



SAR EVALUATION REPORT

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

Date of Testing:
 07/15/19 - 08/25/19
Test Site/Location:
 PCTEST Lab, Columbia, MD, USA
Document Serial No.:
 1M1907050112-01-R1.ZNF

FCC ID: ZNFT600US
APPLICANT: LG ELECTRONICS U.S.A., INC.

DUT Type: Portable Tablet
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model: LM-T600US
Additional Model(s): LMT600US, T600US, LM-T600QS, LMT600QS, T600QS

Equipment Class	Band & Mode	Tx Frequency	SAR
			1g Body (W/kg)
PCB	UMTS 850	826.40 - 846.60 MHz	0.73
PCB	UMTS 1750	1712.4 - 1752.6 MHz	0.55
PCB	UMTS 1900	1852.4 - 1907.6 MHz	0.89
PCB	LTE Band 71	665.5 - 695.5 MHz	0.55
PCB	LTE Band 12	699.7 - 715.3 MHz	0.64
PCB	LTE Band 13	779.5 - 784.5 MHz	0.66
PCB	LTE Band 26 (Cell)	814.7 - 848.3 MHz	0.72
PCB	LTE Band 5 (Cell)	824.7 - 848.3 MHz	N/A
PCB	LTE Band 66 (AWS)	1710.7 - 1779.3 MHz	0.65
PCB	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	N/A
PCB	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.90
PCB	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	N/A
PCB	LTE Band 7	2502.5 - 2567.5 MHz	1.18
PCB	LTE Band 41	2498.5 - 2687.5 MHz	1.22
DTS	2.4 GHz WLAN	2412 - 2462 MHz	0.66
NII	U-NII-1	5180 - 5240 MHz	N/A
NII	U-NII-2A	5260 - 5320 MHz	0.43
NII	U-NII-2C	5500 - 5720 MHz	0.54
NII	U-NII-3	5745 - 5825 MHz	0.40
DSS/DTS	Bluetooth	2402 - 2480 MHz	0.23
Simultaneous SAR per KDB 690783 D01v01r03:			1.59

Note: This revised Test Report (S/N: 1M1907050112-01-R1.ZNF) supersedes and replaces the previously issued test report on the same subject device for the same type of testing as indicated. Please discard or destroy the previously issued test report(s) and dispose of it accordingly.

This wireless portable device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.7 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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1 DEVICE UNDER TEST

1.1 Device Overview

Band & Mode	Operating Modes	Tx Frequency
UMTS 850	Data	826.40 - 846.60 MHz
UMTS 1750	Data	1712.4 - 1752.6 MHz
UMTS 1900	Data	1852.4 - 1907.6 MHz
LTE Band 71	Data	665.5 - 695.5 MHz
LTE Band 12	Data	699.7 - 715.3 MHz
LTE Band 13	Data	779.5 - 784.5 MHz
LTE Band 26 (Cell)	Data	814.7 - 848.3 MHz
LTE Band 5 (Cell)	Data	824.7 - 848.3 MHz
LTE Band 66 (AWS)	Data	1710.7 - 1779.3 MHz
LTE Band 4 (AWS)	Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Data	1850.7 - 1909.3 MHz
LTE Band 7	Data	2502.5 - 2567.5 MHz
LTE Band 41	Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Data	2412 - 2462 MHz
U-NII-1	Data	5180 - 5240 MHz
U-NII-2A	Data	5260 - 5320 MHz
U-NII-2C	Data	5500 - 5720 MHz
U-NII-3	Data	5745 - 5825 MHz
Bluetooth	Data	2402 - 2480 MHz

1.2 Power Reduction for SAR

This device uses a power reduction mechanism for SAR compliance. The power reduction mechanism is activated when the device is used in close proximity to the user's body. FCC KDB Publication 616217 D04v01r02 Section 6 was used as a guideline for selecting SAR test distances for this device. Detailed descriptions of the power reduction mechanism are included in the operational description.

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1.3 Nominal and Maximum Output Power Specifications

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

1.3.1 Maximum Output Power

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA
UMTS Band 5 (850 MHz)	Maximum	25.2	25.2	25.2
	Nominal	24.7	24.7	24.7
UMTS Band 4 (1750 MHz)	Maximum	24.7	24.7	24.7
	Nominal	24.2	24.2	24.2
UMTS Band 2 (1900 MHz)	Maximum	23.7	23.7	23.7
	Nominal	23.2	23.2	23.2

Mode / Band		Modulated Average (dBm)
LTE Band 71	Maximum	25.2
	Nominal	24.7
LTE Band 12	Maximum	25.2
	Nominal	24.7
LTE Band 13	Maximum	25.2
	Nominal	24.7
LTE Band 26 (Cell)	Maximum	25.2
	Nominal	24.7
LTE Band 5 (Cell)	Maximum	25.2
	Nominal	24.7
LTE Band 66 (AWS)	Maximum	24.7
	Nominal	24.2
LTE Band 4 (AWS)	Maximum	24.7
	Nominal	24.2
LTE Band 25 (PCS)	Maximum	23.7
	Nominal	23.2
LTE Band 2 (PCS)	Maximum	23.7
	Nominal	23.2
LTE Band 7	Maximum	22.0
	Nominal	21.5
LTE Band 41	Maximum	23.5
	Nominal	23.0

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Mode / Band		Modulated Average - Single Tx Chain (dBm)
Channel		1 - 11
IEEE 802.11b (2.4 GHz)	Maximum	15.5
	Nominal	14.5
IEEE 802.11g (2.4 GHz)	Maximum	15.5
	Nominal	14.5
IEEE 802.11n (2.4 GHz)	Maximum	15.5
	Nominal	14.5

Mode / Band		Modulated Average - Single Tx Chain (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11a (5 GHz)	Channel	36 - 165	38 - 159	42 - 155
	Maximum	14.5		
IEEE 802.11n (5 GHz)	Nominal	13.5		
	Maximum	14.5	14.5	
IEEE 802.11ac (5 GHz)	Nominal	13.5	13.5	
	Maximum	14.5	14.5	13.5
	Nominal	13.5	13.5	12.5

Mode/Band		Modulated Average (dBm)
Bluetooth	Maximum	7.5
	Nominal	6.5
Bluetooth LE	Maximum	-1.0
	Nominal	-2.0

Mode / Band		Modulated Average - MIMO (dBm)
		20 MHz Bandwidth
Channel		1 - 11
IEEE 802.11g (2.4 GHz)	Maximum	18.5
	Nominal	17.5
IEEE 802.11n (2.4 GHz)	Maximum	18.5
	Nominal	17.5

Mode / Band		Modulated Average - MIMO (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
IEEE 802.11a (5 GHz)	Channel	36 - 165	38 - 159	42 - 155
	Maximum	17.5		
IEEE 802.11n (5 GHz)	Nominal	16.5		
	Maximum	17.5	17.5	
IEEE 802.11ac (5 GHz)	Nominal	16.5	16.5	
	Maximum	17.5	17.5	16.5
	Nominal	16.5	16.5	15.5

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1.3.2 Reduced Output Power

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	3GPP HSDPA	3GPP HSUPA
UMTS Band 5 (850 MHz)	Maximum	18.2	18.2	18.2
	Nominal	17.7	17.7	17.7
UMTS Band 4 (1750 MHz)	Maximum	11.7	11.7	11.7
	Nominal	11.2	11.2	11.2
UMTS Band 2 (1900 MHz)	Maximum	10.7	10.7	10.7
	Nominal	10.2	10.2	10.2

Mode / Band		Modulated Average (dBm)
LTE Band 71	Maximum	17.7
	Nominal	17.2
LTE Band 12	Maximum	17.2
	Nominal	16.7
LTE Band 13	Maximum	17.2
	Nominal	16.7
LTE Band 26 (Cell)	Maximum	18.2
	Nominal	17.7
LTE Band 5 (Cell)	Maximum	18.2
	Nominal	17.7
LTE Band 66 (AWS)	Maximum	11.7
	Nominal	11.2
LTE Band 4 (AWS)	Maximum	11.7
	Nominal	11.2
LTE Band 25 (PCS)	Maximum	10.7
	Nominal	10.2
LTE Band 2 (PCS)	Maximum	10.7
	Nominal	10.2
LTE Band 7	Maximum	10.7
	Nominal	10.2
LTE Band 41	Maximum	14.2
	Nominal	13.7

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Mode / Band		Modulated Average - Single Tx Chain (dBm)
Channel		1 - 11
IEEE 802.11b (2.4 GHz)	Maximum	8.5
	Nominal	7.5
IEEE 802.11g (2.4 GHz)	Maximum	8.5
	Nominal	7.5
IEEE 802.11n (2.4 GHz)	Maximum	8.5
	Nominal	7.5

Mode / Band		Modulated Average - Single Tx Chain (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
Channel		36 - 165	38 - 159	42 - 155
IEEE 802.11a (5 GHz)	Maximum	7.5		
	Nominal	6.5		
IEEE 802.11n (5 GHz)	Maximum	7.5	7.5	
	Nominal	6.5	6.5	
IEEE 802.11ac (5 GHz)	Maximum	7.5	7.5	7.0
	Nominal	6.5	6.5	6.0

Mode / Band		Modulated Average - MIMO (dBm)	
		20 MHz Bandwidth	
Channel		1 - 11	
IEEE 802.11g (2.4 GHz)	Maximum	11.5	
	Nominal	10.5	
IEEE 802.11n (2.4 GHz)	Maximum	11.5	
	Nominal	10.5	

Mode / Band		Modulated Average - MIMO (dBm)		
		20 MHz Bandwidth	40 MHz Bandwidth	80 MHz Bandwidth
Channel		36 - 165	38 - 159	42 - 155
IEEE 802.11a (5 GHz)	Maximum	10.5		
	Nominal	9.5		
IEEE 802.11n (5 GHz)	Maximum	10.5	10.5	
	Nominal	9.5	9.5	
IEEE 802.11ac (5 GHz)	Maximum	10.5	10.5	10.0
	Nominal	9.5	9.5	9.0

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1.4 DUT Antenna Locations

The overall diagonal dimension of the device is > 200 mm. A diagram showing the location of the device antennas can be found in Appendix F. Exact antenna dimensions and separation distances are shown in the Technical Descriptions in the FCC filings.

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

Mode	Back	Top	Bottom	Right	Left
UMTS 850	Yes	Yes	No	Yes	Yes
UMTS 1750	Yes	Yes	No	Yes	Yes
UMTS 1900	Yes	Yes	No	Yes	Yes
LTE Band 71	Yes	Yes	No	Yes	Yes
LTE Band 12	Yes	Yes	No	Yes	Yes
LTE Band 13	Yes	Yes	No	Yes	Yes
LTE Band 26 (Cell)	Yes	Yes	No	Yes	Yes
LTE Band 66 (AWS)	Yes	Yes	No	Yes	Yes
LTE Band 25 (PCS)	Yes	Yes	No	Yes	Yes
LTE Band 7	Yes	Yes	No	No	Yes
LTE Band 41	Yes	Yes	No	No	Yes
2.4 GHz WLAN Ant 1	Yes	Yes	No	Yes	No
2.4 GHz WLAN Ant 2	Yes	Yes	No	Yes	No
2.4 GHz WLAN MIMO	Yes	Yes	No	Yes	No
5 GHz WLAN Ant 1	Yes	Yes	No	Yes	No
5 GHz WLAN Ant 2	Yes	Yes	No	Yes	No
5 GHz WLAN MIMO	Yes	Yes	No	Yes	No
Bluetooth	Yes	Yes	No	Yes	No

Note: Per FCC KDB Publication 616217 D04v01r01, particular edges were not required to be evaluated for SAR based on the SAR exclusion threshold in KDB 447498 D01V06. Additional edges may have been evaluated for simultaneous transmission analysis.

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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.

**Table 1-2
Simultaneous Transmission Scenarios**

No.	Capable Transmit Configuration	Body
1	UMTS + 2.4 GHz WI-FI	Yes
2	UMTS + 5 GHz WI-FI	Yes
3	UMTS + 2.4 GHz Bluetooth	Yes
4	UMTS + 2.4 GHz WI-FI MIMO	Yes
5	UMTS + 5 GHz WI-FI MIMO	Yes
6	UMTS + 2.4 GHz Bluetooth + 5 GHz WI-FI	Yes
7	UMTS + 2.4 GHz Bluetooth + 5 GHz WI-FI MIMO	Yes
8	LTE + 2.4 GHz WI-FI	Yes
9	LTE + 5 GHz WI-FI	Yes
10	LTE + 2.4 GHz Bluetooth	Yes
11	LTE + 2.4 GHz WI-FI MIMO	Yes
12	LTE + 5 GHz WI-FI MIMO	Yes
13	LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI	Yes
14	LTE + 2.4 GHz Bluetooth + 5 GHz WI-FI MIMO	Yes

- 2.4 GHz WLAN and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
- 2.4 GHz WLAN and 5 GHz WLAN cannot transmit simultaneously.
- All licensed modes share the same antenna path and cannot transmit simultaneously.
- This device supports 2x2 MIMO Tx for WLAN 802.11a/g/n/ac. 802.11a/g/n/ac supports CDD and STBC and 802.11n/ac additionally supports SDM. Each WLAN antenna can transmit independently or together when operating with MIMO.

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.

This device supports IEEE 802.11ac with the following features:

- Up to 80 MHz Bandwidth only
- No aggregate channel configurations
- 2 Tx antenna output
- 256 QAM is supported
- TDWR and Band gap channels are supported

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(B) Licensed Transmitter(s)

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

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

This device supports 64QAM on the uplink and 256QAM on the downlink for LTE Operations. Conducted powers for 64QAM uplink configurations were measured per Section 5.1 of FCC KDB Publication 941225 D05v02r05. SAR was not required for 64QAM since the highest maximum output power for 64QAM is $\leq \frac{1}{2}$ dB higher than the same configuration in QPSK and the reported SAR for the QPSK configuration is ≤ 1.45 W/kg, per Section 5.2.4 of FCC KDB Publication 941225 D05v02r05.

1.7 Guidance Applied

- FCC KDB Publication 941225 D01v03r01, D05v02r04, D05Av01r02, D06v02r01 (3G/4G)
- 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 616217 D04v01r02 (Tablet)
- 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 10.

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LTE INFORMATION

LTE Information						
Form Factor	Portable Tablet					
Frequency Range of each LTE transmission band	LTE Band 71 (665.5 - 695.5 MHz)					
	LTE Band 12 (699.7 - 715.3 MHz)					
	LTE Band 13 (779.5 - 784.5 MHz)					
	LTE Band 26 (Cell) (814.7 - 848.3 MHz)					
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)					
	LTE Band 66 (AWS) (1710.7 - 1779.3 MHz)					
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)					
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)					
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)					
	LTE Band 7 (2502.5 - 2567.5 MHz)					
	LTE Band 41 (2498.5 - 2687.5 MHz)					
	Channel Bandwidths	LTE Band 71: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
		LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
LTE Band 13: 5 MHz, 10 MHz						
LTE Band 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz						
LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz						
LTE Band 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						
LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz						
LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz						
LTE Band 7: 5 MHz, 10 MHz, 15 MHz, 20 MHz						
LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz						
Channel Numbers and Frequencies (MHz)		Low	Low-Mid	Mid	Mid-High	High
		LTE Band 71: 5 MHz	665.5 (133147)	680.5 (133297)	695.5 (133447)	
LTE Band 71: 10 MHz	668 (133172)	680.5 (133297)	693 (133422)			
LTE Band 71: 15 MHz	670.5 (133197)	680.5 (133297)	690.5 (133397)			
LTE Band 71: 20 MHz	673 (133222)	680.5 (133297)	688 (133372)			
LTE Band 12: 1.4 MHz	699.7 (23017)	707.5 (23095)	715.3 (23173)			
LTE Band 12: 3 MHz	700.5 (23025)	707.5 (23095)	714.5 (23165)			
LTE Band 12: 5 MHz	701.5 (23035)	707.5 (23095)	713.5 (23155)			
LTE Band 12: 10 MHz	704 (23060)	707.5 (23095)	711 (23130)			
LTE Band 13: 5 MHz	779.5 (23205)	782 (23230)	784.5 (23255)			
LTE Band 13: 10 MHz	N/A	782 (23230)	N/A			
LTE Band 26 (Cell): 1.4 MHz	814.7 (26697)	831.5 (26865)	848.3 (27033)			
LTE Band 26 (Cell): 3 MHz	815.5 (26705)	831.5 (26865)	847.5 (27025)			
LTE Band 26 (Cell): 5 MHz	816.5 (26715)	831.5 (26865)	846.5 (27015)			
LTE Band 26 (Cell): 10 MHz	819 (26740)	831.5 (26865)	844 (26990)			
LTE Band 26 (Cell): 15 MHz	821.5 (26765)	831.5 (26865)	841.5 (26965)			
LTE Band 5 (Cell): 1.4 MHz	824.7 (20407)	836.5 (20525)	848.3 (20643)			
LTE Band 5 (Cell): 3 MHz	825.5 (20415)	836.5 (20525)	847.5 (20635)			
LTE Band 5 (Cell): 5 MHz	826.5 (20425)	836.5 (20525)	846.5 (20625)			
LTE Band 5 (Cell): 10 MHz	829 (20450)	836.5 (20525)	844 (20600)			
LTE Band 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 (19857)	1732.5 (20175)	1754.3 (20393)			
LTE Band 4 (AWS): 3 MHz	1711.5 (19865)	1732.5 (20175)	1753.5 (20385)			
LTE Band 4 (AWS): 5 MHz	1712.5 (19875)	1732.5 (20175)	1752.5 (20375)			
LTE Band 4 (AWS): 10 MHz	1715 (20000)	1732.5 (20175)	1750 (20350)			
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)	1732.5 (20175)	1747.5 (20325)			
LTE Band 4 (AWS): 20 MHz	1720 (20050)	1732.5 (20175)	1745 (20300)			
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)	1882.5 (26365)	1914.3 (26683)			
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)	1882.5 (26365)	1913.5 (26675)			
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)	1882.5 (26365)	1912.5 (26665)			
LTE Band 25 (PCS): 10 MHz	1855 (26090)	1882.5 (26365)	1910 (26640)			
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)	1882.5 (26365)	1907.5 (26615)			
LTE Band 25 (PCS): 20 MHz	1860 (26140)	1882.5 (26365)	1905 (26590)			
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)	1880 (18900)	1909.3 (19193)			
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)	1880 (18900)	1908.5 (19185)			
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)	1880 (18900)	1907.5 (19175)			
LTE Band 2 (PCS): 10 MHz	1855 (18650)	1880 (18900)	1905 (19150)			
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)	1880 (18900)	1902.5 (19125)			
LTE Band 2 (PCS): 20 MHz	1860 (18700)	1880 (18900)	1900 (19100)			
LTE Band 7: 5 MHz	2502.5 (20775)	2535 (21100)	2567.5 (21425)			
LTE Band 7: 10 MHz	2505 (20800)	2535 (21100)	2565 (21400)			
LTE Band 7: 15 MHz	2507.5 (20825)	2535 (21100)	2562.5 (21375)			
LTE Band 7: 20 MHz	2510 (20850)	2535 (21100)	2560 (21350)			
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 13, UL UE Cat 5					
Modulations Supported in UL	QPSK, 16QAM, 64QAM					
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3-6.2.5? (manufacturer attestation to be provided)	YES					
A-MPR (Additional MPR) disabled for SAR Testing?	YES					
LTE Carrier Aggregation Possible Combinations	The technical description includes all the possible carrier aggregation combinations					
LTE Additional Information	This device does not support full CA features on 3GPP Release 11. All uplink communications are identical to the Release 8 Specifications. Uplink communications are done on the PCC. The following LTE Release 11 Features are not supported: Relay, HetNet, Enhanced MIMO, eCIC, WiFi Offloading, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.					

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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]

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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.

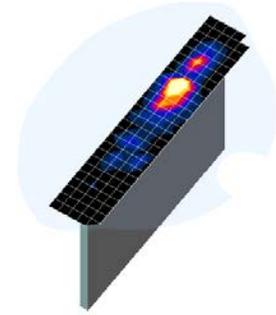


Figure 4-1
Sample SAR Area Scan

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

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

*Also compliant to IEEE 1528-2013 Table 6

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5 TEST CONFIGURATION POSITIONS

5.1 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 $\delta = 0.02$.

5.2 SAR Testing for Tablet per KDB Publication 616217 D04v01r02

Per FCC KDB Publication 616217 D04v01r02, the back surface and edges of the tablet should be tested for SAR compliance with the tablet touching the phantom. The SAR Exclusion Threshold in KDB 447498 D01v06 can be applied to determine SAR test exclusion for adjacent edge configurations. The closest distance from the antenna to an adjacent tablet edge is used to determine if SAR testing is required for the adjacent edges, with the adjacent edge positioned against the phantom and the edge containing the antenna positioned perpendicular to the phantom.

5.3 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 non-reduced 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.

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6 RF EXPOSURE LIMITS

6.1 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.

6.2 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 6-1
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.

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7 FCC MEASUREMENT PROCEDURES

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

7.1 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.

7.2 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.

7.3 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.

7.4 SAR Measurement Conditions for UMTS

7.4.1 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.

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7.4.2 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.

7.4.3 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.

7.4.4 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.

7.5 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).

7.5.1 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.

7.5.2 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.

7.5.3 A-MPR

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

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7.5.4 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.

7.5.5 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.

7.5.6 Downlink Only Carrier Aggregation

Conducted power measurements with LTE Carrier Aggregation (CA) (downlink only) active are made in accordance to KDB Publication 941225 D05Av01r02. The RRC connection is only handled by one cell, the primary component carrier (PCC) for downlink and uplink communications. After making a data connection to the PCC, the UE device adds secondary component carrier(s) (SCC) on the downlink only. All uplink communications and acknowledgements remain identical to specifications when downlink carrier aggregation is inactive on the PCC. Additional conducted output powers are measured with the downlink carrier aggregation active for the configuration with highest measured maximum conducted power with downlink carrier aggregation inactive measured among the channel bandwidth, modulation, and RB combinations in each frequency band. Per FCC KDB Publication 941225 D05Av01r02, no SAR measurements are required for downlink only carrier aggregation configurations when the average output power with downlink only carrier aggregation active is not more than 0.25 dB higher than the average output power with downlink only carrier aggregation inactive.

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7.6 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.

7.6.1 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.

7.6.2 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.

7.6.3 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.

7.6.4 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.

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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.

7.6.5 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.

7.6.6 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 7.6.5).

7.6.7 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.

7.6.8 MIMO SAR considerations

Per KDB Publication 248227 D01v02r02, the simultaneous SAR provisions in KDB Publication 447498 D01v06 should be applied to determine simultaneous transmission SAR test exclusion for WIFI MIMO. If the sum of 1g single transmission chain SAR measurements is < 1.6 W/kg, no additional SAR measurements for MIMO are required. Alternatively, SAR for MIMO can be measured with all antennas transmitting simultaneously at the specified maximum output power of MIMO operation.

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8 RF CONDUCTED POWERS

8.1 UMTS Conducted Powers

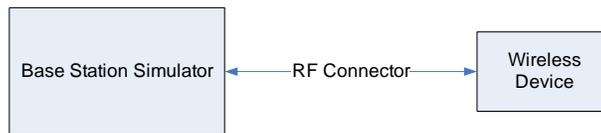
**Table 8-1
Maximum Conducted Power**

	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	24.90	25.16	25.20	24.69	24.66	24.63	23.70	23.60	23.62	-
6	HSDPA	Subtest 1	24.17	24.13	24.16	23.68	23.55	23.56	22.55	22.38	22.37	0
6		Subtest 2	24.13	24.15	24.22	23.79	23.62	23.58	22.57	22.36	22.46	0
6		Subtest 3	23.71	23.58	23.78	23.32	23.11	23.09	21.98	21.82	21.80	0.5
6		Subtest 4	23.65	23.61	23.71	23.30	23.13	23.08	22.01	21.78	21.76	0.5
6	HSUPA	Subtest 1	24.16	24.19	24.29	23.79	23.81	23.80	22.59	22.37	22.37	0
6		Subtest 2	22.21	22.25	22.34	21.74	21.78	21.83	20.60	20.40	20.42	2
6		Subtest 3	23.18	23.24	23.35	22.70	22.74	22.85	21.58	21.41	21.37	1
6		Subtest 4	22.23	22.27	22.36	21.73	21.76	21.84	20.59	20.41	20.41	2
6		Subtest 5	24.21	24.26	24.35	23.73	23.87	23.85	22.61	22.41	22.40	0

**Table 8-2
Reduced 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	17.98	18.04	18.12	11.70	11.58	11.66	10.70	10.69	10.65	-
6	HSDPA	Subtest 1	18.02	18.06	18.12	11.63	11.62	11.54	10.60	10.51	10.37	0
6		Subtest 2	18.12	18.09	18.10	11.70	11.61	11.69	10.69	10.44	10.36	0
6		Subtest 3	16.52	16.24	16.35	10.08	10.02	10.00	8.98	8.78	8.72	0.5
6		Subtest 4	16.54	16.42	16.54	10.02	10.00	10.23	8.96	8.81	8.70	0.5
6	HSUPA	Subtest 1	17.01	17.01	17.12	11.00	10.60	10.70	10.01	9.39	9.35	0
6		Subtest 2	15.04	15.09	15.16	8.61	8.62	8.73	7.60	7.48	7.36	2
6		Subtest 3	16.02	16.08	16.13	10.02	9.85	9.90	8.55	8.39	8.30	1
6		Subtest 4	15.03	15.08	15.14	8.60	8.62	8.81	7.61	7.41	7.36	2
6		Subtest 5	17.03	17.08	17.15	10.62	10.65	10.75	9.59	9.30	9.35	0

This device does not support DC-HSDPA.



