



SAR EVALUATION REPORT

Applicant Name:

Samsung Electronics Co., Ltd.
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Gyeonggi-do, 16677, Korea

Date of Testing:

12/02/15 - 12/17/15

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

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FCC ID:

A3LSMJ700P

APPLICANT:

SAMSUNG ELECTRONICS CO., LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model(s):

SM-J700P

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1 gm Head (W/kg)	1 gm Body-Worn (W/kg)	1 gm Hotspot (W/kg)	10 gm Phablet (W/kg)
PCE	CDMA/EVDO BC10 (\$90S)	817.90 - 823.10 MHz	0.46	0.61	0.61	
PCE	CDMA/EVDO BC0 (\$22H)	824.70 - 848.31 MHz	0.55	0.66	0.69	
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.33	0.43	0.42	
PCE	UMTS 850	826.40 - 846.60 MHz	0.38	0.49	0.49	
PCE	PCS CDMA/EVDO	1851.25 - 1908.75 MHz	0.24	0.91	1.09	
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.12	0.45	0.83	
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.22	0.80	1.07	
PCE	LTE Band 12	699.7 - 715.3 MHz	0.17	0.31	0.31	
PCE	LTE Band 26 (Cell)	814.7 - 848.3 MHz	0.34	0.49	0.49	
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.33	0.76	0.97	
PCE	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.26	0.83	1.03	
PCE	LTE Band 41	2498.5 - 2687.5 MHz	0.55	0.38	1.08	
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.34	0.12	0.19	
NII	U-NII-1	5180 - 5240 MHz	N/A			
NII	U-NII-2A	5260 - 5320 MHz	0.34	0.19		0.62
NII	U-NII-2C	5500 - 5720 MHz	0.66	0.17		0.51
NII	U-NII-3	5745 - 5825 MHz	0.36	0.13	0.25	
DSS/DTS	Bluetooth	2402 - 2480 MHz	N/A			
Simultaneous SAR per KDB 690783 D01v01r03:			1.21	1.10	1.35	0.62

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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FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 1 of 68

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

1	DEVICE UNDER TEST	3
2	LTE INFORMATION	10
3	INTRODUCTION	11
4	DOSIMETRIC ASSESSMENT	12
5	DEFINITION OF REFERENCE POINTS	13
6	TEST CONFIGURATION POSITIONS FOR HANDSETS	14
7	RF EXPOSURE LIMITS	17
8	FCC MEASUREMENT PROCEDURES.....	18
9	RF CONDUCTED POWERS	25
10	SYSTEM VERIFICATION.....	42
11	SAR DATA SUMMARY	45
12	FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS.....	58
13	SAR MEASUREMENT VARIABILITY	63
14	EQUIPMENT LIST	64
15	MEASUREMENT UNCERTAINTIES.....	65
16	CONCLUSION	66
17	REFERENCES	67
APPENDIX A: SAR TEST PLOTS		
APPENDIX B: SAR DIPOLE VERIFICATION PLOTS		
APPENDIX C: PROBE AND DIPOLE CALIBRATION CERTIFICATES		
APPENDIX D: SAR TISSUE SPECIFICATIONS		
APPENDIX E: SAR SYSTEM VALIDATION		
APPENDIX F: DUT ANTENNA DIAGRAM & SAR TEST SETUP PHOTOGRAPHS		

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 2 of 68

1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
CDMA/EVDO BC10 (§90S)	Voice/Data	817.90 - 823.10 MHz
CDMA/EVDO BC0 (§22H)	Voice/Data	824.70 - 848.31 MHz
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
PCS CDMA/EVDO	Voice/Data	1851.25 - 1908.75 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Data	699.7 - 715.3 MHz
LTE Band 26 (Cell)	Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Data	824.7 - 848.3 MHz
LTE Band 4 (AWS)	Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Data	1850.7 - 1909.3 MHz
LTE Band 41	Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Data	2412 - 2462 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

1.2 Power Reduction for SAR

This device utilizes independent power reduction mechanisms for SAR compliance for the WLAN transmitter. This device uses an independent single step fixed level power reduction mechanism for WLAN operations during voice or VoIP held to ear scenarios. Per FCC Guidance, the held-to-ear exposure conditions were evaluated at reduced power according to the head SAR positions described in IEEE 1528-2013. The reduced powers for the power reduction mechanisms were confirmed via conducted power measurements at the RF port (See Section 9). Detailed descriptions of the mechanisms are included in the operational description.

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 3 of 68

1.3 Nominal and Maximum Output Power Specifications

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

1.3.1 Maximum Power

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)					Burst Average 8-PSK (dBm)			
			1 TX Slot	1 TX 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	32.5	32.5	30.0	28.0	26.0		28.0	25.5	25.5	25.0
	Nominal	32.0	32.0	29.5	27.5	25.5		27.5	25.0	25.0	24.5
GSM/GPRS/EDGE 1900	Maximum	30.0	30.0	29.0	26.0	25.0		26.5	25.0	25.0	25.0
	Nominal	29.5	29.5	28.5	25.5	24.5		26.0	24.5	24.5	24.5

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA
UMTS Band 5 (850 MHz)	Maximum	23.5	23.0	23.0
	Nominal	23.0	22.5	22.5
UMTS Band 2 (1900 MHz)	Maximum	23.5	23.0	23.0
	Nominal	23.0	22.5	22.5

Mode / Band		Modulated Average (dBm)
CDMA/EVDO BC10 (\$90S)	Maximum	25.3
	Nominal	24.8
CDMA/EVDO BC0 (\$22H)	Maximum	25.0
	Nominal	24.5
PCS CDMA/EVDO	Maximum	23.5
	Nominal	23.0

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 4 of 68

Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	24.0
	Nominal	23.5
LTE Band 26 (Cell)	Maximum	24.0
	Nominal	23.5
LTE Band 5 (Cell)	Maximum	24.0
	Nominal	23.5
LTE Band 4 (AWS)	Maximum	24.0
	Nominal	23.5
LTE Band 25 (PCS)	Maximum	23.5
	Nominal	23.0
LTE Band 2 (PCS)	Maximum	23.5
	Nominal	23.0
LTE Band 41	Maximum	24.5
	Nominal	24.0

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz) Channel 1-11	Maximum	17.5
	Nominal	17.0
IEEE 802.11b (2.4 GHz) Channel 12, 13	Maximum	12.5
	Nominal	12.0
IEEE 802.11g (2.4 GHz) Channel 1 - 11	Maximum	15.5
	Nominal	15.0
IEEE 802.11g (2.4 GHz) Channel 12, 13	Maximum	11.5
	Nominal	11.0
IEEE 802.11n (2.4 GHz) Channel 1 - 11	Maximum	14.5
	Nominal	14.0
IEEE 802.11n (2.4 GHz) Channel 12, 13	Maximum	10.5
	Nominal	10.0
Bluetooth	Maximum	9.5
	Nominal	9.0
Bluetooth LE	Maximum	2.0
	Nominal	1.5

Mode / Band		Modulated Average (dBm)	
		20 MHz Bandwidth	40 MHz Bandwidth
IEEE 802.11a (5 GHz)	Maximum	15.5	
	Nominal	15.0	
IEEE 802.11n (5 GHz)	Maximum	13.5	12.5
	Nominal	13.0	12.0

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 5 of 68

1.3.2 Reduced Power

Mode / Band		Modulated Average (dBm)
IEEE 802.11b (2.4 GHz)	Maximum	12.5
	Nominal	12.0
IEEE 802.11g (2.4 GHz)	Maximum	11.5
	Nominal	11.0
IEEE 802.11n (2.4 GHz)	Maximum	10.5
	Nominal	10.0

Mode / Band		Modulated Average (dBm)	
		20 MHz Bandwidth	40 MHz Bandwidth
IEEE 802.11a (5 GHz)	Maximum	10.5	
	Nominal	10.0	
IEEE 802.11n (5 GHz)	Maximum	8.5	7.5
	Nominal	8.0	7.0

1.4 DUT Antenna Locations

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

**Table 1-1
Device Edges/Sides for SAR Testing**

Device Sides/Edges for SAR Testing						
Mode	Back	Front	Top	Bottom	Right	Left
EVDO BC10 (\$90S)	Yes	Yes	No	Yes	Yes	Yes
EVDO BC0 (\$22H)	Yes	Yes	No	Yes	Yes	Yes
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
PCS EVDO	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
UMTS 1900	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 26 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 4 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 25 (PCS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 41	Yes	Yes	No	Yes	Yes	Yes
2.4 GHz WLAN	Yes	Yes	Yes	No	Yes	No
5 GHz WLAN	Yes	Yes	Yes	No	Yes	No

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

1.5 Near Field Communications (NFC) Antenna

This DUT has NFC operations. The NFC antenna is integrated into the specialized battery. The SAR tests were performed with the specialized battery (model: EB-BJ700BBU).

FCC ID: A3LSMJ700P	 SAR EVALUATION REPORT 		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 6 of 68

1.6 Simultaneous Transmission Capabilities

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



Figure 1-1
Simultaneous Transmission Paths

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

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	1x CDMA voice + 2.4 GHz Wi-Fi	Yes	Yes	N/A	Yes	
2	1x CDMA voice + 5 GHz Wi-Fi	Yes	Yes	N/A	Yes	
3	1x CDMA voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
4	GSM voice + 2.4 GHz Wi-Fi	Yes	Yes	N/A	Yes	
5	GSM voice + 5 GHz Wi-Fi	Yes	Yes	N/A	Yes	
6	GSM voice + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
7	UMTS + 2.4 GHz Wi-Fi	Yes	Yes	Yes	Yes	
8	UMTS + 5 GHz Wi-Fi	Yes	Yes	Yes	Yes	
9	UMTS + 2.4 GHz Bluetooth	N/A	Yes	N/A	Yes	
10	LTE + 2.4 GHz Wi-Fi	Yes*	Yes*	Yes	Yes	*-Pre-installed VOIP applications are considered.
11	LTE + 5 GHz Wi-Fi	Yes*	Yes*	Yes	Yes	*-Pre-installed VOIP applications are considered.
12	LTE + 2.4 GHz Bluetooth	N/A	Yes*	N/A	Yes	*-Pre-installed VOIP applications are considered.
13	CDMA/EVDO data + 2.4 GHz Wi-Fi	Yes*	Yes*	Yes	Yes	*-Pre-installed VOIP applications are considered.
14	CDMA/EVDO data + 5 GHz Wi-Fi	Yes*	Yes*	Yes	Yes	*-Pre-installed VOIP applications are considered.
15	CDMA/EVDO data + 2.4 GHz Bluetooth	N/A	Yes*	N/A	Yes	*-Pre-installed VOIP applications are considered.
16	GPRS/EDGE + 2.4 GHz Wi-Fi	N/A	N/A	Yes	Yes	
17	GPRS/EDGE + 5 GHz Wi-Fi	N/A	N/A	Yes	Yes	
18	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	N/A	N/A	Yes	

- 2.4 GHz WLAN, 5 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
- All licensed modes share the same antenna path and cannot transmit simultaneously.
- 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.
- 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 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.

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 7 of 68

1.7 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 D06v02r01.

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

Per FCC KDB 447498 D01v06, the 1g SAR exclusion threshold for distances <50mm is defined by the following equation:

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

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; $[(9/10) * \sqrt{2.480}] = 1.4 < 3.0$. Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

Per FCC KDB 447498 D01v06, the 10g SAR exclusion threshold for distances <50mm is defined by the following equation:

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

Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, phablet Bluetooth SAR was not required; $[(9/5) * \sqrt{2.480}] = 2.8 < 7.5$. Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

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

(B) Licensed Transmitter(s)

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

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

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 8 of 68

This device supports both LTE Band 5 (Cell) and LTE Band 26 (Cell). Since the supported frequency span for LTE Band 5 (Cell) falls completely within the supported frequency span for LTE Band 26 (Cell), both LTE bands have the same target power, and both LTE bands share the same transmission path, SAR was only assessed for LTE Band 26 (Cell).

This device supports both LTE Band 25 (PCS) and LTE Band 2 (PCS). Since the supported frequency span for LTE Band 2 (PCS) falls completely within the supported frequency span for LTE Band 25 (PCS), both LTE bands have the same target power, and both LTE bands share the same transmission path, SAR was only assessed for LTE Band 25 (PCS).

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

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

1.8 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r04, D06v02r01 (2G/3G/4G, Hotspot and CDMA 2000 1x Advanced)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D04v01r03 (Phablet Procedures)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)

1.9 Device Serial Numbers

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

	Head Serial Number	Body-Worn Serial Number	Hotspot Serial Number	Phablet Serial Number
CDMA/EVDO BC10 (\$90S)	02306	02197	02197	-
CDMA/EVDO BC0 (\$22H)	02306	02197	02197	-
GSM/GPRS/EDGE 850	02197	02197	02197	-
UMTS 850	02197	02197	02197	-
PCS CDMA/EVDO	02306	02306	02306	-
GSM/GPRS/EDGE 1900	02197	02197	02197	-
UMTS 1900	02197	02197	02197	-
LTE Band 12	01111	01111	01111	-
LTE Band 26 (Cell)	01111	02197	02197	-
LTE Band 4 (AWS)	01111	01111	01111	-
LTE Band 25 (PCS)	01111	01111	01111	-
LTE Band 41	02306	02306	02306	-
2.4 GHz WLAN	02306	02306	02306	-
5 GHz WLAN	01111	02306	02306	02306

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 9 of 68

2

LTE INFORMATION

LTE Information					
FCC ID	A3LSMJ700P				
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)				
	LTE Band 26 (Cell) (814.7 - 848.3 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High	High
LTE Band 12: 1.4 MHz	699.7 (23017)		707.5 (23095)		715.3 (23173)
LTE Band 12: 3 MHz	700.5 (23025)		707.5 (23095)		714.5 (23165)
LTE Band 12: 5 MHz	701.5 (23035)		707.5 (23095)		713.5 (23155)
LTE Band 12: 10 MHz	704 (23060)		707.5 (23095)		711 (23130)
LTE Band 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 25 (PCS): 1.4 MHz	1850.7 (26047)		1882.5 (26365)		1914.3 (26683)
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)		1882.5 (26365)		1913.5 (26675)
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)		1882.5 (26365)		1912.5 (26665)
LTE Band 25 (PCS): 10 MHz	1855 (26090)		1882.5 (26365)		1910 (26640)
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)		1882.5 (26365)		1907.5 (26615)
LTE Band 25 (PCS): 20 MHz	1860 (26140)		1882.5 (26365)		1905 (26590)
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)		1880 (18900)		1909.3 (19193)
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)		1880 (18900)		1908.5 (19185)
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)		1880 (18900)		1907.5 (19175)
LTE Band 2 (PCS): 10 MHz	1855 (18650)		1880 (18900)		1905 (19150)
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)		1880 (18900)		1902.5 (19125)
LTE Band 2 (PCS): 20 MHz	1860 (18700)		1880 (18900)		1900 (19100)
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
UE Category	4				
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 CA features on 3GPP Release 10. The following LTE Release 10 Features are not supported: Carrier Aggregation, Relay, HetNet, Enhanced MIMO, eICl, WIFI Offloading, MDH, eMBMA, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 10 of 68

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/m³)
- E = Total RMS electric field strength (V/m)

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 11 of 68

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

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

1. The SAR distribution at the exposed side of the head or body was measured at a distance no greater than 5.0 mm from the inner surface of the shell. The area covered the entire dimension of the device-head and body interface and the horizontal grid resolution was determined per FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013.
2. The point SAR measurement was taken at the maximum SAR region determined from Step 1 to enable the monitoring of SAR fluctuations/drifts during the 1g/10g cube evaluation. SAR at this fixed point was measured and used as a reference value.
3. Based on the area scan data, the peak of the region with maximum SAR was determined by spline interpolation. Around this point, a volume was assessed according to the measurement resolution and volume size requirements of FCC KDB Publication 865664 D01v01r04 (See Table 4-1) and IEEE 1528-2013. On the basis of this data set, the spatial peak SAR value was evaluated with the following procedure (see references or the DASY manual online for more details):
 - a. SAR values at the inner surface of the phantom are extrapolated from the measured values along the line away from the surface with spacing no greater than that in Table 4-1. The extrapolation was based on a least-squares algorithm. A polynomial of the fourth order was calculated through the points in the z-axis (normal to the phantom shell).
 - b. After the maximum interpolated values were calculated between the points in the cube, the SAR was averaged over the spatial volume (1g or 10g) using a 3D-Spline interpolation algorithm. The 3D-spline is composed of three one-dimensional splines with the "Not a knot" condition (in x, y, and z directions). The volume was then integrated with the trapezoidal algorithm. One thousand points (10 x 10 x 10) were obtained through interpolation, in order to calculate the averaged SAR.
 - c. All neighboring volumes were evaluated until no neighboring volume with a higher average value was found.
4. The SAR reference value, at the same location as step 2, was re-measured after the zoom scan was complete to calculate the SAR drift. If the drift deviated by more than 5%, the SAR test and drift measurements were repeated.

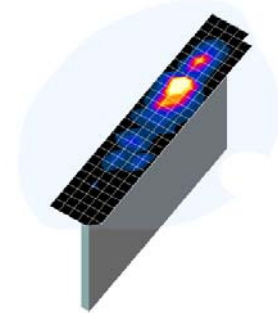


Figure 4-1
Sample SAR Area Scan

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

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

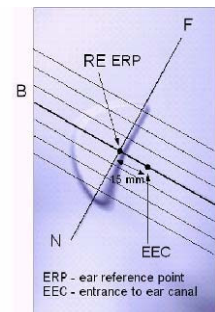
*Also compliant to IEEE 1528-2013 Table 6

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT			Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset			Page 12 of 68

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



point
point
the
plane
line
the
N-F

Figure 5-1
Close-Up Side view
of ERP

5.2 HANDSET REFERENCE POINTS

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



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

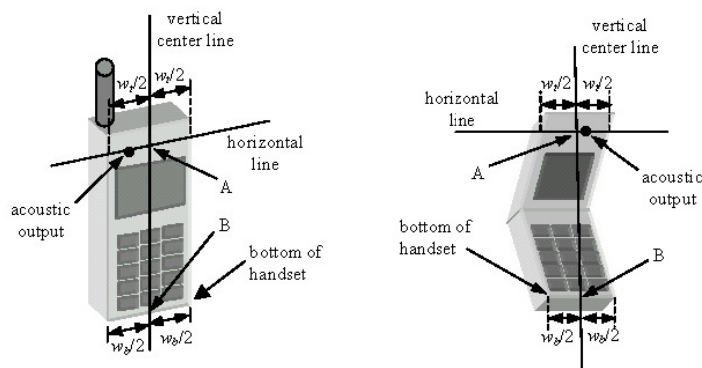


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 13 of 68

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

6.2 Positioning for Cheek

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

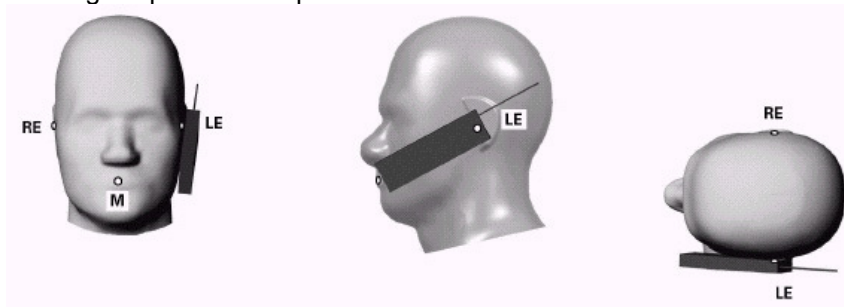


Figure 6-1 Front, Side and Top View of Cheek Position

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

6.3 Positioning for Ear / 15° Tilt

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

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 14 of 68

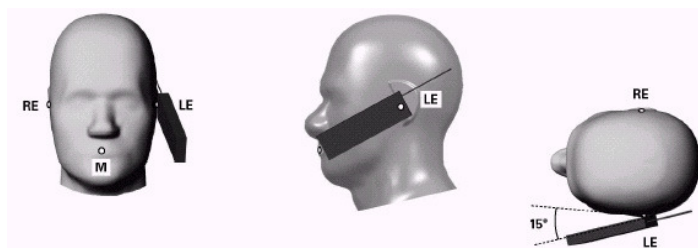


Figure 6-2 Front, Side and Top View of Ear/15° Tilt Position

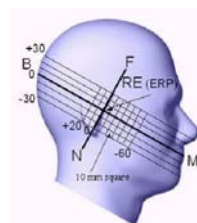


Figure 6-3 Side view w/ relevant markings

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 D04v01r03, Body-worn accessory exposure is typically related to voice mode operations when handsets are carried in body-worn accessories. The body-worn accessory procedures in FCC KDB Publication 447498 D01v06 should be used to test for body-worn accessory SAR compliance, without a headset connected to it. This enables the test results for such configuration to be compatible with that required for hotspot mode when the body-worn accessory test separation distance is greater than or equal to that required for hotspot mode, when applicable. When the reported SAR for a body-worn accessory, measured without a headset connected to the handset, is $> 1.2 \text{ W/kg}$, 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.

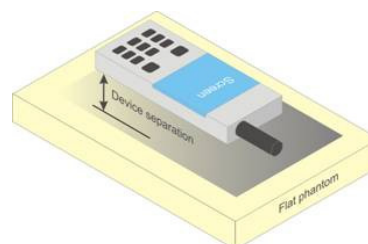


Figure 6-4 Sample Body-Worn Diagram

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.

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 15 of 68

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 D01v06 should be applied to determine SAR test requirements.

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

6.6 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 D06v02r01 where SAR test considerations for handsets ($L \times W \geq 9 \text{ cm} \times 5 \text{ cm}$) are based on a composite test separation distance of 10 mm from the front, back and edges of the device containing transmitting antennas within 2.5 cm of their edges, determined from general mixed use conditions for this type of devices. Since the hotspot SAR results may overlap with the body-worn accessory SAR requirements, the more conservative configurations can be considered, thus excluding some body-worn accessory SAR tests.

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

6.7 Phablet Configurations

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

FCC ID: A3LSMJ700P	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 16 of 68

7 RF EXPOSURE LIMITS

7.1 Uncontrolled Environment

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

7.2 Controlled Environment

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

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

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

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 17 of 68

8 FCC MEASUREMENT PROCEDURES

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

8.1 Measured and Reported SAR

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

8.2 3G SAR Test Reduction Procedure

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

8.3 Procedures Used to Establish RF Signal for SAR

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

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

8.4 SAR Measurement Conditions for CDMA2000

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

8.4.1 Output Power Verification

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 18 of 68

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

Table 8-1
Parameters for Max. Power for RC1

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

Table 8-2
Parameters for Max. Power for RC3

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

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

8.4.2 Head SAR Measurements

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

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

8.4.3 Body-worn SAR Measurements

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

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

8.4.4 Body-worn SAR Measurements for EVDO Devices

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

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 19 of 68

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

8.4.5 Body SAR Measurements for EVDO Hotspot

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

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

8.4.6 CDMA2000 1x Advanced

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

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

8.5 SAR Measurement Conditions for UMTS

8.5.1 Output Power Verification

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

8.5.2 Head SAR Measurements

SAR for next to the ear head exposure is measured using a 12.2 kbps RMC with TPC bits configured to all "1s". 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.

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 20 of 68

8.5.3 Body SAR Measurements

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

8.5.4 SAR Measurements with Rel 5 HSDPA

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

8.5.5 SAR Measurements with Rel 6 HSUPA

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

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

8.6 SAR Measurement Conditions for LTE

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

8.6.1 Spectrum Plots for RB Configurations

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

8.6.2 MPR

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

8.6.3 A-MPR

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 21 of 68

8.6.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

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

8.6.5 TDD

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

8.7 SAR Testing with 802.11 Transmitters

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

8.7.1 General Device Setup

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

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 22 of 68

8.7.2 U-NII-1 and U-NII-2A

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

8.7.3 U-NII-2C and U-NII-3

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

8.7.4 Initial Test Position Procedure

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

8.7.5 2.4 GHz SAR Test Requirements

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

- 1) When the reported SAR of the highest measured maximum output power channel for the exposure configuration is ≤ 0.8 W/kg for 1g and ≤ 2.0 W/kg for 10g, 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 and > 2.0 W/kg for 10g, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

2.4 GHz 802.11 g/n OFDM are additionally evaluated for SAR if the highest reported SAR for 802.11b, adjusted by the ratio of the OFDM to DSSS specified maximum output power, is > 1.2 W/kg for 1g and > 3.0 W/kg for 10g. When SAR is required for OFDM modes in 2.4 GHz band, the Initial Test Configuration Procedures should be followed.

FCC ID: A3LSMJ700P	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 23 of 68

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

8.7.7 Initial Test Configuration Procedure

For OFDM, 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, and lowest data rate. 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 and ≤ 2.0 W/kg for 10g, 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 and ≤ 3.0 W/kg for 10g or all channels are measured. When there are multiple untested channels having the same subsequent highest average RF output power, the channel with higher frequency from the lowest 802.11 mode is considered for SAR measurements (See Section 8.7.6).

8.7.8 Subsequent Test Configuration Procedures

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

FCC ID: A3LSMJ700P	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 24 of 68

9 RF CONDUCTED POWERS

9.1 CDMA Conducted Powers

Band	Channel	Rule Part	Frequency	SO55 [dBm]	SO55 [dBm]	SO75 [dBm]	TDSO SO32 [dBm]	TDSO SO32 [dBm]	1x EvDO Rev. 0 [dBm]	1x EvDO Rev. A [dBm]
	F-RC		MHz	RC1	RC3	RC11	FCH+SCH	FCH	(RTAP)	(RETAP)
Cellular	564	90S	820.1	24.97	24.98	25.00	24.96	24.98	24.97	24.96
Cellular	1013	22H	824.7	24.47	24.50	24.78	24.53	24.49	24.58	24.52
	384	22H	836.52	24.56	24.57	24.87	24.64	24.57	24.65	24.64
	777	22H	848.31	24.32	24.34	24.76	24.33	24.36	24.42	24.36
PCS	25	24E	1851.25	22.91	22.86	23.31	23.02	23.03	23.32	23.01
	600	24E	1880	22.87	22.82	23.36	22.96	22.99	23.35	23.03
	1175	24E	1908.75	23.03	22.98	23.47	23.29	23.30	23.45	23.29

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

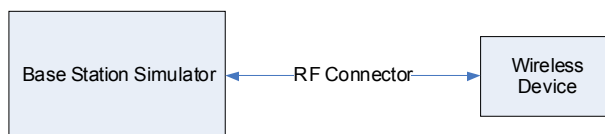


Figure 9-1
Power Measurement Setup

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 25 of 68

9.2 GSM Conducted Powers

		Maximum Burst-Averaged Output Power								
		Voice	GPRS/EDGE Data (GMSK)				EDGE Data (8-PSK)			
Band	Channel	GSM [dBm] CS (1 Slot)	GPRS [dBm] 1 Tx Slot	GPRS [dBm] 2 Tx Slot	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	31.86	31.85	29.60	27.18	25.16	27.06	24.57	24.47	24.40
	190	32.00	32.02	29.72	27.36	25.35	27.22	24.80	24.69	24.50
	251	32.02	32.04	29.48	27.56	25.39	27.40	25.00	24.72	24.65
GSM 1900	512	29.60	29.58	27.86	25.70	24.58	25.81	24.85	24.74	24.82
	661	29.88	29.88	27.74	25.62	24.40	26.01	24.95	24.78	24.97
	810	29.70	29.71	27.88	25.79	24.62	25.96	24.94	24.80	24.95
		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	22.83	22.82	23.58	22.92	22.15	18.03	18.55	20.21	21.39
	190	22.97	22.99	23.70	23.10	22.34	18.19	18.78	20.43	21.49
	251	22.99	23.01	23.46	23.30	22.38	18.37	18.98	20.46	21.64
GSM 1900	512	20.57	20.55	21.84	21.44	21.57	16.78	18.83	20.48	21.81
	661	20.85	20.85	21.72	21.36	21.39	16.98	18.93	20.52	21.96
	810	20.67	20.68	21.86	21.53	21.61	16.93	18.92	20.54	21.94
GSM 850	Frame	22.97	22.97	23.48	23.24	22.49	18.47	18.98	20.74	21.49
GSM 1900	Avg.Targets:	20.47	20.47	22.48	21.24	21.49	16.97	18.48	20.24	21.49

Note:

- 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.
- 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.
- 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

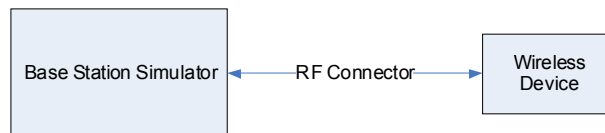


Figure 9-2
Power Measurement Setup

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 26 of 68	

9.3 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	22.84	22.75	22.88	22.81	22.97	22.76	-
99		12.2 kbps AMR	22.78	22.67	22.92	22.77	22.82	22.69	-
6	HSDPA	Subtest 1	21.83	21.72	21.86	22.88	22.90	22.85	0
6		Subtest 2	21.83	21.70	21.91	22.79	22.92	22.88	0
6		Subtest 3	21.36	21.24	21.34	22.28	22.40	22.36	0.5
6		Subtest 4	21.32	21.23	21.33	22.32	22.35	22.14	0.5
6	HSUPA	Subtest 1	21.12	21.07	21.66	21.92	22.41	22.57	0
6		Subtest 2	20.81	20.70	20.42	20.95	21.38	20.88	2
6		Subtest 3	20.36	20.71	20.89	21.79	21.60	21.37	1
6		Subtest 4	20.89	20.84	21.44	21.52	21.41	21.19	2
6		Subtest 5	21.75	21.72	21.84	22.78	22.84	22.74	0

This device does not support DC-HSDPA.

It is expected by the manufacturer that MPR for some HSPA subtests may be up to 1 dB more than specified by 3GPP, but also as low as 0 dB according to the chipset implementation in this model.



Figure 9-3
Power Measurement Setup

FCC ID: A3LSMJ700P	 SAR EVALUATION REPORT 		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 27 of 68

9.4 LTE Conducted Powers

9.4.1

LTE Band 12

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

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23095 (707.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.78	0	0
	1	25	23.77		0
	1	49	23.65		0
	25	0	22.66	0-1	1
	25	12	22.53		1
	25	25	22.49		1
	50	0	22.48		1
16QAM	1	0	22.73	0-1	1
	1	25	22.80		1
	1	49	22.52		1
	25	0	21.47	0-2	2
	25	12	21.56		2
	25	25	21.54		2
	50	0	21.50		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

LTE Band 12 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23035 (701.5 MHz)	23095 (707.5 MHz)	23155 (713.5 MHz)		
			Conducted Power [dBm]	Conducted Power [dBm]	Conducted Power [dBm]		
QPSK	1	0	23.47	23.59	23.69	0	0
	1	12	23.85	23.77	23.61		0
	1	24	23.47	23.65	23.80		0
	12	0	22.82	22.87	22.70	0-1	1
	12	6	22.82	22.86	22.77		1
	12	13	22.88	22.86	22.69		1
	25	0	22.86	22.84	22.77		1
16QAM	1	0	22.28	22.87	22.69	0-1	1
	1	12	22.62	23.00	22.99		1
	1	24	22.20	22.93	22.71		1
	12	0	21.97	21.78	21.65	0-2	2
	12	6	21.67	21.74	21.75		2
	12	13	22.00	21.73	21.72		2
	25	0	21.72	21.81	21.80		2

FCC ID: A3LSMJ700P			SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 28 of 68	

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

LTE Band 12 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23025 (700.5 MHz)	23095 (707.5 MHz)	23165 (714.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.82	23.94	23.64	0	0
	1	7	24.00	24.00	23.98		0
	1	14	23.89	23.94	24.00		0
	8	0	22.62	22.59	22.71	0-1	1
	8	4	22.73	22.60	22.65		1
	8	7	22.65	22.66	22.67		1
	15	0	22.66	22.59	22.67		1
16QAM	1	0	22.84	22.91	22.99	0-1	1
	1	7	23.00	22.92	23.00		1
	1	14	22.60	22.92	22.64		1
	8	0	21.65	21.66	21.76	0-2	2
	8	4	21.95	21.75	21.89		2
	8	7	21.84	21.87	21.82		2
	15	0	21.82	21.69	21.87		2

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

LTE Band 12 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23017 (699.7 MHz)	23095 (707.5 MHz)	23173 (715.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.77	23.94	23.61	0	0
	1	2	23.96	23.79	23.78		0
	1	5	23.75	23.81	23.77		0
	3	0	23.59	23.56	23.63		0
	3	2	23.68	23.68	23.67		0
	3	3	23.76	23.61	23.58		0
	6	0	22.51	22.57	22.70	0-1	1
16QAM	1	0	22.82	22.78	22.75	0-1	1
	1	2	22.90	22.70	22.85		1
	1	5	22.93	22.90	23.00		1
	3	0	22.76	22.69	22.71		1
	3	2	22.91	22.81	22.90		1
	3	3	22.93	22.67	22.78	1	
	6	0	21.88	21.87	21.83	0-2	2

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 29 of 68	

9.4.2

LTE Band 26 (Cell)

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

LTE Band 26 (Cell) 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26915 (836.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.95	0	0
	1	36	23.75		0
	1	74	23.59		0
	36	0	22.66	0-1	1
	36	18	22.61		1
	36	37	22.64		1
	75	0	22.60		1
16QAM	1	0	22.59		1
	1	36	22.41		1
	1	74	22.49		1
	36	0	21.61	0-2	2
	36	18	21.50		2
	36	37	21.54		2
	75	0	21.62		2

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

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

LTE Band 26 (Cell) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26740 (819.0 MHz)	26865 (831.5 MHz)	26990 (844.0 MHz)		
QPSK	1	0	23.89	23.72	23.86	0	0
	1	25	23.84	23.96	23.96		0
	1	49	23.84	23.79	23.95		0
	25	0	22.69	22.74	22.61	0-1	1
	25	12	22.58	22.66	22.60		1
	25	25	22.54	22.56	22.57		1
	50	0	22.69	22.69	22.65		1
16QAM	1	0	23.00	22.99	22.96	0-1	1
	1	25	22.87	22.92	23.00		1
	1	49	22.95	22.99	22.95		1
	25	0	21.81	21.79	21.75	0-2	2
	25	12	21.71	21.76	21.70		2
	25	25	21.70	21.70	21.67		2
	50	0	21.76	21.80	21.62		2

FCC ID: A3LSMJ700P			SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 30 of 68	

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

LTE Band 26 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26715 (816.5 MHz)	26865 (831.5 MHz)	27015 (846.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.41	23.60	23.81	0	0
	1	12	23.34	23.47	23.69		0
	1	24	23.44	23.51	23.58		0
	12	0	22.63	22.67	22.60	0-1	1
	12	6	22.67	22.70	22.60		1
	12	13	22.53	22.53	22.55		1
	25	0	22.65	22.62	22.54		1
16QAM	1	0	22.37	22.63	22.74	0-2	1
	1	12	22.45	22.43	22.47		1
	1	24	22.32	22.29	22.40		1
	12	0	21.69	21.54	21.61	0-2	2
	12	6	21.65	21.66	21.81		2
	12	13	21.79	21.77	21.78		2
	25	0	21.82	21.82	21.76		2

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

LTE Band 26 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26705 (815.5 MHz)	26865 (831.5 MHz)	27025 (847.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.69	23.65	23.71	0	0
	1	7	23.81	24.00	23.92		0
	1	14	23.85	23.72	23.84		0
	8	0	22.64	22.72	22.59	0-1	1
	8	4	22.65	22.66	22.55		1
	8	7	22.62	22.70	22.55		1
15	0	22.67	22.74	22.56	1		
16QAM	1	0	22.66	22.79	22.46	0-1	1
	1	7	22.92	22.67	22.52		1
	1	14	22.47	22.55	22.52		1
	8	0	21.92	21.72	21.81		0-2
	8	4	21.82	21.88	21.76	2	
	8	7	21.83	21.99	21.69	2	
	15	0	21.80	21.87	21.70	2	

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

LTE Band 26 (Cell) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26697 (814.7 MHz)	26865 (831.5 MHz)	27033 (848.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.56	23.61	23.59	0	0
	1	2	23.68	23.92	23.59		0
	1	5	23.63	23.65	23.65		0
	3	0	23.61	23.56	23.43		0
	3	2	23.61	23.76	23.54		0
	3	3	23.67	23.69	23.62		0
	6	0	22.63	22.66	22.55	0-1	1
16QAM	1	0	22.95	22.98	22.93	0-1	1
	1	2	23.00	23.00	23.00		1
	1	5	22.97	22.74	22.89		1
	3	0	22.88	22.86	22.74		1
	3	2	22.94	22.90	22.57		1
	3	3	22.82	22.68	22.52		1
	6	0	21.91	21.95	21.79	0-2	2

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 31 of 68	

9.4.3

LTE Band 4 (AWS)

Table 9-10
LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth

LTE Band 4 (AWS) 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20175 (1732.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.33	0	0
	1	50	23.22		0
	1	99	23.36		0
	50	0	22.27	0-1	1
	50	25	22.15		1
	50	50	22.17		1
	100	0	22.21		1
16QAM	1	0	22.44	0-2	1
	1	50	22.54		1
	1	99	22.06		1
	50	0	21.12		2
	50	25	21.18		2
	50	50	21.14		2
	100	0	21.18		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 9-11
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

LTE Band 4 (AWS) 15 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	Frequency [MHz]	MPR Allowed per 3GPP [dB]	MPR [dB]
			20025 (1717.5 MHz)	20175 (1732.5 MHz)	20325 (1747.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.73	23.67	23.72	0	0
	1	36	23.79	23.65	23.60		0
	1	74	23.78	23.68	23.67		0
	36	0	22.71	22.64	22.67	0-1	1
	36	18	22.67	22.61	22.49		1
	36	37	22.64	22.60	22.50		1
	75	0	22.71	22.62	22.59		1
16QAM	1	0	23.00	22.77	23.00	0-1	1
	1	36	22.98	22.57	22.99		1
	1	74	22.95	22.59	22.98		1
	36	0	21.38	21.56	21.61	0-2	2
	36	18	21.45	21.45	21.58		2
	36	37	21.33	21.44	21.59		2
	75	0	21.47	21.45	21.65		2

FCC ID: A3LSMJ700P	 SAR EVALUATION REPORT 		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 32 of 68

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

LTE Band 4 (AWS) 10 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20000 (1715.0 MHz)	20175 (1732.5 MHz)	20350 (1750.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.48	23.60	23.66	0	0
	1	25	23.35	23.64	23.82		0
	1	49	23.28	23.52	23.55		0
	25	0	22.56	22.49	22.45	0-1	1
	25	12	22.58	22.40	22.40		1
	25	25	22.60	22.44	22.44		1
	50	0	22.51	22.48	22.34		1
16QAM	1	0	22.99	22.49	22.72	0-1	1
	1	25	22.97	22.50	22.81		1
	1	49	22.90	22.71	22.77		1
	25	0	21.59	21.51	21.32	0-2	2
	25	12	21.61	21.53	21.34		2
	25	25	21.63	21.38	21.30		2
	50	0	21.50	21.36	21.40		2

Table 9-13
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

LTE Band 4 (AWS) 5 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			19975 (1712.5 MHz)	20175 (1732.5 MHz)	20375 (1752.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.18	23.41	23.13	0	0
	1	12	23.22	23.52	23.35		0
	1	24	23.10	23.63	23.15		0
	12	0	22.66	22.44	22.35	0-1	1
	12	6	22.53	22.43	22.38		1
	12	13	22.56	22.38	22.36		1
	25	0	22.60	22.41	22.38		1
16QAM	1	0	22.50	22.43	22.67	0-1	1
	1	12	22.56	22.47	23.00		1
	1	24	22.51	22.35	22.72		1
	12	0	21.53	21.30	21.17	0-2	2
	12	6	21.59	21.32	21.29		2
	12	13	21.42	21.27	21.23		2
	25	0	21.71	21.60	21.35		2

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 33 of 68	

Table 9-14
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth

LTE Band 4 (AWS) 3 MHzBandwidth							
Modulation	RB Size	RB Offset	Frequency [MHz]	Frequency [MHz]	Frequency [MHz]	MPR Allowed per 3GPP [dB]	MPR [dB]
			19965 (1711.5 MHz)	20175 (1732.5 MHz)	20385 (1753.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.65	23.52	23.36	0	0
	1	7	23.60	23.54	23.59		0
	1	14	23.61	23.35	23.32		0
	8	0	22.62	22.38	22.40	0-1	1
	8	4	22.67	22.35	22.37		1
	8	7	22.47	22.43	22.40		1
	15	0	22.58	22.36	22.38		1
16QAM	1	0	22.92	22.48	22.88	0-1	1
	1	7	23.00	22.45	22.76		1
	1	14	22.99	22.27	22.66		1
	8	0	21.42	21.57	21.36	0-2	2
	8	4	21.52	21.43	21.38		2
	8	7	21.45	21.41	21.37		2
	15	0	21.63	21.37	21.50		2

Table 9-15
LTE Band 4 (AWS) Conducted Powers - 1.4 MHz Bandwidth

LTE Band 4 (AWS) 1.4 MHzBandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	Frequency [MHz]	MPR Allowed per 3GPP [dB]	MPR [dB]
			19957 (1710.7 MHz)	20175 (1732.5 MHz)	20393 (1754.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.66	23.51	23.52	0	0
	1	2	23.63	23.56	23.51		0
	1	5	23.59	23.49	23.32		0
	3	0	23.72	23.42	23.39		0
	3	2	23.69	23.34	23.43		0
	3	3	23.68	23.52	23.40		0
	6	0	22.73	22.44	22.47	0-1	1
16QAM	1	0	22.39	22.76	22.94	0-1	1
	1	2	22.44	22.91	22.64		1
	1	5	22.32	22.88	22.62		1
	3	0	22.51	22.78	22.46		1
	3	2	22.40	22.82	22.41		1
	3	3	22.35	22.75	22.36	1	
	6	0	21.64	21.20	21.66	0-2	2

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 34 of 68	

9.4.4

LTE Band 25 (PCS)

Table 9-16
LTE Band 25 (PCS) Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26140 (1860.0 MHz)	26365 (1882.5 MHz)	26590 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.27	23.50	23.49	0	0
	1	50	23.37	23.43	23.35		0
	1	99	23.25	23.47	23.46		0
	50	0	21.98	22.12	22.04	0-1	1
	50	25	21.91	21.98	21.96		1
	50	50	21.83	21.91	22.01		1
	100	0	21.96	21.97	21.98		1
16QAM	1	0	21.93	22.45	22.13	0-1	1
	1	50	21.74	22.29	22.29		1
	1	99	21.77	22.00	22.15		1
	50	0	20.91	21.04	21.13	0-2	2
	50	25	21.00	21.03	21.08		2
	50	50	21.07	21.09	21.07		2
	100	0	20.98	20.93	20.94		2

Table 9-17
LTE Band 25 (PCS) Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26115 (1857.5 MHz)	26365 (1882.5 MHz)	26615 (1907.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.49	23.48	23.45	0	0
	1	36	23.43	23.38	23.36		0
	1	74	23.25	23.39	23.45		0
	36	0	21.88	21.98	22.24	0-1	1
	36	18	21.84	21.99	21.99		1
	36	37	21.85	21.98	22.05		1
	75	0	21.84	21.93	22.03		1
16QAM	1	0	22.05	22.03	22.50	0-1	1
	1	36	21.83	21.71	21.89		1
	1	74	22.07	21.75	22.16		1
	36	0	20.65	20.80	21.18	0-2	2
	36	18	20.91	20.98	21.07		2
	36	37	21.02	21.04	21.06		2
	75	0	21.02	21.09	21.14		2

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 35 of 68

Table 9-18
LTE Band 25 (PCS) Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26090 (1855.0 MHz)	26365 (1882.5 MHz)	26640 (1910.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.37	23.41	23.24	0	0
	1	25	23.50	23.26	23.15		0
	1	49	23.46	23.24	23.26		0
	25	0	22.23	21.78	22.22	0-1	1
	25	12	22.10	21.75	22.17		1
	25	25	22.18	21.66	22.19		1
	50	0	22.15	21.81	22.08		1
16QAM	1	0	22.10	22.20	22.49	0-2	1
	1	25	22.26	22.50	22.48		1
	1	49	22.02	22.49	22.50		1
	25	0	21.27	21.25	21.26	0-2	2
	25	12	21.26	21.23	21.25		2
	25	25	21.21	21.13	21.20		2
	50	0	21.20	21.15	21.21		2

Table 9-19
LTE Band 25 (PCS) Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26065 (1852.5 MHz)	26365 (1882.5 MHz)	26665 (1912.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.15	23.06	23.22	0	0
	1	12	23.10	23.24	23.36		0
	1	24	22.93	23.13	23.41		0
	12	0	21.88	21.90	22.00	0-1	1
	12	6	21.83	21.95	22.04		1
	12	13	21.75	21.94	22.05		1
	25	0	21.83	21.92	22.00		1
16QAM	1	0	21.58	21.66	21.82	0-1	1
	1	12	21.93	21.57	21.76		1
	1	24	21.64	21.57	21.84		1
	12	0	20.69	20.58	20.98	0-2	2
	12	6	21.01	20.92	21.21		2
	12	13	20.90	21.04	21.09		2
	25	0	20.85	20.97	21.05		2

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 36 of 68

Table 9-20
LTE Band 25 (PCS) Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26055 (1851.5 MHz)	26365 (1882.5 MHz)	26675 (1913.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.27	23.15	23.37	0	0
	1	7	23.28	23.45	23.35		0
	1	14	23.07	23.42	23.44		0
	8	0	21.87	21.88	22.07	0-1	1
	8	4	21.92	21.90	22.03		1
	8	7	21.76	21.91	22.07		1
	15	0	21.81	21.90	21.99		1
16QAM	1	0	21.89	22.11	21.81	0-2	1
	1	7	22.18	22.18	22.30		1
	1	14	22.06	22.36	22.04		1
	8	0	20.61	20.83	21.29	0-2	2
	8	4	21.00	21.07	21.26		2
	8	7	21.32	21.00	21.42		2
	15	0	20.66	20.89	20.98		2

Table 9-21
LTE Band 25 (PCS) Conducted Powers - 1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26047 (1850.7 MHz)	26365 (1882.5 MHz)	26683 (1914.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.09	23.14	23.31	0	0
	1	2	23.30	23.23	23.34		0
	1	5	23.18	23.34	23.29		0
	3	0	22.95	22.94	23.04		0
	3	2	23.00	23.16	23.12		0
	3	3	22.98	23.09	23.06		0
	6	0	21.91	21.96	21.98	0-1	1
16QAM	1	0	22.33	22.25	22.32	0-1	1
	1	2	22.30	22.49	22.16		1
	1	5	22.04	22.08	22.25		1
	3	0	22.08	22.02	22.31		1
	3	2	22.27	21.99	22.20		1
	3	3	22.04	21.86	22.20		1
	6	0	20.98	21.18	21.23	0-2	2

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 37 of 68

9.4.5

LTE Band 41

Table 9-22
LTE Band 41 Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHzBandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.18	24.50	24.33	24.16	24.12	0	0
	1	50	23.82	24.39	24.27	23.92	23.81		0
	1	99	23.86	24.29	24.11	23.79	23.71		0
	50	0	22.99	23.46	23.43	23.19	23.18	0-1	1
	50	25	22.94	23.50	23.41	23.09	22.91		1
	50	50	22.87	23.44	23.35	22.95	22.81		1
	100	0	22.97	23.48	23.41	23.11	22.95		1
16QAM	1	0	23.22	23.44	23.37	23.06	23.15	0-1	1
	1	50	22.91	23.29	23.15	22.83	22.61		1
	1	99	22.85	23.27	23.06	22.66	22.60		1
	50	0	22.13	22.47	22.46	22.13	22.07	0-2	2
	50	25	22.05	22.50	22.45	22.06	21.91		2
	50	50	21.97	22.47	22.39	21.92	21.80		2
	100	0	22.00	22.48	22.44	21.89	21.78		2

Table 9-23
LTE Band 41 Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHzBandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.33	24.46	24.45	24.15	24.01	0	0
	1	36	24.14	24.28	24.37	24.10	24.02		0
	1	74	24.00	24.23	24.30	23.59	24.11		0
	36	0	23.15	23.38	23.40	23.10	22.95	0-1	1
	36	18	23.06	23.37	23.43	23.17	23.03		1
	36	37	22.94	23.34	23.25	22.92	22.97		1
	75	0	22.99	23.25	23.27	23.09	22.79		1
16QAM	1	0	22.81	23.01	22.86	23.00	22.92	0-1	1
	1	36	22.65	22.84	22.75	22.93	22.69		1
	1	74	22.50	22.80	22.91	22.69	22.76		1
	36	0	22.26	22.44	22.46	22.17	22.11	0-2	2
	36	18	22.22	22.39	22.46	22.18	21.72		2
	36	37	22.07	22.39	22.42	21.73	21.92		2
	75	0	22.12	22.34	22.35	21.79	21.84		2

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 38 of 68

Table 9-24
LTE Band 41 Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHzBandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.34	24.39	24.37	24.26	24.05	0	0
	1	25	24.07	24.43	24.25	24.17	24.07		0
	1	49	24.01	24.13	24.31	23.57	24.03		0
	25	0	23.18	23.46	23.28	23.29	22.88	0-1	1
	25	12	23.09	23.28	23.48	23.13	22.92		1
	25	25	22.89	23.18	23.14	22.84	22.77		1
	50	0	22.92	23.09	23.16	22.90	22.80		1
16QAM	1	0	22.78	23.19	22.99	23.00	22.97	0-1	1
	1	25	22.82	22.74	22.84	22.94	22.50		1
	1	49	22.63	22.77	22.74	22.80	22.72		1
	25	0	22.41	22.16	22.36	22.20	22.00	0-2	2
	25	12	22.21	22.39	22.25	22.09	21.54		2
	25	25	21.99	22.39	22.36	21.67	22.05		2
	50	0	22.14	22.49	22.34	21.83	21.75		2

