



SAR EVALUATION REPORT

Applicant Name:

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

Date of Testing:

07/29/19 - 08/21/19

Test Site/Location:

PCTEST Lab, Columbia, MD, USA

Document Serial No.:

1M1907190124-01-R1.A3L

FCC ID:

A3LSMA307G

APPLICANT:

SAMSUNG ELECTRONICS CO., LTD.

DUT Type:

Portable Handset

Application Type:

Certification

FCC Rule Part(s):

CFR §2.1093

Model:

SM-A307G/DS

Additional Models:

SM-A307GT/DS, SM-A307G

Equipment Class	Band & Mode	Tx Frequency	SAR			
			1g Head (W/kg)	1g Body-Worn (W/kg)	1g Hotspot (W/kg)	10g Phablet (W/kg)
PCE	GSM/GPRS/EDGE 850	824.20 - 848.80 MHz	0.31	0.43	0.78	N/A
PCE	GSM/GPRS/EDGE 1900	1850.20 - 1909.80 MHz	0.18	0.21	0.41	N/A
PCE	UMTS 850	826.40 - 846.60 MHz	0.24	0.33	0.57	N/A
PCE	UMTS 1750	1712.4 - 1752.6 MHz	0.20	0.26	0.47	N/A
PCE	UMTS 1900	1852.4 - 1907.6 MHz	0.22	0.27	0.34	1.31
PCE	LTE Band 12	699.7 - 715.3 MHz	0.19	0.32	0.36	N/A
PCE	LTE Band 17	706.5 - 713.5 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 13	779.5 - 784.5 MHz	0.11	0.29	0.33	N/A
PCE	LTE Band 5 (Cell)	824.7 - 848.3 MHz	0.28	0.42	0.65	N/A
PCE	LTE Band 66 (AWS)	1710.7 - 1779.3 MHz	0.19	0.28	0.49	N/A
PCE	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	N/A	N/A	N/A	N/A
PCE	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	0.32	0.37	0.42	1.96
PCE	LTE Band 41	2498.5 - 2687.5 MHz	0.39	0.24	0.55	N/A
DTS	2.4 GHz WLAN	2412 - 2472 MHz	0.50	0.11	0.27	N/A
NII	U-NII-1	5180 - 5240 MHz	N/A	N/A	N/A	N/A
NII	U-NII-2A	5260 - 5320 MHz	0.87	0.15	N/A	0.80
NII	U-NII-2C	5500 - 5720 MHz	0.75	0.26	N/A	1.04
NII	U-NII-3	5745 - 5825 MHz	0.23	0.13	0.18	N/A
DSS/DTS	Bluetooth	2402 - 2480 MHz	< 0.1	N/A	N/A	N/A
Simultaneous SAR per KDB 690783 D01v01r03:			1.33	0.87	1.24	3.22

Note: This revised Test Report (S/N: 1M1907190124-01-R1.A3L) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.7 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: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 1 of 87	

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

1	DEVICE UNDER TEST	3
2	LTE INFORMATION	11
3	INTRODUCTION	12
4	DOSIMETRIC ASSESSMENT	13
5	DEFINITION OF REFERENCE POINTS	14
6	TEST CONFIGURATION POSITIONS	15
7	RF EXPOSURE LIMITS	19
8	FCC MEASUREMENT PROCEDURES.....	20
9	RF CONDUCTED POWERS.....	26
10	SYSTEM VERIFICATION.....	53
11	SAR DATA SUMMARY	59
12	FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS.....	74
13	SAR MEASUREMENT VARIABILITY	82
14	EQUIPMENT LIST.....	83
15	MEASUREMENT UNCERTAINTIES.....	84
16	CONCLUSION.....	85
17	REFERENCES	86
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		
APPENDIX G: POWER REDUCTION VERIFICATION		
APPENDIX H: DOWNLINK LTE CA RF CONDUCTED POWERS		

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset
		Page 2 of 87

1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
GSM/GPRS/EDGE 850	Voice/Data	824.20 - 848.80 MHz
GSM/GPRS/EDGE 1900	Voice/Data	1850.20 - 1909.80 MHz
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 17	Voice/Data	706.5 - 713.5 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Voice/Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
U-NII-1	Voice/Data	5180 - 5240 MHz
U-NII-2A	Voice/Data	5260 - 5320 MHz
U-NII-2C	Voice/Data	5500 - 5720 MHz
U-NII-3	Voice/Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

This device utilizes a power reduction mechanism for some wireless modes and bands for SAR compliance under portable hotspot conditions, under some conditions when the device is being used in close proximity to the user's hand, and during voice or held to ear scenarios. All hotspot SAR evaluations for this device were performed at the maximum allowed output power when hotspot is enabled. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device when being used in phablet use conditions. Detailed descriptions of the power reduction mechanism are included in the operational description.

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

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.

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 3 of 87

1.3.1 Maximum Output Power

Mode / Band		Voice (dBm)	Burst Average GMSK (dBm)				Burst Average 8-PSK (dBm)			
		1 TX Slot	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots	1 TX Slots	2 TX Slots	3 TX Slots	4 TX Slots
GSM/GPRS/EDGE 850	Maximum	33.5	33.5	30.5	29.0	28.0	26.5	25.0	23.5	22.5
	Nominal	32.5	32.5	29.5	28.0	27.0	25.5	24.0	22.5	21.5
GSM/GPRS/EDGE 1900	Maximum	30.5	30.5	27.0	25.5	24.5	26.0	24.0	23.0	22.0
	Nominal	29.5	29.5	26.0	24.5	23.5	25.0	23.0	22.0	21.0

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA	3GPP DC-HSDPA
UMTS Band 5 (850 MHz)	Maximum	25.0	24.0	24.0	24.0
	Nominal	24.0	23.0	23.0	23.0
UMTS Band 4 (1750 MHz)	Maximum	24.5	24.0	23.0	24.0
	Nominal	23.5	23.0	22.0	23.0
UMTS Band 2 (1900 MHz)	Maximum	23.5	23.5	23.5	23.5
	Nominal	22.5	22.5	22.5	22.5

Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	24.5
	Nominal	23.5
LTE Band 17	Maximum	24.5
	Nominal	23.5
LTE Band 13	Maximum	24.5
	Nominal	23.5
LTE Band 5 (Cell)	Maximum	25.5
	Nominal	24.5
LTE Band 66 (AWS)	Maximum	24.5
	Nominal	23.5
LTE Band 4 (AWS)	Maximum	24.5
	Nominal	23.5
LTE Band 2 (PCS)	Maximum	24.5
	Nominal	23.5
LTE Band 41	Maximum	24.5
	Nominal	23.5

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 4 of 87

Mode / Band		Modulated Average - Single Tx Chain (dBm)		
Channel		1-11	12	13
IEEE 802.11b (2.4 GHz)	Maximum	19.0	15.5	14.5
	Nominal	18.0	14.5	13.5
IEEE 802.11g (2.4 GHz)	Maximum	16.0	11.0	5.0
	Nominal	15.0	10.0	4.0
IEEE 802.11n (2.4 GHz)	Maximum	16.0	11.0	5.0
	Nominal	15.0	10.0	4.0

Mode / Band		Modulated Average - Single Tx Chain (dBm)											
		20 MHz Bandwidth				40 MHz Bandwidth				80 MHz Bandwidth			
	Channel	36-48	52-64	100-144	149-165	38-46	54-62	102-142	151-159	42	58	106-138	155
IEEE 802.11a	Maximum	15.5	15.5	15.0	15.0								
	Nominal	14.5	14.5	14.0	14.0								
IEEE 802.11n	Maximum	15.5	15.5	15.0	15.0	14.5	14.5	14.5	14.0				
	Nominal	14.5	14.5	14.0	14.0	13.5	13.5	13.5	13.0				
IEEE 802.11ac	Maximum	15.5	15.5	15.0	15.0	14.5	14.5	14.5	14.0	12.5	12.5	12.0	12.0
	Nominal	14.5	14.5	14.0	14.0	13.5	13.5	13.5	13.0	11.5	11.5	11.0	11.0

Mode / Band		Modulated Average (dBm)
Bluetooth	Maximum	11.0
	Nominal	10.0
Bluetooth EDR	Maximum	9.5
	Nominal	8.5
Bluetooth LE	Maximum	8.0
	Nominal	7.0

1.3.2 Reduced Output Power – Hotspot Mode, Grip Sensor Mode Active

Mode / Band		Modulated Average (dBm)			
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA	3GPP DC-HSDPA
UMTS Band 2 (1900 MHz)	Maximum	20.5	20.5	20.5	20.5
	Nominal	19.5	19.5	19.5	19.5
Mode / Band		Modulated Average (dBm)			
LTE Band 2 (PCS)	Maximum	21.5			
	Nominal	20.5			

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 5 of 87

1.3.3 Reduced Output Power – Receiver Mode Active

Mode / Band		Modulated Average (dBm)
LTE Band 41	Maximum	21.5
	Nominal	20.5

1.3.4 Reduced WLAN Output Power

Mode / Band		Modulated Average - Single Tx Chain (dBm)		
Channel		1 - 11	12	13
IEEE 802.11b	Maximum	16.0	15.5	14.5
	Nominal	15.0	14.5	13.5
IEEE 802.11g	Maximum	16.0	11.0	5.0
	Nominal	15.0	10.0	4.0
IEEE 802.11n	Maximum	16.0	11.0	5.0
	Nominal	15.0	10.0	4.0

Mode / Band		Modulated Average - Single Tx Chain (dBm)											
		20 MHz Bandwidth				40 MHz Bandwidth				80 MHz Bandwidth			
	Channel	36-48	52-64	100-144	149-165	38-46	54-62	102-142	151-159	42	58	106-138	155
IEEE 802.11a	Maximum	14.0	14.0	14.0	14.0								
	Nominal	13.0	13.0	13.0	13.0								
IEEE 802.11n	Maximum	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0				
	Nominal	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0				
IEEE 802.11ac	Maximum	14.0	14.0	14.0	14.0	14.0	14.0	14.0	14.0	12.5	12.5	12.0	12.0
	Nominal	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	11.5	11.5	11.0	11.0

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.”

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 6 of 87

Table 1-1
Device Edges/Sides for SAR Testing

Mode	Back	Front	Top	Bottom	Right	Left
GPRS 850	Yes	Yes	No	Yes	Yes	Yes
GPRS 1900	Yes	Yes	No	Yes	Yes	Yes
UMTS 850	Yes	Yes	No	Yes	Yes	Yes
UMTS 1750	Yes	Yes	No	Yes	Yes	Yes
UMTS 1900	Yes	Yes	No	Yes	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes	Yes
LTE Band 13	Yes	Yes	No	Yes	Yes	Yes
LTE Band 5 (Cell)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 66 (AWS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 2 (PCS)	Yes	Yes	No	Yes	Yes	Yes
LTE Band 41	Yes	Yes	Yes	No	No	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 Simultaneous Transmission Capabilities

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

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

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 7 of 87	

Table 1-2
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Body-Worn Accessory	Wireless Router	Phablet	Notes
1	GSM voice + 2.4 GHz Wi-Fi	Yes	Yes	N/A	Yes	
2	GSM voice + 5 GHz Wi-Fi	Yes	Yes	N/A	Yes	
3	GSM voice + 2.4 GHz Bluetooth	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
4	GSM voice + 2.4 GHz Bluetooth + 5 GHz Wi-Fi	Yes^	Yes	N/A	Yes	^ Bluetooth Tethering is considered
5	UMTS + 2.4 GHz Wi-Fi	Yes	Yes	Yes	Yes	
6	UMTS + 5 GHz Wi-Fi	Yes	Yes	Yes	Yes	
7	UMTS + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
8	UMTS + 2.4 GHz Bluetooth + 5 GHz Wi-Fi	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
9	LTE + 2.4 GHz Wi-Fi	Yes	Yes	Yes	Yes	
10	LTE + 5 GHz Wi-Fi	Yes	Yes	Yes	Yes	
11	LTE + 2.4 GHz Bluetooth	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
12	LTE + 2.4 GHz Bluetooth + 5 GHz Wi-Fi	Yes^	Yes	Yes^	Yes	^ Bluetooth Tethering is considered
13	GPRS/EDGE + 2.4 GHz Wi-Fi	N/A	N/A	Yes	Yes	
14	GPRS/EDGE + 5 GHz Wi-Fi	N/A	N/A	Yes	Yes	
15	GPRS/EDGE + 2.4 GHz Bluetooth	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered
16	GPRS/EDGE + 2.4 GHz Bluetooth + 5 GHz Wi-Fi	N/A	N/A	Yes^	Yes	^ Bluetooth Tethering is considered

- 2.4 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.
- This device supports VOLTE.
- This device supports VoWIFI.
- This device supports Bluetooth Tethering.

1.6 Miscellaneous SAR Test Considerations

(A) WIFI/BT

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

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

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

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 8 of 87

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; $[(13/15) * \sqrt{2.480}] = 1.4 < 3.0$. Based on the maximum conducted power of Bluetooth (rounded to the nearest mW) and the antenna to user separation distance, hotspot Bluetooth SAR was not required; $[(13/10) * \sqrt{2.480}] = 2.0 < 3.0$. 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; $[(13/5) * \sqrt{2.480}] = 4.1 < 7.5$. Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

This device supports IEEE 802.11ac with the following features:

- a) Up to 80 MHz Bandwidth only
- b) No aggregate channel configurations
- c) 1 Tx antenna output
- d) TDWR and Band gap channels are supported
- e) 256 QAM is supported

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

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset
		Page 9 of 87

maximum output power when downlink carrier aggregation was inactive. The downlink carrier aggregation exclusion analysis can be found in Appendix H.

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.

Additional SAR tests for Phablet SAR were evaluated per KDB 616217 Section 6 (See Section 6.9 for more information).

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

1.7 Guidance Applied

- IEEE 1528-2013
- FCC KDB Publication 941225 D01v03r01, D05v02r04, D05Av01r02, D06v02r01 (2G/3G/4G and Hotspot)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)
- FCC KDB Publication 648474 D04v01r03 (Phablet Procedures)
- FCC KDB Publication 616217 D04v01r02 (Proximity Sensor)
- October 2013 TCB Workshop Notes (GPRS Testing Considerations)
- April 2018 TCB Workshop Notes (LTE Carrier Aggregation)

1.8 Device Serial Numbers

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset
		Page 10 of 87

2 LTE INFORMATION

LTE Information					
Form Factor	Portable Handset				
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)				
	LTE Band 17 (706.5 - 713.5 MHz)				
	LTE Band 13 (779.5 - 784.5 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 66 (AWS) (1710.7 - 1779.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
Channel Bandwidths	LTE Band 41 (2498.5 - 2687.5 MHz)				
	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 17: 5 MHz, 10 MHz				
	LTE Band 13: 5 MHz, 10 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 66 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (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				
	Low	Low-Mid	Mid	Mid-High	High
LTE Band 12: 1.4 MHz	699.7 (23017)		707.5 (23095)	715.3 (23173)	
LTE Band 12: 3 MHz	700.5 (23025)		707.5 (23095)	714.5 (23165)	
LTE Band 12: 5 MHz	701.5 (23035)		707.5 (23095)	713.5 (23155)	
LTE Band 12: 10 MHz	704 (23060)		707.5 (23095)	711 (23130)	
LTE Band 17: 5 MHz	706.5 (23755)		710 (23790)	713.5 (23825)	
LTE Band 17: 10 MHz	709 (23780)		710 (23790)	711 (23800)	
LTE Band 13: 5 MHz	779.5 (23205)		782 (23230)	784.5 (23255)	
LTE Band 13: 10 MHz	N/A		782 (23230)	N/A	
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)		836.5 (20525)	848.3 (20643)	
LTE Band 5 (Cell): 3 MHz	825.5 (20415)		836.5 (20525)	847.5 (20635)	
LTE Band 5 (Cell): 5 MHz	826.5 (20425)		836.5 (20525)	846.5 (20625)	
LTE Band 5 (Cell): 10 MHz	829 (20450)		836.5 (20525)	844 (20600)	
LTE Band 66 (AWS): 1.4 MHz	1710.7 (131979)		1745 (132322)	1779.3 (132665)	
LTE Band 66 (AWS): 3 MHz	1711.5 (131987)		1745 (132322)	1778.5 (132657)	
LTE Band 66 (AWS): 5 MHz	1712.5 (131997)		1745 (132322)	1777.5 (132647)	
LTE Band 66 (AWS): 10 MHz	1715 (132022)		1745 (132322)	1775 (132622)	
LTE Band 66 (AWS): 15 MHz	1717.5 (132047)		1745 (132322)	1772.5 (132597)	
LTE Band 66 (AWS): 20 MHz	1720 (132072)		1745 (132322)	1770 (132572)	
LTE Band 4 (AWS): 1.4 MHz	1710.7 (19957)		1732.5 (20175)	1754.3 (20393)	
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)		1732.5 (20175)	1753.5 (20385)	
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)		1732.5 (20175)	1752.5 (20375)	
LTE Band 4 (AWS): 10 MHz	1715 (20000)		1732.5 (20175)	1750 (20350)	
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)		1732.5 (20175)	1747.5 (20325)	
LTE Band 4 (AWS): 20 MHz	1720 (20050)		1732.5 (20175)	1745 (20300)	
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)		1880 (18900)	1909.3 (19193)	
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)		1880 (18900)	1908.5 (19185)	
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)		1880 (18900)	1907.5 (19175)	
LTE Band 2 (PCS): 10 MHz	1855 (18650)		1880 (18900)	1905 (19150)	
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)		1880 (18900)	1902.5 (19125)	
LTE Band 2 (PCS): 20 MHz	1860 (18700)		1880 (18900)	1900 (19100)	
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
UE Category	DL UE Cat 6, UL UE Cat 6				
Modulations Supported in UL	QPSK, 16QAM				
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3-6.2.5? (manufacturer attestation to be provided)	YES				
A-MPR (Additional MPR) disabled for SAR Testing?	YES				
LTE Carrier Aggregation Possible Combinations	The technical description includes all the possible carrier aggregation combinations				
LTE Additional Information	This device does not support full CA features on 3GPP Release 10. It supports carrier aggregation features as shown in Appendix H. All other uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. The following LTE Release 10 Features are not supported: Relay, HetNet, Enhanced MIMO, eICIC, WIFI Offloading, eMBMS, Cross-Carrier scheduling, Enhanced SC-FDMA.				

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 11 of 87

3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

- σ = conductivity of the tissue-simulating material (S/m)
- ρ = mass density of the tissue-simulating material (kg/m³)
- E = Total RMS electric field strength (V/m)

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

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 12 of 87

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.

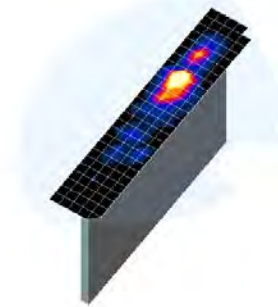


Figure 4-1
Sample SAR Area
Scan

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		
			$\Delta z_{\text{zoom}}(n)$	$\Delta z_{\text{zoom}}(1)^*$	$\Delta z_{\text{zoom}}(n>1)^*$	
≤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: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 13 of 87

5 DEFINITION OF REFERENCE POINTS

5.1 EAR REFERENCE POINT

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

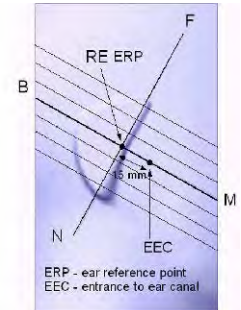


Figure 5-1
Close-Up Side view
of ERP

5.2 HANDSET REFERENCE POINTS

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



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

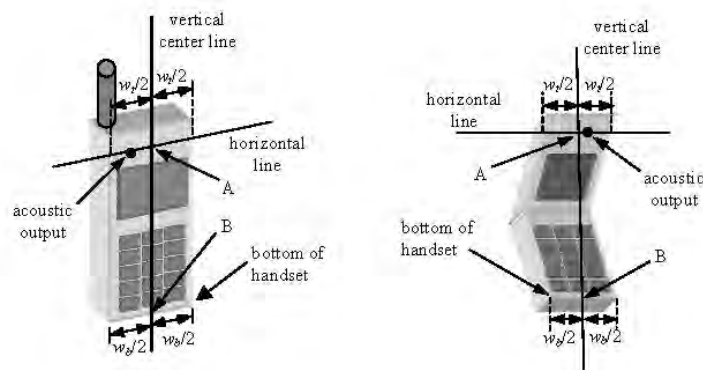


Figure 5-3
Handset Vertical Center & Horizontal Line Reference Points

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 14 of 87

6 TEST CONFIGURATION POSITIONS

6.1 Device Holder

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

6.2 Positioning for Cheek

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



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

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

6.3 Positioning for Ear / 15° Tilt

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

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 15 of 87

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

Body-worn accessories may not always be supplied or available as options for some devices intended to be authorized for body-worn use. In this case, a test configuration with a separation distance between the back of the device and the flat phantom is used. Test position spacing was documented.

Transmitters that are designed to operate in front of a person's face, as in push-to-talk configurations, are tested for SAR compliance with the front of the device positioned to face the flat phantom in head fluid. For devices that are carried next to the body such as a shoulder, waist or chest-worn transmitters, SAR compliance is tested with the accessories, including headsets and microphones, attached to the device and positioned against a flat phantom in a normal use configuration.

6.6 Extremity Exposure Configurations

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

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

6.7 Wireless Router Configurations

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

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

6.8 Phablet Configurations

For smart phones with a display diagonal dimension > 150 mm or an overall diagonal dimension > 160 mm that provide similar mobile web access and multimedia support found in mini-tablets or UMPC mini-tablets that

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 17 of 87

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

6.9 Proximity Sensor Considerations

This device uses a power reduction mechanism to reduce output powers in certain use conditions when the device is used close the user's body. When the device's antenna is within a certain distance of the user, the sensor activates and reduces the maximum allowed output power. However, the sensor is not active when the device is moved beyond the sensor triggering distance and the maximum output power is no longer limited. Therefore, additional evaluation is needed in the vicinity of the triggering distance to ensure SAR is compliant when the device is allowed to operate at a nonreduced output power level. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device at these additional test positions. Sensor triggering distance summary data is included in Appendix G. The sensor is designed to support sufficient detection range and sensitivity to cover regions of the sensors in all applicable directions since the sensor entirely covers the antennas.

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 18 of 87

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: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 19 of 87

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

8.1 Measured and Reported SAR

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

8.2 3G SAR Test Reduction Procedure

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

8.3 Procedures Used to Establish RF Signal for SAR

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

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

8.4 SAR Measurement Conditions for UMTS

8.4.1 Output Power Verification

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 20 of 87

8.4.2 Head SAR Measurements

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

8.4.3 Body SAR Measurements

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

8.4.4 SAR Measurements with Rel 5 HSDPA

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

8.4.5 SAR Measurements with Rel 6 HSUPA

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

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

8.4.6 SAR Measurement Conditions for DC-HSDPA

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

8.5 SAR Measurement Conditions for LTE

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 21 of 87

8.5.1 Spectrum Plots for RB Configurations

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

8.5.2 MPR

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

8.5.3 A-MPR

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

8.5.4 Required RB Size and RB Offsets for SAR Testing

According to FCC KDB 941225 D05v02r04:

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

8.5.5 TDD

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

8.5.6 Downlink Only Carrier Aggregation

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 22 of 87

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

8.6 SAR Testing with 802.11 Transmitters

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

8.6.1 General Device Setup

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

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

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

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

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

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

8.6.4 Initial Test Position Procedure

For exposure conditions with multiple test positions, such as handset operating next to the ear, devices with hotspot mode or UMPC mini-tablet, procedures for initial test position can be applied. Using the transmission

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 23 of 87

mode determined by the DSSS procedure or initial test configuration, area scans are measured for all positions in an exposure condition. The test position with the highest extrapolated (peak) SAR is used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg, no additional testing for the remaining test positions is required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured. When 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.

8.6.5 2.4 GHz SAR Test Requirements

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

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

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

8.6.6 OFDM Transmission Mode and SAR Test Channel Selection

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

8.6.7 Initial Test Configuration Procedure

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

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 24 of 87

8.6.8 Subsequent Test Configuration Procedures

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

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 25 of 87

9 RF CONDUCTED POWERS

9.1 GSM Conducted Powers

Table 9-1
Maximum Conducted 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	31.93	31.90	29.66	28.46	27.01	26.23	24.46	23.22	21.69
	190	32.13	32.19	29.51	28.51	27.20	26.25	24.86	23.35	22.11
	251	32.42	32.43	29.49	28.55	27.13	26.21	24.81	23.50	22.45
GSM 1900	512	29.00	28.96	26.40	24.75	23.62	25.30	23.34	22.00	21.01
	661	28.86	28.87	26.28	24.80	23.43	25.40	23.14	22.01	20.90
	810	28.69	28.65	26.46	25.10	23.70	25.20	23.30	22.26	21.08

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	22.90	22.87	23.64	24.20	24.00	17.20	18.44	18.96	18.68
	190	23.10	23.16	23.49	24.25	24.19	17.22	18.84	19.09	19.10
	251	23.39	23.40	23.47	24.29	24.12	17.18	18.79	19.24	19.44
GSM 1900	512	19.97	19.93	20.38	20.49	20.61	16.27	17.32	17.74	18.00
	661	19.83	19.84	20.26	20.54	20.42	16.37	17.12	17.75	17.89
	810	19.66	19.62	20.44	20.84	20.69	16.17	17.28	18.00	18.07

GSM 850	Frame Avg.Targets:	23.47	23.47	23.48	23.74	23.99	16.47	17.98	18.24	18.49
GSM 1900		20.47	20.47	19.98	20.24	20.49	15.97	16.98	17.74	17.99

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	
			Page 26 of 87

Note:

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

GSM Class: B
GPRS Multislot class: 12 (Max 4 Tx uplink slots)
EDGE Multislot class: 12 (Max 4 Tx uplink slots)
DTM Multislot Class: N/A



Figure 9-1
Power Measurement Setup

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 27 of 87

9.2 UMTS Conducted Powers

Table 9-2
Maximum Conducted Power

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	24.04	24.09	23.85	23.55	23.21	22.91	23.18	22.85	22.93	-
99		12.2 kbps AMR	24.03	24.05	23.85	23.45	23.14	22.85	23.18	22.95	22.97	-
6	HSDPA	Subtest 1	23.41	23.31	23.43	23.48	23.35	23.50	23.07	22.77	22.85	0
6		Subtest 2	22.60	22.42	22.61	22.05	22.02	22.05	22.32	21.93	21.99	0
6		Subtest 3	22.50	22.43	22.62	22.64	22.44	22.59	22.77	22.44	22.50	0.5
6		Subtest 4	21.62	21.50	21.77	21.66	21.51	21.64	21.89	21.63	21.59	0.5
6	HSUPA	Subtest 1	22.44	22.42	22.58	21.32	21.19	21.21	21.98	21.70	21.75	0
6		Subtest 2	20.32	20.24	20.40	19.09	19.00	19.07	20.05	19.94	19.91	2
6		Subtest 3	22.48	22.42	22.59	21.70	21.57	21.88	22.35	22.02	22.04	1
6		Subtest 4	20.28	20.23	20.41	19.08	19.01	19.11	19.99	19.61	19.58	2
6		Subtest 5	22.45	22.38	22.55	21.90	21.81	21.88	22.98	22.77	22.82	0
8	DC-HSDPA	Subtest 1	23.53	23.51	23.48	23.34	23.31	23.39	23.11	22.80	22.84	0
8		Subtest 2	23.15	23.42	23.10	22.54	22.65	22.84	22.65	22.36	22.60	0
8		Subtest 3	22.01	21.78	22.14	21.50	21.55	21.76	21.88	21.32	21.56	0.5
8		Subtest 4	21.53	21.63	21.55	21.67	21.56	21.61	21.80	21.62	21.64	0.5

Table 9-3
Reduced Conducted Power - Hotspot, and/or Proximity Sensor Mode Active

3GPP Release Version	Mode	3GPP 34.121 Subtest	PCS Band [dBm]			3GPP MPR [dB]
			9262	9400	9538	
99	WCDMA	12.2 kbps RMC	19.86	19.51	19.76	-
99		12.2 kbps AMR	19.81	19.58	19.73	-
6	HSDPA	Subtest 1	20.09	19.62	19.78	0
6		Subtest 2	20.05	19.73	19.81	0
6		Subtest 3	19.98	19.80	19.85	0.5
6		Subtest 4	19.86	19.83	19.87	0.5
6	HSUPA	Subtest 1	19.20	18.76	18.94	0
6		Subtest 2	19.26	18.98	18.96	2
6		Subtest 3	19.21	18.88	18.90	1
6		Subtest 4	19.29	19.00	18.88	2
6		Subtest 5	20.10	19.70	19.75	0
8	DC-HSDPA	Subtest 1	19.98	19.71	19.74	0
8		Subtest 2	20.01	19.82	19.84	0
8		Subtest 3	20.04	19.77	19.87	0.5
8		Subtest 4	20.11	19.78	19.94	0.5

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

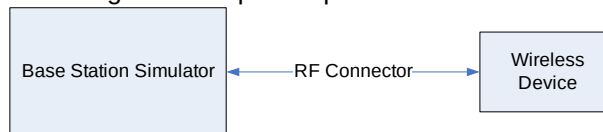


Figure 9-2
Power Measurement Setup

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 28 of 87

9.3 LTE Conducted Powers

9.3.1 LTE Band 12

Table 9-4
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]	Designed MPR [dB]
			23095 (707.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	23.65	0	0
	1	25	23.62		0
	1	49	23.46		0
	25	0	22.16	0-1	2
	25	12	22.07		2
	25	25	22.05		2
	50	0	22.05		2
16QAM	1	0	22.04	0-1	2
	1	25	22.02		2
	1	49	21.75		2
	25	0	20.75	0-2	3
	25	12	20.74		3
	25	25	20.68		3
	50	0	20.73		3

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

Table 9-5
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	Designed MPR [dB]
			23035 (701.5 MHz)	23095 (707.5 MHz)	23155 (713.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.70	23.73	23.63	0
	1	12	23.66	23.41	23.60	0
	1	24	23.50	23.77	23.40	0
	12	0	22.18	22.20	22.15	2
	12	6	22.14	22.15	22.05	2
	12	13	22.00	22.23	22.00	2
	25	0	22.18	22.13	22.14	2
16QAM	1	0	22.06	22.00	21.90	2
	1	12	22.05	22.00	21.97	2
	1	24	21.88	22.02	21.80	2
	12	0	20.75	20.71	20.65	3
	12	6	20.75	20.70	20.65	3
	12	13	20.67	20.73	20.60	3
	25	0	20.80	20.73	20.65	3

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 29 of 87

Table 9-6
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	Designed MPR [dB]
			23025 (700.5 MHz)	23095 (707.5 MHz)	23165 (714.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.71	23.58	23.58	0
	1	7	23.70	23.58	23.35	0
	1	14	23.64	23.70	23.40	0
	8	0	22.20	22.12	22.22	2
	8	4	22.30	22.19	22.08	2
	8	7	22.19	22.26	21.99	2
	15	0	22.20	22.20	22.11	2
16QAM	1	0	21.96	21.91	21.91	2
	1	7	22.00	21.85	21.80	2
	1	14	21.88	22.00	21.66	2
	8	0	20.82	20.68	20.60	3
	8	4	20.78	20.68	20.55	3
	8	7	20.74	20.69	20.60	3
	15	0	20.79	20.68	20.66	3

Table 9-7
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	Designed MPR [dB]
			23017 (699.7 MHz)	23095 (707.5 MHz)	23173 (715.3 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.70	23.54	23.52	0
	1	2	23.67	23.57	23.50	0
	1	5	23.65	23.63	23.53	0
	3	0	23.70	23.59	23.66	0
	3	2	23.75	23.68	23.60	0
	3	3	23.75	23.70	23.63	0
	6	0	22.26	22.22	22.14	2
16QAM	1	0	22.00	22.00	21.88	2
	1	2	21.88	21.88	21.80	2
	1	5	21.90	21.90	21.70	2
	3	0	22.15	21.99	22.10	2
	3	2	22.22	22.18	22.08	2
	3	3	22.23	22.21	22.07	2
	6	0	20.78	20.68	20.59	3

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 30 of 87

9.3.2 LTE Band 13

Table 9-8
LTE Band 13 Conducted Powers - 10 MHz Bandwidth

LTE Band 13 10 MHz Bandwidth				
Modulation	RB Size	RB Offset	Mid Channel	Designed MPR [dB]
			23230 (782.0 MHz)	
			Conducted Power [dBm]	
QPSK	1	0	23.52	0
	1	25	23.50	0
	1	49	23.39	0
	25	0	22.01	2
	25	12	22.00	2
	25	25	21.92	2
	50	0	21.96	2
16QAM	1	0	21.85	2
	1	25	21.89	2
	1	49	21.73	2
	25	0	20.69	3
	25	12	20.66	3
	25	25	20.58	3
	50	0	20.69	3

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

LTE Band 13 5 MHz Bandwidth				
Modulation	RB Size	RB Offset	Mid Channel	Designed MPR [dB]
			23230 (782.0 MHz)	
			Conducted Power [dBm]	
QPSK	1	0	23.45	0
	1	12	23.42	0
	1	24	23.33	0
	12	0	21.97	2
	12	6	21.92	2
	12	13	21.90	2
	25	0	21.92	2
16QAM	1	0	21.65	2
	1	12	21.70	2
	1	24	21.64	2
	12	0	20.53	3
	12	6	20.50	3
	12	13	20.53	3
	25	0	20.52	3

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 31 of 87

9.3.3 LTE Band 5 (Cell)

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

LTE Band 5 (Cell) 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	Designed MPR [dB]
			20525 (836.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	24.48	0	0
	1	25	24.50		0
	1	49	24.36		0
	25	0	22.54	0-1	2
	25	12	22.52		2
	25	25	22.50		2
	50	0	22.50		2
16QAM	1	0	22.22	0-1	2
	1	25	22.35		2
	1	49	22.14		2
	25	0	21.49	0-2	3
	25	12	21.46		3
	25	25	21.45		3
	50	0	21.48		3

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 32 of 87

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

LTE Band 5 (Cell) 5 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			20425 (826.5 MHz)	20525 (836.5 MHz)	20625 (846.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	24.15	24.42	24.61	0
	1	12	24.09	24.42	24.58	0
	1	24	24.10	24.34	24.50	0
	12	0	22.14	22.40	22.60	2
	12	6	22.13	22.43	22.60	2
	12	13	22.07	22.32	22.52	2
	25	0	22.11	22.24	22.57	2
16QAM	1	0	21.95	22.25	22.45	2
	1	12	21.96	22.23	22.44	2
	1	24	21.85	22.25	22.32	2
	12	0	21.03	21.39	21.58	3
	12	6	21.00	21.33	21.58	3
	12	13	20.95	21.32	21.51	3
	25	0	21.02	21.32	21.56	3

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

LTE Band 5 (Cell) 3 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			20415 (825.5 MHz)	20525 (836.5 MHz)	20635 (847.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	24.09	24.41	24.56	0
	1	7	24.06	24.40	24.66	0
	1	14	24.01	24.33	24.37	0
	8	0	22.13	22.39	22.55	2
	8	4	22.06	22.40	22.60	2
	8	7	22.11	22.37	22.55	2
	15	0	22.09	22.36	22.55	2
16QAM	1	0	22.00	22.10	22.44	2
	1	7	21.81	22.11	22.39	2
	1	14	21.82	22.09	22.29	2
	8	0	20.97	21.37	21.55	3
	8	4	21.00	21.37	21.59	3
	8	7	21.00	21.35	21.52	3
	15	0	21.06	21.33	21.61	3

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 33 of 87

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

LTE Band 5 (Cell) 1.4 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			20407 (824.7 MHz)	20525 (836.5 MHz)	20643 (848.3 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	24.06	24.44	24.60	0
	1	2	24.07	24.50	24.61	0
	1	5	24.05	24.41	24.47	0
	3	0	24.11	24.46	24.70	0
	3	2	24.10	24.48	24.60	0
	3	3	24.05	24.43	24.60	0
	6	0	22.00	22.42	22.55	2
16QAM	1	0	21.70	22.08	22.33	2
	1	2	21.77	22.03	22.29	2
	1	5	21.73	21.99	22.18	2
	3	0	21.94	22.23	22.50	2
	3	2	21.91	22.33	22.49	2
	3	3	22.00	22.33	22.46	2
	6	0	21.00	21.50	21.62	3

9.3.4 LTE Band 66 (AWS)

Table 9-14
LTE Band 66 (AWS) Conducted Powers - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.90	23.95	24.03	0
	1	50	23.94	24.01	24.06	0
	1	99	23.88	23.89	23.91	0
	50	0	22.48	22.35	22.41	2
	50	25	22.47	22.37	22.37	2
	50	50	22.44	22.33	22.32	2
	100	0	22.45	22.34	22.34	2
16QAM	1	0	22.36	22.47	22.50	2
	1	50	22.43	22.50	22.48	2
	1	99	22.35	22.34	22.37	2
	50	0	21.49	21.34	21.45	3
	50	25	21.48	21.32	21.35	3
	50	50	21.45	21.31	21.28	3
	100	0	21.48	21.36	21.39	3

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset
Page 34 of 87		

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

LTE Band 66 (AWS) 15 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			132047 (1717.5 MHz)	132322 (1745.0 MHz)	132597 (1772.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.86	23.94	23.85	0
	1	36	23.87	23.85	23.87	0
	1	74	23.90	23.81	23.77	0
	36	0	22.33	22.40	22.35	2
	36	18	22.38	22.40	22.38	2
	36	37	22.37	22.39	22.38	2
	75	0	22.33	22.39	22.35	2
16QAM	1	0	22.18	22.35	22.26	2
	1	36	22.27	22.22	22.30	2
	1	74	22.30	22.35	22.25	2
	36	0	21.33	21.44	21.40	3
	36	18	21.40	21.48	21.36	3
	36	37	21.38	21.42	21.37	3
	75	0	21.38	21.41	21.40	3

Table 9-16
LTE Band 66 (AWS) Conducted Powers - 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			132022 (1715.0 MHz)	132322 (1745.0 MHz)	132622 (1775.0 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.95	23.93	23.79	0
	1	25	23.85	23.87	23.84	0
	1	49	23.95	23.78	23.84	0
	25	0	22.40	22.43	22.34	2
	25	12	22.41	22.39	22.32	2
	25	25	22.49	22.38	22.34	2
	50	0	22.43	22.39	22.34	2
16QAM	1	0	22.22	22.27	22.13	2
	1	25	22.30	22.28	22.30	2
	1	49	22.30	22.13	22.17	2
	25	0	21.35	21.40	21.38	3
	25	12	21.40	21.40	21.33	3
	25	25	21.43	21.36	21.32	3
	50	0	21.42	21.46	21.42	3

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 35 of 87

Table 9-17
LTE Band 66 (AWS) Conducted Powers - 5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			131997 (1712.5 MHz)	132322 (1745.0 MHz)	132647 (1777.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.93	23.92	23.85	0
	1	12	23.95	23.83	23.81	0
	1	24	23.91	23.84	23.81	0
	12	0	22.40	22.36	22.36	2
	12	6	22.45	22.38	22.30	2
	12	13	22.43	22.38	22.35	2
	25	0	22.40	22.40	22.36	2
16QAM	1	0	22.28	22.27	22.23	2
	1	12	22.25	22.21	22.22	2
	1	24	22.34	22.21	22.23	2
	12	0	21.43	21.42	21.36	3
	12	6	21.41	21.41	21.35	3
	12	13	21.44	21.39	21.34	3
	25	0	21.38	21.45	21.37	3

Table 9-18
LTE Band 66 (AWS) Conducted Powers - 3 MHz Bandwidth

LTE Band 66 (AWS) 3 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			131987 (1711.5 MHz)	132322 (1745.0 MHz)	132657 (1778.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.90	23.88	23.83	0
	1	7	23.96	23.80	23.83	0
	1	14	23.95	23.85	23.82	0
	8	0	22.40	22.35	22.35	2
	8	4	22.40	22.39	22.37	2
	8	7	22.40	22.41	22.34	2
	15	0	22.41	22.40	22.38	2
16QAM	1	0	22.32	22.24	22.22	2
	1	7	22.31	22.18	22.20	2
	1	14	22.25	22.17	22.20	2
	8	0	21.40	21.45	21.36	3
	8	4	21.45	21.42	21.38	3
	8	7	21.45	21.45	21.38	3
	15	0	21.46	21.47	21.41	3

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 36 of 87	

Table 9-19
LTE Band 66 (AWS) Conducted Powers -1.4 MHz Bandwidth

LTE Band 66 (AWS) 1.4 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			131979 (1710.7 MHz)	132322 (1745.0 MHz)	132665 (1779.3 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.91	23.90	23.74	0
	1	2	23.97	23.84	23.84	0
	1	5	23.94	23.83	23.76	0
	3	0	23.95	23.86	23.87	0
	3	2	23.97	23.88	23.86	0
	3	3	23.96	23.86	23.83	0
	6	0	22.37	22.33	22.30	2
16QAM	1	0	22.23	22.18	22.20	2
	1	2	22.16	22.20	22.16	2
	1	5	22.20	22.14	22.08	2
	3	0	22.25	22.28	22.29	2
	3	2	22.38	22.40	22.34	2
	3	3	22.34	22.39	22.35	2
	6	0	21.41	21.47	21.40	3

9.3.5 LTE Band 2 (PCS)

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

LTE Band 2 (PCS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			18700 (1860.0 MHz)	18900 (1880.0 MHz)	19100 (1900.0 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.42	23.38	23.35	0
	1	50	23.44	23.43	23.25	0
	1	99	23.51	23.29	23.17	0
	50	0	21.87	21.83	21.71	2
	50	25	21.90	21.80	21.71	2
	50	50	21.83	21.92	21.72	2
	100	0	21.84	21.80	21.76	2
16QAM	1	0	21.73	21.61	21.64	2
	1	50	21.69	21.89	21.52	2
	1	99	21.68	21.57	21.54	2
	50	0	20.92	20.79	20.79	3
	50	25	20.95	20.87	20.68	3
	50	50	20.85	20.84	20.77	3
	100	0	20.88	20.76	20.68	3

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 37 of 87

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

LTE Band 2 (PCS) 15 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			18675 (1857.5 MHz)	18900 (1880.0 MHz)	19125 (1902.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.32	23.33	23.44	0
	1	36	23.39	23.40	23.42	0
	1	74	23.40	23.43	23.40	0
	36	0	21.91	21.88	22.06	2
	36	18	21.91	21.94	21.94	2
	36	37	21.87	22.00	21.99	2
	75	0	21.93	21.92	21.99	2
16QAM	1	0	21.86	21.71	21.80	2
	1	36	21.90	21.82	21.71	2
	1	74	21.91	21.93	21.84	2
	36	0	20.94	20.85	21.07	3
	36	18	20.93	20.98	21.00	3
	36	37	20.85	21.00	21.03	3
	75	0	20.93	20.91	21.03	3

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

LTE Band 2 (PCS) 10 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			18650 (1855.0 MHz)	18900 (1880.0 MHz)	19150 (1905.0 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.50	23.35	23.34	0
	1	25	23.62	23.50	23.42	0
	1	49	23.43	23.40	23.27	0
	25	0	21.96	21.93	22.01	2
	25	12	21.93	21.96	21.97	2
	25	25	21.93	22.00	21.95	2
	50	0	21.94	21.93	21.89	2
16QAM	1	0	21.82	21.70	21.86	2
	1	25	21.80	21.77	21.85	2
	1	49	21.74	21.76	21.70	2
	25	0	20.96	20.98	20.96	3
	25	12	21.00	20.98	21.00	3
	25	25	20.93	20.99	20.94	3
	50	0	20.95	20.98	20.97	3

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 38 of 87

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

LTE Band 2 (PCS) 5 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			18625 (1852.5 MHz)	18900 (1880.0 MHz)	19175 (1907.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.44	23.40	23.35	0
	1	12	23.40	23.40	23.35	0
	1	24	23.45	23.38	23.27	0
	12	0	21.95	21.95	21.93	2
	12	6	22.00	21.94	21.91	2
	12	13	21.97	22.00	21.91	2
	25	0	21.98	22.00	21.92	2
16QAM	1	0	21.86	21.82	21.75	2
	1	12	21.89	21.82	21.77	2
	1	24	21.92	21.85	21.71	2
	12	0	20.88	20.97	20.93	3
	12	6	20.94	20.99	20.89	3
	12	13	21.00	21.00	20.89	3
	25	0	20.96	20.96	20.90	3

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

LTE Band 2 (PCS) 3 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			18615 (1851.5 MHz)	18900 (1880.0 MHz)	19185 (1908.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.45	23.38	23.32	0
	1	7	23.45	23.37	23.32	0
	1	14	23.48	23.36	23.30	0
	8	0	21.97	21.94	21.91	2
	8	4	21.96	21.96	21.87	2
	8	7	21.96	21.96	21.87	2
	15	0	21.96	21.90	21.86	2
16QAM	1	0	21.78	21.80	21.77	2
	1	7	21.82	21.83	21.73	2
	1	14	21.77	21.78	21.61	2
	8	0	20.98	20.97	20.90	3
	8	4	20.97	20.90	20.91	3
	8	7	21.00	21.00	20.88	3
	15	0	20.95	21.00	20.94	3

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset
Page 39 of 87		

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

LTE Band 2 (PCS) 1.4 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Designed MPR [dB]
			18607 (1850.7 MHz)	18900 (1880.0 MHz)	19193 (1909.3 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.43	23.35	23.26	0
	1	2	23.44	23.39	23.27	0
	1	5	23.43	23.36	23.23	0
	3	0	23.45	23.36	23.33	0
	3	2	23.50	23.42	23.30	0
	3	3	23.47	23.38	23.30	0
	6	0	21.94	21.96	21.81	2
16QAM	1	0	21.71	21.70	21.56	2
	1	2	21.70	21.65	21.58	2
	1	5	21.70	21.70	21.50	2
	3	0	21.82	21.70	21.70	2
	3	2	21.85	21.89	21.80	2
	3	3	21.88	21.87	21.73	2
	6	0	21.02	20.97	20.90	3

Table 9-26
LTE Band 2 (PCS) Reduced Conducted Powers - 20 MHz Bandwidth - Hotspot, and/or Proximity Sensor Mode Active

LTE Band 2 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18700 (1860.0 MHz)	18900 (1880.0 MHz)	19100 (1900.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.42	20.38	20.29	0	0
	1	50	20.45	20.34	20.27		0
	1	99	20.34	20.31	20.25		0
	50	0	20.32	20.26	20.18	0-1	0
	50	25	20.36	20.28	20.13		0
	50	50	20.34	20.26	20.15		0
	100	0	20.32	20.22	20.10		0
16QAM	1	0	20.09	20.04	20.38	0-1	0
	1	50	20.14	20.01	20.08		0
	1	99	20.06	20.00	19.96		0
	50	0	20.57	20.25	20.22	0-2	0
	50	25	20.26	20.30	20.10		0
	50	50	20.39	20.28	20.18		0
	100	0	20.40	20.17	20.20		0

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 			Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 40 of 87

Table 9-27
LTE Band 2 (PCS) Reduced Conducted Powers - 15 MHz Bandwidth - Hotspot, and/or Proximity Sensor Mode Active

LTE Band 2 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18675 (1857.5 MHz)	18900 (1880.0 MHz)	19125 (1902.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.27	20.35	20.28	0	0
	1	36	20.34	20.33	20.22		0
	1	74	20.26	20.44	20.26		0
	36	0	20.34	20.25	20.36	0-1	0
	36	18	20.27	20.36	20.29		0
	36	37	20.33	20.41	20.31		0
	75	0	20.34	20.33	20.35		0
16QAM	1	0	20.13	20.17	20.18	0-1	0
	1	36	20.19	20.20	20.10		0
	1	74	20.20	20.22	20.15		0
	36	0	20.32	20.35	20.34	0-2	0
	36	18	20.32	20.39	20.33		0
	36	37	20.29	20.40	20.29		0
	75	0	20.36	20.35	20.33		0

Table 9-28
LTE Band 2 (PCS) Reduced Conducted Powers - 10 MHz Bandwidth - Hotspot, and/or Proximity Sensor Mode Active

Mode Active							
LTE Band 2 (PCS)							
10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18650 (1855.0 MHz)	18900 (1880.0 MHz)	19150 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.36	20.27	20.30	0	0
	1	25	20.38	20.34	20.31		0
	1	49	20.31	20.32	20.24		0
	25	0	20.39	20.28	20.35	0-1	0
	25	12	20.38	20.38	20.34		0
	25	25	20.37	20.37	20.36		0
	50	0	20.38	20.35	20.32		0
16QAM	1	0	20.25	20.22	20.25	0-1	0
	1	25	20.19	20.20	20.15		0
	1	49	20.18	20.17	20.11		0
	25	0	20.37	20.23	20.30	0-2	0
	25	12	20.36	20.34	20.33		0
	25	25	20.36	20.35	20.30		0
	50	0	20.41	20.36	20.35		0

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 41 of 87

Table 9-29
LTE Band 2 (PCS) Reduced Conducted Powers - 5 MHz Bandwidth - Hotspot, and/or Proximity Sensor Mode Active

LTE Band 2 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18625 (1852.5 MHz)	18900 (1880.0 MHz)	19175 (1907.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.32	20.33	20.33	0	0
	1	12	20.36	20.32	20.28		0
	1	24	20.36	20.34	20.26		0
	12	0	20.33	20.26	20.30	0-1	0
	12	6	20.38	20.36	20.34		0
	12	13	20.40	20.37	20.32		0
	25	0	20.40	20.36	20.32		0
16QAM	1	0	20.24	20.22	20.25	0-1	0
	1	12	20.18	20.18	20.20		0
	1	24	20.22	20.13	20.16		0
	12	0	20.34	20.25	20.23	0-2	0
	12	6	20.35	20.36	20.33		0
	12	13	20.42	20.36	20.31		0
	25	0	20.37	20.34	20.32		0

Table 9-30
LTE Band 2 (PCS) Reduced Conducted Powers - 3 MHz Bandwidth - Hotspot, and/or Proximity Sensor Mode Active

LTE Band 2 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18615 (1851.5 MHz)	18900 (1880.0 MHz)	19185 (1908.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.41	20.22	20.21	0	0
	1	7	20.40	20.28	20.28		0
	1	14	20.42	20.30	20.21		0
	8	0	20.35	20.32	20.29	0-1	0
	8	4	20.35	20.36	20.30		0
	8	7	20.40	20.33	20.31		0
	15	0	20.40	20.35	20.30		0
16QAM	1	0	20.27	20.10	20.07	0-1	0
	1	7	20.24	20.09	20.02		0
	1	14	20.24	20.10	20.00		0
	8	0	20.35	20.29	20.32	0-2	0
	8	4	20.40	20.34	20.32		0
	8	7	20.39	20.34	20.33		0
	15	0	20.34	20.35	20.35		0

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 42 of 87

Table 9-31
LTE Band 2 (PCS) Reduced Conducted Powers -1.4 MHz Bandwidth- Hotspot, and/or Proximity Sensor
Mode Active

LTE Band 2 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			18607 (1850.7 MHz)	18900 (1880.0 MHz)	19193 (1909.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	20.30	20.25	20.22	0	0
	1	2	20.30	20.27	20.23		0
	1	5	20.33	20.35	20.21		0
	3	0	20.35	20.33	20.28		0
	3	2	20.38	20.35	20.27		0
	3	3	20.36	20.33	20.30		0
	6	0	20.36	20.33	20.26	0-1	0
16QAM	1	0	20.19	20.06	20.06	0-1	0
	1	2	20.10	20.05	19.93		0
	1	5	20.08	20.08	20.00		0
	3	0	20.24	20.28	20.21		0
	3	2	20.36	20.29	20.24		0
	3	3	20.33	20.34	20.25		0
	6	0	20.36	20.35	20.26	0-2	0

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 43 of 87

9.3.6 LTE Band 41

Table 9-32
LTE Band 41 Max Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	Designed 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	24.01	23.91	24.25	23.94	23.90	0
	1	50	23.90	23.96	24.12	23.97	23.97	0
	1	99	23.73	23.91	23.89	23.89	23.93	0
	50	0	22.31	22.32	22.44	22.22	22.31	2
	50	25	22.27	22.21	22.35	22.22	22.28	2
	50	50	22.18	22.15	22.27	22.19	22.26	2
	100	0	22.25	22.18	22.25	22.21	22.00	2
16QAM	1	0	22.40	22.00	22.50	22.02	22.06	2
	1	50	22.33	22.03	22.42	22.06	22.12	2
	1	99	22.09	21.96	22.30	21.99	22.06	2
	50	0	21.10	21.04	21.35	21.09	21.24	3
	50	25	21.17	21.05	21.50	21.11	21.16	3
	50	50	21.05	21.04	21.25	21.06	21.15	3
	100	0	21.11	21.05	21.26	21.01	21.18	3

Table 9-33
LTE Band 41 Max Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	Designed 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	24.06	23.98	24.09	24.00	23.82	0
	1	36	23.97	24.00	23.92	23.90	23.78	0
	1	74	23.90	24.00	23.81	23.84	23.76	0
	36	0	21.95	21.97	22.02	21.94	21.77	2
	36	18	21.96	22.00	21.96	21.93	21.78	2
	36	37	21.93	22.00	21.88	21.90	21.76	2
	75	0	21.95	22.00	21.95	21.92	21.76	2
16QAM	1	0	21.84	22.05	22.14	21.88	21.75	2
	1	36	21.82	22.10	22.03	21.84	21.72	2
	1	74	21.75	22.08	21.85	21.80	21.64	2
	36	0	21.02	21.08	21.20	21.18	21.04	3
	36	18	21.01	21.05	21.11	21.18	21.06	3
	36	37	21.00	21.06	21.06	21.14	21.05	3
	75	0	21.05	21.09	21.12	21.22	21.09	3

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 44 of 87

Table 9-34
LTE Band 41 Max Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	Designed 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	24.04	24.00	24.06	23.97	23.82	0
	1	25	23.95	24.47	23.97	23.89	23.81	0
	1	49	23.92	23.99	23.90	23.90	23.78	0
	25	0	21.93	21.99	22.02	21.94	21.73	2
	25	12	22.04	21.99	21.97	22.00	21.77	2
	25	25	21.92	21.99	21.92	21.91	21.75	2
	50	0	21.96	21.95	21.95	21.95	21.77	2
16QAM	1	0	21.96	21.82	21.95	21.90	21.72	2
	1	25	21.90	21.86	21.75	21.88	21.66	2
	1	49	21.77	21.86	21.75	21.77	21.69	2
	25	0	20.94	20.97	21.13	21.11	20.96	3
	25	12	20.95	20.97	21.07	21.11	20.95	3
	25	25	20.93	20.98	21.02	21.07	20.98	3
	50	0	21.08	21.12	21.16	21.24	21.11	3

Table 9-35
LTE Band 41 Max Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	Designed MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)	
			Conducted Power [dBm]					
QPSK	1	0	24.00	24.00	24.08	23.93	23.86	0
	1	12	24.02	24.00	23.96	23.91	23.90	0
	1	24	23.98	23.98	23.91	23.85	23.85	0
	12	0	21.93	22.00	21.95	21.91	21.93	2
	12	6	21.97	22.00	21.93	21.93	21.92	2
	12	13	21.90	22.00	21.91	21.90	21.89	2
	25	0	22.00	21.99	21.94	21.92	21.93	2
16QAM	1	0	21.80	21.78	21.88	21.79	21.80	2
	1	12	21.82	21.86	21.80	21.81	21.80	2
	1	24	21.75	21.85	21.75	21.75	21.79	2
	12	0	20.95	21.04	21.05	21.08	21.10	3
	12	6	20.94	21.02	21.02	21.05	21.08	3
	12	13	20.92	21.00	20.97	21.05	21.07	3
	25	0	21.00	21.02	21.00	21.07	21.05	3

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 45 of 87	

Table 9-36
LTE Band 41 Reduced Conducted Powers - 20 MHz Bandwidth – Receiver Mode Active

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	19.87	20.14	20.07	19.94	19.92	0	0
	1	50	19.74	20.13	19.90	19.89	19.85		0
	1	99	19.63	20.12	19.71	19.84	19.87		0
	50	0	19.81	20.13	20.01	19.92	19.90	0-1	0
	50	25	19.75	20.11	19.91	19.88	19.89		0
	50	50	19.71	20.12	19.82	19.84	19.87		0
	100	0	19.57	20.01	19.92	19.86	19.88		0
16QAM	1	0	19.90	20.17	20.16	20.06	20.01	0-1	0
	1	50	19.75	20.22	20.02	20.01	20.03		0
	1	99	19.57	20.20	19.78	19.94	20.00		0
	50	0	19.91	20.21	20.11	20.04	20.03	0-2	0
	50	25	20.16	20.25	20.03	20.01	20.02		0
	50	50	19.80	20.25	19.94	19.96	20.01		0
	100	0	19.84	20.21	20.01	20.00	20.01		0

Table 9-37
LTE Band 41 Reduced Conducted Powers - 15 MHz Bandwidth – Receiver Mode Active

LTE Band 41 15 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	20.06	20.05	20.12	20.25	20.30	0	0
	1	36	20.03	20.04	20.05	20.14	20.33		0
	1	74	20.03	20.09	20.01	20.07	20.29		0
	36	0	20.00	20.00	20.07	20.11	20.14	0-1	0
	36	18	20.00	20.00	20.04	20.05	20.16		0
	36	37	20.00	20.00	20.03	20.02	20.15		0
	75	0	20.01	20.01	20.07	20.08	20.20		0
16QAM	1	0	20.20	20.15	20.18	20.26	20.06	0-1	0
	1	36	20.16	20.11	20.19	20.20	20.12		0
	1	74	20.15	20.12	20.36	20.10	20.09		0
	36	0	20.10	20.07	20.26	20.17	20.07	0-2	0
	36	18	20.11	20.08	20.28	20.13	20.07		0
	36	37	20.09	20.09	20.26	20.06	20.10		0
	75	0	20.12	20.12	20.30	20.12	20.08		0

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 46 of 87

Table 9-38

LTE Band 41 Reduced Conducted Powers - 10 MHz Bandwidth – Receiver Mode Active

LTE Band 41 10 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	20.04	20.06	20.16	20.05	20.10	0	0
	1	25	20.04	20.05	20.17	20.00	20.10		0
	1	49	19.98	20.02	20.02	19.99	20.10		0
	25	0	20.08	20.02	20.08	20.00	20.06	0-1	0
	25	12	20.05	20.00	20.07	19.98	20.07		0
	25	25	20.01	19.98	20.04	19.97	20.05		0
	50	0	20.03	19.99	20.06	20.00	20.06		0
16QAM	1	0	20.23	20.20	20.20	20.28	20.39	0-1	0
	1	25	20.24	20.22	20.19	20.21	20.25		0
	1	49	20.05	20.20	20.12	20.05	20.15		0
	25	0	20.10	20.02	20.10	20.04	20.11	0-2	0
	25	12	20.06	20.02	20.07	20.02	20.11		0
	25	25	20.02	20.00	20.06	19.97	20.11		0
	50	0	20.16	20.12	20.19	20.12	20.23		0

Table 9-39

LTE Band 41 Reduced Conducted Powers - 5 MHz Bandwidth – Receiver Mode Active

LTE Band 41 5 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	20.13	20.00	20.10	20.00	20.08	0	0
	1	12	20.11	20.05	20.13	20.03	20.08		0
	1	24	20.02	20.00	20.08	19.99	20.08		0
	12	0	20.05	19.98	20.05	19.98	20.04	0-1	0
	12	6	20.02	19.98	20.06	19.98	20.04		0
	12	13	20.02	19.97	20.06	19.97	20.03		0
	25	0	20.06	19.98	20.07	20.00	20.07		0
16QAM	1	0	20.11	20.10	20.22	20.15	20.20	0-1	0
	1	12	20.07	20.10	20.25	20.13	20.17		0
	1	24	20.07	20.10	20.20	20.13	20.16		0
	12	0	20.05	19.98	20.11	20.05	20.10	0-2	0
	12	6	20.04	19.98	20.10	20.04	20.11		0
	12	13	20.00	19.97	20.10	20.04	20.09		0
	25	0	20.06	20.00	20.08	20.03	20.11		0

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 47 of 87

9.4 WLAN Conducted Powers

Table 9-40
2.4 GHz WLAN Maximum Average RF Power

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	18.99	15.61	15.22
2437	6	18.81	15.22	15.05
2462	11	18.96	15.94	15.67

Table 9-41
5 GHz WLAN Maximum Average RF Power

5GHz (20MHz) Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11a	802.11n	802.11ac
		Average	Average	Average
5180	36	14.97	14.79	14.80
5200	40	14.98	14.64	14.59
5220	44	15.28	15.21	15.04
5240	48	14.94	14.82	14.58
5260	52	14.92	14.98	15.24
5280	56	15.01	15.22	15.21
5300	60	15.29	15.05	15.02
5320	64	14.89	14.86	14.84
5500	100	14.98	14.99	14.99
5600	120	14.69	14.62	14.56
5620	124	14.65	14.37	14.52
5720	144	14.61	14.41	14.61
5745	149	14.54	14.77	14.64
5785	157	14.48	14.48	14.44
5825	165	14.53	14.36	14.43

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 48 of 87

Table 9-42
2.4 GHz WLAN Reduced Average RF Power

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	15.57	15.61	15.22
2437	6	15.12	15.22	15.05
2462	11	15.43	15.94	15.67

Table 9-43
5 GHz WLAN Reduced Average RF Power

5GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5190	38	13.98	13.71
5230	46	13.23	13.50
5270	54	13.64	13.44
5310	62	13.56	13.80
5510	102	13.95	13.85
5590	118	13.53	13.37
5630	126	13.40	13.14
5710	142	13.76	13.90
5755	151	13.86	13.82
5795	159	13.56	13.59

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.

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 49 of 87

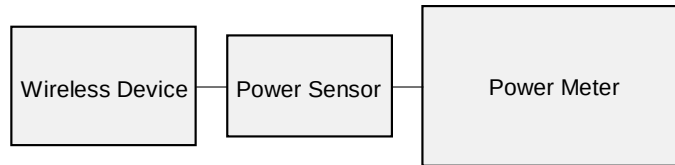


Figure 9-3
Power Measurement Setup

9.5 Bluetooth Conducted Powers

Table 9-44
Bluetooth Average RF Power

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	8.92	7.790
2441	1.0	39	10.74	11.855
2480	1.0	78	8.78	7.547
2402	2.0	0	7.50	5.628
2441	2.0	39	9.21	8.336
2480	2.0	78	7.43	5.539
2402	3.0	0	7.51	5.641
2441	3.0	39	9.27	8.451
2480	3.0	78	7.47	5.589

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 50 of 87

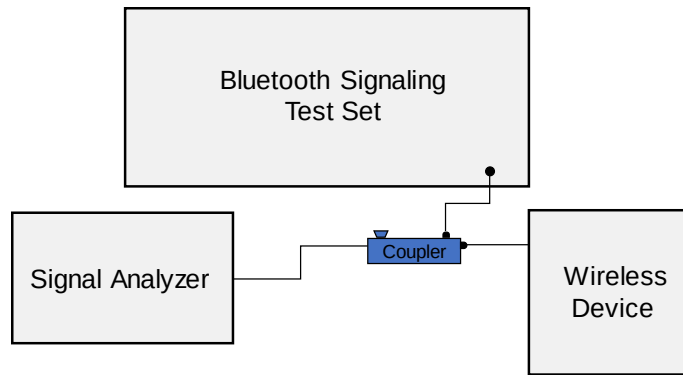


Figure 9-5
Power Measurement Setup

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 52 of 87

10 SYSTEM VERIFICATION

10.1 Tissue Verification

Table 10-1
Measured Tissue Properties

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
7/29/2019	750H	20.4	700	0.852	42.656	0.889	42.201	-4.16%	1.08%
			710	0.856	42.628	0.890	42.149	-3.82%	1.14%
			725	0.861	42.586	0.891	42.071	-3.37%	1.22%
			740	0.867	42.540	0.893	41.994	-2.91%	1.30%
			755	0.872	42.488	0.894	41.916	-2.46%	1.36%
			770	0.878	42.437	0.895	41.838	-1.90%	1.43%
			785	0.884	42.390	0.896	41.760	-1.34%	1.51%
7/30/2019	835H	20.4	800	0.889	42.345	0.897	41.682	-0.89%	1.59%
			820	0.896	42.295	0.899	41.578	-0.33%	1.72%
			835	0.901	42.255	0.900	41.500	0.11%	1.82%
8/1/2019	835H	22.5	850	0.907	42.214	0.916	41.500	-0.98%	1.72%
			820	0.911	41.195	0.899	41.578	1.33%	-0.92%
			835	0.916	41.165	0.900	41.500	1.78%	-0.81%
8/12/2019	1750H	20.7	850	0.920	41.129	0.916	41.500	0.44%	-0.89%
			1710	1.297	39.075	1.348	40.142	-3.78%	-2.66%
			1750	1.320	39.018	1.371	40.079	-3.72%	-2.65%
8/12/2019	1900H	20.7	1790	1.346	38.969	1.394	40.016	-3.44%	-2.62%
			1850	1.380	38.861	1.400	40.000	-1.43%	-2.85%
			1880	1.399	38.812	1.400	40.000	-0.07%	-2.97%
8/8/2019	2450H	21.7	1910	1.418	38.782	1.400	40.000	1.29%	-3.05%
			2400	1.762	38.029	1.756	39.289	0.34%	-3.21%
			2450	1.802	37.944	1.800	39.200	0.11%	-3.20%
			2500	1.842	37.893	1.855	39.136	-0.70%	-3.18%
			2550	1.879	37.792	1.909	39.073	-1.57%	-3.28%
			2600	1.925	37.709	1.964	39.009	-1.99%	-3.33%
			2650	1.959	37.634	2.018	38.945	-2.92%	-3.37%
8/21/2019	2450H	23.5	2700	2.003	37.518	2.073	38.882	-3.38%	-3.51%
			2400	1.803	39.613	1.756	39.289	2.68%	0.82%
			2450	1.839	39.552	1.800	39.200	2.17%	0.90%
			2500	1.878	39.456	1.855	39.136	1.24%	0.82%
			2550	1.919	39.377	1.909	39.073	0.52%	0.78%
			2600	1.957	39.304	1.964	39.009	-0.36%	0.76%
			2650	1.997	39.241	2.018	38.945	-1.04%	0.76%
			2700	2.034	39.131	2.073	38.882	-1.88%	0.64%

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 53 of 87

Table 10-2
Measured Tissue Properties (Cont.)

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
08/14/2019	5200H-5800H	22.6	5180	4.689	36.973	4.635	36.009	1.17%	2.68%
			5200	4.714	36.945	4.655	35.986	1.27%	2.66%
			5220	4.730	36.911	4.676	35.963	1.15%	2.64%
			5240	4.751	36.880	4.696	35.940	1.17%	2.62%
			5260	4.772	36.824	4.717	35.917	1.17%	2.53%
			5280	4.800	36.781	4.737	35.894	1.33%	2.47%
			5300	4.827	36.755	4.758	35.871	1.45%	2.46%
			5320	4.849	36.730	4.778	35.849	1.49%	2.46%
			5500	5.045	36.409	4.963	35.643	1.65%	2.15%
			5520	5.070	36.367	4.983	35.620	1.75%	2.10%
			5540	5.099	36.327	5.004	35.597	1.90%	2.05%
			5560	5.122	36.291	5.024	35.574	1.95%	2.02%
			5580	5.145	36.260	5.045	35.551	1.98%	1.99%
			5600	5.166	36.218	5.065	35.529	1.99%	1.94%
			5620	5.188	36.183	5.086	35.506	2.01%	1.91%
			5640	5.215	36.146	5.106	35.483	2.13%	1.87%
			5660	5.239	36.104	5.127	35.460	2.18%	1.82%
			5680	5.263	36.081	5.147	35.437	2.25%	1.82%
			5700	5.286	36.047	5.168	35.414	2.28%	1.79%
			5745	5.343	35.958	5.214	35.363	2.47%	1.68%
			5765	5.365	35.919	5.234	35.340	2.50%	1.64%
			5785	5.387	35.889	5.255	35.317	2.51%	1.62%
			5800	5.403	35.865	5.270	35.300	2.52%	1.60%
			5805	5.408	35.855	5.275	35.294	2.52%	1.59%
			5825	5.431	35.815	5.296	35.271	2.55%	1.54%

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 54 of 87

Table 10-3
Measured Tissue Properties (Cont.)

Calibrated for Tests Performed on:	Tissue Type	Tissue Temp During Calibration (°C)	Measured Frequency (MHz)	Measured Conductivity, σ (S/m)	Measured Dielectric Constant, ϵ	TARGET Conductivity, σ (S/m)	TARGET Dielectric Constant, ϵ	% dev σ	% dev ϵ
8/1/2019	750B	23.1	700	0.934	54.519	0.959	55.726	-2.61%	-2.17%
			710	0.938	54.494	0.960	55.687	-2.29%	-2.14%
			725	0.943	54.462	0.961	55.629	-1.87%	-2.10%
			740	0.949	54.428	0.963	55.570	-1.45%	-2.06%
			755	0.954	54.391	0.964	55.512	-1.04%	-2.02%
			770	0.959	54.348	0.965	55.453	-0.62%	-1.99%
			785	0.965	54.301	0.966	55.395	-0.10%	-1.97%
			800	0.971	54.260	0.967	55.336	0.41%	-1.94%
8/12/2019	750B	21.1	700	0.932	54.012	0.959	55.726	-2.82%	-3.08%
			710	0.936	53.991	0.960	55.687	-2.50%	-3.05%
			725	0.942	53.962	0.961	55.629	-1.98%	-3.00%
			740	0.948	53.930	0.963	55.570	-1.56%	-2.95%
			755	0.953	53.894	0.964	55.512	-1.14%	-2.91%
			770	0.959	53.853	0.965	55.453	-0.62%	-2.89%
			785	0.964	53.810	0.966	55.395	-0.21%	-2.86%
			800	0.970	53.772	0.967	55.336	0.31%	-2.83%
8/5/2019	835B	19.7	820	0.975	54.495	0.969	55.258	0.62%	-1.38%
			835	0.983	54.443	0.970	55.200	1.34%	-1.37%
			850	0.988	54.418	0.988	55.154	0.00%	-1.33%
8/5/2019	1750B	20.9	1710	1.458	53.751	1.463	53.537	-0.34%	0.40%
			1750	1.487	53.667	1.488	53.432	-0.07%	0.44%
			1790	1.514	53.602	1.514	53.326	0.00%	0.52%
8/7/2019	1750B	21.1	1710	1.457	53.108	1.463	53.537	-0.41%	-0.80%
			1750	1.486	53.046	1.488	53.432	-0.13%	-0.72%
			1790	1.515	52.973	1.514	53.326	0.07%	-0.66%
8/5/2019	1900B	23.8	1850	1.512	52.711	1.520	53.300	-0.53%	-1.11%
			1880	1.547	52.602	1.520	53.300	1.78%	-1.31%
			1910	1.580	52.499	1.520	53.300	3.95%	-1.50%
8/7/2019	1900B	24.0	1850	1.478	51.602	1.520	53.300	-2.76%	-3.19%
			1880	1.511	51.510	1.520	53.300	-0.59%	-3.36%
			1910	1.545	51.419	1.520	53.300	1.64%	-3.53%
8/15/2019	1900B	21.5	1850	1.547	50.933	1.520	53.300	1.78%	-4.44%
			1880	1.569	50.882	1.520	53.300	3.22%	-4.54%
			1910	1.593	50.833	1.520	53.300	4.80%	-4.63%
8/9/2019	2450B	24.3	2400	1.974	51.368	1.902	52.767	3.79%	-2.65%
			2450	2.031	51.241	1.950	52.700	4.15%	-2.77%
			2500	2.088	51.091	2.021	52.636	3.32%	-2.94%
			2550	2.148	50.938	2.092	52.573	2.68%	-3.11%
			2600	2.205	50.794	2.163	52.509	1.94%	-3.27%
			2650	2.264	50.633	2.234	52.445	1.34%	-3.46%
			2700	2.323	50.482	2.305	52.382	0.78%	-3.63%
8/12/2019	2450B	23.2	2400	1.991	51.851	1.902	52.767	4.68%	-1.74%
			2450	2.046	51.692	1.950	52.700	4.92%	-1.91%
			2500	2.112	51.549	2.021	52.636	4.50%	-2.07%
			2550	2.168	51.397	2.092	52.573	3.63%	-2.24%
			2600	2.235	51.220	2.163	52.509	3.33%	-2.45%
			2650	2.290	51.093	2.234	52.445	2.51%	-2.58%
			2700	2.354	50.885	2.305	52.382	2.13%	-2.86%

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 55 of 87

Table 10-4
Measured Tissue Properties (Cont.)

