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SAR EVALUATION REPORT

Applicant Name:
Samsung Electronics, Co. Ltd.
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Gyeonggi-do 443-742, Korea

Date of Testing:
06/03/15 - 06/11/15
Test Site/Location:
PCTEST Lab, Columbia, MD, USA
Document Serial No.:
0Y1506041016.A3L

FCC ID:	**A3LSMN920F**
APPLICANT:	**SAMSUNG ELECTRONICS, CO. LTD.**

DUT Type:	Portable Handset
Application Type:	Certification
FCC Rule Part(s):	CFR §2.1093
Model(s):	SM-N920F

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)	10 gm Extremity (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.16	0.47	0.51	
PCE	UMTS 850	826.40 - 846.60 MHz	0.16	0.48	0.48	
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	< 0.1	0.57	0.70	
PCE	UMTS 1900	1852.4 - 1907.6 MHz	< 0.1	0.77	0.77	
PCE	LTE Band 12	699.7 - 715.3 MHz	< 0.1	< 0.1	< 0.1	
PCE	LTE Band 17	706.5 - 713.5 MHz				
PCE	LTE Band 26 (Cell)	814.7 - 848.3 MHz	0.15	0.46	0.46	
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.16	0.73	0.73	
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.12	1.01	1.01	
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	< 0.1	0.81	1.05	
DTS	2.4 GHz WLAN	2412-2472 MHz	0.65	< 0.1	< 0.1	
NII	U-NII-1	5180 - 5240 MHz				
NII	U-NII-2A	5260 - 5320 MHz	0.72	0.12		0.28
NII	U-NII-2C	5500 - 5720 MHz	0.70	< 0.1		0.34
NII	U-NII-3	5745 - 5825 MHz	0.54	< 0.1	< 0.1	
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A			
Simultaneous SAR per KDB 690783 D01v01r03:			1.53	1.28	1.15	0.59

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

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

Randy Ortanez
President

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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 17	Voice/Data	706.5 - 713.5 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
2.4 GHz WLAN	Data	2412-2472 MHz
U-NII-1	Data	5180 - 5240 MHz
U-NII-2A	Data	5260 - 5320 MHz
U-NII-2C	Data	5500 - 5720 MHz
U-NII-3	Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz
ANT+	Data	2402 - 2480 MHz
MST	Data	1 - 8 kHz

1.2 Nominal and Maximum Output Power Specifications

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

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	*1 TX Slot*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*	*1 TX Slot*	*2 TX Slots*	*3 TX Slots*	*4 TX Slots*
GSM/GPRS/EDGE 850	Maximum	**33.0**	**33.0**	**31.5**	**29.8**	**28.5**	**27.0**	**25.8**	**24.2**	**22.9**
	Nominal	**32.5**	**32.5**	**31.0**	**29.3**	**28.0**	**26.5**	**25.3**	**23.7**	**22.4**
GSM/GPRS/EDGE 1900	Maximum	**30.0**	**30.0**	**27.5**	**26.0**	**24.1**	**26.0**	**25.0**	**23.2**	**22.0**
	Nominal	**29.5**	**29.5**	**27.0**	**25.5**	**23.6**	**25.5**	**24.5**	**22.7**	**21.5**

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA Rel 99	*3GPP HSDPA Rel 5*	*3GPP HSUPA Rel 6*	*3GPP DC-HSDPA Rel 8*
UMTS Band 5 (850 MHz)	Maximum	**23.0**	**23.0**	**23.0**	**23.0**
	Nominal	**22.5**	**22.5**	**22.5**	**22.5**
UMTS Band 2 (1900 MHz)	Maximum	**22.5**	**22.5**	**22.5**	**22.5**
	Nominal	**22.0**	**22.0**	**22.0**	**22.0**

Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	**22.5**
	Nominal	**22.0**
LTE Band 17	Maximum	**22.5**
	Nominal	**22.0**
LTE Band 26 (Cell)	Maximum	**24.0**
	Nominal	**23.5**
LTE Band 5 (Cell)	Maximum	**24.3**
	Nominal	**23.8**
LTE Band 4 (AWS)	Maximum	**22.5**
	Nominal	**22.0**
LTE Band 2 (PCS)	Maximum	**22.5**
	Nominal	**22.0**

Mode / Band		Modulated Average Ant 1 & Ant 2 (dBm)	Modulated Average Ant 1 (dBm)	Modulated Average Ant 2 (dBm)
		Channel 1-11	Channel 12-13	Channel 12-13
IEEE 802.11b (2.4 GHz)	Maximum	**17.5**	**6.5**	**4.5**
	Nominal	**17.0**	**6.0**	**4.0**
IEEE 802.11g (2.4 GHz)	Maximum	**14.5**	**3.5**	**4.5**
	Nominal	**14.0**	**3.0**	**4.0**
IEEE 802.11n (2.4 GHz)	Maximum	**13.5**	**3.0**	**4.5**
	Nominal	**13.0**	**2.5**	**4.0**

Mode / Band		Modulated Average - MIMO (dBm)	
		Channel 1-11	Channel 12-13
IEEE 802.11n (2.4 GHz)	Maximum	**16.5**	**7.0**
	Nominal	**16.0**	**6.5**

Mode / Band		Modulated Average (dBm)
Bluetooth	Maximum	**11.0**
	Nominal	**10.5**
Bluetooth LE	Maximum	**6.0**
	Nominal	**5.5**

Mode / Band		Modulated Average - Single Tx Chain (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11a (5 GHz)	Maximum	**12.5**		
	Nominal	**12.0**		
IEEE 802.11n (5 GHz)	Maximum	**12.5**	**12.5**	
	Nominal	**12.0**	**12.0**	
IEEE 802.11ac (5 GHz)	Maximum	**12.5**	**12.5**	**11.5**
	Nominal	**12.0**	**12.0**	**11.0**

Mode / Band		Modulated Average - MIMO (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11n (5 GHz)	Maximum	**15.5**	**15.5**	
	Nominal	**15.0**	**15.0**	
IEEE 802.11ac (5 GHz)	Maximum	**15.5**	**15.5**	**14.5**
	Nominal	**15.0**	**15.0**	**14.0**

1.3 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	Configuration	Back	Front	Top	Bottom	Right	Left
GPRS 850	Hotspot	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Hotspot	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Hotspot	Yes	Yes	No	Yes	Yes	Yes
UMTS 1900	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 26 (Cell)	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Hotspot	Yes	Yes	No	Yes	Yes	Yes
LTE Band 2 (PCS)	Hotspot	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN	Hotspot	Yes	Yes	Yes	No	No	Yes
U-NII-3	Hotspot	Yes	Yes	Yes	No	No	Yes
U-NII-2A & U-NII-2C	Extremity	Yes	Yes	Yes	No	No	Yes

Note: Particular DUT edges were not required to be evaluated for Wireless Router SAR or Extremity SAR if the edges were greater than 2.5 cm from the transmitting antenna according to FCC KDB Publication 941225 D06v02 guidance, page 2 and FCC KDB 648474 D04v01r02. The distances between the transmit antennas and the edges of the device are included in the filing. When wireless router mode is enabled, U-NII-1, U-NII-2A, and U-NII-2C WLAN operations are disabled.

1.4 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.

1.5 Simultaneous Transmission Capabilities

According to FCC KDB Publication 447498 D05v01, transmitters are considered to be transmitting simultaneously when there is overlapping transmission, with the exception of transmissions during network hand-offs with maximum hand-off duration less than 30 seconds. Possible transmission paths for the DUT are shown in Figure 1-1 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.

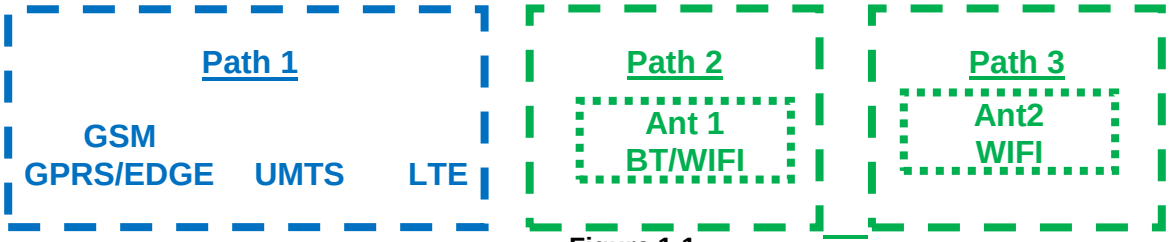

Figure 1-1
Simultaneous Transmission Paths

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

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Extremity	Notes
1	GSM voice + 2.4 GHz WI-FI	Yes	Yes	N/A	Yes	
2	GSM voice + 5 GHz WI-FI	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
4	GSM voice + 2.4 GHz WIFI MIMO	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz WIFI MIMO	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz WIFI Ant 1 + 5 GHz WIFI Ant 2	Yes	Yes	N/A	Yes	
7	GSM voice + 2.4 GHz WIFI Ant 2 + 5 GHz WIFI Ant 1	Yes	Yes	N/A	Yes	
8	UMTS + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes	
9	UMTS + 5 GHz WI-FI	Yes	Yes	Yes	Yes	
10	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
11	UMTS + 2.4 GHz WIFI MIMO	Yes	Yes	Yes	Yes	
12	UMTS + 5 GHz WIFI MIMO	Yes	Yes	Yes	Yes	
13	UMTS + 2.4 GHz WIFI Ant 1 + 5 GHz WIFI Ant 2	Yes	Yes	Yes	Yes	
14	UMTS + 2.4 GHz WIFI Ant 2 + 5 GHz WIFI Ant 1	Yes	Yes	Yes	Yes	
15	LTE + 2.4 GHz WI-FI	Yes	Yes	Yes	Yes	
16	LTE + 5 GHz WI-FI	Yes	Yes	Yes	Yes	
17	LTE + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
18	LTE + 2.4 GHz WIFI MIMO	Yes	Yes	Yes	Yes	
19	LTE + 5 GHz WIFI MIMO	Yes	Yes	Yes	Yes	
20	LTE + 2.4 GHz WIFI Ant 1 + 5 GHz WIFI Ant 2	Yes	Yes	Yes	Yes	
21	LTE + 2.4 GHz WIFI Ant 2 + 5 GHz WIFI Ant 1	Yes	Yes	Yes	Yes	
22	GPRS/EDGE + 2.4 GHz WI-FI	N/A	N/A	Yes	Yes	
23	GPRS/EDGE + 5 GHz WI-FI	N/A	N/A	Yes	Yes	
24	GRPS/EDGE + 2.4 GHz WIFI MIMO	N/A	N/A	Yes	Yes	
25	GRPS/EDGE + 5 GHz WIFI MIMO	N/A	N/A	Yes	Yes	
26	GRPS/EDGE + 2.4 GHz WIFI Ant 1 + 5 GHz WIFI Ant 2	N/A	N/A	Yes	Yes	
27	GRPS/EDGE + 2.4 GHz WIFI Ant 2 + 5 GHz WIFI Ant 1	N/A	N/A	Yes	Yes	
28	GSM voice + 2.4 GHz WIFI Ant 1 + 5 GHz WIFI Ant 1	N/A	N/A	N/A	N/A	Not Supported by HW
30	GSM voice + 2.4 GHz WIFI Ant 2 + 5 GHz WIFI Ant 2	N/A	N/A	N/A	N/A	Not Supported by HW
31	UMTS + 2.4 GHz WIFI Ant 1 + 5 GHz WIFI Ant 1	N/A	N/A	N/A	N/A	Not Supported by HW
33	UMTS + 2.4 GHz WIFI Ant 2 + 5 GHz WIFI Ant 2	N/A	N/A	N/A	N/A	Not Supported by HW
34	LTE + 2.4 GHz WIFI Ant 1 + 5 GHz WIFI Ant 1	N/A	N/A	N/A	N/A	Not Supported by HW
36	LTE + 2.4 GHz WIFI Ant 2 + 5 GHz WIFI Ant 2	N/A	N/A	N/A	N/A	Not Supported by HW
37	GPRS/EDGE + 2.4 GHz WIFI Ant 1 + 5 GHz WIFI Ant 1	N/A	N/A	N/A	N/A	Not Supported by HW
39	GPRS/EDGE + 2.4 GHz WIFI Ant 2 + 5 GHz WIFI Ant 2	N/A	N/A	N/A	N/A	Not Supported by HW

1. 2.4 GHz WLAN, 5 GHz WLAN, and 2.4 GHz Bluetooth that share the same antenna path cannot transmit simultaneously.
2. All licensed modes share the same antenna path and cannot transmit simultaneously.
3. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN Hotspot scenario.
4. Per the manufacturer, WIFI Direct is not expected to be used in conjunction with a held-to-ear or body-worn accessory voice call. Therefore, there are no simultaneous transmission scenarios involving WIFI direct beyond that listed in the above table.
5. 5 GHz Wireless Router is only supported for the U-NII-3 by S/W, therefore U-NII-1, U-NII2A, and U-NII2C were not evaluated for wireless router conditions.
6. This device supports 2x2 MIMO Tx for WLAN 802.11n/ac. Each WLAN antenna can transmit independently or together when operating with MIMO.
7. This model supports VoLTE.

1.6 Miscellaneous SAR Test Considerations

(A) WIFI/BT

Since Wireless Router operations are not allowed by the chipset firmware using U-NII-1, U-NII-2A & U-NII-2C WIFI, only 2.4 GHz and U-NII-3 WIFI Hotspot SAR tests and combinations are considered for SAR with respect to Wireless Router configurations according to FCC KDB 941225 D06v02.

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 and TDWR channels are supported

Per FCC KDB Publication 648474 D04v01r02, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

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 for 1g SAR and less than 3.0 W/kg for 10g SAR, SAR is not required for U-NII-1 band according to FCC KDB 248227 D01v02r01.

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

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, body-worn Bluetooth SAR was not required; [(13/10)* √2.480] = 2.0< 3.0. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

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

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, extremity Bluetooth SAR was not required; [(13/ 5)* √2.480] = 4.1< 7.5. Per KDB Publication 447498 D01v05, the maximum power of the channel was rounded to the nearest mW before calculation.

This device supports channel 1-13 for 2.4 GHz WLAN. However, due to the reduced output power for channels 12 and 13, channels 1, 6, and 11 were considered for SAR testing per KDB 248227 D01v02r01.

(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 D01v03.

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 D05v02r03.

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.

Per FCC KDB Publication 648474 D04v01r02, this device is considered a "phablet" since the diagonal dimension is greater than 160mm and less than 200mm. Therefore, extremity SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR (scaled to the maximum output power, including tolerance) > 1.2 W/kg.

1.7 Power Reduction for SAR

There is no power reduction used for any band/mode implemented in this device for SAR purposes.

1.8 Guidance Applied

- IEEE 1528-2003
- FCC KDB Publication 941225 D01v03, D05v02r03, D06v02 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r01 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v05r02 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r03, D02v01r01 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D04v01r02 (Phablet Procedures)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)

1.9 Device Serial Numbers

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

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number	Extremity Serial Number
GSM/GPRS/EDGE 850	7C924	7CEBF	7CEBF	-
UMTS 850	7C924	7CEBF	7CEBF	-
GSM/GPRS/EDGE 1900	7C924	7CEBF	7C924	-
UMTS 1900	7CEBF	7CEBF	7CEBF	-
LTE Band 12	7C924	7CEBF	7CEBF	-
LTE Band 26 (Cell)	7CEBF	7CEBF	7CEBF	-
LTE Band 5 (Cell)	7CEBF	7C924	7C924	
LTE Band 4 (AWS)	7C924	7C924	7C924	-
LTE Band 2 (PCS)	7CEBF	7CEBF	7CEBF	-
2.4 GHz WLAN	7CEE8	7CEE8	7CEE8	-
5 GHz U-NII 3 WLAN	7C924	7CEE8	7CEE8	-
5 GHz U-NII 2A, U-NII 2C WLAN	7C924	7CEE8	-	7C924

2 LTE INFORMATION

LTE Information			
FCC ID	**A3LSMN920F**		
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 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 2 (PCS) (1850.7 - 1909.3 MHz)		
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz		
	LTE Band 17: 5 MHz, 10 MHz		
	LTE Band 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 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz		
Channel Numbers and Frequencies (MHz)	Low	Mid	High
LTE Band 12: 1.4 MHz	699.7 (23017)	707.5 (23095)	715.3 (23173)
LTE Band 12: 3 MHz	700.5 (23025)	707.5 (23095)	714.5 (23165)
LTE Band 12: 5 MHz	701.5 (23035)	707.5 (23095)	713.5 (23155)
LTE Band 12: 10 MHz	704 (23060)	707.5 (23095)	711 (23130)
LTE Band 17: 5 MHz	706.5 (23755)	710 (23790)	713.5 (23825)
LTE Band 17: 10 MHz	709 (23780)	710 (23790)	711 (23800)
LTE Band 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	831.5 (26865)	836.5 (26915)	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 2 (PCS): 1.4 MHz	1850.7 (18607)	1880 (18900)	1909.3 (19193)
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)	1880 (18900)	1908.5 (19185)
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)	1880 (18900)	1902.5 (19125)
LTE Band 2 (PCS): 20 MHz	1860 (18700)	1880 (18900)	1900 (19100)
UE Category	6		
Modulations Supported in UL	QPSK, 16QAM		
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES		
A-MPR (Additional MPR) disabled for SAR Testing?	YES		
LTE Release 10 Additional Information	This device does not support full LTE Release 10 operations in the US. The following LTE Release 10 Features are not supported: Carrier Aggregation, Relay, HetNet, Enhanced MIMO, eICI, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.		

3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/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 D01v01 and IEEE 1528-2013:

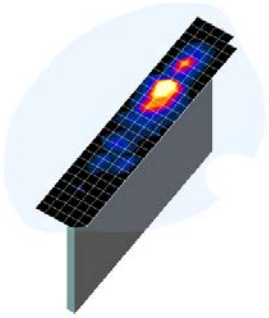

Figure 4-1
Sample SAR Area Scan

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 D01v01 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):

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

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

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

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

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

*Also compliant to IEEE 1528-2013 Table 6

5 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

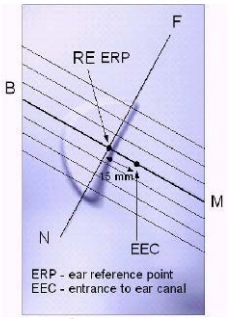

Figure 5-1
Close-Up Side view of ERP

5.2 HANDSET REFERENCE POINTS

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

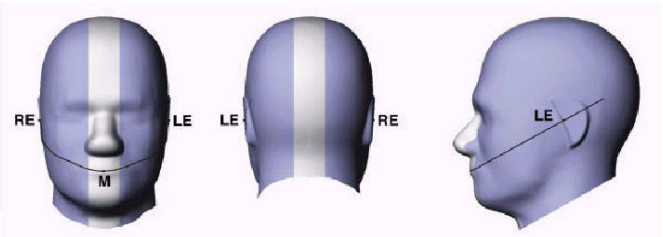

Figure 5-2
Front, back and side view of SAM Twin Phantom

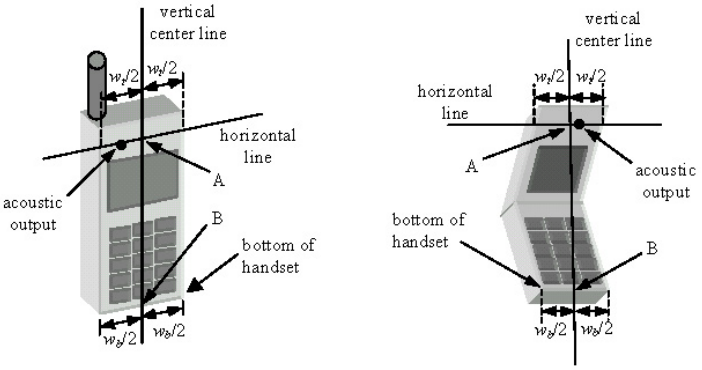

Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

6 TEST CONFIGURATION POSITIONS FOR HANDSETS

6.1 Device Holder

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

6.2 Positioning for Cheek

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

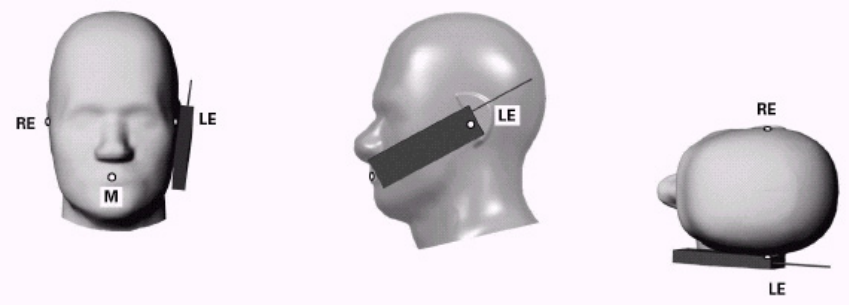

Figure 6-1 Front, Side and Top View of Cheek Position

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

6.3 Positioning for Ear / 15º Tilt

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

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

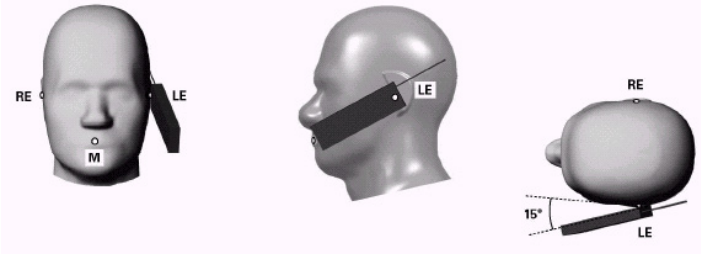

Figure 6-2 Front, Side and Top View of Ear/15º Tilt Position

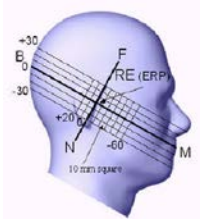

Figure 6-3
Side view w/ relevant markings

6.4 Body-Worn Accessory Configurations

Body-worn operating configurations are tested with the belt-clips and holsters attached to the device and positioned against a flat phantom in a normal use configuration (see Figure 6-4). Per FCC KDB Publication 648474 D04v01r02, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v05 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is > 1.2 W/kg, the highest reported SAR configuration for that wireless mode and frequency band should be repeated for that body-worn accessory with a headset attached to the handset.

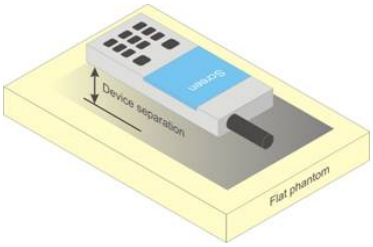

Figure 6-4
Sample Body-Worn Diagram

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.

6.5 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 D01v05 should be applied to determine SAR test requirements.

For smart phones with a display diagonal dimension > 15.0 cm or an overall diagonal dimension > 16.0 cm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that support voice calls next to the ear, the phablets procedures outlined in KDB Publication 648474 D04 v01r02 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 scaled to the maximum output power (including tolerance) is 1-g SAR > 1.2 W/kg.

6.6 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 D06v02 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 D01v05 publication procedures. The "Portable Hotspot" feature on the handset was NOT activated during SAR assessments, to ensure the SAR measurements were evaluated for a single transmission frequency RF signal at a time.

7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

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

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

8 FCC MEASUREMENT PROCEDURES

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

8.1 Measured and Reported SAR

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

8.2 3G SAR Test Reduction Procedure

In FCC KDB Publication 941225 D01v03, 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 $\leq$ 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 $\leq$ 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 D01v03 “3G SAR Measurement Procedures.”

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

8.4 SAR Measurement Conditions for UMTS

8.4.1 Output Power Verification

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

8.4.2 Head SAR Measurements

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

8.4.3 Body SAR Measurements

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

8.4.4 SAR Measurements with Rel 5 HSDPA

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

8.4.5 SAR Measurements with Rel 6 HSUPA

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

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

8.4.6 SAR Measurement Conditions for DC-HSDPA

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

8.5 SAR Measurement Conditions for LTE

LTE modes are tested according to FCC KDB 941225 D05v02r03 publication. Establishing connections with base station simulators ensure a consistent means for testing SAR and are recommended for evaluating SAR [4]. The R&S CMW500 or Anritsu MT8820C simulators are used for LTE output power measurements and SAR testing. Closed loop power control was used so the UE transmits with maximum output power during SAR testing. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

8.5.1 Spectrum Plots for RB Configurations

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

8.5.2 MPR

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

8.5.3 A-MPR

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

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r03:

a. Per Section 4.2.1, SAR is required for QPSK 1 RB Allocation for the largest bandwidth
    i. The required channel and offset combination with the highest maximum output power is required for SAR.
    ii. When the reported SAR is ≤ 0.8 W/kg, testing of the remaining RB offset configurations and required test channels is not required. Otherwise, SAR is required for the remaining required test channels using the RB offset configuration with highest output power for that channel.
    iii. When the reported SAR for a required test channel is > 1.45 W/kg, SAR is required for all RB offset configurations for that channel.
b. Per Section 4.2.2, SAR is required for 50% RB allocation using the largest bandwidth following the same procedures outlined in Section 4.2.1.
c. Per Section 4.2.3, 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 4.2.4 and 4.3, 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 4.2.1 through 4.2.3 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 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 D01v02r01 for more details.

8.6.1 General Device Setup

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

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

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

For devices that operate in both U-NII-1 and U-NII-2A bands, when the same maximum output power is specified for both bands, SAR measurement using OFDM SAR test procedures is not required for U-NII-1 unless the highest reported SAR for U-NII-2A is > 1.2 W/kg for 1g SAR or > 3.0 W/kg for 10g SAR. 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 for 1g SAR or > 3.0 W/kg for 10g SAR.

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

The frequency range covered by U-NII-2C and U-NII-3 is 380 MHz (5.47 – 5.85 GHz), which requires a minimum of at least two SAR probe calibration frequency points to support SAR measurements. When Terminal Doppler Weather Radar (TDWR) restriction applies, the channels at 5.60 – 5.65 GHz in U-NII-2C band must be disabled with acceptable mechanisms and documented in the equipment certification.

Unless band gap channels are permanently disabled, SAR must be considered for these channels.

8.6.4 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g SAR and ≤ 1.0 W/kg for 10g SAR, 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 for 1g SAR and ≤ 2.0 W/kg for 10g SAR or all test positions are measured.

8.6.5 2.4 GHz SAR Test Requirements

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

1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg for 1g SAR and ≤ 1.0 W/kg for 10g SAR, no further SAR testing is required for 802.11b DSSS in that exposure configuration.

2) When the reported SAR is > 0.8 W/kg for 1g SAR or > 2.0 W/kg for 10g SAR, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg or 1g SAR or > 3.0 W/kg for 10g SAR, 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 for 1g SAR or > 3.0 W/kg for 10g SAR. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed.

8.6.6 OFDM Transmission Mode and SAR Test Channel Selection

For the 2.4 GHz and 5 GHz bands, 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, lowest data rate and lowest order 802.11a/g/n/ac mode. When the maximum output power of a channel is the same for equivalent OFDM configurations; for example, 802.11a, 802.11n and 802.11ac or 802.11g and 802.11n with the same channel bandwidth, modulation and data rate etc., the lower order 802.11 mode i.e., 802.11a, then 802.11n and 802.11ac or 802.11g then 802.11n, is used for SAR measurement. When the maximum output power are the same for multiple test channels, either according to the default or additional power measurement requirements, SAR is measured using the channel closest to the middle of the frequency band or aggregated band. When there are multiple channels with the same maximum output power, SAR is measured using the higher number channel.

8.6.7 Initial Test Configuration Procedure

For OFDM, in both 2.4 and 5 GHz bands, 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 802.11a/g/n/ac 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 for 1g SAR and ≤ 2.0 W/kg for 10g SAR, 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 for 1g SAR and ≤ 3.0 W/kg for 10g SAR or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 8.6.6).

8.6.8 Subsequent Test Configuration Procedures

For OFDM configurations in each frequency band and aggregated band, SAR is evaluated for initial test configuration using the fixed test position or the initial test position procedure. When the highest reported SAR (for the initial test configuration), adjusted by the ratio of the specified maximum output power of the subsequent test configuration to initial test configuration, is ≤ 1.2 W/kg for 1g SAR and ≤ 3.0 W/kg for 10g SAR, no additional SAR tests for the subsequent test configurations are required.

8.6.9 MIMO SAR considerations

Per KDB 248227 D01v02r01, the simultaneous SAR provisions in KDB Publication 447498 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 for 1g SAR and < 4.0 W/kg for 10g SAR, 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.

9 RF CONDUCTED POWERS

9.1 GSM Conducted Powers

		Maximum Burst-Averaged Output Power								
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 850	128	32.39	32.41	30.76	29.42	**28.15**	26.90	24.89	23.44	21.47
	190	32.86	32.43	30.67	29.33	**28.11**	26.70	24.87	23.35	21.49
	251	32.40	32.34	30.61	29.27	**27.99**	26.64	24.60	23.32	21.34
GSM 1900	512	28.89	28.88	26.66	**25.10**	23.38	25.37	23.49	22.18	20.90
	661	28.85	28.91	26.60	**25.04**	23.22	25.10	23.27	21.95	20.57
	810	28.84	28.90	26.39	**25.01**	23.14	25.03	23.12	21.83	20.41

		Calculated Maximum Frame-Averaged Output Power								
		Voice	*GPRS/EDGE Data (GMSK)*				*EDGE Data (8-PSK)*			
Band	**Channel**	**GSM [dBm] CS (1 Slot)**	**GPRS [dBm] 1 Tx Slot**	**GPRS [dBm] 2 Tx Slot**	**GPRS [dBm] 3 Tx Slot**	**GPRS [dBm] 4 Tx Slot**	**EDGE [dBm] 1 Tx Slot**	**EDGE [dBm] 2 Tx Slot**	**EDGE [dBm] 3 Tx Slot**	**EDGE [dBm] 4 Tx Slot**
GSM 850	128	23.36	23.38	24.74	25.16	**25.14**	17.87	18.87	19.18	18.46
	190	23.83	23.40	24.65	25.07	**25.10**	17.67	18.85	19.09	18.48
	251	23.37	23.31	24.59	25.01	**24.98**	17.61	18.58	19.06	18.33
GSM 1900	512	19.86	19.85	20.64	**20.84**	20.37	16.34	17.47	17.92	17.89
	661	19.82	19.88	20.58	**20.78**	20.21	16.07	17.25	17.69	17.56
	810	19.81	19.87	20.37	**20.75**	20.13	16.00	17.10	17.57	17.40
GSM 850	**Frame Avg.Targets:**	23.47	23.47	24.98	25.04	**24.99**	17.47	19.28	19.44	19.39
GSM 1900		20.47	20.47	20.98	**21.24**	20.59	16.47	18.48	18.44	18.49

Notes:

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

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

Figure 9-1
Power Measurement Setup

9.2 UMTS Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	21.85	21.74	21.70	21.79	21.70	21.67	-
99		12.2 kbps AMR	21.79	21.66	21.58	21.76	21.62	21.64	-
6	HSDPA	Subtest 1	22.76	22.62	22.46	21.85	21.53	21.56	0
6		Subtest 2	22.81	22.49	22.47	21.81	21.54	21.63	0
6		Subtest 3	22.64	22.52	22.55	21.71	21.62	21.69	0.5
6		Subtest 4	22.67	22.47	22.44	21.75	21.46	21.65	0.5
6	HSUPA	Subtest 1	22.01	21.69	21.56	20.75	20.54	20.59	0
6		Subtest 2	21.74	21.54	21.48	20.86	20.54	20.45	2
6		Subtest 3	21.96	21.60	21.52	20.81	20.52	20.57	1
6		Subtest 4	21.72	21.56	21.44	20.67	20.42	20.59	2
6		Subtest 5	22.91	22.63	22.54	21.83	21.52	21.59	0
8	DC-HSDPA	Subtest 1	22.94	22.64	22.02	21.75	21.67	21.24	0
8		Subtest 2	22.89	22.71	22.00	21.63	21.77	21.27	0
8		Subtest 3	22.92	22.56	22.08	21.49	21.74	21.37	0.5
8		Subtest 4	22.91	22.62	22.00	21.51	21.62	21.33	0.5

DC-HSDPA considerations

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

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

Figure 9-2
Power Measurement Setup

9.3 LTE Conducted Powers

9.3.1 LTE Band 12

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	707.5	23095	10	QPSK	1	0	**22.03**	0	0
	707.5	23095	10	QPSK	1	25	21.95	0	0
	707.5	23095	10	QPSK	1	49	21.91	0	0
	707.5	23095	10	QPSK	25	0	**20.96**	0-1	1
	707.5	23095	10	QPSK	25	12	20.89	0-1	1
	707.5	23095	10	QPSK	25	25	20.75	0-1	1
	707.5	23095	10	QPSK	50	0	20.80	0-1	1
	707.5	23095	10	16QAM	1	0	21.17	0-1	1
	707.5	23095	10	16QAM	1	25	21.24	0-1	1
	707.5	23095	10	16QAM	1	49	20.96	0-1	1
	707.5	23095	10	16QAM	25	0	20.13	0-2	2
	707.5	23095	10	16QAM	25	12	20.07	0-2	2
	707.5	23095	10	16QAM	25	25	19.70	0-2	2
	707.5	23095	10	16QAM	50	0	19.79	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	701.5	23035	5	QPSK	1	0	22.01	0	0
	701.5	23035	5	QPSK	1	12	22.04	0	0
	701.5	23035	5	QPSK	1	24	22.07	0	0
	701.5	23035	5	QPSK	12	0	20.83	0-1	1
	701.5	23035	5	QPSK	12	6	20.81	0-1	1
	701.5	23035	5	QPSK	12	13	20.81	0-1	1
	701.5	23035	5	QPSK	25	0	20.78	0-1	1
	701.5	23035	5	16-QAM	1	0	20.91	0-1	1
	701.5	23035	5	16-QAM	1	12	20.81	0-1	1
	701.5	23035	5	16-QAM	1	24	20.88	0-1	1
	701.5	23035	5	16-QAM	12	0	19.73	0-2	2
	701.5	23035	5	16-QAM	12	6	19.78	0-2	2
	701.5	23035	5	16-QAM	12	13	19.76	0-2	2
	701.5	23035	5	16-QAM	25	0	19.83	0-2	2
Mid	707.5	23095	5	QPSK	1	0	21.94	0	0
	707.5	23095	5	QPSK	1	12	21.87	0	0
	707.5	23095	5	QPSK	1	24	21.89	0	0
	707.5	23095	5	QPSK	12	0	20.95	0-1	1
	707.5	23095	5	QPSK	12	6	20.87	0-1	1
	707.5	23095	5	QPSK	12	13	20.86	0-1	1
	707.5	23095	5	QPSK	25	0	20.99	0-1	1
	707.5	23095	5	16-QAM	1	0	20.96	0-1	1
	707.5	23095	5	16-QAM	1	12	20.93	0-1	1
	707.5	23095	5	16-QAM	1	24	20.83	0-1	1
	707.5	23095	5	16-QAM	12	0	19.92	0-2	2
	707.5	23095	5	16-QAM	12	6	19.88	0-2	2
	707.5	23095	5	16-QAM	12	13	19.79	0-2	2
	707.5	23095	5	16-QAM	25	0	19.83	0-2	2
High	713.5	23155	5	QPSK	1	0	22.25	0	0
	713.5	23155	5	QPSK	1	12	22.21	0	0
	713.5	23155	5	QPSK	1	24	22.20	0	0
	713.5	23155	5	QPSK	12	0	21.03	0-1	1
	713.5	23155	5	QPSK	12	6	20.93	0-1	1
	713.5	23155	5	QPSK	12	13	20.97	0-1	1
	713.5	23155	5	QPSK	25	0	21.09	0-1	1
	713.5	23155	5	16-QAM	1	0	21.38	0-1	1
	713.5	23155	5	16-QAM	1	12	21.36	0-1	1
	713.5	23155	5	16-QAM	1	24	21.33	0-1	1
	713.5	23155	5	16-QAM	12	0	20.05	0-2	2
	713.5	23155	5	16-QAM	12	6	20.02	0-2	2
	713.5	23155	5	16-QAM	12	13	20.02	0-2	2
	713.5	23155	5	16-QAM	25	0	20.03	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	700.5	23025	3	QPSK	1	0	22.02	0	0
	700.5	23025	3	QPSK	1	7	22.02	0	0
	700.5	23025	3	QPSK	1	14	22.06	0	0
	700.5	23025	3	QPSK	8	0	20.69	0-1	1
	700.5	23025	3	QPSK	8	4	20.75	0-1	1
	700.5	23025	3	QPSK	8	7	20.74	0-1	1
	700.5	23025	3	QPSK	15	0	20.72	0-1	1
	700.5	23025	3	16-QAM	1	0	20.79	0-1	1
	700.5	23025	3	16-QAM	1	7	20.89	0-1	1
	700.5	23025	3	16-QAM	1	14	20.86	0-1	1
	700.5	23025	3	16-QAM	8	0	19.72	0-2	2
	700.5	23025	3	16-QAM	8	4	19.76	0-2	2
	700.5	23025	3	16-QAM	8	7	19.80	0-2	2
	700.5	23025	3	16-QAM	15	0	19.77	0-2	2
Mid	707.5	23095	3	QPSK	1	0	21.99	0	0
	707.5	23095	3	QPSK	1	7	21.99	0	0
	707.5	23095	3	QPSK	1	14	21.98	0	0
	707.5	23095	3	QPSK	8	0	20.92	0-1	1
	707.5	23095	3	QPSK	8	4	20.88	0-1	1
	707.5	23095	3	QPSK	8	7	20.76	0-1	1
	707.5	23095	3	QPSK	15	0	20.91	0-1	1
	707.5	23095	3	16-QAM	1	0	21.22	0-1	1
	707.5	23095	3	16-QAM	1	7	21.08	0-1	1
	707.5	23095	3	16-QAM	1	14	21.15	0-1	1
	707.5	23095	3	16-QAM	8	0	19.90	0-2	2
	707.5	23095	3	16-QAM	8	4	19.76	0-2	2
	707.5	23095	3	16-QAM	8	7	19.72	0-2	2
	707.5	23095	3	16-QAM	15	0	19.86	0-2	2
High	714.5	23165	3	QPSK	1	0	22.39	0	0
	714.5	23165	3	QPSK	1	7	22.33	0	0
	714.5	23165	3	QPSK	1	14	22.34	0	0
	714.5	23165	3	QPSK	8	0	21.24	0-1	1
	714.5	23165	3	QPSK	8	4	21.09	0-1	1
	714.5	23165	3	QPSK	8	7	21.08	0-1	1
	714.5	23165	3	QPSK	15	0	21.21	0-1	1
	714.5	23165	3	16-QAM	1	0	21.46	0-1	1
	714.5	23165	3	16-QAM	1	7	21.42	0-1	1
	714.5	23165	3	16-QAM	1	14	21.45	0-1	1
	714.5	23165	3	16-QAM	8	0	20.27	0-2	2
	714.5	23165	3	16-QAM	8	4	20.20	0-2	2
	714.5	23165	3	16-QAM	8	7	20.15	0-2	2
	714.5	23165	3	16-QAM	15	0	20.19	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	699.7	23017	1.4	QPSK	1	0	22.09	0	0
	699.7	23017	1.4	QPSK	1	2	22.09	0	0
	699.7	23017	1.4	QPSK	1	5	22.13	0	0
	699.7	23017	1.4	QPSK	3	0	21.84	0	0
	699.7	23017	1.4	QPSK	3	2	21.88	0	0
	699.7	23017	1.4	QPSK	3	3	21.93	0	0
	699.7	23017	1.4	QPSK	6	0	21.20	0-1	1
	699.7	23017	1.4	16-QAM	1	0	21.01	0-1	1
	699.7	23017	1.4	16-QAM	1	2	21.09	0-1	1
	699.7	23017	1.4	16-QAM	1	5	20.89	0-1	1
	699.7	23017	1.4	16-QAM	3	0	20.82	0-1	1
	699.7	23017	1.4	16-QAM	3	2	20.85	0-1	1
	699.7	23017	1.4	16-QAM	3	3	20.85	0-1	1
	699.7	23017	1.4	16-QAM	6	0	19.62	0-2	2
Mid	707.5	23095	1.4	QPSK	1	0	21.91	0	0
	707.5	23095	1.4	QPSK	1	2	21.91	0	0
	707.5	23095	1.4	QPSK	1	5	21.97	0	0
	707.5	23095	1.4	QPSK	3	0	21.85	0	0
	707.5	23095	1.4	QPSK	3	2	21.83	0	0
	707.5	23095	1.4	QPSK	3	3	21.81	0	0
	707.5	23095	1.4	QPSK	6	0	20.86	0-1	1
	707.5	23095	1.4	16-QAM	1	0	20.99	0-1	1
	707.5	23095	1.4	16-QAM	1	2	20.93	0-1	1
	707.5	23095	1.4	16-QAM	1	5	20.91	0-1	1
	707.5	23095	1.4	16-QAM	3	0	20.77	0-1	1
	707.5	23095	1.4	16-QAM	3	2	20.76	0-1	1
	707.5	23095	1.4	16-QAM	3	3	20.73	0-1	1
	707.5	23095	1.4	16-QAM	6	0	19.86	0-2	2
High	715.3	23173	1.4	QPSK	1	0	22.48	0	0
	715.3	23173	1.4	QPSK	1	2	22.49	0	0
	715.3	23173	1.4	QPSK	1	5	22.50	0	0
	715.3	23173	1.4	QPSK	3	0	22.48	0	0
	715.3	23173	1.4	QPSK	3	2	22.47	0	0
	715.3	23173	1.4	QPSK	3	3	22.44	0	0
	715.3	23173	1.4	QPSK	6	0	21.42	0-1	1
	715.3	23173	1.4	16-QAM	1	0	21.46	0-1	1
	715.3	23173	1.4	16-QAM	1	2	21.42	0-1	1
	715.3	23173	1.4	16-QAM	1	5	21.48	0-1	1
	715.3	23173	1.4	16-QAM	3	0	21.21	0-1	1
	715.3	23173	1.4	16-QAM	3	2	21.21	0-1	1
	715.3	23173	1.4	16-QAM	3	3	21.20	0-1	1
	715.3	23173	1.4	16-QAM	6	0	20.09	0-2	2

9.3.2 LTE Band 26 (Cell)

Table 9-5
LTE Band 26 (Cell) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	26915	15	QPSK	1	0	**22.63**	0	0
	836.5	26915	15	QPSK	1	36	22.57	0	0
	836.5	26915	15	QPSK	1	74	22.40	0	0
	836.5	26915	15	QPSK	36	0	**21.38**	0-1	1
	836.5	26915	15	QPSK	36	18	21.35	0-1	1
	836.5	26915	15	QPSK	36	37	21.31	0-1	1
	836.5	26915	15	QPSK	75	0	21.32	0-1	1
	836.5	26915	15	16QAM	1	0	21.96	0-1	1
	836.5	26915	15	16QAM	1	36	21.92	0-1	1
	836.5	26915	15	16QAM	1	74	21.85	0-1	1
	836.5	26915	15	16QAM	36	0	20.38	0-2	2
	836.5	26915	15	16QAM	36	18	20.35	0-2	2
	836.5	26915	15	16QAM	36	37	20.39	0-2	2
	836.5	26915	15	16QAM	75	0	20.31	0-2	2

Note: LTE Band 26 at 15 MHz bandwidth is only supported for FCC Rule Part 22H. There are not three non-overlapping channels within FCC Rule Part 22H. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

Table 9-6
LTE Band 26 (Cell) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	819	26740	10	QPSK	1	0	22.40	0	0
	819	26740	10	QPSK	1	25	22.37	0	0
	819	26740	10	QPSK	1	49	22.38	0	0
	819	26740	10	QPSK	25	0	21.40	0-1	1
	819	26740	10	QPSK	25	12	21.32	0-1	1
	819	26740	10	QPSK	25	25	21.32	0-1	1
	819	26740	10	QPSK	50	0	21.31	0-1	1
	819	26740	10	16QAM	1	0	21.40	0-1	1
	819	26740	10	16QAM	1	25	21.41	0-1	1
	819	26740	10	16QAM	1	49	21.40	0-1	1
	819	26740	10	16QAM	25	0	20.34	0-2	2
	819	26740	10	16QAM	25	12	20.32	0-2	2
	819	26740	10	16QAM	25	25	20.31	0-2	2
	819	26740	10	16QAM	50	0	20.31	0-2	2
Mid	831.5	26865	10	QPSK	1	0	22.31	0	0
	831.5	26865	10	QPSK	1	25	22.37	0	0
	831.5	26865	10	QPSK	1	49	22.38	0	0
	831.5	26865	10	QPSK	25	0	21.31	0-1	1
	831.5	26865	10	QPSK	25	12	21.31	0-1	1
	831.5	26865	10	QPSK	25	25	21.32	0-1	1
	831.5	26865	10	QPSK	50	0	21.35	0-1	1
	831.5	26865	10	16QAM	1	0	21.35	0-1	1
	831.5	26865	10	16QAM	1	25	21.33	0-1	1
	831.5	26865	10	16QAM	1	49	21.32	0-1	1
	831.5	26865	10	16QAM	25	0	20.34	0-2	2
	831.5	26865	10	16QAM	25	12	20.32	0-2	2
	831.5	26865	10	16QAM	25	25	20.31	0-2	2
	831.5	26865	10	16QAM	50	0	20.31	0-2	2
High	844	26990	10	QPSK	1	0	22.67	0	0
	844	26990	10	QPSK	1	25	22.65	0	0
	844	26990	10	QPSK	1	49	22.40	0	0
	844	26990	10	QPSK	25	0	21.38	0-1	1
	844	26990	10	QPSK	25	12	21.35	0-1	1
	844	26990	10	QPSK	25	25	21.31	0-1	1
	844	26990	10	QPSK	50	0	21.34	0-1	1
	844	26990	10	16QAM	1	0	21.34	0-1	1
	844	26990	10	16QAM	1	25	21.31	0-1	1
	844	26990	10	16QAM	1	49	21.31	0-1	1
	844	26990	10	16QAM	25	0	20.33	0-2	2
	844	26990	10	16QAM	25	12	20.34	0-2	2
	844	26990	10	16QAM	25	25	20.31	0-2	2
	844	26990	10	16QAM	50	0	20.31	0-2	2

Table 9-7
LTE Band 26 (Cell) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	816.5	26715	5	QPSK	1	0	22.37	0	0
	816.5	26715	5	QPSK	1	12	22.38	0	0
	816.5	26715	5	QPSK	1	24	22.41	0	0
	816.5	26715	5	QPSK	12	0	21.37	0-1	1
	816.5	26715	5	QPSK	12	6	21.41	0-1	1
	816.5	26715	5	QPSK	12	13	21.39	0-1	1
	816.5	26715	5	QPSK	25	0	21.31	0-1	1
	816.5	26715	5	16-QAM	1	0	21.45	0-1	1
	816.5	26715	5	16-QAM	1	12	21.40	0-1	1
	816.5	26715	5	16-QAM	1	24	21.35	0-1	1
	816.5	26715	5	16-QAM	12	0	20.37	0-2	2
	816.5	26715	5	16-QAM	12	6	20.33	0-2	2
	816.5	26715	5	16-QAM	12	13	20.32	0-2	2
	816.5	26715	5	16-QAM	25	0	20.31	0-2	2
Mid	831.5	26865	5	QPSK	1	0	22.45	0	0
	831.5	26865	5	QPSK	1	12	22.42	0	0
	831.5	26865	5	QPSK	1	24	22.31	0	0
	831.5	26865	5	QPSK	12	0	21.40	0-1	1
	831.5	26865	5	QPSK	12	6	21.38	0-1	1
	831.5	26865	5	QPSK	12	13	21.36	0-1	1
	831.5	26865	5	QPSK	25	0	21.35	0-1	1
	831.5	26865	5	16-QAM	1	0	21.32	0-1	1
	831.5	26865	5	16-QAM	1	12	21.31	0-1	1
	831.5	26865	5	16-QAM	1	24	21.36	0-1	1
	831.5	26865	5	16-QAM	12	0	20.41	0-2	2
	831.5	26865	5	16-QAM	12	6	20.33	0-2	2
	831.5	26865	5	16-QAM	12	13	20.33	0-2	2
	831.5	26865	5	16-QAM	25	0	20.32	0-2	2
High	846.5	27015	5	QPSK	1	0	22.40	0	0
	846.5	27015	5	QPSK	1	12	22.39	0	0
	846.5	27015	5	QPSK	1	24	22.38	0	0
	846.5	27015	5	QPSK	12	0	21.35	0-1	1
	846.5	27015	5	QPSK	12	6	21.31	0-1	1
	846.5	27015	5	QPSK	12	13	21.31	0-1	1
	846.5	27015	5	QPSK	25	0	21.35	0-1	1
	846.5	27015	5	16-QAM	1	0	21.32	0-1	1
	846.5	27015	5	16-QAM	1	12	21.31	0-1	1
	846.5	27015	5	16-QAM	1	24	21.32	0-1	1
	846.5	27015	5	16-QAM	12	0	20.31	0-2	2
	846.5	27015	5	16-QAM	12	6	20.31	0-2	2
	846.5	27015	5	16-QAM	12	13	20.32	0-2	2
	846.5	27015	5	16-QAM	25	0	20.31	0-2	2

Table 9-8
LTE Band 26 (Cell) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	815.5	26705	3	QPSK	1	0	22.47	0	0
	815.5	26705	3	QPSK	1	7	22.46	0	0
	815.5	26705	3	QPSK	1	14	22.40	0	0
	815.5	26705	3	QPSK	8	0	21.36	0-1	1
	815.5	26705	3	QPSK	8	4	21.35	0-1	1
	815.5	26705	3	QPSK	8	7	21.32	0-1	1
	815.5	26705	3	QPSK	15	0	21.37	0-1	1
	815.5	26705	3	16-QAM	1	0	21.42	0-1	1
	815.5	26705	3	16-QAM	1	7	21.39	0-1	1
	815.5	26705	3	16-QAM	1	14	21.40	0-1	1
	815.5	26705	3	16-QAM	8	0	20.35	0-2	2
	815.5	26705	3	16-QAM	8	4	20.34	0-2	2
	815.5	26705	3	16-QAM	8	7	20.32	0-2	2
	815.5	26705	3	16-QAM	15	0	20.31	0-2	2
Mid	831.5	26865	3	QPSK	1	0	22.36	0	0
	831.5	26865	3	QPSK	1	7	22.40	0	0
	831.5	26865	3	QPSK	1	14	22.31	0	0
	831.5	26865	3	QPSK	8	0	21.39	0-1	1
	831.5	26865	3	QPSK	8	4	21.40	0-1	1
	831.5	26865	3	QPSK	8	7	21.38	0-1	1
	831.5	26865	3	QPSK	15	0	21.32	0-1	1
	831.5	26865	3	16-QAM	1	0	21.35	0-1	1
	831.5	26865	3	16-QAM	1	7	21.37	0-1	1
	831.5	26865	3	16-QAM	1	14	21.31	0-1	1
	831.5	26865	3	16-QAM	8	0	20.35	0-2	2
	831.5	26865	3	16-QAM	8	4	20.31	0-2	2
	831.5	26865	3	16-QAM	8	7	20.33	0-2	2
	831.5	26865	3	16-QAM	15	0	20.31	0-2	2
High	847.5	27025	3	QPSK	1	0	22.42	0	0
	847.5	27025	3	QPSK	1	7	22.38	0	0
	847.5	27025	3	QPSK	1	14	22.45	0	0
	847.5	27025	3	QPSK	8	0	21.32	0-1	1
	847.5	27025	3	QPSK	8	4	21.31	0-1	1
	847.5	27025	3	QPSK	8	7	21.34	0-1	1
	847.5	27025	3	QPSK	15	0	21.38	0-1	1
	847.5	27025	3	16-QAM	1	0	21.40	0-1	1
	847.5	27025	3	16-QAM	1	7	21.42	0-1	1
	847.5	27025	3	16-QAM	1	14	21.45	0-1	1
	847.5	27025	3	16-QAM	8	0	20.31	0-2	2
	847.5	27025	3	16-QAM	8	4	20.35	0-2	2
	847.5	27025	3	16-QAM	8	7	20.33	0-2	2
	847.5	27025	3	16-QAM	15	0	20.31	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	814.7	26697	1.4	QPSK	1	0	22.48	0	0
	814.7	26697	1.4	QPSK	1	2	22.38	0	0
	814.7	26697	1.4	QPSK	1	5	22.45	0	0
	814.7	26697	1.4	QPSK	3	0	22.37	0	0
	814.7	26697	1.4	QPSK	3	2	22.36	0	0
	814.7	26697	1.4	QPSK	3	3	22.34	0	0
	814.7	26697	1.4	QPSK	6	0	21.37	0-1	1
	814.7	26697	1.4	16-QAM	1	0	21.38	0-1	1
	814.7	26697	1.4	16-QAM	1	2	21.40	0-1	1
	814.7	26697	1.4	16-QAM	1	5	21.36	0-1	1
	814.7	26697	1.4	16-QAM	3	0	21.34	0-1	1
	814.7	26697	1.4	16-QAM	3	2	21.33	0-1	1
	814.7	26697	1.4	16-QAM	3	3	21.32	0-1	1
	814.7	26697	1.4	16-QAM	6	0	20.31	0-2	2
Mid	831.5	26865	1.4	QPSK	1	0	22.41	0	0
	831.5	26865	1.4	QPSK	1	2	22.38	0	0
	831.5	26865	1.4	QPSK	1	5	22.40	0	0
	831.5	26865	1.4	QPSK	3	0	22.35	0	0
	831.5	26865	1.4	QPSK	3	2	22.31	0	0
	831.5	26865	1.4	QPSK	3	3	22.36	0	0
	831.5	26865	1.4	QPSK	6	0	21.32	0-1	1
	831.5	26865	1.4	16-QAM	1	0	21.45	0-1	1
	831.5	26865	1.4	16-QAM	1	2	21.48	0-1	1
	831.5	26865	1.4	16-QAM	1	5	21.45	0-1	1
	831.5	26865	1.4	16-QAM	3	0	21.39	0-1	1
	831.5	26865	1.4	16-QAM	3	2	21.40	0-1	1
	831.5	26865	1.4	16-QAM	3	3	21.37	0-1	1
	831.5	26865	1.4	16-QAM	6	0	20.32	0-2	2
High	848.3	27033	1.4	QPSK	1	0	22.32	0	0
	848.3	27033	1.4	QPSK	1	2	22.31	0	0
	848.3	27033	1.4	QPSK	1	5	22.45	0	0
	848.3	27033	1.4	QPSK	3	0	22.31	0	0
	848.3	27033	1.4	QPSK	3	2	22.38	0	0
	848.3	27033	1.4	QPSK	3	3	22.36	0	0
	848.3	27033	1.4	QPSK	6	0	21.34	0-1	1
	848.3	27033	1.4	16-QAM	1	0	21.35	0-1	1
	848.3	27033	1.4	16-QAM	1	2	21.36	0-1	1
	848.3	27033	1.4	16-QAM	1	5	21.37	0-1	1
	848.3	27033	1.4	16-QAM	3	0	21.38	0-1	1
	848.3	27033	1.4	16-QAM	3	2	21.31	0-1	1
	848.3	27033	1.4	16-QAM	3	3	21.34	0-1	1
	848.3	27033	1.4	16-QAM	6	0	20.34	0-2	2