Table 9-25
LTE Band 41 Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHzBandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	24.24	24.47	24.44	24.18	24.21	0	0
	1	12	23.93	24.43	24.14	24.36	24.27		0
	1	24	23.93	23.97	24.12	23.51	23.85		0
	12	0	23.03	23.32	23.33	23.23	22.73	0-1	1
	12	6	23.29	23.44	23.26	23.24	23.00		1
	12	13	22.75	23.30	23.25	22.77	22.86		1
	25	0	22.94	23.23	23.00	23.02	22.94		1
16QAM	1	0	22.98	23.10	22.92	23.06	22.81	0-1	1
	1	12	22.86	22.83	22.94	22.86	22.56		1
	1	24	22.58	22.82	22.74	22.62	22.52		1
	12	0	22.19	22.08	22.26	22.06	21.81	0-2	2
	12	6	22.33	22.42	22.42	22.17	21.70		2
	12	13	22.15	22.43	22.18	21.69	22.21		2
	25	0	22.33	22.26	22.41	21.94	21.58		2

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 39 of 68

9.5 WLAN Conducted Powers

Table 9-26
2.4 GHz Average RF Maximum Power

Freq [MHz]	Channel	2.4 GHz Conducted Power [dBm]	
		IEEE Transmission Mode	
		802.11b	802.11g
2412	1	16.65	15.24
2437	6	16.87	14.78
2462	11	16.94	15.28

Table 9-27
2.4 GHz Average RF Reduced Power

Freq [MHz]	Channel	2.4 GHz Conducted Power [dBm]	
		IEEE Transmission Mode	
		802.11b	802.11g
2412	1	12.00	10.86
2437	6	11.89	11.19
2462	11	11.57	10.75

Table 9-28
5 GHz Average RF Maximum Power

Freq [MHz]	Channel	5 GHz (20 MHz) Conducted Power [dBm]	
		IEEE Transmission Mode	
		802.11a	802.11n
5180	36	14.67	12.75
5200	40	14.81	13.04
5220	44	14.63	12.65
5240	48	15.25	13.42
5260	52	15.06	13.24
5280	56	15.00	12.98
5300	60	15.17	13.27
5320	64	15.36	13.38
5500	100	14.66	13.37
5580	120	15.16	12.88
5660	124	14.65	12.50
5720	144	14.92	12.62
5745	149	15.26	13.41
5785	157	14.83	13.19
5825	165	15.14	13.34

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 40 of 68

Table 9-29
5 GHz Average RF Reduced Power

Freq [MHz]	Channel	5 GHz (20 MHz) Conducted Power [dBm]	
		IEEE Transmission Mode	
		802.11a	802.11n
5180	36	10.41	7.71
5200	40	10.48	8.02
5220	44	10.18	7.50
5240	48	10.00	8.35
5260	52	9.93	7.91
5280	56	9.66	7.98
5300	60	9.83	8.17
5320	64	10.08	8.28
5500	100	9.67	8.47
5580	120	9.36	8.40
5660	124	10.02	7.94
5720	144	9.63	8.48
5745	149	9.73	7.81
5785	157	9.48	7.88
5825	165	9.83	7.95

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

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

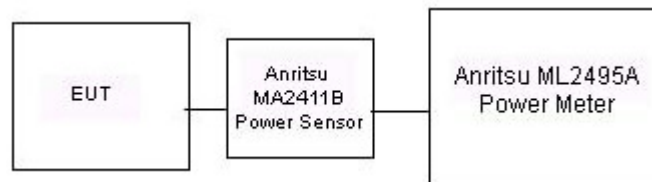


Figure 9-4
Power Measurement Setup

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 41 of 68	

10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Head Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
12/5/2015	750H	22.1	700	0.864	43.814	0.889	42.201	-2.81%	3.82%
			710	0.873	43.684	0.890	42.149	-1.91%	3.64%
			725	0.886	43.483	0.891	42.071	-0.56%	3.36%
			740	0.900	43.276	0.893	41.994	0.78%	3.05%
			755	0.915	43.060	0.894	41.916	2.35%	2.73%
12/8/2015	835H	22.4	820	0.882	41.350	0.899	41.578	-1.89%	-0.55%
			835	0.896	41.145	0.900	41.500	-0.44%	-0.86%
			850	0.910	40.952	0.916	41.500	-0.66%	-1.32%
12/3/2015	1750H	22.1	1710	1.299	39.738	1.348	40.142	-3.64%	-1.01%
			1750	1.341	39.514	1.371	40.079	-2.19%	-1.41%
			1790	1.381	39.403	1.394	40.016	-0.93%	-1.53%
12/6/2015	1900H	22.3	1850	1.348	38.467	1.400	40.000	-3.71%	-3.83%
			1880	1.358	38.293	1.400	40.000	-3.00%	-4.27%
			1910	1.413	38.136	1.400	40.000	0.93%	-4.66%
12/16/2015	2450H	23.8	2400	1.759	38.547	1.756	39.289	0.17%	-1.89%
			2450	1.820	38.336	1.800	39.200	1.11%	-2.20%
			2500	1.872	38.119	1.855	39.136	0.92%	-2.60%
12/7/2015	2600H	23.8	2500	1.851	39.716	1.855	39.136	-0.22%	1.48%
			2550	1.914	39.616	1.909	39.073	0.26%	1.39%
			2600	1.954	39.345	1.964	39.009	-0.51%	0.86%
12/16/2015	5200 - 5800H	21.7	5240	4.503	36.184	4.696	35.940	-4.11%	0.68%
			5260	4.513	36.127	4.717	35.917	-4.32%	0.58%
			5320	4.580	36.006	4.778	35.849	-4.14%	0.44%
			5600	4.882	35.632	5.065	35.529	-3.61%	0.29%
			5620	4.904	35.627	5.086	35.506	-3.58%	0.34%
			5745	5.048	35.443	5.214	35.363	-3.18%	0.23%
			5765	5.067	35.443	5.234	35.340	-3.19%	0.29%
			5825	5.115	35.317	5.296	35.271	-3.42%	0.13%

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 42 of 68

Table 10-2
Measured Body Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (C°)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
12/3/2015	750B	21.7	700	0.936	53.468	0.959	55.726	-2.40%	-4.05%
			710	0.946	53.353	0.960	55.687	-1.46%	-4.19%
			725	0.961	53.189	0.961	55.629	0.00%	-4.39%
			740	0.975	53.039	0.963	55.570	1.25%	-4.55%
			755	0.989	52.884	0.964	55.512	2.59%	-4.73%
12/8/2015	835B	22.2	820	0.980	54.218	0.969	55.258	1.14%	-1.88%
			835	0.995	54.082	0.970	55.200	2.58%	-2.03%
			850	1.009	53.956	0.988	55.154	2.13%	-2.17%
12/8/2015	1750B	23.5	1710	1.421	52.224	1.463	53.537	-2.87%	-2.45%
			1750	1.466	52.103	1.488	53.432	-1.48%	-2.49%
			1790	1.507	51.961	1.514	53.326	-0.46%	-2.56%
12/2/2015	1900B	22.7	1850	1.446	53.557	1.520	53.300	-4.87%	0.48%
			1880	1.481	53.488	1.520	53.300	-2.57%	0.35%
			1910	1.512	53.311	1.520	53.300	-0.53%	0.02%
12/4/2015	1900B	22.0	1850	1.469	52.043	1.520	53.300	-3.36%	-2.36%
			1880	1.498	51.966	1.520	53.300	-1.45%	-2.50%
			1910	1.537	51.840	1.520	53.300	1.12%	-2.74%
12/6/2015	1900B	22.0	1850	1.502	51.694	1.520	53.300	-1.18%	-3.01%
			1880	1.531	51.519	1.520	53.300	0.72%	-3.34%
			1910	1.574	51.414	1.520	53.300	3.55%	-3.54%
12/7/2015	2450B	21.6	2400	1.905	50.985	1.902	52.767	0.16%	-3.38%
			2450	1.987	50.916	1.950	52.700	1.90%	-3.39%
			2500	2.044	50.751	2.021	52.636	1.14%	-3.58%
12/14/2015	2450B	21.7	2400	1.938	51.671	1.902	52.767	1.89%	-2.08%
			2450	2.009	51.481	1.950	52.700	3.03%	-2.31%
			2500	2.082	51.262	2.021	52.636	3.02%	-2.61%
12/7/2015	2600B	21.6	2500	2.044	50.751	2.021	52.636	1.14%	-3.58%
			2550	2.119	50.464	2.092	52.573	1.29%	-4.01%
			2600	2.192	50.466	2.163	52.509	1.34%	-3.89%
			2650	2.251	50.099	2.234	52.445	0.76%	-4.47%
			2700	2.332	49.988	2.305	52.382	1.17%	-4.57%
12/17/2015	5200 - 5800B	22.9	5300	5.448	48.088	5.416	48.879	0.59%	-1.62%
			5320	5.475	48.056	5.439	48.851	0.66%	-1.63%
			5600	5.860	47.586	5.766	48.471	1.63%	-1.83%
			5745	6.051	47.344	5.936	48.275	1.94%	-1.93%
			5800	6.147	47.262	6.000	48.200	2.45%	-1.95%

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 43 of 68

10.2 Test System Verification

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

Table 10-3
System Verification Results – 1g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	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} (%)
K	750	HEAD	12/05/2015	24.2	22.4	0.200	1003	3022	1.710	8.090	8.550	5.69%
I	835	HEAD	12/08/2015	24.3	22.4	0.200	4d133	3333	1.820	9.130	9.100	-0.33%
D	1750	HEAD	12/03/2015	23.5	23.0	0.100	1051	3209	3.720	36.200	37.200	2.76%
K	1900	HEAD	12/06/2015	22.8	22.1	0.100	5d149	3022	3.930	40.700	39.300	-3.44%
J	2450	HEAD	12/16/2015	24.0	23.8	0.100	719	3319	5.050	54.200	50.500	-6.83%
H	2600	HEAD	12/07/2015	22.9	23.0	0.100	1004	3263	5.860	55.800	58.600	5.02%
E	5250	HEAD	12/16/2015	23.6	21.9	0.050	1191	7308	3.860	82.500	77.200	-6.42%
E	5600	HEAD	12/16/2015	23.6	21.9	0.050	1191	7308	4.100	84.500	82.000	-2.96%
E	5750	HEAD	12/16/2015	23.6	21.9	0.050	1191	7308	3.700	80.000	74.000	-7.50%
B	750	BODY	12/03/2015	21.9	21.7	0.200	1046	3287	1.720	8.290	8.600	3.74%
E	835	BODY	12/08/2015	24.2	22.4	0.200	4d133	3351	1.960	9.250	9.800	5.95%
K	1750	BODY	12/08/2015	23.2	23.5	0.100	1051	3022	3.750	37.100	37.500	1.08%
I	1900	BODY	12/02/2015	22.8	22.6	0.100	5d149	3333	3.810	40.400	38.100	-5.69%
I	1900	BODY	12/04/2015	22.2	22.0	0.100	5d149	3333	4.260	40.400	42.600	5.45%
I	1900	BODY	12/06/2015	23.7	22.0	0.100	5d149	3333	4.360	40.400	43.600	7.92%
J	2450	BODY	12/07/2015	22.5	22.0	0.100	719	3319	5.070	51.900	50.700	-2.31%
G	2450	BODY	12/14/2015	21.6	21.7	0.100	719	3334	5.290	51.900	52.900	1.93%
J	2600	BODY	12/07/2015	22.5	22.0	0.100	1004	3319	5.900	56.200	59.000	4.98%
D	5300	BODY	12/17/2015	24.5	22.4	0.050	1057	7357	3.790	74.200	75.800	2.16%
D	5600	BODY	12/17/2015	24.5	22.4	0.050	1057	7357	4.000	77.700	80.000	2.96%
D	5800	BODY	12/17/2015	24.5	22.4	0.050	1057	7357	3.570	75.100	71.400	-4.93%

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} (%)
D	5300	BODY	12/17/2015	24.5	22.4	0.050	1057	7357	1.060	20.900	21.200	1.44%
D	5600	BODY	12/17/2015	24.5	22.4	0.050	1057	7357	1.130	21.500	22.600	5.12%

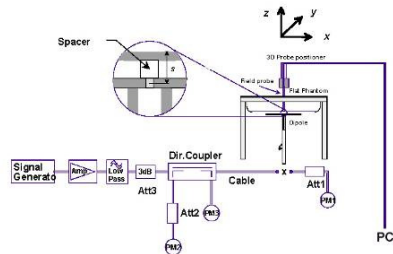


Figure 10-1
System Verification Setup Diagram



Figure 10-2
System Verification Setup Photo

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 44 of 68

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
CDMA BC10 (§90S) Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
820.10	564	CDMA BC10 (\$90S)	RC3 / SO55	25.3	24.98	0.10	Right	Cheek	02306	1:1	0.321	1.076	0.345	
820.10	564	CDMA BC10 (\$90S)	RC3 / SO55	25.3	24.98	-0.06	Right	Tilt	02306	1:1	0.189	1.076	0.203	
820.10	564	CDMA BC10 (\$90S)	RC3 / SO55	25.3	24.98	0.07	Left	Cheek	02306	1:1	0.389	1.076	0.419	
820.10	564	CDMA BC10 (\$90S)	RC3 / SO55	25.3	24.98	0.06	Left	Tilt	02306	1:1	0.208	1.076	0.224	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. A	25.3	24.96	0.09	Right	Cheek	02306	1:1	0.313	1.081	0.338	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. A	25.3	24.96	0.10	Right	Tilt	02306	1:1	0.181	1.081	0.196	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. A	25.3	24.96	0.03	Left	Cheek	02306	1:1	0.427	1.081	0.462	A1
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. A	25.3	24.96	0.04	Left	Tilt	02306	1:1	0.216	1.081	0.233	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-2
CDMA BC0 (§22H) Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.52	384	CDMA BC0 (\$22H)	RC3 / SO55	25.0	24.57	-0.03	Right	Cheek	02306	1:1	0.368	1.104	0.406	
836.52	384	CDMA BC0 (\$22H)	RC3 / SO55	25.0	24.57	0.11	Right	Tilt	02306	1:1	0.252	1.104	0.278	
836.52	384	CDMA BC0 (\$22H)	RC3 / SO55	25.0	24.57	-0.05	Left	Cheek	02306	1:1	0.496	1.104	0.548	A2
836.52	384	CDMA BC0 (\$22H)	RC3 / SO55	25.0	24.57	0.06	Left	Tilt	02306	1:1	0.260	1.104	0.287	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. A	25.0	24.64	0.13	Right	Cheek	02306	1:1	0.347	1.086	0.377	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. A	25.0	24.64	0.13	Right	Tilt	02306	1:1	0.231	1.086	0.251	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. A	25.0	24.64	-0.01	Left	Cheek	02306	1:1	0.479	1.086	0.520	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. A	25.0	24.64	0.04	Left	Tilt	02306	1:1	0.258	1.086	0.280	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

FCC ID: A3LSMJ700P			SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset			Page 45 of 68

Table 11-3
GSM 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	32.5	32.00	-0.06	Right	Cheek	02197	1:8.3	0.211	1.122	0.237	
836.60	190	GSM 850	GSM	32.5	32.00	0.16	Right	Tilt	02197	1:8.3	0.130	1.122	0.146	
836.60	190	GSM 850	GSM	32.5	32.00	-0.07	Left	Cheek	02197	1:8.3	0.298	1.122	0.334	A3
836.60	190	GSM 850	GSM	32.5	32.00	0.09	Left	Tilt	02197	1:8.3	0.165	1.122	0.185	
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 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	23.5	22.75	0.05	Right	Cheek	02197	1:1	0.228	1.189	0.271	
836.60	4183	UMTS 850	RMC	23.5	22.75	0.07	Right	Tilt	02197	1:1	0.142	1.189	0.169	
836.60	4183	UMTS 850	RMC	23.5	22.75	0.03	Left	Cheek	02197	1:1	0.323	1.189	0.384	A4
836.60	4183	UMTS 850	RMC	23.5	22.75	0.04	Left	Tilt	02197	1:1	0.181	1.189	0.215	
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
PCS CDMA Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	600	PCS CDMA	RC3 / SO55	23.5	22.82	0.01	Right	Cheek	02306	1:1	0.195	1.169	0.228	
1880.00	600	PCS CDMA	RC3 / SO55	23.5	22.82	0.11	Right	Tilt	02306	1:1	0.115	1.169	0.134	
1880.00	600	PCS CDMA	RC3 / SO55	23.5	22.82	0.20	Left	Cheek	02306	1:1	0.196	1.169	0.229	
1880.00	600	PCS CDMA	RC3 / SO55	23.5	22.82	0.14	Left	Tilt	02306	1:1	0.072	1.169	0.084	
1880.00	600	PCS CDMA	EVDO Rev. A	23.5	23.03	-0.17	Right	Cheek	02306	1:1	0.195	1.114	0.217	
1880.00	600	PCS CDMA	EVDO Rev. A	23.5	23.03	0.15	Right	Tilt	02306	1:1	0.116	1.114	0.129	
1880.00	600	PCS CDMA	EVDO Rev. A	23.5	23.03	0.09	Left	Cheek	02306	1:1	0.213	1.114	0.237	A5
1880.00	600	PCS CDMA	EVDO Rev. A	23.5	23.03	0.14	Left	Tilt	02306	1:1	0.074	1.114	0.082	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 46 of 68

Table 11-6
GSM 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.0	29.88	0.12	Right	Cheek	02197	1:8.3	0.113	1.028	0.116	
1880.00	661	GSM 1900	GSM	30.0	29.88	0.18	Right	Tilt	02197	1:8.3	0.069	1.028	0.071	
1880.00	661	GSM 1900	GSM	30.0	29.88	0.00	Left	Cheek	02197	1:8.3	0.120	1.028	0.123	A6
1880.00	661	GSM 1900	GSM	30.0	29.88	0.05	Left	Tilt	02197	1:8.3	0.042	1.028	0.043	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-7
UMTS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode/Band	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	23.5	22.97	-0.02	Right	Cheek	02197	1:1	0.187	1.130	0.211	
1880.00	9400	UMTS 1900	RMC	23.5	22.97	0.14	Right	Tilt	02197	1:1	0.109	1.130	0.123	
1880.00	9400	UMTS 1900	RMC	23.5	22.97	-0.05	Left	Cheek	02197	1:1	0.196	1.130	0.221	A7
1880.00	9400	UMTS 1900	RMC	23.5	22.97	0.05	Left	Tilt	02197	1:1	0.072	1.130	0.081	
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 12 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.	(W/kg)														(W/kg)			
707.50	23095	Mid	LTE Band 12	10	24.0	23.78	-0.20	0	Right	Cheek	QPSK	1	0	01111	1:1	0.124	1.052	0.130	
707.50	23095	Mid	LTE Band 12	10	23.0	22.66	-0.04	1	Right	Cheek	QPSK	25	0	01111	1:1	0.096	1.081	0.104	
707.50	23095	Mid	LTE Band 12	10	24.0	23.78	0.05	0	Right	Tilt	QPSK	1	0	01111	1:1	0.092	1.052	0.097	
707.50	23095	Mid	LTE Band 12	10	23.0	22.66	-0.09	1	Right	Tilt	QPSK	25	0	01111	1:1	0.061	1.081	0.066	
707.50	23095	Mid	LTE Band 12	10	24.0	23.78	0.04	0	Left	Cheek	QPSK	1	0	01111	1:1	0.160	1.052	0.168	A8
707.50	23095	Mid	LTE Band 12	10	23.0	22.66	0.04	1	Left	Cheek	QPSK	25	0	01111	1:1	0.118	1.081	0.128	
707.50	23095	Mid	LTE Band 12	10	24.0	23.78	0.14	0	Left	Tilt	QPSK	1	0	01111	1:1	0.078	1.052	0.082	
707.50	23095	Mid	LTE Band 12	10	23.0	22.66	0.01	1	Left	Tilt	QPSK	25	0	01111	1:1	0.063	1.081	0.068	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram									

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 47 of 68

Table 11-9
LTE Band 26 (Cell) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	23.95	0.04	0	Right	Cheek	QPSK	1	0	01111	1:1	0.257	1.012	0.260	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	22.66	0.08	1	Right	Cheek	QPSK	36	0	01111	1:1	0.198	1.081	0.214	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	23.95	0.19	0	Right	Tilt	QPSK	1	0	01111	1:1	0.144	1.012	0.146	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	22.66	0.16	1	Right	Tilt	QPSK	36	0	01111	1:1	0.119	1.081	0.129	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	23.95	-0.15	0	Left	Cheek	QPSK	1	0	01111	1:1	0.337	1.012	0.341	A9
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	22.66	0.03	1	Left	Cheek	QPSK	36	0	01111	1:1	0.255	1.081	0.276	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	23.95	-0.02	0	Left	Tilt	QPSK	1	0	01111	1:1	0.144	1.012	0.146	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	22.66	0.15	1	Left	Tilt	QPSK	36	0	01111	1:1	0.117	1.081	0.126	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-10
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot
MHz	Ch.	(W/kg)														(W/kg)			
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	-0.02	0	Right	Cheek	QPSK	1	99	01111	1:1	0.197	1.159	0.228	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.27	-0.02	1	Right	Cheek	QPSK	50	0	01111	1:1	0.147	1.183	0.174	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	-0.02	0	Right	Tilt	QPSK	1	99	01111	1:1	0.137	1.159	0.159	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.27	0.14	1	Right	Tilt	QPSK	50	0	01111	1:1	0.105	1.183	0.124	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	0.01	0	Left	Cheek	QPSK	1	99	01111	1:1	0.284	1.159	0.329	A10
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.27	0.10	1	Left	Cheek	QPSK	50	0	01111	1:1	0.224	1.183	0.265	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	-0.04	0	Left	Tilt	QPSK	1	99	01111	1:1	0.125	1.159	0.145	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.27	0.01	1	Left	Tilt	QPSK	50	0	01111	1:1	0.112	1.183	0.132	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Head									
Spatial Peak										1.6 W/kg (mW/g)									
Uncontrolled Exposure/General Population										averaged over 1 gram									

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

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot	
MHz	Ch.														(W/kg)		(W/kg)		
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.50	0.11	0	Right	Cheek	QPSK	1	0	01111	1:1	0.216	1.000	0.216	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.5	22.12	-0.10	1	Right	Cheek	QPSK	50	0	01111	1:1	0.155	1.091	0.169	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.50	-0.08	0	Right	Tilt	QPSK	1	0	01111	1:1	0.121	1.000	0.121	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.5	22.12	-0.16	1	Right	Tilt	QPSK	50	0	01111	1:1	0.041	1.091	0.045	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.50	0.10	0	Left	Cheek	QPSK	1	0	01111	1:1	0.257	1.000	0.257	A11
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.5	22.12	0.06	1	Left	Cheek	QPSK	50	0	01111	1:1	0.179	1.091	0.195	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.50	0.11	0	Left	Tilt	QPSK	1	0	01111	1:1	0.077	1.000	0.077	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.5	22.12	0.05	1	Left	Tilt	QPSK	50	0	01111	1:1	0.062	1.091	0.068	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 48 of 68

Table 11-12
LTE Band 41 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	0.09	0	Right	Cheek	QPSK	1	0	02306	1:1.58	0.235	1.000	0.235	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	0.13	1	Right	Cheek	QPSK	50	25	02306	1:1.58	0.203	1.000	0.203	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	0.15	0	Right	Tilt	QPSK	1	0	02306	1:1.58	0.227	1.000	0.227	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	0.11	1	Right	Tilt	QPSK	50	25	02306	1:1.58	0.198	1.000	0.198	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	0.11	0	Left	Cheek	QPSK	1	0	02306	1:1.58	0.550	1.000	0.550	A12
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	0.17	1	Left	Cheek	QPSK	50	25	02306	1:1.58	0.508	1.000	0.508	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	-0.08	0	Left	Tilt	QPSK	1	0	02306	1:1.58	0.185	1.000	0.185	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	0.06	1	Left	Tilt	QPSK	50	25	02306	1:1.58	0.142	1.000	0.142	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-13
DTS Head SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2412	1	802.11b	DSSS	22	12.5	12.00	-	Right	Cheek	02306	1	99.4	0.190	-	1.122	1.006	-	
2412	1	802.11b	DSSS	22	12.5	12.00	-	Right	Tilt	02306	1	99.4	0.209	-	1.122	1.006	-	
2412	1	802.11b	DSSS	22	12.5	12.00	0.11	Left	Cheek	02306	1	99.4	0.315	0.298	1.122	1.006	0.336	A13
2412	1	802.11b	DSSS	22	12.5	12.00	-	Left	Tilt	02306	1	99.4	0.241	-	1.122	1.006	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-14
NII Head SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	Peak SAR of Area Scan	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
5320	64	802.11a	OFDM	20	10.5	10.08	-	Right	Cheek	01111	6	98.3	0.456	-	1.102	1.017	-	
5320	64	802.11a	OFDM	20	10.5	10.08	-	Right	Tilt	01111	6	98.3	0.469	-	1.102	1.017	-	
5320	64	802.11a	OFDM	20	10.5	10.08	0.09	Left	Cheek	01111	6	98.3	0.718	0.303	1.102	1.017	0.340	
5320	64	802.11a	OFDM	20	10.5	10.08	-	Left	Tilt	01111	6	98.3	0.652	-	1.102	1.017	-	
5620	124	802.11a	OFDM	20	10.5	10.02	-	Right	Cheek	01111	6	98.3	0.890	-	1.117	1.017	-	
5620	124	802.11a	OFDM	20	10.5	10.02	-	Right	Tilt	01111	6	98.3	1.051	-	1.117	1.017	-	
5620	124	802.11a	OFDM	20	10.5	10.02	0.09	Left	Cheek	01111	6	98.3	1.461	0.578	1.117	1.017	0.657	
5620	124	802.11a	OFDM	20	10.5	10.02	0.10	Left	Tilt	01111	6	98.3	1.411	0.582	1.117	1.017	0.661	A14
5825	165	802.11a	OFDM	20	10.5	9.83	-	Right	Cheek	01111	6	98.3	0.411	-	1.167	1.017	-	
5825	165	802.11a	OFDM	20	10.5	9.83	-	Right	Tilt	01111	6	98.3	0.452	-	1.167	1.017	-	
5825	165	802.11a	OFDM	20	10.5	9.83	0.19	Left	Cheek	01111	6	98.3	0.766	0.299	1.167	1.017	0.355	
5825	165	802.11a	OFDM	20	10.5	9.83	-	Left	Tilt	01111	6	98.3	0.682	-	1.167	1.017	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram									

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 49 of 68

11.2 Standalone Body-Worn SAR Data

Table 11-15
GSM/UMTS/CDMA Body-Worn SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
820.10	564	CDMA BC10 (§90S)	TDSD / SO32	25.3	24.98	0.00	10 mm	02197	N/A	1:1	back	0.565	1.076	0.608	A15
836.52	384	CDMA BC0 (§22H)	TDSD / SO32	25.0	24.57	-0.06	10 mm	02197	N/A	1:1	back	0.595	1.104	0.657	A17
836.60	190	GSM 850	GSM	32.5	32.00	0.02	10 mm	02197	1	1:8.3	back	0.382	1.122	0.429	A19
836.60	4183	UMTS 850	RMC	23.5	22.75	-0.01	10 mm	02197	N/A	1:1	back	0.411	1.189	0.489	A21
1851.25	25	PCS CDMA	TDSD / SO32	23.5	23.03	0.01	10 mm	02306	N/A	1:1	back	0.815	1.114	0.908	A22
1880.00	600	PCS CDMA	TDSD / SO32	23.5	22.99	0.00	10 mm	02306	N/A	1:1	back	0.803	1.125	0.903	
1908.75	1175	PCS CDMA	TDSD / SO32	23.5	23.30	0.06	10 mm	02306	N/A	1:1	back	0.809	1.047	0.847	
1880.00	661	GSM 1900	GSM	30.0	29.88	0.00	10 mm	02197	1	1:8.3	back	0.439	1.028	0.451	A24
1880.00	9400	UMTS 1900	RMC	23.5	22.97	0.00	10 mm	02197	N/A	1:1	back	0.706	1.130	0.798	A26
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 11-16
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	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
707.50	23095	Md	LTE Band 12	10	24.0	23.78	0.14	0	011111	QPSK	1	0	10 mm	back	1:1	0.295	1.052	0.310	A28
707.50	23095	Md	LTE Band 12	10	23.0	22.66	0.02	1	011111	QPSK	25	0	10 mm	back	1:1	0.227	1.081	0.245	
836.50	26915	Md	LTE Band 26 (Cell)	15	24.0	23.95	-0.02	0	02197	QPSK	1	0	10 mm	back	1:1	0.486	1.012	0.492	A29
836.50	26915	Md	LTE Band 26 (Cell)	15	23.0	22.66	0.07	1	02197	QPSK	36	0	10 mm	back	1:1	0.378	1.081	0.409	
1732.50	20175	Md	LTE Band 4 (AWS)	20	24.0	23.36	-0.11	0	011111	QPSK	1	99	10 mm	back	1:1	0.658	1.159	0.763	A30
1732.50	20175	Md	LTE Band 4 (AWS)	20	23.0	22.27	-0.06	1	011111	QPSK	50	0	10 mm	back	1:1	0.481	1.183	0.569	
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.5	23.37	0.07	0	011111	QPSK	1	50	10 mm	back	1:1	0.764	1.030	0.787	
1882.50	26365	Md	LTE Band 25 (PCS)	20	23.5	23.50	-0.01	0	011111	QPSK	1	0	10 mm	back	1:1	0.834	1.000	0.834	A32
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.49	-0.03	0	011111	QPSK	1	0	10 mm	back	1:1	0.714	1.002	0.715	
1882.50	26365	Md	LTE Band 25 (PCS)	20	22.5	22.12	-0.09	1	011111	QPSK	50	0	10 mm	back	1:1	0.592	1.091	0.646	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	21.98	0.00	1	011111	QPSK	100	0	10 mm	back	1:1	0.589	1.127	0.664	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	0.12	0	02306	QPSK	1	0	10 mm	back	1:1.58	0.382	1.000	0.382	A34
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	-0.05	1	02306	QPSK	50	25	10 mm	back	1:1.58	0.305	1.000	0.305	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT															Body				
Spatial Peak															1.6 W/kg (mW/g)				
Uncontrolled Exposure/General Population															averaged over 1 gram				

Table 11-17
DTS Body-Worn SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan (W/kg)	SAR (1g) (W/kg)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																	
2462	11	802.11b	DSSS	22	17.5	16.94	0.05	10 mm	02306	1	back	99.4	0.114	0.101	1.138	1.006	0.116	A36
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
NII Body-Worn SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan (W/kg)	SAR (1g) (W/kg)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g) (W/kg)	Plot #
MHz	Ch.																	
5320	64	802.11a	OFDM	20	15.5	15.36	0.19	10 mm	02306	6	back	98.3	0.362	0.182	1.033	1.017	0.191	A38
5600	120	802.11a	OFDM	20	15.5	15.16	0.15	10 mm	02306	6	back	98.3	0.298	0.154	1.081	1.017	0.169	
5745	148	802.11a	OFDM	20	15.5	15.26	0.17	10 mm	02306	6	back	98.3	0.239	0.122	1.057	1.017	0.131	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT													Body					
Spatial Peak													1.6 W/kg (mW/g)					
Uncontrolled Exposure/General Population													averaged over 1 gram					

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 50 of 68

11.3 Standalone Hotspot SAR Data

Table 11-19
GPRS/UMTS/CDMA Hotspot SAR Data

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of GPRS Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.3	24.97	-0.11	10 mm	02197	N/A	1:1	back	0.561	1.079	0.605	A16
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.3	24.97	0.05	10 mm	02197	N/A	1:1	front	0.416	1.079	0.449	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.3	24.97	-0.04	10 mm	02197	N/A	1:1	bottom	0.225	1.079	0.243	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.3	24.97	0.08	10 mm	02197	N/A	1:1	right	0.213	1.079	0.230	
820.10	564	CDMA BC10 (\$90S)	EVDO Rev. 0	25.3	24.97	-0.03	10 mm	02197	N/A	1:1	left	0.319	1.079	0.344	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	25.0	24.65	-0.05	10 mm	02197	N/A	1:1	back	0.639	1.084	0.693	A18
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	25.0	24.65	0.04	10 mm	02197	N/A	1:1	front	0.453	1.084	0.491	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	25.0	24.65	0.06	10 mm	02197	N/A	1:1	bottom	0.259	1.084	0.281	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	25.0	24.65	-0.04	10 mm	02197	N/A	1:1	right	0.250	1.084	0.271	
836.52	384	CDMA BC0 (\$22H)	EVDO Rev. 0	25.0	24.65	-0.09	10 mm	02197	N/A	1:1	left	0.339	1.084	0.367	
836.60	190	GSM 850	GPRS	28.0	27.36	0.05	10 mm	02197	3	1:2.76	back	0.364	1.159	0.422	A20
836.60	190	GSM 850	GPRS	28.0	27.36	-0.04	10 mm	02197	3	1:2.76	front	0.283	1.159	0.328	
836.60	190	GSM 850	GPRS	28.0	27.36	-0.01	10 mm	02197	3	1:2.76	bottom	0.141	1.159	0.163	
836.60	190	GSM 850	GPRS	28.0	27.36	-0.06	10 mm	02197	3	1:2.76	right	0.140	1.159	0.162	
836.60	190	GSM 850	GPRS	28.0	27.36	-0.08	10 mm	02197	3	1:2.76	left	0.190	1.159	0.220	
836.60	4183	UMTS 850	RMC	23.5	22.75	-0.01	10 mm	02197	N/A	1:1	back	0.411	1.189	0.489	A21
836.60	4183	UMTS 850	RMC	23.5	22.75	0.05	10 mm	02197	N/A	1:1	front	0.318	1.189	0.378	
836.60	4183	UMTS 850	RMC	23.5	22.75	0.00	10 mm	02197	N/A	1:1	bottom	0.180	1.189	0.214	
836.60	4183	UMTS 850	RMC	23.5	22.75	-0.01	10 mm	02197	N/A	1:1	right	0.163	1.189	0.194	
836.60	4183	UMTS 850	RMC	23.5	22.75	-0.03	10 mm	02197	N/A	1:1	left	0.242	1.189	0.288	
1851.25	25	PCS CDMA	EVDO Rev. 0	23.5	23.32	0.02	10 mm	02306	N/A	1:1	back	0.804	1.042	0.838	
1880.00	600	PCS CDMA	EVDO Rev. 0	23.5	23.35	0.02	10 mm	02306	N/A	1:1	back	0.787	1.035	0.815	
1908.75	1175	PCS CDMA	EVDO Rev. 0	23.5	23.45	0.08	10 mm	02306	N/A	1:1	back	0.786	1.012	0.795	
1851.25	25	PCS CDMA	EVDO Rev. 0	23.5	23.32	-0.09	10 mm	02306	N/A	1:1	front	1.050	1.042	1.094	
1880.00	600	PCS CDMA	EVDO Rev. 0	23.5	23.35	-0.07	10 mm	02306	N/A	1:1	front	1.050	1.035	1.087	
1908.75	1175	PCS CDMA	EVDO Rev. 0	23.5	23.45	-0.12	10 mm	02306	N/A	1:1	front	1.080	1.012	1.093	A23
1851.25	25	PCS CDMA	EVDO Rev. 0	23.5	23.32	-0.03	10 mm	02306	N/A	1:1	bottom	0.834	1.042	0.869	
1880.00	600	PCS CDMA	EVDO Rev. 0	23.5	23.35	0.03	10 mm	02306	N/A	1:1	bottom	0.882	1.035	0.913	
1908.75	1175	PCS CDMA	EVDO Rev. 0	23.5	23.45	-0.04	10 mm	02306	N/A	1:1	bottom	0.917	1.012	0.928	
1880.00	600	PCS CDMA	EVDO Rev. 0	23.5	23.35	0.09	10 mm	02306	N/A	1:1	right	0.135	1.035	0.140	
1880.00	600	PCS CDMA	EVDO Rev. 0	23.5	23.35	-0.05	10 mm	02306	N/A	1:1	left	0.246	1.035	0.255	
1908.75	1175	PCS CDMA	EVDO Rev. 0	23.5	23.45	0.06	10 mm	02306	N/A	1:1	front	0.985	1.012	0.997	
1880.00	661	GSM 1900	GPRS	29.0	27.74	0.01	10 mm	02197	2	1:4.15	back	0.490	1.337	0.655	
1850.20	512	GSM 1900	GPRS	29.0	27.86	0.04	10 mm	02197	2	1:4.15	front	0.630	1.300	0.819	
1880.00	661	GSM 1900	GPRS	29.0	27.74	-0.01	10 mm	02197	2	1:4.15	front	0.621	1.337	0.830	
1909.80	810	GSM 1900	GPRS	29.0	27.88	-0.02	10 mm	02197	2	1:4.15	front	0.643	1.294	0.832	A25
1880.00	661	GSM 1900	GPRS	29.0	27.74	-0.10	10 mm	02197	2	1:4.15	bottom	0.543	1.337	0.726	
1880.00	661	GSM 1900	GPRS	29.0	27.74	0.07	10 mm	02197	2	1:4.15	right	0.077	1.337	0.103	
1880.00	661	GSM 1900	GPRS	29.0	27.74	0.04	10 mm	02197	2	1:4.15	left	0.174	1.337	0.233	
1880.00	9400	UMTS 1900	RMC	23.5	22.97	0.00	10 mm	02197	N/A	1:1	back	0.706	1.130	0.798	
1852.40	9262	UMTS 1900	RMC	23.5	22.81	0.11	10 mm	02197	N/A	1:1	front	0.915	1.172	1.072	
1880.00	9400	UMTS 1900	RMC	23.5	22.97	0.08	10 mm	02197	N/A	1:1	front	0.921	1.130	1.041	A27
1907.60	9538	UMTS 1900	RMC	23.5	22.76	0.15	10 mm	02197	N/A	1:1	front	0.894	1.186	1.060	
1852.40	9262	UMTS 1900	RMC	23.5	22.81	-0.03	10 mm	02197	N/A	1:1	bottom	0.814	1.172	0.954	
1880.00	9400	UMTS 1900	RMC	23.5	22.97	-0.04	10 mm	02197	N/A	1:1	bottom	0.873	1.130	0.986	
1907.60	9538	UMTS 1900	RMC	23.5	22.76	0.04	10 mm	02197	N/A	1:1	bottom	0.815	1.186	0.967	
1880.00	9400	UMTS 1900	RMC	23.5	22.97	0.03	10 mm	02197	N/A	1:1	right	0.137	1.130	0.155	
1880.00	9400	UMTS 1900	RMC	23.5	22.97	-0.03	10 mm	02197	N/A	1:1	left	0.243	1.130	0.275	
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

FCC ID: A3LSMJ700P			SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 51 of 68		

Table 11-20
LTE Band 12 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	24.0	23.78	0.14	0	01111	QPSK	1	0	10 mm	back	1:1	0.295	1.052	0.310	A28
707.50	23095	Mid	LTE Band 12	10	23.0	22.66	0.02	1	01111	QPSK	25	0	10 mm	back	1:1	0.227	1.081	0.245	
707.50	23095	Mid	LTE Band 12	10	24.0	23.78	0.18	0	01111	QPSK	1	0	10 mm	front	1:1	0.229	1.052	0.241	
707.50	23095	Mid	LTE Band 12	10	23.0	22.66	-0.03	1	01111	QPSK	25	0	10 mm	front	1:1	0.172	1.081	0.186	
707.50	23095	Mid	LTE Band 12	10	24.0	23.78	-0.06	0	01111	QPSK	1	0	10 mm	bottom	1:1	0.069	1.052	0.073	
707.50	23095	Mid	LTE Band 12	10	23.0	22.66	-0.01	1	01111	QPSK	25	0	10 mm	bottom	1:1	0.054	1.081	0.058	
707.50	23095	Mid	LTE Band 12	10	24.0	23.78	0.03	0	01111	QPSK	1	0	10 mm	right	1:1	0.086	1.052	0.090	
707.50	23095	Mid	LTE Band 12	10	23.0	22.66	-0.03	1	01111	QPSK	25	0	10 mm	right	1:1	0.071	1.081	0.077	
707.50	23095	Mid	LTE Band 12	10	24.0	23.78	-0.08	0	01111	QPSK	1	0	10 mm	left	1:1	0.231	1.052	0.243	
707.50	23095	Mid	LTE Band 12	10	23.0	22.66	0.00	1	01111	QPSK	25	0	10 mm	left	1:1	0.179	1.081	0.193	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

Table 11-21
LTE Band 26 (Cell) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	23.95	-0.02	0	02197	QPSK	1	0	10 mm	back	1:1	0.486	1.012	0.492	A29
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	22.66	0.07	1	02197	QPSK	36	0	10 mm	back	1:1	0.378	1.081	0.409	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	23.95	-0.05	0	02197	QPSK	1	0	10 mm	front	1:1	0.407	1.012	0.412	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	22.66	-0.09	1	02197	QPSK	36	0	10 mm	front	1:1	0.298	1.081	0.322	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	23.95	-0.18	0	02197	QPSK	1	0	10 mm	bottom	1:1	0.203	1.012	0.205	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	22.66	0.00	1	02197	QPSK	36	0	10 mm	bottom	1:1	0.163	1.081	0.176	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	23.95	-0.07	0	02197	QPSK	1	0	10 mm	right	1:1	0.181	1.012	0.183	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	22.66	-0.04	1	02197	QPSK	36	0	10 mm	right	1:1	0.149	1.081	0.161	
836.50	26915	Mid	LTE Band 26 (Cell)	15	24.0	23.95	-0.01	0	02197	QPSK	1	0	10 mm	left	1:1	0.251	1.012	0.254	
836.50	26915	Mid	LTE Band 26 (Cell)	15	23.0	22.66	-0.02	1	02197	QPSK	36	0	10 mm	left	1:1	0.218	1.081	0.236	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT																			
Spatial Peak								Body											
Uncontrolled Exposure/General Population								1.6 W/kg (mW/g) averaged over 1 gram											

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 52 of 68

Table 11-22
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	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	-0.11	0	01111	QPSK	1	99	10 mm	back	1:1	0.658	1.159	0.763	A31
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.27	-0.06	1	01111	QPSK	50	0	10 mm	back	1:1	0.481	1.183	0.569	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	0.15	0	01111	QPSK	1	99	10 mm	front	1:1	0.839	1.159	0.972	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.27	0.08	1	01111	QPSK	50	0	10 mm	front	1:1	0.617	1.183	0.730	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.21	0.07	1	01111	QPSK	100	0	10 mm	front	1:1	0.616	1.199	0.739	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	0.12	0	01111	QPSK	1	99	10 mm	bottom	1:1	0.593	1.159	0.687	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.27	0.10	1	01111	QPSK	50	0	10 mm	bottom	1:1	0.448	1.183	0.530	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	-0.03	0	01111	QPSK	1	99	10 mm	right	1:1	0.094	1.159	0.109	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.27	0.00	1	01111	QPSK	50	0	10 mm	right	1:1	0.063	1.183	0.075	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	0.02	0	01111	QPSK	1	99	10 mm	left	1:1	0.266	1.159	0.308	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	23.0	22.27	0.00	1	01111	QPSK	50	0	10 mm	left	1:1	0.197	1.183	0.233	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	24.0	23.36	0.03	0	01111	QPSK	1	99	10 mm	front	1:1	0.806	1.159	0.934	
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 11-23
LTE Band 25 (PCS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR(1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.5	23.37	0.07	0	01111	QPSK	1	50	10 mm	back	1:1	0.764	1.030	0.787	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.50	-0.01	0	01111	QPSK	1	0	10 mm	back	1:1	0.834	1.000	0.834	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.49	-0.03	0	01111	QPSK	1	0	10 mm	back	1:1	0.714	1.002	0.715	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.5	22.12	-0.09	1	01111	QPSK	50	0	10 mm	back	1:1	0.592	1.091	0.646	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	21.98	0.00	1	01111	QPSK	100	0	10 mm	back	1:1	0.589	1.127	0.664	
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.5	23.37	-0.13	0	01111	QPSK	1	50	10 mm	front	1:1	0.976	1.030	1.005	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.50	0.01	0	01111	QPSK	1	0	10 mm	front	1:1	1.030	1.000	1.030	A33
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.49	0.16	0	01111	QPSK	1	0	10 mm	front	1:1	1.010	1.002	1.012	
1860.00	26140	Low	LTE Band 25 (PCS)	20	22.5	21.98	0.16	1	01111	QPSK	50	0	10 mm	front	1:1	0.815	1.127	0.919	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.5	22.12	-0.04	1	01111	QPSK	50	0	10 mm	front	1:1	0.820	1.091	0.895	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	22.04	-0.02	1	01111	QPSK	50	0	10 mm	front	1:1	0.871	1.112	0.969	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	21.98	0.03	1	01111	QPSK	100	0	10 mm	front	1:1	0.855	1.127	0.964	
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.5	23.37	-0.10	0	01111	QPSK	1	50	10 mm	bottom	1:1	0.837	1.030	0.862	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.50	0.02	0	01111	QPSK	1	0	10 mm	bottom	1:1	0.927	1.000	0.927	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.5	23.49	0.07	0	01111	QPSK	1	0	10 mm	bottom	1:1	0.915	1.002	0.917	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.5	22.12	-0.13	1	01111	QPSK	50	0	10 mm	bottom	1:1	0.719	1.091	0.784	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.5	21.98	-0.03	1	01111	QPSK	100	0	10 mm	bottom	1:1	0.642	1.127	0.724	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.50	0.05	0	01111	QPSK	1	0	10 mm	right	1:1	0.151	1.000	0.151	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.5	22.12	-0.09	1	01111	QPSK	50	0	10 mm	right	1:1	0.100	1.091	0.109	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.5	23.50	0.15	0	01111	QPSK	1	0	10 mm	left	1:1	0.258	1.000	0.258	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	22.5	22.12	0.08	1	01111	QPSK	50	0	10 mm	left	1:1	0.199	1.091	0.217	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 53 of 68	

Table 11-24
LTE Band 41 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	0.12	0	02306	QPSK	1	0	10 mm	back	1:1.58	0.382	1.000	0.382	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	-0.05	1	02306	QPSK	50	25	10 mm	back	1:1.58	0.305	1.000	0.305	
2506.00	39750	Low	LTE Band 41	20	24.5	24.18	-0.12	0	02306	QPSK	1	0	10 mm	front	1:1.58	0.766	1.076	0.824	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	0.07	0	02306	QPSK	1	0	10 mm	front	1:1.58	0.783	1.000	0.783	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.33	-0.13	0	02306	QPSK	1	0	10 mm	front	1:1.58	0.500	1.040	0.520	
2636.50	41055	Mid-High	LTE Band 41	20	24.5	24.16	-0.13	0	02306	QPSK	1	0	10 mm	front	1:1.58	0.917	1.081	0.991	
2680.00	41490	High	LTE Band 41	20	24.5	24.12	0.02	0	02306	QPSK	1	0	10 mm	front	1:1.58	0.988	1.091	1.078	A35
2506.00	39750	Low	LTE Band 41	20	23.5	22.99	0.00	1	02306	QPSK	50	0	10 mm	front	1:1.58	0.576	1.125	0.648	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	0.03	1	02306	QPSK	50	25	10 mm	front	1:1.58	0.626	1.000	0.626	
2593.00	40620	Mid	LTE Band 41	20	23.5	23.43	0.19	1	02306	QPSK	50	0	10 mm	front	1:1.58	0.398	1.016	0.404	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.19	0.16	1	02306	QPSK	50	0	10 mm	front	1:1.58	0.744	1.074	0.799	
2680.00	41490	High	LTE Band 41	20	23.5	23.18	-0.02	1	02306	QPSK	50	0	10 mm	front	1:1.58	0.747	1.076	0.804	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.48	0.11	1	02306	QPSK	100	0	10 mm	front	1:1.58	0.655	1.005	0.658	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	-0.14	0	02306	QPSK	1	0	10 mm	bottom	1:1.58	0.119	1.000	0.119	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	-0.12	1	02306	QPSK	50	25	10 mm	bottom	1:1.58	0.102	1.000	0.102	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	0.16	0	02306	QPSK	1	0	10 mm	right	1:1.58	0.014	1.000	0.014	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	0.12	1	02306	QPSK	50	25	10 mm	right	1:1.58	0.013	1.000	0.013	
2549.50	40185	Low-Mid	LTE Band 41	20	24.5	24.50	-0.01	0	02306	QPSK	1	0	10 mm	left	1:1.58	0.238	1.000	0.238	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.50	0.05	1	02306	QPSK	50	25	10 mm	left	1:1.58	0.186	1.000	0.186	
2680.00	41490	High	LTE Band 41	20	24.5	24.12	-0.03	0	02306	QPSK	1	0	10 mm	front	1:1.58	0.946	1.091	1.032	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

Blue entry represents variability measurement

Table 11-25
WLAN Hotspot SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR(1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
2462	11	802.11b	DSSS	22	17.5	16.94	-	10 mm	02306	1	back	99.4	0.114	-	1.138	1.006	-	
2462	11	802.11b	DSSS	22	17.5	16.94	-	10 mm	02306	1	front	99.4	0.133	-	1.138	1.006	-	
2462	11	802.11b	DSSS	22	17.5	16.94	0.06	10 mm	02306	1	top	99.4	0.214	0.165	1.138	1.006	0.189	A37
2462	11	802.11b	DSSS	22	17.5	16.94	-	10 mm	02306	1	right	99.4	0.023	-	1.138	1.006	-	
5745	149	802.11a	OFDM	20	15.5	15.26	-	10 mm	02306	6	back	98.3	0.236	-	1.057	1.017	-	
5745	149	802.11a	OFDM	20	15.5	15.26	-	10 mm	02306	6	front	98.3	0.444	-	1.057	1.017	-	
5745	149	802.11a	OFDM	20	15.5	15.26	0.12	10 mm	02306	6	top	98.3	0.514	0.236	1.057	1.017	0.253	A39
5745	149	802.11a	OFDM	20	15.5	15.26	-	10 mm	02306	6	right	98.3	0.009	-	1.057	1.017	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram										

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 54 of 68

11.4 Standalone Phablet SAR Data

Table 11-26
WLAN Phablet SAR

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	Peak SAR of Area Scan	SAR (10g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (10g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
5320	64	802.11a	OFDM	20	15.5	15.36	-	0 mm	02306	6	back	98.3	2.826	-	1.033	1.017	-	
5320	64	802.11a	OFDM	20	15.5	15.36	-	0 mm	02306	6	front	98.3	3.516	-	1.033	1.017	-	
5320	64	802.11a	OFDM	20	15.5	15.36	-0.12	0 mm	02306	6	top	98.3	5.286	0.590	1.033	1.017	0.619	A40
5320	64	802.11a	OFDM	20	15.5	15.36	-	0 mm	02306	6	right	98.3	0.211	-	1.033	1.017	-	
5600	120	802.11a	OFDM	20	15.5	15.16	-	0 mm	02306	6	back	98.3	3.132	-	1.081	1.017	-	
5600	120	802.11a	OFDM	20	15.5	15.16	-	0 mm	02306	6	front	98.3	3.352	-	1.081	1.017	-	
5600	120	802.11a	OFDM	20	15.5	15.16	-0.11	0 mm	02306	6	top	98.3	4.314	0.463	1.081	1.017	0.510	
5600	120	802.11a	OFDM	20	15.5	15.16	-	0 mm	02306	6	right	98.3	0.064	-	1.081	1.017	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Phablet										
Spatial Peak								4.0 W/kg (mW/g)										
Uncontrolled Exposure/General Population								averaged over 10 grams										

11.5 SAR Test Notes

General Notes:

- The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
- Batteries are fully charged at the beginning of the SAR measurements.
- Liquid tissue depth was at least 15.0 cm for all frequencies.
- The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
- SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
- Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 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.
- Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg for 1g and ≤ 3.0 W/kg for 10g, no additional body-worn SAR evaluations using a headset cable were required.
- Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than 0.8 W/kg for 1g and 2.0 W/kg for 10g. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 13 for variability analysis.
- During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.6 for more details).
- Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 55 of 68

GSM Test Notes:

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

CDMA Notes:

1. Head SAR for CDMA2000 mode was tested under RC3/SO55 per FCC KDB Publication 941225 D01v03r01.
2. Body-Worn SAR was tested with 1x RTT with TDSO / SO32 FCH Only. EVDO Rev0 and RevA and TDSO / SO32 FCH+SCH SAR tests were not required per the 3G SAR Test Reduction Procedure in FCC KDB Publication 941225 D01v03r01.
3. CDMA Wireless Router SAR is measured using Subtype 0/1 Physical Layer configurations for Rev. 0 according to KDB 941225 D01v03r01 procedures for data devices. Wireless Router SAR tests for Subtype 2 of Rev.A and 1x RTT configurations were not required per the 3G SAR Test Reduction Policy in KDB Publication 941225 D01v03r01.
4. Head SAR was additionally evaluated using EVDO Rev. A to determine compliance for VoIP operations.
5. Per FCC KDB Publication 447498 D01v06, if the reported (scaled) SAR measured at the middle channel or highest output power channel for each test configuration is ≤ 0.8 W/kg then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is $> \frac{1}{2}$ dB, instead of the middle channel, the highest output power channel was used.