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
08/05/2019	5200B-5800B	22.1	5180	5.098	47.218	5.276	49.041	-3.37%	-3.72%
			5200	5.124	47.184	5.299	49.014	-3.30%	-3.73%
			5220	5.152	47.138	5.323	48.987	-3.21%	-3.77%
			5240	5.180	47.097	5.346	48.960	-3.11%	-3.81%
			5260	5.210	47.075	5.369	48.933	-2.96%	-3.80%
			5280	5.235	47.046	5.393	48.906	-2.93%	-3.80%
			5300	5.259	47.008	5.416	48.879	-2.90%	-3.83%
			5320	5.282	46.970	5.439	48.851	-2.89%	-3.85%
			5500	5.526	46.684	5.650	48.607	-2.19%	-3.96%
			5520	5.556	46.643	5.673	48.580	-2.06%	-3.99%
			5540	5.593	46.598	5.696	48.553	-1.81%	-4.03%
			5560	5.622	46.566	5.720	48.526	-1.71%	-4.04%
			5580	5.653	46.563	5.743	48.499	-1.57%	-3.99%
			5600	5.671	46.518	5.766	48.471	-1.65%	-4.03%
			5620	5.698	46.452	5.790	48.444	-1.59%	-4.11%
			5640	5.727	46.412	5.813	48.417	-1.48%	-4.14%
			5660	5.762	46.385	5.837	48.390	-1.28%	-4.14%
			5680	5.794	46.361	5.860	48.363	-1.13%	-4.14%
			5700	5.821	46.355	5.883	48.336	-1.05%	-4.10%
			5745	5.880	46.252	5.936	48.275	-0.94%	-4.19%
			5765	5.913	46.212	5.959	48.248	-0.77%	-4.22%
			5785	5.947	46.188	5.982	48.220	-0.59%	-4.21%
			5800	5.970	46.172	6.000	48.200	-0.50%	-4.21%
			5805	5.976	46.166	6.006	48.193	-0.50%	-4.21%
			5825	5.996	46.148	6.029	48.166	-0.55%	-4.19%

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: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 56 of 87	

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 10-5
System Verification Results – 1g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR _{1g} (W/kg)	1 W Target SAR _{1g} (W/kg)	1 W Normalized SAR _{1g} (W/kg)	Deviation _{1g} (%)
E	750	HEAD	07/29/2019	21.2	20.4	0.200	1003	3589	1.540	8.280	7.700	-7.00%
E	835	HEAD	07/30/2019	22.9	20.4	0.200	4d132	3589	1.960	9.590	9.800	2.19%
E	835	HEAD	08/01/2019	23.1	22.3	0.200	4d132	3589	2.020	9.590	10.100	5.32%
M	1750	HEAD	08/12/2019	20.7	20.0	0.100	1148	3287	3.600	37.000	36.000	-2.70%
M	1900	HEAD	08/12/2019	20.7	20.0	0.100	5d080	3287	4.100	39.800	41.000	3.02%
E	2450	HEAD	08/08/2019	23.8	21.7	0.100	797	7547	5.620	52.700	56.200	6.64%
E	2600	HEAD	08/21/2019	24.5	22.5	0.100	1004	7547	5.450	55.900	54.500	-2.50%
H	5250	HEAD	08/14/2019	22.5	22.6	0.050	1237	7406	3.810	81.300	76.200	-6.27%
H	5600	HEAD	08/14/2019	22.5	22.6	0.050	1237	7406	4.060	85.700	81.200	-5.25%
H	5750	HEAD	08/14/2019	22.5	22.6	0.050	1237	7406	3.800	80.600	76.000	-5.71%
G	750	BODY	08/01/2019	23.2	22.2	0.200	1003	7409	1.750	8.580	8.750	1.98%
G	750	BODY	08/12/2019	22.0	21.1	0.200	1003	7409	1.800	8.580	9.000	4.90%
O	835	BODY	08/05/2019	20.5	19.7	0.200	4d047	7538	2.030	9.470	10.150	7.18%
G	1750	BODY	08/05/2019	21.5	20.9	0.100	1148	7409	3.840	37.700	38.400	1.86%
G	1750	BODY	08/07/2019	22.0	21.1	0.100	1148	7409	3.990	37.700	39.900	5.84%
J	1900	BODY	08/05/2019	19.7	23.8	0.100	5d080	7488	4.200	39.200	42.000	7.14%
J	1900	BODY	08/07/2019	20.3	22.2	0.100	5d080	7488	4.040	39.200	40.400	3.06%
K	2450	BODY	08/09/2019	22.7	22.3	0.100	797	7417	4.840	51.100	48.400	-5.28%
K	2450	BODY	08/12/2019	22.9	22.0	0.100	797	7417	4.970	51.100	49.700	-2.74%
K	2600	BODY	08/12/2019	22.9	22.0	0.100	1004	7417	5.310	54.800	53.100	-3.10%
L	5250	BODY	08/05/2019	20.3	21.1	0.050	1057	7410	3.480	75.900	69.600	-8.30%
L	5600	BODY	08/05/2019	20.3	21.1	0.050	1057	7410	3.810	79.900	76.200	-4.63%
L	5750	BODY	08/05/2019	20.3	21.1	0.050	1057	7410	3.560	76.700	71.200	-7.17%

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 57 of 87

Table 10-6
System Verification Results – 10g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR _{10g} (W/kg)	1 W Target SAR _{10g} (W/kg)	1 W Normalized SAR _{10g} (W/kg)	Deviation _{10g} (%)
G	1900	BODY	08/15/2019	22.0	21.5	0.100	5d080	7409	2.090	20.600	20.900	1.46%
L	5250	BODY	08/05/2019	20.3	21.1	0.050	1057	7410	0.978	21.100	19.560	-7.30%
L	5600	BODY	08/05/2019	20.3	21.1	0.050	1057	7410	1.050	22.300	21.000	-5.83%
L	5750	BODY	08/05/2019	20.3	21.1	0.050	1057	7410	0.996	21.200	19.920	-6.04%

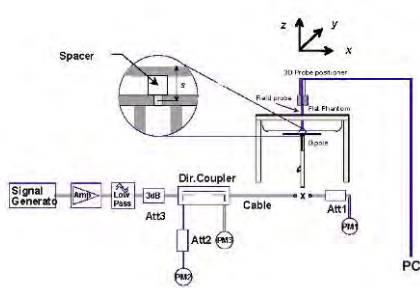


Figure 10-1
System Verification Setup Diagram



Figure 10-2
System Verification Setup Photo

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 58 of 87

11 SAR DATA SUMMARY

11.1 Standalone Head SAR Data

Table 11-1
GSM 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.5	32.13	0.01	Right	Cheek	01666	1:8.3	0.225	1.371	0.308	A1
836.60	190	GSM 850	GSM	33.5	32.13	-0.02	Right	Tilt	01666	1:8.3	0.115	1.371	0.158	
836.60	190	GSM 850	GSM	33.5	32.13	0.01	Left	Cheek	01666	1:8.3	0.196	1.371	0.269	
836.60	190	GSM 850	GSM	33.5	32.13	-0.03	Left	Tilt	01666	1:8.3	0.105	1.371	0.144	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-2
GSM 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	661	GSM 1900	GSM	30.5	28.86	0.04	Right	Cheek	01209	1:8.3	0.106	1.459	0.155	
1880.00	661	GSM 1900	GSM	30.5	28.86	0.15	Right	Tilt	01209	1:8.3	0.058	1.459	0.085	
1880.00	661	GSM 1900	GSM	30.5	28.86	-0.04	Left	Cheek	01209	1:8.3	0.124	1.459	0.181	A2
1880.00	661	GSM 1900	GSM	30.5	28.86	0.03	Left	Tilt	01209	1:8.3	0.080	1.459	0.117	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram							

Table 11-3
UMTS 850 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	25.0	24.09	0.02	Right	Cheek	01666	1:1	0.191	1.233	0.236	A3
836.60	4183	UMTS 850	RMC	25.0	24.09	0.04	Right	Tilt	01666	1:1	0.099	1.233	0.122	
836.60	4183	UMTS 850	RMC	25.0	24.09	0.06	Left	Cheek	01666	1:1	0.173	1.233	0.213	
836.60	4183	UMTS 850	RMC	25.0	24.09	-0.03	Left	Tilt	01666	1:1	0.107	1.233	0.132	
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: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC. SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 59 of 87

Table 11-4
UMTS 1750 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1712.40	1312	UMTS 1750	RMC	24.5	23.55	0.00	Right	Cheek	01209	1:1	0.129	1.245	0.161	
1712.40	1312	UMTS 1750	RMC	24.5	23.55	0.01	Right	Tilt	01209	1:1	0.121	1.245	0.151	
1712.40	1312	UMTS 1750	RMC	24.5	23.55	0.03	Left	Cheek	01209	1:1	0.164	1.245	0.204	A4
1712.40	1312	UMTS 1750	RMC	24.5	23.55	0.00	Left	Tilt	01209	1:1	0.125	1.245	0.156	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 11-5
UMTS 1900 Head SAR

MEASUREMENT RESULTS														
FREQUENCY		Mode	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	22.85	-0.04	Right	Cheek	01209	1:1	0.157	1.161	0.182	
1880.00	9400	UMTS 1900	RMC	23.5	22.85	0.02	Right	Tilt	01209	1:1	0.088	1.161	0.102	
1880.00	9400	UMTS 1900	RMC	23.5	22.85	0.06	Left	Cheek	01209	1:1	0.191	1.161	0.222	A5
1880.00	9400	UMTS 1900	RMC	23.5	22.85	0.04	Left	Tilt	01209	1:1	0.135	1.161	0.157	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram						

Table 11-6
LTE Band 12 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	24.5	23.65	0.06	0	Right	Cheek	QPSK	1	0	01666	1:1	0.157	1.216	0.191	A6
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	-0.01	2	Right	Cheek	QPSK	25	0	01666	1:1	0.111	1.081	0.120	
707.50	23095	Mid	LTE Band 12	10	24.5	23.65	0.09	0	Right	Tilt	QPSK	1	0	01666	1:1	0.092	1.216	0.112	
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	-0.01	2	Right	Tilt	QPSK	25	0	01666	1:1	0.061	1.081	0.066	
707.50	23095	Mid	LTE Band 12	10	24.5	23.65	-0.03	0	Left	Cheek	QPSK	1	0	01666	1:1	0.122	1.216	0.148	
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	0.12	2	Left	Cheek	QPSK	25	0	01666	1:1	0.096	1.081	0.104	
707.50	23095	Mid	LTE Band 12	10	24.5	23.65	0.10	0	Left	Tilt	QPSK	1	0	01666	1:1	0.062	1.216	0.075	
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	0.01	2	Left	Tilt	QPSK	25	0	01666	1:1	0.049	1.081	0.053	
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: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 60 of 87

Table 11-7
LTE Band 13 Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	0.03	0	Right	Cheek	QPSK	1	0	01666	1:1	0.091	1.253	0.114	A7
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	0.09	2	Right	Cheek	QPSK	25	0	01666	1:1	0.059	1.119	0.066	
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	-0.05	0	Right	Tilt	QPSK	1	0	01666	1:1	0.080	1.253	0.100	
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	0.18	2	Right	Tilt	QPSK	25	0	01666	1:1	0.050	1.119	0.056	
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	0.16	0	Left	Cheek	QPSK	1	0	01666	1:1	0.069	1.253	0.086	
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	0.12	2	Left	Cheek	QPSK	25	0	01666	1:1	0.046	1.119	0.051	
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	0.18	0	Left	Tilt	QPSK	1	0	01666	1:1	0.039	1.253	0.049	
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	-0.21	2	Left	Tilt	QPSK	25	0	01666	1:1	0.026	1.119	0.029	
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 5 (Cell) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	-0.02	0	Right	Cheek	QPSK	1	25	01666	1:1	0.219	1.259	0.276	A8
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	0.03	2	Right	Cheek	QPSK	25	0	01666	1:1	0.145	1.247	0.181	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	-0.07	0	Right	Tilt	QPSK	1	25	01666	1:1	0.103	1.259	0.130	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	0.02	2	Right	Tilt	QPSK	25	0	01666	1:1	0.071	1.247	0.089	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	-0.09	0	Left	Cheek	QPSK	1	25	01666	1:1	0.164	1.259	0.206	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	0.04	2	Left	Cheek	QPSK	25	0	01666	1:1	0.119	1.247	0.148	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	-0.14	0	Left	Tilt	QPSK	1	25	01666	1:1	0.104	1.259	0.131	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	0.04	2	Left	Tilt	QPSK	25	0	01666	1:1	0.072	1.247	0.090	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-9
LTE Band 66 (AWS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	-0.02	0	Right	Cheek	QPSK	1	50	01209	1:1	0.157	1.107	0.174	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	0.06	2	Right	Cheek	QPSK	50	0	01209	1:1	0.064	1.005	0.064	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	0.09	0	Right	Tilt	QPSK	1	50	01209	1:1	0.133	1.107	0.147	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	0.08	2	Right	Tilt	QPSK	50	0	01209	1:1	0.061	1.005	0.061	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	0.09	0	Left	Cheek	QPSK	1	50	01209	1:1	0.175	1.107	0.194	A9
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	0.07	2	Left	Cheek	QPSK	50	0	01209	1:1	0.084	1.005	0.084	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	0.01	0	Left	Tilt	QPSK	1	50	01209	1:1	0.150	1.107	0.166	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	0.12	2	Left	Tilt	QPSK	50	0	01209	1:1	0.064	1.005	0.064	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 61 of 87

Table 11-10
LTE Band 2 (PCS) Head SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Side	Test Position	Modulation	RB Size	RB Offset	Device Serial Number	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
																(W/kg)		(W/kg)	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	0.01	0	Right	Cheek	QPSK	1	99	01209	1:1	0.218	1.256	0.274	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	0.05	2	Right	Cheek	QPSK	50	50	01209	1:1	0.141	1.143	0.161	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	-0.04	0	Right	Tilt	QPSK	1	99	01209	1:1	0.119	1.256	0.149	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	0.02	2	Right	Tilt	QPSK	50	50	01209	1:1	0.062	1.143	0.071	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	-0.05	0	Left	Cheek	QPSK	1	99	01209	1:1	0.255	1.256	0.320	A10
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	-0.01	2	Left	Cheek	QPSK	50	50	01209	1:1	0.157	1.143	0.179	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	0.14	0	Left	Tilt	QPSK	1	99	01209	1:1	0.172	1.256	0.216	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	0.07	2	Left	Tilt	QPSK	50	50	01209	1:1	0.107	1.143	0.122	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 11-11
LTE Band 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	21.5	20.14	0.05	0	Right	Cheek	QPSK	1	0	01217	1:1.58	0.283	1.368	0.387	A11
2549.50	40185	Low-Mid	LTE Band 41	20	21.5	20.13	0.05	0	Right	Cheek	QPSK	50	0	01217	1:1.58	0.279	1.371	0.383	
2549.50	40185	Low-Mid	LTE Band 41	20	21.5	20.14	0.21	0	Right	Tilt	QPSK	1	0	01217	1:1.58	0.149	1.368	0.204	
2549.50	40185	Low-Mid	LTE Band 41	20	21.5	20.13	0.06	0	Right	Tilt	QPSK	50	0	01217	1:1.58	0.145	1.371	0.199	
2549.50	40185	Low-Mid	LTE Band 41	20	21.5	20.14	0.13	0	Left	Cheek	QPSK	1	0	01217	1:1.58	0.096	1.368	0.131	
2549.50	40185	Low-Mid	LTE Band 41	20	21.5	20.13	0.06	0	Left	Cheek	QPSK	50	0	01217	1:1.58	0.097	1.371	0.133	
2549.50	40185	Low-Mid	LTE Band 41	20	21.5	20.14	0.10	0	Left	Tilt	QPSK	1	0	01217	1:1.58	0.067	1.368	0.092	
2549.50	40185	Low-Mid	LTE Band 41	20	21.5	20.13	0.13	0	Left	Tilt	QPSK	50	0	01217	1:1.58	0.068	1.371	0.093	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 11-12
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	16.0	15.57	0.13	Right	Cheek	01563	1	99.7	0.253	-	1.104	1.003	-	
2412	1	802.11b	DSSS	22	16.0	15.57	0.14	Right	Tilt	01563	1	99.7	0.309	-	1.104	1.003	-	
2412	1	802.11b	DSSS	22	16.0	15.57	0.14	Left	Cheek	01563	1	99.7	0.731	0.427	1.104	1.003	0.473	
2412	1	802.11b	DSSS	22	16.0	15.57	0.08	Left	Tilt	01563	1	99.7	0.692	0.449	1.104	1.003	0.497	A12
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: A3LSMA307G	 SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset
Page 62 of 87		

Table 11-13
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)	
5270	54	802.11n	OFDM	40	14.0	13.64	-0.09	Right	Cheek	01563	13.5	92.9	0.981	-	1.086	1.076	-	
5270	54	802.11n	OFDM	40	14.0	13.64	-0.12	Right	Tilt	01563	13.5	92.9	1.020	0.559	1.086	1.076	0.653	
5270	54	802.11n	OFDM	40	14.0	13.64	0.16	Left	Cheek	01563	13.5	92.9	1.380	0.554	1.086	1.076	0.647	
5270	54	802.11n	OFDM	40	14.0	13.64	0.01	Left	Tilt	01563	13.5	92.9	1.961	0.711	1.086	1.076	0.831	
5310	62	802.11n	OFDM	40	14.0	13.56	0.08	Left	Tilt	01563	13.5	92.9	2.051	0.728	1.107	1.076	0.867	A13
5510	102	802.11n	OFDM	40	14.0	13.95	0.12	Right	Cheek	01563	13.5	92.9	1.128	-	1.012	1.076	-	
5510	102	802.11n	OFDM	40	14.0	13.95	-0.10	Right	Tilt	01563	13.5	92.9	1.347	0.630	1.012	1.076	0.686	
5510	102	802.11n	OFDM	40	14.0	13.95	0.17	Left	Cheek	01563	13.5	92.9	1.303	-	1.012	1.076	-	
5510	102	802.11n	OFDM	40	14.0	13.95	0.20	Left	Tilt	01563	13.5	92.9	1.809	0.684	1.012	1.076	0.745	
5755	151	802.11n	OFDM	40	14.0	13.86	0.17	Right	Cheek	01563	13.5	92.9	0.375	-	1.033	1.076	-	
5755	151	802.11n	OFDM	40	14.0	13.86	0.17	Right	Tilt	01563	13.5	92.9	0.465	-	1.033	1.076	-	
5755	151	802.11n	OFDM	40	14.0	13.86	0.11	Left	Cheek	01563	13.5	92.9	0.435	-	1.033	1.076	-	
5755	151	802.11n	OFDM	40	14.0	13.86	0.17	Left	Tilt	01563	13.5	92.9	0.612	0.207	1.033	1.076	0.230	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Head 1.6 W/kg (mW/g) averaged over 1 gram										
Spatial Peak Uncontrolled Exposure/General Population																		

Table 11-14
DSS Head SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	Test Position	Device Serial Number	Data Rate (Mbps)	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441.00	39	Bluetooth	FHSS	11.0	10.74	0.19	Right	Cheek	01563	1	76.6	0.026	1.062	1.305	0.036	
2441.00	39	Bluetooth	FHSS	11.0	10.74	0.13	Right	Tilt	01563	1	76.6	0.028	1.062	1.305	0.039	
2441.00	39	Bluetooth	FHSS	11.0	10.74	0.09	Left	Cheek	01563	1	76.6	0.054	1.062	1.305	0.075	
2441.00	39	Bluetooth	FHSS	11.0	10.74	0.09	Left	Tilt	01563	1	76.6	0.055	1.062	1.305	0.076	A14
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: A3LSMA307G	 SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset
Page 63 of 87		

11.2 Standalone Body-Worn SAR Data

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

MEASUREMENT RESULTS															
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)		(W/kg)	
836.60	190	GSM 850	GSM	33.5	32.13	-0.06	15 mm	01183	1	1:8.3	back	0.313	1.371	0.429	A15
1880.00	661	GSM 1900	GSM	30.5	28.86	-0.02	15 mm	01209	1	1:8.3	back	0.141	1.459	0.206	A17
836.60	4183	UMTS 850	RMC	25.0	24.09	0.02	15 mm	02417	N/A	1:1	back	0.268	1.233	0.330	A19
1712.40	1312	UMTS 1750	RMC	24.5	23.55	-0.04	15 mm	01191	N/A	1:1	back	0.210	1.245	0.261	A21
1880.00	9400	UMTS 1900	RMC	23.5	22.85	0.02	15 mm	01209	N/A	1:1	back	0.236	1.161	0.274	A23
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram								

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	Mid	LTE Band 12	10	24.5	23.65	0.03	0	01209	QPSK	1	0	15 mm	back	1:1	0.263	1.216	0.320	A25
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	0.03	2	01209	QPSK	25	0	15 mm	back	1:1	0.169	1.081	0.183	
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	0.10	0	01209	QPSK	1	0	15 mm	back	1:1	0.231	1.253	0.289	A27
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	0.00	2	01209	QPSK	25	0	15 mm	back	1:1	0.167	1.119	0.187	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	-0.04	0	02417	QPSK	1	25	15 mm	back	1:1	0.331	1.259	0.417	A29
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	-0.04	2	02417	QPSK	25	0	15 mm	back	1:1	0.215	1.247	0.268	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	0.02	0	01191	QPSK	1	50	15 mm	back	1:1	0.248	1.107	0.275	A31
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	-0.02	2	01191	QPSK	50	0	15 mm	back	1:1	0.113	1.005	0.114	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	-0.05	0	01209	QPSK	1	99	15 mm	back	1:1	0.295	1.256	0.371	A33
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	-0.03	2	01209	QPSK	50	50	15 mm	back	1:1	0.189	1.143	0.216	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.25	-0.13	0	01191	QPSK	1	0	15 mm	back	1:1.58	0.227	1.059	0.240	A35
2593.00	40620	Mid	LTE Band 41	20	22.5	22.44	0.08	2	01191	QPSK	50	0	15 mm	back	1:1.58	0.149	1.014	0.151	
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: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 64 of 87

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	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	19.0	18.99	0.12	15 mm	01563	1	back	99.7	0.160	0.110	1.002	1.003	0.111	A37
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram									

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 65 of 87

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	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.												W/kg	(W/kg)			(W/kg)	
5300	60	802.11a	OFDM	20	15.5	15.29	-0.04	15 mm	01738	6	back	97.3	0.290	0.135	1.050	1.028	0.146	
5500	100	802.11a	OFDM	20	15.0	14.98	-0.06	15 mm	01738	6	back	97.3	0.510	0.248	1.005	1.028	0.256	A39
5745	149	802.11a	OFDM	20	15.0	14.54	0.13	15 mm	01738	6	back	97.3	0.243	0.110	1.112	1.028	0.126	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body										
Spatial Peak								1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population								averaged over 1 gram										

11.3 Standalone Hotspot SAR Data

Table 11-19
GPRS/UMTS Hotspot SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	# of Time Slots	Duty Cycle	Side	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.											(W/kg)		(W/kg)		
824.20	128	GSM 850	GPRS	28.0	27.01	-0.06	10 mm	01183	4	1:2.076	back	0.412	1.256	0.517		
836.60	190	GSM 850	GPRS	28.0	27.20	-0.08	10 mm	01183	4	1:2.076	back	0.568	1.202	0.683		
848.80	251	GSM 850	GPRS	28.0	27.13	-0.03	10 mm	01183	4	1:2.076	back	0.641	1.222	0.783	A16	
836.60	190	GSM 850	GPRS	28.0	27.20	0.01	10 mm	01183	4	1:2.076	front	0.259	1.202	0.311		
836.60	190	GSM 850	GPRS	28.0	27.20	0.06	10 mm	01183	4	1:2.076	bottom	0.222	1.202	0.267		
836.60	190	GSM 850	GPRS	28.0	27.20	0.06	10 mm	01183	4	1:2.076	right	0.399	1.202	0.480		
836.60	190	GSM 850	GPRS	28.0	27.20	0.02	10 mm	01183	4	1:2.076	left	0.186	1.202	0.224		
1880.00	661	GSM 1900	GPRS	24.5	23.43	0.12	10 mm	01209	4	1:2.076	back	0.322	1.279	0.412	A18	
1880.00	661	GSM 1900	GPRS	24.5	23.43	0.07	10 mm	01209	4	1:2.076	front	0.220	1.279	0.281		
1880.00	661	GSM 1900	GPRS	24.5	23.43	-0.04	10 mm	01209	4	1:2.076	bottom	0.279	1.279	0.357		
1880.00	661	GSM 1900	GPRS	24.5	23.43	-0.04	10 mm	01209	4	1:2.076	right	0.069	1.279	0.088		
1880.00	661	GSM 1900	GPRS	24.5	23.43	0.06	10 mm	01209	4	1:2.076	left	0.189	1.279	0.242		
836.60	4183	UMTS 850	RMC	25.0	24.09	0.01	10 mm	02417	N/A	1:1	back	0.464	1.233	0.572	A20	
836.60	4183	UMTS 850	RMC	25.0	24.09	0.00	10 mm	02417	N/A	1:1	front	0.171	1.233	0.211		
836.60	4183	UMTS 850	RMC	25.0	24.09	-0.03	10 mm	02417	N/A	1:1	bottom	0.200	1.233	0.247		
836.60	4183	UMTS 850	RMC	25.0	24.09	-0.05	10 mm	02417	N/A	1:1	right	0.294	1.233	0.363		
836.60	4183	UMTS 850	RMC	25.0	24.09	0.02	10 mm	02417	N/A	1:1	left	0.128	1.233	0.158		
1712.40	1312	UMTS 1750	RMC	24.5	23.55	0.03	10 mm	01191	N/A	1:1	back	0.376	1.245	0.468	A22	
1712.40	1312	UMTS 1750	RMC	24.5	23.55	-0.01	10 mm	01191	N/A	1:1	front	0.331	1.245	0.412		
1712.40	1312	UMTS 1750	RMC	24.5	23.55	-0.06	10 mm	01191	N/A	1:1	bottom	0.280	1.245	0.349		
1712.40	1312	UMTS 1750	RMC	24.5	23.55	-0.06	10 mm	01191	N/A	1:1	right	0.089	1.245	0.111		
1712.40	1312	UMTS 1750	RMC	24.5	23.55	-0.14	10 mm	01191	N/A	1:1	left	0.191	1.245	0.238		
1880.00	9400	UMTS 1900	RMC	20.5	19.51	0.04	10 mm	01209	N/A	1:1	back	0.267	1.256	0.335	A24	
1880.00	9400	UMTS 1900	RMC	20.5	19.51	0.11	10 mm	01209	N/A	1:1	front	0.141	1.256	0.177		
1880.00	9400	UMTS 1900	RMC	20.5	19.51	-0.05	10 mm	01209	N/A	1:1	bottom	0.238	1.256	0.299		
1880.00	9400	UMTS 1900	RMC	20.5	19.51	0.03	10 mm	01209	N/A	1:1	right	0.052	1.256	0.065		
1880.00	9400	UMTS 1900	RMC	20.5	19.51	0.06	10 mm	01209	N/A	1:1	left	0.154	1.256	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									

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 66 of 87

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	24.5	23.65	0.01	0	01209	QPSK	1	0	10 mm	back	1:1	0.298	1.216	0.362	A26
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	0.00	2	01209	QPSK	25	0	10 mm	back	1:1	0.202	1.081	0.218	
707.50	23095	Mid	LTE Band 12	10	24.5	23.65	0.06	0	01209	QPSK	1	0	10 mm	front	1:1	0.143	1.216	0.174	
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	0.03	2	01209	QPSK	25	0	10 mm	front	1:1	0.094	1.081	0.102	
707.50	23095	Mid	LTE Band 12	10	24.5	23.65	0.10	0	01209	QPSK	1	0	10 mm	bottom	1:1	0.061	1.216	0.074	
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	0.06	2	01209	QPSK	25	0	10 mm	bottom	1:1	0.041	1.081	0.044	
707.50	23095	Mid	LTE Band 12	10	24.5	23.65	-0.12	0	01209	QPSK	1	0	10 mm	right	1:1	0.234	1.216	0.285	
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	-0.06	2	01209	QPSK	25	0	10 mm	right	1:1	0.158	1.081	0.171	
707.50	23095	Mid	LTE Band 12	10	24.5	23.65	0.12	0	01209	QPSK	1	0	10 mm	left	1:1	0.133	1.216	0.162	
707.50	23095	Mid	LTE Band 12	10	22.5	22.16	-0.19	2	01209	QPSK	25	0	10 mm	left	1:1	0.087	1.081	0.094	
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 13 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	0.00	0	01209	QPSK	1	0	10 mm	back	1:1	0.264	1.253	0.331	A28
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	-0.07	2	01209	QPSK	25	0	10 mm	back	1:1	0.192	1.119	0.215	
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	0.07	0	01209	QPSK	1	0	10 mm	front	1:1	0.147	1.253	0.184	
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	0.01	2	01209	QPSK	25	0	10 mm	front	1:1	0.106	1.119	0.119	
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	-0.07	0	01209	QPSK	1	0	10 mm	bottom	1:1	0.052	1.253	0.065	
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	0.15	2	01209	QPSK	25	0	10 mm	bottom	1:1	0.038	1.119	0.043	
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	0.07	0	01209	QPSK	1	0	10 mm	right	1:1	0.198	1.253	0.248	
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	-0.11	2	01209	QPSK	25	0	10 mm	right	1:1	0.145	1.119	0.162	
782.00	23230	Mid	LTE Band 13	10	24.5	23.52	0.03	0	01209	QPSK	1	0	10 mm	left	1:1	0.124	1.253	0.155	
782.00	23230	Mid	LTE Band 13	10	22.5	22.01	0.07	2	01209	QPSK	25	0	10 mm	left	1:1	0.087	1.119	0.097	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

Table 11-22
LTE Band 5 (Cell) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	-0.02	0	02417	QPSK	1	25	10 mm	back	1:1	0.512	1.259	0.645	A30
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	0.07	2	02417	QPSK	25	0	10 mm	back	1:1	0.323	1.247	0.403	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	-0.08	0	02417	QPSK	1	25	10 mm	front	1:1	0.197	1.259	0.248	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	-0.01	2	02417	QPSK	25	0	10 mm	front	1:1	0.129	1.247	0.161	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	0.01	0	02417	QPSK	1	25	10 mm	bottom	1:1	0.214	1.259	0.269	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	-0.01	2	02417	QPSK	25	0	10 mm	bottom	1:1	0.137	1.247	0.171	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	-0.08	0	02417	QPSK	1	25	10 mm	right	1:1	0.374	1.259	0.471	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	-0.03	2	02417	QPSK	25	0	10 mm	right	1:1	0.245	1.247	0.306	
836.50	20525	Mid	LTE Band 5 (Cell)	10	25.5	24.50	0.05	0	02417	QPSK	1	25	10 mm	left	1:1	0.171	1.259	0.215	
836.50	20525	Mid	LTE Band 5 (Cell)	10	23.5	22.54	0.02	2	02417	QPSK	25	0	10 mm	left	1:1	0.115	1.247	0.143	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 67 of 87

Table 11-23
LTE Band 66 (AWS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	0.03	0	01191	QPSK	1	50	10 mm	back	1:1	0.442	1.107	0.489	A32
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	-0.01	2	01191	QPSK	50	0	10 mm	back	1:1	0.223	1.005	0.224	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	0.02	0	01191	QPSK	1	50	10 mm	front	1:1	0.390	1.107	0.432	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	0.07	2	01191	QPSK	50	0	10 mm	front	1:1	0.193	1.005	0.194	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	-0.03	0	01191	QPSK	1	50	10 mm	bottom	1:1	0.425	1.107	0.470	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	0.01	2	01191	QPSK	50	0	10 mm	bottom	1:1	0.182	1.005	0.183	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	0.07	0	01191	QPSK	1	50	10 mm	right	1:1	0.127	1.107	0.141	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	0.05	2	01191	QPSK	50	0	10 mm	right	1:1	0.052	1.005	0.052	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.5	24.06	0.08	0	01191	QPSK	1	50	10 mm	left	1:1	0.338	1.107	0.374	
1720.00	132072	Low	LTE Band 66 (AWS)	20	22.5	22.48	-0.06	2	01191	QPSK	50	0	10 mm	left	1:1	0.133	1.005	0.134	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

Table 11-24
LTE Band 2 (PCS) Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.	(W/kg)														(W/kg)			
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.45	-0.03	0	01209	QPSK	1	50	10 mm	back	1:1	0.323	1.274	0.412	A34
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.36	0.03	0	01209	QPSK	50	25	10 mm	back	1:1	0.319	1.300	0.415	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.45	-0.02	0	01209	QPSK	1	50	10 mm	front	1:1	0.194	1.274	0.247	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.36	0.03	0	01209	QPSK	50	25	10 mm	front	1:1	0.190	1.300	0.247	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.45	-0.04	0	01209	QPSK	1	50	10 mm	bottom	1:1	0.311	1.274	0.396	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.36	-0.03	0	01209	QPSK	50	25	10 mm	bottom	1:1	0.299	1.300	0.389	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.45	-0.15	0	01209	QPSK	1	50	10 mm	right	1:1	0.077	1.274	0.098	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.36	0.07	0	01209	QPSK	50	25	10 mm	right	1:1	0.074	1.300	0.096	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.45	0.01	0	01209	QPSK	1	50	10 mm	left	1:1	0.214	1.274	0.273	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.36	-0.04	0	01209	QPSK	50	25	10 mm	left	1:1	0.206	1.300	0.268	
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: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 68 of 87

Table 11-25
LTE Band 41 Hotspot SAR

MEASUREMENT RESULTS																			
FREQUENCY			Side	Modulation	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Side	# of Time Slots	RB Size	RB Offset	MPR [dB]	Spacing	Maximum Allowed Power	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.	(W/kg)														(W/kg)			
2593.00	40620	Mid	LTE Band 41	20	24.5	24.25	-0.05	0	01191	QPSK	1	0	10 mm	back	1:1.58	0.516	1.059	0.546	A36
2593.00	40620	Mid	LTE Band 41	20	22.5	22.44	0.08	2	01191	QPSK	50	0	10 mm	back	1:1.58	0.348	1.014	0.353	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.25	0.00	0	01191	QPSK	1	0	10 mm	front	1:1.58	0.166	1.059	0.176	
2593.00	40620	Mid	LTE Band 41	20	22.5	22.44	0.11	2	01191	QPSK	50	0	10 mm	front	1:1.58	0.112	1.014	0.114	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.25	0.06	0	01191	QPSK	1	0	10 mm	top	1:1.58	0.115	1.059	0.122	
2593.00	40620	Mid	LTE Band 41	20	22.5	22.44	0.11	2	01191	QPSK	50	0	10 mm	top	1:1.58	0.077	1.014	0.078	
2593.00	40620	Mid	LTE Band 41	20	24.5	24.25	-0.13	0	01191	QPSK	1	0	10 mm	left	1:1.58	0.488	1.059	0.517	
2593.00	40620	Mid	LTE Band 41	20	22.5	22.44	-0.08	2	01191	QPSK	50	0	10 mm	left	1:1.58	0.329	1.014	0.334	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body											
Spatial Peak								1.6 W/kg (mW/g)											
Uncontrolled Exposure/General Population								averaged over 1 gram											

Table 11-26
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)	
2412	1	802.11b	DSSS	22	19.0	18.99	0.15	10 mm	01563	1	back	99.7	0.442	0.273	1.002	1.003	0.274	A38
2412	1	802.11b	DSSS	22	19.0	18.99	0.18	10 mm	01563	1	front	99.7	0.181	-	1.002	1.003	-	
2412	1	802.11b	DSSS	22	19.0	18.99	0.15	10 mm	01563	1	top	99.7	0.385	-	1.002	1.003	-	
2412	1	802.11b	DSSS	22	19.0	18.99	0.14	10 mm	01563	1	right	99.7	0.098	-	1.002	1.003	-	
5745	149	802.11a	OFDM	20	15.0	14.54	0.03	10 mm	01738	6	back	97.3	0.288	-	1.112	1.028	-	
5745	149	802.11a	OFDM	20	15.0	14.54	0.13	10 mm	01738	6	front	97.3	0.073	-	1.112	1.028	-	
5745	149	802.11a	OFDM	20	15.0	14.54	-0.03	10 mm	01738	6	top	97.3	0.402	0.158	1.112	1.028	0.181	A40
5745	149	802.11a	OFDM	20	15.0	14.54	0.10	10 mm	01738	6	right	97.3	0.023	-	1.112	1.028	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body										
Spatial Peak								1.6 W/kg (mW/g)										
Uncontrolled Exposure/General Population								averaged over 1 gram										

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset
Page 69 of 87		

11.4 Standalone Phablet SAR Data

Table 11-27
UMTS Phablet SAR Data

MEASUREMENT RESULTS														
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Duty Cycle	Side	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
1880.00	9400	UMTS 1900	RMC	23.5	22.85	0.00	11 mm	01209	1:1	back	0.272	1.161	0.316	
1880.00	9400	UMTS 1900	RMC	23.5	22.85	0.15	0 mm	01209	1:1	front	1.130	1.161	1.312	A41
1880.00	9400	UMTS 1900	RMC	23.5	22.85	-0.12	5 mm	01209	1:1	bottom	0.520	1.161	0.604	
1880.00	9400	UMTS 1900	RMC	23.5	22.85	0.07	0 mm	01209	1:1	right	0.130	1.161	0.151	
1880.00	9400	UMTS 1900	RMC	23.5	22.85	-0.07	0 mm	01209	1:1	left	1.090	1.161	1.265	
1880.00	9400	UMTS 1900	RMC	20.5	19.51	0.03	0 mm	01209	1:1	back	0.540	1.256	0.678	
1880.00	9400	UMTS 1900	RMC	20.5	19.51	-0.12	0 mm	01209	1:1	bottom	0.570	1.256	0.716	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Phablet 4.0 W/kg (mW/g) averaged over 10 grams							

Table 11-28
LTE Phablet SAR

MEASUREMENT RESULTS																			
FREQUENCY			Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.	(W/kg)														(W/kg)			
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	-0.16	0	01209	QPSK	1	99	11 mm	back	1:1	0.385	1.256	0.484	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	-0.14	2	01209	QPSK	50	50	11 mm	back	1:1	0.235	1.143	0.269	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	0.17	0	01209	QPSK	1	99	0 mm	front	1:1	1.540	1.256	1.934	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	0.18	2	01209	QPSK	50	50	0 mm	front	1:1	0.753	1.143	0.861	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	-0.02	0	01209	QPSK	1	99	5 mm	bottom	1:1	0.693	1.256	0.870	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	-0.06	2	01209	QPSK	50	50	5 mm	bottom	1:1	0.437	1.143	0.499	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	-0.19	0	01209	QPSK	1	99	0 mm	right	1:1	0.148	1.256	0.186	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	0.06	2	01209	QPSK	50	50	0 mm	right	1:1	0.097	1.143	0.111	
1860.00	18700	Low	LTE Band 2 (PCS)	20	24.5	23.51	-0.14	0	01209	QPSK	1	99	0 mm	left	1:1	1.560	1.256	1.959	A32
1880.00	18900	Mid	LTE Band 2 (PCS)	20	24.5	23.43	-0.14	0	01209	QPSK	1	50	0 mm	left	1:1	1.330	1.279	1.701	
1900.00	19100	High	LTE Band 2 (PCS)	20	24.5	23.35	-0.13	0	01209	QPSK	1	0	0 mm	left	1:1	1.310	1.303	1.707	
1880.00	18900	Mid	LTE Band 2 (PCS)	20	22.5	21.92	-0.13	2	01209	QPSK	50	50	0 mm	left	1:1	0.937	1.143	1.071	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.45	0.02	0	01209	QPSK	1	50	0 mm	back	1:1	0.790	1.274	1.006	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.36	0.00	0	01209	QPSK	50	25	0 mm	back	1:1	0.781	1.300	1.015	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.45	-0.16	0	01209	QPSK	1	50	0 mm	bottom	1:1	0.749	1.274	0.954	
1860.00	18700	Low	LTE Band 2 (PCS)	20	21.5	20.36	-0.17	0	01209	QPSK	50	25	0 mm	bottom	1:1	0.735	1.300	0.956	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Phablet 4.0 W/kg (mW/g) averaged over 10 grams											

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 70 of 87

Table 11-29
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)	
5300	60	802.11a	OFDM	20	15.5	15.29	-0.16	0 mm	01738	6	back	97.3	7.674	-	1.050	1.028	-	
5300	60	802.11a	OFDM	20	15.5	15.29	0.01	0 mm	01738	6	front	97.3	2.566	-	1.050	1.028	-	
5300	60	802.11a	OFDM	20	15.5	15.29	-0.18	0 mm	01738	6	top	97.3	18.132	0.739	1.050	1.028	0.798	
5300	60	802.11a	OFDM	20	15.5	15.29	0.10	0 mm	01738	6	right	97.3	0.056	-	1.050	1.028	-	
5500	100	802.11a	OFDM	20	15.0	14.98	-0.17	0 mm	01738	6	back	97.3	9.076	0.812	1.005	1.028	0.839	
5500	100	802.11a	OFDM	20	15.0	14.98	0.03	0 mm	01738	6	front	97.3	3.582	-	1.005	1.028	-	
5500	100	802.11a	OFDM	20	15.0	14.98	0.00	0 mm	01738	6	top	97.3	18.490	1.010	1.005	1.028	1.043	A43
5500	100	802.11a	OFDM	20	15.0	14.98	0.10	0 mm	01738	6	right	97.3	0.107	-	1.005	1.028	-	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Phablet 4.0 W/kg (mW/g) averaged over 10 grams										

11.5 SAR Test Notes

General Notes:

- The test data reported are the worst-case SAR values according to test procedures specified in IEEE 1528-2013, and FCC KDB Publication 447498 D01v06.
- Batteries are fully charged at the beginning of the SAR measurements.
- Liquid tissue depth was at least 15.0 cm for all frequencies.
- The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
- SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
- Device was tested using a fixed spacing for body-worn accessory testing. A separation distance of 15 mm was considered because the manufacturer has determined that there will be body-worn accessories available in the marketplace for users to support this separation distance.
- Per FCC KDB Publication 648474 D04v01r03, body-worn SAR was evaluated without a headset connected to the device. Since the standalone reported body-worn SAR was ≤ 1.2 W/kg, no additional body-worn SAR evaluations using a headset cable were required.
- Per FCC KDB Publication 865664 D01v01r04, variability SAR tests were not required since measured SAR results for all frequency bands were less than 0.8 W/kg and 2.0 W/kg for 10g SAR. Please see Section 13 for variability analysis.
- During SAR Testing for the Wireless Router conditions per FCC KDB Publication 941225 D06v02r01, the actual Portable Hotspot operation (with actual simultaneous transmission of a transmitter with WIFI) was not activated (See Section 6.7 for more details).
- Per FCC KDB Publication 648474 D04v01r03, this device is considered a "phablet" since the diagonal dimension is > 160 mm and < 200 mm. Therefore, phablet SAR tests are required when wireless router mode does not apply or if wireless router 1g SAR > 1.2 W/kg.
- This device utilizes power reduction for some wireless modes and technologies, as outlined in Section 1.3. The maximum output power allowed for each transmitter and exposure condition was evaluated for SAR compliance based on expected use conditions and simultaneous transmission scenarios.
- Unless otherwise noted, when 10g SAR measurement is considered, a factor of 2.5 is applied to the thresholds below.
- Additional SAR tests for phablet SAR were evaluated per KDB 616217 Section 6 (See Section 6.9 for more information).

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 71 of 87

GSM Test Notes:

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

UMTS Notes:

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

LTE Notes:

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

WLAN Notes:

1. For held-to-ear, hotspot, and phablet operations, the initial test position procedures were applied. The test position with the highest extrapolated peak SAR will be used as the initial test position. When reported SAR for the initial test position is ≤ 0.4 W/kg for 1g evaluations, no additional testing for the remaining test positions was required. Otherwise, SAR is evaluated at the subsequent highest peak SAR positions until the reported SAR result is ≤ 0.8 W/kg or all test positions are measured.

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset
		Page 72 of 87

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 8.6.5 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 evaluations. See Section 8.6.6 for more information.
4. When the maximum reported 1g averaged SAR is ≤ 0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg for 1g evaluations or all test channels were measured.
5. The device was configured to transmit continuously at the required data rate, channel bandwidth and signal modulation, using the highest transmission duty factor supported by the test mode tools. The reported SAR was scaled to the 100% transmission duty factor to determine compliance. Procedures used to measure the duty factor are identical to that in the associated EMC test reports.

Bluetooth Notes

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 73 of 87

12 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

12.1 Introduction

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

12.2 Simultaneous Transmission Procedures

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

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.

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

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 10g SAR for simultaneous transmission assessment involving that transmitter.

$$\text{Estimated SAR} = \frac{\sqrt{f(\text{GHz})}}{18.75} * \frac{(\text{Max Power of channel, mW})}{\text{Min. Separation Distance, mm}}$$

Table 12-1
Estimated SAR

Mode	Frequency	Maximum Allowed Power	Separation Distance (Hotspot)	Estimated SAR (Hotspot)	Separation Distance (Body-worn)	Estimated SAR (Body-worn)	Separation Distance (Phablet)	Estimated SAR (Phablet)
	[MHz]	[dBm]	[mm]	[W/kg]	[mm]	[W/kg]	[mm]	[W/kg]
Bluetooth	2480	11.00	10	0.273	15	0.182	5	0.218

Note: Per KDB Publication 447498 D01v06, the maximum power of the channel was rounded to the nearest mW before calculation.

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 74 of 87

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)
		1	2	1+2
Head SAR	GSM 850	0.308	0.497	0.805
	GSM 1900	0.181	0.497	0.678
	UMTS 850	0.236	0.497	0.733
	UMTS 1750	0.204	0.497	0.701
	UMTS 1900	0.222	0.497	0.719
	LTE Band 12	0.191	0.497	0.688
	LTE Band 13	0.114	0.497	0.611
	LTE Band 5 (Cell)	0.276	0.497	0.773
	LTE Band 66 (AWS)	0.194	0.497	0.691
	LTE Band 2 (PCS)	0.320	0.497	0.817
	LTE Band 41	0.387	0.497	0.884

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)
		1	2	1+2
Head SAR	GSM 850	0.308	0.867	1.175
	GSM 1900	0.181	0.867	1.048
	UMTS 850	0.236	0.867	1.103
	UMTS 1750	0.204	0.867	1.071
	UMTS 1900	0.222	0.867	1.089
	LTE Band 12	0.191	0.867	1.058
	LTE Band 13	0.114	0.867	0.981
	LTE Band 5 (Cell)	0.276	0.867	1.143
	LTE Band 66 (AWS)	0.194	0.867	1.061
	LTE Band 2 (PCS)	0.320	0.867	1.187
	LTE Band 41	0.387	0.867	1.254

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 75 of 87	

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	GSM 850	0.308	0.076	0.384
	GSM 1900	0.181	0.076	0.257
	UMTS 850	0.236	0.076	0.312
	UMTS 1750	0.204	0.076	0.280
	UMTS 1900	0.222	0.076	0.298
	LTE Band 12	0.191	0.076	0.267
	LTE Band 13	0.114	0.076	0.190
	LTE Band 5 (Cell)	0.276	0.076	0.352
	LTE Band 66 (AWS)	0.194	0.076	0.270
	LTE Band 2 (PCS)	0.320	0.076	0.396
	LTE Band 41	0.387	0.076	0.463

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

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Head SAR	GSM 850	0.308	0.076	0.867	1.251
	GSM 1900	0.181	0.076	0.867	1.124
	UMTS 850	0.236	0.076	0.867	1.179
	UMTS 1750	0.204	0.076	0.867	1.147
	UMTS 1900	0.222	0.076	0.867	1.165
	LTE Band 12	0.191	0.076	0.867	1.134
	LTE Band 13	0.114	0.076	0.867	1.057
	LTE Band 5 (Cell)	0.276	0.076	0.867	1.219
	LTE Band 66 (AWS)	0.194	0.076	0.867	1.137
	LTE Band 2 (PCS)	0.320	0.076	0.867	1.263
	LTE Band 41	0.387	0.076	0.867	1.330

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 76 of 87

12.4 Body-Worn Simultaneous Transmission Analysis

Table 12-6
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body-Worn	GSM 850	0.429	0.111	0.540
	GSM 1900	0.206	0.111	0.317
	UMTS 850	0.330	0.111	0.441
	UMTS 1750	0.261	0.111	0.372
	UMTS 1900	0.274	0.111	0.385
	LTE Band 12	0.320	0.111	0.431
	LTE Band 13	0.289	0.111	0.400
	LTE Band 5 (Cell)	0.417	0.111	0.528
	LTE Band 66 (AWS)	0.275	0.111	0.386
	LTE Band 2 (PCS)	0.371	0.111	0.482
	LTE Band 41	0.240	0.111	0.351

Table 12-7
Simultaneous Transmission Scenario with 5 GHz WLAN (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body-Worn	GSM 850	0.429	0.256	0.685
	GSM 1900	0.206	0.256	0.462
	UMTS 850	0.330	0.256	0.586
	UMTS 1750	0.261	0.256	0.517
	UMTS 1900	0.274	0.256	0.530
	LTE Band 12	0.320	0.256	0.576
	LTE Band 13	0.289	0.256	0.545
	LTE Band 5 (Cell)	0.417	0.256	0.673
	LTE Band 66 (AWS)	0.275	0.256	0.531
	LTE Band 2 (PCS)	0.371	0.256	0.627
	LTE Band 41	0.240	0.256	0.496

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 77 of 87

Table 12-8
Simultaneous Transmission Scenario with Bluetooth (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body-Worn	GSM 850	0.429	0.182	0.611
	GSM 1900	0.206	0.182	0.388
	UMTS 850	0.330	0.182	0.512
	UMTS 1750	0.261	0.182	0.443
	UMTS 1900	0.274	0.182	0.456
	LTE Band 12	0.320	0.182	0.502
	LTE Band 13	0.289	0.182	0.471
	LTE Band 5 (Cell)	0.417	0.182	0.599
	LTE Band 66 (AWS)	0.275	0.182	0.457
	LTE Band 2 (PCS)	0.371	0.182	0.553
	LTE Band 41	0.240	0.182	0.422

Note: Bluetooth SAR was not required to be measured per FCC KDB Publication 447498 D01v06. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

Table 12-9
Simultaneous Transmission Scenario with Bluetooth and 5 GHz WLAN (Body-Worn at 1.5 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Body-Worn	GSM 850	0.429	0.182	0.256	0.867
	GSM 1900	0.206	0.182	0.256	0.644
	UMTS 850	0.330	0.182	0.256	0.768
	UMTS 1750	0.261	0.182	0.256	0.699
	UMTS 1900	0.274	0.182	0.256	0.712
	LTE Band 12	0.320	0.182	0.256	0.758
	LTE Band 13	0.289	0.182	0.256	0.727
	LTE Band 5 (Cell)	0.417	0.182	0.256	0.855
	LTE Band 66 (AWS)	0.275	0.182	0.256	0.713
	LTE Band 2 (PCS)	0.371	0.182	0.256	0.809
	LTE Band 41	0.240	0.182	0.256	0.678

Note: Bluetooth SAR was not required to be measured per FCC KDB Publication 447498 D01v06. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

FCC ID: A3LSMA307G		SAR EVALUATION REPORT 	Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 78 of 87

12.5 Hotspot SAR Simultaneous Transmission Analysis

Table 12-10
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)
		1	2	1+2
Hotspot SAR	GPRS 850	0.783	0.274	1.057
	GPRS 1900	0.412	0.274	0.686
	UMTS 850	0.572	0.274	0.846
	UMTS 1750	0.468	0.274	0.742
	UMTS 1900	0.335	0.274	0.609
	LTE Band 12	0.362	0.274	0.636
	LTE Band 13	0.331	0.274	0.605
	LTE Band 5 (Cell)	0.645	0.274	0.919
	LTE Band 66 (AWS)	0.489	0.274	0.763
	LTE Band 2 (PCS)	0.415	0.274	0.689
	LTE Band 41	0.546	0.274	0.820

Table 12-11
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)
		1	2	1+2
Hotspot SAR	GPRS 850	0.783	0.181	0.964
	GPRS 1900	0.412	0.181	0.593
	UMTS 850	0.572	0.181	0.753
	UMTS 1750	0.468	0.181	0.649
	UMTS 1900	0.335	0.181	0.516
	LTE Band 12	0.362	0.181	0.543
	LTE Band 13	0.331	0.181	0.512
	LTE Band 5 (Cell)	0.645	0.181	0.826
	LTE Band 66 (AWS)	0.489	0.181	0.670
	LTE Band 2 (PCS)	0.415	0.181	0.596
	LTE Band 41	0.546	0.181	0.727

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 79 of 87

Table 12-12
Simultaneous Transmission Scenario with Bluetooth (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Hotspot SAR	GPRS 850	0.783	0.273	1.056
	GPRS 1900	0.412	0.273	0.685
	UMTS 850	0.572	0.273	0.845
	UMTS 1750	0.468	0.273	0.741
	UMTS 1900	0.335	0.273	0.608
	LTE Band 12	0.362	0.273	0.635
	LTE Band 13	0.331	0.273	0.604
	LTE Band 5 (Cell)	0.645	0.273	0.918
	LTE Band 66 (AWS)	0.489	0.273	0.762
	LTE Band 2 (PCS)	0.415	0.273	0.688
	LTE Band 41	0.546	0.273	0.819

Note: Bluetooth SAR was not required to be measured per FCC KDB Publication 447498 D01v06. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

Table 12-13
Simultaneous Transmission Scenario with Bluetooth and 5 GHz WLAN (Hotspot at 1.0 cm)

Exposure Condition	Mode	2G/3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Hotspot SAR	GPRS 850	0.783	0.273	0.181	1.237
	GPRS 1900	0.412	0.273	0.181	0.866
	UMTS 850	0.572	0.273	0.181	1.026
	UMTS 1750	0.468	0.273	0.181	0.922
	UMTS 1900	0.335	0.273	0.181	0.789
	LTE Band 12	0.362	0.273	0.181	0.816
	LTE Band 13	0.331	0.273	0.181	0.785
	LTE Band 5 (Cell)	0.645	0.273	0.181	1.099
	LTE Band 66 (AWS)	0.489	0.273	0.181	0.943
	LTE Band 2 (PCS)	0.415	0.273	0.181	0.869
	LTE Band 41	0.546	0.273	0.181	1.000

Note: Bluetooth SAR was not required to be measured per FCC KDB Publication 447498 D01v06. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 80 of 87

12.6 Phablet Simultaneous Transmission Analysis

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

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

Table 12-14
Simultaneous Transmission Scenario with 5 GHz WLAN (Phablet)

Exposure Condition	Mode	3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Phablet SAR	UMTS 1900	1.312	1.043	2.355
	LTE Band 2 (PCS)	1.959	1.043	3.002

Table 12-15
Simultaneous Transmission Scenario with 2.4 GHz Bluetooth (Phablet)

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Phablet SAR	UMTS 1900	1.312	0.218	1.530
	LTE Band 2 (PCS)	1.959	0.218	2.177

Note: Bluetooth SAR was not required to be measured per FCC KDB Publication 447498 D01v06. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

Table 12-16
Simultaneous Transmission Scenario with 2.4 GHz Bluetooth and 5 GHz WLAN (Phablet)

Exposure Condition	Mode	3G/4G SAR (W/kg)	5 GHz WLAN SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Phablet SAR	UMTS 1900	1.312	1.043	0.218	2.573
	LTE Band 2 (PCS)	1.959	1.043	0.218	3.220

Note: Bluetooth SAR was not required to be measured per FCC KDB Publication 447498 D01v06. Estimated SAR results were used in the above table to determine simultaneous transmission SAR test exclusion.

12.7 Simultaneous Transmission Conclusion

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

FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 			Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 81 of 87

13 SAR MEASUREMENT VARIABILITY

13.1 Measurement Variability

Per FCC KDB Publication 865664 D01v01, SAR measurement variability was not assessed for each frequency band since all measured SAR values are < 0.80 W/kg for 1g SAR and < 2.0 W/kg for 10g SAR.

13.2 Measurement Uncertainty

The measured SAR was <1.5 W/kg for 1g and <3.75 W/kg for 10g for all frequency bands. Therefore, per KDB Publication 865664 D01v01r04, the extended measurement uncertainty analysis per IEEE 1528-2013 was not required.

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 82 of 87

14 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4438C	ESG Vector Signal Generator	5/22/2019	Annual	5/22/2020	MY45091346
Agilent	E4438C	ESG Vector Signal Generator	5/23/2019	Annual	5/23/2020	MY47270002
Agilent	N9020A	MXA Signal Analyzer	4/20/2019	Annual	4/20/2020	US46470561
Agilent	N5182A	MXG Vector Signal Generator	11/28/2018	Annual	11/28/2019	MY47420603
Agilent	N9030A	PXA Signal Analyzer (44GHz)	6/12/2019	Annual	6/12/2020	MY52350166
Agilent	8753ES	S-Parameter Network Analyzer	3/11/2019	Annual	3/11/2020	US39170122
Agilent	8753ES	S-Parameter Vector Network Analyzer	8/30/2018	Annual	8/30/2019	MY40003841
Agilent	E5515C	Wireless Communications Test Set	5/22/2018	Biennial	5/22/2020	GB43193563
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB44450273
Agilent	N4010A	Wireless Connectivity Test Set	N/A	N/A	N/A	GB46170464
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433972
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433974
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1126066
Anritsu	MA2411B	Pulse Power Sensor	6/11/2019	Annual	6/11/2020	1207364
Anritsu	MT8821C	Radio Communication Analyzer	11/6/2018	Annual	11/6/2019	6200901190
Anritsu	MT8821C	Radio Communication Analyzer	3/18/2019	Annual	3/18/2020	6201144419
Anritsu	MT8000A	Radio Communication Test Station	11/14/2018	Annual	11/14/2019	6261914237
Anritsu	MA24106A	USB Power Sensor	5/22/2019	Annual	5/22/2020	1231535
Anritsu	MA24106A	USB Power Sensor	5/6/2019	Annual	5/6/2020	1231538
Anritsu	ML2495A	Power Meter	10/5/2018	Annual	10/5/2019	1328004
Control Company	4352	Long Stem Thermometer	6/26/2019	Biennial	6/26/2021	192282739
Control Company	4352	Long Stem Thermometer	6/26/2019	Biennial	6/26/2021	192282744
Control Company	4352	Long Stem Thermometer	6/26/2019	Annual	6/26/2020	192282745
Control Company	4352	Long Stem Thermometer	6/26/2019	Biennial	6/26/2021	192282753
Control Company	4040	Therm / Clock / Humidity Monitor	10/9/2018	Biennial	10/9/2020	181647802
Control Company	4352	Ultra Long Stem Thermometer	11/29/2018	Biennial	11/29/2020	181766777
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	N6705B	DC Power Analyzer	4/27/2019	Biennial	4/27/2021	MY53004059
Keysight Technologies	85033C	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	7/2/2019	Annual	7/2/2020	MY53401181
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini Circuits	PWR-SEN-4GH5	USB Power Sensor	4/19/2019	Annual	4/19/2020	11401010036
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
Mini-Circuits	BW-N20W5	Power Attenuator	CBT	N/A	CBT	1226
Mitutoyo	CD-6°CSX	Digital Caliper	4/18/2018	Biennial	4/18/2020	13264165
Narda	BW-53W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternak	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	5/23/2018	Biennial	5/23/2020	N/A
Pasternack	NC-100	Torque Wrench	11/7/2017	Biennial	11/7/2019	N/A
Rohde & Schwarz	CMW500	Radio Communication Tester	10/4/2018	Annual	10/4/2019	109366
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	6/6/2019	Annual	6/6/2020	161662
SPEAG	D1750V2	1750 MHz SAR Dipole	5/15/2019	Annual	5/15/2020	1148
SPEAG	D1900V2	1900 MHz SAR Dipole	10/23/2018	Annual	10/23/2019	50080
SPEAG	D2450V2	2450 MHz SAR Dipole	9/11/2017	Biennial	9/11/2019	797
SPEAG	D2600V2	2600 MHz SAR Dipole	4/11/2018	Biennial	4/11/2020	1004
SPEAG	D5GHzV2	5 GHz SAR Dipole	1/16/2018	Biennial	1/16/2020	1057
SPEAG	D5GHzV2	5 GHz SAR Dipole	8/10/2018	Annual	8/10/2019	1237
SPEAG	D750V3	750 MHz SAR Dipole	1/15/2018	Biennial	1/15/2020	1003
SPEAG	D835V2	835 MHz SAR Dipole	3/13/2019	Annual	3/13/2020	40407
SPEAG	D835V2	835 MHz SAR Dipole	1/22/2019	Annual	1/22/2020	40132
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/13/2019	Annual	2/13/2020	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/8/2019	Annual	5/8/2020	728
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/8/2019	Annual	5/8/2020	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/11/2019	Annual	7/11/2020	1322
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/11/2019	Annual	7/11/2020	1323
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/18/2018	Annual	10/18/2019	1333
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/20/2019	Annual	6/20/2020	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/22/2018	Annual	8/22/2019	1450
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/15/2019	Annual	1/15/2020	1530
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/11/2018	Annual	9/11/2019	1091
SPEAG	ES3DV3	SAR Probe	10/22/2018	Annual	10/22/2019	3287
SPEAG	EX3DV4	SAR Probe	1/25/2019	Annual	1/25/2020	3589
SPEAG	EX3DV4	SAR Probe	5/16/2019	Annual	5/16/2020	7406
SPEAG	EX3DV4	SAR Probe	6/19/2019	Annual	6/19/2020	7409
SPEAG	EX3DV4	SAR Probe	7/16/2019	Annual	7/16/2020	7410
SPEAG	EX3DV4	SAR Probe	2/19/2019	Annual	2/19/2020	7417
SPEAG	EX3DV4	SAR Probe	1/24/2019	Annual	1/24/2020	7488
SPEAG	EX3DV4	SAR Probe	5/16/2019	Annual	5/16/2020	7538
SPEAG	EX3DV4	SAR Probe	7/15/2019	Annual	7/15/2020	7547

Notes:

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

FCC ID: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 83 of 87

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: A3LSMA307G		SAR EVALUATION REPORT		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset		Page 84 of 87

16 CONCLUSION

16.1 Measurement Conclusion

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

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

FCC ID: A3LSMA307G	 PCTEST ENGINEERING LABORATORY, INC.	SAR EVALUATION REPORT	 Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 85 of 87

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FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 86 of 87

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FCC ID: A3LSMA307G	 SAR EVALUATION REPORT 		Approved by: Quality Manager
Document S/N: 1M1907190124-01-R1.A3L	Test Dates: 07/29/19 - 08/21/19	DUT Type: Portable Handset	Page 87 of 87

APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01666

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

Medium: 835 Head; Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.916 \text{ S/m}$; $\epsilon_r = 41.161$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section;

Test Date: 08-01-2019; Ambient Temp: 23.1°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN3589; ConvF(8.39, 8.39, 8.39) @ 836.6 MHz; Calibrated: 1/25/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1450; Calibrated: 8/22/2018

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

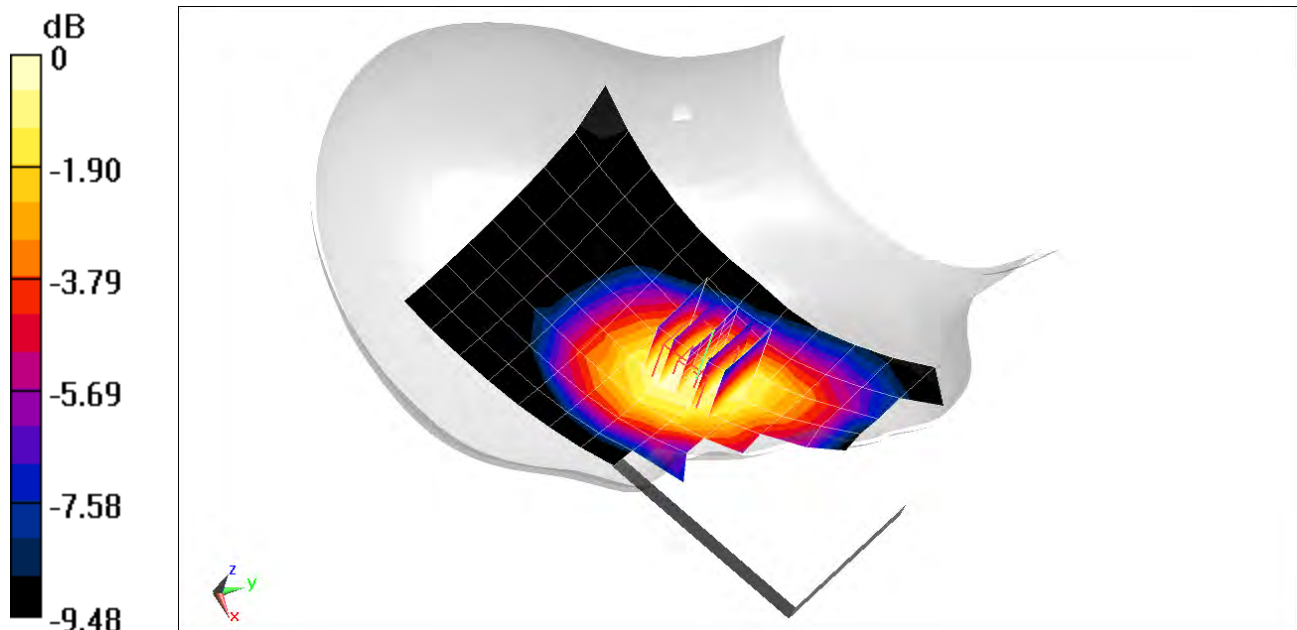
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 16.08 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.290 W/kg

SAR(1 g) = 0.225 W/kg



0 dB = 0.267 W/kg = -5.73 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 1900 MHz; Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.399 \text{ S/m}$; $\epsilon_r = 38.812$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-12-2019; Ambient Temp: 20.7°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3287; ConvF(5.24, 5.24, 5.24) @ 1880 MHz; Calibrated: 10/22/2018

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/18/2018

Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

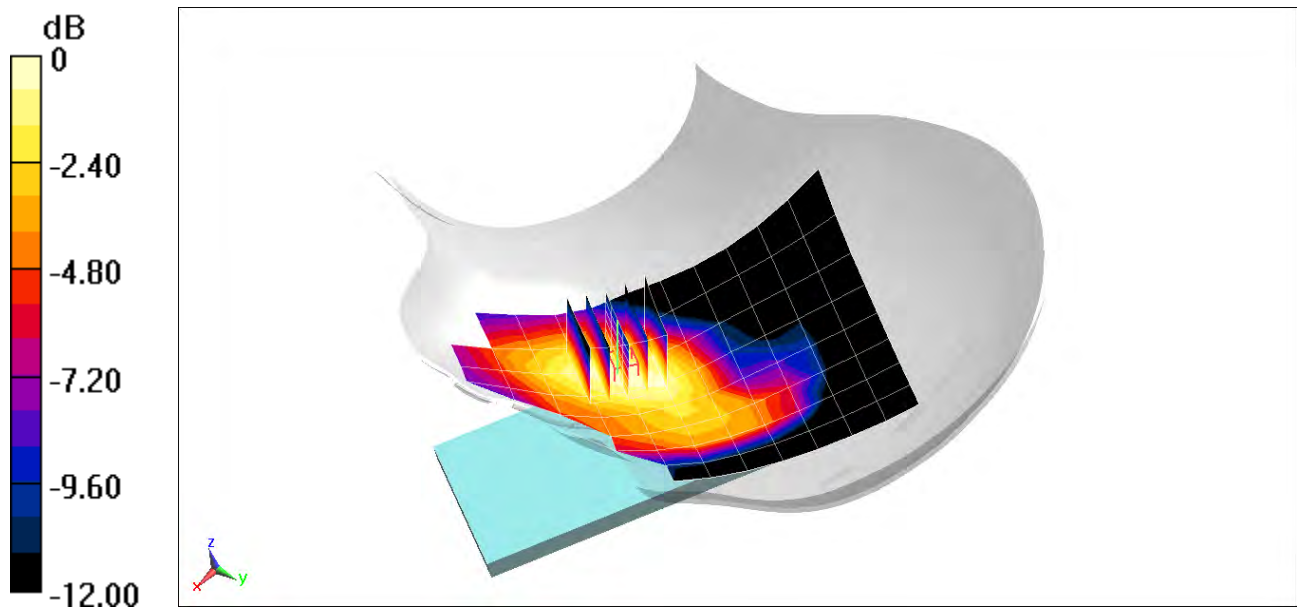
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 9.896 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.189 W/kg

SAR(1 g) = 0.124 W/kg



0 dB = 0.144 W/kg = -8.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01666

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

Medium: 835 Head; Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.916 \text{ S/m}$; $\epsilon_r = 41.161$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 08-01-2019; Ambient Temp: 23.1°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN3589; ConvF(8.39, 8.39, 8.39) @ 836.6 MHz; Calibrated: 1/25/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1450; Calibrated: 8/22/2018

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

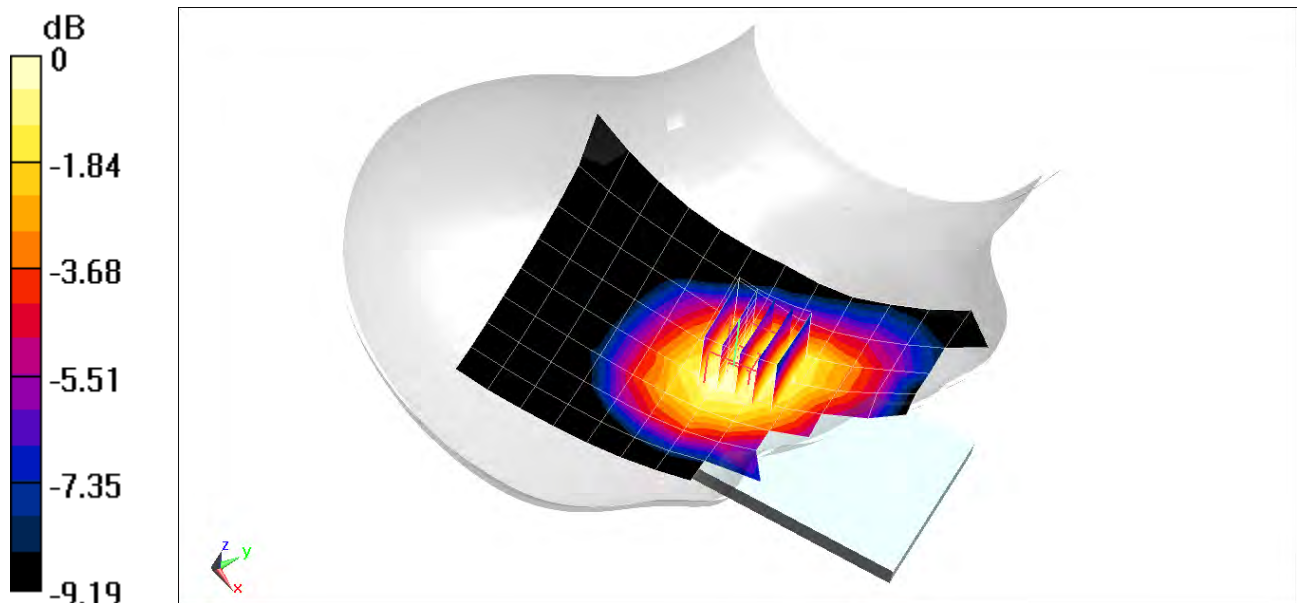
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 14.80 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.248 W/kg

SAR(1 g) = 0.191 W/kg



0 dB = 0.228 W/kg = -6.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

Communication System: UID 0, _UMTS; Frequency: 1712.4 MHz; Duty Cycle: 1:1
Medium: 1750 MHz; Medium parameters used (interpolated):
 $f = 1712.4 \text{ MHz}$; $\sigma = 1.298 \text{ S/m}$; $\epsilon_r = 39.072$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Left Section

Test Date: 08-12-2019; Ambient Temp: 20.7°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3287; ConvF(5.48, 5.48, 5.48) @ 1712.4 MHz; Calibrated: 10/22/2018
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1333; Calibrated: 10/18/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964
Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

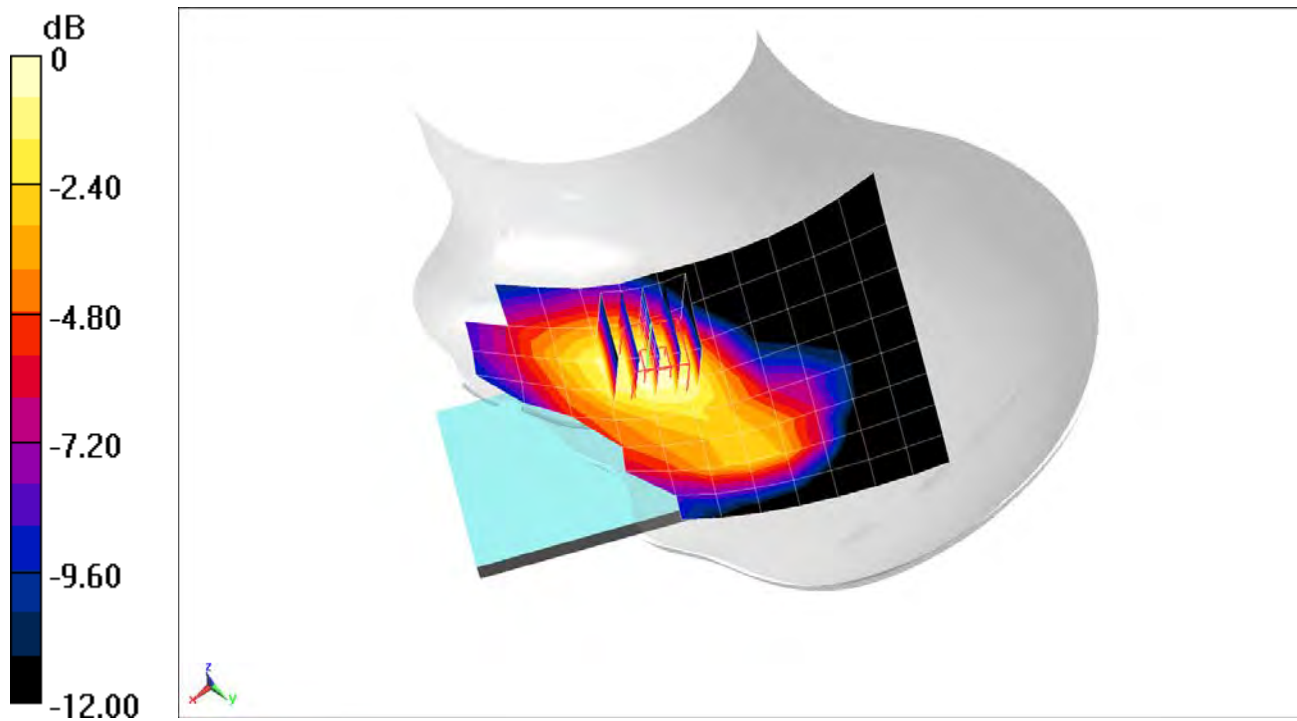
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 11.78 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.245 W/kg

SAR(1 g) = 0.164 W/kg



0 dB = 0.190 W/kg = -7.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 1900 MHz; Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.399 \text{ S/m}$; $\epsilon_r = 38.812$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-12-2019; Ambient Temp: 20.7°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3287; ConvF(5.24, 5.24, 5.24) @ 1880 MHz; Calibrated: 10/22/2018

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/18/2018

Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

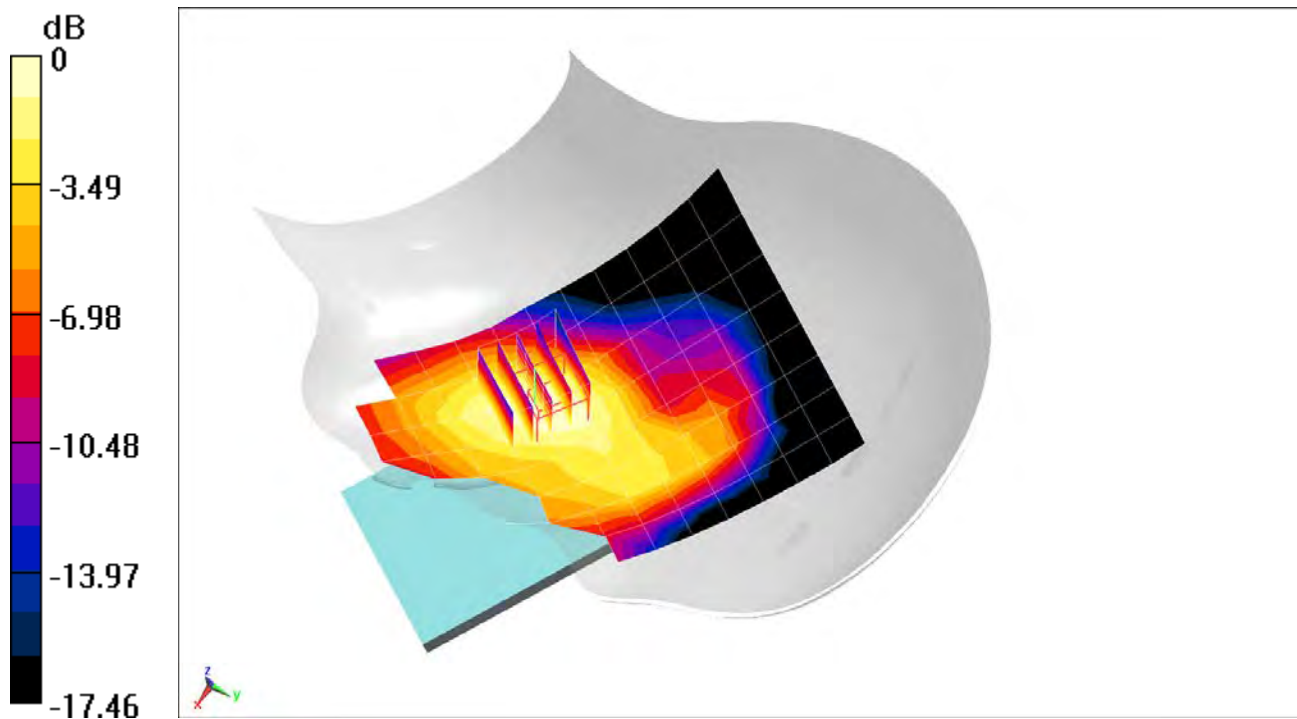
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 12.32 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.293 W/kg

SAR(1 g) = 0.191 W/kg



0 dB = 0.224 W/kg = -6.50 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01666

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

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

$f = 707.5 \text{ MHz}$; $\sigma = 0.855 \text{ S/m}$; $\epsilon_r = 42.635$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 07-29-2019; Ambient Temp: 21.2°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN3589; ConvF(8.67, 8.67, 8.67) @ 707.5 MHz; Calibrated: 1/25/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1450; Calibrated: 8/22/2018

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

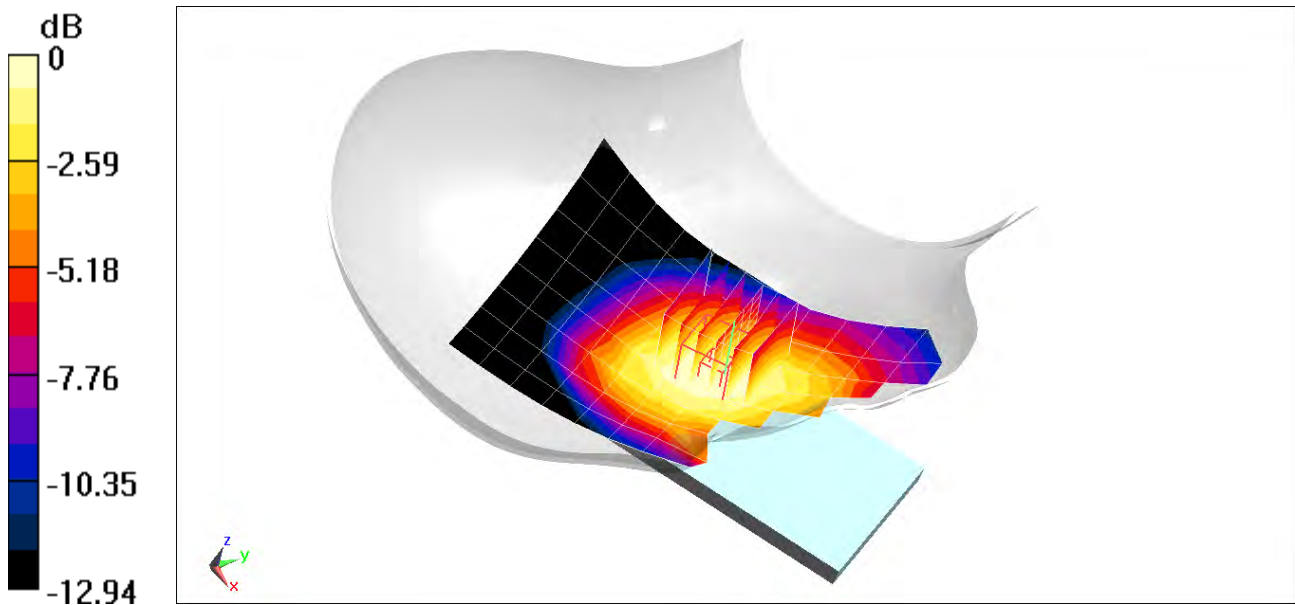
Area Scan (9x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.97 V/m; Power Drift = 0.06 dB

