype 2 Physical Layer configurations, using the highest reported SAR configuration for body-worn accessory exposure in Rev. 0 or 1x RTT RC3, as appropriate.

8.4.5 Body SAR Measurements for EVDO Hotspot

Hotspot Body SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0. The 3G SAR test reduction procedure is applied to Rev. A, Subtype 2 Physical layer configuration, with Rev. 0 as the primary mode; otherwise, SAR is measured for Rev. A using the highest reported SAR configuration for body-worn accessory exposure in Rev. 0. The AT is tested with a Reverse Data Channel rate of 153.6 kbps in Subtype 0/1 Physical Layer configurations; and a Reverse Data Channel payload size of 4096 bits and Termination Target of 16 slots in Subtype 2 Physical Layer configurations.

For Ev-Do data devices that also support 1x RTT voice and/or data operations, the 3G SAR test reduction procedure is applied to 1x RTT RC3 and RC1 with Ev-Do Rev. 0 and Rev. A as the respective primary modes. Otherwise, the ‘Body-Worn Accessory SAR’ procedures in the ‘3GPP2 CDMA 2000 1x Handsets’ section are applied.

8.4.6 CDMA2000 1x Advanced

This device additionally supports 1x Advanced. Conducted powers are measured using SO75 with RC8 on the uplink and RC11 on the downlink per FCC KDB Publication 941225 D01v03r01. Smart blanking is disabled for all measurements. The EUT is configured with forward power control Mode 000 and reverse power control at 400 bps. Conducted powers are measured on an Agilent 8960 Series 10 Wireless Communications Test Set, Model E5515C using the CDMA2000 1x Advanced application, Option E1962B-410.

The 3G SAR test reduction procedure is applied to the 1x-Advanced transmission mode with 1x RTT RC3 as the primary mode. When SAR measurement is required, the 1x-Advanced power measurement configurations are used. The1x Advanced SAR procedures are applied separately to head, body-worn accessory and other exposure conditions.

8.5 SAR Measurement Conditions for UMTS

8.5.1 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.

8.5.2 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.

8.5.3 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.

8.5.4 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.

8.5.5 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.

8.6 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).

8.6.1 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.

8.6.2 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.

8.6.3 A-MPR

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

8.6.4 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 for FDD and ≤0.6 W/kg for TDD, 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.

8.6.5 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.

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

8.7 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.

8.7.1 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.

8.7.2 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 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.7.3 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.

8.7.4 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 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.7.5 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 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.7.6 OFDM Transmission Mode and SAR Test Channel Selection

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

8.7.7 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 8.7.6). When 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.7.8 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 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.7.9 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 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

9 RF CONDUCTED POWERS

9.1 CDMA Conducted Powers

				Loopback			Data			
Band	**Channel**	**Rule Part**	**Frequency**	**SO55 [dBm]**	**SO55 [dBm]**	**SO75 [dBm]**	**TDSO SO32 [dBm]**	**TDSO SO32 [dBm]**	**1x EvDO Rev. 0 [dBm]**	**1x EvDO Rev. A [dBm]**
	F-RC		MHz	RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	564	90S	820.1	25.21	25.30	25.43	25.31	25.32	25.13	25.13
Cellular	1013	22H	824.7	25.30	25.29	25.36	25.48	25.30	25.18	25.18
	384	22H	836.52	25.34	25.46	25.39	25.30	25.37	25.11	25.13
	777	22H	848.31	25.32	25.36	25.38	25.42	25.33	25.06	25.14
PCS	25	24E	1851.25	25.01	24.95	24.92	24.91	24.94	24.70	24.73
	600	24E	1880	24.94	24.92	25.04	25.04	25.05	24.80	24.82
	1175	24E	1908.75	25.07	24.97	24.90	24.91	24.89	24.76	24.81

Note: RC1 is only applicable for IS-95 compatibility. For FCC Rule Part 90S, Per FCC KDB Publication 447498 D01v06 4.1.g), only one channel is required since the device operates within the transmission range of 817.90 – 823.10 MHz.

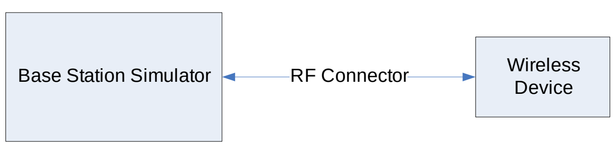


Figure 9-1
Power Measurement Setup

9.2 GSM Conducted Powers

Maximum Burst-Averaged Output Power						
		Voice	GPRS/EDGE Data (GMSK)		EDGE Data (8-PSK)	
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot
GSM 850	128	33.96	**33.91**	29.96	26.55	25.58
	190	34.00	**34.06**	29.80	26.65	26.63
	251	33.97	**33.95**	29.90	26.80	26.75
GSM 1900	512	31.52	**31.55**	27.35	25.80	25.60
	661	31.56	**31.55**	27.33	25.77	25.54
	810	31.45	**31.48**	27.40	25.88	25.61

Calculated Maximum Frame-Averaged Output Power						
		Voice	GPRS/EDGE Data (GMSK)		EDGE Data (8-PSK)	
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	EDGE [dBm] 1 Tx Slot	EDGE [dBm] 2 Tx Slot
GSM 850	128	24.93	**24.88**	23.94	17.52	19.56
	190	24.97	**25.03**	23.78	17.62	20.61
	251	24.94	**24.92**	23.88	17.77	20.73
GSM 1900	512	22.49	**22.52**	21.33	16.77	19.58
	661	22.53	**22.52**	21.31	16.74	19.52
	810	22.42	**22.45**	21.38	16.85	19.59

GSM 850	Frame Avg.Targets:	24.67	**24.67**	23.48	17.47	20.48
GSM 1900		22.17	**22.17**	20.98	16.47	19.48

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

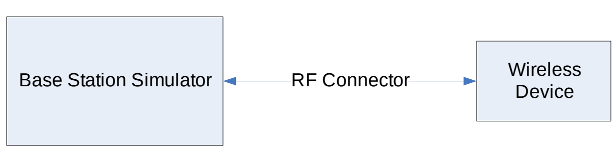


Figure 9-2
Power Measurement Setup

9.3 UMTS Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	25.48	25.43	25.46	24.59	24.70	24.69	24.65	24.66	24.65	-
99		12.2 kbps AMR	25.45	25.45	25.42	24.61	24.66	24.58	24.63	24.67	24.58	-
6	HSDPA	Subtest 1	25.31	25.38	25.40	24.39	24.68	24.50	24.35	24.47	24.51	0
6		Subtest 2	25.31	25.27	25.31	24.46	24.46	24.60	24.46	24.40	24.38	0
6		Subtest 3	24.86	24.55	24.75	24.03	23.96	24.06	23.75	23.77	24.06	0.5
6		Subtest 4	24.70	24.96	24.95	23.81	23.96	24.10	23.80	24.06	23.93	0.5
6	HSUPA	Subtest 1	25.02	25.04	25.33	24.34	24.50	24.59	24.50	24.52	24.48	0
6		Subtest 2	23.21	23.32	23.02	22.37	22.52	22.48	22.48	22.59	22.61	2
6		Subtest 3	24.36	24.33	24.40	23.33	23.57	23.41	23.53	23.32	23.52	1
6		Subtest 4	23.18	23.36	23.26	22.36	22.32	22.62	22.33	22.49	22.59	2
6		Subtest 5	25.17	25.06	25.08	24.44	24.57	24.60	24.47	24.38	24.38	0

This device does not support DC-HSDPA.

Figure 9-3
Power Measurement Setup

9.4 LTE Conducted Powers

9.4.1 LTE Band 12

Table 9-1
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	25.27	0	0
	1	25	**25.45**		0
	1	49	25.38		0
	25	0	**24.47**	0-1	1
	25	12	24.45		1
	25	25	24.35		1
	50	0	24.32		1
16QAM	1	0	24.41	0-1	1
	1	25	24.40		1
	1	49	24.18		1
	25	0	23.23	0-2	2
	25	12	23.23		2
	25	25	23.36		2
	50	0	23.34		2
64QAM	1	0	23.20	0-2	2
	1	25	23.13		2
	1	49	23.22		2
	25	0	22.16	0-3	3
	25	12	22.20		3
	25	25	22.13		3
	50	0	22.21		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 9-2
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	25.01	25.30	25.33	0	0
	1	12	25.30	25.41	25.15		0
	1	24	25.33	25.41	24.72		0
	12	0	24.17	24.44	24.43	0-1	1
	12	6	24.40	24.49	24.25		1
	12	13	24.36	24.26	24.06		1
	25	0	24.30	24.30	24.20		1
16QAM	1	0	24.32	24.22	24.40	0-1	1
	1	12	24.48	24.44	24.33		1
	1	24	24.44	24.47	24.06		1
	12	0	23.28	23.31	23.44	0-2	2
	12	6	23.49	23.49	23.30		2
	12	13	23.38	23.40	23.20		2
	25	0	23.49	23.32	23.31		2
64QAM	1	0	23.19	23.23	23.41	0-2	2
	1	12	23.16	23.18	23.26		2
	1	24	23.50	23.31	23.09		2
	12	0	22.31	22.31	22.40	0-3	3
	12	6	22.42	22.39	22.30		3
	12	13	22.46	22.49	22.35		3
	25	0	22.40	22.44	22.22		3

Table 9-3
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	24.91	25.38	25.18	0	0
	1	7	25.18	25.20	24.98		0
	1	14	25.26	25.24	24.49		0
	8	0	24.18	24.50	24.31	0-1	1
	8	4	24.22	24.47	24.09		1
	8	7	24.26	24.36	23.99		1
	15	0	24.20	24.46	24.11		1
16QAM	1	0	24.28	24.46	24.38	0-1	1
	1	7	24.30	24.43	24.34		1
	1	14	24.46	24.38	24.15		1
	8	0	23.37	23.45	23.34	0-2	2
	8	4	23.40	23.37	23.20		2
	8	7	23.41	23.39	23.12		2
	15	0	23.25	23.37	23.15		2
64QAM	1	0	23.35	23.47	23.47	0-2	2
	1	7	23.35	23.31	23.26		2
	1	14	23.48	23.20	23.07		2
	8	0	22.26	22.42	22.39	0-3	3
	8	4	22.39	22.23	22.24		3
	8	7	22.41	22.26	22.07		3
	15	0	22.27	22.50	22.08		3

Table 9-4
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	24.97	25.26	24.76	0	0
	1	2	25.04	25.34	24.75		0
	1	5	24.92	25.24	24.72		0
	3	0	24.99	25.34	24.77		0
	3	2	24.95	25.32	24.66		0
	3	3	25.06	25.31	24.61		0
	6	0	24.16	24.26	23.86	0-1	1
16QAM	1	0	24.17	24.44	24.27	0-1	1
	1	2	24.37	24.48	24.32		1
	1	5	24.26	24.39	24.04		1
	3	0	24.18	24.44	24.01		1
	3	2	24.23	24.41	23.90		1
	3	3	24.25	24.41	23.69		1
	6	0	23.10	23.49	22.88	0-2	2
64QAM	1	0	23.13	23.40	23.18	0-2	2
	1	2	23.24	23.39	23.31		2
	1	5	23.38	23.36	22.93		2
	3	0	23.14	23.40	22.93		2
	3	2	23.14	23.47	23.00		2
	3	3	23.12	23.45	22.85		2
	6	0	22.14	22.26	21.86	0-3	3

9.4.2 LTE Band 13

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

LTE Band 13 10 MHzBandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	25.45	0	0
	1	25	**25.47**		0
	1	49	25.35		0
	25	0	**24.48**	0-1	1
	25	12	24.46		1
	25	25	24.39		1
	50	0	24.34		1
16QAM	1	0	24.42	0-1	1
	1	25	24.20		1
	1	49	24.37		1
	25	0	23.28	0-2	2
	25	12	23.26		2
	25	25	23.49		2
	50	0	23.28		2
64QAM	1	0	23.13	0-2	2
	1	25	23.13		2
	1	49	23.20		2
	25	0	22.20	0-3	3
	25	12	22.21		3
	25	25	22.03		3
	50	0	22.01		3

Table 9-6
LTE Band 13 Conducted Powers - 5 MHz Bandwidth

LTE Band 13 5 MHzBandwidth					
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	25.10	0	0
	1	12	25.33		0
	1	24	25.37		0
	12	0	24.23	0-1	1
	12	6	24.37		1
	12	13	24.32		1
	25	0	24.26		1
16QAM	1	0	24.26	0-1	1
	1	12	24.50		1
	1	24	24.39		1
	12	0	23.28	0-2	2
	12	6	23.46		2
	12	13	23.41		2
	25	0	23.30		2
64QAM	1	0	23.27	0-2	2
	1	12	23.05		2
	1	24	23.47		2
	12	0	22.31	0-3	3
	12	6	22.41		3
	12	13	22.48		3
	25	0	22.39		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.

9.4.3 LTE Band 26 (Cell)

Table 9-7
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	**25.49**	0	0
	1	36	25.40		0
	1	74	25.37		0
	36	0	24.39	0-1	1
	36	18	24.44		1
	36	37	**24.46**		1
	75	0	24.36		1
16QAM	1	0	24.28	0-1	1
	1	36	24.20		1
	1	74	24.25		1
	36	0	23.27	0-2	2
	36	18	23.27		2
	36	37	23.47		2
	75	0	23.40		2
64QAM	1	0	23.10	0-2	2
	1	36	23.16		2
	1	74	23.40		2
	36	0	22.12	0-3	3
	36	18	22.03		3
	36	37	22.23		3
	75	0	22.20		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 9-8
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]
QPSK	1	0	25.04	25.12	25.17	0	0
	1	25	24.86	25.27	25.12		0
	1	49	24.87	24.95	24.69		0
	25	0	24.15	24.17	24.33	0-1	1
	25	12	24.02	24.16	24.34		1
	25	25	24.10	24.02	24.18		1
	50	0	24.02	24.24	24.19		1
16QAM	1	0	24.38	24.49	24.43	0-1	1
	1	25	24.22	24.37	24.41		1
	1	49	24.29	24.44	23.91		1
	25	0	23.10	23.19	23.33	0-2	2
	25	12	23.14	23.29	23.27		2
	25	25	23.10	23.11	23.31		2
	50	0	23.15	23.32	23.19		2
64QAM	1	0	23.41	23.45	23.40	0-2	2
	1	25	23.12	23.23	23.44		2
	1	49	23.25	23.45	23.14		2
	25	0	22.05	22.23	22.31	0-3	3
	25	12	22.10	22.16	22.31		3
	25	25	22.18	22.13	22.34		3
	50	0	22.06	22.27	22.19		3

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

LTE Band 26 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26715 (816.5 MHz)	26865 (831.5 MHz)	27015 (846.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	25.06	25.23	25.09	0	0
	1	12	24.92	25.23	25.09		0
	1	24	24.89	24.91	24.74		0
	12	0	24.08	24.32	24.28	0-1	1
	12	6	24.03	24.20	24.28		1
	12	13	24.04	24.02	24.21		1
	25	0	24.00	24.23	24.20		1
16QAM	1	0	24.39	24.45	24.43	0-1	1
	1	12	24.27	24.39	24.40		1
	1	24	24.28	24.44	24.02		1
	12	0	23.14	23.31	23.28	0-2	2
	12	6	23.09	23.28	23.35		2
	12	13	23.08	23.19	23.24		2
	25	0	23.13	23.31	23.24		2
64QAM	1	0	23.44	23.48	23.38	0-2	2
	1	12	23.16	23.26	23.50		2
	1	24	23.24	23.36	23.02		2
	12	0	22.11	22.30	22.33	0-3	3
	12	6	22.02	22.21	22.29		3
	12	13	22.20	22.17	22.37		3
	25	0	22.10	22.27	22.20		3

Table 9-10
LTE Band 26 (Cell) Conducted Powers - 3 MHz Bandwidth

LTE Band 26 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26705 (815.5 MHz)	26865 (831.5 MHz)	27025 (847.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.98	25.15	25.08	0	0
	1	7	24.92	25.14	25.05		0
	1	14	24.80	24.87	24.67		0
	8	0	24.11	24.20	24.36	0-1	1
	8	4	23.99	24.14	24.21		1
	8	7	24.10	24.07	24.22		1
	15	0	24.02	24.18	24.27		1
16QAM	1	0	24.36	24.45	24.42	0-1	1
	1	7	24.19	24.37	24.30		1
	1	14	24.27	24.48	23.97		1
	8	0	23.06	23.17	23.27	0-2	2
	8	4	23.05	23.34	23.32		2
	8	7	23.03	23.15	23.36		2
	15	0	23.14	23.20	23.31		2
64QAM	1	0	23.40	23.43	23.44	0-2	2
	1	7	23.18	23.35	23.40		2
	1	14	23.26	23.31	23.04		2
	8	0	22.19	22.26	22.24	0-3	3
	8	4	22.01	22.18	22.23		3
	8	7	22.14	22.12	22.40		3
	15	0	22.12	22.34	22.11		3

Table 9-11
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	24.90	25.21	24.97	0	0
	1	2	24.98	25.32	24.97		0
	1	5	25.03	25.26	24.85		0
	3	0	24.94	25.35	25.03		0
	3	2	25.08	25.26	24.96		0
	3	3	24.93	25.22	24.80		0
	6	0	24.10	24.28	24.12	0-1	1
16QAM	1	0	24.16	24.42	24.31	0-1	1
	1	2	24.35	24.13	24.40		1
	1	5	24.32	24.30	24.26		1
	3	0	24.13	24.41	24.14		1
	3	2	24.26	24.48	24.12		1
	3	3	24.25	24.44	23.93		1
	6	0	23.13	23.39	23.05	0-2	2
64QAM	1	0	23.09	23.38	23.39	0-2	2
	1	2	23.22	23.39	23.30		2
	1	5	23.42	23.44	23.04		2
	3	0	23.12	23.42	23.18		2
	3	2	23.23	23.48	23.15		2
	3	3	23.08	23.36	23.02		2
	6	0	22.14	22.30	22.01	0-3	3

9.4.4 LTE Band 4 (AWS)

Table 9-12
LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth

LTE Band 4 (AWS) 20 MHzBandwidth					
Modulation	RB Size	RB Offset	Mid Channel 20175 (1732.5 MHz) Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
QPSK	1	0	**24.70**	0	0
	1	50	24.34		0
	1	99	24.52		0
	50	0	23.45	0-1	1
	50	25	**23.50**		1
	50	50	23.40		1
	100	0	23.27		1
16QAM	1	0	23.60	0-1	1
	1	50	23.62		1
	1	99	23.47		1
	50	0	22.45	0-2	2
	50	25	22.37		2
	50	50	22.44		2
	100	0	22.43		2
64QAM	1	0	22.13	0-2	2
	1	50	22.44		2
	1	99	22.31		2
	50	0	21.15	0-3	3
	50	25	21.20		3
	50	50	21.13		3
	100	0	21.02		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 9-13
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

LTE Band 4 (AWS) 15 MHzBandwidth							
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	24.27	24.57	23.94	0	0
	1	36	24.68	24.49	23.68		0
	1	74	24.25	24.33	23.52		0
	36	0	23.41	23.45	22.97	0-1	1
	36	18	23.52	23.39	22.80		1
	36	37	23.16	23.40	22.98		1
	75	0	23.51	23.34	22.86		1
16QAM	1	0	23.03	23.53	23.28	0-1	1
	1	36	22.95	23.60	23.06		1
	1	74	23.48	23.57	23.12		1
	36	0	22.53	22.52	21.96	0-2	2
	36	18	22.12	22.35	21.98		2
	36	37	22.16	22.40	22.07		2
	75	0	21.77	22.46	21.94		2
64QAM	1	0	21.96	22.51	22.44	0-2	2
	1	36	21.77	22.61	22.01		2
	1	74	22.57	22.62	22.08		2
	36	0	21.48	21.31	21.00	0-3	3
	36	18	21.18	21.32	21.03		3
	36	37	21.16	21.37	21.04		3
	75	0	20.89	21.39	20.92		3

Table 9-14
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

LTE Band 4 (AWS) 10 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20000 (1715.0 MHz)	20175 (1732.5 MHz)	20350 (1750.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.45	24.43	23.85	0	0
	1	25	24.39	24.38	23.96		0
	1	49	24.28	24.28	23.99		0
	25	0	23.55	23.43	23.11	0-1	1
	25	12	23.48	23.43	23.19		1
	25	25	23.51	23.56	23.23		1
	50	0	23.51	23.44	23.27		1
16QAM	1	0	23.60	23.68	23.19	0-1	1
	1	25	23.65	23.64	23.41		1
	1	49	23.65	23.61	23.36		1
	25	0	22.49	22.50	22.08	0-2	2
	25	12	22.44	22.45	22.23		2
	25	25	22.44	22.55	22.20		2
	50	0	22.44	22.49	22.31		2
64QAM	1	0	22.56	22.69	22.19	0-2	2
	1	25	22.61	22.53	22.30		2
	1	49	22.69	22.55	22.35		2
	25	0	21.46	21.48	21.17	0-3	3
	25	12	21.54	21.51	21.29		3
	25	25	21.58	21.61	21.26		3
	50	0	21.50	21.52	21.14		3

Table 9-15
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

LTE Band 4 (AWS) 5 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19975 (1712.5 MHz)	20175 (1732.5 MHz)	20375 (1752.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.67	24.37	24.08	0	0
	1	12	24.67	24.37	24.09		0
	1	24	24.51	24.30	24.06		0
	12	0	23.63	23.45	23.19	0-1	1
	12	6	23.65	23.52	23.31		1
	12	13	23.63	23.50	23.13		1
	25	0	23.53	23.58	23.07		1
16QAM	1	0	23.53	23.69	23.49	0-1	1
	1	12	23.58	23.63	23.32		1
	1	24	23.59	23.49	23.27		1
	12	0	22.47	22.57	22.30	0-2	2
	12	6	22.45	22.50	22.26		2
	12	13	22.57	22.65	22.29		2
	25	0	22.66	22.56	22.16		2
64QAM	1	0	22.58	22.58	22.51	0-2	2
	1	12	22.53	22.46	22.37		2
	1	24	22.54	22.43	22.41		2
	12	0	21.56	21.55	21.34	0-3	3
	12	6	21.42	21.63	21.39		3
	12	13	21.58	21.63	21.16		3
	25	0	21.51	21.62	21.14		3

Table 9-16
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth

LTE Band 4 (AWS) 3 MHzBandwidth							
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	24.35	24.34	24.10	0	0
	1	7	24.16	24.56	24.12		0
	1	14	24.18	24.45	24.06		0
	8	0	23.11	23.40	23.20	0-1	1
	8	4	23.17	23.50	23.22		1
	8	7	23.33	23.53	23.30		1
	15	0	23.14	23.49	23.34		1
16QAM	1	0	23.42	23.60	23.41	0-1	1
	1	7	23.65	23.64	23.51		1
	1	14	23.53	23.50	23.34		1
	8	0	22.19	22.33	22.24	0-2	2
	8	4	22.31	22.42	22.23		2
	8	7	22.37	22.56	22.29		2
	15	0	22.20	22.55	22.12		2
64QAM	1	0	22.48	22.61	22.44	0-2	2
	1	7	22.57	22.68	22.49		2
	1	14	22.46	22.49	22.45		2
	8	0	21.16	21.26	21.26	0-3	3
	8	4	21.20	21.48	21.36		3
	8	7	21.41	21.50	21.33		3
	15	0	21.16	21.52	21.02		3

Table 9-17
LTE Band 4 (AWS) Conducted Powers -1.4 MHz Bandwidth

LTE Band 4 (AWS) 1.4 MHzBandwidth							
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	24.41	24.23	24.14	0	0
	1	2	24.48	24.30	24.10		0
	1	5	24.47	24.30	23.99		0
	3	0	24.49	24.36	24.02		0
	3	2	24.41	24.48	24.13		0
	3	3	24.37	24.34	24.06		0
	6	0	23.50	23.47	23.15	0-1	1
16QAM	1	0	23.65	23.70	23.38	0-1	1
	1	2	23.60	23.56	23.33		1
	1	5	23.50	23.55	23.37		1
	3	0	23.57	23.34	23.25		1
	3	2	23.61	23.55	23.23		1
	3	3	23.50	23.49	23.25		1
	6	0	22.49	22.43	22.10	0-2	2
64QAM	1	0	22.70	22.57	22.29	0-2	2
	1	2	22.70	22.55	22.30		2
	1	5	22.54	22.53	22.33		2
	3	0	22.49	22.22	22.30		2
	3	2	22.47	22.40	22.42		2
	3	3	22.55	22.58	22.16		2
	6	0	21.56	21.45	21.02	0-3	3

9.4.5 LTE Band 25 (PCS)

Table 9-18
LTE Band 25 (PCS) 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	**25.15**	25.02	25.02	0	0
	1	50	24.95	24.70	24.84		0
	1	99	24.73	24.35	24.90		0
	50	0	23.89	**24.11**	24.07	0-1	1
	50	25	23.88	23.97	24.06		1
	50	50	23.82	23.80	24.03		1
	100	0	23.79	23.81	24.09		1
16QAM	1	0	24.20	24.18	24.11	0-1	1
	1	50	23.99	24.18	24.16		1
	1	99	24.06	24.07	24.15		1
	50	0	22.98	22.99	23.05	0-2	2
	50	25	22.88	22.95	23.10		2
	50	50	22.77	22.88	23.08		2
	100	0	22.85	22.98	23.05		2
64QAM	1	0	23.07	23.14	23.13	0-2	2
	1	50	22.93	23.10	23.10		2
	1	99	22.98	23.10	23.15		2
	50	0	21.87	21.81	22.14	0-3	3
	50	25	21.84	21.88	22.13		3
	50	50	21.75	21.80	22.05		3
	100	0	21.86	21.79	22.01		3

Table 9-19
LTE Band 25 (PCS) 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	25.16	25.02	24.98	0	0
	1	36	24.96	24.66	24.88		0
	1	74	24.77	24.73	24.87		0
	36	0	24.00	24.08	23.99	0-1	1
	36	18	23.90	23.94	24.08		1
	36	37	23.81	23.86	24.07		1
	75	0	23.85	23.94	24.13		1
16QAM	1	0	24.11	24.13	24.09	0-1	1
	1	36	24.00	24.09	24.00		1
	1	74	23.98	24.18	24.15		1
	36	0	22.95	22.91	23.13	0-2	2
	36	18	22.87	23.00	23.08		2
	36	37	22.89	22.86	23.01		2
	75	0	22.80	22.90	23.10		2
64QAM	1	0	23.11	23.00	23.00	0-2	2
	1	36	22.96	23.16	23.09		2
	1	74	23.01	23.12	23.07		2
	36	0	21.88	21.83	22.05	0-3	3
	36	18	21.85	21.98	22.16		3
	36	37	21.82	21.86	22.02		3
	75	0	21.85	21.84	22.06		3

Table 9-20
LTE Band 25 (PCS) 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	25.18	25.09	24.91	0	0
	1	25	24.96	24.68	24.87		0
	1	49	24.74	24.78	24.82		0
	25	0	23.95	24.12	23.98	0-1	1
	25	12	23.93	23.97	24.05		1
	25	25	23.87	23.83	24.09		1
	50	0	23.86	23.91	24.10		1
16QAM	1	0	24.17	24.17	24.16	0-1	1
	1	25	23.90	24.14	24.00		1
	1	49	24.02	24.06	24.13		1
	25	0	22.87	23.04	23.09	0-2	2
	25	12	22.85	23.00	23.10		2
	25	25	22.84	22.82	23.05		2
	50	0	22.85	22.94	23.05		2
64QAM	1	0	23.02	23.00	23.09	0-2	2
	1	25	22.99	23.20	23.18		2
	1	49	23.05	23.17	23.15		2
	25	0	21.89	21.84	22.03	0-3	3
	25	12	21.88	21.93	22.11		3
	25	25	21.78	21.77	22.01		3
	50	0	21.76	21.78	21.99		3

Table 9-21
LTE Band 25 (PCS) 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	25.19	25.09	24.99	0	0
	1	12	24.91	24.65	24.81		0
	1	24	24.76	24.75	24.88		0
	12	0	23.94	24.13	24.02	0-1	1
	12	6	23.93	23.94	24.00		1
	12	13	23.74	23.88	24.06		1
	25	0	23.89	23.85	24.13		1
16QAM	1	0	24.00	24.12	24.10	0-1	1
	1	12	23.95	24.18	24.00		1
	1	24	24.04	24.07	24.00		1
	12	0	22.92	23.00	23.11	0-2	2
	12	6	22.92	22.98	23.09		2
	12	13	22.78	22.83	23.05		2
	25	0	22.77	22.90	23.07		2
64QAM	1	0	23.12	23.00	23.19	0-2	2
	1	12	23.00	23.00	23.09		2
	1	24	23.04	23.10	23.11		2
	12	0	21.86	21.85	22.06	0-3	3
	12	6	21.85	21.92	22.10		3
	12	13	21.83	21.86	21.95		3
	25	0	21.74	21.82	22.11		3

Table 9-22
LTE Band 25 (PCS) 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	25.19	24.97	24.95	0	0
	1	7	24.87	24.61	24.93		0
	1	14	24.76	24.72	24.92		0
	8	0	23.94	24.17	24.04	0-1	1
	8	4	23.87	23.91	24.03		1
	8	7	23.84	23.85	24.02		1
	15	0	23.89	23.85	24.08		1
16QAM	1	0	24.19	24.12	24.06	0-1	1
	1	7	23.98	24.20	24.18		1
	1	14	24.07	24.10	24.00		1
	8	0	22.92	23.01	23.02	0-2	2
	8	4	22.96	22.99	23.10		2
	8	7	22.84	22.85	23.05		2
	15	0	22.78	22.84	23.04		2
64QAM	1	0	23.12	23.16	23.10	0-2	2
	1	7	22.98	23.13	23.12		2
	1	14	23.08	23.00	23.09		2
	8	0	21.90	21.92	22.04	0-3	3
	8	4	21.81	21.89	22.12		3
	8	7	21.81	21.78	21.99		3
	15	0	21.79	21.91	22.05		3

Table 9-23
LTE Band 25 (PCS) Conducted Powers -1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel 26047 (1850.7 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26683 (1914.3 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]				
QPSK	1	0	24.91	25.04	24.95	0	0
	1	2	24.97	25.00	24.95		0
	1	5	24.91	25.19	24.98		0
	3	0	24.94	25.13	25.06		0
	3	2	24.92	25.15	25.10		0
	3	3	24.91	25.17	24.99		0
	6	0	23.94	24.20	24.11	0-1	1
16QAM	1	0	24.10	24.13	24.00	0-1	1
	1	2	24.14	24.13	24.00		1
	1	5	24.12	24.02	24.13		1
	3	0	24.10	24.03	24.04		1
	3	2	24.12	24.20	24.06		1
	3	3	23.98	24.13	24.04		1
	6	0	22.94	23.03	22.99	0-2	2
64QAM	1	0	23.12	23.14	23.00	0-2	2
	1	2	23.15	23.06	23.05		2
	1	5	23.13	23.13	23.01		2
	3	0	23.05	23.09	23.05		2
	3	2	22.95	23.20	23.12		2
	3	3	23.06	23.13	23.02		2
	6	0	21.84	22.03	22.05	0-3	3

9.4.6 LTE Band 41

Table 9-24
LTE Band 41 Power Class 3 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	23.32	24.08	**24.20**	24.04	23.96	0	0
	1	50	23.31	23.98	24.02	23.98	23.96		0
	1	99	23.33	23.84	24.00	23.50	23.57		0
	50	0	22.41	22.82	22.89	22.76	22.89	0-1	1
	50	25	22.50	22.88	**22.96**	22.77	22.78		1
	50	50	22.38	22.83	22.81	22.73	22.85		1
	100	0	22.41	22.91	22.91	22.85	22.90		1
16QAM	1	0	22.33	23.07	23.11	22.69	23.12	0-1	1
	1	50	22.26	22.92	22.94	22.63	23.06		1
	1	99	22.18	22.97	22.88	22.61	23.02		1
	50	0	21.50	22.02	21.93	21.73	21.95	0-2	2
	50	25	21.33	21.92	21.80	21.78	21.83		2
	50	50	21.44	21.85	21.83	21.68	21.84		2
	100	0	21.37	21.82	21.94	21.76	21.85		2
64QAM	1	0	21.87	22.11	22.12	21.63	22.19	0-2	2
	1	50	21.62	21.89	21.85	21.64	22.04		2
	1	99	21.82	21.87	21.77	21.70	22.06		2
	50	0	20.98	21.04	20.88	20.76	20.88	0-3	3
	50	25	20.86	21.08	20.94	20.88	20.86		3
	50	50	20.88	20.90	20.90	20.72	20.81		3
	100	0	20.93	20.86	20.85	20.80	20.84		3

Table 9-25
LTE Band 41 Power Class 3 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	24.03	23.96	24.00	23.94	23.85	0	0
	1	36	23.79	23.77	23.96	23.92	23.77		0
	1	74	23.81	23.86	23.84	23.81	23.61		0
	36	0	23.01	23.01	22.89	22.91	22.73	0-1	1
	36	18	22.93	22.90	22.84	22.87	22.67		1
	36	37	22.86	22.86	22.77	22.89	22.86		1
	75	0	22.91	22.80	22.90	22.85	22.71		1
16QAM	1	0	22.94	23.06	23.11	22.85	22.82	0-1	1
	1	36	22.80	22.83	22.99	22.85	22.72		1
	1	74	22.68	22.73	22.86	22.71	22.69		1
	36	0	21.97	21.98	21.86	21.80	21.85	0-2	2
	36	18	21.87	21.80	21.85	21.87	21.68		2
	36	37	21.85	21.88	21.89	21.82	21.68		2
	75	0	21.88	21.87	21.91	21.86	21.76		2
64QAM	1	0	21.92	22.01	22.18	21.96	21.75	0-2	2
	1	36	21.70	21.90	22.20	21.75	21.72		2
	1	74	21.68	21.78	21.94	21.68	21.61		2
	36	0	20.93	20.97	20.92	20.88	20.85	0-3	3
	36	18	20.86	20.91	20.88	20.92	20.78		3
	36	37	20.73	20.79	20.84	20.88	20.69		3
	75	0	20.99	20.92	20.89	20.93	20.78		3

Table 9-26
LTE Band 41 Power Class 3 Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHzBandwidth									
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	24.00	23.87	24.02	23.97	23.99	0	0
	1	25	23.78	23.82	23.94	23.83	23.68		0
	1	49	23.87	23.80	23.82	23.88	23.93		0
	25	0	22.90	22.90	22.88	22.92	22.83	0-1	1
	25	12	22.99	22.96	22.85	22.92	22.79		1
	25	25	22.87	22.80	22.85	22.88	22.92		1
	50	0	22.90	22.87	22.86	22.87	22.95		1
16QAM	1	0	22.83	23.00	23.04	22.86	23.14	0-1	1
	1	25	22.85	22.93	23.01	22.85	22.66		1
	1	49	22.87	22.81	22.99	22.71	23.09		1
	25	0	21.96	21.88	21.82	21.99	21.88	0-2	2
	25	12	22.02	21.78	21.81	21.86	21.73		2
	25	25	21.92	21.88	21.92	21.82	21.81		2
	50	0	21.91	21.93	21.94	21.89	21.98		2
64QAM	1	0	21.97	22.01	22.19	21.94	21.97	0-2	2
	1	25	21.69	21.92	22.06	21.74	21.74		2
	1	49	21.75	21.81	22.00	21.70	22.19		2
	25	0	20.94	20.70	20.83	20.99	20.89	0-3	3
	25	12	20.86	20.86	20.90	20.84	20.64		3
	25	25	20.88	20.80	20.90	20.91	20.80		3
	50	0	20.77	20.77	20.98	20.88	20.96		3

Table 9-27
LTE Band 41 Power Class 3 Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHzBandwidth									
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	23.84	23.85	23.70	23.85	23.69	0	0
	1	12	23.82	23.78	23.65	23.98	23.68		0
	1	24	23.83	23.80	23.70	23.87	23.63		0
	12	0	22.92	22.78	22.97	22.93	22.77	0-1	1
	12	6	22.91	22.93	22.88	22.93	22.79		1
	12	13	22.95	22.82	22.85	22.88	22.72		1
	25	0	22.88	22.86	22.92	22.89	22.77		1
16QAM	1	0	22.77	22.82	22.90	22.82	22.76	0-1	1
	1	12	22.83	22.71	23.09	22.89	22.60		1
	1	24	22.73	22.82	23.00	22.79	22.71		1
	12	0	21.95	21.91	21.86	21.89	21.74	0-2	2
	12	6	21.91	21.83	21.94	21.87	21.75		2
	12	13	21.93	21.82	21.91	21.87	21.64		2
	25	0	21.94	21.90	21.88	21.93	21.70		2
64QAM	1	0	21.94	21.69	21.88	21.82	21.70	0-2	2
	1	12	21.77	21.79	22.11	21.93	21.56		2
	1	24	21.61	21.72	21.96	21.90	21.67		2
	12	0	20.89	20.83	20.88	20.94	20.75	0-3	3
	12	6	20.99	20.91	20.95	21.05	20.72		3
	12	13	20.82	20.93	20.86	20.95	20.55		3
	25	0	20.82	20.71	20.85	20.94	20.71		3

Table 9-28
LTE Band 41 Power Class 2 Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHzBandwidth									
Modulation	RB Size	RB Offset	Low Channel 39750 (2506.0 MHz)	Low-Mid Channel 40185 (2549.5 MHz)	Mid Channel 40620 (2593.0 MHz)	Mid-High Channel 41055 (2636.5 MHz)	High Channel 41490 (2680.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]						
QPSK	1	0	26.69	26.96	**27.00**	26.59	26.74	0	0
	1	50	26.98	26.95	26.86	26.62	26.77		0
	1	99	26.71	26.89	26.80	26.45	26.76		0
	50	0	25.94	25.95	25.85	25.74	25.84	0-1	1
	50	25	**25.98**	25.80	25.89	25.76	25.81		1
	50	50	25.84	25.95	25.87	25.74	25.70		1
	100	0	25.96	25.94	25.93	25.65	25.82		1
16QAM	1	0	25.77	25.83	25.83	25.93	25.86	0-1	1
	1	50	25.90	25.76	25.87	25.81	25.86		1
	1	99	25.73	25.76	25.86	25.80	25.81		1
	50	0	24.90	24.92	24.87	24.88	24.81	0-2	2
	50	25	24.66	25.00	24.87	24.85	24.76		2
	50	50	24.75	24.95	24.90	24.86	24.77		2
	100	0	24.97	24.96	24.95	24.67	24.90		2
64QAM	1	0	24.97	24.58	24.90	24.41	24.38	0-2	2
	1	50	24.79	24.82	24.90	24.60	24.87		2
	1	99	24.61	24.86	24.63	24.50	24.84		2
	50	0	23.94	23.95	23.68	23.56	23.96	0-3	3
	50	25	23.90	23.82	23.66	23.44	23.63		3
	50	50	23.78	23.93	23.97	23.60	23.93		3
	100	0	23.82	23.96	23.83	23.60	23.81		3

Table 9-29
LTE Band 41 Power Class 2 Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHzBandwidth									
Modulation	RB Size	RB Offset	Low Channel 39750 (2506.0 MHz)	Low-Mid Channel 40185 (2549.5 MHz)	Mid Channel 40620 (2593.0 MHz)	Mid-High Channel 41055 (2636.5 MHz)	High Channel 41490 (2680.0 MHz)	MPR Allowed per 3GPP [dB]	MPR [dB]
			Conducted Power [dBm]						
QPSK	1	0	26.98	26.86	26.74	26.63	26.84	0	0
	1	36	26.85	27.00	26.94	26.39	26.84		0
	1	74	26.68	26.84	26.91	26.25	26.73		0
	36	0	26.00	25.88	25.99	25.64	25.74	0-1	1
	36	18	26.00	25.87	25.92	25.68	25.75		1
	36	37	25.95	25.77	25.83	25.56	25.77		1
	75	0	25.91	25.90	25.90	25.59	25.72		1
16QAM	1	0	25.98	25.80	25.83	25.86	25.97	0-1	1
	1	36	25.88	26.00	25.84	25.73	25.77		1
	1	74	25.97	25.76	25.89	25.54	25.91		1
	36	0	24.93	24.92	25.00	24.64	24.77	0-2	2
	36	18	24.95	24.92	24.93	24.69	24.84		2
	36	37	24.88	24.79	24.90	24.60	24.73		2
	75	0	24.93	24.85	24.96	24.65	24.75		2
64QAM	1	0	24.92	24.84	24.77	24.85	24.93	0-2	2
	1	36	24.86	24.87	24.79	24.71	24.87		2
	1	74	24.80	24.75	24.90	24.52	24.97		2
	36	0	23.75	23.87	23.93	23.67	23.83	0-3	3
	36	18	23.94	23.93	23.68	23.78	23.65		3
	36	37	23.86	23.89	23.72	23.54	23.68		3
	75	0	23.87	23.83	23.87	23.66	23.87		3

Table 9-30
LTE Band 41 Power Class 2 Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHzBandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	26.81	26.82	26.99	26.48	26.59	0	0
	1	25	26.78	26.95	26.96	26.40	26.82		0
	1	49	26.76	26.93	26.85	26.30	26.85		0
	25	0	25.90	25.93	25.99	25.56	25.96	0-1	1
	25	12	25.99	25.95	25.82	25.61	25.84		1
	25	25	25.96	25.77	25.88	25.56	25.90		1
	50	0	25.93	25.89	25.93	25.56	25.78		1
16QAM	1	0	25.97	25.65	25.82	25.71	25.84	0-1	1
	1	25	25.84	25.68	25.90	25.79	25.82		1
	1	49	25.77	25.59	25.82	25.60	25.93		1
	25	0	24.66	24.93	24.98	24.69	24.68	0-2	2
	25	12	24.94	24.89	24.94	24.69	24.78		2
	25	25	24.91	24.92	24.92	24.61	24.91		2
	50	0	24.89	24.98	24.98	24.64	24.80		2
64QAM	1	0	24.99	24.69	24.92	24.83	24.84	0-2	2
	1	25	24.88	24.77	24.76	24.60	24.75		2
	1	49	24.87	24.63	24.74	24.75	24.93		2
	25	0	23.86	23.88	23.88	23.55	23.86	0-3	3
	25	12	23.88	23.95	23.91	23.69	23.71		3
	25	25	23.88	23.88	23.86	23.63	23.95		3
	50	0	23.82	23.80	23.91	23.69	23.86		3

Table 9-31
LTE Band 41 Power Class 2 Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHzBandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	26.91	26.98	26.67	26.60	26.87	0	0
	1	12	26.60	26.94	26.84	26.55	26.76		0
	1	24	26.83	26.85	26.90	26.51	26.78		0
	12	0	25.94	25.93	25.90	25.81	25.81	0-1	1
	12	6	25.94	25.99	25.91	25.77	25.77		1
	12	13	25.87	25.92	25.93	25.71	25.73		1
	25	0	26.00	25.90	25.93	25.69	25.73		1
16QAM	1	0	25.74	25.84	25.84	25.91	25.81	0-1	1
	1	12	25.83	25.79	25.92	25.75	25.94		1
	1	24	25.78	25.79	25.81	25.76	25.79		1
	12	0	24.86	24.89	24.89	24.80	24.76	0-2	2
	12	6	24.96	24.92	24.80	24.85	24.80		2
	12	13	25.00	24.96	24.80	24.77	24.75		2
	25	0	24.97	24.90	24.96	24.68	24.87		2
64QAM	1	0	24.71	24.75	24.88	24.98	24.92	0-2	2
	1	12	24.96	24.85	24.88	24.82	24.97		2
	1	24	24.79	24.85	24.79	24.84	24.81		2
	12	0	23.87	23.85	23.89	23.84	23.88	0-3	3
	12	6	23.60	24.00	23.69	23.89	23.86		3
	12	13	23.86	23.96	23.74	23.86	23.80		3
	25	0	23.87	23.73	23.82	23.72	23.85		3

9.4.7 LTE Carrier Aggregation Conducted Powers

Table 9-32
Two Component Carrier Conducted Powers

	PCC									SCC				Power	
Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Frequency [MHz]	SCC Band	SCC Bandwidth [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41C (1)	LTE B41 PC3	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	24.10	24.20
CA_41A-41A (1)	LTE B41 PC3	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	5	39675	2498.5	24.13	24.20
CA_41C (1)	LTE B41 PC2	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	26.99	27.00
CA_41A-41A (1)	LTE B41 PC2	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	5	39675	2498.5	26.90	27.00
CA_25A-25A (1)	LTE B25	5	26065	1852.5	QPSK	1	0	8065	1932.5	LTE B25	5	8665	1992.5	25.20	25.19
CA_5A-25A	LTE B25	5	26065	1852.5	QPSK	1	0	8065	1932.5	LTE B5	10	2525	881.5	25.14	25.19
CA_12A-25A	LTE B25	5	26065	1852.5	QPSK	1	0	8065	1932.5	LTE B12	10	5095	737.5	25.11	25.19
CA_2A-5A	LTE B2	5	18625	1852.5	QPSK	1	0	625	1932.5	LTE B5	10	2525	881.5	25.10	25.19
CA_2A-12A	LTE B2	5	18625	1852.5	QPSK	1	0	625	1932.5	LTE B12	10	5095	737.5	25.09	25.19
CA_2A-5A	LTE B5	10	20475	831.5	QPSK	1	25	2475	876.5	LTE B2	20	900	1960	25.25	25.27
CA_5A-25A	LTE B5	10	20475	831.5	QPSK	1	25	2475	876.5	LTE B25	20	8365	1962.5	25.25	25.27
CA_2A-12A	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B2	20	900	1960	25.46	25.45
CA_12A-25A	LTE B12	10	23095	707.5	QPSK	1	25	5095	737.5	LTE B25	20	8365	1962.5	25.40	25.45

Table 9-33
Three Component Carrier Conducted Powers

	PCC									SCC 1				SCC 2				Power	
Combination	PCC Band	PCC Bandwidth [MHz]	PCC (UL) Channel	PCC (UL) Frequency [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Frequency [MHz]	SCC Band	SCC Bandwidth [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	SCC Band	SCC Bandwidth [MHz]	SCC (DL) Channel	SCC (DL) Frequency [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41D	LTE B41 PC3	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	LTE B41	20	40224	2553.4	24.18	24.20
CA_41A-41C	LTE B41 PC3	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	24.20	24.20
CA_41D	LTE B41 PC2	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	LTE B41	20	40224	2553.4	26.98	27.00
CA_41A-41C	LTE B41 PC2	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	26.95	27.00
CA_41C-41A	LTE B41 PC3	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	LTE B41	20	41490	2680	24.17	24.20
CA_41C-41A	LTE B41 PC2	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	LTE B41	20	41490	2680	26.97	27.00

Table 9-34
Four Component Carrier Conducted Powers

	PCC									SCC 1				SCC 2				SCC 3				Power	
Combination	PCC Band	PCC BW [MHz]	PCC (UL) Channel	PCC (UL) Freq. [MHz]	Modulation	PCC UL# RB	PCC UL RB Offset	PCC (DL) Channel	PCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	SCC Band	SCC BW [MHz]	SCC (DL) Channel	SCC (DL) Freq. [MHz]	LTE Tx.Power with DL CA Enabled (dBm)	LTE Single Carrier Tx Power (dBm)
CA_41A-41D	LTE B41 PC3	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	41094	2640.4	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	24.18	24.20
CA_41C-41C	LTE B41 PC3	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	24.19	24.20
CA_41A-41D	LTE B41 PC2	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	41094	2640.4	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	26.99	27.00
CA_41C-41C	LTE B41 PC2	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	LTE B41	20	41292	2660.2	LTE B41	20	41490	2680	26.95	27.00
CA_41D-41A	LTE B41 PC3	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	LTE B41	20	40818	2612.8	LTE B41	5	41565	2687.5	24.14	24.20
CA_41D-41A	LTE B41 PC2	20	40620	2593	QPSK	1	0	40620	2593	LTE B41	20	40422	2573.2	LTE B41	20	40818	2612.8	LTE B41	5	41565	2687.5	26.96	27.00

1. For every supported combination of downlink carrier aggregation, power measurements were performed with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band.
2. All control and acknowledge data is sent on uplink channels that operate identical to specifications when downlink carrier aggregation is inactive.
3. Per FCC guidance, LTE B26 standalone powers were used to select measurement configurations for LTE B5, and LTE Band 25 standalone powers were used to select measurement configurations for LTE Band 2.
4. For downlink carrier aggregation combinations, PCC uplink channel was selected based on section C)3)b)ii) of KBD 941225 D05 V01r02. The downlink PCC channel was paired with the selected PCC uplink channel according to normal configurations without carrier aggregation. For inter-band CA, the SCC downlink channels were selected near the middle of their transmission bands. For contiguous intra-band CA, the downlink channel spacing between the component carriers was set to multiple of 300 kHz less than the nominal channel spacing defined in section 5.4.1A of 3GPP TS 36.521. For non-contiguous intra-band CA, the downlink channel spacing between the component carriers was set to be larger than the nominal channel spacing and provided maximum separation between the component carriers. All selected downlink channels remained fully within the downlink transmission band of the respective component carrier.

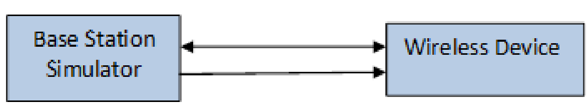


Figure 9-4
Power Measurement Setup

9.4.8 LTE Uplink Carrier Aggregation Conducted Powers

Table 9-35
LTE 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)	Single Carrier Target Power (dBm) [Tolerance: +0.5/-1.5 dB]
CA_41C	LTE B41	20	39750	2506.0	QPSK	1	99	LTE B41	20	39948	2525.8	QPSK	1	0	24.43	24.2
CA_41C	LTE B41	20	40185	2549.5	QPSK	1	0	LTE B41	20	39987	2529.7	QPSK	1	99	24.64	24.2
CA_41C	LTE B41	20	40620	2593.0	QPSK	1	0	LTE B41	20	40422	2573.2	QPSK	1	99	24.70	24.2
CA_41C	LTE B41	20	41055	2636.5	QPSK	1	0	LTE B41	20	40857	2616.7	QPSK	1	99	24.51	24.2
CA_41C	LTE B41	20	41490	2680.0	QPSK	1	0	LTE B41	20	41292	2660.2	QPSK	1	99	24.45	24.2

Notes:

1. This device supports uplink carrier aggregation for LTE CA_41C with a maximum of two 20 MHz component carriers.
2. For intraband contiguous carrier aggregation scenarios, 3GPP 36.101 Table 6.2.2A-1 specifies that the aggregate maximum allowed output power should be 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. Per FCC Guidance, the output power with uplink CA active was measured for the configuration with the highest reported SAR under single carrier scenario for each exposure condition. The power was measured with wideband signal integration over both component carriers (40 MHz Bandwidth).
3. Uplink carrier aggregation is only supported when the device is operating with Power Class 3 for LTE Band 41.

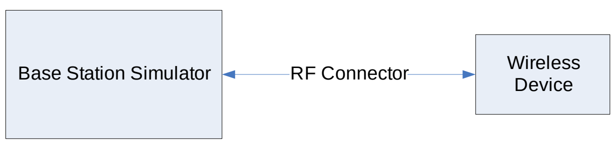


Figure 9-5
Power Measurement Setup

9.5 WLAN Conducted Powers

Table 9-36
2.4 GHz WLAN Ant 1 Maximum Average RF Power

2.4GHz Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11b	802.11g
		Average	Average
2412	1	18.26	17.15
2422	3	N/A	17.76
2437	6	**18.45**	17.70
2452	9	N/A	17.68
2462	11	18.44	15.87

Table 9-37
2.4 GHz WLAN Ant 2 Maximum Average RF Power

2.4GHz Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11b	802.11g
		Average	Average
2412	1	18.23	17.48
2422	3	N/A	17.86
2437	6	**18.47**	17.76
2452	9	N/A	17.94
2462	11	18.42	15.90

Table 9-38
2.4 GHz WLAN Ant 1 Reduced Average RF Power

2.4GHz Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11b	802.11g
2412	1	16.80	16.69
2437	6	**16.95**	16.98
2452	9	N/A	16.92
2462	11	16.80	N/A

Table 9-39
2.4 GHz WLAN Ant 2 Reduced Average RF Power

2.4GHz Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11b	802.11g
2412	1	16.33	16.31
2437	6	**16.43**	16.23
2452	9	N/A	16.19
2462	11	16.37	N/A

Table 9-40
5 GHz WLAN Ant 1 Maximum Average RF Power

5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
5180	36	**16.63**	16.55	16.53
5200	40	16.60	16.55	16.57
5220	44	16.61	16.54	16.56
5240	48	16.39	16.42	16.48
5260	52	16.42	16.52	16.50
5280	56	**16.77**	16.67	16.66
5300	60	16.54	16.52	16.53
5320	64	16.66	16.61	16.62
5500	100	16.58	16.52	16.57
5580	116	**16.71**	16.59	16.65
5660	132	16.65	16.45	16.45
5720	144	16.62	16.50	16.48
5745	149	**16.59**	16.46	16.47
5785	157	16.57	16.44	16.46
5825	165	16.55	16.44	16.47

Table 9-41
5 GHz WLAN Ant 2 Maximum Average RF Power

5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
5180	36	14.88	14.80	14.94
5200	40	14.91	14.79	14.91
5220	44	14.94	14.79	14.95
5240	48	**14.99**	14.84	14.95
5260	52	14.95	14.89	14.95
5280	56	15.10	14.98	15.02
5300	60	15.14	14.96	15.07
5320	64	**15.28**	15.22	15.23
5500	100	15.29	15.15	15.12
5580	116	**15.77**	15.60	15.59
5660	132	15.71	15.56	15.49
5720	144	15.75	15.58	15.54
5745	149	**15.87**	15.67	15.62
5785	157	15.85	15.62	15.62
5825	165	15.77	15.60	15.52

Table 9-42
5 GHz 802.11n WLAN MIMO Maximum Average RF Power

5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5180	36	16.55	14.80	18.77
5200	40	16.55	14.79	**18.77**
5220	44	16.54	14.79	18.76
5240	48	16.42	14.84	18.71
5260	52	16.52	14.89	18.79
5280	56	16.67	14.98	18.92
5300	60	16.52	14.96	18.82
5320	64	16.61	15.22	**18.98**
5500	100	16.52	15.15	18.90
5580	116	16.59	15.60	**19.13**
5660	132	16.45	15.56	19.04
5720	144	16.50	15.58	19.07
5745	149	16.46	15.67	**19.09**
5785	157	16.44	15.62	19.06
5825	165	16.44	15.60	19.05

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.