UMTS Notes:

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

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 D05v02r04. The general test procedures used for testing can be found in Section 8.6.4.
2. MPR is permanently implemented for this device by the manufacturer. The specific manufacturer target MPR is indicated alongside the SAR results. MPR is enabled for this device, according to 3GPP TS36.101 Section 6.2.3 – 6.2.5 under Table 6.2.3-1.
3. A-MPR was disabled for all SAR tests by setting NS=01 on the base station simulator. SAR tests were performed with the same number of RB and RB offsets transmitting on all TTI frames (maximum TTI).
4. Per FCC KDB Publication 447498 D01v06, when the reported (scaled) for LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg, testing at the other channels was required for such test configurations.

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 56 of 68

5. TDD LTE was tested per the guidance provided in FCC KDB Publication 941225 D05v02r04. Testing was performed using UL-DL configuration 0 with 6 UL subframes and 2 S subframes using extended cyclic prefix only and special subframe configuration 6. SAR tests were performed at maximum output power and worst-case transmission duty factor in extended cyclic prefix. Per 3GPP 36.211 Section 4, the duty factor for special subframe configuration 6 using extended cyclic prefix is 0.633.

WLAN Notes:

1. For held-to-ear and hotspot operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g and ≤ 1.0 W/kg for 10g, 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 and ≤ 2.0 W/kg for 10g or all test positions are measured.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 8.7.5 for more information.
3. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI 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 and 3.0 W/kg for 10g. See Section 8.7.6 for more information. When the maximum reported averaged SAR is ≤ 0.8 W/kg for 1g and ≤ 2.0 W/kg for 10g, 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 and ≤ 3.0 W/kg for 10g or all test channels were measured.
4. 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.
5. For SAR compliance, this device always uses power reduction when the device is in a held-to-ear RF exposure condition with WIFI operations. Per FCC Guidance, WIFI Head SAR was evaluated at reduced power levels.

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 57 of 68

12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

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

12.2 Simultaneous Transmission Procedures

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

When standalone SAR is not required to be measured, per FCC KDB 447498 D01v06 4.3.2 b), the following equation must be used to estimate the standalone 1g SAR for simultaneous transmission assessment involving that transmitter.

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

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Body)	Estimated SAR (Body)
	[MHz]	[dBm]	[mm]	[W/kg]
Bluetooth	2480	9.50	10	0.189

Note: Held-to ear configurations are not applicable to Bluetooth operations and therefore were not considered for simultaneous transmission. Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 58 of 68

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 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	CDMA/EVDO BC10 (§90S)	0.462	0.336	0.798
	CDMA/EVDO BC0 (§22H)	0.548	0.336	0.884
	GSM 850	0.334	0.336	0.670
	UMTS 850	0.384	0.336	0.720
	PCS CDMA/EVDO	0.237	0.336	0.573
	GSM 1900	0.123	0.336	0.459
	UMTS 1900	0.221	0.336	0.557
	LTE Band 12	0.168	0.336	0.504
	LTE Band 26 (Cell)	0.341	0.336	0.677
	LTE Band 4 (AWS)	0.329	0.336	0.665
	LTE Band 25 (PCS)	0.257	0.336	0.593
	LTE Band 41	0.550	0.336	0.886

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 SAR (W/kg)	Σ SAR (W/kg)
Head SAR	CDMA/EVDO BC10 (§90S)	0.462	0.661	1.123
	CDMA/EVDO BC0 (§22H)	0.548	0.661	1.209
	GSM 850	0.334	0.661	0.995
	UMTS 850	0.384	0.661	1.045
	PCS CDMA/EVDO	0.237	0.661	0.898
	GSM 1900	0.123	0.661	0.784
	UMTS 1900	0.221	0.661	0.882
	LTE Band 12	0.168	0.661	0.829
	LTE Band 26 (Cell)	0.341	0.661	1.002
	LTE Band 4 (AWS)	0.329	0.661	0.990
	LTE Band 25 (PCS)	0.257	0.661	0.918
	LTE Band 41	0.550	0.661	1.211

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 59 of 68	

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-4
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 SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	CDMA BC10 (§90S)	0.608	0.116	0.724
	CDMA BC0 (§22H)	0.657	0.116	0.773
	GSM 850	0.429	0.116	0.545
	UMTS 850	0.489	0.116	0.605
	PCS CDMA	0.908	0.116	1.024
	GSM 1900	0.451	0.116	0.567
	UMTS 1900	0.798	0.116	0.914
	LTE Band 12	0.310	0.116	0.426
	LTE Band 26 (Cell)	0.492	0.116	0.608
	LTE Band 4 (AWS)	0.763	0.116	0.879
	LTE Band 25 (PCS)	0.834	0.116	0.950
	LTE Band 41	0.382	0.116	0.498

Table 12-5
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 SAR (W/kg)	Σ SAR (W/kg)
Body-Worn	CDMA BC10 (§90S)	0.608	0.191	0.799
	CDMA BC0 (§22H)	0.657	0.191	0.848
	GSM 850	0.429	0.191	0.620
	UMTS 850	0.489	0.191	0.680
	PCS CDMA	0.908	0.191	1.099
	GSM 1900	0.451	0.191	0.642
	UMTS 1900	0.798	0.191	0.989
	LTE Band 12	0.310	0.191	0.501
	LTE Band 26 (Cell)	0.492	0.191	0.683
	LTE Band 4 (AWS)	0.763	0.191	0.954
	LTE Band 25 (PCS)	0.834	0.191	1.025
	LTE Band 41	0.382	0.191	0.573

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 60 of 68

Table 12-6
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)
Body-Worn	CDMA BC10 (§90S)	0.608	0.189	0.797
	CDMA BC0 (§22H)	0.657	0.189	0.846
	GSM 850	0.429	0.189	0.618
	UMTS 850	0.489	0.189	0.678
	PCS CDMA	0.908	0.189	1.097
	GSM 1900	0.451	0.189	0.640
	UMTS 1900	0.798	0.189	0.987
	LTE Band 12	0.310	0.189	0.499
	LTE Band 26 (Cell)	0.492	0.189	0.681
	LTE Band 4 (AWS)	0.763	0.189	0.952
	LTE Band 25 (PCS)	0.834	0.189	1.023
	LTE Band 41	0.382	0.189	0.571

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 12-7
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 SAR (W/kg)	Σ SAR (W/kg)
Hotspot SAR	EVDO BC10 (§90S)	0.605	0.189	0.794
	EVDO BC0 (§22H)	0.693	0.189	0.882
	GPRS 850	0.422	0.189	0.611
	UMTS 850	0.489	0.189	0.678
	PCS EVDO	1.094	0.189	1.283
	GPRS 1900	0.832	0.189	1.021
	UMTS 1900	1.072	0.189	1.261
	LTE Band 12	0.310	0.189	0.499
	LTE Band 26 (Cell)	0.492	0.189	0.681
	LTE Band 4 (AWS)	0.972	0.189	1.161
	LTE Band 25 (PCS)	1.030	0.189	1.219
	LTE Band 41	1.078	0.189	1.267

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 61 of 68

Table 12-8
Simultaneous Transmission Scenario with 5 GHz WLAN (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
Hotspot SAR	EVDO BC10 (§90S)	0.605	0.253	0.858
	EVDO BC0 (§22H)	0.693	0.253	0.946
	GPRS 850	0.422	0.253	0.675
	UMTS 850	0.489	0.253	0.742
	PCS EVDO	1.094	0.253	1.347
	GPRS 1900	0.832	0.253	1.085
	UMTS 1900	1.072	0.253	1.325
	LTE Band 12	0.310	0.253	0.563
	LTE Band 26 (Cell)	0.492	0.253	0.745
	LTE Band 4 (AWS)	0.972	0.253	1.225
	LTE Band 25 (PCS)	1.030	0.253	1.283
	LTE Band 41	1.078	0.253	1.331

12.6 Simultaneous Transmission Conclusion

The above numerical summed SAR results for all the worst-case simultaneous transmission conditions were below the SAR limit. Therefore, the above analysis is sufficient to determine that simultaneous transmission cases will not exceed the SAR limit and therefore no measured volumetric simultaneous SAR summation is required per FCC KDB Publication 447498 D01v06 and IEEE 1528-2013 Section 6.3.4.1.2.

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 62 of 68

13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

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

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

- 1) When the original highest measured SAR is ≥ 0.80 W/kg, the measurement was repeated once.
- 2) A second repeated measurement was performed only if the ratio of largest to smallest SAR for the original and first repeated measurements was > 1.20 or when the original or repeated measurement was ≥ 1.45 W/kg ($\sim 10\%$ from the 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 measurement 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)
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)
1750	1732.50	20175	LTE Band 4 (AWS), 20 MHz Bandwidth	QPSK, 1 RB, 99 RB Offset	front	10 mm	0.839	0.806	1.04	N/A	N/A	N/A
1900	1908.75	1175	PCS CDMA	EVDO Rev. 0	front	10 mm	1.080	0.985	1.10	N/A	N/A	N/A
2600	2680.00	41490	LTE Band 41, 20 MHz Bandwidth	QPSK, 1 RB, 0 RB Offset	front	10 mm	0.988	0.946	1.04	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population						Body 1.6 W/kg (mW/g) averaged over 1 gram						

13.2 Measurement Uncertainty

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

FCC ID: A3LSMJ700P	 SAR EVALUATION REPORT 		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 63 of 68

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
SPEAG	D750V3	750 MHz SAR Dipole	1/16/2015	Annual	1/16/2016	1003
SPEAG	D750V3	750 MHz SAR Dipole	2/19/2015	Annual	2/19/2016	1046
SPEAG	D835V2	835 MHz SAR Dipole	7/23/2015	Annual	7/23/2016	4d133
SPEAG	D1750V2	1750 MHz SAR Dipole	4/15/2015	Annual	4/15/2016	1051
SPEAG	D1900V2	1900 MHz SAR Dipole	7/14/2015	Annual	7/14/2016	5d149
SPEAG	D2450V2	2450 MHz SAR Dipole	8/20/2015	Annual	8/20/2016	719
SPEAG	D2600V2	2600 MHz SAR Dipole	4/14/2015	Annual	4/14/2016	1004
SPEAG	D5GHzV2	5 GHz SAR Dipole	9/16/2015	Annual	9/16/2016	1191
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/21/2015	Annual	1/21/2016	1057
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	ES3DV3	SAR Probe	5/20/2015	Annual	5/20/2016	3263
SPEAG	ES3DV3	SAR Probe	6/22/2015	Annual	6/22/2016	3351
SPEAG	ES3DV2	SAR Probe	8/26/2015	Annual	8/26/2016	3022
SPEAG	ES3DV3	SAR Probe	10/29/2015	Annual	10/29/2016	3287
SPEAG	ES3DV3	SAR Probe	10/29/2015	Annual	10/29/2016	3333
SPEAG	ES3DV3	SAR Probe	11/17/2015	Annual	11/17/2016	3334
SPEAG	EX3DV4	SAR Probe	7/21/2015	Annual	7/21/2016	7308
SPEAG	EX3DV4	SAR Probe	4/23/2015	Annual	4/23/2016	7357
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/18/2015	Annual	2/18/2016	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/13/2015	Annual	3/13/2016	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/20/2015	Annual	4/20/2016	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/17/2015	Annual	6/17/2016	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/24/2015	Annual	8/24/2016	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/20/2015	Annual	10/20/2016	1408
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/27/2015	Annual	10/27/2016	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	11/11/2015	Annual	11/11/2016	1415
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/12/2015	Annual	5/12/2016	1070
SPEAG	DAK-3.5	Dielectric Assessment Kit	10/20/2015	Annual	10/20/2016	1091
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264162
Mitutoyo	CD-6"CSX	Digital Caliper	5/8/2014	Biennial	5/8/2016	13264165
Control Company	4040	Digital Thermometer	3/15/2015	Biennial	3/15/2017	150194929
Control Company	4040	Digital Thermometer	3/15/2015	Biennial	3/15/2017	150195005
Agilent	E4438C	ESG Vector Signal Generator	3/12/2015	Annual	3/12/2016	MY45090700
Agilent	E4438C	ESG Vector Signal Generator	3/13/2015	Annual	3/13/2016	MY42082385
Control Company	4353	Long Stem Thermometer	1/22/2015	Biennial	1/22/2017	150053081
Control Company	4353	Long Stem Thermometer	1/22/2015	Biennial	1/22/2017	150053059
Agilent	N5182A	MXG Vector Signal Generator	3/16/2015	Annual	3/16/2016	MY47420800
Agilent	N5182A	MXG Vector Signal Generator	3/16/2015	Annual	3/16/2016	MY47420651
Agilent	8753ES	Network Analyzer	3/20/2015	Annual	3/20/2016	MY40001472
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	0941001
Anritsu	ML2495A	Power Meter	10/16/2015	Biennial	10/16/2017	1039008
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	3/13/2015	Annual	3/13/2016	1207470
Anritsu	MA2411B	Pulse Power Sensor	8/3/2015	Annual	8/3/2016	1126066
Anritsu	MT8820C	Radio Communication Analyzer	6/12/2015	Annual	6/12/2016	6201240328
Anritsu	MT8820C	Radio Communication Analyzer	7/24/2015	Annual	7/24/2016	6200901190
Rohde & Schwarz	CMW500	Radio Communication Tester	3/18/2015	Annual	3/18/2016	128633
Rohde & Schwarz	CMW500	Radio Communication Tester	4/8/2015	Annual	4/8/2016	140148
Agilent	8753ES	S-Parameter Network Analyzer	1/20/2015	Annual	1/20/2016	US39170122
Agilent	8753ES	S-Parameter Network Analyzer	3/12/2015	Annual	3/12/2016	MY40000670
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	N/A
Seekonk	NC-100	Torque Wrench	3/18/2014	Biennial	3/18/2016	N/A
Seekonk	NC-100	Torque Wrench 5/16", 8" lbs	3/18/2014	Biennial	3/18/2016	N/A
Anritsu	MA24106A	USB Power Sensor	3/2/2015	Annual	3/2/2016	1344555
Anritsu	MA24106A	USB Power Sensor	3/2/2015	Annual	3/2/2016	1344556
Agilent	E5515C	Wireless Communications Test Set	4/13/2015	Annual	4/13/2016	GB43460554
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433976
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433977
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-53W2	Attenuator (3dB)	CBT	N/A	CBT	120
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
MiniCircuits	SLP-2400+	Low Pass Filter	CBT	N/A	CBT	R8979500903
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	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

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.

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: OY1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 64 of 68

15 MEASUREMENT UNCERTAINTIES

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

FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 65 of 68

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]

FCC ID: A3LSMJ700P	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 SAMSUNG	Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 66 of 68

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FCC ID: A3LSMJ700P	 SAR EVALUATION REPORT 		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset	Page 67 of 68

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FCC ID: A3LSMJ700P		SAR EVALUATION REPORT		Reviewed by: Quality Manager
Document S/N: 0Y1512032046.A3L	Test Dates: 12/02/15 - 12/17/15	DUT Type: Portable Handset		Page 68 of 68

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

Communication System: UID 0, Cellular CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 820.1 \text{ MHz}$; $\sigma = 0.882 \text{ S/m}$; $\epsilon_r = 41.349$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-08-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3333; ConvF(6.16, 6.16, 6.16); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: 1757

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: Cell. EVDO Rev. A, BC10, Left Head, Cheek, Mid.ch

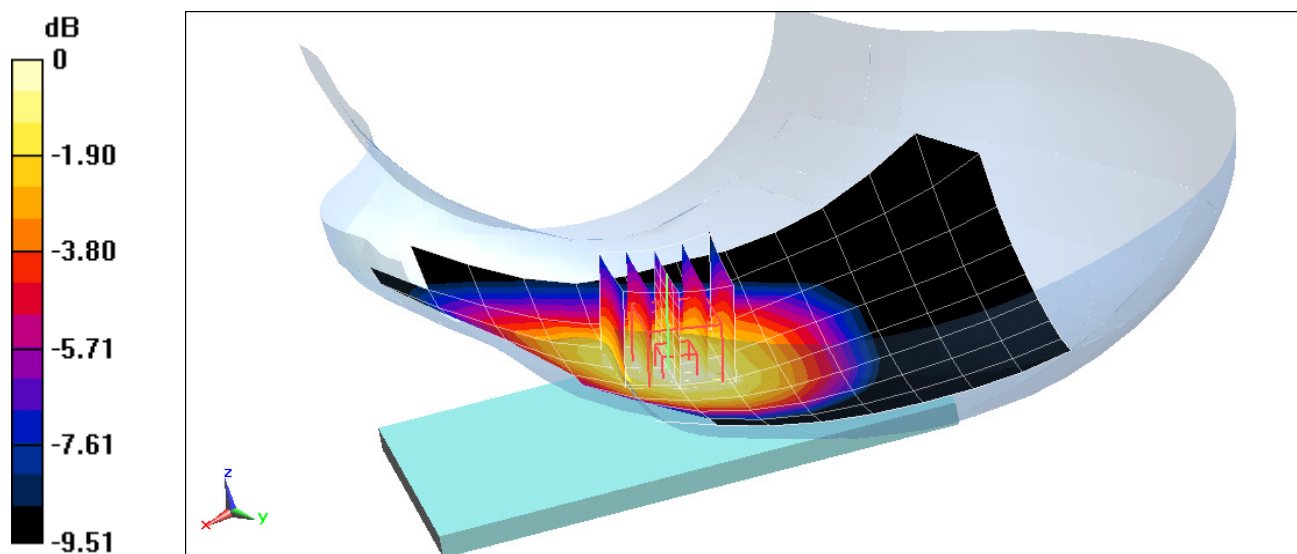
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.79 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.544 W/kg

SAR(1 g) = 0.427 W/kg



0 dB = 0.472 W/kg = -3.26 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

Communication System: UID 0, Cellular CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.897 \text{ S/m}$; $\epsilon_r = 41.125$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-08-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3333; ConvF(6.16, 6.16, 6.16); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: 1757

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: Cell. CDMA, BC0, Left Head, Cheek, Mid.ch

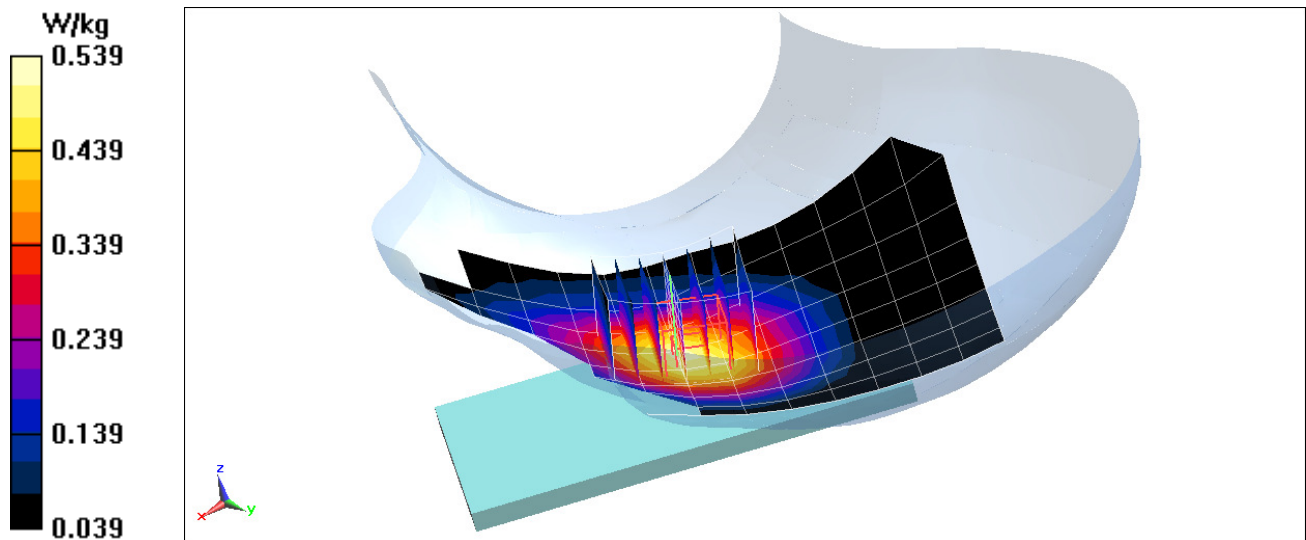
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 24.04 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.627 W/kg

SAR(1 g) = 0.496 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.897 \text{ S/m}$; $\epsilon_r = 41.124$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-08-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3333; ConvF(6.16, 6.16, 6.16); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: 1757

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

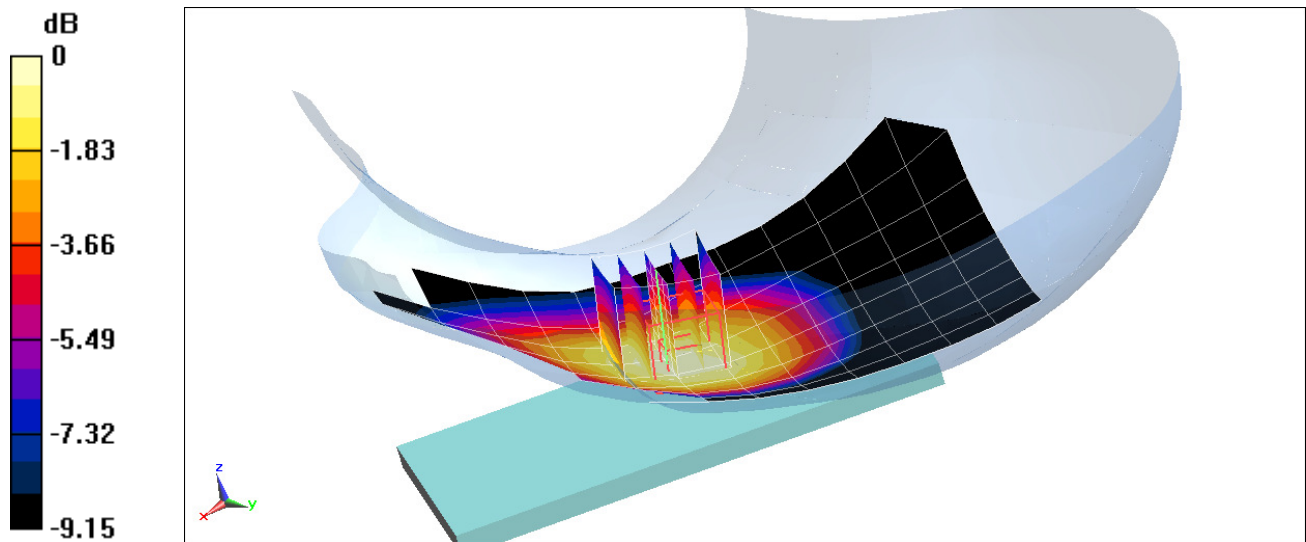
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 19.00 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 0.377 W/kg

SAR(1 g) = 0.298 W/kg



0 dB = 0.325 W/kg = -4.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

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

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.897 \text{ S/m}$; $\epsilon_r = 41.124$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-08-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3333; ConvF(6.16, 6.16, 6.16); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: 1757

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

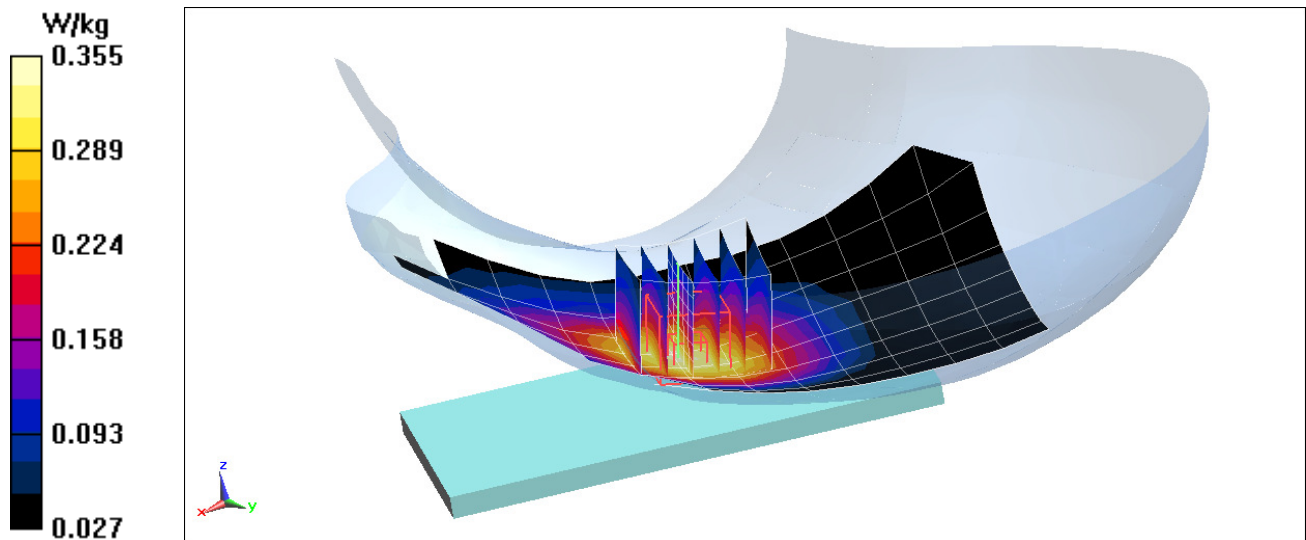
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 19.52 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.407 W/kg

SAR(1 g) = 0.323 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

Communication System: UID 0, PCS CDMA; Frequency: 1880 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.358 \text{ S/m}$; $\epsilon_r = 38.293$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-06-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.93, 4.93, 4.93); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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: PCS EVDO Rev. A, Left Head, Cheek, Mid.ch

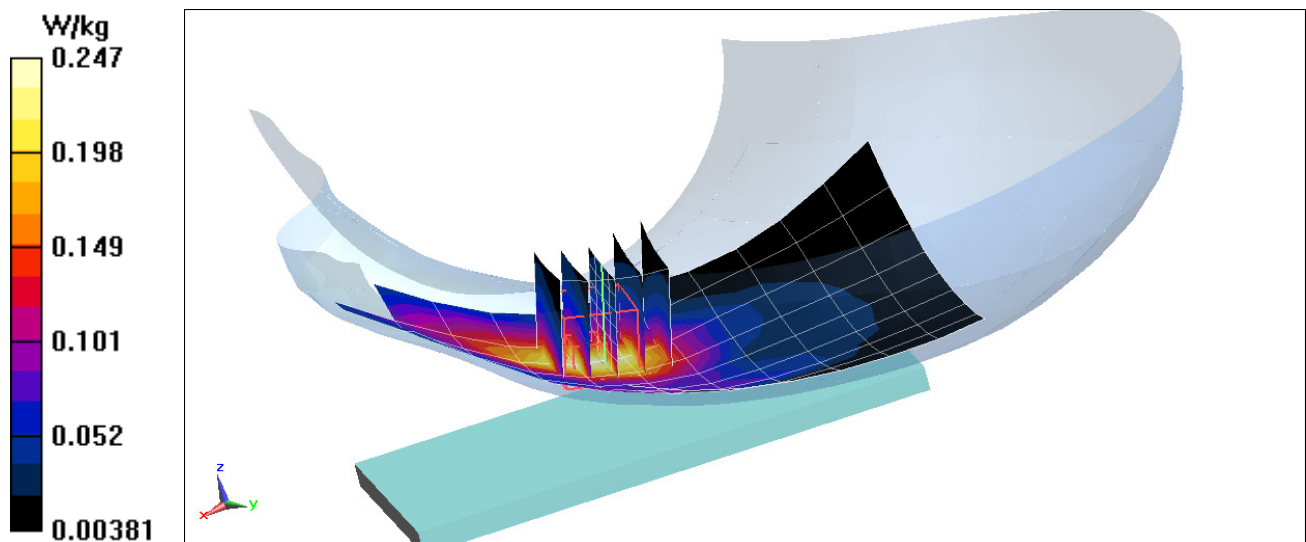
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.05 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.334 W/kg

SAR(1 g) = 0.213 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

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

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.358 \text{ S/m}$; $\epsilon_r = 38.293$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-06-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.93, 4.93, 4.93); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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

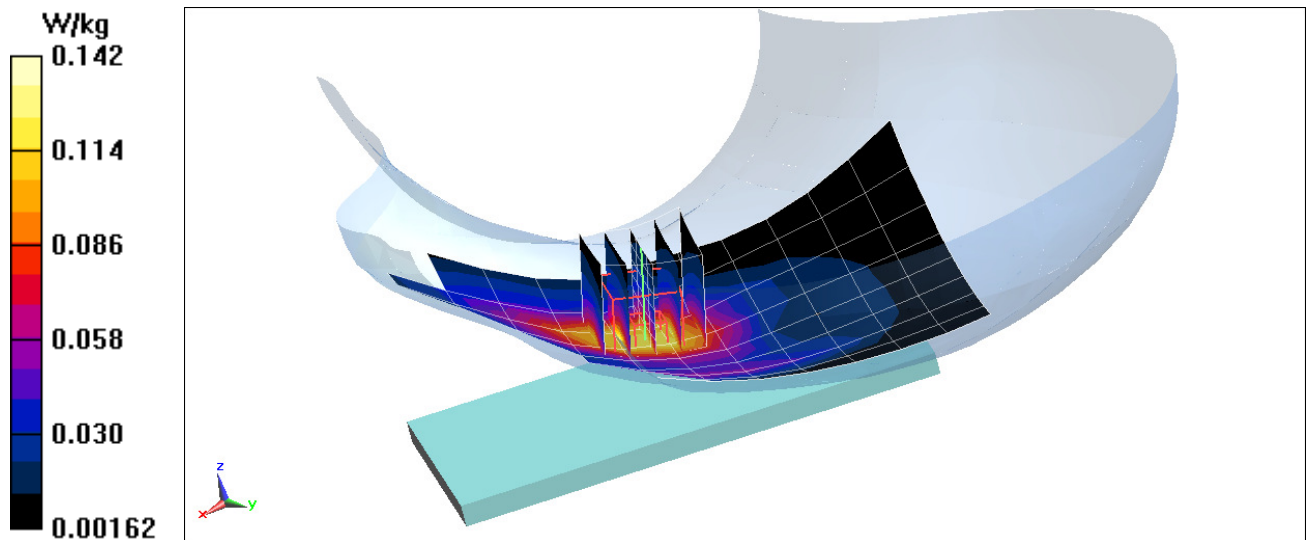
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 9.163 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.188 W/kg

SAR(1 g) = 0.120 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

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

Medium: 1900 Head Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.358 \text{ S/m}$; $\epsilon_r = 38.293$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-06-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.93, 4.93, 4.93); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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

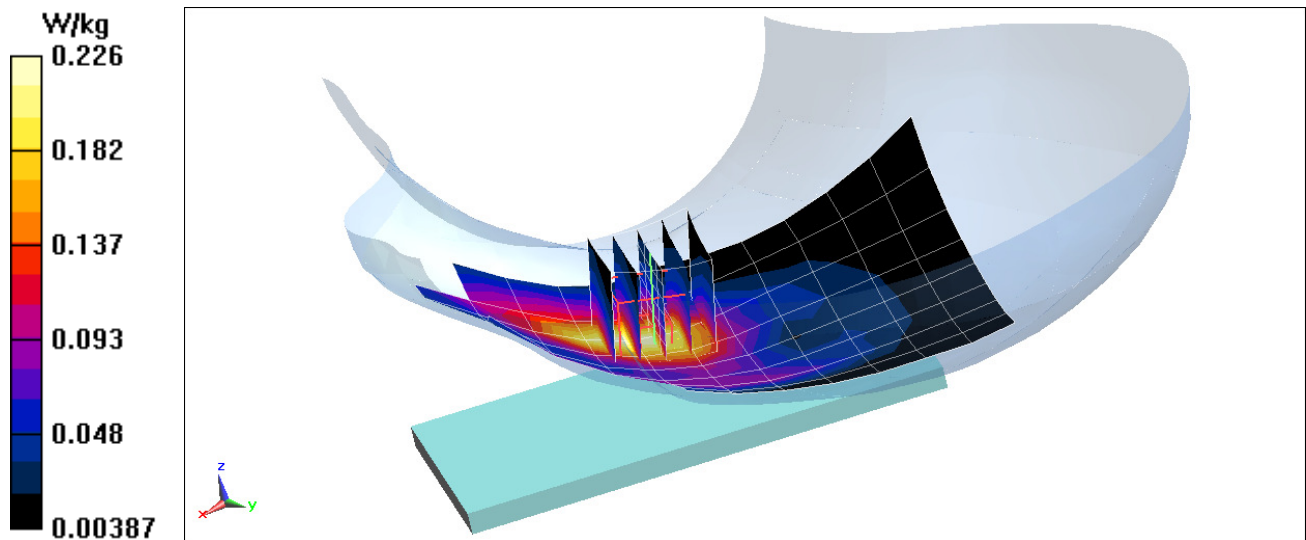
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.63 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.305 W/kg

SAR(1 g) = 0.196 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.871 \text{ S/m}$; $\epsilon_r = 43.717$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-05-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV2 - SN3022; ConvF(6.33, 6.33, 6.33); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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 12, Left Head, Cheek, Mid.ch, QPSK
10 MHz Bandwidth, 1 RB, 0 RB Offset

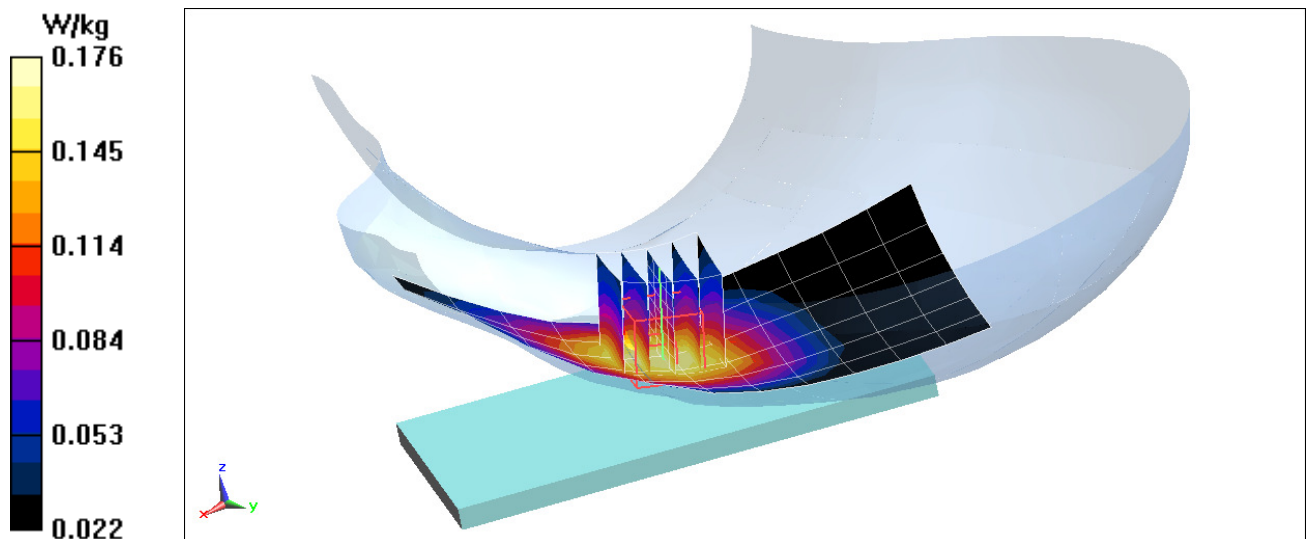
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 14.29 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.200 W/kg

SAR(1 g) = 0.160 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

Communication System: UID 0, LTE Band 26; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Head Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 0.897 \text{ S/m}$; $\epsilon_r = 41.126$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-08-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3333; ConvF(6.16, 6.16, 6.16); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: 1757

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

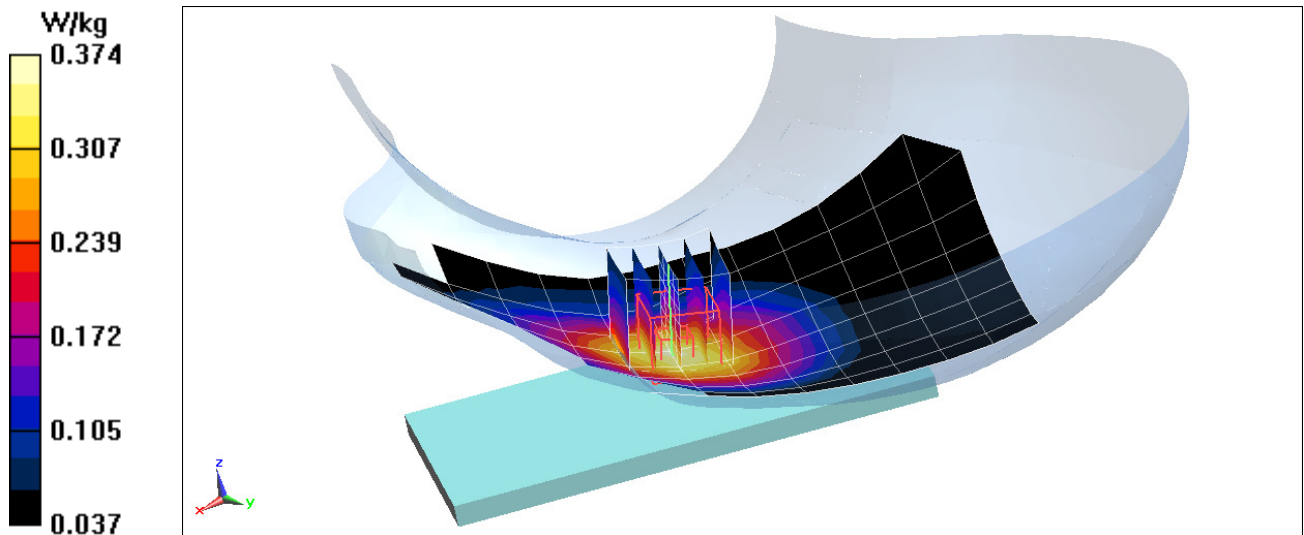
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.95 V/m; Power Drift = -0.15 dB

Peak SAR (extrapolated) = 0.452 W/kg

SAR(1 g) = 0.337 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

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

Medium: 1750 Head Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.323 \text{ S/m}$; $\epsilon_r = 39.612$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-03-2015; Ambient Temp: 23.5°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(5.23, 5.23, 5.23); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

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: LTE Band 4 (AWS), Left Head, Cheek, Mid.ch, QPSK
20 MHz Bandwidth, 1 RB, 99 RB Offset

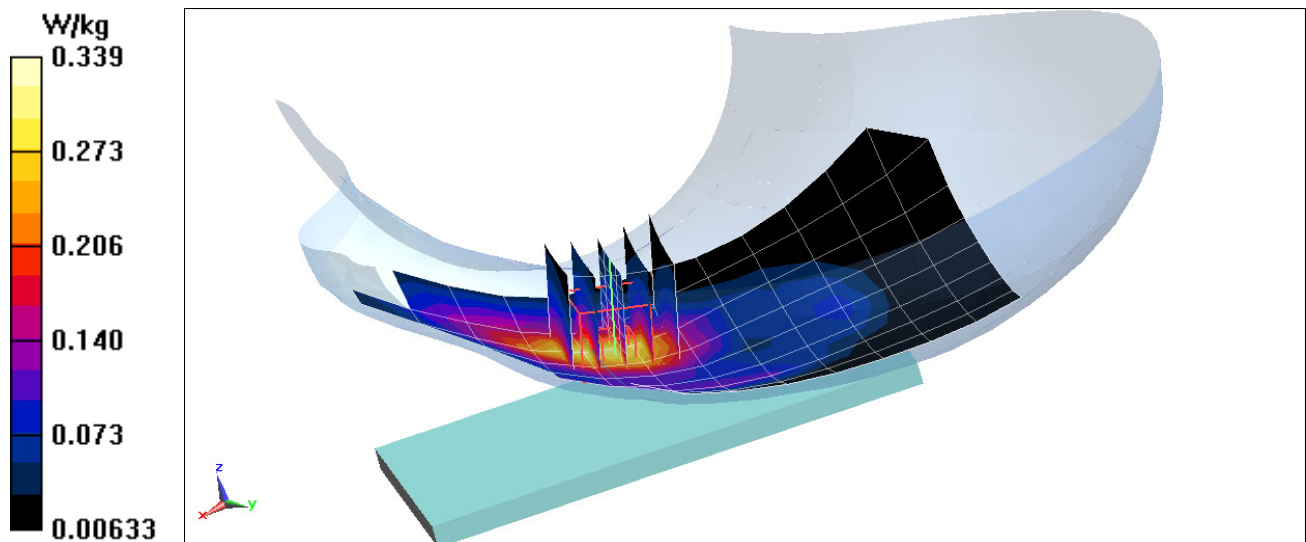
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.72 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.430 W/kg

SAR(1 g) = 0.284 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1

Medium: 1900 Head Medium parameters used (interpolated):

$f = 1882.5 \text{ MHz}$; $\sigma = 1.363 \text{ S/m}$; $\epsilon_r = 38.28$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-06-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.93, 4.93, 4.93); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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

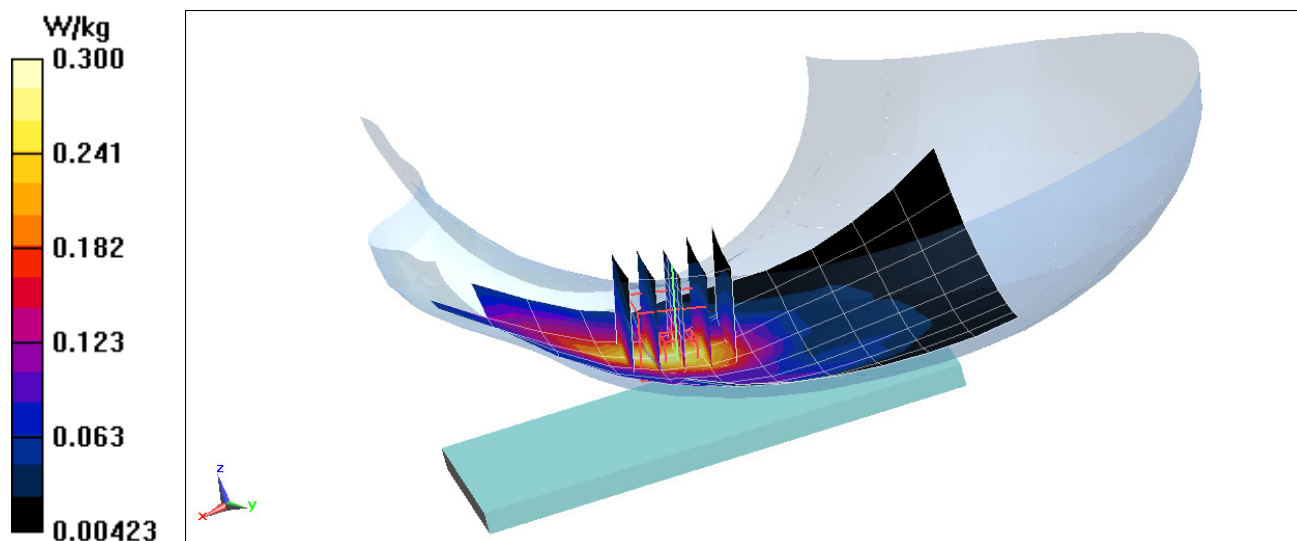
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 14.96 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.397 W/kg

SAR(1 g) = 0.257 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

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

Medium: 2600 Head Medium parameters used (interpolated):

$f = 2549.5 \text{ MHz}$; $\sigma = 1.913 \text{ S/m}$; $\epsilon_r = 39.617$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-07-2015; Ambient Temp: 22.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3263; ConvF(4.25, 4.25, 4.25); Calibrated: 5/20/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 6/17/2015

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 41, Left Head, Cheek, Low-Mid.ch, QPSK
20 MHz Bandwidth, 1 RB, 0 RB Offset

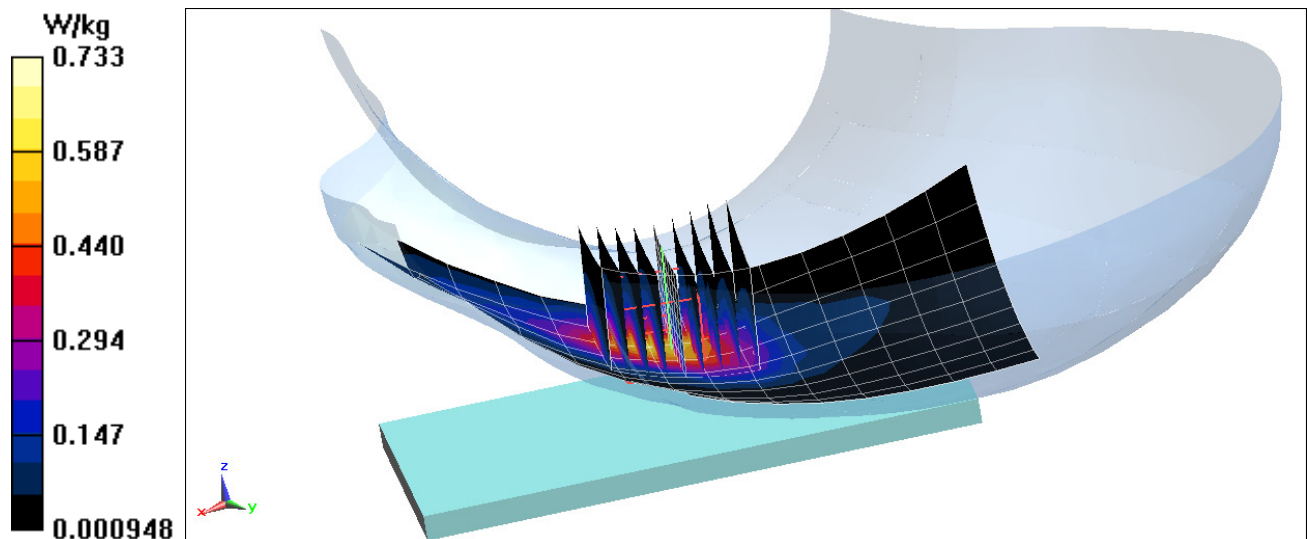
Area Scan (10x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 20.05 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 1.05 W/kg

SAR(1 g) = 0.550 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

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

Medium: 2450 Head Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.774 \text{ S/m}$; $\epsilon_r = 38.496$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-16-2015; Ambient Temp: 24.0°C; Tissue Temp: 23.8°C

Probe: ES3DV3 - SN3319; ConvF(4.55, 4.55, 4.55); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11b, 22 MHz Bandwidth, Left Head, Cheek, Ch 1, 1 Mbps