Peak SAR (extrapolated) = 0.197 W/kg

SAR(1 g) = 0.157 W/kg



0 dB = 0.184 W/kg = -7.35 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01666

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

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

$f = 782 \text{ MHz}$; $\sigma = 0.883 \text{ S/m}$; $\epsilon_r = 42.399$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 07-29-2019; Ambient Temp: 21.2°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN3589; ConvF(8.67, 8.67, 8.67) @ 782 MHz; Calibrated: 1/25/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1450; Calibrated: 8/22/2018

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

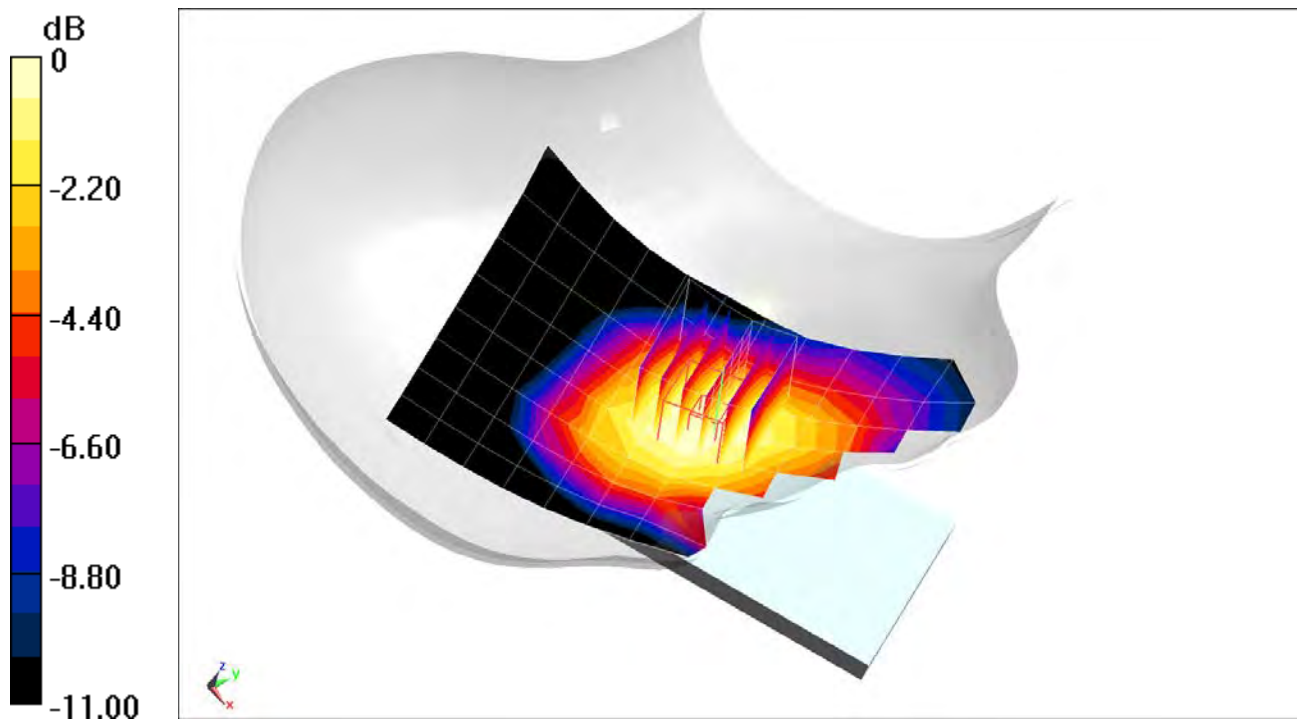
Area Scan (9x14x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 10.64 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.116 W/kg

SAR(1 g) = 0.091 W/kg



0 dB = 0.107 W/kg = -9.71 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01666

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

Medium: 835 Head; Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 0.902 \text{ S/m}$; $\epsilon_r = 42.251$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 07-30-2019; Ambient Temp: 22.9°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN3589; ConvF(8.39, 8.39, 8.39) @ 836.5 MHz; Calibrated: 1/25/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1450; Calibrated: 8/22/2018

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: LTE Band 5 (Cell.), Right Head, Cheek, Mid.ch
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

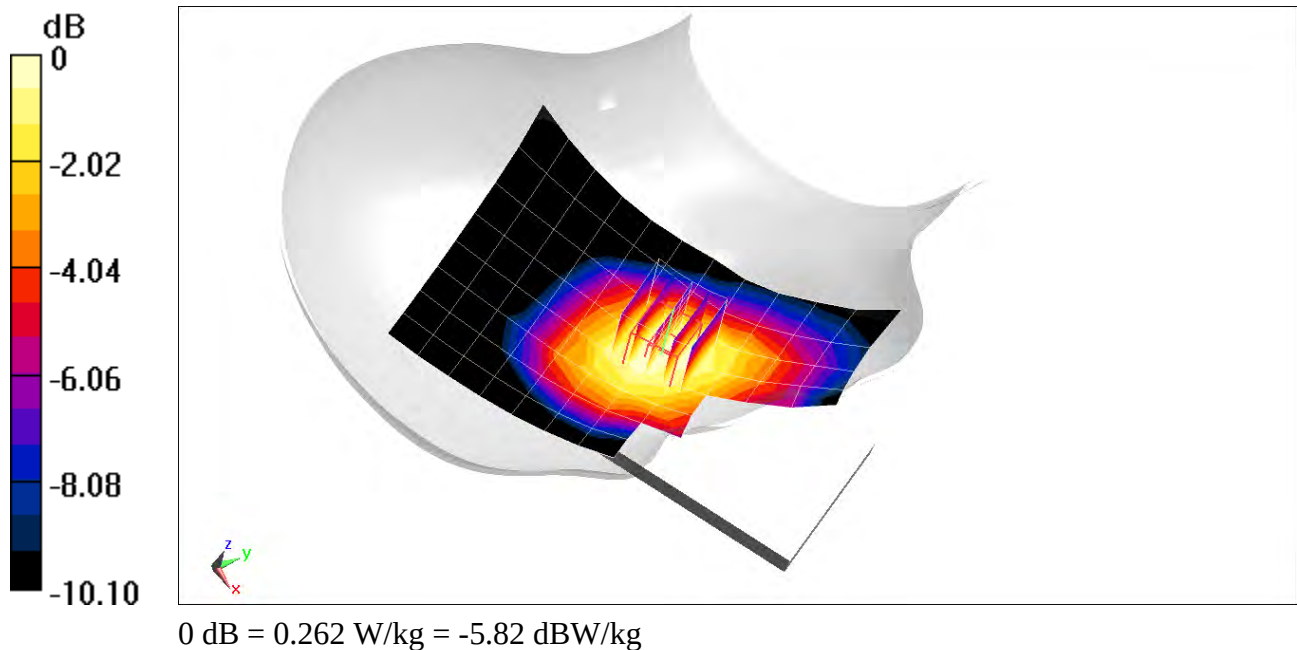
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 16.48 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.281 W/kg

SAR(1 g) = 0.219 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 1750 MHz; Medium parameters used (interpolated):

$f = 1770 \text{ MHz}$; $\sigma = 1.333 \text{ S/m}$; $\epsilon_r = 38.993$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-12-2019; Ambient Temp: 20.7°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3287; ConvF(5.48, 5.48, 5.48) @ 1770 MHz; Calibrated: 10/22/2018

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/18/2018

Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

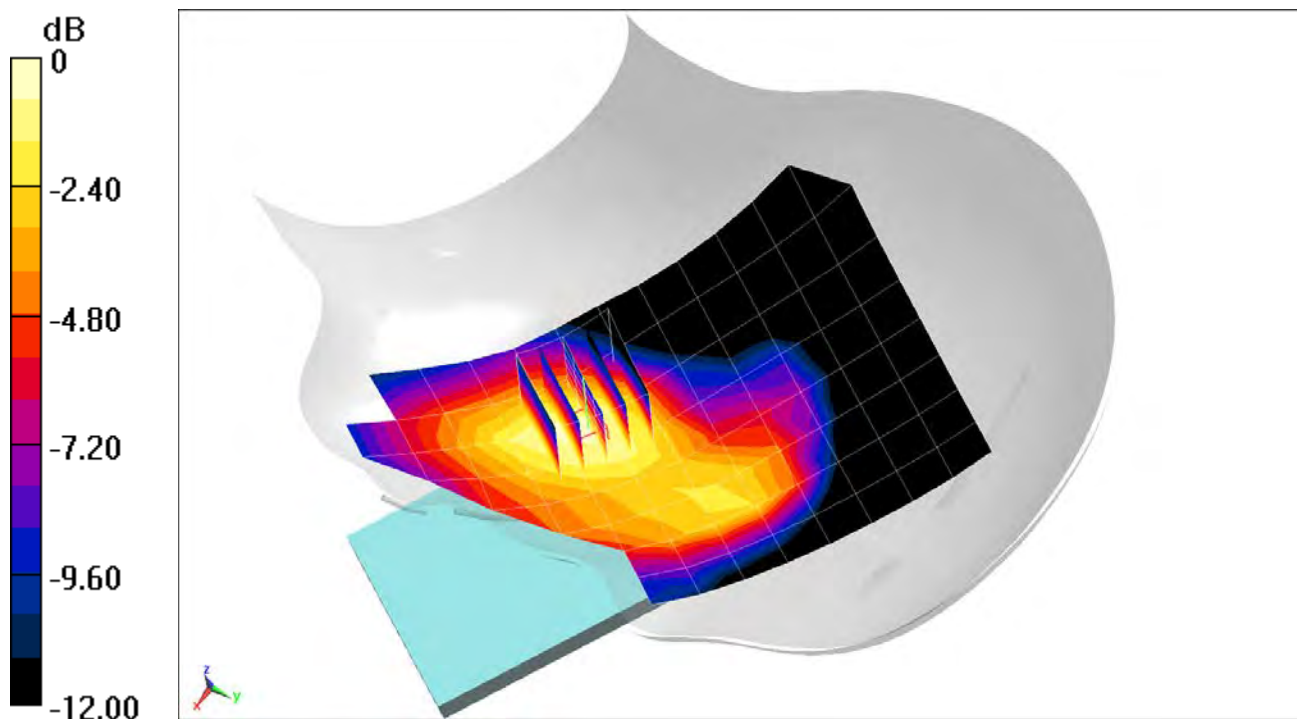
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 12.59 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.263 W/kg

SAR(1 g) = 0.175 W/kg



0 dB = 0.204 W/kg = -6.90 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1

Medium: 1900 MHz; Medium parameters used (interpolated):

$f = 1860 \text{ MHz}$; $\sigma = 1.386 \text{ S/m}$; $\epsilon_r = 38.845$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-12-2019; Ambient Temp: 20.7°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3287; ConvF(5.24, 5.24, 5.24) @ 1860 MHz; Calibrated: 10/22/2018

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/18/2018

Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: LTE Band 2 (PCS), Left Head, Cheek, Low.ch
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

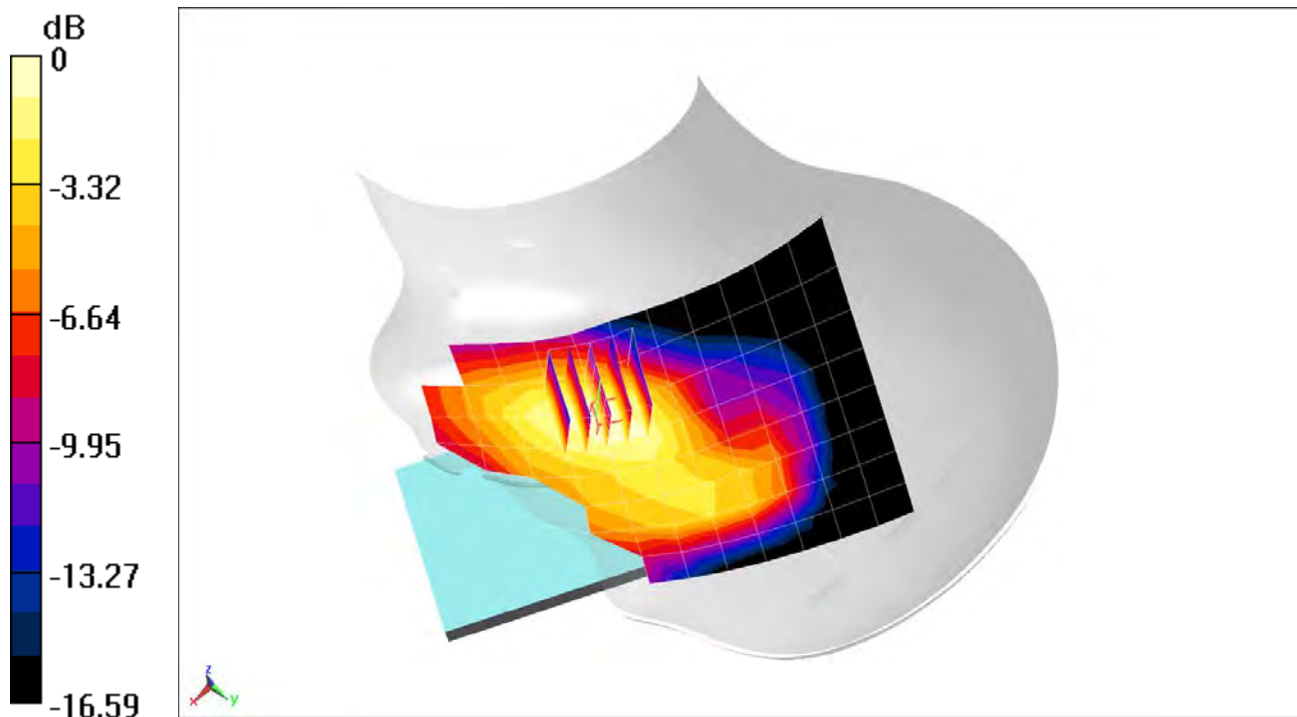
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.06 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.396 W/kg

SAR(1 g) = 0.255 W/kg



0 dB = 0.298 W/kg = -5.26 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01217

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

Medium: 2450 Head; Medium parameters used:

$f = 2550 \text{ MHz}$; $\sigma = 1.919 \text{ S/m}$; $\epsilon_r = 39.377$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Right Section

Test Date: 08-21-2019; Ambient Temp: 24.5°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN7547; ConvF(6.99, 6.99, 6.99) @ 2549.5 MHz; Calibrated: 7/15/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: LTE Band 41, Right Head, Cheek, Low-Mid.ch
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset

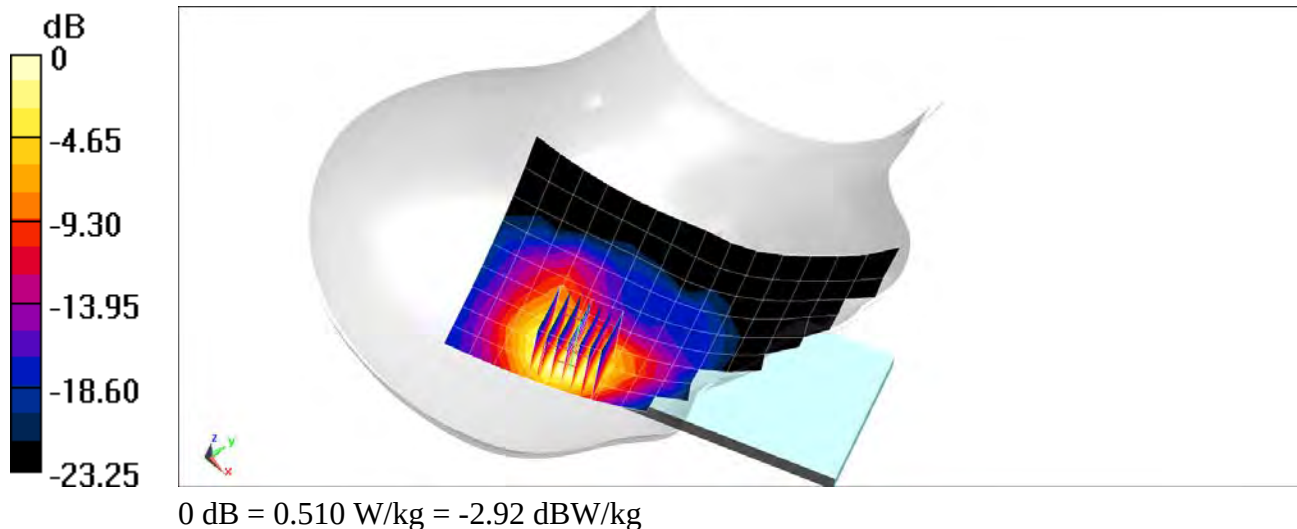
Area Scan (10x17x1): Measurement grid: dx=12mm, dy=12mm

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

Reference Value = 14.44 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 0.665 W/kg

SAR(1 g) = 0.283 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01563

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

Medium: 2450 Head; Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.772 \text{ S/m}$; $\epsilon_r = 38.009$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-08-2019; Ambient Temp: 23.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN7547; ConvF(7.17, 7.17, 7.17) @ 2412 MHz; Calibrated: 7/15/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

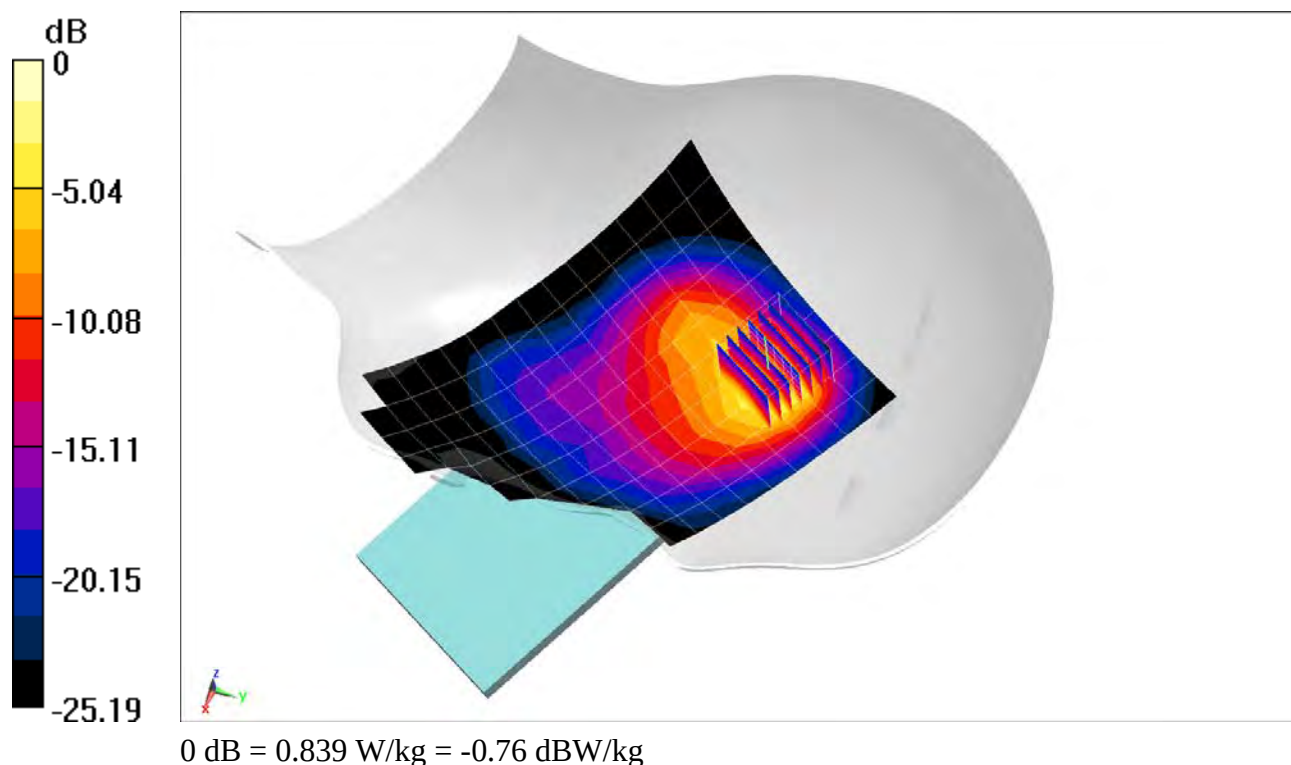
Area Scan (11x18x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 9.878 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 1.11 W/kg

SAR(1 g) = 0.449 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01563

Communication System: UID 0, 802.11n 5.2-5.8 GHz Band; Frequency: 5310 MHz; Duty Cycle: 1:1

Medium: 5GHz Head; Medium parameters used (interpolated):

$f = 5310 \text{ MHz}$; $\sigma = 4.838 \text{ S/m}$; $\epsilon_r = 36.742$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-14-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7406; ConvF(5.54, 5.54, 5.54) @ 5310 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/8/2019

Phantom: Twin-SAM V5.0 Right 20; Type: QD 000 P40 CD; Serial: 1759

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: IEEE 802.11n, U-NII-2A, 40 MHz Bandwidth, Left Head, Tilt, Ch 62, 13.5 Mbps

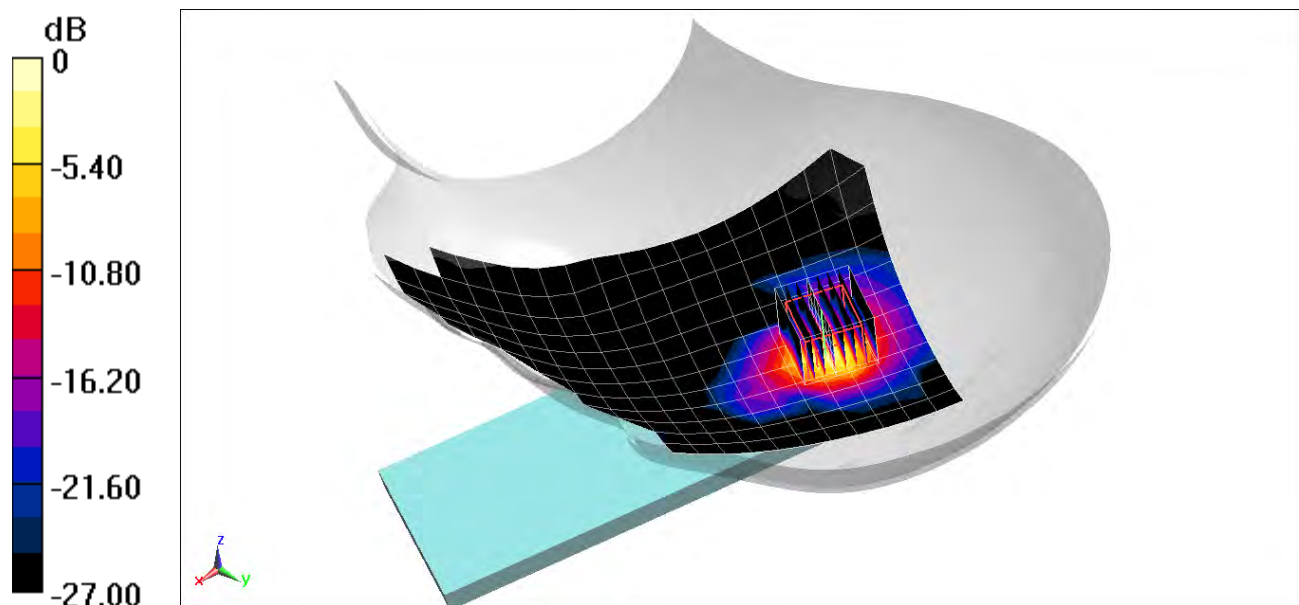
Area Scan (13x22x1): Measurement grid: $dx=10\text{mm}$, $dy=10\text{mm}$

Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Reference Value = 8.053 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 3.33 W/kg

SAR(1 g) = 0.728 W/kg



0 dB = 1.99 W/kg = 2.99 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01563

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.305

Medium: 2450 Head; Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 1.795 \text{ S/m}$; $\epsilon_r = 37.959$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Left Section

Test Date: 08-08-2019; Ambient Temp: 23.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN7547; ConvF(7.17, 7.17, 7.17) @ 2441 MHz; Calibrated: 7/15/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: Bluetooth, Left Head, Tilt, Ch 39, 1 Mbps

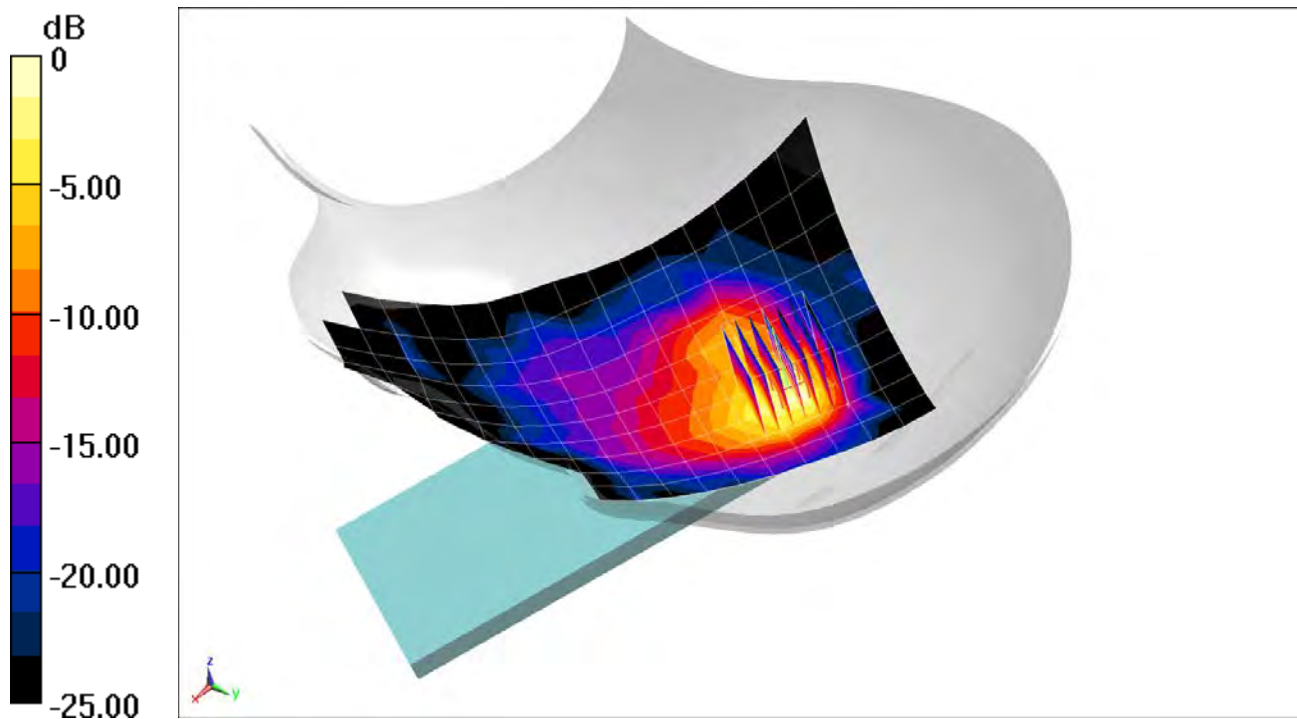
Area Scan (11x19x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 5.905 V/m; Power Drift = 0.09 dB

Peak SAR (extrapolated) = 0.137 W/kg

SAR(1 g) = 0.055 W/kg



0 dB = 0.100 W/kg = -10.00 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01183

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

Medium: 835 Body; Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.984 \text{ S/m}$; $\epsilon_r = 54.44$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-05-2019; Ambient Temp: 20.5°C; Tissue Temp: 19.7°C

Probe: EX3DV4 - SN7538; ConvF(9.85, 9.85, 9.85) @ 836.6 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn728; Calibrated: 5/8/2019

Phantom: Left Twin-SAM V5.0 30; Type: QD 000 P40 CD; Serial: 1792

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

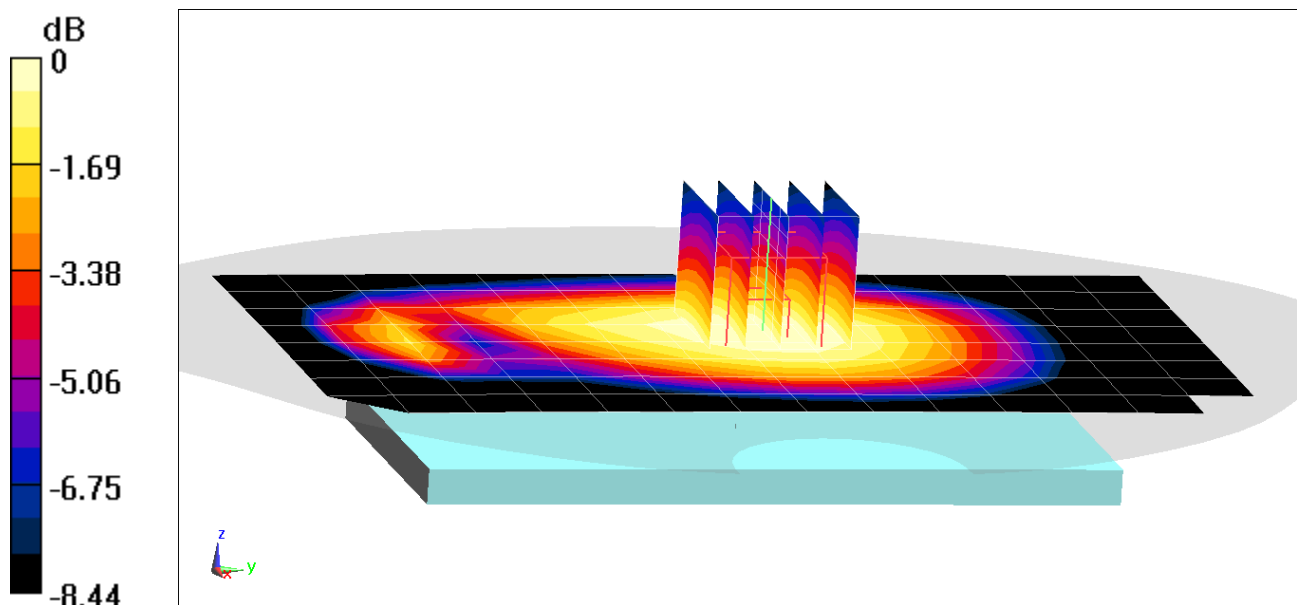
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 18.08 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.430 W/kg

SAR(1 g) = 0.313 W/kg



0 dB = 0.386 W/kg = -4.13 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01183

Communication System: UID 0, GSM GPRS; 4 Tx slots; Frequency: 848.8 MHz; Duty Cycle: 1:2.076

Medium: 835 Body; Medium parameters used (interpolated):

$f = 848.8 \text{ MHz}$; $\sigma = 0.988 \text{ S/m}$; $\epsilon_r = 54.42$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2019; Ambient Temp: 20.5°C; Tissue Temp: 19.7°C

Probe: EX3DV4 - SN7538; ConvF(9.85, 9.85, 9.85) @ 848.8 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn728; Calibrated: 5/8/2019

Phantom: Left Twin-SAM V5.0 30; Type: QD 000 P40 CD; Serial: 1792

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

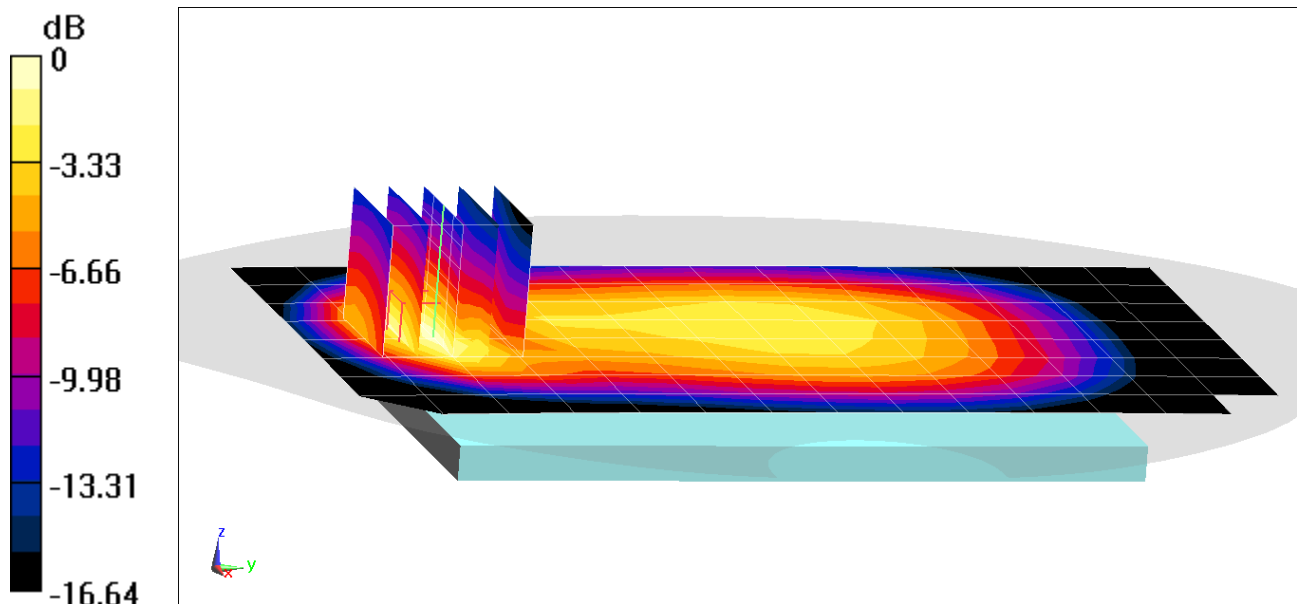
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 25.94 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 1.25 W/kg

SAR(1 g) = 0.641 W/kg



0 dB = 0.967 W/kg = -0.15 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 1900 Body; Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.547 \text{ S/m}$; $\epsilon_r = 52.602$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-05-2019; Ambient Temp: 19.7°C; Tissue Temp: 23.8°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1880 MHz; Calibrated: 1/24/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1530; Calibrated: 1/15/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

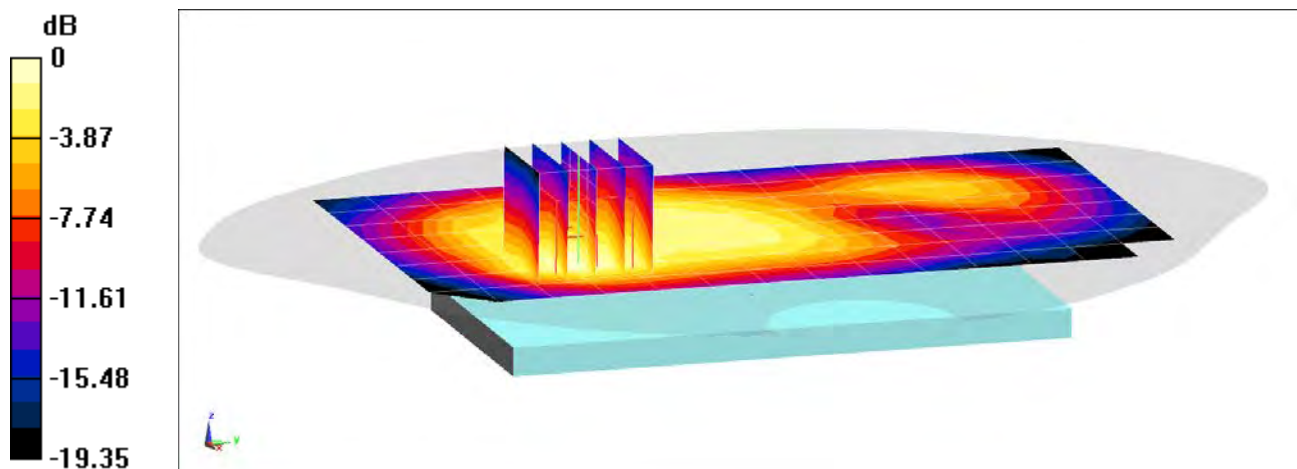
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 9.984 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.246 W/kg

SAR(1 g) = 0.141 W/kg



0 dB = 0.206 W/kg = -6.86 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

Communication System: UID 0, _GSM GPRS; 4 Tx slots; Frequency: 1880 MHz; Duty Cycle: 1:2.076

Medium: 1900 Body; Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.547 \text{ S/m}$; $\epsilon_r = 52.602$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2019; Ambient Temp: 19.7°C; Tissue Temp: 23.8°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1880 MHz; Calibrated: 1/24/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1530; Calibrated: 1/15/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

Mode: GPRS 1900, Body SAR, Back side, Mid.ch, 4 Tx Slots

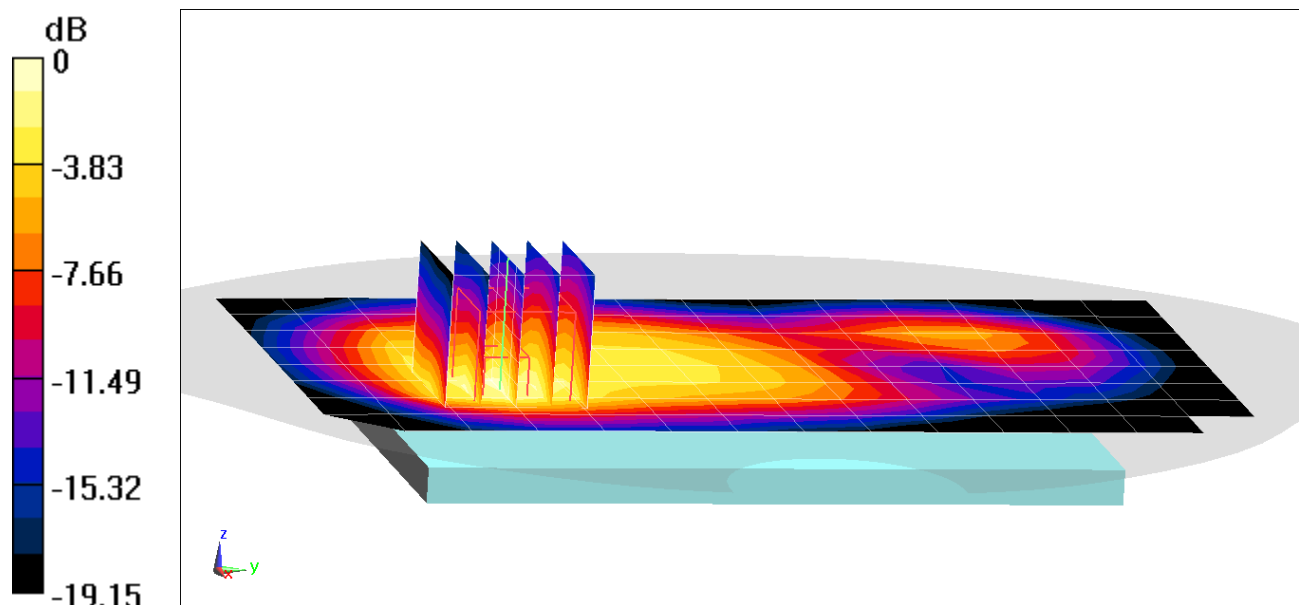
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.92 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.592 W/kg

SAR(1 g) = 0.322 W/kg



0 dB = 0.490 W/kg = -3.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 02417

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

Medium: 835 Body; Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.984 \text{ S/m}$; $\epsilon_r = 54.44$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-05-2019; Ambient Temp: 20.5°C; Tissue Temp: 19.7°C

Probe: EX3DV4 - SN7538; ConvF(9.85, 9.85, 9.85) @ 836.6 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn728; Calibrated: 5/8/2019

Phantom: Left Twin-SAM V5.0 30; Type: QD 000 P40 CD; Serial: 1792

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

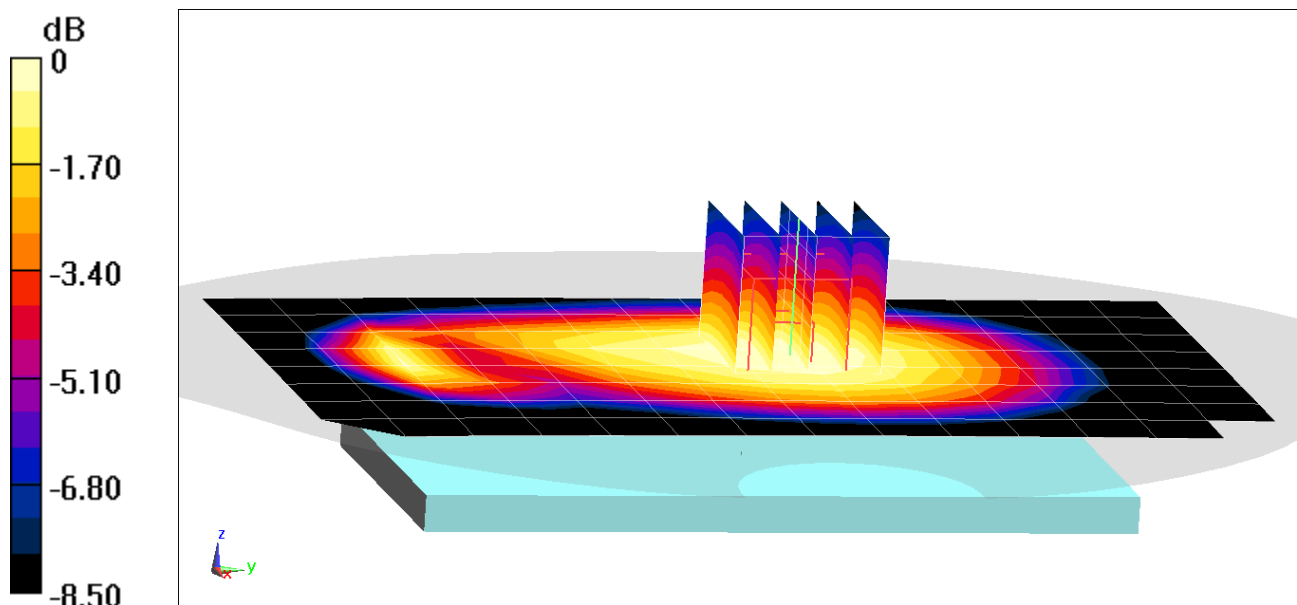
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 16.64 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.372 W/kg

SAR(1 g) = 0.268 W/kg



0 dB = 0.333 W/kg = -4.78 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 02417

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

Medium: 835 Body; Medium parameters used (interpolated):

$f = 836.6 \text{ MHz}$; $\sigma = 0.984 \text{ S/m}$; $\epsilon_r = 54.44$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2019; Ambient Temp: 20.5°C; Tissue Temp: 19.7°C

Probe: EX3DV4 - SN7538; ConvF(9.85, 9.85, 9.85) @ 836.6 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn728; Calibrated: 5/8/2019

Phantom: Left Twin-SAM V5.0 30; Type: QD 000 P40 CD; Serial: 1792

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

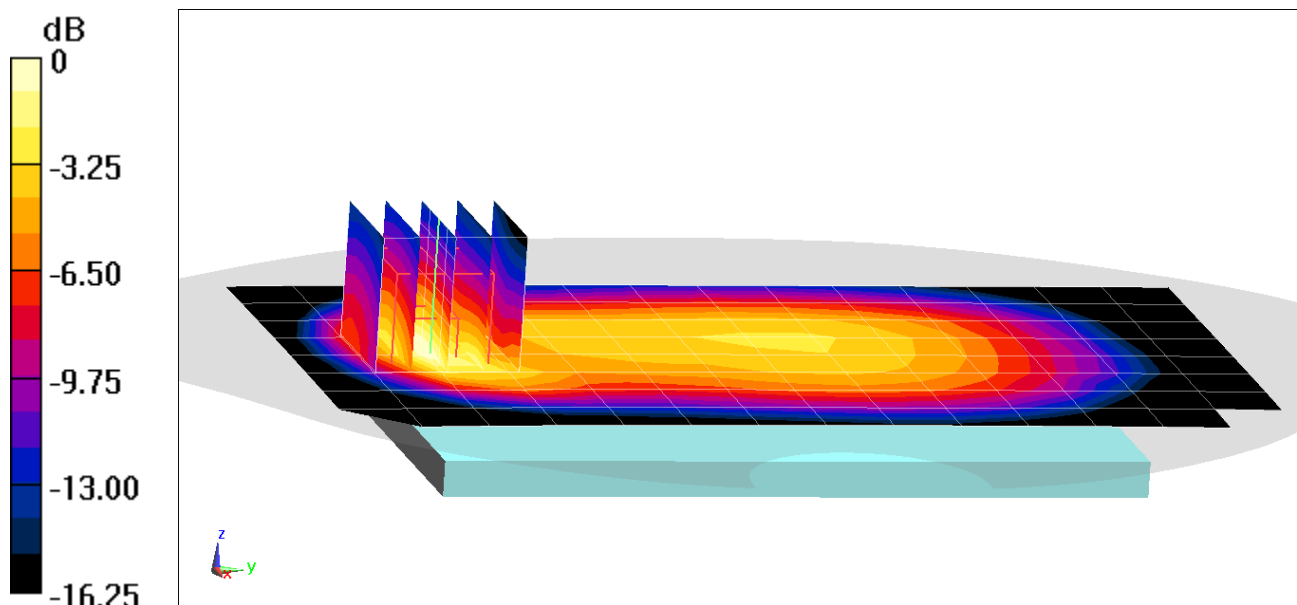
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 22.86 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.917 W/kg

SAR(1 g) = 0.464 W/kg



0 dB = 0.744 W/kg = -1.28 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01191

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

Medium: 1750 Body; Medium parameters used (interpolated):

$f = 1712.4 \text{ MHz}$; $\sigma = 1.46 \text{ S/m}$; $\epsilon_r = 53.746$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-05-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1712.4 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

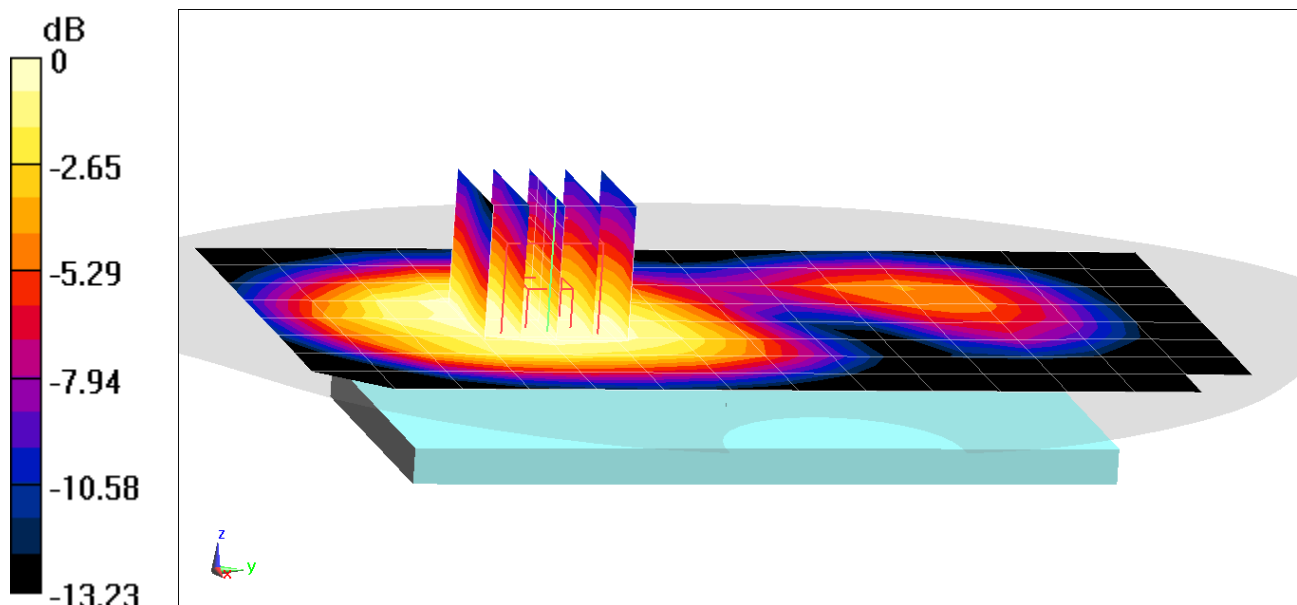
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 12.28 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.320 W/kg

SAR(1 g) = 0.210 W/kg



0 dB = 0.277 W/kg = -5.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01191

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

Medium: 1750 Body; Medium parameters used (interpolated):

$f = 1712.4 \text{ MHz}$; $\sigma = 1.46 \text{ S/m}$; $\epsilon_r = 53.746$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1712.4 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

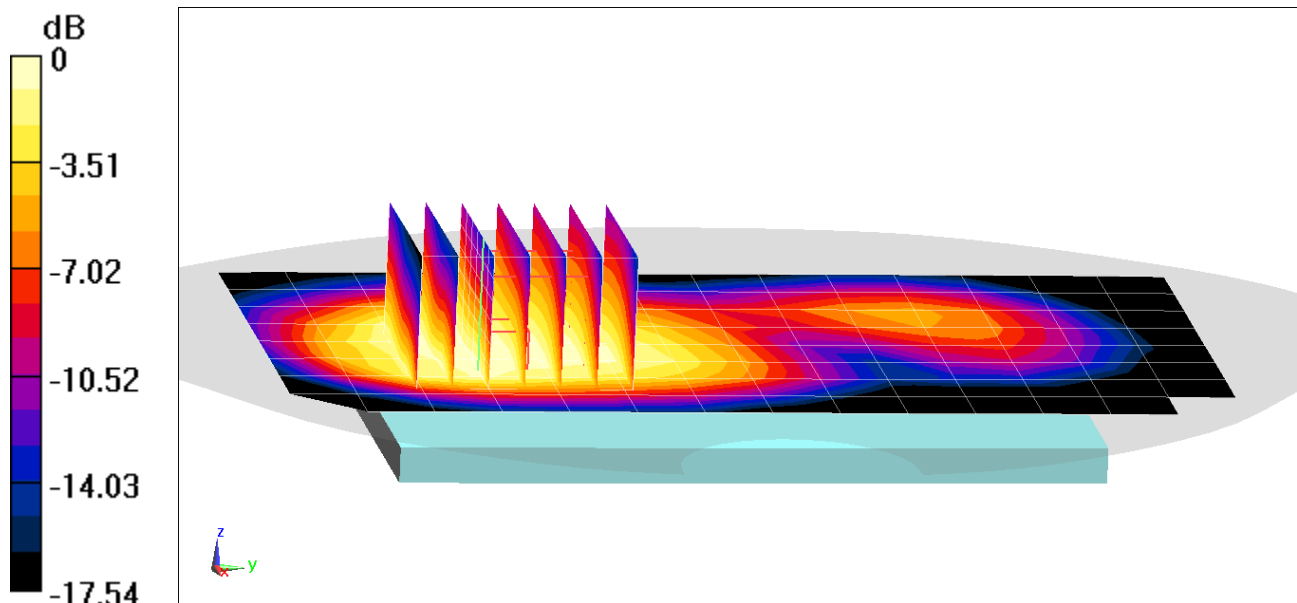
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 16.28 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.633 W/kg

SAR(1 g) = 0.376 W/kg



0 dB = 0.515 W/kg = -2.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 1900 Body; Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.511 \text{ S/m}$; $\epsilon_r = 51.51$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-07-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1880 MHz; Calibrated: 1/24/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1530; Calibrated: 1/15/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

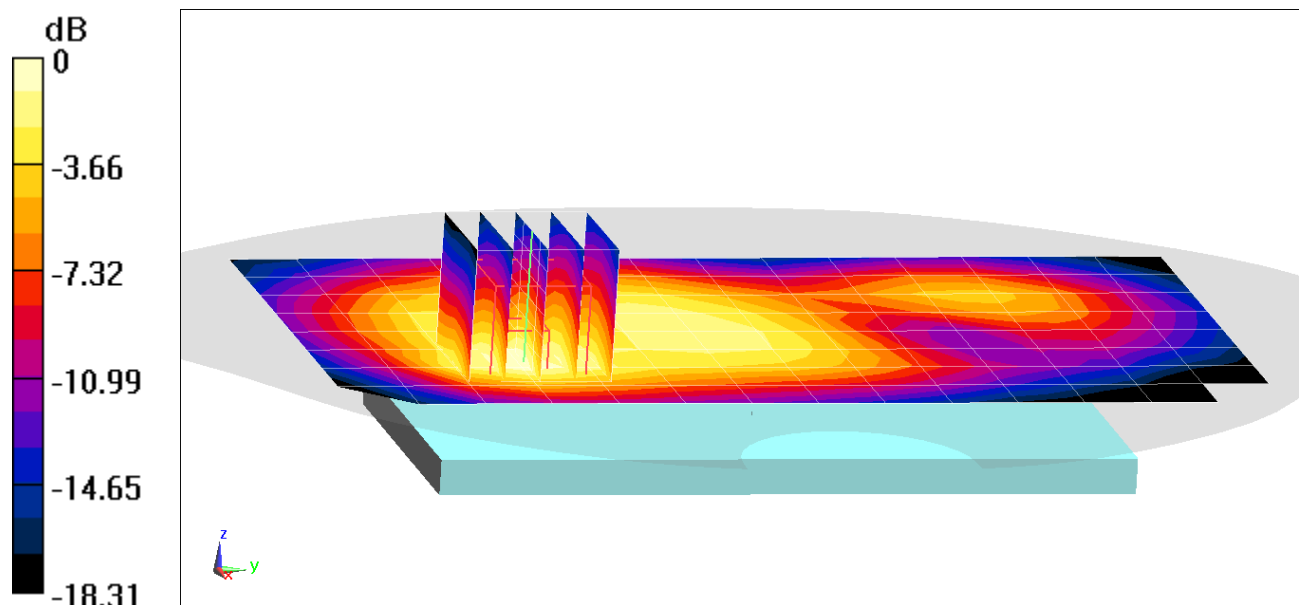
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.09 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.416 W/kg

SAR(1 g) = 0.236 W/kg



0 dB = 0.346 W/kg = -4.61 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 1900 Body; Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.511 \text{ S/m}$; $\epsilon_r = 51.51$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-07-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1880 MHz; Calibrated: 1/24/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1530; Calibrated: 1/15/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

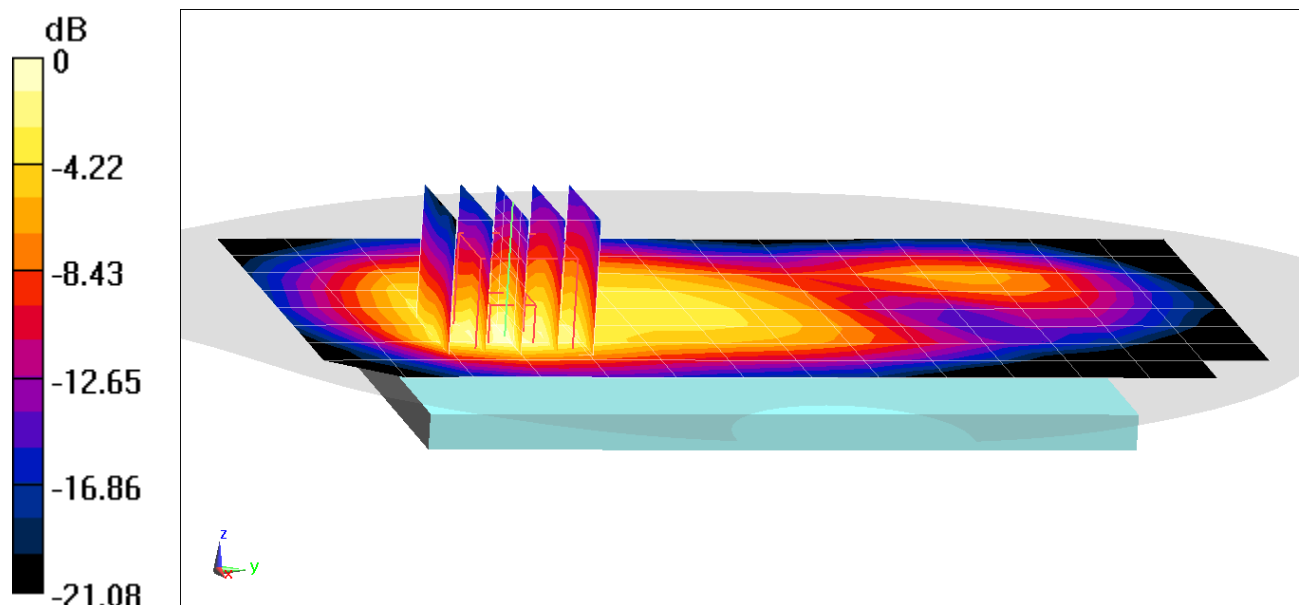
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.11 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 0.494 W/kg

SAR(1 g) = 0.267 W/kg



0 dB = 0.409 W/kg = -3.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 750 Body; Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.935 \text{ S/m}$; $\epsilon_r = 53.996$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-12-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7409; ConvF(9.96, 9.96, 9.96) @ 707.5 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

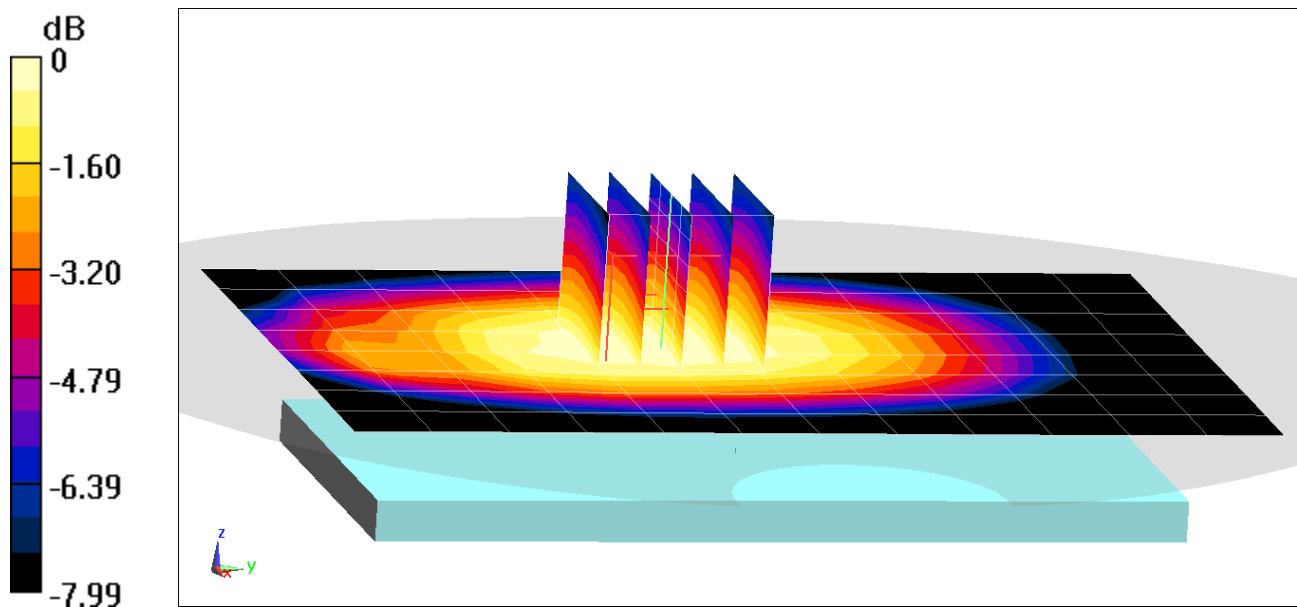
Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm

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

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

Peak SAR (extrapolated) = 0.356 W/kg

SAR(1 g) = 0.263 W/kg



0 dB = 0.321 W/kg = -4.93 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 750 Body; Medium parameters used (interpolated):

$f = 707.5 \text{ MHz}$; $\sigma = 0.935 \text{ S/m}$; $\epsilon_r = 53.996$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7409; ConvF(9.96, 9.96, 9.96) @ 707.5 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

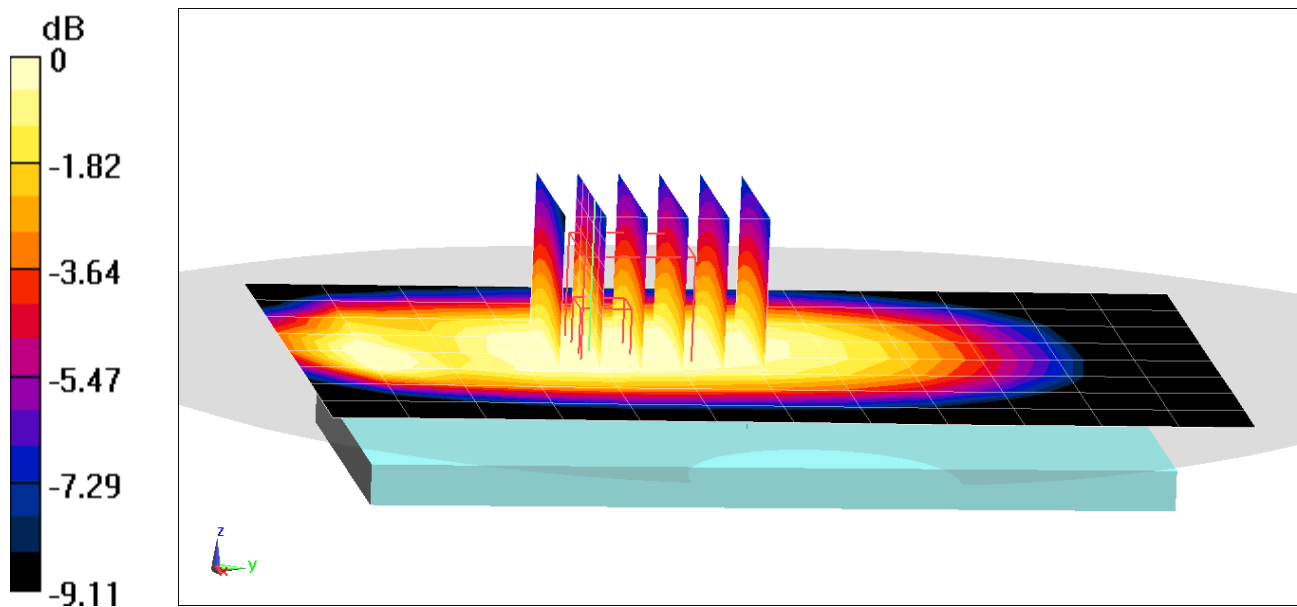
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 16.51 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 0.400 W/kg

SAR(1 g) = 0.298 W/kg



0 dB = 0.362 W/kg = -4.41 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 750 Body; Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.964 \text{ S/m}$; $\epsilon_r = 54.31$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-01-2019; Ambient Temp: 23.2°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN7409; ConvF(9.96, 9.96, 9.96) @ 782 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

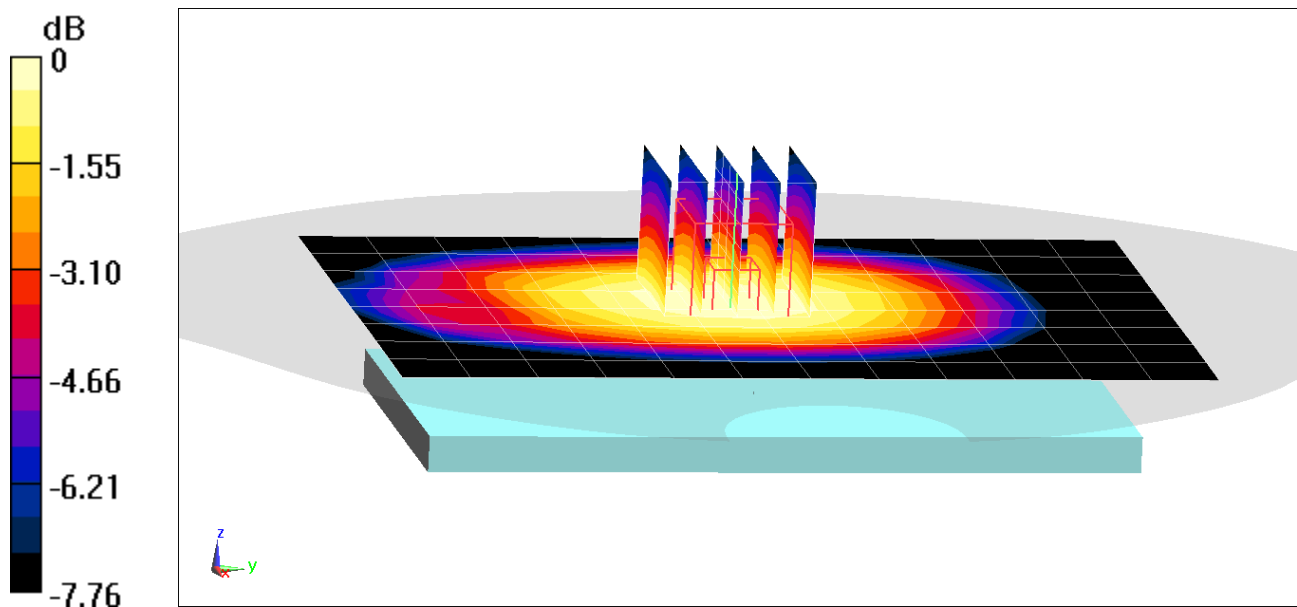
Area Scan (9x13x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 15.56 V/m; Power Drift = 0.10 dB

Peak SAR (extrapolated) = 0.316 W/kg

SAR(1 g) = 0.231 W/kg



0 dB = 0.282 W/kg = -5.50 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 750 Body; Medium parameters used (interpolated):

$f = 782 \text{ MHz}$; $\sigma = 0.964 \text{ S/m}$; $\epsilon_r = 54.31$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-01-2019; Ambient Temp: 23.2°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN7409; ConvF(9.96, 9.96, 9.96) @ 782 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

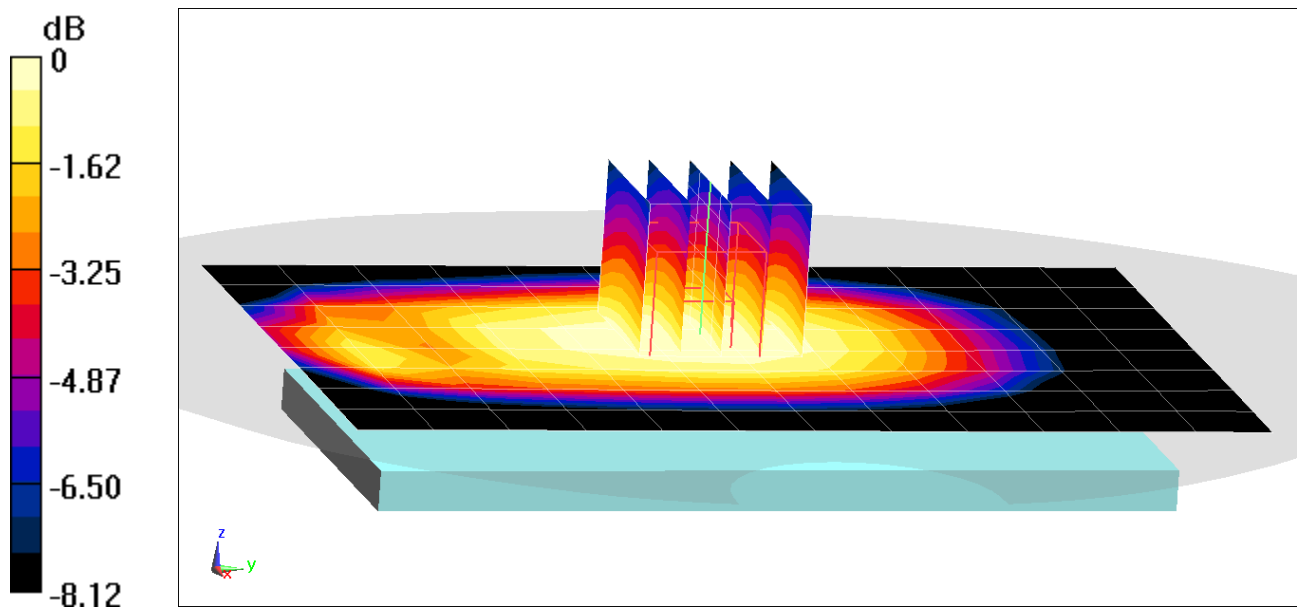
Area Scan (9x13x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 16.83 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 0.355 W/kg

SAR(1 g) = 0.264 W/kg



0 dB = 0.322 W/kg = -4.92 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 02417

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

Medium: 835 Body; Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 0.983 \text{ S/m}$; $\epsilon_r = 54.441$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-05-2019; Ambient Temp: 20.5°C; Tissue Temp: 19.7°C

Probe: EX3DV4 - SN7538; ConvF(9.85, 9.85, 9.85) @ 836.5 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn728; Calibrated: 5/8/2019

Phantom: Left Twin-SAM V5.0 30; Type: QD 000 P40 CD; Serial: 1792

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: LTE Band 5 (Cell.), Body SAR, Back side, Mid.ch
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

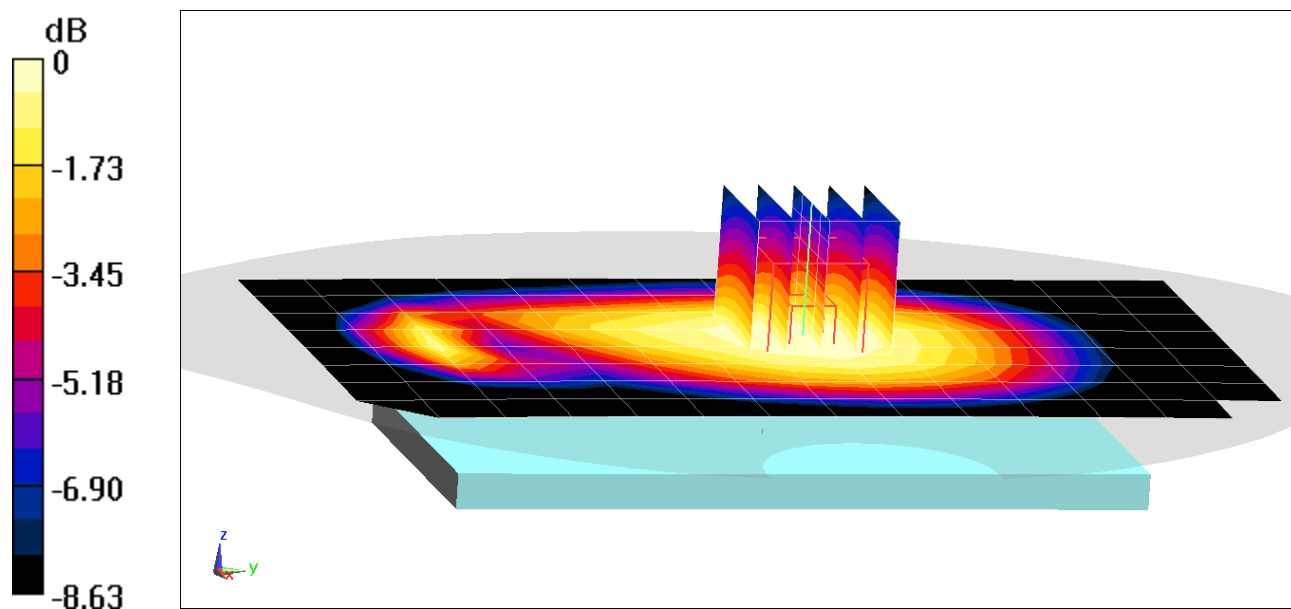
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 18.59 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 0.459 W/kg

SAR(1 g) = 0.331 W/kg



0 dB = 0.412 W/kg = -3.85 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 02417

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

Medium: 835 Body; Medium parameters used (interpolated):

$f = 836.5 \text{ MHz}$; $\sigma = 0.983 \text{ S/m}$; $\epsilon_r = 54.441$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2019; Ambient Temp: 20.5°C; Tissue Temp: 19.7°C

Probe: EX3DV4 - SN7538; ConvF(9.85, 9.85, 9.85) @ 836.5 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn728; Calibrated: 5/8/2019

Phantom: Left Twin-SAM V5.0 30; Type: QD 000 P40 CD; Serial: 1792

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: LTE Band 5 (Cell.), Body SAR, Back side, Mid.ch
10 MHz Bandwidth, QPSK, 1 RB, 25 RB Offset

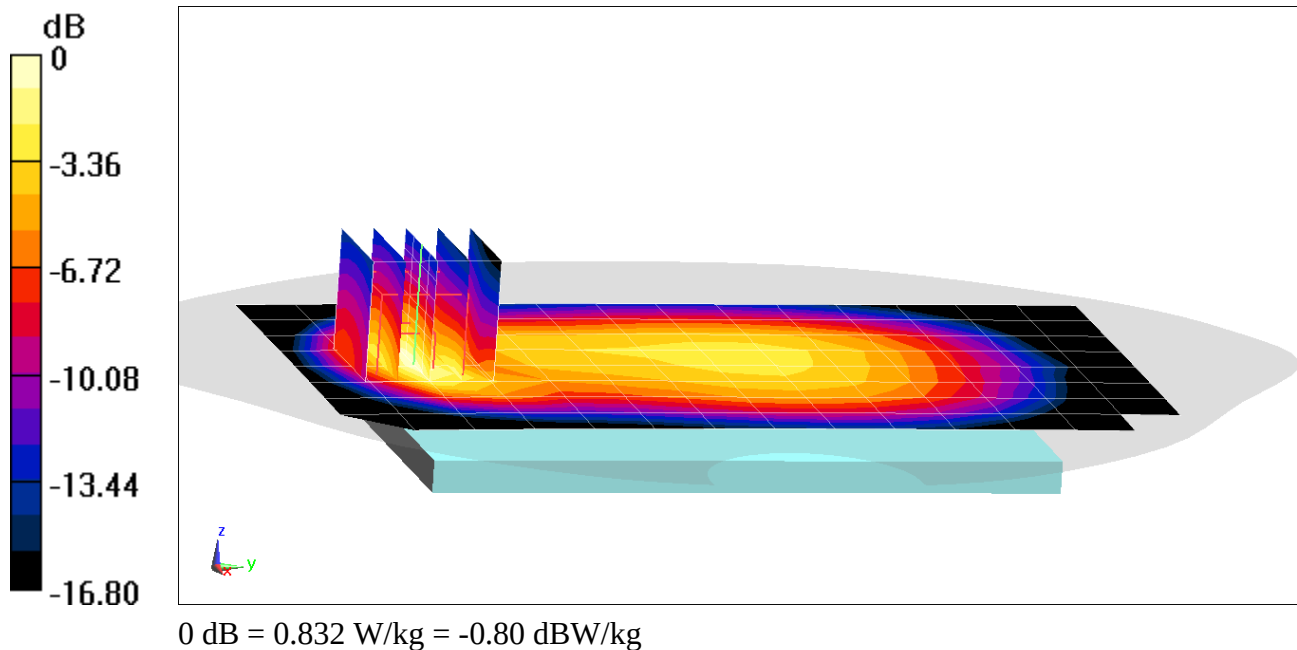
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 23.97 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 1.02 W/kg

SAR(1 g) = 0.512 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01191

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

Medium: 1750 Body; Medium parameters used (interpolated):

$f = 1770 \text{ MHz}$; $\sigma = 1.5 \text{ S/m}$; $\epsilon_r = 53.01$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-07-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1770 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