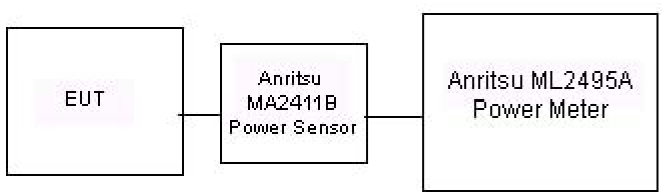


Figure 9-6
Power Measurement Setup

9.6 Bluetooth Conducted Powers

Table 9-43
Bluetooth Average RF Power

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	10.25	10.595
2441	1.0	39	**11.34**	13.612
2480	1.0	78	10.65	11.603
2402	2.0	0	9.46	8.839
2441	2.0	39	10.60	11.476
2480	2.0	78	9.91	9.801
2402	3.0	0	9.52	8.945
2441	3.0	39	10.65	11.618
2480	3.0	78	9.96	9.919

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

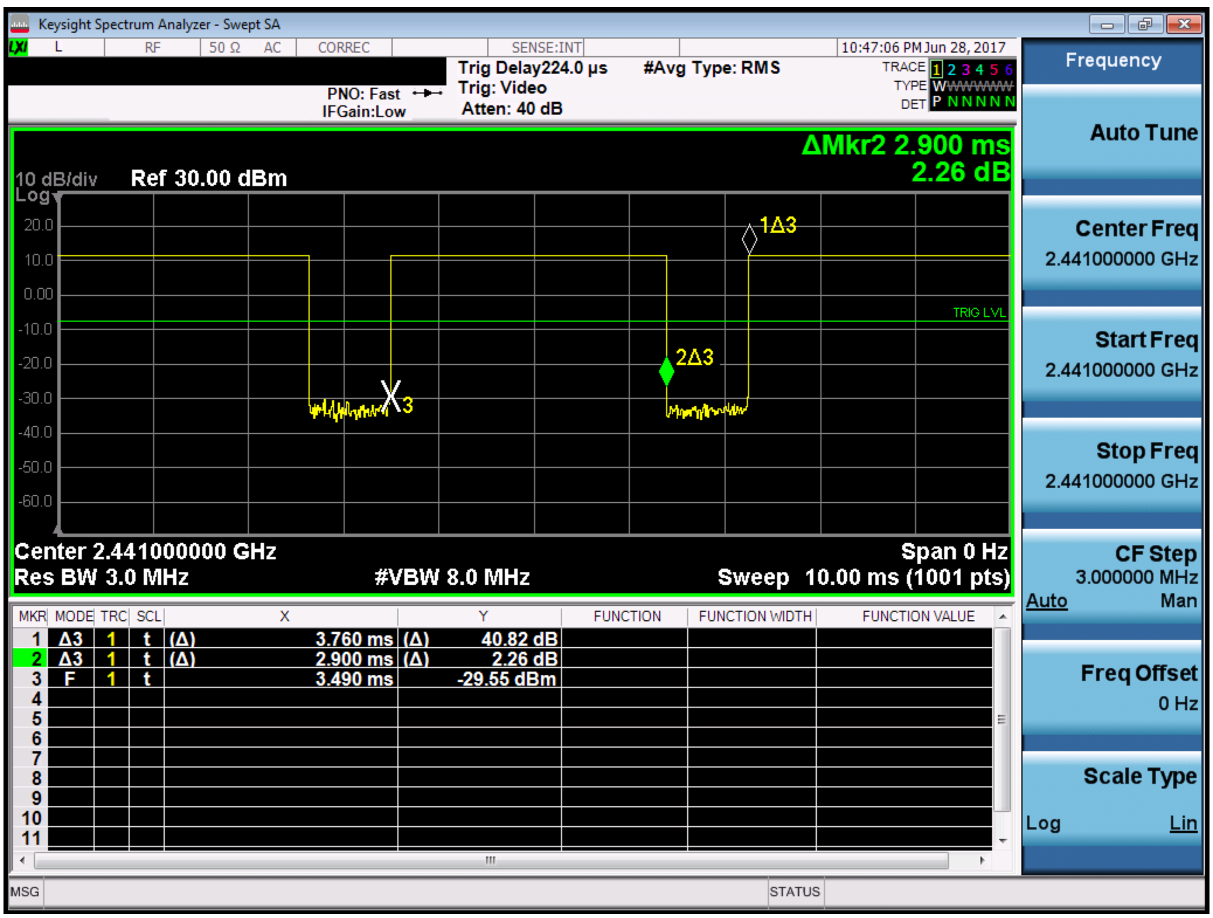


Figure 9-7
Bluetooth Transmission Plot

Equation 2
Bluetooth Duty Cycle Calculation

$$Duty\ Cycle = Pulse \frac{Width}{Period} * 100\% = \frac{2.900ms}{3.760ms} * 100\% = 77.1\%$$

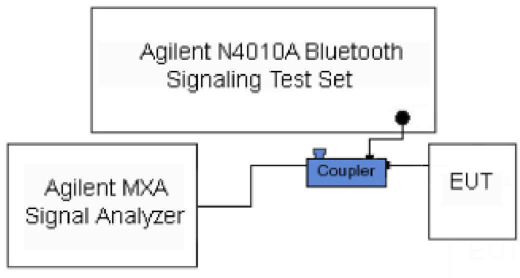


Figure 9-8
Power Measurement Setup

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
7/24/2017	750H	20.5	700	0.880	44.097	0.889	42.201	-1.01%	4.49%
			710	0.883	44.057	0.890	42.149	-0.79%	4.53%
			720	0.887	44.028	0.891	42.097	-0.45%	4.59%
			725	0.888	44.013	0.891	42.071	-0.34%	4.62%
			740	0.893	43.978	0.893	41.994	0.00%	4.72%
			755	0.898	43.942	0.894	41.916	0.45%	4.83%
			770	0.903	43.886	0.895	41.838	0.89%	4.90%
			785	0.908	43.833	0.896	41.760	1.34%	4.96%
8/2/2017	835H	20.2	820	0.870	40.062	0.899	41.578	-3.23%	-3.65%
			835	0.885	39.863	0.900	41.500	-1.67%	-3.94%
			850	0.900	39.656	0.916	41.500	-1.75%	-4.44%
8/7/2017	835H	21.0	820	0.893	42.634	0.899	41.578	-0.67%	2.54%
			835	0.908	42.461	0.900	41.500	0.89%	2.32%
			850	0.921	42.281	0.916	41.500	0.55%	1.88%
7/26/2017	1750H	20.0	1710	1.369	39.841	1.348	40.142	1.56%	-0.75%
			1750	1.407	39.653	1.371	40.079	2.63%	-1.06%
			1790	1.450	39.457	1.394	40.016	4.02%	-1.40%
7/24/2017	1900H	22.7	1850	1.395	40.279	1.400	40.000	-0.36%	0.70%
			1880	1.435	40.128	1.400	40.000	2.50%	0.32%
			1910	1.464	40.013	1.400	40.000	4.57%	0.03%
8/9/2017	1900H	21.5	1850	1.378	39.824	1.400	40.000	-1.57%	-0.44%
			1880	1.418	39.726	1.400	40.000	1.29%	-0.69%
			1910	1.447	39.557	1.400	40.000	3.36%	-1.11%
7/26/2017	2450H	22.7	2400	1.825	38.609	1.756	39.289	3.93%	-1.73%
			2450	1.877	38.446	1.800	39.200	4.28%	-1.92%
			2500	1.938	38.233	1.855	39.136	4.47%	-2.31%
			2550	1.992	38.072	1.909	39.073	4.35%	-2.56%
			2600	2.046	37.849	1.964	39.009	4.18%	-2.97%
			2650	2.109	37.672	2.018	38.945	4.51%	-3.27%
			2700	2.159	37.463	2.073	38.882	4.15%	-3.65%
7/31/2017	2450H	21.6	2400	1.812	39.268	1.756	39.289	3.19%	-0.05%
			2450	1.865	39.092	1.800	39.200	3.61%	-0.28%
			2500	1.927	38.894	1.855	39.136	3.88%	-0.62%
			2550	1.988	38.732	1.909	39.073	4.14%	-0.87%
07/31/2017	5200H-5800H	21.5	5180	4.481	35.927	4.635	36.009	-3.32%	-0.23%
			5200	4.510	35.908	4.655	35.986	-3.11%	-0.22%
			5220	4.522	35.871	4.676	35.963	-3.29%	-0.26%
			5240	4.552	35.877	4.696	35.940	-3.07%	-0.18%
			5260	4.600	35.828	4.717	35.917	-2.48%	-0.25%
			5280	4.606	35.771	4.737	35.894	-2.77%	-0.34%
			5300	4.598	35.817	4.758	35.871	-3.36%	-0.15%
			5320	4.616	35.755	4.778	35.849	-3.39%	-0.26%
			5500	4.805	35.541	4.963	35.643	-3.18%	-0.29%
			5520	4.821	35.469	4.983	35.620	-3.25%	-0.42%
			5540	4.832	35.468	5.004	35.597	-3.44%	-0.36%
			5560	4.860	35.457	5.024	35.574	-3.26%	-0.33%
			5580	4.889	35.428	5.045	35.551	-3.09%	-0.35%
			5600	4.913	35.421	5.065	35.529	-3.00%	-0.30%
			5620	4.921	35.411	5.086	35.506	-3.24%	-0.27%
			5640	4.964	35.275	5.106	35.483	-2.78%	-0.59%
			5660	4.952	35.280	5.127	35.460	-3.41%	-0.51%
			5680	4.995	35.311	5.147	35.437	-2.95%	-0.36%
			5700	5.018	35.225	5.168	35.414	-2.90%	-0.53%
			5745	5.078	35.166	5.214	35.363	-2.61%	-0.56%
			5765	5.087	35.252	5.234	35.340	-2.81%	-0.25%
			5785	5.099	35.208	5.255	35.317	-2.97%	-0.31%
			5800	5.127	35.141	5.270	35.300	-2.71%	-0.45%
			5805	5.124	35.084	5.275	35.294	-2.86%	-0.60%
			5825	5.144	35.095	5.296	35.271	-2.87%	-0.50%

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
8/4/2017	750B	20.6	700	0.919	56.266	0.959	55.726	-4.17%	0.97%
			710	0.931	56.158	0.960	55.687	-3.02%	0.85%
			720	0.939	56.032	0.961	55.648	-2.29%	0.69%
			725	0.944	55.993	0.961	55.629	-1.77%	0.65%
			740	0.957	55.831	0.963	55.570	-0.62%	0.47%
			755	0.970	55.661	0.964	55.512	0.62%	0.27%
			770	0.984	55.473	0.965	55.453	1.97%	0.04%
			785	1.002	55.334	0.966	55.395	3.73%	-0.11%
8/6/2017	835B	20.2	820	0.961	52.799	0.969	55.258	-0.83%	-4.45%
			835	0.977	52.650	0.970	55.200	0.72%	-4.62%
			850	0.992	52.501	0.988	55.154	0.40%	-4.81%
8/14/2017	835B	19.1	820	0.956	52.878	0.969	55.258	-1.34%	-4.31%
			835	0.970	52.719	0.970	55.200	0.00%	-4.49%
			850	0.986	52.571	0.988	55.154	-0.20%	-4.68%
7/27/2017	1750B	21.5	1710	1.463	51.569	1.463	53.537	0.00%	-3.68%
			1750	1.505	51.397	1.488	53.432	1.14%	-3.81%
			1790	1.550	51.246	1.514	53.326	2.38%	-3.90%
7/29/2017	1900B	21.8	1850	1.503	52.410	1.520	53.300	-1.12%	-1.67%
			1880	1.539	52.276	1.520	53.300	1.25%	-1.92%
			1910	1.571	52.170	1.520	53.300	3.36%	-2.12%
7/31/2017	1900B	21.9	1850	1.520	53.355	1.520	53.300	0.00%	0.10%
			1880	1.556	53.270	1.520	53.300	2.37%	-0.06%
			1910	1.590	53.182	1.520	53.300	4.61%	-0.22%
7/31/2017	2450B	22.5	2400	1.972	52.924	1.902	52.767	3.68%	0.30%
			2450	2.036	52.738	1.950	52.700	4.41%	0.07%
			2500	2.108	52.548	2.021	52.636	4.30%	-0.17%
			2550	2.177	52.390	2.092	52.573	4.06%	-0.35%
			2600	2.242	52.155	2.163	52.509	3.65%	-0.67%
			2650	2.325	51.987	2.234	52.445	4.07%	-0.87%
			2700	2.383	51.794	2.305	52.382	3.38%	-1.12%
8/3/2017	2450B	23.0	2400	1.939	52.211	1.902	52.767	1.95%	-1.05%
			2450	2.008	52.040	1.950	52.700	2.97%	-1.25%
			2500	2.074	51.836	2.021	52.636	2.62%	-1.52%
			2550	2.144	51.671	2.092	52.573	2.49%	-1.72%
			2600	2.211	51.472	2.163	52.509	2.22%	-1.97%
			2650	2.275	51.315	2.234	52.445	1.84%	-2.15%
			2700	2.347	51.104	2.305	52.382	1.82%	-2.44%
8/5/2017	2450B	22.6	2400	1.964	51.575	1.902	52.767	3.26%	-2.26%
			2450	2.022	51.484	1.950	52.700	3.69%	-2.31%
			2500	2.106	51.230	2.021	52.636	4.21%	-2.67%
			2550	2.166	51.043	2.092	52.573	3.54%	-2.91%
			2600	2.244	50.786	2.163	52.509	3.74%	-3.28%
07/31/2017	5200B-5800B	21.9	5180	5.332	47.906	5.276	49.041	1.06%	-2.31%
			5200	5.351	47.862	5.299	49.014	0.98%	-2.35%
			5220	5.375	47.819	5.323	48.987	0.98%	-2.38%
			5240	5.411	47.779	5.346	48.960	1.22%	-2.41%
			5260	5.446	47.792	5.369	48.933	1.43%	-2.33%
			5280	5.466	47.709	5.393	48.906	1.35%	-2.45%
			5300	5.491	47.657	5.416	48.879	1.38%	-2.50%
			5320	5.517	47.659	5.439	48.851	1.43%	-2.44%
			5500	5.733	47.358	5.650	48.607	1.47%	-2.57%
			5520	5.760	47.313	5.673	48.580	1.53%	-2.61%
			5540	5.793	47.249	5.696	48.553	1.70%	-2.69%
			5560	5.829	47.228	5.720	48.526	1.91%	-2.67%
			5580	5.860	47.196	5.743	48.499	2.04%	-2.69%
			5600	5.894	47.157	5.766	48.471	2.22%	-2.71%
			5620	5.930	47.121	5.790	48.444	2.42%	-2.73%
			5640	5.962	47.105	5.813	48.417	2.56%	-2.71%
			5660	5.977	47.086	5.837	48.390	2.40%	-2.69%
			5680	5.992	47.051	5.860	48.363	2.25%	-2.71%
			5700	6.024	47.019	5.883	48.336	2.40%	-2.72%
			5745	6.097	46.970	5.936	48.275	2.71%	-2.70%
			5765	6.130	46.941	5.959	48.248	2.87%	-2.71%
			5785	6.150	46.927	5.982	48.220	2.81%	-2.68%
			5800	6.161	46.867	6.000	48.200	2.68%	-2.77%
			5805	6.172	46.839	6.006	48.193	2.76%	-2.81%
			5825	6.206	46.803	6.029	48.166	2.94%	-2.83%

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

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)	$Deviation_{1g}$ (%)
J	750	HEAD	07/24/2017	20.7	20.5	0.200	1054	3209	1.650	8.370	8.250	-1.43%
K	835	HEAD	08/02/2017	22.1	20.2	0.200	4d119	7406	1.960	9.460	9.800	3.59%
K	835	HEAD	08/07/2017	22.4	21.5	0.200	4d132	7406	1.920	9.520	9.600	0.84%
H	1750	HEAD	07/26/2017	22.3	20.0	0.100	1092	3318	3.700	36.400	37.000	1.65%
H	1900	HEAD	07/24/2017	22.6	22.7	0.100	5d026	3318	4.180	39.300	41.800	6.36%
H	1900	HEAD	08/09/2017	22.2	21.5	0.100	5d148	3318	4.090	40.200	40.900	1.74%
I	2450	HEAD	07/31/2017	22.1	21.6	0.100	797	3213	5.500	52.100	55.000	5.57%
I	2600	HEAD	07/26/2017	21.7	21.7	0.100	1071	3213	5.870	56.300	58.700	4.26%
H	5250	HEAD	07/31/2017	21.1	20.0	0.050	1237	3914	3.870	79.200	77.400	-2.27%
H	5600	HEAD	07/31/2017	21.1	20.0	0.050	1237	3914	4.050	83.300	81.000	-2.76%
H	5750	HEAD	07/31/2017	21.1	20.0	0.050	1237	3914	4.000	81.500	80.000	-1.84%
J	750	BODY	08/04/2017	20.7	20.6	0.200	1034	3209	1.710	8.710	8.550	-1.84%
I	835	BODY	08/06/2017	21.9	20.2	0.200	4d180	3213	1.980	9.610	9.900	3.02%
I	835	BODY	08/14/2017	19.9	19.1	0.200	4d180	3213	2.020	9.610	10.100	5.10%
K	1750	BODY	07/27/2017	22.4	21.5	0.100	1092	7406	3.880	37.000	38.800	4.86%
J	1900	BODY	07/29/2017	21.5	21.0	0.100	5d026	3209	3.970	40.300	39.700	-1.49%
J	1900	BODY	07/31/2017	21.3	21.6	0.100	5d026	3209	4.040	40.300	40.400	0.25%
G	2450	BODY	07/31/2017	22.2	21.9	0.100	882	3287	5.430	49.700	54.300	9.26%
G	2450	BODY	08/03/2017	21.7	22.0	0.100	797	3287	5.390	50.700	53.900	6.31%
G	2450	BODY	08/05/2017	22.9	22.5	0.100	797	3287	5.490	50.700	54.900	8.28%
G	2600	BODY	07/31/2017	22.2	21.9	0.100	1071	3287	5.830	54.200	58.300	7.56%
D	5250	BODY	07/31/2017	22.1	21.2	0.050	1123	3589	3.510	75.900	70.200	-7.51%
D	5600	BODY	07/31/2017	22.1	21.2	0.050	1123	3589	3.950	78.900	79.000	0.13%
D	5750	BODY	07/31/2017	22.1	21.2	0.050	1123	3589	3.710	76.300	74.200	-2.75%

Table 10-4
System Verification Results – 10g

SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR_{10g} (W/kg)	1 W Target SAR_{10g} (W/kg)	1 W Normalized SAR_{10g} (W/kg)	$Deviation_{10g}$ (%)
D	5250	BODY	07/31/2017	22.1	21.2	0.050	1123	3589	0.970	21.300	19.400	-8.92%
D	5600	BODY	07/31/2017	22.1	21.2	0.050	1123	3589	1.100	22.100	22.000	-0.45%

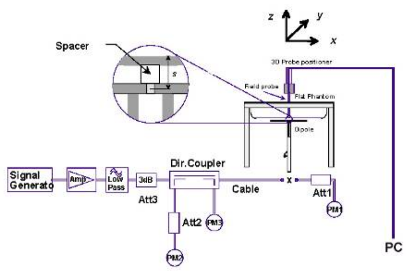


Figure 10-1
System Verification Setup Diagram

Figure 10-2
System Verification Setup Photo

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
CDMA BC10 (§90S) 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)	
820.10	564	CDMA BC10 (§90S)	RC3 / SO55	25.5	25.30	0.00	Right	Cheek	01555	1:1	0.128	1.047	0.134	
820.10	564	CDMA BC10 (§90S)	RC3 / SO55	25.5	25.30	0.02	Right	Tilt	01555	1:1	0.097	1.047	0.102	
820.10	564	CDMA BC10 (§90S)	RC3 / SO55	25.5	25.30	0.05	Left	Cheek	01555	1:1	0.204	1.047	0.214	A1
820.10	564	CDMA BC10 (§90S)	RC3 / SO55	25.5	25.30	0.03	Left	Tilt	01555	1:1	0.094	1.047	0.098	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. A	25.5	25.13	-0.08	Right	Cheek	01569	1:1	0.132	1.089	0.144	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. A	25.5	25.13	0.20	Right	Tilt	01569	1:1	0.099	1.089	0.108	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. A	25.5	25.13	0.04	Left	Cheek	01569	1:1	0.177	1.089	0.193	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. A	25.5	25.13	0.09	Left	Tilt	01569	1:1	0.081	1.089	0.088	
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
CDMA BC0 (§22H) 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)	
836.52	384	CDMA BC0 (§22H)	RC3 / SO55	25.5	25.46	0.14	Right	Cheek	01555	1:1	0.114	1.009	0.115	
836.52	384	CDMA BC0 (§22H)	RC3 / SO55	25.5	25.46	0.06	Right	Tilt	01555	1:1	0.082	1.009	0.083	
836.52	384	CDMA BC0 (§22H)	RC3 / SO55	25.5	25.46	-0.01	Left	Cheek	01555	1:1	0.182	1.009	0.184	A2
836.52	384	CDMA BC0 (§22H)	RC3 / SO55	25.5	25.46	-0.18	Left	Tilt	01555	1:1	0.090	1.009	0.091	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	25.5	25.13	0.13	Right	Cheek	01569	1:1	0.113	1.089	0.123	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	25.5	25.13	0.03	Right	Tilt	01569	1:1	0.091	1.089	0.099	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	25.5	25.13	0.00	Left	Cheek	01569	1:1	0.172	1.089	0.187	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. A	25.5	25.13	-0.10	Left	Tilt	01569	1:1	0.088	1.089	0.096	
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
PCS CDMA 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	600	PCS CDMA	RC3 / SO55	25.2	24.92	0.05	Right	Cheek	01556	1:1	0.158	1.067	0.169	
1880.00	600	PCS CDMA	RC3 / SO55	25.2	24.92	0.11	Right	Tilt	01556	1:1	0.072	1.067	0.077	
1880.00	600	PCS CDMA	RC3 / SO55	25.2	24.92	0.03	Left	Cheek	01556	1:1	0.202	1.067	**0.216**	A3
1880.00	600	PCS CDMA	RC3 / SO55	25.2	24.92	0.07	Left	Tilt	01556	1:1	0.091	1.067	0.097	
1880.00	600	PCS CDMA	EVDO Rev. A	25.2	24.82	0.06	Right	Cheek	01556	1:1	0.166	1.091	0.181	
1880.00	600	PCS CDMA	EVDO Rev. A	25.2	24.82	0.13	Right	Tilt	01556	1:1	0.077	1.091	0.084	
1880.00	600	PCS CDMA	EVDO Rev. A	25.2	24.82	0.06	Left	Cheek	01556	1:1	0.186	1.091	0.203	
1880.00	600	PCS CDMA	EVDO Rev. A	25.2	24.82	0.04	Left	Tilt	01556	1:1	0.099	1.091	0.108	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-4
GSM 850 Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	34.2	34.00	0.05	Right	Cheek	01556	1	1:8.3	0.089	1.047	0.093	
836.60	190	GSM 850	GSM	34.2	34.00	0.04	Right	Tilt	01556	1	1:8.3	0.065	1.047	0.068	
836.60	190	GSM 850	GSM	34.2	34.00	0.04	Left	Cheek	01556	1	1:8.3	0.135	1.047	0.141	A4
836.60	190	GSM 850	GSM	34.2	34.00	0.18	Left	Tilt	01556	1	1:8.3	0.066	1.047	0.069	
836.60	190	GSM 850	GPRS	34.2	34.06	-0.02	Right	Cheek	01556	1	1:8.3	0.083	1.033	0.086	
836.60	190	GSM 850	GPRS	34.2	34.06	0.10	Right	Tilt	01556	1	1:8.3	0.061	1.033	0.063	
836.60	190	GSM 850	GPRS	34.2	34.06	0.12	Left	Cheek	01556	1	1:8.3	0.117	1.033	0.121	
836.60	190	GSM 850	GPRS	34.2	34.06	0.13	Left	Tilt	01556	1	1:8.3	0.057	1.033	0.059	
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
GSM 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	# of Time Slots	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	31.7	31.56	0.03	Right	Cheek	01556	1	1:8.3	0.071	1.033	0.073	
1880.00	661	GSM 1900	GSM	31.7	31.56	0.20	Right	Tilt	01556	1	1:8.3	0.033	1.033	0.034	
1880.00	661	GSM 1900	GSM	31.7	31.56	0.07	Left	Cheek	01556	1	1:8.3	0.075	1.033	0.077	
1880.00	661	GSM 1900	GSM	31.7	31.56	0.19	Left	Tilt	01556	1	1:8.3	0.041	1.033	0.042	
1880.00	661	GSM 1900	GPRS	31.7	31.55	-0.01	Right	Cheek	01556	1	1:8.3	0.075	1.035	0.078	A5
1880.00	661	GSM 1900	GPRS	31.7	31.55	0.06	Right	Tilt	01556	1	1:8.3	0.030	1.035	0.031	
1880.00	661	GSM 1900	GPRS	31.7	31.55	0.02	Left	Cheek	01556	1	1:8.3	0.073	1.035	0.076	
1880.00	661	GSM 1900	GPRS	31.7	31.55	0.06	Left	Tilt	01556	1	1:8.3	0.047	1.035	0.049	
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
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	25.43	-0.01	Right	Cheek	01556	1:1	0.122	1.016	0.124	
836.60	4183	UMTS 850	RMC	25.5	25.43	0.01	Right	Tilt	01556	1:1	0.093	1.016	0.094	
836.60	4183	UMTS 850	RMC	25.5	25.43	-0.04	Left	Cheek	01556	1:1	0.192	1.016	0.195	A6
836.60	4183	UMTS 850	RMC	25.5	25.43	0.03	Left	Tilt	01556	1:1	0.086	1.016	0.087	
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
UMTS 1750 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1732.40	1412	UMTS 1750	RMC	24.7	24.70	0.04	Right	Cheek	01556	1:1	0.145	1.000	0.145	
1732.40	1412	UMTS 1750	RMC	24.7	24.70	0.05	Right	Tilt	01556	1:1	0.072	1.000	0.072	
1732.40	1412	UMTS 1750	RMC	24.7	24.70	0.08	Left	Cheek	01556	1:1	0.161	1.000	0.161	A7
1732.40	1412	UMTS 1750	RMC	24.7	24.70	-0.07	Left	Tilt	01556	1:1	0.090	1.000	0.090	
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
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	24.7	24.66	0.07	Right	Cheek	01556	1:1	0.137	1.009	0.138	A8
1880.00	9400	UMTS 1900	RMC	24.7	24.66	0.02	Right	Tilt	01556	1:1	0.052	1.009	0.052	
1880.00	9400	UMTS 1900	RMC	24.7	24.66	0.01	Left	Cheek	01556	1:1	0.122	1.009	0.123	
1880.00	9400	UMTS 1900	RMC	24.7	24.66	0.11	Left	Tilt	01556	1:1	0.069	1.009	0.070	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-9
LTE Band 12 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	-0.07	0	Right	Cheek	QPSK	1	25	01559	1:1	0.082	1.012	0.083	
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	0.07	1	Right	Cheek	QPSK	25	0	01559	1:1	0.062	1.007	0.062	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	0.00	0	Right	Tilt	QPSK	1	25	01559	1:1	0.056	1.012	0.057	
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	0.11	1	Right	Tilt	QPSK	25	0	01559	1:1	0.041	1.007	0.041	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	-0.08	0	Left	Cheek	QPSK	1	25	01559	1:1	0.115	1.012	0.116	A9
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	0.04	1	Left	Cheek	QPSK	25	0	01559	1:1	0.085	1.007	0.086	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	0.02	0	Left	Tilt	QPSK	1	25	01559	1:1	0.054	1.012	0.055	
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	0.02	1	Left	Tilt	QPSK	25	0	01559	1:1	0.040	1.007	0.040	
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 13 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	0.03	0	Right	Cheek	QPSK	1	25	01559	1:1	0.089	1.007	0.090	
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	0.01	1	Right	Cheek	QPSK	25	0	01559	1:1	0.068	1.005	0.068	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	-0.01	0	Right	Tilt	QPSK	1	25	01559	1:1	0.069	1.007	0.069	
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	-0.04	1	Right	Tilt	QPSK	25	0	01559	1:1	0.052	1.005	0.052	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	-0.01	0	Left	Cheek	QPSK	1	25	01559	1:1	0.121	1.007	0.122	A10
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	0.00	1	Left	Cheek	QPSK	25	0	01559	1:1	0.093	1.005	0.093	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	0.04	0	Left	Tilt	QPSK	1	25	01559	1:1	0.057	1.007	0.057	
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	-0.01	1	Left	Tilt	QPSK	25	0	01559	1:1	0.044	1.005	0.044	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

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

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	0.05	0	Right	Cheek	QPSK	1	0	01558	1:1	0.124	1.002	0.124	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	0.09	1	Right	Cheek	QPSK	36	37	01558	1:1	0.085	1.009	0.086	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	-0.06	0	Right	Tilt	QPSK	1	0	01558	1:1	0.093	1.002	0.093	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	0.03	1	Right	Tilt	QPSK	36	37	01558	1:1	0.067	1.009	0.068	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	-0.12	0	Left	Cheek	QPSK	1	0	01558	1:1	0.157	1.002	0.157	A11
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	-0.02	1	Left	Cheek	QPSK	36	37	01558	1:1	0.123	1.009	0.124	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	0.04	0	Left	Tilt	QPSK	1	0	01558	1:1	0.079	1.002	0.079	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	-0.01	1	Left	Tilt	QPSK	36	37	01558	1:1	0.066	1.009	0.067	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-12
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.7	24.70	0.05	0	Right	Cheek	QPSK	1	0	01558	1:1	0.149	1.000	0.149	A12
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.7	23.50	-0.03	1	Right	Cheek	QPSK	50	25	01558	1:1	0.113	1.047	0.118	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.7	24.70	0.09	0	Right	Tilt	QPSK	1	0	01558	1:1	0.075	1.000	0.075	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.7	23.50	0.10	1	Right	Tilt	QPSK	50	25	01558	1:1	0.056	1.047	0.059	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.7	24.70	-0.02	0	Left	Cheek	QPSK	1	0	01558	1:1	0.143	1.000	0.143	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.7	23.50	0.03	1	Left	Cheek	QPSK	50	25	01558	1:1	0.119	1.047	0.125	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.7	24.70	0.09	0	Left	Tilt	QPSK	1	0	01558	1:1	0.071	1.000	0.071	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.7	23.50	0.10	1	Left	Tilt	QPSK	50	25	01558	1:1	0.058	1.047	0.061	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-13
LTE Band 25 (PCS) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1860.00	26140	Low	LTE Band 25 (PCS)	20	25.2	25.15	-0.03	0	Right	Cheek	QPSK	1	0	01558	1:1	0.125	1.012	0.127	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.11	0.07	1	Right	Cheek	QPSK	50	0	01558	1:1	0.097	1.021	0.099	
1860.00	26140	Low	LTE Band 25 (PCS)	20	25.2	25.15	0.12	0	Right	Tilt	QPSK	1	0	01558	1:1	0.059	1.012	0.060	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.11	0.11	1	Right	Tilt	QPSK	50	0	01558	1:1	0.047	1.021	0.048	
1860.00	26140	Low	LTE Band 25 (PCS)	20	25.2	25.15	0.05	0	Left	Cheek	QPSK	1	0	01558	1:1	0.132	1.012	0.134	A13
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.11	0.02	1	Left	Cheek	QPSK	50	0	01558	1:1	0.096	1.021	0.098	
1860.00	26140	Low	LTE Band 25 (PCS)	20	25.2	25.15	0.10	0	Left	Tilt	QPSK	1	0	01558	1:1	0.079	1.012	0.080	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.11	0.10	1	Left	Tilt	QPSK	50	0	01558	1:1	0.060	1.021	0.061	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-14
LTE Band 41 Head SAR

MEASUREMENT RESULTS																					
1CC Uplink | 2CC 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)	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	24.7	24.20	-0.15	0	Right	Cheek	QPSK	1	0	01559	1:1.58	0.073	1.122	0.082	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.96	0.13	1	Right	Cheek	QPSK	50	25	01559	1:1.58	0.047	1.186	0.056	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	24.7	24.20	0.16	0	Right	Tilt	QPSK	1	0	01559	1:1.58	0.044	1.122	0.049	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.96	0.13	1	Right	Tilt	QPSK	50	25	01559	1:1.58	0.032	1.186	0.038	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	24.7	24.20	0.15	0	Left	Cheek	QPSK	1	0	01559	1:1.58	0.084	1.122	0.094	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.96	0.16	1	Left	Cheek	QPSK	50	25	01559	1:1.58	0.055	1.186	0.065	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	24.7	24.20	0.18	0	Left	Tilt	QPSK	1	0	01559	1:1.58	0.041	1.122	0.046	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.96	0.13	1	Left	Tilt	QPSK	50	25	01559	1:1.58	0.016	1.186	0.019	
2CC Uplink, Power Class 3	PCC	2593.00	40620	Mid	LTE Band 41	20	24.7	24.70	0.06	0	Left	Cheek	QPSK	1	0	01559	1:1.58	0.107	1.000	0.107	A14
	SCC	2573.20	40422	Mid	LTE Band 41	20							QPSK	1	99						
1CC Uplink, Power Class 2	N/A	2593.00	40620	Mid	LTE Band 41	20	27.0	27.00	-0.04	0	Left	Cheek	QPSK	1	0	01559	1:2.31	0.104	1.000	0.104	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-15
DTS 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)	
2437	6	802.11b	DSSS	22	17.0	16.95	-0.17	Right	Cheek	1	01585	1	99.0	0.591	0.463	1.012	1.010	0.473	
2437	6	802.11b	DSSS	22	17.0	16.95	0.07	Right	Tilt	1	01585	1	99.0	0.182	0.142	1.012	1.010	0.145	
2437	6	802.11b	DSSS	22	17.0	16.95	-0.15	Left	Cheek	1	01585	1	99.0	0.115	-	1.012	1.010	-	
2437	6	802.11b	DSSS	22	17.0	16.95	0.14	Left	Tilt	1	01585	1	99.0	0.065	-	1.012	1.010	-	
2437	6	802.11b	DSSS	22	17.0	16.43	0.01	Right	Cheek	2	01585	1	97.4	0.581	0.509	1.140	1.027	**0.596**	A15
2437	6	802.11b	DSSS	22	17.0	16.43	-0.14	Right	Tilt	2	01585	1	97.4	0.511	0.509	1.140	1.027	**0.596**	
2437	6	802.11b	DSSS	22	17.0	16.43	0.10	Left	Cheek	2	01585	1	97.4	0.403	-	1.140	1.027	-	
2437	6	802.11b	DSSS	22	17.0	16.43	0.08	Left	Tilt	2	01585	1	97.4	0.424	-	1.140	1.027	-	
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 11-16
NII Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5280	56	802.11a	OFDM	20	17.0	16.77	0.18	Right	Cheek	1	01585	6	94.5	0.507	0.169	1.054	1.058	0.188	
5280	56	802.11a	OFDM	20	17.0	16.77	0.17	Right	Tilt	1	01585	6	94.5	0.407	-	1.054	1.058	-	
5280	56	802.11a	OFDM	20	17.0	16.77	0.12	Left	Cheek	1	01585	6	94.5	0.162	-	1.054	1.058	-	
5280	56	802.11a	OFDM	20	17.0	16.77	0.13	Left	Tilt	1	01585	6	94.5	0.141	-	1.054	1.058	-	
5320	64	802.11a	OFDM	20	16.5	15.28	0.13	Right	Cheek	2	01585	6	94.5	0.618	0.383	1.324	1.058	0.537	
5320	64	802.11a	OFDM	20	16.5	15.28	0.20	Right	Tilt	2	01585	6	94.5	0.948	0.413	1.324	1.058	**0.579**	A16
5320	64	802.11a	OFDM	20	16.5	15.28	0.19	Left	Cheek	2	01585	6	94.5	0.182	-	1.324	1.058	-	
5320	64	802.11a	OFDM	20	16.5	15.28	0.20	Left	Tilt	2	01585	6	94.5	0.181	-	1.324	1.058	-	
5580	116	802.11a	OFDM	20	17.0	16.71	0.12	Right	Cheek	1	01585	6	94.5	0.478	0.284	1.069	1.058	0.321	
5580	116	802.11a	OFDM	20	17.0	16.71	0.16	Right	Tilt	1	01585	6	94.5	0.404	-	1.069	1.058	-	
5580	116	802.11a	OFDM	20	17.0	16.71	0.11	Left	Cheek	1	01585	6	94.5	0.145	-	1.069	1.058	-	
5580	116	802.11a	OFDM	20	17.0	16.71	0.02	Left	Tilt	1	01585	6	94.5	0.278	-	1.069	1.058	-	
5580	116	802.11a	OFDM	20	16.5	15.77	0.17	Right	Cheek	2	01585	6	94.5	0.358	-	1.183	1.058	-	
5580	116	802.11a	OFDM	20	16.5	15.77	0.20	Right	Tilt	2	01585	6	94.5	0.399	0.172	1.183	1.058	0.215	
5580	116	802.11a	OFDM	20	16.5	15.77	0.15	Left	Cheek	2	01585	6	94.5	0.216	-	1.183	1.058	-	
5580	116	802.11a	OFDM	20	16.5	15.77	0.17	Left	Tilt	2	01585	6	94.5	0.301	-	1.183	1.058	-	
5745	149	802.11a	OFDM	20	17.0	16.59	0.14	Right	Cheek	1	01585	6	94.5	0.541	0.410	1.099	1.058	0.477	
5745	149	802.11a	OFDM	20	17.0	16.59	0.12	Right	Tilt	1	01585	6	94.5	0.524	0.204	1.099	1.058	0.237	
5745	149	802.11a	OFDM	20	17.0	16.59	0.17	Left	Cheek	1	01585	6	94.5	0.171	-	1.099	1.058	-	
5745	149	802.11a	OFDM	20	17.0	16.59	0.14	Left	Tilt	1	01585	6	94.5	0.236	-	1.099	1.058	-	
5745	149	802.11a	OFDM	20	16.5	15.87	0.14	Right	Cheek	2	01585	6	94.5	0.184	-	1.156	1.058	-	
5745	149	802.11a	OFDM	20	16.5	15.87	0.20	Right	Tilt	2	01585	6	94.5	0.121	-	1.156	1.058	-	
5745	149	802.11a	OFDM	20	16.5	15.87	0.20	Left	Cheek	2	01585	6	94.5	0.223	-	1.156	1.058	-	
5745	149	802.11a	OFDM	20	16.5	15.87	0.20	Left	Tilt	2	01585	6	94.5	0.275	0.119	1.156	1.058	0.146	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram											

Table 11-17
Bluetooth Head SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Service	Data Rate (Mbps)	Device Serial Number	Duty Cycle (%)	SAR (1g)	Scaling Factor (Conducted Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441	39	Bluetooth	12.5	11.34	-0.18	Right	Cheek	FHSS	1	01585	77.1	0.114	1.306	1.297	**0.193**	A17
2441	39	Bluetooth	12.5	11.34	0.19	Right	Tilt	FHSS	1	01585	77.1	0.030	1.306	1.297	0.051	
2441	39	Bluetooth	12.5	11.34	-0.14	Left	Cheek	FHSS	1	01585	77.1	0.018	1.306	1.297	0.030	
2441	39	Bluetooth	12.5	11.34	-0.13	Left	Tilt	FHSS	1	01585	77.1	0.011	1.306	1.297	0.019	
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 11-18
GSM/UMTS/CDMA 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)	
820.10	564	CDMA BC10 (§90S)	TDSO / SO32	25.5	25.32	-0.02	10 mm	01555	N/A	1:1	back	0.830	1.042	0.865	A18
820.10	564	CDMA BC10 (§90S)	TDSO / SO32	25.5	25.32	-0.05	10 mm	01555	N/A	1:1	back	0.768	1.042	0.800	
836.52	384	CDMA BC0 (§22H)	TDSO / SO32	25.5	25.37	0.00	10 mm	01555	N/A	1:1	back	0.759	1.030	0.782	A20
1880.00	600	PCS CDMA	TDSO / SO32	25.2	25.05	0.00	10 mm	01555	N/A	1:1	back	0.553	1.035	0.572	A22
836.60	190	GSM 850	GSM	34.2	34.00	0.02	10 mm	01556	1	1:8.3	back	0.492	1.047	0.515	
836.60	190	GSM 850	GPRS	34.2	34.06	-0.01	10 mm	01556	1	1:8.3	back	0.493	1.033	0.509	A24
1880.00	661	GSM 1900	GSM	31.7	31.56	0.02	10 mm	01556	1	1:8.3	back	0.259	1.033	0.268	A25
1880.00	661	GSM 1900	GPRS	31.7	31.55	-0.01	10 mm	01556	1	1:8.3	back	0.248	1.035	0.257	
836.60	4183	UMTS 850	RMC	25.5	25.43	0.00	10 mm	01556	N/A	1:1	back	0.786	1.016	0.799	A27
1732.40	1412	UMTS 1750	RMC	24.7	24.70	0.04	10 mm	01556	N/A	1:1	back	0.751	1.000	0.751	A28
1880.00	9400	UMTS 1900	RMC	24.7	24.66	0.00	10 mm	01556	N/A	1:1	back	0.476	1.009	0.480	A29
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram								

Note: Blue entry represents variability measurement.

Table 11-19
LTE FDD Body-Worn SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	0.01	0	01557	QPSK	1	25	10 mm	back	1:1	0.573	1.012	0.580	A31
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	0.00	1	01557	QPSK	25	0	10 mm	back	1:1	0.387	1.007	0.390	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	-0.02	0	01557	QPSK	1	25	10 mm	back	1:1	0.489	1.007	0.492	A32
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	-0.01	1	01557	QPSK	25	0	10 mm	back	1:1	0.441	1.005	0.443	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	0.04	0	01558	QPSK	1	0	10 mm	back	1:1	0.478	1.002	0.479	A33
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	0.01	1	01558	QPSK	36	37	10 mm	back	1:1	0.461	1.009	0.465	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.7	24.70	-0.02	0	01560	QPSK	1	0	10 mm	back	1:1	0.720	1.000	0.720	A34
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.7	23.50	0.00	1	01560	QPSK	50	25	10 mm	back	1:1	0.534	1.047	0.559	
1860.00	26140	Low	LTE Band 25 (PCS)	20	25.2	25.15	0.03	0	01559	QPSK	1	0	10 mm	back	1:1	0.500	1.012	0.506	A35
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.11	0.06	1	01559	QPSK	50	0	10 mm	back	1:1	0.334	1.021	0.341	
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
LTE TDD Body-Worn SAR

MEASUREMENT RESULTS																						
1CC Uplink | 2CC 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)	
1CC Uplink, Power Class 3	N/A	2506.00	39750	Low	LTE Band 41	20	24.7	23.33	-0.06	0	01559	QPSK	1	99	10 mm	back	1:1.58	0.602	1.371	0.825	
1CC Uplink, Power Class 3	N/A	2549.50	40185	Low-Mid	LTE Band 41	20	24.7	24.08	0.02	0	01559	QPSK	1	0	10 mm	back	1:1.58	0.790	1.153	0.911	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	24.7	24.20	0.11	0	01559	QPSK	1	0	10 mm	back	1:1.58	0.907	1.122	1.018	
2CC Uplink, Power Class 3	PCC	2593.00	40620	Mid	LTE Band 41	20	24.7	24.70	0.08	0	01559	QPSK	1	0	10 mm	back	1:1.58	1.040	1.000	1.040	
	SCC	2573.20	40422	Mid	LTE Band 41	20						QPSK	1	99							
1CC Uplink, Power Class 3	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.7	24.04	0.20	0	01559	QPSK	1	0	10 mm	back	1:1.58	0.849	1.164	0.988	
1CC Uplink, Power Class 3	N/A	2680.00	41490	High	LTE Band 41	20	24.7	23.96	-0.08	0	01559	QPSK	1	0	10 mm	back	1:1.58	0.808	1.186	0.958	
1CC Uplink, Power Class 3	N/A	2506.00	39750	Low	LTE Band 41	20	23.7	22.50	-0.10	1	01559	QPSK	50	25	10 mm	back	1:1.58	0.429	1.318	0.565	
1CC Uplink, Power Class 3	N/A	2549.50	40185	Low-Mid	LTE Band 41	20	23.7	22.88	0.06	1	01559	QPSK	50	25	10 mm	back	1:1.58	0.562	1.208	0.679	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.96	-0.01	1	01559	QPSK	50	25	10 mm	back	1:1.58	0.651	1.186	0.772	
1CC Uplink, Power Class 3	N/A	2636.50	41055	Mid-High	LTE Band 41	20	23.7	22.77	-0.01	1	01559	QPSK	50	25	10 mm	back	1:1.58	0.580	1.239	0.719	
1CC Uplink, Power Class 3	N/A	2680.00	41490	High	LTE Band 41	20	23.7	22.89	-0.03	1	01559	QPSK	50	0	10 mm	back	1:1.58	0.529	1.205	0.637	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.91	0.07	1	01559	QPSK	100	0	10 mm	back	1:1.58	0.633	1.199	0.759	
1CC Uplink, Power Class 2	N/A	2593.00	40620	Mid	LTE Band 41	20	27.0	27.00	-0.06	0	01559	QPSK	1	0	10 mm	back	1:2.31	1.200	1.000	**1.200**	A36
1CC Uplink, Power Class 2	N/A	2593.00	40620	Mid	LTE Band 41	20	27.0	27.00	0.06	0	01559	QPSK	1	0	10 mm	back	1:2.31	1.150	1.000	1.150	
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 11-21
DTS Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2437	6	802.11b	DSSS	22	19.0	18.45	0.03	10 mm	1	01586	1	back	99.0	0.247	0.176	1.135	1.010	**0.202**	
2437	6	802.11b	DSSS	22	18.5	18.47	0.05	10 mm	2	01586	1	back	97.4	0.223	0.194	1.007	1.027	**0.201**	A37
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

Table 11-22
NII SISO Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5280	56	802.11a	OFDM	20	17.0	16.77	0.06	10 mm	1	01586	6	back	94.5	0.820	0.404	1.054	1.058	0.451	
5320	64	802.11a	OFDM	20	16.5	15.28	-0.06	10 mm	2	01586	6	back	94.5	0.805	0.354	1.324	1.058	0.496	
5580	116	802.11a	OFDM	20	17.0	16.71	0.12	10 mm	1	01586	6	back	94.5	1.188	0.555	1.069	1.058	0.628	
5580	116	802.11a	OFDM	20	16.5	15.77	0.03	10 mm	2	01586	6	back	94.5	0.558	0.285	1.183	1.058	0.357	
5745	149	802.11a	OFDM	20	17.0	16.59	0.04	10 mm	1	01586	6	back	94.5	1.355	0.552	1.099	1.058	0.642	
5745	149	802.11a	OFDM	20	16.5	15.87	0.04	10 mm	2	01586	6	back	94.5	0.398	0.172	1.156	1.058	0.210	
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 11-23
NII MIMO Body-Worn SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Ant 1 Maximum Allowed Power [dBm]	Ant 1 Conducted Power [dBm]	Ant 2 Maximum Allowed Power [dBm]	Ant 2 Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															W/kg	(W/kg)			(W/kg)	
5280	56	802.11n	OFDM	20	17.0	16.67	16.5	14.98	0.20	10 mm	MIMO	01586	13	back	95.0	1.217	0.533	1.419	1.053	0.796	
5320	64	802.11n	OFDM	20	17.0	16.61	16.5	15.22	0.14	10 mm	MIMO	01586	13	back	95.0	1.308	0.594	1.343	1.053	0.840	A39
5580	116	802.11n	OFDM	20	17.0	16.59	16.5	15.60	0.13	10 mm	MIMO	01586	13	back	95.0	1.270	0.542	1.230	1.053	0.702	
5745	149	802.11n	OFDM	20	17.0	16.46	16.5	15.67	0.17	10 mm	MIMO	01586	13	back	95.0	1.333	0.585	1.211	1.053	0.746	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram											

To achieve the 19.7 dBm maximum allowed MIMO power shown in the documentation, antenna 1 transmits at a maximum allowed power of 17.0 dBm and antenna 2 transmits at a maximum allowed power of 16.5 dBm.

Table 11-24
Bluetooth 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 (Conducted Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	12.5	11.34	-0.03	10 mm	01586	1	back	77.1	0.020	1.306	1.297	0.034	A41
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 11-25
GPRS/UMTS/CDMA 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)	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. 0	25.5	25.13	-0.04	10 mm	01555	N/A	1:1	back	0.801	1.089	0.872	A19
820.10	564	CDMA BC10 (§90S)	EVDO Rev. 0	25.5	25.13	0.01	10 mm	01555	N/A	1:1	front	0.795	1.089	0.866	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. 0	25.5	25.13	0.00	10 mm	01555	N/A	1:1	bottom	0.449	1.089	0.489	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. 0	25.5	25.13	0.07	10 mm	01555	N/A	1:1	right	0.143	1.089	0.156	
820.10	564	CDMA BC10 (§90S)	EVDO Rev. 0	25.5	25.13	-0.01	10 mm	01555	N/A	1:1	left	0.331	1.089	0.360	
824.70	1013	CDMA BC0 (§22H)	EVDO Rev. 0	25.5	25.18	0.02	10 mm	01555	N/A	1:1	back	0.680	1.076	0.732	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. 0	25.5	25.11	-0.02	10 mm	01555	N/A	1:1	back	0.736	1.094	0.805	
848.31	777	CDMA BC0 (§22H)	EVDO Rev. 0	25.5	25.06	-0.06	10 mm	01555	N/A	1:1	back	0.824	1.107	0.912	A21
836.52	384	CDMA BC0 (§22H)	EVDO Rev. 0	25.5	25.11	0.00	10 mm	01555	N/A	1:1	front	0.717	1.094	0.784	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. 0	25.5	25.11	-0.01	10 mm	01555	N/A	1:1	bottom	0.434	1.094	0.475	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. 0	25.5	25.11	0.01	10 mm	01555	N/A	1:1	right	0.056	1.094	0.061	
836.52	384	CDMA BC0 (§22H)	EVDO Rev. 0	25.5	25.11	-0.03	10 mm	01555	N/A	1:1	left	0.261	1.094	0.286	
1880.00	600	PCS CDMA	EVDO Rev. 0	25.2	24.80	0.03	10 mm	01555	N/A	1:1	back	0.512	1.096	0.561	
1880.00	600	PCS CDMA	EVDO Rev. 0	25.2	24.80	0.04	10 mm	01555	N/A	1:1	front	0.485	1.096	0.532	
1880.00	600	PCS CDMA	EVDO Rev. 0	25.2	24.80	-0.03	10 mm	01555	N/A	1:1	bottom	0.518	1.096	0.568	A23
1880.00	600	PCS CDMA	EVDO Rev. 0	25.2	24.80	-0.06	10 mm	01555	N/A	1:1	left	0.247	1.096	0.271	
836.60	190	GSM 850	GPRS	34.2	34.06	-0.01	10 mm	01556	1	1:8.3	back	0.493	1.033	0.509	A24
836.60	190	GSM 850	GPRS	34.2	34.06	-0.01	10 mm	01556	1	1:8.3	front	0.452	1.033	0.467	
836.60	190	GSM 850	GPRS	34.2	34.06	-0.11	10 mm	01556	1	1:8.3	bottom	0.265	1.033	0.274	
836.60	190	GSM 850	GPRS	34.2	34.06	0.15	10 mm	01556	1	1:8.3	right	0.081	1.033	0.084	
836.60	190	GSM 850	GPRS	34.2	34.06	0.00	10 mm	01556	1	1:8.3	left	0.211	1.033	0.218	
1880.00	661	GSM 1900	GPRS	31.7	31.55	-0.01	10 mm	01556	1	1:8.3	back	0.248	1.035	0.257	
1880.00	661	GSM 1900	GPRS	31.7	31.55	0.05	10 mm	01556	1	1:8.3	front	0.320	1.035	0.331	A26
1880.00	661	GSM 1900	GPRS	31.7	31.55	-0.04	10 mm	01556	1	1:8.3	bottom	0.279	1.035	0.289	
1880.00	661	GSM 1900	GPRS	31.7	31.55	0.00	10 mm	01556	1	1:8.3	left	0.148	1.035	0.153	
836.60	4183	UMTS 850	RMC	25.5	25.43	0.00	10 mm	01556	N/A	1:1	back	0.786	1.016	0.799	A27
836.60	4183	UMTS 850	RMC	25.5	25.43	0.05	10 mm	01556	N/A	1:1	front	0.720	1.016	0.732	
836.60	4183	UMTS 850	RMC	25.5	25.43	-0.03	10 mm	01556	N/A	1:1	bottom	0.388	1.016	0.394	
836.60	4183	UMTS 850	RMC	25.5	25.43	-0.01	10 mm	01556	N/A	1:1	right	0.133	1.016	0.135	
836.60	4183	UMTS 850	RMC	25.5	25.43	0.00	10 mm	01556	N/A	1:1	left	0.322	1.016	0.327	
1732.40	1412	UMTS 1750	RMC	24.7	24.70	0.04	10 mm	01556	N/A	1:1	back	0.751	1.000	0.751	A28
1732.40	1412	UMTS 1750	RMC	24.7	24.70	-0.15	10 mm	01556	N/A	1:1	front	0.712	1.000	0.712	
1732.40	1412	UMTS 1750	RMC	24.7	24.70	-0.06	10 mm	01556	N/A	1:1	bottom	0.585	1.000	0.585	
1732.40	1412	UMTS 1750	RMC	24.7	24.70	0.00	10 mm	01556	N/A	1:1	left	0.266	1.000	0.266	
1880.00	9400	UMTS 1900	RMC	24.7	24.66	0.00	10 mm	01556	N/A	1:1	back	0.476	1.009	0.480	
1880.00	9400	UMTS 1900	RMC	24.7	24.66	-0.02	10 mm	01556	N/A	1:1	front	0.420	1.009	0.424	
1880.00	9400	UMTS 1900	RMC	24.7	24.66	-0.02	10 mm	01556	N/A	1:1	bottom	0.511	1.009	0.516	A30
1880.00	9400	UMTS 1900	RMC	24.7	24.66	-0.06	10 mm	01556	N/A	1:1	left	0.256	1.009	0.258	
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 12 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	0.01	0	01557	QPSK	1	25	10 mm	back	1:1	0.573	1.012	0.580	A31
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	0.00	1	01557	QPSK	25	0	10 mm	back	1:1	0.387	1.007	0.390	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	-0.06	0	01557	QPSK	1	25	10 mm	front	1:1	0.526	1.012	0.532	
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	-0.11	1	01557	QPSK	25	0	10 mm	front	1:1	0.351	1.007	0.353	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	-0.05	0	01557	QPSK	1	25	10 mm	bottom	1:1	0.306	1.012	0.310	
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	-0.08	1	01557	QPSK	25	0	10 mm	bottom	1:1	0.210	1.007	0.211	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	0.06	0	01557	QPSK	1	25	10 mm	right	1:1	0.160	1.012	0.162	
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	0.00	1	01557	QPSK	25	0	10 mm	right	1:1	0.103	1.007	0.104	
707.50	23095	Mid	LTE Band 12	10	25.5	25.45	0.07	0	01557	QPSK	1	25	10 mm	left	1:1	0.141	1.012	0.143	
707.50	23095	Mid	LTE Band 12	10	24.5	24.47	0.10	1	01557	QPSK	25	0	10 mm	left	1:1	0.113	1.007	0.114	
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 13 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	-0.02	0	01557	QPSK	1	25	10 mm	back	1:1	0.489	1.007	0.492	A32
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	-0.01	1	01557	QPSK	25	0	10 mm	back	1:1	0.441	1.005	0.443	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	-0.04	0	01557	QPSK	1	25	10 mm	front	1:1	0.445	1.007	0.448	
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	0.01	1	01557	QPSK	25	0	10 mm	front	1:1	0.391	1.005	0.393	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	-0.12	0	01557	QPSK	1	25	10 mm	bottom	1:1	0.276	1.007	0.278	
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	-0.08	1	01557	QPSK	25	0	10 mm	bottom	1:1	0.221	1.005	0.222	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	-0.06	0	01557	QPSK	1	25	10 mm	right	1:1	0.098	1.007	0.099	
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	-0.03	1	01557	QPSK	25	0	10 mm	right	1:1	0.075	1.005	0.075	
782.00	23230	Mid	LTE Band 13	10	25.5	25.47	-0.01	0	01557	QPSK	1	25	10 mm	left	1:1	0.214	1.007	0.215	
782.00	23230	Mid	LTE Band 13	10	24.5	24.48	-0.05	1	01557	QPSK	25	0	10 mm	left	1:1	0.176	1.005	0.177	
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 26 (Cell) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	0.04	0	01558	QPSK	1	0	10 mm	back	1:1	0.478	1.002	0.479	A33
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	0.01	1	01558	QPSK	36	37	10 mm	back	1:1	0.461	1.009	0.465	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	0.04	0	01558	QPSK	1	0	10 mm	front	1:1	0.471	1.002	0.472	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	-0.01	1	01558	QPSK	36	37	10 mm	front	1:1	0.462	1.009	0.466	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	-0.06	0	01558	QPSK	1	0	10 mm	bottom	1:1	0.289	1.002	0.290	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	-0.05	1	01558	QPSK	36	37	10 mm	bottom	1:1	0.275	1.009	0.277	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	0.07	0	01558	QPSK	1	0	10 mm	right	1:1	0.084	1.002	0.084	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	-0.03	1	01558	QPSK	36	37	10 mm	right	1:1	0.082	1.009	0.083	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.5	25.49	-0.01	0	01558	QPSK	1	0	10 mm	left	1:1	0.201	1.002	0.201	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.5	24.46	0.03	1	01558	QPSK	36	37	10 mm	left	1:1	0.199	1.009	0.201	
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 4 (AWS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.7	24.70	-0.02	0	01560	QPSK	1	0	10 mm	back	1:1	0.720	1.000	0.720	A34
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.7	23.50	0.00	1	01560	QPSK	50	25	10 mm	back	1:1	0.534	1.047	0.559	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.7	24.70	0.01	0	01560	QPSK	1	0	10 mm	front	1:1	0.686	1.000	0.686	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.7	23.50	0.04	1	01560	QPSK	50	25	10 mm	front	1:1	0.508	1.047	0.532	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.7	24.70	0.02	0	01560	QPSK	1	0	10 mm	bottom	1:1	0.509	1.000	0.509	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.7	23.50	-0.07	1	01560	QPSK	50	25	10 mm	bottom	1:1	0.427	1.047	0.447	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.7	24.70	-0.07	0	01560	QPSK	1	0	10 mm	left	1:1	0.256	1.000	0.256	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.7	23.50	-0.03	1	01560	QPSK	50	25	10 mm	left	1:1	0.205	1.047	0.215	
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
LTE Band 25 (PCS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																		
1860.00	26140	Low	LTE Band 25 (PCS)	20	25.2	25.15	0.03	0	01559	QPSK	1	0	10 mm	back	1:1	0.500	1.012	0.506	A35
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.11	0.06	1	01559	QPSK	50	0	10 mm	back	1:1	0.334	1.021	0.341	
1860.00	26140	Low	LTE Band 25 (PCS)	20	25.2	25.15	-0.01	0	01559	QPSK	1	0	10 mm	front	1:1	0.428	1.012	0.433	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.11	0.05	1	01559	QPSK	50	0	10 mm	front	1:1	0.327	1.021	0.334	
1860.00	26140	Low	LTE Band 25 (PCS)	20	25.2	25.15	-0.03	0	01559	QPSK	1	0	10 mm	bottom	1:1	0.418	1.012	0.423	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.11	-0.02	1	01559	QPSK	50	0	10 mm	bottom	1:1	0.355	1.021	0.362	
1860.00	26140	Low	LTE Band 25 (PCS)	20	25.2	25.15	0.06	0	01559	QPSK	1	0	10 mm	left	1:1	0.245	1.012	0.248	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	24.2	24.11	0.02	1	01559	QPSK	50	0	10 mm	left	1:1	0.181	1.021	0.185	
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 11-31
LTE Band 41 Hotspot SAR

MEASUREMENT RESULTS																					
1CC Uplink | 2CC 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)	
1CC Uplink, Power Class 3	N/A	2506.00	39750	Low	LTE Band 41	20	24.7	23.33	-0.06	0	01559	QPSK	1	99	10 mm	back	1:1.58	0.602	1.371	0.825	
1CC Uplink, Power Class 3	N/A	2549.50	40185	Low-Mid	LTE Band 41	20	24.7	24.08	0.02	0	01559	QPSK	1	0	10 mm	back	1:1.58	0.790	1.153	0.911	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	24.7	24.20	0.11	0	01559	QPSK	1	0	10 mm	back	1:1.58	0.907	1.122	1.018	
2CC Uplink, Power Class 3	PCC	2593.00	40620	Mid	LTE Band 41	20	24.7	24.70	0.08	0	01559	QPSK	1	0	10 mm	back	1:1.58	1.040	1.000	1.040	
	SCC	2573.20	40422	Mid	LTE Band 41	20						QPSK	1	99							
1CC Uplink, Power Class 3	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.7	24.04	0.20	0	01559	QPSK	1	0	10 mm	back	1:1.58	0.849	1.164	0.988	
1CC Uplink, Power Class 3	N/A	2680.00	41490	High	LTE Band 41	20	24.7	23.96	-0.08	0	01559	QPSK	1	0	10 mm	back	1:1.58	0.808	1.186	0.958	
1CC Uplink, Power Class 3	N/A	2506.00	39750	Low	LTE Band 41	20	23.7	22.50	-0.10	1	01559	QPSK	50	25	10 mm	back	1:1.58	0.429	1.318	0.565	
1CC Uplink, Power Class 3	N/A	2549.50	40185	Low-Mid	LTE Band 41	20	23.7	22.88	0.06	1	01559	QPSK	50	25	10 mm	back	1:1.58	0.562	1.208	0.679	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.96	-0.01	1	01559	QPSK	50	25	10 mm	back	1:1.58	0.651	1.186	0.772	
1CC Uplink, Power Class 3	N/A	2636.50	41055	Mid-High	LTE Band 41	20	23.7	22.77	-0.01	1	01559	QPSK	50	25	10 mm	back	1:1.58	0.580	1.239	0.719	
1CC Uplink, Power Class 3	N/A	2680.00	41490	High	LTE Band 41	20	23.7	22.89	-0.03	1	01559	QPSK	50	0	10 mm	back	1:1.58	0.529	1.205	0.637	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.91	0.07	1	01559	QPSK	100	0	10 mm	back	1:1.58	0.633	1.199	0.759	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	24.7	24.20	0.04	0	01559	QPSK	1	0	10 mm	front	1:1.58	0.534	1.122	0.599	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.96	0.00	1	01559	QPSK	50	25	10 mm	front	1:1.58	0.369	1.186	0.438	
1CC Uplink, Power Class 3	N/A	2506.00	39750	Low	LTE Band 41	20	24.7	23.33	-0.05	0	01559	QPSK	1	99	10 mm	bottom	1:1.58	0.469	1.371	0.643	
1CC Uplink, Power Class 3	N/A	2549.50	40185	Low-Mid	LTE Band 41	20	24.7	24.08	-0.17	0	01559	QPSK	1	0	10 mm	bottom	1:1.58	0.626	1.153	0.722	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	24.7	24.20	-0.05	0	01559	QPSK	1	0	10 mm	bottom	1:1.58	0.721	1.122	0.809	
1CC Uplink, Power Class 3	N/A	2636.50	41055	Mid-High	LTE Band 41	20	24.7	24.04	-0.14	0	01559	QPSK	1	0	10 mm	bottom	1:1.58	0.595	1.164	0.693	
1CC Uplink, Power Class 3	N/A	2680.00	41490	High	LTE Band 41	20	24.7	23.96	-0.12	0	01559	QPSK	1	0	10 mm	bottom	1:1.58	0.509	1.186	0.604	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.96	0.03	1	01559	QPSK	50	25	10 mm	bottom	1:1.58	0.479	1.186	0.568	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.91	0.00	1	01559	QPSK	100	0	10 mm	bottom	1:1.58	0.479	1.199	0.574	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	24.7	24.20	0.07	0	01559	QPSK	1	0	10 mm	left	1:1.58	0.197	1.122	0.221	
1CC Uplink, Power Class 3	N/A	2593.00	40620	Mid	LTE Band 41	20	23.7	22.96	-0.01	1	01559	QPSK	50	25	10 mm	left	1:1.58	0.134	1.186	0.159	
1CC Uplink, Power Class 2	N/A	2593.00	40620	Mid	LTE Band 41	20	27.0	27.00	-0.06	0	01559	QPSK	1	0	10 mm	back	1:2.31	1.200	1.000	**1.200**	A36
1CC Uplink, Power Class 2	N/A	2593.00	40620	Mid	LTE Band 41	20	27.0	27.00	0.06	0	01559	QPSK	1	0	10 mm	back	1:2.31	1.150	1.000	1.150	
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 11-32
WLAN SISO Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2437	6	802.11b	DSSS	22	19.0	18.45	0.03	10 mm	1	01586	1	back	99.0	0.247	0.176	1.135	1.010	0.202	
2437	6	802.11b	DSSS	22	19.0	18.45	0.15	10 mm	1	01586	1	front	99.0	0.225	-	1.135	1.010	-	
2437	6	802.11b	DSSS	22	19.0	18.45	-0.07	10 mm	1	01586	1	top	99.0	0.053	-	1.135	1.010	-	
2437	6	802.11b	DSSS	22	19.0	18.45	-0.15	10 mm	1	01586	1	left	99.0	0.213	-	1.135	1.010	-	
2437	6	802.11b	DSSS	22	18.5	18.47	0.05	10 mm	2	01586	1	back	97.4	0.223	0.194	1.007	1.027	0.201	
2437	6	802.11b	DSSS	22	18.5	18.47	0.18	10 mm	2	01586	1	front	97.4	0.205	-	1.007	1.027	-	
2437	6	802.11b	DSSS	22	18.5	18.47	0.01	10 mm	2	01586	1	top	97.4	0.256	0.206	1.007	1.027	0.213	A38
2437	6	802.11b	DSSS	22	18.5	18.47	0.12	10 mm	2	01586	1	left	97.4	0.029	-	1.007	1.027	-	
5180	36	802.11a	OFDM	20	17.0	16.63	0.15	10 mm	1	01586	6	back	94.5	0.658	0.329	1.089	1.058	0.379	
5180	36	802.11a	OFDM	20	17.0	16.63	0.20	10 mm	1	01586	6	front	94.5	0.077	-	1.089	1.058	-	
5180	36	802.11a	OFDM	20	17.0	16.63	-0.19	10 mm	1	01586	6	top	94.5	0.131	-	1.089	1.058	-	
5180	36	802.11a	OFDM	20	17.0	16.63	0.20	10 mm	1	01586	6	left	94.5	0.463	-	1.089	1.058	-	
5240	48	802.11a	OFDM	20	16.5	14.99	0.00	10 mm	2	01586	6	back	94.5	0.629	0.298	1.416	1.058	0.446	
5240	48	802.11a	OFDM	20	16.5	14.99	0.20	10 mm	2	01586	6	front	94.5	0.088	-	1.416	1.058	-	
5240	48	802.11a	OFDM	20	16.5	14.99	-0.03	10 mm	2	01586	6	top	94.5	0.244	0.105	1.416	1.058	0.157	
5240	48	802.11a	OFDM	20	16.5	14.99	0.00	10 mm	2	01586	6	left	94.5	0.142	-	1.416	1.058	-	
5745	149	802.11a	OFDM	20	17.0	16.59	0.04	10 mm	1	01586	6	back	94.5	1.355	0.552	1.099	1.058	0.642	
5745	149	802.11a	OFDM	20	17.0	16.59	-0.20	10 mm	1	01586	6	front	94.5	0.169	-	1.099	1.058	-	
5745	149	802.11a	OFDM	20	17.0	16.59	-0.20	10 mm	1	01586	6	top	94.5	0.189	-	1.099	1.058	-	
5745	149	802.11a	OFDM	20	17.0	16.59	0.03	10 mm	1	01586	6	left	94.5	0.741	0.317	1.099	1.058	0.369	
5745	149	802.11a	OFDM	20	16.5	15.87	0.04	10 mm	2	01586	6	back	94.5	0.398	0.172	1.156	1.058	0.210	
5745	149	802.11a	OFDM	20	16.5	15.87	0.00	10 mm	2	01586	6	front	94.5	0.015	-	1.156	1.058	-	
5745	149	802.11a	OFDM	20	16.5	15.87	0.20	10 mm	2	01586	6	top	94.5	0.307	-	1.156	1.058	-	
5745	149	802.11a	OFDM	20	16.5	15.87	0.00	10 mm	2	01586	6	left	94.5	0.014	-	1.156	1.058	-	
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 11-33
WLAN MIMO Hotspot SAR

MEASUREMENT RESULTS																					
FREQUENCY		Mode	Service	Bandwidth [MHz]	Ant 1 Maximum Allowed Power [dBm]	Ant 1 Conducted Power [dBm]	Ant 2 Maximum Allowed Power [dBm]	Ant 2 Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															W/kg	(W/kg)			(W/kg)	
5180	36	802.11n	OFDM	20	17.0	16.55	16.5	14.80	0.13	10 mm	MIMO	01586	13	back	95.0	1.028	0.476	1.479	1.053	0.741	
5200	40	802.11n	OFDM	20	17.0	16.55	16.5	14.79	0.14	10 mm	MIMO	01586	13	back	95.0	1.191	0.536	1.483	1.053	0.837	
5200	40	802.11n	OFDM	20	17.0	16.55	16.5	14.79	0.10	10 mm	MIMO	01586	13	front	95.0	0.141	-	1.483	1.053	-	
5200	40	802.11n	OFDM	20	17.0	16.55	16.5	14.79	0.19	10 mm	MIMO	01586	13	top	95.0	0.351	-	1.483	1.053	-	
5200	40	802.11n	OFDM	20	17.0	16.55	16.5	14.79	0.13	10 mm	MIMO	01586	13	left	95.0	0.482	0.220	1.483	1.053	0.344	
5745	149	802.11n	OFDM	20	17.0	16.46	16.5	15.67	0.17	10 mm	MIMO	01586	13	back	95.0	1.333	0.585	1.211	1.053	0.746	A40
5745	149	802.11n	OFDM	20	17.0	16.46	16.5	15.67	0.17	10 mm	MIMO	01586	13	front	95.0	0.141	-	1.211	1.053	-	
5745	149	802.11n	OFDM	20	17.0	16.46	16.5	15.67	0.13	10 mm	MIMO	01586	13	top	95.0	0.316	-	1.211	1.053	-	
5745	149	802.11n	OFDM	20	17.0	16.46	16.5	15.67	0.13	10 mm	MIMO	01586	13	left	95.0	0.710	0.294	1.211	1.053	0.375	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram											

To achieve the 19.7 dBm maximum allowed MIMO power shown in the documentation, antenna 1 transmits at a maximum allowed power of 17.0 dBm and antenna 2 transmits at a maximum allowed power of 16.5 dBm.

Table 11-34
Bluetooth Hotspot SAR

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor (Conducted Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	12.5	11.34	-0.03	10 mm	01586	1	back	77.1	0.020	1.306	1.297	0.034	
2441	39	Bluetooth	FHSS	12.5	11.34	0.20	10 mm	01586	1	front	77.1	0.014	1.306	1.297	0.024	
2441	39	Bluetooth	FHSS	12.5	11.34	-0.11	10 mm	01586	1	top	77.1	0.005	1.306	1.297	0.008	
2441	39	Bluetooth	FHSS	12.5	11.34	0.13	10 mm	01586	1	left	77.1	0.026	1.306	1.297	0.044	A42
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram									

11.4 Standalone Phablet SAR Data

Table 11-35
WLAN Phablet SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (10g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (10g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5280	56	802.11a	OFDM	20	17.0	16.77	0.00	0 mm	1	01586	6	back	94.5	22.269	1.120	1.054	1.058	1.249	
5280	56	802.11a	OFDM	20	17.0	16.77	0.00	0 mm	1	01586	6	front	94.5	1.691	-	1.054	1.058	-	
5280	56	802.11a	OFDM	20	17.0	16.77	0.18	0 mm	1	01586	6	top	94.5	2.410	-	1.054	1.058	-	
5280	56	802.11a	OFDM	20	17.0	16.77	0.00	0 mm	1	01586	6	left	94.5	7.370	0.693	1.054	1.058	0.773	
5320	64	802.11a	OFDM	20	16.5	15.28	0.09	0 mm	2	01586	6	back	94.5	6.715	0.927	1.324	1.058	1.299	
5320	64	802.11a	OFDM	20	16.5	15.28	0.17	0 mm	2	01586	6	front	94.5	1.872	-	1.324	1.058	-	
5320	64	802.11a	OFDM	20	16.5	15.28	-0.01	0 mm	2	01586	6	top	94.5	5.432	0.518	1.324	1.058	0.726	
5320	64	802.11a	OFDM	20	16.5	15.28	0.16	0 mm	2	01586	6	left	94.5	0.625	-	1.324	1.058	-	
5580	116	802.11a	OFDM	20	17.0	16.71	0.02	0 mm	1	01586	6	back	94.5	16.207	1.320	1.069	1.058	1.493	A43
5580	116	802.11a	OFDM	20	17.0	16.71	0.00	0 mm	1	01586	6	front	94.5	1.586	-	1.069	1.058	-	
5580	116	802.11a	OFDM	20	17.0	16.71	-0.17	0 mm	1	01586	6	top	94.5	1.106	-	1.069	1.058	-	
5580	116	802.11a	OFDM	20	17.0	16.71	0.00	0 mm	1	01586	6	left	94.5	8.917	0.871	1.069	1.058	0.985	
5580	116	802.11a	OFDM	20	16.5	15.77	0.06	0 mm	2	01586	6	back	94.5	4.367	0.807	1.183	1.058	1.010	
5580	116	802.11a	OFDM	20	16.5	15.77	0.16	0 mm	2	01586	6	front	94.5	1.103	-	1.183	1.058	-	
5580	116	802.11a	OFDM	20	16.5	15.77	0.19	0 mm	2	01586	6	top	94.5	2.729	0.272	1.183	1.058	0.340	
5580	116	802.11a	OFDM	20	16.5	15.77	0.17	0 mm	2	01586	6	left	94.5	0.215	-	1.183	1.058	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Phablet 4.0 W/kg (mW/g) averaged over 10 grams											

11.5 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 10 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
7. Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
9. During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
10. Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

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 then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.
4. GPRS was additionally evaluated for head and body-worn exposure conditions to address possible VoIP scenarios.