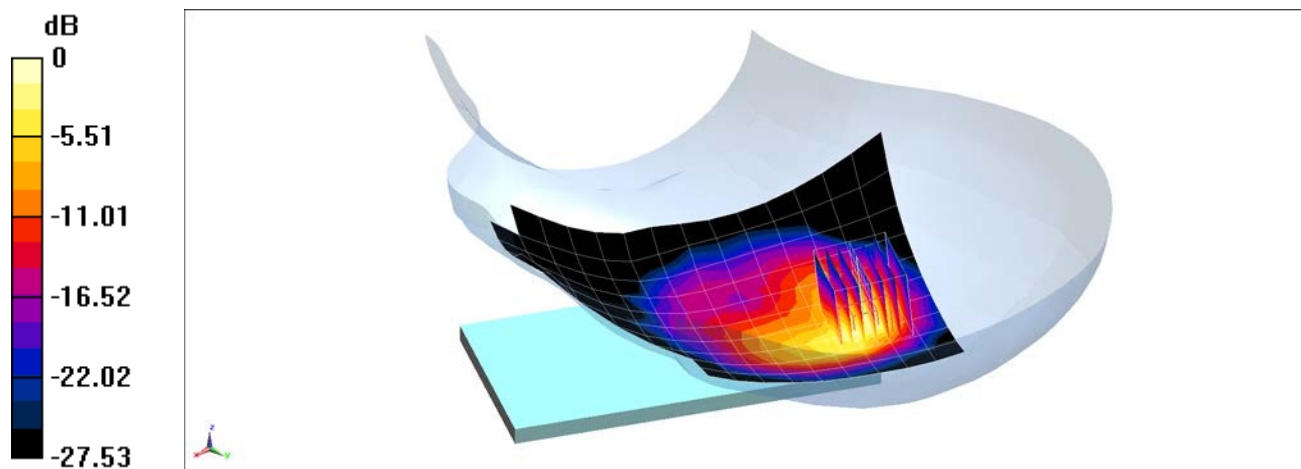
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 12.63 V/m; Power Drift = 0.11 dB

Peak SAR (extrapolated) = 0.766 W/kg

SAR(1 g) = 0.298 W/kg



0 dB = 0.424 W/kg = -3.73 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

Communication System: UID 0, 802.11a; Frequency: 5620 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5620 \text{ MHz}$; $\sigma = 4.904 \text{ S/m}$; $\epsilon_r = 35.627$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 12-16-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7308; ConvF(4.65, 4.65, 4.65); Calibrated: 7/21/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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 802.11a, U-NII-2C, 20 MHz Bandwidth
Left Head, Tilt, Ch 124, 6 Mbps

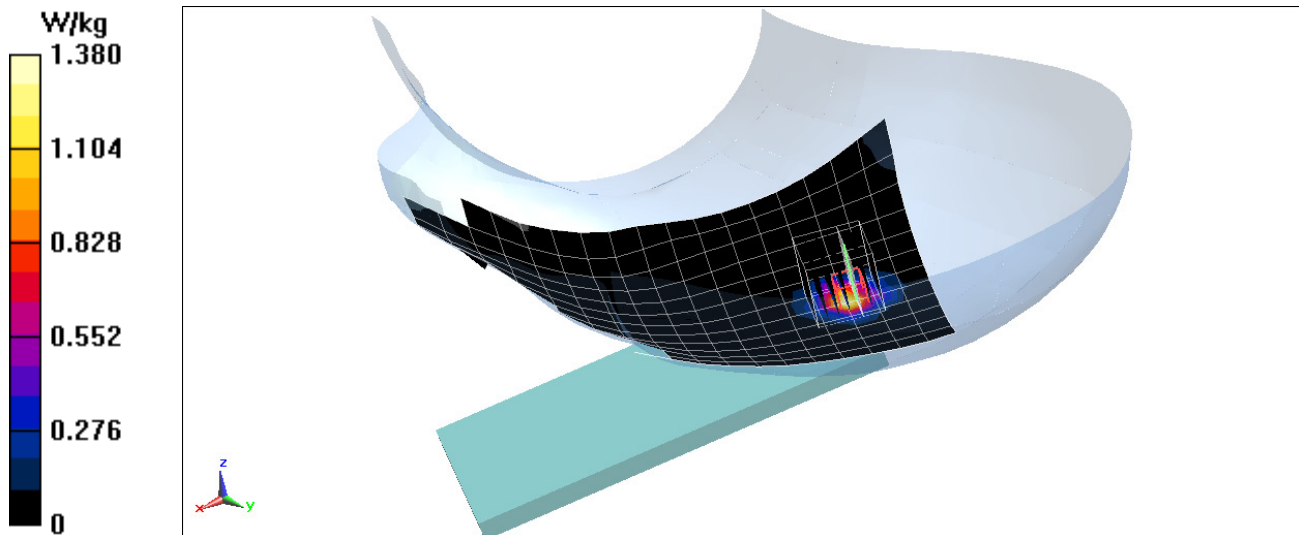
Area Scan (13x21x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 11.25 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 2.31 W/kg

SAR(1 g) = 0.582 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

Communication System: UID 0, CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 820.1 \text{ MHz}$; $\sigma = 0.98 \text{ S/m}$; $\epsilon_r = 54.217$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3351; ConvF(6.11, 6.11, 6.11); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: Cell. CDMA, BC10, Body SAR, Back side, Mid.ch

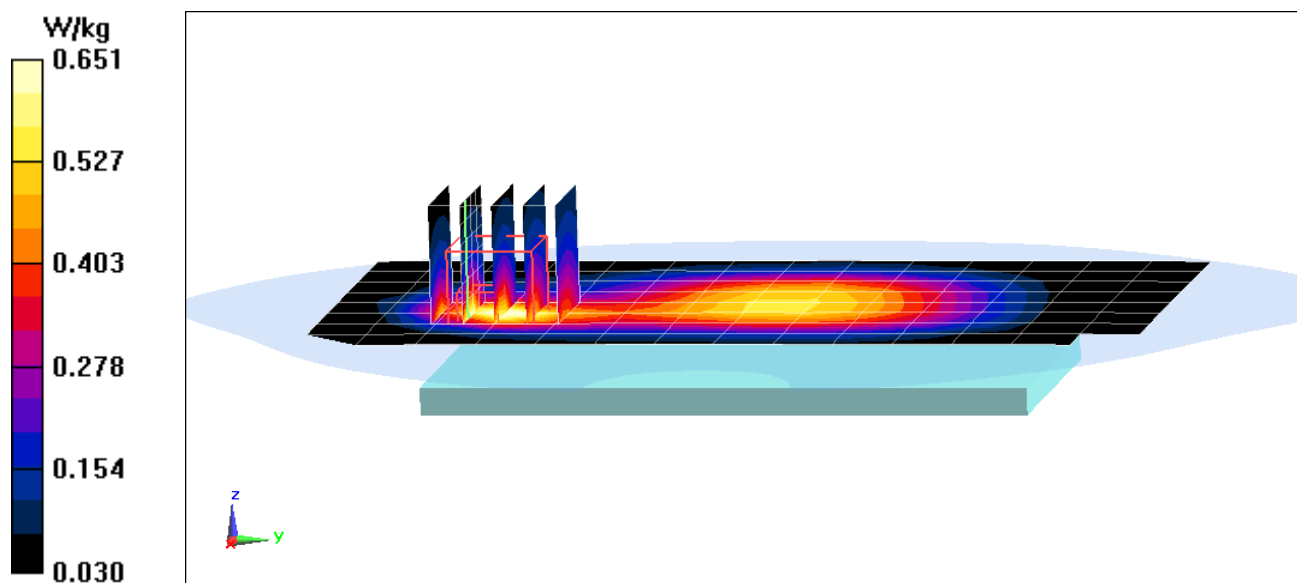
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 23.62 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.912 W/kg

SAR(1 g) = 0.565 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

Communication System: UID 0, CDMA; Frequency: 820.1 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 820.1 \text{ MHz}$; $\sigma = 0.98 \text{ S/m}$; $\epsilon_r = 54.217$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3351; ConvF(6.11, 6.11, 6.11); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: Cell. EVDO Rev.0, BC10, Body SAR, Back side, Mid.ch

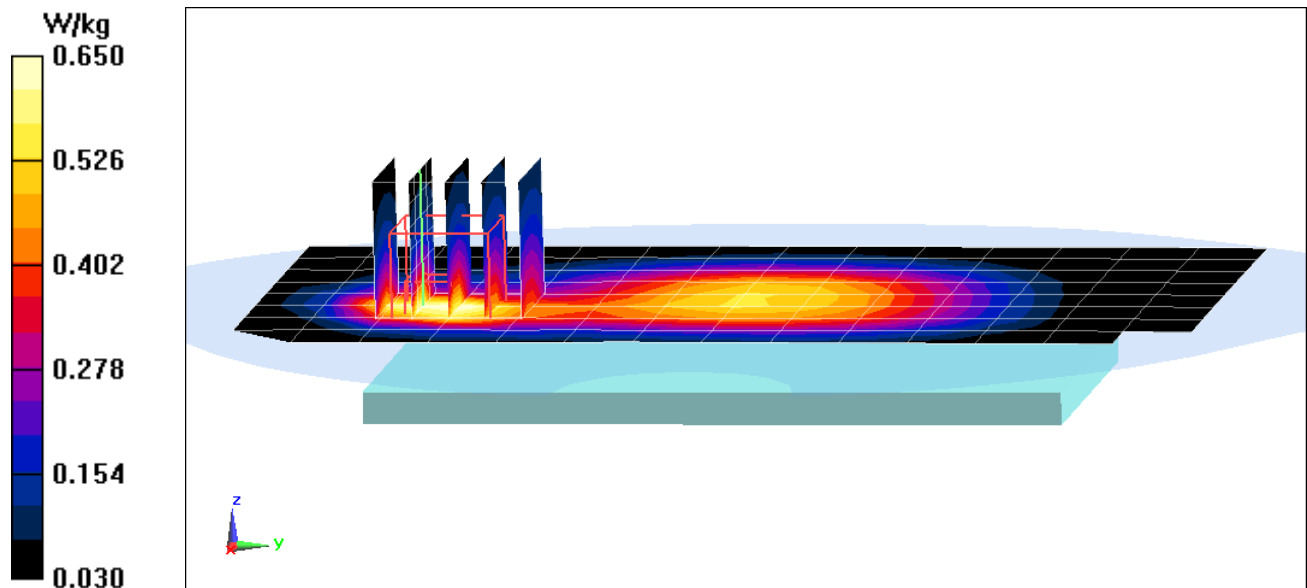
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 23.74 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 0.894 W/kg

SAR(1 g) = 0.561 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.996 \text{ S/m}$; $\epsilon_r = 54.069$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3351; ConvF(6.11, 6.11, 6.11); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: Cell. CDMA, BC0, Body SAR, Back side, Mid.ch

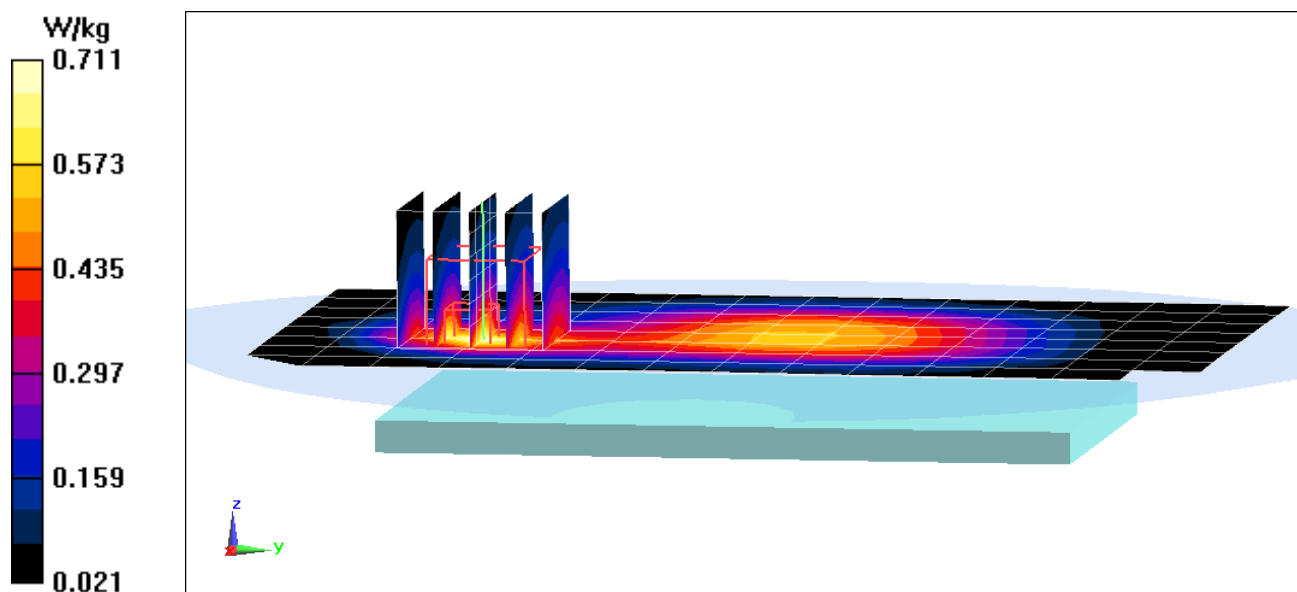
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 26.30 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.951 W/kg

SAR(1 g) = 0.595 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

Communication System: UID 0, CDMA; Frequency: 836.52 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.52 \text{ MHz}$; $\sigma = 0.996 \text{ S/m}$; $\epsilon_r = 54.069$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3351; ConvF(6.11, 6.11, 6.11); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: Cell. EVDO Rev.0, BC0, Body SAR, Back side, Mid.ch

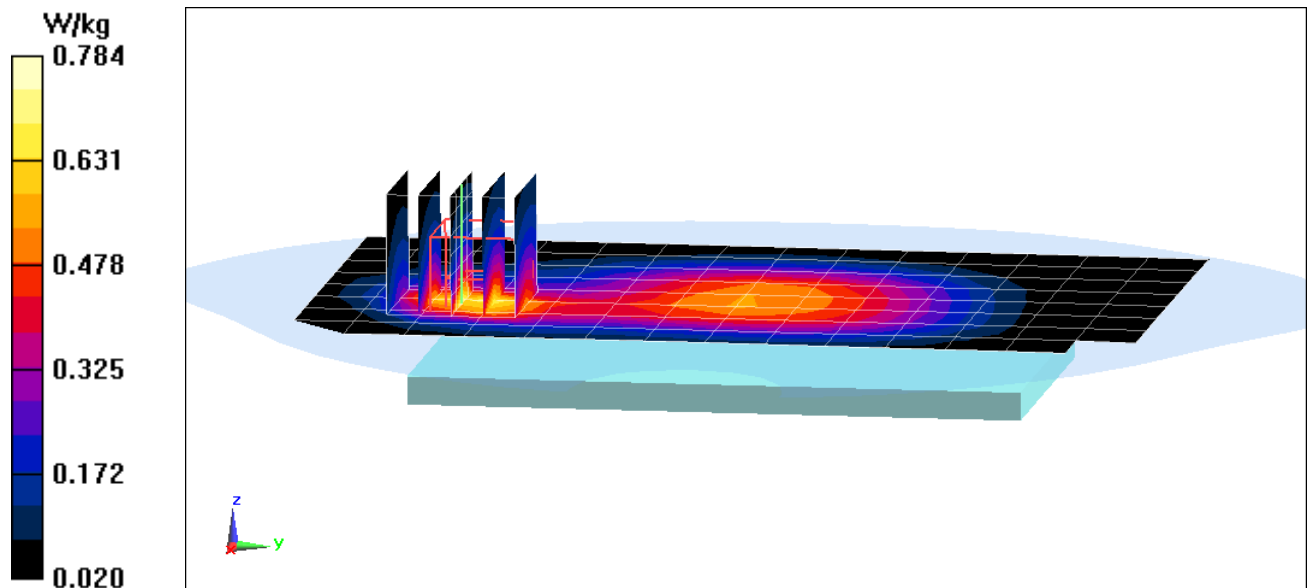
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 25.36 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 1.03 W/kg

SAR(1 g) = 0.639 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.996 \text{ S/m}$; $\epsilon_r = 54.069$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3351; ConvF(6.11, 6.11, 6.11); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

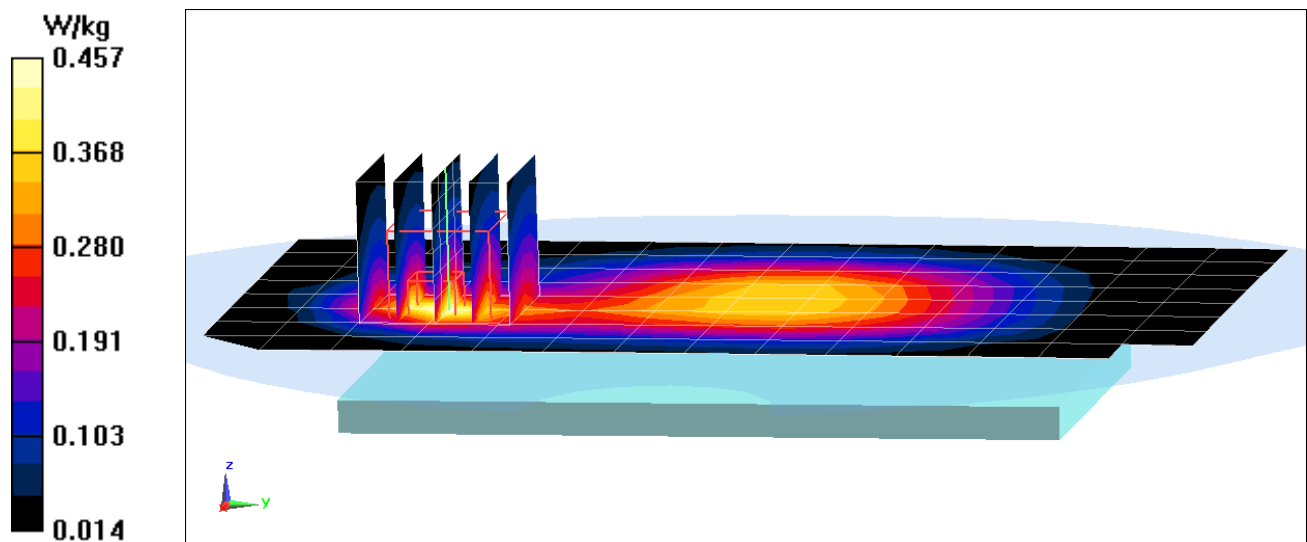
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.99 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.615 W/kg

SAR(1 g) = 0.382 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

Communication System: UID 0, GSM GPRS; 3 Tx slots; Frequency: 836.6 MHz; Duty Cycle: 1:2.76

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.996 \text{ S/m}$; $\epsilon_r = 54.069$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3351; ConvF(6.11, 6.11, 6.11); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

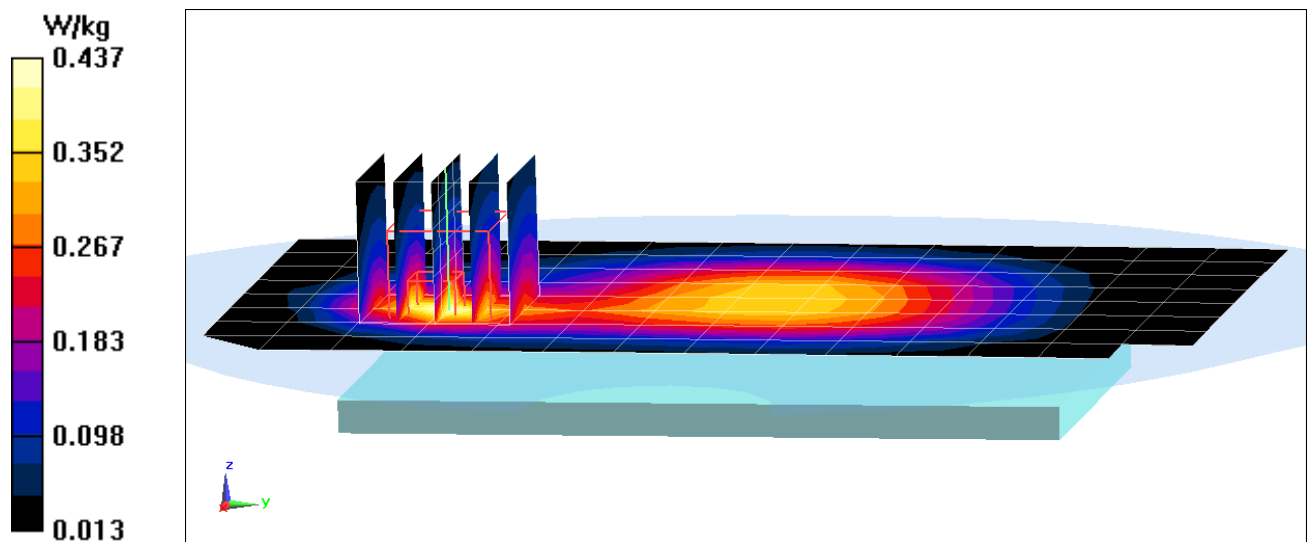
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 20.38 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.582 W/kg

SAR(1 g) = 0.364 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

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

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.996 \text{ S/m}$; $\epsilon_r = 54.069$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3351; ConvF(6.11, 6.11, 6.11); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

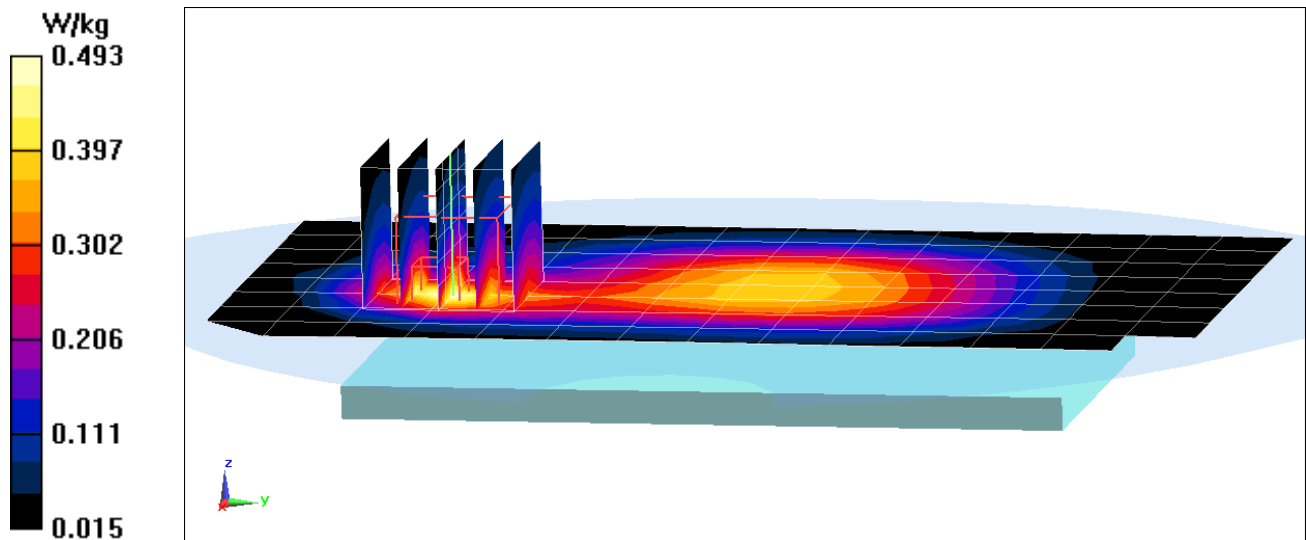
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.81 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 0.653 W/kg

SAR(1 g) = 0.411 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

Communication System: UID 0, CDMA; Frequency: 1851.25 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1851.25 \text{ MHz}$; $\sigma = 1.503 \text{ S/m}$; $\epsilon_r = 51.687$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-06-2015; Ambient Temp: 23.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: PCS CDMA, Body SAR, Back side, Low.ch

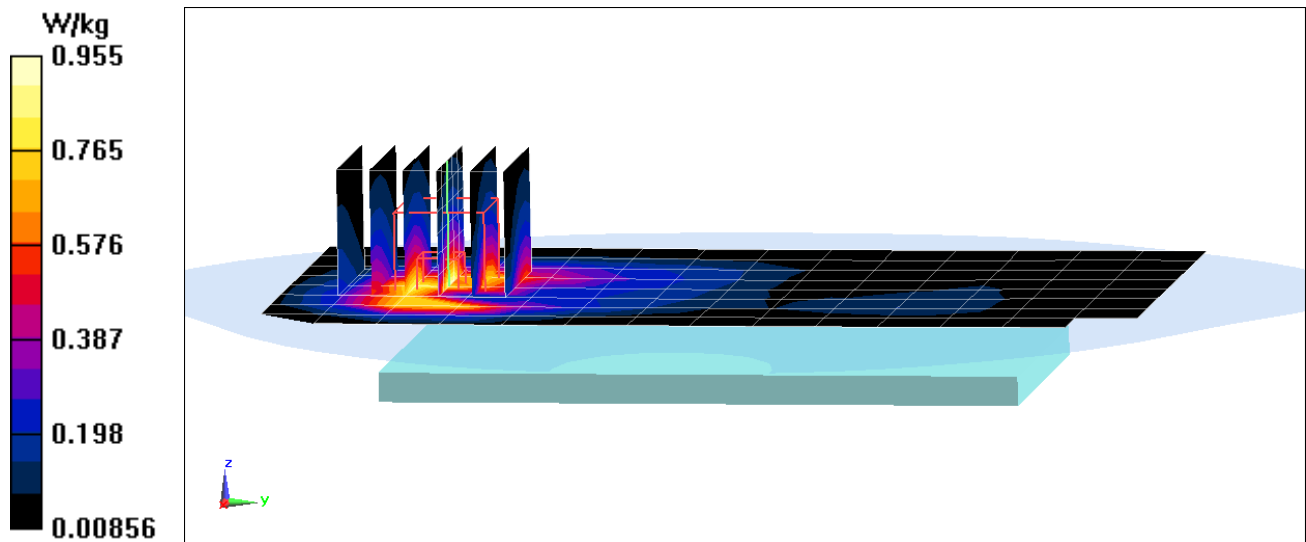
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 23.34 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.33 W/kg

SAR(1 g) = 0.815 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

Communication System: UID 0, CDMA, Frequency: 1908.75 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1908.75 \text{ MHz}$; $\sigma = 1.572 \text{ S/m}$; $\epsilon_r = 51.418$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-06-2015; Ambient Temp: 23.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: PCS EVDO Rev.0, Body SAR, Front side, High.ch

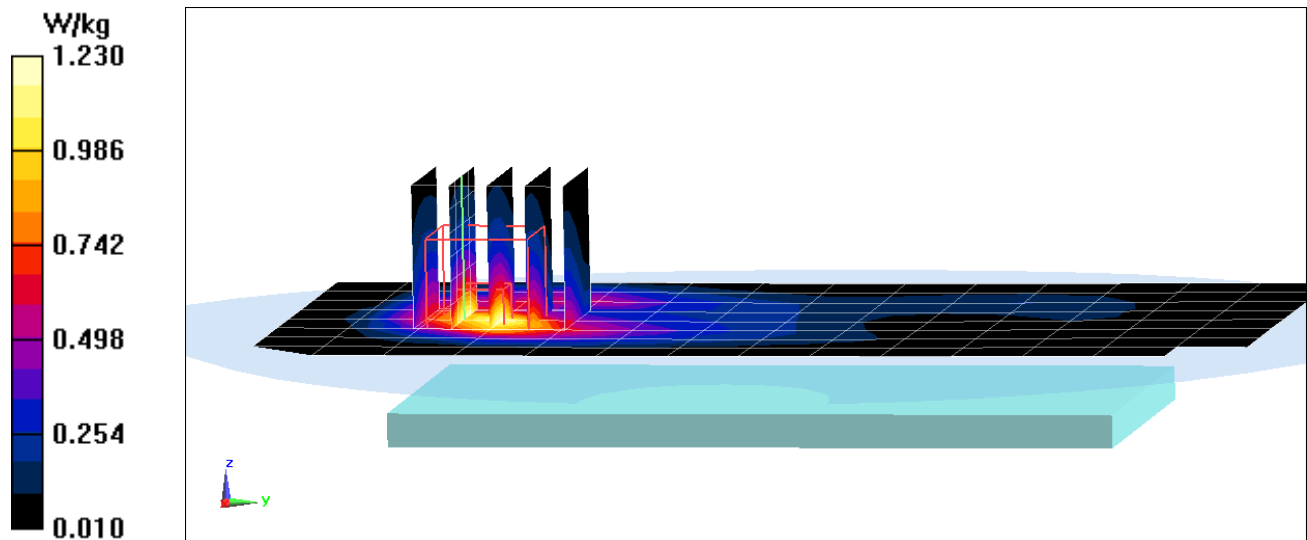
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 27.22 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 1.77 W/kg

SAR(1 g) = 1.08 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.531 \text{ S/m}$; $\epsilon_r = 51.519$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-06-2015; Ambient Temp: 23.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

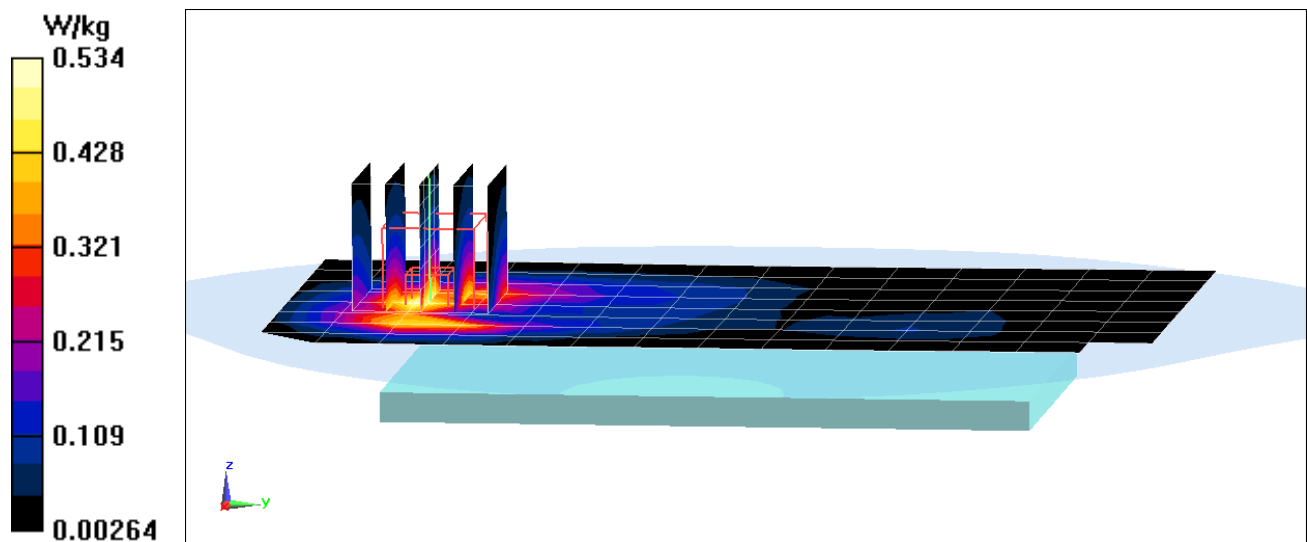
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 17.99 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.715 W/kg

SAR(1 g) = 0.439 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

Communication System: UID 0, GSM GPRS; 2 Tx slots; Frequency: 1909.8 MHz; Duty Cycle: 1:4.15

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1909.8 \text{ MHz}$; $\sigma = 1.574 \text{ S/m}$; $\epsilon_r = 51.415$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-06-2015; Ambient Temp: 23.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: GPRS 1900, Body SAR, Front side, High.ch, 2 Tx Slots

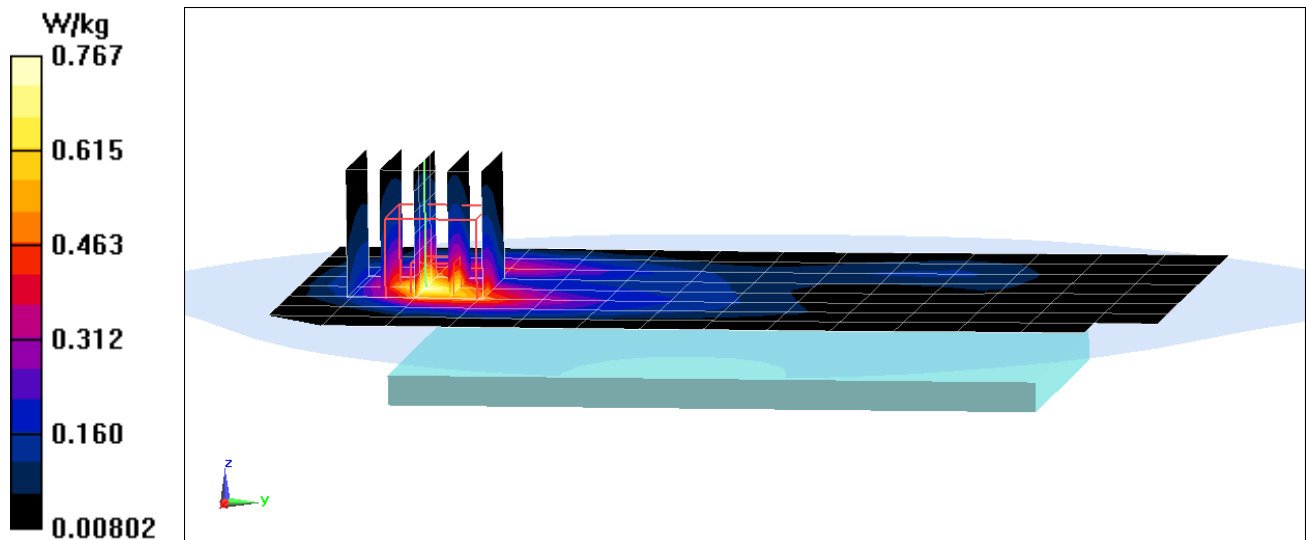
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 21.62 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.04 W/kg

SAR(1 g) = 0.643 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.481 \text{ S/m}$; $\epsilon_r = 53.488$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-02-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

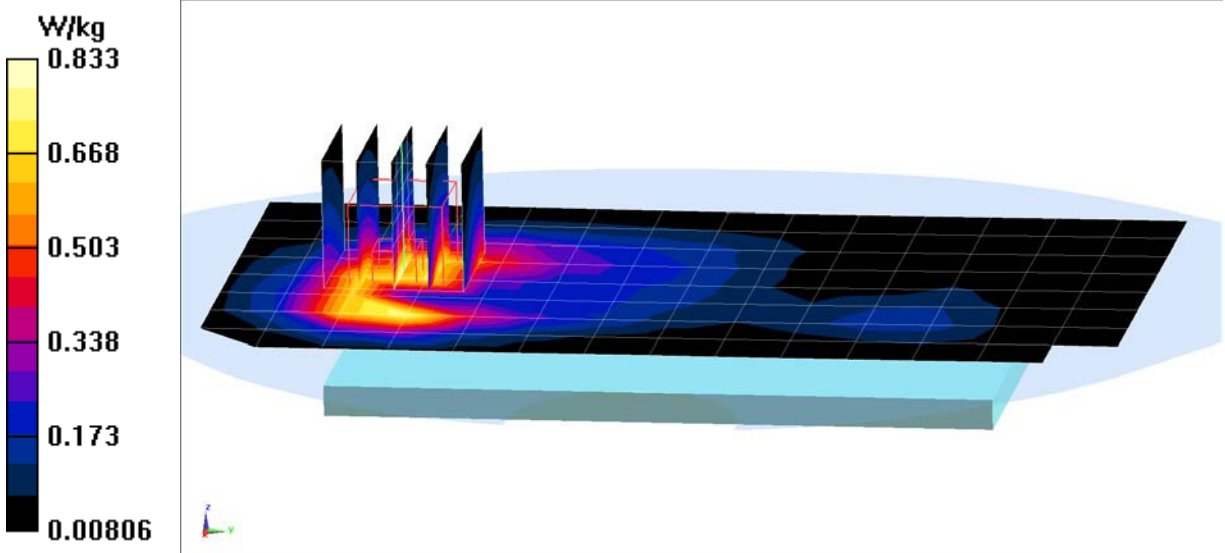
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 21.65 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 1.13 W/kg

SAR(1 g) = 0.706 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

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

Medium: 1900 Body Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.481 \text{ S/m}$; $\epsilon_r = 53.488$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-02-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.6°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

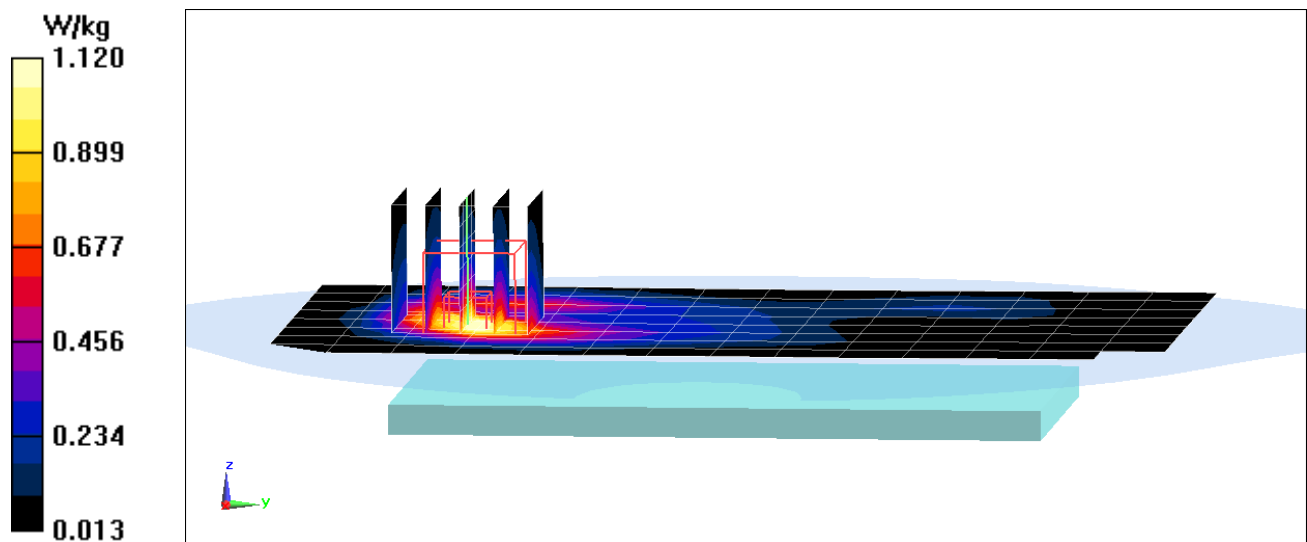
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 26.96 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.48 W/kg

SAR(1 g) = 0.921 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.944 \text{ S/m}$; $\epsilon_r = 53.382$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-03-2015; Ambient Temp: 21.9°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3287; ConvF(6.62, 6.62, 6.62); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 10/20/2015

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

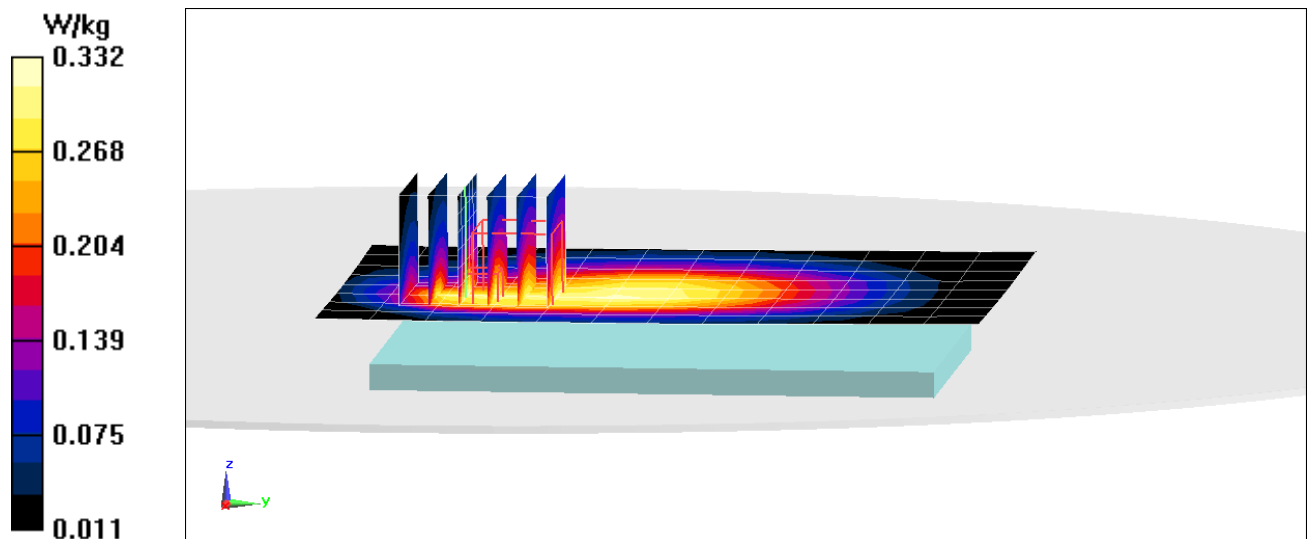
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 18.18 V/m; Power Drift = 0.14 dB

Peak SAR (extrapolated) = 0.426 W/kg

SAR(1 g) = 0.295 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02197

Communication System: UID 0, LTE Band 26; Frequency: 836.5 MHz; Duty Cycle: 1:1

Medium: 835 Body Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 0.996 \text{ S/m}$; $\epsilon_r = 54.069$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3351; ConvF(6.11, 6.11, 6.11); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

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, QPSK
15 MHz Bandwidth, 1 RB, 0 RB Offset

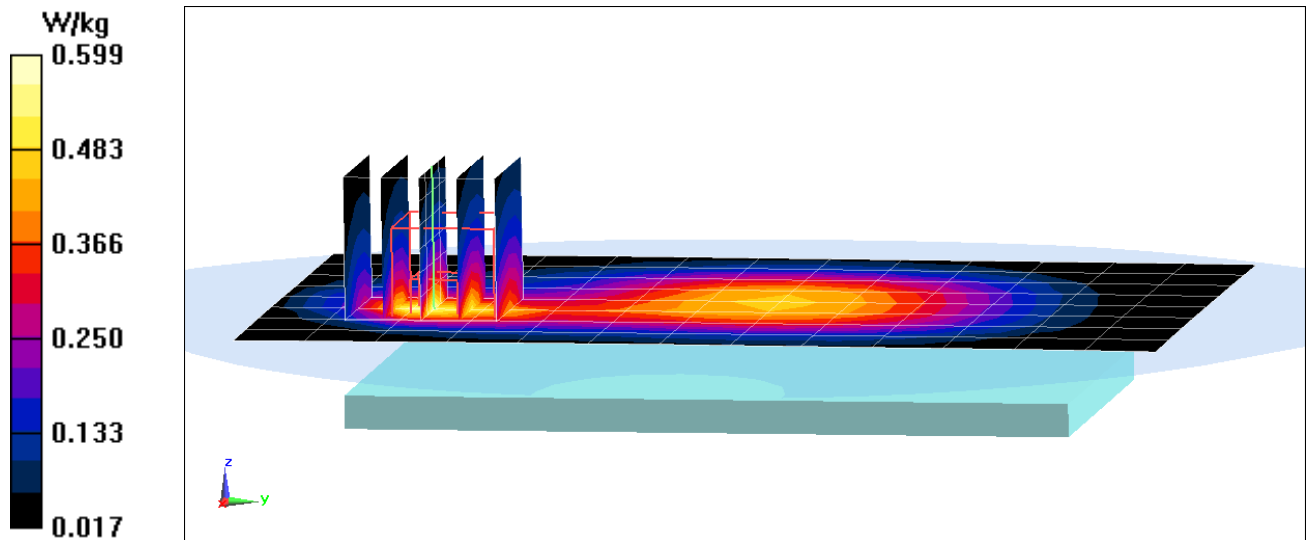
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.82 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.778 W/kg

SAR(1 g) = 0.486 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

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

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.446 \text{ S/m}$; $\epsilon_r = 52.156$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.5°C

Probe: ES3DV2 - SN3022; ConvF(4.79, 4.79, 4.79); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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 4 (AWS), Body SAR, Back side, Mid.ch, QPSK
20 MHz Bandwidth, 1 RB, 99 RB Offset

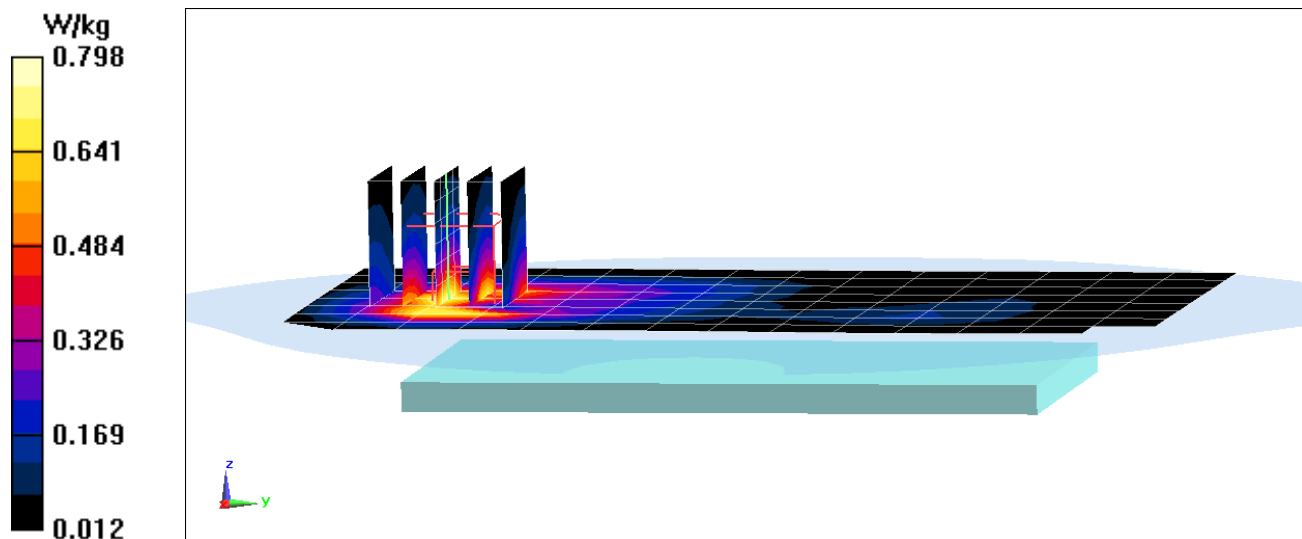
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.58 V/m; Power Drift = -0.11 dB

Peak SAR (extrapolated) = 1.06 W/kg

SAR(1 g) = 0.658 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

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

Medium: 1750 Body Medium parameters used (interpolated):

$f = 1732.5 \text{ MHz}$; $\sigma = 1.446 \text{ S/m}$; $\epsilon_r = 52.156$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.5°C

Probe: ES3DV2 - SN3022; ConvF(4.79, 4.79, 4.79); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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 4 (AWS), Body SAR, Front side, Mid.ch, QPSK
20 MHz Bandwidth, 1 RB, 99 RB Offset

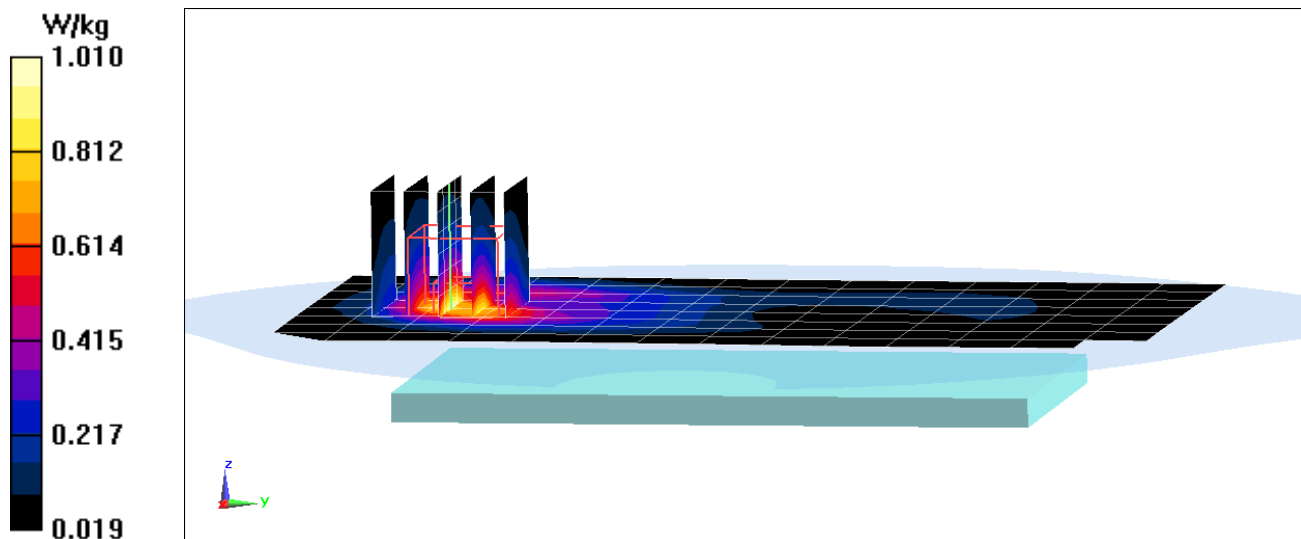
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 22.77 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 1.35 W/kg

SAR(1 g) = 0.839 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1882.5 \text{ MHz}$; $\sigma = 1.501 \text{ S/m}$; $\epsilon_r = 51.956$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-04-2015; Ambient Temp: 22.2°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