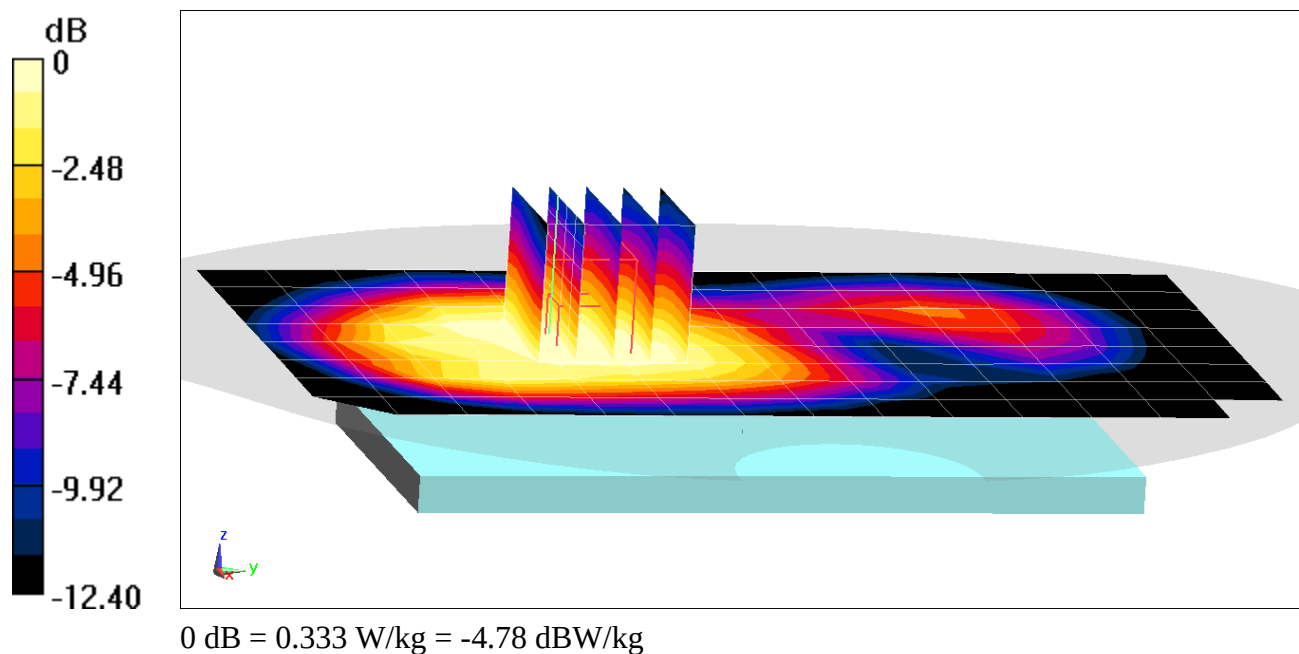
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 13.04 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 0.388 W/kg

SAR(1 g) = 0.248 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01191

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

Medium: 1750 Body; Medium parameters used (interpolated):

$f = 1770 \text{ MHz}$; $\sigma = 1.5 \text{ S/m}$; $\epsilon_r = 53.01$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-07-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1770 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

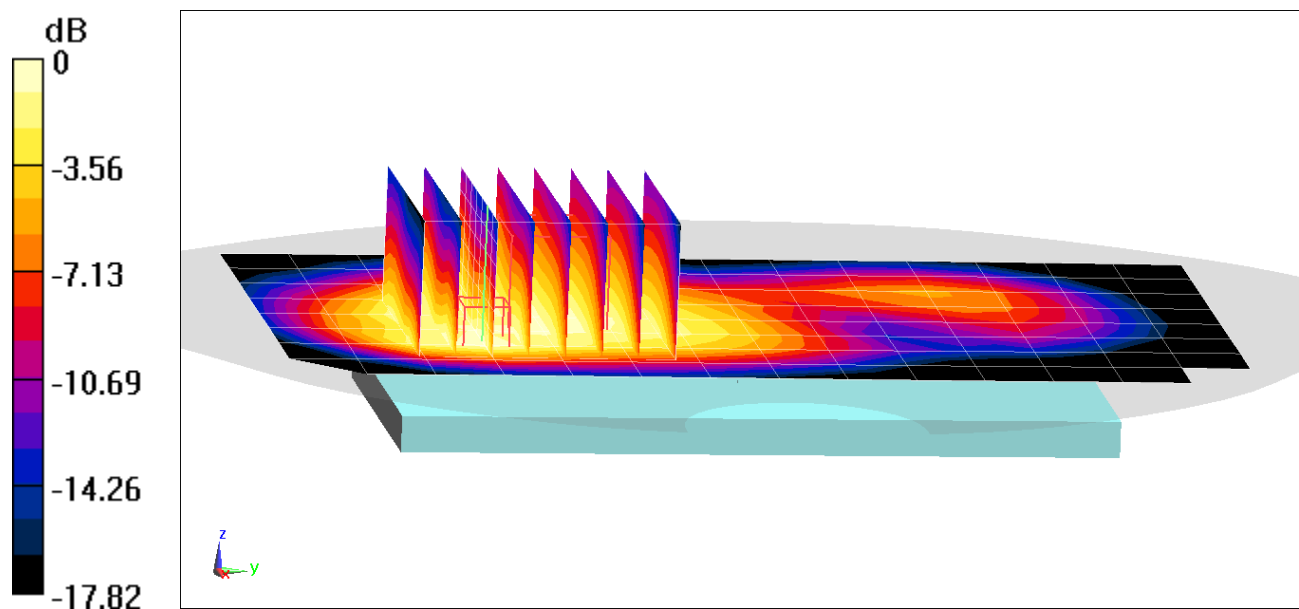
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm

Reference Value = 17.97 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 0.821 W/kg

SAR(1 g) = 0.442 W/kg



0 dB = 0.647 W/kg = -1.89 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1

Medium: 1900 Body; Medium parameters used (interpolated):

$f = 1860 \text{ MHz}$; $\sigma = 1.489 \text{ S/m}$; $\epsilon_r = 51.571$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-07-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1860 MHz; Calibrated: 1/24/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1530; Calibrated: 1/15/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: LTE Band 2 (PCS), Body SAR, Back side, Low.ch
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

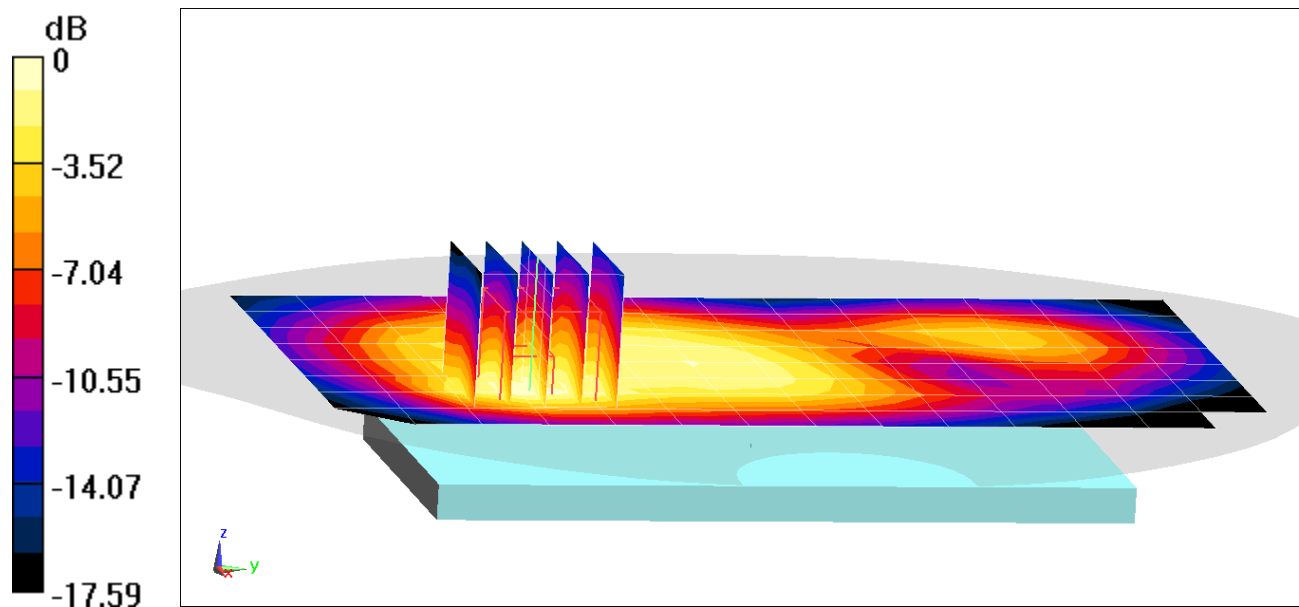
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 14.73 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 0.504 W/kg

SAR(1 g) = 0.295 W/kg



0 dB = 0.425 W/kg = -3.72 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1

Medium: 1900 Body; Medium parameters used (interpolated):

$f = 1860 \text{ MHz}$; $\sigma = 1.489 \text{ S/m}$; $\epsilon_r = 51.571$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-07-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1860 MHz; Calibrated: 1/24/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1530; Calibrated: 1/15/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: LTE Band 2 (PCS), Body SAR, Back side, Low.ch
20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset

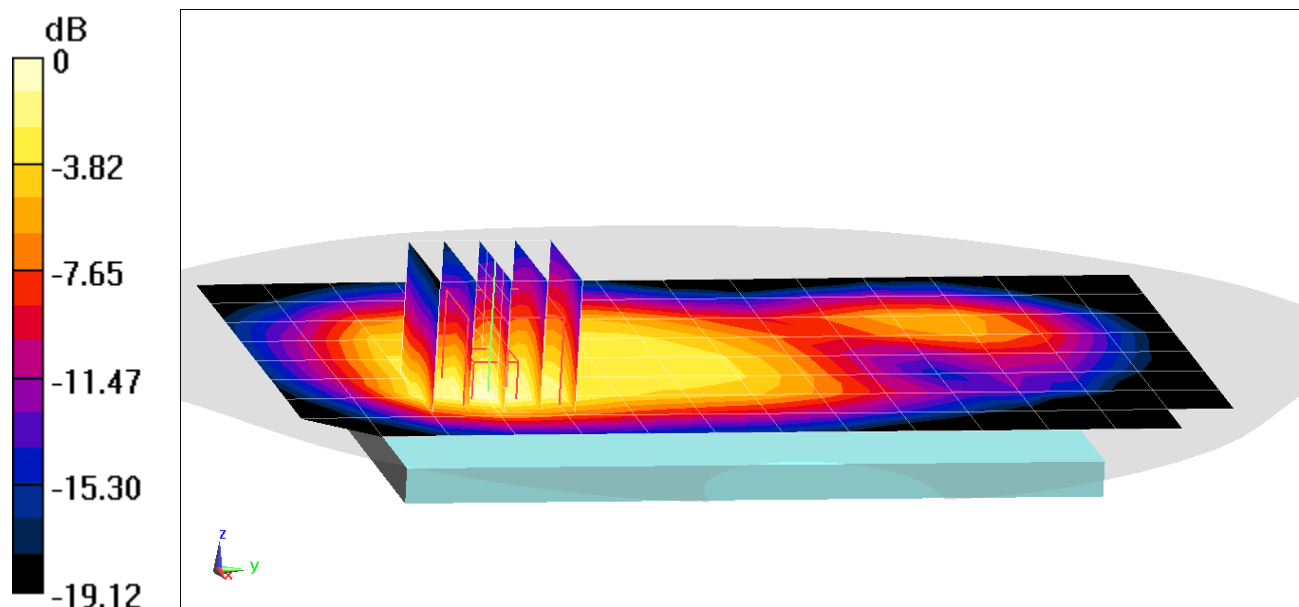
Area Scan (9x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 15.61 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 0.574 W/kg

SAR(1 g) = 0.323 W/kg



0 dB = 0.480 W/kg = -3.19 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01191

Communication System: UID 0, LTE Band 41; Frequency: 2593 MHz; Duty Cycle: 1:1.58

Medium: 2450 Body; Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$; $\sigma = 2.226 \text{ S/m}$; $\epsilon_r = 51.245$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-12-2019; Ambient Temp: 22.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2593 MHz; Calibrated: 2/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/13/2019

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

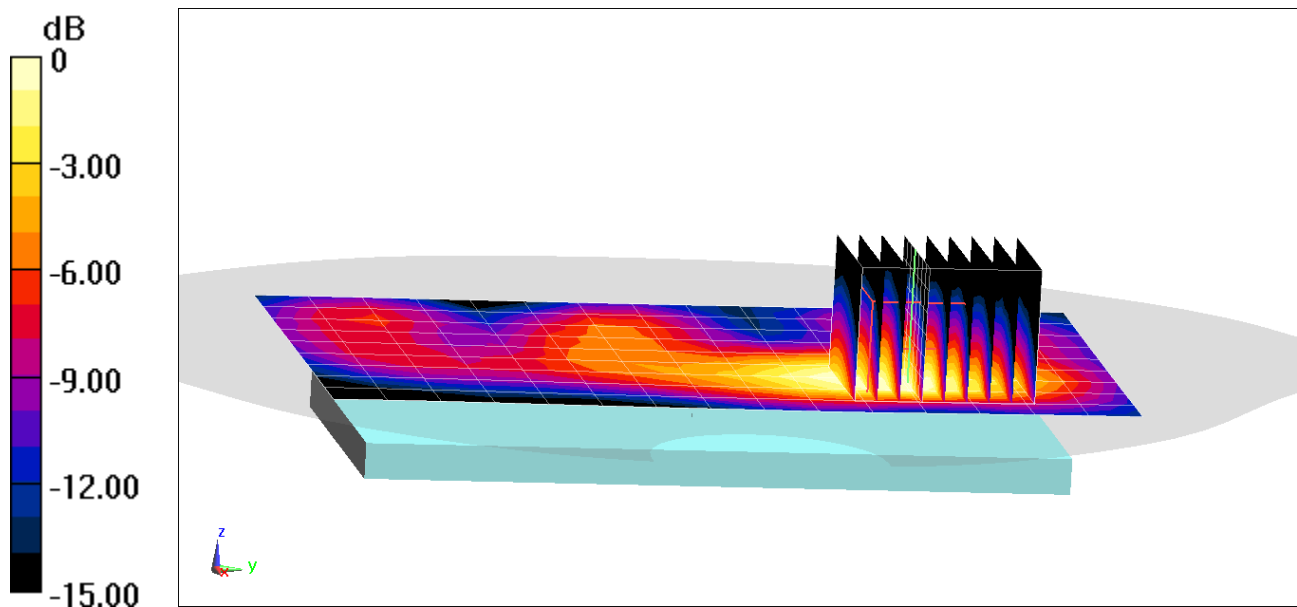
Area Scan (10x16x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

Zoom Scan (8x9x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 9.305 V/m; Power Drift = -0.13 dB

Peak SAR (extrapolated) = 0.480 W/kg

SAR(1 g) = 0.227 W/kg



0 dB = 0.379 W/kg = -4.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01191

Communication System: UID 0, LTE Band 41; Frequency: 2593 MHz; Duty Cycle: 1:1.58

Medium: 2450 Body; Medium parameters used (interpolated):

$f = 2593 \text{ MHz}$; $\sigma = 2.226 \text{ S/m}$; $\epsilon_r = 51.245$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2019; Ambient Temp: 22.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2593 MHz; Calibrated: 2/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/13/2019

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

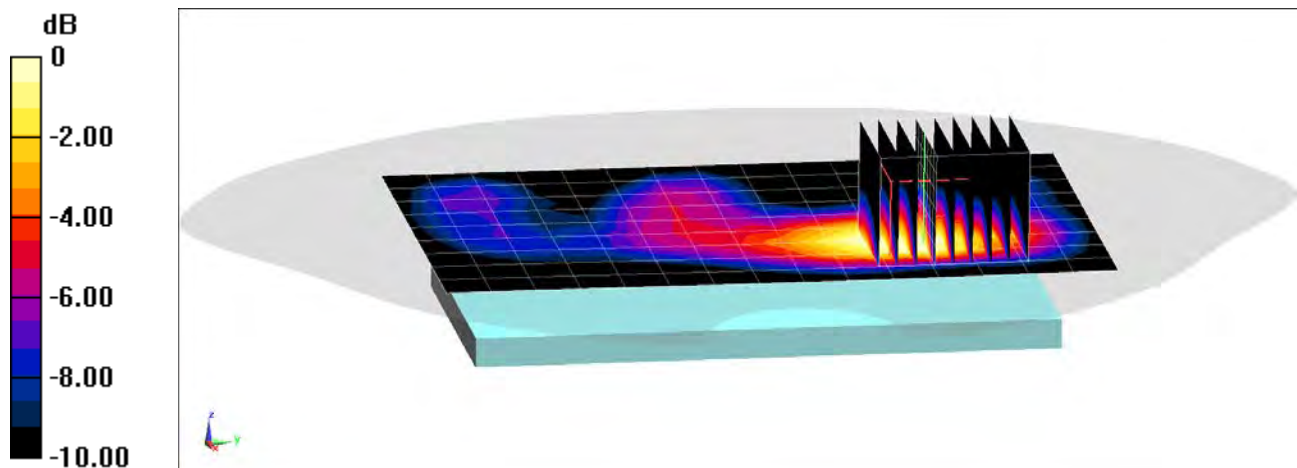
Area Scan (10x16x1): Measurement grid: dx=12mm, dy=12mm

Zoom Scan (8x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 16.32 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 1.16 W/kg

SAR(1 g) = 0.516 W/kg



0 dB = 0.379 W/kg = -4.21 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01563

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

Medium: 2450 Body; Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.988 \text{ S/m}$; $\epsilon_r = 51.338$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-09-2019; Ambient Temp: 22.7°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2412 MHz; Calibrated: 2/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/13/2019

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

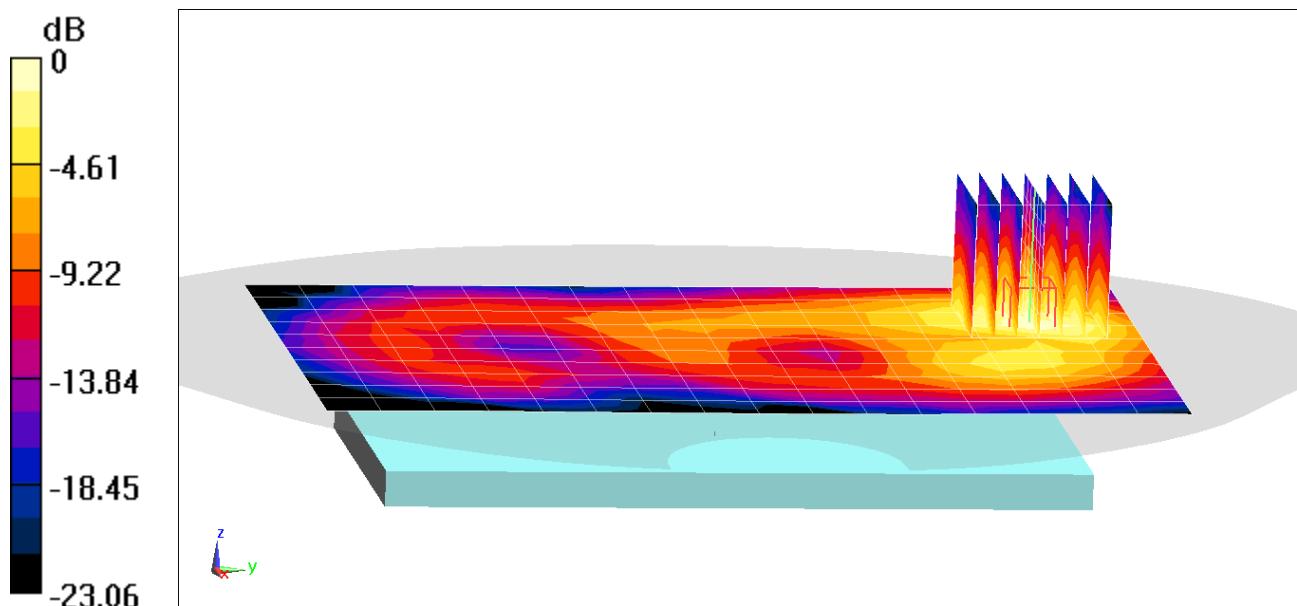
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 7.869 V/m; Power Drift = 0.12 dB

Peak SAR (extrapolated) = 0.229 W/kg

SAR(1 g) = 0.110 W/kg



0 dB = 0.183 W/kg = -7.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01563

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

Medium: 2450 Body; Medium parameters used (interpolated):

$f = 2412 \text{ MHz}$; $\sigma = 1.988 \text{ S/m}$; $\epsilon_r = 51.338$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-09-2019; Ambient Temp: 22.7°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2412 MHz; Calibrated: 2/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/13/2019

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

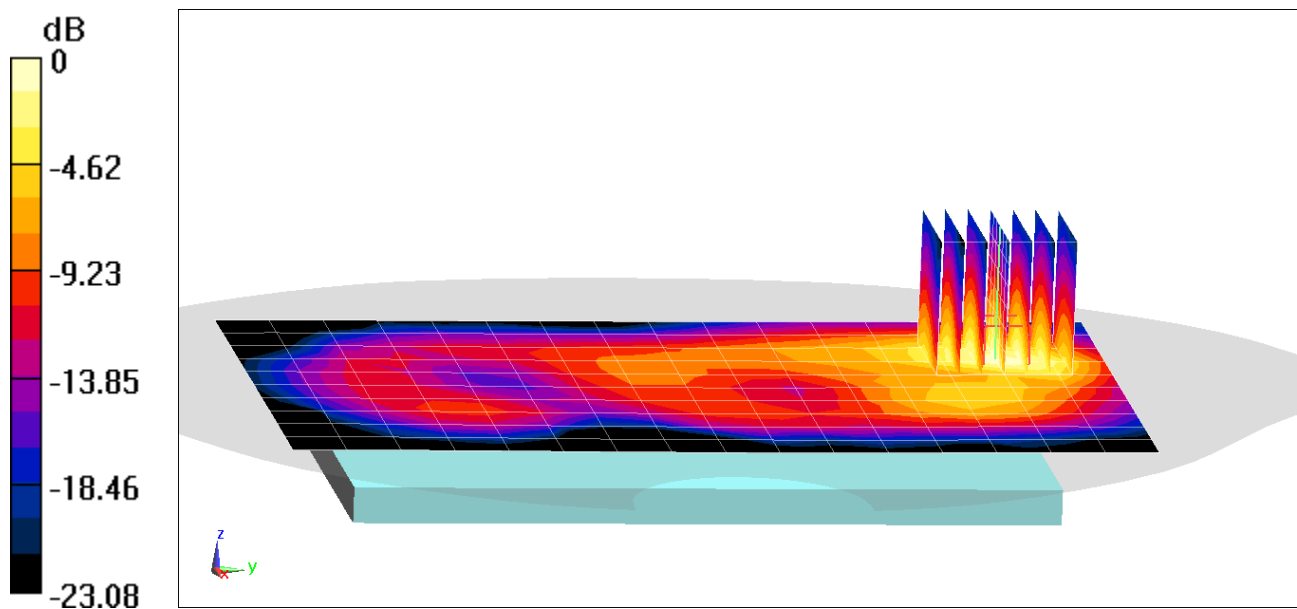
Area Scan (11x17x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Reference Value = 4.409 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 0.602 W/kg

SAR(1 g) = 0.273 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01738

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

Medium: 5GHz Body; Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.526 \text{ S/m}$; $\epsilon_r = 46.684$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date:08-05-2019 Ambient Temp: 20.3°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7410; ConvF(4.42, 4.42, 4.42) @ 5500 MHz; Calibrated: 7/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

Mode: IEEE 802.11a, UNII-2C, 20 MHz Bandwidth, Body SAR, Ch 100, 6 Mbps, Back Side

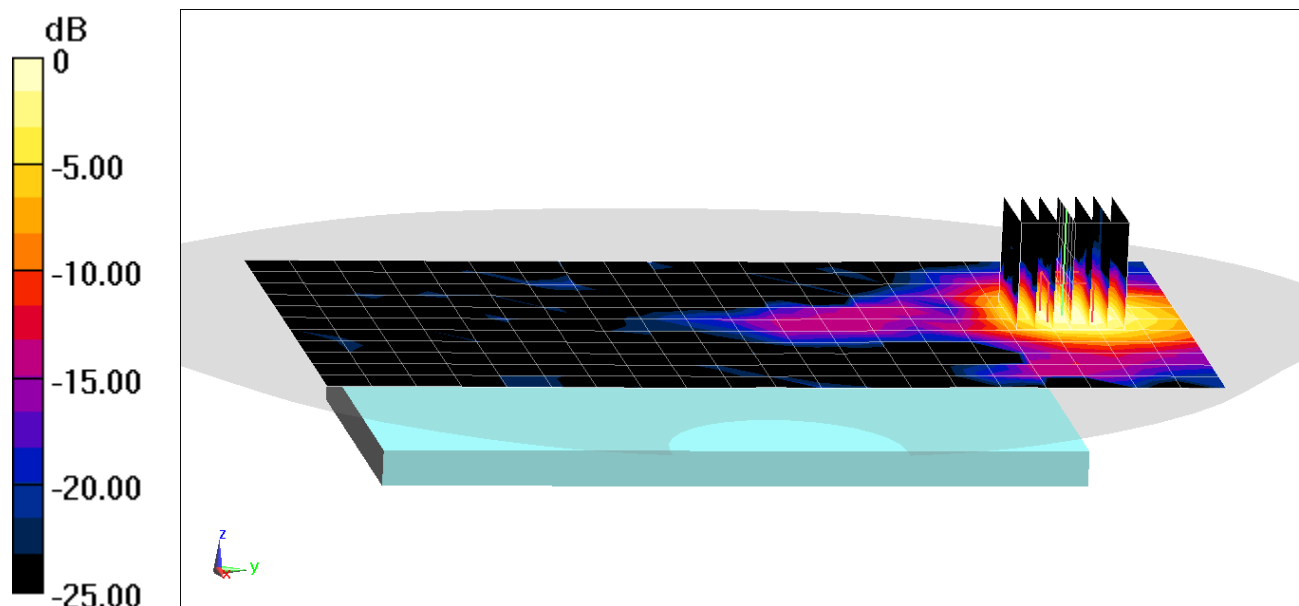
Area Scan (12x21x1): Measurement grid: dx=10mm, dy=10mm

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

Reference Value = 6.915 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 0.954 W/kg

SAR(1 g) = 0.248 W/kg



0 dB = 0.575 W/kg = -2.40 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01738

Communication System: UID 0, 802.11a 5.2-5.8 GHz Band; Frequency: 5745 MHz; Duty Cycle: 1:1

Medium: 5GHz Body; Medium parameters used:

$f = 5745 \text{ MHz}$; $\sigma = 5.88 \text{ S/m}$; $\epsilon_r = 46.252$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date:08-05-2019 Ambient Temp: 20.3°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7410; ConvF(4.6, 4.6, 4.6) @ 5745 MHz; Calibrated: 7/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

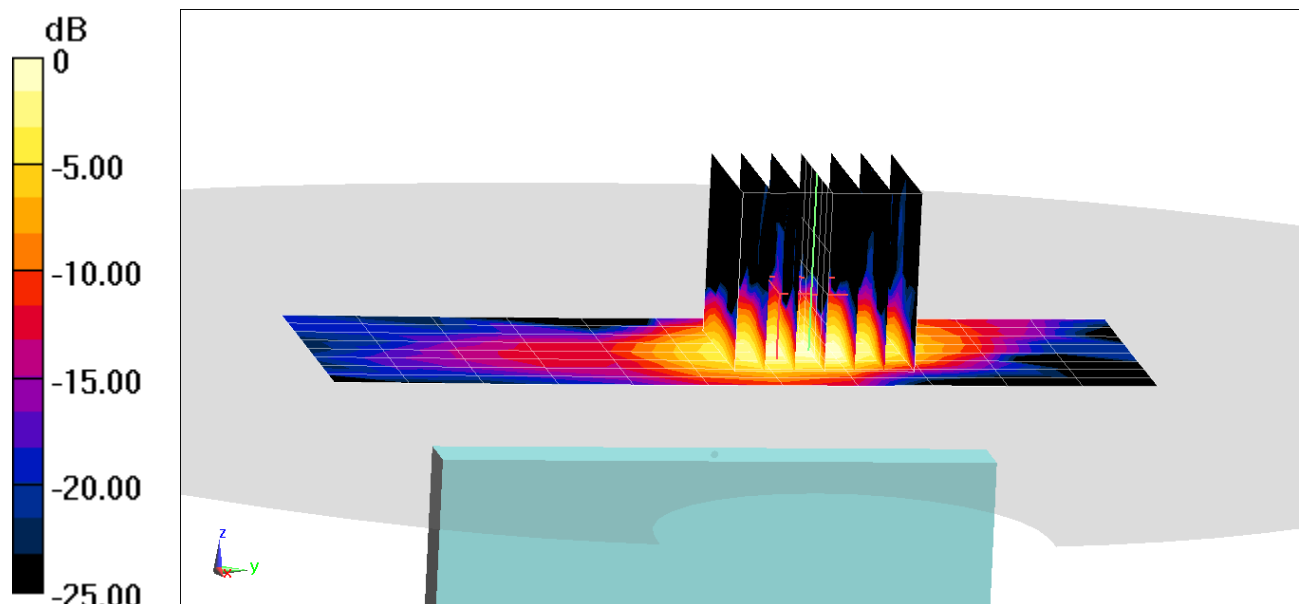
Area Scan (9x12x1): Measurement grid: dx=5mm, dy=10mm

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

Reference Value = 5.554 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 1.24 W/kg

SAR(1 g) = 0.158 W/kg



0 dB = 0.420 W/kg = -3.77 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

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

Medium: 1900 Body; Medium parameters used:

$f = 1880 \text{ MHz}$; $\sigma = 1.569 \text{ S/m}$; $\epsilon_r = 50.882$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 08-15-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(7.67, 7.67, 7.67) @ 1880 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

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

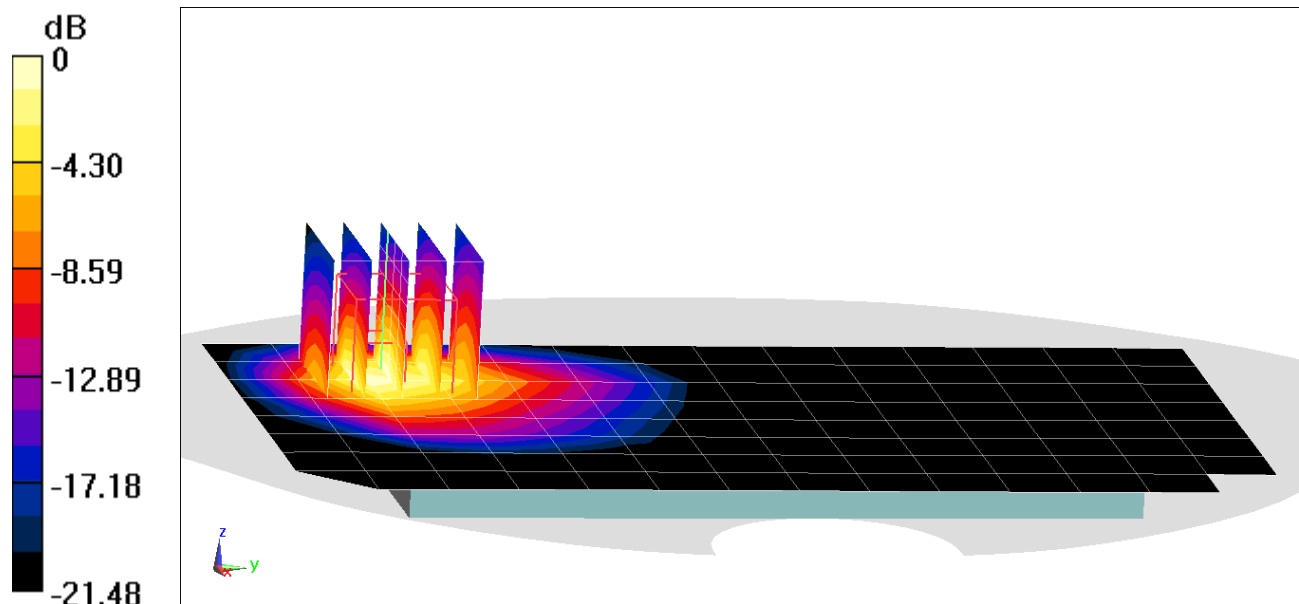
Area Scan (9x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Reference Value = 39.46 V/m; Power Drift = 0.15 dB

Peak SAR (extrapolated) = 5.18 W/kg

SAR(10 g) = 1.130 W/kg



0 dB = 3.41 W/kg = 5.33 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01209

Communication System: UID 0, LTE Band 2 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1

Medium: 1900 Body; Medium parameters used (interpolated):

$f = 1860 \text{ MHz}$; $\sigma = 1.554 \text{ S/m}$; $\epsilon_r = 50.916$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date: 08-15-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(7.67, 7.67, 7.67) @ 1860 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

Mode: LTE Band 2 (PCS), Phablet SAR, Left Edge, Low.ch
20 MHz Bandwidth, QPSK, 1 RB, 99 RB Offset

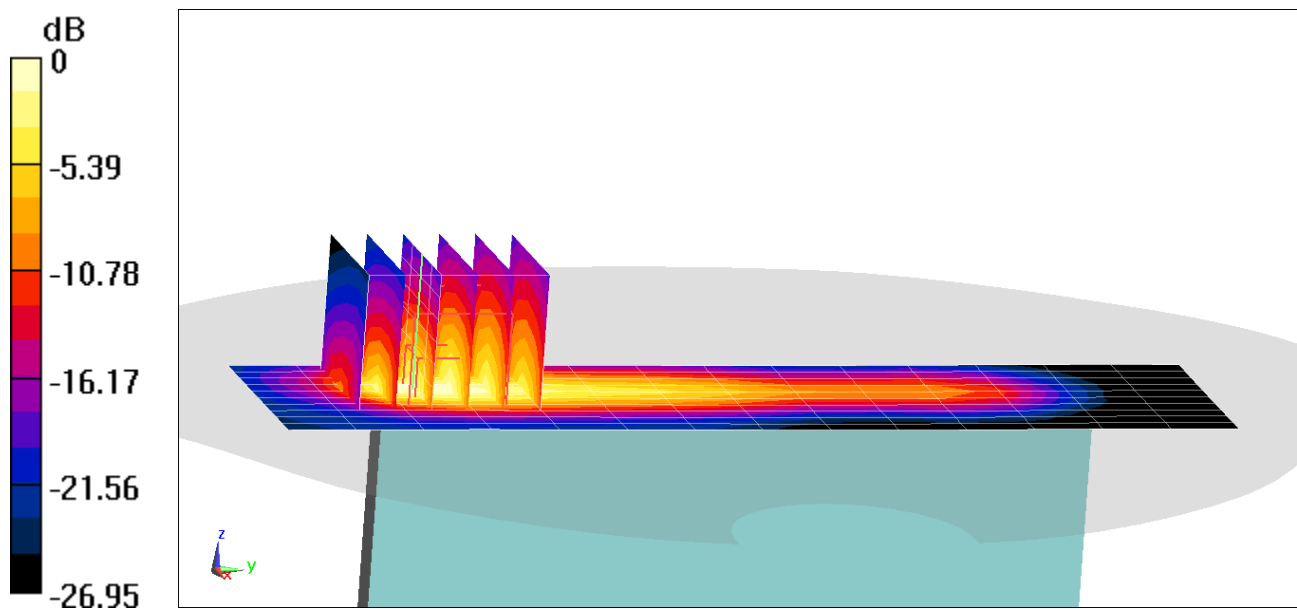
Area Scan (11x15x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 50.39 V/m; Power Drift = -0.14 dB

Peak SAR (extrapolated) = 8.33 W/kg

SAR(10 g) = 1.560 W/kg



0 dB = 6.40 W/kg = 8.06 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: A3LSMA307G; Type: Portable Handset; Serial: 01738

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

Medium: 5GHz Body; Medium parameters used:

$f = 5500 \text{ MHz}$; $\sigma = 5.526 \text{ S/m}$; $\epsilon_r = 46.684$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0.0 cm

Test Date:08-05-2019 Ambient Temp: 20.3°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7410; ConvF(4.42, 4.42, 4.42) @ 5500 MHz; Calibrated: 7/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

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

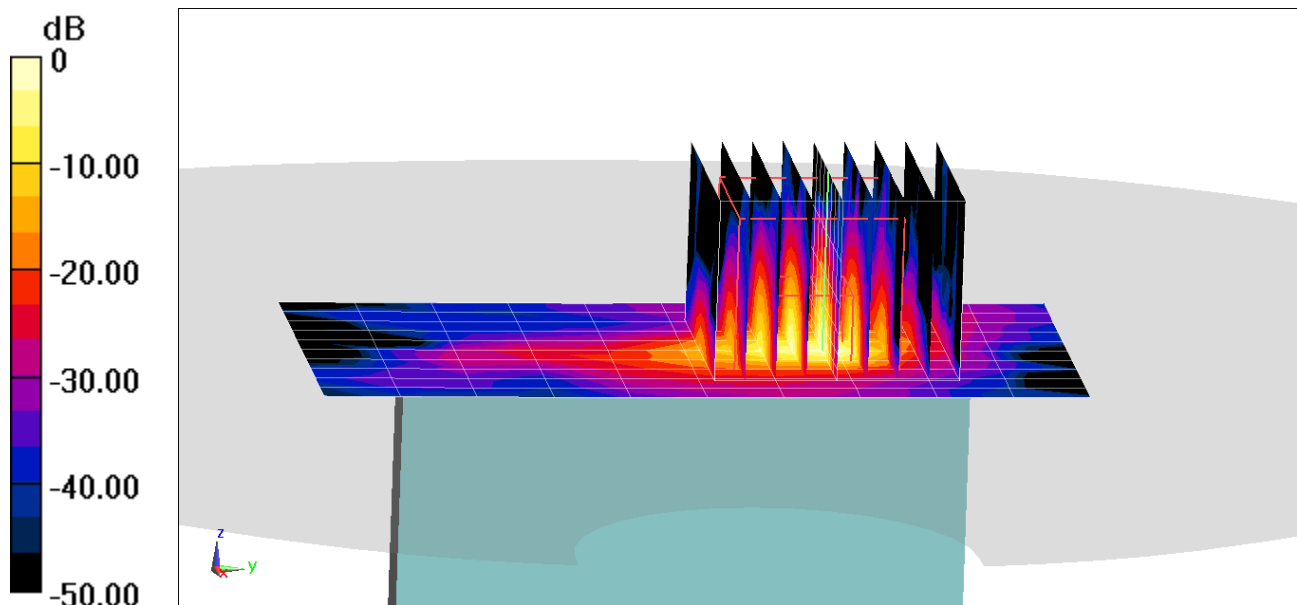
Area Scan (11x11x1): Measurement grid: $dx=5\text{mm}$, $dy=10\text{mm}$

Zoom Scan (9x9x7)/Cube 0: Measurement grid: $dx=4\text{mm}$, $dy=4\text{mm}$, $dz=1.4\text{mm}$; Graded Ratio: 1.4

Reference Value = 41.58 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 57.9 W/kg

SAR(10 g) = 1.010 W/kg



0 dB = 25.5 W/kg = 14.07 dBW/kg

APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Head Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.87 \text{ S/m}$; $\epsilon_r = 42.505$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-29-2019; Ambient Temp: 21.2°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN3589; ConvF(8.67, 8.67, 8.67) @ 750 MHz; Calibrated: 1/25/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1450; Calibrated: 8/22/2018

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

750 MHz System Verification at 23.0 dBm (200 mW)

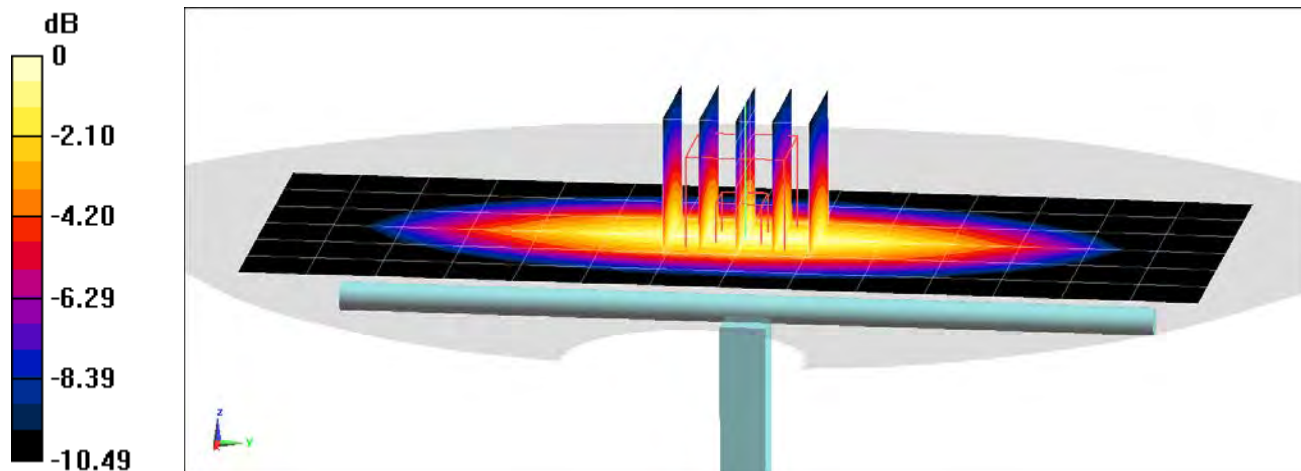
Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.28 W/kg

SAR(1 g) = 1.54 W/kg

Deviation(1 g) = -7.00%



0 dB = 2.05 W/kg = 3.12 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.901 \text{ S/m}$; $\epsilon_r = 42.255$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-30-2019; Ambient Temp: 22.9°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN3589; ConvF(8.39, 8.39, 8.39) @ 835 MHz; Calibrated: 1/25/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1450; Calibrated: 8/22/2018

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

835 MHz System Verification at 23.0 dBm (200 mW)

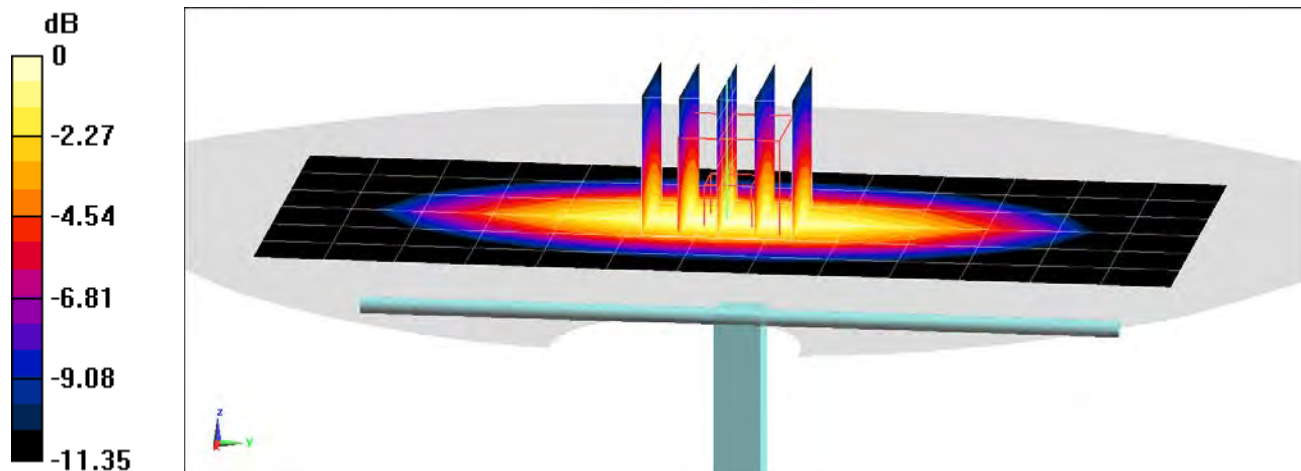
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 3.05 W/kg

SAR(1 g) = 1.96 W/kg

Deviation(1 g) = 2.19%



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

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Head Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.916 \text{ S/m}$; $\epsilon_r = 41.165$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-01-2019; Ambient Temp: 23.1°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN3589; ConvF(8.39, 8.39, 8.39) @ 835 MHz; Calibrated: 1/25/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1450; Calibrated: 8/22/2018

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

835 MHz System Verification at 23.0 dBm (200 mW)

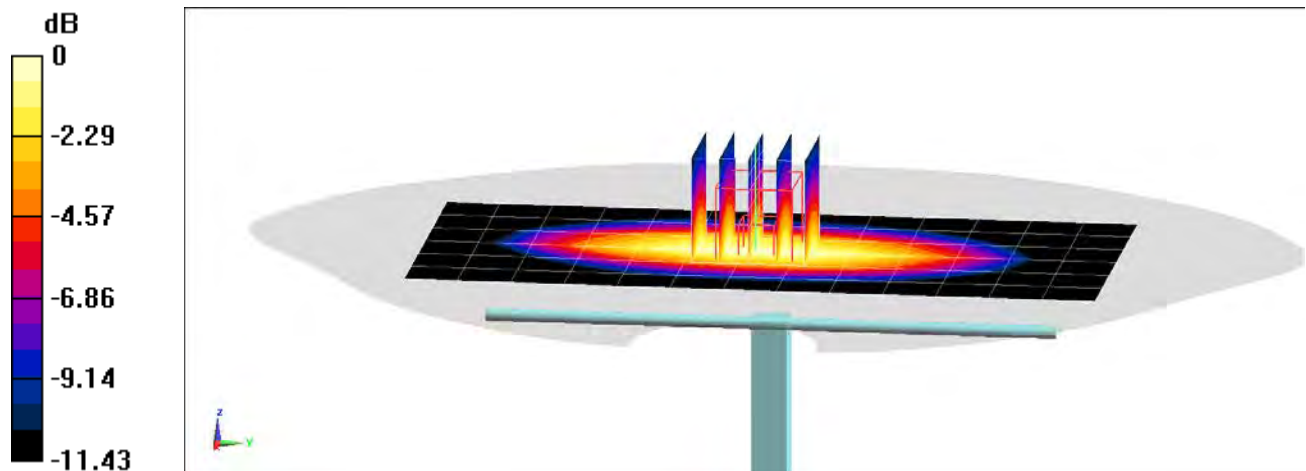
Area Scan (7x14x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 3.18 W/kg

SAR(1 g) = 2.02 W/kg

Deviation(1 g) = 5.32%



0 dB = 2.77 W/kg = 4.42 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 MHz; Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.32 \text{ S/m}$; $\epsilon_r = 39.018$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2019; Ambient Temp: 20.7°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3287; ConvF(5.48, 5.48, 5.48) @ 1750 MHz; Calibrated: 10/22/2018

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/18/2018

Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

1750 MHz System Verification at 20.0 dBm (100 mW)

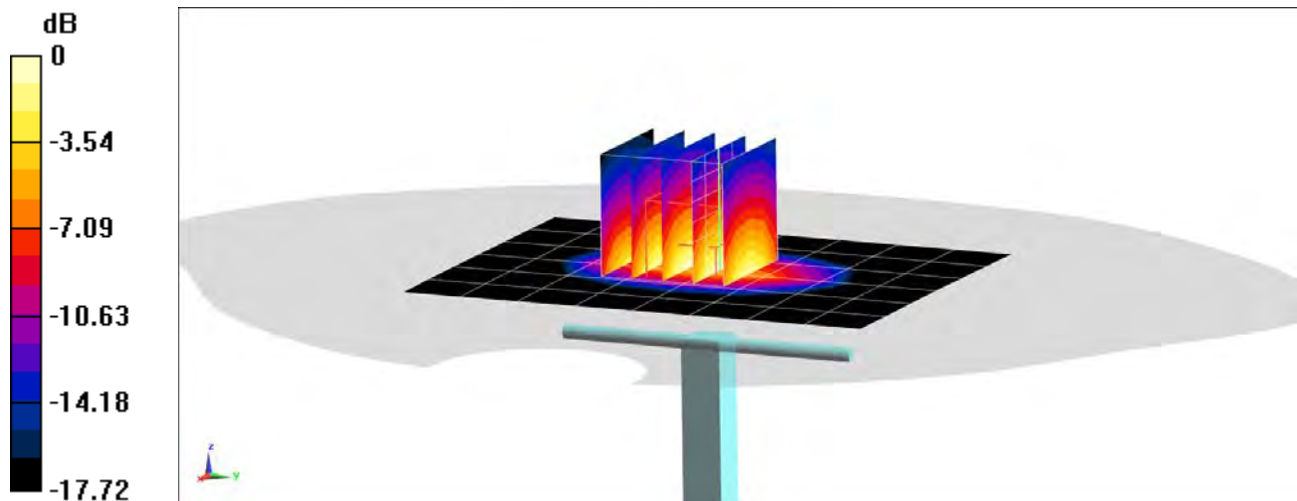
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 6.47 W/kg

SAR(1 g) = 3.6 W/kg

Deviation(1 g) = -2.70%



0 dB = 4.47 W/kg = 6.50 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 MHz; Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.412 \text{ S/m}$; $\epsilon_r = 38.792$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2019; Ambient Temp: 20.7°C; Tissue Temp: 20.0°C

Probe: ES3DV3 - SN3287; ConvF(5.24, 5.24, 5.24) @ 1900 MHz; Calibrated: 10/22/2018

Sensor-Surface: 3mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1333; Calibrated: 10/18/2018

Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1964

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

1900 MHz System Verification at 20.0 dBm (100 mW)

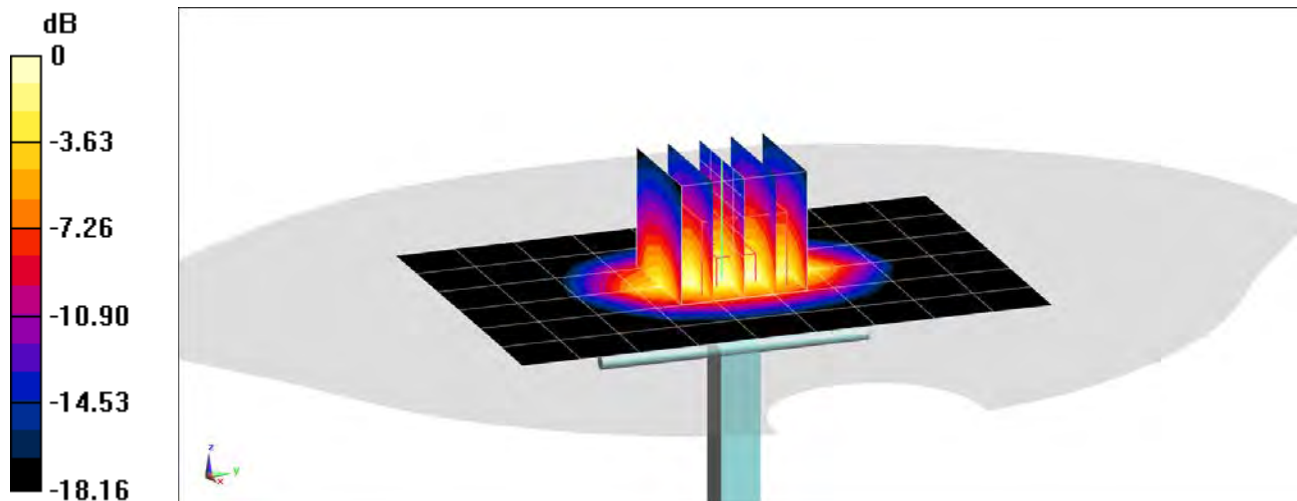
Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.55 W/kg

SAR(1 g) = 4.1 W/kg

Deviation(1 g) = 3.02%



0 dB = 5.20 W/kg = 7.16 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Head Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 1.802 \text{ S/m}$; $\epsilon_r = 37.944$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-08-2019; Ambient Temp: 23.8°C; Tissue Temp: 21.7°C

Probe: EX3DV4 - SN7547; ConvF(7.17, 7.17, 7.17) @ 2450 MHz; Calibrated: 7/15/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

2450 MHz System Verification at 20.0 dBm (100 mW)

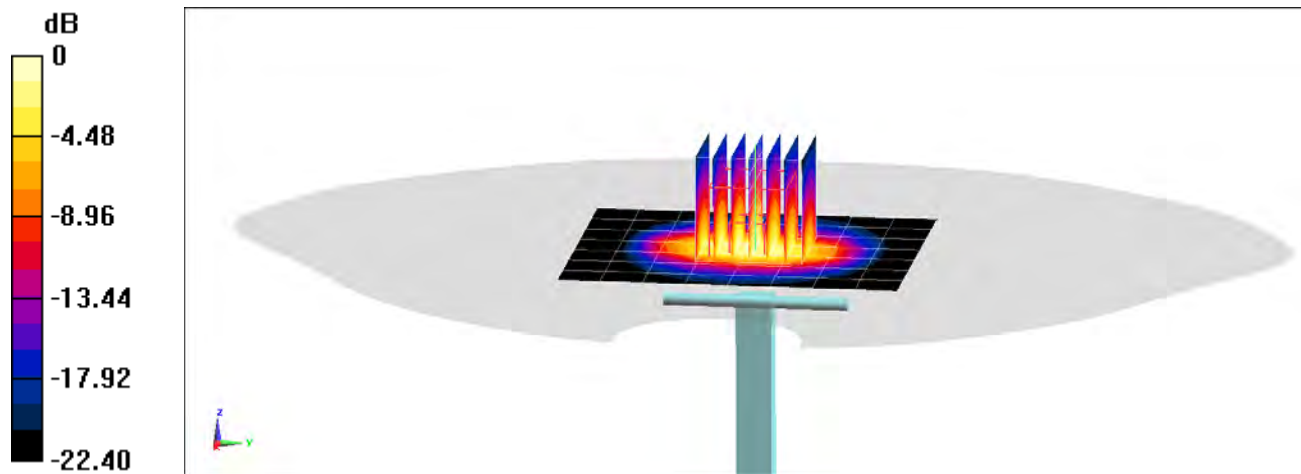
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 11.6 W/kg

SAR(1 g) = 5.62 W/kg

Deviation(1 g) = 6.64%



0 dB = 9.37 W/kg = 9.72 dBW/kg

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: 2450 Head Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 1.957 \text{ S/m}$; $\epsilon_r = 39.304$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-21-2019; Ambient Temp: 24.5°C; Tissue Temp: 22.5°C

Probe: EX3DV4 - SN7547; ConvF(6.99, 6.99, 6.99) @ 2600 MHz; Calibrated: 7/15/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1323; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0 (30); Type: QD 000 P40 CD; Serial: 1647

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

2600 MHz System Verification at 20.0 dBm (100 mW)

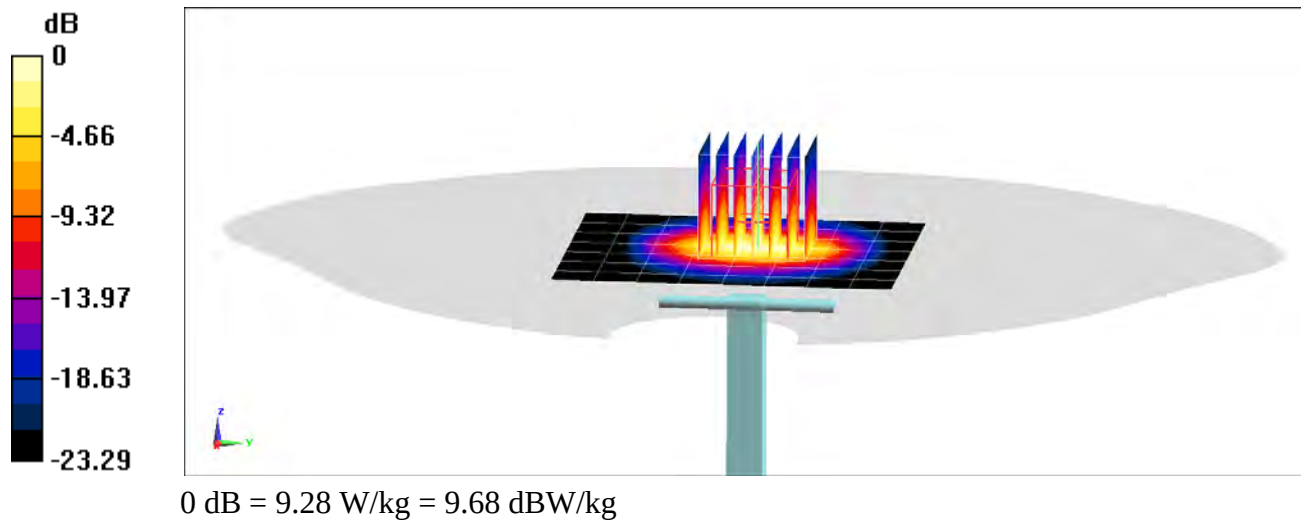
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 11.5 W/kg

SAR(1 g) = 5.45 W/kg

Deviation(1 g) = -2.50%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium: 5GHz Head; Medium parameters used (interpolated):

$f = 5250 \text{ MHz}$; $\sigma = 4.761 \text{ S/m}$; $\epsilon_r = 36.852$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-14-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7406; ConvF(5.54, 5.54, 5.54) @ 5250 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/8/2019

Phantom: Twin-SAM V5.0 Right 20; Type: QD 000 P40 CD; Serial: 1759

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

5250 MHz System Verification at 17.0 dBm (50 mW)

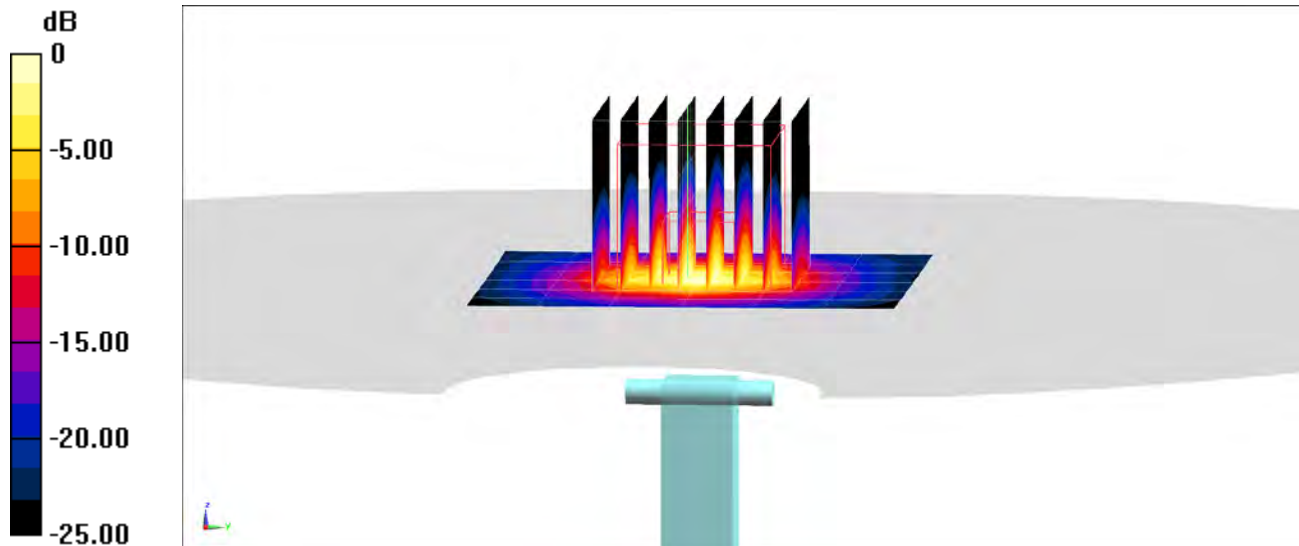
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 15.4 W/kg

SAR(1 g) = 3.81 W/kg

Deviation(1 g) = -6.27%



0 dB = 9.06 W/kg = 9.57 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5600 MHz; Duty Cycle: 1:1

Medium: 5GHz Head; Medium parameters used:

$f = 5600 \text{ MHz}$; $\sigma = 5.166 \text{ S/m}$; $\epsilon_r = 36.218$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-14-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7406; ConvF(4.94, 4.94, 4.94) @ 5600 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/8/2019

Phantom: Twin-SAM V5.0 Right 20; Type: QD 000 P40 CD; Serial: 1759

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

5600 MHz System Verification at 17.0 dBm (50 mW)

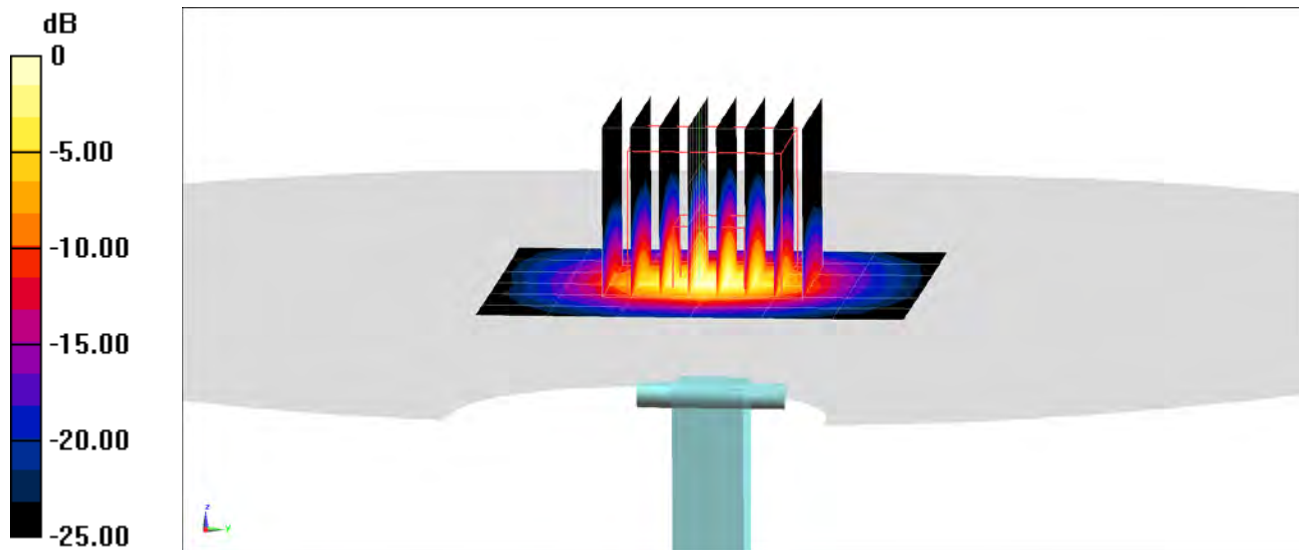
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 18.1 W/kg

SAR(1 g) = 4.06 W/kg;

Deviation(1 g) = -5.25%



0 dB = 9.84 W/kg = 9.93 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1

Medium: 5GHz Head; Medium parameters used (interpolated):

$f = 5750 \text{ MHz}$; $\sigma = 5.348 \text{ S/m}$; $\epsilon_r = 35.948$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-14-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN7406; ConvF(5.23, 5.23, 5.23) @ 5750 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn859; Calibrated: 5/8/2019

Phantom: Twin-SAM V5.0 Right 20; Type: QD 000 P40 CD; Serial: 1759

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

5750 MHz System Verification at 17.0 dBm (50 mW)

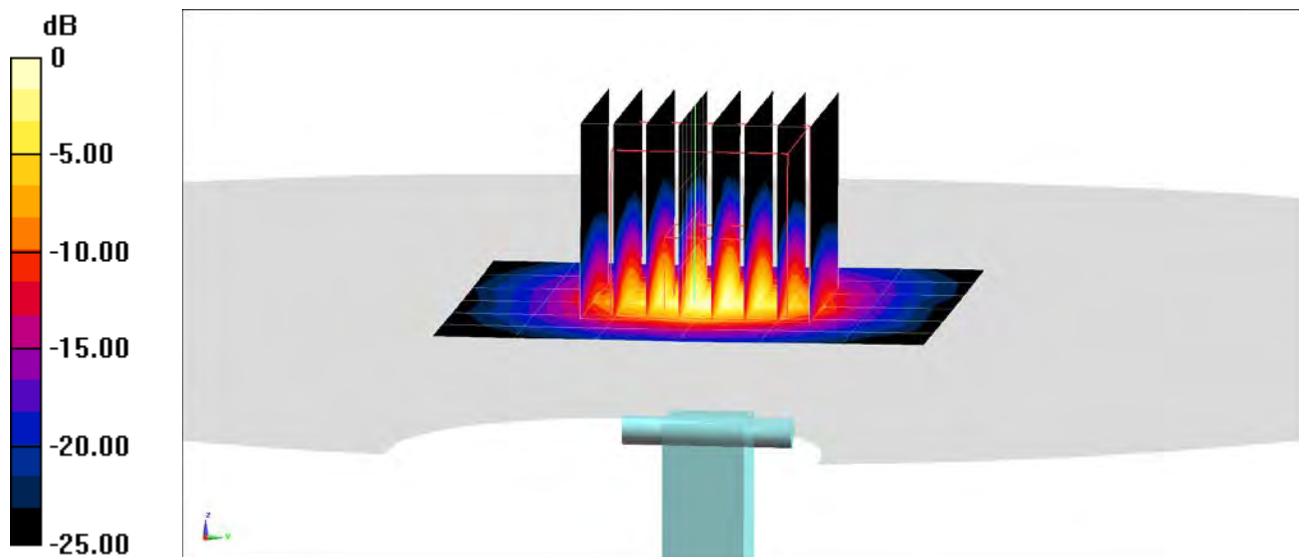
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 17.7 W/kg

SAR(1 g) = 3.8 W/kg

Deviation(1 g) = -5.71%



0 dB = 9.73 W/kg = 9.88 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.952 \text{ S/m}$; $\epsilon_r = 54.403$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-01-2019; Ambient Temp: 23.2°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN7409; ConvF(9.96, 9.96, 9.96) @ 750 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

750 MHz System Verification at 23.0 dBm (200 mW)

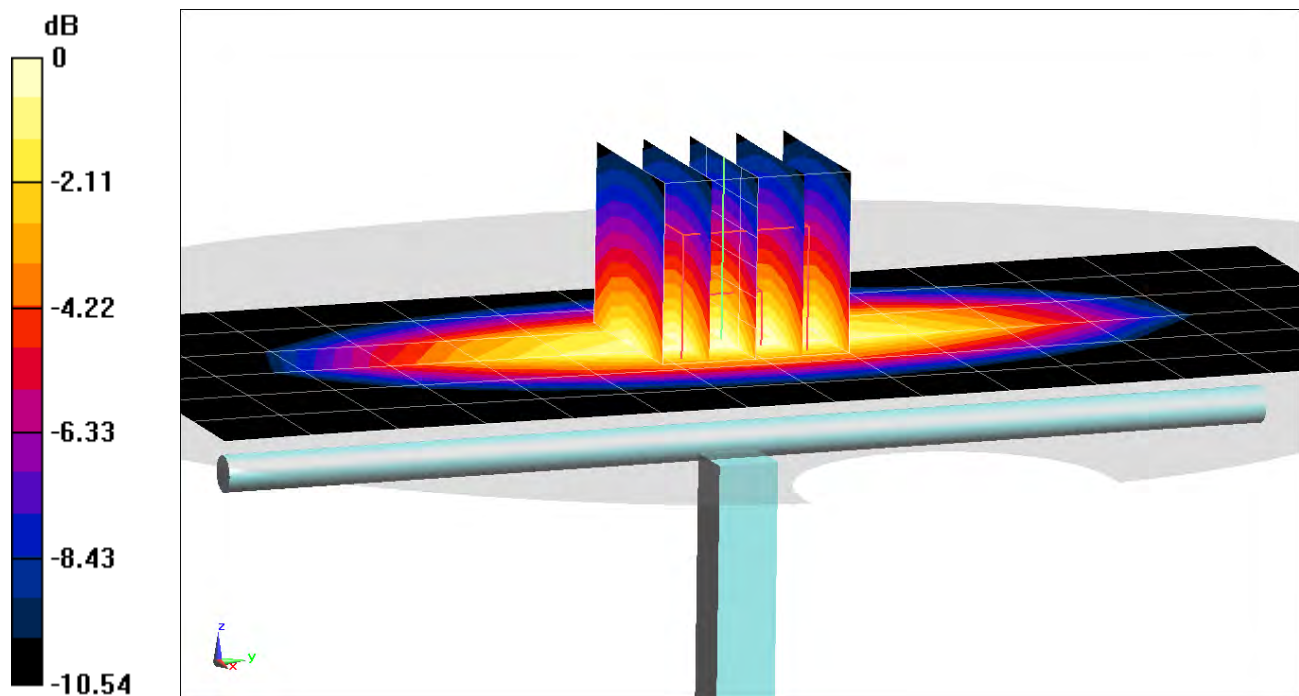
Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 2.79 W/kg

SAR(1 g) = 1.75 W/kg

Deviation(1 g) = 1.98%



0 dB = 2.41 W/kg = 3.82 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 750 Body Medium parameters used (interpolated):

$f = 750 \text{ MHz}$; $\sigma = 0.951 \text{ S/m}$; $\epsilon_r = 53.906$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-12-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7409; ConvF(9.96, 9.96, 9.96) @ 750 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

750 MHz System Verification at 23.0 dBm (200 mW)

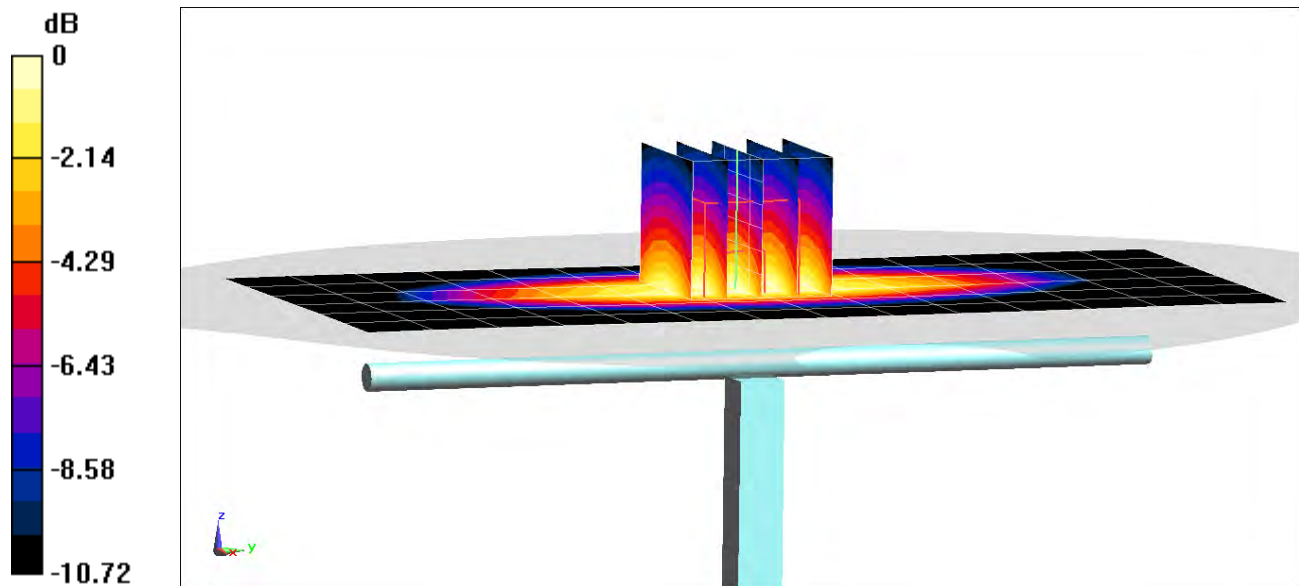
Area Scan (7x15x1): Measurement grid: $dx=15\text{mm}$, $dy=15\text{mm}$

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

Peak SAR (extrapolated) = 2.90 W/kg

SAR(1 g) = 1.8 W/kg

Deviation(1 g) = 4.90%



0 dB = 2.47 W/kg = 3.93 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 835 Body Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.983 \text{ S/m}$; $\epsilon_r = 54.443$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-05-2019; Ambient Temp: 20.5°C; Tissue Temp: 19.7°C

Probe: EX3DV4 - SN7538; ConvF(9.85, 9.85, 9.85) @ 835 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn728; Calibrated: 5/8/2019

Phantom: Left Twin-SAM V5.0 30; Type: QD 000 P40 CD; Serial: 1792

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

835 MHz System Verification at 23.0 dBm (200 mW)

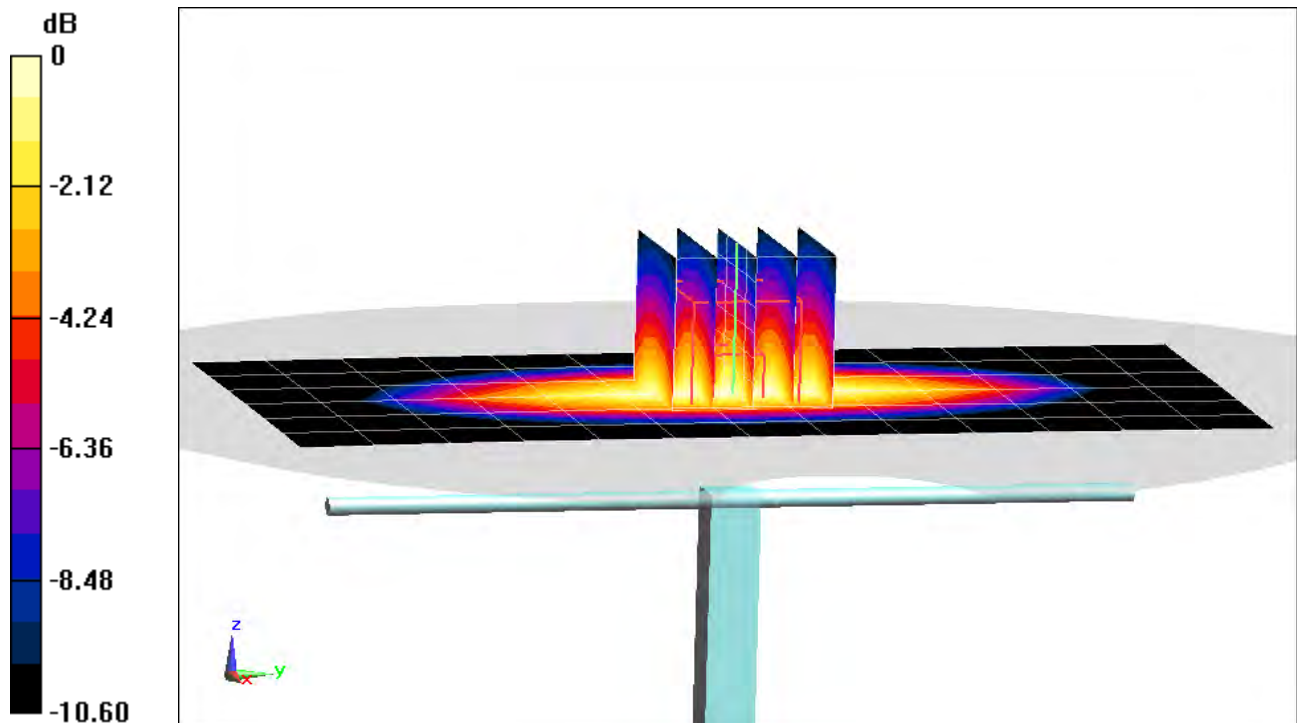
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 3.12 W/kg

SAR(1 g) = 2.03 W/kg

Deviation(1 g) = 7.18%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.487 \text{ S/m}$; $\epsilon_r = 53.667$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1750 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

1750 MHz System Verification at 20.0 dBm (100 mW)

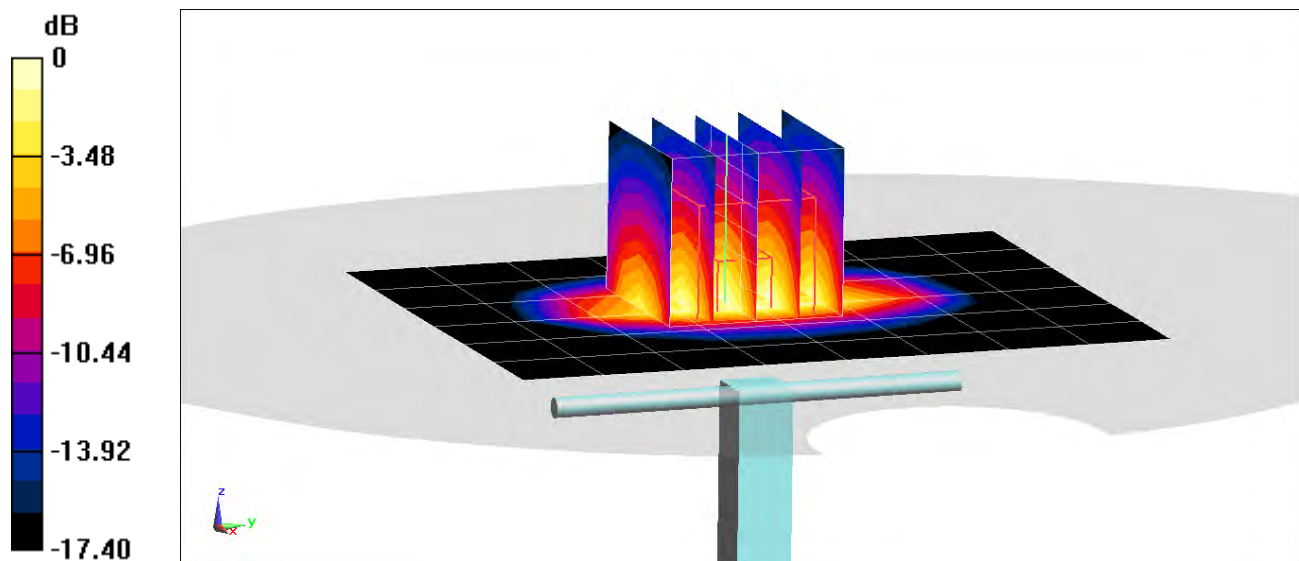
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.19 W/kg

SAR(1 g) = 3.84 W/kg

Deviation(1 g) = 1.86%



0 dB = 5.96 W/kg = 7.75 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.486 \text{ S/m}$; $\epsilon_r = 53.046$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-07-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1750 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