CDMA Notes:

1. Head SAR for CDMA2000 mode was tested under RC3/SO55 per FCC KDB Publication 941225 D01v03r01.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. EVDO Rev0 and RevA and TDSO / SO32 FCH+SCH SAR tests were not required per the 3G SAR Test Reduction Procedure in FCC KDB Publication 941225 D01v03r01.
3. CDMA Wireless Router SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 according to KDB 941225 D01v03r01 procedures for data devices. Wireless Router SAR tests for Subtype 2 of Rev.A and 1x RTT configurations were not required per the 3G SAR Test Reduction Policy in KDB Publication 941225 D01v03r01.

4. Head SAR was additionally evaluated using EVDO Rev. A to determine compliance for VoIP operations.
5. 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 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.
6. CDMA 1x Advanced technology was not required for SAR testing since the maximum allowed output powers for 1x Advanced was not more than 0.25 dB higher than the maximum allowed powers for 1x.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSDPA 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 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 8.6.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC KDB Publication 447498 D01v06, when the reported (scaled) for LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg, 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 LTE CA operations was not needed since the maximum average output power in LTE CA mode was not >0.25 dB higher than the maximum output power when downlink carrier aggregation was inactive.
7. This device supports Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operations is 43.3 % using UL-DL configuration 1. Per FCC Guidance, all SAR tests were performed using Power Class 3. SAR with Power Class 2 at the highest available duty factor was additionally performed for the Power Class 3 configuration with the highest SAR among all exposure condition. Please see Section 14 for linearity results.
8. 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, 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 8.7.5 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. See Section 8.7.6 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. Please see Section 12 for complete analysis. Per KDB Publication 248227 D01v02r02, MIMO SAR was measured with both antennas transmitting simultaneously at the specified maximum output power in MIMO mode following the initial test configuration procedures.
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 or all test channels were measured.
6. When 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.
7. 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 9.6 for the timedomain plot and calculation for the duty factor of the device.

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 1-g 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 1-g or 10-g SAR.

Main antenna SAR testing was not required for phablet exposure conditions per FCC KDB 648474 D04v01r03. Therefore, no further analysis was required to determine that possible simultaneous scenarios would not exceed the SAR limit.

12.3 Head SAR Simultaneous Transmission Analysis

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Head SAR	CDMA/EVDO BC10 (§90S)	0.214	0.473	0.596	0.687	0.810	1.283
	CDMA/EVDO BC0 (§22H)	0.187	0.473	0.596	0.660	0.783	1.256
	PCS CDMA/EVDO	0.216	0.473	0.596	0.689	0.812	**1.285**
	GSM/GPRS 850	0.141	0.473	0.596	0.614	0.737	1.210
	GSM/GPRS 1900	0.078	0.473	0.596	0.551	0.674	1.147
	UMTS 850	0.195	0.473	0.596	0.668	0.791	1.264
	UMTS 1750	0.161	0.473	0.596	0.634	0.757	1.230
	UMTS 1900	0.138	0.473	0.596	0.611	0.734	1.207
	LTE Band 12	0.116	0.473	0.596	0.589	0.712	1.185
	LTE Band 13	0.122	0.473	0.596	0.595	0.718	1.191
	LTE Band 26 (Cell)	0.157	0.473	0.596	0.630	0.753	1.226
	LTE Band 4 (AWS)	0.149	0.473	0.596	0.622	0.745	1.218
	LTE Band 25 (PCS)	0.134	0.473	0.596	0.607	0.730	1.203
	LTE Band 41	0.107	0.473	0.596	0.580	0.703	1.176

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Head SAR	CDMA/EVDO BC10 (§90S)	0.214	0.477	0.579	0.691	0.793	1.270
	CDMA/EVDO BC0 (§22H)	0.187	0.477	0.579	0.664	0.766	1.243
	PCS CDMA/EVDO	0.216	0.477	0.579	0.693	0.795	**1.272**
	GSM/GPRS 850	0.141	0.477	0.579	0.618	0.720	1.197
	GSM/GPRS 1900	0.078	0.477	0.579	0.555	0.657	1.134
	UMTS 850	0.195	0.477	0.579	0.672	0.774	1.251
	UMTS 1750	0.161	0.477	0.579	0.638	0.740	1.217
	UMTS 1900	0.138	0.477	0.579	0.615	0.717	1.194
	LTE Band 12	0.116	0.477	0.579	0.593	0.695	1.172
	LTE Band 13	0.122	0.477	0.579	0.599	0.701	1.178
	LTE Band 26 (Cell)	0.157	0.477	0.579	0.634	0.736	1.213
	LTE Band 4 (AWS)	0.149	0.477	0.579	0.626	0.728	1.205
	LTE Band 25 (PCS)	0.134	0.477	0.579	0.611	0.713	1.190
	LTE Band 41	0.107	0.477	0.579	0.584	0.686	1.163

Table 12-3
Simultaneous Transmission Scenario with 2.4 GHz Ant 1 & 5 GHz Ant 2 WLAN (Held to Ear)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 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	CDMA/EVDO BC10 (§90S)	0.214	0.473	0.579	0.687	0.793	1.266
	CDMA/EVDO BC0 (§22H)	0.187	0.473	0.579	0.660	0.766	1.239
	PCS CDMA/EVDO	0.216	0.473	0.579	0.689	0.795	**1.268**
	GSM/GPRS 850	0.141	0.473	0.579	0.614	0.720	1.193
	GSM/GPRS 1900	0.078	0.473	0.579	0.551	0.657	1.130
	UMTS 850	0.195	0.473	0.579	0.668	0.774	1.247
	UMTS 1750	0.161	0.473	0.579	0.634	0.740	1.213
	UMTS 1900	0.138	0.473	0.579	0.611	0.717	1.190
	LTE Band 12	0.116	0.473	0.579	0.589	0.695	1.168
	LTE Band 13	0.122	0.473	0.579	0.595	0.701	1.174
	LTE Band 26 (Cell)	0.157	0.473	0.579	0.630	0.736	1.209
	LTE Band 4 (AWS)	0.149	0.473	0.579	0.622	0.728	1.201
	LTE Band 25 (PCS)	0.134	0.473	0.579	0.607	0.713	1.186
	LTE Band 41	0.107	0.473	0.579	0.580	0.686	1.159

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	CDMA/EVDO BC10 (§90S)	0.214	0.193	0.407
	CDMA/EVDO BC0 (§22H)	0.187	0.193	0.380
	PCS CDMA/EVDO	0.216	0.193	**0.409**
	GSM/GPRS 850	0.141	0.193	0.334
	GSM/GPRS 1900	0.078	0.193	0.271
	UMTS 850	0.195	0.193	0.388
	UMTS 1750	0.161	0.193	0.354
	UMTS 1900	0.138	0.193	0.331
	LTE Band 12	0.116	0.193	0.309
	LTE Band 13	0.122	0.193	0.315
	LTE Band 26 (Cell)	0.157	0.193	0.350
	LTE Band 4 (AWS)	0.149	0.193	0.342
	LTE Band 25 (PCS)	0.134	0.193	0.327
	LTE Band 41	0.107	0.193	0.300

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-5
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)			SPLSR		
		1	2	3	1+2	1+3	1+2+3	1+2	1+3	2+3
Body-Worn	CDMA BC10 (§90S)	0.865	0.202	0.201	1.067	1.066	1.268	N/A	N/A	N/A
	CDMA BC0 (§22H)	0.782	0.202	0.201	0.984	0.983	1.185	N/A	N/A	N/A
	PCS CDMA	0.572	0.202	0.201	0.774	0.773	0.975	N/A	N/A	N/A
	GSM/GPRS 850	0.515	0.202	0.201	0.717	0.716	0.918	N/A	N/A	N/A
	GSM/GPRS 1900	0.268	0.202	0.201	0.470	0.469	0.671	N/A	N/A	N/A
	UMTS 850	0.799	0.202	0.201	1.001	1.000	1.202	N/A	N/A	N/A
	UMTS 1750	0.751	0.202	0.201	0.953	0.952	1.154	N/A	N/A	N/A
	UMTS 1900	0.480	0.202	0.201	0.682	0.681	0.883	N/A	N/A	N/A
	LTE Band 12	0.580	0.202	0.201	0.782	0.781	0.983	N/A	N/A	N/A
	LTE Band 13	0.492	0.202	0.201	0.694	0.693	0.895	N/A	N/A	N/A
	LTE Band 26 (Cell)	0.479	0.202	0.201	0.681	0.680	0.882	N/A	N/A	N/A
	LTE Band 4 (AWS)	0.720	0.202	0.201	0.922	0.921	1.123	N/A	N/A	N/A
	LTE Band 25 (PCS)	0.506	0.202	0.201	0.708	0.707	0.909	N/A	N/A	N/A
	LTE Band 41	1.200	0.202	0.201	**1.402**	1.401	See Note 1	0.01	0.01	0.01

Table 12-6
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn 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)		SPLSR	
		1	2	3	1+2	1+3	1+2	1+3
Body-Worn	CDMA BC10 (§90S)	0.865	0.642	0.496	**1.507**	1.361	N/A	N/A
	CDMA BC0 (§22H)	0.782	0.642	0.496	1.424	1.278	N/A	N/A
	PCS CDMA	0.572	0.642	0.496	1.214	1.068	N/A	N/A
	GSM/GPRS 850	0.515	0.642	0.496	1.157	1.011	N/A	N/A
	GSM/GPRS 1900	0.268	0.642	0.496	0.910	0.764	N/A	N/A
	UMTS 850	0.799	0.642	0.496	1.441	1.295	N/A	N/A
	UMTS 1750	0.751	0.642	0.496	1.393	1.247	N/A	N/A
	UMTS 1900	0.480	0.642	0.496	1.122	0.976	N/A	N/A
	LTE Band 12	0.580	0.642	0.496	1.222	1.076	N/A	N/A
	LTE Band 13	0.492	0.642	0.496	1.134	0.988	N/A	N/A
	LTE Band 26 (Cell)	0.479	0.642	0.496	1.121	0.975	N/A	N/A
	LTE Band 4 (AWS)	0.720	0.642	0.496	1.362	1.216	N/A	N/A
	LTE Band 25 (PCS)	0.506	0.642	0.496	1.148	1.002	N/A	N/A
	LTE Band 41	1.200	0.642	0.496	See Note 1	See Note 1	0.02	0.02

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Body-Worn	CDMA BC10 (§90S)	0.865	0.840	See Note 1	0.02
	CDMA BC0 (§22H)	0.782	0.840	See Note 1	0.01
	PCS CDMA	0.572	0.840	1.412	N/A
	GSM/GPRS 850	0.515	0.840	1.355	N/A
	GSM/GPRS 1900	0.268	0.840	1.108	N/A
	UMTS 850	0.799	0.840	See Note 1	0.01
	UMTS 1750	0.751	0.840	**1.591**	N/A
	UMTS 1900	0.480	0.840	1.320	N/A
	LTE Band 12	0.580	0.840	1.420	N/A
	LTE Band 13	0.492	0.840	1.332	N/A
	LTE Band 26 (Cell)	0.479	0.840	1.319	N/A
	LTE Band 4 (AWS)	0.720	0.840	1.560	N/A
	LTE Band 25 (PCS)	0.506	0.840	1.346	N/A
	LTE Band 41	1.200	0.840	See Note 1	0.02

Table 12-7
Simultaneous Transmission Scenario with 2.4 GHz Ant1 and 5 GHz Ant2 WLAN (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)			SPLSR		
		1	2	3	1+2	1+3	1+2+3	1+2	1+3	2+3
Body-Worn	CDMA BC10 (§90S)	0.865	0.202	0.496	1.067	1.361	**1.563**	N/A	N/A	N/A
	CDMA BC0 (§22H)	0.782	0.202	0.496	0.984	1.278	1.480	N/A	N/A	N/A
	PCS CDMA	0.572	0.202	0.496	0.774	1.068	1.270	N/A	N/A	N/A
	GSM/GPRS 850	0.515	0.202	0.496	0.717	1.011	1.213	N/A	N/A	N/A
	GSM/GPRS 1900	0.268	0.202	0.496	0.470	0.764	0.966	N/A	N/A	N/A
	UMTS 850	0.799	0.202	0.496	1.001	1.295	1.497	N/A	N/A	N/A
	UMTS 1750	0.751	0.202	0.496	0.953	1.247	1.449	N/A	N/A	N/A
	UMTS 1900	0.480	0.202	0.496	0.682	0.976	1.178	N/A	N/A	N/A
	LTE Band 12	0.580	0.202	0.496	0.782	1.076	1.278	N/A	N/A	N/A
	LTE Band 13	0.492	0.202	0.496	0.694	0.988	1.190	N/A	N/A	N/A
	LTE Band 26 (Cell)	0.479	0.202	0.496	0.681	0.975	1.177	N/A	N/A	N/A
	LTE Band 4 (AWS)	0.720	0.202	0.496	0.922	1.216	1.418	N/A	N/A	N/A
	LTE Band 25 (PCS)	0.506	0.202	0.496	0.708	1.002	1.204	N/A	N/A	N/A
	LTE Band 41	1.200	0.202	0.496	1.402	See Note 1	See Note 1	0.01	0.02	0.02

Table 12-8
Simultaneous Transmission Scenario with Bluetooth (Body-Worn 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
Body-Worn	CDMA BC10 (§90S)	0.865	0.034	0.899
	CDMA BC0 (§22H)	0.782	0.034	0.816
	PCS CDMA	0.572	0.034	0.606
	GSM/GPRS 850	0.515	0.034	0.549
	GSM/GPRS 1900	0.268	0.034	0.302
	UMTS 850	0.799	0.034	0.833
	UMTS 1750	0.751	0.034	0.785
	UMTS 1900	0.480	0.034	0.514
	LTE Band 12	0.580	0.034	0.614
	LTE Band 13	0.492	0.034	0.526
	LTE Band 26 (Cell)	0.479	0.034	0.513
	LTE Band 4 (AWS)	0.720	0.034	0.754
	LTE Band 25 (PCS)	0.506	0.034	0.540
	LTE Band 41	1.200	0.034	**1.234**

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

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 applicable exposure conditions was used for simultaneous transmission analysis.

Table 12-9
Simultaneous Transmission Scenario (2.4 GHz 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	EVDO BC10 (§90S)	0.872	0.202	0.213	1.074	1.085	1.287
	EVDO BC0 (§22H)	0.912	0.202	0.213	1.114	1.125	1.327
	PCS EVDO	0.568	0.202	0.213	0.770	0.781	0.983
	GPRS 850	0.509	0.202	0.213	0.711	0.722	0.924
	GPRS 1900	0.331	0.202	0.213	0.533	0.544	0.746
	UMTS 850	0.799	0.202	0.213	1.001	1.012	1.214
	UMTS 1750	0.751	0.202	0.213	0.953	0.964	1.166
	UMTS 1900	0.516	0.202	0.213	0.718	0.729	0.931
	LTE Band 12	0.580	0.202	0.213	0.782	0.793	0.995
	LTE Band 13	0.492	0.202	0.213	0.694	0.705	0.907
	LTE Band 26 (Cell)	0.479	0.202	0.213	0.681	0.692	0.894
	LTE Band 4 (AWS)	0.720	0.202	0.213	0.922	0.933	1.135
	LTE Band 25 (PCS)	0.506	0.202	0.213	0.708	0.719	0.921
	LTE Band 41	1.200	0.202	0.213	1.402	**1.413**	See Table Below

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)			SPLSR		
		1	2	3	1+2	1+3	1+2+3	1+2	1+3	2+3
Hotspot SAR	Back	1.200	0.202	0.201	**1.402**	1.401	See Note 1	0.01	0.01	0.01
	Front	0.599	0.202*	0.213*	0.801	0.812	1.014	N/A	N/A	N/A
	Top	-	0.202*	0.213	0.202	0.213	0.415	N/A	N/A	N/A
	Bottom	0.809	-	-	0.809	0.809	0.809	N/A	N/A	N/A
	Right	-	-	-	0.000	0.000	0.000	N/A	N/A	N/A
	Left	0.221	0.202*	0.213*	0.423	0.434	0.636	N/A	N/A	N/A

Table 12-10
Simultaneous Transmission Scenario (5 GHz 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
Hotspot SAR	EVDO BC10 (§90S)	0.872	0.642	0.446	1.514	1.318
	EVDO BC0 (§22H)	0.912	0.642	0.446	**1.554**	1.358
	PCS EVDO	0.568	0.642	0.446	1.210	1.014
	GPRS 850	0.509	0.642	0.446	1.151	0.955
	GPRS 1900	0.331	0.642	0.446	0.973	0.777
	UMTS 850	0.799	0.642	0.446	1.441	1.245
	UMTS 1750	0.751	0.642	0.446	1.393	1.197
	UMTS 1900	0.516	0.642	0.446	1.158	0.962
	LTE Band 12	0.580	0.642	0.446	1.222	1.026
	LTE Band 13	0.492	0.642	0.446	1.134	0.938
	LTE Band 26 (Cell)	0.479	0.642	0.446	1.121	0.925
	LTE Band 4 (AWS)	0.720	0.642	0.446	1.362	1.166
	LTE Band 25 (PCS)	0.506	0.642	0.446	1.148	0.952
	LTE Band 41	1.200	0.642	0.446	See Table Below	See Table Below

Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		SPLSR	
		1	2	3	1+2	1+3	1+2	1+3
Hotspot SAR	Back	1.200	0.642	0.446	See Note 1	See Note 1	0.02	0.01
	Front	0.599	0.642*	0.446*	**1.241**	1.045	N/A	N/A
	Top	-	0.642*	0.157	0.642	0.157	N/A	N/A
	Bottom	0.809	-	-	0.809	0.809	N/A	N/A
	Right	-	-	-	0.000	0.000	N/A	N/A
	Left	0.221	0.369	0.446*	0.590	0.667	N/A	N/A

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Hotspot SAR	EVDO BC10 (§90S)	0.872	0.837	See Table Below
	EVDO BC0 (§22H)	0.912	0.837	See Table Below
	PCS EVDO	0.568	0.837	1.405
	GPRS 850	0.509	0.837	1.346
	GPRS 1900	0.331	0.837	1.168
	UMTS 850	0.799	0.837	See Table Below
	UMTS 1750	0.751	0.837	**1.588**
	UMTS 1900	0.516	0.837	1.353
	LTE Band 12	0.580	0.837	1.417
	LTE Band 13	0.492	0.837	1.329
	LTE Band 26 (Cell)	0.479	0.837	1.316
	LTE Band 4 (AWS)	0.720	0.837	1.557
	LTE Band 25 (PCS)	0.506	0.837	1.343
	LTE Band 41	1.200	0.837	See Table Below

Simult Tx	Configuration	EVDO BC10 (§90S) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	0.872	0.837	See Note 1	0.02
	Front	0.866	0.108	**0.974**	N/A
	Top	-	0.837*	0.837	N/A
	Bottom	0.489	-	0.489	N/A
	Right	0.156	-	0.156	N/A
	Left	0.360	0.375	0.735	N/A

Simult Tx	Configuration	EVDO BC0 (§22H) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	0.912	0.837	See Note 1	0.02
	Front	0.784	0.108	**0.892**	N/A
	Top	-	0.837*	0.837	N/A
	Bottom	0.475	-	0.475	N/A
	Right	0.061	-	0.061	N/A
	Left	0.286	0.375	0.661	N/A

Simult Tx	Configuration	UMTS 850 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	0.799	0.837	See Note 1	0.02
	Front	0.732	0.108	**0.840**	N/A
	Top	-	0.837*	0.837	N/A
	Bottom	0.394	-	0.394	N/A
	Right	0.135	-	0.135	N/A
	Left	0.327	0.375	0.702	N/A

Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	SPLSR
		1	2	1+2	1+2
Hotspot SAR	Back	1.200	0.837	See Note 1	0.02
	Front	0.599	0.108	0.707	N/A
	Top	-	0.837*	**0.837**	N/A
	Bottom	0.809	-	0.809	N/A
	Right	-	-	0.000	N/A
	Left	0.221	0.375	0.596	N/A

Table 12-11
Simultaneous Transmission Scenario (2.4 GHz Ant1 and 5 GHz Ant2 Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 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	EVDO BC10 (§90S)	0.872	0.202	0.446	1.074	1.318	1.520
	EVDO BC0 (§22H)	0.912	0.202	0.446	1.114	1.358	**1.560**
	PCS EVDO	0.568	0.202	0.446	0.770	1.014	1.216
	GPRS 850	0.509	0.202	0.446	0.711	0.955	1.157
	GPRS 1900	0.331	0.202	0.446	0.533	0.777	0.979
	UMTS 850	0.799	0.202	0.446	1.001	1.245	1.447
	UMTS 1750	0.751	0.202	0.446	0.953	1.197	1.399
	UMTS 1900	0.516	0.202	0.446	0.718	0.962	1.164
	LTE Band 12	0.580	0.202	0.446	0.782	1.026	1.228
	LTE Band 13	0.492	0.202	0.446	0.694	0.938	1.140
	LTE Band 26 (Cell)	0.479	0.202	0.446	0.681	0.925	1.127
	LTE Band 4 (AWS)	0.720	0.202	0.446	0.922	1.166	1.368
	LTE Band 25 (PCS)	0.506	0.202	0.446	0.708	0.952	1.154
	LTE Band 41	1.200	0.202	0.446	1.402	See Table Below	See Table Below

Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)			SPLSR		
		1	2	3	1+2	1+3	1+2+3	1+2	1+3	2+3
Hotspot SAR	Back	1.200	0.202	0.446	**1.402**	See Note 1	See Note 1	0.01	0.01	0.02
	Front	0.599	0.202*	0.446*	0.801	1.045	1.247	N/A	N/A	N/A
	Top	-	0.202*	0.157	0.202	0.157	0.359	N/A	N/A	N/A
	Bottom	0.809	-	-	0.809	0.809	0.809	N/A	N/A	N/A
	Right	-	-	-	0.000	0.000	0.000	N/A	N/A	N/A
	Left	0.221	0.202*	0.446*	0.423	0.667	0.869	N/A	N/A	N/A

Table 12-12
Simultaneous Transmission Scenario (Bluetooth Hotpot 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	EVDO BC10 (§90S)	0.872	0.044	0.916
	EVDO BC0 (§22H)	0.912	0.044	0.956
	PCS EVDO	0.568	0.044	0.612
	GPRS 850	0.509	0.044	0.553
	GPRS 1900	0.331	0.044	0.375
	UMTS 850	0.799	0.044	0.843
	UMTS 1750	0.751	0.044	0.795
	UMTS 1900	0.516	0.044	0.560
	LTE Band 12	0.580	0.044	0.624
	LTE Band 13	0.492	0.044	0.536
	LTE Band 26 (Cell)	0.479	0.044	0.523
	LTE Band 4 (AWS)	0.720	0.044	0.764
	LTE Band 25 (PCS)	0.506	0.044	0.550
	LTE Band 41	1.200	0.044	**1.244**

Notes:

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

12.6 Phablet Simultaneous Transmission Analysis

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

Exposure Condition	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)
Phablet SAR	1.493	1.299	**2.792**

12.7 SPLSR Evaluation and Analysis

Per FCC KDB Publication 447498 D01v06, when the sum of the standalone transmitters is more than 1.6 W/kg for 1g, the SAR sum to peak locations can be analyzed to determine SAR distribution overlaps. When the SAR peak to location ratio (shown below) for each pair of antennas is
≤ 0.04 for 1g, simultaneous SAR evaluation is not required. The distance between the transmitters was calculated using the following formula.

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

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

12.7.1 Body-Worn SPLSR Evaluation and Analysis

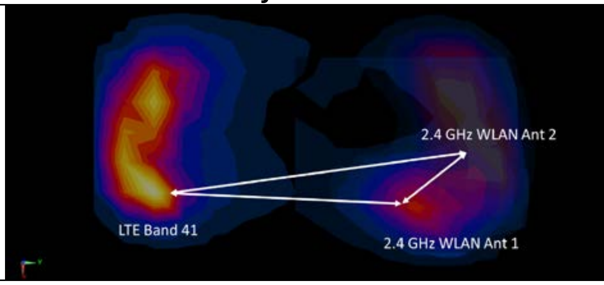
Table 12-14
Peak SAR Locations for Body-Worn Back Side

Mode/Band	x (mm)	y (mm)	Reported SAR (W/kg)
2.4 GHz WLAN Ant 1	24.00	45.40	0.202
2.4 GHz WLAN Ant 2	9.60	68.40	0.201
5 GHz WLAN Ant 1	15.00	55.00	0.642
5 GHz WLAN Ant 2	6.00	66.00	0.496
5 GHz WLAN MIMO	13.00	61.00	0.840
CDMA BC10	-17.00	-45.00	0.865
CDMA BC0	-32.00	-81.50	0.782
UMTS 850	-32.00	-73.50	0.799
LTE Band 41	6.80	-72.20	1.200

Table 12-15
Body-Worn Back Side SAR to Peak Location Separation Ratio Calculations

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio	Plot Number
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$	
2.4 GHz WLAN Ant 1	2.4 GHz WLAN Ant 2	0.202	0.201	0.403	27.14	0.01	1
2.4 GHz WLAN Ant 1	LTE Band 41	0.202	1.200	1.402	118.85	0.01	1, 8
2.4 GHz WLAN Ant 2	LTE Band 41	0.201	1.200	1.401	140.63	0.01	1
5 GHz WLAN Ant 1	LTE Band 41	0.642	1.200	1.842	127.46	0.02	2
5 GHz WLAN Ant 2	LTE Band 41	0.496	1.200	1.696	138.20	0.02	3, 8
5 GHz WLAN MIMO	CDMA BC10	0.840	0.865	1.705	110.16	0.02	4
5 GHz WLAN MIMO	CDMA BC0	0.840	0.782	1.622	149.44	0.01	5
5 GHz WLAN MIMO	UMTS 850	0.840	0.799	1.639	141.83	0.01	6
5 GHz WLAN MIMO	LTE Band 41	0.840	1.200	2.040	133.34	0.02	7
2.4 GHz WLAN Ant 1	5 GHz WLAN Ant 2	0.202	0.496	0.698	27.36	0.02	8

Table 12-16
Body-Worn Back Side SAR to Peak Location Separation Ratio Plots



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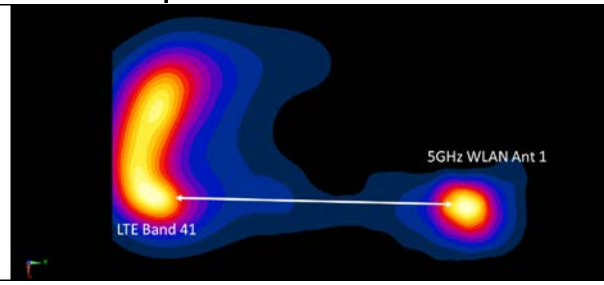

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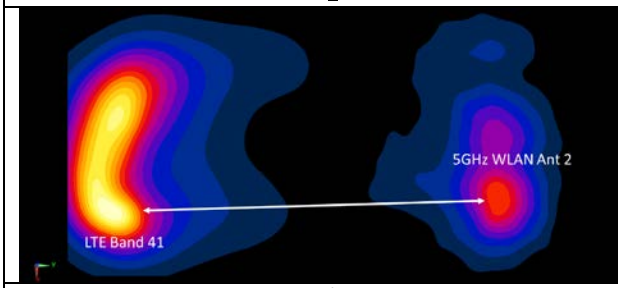

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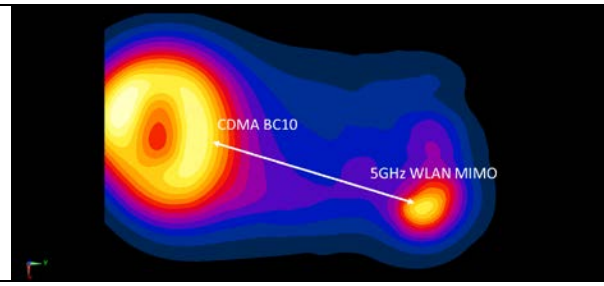

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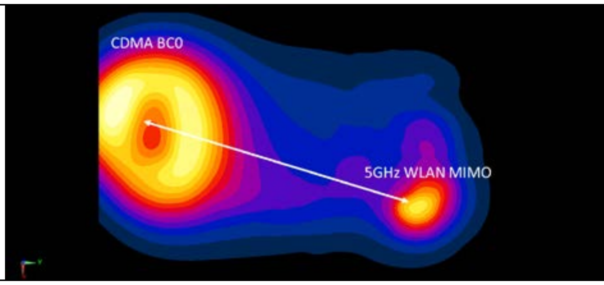

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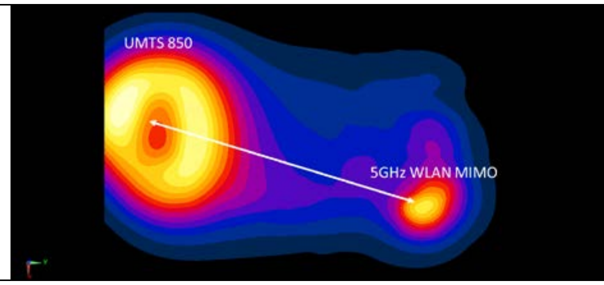

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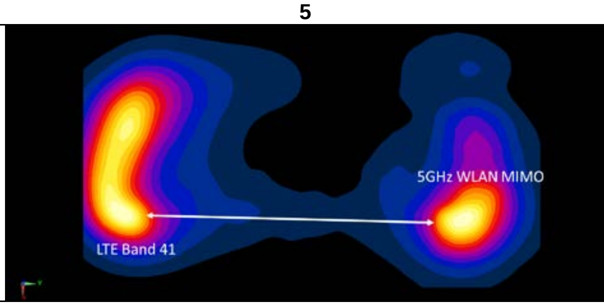

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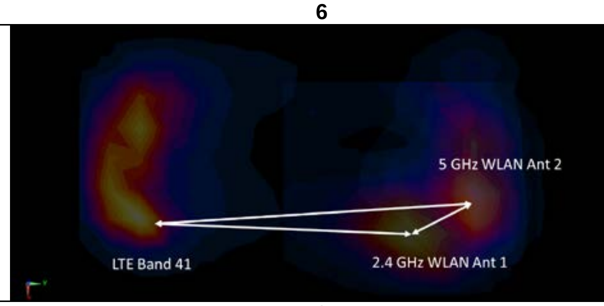

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12.7.2 Hotspot Back Side SPLSR Evaluation and Analysis

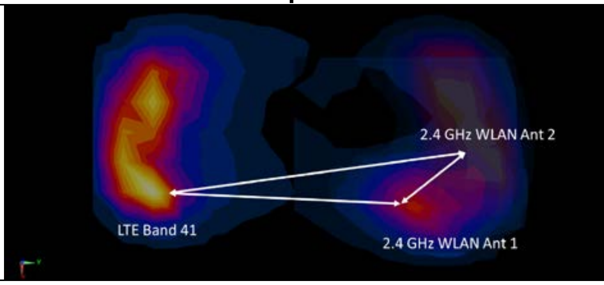
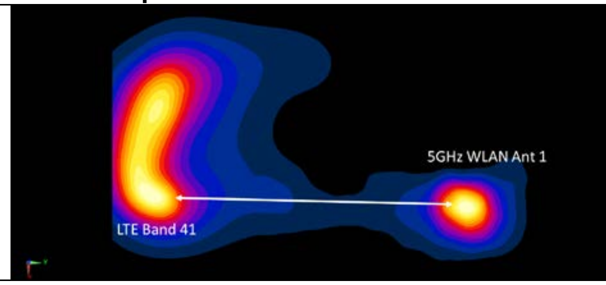
Table 12-17
Peak SAR Locations for Hotspot Back Side

Mode/Band	x (mm)	y (mm)	Reported SAR (W/kg)
2.4 GHz WLAN Ant 1	24.00	45.40	0.202
2.4 GHz WLAN Ant 2	9.60	68.40	0.201
5 GHz WLAN Ant 1	15.00	55.00	0.642
5 GHz WLAN Ant 2	8.00	69.00	0.446
5 GHz WLAN MIMO	13.00	58.00	0.837
EVDO BC10	-8.50	-48.50	0.872
EVDO BC0	-12.00	-48.50	0.912
UMTS 850	-32.00	-73.50	0.799
LTE Band 41	6.80	-72.20	1.200

Table 12-18
Hotspot Back Side SAR to Peak Location Separation Ratio Calculations

Antenna Pair		Standalone 1g SAR (W/kg)		Standalone SAR Sum (W/kg)	Peak SAR Separation Distance (mm)	SPLS Ratio	Plot Number
Ant "a"	Ant "b"	a	b	a+b	D_{a-b}	$(a+b)^{1.5}/D_{a-b}$	
2.4 GHz WLAN Ant 1	2.4 GHz WLAN Ant 2	0.202	0.201	0.403	27.14	0.01	1
2.4 GHz WLAN Ant 1	LTE Band 41	0.202	1.200	1.402	118.85	0.01	1, 8
2.4 GHz WLAN Ant 2	LTE Band 41	0.201	1.200	1.401	140.63	0.01	1
5 GHz WLAN Ant 1	LTE Band 41	0.642	1.200	1.842	127.46	0.02	2
5 GHz WLAN Ant 2	LTE Band 41	0.446	1.200	1.646	141.21	0.01	3, 8
5 GHz WLAN MIMO	EVDO BC10	0.837	0.872	1.709	108.65	0.02	4
5 GHz WLAN MIMO	EVDO BC0	0.837	0.912	1.749	109.39	0.02	5
5 GHz WLAN MIMO	UMTS 850	0.837	0.799	1.636	138.99	0.02	6
5 GHz WLAN MIMO	LTE Band 41	0.837	1.200	2.037	130.35	0.02	7
2.4 GHz WLAN Ant 1	5 GHz WLAN Ant 2	0.202	0.446	0.648	28.51	0.02	8

Table 12-19
Hotspot Back Side SAR to Peak Location Separation Ratio Plots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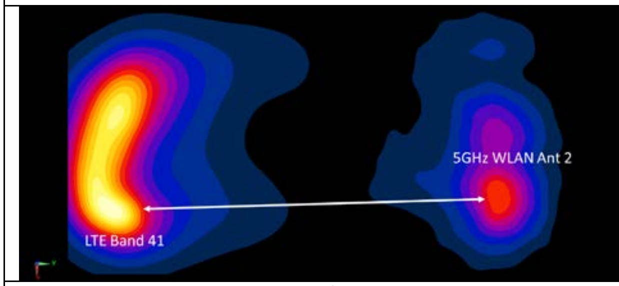	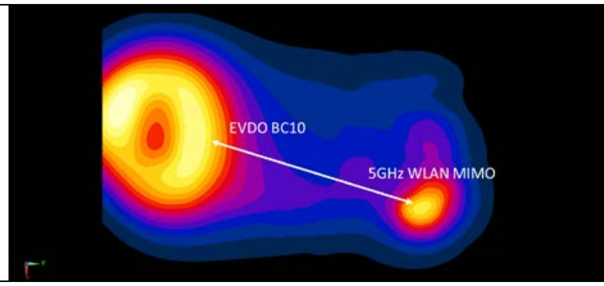
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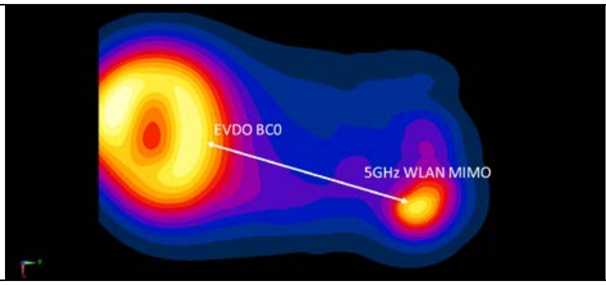
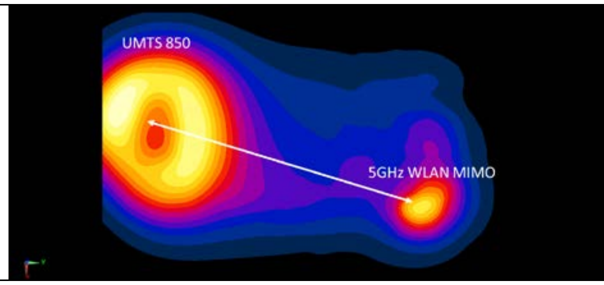
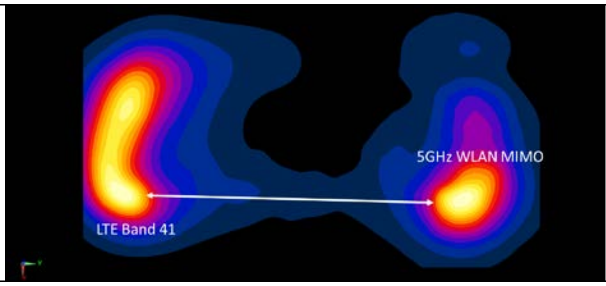
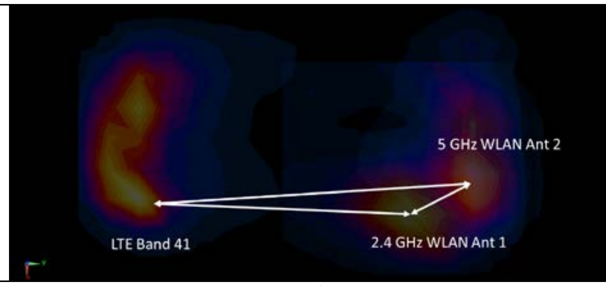
	
5	6
	
7	8

12.8 Simultaneous Transmission Conclusion

The above numerical summed SAR results and SPLSR analysis are sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528- 2013 Section 6.3.4.1.

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

Table 13-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
835	820.10	564	CDMA BC10 (§90S)	TDSO / SO32	back	10 mm	0.830	0.768	1.08	N/A	N/A	N/A	N/A
2600	2593.00	40620	LTE Band 41 HPUE (PC2), 20 MHz Bandwidth	QPSK, 1 RB, 0 RB Offset	back	10 mm	1.200	1.150	1.04	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 LTE Band 41 Power Class 2 and Power Class 3 Linearity

This device supports Power Class 2 and Power Class 3 operations for LTE Band 41. The highest available duty cycle for Power Class 2 operations is 43.3 % using UL-DL configuration 1. Per FCC Guidance based on the device behavior, all SAR tests were performed using Power Class 3. SAR with Power Class 2 at the highest power and available duty factor was additionally performed for the Power Class 3 configuration with the highest SAR test configuration for each exposure condition. The linearity between the Power Class 2 and Power Class 3 SAR results and the respective frame averaged powers was calculated to determine that the results were linear. Per FCC Guidance, no additional SAR measurements were required.

	LTE Band 41 PC3	LTE Band 41 PC2
Maximum Allowed Output Power (dBm)	24.7	27.0
Measured Output Power (dBm)	24.20	27.00
Measured SAR (W/kg)	0.084	0.104
Measured Power (mW)	263.03	501.19
Duty Cycle	63.3%	43.3%
Frame Averaged Output Power (mW)	166.50	217.01
% deviation from expected linearity		**-5.01%**

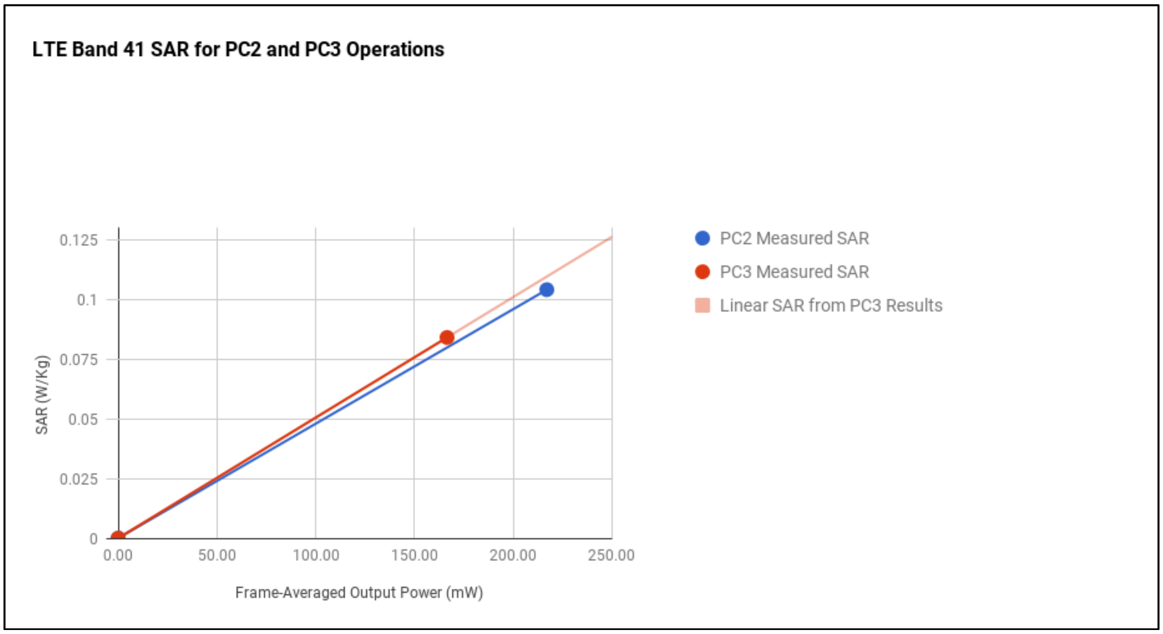


Table 14-1
LTE Band 41 Head Linearity Data

	LTE Band 41 PC3	LTE Band 41 PC2
Maximum Allowed Output Power (dBm)	24.7	27.0
Measured Output Power (dBm)	24.20	27.00
Measured SAR (W/kg)	0.907	1.200
Measured Power (mW)	263.03	501.19
Duty Cycle	63.3%	43.3%
Frame Averaged Output Power (mW)	166.50	217.01
% deviation from expected linearity		**1.51%**

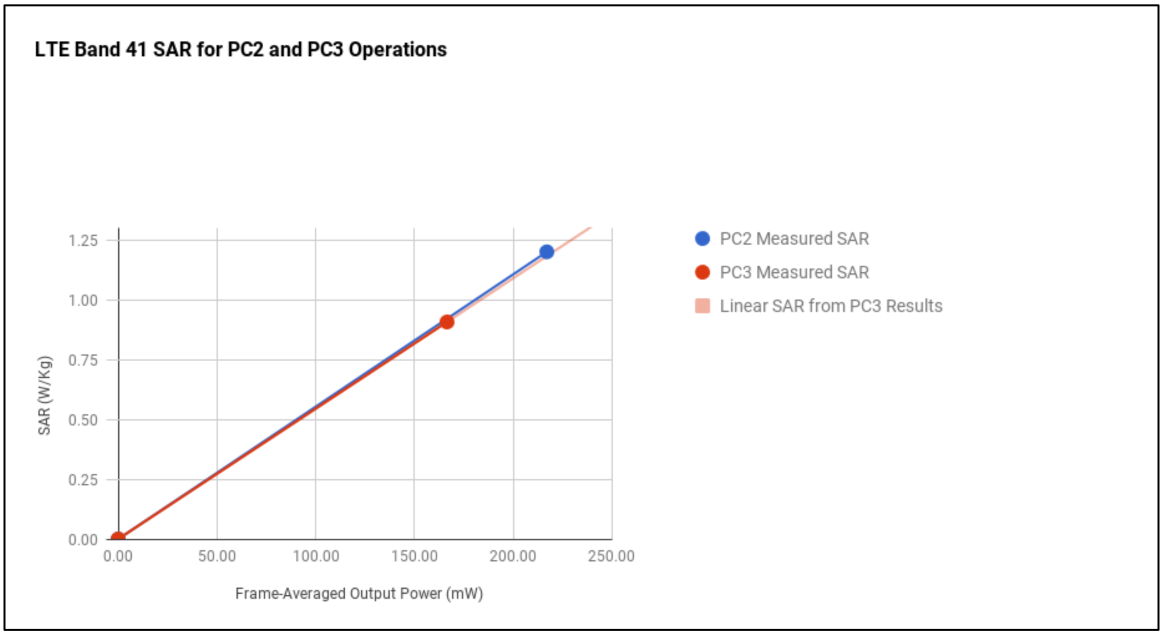


Table 14-2
LTE Band 41 Body Linearity Data

15 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/22/2017	Annual	3/22/2018	MY45470194
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	E5515C	8960 Series 10 Wireless Communications Test Set	10/5/2016	Annual	10/5/2017	GB42230325
Agilent	E4438C	ESG Vector Signal Generator	3/24/2017	Biennial	3/24/2019	MY42082385
Agilent	E4438C	ESG Vector Signal Generator	3/23/2017	Annual	3/23/2018	MY47270002
Agilent	E4432B	ESG-D Series Signal Generator	3/24/2017	Annual	3/24/2018	US40053896
Agilent	N9020A	MXA Signal Analyzer	10/28/2016	Annual	10/28/2017	US46470561
Agilent	N5182A	MXG Vector Signal Generator	2/28/2017	Annual	2/28/2018	MY47420800
Agilent	N5182A	MXG Vector Signal Generator	10/27/2016	Annual	10/27/2017	MY47420603
Agilent	8753ES	S-Parameter Network Analyzer	10/26/2016	Annual	10/26/2017	US39170118
Agilent	8753ES	S-Parameter Vector Network Analyzer	8/19/2016	Annual	8/19/2017	MY40003841
Agilent	E5515C	Wireless Communications Test Set	1/29/2016	Biennial	1/29/2018	GB46310798
Agilent	N4010A	Wireless Connectivity Test Set	CBT	N/A	CBT	GB46170464
Agilent	N4010A	Wireless Connectivity Test Set	CBT	N/A	CBT	GB44450273
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433972
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	941001
Anritsu	ML2496A	Power Meter	3/28/2017	Annual	3/28/2018	1351001
Anritsu	ML2496A	Power Meter	4/20/2017	Annual	4/20/2018	1306009
Anritsu	MA2411B	Pulse Power Sensor	2/10/2017	Annual	2/10/2018	1207364
Anritsu	MA2411B	Pulse Power Sensor	8/18/2016	Annual	8/18/2017	1126066
Anritsu	MT8820C	Radio Communication Analyzer	9/15/2016	Annual	9/15/2017	6200901190
Anritsu	MT8820C	Radio Communication Analyzer	5/23/2017	Annual	5/23/2018	6201240328
Anritsu	MA24106A	USB Power Sensor	6/7/2017	Annual	6/7/2018	1231538
Anritsu	MA24106A	USB Power Sensor	6/7/2017	Annual	6/7/2018	1231535
COMTECH	AR85729-5/5759B	Solid State Amplifier	CBT	N/A	CBT	M3W1A00-1002
COMTech	AR85729-5	Solid State Amplifier	CBT	N/A	CBT	M1S5A00-009
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	3/8/2016	Biennial	3/8/2018	160261729
Control Company	4352	Ultra Long Stem Thermometer	3/8/2016	Biennial	3/8/2018	160261732
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-1200+	Low Pass Filter DC to 1000 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mitutoyo	CD-6"CSX	Digital Caliper	3/2/2016	Biennial	3/2/2018	13264162
Mitutoyo	CD-6"CSX	Digital Caliper	3/2/2016	Biennial	3/2/2018	13264165
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Rohde & Schwarz	CMU200	Base Station Simulator	4/11/2017	Annual	4/11/2018	836371/0079
Rohde & Schwarz	CMU200	Base Station Simulator	12/12/2016	Annual	12/12/2017	833855/0010
Rohde & Schwarz	CMW500	Radio Communication Tester	10/20/2016	Annual	10/20/2017	100976
Rohde & Schwarz	CMW500	Radio Communication Tester	5/4/2017	Annual	5/4/2018	112347
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	7/20/2017	Annual	7/20/2018	132885
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	2/10/2017	Annual	2/10/2018	162125
Seekonk	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	N/A
Seekonk	NC-100	Torque Wrench	11/6/2015	Biennial	11/6/2017	22313
Seekonk	NC-100	Torque Wrench (8" lb)	9/1/2016	Biennial	9/1/2018	21053
Seekonk	NC-100	Torque Wrench (8" lb)	8/30/2016	Biennial	8/30/2018	N/A
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/2/2016	Biennial	3/2/2018	N/A
SPEAG	D1750V2	1750 MHz SAR Dipole	5/9/2017	Annual	5/9/2018	1092
SPEAG	D1900V2	1900 MHz SAR Dipole	2/9/2017	Annual	2/9/2018	5d148
SPEAG	D1900V2	1900 MHz SAR Dipole	5/10/2017	Annual	5/10/2018	5d026
SPEAG	D2450V2	2450 MHz SAR Dipole	9/13/2016	Annual	9/13/2017	797
SPEAG	D2450V2	2450 MHz SAR Dipole	2/13/2017	Annual	2/13/2018	882
SPEAG	D2600V2	2600 MHz SAR Dipole	9/13/2016	Annual	9/13/2017	1071
SPEAG	D5GHzV2	5 GHz SAR Dipole	8/2/2016	Annual	8/2/2017	1237
SPEAG	D5GHzV2	5 GHz SAR Dipole	3/9/2017	Annual	3/9/2018	1123
SPEAG	D750V3	750 MHz Dipole	3/7/2017	Annual	3/7/2018	1054
SPEAG	D750V3	750 MHz SAR Dipole	5/11/2017	Annual	5/11/2018	1034
SPEAG	D835V2	835 MHz SAR Dipole	4/11/2017	Annual	4/11/2018	4d119
SPEAG	D835V2	835 MHz SAR Dipole	1/11/2017	Annual	1/11/2018	4d132
SPEAG	D835V2	850 MHz SAR Dipole	5/11/2017	Annual	5/11/2018	4d180
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/9/2017	Annual	2/9/2018	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2017	Annual	3/13/2018	1415
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/11/2017	Annual	4/11/2018	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/14/2016	Annual	9/14/2017	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/16/2017	Annual	1/16/2018	1466
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/10/2017	Annual	5/10/2018	1070
SPEAG	ES3DV3	SAR Probe	2/10/2017	Annual	2/10/2018	3213
SPEAG	ES3DV3	SAR Probe	3/14/2017	Annual	3/14/2018	3209
SPEAG	ES3DV3	SAR Probe	9/19/2016	Annual	9/19/2017	3287
SPEAG	ES3DV3	SAR Probe	2/10/2017	Annual	2/10/2018	3318
SPEAG	EX3DV4	SAR Probe	1/13/2017	Annual	1/13/2018	3589
SPEAG	EX3DV4	SAR Probe	2/13/2017	Annual	2/13/2018	3914
SPEAG	EX3DV4	SAR Probe	4/18/2017	Annual	4/18/2018	7406

Note:

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

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]

18 REFERENCES

[1] Federal Communications Commission, ET Docket 93-62, Guidelines for Evaluating the Environmental Effects of Radiofrequency Radiation, Aug. 1996.

[2] ANSI/IEEE C95.1-2005, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, 2006.

[3] ANSI/IEEE C95.1-1992, American National Standard safety levels with respect to human exposure to radio frequency electromagnetic fields, 3kHz to 300GHz, New York: IEEE, Sept. 1992.

[4] ANSI/IEEE C95.3-2002, IEEE Recommended Practice for the Measurement of Potentially Hazardous Electromagnetic Fields - RF and Microwave, New York: IEEE, December 2002.

[5] IEEE Standards Coordinating Committee 39 –Standards Coordinating Committee 34 – IEEE Std. 1528-2013, IEEE Recommended Practice for Determining the Peak Spatial-Average Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques.

[6] NCRP, National Council on Radiation Protection and Measurements, Biological Effects and Exposure Criteria for RadioFrequency Electromagnetic Fields, NCRP Report No. 86, 1986. Reprinted Feb. 1995.

[7] T. Schmid, O. Egger, N. Kuster, Automated E-field scanning system for dosimetric assessments, IEEE Transaction on Microwave Theory and Techniques, vol. 44, Jan. 1996, pp. 105-113.

[8] K. Pokovic, T. Schmid, N. Kuster, Robust setup for precise calibration of E-field probes in tissue simulating liquids at mobile communications frequencies, ICECOM97, Oct. 1997, pp. 1 -124.

[9] K. Pokovic, T. Schmid, and N. Kuster, E-field Probe with improved isotropy in brain simulating liquids, Proceedings of the ELMAR, Zadar, Croatia, June 23-25, 1996, pp. 172-175.

[10] Schmid & Partner Engineering AG, Application Note: Data Storage and Evaluation, June 1998, p2.

[11] V. Hombach, K. Meier, M. Burkhardt, E. Kuhn, N. Kuster, The Dependence of EM Energy Absorption upon Human Modeling at 900 MHz, IEEE Transaction on Microwave Theory and Techniques, vol. 44 no. 10, Oct. 1996, pp. 1865-1873.

[12] N. Kuster and Q. Balzano, Energy absorption mechanism by biological bodies in the near field of dipole antennas above 300MHz, IEEE Transaction on Vehicular Technology, vol. 41, no. 1, Feb. 1992, pp. 17-23.

[13] G. Hartsgrove, A. Kraszewski, A. Surowiec, Simulated Biological Materials for Electromagnetic Radiation Absorption Studies, University of Ottawa, Bioelectromagnetics, Canada: 1987, pp. 29-36.

[14] Q. Balzano, O. Garay, T. Manning Jr., Electromagnetic Energy Exposure of Simulated Users of Portable Cellular Telephones, IEEE Transactions on Vehicular Technology, vol. 44, no.3, Aug. 1995.

[15] W. Gander, Computermathematick, Birkhaeuser, Basel, 1992.

[16] W.H. Press, S.A. Teukolsky, W.T. Vetterling, and B.P. Flannery, Numerical Recipes in C, The Art of Scientific Computing, Second edition, Cambridge University Press, 1992.

[17] N. Kuster, R. Kastle, T. Schmid, Dosimetric evaluation of mobile communications equipment with known precision, IEEE Transaction on Communications, vol. E80-B, no. 5, May 1997, pp. 645-652.

[18] CENELEC CLC/SC111B, European Prestandard (prENV 50166-2), Human Exposure to Electromagnetic Fields High-frequency: 10kHz-300GHz, Jan. 1995.

[19] Prof. Dr. Niels Kuster, ETH, Eidgenössische Technische Hoschschule Zürich, Dosimetric Evaluation of the Cellular Phone.

[20] IEC 62209-1, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 1: Procedure to determine the specific absorption rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz), Feb. 2005.

[21] Innovation, Science, Economic Development Canada RSS-102 Radio Frequency Exposure Compliance of Radiocommunication Apparatus (All Frequency Bands) Issue 5, March 2015.

[22] Health Canada Safety Code 6 Limits of Human Exposure to Radio Frequency Electromagnetic Fields in the Frequency Range from 3 kHz – 300 GHz, 2015

[23] FCC SAR Test Procedures for 2G-3G Devices, Mobile Hotspot and UMPC Devices KDB Publications 941225, D01-D07

[24] SAR Measurement Guidance for IEEE 802.11 Transmitters, KDB Publication 248227 D01

[25] FCC SAR Considerations for Handsets with Multiple Transmitters and Antennas, KDB Publications 648474 D03-D04

[26] FCC SAR Evaluation Considerations for Laptop, Notebook, Netbook and Tablet Computers, FCC KDB Publication 616217 D04

[27] FCC SAR Measurement and Reporting Requirements for 100MHz – 6 GHz, KDB Publications 865664 D01-D02

[28] FCC General RF Exposure Guidance and SAR Procedures for Dongles, KDB Publication 447498, D01-D02

[29] Anexo à Resolução No. 533, de 10 de Septembro de 2009.

[30] IEC 62209-2, Human exposure to radio frequency fields from hand-held and body-mounted wireless communication devices - Human models, instrumentation, and procedures - Part 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), Mar. 2010.