**Figure 8-1
Power Measurement Setup**

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8.2 LTE Conducted Powers

8.2.1 LTE Band 71

Table 8-3
LTE Band 71 Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			133297 (680.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	24.55	0	0
	1	50	24.82		0
	1	99	24.99		0
	50	0	23.85	0-1	1
	50	25	23.72		1
	50	50	23.72		1
	100	0	23.69		1
16QAM	1	0	24.19	0-1	1
	1	50	23.84		1
	1	99	23.97		1
	50	0	22.84	0-2	2
	50	25	22.71		2
	50	50	22.72		2
	100	0	22.83		2
64QAM	1	0	23.07	0-2	2
	1	50	22.64		2
	1	99	23.00		2
	50	0	21.72	0-3	3
	50	25	21.56		3
	50	50	21.71		3
	100	0	21.70		3

Note: LTE Band 71 at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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**Table 8-4
LTE Band 71 Maximum Conducted Powers - 15 MHz Bandwidth**

LTE Band 71 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			133297 (680.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	24.92	0	0
	1	36	24.65		0
	1	74	24.82		0
	36	0	23.60	0-1	1
	36	18	23.53		1
	36	37	23.50		1
	75	0	23.55		1
16QAM	1	0	23.72	0-1	1
	1	36	23.49		1
	1	74	23.62		1
	36	0	22.63	0-2	2
	36	18	22.52		2
	36	37	22.48		2
	75	0	22.58		2
64QAM	1	0	23.08	0-2	2
	1	36	23.11		2
	1	74	22.98		2
	36	0	21.61	0-3	3
	36	18	21.53		3
	36	37	21.57		3
	75	0	21.48		3

Note: LTE Band 71 at 15 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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Table 8-5
LTE Band 71 Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 71 10 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			133172 (668.0 MHz)	133297 (680.5 MHz)	133422 (693.0 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	24.92	24.87	24.87	0	0	
	1	25	25.11	25.05	24.92		0	
	1	49	24.72	24.91	24.77		0	
	25	0	23.83	23.87	23.80	0-1	1	
	25	12	23.89	23.83	23.79		1	
	25	25	23.86	23.78	23.70		1	
16QAM	50	0	23.90	23.80	23.75	0-1	1	
	1	0	23.69	23.77	23.64		0-1	1
	1	25	23.65	23.71	23.81			1
	1	49	23.38	23.88	23.56	0-2		1
	25	0	22.81	22.86	22.79		2	
	25	12	22.88	22.86	22.78		2	
64QAM	25	25	22.81	22.74	22.73	0-2	2	
	50	0	22.88	22.76	22.73		2	
	1	0	22.83	22.89	22.84		0-2	2
	1	25	23.10	22.84	22.72	2		
	1	49	22.73	22.73	22.81	2		
	64QAM	25	0	21.93	21.96	21.81	0-3	3
25		12	21.93	21.92	21.77	3		
25		25	21.94	21.82	21.69	3		
50		0	21.89	21.81	21.74	0-3	3	
							3	
							3	

Table 8-6
LTE Band 71 Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 71 5 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			133147 (665.5 MHz)	133297 (680.5 MHz)	133447 (695.5 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	24.96	24.98	24.58	0	0	
	1	12	25.07	24.92	24.66		0	
	1	24	25.08	24.89	24.65		0	
	12	0	23.73	23.68	23.67	0-1	1	
	12	6	23.74	23.79	23.66		1	
	12	13	23.71	23.75	23.71		1	
16QAM	25	0	23.68	23.66	23.62	0-1	1	
	1	0	23.27	23.62	23.18		0-1	1
	1	12	23.42	23.66	23.35			1
	1	24	23.37	23.59	23.24	0-2		1
	12	0	22.73	22.74	22.62		2	
	12	6	22.85	22.81	22.70		2	
64QAM	12	13	22.71	22.80	22.71	0-2	2	
	25	0	22.71	22.69	22.63		2	
	1	0	23.17	23.00	22.76		0-2	2
	1	12	23.17	23.09	22.91	2		
	1	24	23.19	22.88	22.86	0-3		2
	12	0	21.74	21.66	21.60		3	
12	6	21.75	21.86	21.65	3			
64QAM	12	13	21.77	21.81	21.65	0-3	3	
	25	0	21.63	21.72	21.57		3	

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**Table 8-7
LTE Band 71 Reduced Conducted Powers - 20 MHz Bandwidth**

LTE Band 71 20 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			133297 (680.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	17.52	0	0
	1	50	17.00		0
	1	99	17.32		0
	50	0	17.25	0-1	0
	50	25	17.05		0
	50	50	17.16		0
	100	0	17.22		0
16QAM	1	0	17.70	0-1	0
	1	50	17.19		0
	1	99	17.44		0
	50	0	17.18	0-2	0
	50	25	17.04		0
	50	50	17.07		0
	100	0	17.18		0
64QAM	1	0	17.70	0-2	0
	1	50	17.45		0
	1	99	17.68		0
	50	0	17.22	0-3	0
	50	25	17.13		0
	50	50	17.21		0
	100	0	17.28		0

Note: LTE Band 71 at 20 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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**Table 8-8
LTE Band 71 Reduced Conducted Powers - 15 MHz Bandwidth**

LTE Band 71 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			133297 (680.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	17.28	0	0
	1	36	17.07		0
	1	74	17.12		0
	36	0	17.34	0-1	0
	36	18	17.22		0
	36	37	17.25		0
	75	0	17.23		0
16QAM	1	0	17.63	0-1	0
	1	36	17.41		0
	1	74	17.41		0
	36	0	17.31	0-2	0
	36	18	17.18		0
	36	37	17.31		0
	75	0	17.21		0
64QAM	1	0	17.65	0-2	0
	1	36	17.64		0
	1	74	17.50		0
	36	0	17.30	0-3	0
	36	18	17.23		0
	36	37	17.22		0
	75	0	17.12		0

Note: LTE Band 71 at 15 MHz bandwidth does not support three non-overlapping channels. Per KDB Publication 941225 D05v02, when a device supports overlapping channel assignment in a channel bandwidth configuration, the middle channel of the group of overlapping channels should be selected for testing.

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Table 8-9
LTE Band 71 Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 71 10 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			133172 (668.0 MHz)	133297 (680.5 MHz)	133422 (693.0 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	17.23	17.27	17.29	0	0	
	1	25	17.36	17.32	17.25		0	
	1	49	17.13	17.19	17.10		0	
	25	0	17.51	17.55	17.51	0-1	0	
	25	12	17.48	17.41	17.40		0	
	25	25	17.48	17.37	17.31		0	
16QAM	50	0	17.56	17.43	17.33	0-1	0	
	1	0	17.39	17.45	17.66		0-1	0
	1	25	17.54	17.27	17.69			0
	1	49	17.32	17.57	17.46	0-2		0
	25	0	17.50	17.56	17.48		0	
	25	12	17.50	17.45	17.40		0	
64QAM	25	25	17.46	17.36	17.36	0-2	0	
	50	0	17.52	17.36	17.37		0	
	1	0	17.28	17.20	17.68		0-2	0
	1	25	17.41	17.27	17.55	0		
	1	49	17.29	17.24	17.48	0		
	64QAM	25	0	17.63	17.62	17.46	0-3	0
25		12	17.60	17.48	17.40	0		
25		25	17.55	17.44	17.35	0		
50		0	17.55	17.41	17.32	0		

Table 8-10
LTE Band 71 Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 71 5 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			133147 (665.5 MHz)	133297 (680.5 MHz)	133447 (695.5 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	17.33	17.59	17.19	0	0	
	1	12	17.44	17.42	17.28		0	
	1	24	17.39	17.40	17.19		0	
	12	0	17.39	17.36	17.39	0-1	0	
	12	6	17.50	17.47	17.38		0	
	12	13	17.39	17.48	17.44		0	
16QAM	25	0	17.41	17.36	17.34	0-1	0	
	1	0	17.46	17.67	17.38		0-1	0
	1	12	17.47	17.59	17.49			0
	1	24	17.43	17.59	17.39	0-2		0
	12	0	17.49	17.43	17.39		0	
	12	6	17.53	17.55	17.39		0	
64QAM	12	13	17.47	17.54	17.39	0-2	0	
	25	0	17.45	17.41	17.35		0-2	0
	1	0	17.48	17.58	17.31			0-2
	1	12	17.65	17.61	17.42	0-3		
	1	24	17.59	17.47	17.35		0	
	12	0	17.46	17.38	17.35		0	
64QAM	12	6	17.51	17.51	17.40	0-3	0	
	12	13	17.44	17.54	17.34		0	
	25	0	17.40	17.42	17.31		0	

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8.2.2

LTE Band 12

Table 8-11
LTE Band 12 Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23095 (707.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	25.01	0	0
	1	25	24.87		0
	1	49	24.97		0
	25	0	23.90	0-1	1
	25	12	23.73		1
	25	25	23.84		1
	50	0	23.89		1
16QAM	1	0	24.00	0-1	1
	1	25	23.88		1
	1	49	23.92		1
	25	0	22.80	0-2	2
	25	12	22.64		2
	25	25	22.77		2
	50	0	22.75		2
64QAM	1	0	23.20	0-2	2
	1	25	23.18		2
	1	49	23.19		2
	25	0	21.81	0-3	3
	25	12	21.70		3
	25	25	21.85		3
	50	0	21.76		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.

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Table 8-12
LTE Band 12 Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 12 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23035 (701.5 MHz)	23095 (707.5 MHz)	23155 (713.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.79	24.86	24.89	0	0
	1	12	24.77	25.03	24.95		0
	1	24	24.75	24.95	24.84		0
	12	0	23.68	23.67	23.74	0-1	1
	12	6	23.83	23.74	23.77		1
	12	13	23.76	23.83	23.75		1
	25	0	23.77	23.74	23.74		1
16QAM	1	0	23.74	23.46	23.77	0-1	1
	1	12	23.83	23.69	23.89		1
	1	24	23.71	23.60	23.75		1
	12	0	22.73	22.72	22.75	0-2	2
	12	6	22.83	22.79	22.81		2
	12	13	22.73	22.84	22.77		2
	25	0	22.74	22.79	22.75		2
64QAM	1	0	22.98	23.11	22.98	0-2	2
	1	12	22.97	22.75	23.11		2
	1	24	23.12	23.19	22.97		2
	12	0	21.66	21.64	21.74	0-3	3
	12	6	21.82	21.68	21.77		3
	12	13	21.65	21.83	21.76		3
	25	0	21.70	21.78	21.81		3

Table 8-13
LTE Band 12 Maximum Conducted Powers - 3 MHz Bandwidth

LTE Band 12 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23025 (700.5 MHz)	23095 (707.5 MHz)	23165 (714.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.80	24.77	24.83	0	0
	1	7	24.93	25.07	25.10		0
	1	14	24.80	24.97	24.88		0
	8	0	23.81	23.68	23.75	0-1	1
	8	4	23.76	23.80	23.82		1
	8	7	23.68	23.75	23.77		1
	15	0	23.77	23.80	23.77		1
16QAM	1	0	23.64	23.28	23.76	0-1	1
	1	7	23.91	23.58	24.13		1
	1	14	23.69	23.37	23.76		1
	8	0	22.67	22.53	22.82	0-2	2
	8	4	22.66	22.63	22.85		2
	8	7	22.58	22.58	22.85		2
	15	0	22.77	22.75	22.93		2
64QAM	1	0	23.01	22.62	22.67	0-2	2
	1	7	22.98	22.97	22.83		2
	1	14	22.81	22.69	22.65		2
	8	0	21.79	21.76	21.90	0-3	3
	8	4	21.77	21.98	22.02		3
	8	7	21.63	21.87	21.96		3
	15	0	21.86	21.86	21.72		3

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Table 8-14
LTE Band 12 Maximum Conducted Powers -1.4 MHz Bandwidth

LTE Band 12 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23017 (699.7 MHz)	23095 (707.5 MHz)	23173 (715.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.87	24.73	24.96	0	0
	1	2	24.69	24.78	25.03		0
	1	5	24.67	24.87	25.06		0
	3	0	25.07	24.76	25.02		0
	3	2	24.96	24.90	25.02		0
	3	3	24.84	24.84	24.90		0
16QAM	6	0	23.85	23.57	23.62	0-1	1
	1	0	23.77	23.24	23.70	0-1	1
	1	2	23.70	23.31	23.78		1
	1	5	23.67	23.33	23.82		1
	3	0	24.00	23.67	23.81		1
	3	2	23.84	23.85	23.89		1
3	3	23.71	23.83	23.84	1		
64QAM	6	0	22.80	22.53	22.57	0-2	2
	1	0	22.74	22.65	22.52	0-2	2
	1	2	22.79	22.69	22.49		2
	1	5	22.85	22.68	22.50		2
	3	0	22.90	22.98	23.00		2
	3	2	23.04	23.12	23.04		2
3	3	22.80	23.07	22.99	2		
	6	0	21.78	21.55	21.68	0-3	3

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**Table 8-15
LTE Band 12 Reduced Conducted Powers - 10 MHz Bandwidth**

LTE Band 12 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23095 (707.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	16.99	0	0
	1	25	16.81		0
	1	49	16.89		0
	25	0	17.00	0-1	0
	25	12	16.80		0
	25	25	16.93		0
	50	0	16.94		0
16QAM	1	0	17.18	0-1	0
	1	25	17.20		0
	1	49	17.12		0
	25	0	16.90	0-2	0
	25	12	16.76		0
	25	25	16.88		0
	50	0	16.90		0
64QAM	1	0	17.06	0-2	0
	1	25	16.88		0
	1	49	17.00		0
	25	0	16.93	0-3	0
	25	12	16.80		0
	25	25	16.94		0
	50	0	16.94		0

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.

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Table 8-16
LTE Band 12 Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 12 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23035 (701.5 MHz)	23095 (707.5 MHz)	23155 (713.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	16.95	16.90	16.90	0	0
	1	12	16.83	16.91	16.92		0
	1	24	16.85	16.76	16.76		0
	12	0	16.79	16.76	16.88	0-1	0
	12	6	17.00	16.82	16.86		0
	12	13	16.83	16.90	16.90		0
	25	0	16.83	16.82	16.83		0
16QAM	1	0	17.15	17.00	17.15	0-1	0
	1	12	17.05	17.17	17.19		0
	1	24	17.00	17.00	17.07		0
	12	0	16.93	16.88	17.00	0-2	0
	12	6	17.06	16.98	17.01		0
	12	13	16.98	17.03	16.99		0
	25	0	16.88	16.94	16.94		0
64QAM	1	0	17.17	17.03	17.16	0-2	0
	1	12	17.09	17.13	17.13		0
	1	24	17.15	17.05	17.08		0
	12	0	16.88	16.86	16.96	0-3	0
	12	6	17.05	16.96	17.03		0
	12	13	16.91	16.99	16.97		0
	25	0	16.91	16.98	16.97		0

Table 8-17
LTE Band 12 Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 12 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23025 (700.5 MHz)	23095 (707.5 MHz)	23165 (714.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	16.88	16.77	16.89	0	0
	1	7	16.89	16.88	17.02		0
	1	14	16.91	16.80	16.86		0
	8	0	16.93	16.78	16.93	0-1	0
	8	4	16.86	16.92	16.92		0
	8	7	16.85	16.82	16.87		0
16QAM	15	0	16.96	16.88	16.85	0	
	1	0	17.09	16.86	16.93	0-1	0
	1	7	17.20	17.20	17.19		0
	1	14	17.06	17.13	17.18		0
	8	0	16.93	16.95	16.96	0-2	0
	8	4	16.86	17.03	17.05		0
8	7	16.83	16.95	16.97	0		
64QAM	15	0	16.92	16.98	16.96	0	
	1	0	17.10	16.96	17.10	0-2	0
	1	7	17.20	17.19	17.18		0
	1	14	17.11	17.13	17.20		0
	8	0	17.00	16.92	16.99	0-3	0
	8	4	16.93	17.05	17.10		0
8	7	16.90	16.97	17.05	0		
	15	0	16.88	16.97	16.96	0	

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Table 8-18
LTE Band 12 Reduced Conducted Powers -1.4 MHz Bandwidth

LTE Band 12 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23017 (699.7 MHz)	23095 (707.5 MHz)	23173 (715.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	16.94	16.68	16.80	0	0
	1	2	17.16	16.69	16.81		0
	1	5	16.82	16.69	16.88		0
	3	0	16.94	16.69	16.84		0
	3	2	16.89	16.81	16.90		0
	3	3	16.73	16.75	16.80		0
16QAM	1	0	17.12	16.95	17.05	0-1	0
	1	2	17.18	16.94	17.10		0
	1	5	17.03	16.98	17.13		0
	3	0	17.08	16.83	16.96		0
	3	2	17.06	17.00	17.06		0
	3	3	16.95	16.93	17.00		0
64QAM	1	0	17.11	16.96	17.11	0-2	0
	1	2	17.11	17.05	17.16		0
	1	5	17.05	17.00	17.18		0
	3	0	17.14	16.84	17.10		0
	3	2	17.05	17.00	17.19		0
	3	3	16.95	16.95	17.20		0
	6	0	16.94	16.79	16.92	0-3	0

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LTE Band 13

Table 8-19
 LTE Band 13 Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 13 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	25.10	0	0
	1	25	24.92		0
	1	49	24.87		0
	25	0	23.90	0-1	1
	25	12	23.86		1
	25	25	23.84		1
	50	0	23.88		1
16QAM	1	0	23.41	0-1	1
	1	25	24.10		1
	1	49	24.16		1
	25	0	22.82	0-2	2
	25	12	22.81		2
	25	25	22.78		2
	50	0	22.98		2
64QAM	1	0	23.11	0-2	2
	1	25	22.85		2
	1	49	22.95		2
	25	0	21.98	0-3	3
	25	12	21.90		3
	25	25	21.87		3
	50	0	21.88		3

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**Table 8-20
LTE Band 13 Maximum Conducted Powers - 5 MHz Bandwidth**

LTE Band 13 5 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	24.77	0	0
	1	12	24.75		0
	1	24	24.72		0
	12	0	23.79	0-1	1
	12	6	23.74		1
	12	13	23.78		1
	25	0	23.84		1
16QAM	1	0	23.73	0-1	1
	1	12	23.73		1
	1	24	23.67		1
	12	0	22.79	0-2	2
	12	6	22.83		2
	12	13	22.80		2
	25	0	22.80		2
64QAM	1	0	23.01	0-2	2
	1	12	23.11		2
	1	24	22.98		2
	12	0	21.78	0-3	3
	12	6	21.78		3
	12	13	21.78		3
	25	0	21.82		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.

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**Table 8-21
LTE Band 13 Reduced Conducted Powers - 10 MHz Bandwidth**

LTE Band 13 10 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	17.20	0	0
	1	25	16.95		0
	1	49	17.00		0
	25	0	17.18	0-1	0
	25	12	17.09		0
	25	25	17.00		0
	50	0	17.17		0
16QAM	1	0	17.19	0-1	0
	1	25	17.13		0
	1	49	17.20		0
	25	0	17.10	0-2	0
	25	12	17.04		0
	25	25	16.97		0
	50	0	17.20		0
64QAM	1	0	17.16	0-2	0
	1	25	17.10		0
	1	49	17.06		0
	25	0	17.04	0-3	0
	25	12	16.92		0
	25	25	16.83		0
	50	0	17.04		0

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**Table 8-22
LTE Band 13 Reduced Conducted Powers - 5 MHz Bandwidth**

LTE Band 13 5 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			23230 (782.0 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	16.82	0	0
	1	12	16.83		0
	1	24	16.69		0
	12	0	16.91	0-1	0
	12	6	16.86		0
	12	13	16.88		0
	25	0	16.88		0
16QAM	1	0	17.12	0-1	0
	1	12	17.06		0
	1	24	16.90		0
	12	0	16.90	0-2	0
	12	6	16.91		0
	12	13	16.89		0
	25	0	16.92		0
64QAM	1	0	17.05	0-2	0
	1	12	17.07		0
	1	24	17.00		0
	12	0	16.92	0-3	0
	12	6	16.90		0
	12	13	16.90		0
	25	0	16.88		0

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.

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LTE Band 26 (Cell)

Table 8-23
LTE Band 26 (Cell) Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 26 (Cell) 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26865 (831.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	24.99	0	0
	1	36	25.14		0
	1	74	25.20		0
	36	0	24.17	0-1	1
	36	18	24.07		1
	36	37	24.02		1
	75	0	23.96		1
16QAM	1	0	23.99	0-1	1
	1	36	24.17		1
	1	74	24.19		1
	36	0	23.20	0-2	2
	36	18	23.10		2
	36	37	23.07		2
	75	0	23.02		2
64QAM	1	0	23.02	0-2	2
	1	36	23.00		2
	1	74	23.20		2
	36	0	21.90	0-3	3
	36	18	21.91		3
	36	37	21.90		3
	75	0	21.82		3

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

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Table 8-24
LTE Band 26 (Cell) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 26 (Cell) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26740 (819.0 MHz)	26865 (831.5 MHz)	26990 (844.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.97	25.03	25.05	0	0
	1	25	24.78	24.75	24.82		0
	1	49	25.01	25.00	25.02		0
	25	0	23.85	23.85	23.88	0-1	1
	25	12	23.70	23.75	23.84		1
	25	25	23.70	23.78	23.78		1
16QAM	50	0	23.75	23.80	23.90	0-1	1
	1	0	23.85	23.98	23.99		1
	1	25	23.76	23.67	23.69		1
	1	49	23.95	23.93	23.88	0-2	1
	25	0	22.75	22.85	22.81		2
	25	12	22.70	22.70	22.82		2
64QAM	25	25	22.70	22.75	22.82	0-2	2
	50	0	22.75	22.80	22.84		2
	1	0	23.17	23.12	23.20		0-2
	1	25	23.10	23.03	23.05	2	
	1	49	23.12	23.20	23.18	2	
	64QAM	25	0	21.81	21.88	21.90	0-3
25		12	21.76	21.75	21.88	3	
25		25	21.75	21.82	21.85	3	
50		0	21.75	21.84	21.86	3	

Table 8-25
LTE Band 26 (Cell) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 26 (Cell) 5 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]		
			26715 (816.5 MHz)	26865 (831.5 MHz)	27015 (846.5 MHz)				
			Conducted Power [dBm]						
QPSK	1	0	25.00	24.95	25.00	0	0		
	1	12	24.95	24.80	24.99		0		
	1	24	24.95	24.80	25.00		0		
	16QAM	12	0	23.91	23.65	23.88	0-1	1	
		12	6	23.91	23.73	23.88		1	
		12	13	23.83	23.71	23.79		1	
64QAM		25	0	23.85	23.70	23.82	0-1	1	
		1	0	23.65	23.85	23.91		1	
		1	12	23.65	23.80	24.00		1	
	64QAM	1	24	23.65	23.75	23.80	0-1	1	
		12	0	22.69	22.73	22.91		0-2	2
		12	6	22.75	22.86	22.91			2
64QAM		12	13	22.85	22.77	22.85	0-2		2
		25	0	22.86	22.73	22.89		2	
		1	0	22.92	23.15	23.19		0-2	2
	1	12	22.94	23.07	23.20	2			
	1	24	22.95	23.10	23.14	0-3	2		
	12	0	21.71	21.67	21.95		3		
12	6	21.70	21.80	21.98	3				
64QAM	12	13	21.65	21.76	21.86	0-3	3		
	25	0	21.58	21.75	21.94		3		