9.3.3 LTE Band 5 (Cell)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	836.5	20525	10	QPSK	1	0	**23.85**	0	0
	836.5	20525	10	QPSK	1	25	23.80	0	0
	836.5	20525	10	QPSK	1	49	23.68	0	0
	836.5	20525	10	QPSK	25	0	22.53	0-1	1
	836.5	20525	10	QPSK	25	12	**22.54**	0-1	1
	836.5	20525	10	QPSK	25	25	22.51	0-1	1
	836.5	20525	10	QPSK	50	0	22.50	0-1	1
	836.5	20525	10	16QAM	1	0	22.91	0-1	1
	836.5	20525	10	16QAM	1	25	22.90	0-1	1
	836.5	20525	10	16QAM	1	49	22.81	0-1	1
	836.5	20525	10	16QAM	25	0	21.58	0-2	2
	836.5	20525	10	16QAM	25	12	21.42	0-2	2
	836.5	20525	10	16QAM	25	25	21.36	0-2	2
	836.5	20525	10	16QAM	50	0	21.48	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	826.5	20425	5	QPSK	1	0	23.98	0	0
	826.5	20425	5	QPSK	1	12	23.96	0	0
	826.5	20425	5	QPSK	1	24	24.02	0	0
	826.5	20425	5	QPSK	12	0	22.72	0-1	1
	826.5	20425	5	QPSK	12	6	22.63	0-1	1
	826.5	20425	5	QPSK	12	13	22.61	0-1	1
	826.5	20425	5	QPSK	25	0	22.65	0-1	1
	826.5	20425	5	16-QAM	1	0	22.92	0-1	1
	826.5	20425	5	16-QAM	1	12	22.84	0-1	1
	826.5	20425	5	16-QAM	1	24	22.76	0-1	1
	826.5	20425	5	16-QAM	12	0	21.65	0-2	2
	826.5	20425	5	16-QAM	12	6	21.56	0-2	2
	826.5	20425	5	16-QAM	12	13	21.54	0-2	2
	826.5	20425	5	16-QAM	25	0	21.68	0-2	2
Mid	836.5	20525	5	QPSK	1	0	23.83	0	0
	836.5	20525	5	QPSK	1	12	23.81	0	0
	836.5	20525	5	QPSK	1	24	23.82	0	0
	836.5	20525	5	QPSK	12	0	22.58	0-1	1
	836.5	20525	5	QPSK	12	6	22.64	0-1	1
	836.5	20525	5	QPSK	12	13	22.59	0-1	1
	836.5	20525	5	QPSK	25	0	22.57	0-1	1
	836.5	20525	5	16-QAM	1	0	22.95	0-1	1
	836.5	20525	5	16-QAM	1	12	22.98	0-1	1
	836.5	20525	5	16-QAM	1	24	22.98	0-1	1
	836.5	20525	5	16-QAM	12	0	21.48	0-2	2
	836.5	20525	5	16-QAM	12	6	21.52	0-2	2
	836.5	20525	5	16-QAM	12	13	21.52	0-2	2
	836.5	20525	5	16-QAM	25	0	21.52	0-2	2
High	846.5	20625	5	QPSK	1	0	23.92	0	0
	846.5	20625	5	QPSK	1	12	23.87	0	0
	846.5	20625	5	QPSK	1	24	23.95	0	0
	846.5	20625	5	QPSK	12	0	22.70	0-1	1
	846.5	20625	5	QPSK	12	6	22.58	0-1	1
	846.5	20625	5	QPSK	12	13	22.56	0-1	1
	846.5	20625	5	QPSK	25	0	22.64	0-1	1
	846.5	20625	5	16-QAM	1	0	22.94	0-1	1
	846.5	20625	5	16-QAM	1	12	22.94	0-1	1
	846.5	20625	5	16-QAM	1	24	22.95	0-1	1
	846.5	20625	5	16-QAM	12	0	21.72	0-2	2
	846.5	20625	5	16-QAM	12	6	21.52	0-2	2
	846.5	20625	5	16-QAM	12	13	21.53	0-2	2
	846.5	20625	5	16-QAM	25	0	21.56	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	825.5	20415	3	QPSK	1	0	23.97	0	0
	825.5	20415	3	QPSK	1	7	23.87	0	0
	825.5	20415	3	QPSK	1	14	23.86	0	0
	825.5	20415	3	QPSK	8	0	22.70	0-1	1
	825.5	20415	3	QPSK	8	4	22.63	0-1	1
	825.5	20415	3	QPSK	8	7	22.63	0-1	1
	825.5	20415	3	QPSK	15	0	22.67	0-1	1
	825.5	20415	3	16-QAM	1	0	22.81	0-1	1
	825.5	20415	3	16-QAM	1	7	22.80	0-1	1
	825.5	20415	3	16-QAM	1	14	22.92	0-1	1
	825.5	20415	3	16-QAM	8	0	21.67	0-2	2
	825.5	20415	3	16-QAM	8	4	21.60	0-2	2
	825.5	20415	3	16-QAM	8	7	21.53	0-2	2
	825.5	20415	3	16-QAM	15	0	21.57	0-2	2
Mid	836.5	20525	3	QPSK	1	0	23.93	0	0
	836.5	20525	3	QPSK	1	7	23.94	0	0
	836.5	20525	3	QPSK	1	14	23.96	0	0
	836.5	20525	3	QPSK	8	0	22.53	0-1	1
	836.5	20525	3	QPSK	8	4	22.58	0-1	1
	836.5	20525	3	QPSK	8	7	22.61	0-1	1
	836.5	20525	3	QPSK	15	0	22.55	0-1	1
	836.5	20525	3	16-QAM	1	0	23.12	0-1	1
	836.5	20525	3	16-QAM	1	7	22.99	0-1	1
	836.5	20525	3	16-QAM	1	14	23.12	0-1	1
	836.5	20525	3	16-QAM	8	0	21.54	0-2	2
	836.5	20525	3	16-QAM	8	4	21.57	0-2	2
	836.5	20525	3	16-QAM	8	7	21.56	0-2	2
	836.5	20525	3	16-QAM	15	0	21.49	0-2	2
High	847.5	20635	3	QPSK	1	0	24.02	0	0
	847.5	20635	3	QPSK	1	7	24.00	0	0
	847.5	20635	3	QPSK	1	14	24.06	0	0
	847.5	20635	3	QPSK	8	0	22.61	0-1	1
	847.5	20635	3	QPSK	8	4	22.57	0-1	1
	847.5	20635	3	QPSK	8	7	22.53	0-1	1
	847.5	20635	3	QPSK	15	0	22.55	0-1	1
	847.5	20635	3	16-QAM	1	0	22.98	0-1	1
	847.5	20635	3	16-QAM	1	7	22.82	0-1	1
	847.5	20635	3	16-QAM	1	14	22.97	0-1	1
	847.5	20635	3	16-QAM	8	0	21.61	0-2	2
	847.5	20635	3	16-QAM	8	4	21.56	0-2	2
	847.5	20635	3	16-QAM	8	7	21.48	0-2	2
	847.5	20635	3	16-QAM	15	0	21.49	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	824.7	20407	1.4	QPSK	1	0	23.76	0	0
	824.7	20407	1.4	QPSK	1	2	23.77	0	0
	824.7	20407	1.4	QPSK	1	5	23.79	0	0
	824.7	20407	1.4	QPSK	3	0	23.77	0	0
	824.7	20407	1.4	QPSK	3	2	23.74	0	0
	824.7	20407	1.4	QPSK	3	3	23.69	0	0
	824.7	20407	1.4	QPSK	6	0	22.60	0-1	1
	824.7	20407	1.4	16-QAM	1	0	23.26	0-1	1
	824.7	20407	1.4	16-QAM	1	2	22.78	0-1	1
	824.7	20407	1.4	16-QAM	1	5	22.90	0-1	1
	824.7	20407	1.4	16-QAM	3	0	22.60	0-1	1
	824.7	20407	1.4	16-QAM	3	2	22.66	0-1	1
	824.7	20407	1.4	16-QAM	3	3	22.65	0-1	1
	824.7	20407	1.4	16-QAM	6	0	21.54	0-2	2
Mid	836.5	20525	1.4	QPSK	1	0	23.94	0	0
	836.5	20525	1.4	QPSK	1	2	24.00	0	0
	836.5	20525	1.4	QPSK	1	5	24.02	0	0
	836.5	20525	1.4	QPSK	3	0	23.77	0	0
	836.5	20525	1.4	QPSK	3	2	23.82	0	0
	836.5	20525	1.4	QPSK	3	3	23.80	0	0
	836.5	20525	1.4	QPSK	6	0	22.56	0-1	1
	836.5	20525	1.4	16-QAM	1	0	22.56	0-1	1
	836.5	20525	1.4	16-QAM	1	2	22.72	0-1	1
	836.5	20525	1.4	16-QAM	1	5	22.52	0-1	1
	836.5	20525	1.4	16-QAM	3	0	22.63	0-1	1
	836.5	20525	1.4	16-QAM	3	2	22.63	0-1	1
	836.5	20525	1.4	16-QAM	3	3	22.56	0-1	1
	836.5	20525	1.4	16-QAM	6	0	21.51	0-2	2
High	848.3	20643	1.4	QPSK	1	0	24.04	0	0
	848.3	20643	1.4	QPSK	1	2	23.96	0	0
	848.3	20643	1.4	QPSK	1	5	23.99	0	0
	848.3	20643	1.4	QPSK	3	0	23.76	0	0
	848.3	20643	1.4	QPSK	3	2	23.75	0	0
	848.3	20643	1.4	QPSK	3	3	23.65	0	0
	848.3	20643	1.4	QPSK	6	0	22.65	0-1	1
	848.3	20643	1.4	16-QAM	1	0	22.98	0-1	1
	848.3	20643	1.4	16-QAM	1	2	22.98	0-1	1
	848.3	20643	1.4	16-QAM	1	5	22.96	0-1	1
	848.3	20643	1.4	16-QAM	3	0	22.70	0-1	1
	848.3	20643	1.4	16-QAM	3	2	22.64	0-1	1
	848.3	20643	1.4	16-QAM	3	3	22.56	0-1	1
	848.3	20643	1.4	16-QAM	6	0	21.61	0-2	2

9.3.4 LTE Band 4 (AWS)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Mid	1732.5	20175	20	QPSK	1	0	**22.47**	0	0
	1732.5	20175	20	QPSK	1	50	22.44	0	0
	1732.5	20175	20	QPSK	1	99	22.34	0	0
	1732.5	20175	20	QPSK	50	0	**21.17**	0-1	1
	1732.5	20175	20	QPSK	50	25	21.04	0-1	1
	1732.5	20175	20	QPSK	50	50	21.04	0-1	1
	1732.5	20175	20	QPSK	100	0	21.08	0-1	1
	1732.5	20175	20	16QAM	1	0	21.21	0-1	1
	1732.5	20175	20	16QAM	1	50	21.12	0-1	1
	1732.5	20175	20	16QAM	1	99	21.09	0-1	1
	1732.5	20175	20	16QAM	50	0	20.14	0-2	2
	1732.5	20175	20	16QAM	50	25	20.09	0-2	2
	1732.5	20175	20	16QAM	50	50	20.07	0-2	2
	1732.5	20175	20	16QAM	100	0	20.07	0-2	2

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

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1717.5	20025	15	QPSK	1	0	22.44	0	0
	1717.5	20025	15	QPSK	1	36	22.44	0	0
	1717.5	20025	15	QPSK	1	74	22.31	0	0
	1717.5	20025	15	QPSK	36	0	21.14	0-1	1
	1717.5	20025	15	QPSK	36	18	21.01	0-1	1
	1717.5	20025	15	QPSK	36	37	21.03	0-1	1
	1717.5	20025	15	QPSK	75	0	21.05	0-1	1
	1717.5	20025	15	16QAM	1	0	21.18	0-1	1
	1717.5	20025	15	16QAM	1	36	21.09	0-1	1
	1717.5	20025	15	16QAM	1	74	21.06	0-1	1
	1717.5	20025	15	16QAM	36	0	20.11	0-2	2
	1717.5	20025	15	16QAM	36	18	20.06	0-2	2
	1717.5	20025	15	16QAM	36	37	20.10	0-2	2
	1717.5	20025	15	16QAM	75	0	20.05	0-2	2
Mid	1732.5	20175	15	QPSK	1	0	22.40	0	0
	1732.5	20175	15	QPSK	1	36	22.37	0	0
	1732.5	20175	15	QPSK	1	74	22.27	0	0
	1732.5	20175	15	QPSK	36	0	21.10	0-1	1
	1732.5	20175	15	QPSK	36	18	20.97	0-1	1
	1732.5	20175	15	QPSK	36	37	20.97	0-1	1
	1732.5	20175	15	QPSK	75	0	21.01	0-1	1
	1732.5	20175	15	16QAM	1	0	21.14	0-1	1
	1732.5	20175	15	16QAM	1	36	21.05	0-1	1
	1732.5	20175	15	16QAM	1	74	21.02	0-1	1
	1732.5	20175	15	16QAM	36	0	20.07	0-2	2
	1732.5	20175	15	16QAM	36	18	20.02	0-2	2
	1732.5	20175	15	16QAM	36	37	20.16	0-2	2
	1732.5	20175	15	16QAM	75	0	20.10	0-2	2
High	1747.5	20325	15	QPSK	1	0	22.38	0	0
	1747.5	20325	15	QPSK	1	36	22.35	0	0
	1747.5	20325	15	QPSK	1	74	22.25	0	0
	1747.5	20325	15	QPSK	36	0	21.08	0-1	1
	1747.5	20325	15	QPSK	36	18	20.95	0-1	1
	1747.5	20325	15	QPSK	36	37	20.95	0-1	1
	1747.5	20325	15	QPSK	75	0	20.99	0-1	1
	1747.5	20325	15	16QAM	1	0	21.12	0-1	1
	1747.5	20325	15	16QAM	1	36	21.03	0-1	1
	1747.5	20325	15	16QAM	1	74	21.11	0-1	1
	1747.5	20325	15	16QAM	36	0	20.05	0-2	2
	1747.5	20325	15	16QAM	36	18	20.13	0-2	2
	1747.5	20325	15	16QAM	36	37	20.00	0-2	2
	1747.5	20325	15	16QAM	75	0	20.03	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1715	20000	10	QPSK	1	0	22.12	0	0
	1715	20000	10	QPSK	1	25	22.15	0	0
	1715	20000	10	QPSK	1	49	22.10	0	0
	1715	20000	10	QPSK	25	0	20.90	0-1	1
	1715	20000	10	QPSK	25	12	20.90	0-1	1
	1715	20000	10	QPSK	25	25	20.90	0-1	1
	1715	20000	10	QPSK	50	0	20.86	0-1	1
	1715	20000	10	16QAM	1	0	21.18	0-1	1
	1715	20000	10	16QAM	1	25	21.13	0-1	1
	1715	20000	10	16QAM	1	49	21.06	0-1	1
	1715	20000	10	16QAM	25	0	20.01	0-2	2
	1715	20000	10	16QAM	25	12	19.93	0-2	2
	1715	20000	10	16QAM	25	25	19.92	0-2	2
	1715	20000	10	16QAM	50	0	19.89	0-2	2
Mid	1732.5	20175	10	QPSK	1	0	22.45	0	0
	1732.5	20175	10	QPSK	1	25	22.42	0	0
	1732.5	20175	10	QPSK	1	49	22.32	0	0
	1732.5	20175	10	QPSK	25	0	21.14	0-1	1
	1732.5	20175	10	QPSK	25	12	21.08	0-1	1
	1732.5	20175	10	QPSK	25	25	21.04	0-1	1
	1732.5	20175	10	QPSK	50	0	20.98	0-1	1
	1732.5	20175	10	16QAM	1	0	21.38	0-1	1
	1732.5	20175	10	16QAM	1	25	21.29	0-1	1
	1732.5	20175	10	16QAM	1	49	21.18	0-1	1
	1732.5	20175	10	16QAM	25	0	20.14	0-2	2
	1732.5	20175	10	16QAM	25	12	20.02	0-2	2
	1732.5	20175	10	16QAM	25	25	20.00	0-2	2
	1732.5	20175	10	16QAM	50	0	19.99	0-2	2
High	1750	20350	10	QPSK	1	0	22.21	0	0
	1750	20350	10	QPSK	1	25	22.23	0	0
	1750	20350	10	QPSK	1	49	22.21	0	0
	1750	20350	10	QPSK	25	0	20.87	0-1	1
	1750	20350	10	QPSK	25	12	20.86	0-1	1
	1750	20350	10	QPSK	25	25	20.84	0-1	1
	1750	20350	10	QPSK	50	0	20.86	0-1	1
	1750	20350	10	16QAM	1	0	21.27	0-1	1
	1750	20350	10	16QAM	1	25	21.27	0-1	1
	1750	20350	10	16QAM	1	49	21.25	0-1	1
	1750	20350	10	16QAM	25	0	19.87	0-2	2
	1750	20350	10	16QAM	25	12	19.84	0-2	2
	1750	20350	10	16QAM	25	25	19.85	0-2	2
	1750	20350	10	16QAM	50	0	19.85	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1712.5	19975	5	QPSK	1	0	22.12	0	0
	1712.5	19975	5	QPSK	1	12	22.13	0	0
	1712.5	19975	5	QPSK	1	24	22.15	0	0
	1712.5	19975	5	QPSK	12	0	21.23	0-1	1
	1712.5	19975	5	QPSK	12	6	21.07	0-1	1
	1712.5	19975	5	QPSK	12	13	21.00	0-1	1
	1712.5	19975	5	QPSK	25	0	20.97	0-1	1
	1712.5	19975	5	16-QAM	1	0	21.07	0-1	1
	1712.5	19975	5	16-QAM	1	12	21.03	0-1	1
	1712.5	19975	5	16-QAM	1	24	21.02	0-1	1
	1712.5	19975	5	16-QAM	12	0	19.96	0-2	2
	1712.5	19975	5	16-QAM	12	6	19.90	0-2	2
	1712.5	19975	5	16-QAM	12	13	19.92	0-2	2
	1712.5	19975	5	16-QAM	25	0	19.98	0-2	2
Mid	1732.5	20175	5	QPSK	1	0	22.15	0	0
	1732.5	20175	5	QPSK	1	12	22.15	0	0
	1732.5	20175	5	QPSK	1	24	22.18	0	0
	1732.5	20175	5	QPSK	12	0	21.17	0-1	1
	1732.5	20175	5	QPSK	12	6	20.96	0-1	1
	1732.5	20175	5	QPSK	12	13	20.98	0-1	1
	1732.5	20175	5	QPSK	25	0	20.99	0-1	1
	1732.5	20175	5	16-QAM	1	0	21.19	0-1	1
	1732.5	20175	5	16-QAM	1	12	21.12	0-1	1
	1732.5	20175	5	16-QAM	1	24	21.13	0-1	1
	1732.5	20175	5	16-QAM	12	0	20.03	0-2	2
	1732.5	20175	5	16-QAM	12	6	19.95	0-2	2
	1732.5	20175	5	16-QAM	12	13	19.90	0-2	2
	1732.5	20175	5	16-QAM	25	0	19.92	0-2	2
High	1752.5	20375	5	QPSK	1	0	22.08	0	0
	1752.5	20375	5	QPSK	1	12	22.09	0	0
	1752.5	20375	5	QPSK	1	24	22.10	0	0
	1752.5	20375	5	QPSK	12	0	20.77	0-1	1
	1752.5	20375	5	QPSK	12	6	20.72	0-1	1
	1752.5	20375	5	QPSK	12	13	20.77	0-1	1
	1752.5	20375	5	QPSK	25	0	20.74	0-1	1
	1752.5	20375	5	16-QAM	1	0	21.16	0-1	1
	1752.5	20375	5	16-QAM	1	12	21.16	0-1	1
	1752.5	20375	5	16-QAM	1	24	21.16	0-1	1
	1752.5	20375	5	16-QAM	12	0	19.70	0-2	2
	1752.5	20375	5	16-QAM	12	6	19.74	0-2	2
	1752.5	20375	5	16-QAM	12	13	19.74	0-2	2
	1752.5	20375	5	16-QAM	25	0	19.70	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1711.5	19965	3	QPSK	1	0	21.91	0	0
	1711.5	19965	3	QPSK	1	7	21.92	0	0
	1711.5	19965	3	QPSK	1	14	21.91	0	0
	1711.5	19965	3	QPSK	8	0	20.61	0-1	1
	1711.5	19965	3	QPSK	8	4	20.72	0-1	1
	1711.5	19965	3	QPSK	8	7	20.64	0-1	1
	1711.5	19965	3	QPSK	15	0	20.68	0-1	1
	1711.5	19965	3	16-QAM	1	0	21.08	0-1	1
	1711.5	19965	3	16-QAM	1	7	21.09	0-1	1
	1711.5	19965	3	16-QAM	1	14	21.05	0-1	1
	1711.5	19965	3	16-QAM	8	0	19.50	0-2	2
	1711.5	19965	3	16-QAM	8	4	19.55	0-2	2
	1711.5	19965	3	16-QAM	8	7	19.58	0-2	2
	1711.5	19965	3	16-QAM	15	0	19.61	0-2	2
Mid	1732.5	20175	3	QPSK	1	0	22.38	0	0
	1732.5	20175	3	QPSK	1	7	22.32	0	0
	1732.5	20175	3	QPSK	1	14	22.28	0	0
	1732.5	20175	3	QPSK	8	0	21.01	0-1	1
	1732.5	20175	3	QPSK	8	4	20.95	0-1	1
	1732.5	20175	3	QPSK	8	7	20.91	0-1	1
	1732.5	20175	3	QPSK	15	0	20.94	0-1	1
	1732.5	20175	3	16-QAM	1	0	21.38	0-1	1
	1732.5	20175	3	16-QAM	1	7	21.31	0-1	1
	1732.5	20175	3	16-QAM	1	14	21.47	0-1	1
	1732.5	20175	3	16-QAM	8	0	19.94	0-2	2
	1732.5	20175	3	16-QAM	8	4	19.89	0-2	2
	1732.5	20175	3	16-QAM	8	7	19.95	0-2	2
	1732.5	20175	3	16-QAM	15	0	19.98	0-2	2
High	1753.5	20385	3	QPSK	1	0	22.18	0	0
	1753.5	20385	3	QPSK	1	7	22.14	0	0
	1753.5	20385	3	QPSK	1	14	22.16	0	0
	1753.5	20385	3	QPSK	8	0	20.69	0-1	1
	1753.5	20385	3	QPSK	8	4	20.70	0-1	1
	1753.5	20385	3	QPSK	8	7	20.70	0-1	1
	1753.5	20385	3	QPSK	15	0	20.68	0-1	1
	1753.5	20385	3	16-QAM	1	0	21.09	0-1	1
	1753.5	20385	3	16-QAM	1	7	21.10	0-1	1
	1753.5	20385	3	16-QAM	1	14	21.02	0-1	1
	1753.5	20385	3	16-QAM	8	0	19.66	0-2	2
	1753.5	20385	3	16-QAM	8	4	19.68	0-2	2
	1753.5	20385	3	16-QAM	8	7	19.59	0-2	2
	1753.5	20385	3	16-QAM	15	0	19.64	0-2	2

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1710.7	19957	1.4	QPSK	1	0	21.80	0	0
	1710.7	19957	1.4	QPSK	1	2	21.83	0	0
	1710.7	19957	1.4	QPSK	1	5	21.86	0	0
	1710.7	19957	1.4	QPSK	3	0	21.70	0	0
	1710.7	19957	1.4	QPSK	3	2	21.69	0	0
	1710.7	19957	1.4	QPSK	3	3	21.62	0	0
	1710.7	19957	1.4	QPSK	6	0	20.62	0-1	1
	1710.7	19957	1.4	16-QAM	1	0	20.86	0-1	1
	1710.7	19957	1.4	16-QAM	1	2	20.85	0-1	1
	1710.7	19957	1.4	16-QAM	1	5	20.98	0-1	1
	1710.7	19957	1.4	16-QAM	3	0	20.50	0-1	1
	1710.7	19957	1.4	16-QAM	3	2	20.54	0-1	1
	1710.7	19957	1.4	16-QAM	3	3	20.50	0-1	1
	1710.7	19957	1.4	16-QAM	6	0	19.55	0-2	2
Mid	1732.5	20175	1.4	QPSK	1	0	22.38	0	0
	1732.5	20175	1.4	QPSK	1	2	22.37	0	0
	1732.5	20175	1.4	QPSK	1	5	22.41	0	0
	1732.5	20175	1.4	QPSK	3	0	22.12	0	0
	1732.5	20175	1.4	QPSK	3	2	22.14	0	0
	1732.5	20175	1.4	QPSK	3	3	22.08	0	0
	1732.5	20175	1.4	QPSK	6	0	21.05	0-1	1
	1732.5	20175	1.4	16-QAM	1	0	21.06	0-1	1
	1732.5	20175	1.4	16-QAM	1	2	20.96	0-1	1
	1732.5	20175	1.4	16-QAM	1	5	21.03	0-1	1
	1732.5	20175	1.4	16-QAM	3	0	20.96	0-1	1
	1732.5	20175	1.4	16-QAM	3	2	20.96	0-1	1
	1732.5	20175	1.4	16-QAM	3	3	20.93	0-1	1
	1732.5	20175	1.4	16-QAM	6	0	19.92	0-2	2
High	1754.3	20393	1.4	QPSK	1	0	22.09	0	0
	1754.3	20393	1.4	QPSK	1	2	22.05	0	0
	1754.3	20393	1.4	QPSK	1	5	22.09	0	0
	1754.3	20393	1.4	QPSK	3	0	21.77	0	0
	1754.3	20393	1.4	QPSK	3	2	21.84	0	0
	1754.3	20393	1.4	QPSK	3	3	21.79	0	0
	1754.3	20393	1.4	QPSK	6	0	20.78	0-1	1
	1754.3	20393	1.4	16-QAM	1	0	21.14	0-1	1
	1754.3	20393	1.4	16-QAM	1	2	21.17	0-1	1
	1754.3	20393	1.4	16-QAM	1	5	21.10	0-1	1
	1754.3	20393	1.4	16-QAM	3	0	20.86	0-1	1
	1754.3	20393	1.4	16-QAM	3	2	20.76	0-1	1
	1754.3	20393	1.4	16-QAM	3	3	20.67	0-1	1
	1754.3	20393	1.4	16-QAM	6	0	19.59	0-2	2

9.3.5 LTE Band 2 (PCS)

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

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1860	18700	20	QPSK	1	0	**22.46**	0	0
	1860	18700	20	QPSK	1	50	22.45	0	0
	1860	18700	20	QPSK	1	99	22.36	0	0
	1860	18700	20	QPSK	50	0	**21.31**	0-1	1
	1860	18700	20	QPSK	50	25	21.18	0-1	1
	1860	18700	20	QPSK	50	50	21.16	0-1	1
	1860	18700	20	QPSK	100	0	21.14	0-1	1
	1860	18700	20	16QAM	1	0	21.50	0-1	1
	1860	18700	20	16QAM	1	50	21.30	0-1	1
	1860	18700	20	16QAM	1	99	21.25	0-1	1
	1860	18700	20	16QAM	50	0	20.25	0-2	2
	1860	18700	20	16QAM	50	25	20.09	0-2	2
	1860	18700	20	16QAM	50	50	20.11	0-2	2
	1860	18700	20	16QAM	100	0	20.12	0-2	2
Mid	1880.0	18900	20	QPSK	1	0	22.03	0	0
	1880.0	18900	20	QPSK	1	50	22.07	0	0
	1880.0	18900	20	QPSK	1	99	22.02	0	0
	1880.0	18900	20	QPSK	50	0	20.76	0-1	1
	1880.0	18900	20	QPSK	50	25	20.80	0-1	1
	1880.0	18900	20	QPSK	50	50	20.79	0-1	1
	1880.0	18900	20	QPSK	100	0	20.75	0-1	1
	1880.0	18900	20	16QAM	1	0	21.00	0-1	1
	1880.0	18900	20	16QAM	1	50	20.95	0-1	1
	1880.0	18900	20	16QAM	1	99	20.93	0-1	1
	1880.0	18900	20	16QAM	50	0	19.74	0-2	2
	1880.0	18900	20	16QAM	50	25	19.76	0-2	2
	1880.0	18900	20	16QAM	50	50	19.77	0-2	2
	1880.0	18900	20	16QAM	100	0	19.80	0-2	2
High	1900	19100	20	QPSK	1	0	22.18	0	0
	1900	19100	20	QPSK	1	50	22.13	0	0
	1900	19100	20	QPSK	1	99	22.12	0	0
	1900	19100	20	QPSK	50	0	21.20	0-1	1
	1900	19100	20	QPSK	50	25	21.03	0-1	1
	1900	19100	20	QPSK	50	50	20.91	0-1	1
	1900	19100	20	QPSK	100	0	20.92	0-1	1
	1900	19100	20	16QAM	1	0	21.26	0-1	1
	1900	19100	20	16QAM	1	50	21.03	0-1	1
	1900	19100	20	16QAM	1	99	21.00	0-1	1
	1900	19100	20	16QAM	50	0	20.27	0-2	2
	1900	19100	20	16QAM	50	25	19.95	0-2	2
	1900	19100	20	16QAM	50	50	19.92	0-2	2
	1900	19100	20	16QAM	100	0	19.89	0-2	2

Table 9-21
LTE Band 2 (PCS) Conducted Powers - 15 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1857.5	18675	15	QPSK	1	0	22.45	0	0
	1857.5	18675	15	QPSK	1	36	22.50	0	0
	1857.5	18675	15	QPSK	1	74	22.49	0	0
	1857.5	18675	15	QPSK	36	0	21.25	0-1	1
	1857.5	18675	15	QPSK	36	18	21.30	0-1	1
	1857.5	18675	15	QPSK	36	37	21.32	0-1	1
	1857.5	18675	15	QPSK	75	0	21.23	0-1	1
	1857.5	18675	15	16QAM	1	0	21.50	0-1	1
	1857.5	18675	15	16QAM	1	36	21.49	0-1	1
	1857.5	18675	15	16QAM	1	74	21.48	0-1	1
	1857.5	18675	15	16QAM	36	0	20.24	0-2	2
	1857.5	18675	15	16QAM	36	18	20.18	0-2	2
	1857.5	18675	15	16QAM	36	37	20.23	0-2	2
	1857.5	18675	15	16QAM	75	0	20.22	0-2	2
Mid	1880.0	18900	15	QPSK	1	0	22.02	0	0
	1880.0	18900	15	QPSK	1	36	22.13	0	0
	1880.0	18900	15	QPSK	1	74	22.08	0	0
	1880.0	18900	15	QPSK	36	0	21.03	0-1	1
	1880.0	18900	15	QPSK	36	18	20.82	0-1	1
	1880.0	18900	15	QPSK	36	37	20.89	0-1	1
	1880.0	18900	15	QPSK	75	0	20.84	0-1	1
	1880.0	18900	15	16QAM	1	0	21.31	0-1	1
	1880.0	18900	15	16QAM	1	36	21.25	0-1	1
	1880.0	18900	15	16QAM	1	74	21.26	0-1	1
	1880.0	18900	15	16QAM	36	0	19.89	0-2	2
	1880.0	18900	15	16QAM	36	18	19.87	0-2	2
	1880.0	18900	15	16QAM	36	37	19.90	0-2	2
	1880.0	18900	15	16QAM	75	0	19.88	0-2	2
High	1902.5	19125	15	QPSK	1	0	22.49	0	0
	1902.5	19125	15	QPSK	1	36	22.50	0	0
	1902.5	19125	15	QPSK	1	74	22.47	0	0
	1902.5	19125	15	QPSK	36	0	21.20	0-1	1
	1902.5	19125	15	QPSK	36	18	21.25	0-1	1
	1902.5	19125	15	QPSK	36	37	21.26	0-1	1
	1902.5	19125	15	QPSK	75	0	21.13	0-1	1
	1902.5	19125	15	16QAM	1	0	21.48	0-1	1
	1902.5	19125	15	16QAM	1	36	21.46	0-1	1
	1902.5	19125	15	16QAM	1	74	21.44	0-1	1
	1902.5	19125	15	16QAM	36	0	20.18	0-2	2
	1902.5	19125	15	16QAM	36	18	20.16	0-2	2
	1902.5	19125	15	16QAM	36	37	20.13	0-2	2
	1902.5	19125	15	16QAM	75	0	20.12	0-2	2

Table 9-22
LTE Band 2 (PCS) Conducted Powers - 10 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1855	18650	10	QPSK	1	0	22.46	0	0
	1855	18650	10	QPSK	1	25	22.48	0	0
	1855	18650	10	QPSK	1	49	22.50	0	0
	1855	18650	10	QPSK	25	0	21.24	0-1	1
	1855	18650	10	QPSK	25	12	21.24	0-1	1
	1855	18650	10	QPSK	25	25	21.33	0-1	1
	1855	18650	10	QPSK	50	0	21.29	0-1	1
	1855	18650	10	16QAM	1	0	21.49	0-1	1
	1855	18650	10	16QAM	1	25	21.48	0-1	1
	1855	18650	10	16QAM	1	49	21.50	0-1	1
	1855	18650	10	16QAM	25	0	20.32	0-2	2
	1855	18650	10	16QAM	25	12	20.34	0-2	2
	1855	18650	10	16QAM	25	25	20.33	0-2	2
	1855	18650	10	16QAM	50	0	20.31	0-2	2
Mid	1880.0	18900	10	QPSK	1	0	22.10	0	0
	1880.0	18900	10	QPSK	1	25	22.12	0	0
	1880.0	18900	10	QPSK	1	49	22.13	0	0
	1880.0	18900	10	QPSK	25	0	20.86	0-1	1
	1880.0	18900	10	QPSK	25	12	20.94	0-1	1
	1880.0	18900	10	QPSK	25	25	20.96	0-1	1
	1880.0	18900	10	QPSK	50	0	20.86	0-1	1
	1880.0	18900	10	16QAM	1	0	21.24	0-1	1
	1880.0	18900	10	16QAM	1	25	21.22	0-1	1
	1880.0	18900	10	16QAM	1	49	21.24	0-1	1
	1880.0	18900	10	16QAM	25	0	19.86	0-2	2
	1880.0	18900	10	16QAM	25	12	19.84	0-2	2
	1880.0	18900	10	16QAM	25	25	19.84	0-2	2
	1880.0	18900	10	16QAM	50	0	19.85	0-2	2
High	1905	19150	10	QPSK	1	0	22.48	0	0
	1905	19150	10	QPSK	1	25	22.50	0	0
	1905	19150	10	QPSK	1	49	22.49	0	0
	1905	19150	10	QPSK	25	0	21.00	0-1	1
	1905	19150	10	QPSK	25	12	21.27	0-1	1
	1905	19150	10	QPSK	25	25	21.22	0-1	1
	1905	19150	10	QPSK	50	0	21.13	0-1	1
	1905	19150	10	16QAM	1	0	21.50	0-1	1
	1905	19150	10	16QAM	1	25	21.48	0-1	1
	1905	19150	10	16QAM	1	49	21.45	0-1	1
	1905	19150	10	16QAM	25	0	20.20	0-2	2
	1905	19150	10	16QAM	25	12	20.26	0-2	2
	1905	19150	10	16QAM	25	25	20.17	0-2	2
	1905	19150	10	16QAM	50	0	20.16	0-2	2

Table 9-23
LTE Band 2 (PCS) Conducted Powers - 5 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1852.5	18625	5	QPSK	1	0	22.47	0	0
	1852.5	18625	5	QPSK	1	12	22.50	0	0
	1852.5	18625	5	QPSK	1	24	22.49	0	0
	1852.5	18625	5	QPSK	12	0	21.14	0-1	1
	1852.5	18625	5	QPSK	12	6	21.21	0-1	1
	1852.5	18625	5	QPSK	12	13	21.22	0-1	1
	1852.5	18625	5	QPSK	25	0	21.15	0-1	1
	1852.5	18625	5	16-QAM	1	0	21.29	0-1	1
	1852.5	18625	5	16-QAM	1	12	21.29	0-1	1
	1852.5	18625	5	16-QAM	1	24	21.32	0-1	1
	1852.5	18625	5	16-QAM	12	0	20.12	0-2	2
	1852.5	18625	5	16-QAM	12	6	20.16	0-2	2
	1852.5	18625	5	16-QAM	12	13	20.18	0-2	2
	1852.5	18625	5	16-QAM	25	0	20.15	0-2	2
Mid	1880.0	18900	5	QPSK	1	0	21.98	0	0
	1880.0	18900	5	QPSK	1	12	22.00	0	0
	1880.0	18900	5	QPSK	1	24	21.98	0	0
	1880.0	18900	5	QPSK	12	0	20.89	0-1	1
	1880.0	18900	5	QPSK	12	6	20.91	0-1	1
	1880.0	18900	5	QPSK	12	13	20.92	0-1	1
	1880.0	18900	5	QPSK	25	0	20.88	0-1	1
	1880.0	18900	5	16-QAM	1	0	20.88	0-1	1
	1880.0	18900	5	16-QAM	1	12	20.99	0-1	1
	1880.0	18900	5	16-QAM	1	24	21.01	0-1	1
	1880.0	18900	5	16-QAM	12	0	19.86	0-2	2
	1880.0	18900	5	16-QAM	12	6	19.85	0-2	2
	1880.0	18900	5	16-QAM	12	13	19.86	0-2	2
	1880.0	18900	5	16-QAM	25	0	19.81	0-2	2
High	1907.5	19175	5	QPSK	1	0	22.50	0	0
	1907.5	19175	5	QPSK	1	12	22.49	0	0
	1907.5	19175	5	QPSK	1	24	22.43	0	0
	1907.5	19175	5	QPSK	12	0	21.16	0-1	1
	1907.5	19175	5	QPSK	12	6	21.12	0-1	1
	1907.5	19175	5	QPSK	12	13	21.11	0-1	1
	1907.5	19175	5	QPSK	25	0	21.13	0-1	1
	1907.5	19175	5	16-QAM	1	0	21.49	0-1	1
	1907.5	19175	5	16-QAM	1	12	21.48	0-1	1
	1907.5	19175	5	16-QAM	1	24	21.49	0-1	1
	1907.5	19175	5	16-QAM	12	0	20.15	0-2	2
	1907.5	19175	5	16-QAM	12	6	20.09	0-2	2
	1907.5	19175	5	16-QAM	12	13	20.13	0-2	2
	1907.5	19175	5	16-QAM	25	0	20.08	0-2	2

Table 9-24
LTE Band 2 (PCS) Conducted Powers - 3 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1851.5	18615	3	QPSK	1	0	22.32	0	0
	1851.5	18615	3	QPSK	1	7	22.36	0	0
	1851.5	18615	3	QPSK	1	14	22.34	0	0
	1851.5	18615	3	QPSK	8	0	21.01	0-1	1
	1851.5	18615	3	QPSK	8	4	21.04	0-1	1
	1851.5	18615	3	QPSK	8	7	21.09	0-1	1
	1851.5	18615	3	QPSK	15	0	21.02	0-1	1
	1851.5	18615	3	16-QAM	1	0	21.49	0-1	1
	1851.5	18615	3	16-QAM	1	7	21.50	0-1	1
	1851.5	18615	3	16-QAM	1	14	21.49	0-1	1
	1851.5	18615	3	16-QAM	8	0	20.03	0-2	2
	1851.5	18615	3	16-QAM	8	4	20.03	0-2	2
	1851.5	18615	3	16-QAM	8	7	20.02	0-2	2
	1851.5	18615	3	16-QAM	15	0	20.02	0-2	2
Mid	1880.0	18900	3	QPSK	1	0	22.07	0	0
	1880.0	18900	3	QPSK	1	7	22.12	0	0
	1880.0	18900	3	QPSK	1	14	22.05	0	0
	1880.0	18900	3	QPSK	8	0	20.74	0-1	1
	1880.0	18900	3	QPSK	8	4	20.78	0-1	1
	1880.0	18900	3	QPSK	8	7	20.79	0-1	1
	1880.0	18900	3	QPSK	15	0	20.75	0-1	1
	1880.0	18900	3	16-QAM	1	0	21.14	0-1	1
	1880.0	18900	3	16-QAM	1	7	21.13	0-1	1
	1880.0	18900	3	16-QAM	1	14	21.16	0-1	1
	1880.0	18900	3	16-QAM	8	0	19.92	0-2	2
	1880.0	18900	3	16-QAM	8	4	19.84	0-2	2
	1880.0	18900	3	16-QAM	8	7	19.87	0-2	2
	1880.0	18900	3	16-QAM	15	0	19.78	0-2	2
High	1908.5	19185	3	QPSK	1	0	22.50	0	0
	1908.5	19185	3	QPSK	1	7	22.47	0	0
	1908.5	19185	3	QPSK	1	14	22.50	0	0
	1908.5	19185	3	QPSK	8	0	21.08	0-1	1
	1908.5	19185	3	QPSK	8	4	21.06	0-1	1
	1908.5	19185	3	QPSK	8	7	21.07	0-1	1
	1908.5	19185	3	QPSK	15	0	21.13	0-1	1
	1908.5	19185	3	16-QAM	1	0	21.33	0-1	1
	1908.5	19185	3	16-QAM	1	7	21.42	0-1	1
	1908.5	19185	3	16-QAM	1	14	21.41	0-1	1
	1908.5	19185	3	16-QAM	8	0	20.08	0-2	2
	1908.5	19185	3	16-QAM	8	4	20.01	0-2	2
	1908.5	19185	3	16-QAM	8	7	20.03	0-2	2
	1908.5	19185	3	16-QAM	15	0	20.03	0-2	2

Table 9-25
LTE Band 2 (PCS) Conducted Powers -1.4 MHz Bandwidth

	Frequency [MHz]	Channel	Bandwidth [MHz]	Modulation	RB Size	RB Offset	Conducted Power [dBm]	MPR Allowed per 3GPP [dB]	MPR [dB]
Low	1850.7	18607	1.4	QPSK	1	0	22.44	0	0
	1850.7	18607	1.4	QPSK	1	2	22.41	0	0
	1850.7	18607	1.4	QPSK	1	5	22.46	0	0
	1850.7	18607	1.4	QPSK	3	0	22.13	0	0
	1850.7	18607	1.4	QPSK	3	2	22.14	0	0
	1850.7	18607	1.4	QPSK	3	3	22.12	0	0
	1850.7	18607	1.4	QPSK	6	0	21.06	0-1	1
	1850.7	18607	1.4	16-QAM	1	0	21.33	0-1	1
	1850.7	18607	1.4	16-QAM	1	2	21.37	0-1	1
	1850.7	18607	1.4	16-QAM	1	5	21.43	0-1	1
	1850.7	18607	1.4	16-QAM	3	0	21.16	0-1	1
	1850.7	18607	1.4	16-QAM	3	2	21.16	0-1	1
	1850.7	18607	1.4	16-QAM	3	3	21.16	0-1	1
	1850.7	18607	1.4	16-QAM	6	0	20.08	0-2	2
Mid	1880.0	18900	1.4	QPSK	1	0	22.12	0	0
	1880.0	18900	1.4	QPSK	1	2	22.17	0	0
	1880.0	18900	1.4	QPSK	1	5	22.19	0	0
	1880.0	18900	1.4	QPSK	3	0	21.87	0	0
	1880.0	18900	1.4	QPSK	3	2	21.86	0	0
	1880.0	18900	1.4	QPSK	3	3	21.82	0	0
	1880.0	18900	1.4	QPSK	6	0	20.85	0-1	1
	1880.0	18900	1.4	16-QAM	1	0	20.91	0-1	1
	1880.0	18900	1.4	16-QAM	1	2	20.95	0-1	1
	1880.0	18900	1.4	16-QAM	1	5	21.04	0-1	1
	1880.0	18900	1.4	16-QAM	3	0	20.75	0-1	1
	1880.0	18900	1.4	16-QAM	3	2	20.74	0-1	1
	1880.0	18900	1.4	16-QAM	3	3	20.59	0-1	1
	1880.0	18900	1.4	16-QAM	6	0	19.74	0-2	2
High	1909.3	19193	1.4	QPSK	1	0	22.35	0	0
	1909.3	19193	1.4	QPSK	1	2	22.32	0	0
	1909.3	19193	1.4	QPSK	1	5	22.40	0	0
	1909.3	19193	1.4	QPSK	3	0	22.19	0	0
	1909.3	19193	1.4	QPSK	3	2	22.18	0	0
	1909.3	19193	1.4	QPSK	3	3	22.10	0	0
	1909.3	19193	1.4	QPSK	6	0	21.20	0-1	1
	1909.3	19193	1.4	16-QAM	1	0	21.47	0-1	1
	1909.3	19193	1.4	16-QAM	1	2	21.46	0-1	1
	1909.3	19193	1.4	16-QAM	1	5	21.50	0-1	1
	1909.3	19193	1.4	16-QAM	3	0	21.18	0-1	1
	1909.3	19193	1.4	16-QAM	3	2	21.08	0-1	1
	1909.3	19193	1.4	16-QAM	3	3	21.06	0-1	1
	1909.3	19193	1.4	16-QAM	6	0	20.07	0-2	2

9.4 WLAN Conducted Powers

Table 9-26
2.4 GHz WLAN Average RF Power – Ant 1

Freq [MHz]	Channel	2.4GHz Conducted Power [dBm]	
		IEEE Transmission Mode	
		802.11b	802.11g
2412	1	**17.49**	13.77
2437	6	17.39	13.83
2462	11	17.24	13.60

Table 9-27
2.4 GHz WLAN Average RF Power – Ant 2

Freq [MHz]	Channel	2.4GHz Conducted Power [dBm]	
		IEEE Transmission Mode	
		802.11b	802.11g
2412	1	16.81	13.70
2437	6	16.70	13.50
2462	11	**17.43**	14.00

Table 9-28
5 GHz WLAN (40MHz) Average RF Power – Ant 1

Freq [MHz]	Channel	5GHz (40MHz) Conducted Power [dBm]	
		IEEE Transmission Mode	
		802.11n	802.11ac
5190	38	11.50	11.50
5230	46	11.30	11.33
5270	54	12.16	12.30
5310	62	**12.25**	12.42
5510	102	**12.39**	12.44
5590	118	12.27	12.24
5630	126	12.18	12.15
5710	142	12.00	12.03
5755	151	**12.40**	12.37
5795	159	12.27	12.28

Table 9-29
5 GHz WLAN (40MHz) Average RF Power – Ant 2

Freq [MHz]	Channel	5GHz (40MHz) Conducted Power [dBm]	
		IEEE Transmission Mode	
		802.11n	802.11ac
5190	38	11.70	11.65
5230	46	11.62	11.60
5270	54	11.54	11.56
5310	62	**12.28**	11.50
5510	102	11.60	11.60
5590	118	11.40	11.50
5630	126	11.40	12.42
5710	142	**12.40**	12.37
5755	151	**12.35**	12.28
5795	159	12.28	12.26

Justification for test configurations for WLAN per KDB Publication 248227 D01v02r01:

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

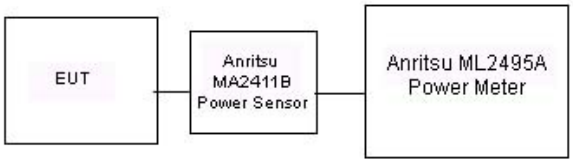

Figure 9-3
Power Measurement Setup

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
06/05/2015	750H	21.8	700	0.856	43.226	0.889	42.201	-3.71%	2.43%
			710	0.865	43.080	0.890	42.149	-2.81%	2.21%
			725	0.878	42.874	0.891	42.071	-1.46%	1.91%
			740	0.892	42.684	0.893	41.994	-0.11%	1.64%
			755	0.907	42.514	0.894	41.916	1.45%	1.43%
06/08/2015	835H	21.5	820	0.883	40.658	0.899	41.578	-1.78%	-2.21%
			835	0.898	40.464	0.900	41.500	-0.22%	-2.50%
			850	0.912	40.263	0.916	41.500	-0.44%	-2.98%
06/10/2015	835H	22.5	820	0.892	40.482	0.899	41.578	-0.78%	-2.64%
			835	0.906	40.302	0.900	41.500	0.67%	-2.89%
			850	0.920	40.078	0.916	41.500	0.44%	-3.43%
06/06/2015	1750H	22.0	1710	1.337	39.574	1.348	40.142	-0.82%	-1.41%
			1750	1.378	39.382	1.371	40.079	0.51%	-1.74%
			1790	1.419	39.189	1.394	40.016	1.79%	-2.07%
06/06/2015	1900H	21.5	1850	1.390	39.816	1.400	40.000	-0.71%	-0.46%
			1880	1.419	39.681	1.400	40.000	1.36%	-0.80%
			1910	1.451	39.531	1.400	40.000	3.64%	-1.17%
06/05/2015	2400H	22.6	2400	1.830	39.103	1.756	39.289	4.21%	-0.47%
			2450	1.887	38.883	1.800	39.200	4.83%	-0.81%
			2500	1.947	38.656	1.855	39.136	4.96%	-1.23%
06/08/2015	5200H-5800H	20.1	5300	4.607	35.501	4.758	35.871	-3.17%	-1.03%
			5320	4.645	35.449	4.778	35.849	-2.78%	-1.12%
			5500	4.860	35.279	4.963	35.643	-2.08%	-1.02%
			5520	4.855	35.308	4.983	35.620	-2.57%	-0.88%
			5700	5.063	34.827	5.168	35.414	-2.03%	-1.66%
			5745	5.154	34.887	5.214	35.363	-1.15%	-1.35%
			5765	5.175	34.885	5.234	35.340	-1.13%	-1.29%
			5800	5.164	34.752	5.270	35.300	-2.01%	-1.55%

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
06/08/2015	750B	22.0	700	0.933	56.030	0.959	55.726	-2.71%	0.55%
			710	0.942	55.955	0.960	55.687	-1.88%	0.48%
			725	0.956	55.834	0.961	55.629	-0.52%	0.37%
			740	0.970	55.699	0.963	55.570	0.73%	0.23%
			755	0.985	55.547	0.964	55.512	2.18%	0.06%
06/04/2015	835B	20.2	820	1.003	55.144	0.969	55.258	3.51%	-0.21%
			835	1.018	55.002	0.970	55.200	4.95%	-0.36%
			850	1.033	54.851	0.988	55.154	4.55%	-0.55%
06/10/2015	835B	21.8	820	0.964	54.261	0.969	55.258	-0.52%	-1.80%
			835	0.982	54.062	0.970	55.200	1.24%	-2.06%
			850	0.995	53.926	0.988	55.154	0.71%	-2.23%
06/04/2015	1750B	22.0	1710	1.441	51.885	1.463	53.537	-1.50%	-3.09%
			1750	1.485	51.684	1.488	53.432	-0.20%	-3.27%
			1790	1.531	51.535	1.514	53.326	1.12%	-3.36%
06/08/2015	1750B	21.8	1710	1.438	52.743	1.463	53.537	-1.71%	-1.48%
			1750	1.484	52.598	1.488	53.432	-0.27%	-1.56%
			1790	1.526	52.440	1.514	53.326	0.79%	-1.66%
06/06/2015	1900B	22.4	1850	1.500	53.400	1.520	53.300	-1.32%	0.19%
			1880	1.533	53.346	1.520	53.300	0.86%	0.09%
			1910	1.561	53.204	1.520	53.300	2.70%	-0.18%
06/08/2015	1900B	22.0	1850	1.501	51.793	1.520	53.300	-1.25%	-2.83%
			1880	1.535	51.709	1.520	53.300	0.99%	-2.98%
			1910	1.571	51.607	1.520	53.300	3.36%	-3.18%
06/03/2015	2450B	22.0	2401	1.942	50.647	1.903	52.765	2.05%	-4.01%
			2450	2.008	50.462	1.950	52.700	2.97%	-4.25%
			2499	2.068	50.278	2.019	52.638	2.43%	-4.48%
06/03/2015	5200B-5800B	21.4	5300	5.248	48.083	5.416	48.879	-3.10%	-1.63%
			5320	5.270	48.063	5.439	48.851	-3.11%	-1.61%
			5500	5.495	47.779	5.650	48.607	-2.74%	-1.70%
			5520	5.534	47.739	5.673	48.580	-2.45%	-1.73%
			5700	5.772	47.478	5.883	48.336	-1.89%	-1.78%
			5745	5.822	47.405	5.936	48.275	-1.92%	-1.80%
			5765	5.854	47.386	5.959	48.248	-1.76%	-1.79%
			5800	5.914	47.336	6.000	48.200	-1.43%	-1.79%
06/11/2015	5200B-5800B	21.3	5300	5.450	48.362	5.416	48.879	0.63%	-1.06%
			5320	5.483	48.346	5.439	48.851	0.81%	-1.03%
			5500	5.706	48.053	5.650	48.607	0.99%	-1.14%
			5520	5.727	48.016	5.673	48.580	0.95%	-1.16%
			5700	6.004	47.668	5.883	48.336	2.06%	-1.38%
			5745	6.073	47.632	5.936	48.275	2.31%	-1.33%
			5800	6.139	47.566	6.000	48.200	2.32%	-1.32%

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

10.2 Test System Verification

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

Table 10-3
System Verification Results – 1g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
G	750	HEAD	06/05/2015	23.3	21.8	0.100	1003	3318	0.832	8.090	8.320	2.84%
K	835	HEAD	06/08/2015	22.3	22.1	0.200	4d133	3288	1.940	9.200	9.700	5.43%
K	835	HEAD	06/10/2015	23.2	22.5	0.200	4d133	3288	1.950	9.200	9.750	5.98%
H	1750	HEAD	06/06/2015	21.5	22.0	0.100	1051	3263	3.670	36.200	36.700	1.38%
K	1900	HEAD	06/06/2015	23.5	22.7	0.100	5d141	3288	3.810	39.900	38.100	-4.51%
G	2450	HEAD	06/05/2015	22.9	22.2	0.100	719	3318	5.120	52.100	51.200	-1.73%
D	5300	HEAD	06/08/2015	21.9	20.1	0.050	1057	7357	4.020	84.700	80.400	-5.08%
D	5500	HEAD	06/08/2015	22.5	20.1	0.050	1057	7357	4.400	84.300	88.000	4.39%
D	5800	HEAD	06/08/2015	22.9	20.1	0.050	1057	7357	4.060	81.100	81.200	0.12%
H	750	BODY	06/08/2015	22.3	22.0	0.200	1054	3263	1.810	8.530	9.050	6.10%
I	835	BODY	06/04/2015	22.7	22.0	0.100	4d133	3213	0.883	9.350	8.830	-5.56%
K	835	BODY	06/10/2015	23.3	21.9	0.200	4d133	3288	2.030	9.350	10.150	8.56%
H	1750	BODY	06/04/2015	21.5	22.0	0.100	1051	3263	3.820	37.100	38.200	2.96%
G	1750	BODY	06/08/2015	20.2	21.8	0.100	1051	3318	3.710	37.100	37.100	0.00%
J	1900	BODY	06/06/2015	20.7	20.8	0.100	5d149	3319	4.140	40.400	41.400	2.48%
H	1900	BODY	06/08/2015	21.0	22.0	0.100	5d149	3263	4.190	40.400	41.900	3.71%
D	2450	BODY	06/03/2015	21.1	21.0	0.100	719	3209	5.400	51.800	54.000	4.25%
E	5300	BODY	06/03/2015	22.1	21.2	0.050	1057	3589	3.910	74.200	78.200	5.39%
E	5500	BODY	06/03/2015	22.2	21.4	0.050	1057	3589	3.680	79.200	73.600	-7.07%
E	5800	BODY	06/03/2015	22.1	21.2	0.050	1057	3589	3.410	75.100	68.200	-9.19%

Table 10-4
System Verification Results – 10g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Dipole SN	Probe SN	Measured SAR_{10g} (W/kg)	1 W Target SAR_{10g} (W/kg)	1 W Normalized SAR_{10g} (W/kg)	$Deviation_{10g}$ (%)
E	5300	BODY	06/11/2015	22.7	21.3	0.050	1057	3589	1.090	20.900	21.800	4.31%
E	5500	BODY	06/11/2015	22.7	21.3	0.050	1057	3589	1.080	22.000	21.600	-1.82%
E	5800	BODY	06/11/2015	22.6	21.3	0.050	1057	3589	0.962	20.600	19.240	-6.60%

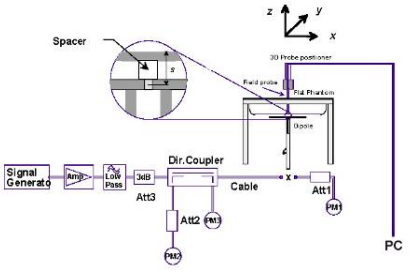

Figure 10-1
System Verification Setup Diagram

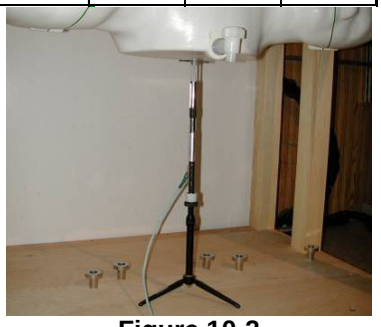

Figure 10-2
System Verification Setup Photo

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.0	32.86	0.00	Right	Cheek	7C924	1:8.3	0.158	1.033	**0.163**	A1
836.60	190	GSM 850	GSM	33.0	32.86	0.10	Right	Tilt	7C924	1:8.3	0.059	1.033	0.061	
836.60	190	GSM 850	GSM	33.0	32.86	-0.05	Left	Cheek	7C924	1:8.3	0.107	1.033	0.111	
836.60	190	GSM 850	GSM	33.0	32.86	-0.01	Left	Tilt	7C924	1:8.3	0.058	1.033	0.060	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**							**Head** **1.6 W/kg (mW/g)** averaged over 1 gram							

Table 11-2
UMTS 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	23.0	21.74	-0.02	Right	Cheek	7C924	1:1	0.121	1.337	0.162	A2
836.60	4183	UMTS 850	RMC	23.0	21.74	0.01	Right	Tilt	7C924	1:1	0.046	1.337	0.062	
836.60	4183	UMTS 850	RMC	23.0	21.74	0.08	Left	Cheek	7C924	1:1	0.083	1.337	0.111	
836.60	4183	UMTS 850	RMC	23.0	21.74	0.16	Left	Tilt	7C924	1:1	0.044	1.337	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 11-3
GSM 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.0	28.85	0.12	Right	Cheek	7C924	1:8.3	0.029	1.303	0.038	
1880.00	661	GSM 1900	GSM	30.0	28.85	0.03	Right	Tilt	7C924	1:8.3	0.019	1.303	0.025	
1880.00	661	GSM 1900	GSM	30.0	28.85	0.00	Left	Cheek	7C924	1:8.3	0.036	1.303	0.047	A3
1880.00	661	GSM 1900	GSM	30.0	28.85	0.06	Left	Tilt	7C924	1:8.3	0.016	1.303	0.021	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**							**Head** **1.6 W/kg (mW/g)** averaged over 1 gram							