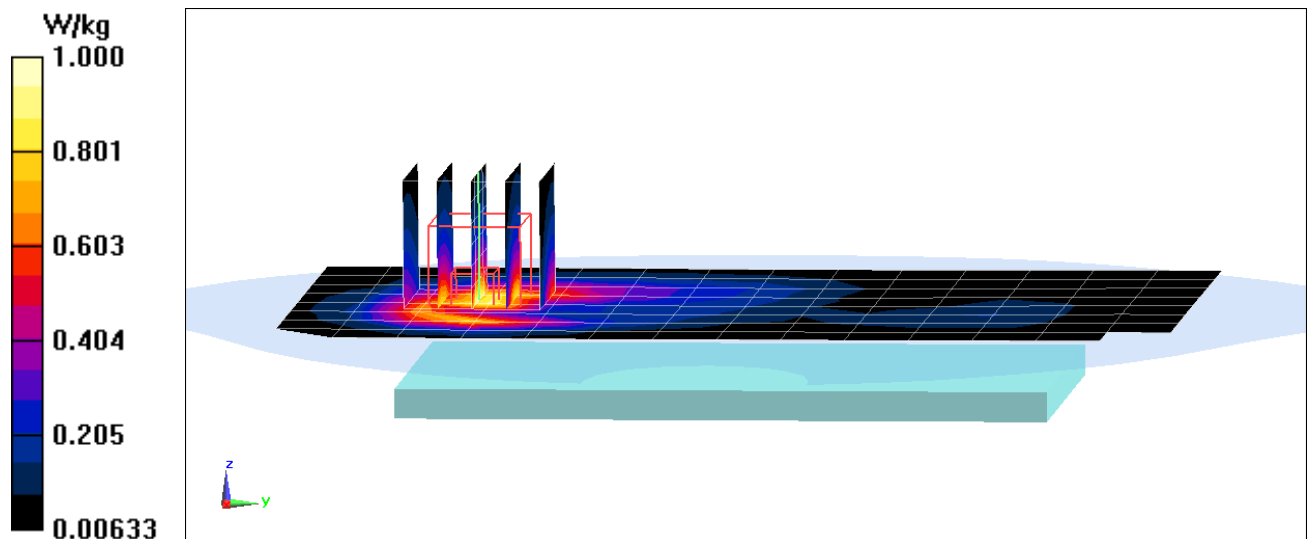
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 25.23 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.34 W/kg

SAR(1 g) = 0.834 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 01111

Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1882.5 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1882.5 \text{ MHz}$; $\sigma = 1.501 \text{ S/m}$; $\epsilon_r = 51.956$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-04-2015; Ambient Temp: 22.2°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

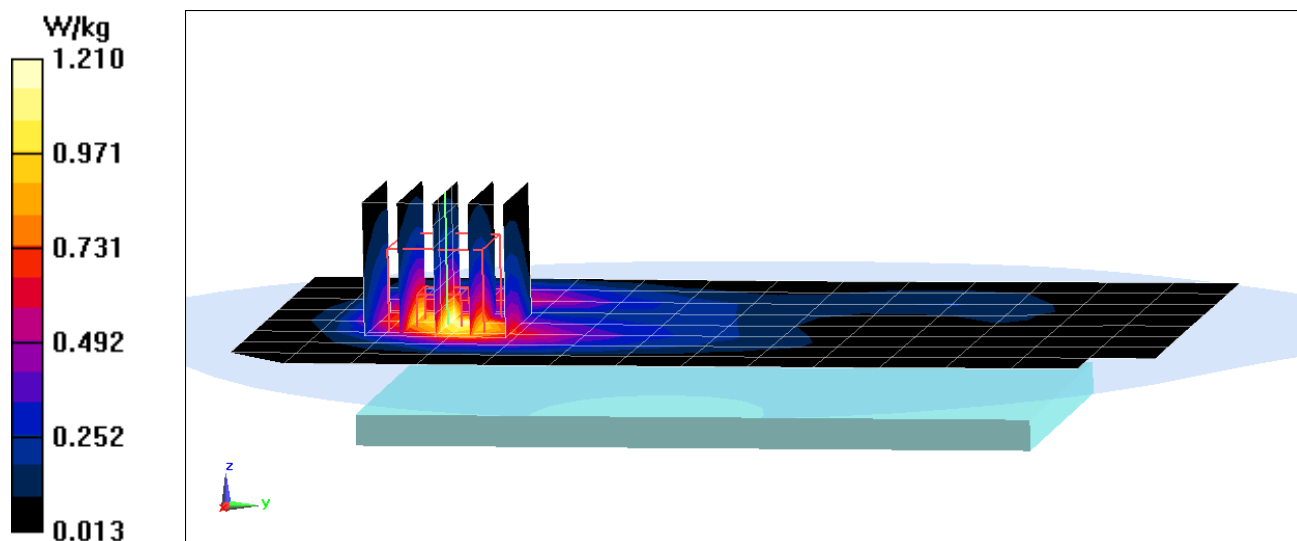
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 27.94 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 1.67 W/kg

SAR(1 g) = 1.03 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

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

Medium: 2600 Body Medium parameters used (interpolated):

$f = 2549.5 \text{ MHz}$; $\sigma = 2.118 \text{ S/m}$; $\epsilon_r = 50.467$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2015; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(3.9, 3.9, 3.9); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

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

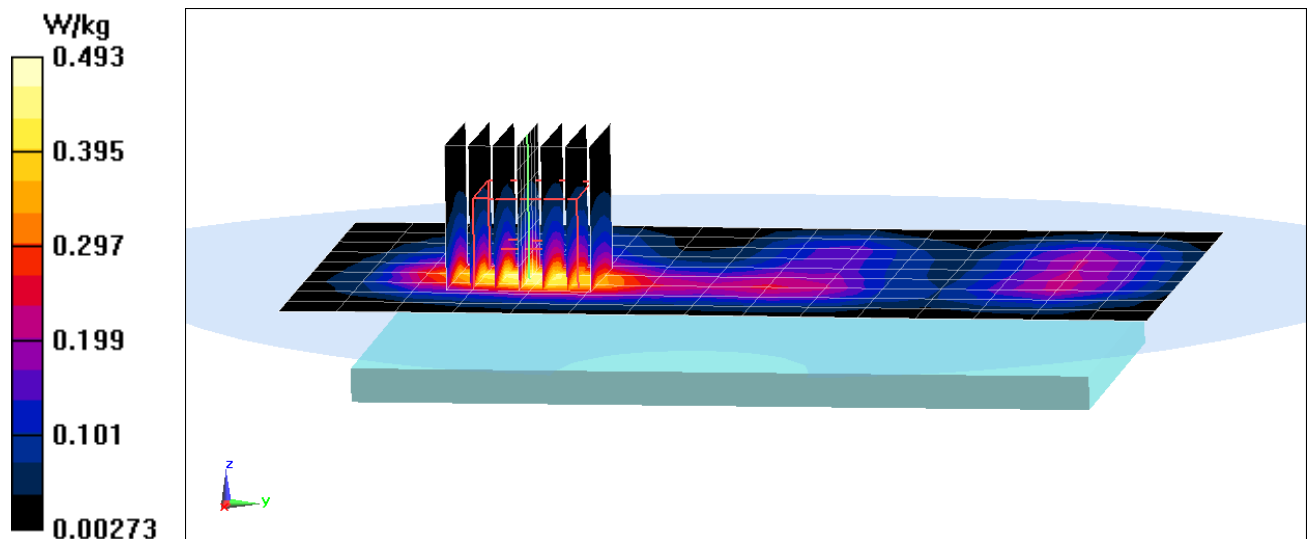
Area Scan (10x16x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 14.14 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.769 W/kg

SAR(1 g) = 0.382 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

Communication System: UID 0, LTE Band 41; Frequency: 2680 MHz; Duty Cycle: 1:1.58

Medium: 2600 Body Medium parameters used (interpolated):

$f = 2680 \text{ MHz}$; $\sigma = 2.3 \text{ S/m}$; $\epsilon_r = 50.032$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2015; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(3.9, 3.9, 3.9); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: LTE Band 41, Body SAR, Front side, High.ch, QPSK
20 MHz Bandwidth, 1 RB, 0 RB Offset

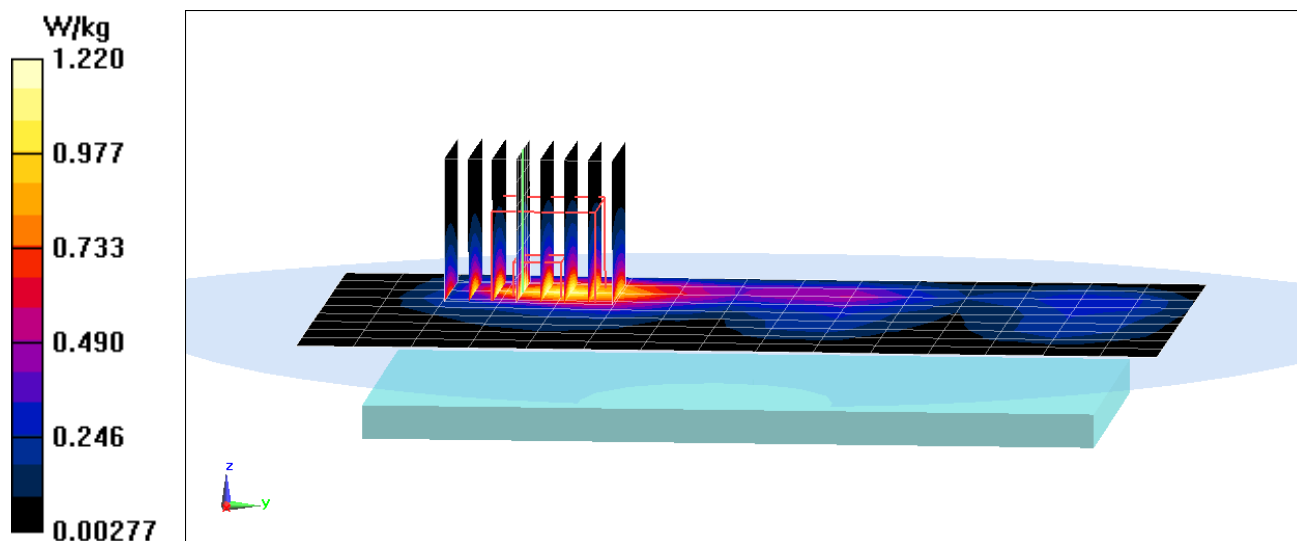
Area Scan (10x16x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 21.65 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 1.98 W/kg

SAR(1 g) = 0.988 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

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

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 2.027 \text{ S/m}$; $\epsilon_r = 51.428$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-14-2015; Ambient Temp: 21.6°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3334; ConvF(4.45, 4.45, 4.45); Calibrated: 11/17/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 11/11/2015

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, 22 MHz Bandwidth, Body SAR, Ch 11, 1 Mbps, Back Side

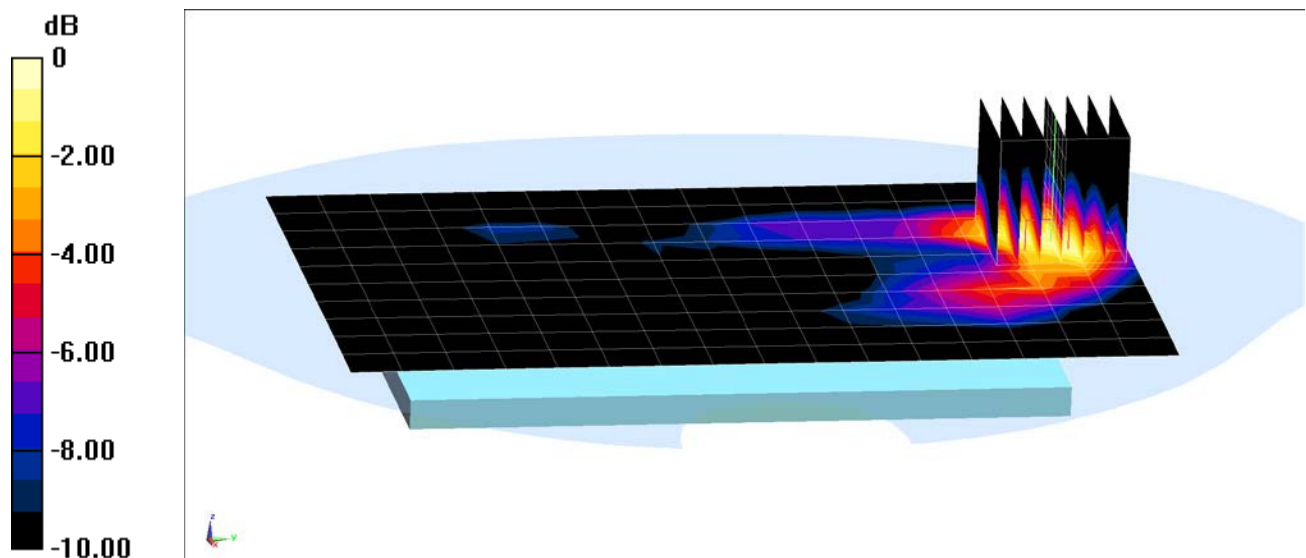
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 7.122 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.201 W/kg

SAR(1 g) = 0.101 W/kg



0 dB = 0.130 W/kg = -8.86 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

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

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2462 \text{ MHz}$; $\sigma = 2.027 \text{ S/m}$; $\epsilon_r = 51.428$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-14-2015; Ambient Temp: 21.6°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3334; ConvF(4.45, 4.45, 4.45); Calibrated: 11/17/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 11/11/2015

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, 22 MHz Bandwidth, Body SAR, Ch 11, 1 Mbps, Top Edge

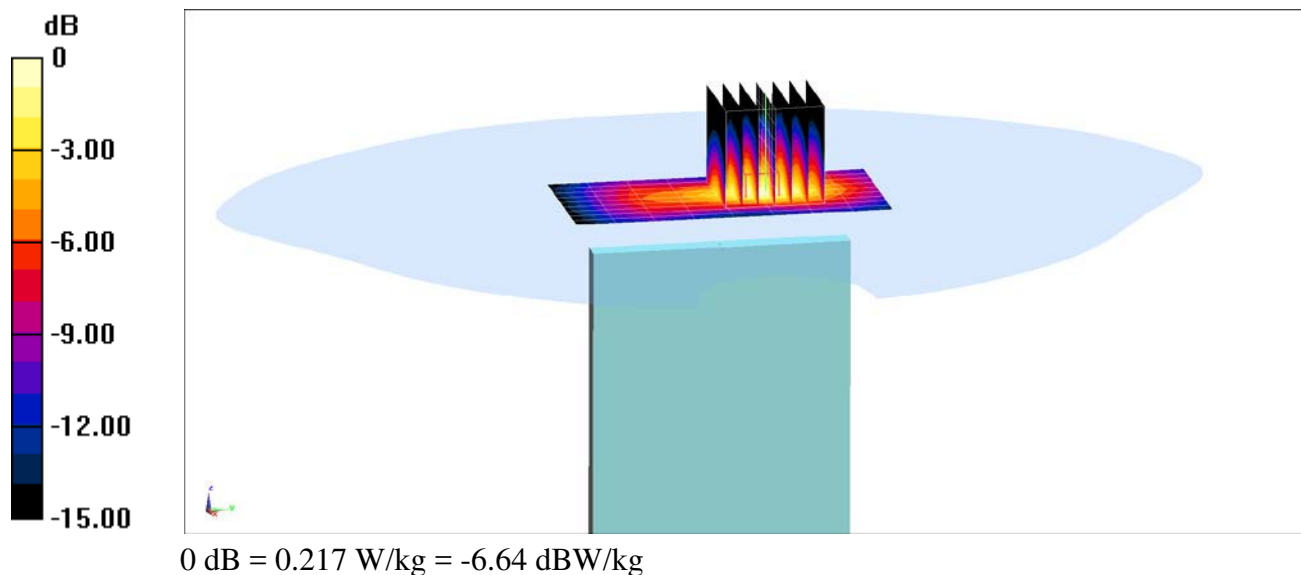
Area Scan (10x9x1): Measurement grid: dx=5mm, dy=12mm

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

Reference Value = 9.809 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.341 W/kg

SAR(1 g) = 0.165 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

Communication System: UID 0, 802.11a; Frequency: 5320 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5320 \text{ MHz}$; $\sigma = 5.475 \text{ S/m}$; $\epsilon_r = 48.056$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2015; Ambient Temp: 24.5°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7357; ConvF(4.11, 4.11, 4.11); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11a, U-NII-2A, 20 MHz Bandwidth
Body SAR, Ch 64, 6 Mbps, Back Side

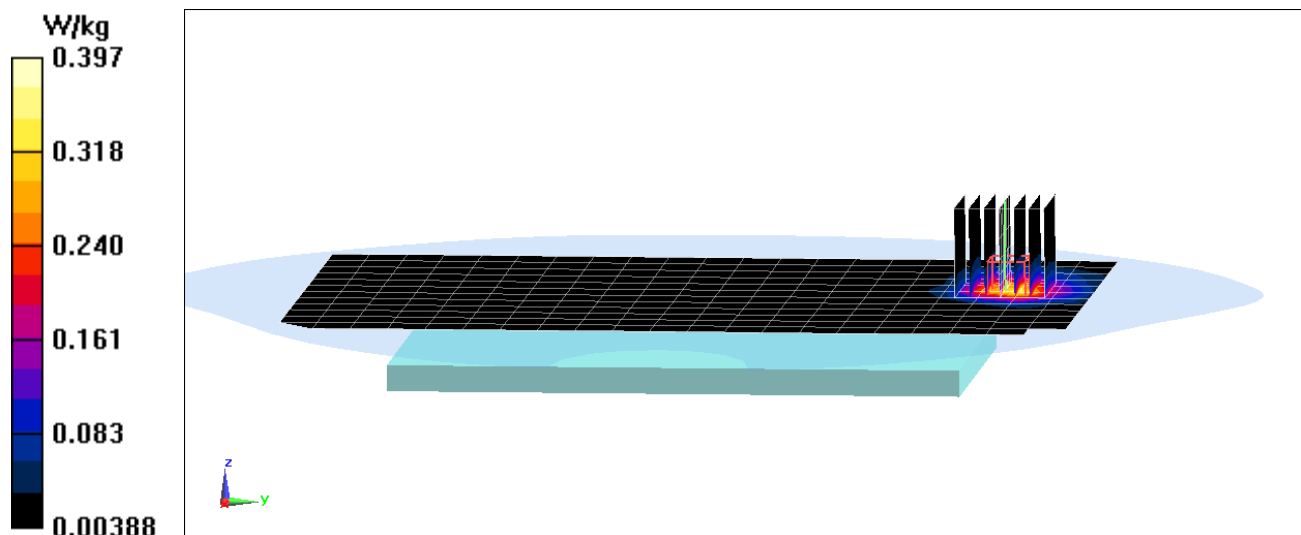
Area Scan (13x22x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 5.878 V/m; Power Drift = 0.19 dB

Peak SAR (extrapolated) = 0.627 W/kg

SAR(1 g) = 0.182 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

Communication System: UID 0, 802.11a; Frequency: 5745 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5745 \text{ MHz}$; $\sigma = 6.051 \text{ S/m}$; $\epsilon_r = 47.344$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2015; Ambient Temp: 24.5°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7357; ConvF(3.82, 3.82, 3.82); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11a, U-NII-3, 20 MHz Bandwidth
Body SAR, Ch 149, 6 Mbps, Top Edge

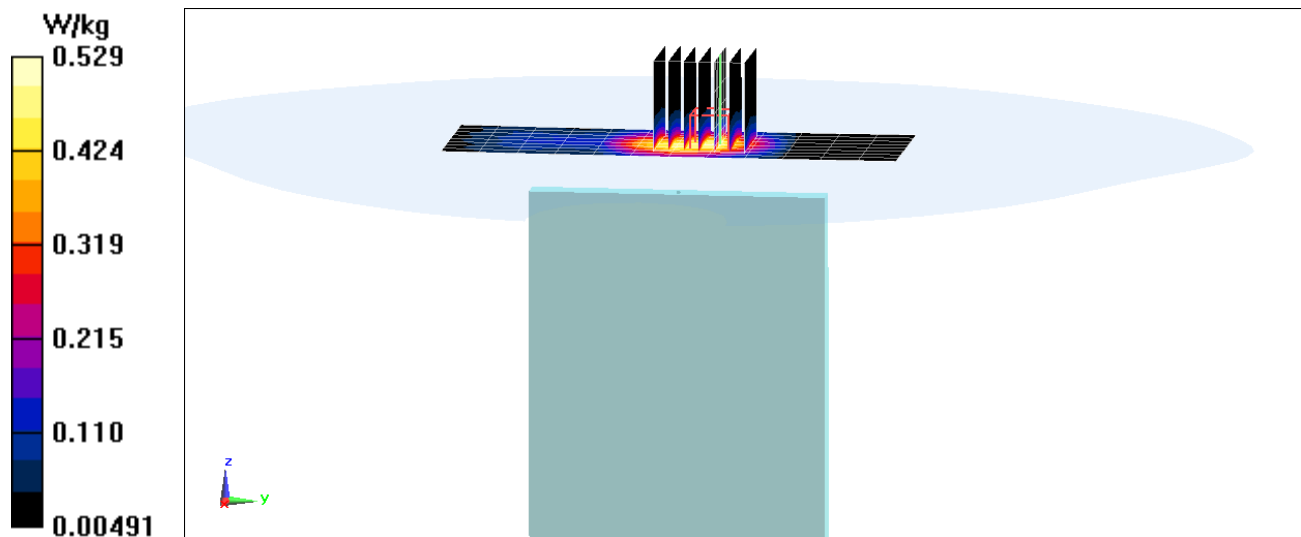
Area Scan (9x13x1): Measurement grid: $dx=5\text{mm}$, $dy=10\text{mm}$

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

Reference Value = 6.459 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.838 W/kg

SAR(1 g) = 0.236 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMJ700P; Type: Portable Handset; Serial: 02306

Communication System: UID 0, 802.11a; Frequency: 5320 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5320 \text{ MHz}$; $\sigma = 5.475 \text{ S/m}$; $\epsilon_r = 48.056$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 12-17-2015; Ambient Temp: 24.5°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7357; ConvF(4.11, 4.11, 4.11); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

Mode: IEEE 802.11a, U-NII-2A, 20 MHz Bandwidth
Phablet SAR, Ch 64, 6 Mbps, Top Edge

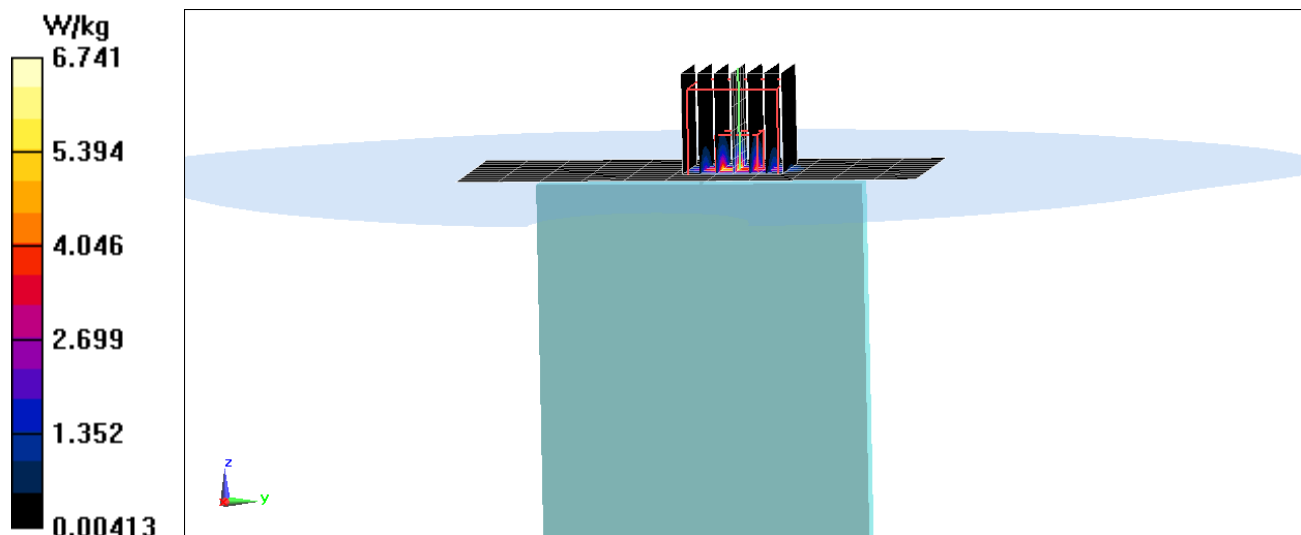
Area Scan (11x12x1): Measurement grid: dx=5mm, dy=10mm

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

Reference Value = 21.91 V/m; Power Drift = -0.12 dB

Peak SAR (extrapolated) = 10.6 W/kg

SAR(10 g) = 0.590 W/kg



APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Head, Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.91 \text{ S/m}$; $\epsilon_r = 43.132$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-05-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV2 - SN3022; ConvF(6.33, 6.33, 6.33); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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)

750 MHz System Verification at 23.0 dBm (200 mW)

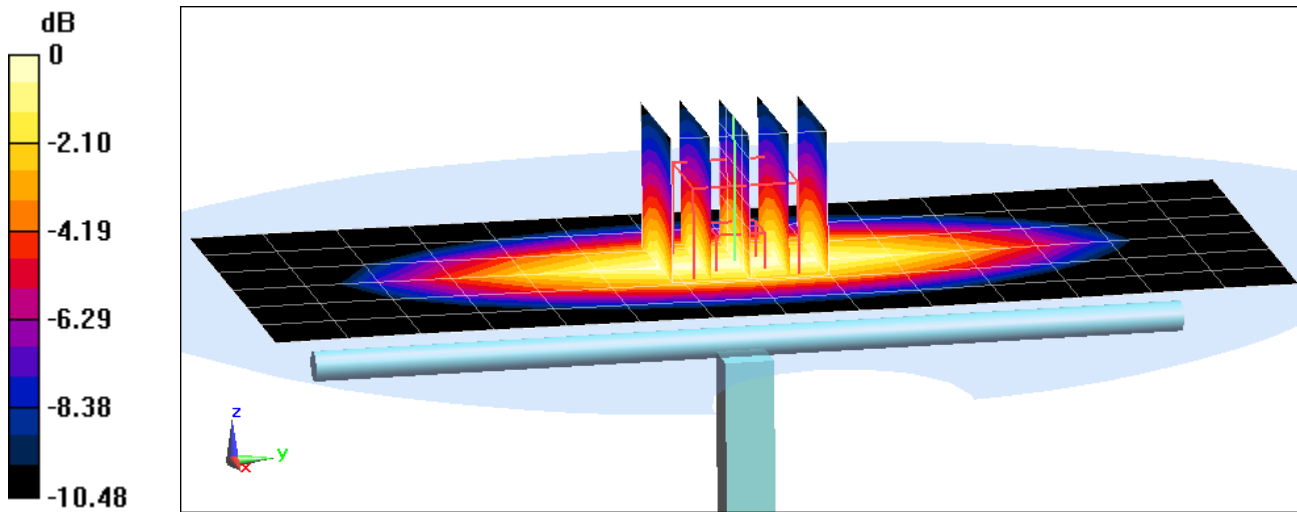
Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 2.57 W/kg

SAR(1 g) = 1.710 W/kg

Deviation(1 g) = 5.69%



0 dB = 2.00 W/kg = 3.01 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:

$f = 835 \text{ MHz}$; $\sigma = 0.896 \text{ S/m}$; $\epsilon_r = 41.145$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-08-2015; Ambient Temp: 24.3°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3333; ConvF(6.16, 6.16, 6.16); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

Phantom: SAM Right; Type: QD000P40CD; Serial: 1757

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

835 MHz System Verification at 23.0 dBm (200 mW)

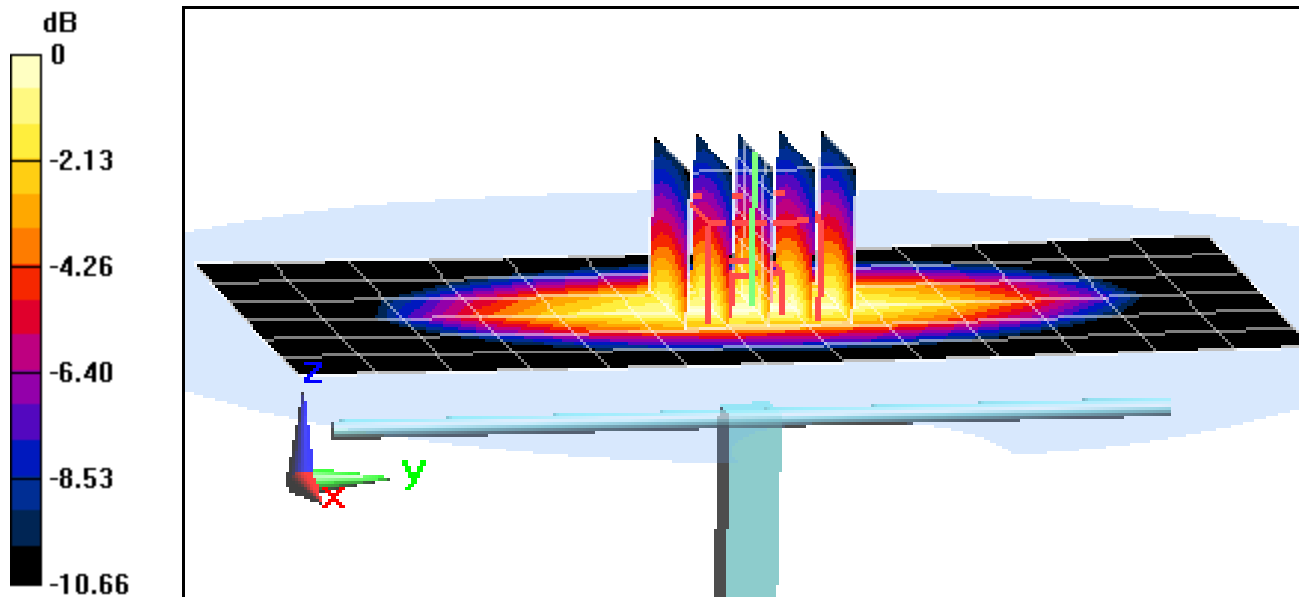
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.71 W/kg

SAR(1 g) = 1.820 W/kg

Deviation(1 g) = -0.33%



0 dB = 2.13 W/kg = 3.28 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:

$f = 1750 \text{ MHz}$; $\sigma = 1.341 \text{ S/m}$; $\epsilon_r = 39.514$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-03-2015; Ambient Temp: 23.5°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3209; ConvF(5.23, 5.23, 5.23); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 front; Type: QD000P40CD; Serial: TP-1646

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1750 MHz System Verification at 20.0 dBm (100 mW)

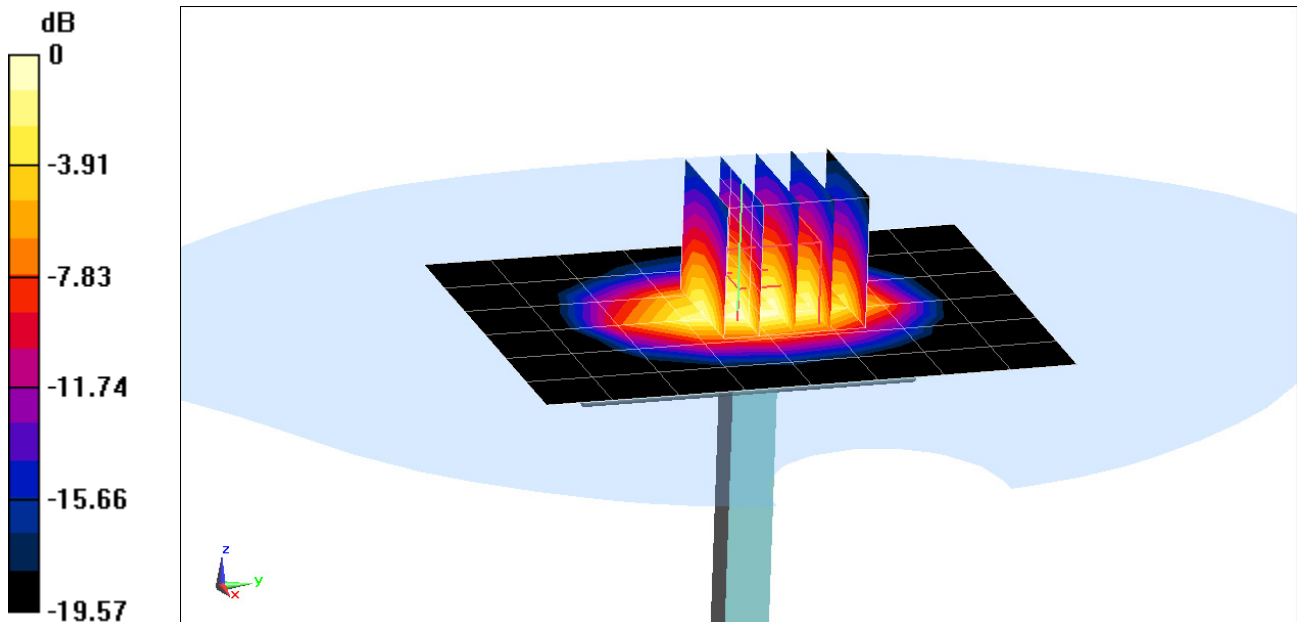
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.18 W/kg

SAR(1 g) = 3.720 W/kg

Deviation(1 g) = 2.76%



0 dB = 4.68 W/kg = 6.70 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1

Medium: 1900 Head, Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.395 \text{ S/m}$; $\epsilon_r = 38.188$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-06-2015; Ambient Temp: 22.8°C; Tissue Temp: 22.1°C

Probe: ES3DV2 - SN3022; ConvF(4.93, 4.93, 4.93); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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 at 20.0 dBm (100 mW)

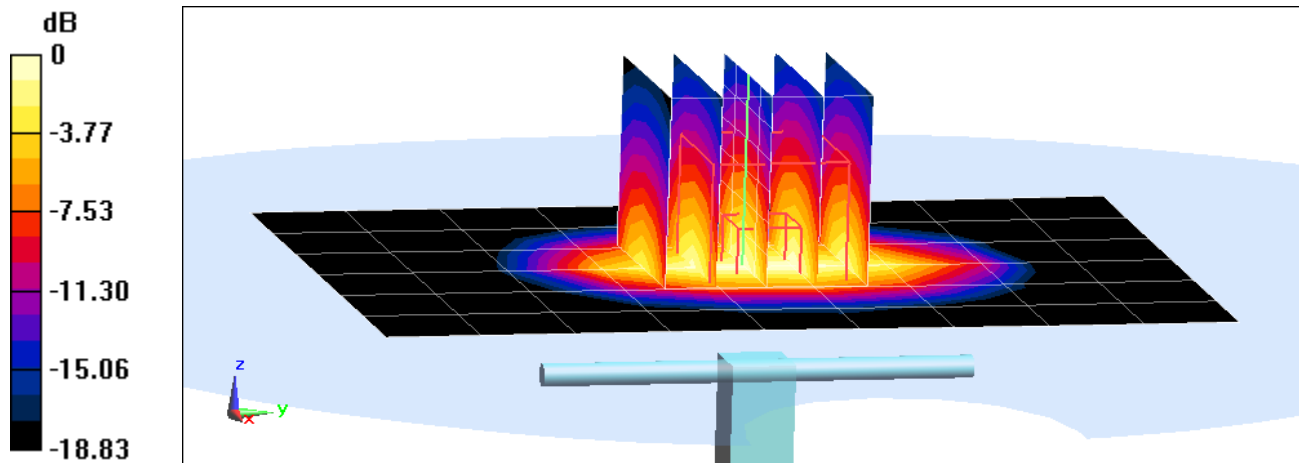
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.31 W/kg

SAR(1 g) = 3.930 W/kg

Deviation(1 g) = -3.44%



0 dB = 4.94 W/kg = 6.94 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:

$f = 2450 \text{ MHz}$; $\sigma = 1.82 \text{ S/m}$; $\epsilon_r = 38.336$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-16-2015; Ambient Temp: 24.0°C; Tissue Temp: 23.8°C

Probe: ES3DV3 - SN3319; ConvF(4.55, 4.55, 4.55); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification at 20 dBm (100 mW)

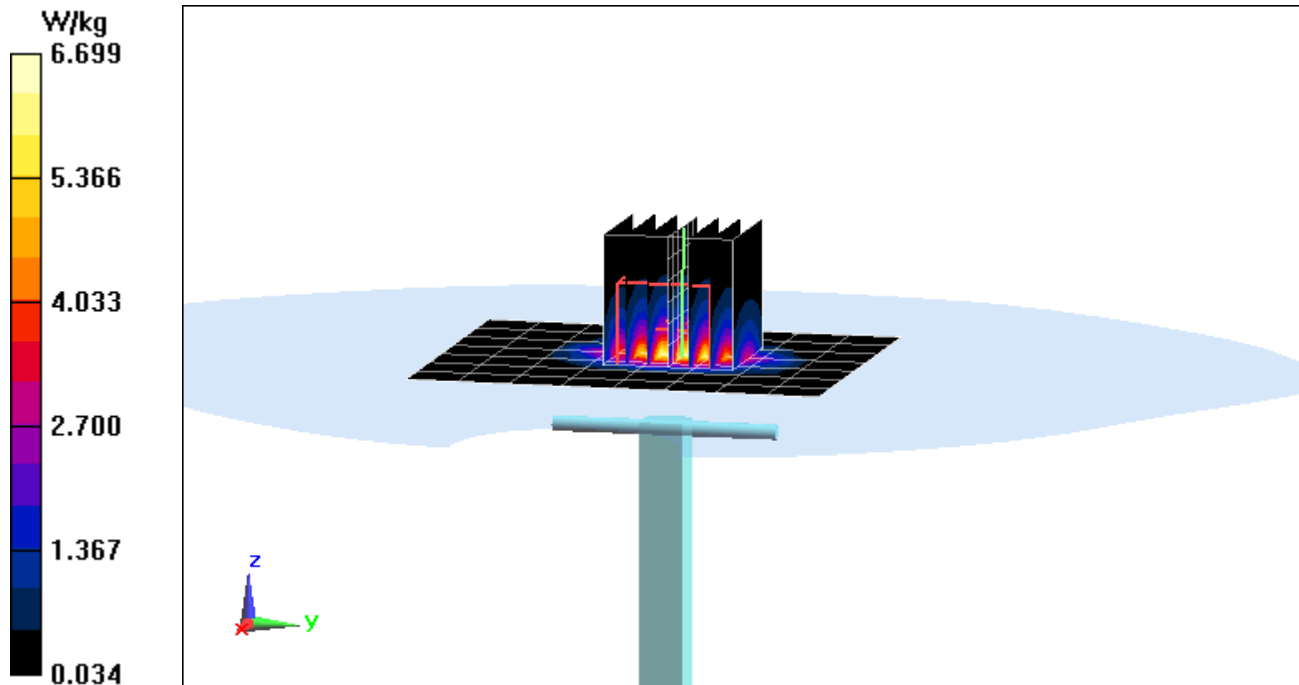
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 10.6 W/kg

SAR(1 g) = 5.050 W/kg

Deviation(1 g) = -6.83%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: 2600 Head Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 1.954 \text{ S/m}$; $\epsilon_r = 39.345$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2015; Ambient Temp: 22.9°C; Tissue Temp: 23.0°C

Probe: ES3DV3 - SN3263; ConvF(4.25, 4.25, 4.25); Calibrated: 5/20/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 6/17/2015

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)

2600 MHz System Verification at 20.0 dBm (100 mW)

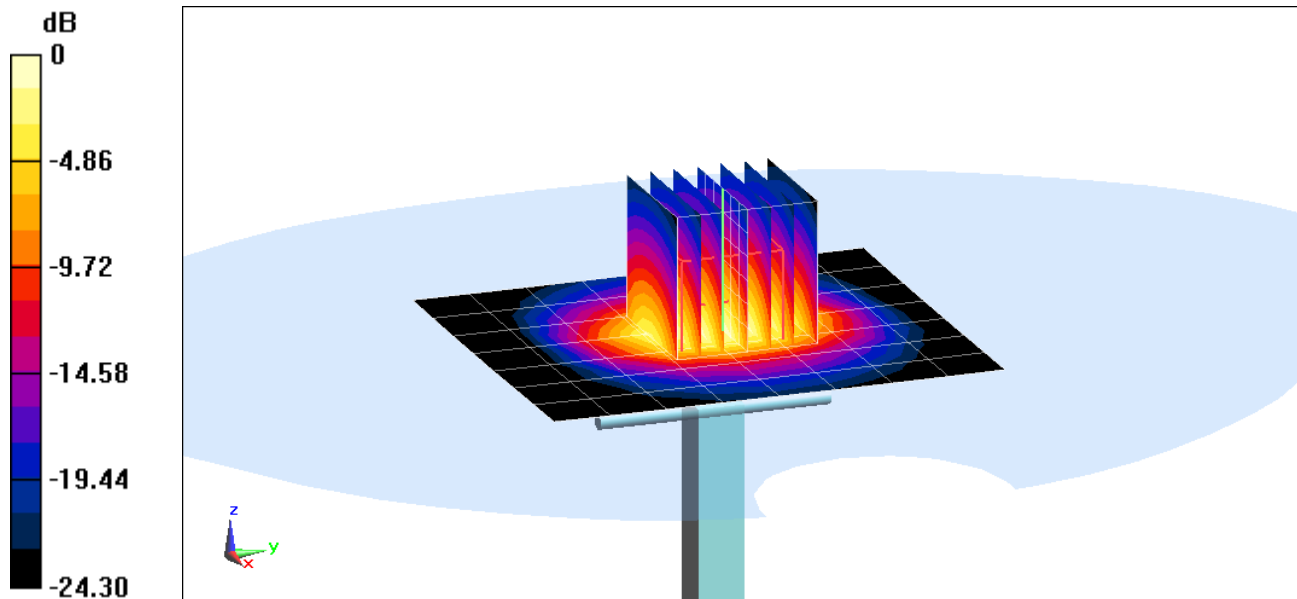
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 12.9 W/kg

SAR(1 g) = 5.860 W/kg

Deviation(1 g) = 5.02%



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

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1

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

$f = 5250 \text{ MHz}$; $\sigma = 4.508 \text{ S/m}$; $\epsilon_r = 36.156$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-16-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7308; ConvF(5.2, 5.2, 5.2); Calibrated: 7/21/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5250 MHz System Verification at 17.0 dBm (50 mW)

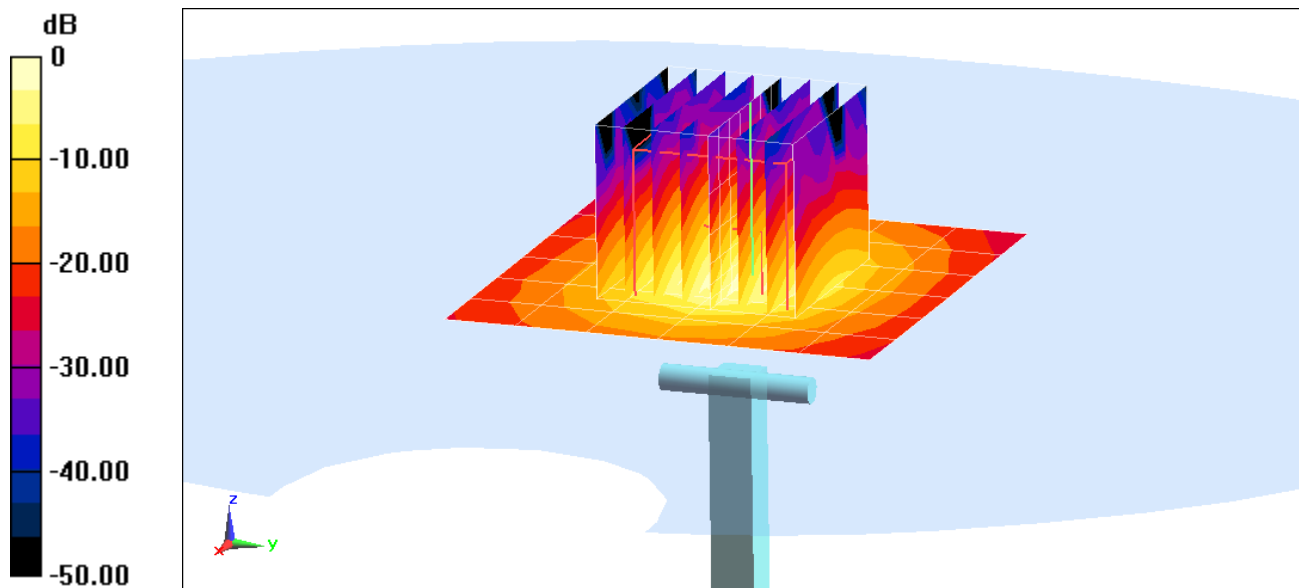
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 15.6 W/kg

SAR(1 g) = 3.860 W/kg

Deviation(1 g) = -6.42 %



0 dB = 9.04 W/kg = 9.56 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5 GHz Head Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 4.882 \text{ S/m}$; $\epsilon_r = 35.632$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-16-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7308; ConvF(4.65, 4.65, 4.65); Calibrated: 7/21/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5600 MHz System Verification at 17.0 dBm (50 mW)

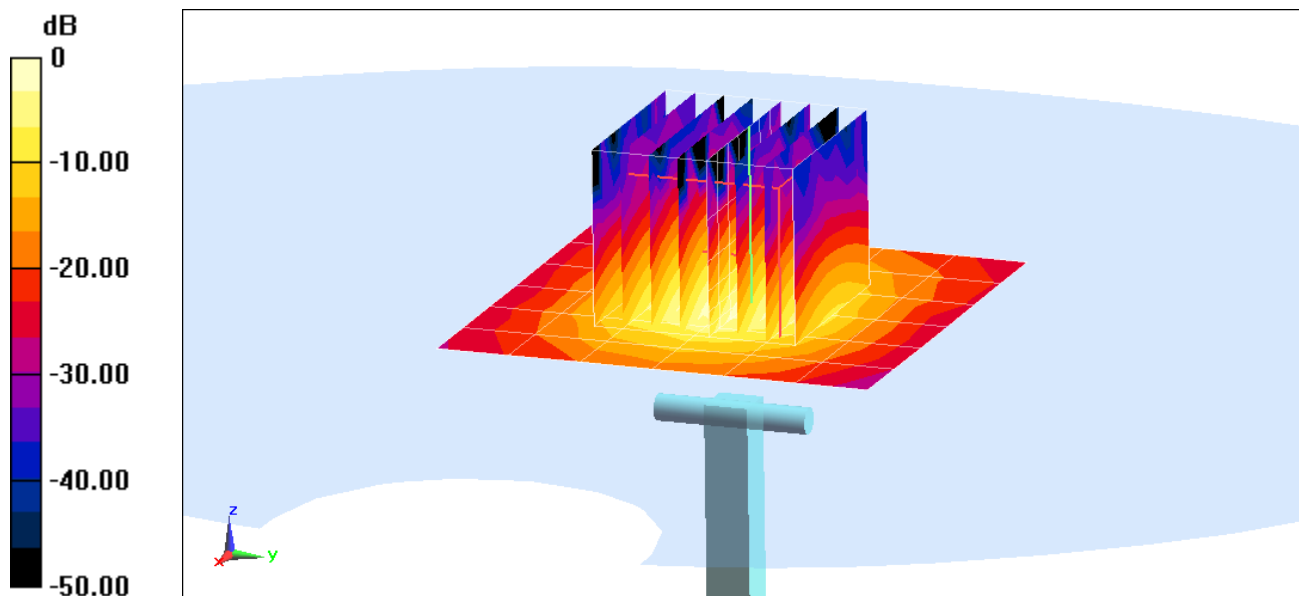
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 17.5 W/kg

SAR(1 g) = 4.100 W/kg

Deviation(1 g) = -2.96 %



0 dB = 9.83 W/kg = 9.93 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1

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

$f = 5750 \text{ MHz}$; $\sigma = 5.053 \text{ S/m}$; $\epsilon_r = 35.443$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-16-2015; Ambient Temp: 23.6°C; Tissue Temp: 21.9°C

Probe: EX3DV4 - SN7308; ConvF(4.86, 4.86, 4.86); Calibrated: 7/21/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5750 MHz System Verification at 17.0 dBm (50 mW)

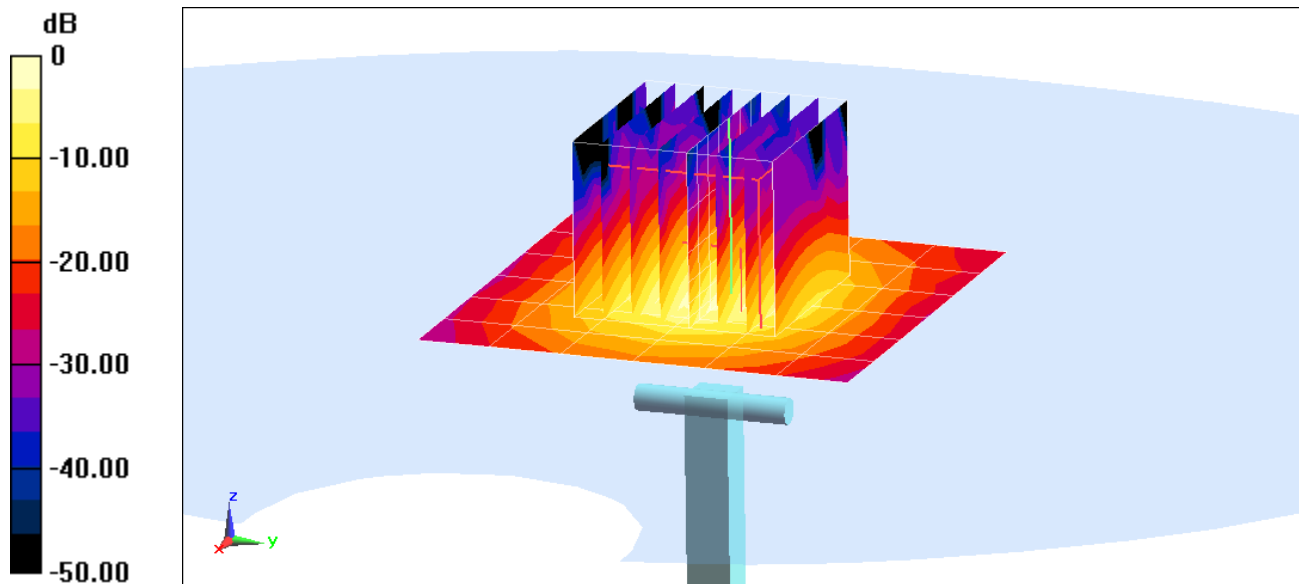
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 16.2 W/kg

SAR(1 g) = 3.700 W/kg

Deviation(1 g) = -7.50 %



0 dB = 8.99 W/kg = 9.54 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 750 MHz; Type: D750V3; Serial: 1046