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

LTE Band 26 (Cell) 3 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			26705 (815.5 MHz)	26865 (831.5 MHz)	27025 (847.5 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	24.98	24.92	24.96	0	0	
	1	7	24.98	24.90	25.11		0	
	1	14	25.00	24.93	25.07		0	
	8	0	23.88	23.71	23.90	0-1	1	
	8	4	23.91	23.76	23.91		1	
	8	7	23.87	23.76	23.88		1	
16QAM	15	0	23.88	23.70	23.86	0-1	1	
	1	0	23.66	23.85	24.00		0-1	1
	1	7	23.75	23.95	24.00			1
	1	14	23.70	23.75	23.91	0-2		1
	8	0	22.73	22.75	22.92		2	
	8	4	22.78	22.73	22.83		2	
64QAM	8	7	22.65	22.76	22.83	0-2	2	
	15	0	22.68	22.73	22.78		2	
	1	0	22.95	23.13	23.11		0-2	2
	1	7	23.00	23.20	23.20	0-3		2
	1	14	22.95	23.18	23.08			2
	8	0	21.71	21.82	21.84		0-3	3
	8	4	21.80	21.84	21.88	3		
	8	7	21.71	21.85	21.83	3		
15	0	21.66	21.75	21.80		3		

Table 8-27
LTE Band 26 (Cell) Maximum Conducted Powers -1.4 MHz Bandwidth

LTE Band 26 (Cell) 1.4 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			26697 (814.7 MHz)	26865 (831.5 MHz)	27033 (848.3 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	24.87	25.00	24.97	0	0	
	1	2	24.90	24.96	24.94		0	
	1	5	24.88	24.90	24.99		0	
	3	0	24.90	24.90	24.92	0-1	0	
	3	2	25.00	24.95	24.97		0	
	3	3	24.88	24.88	24.94		0	
16QAM	6	0	23.75	23.70	23.82	0-1	1	
	1	0	23.83	23.95	23.89		0-1	1
	1	2	23.87	23.96	23.95			1
	1	5	23.76	23.88	23.87	0-1		1
	3	0	23.72	23.76	23.88		1	
	3	2	23.88	23.80	23.87		1	
64QAM	3	3	23.74	23.75	23.88	0-2	1	
	6	0	22.81	22.79	22.90		2	
	1	0	23.10	23.10	23.15		0-2	2
	1	2	23.16	23.20	23.12	0-2		2
	1	5	23.10	23.20	23.16			2
	3	0	23.17	23.09	23.19		0-2	2
	3	2	23.20	23.10	23.19	2		
	3	3	23.15	23.07	23.15	2		
6	0	21.76	21.70	21.80	0-3	3		

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**Table 8-28
LTE Band 26 (Cell) Reduced Conducted Powers - 15 MHz Bandwidth**

LTE Band 26 (Cell) 15 MHz Bandwidth					
Modulation	RB Size	RB Offset	Mid Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26865 (831.5 MHz)		
			Conducted Power [dBm]		
QPSK	1	0	18.12	0	0
	1	36	17.96		0
	1	74	18.13		0
	36	0	18.12	0-1	0
	36	18	18.01		0
	36	37	18.08		0
	75	0	18.04		0
16QAM	1	0	18.17	0-1	0
	1	36	18.19		0
	1	74	18.20		0
	36	0	18.08	0-2	0
	36	18	18.01		0
	36	37	18.02		0
	75	0	18.00		0
64QAM	1	0	17.98	0-2	0
	1	36	17.81		0
	1	74	18.10		0
	36	0	17.94	0-3	0
	36	18	17.91		0
	36	37	17.92		0
	75	0	17.87		0

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

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Table 8-29
LTE Band 26 (Cell) Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 26 (Cell) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26740 (819.0 MHz)	26865 (831.5 MHz)	26990 (844.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	17.89	17.90	18.00	0	0
	1	25	17.70	17.63	17.75		0
	1	49	17.90	17.94	17.86		0
	25	0	17.90	17.94	18.05	0-1	0
	25	12	17.88	17.85	17.98		0
	25	25	17.91	17.88	17.92		0
16QAM	50	0	17.90	17.93	18.01	0-1	0
	1	0	18.10	18.10	18.20		0
	1	25	17.90	17.85	18.04		0
	1	49	18.17	18.17	18.10	0-2	0
	25	0	17.90	18.17	17.97		0
	25	12	17.82	17.90	17.95		0
64QAM	25	25	17.86	17.83	17.96	0-2	0
	50	0	17.85	17.86	18.01		0
	1	0	18.10	17.90	18.20		0-3
	1	25	18.00	17.91	18.04	0	
	1	49	18.20	18.17	18.10	0	
	25	0	17.96	17.94	18.01	0-3	0
25	12	17.88	17.86	17.99	0		
25	25	17.88	17.92	17.97	0		
50	0	17.88	17.92	17.99		0	

Table 8-30
LTE Band 26 (Cell) Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 26 (Cell) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26715 (816.5 MHz)	26865 (831.5 MHz)	27015 (846.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	17.78	18.05	18.17	0	0
	1	12	17.80	18.00	18.10		0
	1	24	17.78	17.95	17.98		0
	12	0	17.88	18.00	18.16	0-1	0
	12	6	17.86	18.05	18.15		0
	12	13	17.86	18.05	18.08		0
16QAM	25	0	17.80	18.05	18.14	0-1	0
	1	0	18.00	18.18	18.20		0
	1	12	18.03	18.20	18.17		0
	1	24	18.06	18.18	18.17	0-2	0
	12	0	17.96	18.02	18.20		0
	12	6	17.93	18.14	18.19		0
64QAM	12	13	17.93	18.07	18.11	0-2	0
	25	0	17.80	18.00	18.20		0
	1	0	17.94	18.20	18.19		0-3
	1	12	18.02	18.18	18.20	0	
	1	24	17.95	18.15	18.20	0	
	12	0	17.86	18.00	18.16	0-3	0
12	6	17.86	18.11	18.12	0		
12	13	17.85	18.10	18.13	0		
25	0	17.83	18.06	18.16		0	

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Table 8-31
LTE Band 26 (Cell) Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 26 (Cell) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26705 (815.5 MHz)	26865 (831.5 MHz)	27025 (847.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	17.89	17.92	18.08	0	0
	1	7	17.97	17.95	18.11		0
	1	14	17.91	17.90	18.00		0
	8	0	17.97	18.00	18.08	0-1	0
	8	4	18.04	17.96	18.11		0
	8	7	17.91	18.00	18.03		0
16QAM	15	0	17.92	17.95	18.06	0-1	0
	1	0	18.01	18.15	18.20		0
	1	7	18.17	18.20	18.20		0
	1	14	18.11	18.11	18.19	0-2	0
	8	0	18.00	18.00	18.15		0
	8	4	18.08	17.97	18.12		0
64QAM	8	7	18.00	18.01	18.16	0-2	0
	15	0	17.97	17.95	18.10		0
	1	0	18.05	18.10	18.20		0-3
	1	7	18.18	18.20	18.20	0	
	1	14	18.05	18.05	18.19	0	
	8	0	17.96	18.00	18.12	0	
8	4	18.07	18.00	18.18	0		
8	7	17.98	18.01	18.10	0		
15	0	17.97	17.94	18.17	0		

Table 8-32
LTE Band 26 (Cell) Conducted Powers -1.4 MHz Bandwidth

LTE Band 26 (Cell) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26697 (814.7 MHz)	26865 (831.5 MHz)	27033 (848.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	17.80	17.88	18.02	0	0
	1	2	17.79	17.92	18.03		0
	1	5	17.80	17.95	17.99		0
	3	0	17.75	17.87	18.00	0-1	0
	3	2	17.85	17.92	18.08		0
	3	3	17.75	17.86	18.01		0
16QAM	6	0	17.77	17.90	18.03	0-1	0
	1	0	18.00	18.10	18.20		0
	1	2	18.04	18.15	18.20		0
	1	5	17.99	18.14	18.18	0-2	0
	3	0	17.90	18.01	18.18		0
	3	2	18.02	18.08	18.16		0
64QAM	3	3	17.94	18.00	18.14	0-2	0
	6	0	17.85	17.93	18.15		0
	1	0	17.94	18.08	18.16		0-3
	1	2	17.93	18.06	18.18	0	
	1	5	17.94	18.13	18.16	0	
	3	0	17.81	17.98	18.15	0	
3	2	17.96	18.03	18.20	0		
3	3	17.85	17.96	18.11	0		
6	0	17.81	17.93	18.04	0		

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LTE Band 66 (AWS)

Table 8-33
LTE Band 66 (AWS) Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.92	24.35	24.28	0	0
	1	50	23.91	24.24	24.00		0
	1	99	24.09	24.42	24.01		0
	50	0	22.97	23.12	23.11	0-1	1
	50	25	23.02	22.92	23.03		1
	50	50	23.00	22.97	22.90		1
16QAM	100	0	22.99	22.99	22.96	0-1	1
	1	0	23.69	23.69	23.70		1
	1	50	23.69	23.41	23.42		1
	1	99	23.70	23.63	23.38	0-2	1
	50	0	22.24	22.03	22.12		2
	50	25	22.01	21.87	22.06		2
64QAM	50	50	22.01	21.87	22.11	0-2	2
	100	0	21.91	21.96	22.01		2
	1	0	22.21	22.00	22.70		0-3
	1	50	22.09	21.84	22.61	2	
	1	99	22.40	22.08	22.64	2	
	50	0	21.04	21.15	21.15	3	
50	25	21.05	21.06	21.09	3		
50	50	21.10	21.14	21.15	3		
100	0	21.13	21.07	21.10	3		

Table 8-34
LTE Band 66 (AWS) Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 66 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132047 (1717.5 MHz)	132322 (1745.0 MHz)	132597 (1772.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.09	24.28	24.27	0	0
	1	36	23.94	23.96	24.05		0
	1	74	24.15	24.14	24.07		0
	36	0	23.15	23.15	23.23	0-1	1
	36	18	23.16	23.10	23.18		1
	36	37	23.20	23.22	23.12		1
16QAM	75	0	23.13	23.03	23.16	0-1	1
	1	0	23.35	23.12	23.66		1
	1	36	23.19	23.13	23.48		1
	1	74	23.46	23.49	23.61	0-2	1
	36	0	22.20	22.15	22.18		2
	36	18	22.22	22.13	22.20		2
64QAM	36	37	22.22	22.13	22.10	0-2	2
	75	0	22.08	22.09	22.25		2
	1	0	22.36	22.07	22.45		0-3
	1	36	22.12	22.37	22.67	2	
	1	74	22.44	22.15	22.22	2	
	36	0	21.18	21.10	21.19	3	
36	18	21.21	21.15	21.10	3		
36	37	21.23	21.09	21.20	3		
75	0	21.11	21.09	21.17	3		

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Table 8-35
LTE Band 66 (AWS) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132022 (1715.0 MHz)	132322 (1745.0 MHz)	132622 (1775.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.17	24.32	23.96	0	0
	1	25	24.14	24.12	24.01		0
	1	49	24.28	23.86	23.90		0
	25	0	23.30	23.34	23.21	0-1	1
	25	12	23.24	23.22	23.04		1
	25	25	23.30	23.20	23.25		1
16QAM	50	0	23.35	23.18	23.22	0-1	1
	1	0	23.55	23.21	23.19		1
	1	25	23.51	23.16	23.45		1
	1	49	23.67	23.36	23.63	0-2	1
	25	0	22.29	22.25	22.23		2
	25	12	22.23	22.21	22.19		2
64QAM	25	25	22.31	22.25	22.27	0-2	2
	50	0	22.28	22.17	22.25		2
	1	0	22.27	22.31	22.55		0-2
	1	25	22.45	22.16	22.41	2	
	1	49	22.60	22.47	22.14	0-3	
	25	0	21.19	21.14	21.25		3
25	12	21.24	21.19	21.20	3		
25	25	21.30	21.16	21.26	0-3	3	
50	0	21.26	21.21	21.27		3	

Table 8-36
LTE Band 66 (AWS) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131997 (1712.5 MHz)	132322 (1745.0 MHz)	132647 (1777.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.16	24.22	24.31	0	0
	1	12	24.26	24.33	24.22		0
	1	24	24.05	24.31	24.19		0
	12	0	23.15	23.12	23.06	0-1	1
	12	6	23.22	23.19	23.03		1
	12	13	23.15	23.05	23.03		1
16QAM	25	0	23.16	23.12	23.05	0-1	1
	1	0	23.35	23.69	23.55		1
	1	12	23.41	23.64	23.40		1
	1	24	23.38	23.41	23.32	0-2	1
	12	0	22.27	22.18	22.09		2
	12	6	22.26	22.21	22.12		2
64QAM	12	13	22.20	22.09	22.03	0-2	2
	25	0	22.21	22.14	22.06		2
	1	0	22.39	22.59	22.55		0-2
	1	12	22.29	22.46	22.27	2	
	1	24	22.36	22.40	22.22	0-3	
	12	0	21.29	21.15	21.11		3
12	6	21.25	21.23	21.09	3		
12	13	21.19	21.16	21.01	0-3	3	
25	0	21.19	21.13	21.07		3	

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Table 8-37
LTE Band 66 (AWS) Maximum Conducted Powers - 3 MHz Bandwidth

LTE Band 66 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131987 (1711.5 MHz)	132322 (1745.0 MHz)	132657 (1778.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.16	24.37	24.24	0	0
	1	7	24.29	24.38	24.28		0
	1	14	24.17	24.28	23.99		0
	8	0	23.18	23.16	23.06	0-1	1
	8	4	23.18	23.16	23.10		1
	8	7	23.10	23.12	23.00		1
	15	0	23.21	23.14	23.05		1
16QAM	1	0	23.42	23.12	23.36	0-1	1
	1	7	23.65	23.21	23.66		1
	1	14	23.39	23.02	23.24		1
	8	0	21.93	22.02	22.15	0-2	2
	8	4	22.01	22.01	22.13		2
	8	7	22.00	21.95	22.12		2
	15	0	22.17	22.09	22.19		2
64QAM	1	0	22.49	22.19	22.62	0-2	2
	1	7	22.53	22.21	22.61		2
	1	14	22.53	21.97	22.30		2
	8	0	20.91	21.04	21.14	0-3	3
	8	4	21.06	21.03	21.15		3
	8	7	21.01	20.98	21.12		3
	15	0	21.22	21.07	21.19		3

Table 8-38
LTE Band 66 (AWS) Maximum 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	MPR Allowed per 3GPP [dB]	MPR [dB]
			131979 (1710.7 MHz)	132322 (1745.0 MHz)	132665 (1779.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	24.33	24.63	24.27	0	0
	1	2	24.42	24.59	24.23		0
	1	5	24.30	24.51	24.15		0
	3	0	24.34	24.16	24.04	0-1	0
	3	2	24.36	24.33	24.19		0
	3	3	24.33	24.17	24.17		0
	6	0	23.07	23.00	22.92		1
16QAM	1	0	23.36	23.27	22.91	0-1	1
	1	2	23.34	23.25	23.06		1
	1	5	23.37	23.05	23.08		1
	3	0	23.35	23.22	23.36	0-2	1
	3	2	23.27	23.27	23.49		1
	3	3	23.29	23.33	23.38		1
	6	0	22.25	22.11	22.27		2
64QAM	1	0	22.40	22.21	22.55	0-2	2
	1	2	22.41	22.34	22.65		2
	1	5	22.50	22.26	22.64		2
	3	0	22.28	22.29	22.56	0-3	2
	3	2	22.33	22.25	22.60		2
	3	3	22.26	22.44	22.35		2
	6	0	21.30	21.50	21.45		3

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Table 8-39
LTE Band 66 (AWS) Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 66 (AWS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132072 (1720.0 MHz)	132322 (1745.0 MHz)	132572 (1770.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	11.40	11.33	11.42	0	0
	1	50	11.17	11.20	11.31		0
	1	99	11.45	11.38	11.48		0
	50	0	11.27	11.27	11.37	0-1	0
	50	25	11.16	11.13	11.31		0
	50	50	11.25	11.25	11.36		0
16QAM	100	0	11.26	11.26	11.36	0-1	0
	1	0	11.57	11.56	11.56		0
	1	50	11.40	11.42	11.50		0
	1	99	11.56	11.67	11.64	0-2	0
	50	0	11.20	11.25	11.36		0
	50	25	11.16	11.16	11.31		0
64QAM	50	50	11.17	11.22	11.38	0-2	0
	100	0	11.22	11.22	11.29		0
	1	0	11.60	11.60	11.65		0-2
	1	50	11.65	11.50	11.55	0	
	1	99	11.70	11.70	11.70	0-3	
	50	0	11.14	11.55	11.35		0
	50	25	11.23	11.46	11.32		0
	100	0	11.26	11.57	11.40	0	
			11.32	11.51	11.35	0	

Table 8-40
LTE Band 66 (AWS) Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 66 (AWS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132047 (1717.5 MHz)	132322 (1745.0 MHz)	132597 (1772.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	11.30	11.29	11.36	0	0
	1	36	11.26	11.24	11.26		0
	1	74	11.39	11.35	11.35		0
	36	0	11.34	11.41	11.56	0-1	0
	36	18	11.30	11.41	11.50		0
	36	37	11.30	11.41	11.39		0
16QAM	75	0	11.28	11.32	11.48	0-1	0
	1	0	11.40	11.26	11.36		0
	1	36	11.49	11.22	11.67		0
	1	74	11.44	11.23	11.69	0-2	0
	36	0	11.41	11.42	11.57		0
	36	18	11.42	11.43	11.52		0
64QAM	36	37	11.33	11.42	11.41	0-2	0
	75	0	11.30	11.34	11.54		0
	1	0	11.68	11.25	11.60		0-2
	1	36	11.52	11.21	11.55	0	
	1	74	11.56	11.25	11.57	0-3	
	36	0	11.35	11.54	11.63		0
	36	18	11.42	11.52	11.62		0
			11.37	11.55	11.52	0	
			11.33	11.39	11.49	0	

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Table 8-41
LTE Band 66 (AWS) Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 66 (AWS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			132022 (1715.0 MHz)	132322 (1745.0 MHz)	132622 (1775.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	11.41	11.52	11.58	0	0
	1	25	11.24	11.44	11.27		0
	1	49	11.34	11.51	11.50		0
	25	0	11.49	11.59	11.47	0-1	0
	25	12	11.43	11.51	11.46		0
	25	25	11.47	11.49	11.44		0
16QAM	50	0	11.44	11.48	11.52	0-1	0
	1	0	11.62	11.28	11.59		0
	1	25	11.43	11.18	11.57		0
	1	49	11.54	11.28	11.61	0-2	0
	25	0	11.36	11.52	11.48		0
	25	12	11.41	11.42	11.51		0
64QAM	25	25	11.37	11.44	11.45	0-2	0
	50	0	11.35	11.39	11.48		0
	1	0	11.58	11.48	11.39		0-2
	1	25	11.32	11.38	11.29	0	
	1	49	11.44	11.46	11.23	0-3	
	25	0	11.44	11.67	11.64		0
25	12	11.47	11.49	11.65	0		
	25	25	11.57	11.60	11.63	0-3	0
	50	0	11.63	11.69	11.61		0

Table 8-42
LTE Band 66 (AWS) Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 66 (AWS) 5 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			131997 (1712.5 MHz)	132322 (1745.0 MHz)	132647 (1777.5 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	11.31	11.56	11.30	0	0	
	1	12	11.27	11.46	11.27		0	
	1	24	11.22	11.40	11.25		0-1	0
	12	0	11.42	11.42	11.44	0		
	12	6	11.41	11.46	11.41	0		
	16QAM	12	13	11.35	11.33	11.38	0-1	0
25		0	11.38	11.38	11.42	0		
1		0	11.52	11.63	11.68	0-1		0
1		12	11.35	11.62	11.55		0	
1		24	11.51	11.68	11.52		0-2	0
12		0	11.49	11.47	11.41	0		
64QAM	12	6	11.48	11.44	11.46	0-2		0
	12	13	11.40	11.48	11.35		0	
	25	0	11.39	11.38	11.39		0-2	0
	1	0	11.52	11.70	11.62	0-2		0
	1	12	11.65	11.64	11.51			0
	1	24	11.68	11.51	11.51		0-3	0
12	0	11.69	11.47	11.48	0			
12	6	11.64	11.52	11.55	0-3	0		
12	13	11.62	11.51	11.44		0		
	25	0	11.50	11.63	11.53	0-3	0	

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Table 8-43
LTE Band 66 (AWS) Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 66 (AWS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			131987 (1711.5 MHz)	132322 (1745.0 MHz)	132657 (1778.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	11.31	11.34	11.28	0	0
	1	7	11.28	11.38	11.32		0
	1	14	11.24	11.26	11.18		0
	8	0	11.41	11.49	11.42	0-1	0
	8	4	11.41	11.41	11.47		0
	8	7	11.33	11.43	11.37		0
	15	0	11.35	11.44	11.41	0	
16QAM	1	0	11.62	11.25	11.60	0-1	0
	1	7	11.64	11.25	11.69		0
	1	14	11.48	11.08	11.49		0
	8	0	11.38	11.47	11.54	0-2	0
	8	4	11.32	11.38	11.51		0
	8	7	11.33	11.29	11.36		0
	15	0	11.49	11.39	11.40	0	
64QAM	1	0	11.33	11.23	11.30	0-2	0
	1	7	11.34	11.38	11.47		0
	1	14	11.25	11.09	11.51		0
	8	0	11.39	11.52	11.36	0-3	0
	8	4	11.69	11.61	11.41		0
	8	7	11.54	11.49	11.52		0
	15	0	11.56	11.44	11.66	0	

Table 8-44
LTE Band 66 (AWS) Reduced 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	MPR Allowed per 3GPP [dB]	MPR [dB]
			131979 (1710.7 MHz)	132322 (1745.0 MHz)	132665 (1779.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	11.38	11.30	11.39	0	0
	1	2	11.36	11.33	11.41		0
	1	5	11.36	11.18	11.38		0
	3	0	11.37	11.42	11.45	0-1	0
	3	2	11.38	11.47	11.46		0
	3	3	11.33	11.44	11.39		0
	6	0	11.24	11.32	11.28	0	
16QAM	1	0	11.48	11.48	11.47	0-1	0
	1	2	11.48	11.47	11.48		0
	1	5	11.45	11.46	11.47		0
	3	0	11.50	11.50	11.48	0-2	0
	3	2	11.52	11.52	11.59		0
	3	3	11.50	11.47	11.49		0
	6	0	11.25	11.47	11.26	0	
64QAM	1	0	11.55	11.41	11.68	0-2	0
	1	2	11.61	11.37	11.55		0
	1	5	11.43	11.34	11.54		0
	3	0	11.49	11.44	11.47	0-3	0
	3	2	11.40	11.42	11.48		0
	3	3	11.35	11.41	11.47		0
	6	0	11.44	11.39	11.44	0	

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LTE Band 25 (PCS)

Table 8-45
LTE Band 25 (PCS) Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26140 (1860.0 MHz)	26365 (1882.5 MHz)	26590 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.27	23.32	23.66	0	0
	1	50	23.25	23.17	23.53		0
	1	99	23.27	23.40	23.56		0
	50	0	22.26	22.30	22.31	0-1	1
	50	25	22.18	22.15	22.29		1
	50	50	22.21	22.17	22.19		1
16QAM	100	0	22.17	22.13	22.22	0-1	1
	1	0	22.70	22.40	22.58		1
	1	50	22.67	22.24	22.47		1
	1	99	22.68	22.47	22.70	0-2	1
	50	0	21.24	21.23	21.20		2
	50	25	21.21	21.21	21.28		2
64QAM	50	50	21.25	21.23	21.26	0-2	2
	100	0	21.16	21.12	21.26		2
	1	0	21.22	21.65	21.50		0-2
	1	50	21.04	21.57	21.34	2	
	1	99	21.17	21.70	21.52	2	
	64QAM	50	0	20.19	20.17	20.20	0-3
50		25	20.22	20.12	20.26	3	
50		50	20.27	20.21	20.33	3	
100		0	20.18	20.12	20.25	3	

Table 8-46
LTE Band 25 (PCS) Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26115 (1857.5 MHz)	26365 (1882.5 MHz)	26615 (1907.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.57	23.25	23.41	0	0
	1	36	23.42	23.19	23.38		0
	1	74	23.55	23.20	23.65		0
	36	0	22.32	22.14	22.40	0-1	1
	36	18	22.27	22.15	22.45		1
	36	37	22.34	22.15	22.38		1
16QAM	75	0	22.30	22.11	22.35	0-1	1
	1	0	22.22	21.96	22.46		1
	1	36	22.17	21.83	22.37		1
	1	74	22.39	21.89	22.51	0-2	1
	36	0	21.29	21.12	21.40		2
	36	18	21.32	21.18	21.42		2
64QAM	36	37	21.40	21.15	21.37	0-2	2
	75	0	21.29	21.18	21.44		2
	1	0	21.21	20.97	21.47		0-2
	1	36	21.15	20.82	21.38	2	
	1	74	21.41	20.87	21.44	2	
	64QAM	36	0	20.29	20.31	20.39	0-3
36		18	20.33	20.20	20.44	3	
36		37	20.35	20.15	20.37	3	
75		0	20.29	20.11	20.44	3	