Table 11-4
UMTS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	22.5	21.70	-0.13	Right	Cheek	7CEBF	1:1	0.050	1.202	0.060	
1880.00	9400	UMTS 1900	RMC	22.5	21.70	-0.13	Right	Tilt	7CEBF	1:1	0.033	1.202	0.040	
1880.00	9400	UMTS 1900	RMC	22.5	21.70	0.18	Left	Cheek	7CEBF	1:1	0.070	1.202	0.084	A4
1880.00	9400	UMTS 1900	RMC	22.5	21.70	0.06	Left	Tilt	7CEBF	1:1	0.029	1.202	0.035	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 11-5
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	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	-0.05	0	Right	Cheek	QPSK	1	0	7C924	1:1	0.002	1.114	0.002	A5
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	0.01	1	Right	Cheek	QPSK	25	0	7C924	1:1	0.001	1.132	0.001	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	-0.02	0	Right	Tilt	QPSK	1	0	7C924	1:1	0.001	1.114	0.001	
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	0.05	1	Right	Tilt	QPSK	25	0	7C924	1:1	0.001	1.132	0.001	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	0.10	0	Left	Cheek	QPSK	1	0	7C924	1:1	0.001	1.114	0.001	
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	0.10	1	Left	Cheek	QPSK	25	0	7C924	1:1	0.001	1.132	0.001	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	0.20	0	Left	Tilt	QPSK	1	0	7C924	1:1	0.000	1.114	0.000	
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	0.07	1	Left	Tilt	QPSK	25	0	7C924	1:1	0.000	1.132	0.000	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-6
LTE Band 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	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	0.02	0	Right	Cheek	QPSK	1	0	7CEBF	1:1	0.107	1.371	0.147	A6
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	0.07	1	Right	Cheek	QPSK	36	0	7CEBF	1:1	0.083	1.452	0.121	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	0.12	0	Right	Tilt	QPSK	1	0	7CEBF	1:1	0.043	1.371	0.059	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	0.07	1	Right	Tilt	QPSK	36	0	7CEBF	1:1	0.035	1.452	0.051	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	-0.12	0	Left	Cheek	QPSK	1	0	7CEBF	1:1	0.061	1.371	0.084	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	0.12	1	Left	Cheek	QPSK	36	0	7CEBF	1:1	0.052	1.452	0.076	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	0.10	0	Left	Tilt	QPSK	1	0	7CEBF	1:1	0.032	1.371	0.044	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	0.13	1	Left	Tilt	QPSK	36	0	7CEBF	1:1	0.027	1.452	0.039	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-7
LTE Band 5 (Cell) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.3	23.85	-0.01	0	Right	Cheek	QPSK	1	0	7CEBF	1:1	0.146	1.109	0.162	A7
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.3	22.54	0.03	1	Right	Cheek	QPSK	25	12	7CEBF	1:1	0.130	1.191	0.155	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.3	23.85	-0.11	0	Right	Tilt	QPSK	1	0	7CEBF	1:1	0.058	1.109	0.064	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.3	22.54	0.04	1	Right	Tilt	QPSK	25	12	7CEBF	1:1	0.050	1.191	0.060	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.3	23.85	0.11	0	Left	Cheek	QPSK	1	0	7CEBF	1:1	0.095	1.109	0.105	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.3	22.54	0.18	1	Left	Cheek	QPSK	25	12	7CEBF	1:1	0.081	1.191	0.096	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.3	23.85	0.11	0	Left	Tilt	QPSK	1	0	7CEBF	1:1	0.051	1.109	0.057	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.3	22.54	0.13	1	Left	Tilt	QPSK	25	12	7CEBF	1:1	0.039	1.191	0.046	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-8
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	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	0.02	0	Right	Cheek	QPSK	1	0	7C924	1:1	0.072	1.007	0.073	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	0.04	1	Right	Cheek	QPSK	50	0	7C924	1:1	0.050	1.079	0.054	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	-0.03	0	Right	Tilt	QPSK	1	0	7C924	1:1	0.056	1.007	0.056	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	-0.07	1	Right	Tilt	QPSK	50	0	7C924	1:1	0.038	1.079	0.041	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	-0.07	0	Left	Cheek	QPSK	1	0	7C924	1:1	0.114	1.007	0.115	A8
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	0.07	1	Left	Cheek	QPSK	50	0	7C924	1:1	0.086	1.079	0.093	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	0.07	0	Left	Tilt	QPSK	1	0	7C924	1:1	0.042	1.007	0.042	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	0.04	1	Left	Tilt	QPSK	50	0	7C924	1:1	0.034	1.079	0.037	
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 2 (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	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	0.00	0	Right	Cheek	QPSK	1	0	7CEBF	1:1	0.056	1.009	0.057	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	0.09	1	Right	Cheek	QPSK	50	0	7CEBF	1:1	0.043	1.045	0.045	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	0.03	0	Right	Tilt	QPSK	1	0	7CEBF	1:1	0.051	1.009	0.051	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	-0.03	1	Right	Tilt	QPSK	50	0	7CEBF	1:1	0.035	1.045	0.037	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	0.03	0	Left	Cheek	QPSK	1	0	7CEBF	1:1	0.078	1.009	0.079	A9
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	0.14	1	Left	Cheek	QPSK	50	0	7CEBF	1:1	0.060	1.045	0.063	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	0.02	0	Left	Tilt	QPSK	1	0	7CEBF	1:1	0.037	1.009	0.037	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	-0.07	1	Left	Tilt	QPSK	50	0	7CEBF	1:1	0.027	1.045	0.028	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-10
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)	Scaled SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2412	1	802.11b	DSSS	22	17.5	17.49	0.05	Right	Cheek	1	7CEE8	1	99.5	0.806	0.644	1.002	1.005	0.648	A10
2412	1	802.11b	DSSS	22	17.5	17.49	-0.02	Right	Tilt	1	7CEE8	1	99.5	0.699	0.601	1.002	1.005	0.605	
2412	1	802.11b	DSSS	22	17.5	17.49	-	Left	Cheek	1	7CEE8	1	99.5	0.223	-	1.002	1.005	-	
2412	1	802.11b	DSSS	22	17.5	17.49	-	Left	Tilt	1	7CEE8	1	99.5	0.221	-	1.002	1.005	-	
2462	11	802.11b	DSSS	22	17.5	17.43	0.18	Right	Cheek	2	7CEE8	1	99.2	0.266	0.211	1.016	1.008	0.216	
2462	11	802.11b	DSSS	22	17.5	17.43	-	Right	Tilt	2	7CEE8	1	99.2	0.118	-	1.016	1.008	-	
2462	11	802.11b	DSSS	22	17.5	17.43	-	Left	Cheek	2	7CEE8	1	99.2	0.081	-	1.016	1.008	-	
2462	11	802.11b	DSSS	22	17.5	17.43	-	Left	Tilt	2	7CEE8	1	99.2	0.097	-	1.016	1.008	-	
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
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)	Scaled SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5310	62	802.11n	OFDM	40	12.5	12.25	0.06	Right	Cheek	1	7C924	13.5	98.8	0.269	0.102	1.059	1.012	0.109	
5310	62	802.11n	OFDM	40	12.5	12.25	-	Right	Tilt	1	7C924	13.5	98.8	0.210	-	1.059	1.012	-	
5310	62	802.11n	OFDM	40	12.5	12.25	-	Left	Cheek	1	7C924	13.5	98.8	0.079	-	1.059	1.012	-	
5310	62	802.11n	OFDM	40	12.5	12.25	-	Left	Tilt	1	7C924	13.5	98.8	0.079	-	1.059	1.012	-	
5310	62	802.11n	OFDM	40	12.5	12.28	-0.07	Right	Cheek	2	7C924	13.5	99.1	1.882	0.676	1.052	1.009	**0.717**	
5310	62	802.11n	OFDM	40	12.5	12.28	0.07	Right	Tilt	2	7C924	13.5	99.1	0.700	0.513	1.052	1.009	0.545	
5310	62	802.11n	OFDM	40	12.5	12.28	-	Left	Cheek	2	7C924	13.5	99.1	0.554	-	1.052	1.009	-	
5310	62	802.11n	OFDM	40	12.5	12.28	-	Left	Tilt	2	7C924	13.5	99.1	0.270	-	1.052	1.009	-	
5510	102	802.11n	OFDM	40	12.5	12.39	0.05	Right	Cheek	1	7C924	13.5	98.8	0.029	0.005	1.026	1.012	0.005	
5510	102	802.11n	OFDM	40	12.5	12.39	-	Right	Tilt	1	7C924	13.5	98.8	0.025	-	1.026	1.012	-	
5510	102	802.11n	OFDM	40	12.5	12.39	-	Left	Cheek	1	7C924	13.5	98.8	0.008	-	1.026	1.012	-	
5510	102	802.11n	OFDM	40	12.5	12.39	-	Left	Tilt	1	7C924	13.5	98.8	0.010	-	1.026	1.012	-	
5710	142	802.11n	OFDM	40	12.5	12.40	0.02	Right	Cheek	2	7C924	13.5	99.1	1.665	0.677	1.023	1.009	0.699	A11
5710	142	802.11n	OFDM	40	12.5	12.40	0.13	Right	Tilt	2	7C924	13.5	99.1	1.269	0.544	1.023	1.009	0.562	
5710	142	802.11n	OFDM	40	12.5	12.40	-	Left	Cheek	2	7C924	13.5	99.1	0.661	-	1.023	1.009	-	
5710	142	802.11n	OFDM	40	12.5	12.40	-	Left	Tilt	2	7C924	13.5	99.1	0.633	-	1.023	1.009	-	
5755	151	802.11n	OFDM	40	12.5	12.40	0.10	Right	Cheek	1	7C924	13.5	98.8	0.018	0.007	1.023	1.012	0.007	
5755	151	802.11n	OFDM	40	12.5	12.40	-	Right	Tilt	1	7C924	13.5	98.8	0.014	-	1.023	1.012	-	
5755	151	802.11n	OFDM	40	12.5	12.40	-	Left	Cheek	1	7C924	13.5	98.8	0.013	-	1.023	1.012	-	
5755	151	802.11n	OFDM	40	12.5	12.40	-	Left	Tilt	1	7C924	13.5	98.8	0.014	-	1.023	1.012	-	
5755	151	802.11n	OFDM	40	12.5	12.35	0.02	Right	Cheek	2	7C924	13.5	99.1	1.245	0.518	1.035	1.009	0.541	
5755	151	802.11n	OFDM	40	12.5	12.35	0.03	Right	Tilt	2	7C924	13.5	99.1	0.919	0.405	1.035	1.009	0.423	
5755	151	802.11n	OFDM	40	12.5	12.35	-	Left	Cheek	2	7C924	13.5	99.1	0.507	-	1.035	1.009	-	
5755	151	802.11n	OFDM	40	12.5	12.35	-	Left	Tilt	2	7C924	13.5	99.1	0.396	-	1.035	1.009	-	
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 11-12
GSM/UMTS Body-Worn SAR Data

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.0	32.86	0.02	10 mm	7CEBF	1	1:8.3	back	0.454	1.033	0.469	A12
836.60	4183	UMTS 850	RMC	23.0	21.74	0.01	10 mm	7CEBF	N/A	1:1	back	0.362	1.337	0.484	A14
1880.00	661	GSM 1900	GSM	30.0	28.85	0.13	10 mm	7CEBF	1	1:8.3	back	0.439	1.303	0.572	A15
1880.00	9400	UMTS 1900	RMC	22.5	21.70	0.07	10 mm	7CEBF	N/A	1:1	back	0.642	1.202	0.772	A17
ANSI / IEEE C95.1 1992 - SAFETY LIMIT **Spatial Peak** **Uncontrolled Exposure/General Population**								**Body** **1.6 W/kg (mW/g)** averaged over 1 gram							

Table 11-13
LTE 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	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	-0.02	0	7CEBF	QPSK	1	0	10 mm	back	1:1	0.015	1.114	0.017	A18
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	0.01	1	7CEBF	QPSK	25	0	10 mm	back	1:1	0.012	1.132	0.014	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	0.00	0	7CEBF	QPSK	1	0	10 mm	back	1:1	0.333	1.371	0.457	A19
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	0.00	1	7CEBF	QPSK	36	0	10 mm	back	1:1	0.263	1.452	0.382	
836.50	26915	Mid	LTE Band 5 (Cell)	10	24.3	23.85	0.02	0	7C924	QPSK	1	0	10 mm	back	1:1	0.658	1.109	0.730	A20
836.50	26915	Mid	LTE Band 5 (Cell)	10	23.3	22.54	0.08	1	7C924	QPSK	25	12	10 mm	back	1:1	0.509	1.191	0.606	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	0.01	0	7C924	QPSK	1	0	10 mm	back	1:1	1.000	1.007	**1.007**	A21
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	0.00	1	7C924	QPSK	50	0	10 mm	back	1:1	0.742	1.079	0.801	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.08	0.00	1	7C924	QPSK	100	0	10 mm	back	1:1	0.761	1.102	0.839	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	-0.02	0	7C924	QPSK	1	0	10 mm	back	1:1	0.952	1.007	0.959	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	-0.10	0	7CEBF	QPSK	1	0	10 mm	back	1:1	0.807	1.009	0.814	A22
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	22.07	-0.05	0	7CEBF	QPSK	1	50	10 mm	back	1:1	0.703	1.104	0.776	
1900.00	19100	High	LTE Band 2 (PCS)	20	22.5	22.18	-0.06	0	7CEBF	QPSK	1	0	10 mm	back	1:1	0.741	1.076	0.797	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	-0.08	1	7CEBF	QPSK	50	0	10 mm	back	1:1	0.578	1.045	0.604	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.14	-0.05	1	7CEBF	QPSK	100	0	10 mm	back	1:1	0.592	1.086	0.643	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

Blue entry represents variability measurement.

Table 11-14
DTS Body-Worn SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Scaled SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2412	1	802.11b	DSSS	22	17.5	17.49	0.01	10 mm	1	7CEE8	1	back	99.5	0.080	0.058	1.002	1.005	**0.058**	A24
2462	11	802.11b	DSSS	22	17.5	17.43	0.13	10 mm	2	7CEE8	1	back	99.2	0.071	0.042	1.016	1.008	0.043	
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 11-15
NII Body-Worn SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Scaled SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
5310	62	802.11n	OFDM	40	12.5	12.25	0.03	10 mm	1	7CEE8	13.5	back	98.8	0.197	0.099	1.059	1.012	0.106	
5310	62	802.11n	OFDM	40	12.5	12.28	0.04	10 mm	2	7CEE8	13.5	back	99.1	0.271	0.108	1.052	1.009	**0.115**	A25
5510	102	802.11n	OFDM	40	12.5	12.39	0.07	10 mm	1	7CEE8	13.5	back	98.8	0.055	0.022	1.026	1.012	0.023	
5710	142	802.11n	OFDM	40	12.5	12.40	0.09	10 mm	2	7CEE8	13.5	back	99.1	0.087	0.084	1.023	1.009	0.087	
5755	151	802.11n	OFDM	40	12.5	12.40	-0.10	10 mm	1	7CEE8	13.5	back	98.8	0.043	0.017	1.023	1.012	0.017	
5755	151	802.11n	OFDM	40	12.5	12.35	0.20	10 mm	2	7CEE8	13.5	back	99.1	0.049	0.023	1.035	1.009	0.024	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

11.3 Standalone Wireless Router SAR Data

Table 11-16
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GPRS	28.5	28.11	-0.10	10 mm	7CEBF	4	1:2.076	back	0.466	1.094	0.510	A13
836.60	190	GSM 850	GPRS	28.5	28.11	0.01	10 mm	7CEBF	4	1:2.076	front	0.393	1.094	0.430	
836.60	190	GSM 850	GPRS	28.5	28.11	-0.06	10 mm	7CEBF	4	1:2.076	bottom	0.268	1.094	0.293	
836.60	190	GSM 850	GPRS	28.5	28.11	0.08	10 mm	7CEBF	4	1:2.076	right	0.125	1.094	0.137	
836.60	190	GSM 850	GPRS	28.5	28.11	0.08	10 mm	7CEBF	4	1:2.076	left	0.047	1.094	0.051	
836.60	4183	UMTS 850	RMC	23.0	21.74	0.01	10 mm	7CEBF	N/A	1:1	back	0.362	1.337	0.484	A14
836.60	4183	UMTS 850	RMC	23.0	21.74	0.00	10 mm	7CEBF	N/A	1:1	front	0.354	1.337	0.473	
836.60	4183	UMTS 850	RMC	23.0	21.74	-0.10	10 mm	7CEBF	N/A	1:1	bottom	0.228	1.337	0.305	
836.60	4183	UMTS 850	RMC	23.0	21.74	0.02	10 mm	7CEBF	N/A	1:1	right	0.143	1.337	0.191	
836.60	4183	UMTS 850	RMC	23.0	21.74	0.05	10 mm	7CEBF	N/A	1:1	left	0.048	1.337	0.064	
1880.00	661	GSM 1900	GPRS	26.0	25.04	-0.02	10 mm	7C924	3	1:2.76	back	0.562	1.247	0.701	A16
1880.00	661	GSM 1900	GPRS	26.0	25.04	-0.05	10 mm	7C924	3	1:2.76	front	0.405	1.247	0.505	
1880.00	661	GSM 1900	GPRS	26.0	25.04	0.01	10 mm	7C924	3	1:2.76	bottom	0.543	1.247	0.677	
1880.00	661	GSM 1900	GPRS	26.0	25.04	-0.04	10 mm	7C924	3	1:2.76	right	0.128	1.247	0.160	
1880.00	661	GSM 1900	GPRS	26.0	25.04	-0.20	10 mm	7C924	3	1:2.76	left	0.038	1.247	0.047	
1880.00	9400	UMTS 1900	RMC	22.5	21.70	0.07	10 mm	7CEBF	N/A	1:1	back	0.642	1.202	0.772	A17
1880.00	9400	UMTS 1900	RMC	22.5	21.70	0.08	10 mm	7CEBF	N/A	1:1	front	0.513	1.202	0.617	
1880.00	9400	UMTS 1900	RMC	22.5	21.70	-0.20	10 mm	7CEBF	N/A	1:1	bottom	0.594	1.202	0.714	
1880.00	9400	UMTS 1900	RMC	22.5	21.70	0.03	10 mm	7CEBF	N/A	1:1	right	0.140	1.202	0.168	
1880.00	9400	UMTS 1900	RMC	22.5	21.70	-0.01	10 mm	7CEBF	N/A	1:1	left	0.045	1.202	0.054	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Body 1.6 W/kg (mW/g) averaged over 1 gram				

Table 11-17
LTE 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	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	-0.02	0	7CEBF	QPSK	1	0	10 mm	back	1:1	0.015	1.114	0.017	A18
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	0.01	1	7CEBF	QPSK	25	0	10 mm	back	1:1	0.012	1.132	0.014	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	-0.05	0	7CEBF	QPSK	1	0	10 mm	front	1:1	0.013	1.114	0.014	
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	-0.06	1	7CEBF	QPSK	25	0	10 mm	front	1:1	0.009	1.132	0.010	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	-0.05	0	7CEBF	QPSK	1	0	10 mm	bottom	1:1	0.006	1.114	0.007	
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	0.07	1	7CEBF	QPSK	25	0	10 mm	bottom	1:1	0.005	1.132	0.006	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	0.05	0	7CEBF	QPSK	1	0	10 mm	right	1:1	0.003	1.114	0.003	
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	0.03	1	7CEBF	QPSK	25	0	10 mm	right	1:1	0.002	1.132	0.002	
707.50	23095	Mid	LTE Band 12	10	22.5	22.03	-0.14	0	7CEBF	QPSK	1	0	10 mm	left	1:1	0.001	1.114	0.001	
707.50	23095	Mid	LTE Band 12	10	21.5	20.96	-0.08	1	7CEBF	QPSK	25	0	10 mm	left	1:1	0.001	1.132	0.001	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population													Body 1.6 W/kg (mW/g) averaged over 1 gram						

Table 11-18
LTE Band 26 (Cell) Hotspot SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	0.00	0	7CEBF	QPSK	1	0	10 mm	back	1:1	0.333	1.371	0.457	A19
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	0.00	1	7CEBF	QPSK	36	0	10 mm	back	1:1	0.263	1.452	0.382	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	0.00	0	7CEBF	QPSK	1	0	10 mm	front	1:1	0.320	1.371	0.439	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	0.00	1	7CEBF	QPSK	36	0	10 mm	front	1:1	0.255	1.452	0.370	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	-0.06	0	7CEBF	QPSK	1	0	10 mm	bottom	1:1	0.187	1.371	0.256	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	-0.06	1	7CEBF	QPSK	36	0	10 mm	bottom	1:1	0.148	1.452	0.215	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	-0.04	0	7CEBF	QPSK	1	0	10 mm	right	1:1	0.142	1.371	0.195	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	-0.01	1	7CEBF	QPSK	36	0	10 mm	right	1:1	0.118	1.452	0.171	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	22.63	0.07	0	7CEBF	QPSK	1	0	10 mm	left	1:1	0.038	1.371	0.052	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	21.38	0.07	1	7CEBF	QPSK	36	0	10 mm	left	1:1	0.029	1.452	0.042	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram													

Table 11-19
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.3	23.85	0.02	0	7C924	QPSK	1	0	10 mm	back	1:1	0.658	1.109	0.730	A20
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.3	22.54	0.08	1	7C924	QPSK	25	12	10 mm	back	1:1	0.509	1.191	0.606	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.3	23.85	0.00	0	7C924	QPSK	1	0	10 mm	front	1:1	0.643	1.109	0.713	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.3	22.54	0.02	1	7C924	QPSK	25	12	10 mm	front	1:1	0.505	1.191	0.601	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.3	23.85	0.11	0	7C924	QPSK	1	0	10 mm	bottom	1:1	0.402	1.109	0.446	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.3	22.54	-0.09	1	7C924	QPSK	25	12	10 mm	bottom	1:1	0.292	1.191	0.348	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.3	23.85	0.02	0	7C924	QPSK	1	0	10 mm	right	1:1	0.264	1.109	0.293	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.3	22.54	-0.01	1	7C924	QPSK	25	12	10 mm	right	1:1	0.196	1.191	0.233	
836.50	20525	Mid	LTE Band 5 (Cell)	10	24.3	23.85	0.20	0	7C924	QPSK	1	0	10 mm	left	1:1	0.085	1.109	0.094	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.3	22.54	0.06	1	7C924	QPSK	25	12	10 mm	left	1:1	0.063	1.191	0.075	
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 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)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	0.01	0	7C924	QPSK	1	0	10 mm	back	1:1	1.000	1.007	1.007	A21
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	0.00	1	7C924	QPSK	50	0	10 mm	back	1:1	0.742	1.079	0.801	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.08	0.00	1	7C924	QPSK	100	0	10 mm	back	1:1	0.761	1.102	0.839	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	-0.01	0	7C924	QPSK	1	0	10 mm	front	1:1	0.836	1.007	0.842	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	0.01	1	7C924	QPSK	50	0	10 mm	front	1:1	0.607	1.079	0.655	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.08	0.00	1	7C924	QPSK	100	0	10 mm	front	1:1	0.616	1.102	0.679	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	0.03	0	7C924	QPSK	1	0	10 mm	bottom	1:1	1.000	1.007	1.007	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	0.03	1	7C924	QPSK	50	0	10 mm	bottom	1:1	0.736	1.079	0.794	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.08	0.00	1	7C924	QPSK	100	0	10 mm	bottom	1:1	0.744	1.102	0.820	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	-0.04	0	7C924	QPSK	1	0	10 mm	right	1:1	0.241	1.007	0.243	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	0.01	1	7C924	QPSK	50	0	10 mm	right	1:1	0.179	1.079	0.193	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	-0.01	0	7C924	QPSK	1	0	10 mm	left	1:1	0.083	1.007	0.084	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	21.5	21.17	-0.04	1	7C924	QPSK	50	0	10 mm	left	1:1	0.060	1.079	0.065	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	22.5	22.47	-0.02	0	7C924	QPSK	1	0	10 mm	back	1:1	0.952	1.007	0.959	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram													

Blue entry represents variability measurement.

Table 11-21
LTE Band 2 (PCS) Hotspot SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Scaled SAR (1g)	Plot #
MHz	Ch.															(W/kg)		(W/kg)	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	-0.10	0	7CEBF	QPSK	1	0	10 mm	back	1:1	0.807	1.009	0.814	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	22.07	-0.05	0	7CEBF	QPSK	1	50	10 mm	back	1:1	0.703	1.104	0.776	
1900.00	19100	High	LTE Band 2 (PCS)	20	22.5	22.18	-0.06	0	7CEBF	QPSK	1	0	10 mm	back	1:1	0.741	1.076	0.797	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	-0.08	1	7CEBF	QPSK	50	0	10 mm	back	1:1	0.578	1.045	0.604	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.14	-0.05	1	7CEBF	QPSK	100	0	10 mm	back	1:1	0.592	1.086	0.643	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	0.00	0	7CEBF	QPSK	1	0	10 mm	front	1:1	0.681	1.009	0.687	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	-0.02	1	7CEBF	QPSK	50	0	10 mm	front	1:1	0.503	1.045	0.526	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	-0.01	0	7CEBF	QPSK	1	0	10 mm	bottom	1:1	0.845	1.009	0.853	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	22.07	-0.05	0	7CEBF	QPSK	1	50	10 mm	bottom	1:1	0.881	1.104	0.973	
1900.00	19100	High	LTE Band 2 (PCS)	20	22.5	22.18	-0.02	0	7CEBF	QPSK	1	0	10 mm	bottom	1:1	0.943	1.076	1.015	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	-0.05	1	7CEBF	QPSK	50	0	10 mm	bottom	1:1	0.655	1.045	0.684	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.14	-0.02	1	7CEBF	QPSK	100	0	10 mm	bottom	1:1	0.641	1.086	0.696	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	-0.03	0	7CEBF	QPSK	1	0	10 mm	right	1:1	0.226	1.009	0.228	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	-0.02	1	7CEBF	QPSK	50	0	10 mm	right	1:1	0.170	1.045	0.178	
1860.00	18700	Low	LTE Band 2 (PCS)	20	22.5	22.46	-0.04	0	7CEBF	QPSK	1	0	10 mm	left	1:1	0.052	1.009	0.052	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	21.31	-0.14	1	7CEBF	QPSK	50	0	10 mm	left	1:1	0.036	1.045	0.038	
1900.00	19100	High	LTE Band 2 (PCS)	20	22.5	22.18	-0.01	0	7CEBF	QPSK	1	0	10 mm	bottom	1:1	0.978	1.076	1.052	A23
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram						

Blue entry represents variability measurement.

Table 11-22
WLAN Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Scaled SAR (1g)	Plot #
MHz	Ch.													W/kg	(W/kg)			(W/kg)	
2412	1	802.11b	DSSS	22	17.5	17.49	0.01	10 mm	1	7CEE8	1	back	99.5	0.080	0.058	1.002	1.005	0.058	A24
2412	1	802.11b	DSSS	22	17.5	17.49	-	10 mm	1	7CEE8	1	front	99.5	0.064	-	1.002	1.005	-	
2412	1	802.11b	DSSS	22	17.5	17.49	-	10 mm	1	7CEE8	1	top	99.5	0.042	-	1.002	1.005	-	
2412	1	802.11b	DSSS	22	17.5	17.49	-	10 mm	1	7CEE8	1	left	99.5	0.067	-	1.002	1.005	-	
2462	11	802.11b	DSSS	22	17.5	17.43	0.13	10 mm	2	7CEE8	1	back	99.2	0.071	0.042	1.016	1.008	0.043	
2462	11	802.11b	DSSS	22	17.5	17.43	-	10 mm	2	7CEE8	1	front	99.2	0.015	-	1.016	1.008	-	
2462	11	802.11b	DSSS	22	17.5	17.43	-	10 mm	2	7CEE8	1	top	99.2	0.036	-	1.016	1.008	-	
2462	11	802.11b	DSSS	22	17.5	17.43	-	10 mm	2	7CEE8	1	left	99.2	0.003	-	1.016	1.008	-	
5755	151	802.11n	OFDM	40	12.5	12.40	-0.10	10 mm	1	7CEE8	13.5	back	98.8	0.043	0.017	1.023	1.012	0.017	
5755	151	802.11n	OFDM	40	12.5	12.40	-	10 mm	1	7CEE8	13.5	front	98.8	0.012	-	1.023	1.012	-	
5755	151	802.11n	OFDM	40	12.5	12.40	-	10 mm	1	7CEE8	13.5	top	98.8	0.010	-	1.023	1.012	-	
5755	151	802.11n	OFDM	40	12.5	12.40	-	10 mm	1	7CEE8	13.5	left	98.8	0.015	-	1.023	1.012	-	
5755	151	802.11n	OFDM	40	12.5	12.35	-	10 mm	2	7CEE8	13.5	back	99.1	0.049	-	1.035	1.009	-	
5755	151	802.11n	OFDM	40	12.5	12.35	0.10	10 mm	2	7CEE8	13.5	front	99.1	0.093	0.042	1.035	1.009	0.043	A26
5755	151	802.11n	OFDM	40	12.5	12.35	-	10 mm	2	7CEE8	13.5	top	99.1	0.049	-	1.035	1.009	-	
5755	151	802.11n	OFDM	40	12.5	12.35	-	10 mm	2	7CEE8	13.5	left	99.1	0.021	-	1.035	1.009	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population														Body 1.6 W/kg (mW/g) averaged over 1 gram					

11.4 Standalone Extremity SAR Data

Table 11-23
WLAN Extremity SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan W/kg	SAR (10g) (W/kg)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Scaled SAR (10g) (W/kg)	Plot #
MHz	Ch.																		
5310	62	802.11n	OFDM	40	12.5	12.25	0.08	0 mm	1	7C924	13.5	back	98.8	2.222	0.233	1.059	1.012	0.250	
5310	62	802.11n	OFDM	40	12.5	12.25	-	0 mm	1	7C924	13.5	front	98.8	0.562	-	1.059	1.012	-	
5310	62	802.11n	OFDM	40	12.5	12.25	-	0 mm	1	7C924	13.5	top	98.8	0.587	-	1.059	1.012	-	
5310	62	802.11n	OFDM	40	12.5	12.25	-	0 mm	1	7C924	13.5	left	98.8	0.308	-	1.059	1.012	-	
5310	62	802.11n	OFDM	40	12.5	12.28	-	0 mm	2	7C924	13.5	back	99.1	2.016	-	1.052	1.009	-	
5310	62	802.11n	OFDM	40	12.5	12.28	0.20	0 mm	2	7C924	13.5	front	99.1	3.025	0.263	1.052	1.009	0.279	
5310	62	802.11n	OFDM	40	12.5	12.28	-	0 mm	2	7C924	13.5	top	99.1	2.067	-	1.052	1.009	-	
5310	62	802.11n	OFDM	40	12.5	12.28	-	0 mm	2	7C924	13.5	left	99.1	0.225	-	1.052	1.009	-	
5510	102	802.11n	OFDM	40	12.5	12.39	0.05	0 mm	1	7C924	13.5	back	98.8	0.959	0.097	1.026	1.012	0.101	
5510	102	802.11n	OFDM	40	12.5	12.39	-	0 mm	1	7C924	13.5	front	98.8	0.042	-	1.026	1.012	-	
5510	102	802.11n	OFDM	40	12.5	12.39	-	0 mm	1	7C924	13.5	top	98.8	0.110	-	1.026	1.012	-	
5510	102	802.11n	OFDM	40	12.5	12.39	-	0 mm	1	7C924	13.5	left	98.8	0.044	-	1.026	1.012	-	
5710	142	802.11n	OFDM	40	12.5	12.40	-	0 mm	2	7C924	13.5	back	99.1	1.433	-	1.023	1.009	-	
5710	142	802.11n	OFDM	40	12.5	12.40	-0.03	0 mm	2	7C924	13.5	front	99.1	3.827	0.330	1.023	1.009	**0.341**	A27
5710	142	802.11n	OFDM	40	12.5	12.40	-	0 mm	2	7C924	13.5	top	99.1	1.882	-	1.023	1.009	-	
5710	142	802.11n	OFDM	40	12.5	12.40	-	0 mm	2	7C924	13.5	left	99.1	0.147	-	1.023	1.009	-	

ANSI / IEEE C95.1 1992 - SAFETY LIMIT	**Extremity**
Spatial Peak	**4.0 W/kg (mW/g)**
Uncontrolled Exposure/General Population	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 1528-2003, and FCC KDB Publication 447498 D01v05.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v05.
6. Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 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 D04v01r02, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
8. Per FCC KDB 865664 D01 v01, variability SAR tests were performed when the measured SAR results for a frequency band were greater than 0.8 W/kg for 1g SAR and 2.0 W/kg for 10g SAR. 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 D06v02, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.6 for more details).
10. Per FCC KDB Publication 648474 D04v01r02, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, hand SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR (scaled to the maximum output power, including tolerance) > 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 D01v03 and October 2013 TCB Workshop Notes: The source-based frame-averaged output power was evaluated for all GPRS/EDGE slot configurations. The configuration with the highest target frame averaged output power was evaluated for hotspot SAR. When the maximum frame-averaged powers are equivalent across two or more slots (within 0.25 dB), the configuration with the most number of time slots was tested.
3. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g SAR and 2.0 W/kg for 10g SAR then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.

UMTS Notes:

1. UMTS mode in was tested under RMC 12.2 kbps with HSPA Inactive per KDB Publication 941225 D01v03. AMR and HSPA SAR was not required per the 3G Test Reduction Procedure in KDB Publication 941225 D01v03.
2. Per FCC KDB Publication 447498 D01v05, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg for 1g SAR and 2.0 W/kg for 10g SAR 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 D05v02r03. The general test procedures used for testing can be found in Section 8.5.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).

WLAN Notes:

1. For held-to-ear and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g SAR and ≤ 1.0 W/kg for 10g SAR, 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 for 1g SAR and ≤ 2.0 W/kg for 10g SAR or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r01 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 8.6.5 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r01 for 5 GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not investigated since the highest reported SAR for initial test configuration adjusted by the ratio of maximum output powers is less than 1.2 W/kg for 1g SAR and less than 3.0 W/kg for 10g SAR. See Section 8.6.6 for more information.
4. Per KDB Publication 248227 D01v02r01, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498. Please see Section 12 for complete analysis.
5. When the maximum reported averaged SAR is ≤0.8 W/kg for 1g SAR and ≤2.0 W/kg for 10g SAR, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g SAR and ≤ 3.0 W/kg for 10g SAR or all test channels were measured.
6. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.

12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

The following procedures adopted from FCC KDB Publication 447498 D01v05r02 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 447498 D01v05 IV.C.1.iii and IEEE 1528-2013 Section 6.3.4.1.2, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg and the sum of 10-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤ 4 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.

When standalone SAR is not required to be measured, per FCC KDB 447498 D01v05 4.3.2 2), the following equation must be used to estimate the standalone 1g or 10g SAR for simultaneous transmission assessment involving that transmitter.

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

Table 12-1
Estimated 1g SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2480	11.00	10	0.273

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

12.3 Head SAR Simultaneous Transmission Analysis

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Head SAR	GSM 850	0.163	0.648	0.216	0.811	0.379	**1.027**
	UMTS 850	0.162	0.648	0.216	0.810	0.378	1.026
	GSM 1900	0.047	0.648	0.216	0.695	0.263	0.911
	UMTS 1900	0.084	0.648	0.216	0.732	0.300	0.948
	LTE Band 12	0.002	0.648	0.216	0.650	0.218	0.866
	LTE Band 26 (Cell)	0.147	0.648	0.216	0.795	0.363	1.011
	LTE Band 5 (Cell)	0.162	0.648	0.216	0.810	0.378	1.026
	LTE Band 4 (AWS)	0.115	0.648	0.216	0.763	0.331	0.979
	LTE Band 2 (PCS)	0.079	0.648	0.216	0.727	0.295	0.943

Note: 1+2+3 denotes MIMO summation

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Head SAR	GSM 850	0.163	0.109	0.717	0.272	0.880	**0.989**
	UMTS 850	0.162	0.109	0.717	0.271	0.879	0.988
	GSM 1900	0.047	0.109	0.717	0.156	0.764	0.873
	UMTS 1900	0.084	0.109	0.717	0.193	0.801	0.910
	LTE Band 12	0.002	0.109	0.717	0.111	0.719	0.828
	LTE Band 26 (Cell)	0.147	0.109	0.717	0.256	0.864	0.973
	LTE Band 5 (Cell)	0.162	0.109	0.717	0.271	0.879	0.988
	LTE Band 4 (AWS)	0.115	0.109	0.717	0.224	0.832	0.941
	LTE Band 2 (PCS)	0.079	0.109	0.717	0.188	0.796	0.905

Note: 1+2+3 denotes MIMO summation

Table 12-4
Simultaneous Transmission Scenario with 2.4 GHz Ant 1 and 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+3
Head SAR	GSM 850	0.163	0.648	0.717	**1.528**
	UMTS 850	0.162	0.648	0.717	1.527
	GSM 1900	0.047	0.648	0.717	1.412
	UMTS 1900	0.084	0.648	0.717	1.449
	LTE Band 12	0.002	0.648	0.717	1.367
	LTE Band 26 (Cell)	0.147	0.648	0.717	1.512
	LTE Band 5 (Cell)	0.162	0.648	0.717	1.527
	LTE Band 4 (AWS)	0.115	0.648	0.717	1.480
	LTE Band 2 (PCS)	0.079	0.648	0.717	1.444

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Head SAR	GSM 850	0.163	0.216	0.109	**0.488**
	UMTS 850	0.162	0.216	0.109	0.487
	GSM 1900	0.047	0.216	0.109	0.372
	UMTS 1900	0.084	0.216	0.109	0.409
	LTE Band 12	0.002	0.216	0.109	0.327
	LTE Band 26 (Cell)	0.147	0.216	0.109	0.472
	LTE Band 5 (Cell)	0.162	0.216	0.109	0.487
	LTE Band 4 (AWS)	0.115	0.216	0.109	0.440
	LTE Band 2 (PCS)	0.079	0.216	0.109	0.404

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-6
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)		
		1	2	3	1+2	1+3	1+2+3
Body-Worn	GSM 850	0.469	0.058	0.043	0.527	0.512	0.570
	UMTS 850	0.484	0.058	0.043	0.542	0.527	0.585
	GSM 1900	0.572	0.058	0.043	0.630	0.615	0.673
	UMTS 1900	0.772	0.058	0.043	0.830	0.815	0.873
	LTE Band 12	0.017	0.058	0.043	0.075	0.060	0.118
	LTE Band 26 (Cell)	0.457	0.058	0.043	0.515	0.500	0.558
	LTE Band 5 (Cell)	0.730	0.058	0.043	0.788	0.773	0.831
	LTE Band 4 (AWS)	1.007	0.058	0.043	1.065	1.050	**1.108**
	LTE Band 2 (PCS)	0.814	0.058	0.043	0.872	0.857	0.915

Note: 1+2+3 denotes MIMO summation

Table 12-7
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)		
		1	2	3	1+2	1+3	1+2+3
Body-Worn	GSM 850	0.469	0.106	0.115	0.575	0.584	0.690
	UMTS 850	0.484	0.106	0.115	0.590	0.599	0.705
	GSM 1900	0.572	0.106	0.115	0.678	0.687	0.793
	UMTS 1900	0.772	0.106	0.115	0.878	0.887	0.993
	LTE Band 12	0.017	0.106	0.115	0.123	0.132	0.238
	LTE Band 26 (Cell)	0.457	0.106	0.115	0.563	0.572	0.678
	LTE Band 5 (Cell)	0.730	0.106	0.115	0.836	0.845	0.951
	LTE Band 4 (AWS)	1.007	0.106	0.115	1.113	1.122	**1.228**
	LTE Band 2 (PCS)	0.814	0.106	0.115	0.920	0.929	1.035

Note: 1+2+3 denotes MIMO summation

Table 12-8
Simultaneous Transmission Scenario with 2.4 GHz Ant 1 and 5 GHz Ant 2 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)
		1	2	3	1+2+3
Body-Worn	GSM 850	0.469	0.058	0.115	0.642
	UMTS 850	0.484	0.058	0.115	0.657
	GSM 1900	0.572	0.058	0.115	0.745
	UMTS 1900	0.772	0.058	0.115	0.945
	LTE Band 12	0.017	0.058	0.115	0.190
	LTE Band 26 (Cell)	0.457	0.058	0.115	0.630
	LTE Band 5 (Cell)	0.730	0.058	0.115	0.903
	LTE Band 4 (AWS)	1.007	0.058	0.115	**1.180**
	LTE Band 2 (PCS)	0.814	0.058	0.115	0.987

Table 12-9
Simultaneous Transmission Scenario with 2.4 GHz Ant 2 and 5 GHz Ant 1 WLAN (Body-Worn at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Body-Worn	GSM 850	0.469	0.043	0.106	0.618
	UMTS 850	0.484	0.043	0.106	0.633
	GSM 1900	0.572	0.043	0.106	0.721
	UMTS 1900	0.772	0.043	0.106	0.921
	LTE Band 12	0.017	0.043	0.106	0.166
	LTE Band 26 (Cell)	0.457	0.043	0.106	0.606
	LTE Band 5 (Cell)	0.730	0.043	0.106	0.879
	LTE Band 4 (AWS)	1.007	0.043	0.106	**1.156**
	LTE Band 2 (PCS)	0.814	0.043	0.106	0.963

Table 12-10
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	GSM 850	0.469	0.273	0.742
	UMTS 850	0.484	0.273	0.757
	GSM 1900	0.572	0.273	0.845
	UMTS 1900	0.772	0.273	1.045
	LTE Band 12	0.017	0.273	0.290
	LTE Band 26 (Cell)	0.457	0.273	0.730
	LTE Band 5 (Cell)	0.730	0.273	1.003
	LTE Band 4 (AWS)	1.007	0.273	**1.280**
	LTE Band 2 (PCS)	0.814	0.273	1.087

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

12.5 Hotspot SAR Simultaneous Transmission Analysis

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Hotspot SAR	GPRS 850	0.510	0.058	0.043	0.568	0.553	0.611
	UMTS 850	0.484	0.058	0.043	0.542	0.527	0.585
	GPRS 1900	0.701	0.058	0.043	0.759	0.744	0.802
	UMTS 1900	0.772	0.058	0.043	0.830	0.815	0.873
	LTE Band 12	0.017	0.058	0.043	0.075	0.060	0.118
	LTE Band 26 (Cell)	0.457	0.058	0.043	0.515	0.500	0.558
	LTE Band 5 (Cell)	0.730	0.058	0.043	0.788	0.773	0.831
	LTE Band 4 (AWS)	1.007	0.058	0.043	1.065	1.050	1.108
	LTE Band 2 (PCS)	1.052	0.058	0.043	1.110	1.095	**1.153**

Note: 1+2+3 denotes MIMO summation

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		
		1	2	3	1+2	1+3	1+2+3
Hotspot SAR	GPRS 850	0.510	0.017	0.043	0.527	0.553	0.570
	UMTS 850	0.484	0.017	0.043	0.501	0.527	0.544
	GPRS 1900	0.701	0.017	0.043	0.718	0.744	0.761
	UMTS 1900	0.772	0.017	0.043	0.789	0.815	0.832
	LTE Band 12	0.017	0.017	0.043	0.034	0.060	0.077
	LTE Band 26 (Cell)	0.457	0.017	0.043	0.474	0.500	0.517
	LTE Band 5 (Cell)	0.730	0.017	0.043	0.747	0.773	0.790
	LTE Band 4 (AWS)	1.007	0.017	0.043	1.024	1.050	1.067
	LTE Band 2 (PCS)	1.052	0.017	0.043	1.069	1.095	**1.112**

Note: 1+2+3 denotes MIMO summation

Table 12-13
Simultaneous Transmission Scenario with 2.4 GHz Ant 1 and 5 GHz Ant 2 WLAN (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+3
Hotspot SAR	GPRS 850	0.510	0.058	0.043	0.611
	UMTS 850	0.484	0.058	0.043	0.585
	GPRS 1900	0.701	0.058	0.043	0.802
	UMTS 1900	0.772	0.058	0.043	0.873
	LTE Band 12	0.017	0.058	0.043	0.118
	LTE Band 26 (Cell)	0.457	0.058	0.043	0.558
	LTE Band 5 (Cell)	0.730	0.058	0.043	0.831
	LTE Band 4 (AWS)	1.007	0.058	0.043	1.108
	LTE Band 2 (PCS)	1.052	0.058	0.043	**1.153**

Table 12-14
Simultaneous Transmission Scenario with 2.4 GHz Ant 2 and 5 GHz Ant 1 WLAN
(Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Hotspot SAR	GPRS 850	0.510	0.043	0.017	0.570
	UMTS 850	0.484	0.043	0.017	0.544
	GPRS 1900	0.701	0.043	0.017	0.761
	UMTS 1900	0.772	0.043	0.017	0.832
	LTE Band 12	0.017	0.043	0.017	0.077
	LTE Band 26 (Cell)	0.457	0.043	0.017	0.517
	LTE Band 5 (Cell)	0.730	0.043	0.017	0.790
	LTE Band 4 (AWS)	1.007	0.043	0.017	1.067
	LTE Band 2 (PCS)	1.052	0.043	0.017	**1.112**

12.6 Extremity SAR Simultaneous Transmission Analysis

Main antenna, 2.4 GHz WIFI/BT SAR testing was not required for extremity exposure conditions per FCC KDB 648474 D04v01r02. Therefore, no further analysis beyond **Table 12-15** was required to determine that possible simultaneous scenarios would not exceed the SAR limit.

Table 12-15
Simultaneous Transmission Scenario for MIMO 5 GHz WLAN
(Extremity at 0.0 cm)

Exposure Condition	5 GHz Ant 1 SAR (W/kg)	5 GHz Ant 2 SAR (W/kg)	Σ SAR (W/kg)
	1	2	1+2
Extremity	0.250	0.341	0.591

12.7 Simultaneous Transmission Conclusion

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

13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

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

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

1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
2) A second repeated measurement was 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) 10g Extremity SAR measurement variability analysis applies a factor of 2.5 to the procedures outlined above.

Table 13-1
Body SAR Measurement Variability Results

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	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)	
1750	1732.50	20175	LTE Band 4 (AWS)	QPSK, 1 RB, 0 RB Offset	back	10 mm	1.000	0.952	1.05	N/A	N/A	N/A	N/A
1900	1900.00	19100	LTE Band 2 (PCS)	QPSK, 1 RB, 0 RB Offset	bottom	10 mm	0.943	0.978	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 1g SAR was <1.5 W/kg and the measured 10g SAR was < 3.75 W/kg for all frequency bands. Therefore, per KDB Publication 865664 D01v01, the extended measurement uncertainty analysis per IEEE 1528-2003 was not required.

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E8257D	(250kHz-20GHz) Signal Generator	3/15/2015	Annual	3/15/2016	MY45470194
Agilent	8753E	(30kHz-6GHz) Network Analyzer	12/30/2014	Annual	12/30/2015	JP38020182
Agilent	8594A	(9kHz-2.9GHz) Spectrum Analyzer	N/A	N/A	N/A	3051A00187
Agilent	8648D	(9kHz-4GHz) Signal Generator	3/15/2015	Annual	3/15/2016	3629U00687
Agilent	E4432B	ESG-D Series Signal Generator	3/16/2015	Annual	3/16/2016	US40053896
Agilent	N9020A	MXA Signal Analyzer	10/27/2014	Annual	10/27/2015	US46470561
Agilent	8753ES	S-Parameter Network Analyzer	1/20/2015	Annual	1/20/2016	US39170122
Agilent	E5515C	Wireless Communications Test Set	11/5/2013	Biennial	11/5/2015	GB46310798
Anritsu	ML2438A	Power Meter	3/13/2015	Annual	3/13/2016	1190013
Anritsu	ML2495A	Power Meter	10/31/2013	Biennial	10/31/2015	941001
Anritsu	MA2481A	Power Sensor	3/10/2015	Annual	3/10/2016	5821
Anritsu	MA2481A	Power Sensor	3/10/2015	Annual	3/10/2016	5605
Anritsu	MA2411B	Pulse Power Sensor	11/17/2014	Annual	11/17/2015	1207364
Anritsu	MA2411B	Pulse Power Sensor	11/17/2014	Annual	11/17/2015	1126066
Anritsu	MT8820C	Radio Communication Analyzer	8/28/2014	Annual	8/28/2015	6201240328
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	4052	Long Stem Thermometer	9/27/2013	Biennial	9/27/2015	130567447
Control Company	36934-158	Wall-Mounted Thermometer	4/29/2014	Biennial	4/29/2016	122014488
Gigatronics	80701A	(0.05-18GHz) Power Sensor	10/30/2014	Annual	10/30/2015	1833460
Gigatronics	8651A	Universal Power Meter	10/30/2014	Annual	10/30/2015	8650319
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
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
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	CMW500	Radio Communication Tester	7/9/2014	Annual	7/9/2015	106578
Rohde & Schwarz	CMW500	Radio Communication Tester	7/22/2014	Annual	7/22/2015	116743
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
SPEAG	D1750V2	1750 MHz SAR Dipole	4/15/2015	Annual	4/15/2016	1051
SPEAG	D1900V2	1900 MHz SAR Dipole	7/23/2014	Annual	7/23/2015	5d149
SPEAG	D1900V2	1900 MHz SAR Dipole	4/14/2015	Annual	4/14/2016	5d141
SPEAG	D2450V2	2450 MHz SAR Dipole	8/11/2014	Annual	8/11/2015	719
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/21/2015	Annual	1/21/2016	1057
SPEAG	D750V3	750 MHz Dipole	1/16/2015	Annual	1/16/2016	1003
SPEAG	D750V3	750 MHz Dipole	3/11/2015	Annual	3/11/2016	1054
SPEAG	D835V2	835 MHz SAR Dipole	7/24/2014	Annual	7/24/2015	4d133
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/18/2014	Annual	9/18/2015	1364
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/14/2015	Annual	1/14/2016	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/22/2015	Annual	5/22/2016	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/23/2014	Annual	10/23/2015	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2015	Annual	3/13/2016	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2015	Annual	3/13/2016	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	9/17/2014	Annual	9/17/2015	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/19/2015	Annual	1/19/2016	1407
SPEAG	DAK-3.5	Dielectric Assessment Kit	10/21/2014	Annual	10/21/2015	1091
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	7/15/2014	Annual	7/15/2015	1039
SPEAG	DAKS-3.5	Portable Dielectric Assessment Kit	8/12/2014	Annual	8/12/2015	1041
SPEAG	ES3DV3	SAR Probe	5/20/2015	Annual	5/20/2016	3263
SPEAG	ES3DV3	SAR Probe	9/24/2014	Annual	9/24/2015	3288
SPEAG	ES3DV3	SAR Probe	1/20/2015	Annual	1/20/2016	3213
SPEAG	EX3DV4	SAR Probe	1/22/2015	Annual	1/22/2016	3589
SPEAG	ES3DV3	SAR Probe	1/23/2015	Annual	1/23/2016	3318
SPEAG	ES3DV3	SAR Probe	3/19/2015	Annual	3/19/2016	3209
SPEAG	ES3DV3	SAR Probe	3/19/2015	Annual	3/19/2016	3319
SPEAG	EX3DV4	SAR Probe	4/23/2015	Annual	4/23/2016	7357
VWR	36934-158	Wall-Mounted Thermometer	8/8/2013	Biennial	8/8/2015	130477877

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

15 MEASUREMENT UNCERTAINTIES

Applicable for frequencies less than 3000 MHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	**IEEE 1528 Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i 1gm**	**c_i 10 gms**	**1gm u_i (± %)**	**10gms u_i (± %)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	6.0	N	1	1.0	1.0	6.0	6.0	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)			RSS				12.1	11.7	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.2	23.5	

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

Applicable for frequencies up to 6 GHz.

a	b	c	d	e= f(d,k)	f	g	h = c x f/e	i = c x g/e	k
Uncertainty Component	**IEEE 1528 Sec.**	**Tol. (± %)**	**Prob. Dist.**	**Div.**	**c_i 1gm**	**c_i 10 gms**	**1gm u_i (± %)**	**10gms u_i (± %)**	**v_i**
Measurement System									
Probe Calibration	E.2.1	6.55	N	1	1.0	1.0	6.6	6.6	∞
Axial Isotropy	E.2.2	0.25	N	1	0.7	0.7	0.2	0.2	∞
Hemishperical Isotropy	E.2.2	1.3	N	1	1.0	1.0	1.3	1.3	∞
Boundary Effect	E.2.3	0.4	N	1	1.0	1.0	0.4	0.4	∞
Linearity	E.2.4	0.3	N	1	1.0	1.0	0.3	0.3	∞
System Detection Limits	E.2.5	5.1	N	1	1.0	1.0	5.1	5.1	∞
Readout Electronics	E.2.6	1.0	N	1	1.0	1.0	1.0	1.0	∞
Response Time	E.2.7	0.8	R	1.73	1.0	1.0	0.5	0.5	∞
Integration Time	E.2.8	2.6	R	1.73	1.0	1.0	1.5	1.5	∞
RF Ambient Conditions	E.6.1	3.0	R	1.73	1.0	1.0	1.7	1.7	∞
Probe Positioner Mechanical Tolerance	E.6.2	0.4	R	1.73	1.0	1.0	0.2	0.2	∞
Probe Positioning w/ respect to Phantom	E.6.3	2.9	R	1.73	1.0	1.0	1.7	1.7	∞
Extrapolation, Interpolation & Integration algorithms for Max. SAR Evaluation	E.5	1.0	R	1.73	1.0	1.0	0.6	0.6	∞
Test Sample Related									
Test Sample Positioning	E.4.2	6.0	N	1	1.0	1.0	6.0	6.0	287
Device Holder Uncertainty	E.4.1	3.32	R	1.73	1.0	1.0	1.9	1.9	∞
Output Power Variation - SAR drift measurement	6.6.2	5.0	R	1.73	1.0	1.0	2.9	2.9	∞
Phantom & Tissue Parameters									
Phantom Uncertainty (Shape & Thickness tolerances)	E.3.1	4.0	R	1.73	1.0	1.0	2.3	2.3	∞
Liquid Conductivity - deviation from target values	E.3.2	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Conductivity - measurement uncertainty	E.3.3	3.8	N	1	0.64	0.43	2.4	1.6	6
Liquid Permittivity - deviation from target values	E.3.2	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Liquid Permittivity - measurement uncertainty	E.3.3	4.5	N	1	0.60	0.49	2.7	2.2	6
Combined Standard Uncertainty (k=1)			RSS				12.4	12.0	299
Expanded Uncertainty (95% CONFIDENCE LEVEL)			k=2				24.7	24.0	

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

16 CONCLUSION

16.1 Measurement Conclusion

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

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

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[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: A3LSMN920F; Type: Portable Handset; Serial: 7C924

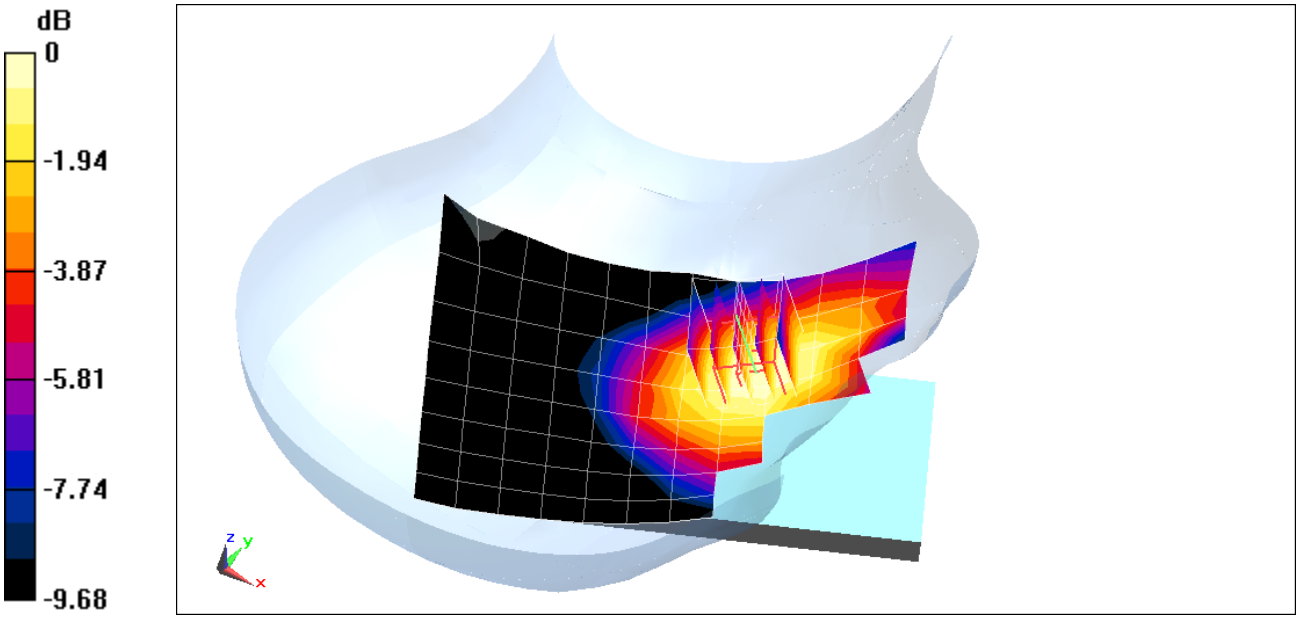
Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium: 835 Head Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.899$ S/m; $\varepsilon_r = 40.443$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 06-08-2015; Ambient Temp: 22.3°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3288; ConvF(6.51, 6.51, 6.51); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GSM850, Right 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 = 13.28 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.195 W/kg
SAR(1 g) = 0.158 W/kg