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01555

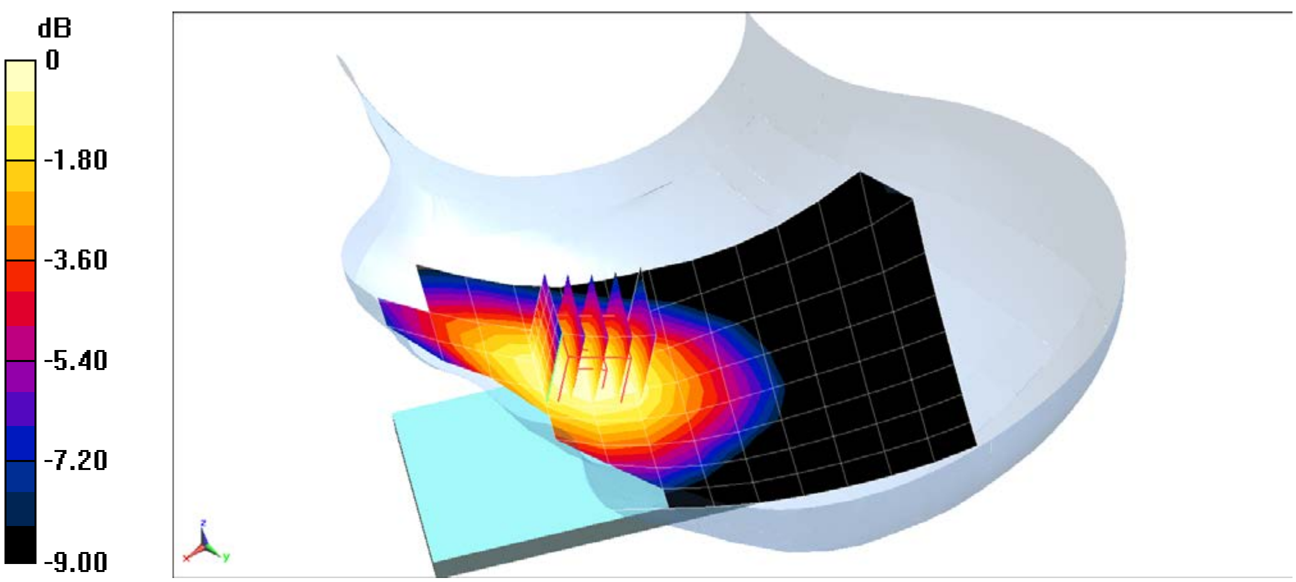
Communication System: UID 0, Cellular CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 820.1 MHz; σ = 0.87 S/m; ε_r = 40.061; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 08-02-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.2°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: BC10 Cell. CDMA, Rule Part 90S, Left Head, Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.71 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.255 W/kg
SAR(1 g) = 0.204 W/kg



0 dB = 0.237 W/kg = -6.25 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01555

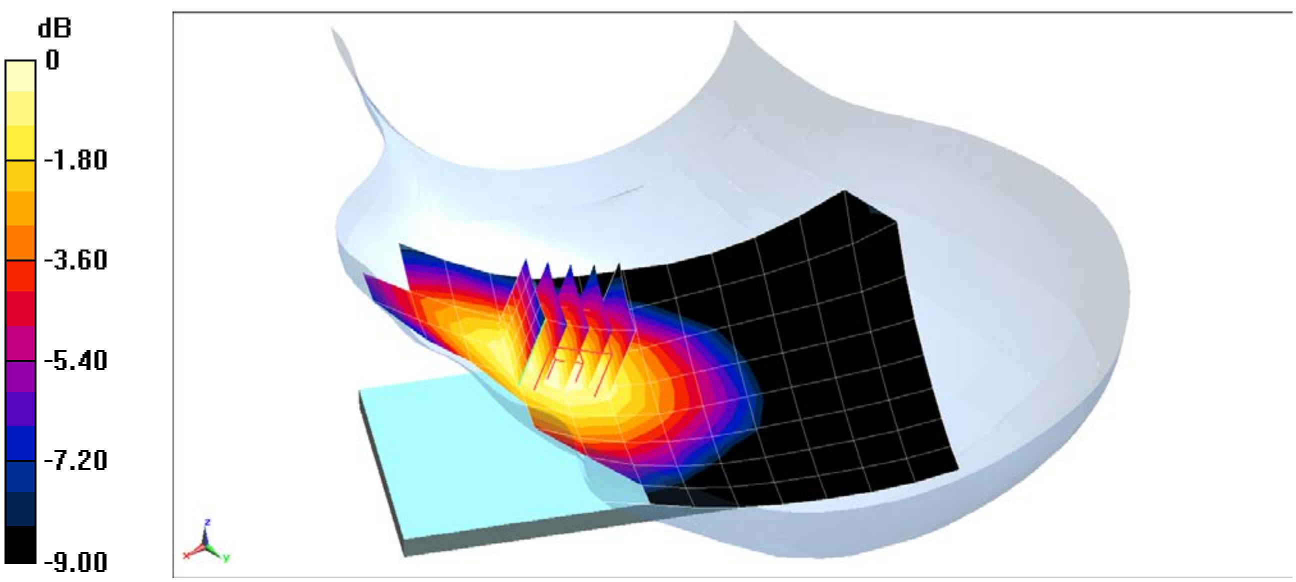
Communication System: UID 0, Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.52 MHz; σ = 0.887 S/m; ε_r = 39.842; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 08-02-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.2°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: BC0 Cell. CDMA, Rule Part 22H, Left Head, Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.69 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.231 W/kg
SAR(1 g) = 0.182 W/kg



0 dB = 0.213 W/kg = -6.72 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

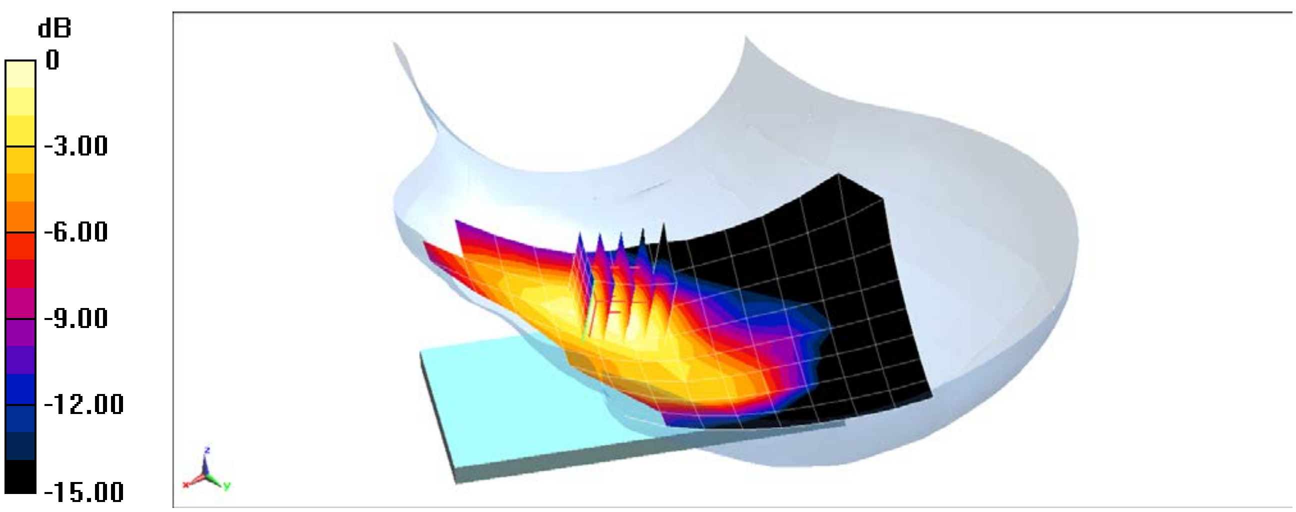
Communication System: UID 0, PCS CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.435 S/m; ε_r = 40.128; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 07-24-2017; Ambient Temp: 22.6°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3318; ConvF(5.31, 5.31, 5.31); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: PCS CDMA, Left Head, Cheek, Mid.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.48 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.309 W/kg
SAR(1 g) = 0.202 W/kg



0 dB = 0.232 W/kg = -6.35 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

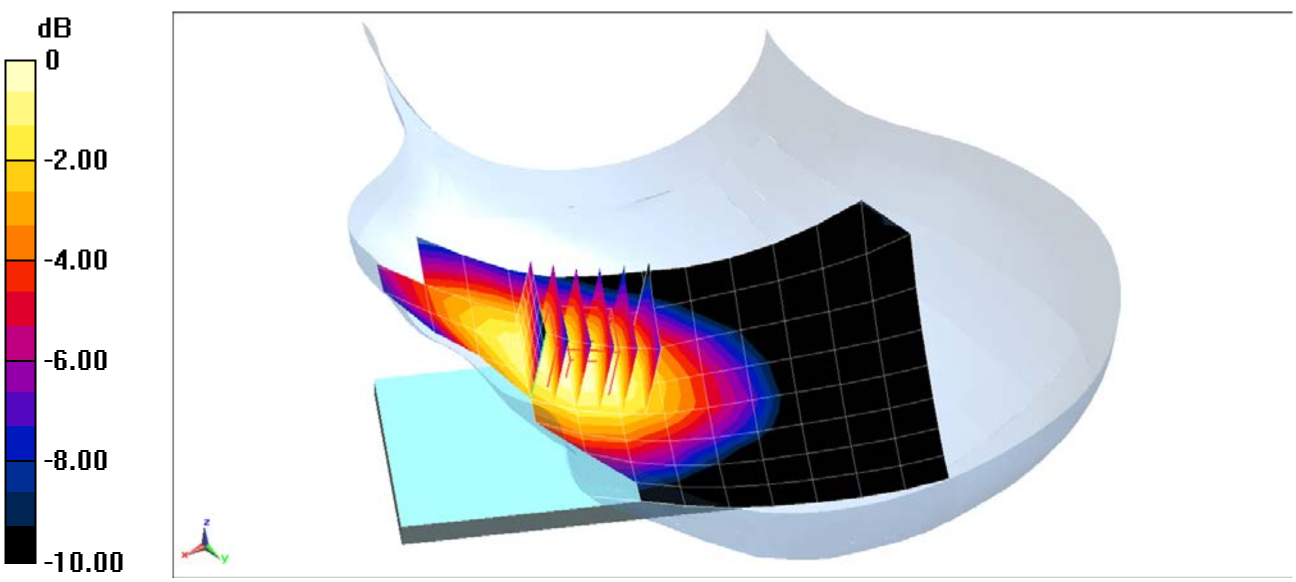
Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.887 S/m; ε_r = 39.841; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 08-02-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.2°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: GSM 850, Left Head, Cheek, 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 = 12.64 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.171 W/kg
SAR(1 g) = 0.135 W/kg



0 dB = 0.158 W/kg = -8.01 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

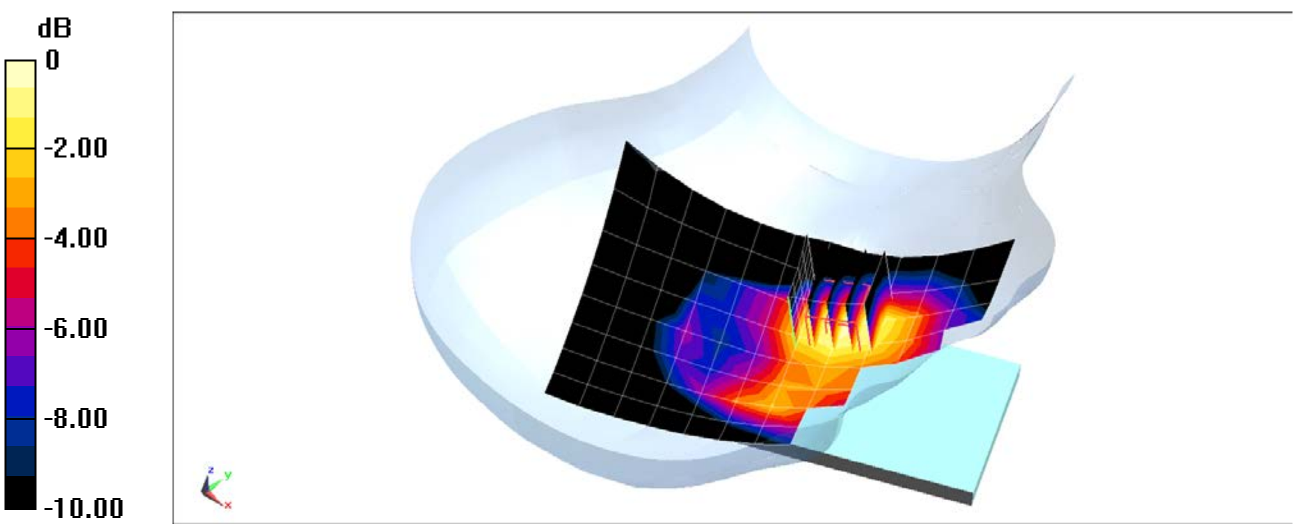
Communication System: UID 0, GSM GPRS; 1 Tx slot; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.418 S/m; ε_r = 39.726; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 08-09-2017; Ambient Temp: 22.2°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3318; ConvF(5.31, 5.31, 5.31); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: GPRS 1900, Right Head, Cheek, Mid.ch, 1 Tx slot

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.691 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.118 W/kg
SAR(1 g) = 0.075 W/kg



0 dB = 0.0825 W/kg = -10.84 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

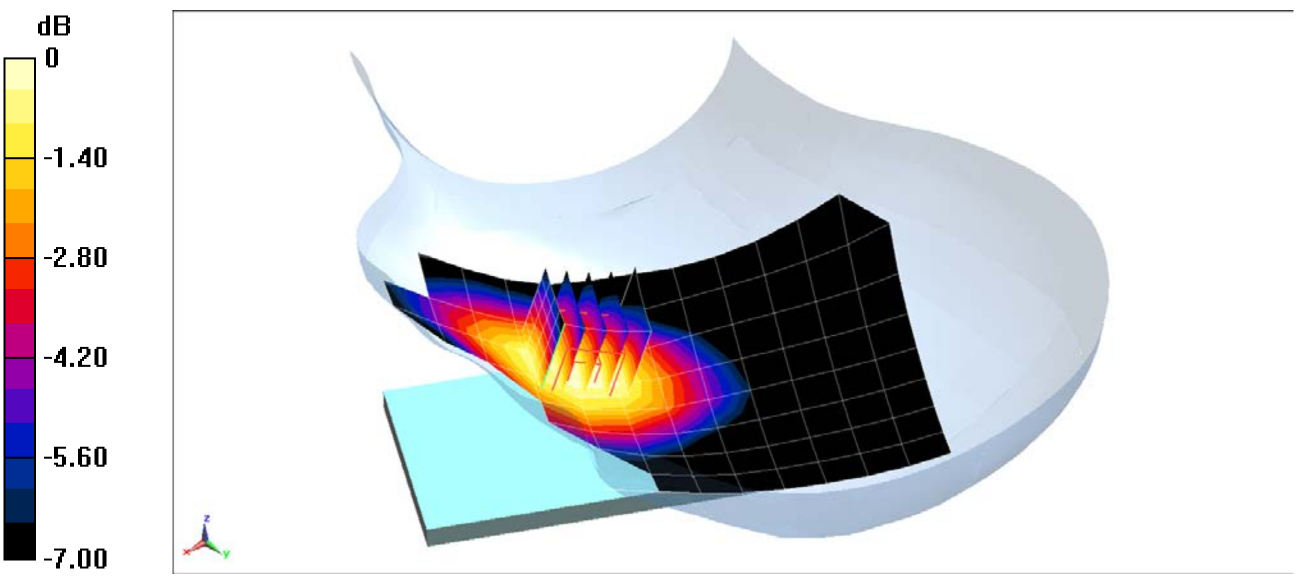
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.909 S/m; ε_r = 42.442; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 08-07-2017; Ambient Temp: 22.4°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.84 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.241 W/kg
SAR(1 g) = 0.192 W/kg



0 dB = 0.223 W/kg = -6.52 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

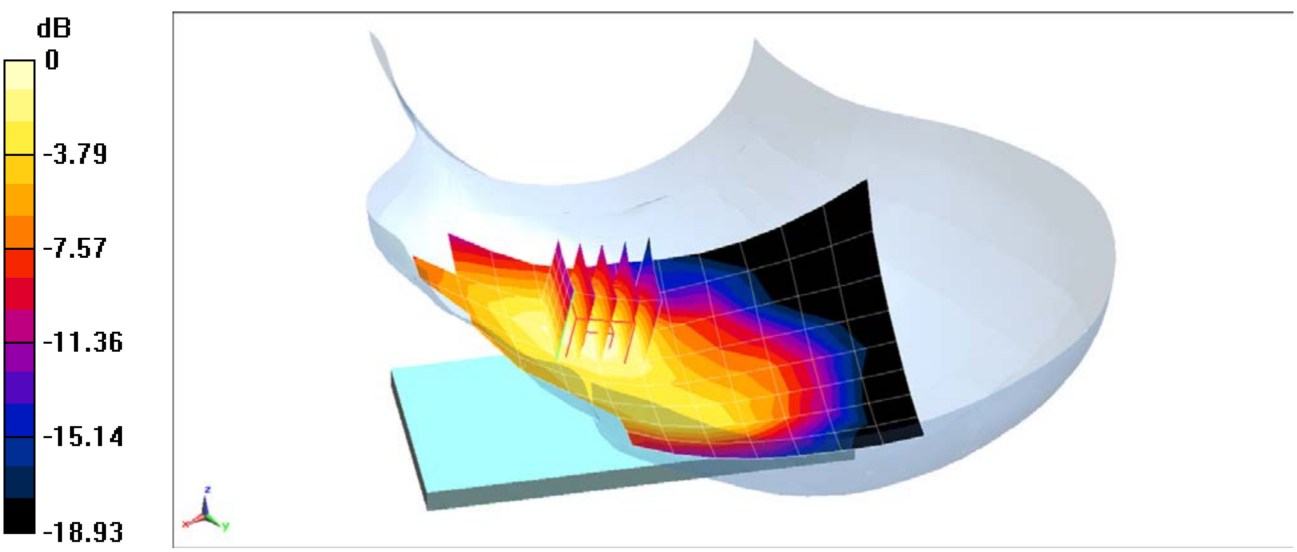
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.39 S/m; ε_r = 39.736; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 07-26-2017; Ambient Temp: 22.3°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3318; ConvF(5.49, 5.49, 5.49); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 11.30 V/m; Power Drift = 0.08 dB
Peak SAR (extrapolated) = 0.244 W/kg
SAR(1 g) = 0.161 W/kg



0 dB = 0.187 W/kg = -7.27 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

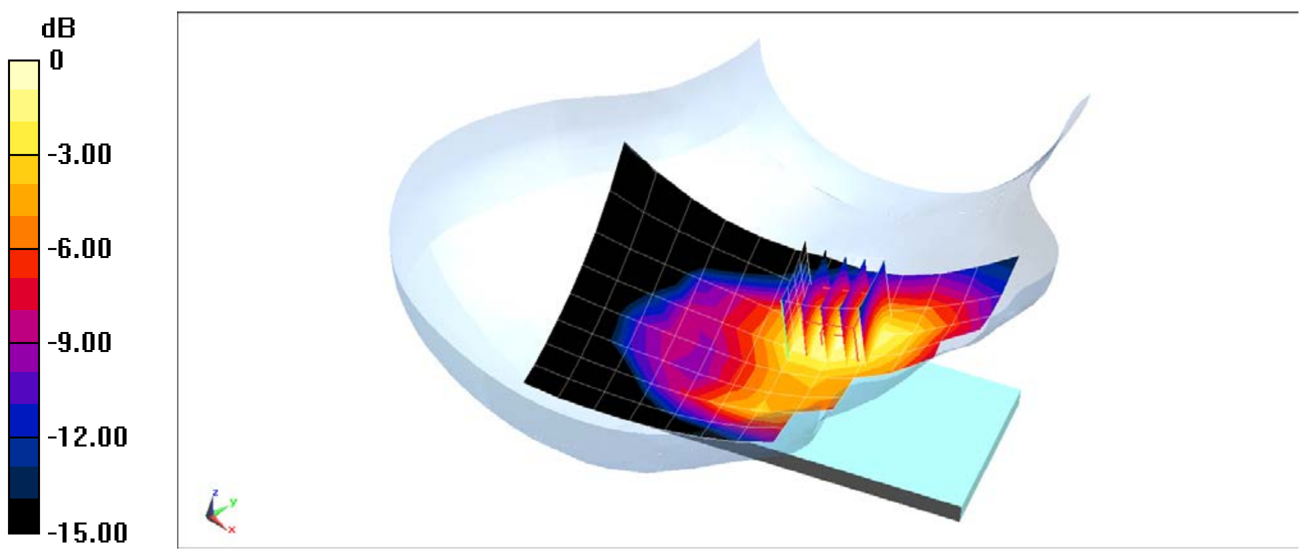
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.435 S/m; ε_r = 40.128; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 07-24-2017; Ambient Temp: 22.6°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3318; ConvF(5.31, 5.31, 5.31); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: UMTS 1900, Right 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 = 10.32 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 0.210 W/kg
SAR(1 g) = 0.137 W/kg



0 dB = 0.161 W/kg = -7.92 dBW/kg

DUT: ZNFLS998; Type: Portable Handset; Serial: 01559

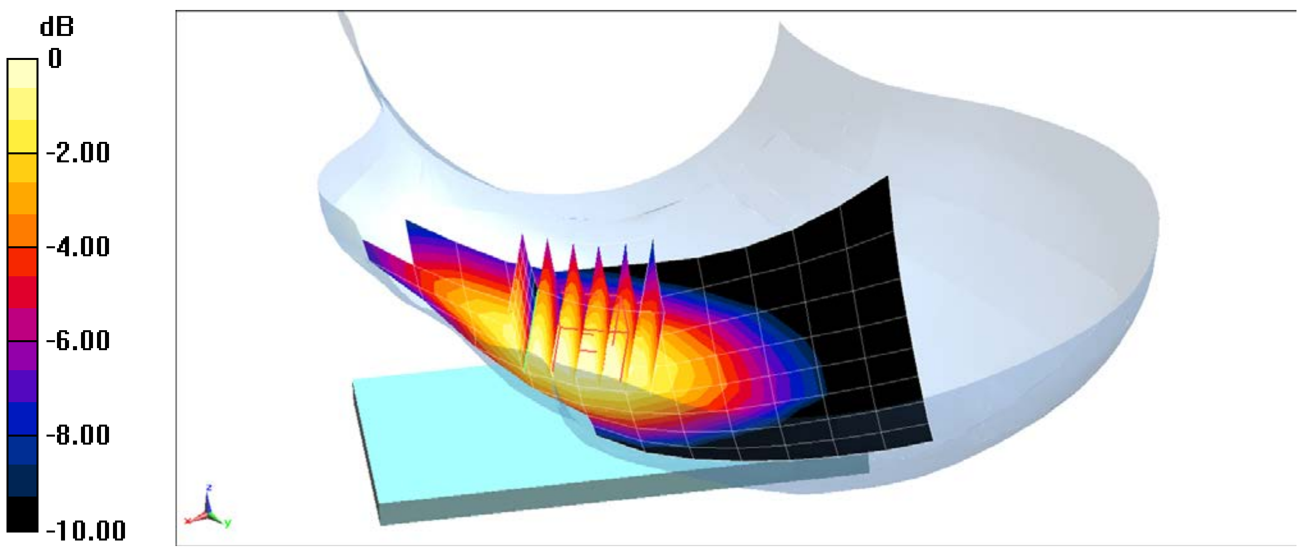
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.882 S/m; ε_r = 44.067; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 07-24-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3209; ConvF(6.76, 6.76, 6.76); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 12, Left Head, Cheek, Mid.ch,
QPSK, 10 MHz Bandwidth, 1 RB, 25 RB Offset

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.23 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 0.140 W/kg
SAR(1 g) = 0.115 W/kg



0 dB = 0.124 W/kg = -9.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01559

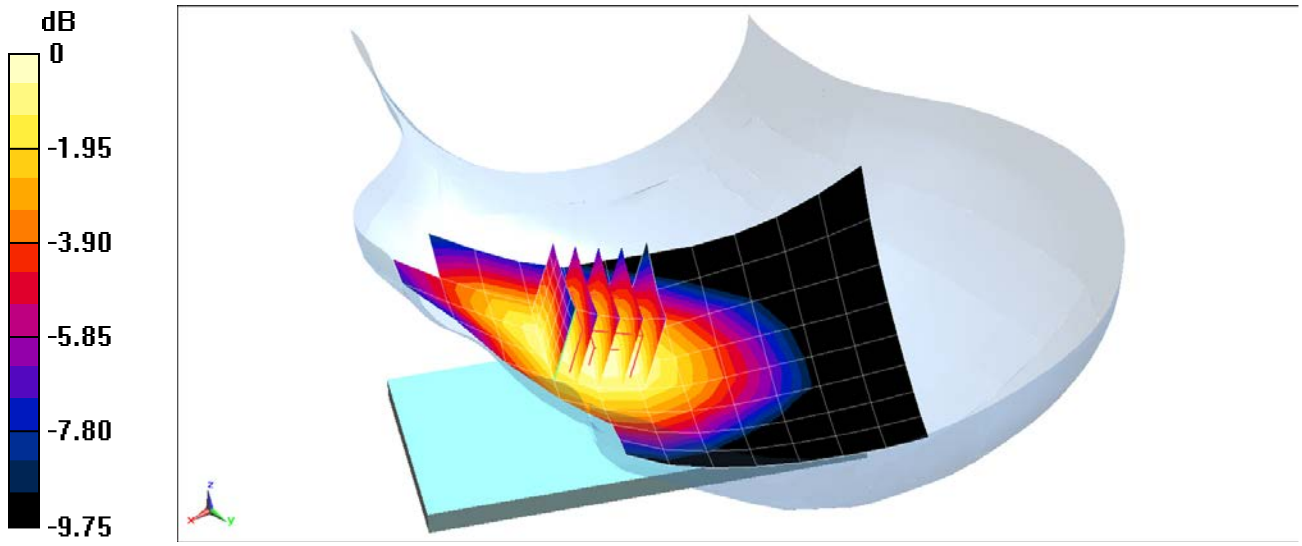
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 782 MHz; σ = 0.907 S/m; ε_r = 43.844; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 07-24-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3209; ConvF(6.76, 6.76, 6.76); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 13, Left Head, Cheek, Mid.ch,
QPSK, 10 MHz Bandwidth, 1 RB, 25 RB Offset

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.25 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.147 W/kg
SAR(1 g) = 0.121 W/kg



0 dB = 0.128 W/kg = -8.92 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01558

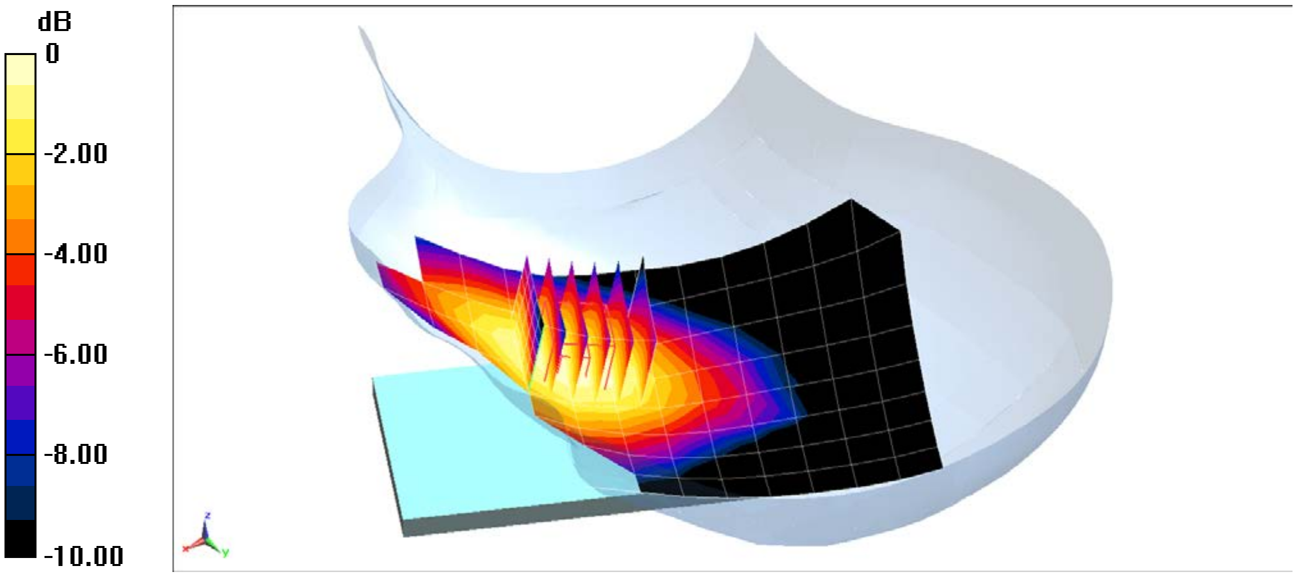
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 831.5 MHz; σ = 0.882 S/m; ε_r = 39.909; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 08-02-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.2°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 26 (Cell.), Left Head, Cheek, Mid.ch,
15 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.94 V/m; Power Drift = -0.12 dB
Peak SAR (extrapolated) = 0.196 W/kg
SAR(1 g) = 0.157 W/kg



0 dB = 0.182 W/kg = -7.40 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01558

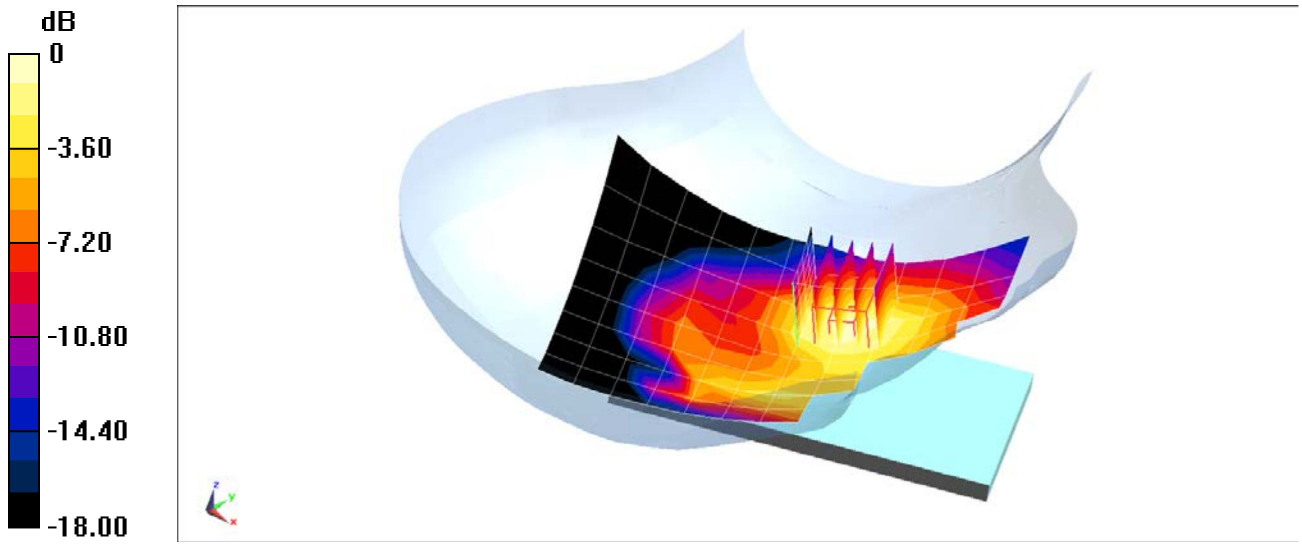
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.39 S/m; ε_r = 39.735; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 07-26-2017; Ambient Temp: 22.3°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3318; ConvF(5.49, 5.49, 5.49); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 4 (AWS), Right 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 = 11.50 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.221 W/kg
SAR(1 g) = 0.149 W/kg



0 dB = 0.174 W/kg = -7.59 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01558

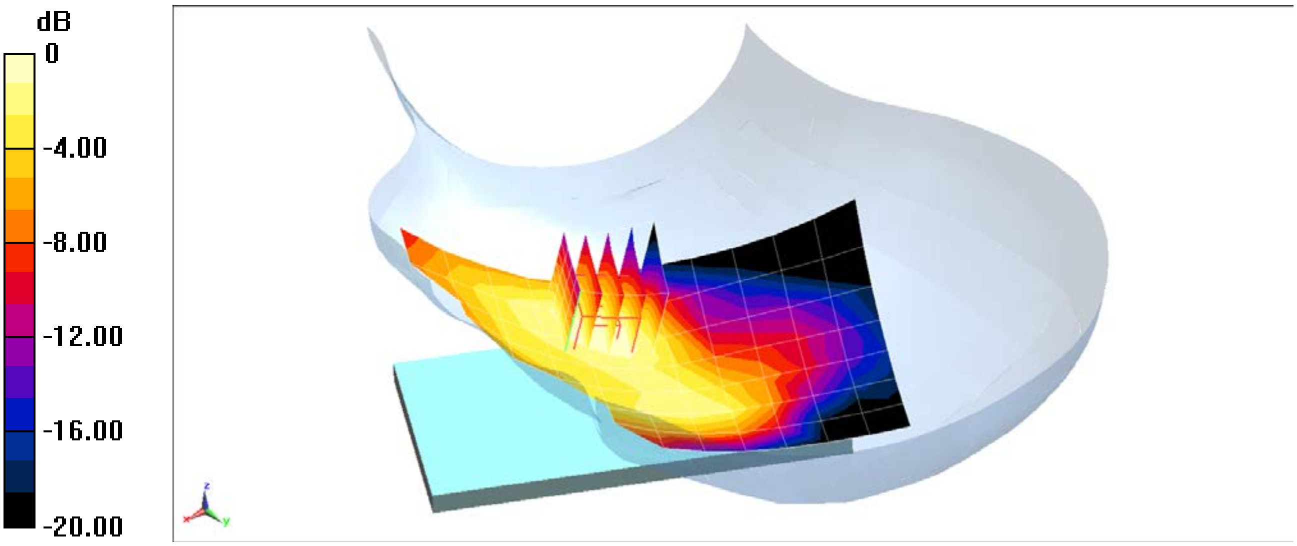
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.408 S/m; ε_r = 40.229; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 07-24-2017; Ambient Temp: 22.6°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3318; ConvF(5.31, 5.31, 5.31); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (8x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.71 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.198 W/kg
SAR(1 g) = 0.132 W/kg



0 dB = 0.153 W/kg = -8.15 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01559

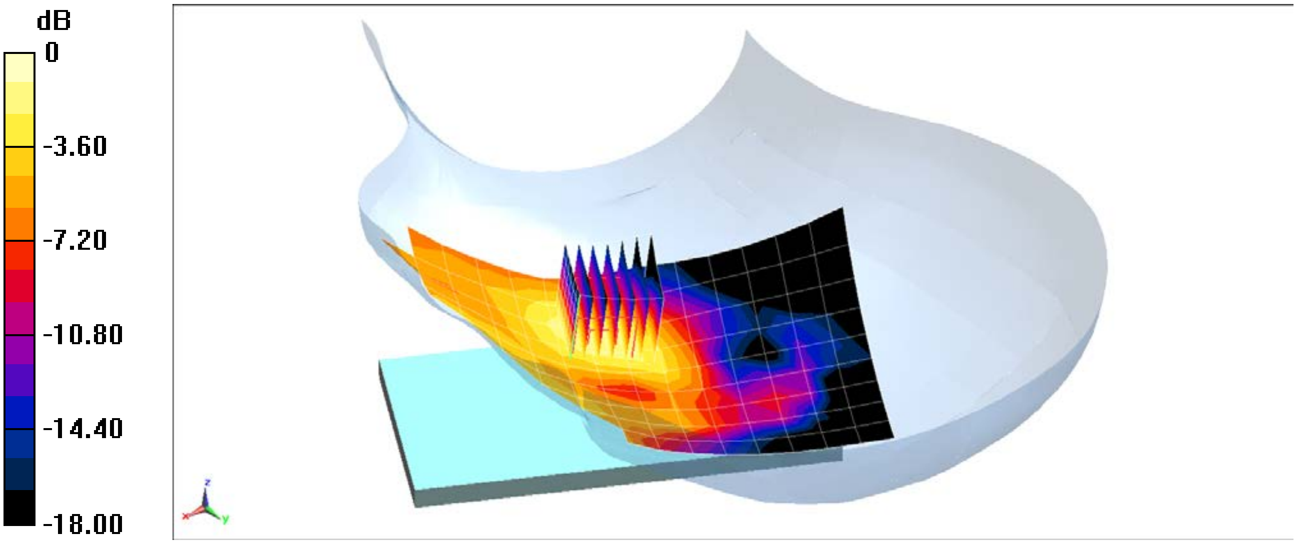
Communication System: UID 0, LTE Band 41; Frequency: 2593 MHz; Duty Cycle: 1:1.58
Medium: 2450 Head Medium parameters used (interpolated):
f = 2593 MHz; σ = 2.038 S/m; ε_r = 37.88; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 07-26-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3213; ConvF(4.52, 4.52, 4.52); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 41, 2CC Uplink, Left Head, Cheek, Mid.ch, 20 MHz Bandwidth
PCC: QPSK, Ch 40620, 1 RB, 0 RB Offset
SCC: QPSK, Ch 40422, 1 RB, 99 RB Offset

Area Scan (10x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.357 V/m; Power Drift = 0.06 dB
Peak SAR (extrapolated) = 0.189 W/kg
SAR(1 g) = 0.107 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01585

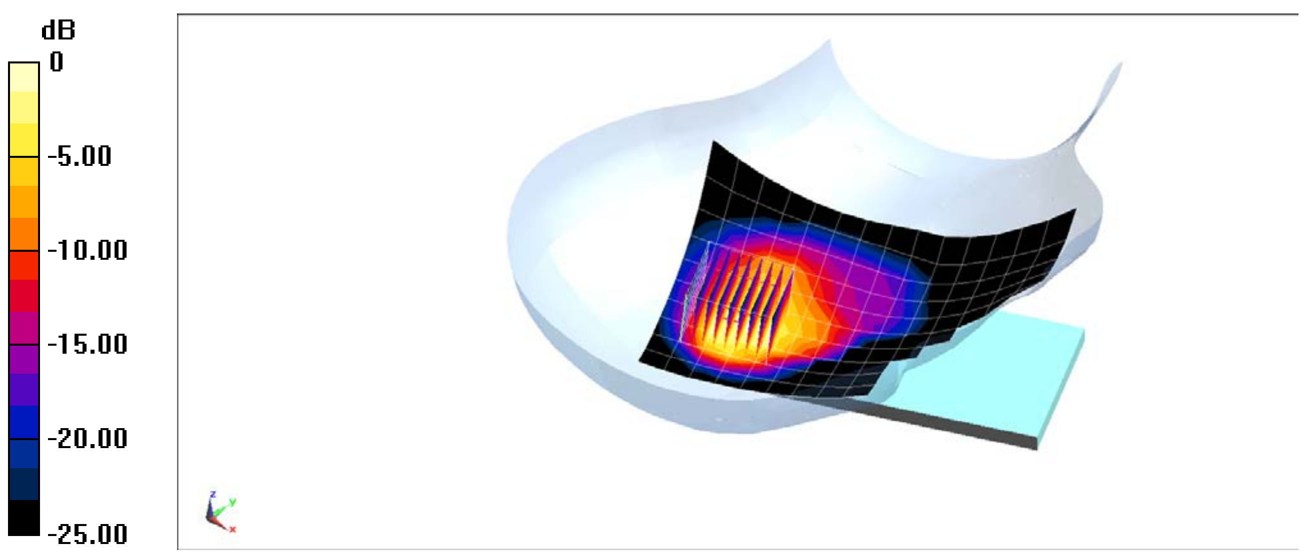
Communication System: UID 0, 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
$f = 2437$ MHz; $\sigma = 1.851$ S/m; $\varepsilon_r = 39.138$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 07-31-2017; Ambient Temp: 22.1°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3213; ConvF(4.7, 4.7, 4.7); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11b, Antenna 2, 22 MHz Bandwidth, Right Head, Cheek, Ch 6, 1 Mbps

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (8x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 13.93 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.509 W/kg



0 dB = 0.692 W/kg = -1.60 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01585

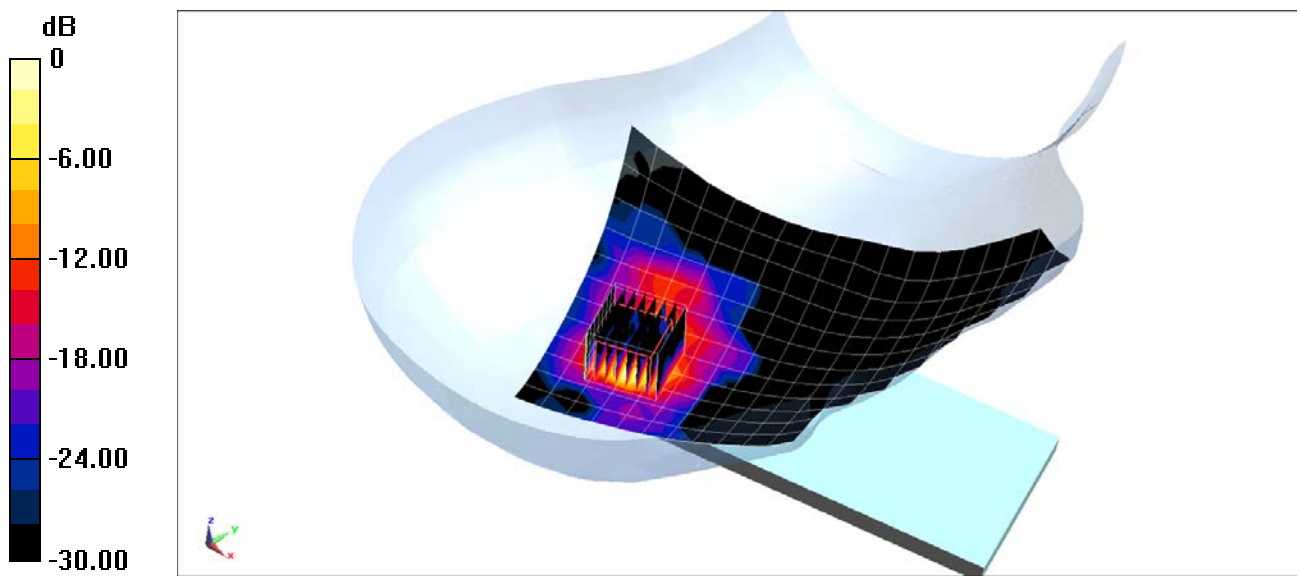
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5320 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used:
f = 5320 MHz; σ = 4.616 S/m; ε_r = 35.755; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 07-31-2017; Ambient Temp: 21.1°C; Tissue Temp: 20.0°C

Probe: EX3DV4 - SN3914; ConvF(5.49, 5.49, 5.49); Calibrated: 2/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11a, Antenna 2, U-NII-2A, 20 MHz Bandwidth, Right Head, Tilt, Ch 64, 6 Mbps

Area Scan (13x20x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 3.329 V/m; Power Drift = 0.20 dB
Peak SAR (extrapolated) = 3.17 W/kg
SAR(1 g) = 0.413 W/kg



0 dB = 1.12 W/kg = 0.49 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01585

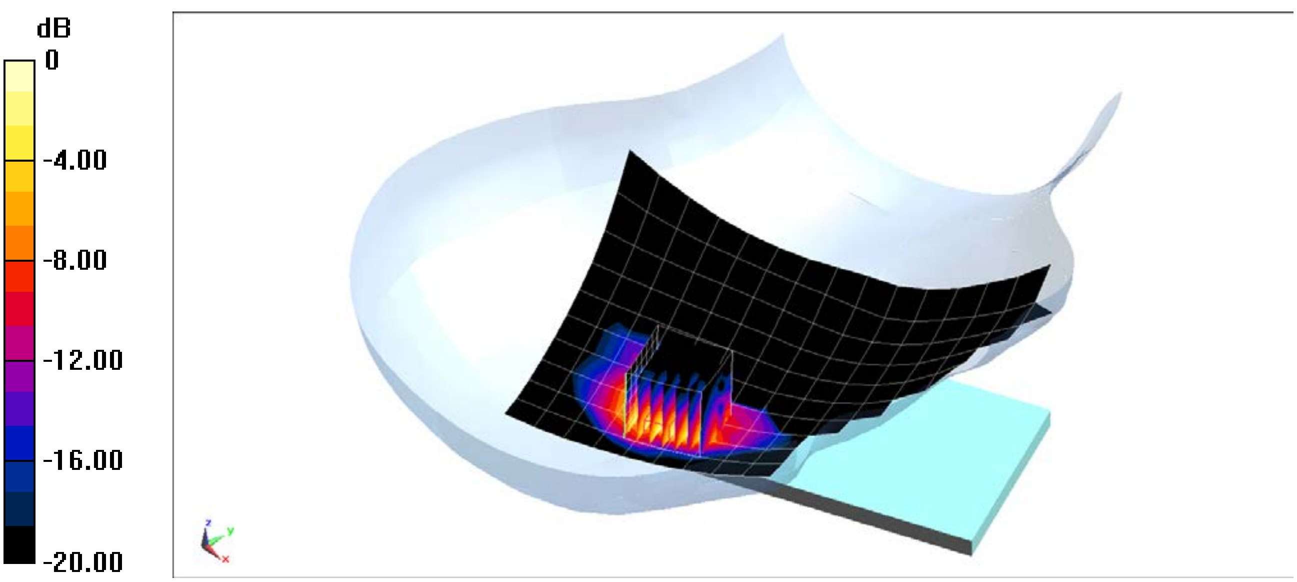
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.297
Medium: 2450 Head Medium parameters used (interpolated):
f = 2441 MHz; σ = 1.855 S/m; ε_r = 39.124; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 07-31-2017; Ambient Temp: 22.1°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3213; ConvF(4.7, 4.7, 4.7); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (11x19x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.012 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.387 W/kg
SAR(1 g) = 0.114 W/kg



0 dB = 0.171 W/kg = -7.67 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01555

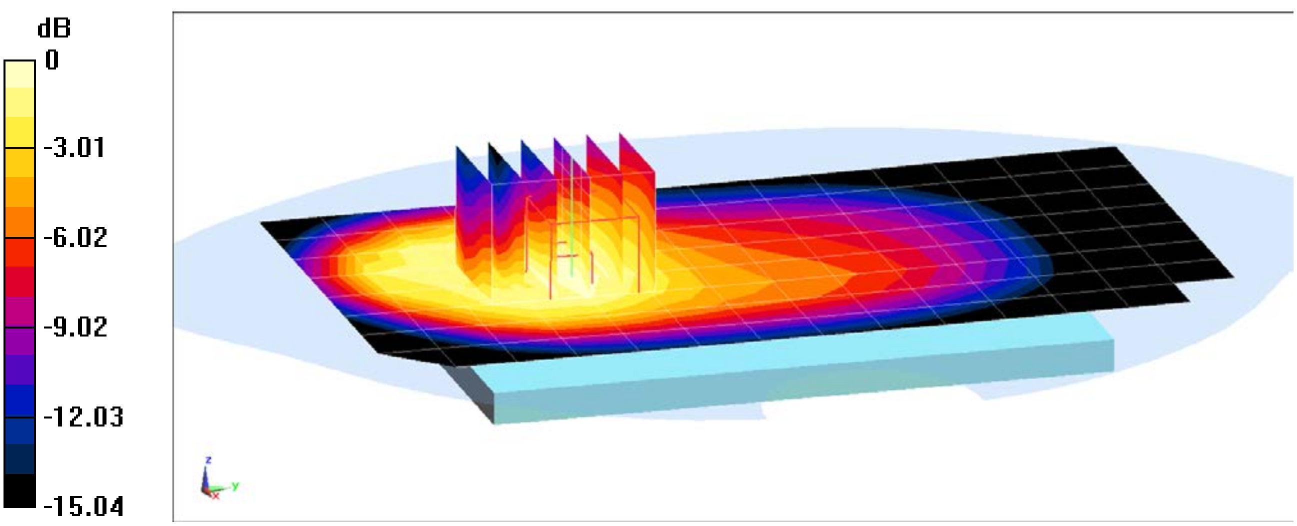
Communication System: UID 0, CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 820.1 MHz; σ = 0.961 S/m; ε_r = 52.798; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-06-2017; Ambient Temp: 21.9°C; Tissue Temp: 20.2°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: BC10 Cell. CDMA, Rule Part 90S, 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 = 15.84 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.44 W/kg
SAR(1 g) = 0.830 W/kg



0 dB = 0.874 W/kg = -0.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01555

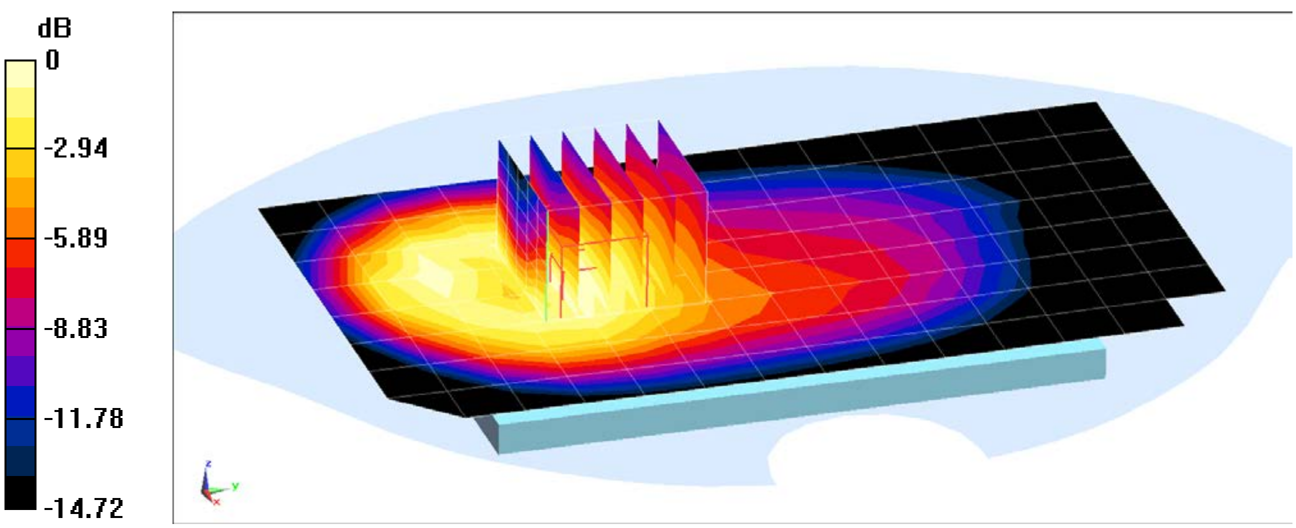
Communication System: UID 0, CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
$f = 820.1$ MHz; $\sigma = 0.961$ S/m; $\varepsilon_r = 52.798$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-06-2017; Ambient Temp: 21.9°C; Tissue Temp: 20.2°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: Cell. EVDO Rev. 0, Rule Part 90S, 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 = 29.99 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 1.20 W/kg
SAR(1 g) = 0.801 W/kg



0 dB = 0.897 W/kg = -0.47 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01555

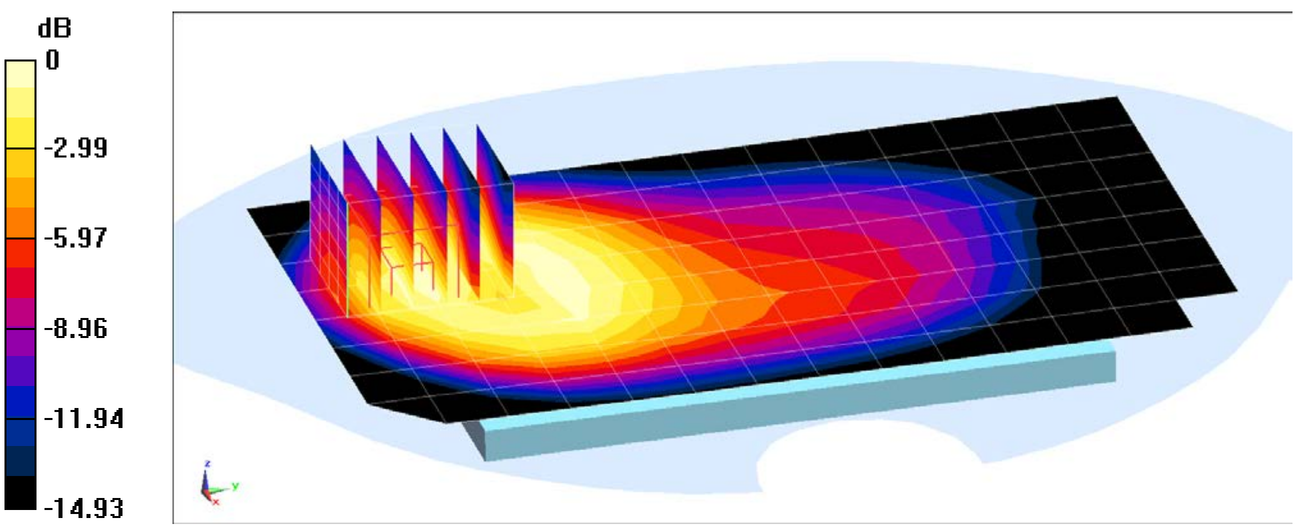
Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.52 MHz; σ = 0.979 S/m; ε_r = 52.635; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-06-2017; Ambient Temp: 21.9°C; Tissue Temp: 20.2°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: Cell. CDMA, Rule Part 22H, 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 = 27.38 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.30 W/kg
SAR(1 g) = 0.759 W/kg



0 dB = 0.886 W/kg = -0.53 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01555

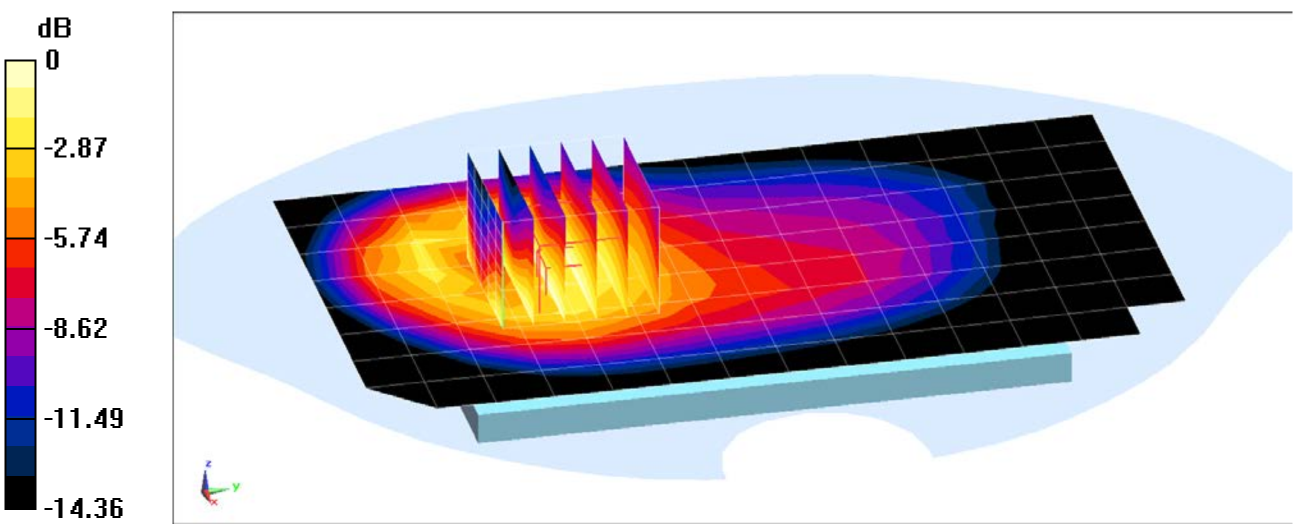
Communication System: UID 0, CDMA; Frequency: 848.31 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 848.31 MHz; σ = 0.99 S/m; ε_r = 52.518; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-06-2017; Ambient Temp: 21.9°C; Tissue Temp: 20.2°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: Cell. EVDO Rev. 0, Rule Part 22H, Body SAR, Back side, High.ch

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.65 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 1.27 W/kg
SAR(1 g) = 0.824 W/kg



0 dB = 0.945 W/kg = -0.24 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01555

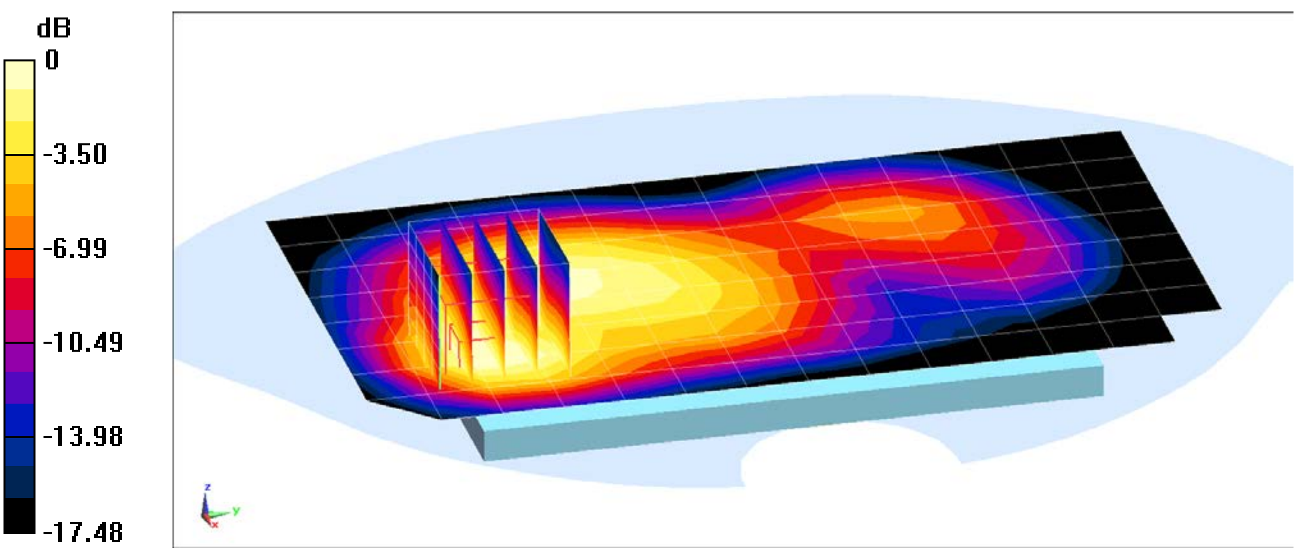
Communication System: UID 0, CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.556 S/m; ε_r = 53.27; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0 Left; Type: QD000P40CD; Serial: TP:1692
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: PCS CDMA, 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 = 19.32 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.978 W/kg
SAR(1 g) = 0.553 W/kg



0 dB = 0.657 W/kg = -1.82 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01555

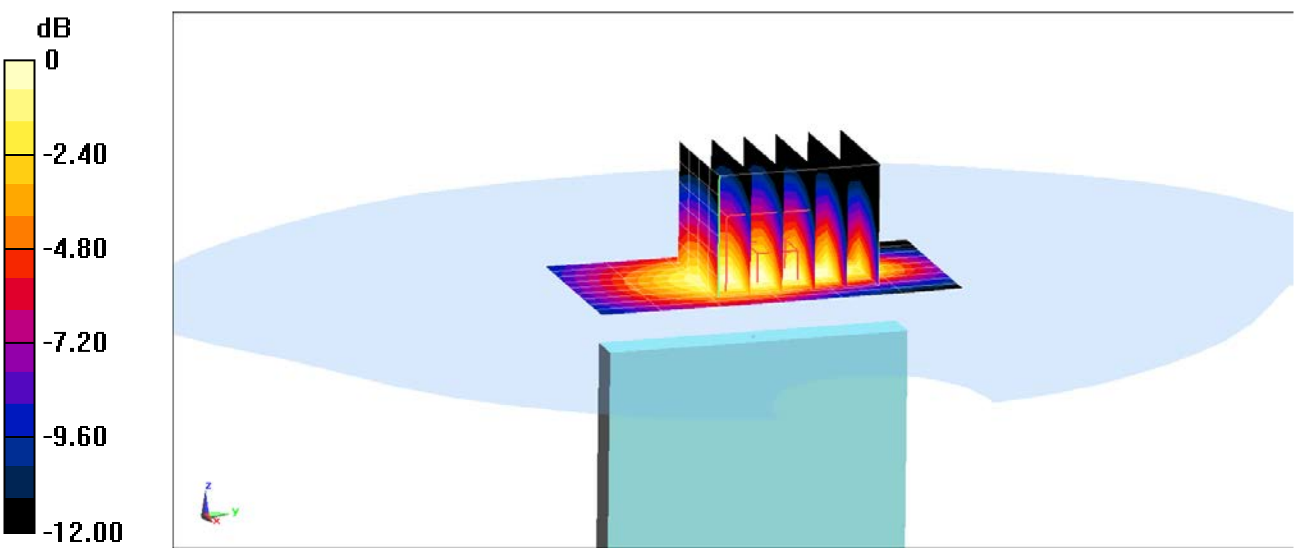
Communication System: UID 0, CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.556 S/m; ε_r = 53.27; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0 Left; Type: QD000P40CD; Serial: TP:1692
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: PCS EVDO Rev. 0, Body SAR, Bottom Edge, Mid.ch

Area Scan (10x7x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.57 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.861 W/kg
SAR(1 g) = 0.518 W/kg



0 dB = 0.630 W/kg = -2.01 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

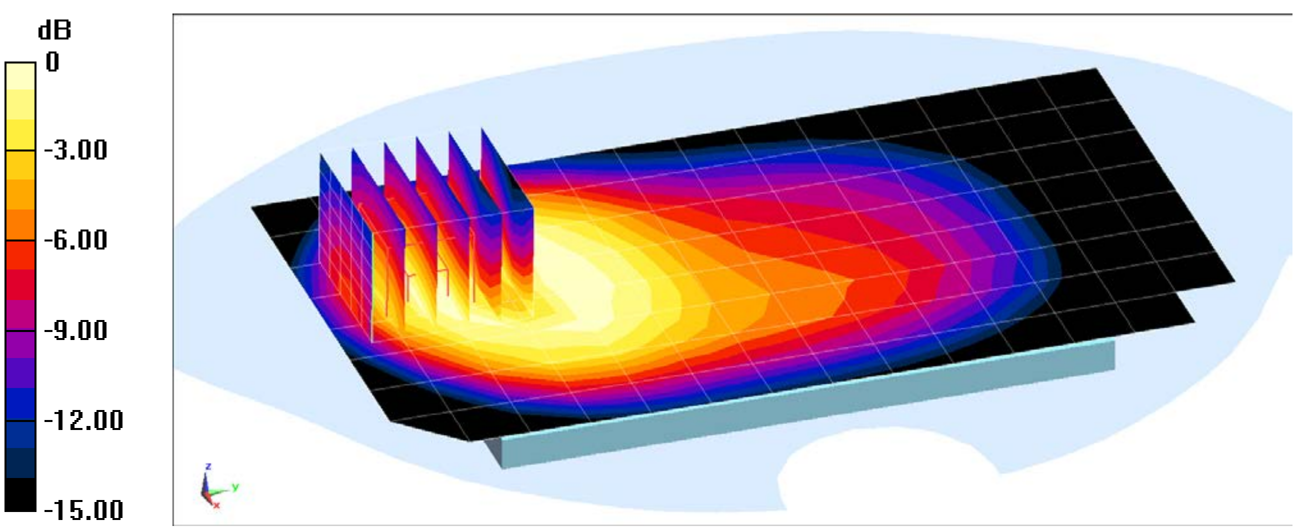
Communication System: UID 0, _GSM GPRS; 1 Tx slot; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium: 835 Body Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.979$ S/m; $\varepsilon_r = 52.634$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-06-2017; Ambient Temp: 21.9°C; Tissue Temp: 20.2°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 1 Tx Slots

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.93 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.838 W/kg
SAR(1 g) = 0.493 W/kg



0 dB = 0.564 W/kg = -2.49 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

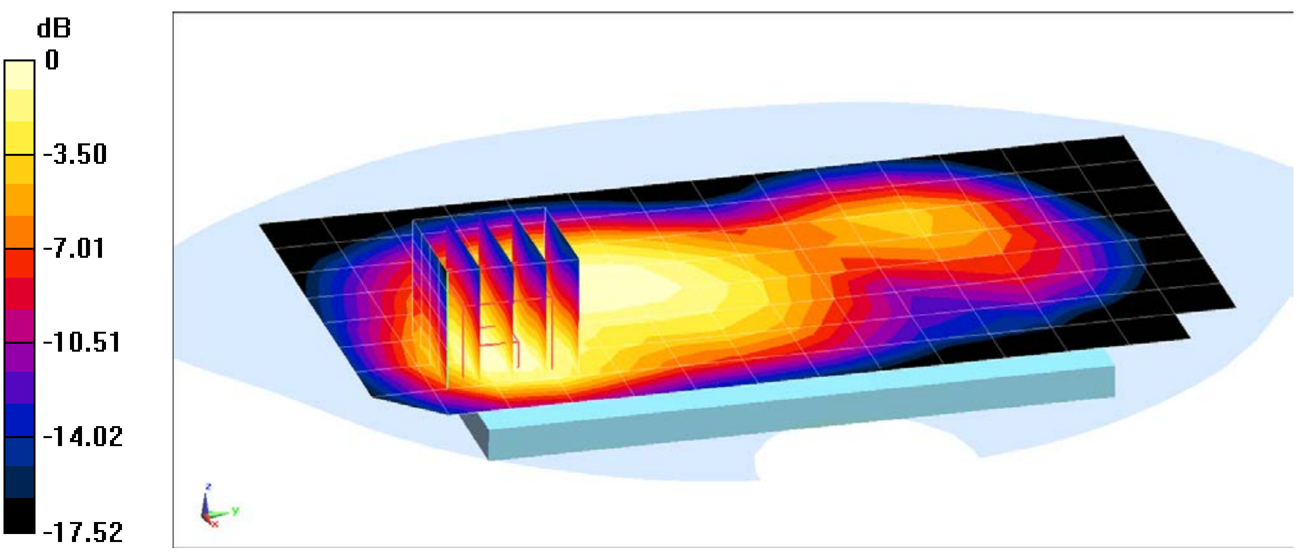
Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.556 S/m; ε_r = 53.27; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0 Left; Type: QD000P40CD; Serial: TP:1692
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.33 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.457 W/kg
SAR(1 g) = 0.259 W/kg



0 dB = 0.312 W/kg = -5.06 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

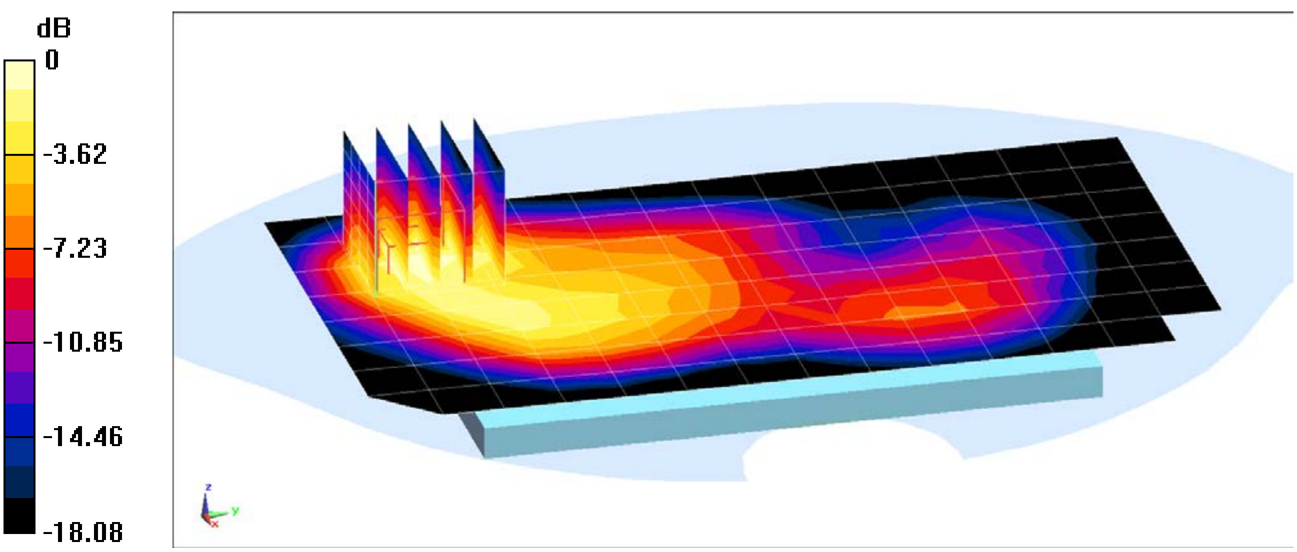
Communication System: UID 0, GSM GPRS; 1 Tx slot; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.556 S/m; ε_r = 53.27; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0 Left; Type: QD000P40CD; Serial: TP:1692
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: GPRS 1900, Body SAR, Front side, Mid.ch, 1 Tx Slot

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.25 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.614 W/kg
SAR(1 g) = 0.320 W/kg



0 dB = 0.401 W/kg = -3.97 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

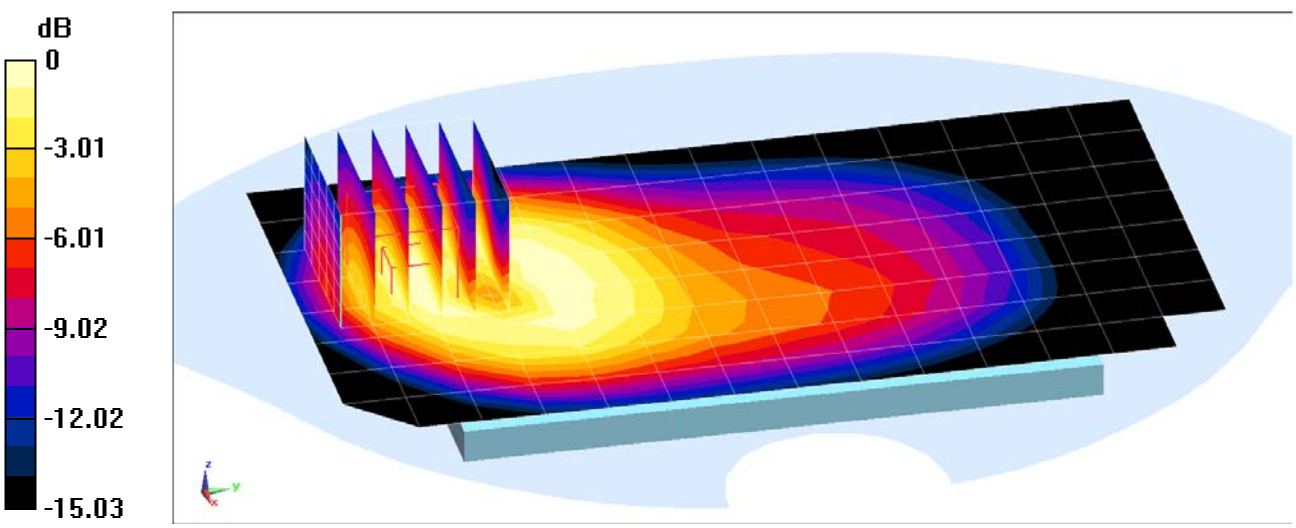
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.979 S/m; ε_r = 52.634; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-06-2017; Ambient Temp: 21.9°C; Tissue Temp: 20.2°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 29.27 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.36 W/kg
SAR(1 g) = 0.786 W/kg