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Table 8-47
LTE Band 25 (PCS) Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26090 (1855.0 MHz)	26365 (1882.5 MHz)	26640 (1910.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.39	23.40	23.42	0	0
	1	25	23.26	23.18	23.34		0
	1	49	23.45	23.39	23.68		0
	25	0	22.20	22.27	22.30	0-1	1
	25	12	22.26	22.27	22.30		1
	25	25	22.20	22.23	22.32		1
16QAM	50	0	22.23	22.30	22.30	0-1	1
	1	0	22.26	22.31	22.05		1
	1	25	22.14	22.11	21.85		1
	1	49	22.32	22.29	22.13	0-2	1
	25	0	21.25	21.26	21.36		2
	25	12	21.33	21.23	21.31		2
64QAM	25	25	21.25	21.22	21.34	0-2	2
	50	0	21.27	21.27	21.30		2
	1	0	21.28	21.34	21.04		2
	1	25	21.15	21.11	20.91	0-2	2
	1	49	21.36	21.30	21.16		2
	25	0	20.24	20.25	20.36		0-3
25	12	20.32	20.25	20.31	3		
25	25	20.26	20.22	20.35	3		
	50	0	20.24	20.26	20.31		3

Table 8-48
LTE Band 25 (PCS) Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			26065 (1852.5 MHz)	26365 (1882.5 MHz)	26665 (1912.5 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	23.40	23.40	23.38	0	0	
	1	12	23.41	23.38	23.45		0	
	1	24	23.38	23.31	23.32		0	
	16QAM	12	0	22.33	22.22	22.34	0-1	1
		12	6	22.31	22.20	22.38		1
		12	13	22.26	22.12	22.29		1
64QAM		25	0	22.27	22.16	22.34	0-1	1
		1	0	22.16	22.27	22.22		1
		1	12	22.09	22.29	22.33		1
	16QAM	1	24	22.06	22.19	22.24	0-2	1
		12	0	21.38	21.27	21.39		2
		12	6	21.34	21.30	21.38		2
64QAM		12	13	21.33	21.18	21.31	0-2	2
		25	0	21.28	21.18	21.34		2
		1	0	21.19	21.31	21.21		0-3
	1	12	21.10	21.29	21.28	2		
	1	24	21.05	21.20	21.21	2		
	64QAM	12	0	20.37	20.29	20.36	0-3	3
12		6	20.33	20.28	20.39	3		
12		13	20.35	20.19	20.35	3		
25		0	20.31	20.19	20.34	3		

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Table 8-49
LTE Band 25 (PCS) Maximum Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26055 (1851.5 MHz)	26365 (1882.5 MHz)	26675 (1913.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.21	23.28	23.35	0	0
	1	7	23.40	23.44	23.54		0
	1	14	23.14	23.32	23.46		0
	8	0	22.27	22.33	22.36	0-1	1
	8	4	22.29	22.27	22.38		1
	8	7	22.20	22.28	22.29		1
16QAM	15	0	22.26	22.26	22.33	0-1	1
	1	0	22.27	22.08	22.32		1
	1	7	22.37	22.20	22.45		1
	1	14	22.14	21.90	22.15	0-2	1
	8	0	21.16	21.42	21.46		2
	8	4	21.20	21.35	21.43		2
64QAM	8	7	21.14	21.36	21.41	0-2	2
	15	0	21.30	21.45	21.47		2
	1	0	21.27	21.10	21.30		0-2
	1	7	21.33	21.21	21.44	2	
	1	14	21.14	20.91	21.17	2	
	64QAM	8	0	20.19	20.22	20.22	0-3
8		4	20.19	20.16	20.22	3	
8		7	20.13	20.16	20.20	3	
15		0	20.29	20.27	20.26	0-3	3

Table 8-50
LTE Band 25 (PCS) Maximum Conducted Powers - 1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26047 (1850.7 MHz)	26365 (1882.5 MHz)	26683 (1914.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	23.23	23.26	23.49	0	0
	1	2	23.31	23.35	23.52		0
	1	5	23.17	23.20	23.57		0
	3	0	23.36	23.35	23.47	0-1	0
	3	2	23.44	23.41	23.42		0
	3	3	23.38	23.29	23.31		0
16QAM	6	0	22.20	22.09	22.18	0-1	1
	1	0	22.33	21.86	22.19		1
	1	2	22.37	21.88	22.23		1
	1	5	22.31	21.81	22.18	0-1	1
	3	0	22.30	22.33	22.22		1
	3	2	22.33	22.32	22.25		1
64QAM	3	3	22.27	22.28	22.27	0-2	1
	6	0	21.37	21.16	21.18		2
	1	0	21.35	20.83	21.20		0-2
	1	2	21.38	20.87	21.22	2	
	1	5	21.32	20.81	21.19	2	
	64QAM	3	0	21.31	21.28	21.19	0-2
3		2	21.33	21.32	21.27	2	
3		3	21.31	21.29	21.29	0-3	2
6		0	20.40	20.13	20.19		3

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Table 8-51
LTE Band 25 (PCS) Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26140 (1860.0 MHz)	26365 (1882.5 MHz)	26590 (1905.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.47	10.46	10.48	0	0
	1	50	10.37	10.26	10.31		0
	1	99	10.54	10.45	10.47		0
	50	0	10.45	10.48	10.41	0-1	0
	50	25	10.44	10.37	10.39		0
	50	50	10.59	10.45	10.43		0
	100	0	10.50	10.43	10.44		0
16QAM	1	0	10.45	10.69	10.67	0-1	0
	1	50	10.69	10.50	10.55		0
	1	99	10.63	10.70	10.70		0
	50	0	10.41	10.43	10.36	0-2	0
	50	25	10.47	10.38	10.38		0
	50	50	10.56	10.43	10.39		0
	100	0	10.42	10.41	10.40		0
64QAM	1	0	10.66	10.57	10.40	0-2	0
	1	50	10.60	10.40	10.26		0
	1	99	10.70	10.61	10.46		0
	50	0	10.32	10.38	10.35	0-3	0
	50	25	10.27	10.34	10.38		0
	50	50	10.36	10.40	10.45		0
	100	0	10.34	10.35	10.41		0

Table 8-52
LTE Band 25 (PCS) Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26115 (1857.5 MHz)	26365 (1882.5 MHz)	26615 (1907.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.50	10.50	10.42	0	0
	1	36	10.41	10.43	10.36		0
	1	74	10.48	10.40	10.49		0
	36	0	10.46	10.54	10.59	0-1	0
	36	18	10.44	10.61	10.62		0
	36	37	10.46	10.58	10.55		0
	75	0	10.46	10.50	10.53		0
16QAM	1	0	10.47	10.44	10.70	0-1	0
	1	36	10.43	10.35	10.64		0
	1	74	10.50	10.37	10.67		0
	36	0	10.49	10.53	10.56	0-2	0
	36	18	10.49	10.62	10.61		0
	36	37	10.53	10.53	10.53		0
	75	0	10.44	10.53	10.55		0
64QAM	1	0	10.40	10.43	10.20	0-2	0
	1	36	10.48	10.37	10.41		0
	1	74	10.36	10.34	10.22		0
	36	0	10.45	10.62	10.63	0-3	0
	36	18	10.45	10.66	10.45		0
	36	37	10.45	10.64	10.63		0
	75	0	10.49	10.55	10.50		0

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Table 8-53
LTE Band 25 (PCS) Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26090 (1855.0 MHz)	26365 (1882.5 MHz)	26640 (1910.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.44	10.41	10.22	0	0
	1	25	10.28	10.24	10.32		0
	1	49	10.43	10.39	10.28		0
	25	0	10.51	10.37	10.30	0-1	0
	25	12	10.54	10.38	10.28		0
	25	25	10.53	10.34	10.28		0
16QAM	50	0	10.51	10.37	10.33	0-1	0
	1	0	10.65	10.34	10.52		0
	1	25	10.52	10.55	10.28		0
	1	49	10.67	10.28	10.49	0-2	0
	25	0	10.50	10.42	10.29		0
	25	12	10.57	10.37	10.34		0
64QAM	25	25	10.51	10.38	10.37	0-2	0
	50	0	10.50	10.35	10.37		0
	1	0	10.49	10.33	10.55		0
	1	25	10.40	10.32	10.48	0-3	0
	1	49	10.58	10.29	10.39		0
	25	0	10.62	10.47	10.28		0
64QAM	25	12	10.68	10.46	10.29	0-3	0
	25	25	10.62	10.44	10.33		0
	50	0	10.55	10.45	10.32		0

Table 8-54
LTE Band 25 (PCS) Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26065 (1852.5 MHz)	26365 (1882.5 MHz)	26665 (1912.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.43	10.36	10.22	0	0
	1	12	10.39	10.28	10.27		0
	1	24	10.28	10.20	10.41		0
	12	0	10.50	10.33	10.22	0-1	0
	12	6	10.44	10.30	10.26		0
	12	13	10.44	10.21	10.25		0
16QAM	25	0	10.41	10.25	10.28	0-1	0
	1	0	10.40	10.51	10.26		0
	1	12	10.36	10.48	10.29		0
	1	24	10.28	10.41	10.24	0-2	0
	12	0	10.53	10.38	10.23		0
	12	6	10.49	10.37	10.25		0
64QAM	12	13	10.47	10.30	10.21	0-2	0
	25	0	10.44	10.31	10.19		0
	1	0	10.61	10.42	10.35		0-3
	1	12	10.55	10.38	10.31	0	
	1	24	10.64	10.28	10.22	0	
	64QAM	12	0	10.51	10.37	10.18	0-3
12		6	10.50	10.36	10.20	0	
12		13	10.49	10.29	10.25	0	
25		0	10.41	10.34	10.21	0	

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Table 8-55
LTE Band 25 (PCS) Reduced Conducted Powers - 3 MHz Bandwidth

LTE Band 25 (PCS) 3 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26055 (1851.5 MHz)	26365 (1882.5 MHz)	26675 (1913.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.27	10.21	10.31	0	0
	1	7	10.39	10.24	10.23		0
	1	14	10.25	10.22	10.33		0
	8	0	10.43	10.34	10.21	0-1	0
	8	4	10.46	10.25	10.21		0
	8	7	10.38	10.25	10.25		0
	15	0	10.44	10.28	10.26		0
16QAM	1	0	10.46	10.44	10.27	0-1	0
	1	7	10.62	10.35	10.38		0
	1	14	10.35	10.52	10.24		0
	8	0	10.32	10.22	10.30	0-2	0
	8	4	10.38	10.27	10.28		0
	8	7	10.27	10.23	10.26		0
	15	0	10.48	10.28	10.31		0
64QAM	1	0	10.37	10.42	10.37	0-2	0
	1	7	10.53	10.22	10.40		0
	1	14	10.26	10.34	10.63		0
	8	0	10.47	10.43	10.35	0-3	0
	8	4	10.49	10.40	10.37		0
	8	7	10.43	10.39	10.29		0
	15	0	10.51	10.37	10.21		0

Table 8-56
LTE Band 25 (PCS) Reduced Conducted Powers – 1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			26047 (1850.7 MHz)	26365 (1882.5 MHz)	26683 (1914.3 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.49	10.46	10.46	0	0
	1	2	10.53	10.46	10.54		0
	1	5	10.47	10.36	10.50		0
	3	0	10.65	10.52	10.49		0
	3	2	10.60	10.54	10.58		0
	3	3	10.69	10.48	10.46		0
	6	0	10.67	10.47	10.44	0-1	0
16QAM	1	0	10.70	10.38	10.53	0-1	0
	1	2	10.66	10.44	10.59		0
	1	5	10.68	10.33	10.53		0
	3	0	10.56	10.68	10.56		0
	3	2	10.61	10.67	10.66		0
	3	3	10.62	10.61	10.63		0
	6	0	10.47	10.43	10.41	0-2	0
64QAM	1	0	10.63	10.38	10.55	0-2	0
	1	2	10.69	10.43	10.58		0
	1	5	10.63	10.26	10.47		0
	3	0	10.68	10.66	10.56		0
	3	2	10.68	10.52	10.61		0
	3	3	10.69	10.61	10.55		0
	6	0	10.69	10.48	10.46	0-3	0

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LTE Band 7

Table 8-57
LTE Band 7 Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20850 (2510.0 MHz)	21100 (2535.0 MHz)	21350 (2560.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	21.92	21.85	21.87	0	0
	1	50	21.73	21.71	21.68		0
	1	99	21.96	21.93	21.95		0
	50	0	20.64	20.45	20.48	0-1	1
	50	25	20.65	20.43	20.50		1
	50	50	20.63	20.50	20.48		1
16QAM	100	0	20.64	20.49	20.53	0-1	1
	1	0	20.95	20.86	21.00		1
	1	50	20.66	20.74	20.78		1
	1	99	20.95	20.91	21.00	0-2	1
	50	0	19.43	19.15	19.22		2
	50	25	19.43	19.13	19.22		2
64QAM	50	50	19.37	19.19	19.18	0-2	2
	100	0	19.45	19.22	19.24		2
	1	0	19.97	19.85	19.86		0-2
	1	50	19.92	19.78	19.62	2	
	1	99	19.98	20.00	19.88	0-3	
	50	0	18.93	18.67	18.79		3
50	25	18.94	18.64	18.75	3		
50	50	18.88	18.69	18.76	3		
100	0	19.00	18.77	18.75	3		

Table 8-58
LTE Band 7 Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 7 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20825 (2507.5 MHz)	21100 (2535.0 MHz)	21375 (2562.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	21.76	21.59	21.78	0	0
	1	36	21.72	21.71	21.76		0
	1	74	21.80	21.70	21.97		0
	36	0	20.50	20.50	20.54	0-1	1
	36	18	20.53	20.48	20.50		1
	36	37	20.48	20.40	20.44		1
16QAM	75	0	20.42	20.38	20.45	0-1	1
	1	0	20.69	20.67	20.61		1
	1	36	20.66	20.61	20.49		1
	1	74	20.85	20.75	20.75	0-2	1
	36	0	19.50	19.36	19.52		2
	36	18	19.52	19.42	19.55		2
64QAM	36	37	19.45	19.44	19.43	0-2	2
	75	0	19.47	19.45	19.45		2
	1	0	19.77	19.89	19.81		0-2
	1	36	19.67	19.82	19.96	2	
	1	74	19.80	19.88	19.96	0-3	
	36	0	18.99	18.86	18.65		3
36	18	18.70	18.93	18.99	3		
36	37	18.94	18.96	18.93	3		
75	0	18.95	18.96	18.93	3		

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Table 8-59
LTE Band 7 Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 7 10 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			20800 (2505.0 MHz)	21100 (2535.0 MHz)	21400 (2565.0 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	21.95	21.67	21.91	0	0	
	1	25	21.80	21.50	21.64		0	
	1	49	21.98	21.71	21.92		0	
	25	0	20.69	20.49	20.58	0-1	1	
	25	12	20.68	20.46	20.51		1	
	25	25	20.64	20.49	20.68		1	
16QAM	50	0	20.73	20.45	20.65	0-1	1	
	1	0	20.86	20.59	20.85		0-1	1
	1	25	20.68	20.55	20.71			1
	1	49	20.93	20.88	20.94	0-2		1
	25	0	19.64	19.49	19.60		2	
	25	12	19.69	19.50	19.58		2	
64QAM	25	25	19.65	19.55	19.72	0-2	2	
	50	0	19.70	19.45	19.69		2	
	1	0	19.79	19.62	19.79		0-2	2
	1	25	19.83	19.41	19.68	2		
	1	49	19.84	19.63	19.73	2		
	64QAM	25	0	18.72	18.88	18.87	0-3	3
25		12	18.92	18.89	18.99	3		
25		25	18.84	18.96	18.72	3		
50		0	18.91	18.84	18.71	3		

Table 8-60
LTE Band 7 Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 7 5 MHz Bandwidth								
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			20775 (2502.5 MHz)	21100 (2535.0 MHz)	21425 (2567.5 MHz)			
			Conducted Power [dBm]					
QPSK	1	0	22.00	21.82	21.74	0	0	
	1	12	21.95	21.78	21.78		0	
	1	24	21.77	21.70	21.79		0	
	12	0	20.62	20.72	20.62	0-1	1	
	12	6	20.71	20.40	20.60		1	
	12	13	20.59	20.43	20.58		1	
16QAM	25	0	20.62	20.39	20.68	0-1	1	
	1	0	20.71	20.66	20.63		0-1	1
	1	12	20.69	20.54	20.67			1
	1	24	20.56	20.57	20.61	0-2		1
	12	0	19.69	19.43	19.66		2	
	12	6	19.76	19.48	19.66		2	
64QAM	12	13	19.68	19.50	19.63	0-2	2	
	25	0	19.70	19.42	19.68		2	
	1	0	19.65	19.60	19.65		0-2	2
	1	12	19.70	19.55	19.68	2		
	1	24	19.58	19.54	19.61	2		
	64QAM	12	0	18.70	18.44	18.66	0-3	3
12		6	18.70	18.48	18.65	3		
12		13	18.65	18.50	18.63	3		
25		0	18.66	18.55	18.69	3		

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**Table 8-61
LTE Band 7 Reduced Conducted Powers - 20 MHz Bandwidth**

LTE Band 7 20 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20850 (2510.0 MHz)	21100 (2535.0 MHz)	21350 (2560.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.52	10.39	10.34	0	0
	1	50	10.29	10.14	10.05		0
	1	99	10.47	10.37	10.11		0
	50	0	10.47	10.28	10.17	0-1	0
	50	25	10.39	10.19	10.11		0
	50	50	10.33	10.24	10.08		0
	100	0	10.41	10.27	10.13		0
16QAM	1	0	10.68	10.18	10.61	0-1	0
	1	50	10.45	10.38	10.27		0
	1	99	10.67	10.51	10.46		0
	50	0	10.40	10.26	10.17	0-2	0
	50	25	10.40	10.18	10.09		0
	50	50	10.30	10.22	10.07		0
	100	0	10.39	10.28	10.14		0
64QAM	1	0	10.55	10.70	10.65	0-2	0
	1	50	10.52	10.55	10.43		0
	1	99	10.70	10.70	10.60		0
	50	0	10.37	10.29	10.38	0-3	0
	50	25	10.28	10.30	10.33		0
	50	50	10.34	10.34	10.38		0
	100	0	10.51	10.34	10.42		0

**Table 8-62
LTE Band 7 Reduced Conducted Powers - 15 MHz Bandwidth**

LTE Band 7 15 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20825 (2507.5 MHz)	21100 (2535.0 MHz)	21375 (2562.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.28	10.26	10.46	0	0
	1	36	10.25	10.13	10.35		0
	1	74	10.40	10.32	10.27		0
	36	0	10.25	10.18	10.44	0-1	0
	36	18	10.27	10.23	10.27		0
	36	37	10.25	10.25	10.15		0
	75	0	10.21	10.18	10.27		0
16QAM	1	0	10.56	10.45	10.70	0-1	0
	1	36	10.46	10.37	10.68		0
	1	74	10.65	10.54	10.49		0
	36	0	10.22	10.14	10.39	0-2	0
	36	18	10.31	10.20	10.30		0
	36	37	10.27	10.25	10.16		0
	75	0	10.24	10.21	10.23		0
64QAM	1	0	10.48	10.38	10.66	0-2	0
	1	36	10.50	10.35	10.39		0
	1	74	10.51	10.55	10.55		0
	36	0	10.28	10.18	10.43	0-3	0
	36	18	10.32	10.27	10.40		0
	36	37	10.32	10.33	10.23		0
	75	0	10.23	10.21	10.25		0

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Table 8-63
LTE Band 7 Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 7 10 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20800 (2505.0 MHz)	21100 (2535.0 MHz)	21400 (2565.0 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.50	10.42	10.67	0	0
	1	25	10.35	10.33	10.40		0
	1	49	10.58	10.52	10.59		0
	25	0	10.28	10.30	10.48	0-1	0
	25	12	10.31	10.31	10.45		0
	25	25	10.34	10.35	10.53		0
16QAM	50	0	10.39	10.32	10.54	0-1	0
	1	0	10.68	10.61	10.47		0
	1	25	10.47	10.43	10.59		0
	1	49	10.70	10.57	10.70	0-2	0
	25	0	10.30	10.33	10.55		0
	25	12	10.30	10.27	10.42		0
64QAM	25	25	10.33	10.36	10.52	0-2	0
	50	0	10.35	10.29	10.53		0
	1	0	10.56	10.55	10.66		0-3
	1	25	10.50	10.44	10.59	0	
	1	49	10.70	10.41	10.70	0	
	25	0	10.31	10.32	10.50	0	
25	12	10.34	10.33	10.43	0		
25	25	10.32	10.41	10.56	0		
50	0	10.38	10.30	10.54	0		

Table 8-64
LTE Band 7 Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 7 5 MHz Bandwidth							
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			20775 (2502.5 MHz)	21100 (2535.0 MHz)	21425 (2567.5 MHz)		
			Conducted Power [dBm]				
QPSK	1	0	10.50	10.31	10.46	0	0
	1	12	10.44	10.15	10.39		0
	1	24	10.31	10.22	10.38		0
	12	0	10.36	10.23	10.48	0-1	0
	12	6	10.47	10.25	10.41		0
	12	13	10.40	10.25	10.39		0
16QAM	25	0	10.45	10.18	10.44	0-1	0
	1	0	10.67	10.48	10.61		0
	1	12	10.67	10.36	10.46		0
	1	24	10.44	10.41	10.56	0-2	0
	12	0	10.42	10.23	10.44		0
	12	6	10.51	10.32	10.45		0
64QAM	12	13	10.42	10.30	10.29	0-2	0
	25	0	10.45	10.22	10.42		0
	1	0	10.61	10.44	10.51		0-3
	1	12	10.56	10.27	10.42	0	
	1	24	10.51	10.36	10.47	0	
	12	0	10.45	10.30	10.51	0	
12	6	10.57	10.34	10.48	0		
12	13	10.45	10.32	10.45	0		
25	0	10.45	10.23	10.51	0		

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LTE Band 41

Table 8-65
LTE Band 41 Maximum Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.50	23.30	23.04	22.95	23.37	0	0
	1	50	23.28	23.07	23.42	23.25	23.48		0
	1	99	23.49	23.40	23.26	23.01	23.23		0
	50	0	22.50	22.36	22.45	22.39	22.49	0-1	1
	50	25	22.48	22.33	22.49	22.48	22.48		1
	50	50	22.49	22.34	22.49	22.45	22.45		1
16QAM	100	0	22.49	22.40	22.46	22.47	22.49	0-1	1
	1	0	22.50	22.26	22.02	22.48	22.19		1
	1	50	22.46	22.06	22.38	21.81	22.46		1
	1	99	22.49	22.32	22.14	22.20	22.35	0-2	1
	50	0	21.50	21.33	21.39	21.50	21.22		2
	50	25	21.46	21.32	21.50	21.33	21.48		2
64QAM	50	50	21.49	21.37	21.45	21.50	21.45	0-2	2
	100	0	21.47	21.45	21.42	21.38	21.35		2
	1	0	21.50	21.18	21.00	21.45	21.16		0-3
	1	50	21.45	21.03	21.47	20.83	21.39	2	
	1	99	21.50	21.22	21.23	21.27	21.22	2	
	50	0	20.50	20.50	20.45	20.38	20.46	0-3	3
50	25	20.40	20.41	20.50	20.49	20.48	3		
50	50	20.45	20.49	20.48	20.50	20.50	3		
	100	0	20.49	20.43	20.47	20.47	20.43		3

Table 8-66
LTE Band 41 Maximum Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHz Bandwidth										
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)			
			Conducted Power [dBm]							
QPSK	1	0	23.35	23.08	22.94	22.80	23.26	0	0	
	1	36	23.25	22.97	23.20	22.97	23.24		0	
	1	74	23.32	23.07	23.06	22.92	23.16		0	
	36	0	22.39	22.13	22.15	21.97	22.34	0-1	1	
	36	18	22.41	22.13	22.29	22.10	22.44		1	
	36	37	22.28	22.11	22.27	22.03	22.37		1	
16QAM	75	0	22.32	22.07	22.23	22.03	22.34	0-1	1	
	1	0	22.41	22.18	22.04	21.78	22.25		0-2	1
	1	36	22.36	22.06	22.23	22.00	22.27			1
	1	74	22.39	22.12	22.01	22.00	22.21	0-2		1
	36	0	21.47	21.14	21.27	21.06	21.44		2	
	36	18	21.47	21.20	21.37	21.16	21.50		2	
64QAM	36	37	21.43	21.14	21.36	21.14	21.41	0-2	2	
	75	0	21.30	21.11	21.25	21.04	21.36		2	
	1	0	21.32	20.99	20.86	20.76	21.16		0-3	2
	1	36	21.30	20.92	21.12	20.97	21.23	2		
	1	74	21.29	20.98	21.04	20.93	21.11	2		
	36	0	20.43	20.20	20.26	19.96	20.38	0-3	3	
36	18	20.48	20.23	20.46	20.18	20.45	3			
36	37	20.35	20.18	20.33	20.10	20.44	3			
	75	0	20.34	20.17	20.27	20.07	20.40		3	