0 dB = 0.173 W/kg = -7.62 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7C924

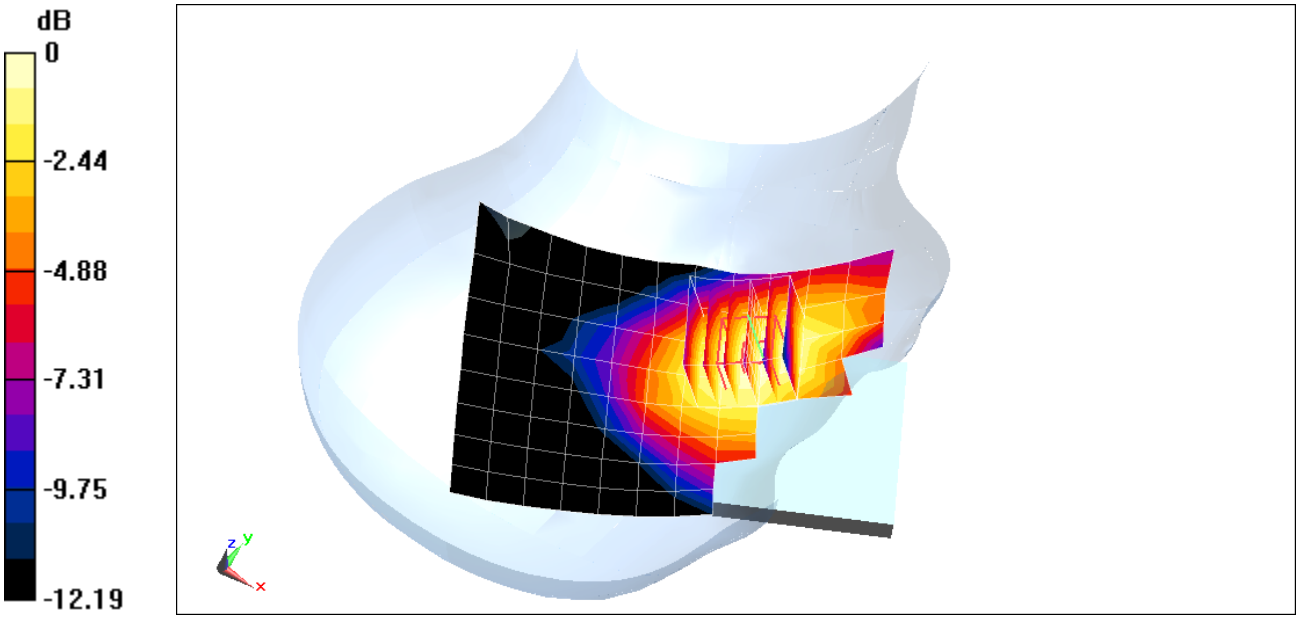
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.899 S/m; ε_r = 40.443; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 06-08-2015; Ambient Temp: 22.3°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3288; ConvF(6.51, 6.51, 6.51); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: UMTS 850, Right 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 = 11.73 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.149 W/kg
SAR(1 g) = 0.121 W/kg



0 dB = 0.132 W/kg = -8.79 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7C924

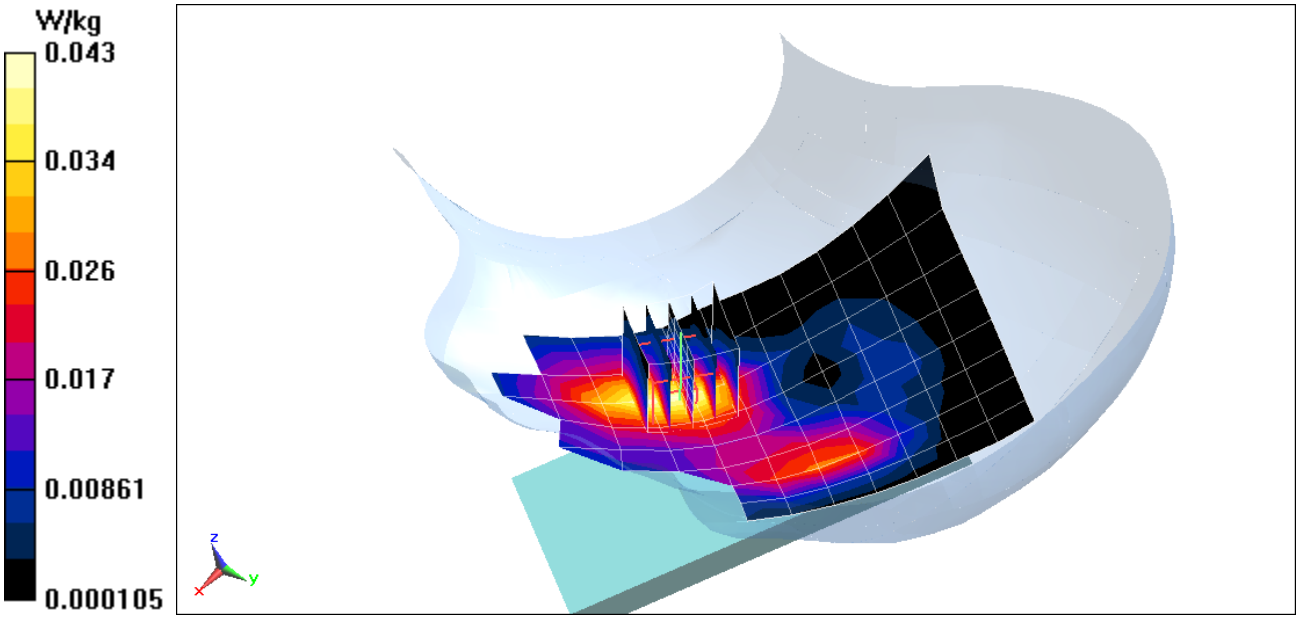
Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.419 S/m; ε_r = 39.681; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 06-06-2015; Ambient Temp: 23.5°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3288; ConvF(5.17, 5.17, 5.17); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GSM 1900, 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 = 5.447 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.0550 W/kg
SAR(1 g) = 0.036 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

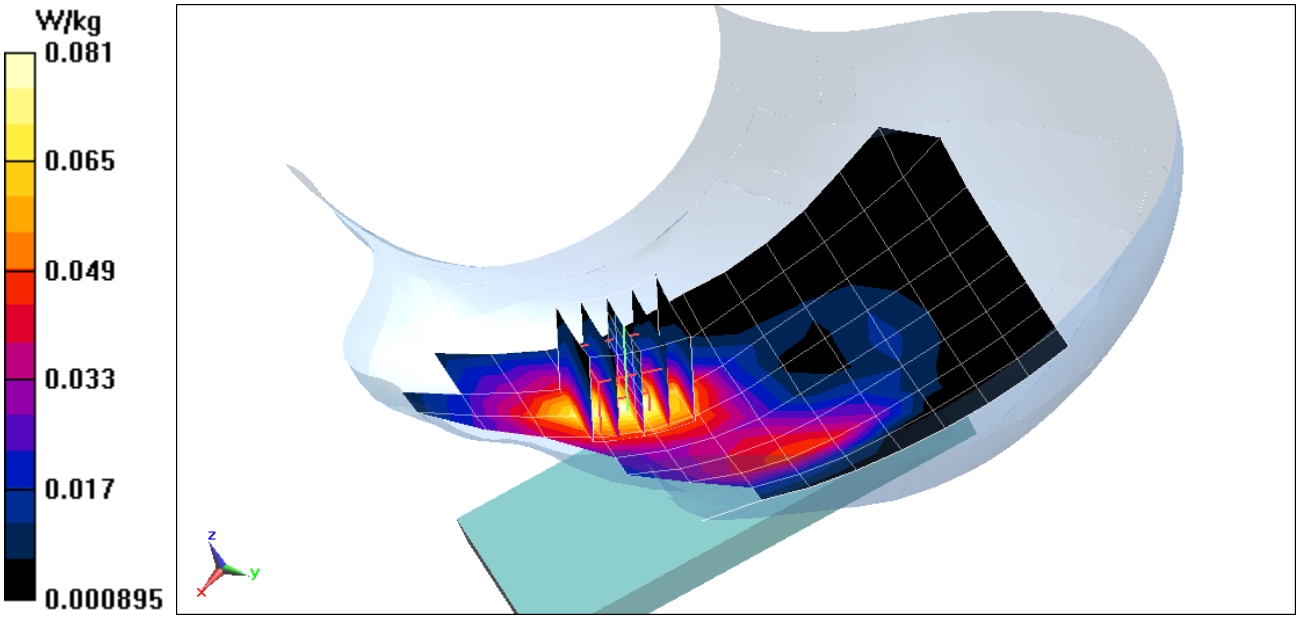
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.419 S/m; ε_r = 39.681; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 06-06-2015; Ambient Temp: 23.5°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3288; ConvF(5.17, 5.17, 5.17); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 7.324 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.106 W/kg
SAR(1 g) = 0.070 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7C924

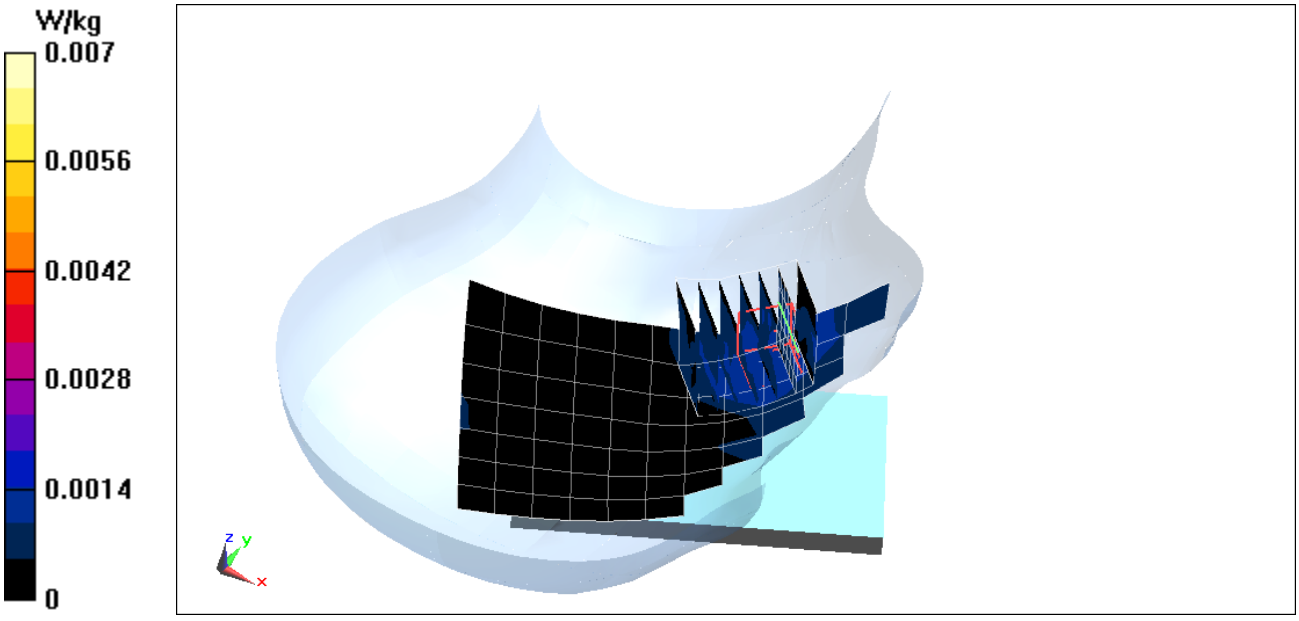
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.863 S/m; ε_r = 43.116; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 06-05-2015; Ambient Temp: 23.3°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3318; ConvF(6.58, 6.58, 6.58); Calibrated: 1/23/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/14/2015
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (8x13x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.220 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 0.00247 W/kg
SAR(1 g) = 0.00151 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

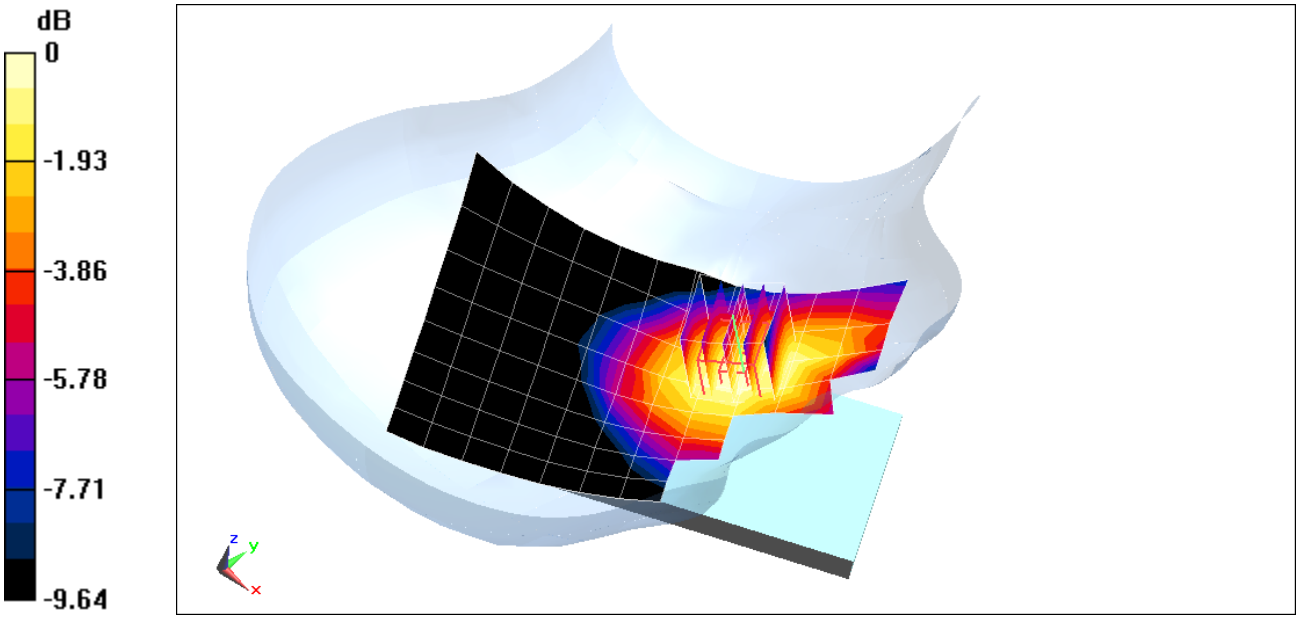
Communication System: UID 0, LTE Band 26 (Cell.); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
$f = 836.5$ MHz; $\sigma = 0.907$ S/m; $\varepsilon_r = 40.280$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 06-10-2015; Ambient Temp: 23.2°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3288; ConvF(6.51, 6.51, 6.51); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 26 (Cell.), Right Head, Cheek, 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 = 11.67 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.133 W/kg
SAR(1 g) = 0.107 W/kg



0 dB = 0.116 W/kg = -9.36 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

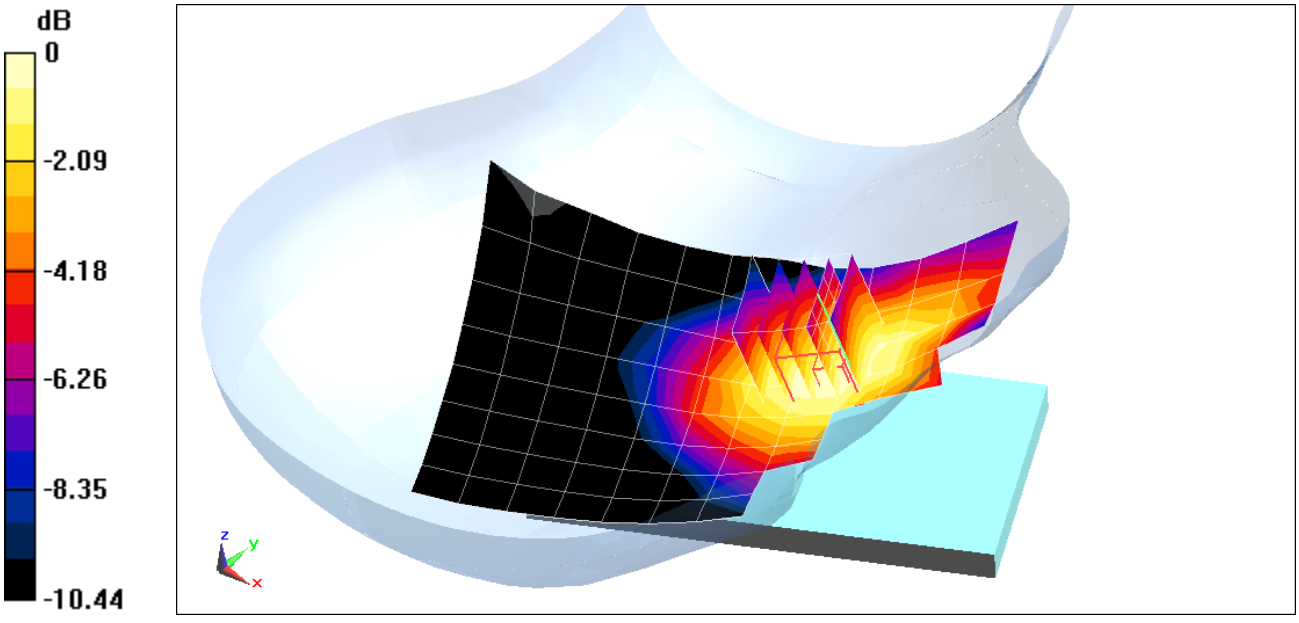
Communication System: UID 0, LTE Band 5 (Cell.); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
$f = 836.5$ MHz; $\sigma = 0.899$ S/m; $\varepsilon_r = 40.444$; $\rho = 1000$ kg/m^3
Phantom section: Right Section

Test Date: 06-08-2015; Ambient Temp: 22.3°C; Tissue Temp: 22.1°C

Probe: ES3DV3 - SN3288; ConvF(6.51, 6.51, 6.51); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 13.66 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 0.181 W/kg
SAR(1 g) = 0.146 W/kg



0 dB = 0.157 W/kg = -8.04 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7C924

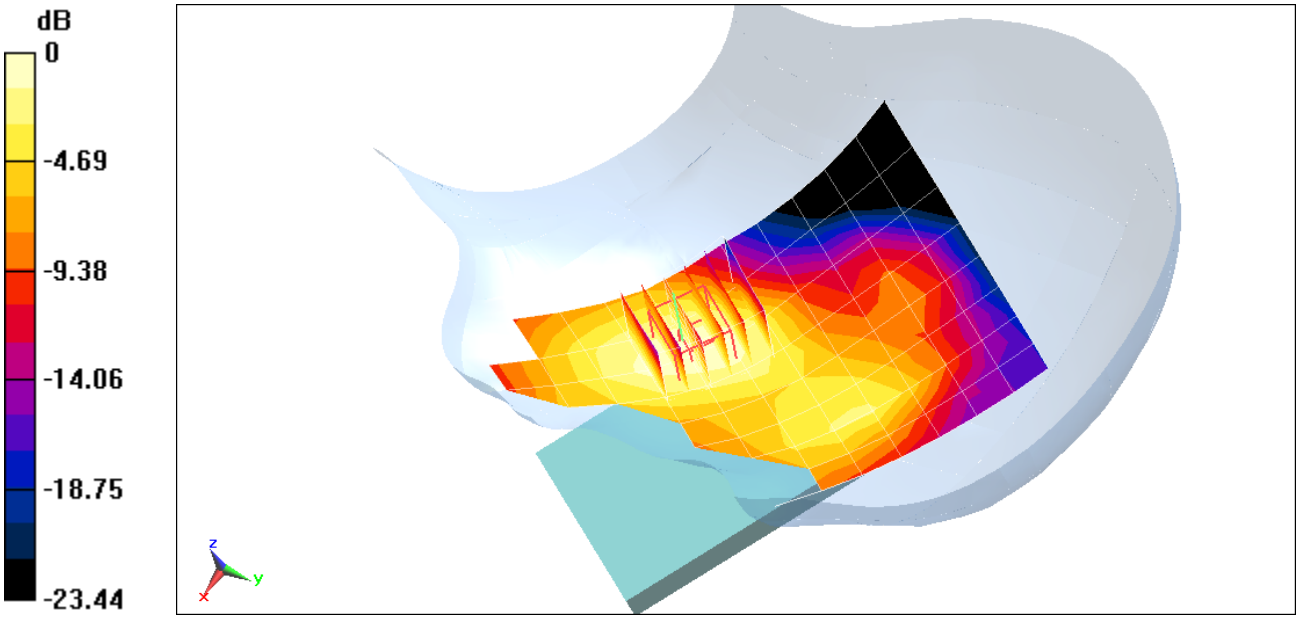
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.360$ S/m; $\varepsilon_r = 39.466$; $\rho = 1000$ kg/m^3
Phantom section: Left Section

Test Date: 06-06-2015; Ambient Temp: 21.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3263; ConvF(5.27, 5.27, 5.27); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.01 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 0.165 W/kg
SAR(1 g) = 0.114 W/kg



0 dB = 0.126 W/kg = -9.00 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

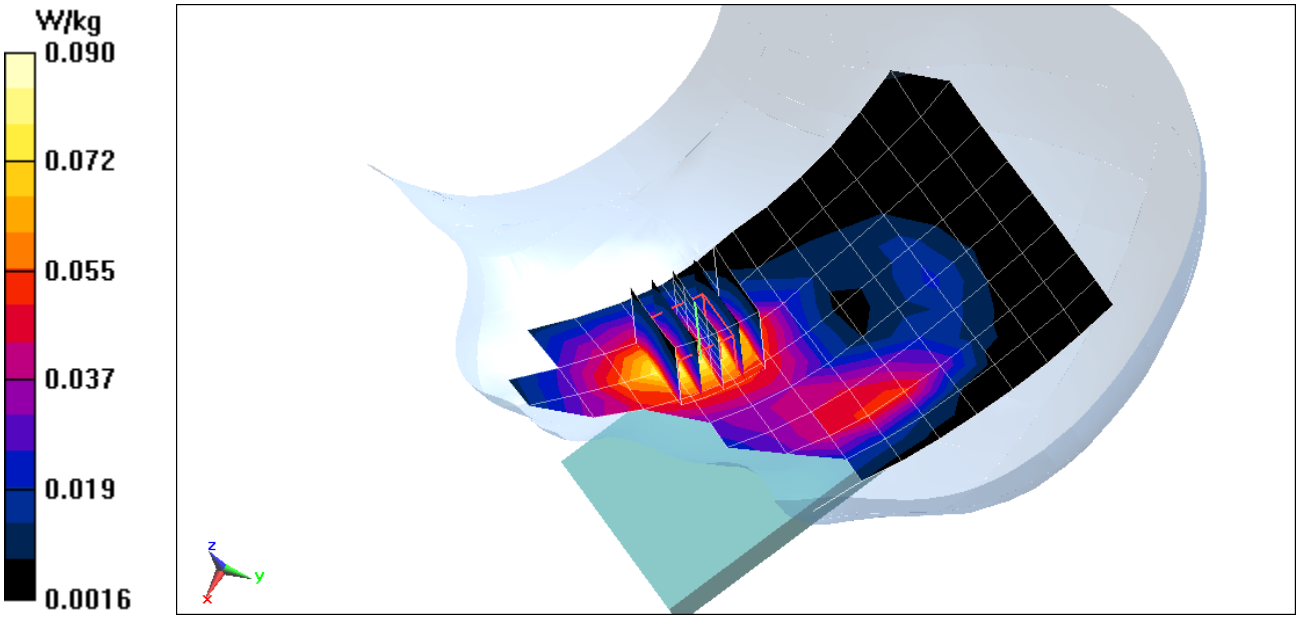
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.400 S/m; ε_r = 39.771; ρ = 1000 kg/m^3
Phantom section: Left Section

Test Date: 06-06-2015; Ambient Temp: 23.5°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3288; ConvF(5.17, 5.17, 5.17); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 2 (PCS), Left Head, Cheek, Low.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 = 7.995 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 0.119 W/kg
SAR(1 g) = 0.078 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEE8

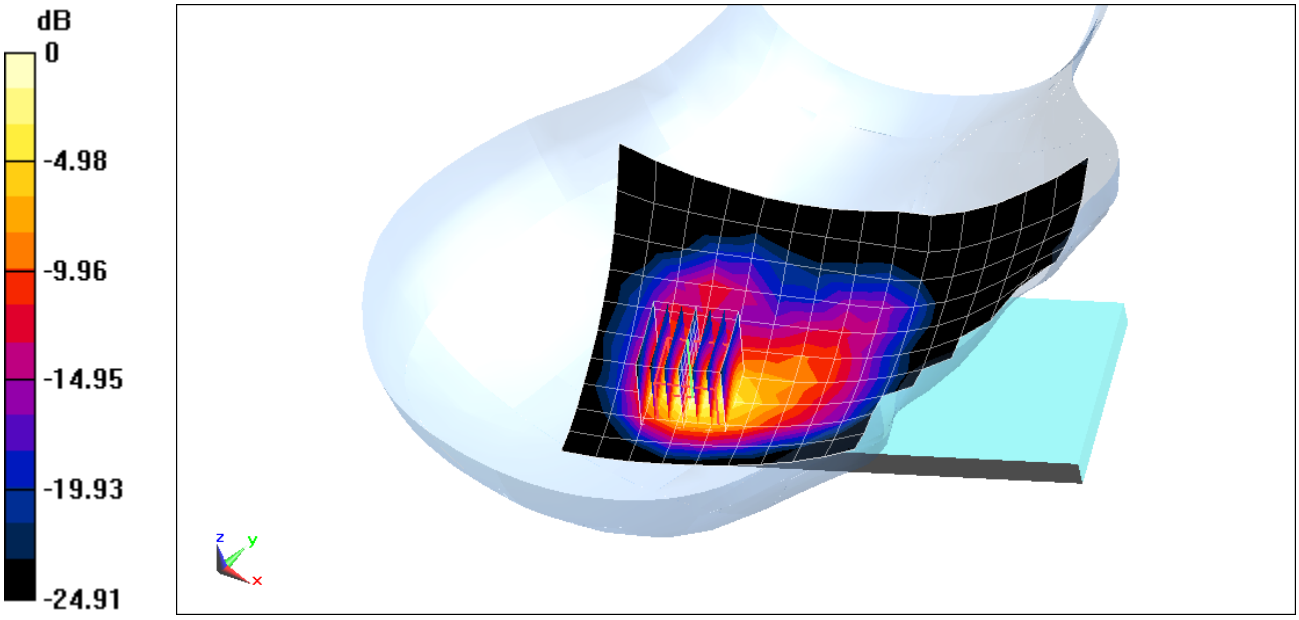
Communication System: UID 0, IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.844 S/m; ε_r = 39.050; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 06-05-2015; Ambient Temp: 22.9°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3318; ConvF(4.5, 4.5, 4.5); Calibrated: 1/23/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/14/2015
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, Ant. 1, 22 MHz Bandwidth, Right Head, Cheek, Ch 1, 1 Mbps

Area Scan (11x18x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.81 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 1.61 W/kg
SAR(1 g) = 0.644 W/kg



0 dB = 0.909 W/kg = -0.41 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7C924

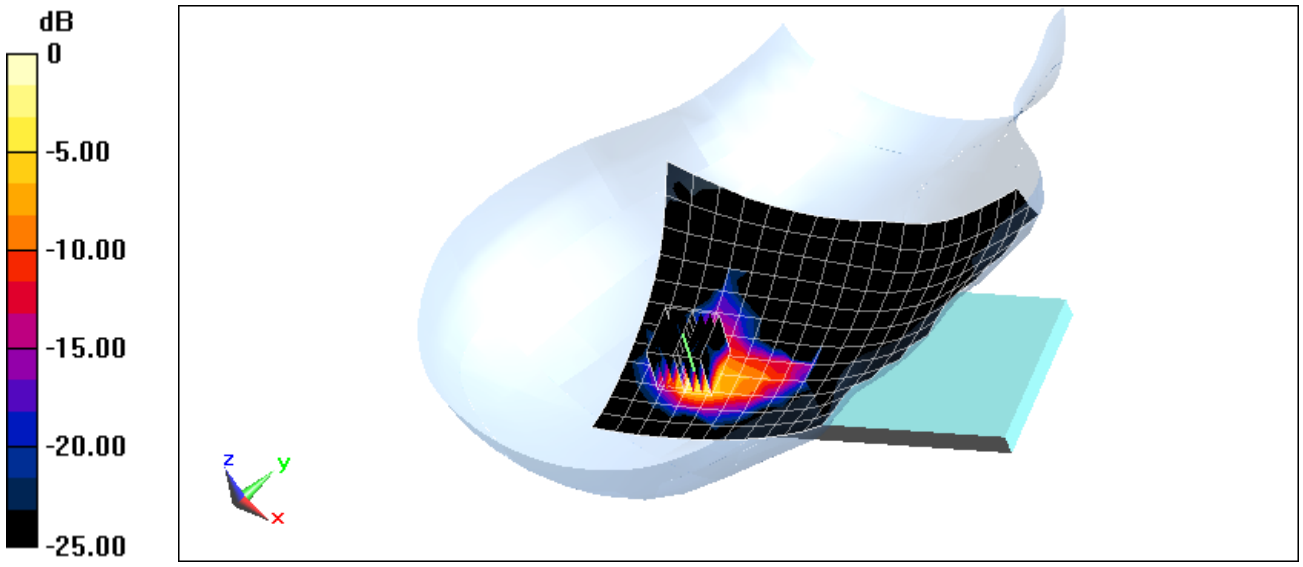
Communication System: UID 0, IEEE 802.11n; Frequency: 5710 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used (interpolated):
f = 5710 MHz; σ = 5.083 S/m; ε_r = 34.840; ρ = 1000 kg/m^3
Phantom section: Right Section

Test Date: 06-08-2015; Ambient Temp: 22.9°C; Tissue Temp: 20.1°C

Probe: EX3DV4 - SN7357; ConvF(4.41, 4.41, 4.41); Calibrated: 4/23/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/13/2015
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11n, Ant. 2, U-NII-2C, 40 MHz Bandwidth, Right Head, Cheek, Ch 142, 13.5 Mbps

Area Scan (11x9x1): 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 = 12.41 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 2.99 W/kg
SAR(1 g) = 0.677 W/kg



0 dB = 1.71 W/kg = 2.33 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

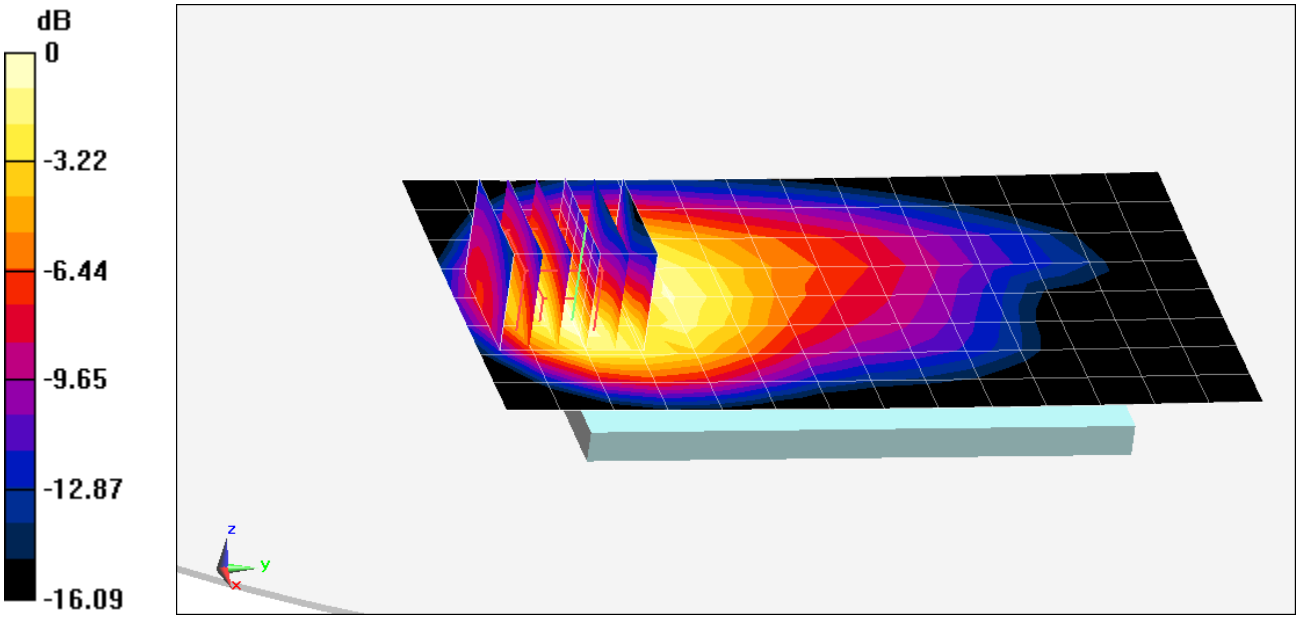
Communication System: UID 0, GSM; Frequency: 836.6 MHz; Duty Cycle: 1:8.3
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.983 S/m; ε_r = 54.047; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-10-2015; Ambient Temp: 23.3°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(6.32, 6.32, 6.32); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.91 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.799 W/kg
SAR(1 g) = 0.454 W/kg



0 dB = 0.531 W/kg = -2.75 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

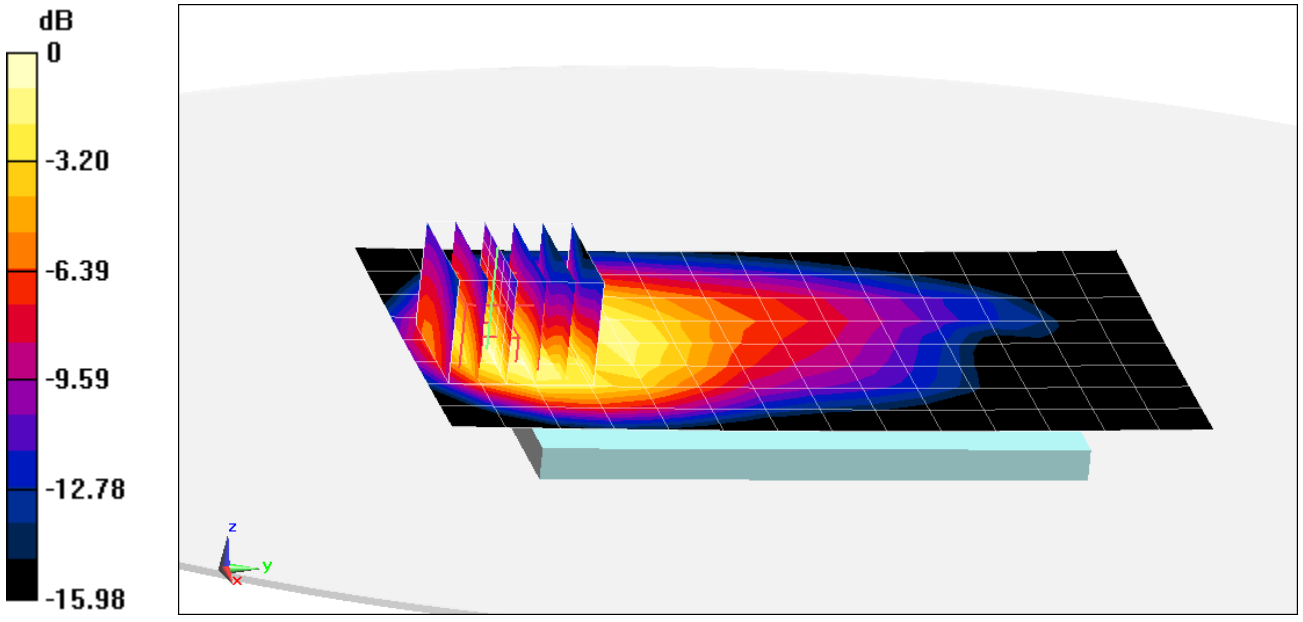
Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.076
Medium: 835 Body Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 0.983$ S/m; $\varepsilon_r = 54.047$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-10-2015; Ambient Temp: 23.3°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(6.32, 6.32, 6.32); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 850, Body SAR, Back side, Mid.ch, 4 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 = 21.43 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.815 W/kg
SAR(1 g) = 0.466 W/kg



0 dB = 0.563 W/kg = -2.49 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

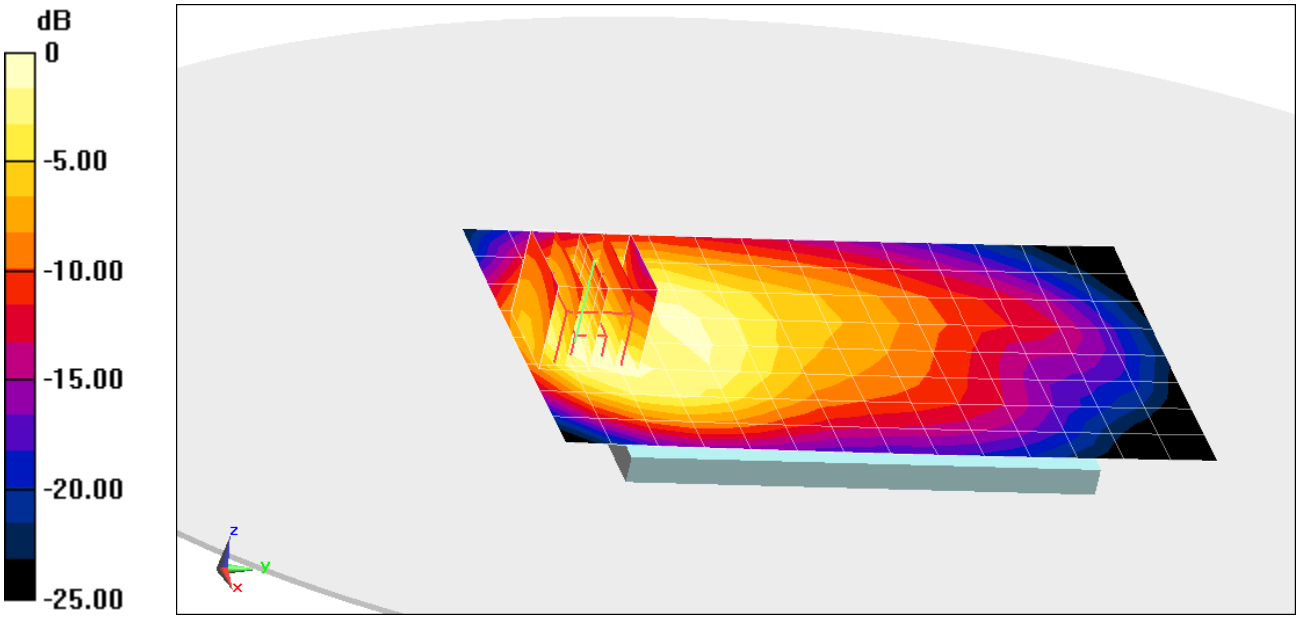
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
$f = 836.6$ MHz; $\sigma = 1.020$ S/m; $\varepsilon_r = 54.986$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-04-2015; Ambient Temp: 22.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/20/2015
Phantom: ELI Left v6.0; Type: QDOVA003AA; Serial: TP-1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: UMTS 850, 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 = 17.92 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.604 W/kg
SAR(1 g) = 0.362 W/kg



0 dB = 0.426 W/kg = -3.71 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

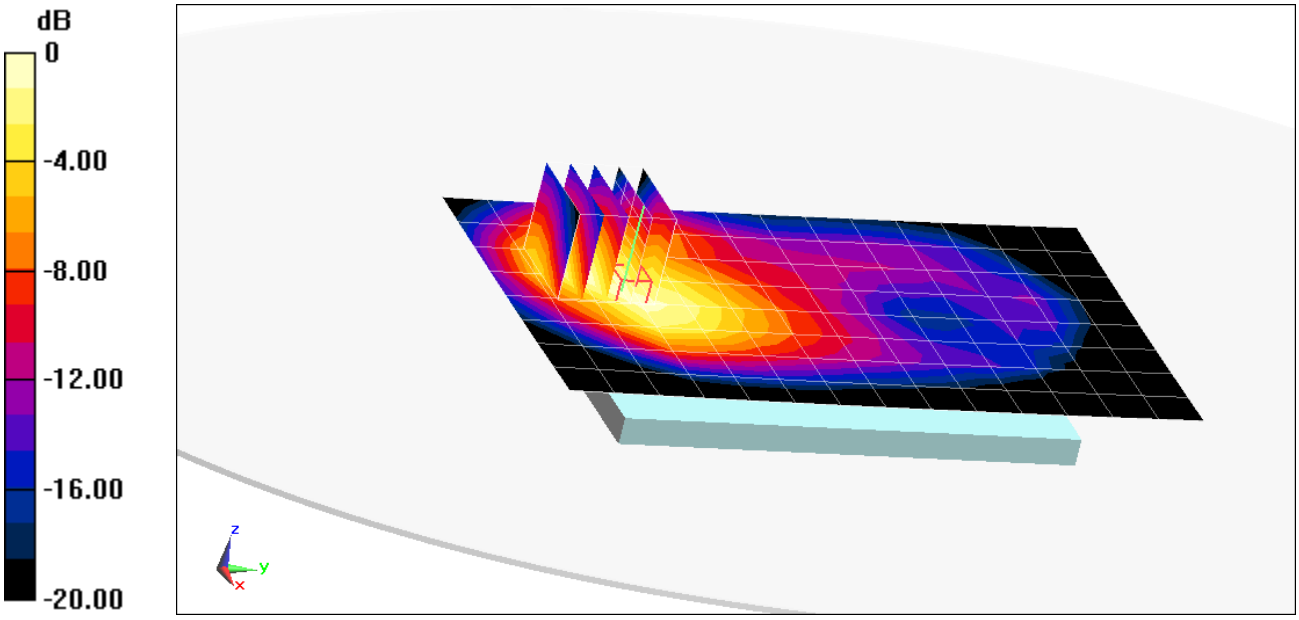
Communication System: UID 0, GSM; Frequency: 1880 MHz; Duty Cycle: 1:8.3
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.533 S/m; ε_r = 53.346; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-06-2015; Ambient Temp: 20.7°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3319; ConvF(4.53, 4.53, 4.53); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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 = 17.05 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.692 W/kg
SAR(1 g) = 0.439 W/kg



0 dB = 0.534 W/kg = -2.72 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7C924

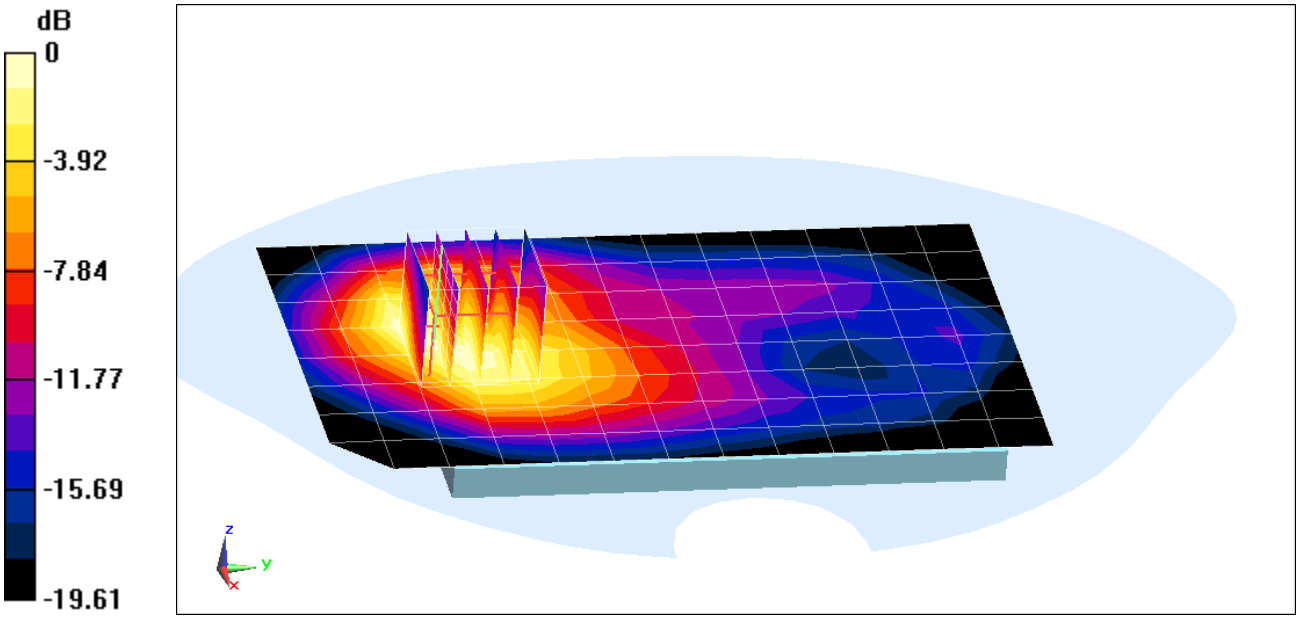
Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.76
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.535 S/m; ε_r = 51.709; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-08-2015; Ambient Temp: 21.0°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3263; ConvF(4.66, 4.66, 4.66); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 3 Tx Slots

Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 21.09 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.978 W/kg
SAR(1 g) = 0.562 W/kg



0 dB = 0.699 W/kg = -1.56 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

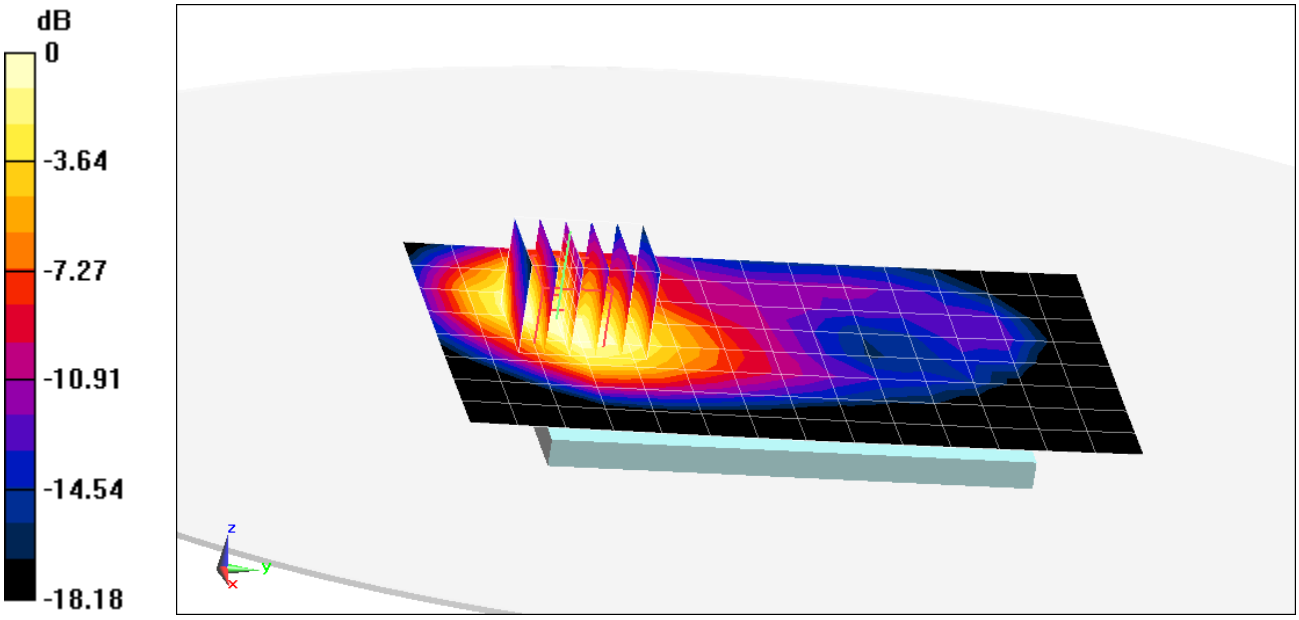
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.533 S/m; ε_r = 53.346; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-06-2015; Ambient Temp: 20.7°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3319; ConvF(4.53, 4.53, 4.53); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: UMTS 1900, 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 = 20.55 V/m; Power Drift = 0.07 dB
Peak SAR (extrapolated) = 1.03 W/kg
SAR(1 g) = 0.642 W/kg



0 dB = 0.752 W/kg = -1.24 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

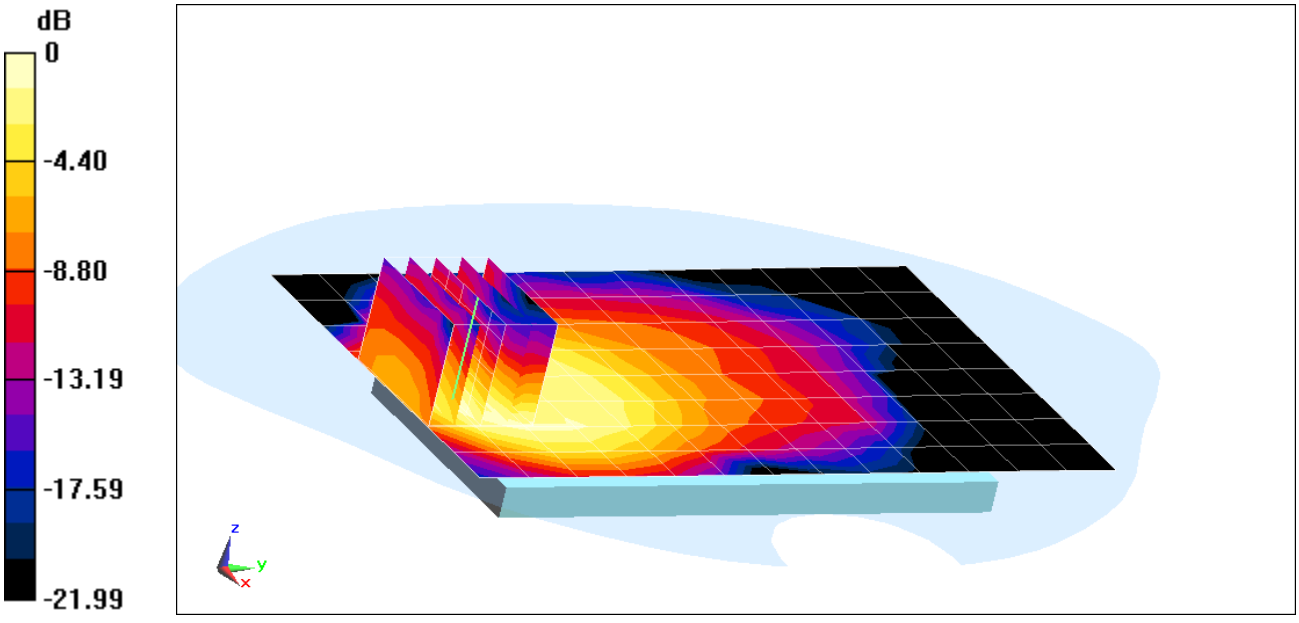
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
$f = 707.5$ MHz; $\sigma = 0.940$ S/m; $\varepsilon_r = 55.974$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-08-2015; Ambient Temp: 22.3°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3263; ConvF(6.07, 6.07, 6.07); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 12, Body SAR, Back side, Mid.ch
10 MHz Bandwidth, QPSK, 1 RB, 0 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 = 3.975 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.0270 W/kg
SAR(1 g) = 0.015 W/kg



0 dB = 0.0172 W/kg = -17.64 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

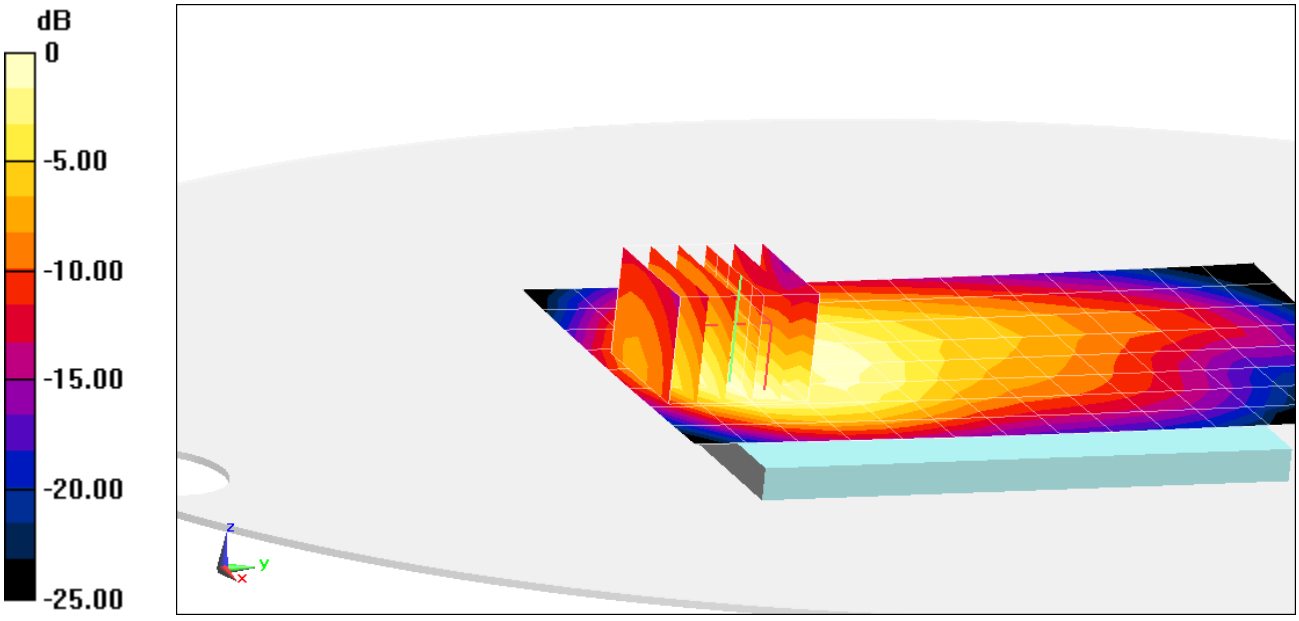
Communication System: UID 0, LTE Band 26 (Cell.); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
$f = 836.5$ MHz; $\sigma = 0.983$ S/m; $\varepsilon_r = 54.048$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-10-2015; Ambient Temp: 23.3°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(6.32, 6.32, 6.32); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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 (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 19.44 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.558 W/kg
SAR(1 g) = 0.333 W/kg



0 dB = 0.402 W/kg = -3.96 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7C924

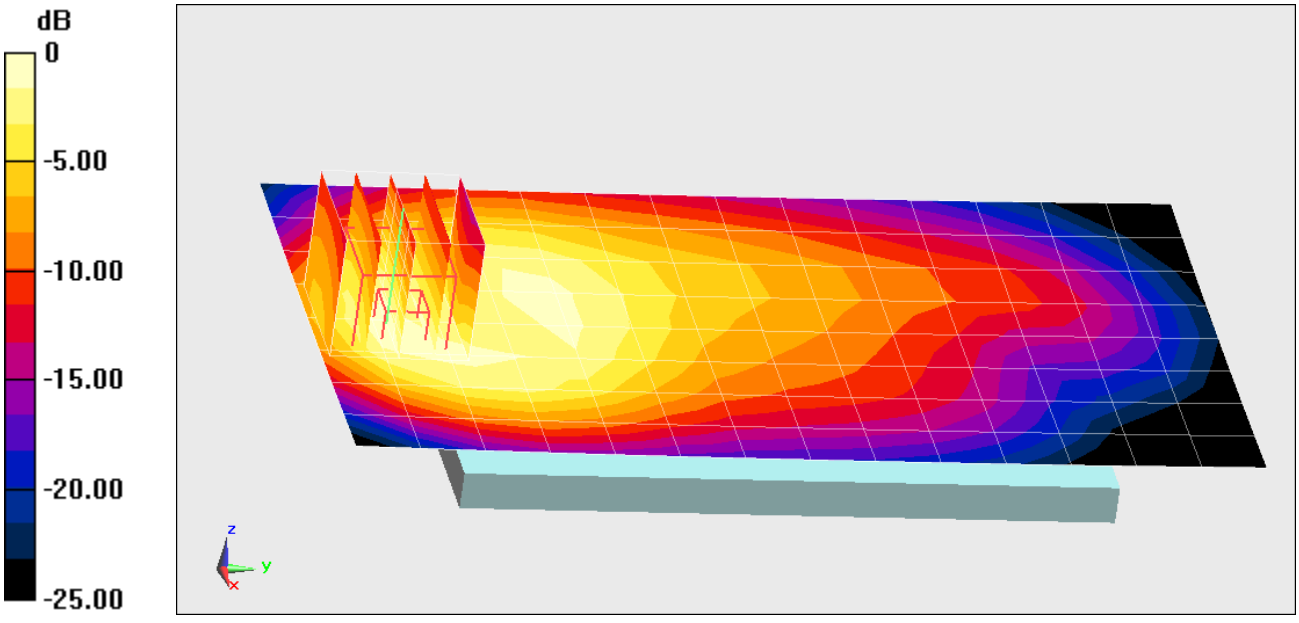
Communication System: UID 0, LTE Band 5 (Cell.); Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
$f = 836.5$ MHz; $\sigma = 1.020$ S/m; $\varepsilon_r = 54.987$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-04-2015; Ambient Temp: 22.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/20/2015
Phantom: ELI Left v6.0; Type: QDOVA003AA; Serial: TP-1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.07 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 1.09 W/kg
SAR(1 g) = 0.658 W/kg