0 dB = 0.900 W/kg = -0.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

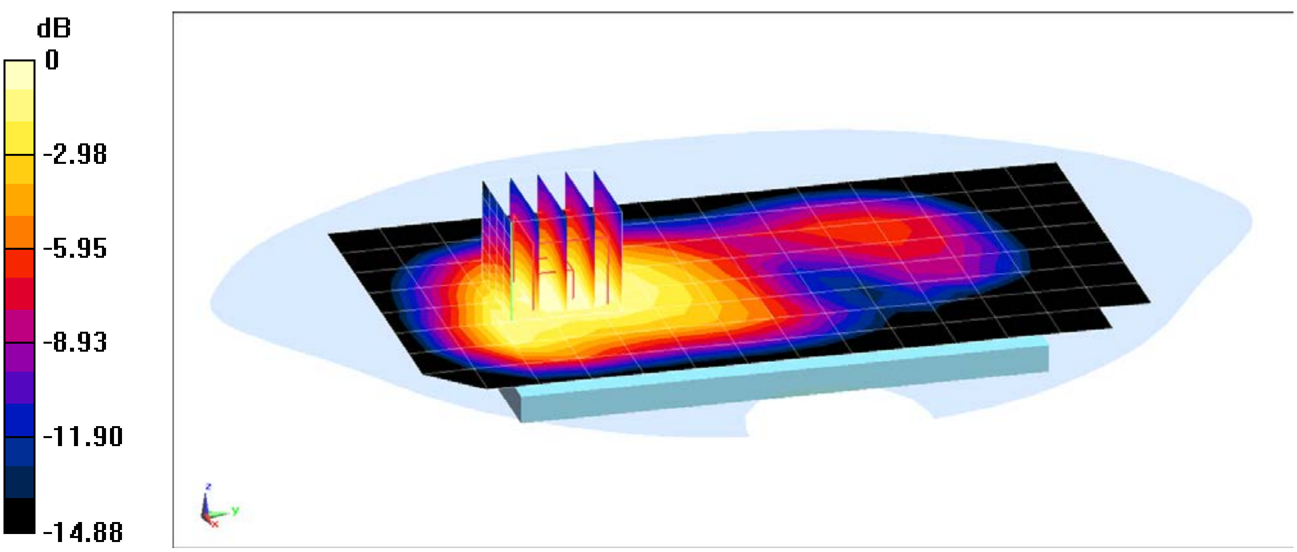
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.487 S/m; ε_r = 51.473; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-27-2017; Ambient Temp: 22.4°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.13 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.15 W/kg
SAR(1 g) = 0.751 W/kg



0 dB = 1.01 W/kg = 0.03 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

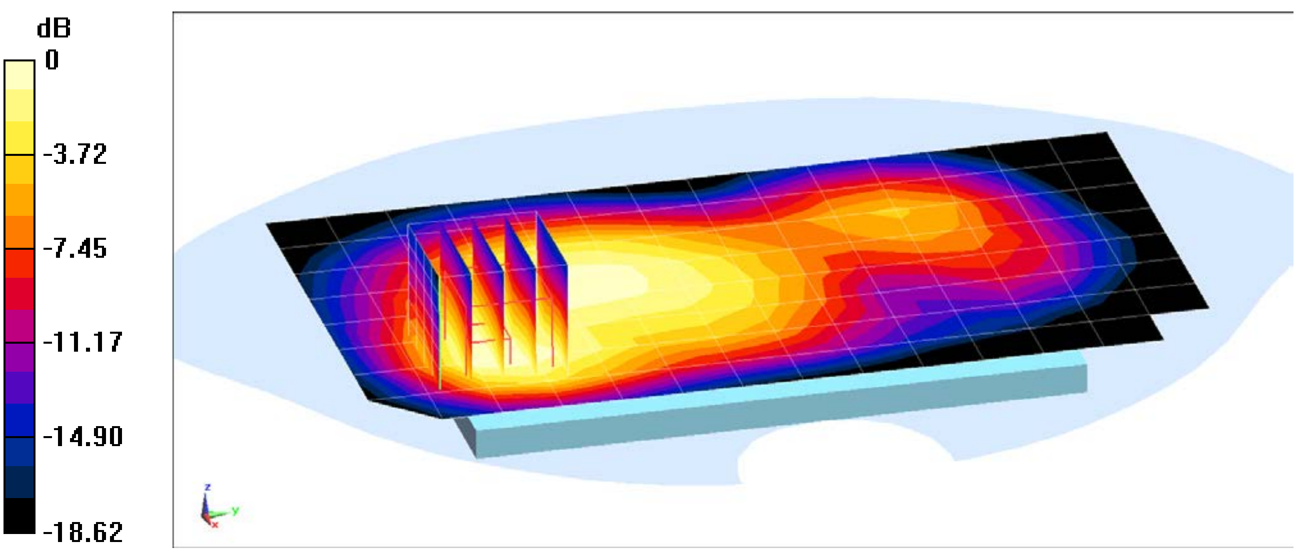
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; $\sigma = 1.539$ S/m; $\varepsilon_r = 52.276$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-29-2017; Ambient Temp: 21.5°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0 Left; Type: QD000P40CD; Serial: TP:1692
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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 = 18.84 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.850 W/kg
SAR(1 g) = 0.476 W/kg



0 dB = 0.582 W/kg = -2.35 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01556

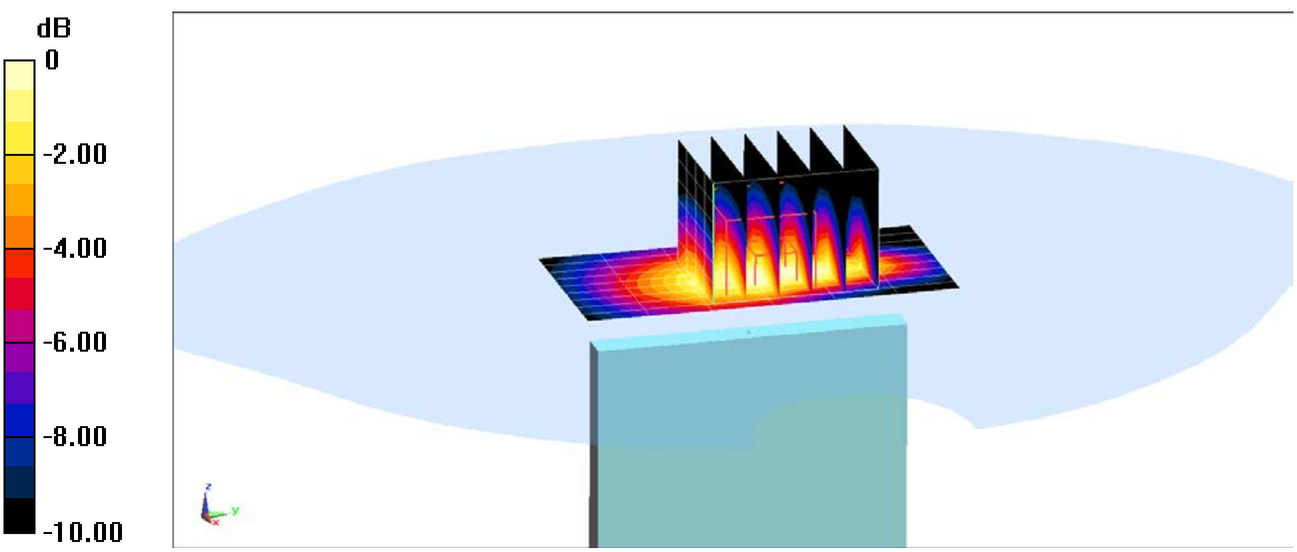
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.539 S/m; ε_r = 52.276; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-29-2017; Ambient Temp: 21.5°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0 Left; Type: QD000P40CD; Serial: TP:1692
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (10x7x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.52 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.847 W/kg
SAR(1 g) = 0.511 W/kg



0 dB = 0.621 W/kg = -2.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01557

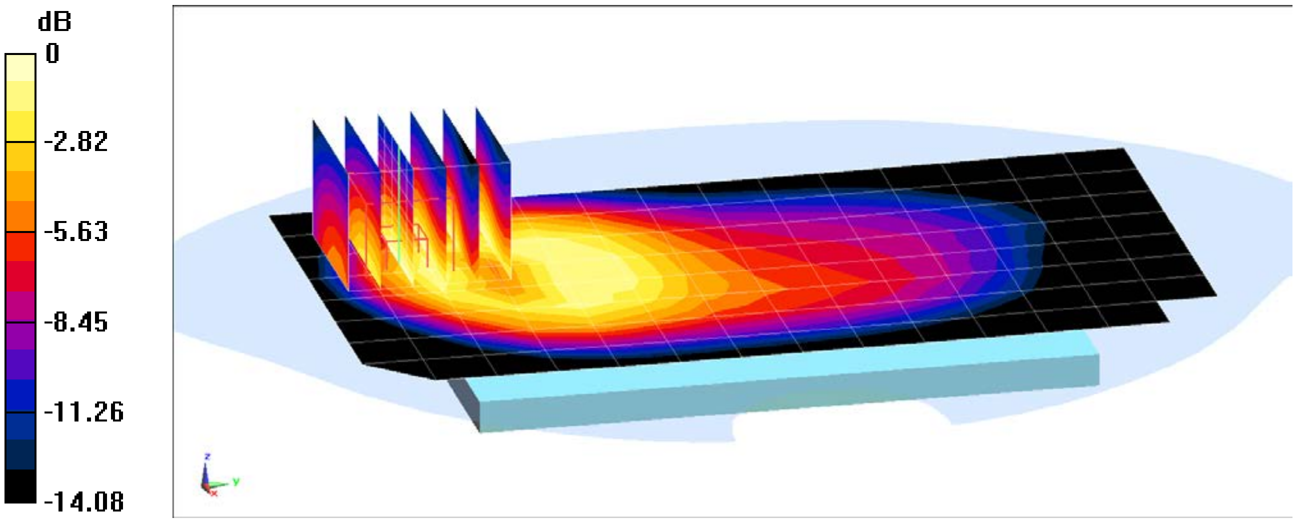
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.928 S/m; ε_r = 56.185; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-04-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.6°C

Probe: ES3DV3 - SN3209; ConvF(6.44, 6.44, 6.44); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 12, Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 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 = 25.28 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.996 W/kg
SAR(1 g) = 0.573 W/kg



0 dB = 0.696 W/kg = -1.57 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01557

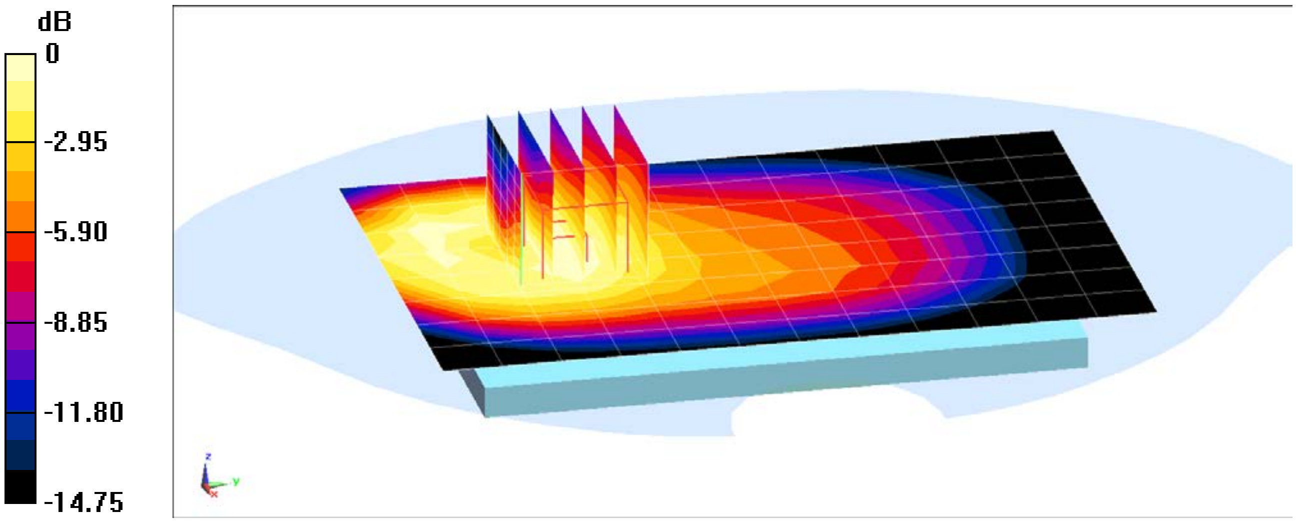
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 782 MHz; σ = 0.998 S/m; ε_r = 55.362; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-04-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.6°C

Probe: ES3DV3 - SN3209; ConvF(6.44, 6.44, 6.44); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 13, Body SAR, Back side, Mid.ch,
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.07 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.719 W/kg
SAR(1 g) = 0.489 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01558

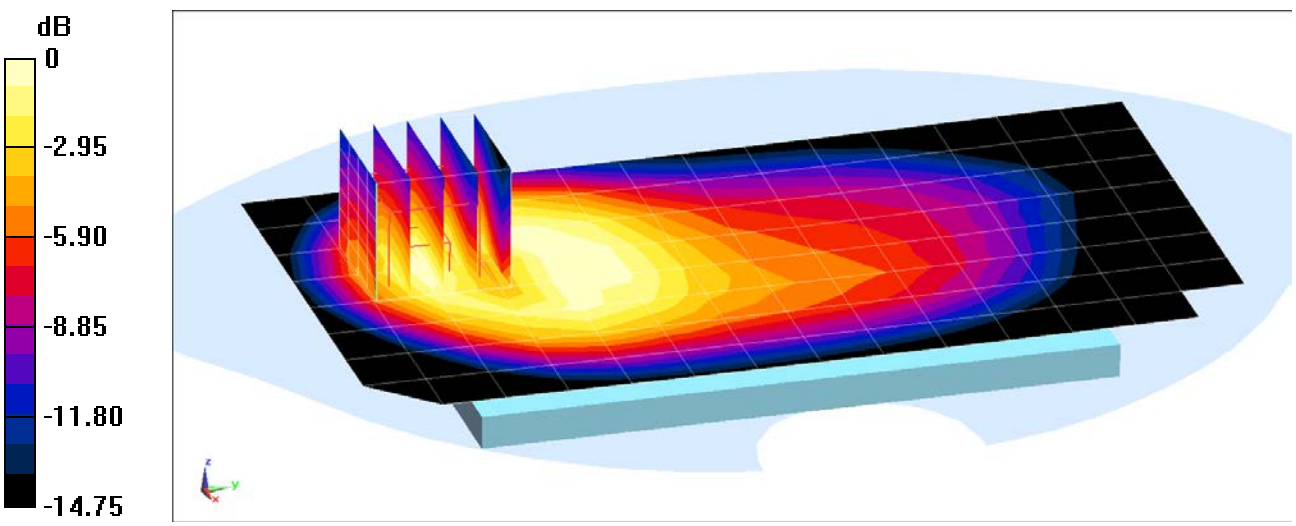
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 831.5 MHz; σ = 0.973 S/m; ε_r = 52.685; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-06-2017; Ambient Temp: 21.9°C; Tissue Temp: 20.2°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 26 (Cell.), Body SAR, Back side, Mid.ch,
15 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 23.70 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.792 W/kg
SAR(1 g) = 0.478 W/kg



0 dB = 0.589 W/kg = -2.30 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01560

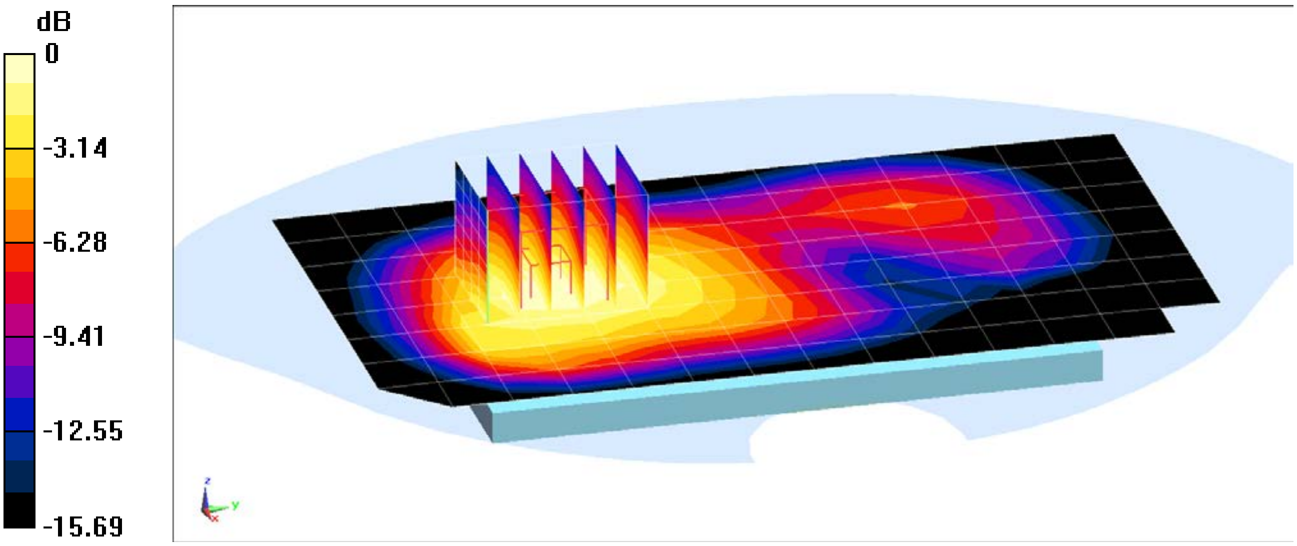
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.487 S/m; ε_r = 51.472; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-27-2017; Ambient Temp: 22.4°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 22.68 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 1.12 W/kg
SAR(1 g) = 0.720 W/kg



0 dB = 0.967 W/kg = -0.14 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01559

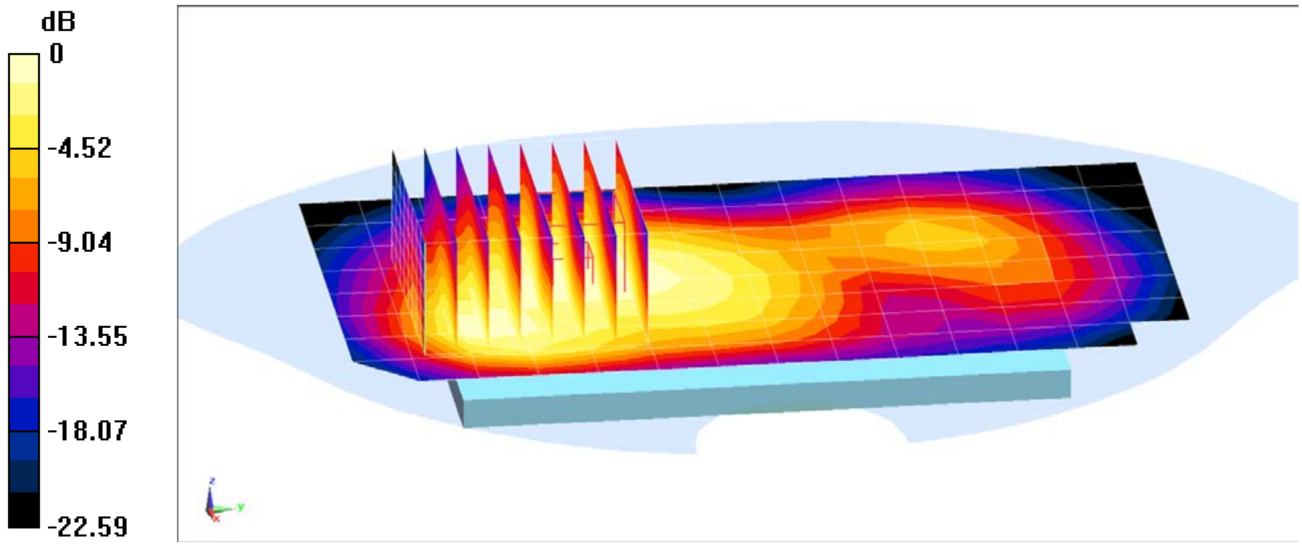
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.515 S/m; ε_r = 52.365; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-29-2017; Ambient Temp: 21.5°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0 Left; Type: QD000P40CD; Serial: TP:1692
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (9x8x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 18.44 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.752 W/kg
SAR(1 g) = 0.500 W/kg



0 dB = 0.578 W/kg = -2.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01559

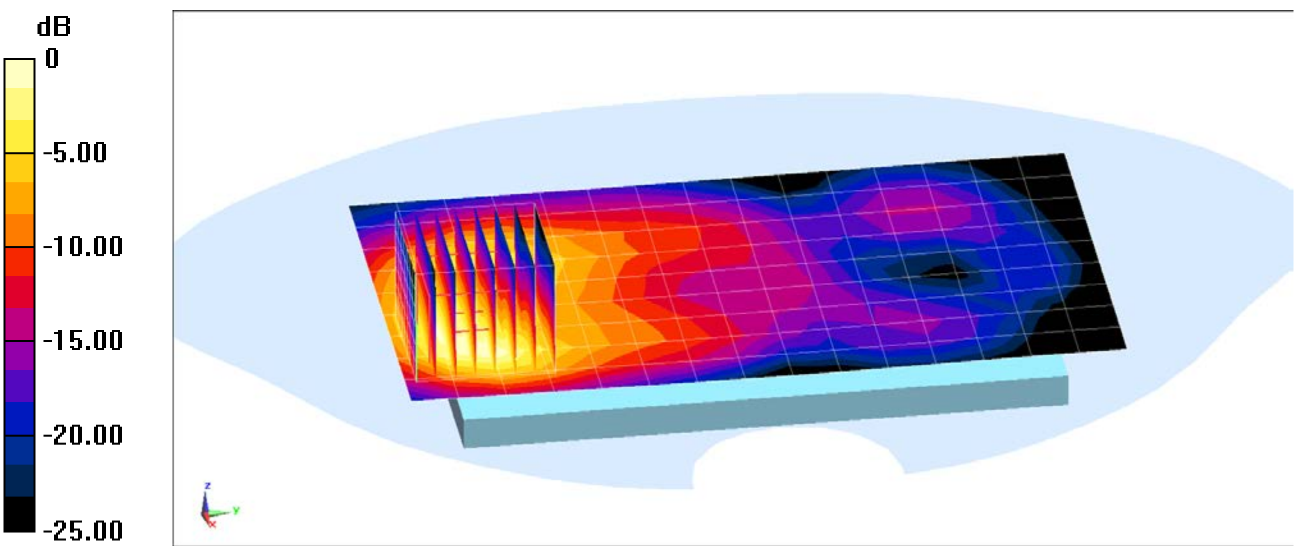
Communication System: UID 0, LTE Band 41 (Class 2); Frequency: 2593 MHz; Duty Cycle: 1:2.31
Medium: 2450 Body Medium parameters used (interpolated):
f = 2593 MHz; σ = 2.233 S/m; ε_r = 52.188; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.2°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3287; ConvF(4.12, 4.12, 4.12); Calibrated: 9/19/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 9/14/2016
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 41 (Class 2), Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.71 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 2.73 W/kg
SAR(1 g) = 1.2 W/kg



0 dB = 1.58 W/kg = 1.99 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01586

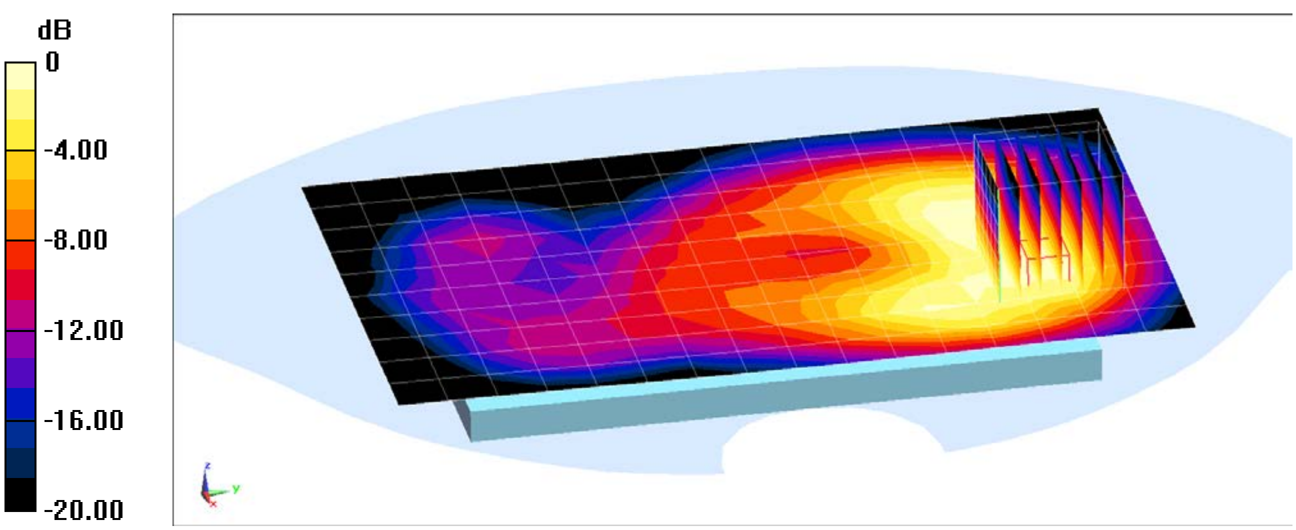
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.99 S/m; ε_r = 52.084; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-03-2017; Ambient Temp: 21.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3287; ConvF(4.35, 4.35, 4.35); Calibrated: 9/19/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 9/14/2016
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11b, Antenna 2, 22 MHz Bandwidth, Body SAR, Ch 06, 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 = 10.47 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.400 W/kg
SAR(1 g) = 0.194 W/kg



0 dB = 0.248 W/kg = -6.06 dBW/kg

DUT: ZNFLS998; Type: Portable Handset; Serial: 01586

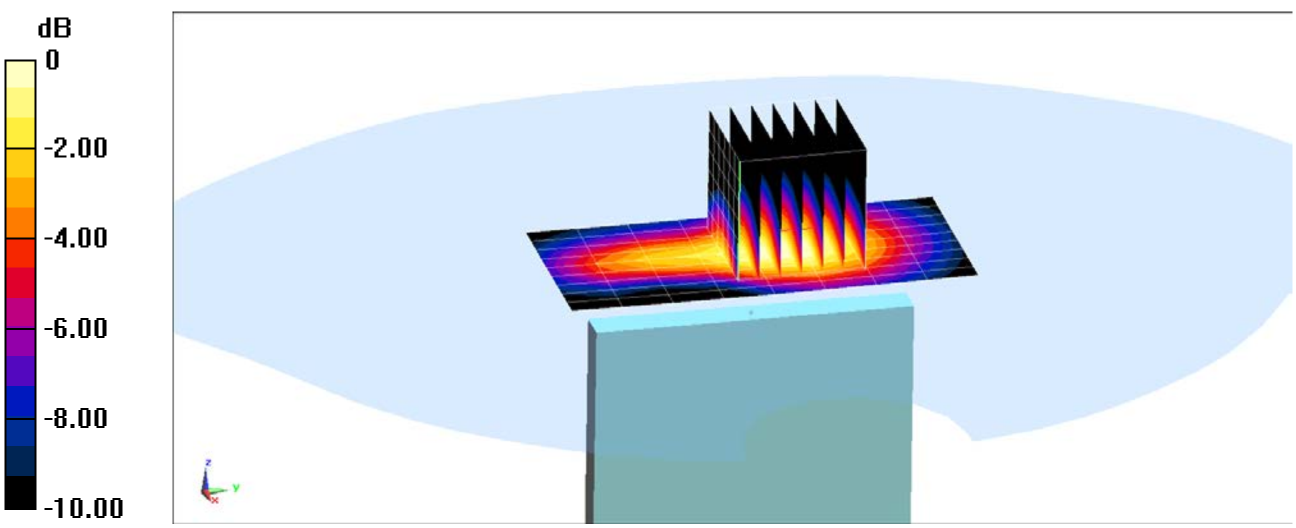
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2437 MHz; σ = 1.99 S/m; ε_r = 52.084; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-03-2017; Ambient Temp: 21.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3287; ConvF(4.35, 4.35, 4.35); Calibrated: 9/19/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 9/14/2016
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11b, Antenna 2, 22 MHz Bandwidth, Body SAR, Ch 06, 1 Mbps, Top Edge

Area Scan (10x9x1): Measurement grid: dx=5mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.28 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.388 W/kg
SAR(1 g) = 0.206 W/kg



0 dB = 0.258 W/kg = -5.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01586

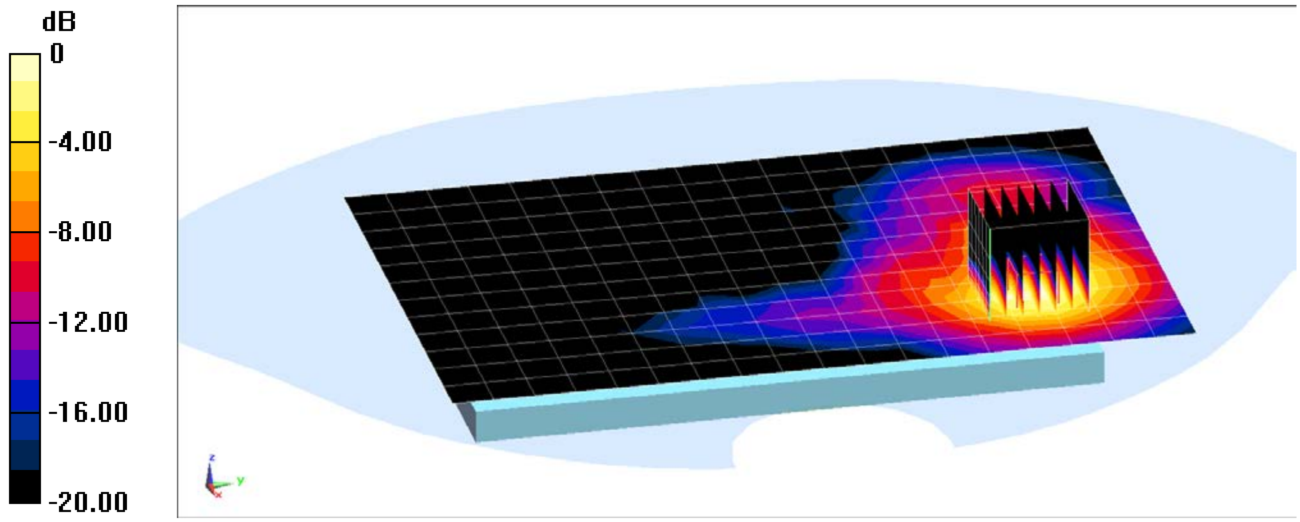
Communication System: UID 0, 802.11n 5.2-5.8 GHz Band; Frequency: 5320 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5320 MHz; σ = 5.517 S/m; ε_r = 47.659; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(4.19, 4.19, 4.19); Calibrated: 1/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1466; Calibrated: 1/16/2017
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11n, MIMO, UNII-2A, 20 MHz Bandwidth,
Body SAR, Ch 64, 13 Mbps, Back Side

Area Scan (13x19x1): 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 = 10.90 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 2.34 W/kg
SAR(1 g) = 0.594 W/kg



0 dB = 1.40 W/kg = 1.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01586

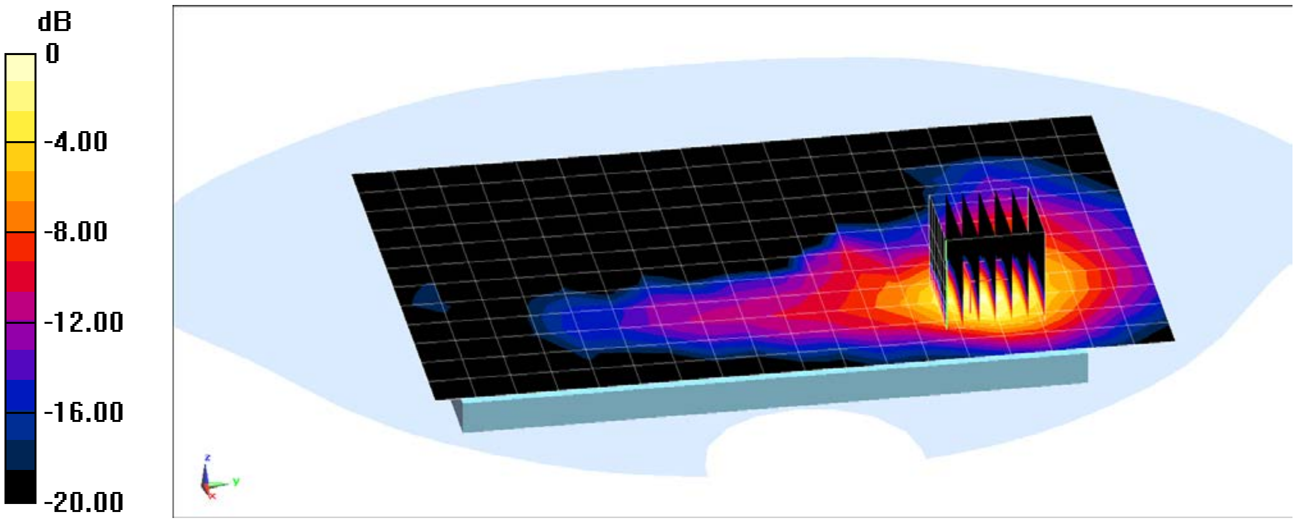
Communication System: UID 0, 802.11n' 5.2-5.8 GHz Band; Frequency: 5745 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5745 MHz; σ = 6.097 S/m; ε_r = 46.97; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(3.83, 3.83, 3.83); Calibrated: 1/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1466; Calibrated: 1/16/2017
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

**Mode: IEEE 802.11n, MIMO, U-NII-3, 20 MHz Bandwidth,
Body SAR, Ch 149, 13 Mbps, Back Side**

Area Scan (13x19x1): 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 = 10.45 V/m; Power Drift = 0.17 dB
Peak SAR (extrapolated) = 2.50 W/kg
SAR(1 g) = 0.585 W/kg



0 dB = 1.50 W/kg = 1.76 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01586

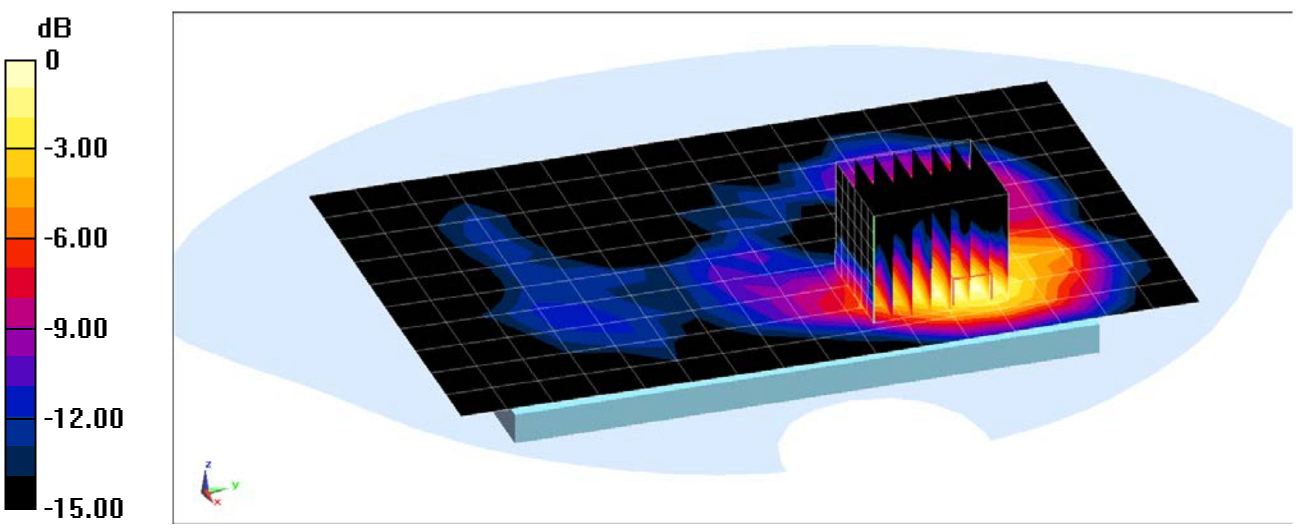
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.297
Medium: 2450 Body Medium parameters used (interpolated):
f = 2441 MHz; σ = 2.012 S/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2017; Ambient Temp: 22.9°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3287; ConvF(4.35, 4.35, 4.35); Calibrated: 9/19/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 9/14/2016
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 2.787 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.0800 W/kg
SAR(1 g) = 0.020 W/kg



0 dB = 0.0278 W/kg = -15.56 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01586

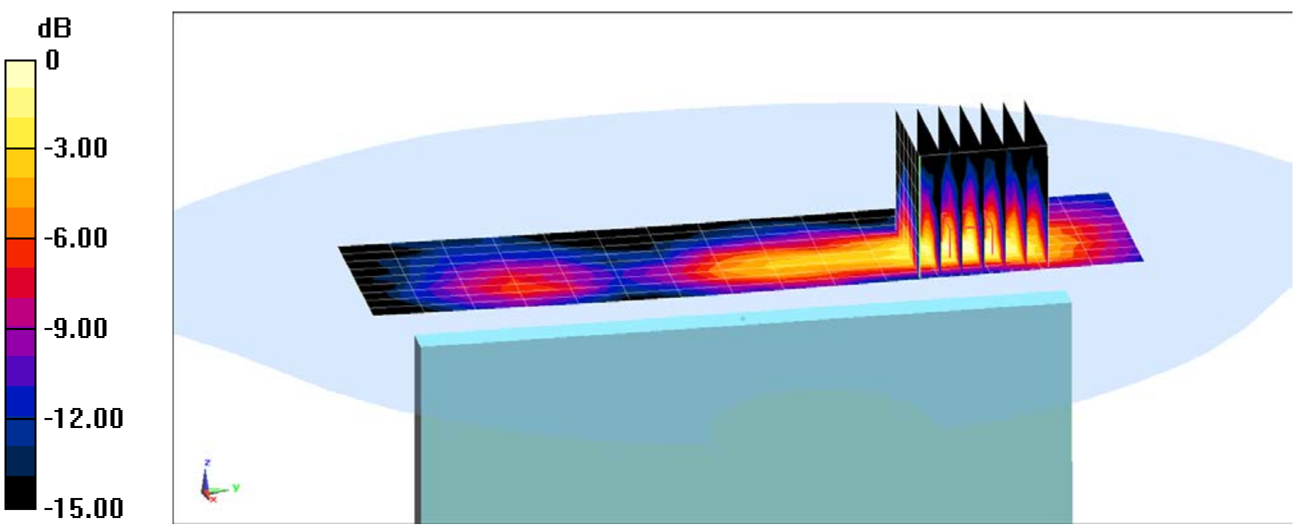
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.297
Medium: 2450 Body Medium parameters used (interpolated):
f = 2441 MHz; σ = 2.012 S/m; ε_r = 51.5; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2017; Ambient Temp: 22.9°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3287; ConvF(4.35, 4.35, 4.35); Calibrated: 9/19/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 9/14/2016
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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 = 3.678 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.0530 W/kg
SAR(1 g) = 0.026 W/kg



0 dB = 0.0349 W/kg = -14.57 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFLS998; Type: Portable Handset; Serial: 01586

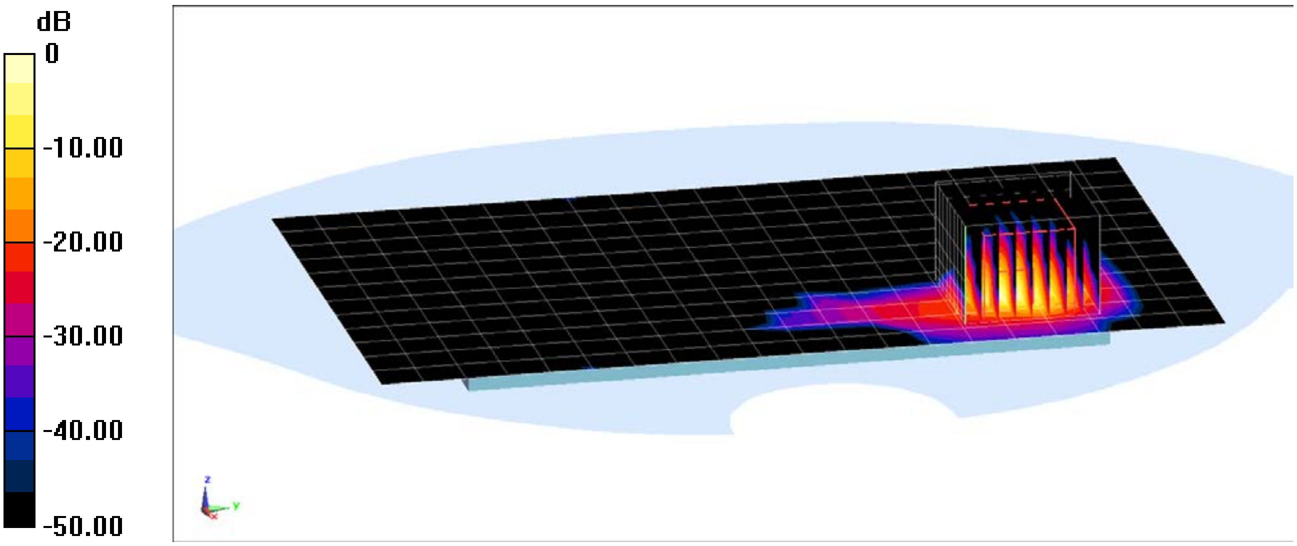
Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5580 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5580 MHz; σ = 5.86 S/m; ε_r = 47.196; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(3.82, 3.82, 3.82); Calibrated: 1/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1466; Calibrated: 1/16/2017
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11a, U-NII-2C, Antenna 1, 20 MHz Bandwidth, Phablet SAR, Ch 116, 6 Mbps, Back Side

Area Scan (13x21x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 41.69 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 67.5 W/kg
SAR(10 g) = 1.32 W/kg



0 dB = 28.5 W/kg = 14.55 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

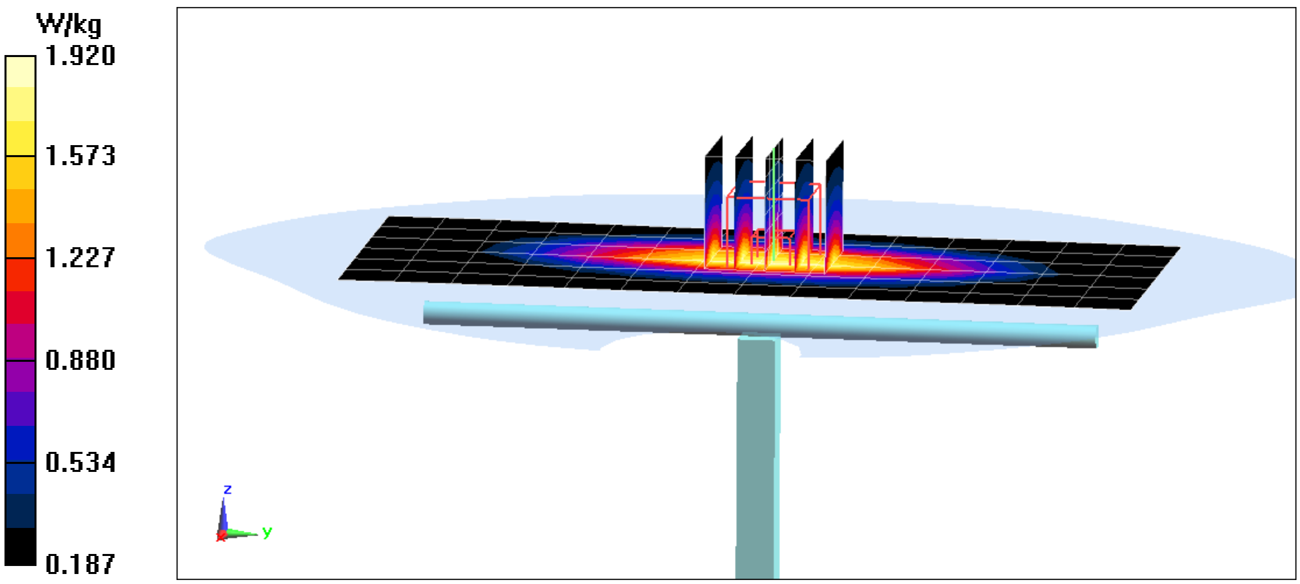
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 750 MHz; σ = 0.896 S/m; ε_r = 43.954; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-24-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.5°C

Probe: ES3DV3 - SN3209; ConvF(6.76, 6.76, 6.76); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.42 W/kg
SAR(1 g) = 1.65 W/kg
Deviation(1 g) = -1.43%



PCTEST ENGINEERING LABORATORY, INC.

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

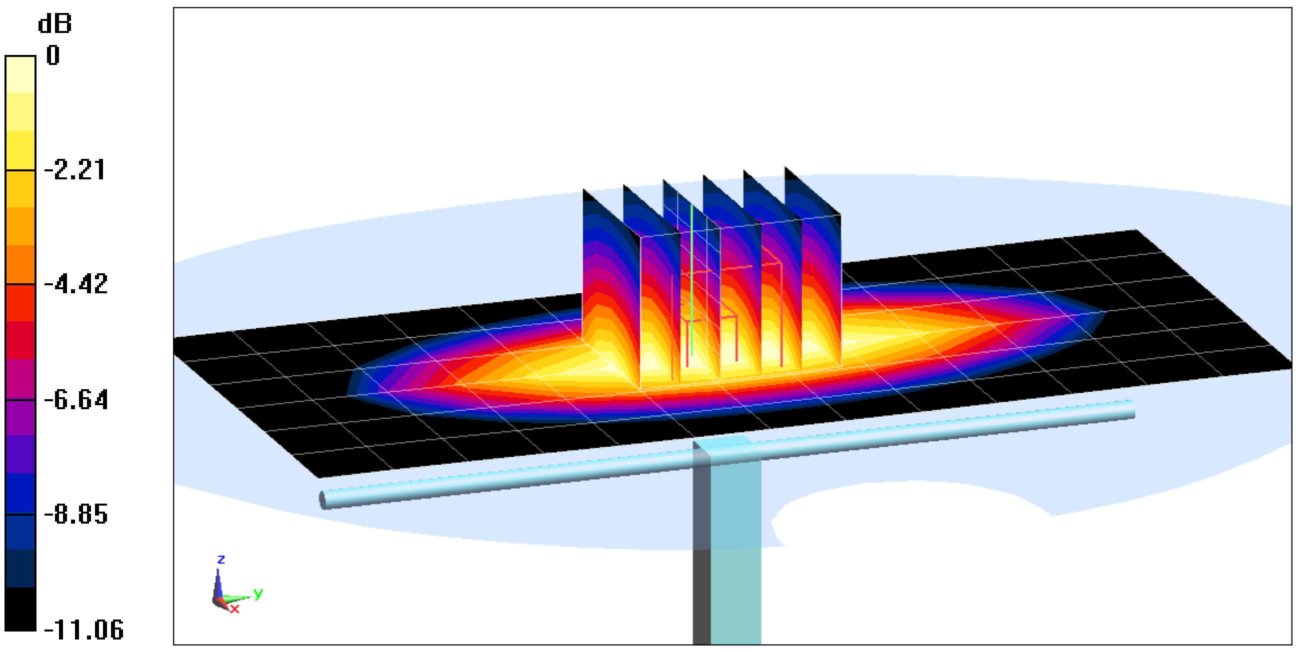
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.885 S/m; ε_r = 39.863; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-02-2017; Ambient Temp: 22.1°C; Tissue Temp: 20.2°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 3.06 W/kg
SAR(1 g) = 1.96 W/kg
Deviation(1 g) = 3.59%



0 dB = 2.68 W/kg = 4.28 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

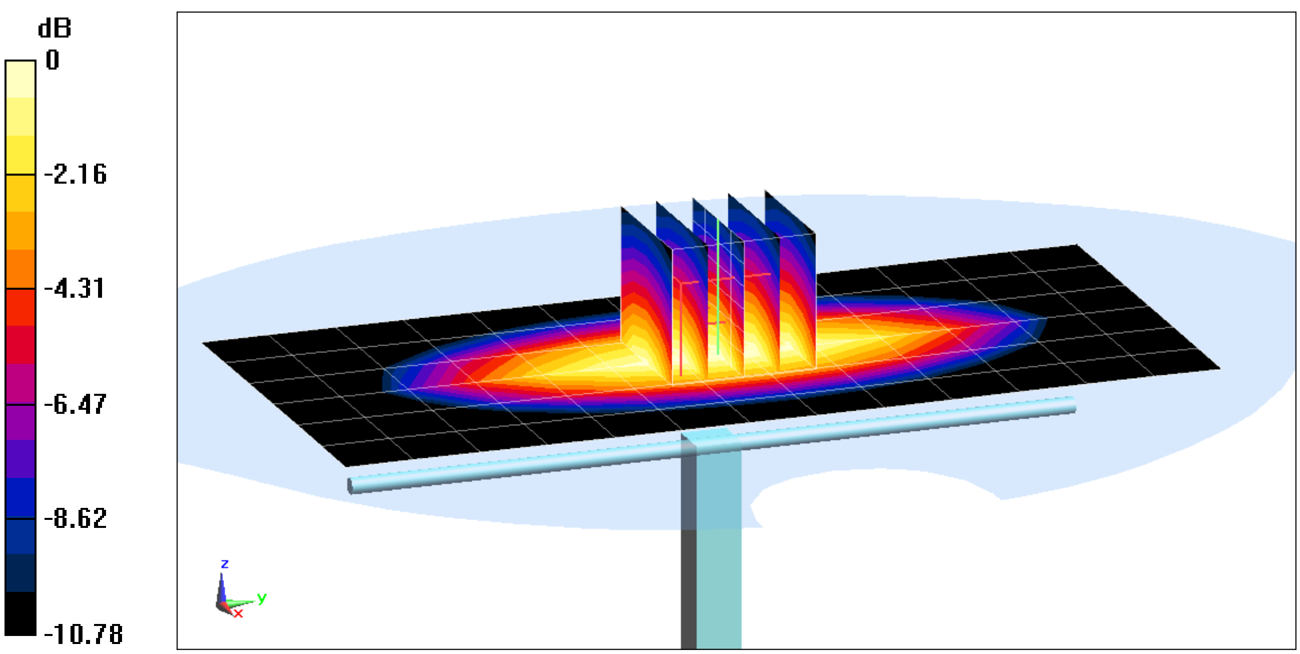
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.908 S/m; ε_r = 42.461; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-07-2017; Ambient Temp: 22.4°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(9.97, 9.97, 9.97); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.88 W/kg
SAR(1 g) = 1.92 W/kg
Deviation(1 g) = 0.84%



0 dB = 2.55 W/kg = 4.07 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1092

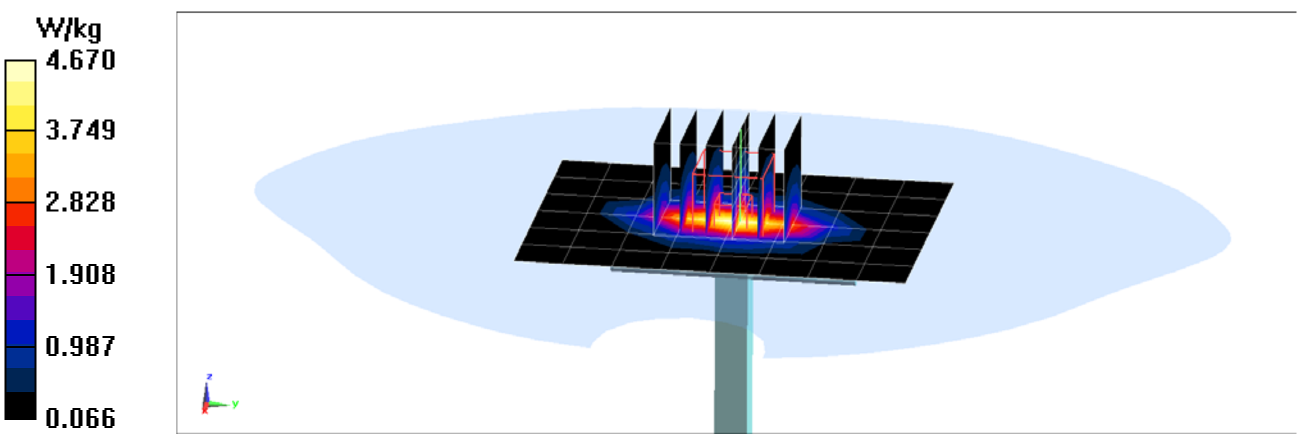
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used:
f = 1750 MHz; σ = 1.407 S/m; ε_r = 39.653; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-26-2017; Ambient Temp: 22.3°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3318; ConvF(5.49, 5.49, 5.49); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.72 W/kg
SAR(1 g) = 3.70 W/kg
Deviation(1 g) = 1.65%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d026

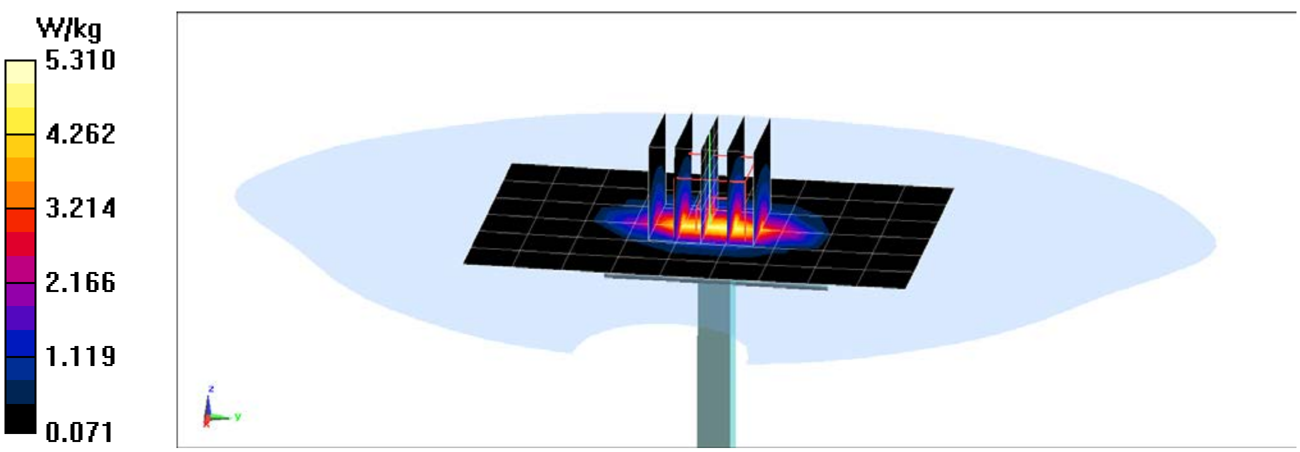
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.454 S/m; ε_r = 40.051; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-24-2017; Ambient Temp: 22.6°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3318; ConvF(5.31, 5.31, 5.31); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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) = 7.84 W/kg
SAR(1 g) = 4.18 W/kg
Deviation(1 g) = 6.36%



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

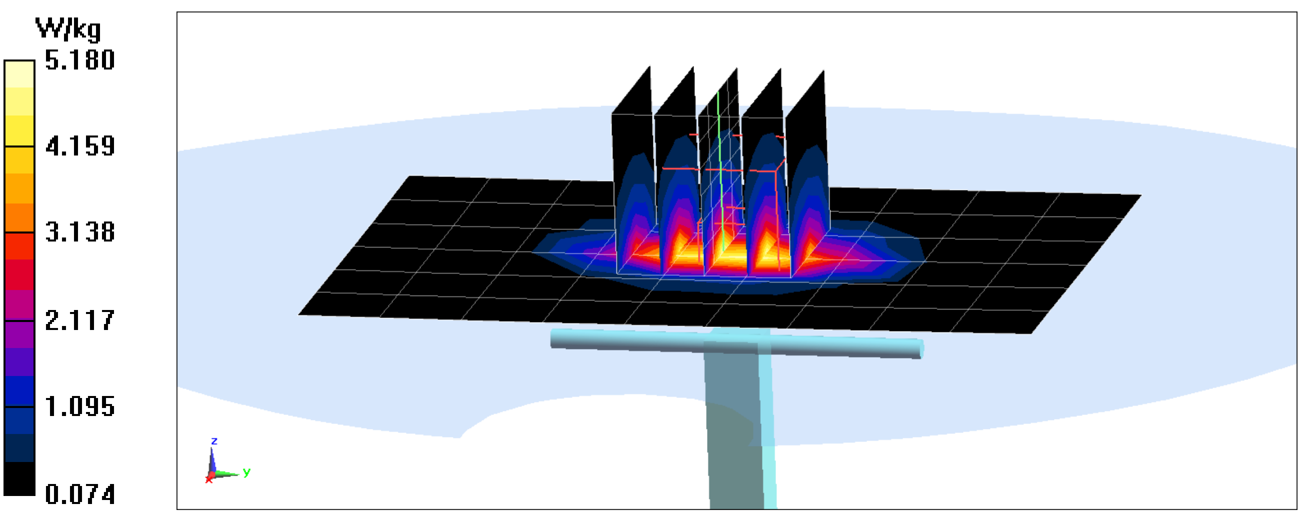
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.437 S/m; ε_r = 39.613; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-09-2017; Ambient Temp: 22.2°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3318; ConvF(5.31, 5.31, 5.31); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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) = 7.57 W/kg
SAR(1 g) = 4.09 W/kg
Deviation(1 g) = 1.74%



PCTEST ENGINEERING LABORATORY, INC.