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Table 8-67
LTE Band 41 Maximum Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	23.49	23.35	23.14	23.39	23.40	0	0
	1	25	23.23	23.08	23.20	22.94	23.30		0
	1	49	23.35	23.31	23.42	23.39	23.41		0
	25	0	22.44	22.32	22.46	22.21	22.34	0-1	1
	25	12	22.38	22.31	22.40	22.16	22.46		1
	25	25	22.41	22.37	22.46	22.30	22.43		1
16QAM	50	0	22.49	22.38	22.45	22.27	22.46	0-1	1
	1	0	22.46	22.42	22.37	22.40	22.47		1
	1	25	22.24	22.21	22.28	22.09	22.30		1
	1	49	22.40	22.38	22.37	22.35	22.48	0-2	2
	25	0	21.47	21.39	21.41	21.17	21.40		2
	25	12	21.35	21.36	21.41	21.17	21.46		2
64QAM	25	25	21.41	21.39	21.37	21.26	21.35	0-2	2
	50	0	21.46	21.37	21.41	21.25	21.37		2
	1	0	21.40	21.31	21.37	21.26	21.44		0-2
	1	25	21.19	21.13	21.16	21.00	21.20	2	
	1	49	21.29	21.24	21.35	21.34	21.44	2	
	25	0	20.45	20.42	20.36	20.24	20.47	0-3	3
	25	12	20.39	20.43	20.27	20.22	20.35		3
	25	25	20.48	20.41	20.49	20.36	20.31		3
50	0	20.43	20.46	20.40	20.26	20.45	3		

Table 8-68
LTE Band 41 Maximum Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHz Bandwidth										
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]	
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)			
			Conducted Power [dBm]							
QPSK	1	0	23.29	23.12	23.28	23.14	23.49	0	0	
	1	12	23.19	23.10	23.18	23.02	23.31		0	
	1	24	23.16	23.05	23.15	22.96	23.25		0	
	12	0	22.38	22.26	22.37	22.02	22.48	0-1	1	
	12	6	22.31	22.27	22.30	22.01	22.46		1	
	12	13	22.22	22.21	22.32	21.98	22.43		1	
16QAM	25	0	22.35	22.27	22.32	22.04	22.42	0-1	1	
	1	0	22.10	22.05	22.02	21.71	22.23		0-1	1
	1	12	21.96	21.96	21.92	21.59	22.04			1
	1	24	21.99	21.91	21.94	21.65	22.06	0-2		1
	12	0	21.50	21.38	21.44	21.09	21.34		2	
	12	6	21.45	21.40	21.46	21.08	21.45		2	
64QAM	12	13	21.34	21.31	21.33	21.04	21.45	0-2	2	
	25	0	21.36	21.30	21.33	21.00	21.46		2	
	1	0	21.40	21.33	21.28	20.94	21.47		0-2	2
	1	12	21.30	21.20	21.25	20.99	21.41	2		
	1	24	21.21	21.20	21.18	20.98	21.37	2		
	12	0	20.49	20.42	20.43	20.12	20.41	0-3	3	
	12	6	20.33	20.43	20.35	20.23	20.36		3	
	12	13	20.41	20.35	20.45	20.19	20.25		3	
25	0	20.36	20.28	20.31	20.04	20.46	3			

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Table 8-69
LTE Band 41 Reduced Conducted Powers - 20 MHz Bandwidth

LTE Band 41 20 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	13.73	13.47	13.07	12.92	13.50	0	0
	1	50	13.45	13.31	13.45	13.22	13.82		0
	1	99	13.68	13.32	13.15	13.01	13.72		0
	50	0	13.84	13.49	13.33	13.33	13.97	0-1	0
	50	25	13.78	13.52	13.62	13.43	14.07		0
	50	50	13.87	13.51	13.58	13.53	14.05		0
16QAM	100	0	13.67	13.50	13.39	13.47	13.80	0-1	0
	1	0	13.95	13.65	13.24	13.01	13.30		0
	1	50	13.75	13.59	13.30	13.52	13.57		0
	1	99	13.85	13.60	13.43	13.31	13.38	0-2	0
	50	0	13.90	13.62	13.23	13.39	14.02		0
	50	25	13.86	13.60	13.46	13.61	14.00		0
64QAM	50	50	13.87	13.58	13.60	13.59	13.99	0-2	0
	100	0	13.82	13.58	13.33	13.54	13.97		0
	1	0	13.45	13.52	13.35	13.25	13.65		0-3
	1	50	13.15	13.30	13.74	13.72	13.91	0	
	1	99	13.40	13.58	13.55	13.51	13.57	0	
	50	0	13.74	13.53	13.52	13.51	13.98	0	
50	25	13.68	13.54	13.75	13.73	14.08	0		
50	50	13.80	13.55	13.70	13.68	14.04	0		
100	0	13.65	13.52	13.68	13.68	14.00	0		

Table 8-70
LTE Band 41 Reduced Conducted Powers - 15 MHz Bandwidth

LTE Band 41 15 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	13.57	13.56	13.25	13.04	13.55	0	0
	1	36	13.58	13.40	13.37	13.08	13.51		0
	1	74	13.74	13.55	13.22	13.07	13.49		0
	36	0	13.78	13.72	13.55	13.33	13.80	0-1	0
	36	18	13.86	13.74	13.70	13.45	13.84		0
	36	37	13.81	13.73	13.63	13.42	13.82		0
16QAM	75	0	13.75	13.76	13.61	13.37	13.79	0-1	0
	1	0	13.89	13.87	13.60	13.41	13.90		0
	1	36	13.77	13.68	13.69	13.38	13.79		0
	1	74	13.98	13.86	13.60	13.45	13.85	0-2	0
	36	0	13.84	13.75	13.61	13.37	13.77		0
	36	18	13.90	13.76	13.73	13.48	13.87		0
64QAM	36	37	13.83	13.75	13.67	13.44	13.87	0-2	0
	75	0	13.84	13.78	13.65	13.43	13.89		0
	1	0	13.45	13.44	13.32	13.07	13.50		0-3
	1	36	13.49	13.34	13.38	13.09	13.48	0	
	1	74	13.75	13.46	13.28	13.13	13.44	0	
	36	0	13.89	13.83	13.55	13.33	13.88	0	
36	18	13.94	13.83	13.72	13.45	13.94	0		
36	37	13.86	13.80	13.64	13.44	13.91	0		
75	0	13.86	13.83	13.61	13.37	13.90	0		

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Table 8-71
LTE Band 41 Reduced Conducted Powers - 10 MHz Bandwidth

LTE Band 41 10 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	13.68	13.65	13.47	13.32	13.63	0	0
	1	25	13.46	13.54	13.08	12.88	13.50		0
	1	49	13.68	13.75	13.57	13.30	13.60		0
	25	0	13.80	13.92	13.48	13.28	13.58	0-1	0
	25	12	13.80	13.86	13.46	13.30	13.46		0
	25	25	13.81	13.88	13.43	13.18	13.56		0
16QAM	50	0	13.84	13.92	13.53	13.30	13.59	0-1	0
	1	0	13.90	13.95	13.66	13.42	13.73		0
	1	25	13.69	13.77	13.31	13.07	13.39		0
	1	49	13.87	13.92	13.70	13.48	13.75	0-2	0
	25	0	13.78	13.88	13.47	13.26	13.57		0
	25	12	13.78	13.89	13.42	13.20	13.52		0
64QAM	25	25	13.81	13.85	13.44	13.26	13.53	0-2	0
	50	0	13.88	13.96	13.57	13.35	13.68		0
	1	0	13.66	13.68	13.40	13.26	13.52		0
	1	25	13.46	13.52	13.00	13.10	13.43	0-3	0
	1	49	13.63	13.67	13.44	13.20	13.50		0
	25	0	13.91	14.03	13.59	13.39	13.69		0
25	12	13.89	13.55	13.57	13.28	13.62	0		
25	25	13.95	14.00	13.57	13.44	13.66	0		
50	0	13.92	14.01	13.59	13.37	13.67	0		

Table 8-72
LTE Band 41 Reduced Conducted Powers - 5 MHz Bandwidth

LTE Band 41 5 MHz Bandwidth									
Modulation	RB Size	RB Offset	Low Channel	Low-Mid Channel	Mid Channel	Mid-High Channel	High Channel	MPR Allowed per 3GPP [dB]	MPR [dB]
			39750 (2506.0 MHz)	40185 (2549.5 MHz)	40620 (2593.0 MHz)	41055 (2636.5 MHz)	41490 (2680.0 MHz)		
			Conducted Power [dBm]						
QPSK	1	0	13.65	13.62	13.46	13.20	13.62	0	0
	1	12	13.53	13.58	13.46	13.24	13.60		0
	1	24	13.47	13.51	13.32	13.14	13.51		0
	12	0	13.79	13.85	13.70	13.50	13.86	0-1	0
	12	6	13.75	13.85	13.67	13.49	13.86		0
	12	13	13.69	13.83	13.62	13.43	13.81		0
16QAM	25	0	13.70	13.80	13.64	13.46	13.85	0-1	0
	1	0	13.75	13.88	13.66	13.49	13.88		0
	1	12	13.76	13.83	13.65	13.46	13.80		0
	1	24	13.68	13.76	13.53	13.40	13.75	0-2	0
	12	0	13.89	13.95	13.62	13.50	13.81		0
	12	6	13.83	13.93	13.75	13.52	13.94		0
64QAM	12	13	13.76	13.87	13.66	13.52	13.88	0-2	0
	25	0	13.72	13.80	13.60	13.37	13.82		0
	1	0	13.49	13.57	13.36	13.19	13.61		0
	1	12	13.40	13.40	13.24	13.31	13.56	0-3	0
	1	24	13.40	13.44	13.24	13.09	13.45		0
	12	0	13.93	14.00	13.88	13.60	13.78		0
12	6	13.88	14.00	13.85	13.61	13.88	0		
12	13	13.75	13.95	13.73	13.58	13.95	0		
25	0	13.74	13.92	13.80	13.54	13.98	0		

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8.3 WLAN Conducted Powers

Table 8-73
2.4 GHz WLAN Maximum Average RF Power – Ant 1

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	15.02	15.26	15.04
2437	6	15.13	15.41	15.21
2462	11	15.16	15.35	15.13

Table 8-74
2.4 GHz WLAN Maximum Average RF Power – Ant 2

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	15.01	15.32	15.08
2437	6	15.19	15.45	15.24
2462	11	15.27	15.48	15.31

Table 8-75
2.4 GHz WLAN Maximum Average RF Power – MIMO

2.4GHz 802.11n Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
2412	1	15.04	15.08	18.07
2437	6	15.21	15.24	18.24
2462	11	15.13	15.31	18.23

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Table 8-76
5 GHz WLAN Maximum Average RF Power – Ant 1

5GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5190	38	14.48	14.45
5230	46	14.46	14.49
5270	54	14.27	14.19
5310	62	14.21	14.21
5510	102	14.24	14.18
5590	118	13.87	13.84
5630	126	13.79	13.81
5710	142	13.97	14.02
5755	151	14.08	14.08
5795	159	14.19	14.21

Table 8-77
5 GHz WLAN Maximum Average RF Power – Ant 2

5GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5190	38	14.25	14.26
5230	46	14.33	14.33
5270	54	14.15	14.17
5310	62	14.12	14.12
5510	102	14.42	14.37
5590	118	14.19	14.16
5630	126	14.26	14.28
5710	142	14.48	14.49
5755	151	14.49	14.47
5795	159	14.36	14.34

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Table 8-78
5 GHz WLAN Maximum Average RF Power – MIMO

5GHz (40MHz) 802.11n Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5190	38	14.48	14.25	17.38
5230	46	14.46	14.33	17.41
5270	54	14.27	14.15	17.22
5310	62	14.21	14.12	17.18
5510	102	14.24	14.42	17.34
5590	118	13.87	14.19	17.04
5630	126	13.79	14.26	17.04
5710	142	13.97	14.48	17.24
5755	151	14.08	14.49	17.30
5795	159	14.19	14.36	17.29

Table 8-79
2.4 GHz WLAN Reduced Average RF Power – Ant 1

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	8.12	8.10	8.10
2437	6	8.26	7.94	7.96
2462	11	8.18	8.18	8.15

Table 8-80
2.4 GHz WLAN Reduced Average RF Power – Ant 2

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	7.81	7.75	7.76
2437	6	8.06	7.90	7.95
2462	11	8.34	8.06	7.94

Table 8-81
2.4 GHz WLAN Reduced Average RF Power – MIMO

2.4GHz 802.11n Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
2412	1	8.10	7.76	10.94
2437	6	7.96	7.95	10.97
2462	11	8.15	7.94	11.06

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Table 8-82
5 GHz WLAN Reduced Average RF Power – Ant 1

5GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5190	38	7.24	7.40
5230	46	7.33	7.23
5270	54	7.07	7.16
5310	62	7.05	7.21
5510	102	6.95	6.80
5590	118	6.62	6.55
5630	126	6.91	6.91
5710	142	6.73	6.81
5755	151	6.97	6.82
5795	159	6.89	6.90

Table 8-83
5 GHz WLAN Reduced Average RF Power – Ant 2

5GHz (40MHz) Conducted Power [dBm]			
Freq [MHz]	Channel	IEEE Transmission Mode	
		802.11n	802.11ac
		Average	Average
5190	38	7.42	7.41
5230	46	7.40	7.01
5270	54	7.29	7.43
5310	62	6.92	7.16
5510	102	6.90	6.77
5590	118	6.62	6.51
5630	126	6.79	7.09
5710	142	6.83	6.72
5755	151	6.91	7.00
5795	159	7.12	6.85

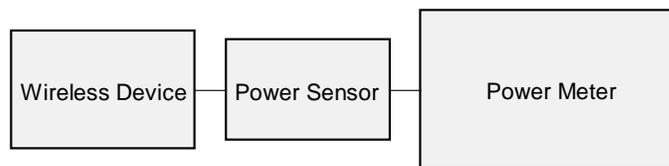
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**Table 8-84
5 GHz WLAN Reduced Average RF Power – MIMO**

5GHz (40MHz) 802.11n Conducted Power [dBm]				
Freq [MHz]	Channel	ANT1	ANT2	MIMO
5190	38	7.24	7.42	10.34
5230	46	7.33	7.40	10.38
5270	54	7.07	7.29	10.19
5310	62	7.05	6.92	10.00
5510	102	6.95	6.90	9.94
5590	118	6.62	6.62	9.63
5630	126	6.91	6.79	9.86
5710	142	6.73	6.83	9.79
5755	151	6.97	6.91	9.95
5795	159	6.89	7.12	10.02

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

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



**Figure 8-2
Power Measurement Setup**

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8.4 Bluetooth Conducted Powers

Table 8-85
Bluetooth Average RF Power

Frequency [MHz]	Data Rate [Mbps]	Channel No.	Avg Conducted Power	
			[dBm]	[mW]
2402	1.0	0	5.71	3.727
2441	1.0	39	7.19	5.236
2480	1.0	78	5.81	3.811
2402	2.0	0	5.12	3.250
2441	2.0	39	6.56	4.525
2480	2.0	78	5.22	3.328
2402	3.0	0	5.14	3.267
2441	3.0	39	6.60	4.569
2480	3.0	78	5.23	3.334

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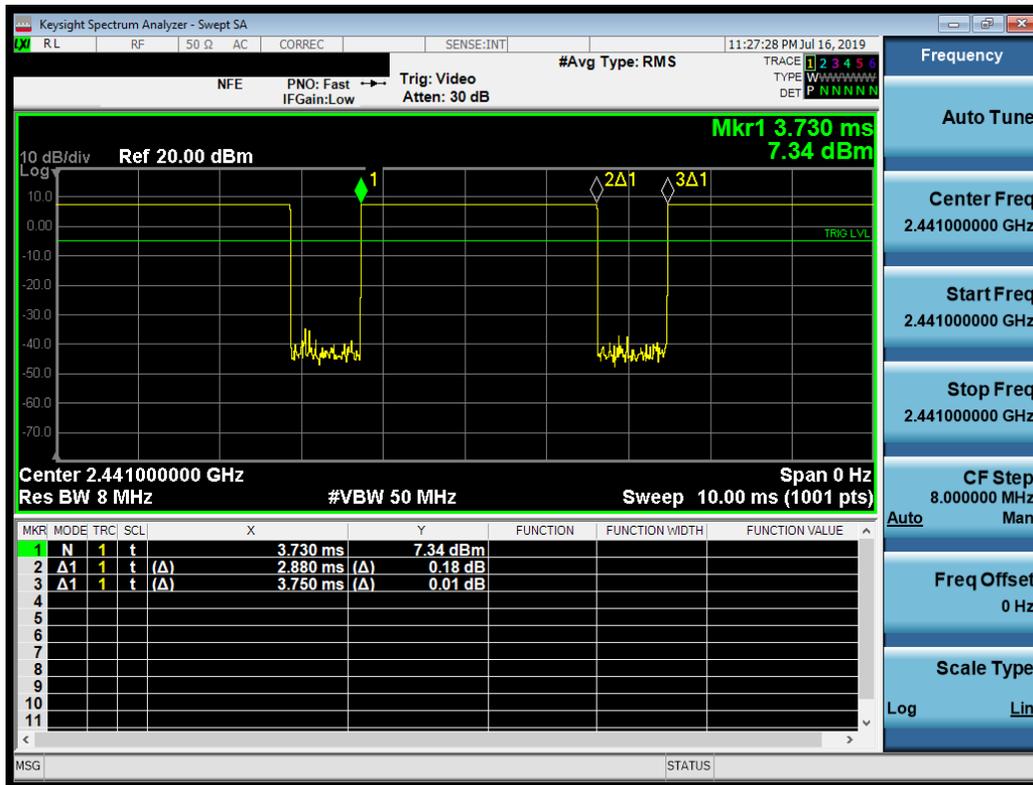


Figure 8-3
Bluetooth Transmission Plot

Equation 8-1
Bluetooth Duty Cycle Calculation

$$Duty\ Cycle = \frac{Pulse\ Width}{Period} * 100\% = \frac{2.88ms}{3.75ms} * 100\% = 76.8\%$$

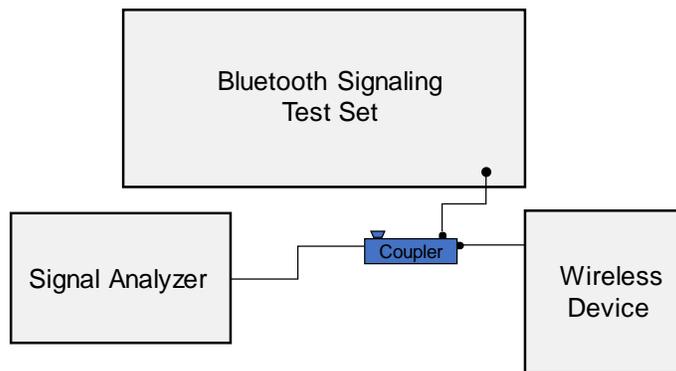


Figure 8-4
Power Measurement Setup

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9 SYSTEM VERIFICATION

9.1 Tissue Verification

**Table 9-1
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
7/15/2019	750B	23.8	680	0.919	57.445	0.958	55.804	-4.07%	2.94%
			695	0.923	57.410	0.959	55.745	-3.75%	2.99%
			700	0.925	57.398	0.959	55.726	-3.55%	3.00%
			710	0.929	57.376	0.960	55.687	-3.23%	3.03%
			740	0.939	57.327	0.963	55.570	-2.49%	3.16%
			755	0.944	57.299	0.964	55.512	-2.07%	3.22%
			770	0.949	57.264	0.965	55.453	-1.66%	3.27%
			785	0.954	57.219	0.966	55.395	-1.24%	3.29%
8/20/2019	750B	22.8	740	0.948	56.679	0.963	55.570	-1.56%	2.00%
			755	0.954	56.666	0.964	55.512	-1.04%	2.08%
			770	0.959	56.606	0.965	55.453	-0.62%	2.08%
			785	0.963	56.580	0.966	55.395	-0.31%	2.14%
8/19/2019	835B	21.9	820	0.940	57.123	0.969	55.258	-2.99%	3.38%
			835	0.945	57.098	0.970	55.200	-2.58%	3.44%
			850	0.951	57.065	0.988	55.154	-3.74%	3.46%
7/17/2019	1750B	21.9	1710	1.436	54.029	1.463	53.537	-1.85%	0.92%
			1750	1.464	53.969	1.488	53.432	-1.61%	1.01%
			1790	1.491	53.914	1.514	53.326	-1.52%	1.10%
8/19/2019	1750B	21.4	1710	1.413	51.869	1.463	53.537	-3.42%	-3.12%
			1750	1.437	51.764	1.488	53.432	-3.43%	-3.12%
			1790	1.466	51.703	1.514	53.326	-3.17%	-3.04%
8/20/2019	1900B	24.6	1850	1.488	53.785	1.520	53.300	-2.11%	0.91%
			1880	1.521	53.677	1.520	53.300	0.07%	0.71%
			1910	1.554	53.583	1.520	53.300	2.24%	0.53%
8/25/2019	1900B	21.6	1850	1.523	54.770	1.520	53.300	0.20%	2.76%
			1880	1.558	54.661	1.520	53.300	2.50%	2.55%
			1910	1.592	54.547	1.520	53.300	4.74%	2.34%
7/31/2019	2450B	22.1	2400	1.854	51.645	1.902	52.767	-2.52%	-2.13%
			2450	1.917	51.463	1.950	52.700	-1.69%	-2.35%
			2500	1.983	51.300	2.021	52.636	-1.88%	-2.54%
8/1/2019	2450B	23.3	2450	2.013	50.759	1.950	52.700	3.23%	-3.68%
			2500	2.071	50.620	2.021	52.636	2.47%	-3.83%
			2550	2.131	50.472	2.092	52.573	1.86%	-4.00%
			2600	2.189	50.331	2.163	52.509	1.20%	-4.15%
			2650	2.247	50.170	2.234	52.445	0.58%	-4.34%
			2700	2.306	50.016	2.305	52.382	0.04%	-4.52%
			2400	1.983	51.695	1.902	52.767	4.26%	-2.03%
8/4/2019	2450B	22.5	2450	2.042	51.536	1.950	52.700	4.72%	-2.21%
			2500	2.102	51.400	2.021	52.636	4.01%	-2.35%
			5240	5.150	47.084	5.346	48.960	-3.67%	-3.83%
07/31/2019	5200B-5800B	21.4	5260	5.180	47.051	5.369	48.933	-3.52%	-3.85%
			5280	5.202	47.019	5.393	48.906	-3.54%	-3.86%
			5320	5.253	46.964	5.439	48.851	-3.42%	-3.86%
			5500	5.489	46.656	5.650	48.607	-2.85%	-4.01%
			5520	5.515	46.615	5.673	48.580	-2.79%	-4.04%
			5600	5.629	46.485	5.766	48.471	-2.38%	-4.10%
			5620	5.655	46.425	5.790	48.444	-2.33%	-4.17%
			5640	5.691	46.405	5.813	48.417	-2.10%	-4.16%
			5700	5.772	46.321	5.883	48.336	-1.89%	-4.17%
			5745	5.834	46.233	5.936	48.275	-1.72%	-4.23%
			5765	5.864	46.188	5.959	48.248	-1.59%	-4.27%
			5785	5.895	46.146	5.982	48.220	-1.45%	-4.30%
			5800	5.914	46.136	6.000	48.200	-1.43%	-4.28%

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.