0 dB = 0.765 W/kg = -1.16 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7C924

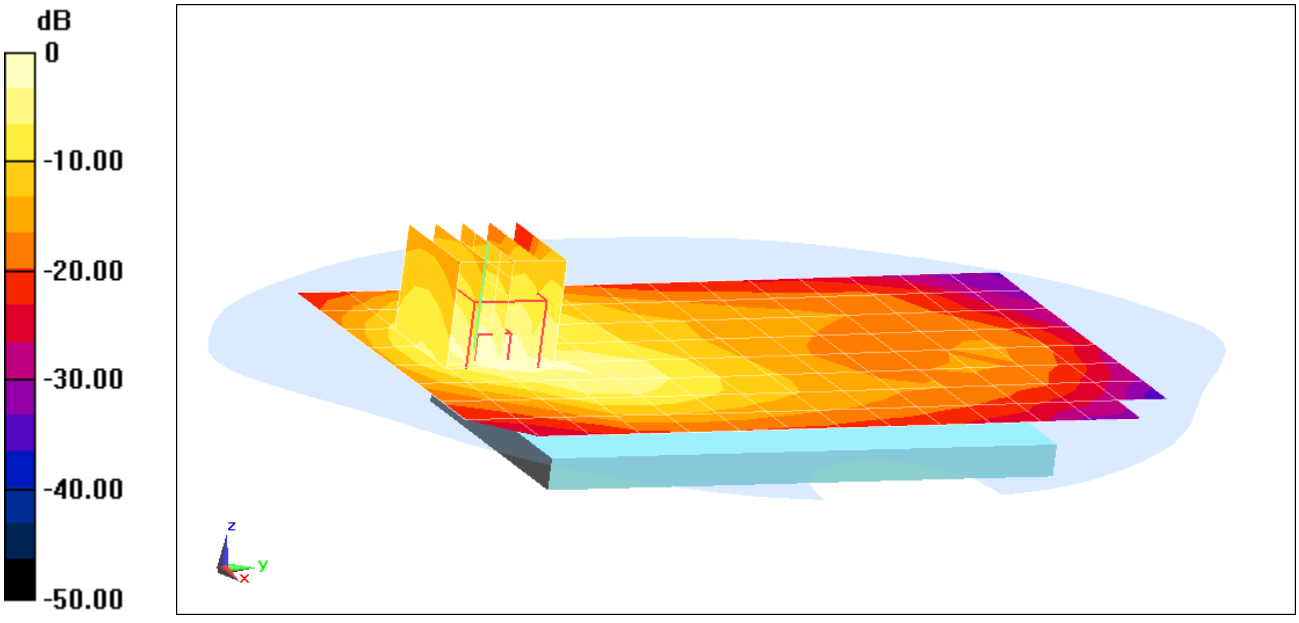
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
$f = 1732.5$ MHz; $\sigma = 1.466$ S/m; $\varepsilon_r = 51.772$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-04-2015; Ambient Temp: 21.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3263; ConvF(4.88, 4.88, 4.88); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2015
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 4 (AWS), Body SAR, Back side, Mid.ch
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 = 27.92 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 1.75 W/kg
SAR(1 g) = 1.00 W/kg



0 dB = 1.24 W/kg = 0.93 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

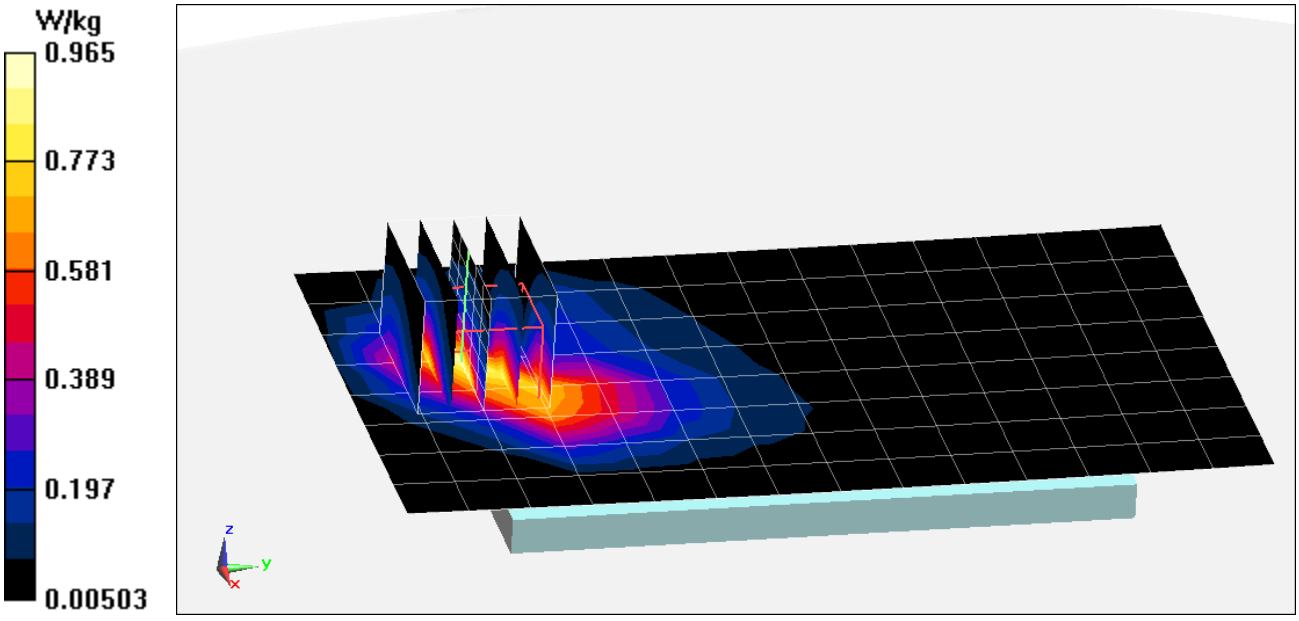
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.511 S/m; ε_r = 53.382; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-06-2015; Ambient Temp: 20.7°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3319; ConvF(4.53, 4.53, 4.53); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 2 (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 (6x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.71 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 1.40 W/kg
SAR(1 g) = 0.807 W/kg



DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEBF

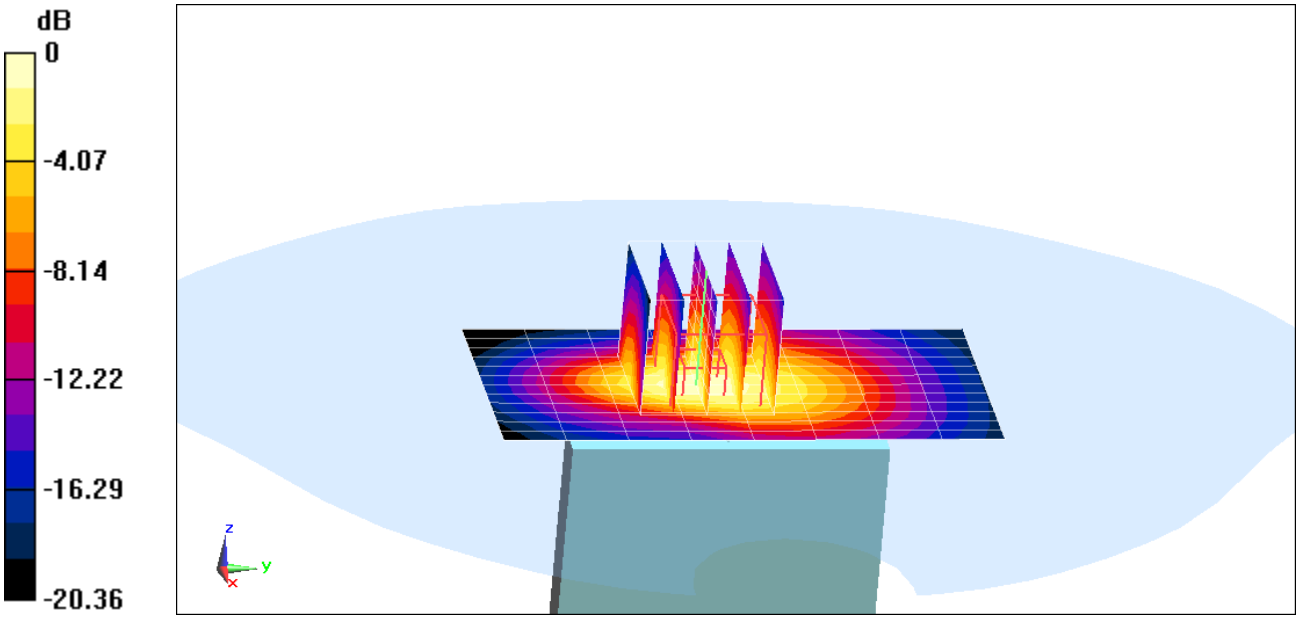
Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.559 S/m; ε_r = 51.641; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-08-2015; Ambient Temp: 21.0°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3263; ConvF(4.66, 4.66, 4.66); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 2 (PCS), Body SAR, Bottom Edge, High.ch
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

Area Scan (13x9x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 27.36 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.69 W/kg
SAR(1 g) = 0.978 W/kg



0 dB = 1.24 W/kg = 0.93 dBW/kg

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEE8

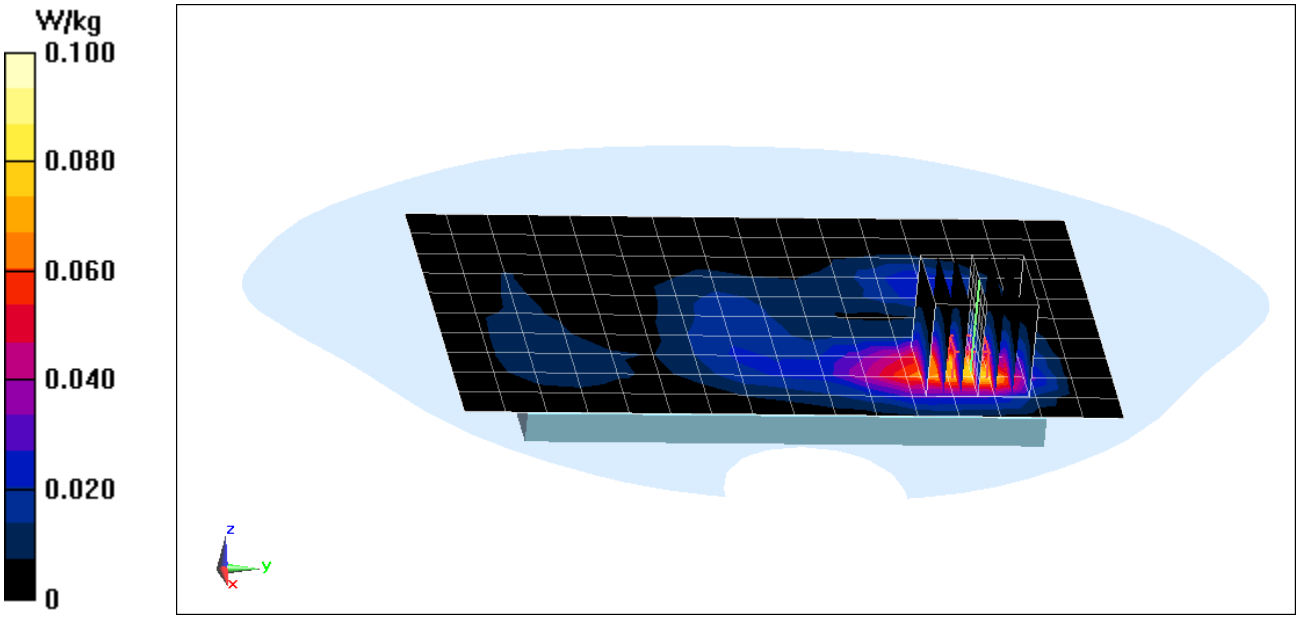
Communication System: UID 0, IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.957 S/m; ε_r = 50.605; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-03-2015; Ambient Temp: 21.1°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(4.12, 4.12, 4.12); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/13/2015
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, Ant. 1, 22 MHz Bandwidth, Body SAR, Back Side, Ch 01, 1 Mbps

Area Scan (11x17x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 5.527 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.107 W/kg
SAR(1 g) = 0.0575 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEE8

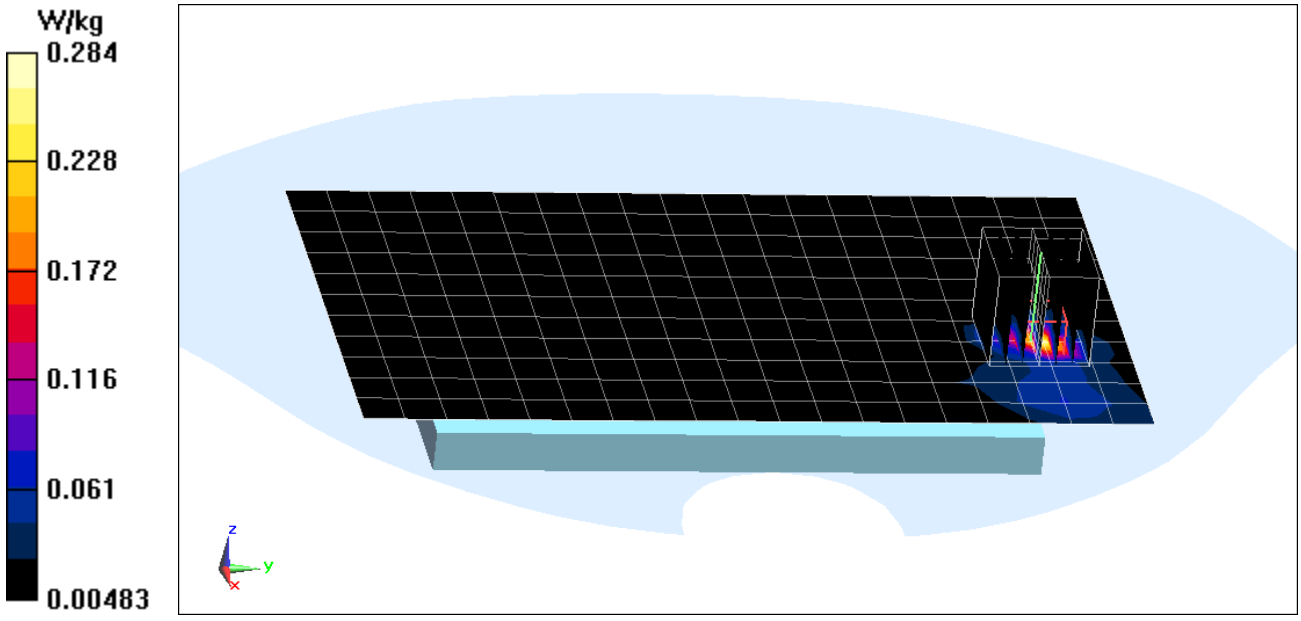
Communication System: UID 0, IEEE 802.11n; Frequency: 5310 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5310 MHz; σ = 5.259 S/m; ε_r = 48.073; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-03-2015; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(3.79, 3.79, 3.79); Calibrated: 1/22/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11n, Ant. 2, U-NII-2A, 40 MHz Bandwidth, Body SAR
Back Side, Ch 62, 13.5 Mbps

Area Scan (12x20x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 4.942 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 1.16 W/kg
SAR(1 g) = 0.108 W/kg



DUT: A3LSMN920F; Type: Portable Handset; Serial: 7CEE8

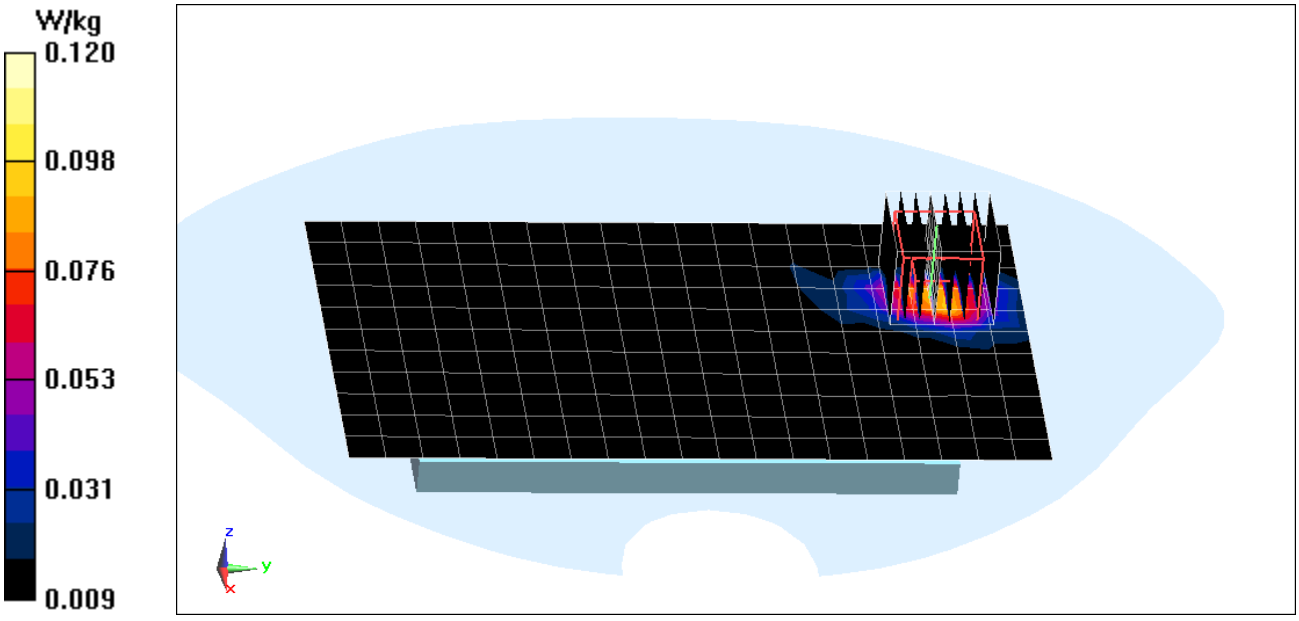
Communication System: UID 0, IEEE 802.11n; Frequency: 5755 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5755 MHz; σ = 5.838 S/m; ε_r = 47.396; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-03-2015; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(3.79, 3.79, 3.79); Calibrated: 1/22/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11n, Ant. 2, U-NII-3, 40 MHz Bandwidth, Body SAR
Front Side, Ch 151, 13.5 Mbps

Area Scan (12x20x1): 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 = 2.442 V/m; Power Drift = 0.10 dB
Peak SAR (extrapolated) = 0.317 W/kg
SAR(1 g) = 0.042 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMN920F; Type: Portable Handset; Serial: 7C924

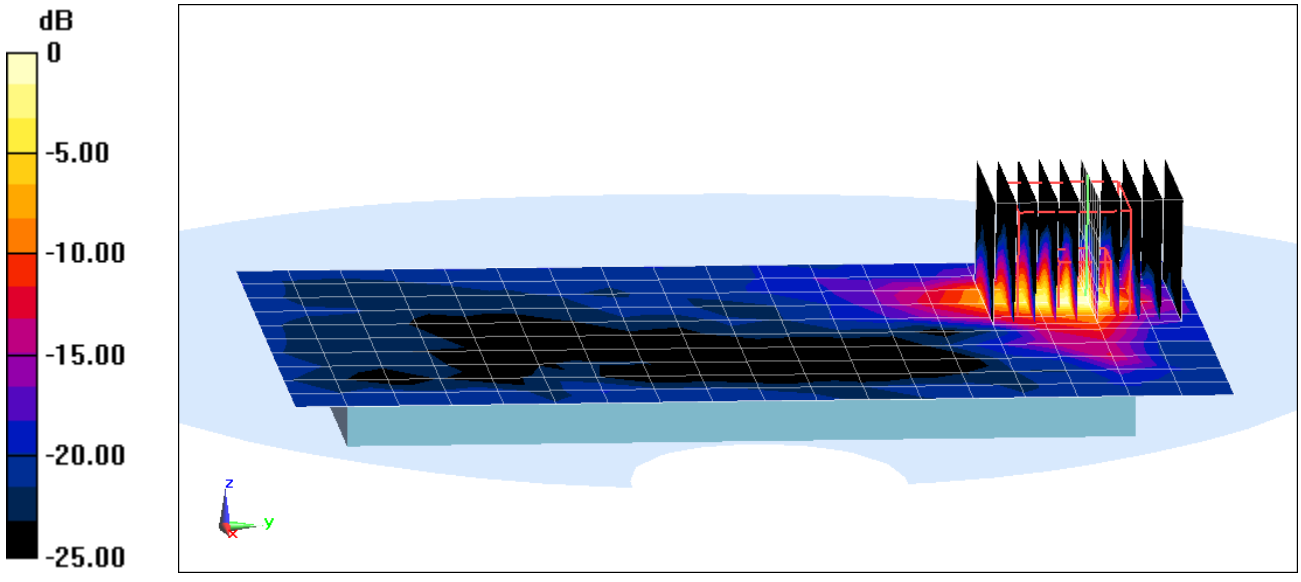
Communication System: UID 0, IEEE 802.11n; Frequency: 5710 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used (interpolated):
f = 5710 MHz; σ = 6.019 S/m; ε_r = 47.66; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 0.0 cm

Test Date: 06-11-2015; Ambient Temp: 22.6°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3589; ConvF(3.79, 3.79, 3.79); Calibrated: 1/22/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11n, Ant. 2, U-NII-2C, 40 MHz Bandwidth, Extremity SAR Front Side, Ch 142, 13.5 Mbps

Area Scan (11x19x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (9x10x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Reference Value = 16.65 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 7.02 W/kg
SAR(10 g) = 0.330 W/kg



0 dB = 3.58 W/kg = 5.54 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

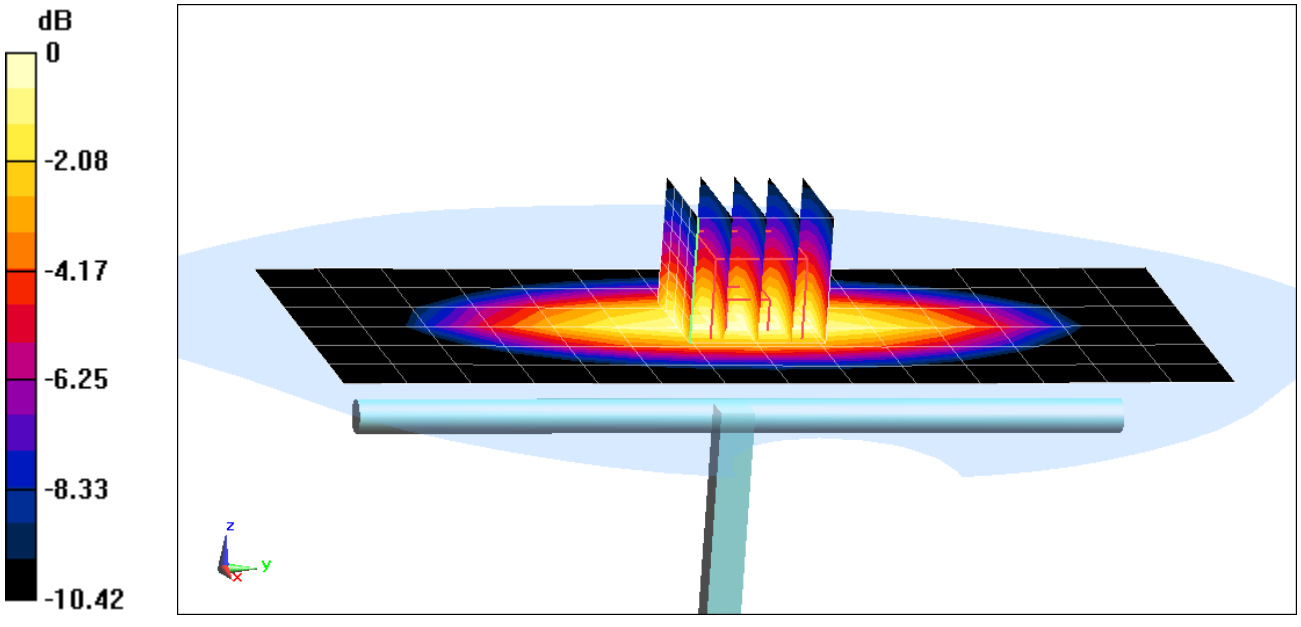
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
$f = 750$ MHz; $\sigma = 0.902$ S/m; $\varepsilon_r = 42.571$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-05-2015; Ambient Temp: 23.3°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3318; ConvF(6.58, 6.58, 6.58); Calibrated: 1/23/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/14/2015
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 1.23 W/kg
SAR(1 g) = 0.832 W/kg
Deviation = 2.84%



0 dB = 0.974 W/kg = -0.11 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

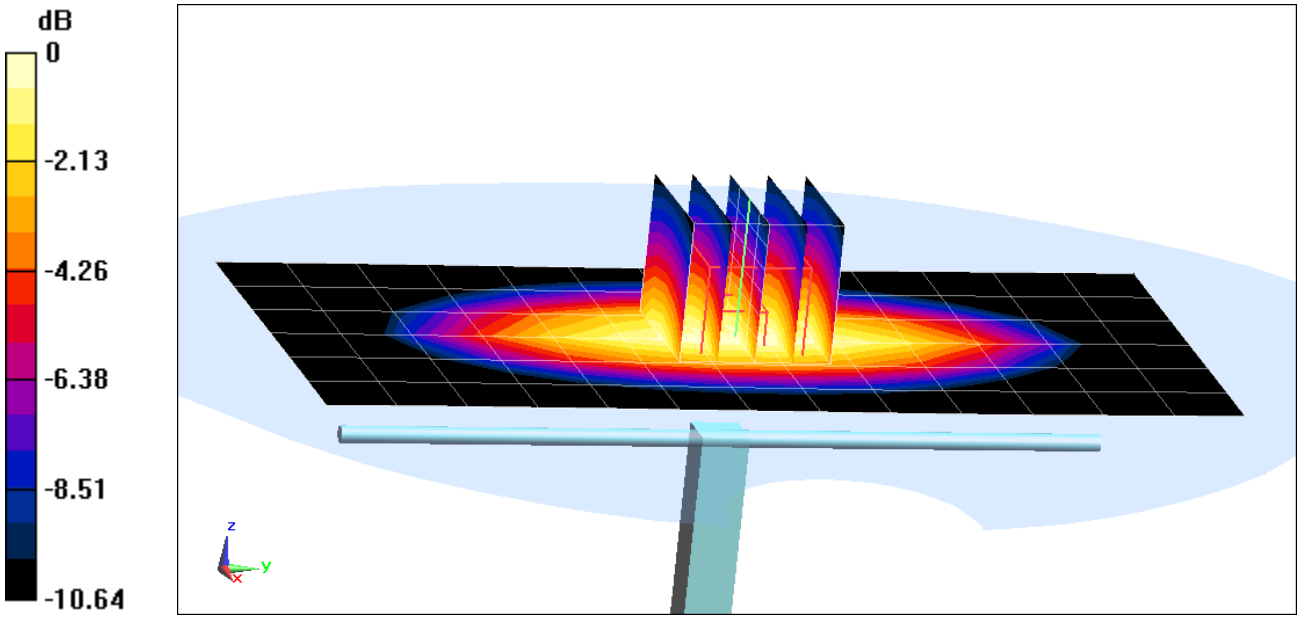
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.906 S/m; ε_r = 40.302; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-10-2015; Ambient Temp: 23.2°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3288; ConvF(6.51, 6.51, 6.51); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 23 dBm (200 mW)
Peak SAR (extrapolated) = 2.92 W/kg
SAR(1 g) = 1.95 W/kg
Deviation = 5.98%



0 dB = 2.29 W/kg = 3.60 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

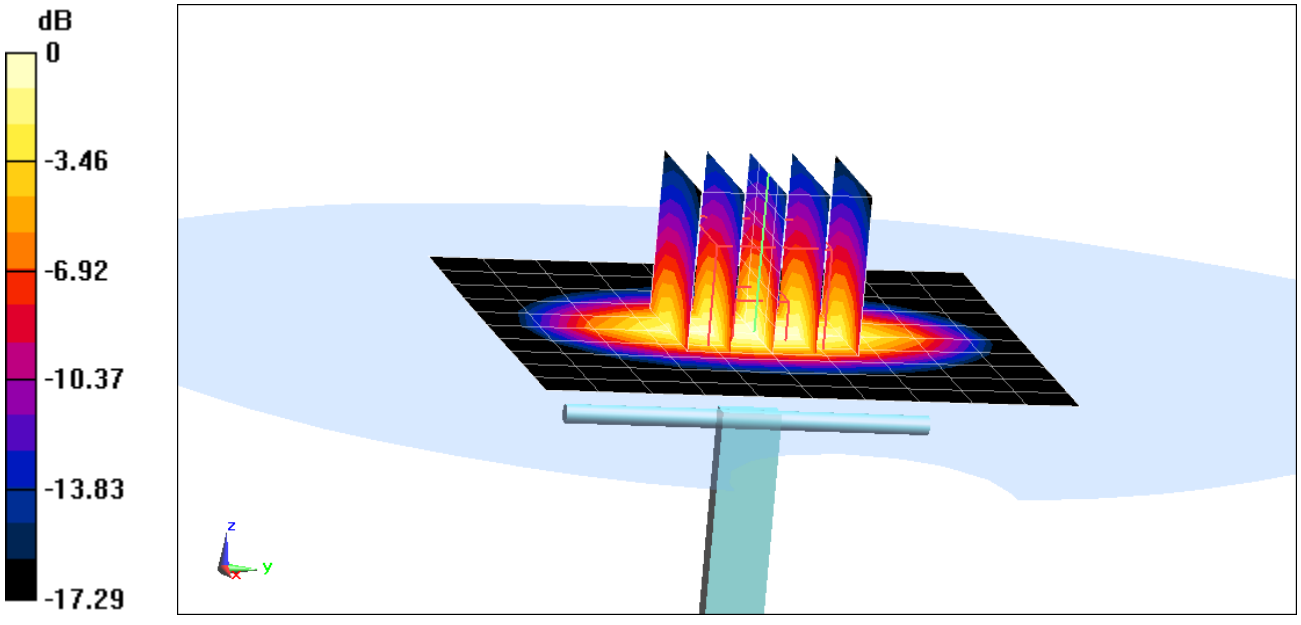
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used:
f = 1750 MHz; σ = 1.378 S/m; ε_r = 39.382; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-06-2015; Ambient Temp: 21.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3263; ConvF(5.27, 5.27, 5.27); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification

Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 6.60 W/kg
SAR(1 g) = 3.67 W/kg
Deviation = 1.38%



0 dB = 4.62 W/kg = 6.65 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d141

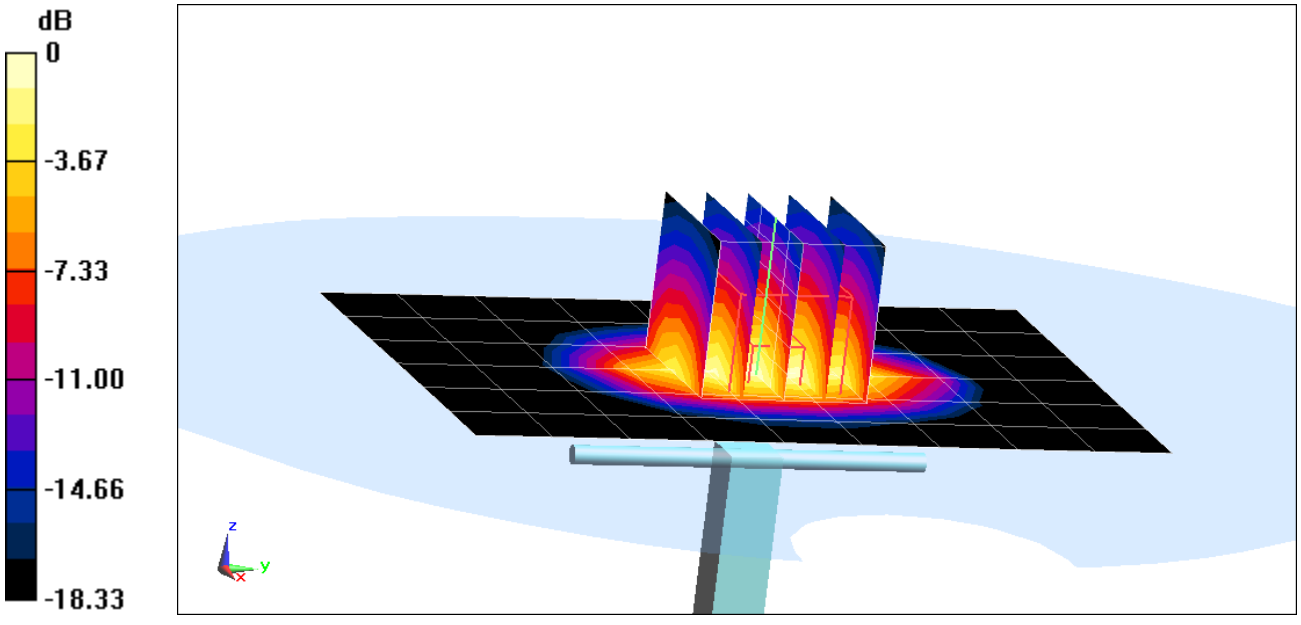
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.440 S/m; ε_r = 39.581; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-06-2015; Ambient Temp: 23.5°C; Tissue Temp: 22.7°C

Probe: ES3DV3 - SN3288; ConvF(5.17, 5.17, 5.17); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1797
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 7.06 W/kg
SAR(1 g) = 3.81 W/kg
Deviation = -4.51%



0 dB = 4.85 W/kg = 6.86 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

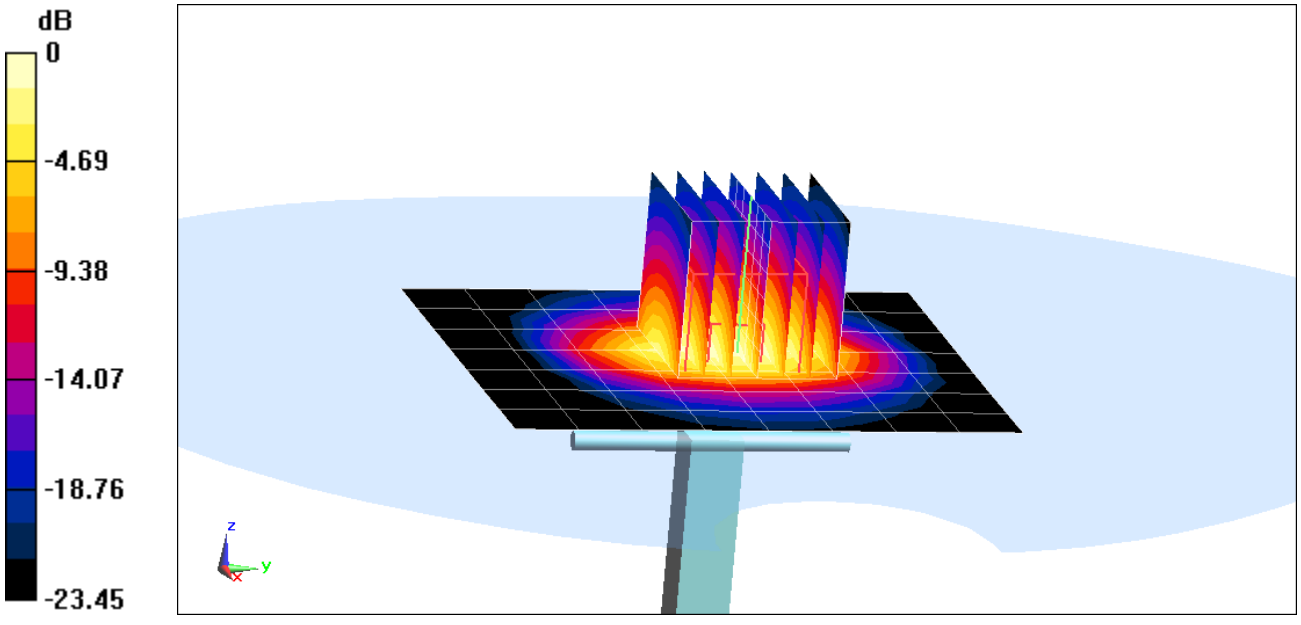
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.887 S/m; ε_r = 38.883; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-05-2015; Ambient Temp: 22.9°C; Tissue Temp: 22.2°C

Probe: ES3DV3 - SN3318; ConvF(4.5, 4.5, 4.5); Calibrated: 1/23/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/14/2015
Phantom: SAM Front; Type: SAM; Serial: 1686
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 10.9 W/kg
SAR(1 g) = 5.12 W/kg
Deviation = -1.73%



0 dB = 6.78 W/kg = 8.31 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1057

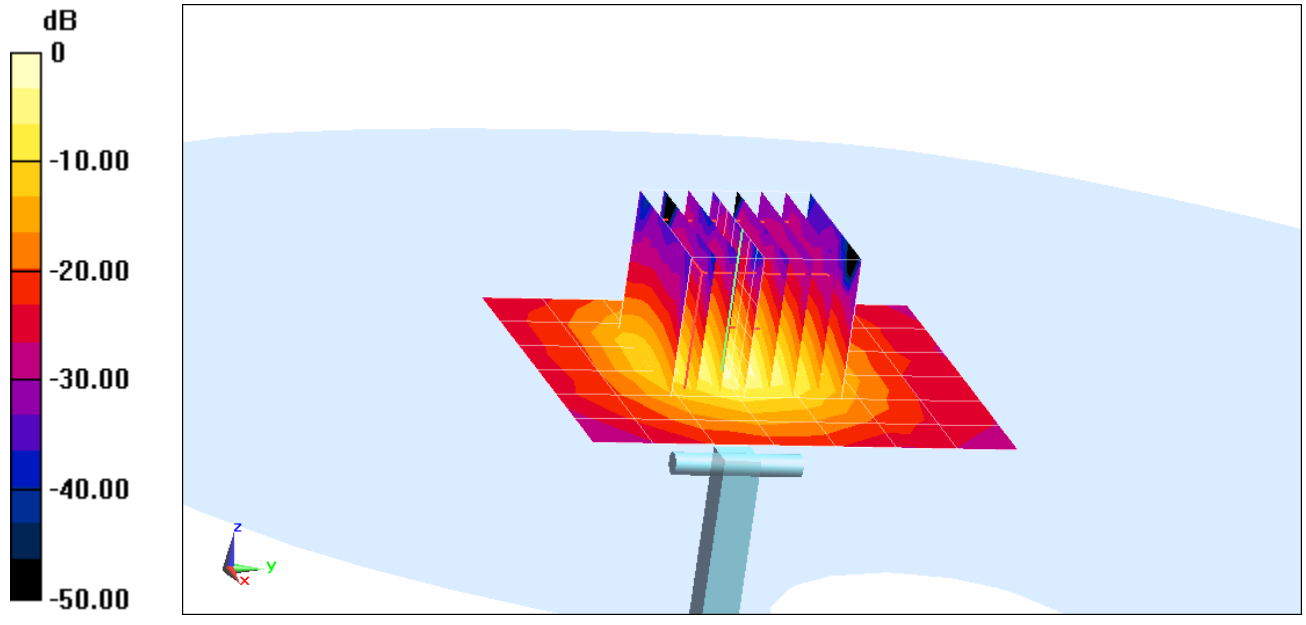
Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5300 MHz; σ = 4.607 S/m; ε_r = 35.501; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-08-2015; Ambient Temp: 21.9°C; Tissue Temp: 20.1°C

Probe: EX3DV4 - SN7357; ConvF(4.93, 4.93, 4.93); Calibrated: 4/23/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/13/2015
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 17 dBm (50 mW)
Peak SAR (extrapolated) = 16.5 W/kg
SAR(1 g) = 4.02 W/kg
Deviation = -5.08%



0 dB = 9.47 W/kg = 9.76 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057

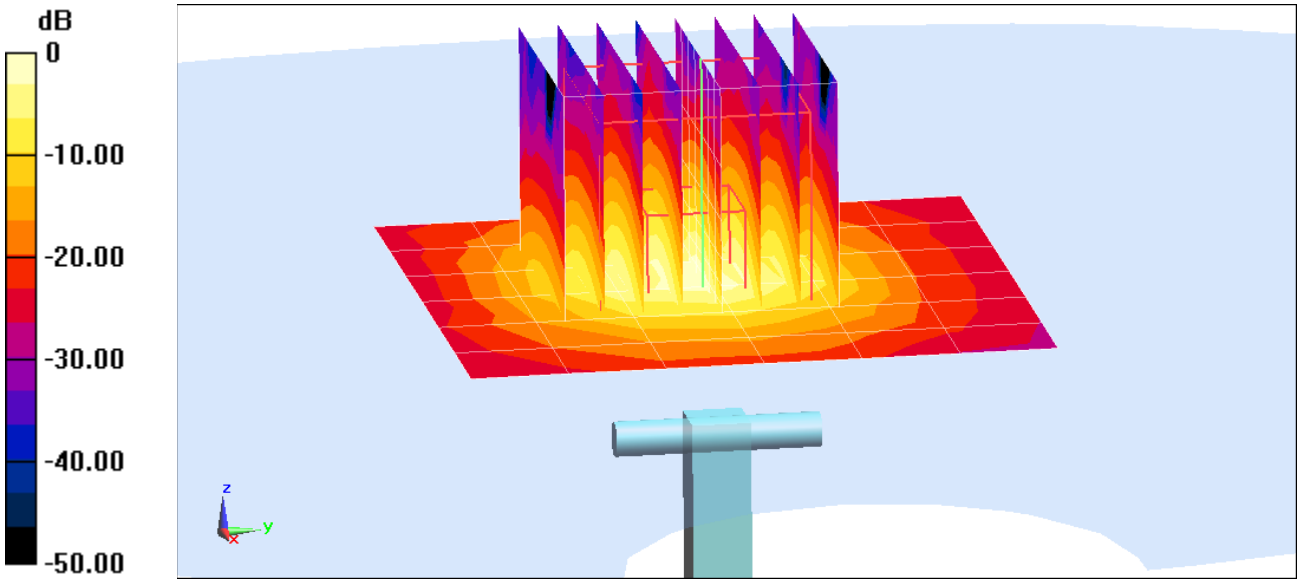
Communication System: UID 0, CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5500 MHz; σ = 4.860 S/m; ε_r = 35.279; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 06-08-2015; Ambient Temp: 22.5°C; Tissue Temp: 20.1°C

Probe: EX3DV4 - SN7357; ConvF(4.7, 4.7, 4.7); Calibrated: 4/23/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/13/2015
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5500 MHz System Verification

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
Input Power = 17 dBm (50 mW)
Peak SAR (extrapolated) = 18.8 W/kg
SAR(1 g) = 4.4 W/kg
Deviation = 4.39%



0 dB = 10.5 W/kg = 10.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1057

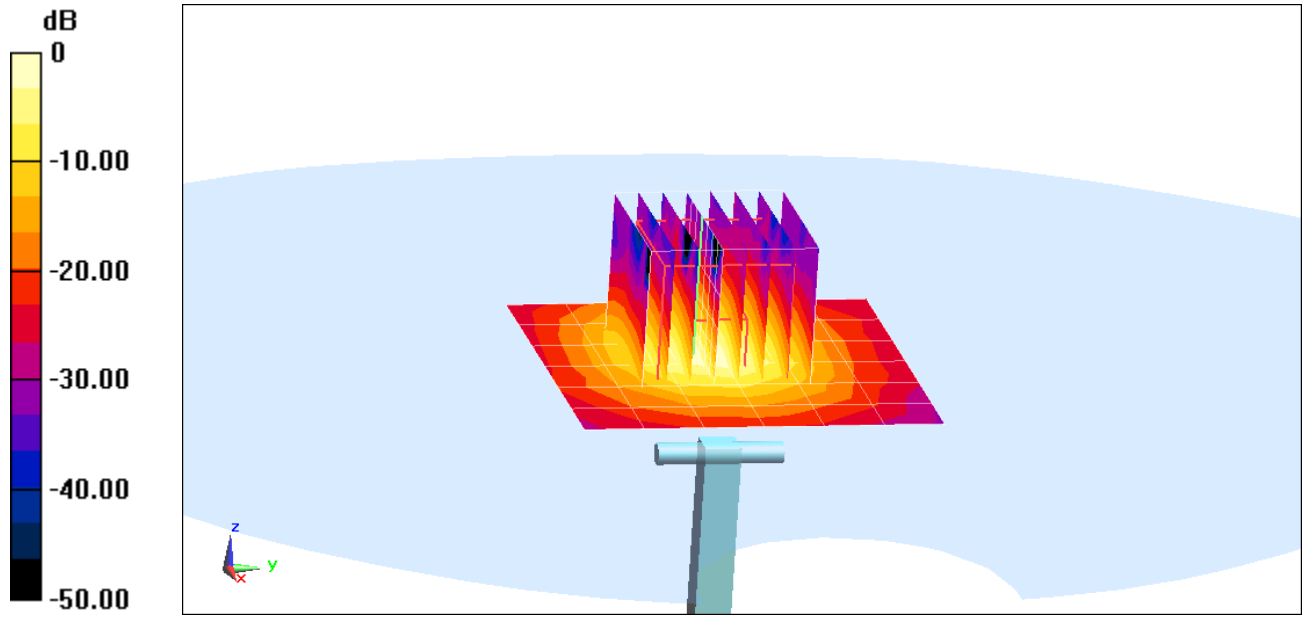
Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: 5 GHz Head Medium parameters used:
f = 5800 MHz; σ = 5.164 S/m; ε_r = 34.752; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-08-2015; Ambient Temp: 22.9°C; Tissue Temp: 20.1°C

Probe: EX3DV4 - SN7357; ConvF(4.41, 4.41, 4.41); Calibrated: 4/23/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/13/2015
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5800 MHz System Verification

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
Input Power = 17 dBm (50 mW)
Peak SAR (extrapolated) = 18.0 W/kg
SAR(1 g) = 4.06 W/kg
Deviation = 0.12%



0 dB = 9.82 W/kg = 9.92 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

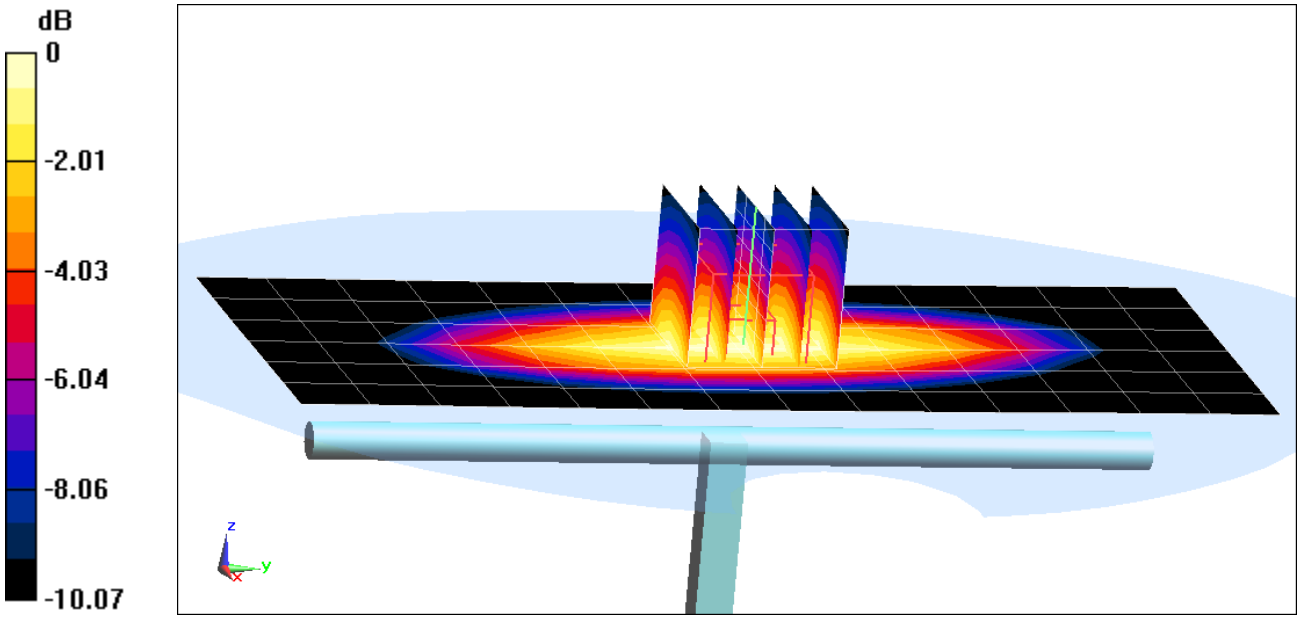
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.980 S/m; ε_r = 55.598; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-08-2015; Ambient Temp: 22.3°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3263; ConvF(6.07, 6.07, 6.07); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

750 MHz System Verification

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 23 dBm (200 mW)
Peak SAR (extrapolated) = 2.63 W/kg
SAR(1 g) = 1.81 W/kg
Deviation = 6.10%



0 dB = 2.11 W/kg = 3.24 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

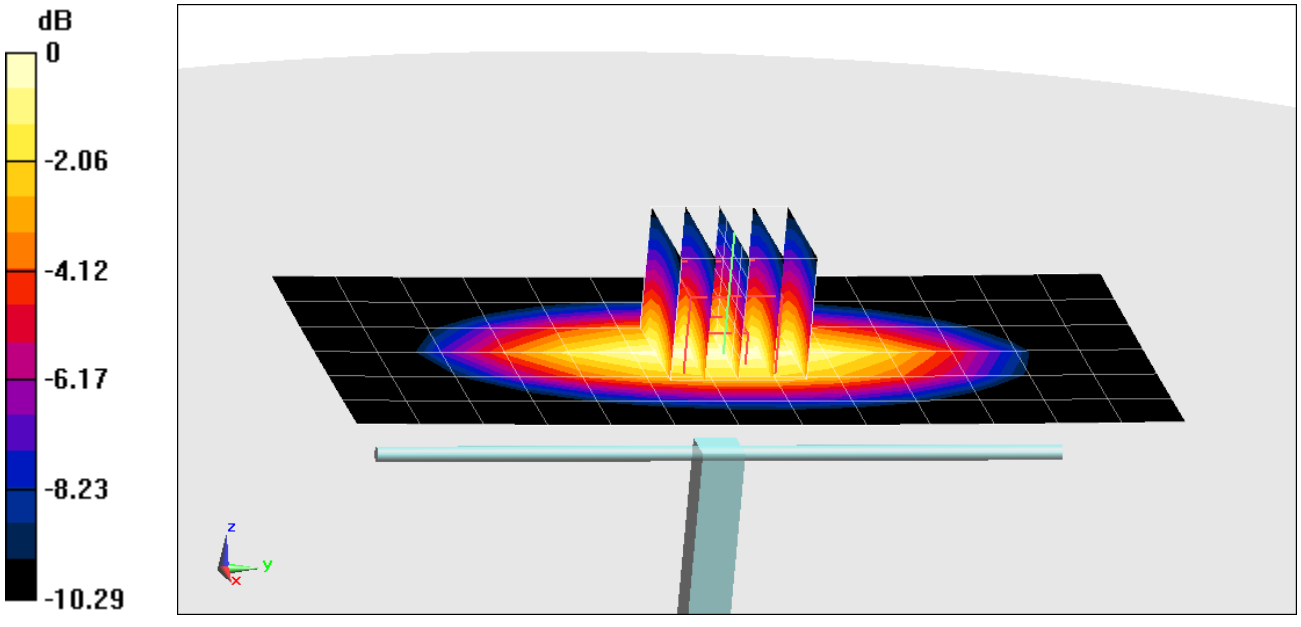
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 1.018 S/m; ε_r = 55.002; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-04-2015; Ambient Temp: 22.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3213; ConvF(6.07, 6.07, 6.07); Calibrated: 1/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/20/2015
Phantom: ELI Left v6.0; Type: QDOVA003AA; Serial: TP-1202
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 1.28 W/kg
SAR(1 g) = 0.883 W/kg
Deviation = -5.56%



0 dB = 1.03 W/kg = 0.13 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

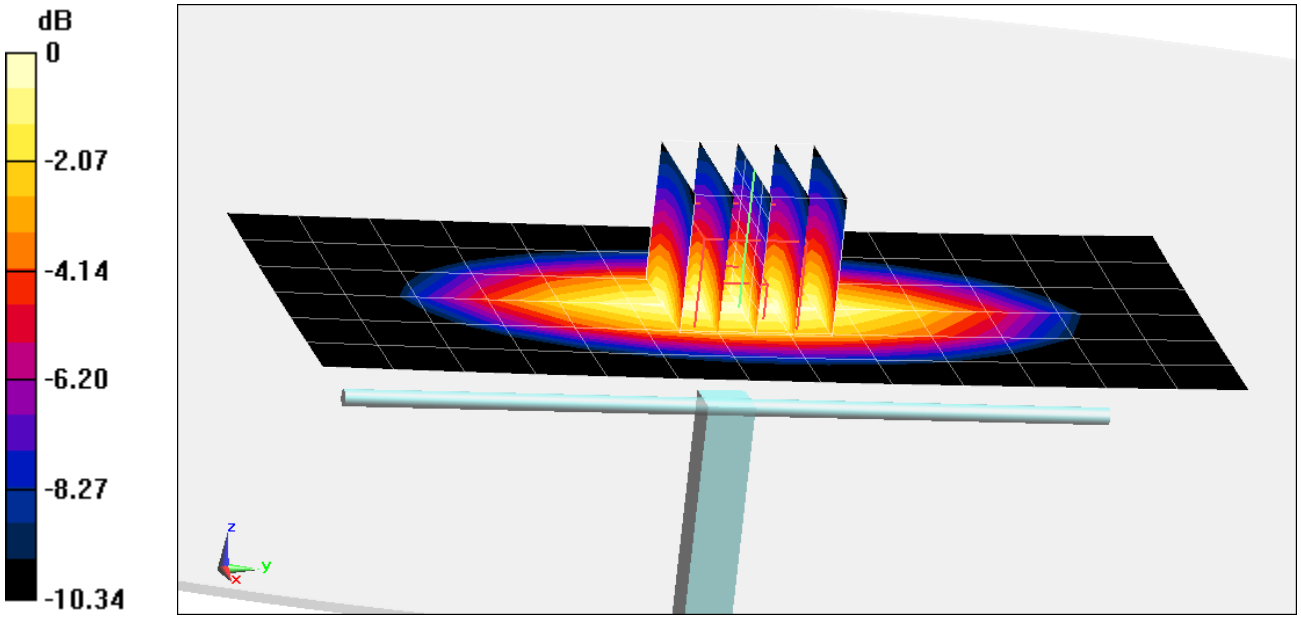
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 0.982 S/m; ε_r = 54.062; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 06-10-2015; Ambient Temp: 23.3°C; Tissue Temp: 21.9°C

Probe: ES3DV3 - SN3288; ConvF(6.32, 6.32, 6.32); Calibrated: 9/24/2014;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1364; Calibrated: 9/18/2014
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1229
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

835 MHz System Verification

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 23 dBm (200 mW)
Peak SAR (extrapolated) = 2.99 W/kg
SAR(1 g) = 2.03 W/kg
Deviation = 8.56%



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

PCTEST ENGINEERING LABORATORY, INC.