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

Medium: 750 Body; Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.984 \text{ S/m}$; $\epsilon_r = 52.936$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-03-2015; Ambient Temp: 21.9°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3287; ConvF(6.62, 6.62, 6.62); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1408; Calibrated: 10/20/2015

Phantom: ELI v5.0; Type: QDOVA001BB; Serial: 1158

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

750 MHz System Verification at 23.0 dBm (200 mW)

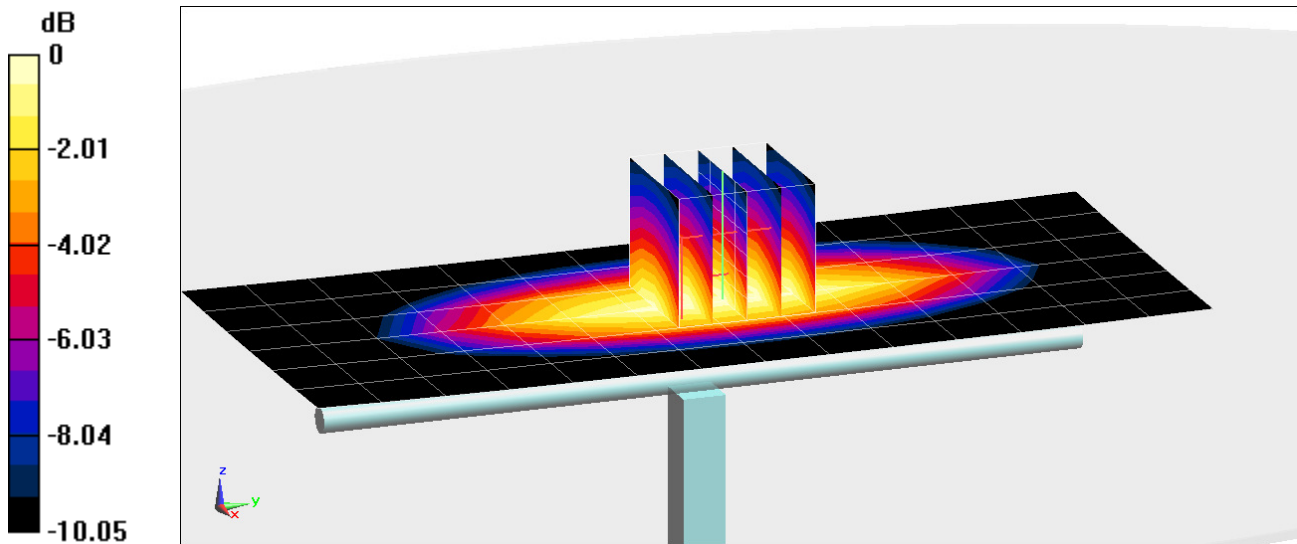
Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.52 W/kg

SAR(1 g) = 1.720 W/kg

Deviation(1 g) = 3.74%



0 dB = 1.97 W/kg = 2.94 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.995 \text{ S/m}$; $\epsilon_r = 54.082$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 12-08-2015; Ambient Temp: 24.2°C; Tissue Temp: 22.4°C

Probe: ES3DV3 - SN3351; ConvF(6.11, 6.11, 6.11); Calibrated: 6/22/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 8/24/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

835 MHz System Verification at 23.0 dBm (200 mW)

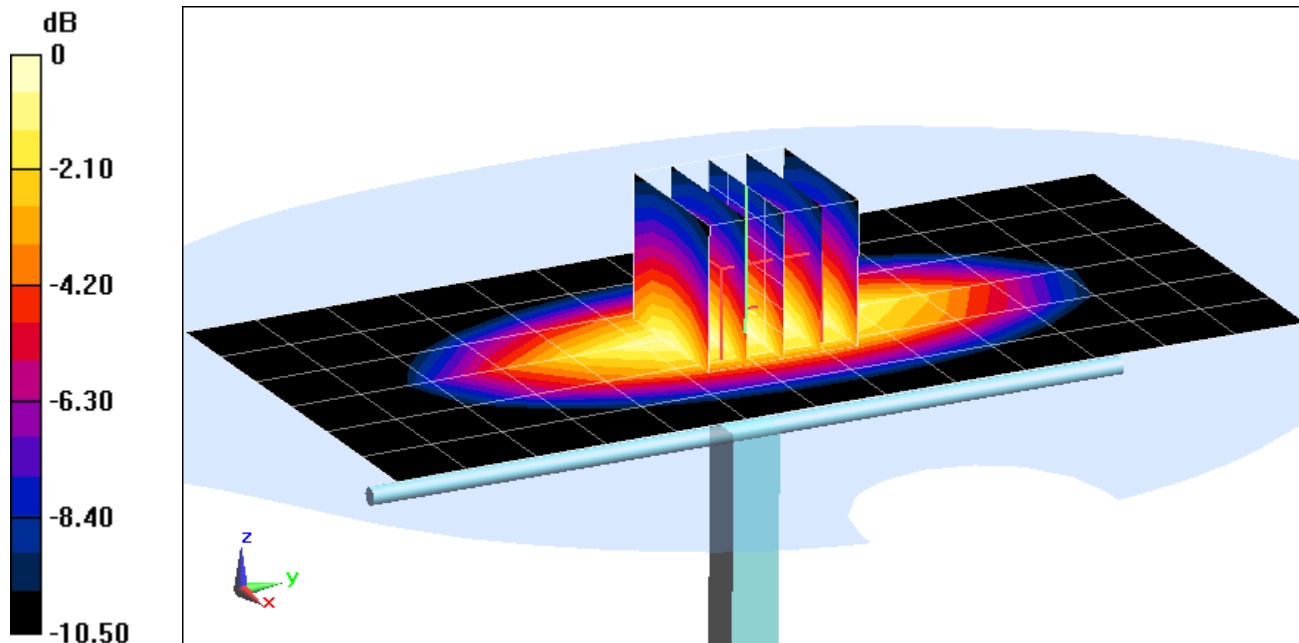
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.86 W/kg

SAR(1 g) = 1.960 W/kg

Deviation(1 g) = 5.95%



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 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.466 \text{ S/m}$; $\epsilon_r = 52.103$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-08-2015; Ambient Temp: 23.2°C; Tissue Temp: 23.5°C

Probe: ES3DV2 - SN3022; ConvF(4.79, 4.79, 4.79); Calibrated: 8/26/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/18/2015

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)

1750 MHz System Verification at 20.0 dBm (100 mW)

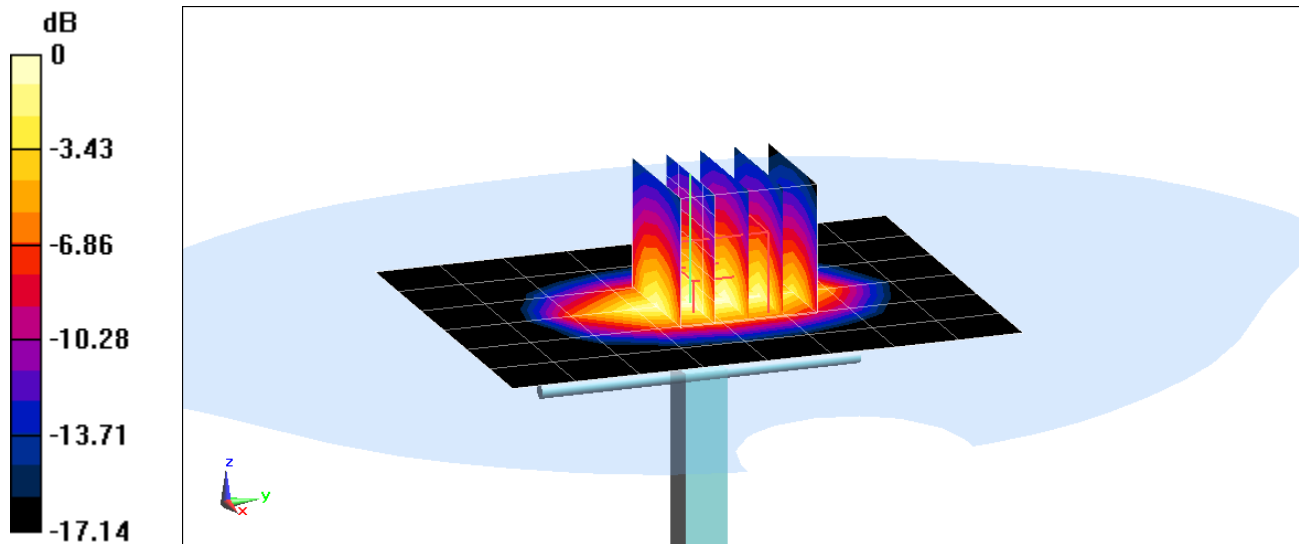
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 6.57 W/kg

SAR(1 g) = 3.750 W/kg

Deviation(1 g) = 1.08%



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):

$f = 1900 \text{ MHz}$; $\sigma = 1.56 \text{ S/m}$; $\epsilon_r = 51.449$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-06-2015; Ambient Temp: 23.7°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3333; ConvF(4.7, 4.7, 4.7); Calibrated: 10/29/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/27/2015

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

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

1900 MHz System Verification at 20.0 dBm (100 mW)

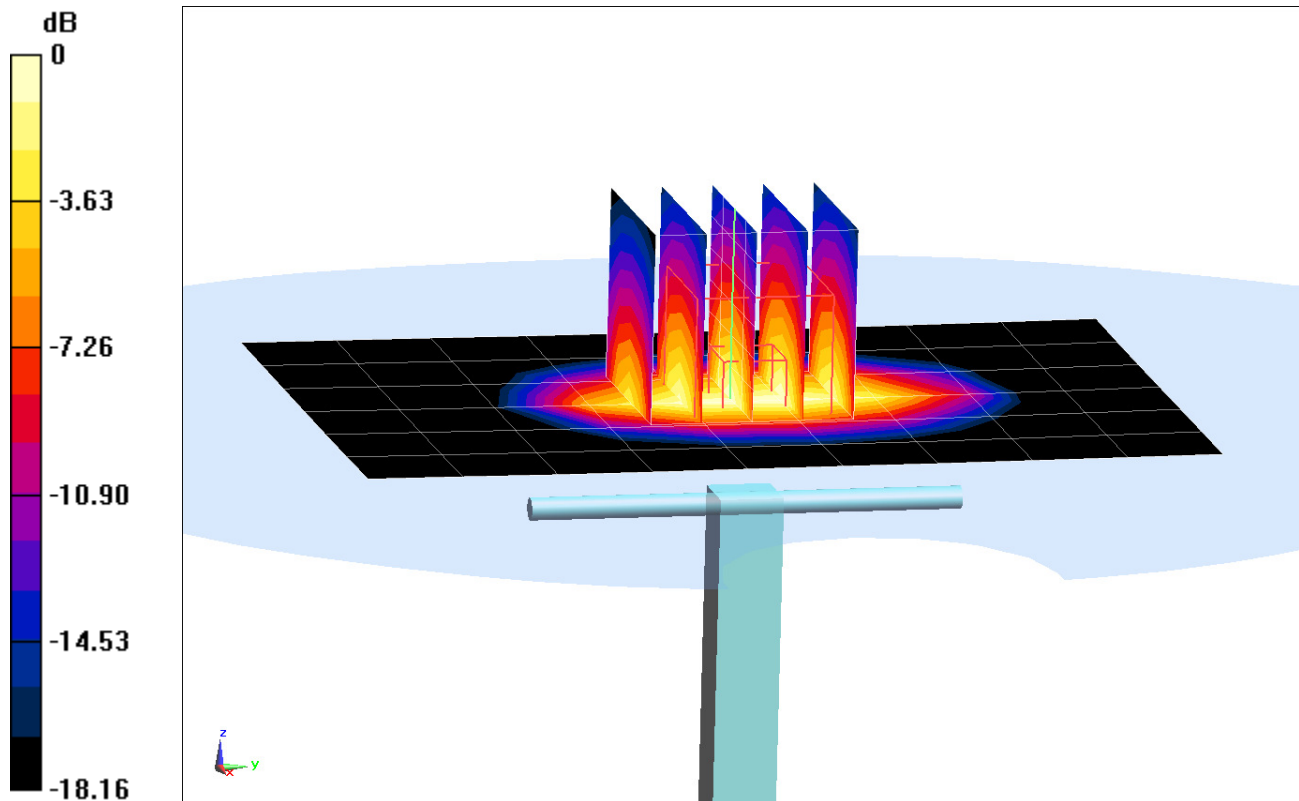
Area Scan (7x10x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 7.85 W/kg

SAR(1 g) = 4.360 W/kg

Deviation(1 g) = 7.92%



0 dB = 5.47 W/kg = 7.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.987 \text{ S/m}$; $\epsilon_r = 50.916$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2015; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(4.11, 4.11, 4.11); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

2450 MHz System Verification at 20.0 dBm (100 mW)

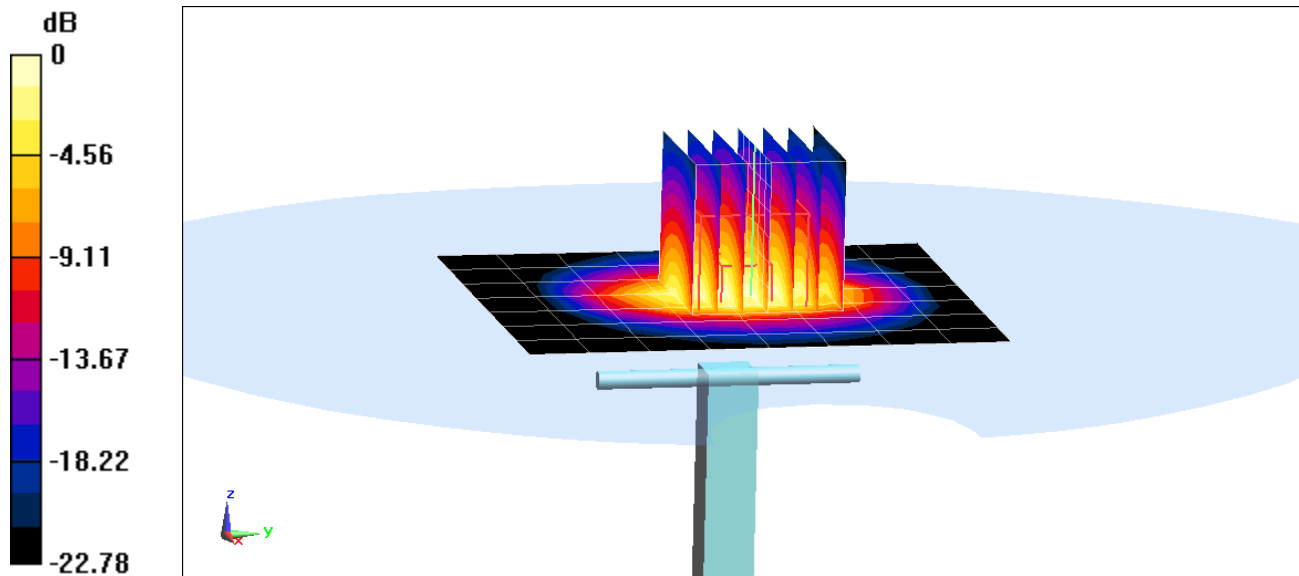
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 10.8 W/kg

SAR(1 g) = 5.07 W/kg

Deviation(1 g) = -2.31%



0 dB = 6.67 W/kg = 8.24 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.009 \text{ S/m}$; $\epsilon_r = 51.481$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-14-2015; Ambient Temp: 21.6°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3334; ConvF(4.45, 4.45, 4.45); Calibrated: 11/17/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1415; Calibrated: 11/11/2015

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 at 20.0 dBm (100 mW)

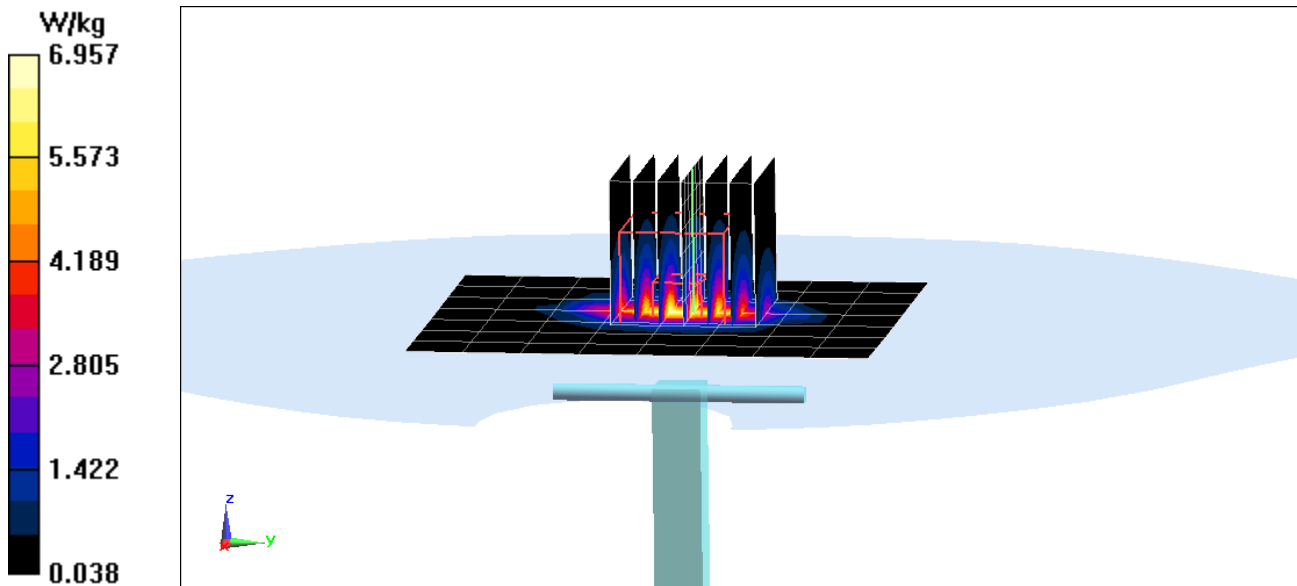
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 11.3 W/kg

SAR(1 g) = 5.290 W/kg

Deviation(1 g) = 1.93%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1

Medium: 2600 Body Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 2.192 \text{ S/m}$; $\epsilon_r = 50.466$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-07-2015; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: ES3DV3 - SN3319; ConvF(3.9, 3.9, 3.9); Calibrated: 3/19/2015;

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1368; Calibrated: 3/13/2015

Phantom: SAM with CRP v4.0; Type: QD000P40CD; Serial: TP:1800

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

2600 MHz System Verification at 20.0 dBm (100 mW)

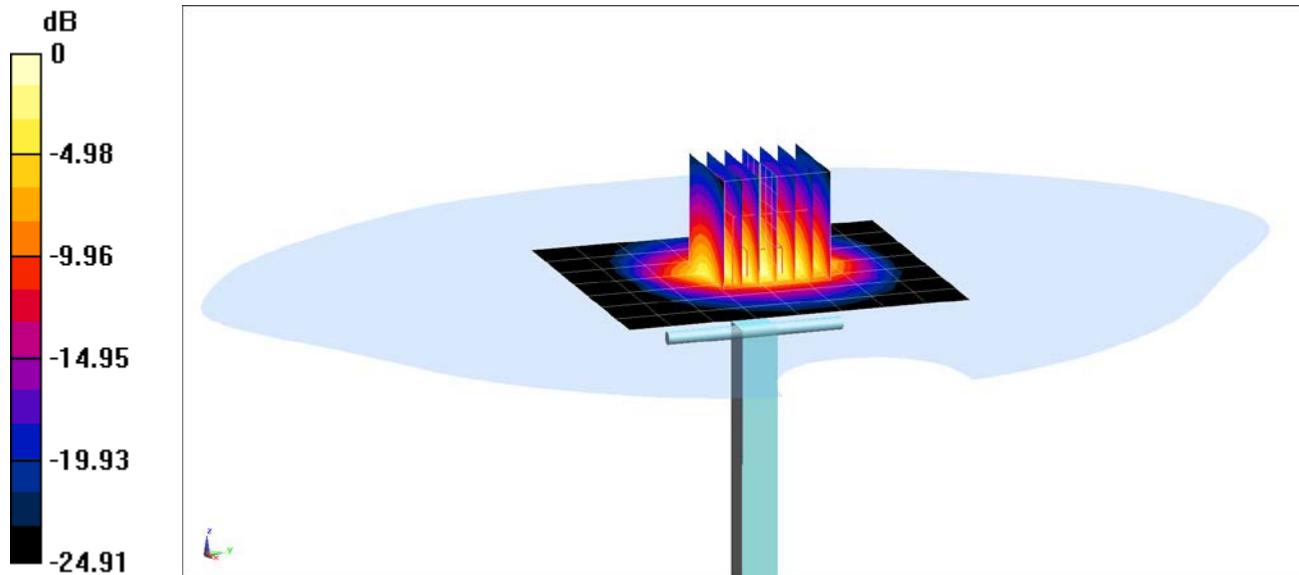
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 13.5 W/kg

SAR(1 g) = 5.900 W/kg

Deviation(1 g) = 4.98%



0 dB = 7.81 W/kg = 8.93 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5300 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5300 \text{ MHz}$; $\sigma = 5.448 \text{ S/m}$; $\epsilon_r = 48.088$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2015; Ambient Temp: 24.5°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7357; ConvF(4.11, 4.11, 4.11); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5300 MHz System Verification at 17.0 dBm (50 mW)

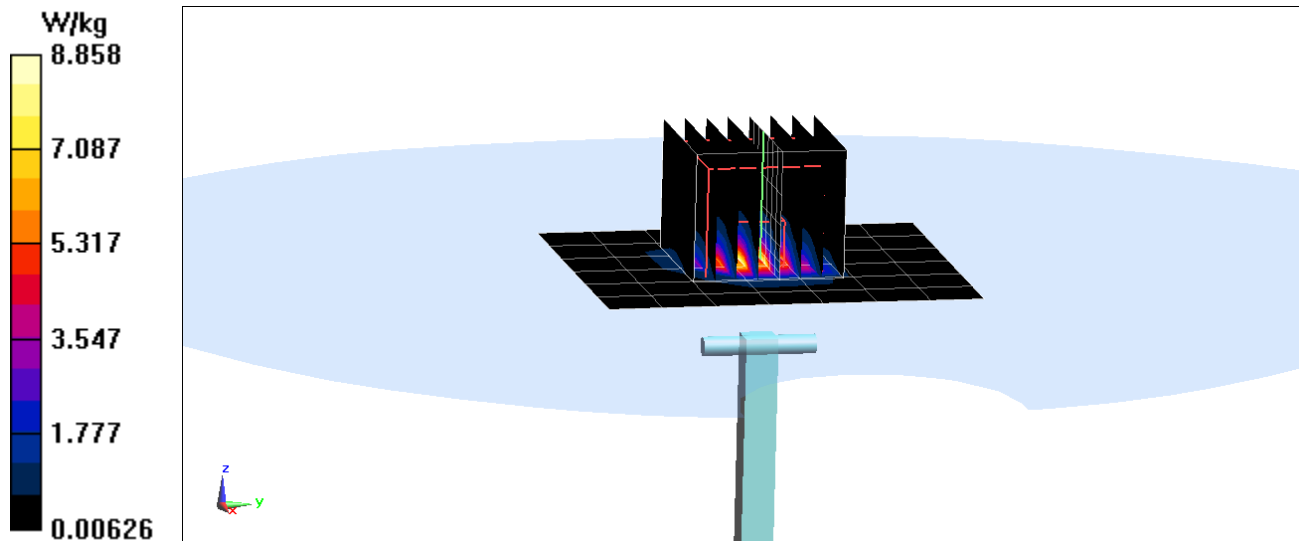
Area Scan (7x8x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 14.9 W/kg

SAR(1 g) = 3.790 W/kg; SAR(10 g) = 1.060 W/kg

Deviation (1g) = 2.16%; Deviation (10g) = 1.44%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.86 \text{ S/m}$; $\epsilon_r = 47.586$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2015; Ambient Temp: 24.5°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7357; ConvF(3.72, 3.72, 3.72); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5600 MHz System Verification at 17.0 dBm (50 mW)

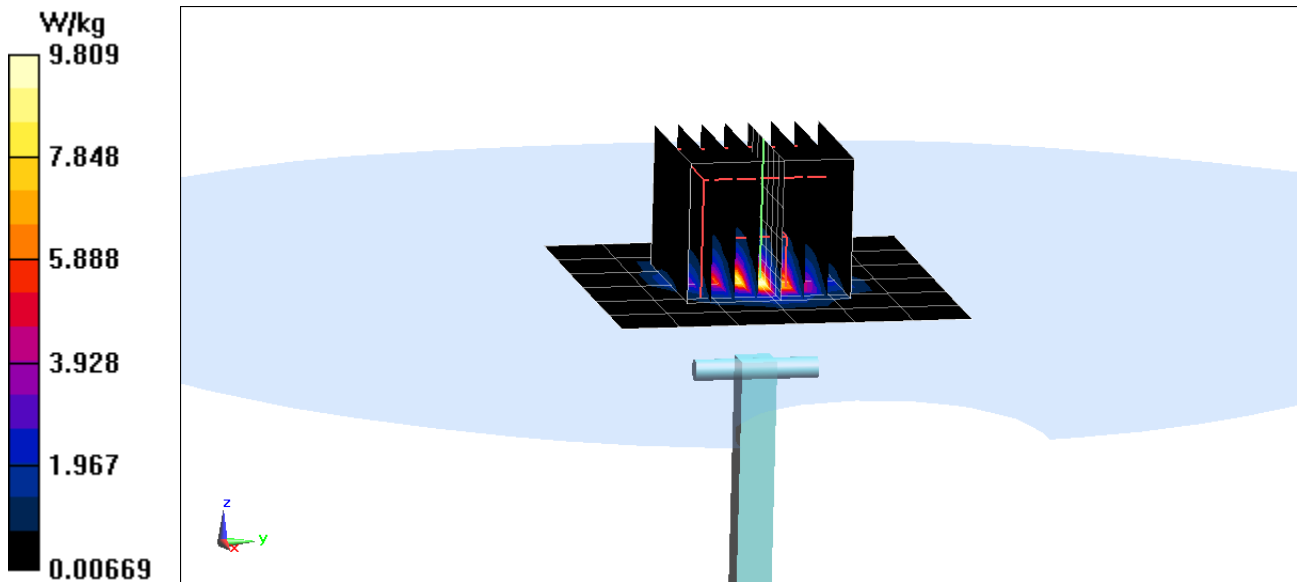
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 16.4 W/kg

SAR(1 g) = 4.000 W/kg; SAR(10 g) = 1.130 W/kg

Deviation (1g) = 2.96%; Deviation (10g) = 5.12%



PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5800 MHz; Duty Cycle: 1:1

Medium: 5 GHz Body Medium parameters used:

$f = 5800 \text{ MHz}$; $\sigma = 6.147 \text{ S/m}$; $\epsilon_r = 47.262$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 12-17-2015; Ambient Temp: 24.5°C; Tissue Temp: 22.4°C

Probe: EX3DV4 - SN7357; ConvF(3.82, 3.82, 3.82); Calibrated: 4/23/2015;

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/20/2015

Phantom: SAM v5.0 Left; Type: QD000P40CD; Serial: TP: 1687

Measurement SW: DASY52, Version 52.8 (8); SEMCAD X Version 14.6.10 (7331)

5800 MHz System Verification at 17.0 dBm (50 mW)

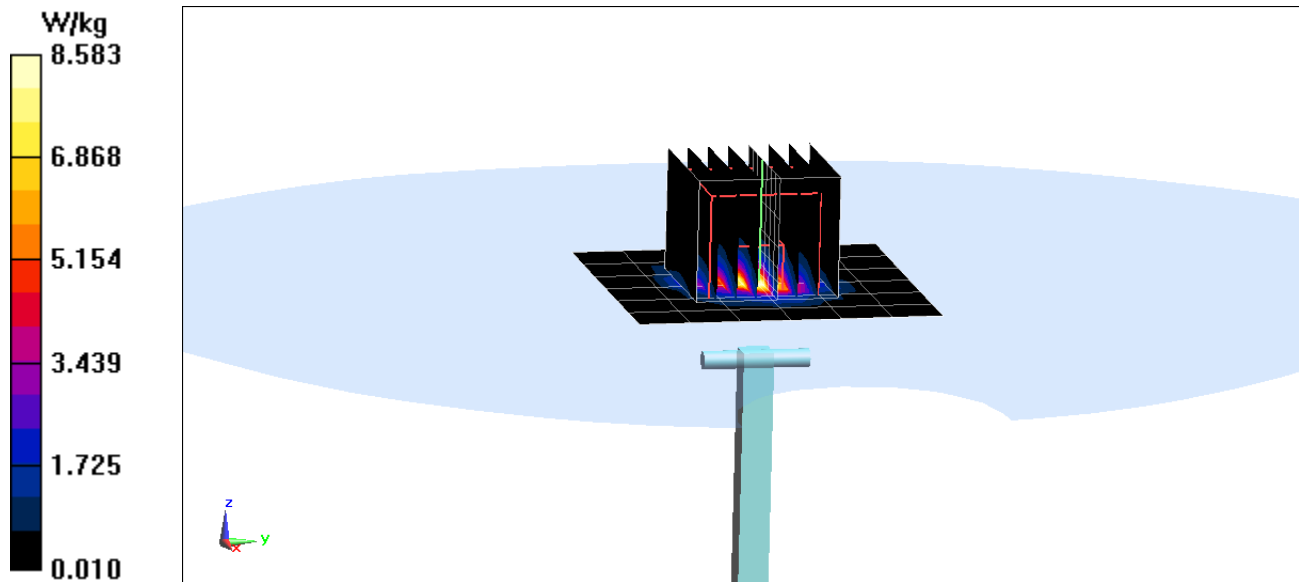
Area Scan (7x7x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Peak SAR (extrapolated) = 15.3 W/kg

SAR(1 g) = 3.570 W/kg

Deviation (1g) = -4.93%



APPENDIX C: PROBE CALIBRATION



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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3022_Aug15**

CALIBRATION CERTIFICATE

Object **ES3DV2 - SN:3022**

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

Calibration date: **August 26, 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)

BN ✓
9/3/2015

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

Calibrated by:	Name Michael Weber	Function Laboratory Technician	Signature <i>M. Weber</i>
Approved by:	Katja Pokovic	Technical Manager	<i>K. Pokovic</i>

Issued: August 27, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).

Probe ES3DV2

SN:3022

Manufactured: April 15, 2003
Calibrated: August 26, 2015

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

DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.00	1.03	0.95	$\pm 10.1 \%$
DCP (mV) ^B	99.9	99.7	100.9	

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	179.6	$\pm 3.3 \%$
		Y	0.0	0.0	1.0		183.9	
		Z	0.0	0.0	1.0		179.0	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	3.60	65.9	14.2	10.00	43.5	$\pm 2.2 \%$
		Y	2.84	63.5	13.0		43.3	
		Z	2.76	63.7	12.7		41.7	
10011-CAB	UMTS-FDD (WCDMA)	X	3.32	67.0	18.7	2.91	144.4	$\pm 0.7 \%$
		Y	3.24	66.3	18.0		147.3	
		Z	3.19	66.3	18.0		143.5	
10012-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.15	69.9	19.5	1.87	146.1	$\pm 0.7 \%$
		Y	2.88	67.7	18.0		147.9	
		Z	2.78	67.4	17.8		145.6	
10013-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.40	71.3	23.8	9.46	144.9	$\pm 3.3 \%$
		Y	11.15	70.5	23.1		146.9	
		Z	10.95	70.5	23.3		140.3	
10021-DAB	GSM-FDD (TDMA, GMSK)	X	20.66	99.8	29.2	9.39	132.6	$\pm 2.2 \%$
		Y	14.36	93.3	26.6		145.3	
		Z	17.17	97.2	27.8		145.4	
10023-DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	17.22	96.5	28.2	9.57	125.4	$\pm 1.9 \%$
		Y	11.06	88.6	25.0		136.0	
		Z	8.71	84.6	23.4		130.7	
10024-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	31.05	99.5	25.9	6.56	135.2	$\pm 2.2 \%$
		Y	25.28	97.4	25.0		132.5	
		Z	21.58	95.7	24.5		144.4	
10027-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	42.88	99.9	24.0	4.80	129.5	$\pm 1.9 \%$
		Y	40.80	99.6	23.7		124.9	
		Z	38.42	99.7	23.7		137.8	
10028-DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	44.48	100.0	23.2	3.55	138.2	$\pm 1.9 \%$
		Y	44.03	99.7	22.8		133.0	
		Z	41.36	99.8	22.8		147.5	
10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	16.08	99.5	23.3	1.16	127.5	$\pm 1.4 \%$
		Y	79.69	99.6	19.3		146.2	
		Z	45.81	99.9	20.4		138.2	
10100-CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.43	67.4	19.8	5.67	138.7	$\pm 1.4 \%$
		Y	6.27	66.8	19.2		134.9	
		Z	6.16	66.6	19.2		127.6	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	10.13	75.0	25.9	9.29	129.4	±3.3 %
		Y	9.46	73.0	24.5		131.8	
		Z	9.52	74.0	25.4		137.0	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.27	66.9	19.7	5.80	137.0	±1.7 %
		Y	6.24	66.7	19.3		140.0	
		Z	6.06	66.3	19.2		127.1	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.16	68.7	21.3	8.07	127.7	±2.2 %
		Y	9.99	68.2	20.9		131.5	
		Z	10.22	69.1	21.4		141.6	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.34	73.4	25.2	9.28	125.0	±3.3 %
		Y	8.92	72.2	24.3		127.2	
		Z	8.95	73.1	25.1		131.9	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.95	66.4	19.4	5.75	134.4	±1.4 %
		Y	5.92	66.2	19.1		137.0	
		Z	5.98	66.7	19.5		146.8	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.39	66.9	19.6	5.82	139.9	±1.7 %
		Y	6.35	66.7	19.3		141.9	
		Z	6.15	66.2	19.2		128.4	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.96	66.6	19.8	5.73	137.3	±1.4 %
		Y	4.85	66.1	19.3		139.8	
		Z	4.85	66.6	19.7		146.7	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	8.75	78.7	28.3	9.21	138.9	±3.0 %
		Y	7.69	75.1	26.1		140.1	
		Z	7.80	76.6	27.2		144.0	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.88	66.2	19.6	5.72	132.0	±1.4 %
		Y	4.77	65.8	19.1		132.6	
		Z	4.83	66.5	19.6		146.0	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.91	66.3	19.7	5.72	131.7	±1.4 %
		Y	4.82	66.0	19.2		138.4	
		Z	4.86	66.7	19.7		145.7	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.04	69.1	21.7	8.10	140.9	±2.2 %
		Y	9.62	67.9	20.8		125.2	
		Z	9.74	68.6	21.3		133.3	
10225-CAB	UMTS-FDD (HSPA+)	X	7.01	67.1	19.6	5.97	143.7	±1.4 %
		Y	6.78	66.2	19.0		129.3	
		Z	6.80	66.7	19.3		136.5	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	8.55	78.0	27.9	9.21	134.6	±3.0 %
		Y	7.79	75.6	26.3		141.6	
		Z	7.89	76.9	27.4		145.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.30	74.8	26.1	9.24	134.8	±3.3 %
		Y	8.65	72.5	24.5		136.4	
		Z	8.33	72.3	24.8		126.6	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	10.20	76.2	26.8	9.30	144.8	±3.3 %
		Y	9.41	73.7	25.1		145.9	
		Z	9.18	73.9	25.6		138.6	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.45	66.7	18.9	3.96	147.0	±0.9 %
		Y	4.21	65.5	17.9		126.5	
		Z	4.36	66.5	18.5		148.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.57	66.3	18.5	3.46	134.3	±0.7 %
		Y	3.48	65.6	17.8		136.8	
		Z	3.51	66.2	18.3		136.4	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.53	66.4	18.6	3.39	135.8	±0.7 %
		Y	3.45	65.8	17.9		140.4	
		Z	3.50	66.5	18.5		137.0	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.18	66.5	19.5	5.81	129.4	±1.4 %
		Y	6.15	66.3	19.1		133.6	
		Z	6.13	66.5	19.3		131.2	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.77	67.2	19.9	6.06	134.8	±1.7 %
		Y	6.81	67.3	19.7		144.8	
		Z	6.68	67.1	19.7		136.7	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.30	69.4	22.0	8.37	142.0	±2.5 %
		Y	9.90	68.2	21.1		126.8	
		Z	10.15	69.3	21.9		142.6	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.72	68.1	18.9	3.76	147.8	±0.7 %
		Y	4.56	67.5	18.2		133.6	
		Z	4.61	68.2	18.7		147.4	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.57	67.8	18.8	3.77	144.3	±0.7 %
		Y	4.43	67.3	18.1		131.3	
		Z	4.57	68.3	18.8		145.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.64	67.9	18.7	1.54	142.1	±0.5 %
		Y	2.36	65.4	16.8		130.3	
		Z	2.50	66.7	17.7		145.0	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.04	69.0	21.7	8.23	138.8	±2.2 %
		Y	9.71	68.0	20.9		125.6	
		Z	9.94	69.0	21.6		140.4	

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

^A The uncertainties of Norm X,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 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: ES3DV2 - SN:3022

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
750	41.9	0.89	6.33	6.33	6.33	0.46	1.43	± 12.0 %
835	41.5	0.90	6.11	6.11	6.11	0.24	2.08	± 12.0 %
1750	40.1	1.37	5.08	5.08	5.08	0.45	1.47	± 12.0 %
1900	40.0	1.40	4.93	4.93	4.93	0.59	1.25	± 12.0 %
2300	39.5	1.67	4.63	4.63	4.63	0.55	1.39	± 12.0 %
2450	39.2	1.80	4.30	4.30	4.30	0.51	1.47	± 12.0 %
2600	39.0	1.96	4.12	4.12	4.12	0.57	1.46	± 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: ES3DV2 - SN:3022

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
750	55.5	0.96	6.16	6.16	6.16	0.50	1.34	± 12.0 %
835	55.2	0.97	6.13	6.13	6.13	0.25	2.16	± 12.0 %
1750	53.4	1.49	4.79	4.79	4.79	0.61	1.33	± 12.0 %
1900	53.3	1.52	4.56	4.56	4.56	0.31	2.02	± 12.0 %
2300	52.9	1.81	4.32	4.32	4.32	0.79	1.19	± 12.0 %
2450	52.7	1.95	4.08	4.08	4.08	0.80	1.12	± 12.0 %
2600	52.5	2.16	3.96	3.96	3.96	0.80	1.10	± 12.0 %

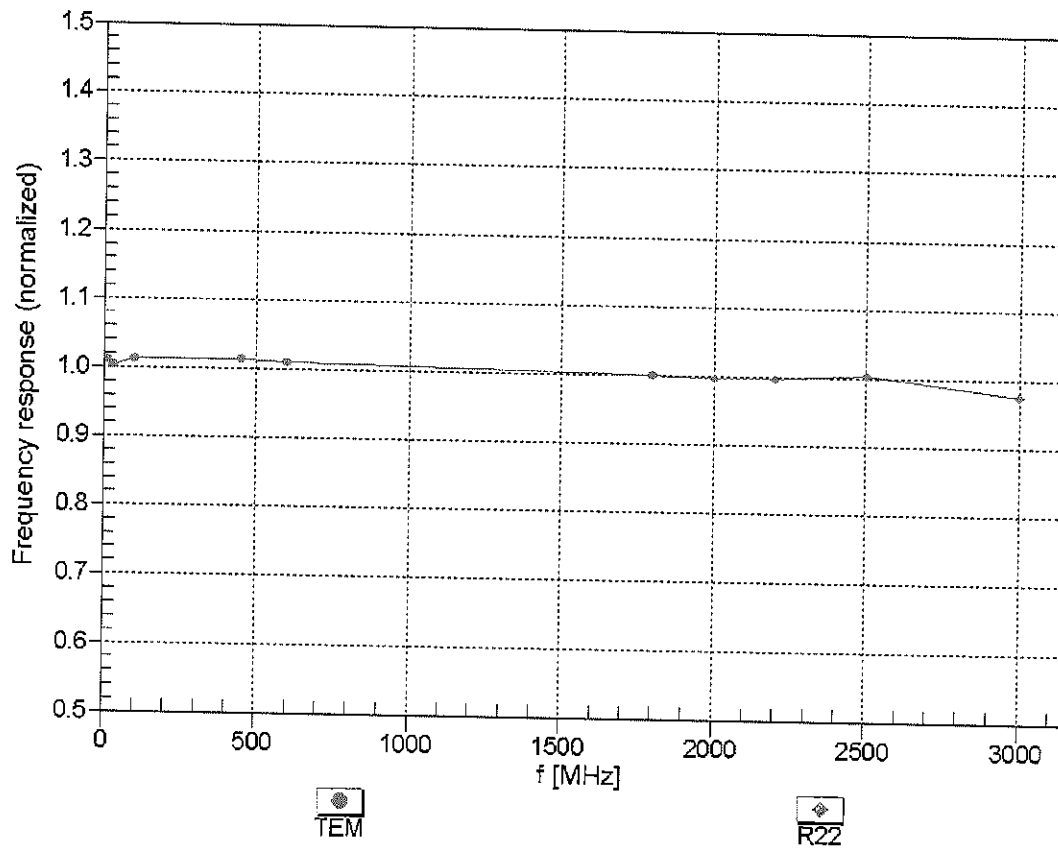
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is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

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

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

Frequency Response of E-Field

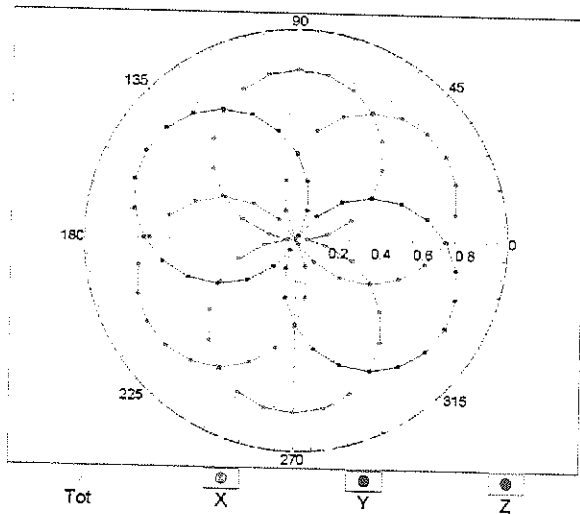
(TEM-Cell: ifi110 EXX, Waveguide: R22)



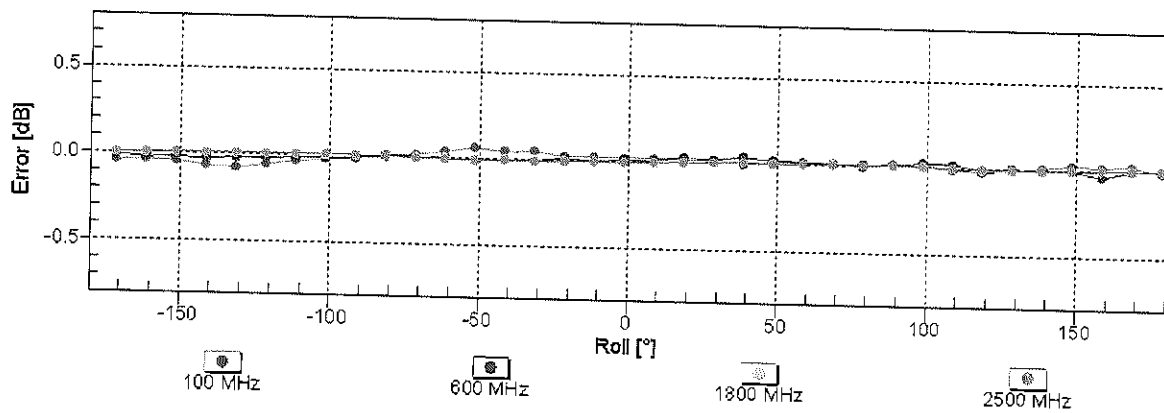
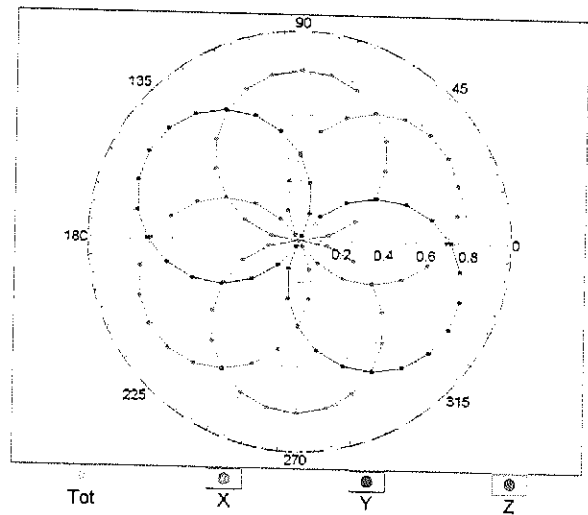
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz, TEM

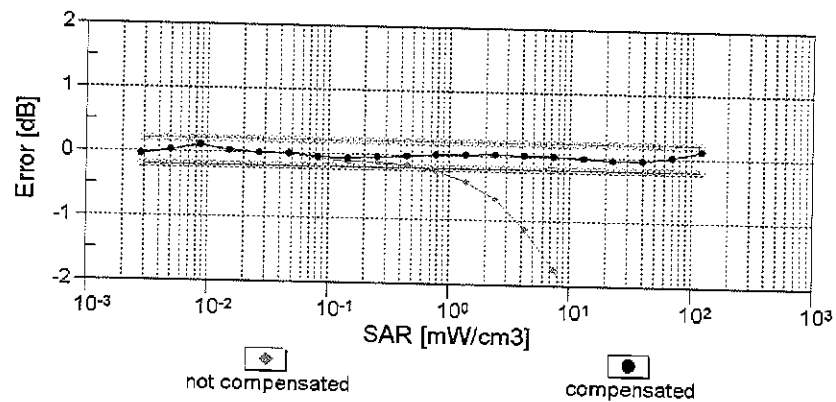
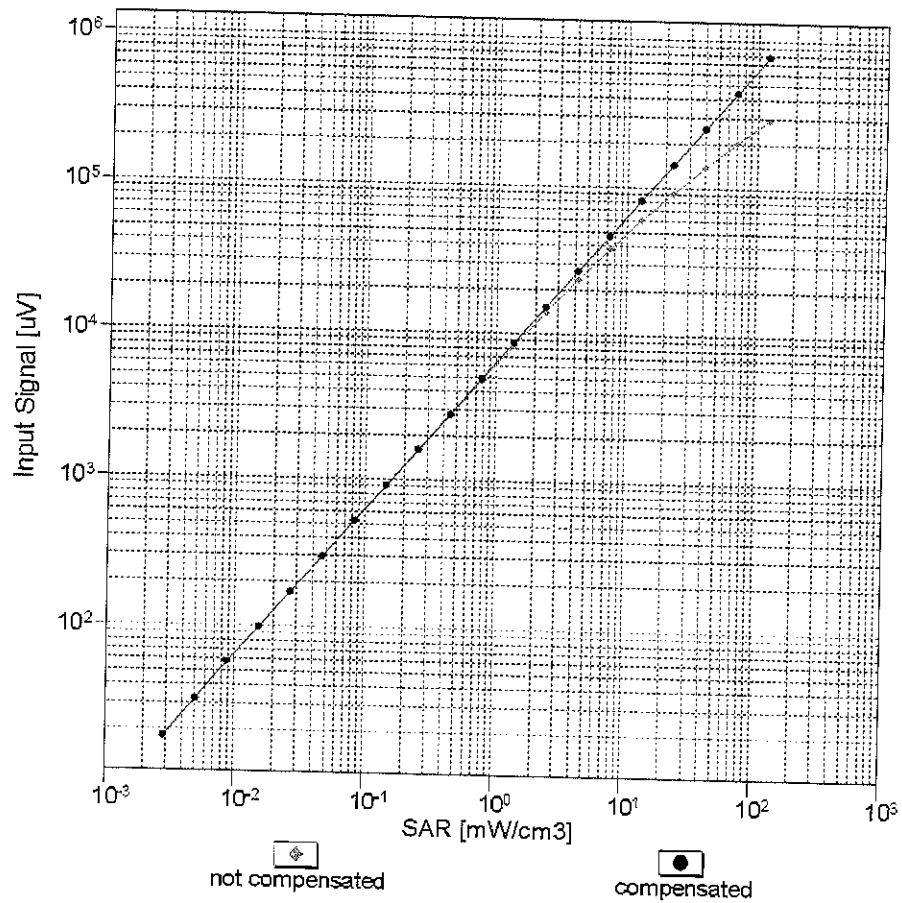


f=1800 MHz, R22



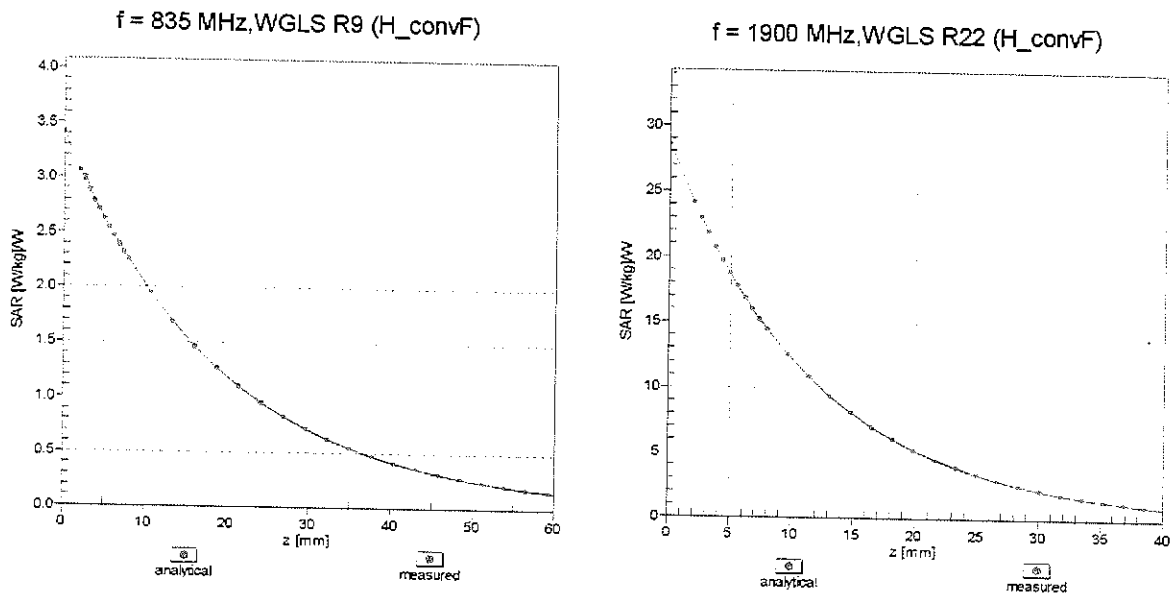
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



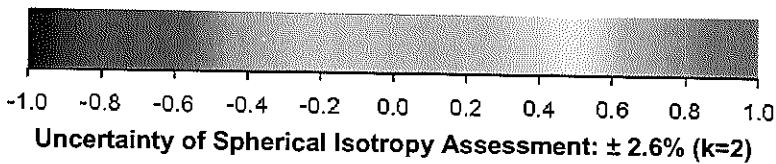
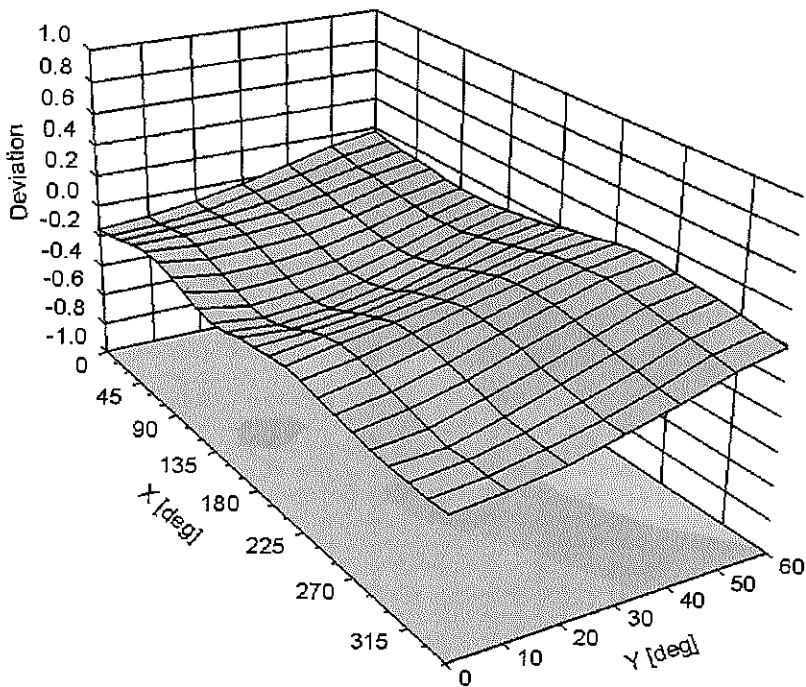
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), f = 900 MHz



DASY/EASY - Parameters of Probe: ES3DV2 - SN:3022

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	98.5
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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

Client **PC Test**

Certificate No: **ES3-3333_Oct15**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3333**

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

*DN ✓
14/03/15*

Calibration date: **October 29, 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 $(22 \pm 3)^{\circ}\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter 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-15)	In house check: Oct-16

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

Issued: October 29, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Accreditation No.: **SCS 0108**

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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865604, "SAR Measurement Requirements for 100 MHz to 6 GHz"

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\theta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- 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
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).