1750 MHz System Verification at 20.0 dBm (100 mW)

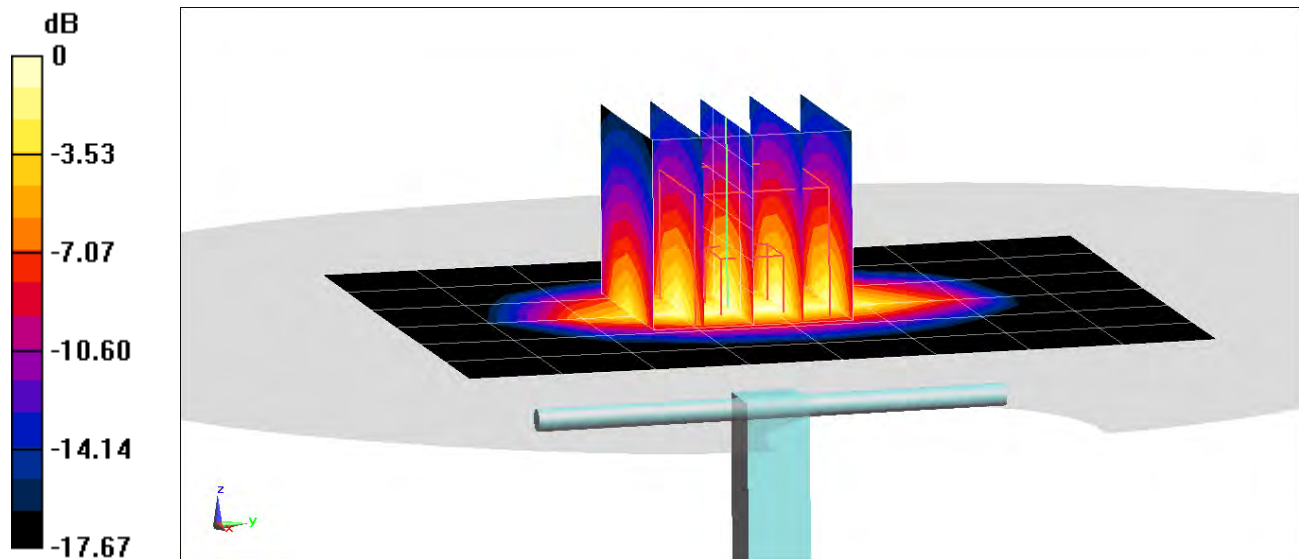
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.60 W/kg

SAR(1 g) = 3.99 W/kg

Deviation(1 g) = 5.84%



0 dB = 6.21 W/kg = 7.93 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.569 \text{ S/m}$; $\epsilon_r = 52.533$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-05-2019; Ambient Temp: 19.7°C; Tissue Temp: 23.8°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1900 MHz; Calibrated: 1/24/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1530; Calibrated: 1/15/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

1900 MHz System Verification at 20.0 dBm (100 mW)

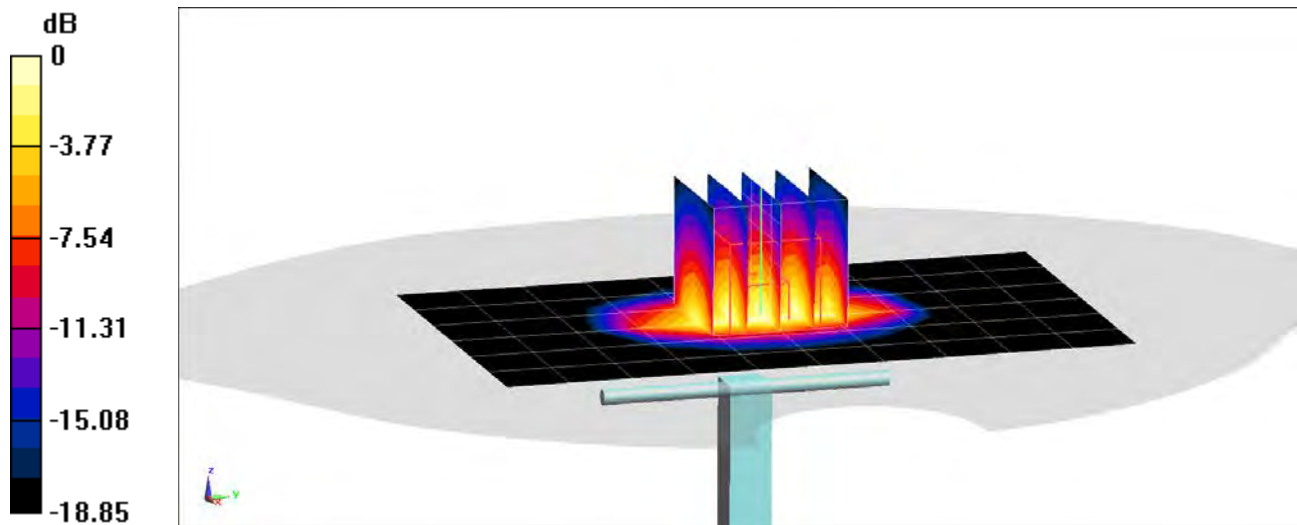
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.91 W/kg

SAR(1 g) = 4.2 W/kg

Deviation(1 g) = 7.14%



0 dB = 6.61 W/kg = 8.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.534 \text{ S/m}$; $\epsilon_r = 51.449$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-07-2019; Ambient Temp: 20.3°C; Tissue Temp: 22.2°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1900 MHz; Calibrated: 1/24/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1530; Calibrated: 1/15/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1800

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

1900 MHz System Verification at 20.0 dBm (100 mW)

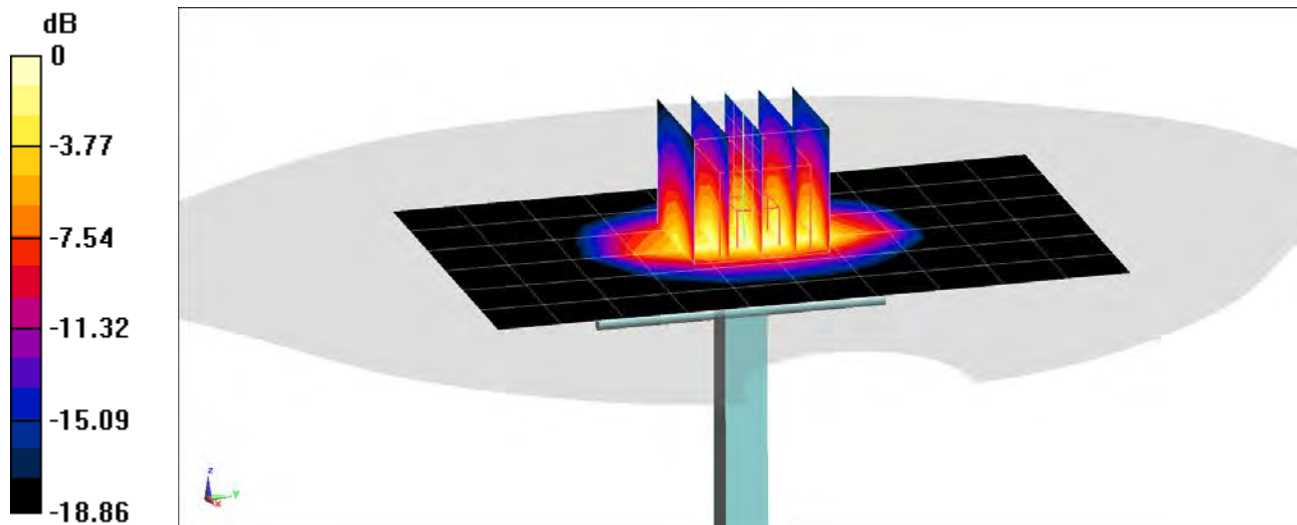
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.78 W/kg

SAR(1 g) = 4.04 W/kg

Deviation(1 g) = 3.06%



0 dB = 6.42 W/kg = 8.08 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

Medium: 1900 Body Medium parameters used (interpolated):

$f = 1900 \text{ MHz}$; $\sigma = 1.585 \text{ S/m}$; $\epsilon_r = 50.849$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-15-2019; Ambient Temp: 22.0°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7409; ConvF(7.67, 7.67, 7.67) @ 1900 MHz; Calibrated: 6/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1334; Calibrated: 6/20/2019

Phantom: Front; Type: QD 000 P40 CD; Serial: 1686

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

1900 MHz System Verification at 20.0 dBm (100 mW)

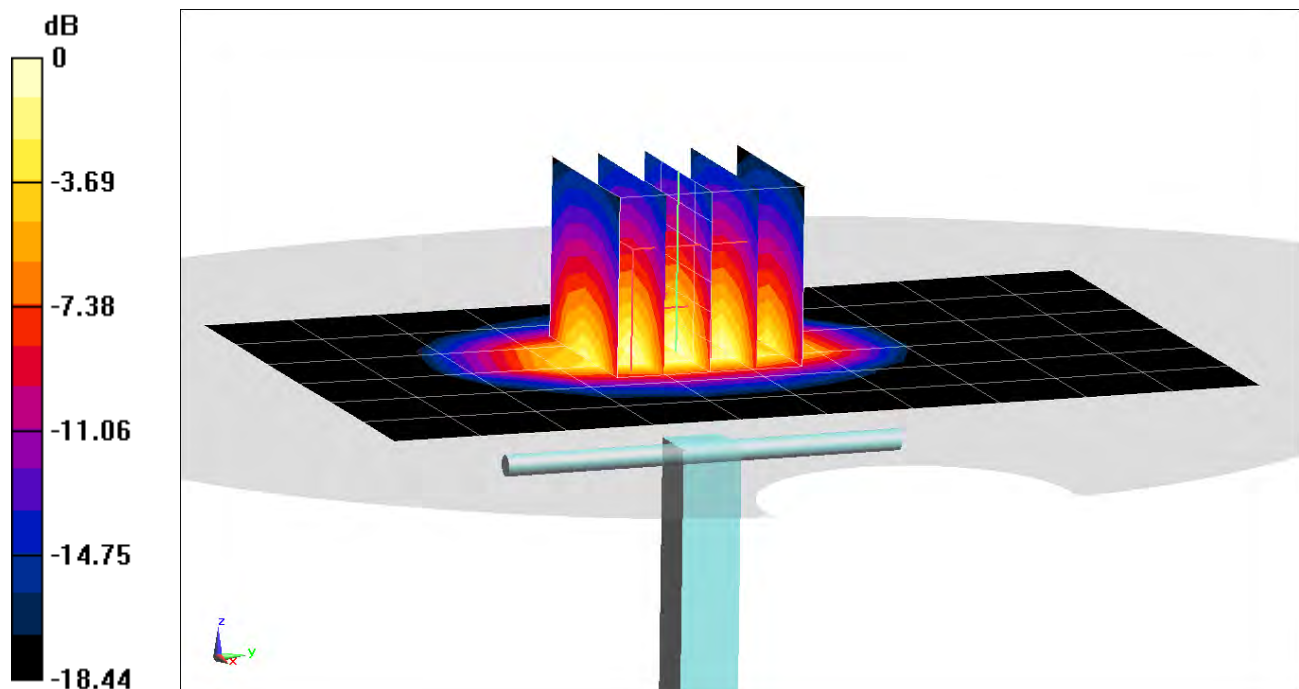
Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.67 W/kg

SAR(10 g) = 2.09 W/kg

Deviation(10 g) = 1.46%



0 dB = 6.43 W/kg = 8.08 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body; Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.031 \text{ S/m}$; $\epsilon_r = 51.241$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-09-2019; Ambient Temp: 22.7°C; Tissue Temp: 22.3°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2450 MHz; Calibrated: 2/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/13/2019

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

2450 MHz System Verification at 20.0 dBm (100 mW)

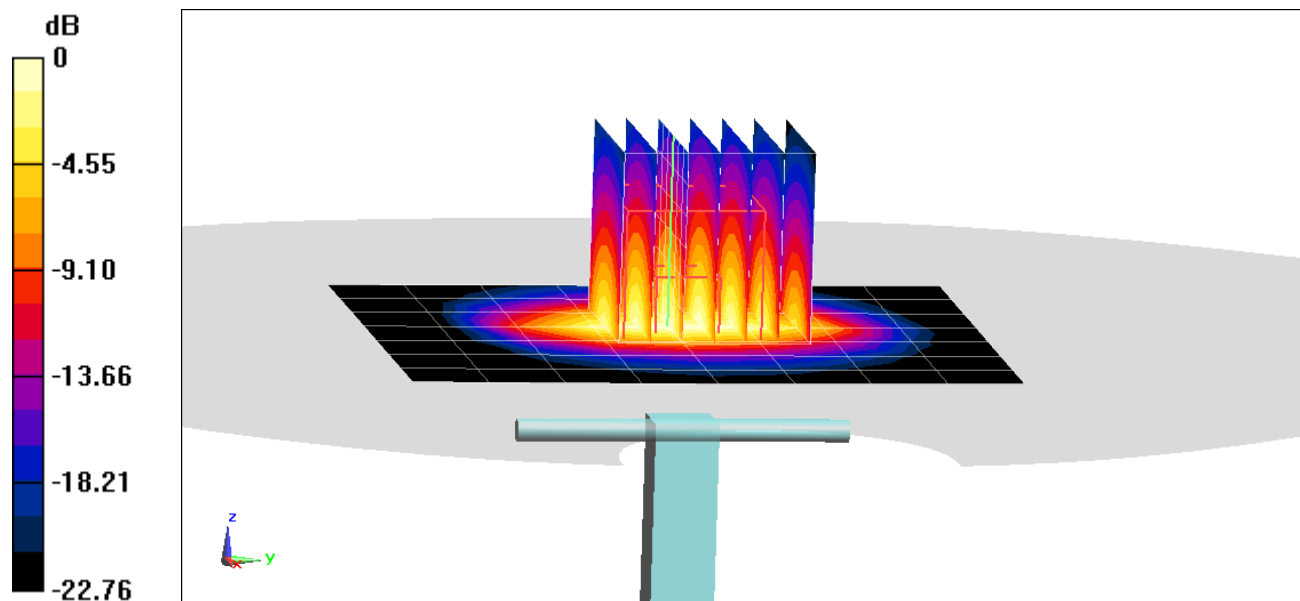
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 9.96 W/kg

SAR(1 g) = 4.84 W/kg

Deviation(1 g) = -5.28%



PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body; Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.046 \text{ S/m}$; $\epsilon_r = 51.692$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2019; Ambient Temp: 22.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2450 MHz; Calibrated: 2/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/13/2019

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10 (2); SEMCAD X Version 14.6.12 (7470)

2450 MHz System Verification at 20.0 dBm (100 mW)

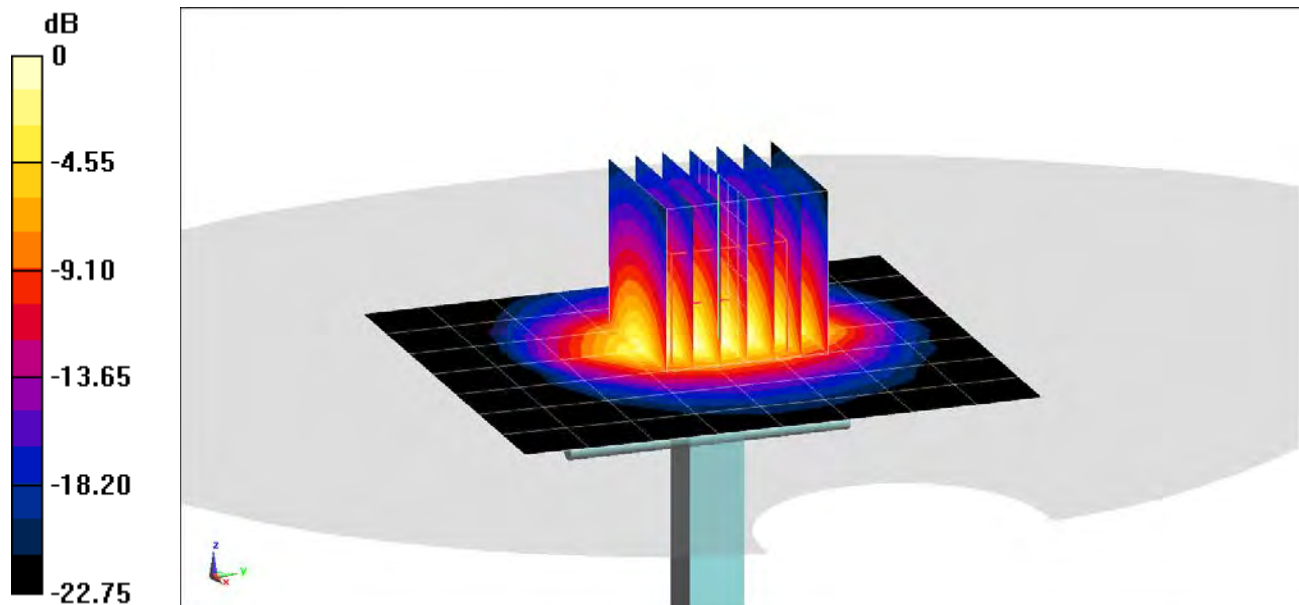
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 10.4 W/kg

SAR(1 g) = 4.97 W/kg

Deviation(1 g) = -2.74%



0 dB = 8.39 W/kg = 9.24 dBW/kg

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: 2450 Body; Medium parameters used:

$f = 2600 \text{ MHz}$; $\sigma = 2.235 \text{ S/m}$; $\epsilon_r = 51.22$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-12-2019; Ambient Temp: 22.9°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2600 MHz; Calibrated: 2/19/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn665; Calibrated: 2/13/2019

Phantom: LeftTwin-SAM V5.0; Type: QD 000 P40 CD; Serial: TP1375

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

2600 MHz System Verification at 20.0 dBm (100 mW)

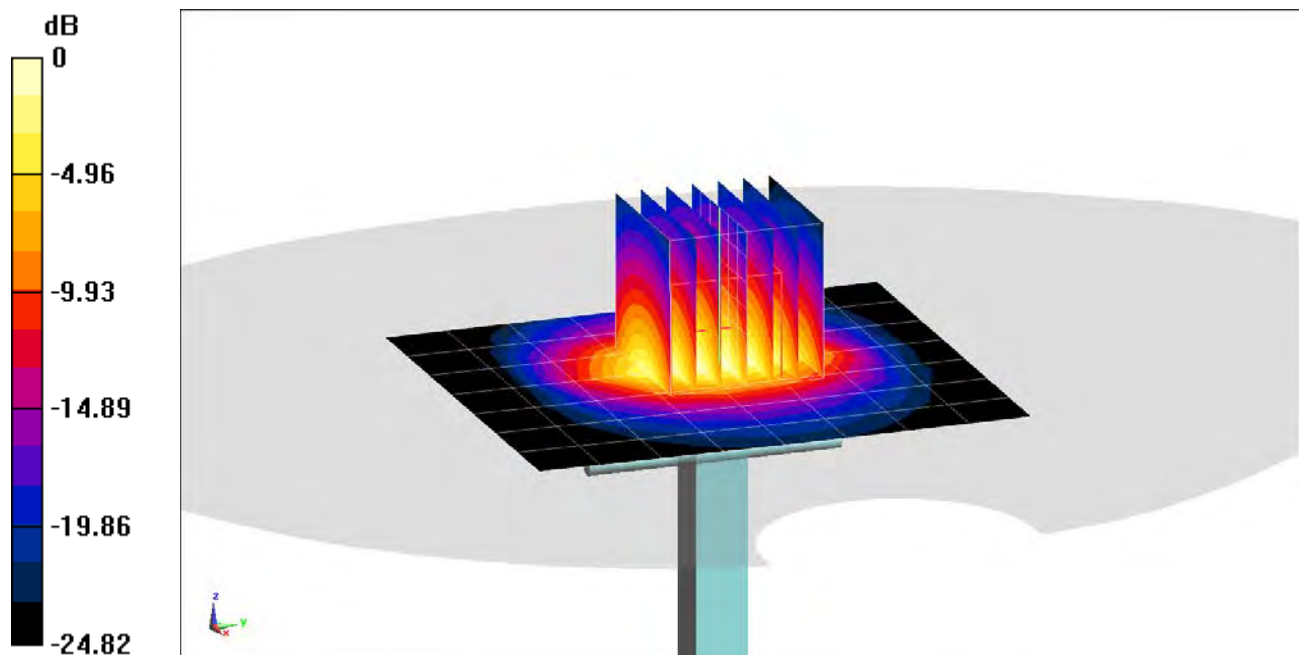
Area Scan (8x9x1): Measurement grid: $dx=12\text{mm}$, $dy=12\text{mm}$

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

Peak SAR (extrapolated) = 11.5 W/kg

SAR(1 g) = 5.31 W/kg

Deviation(1 g) = -3.10%



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5250 MHz; Duty Cycle: 1:1

Medium: 5GHz Body Medium parameters used (interpolated):

$f = 5250 \text{ MHz}$; $\sigma = 5.195 \text{ S/m}$; $\epsilon_r = 47.086$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date:08-05-2019 Ambient Temp: 20.3°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7410; ConvF(4.95, 4.95, 4.95) @ 5250 MHz; Calibrated: 7/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

5250 MHz System Verification at 17.0 dBm (50 mW)

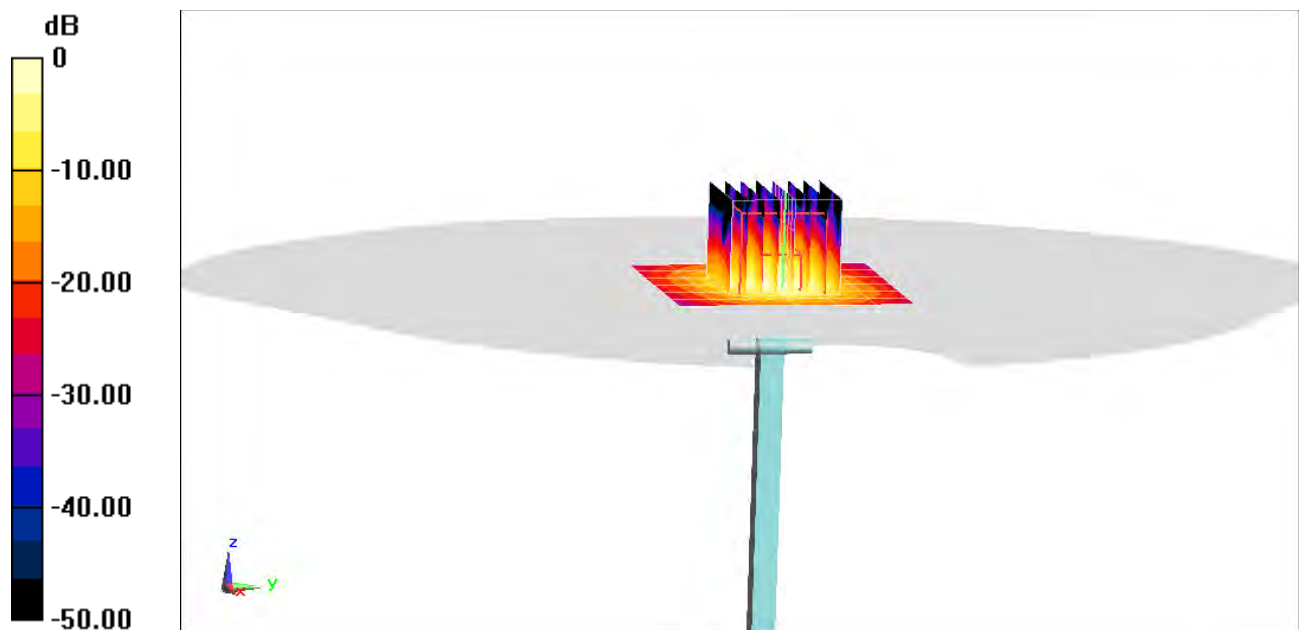
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 14.0 W/kg

SAR(1 g) = 3.48 W/kg; SAR(10 g) = 0.978 W/kg

Deviation(1 g) = -8.30%; Deviation(10 g) = -7.30%



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: 5GHz Body Medium parameters used:

$f = 5600$ MHz; $\sigma = 5.671$ S/m; $\epsilon_r = 46.518$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date:08-05-2019 Ambient Temp: 20.3°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7410; ConvF(4.42, 4.42, 4.42) @ 5600 MHz; Calibrated: 7/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

5600 MHz System Verification at 17.0 dBm (50 mW)

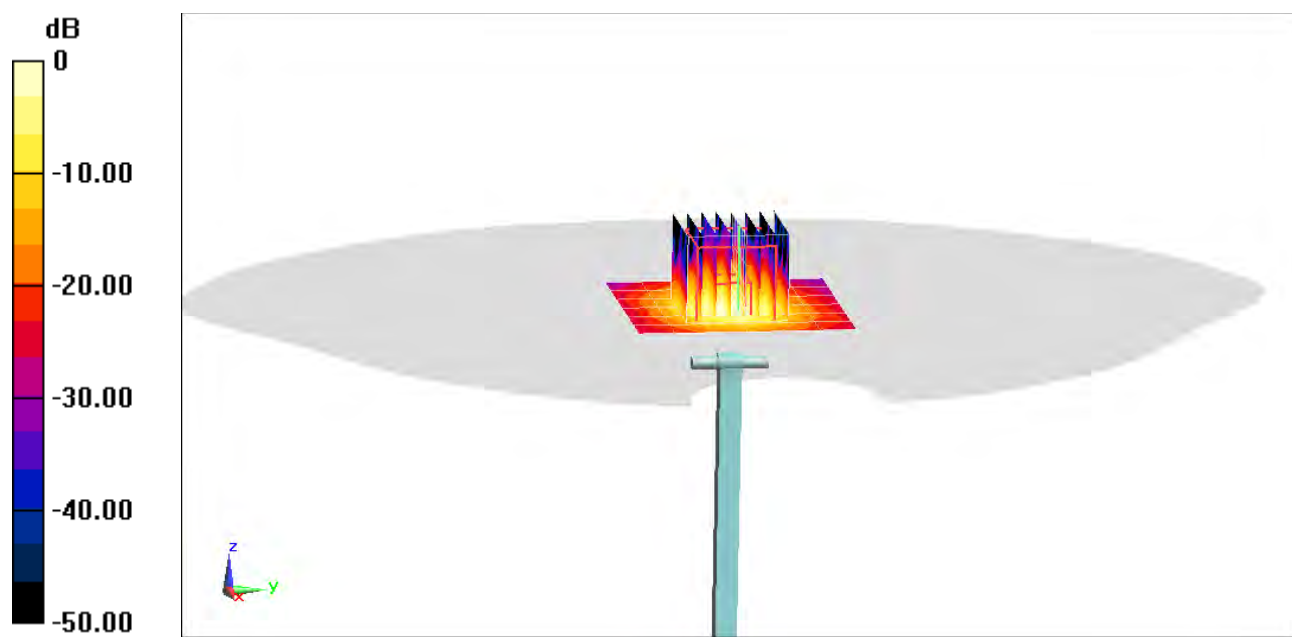
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 16.9 W/kg

SAR(1 g) = 3.81 W/kg; SAR(10 g) = 1.05 W/kg

Deviation(1 g) = -4.63%; Deviation(10 g) = -5.83%



0 dB = 9.18 W/kg = 9.63 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 5 GHz; Type: D5GHzV2; Serial: 1057

Communication System: UID 0, CW; Frequency: 5750 MHz; Duty Cycle: 1:1

Medium: 5GHz Body Medium parameters used (interpolated):

$f = 5750 \text{ MHz}$; $\sigma = 5.888 \text{ S/m}$; $\epsilon_r = 46.242$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date:08-05-2019 Ambient Temp: 20.3°C; Tissue Temp: 21.1°C

Probe: EX3DV4 - SN7410; ConvF(4.6, 4.6, 4.6) @ 5750 MHz; Calibrated: 7/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1322; Calibrated: 7/11/2019

Phantom: Twin-SAM V5.0; Type: QD 000 P40 CD; Serial: 1630

Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

5750 MHz System Verification at 17.0 dBm (50 mW)

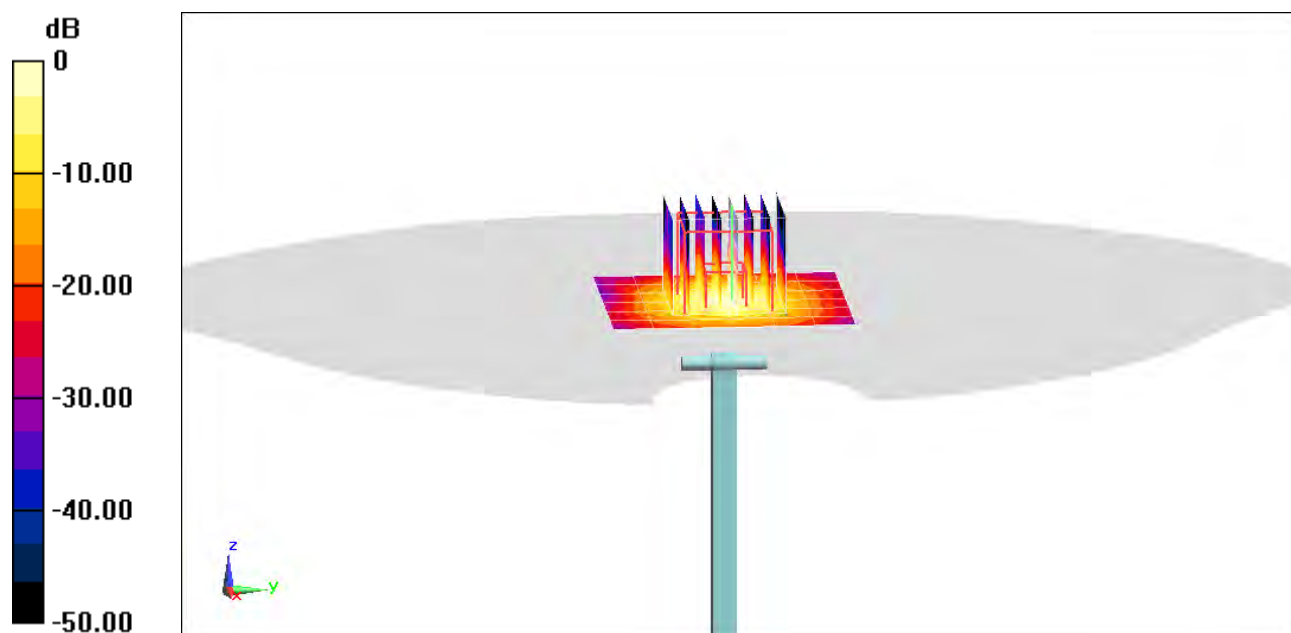
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 16.6 W/kg

SAR(1 g) = 3.56 W/kg; SAR(10 g) = 0.996 W/kg

Deviation(1 g) = -7.17%; Deviation(10 g) = -6.04%



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: **D5GHzV2-1057_Jan18**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1057**

Calibration procedure(s) **QA CAL-22.v2**
Calibration procedure for dipole validation kits between 3-6 GHz

Calibration date: **January 16, 2018**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 3503	30-Dec-17 (No. EX3-3503_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37490704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292763	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

Calibrated by: **Leif Klysner** Name: **Leif Klysner** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager**

Signature

Signature

Issued: January 18, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5200 MHz $\pm$ 1 MHz 5250 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5750 MHz $\pm$ 1 MHz 5800 MHz $\pm$ 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	36.2 $\pm$ 6 %	4.55 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.2 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.8 W/kg $\pm$ 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.8 ± 6 %	4.90 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	84.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.40 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.0 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.5 ± 6 %	5.06 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.30 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5200 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	49.0	5.30 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.3 ± 6 %	5.41 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5200 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.36 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	73.1 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.06 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.4 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	47.2 ± 6 %	5.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.64 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.1 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.6 ± 6 %	5.94 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	8.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	79.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.25 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.3 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	6.15 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.72 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.7 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5800 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.2	6.00 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.2 ± 6 %	6.22 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5800 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	76.3 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.1 W/kg ± 19.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	50.0 Ω - 5.5 j Ω
Return Loss	- 25.2 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	54.7 Ω - 2.1 j Ω
Return Loss	- 26.2 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	52.7 Ω + 0.0 j Ω
Return Loss	- 31.5 dB

Antenna Parameters with Body TSL at 5200 MHz

Impedance, transformed to feed point	49.3 Ω - 6.7 j Ω
Return Loss	- 23.4 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	48.4 Ω - 3.9 j Ω
Return Loss	- 27.4 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	55.3 Ω - 1.6 j Ω
Return Loss	- 25.6 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	52.6 Ω + 1.1 j Ω
Return Loss	- 31.2 dB

Antenna Parameters with Body TSL at 5800 MHz

Impedance, transformed to feed point	51.8 Ω - 0.4 j Ω
Return Loss	- 34.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	November 27, 2006

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions (f=5200 MHz)

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

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.24 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	82.6 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.6 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	85.6 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.7 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.6 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.7 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	5.16 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.7 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	1.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	17.7 W/kg ± 19.9 % (k=2)

Measurement Conditions (f=5800 MHz)

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

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.62 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	86.3 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.41 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.1 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.88 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	88.9 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.4 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	83.4 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.5 W/kg ± 19.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	5.68 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	56.8 W/kg ± 20.3 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	1.89 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	18.9 W/kg ± 19.9 % (k=2)

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: $f = 5250$ MHz; $\sigma = 4.55$ S/m; $\epsilon_r = 36.2$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5600$ MHz; $\sigma = 4.9$ S/m; $\epsilon_r = 35.8$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5750$ MHz; $\sigma = 5.06$ S/m; $\epsilon_r = 35.5$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

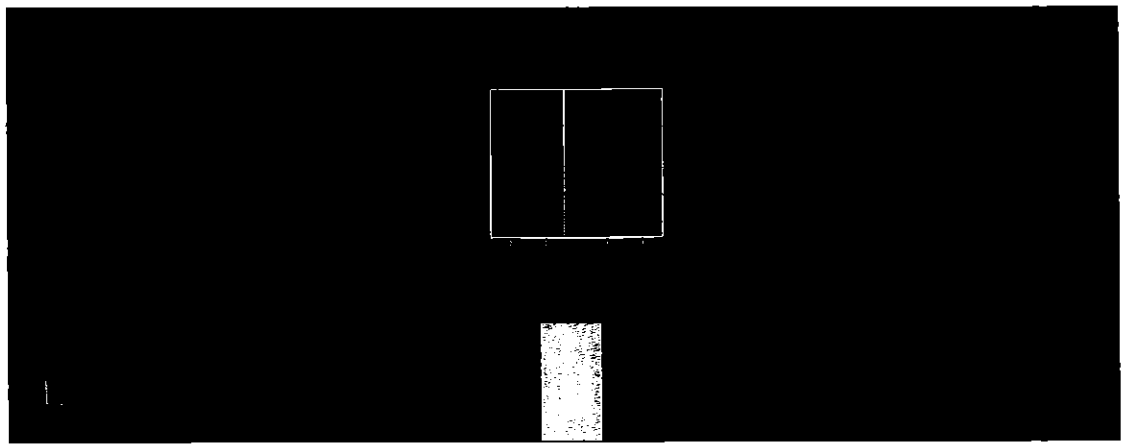
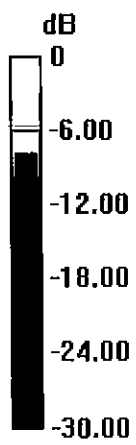
DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51); Calibrated: 30.12.2017, ConvF(5.05, 5.05, 5.05); Calibrated: 30.12.2017, ConvF(4.98, 4.98, 4.98); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 - modified; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.54 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 27.5 W/kg
SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.28 W/kg
Maximum value of SAR (measured) = 17.7 W/kg

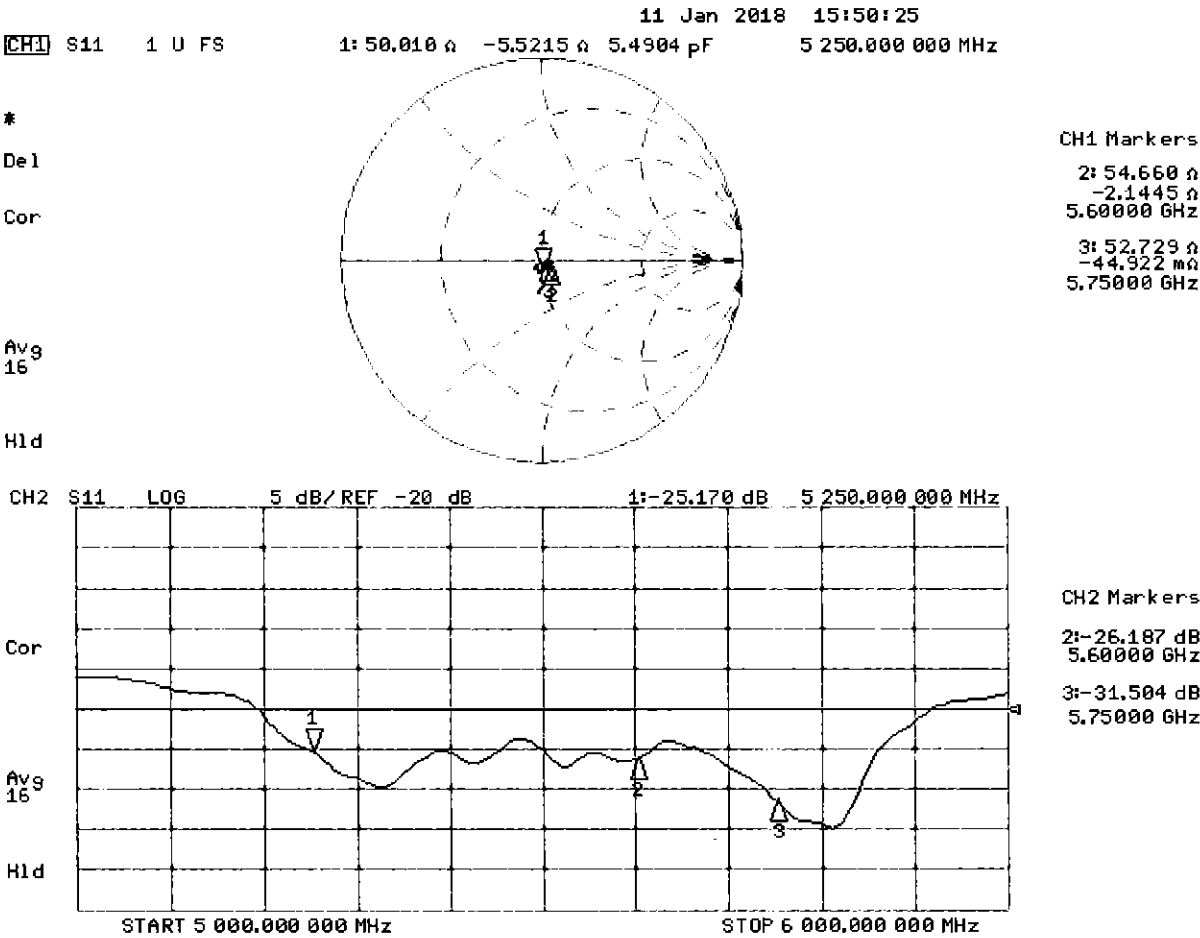
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 72.77 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 32.2 W/kg
SAR(1 g) = 8.41 W/kg; SAR(10 g) = 2.4 W/kg
Maximum value of SAR (measured) = 19.7 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 70.93 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 31.4 W/kg
SAR(1 g) = 8.06 W/kg; SAR(10 g) = 2.3 W/kg
Maximum value of SAR (measured) = 18.9 W/kg



0 dB = 18.9 W/kg = 12.76 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 10.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 5.41$ S/m; $\epsilon_r = 47.3$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5250$ MHz; $\sigma = 5.48$ S/m; $\epsilon_r = 47.2$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5600$ MHz; $\sigma = 5.94$ S/m; $\epsilon_r = 46.6$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5750$ MHz; $\sigma = 6.15$ S/m; $\epsilon_r = 46.3$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5800$ MHz; $\sigma = 6.22$ S/m; $\epsilon_r = 46.2$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.35, 5.35, 5.35); Calibrated: 30.12.2017, ConvF(5.26, 5.26, 5.26); Calibrated: 30.12.2017, ConvF(4.65, 4.65, 4.65); Calibrated: 30.12.2017, ConvF(4.57, 4.57, 4.57); Calibrated: 30.12.2017, ConvF(4.53, 4.53, 4.53); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5200 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.05 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.6 W/kg

SAR(1 g) = 7.36 W/kg; SAR(10 g) = 2.06 W/kg

Maximum value of SAR (measured) = 17.1 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 64.53 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 29.4 W/kg

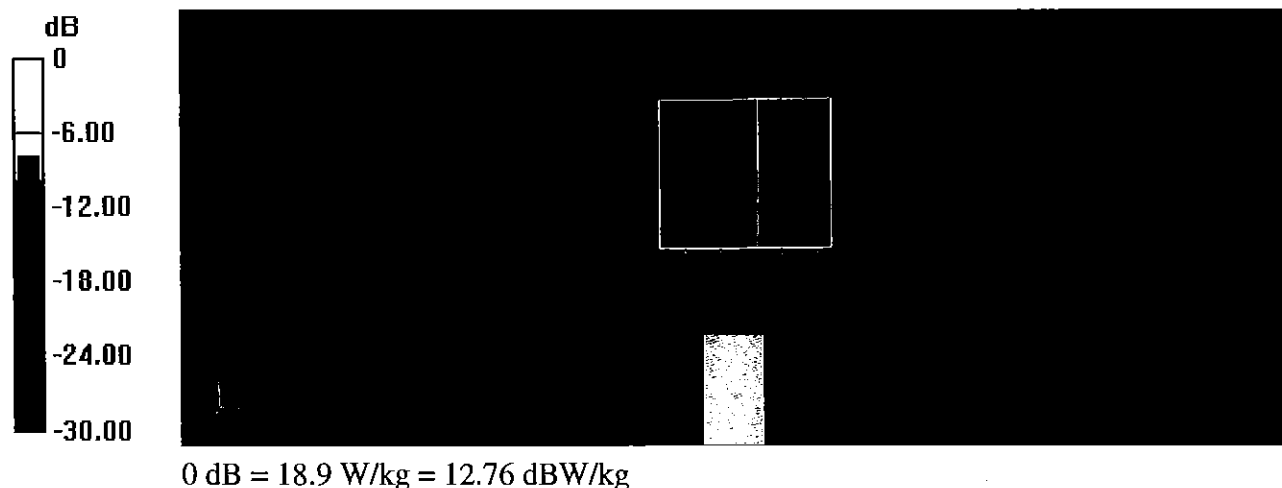
SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.13 W/kg

Maximum value of SAR (measured) = 17.9 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 65.09 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 34.0 W/kg
SAR(1 g) = 8.05 W/kg; SAR(10 g) = 2.25 W/kg
Maximum value of SAR (measured) = 19.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.45 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 32.9 W/kg
SAR(1 g) = 7.72 W/kg; SAR(10 g) = 2.14 W/kg
Maximum value of SAR (measured) = 18.9 W/kg

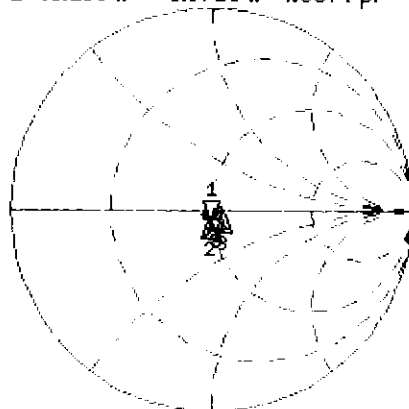
Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5800 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm
Reference Value = 63.14 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 33.3 W/kg
SAR(1 g) = 7.68 W/kg; SAR(10 g) = 2.13 W/kg



Impedance Measurement Plot for Body TSL

10 Jan 2018 17:45:41
 CH1 S11 1 U FS 1: 49.266 Ω -6.6719 Ω 4.5874 pF 5 200.000 000 MHz

*
 Del
 Cor
 Avg
 16
 H1d

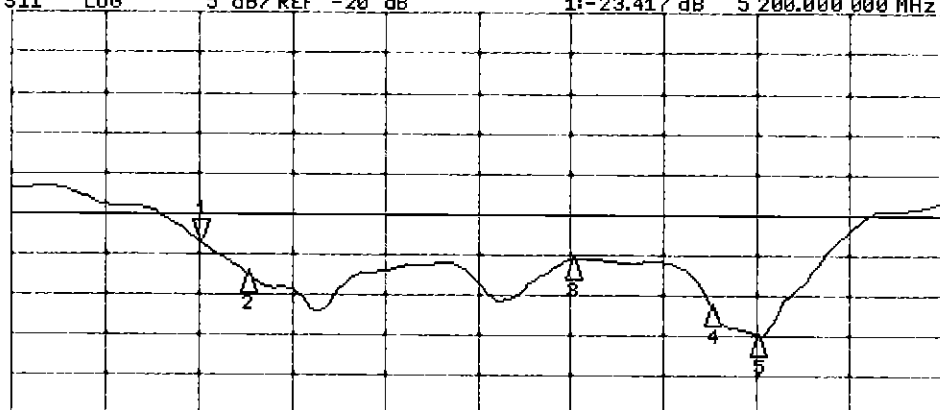


CH1 Markers

2: 48.449 Ω
 -3.9297 Ω
 5.25000 GHz
 3: 55.279 Ω
 -1.5723 Ω
 5.60000 GHz
 4: 52.627 Ω
 1.0625 Ω
 5.75000 GHz
 5: 51.801 Ω
 -375.00 m Ω
 5.80000 GHz

CH2 S11 LOG 5 dB/ REF -20 dB 1: -23.417 dB 5 200.000 000 MHz

Cor
 Avg
 16
 H1d



CH2 Markers

2: -27.356 dB
 5.25000 GHz
 3: -25.621 dB
 5.60000 GHz
 4: -31.162 dB
 5.75000 GHz
 5: -34.851 dB
 5.80000 GHz

START 5 000.000 000 MHz

STOP 5 800.000 000 MHz

DASY5 Validation Report for SAM Head

Date: 16.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 5GHz; Type: D5GHzV2; Serial: D5GHzV2 - SN:1057

Communication System: UID 0 - CW; Frequency: 5200 MHz, Frequency: 5800 MHz

Medium parameters used: $f = 5200$ MHz; $\sigma = 4.59$ S/m; $\epsilon_r = 36.5$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5800$ MHz; $\sigma = 5.28$ S/m; $\epsilon_r = 35.4$; $\rho = 1000$ kg/m³

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2007)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.75, 5.75, 5.75); Calibrated: 30.12.2017, ConvF(4.96, 4.96, 4.96); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: SAM Head
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

SAM Head/Top - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 72.99 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 30.6 W/kg

SAR(1 g) = 8.24 W/kg; SAR(10 g) = 2.35 W/kg

Maximum value of SAR (measured) = 19.7 W/kg

SAM Head/Top - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 73.00 V/m; Power Drift = 0.07 dB

Peak SAR (extrapolated) = 36.5 W/kg

SAR(1 g) = 8.62 W/kg; SAR(10 g) = 2.41 W/kg

Maximum value of SAR (measured) = 21.9 W/kg

SAM Head/Mouth - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: $dx=4$ mm, $dy=4$ mm, $dz=1.4$ mm

Reference Value = 72.79 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 29.5 W/kg

SAR(1 g) = 8.54 W/kg; SAR(10 g) = 2.37 W/kg

Maximum value of SAR (measured) = 20.7 W/kg

SAM Head/Mouth - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 71.69 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 34.9 W/kg

SAR(1 g) = 8.88 W/kg; SAR(10 g) = 2.44 W/kg

Maximum value of SAR (measured) = 23.0 W/kg

SAM Head/Neck - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 72.48 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 27.9 W/kg

SAR(1 g) = 8.14 W/kg; SAR(10 g) = 2.37 W/kg

Maximum value of SAR (measured) = 19.3 W/kg

SAM Head/Neck - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 72.90 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 33.4 W/kg

SAR(1 g) = 8.33 W/kg; SAR(10 g) = 2.35 W/kg

Maximum value of SAR (measured) = 21.8 W/kg

SAM Head/Ear - 5200/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 54.68 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 16.3 W/kg

SAR(1 g) = 5.16 W/kg; SAR(10 g) = 1.76 W/kg

Maximum value of SAR (measured) = 11.1 W/kg

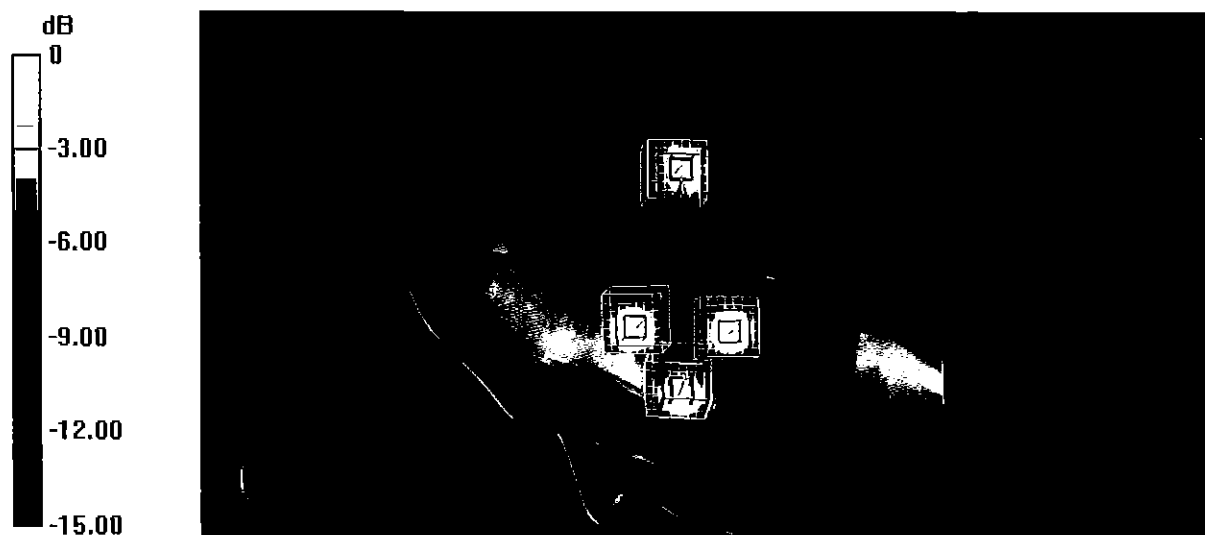
SAM Head/Ear - 5800/Zoom Scan (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 56.96 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 21.2 W/kg

SAR(1 g) = 5.68 W/kg; SAR(10 g) = 1.89 W/kg

Maximum value of SAR (measured) = 13.8 W/kg



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

Certification of Calibration

Object D5GHzV2 – SN: 1057

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extension Calibration date: 1/16/2019

Description: SAR Validation Dipole at 5250, 5600, and 5750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	2/8/2018	Annual	2/8/2019	US39170122
Agilent	N5182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1339018
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Seekonk	NC-100	Torque Wrench	7/11/2018	Annual	7/11/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/3/2018	Annual	10/3/2019	1558
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/18/2018	Annual	6/18/2019	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/11/2018	Annual	9/11/2019	1091
SPEAG	EX3DV4	SAR Probe	8/23/2018	Annual	8/23/2019	7308
SPEAG	EX3DV4	SAR Probe	6/25/2018	Annual	6/25/2019	7409

Measurement Uncertainty = $\pm 23\%$ (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halfoster	Test Engineer	<i>BRODIE HALFOSTER</i>
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	<i>KOK</i>

DIPOLE CALIBRATION EXTENSION

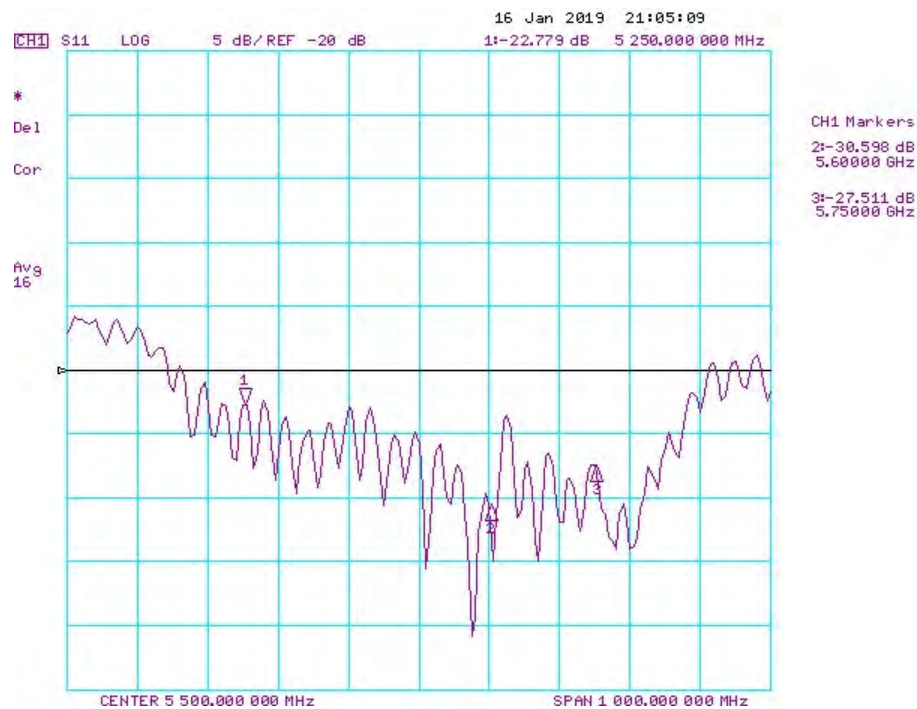
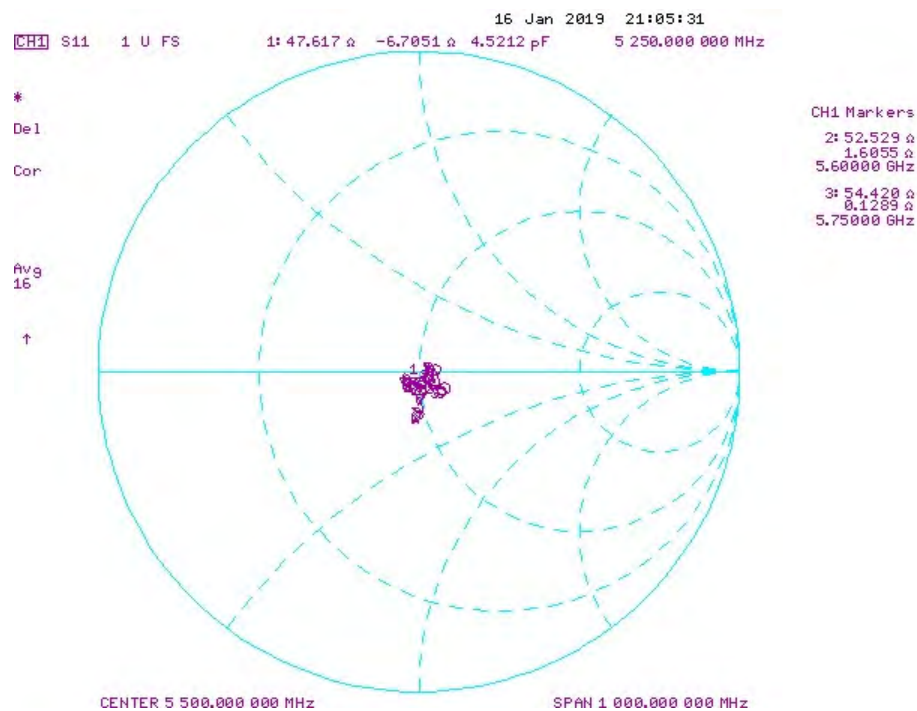
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

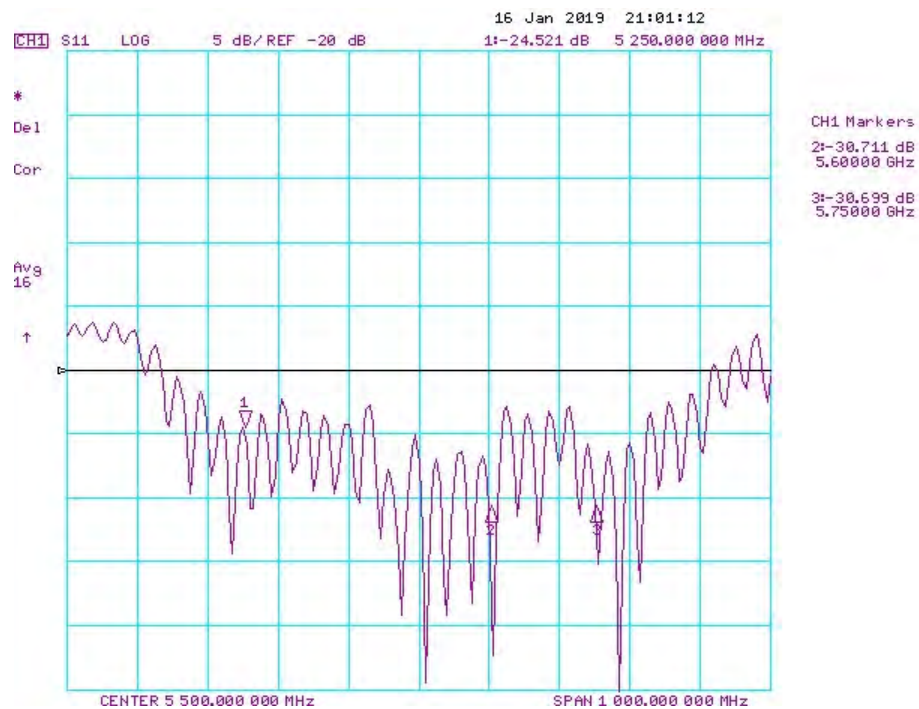
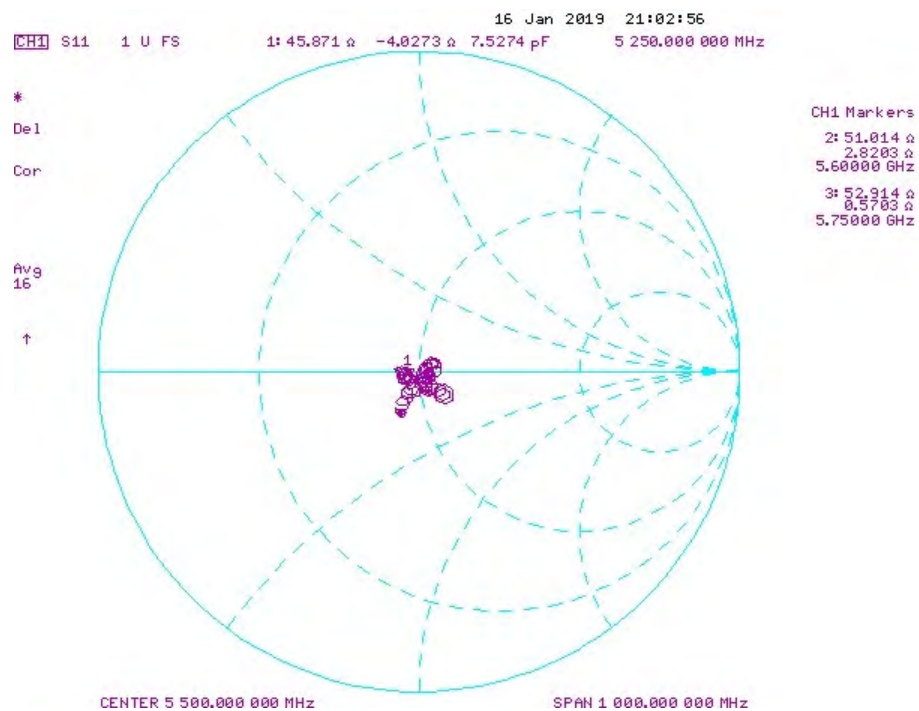
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 17.0 dBm	Measured Head SAR (1g) W/kg @ 17.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 17.0 dBm	Measured Head SAR (10g) W/kg @ 17.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
5250	1/16/2018	1/16/2019	1.203	3.95	3.63	-8.33%	1.14	1.04	-8.77%	50	47.6	2.4	-5.5	-6.7	1.2	-25.2	-22.8	9.50%	PASS
5600	1/16/2018	1/16/2019	1.203	4.205	3.84	-8.68%	1.2	1.09	-9.17%	54.7	52.5	2.2	-2.1	1.6	3.7	-26.2	-30.6	-16.90%	PASS
5750	1/16/2018	1/16/2019	1.203	4.025	3.76	-6.58%	1.15	1.07	-6.96%	52.7	54.4	1.7	0	0.1	0.1	-31.5	-27.5	12.70%	PASS
Frequency (MHz)	Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 17.0 dBm	Measured Body SAR (1g) W/kg @ 17.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 17.0 dBm	Measured Body SAR (10g) W/kg @ 17.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
5250	1/16/2018	1/16/2019	1.203	3.795	3.73	-1.71%	1.06	1.03	-2.37%	48.4	45.9	2.5	-3.9	-4	0.1	-27.4	-24.5	10.50%	PASS
5600	1/16/2018	1/16/2019	1.203	3.995	4.06	1.63%	1.12	1.12	0.45%	55.3	51	4.3	-1.6	2.8	4.4	-25.6	-30.7	-20.00%	PASS
5750	1/16/2018	1/16/2019	1.203	3.835	3.65	-4.82%	1.06	1.02	-3.77%	52.6	52.9	0.3	1.1	0.6	0.5	-31.2	-30.7	1.60%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D5GHzV2-1237_Aug18**

CALIBRATION CERTIFICATE

Object **D5GHzV2 - SN:1237**

Calibration procedure(s) **QA CAL-22.v3**
Calibration procedure for dipole validation kits between 3-6 GHz

BN
09-06-2018

Calibration date: **August 10, 2018**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 3503	30-Dec-17 (No. EX3-3503_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-17)	In house check: Oct-18

Calibrated by: **Manu Seitz** Name: **Manu Seitz** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Technical Manager

Signature
[Signature]
[Signature]

Issued: August 17, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom V5.0	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy = 4.0 mm, dz = 1.4 mm	Graded Ratio = 1.4 (Z direction)
Frequency	5250 MHz $\pm$ 1 MHz 5600 MHz $\pm$ 1 MHz 5750 MHz $\pm$ 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	35.6 $\pm$ 6 %	4.61 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	81.3 W/kg $\pm$ 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.5 W/kg $\pm$ 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	35.1 ± 6 %	4.98 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5600 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	85.7 W / kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.46 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.5 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.4	5.22 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	34.9 ± 6 %	5.14 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	8.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	80.6 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.32 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	23.1 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.9	5.36 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.9 ± 6 %	5.49 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5250 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.6 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.5	5.77 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.3 ± 6 %	5.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5600 MHz

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	78.5 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.22 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	22.0 W/kg ± 19.5 % (k=2)

Body TSL parameters at 5750 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	48.3	5.94 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	46.0 ± 6 %	6.16 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL at 5750 MHz

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	100 mW input power	7.65 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	75.9 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	100 mW input power	2.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	21.2 W/kg ± 19.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL at 5250 MHz

Impedance, transformed to feed point	47.5 Ω - 3.5 j Ω
Return Loss	- 27.0 dB

Antenna Parameters with Head TSL at 5600 MHz

Impedance, transformed to feed point	50.1 Ω + 4.7 j Ω
Return Loss	- 26.7 dB

Antenna Parameters with Head TSL at 5750 MHz

Impedance, transformed to feed point	52.7 Ω + 0.8 j Ω
Return Loss	- 31.2 dB

Antenna Parameters with Body TSL at 5250 MHz

Impedance, transformed to feed point	46.5 Ω - 1.3 j Ω
Return Loss	- 28.2 dB

Antenna Parameters with Body TSL at 5600 MHz

Impedance, transformed to feed point	53.1 Ω + 6.2 j Ω
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL at 5750 MHz

Impedance, transformed to feed point	53.6 Ω + 2.1 j Ω
Return Loss	- 27.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1,195 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 04, 2015

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1237

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz

Medium parameters used: $f = 5250$ MHz; $\sigma = 4.61$ S/m; $\epsilon_r = 35.6$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5600$ MHz; $\sigma = 4.98$ S/m; $\epsilon_r = 35.1$; $\rho = 1000$ kg/m³,

Medium parameters used: $f = 5750$ MHz; $\sigma = 5.14$ S/m; $\epsilon_r = 34.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.51, 5.51, 5.51) @ 5250 MHz, ConvF(5.05, 5.05, 5.05) @ 5600 MHz, ConvF(4.98, 4.98, 4.98) @ 5750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 (5GHz); Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 75.17 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 27.8 W/kg

SAR(1 g) = 8.15 W/kg; SAR(10 g) = 2.36 W/kg

Maximum value of SAR (measured) = 18.4 W/kg

Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 75.53 V/m; Power Drift = -0.05 dB

Peak SAR (extrapolated) = 32.4 W/kg

SAR(1 g) = 8.6 W/kg; SAR(10 g) = 2.46 W/kg

Maximum value of SAR (measured) = 20.2 W/kg

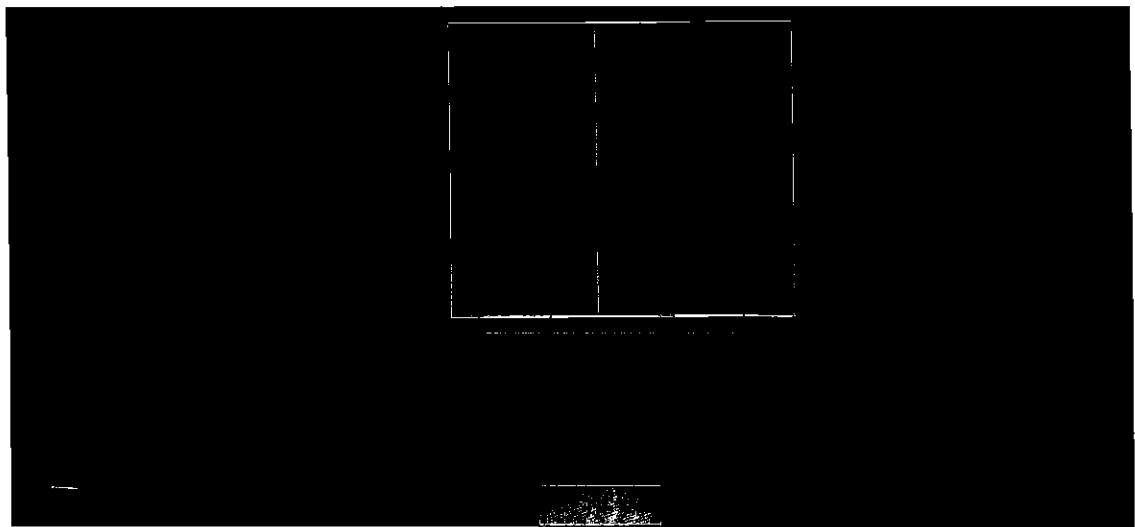
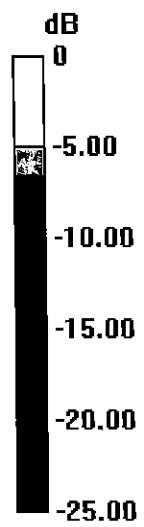
Dipole Calibration for Head Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan, dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 73.04 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 31.1 W/kg

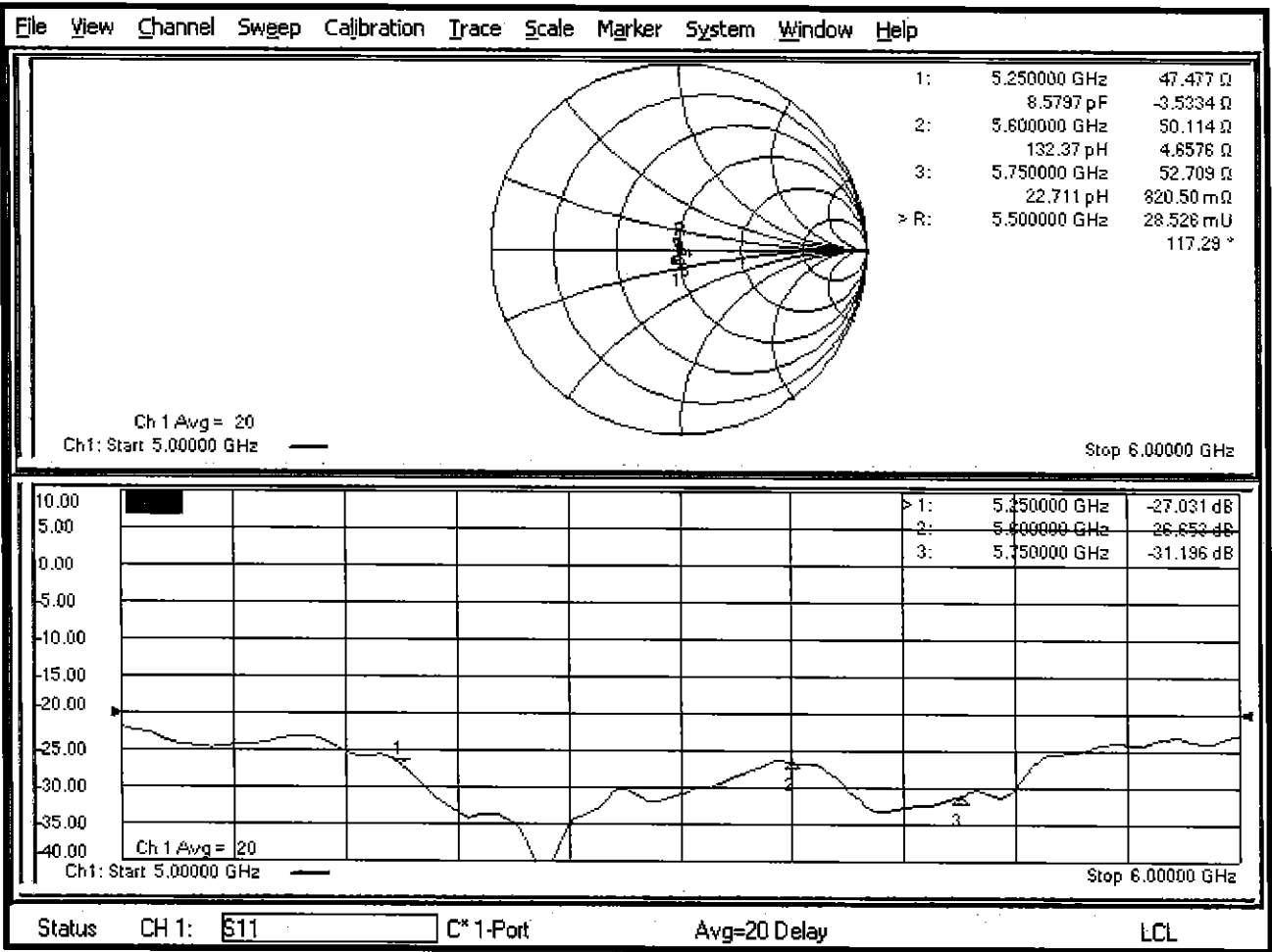
SAR(1 g) = 8.09 W/kg; SAR(10 g) = 2.32 W/kg

Maximum value of SAR (measured) = 19.9 W/kg



0 dB = 19.9 W/kg = 12.99 dBW/kg

Impedance Measurement Plot for Head TSL



Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole D5GHzV2; Type: D5GHzV2; Serial: D5GHzV2 - SN:1237

Communication System: UID 0 - CW; Frequency: 5250 MHz, Frequency: 5600 MHz, Frequency: 5750 MHz
Medium parameters used: $f = 5250$ MHz; $\sigma = 5.49$ S/m; $\epsilon_r = 46.9$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5600$ MHz; $\sigma = 5.96$ S/m; $\epsilon_r = 46.3$; $\rho = 1000$ kg/m³,
Medium parameters used: $f = 5750$ MHz; $\sigma = 6.16$ S/m; $\epsilon_r = 46$; $\rho = 1000$ kg/m³
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN3503; ConvF(5.26, 5.26, 5.26) @ 5250 MHz, ConvF(4.65, 4.65, 4.65) @ 5600 MHz, ConvF(4.57, 4.57, 4.57) @ 5750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601 (5GHz); Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5250 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 68.22 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 28.5 W/kg

SAR(1 g) = 7.62 W/kg; SAR(10 g) = 2.14 W/kg

Maximum value of SAR (measured) = 17.3 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5600 MHz/Zoom Scan,

dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 67.51 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 32.1 W/kg

SAR(1 g) = 7.91 W/kg; SAR(10 g) = 2.22 W/kg

Maximum value of SAR (measured) = 18.5 W/kg

Dipole Calibration for Body Tissue/Pin=100mW, dist=10mm, f=5750 MHz/Zoom Scan,

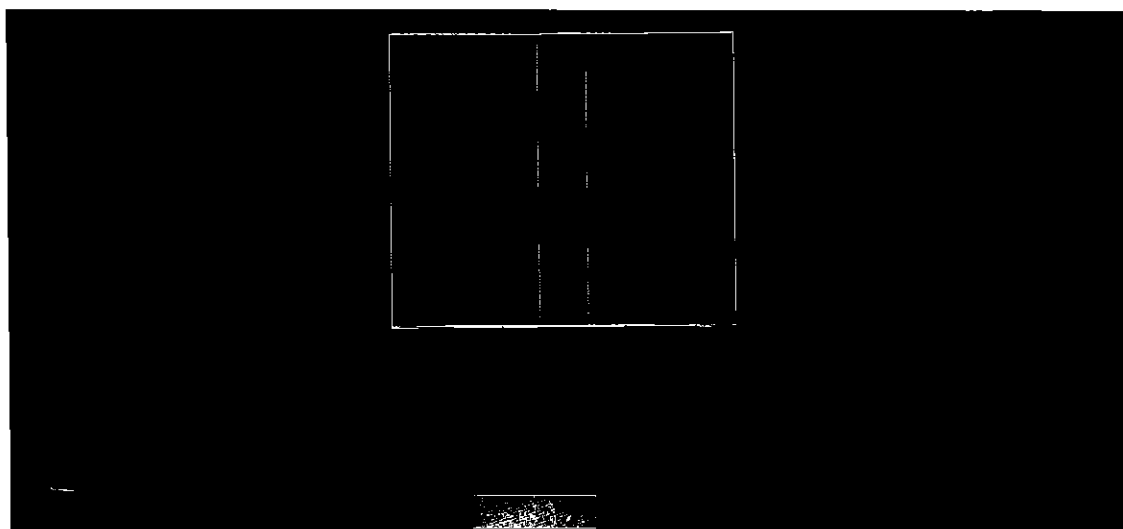
dist=1.4mm (8x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm

Reference Value = 65.91 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 31.7 W/kg

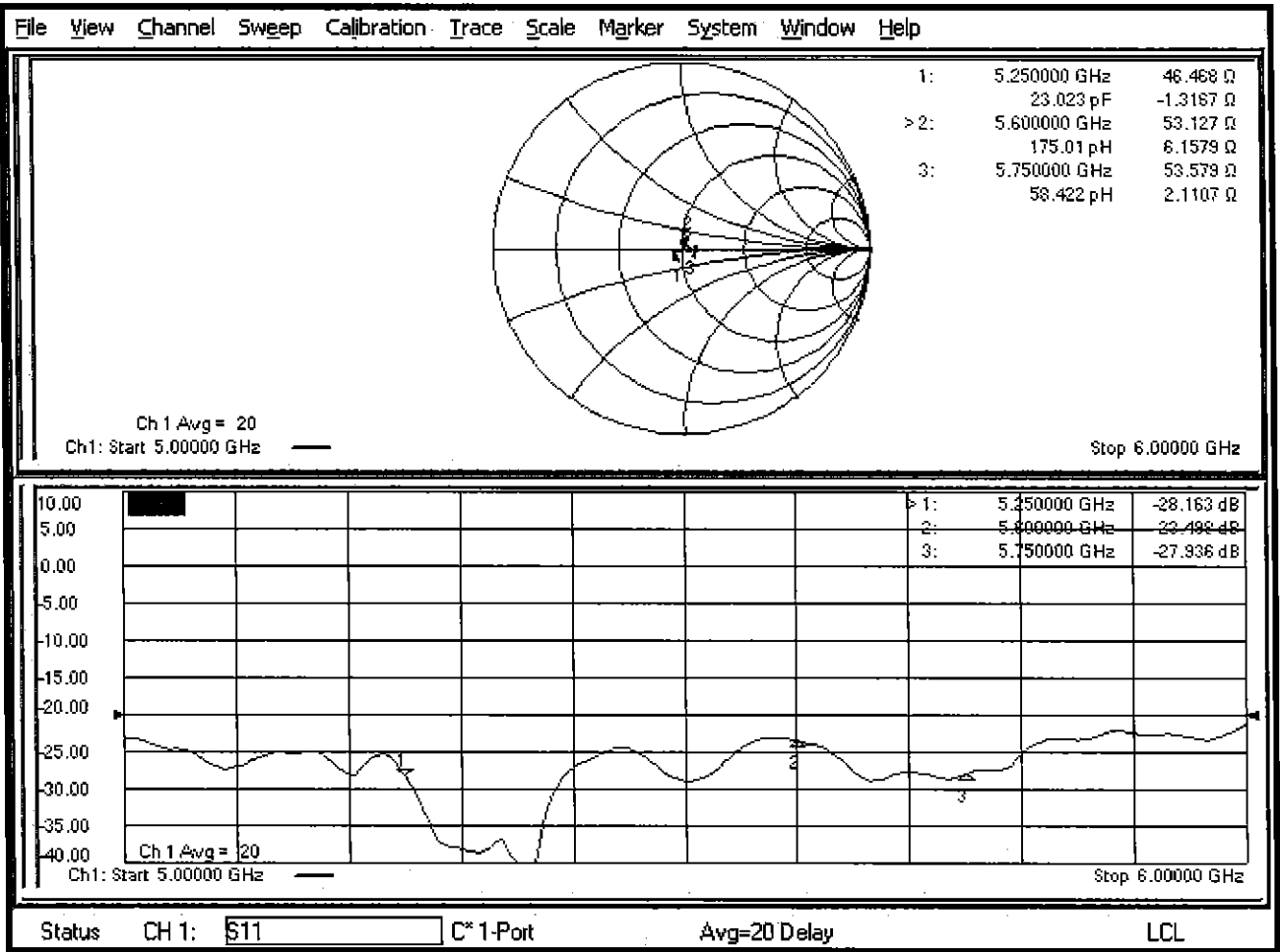
SAR(1 g) = 7.65 W/kg; SAR(10 g) = 2.14 W/kg

Maximum value of SAR (measured) = 18.0 W/kg



0 dB = 18.0 W/kg = 12.55 dBW/kg

Impedance Measurement Plot for Body TSL



**Calibration Laboratory of
Schmid & Partner
Engineering AG**

Zeughausstrasse 43, 8004 Zurich, Switzerland



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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D750V3-1003_Jan18**

CALIBRATION CERTIFICATE

Object **D750V3 - SN:1003**

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

Calibration date: **January 15, 2018**

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

Calibrated by: **Leli Klysner** Name
Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name
Function: **Technical Manager**

Signature

Leli Klysner

Katja Pokovic

Issued: January 15, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.