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

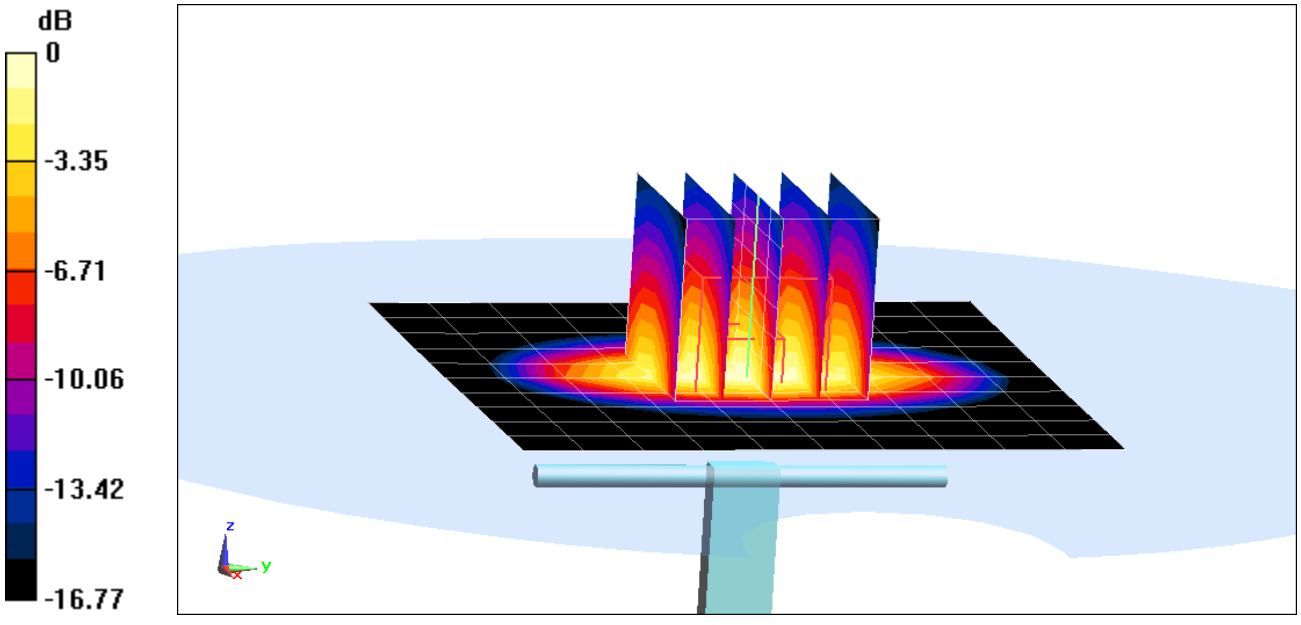
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.485 S/m; ε_r = 51.684; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-04-2015; Ambient Temp: 21.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3263; ConvF(4.88, 4.88, 4.88); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/22/2015
Phantom: SAM with CRP v5.0 (Right); Type: QD000P40CD; Serial: TP:1759
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification

Area Scan (11x11x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 6.70 W/kg
SAR(1 g) = 3.82 W/kg
Deviation = 2.96%



0 dB = 4.66 W/kg = 6.68 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

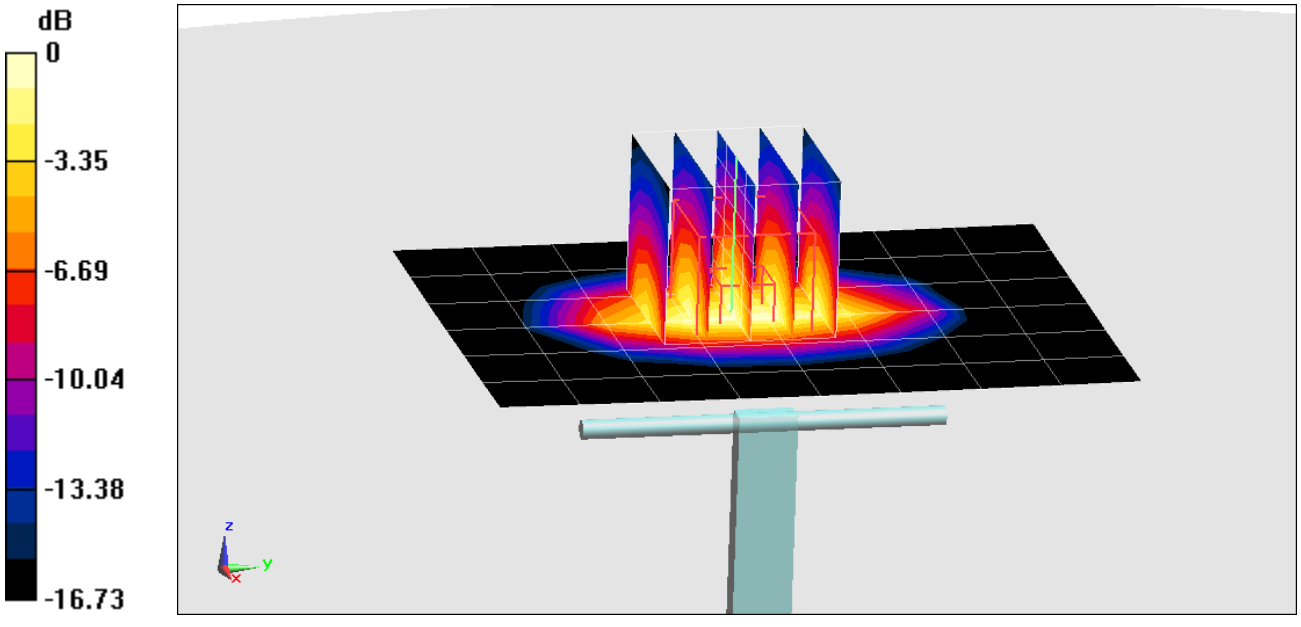
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.484 S/m; ε_r = 52.598; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-08-2015; Ambient Temp: 20.2°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3318; ConvF(4.95, 4.95, 4.95); Calibrated: 1/23/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 1/14/2015
Phantom: ELI v6.0; Type: QDOVA003AA; Serial: TP:2027
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 6.49 W/kg
SAR(1 g) = 3.71 W/kg
Deviation = 0.00%



0 dB = 4.64 W/kg = 6.67 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

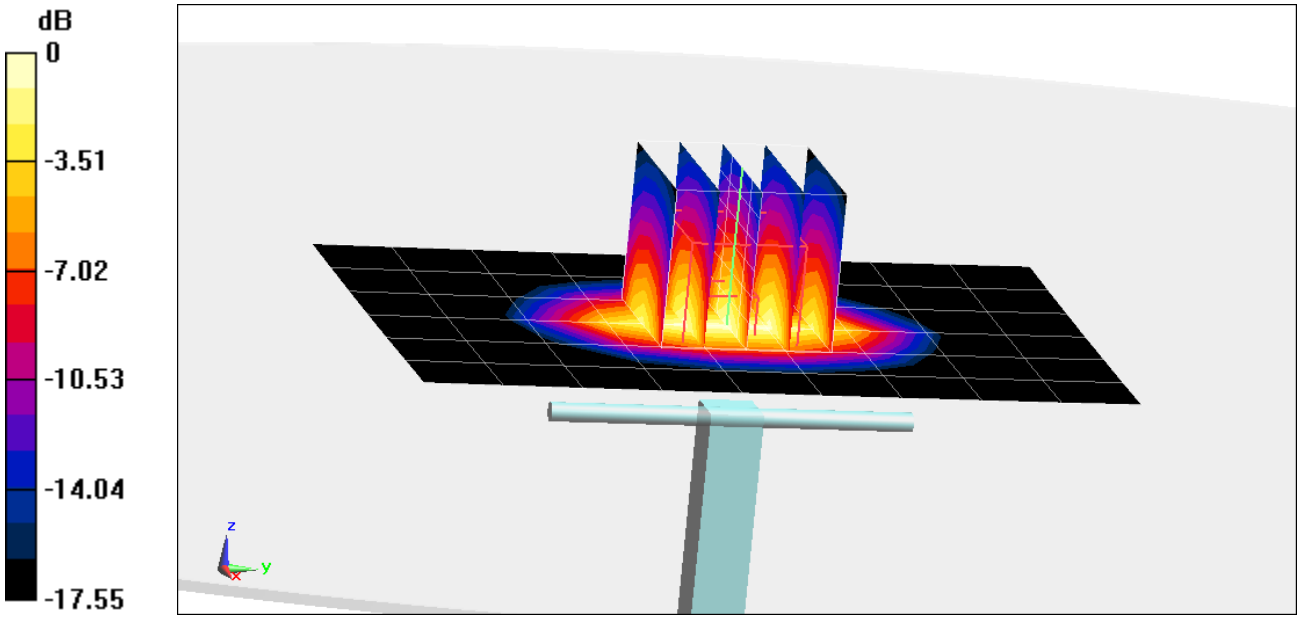
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.552 S/m; ε_r = 53.251; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-06-2015; Ambient Temp: 20.7°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3319; ConvF(4.53, 4.53, 4.53); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1368; Calibrated: 3/13/2015
Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1226
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1900 MHz System Verification

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 7.30 W/kg
SAR(1 g) = 4.14 W/kg
Deviation = 2.48%



0 dB = 5.26 W/kg = 7.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

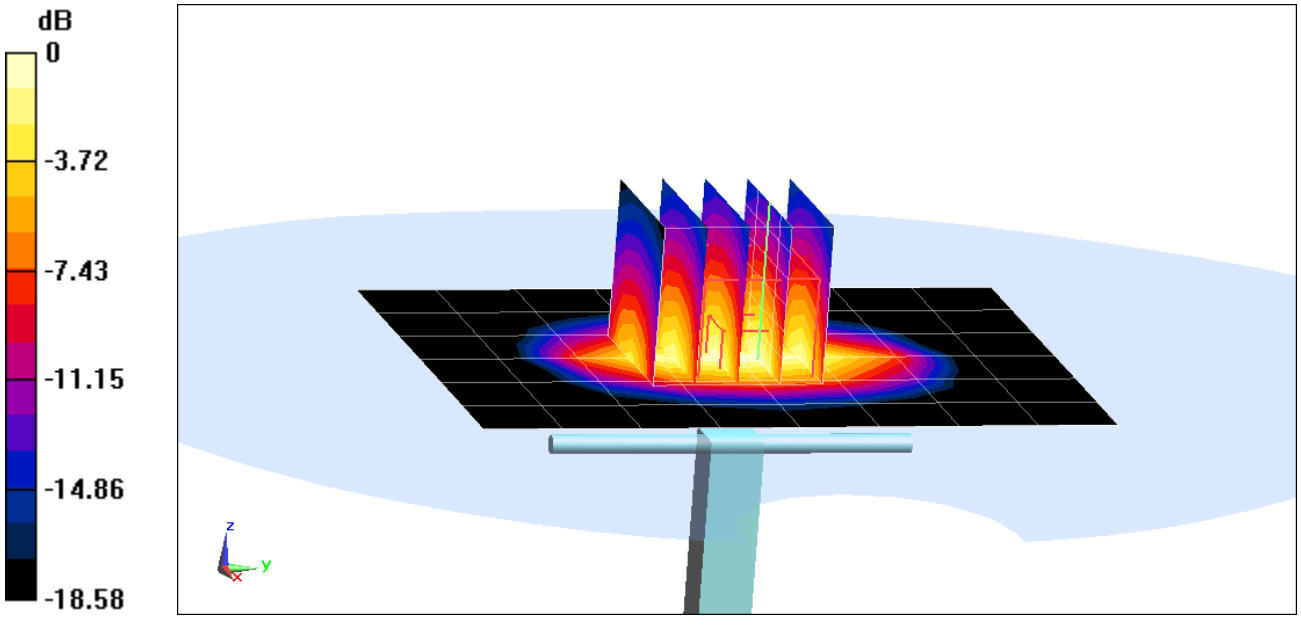
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.559 S/m; ε_r = 51.641; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-08-2015; Ambient Temp: 21.0°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3263; ConvF(4.66, 4.66, 4.66); Calibrated: 5/20/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1408; Calibrated: 10/23/2014
Phantom: SAM with CRP (Left); Type: SAM; Serial: 1715
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1900 MHz System Verification

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 7.45 W/kg
SAR(1 g) = 4.19 W/kg
Deviation = 3.71%



0 dB = 5.23 W/kg = 7.19 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

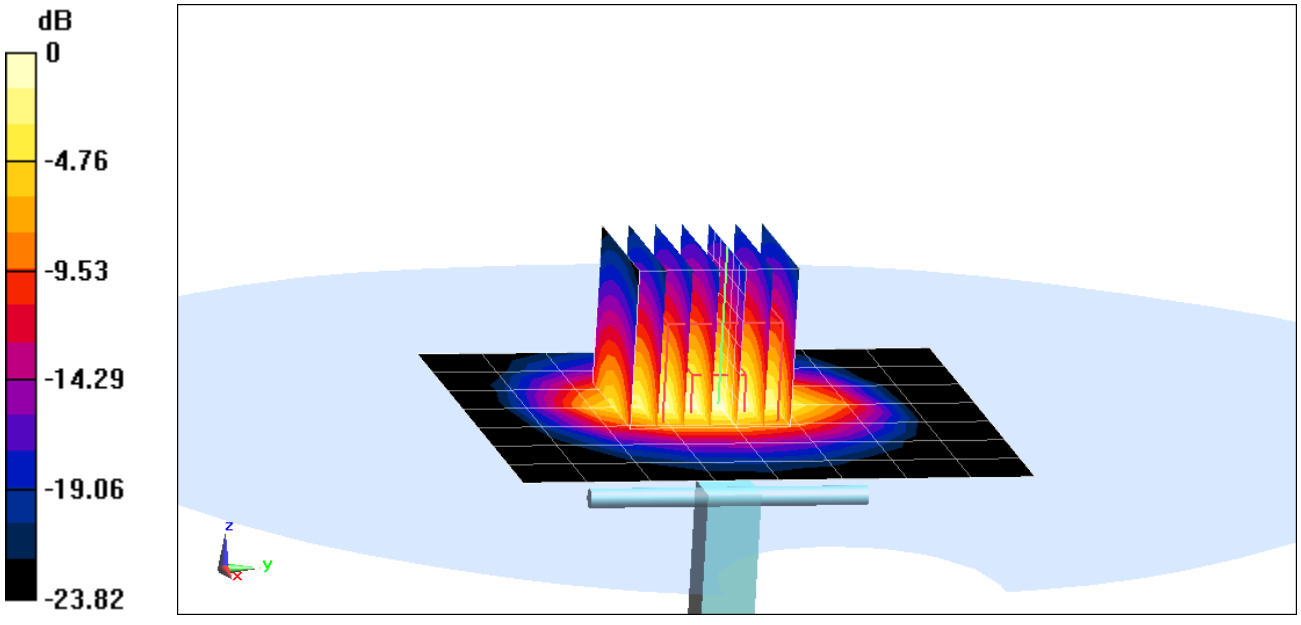
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.008 S/m; ε_r = 50.462; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-03-2015; Ambient Temp: 21.1°C; Tissue Temp: 21.0°C

Probe: ES3DV3 - SN3209; ConvF(4.12, 4.12, 4.12); Calibrated: 3/19/2015;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1334; Calibrated: 3/13/2015
Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Input Power = 20 dBm (100 mW)
Peak SAR (extrapolated) = 11.8 W/kg
SAR(1 g) = 5.40 W/kg
Deviation = 4.25%



0 dB = 7.15 W/kg = 8.54 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1057

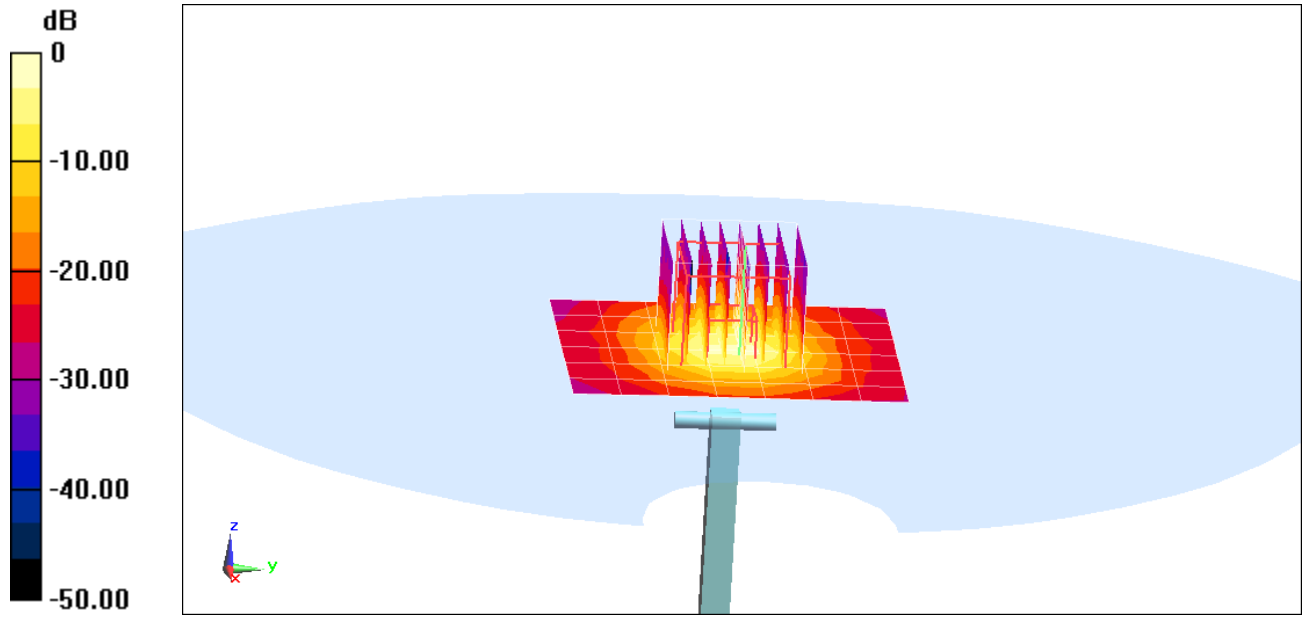
Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5300 MHz; σ = 5.248 S/m; ε_r = 48.083; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-03-2015; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(3.79, 3.79, 3.79); Calibrated: 1/22/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 17 dBm (50 mW)
Peak SAR (extrapolated) = 16.2 W/kg
SAR(1 g) = 3.91 W/kg
Deviation = 5.39%



0 dB = 9.31 W/kg = 9.69 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057

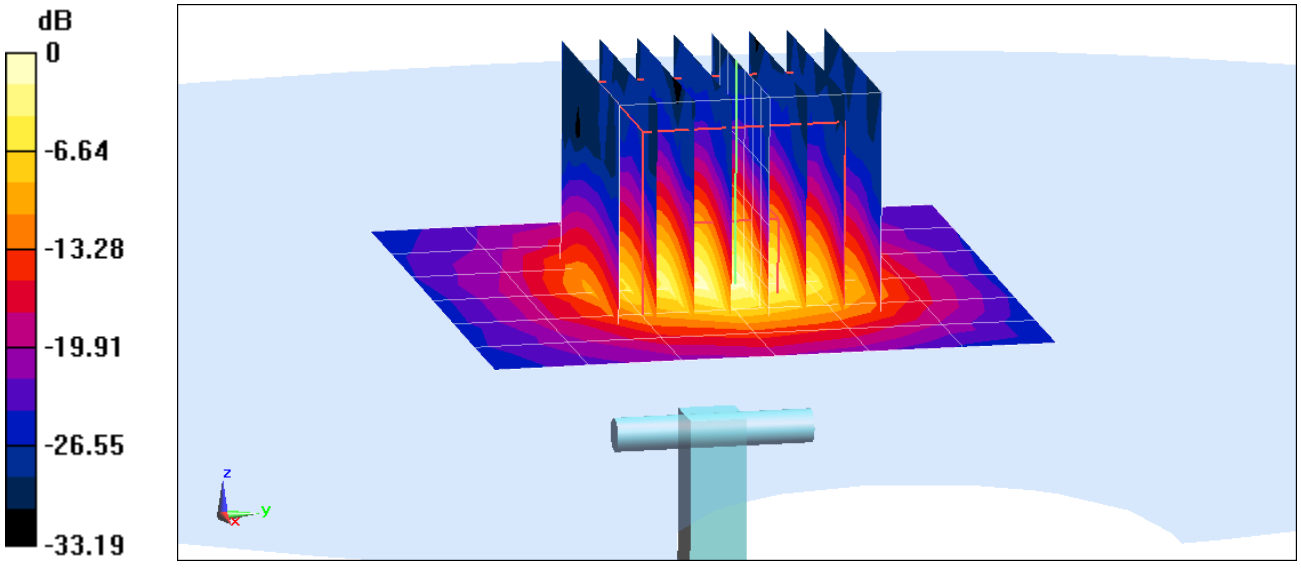
Communication System: UID 0, CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5500 MHz; σ = 5.495 S/m; ε_r = 47.779; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 06-03-2015; Ambient Temp: 22.2°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN3589; ConvF(3.65, 3.65, 3.65); Calibrated: 1/22/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5500 MHz System Verification

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
Input Power: 17 dBm (50 mW)
Peak SAR (extrapolated) = 16.1 W/kg
SAR(1 g) = 3.68 W/kg
Deviation = -7.07%



0 dB = 8.74 W/kg = 9.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1057

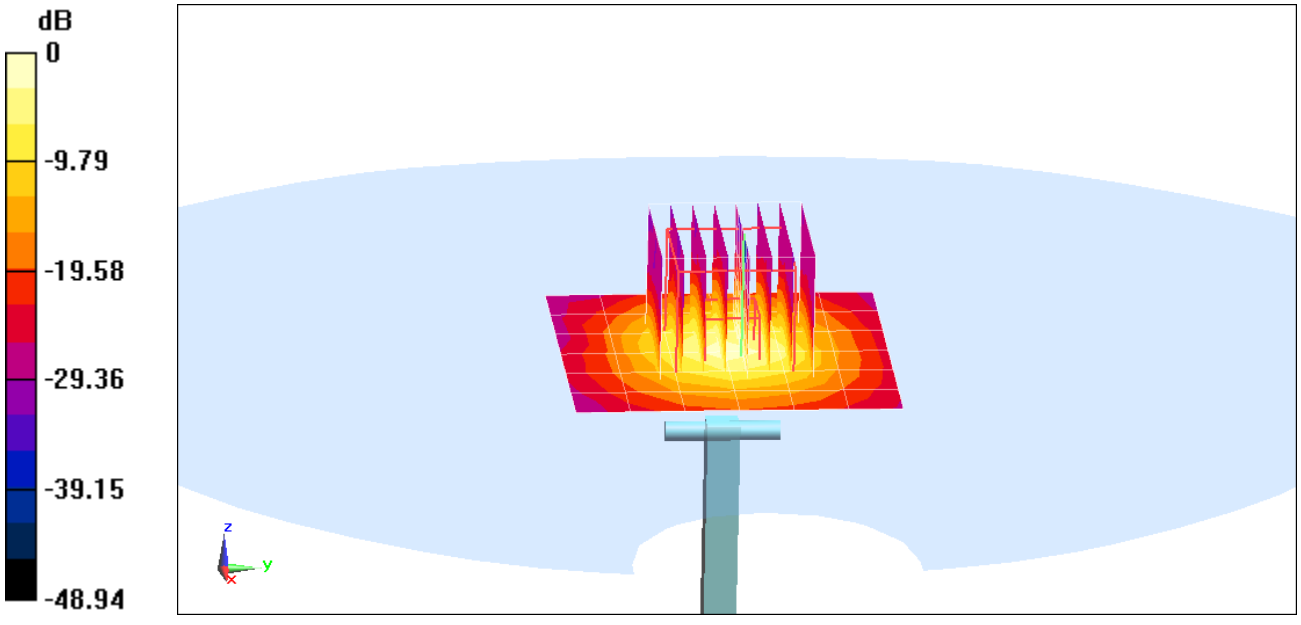
Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5800 MHz; σ = 5.914 S/m; ε_r = 47.336; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-03-2015; Ambient Temp: 22.1°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN3589; ConvF(3.79, 3.79, 3.79); Calibrated: 1/22/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5800 MHz System Verification

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
Input Power = 17 dBm (50 mW)
Peak SAR (extrapolated) = 15.5 W/kg
SAR(1 g) = 3.41 W/kg
Deviation = -9.19%



0 dB = 8.24 W/kg = 9.16 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5300 MHz; Type: D5GHzV2; Serial: 1057

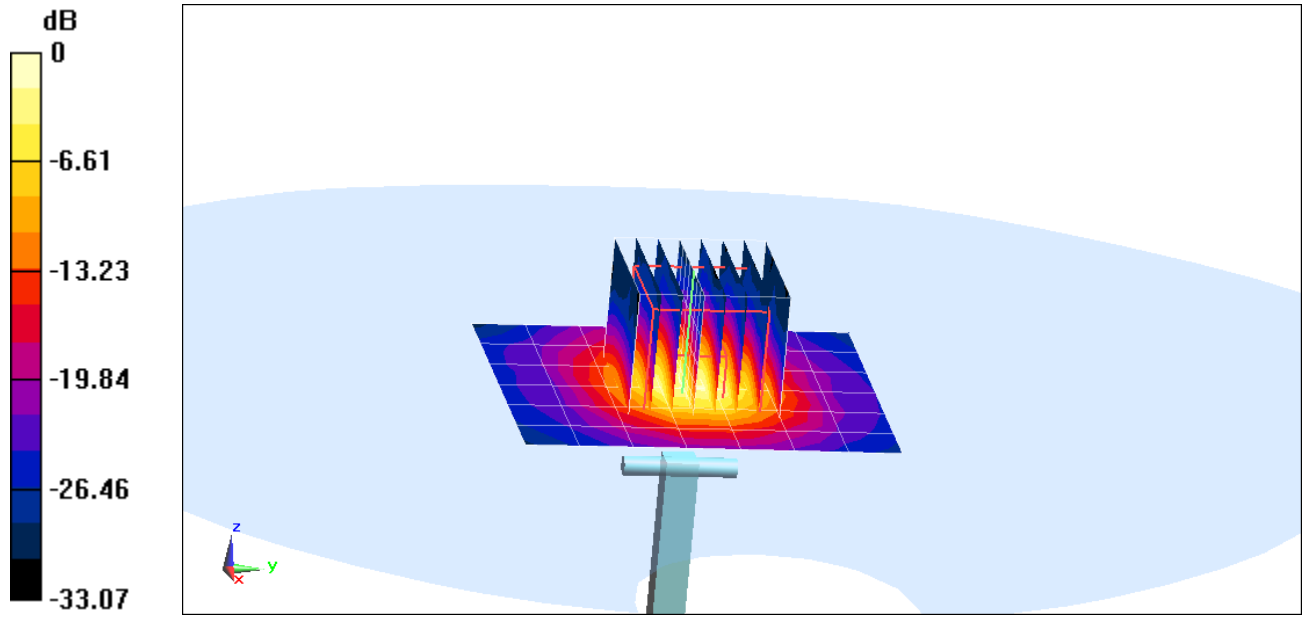
Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5300 MHz; σ = 5.450 S/m; ε_r = 48.362; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 06-11-2015; Ambient Temp: 22.7°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3589; ConvF(3.79, 3.79, 3.79); Calibrated: 1/22/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5300 MHz System Verification

Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm
Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4
Input Power = 17 dBm (50 mW)
Peak SAR (extrapolated) = 16.2 W/kg
SAR(10 g) = 1.09 W/kg
Deviation = 4.31%



0 dB = 9.22 W/kg = 9.65 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5500 MHz; Type: D5GHzV2; Serial: 1057

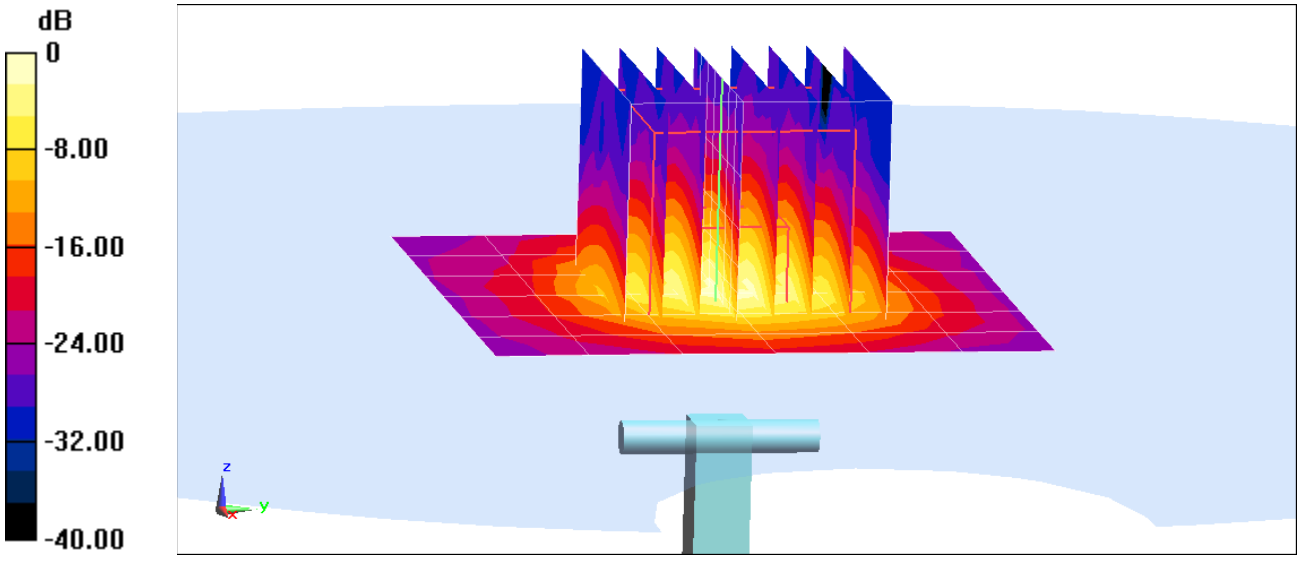
Communication System: UID 0, CW; Frequency: 5500 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5500 MHz; σ = 5.706 S/m; ε_r = 48.053; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 06-11-2015; Ambient Temp: 22.6°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3589; ConvF(3.65, 3.65, 3.65); Calibrated: 1/22/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5500 MHz System Verification

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
Input Power = 17 dBm (50 mW)
Peak SAR (extrapolated) = 17.2 W/kg
SAR(10 g) = 1.08 W/kg
Deviation = -1.82%



0 dB = 9.47 W/kg = 9.76 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5800 MHz; Type: D5GHzV2; Serial: 1057

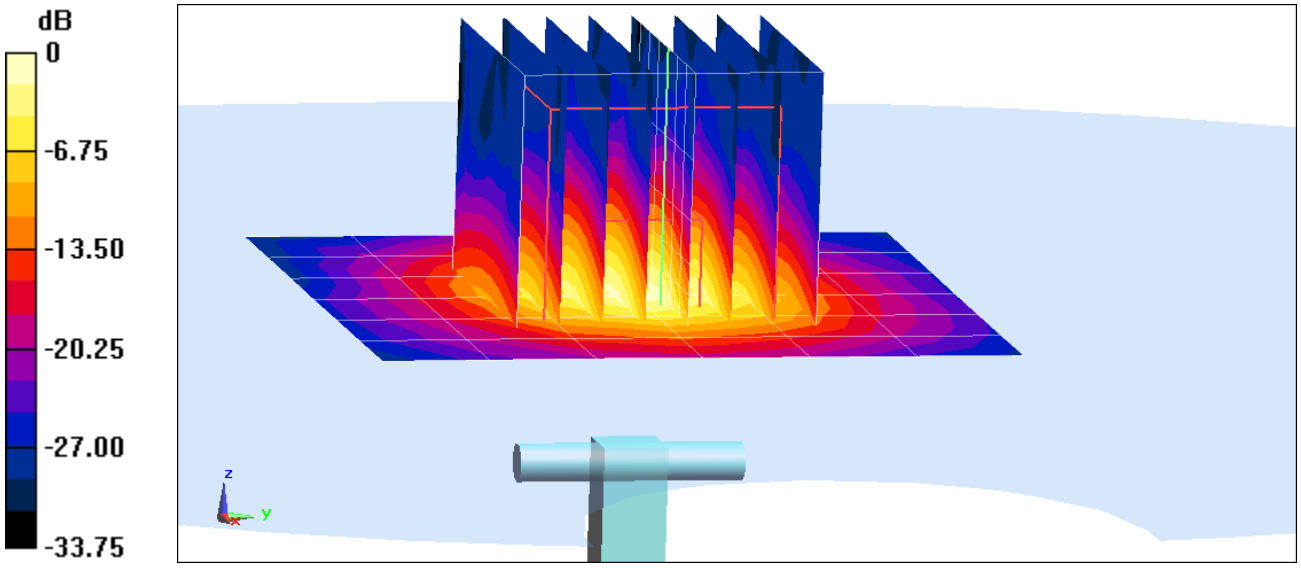
Communication System: UID 0, CW; Frequency: 5800 MHz;Duty Cycle: 1:1
Medium: 5 GHz Body Medium parameters used:
f = 5800 MHz; σ = 6.139 S/m; ε_r = 47.566; ρ = 1000 kg/m^3
Phantom section: Flat Section ; Space: 1.0 cm

Test Date: 06-11-2015; Ambient Temp: 22.6°C; Tissue Temp: 21.3°C

Probe: EX3DV4 - SN3589; ConvF(3.79, 3.79, 3.79); Calibrated: 1/22/2015;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1323; Calibrated: 9/17/2014
Phantom: SAM 5.0 front; Type: QD000P40CD; Serial: TP:-1648
Measurement SW: DASY52, Version 52.8 (8);SEMCAD X Version 14.6.10 (7331)

5800 MHz System Verification

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
Input Power = 17 dBm (50 mW)
Peak SAR (extrapolated) = 15.3 W/kg
SAR(10 g) = 0.962 W/kg
Deviation = -6.60%



0 dB = 8.29 W/kg = 9.19 dBW/kg

APPENDIX C: PROBE CALIBRATION

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

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

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

Accreditation No.: SCS 0108

Client PC Test

Certificate No: ES3-3318_Jan15

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3318

Calibration procedure(s): QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

CC 1/30/15

Calibration date: January 23, 2015

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 E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Israe Elnaouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 26, 2015

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

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

Accredited by the Swiss Accreditation Service (SAS)
Accreditation No.: SCS 0108

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3318

Manufactured: January 10, 2012
Calibrated: January 23, 2015

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3318

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.15	0.92	1.28	± 10.1 %
DCP (mV)[B]	106.4	109.2	103.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	200.6	±3.5 %
		Y	0.0	0.0	1.0		185.3	
		Z	0.0	0.0	1.0		207.7	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	3.26	66.4	14.0	10.00	41.4	±1.2 %
		Y	1.76	59.6	9.8		36.1	
		Z	1.82	57.7	9.6		43.6	
10011-CAB	UMTS-FDD (WCDMA)	X	3.48	68.9	19.9	2.91	120.2	±0.5 %
		Y	3.76	70.1	19.9		146.0	
		Z	3.11	66.0	17.9		124.4	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.71	74.2	21.7	1.87	121.7	±0.7 %
		Y	3.65	73.3	20.7		147.5	
		Z	2.77	67.4	17.8		126.6	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.68	69.5	22.7	9.46	114.7	±2.5 %
		Y	10.82	70.4	23.0		139.8	
		Z	11.22	71.1	23.7		122.2	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	16.13	95.0	26.6	9.39	122.7	±2.2 %
		Y	4.61	73.1	17.2		130.8	
		Z	15.10	92.0	25.4		135.9	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	17.03	96.8	27.5	9.57	113.0	±1.9 %
		Y	4.15	71.7	16.8		119.9	
		Z	21.50	98.0	27.5		130.9	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	35.51	99.5	24.5	6.56	147.6	±2.7 %
		Y	6.12	77.2	17.1		118.1	
		Z	38.50	99.7	24.7		114.0	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	45.57	99.9	23.2	4.80	113.3	±1.7 %
		Y	2.73	68.4	12.6		133.3	
		Z	54.59	99.9	22.9		131.0	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	53.68	99.5	21.9	3.55	123.0	±3.0 %
		Y	60.05	99.8	21.1		144.9	
		Z	66.60	99.6	21.6		140.7	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	20.92	99.4	21.8	1.16	136.6	±2.2 %
		Y	95.40	88.3	13.8		117.6	
		Z	100.00	99.5	18.7		110.1	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.50	68.1	20.2	5.67	130.5	±1.2 %
		Y	6.11	66.7	19.2		107.2	
		Z	6.55	68.2	20.1		142.7	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	9.76	74.8	25.9	9.29	116.0	±2.5 %
		Y	8.85	72.2	24.1		134.9	
		Z	10.83	77.4	27.2		131.5	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.36	67.7	20.1	5.80	128.7	±1.2 %
		Y	5.92	66.1	19.0		106.6	
		Z	6.42	67.7	20.0		140.4	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.20	69.1	21.6	8.07	118.1	±2.5 %
		Y	10.27	69.3	21.4		143.9	
		Z	10.43	69.7	21.8		131.0	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.09	73.7	25.5	9.28	112.0	±2.7 %
		Y	8.35	71.5	23.9		131.1	
		Z	9.58	74.4	25.6		126.8	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.01	67.0	19.8	5.75	126.4	±1.2 %
		Y	6.17	67.7	19.9		148.9	
		Z	6.07	67.1	19.7		137.2	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.41	67.4	19.9	5.82	130.9	±0.9 %
		Y	6.06	66.2	19.0		109.1	
		Z	6.54	67.7	20.0		142.6	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.79	66.5	19.8	5.73	109.4	±0.9 %
		Y	4.82	67.1	19.8		128.8	
		Z	4.85	66.4	19.5		119.0	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.44	79.3	28.7	9.21	125.1	±2.5 %
		Y	7.15	75.0	26.0		144.0	
		Z	10.13	83.8	30.8		141.9	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.13	68.2	20.8	5.72	146.5	±0.9 %
		Y	4.77	66.8	19.6		125.2	
		Z	4.81	66.2	19.4		118.5	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.11	68.1	20.7	5.72	146.4	±0.9 %
		Y	4.79	67.0	19.7		126.0	
		Z	4.88	66.6	19.7		118.9	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.63	68.3	21.2	8.10	108.2	±2.5 %
		Y	9.84	68.9	21.3		135.5	
		Z	9.99	69.2	21.7		124.0	
10225-CAB	UMTS-FDD (HSPA+)	X	6.99	67.3	19.7	5.97	134.8	±0.9 %
		Y	6.73	66.8	19.2		115.9	
		Z	6.71	66.2	19.0		106.3	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	7.79	76.4	27.0	9.21	126.4	±2.5 %
		Y	7.19	75.1	26.1		144.7	
		Z	10.12	83.9	30.9		142.0	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.19	71.9	24.7	9.24	103.3	±2.2 %
		Y	7.76	70.8	23.6		122.0	
		Z	9.31	75.2	26.4		119.1	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	8.90	73.0	25.1	9.30	108.7	±2.2 %
		Y	8.38	71.6	24.0		129.7	
		Z	10.15	76.5	26.9		126.1	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.42	67.2	19.2	3.96	119.1	±0.7 %
		Y	4.71	68.5	19.5		143.8	
		Z	4.39	66.7	18.6		131.7	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.65	67.5	19.3	3.46	111.3	±0.5 %
		Y	3.89	69.0	19.6		130.9	
		Z	3.49	66.1	18.2		122.4	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.60	67.6	19.3	3.39	114.4	±0.5 %
		Y	3.85	69.1	19.7		133.4	
		Z	3.45	66.2	18.2		123.7	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.36	67.6	20.1	5.81	128.7	±1.2 %
		Y	5.95	66.1	19.0		106.5	
		Z	6.39	67.6	19.9		140.7	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.98	68.4	20.6	6.06	134.9	±1.2 %
		Y	6.52	66.7	19.3		111.3	
		Z	7.06	68.6	20.5		146.2	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.97	69.7	19.7	3.76	122.2	±0.5 %
		Y	5.31	71.6	20.2		143.6	
		Z	4.54	67.3	18.2		133.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.77	69.4	19.6	3.77	120.8	±0.5 %
		Y	5.40	72.4	20.6		141.3	
		Z	4.71	68.5	18.9		131.5	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	3.07	71.7	20.7	1.54	120.5	±0.7 %
		Y	3.52	73.8	21.0		142.0	
		Z	2.38	66.1	17.4		129.6	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.73	68.3	21.2	8.23	114.7	±2.5 %
		Y	9.99	69.2	21.5		138.0	
		Z	10.10	69.4	21.9		125.3	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 7 and 8).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3318

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.58	6.58	6.58	0.36	1.73	± 12.0 %
835	41.5	0.90	6.39	6.39	6.39	0.80	1.14	± 12.0 %
1750	40.1	1.37	5.27	5.27	5.27	0.76	1.19	± 12.0 %
1900	40.0	1.40	5.05	5.05	5.05	0.44	1.55	± 12.0 %
2300	39.5	1.67	4.78	4.78	4.78	0.80	1.23	± 12.0 %
2450	39.2	1.80	4.50	4.50	4.50	0.55	1.49	± 12.0 %
2600	39.0	1.96	4.34	4.34	4.34	0.76	1.32	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3318

Calibration Parameter Determined in Body Tissue Simulating Media

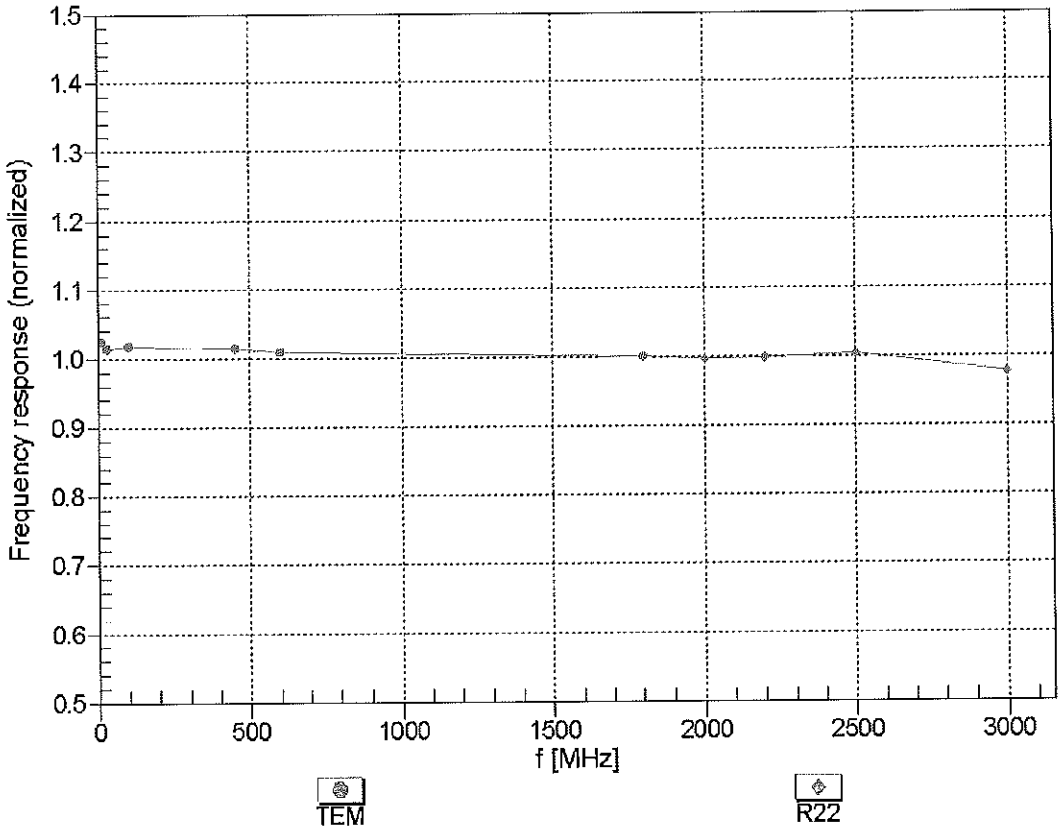
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.22	6.22	6.22	0.67	1.28	± 12.0 %
835	55.2	0.97	6.23	6.23	6.23	0.80	1.19	± 12.0 %
1750	53.4	1.49	4.95	4.95	4.95	0.40	1.77	± 12.0 %
1900	53.3	1.52	4.76	4.76	4.76	0.60	1.48	± 12.0 %
2300	52.9	1.81	4.52	4.52	4.52	0.80	1.19	± 12.0 %
2450	52.7	1.95	4.37	4.37	4.37	0.72	1.23	± 12.0 %
2600	52.5	2.16	4.17	4.17	4.17	0.80	1.00	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

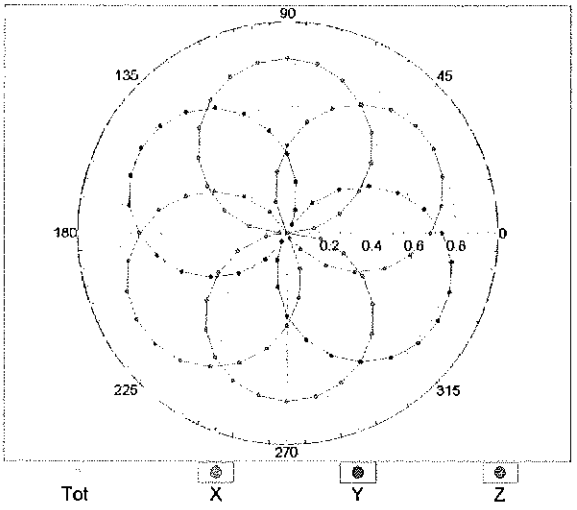
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



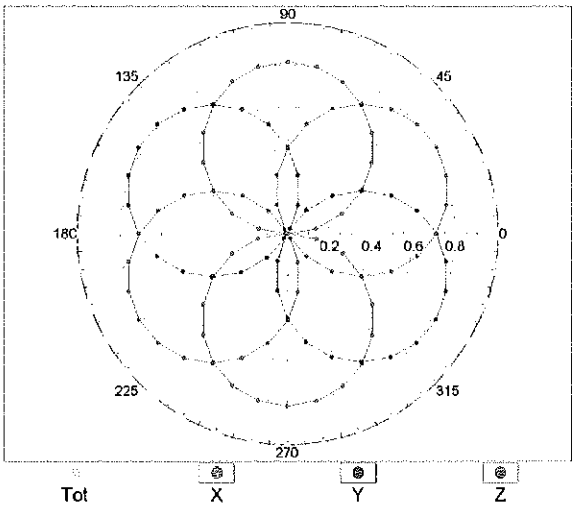
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

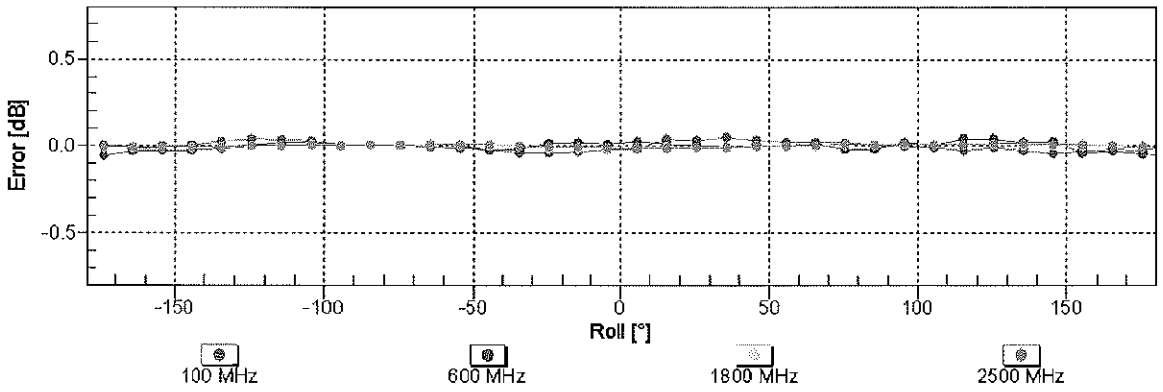
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

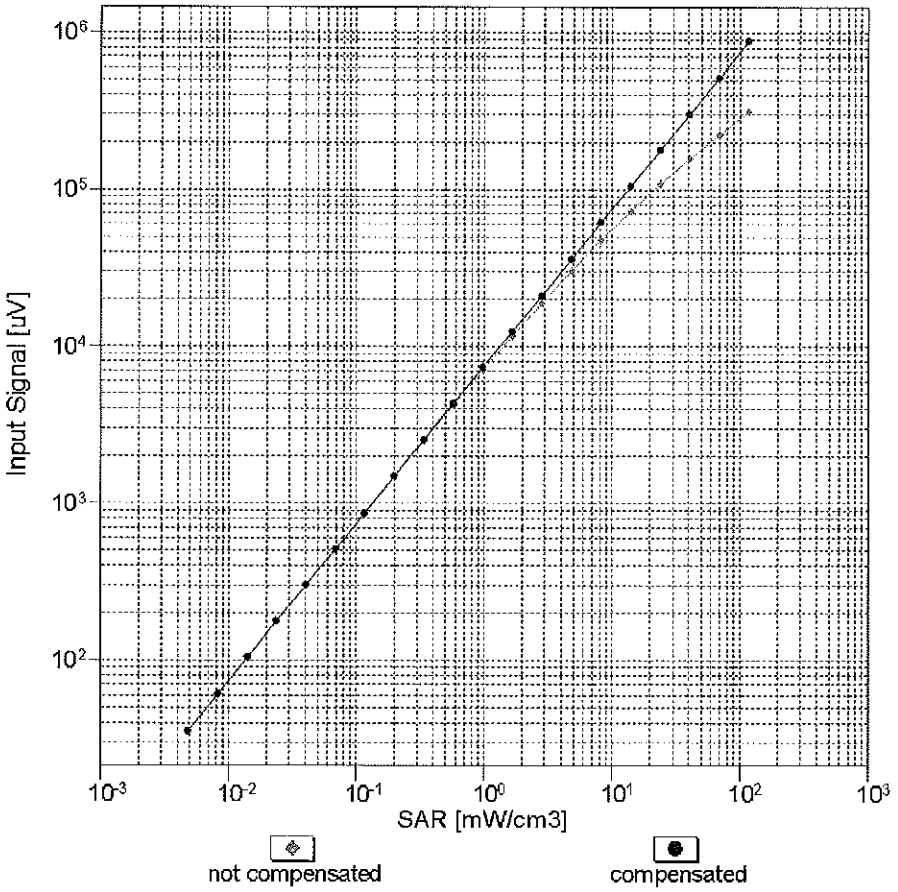


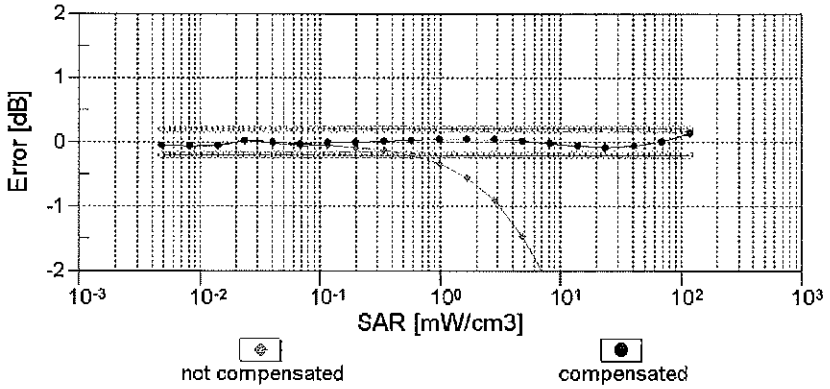


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)

(TEM cell , f_{eval}= 1900 MHz)

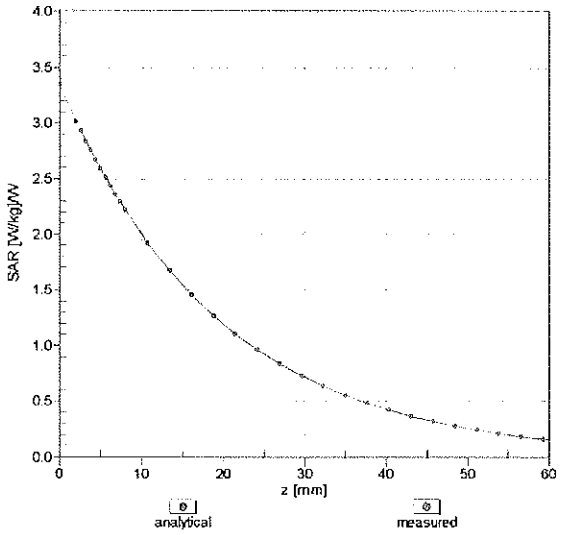




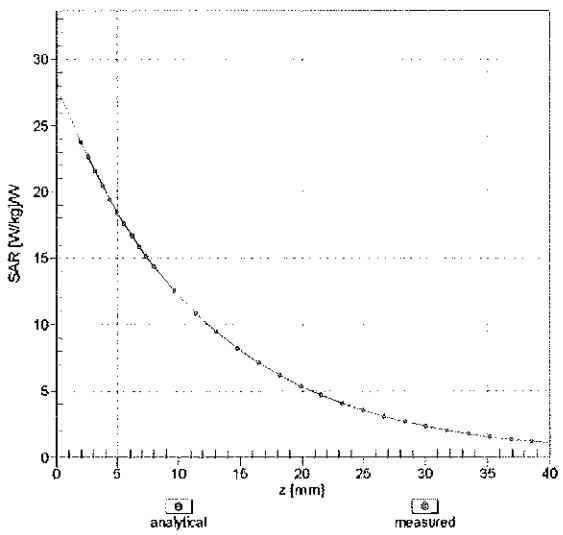
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

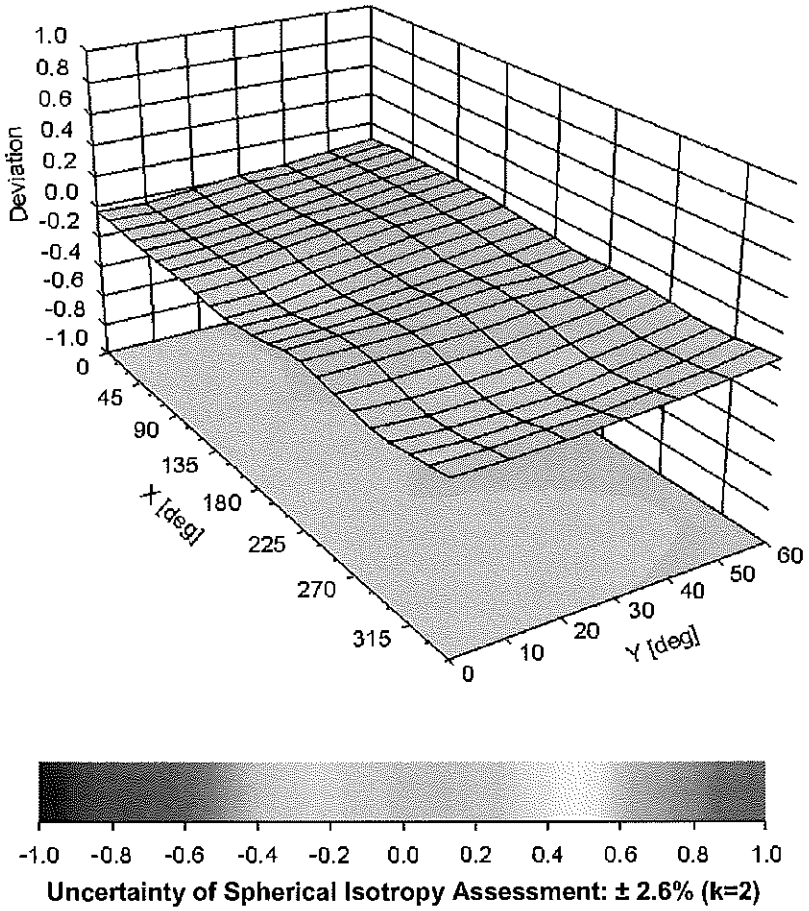


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3318

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-104.4
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
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 108

Client PC Test

Certificate No: ES3-3288_Sep14/2

CALIBRATION CERTIFICATE (Replacement of No:ES3-3288_Sep14)

Object: ES3DV3 - SN:3288

Calibration procedure(s): QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

CC 12/12/14

Calibration date: September 24, 2014

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-13 (No. ES3-3013_Dec13)	Dec-14
DAE4	SN: 660	13-Dec-13 (No. DAE4-660_Dec13)	Dec-14
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-13)	In house check: Oct-14

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

Issued: November 3, 2014

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
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 108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z*: *A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3288

Manufactured:	July 6, 2010
Repaired:	September 18, 2014
Calibrated:	September 24, 2014