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

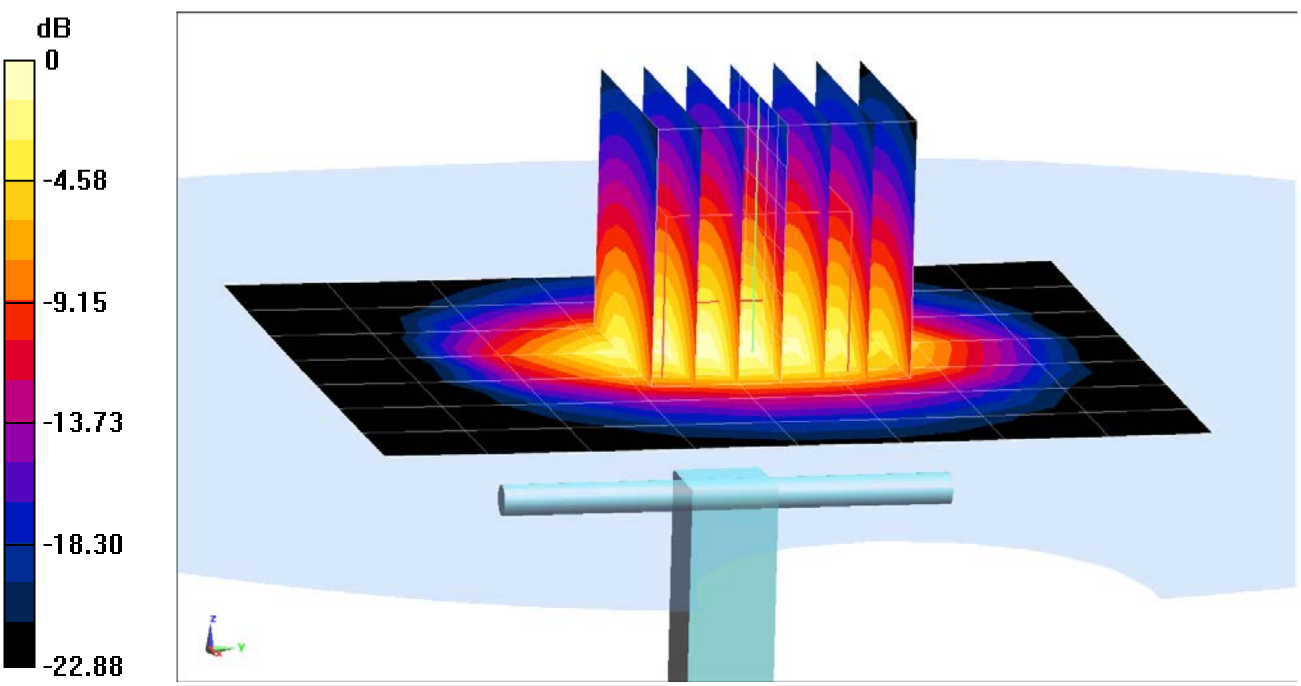
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.865 S/m; ε_r = 39.092; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.1°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3213; ConvF(4.7, 4.7, 4.7); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.5 W/kg
SAR(1 g) = 5.50 W/kg
Deviation(1 g) = 5.57%



0 dB = 7.20 W/kg = 8.57 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

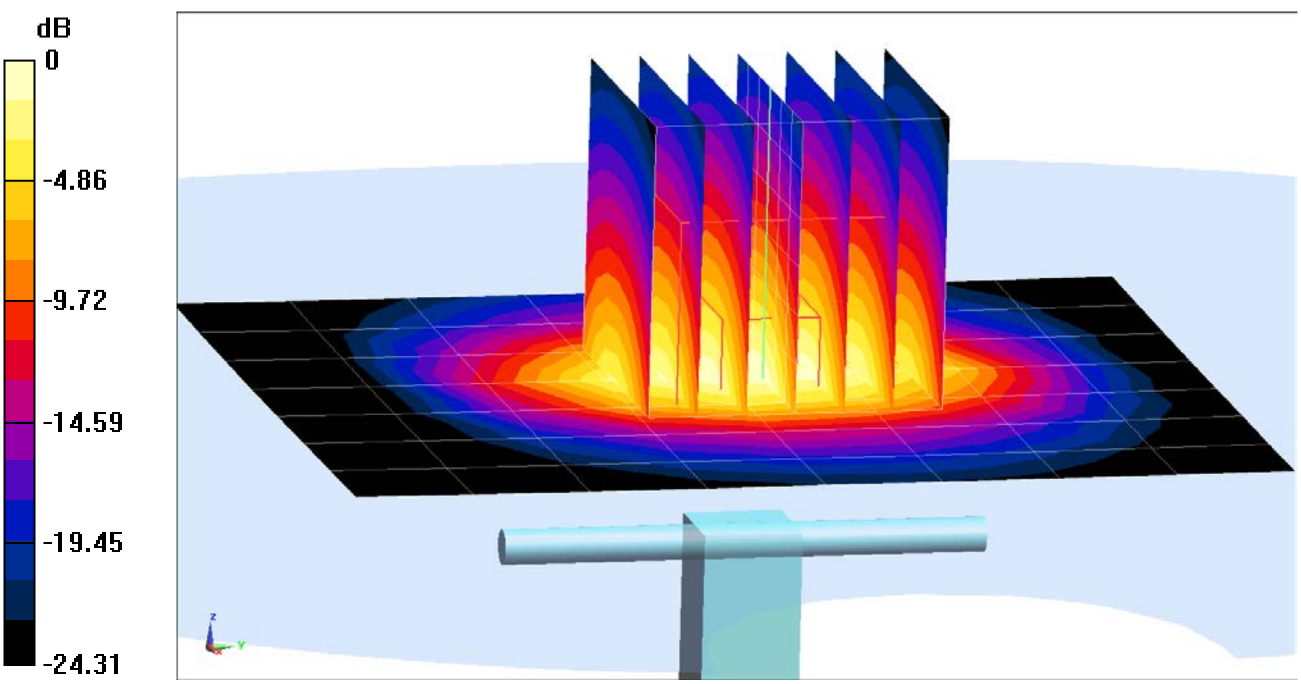
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2600 MHz; σ = 2.046 S/m; ε_r = 37.849; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-26-2017; Ambient Temp: 21.7°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3213; ConvF(4.52, 4.52, 4.52); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Right; Type: SAM; Serial: 1757
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2600 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 12.9 W/kg
SAR(1 g) = 5.87 W/kg
Deviation(1 g) = 4.26%



0 dB = 7.74 W/kg = 8.89 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

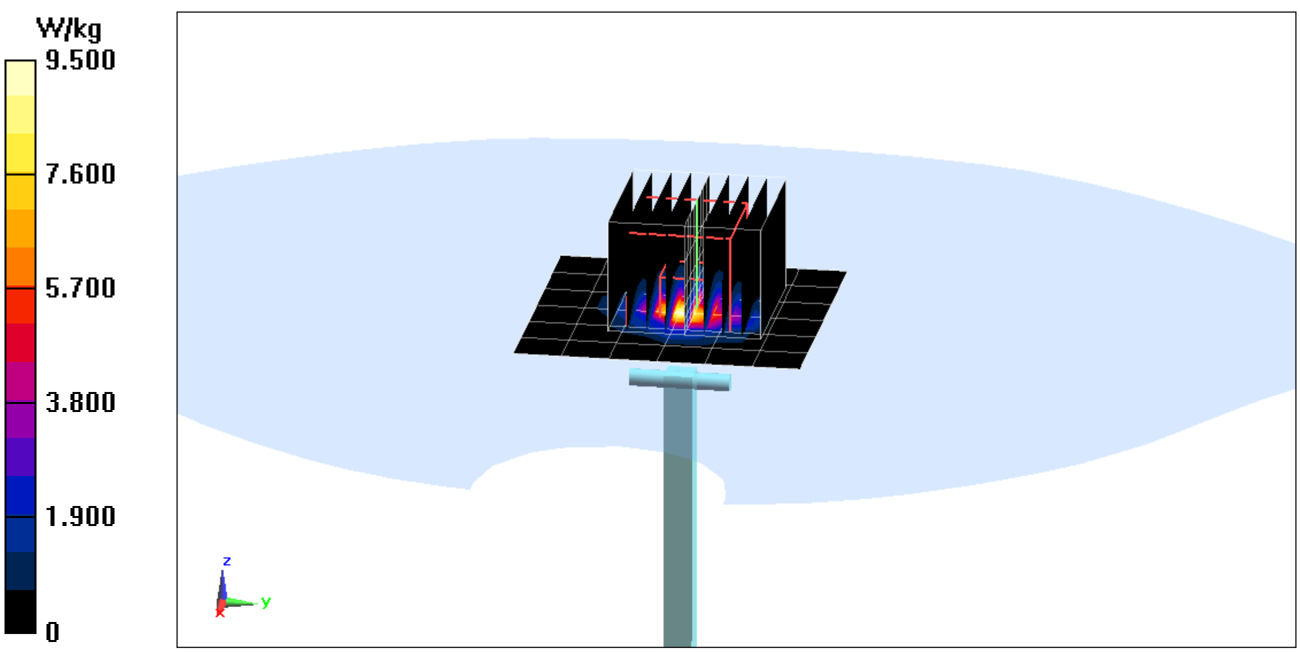
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
f = 5250 MHz; σ = 4.576 S/m; ε_r = 35.853; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 21.1°C; Tissue Temp: 20.0°C

Probe: EX3DV4 - SN3914; ConvF(5.49, 5.49, 5.49); Calibrated: 2/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5250 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x9x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 16.8 W/kg
SAR(1 g) = 3.87 W/kg
Deviation(1 g) = -2.27%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

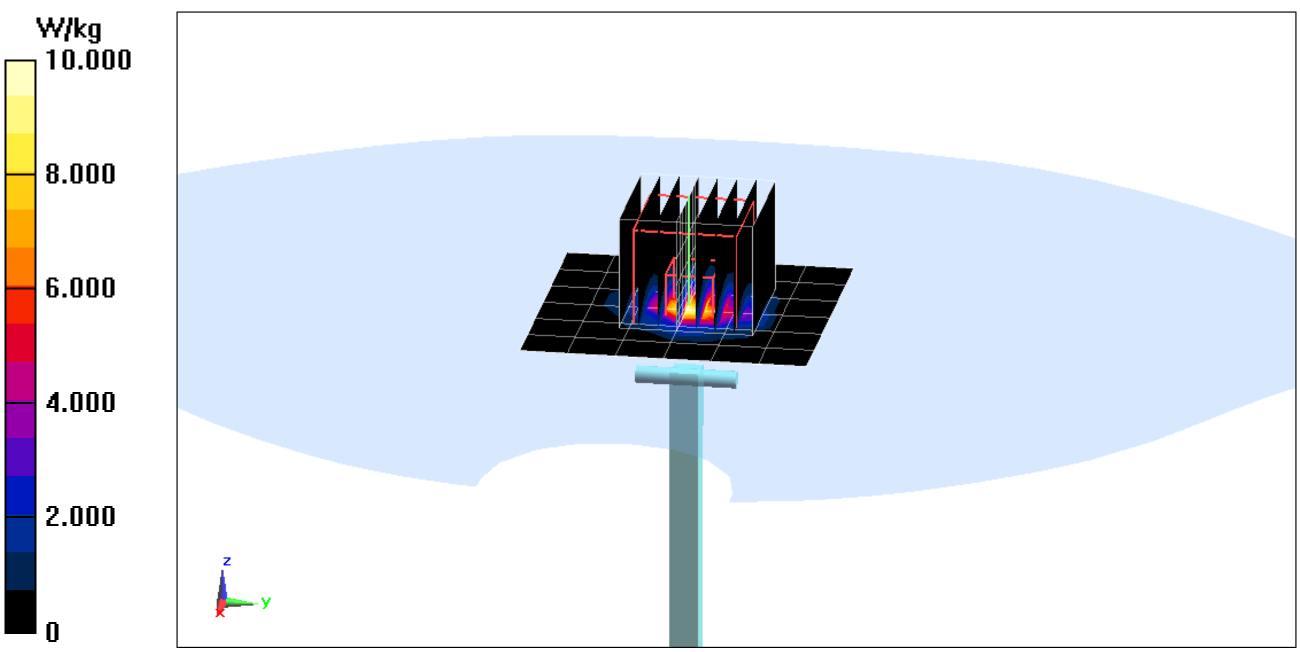
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used:
f = 5600 MHz; $\sigma = 4.913$ S/m; $\varepsilon_r = 35.421$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 21.1°C; Tissue Temp: 20.0°C

Probe: EX3DV4 - SN3914; ConvF(4.94, 4.94, 4.94); Calibrated: 2/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5600 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 18.1 W/kg
SAR(1 g) = 4.05 W/kg
Deviation(1 g) = -2.76%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1237

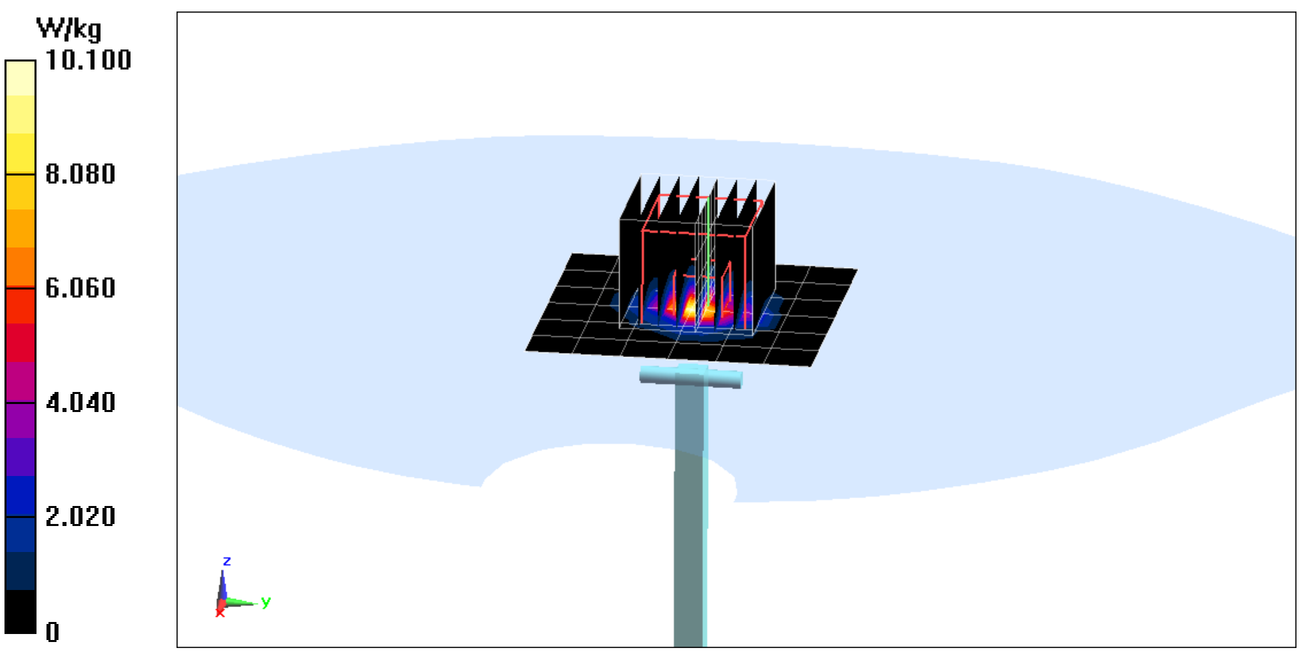
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5GHz Head Medium parameters used (interpolated):
f = 5750 MHz; σ = 5.08 S/m; ε_r = 35.188; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 21.1°C; Tissue Temp: 20.0°C

Probe: EX3DV4 - SN3914; ConvF(4.91, 4.91, 4.91); Calibrated: 2/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn665; Calibrated: 2/9/2017
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5750 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 18.3 W/kg
SAR(1 g) = 4.00 W/kg
Deviation(1 g) = -1.84%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 750 MHz 1034; Type: D750V3; Serial: 1034

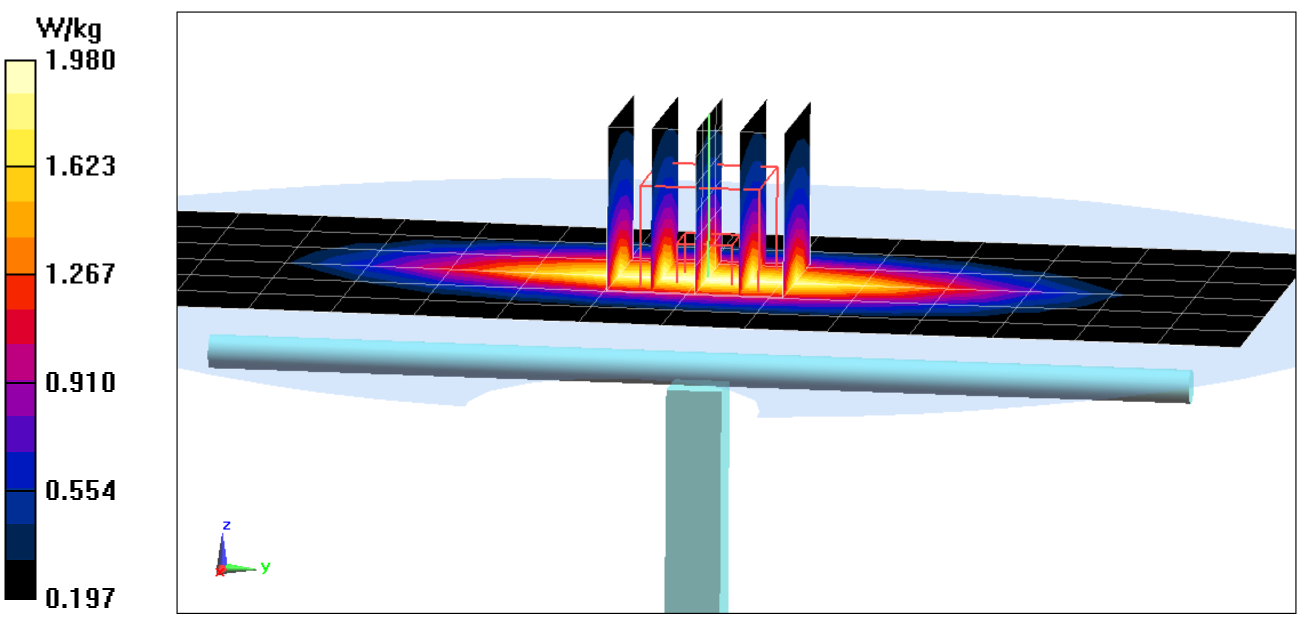
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.966 S/m; ε_r = 55.718; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-04-2017; Ambient Temp: 20.7°C; Tissue Temp: 20.6°C

Probe: ES3DV3 - SN3209; ConvF(6.44, 6.44, 6.44); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800
Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.48 W/kg
SAR(1 g) = 1.71 W/kg
Deviation(1 g) = -1.84%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d180

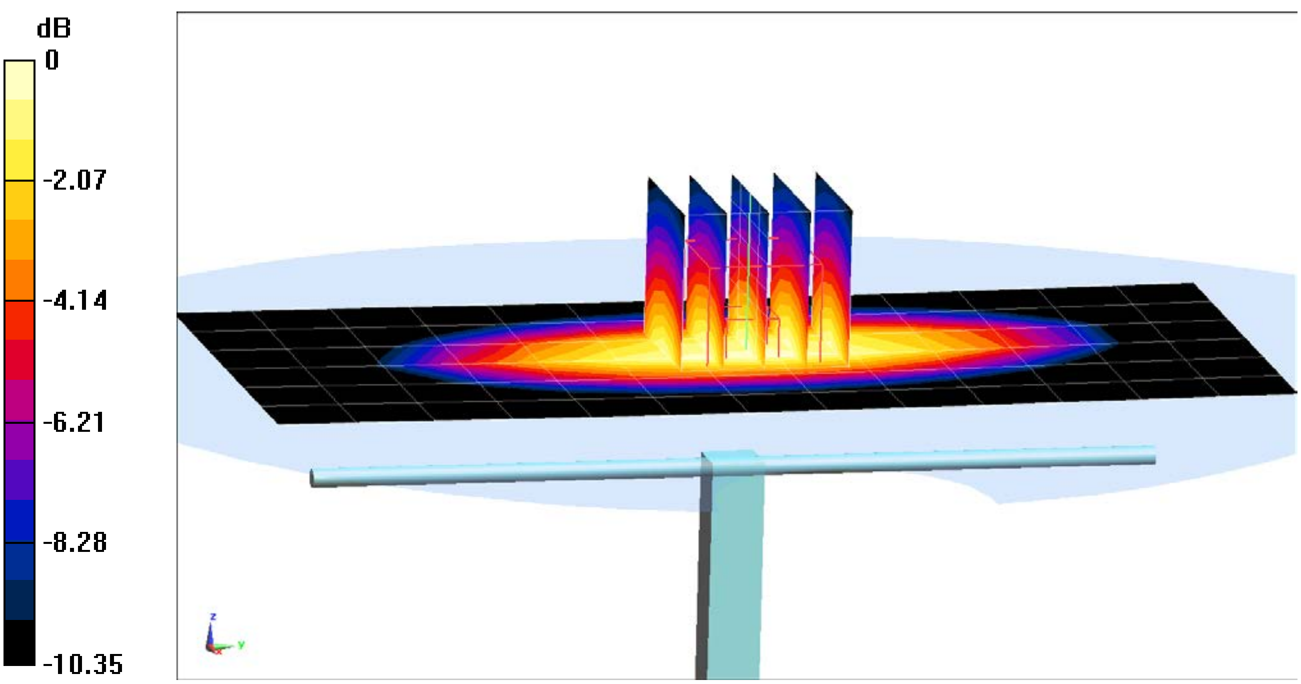
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; $\sigma = 0.977$ S/m; $\varepsilon_r = 52.65$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-06-2017; Ambient Temp: 21.9°C; Tissue Temp: 20.2°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.86 W/kg
SAR(1 g) = 1.98 W/kg
Deviation(1 g) = 3.02%



0 dB = 2.31 W/kg = 3.64 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 835 MHz; Type: D835V2; Serial: 4d180

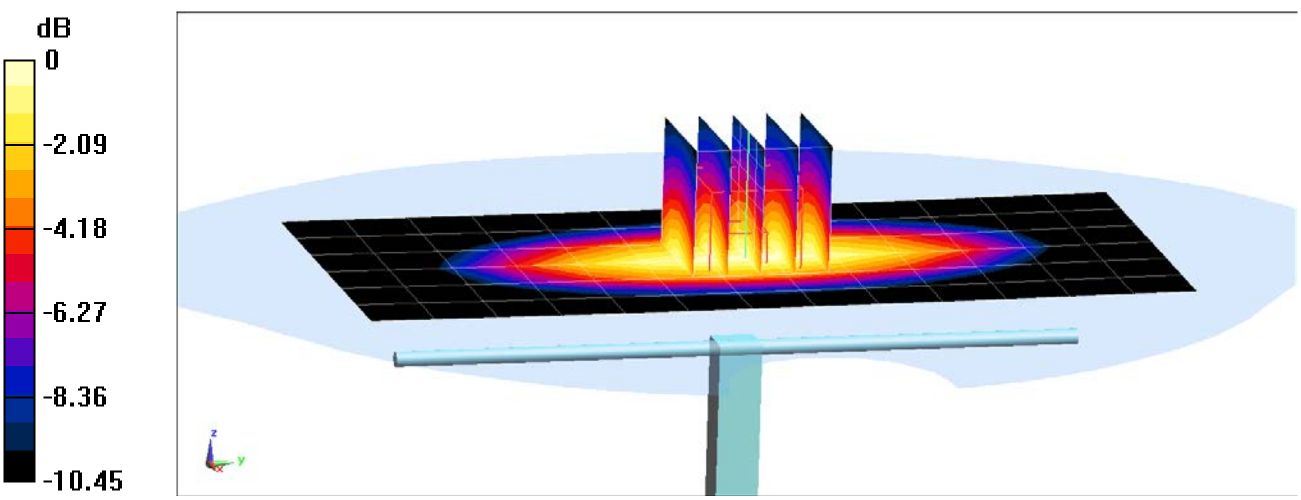
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.97 S/m; ε_r = 52.719; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-14-2017; Ambient Temp: 19.9°C; Tissue Temp: 19.1°C

Probe: ES3DV3 - SN3213; ConvF(6.28, 6.28, 6.28); Calibrated: 2/10/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/9/2017
Phantom: SAM Front; Type: QD000P40CD; Serial: TP:1758
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.97 W/kg
SAR(1 g) = 2.02 W/kg
Deviation(1 g) = 5.10%



0 dB = 2.38 W/kg = 3.77 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1092

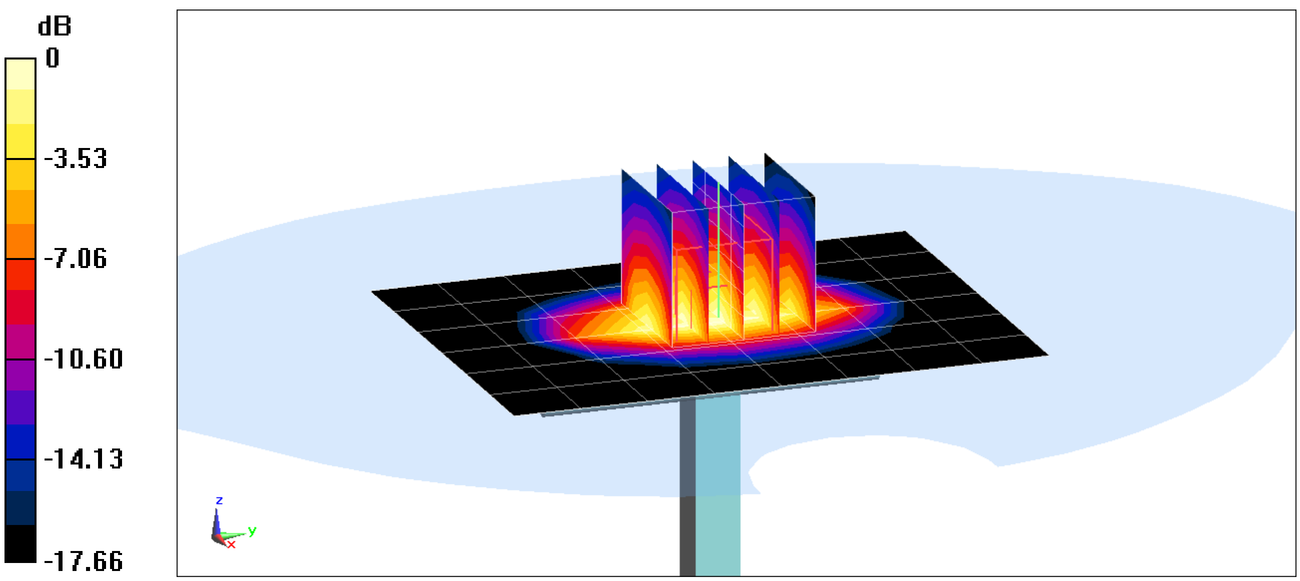
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.505 S/m; ε_r = 51.397; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-27-2017; Ambient Temp: 22.4°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(8.08, 8.08, 8.08); Calibrated: 4/18/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/11/2017
Phantom: SAM Left; Type: QD000P40CD; Serial: TP:7535
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.06 W/kg
SAR(1 g) = 3.88 W/kg
Deviation(1 g) = 4.86%



0 dB = 5.93 W/kg = 7.73 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d026

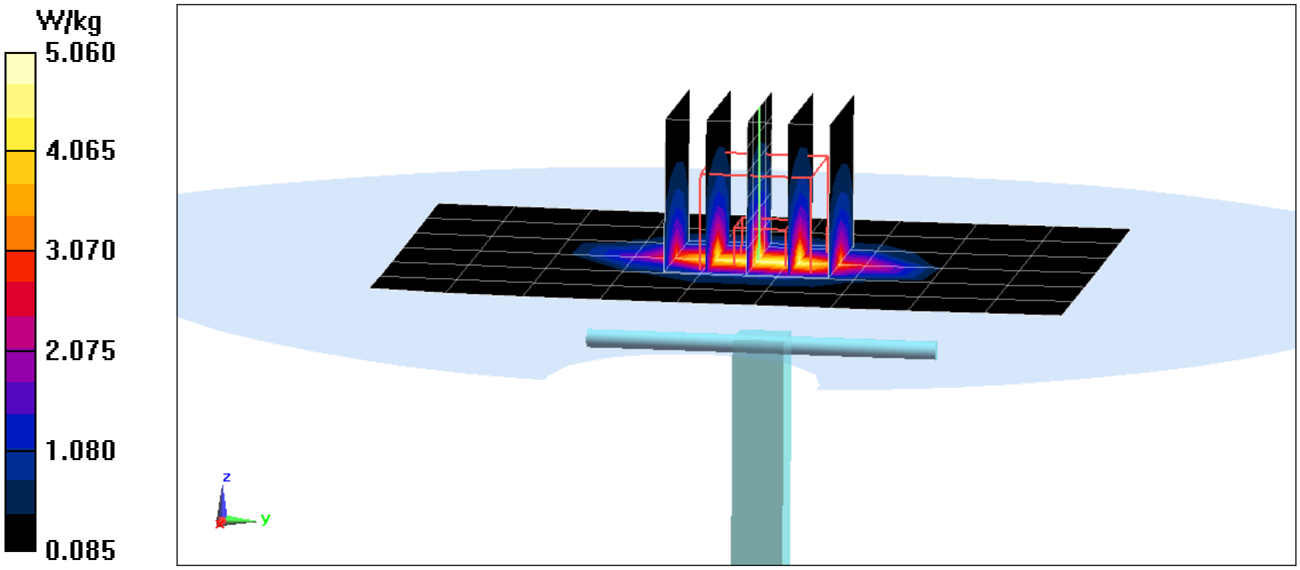
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.56 S/m; ε_r = 52.205; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-29-2017; Ambient Temp: 21.5°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0 Left; Type: QD000P40CD; Serial: TP:1692
Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.11 W/kg
SAR(1 g) = 3.97 W/kg
Deviation(1 g) = -1.49%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d026

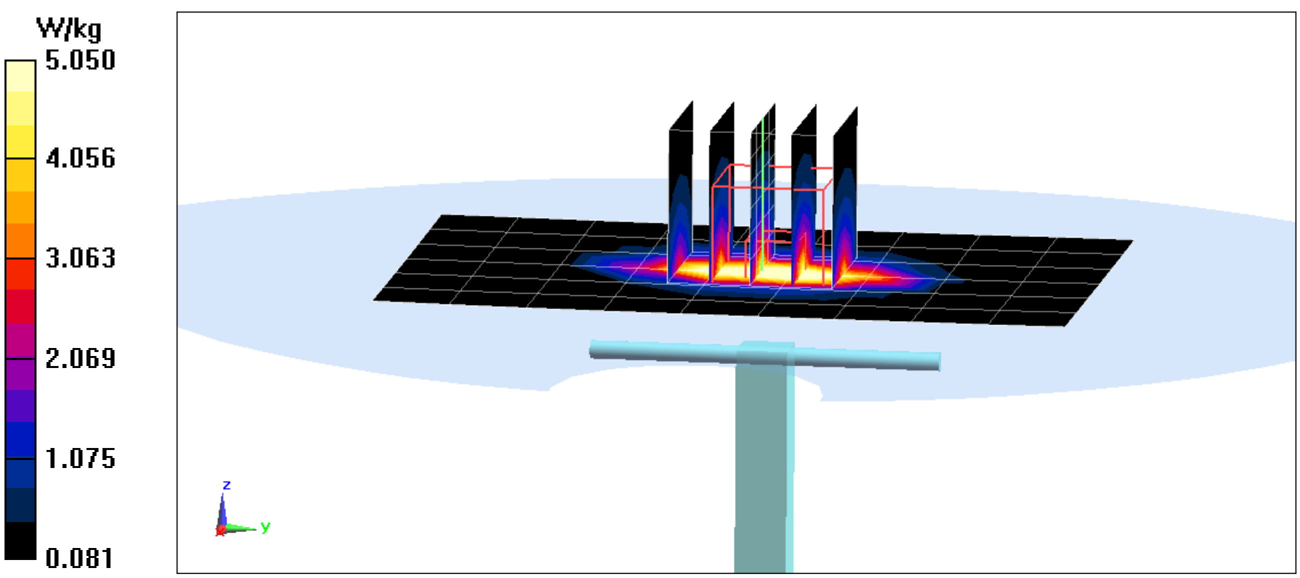
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.579 S/m; ε_r = 53.211; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 21.3°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3209; ConvF(4.93, 4.93, 4.93); Calibrated: 3/14/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1415; Calibrated: 3/13/2017
Phantom: SAM with CRP v4.0 Left; Type: QD000P40CD; Serial: TP:1692
Measurement SW: DASY52, Version 52.10; SEMCAD X Version 14.6.10 (7417)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.18 W/kg
SAR(1 g) = 4.04 W/kg
Deviation(1 g) = 0.25%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 882

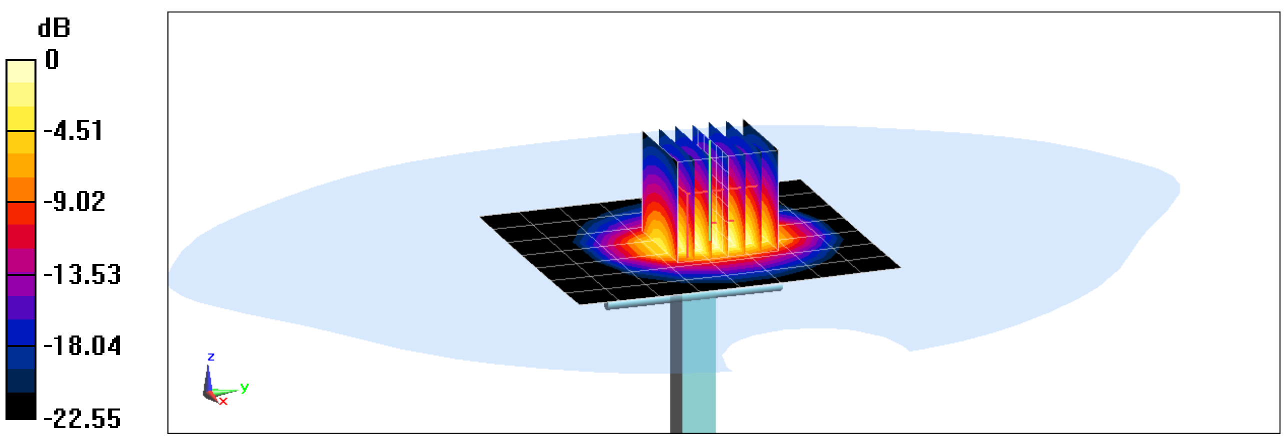
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.036 S/m; ε_r = 52.738; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.2°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3287; ConvF(4.35, 4.35, 4.35); Calibrated: 9/19/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 9/14/2016
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.7 W/kg
SAR(1 g) = 5.43 W/kg
Deviation(1 g) = 9.26%



0 dB = 7.25 W/kg = 8.60 dBW/kg

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

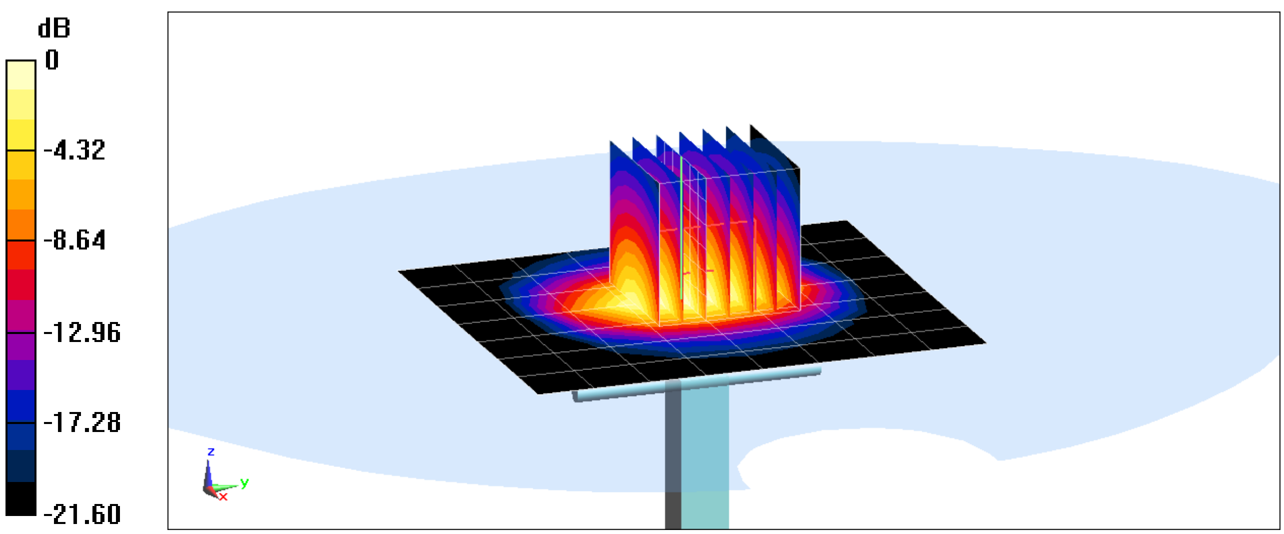
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.008 S/m; ε_r = 52.04; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-03-2017; Ambient Temp: 21.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3287; ConvF(4.35, 4.35, 4.35); Calibrated: 9/19/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 9/14/2016
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.0 W/kg
SAR(1 g) = 5.39 W/kg
Deviation(1 g) = 6.31%



0 dB = 6.90 W/kg = 8.39 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

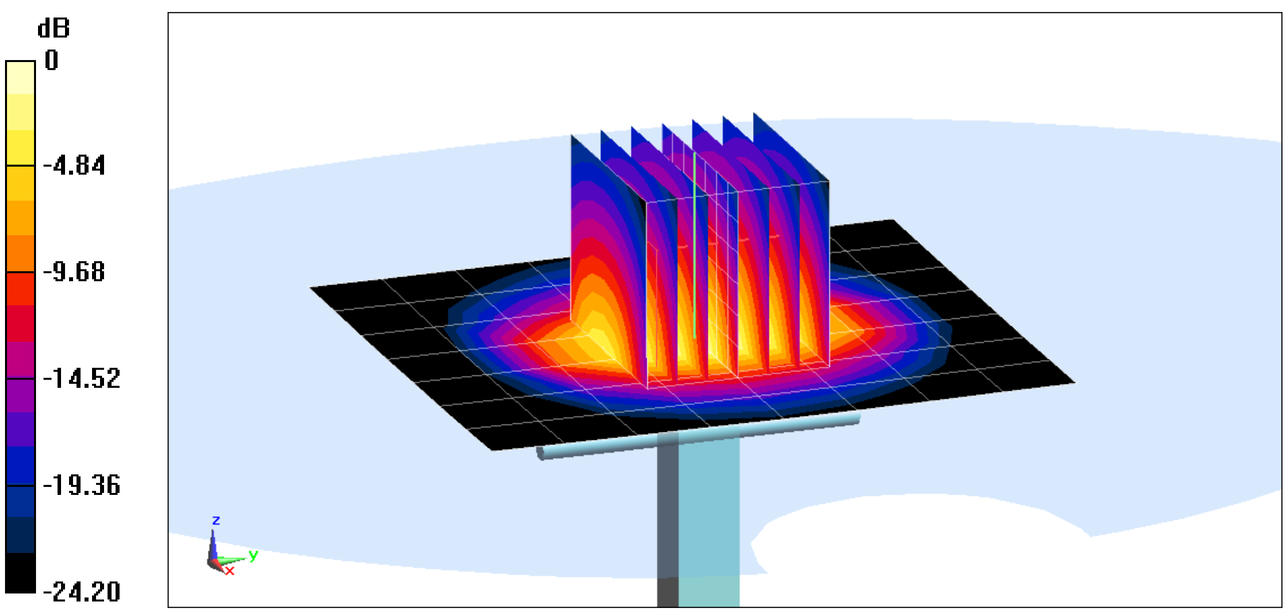
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.022 S/m; ε_r = 51.484; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2017; Ambient Temp: 22.9°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3287; ConvF(4.35, 4.35, 4.35); Calibrated: 9/19/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 9/14/2016
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.5 W/kg
SAR(1 g) = 5.49 W/kg
Deviation(1 g) = 8.28%



0 dB = 7.26 W/kg = 8.61 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

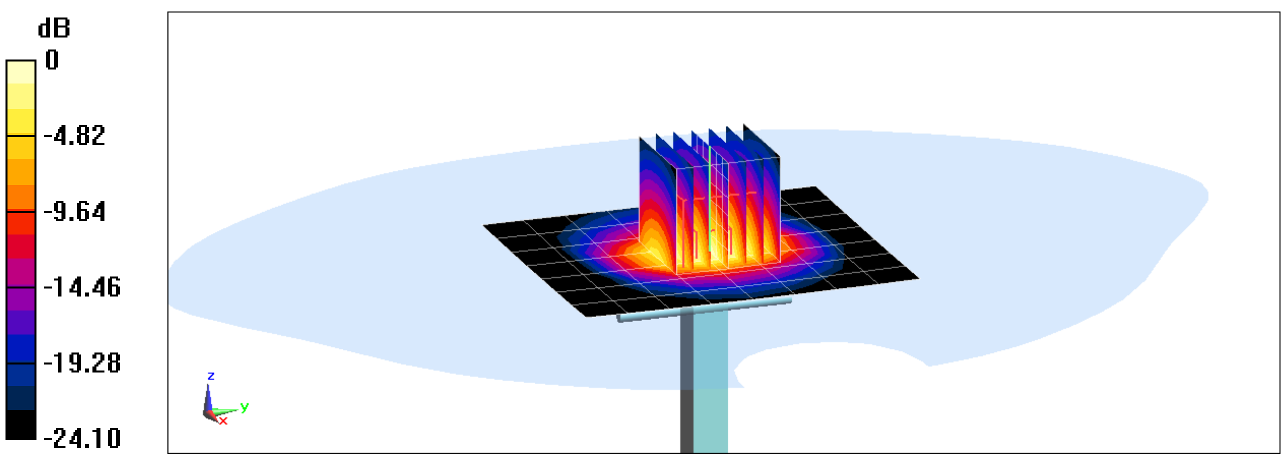
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2600 MHz; σ = 2.242 S/m; ε_r = 52.155; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.2°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3287; ConvF(4.12, 4.12, 4.12); Calibrated: 9/19/2016;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 9/14/2016
Phantom: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2600 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 13.0 W/kg
SAR(1 g) = 5.83 W/kg
Deviation(1 g) = 7.56%



0 dB = 7.76 W/kg = 8.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1123

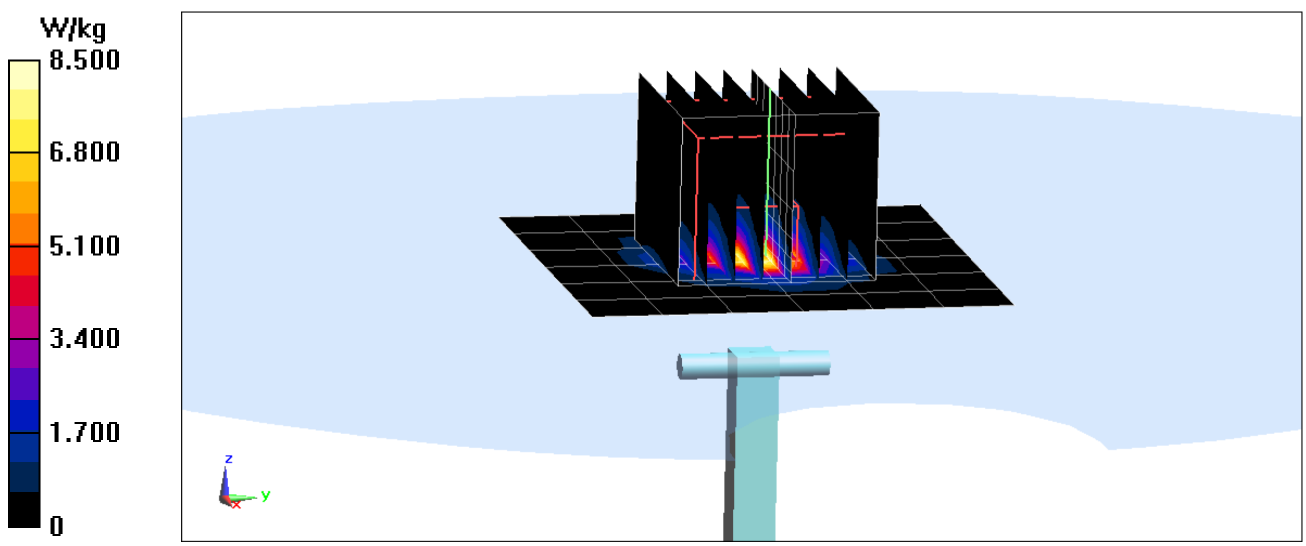
Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5250 MHz; σ = 5.428 S/m; ε_r = 47.785; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(4.19, 4.19, 4.19); Calibrated: 1/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1466; Calibrated: 1/16/2017
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5250 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 15.2 W/kg
SAR(1 g) = 3.51 W/kg; SAR(10 g) = 0.97 W/kg
Deviation(1 g) = -7.51%; Deviation(10 g) = -8.92%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1123

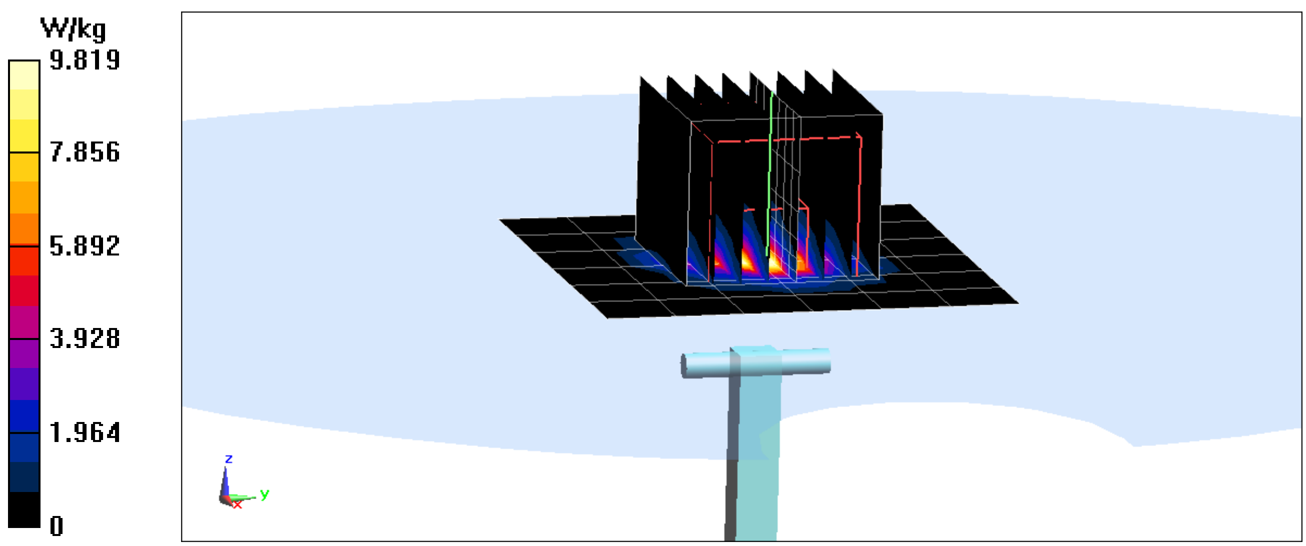
Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5600 MHz; $\sigma = 5.894$ S/m; $\varepsilon_r = 47.157$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(3.82, 3.82, 3.82); Calibrated: 1/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1466; Calibrated: 1/16/2017
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5600 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 18.6 W/kg
SAR(1 g) = 3.95 W/kg; SAR(10 g) = 1.10 W/kg
Deviation(1 g) = 0.13%; Deviation(10 g) = -0.45%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1123

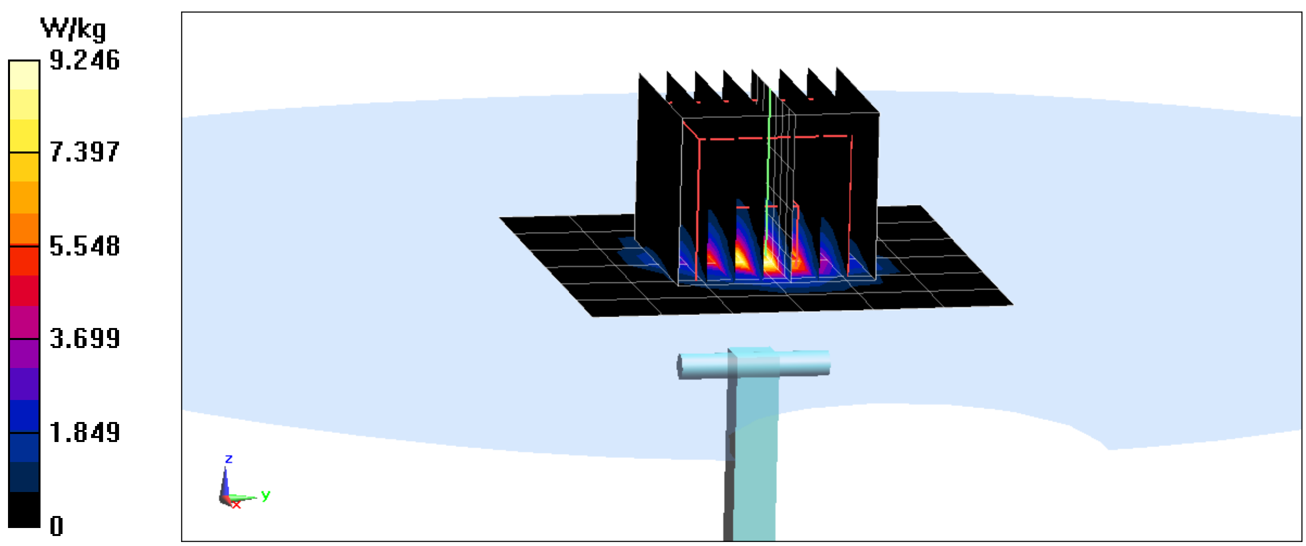
Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5750 MHz; σ = 6.105 S/m; ε_r = 46.963; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2017; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(3.83, 3.83, 3.83); Calibrated: 1/13/2017;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1466; Calibrated: 1/16/2017
Phantom: SAM with CRP v5.0 Front; Type: QD000P40CD; Serial: 1646
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

5750 MHz System Verification at 17.0 dBm (50 mW)

Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Peak SAR (extrapolated) = 16.7 W/kg
SAR(1 g) = 3.71 W/kg
Deviation(1 g) = -2.75%



APPENDIX C: PROBE CALIBRATION

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

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

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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1054_Mar17**

CALIBRATION CERTIFICATE

Object: D750V3 - SN:1054

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

BNV
03-27-2017

Calibration date: March 07, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	04-Jan-17 (No. DAE4-601_Jan17)	Jan-18

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

	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

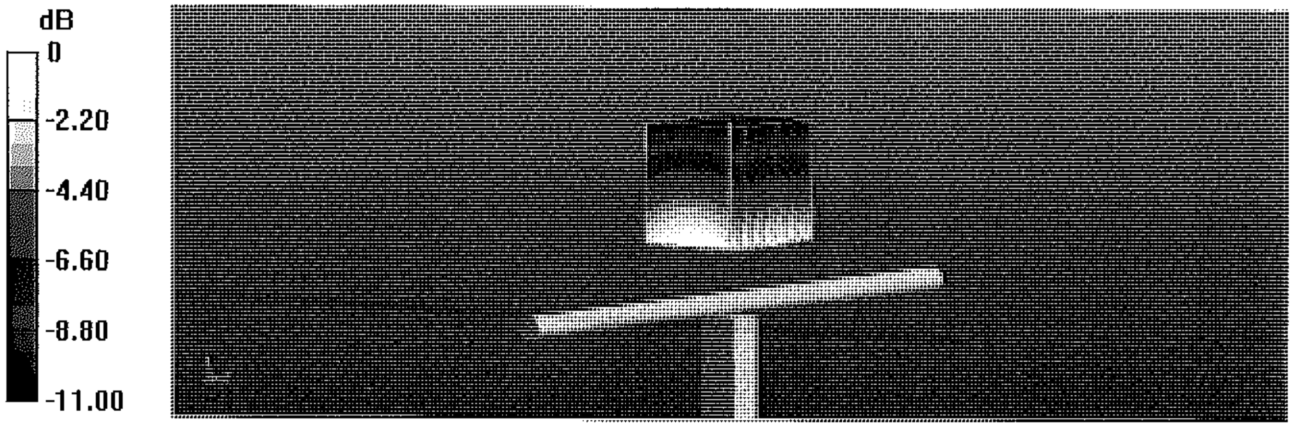
Communication System: UID 0 - CW ; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.91$ S/m; $\varepsilon_r = 40.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

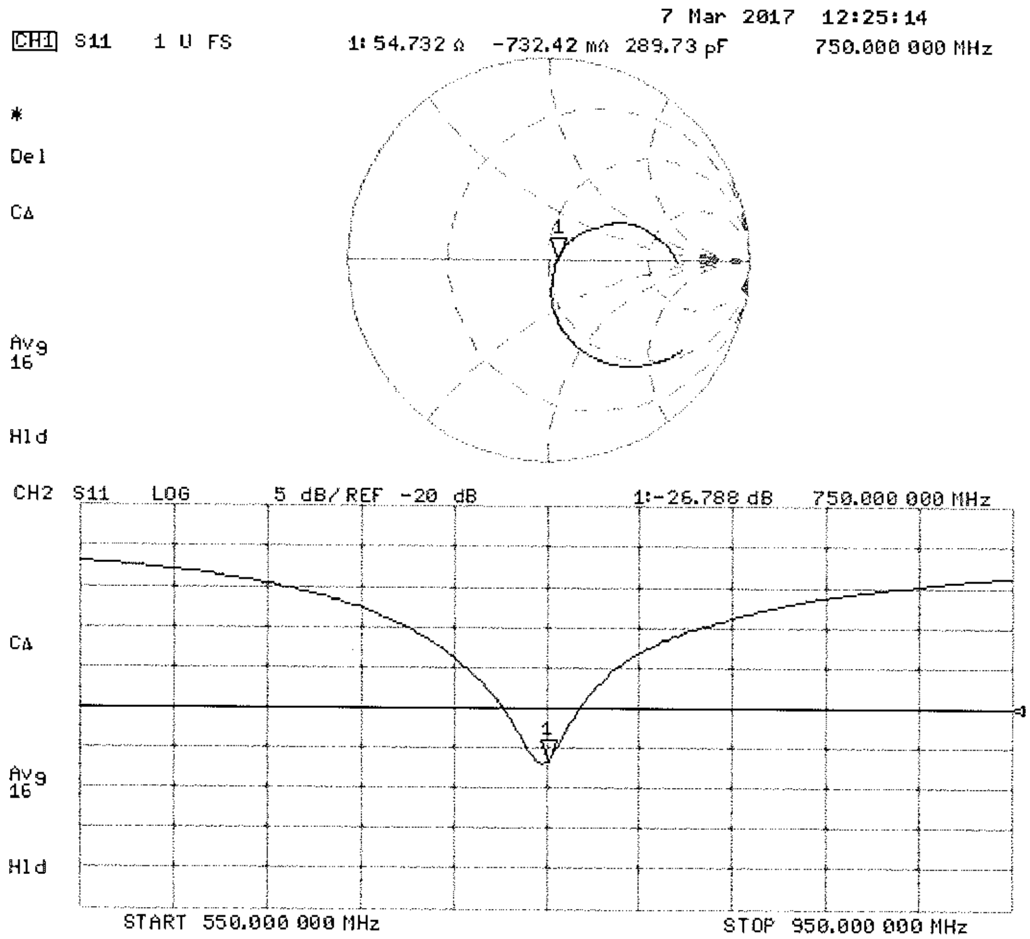
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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

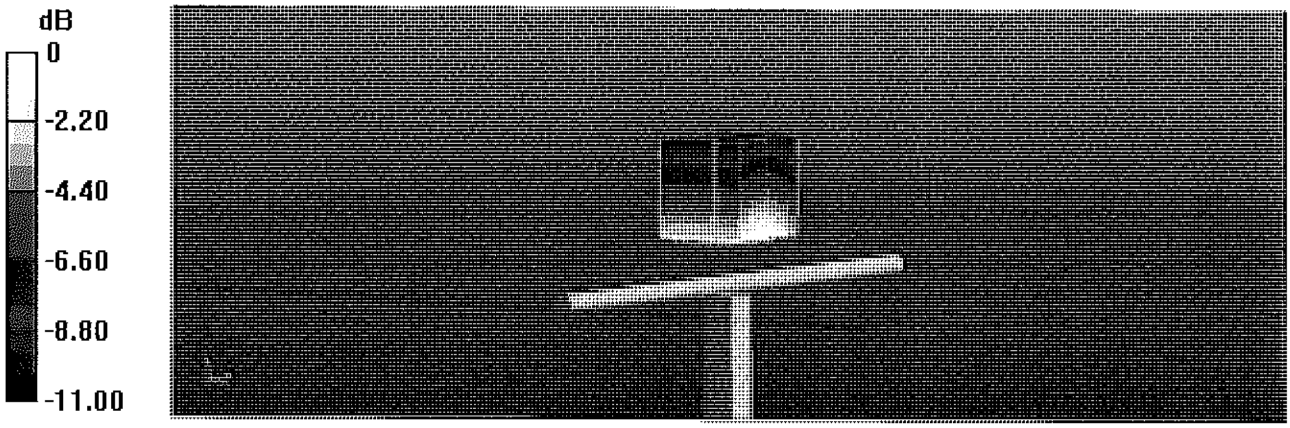
Communication System: UID 0 - CW ; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.99$ S/m; $\varepsilon_r = 54.6$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

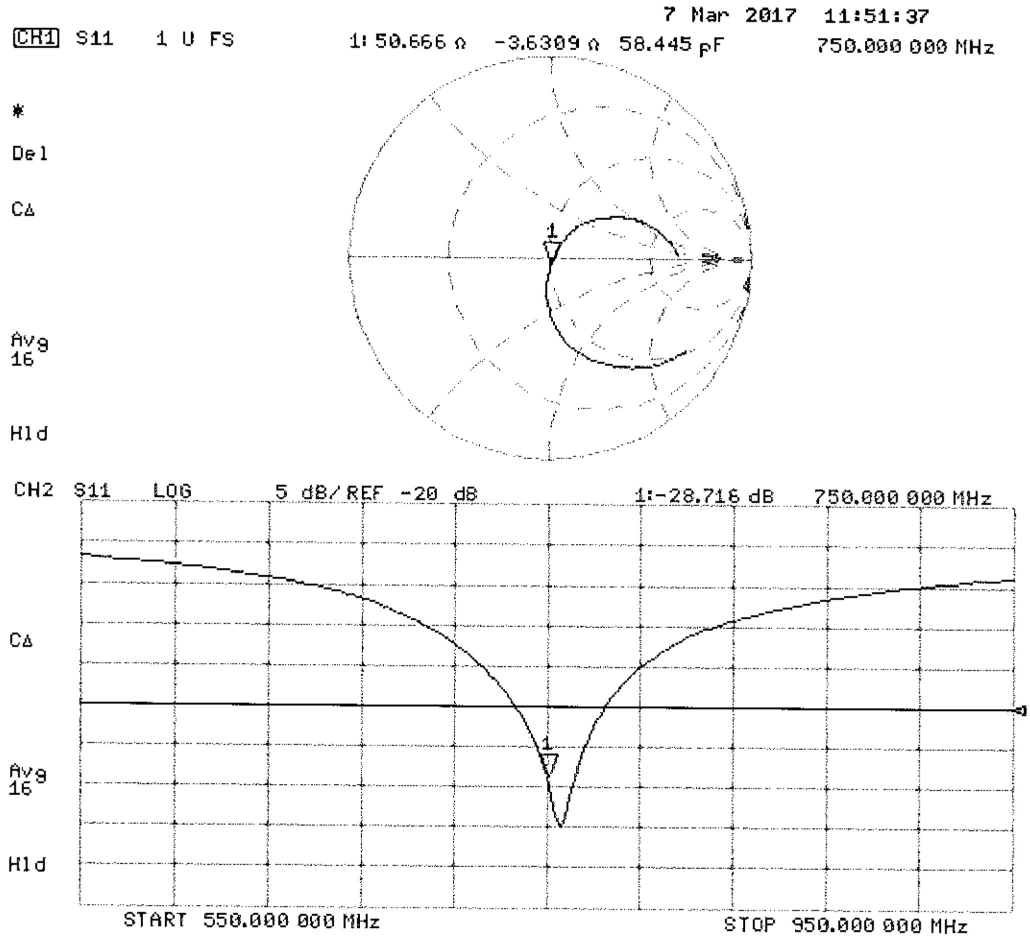
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

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



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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D835V2-4d119_Apr17**

CALIBRATION CERTIFICATE

Object	D835V2 - SN:4d119
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	April 11, 2017

BN ✓
5-3-2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

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

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: April 12, 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	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 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	40.9 ± 6 %	0.94 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	2.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.46 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.15 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	53.9 ± 6 %	1.01 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	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.42 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.23 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	50.5 Ω - 4.6 jΩ
Return Loss	- 26.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.1 Ω - 4.2 jΩ
Return Loss	- 27.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.387 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 29, 2010

DASY5 Validation Report for Head TSL

Date: 11.04.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

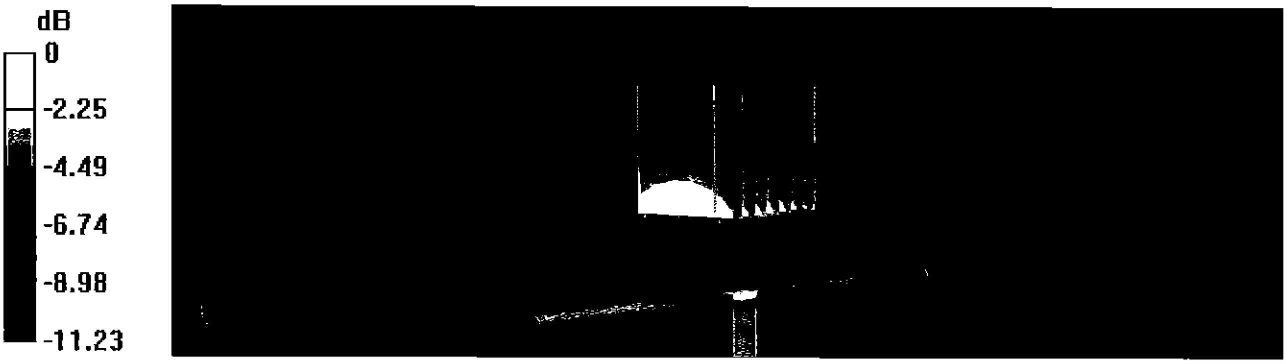
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma = 0.94$ S/m; $\varepsilon_r = 40.9$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.72, 9.72, 9.72); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

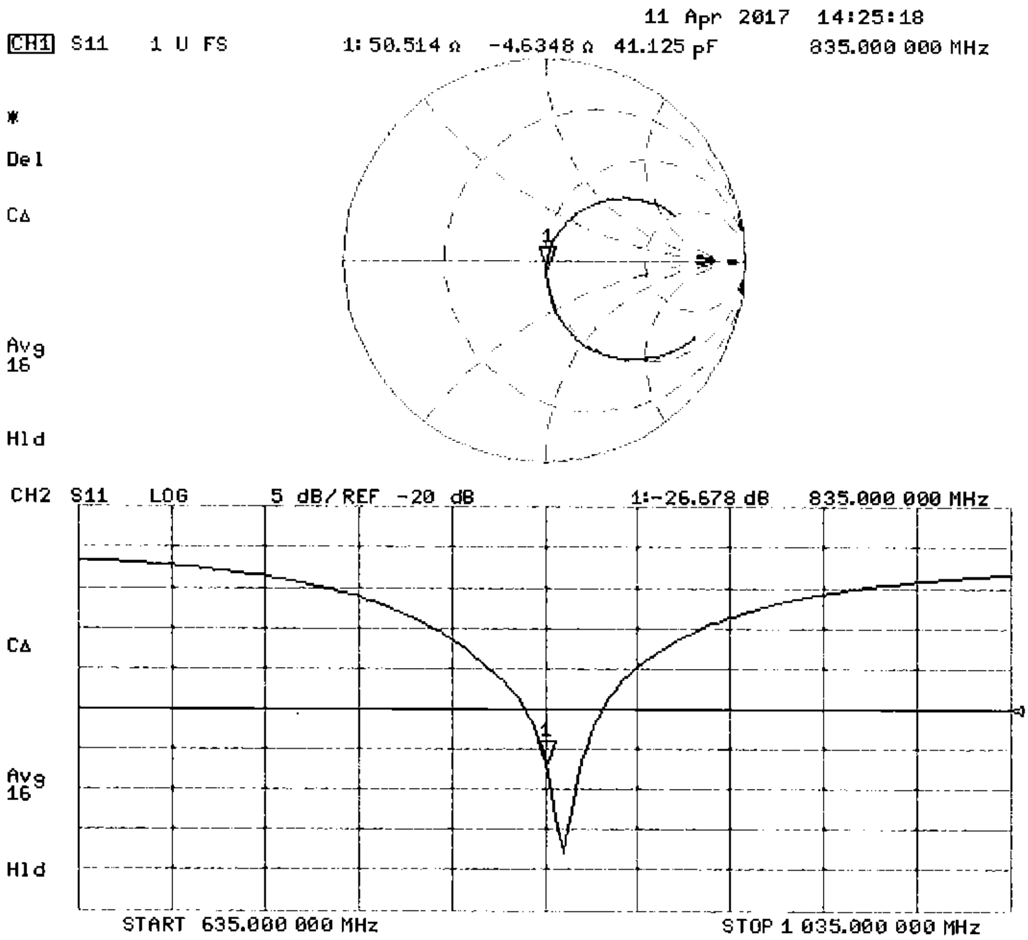
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.10 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.65 W/kg
SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 3.21 W/kg



0 dB = 3.21 W/kg = 5.07 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.04.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

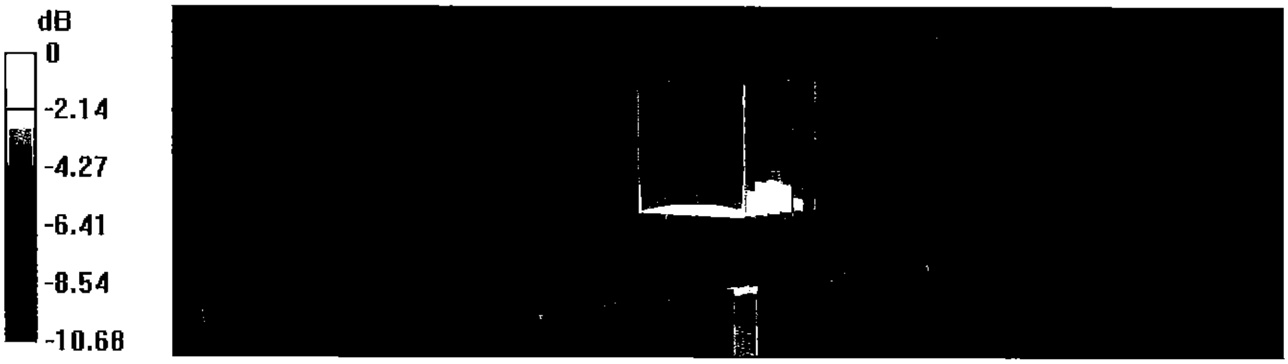
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 1.01 S/m; ε_r = 53.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.73, 9.73, 9.73); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1442); SEMCAD X 14.6.10(7413)