Calibration Laboratory of

Schmid & Partner

Engineering AG

Zeughausstrasse 43, 8004 Zurich, Switzerland



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

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

Head TSL parameters

The following parameters and calculations were applied.

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

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.10 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.28 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.42 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

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

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.58 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.71 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

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

Antenna Parameters with Body TSL

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

General Antenna Parameters and Design

Electrical Delay (one direction)	1.043 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 21, 2009

Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

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

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	7.94 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.33 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.32 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.22 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.52 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.01 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.06 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.52 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	1.67 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.70 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	4.60 W/kg ± 16.9 % (k=2)

DASY5 Validation Report for Head TSL

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.9 \text{ S/m}$; $\epsilon_r = 40.9$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

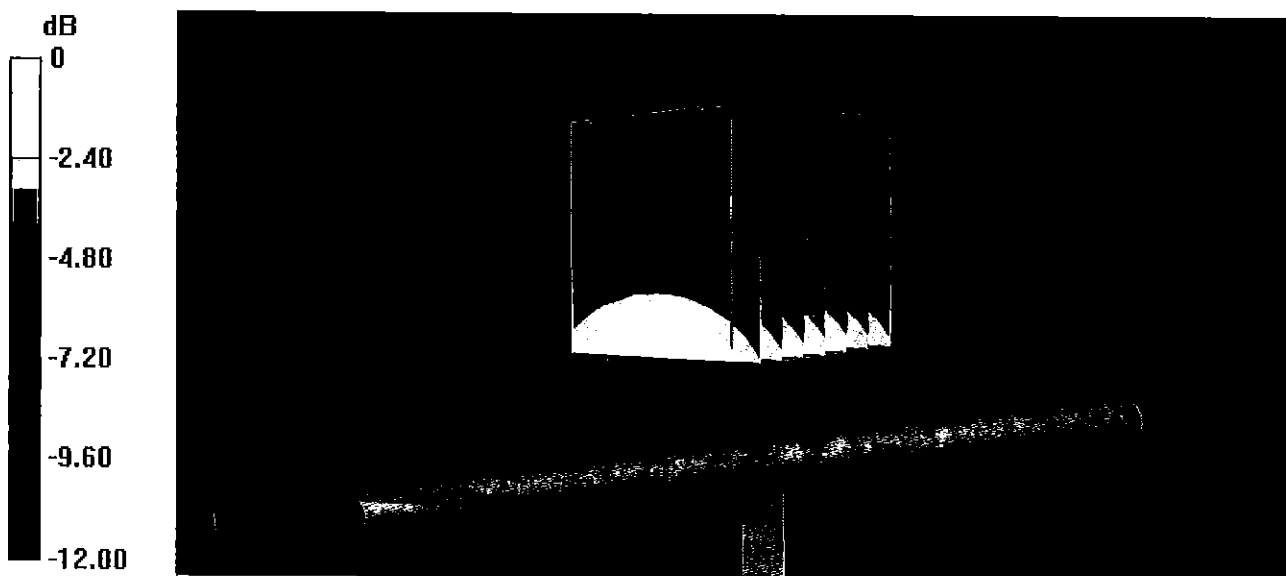
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 59.11 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 3.15 W/kg

SAR(1 g) = 2.1 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.80 W/kg

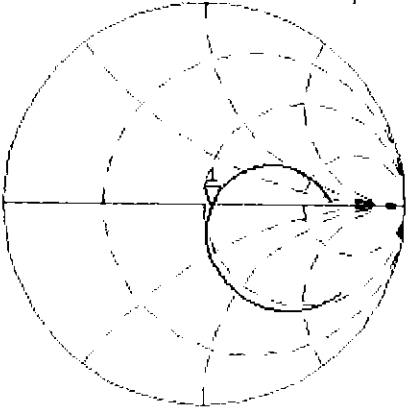


0 dB = 2.80 W/kg = 4.47 dBW/kg

Impedance Measurement Plot for Head TSL

12 Jan 2018 13:14:07
CH1 S11 1 U FS 1: 53.754 Ω -2.0996 Ω 101.07 pF 750.000 000 MHz

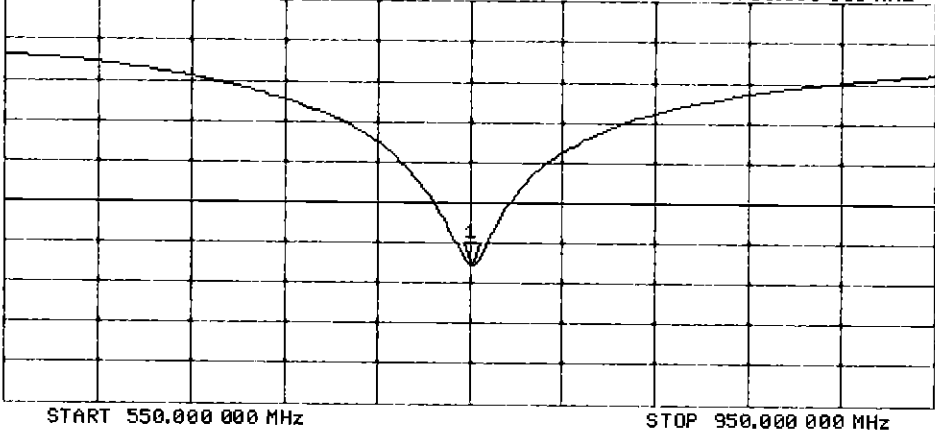
*
De1
CA



Avg
16
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1:-27.643 dB 750.000 000 MHz

CA
Avg
16
H1d



DASY5 Validation Report for Body TSL

Date: 12.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.96 \text{ S/m}$; $\epsilon_r = 55$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

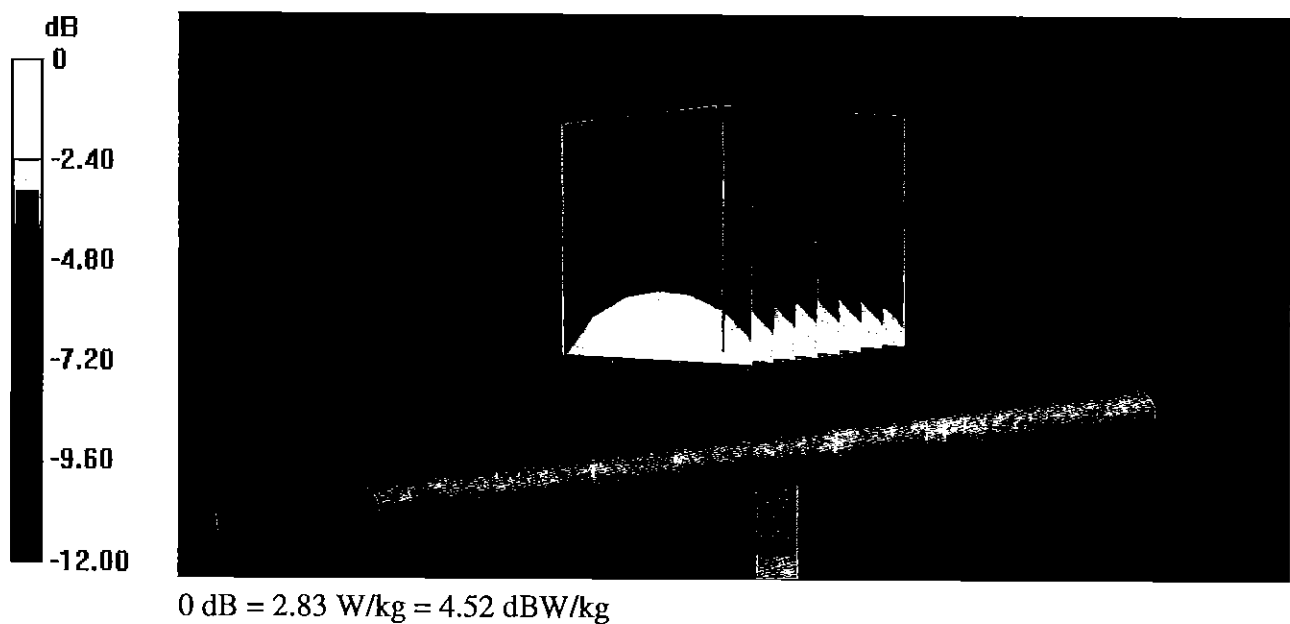
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 57.31 V/m; Power Drift = -0.01 dB

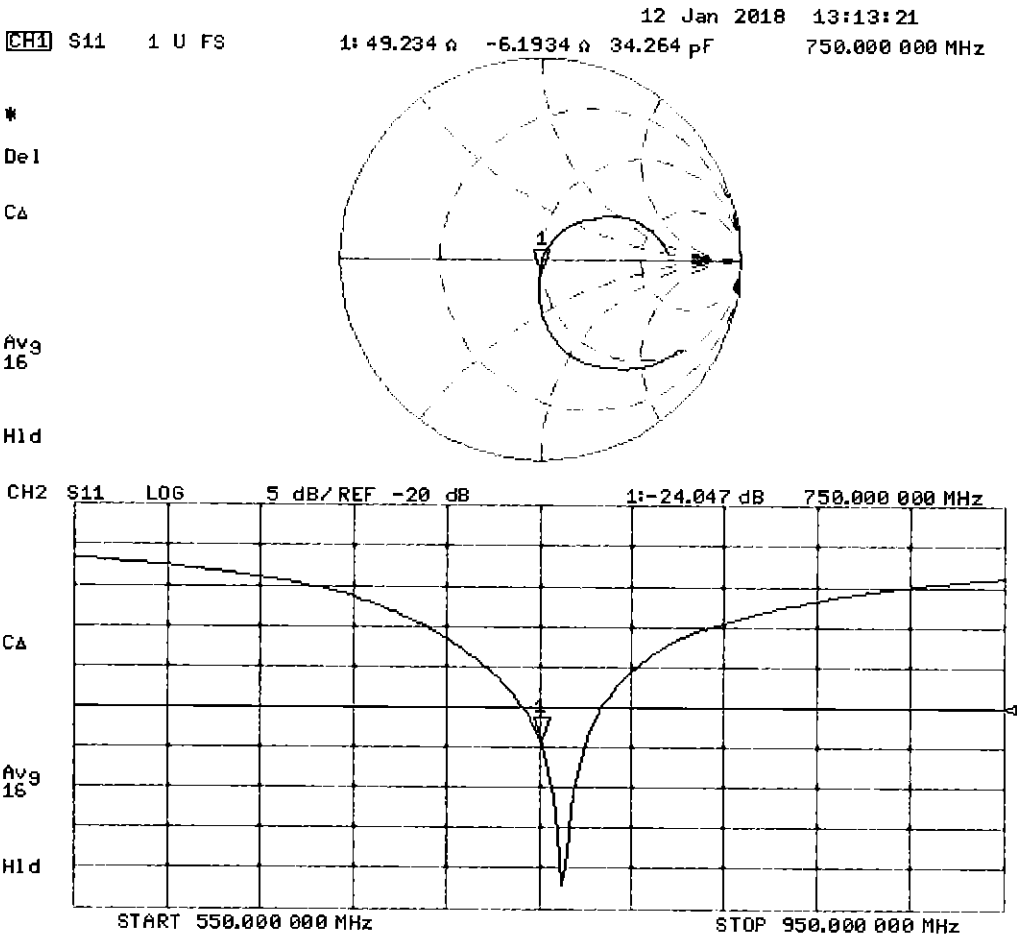
Peak SAR (extrapolated) = 3.17 W/kg

SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.43 W/kg

Maximum value of SAR (measured) = 2.83 W/kg



Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 15.01.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750 \text{ MHz}$; $\sigma = 0.9 \text{ S/m}$; $\epsilon_r = 44.2$; $\rho = 1000 \text{ kg/m}^3$

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

Reference Value = 56.79 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 2.89 W/kg

SAR(1 g) = 1.98 W/kg; SAR(10 g) = 1.33 W/kg

Maximum value of SAR (measured) = 2.58 W/kg

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

Reference Value = 56.85 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 2.94 W/kg

SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (measured) = 2.62 W/kg

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

Reference Value = 56.29 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 2.78 W/kg

SAR(1 g) = 2.01 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (measured) = 2.56 W/kg

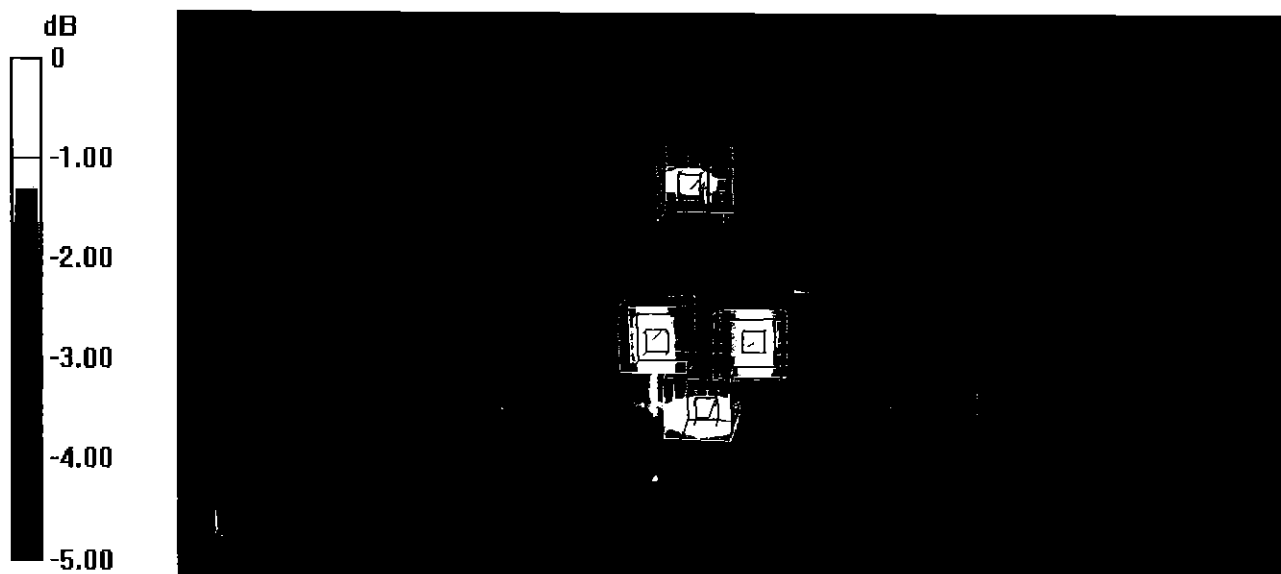
SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 51.01 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 2.31 W/kg

SAR(1 g) = 1.67 W/kg; SAR(10 g) = 1.15 W/kg

Maximum value of SAR (measured) = 2.11 W/kg



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

Certification of Calibration

Object D750V3 – SN: 1003

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extension Calibration date: 1/15/2019

Description: SAR Validation Dipole at 750 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	2/8/2018	Annual	2/8/2019	US39170122
Agilent	N5182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1339018
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Seekonk	NC-100	Torque Wrench	7/11/2018	Annual	7/11/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	10/3/2018	Annual	10/3/2019	1558
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/18/2018	Annual	6/18/2019	1334
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/11/2018	Annual	9/11/2019	1091
SPEAG	EX3DV4	SAR Probe	8/23/2018	Annual	8/23/2019	7308
SPEAG	EX3DV4	SAR Probe	6/25/2018	Annual	6/25/2019	7409

Measurement Uncertainty = $\pm 23\%$ (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halfoster	Test Engineer	<i>BRODIE HALFOSTER</i>
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	<i>KOK</i>

DIPOLE CALIBRATION EXTENSION

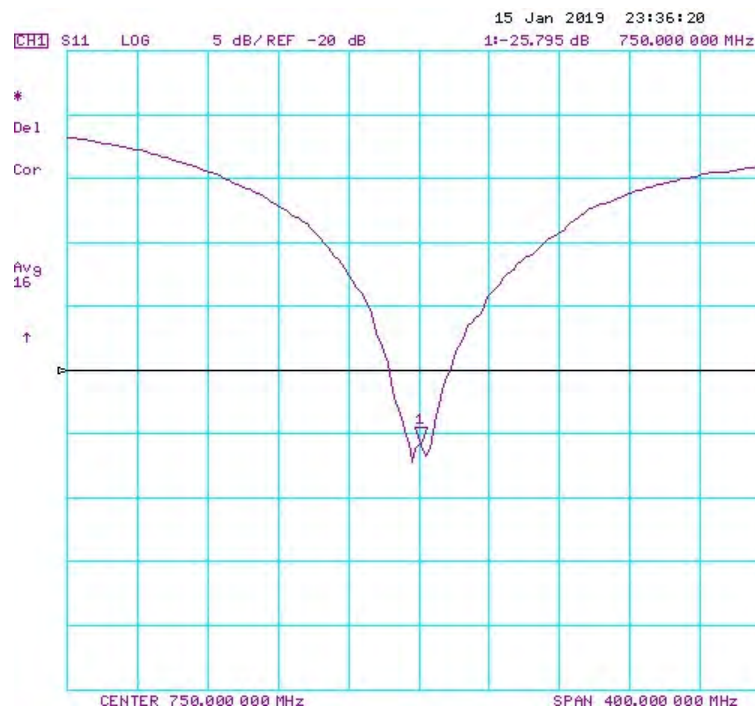
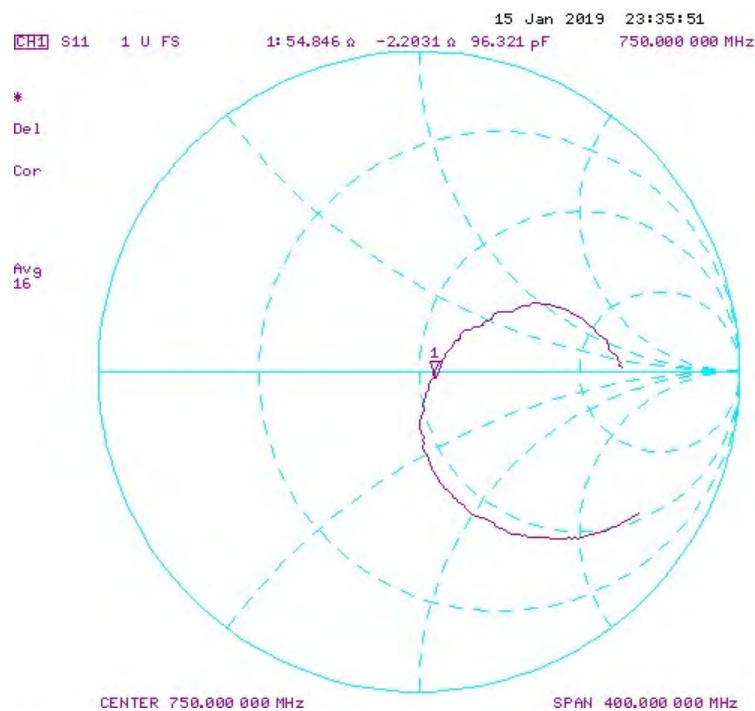
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

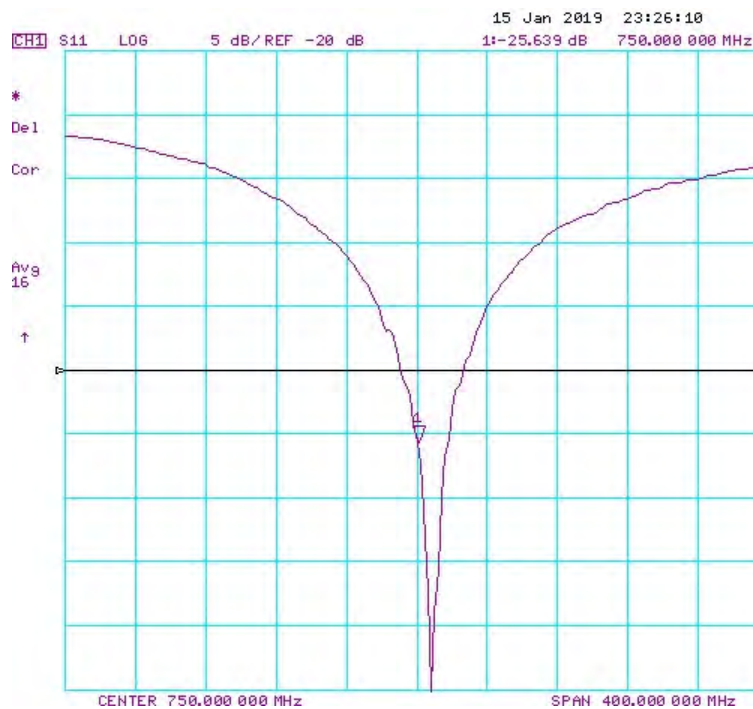
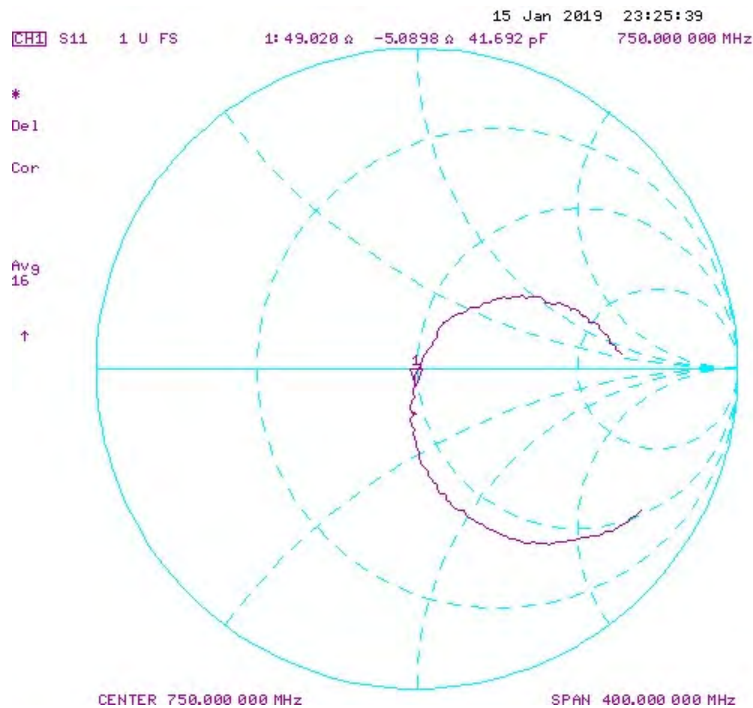
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 23.0 dBm	Measured Head SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 23.0 dBm	Measured Head SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
1/15/2018	1/15/2019	1.043	1.656	1.75	5.88%	1.08	1.15	6.09%	53.8	54.8	1	-2.1	-2.2	0.1	-27.6	-25.8	6.50%	PASS
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 23.0 dBm	Measured Body SAR (1g) W/kg @ 23.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 23.0 dBm	Measured Body SAR (10g) W/kg @ 23.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
1/15/2018	1/15/2019	1.043	1.716	1.84	7.23%	1.14	1.23	7.71%	49.2	49	0.2	-6.2	-5.1	1.1	-24	-25.6	-6.80%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D835V2-4d047_Mar19**

CALIBRATION CERTIFICATE

Object **D835V2 - SN:4d047**

Calibration procedure(s) **QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

Calibration date: **March 13, 2019**

BN
04-12-2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	31-Dec-18 (No. EX3-7349_Dec18)	Dec-19
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	07-Oct-15 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

Calibrated by:	Name Manu Seitz	Function Laboratory Technician	Signature
Approved by:	Katja Pokovic	Technical Manager	

Issued: March 13, 2019

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



Accredited by the Swiss Accreditation Service (SAS)

Accreditation No.: **SCS 0108**

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

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.9 $\pm$ 6 %	0.91 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.42 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.54 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.13 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.3 $\pm$ 6 %	1.01 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.45 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.47 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.27 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω - 2.6 j Ω
Return Loss	- 30.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.8 Ω - 6.1 j Ω
Return Loss	- 22.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.387 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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DASY5 Validation Report for Head TSL

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835$ MHz; $\sigma = 0.91$ S/m; $\epsilon_r = 41.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10, 10, 10) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

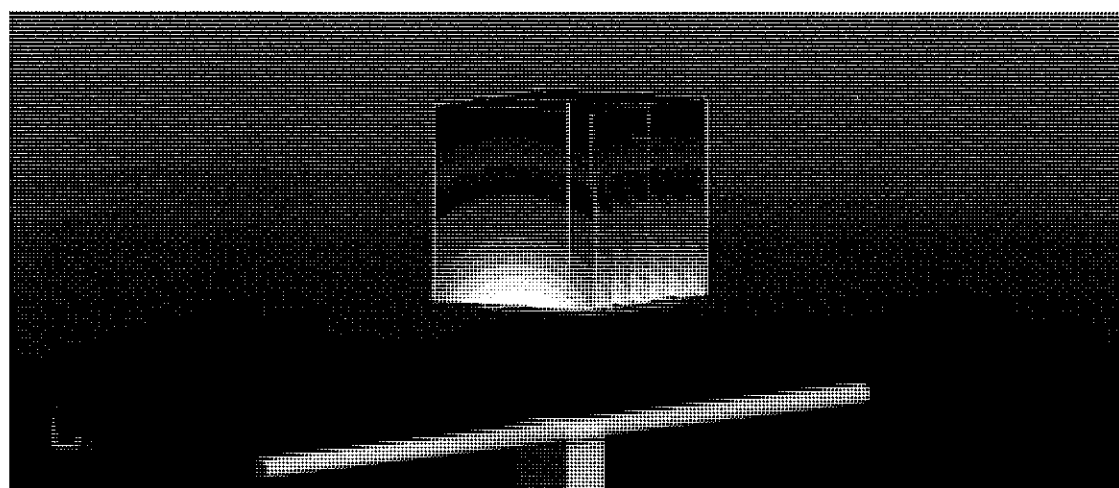
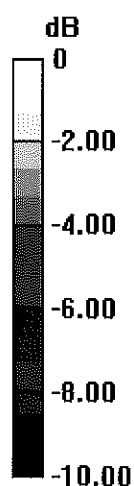
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 62.48 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 3.60 W/kg

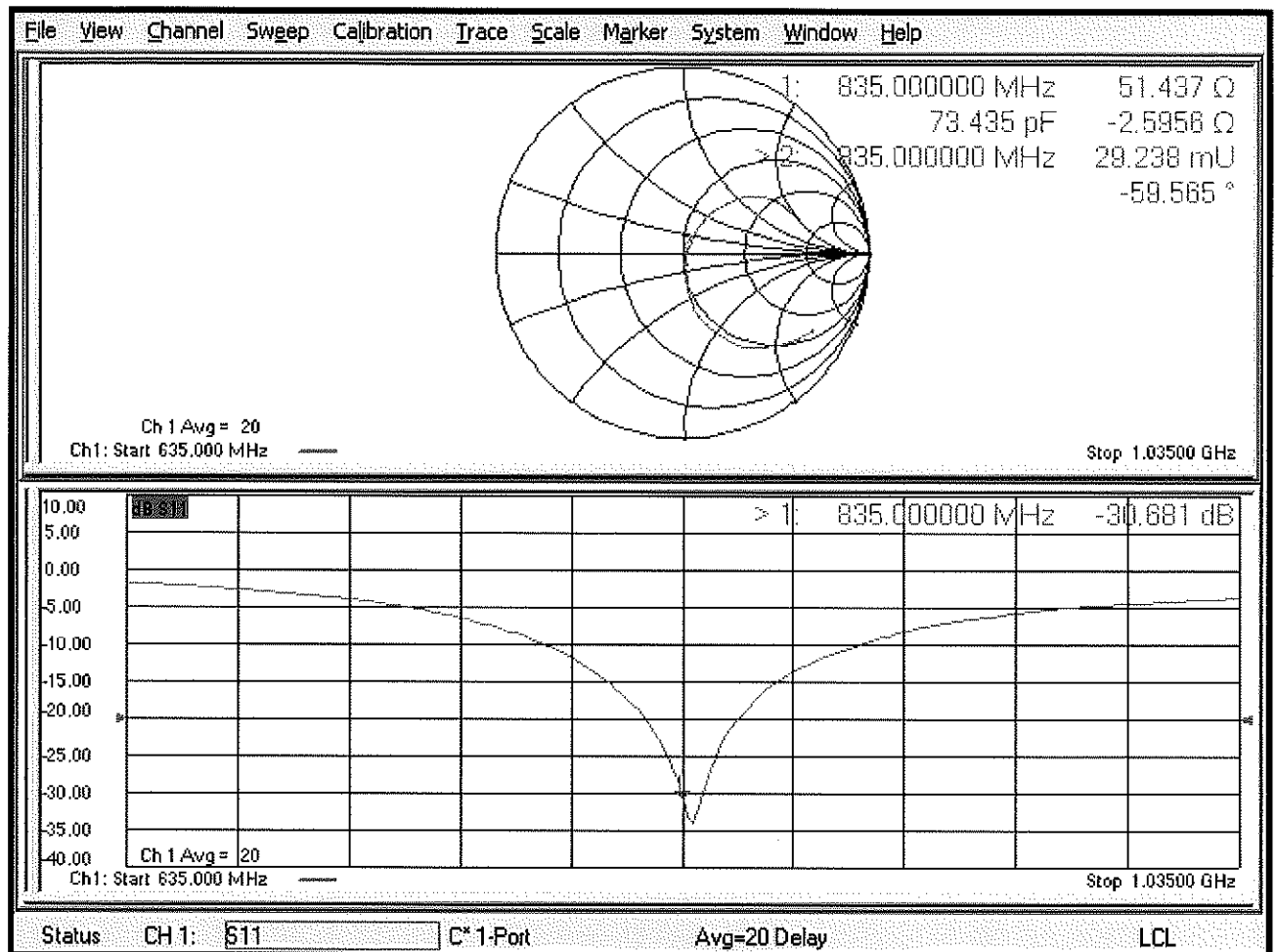
SAR(1 g) = 2.37 W/kg; SAR(10 g) = 1.54 W/kg

Maximum value of SAR (measured) = 3.18 W/kg



0 dB = 3.18 W/kg = 5.02 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 1.01 \text{ S/m}$; $\epsilon_r = 54.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.15, 10.15, 10.15) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

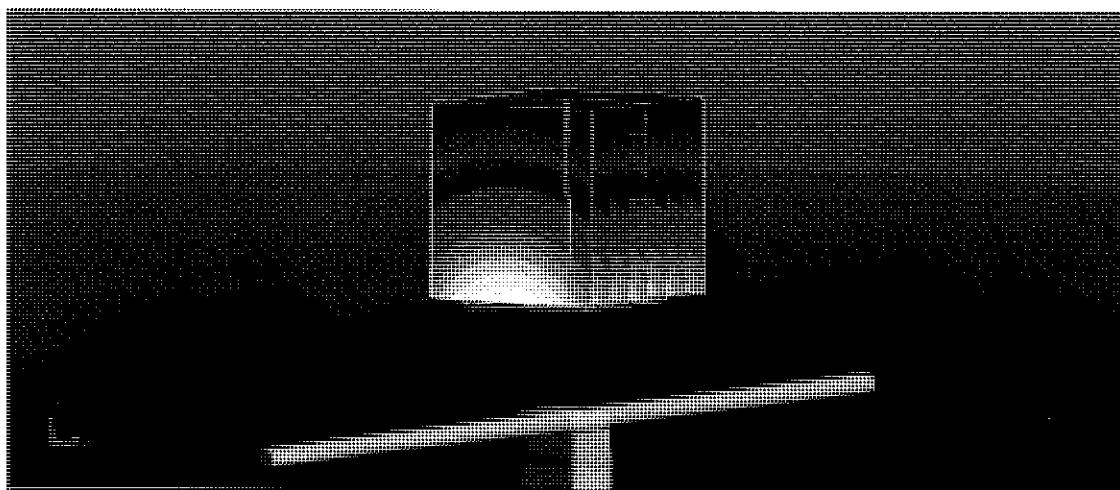
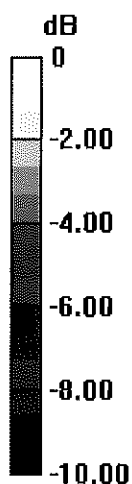
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 60.49 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 3.58 W/kg

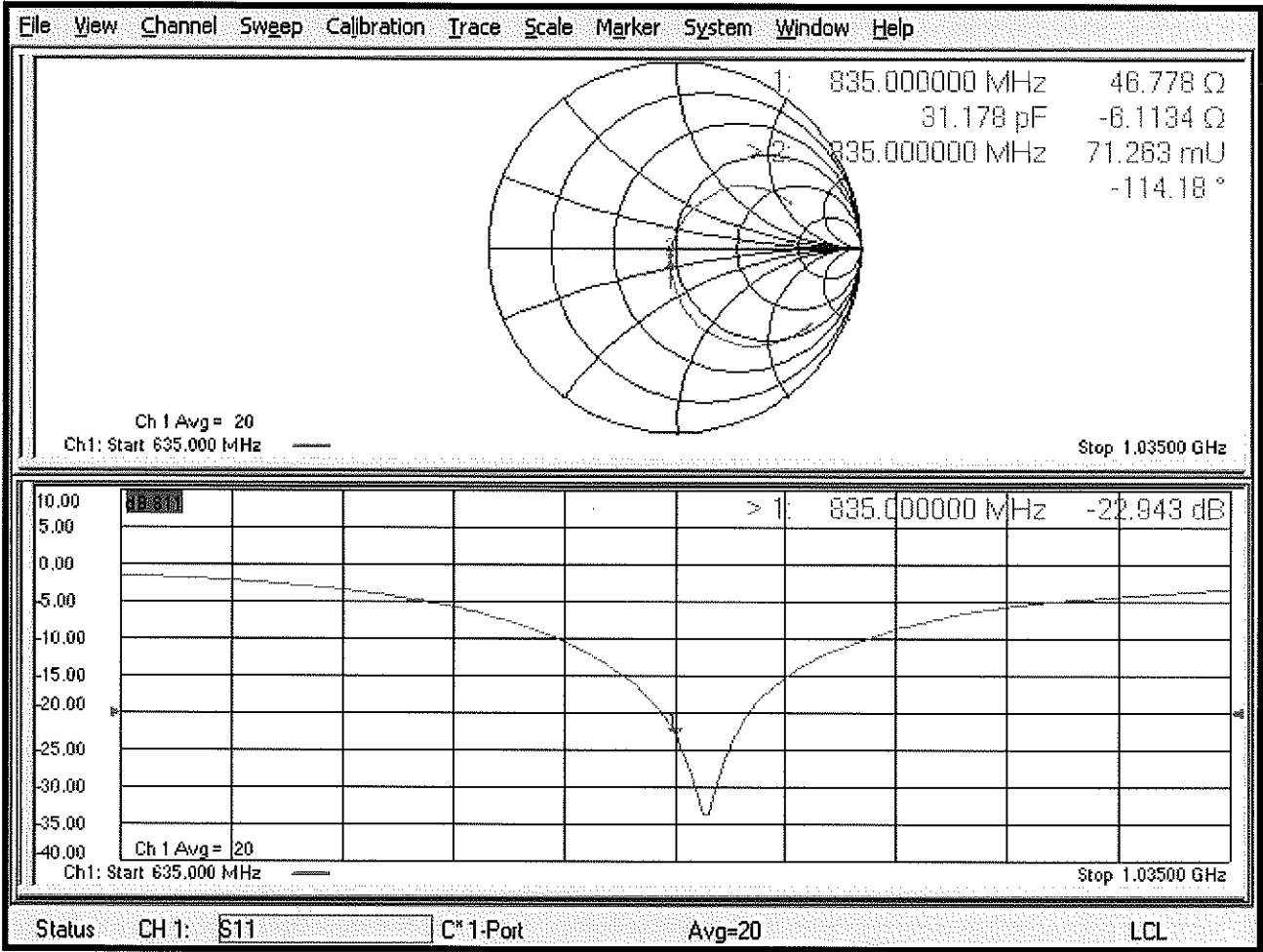
SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 3.23 W/kg



0 dB = 3.23 W/kg = 5.09 dBW/kg

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 0108**

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 Multilateral Agreement for the recognition of calibration certificates

Client **PC Test**

Certificate No: **D835V2-4d132_Jan19**

CALIBRATION CERTIFICATE

Object **D835V2 - SN:4d132**

Calibration procedure(s) **QA CAL-05.v11**
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

BN ✓
02/06/2019

Calibration date: **January 22, 2019**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	31-Dec-18 (No. EX3-7349_Dec18)	Dec-19
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

Calibrated by: **Leif Klysner** **Laboratory Technician**

Signature

Leif Klysner

Approved by: **Katja Pokovic** **Technical Manager**

Katja Pokovic

Issued: January 22, 2019

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	835 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	41.3 $\pm$ 6 %	0.92 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.44 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.59 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.23 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	54.6 $\pm$ 6 %	0.99 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.67 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.35 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.6 Ω - 3.6 j Ω
Return Loss	- 28.7 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 6.2 j Ω
Return Loss	- 23.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.387 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

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

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.38 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.57 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.26 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.47 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.86 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.65 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.58 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	9.42 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.38 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.06 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.42 W/kg ± 16.9 % (k=2)

DASY5 Validation Report for Head TSL

Date: 17.01.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.92 \text{ S/m}$; $\epsilon_r = 41.3$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10, 10, 10) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (front); Type: QD 00L P49 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

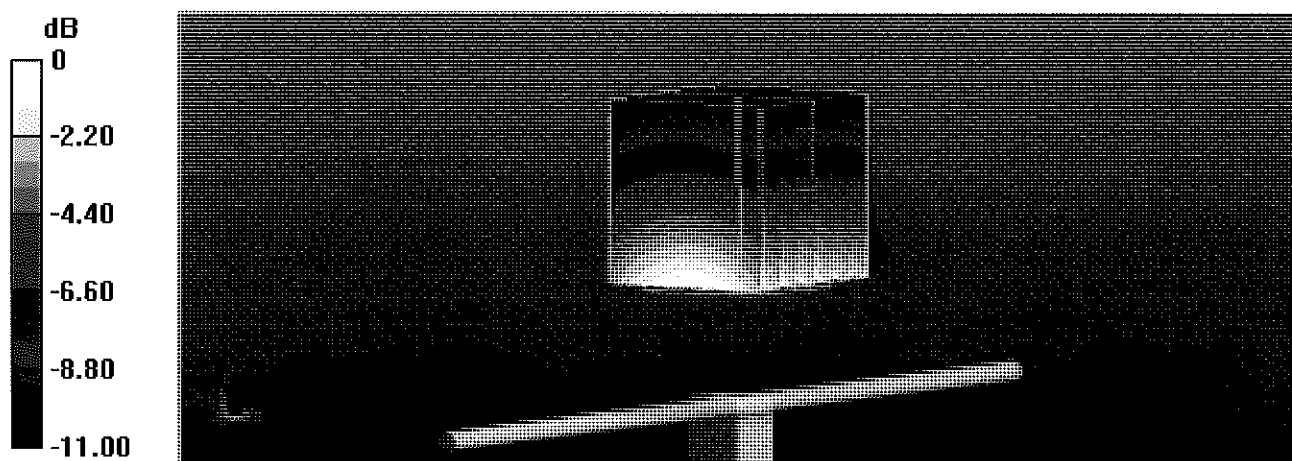
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 34.24 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.73 W/kg

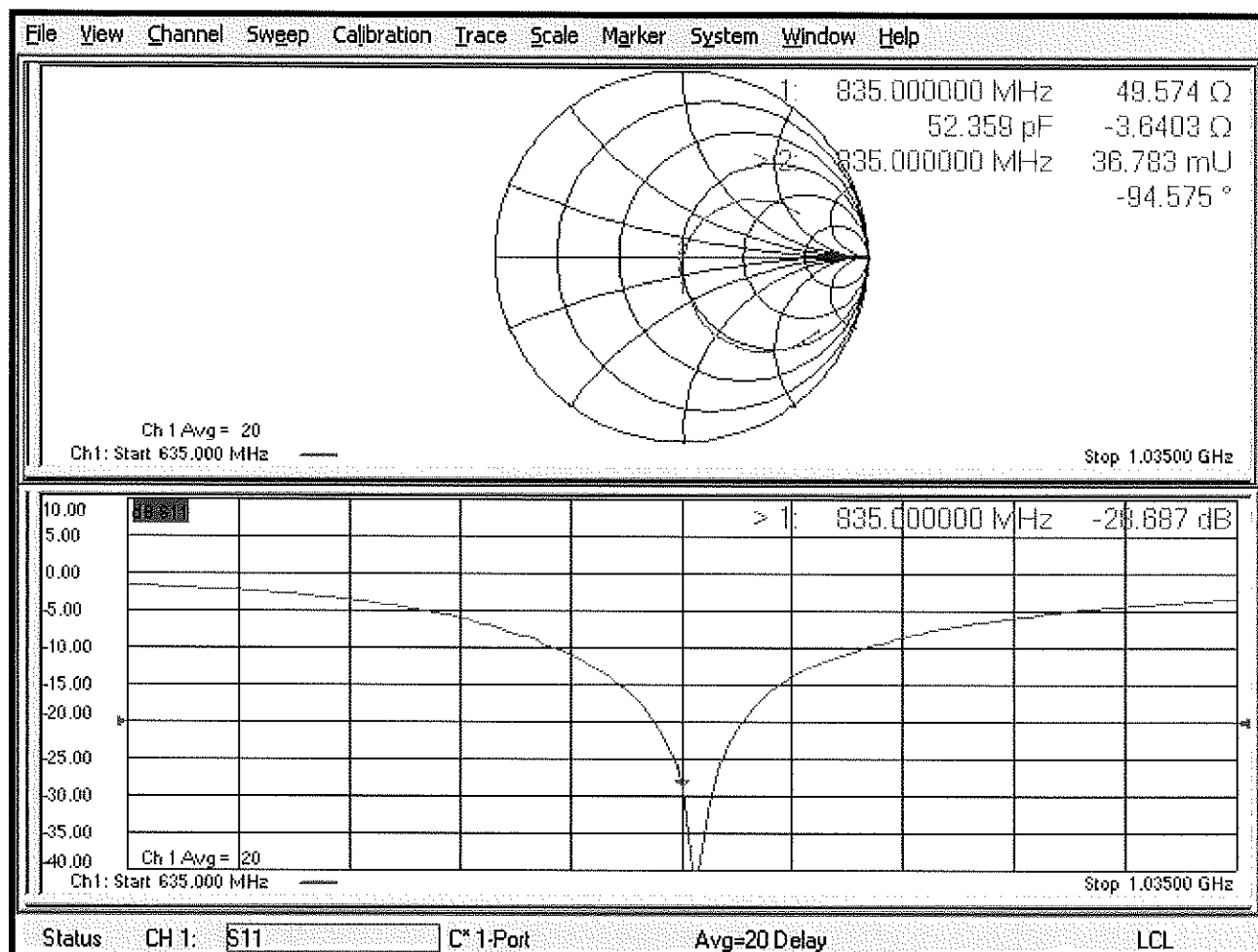
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.58 W/kg

Maximum value of SAR (measured) = 3.28 W/kg



0 dB = 3.28 W/kg = 5.16 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 17.01.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.99 \text{ S/m}$; $\epsilon_r = 54.6$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.15, 10.15, 10.15) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 4.9 (Back); Type: QD 00R P49 AA; Serial: 1005
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

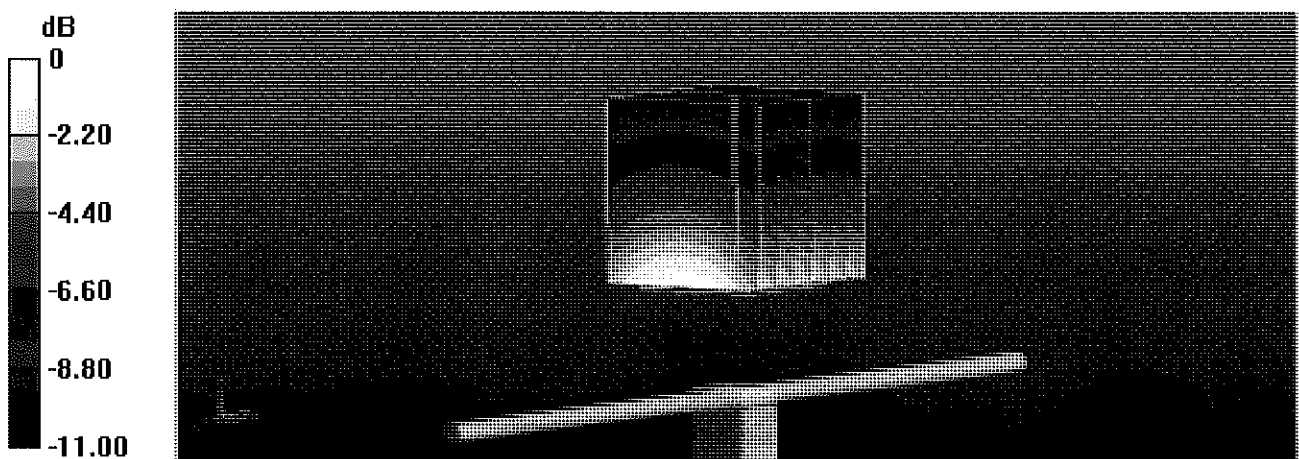
Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 63.32 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 3.64 W/kg

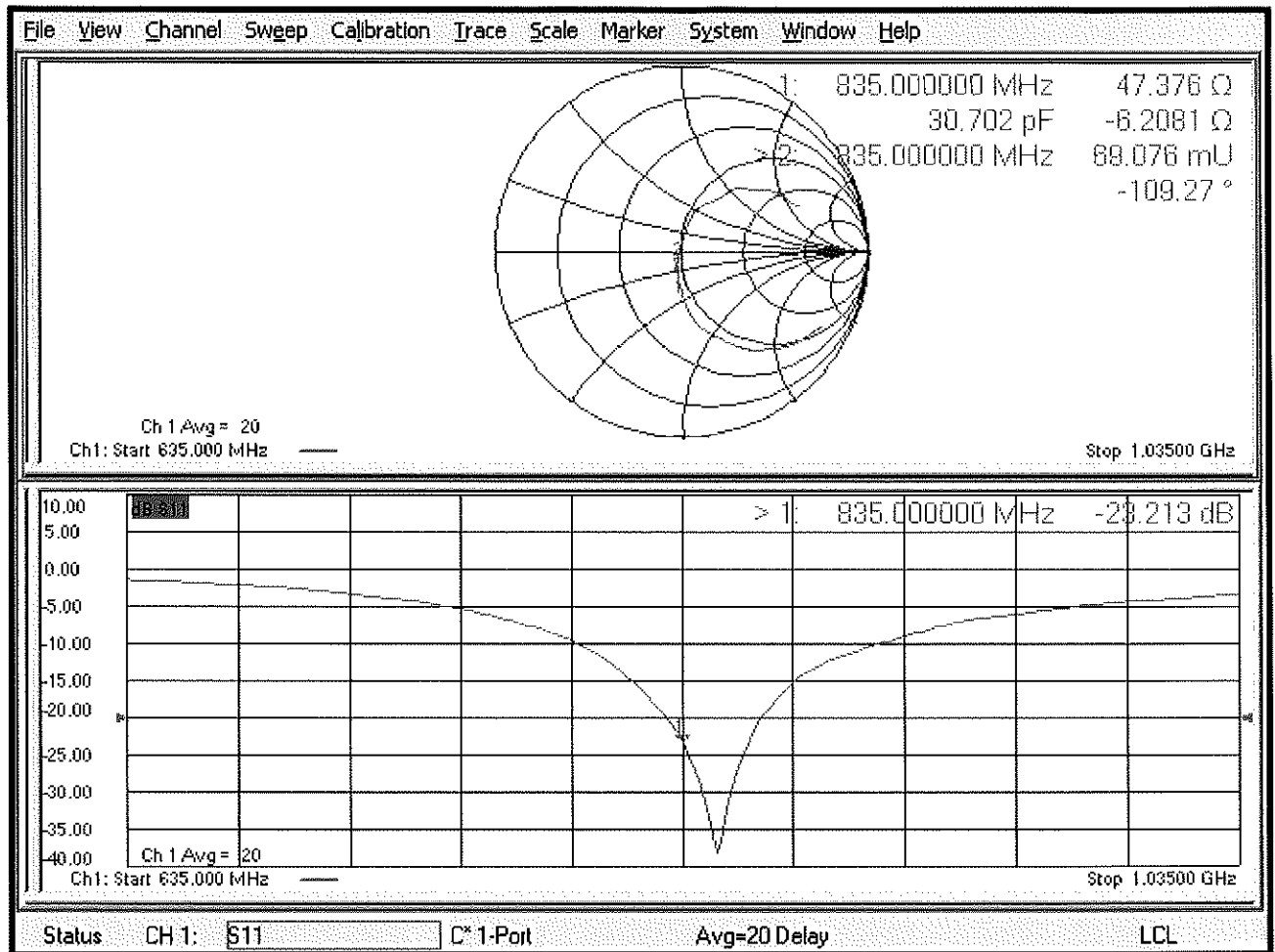
SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.61 W/kg

Maximum value of SAR (measured) = 3.26 W/kg



0 dB = 3.26 W/kg = 5.13 dBW/kg

Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 22.01.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 835 MHz

Medium parameters used: $f = 835 \text{ MHz}$; $\sigma = 0.92 \text{ S/m}$; $\epsilon_r = 44.4$; $\rho = 1000 \text{ kg/m}^3$

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10, 10, 10) @ 835 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: SAM Head
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

Reference Value = 61.32 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 3.51 W/kg

SAR(1 g) = 2.35 W/kg; SAR(10 g) = 1.57 W/kg

Maximum value of SAR (measured) = 3.12 W/kg

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

Reference Value = 62.25 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 3.67 W/kg

SAR(1 g) = 2.47 W/kg; SAR(10 g) = 1.65 W/kg

Maximum value of SAR (measured) = 3.24 W/kg

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

Reference Value = 60.69 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 3.43 W/kg

SAR(1 g) = 2.36 W/kg; SAR(10 g) = 1.6 W/kg

Maximum value of SAR (measured) = 3.08 W/kg

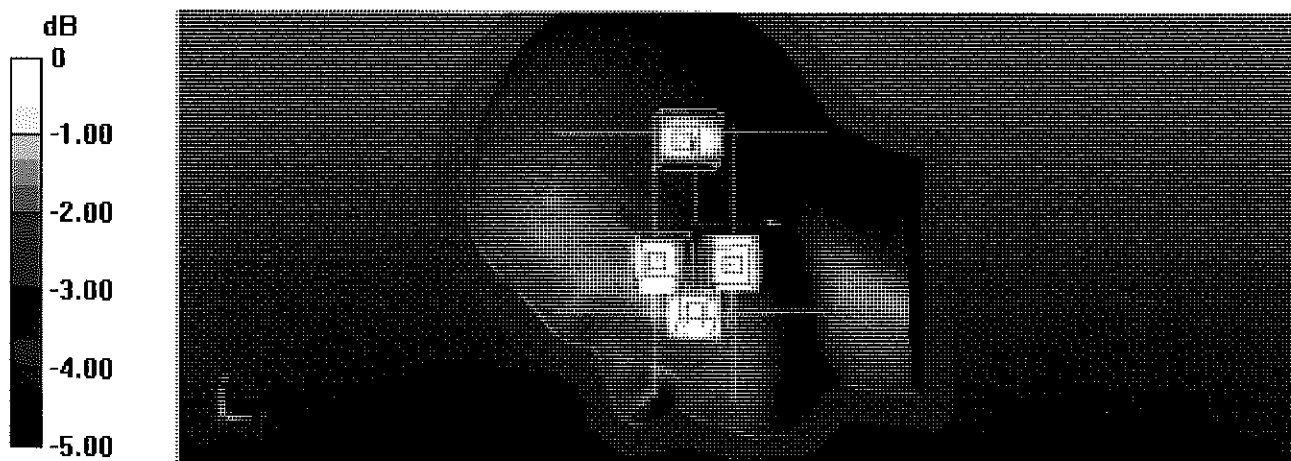
SAM/Head/Ear/Zoom Scan (8x7x7)/Cube 0: Measurement grid: $dx=5\text{mm}$, $dy=5\text{mm}$, $dz=5\text{mm}$

Reference Value = 55.79 V/m; Power Drift = 0.05 dB

Peak SAR (extrapolated) = 2.94 W/kg

SAR(1 g) = 2.02 W/kg; SAR(10 g) = 1.36 W/kg

Maximum value of SAR (measured) = 2.62 W/kg





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1750V2-1148_May19**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1148**

Calibration procedure(s) **QA CAL-05.v11**
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz

Calibration date: **May 15, 2019**

BNV
05-23-2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	03-Apr-19 (No. 217-02892/02893)	Apr-20
Power sensor NRP-Z91	SN: 103244	03-Apr-19 (No. 217-02892)	Apr-20
Power sensor NRP-Z91	SN: 103245	03-Apr-19 (No. 217-02893)	Apr-20
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-19 (No. 217-02894)	Apr-20
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-19 (No. 217-02895)	Apr-20
Reference Probe EX3DV4	SN: 7349	31-Dec-18 (No. EX3-7349_Dec18)	Dec-19
DAE4	SN: 601	30-Apr-19 (No. DAE4-601_Apr19)	Apr-20

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB39512475	30-Oct-14 (in house check Feb-19)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

Calibrated by:	Name Leif Klysner	Function Laboratory Technician	Signature <i>Leif Klysner</i>
Approved by:	Katja Pokovic	Technical Manager	<i>Katja Pokovic</i>

Issued: May 15, 2019

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 mm	
Frequency	1750 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.0 $\pm$ 6 %	1.34 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	---	----

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.13 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	37.0 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.83 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.5 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	53.5 $\pm$ 6 %	1.47 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	---	----

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.35 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	37.7 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.93 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	19.8 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	51.4 Ω - 0.2 j Ω
Return Loss	- 37.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.4 Ω - 0.5 j Ω
Return Loss	- 31.4 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.222 ns
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After long term use with 100W radiated power, only a slight warming of the dipole near the feedpoint can be measured.

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
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Appendix (Additional assessments outside the scope of SCS 0108)

Measurement Conditions

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

Phantom	SAM Head Phantom	For usage with cSAR3DV2-R/L
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SAR result with SAM Head (Top)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	37.9 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.3 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Mouth)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.34 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	37.8 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.04 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.3 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Neck)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.06 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.6 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.95 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.9 W/kg ± 16.9 % (k=2)

SAR result with SAM Head (Ear)

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	7.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	28.7 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	3.98 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	16.0 W/kg ± 16.9 % (k=2)

DASY5 Validation Report for Head TSL

Date: 08.05.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.34$ S/m; $\epsilon_r = 40$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.59, 8.59, 8.59) @ 1750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

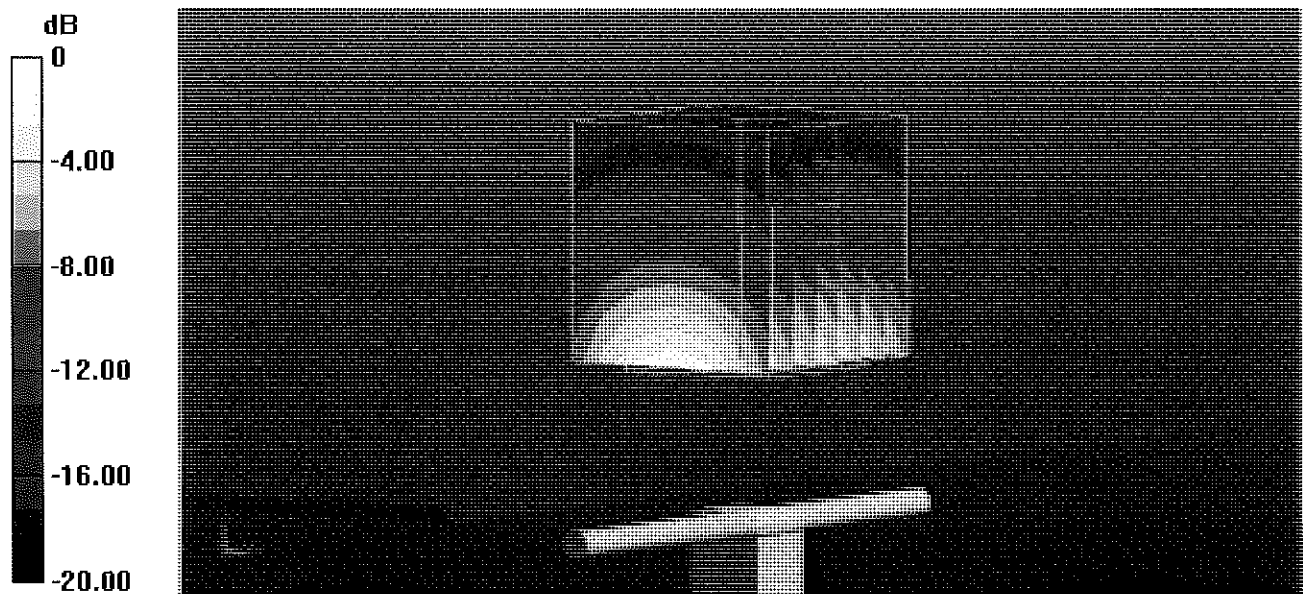
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 107.8 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 16.7 W/kg

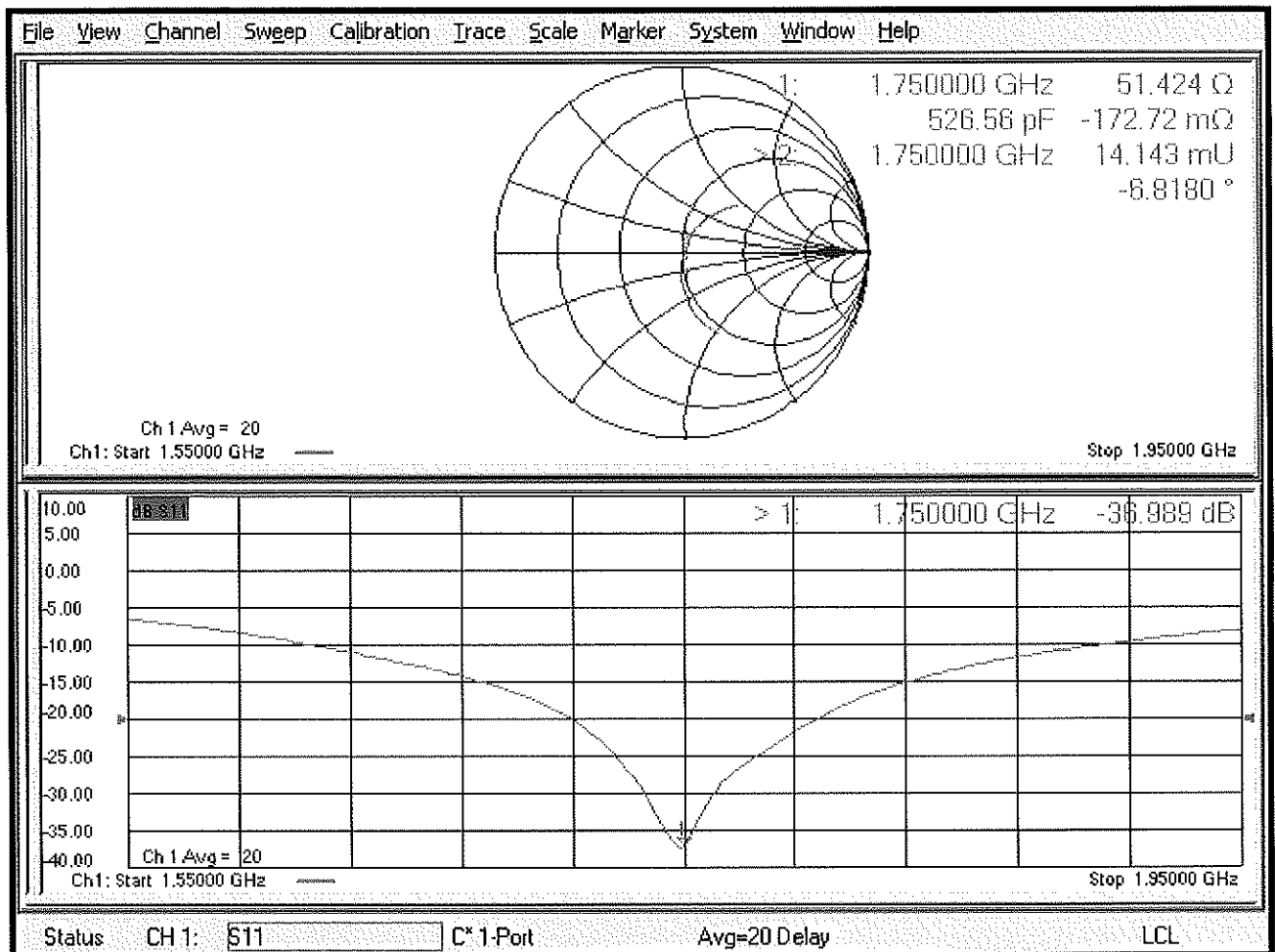
SAR(1 g) = 9.13 W/kg; SAR(10 g) = 4.83 W/kg

Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 08.05.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.47$ S/m; $\epsilon_r = 53.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43) @ 1750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

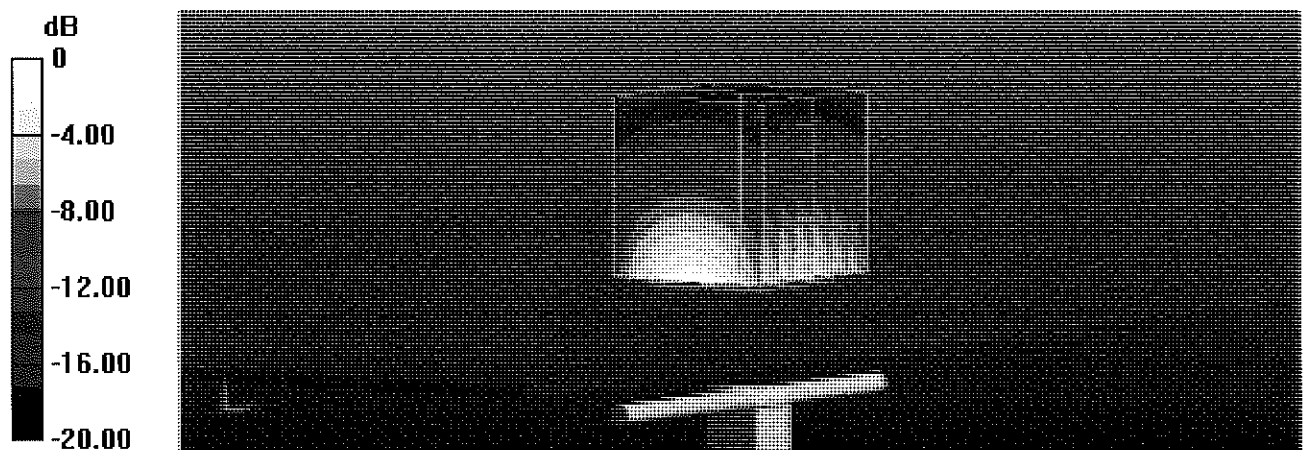
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.1 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 17.2 W/kg

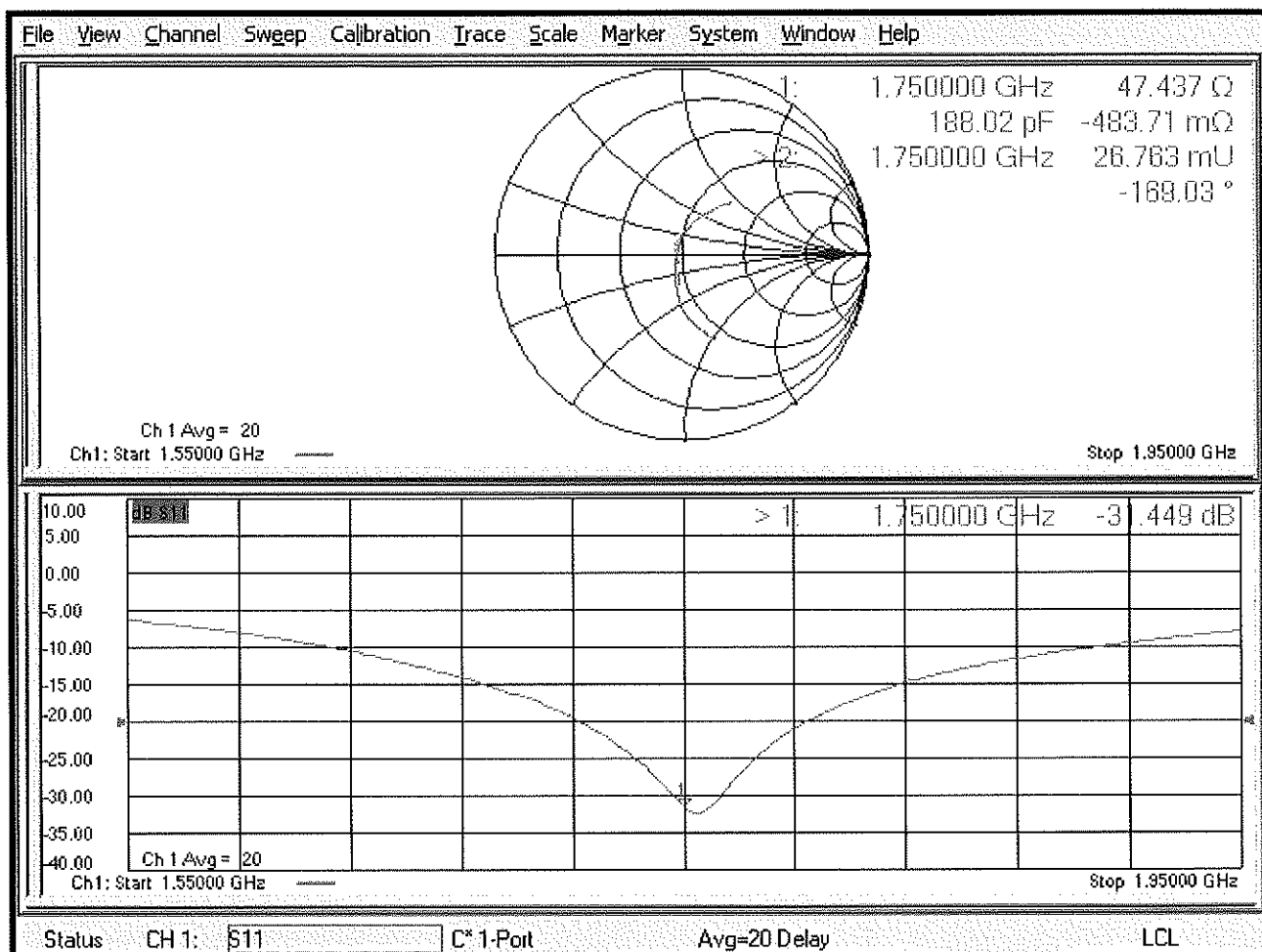
SAR(1 g) = 9.35 W/kg; SAR(10 g) = 4.93 W/kg

Maximum value of SAR (measured) = 14.4 W/kg



0 dB = 14.4 W/kg = 11.58 dBW/kg

Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 15.05.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.37$ S/m; $\epsilon_r = 42.1$; $\rho = 1000$ kg/m³

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.59, 8.59, 8.59) @ 1750 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 30.04.2019
- Phantom: SAM Head
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

Reference Value = 107.2 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 16.6 W/kg

SAR(1 g) = 9.38 W/kg; SAR(10 g) = 5.04 W/kg

Maximum value of SAR (measured) = 14.2 W/kg

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

Reference Value = 104.7 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 16.5 W/kg

SAR(1 g) = 9.34 W/kg; SAR(10 g) = 5.04 W/kg

Maximum value of SAR (measured) = 13.9 W/kg

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

Reference Value = 103.3 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 15.5 W/kg

SAR(1 g) = 9.06 W/kg; SAR(10 g) = 4.95 W/kg

Maximum value of SAR (measured) = 13.1 W/kg

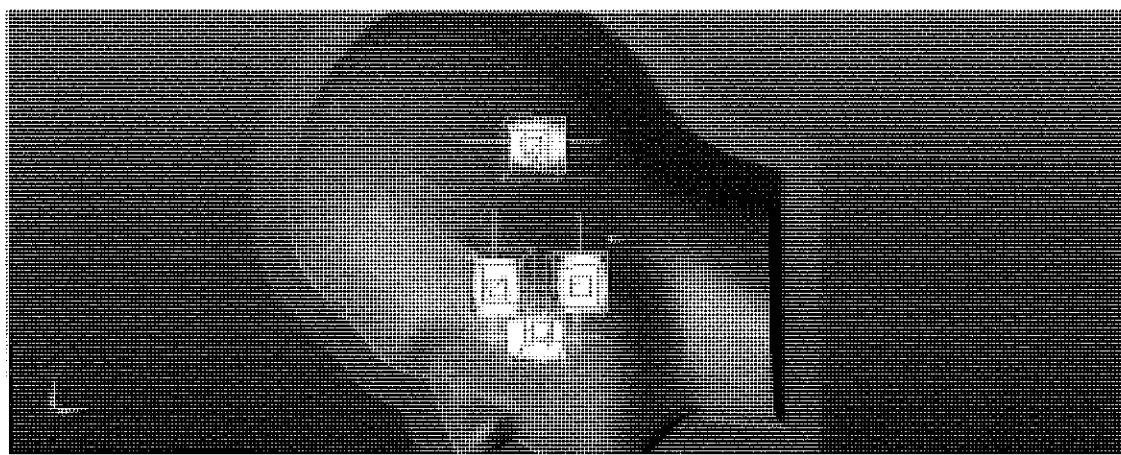
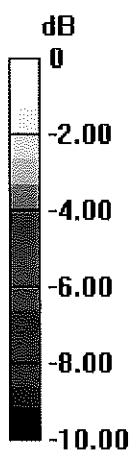
SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 90.82 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 12.0 W/kg

SAR(1 g) = 7.11 W/kg; SAR(10 g) = 3.98 W/kg

Maximum value of SAR (measured) = 10.2 W/kg



0 dB = 10.2 W/kg = 10.09 dBW/kg



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1900V2-5d080_Oct18**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d080**

Calibration procedure(s) **QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **October 23, 2018**

*BN ✓
10-30-2018*

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	04-Oct-18 (No. DAE4-601_Oct18)	Oct-19
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-18)	In house check: Oct-20
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-18)	In house check: Oct-20
Network Analyzer Agilent E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

Calibrated by: **Jeton Kastrati** Function: **Laboratory Technician** Signature: *[Signature]*

Approved by: **Katja Pokovic** Technical Manager

Issued: October 23, 2018

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Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	40.3 $\pm$ 6 %	1.40 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.18 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.7 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.9 $\pm$ 6 %	1.47 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.62 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	39.2 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.09 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.6 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	52.5 Ω + 7.9 j Ω
Return Loss	- 21.8 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.1 Ω + 8.1 j Ω
Return Loss	- 21.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.193 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	June 28, 2006

DASY5 Validation Report for Head TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.4$ S/m; $\epsilon_r = 40.3$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.18, 8.18, 8.18) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

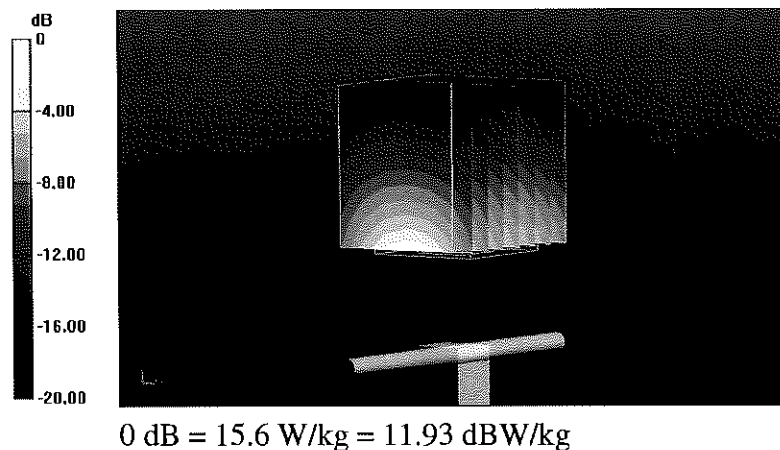
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 110.0 V/m; Power Drift = -0.05 dB

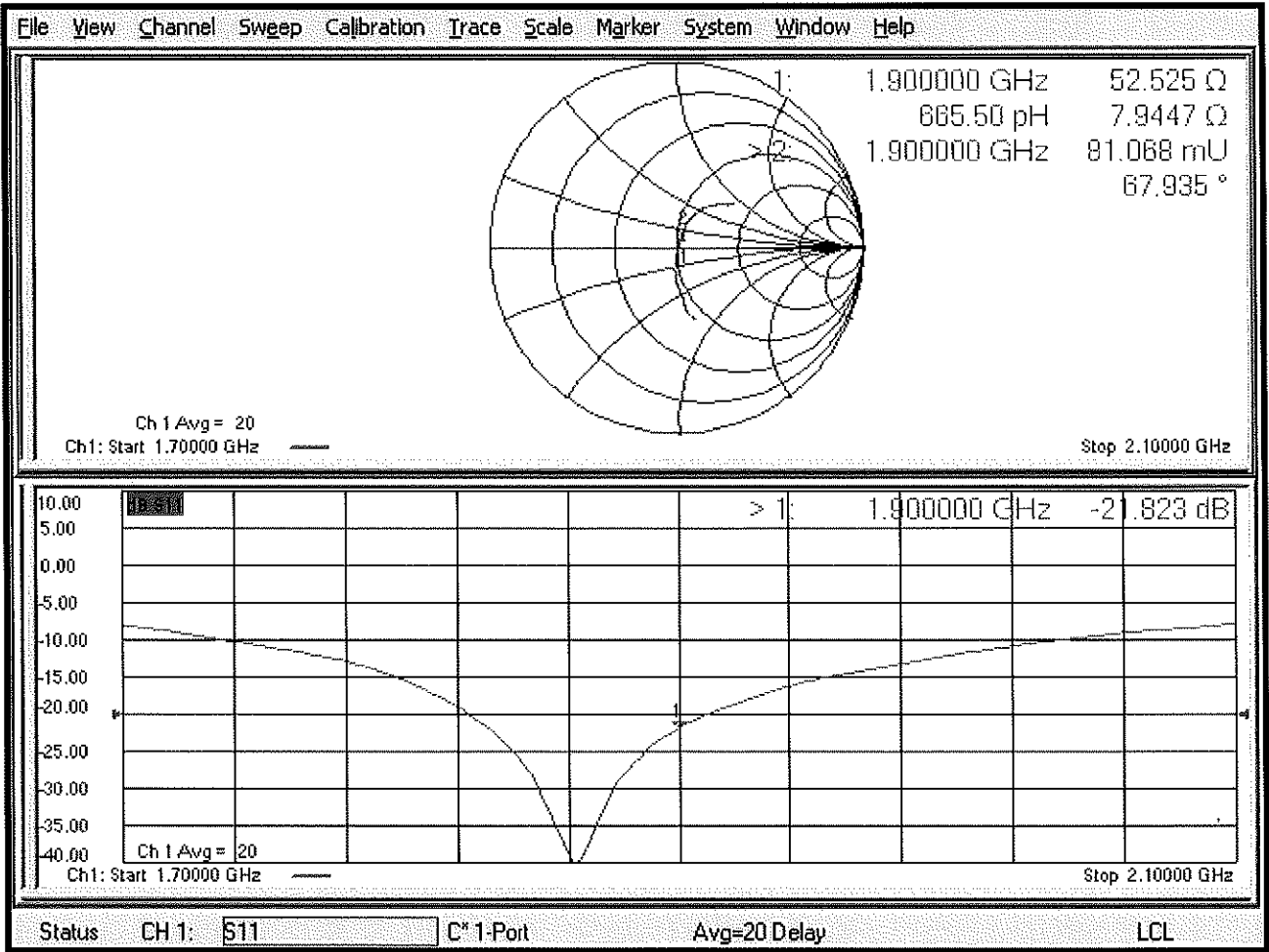
Peak SAR (extrapolated) = 18.7 W/kg

SAR(1 g) = 9.93 W/kg; SAR(10 g) = 5.18 W/kg

Maximum value of SAR (measured) = 15.6 W/kg



Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 23.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.47$ S/m; $\epsilon_r = 52.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.15, 8.15, 8.15) @ 1900 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