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.05	1.16	0.92	± 10.1 %
DCP (mV)[B]	105.1	104.6	106.7	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	195.8	±3.5 %
		Y	0.0	0.0	1.0		175.9	
		Z	0.0	0.0	1.0		177.1	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	2.71	61.9	11.4	10.00	40.3	±2.2 %
		Y	2.37	60.2	11.2		42.6	
		Z	1.54	56.6	8.9		41.2	
10011-CAB	UMTS-FDD (WCDMA)	X	3.29	67.1	18.4	2.91	133.8	±0.5 %
		Y	3.43	67.9	18.9		139.5	
		Z	3.45	68.1	18.9		141.3	
10012-CAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.99	68.9	18.6	1.87	135.1	±0.7 %
		Y	3.59	72.4	20.4		140.7	
		Z	3.54	72.4	20.3		143.0	
10013-CAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.15	70.8	23.3	9.46	132.3	±3.5 %
		Y	11.29	70.8	23.2		141.1	
		Z	11.07	70.7	23.2		139.2	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	14.71	90.5	24.5	9.39	149.0	±1.9 %
		Y	16.40	92.8	26.0		131.3	
		Z	11.34	87.2	23.6		126.1	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	15.91	92.2	25.3	9.57	138.9	±2.5 %
		Y	21.25	96.9	27.2		142.0	
		Z	11.68	87.2	23.5		145.9	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	38.62	99.8	24.7	6.56	123.8	±2.2 %
		Y	36.71	99.7	25.2		128.1	
		Z	36.56	99.4	24.5		129.5	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	56.60	99.6	22.6	4.80	138.8	±1.9 %
		Y	46.94	99.9	23.7		149.9	
		Z	51.17	99.8	22.9		144.9	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	70.88	100.0	21.6	3.55	147.5	±1.9 %
		Y	52.58	99.8	22.6		129.4	
		Z	76.98	99.8	21.2		128.7	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	98.89	99.5	18.9	1.16	135.8	±1.4 %
		Y	78.39	99.6	19.5		141.7	
		Z	95.21	95.5	17.1		143.4	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	4.72	66.7	18.9	4.57	133.7	±0.9 %
		Y	4.85	67.1	19.1		137.7	
		Z	4.81	67.4	19.2		141.9	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	3.91	66.3	18.6	3.97	129.5	±0.7 %
		Y	4.00	66.6	18.7		133.7	
		Z	3.99	66.8	18.8		137.5	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	4.63	66.9	18.7	3.98	141.4	±0.7 %
		Y	4.78	67.5	19.0		147.7	
		Z	4.57	66.8	18.6		127.8	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.59	68.2	20.1	5.67	149.2	±1.4 %
		Y	6.36	67.3	19.6		130.7	
		Z	6.36	67.5	19.6		133.6	
10108-CAB	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.44	67.8	20.0	5.80	146.6	±1.4 %
		Y	6.23	66.8	19.4		128.8	
		Z	6.24	67.1	19.6		131.4	
10110-CAB	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	6.08	67.1	19.6	5.75	143.2	±1.4 %
		Y	6.20	67.4	19.8		148.0	
		Z	5.92	66.6	19.3		128.5	
10114-CAA	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	10.32	69.3	21.5	8.10	137.0	±2.2 %
		Y	10.31	69.1	21.4		143.5	
		Z	10.37	69.5	21.6		146.1	
10117-CAA	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.35	69.4	21.6	8.07	138.3	±2.2 %
		Y	10.36	69.3	21.4		146.4	
		Z	10.42	69.6	21.6		149.0	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.95	75.7	26.2	9.28	134.9	±3.3 %
		Y	10.37	76.0	26.1		146.6	
		Z	9.77	75.4	26.0		142.5	
10154-CAB	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.12	67.2	19.7	5.75	144.9	±1.4 %
		Y	6.21	67.4	19.8		148.8	
		Z	5.91	66.5	19.3		128.7	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.28	66.7	19.4	5.82	125.5	±1.2 %
		Y	6.37	66.8	19.4		129.7	
		Z	6.36	67.1	19.6		132.9	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.08	67.6	20.2	5.73	147.0	±1.2 %
		Y	4.95	66.6	19.6		128.6	
		Z	4.91	66.9	19.8		131.2	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.18	77.2	27.2	9.21	123.4	±2.7 %
		Y	8.37	76.6	26.6		129.5	
		Z	7.97	76.7	26.9		128.7	
10175-CAB	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.05	67.4	20.1	5.72	146.2	±1.4 %
		Y	5.10	67.3	20.0		142.8	
		Z	4.87	66.7	19.6		129.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.04	67.4	20.0	5.72	145.5	±1.2 %
		Y	5.12	67.4	20.0		143.4	
		Z	4.87	66.7	19.6		129.9	
10193-CAA	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	9.92	68.9	21.4	8.09	131.0	±2.2 %
		Y	9.84	68.5	21.1		130.0	
		Z	9.94	69.0	21.4		138.6	

10196-CAA	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.90	68.9	21.4	8.10	130.8	±2.2 %
		Y	9.81	68.4	21.0		131.4	
		Z	9.95	69.1	21.5		140.5	
10219-CAA	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	9.81	68.8	21.3	8.03	130.0	±2.2 %
		Y	9.89	68.9	21.3		138.1	
		Z	9.89	69.1	21.5		140.5	
10222-CAA	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	10.25	69.2	21.4	8.06	137.1	±2.2 %
		Y	10.30	69.2	21.4		144.4	
		Z	10.38	69.6	21.6		148.4	
10225-CAB	UMTS-FDD (HSPA+)	X	6.90	66.8	19.3	5.97	132.8	±1.4 %
		Y	7.09	67.3	19.6		142.0	
		Z	7.04	67.4	19.6		143.5	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	9.61	81.9	29.6	9.21	149.3	±2.7 %
		Y	8.66	77.6	27.1		133.7	
		Z	8.20	77.5	27.3		132.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.16	74.5	25.8	9.24	126.3	±3.0 %
		Y	9.62	75.0	25.8		137.4	
		Z	9.16	74.8	25.9		135.2	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.97	75.7	26.3	9.30	133.7	±3.3 %
		Y	10.38	75.9	26.1		146.1	
		Z	9.91	75.7	26.3		143.8	
10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	5.86	66.6	18.7	4.87	129.9	±0.9 %
		Y	6.01	67.1	19.0		135.7	
		Z	5.95	67.1	19.0		139.4	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.40	66.7	18.6	3.96	136.4	±0.7 %
		Y	4.55	67.3	19.0		138.3	
		Z	4.56	67.6	19.1		144.3	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.64	66.9	18.7	3.46	127.4	±0.5 %
		Y	3.77	67.6	19.1		130.2	
		Z	3.72	67.5	19.0		134.4	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.58	67.0	18.7	3.39	128.4	±0.5 %
		Y	3.73	67.7	19.1		132.7	
		Z	3.69	67.8	19.1		136.1	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.43	67.7	19.9	5.81	145.5	±1.4 %
		Y	6.49	67.7	19.9		149.5	
		Z	6.23	67.0	19.6		129.5	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.74	67.3	19.8	6.06	126.7	±1.4 %
		Y	6.83	67.5	19.8		132.9	
		Z	6.81	67.6	19.9		135.8	
10315-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	3.00	69.9	19.4	1.71	133.9	±0.5 %
		Y	3.30	71.5	20.1		141.0	
		Z	3.22	71.4	20.0		142.9	
10316-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	10.17	69.2	21.8	8.36	130.5	±2.5 %
		Y	10.20	69.1	21.6		138.4	
		Z	10.20	69.4	21.8		140.7	

10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.75	68.3	18.8	3.76	138.5	±0.7 %
		Y	5.00	69.1	19.2		146.7	
		Z	4.92	69.2	19.1		148.5	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.73	68.6	18.9	3.77	136.3	±0.7 %
		Y	4.97	69.4	19.4		143.7	
		Z	4.91	69.6	19.3		146.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.65	68.1	18.5	1.54	135.2	±0.5 %
		Y	3.05	70.8	19.9		140.7	
		Z	2.87	69.8	19.3		144.8	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.00	69.0	21.5	8.23	130.8	±2.2 %
		Y	10.06	68.9	21.4		138.6	
		Z	10.08	69.3	21.7		141.6	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 8 and 9).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.81	6.81	6.81	0.37	1.70	± 12.0 %
835	41.5	0.90	6.51	6.51	6.51	0.45	1.52	± 12.0 %
1750	40.1	1.37	5.38	5.38	5.38	0.44	1.58	± 12.0 %
1900	40.0	1.40	5.17	5.17	5.17	0.80	1.18	± 12.0 %
2450	39.2	1.80	4.56	4.56	4.56	0.80	1.21	± 12.0 %
2600	39.0	1.96	4.44	4.44	4.44	0.80	1.22	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Calibration Parameter Determined in Body Tissue Simulating Media

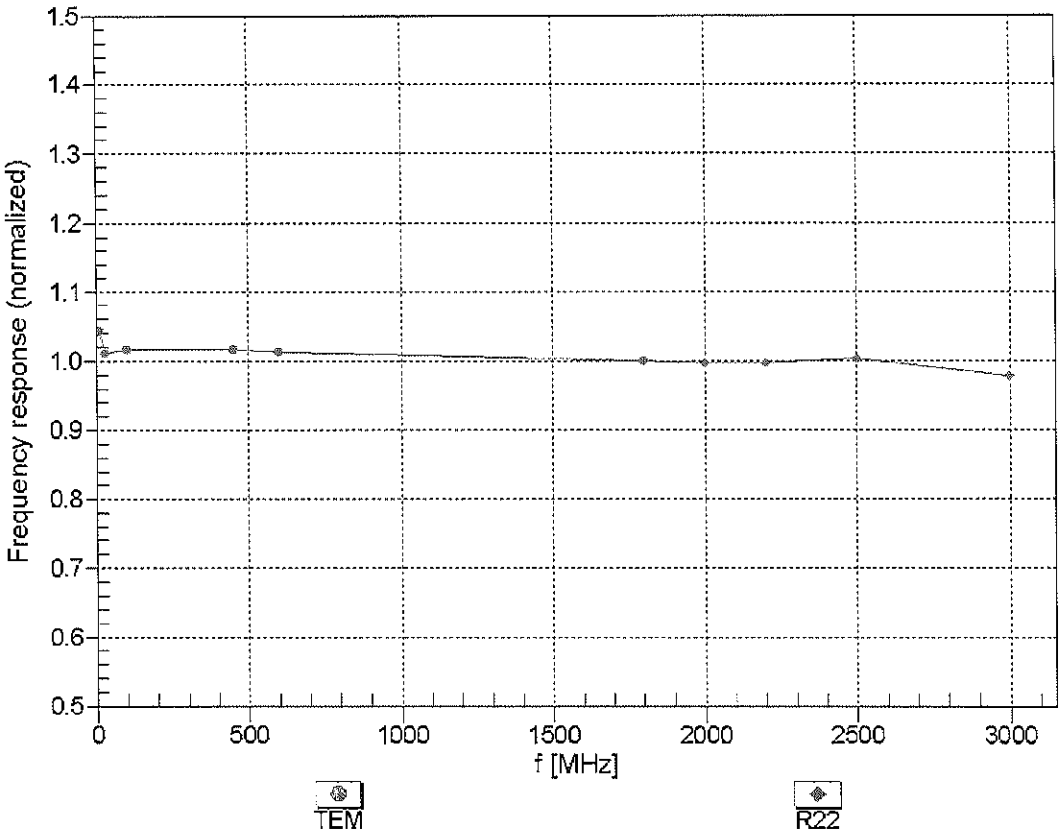
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.38	6.38	6.38	0.31	1.89	± 12.0 %
835	55.2	0.97	6.32	6.32	6.32	0.55	1.39	± 12.0 %
1750	53.4	1.49	5.03	5.03	5.03	0.57	1.44	± 12.0 %
1900	53.3	1.52	4.82	4.82	4.82	0.51	1.54	± 12.0 %
2450	52.7	1.95	4.36	4.36	4.36	0.71	1.07	± 12.0 %
2600	52.5	2.16	4.22	4.22	4.22	0.80	1.07	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

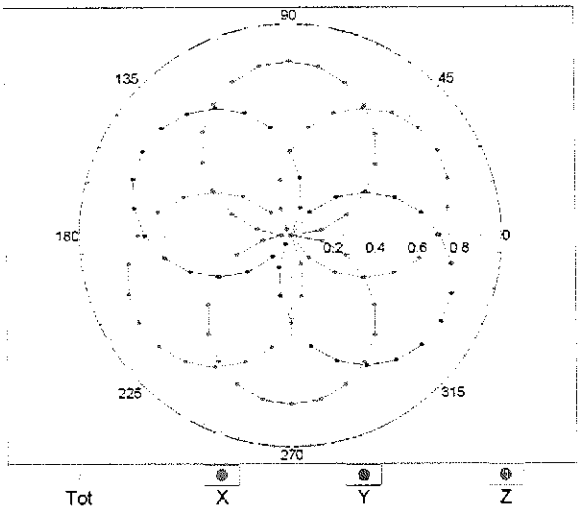
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



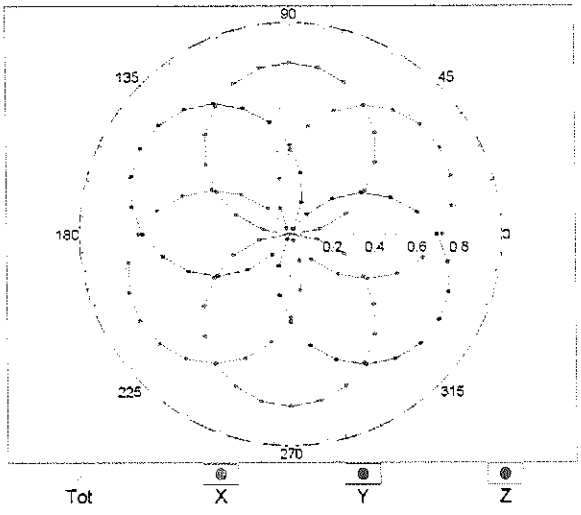
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

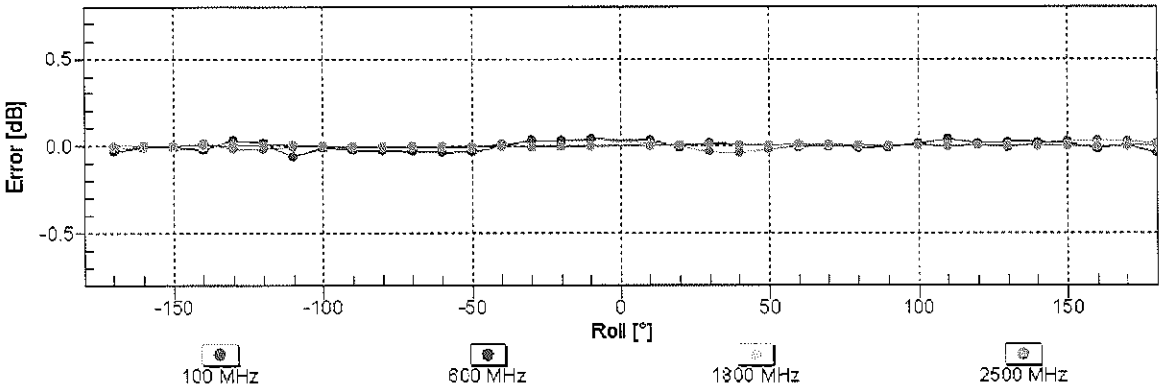
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



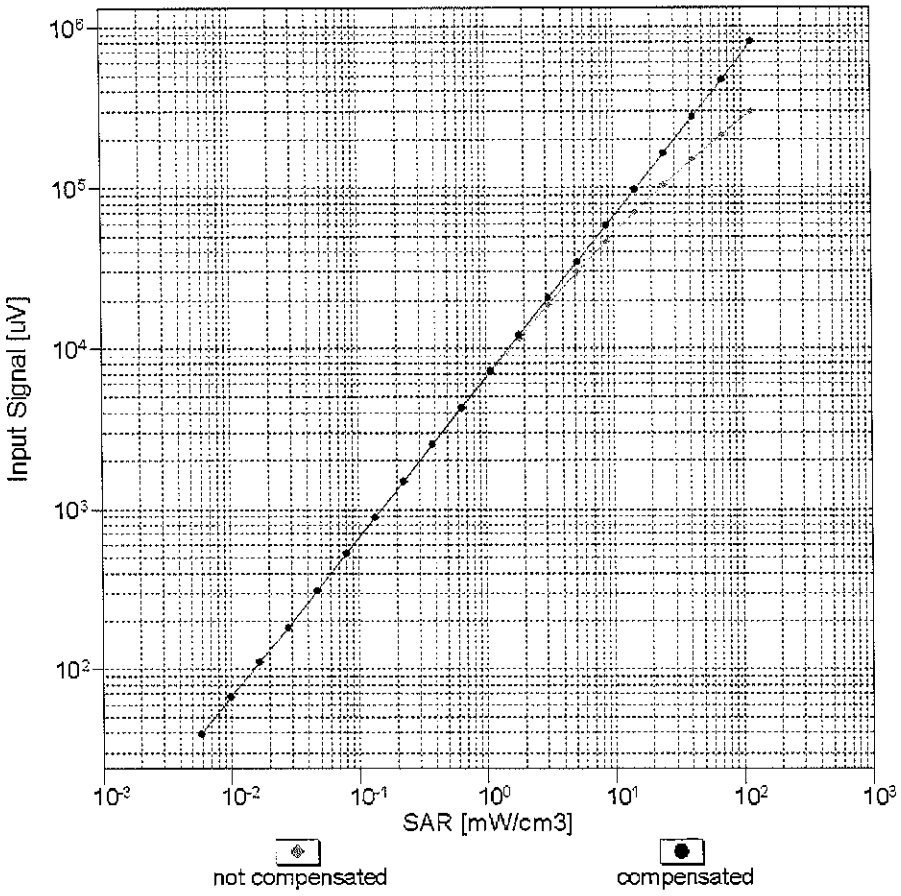
f=1800 MHz,R22

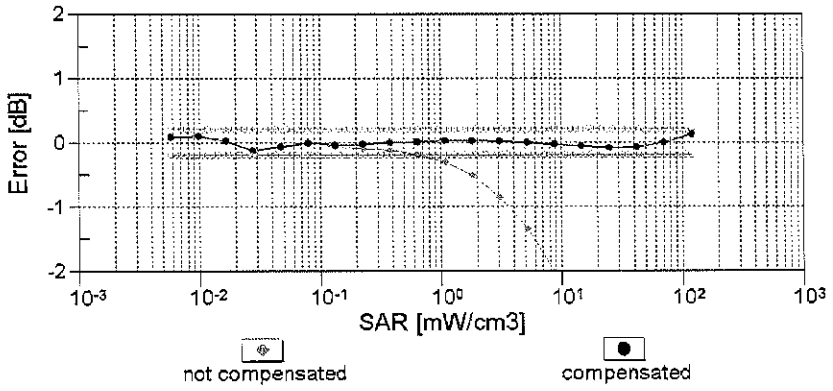




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)

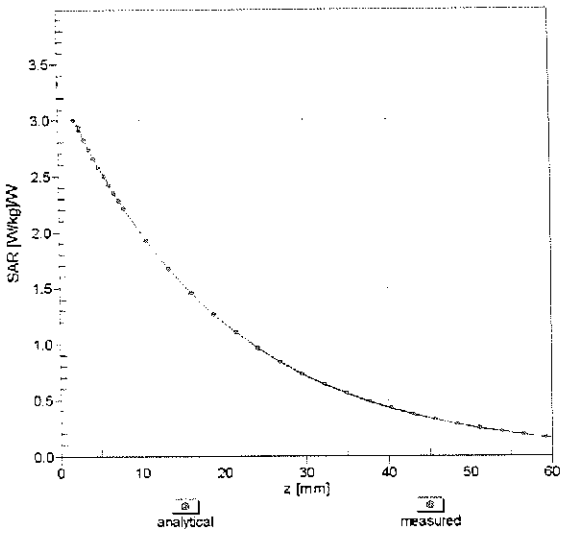




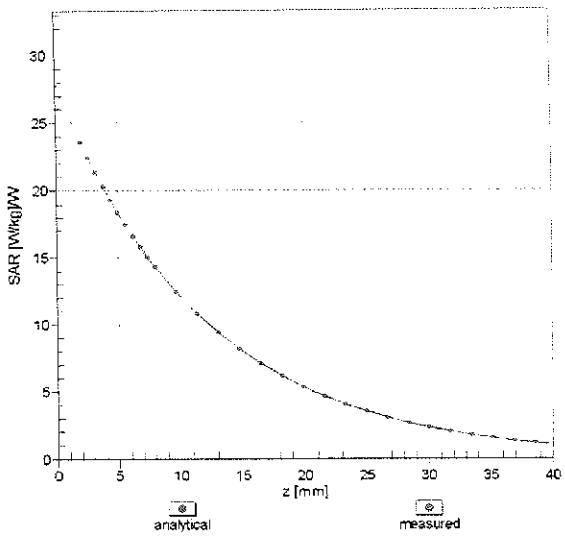
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

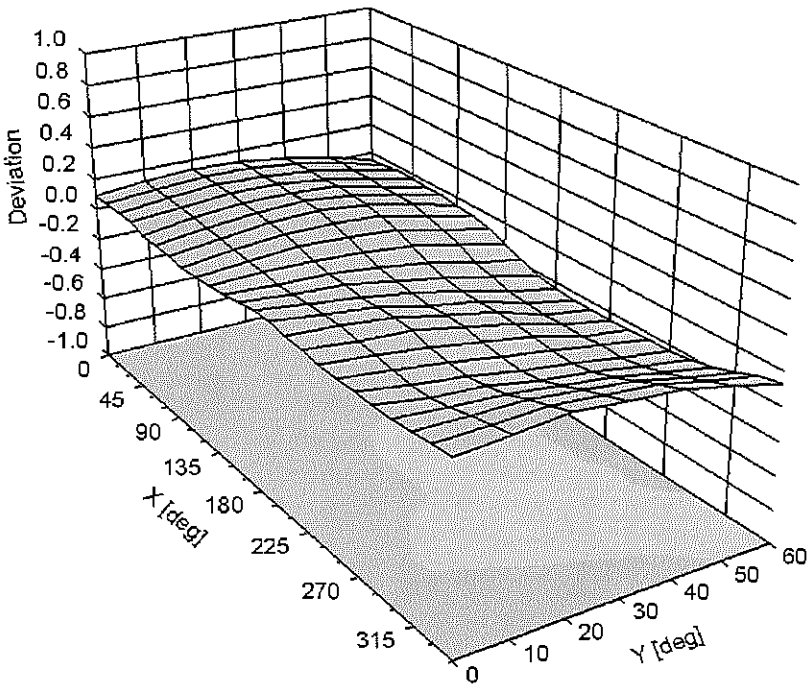


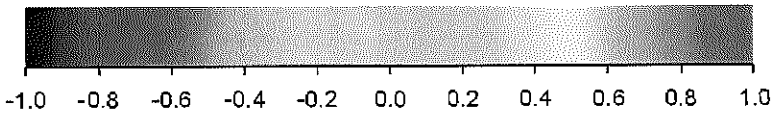
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3288

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-110
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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

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

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

Accreditation No.: SCS 0108

Client PC Test

Certificate No: ES3-3263_May15

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3263

Calibration procedure(s): QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

BN ✓ 5/28/15

Calibration date: May 20, 2015

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 E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: May 19, 2015

Calibration Laboratory of
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Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3263

Manufactured: January 25, 2010
Calibrated: May 20, 2015

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.21	1.25	1.13	± 10.1 %
DCP (mV)[B]	106.1	103.6	108.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	205.3	±3.3 %
		Y	0.0	0.0	1.0		207.3	
		Z	0.0	0.0	1.0		199.5	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	1.83	58.4	9.4	10.00	41.2	±1.4 %
		Y	3.88	63.3	12.9		47.5	
		Z	1.42	56.8	8.7		39.5	
10011-CAB	UMTS-FDD (WCDMA)	X	3.27	67.4	18.6	2.91	140.1	±0.7 %
		Y	3.39	67.5	18.7		142.7	
		Z	3.32	67.6	18.6		136.9	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.85	68.8	18.8	1.87	142.2	±0.7 %
		Y	3.38	70.7	19.5		144.8	
		Z	3.07	70.0	19.1		138.1	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.99	70.8	23.4	9.46	135.9	±2.5 %
		Y	11.36	70.3	22.8		124.7	
		Z	10.57	70.0	22.9		129.4	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	9.38	84.7	22.1	9.39	139.8	±1.9 %
		Y	27.79	100.0	28.7		129.4	
		Z	9.29	86.8	23.8		134.5	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	9.63	84.9	22.1	9.57	134.1	±2.5 %
		Y	25.29	98.2	28.2		124.0	
		Z	9.65	87.7	24.3		128.2	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	16.20	88.9	21.0	6.56	145.2	±1.4 %
		Y	41.82	99.7	25.6		128.5	
		Z	24.57	96.8	24.1		142.0	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	55.77	99.6	22.1	4.80	138.5	±2.2 %
		Y	53.39	99.7	23.9		140.5	
		Z	40.28	99.6	23.2		134.3	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	81.43	99.8	20.7	3.55	148.6	±1.7 %
		Y	60.49	99.7	22.9		146.0	
		Z	62.69	99.6	21.2		145.0	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	96.06	93.7	16.0	1.16	140.3	±1.9 %
		Y	77.08	99.9	20.1		149.0	
		Z	99.64	99.9	18.6		138.0	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.24	67.2	19.6	5.67	131.7	±1.4 %
		Y	6.39	67.3	19.5		133.8	
		Z	6.19	67.2	19.6		126.8	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	10.13	76.3	26.6	9.29	142.6	±2.7 %
		Y	12.07	77.9	26.6		138.9	
		Z	9.41	74.3	25.6		134.1	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.13	66.9	19.5	5.80	129.6	±1.4 %
		Y	6.35	67.1	19.5		133.7	
		Z	6.39	68.0	20.1		150.0	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.34	69.6	21.7	8.07	147.0	±1.9 %
		Y	10.05	68.3	20.9		123.4	
		Z	10.08	69.1	21.3		138.2	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.44	75.3	26.3	9.28	137.0	±3.5 %
		Y	11.36	76.9	26.3		134.5	
		Z	8.85	73.5	25.3		130.3	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.79	66.2	19.2	5.75	126.9	±1.2 %
		Y	6.05	66.5	19.3		130.9	
		Z	5.92	66.9	19.5		145.5	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.25	66.9	19.5	5.82	131.8	±1.4 %
		Y	6.47	67.0	19.5		135.4	
		Z	6.09	66.5	19.3		127.5	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.78	66.7	19.7	5.73	130.0	±1.2 %
		Y	5.14	66.7	19.5		135.0	
		Z	4.83	67.1	19.9		147.9	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.63	80.4	29.1	9.21	147.7	±2.7 %
		Y	9.72	78.5	27.2		123.9	
		Z	7.63	76.7	27.2		142.5	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.75	66.6	19.6	5.72	128.2	±1.2 %
		Y	5.12	66.6	19.5		134.3	
		Z	4.87	67.1	19.9		148.0	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.76	66.6	19.6	5.72	127.9	±1.2 %
		Y	5.12	66.6	19.5		134.5	
		Z	4.87	67.3	20.0		147.0	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.87	69.1	21.6	8.10	135.8	±2.2 %
		Y	10.19	69.1	21.4		145.3	
		Z	9.65	68.8	21.3		130.5	
10225-CAB	UMTS-FDD (HSPA+)	X	6.90	67.2	19.5	5.97	139.2	±1.7 %
		Y	7.22	67.3	19.6		148.0	
		Z	6.75	67.0	19.4		134.1	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.68	80.6	29.2	9.21	148.0	±3.0 %
		Y	9.82	78.8	27.3		125.0	
		Z	7.85	77.6	27.7		143.5	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.56	73.7	25.6	9.24	126.6	±3.5 %
		Y	10.58	76.0	25.9		126.3	
		Z	8.84	74.8	26.1		146.7	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.24	74.6	25.9	9.30	133.6	±3.3 %
		Y	11.38	76.9	26.2		134.3	
		Z	8.79	73.2	25.1		128.6	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.39	67.0	18.9	3.96	143.8	±0.9 %
		Y	4.55	67.1	18.8		147.3	
		Z	4.42	67.4	19.0		139.9	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.59	67.2	18.9	3.46	132.2	±0.5 %
		Y	3.68	66.7	18.5		136.0	
		Z	3.57	67.1	18.6		128.5	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.50	67.0	18.7	3.39	134.0	±0.7 %
		Y	3.62	66.6	18.4		138.6	
		Z	3.50	67.2	18.7		129.8	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.11	66.8	19.4	5.81	127.7	±1.4 %
		Y	6.33	67.0	19.5		132.1	
		Z	6.28	67.6	19.9		146.6	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.71	67.5	19.9	6.06	134.2	±1.7 %
		Y	6.93	67.7	19.9		138.0	
		Z	6.57	67.2	19.6		128.0	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.17	69.5	21.9	8.37	138.5	±2.5 %
		Y	10.55	69.5	21.8		148.0	
		Z	9.92	69.0	21.6		132.5	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.79	69.2	19.1	3.76	144.1	±0.7 %
		Y	4.71	67.0	18.2		129.2	
		Z	4.72	69.3	19.2		139.3	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.69	69.2	19.2	3.77	142.1	±0.7 %
		Y	4.71	67.5	18.5		126.7	
		Z	4.51	68.6	18.8		137.3	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.55	68.0	18.5	1.54	141.7	±0.7 %
		Y	2.67	68.4	18.6		144.0	
		Z	2.98	70.8	19.5		138.0	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.01	69.3	21.8	8.23	137.3	±2.5 %
		Y	10.31	69.3	21.6		146.0	
		Z	9.69	68.8	21.4		129.9	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 7 and 8).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.27	6.27	6.27	0.29	1.87	± 12.0 %
835	41.5	0.90	6.18	6.18	6.18	0.49	1.42	± 12.0 %
1750	40.1	1.37	5.27	5.27	5.27	0.49	1.46	± 12.0 %
1900	40.0	1.40	4.96	4.96	4.96	0.66	1.28	± 12.0 %
2300	39.5	1.67	4.63	4.63	4.63	0.58	1.41	± 12.0 %
2450	39.2	1.80	4.40	4.40	4.40	0.71	1.34	± 12.0 %
2600	39.0	1.96	4.25	4.25	4.25	0.80	1.25	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.07	6.07	6.07	0.53	1.42	± 12.0 %
835	55.2	0.97	6.08	6.08	6.08	0.57	1.36	± 12.0 %
1750	53.4	1.49	4.88	4.88	4.88	0.54	1.50	± 12.0 %
1900	53.3	1.52	4.66	4.66	4.66	0.56	1.51	± 12.0 %
2300	52.9	1.81	4.42	4.42	4.42	0.69	1.33	± 12.0 %
2450	52.7	1.95	4.28	4.28	4.28	0.80	1.08	± 12.0 %
2600	52.5	2.16	4.11	4.11	4.11	0.80	1.09	± 12.0 %

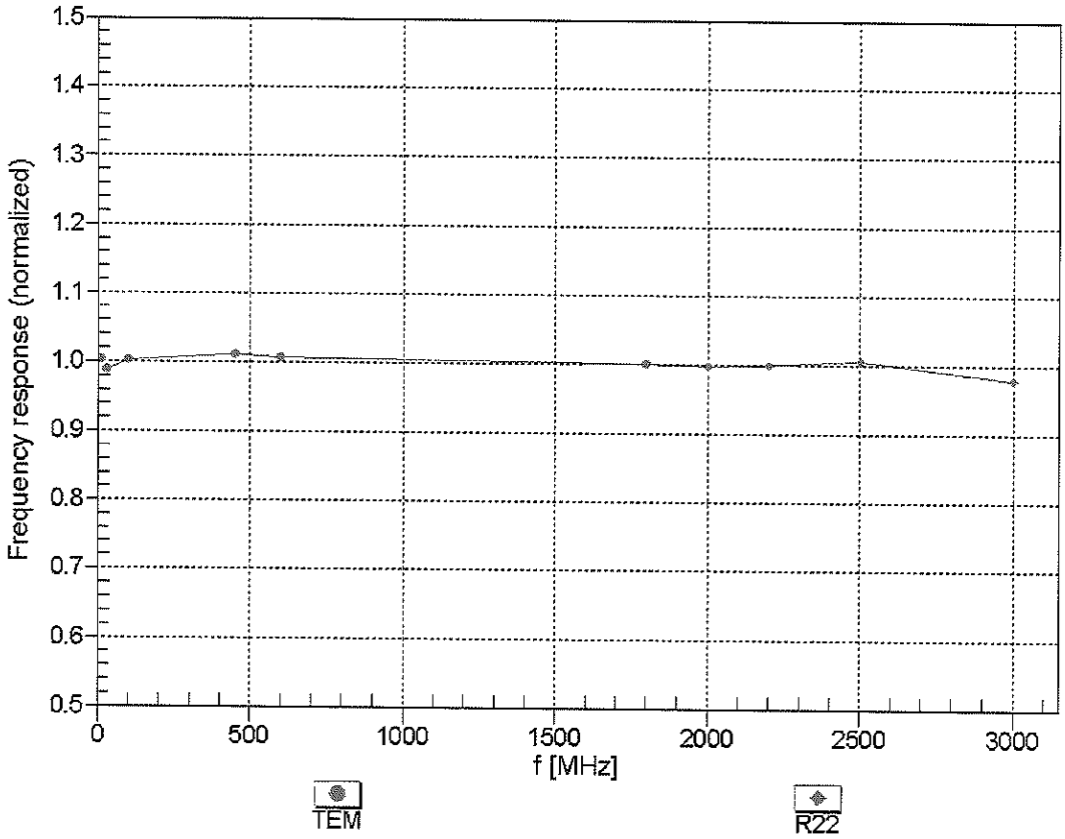
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

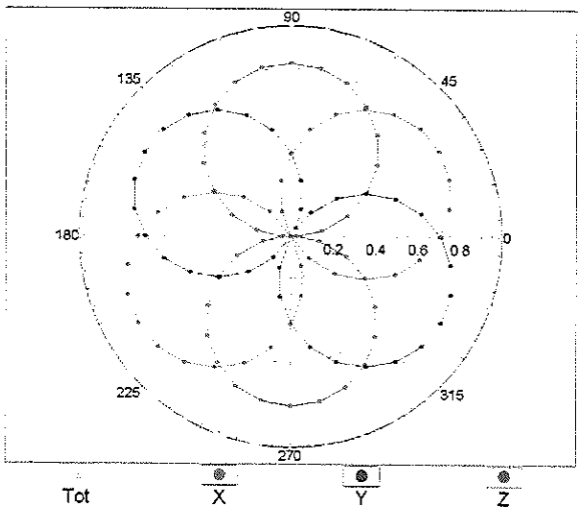
(TEM-Cell:ifi110 EXX, Waveguide: R22)



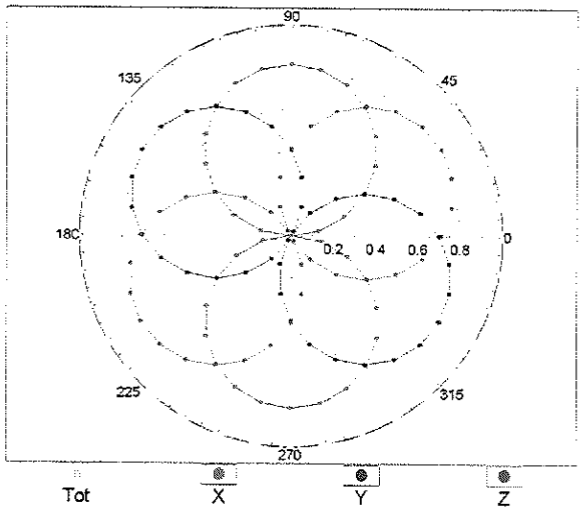
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

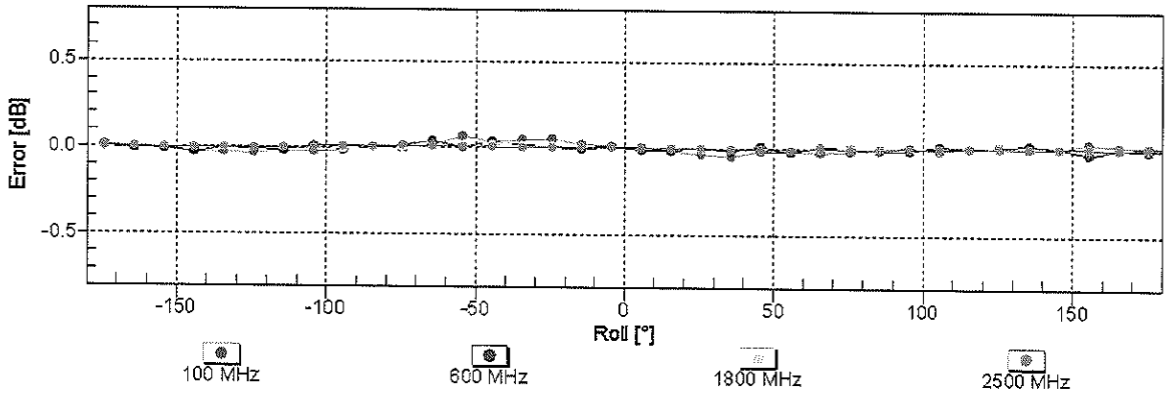
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

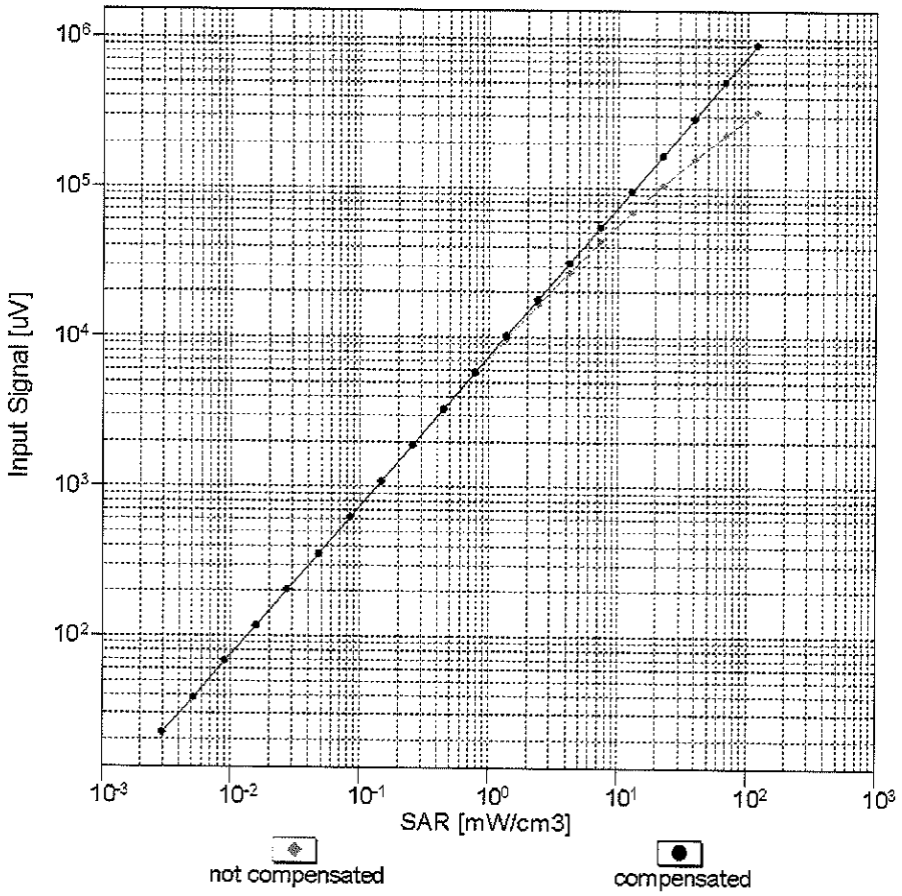


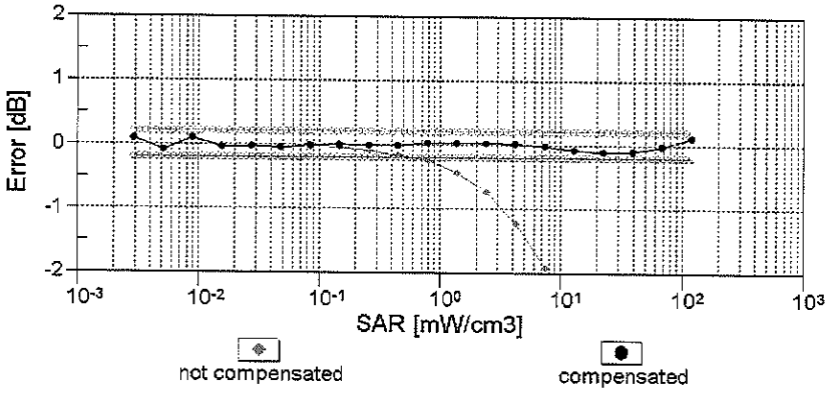


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

(TEM cell , f_{eval}= 1900 MHz)

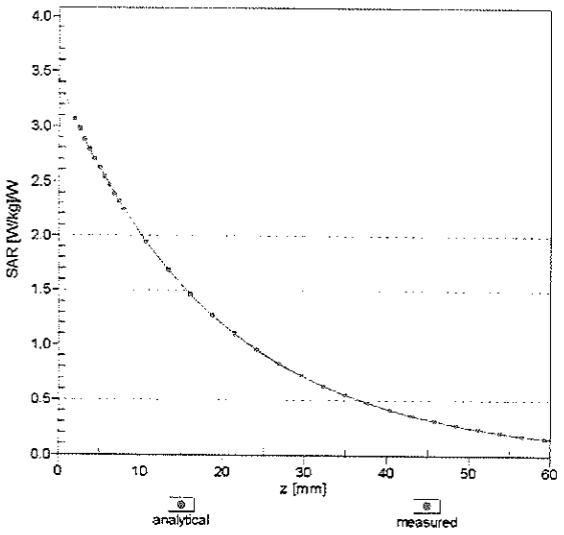




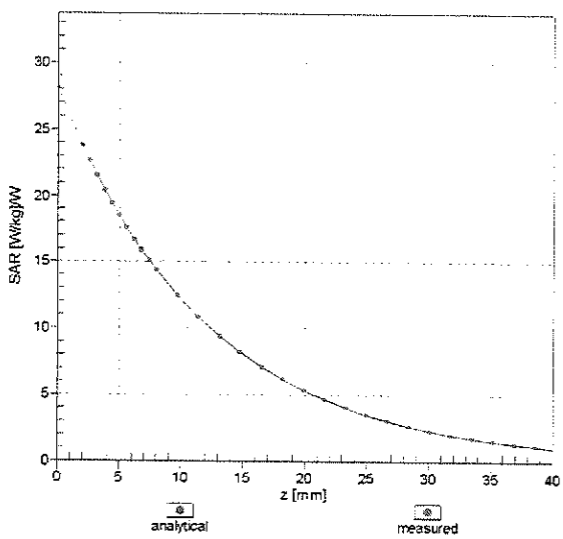
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

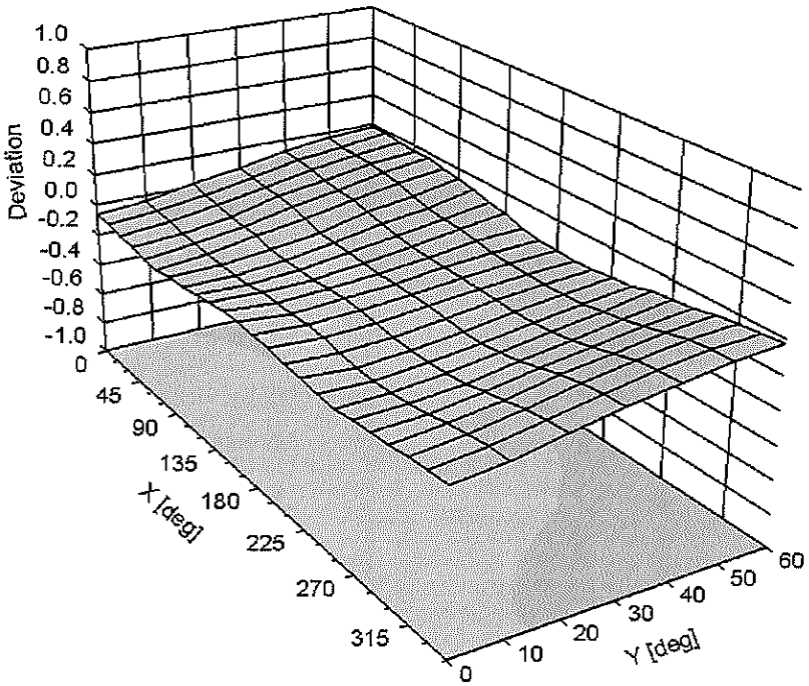


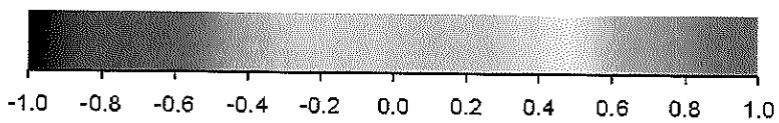
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	65.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3263

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-111.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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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: EX3-7357_Apr15

CALIBRATION CERTIFICATE

Object: EX3DV4 - SN:7357

Calibration procedure(s): QA CAL-01.v9, QA CAL-14.v4, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: April 23, 2015

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 E4419B	GB41293874	01-Apr-15 (No. 217-02128)	Mar-16
Power sensor E4412A	MY41498087	01-Apr-15 (No. 217-02128)	Mar-16
Reference 3 dB Attenuator	SN: S5054 (3c)	01-Apr-15 (No. 217-02129)	Mar-16
Reference 20 dB Attenuator	SN: S5277 (20x)	01-Apr-15 (No. 217-02132)	Mar-16
Reference 30 dB Attenuator	SN: S5129 (30b)	01-Apr-15 (No. 217-02133)	Mar-16
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

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

Issued: April 23, 2015

Calibration Laboratory of
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Accreditation No.: SCS 0108

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., $\vartheta = 0$ is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization $\vartheta = 0$ ($f \le 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \le 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe EX3DV4

SN:7357

Manufactured: February 5, 2015
Calibrated: April 23, 2015

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7357

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	0.41	0.49	0.42	± 10.1 %
DCP (mV)[B]	103.9	96.9	101.6	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	146.9	±3.3 %
		Y	0.0	0.0	1.0		157.7	
		Z	0.0	0.0	1.0		138.2	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	0.83	57.1	8.0	10.00	45.6	±0.7 %
		Y	1.12	59.0	9.6		45.6	
		Z	0.93	58.4	8.9		43.4	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.61	73.9	21.5	1.87	133.3	±0.9 %
		Y	2.64	66.3	17.3		127.2	
		Z	3.06	70.4	19.9		149.2	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.42	68.9	22.1	9.46	142.7	±3.3 %
		Y	10.68	69.5	22.6		140.9	
		Z	10.33	68.6	21.9		134.3	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	0.06	0.0	100.0	1.16	149.4	±3.5 %
		Y	0.26	57.7	4.5		143.7	
		Z	0.05	0.6	100.0		143.3	
10062-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	10.19	68.8	21.5	8.68	144.0	±3.5 %
		Y	10.40	69.2	21.8		145.6	
		Z	10.11	68.5	21.4		138.3	
10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	7.21	67.1	21.4	9.29	132.3	±1.9 %
		Y	7.94	69.4	22.8		136.4	
		Z	7.15	66.8	21.3		145.0	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.10	68.5	20.9	8.07	131.3	±2.5 %
		Y	10.12	68.3	20.8		128.9	
		Z	9.95	68.0	20.6		124.4	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.97	67.1	21.5	9.28	148.9	±1.9 %
		Y	7.50	68.7	22.5		130.8	
		Z	6.89	66.6	21.3		141.8	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.57	68.9	22.9	9.21	141.8	±1.9 %
		Y	5.84	69.6	23.4		139.9	
		Z	5.43	68.1	22.5		134.4	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.69	68.2	20.8	8.10	124.8	±3.3 %
		Y	10.09	69.0	21.4		148.5	
		Z	9.90	68.6	21.1		143.9	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.57	69.0	22.9	9.21	140.3	±1.9 %
		Y	5.85	69.6	23.4		141.2	
		Z	5.43	68.0	22.4		133.8	

10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.62	67.0	21.6	9.24	143.6	±2.2 %
		Y	7.21	68.9	22.9		144.8	
		Z	6.54	66.4	21.3		137.3	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	7.00	67.1	21.6	9.30	149.1	±1.9 %
		Y	7.52	68.7	22.6		128.6	
		Z	6.91	66.6	21.3		142.7	
10317-AAB	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	9.81	68.2	21.0	8.36	123.5	±3.3 %
		Y	10.26	69.1	21.6		148.1	
		Z	10.06	68.7	21.3		144.2	
10400-AAB	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	9.88	68.2	21.0	8.37	123.6	±2.7 %
		Y	9.94	68.1	21.0		124.7	
		Z	10.15	68.8	21.3		144.7	
10401-AAB	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	X	10.61	68.7	21.2	8.60	132.4	±3.0 %
		Y	10.82	69.0	21.5		134.7	
		Z	10.54	68.4	21.1		126.8	
10402-AAB	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	10.66	68.6	21.1	8.53	133.5	±3.0 %
		Y	11.03	69.4	21.5		136.6	
		Z	10.56	68.3	20.9		126.5	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	4.15	76.8	22.5	1.54	130.0	±0.9 %
		Y	2.63	66.8	17.4		129.6	
		Z	3.25	72.3	20.7		147.1	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.99	68.7	21.2	8.23	146.6	±3.3 %
		Y	10.19	69.0	21.5		149.3	
		Z	9.96	68.6	21.2		141.2	
10417-AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	10.02	68.8	21.3	8.23	148.2	±2.7 %
		Y	9.78	68.0	20.9		124.2	
		Z	9.96	68.6	21.2		142.5	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 6 and 7).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7357

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
2450	39.2	1.80	7.31	7.31	7.31	0.36	0.80	± 12.0 %
2600	39.0	1.96	7.06	7.06	7.06	0.38	0.80	± 12.0 %
5200	36.0	4.66	5.14	5.14	5.14	0.40	1.80	± 13.1 %
5300	35.9	4.76	4.93	4.93	4.93	0.40	1.80	± 13.1 %
5500	35.6	4.96	4.70	4.70	4.70	0.40	1.80	± 13.1 %
5600	35.5	5.07	4.38	4.38	4.38	0.45	1.80	± 13.1 %
5800	35.3	5.27	4.41	4.41	4.41	0.45	1.80	± 13.1 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7357

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
2450	52.7	1.95	6.95	6.95	6.95	0.26	0.99	± 12.0 %
2600	52.5	2.16	6.68	6.68	6.68	0.28	0.99	± 12.0 %
5200	49.0	5.30	4.27	4.27	4.27	0.50	1.90	± 13.1 %
5300	48.9	5.42	4.11	4.11	4.11	0.50	1.90	± 13.1 %
5500	48.6	5.65	3.83	3.83	3.83	0.50	1.90	± 13.1 %
5600	48.5	5.77	3.72	3.72	3.72	0.55	1.90	± 13.1 %
5800	48.2	6.00	3.82	3.82	3.82	0.55	1.90	± 13.1 %

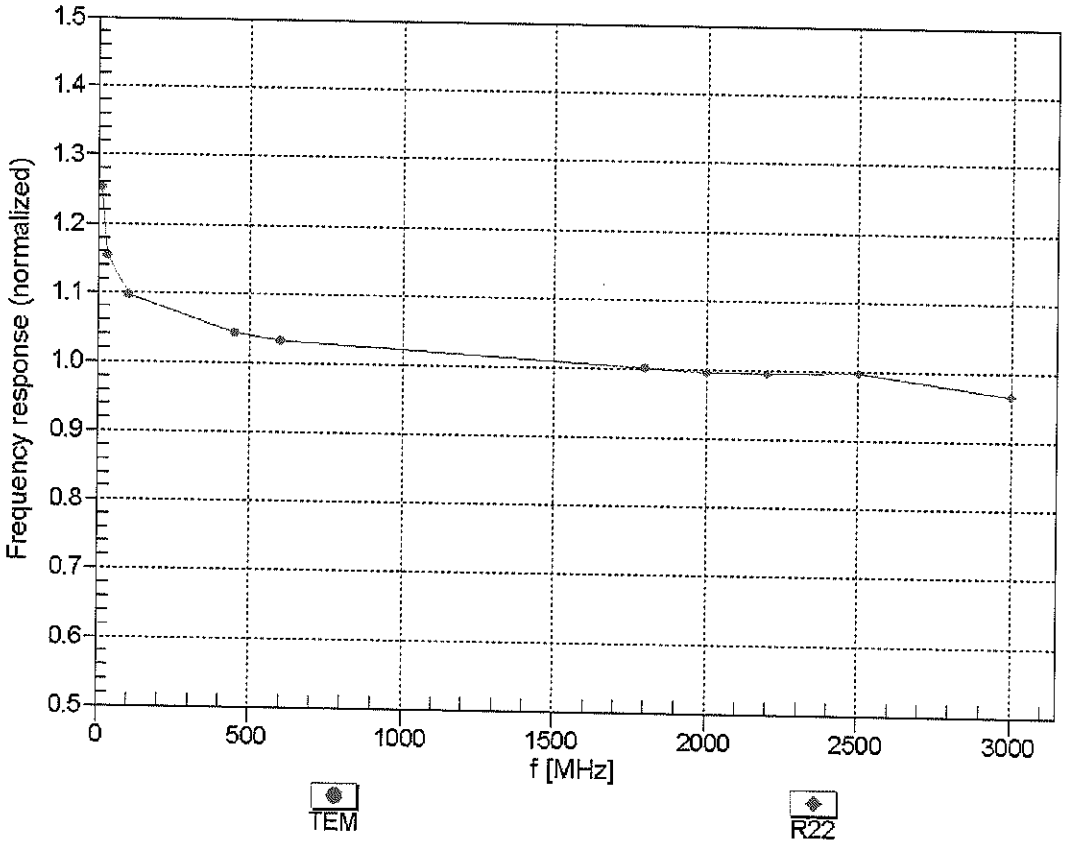
[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

Frequency Response of E-Field

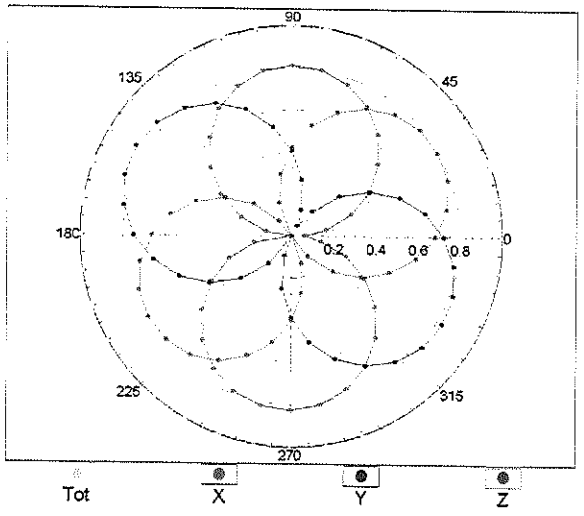
(TEM-Cell:ifi110 EXX, Waveguide: R22)



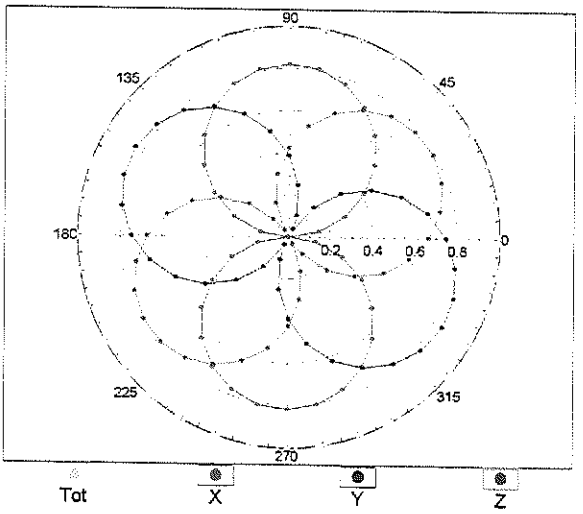
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

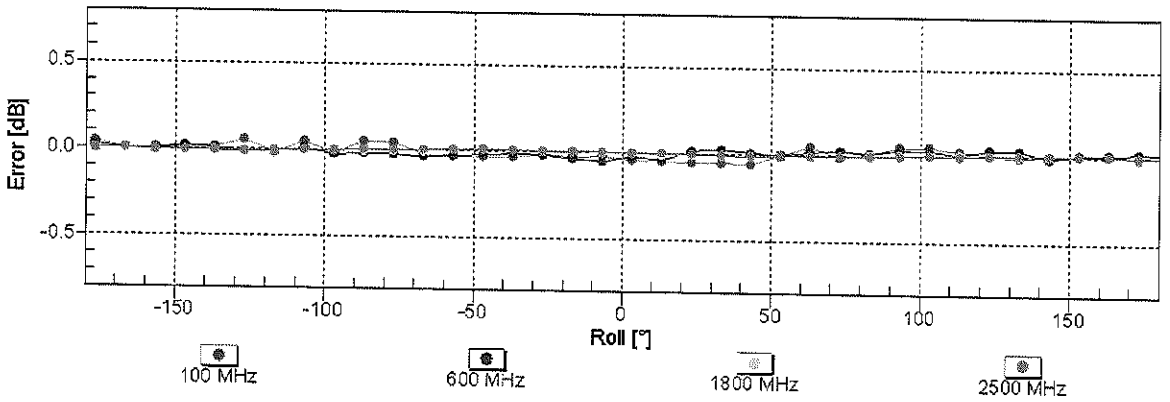
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



f=1800 MHz,R22

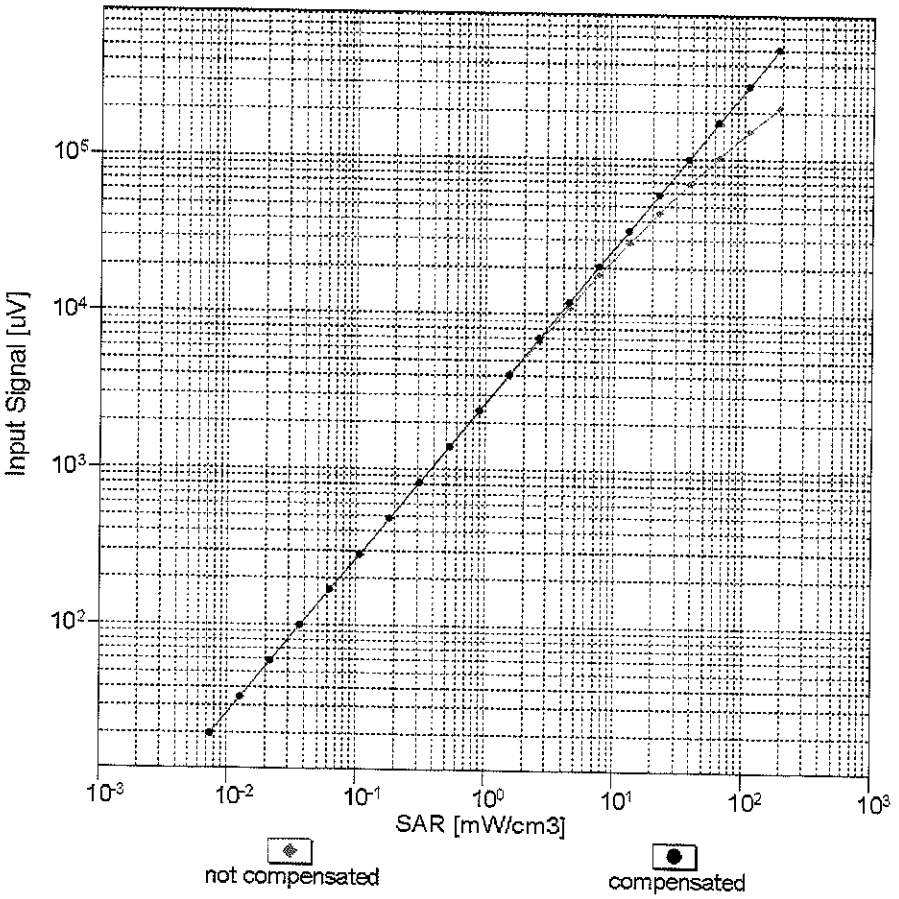


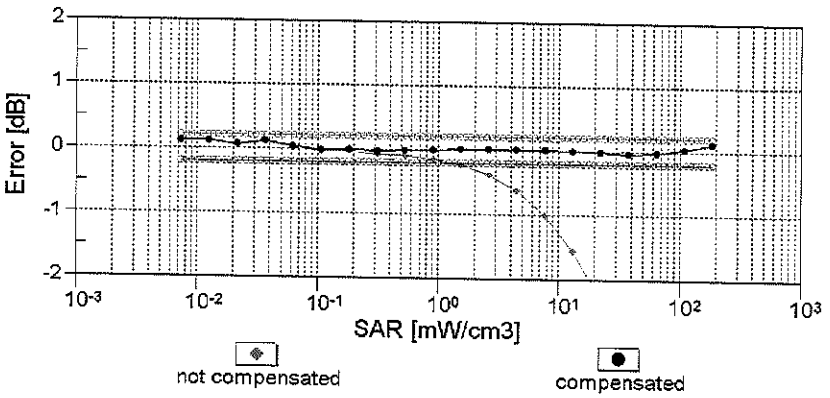


Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})