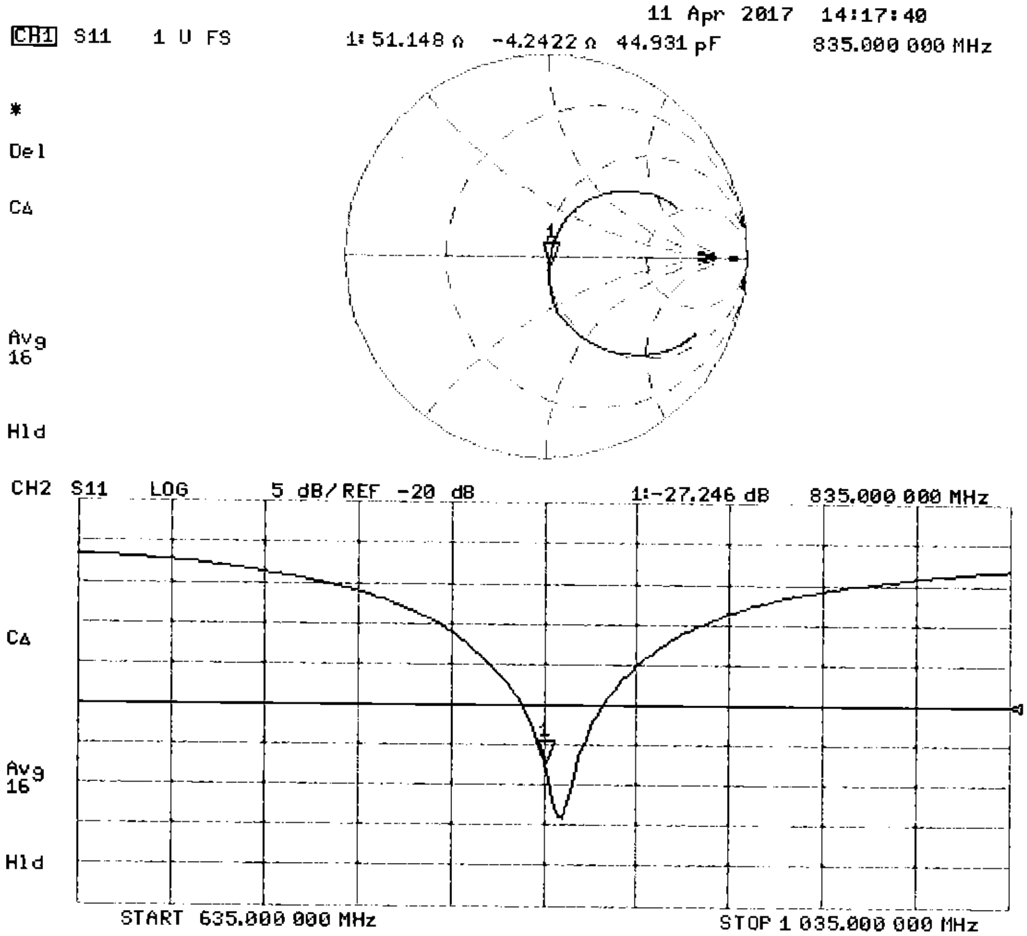
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.70 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.64 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.21 W/kg



0 dB = 3.21 W/kg = 5.07 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D835V2-4d132_Jan17

CALIBRATION CERTIFICATE

Object	D835V2 - SN:4d132
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	January 11, 2017

BN ✓ 01/26/2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	04-Jan-17 (No. DAE4-601_Jan17)	Jan-18

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

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 12, 2017

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Swiss Calibration Service

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

Accreditation No.: SCS 0108

Glossary:

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

Calibration is Performed According to the Following Standards:

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	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.4 ± 6 %	0.92 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	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.52 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.16 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	54.0 ± 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	2.50 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.80 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.46 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 - 2.6 jΩ
Return Loss	- 29.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.3 Ω - 6.1 jΩ
Return Loss	- 23.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.386 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 22, 2011

DASY5 Validation Report for Head TSL

Date: 11.01.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

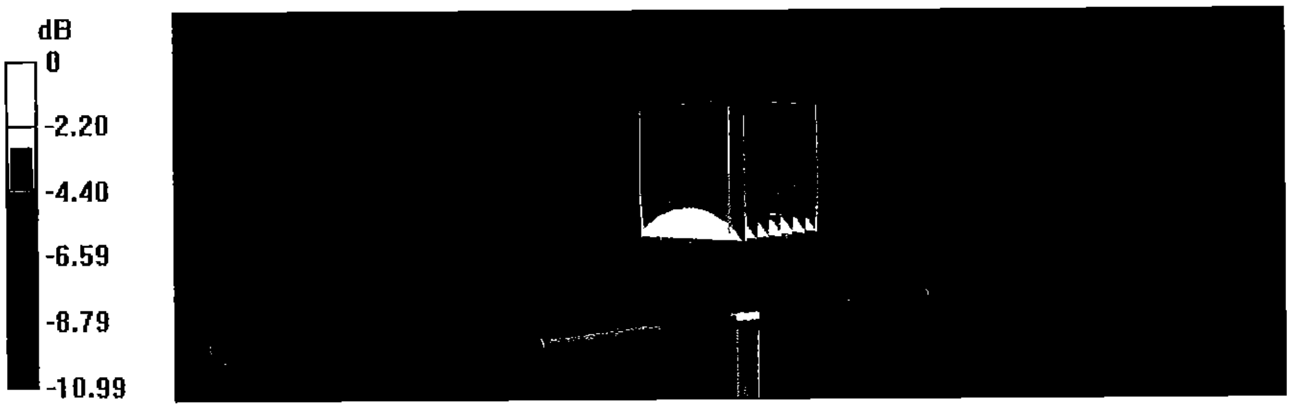
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; ε_r = 41.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.72, 9.72, 9.72); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

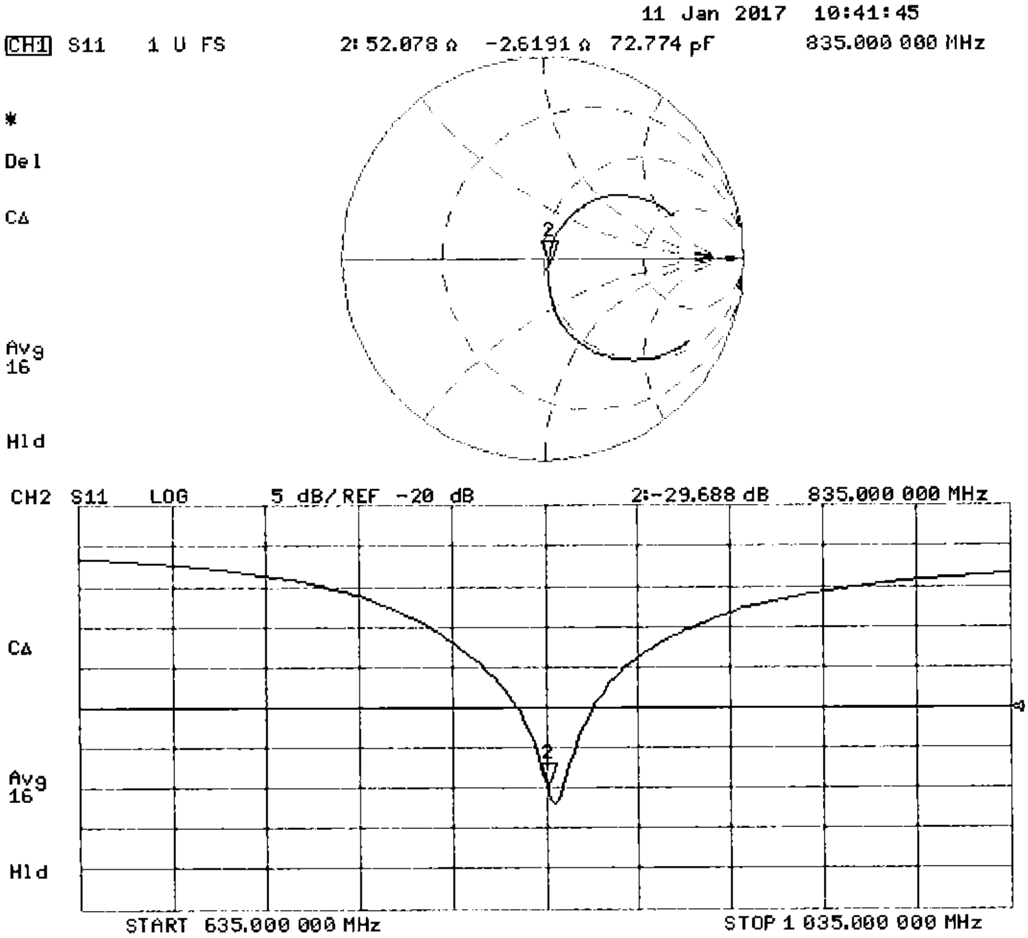
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.53 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.69 W/kg
SAR(1 g) = 2.42 W/kg; SAR(10 g) = 1.56 W/kg
Maximum value of SAR (measured) = 3.27 W/kg



0 dB = 3.27 W/kg = 5.15 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.01.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

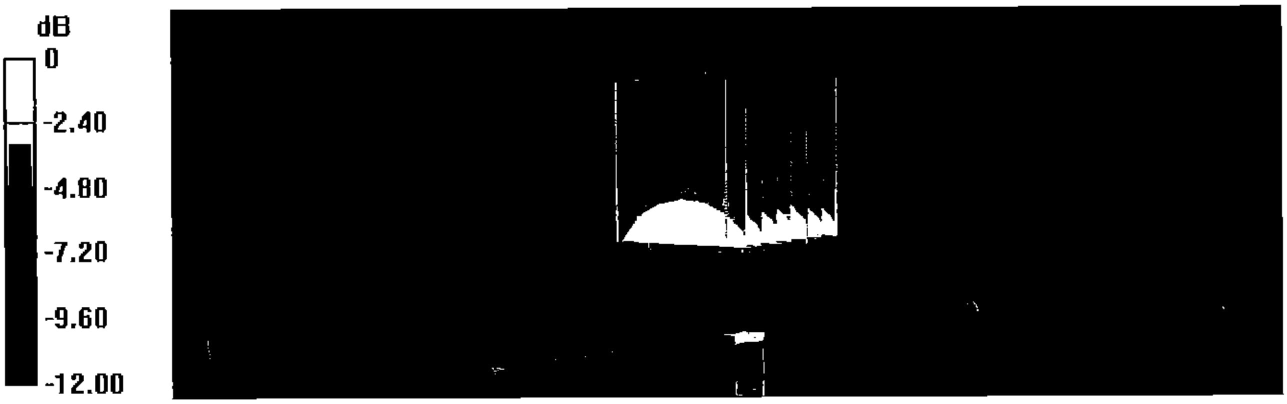
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 S/m; ε_r = 54; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.73, 9.73, 9.73); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

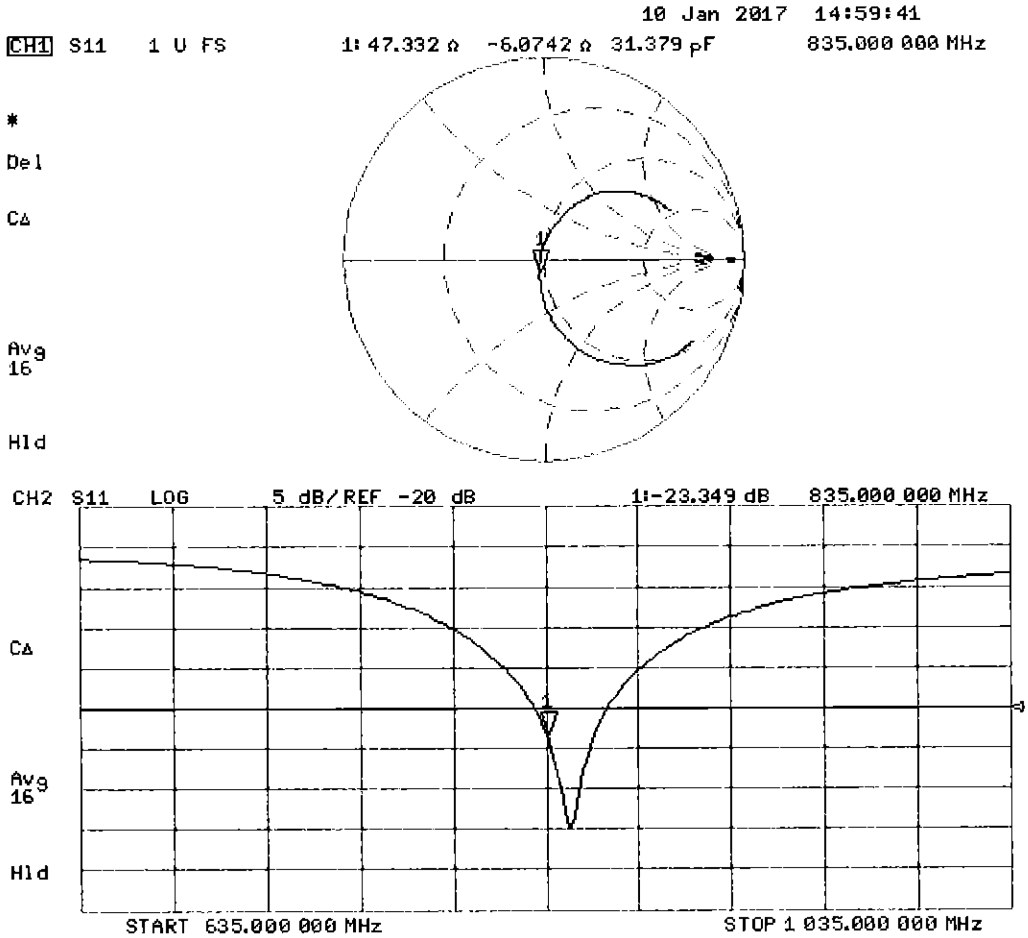
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 61.28 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 3.75 W/kg
SAR(1 g) = 2.5 W/kg; SAR(10 g) = 1.64 W/kg
Maximum value of SAR (measured) = 3.32 W/kg



0 dB = 3.32 W/kg = 5.21 dBW/kg

Impedance Measurement Plot for Body TSL



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

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Swiss Calibration Service

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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1750V2-1092_May17**

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1092
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 09, 2017

BN ✓
05-23-2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

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

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 11, 2017

Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

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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	9.15 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	48.9 Ω - 0.5 jΩ
Return Loss	- 38.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	45.2 Ω - 0.8 jΩ
Return Loss	- 25.9 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	November 07, 2012

DASY5 Validation Report for Head TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1092

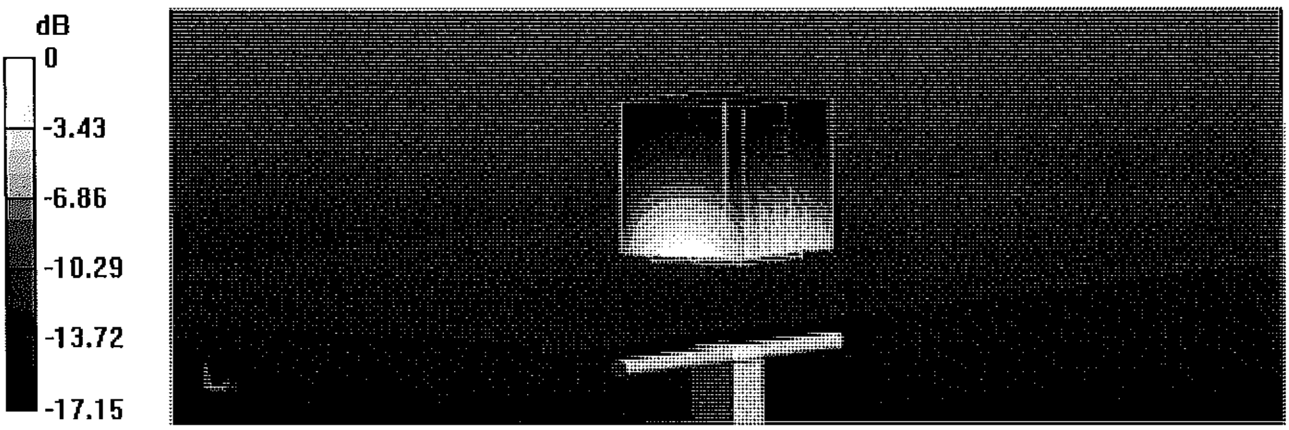
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; $\sigma = 1.36$ S/m; $\varepsilon_r = 39$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

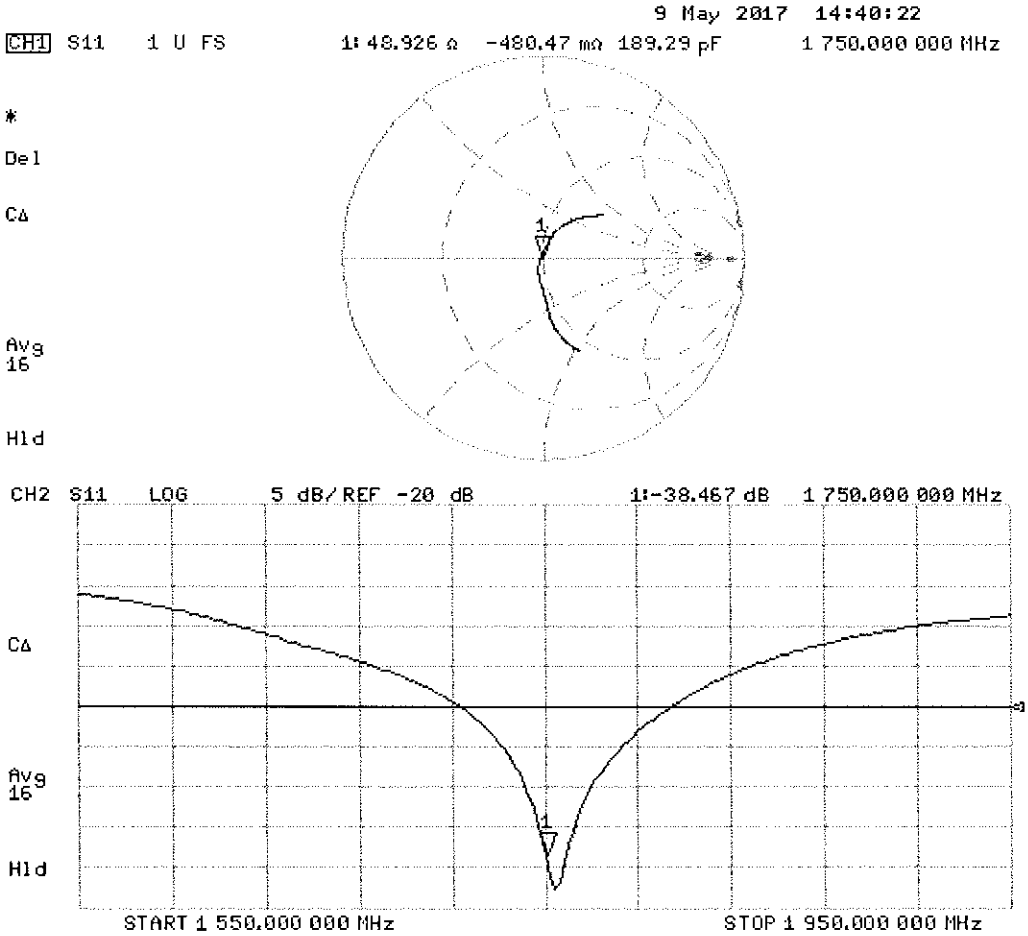
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.6 V/m; Power Drift = -0.05 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) = 13.8 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1092

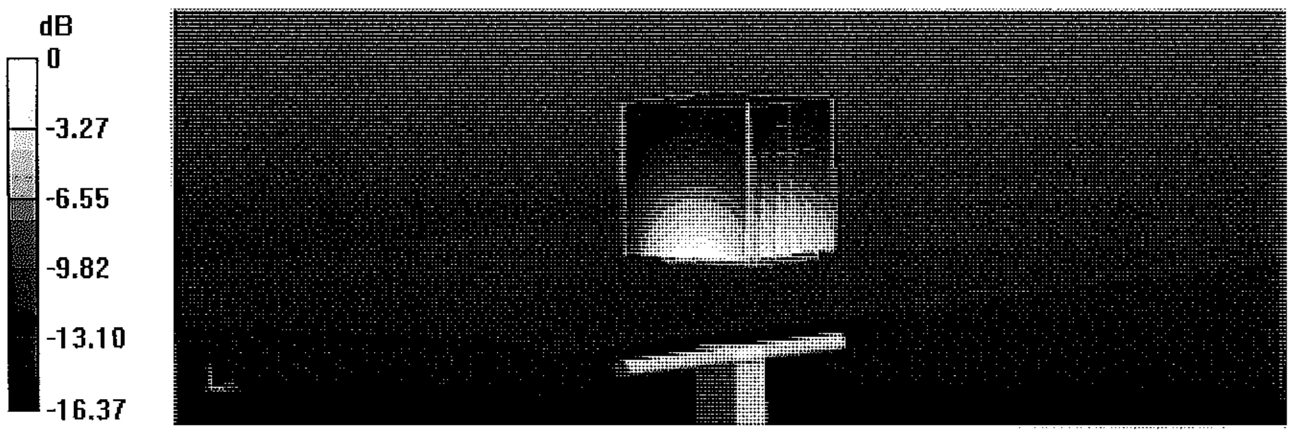
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.47 S/m; ε_r = 53.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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)

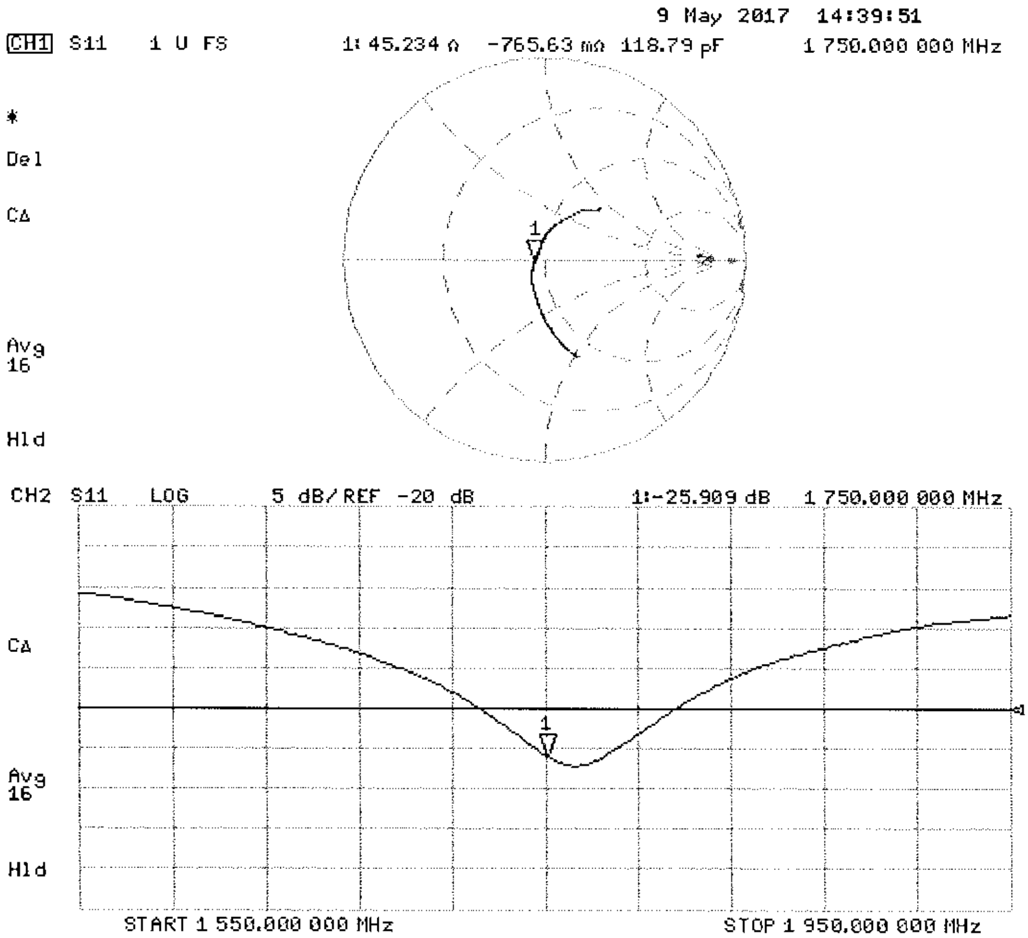
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 98.81 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 15.8 W/kg
SAR(1 g) = 9.15 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



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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1900V2-5d026_May17**

CALIBRATION CERTIFICATE

Object	D1900V2 - SN:5d026
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 10, 2017

BNV
05-23-2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

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

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

Issued: May 12, 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	V52.10.0
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	41.3 ± 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	9.75 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	5.14 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	54.2 ± 6 %	1.51 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	10.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.34 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 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	52.7 Ω + 8.4 jΩ
Return Loss	- 21.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.3 Ω + 8.8 jΩ
Return Loss	- 20.5 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	December 17, 2002

DASY5 Validation Report for Head TSL

Date: 10.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d026

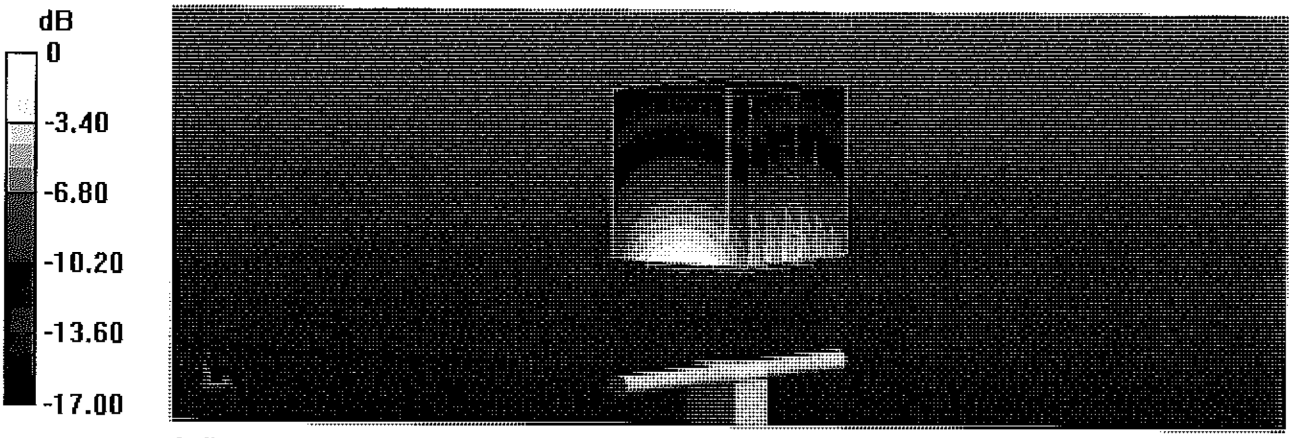
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.4 S/m; ε_r = 41.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); 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(1444); SEMCAD X 14.6.10(7416)

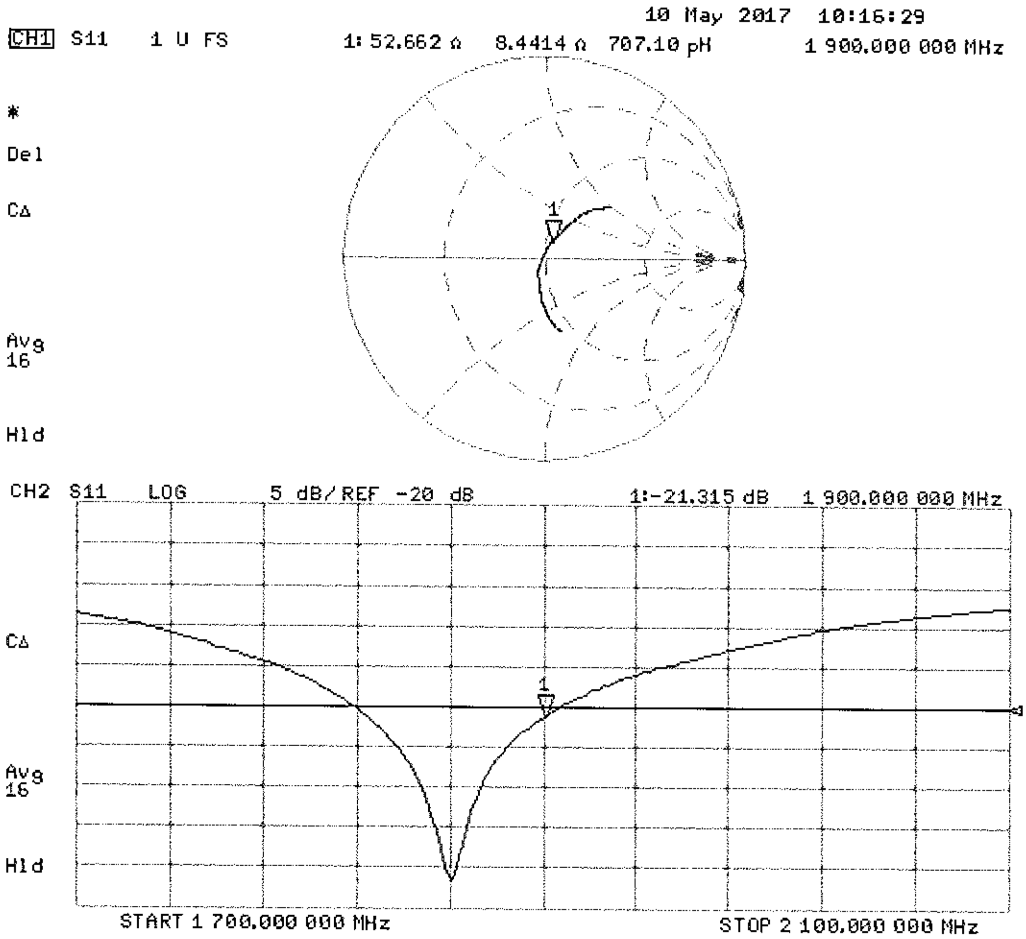
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 107.4 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 17.9 W/kg
SAR(1 g) = 9.75 W/kg; SAR(10 g) = 5.14 W/kg
Maximum value of SAR (measured) = 14.9 W/kg



0 dB = 14.9 W/kg = 11.73 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d026

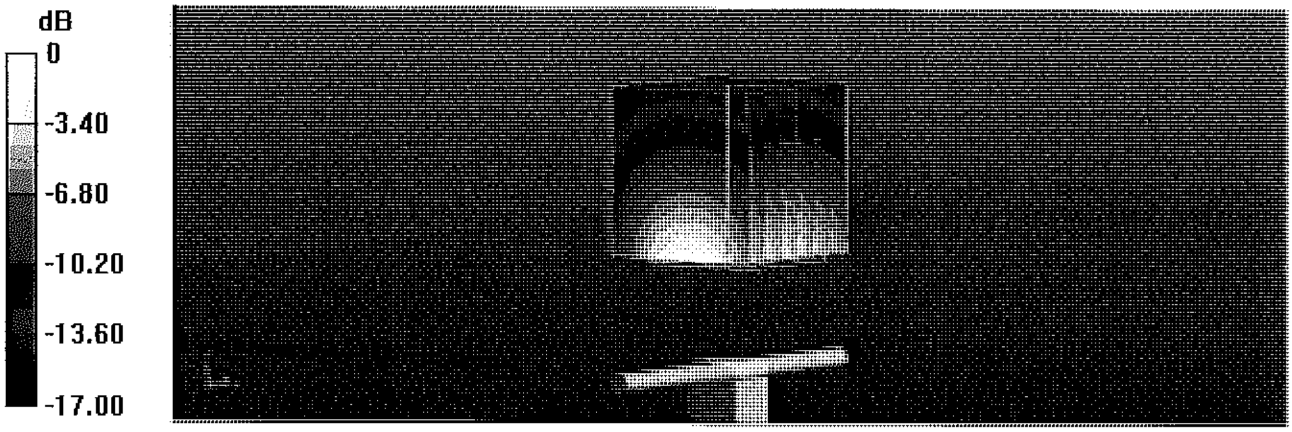
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.51 S/m; ε_r = 54.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.03, 8.03, 8.03); 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(1444); SEMCAD X 14.6.10(7416)

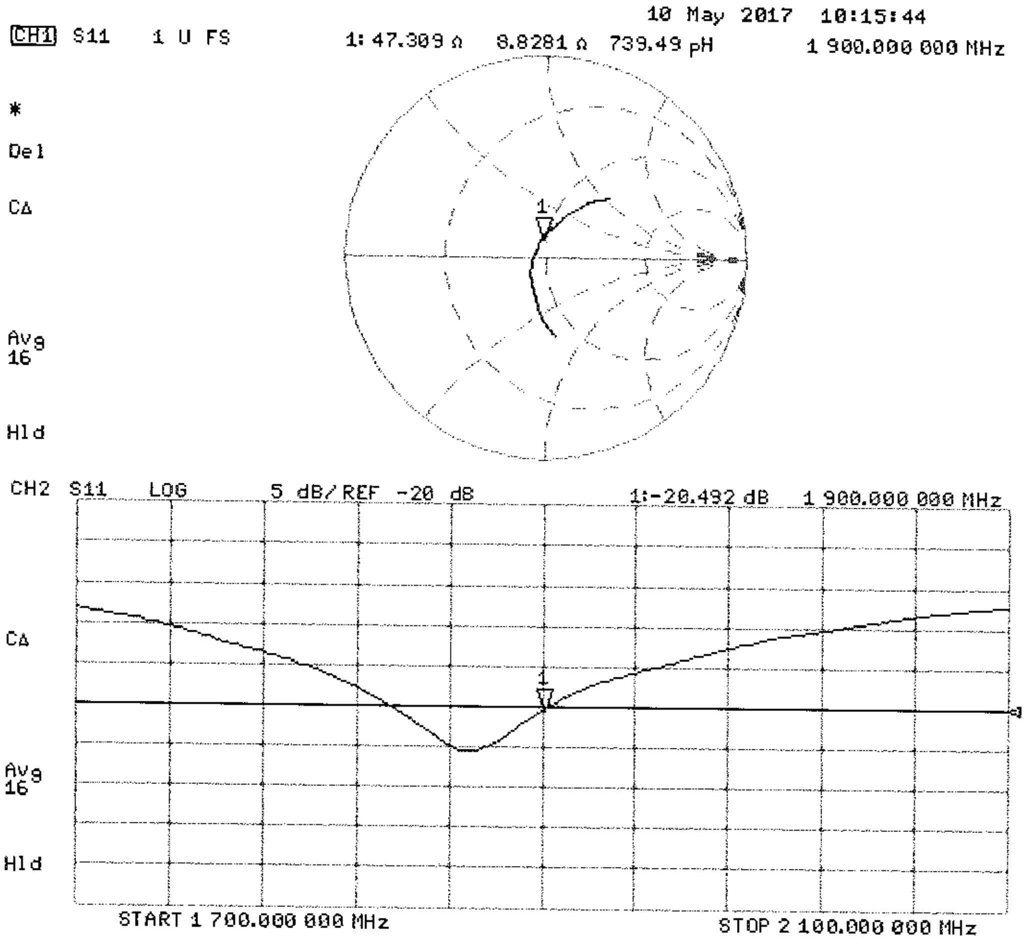
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 102.9 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 17.7 W/kg
SAR(1 g) = 10 W/kg; SAR(10 g) = 5.34 W/kg
Maximum value of SAR (measured) = 14.5 W/kg



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

Impedance 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
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: **D1900V2-5d148_Feb17**

CALIBRATION CERTIFICATE

Object D1900V2 - SN:5d148

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

BN ✓
03/06/2017

Calibration date: February 09, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	04-Jan-17 (No. DAE4-601_Jan17)	Jan-18

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

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 10, 2017

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	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 %	1.38 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	**40.2 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	**20.9 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	54.1 ± 6 %	1.50 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	10.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**40.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.33 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 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	54.1 Ω + 5.8 jΩ
Return Loss	- 23.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.3 Ω + 7.1 jΩ
Return Loss	- 22.6 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: 09.02.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

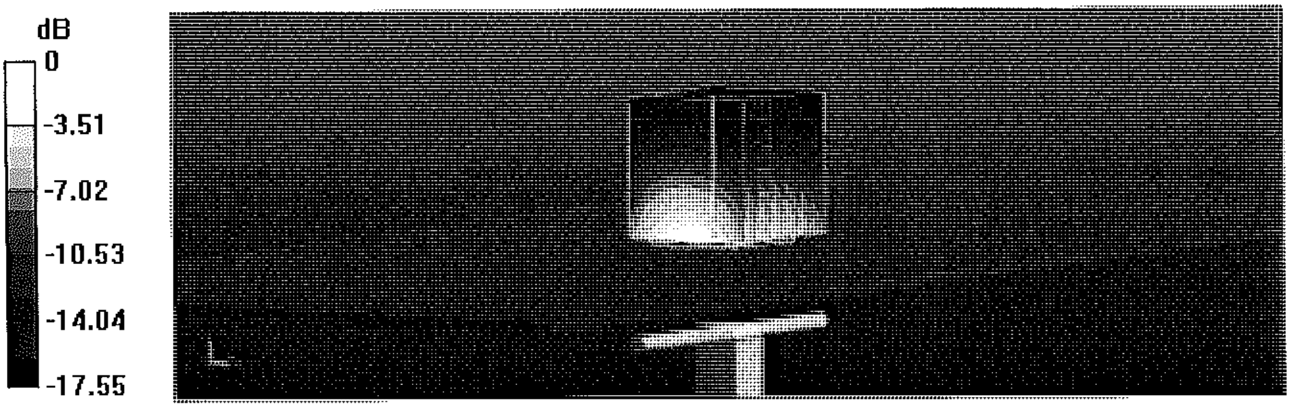
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 40.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

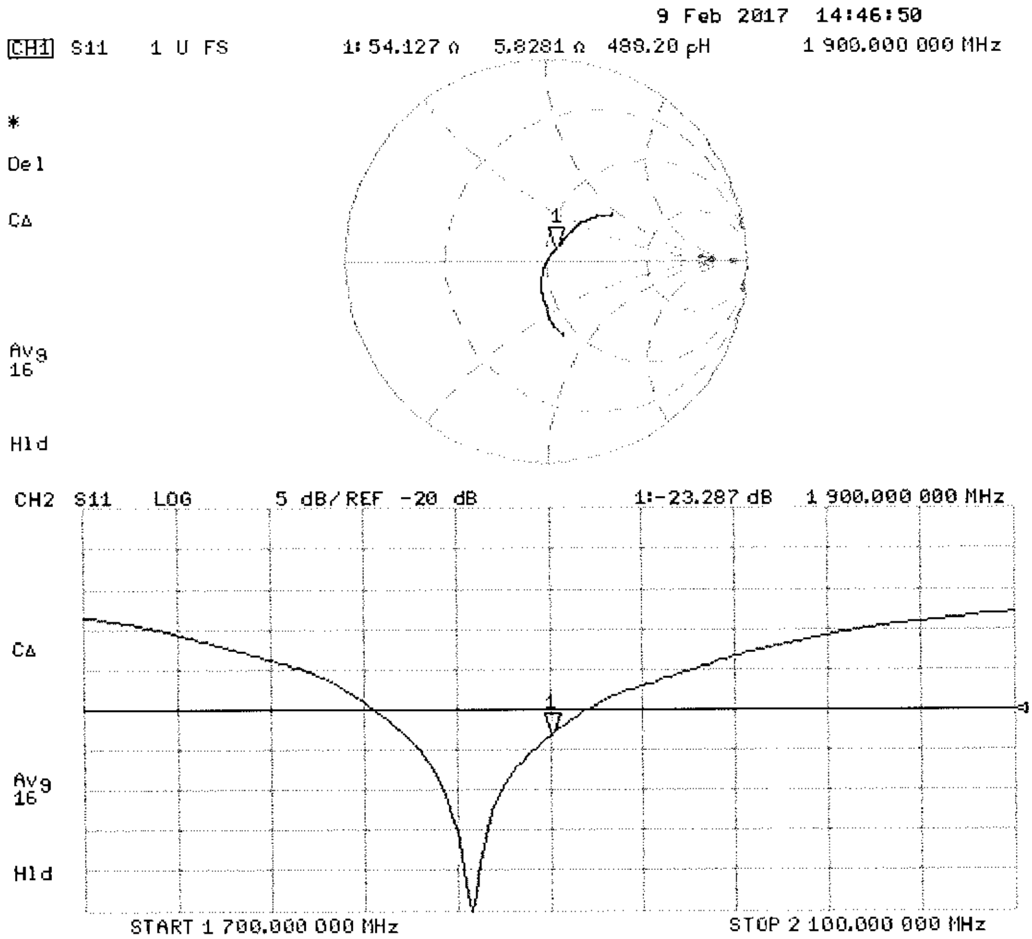
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 108.8 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 19.2 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: 09.02.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

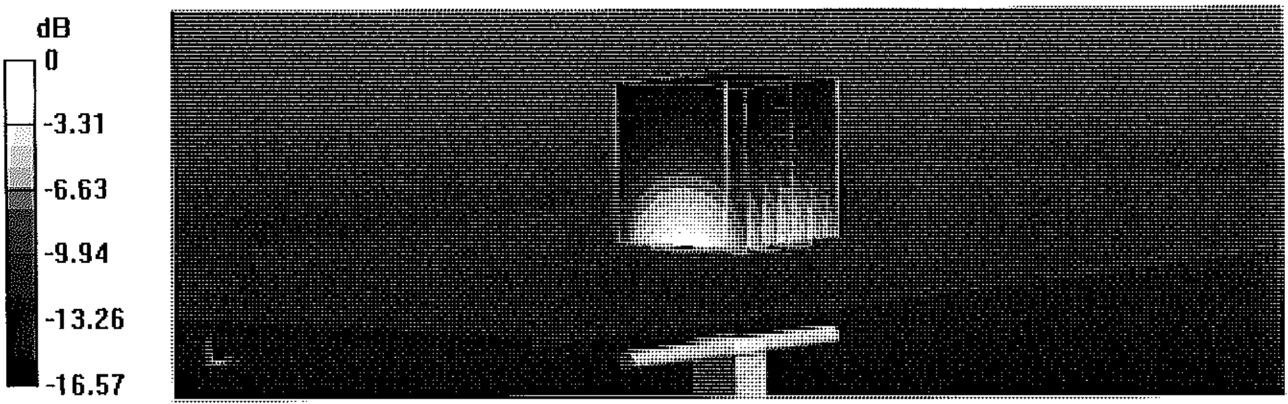
Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.5 S/m; ε_r = 54.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.03, 8.03, 8.03); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

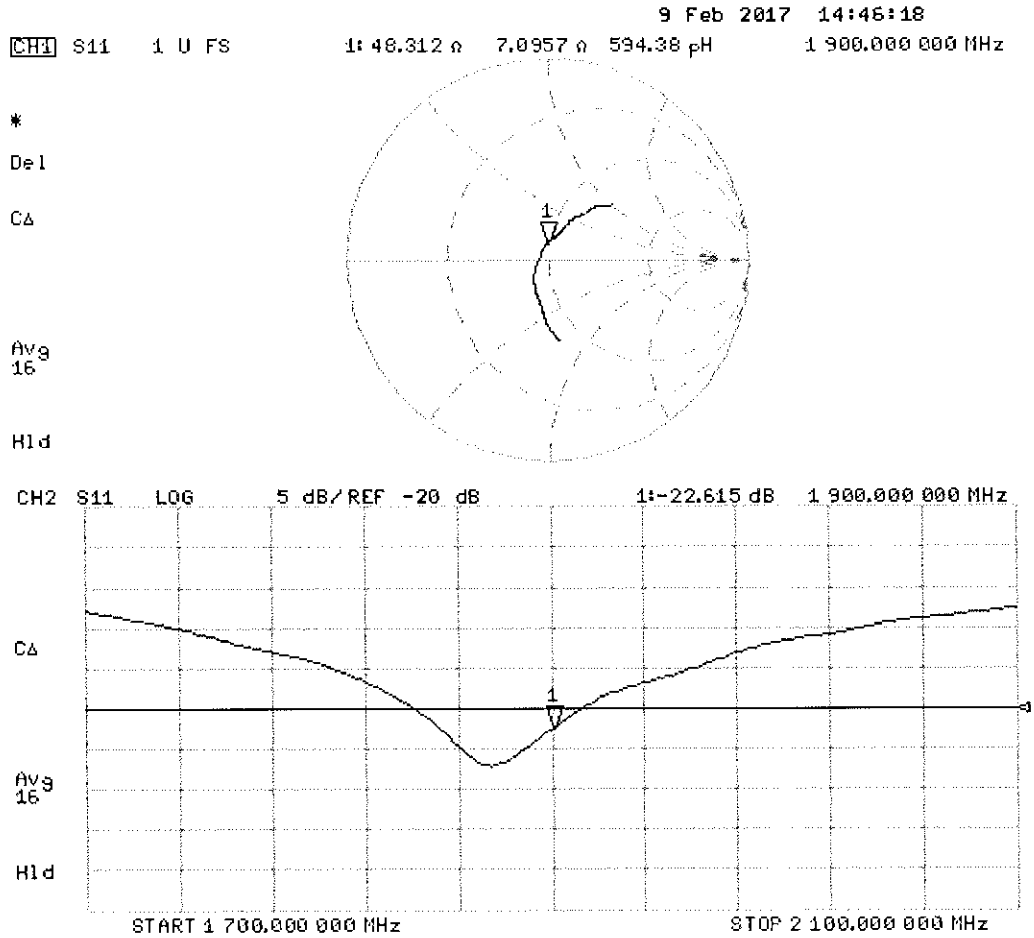
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.3 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 18.1 W/kg
SAR(1 g) = 10.1 W/kg; SAR(10 g) = 5.33 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 Body TSL



Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D2600V2-1071_Sep16

CALIBRATION CERTIFICATE

Object	D2600V2 - SN:1071
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 13, 2016

BN✓
09-28-2016

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	15-Jun-16 (No. EX3-7349_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 13, 2016

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.3 ± 6 %	2.05 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	14.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**56.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.3 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	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.1 ± 6 %	2.22 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	13.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**54.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.5 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	49.9 Ω - 6.7 jΩ
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.1 Ω - 2.1 jΩ
Return Loss	- 26.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 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 17, 2013

DASY5 Validation Report for Head TSL

Date: 13.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

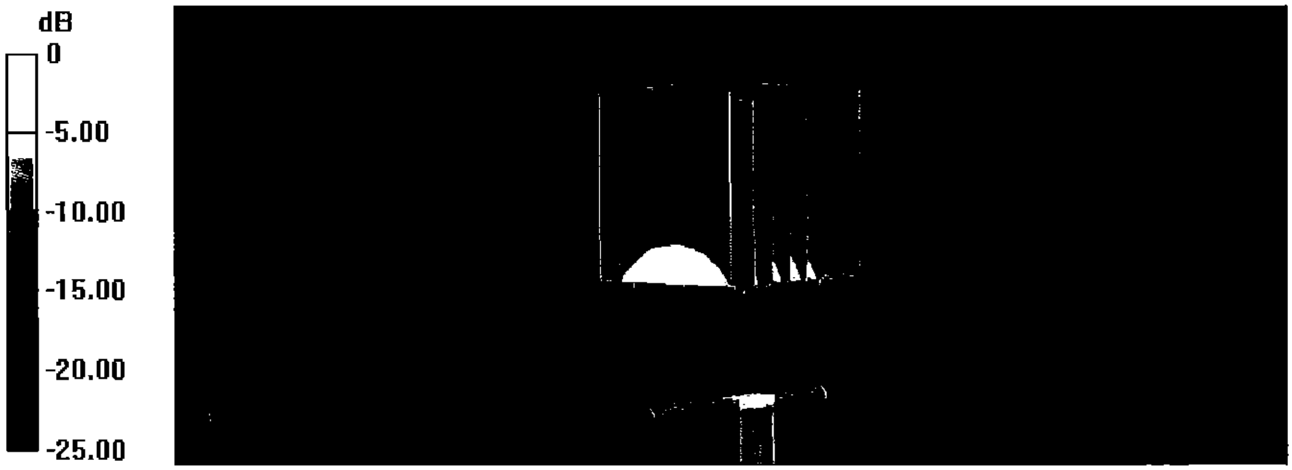
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; $\sigma = 2.05$ S/m; $\varepsilon_r = 37.3$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.56, 7.56, 7.56); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

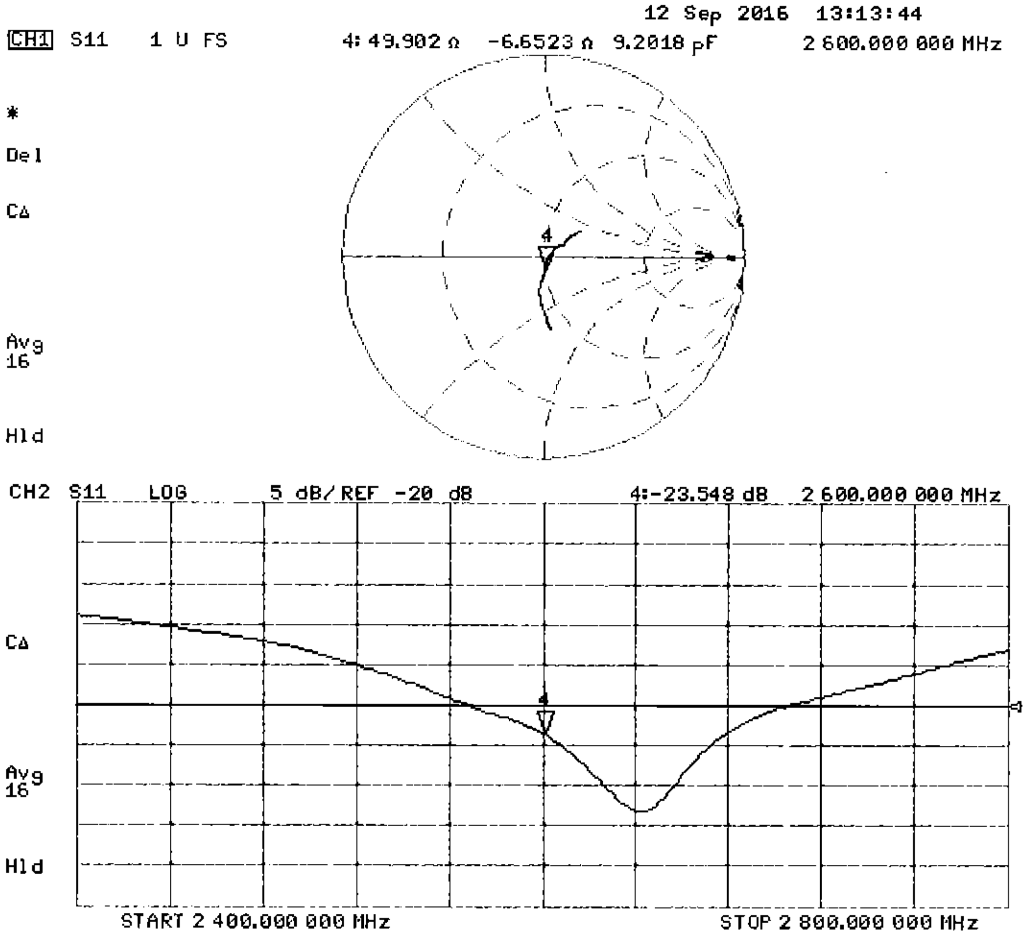
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 115.1 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 30.4 W/kg
SAR(1 g) = 14.5 W/kg; SAR(10 g) = 6.45 W/kg
Maximum value of SAR (measured) = 24.6 W/kg



0 dB = 24.6 W/kg = 13.91 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; $\sigma = 2.22$ S/m; $\varepsilon_r = 51.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

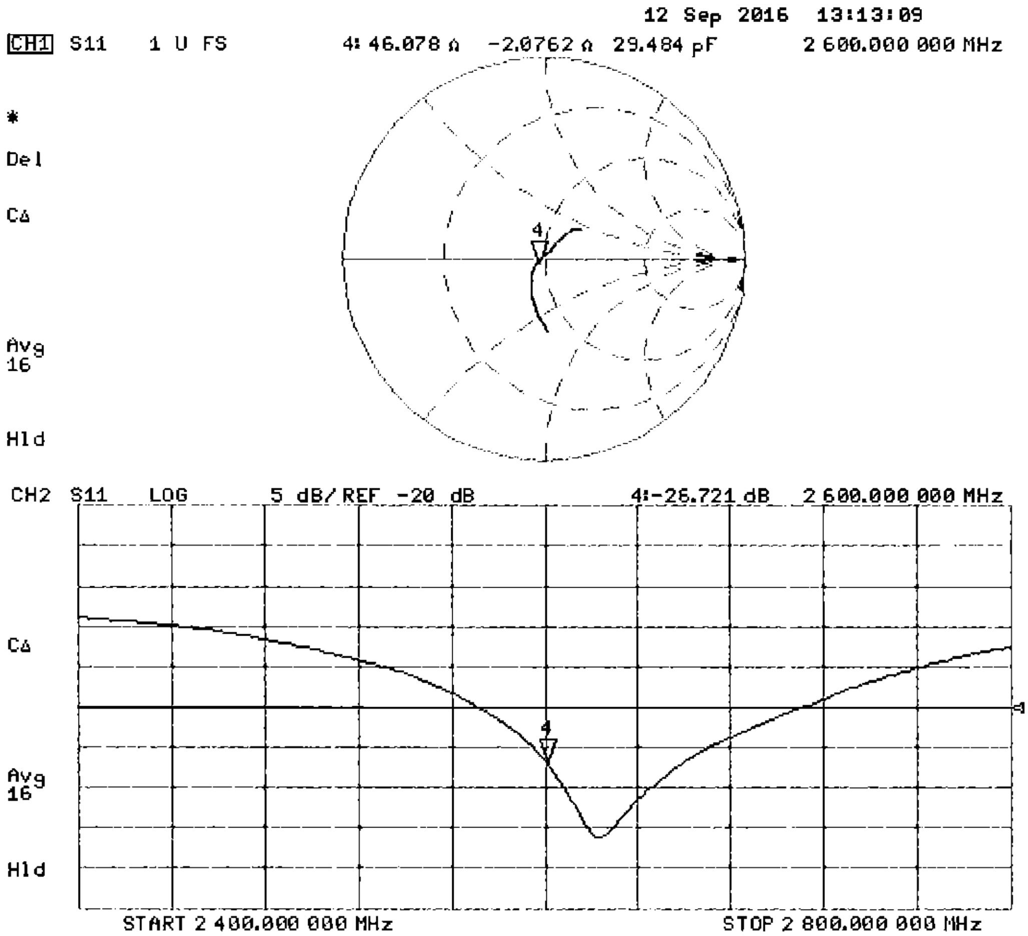
- Probe: EX3DV4 - SN7349; ConvF(7.48, 7.48, 7.48); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

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

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 107.7 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 28.3 W/kg
SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.2 W/kg
Maximum value of SAR (measured) = 23.3 W/kg

0 dB = 23.3 W/kg = 13.67 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
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S Schweizerischer Kalibrierdienst
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Swiss Calibration Service

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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: **D2450V2-797_Sep16**

CALIBRATION CERTIFICATE

Object: D2450V2 - SN:797

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

BNV
09-28-2016

Calibration date: September 13, 2016

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	15-Jun-16 (No. EX3-7349_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: September 13, 2016

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 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	37.9 ± 6 %	1.88 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	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.1 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.26 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.6 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	51.6 ± 6 %	2.04 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	13.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.13 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 + 6.0 jΩ
Return Loss	- 23.3 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.8 Ω + 8.0 jΩ
Return Loss	- 22.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.160 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: 13.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

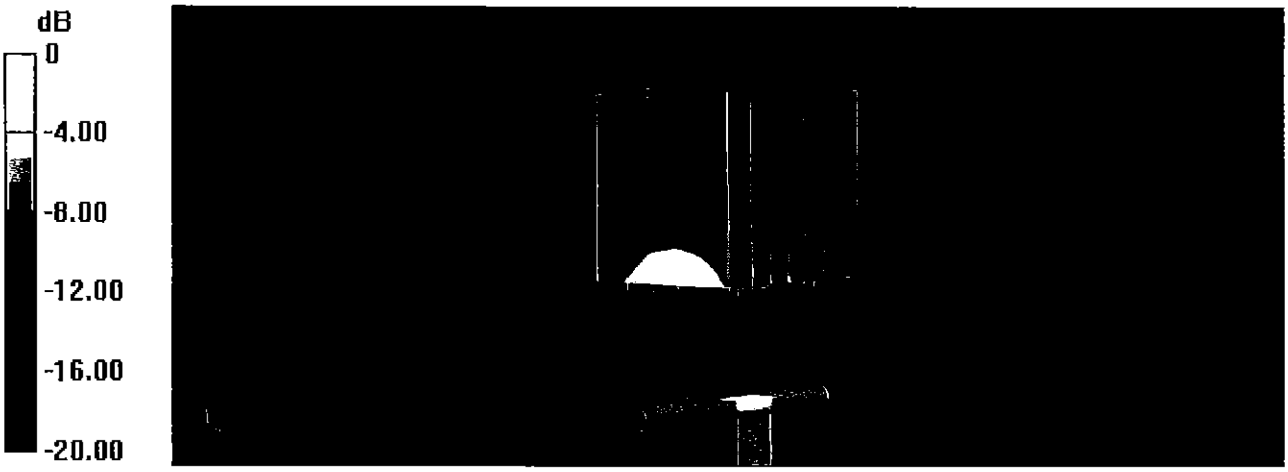
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.88 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.72, 7.72, 7.72); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

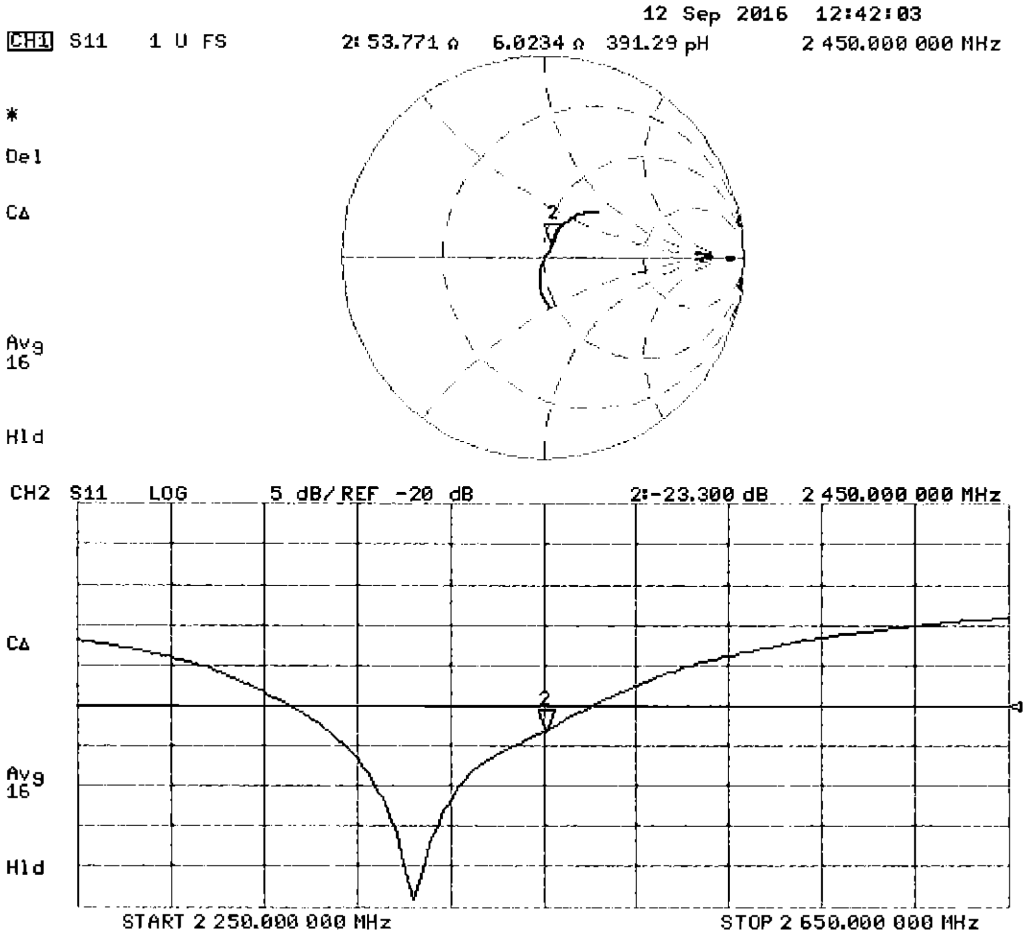
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.4 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 26.9 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.26 W/kg
Maximum value of SAR (measured) = 21.9 W/kg



0 dB = 21.9 W/kg = 13.40 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.09.2016

Test Laboratory: SPEAG, Zurich, Switzerland

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

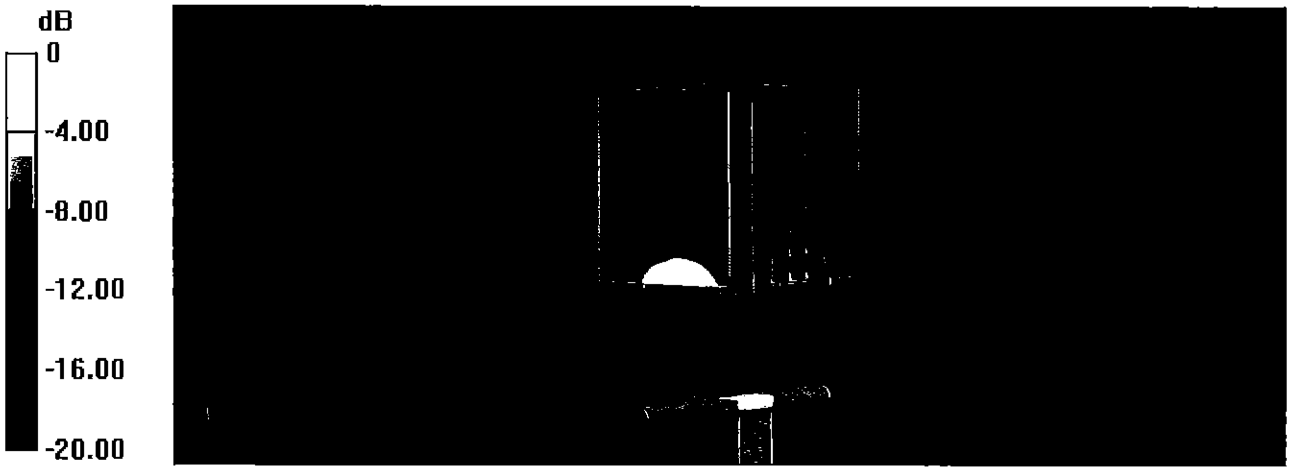
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.04 S/m; ε_r = 51.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.79, 7.79, 7.79); Calibrated: 15.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

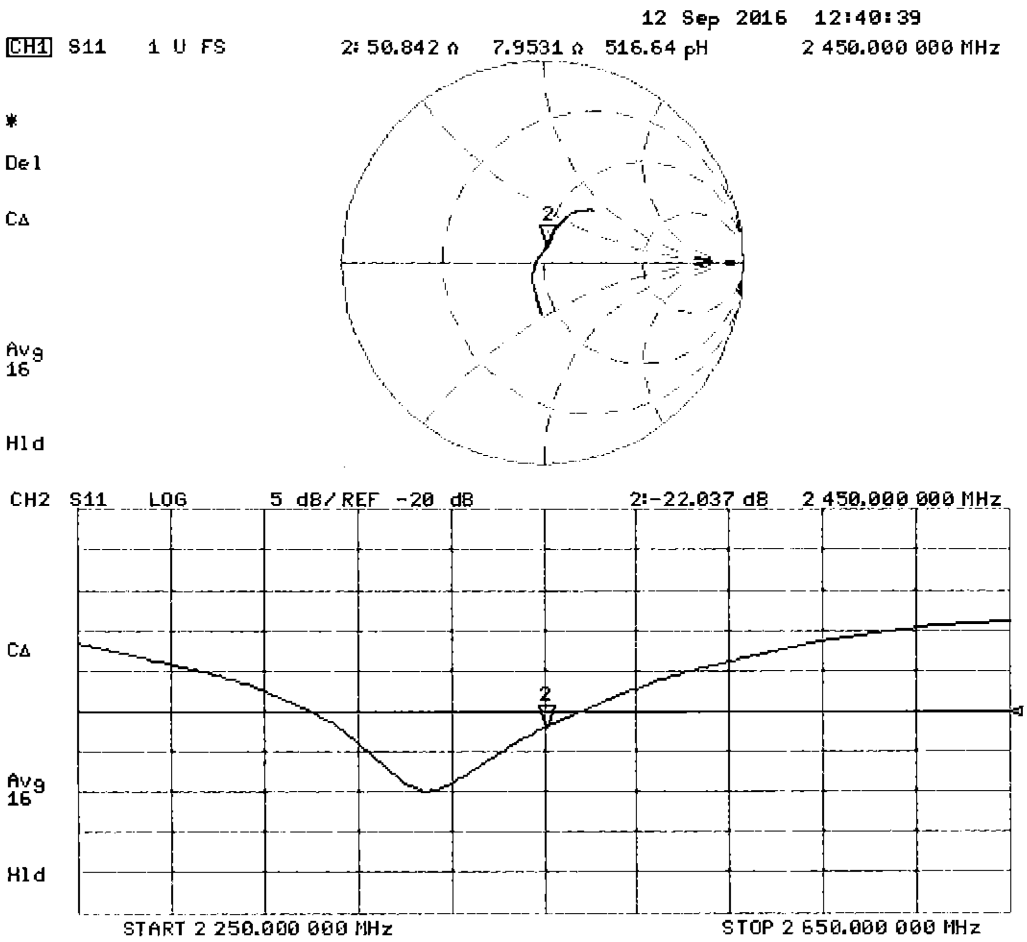
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.5 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 25.6 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.13 W/kg
Maximum value of SAR (measured) = 21.2 W/kg