Probe ES3DV3

SN:3333

Manufactured: January 24, 2012
Calibrated: October 29, 2015

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.07	0.90	0.88	$\pm 10.1 \%$
DCP (mV) ^B	106.8	108.5	106.8	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	201.0	$\pm 3.5 \%$
		Y	0.0	0.0	1.0		187.1	
		Z	0.0	0.0	1.0		184.8	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	2.43	80.7	11.4	10.00	41.6	$\pm 2.2 \%$
		Y	4.35	67.4	13.2		35.6	
		Z	1.46	57.0	8.7		36.2	
10011- CAB	UMTS-FDD (WCDMA)	X	3.35	67.9	19.1	2.91	138.2	$\pm 0.5 \%$
		Y	3.48	68.8	19.2		127.5	
		Z	3.37	67.6	18.6		149.0	
10012- CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	3.80	72.8	20.8	1.87	141.0	$\pm 0.7 \%$
		Y	3.68	73.3	20.8		128.0	
		Z	3.01	69.3	18.8		128.2	
10013- CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	11.52	71.7	23.9	9.46	139.3	$\pm 3.0 \%$
		Y	10.94	70.4	22.9		147.1	
		Z	10.95	70.8	23.4		144.5	
10021- DAB	GSM-FDD (TDMA, GMSK)	X	21.45	95.2	26.5	9.39	139.9	$\pm 2.5 \%$
		Y	9.12	82.9	21.9		142.0	
		Z	11.47	88.1	23.9		127.6	
10023- DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	20.81	95.6	27.0	9.57	135.8	$\pm 2.2 \%$
		Y	9.78	84.4	22.7		135.3	
		Z	9.12	83.5	22.1		144.6	
10024- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	39.84	99.8	25.2	6.56	140.9	$\pm 1.9 \%$
		Y	35.07	100.0	25.0		128.4	
		Z	35.20	99.8	24.7		131.9	
10027- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	47.16	99.8	23.9	4.80	124.9	$\pm 2.5 \%$
		Y	49.75	99.6	22.8		145.4	
		Z	45.37	99.9	23.1		148.5	
10028- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	56.24	99.6	22.6	3.55	140.4	$\pm 2.7 \%$
		Y	56.95	99.7	21.9		129.1	
		Z	48.45	99.6	22.1		133.2	
10032- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	18.03	98.1	22.8	1.16	127.5	$\pm 1.9 \%$
		Y	35.17	99.6	20.7		141.1	
		Z	21.08	99.9	21.9		127.5	
10100- CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.36	87.6	19.8	5.67	137.5	$\pm 1.2 \%$
		Y	6.29	87.4	19.6		128.9	
		Z	6.35	87.5	19.7		139.5	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	10.85	76.6	28.4	9.29	130.8	±2.7 %
		Y	9.58	73.7	24.8		143.0	
		Z	9.94	75.6	26.2		149.3	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	8.21	67.0	19.7	5.80	128.9	±1.2 %
		Y	6.16	66.9	19.5		129.2	
		Z	6.22	67.2	19.7		138.0	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.05	68.7	21.2	8.07	126.1	±2.5 %
		Y	10.13	69.0	21.3		146.1	
		Z	9.97	68.7	21.1		126.2	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	10.11	75.5	26.0	9.28	125.8	±3.3 %
		Y	9.08	73.2	24.7		138.2	
		Z	9.32	74.8	26.0		143.1	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.97	66.8	19.6	5.75	133.4	±1.2 %
		Y	5.92	66.7	19.5		127.0	
		Z	5.91	68.7	19.5		134.2	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.40	67.3	19.9	5.82	137.8	±1.2 %
		Y	6.31	67.1	19.6		130.7	
		Z	6.32	67.1	19.8		139.8	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	5.05	67.3	20.1	5.73	136.8	±1.2 %
		Y	4.89	67.0	19.9		131.1	
		Z	4.93	67.2	20.0		137.4	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	10.74	83.9	30.3	9.21	136.8	±2.7 %
		Y	7.34	74.3	25.5		125.9	
		Z	7.74	76.6	27.1		131.2	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.97	66.9	19.9	5.72	130.8	±1.2 %
		Y	4.86	66.9	19.8		128.5	
		Z	4.97	67.3	20.1		137.0	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.99	67.0	19.9	5.72	130.1	±1.2 %
		Y	4.88	67.0	19.9		127.6	
		Z	4.95	67.2	20.0		136.2	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.00	69.2	21.7	8.10	137.9	±2.2 %
		Y	9.75	68.7	21.2		137.5	
		Z	9.94	69.4	21.7		145.3	
10225-CAB	UMTS-FDD (HSPA+)	X	7.08	67.5	19.8	5.97	147.1	±1.4 %
		Y	7.06	67.7	19.8		142.3	
		Z	7.04	67.7	19.9		148.8	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	10.66	83.5	30.1	9.21	144.0	±3.0 %
		Y	7.43	74.7	25.7		127.6	
		Z	7.86	77.1	27.4		132.3	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	10.81	78.7	27.9	9.24	139.7	±3.0 %
		Y	8.48	72.4	24.4		130.1	
		Z	8.71	74.1	25.8		135.2	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	11.73	79.9	28.3	9.30	148.6	±3.3 %
		Y	9.11	73.2	24.8		139.0	
		Z	9.38	74.9	26.1		142.7	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.52	67.6	19.3	3.96	144.5	±0.7 %
		Y	4.67	68.3	19.6		146.0	
		Z	4.41	67.0	18.9		130.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.66	67.2	19.0	3.46	134.5	±0.5 %
		Y	3.91	68.9	19.9		133.2	
		Z	3.86	68.5	19.6		146.9	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.63	67.5	19.1	3.39	134.9	±0.5 %
		Y	3.93	69.3	20.0		136.0	
		Z	3.81	68.5	19.6		148.6	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.20	67.1	19.7	5.81	129.0	±1.2 %
		Y	6.20	67.0	19.6		128.0	
		Z	6.32	67.5	19.9		142.7	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.76	67.6	20.0	6.06	134.7	±1.4 %
		Y	6.75	67.5	19.9		133.5	
		Z	6.90	68.1	20.3		149.2	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.30	69.7	22.1	8.37	140.1	±2.5 %
		Y	10.05	69.0	21.5		141.2	
		Z	9.94	69.0	21.7		126.3	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.80	68.5	19.0	3.76	129.3	±0.5 %
		Y	5.30	71.1	20.2		148.4	
		Z	5.10	70.4	19.9		135.2	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.77	68.8	19.2	3.77	127.3	±0.7 %
		Y	5.35	71.7	20.5		145.4	
		Z	5.03	70.6	20.1		133.3	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.77	69.7	19.7	1.54	147.0	±0.7 %
		Y	3.73	75.4	22.2		143.7	
		Z	3.25	72.2	20.7		133.9	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 8 Mbps, 99pc duty cycle)	X	10.11	69.4	21.8	8.23	144.7	±2.5 %
		Y	9.86	68.8	21.4		139.3	
		Z	9.72	68.6	21.3		126.0	

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

^A The uncertainties of Norm X,Y,Z do not affect the E^2 -field uncertainty inside TSL (see Pages 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:3333

Calibration Parameter Determined In Head Tissue Simulating Media

f (MHz) ^c	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
750	41.9	0.89	6.46	6.46	6.46	0.75	1.22	± 12.0 %
835	41.5	0.90	6.16	6.16	6.16	0.36	1.67	± 12.0 %
1750	40.1	1.37	5.21	5.21	5.21	0.80	1.19	± 12.0 %
1900	40.0	1.40	5.03	5.03	5.03	0.73	1.25	± 12.0 %
2300	39.5	1.67	4.73	4.73	4.73	0.60	1.43	± 12.0 %
2450	39.2	1.80	4.53	4.53	4.53	0.80	1.28	± 12.0 %
2600	39.0	1.96	4.39	4.39	4.39	0.80	1.29	± 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:3333

Calibration Parameter Determined in Body Tissue Simulating Media

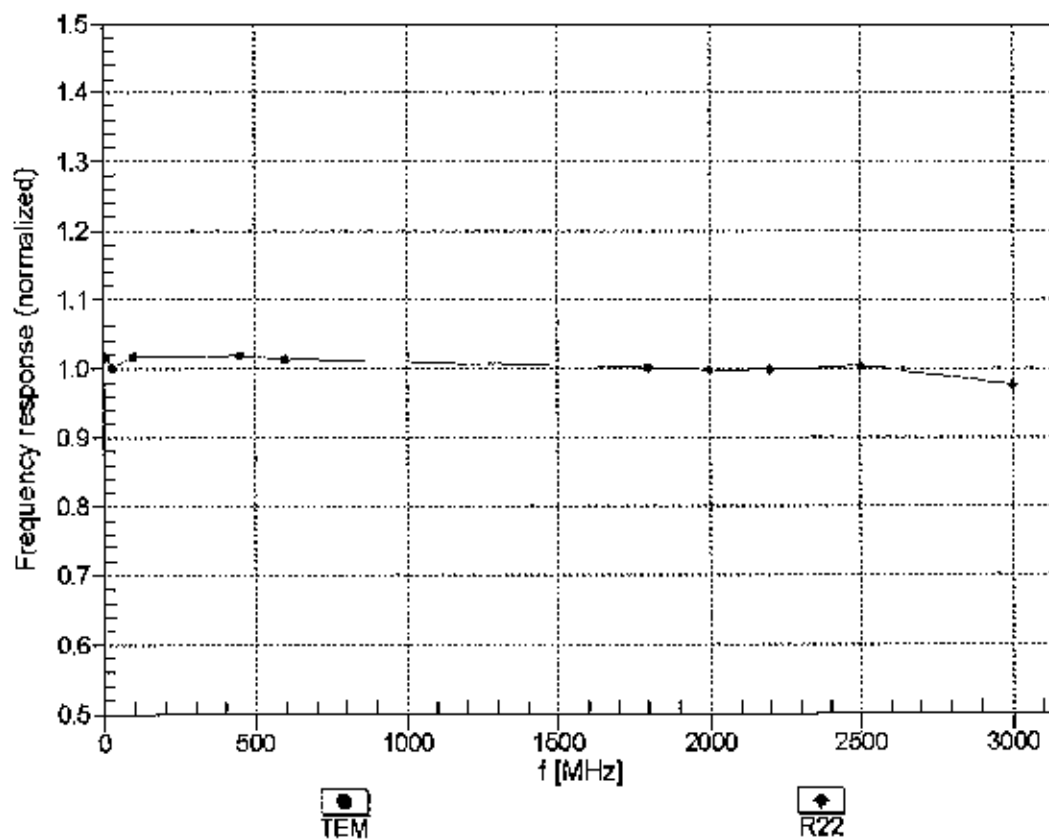
f (MHz) ^c	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^g	Depth ^g (mm)	Unc (k=2)
750	55.5	0.98	6.31	6.31	6.31	0.70	1.26	± 12.0 %
835	55.2	0.97	6.25	6.25	6.25	0.47	1.54	± 12.0 %
1750	53.4	1.49	4.90	4.90	4.90	0.49	1.63	± 12.0 %
1900	53.3	1.52	4.70	4.70	4.70	0.54	1.49	± 12.0 %
2300	52.9	1.81	4.51	4.51	4.51	0.80	1.15	± 12.0 %
2450	52.7	1.95	4.34	4.34	4.34	0.80	1.15	± 12.0 %
2600	52.5	2.16	4.23	4.23	4.23	0.80	1.03	± 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, 160 and 220 MHz respectively. Above 5 GHz frequency validity can be extended to ± 110 MHz.

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

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

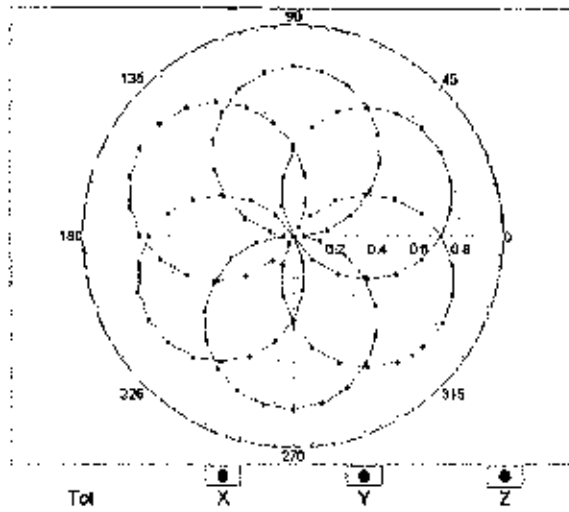
Frequency Response of E-Field (TEM-Cell:ifi110 EXX, Waveguide: R22)



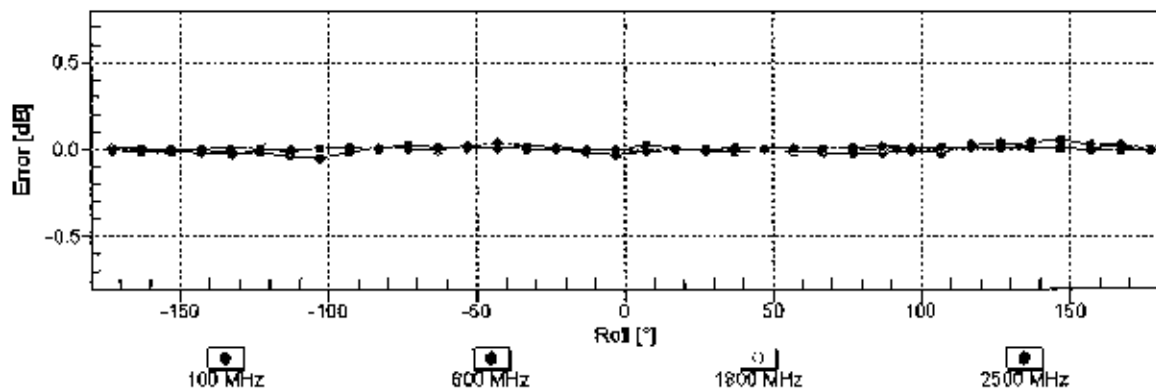
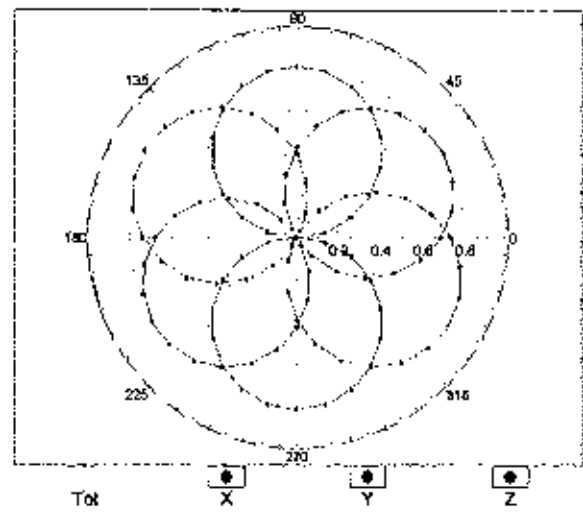
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz,TEM

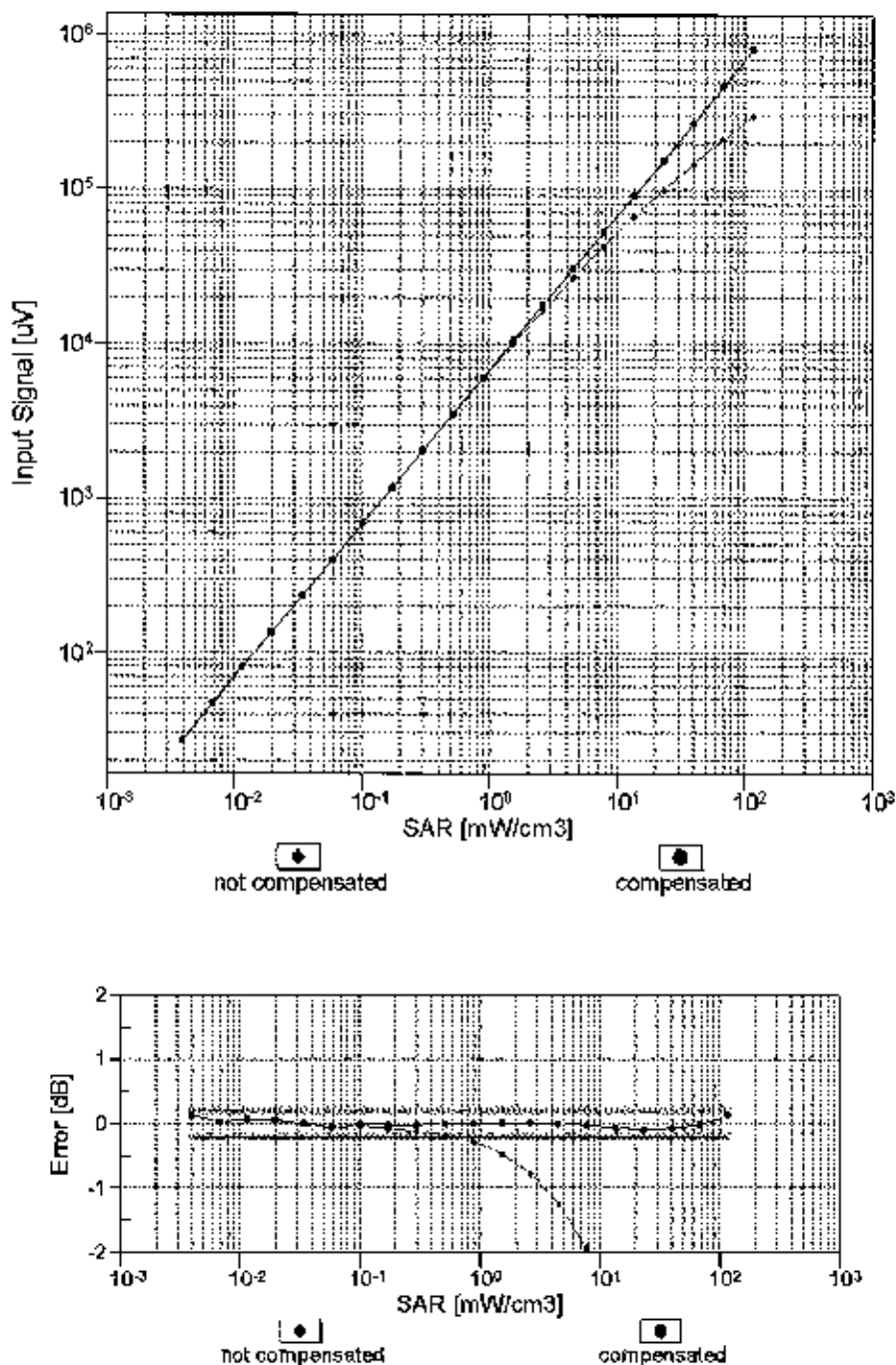


f=1800 MHz,R22



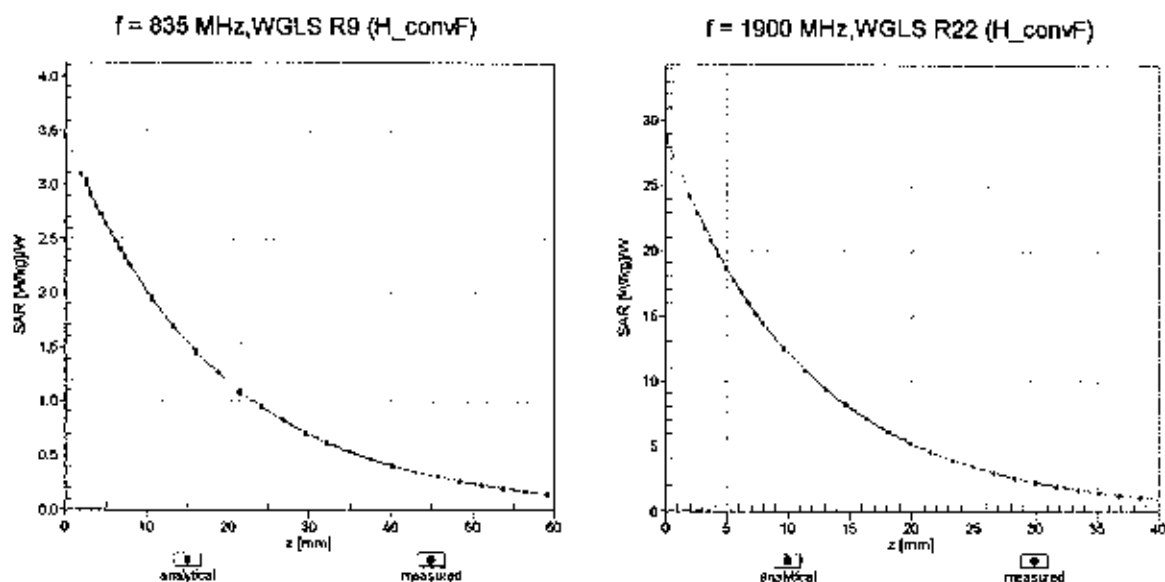
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



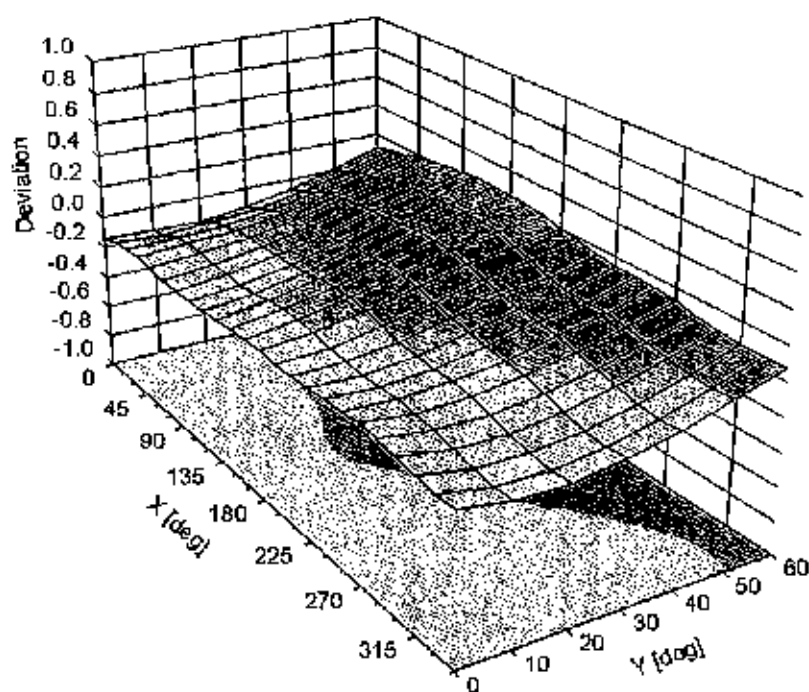
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3333**Other Probe Parameters**

Sensor Arrangement	Triangular
Connector Angle (°)	-32.8
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



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: **ES3-3209_Mar15**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3209**

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

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

Issued: March 19, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

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

Probe ES3DV3

SN:3209

Manufactured: October 14, 2008
Calibrated: March 19, 2015

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu V/(V/m)^2$) ^A	1.35	1.33	1.14	± 10.1 %
DCP (mV) ^B	102.0	100.9	103.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu V}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	214.5	±3.5 %
		Y	0.0	0.0	1.0		192.6	
		Z	0.0	0.0	1.0		199.1	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	2.61	65.1	12.2	10.00	42.3	±1.7 %
		Y	1.39	57.8	8.9		42.7	
		Z	4.57	70.3	14.0		38.3	
10011- CAB	UMTS-FDD (WCDMA)	X	3.12	66.3	18.1	2.91	130.3	±0.7 %
		Y	3.08	65.6	17.5		132.2	
		Z	3.32	67.7	19.0		137.6	
10012- CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	2.54	66.8	17.8	1.87	131.1	±0.7 %
		Y	2.67	67.1	17.7		131.6	
		Z	2.85	69.2	19.1		138.0	
10013- CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	10.78	70.5	23.4	9.46	146.9	±2.7 %
		Y	10.39	69.2	22.5		123.5	
		Z	10.50	69.9	23.1		128.4	
10021- DAB	GSM-FDD (TDMA, GMSK)	X	3.65	74.2	17.7	9.39	130.0	±1.9 %
		Y	6.62	83.5	22.0		149.4	
		Z	4.25	76.8	19.2		136.2	
10023- DAB	GPRS-FDD (TDMA, GMSK, TN 0)	X	3.95	75.3	18.4	9.57	138.8	±2.5 %
		Y	4.99	78.2	19.8		143.3	
		Z	4.11	75.8	18.9		129.3	
10024- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	6.44	80.3	17.7	6.56	135.0	±1.7 %
		Y	3.76	73.7	16.0		144.2	
		Z	11.61	88.5	20.7		148.0	
10027- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	43.77	99.9	21.8	4.80	131.8	±1.7 %
		Y	13.95	87.5	19.0		142.7	
		Z	39.96	99.9	22.1		145.6	
10028- DAB	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	62.88	99.8	20.4	3.55	144.5	±2.2 %
		Y	2.45	70.4	12.9		130.3	
		Z	80.83	99.9	19.9		135.1	
10032- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	0.32	58.4	4.3	1.16	144.1	±1.9 %
		Y	16.25	79.9	12.1		129.5	
		Z	95.90	91.1	14.4		134.6	
10100- CAB	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	6.32	67.4	19.8	5.67	138.3	±1.4 %
		Y	6.35	67.3	19.5		144.4	
		Z	6.20	67.1	19.6		127.7	

10103-CAB	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	8.72	73.1	25.3	9.29	138.6	±2.7 %
		Y	8.88	72.9	24.9		147.9	
		Z	8.48	72.3	24.9		127.4	
10108-CAC	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	6.14	66.9	19.6	5.80	136.2	±1.7 %
		Y	6.20	66.8	19.4		142.8	
		Z	6.10	66.8	19.6		126.2	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.05	68.9	21.4	8.07	126.8	±2.2 %
		Y	9.98	68.5	21.1		132.4	
		Z	10.23	69.4	21.7		140.4	
10151-CAB	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	8.16	72.2	25.0	9.28	133.6	±2.7 %
		Y	8.33	72.0	24.5		142.6	
		Z	8.40	73.1	25.6		147.5	
10154-CAC	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	5.83	66.5	19.4	5.75	133.1	±1.4 %
		Y	5.89	66.3	19.2		139.3	
		Z	6.00	67.2	19.9		146.5	
10160-CAB	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	6.26	66.9	19.6	5.82	138.8	±1.7 %
		Y	6.34	67.0	19.5		145.1	
		Z	6.22	66.9	19.7		128.8	
10169-CAB	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.77	66.7	19.8	5.73	135.9	±1.4 %
		Y	4.89	66.6	19.5		141.8	
		Z	4.85	66.8	19.9		128.3	
10172-CAB	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	6.77	75.0	26.9	9.21	144.2	±2.5 %
		Y	6.56	72.6	25.2		131.1	
		Z	6.68	74.0	26.4		137.1	
10175-CAC	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.80	66.9	19.9	5.72	135.2	±1.4 %
		Y	4.87	66.5	19.5		140.6	
		Z	5.03	67.7	20.4		149.4	
10181-CAB	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.77	66.7	19.8	5.72	134.7	±1.2 %
		Y	4.88	66.5	19.5		140.6	
		Z	4.84	66.8	19.9		127.8	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	9.97	69.5	21.9	8.10	145.2	±2.2 %
		Y	9.60	68.2	21.0		125.1	
		Z	9.80	69.1	21.7		133.9	
10225-CAB	UMTS-FDD (HSPA+)	X	6.95	67.5	19.8	5.97	147.3	±1.4 %
		Y	6.73	66.4	19.1		128.7	
		Z	6.89	67.4	19.8		137.2	
10237-CAB	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	6.85	75.4	27.2	9.21	146.0	±2.5 %
		Y	6.54	72.5	25.1		131.6	
		Z	6.76	74.4	26.6		138.2	
10252-CAB	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	7.58	71.3	24.6	9.24	126.6	±2.5 %
		Y	7.73	71.1	24.2		133.3	
		Z	7.82	72.4	25.3		139.0	
10267-CAB	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	8.18	72.2	25.1	9.30	133.6	±2.7 %
		Y	8.35	72.0	24.6		141.1	
		Z	8.42	73.2	25.6		147.0	

10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	4.22	66.1	18.4	3.96	128.8	±0.9 %
		Y	4.24	65.9	18.1		133.8	
		Z	4.39	67.1	19.0		141.7	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	3.51	66.7	18.6	3.46	140.9	±0.7 %
		Y	3.52	66.2	18.1		143.4	
		Z	3.58	67.2	19.0		131.7	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	3.45	66.7	18.5	3.39	142.0	±0.7 %
		Y	3.50	66.4	18.2		146.9	
		Z	3.61	67.8	19.3		132.2	
10297-AAA	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	6.15	66.9	19.6	5.81	136.3	±1.4 %
		Y	6.20	66.8	19.4		140.3	
		Z	6.11	66.8	19.6		126.6	
10311-AAA	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	6.80	67.8	20.1	6.06	143.2	±1.7 %
		Y	6.80	67.5	19.9		147.4	
		Z	6.71	67.6	20.1		131.9	
10400-AAB	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.31	70.0	22.4	8.37	147.9	±3.0 %
		Y	9.88	68.5	21.3		127.2	
		Z	10.13	69.5	22.1		135.8	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	4.60	68.6	18.9	3.76	128.2	±0.5 %
		Y	4.58	67.9	18.4		134.2	
		Z	4.86	69.6	19.5		142.6	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	4.57	68.9	19.1	3.77	149.7	±0.5 %
		Y	4.51	68.0	18.5		132.3	
		Z	4.78	69.6	19.5		140.3	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	2.47	67.0	17.9	1.54	128.1	±0.7 %
		Y	2.46	66.4	17.4		132.5	
		Z	2.72	69.1	19.2		140.6	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	10.12	69.7	22.1	8.23	146.8	±2.7 %
		Y	9.66	68.2	21.1		125.0	
		Z	9.91	69.2	21.8		134.3	

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:3209

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	6.34	6.34	6.34	0.29	2.02	± 12.0 %
835	41.5	0.90	6.04	6.04	6.04	0.23	2.57	± 12.0 %
1750	40.1	1.37	5.23	5.23	5.23	0.80	1.08	± 12.0 %
1900	40.0	1.40	5.05	5.05	5.05	0.10	2.40	± 12.0 %
2300	39.5	1.67	4.76	4.76	4.76	0.70	1.27	± 12.0 %
2450	39.2	1.80	4.53	4.53	4.53	0.80	1.22	± 12.0 %
2600	39.0	1.96	4.36	4.36	4.36	0.75	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:3209

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	6.12	6.12	6.12	0.34	1.81	± 12.0 %
835	55.2	0.97	6.07	6.07	6.07	0.37	1.79	± 12.0 %
1750	53.4	1.49	4.86	4.86	4.86	0.67	1.43	± 12.0 %
1900	53.3	1.52	4.57	4.57	4.57	0.57	1.53	± 12.0 %
2300	52.9	1.81	4.28	4.28	4.28	0.80	1.19	± 12.0 %
2450	52.7	1.95	4.12	4.12	4.12	0.72	1.15	± 12.0 %
2600	52.5	2.16	3.92	3.92	3.92	0.80	1.10	± 12.0 %

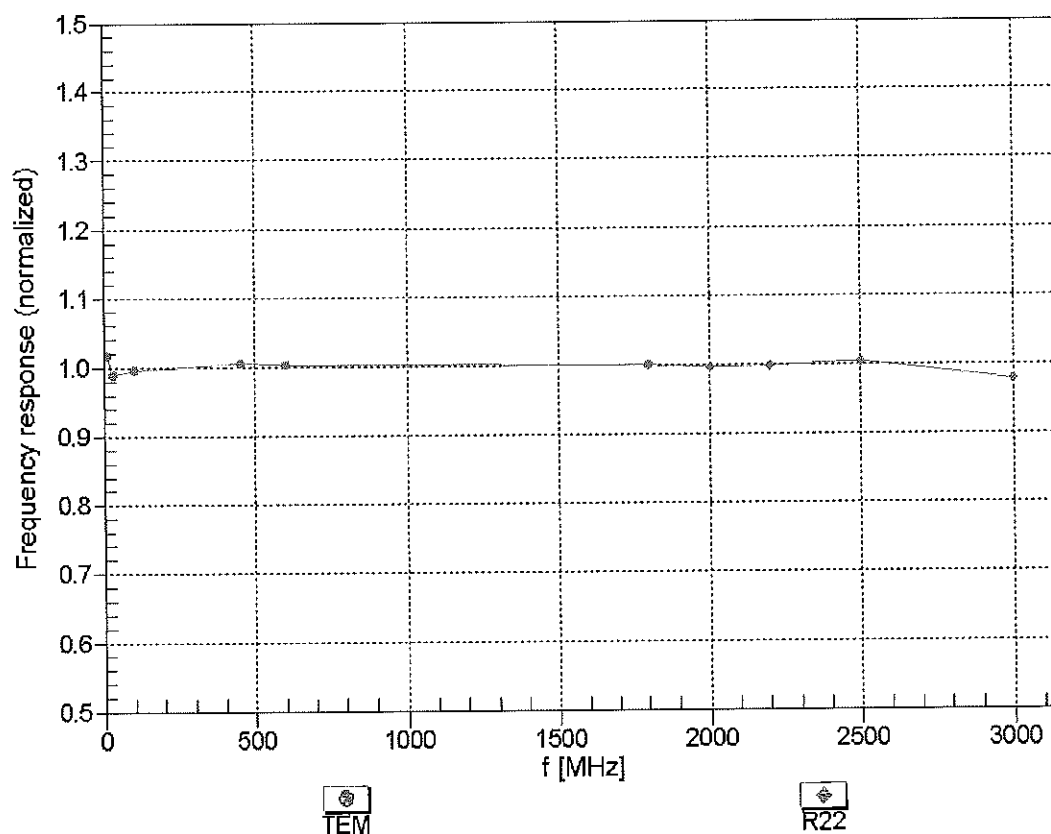
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is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

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

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

Frequency Response of E-Field

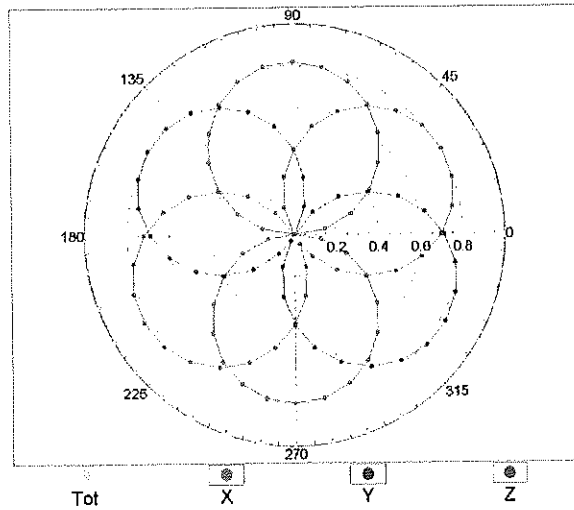
(TEM-Cell:ifi110 EXX, Waveguide: R22)



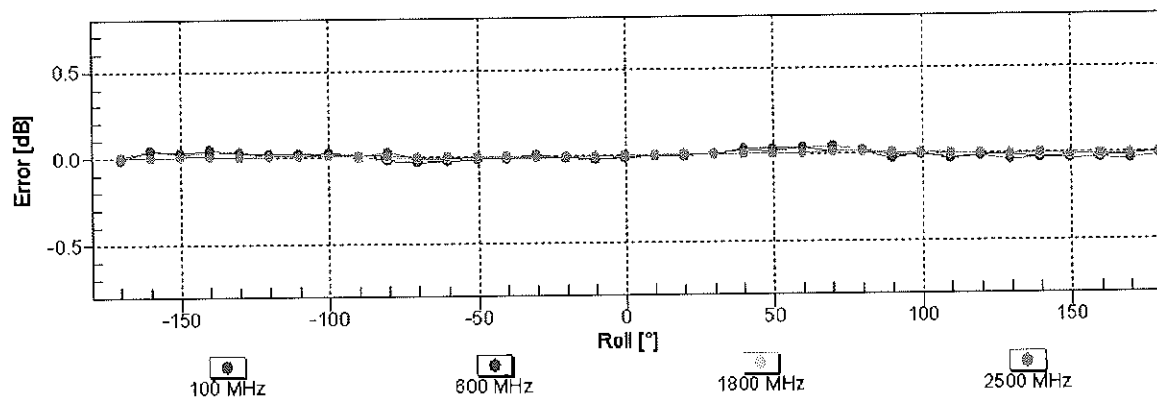
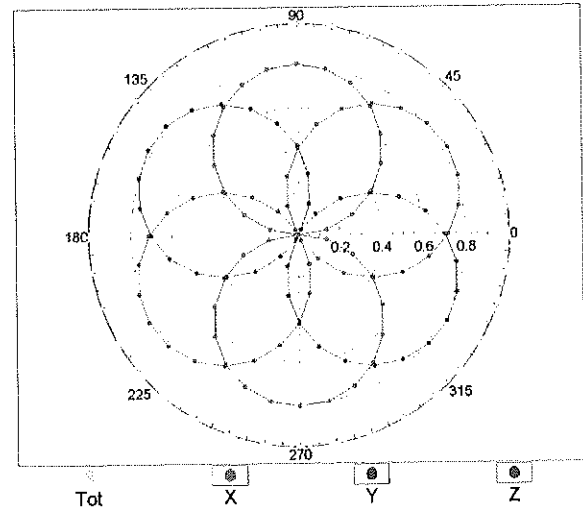
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz,TEM

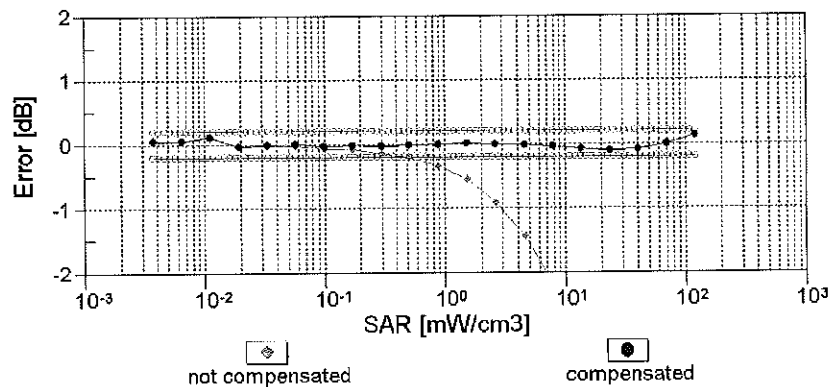
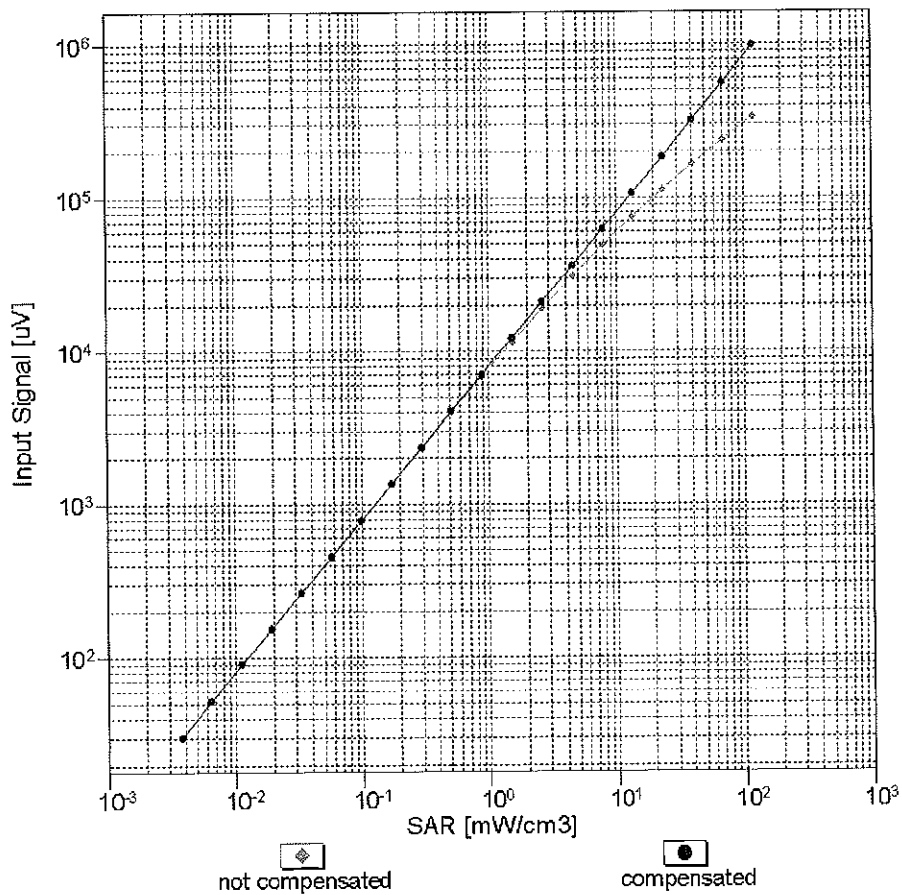


f=1800 MHz,R22



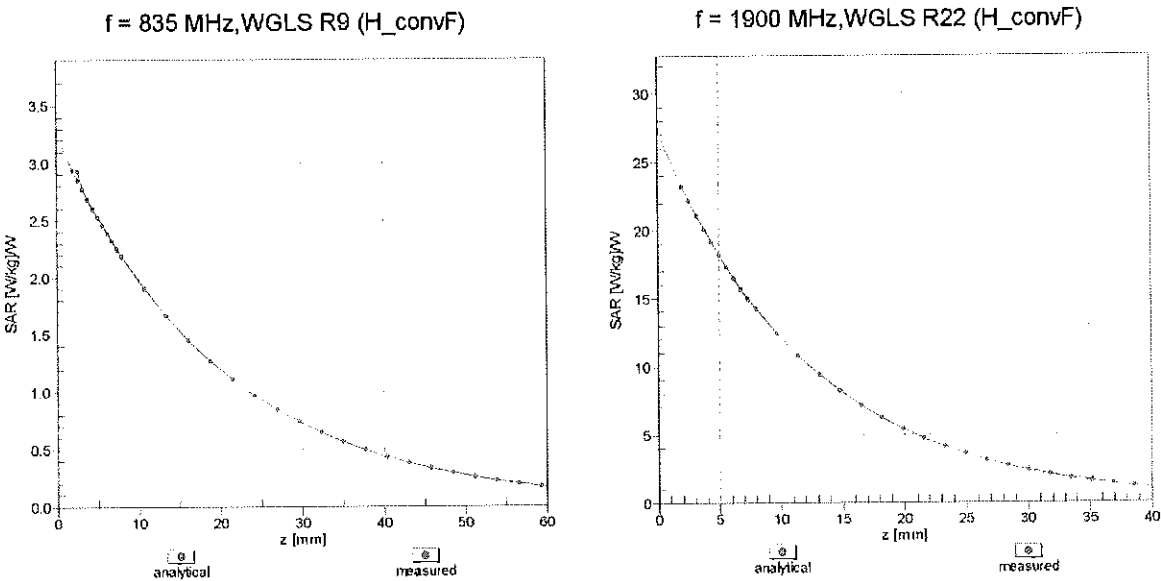
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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

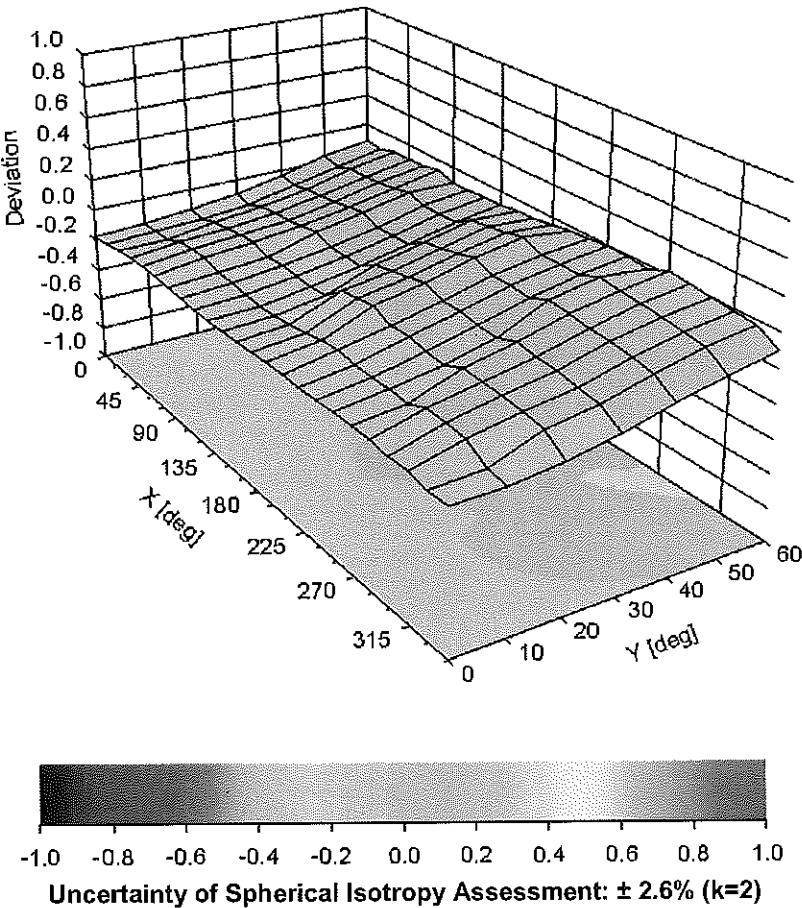


Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid Error (ϕ , θ), f = 900 MHz



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3209

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	-40.3
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



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

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

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

Issued: March 19, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Accreditation No.: **SCS 0108**

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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

- NORM_{x,y,z}**: Assessed for E-field polarization $\vartheta = 0$ ($f \leq 900$ MHz in TEM-cell; $f > 1800$ MHz: R22 waveguide). NORM_{x,y,z} are only intermediate values, i.e., the uncertainties of NORM_{x,y,z} does not affect the E²-field uncertainty inside TSL (see below ConvF).
- NORM(f)_{x,y,z}** = NORM_{x,y,z} * frequency_response (see Frequency Response Chart). This linearization is implemented in DASY4 software versions later than 4.2. The uncertainty of the frequency response is included in the stated uncertainty of ConvF.
- DCP_{x,y,z}**: DCP are numerical linearization parameters assessed based on the data of power sweep with CW signal (no uncertainty required). DCP does not depend on frequency nor media.
- PAR**: PAR is the Peak to Average Ratio that is not calibrated but determined based on the signal characteristics
- A_{x,y,z}; B_{x,y,z}; C_{x,y,z}; D_{x,y,z}; VR_{x,y,z}**: A, B, C, D are numerical linearization parameters assessed based on the data of power sweep for specific modulation signal. The parameters do not depend on frequency nor media. VR is the maximum calibration range expressed in RMS voltage across the diode.
- ConvF and Boundary Effect Parameters**: Assessed in flat phantom using E-field (or Temperature Transfer Standard for $f \leq 800$ MHz) and inside waveguide using analytical field distributions based on power measurements for $f > 800$ MHz. The same setups are used for assessment of the parameters applied for boundary compensation (alpha, depth) of which typical uncertainty values are given. These parameters are used in DASY4 software to improve probe accuracy close to the boundary. The sensitivity in TSL corresponds to NORM_{x,y,z} * ConvF whereby the uncertainty corresponds to that given for ConvF. A frequency dependent ConvF is used in DASY version 4.4 and higher which allows extending the validity from ± 50 MHz to ± 100 MHz.
- Spherical isotropy (3D deviation from isotropy)**: in a field of low gradients realized using a flat phantom exposed by a patch antenna.
- Sensor Offset**: The sensor offset corresponds to the offset of virtual measurement center from the probe tip (on probe axis). No tolerance required.
- Connector Angle**: The angle is assessed using the information gained by determining the NORM_x (no uncertainty required).