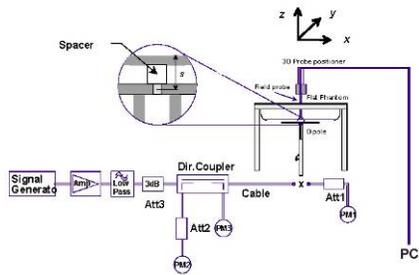
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9.2 Test System Verification

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 9-2
System Verification Results**

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} (%)
D	750	BODY	07/15/2019	22.8	22.6	0.200	1003	3914	1.700	8.580	8.500	-0.93%
H	750	BODY	08/20/2019	23.5	21.5	0.200	1054	7406	1.790	8.550	8.950	4.68%
H	835	BODY	08/19/2019	21.0	20.9	0.200	4d132	7406	2.010	9.670	10.050	3.93%
G	1750	BODY	07/17/2019	22.6	21.9	0.100	1150	7409	3.880	36.600	38.800	6.01%
G	1750	BODY	08/19/2019	22.4	21.4	0.100	1150	7409	3.630	36.600	36.300	-0.82%
J	1900	BODY	08/20/2019	20.9	23.0	0.100	5d148	7488	4.100	39.100	41.000	4.86%
J	1900	BODY	08/25/2019	20.0	20.1	0.100	5d148	7488	4.160	39.100	41.600	6.39%
I	2450	BODY	07/31/2019	22.6	21.2	0.100	797	7357	4.950	51.100	49.500	-3.13%
K	2450	BODY	08/01/2019	22.5	22.0	0.100	719	7417	5.210	50.100	52.100	3.99%
K	2450	BODY	08/04/2019	22.2	21.2	0.100	719	7417	5.310	50.100	53.100	5.99%
K	2600	BODY	08/01/2019	22.5	22.0	0.100	1004	7417	5.600	54.800	56.000	2.19%
L	5250	BODY	07/31/2019	21.5	20.4	0.050	1057	7410	3.470	75.900	69.400	-8.56%
L	5600	BODY	07/31/2019	21.5	20.4	0.050	1057	7410	3.740	79.900	74.800	-6.38%
L	5750	BODY	07/31/2019	21.5	20.4	0.050	1057	7410	3.570	76.700	71.400	-6.91%



**Figure 9-1
System Verification Setup Diagram**



**Figure 9-2
System Verification Setup Photo**

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10 SAR DATA SUMMARY

10.1 Standalone Body SAR Data

**Table 10-1
UMTS Body 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 (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.										(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	25.2	25.16	0.01	15 mm	00657	1:1	back	0.504	1.009	0.509	
826.40	4132	UMTS 850	RMC	25.2	24.90	-0.04	15 mm	00657	1:1	top	0.624	1.072	0.669	
836.60	4183	UMTS 850	RMC	25.2	25.16	-0.02	15 mm	00657	1:1	top	0.701	1.009	0.707	
846.60	4233	UMTS 850	RMC	25.2	25.20	-0.01	15 mm	00657	1:1	top	0.732	1.000	0.732	A1
836.60	4183	UMTS 850	RMC	25.2	25.16	0.01	0 mm	00640	1:1	right	0.103	1.009	0.104	
836.60	4183	UMTS 850	RMC	25.2	25.16	0.05	0 mm	00640	1:1	left	0.207	1.009	0.209	
836.60	4183	UMTS 850	RMC	18.2	18.04	0.03	0 mm	00640	1:1	back	0.582	1.038	0.604	
826.40	4132	UMTS 850	RMC	18.2	17.98	-0.03	0 mm	00640	1:1	top	0.616	1.052	0.648	
836.60	4183	UMTS 850	RMC	18.2	18.04	0.01	0 mm	00640	1:1	top	0.597	1.038	0.620	
846.60	4233	UMTS 850	RMC	18.2	18.12	0.00	0 mm	00640	1:1	top	0.591	1.019	0.602	
1732.40	1412	UMTS 1750	RMC	24.7	24.66	-0.02	15 mm	00640	1:1	back	0.542	1.009	0.547	A2
1732.40	1412	UMTS 1750	RMC	24.7	24.66	-0.06	15 mm	00640	1:1	top	0.520	1.009	0.525	
1732.40	1412	UMTS 1750	RMC	24.7	24.66	-0.19	0 mm	00657	1:1	right	0.211	1.009	0.213	
1732.40	1412	UMTS 1750	RMC	24.7	24.66	0.06	0 mm	00657	1:1	left	0.502	1.009	0.507	
1732.40	1412	UMTS 1750	RMC	11.7	11.58	-0.01	0 mm	00657	1:1	back	0.452	1.028	0.465	
1732.40	1412	UMTS 1750	RMC	11.7	11.58	0.02	0 mm	00657	1:1	top	0.455	1.028	0.468	
1852.40	9262	UMTS 1900	RMC	23.7	23.70	-0.01	15 mm	00657	1:1	back	0.616	1.000	0.616	
1880.00	9400	UMTS 1900	RMC	23.7	23.60	-0.01	15 mm	00657	1:1	back	0.650	1.023	0.665	
1907.60	9538	UMTS 1900	RMC	23.7	23.62	0.01	15 mm	00657	1:1	back	0.734	1.019	0.748	
1852.40	9262	UMTS 1900	RMC	23.7	23.70	-0.02	15 mm	00657	1:1	top	0.700	1.000	0.700	
1880.00	9400	UMTS 1900	RMC	23.7	23.60	-0.02	15 mm	00657	1:1	top	0.759	1.023	0.776	
1907.60	9538	UMTS 1900	RMC	23.7	23.62	0.00	15 mm	00657	1:1	top	0.877	1.019	0.894	A3
1880.00	9400	UMTS 1900	RMC	23.7	23.60	0.00	0 mm	00640	1:1	right	0.177	1.023	0.181	
1880.00	9400	UMTS 1900	RMC	23.7	23.60	0.10	0 mm	00640	1:1	left	0.467	1.023	0.478	
1880.00	9400	UMTS 1900	RMC	10.7	10.69	-0.11	0 mm	00640	1:1	back	0.567	1.002	0.568	
1880.00	9400	UMTS 1900	RMC	10.7	10.69	0.02	0 mm	00640	1:1	top	0.281	1.002	0.282	
1907.60	9538	UMTS 1900	RMC	23.7	23.62	-0.03	15 mm	00657	1:1	top	0.871	1.019	0.888	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram							

Note: Blue entry represents variability measurement.

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**Table 10-2
LTE Band 71 Body 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)		
680.50	133297	Mid	LTE Band 71	20	25.2	24.99	-0.01	0	00657	QPSK	1	99	15 mm	back	1:1	0.388	1.050	0.407	
680.50	133297	Mid	LTE Band 71	20	24.2	23.85	-0.02	1	00657	QPSK	50	0	15 mm	back	1:1	0.310	1.084	0.336	
680.50	133297	Mid	LTE Band 71	20	25.2	24.99	-0.08	0	00657	QPSK	1	99	15 mm	top	1:1	0.307	1.050	0.322	
680.50	133297	Mid	LTE Band 71	20	24.2	23.85	-0.05	1	00657	QPSK	50	0	15 mm	top	1:1	0.217	1.084	0.235	
680.50	133297	Mid	LTE Band 71	20	25.2	24.99	-0.06	0	00665	QPSK	1	99	0 mm	right	1:1	0.094	1.050	0.099	
680.50	133297	Mid	LTE Band 71	20	24.2	23.85	-0.02	1	00665	QPSK	50	0	0 mm	right	1:1	0.056	1.084	0.061	
680.50	133297	Mid	LTE Band 71	20	25.2	24.99	0.07	0	00665	QPSK	1	99	0 mm	left	1:1	0.125	1.050	0.131	
680.50	133297	Mid	LTE Band 71	20	24.2	23.85	-0.01	1	00665	QPSK	50	0	0 mm	left	1:1	0.115	1.084	0.125	
680.50	133297	Mid	LTE Band 71	20	17.7	17.52	-0.01	0	00665	QPSK	1	0	0 mm	back	1:1	0.502	1.042	0.523	A4
680.50	133297	Mid	LTE Band 71	20	17.7	17.25	0.00	0	00665	QPSK	50	0	0 mm	back	1:1	0.496	1.109	0.550	
680.50	133297	Mid	LTE Band 71	20	17.7	17.52	0.05	0	00665	QPSK	1	0	0 mm	top	1:1	0.382	1.042	0.398	
680.50	133297	Mid	LTE Band 71	20	17.7	17.25	0.05	0	00665	QPSK	50	0	0 mm	top	1:1	0.375	1.109	0.416	
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 10-3
LTE Band 12 Body SAR**

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
707.50	23095	Mid	LTE Band 12	10	25.2	25.01	0.01	0	00657	QPSK	1	0	15 mm	back	1:1	0.474	1.045	0.495	
707.50	23095	Mid	LTE Band 12	10	24.2	23.90	-0.11	1	00657	QPSK	25	0	15 mm	back	1:1	0.375	1.072	0.402	
707.50	23095	Mid	LTE Band 12	10	25.2	25.01	-0.03	0	00657	QPSK	1	0	15 mm	top	1:1	0.374	1.045	0.391	
707.50	23095	Mid	LTE Band 12	10	24.2	23.90	-0.03	1	00657	QPSK	25	0	15 mm	top	1:1	0.302	1.072	0.324	
707.50	23095	Mid	LTE Band 12	10	25.2	25.01	0.02	0	00665	QPSK	1	0	0 mm	right	1:1	0.089	1.045	0.093	
707.50	23095	Mid	LTE Band 12	10	24.2	23.90	-0.04	1	00665	QPSK	25	0	0 mm	right	1:1	0.061	1.072	0.065	
707.50	23095	Mid	LTE Band 12	10	25.2	25.01	-0.07	0	00665	QPSK	1	0	0 mm	left	1:1	0.183	1.045	0.191	
707.50	23095	Mid	LTE Band 12	10	24.2	23.90	0.05	1	00665	QPSK	25	0	0 mm	left	1:1	0.143	1.072	0.153	
707.50	23095	Mid	LTE Band 12	10	17.2	16.99	0.00	0	00665	QPSK	1	0	0 mm	back	1:1	0.607	1.050	0.637	A5
707.50	23095	Mid	LTE Band 12	10	17.2	17.00	0.01	0	00665	QPSK	25	0	0 mm	back	1:1	0.599	1.047	0.627	
707.50	23095	Mid	LTE Band 12	10	17.2	16.99	0.03	0	00665	QPSK	1	0	0 mm	top	1:1	0.452	1.050	0.475	
707.50	23095	Mid	LTE Band 12	10	17.2	17.00	0.02	0	00665	QPSK	25	0	0 mm	top	1:1	0.455	1.047	0.476	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram											

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**Table 10-4
LTE Band 13 Body SAR**

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
782.00	23230	Mid	LTE Band 13	10	25.2	25.10	-0.01	0	00657	QPSK	1	0	15 mm	back	1:1	0.649	1.023	0.664	A6
782.00	23230	Mid	LTE Band 13	10	24.2	23.90	-0.11	1	00657	QPSK	25	0	15 mm	back	1:1	0.413	1.072	0.443	
782.00	23230	Mid	LTE Band 13	10	25.2	25.10	-0.13	0	00657	QPSK	1	0	15 mm	top	1:1	0.516	1.023	0.528	
782.00	23230	Mid	LTE Band 13	10	24.2	23.90	-0.12	1	00657	QPSK	25	0	15 mm	top	1:1	0.342	1.072	0.367	
782.00	23230	Mid	LTE Band 13	10	25.2	25.10	-0.11	0	00665	QPSK	1	0	0 mm	right	1:1	0.099	1.023	0.101	
782.00	23230	Mid	LTE Band 13	10	24.2	23.90	-0.07	1	00665	QPSK	25	0	0 mm	right	1:1	0.063	1.072	0.068	
782.00	23230	Mid	LTE Band 13	10	25.2	25.10	0.00	0	00665	QPSK	1	0	0 mm	left	1:1	0.264	1.023	0.270	
782.00	23230	Mid	LTE Band 13	10	24.2	23.90	-0.06	1	00665	QPSK	25	0	0 mm	left	1:1	0.173	1.072	0.185	
782.00	23230	Mid	LTE Band 13	10	17.2	17.20	-0.01	0	00665	QPSK	1	0	0 mm	back	1:1	0.591	1.000	0.591	
782.00	23230	Mid	LTE Band 13	10	17.2	17.18	0.01	0	00665	QPSK	25	0	0 mm	back	1:1	0.602	1.005	0.605	
782.00	23230	Mid	LTE Band 13	10	17.2	17.20	-0.04	0	00665	QPSK	1	0	0 mm	top	1:1	0.430	1.000	0.430	
782.00	23230	Mid	LTE Band 13	10	17.2	17.18	0.02	0	00665	QPSK	25	0	0 mm	top	1:1	0.443	1.005	0.445	
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 10-5
LTE Band 26 (Cell) Body 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)		
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.20	-0.04	0	00657	QPSK	1	74	15 mm	back	1:1	0.473	1.000	0.473	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.17	-0.05	1	00657	QPSK	36	0	15 mm	back	1:1	0.356	1.007	0.358	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.20	-0.05	0	00657	QPSK	1	74	15 mm	top	1:1	0.724	1.000	0.724	A7
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.17	-0.01	1	00657	QPSK	36	0	15 mm	top	1:1	0.491	1.007	0.494	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.20	0.13	0	00640	QPSK	1	74	0 mm	right	1:1	0.118	1.000	0.118	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.17	0.06	1	00640	QPSK	36	0	0 mm	right	1:1	0.085	1.007	0.086	
831.50	26865	Mid	LTE Band 26 (Cell)	15	25.2	25.20	-0.04	0	00640	QPSK	1	74	0 mm	left	1:1	0.209	1.000	0.209	
831.50	26865	Mid	LTE Band 26 (Cell)	15	24.2	24.17	-0.02	1	00640	QPSK	36	0	0 mm	left	1:1	0.142	1.007	0.143	
831.50	26865	Mid	LTE Band 26 (Cell)	15	18.2	18.13	-0.02	0	00640	QPSK	1	74	0 mm	back	1:1	0.638	1.016	0.648	
831.50	26865	Mid	LTE Band 26 (Cell)	15	18.2	18.12	-0.03	0	00640	QPSK	36	0	0 mm	back	1:1	0.667	1.019	0.680	
831.50	26865	Mid	LTE Band 26 (Cell)	15	18.2	18.13	0.00	0	00640	QPSK	1	74	0 mm	top	1:1	0.617	1.016	0.627	
831.50	26865	Mid	LTE Band 26 (Cell)	15	18.2	18.12	0.01	0	00640	QPSK	36	0	0 mm	top	1:1	0.649	1.019	0.661	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram									

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**Table 10-6
LTE Band 66 (AWS) Body 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)		
1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.7	24.42	-0.01	0	00640	QPSK	1	99	15 mm	back	1:1	0.501	1.067	0.535	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.7	23.12	0.01	1	00640	QPSK	50	0	15 mm	back	1:1	0.378	1.143	0.432	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.7	24.42	-0.01	0	00640	QPSK	1	99	15 mm	top	1:1	0.484	1.067	0.516	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.7	23.12	-0.02	1	00640	QPSK	50	0	15 mm	top	1:1	0.364	1.143	0.416	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.7	24.42	0.06	0	00657	QPSK	1	99	0 mm	right	1:1	0.242	1.067	0.258	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.7	23.12	0.03	1	00657	QPSK	50	0	0 mm	right	1:1	0.161	1.143	0.184	
1720.00	132072	Low	LTE Band 66 (AWS)	20	24.7	24.09	0.15	0	00657	QPSK	1	99	0 mm	left	1:1	0.469	1.151	0.540	
1745.00	132322	Mid	LTE Band 66 (AWS)	20	24.7	24.42	0.08	0	00657	QPSK	1	99	0 mm	left	1:1	0.564	1.067	0.602	
1770.00	132572	High	LTE Band 66 (AWS)	20	24.7	24.28	0.11	0	00657	QPSK	1	0	0 mm	left	1:1	0.586	1.102	0.646	A8
1745.00	132322	Mid	LTE Band 66 (AWS)	20	23.7	23.12	0.11	1	00657	QPSK	50	0	0 mm	left	1:1	0.443	1.143	0.506	
1770.00	132572	High	LTE Band 66 (AWS)	20	11.7	11.48	-0.04	0	00657	QPSK	1	99	0 mm	back	1:1	0.372	1.052	0.391	
1770.00	132572	High	LTE Band 66 (AWS)	20	11.7	11.37	-0.01	0	00657	QPSK	50	0	0 mm	back	1:1	0.384	1.079	0.414	
1770.00	132572	High	LTE Band 66 (AWS)	20	11.7	11.48	0.01	0	00657	QPSK	1	99	0 mm	top	1:1	0.463	1.052	0.487	
1770.00	132572	High	LTE Band 66 (AWS)	20	11.7	11.37	-0.01	0	00657	QPSK	50	0	0 mm	top	1:1	0.468	1.079	0.505	
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 10-7
LTE Band 25 (PCS) Body SAR**

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #	
MHz	Ch.														(W/kg)		(W/kg)		
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.7	23.27	0.02	0	00657	QPSK	1	99	15 mm	back	1:1	0.750	1.104	0.828	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.7	23.40	-0.03	0	00657	QPSK	1	99	15 mm	back	1:1	0.815	1.072	0.874	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.7	23.66	0.02	0	00657	QPSK	1	0	15 mm	back	1:1	0.821	1.009	0.828	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.7	22.31	-0.02	1	00657	QPSK	50	0	15 mm	back	1:1	0.651	1.094	0.712	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.7	22.22	-0.01	1	00657	QPSK	100	0	15 mm	back	1:1	0.668	1.117	0.746	
1860.00	26140	Low	LTE Band 25 (PCS)	20	23.7	23.27	-0.01	0	00657	QPSK	1	99	15 mm	top	1:1	0.751	1.104	0.829	
1882.50	26365	Mid	LTE Band 25 (PCS)	20	23.7	23.40	0.00	0	00657	QPSK	1	99	15 mm	top	1:1	0.835	1.072	0.895	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.7	23.66	0.00	0	00657	QPSK	1	0	15 mm	top	1:1	0.863	1.009	0.871	A9
1905.00	26590	High	LTE Band 25 (PCS)	20	22.7	22.31	-0.01	1	00657	QPSK	50	0	15 mm	top	1:1	0.668	1.094	0.731	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.7	22.22	0.00	1	00657	QPSK	100	0	15 mm	top	1:1	0.684	1.117	0.764	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.7	23.66	-0.08	0	00640	QPSK	1	0	0 mm	right	1:1	0.178	1.009	0.180	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.7	22.31	0.02	1	00640	QPSK	50	0	0 mm	right	1:1	0.146	1.094	0.160	
1905.00	26590	High	LTE Band 25 (PCS)	20	23.7	23.66	0.06	0	00640	QPSK	1	0	0 mm	left	1:1	0.543	1.009	0.548	
1905.00	26590	High	LTE Band 25 (PCS)	20	22.7	22.31	0.03	1	00640	QPSK	50	0	0 mm	left	1:1	0.437	1.094	0.478	
1860.00	26140	Low	LTE Band 25 (PCS)	20	10.7	10.54	-0.03	0	00640	QPSK	1	99	0 mm	back	1:1	0.434	1.038	0.450	
1860.00	26140	Low	LTE Band 25 (PCS)	20	10.7	10.59	-0.07	0	00640	QPSK	50	50	0 mm	back	1:1	0.437	1.026	0.448	
1860.00	26140	Low	LTE Band 25 (PCS)	20	10.7	10.54	0.03	0	00640	QPSK	1	99	0 mm	top	1:1	0.304	1.038	0.316	
1860.00	26140	Low	LTE Band 25 (PCS)	20	10.7	10.59	0.00	0	00640	QPSK	50	50	0 mm	top	1:1	0.312	1.026	0.320	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Body 1.6 W/kg (mW/g) averaged over 1 gram									

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**Table 10-8
LTE Band 7 Body SAR**

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g) (W/kg)	Scaling Factor	Reported SAR (1g) (W/kg)	Plot #	
MHz	Ch.																		
2510.00	20850	Low	LTE Band 7	20	22.0	21.96	0.02	0	00665	QPSK	1	99	15 mm	back	1:1	0.264	1.009	0.266	
2510.00	20850	Low	LTE Band 7	20	21.0	20.65	0.02	1	00665	QPSK	50	25	15 mm	back	1:1	0.227	1.084	0.246	
2510.00	20850	Low	LTE Band 7	20	22.0	21.96	0.02	0	00665	QPSK	1	99	15 mm	top	1:1	0.339	1.009	0.342	
2510.00	20850	Low	LTE Band 7	20	21.0	20.65	-0.02	1	00665	QPSK	50	25	15 mm	top	1:1	0.304	1.084	0.330	
2510.00	20850	Low	LTE Band 7	20	22.0	21.96	-0.03	0	00657	QPSK	1	99	0 mm	left	1:1	1.170	1.009	1.181	A10
2535.00	21100	Mid	LTE Band 7	20	22.0	21.93	0.00	0	00657	QPSK	1	99	0 mm	left	1:1	1.060	1.016	1.077	
2560.00	21350	High	LTE Band 7	20	22.0	21.95	-0.09	0	00657	QPSK	1	99	0 mm	left	1:1	1.150	1.012	1.164	
2510.00	20850	Low	LTE Band 7	20	21.0	20.65	0.01	1	00657	QPSK	50	25	0 mm	left	1:1	0.981	1.084	1.063	
2535.00	21100	Mid	LTE Band 7	20	21.0	20.50	-0.02	1	00657	QPSK	50	50	0 mm	left	1:1	0.923	1.122	1.036	
2560.00	21350	High	LTE Band 7	20	21.0	20.50	-0.02	1	00657	QPSK	50	25	0 mm	left	1:1	0.974	1.122	1.093	
2510.00	20850	Low	LTE Band 7	20	21.0	20.64	0.00	1	00657	QPSK	100	0	0 mm	left	1:1	0.961	1.086	1.044	
2510.00	20850	Low	LTE Band 7	20	10.7	10.52	-0.18	0	00665	QPSK	1	0	0 mm	back	1:1	0.498	1.042	0.519	
2510.00	20850	Low	LTE Band 7	20	10.7	10.47	-0.19	0	00665	QPSK	50	0	0 mm	back	1:1	0.488	1.054	0.514	
2510.00	20850	Low	LTE Band 7	20	10.7	10.52	-0.15	0	00665	QPSK	1	0	0 mm	top	1:1	0.204	1.042	0.213	
2510.00	20850	Low	LTE Band 7	20	10.7	10.47	-0.15	0	00665	QPSK	50	0	0 mm	top	1:1	0.216	1.054	0.228	
2510.00	20850	Low	LTE Band 7	20	22.0	21.96	0.05	0	00657	QPSK	1	99	0 mm	left	1:1	1.120	1.009	1.130	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Body 1.6 W/kg (mW/g) averaged over 1 gram										

Note: Blue entry represents variability measurement.

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**Table 10-9
LTE Band 41 Body 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)		
2506.00	39750	Low	LTE Band 41	20	23.5	23.50	0.05	0	00665	QPSK	1	0	15 mm	back	1:1.58	0.224	1.000	0.224	
2506.00	39750	Low	LTE Band 41	20	22.5	22.50	-0.03	1	00665	QPSK	50	0	15 mm	back	1:1.58	0.186	1.000	0.186	
2506.00	39750	Low	LTE Band 41	20	23.5	23.50	0.00	0	00665	QPSK	1	0	15 mm	top	1:1.58	0.296	1.000	0.296	
2506.00	39750	Low	LTE Band 41	20	22.5	22.50	0.12	1	00665	QPSK	50	0	15 mm	top	1:1.58	0.252	1.000	0.252	
2506.00	39750	Low	LTE Band 41	20	23.5	23.50	0.01	0	00665	QPSK	1	0	0 mm	left	1:1.58	1.020	1.000	1.020	
2549.50	40185	Low-Mid	LTE Band 41	20	23.5	23.40	0.05	0	00665	QPSK	1	99	0 mm	left	1:1.58	1.110	1.023	1.136	
2593.00	40620	Mid	LTE Band 41	20	23.5	23.42	0.01	0	00665	QPSK	1	50	0 mm	left	1:1.58	1.080	1.019	1.101	
2636.50	41055	Mid-High	LTE Band 41	20	23.5	23.25	0.02	0	00665	QPSK	1	50	0 mm	left	1:1.58	0.949	1.059	1.005	
2680.00	41490	High	LTE Band 41	20	23.5	23.48	0.04	0	00665	QPSK	1	50	0 mm	left	1:1.58	1.210	1.005	1.216	A11
2506.00	39750	Low	LTE Band 41	20	22.5	22.50	0.05	1	00665	QPSK	50	0	0 mm	left	1:1.58	0.841	1.000	0.841	
2549.50	40185	Low-Mid	LTE Band 41	20	22.5	22.36	0.04	1	00665	QPSK	50	0	0 mm	left	1:1.58	0.867	1.033	0.896	
2593.00	40620	Mid	LTE Band 41	20	22.5	22.49	0.00	1	00665	QPSK	50	25	0 mm	left	1:1.58	0.892	1.002	0.894	
2636.50	41055	Mid-High	LTE Band 41	20	22.5	22.48	0.01	1	00665	QPSK	50	25	0 mm	left	1:1.58	0.820	1.005	0.824	
2680.00	41490	High	LTE Band 41	20	22.5	22.49	0.01	1	00665	QPSK	50	0	0 mm	left	1:1.58	1.040	1.002	1.042	
2680.00	41490	High	LTE Band 41	20	22.5	22.49	0.07	1	00665	QPSK	100	0	0 mm	left	1:1.58	1.020	1.002	1.022	
2506.00	39750	Low	LTE Band 41	20	14.2	13.73	-0.14	0	00665	QPSK	1	0	0 mm	back	1:1.58	0.732	1.114	0.815	
2549.50	40185	Low-Mid	LTE Band 41	20	14.2	13.47	-0.17	0	00665	QPSK	1	0	0 mm	back	1:1.58	0.745	1.183	0.881	
2593.00	40620	Mid	LTE Band 41	20	14.2	13.45	-0.17	0	00665	QPSK	1	50	0 mm	back	1:1.58	0.767	1.189	0.912	
2636.50	41055	Mid-High	LTE Band 41	20	14.2	13.22	-0.12	0	00665	QPSK	1	50	0 mm	back	1:1.58	0.702	1.253	0.880	
2680.00	41490	High	LTE Band 41	20	14.2	13.82	-0.11	0	00665	QPSK	1	50	0 mm	back	1:1.58	0.822	1.091	0.897	
2506.00	39750	Low	LTE Band 41	20	14.2	13.87	-0.07	0	00665	QPSK	50	50	0 mm	back	1:1.58	0.784	1.079	0.846	
2549.50	40185	Low-Mid	LTE Band 41	20	14.2	13.52	-0.14	0	00665	QPSK	50	25	0 mm	back	1:1.58	0.783	1.169	0.915	
2593.00	40620	Mid	LTE Band 41	20	14.2	13.62	-0.17	0	00665	QPSK	50	25	0 mm	back	1:1.58	0.797	1.143	0.911	
2636.50	41055	Mid-High	LTE Band 41	20	14.2	13.53	-0.21	0	00665	QPSK	50	50	0 mm	back	1:1.58	0.726	1.167	0.847	
2680.00	41490	High	LTE Band 41	20	14.2	14.07	-0.12	0	00665	QPSK	50	25	0 mm	back	1:1.58	0.893	1.030	0.920	
2680.00	41490	High	LTE Band 41	20	14.2	13.80	-0.19	0	00665	QPSK	100	0	0 mm	back	1:1.58	0.870	1.096	0.954	
2680.00	41490	High	LTE Band 41	20	14.2	13.82	0.01	0	00665	QPSK	1	50	0 mm	top	1:1.58	0.370	1.091	0.404	
2680.00	41490	High	LTE Band 41	20	14.2	14.07	-0.18	0	00665	QPSK	50	25	0 mm	top	1:1.58	0.407	1.030	0.419	
2680.00	41490	High	LTE Band 41	20	23.5	23.48	-0.01	0	00665	QPSK	1	50	0 mm	left	1:1.58	1.200	1.005	1.206	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT										Body									
Spatial Peak										1.6 W/kg (mW/g)									
Uncontrolled Exposure/General Population										averaged over 1 gram									

Note: Blue entry represents variability measurement.