0 dB = 21.2 W/kg = 13.26 dBW/kg

Impedance Measurement Plot for Body TSL



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S **Schweizerischer Kalibrierdienst**
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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: **D5GHzV2-1237_Aug16**

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN:1237

Calibration procedure(s): QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

vPM 8/9/16

Calibration date: August 02, 2016

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 3503	30-Jun-16 (No. EX3-3503_Jun16)	Jun-17
DAE4	SN: 601	30-Dec-15 (No. DAE4-601_Dec15)	Dec-16

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (No. 217-02222)	In house check: Oct-16
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (No. 217-02223)	In house check: Oct-16
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Jun-15)	In house check: Oct-16
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-15)	In house check: Oct-16

	Name	Function	Signature
Calibrated by:	Claudio Leubler	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 4, 2016

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 62209-2, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.4 ± 6 %	4.52 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.2 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.9 ± 6 %	4.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.43 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**83.3 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.9 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	33.7 ± 6 %	5.02 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.25 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**81.5 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.2 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.1 ± 6 %	5.42 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.54 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**74.8 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.12 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.0 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.5 ± 6 %	5.88 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.76 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**77.0 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.5 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	6.11 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.4 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.11 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	48.6 Ω - 2.5 jΩ
Return Loss	- 30.7 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	50.9 Ω + 1.5 jΩ
Return Loss	- 35.3 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	53.8 Ω + 5.8 jΩ
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	47.0 Ω - 3.9 jΩ
Return Loss	- 25.9 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	51.5 Ω + 3.9 jΩ
Return Loss	- 27.7 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	53.8 Ω + 0.3 jΩ
Return Loss	- 28.6 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	May 04, 2015

DASY5 Validation Report for Head TSL

Date: 02.08.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1237

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 4.52 S/m; ε_r = 34.4; ρ = 1000 kg/m^3
Medium parameters used: f = 5600 MHz; σ = 4.86 S/m; ε_r = 33.9; ρ = 1000 kg/m^3
Medium parameters used: f = 5750 MHz; σ = 5.02 S/m; ε_r = 33.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

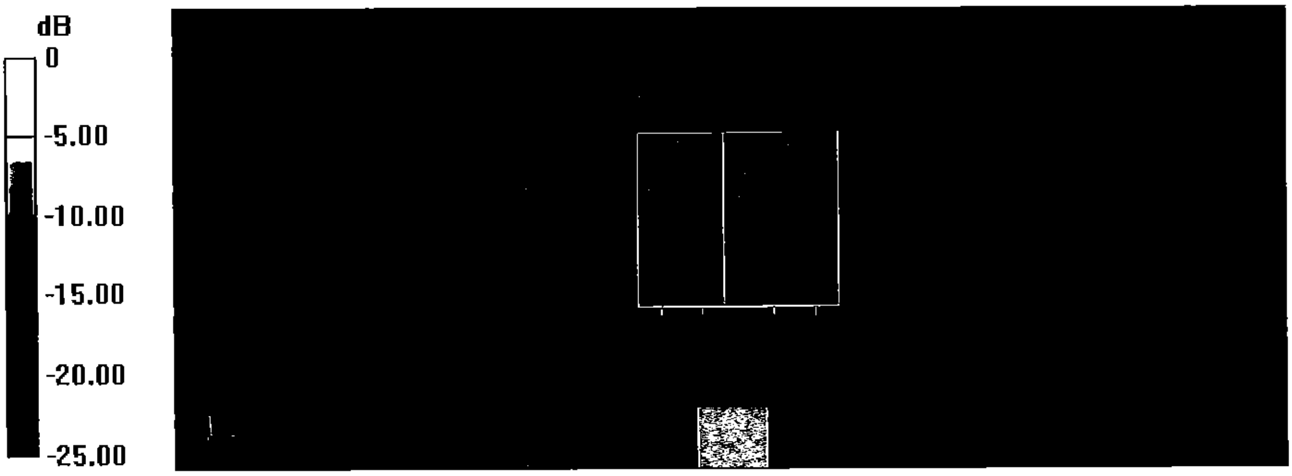
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.42, 5.42, 5.42); Calibrated: 30.06.2016; ConvF(4.89, 4.89, 4.89); Calibrated: 30.06.2016, ConvF(4.85, 4.85, 4.85); Calibrated: 30.06.2016,
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (front); Type: QD000P50AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 74.10 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 29.5 W/kg
SAR(1 g) = 8 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 18.3 W/kg

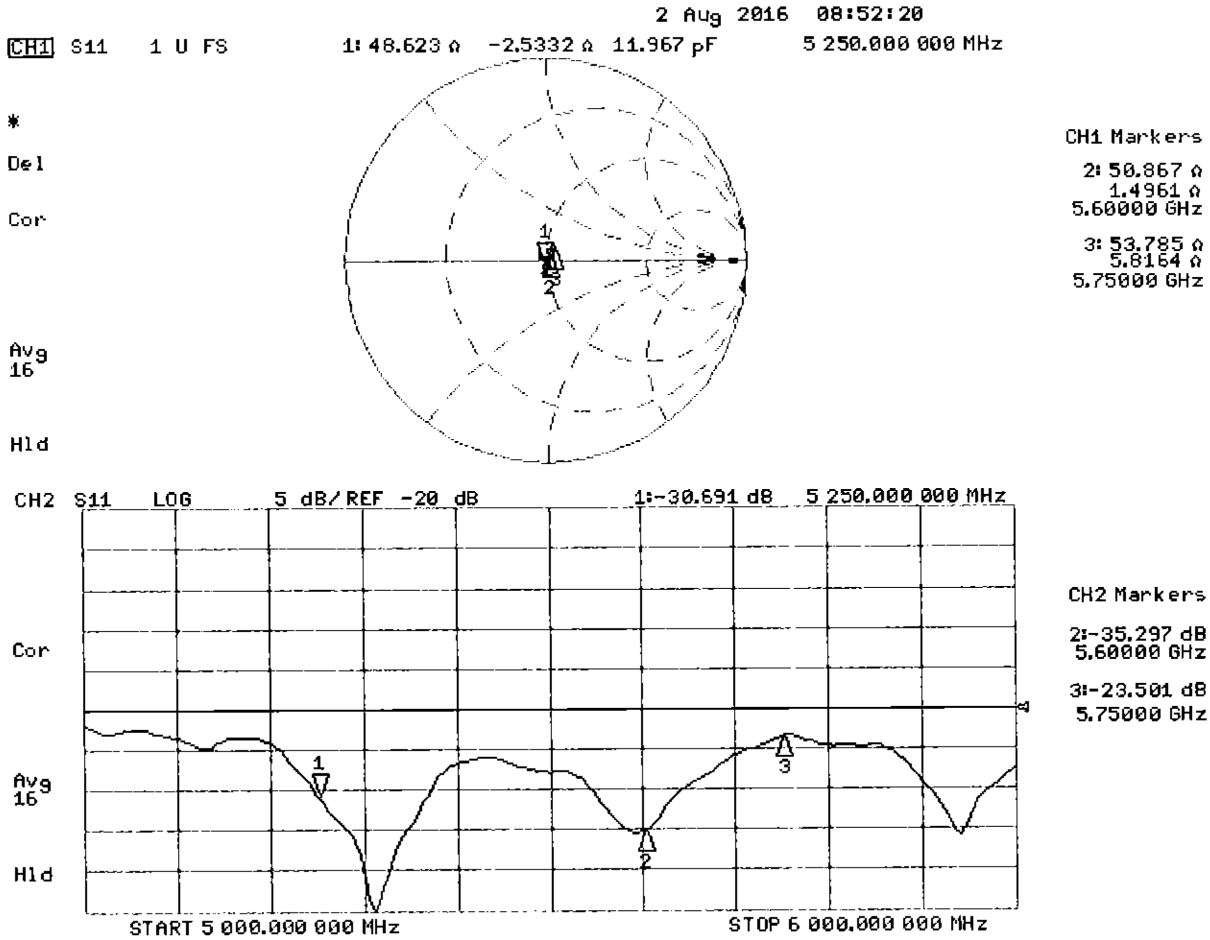
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 73.55 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 8.43 W/kg; SAR(10 g) = 2.42 W/kg
Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.23 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 33.6 W/kg
SAR(1 g) = 8.25 W/kg; SAR(10 g) = 2.35 W/kg
Maximum value of SAR (measured) = 18.3 W/kg



0 dB = 18.3 W/kg = 12.62 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 02.08.2016

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1237

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 5.42 S/m; ε_r = 47.1; ρ = 1000 kg/m^3
Medium parameters used: f = 5600 MHz; σ = 5.88 S/m; ε_r = 46.5; ρ = 1000 kg/m^3
Medium parameters used: f = 5750 MHz; σ = 6.11 S/m; ε_r = 46.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

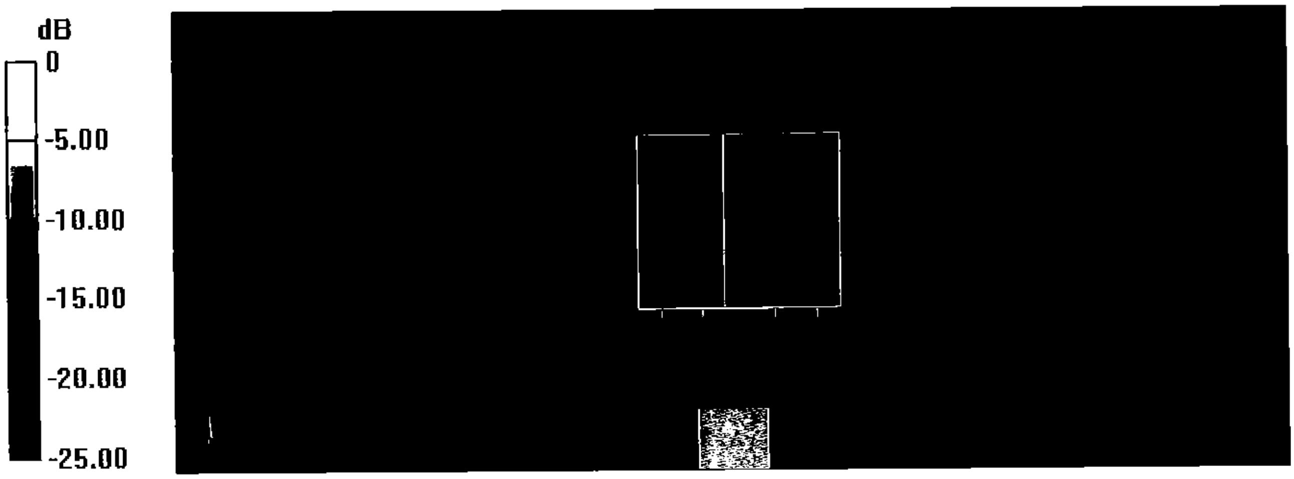
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(4.85, 4.85, 4.85); Calibrated: 30.06.2016, ConvF(4.35, 4.35, 4.35); Calibrated: 30.06.2016, ConvF(4.3, 4.3, 4.3); Calibrated: 30.06.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.12.2015
- Phantom: Flat Phantom 5.0 (back); Type: QD000P50AA; Serial: 1002
- DASY52 52.8.8(1222); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 67.19 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 28.4 W/kg
SAR(1 g) = 7.54 W/kg; SAR(10 g) = 2.12 W/kg
Maximum value of SAR (measured) = 17.3 W/kg

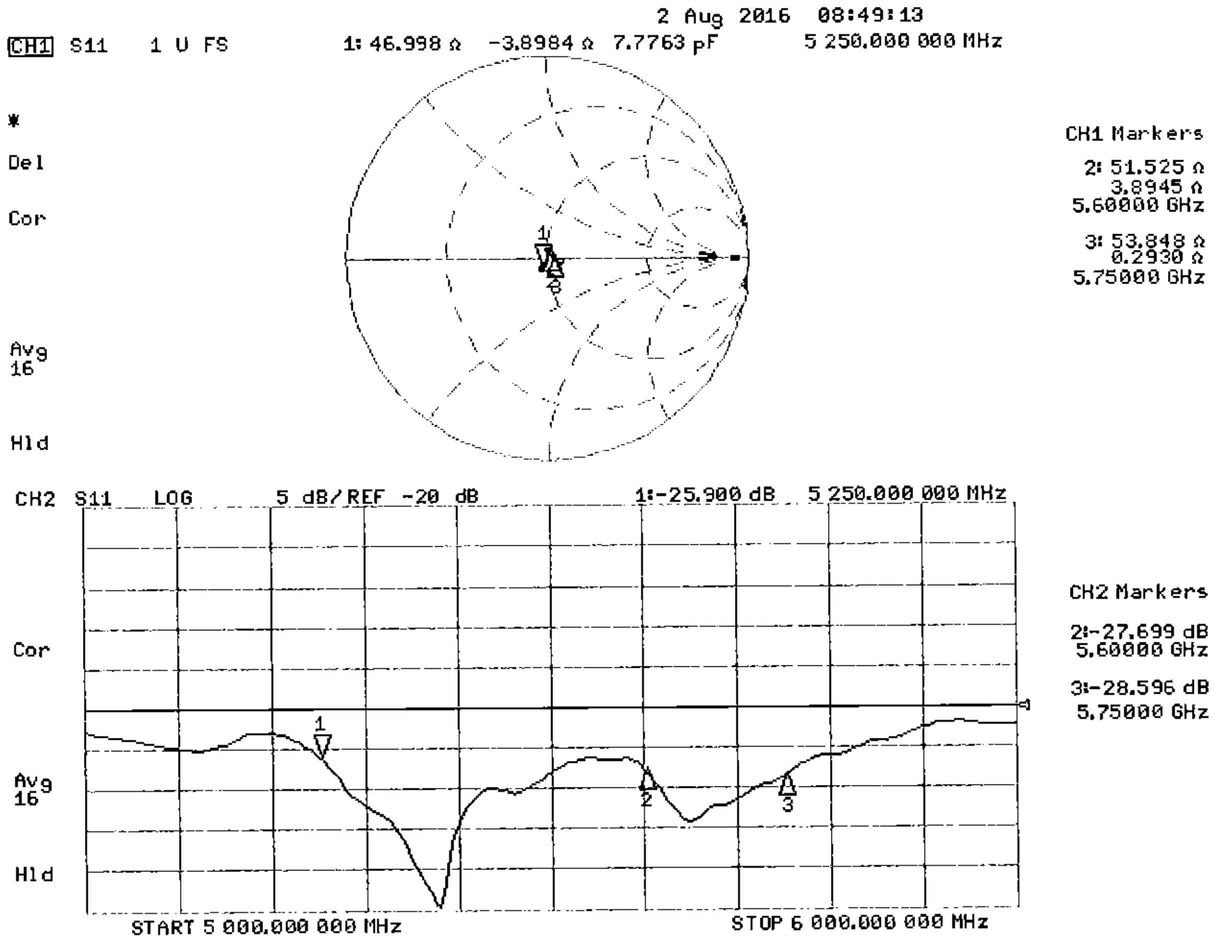
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 66.80 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.9 W/kg
SAR(1 g) = 7.76 W/kg; SAR(10 g) = 2.17 W/kg
Maximum value of SAR (measured) = 18.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.31 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 32.6 W/kg
SAR(1 g) = 7.6 W/kg; SAR(10 g) = 2.11 W/kg
Maximum value of SAR (measured) = 18.4 W/kg



0 dB = 17.3 W/kg = 12.38 dBW/kg

Impedance Measurement Plot for Body TSL



Calibration Laboratory of
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Engineering AG
Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D750V3-1034_May17

CALIBRATION CERTIFICATE

Object	D750V3 - SN:1034
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 11, 2017

BN ✓ 05-23-2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

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

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

Issued: May 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, "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	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	41.0 ± 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	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.22 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.39 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	55.3 ± 6 %	0.96 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	2.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.71 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.76 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	55.6 Ω + 0.9 jΩ
Return Loss	- 25.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.4 Ω - 2.5 jΩ
Return Loss	- 32.0 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.033 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 06, 2011

DASY5 Validation Report for Head TSL

Date: 11.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1034

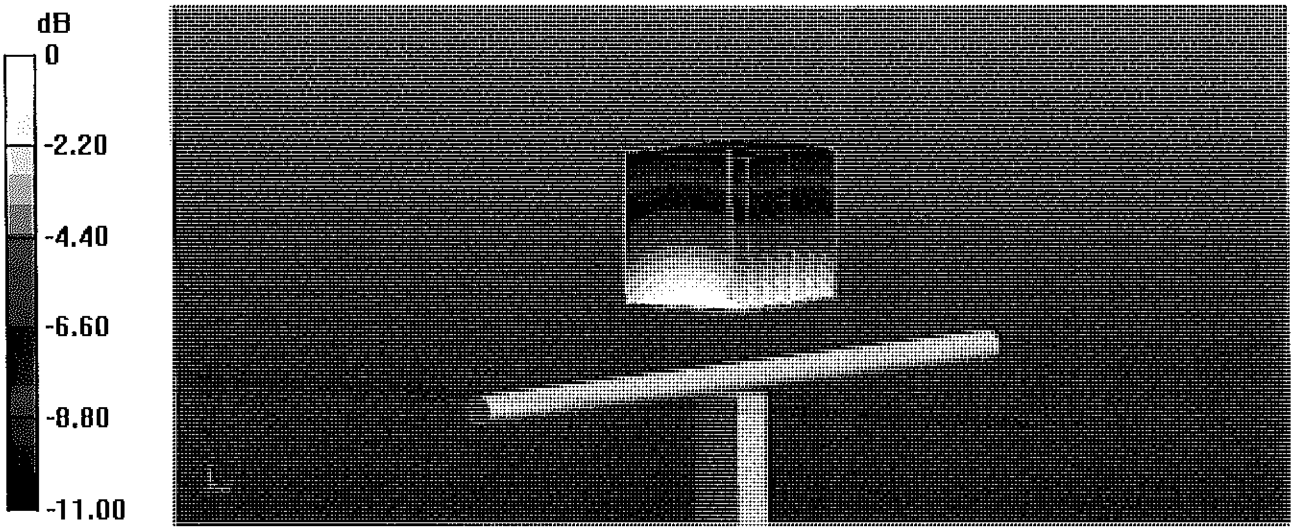
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.91 S/m; ε_r = 41; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

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: 28.03.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1444); SEMCAD X 14.6.10(7416)

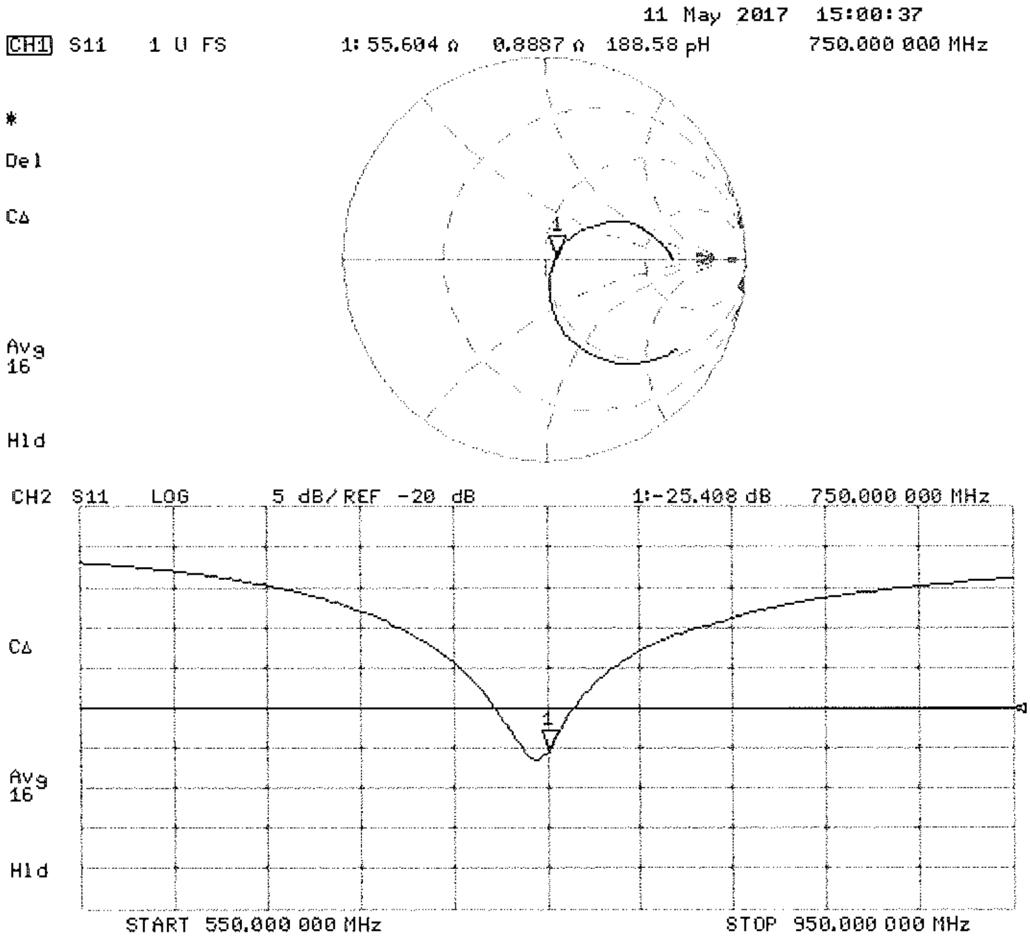
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 58.89 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 3.13 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



DASY5 Validation Report for Body TSL

Date: 11.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 750 MHz; Type: D750V3; Serial: D750V3 - SN:1034

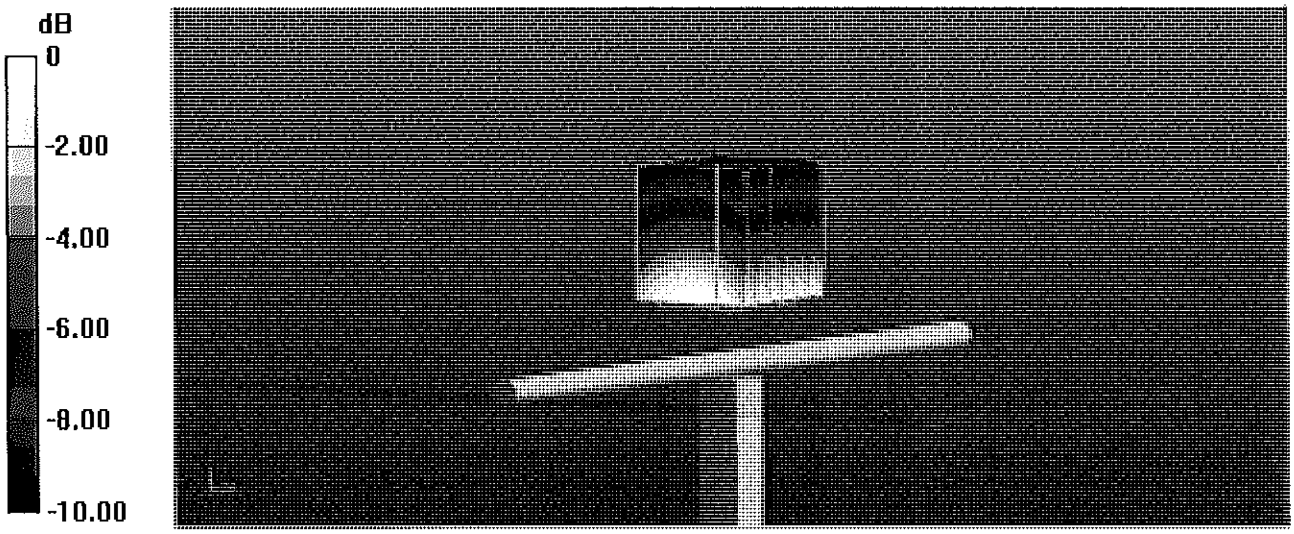
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 55.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.99, 9.99, 9.99); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1444); SEMCAD X 14.6.10(7416)

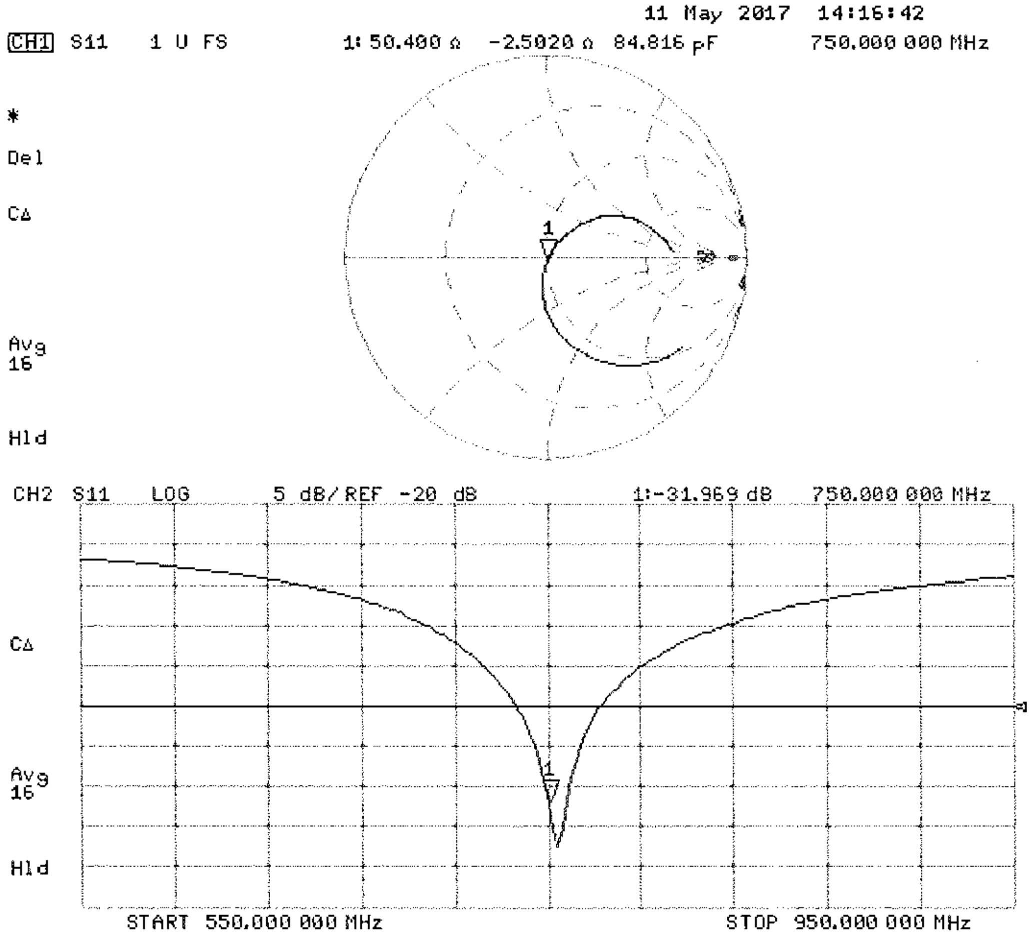
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.84 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.17 W/kg
SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.44 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 Body TSL



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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D835V2-4d180_May17

CALIBRATION CERTIFICATE

Object	D835V2 - SN:4d180
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 11, 2017

BN ✓
05-23-2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

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

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

Issued: May 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, "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	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	40.8 ± 6 %	0.94 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	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.26 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.56 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.07 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	55.2 ± 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	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.61 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.32 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	51.9 Ω - 5.0 jΩ
Return Loss	- 25.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.7 Ω - 8.6 jΩ
Return Loss	- 20.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.393 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 24, 2014

DASY5 Validation Report for Head TSL

Date: 11.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d180

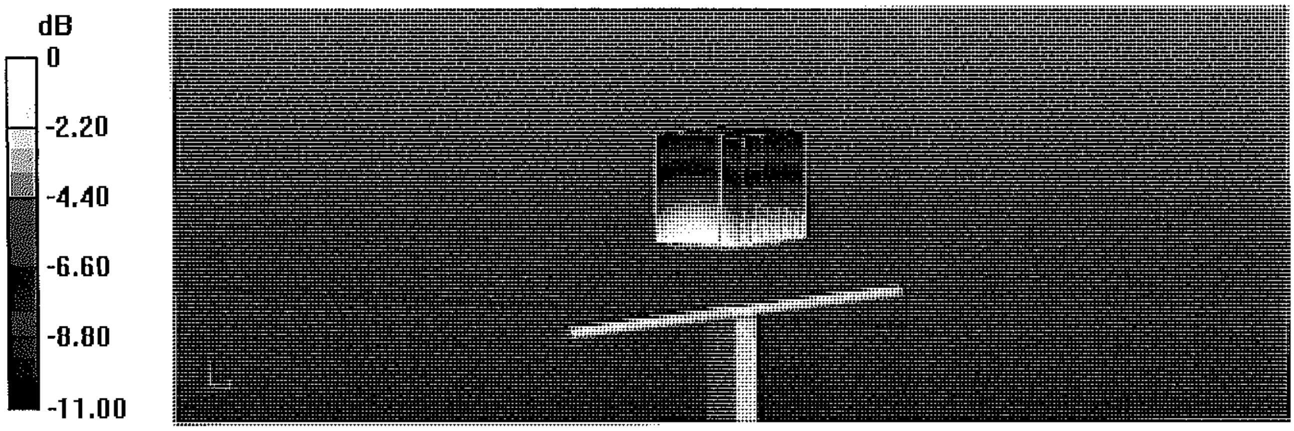
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.94 S/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.72, 9.72, 9.72); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.0(1444); SEMCAD X 14.6.10(7416)

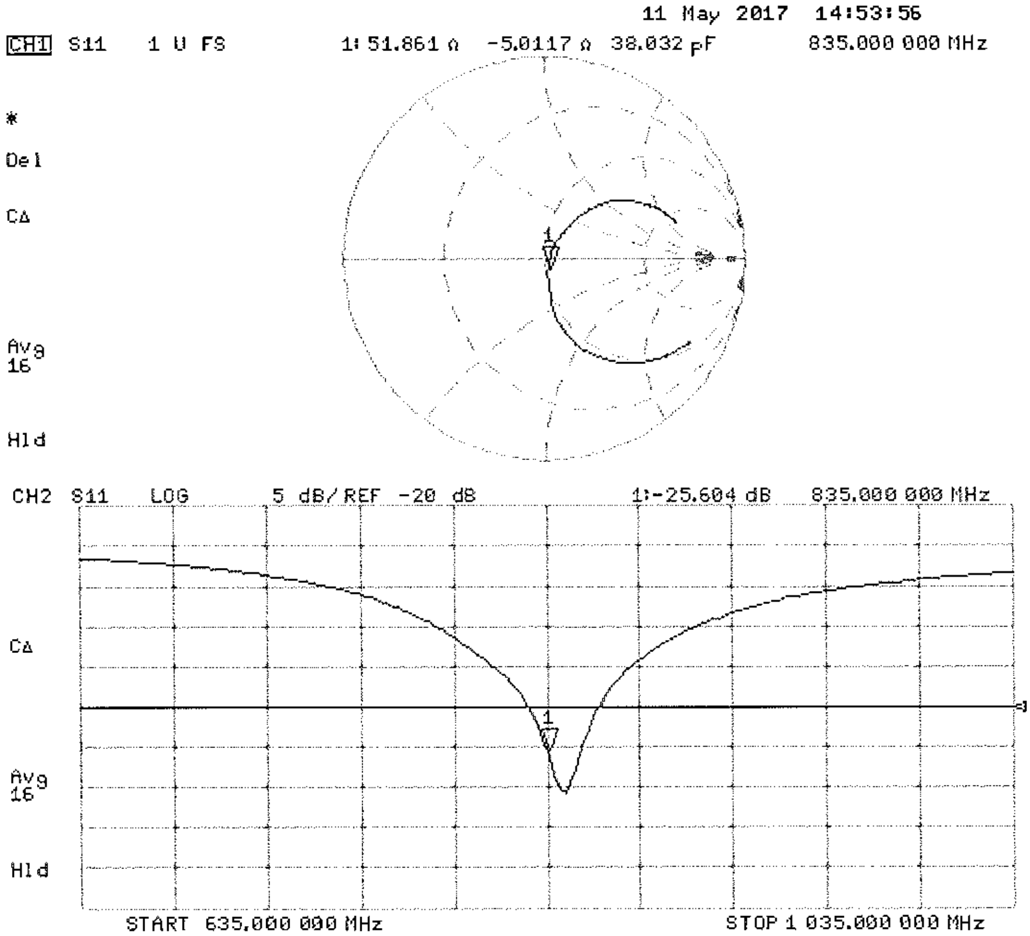
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 62.02 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 2.4 W/kg; SAR(10 g) = 1.56 W/kg
Maximum value of SAR (measured) = 3.21 W/kg



0 dB = 3.21 W/kg = 5.07 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.05.2017

Test Laboratory: SPEAG, Zurich, Switzerland

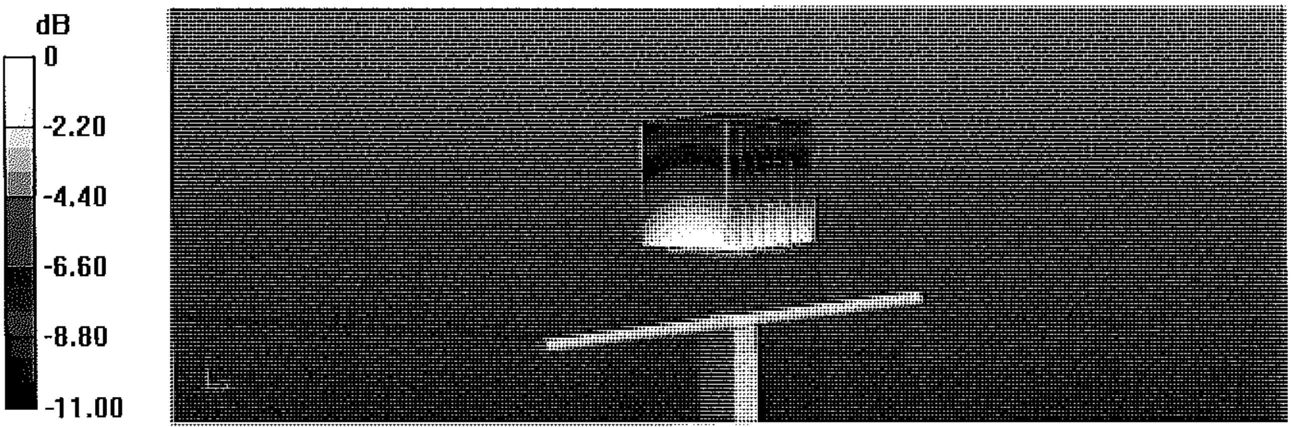
DUT: Dipole 835 MHz; Type: D835V2; Serial: D835V2 - SN:4d180

Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.99 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:

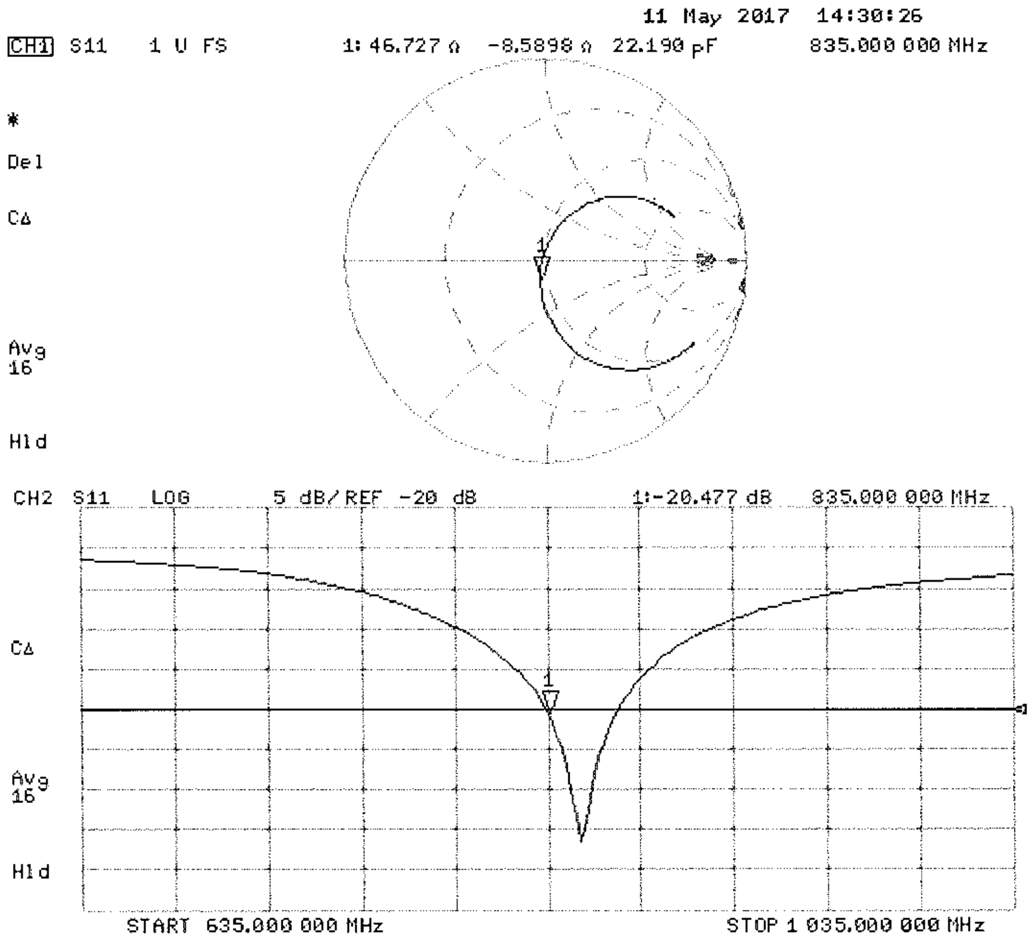
- Probe: EX3DV4 - SN7349; ConvF(9.73, 9.73, 9.73); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.0(1444); SEMCAD X 14.6.10(7416)

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 = 60.10 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.58 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.19 W/kg



0 dB = 3.19 W/kg = 5.04 dBW/kg

Impedance Measurement Plot for Body TSL



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S Schweizerischer Kalibrierdienst
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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: D2450V2-882_Feb17

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:882
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	February 13, 2017

BN✓ 03-01-2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 7349	31-Dec-16 (No. EX3-7349_Dec16)	Dec-17
DAE4	SN: 601	04-Jan-17 (No. DAE4-601_Jan17)	Jan-18

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

	Name	Function	Signature
Calibrated by:	Jeton Kastrati	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: February 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	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	37.5 ± 6 %	1.87 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	13.2 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 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	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.6 ± 6 %	2.02 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	12.7 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**49.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.90 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.3 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	53.5 Ω + 0.8 jΩ
Return Loss	- 29.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.6 Ω + 2.1 jΩ
Return Loss	- 31.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.157 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	October 06, 2011

DASY5 Validation Report for Head TSL

Date: 10.02.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:882

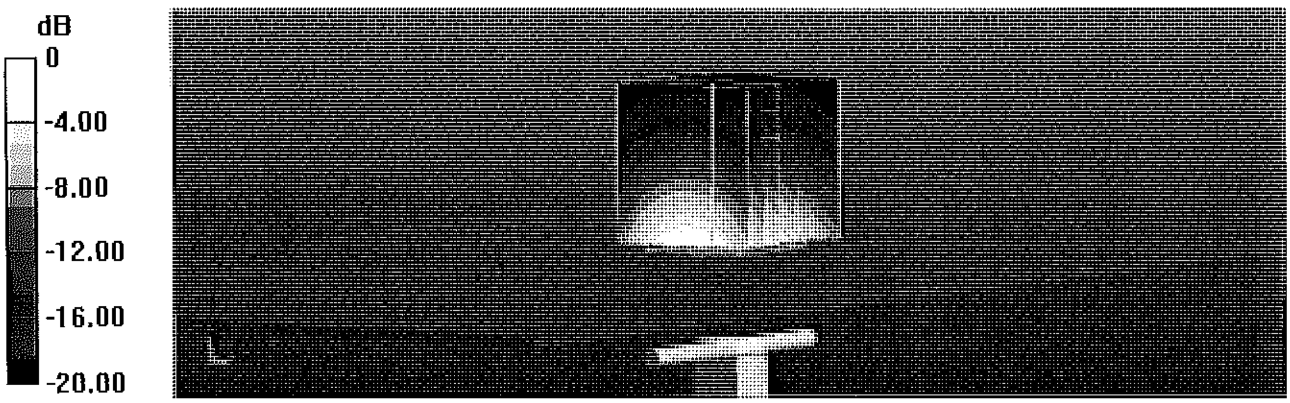
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; $\sigma = 1.87$ S/m; $\varepsilon_r = 37.5$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.72, 7.72, 7.72); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

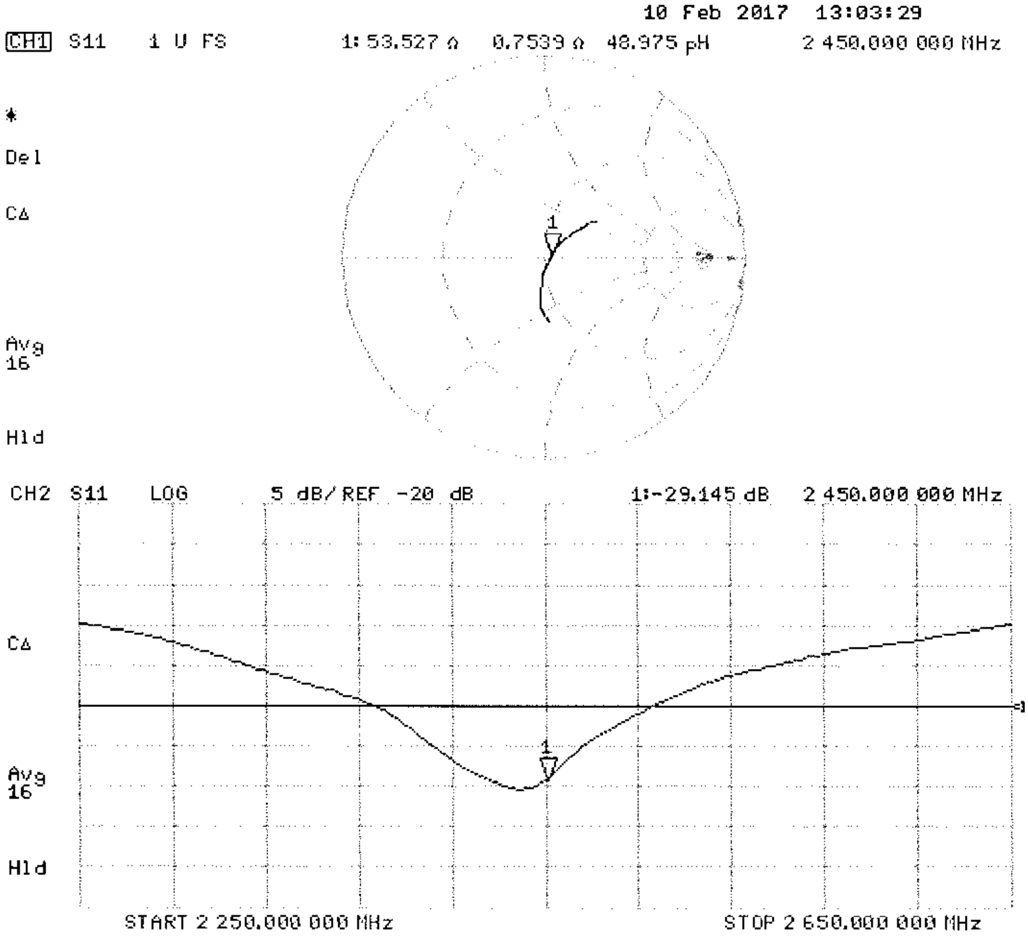
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 112.5 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 13.2 W/kg; SAR(10 g) = 6.1 W/kg
Maximum value of SAR (measured) = 21.8 W/kg



0 dB = 21.8 W/kg = 13.38 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.02.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:882

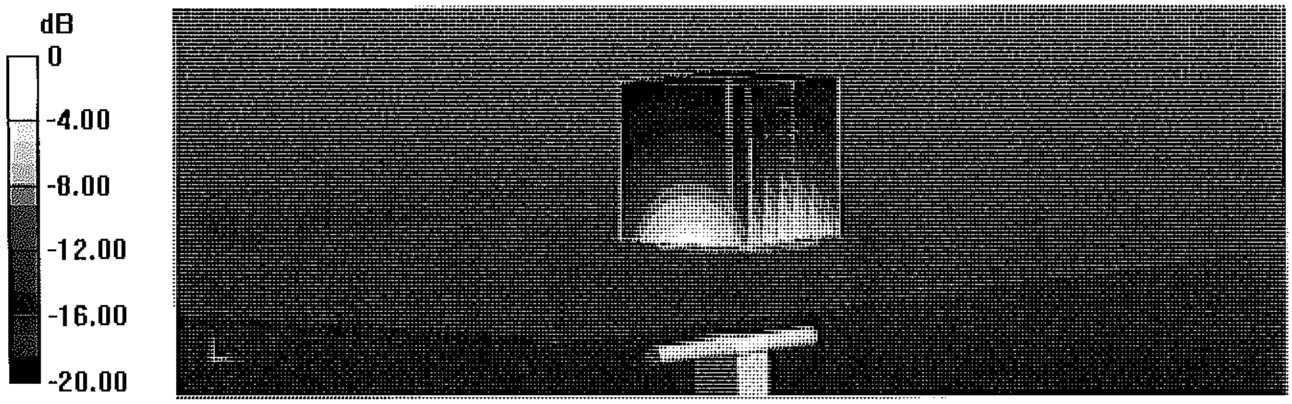
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.02 S/m; ε_r = 51.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.79, 7.79, 7.79); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

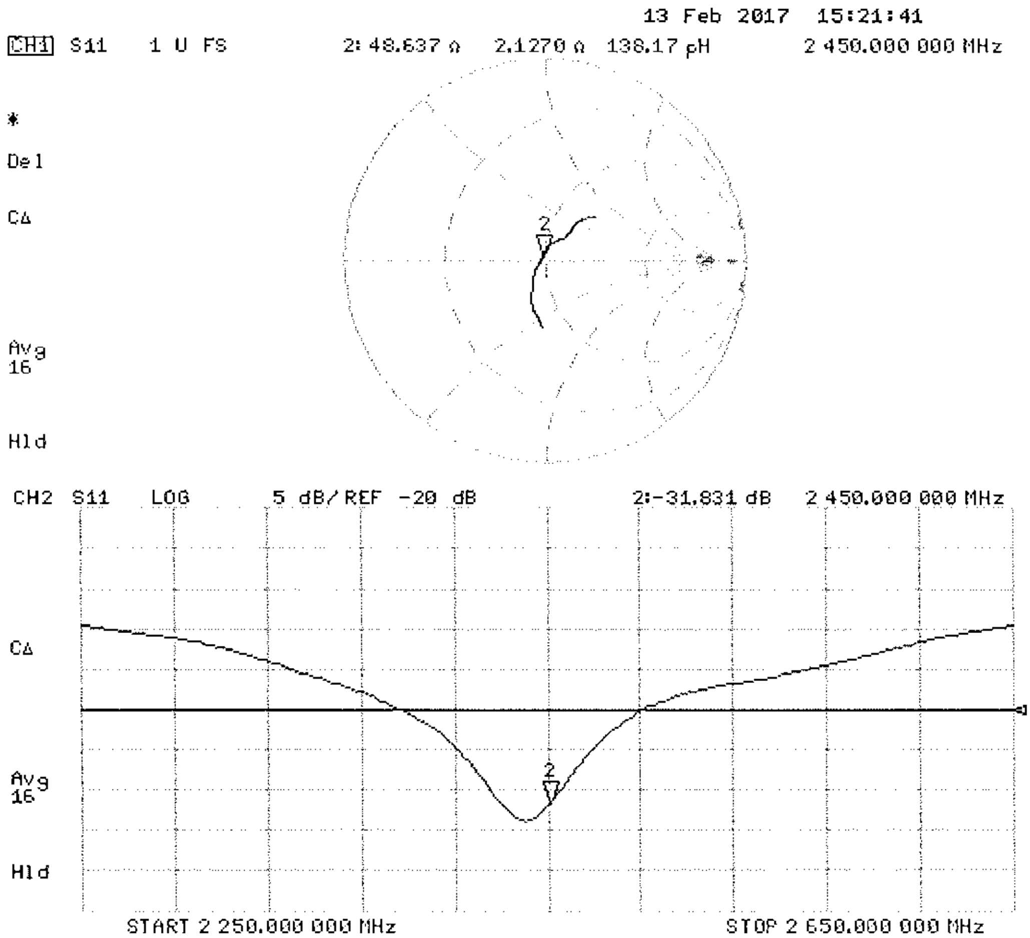
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 105.6 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 26.2 W/kg
SAR(1 g) = 12.7 W/kg; SAR(10 g) = 5.9 W/kg
Maximum value of SAR (measured) = 20.8 W/kg



0 dB = 20.8 W/kg = 13.18 dBW/kg

Impedance Measurement Plot for Body TSL



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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: **D5GHzV2-1123_Mar17**

CALIBRATION CERTIFICATE

Object: D5GHzV2 - SN:1123

Calibration procedure(s): QA CAL-22.v2
Calibration procedure for dipole validation kits between 3-6 GHz

BN✓
03-27-2017

Calibration date: March 09, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	06-Apr-16 (No. 217-02288/02289)	Apr-17
Power sensor NRP-Z91	SN: 103244	06-Apr-16 (No. 217-02288)	Apr-17
Power sensor NRP-Z91	SN: 103245	06-Apr-16 (No. 217-02289)	Apr-17
Reference 20 dB Attenuator	SN: 5058 (20k)	05-Apr-16 (No. 217-02292)	Apr-17
Type-N mismatch combination	SN: 5047.2 / 06327	05-Apr-16 (No. 217-02295)	Apr-17
Reference Probe EX3DV4	SN: 3503	31-Dec-16 (No. EX3-3503_Dec16)	Dec-17
DAE4	SN: 601	04-Jan-17 (No. DAE4-601_Jan17)	Jan-18

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

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

Issued: March 10, 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 62209-2, "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
c) KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Additional Documentation:

d) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.8.8
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	4.57 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**79.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.29 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**22.7 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.4 ± 6 %	4.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.49 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**84.2 W / kg ± 19.9 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.42 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.0 W/kg ± 19.5 % (k=2)**

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.2 ± 6 %	5.07 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**82.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	48.1 ± 6 %	5.52 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**75.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.5 ± 6 %	5.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**78.9 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**22.1 W/kg ± 19.5 % (k=2)**

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	6.21 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.65 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**76.3 W/kg ± 19.9 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**21.3 W/kg ± 19.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	51.6 Ω - 5.7 jΩ
Return Loss	- 24.7 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	55.9 Ω - 0.7 jΩ
Return Loss	- 25.1 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	56.7 Ω + 1.2 jΩ
Return Loss	- 23.9 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	51.8 Ω - 3.8 jΩ
Return Loss	- 27.7 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	58.2 Ω + 1.4 jΩ
Return Loss	- 22.3 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	57.3 Ω + 3.7 jΩ
Return Loss	- 22.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.205 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 08, 2011

DASY5 Validation Report for Head TSL

Date: 08.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1123

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 4.57 S/m; ε_r = 34.9; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 4.92 S/m; ε_r = 34.4; ρ = 1000 kg/m^3 , Medium parameters used: f = 5750 MHz; σ = 5.07 S/m; ε_r = 34.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

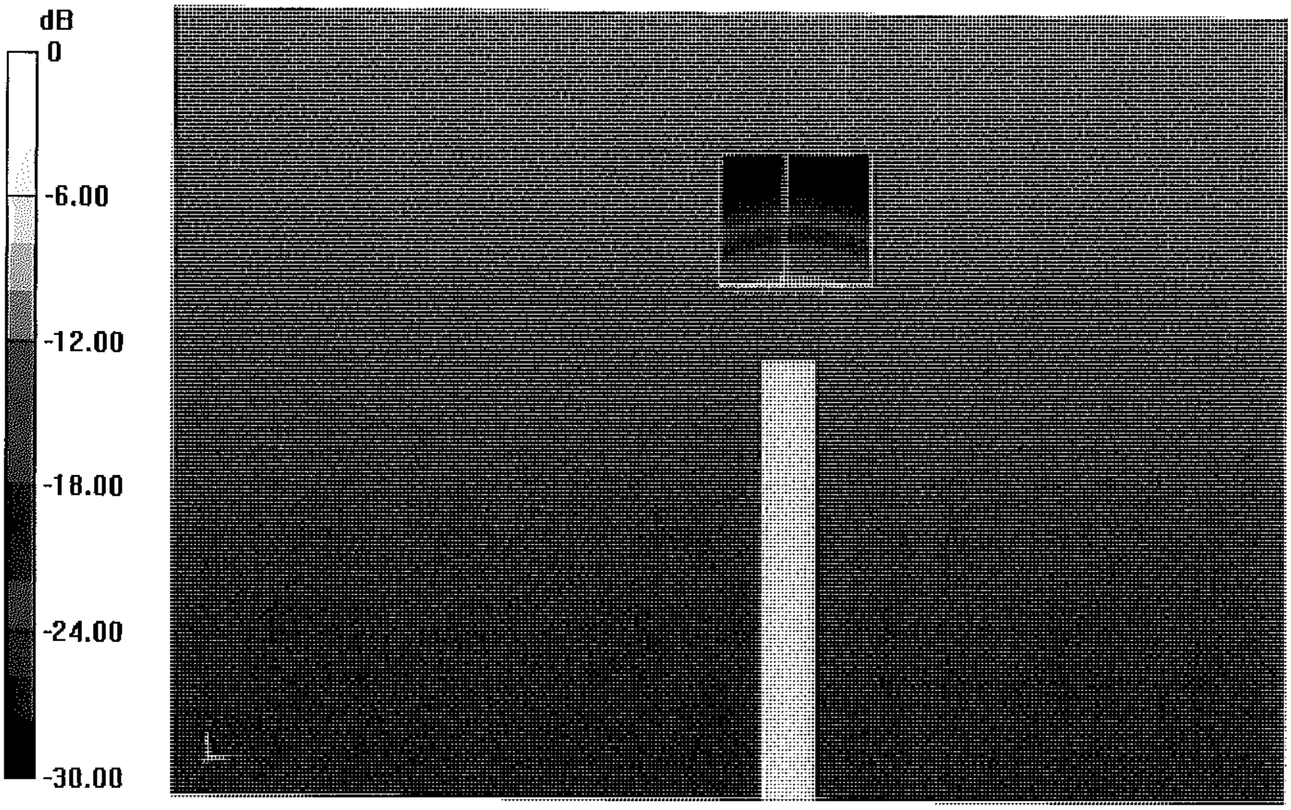
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.58, 5.58, 5.58); Calibrated: 31.12.2016, ConvF(5.09, 5.09, 5.09); Calibrated: 31.12.2016, ConvF(5.02, 5.02, 5.02); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.62 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 29.9 W/kg
SAR(1 g) = 7.98 W/kg; SAR(10 g) = 2.29 W/kg
Maximum value of SAR (measured) = 18.3 W/kg

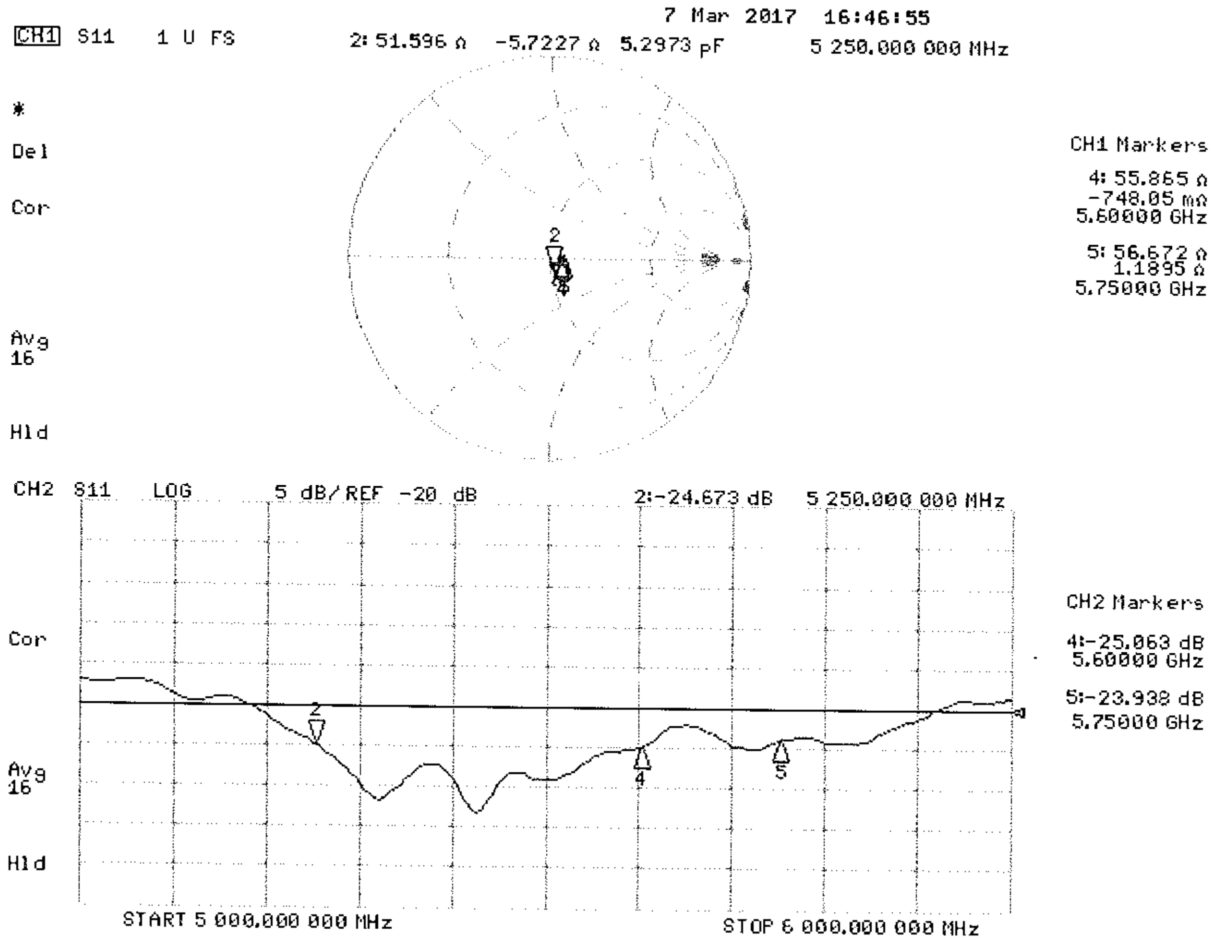
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 71.47 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 34.1 W/kg
SAR(1 g) = 8.49 W/kg; SAR(10 g) = 2.42 W/kg
Maximum value of SAR (measured) = 19.8 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.34 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 34.6 W/kg
SAR(1 g) = 8.3 W/kg; SAR(10 g) = 2.35 W/kg
Maximum value of SAR (measured) = 19.6 W/kg



0 dB = 18.3 W/kg = 12.62 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 09.03.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1123

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: f = 5250 MHz; σ = 5.52 S/m; ε_r = 48.1; ρ = 1000 kg/m^3 , Medium parameters used: f = 5600 MHz; σ = 5.99 S/m; ε_r = 47.5; ρ = 1000 kg/m^3 , Medium parameters used: f = 5750 MHz; σ = 6.21 S/m; ε_r = 47.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

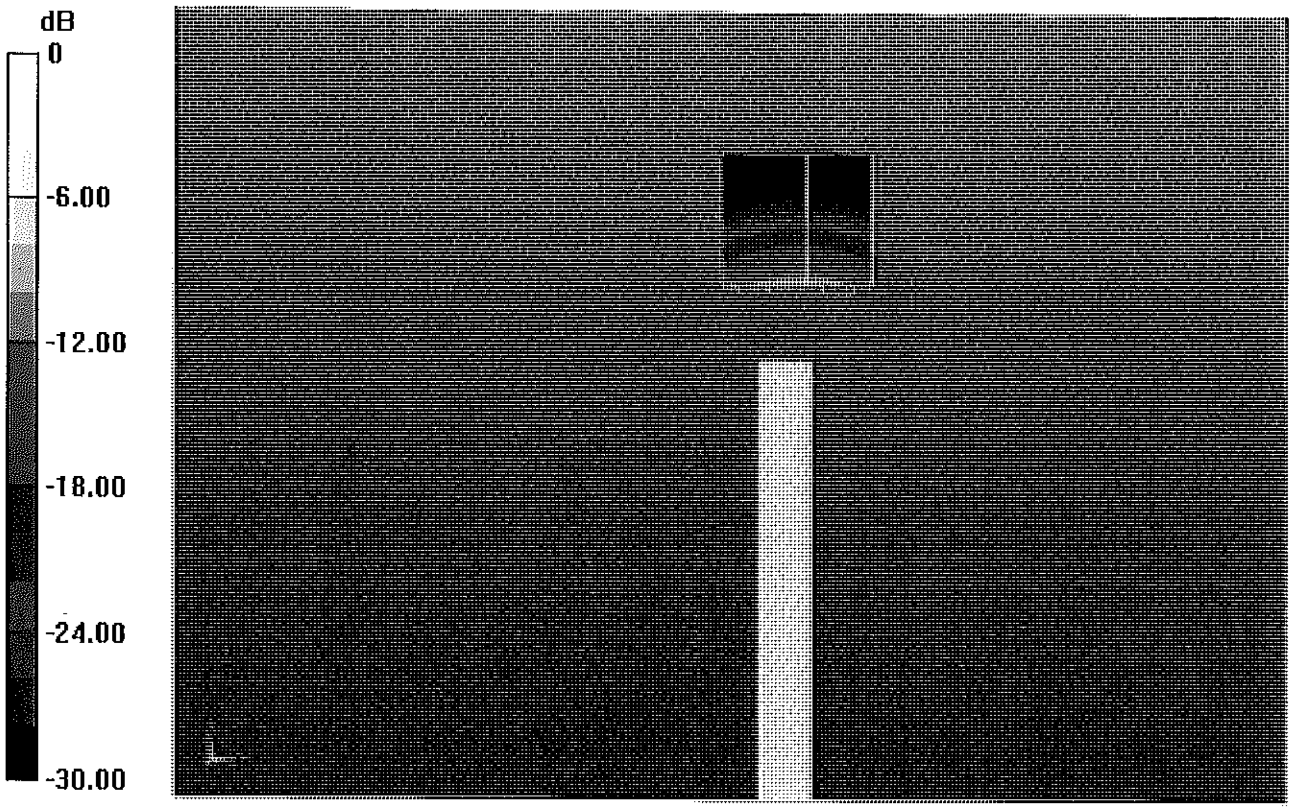
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.14, 5.14, 5.14); Calibrated: 31.12.2016, ConvF(4.57, 4.57, 4.57); Calibrated: 31.12.2016, ConvF(4.52, 4.52, 4.52); Calibrated: 31.12.2016;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.01.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.8.8(1258); SEMCAD X 14.6.10(7372)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 64.40 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 29.1 W/kg
SAR(1 g) = 7.61 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 17.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.91 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 33.2 W/kg
SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.22 W/kg
Maximum value of SAR (measured) = 18.7 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.25 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 33.4 W/kg
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 18.3 W/kg



0 dB = 17.5 W/kg = 12.43 dBW/kg

Impedance Measurement Plot for Body TSL