Probe 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 $\sqrt{\mu V}$	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

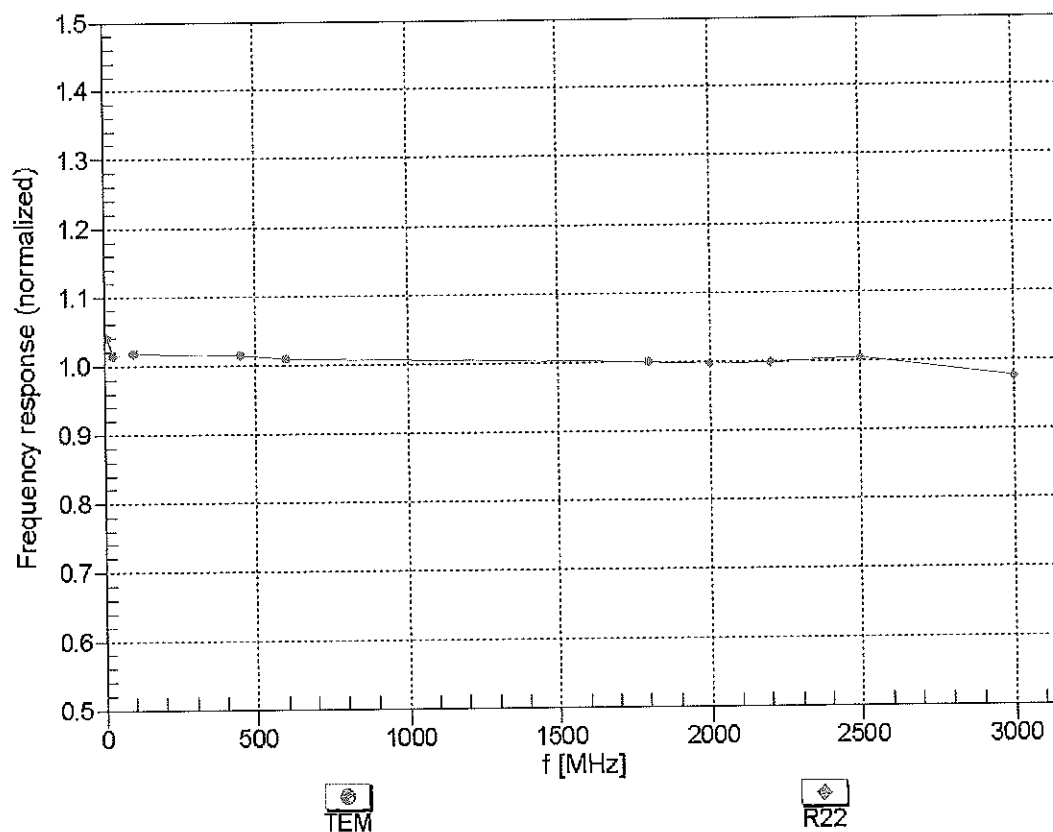
f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth (mm) ^G	Unct. (k=2)
750	55.5	0.96	6.10	6.10	6.10	0.34	1.80	± 12.0 %
835	55.2	0.97	6.07	6.07	6.07	0.47	1.56	± 12.0 %
1750	53.4	1.49	4.83	4.83	4.83	0.70	1.36	± 12.0 %
1900	53.3	1.52	4.53	4.53	4.53	0.71	1.39	± 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)

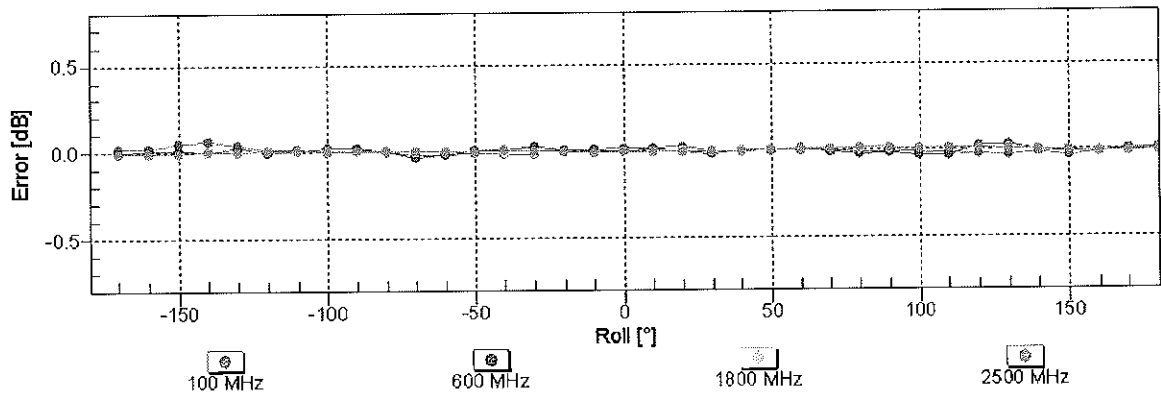
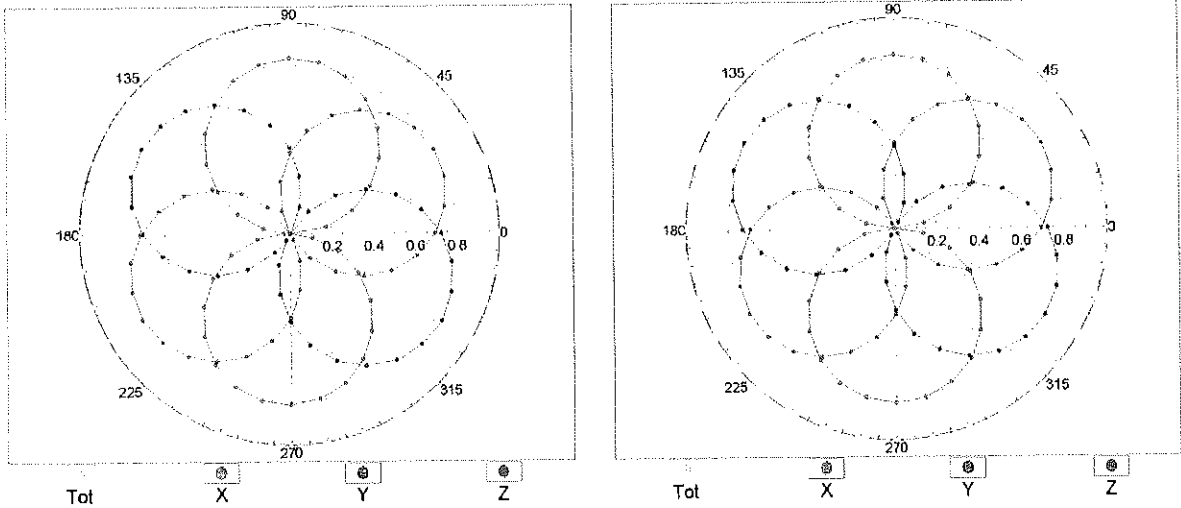


Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$

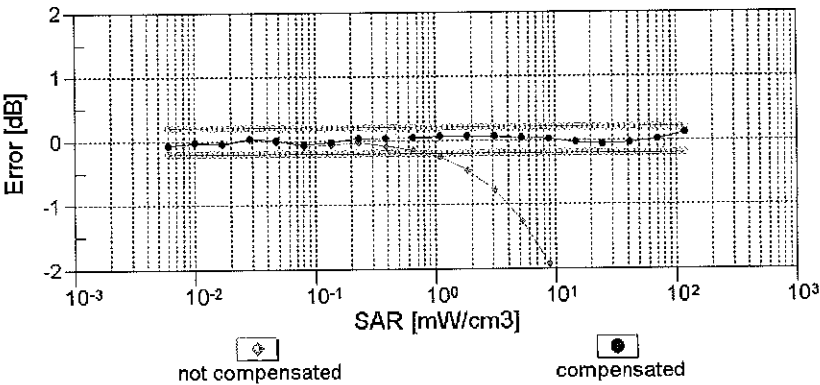
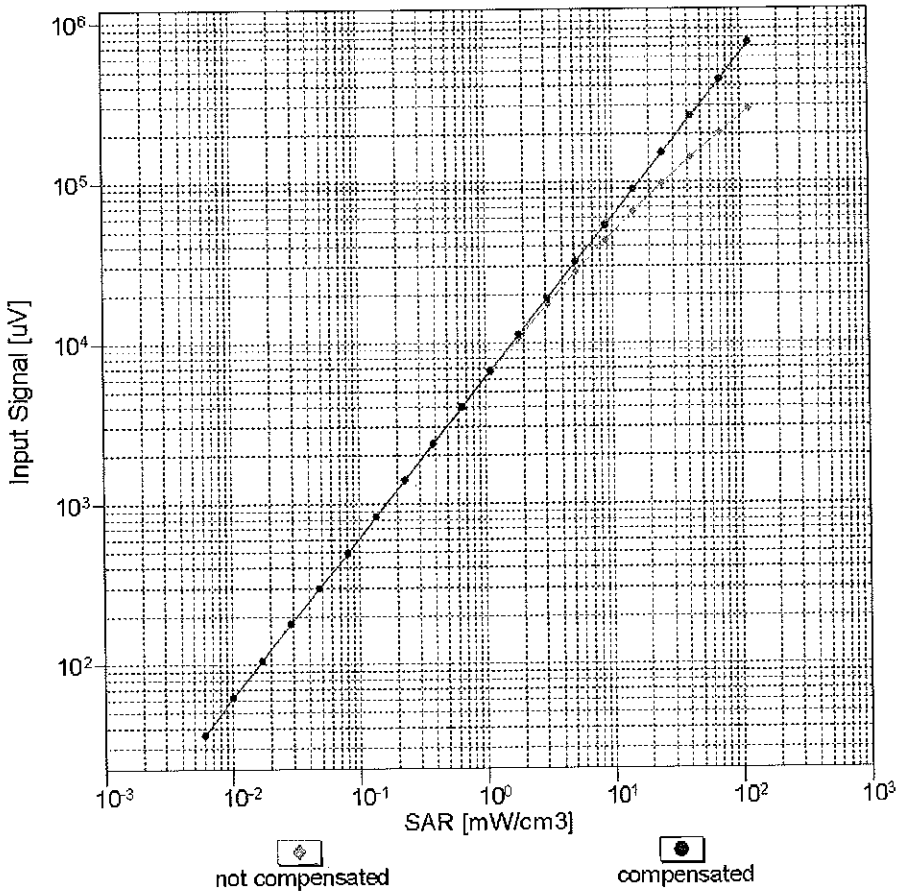
f=600 MHz,TEM

f=1800 MHz,R22



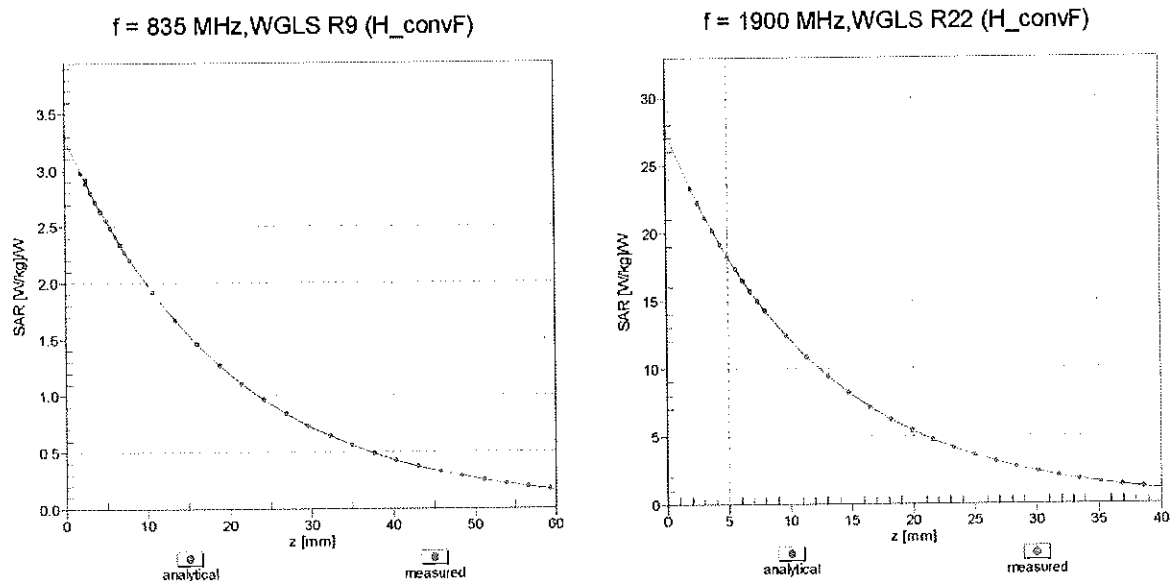
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



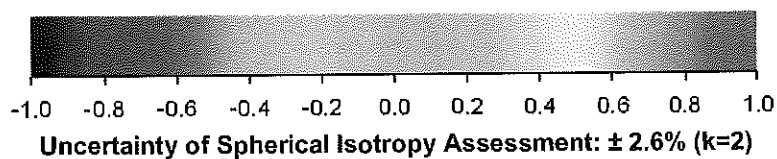
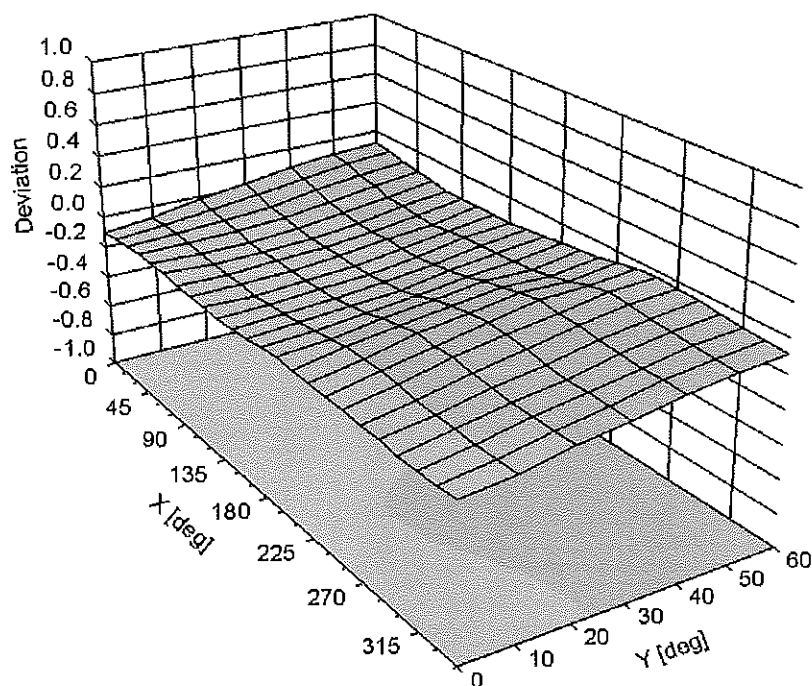
Uncertainty of Linearity Assessment: ± 0.6% (k=2)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



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



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

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

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

Issued: May 19, 2015

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

BN ✓
5/28/15



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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Glossary:

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

Calibration is Performed According to the Following Standards:

- IEEE Std 1528-2013, "IEEE Recommended Practice for Determining the Peak Spatial-Averaged Specific Absorption Rate (SAR) in the Human Head from Wireless Communications Devices: Measurement Techniques", June 2013
- IEC 62209-1, "Procedure to measure the Specific Absorption Rate (SAR) for hand-held devices used in close proximity to the ear (frequency range of 300 MHz to 3 GHz)", February 2005

Methods Applied and Interpretation of Parameters:

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

Probe 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 ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	1.21	1.25	1.13	$\pm 10.1 \%$
DCP (mV) ^B	106.1	103.6	108.3	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	205.3	$\pm 3.3 \%$
		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	$\pm 1.4 \%$
		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	$\pm 0.7 \%$
		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	$\pm 0.7 \%$
		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	$\pm 2.5 \%$
		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	$\pm 1.9 \%$
		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	$\pm 2.5 \%$
		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	$\pm 1.4 \%$
		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	$\pm 2.2 \%$
		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	$\pm 1.7 \%$
		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	$\pm 1.9 \%$
		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	$\pm 1.4 \%$
		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 %

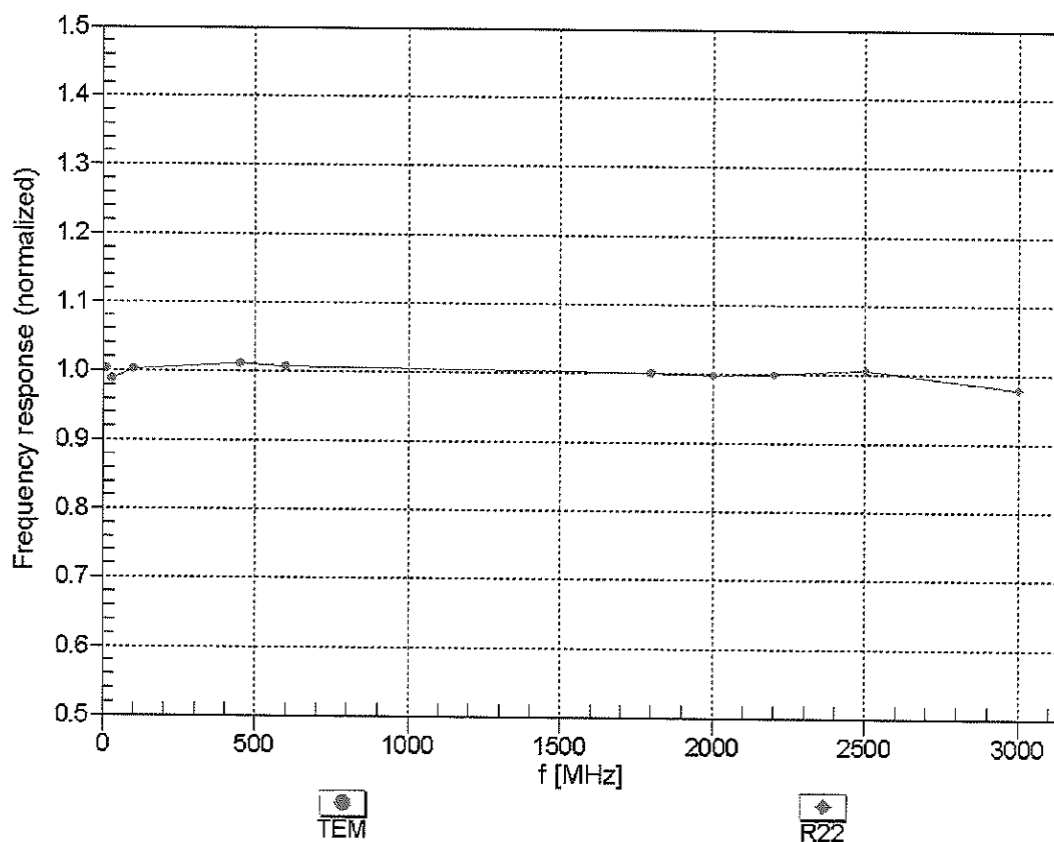
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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

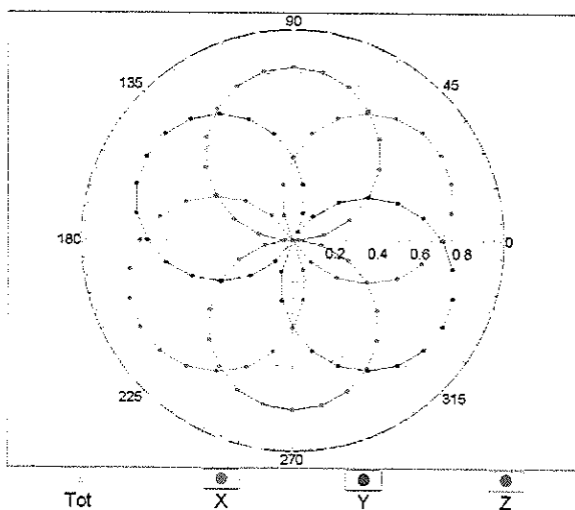
(TEM-Cell:ifi110 EXX, Waveguide: R22)



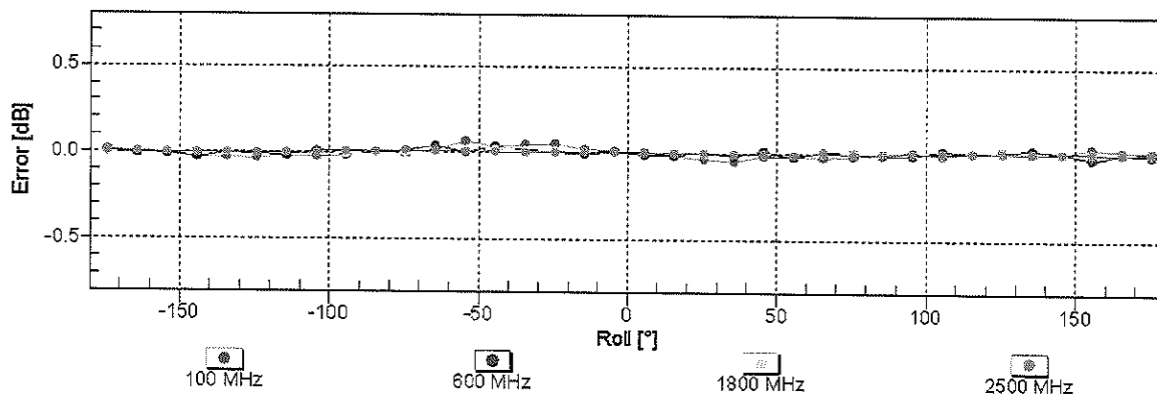
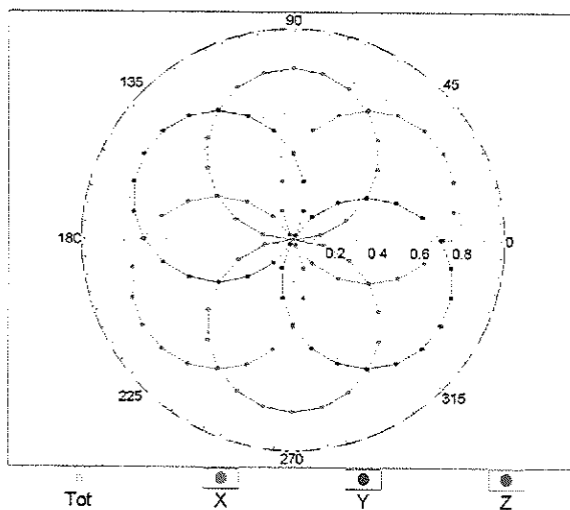
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$

f=600 MHz,TEM

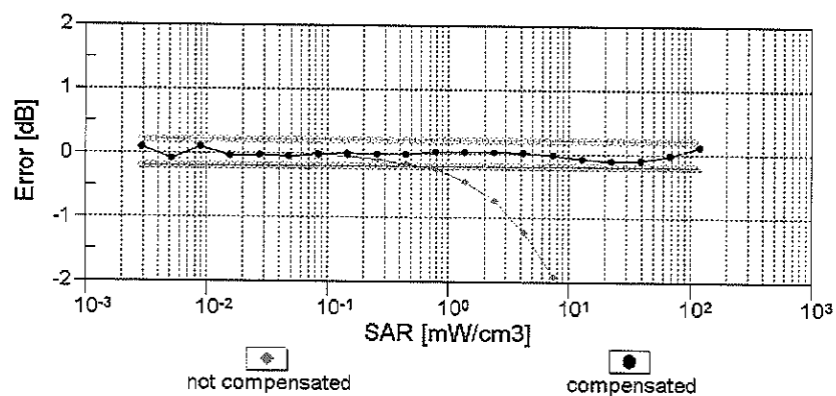
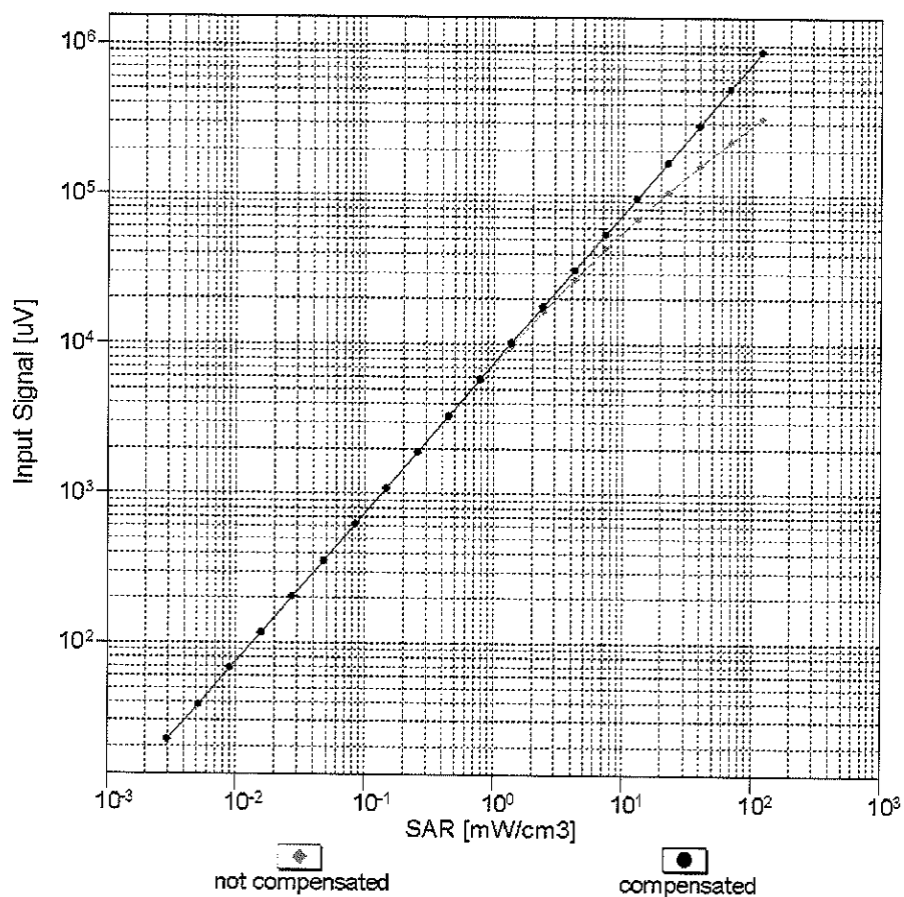


f=1800 MHz,R22



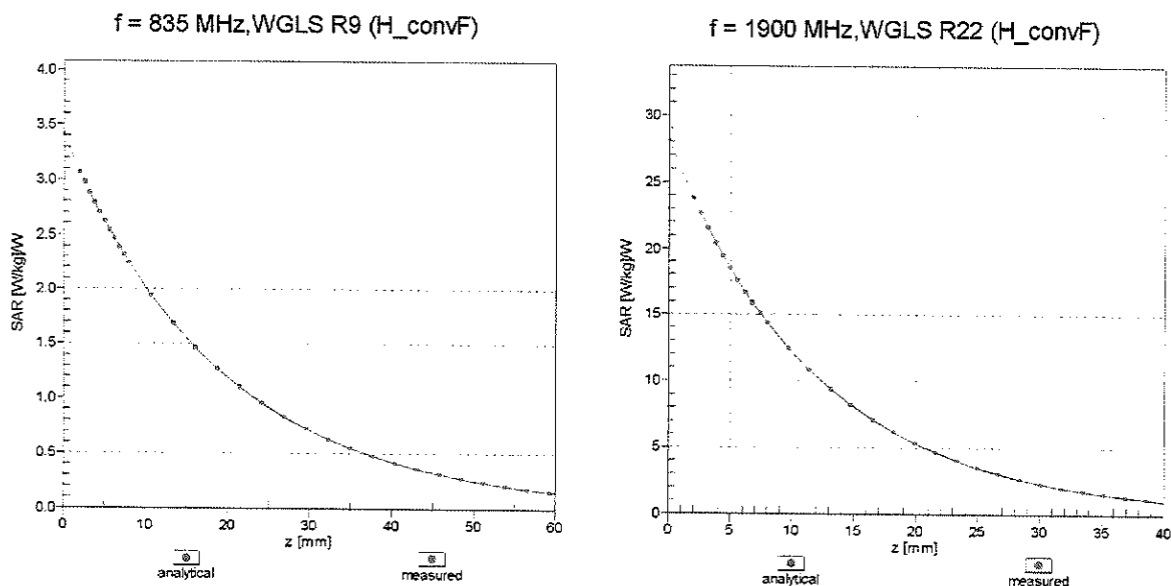
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



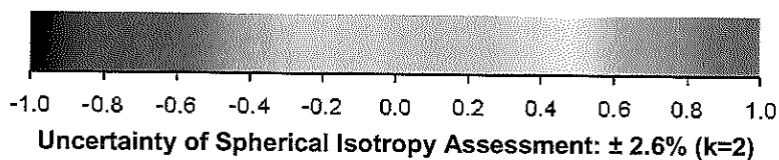
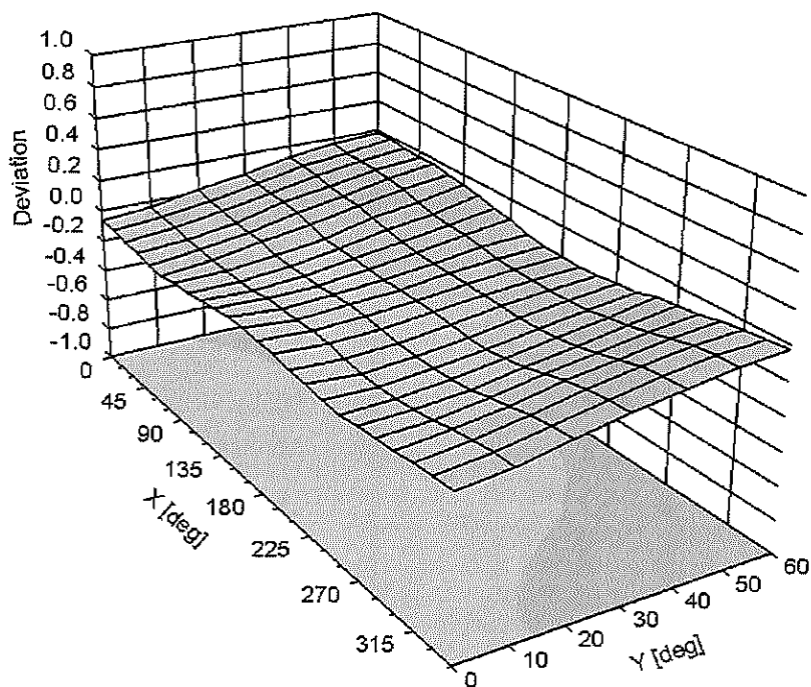
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, θ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: 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



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

Client **PC Test**

Certificate No: **EX3-7308_Jul15**

CALIBRATION CERTIFICATE

Object **EX3DV4 - SN:7308**

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: **July 21, 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

Calibrated by:	Name Claudio Leubler	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	
Issued: July 22, 2015			
This calibration certificate shall not be reproduced except in full without written approval of the laboratory.			



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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Glossary:

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

Calibration is Performed According to the Following Standards:

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

Methods Applied and Interpretation of Parameters:

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

Probe EX3DV4

SN:7308

Manufactured: March 11, 2014
Calibrated: July 21, 2015

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

DASY/EASY - Parameters of Probe: EX3DV4 - SN:7308

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.50	0.60	0.45	$\pm 10.1 \%$
DCP (mV) ^B	98.7	98.5	103.0	

Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB $\sqrt{\mu\text{V}}$	C	D dB	VR mV	Unc ^E (k=2)
0	CW	X	0.0	0.0	1.0	0.00	157.9	$\pm 3.3 \%$
		Y	0.0	0.0	1.0		152.7	
		Z	0.0	0.0	1.0		146.1	
10010-CAA	SAR Validation (Square, 100ms, 10ms)	X	1.57	63.2	12.0	10.00	44.9	$\pm 0.9 \%$
		Y	4.80	74.9	16.5		43.8	
		Z	0.93	58.1	8.8		41.8	
10062-CAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	10.36	69.2	21.9	8.68	145.4	$\pm 3.3 \%$
		Y	10.44	69.2	21.9		144.1	
		Z	9.89	68.5	21.5		130.2	
10117-CAB	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	10.03	68.2	20.8	8.07	127.1	$\pm 3.0 \%$
		Y	10.43	69.2	21.4		148.2	
		Z	10.05	68.6	21.1		138.2	
10196-CAB	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	10.03	68.9	21.4	8.10	146.1	$\pm 3.0 \%$
		Y	10.09	68.9	21.4		143.5	
		Z	9.59	68.3	21.1		131.0	
10317-AAB	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	10.17	69.0	21.6	8.36	144.5	$\pm 3.3 \%$
		Y	10.23	69.0	21.6		141.8	
		Z	9.72	68.4	21.3		130.2	
10400-AAC	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	10.28	69.1	21.6	8.37	144.6	$\pm 3.3 \%$
		Y	10.32	69.1	21.6		142.0	
		Z	9.81	68.5	21.3		129.4	
10401-AAC	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	X	10.70	68.8	21.5	8.60	129.8	$\pm 3.0 \%$
		Y	10.55	68.4	21.2		123.2	
		Z	10.64	69.1	21.6		140.3	
10402-AAC	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	10.84	69.0	21.4	8.53	130.1	$\pm 3.0 \%$
		Y	10.57	68.4	21.0		123.5	
		Z	10.91	69.6	21.7		142.7	

10417- AAA	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	10.10	68.9	21.5	8.23	145.0	±3.0 %
		Y	10.15	68.9	21.5		142.0	
		Z	9.64	68.3	21.1		130.3	

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 Norm X,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:7308

Calibration Parameter Determined in Head Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
5250	35.9	4.71	5.20	5.20	5.20	0.35	1.80	± 13.1 %
5600	35.5	5.07	4.65	4.65	4.65	0.40	1.80	± 13.1 %
5750	35.4	5.22	4.86	4.86	4.86	0.40	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:7308

Calibration Parameter Determined in Body Tissue Simulating Media

f (MHz) ^C	Relative Permittivity ^F	Conductivity (S/m) ^F	ConvF X	ConvF Y	ConvF Z	Alpha ^G	Depth ^G (mm)	Unc (k=2)
5250	48.9	5.36	4.63	4.63	4.63	0.40	1.90	± 13.1 %
5600	48.5	5.77	3.92	3.92	3.92	0.50	1.90	± 13.1 %
5750	48.3	5.94	4.24	4.24	4.24	0.50	1.90	± 13.1 %

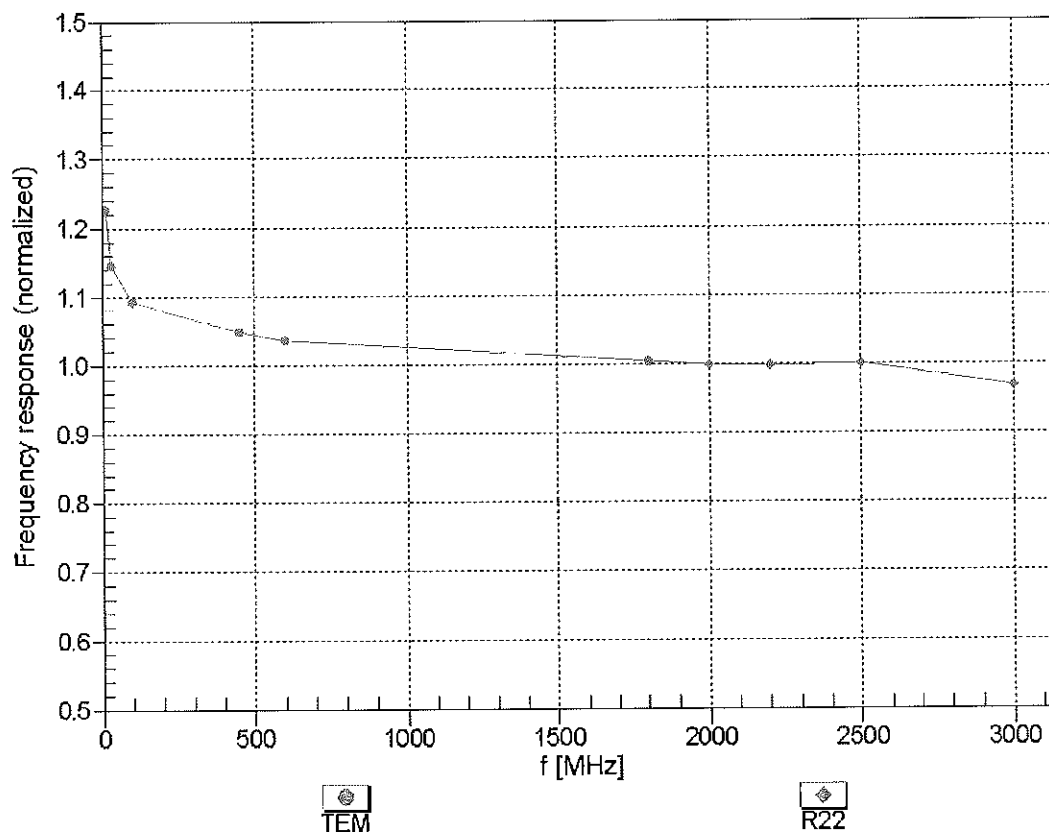
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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

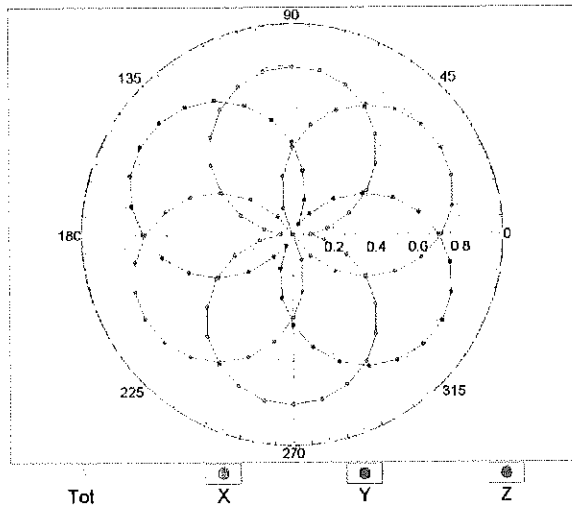
(TEM-Cell:ifi110 EXX, Waveguide: R22)



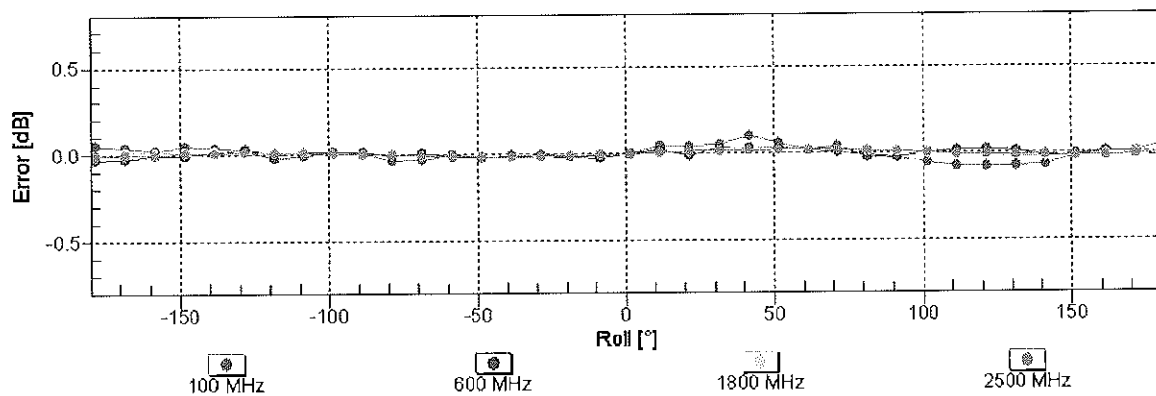
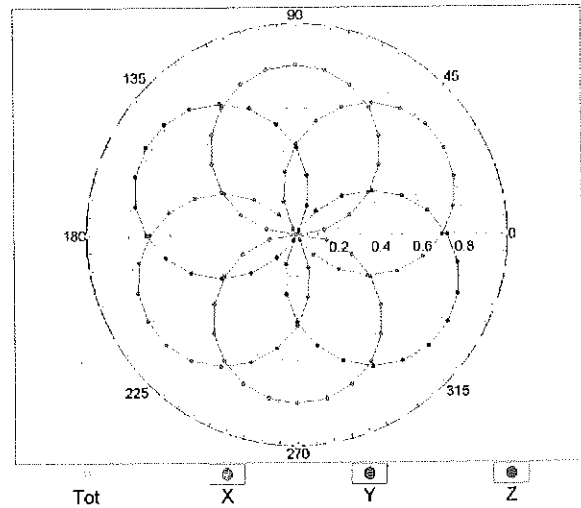
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ (k=2)

Receiving Pattern (ϕ), $\theta = 0^\circ$

$f=600$ MHz, TEM

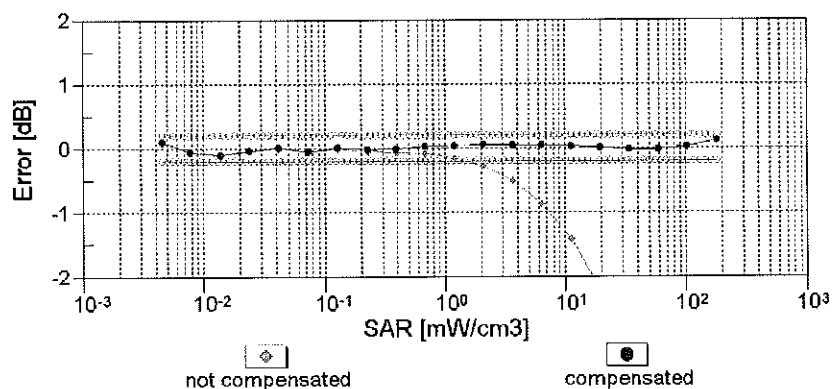
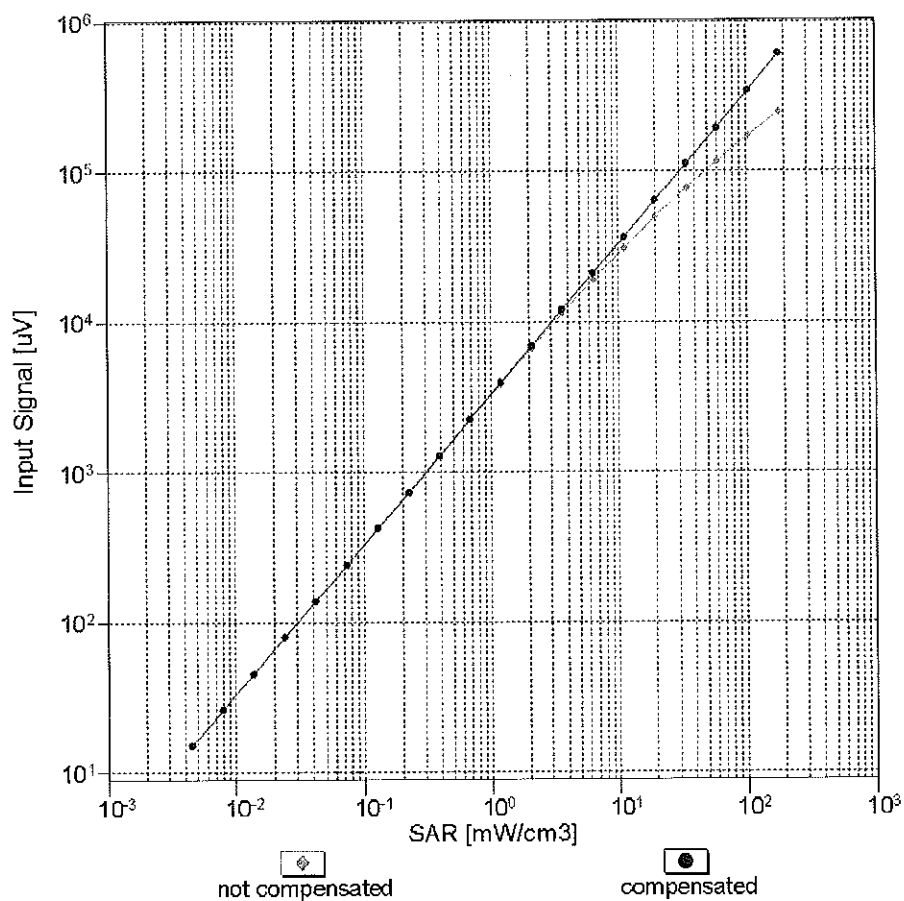


$f=1800$ MHz, R22



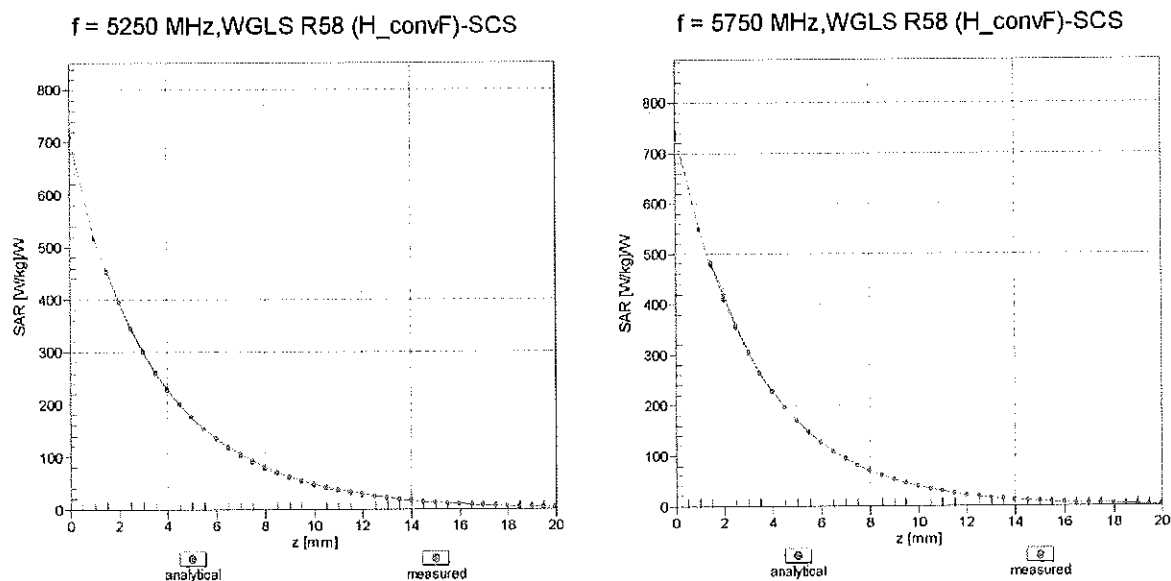
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



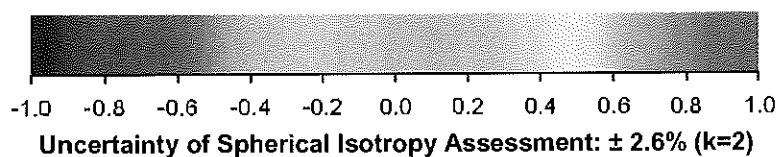
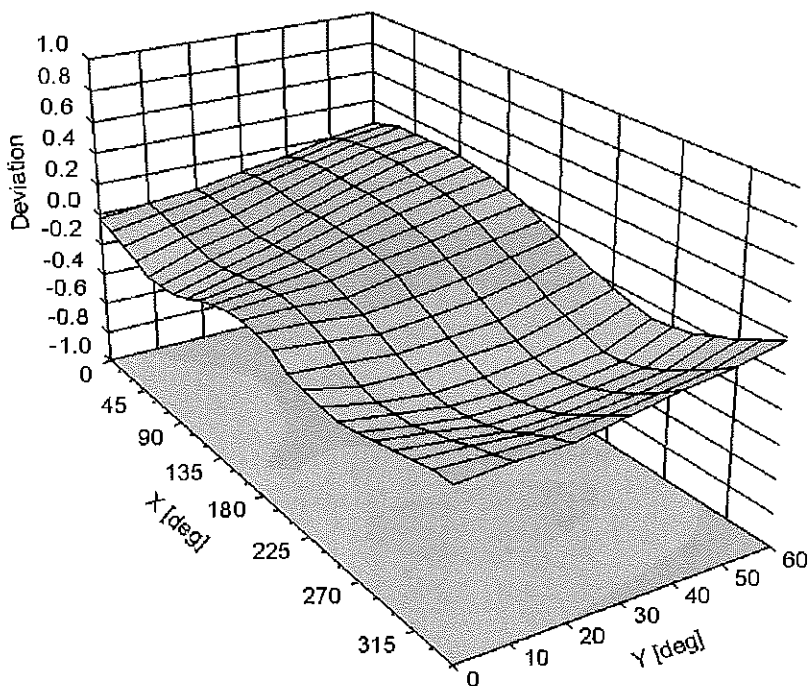
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), $f = 900 \text{ MHz}$



DASY/EASY - Parameters of Probe: EX3DV4 - SN:7308

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	111.5
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