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**Table 10-10
DTS SISO Body SAR**

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													(W/kg)			(W/kg)	
2462	11	802.11b	DSSS	22	15.5	15.16	0.10	15 mm	1	00665	1	back	99.1	0.077	1.081	1.009	0.084	
2437	6	802.11b	DSSS	22	8.5	8.26	-0.05	0 mm	1	00640	1	back	99.1	0.411	1.057	1.009	0.438	
2462	11	802.11b	DSSS	22	15.5	15.16	0.04	15 mm	1	00665	1	top	99.1	0.100	1.081	1.009	0.109	
2437	6	802.11b	DSSS	22	8.5	8.26	0.17	0 mm	1	00640	1	top	99.1	0.232	1.057	1.009	0.247	
2462	11	802.11b	DSSS	22	15.5	15.16	-0.09	0 mm	1	00665	1	right	99.1	0.164	1.081	1.009	0.179	
2462	11	802.11b	DSSS	22	15.5	15.16	-0.19	0 mm	1	00640	1	left	99.1	0.002	1.081	1.009	0.002	
2462	11	802.11b	DSSS	22	15.5	15.27	0.14	15 mm	2	00665	1	back	99.1	0.060	1.054	1.009	0.064	
2462	11	802.11b	DSSS	22	8.5	8.34	-0.04	0 mm	2	00640	1	back	99.1	0.325	1.038	1.009	0.340	
2462	11	802.11b	DSSS	22	15.5	15.27	0.05	15 mm	2	00665	1	top	99.1	0.079	1.054	1.009	0.084	
2412	1	802.11b	DSSS	22	8.5	7.81	-0.19	0 mm	2	00640	1	top	99.1	0.484	1.172	1.009	0.572	
2437	6	802.11b	DSSS	22	8.5	8.06	-0.03	0 mm	2	00640	1	top	99.1	0.590	1.107	1.009	0.659	A12
2462	11	802.11b	DSSS	22	8.5	8.34	-0.06	0 mm	2	00640	1	top	99.1	0.573	1.038	1.009	0.600	
2462	11	802.11b	DSSS	22	15.5	15.27	0.14	0 mm	2	00665	1	right	99.1	0.162	1.054	1.009	0.172	
2462	11	802.11b	DSSS	22	15.5	15.27	-0.17	0 mm	2	00640	1	left	99.1	0.023	1.054	1.009	0.024	
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 10-11
DTS MIMO Body SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)			(W/kg)	
2437	6	802.11n	OFDM	20	15.5	15.21	15.5	15.24	-0.13	15 mm	MIMO	00640	13	back	94.5	0.108	1.069	1.058	0.122	
2437	6	802.11n	OFDM	20	15.5	15.21	15.5	15.24	0.16	15 mm	MIMO	00640	13	top	94.5	0.135	1.069	1.058	0.153	
2437	6	802.11n	OFDM	20	15.5	15.21	15.5	15.24	0.14	0 mm	MIMO	00640	13	right	94.5	0.220	1.069	1.058	0.249	
2437	6	802.11n	OFDM	20	15.5	15.21	15.5	15.24	0.11	0 mm	MIMO	00640	13	left	94.5	0.018	1.069	1.058	0.020	
2462	11	802.11n	OFDM	20	8.5	8.15	8.5	7.94	0.10	0 mm	MIMO	00640	13	back	94.5	0.319	1.138	1.058	0.384	
2412	1	802.11n	OFDM	20	8.5	8.10	8.5	7.76	0.20	0 mm	MIMO	00640	13	top	94.5	0.533	1.186	1.058	0.669	
2437	6	802.11n	OFDM	20	8.5	7.96	8.5	7.95	0.13	0 mm	MIMO	00640	13	top	94.5	0.581	1.135	1.058	0.698	
2462	11	802.11n	OFDM	20	8.5	8.15	8.5	7.94	0.18	0 mm	MIMO	00640	13	top	94.5	0.563	1.138	1.058	0.678	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT								Body												
Spatial Peak								1.6 W/kg (mW/g)												
Uncontrolled Exposure/General Population								averaged over 1 gram												

For channels 1, 6, and 11, to achieve the 18.5/11.5 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 15.5/8.5 dBm.

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**Table 10-12
U-NII SISO Body SAR**

MEASUREMENT RESULTS																		
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.													(W/kg)			(W/kg)	
5270	54	802.11n	OFDM	40	14.5	14.27	0.13	15 mm	1	00665	13.5	back	93.0	0.029	1.054	1.075	0.033	
5270	54	802.11n	OFDM	40	7.5	7.07	-0.19	0 mm	1	00665	13.5	back	93.0	0.289	1.104	1.075	0.343	
5270	54	802.11n	OFDM	40	14.5	14.27	-0.13	15 mm	1	00665	13.5	top	93.0	0.053	1.054	1.075	0.060	
5270	54	802.11n	OFDM	40	7.5	7.07	-0.09	0 mm	1	00665	13.5	top	93.0	0.168	1.104	1.075	0.199	
5270	54	802.11n	OFDM	40	14.5	14.27	-0.12	0 mm	1	00665	13.5	right	93.0	0.017	1.054	1.075	0.019	
5270	54	802.11n	OFDM	40	14.5	14.27	0.14	0 mm	1	00665	13.5	left	93.0	0.026	1.054	1.075	0.029	
5270	54	802.11n	OFDM	40	14.5	14.15	0.18	15 mm	2	00665	13.5	back	92.4	0.086	1.084	1.082	0.101	
5270	54	802.11n	OFDM	40	7.5	7.29	-0.01	0 mm	2	00665	13.5	back	92.4	0.193	1.050	1.082	0.219	
5270	54	802.11n	OFDM	40	14.5	14.15	0.12	15 mm	2	00665	13.5	top	92.4	0.153	1.084	1.082	0.179	
5270	54	802.11n	OFDM	40	7.5	7.29	-0.19	0 mm	2	00665	13.5	top	92.4	0.374	1.050	1.082	0.425	
5270	54	802.11n	OFDM	40	14.5	14.15	-0.18	0 mm	2	00665	13.5	right	92.4	0.291	1.084	1.082	0.341	
5270	54	802.11n	OFDM	40	14.5	14.15	-0.19	0 mm	2	00665	13.5	left	92.4	0.015	1.084	1.082	0.018	
5510	102	802.11n	OFDM	40	14.5	14.24	0.13	15 mm	1	00665	13.5	back	93.0	0.037	1.062	1.075	0.042	
5510	102	802.11n	OFDM	40	7.5	6.95	0.02	0 mm	1	00665	13.5	back	93.0	0.333	1.135	1.075	0.406	
5510	102	802.11n	OFDM	40	14.5	14.24	0.14	15 mm	1	00665	13.5	top	93.0	0.053	1.062	1.075	0.061	
5510	102	802.11n	OFDM	40	7.5	6.95	-0.08	0 mm	1	00665	13.5	top	93.0	0.121	1.135	1.075	0.148	
5510	102	802.11n	OFDM	40	14.5	14.24	-0.16	0 mm	1	00665	13.5	right	93.0	0.031	1.062	1.075	0.035	
5510	102	802.11n	OFDM	40	14.5	14.24	0.07	0 mm	1	00665	13.5	left	93.0	0.015	1.062	1.075	0.017	
5710	142	802.11n	OFDM	40	14.5	14.48	0.11	15 mm	2	00665	13.5	back	92.4	0.102	1.005	1.082	0.111	
5510	102	802.11n	OFDM	40	7.5	6.90	-0.04	0 mm	2	00665	13.5	back	92.4	0.277	1.148	1.082	0.344	
5710	142	802.11n	OFDM	40	14.5	14.48	0.19	15 mm	2	00665	13.5	top	92.4	0.158	1.005	1.082	0.172	
5510	102	802.11n	OFDM	40	7.5	6.90	-0.17	0 mm	2	00665	13.5	top	92.4	0.432	1.148	1.082	0.537	A13
5710	142	802.11n	OFDM	40	14.5	14.48	-0.07	0 mm	2	00665	13.5	right	92.4	0.208	1.005	1.082	0.226	
5710	142	802.11n	OFDM	40	14.5	14.48	-0.14	0 mm	2	00665	13.5	left	92.4	0.045	1.005	1.082	0.049	
5795	159	802.11n	OFDM	40	14.5	14.19	-0.14	15 mm	1	00665	13.5	back	93.0	0.041	1.074	1.075	0.047	
5755	151	802.11n	OFDM	40	7.5	6.97	-0.16	0 mm	1	00665	13.5	back	93.0	0.328	1.130	1.075	0.398	
5795	159	802.11n	OFDM	40	14.5	14.19	0.03	15 mm	1	00665	13.5	top	93.0	0.043	1.074	1.075	0.050	
5755	151	802.11n	OFDM	40	7.5	6.97	-0.11	0 mm	1	00665	13.5	top	93.0	0.118	1.130	1.075	0.143	
5795	159	802.11n	OFDM	40	14.5	14.19	-0.19	0 mm	1	00665	13.5	right	93.0	0.033	1.074	1.075	0.038	
5795	159	802.11n	OFDM	40	14.5	14.19	-0.21	0 mm	1	00665	13.5	left	93.0	0.011	1.074	1.075	0.013	
5755	151	802.11n	OFDM	40	14.5	14.49	0.15	15 mm	2	00665	13.5	back	92.4	0.061	1.002	1.082	0.066	
5795	159	802.11n	OFDM	40	7.5	7.12	-0.18	0 mm	2	00665	13.5	back	92.4	0.174	1.091	1.082	0.205	
5755	151	802.11n	OFDM	40	14.5	14.49	0.17	15 mm	2	00665	13.5	top	92.4	0.097	1.002	1.082	0.105	
5795	159	802.11n	OFDM	40	7.5	7.12	0.15	0 mm	2	00665	13.5	top	92.4	0.263	1.091	1.082	0.310	
5755	151	802.11n	OFDM	40	14.5	14.49	0.04	0 mm	2	00665	13.5	right	92.4	0.117	1.002	1.082	0.127	
5755	151	802.11n	OFDM	40	14.5	14.49	-0.14	0 mm	2	00665	13.5	left	92.4	0.025	1.002	1.082	0.027	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Body 1.6 W/kg (mW/g) averaged over 1 gram										

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**Table 10-13
U-NII MIMO Body SAR**

MEASUREMENT RESULTS																				
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power (Ant 1) [dBm]	Conducted Power (Ant 1) [dBm]	Maximum Allowed Power (Ant 2) [dBm]	Conducted Power (Ant 2) [dBm]	Power Drift [dB]	Spacing	Antenna Config.	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.															(W/kg)			(W/kg)	
5270	54	802.11n	OFDM	40	14.5	14.27	14.5	14.15	0.07	15 mm	MIMO	00665	27	back	92.9	0.078	1.084	1.076	0.091	
5270	54	802.11n	OFDM	40	14.5	14.27	14.5	14.15	0.01	15 mm	MIMO	00665	27	top	92.9	0.162	1.084	1.076	0.189	
5270	54	802.11n	OFDM	40	14.5	14.27	14.5	14.15	-0.11	0 mm	MIMO	00665	27	right	92.9	0.164	1.084	1.076	0.191	
5270	54	802.11n	OFDM	40	14.5	14.27	14.5	14.15	0.13	0 mm	MIMO	00665	27	left	92.9	0.039	1.084	1.076	0.045	
5270	54	802.11n	OFDM	40	7.5	7.07	7.5	7.29	-0.01	0 mm	MIMO	00665	27	back	92.9	0.304	1.104	1.076	0.361	
5270	54	802.11n	OFDM	40	7.5	7.07	7.5	7.29	-0.13	0 mm	MIMO	00665	27	top	92.9	0.379	1.104	1.076	0.450	
5510	102	802.11n	OFDM	40	14.5	14.24	14.5	14.42	0.16	15 mm	MIMO	00665	27	back	92.9	0.110	1.062	1.076	0.126	
5510	102	802.11n	OFDM	40	14.5	14.24	14.5	14.42	0.07	15 mm	MIMO	00665	27	top	92.9	0.129	1.062	1.076	0.147	
5510	102	802.11n	OFDM	40	14.5	14.24	14.5	14.42	0.15	0 mm	MIMO	00665	27	right	92.9	0.142	1.062	1.076	0.162	
5510	102	802.11n	OFDM	40	14.5	14.24	14.5	14.42	0.14	0 mm	MIMO	00665	27	left	92.9	0.043	1.062	1.076	0.049	
5510	102	802.11n	OFDM	40	7.5	6.95	7.5	6.90	-0.20	0 mm	MIMO	00665	27	back	92.9	0.332	1.148	1.076	0.410	
5510	102	802.11n	OFDM	40	7.5	6.95	7.5	6.90	0.08	0 mm	MIMO	00665	27	top	92.9	0.388	1.148	1.076	0.479	
5755	151	802.11n	OFDM	40	14.5	14.08	14.5	14.49	-0.14	15 mm	MIMO	00665	27	back	92.9	0.083	1.102	1.076	0.098	
5755	151	802.11n	OFDM	40	14.5	14.08	14.5	14.49	0.05	15 mm	MIMO	00665	27	top	92.9	0.147	1.102	1.076	0.174	
5755	151	802.11n	OFDM	40	14.5	14.08	14.5	14.49	0.15	0 mm	MIMO	00665	27	right	92.9	0.078	1.102	1.076	0.092	
5755	151	802.11n	OFDM	40	14.5	14.08	14.5	14.49	0.07	0 mm	MIMO	00665	27	left	92.9	0.042	1.102	1.076	0.050	
5795	159	802.11n	OFDM	40	7.5	6.89	7.5	7.12	-0.01	0 mm	MIMO	00665	27	back	92.9	0.331	1.151	1.076	0.410	
5795	159	802.11n	OFDM	40	7.5	6.89	7.5	7.12	0.17	0 mm	MIMO	00665	27	top	92.9	0.378	1.151	1.076	0.468	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Body 1.6 W/kg (mW/g) averaged over 1 gram									

For channels 54, 102, 151, and 159, to achieve the 17.5/10.5 dBm maximum allowed MIMO power shown in the documentation, each antenna transmits at a maximum allowed power of 14.5/7.5 dBm.

**Table 10-14
DSS Body SAR**

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (1g)	Scaling Factor (Cond Power)	Scaling Factor (Duty Cycle)	Reported SAR (1g)	Plot #
MHz	Ch.											(W/kg)			(W/kg)	
2441	39	Bluetooth	FHSS	7.5	7.19	0.08	0 mm	00657	1	back	76.8	0.164	1.074	1.302	0.229	A14
2441	39	Bluetooth	FHSS	7.5	7.19	0.15	0 mm	00657	1	top	76.8	0.116	1.074	1.302	0.162	
2441	39	Bluetooth	FHSS	7.5	7.19	0.16	0 mm	00665	1	right	76.8	0.020	1.074	1.302	0.028	
2441	39	Bluetooth	FHSS	7.5	7.19	0.19	0 mm	00665	1	left	76.8	0.002	1.074	1.302	0.003	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Body 1.6 W/kg (mW/g) averaged over 1 gram					

10.2 SAR Test Notes

General Notes:

1. The test data reported are the worst-case SAR values according to test procedures specified in FCC KDB Publication 616217 D04v01r02 and FCC KDB Publication 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.

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5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Per FCC KDB 865664 D01v01r04, variability SAR tests were performed when the measured SAR results for a frequency band were greater than or equal to 0.8 W/kg. Repeated SAR measurements are highlighted in the tables above for clarity. Please see Section 12 for variability analysis.
7. FCC KDB Publication 616217 D04v01r02 Section 4.3, SAR tests are required for the back surface and edges of the tablet with the tablet touching the phantom. The SAR Exclusion Threshold in FCC KDB 447498 D01v06 was applied to determine SAR test exclusion for adjacent edge configurations.

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 7.5.4.
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. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI single transmission chain operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.6.4 for more information.
2. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 5 GHz WIFI single transmission chain operations, the initial test configuration was selected according to the transmission mode with the highest maximum allowed powers. Other transmission modes were not

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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 7.6.5 for more information.

3. Per KDB Publication 248227 D01v02r02, SAR for MIMO was evaluated by following the simultaneous SAR provisions from KDB Publication 447498 D01v06 by either evaluating the sum of the 1g SAR values of each antenna transmitting independently or making a SAR measurement with both antennas transmitting simultaneously. Please see Section 11 for complete analysis.
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 8.4 for the time domain plot and calculation for the duty factor of the device.

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11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS

11.1 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.

11.2 Simultaneous Transmission Procedures

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

Notes:

1. 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.
2. When the antenna separation distance was > 50 mm, an estimated SAR of 0.4 W/kg was used to determine the simultaneous transmission SAR exclusion for test positions excluded per FCC KDB Publication 447498 D01v06.

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Table 11-1
Simultaneous Transmission Scenario with 2.4 GHz WLAN

Exposure Condition	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	
		1	2	3	1+2	1+3
Body SAR	UMTS 850	0.732	0.438	0.659	1.170	1.391
	UMTS 1750	0.547	0.438	0.659	0.985	1.206
	UMTS 1900	0.894	0.438	0.659	1.332	1.553
	LTE Band 71	0.550	0.438	0.659	0.988	1.209
	LTE Band 12	0.637	0.438	0.659	1.075	1.296
	LTE Band 13	0.664	0.438	0.659	1.102	1.323
	LTE Band 26 (Cell)	0.724	0.438	0.659	1.162	1.383
	LTE Band 66 (AWS)	0.646	0.438	0.659	1.084	1.305
	LTE Band 25 (PCS)	0.895	0.438	0.659	1.333	1.554
	LTE Band 7	1.181	0.438	0.659	See Table Below	See Table Below
	LTE Band 41	1.216	0.438	0.659	See Table Below	See Table Below

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)		Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	2.4 GHz WLAN Ant 1 SAR (W/kg)	2.4 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	
		1	2	3	1+2	1+3			1	2	3	1+2	1+3
Body SAR	Back	0.519	0.438	0.340	0.957	0.859	Body SAR	Back	0.954	0.438	0.340	1.392	1.294
	Top	0.342	0.247	0.659	0.589	1.001		Top	0.419	0.247	0.659	0.666	1.078
	Bottom	0.400	0.400	0.400	0.800	0.800		Bottom	0.400	0.400	0.400	0.800	0.800
	Right	0.400	0.179	0.172	0.579	0.572		Right	0.400	0.179	0.172	0.579	0.572
	Left	1.181	0.002	0.024	1.183	1.205		Left	1.216	0.002	0.024	1.218	1.240

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Exposure Condition	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body SAR	UMTS 850	0.732	0.698	1.430
	UMTS 1750	0.547	0.698	1.245
	UMTS 1900	0.894	0.698	1.592
	LTE Band 71	0.550	0.698	1.248
	LTE Band 12	0.637	0.698	1.335
	LTE Band 13	0.664	0.698	1.362
	LTE Band 26 (Cell)	0.724	0.698	1.422
	LTE Band 66 (AWS)	0.646	0.698	1.344
	LTE Band 25 (PCS)	0.895	0.698	1.593
	LTE Band 7	1.181	0.698	See Table Below
	LTE Band 41	1.216	0.698	See Table Below

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	2.4 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2			1	2	1+2
Body SAR	Back	0.519	0.384	0.903	Body SAR	Back	0.954	0.384	1.338
	Top	0.342	0.698	1.040		Top	0.419	0.698	1.117
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.400	0.249	0.649		Right	0.400	0.249	0.649
	Left	1.181	0.020	1.201		Left	1.216	0.020	1.236

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**Table 11-2
Simultaneous Transmission Scenario with 5 GHz WLAN**

Exposure Condition	Mode	3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	
		1	2	3	1+2	1+3
Body SAR	UMTS 850	0.732	0.406	0.537	1.138	1.269
	UMTS 1750	0.547	0.406	0.537	0.953	1.084
	UMTS 1900	0.894	0.406	0.537	1.300	1.431
	LTE Band 71	0.550	0.406	0.537	0.956	1.087
	LTE Band 12	0.637	0.406	0.537	1.043	1.174
	LTE Band 13	0.664	0.406	0.537	1.070	1.201
	LTE Band 26 (Cell)	0.724	0.406	0.537	1.130	1.261
	LTE Band 66 (AWS)	0.646	0.406	0.537	1.052	1.183
	LTE Band 25 (PCS)	0.895	0.406	0.537	1.301	1.432
	LTE Band 7	1.181	0.406	0.537	1.587	See Table Below
	LTE Band 41	1.216	0.406	0.537	See Table Below	See Table Below

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Σ SAR (W/kg)	
		1	2	1+2			1	2	3	1+2	1+3
Body SAR	Back	0.519	0.344	0.863	Body SAR	Back	0.954	0.406	0.344	1.360	1.298
	Top	0.342	0.537	0.879		Top	0.419	0.199	0.537	0.618	0.956
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.400	0.800	0.800
	Right	0.400	0.341	0.741		Right	0.400	0.038	0.341	0.438	0.741
	Left	1.181	0.049	1.230		Left	1.216	0.029	0.049	1.245	1.265

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Exposure Condition	Mode	3G/4G SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
		1	2	
Body SAR	UMTS 850	0.732	0.479	1.211
	UMTS 1750	0.547	0.479	1.026
	UMTS 1900	0.894	0.479	1.373
	LTE Band 71	0.550	0.479	1.029
	LTE Band 12	0.637	0.479	1.116
	LTE Band 13	0.664	0.479	1.143
	LTE Band 26 (Cell)	0.724	0.479	1.203
	LTE Band 66 (AWS)	0.646	0.479	1.125
	LTE Band 25 (PCS)	0.895	0.479	1.374
	LTE Band 7	1.181	0.479	See Table Below
	LTE Band 41	1.216	0.479	See Table Below

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2			1	2	1+2
Body SAR	Back	0.519	0.410	0.929	Body SAR	Back	0.954	0.410	1.364
	Top	0.342	0.479	0.821		Top	0.419	0.479	0.898
	Bottom	0.400	0.400	0.800		Bottom	0.400	0.400	0.800
	Right	0.400	0.191	0.591		Right	0.400	0.191	0.591
	Left	1.181	0.050	1.231		Left	1.216	0.050	1.266

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**Table 11-3
Simultaneous Transmission Scenario with Bluetooth**

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Body SAR	UMTS 850	0.732	0.229	0.961
	UMTS 1750	0.547	0.229	0.776
	UMTS 1900	0.894	0.229	1.123
	LTE Band 71	0.550	0.229	0.779
	LTE Band 12	0.637	0.229	0.866
	LTE Band 13	0.664	0.229	0.893
	LTE Band 26 (Cell)	0.724	0.229	0.953
	LTE Band 66 (AWS)	0.646	0.229	0.875
	LTE Band 25 (PCS)	0.895	0.229	1.124
	LTE Band 7	1.181	0.229	1.410
	LTE Band 41	1.216	0.229	1.445