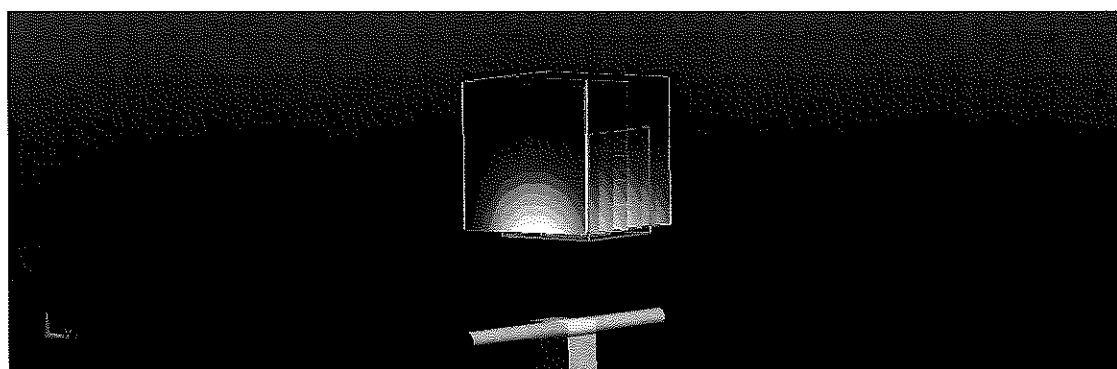
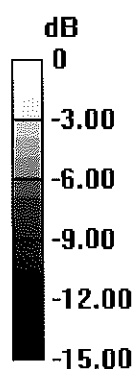
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 99.86 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 17.3 W/kg

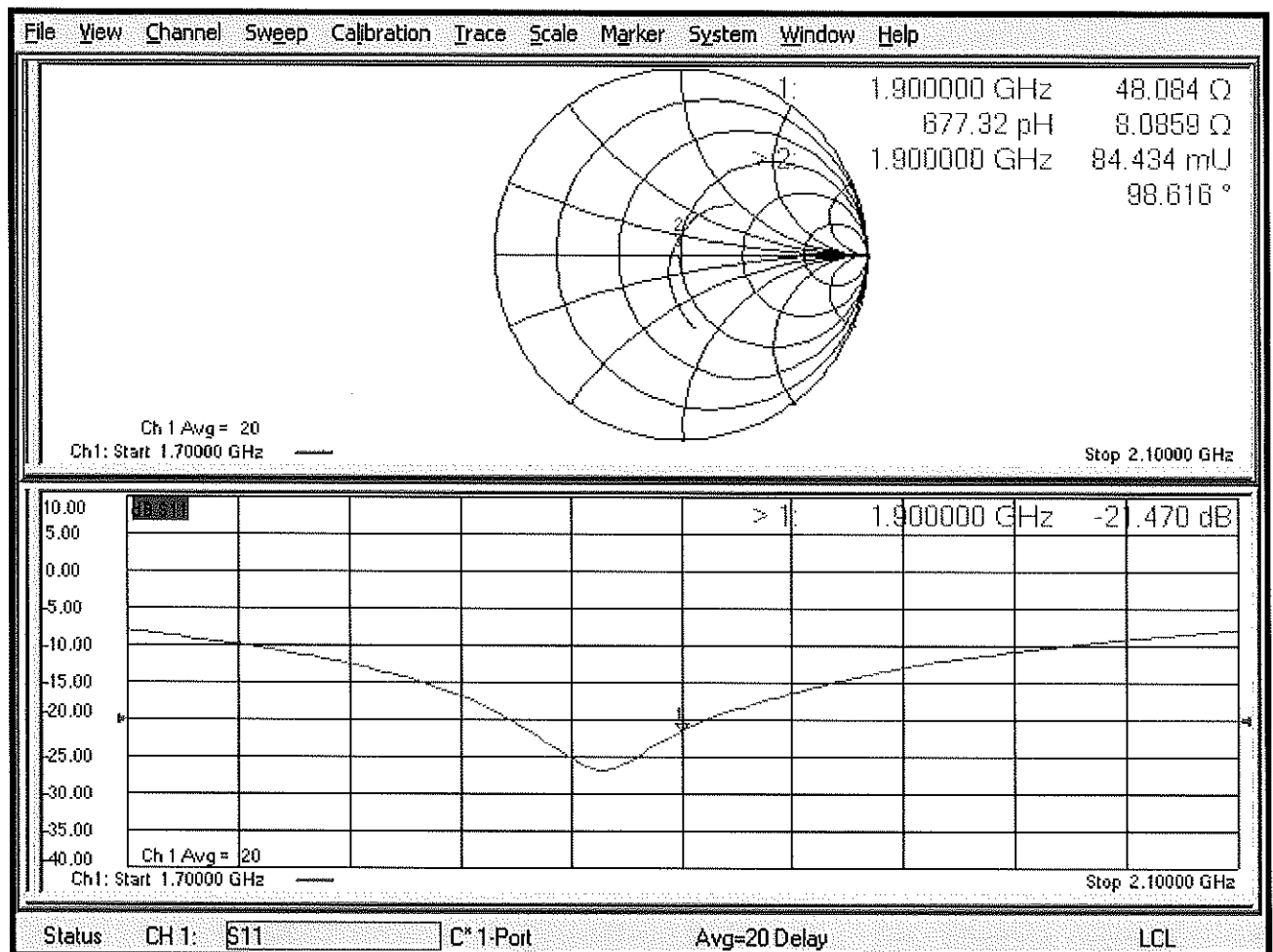
SAR(1 g) = 9.62 W/kg; SAR(10 g) = 5.09 W/kg

Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

Impedance Measurement Plot for Body TSL





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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2450V2-797_Sep17**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN:797**

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

Calibration date: **September 11, 2017**

SCV
10/03/2017
Extended PMV
9/20/2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 08327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-May-17 (No. EX3-7349_May17)	May-18
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18

Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-08	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by: **Michael Weber** Name: **Michael Weber** Function: **Laboratory Technician**

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager**

Signature

Issued: September 11, 2017

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	37.8 $\pm$ 6 %	1.86 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.7 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.8 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	51.9 $\pm$ 6 %	2.04 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	51.1 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.2 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.8 \Omega + 7.4 j\Omega$
Return Loss	- 21.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	$49.7 \Omega + 9.1 j\Omega$
Return Loss	- 20.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.152 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	January 24, 2006

DASY5 Validation Report for Head TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.86$ S/m; $\epsilon_r = 37.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

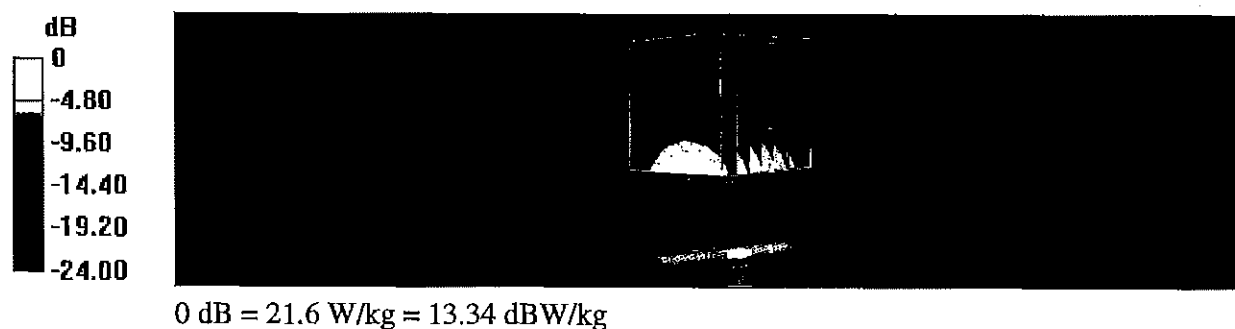
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 113.5 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 26.9 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.28 W/kg

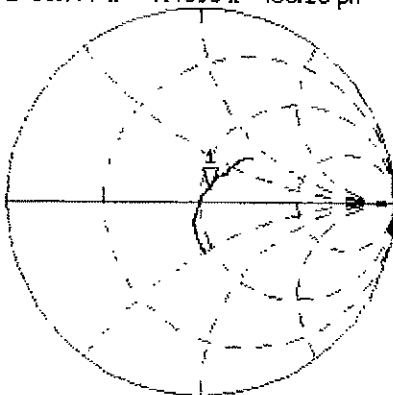
Maximum value of SAR (measured) = 21.6 W/kg



Impedance Measurement Plot for Head TSL

11 Sep 2017 11:52:57
 CH1 S11 1 U FS 1: 53.777 Ω 7.4395 Ω 483.28 μ H 2 450.000 000 MHz

*
 Del
 CA



Avg
 16

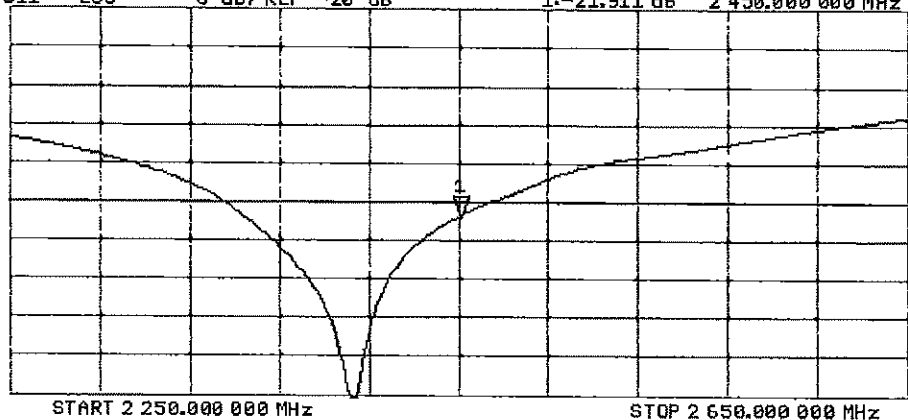
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.911 dB 2 450.000 000 MHz

CA

Avg
 16

H1d



START 2 250.000 000 MHz

STOP 2 650.000 000 MHz

DASY5 Validation Report for Body TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.04$ S/m; $\epsilon_r = 51.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.1, 8.1, 8.1); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAB4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

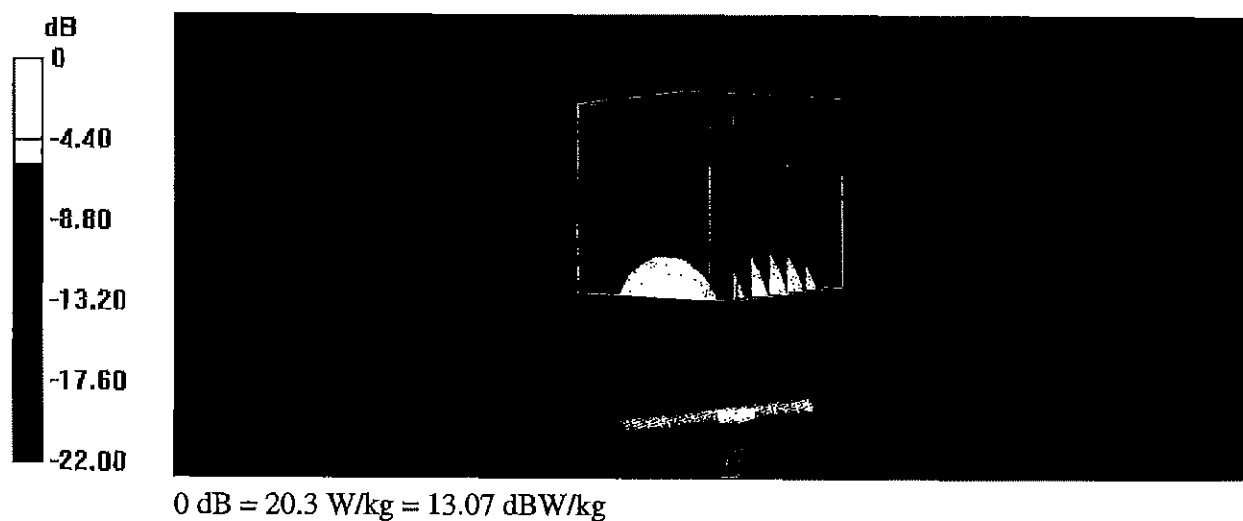
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 105.4 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 25.6 W/kg

SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.14 W/kg

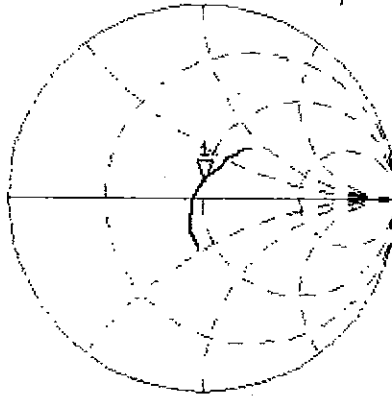
Maximum value of SAR (measured) = 20.3 W/kg



Impedance Measurement Plot for Body TSL

11 Sep 2017 11:52:10
 CH1 S11 1 U FS 1: 49.725 Ω 9.0703 Ω 589.22 pH 2 450.000 000 MHz

 Del
 CA



Avg
 16

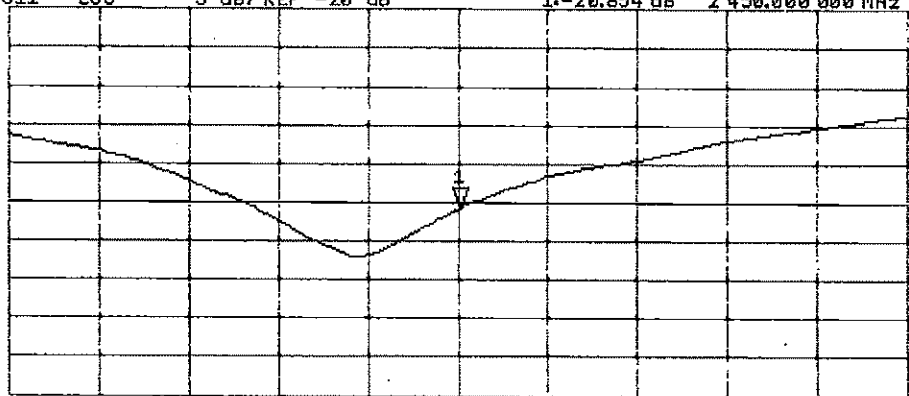
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -20.854 dB 2 450.000 000 MHz

CA

Avg
 16

H1d



START 2 250.000 000 MHz

STOP 2 650.000 000 MHz

Certification of Calibration

Object: D2450V2 – SN: 797

Calibration procedure(s): Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: September 11, 2018

Description: SAR Validation Dipole at 2450 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Amplifier Research	1551G6	Amplifier	CBT	N/A	CBT	433971
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Agilent	8753ES	S-Parameter Vector Network Analyzer	8/30/2018	Annual	8/30/2019	MY40003841
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/15/2018	Annual	5/15/2019	1070
SPEAG	EX3DV4	SAR Probe	7/20/2018	Annual	7/20/2019	7410
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/11/2018	Annual	7/11/2019	1322
SPEAG	ES3DV3	SAR Probe	3/13/2018	Annual	3/13/2019	3319
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/7/2018	Annual	3/7/2019	1368
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1339018
Anritsu	ML2495A	Power Meter	10/22/2017	Annual	10/22/2018	1328004
Agilent	NS182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
Seekonk	NC-100	Torque Wrench	7/11/2018	Annual	7/11/2019	N/A
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A

Note: CBT (Calibrated Before Testing). Prior to testing, the measurement paths containing a cable, amplifier, attenuator, coupler or filter were connected to a calibrated source (i.e. a signal generator) to determine the losses of the measurement path.

Measurement Uncertainty = $\pm 23\%$ (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halfoster	Team Lead Engineer	<i>BRODIE HALFOSTER</i>
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	<i>KOK</i>

DIPOLE CALIBRATION EXTENSION

Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

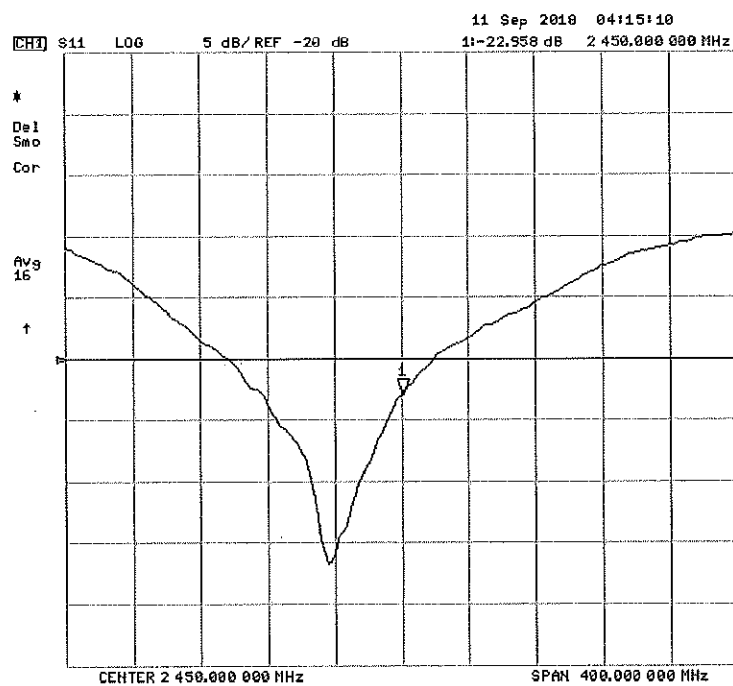
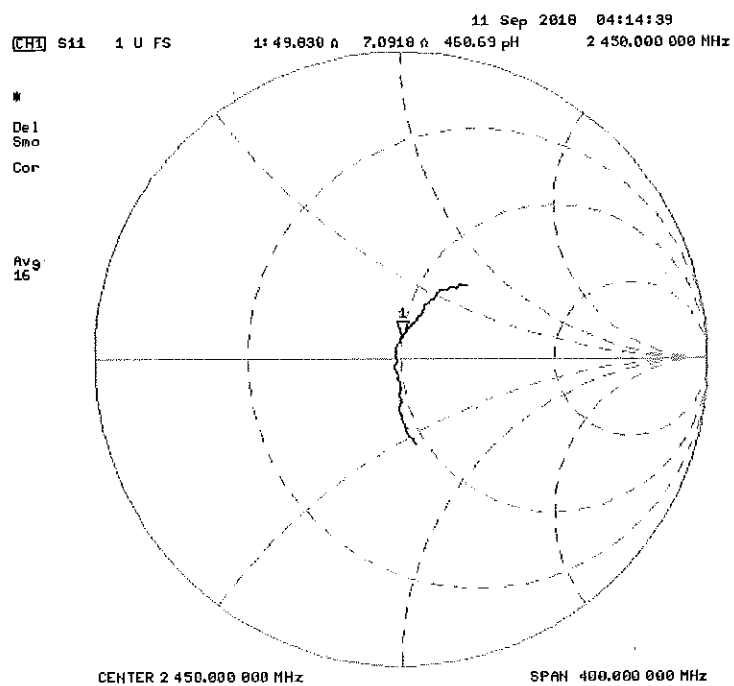
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
9/11/2017	9/11/2018	1.152	5.27	5.52	4.74%	2.48	2.54	2.42%	53.8	49.8	4	7.4	7.1	0.3	-21.9	-23	-4.80%	PASS

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
9/11/2017	9/11/2018	1.152	5.11	5.17	1.17%	2.42	2.37	-2.07%	49.7	49.8	0.1	9.1	7.2	1.9	-20.9	-22.6	-8.20%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Object:

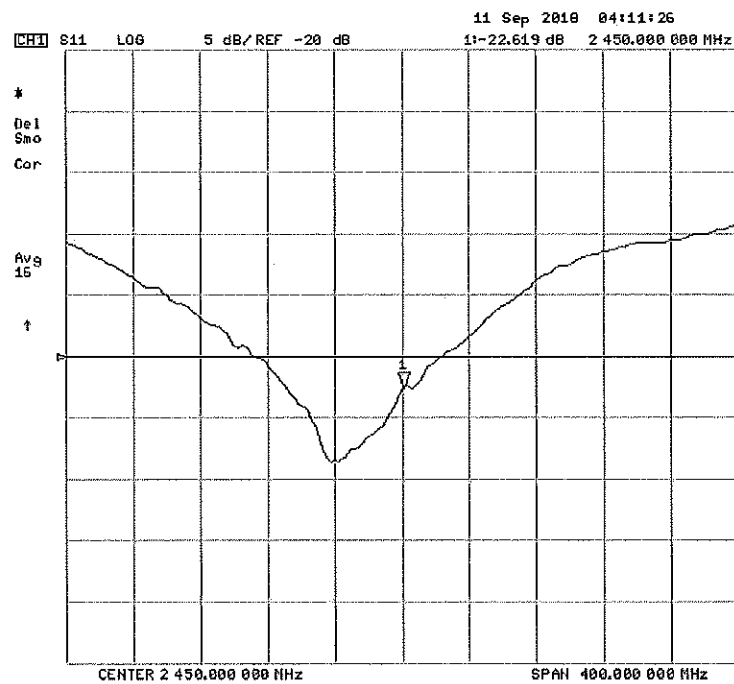
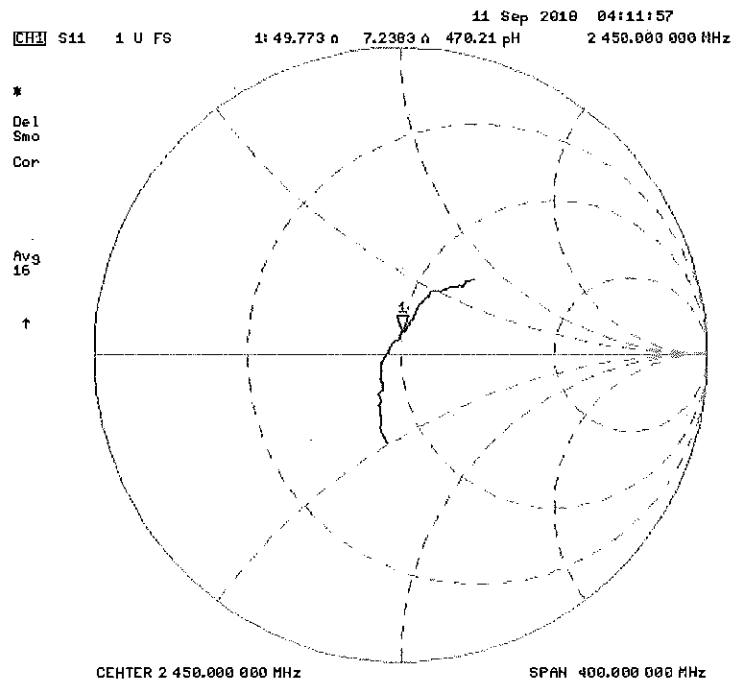
D2450V2 -- SN: 797

Date Issued:

09/11/2018

Page 3 of 4

Impedance & Return-Loss Measurement Plot for Body TSL





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Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2600V2-1004_Apr18**

CALIBRATION CERTIFICATE

Object **D2600V2 - SN:1004**

Calibration procedure(s)

OPTICAL BEAM

Calibration procedure for optical beam with wave front filter

Calibration date: **April 11, 2018**

BN ✓
05-01-2018
Extended
04-20-2019

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: 5058 (20k)	04-Apr-18 (No. 217-02682)	Apr-19
Type-N mismatch combination	SN: 5047.2 / 06327	04-Apr-18 (No. 217-02683)	Apr-19
Reference Probe EX3DV4	SN: 7349	30-Dec-17 (No. EX3-7349_Dec17)	Dec-18
DAE4	SN: 601	26-Oct-17 (No. DAE4-601_Oct17)	Oct-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-17)	In house check: Oct-18

Calibrated by:	Name Michael Weber	Function Laboratory Technician	Signature
Approved by:	Name Katja Pokovic	Technical Manager	

Issued: April 12, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

- DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz $\pm$ 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 $\pm$ 0.2) °C	37.8 $\pm$ 6 %	2.03 mho/m $\pm$ 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	55.9 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.35 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	25.1 W/kg $\pm$ 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 $\pm$ 0.2) °C	52.1 $\pm$ 6 %	2.19 mho/m $\pm$ 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	54.8 W/kg $\pm$ 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.20 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.7 W/kg $\pm$ 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	47.7 Ω - 5.7 j Ω
Return Loss	- 24.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.0 Ω - 3.8 j Ω
Return Loss	- 24.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.149 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	December 23, 2006

DASY5 Validation Report for Head TSL

Date: 11.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.03$ S/m; $\epsilon_r = 37.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.7, 7.7, 7.7); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

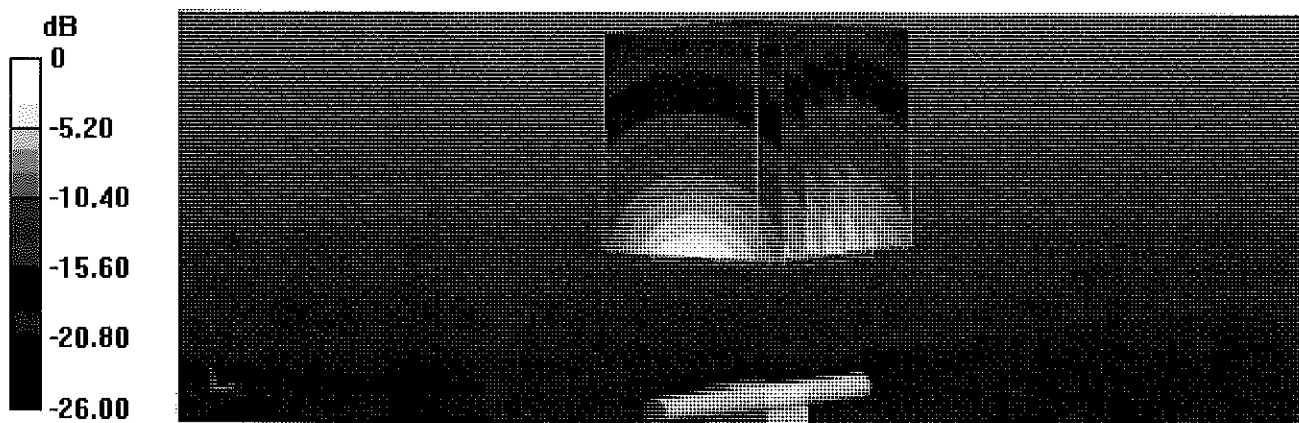
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 118.5 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 28.6 W/kg

SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.35 W/kg

Maximum value of SAR (measured) = 23.9 W/kg



0 dB = 23.9 W/kg = 13.78 dBW/kg

Impedance Measurement Plot for Head TSL

11 Apr 2018 11:25:16
 [CH1] S11 1 U FS 1: 47.721 Ω -5.6836 Ω 10.770 pF 2 500.000 000 MHz

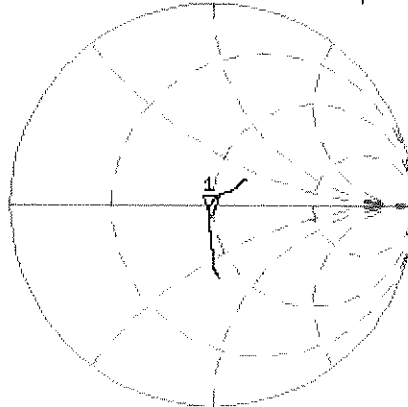
*

De1

CA

Avg
16

H1d

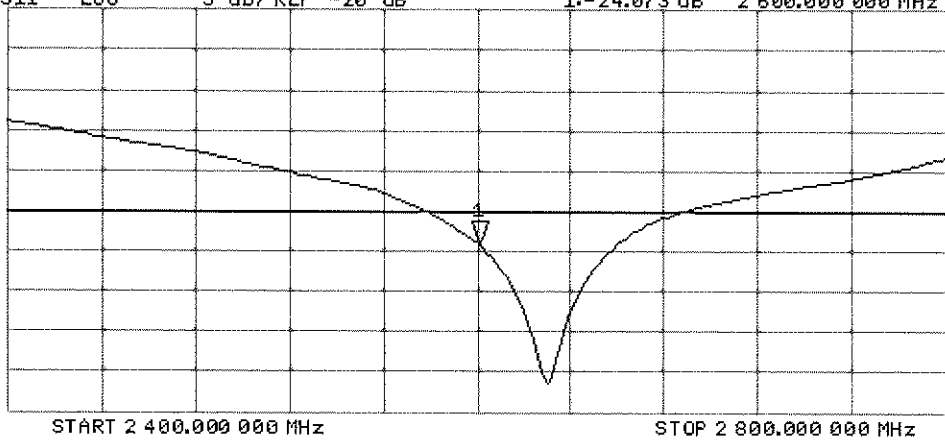


CH2 S11 LOG 5 dB/REF -20 dB 1:-24.073 dB 2 500.000 000 MHz

CA

Avg
16

H1d



DASY5 Validation Report for Body TSL

Date: 11.04.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2600 MHz

Medium parameters used: $f = 2600$ MHz; $\sigma = 2.19$ S/m; $\epsilon_r = 52.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.81, 7.81, 7.81); Calibrated: 30.12.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

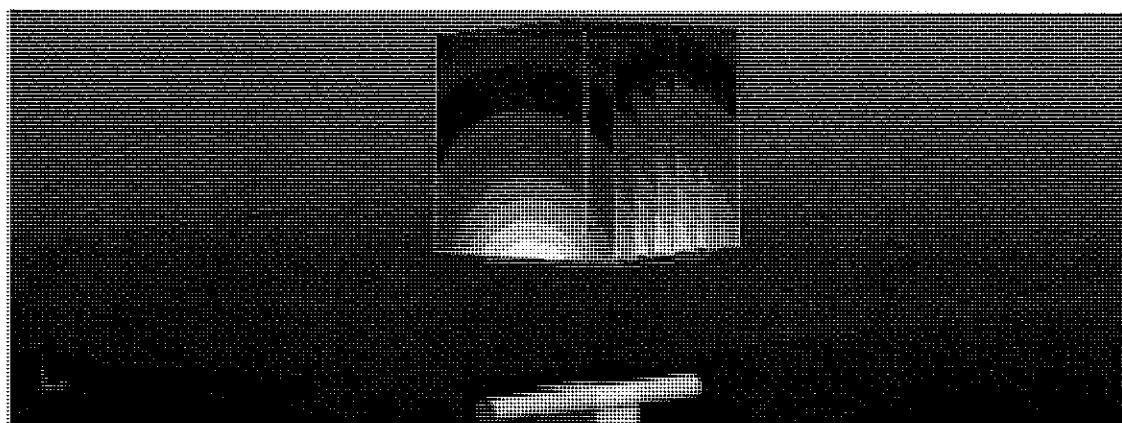
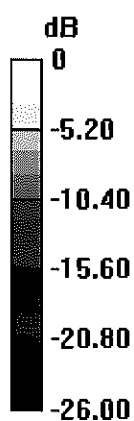
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.5 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 28.3 W/kg

SAR(1 g) = 13.8 W/kg; SAR(10 g) = 6.2 W/kg

Maximum value of SAR (measured) = 22.9 W/kg



0 dB = 22.9 W/kg = 13.60 dBW/kg

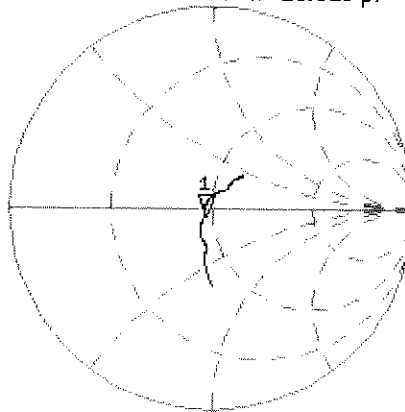
Impedance Measurement Plot for Body TSL

CH1 S11 1 U FS 11 Apr 2018 11:24:36
 1: 46.039 Ω -3.7520 Ω 16.315 pF 2 600.000 000 MHz

*
 Del
 CA

Avg
 16

H1d

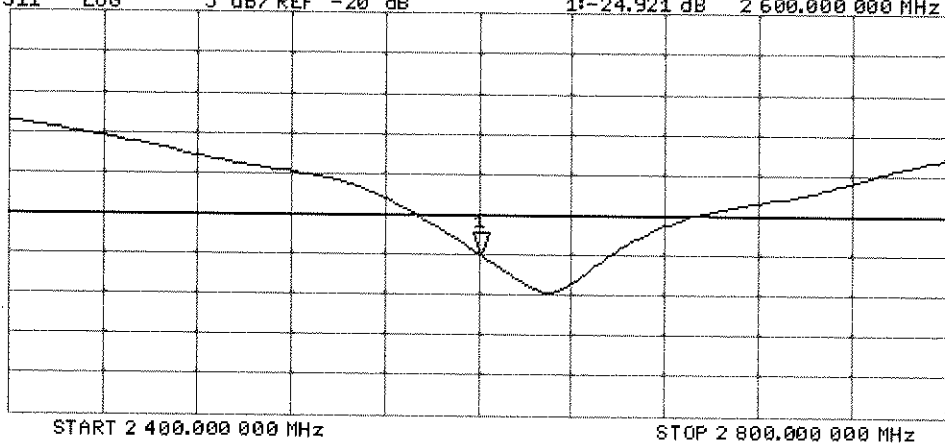


CH2 S11 LOG 5 dB/REF -20 dB 1:-24.921 dB 2 600.000 000 MHz

CA

Avg
 16

H1d



Certification of Calibration

Object D2600V2 – SN: 1004

Calibration procedure(s) Procedure for Calibration Extension for SAR Dipoles.

Extension Calibration date: 4/11/2019

Description: SAR Validation Dipole at 2600 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	3/11/2019	Annual	3/11/2020	US39170122
Agilent	N5182A	MXG Vector Signal Generator	4/18/2018	Annual	4/18/2019	MY47420800
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1027293
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1126066
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Control Company	4040	Therm./ Clock/ Humidity Monitor	10/9/2018	Biennial	10/9/2020	181647811
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
MiniCircuits	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Seekonk	NC-100	Torque Wrench	7/11/2018	Annual	7/11/2019	N/A
SPEAG	EX3DV4	SAR Probe	6/25/2018	Annual	6/25/2019	7409
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/18/2018	Annual	6/18/2019	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/13/2019	Annual	2/13/2020	665
SPEAG	EX3DV4	SAR Probe	2/19/2019	Annual	2/19/2020	7417
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/11/2018	Annual	9/11/2019	1091

Measurement Uncertainty = $\pm 23\%$ (k=2)

	Name	Function	Signature
Calibrated By:	Brodie Halfoster	Test Engineer	<i>BRODIE HALFOSTER</i>
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	<i>KOK</i>

DIPOLE CALIBRATION EXTENSION

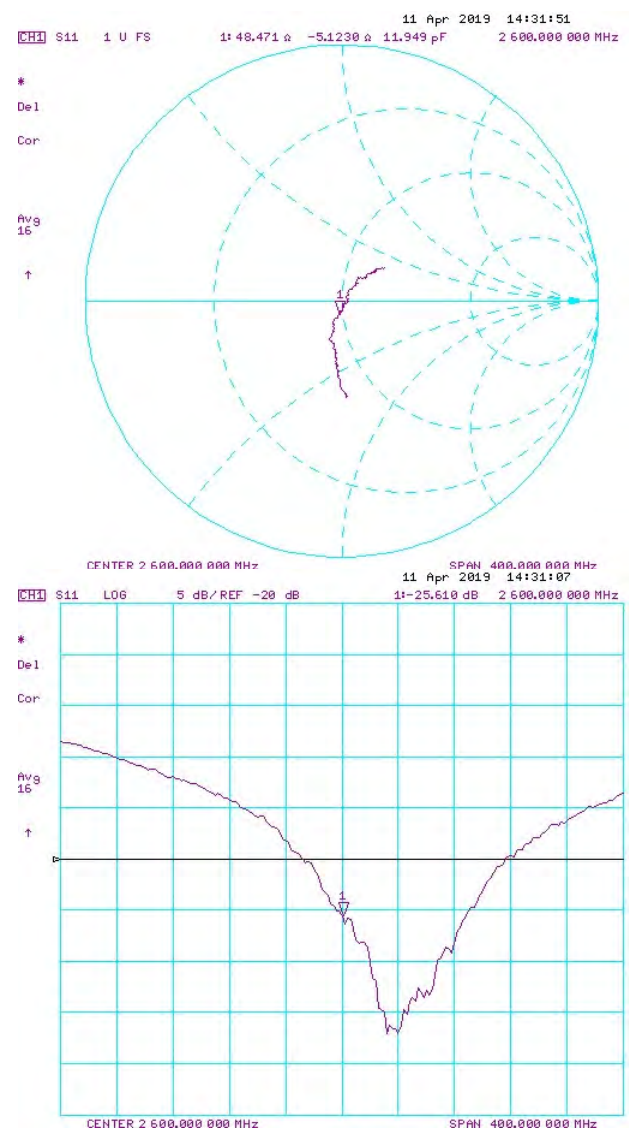
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

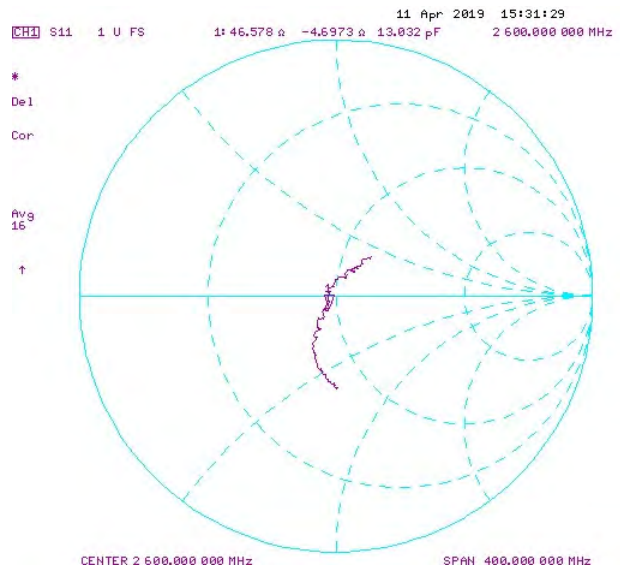
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
4/11/2018	4/11/2019	1.140	5.59	5.51	-1.43%	2.51	2.47	-1.59%	47.7	48.5	0.8	-5.7	-5.1	0.6	-24.1	-25.6	-6.30%	PASS
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
4/11/2018	4/11/2019	1.140	5.48	5.65	3.10%	2.47	2.48	0.40%	46	46.6	0.6	-3.8	-4.7	0.9	-24.9	-24.5	1.60%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





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 Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **ES3-3287_Oct18**

CALIBRATION CERTIFICATE

Object **ES3DV3 - SN:3287**

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

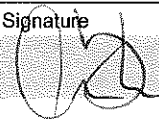
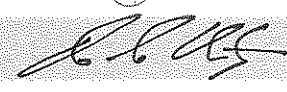
Calibration date: **October 22, 2018**

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

All calibrations have been conducted in the closed laboratory facility: environment temperature $(22 \pm 3)^\circ\text{C}$ and humidity $< 70\%$.

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-18 (No. 217-02672/02673)	Apr-19
Power sensor NRP-Z91	SN: 103244	04-Apr-18 (No. 217-02672)	Apr-19
Power sensor NRP-Z91	SN: 103245	04-Apr-18 (No. 217-02673)	Apr-19
Reference 20 dB Attenuator	SN: S5277 (20x)	04-Apr-18 (No. 217-02682)	Apr-19
Reference Probe ES3DV2	SN: 3013	30-Dec-17 (No. ES3-3013_Dec17)	Dec-18
DAE4	SN: 660	21-Dec-17 (No. DAE4-660_Dec17)	Dec-18
Secondary Standards	ID	Check Date (in house)	Scheduled Check
Power meter E4419B	SN: GB41293874	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: MY41498087	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
Power sensor E4412A	SN: 000110210	06-Apr-16 (in house check Jun-18)	In house check: Jun-20
RF generator HP 8648C	SN: US3642U01700	04-Aug-99 (in house check Jun-18)	In house check: Jun-20
Network Analyzer E8358A	SN: US41080477	31-Mar-14 (in house check Oct-18)	In house check: Oct-19

Calibrated by:	Name Claudio Leubler	Function Laboratory Technician	Signature 
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature 
			Issued: October 23, 2018
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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 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, "Measurement procedure for the assessment of Specific Absorption Rate (SAR) from hand-held and body-mounted devices used next to the ear (frequency range of 300 MHz to 6 GHz)", July 2016
- IEC 62209-2, "Procedure to determine the Specific Absorption Rate (SAR) for wireless communication devices used in close proximity to the human body (frequency range of 30 MHz to 6 GHz)", March 2010
- KDB 865664, "SAR Measurement Requirements for 100 MHz to 6 GHz"

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:3287

Manufactured: June 7, 2010
Calibrated: October 22, 2018

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

DASY/EASY - Parameters of Probe: ES3DV3 - SN:3287

Basic Calibration Parameters

	Sensor X	Sensor Y	Sensor Z	Unc (k=2)
Norm ($\mu\text{V}/(\text{V}/\text{m})^2$) ^A	0.88	0.99	1.01	$\pm 10.1 \%$
DCP (mV) ^B	106.5	104.5	106.2	

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	170.5	$\pm 3.3 \%$
		Y	0.0	0.0	1.0		183.9	
		Z	0.0	0.0	1.0		185.7	

Note: For details on UID parameters see Appendix.

Sensor Model Parameters

	C1 fF	C2 fF	α V^{-1}	T1 $\text{ms}\cdot\text{V}^{-2}$	T2 $\text{ms}\cdot\text{V}^{-1}$	T3 ms	T4 V^{-2}	T5 V^{-1}	T6
X	63.21	438.0	33.52	29.02	2.824	5.044	1.538	0.382	1.009
Y	66.95	483.3	35.70	29.79	3.474	5.100	0.294	0.696	1.011
Z	55.14	387.3	34.16	28.13	2.433	5.100	1.594	0.322	1.010

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 5 and 6).

^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:3287

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	6.76	6.76	6.76	0.28	1.78	± 12.0 %
835	41.5	0.90	6.61	6.61	6.61	0.60	1.20	± 12.0 %
1750	40.1	1.37	5.48	5.48	5.48	0.53	1.28	± 12.0 %
1900	40.0	1.40	5.24	5.24	5.24	0.41	1.52	± 12.0 %
2300	39.5	1.67	4.82	4.82	4.82	0.42	1.57	± 12.0 %
2450	39.2	1.80	4.63	4.63	4.63	0.55	1.39	± 12.0 %
2600	39.0	1.96	4.38	4.38	4.38	0.58	1.43	± 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:3287

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	6.43	6.43	6.43	0.72	1.15	± 12.0 %
835	55.2	0.97	6.34	6.34	6.34	0.52	1.32	± 12.0 %
1750	53.4	1.49	4.98	4.98	4.98	0.28	2.12	± 12.0 %
1900	53.3	1.52	4.83	4.83	4.83	0.43	1.57	± 12.0 %
2300	52.9	1.81	4.55	4.55	4.55	0.62	1.36	± 12.0 %
2450	52.7	1.95	4.29	4.29	4.29	0.72	1.17	± 12.0 %
2600	52.5	2.16	4.19	4.19	4.19	0.50	1.20	± 12.0 %

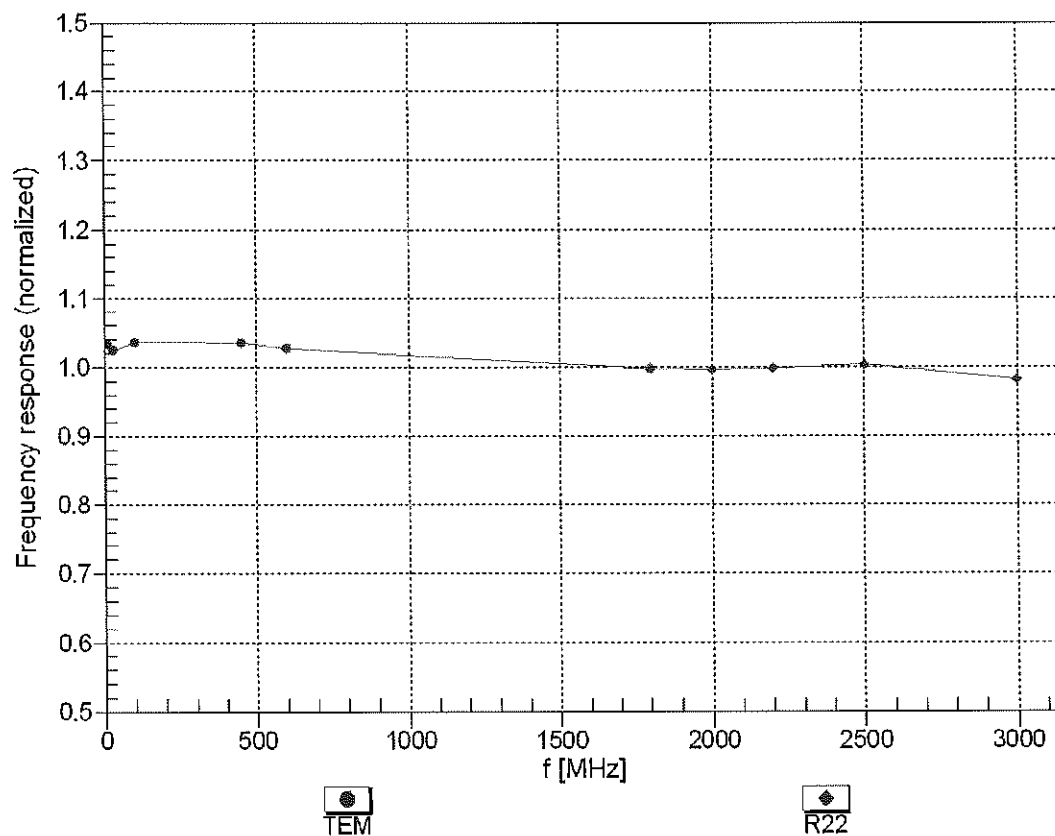
^C Frequency validity above 300 MHz of ± 100 MHz only applies for DASY v4.4 and higher (see Page 2), else it is restricted to ± 50 MHz. The uncertainty is the RSS of the ConvF uncertainty at calibration frequency and the uncertainty for the indicated frequency band. Frequency validity below 300 MHz is ± 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

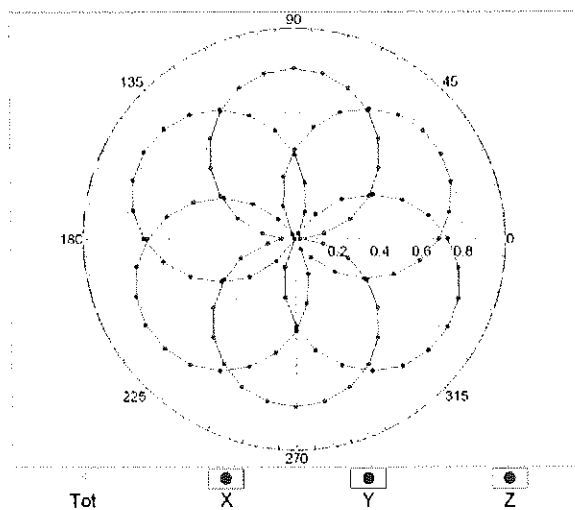
(TEM-Cell:ifi110 EXX, Waveguide: R22)



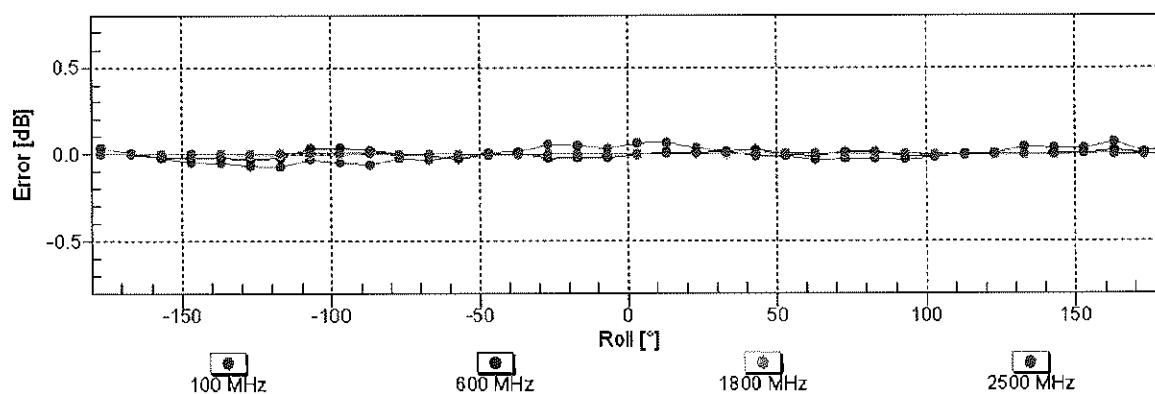
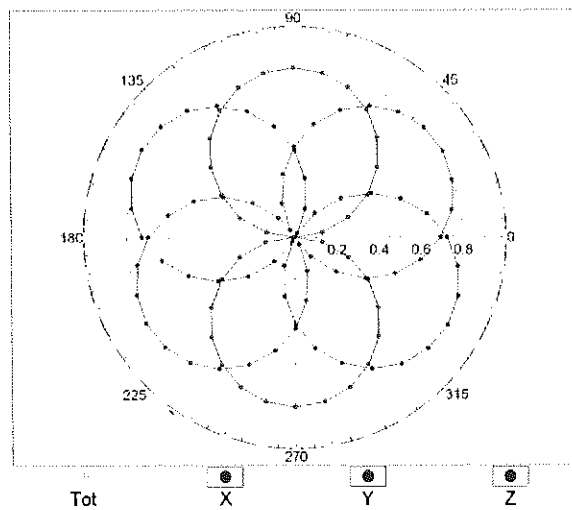
Uncertainty of Frequency Response of E-field: $\pm 6.3\%$ ($k=2$)

Receiving Pattern (ϕ), $\theta = 0^\circ$

$f=600$ MHz, TEM

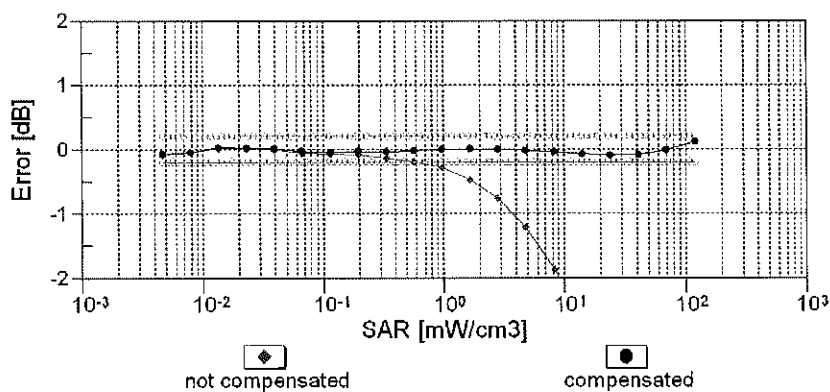
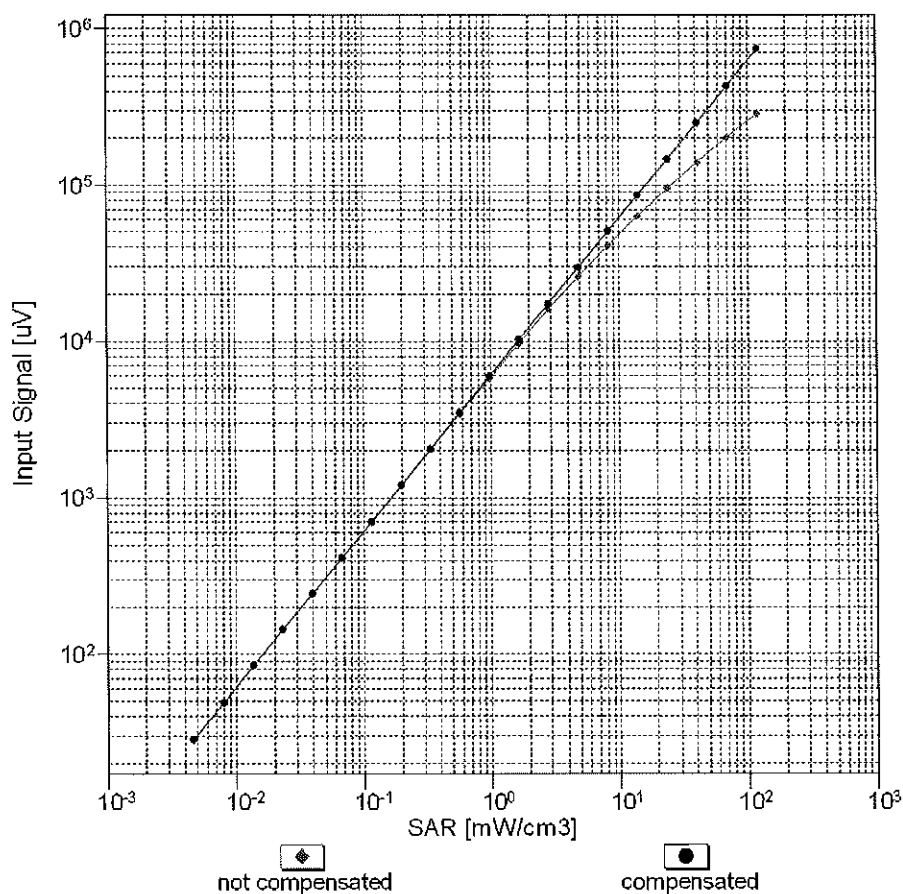


$f=1800$ MHz, R22



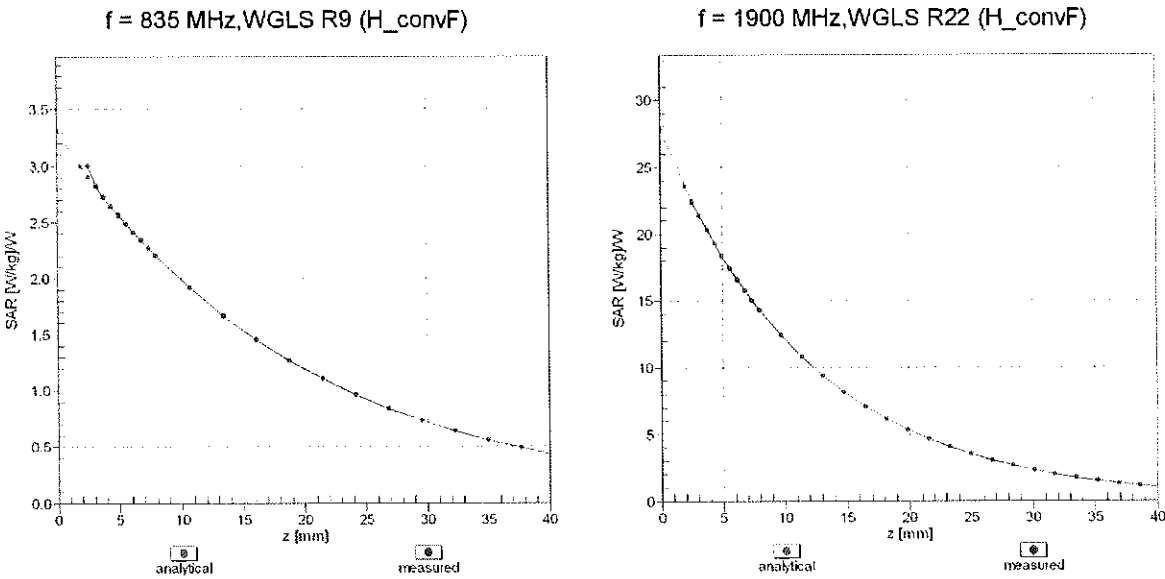
Uncertainty of Axial Isotropy Assessment: $\pm 0.5\%$ ($k=2$)

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



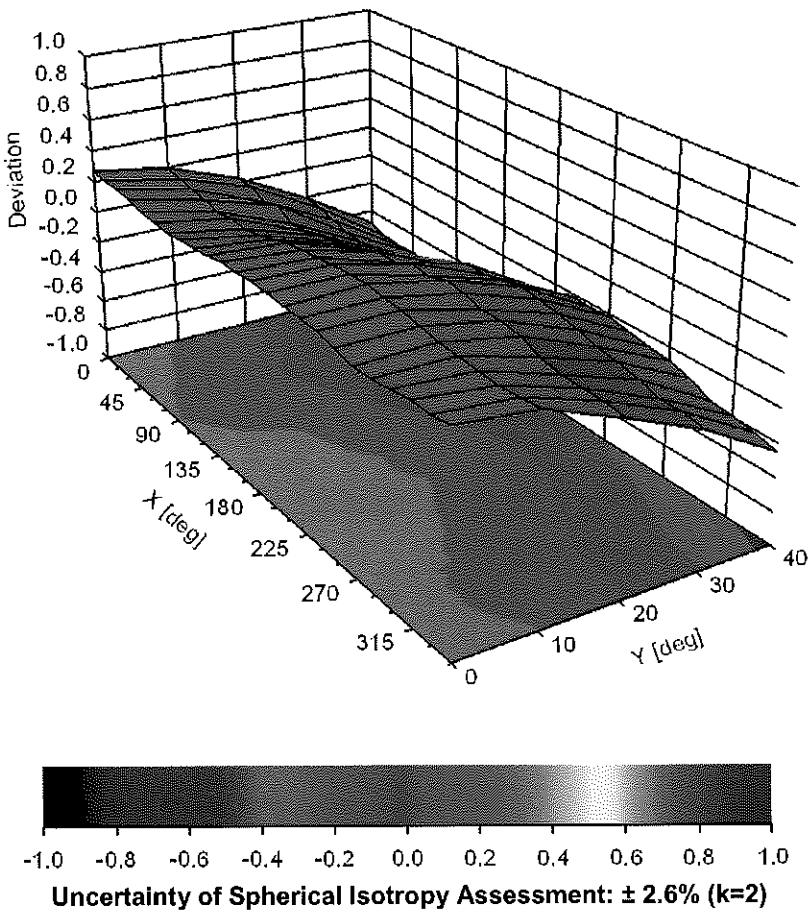
Uncertainty of Linearity Assessment: $\pm 0.6\%$ ($k=2$)

Conversion Factor Assessment



Deviation from Isotropy in Liquid

Error (ϕ, ϑ), f = 900 MHz



DASY/EASY - Parameters of Probe: ES3DV3 - SN:3287

Other Probe Parameters

Sensor Arrangement	Triangular
Connector Angle (°)	93.1
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

Appendix: Modulation Calibration Parameters

UID	Communication System Name		A dB	B dB μ V	C	D dB	VR mV	Max Unc ^E (k=2)
0	CW	X	0.00	0.00	1.00	0.00	170.5	$\pm 3.3 \%$
		Y	0.00	0.00	1.00		183.9	
		Z	0.00	0.00	1.00		185.7	
10010- CAA	SAR Validation (Square, 100ms, 10ms)	X	7.53	77.06	17.83	10.00	25.0	$\pm 9.6 \%$
		Y	8.14	78.38	19.04		25.0	
		Z	9.25	80.89	19.28		25.0	
10011- CAB	UMTS-FDD (WCDMA)	X	1.43	73.85	18.87	0.00	150.0	$\pm 9.6 \%$
		Y	0.97	66.02	14.16		150.0	
		Z	1.09	68.86	15.96		150.0	
10012- CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps)	X	1.37	66.92	17.13	0.41	150.0	$\pm 9.6 \%$
		Y	1.26	64.41	15.18		150.0	
		Z	1.30	65.60	16.10		150.0	
10013- CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps)	X	5.15	67.38	17.44	1.46	150.0	$\pm 9.6 \%$
		Y	5.18	67.06	17.28		150.0	
		Z	5.09	67.36	17.42		150.0	
10021- DAC	GSM-FDD (TDMA, GMSK)	X	14.53	88.52	23.56	9.39	50.0	$\pm 9.6 \%$
		Y	14.96	89.86	24.90		50.0	
		Z	31.90	102.69	28.16		50.0	
10023- DAC	GPRS-FDD (TDMA, GMSK, TN 0)	X	13.53	87.25	23.18	9.57	50.0	$\pm 9.6 \%$
		Y	14.02	88.59	24.52		50.0	
		Z	26.42	99.51	27.28		50.0	
10024- DAC	GPRS-FDD (TDMA, GMSK, TN 0-1)	X	52.08	107.25	27.36	6.56	60.0	$\pm 9.6 \%$
		Y	41.48	106.06	28.00		60.0	
		Z	100.00	118.06	30.27		60.0	
10025- DAC	EDGE-FDD (TDMA, 8PSK, TN 0)	X	16.26	99.58	37.07	12.57	50.0	$\pm 9.6 \%$
		Y	13.58	93.24	34.70		50.0	
		Z	21.87	110.76	41.97		50.0	
10026- DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1)	X	18.41	99.97	33.81	9.56	60.0	$\pm 9.6 \%$
		Y	15.35	95.05	32.27		60.0	
		Z	21.72	105.96	36.44		60.0	
10027- DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2)	X	100.00	115.09	28.07	4.80	80.0	$\pm 9.6 \%$
		Y	100.00	117.60	29.52		80.0	
		Z	100.00	116.87	28.79		80.0	
10028- DAC	GPRS-FDD (TDMA, GMSK, TN 0-1-2-3)	X	100.00	115.09	27.27	3.55	100.0	$\pm 9.6 \%$
		Y	100.00	116.90	28.32		100.0	
		Z	100.00	116.94	28.01		100.0	
10029- DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2)	X	13.44	93.53	30.58	7.80	80.0	$\pm 9.6 \%$
		Y	11.59	89.61	29.29		80.0	
		Z	14.19	96.32	32.08		80.0	
10030- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH1)	X	100.00	114.89	28.31	5.30	70.0	$\pm 9.6 \%$
		Y	92.82	116.56	29.65		70.0	
		Z	100.00	116.45	28.94		70.0	
10031- CAA	IEEE 802.15.1 Bluetooth (GFSK, DH3)	X	100.00	116.79	26.49	1.88	100.0	$\pm 9.6 \%$
		Y	100.00	115.79	26.19		100.0	
		Z	100.00	117.41	26.65		100.0	

10032-CAA	IEEE 802.15.1 Bluetooth (GFSK, DH5)	X	100.00	123.13	28.06	1.17	100.0	± 9.6 %
		Y	100.00	116.53	25.36		100.0	
		Z	100.00	121.10	27.07		100.0	
10033-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH1)	X	15.49	93.49	25.39	5.30	70.0	± 9.6 %
		Y	12.09	89.66	24.64		70.0	
		Z	22.85	100.72	27.71		70.0	
10034-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH3)	X	11.69	94.03	24.43	1.88	100.0	± 9.6 %
		Y	5.21	81.43	20.33		100.0	
		Z	10.45	92.04	23.50		100.0	
10035-CAA	IEEE 802.15.1 Bluetooth (PI/4-DQPSK, DH5)	X	7.19	89.07	22.83	1.17	100.0	± 9.6 %
		Y	3.19	76.15	18.09		100.0	
		Z	5.32	84.13	20.72		100.0	
10036-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH1)	X	18.47	96.50	26.38	5.30	70.0	± 9.6 %
		Y	13.77	92.00	25.46		70.0	
		Z	29.42	105.03	29.00		70.0	
10037-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH3)	X	11.12	93.30	24.16	1.88	100.0	± 9.6 %
		Y	5.06	81.04	20.15		100.0	
		Z	9.78	91.13	23.19		100.0	
10038-CAA	IEEE 802.15.1 Bluetooth (8-DPSK, DH5)	X	7.70	90.38	23.33	1.17	100.0	± 9.6 %
		Y	3.27	76.73	18.38		100.0	
		Z	5.57	85.06	21.13		100.0	
10039-CAB	CDMA2000 (1xRTT, RC1)	X	3.68	82.65	21.02	0.00	150.0	± 9.6 %
		Y	1.70	69.59	15.11		150.0	
		Z	2.11	74.03	16.84		150.0	
10042-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Halfrate)	X	23.70	95.06	24.07	7.78	50.0	± 9.6 %
		Y	21.98	95.27	24.98		50.0	
		Z	100.00	116.88	29.97		50.0	
10044-CAA	IS-91/EIA/TIA-553 FDD (FDMA, FM)	X	0.00	115.10	1.28	0.00	150.0	± 9.6 %
		Y	0.01	122.01	1.58		150.0	
		Z	0.00	110.42	5.98		150.0	
10048-CAA	DECT (TDD, TDMA/FDM, GFSK, Full Slot, 24)	X	9.90	79.84	22.32	13.80	25.0	± 9.6 %
		Y	10.52	80.91	23.58		25.0	
		Z	12.94	86.06	24.76		25.0	
10049-CAA	DECT (TDD, TDMA/FDM, GFSK, Double Slot, 12)	X	11.07	83.29	22.21	10.79	40.0	± 9.6 %
		Y	11.66	84.62	23.55		40.0	
		Z	15.99	90.77	24.97		40.0	
10056-CAA	UMTS-TDD (TD-SCDMA, 1.28 Mcps)	X	11.47	84.45	23.20	9.03	50.0	± 9.6 %
		Y	11.19	84.08	23.66		50.0	
		Z	14.67	89.92	25.31		50.0	
10058-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-1-2-3)	X	10.29	88.76	28.24	6.55	100.0	± 9.6 %
		Y	9.12	85.50	27.09		100.0	
		Z	10.20	89.78	29.04		100.0	
10059-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps)	X	1.61	69.65	18.33	0.61	110.0	± 9.6 %
		Y	1.43	66.43	16.16		110.0	
		Z	1.49	68.00	17.26		110.0	
10060-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps)	X	100.00	131.01	33.54	1.30	110.0	± 9.6 %
		Y	22.84	107.12	27.36		110.0	
		Z	100.00	130.89	33.42		110.0	

10061-CAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps)	X	18.52	105.45	29.38	2.04	110.0	± 9.6 %
		Y	6.96	88.43	24.11		110.0	
		Z	15.38	103.23	28.94		110.0	
10062-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps)	X	4.90	67.27	16.85	0.49	100.0	± 9.6 %
		Y	4.89	66.79	16.55		100.0	
		Z	4.81	67.12	16.71		100.0	
10063-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps)	X	4.93	67.42	16.97	0.72	100.0	± 9.6 %
		Y	4.94	66.96	16.70		100.0	
		Z	4.85	67.28	16.85		100.0	
10064-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps)	X	5.27	67.73	17.21	0.86	100.0	± 9.6 %
		Y	5.30	67.34	16.98		100.0	
		Z	5.17	67.59	17.11		100.0	
10065-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps)	X	5.17	67.74	17.34	1.21	100.0	± 9.6 %
		Y	5.20	67.39	17.15		100.0	
		Z	5.08	67.64	17.28		100.0	
10066-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps)	X	5.22	67.85	17.55	1.46	100.0	± 9.6 %
		Y	5.26	67.54	17.39		100.0	
		Z	5.14	67.77	17.52		100.0	
10067-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps)	X	5.52	67.92	17.94	2.04	100.0	± 9.6 %
		Y	5.59	67.70	17.86		100.0	
		Z	5.46	67.96	17.98		100.0	
10068-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps)	X	5.67	68.31	18.30	2.55	100.0	± 9.6 %
		Y	5.76	68.13	18.25		100.0	
		Z	5.59	68.29	18.34		100.0	
10069-CAC	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps)	X	5.74	68.18	18.44	2.67	100.0	± 9.6 %
		Y	5.83	68.02	18.41		100.0	
		Z	5.67	68.25	18.53		100.0	
10071-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 9 Mbps)	X	5.29	67.59	17.79	1.99	100.0	± 9.6 %
		Y	5.34	67.32	17.67		100.0	
		Z	5.24	67.60	17.81		100.0	
10072-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 12 Mbps)	X	5.36	68.17	18.10	2.30	100.0	± 9.6 %
		Y	5.42	67.91	18.00		100.0	
		Z	5.30	68.17	18.14		100.0	
10073-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 18 Mbps)	X	5.49	68.49	18.48	2.83	100.0	± 9.6 %
		Y	5.57	68.29	18.43		100.0	
		Z	5.44	68.53	18.57		100.0	
10074-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 24 Mbps)	X	5.52	68.57	18.73	3.30	100.0	± 9.6 %
		Y	5.62	68.40	18.71		100.0	
		Z	5.48	68.62	18.83		100.0	
10075-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 36 Mbps)	X	5.69	69.08	19.21	3.82	90.0	± 9.6 %
		Y	5.81	68.98	19.24		90.0	
		Z	5.63	69.10	19.33		90.0	
10076-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 48 Mbps)	X	5.69	68.85	19.30	4.15	90.0	± 9.6 %
		Y	5.82	68.76	19.35		90.0	
		Z	5.65	68.92	19.46		90.0	
10077-CAB	IEEE 802.11g WiFi 2.4 GHz (DSSS/OFDM, 54 Mbps)	X	5.73	68.94	19.41	4.30	90.0	± 9.6 %
		Y	5.86	68.86	19.45		90.0	
		Z	5.70	69.02	19.57		90.0	

10081-CAB	CDMA2000 (1xRTT, RC3)	X	1.50	74.73	17.78	0.00	150.0	± 9.6 %
		Y	0.85	64.97	12.38		150.0	
		Z	0.93	67.53	13.57		150.0	
10082-CAB	IS-54 / IS-136 FDD (TDMA/FDM, PI/4-DQPSK, Fullrate)	X	2.13	63.53	8.53	4.77	80.0	± 9.6 %
		Y	2.34	64.23	9.30		80.0	
		Z	2.05	63.65	8.54		80.0	
10090-DAC	GPRS-FDD (TDMA, GMSK, TN 0-4)	X	49.50	106.58	27.22	6.56	60.0	± 9.6 %
		Y	40.33	105.69	27.94		60.0	
		Z	100.00	118.15	30.33		60.0	
10097-CAB	UMTS-FDD (HSDPA)	X	2.07	70.20	17.39	0.00	150.0	± 9.6 %
		Y	1.76	66.51	15.04		150.0	
		Z	1.86	68.23	16.00		150.0	
10098-CAB	UMTS-FDD (HSUPA, Subtest 2)	X	2.03	70.21	17.38	0.00	150.0	± 9.6 %
		Y	1.72	66.45	14.99		150.0	
		Z	1.83	68.21	15.97		150.0	
10099-DAC	EDGE-FDD (TDMA, 8PSK, TN 0-4)	X	18.31	99.80	33.74	9.56	60.0	± 9.6 %
		Y	15.30	94.94	32.23		60.0	
		Z	21.61	105.78	36.38		60.0	
10100-CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	3.71	73.39	18.12	0.00	150.0	± 9.6 %
		Y	3.14	69.82	16.14		150.0	
		Z	3.27	71.18	16.96		150.0	
10101-CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	3.51	69.02	16.73	0.00	150.0	± 9.6 %
		Y	3.32	67.43	15.69		150.0	
		Z	3.32	68.05	16.10		150.0	
10102-CAE	LTE-FDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	3.59	68.86	16.77	0.00	150.0	± 9.6 %
		Y	3.42	67.38	15.79		150.0	
		Z	3.42	67.96	16.18		150.0	
10103-CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK)	X	8.68	77.91	20.86	3.98	65.0	± 9.6 %
		Y	8.39	76.97	20.64		65.0	
		Z	8.88	79.01	21.52		65.0	
10104-CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM)	X	8.68	76.81	21.30	3.98	65.0	± 9.6 %
		Y	8.50	76.03	21.10		65.0	
		Z	8.59	77.26	21.68		65.0	
10105-CAG	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM)	X	8.09	75.44	21.00	3.98	65.0	± 9.6 %
		Y	7.65	73.94	20.48		65.0	
		Z	7.67	75.03	21.01		65.0	
10108-CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	3.25	72.47	17.95	0.00	150.0	± 9.6 %
		Y	2.79	69.04	15.96		150.0	
		Z	2.87	70.38	16.80		150.0	
10109-CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	3.18	68.93	16.75	0.00	150.0	± 9.6 %
		Y	2.99	67.17	15.59		150.0	
		Z	2.98	67.88	16.03		150.0	
10110-CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	2.67	71.57	17.72	0.00	150.0	± 9.6 %
		Y	2.28	68.03	15.59		150.0	
		Z	2.34	69.49	16.47		150.0	
10111-CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	2.93	69.90	17.29	0.00	150.0	± 9.6 %
		Y	2.67	67.50	15.78		150.0	
		Z	2.69	68.60	16.34		150.0	

10112-CAG	LTE-FDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	3.29	68.76	16.73	0.00	150.0	± 9.6 %
		Y	3.11	67.13	15.65		150.0	
		Z	3.10	67.82	16.07		150.0	
10113-CAG	LTE-FDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	3.07	69.85	17.32	0.00	150.0	± 9.6 %
		Y	2.83	67.62	15.92		150.0	
		Z	2.84	68.68	16.45		150.0	
10114-CAC	IEEE 802.11n (HT Greenfield, 13.5 Mbps, BPSK)	X	5.26	67.69	16.67	0.00	150.0	± 9.6 %
		Y	5.23	67.13	16.29		150.0	
		Z	5.17	67.44	16.47		150.0	
10115-CAC	IEEE 802.11n (HT Greenfield, 81 Mbps, 16-QAM)	X	5.63	67.96	16.80	0.00	150.0	± 9.6 %
		Y	5.62	67.49	16.48		150.0	
		Z	5.52	67.74	16.63		150.0	
10116-CAC	IEEE 802.11n (HT Greenfield, 135 Mbps, 64-QAM)	X	5.39	67.95	16.72	0.00	150.0	± 9.6 %
		Y	5.36	67.40	16.35		150.0	
		Z	5.29	67.69	16.52		150.0	
10117-CAC	IEEE 802.11n (HT Mixed, 13.5 Mbps, BPSK)	X	5.27	67.71	16.70	0.00	150.0	± 9.6 %
		Y	5.24	67.16	16.33		150.0	
		Z	5.16	67.39	16.47		150.0	
10118-CAC	IEEE 802.11n (HT Mixed, 81 Mbps, 16-QAM)	X	5.69	68.10	16.87	0.00	150.0	± 9.6 %
		Y	5.66	67.55	16.52		150.0	
		Z	5.60	67.91	16.73		150.0	
10119-CAC	IEEE 802.11n (HT Mixed, 135 Mbps, 64-QAM)	X	5.36	67.90	16.71	0.00	150.0	± 9.6 %
		Y	5.33	67.36	16.35		150.0	
		Z	5.26	67.63	16.50		150.0	
10140-CAE	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	3.65	68.85	16.68	0.00	150.0	± 9.6 %
		Y	3.47	67.39	15.72		150.0	
		Z	3.46	67.97	16.10		150.0	
10141-CAE	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	3.76	68.83	16.80	0.00	150.0	± 9.6 %
		Y	3.60	67.45	15.88		150.0	
		Z	3.58	68.02	16.25		150.0	
10142-CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	2.48	71.91	17.76	0.00	150.0	± 9.6 %
		Y	2.05	67.79	15.33		150.0	
		Z	2.12	69.52	16.24		150.0	
10143-CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	2.90	71.18	17.49	0.00	150.0	± 9.6 %
		Y	2.52	67.93	15.59		150.0	
		Z	2.57	69.41	16.20		150.0	
10144-CAE	LTE-FDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	2.62	68.68	15.85	0.00	150.0	± 9.6 %
		Y	2.38	66.30	14.35		150.0	
		Z	2.36	67.27	14.69		150.0	
10145-CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	2.00	71.99	16.45	0.00	150.0	± 9.6 %
		Y	1.42	65.89	13.07		150.0	
		Z	1.41	66.95	13.17		150.0	
10146-CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	5.79	80.59	18.98	0.00	150.0	± 9.6 %
		Y	3.05	71.20	15.41		150.0	
		Z	3.43	73.13	15.30		150.0	
10147-CAF	LTE-FDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	9.98	88.43	21.82	0.00	150.0	± 9.6 %
		Y	3.72	74.13	16.84		150.0	
		Z	4.87	77.77	17.26		150.0	