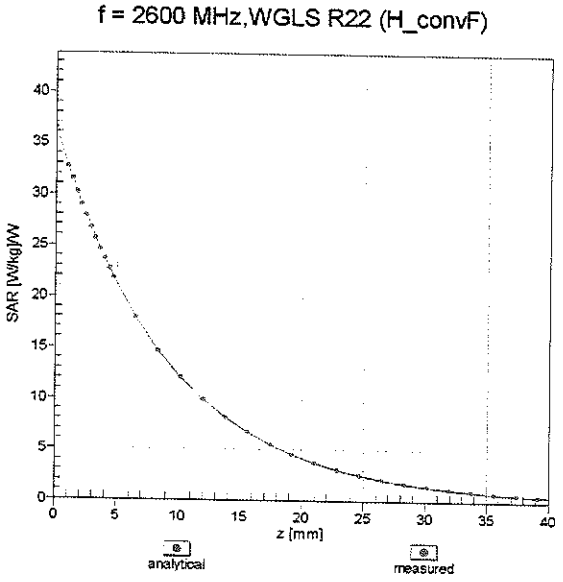
(TEM cell , f_{eval}= 1900 MHz)

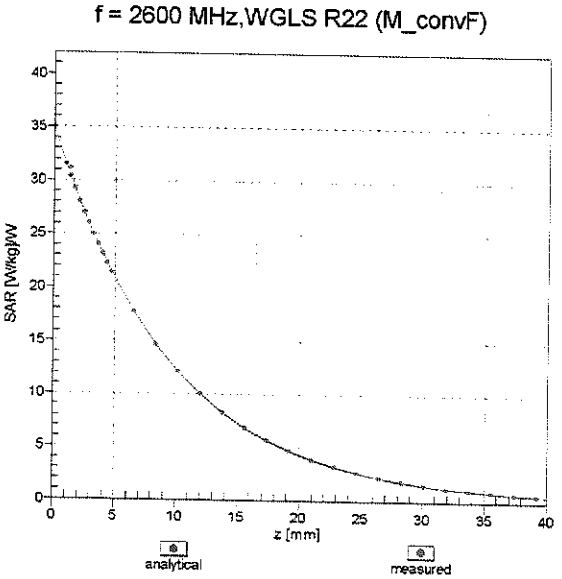




Uncertainty of Linearity Assessment: ± 0.6% (k=2)

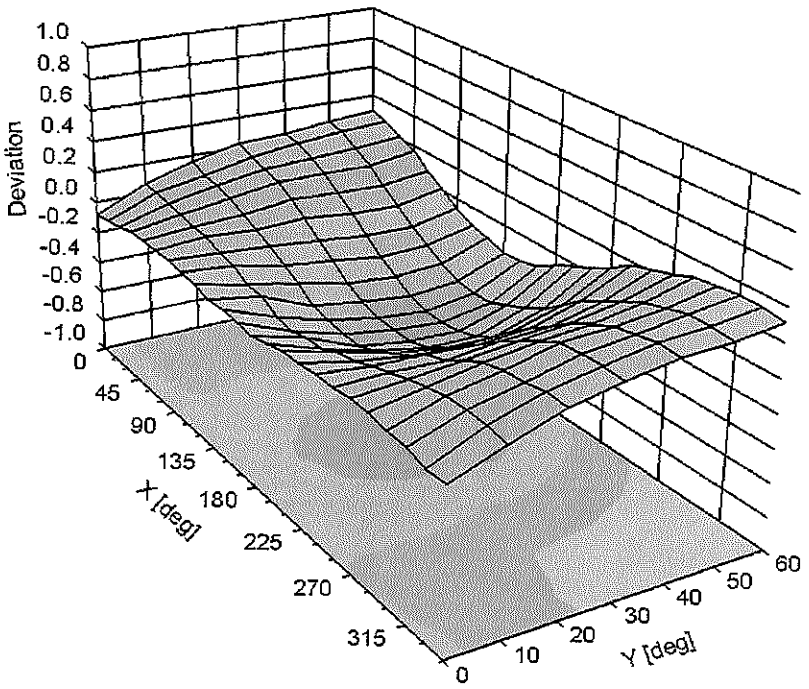
Conversion Factor Assessment

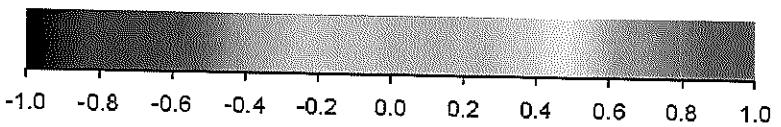




Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7357

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	13.1
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	9 mm
Tip Diameter	2.5 mm
Probe Tip to Sensor X Calibration Point	1 mm
Probe Tip to Sensor Y Calibration Point	1 mm
Probe Tip to Sensor Z Calibration Point	1 mm
Recommended Measurement Distance from Surface	1.4 mm

Calibration Laboratory of
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Zeughausstrasse 43, 8004 Zurich, Switzerland

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
S Servizio svizzero di taratura
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: ES3-3213_Jan15

CALIBRATION CERTIFICATE

Object: ES3DV3 - SN:3213

Calibration procedure(s): QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

CC 1/30/15

Calibration date: January 20, 2015

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 E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Israe Elnaouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: January 22, 2015

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

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

Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3213

Manufactured: October 14, 2008
Calibrated: January 20, 2015

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.49	1.37	1.34	± 10.1 %
DCP (mV)[B]	99.9	101.8	101.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	169.8	±3.8 %
		Y	0.0	0.0	1.0		215.4	
		Z	0.0	0.0	1.0		214.5	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	1.84	57.8	10.2	10.00	47.4	±1.9 %
		Y	1.82	58.6	10.3		44.3	
		Z	1.65	57.3	9.2		44.2	
10011-CAB	UMTS-FDD (WCDMA)	X	3.32	66.8	18.5	2.91	135.8	±0.5 %
		Y	3.18	66.4	18.2		127.9	
		Z	3.21	66.5	18.2		128.1	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.90	68.1	18.4	1.87	137.2	±0.7 %
		Y	2.97	69.2	19.0		130.1	
		Z	2.80	68.0	18.4		129.9	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.40	71.2	23.7	9.46	135.1	±3.8 %
		Y	11.25	71.3	23.9		124.2	
		Z	10.96	70.3	23.2		124.8	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	18.25	96.6	27.2	9.39	140.4	±1.7 %
		Y	21.48	99.9	28.2		133.3	
		Z	11.76	89.4	24.5		127.3	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	13.12	91.7	26.0	9.57	126.4	±1.9 %
		Y	17.05	95.2	26.6		127.3	
		Z	8.91	85.2	23.3		118.8	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	34.78	100.0	25.2	6.56	116.4	±1.7 %
		Y	33.37	99.5	24.8		111.7	
		Z	34.11	99.5	24.6		110.5	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	37.18	99.7	24.0	4.80	131.2	±1.7 %
		Y	44.91	99.8	23.3		127.4	
		Z	41.51	99.7	23.2		125.0	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	48.95	99.5	22.4	3.55	140.9	±1.7 %
		Y	67.41	99.8	21.5		137.8	
		Z	56.45	100.0	21.9		135.0	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	20.23	99.3	22.1	1.16	111.3	±1.2 %
		Y	32.72	99.5	20.6		109.6	
		Z	48.57	100.0	20.0		108.8	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.60	67.9	20.0	5.67	144.6	±1.2 %
		Y	6.55	68.2	20.2		142.7	
		Z	6.50	67.8	19.9		141.5	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	10.34	75.7	26.2	9.29	133.2	±2.5 %
		Y	10.31	76.5	26.9		128.2	
		Z	9.74	74.5	25.6		127.1	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.50	67.6	20.0	5.80	142.8	±1.2 %
		Y	6.41	67.7	20.1		140.3	
		Z	6.41	67.6	19.9		140.2	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.36	69.2	21.6	8.07	132.8	±2.7 %
		Y	10.42	69.7	21.9		131.4	
		Z	10.22	69.1	21.4		130.0	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.65	74.6	25.8	9.28	127.9	±2.5 %
		Y	9.66	75.6	26.7		123.7	
		Z	9.14	73.6	25.3		122.7	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.14	66.9	19.6	5.75	139.3	±1.4 %
		Y	6.08	67.2	19.9		138.5	
		Z	6.05	66.9	19.6		137.3	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.58	67.5	19.9	5.82	144.3	±1.4 %
		Y	6.54	67.8	20.1		143.7	
		Z	6.50	67.5	19.8		142.1	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.93	66.1	19.3	5.73	120.6	±0.9 %
		Y	4.93	66.7	19.8		120.9	
		Z	4.85	66.3	19.5		118.9	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.93	79.5	28.6	9.21	140.8	±2.5 %
		Y	9.60	82.9	30.6		139.9	
		Z	8.30	78.2	27.9		136.6	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.90	66.0	19.3	5.72	118.8	±0.9 %
		Y	4.93	66.8	19.8		120.2	
		Z	4.81	66.1	19.3		116.6	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.92	66.1	19.3	5.72	119.0	±0.9 %
		Y	4.92	66.6	19.8		120.5	
		Z	4.77	65.8	19.2		115.8	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.93	68.7	21.4	8.10	125.0	±2.5 %
		Y	10.06	69.4	21.9		128.3	
		Z	9.78	68.5	21.2		120.5	
10225-CAB	UMTS-FDD (HSPA+)	X	6.66	65.7	18.8	5.97	106.5	±0.9 %
		Y	6.81	66.6	19.3		112.3	
		Z	6.64	66.0	18.9		108.0	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.91	79.4	28.5	9.21	141.4	±2.2 %
		Y	9.39	82.3	30.4		146.7	
		Z	8.40	78.5	28.2		141.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	8.84	73.3	25.2	9.24	119.1	±2.7 %
		Y	8.94	74.6	26.3		118.6	
		Z	8.39	72.4	24.7		114.0	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.62	74.6	25.8	9.30	126.2	±2.7 %
		Y	9.77	76.0	26.9		126.1	
		Z	9.10	73.4	25.2		121.4	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.43	66.4	18.5	3.96	132.5	±0.7 %
		Y	4.37	66.6	18.6		134.1	
		Z	4.40	66.7	18.6		130.5	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.63	66.4	18.4	3.46	122.5	±0.5 %
		Y	3.54	66.5	18.5		124.9	
		Z	3.55	66.3	18.3		121.4	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.49	65.9	18.1	3.39	125.1	±0.5 %
		Y	3.52	66.7	18.6		126.1	
		Z	3.51	66.5	18.4		123.8	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.49	67.6	19.9	5.81	143.1	±1.4 %
		Y	6.49	68.0	20.3		142.3	
		Z	6.42	67.6	19.9		144.3	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	7.06	68.1	20.2	6.06	147.6	±1.7 %
		Y	7.09	68.7	20.7		148.2	
		Z	7.03	68.3	20.4		149.8	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.66	67.4	18.4	3.76	135.3	±0.5 %
		Y	4.69	68.1	18.7		134.9	
		Z	4.72	68.2	18.7		136.5	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.58	67.4	18.3	3.77	133.4	±0.5 %
		Y	4.68	68.4	18.9		132.8	
		Z	4.58	67.9	18.5		135.4	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.41	65.7	17.2	1.54	131.4	±0.7 %
		Y	2.42	66.4	17.7		131.3	
		Z	2.59	67.7	18.2		134.1	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.06	68.9	21.5	8.23	127.6	±2.7 %
		Y	10.12	69.5	22.0		126.3	
		Z	10.04	69.1	21.7		129.7	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 7 and 8).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.45	6.45	6.45	0.57	1.37	± 12.0 %
835	41.5	0.90	6.26	6.26	6.26	0.65	1.26	± 12.0 %
1750	40.1	1.37	5.22	5.22	5.22	0.47	1.47	± 12.0 %
1900	40.0	1.40	5.06	5.06	5.06	0.80	1.14	± 12.0 %
2450	39.2	1.80	4.54	4.54	4.54	0.78	1.22	± 12.0 %
2600	39.0	1.96	4.33	4.33	4.33	0.80	1.28	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

Calibration Parameter Determined in Body Tissue Simulating Media

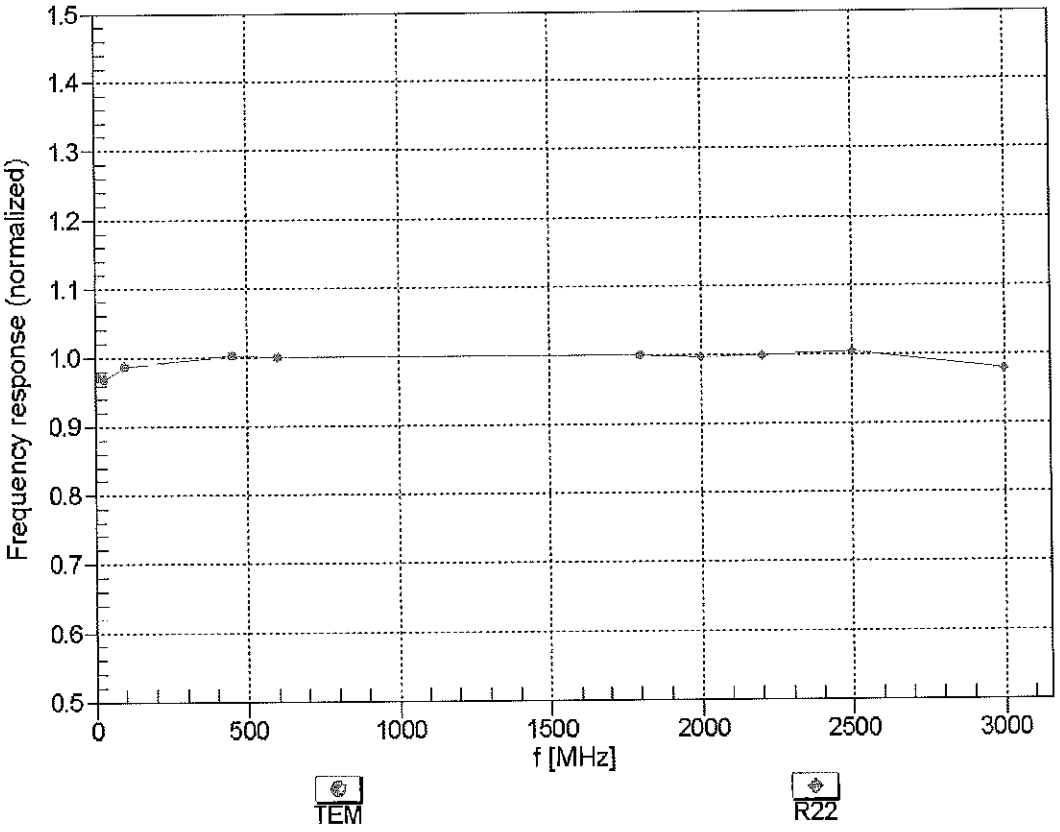
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.11	6.11	6.11	0.71	1.24	± 12.0 %
835	55.2	0.97	6.07	6.07	6.07	0.35	1.86	± 12.0 %
1750	53.4	1.49	4.93	4.93	4.93	0.51	1.47	± 12.0 %
1900	53.3	1.52	4.72	4.72	4.72	0.80	1.20	± 12.0 %
2450	52.7	1.95	4.37	4.37	4.37	0.71	1.12	± 12.0 %
2600	52.5	2.16	4.20	4.20	4.20	0.66	0.95	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

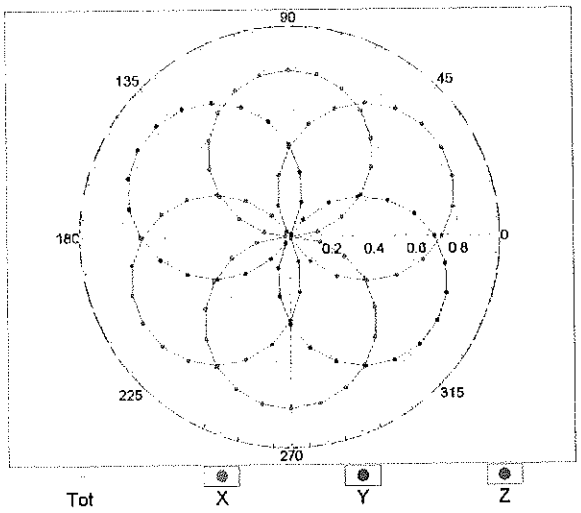
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



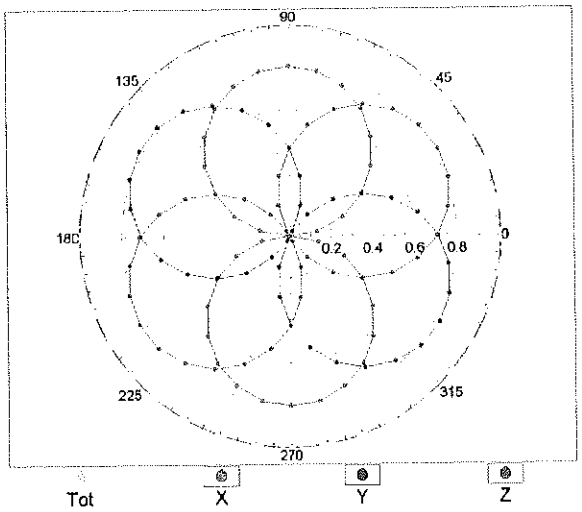
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

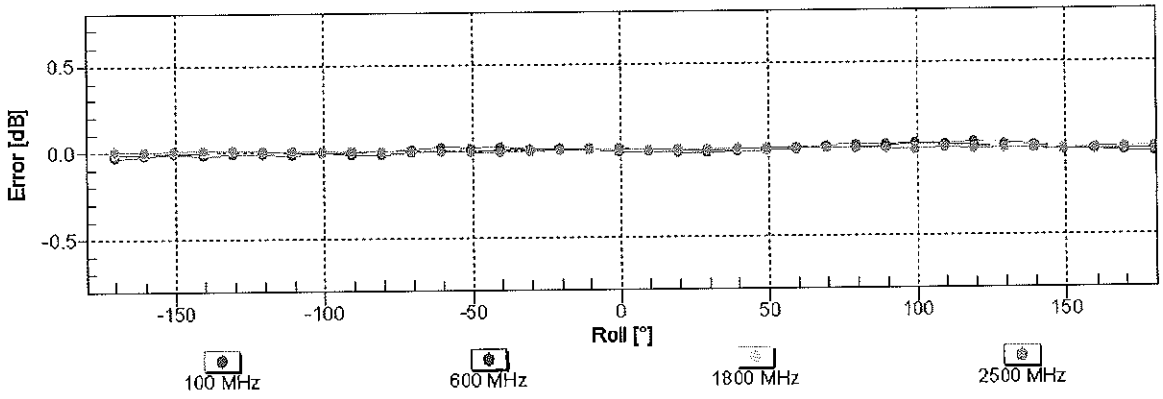
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



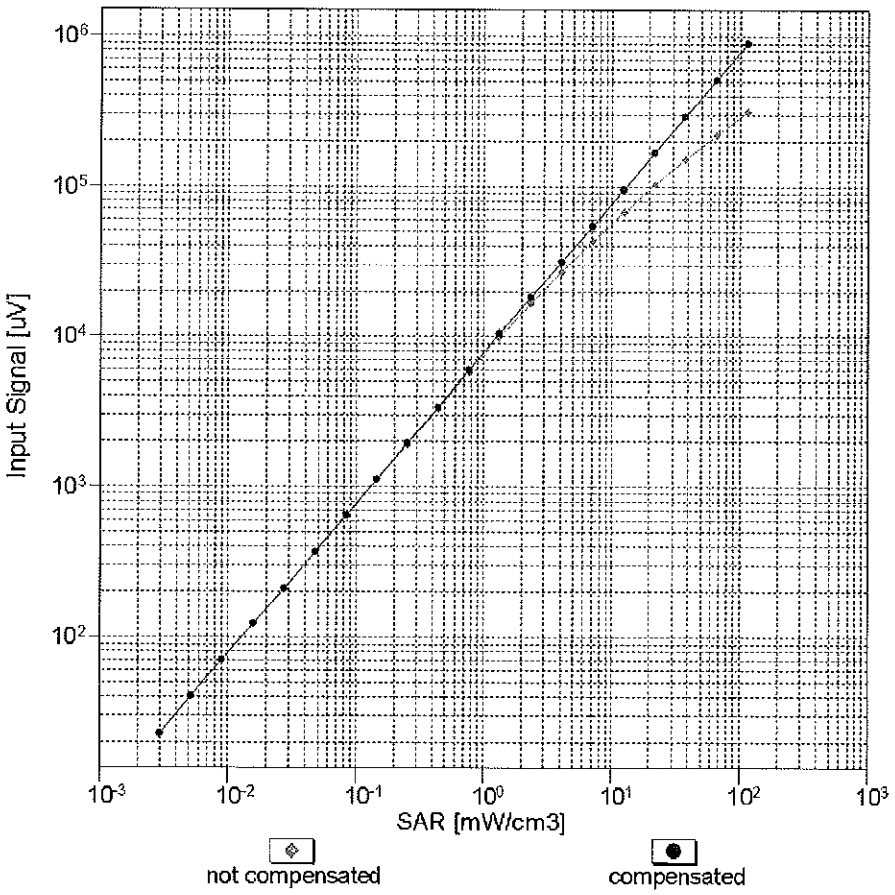
f=1800 MHz,R22

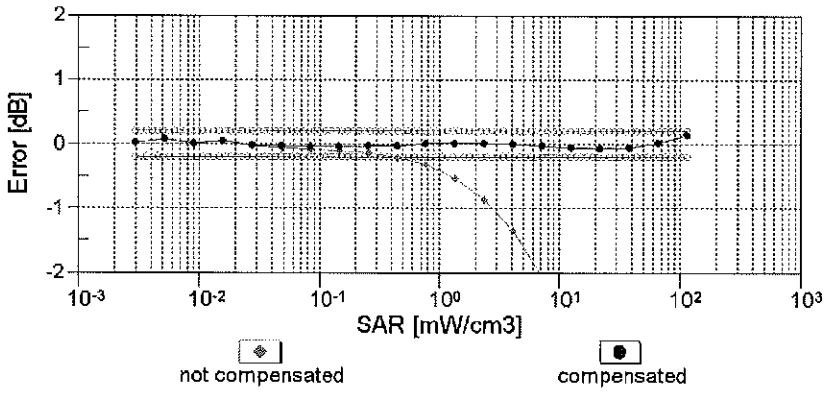




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR$_{head}$)
(TEM cell , f_{eval}= 1900 MHz)

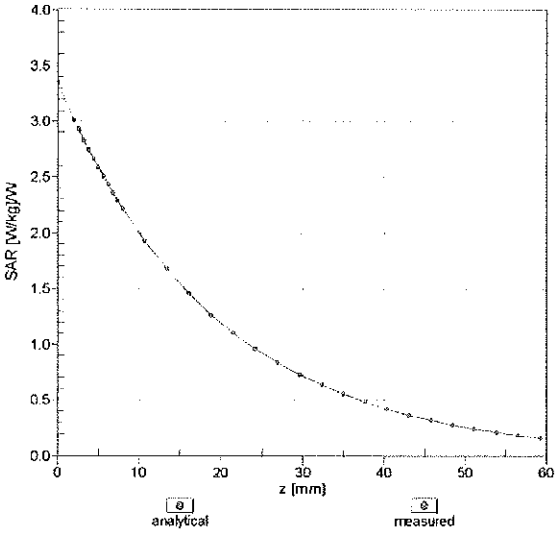




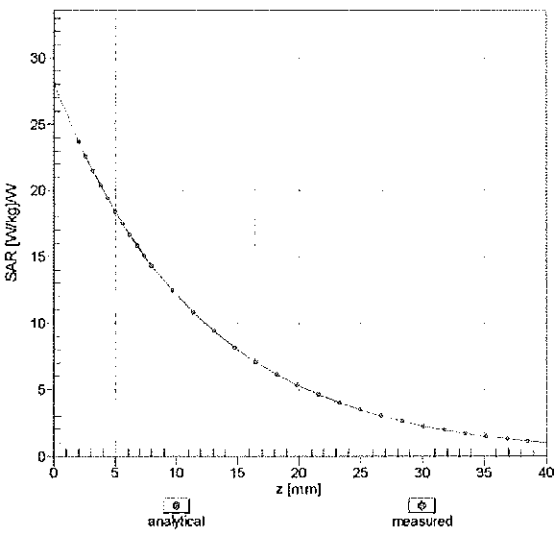
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

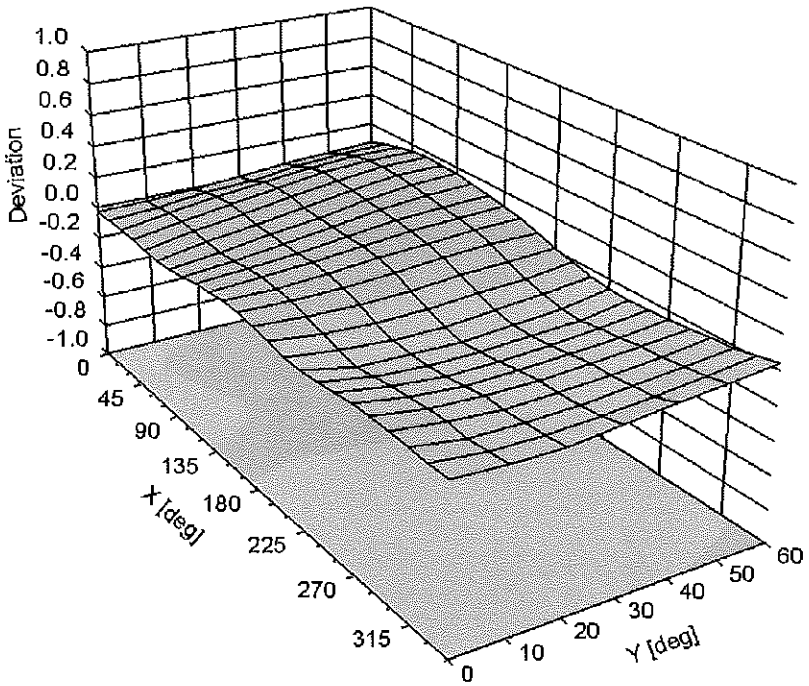


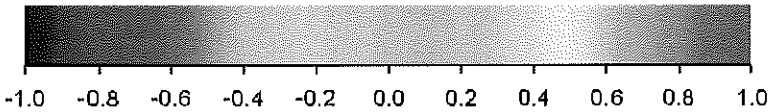
f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz





Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3213

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-70.6
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm

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

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

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

Accreditation No.: SCS 0108

Client PC Test

Certificate No: ES3-3319_Mar15

CALIBRATION CERTIFICATE

PN ✓ 3/26/15

Object ES3DV3 - SN:3319

Calibration procedure(s) QA CAL-01.v9, QA CAL-23.v5, QA CAL-25.v6
Calibration procedure for dosimetric E-field probes

Calibration date: March 19, 2015

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 E4419B	GB41293874	03-Apr-14 (No. 217-01911)	Apr-15
Power sensor E4412A	MY41498087	03-Apr-14 (No. 217-01911)	Apr-15
Reference 3 dB Attenuator	SN: S5054 (3c)	03-Apr-14 (No. 217-01915)	Apr-15
Reference 20 dB Attenuator	SN: S5277 (20x)	03-Apr-14 (No. 217-01919)	Apr-15
Reference 30 dB Attenuator	SN: S5129 (30b)	03-Apr-14 (No. 217-01920)	Apr-15
Reference Probe ES3DV2	SN: 3013	30-Dec-14 (No. ES3-3013_Dec14)	Dec-15
DAE4	SN: 660	14-Jan-15 (No. DAE4-660_Jan15)	Jan-16
Secondary Standards	ID	Check Date (in house)	Scheduled Check
RF generator HP 8648C	US3642U01700	4-Aug-99 (in house check Apr-13)	In house check: Apr-16
Network Analyzer HP 8753E	US37390585	18-Oct-01 (in house check Oct-14)	In house check: Oct-15

	Name	Function	Signature
Calibrated by:	Israe Elnaouq	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 19, 2015

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

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S Servizio svizzero di taratura
Swiss Calibration Service

Accredited by the Swiss Accreditation Service (SAS)
Accreditation No.: SCS 0108
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Glossary:

TSL	tissue simulating liquid
NORMx,y,z	sensitivity in free space
ConvF	sensitivity in TSL / NORMx,y,z
DCP	diode compression point
CF	crest factor (1/duty_cycle) of the RF signal
A, B, C, D	modulation dependent linearization parameters
Polarization φ	φ rotation around probe axis
Polarization ϑ	ϑ rotation around an axis that is in the plane normal to probe axis (at measurement center), i.e., ϑ = 0 is normal to probe axis
Connector Angle	information used in DASY system to align probe sensor X to the robot coordinate system

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- *NORMx,y,z:* Assessed for E-field polarization ϑ = 0 (f ≤ 900 MHz in TEM-cell; f > 1800 MHz: R22 waveguide). NORMx,y,z are only intermediate values, i.e., the uncertainties of NORMx,y,z does not affect the E^2-field uncertainty inside TSL (see below *ConvF*).
- *NORM(f)x,y,z = NORMx,y,z * frequency_response* (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of *ConvF*.
- *DCPx,y,z:* DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- *PAR:* PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- *Ax,y,z; Bx,y,z; Cx,y,z; Dx,y,z; VRx,y,z: A, B, C, D* are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. *VR* is the maximum calibration range expressed in RMS voltage across the diode.
- *ConvF and Boundary Effect Parameters:* Assessed in flat phantom using E-field (or Temperature Transfer Standard for f ≤ 800 MHz) and inside waveguide using analytical field distributions based on power measurements for f > 800 MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to *NORMx,y,z * ConvF* whereby the uncertainty corresponds to that given for *ConvF*. A frequency dependent *ConvF* is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- *Spherical isotropy (3D deviation from isotropy)*: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- *Sensor Offset*: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- *Connector Angle*: The angle is assessed using the information gained by determining the *NORMx* (no uncertainty required).

Probe ES3DV3

SN:3319

Manufactured: January 10, 2012
Calibrated: March 19, 2015

Calibrated for DASY/EASY Systems
(Note: non-compatible with DASY2 system!)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$)[A]	1.12	1.08	1.15	± 10.1 %
DCP (mV)[B]	104.4	106.0	104.4	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB√μV	C	D dB	VR mV	Unc[E] (k=2)
0	CW	X	0.0	0.0	1.0	0.00	176.1	±3.3 %
		Y	0.0	0.0	1.0		192.7	
		Z	0.0	0.0	1.0		174.6	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	3.26	64.8	13.4	10.00	41.7	±1.9 %
		Y	2.66	62.2	11.7		39.5	
		Z	3.51	64.8	13.2		42.1	
10011-CAB	UMTS-FDD (WCDMA)	X	3.47	68.1	19.1	2.91	142.9	±0.5 %
		Y	3.37	67.9	19.1		133.0	
		Z	3.57	68.7	19.4		138.6	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.48	71.8	20.2	1.87	143.9	±0.7 %
		Y	3.23	70.9	19.9		134.6	
		Z	3.68	72.8	20.6		140.5	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.18	70.5	23.1	9.46	143.4	±3.3 %
		Y	10.98	70.5	23.2		129.9	
		Z	11.19	70.6	23.1		138.8	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	15.55	92.7	26.1	9.39	126.5	±1.7 %
		Y	21.21	98.0	27.2		142.0	
		Z	19.50	96.1	27.0		125.4	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	23.54	100.0	28.4	9.57	142.6	±2.2 %
		Y	23.24	99.9	28.0		137.4	
		Z	23.57	99.6	28.2		139.7	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	17.00	90.2	22.7	6.56	128.9	±2.2 %
		Y	35.20	99.7	24.9		148.2	
		Z	33.12	99.6	25.4		123.8	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	44.20	99.6	23.6	4.80	146.0	±1.9 %
		Y	49.99	99.9	23.0		136.6	
		Z	41.43	99.6	23.9		141.4	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	46.56	99.7	22.7	3.55	127.7	±2.2 %
		Y	58.11	99.8	21.9		145.3	
		Z	55.65	99.6	22.2		124.3	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	34.25	99.4	21.1	1.16	140.3	±1.7 %
		Y	40.72	100.0	20.6		135.7	
		Z	45.39	100.0	20.8		136.4	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.30	67.1	19.5	5.67	127.4	±1.4 %
		Y	6.58	68.4	20.3		149.0	
		Z	6.55	68.0	19.9		146.3	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	10.47	75.6	25.8	9.29	146.6	±3.0 %
		Y	10.18	75.8	26.3		136.2	
		Z	10.38	75.3	25.6		140.8	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.18	66.6	19.4	5.80	126.9	±1.4 %
		Y	6.40	67.8	20.1		147.0	
		Z	6.44	67.6	19.9		145.7	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.24	69.0	21.3	8.07	142.7	±2.5 %
		Y	10.25	69.2	21.5		136.7	
		Z	10.16	68.8	21.2		136.6	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.85	74.8	25.6	9.28	140.8	±3.0 %
		Y	9.49	74.7	25.9		130.5	
		Z	9.90	74.8	25.6		136.8	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	6.13	67.1	19.7	5.75	146.6	±1.4 %
		Y	6.11	67.4	19.9		147.7	
		Z	6.12	67.1	19.7		142.3	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.33	66.7	19.4	5.82	128.9	±1.4 %
		Y	6.33	67.1	19.7		128.7	
		Z	6.57	67.6	19.9		147.4	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.89	66.4	19.5	5.73	127.5	±1.2 %
		Y	4.99	67.5	20.2		149.3	
		Z	5.09	67.3	20.0		145.1	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	7.99	75.8	26.3	9.21	127.6	±2.7 %
		Y	9.29	81.7	29.6		149.8	
		Z	8.04	75.8	26.3		123.6	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	5.08	67.3	20.0	5.72	149.3	±1.4 %
		Y	5.00	67.6	20.3		145.0	
		Z	5.09	67.3	20.0		145.0	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	5.08	67.3	20.0	5.72	148.5	±1.4 %
		Y	5.06	67.9	20.4		147.1	
		Z	5.11	67.4	20.0		144.8	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.89	68.7	21.2	8.10	134.6	±2.2 %
		Y	9.84	68.9	21.4		130.4	
		Z	9.82	68.5	21.1		130.4	
10225-CAB	UMTS-FDD (HSPA+)	X	7.02	67.1	19.5	5.97	138.0	±1.4 %
		Y	6.88	67.0	19.5		133.2	
		Z	7.01	67.1	19.5		134.6	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.01	75.9	26.4	9.21	128.0	±2.7 %
		Y	9.39	82.1	29.9		149.7	
		Z	8.34	76.9	26.9		129.1	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.05	73.6	25.1	9.24	130.6	±3.0 %
		Y	8.76	73.7	25.5		123.6	
		Z	9.10	73.6	25.1		127.8	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.81	74.7	25.6	9.30	139.3	±3.0 %
		Y	9.50	74.8	25.9		130.7	
		Z	9.81	74.6	25.5		135.0	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.49	67.1	18.9	3.96	140.1	±0.7 %
		Y	4.46	67.2	19.0		137.6	
		Z	4.52	67.1	18.9		137.1	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.68	67.0	18.8	3.46	129.3	±0.7 %
		Y	3.64	67.3	19.0		130.3	
		Z	3.84	67.9	19.2		148.6	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.64	67.2	18.8	3.39	131.8	±0.5 %
		Y	3.60	67.4	19.1		128.2	
		Z	3.71	67.5	19.0		128.0	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.43	67.5	19.9	5.81	147.2	±1.7 %
		Y	6.39	67.7	20.0		145.4	
		Z	6.42	67.5	19.8		143.2	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.73	67.1	19.7	6.06	129.7	±1.4 %
		Y	6.75	67.5	19.9		130.8	
		Z	6.75	67.3	19.7		126.2	
10400-AAB	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.14	68.9	21.5	8.37	136.7	±2.5 %
		Y	10.23	69.5	22.0		136.5	
		Z	10.13	68.9	21.5		132.8	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.97	69.2	19.3	3.76	143.5	±0.5 %
		Y	4.87	69.3	19.4		141.0	
		Z	5.02	69.2	19.3		139.6	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.91	69.3	19.4	3.77	139.8	±0.7 %
		Y	4.67	68.9	19.1		138.9	
		Z	4.89	69.1	19.3		137.1	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.93	70.1	19.6	1.54	137.8	±0.7 %
		Y	2.84	69.8	19.6		138.2	
		Z	3.04	70.8	19.9		134.2	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	9.94	68.7	21.3	8.23	134.6	±2.2 %
		Y	10.00	69.1	21.7		134.1	
		Z	9.89	68.5	21.2		130.1	

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

[A] The uncertainties of NormX,Y,Z do not affect the E^2-field uncertainty inside TSL (see Pages 7 and 8).
[B] Numerical linearization parameter: uncertainty not required.
[E] Uncertainty is determined using the max. deviation from linear response applying rectangular distribution and is expressed for the square of the field value.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	41.9	0.89	6.69	6.69	6.69	0.40	1.70	± 12.0 %
835	41.5	0.90	6.41	6.41	6.41	0.43	1.62	± 12.0 %
1750	40.1	1.37	5.29	5.29	5.29	0.80	1.16	± 12.0 %
1900	40.0	1.40	5.10	5.10	5.10	0.80	1.24	± 12.0 %
2300	39.5	1.67	4.77	4.77	4.77	0.64	1.38	± 12.0 %
2450	39.2	1.80	4.55	4.55	4.55	0.80	1.29	± 12.0 %
2600	39.0	1.96	4.39	4.39	4.39	0.80	1.31	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

Calibration Parameter Determined in Body Tissue Simulating Media

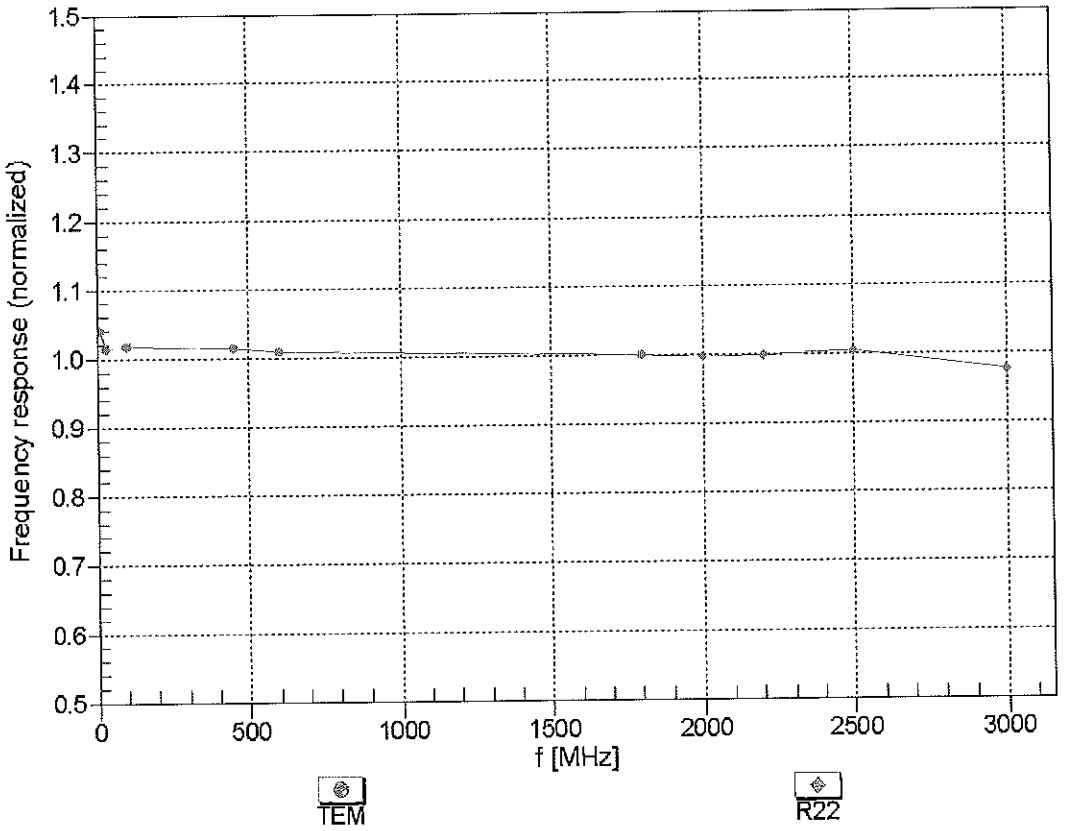
f (MHz) [C]	Relative Permittivity [F]	Conductivity (S/m) [F]	ConvF X	ConvF Y	ConvF Z	Alpha [G]	Depth [G] (mm)	Unct. (k=2)
750	55.5	0.96	6.10	6.10	6.10	0.34	1.80	± 12.0 %
835	55.2	0.97	6.07	6.07	6.07	0.47	1.56	± 12.0 %
1750	53.4	1.49	4.83	4.83	4.83	0.70	1.36	± 12.0 %
1900	53.3	1.52	4.53	4.53	4.53	0.71	1.39	± 12.0 %
2300	52.9	1.81	4.24	4.24	4.24	0.80	1.26	± 12.0 %
2450	52.7	1.95	4.11	4.11	4.11	0.80	1.10	± 12.0 %
2600	52.5	2.16	3.90	3.90	3.90	0.80	1.11	± 12.0 %

[C] Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 10, 25, 40, 50 and 70 MHz for ConvF assessments at 30, 64, 128, 150 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

[F] At frequencies below 3 GHz, the validity of tissue parameters (ε and σ) can be relaxed to ± 10% if liquid compensation formula is applied to measured SAR values. At frequencies above 3 GHz, the validity of tissue parameters (ε and σ) is restricted to ± 5%. The uncertainty is the RSS of the ConvF uncertainty for indicated target tissue parameters.

[G] Alpha/Depth are determined during calibration. SPEAG warrants that the remaining deviation due to the boundary effect after compensation is always less than ± 1% for frequencies below 3 GHz and below ± 2% for frequencies between 3-6 GHz at any distance larger than half the probe tip diameter from the boundary.

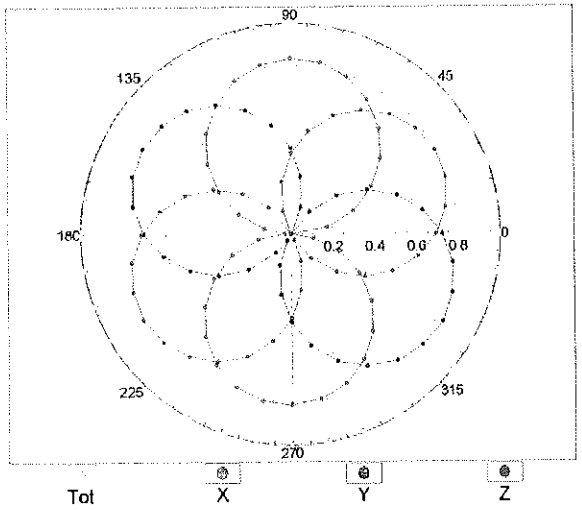
Frequency Response of E-Field
(TEM-Cell:ifi110 EXX, Waveguide: R22)



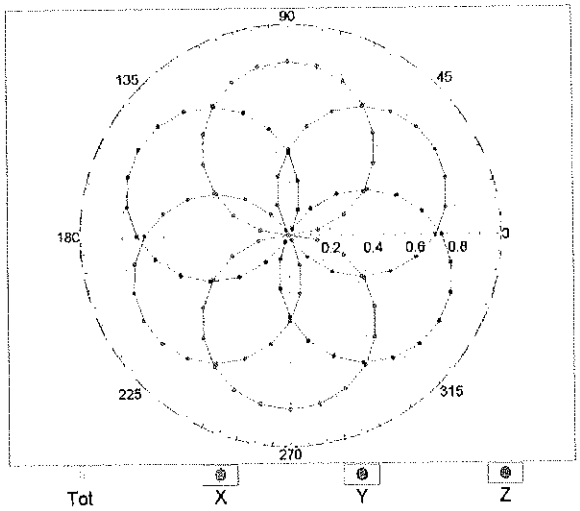
Uncertainty of Frequency Response of E-field: ± 6.3% (k=2)

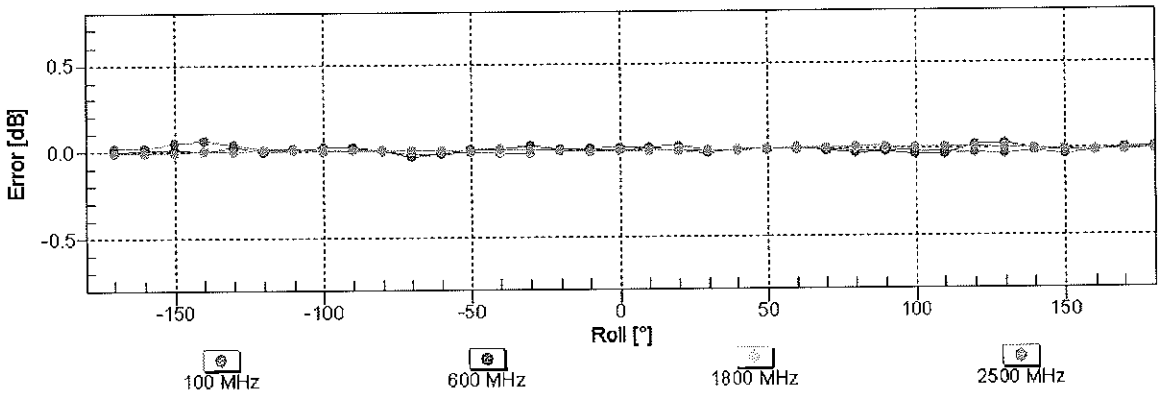
Receiving Pattern (ϕ), ϑ = 0°

f=600 MHz,TEM



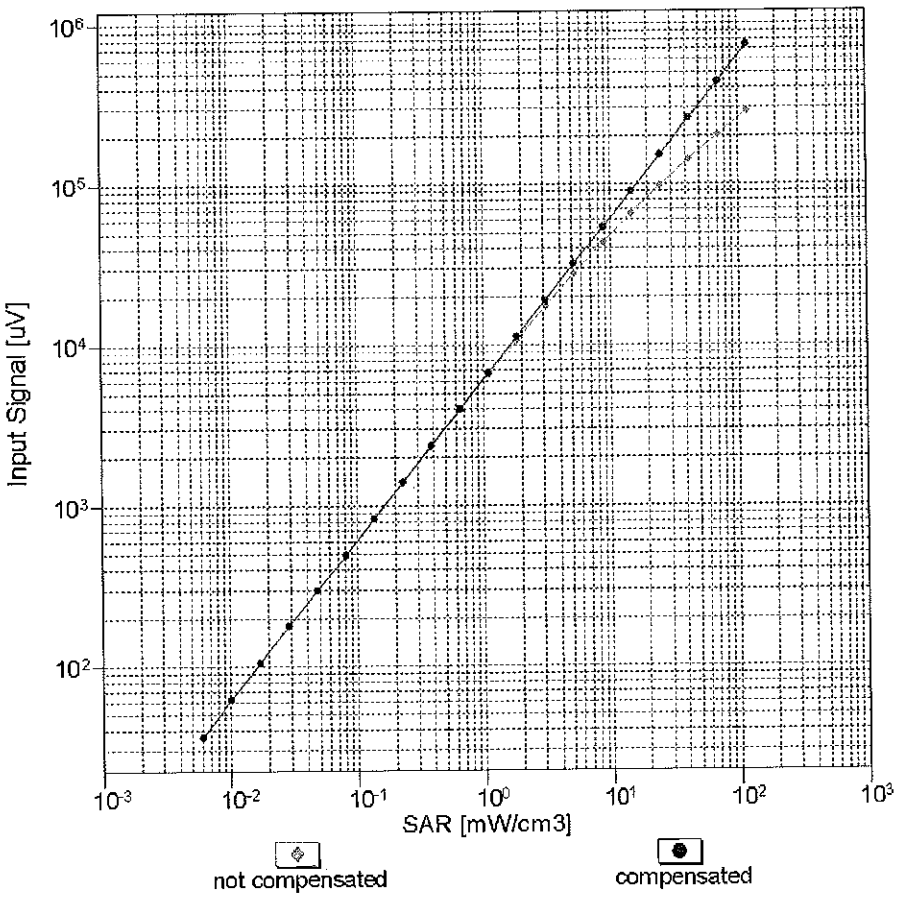
f=1800 MHz,R22

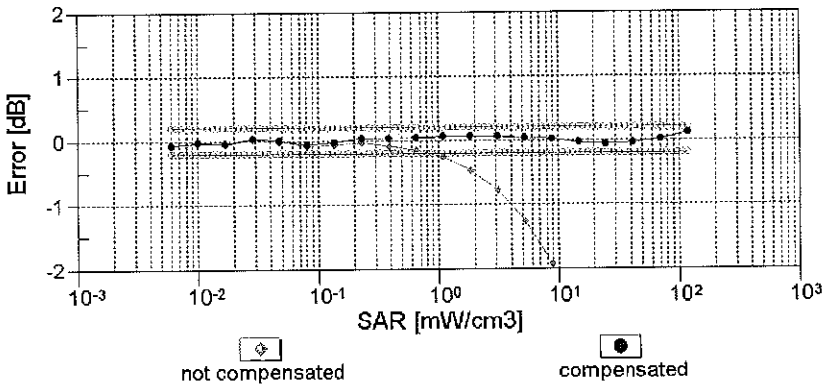




Uncertainty of Axial Isotropy Assessment: ± 0.5% (k=2)

Dynamic Range f(SAR_{head})
(TEM cell , f_{eval}= 1900 MHz)

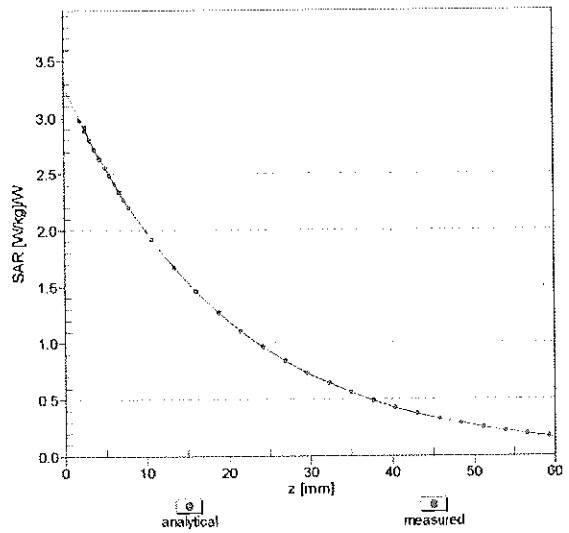




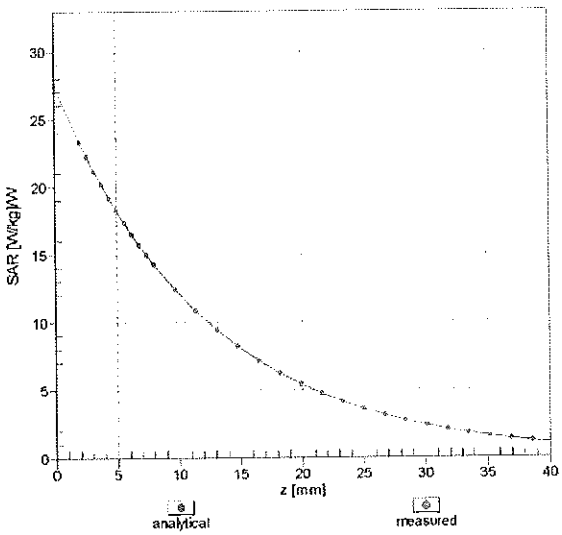
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment

f = 835 MHz,WGLS R9 (H_convF)

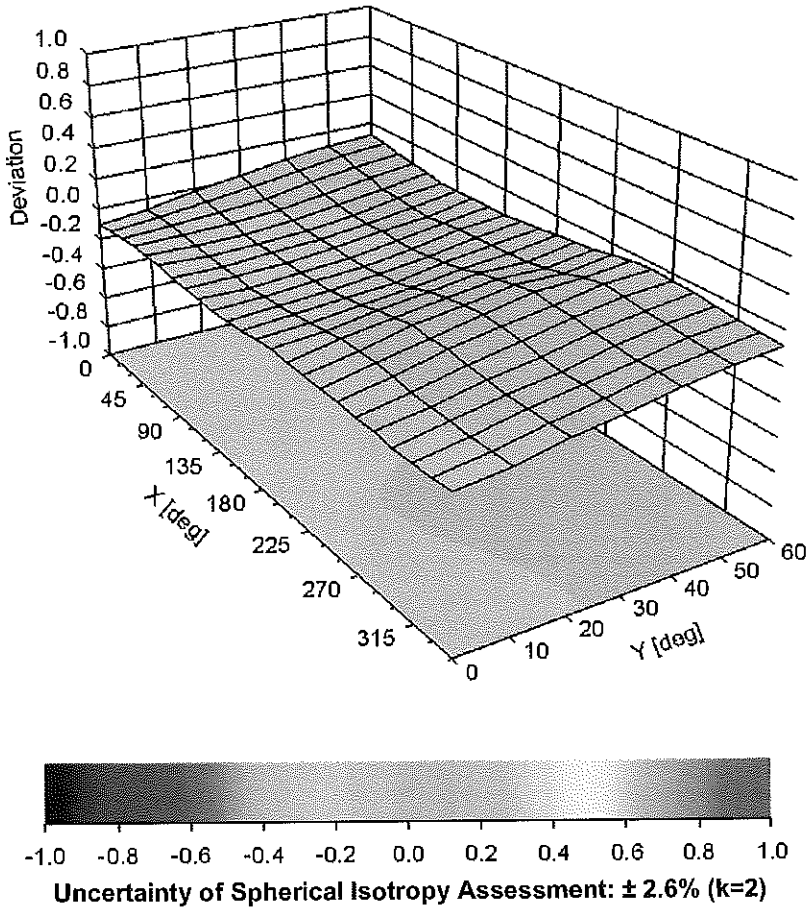


f = 1900 MHz,WGLS R22 (H_convF)



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



Uncertainty of Spherical Isotropy Assessment: ± 2.6% (k=2)

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3319

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-120.2
Mechanical Surface Detection Mode	enabled
Optical Surface Detection Mode	disabled
Probe Overall Length	337 mm
Probe Body Diameter	10 mm
Tip Length	10 mm
Tip Diameter	4 mm
Probe Tip to Sensor X Calibration Point	2 mm
Probe Tip to Sensor Y Calibration Point	2 mm
Probe Tip to Sensor Z Calibration Point	2 mm
Recommended Measurement Distance from Surface	3 mm