10149-CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	3.19	69.00	16.80	0.00	150.0	± 9.6 %
		Y	3.00	67.22	15.63		150.0	
		Z	2.99	67.94	16.08		150.0	
10150-CAE	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	3.30	68.82	16.78	0.00	150.0	± 9.6 %
		Y	3.12	67.17	15.69		150.0	
		Z	3.11	67.87	16.11		150.0	
10151-CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	9.20	80.06	21.79	3.98	65.0	± 9.6 %
		Y	8.68	78.68	21.42		65.0	
		Z	9.50	81.45	22.55		65.0	
10152-CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM)	X	8.32	76.99	21.17	3.98	65.0	± 9.6 %
		Y	8.10	76.11	20.95		65.0	
		Z	8.24	77.53	21.54		65.0	
10153-CAG	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM)	X	8.68	77.73	21.81	3.98	65.0	± 9.6 %
		Y	8.45	76.81	21.57		65.0	
		Z	8.63	78.31	22.20		65.0	
10154-CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	2.76	72.22	18.09	0.00	150.0	± 9.6 %
		Y	2.34	68.47	15.87		150.0	
		Z	2.39	69.94	16.75		150.0	
10155-CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	2.93	69.90	17.30	0.00	150.0	± 9.6 %
		Y	2.67	67.50	15.78		150.0	
		Z	2.69	68.61	16.35		150.0	
10156-CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	2.40	72.73	18.02	0.00	150.0	± 9.6 %
		Y	1.91	67.88	15.23		150.0	
		Z	1.98	69.77	16.17		150.0	
10157-CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	2.54	69.89	16.32	0.00	150.0	± 9.6 %
		Y	2.20	66.71	14.41		150.0	
		Z	2.21	67.97	14.84		150.0	
10158-CAG	LTE-FDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	3.08	69.91	17.37	0.00	150.0	± 9.6 %
		Y	2.83	67.66	15.96		150.0	
		Z	2.85	68.73	16.49		150.0	
10159-CAG	LTE-FDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	2.68	70.46	16.65	0.00	150.0	± 9.6 %
		Y	2.30	67.13	14.70		150.0	
		Z	2.33	68.43	15.13		150.0	
10160-CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	3.08	70.59	17.38	0.00	150.0	± 9.6 %
		Y	2.80	68.13	15.84		150.0	
		Z	2.83	69.23	16.52		150.0	
10161-CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	3.19	68.74	16.75	0.00	150.0	± 9.6 %
		Y	3.01	67.04	15.62		150.0	
		Z	3.00	67.79	16.05		150.0	
10162-CAE	LTE-FDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	3.29	68.74	16.78	0.00	150.0	± 9.6 %
		Y	3.12	67.09	15.70		150.0	
		Z	3.11	67.88	16.13		150.0	
10166-CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	4.20	71.91	20.30	3.01	150.0	± 9.6 %
		Y	3.97	69.88	19.20		150.0	
		Z	4.01	71.48	20.04		150.0	
10167-CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	5.82	76.43	21.33	3.01	150.0	± 9.6 %
		Y	5.06	72.83	19.70		150.0	
		Z	5.46	75.92	21.03		150.0	

10168-CAF	LTE-FDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	6.57	79.03	22.72	3.01	150.0	± 9.6 %
		Y	5.52	74.71	20.84		150.0	
		Z	6.17	78.53	22.43		150.0	
10169-CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	4.18	75.15	21.66	3.01	150.0	± 9.6 %
		Y	3.68	71.43	19.79		150.0	
		Z	3.71	73.29	20.84		150.0	
10170-CAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	8.28	87.06	25.72	3.01	150.0	± 9.6 %
		Y	5.41	77.71	22.06		150.0	
		Z	6.71	83.81	24.55		150.0	
10171-AAE	LTE-FDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	5.78	79.38	21.89	3.01	150.0	± 9.6 %
		Y	4.38	73.23	19.30		150.0	
		Z	4.93	77.24	21.04		150.0	
10172-CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK)	X	34.48	110.68	33.22	6.02	65.0	± 9.6 %
		Y	19.27	99.23	30.20		65.0	
		Z	64.25	125.69	37.96		65.0	
10173-CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM)	X	43.93	109.49	31.07	6.02	65.0	± 9.6 %
		Y	20.84	96.83	28.02		65.0	
		Z	100.00	126.58	36.03		65.0	
10174-CAG	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM)	X	30.93	102.12	28.52	6.02	65.0	± 9.6 %
		Y	17.32	92.53	26.25		65.0	
		Z	61.98	116.33	32.90		65.0	
10175-CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	4.10	74.63	21.33	3.01	150.0	± 9.6 %
		Y	3.62	71.04	19.52		150.0	
		Z	3.65	72.87	20.55		150.0	
10176-CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	8.30	87.09	25.74	3.01	150.0	± 9.6 %
		Y	5.42	77.74	22.07		150.0	
		Z	6.72	83.85	24.57		150.0	
10177-CAI	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	4.15	74.88	21.47	3.01	150.0	± 9.6 %
		Y	3.66	71.24	19.64		150.0	
		Z	3.69	73.07	20.66		150.0	
10178-CAG	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	8.06	86.52	25.50	3.01	150.0	± 9.6 %
		Y	5.33	77.40	21.91		150.0	
		Z	6.59	83.44	24.39		150.0	
10179-CAG	LTE-FDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	6.83	82.82	23.58	3.01	150.0	± 9.6 %
		Y	4.83	75.24	20.50		150.0	
		Z	5.71	80.26	22.61		150.0	
10180-CAG	LTE-FDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	5.73	79.20	21.80	3.01	150.0	± 9.6 %
		Y	4.36	73.12	19.23		150.0	
		Z	4.90	77.11	20.97		150.0	
10181-CAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	4.14	74.86	21.46	3.01	150.0	± 9.6 %
		Y	3.65	71.22	19.63		150.0	
		Z	3.68	73.05	20.65		150.0	
10182-CAE	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	8.05	86.48	25.49	3.01	150.0	± 9.6 %
		Y	5.32	77.37	21.89		150.0	
		Z	6.57	83.40	24.38		150.0	
10183-AAD	LTE-FDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	5.72	79.16	21.78	3.01	150.0	± 9.6 %
		Y	4.35	73.09	19.22		150.0	
		Z	4.89	77.08	20.96		150.0	

10184-CAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	4.16	74.92	21.48	3.01	150.0	± 9.6 %
		Y	3.67	71.26	19.65		150.0	
		Z	3.70	73.10	20.68		150.0	
10185-CAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	8.10	86.60	25.54	3.01	150.0	± 9.6 %
		Y	5.35	77.45	21.93		150.0	
		Z	6.62	83.51	24.42		150.0	
10186-AAE	LTE-FDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	5.76	79.27	21.83	3.01	150.0	± 9.6 %
		Y	4.38	73.16	19.26		150.0	
		Z	4.92	77.18	21.00		150.0	
10187-CAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	4.17	74.96	21.54	3.01	150.0	± 9.6 %
		Y	3.67	71.29	19.69		150.0	
		Z	3.71	73.16	20.74		150.0	
10188-CAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	8.67	87.99	26.14	3.01	150.0	± 9.6 %
		Y	5.56	78.25	22.35		150.0	
		Z	6.98	84.62	24.93		150.0	
10189-AAF	LTE-FDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	5.99	80.05	22.22	3.01	150.0	± 9.6 %
		Y	4.49	73.64	19.55		150.0	
		Z	5.09	77.84	21.35		150.0	
10193-CAC	IEEE 802.11n (HT Greenfield, 6.5 Mbps, BPSK)	X	4.70	67.14	16.49	0.00	150.0	± 9.6 %
		Y	4.65	66.50	16.06		150.0	
		Z	4.58	66.86	16.22		150.0	
10194-CAC	IEEE 802.11n (HT Greenfield, 39 Mbps, 16-QAM)	X	4.90	67.52	16.60	0.00	150.0	± 9.6 %
		Y	4.86	66.88	16.17		150.0	
		Z	4.77	67.20	16.34		150.0	
10195-CAC	IEEE 802.11n (HT Greenfield, 65 Mbps, 64-QAM)	X	4.94	67.52	16.60	0.00	150.0	± 9.6 %
		Y	4.90	66.89	16.18		150.0	
		Z	4.81	67.23	16.35		150.0	
10196-CAC	IEEE 802.11n (HT Mixed, 6.5 Mbps, BPSK)	X	4.72	67.25	16.53	0.00	150.0	± 9.6 %
		Y	4.68	66.61	16.10		150.0	
		Z	4.60	66.94	16.25		150.0	
10197-CAC	IEEE 802.11n (HT Mixed, 39 Mbps, 16-QAM)	X	4.91	67.54	16.61	0.00	150.0	± 9.6 %
		Y	4.87	66.90	16.18		150.0	
		Z	4.78	67.23	16.35		150.0	
10198-CAC	IEEE 802.11n (HT Mixed, 65 Mbps, 64-QAM)	X	4.94	67.54	16.61	0.00	150.0	± 9.6 %
		Y	4.90	66.90	16.19		150.0	
		Z	4.81	67.24	16.37		150.0	
10219-CAC	IEEE 802.11n (HT Mixed, 7.2 Mbps, BPSK)	X	4.67	67.27	16.50	0.00	150.0	± 9.6 %
		Y	4.63	66.62	16.06		150.0	
		Z	4.54	66.96	16.22		150.0	
10220-CAC	IEEE 802.11n (HT Mixed, 43.3 Mbps, 16-QAM)	X	4.91	67.53	16.61	0.00	150.0	± 9.6 %
		Y	4.87	66.90	16.18		150.0	
		Z	4.78	67.21	16.35		150.0	
10221-CAC	IEEE 802.11n (HT Mixed, 72.2 Mbps, 64-QAM)	X	4.95	67.46	16.60	0.00	150.0	± 9.6 %
		Y	4.91	66.85	16.18		150.0	
		Z	4.82	67.17	16.35		150.0	
10222-CAC	IEEE 802.11n (HT Mixed, 15 Mbps, BPSK)	X	5.25	67.74	16.71	0.00	150.0	± 9.6 %
		Y	5.22	67.19	16.33		150.0	
		Z	5.14	67.40	16.47		150.0	

10223-CAC	IEEE 802.11n (HT Mixed, 90 Mbps, 16-QAM)	X	5.62	68.04	16.87	0.00	150.0	± 9.6 %
		Y	5.61	67.57	16.55		150.0	
		Z	5.46	67.62	16.59		150.0	
10224-CAC	IEEE 802.11n (HT Mixed, 150 Mbps, 64-QAM)	X	5.30	67.86	16.69	0.00	150.0	± 9.6 %
		Y	5.27	67.29	16.31		150.0	
		Z	5.18	67.50	16.44		150.0	
10225-CAB	UMTS-FDD (HSPA+)	X	3.00	67.11	16.18	0.00	150.0	± 9.6 %
		Y	2.89	65.79	15.26		150.0	
		Z	2.86	66.46	15.54		150.0	
10226-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM)	X	47.57	111.04	31.57	6.02	65.0	± 9.6 %
		Y	21.77	97.71	28.37		65.0	
		Z	100.00	126.78	36.17		65.0	
10227-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM)	X	33.21	103.47	29.00	6.02	65.0	± 9.6 %
		Y	18.61	93.88	26.76		65.0	
		Z	72.01	119.09	33.69		65.0	
10228-CAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK)	X	43.41	115.45	34.63	6.02	65.0	± 9.6 %
		Y	21.18	101.54	31.02		65.0	
		Z	73.36	128.78	38.85		65.0	
10229-CAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM)	X	43.98	109.51	31.08	6.02	65.0	± 9.6 %
		Y	20.89	96.85	28.04		65.0	
		Z	100.00	126.58	36.04		65.0	
10230-CAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM)	X	31.28	102.35	28.60	6.02	65.0	± 9.6 %
		Y	17.95	93.18	26.47		65.0	
		Z	65.65	117.34	33.17		65.0	
10231-CAC	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK)	X	40.51	113.99	34.16	6.02	65.0	± 9.6 %
		Y	20.32	100.64	30.68		65.0	
		Z	66.72	126.73	38.25		65.0	
10232-CAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM)	X	43.98	109.51	31.08	6.02	65.0	± 9.6 %
		Y	20.87	96.85	28.04		65.0	
		Z	100.00	126.58	36.04		65.0	
10233-CAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM)	X	31.31	102.37	28.61	6.02	65.0	± 9.6 %
		Y	17.95	93.19	26.47		65.0	
		Z	65.78	117.38	33.18		65.0	
10234-CAF	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK)	X	37.61	112.37	33.61	6.02	65.0	± 9.6 %
		Y	19.46	99.66	30.29		65.0	
		Z	60.59	124.57	37.59		65.0	
10235-CAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM)	X	44.16	109.59	31.10	6.02	65.0	± 9.6 %
		Y	20.90	96.88	28.05		65.0	
		Z	100.00	126.59	36.05		65.0	
10236-CAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM)	X	31.57	102.49	28.64	6.02	65.0	± 9.6 %
		Y	18.06	93.27	26.50		65.0	
		Z	66.68	117.58	33.22		65.0	
10237-CAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK)	X	40.98	114.23	34.22	6.02	65.0	± 9.6 %
		Y	20.43	100.76	30.72		65.0	
		Z	67.89	127.10	38.35		65.0	
10238-CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM)	X	44.02	109.54	31.08	6.02	65.0	± 9.6 %
		Y	20.87	96.85	28.04		65.0	
		Z	100.00	126.59	36.04		65.0	

10239-CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM)	X	31.34	102.40	28.62	6.02	65.0	± 9.6 %
		Y	17.95	93.19	26.48		65.0	
		Z	65.90	117.43	33.19		65.0	
10240-CAF	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK)	X	40.84	114.17	34.21	6.02	65.0	± 9.6 %
		Y	20.37	100.72	30.70		65.0	
		Z	67.60	127.02	38.33		65.0	
10241-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM)	X	13.50	87.98	27.59	6.98	65.0	± 9.6 %
		Y	11.90	84.56	26.53		65.0	
		Z	14.12	90.28	28.72		65.0	
10242-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM)	X	13.27	87.58	27.38	6.98	65.0	± 9.6 %
		Y	11.12	83.03	25.85		65.0	
		Z	12.87	88.25	27.90		65.0	
10243-CAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK)	X	9.24	81.69	25.97	6.98	65.0	± 9.6 %
		Y	9.29	80.98	25.85		65.0	
		Z	9.97	84.60	27.47		65.0	
10244-CAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	10.07	81.06	21.15	3.98	65.0	± 9.6 %
		Y	9.37	79.84	21.15		65.0	
		Z	10.40	82.17	21.43		65.0	
10245-CAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	9.92	80.58	20.93	3.98	65.0	± 9.6 %
		Y	9.29	79.47	20.97		65.0	
		Z	10.13	81.50	21.13		65.0	
10246-CAC	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	9.36	82.64	21.70	3.98	65.0	± 9.6 %
		Y	8.42	80.73	21.28		65.0	
		Z	9.87	84.16	22.17		65.0	
10247-CAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM)	X	7.85	77.75	20.44	3.98	65.0	± 9.6 %
		Y	7.56	76.79	20.29		65.0	
		Z	7.78	78.21	20.53		65.0	
10248-CAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM)	X	7.84	77.28	20.24	3.98	65.0	± 9.6 %
		Y	7.59	76.41	20.13		65.0	
		Z	7.72	77.63	20.29		65.0	
10249-CAF	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK)	X	10.16	84.10	22.78	3.98	65.0	± 9.6 %
		Y	9.02	81.83	22.19		65.0	
		Z	11.03	86.34	23.62		65.0	
10250-CAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM)	X	8.66	79.41	22.21	3.98	65.0	± 9.6 %
		Y	8.28	78.20	21.90		65.0	
		Z	8.69	80.22	22.63		65.0	
10251-CAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM)	X	8.19	77.31	21.11	3.98	65.0	± 9.6 %
		Y	7.93	76.33	20.88		65.0	
		Z	8.16	77.97	21.45		65.0	
10252-CAF	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK)	X	9.91	83.04	22.96	3.98	65.0	± 9.6 %
		Y	9.02	81.03	22.39		65.0	
		Z	10.55	85.09	23.89		65.0	
10253-CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM)	X	8.10	76.42	20.99	3.98	65.0	± 9.6 %
		Y	7.91	75.57	20.78		65.0	
		Z	8.03	76.94	21.33		65.0	
10254-CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM)	X	8.47	77.16	21.59	3.98	65.0	± 9.6 %
		Y	8.27	76.28	21.37		65.0	
		Z	8.42	77.71	21.94		65.0	

10255-CAF	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK)	X	8.92	79.74	21.91	3.98	65.0	± 9.6 %
		Y	8.44	78.38	21.54		65.0	
		Z	9.16	81.05	22.63		65.0	
10256-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM)	X	8.96	78.82	19.56	3.98	65.0	± 9.6 %
		Y	8.66	78.38	19.92		65.0	
		Z	8.87	79.14	19.45		65.0	
10257-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM)	X	8.76	78.15	19.23	3.98	65.0	± 9.6 %
		Y	8.57	77.86	19.65		65.0	
		Z	8.54	78.21	19.01		65.0	
10258-CAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK)	X	8.23	80.27	20.30	3.98	65.0	± 9.6 %
		Y	7.69	79.06	20.18		65.0	
		Z	8.13	80.56	20.22		65.0	
10259-CAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM)	X	8.16	78.29	21.04	3.98	65.0	± 9.6 %
		Y	7.83	77.23	20.83		65.0	
		Z	8.14	78.91	21.27		65.0	
10260-CAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM)	X	8.18	78.05	20.97	3.98	65.0	± 9.6 %
		Y	7.89	77.07	20.79		65.0	
		Z	8.12	78.59	21.15		65.0	
10261-CAC	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK)	X	9.70	83.10	22.69	3.98	65.0	± 9.6 %
		Y	8.75	81.03	22.13		65.0	
		Z	10.33	85.06	23.50		65.0	
10262-CAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM)	X	8.65	79.37	22.18	3.98	65.0	± 9.6 %
		Y	8.27	78.16	21.87		65.0	
		Z	8.68	80.17	22.59		65.0	
10263-CAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM)	X	8.18	77.31	21.11	3.98	65.0	± 9.6 %
		Y	7.93	76.34	20.88		65.0	
		Z	8.15	77.96	21.45		65.0	
10264-CAF	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK)	X	9.85	82.90	22.89	3.98	65.0	± 9.6 %
		Y	8.97	80.91	22.33		65.0	
		Z	10.47	84.92	23.82		65.0	
10265-CAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM)	X	8.32	77.00	21.17	3.98	65.0	± 9.6 %
		Y	8.10	76.11	20.95		65.0	
		Z	8.24	77.53	21.55		65.0	
10266-CAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM)	X	8.68	77.72	21.80	3.98	65.0	± 9.6 %
		Y	8.45	76.80	21.57		65.0	
		Z	8.63	78.31	22.20		65.0	
10267-CAF	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK)	X	9.19	80.02	21.78	3.98	65.0	± 9.6 %
		Y	8.67	78.65	21.41		65.0	
		Z	9.48	81.42	22.54		65.0	
10268-CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM)	X	8.76	76.52	21.32	3.98	65.0	± 9.6 %
		Y	8.60	75.79	21.15		65.0	
		Z	8.66	76.94	21.68		65.0	
10269-CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM)	X	8.68	76.12	21.24	3.98	65.0	± 9.6 %
		Y	8.54	75.43	21.08		65.0	
		Z	8.58	76.51	21.57		65.0	
10270-CAF	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	8.76	77.59	20.98	3.98	65.0	± 9.6 %
		Y	8.48	76.66	20.76		65.0	
		Z	8.82	78.43	21.53		65.0	

10274-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.10)	X	2.75	67.54	16.13	0.00	150.0	± 9.6 %
		Y	2.59	65.84	14.97		150.0	
		Z	2.62	66.79	15.44		150.0	
10275-CAB	UMTS-FDD (HSUPA, Subtest 5, 3GPP Rel8.4)	X	1.98	71.72	17.77	0.00	150.0	± 9.6 %
		Y	1.57	66.85	14.80		150.0	
		Z	1.68	68.85	15.99		150.0	
10277-CAA	PHS (QPSK)	X	5.52	68.98	13.68	9.03	50.0	± 9.6 %
		Y	6.18	70.61	15.13		50.0	
		Z	5.33	69.04	13.51		50.0	
10278-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.5)	X	8.68	78.27	19.91	9.03	50.0	± 9.6 %
		Y	9.24	79.43	21.04		50.0	
		Z	9.06	79.61	20.36		50.0	
10279-CAA	PHS (QPSK, BW 884MHz, Rolloff 0.38)	X	8.84	78.47	20.00	9.03	50.0	± 9.6 %
		Y	9.40	79.62	21.12		50.0	
		Z	9.21	79.79	20.45		50.0	
10290-AAB	CDMA2000, RC1, SO55, Full Rate	X	2.53	76.75	18.53	0.00	150.0	± 9.6 %
		Y	1.47	67.51	13.90		150.0	
		Z	1.65	70.41	15.02		150.0	
10291-AAB	CDMA2000, RC3, SO55, Full Rate	X	1.44	74.15	17.52	0.00	150.0	± 9.6 %
		Y	0.84	64.78	12.27		150.0	
		Z	0.91	67.24	13.41		150.0	
10292-AAB	CDMA2000, RC3, SO32, Full Rate	X	2.94	86.43	22.66	0.00	150.0	± 9.6 %
		Y	0.94	67.21	13.88		150.0	
		Z	1.25	72.55	16.26		150.0	
10293-AAB	CDMA2000, RC3, SO3, Full Rate	X	8.52	104.26	28.75	0.00	150.0	± 9.6 %
		Y	1.19	70.50	15.89		150.0	
		Z	2.08	80.22	19.81		150.0	
10295-AAB	CDMA2000, RC1, SO3, 1/8th Rate 25 fr.	X	9.77	81.63	23.08	9.03	50.0	± 9.6 %
		Y	9.82	81.44	23.46		50.0	
		Z	11.19	84.96	24.41		50.0	
10297-AAD	LTE-FDD (SC-FDMA, 50% RB, 20 MHz, QPSK)	X	3.27	72.60	18.02	0.00	150.0	± 9.6 %
		Y	2.80	69.13	16.02		150.0	
		Z	2.88	70.48	16.86		150.0	
10298-AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, QPSK)	X	2.28	73.12	17.57	0.00	150.0	± 9.6 %
		Y	1.68	67.21	14.31		150.0	
		Z	1.73	69.06	15.02		150.0	
10299-AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM)	X	5.83	80.69	19.80	0.00	150.0	± 9.6 %
		Y	3.42	72.22	16.49		150.0	
		Z	4.30	76.07	17.39		150.0	
10300-AAD	LTE-FDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM)	X	3.42	71.78	15.52	0.00	150.0	± 9.6 %
		Y	2.69	67.85	13.82		150.0	
		Z	2.73	68.87	13.61		150.0	
10301-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC)	X	5.57	67.67	18.57	4.17	80.0	± 9.6 %
		Y	5.78	67.86	18.57		80.0	
		Z	5.72	68.56	18.87		80.0	
10302-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, QPSK, PUSC, 3 CTRL symbols)	X	6.16	68.78	19.58	4.96	80.0	± 9.6 %
		Y	6.30	68.51	19.30		80.0	
		Z	6.18	69.12	19.60		80.0	

10303-AAA	IEEE 802.16e WiMAX (31:15, 5ms, 10MHz, 64QAM, PUSC)	X	6.02	68.90	19.67	4.96	80.0	± 9.6 %
		Y	6.17	68.65	19.39		80.0	
		Z	6.04	69.21	19.66		80.0	
10304-AAA	IEEE 802.16e WiMAX (29:18, 5ms, 10MHz, 64QAM, PUSC)	X	5.66	68.19	18.86	4.17	80.0	± 9.6 %
		Y	5.77	67.85	18.54		80.0	
		Z	5.66	68.44	18.81		80.0	
10305-AAA	IEEE 802.16e WiMAX (31:15, 10ms, 10MHz, 64QAM, PUSC, 15 symbols)	X	7.03	75.37	23.25	6.02	50.0	± 9.6 %
		Y	9.48	82.40	26.40		50.0	
		Z	9.45	83.47	26.75		50.0	
10306-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 64QAM, PUSC, 18 symbols)	X	6.41	71.60	21.68	6.02	50.0	± 9.6 %
		Y	6.61	71.33	21.32		50.0	
		Z	6.53	72.26	21.74		50.0	
10307-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, PUSC, 18 symbols)	X	6.53	72.42	21.88	6.02	50.0	± 9.6 %
		Y	6.71	72.00	21.44		50.0	
		Z	6.64	73.01	21.90		50.0	
10308-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, PUSC)	X	6.58	72.85	22.10	6.02	50.0	± 9.6 %
		Y	7.88	77.20	24.23		50.0	
		Z	6.72	73.52	22.14		50.0	
10309-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, 16QAM, AMC 2x3, 18 symbols)	X	6.53	71.94	21.86	6.02	50.0	± 9.6 %
		Y	6.73	71.62	21.48		50.0	
		Z	6.64	72.61	21.93		50.0	
10310-AAA	IEEE 802.16e WiMAX (29:18, 10ms, 10MHz, QPSK, AMC 2x3, 18 symbols)	X	6.43	71.87	21.71	6.02	50.0	± 9.6 %
		Y	6.62	71.53	21.32		50.0	
		Z	6.55	72.54	21.77		50.0	
10311-AAD	LTE-FDD (SC-FDMA, 100% RB, 15 MHz, QPSK)	X	3.66	71.76	17.57	0.00	150.0	± 9.6 %
		Y	3.14	68.49	15.73		150.0	
		Z	3.24	69.73	16.49		150.0	
10313-AAA	IDEN 1:3	X	6.89	76.52	17.70	6.99	70.0	± 9.6 %
		Y	6.61	75.87	17.81		70.0	
		Z	7.80	79.06	18.82		70.0	
10314-AAA	IDEN 1:6	X	8.95	82.07	22.06	10.00	30.0	± 9.6 %
		Y	7.91	79.82	21.63		30.0	
		Z	10.67	86.11	23.72		30.0	
10315-AAB	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 96pc duty cycle)	X	1.22	66.52	17.02	0.17	150.0	± 9.6 %
		Y	1.11	63.83	14.85		150.0	
		Z	1.15	65.06	15.82		150.0	
10316-AAB	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 96pc duty cycle)	X	4.79	67.26	16.63	0.17	150.0	± 9.6 %
		Y	4.77	66.71	16.27		150.0	
		Z	4.69	67.06	16.44		150.0	
10317-AAC	IEEE 802.11a WiFi 5 GHz (OFDM, 6 Mbps, 96pc duty cycle)	X	4.79	67.26	16.63	0.17	150.0	± 9.6 %
		Y	4.77	66.71	16.27		150.0	
		Z	4.69	67.06	16.44		150.0	
10400-AAD	IEEE 802.11ac WiFi (20MHz, 64-QAM, 99pc duty cycle)	X	4.91	67.58	16.59	0.00	150.0	± 9.6 %
		Y	4.87	66.94	16.16		150.0	
		Z	4.77	67.27	16.35		150.0	
10401-AAD	IEEE 802.11ac WiFi (40MHz, 64-QAM, 99pc duty cycle)	X	5.51	67.53	16.59	0.00	150.0	± 9.6 %
		Y	5.48	67.02	16.26		150.0	
		Z	5.43	67.39	16.46		150.0	

10402-AAD	IEEE 802.11ac WiFi (80MHz, 64-QAM, 99pc duty cycle)	X	5.82	68.12	16.73	0.00	150.0	± 9.6 %
		Y	5.79	67.61	16.40		150.0	
		Z	5.71	67.82	16.52		150.0	
10403-AAB	CDMA2000 (1xEV-DO, Rev. 0)	X	2.53	76.75	18.53	0.00	115.0	± 9.6 %
		Y	1.47	67.51	13.90		115.0	
		Z	1.65	70.41	15.02		115.0	
10404-AAB	CDMA2000 (1xEV-DO, Rev. A)	X	2.53	76.75	18.53	0.00	115.0	± 9.6 %
		Y	1.47	67.51	13.90		115.0	
		Z	1.65	70.41	15.02		115.0	
10406-AAB	CDMA2000, RC3, SO32, SCH0, Full Rate	X	100.00	121.33	30.70	0.00	100.0	± 9.6 %
		Y	17.68	98.28	25.62		100.0	
		Z	100.00	119.36	29.52		100.0	
10410-AAF	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9, Subframe Conf=4)	X	100.00	117.12	29.14	3.23	80.0	± 9.6 %
		Y	100.00	119.43	30.56		80.0	
		Z	100.00	119.33	29.99		80.0	
10415-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 99pc duty cycle)	X	1.05	64.70	16.09	0.00	150.0	± 9.6 %
		Y	0.96	62.34	13.96		150.0	
		Z	1.00	63.43	14.88		150.0	
10416-AAA	IEEE 802.11g WiFi 2.4 GHz (ERP-OFDM, 6 Mbps, 99pc duty cycle)	X	4.70	67.17	16.53	0.00	150.0	± 9.6 %
		Y	4.65	66.53	16.09		150.0	
		Z	4.59	66.90	16.28		150.0	
10417-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 99pc duty cycle)	X	4.70	67.17	16.53	0.00	150.0	± 9.6 %
		Y	4.65	66.53	16.09		150.0	
		Z	4.59	66.90	16.28		150.0	
10418-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Long preamble)	X	4.69	67.33	16.54	0.00	150.0	± 9.6 %
		Y	4.64	66.65	16.08		150.0	
		Z	4.57	67.05	16.29		150.0	
10419-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 99pc duty cycle, Short preamble)	X	4.71	67.28	16.55	0.00	150.0	± 9.6 %
		Y	4.66	66.62	16.10		150.0	
		Z	4.60	67.00	16.30		150.0	
10422-AAB	IEEE 802.11n (HT Greenfield, 7.2 Mbps, BPSK)	X	4.83	67.27	16.55	0.00	150.0	± 9.6 %
		Y	4.79	66.64	16.13		150.0	
		Z	4.72	67.01	16.31		150.0	
10423-AAB	IEEE 802.11n (HT Greenfield, 43.3 Mbps, 16-QAM)	X	5.04	67.66	16.69	0.00	150.0	± 9.6 %
		Y	5.01	67.04	16.28		150.0	
		Z	4.90	67.36	16.44		150.0	
10424-AAB	IEEE 802.11n (HT Greenfield, 72.2 Mbps, 64-QAM)	X	4.95	67.60	16.66	0.00	150.0	± 9.6 %
		Y	4.91	66.97	16.23		150.0	
		Z	4.82	67.30	16.41		150.0	
10425-AAB	IEEE 802.11n (HT Greenfield, 15 Mbps, BPSK)	X	5.50	67.84	16.74	0.00	150.0	± 9.6 %
		Y	5.49	67.38	16.43		150.0	
		Z	5.41	67.63	16.57		150.0	
10426-AAB	IEEE 802.11n (HT Greenfield, 90 Mbps, 16-QAM)	X	5.52	67.88	16.76	0.00	150.0	± 9.6 %
		Y	5.51	67.41	16.44		150.0	
		Z	5.41	67.63	16.57		150.0	

10427-AAB	IEEE 802.11n (HT Greenfield, 150 Mbps, 64-QAM)	X	5.54	67.91	16.77	0.00	150.0	± 9.6 %
		Y	5.52	67.43	16.44		150.0	
		Z	5.42	67.62	16.56		150.0	
10430-AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1)	X	4.52	71.31	18.76	0.00	150.0	± 9.6 %
		Y	4.32	69.77	17.85		150.0	
		Z	4.28	70.66	18.14		150.0	
10431-AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1)	X	4.46	67.83	16.68	0.00	150.0	± 9.6 %
		Y	4.39	67.02	16.13		150.0	
		Z	4.30	67.47	16.32		150.0	
10432-AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1)	X	4.74	67.68	16.66	0.00	150.0	± 9.6 %
		Y	4.69	66.98	16.18		150.0	
		Z	4.59	67.35	16.37		150.0	
10433-AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1)	X	4.97	67.65	16.69	0.00	150.0	± 9.6 %
		Y	4.93	67.02	16.26		150.0	
		Z	4.83	67.34	16.43		150.0	
10434-AAA	W-CDMA (BS Test Model 1, 64 DPCH)	X	4.66	72.23	18.86	0.00	150.0	± 9.6 %
		Y	4.38	70.37	17.81		150.0	
		Z	4.38	71.47	18.13		150.0	
10435-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	116.95	29.06	3.23	80.0	± 9.6 %
		Y	100.00	119.28	30.50		80.0	
		Z	100.00	119.16	29.91		80.0	
10447-AAD	LTE-FDD (OFDMA, 5 MHz, E-TM 3.1, Clipping 44%)	X	3.81	68.11	16.36	0.00	150.0	± 9.6 %
		Y	3.69	66.93	15.60		150.0	
		Z	3.61	67.54	15.77		150.0	
10448-AAD	LTE-FDD (OFDMA, 10 MHz, E-TM 3.1, Clipping 44%)	X	4.28	67.62	16.54	0.00	150.0	± 9.6 %
		Y	4.20	66.78	15.97		150.0	
		Z	4.13	67.25	16.18		150.0	
10449-AAC	LTE-FDD (OFDMA, 15 MHz, E-TM 3.1, Clipping 44%)	X	4.52	67.52	16.57	0.00	150.0	± 9.6 %
		Y	4.46	66.78	16.07		150.0	
		Z	4.39	67.18	16.27		150.0	
10450-AAC	LTE-FDD (OFDMA, 20 MHz, E-TM 3.1, Clipping 44%)	X	4.69	67.43	16.56	0.00	150.0	± 9.6 %
		Y	4.64	66.74	16.10		150.0	
		Z	4.58	67.10	16.28		150.0	
10451-AAA	W-CDMA (BS Test Model 1, 64 DPCH, Clipping 44%)	X	3.77	68.52	16.20	0.00	150.0	± 9.6 %
		Y	3.62	67.16	15.35		150.0	
		Z	3.52	67.79	15.46		150.0	
10456-AAB	IEEE 802.11ac WiFi (160MHz, 64-QAM, 99pc duty cycle)	X	6.36	68.45	16.90	0.00	150.0	± 9.6 %
		Y	6.35	68.04	16.63		150.0	
		Z	6.26	68.19	16.72		150.0	
10457-AAA	UMTS-FDD (DC-HSDPA)	X	3.87	65.81	16.29	0.00	150.0	± 9.6 %
		Y	3.82	65.17	15.81		150.0	
		Z	3.80	65.53	16.00		150.0	
10458-AAA	CDMA2000 (1xEV-DO, Rev. B, 2 carriers)	X	4.22	71.17	18.26	0.00	150.0	± 9.6 %
		Y	3.94	69.22	17.15		150.0	
		Z	4.01	70.71	17.59		150.0	
10459-AAA	CDMA2000 (1xEV-DO, Rev. B, 3 carriers)	X	5.26	68.17	18.33	0.00	150.0	± 9.6 %
		Y	5.16	67.29	17.83		150.0	
		Z	5.10	68.13	18.06		150.0	

10460-AAA	UMTS-FDD (WCDMA, AMR)	X	1.33	76.50	20.68	0.00	150.0	± 9.6 %
		Y	0.81	66.18	14.61		150.0	
		Z	0.95	69.86	16.92		150.0	
10461-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	120.53	30.78	3.29	80.0	± 9.6 %
		Y	100.00	120.99	31.37		80.0	
		Z	100.00	124.03	32.20		80.0	
10462-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	105.89	23.78	3.23	80.0	± 9.6 %
		Y	68.65	104.80	24.72		80.0	
		Z	100.00	107.80	24.46		80.0	
10463-AAA	LTE-TDD (SC-FDMA, 1 RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	34.22	92.48	19.99	3.23	80.0	± 9.6 %
		Y	20.78	89.39	20.30		80.0	
		Z	100.00	104.65	22.95		80.0	
10464-AAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	118.59	29.74	3.23	80.0	± 9.6 %
		Y	100.00	119.30	30.44		80.0	
		Z	100.00	122.02	31.12		80.0	
10465-AAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	105.43	23.55	3.23	80.0	± 9.6 %
		Y	36.42	97.15	22.76		80.0	
		Z	100.00	107.28	24.20		80.0	
10466-AAB	LTE-TDD (SC-FDMA, 1 RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	17.89	85.74	18.15	3.23	80.0	± 9.6 %
		Y	13.99	84.78	18.93		80.0	
		Z	100.00	104.18	22.73		80.0	
10467-AAE	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	118.79	29.83	3.23	80.0	± 9.6 %
		Y	100.00	119.47	30.52		80.0	
		Z	100.00	122.25	31.22		80.0	
10468-AAE	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	105.55	23.61	3.23	80.0	± 9.6 %
		Y	42.04	98.90	23.22		80.0	
		Z	100.00	107.44	24.27		80.0	
10469-AAE	LTE-TDD (SC-FDMA, 1 RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	18.42	86.04	18.22	3.23	80.0	± 9.6 %
		Y	14.20	84.95	18.97		80.0	
		Z	100.00	104.18	22.73		80.0	
10470-AAE	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	118.81	29.83	3.23	80.0	± 9.6 %
		Y	100.00	119.49	30.52		80.0	
		Z	100.00	122.27	31.22		80.0	
10471-AAE	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	105.50	23.58	3.23	80.0	± 9.6 %
		Y	42.06	98.87	23.20		80.0	
		Z	100.00	107.39	24.25		80.0	
10472-AAE	LTE-TDD (SC-FDMA, 1 RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	18.24	85.92	18.18	3.23	80.0	± 9.6 %
		Y	14.18	84.92	18.95		80.0	
		Z	100.00	104.13	22.70		80.0	
10473-AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	100.00	118.78	29.81	3.23	80.0	± 9.6 %
		Y	100.00	119.47	30.51		80.0	
		Z	100.00	122.24	31.21		80.0	
10474-AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	105.51	23.58	3.23	80.0	± 9.6 %
		Y	41.44	98.71	23.16		80.0	
		Z	100.00	107.39	24.25		80.0	
10475-AAE	LTE-TDD (SC-FDMA, 1 RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	18.00	85.79	18.14	3.23	80.0	± 9.6 %
		Y	14.03	84.82	18.92		80.0	
		Z	100.00	104.14	22.70		80.0	

10477-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	100.00	105.36	23.51	3.23	80.0	± 9.6 %
		Y	37.47	97.45	22.82		80.0	
		Z	100.00	107.23	24.17		80.0	
10478-AAF	LTE-TDD (SC-FDMA, 1 RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	17.45	85.46	18.04	3.23	80.0	± 9.6 %
		Y	13.87	84.66	18.87		80.0	
		Z	100.00	104.09	22.68		80.0	
10479-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	19.39	97.98	26.98	3.23	80.0	± 9.6 %
		Y	9.97	87.11	23.93		80.0	
		Z	31.86	106.57	29.32		80.0	
10480-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	21.21	93.58	24.05	3.23	80.0	± 9.6 %
		Y	10.89	84.18	21.64		80.0	
		Z	36.29	101.38	25.98		80.0	
10481-AAA	LTE-TDD (SC-FDMA, 50% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	17.21	89.86	22.63	3.23	80.0	± 9.6 %
		Y	9.94	82.29	20.73		80.0	
		Z	25.83	95.66	24.06		80.0	
10482-AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	7.29	82.03	20.94	2.23	80.0	± 9.6 %
		Y	4.92	75.71	18.70		80.0	
		Z	6.76	81.31	20.47		80.0	
10483-AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	10.85	84.57	21.63	2.23	80.0	± 9.6 %
		Y	7.87	79.68	20.28		80.0	
		Z	11.75	85.89	21.77		80.0	
10484-AAB	LTE-TDD (SC-FDMA, 50% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	9.90	83.05	21.15	2.23	80.0	± 9.6 %
		Y	7.49	78.74	19.95		80.0	
		Z	10.27	83.81	21.11		80.0	
10485-AAE	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	7.24	82.21	21.64	2.23	80.0	± 9.6 %
		Y	5.20	76.44	19.53		80.0	
		Z	6.79	81.80	21.44		80.0	
10486-AAE	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	5.34	74.77	18.72	2.23	80.0	± 9.6 %
		Y	4.58	71.87	17.58		80.0	
		Z	5.06	74.40	18.37		80.0	
10487-AAE	LTE-TDD (SC-FDMA, 50% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.26	74.21	18.50	2.23	80.0	± 9.6 %
		Y	4.59	71.54	17.46		80.0	
		Z	4.97	73.79	18.13		80.0	
10488-AAE	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.65	79.53	21.12	2.23	80.0	± 9.6 %
		Y	5.36	75.42	19.52		80.0	
		Z	6.19	79.05	21.03		80.0	
10489-AAE	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	5.18	73.29	18.99	2.23	80.0	± 9.6 %
		Y	4.74	71.24	18.12		80.0	
		Z	4.94	73.02	18.87		80.0	
10490-AAE	LTE-TDD (SC-FDMA, 50% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.20	72.84	18.84	2.23	80.0	± 9.6 %
		Y	4.81	70.96	18.04		80.0	
		Z	4.98	72.63	18.73		80.0	
10491-AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.09	76.27	20.02	2.23	80.0	± 9.6 %
		Y	5.32	73.47	18.88		80.0	
		Z	5.74	75.88	19.98		80.0	
10492-AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	5.29	71.86	18.63	2.23	80.0	± 9.6 %
		Y	5.01	70.36	17.98		80.0	
		Z	5.08	71.61	18.56		80.0	

10493-AAE	LTE-TDD (SC-FDMA, 50% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.33	71.59	18.55	2.23	80.0	± 9.6 %
		Y	5.07	70.18	17.93		80.0	
		Z	5.12	71.37	18.48		80.0	
10494-AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	7.00	78.56	20.67	2.23	80.0	± 9.6 %
		Y	5.85	75.11	19.32		80.0	
		Z	6.51	77.97	20.58		80.0	
10495-AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	5.43	72.52	18.88	2.23	80.0	± 9.6 %
		Y	5.10	70.90	18.18		80.0	
		Z	5.18	72.18	18.80		80.0	
10496-AAF	LTE-TDD (SC-FDMA, 50% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.43	71.99	18.72	2.23	80.0	± 9.6 %
		Y	5.15	70.54	18.08		80.0	
		Z	5.20	71.70	18.65		80.0	
10497-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	5.92	78.88	19.20	2.23	80.0	± 9.6 %
		Y	4.08	73.19	17.18		80.0	
		Z	5.11	76.97	18.12		80.0	
10498-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	4.00	70.80	15.33	2.23	80.0	± 9.6 %
		Y	3.45	68.39	14.47		80.0	
		Z	3.24	68.34	13.80		80.0	
10499-AAA	LTE-TDD (SC-FDMA, 100% RB, 1.4 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	3.89	70.09	14.92	2.23	80.0	± 9.6 %
		Y	3.42	67.98	14.18		80.0	
		Z	3.10	67.51	13.31		80.0	
10500-AAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.64	80.28	21.17	2.23	80.0	± 9.6 %
		Y	5.11	75.52	19.37		80.0	
		Z	6.26	79.98	21.06		80.0	
10501-AAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	5.23	73.99	18.74	2.23	80.0	± 9.6 %
		Y	4.64	71.50	17.74		80.0	
		Z	4.99	73.73	18.51		80.0	
10502-AAB	LTE-TDD (SC-FDMA, 100% RB, 3 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.24	73.65	18.58	2.23	80.0	± 9.6 %
		Y	4.68	71.29	17.63		80.0	
		Z	5.01	73.41	18.34		80.0	
10503-AAE	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.55	79.28	21.02	2.23	80.0	± 9.6 %
		Y	5.29	75.23	19.44		80.0	
		Z	6.10	78.82	20.93		80.0	
10504-AAE	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	5.15	73.20	18.93	2.23	80.0	± 9.6 %
		Y	4.72	71.16	18.07		80.0	
		Z	4.91	72.93	18.81		80.0	
10505-AAE	LTE-TDD (SC-FDMA, 100% RB, 5 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.17	72.74	18.78	2.23	80.0	± 9.6 %
		Y	4.79	70.88	17.99		80.0	
		Z	4.95	72.53	18.68		80.0	
10506-AAE	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.92	78.38	20.59	2.23	80.0	± 9.6 %
		Y	5.80	74.97	19.25		80.0	
		Z	6.45	77.80	20.51		80.0	
10507-AAE	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	5.40	72.45	18.84	2.23	80.0	± 9.6 %
		Y	5.08	70.84	18.14		80.0	
		Z	5.16	72.12	18.76		80.0	

10508-AAE	LTE-TDD (SC-FDMA, 100% RB, 10 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.41	71.92	18.67	2.23	80.0	± 9.6 %
		Y	5.13	70.47	18.04		80.0	
		Z	5.18	71.63	18.60		80.0	
10509-AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	6.58	75.63	19.59	2.23	80.0	± 9.6 %
		Y	5.87	73.25	18.62		80.0	
		Z	6.22	75.16	19.53		80.0	
10510-AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	5.77	71.69	18.60	2.23	80.0	± 9.6 %
		Y	5.53	70.43	18.05		80.0	
		Z	5.54	71.36	18.54		80.0	
10511-AAE	LTE-TDD (SC-FDMA, 100% RB, 15 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.76	71.27	18.48	2.23	80.0	± 9.6 %
		Y	5.55	70.11	17.98		80.0	
		Z	5.55	70.97	18.43		80.0	
10512-AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, QPSK, UL Subframe=2,3,4,7,8,9)	X	7.41	78.14	20.36	2.23	80.0	± 9.6 %
		Y	6.29	75.00	19.14		80.0	
		Z	6.91	77.49	20.25		80.0	
10513-AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 16-QAM, UL Subframe=2,3,4,7,8,9)	X	5.76	72.30	18.82	2.23	80.0	± 9.6 %
		Y	5.46	70.89	18.20		80.0	
		Z	5.50	71.88	18.73		80.0	
10514-AAF	LTE-TDD (SC-FDMA, 100% RB, 20 MHz, 64-QAM, UL Subframe=2,3,4,7,8,9)	X	5.67	71.64	18.62	2.23	80.0	± 9.6 %
		Y	5.42	70.37	18.07		80.0	
		Z	5.44	71.27	18.55		80.0	
10515-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 99pc duty cycle)	X	1.02	65.05	16.27	0.00	150.0	± 9.6 %
		Y	0.92	62.47	13.97		150.0	
		Z	0.96	63.65	14.96		150.0	
10516-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 99pc duty cycle)	X	2.27	97.97	29.12	0.00	150.0	± 9.6 %
		Y	0.48	66.91	14.54		150.0	
		Z	0.71	74.58	19.09		150.0	
10517-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 99pc duty cycle)	X	0.95	69.11	18.10	0.00	150.0	± 9.6 %
		Y	0.76	63.96	14.22		150.0	
		Z	0.83	66.01	15.81		150.0	
10518-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 99pc duty cycle)	X	4.70	67.26	16.52	0.00	150.0	± 9.6 %
		Y	4.65	66.61	16.07		150.0	
		Z	4.58	66.98	16.26		150.0	
10519-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 99pc duty cycle)	X	4.92	67.55	16.65	0.00	150.0	± 9.6 %
		Y	4.88	66.92	16.23		150.0	
		Z	4.78	67.24	16.39		150.0	
10520-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 99pc duty cycle)	X	4.77	67.56	16.60	0.00	150.0	± 9.6 %
		Y	4.73	66.89	16.14		150.0	
		Z	4.63	67.21	16.32		150.0	
10521-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 99pc duty cycle)	X	4.71	67.58	16.60	0.00	150.0	± 9.6 %
		Y	4.66	66.89	16.12		150.0	
		Z	4.57	67.22	16.30		150.0	
10522-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 99pc duty cycle)	X	4.75	67.52	16.61	0.00	150.0	± 9.6 %
		Y	4.70	66.83	16.14		150.0	
		Z	4.62	67.26	16.37		150.0	

10523-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 99pc duty cycle)	X	4.62	67.46	16.49	0.00	150.0	± 9.6 %
		Y	4.57	66.74	16.00		150.0	
		Z	4.50	67.13	16.21		150.0	
10524-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 99pc duty cycle)	X	4.70	67.49	16.61	0.00	150.0	± 9.6 %
		Y	4.65	66.81	16.14		150.0	
		Z	4.57	67.19	16.34		150.0	
10525-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 99pc duty cycle)	X	4.66	66.53	16.20	0.00	150.0	± 9.6 %
		Y	4.60	65.83	15.72		150.0	
		Z	4.54	66.22	15.93		150.0	
10526-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 99pc duty cycle)	X	4.87	66.95	16.34	0.00	150.0	± 9.6 %
		Y	4.81	66.24	15.87		150.0	
		Z	4.73	66.61	16.08		150.0	
10527-AAB	IEEE 802.11ac WiFi (20MHz, MCS2, 99pc duty cycle)	X	4.78	66.94	16.31	0.00	150.0	± 9.6 %
		Y	4.72	66.21	15.82		150.0	
		Z	4.64	66.58	16.02		150.0	
10528-AAB	IEEE 802.11ac WiFi (20MHz, MCS3, 99pc duty cycle)	X	4.80	66.96	16.34	0.00	150.0	± 9.6 %
		Y	4.74	66.23	15.85		150.0	
		Z	4.66	66.60	16.06		150.0	
10529-AAB	IEEE 802.11ac WiFi (20MHz, MCS4, 99pc duty cycle)	X	4.80	66.96	16.34	0.00	150.0	± 9.6 %
		Y	4.74	66.23	15.85		150.0	
		Z	4.66	66.60	16.06		150.0	
10531-AAB	IEEE 802.11ac WiFi (20MHz, MCS6, 99pc duty cycle)	X	4.82	67.12	16.37	0.00	150.0	± 9.6 %
		Y	4.76	66.38	15.88		150.0	
		Z	4.66	66.73	16.08		150.0	
10532-AAB	IEEE 802.11ac WiFi (20MHz, MCS7, 99pc duty cycle)	X	4.67	67.01	16.33	0.00	150.0	± 9.6 %
		Y	4.60	66.25	15.82		150.0	
		Z	4.52	66.59	16.02		150.0	
10533-AAB	IEEE 802.11ac WiFi (20MHz, MCS8, 99pc duty cycle)	X	4.82	66.98	16.32	0.00	150.0	± 9.6 %
		Y	4.75	66.24	15.83		150.0	
		Z	4.67	66.63	16.04		150.0	
10534-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 99pc duty cycle)	X	5.30	67.05	16.34	0.00	150.0	± 9.6 %
		Y	5.26	66.45	15.95		150.0	
		Z	5.18	66.72	16.10		150.0	
10535-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 99pc duty cycle)	X	5.37	67.19	16.39	0.00	150.0	± 9.6 %
		Y	5.33	66.59	16.00		150.0	
		Z	5.25	66.87	16.17		150.0	
10536-AAB	IEEE 802.11ac WiFi (40MHz, MCS2, 99pc duty cycle)	X	5.25	67.20	16.39	0.00	150.0	± 9.6 %
		Y	5.19	66.57	15.97		150.0	
		Z	5.12	66.85	16.14		150.0	
10537-AAB	IEEE 802.11ac WiFi (40MHz, MCS3, 99pc duty cycle)	X	5.31	67.16	16.37	0.00	150.0	± 9.6 %
		Y	5.26	66.55	15.97		150.0	
		Z	5.18	66.81	16.12		150.0	
10538-AAB	IEEE 802.11ac WiFi (40MHz, MCS4, 99pc duty cycle)	X	5.42	67.22	16.43	0.00	150.0	± 9.6 %
		Y	5.38	66.65	16.06		150.0	
		Z	5.28	66.86	16.19		150.0	
10540-AAB	IEEE 802.11ac WiFi (40MHz, MCS6, 99pc duty cycle)	X	5.32	67.17	16.43	0.00	150.0	± 9.6 %
		Y	5.28	66.57	16.03		150.0	
		Z	5.20	66.84	16.19		150.0	

10541-AAB	IEEE 802.11ac WiFi (40MHz, MCS7, 99pc duty cycle)	X	5.31	67.10	16.39	0.00	150.0	± 9.6 %
		Y	5.26	66.51	16.00		150.0	
		Z	5.17	66.72	16.13		150.0	
10542-AAB	IEEE 802.11ac WiFi (40MHz, MCS8, 99pc duty cycle)	X	5.45	67.10	16.40	0.00	150.0	± 9.6 %
		Y	5.41	66.53	16.03		150.0	
		Z	5.33	66.78	16.17		150.0	
10543-AAB	IEEE 802.11ac WiFi (40MHz, MCS9, 99pc duty cycle)	X	5.54	67.11	16.42	0.00	150.0	± 9.6 %
		Y	5.50	66.55	16.05		150.0	
		Z	5.41	66.81	16.20		150.0	
10544-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 99pc duty cycle)	X	5.58	67.14	16.31	0.00	150.0	± 9.6 %
		Y	5.53	66.57	15.94		150.0	
		Z	5.48	66.82	16.09		150.0	
10545-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 99pc duty cycle)	X	5.78	67.52	16.44	0.00	150.0	± 9.6 %
		Y	5.75	66.98	16.08		150.0	
		Z	5.68	67.24	16.24		150.0	
10546-AAB	IEEE 802.11ac WiFi (80MHz, MCS2, 99pc duty cycle)	X	5.68	67.44	16.42	0.00	150.0	± 9.6 %
		Y	5.63	66.87	16.05		150.0	
		Z	5.56	67.08	16.18		150.0	
10547-AAB	IEEE 802.11ac WiFi (80MHz, MCS3, 99pc duty cycle)	X	5.77	67.50	16.44	0.00	150.0	± 9.6 %
		Y	5.72	66.94	16.07		150.0	
		Z	5.64	67.14	16.20		150.0	
10548-AAB	IEEE 802.11ac WiFi (80MHz, MCS4, 99pc duty cycle)	X	6.03	68.45	16.88	0.00	150.0	± 9.6 %
		Y	6.07	68.12	16.63		150.0	
		Z	5.92	68.14	16.67		150.0	
10550-AAB	IEEE 802.11ac WiFi (80MHz, MCS6, 99pc duty cycle)	X	5.70	67.38	16.39	0.00	150.0	± 9.6 %
		Y	5.65	66.81	16.02		150.0	
		Z	5.58	67.05	16.17		150.0	
10551-AAB	IEEE 802.11ac WiFi (80MHz, MCS7, 99pc duty cycle)	X	5.71	67.48	16.40	0.00	150.0	± 9.6 %
		Y	5.68	66.94	16.05		150.0	
		Z	5.59	67.11	16.16		150.0	
10552-AAB	IEEE 802.11ac WiFi (80MHz, MCS8, 99pc duty cycle)	X	5.61	67.24	16.31	0.00	150.0	± 9.6 %
		Y	5.57	66.68	15.94		150.0	
		Z	5.50	66.90	16.07		150.0	
10553-AAB	IEEE 802.11ac WiFi (80MHz, MCS9, 99pc duty cycle)	X	5.71	67.29	16.35	0.00	150.0	± 9.6 %
		Y	5.66	66.72	15.98		150.0	
		Z	5.59	66.95	16.12		150.0	
10554-AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 99pc duty cycle)	X	5.97	67.50	16.39	0.00	150.0	± 9.6 %
		Y	5.93	66.97	16.05		150.0	
		Z	5.88	67.19	16.18		150.0	
10555-AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 99pc duty cycle)	X	6.13	67.85	16.53	0.00	150.0	± 9.6 %
		Y	6.09	67.34	16.20		150.0	
		Z	6.02	67.50	16.31		150.0	
10556-AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 99pc duty cycle)	X	6.13	67.85	16.53	0.00	150.0	± 9.6 %
		Y	6.09	67.32	16.19		150.0	
		Z	6.04	67.54	16.32		150.0	
10557-AAC	IEEE 802.11ac WiFi (160MHz, MCS3, 99pc duty cycle)	X	6.12	67.82	16.54	0.00	150.0	± 9.6 %
		Y	6.09	67.31	16.21		150.0	
		Z	6.01	67.47	16.31		150.0	

10558-AAC	IEEE 802.11ac WiFi (160MHz, MCS4, 99pc duty cycle)	X	6.18	68.01	16.64	0.00	150.0	± 9.6 %
		Y	6.16	67.51	16.32		150.0	
		Z	6.06	67.65	16.41		150.0	
10560-AAC	IEEE 802.11ac WiFi (160MHz, MCS6, 99pc duty cycle)	X	6.18	67.85	16.60	0.00	150.0	± 9.6 %
		Y	6.14	67.33	16.27		150.0	
		Z	6.06	67.49	16.37		150.0	
10561-AAC	IEEE 802.11ac WiFi (160MHz, MCS7, 99pc duty cycle)	X	6.09	67.79	16.61	0.00	150.0	± 9.6 %
		Y	6.05	67.28	16.28		150.0	
		Z	5.98	67.45	16.39		150.0	
10562-AAC	IEEE 802.11ac WiFi (160MHz, MCS8, 99pc duty cycle)	X	6.24	68.26	16.85	0.00	150.0	± 9.6 %
		Y	6.23	67.81	16.55		150.0	
		Z	6.12	67.89	16.61		150.0	
10563-AAC	IEEE 802.11ac WiFi (160MHz, MCS9, 99pc duty cycle)	X	6.53	68.65	16.98	0.00	150.0	± 9.6 %
		Y	6.51	68.18	16.68		150.0	
		Z	6.46	68.48	16.85		150.0	
10564-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 99pc duty cycle)	X	5.03	67.33	16.65	0.46	150.0	± 9.6 %
		Y	5.00	66.77	16.28		150.0	
		Z	4.92	67.10	16.44		150.0	
10565-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 99pc duty cycle)	X	5.29	67.82	16.98	0.46	150.0	± 9.6 %
		Y	5.27	67.28	16.62		150.0	
		Z	5.16	67.55	16.76		150.0	
10566-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 99pc duty cycle)	X	5.13	67.71	16.82	0.46	150.0	± 9.6 %
		Y	5.10	67.14	16.44		150.0	
		Z	5.00	67.42	16.59		150.0	
10567-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 99pc duty cycle)	X	5.16	68.12	17.17	0.46	150.0	± 9.6 %
		Y	5.12	67.51	16.77		150.0	
		Z	5.02	67.79	16.92		150.0	
10568-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 99pc duty cycle)	X	5.03	67.41	16.55	0.46	150.0	± 9.6 %
		Y	5.01	66.85	16.18		150.0	
		Z	4.92	67.21	16.38		150.0	
10569-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 99pc duty cycle)	X	5.10	68.15	17.20	0.46	150.0	± 9.6 %
		Y	5.06	67.52	16.78		150.0	
		Z	4.97	67.85	16.96		150.0	
10570-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 99pc duty cycle)	X	5.14	67.95	17.12	0.46	150.0	± 9.6 %
		Y	5.10	67.36	16.72		150.0	
		Z	5.01	67.70	16.91		150.0	
10571-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 1 Mbps, 90pc duty cycle)	X	1.44	68.10	17.64	0.46	130.0	± 9.6 %
		Y	1.29	65.22	15.55		130.0	
		Z	1.34	66.59	16.56		130.0	
10572-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 2 Mbps, 90pc duty cycle)	X	1.48	69.02	18.14	0.46	130.0	± 9.6 %
		Y	1.31	65.80	15.88		130.0	
		Z	1.37	67.32	16.97		130.0	
10573-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 5.5 Mbps, 90pc duty cycle)	X	100.00	147.85	39.47	0.46	130.0	± 9.6 %
		Y	2.24	82.28	20.72		130.0	
		Z	17.41	116.36	31.42		130.0	
10574-AAA	IEEE 802.11b WiFi 2.4 GHz (DSSS, 11 Mbps, 90pc duty cycle)	X	2.28	80.74	23.27	0.46	130.0	± 9.6 %
		Y	1.50	71.42	18.45		130.0	
		Z	1.74	75.30	20.61		130.0	

10575-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 6 Mbps, 90pc duty cycle)	X	4.83	67.17	16.72	0.46	130.0	± 9.6 %
		Y	4.82	66.65	16.39		130.0	
		Z	4.74	66.99	16.56		130.0	
10576-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 9 Mbps, 90pc duty cycle)	X	4.86	67.33	16.79	0.46	130.0	± 9.6 %
		Y	4.85	66.81	16.45		130.0	
		Z	4.77	67.14	16.61		130.0	
10577-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 12 Mbps, 90pc duty cycle)	X	5.10	67.66	16.96	0.46	130.0	± 9.6 %
		Y	5.09	67.16	16.64		130.0	
		Z	4.98	67.44	16.78		130.0	
10578-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 18 Mbps, 90pc duty cycle)	X	5.00	67.86	17.08	0.46	130.0	± 9.6 %
		Y	4.98	67.32	16.73		130.0	
		Z	4.88	67.61	16.88		130.0	
10579-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 24 Mbps, 90pc duty cycle)	X	4.77	67.23	16.44	0.46	130.0	± 9.6 %
		Y	4.76	66.70	16.10		130.0	
		Z	4.66	66.98	16.25		130.0	
10580-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 36 Mbps, 90pc duty cycle)	X	4.81	67.17	16.42	0.46	130.0	± 9.6 %
		Y	4.81	66.65	16.08		130.0	
		Z	4.70	66.98	16.26		130.0	
10581-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 48 Mbps, 90pc duty cycle)	X	4.91	67.97	17.05	0.46	130.0	± 9.6 %
		Y	4.89	67.40	16.68		130.0	
		Z	4.78	67.68	16.84		130.0	
10582-AAA	IEEE 802.11g WiFi 2.4 GHz (DSSS-OFDM, 54 Mbps, 90pc duty cycle)	X	4.72	66.95	16.22	0.46	130.0	± 9.6 %
		Y	4.72	66.45	15.89		130.0	
		Z	4.61	66.75	16.05		130.0	
10583-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 6 Mbps, 90pc duty cycle)	X	4.83	67.17	16.72	0.46	130.0	± 9.6 %
		Y	4.82	66.65	16.39		130.0	
		Z	4.74	66.99	16.56		130.0	
10584-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 9 Mbps, 90pc duty cycle)	X	4.86	67.33	16.79	0.46	130.0	± 9.6 %
		Y	4.85	66.81	16.45		130.0	
		Z	4.77	67.14	16.61		130.0	
10585-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 12 Mbps, 90pc duty cycle)	X	5.10	67.66	16.96	0.46	130.0	± 9.6 %
		Y	5.09	67.16	16.64		130.0	
		Z	4.98	67.44	16.78		130.0	
10586-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 18 Mbps, 90pc duty cycle)	X	5.00	67.86	17.08	0.46	130.0	± 9.6 %
		Y	4.98	67.32	16.73		130.0	
		Z	4.88	67.61	16.88		130.0	
10587-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 24 Mbps, 90pc duty cycle)	X	4.77	67.23	16.44	0.46	130.0	± 9.6 %
		Y	4.76	66.70	16.10		130.0	
		Z	4.66	66.98	16.25		130.0	
10588-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 36 Mbps, 90pc duty cycle)	X	4.81	67.17	16.42	0.46	130.0	± 9.6 %
		Y	4.81	66.65	16.08		130.0	
		Z	4.70	66.98	16.26		130.0	
10589-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 48 Mbps, 90pc duty cycle)	X	4.91	67.97	17.05	0.46	130.0	± 9.6 %
		Y	4.89	67.40	16.68		130.0	
		Z	4.78	67.68	16.84		130.0	
10590-AAB	IEEE 802.11a/h WiFi 5 GHz (OFDM, 54 Mbps, 90pc duty cycle)	X	4.72	66.95	16.22	0.46	130.0	± 9.6 %
		Y	4.72	66.45	15.89		130.0	
		Z	4.61	66.75	16.05		130.0	

10591-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS0, 90pc duty cycle)	X	4.98	67.21	16.80	0.46	130.0	± 9.6 %
		Y	4.97	66.72	16.49		130.0	
		Z	4.89	67.03	16.64		130.0	
10592-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS1, 90pc duty cycle)	X	5.16	67.56	16.92	0.46	130.0	± 9.6 %
		Y	5.15	67.07	16.61		130.0	
		Z	5.05	67.37	16.77		130.0	
10593-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS2, 90pc duty cycle)	X	5.09	67.52	16.84	0.46	130.0	± 9.6 %
		Y	5.09	67.03	16.52		130.0	
		Z	4.98	67.31	16.67		130.0	
10594-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS3, 90pc duty cycle)	X	5.14	67.66	16.97	0.46	130.0	± 9.6 %
		Y	5.13	67.17	16.66		130.0	
		Z	5.03	67.46	16.81		130.0	
10595-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS4, 90pc duty cycle)	X	5.12	67.64	16.89	0.46	130.0	± 9.6 %
		Y	5.12	67.15	16.57		130.0	
		Z	5.00	67.42	16.71		130.0	
10596-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS5, 90pc duty cycle)	X	5.06	67.64	16.89	0.46	130.0	± 9.6 %
		Y	5.05	67.13	16.56		130.0	
		Z	4.94	67.43	16.72		130.0	
10597-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS6, 90pc duty cycle)	X	5.01	67.59	16.80	0.46	130.0	± 9.6 %
		Y	5.00	67.08	16.47		130.0	
		Z	4.89	67.36	16.62		130.0	
10598-AAB	IEEE 802.11n (HT Mixed, 20MHz, MCS7, 90pc duty cycle)	X	5.00	67.87	17.08	0.46	130.0	± 9.6 %
		Y	4.98	67.33	16.73		130.0	
		Z	4.87	67.59	16.87		130.0	
10599-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS0, 90pc duty cycle)	X	5.63	67.75	16.95	0.46	130.0	± 9.6 %
		Y	5.64	67.37	16.71		130.0	
		Z	5.54	67.56	16.82		130.0	
10600-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS1, 90pc duty cycle)	X	5.83	68.33	17.20	0.46	130.0	± 9.6 %
		Y	5.90	68.12	17.06		130.0	
		Z	5.71	68.07	17.05		130.0	
10601-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS2, 90pc duty cycle)	X	5.69	67.99	17.05	0.46	130.0	± 9.6 %
		Y	5.72	67.66	16.84		130.0	
		Z	5.58	67.77	16.91		130.0	
10602-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS3, 90pc duty cycle)	X	5.78	67.98	16.97	0.46	130.0	± 9.6 %
		Y	5.82	67.70	16.78		130.0	
		Z	5.67	67.76	16.83		130.0	
10603-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS4, 90pc duty cycle)	X	5.89	68.37	17.29	0.46	130.0	± 9.6 %
		Y	5.93	68.09	17.10		130.0	
		Z	5.76	68.08	17.11		130.0	
10604-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS5, 90pc duty cycle)	X	5.64	67.73	16.96	0.46	130.0	± 9.6 %
		Y	5.66	67.36	16.73		130.0	
		Z	5.55	67.52	16.82		130.0	
10605-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS6, 90pc duty cycle)	X	5.74	67.99	17.09	0.46	130.0	± 9.6 %
		Y	5.77	67.65	16.87		130.0	
		Z	5.66	67.85	16.99		130.0	
10606-AAB	IEEE 802.11n (HT Mixed, 40MHz, MCS7, 90pc duty cycle)	X	5.53	67.51	16.73	0.46	130.0	± 9.6 %
		Y	5.54	67.14	16.49		130.0	
		Z	5.44	67.32	16.59		130.0	

10607-AAB	IEEE 802.11ac WiFi (20MHz, MCS0, 90pc duty cycle)	X	4.82	66.53	16.43	0.46	130.0	± 9.6 %
		Y	4.79	65.97	16.07		130.0	
		Z	4.72	66.33	16.26		130.0	
10608-AAB	IEEE 802.11ac WiFi (20MHz, MCS1, 90pc duty cycle)	X	5.04	66.97	16.59	0.46	130.0	± 9.6 %
		Y	5.01	66.40	16.23		130.0	
		Z	4.92	66.75	16.42		130.0	
10609-AAB	IEEE 802.11ac WiFi (20MHz, MCS2, 90pc duty cycle)	X	4.93	66.86	16.46	0.46	130.0	± 9.6 %
		Y	4.90	66.28	16.10		130.0	
		Z	4.81	66.62	16.28		130.0	
10610-AAB	IEEE 802.11ac WiFi (20MHz, MCS3, 90pc duty cycle)	X	4.98	67.02	16.62	0.46	130.0	± 9.6 %
		Y	4.96	66.44	16.25		130.0	
		Z	4.86	66.77	16.43		130.0	
10611-AAB	IEEE 802.11ac WiFi (20MHz, MCS4, 90pc duty cycle)	X	4.90	66.85	16.48	0.46	130.0	± 9.6 %
		Y	4.88	66.29	16.12		130.0	
		Z	4.78	66.60	16.29		130.0	
10612-AAB	IEEE 802.11ac WiFi (20MHz, MCS5, 90pc duty cycle)	X	4.92	67.00	16.52	0.46	130.0	± 9.6 %
		Y	4.90	66.42	16.15		130.0	
		Z	4.80	66.76	16.34		130.0	
10613-AAB	IEEE 802.11ac WiFi (20MHz, MCS6, 90pc duty cycle)	X	4.94	66.93	16.43	0.46	130.0	± 9.6 %
		Y	4.91	66.35	16.06		130.0	
		Z	4.81	66.67	16.24		130.0	
10614-AAB	IEEE 802.11ac WiFi (20MHz, MCS7, 90pc duty cycle)	X	4.87	67.14	16.68	0.46	130.0	± 9.6 %
		Y	4.84	66.54	16.29		130.0	
		Z	4.74	66.84	16.45		130.0	
10615-AAB	IEEE 802.11ac WiFi (20MHz, MCS8, 90pc duty cycle)	X	4.90	66.65	16.25	0.46	130.0	± 9.6 %
		Y	4.88	66.09	15.90		130.0	
		Z	4.79	66.44	16.08		130.0	
10616-AAB	IEEE 802.11ac WiFi (40MHz, MCS0, 90pc duty cycle)	X	5.46	67.05	16.59	0.46	130.0	± 9.6 %
		Y	5.45	66.60	16.30		130.0	
		Z	5.36	66.82	16.44		130.0	
10617-AAB	IEEE 802.11ac WiFi (40MHz, MCS1, 90pc duty cycle)	X	5.52	67.16	16.60	0.46	130.0	± 9.6 %
		Y	5.52	66.71	16.32		130.0	
		Z	5.42	66.95	16.47		130.0	
10618-AAB	IEEE 802.11ac WiFi (40MHz, MCS2, 90pc duty cycle)	X	5.42	67.26	16.68	0.46	130.0	± 9.6 %
		Y	5.41	66.77	16.37		130.0	
		Z	5.32	67.01	16.51		130.0	
10619-AAB	IEEE 802.11ac WiFi (40MHz, MCS3, 90pc duty cycle)	X	5.44	67.06	16.51	0.46	130.0	± 9.6 %
		Y	5.43	66.58	16.21		130.0	
		Z	5.34	66.85	16.37		130.0	
10620-AAB	IEEE 802.11ac WiFi (40MHz, MCS4, 90pc duty cycle)	X	5.56	67.16	16.61	0.46	130.0	± 9.6 %
		Y	5.56	66.73	16.34		130.0	
		Z	5.44	66.90	16.45		130.0	
10621-AAB	IEEE 802.11ac WiFi (40MHz, MCS5, 90pc duty cycle)	X	5.53	67.24	16.76	0.46	130.0	± 9.6 %
		Y	5.52	66.78	16.47		130.0	
		Z	5.42	66.97	16.59		130.0	
10622-AAB	IEEE 802.11ac WiFi (40MHz, MCS6, 90pc duty cycle)	X	5.53	67.34	16.81	0.46	130.0	± 9.6 %
		Y	5.52	66.87	16.51		130.0	
		Z	5.43	67.11	16.66		130.0	

10623-AAB	IEEE 802.11ac WiFi (40MHz, MCS7, 90pc duty cycle)	X	5.42	66.95	16.50	0.46	130.0	± 9.6 %
		Y	5.42	66.51	16.22		130.0	
		Z	5.31	66.68	16.33		130.0	
10624-AAB	IEEE 802.11ac WiFi (40MHz, MCS8, 90pc duty cycle)	X	5.60	67.07	16.62	0.46	130.0	± 9.6 %
		Y	5.60	66.64	16.35		130.0	
		Z	5.51	66.87	16.48		130.0	
10625-AAB	IEEE 802.11ac WiFi (40MHz, MCS9, 90pc duty cycle)	X	5.97	68.00	17.12	0.46	130.0	± 9.6 %
		Y	6.00	67.65	16.90		130.0	
		Z	5.91	67.94	17.06		130.0	
10626-AAB	IEEE 802.11ac WiFi (80MHz, MCS0, 90pc duty cycle)	X	5.71	67.08	16.51	0.46	130.0	± 9.6 %
		Y	5.70	66.63	16.24		130.0	
		Z	5.64	66.86	16.37		130.0	
10627-AAB	IEEE 802.11ac WiFi (80MHz, MCS1, 90pc duty cycle)	X	5.96	67.58	16.71	0.46	130.0	± 9.6 %
		Y	5.96	67.18	16.47		130.0	
		Z	5.89	67.42	16.61		130.0	
10628-AAB	IEEE 802.11ac WiFi (80MHz, MCS2, 90pc duty cycle)	X	5.78	67.26	16.49	0.46	130.0	± 9.6 %
		Y	5.78	66.83	16.23		130.0	
		Z	5.69	67.01	16.35		130.0	
10629-AAB	IEEE 802.11ac WiFi (80MHz, MCS3, 90pc duty cycle)	X	5.87	67.32	16.51	0.46	130.0	± 9.6 %
		Y	5.88	66.93	16.27		130.0	
		Z	5.78	67.09	16.38		130.0	
10630-AAB	IEEE 802.11ac WiFi (80MHz, MCS4, 90pc duty cycle)	X	6.37	68.98	17.34	0.46	130.0	± 9.6 %
		Y	6.50	68.90	17.25		130.0	
		Z	6.28	68.77	17.22		130.0	
10631-AAB	IEEE 802.11ac WiFi (80MHz, MCS5, 90pc duty cycle)	X	6.28	68.81	17.44	0.46	130.0	± 9.6 %
		Y	6.32	68.50	17.24		130.0	
		Z	6.15	68.46	17.24		130.0	
10632-AAB	IEEE 802.11ac WiFi (80MHz, MCS6, 90pc duty cycle)	X	5.95	67.71	16.91	0.46	130.0	± 9.6 %
		Y	5.94	67.27	16.65		130.0	
		Z	5.85	67.45	16.76		130.0	
10633-AAB	IEEE 802.11ac WiFi (80MHz, MCS7, 90pc duty cycle)	X	5.89	67.53	16.65	0.46	130.0	± 9.6 %
		Y	5.90	67.16	16.42		130.0	
		Z	5.76	67.17	16.45		130.0	
10634-AAB	IEEE 802.11ac WiFi (80MHz, MCS8, 90pc duty cycle)	X	5.86	67.52	16.71	0.46	130.0	± 9.6 %
		Y	5.87	67.11	16.46		130.0	
		Z	5.74	67.18	16.52		130.0	
10635-AAB	IEEE 802.11ac WiFi (80MHz, MCS9, 90pc duty cycle)	X	5.74	66.83	16.11	0.46	130.0	± 9.6 %
		Y	5.74	66.43	15.86		130.0	
		Z	5.63	66.58	15.96		130.0	
10636-AAC	IEEE 802.11ac WiFi (160MHz, MCS0, 90pc duty cycle)	X	6.11	67.45	16.59	0.46	130.0	± 9.6 %
		Y	6.11	67.04	16.35		130.0	
		Z	6.05	67.24	16.46		130.0	
10637-AAC	IEEE 802.11ac WiFi (160MHz, MCS1, 90pc duty cycle)	X	6.29	67.85	16.76	0.46	130.0	± 9.6 %
		Y	6.30	67.47	16.54		130.0	
		Z	6.21	67.62	16.63		130.0	
10638-AAC	IEEE 802.11ac WiFi (160MHz, MCS2, 90pc duty cycle)	X	6.28	67.80	16.72	0.46	130.0	± 9.6 %
		Y	6.28	67.40	16.49		130.0	
		Z	6.21	67.59	16.60		130.0	