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**Table 11-4
Simultaneous Transmission Scenario with 5GHz WLAN and Bluetooth**

Exposure Condition	Mode	3G/4G SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Body SAR	UMTS 850	0.732	0.406	0.229	1.367
	UMTS 1750	0.547	0.406	0.229	1.182
	UMTS 1900	0.894	0.406	0.229	1.529
	LTE Band 71	0.550	0.406	0.229	1.185
	LTE Band 12	0.637	0.406	0.229	1.272
	LTE Band 13	0.664	0.406	0.229	1.299
	LTE Band 26 (Cell)	0.724	0.406	0.229	1.359
	LTE Band 66 (AWS)	0.646	0.406	0.229	1.281
	LTE Band 25 (PCS)	0.895	0.406	0.229	1.530
	LTE Band 7	1.181	0.406	0.229	See Table Below
	LTE Band 41	1.216	0.406	0.229	See Table Below

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	5 GHz WLAN Ant 1 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3			1	2	3	1+2+3
Body SAR	Back	0.519	0.406	0.229	1.154	Body SAR	Back	0.954	0.406	0.229	1.589
	Top	0.342	0.199	0.162	0.703		Top	0.419	0.199	0.162	0.780
	Bottom	0.400	0.400	0.400	1.200		Bottom	0.400	0.400	0.400	1.200
	Right	0.400	0.038	0.028	0.466		Right	0.400	0.038	0.028	0.466
	Left	1.181	0.029	0.003	1.213		Left	1.216	0.029	0.003	1.248

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Exposure Condition	Mode	3G/4G SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Body SAR	UMTS 850	0.732	0.537	0.229	1.498
	UMTS 1750	0.547	0.537	0.229	1.313
	UMTS 1900	0.894	0.537	0.229	See Table Below
	LTE Band 71	0.550	0.537	0.229	1.316
	LTE Band 12	0.637	0.537	0.229	1.403
	LTE Band 13	0.664	0.537	0.229	1.430
	LTE Band 26 (Cell)	0.724	0.537	0.229	1.490
	LTE Band 66 (AWS)	0.646	0.537	0.229	1.412
	LTE Band 25 (PCS)	0.895	0.537	0.229	See Table Below
	LTE Band 7	1.181	0.537	0.229	See Table Below
	LTE Band 41	1.216	0.537	0.229	See Table Below

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3			1	2	3	1+2+3
Body SAR	Back	0.748	0.344	0.229	1.321	Body SAR	Back	0.874	0.344	0.229	1.447
	Top	0.894	0.537	0.162	1.593		Top	0.895	0.537	0.162	1.594
	Bottom	0.400	0.400	0.400	1.200		Bottom	0.400	0.400	0.400	1.200
	Right	0.181	0.341	0.028	0.550		Right	0.180	0.341	0.028	0.549
	Left	0.478	0.049	0.003	0.530		Left	0.548	0.049	0.003	0.600

Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	5 GHz WLAN Ant 2 SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3			1	2	3	1+2+3
Body SAR	Back	0.519	0.344	0.229	1.092	Body SAR	Back	0.954	0.344	0.229	1.527
	Top	0.342	0.537	0.162	1.041		Top	0.419	0.537	0.162	1.118
	Bottom	0.400	0.400	0.400	1.200		Bottom	0.400	0.400	0.400	1.200
	Right	0.400	0.341	0.028	0.769		Right	0.400	0.341	0.028	0.769
	Left	1.181	0.049	0.003	1.233		Left	1.216	0.049	0.003	1.268

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Exposure Condition	Mode	3G/4G SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3
Body SAR	UMTS 850	0.732	0.479	0.229	1.440
	UMTS 1750	0.547	0.479	0.229	1.255
	UMTS 1900	0.894	0.479	0.229	See Table Below
	LTE Band 71	0.550	0.479	0.229	1.258
	LTE Band 12	0.637	0.479	0.229	1.345
	LTE Band 13	0.664	0.479	0.229	1.372
	LTE Band 26 (Cell)	0.724	0.479	0.229	1.432
	LTE Band 66 (AWS)	0.646	0.479	0.229	1.354
	LTE Band 25 (PCS)	0.895	0.479	0.229	See Table Below
	LTE Band 7	1.181	0.479	0.229	See Table Below
LTE Band 41	1.216	0.479	0.229	See Table Below	

Simult Tx	Configuration	UMTS 1900 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 25 (PCS) SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3			1	2	3	1+2+3
Body SAR	Back	0.748	0.410	0.229	1.387	Body SAR	Back	0.874	0.410	0.229	1.513
	Top	0.894	0.479	0.162	1.535		Top	0.895	0.479	0.162	1.536
	Bottom	0.400	0.400	0.400	1.200		Bottom	0.400	0.400	0.400	1.200
	Right	0.181	0.191	0.028	0.400		Right	0.180	0.191	0.028	0.399
	Left	0.478	0.050	0.003	0.531		Left	0.548	0.050	0.003	0.601
Simult Tx	Configuration	LTE Band 7 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)	Simult Tx	Configuration	LTE Band 41 SAR (W/kg)	5 GHz WLAN MIMO SAR (W/kg)	Bluetooth SAR (W/kg)	Σ SAR (W/kg)
		1	2	3	1+2+3			1	2	3	1+2+3
Body SAR	Back	0.519	0.410	0.229	1.158	Body SAR	Back	0.954	0.410	0.229	1.593
	Top	0.342	0.479	0.162	0.983		Top	0.419	0.479	0.162	1.060
	Bottom	0.400	0.400	0.400	1.200		Bottom	0.400	0.400	0.400	1.200
	Right	0.400	0.191	0.028	0.619		Right	0.400	0.191	0.028	0.619
	Left	1.181	0.050	0.003	1.234		Left	1.216	0.050	0.003	1.269

11.3 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.

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12 SAR MEASUREMENT VARIABILITY

12.1 Measurement Variability

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

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

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

**Table 12-1
Body SAR Measurement Variability Results**

BODY VARIABILITY RESULTS													
Band	FREQUENCY		Mode	Service	Side	Spacing	Measured SAR (1g)	1st Repeated SAR (1g)	Ratio	2nd Repeated SAR (1g)	Ratio	3rd Repeated SAR (1g)	Ratio
	MHz	Ch.					(W/kg)	(W/kg)		(W/kg)		(W/kg)	
1900	1907.60	9538	UMTS 1900	RMC	top	15 mm	0.877	0.871	1.01	N/A	N/A	N/A	N/A
2450	2510.00	20850	LTE Band 7, 20 MHz Bandwidth	QPSK, 1 RB, 99 RB Offset	left	0 mm	1.170	1.120	1.04	N/A	N/A	N/A	N/A
2600	2680.00	41490	LTE Band 41, 20 MHz Bandwidth	QPSK, 1 RB, 50 RB Offset	left	0 mm	1.210	1.200	1.01	N/A	N/A	N/A	N/A
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Body 1.6 W/kg (mW/g) averaged over 1 gram						

12.2 Measurement Uncertainty

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

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13 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	10/2/2018	Annual	10/2/2019	US39170118
Agilent	8753ES	Network Analyzer	3/19/2018	Annual	3/19/2020	MY40001472
Agilent	E4438C	ESG Vector Signal Generator	5/23/2019	Annual	5/23/2020	MY47270002
Agilent	E4440A	PSA Series Spectrum Analyzer	11/14/2018	Annual	11/14/2019	MY46186272
Agilent	E5515C	Wireless Communications Test Set	2/28/2018	Biennial	2/28/2020	GB41450275
Agilent	N5182A	MXG Vector Signal Generator	6/27/2019	Annual	6/27/2020	US46240505
Amplifier Research	150A100C	Amplifier	CBT	N/A	CBT	350132
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343971
Anritsu	MA24106A	USB Power Sensor	5/6/2019	Annual	5/6/2020	1231538
Anritsu	MA24106A	USB Power Sensor	5/22/2019	Annual	5/22/2020	1231535
Anritsu	MA2411B	Pulse Power Sensor	10/30/2018	Annual	10/30/2019	1207470
Anritsu	MA2411B	Pulse Power Sensor	11/20/2018	Annual	11/20/2019	1339007
Anritsu	ML2495A	Power Meter	10/21/2018	Annual	10/21/2019	941001
Anritsu	ML2496A	Power Meter	10/21/2018	Annual	10/21/2019	1138001
Anritsu	MT8820C	Radio Communication Analyzer	3/29/2019	Annual	3/29/2020	6201300731
Anritsu	MT8821C	Radio Communication Analyzer	1/25/2019	Annual	1/25/2020	6261895213
Control Company	4040	Digital Thermometer	2/28/2018	Biennial	2/28/2020	130448366
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	6/6/2018	Biennial	6/6/2020	181334694
Control Company	4352	Ultra Long Stem Thermometer	5/21/2018	Biennial	5/21/2020	181292000
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
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	VLF-6000+	Low Pass Filter	CBT	N/A	CBT	N/A
Mitutoyo	CD-6°CSX	Digital Caliper	4/18/2018	Biennial	4/18/2020	13264165
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Narda	BW-S3W2	Attenuator (3dB)	CBT	N/A	CBT	120
Narda	4014C-6	4 - 8 GHz SMA 6 dB Directional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	NC-100	Torque Wrench	11/7/2017	Biennial	11/7/2019	N/A
Rohde & Schwarz	CMW500	Radio Communication Tester	6/8/2018	Biennial	6/8/2020	101767
Rohde & Schwarz	CMW500	Radio Communication Tester	9/25/2018	Annual	9/25/2019	102060
Rohde & Schwarz	CMW500	Wideband Radio Communication Tester	6/7/2019	Annual	6/7/2020	155397
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/11/2018	Annual	9/11/2019	1091
SPEAG	D750V3	750 MHz SAR Dipole	1/15/2018	Biennial	1/15/2020	1003
SPEAG	D750V3	750 MHz Dipole	3/18/2019	Annual	3/18/2020	1054
SPEAG	D835V2	835 MHz SAR Dipole	1/22/2019	Annual	1/22/2020	4d132
SPEAG	D1750V2	1750 MHz SAR Dipole	10/22/2018	Annual	10/22/2019	1150
SPEAG	D1900V2	1900 MHz SAR Dipole	2/21/2019	Annual	2/21/2020	5d148
SPEAG	D2450V2	2450 MHz SAR Dipole	9/11/2017	Biennial	9/11/2019	797
SPEAG	D2450V2	2450 MHz SAR Dipole	8/17/2017	Biennial	8/17/2019	719
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	EX3DV4	SAR Probe	2/19/2019	Annual	2/19/2020	3914
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	1/24/2019	Annual	1/24/2020	7488
SPEAG	EX3DV4	SAR Probe	4/24/2019	Annual	4/24/2020	7357
SPEAG	EX3DV4	SAR Probe	2/19/2019	Annual	2/19/2020	7417
SPEAG	EX3DV4	SAR Probe	7/16/2019	Annual	7/16/2020	7410
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/14/2019	Annual	2/14/2020	1272
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/8/2019	Annual	5/8/2020	859
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/20/2019	Annual	6/20/2020	1334
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/15/2019	Annual	1/15/2020	1530
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/18/2019	Annual	4/18/2020	1407
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/13/2019	Annual	2/13/2020	665
SPEAG	DAE4	Dasy Data Acquisition Electronics	7/11/2019	Annual	7/11/2020	1322

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

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14 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	60
Expanded Uncertainty (95% CONFIDENCE LEVEL)	k=2					23.0	22.6	

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15 CONCLUSION

15.1 Measurement Conclusion

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

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

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APPENDIX A: SAR TEST DATA

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657

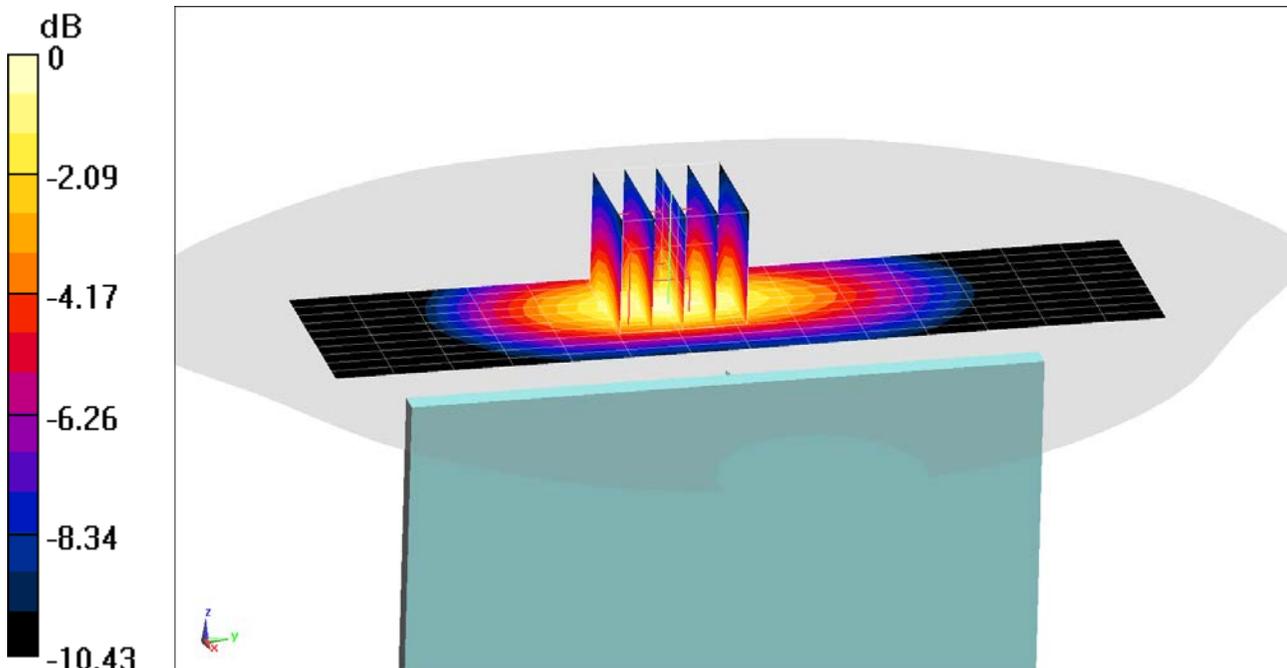
Communication System: UID 0, UMTS; Frequency: 846.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
 $f = 846.6 \text{ MHz}$; $\sigma = 0.95 \text{ S/m}$; $\epsilon_r = 57.072$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-19-2019; Ambient Temp: 21.0°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 846.6 MHz; Calibrated: 5/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/8/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

Mode: UMTS 850, Body SAR, Top Edge, High.ch

Area Scan (11x15x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.58 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.10 W/kg
SAR(1 g) = 0.732 W/kg



0 dB = 0.977 W/kg = -0.10 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00640

Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
 $f = 1732.4 \text{ MHz}$; $\sigma = 1.426 \text{ S/m}$; $\epsilon_r = 51.81$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-19-2019; Ambient Temp: 22.4°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN7409; ConvF(7.85, 7.85, 7.85) @ 1732.4 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, Mid.ch

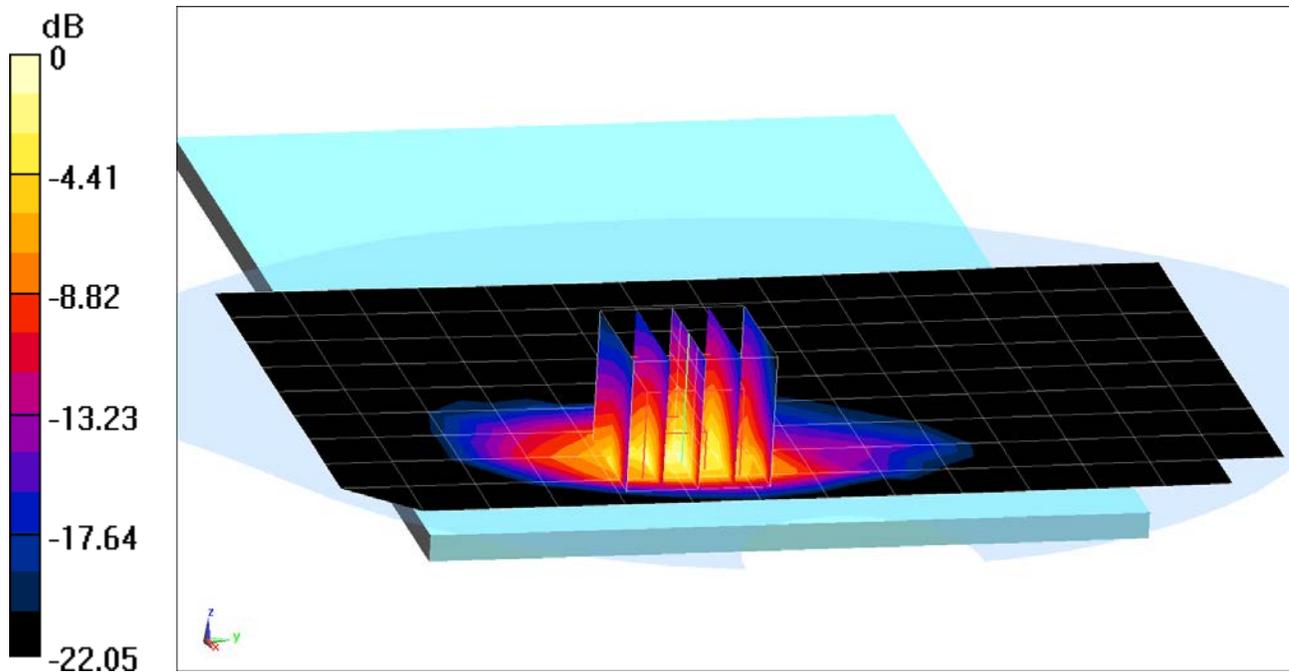
Area Scan (10x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 20.36 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 0.888 W/kg

SAR(1 g) = 0.542 W/kg



0 dB = 0.764 W/kg = -1.17 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657

Communication System: UID 0, UMTS; Frequency: 1907.6 MHz; Duty Cycle: 1:1

Medium: 1900 Body Medium parameters used:

$f = 1907.6$ MHz; $\sigma = 1.589$ S/m; $\epsilon_r = 54.556$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-25-2019; Ambient Temp: 20.0°C; Tissue Temp: 20.1°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1907.6 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, Top Edge, High.ch

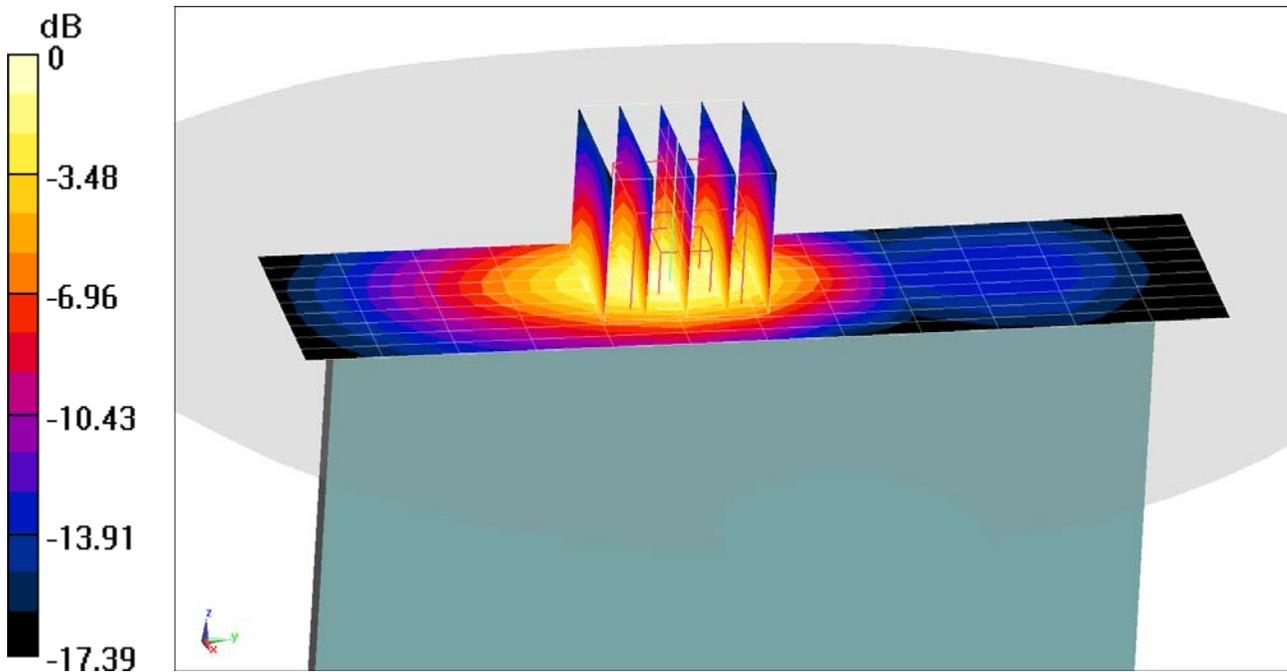
Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm

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

Reference Value = 24.49 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 1.50 W/kg

SAR(1 g) = 0.877 W/kg



0 dB = 1.27 W/kg = 1.04 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00665

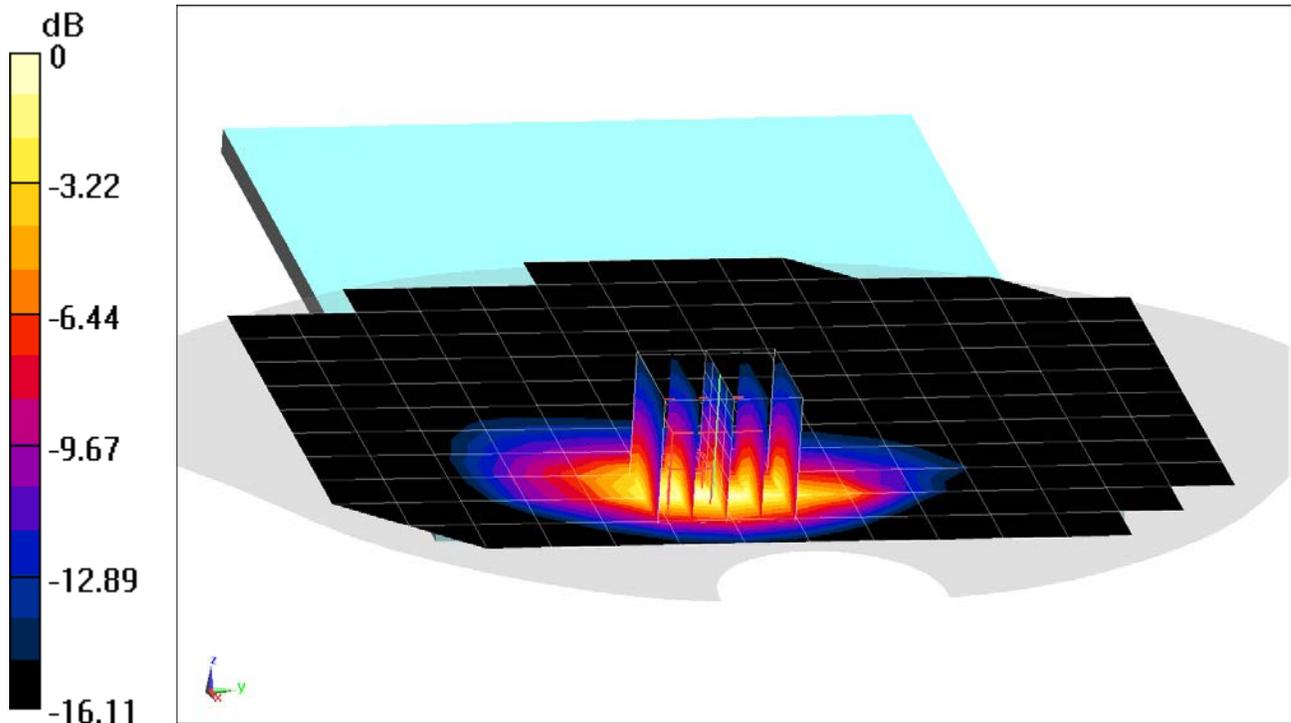
Communication System: UID 0, LTE Band 71; Frequency: 680.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
 $f = 680.5 \text{ MHz}$; $\sigma = 0.919 \text{ S/m}$; $\epsilon_r = 57.444$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-15-2019; Ambient Temp: 22.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3914; ConvF(9.73, 9.73, 9.73) @ 680.5 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1687
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 71, Body SAR, Back side, Mid.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

Area Scan (13x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.51 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 1.21 W/kg
SAR(1 g) = 0.502 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00665

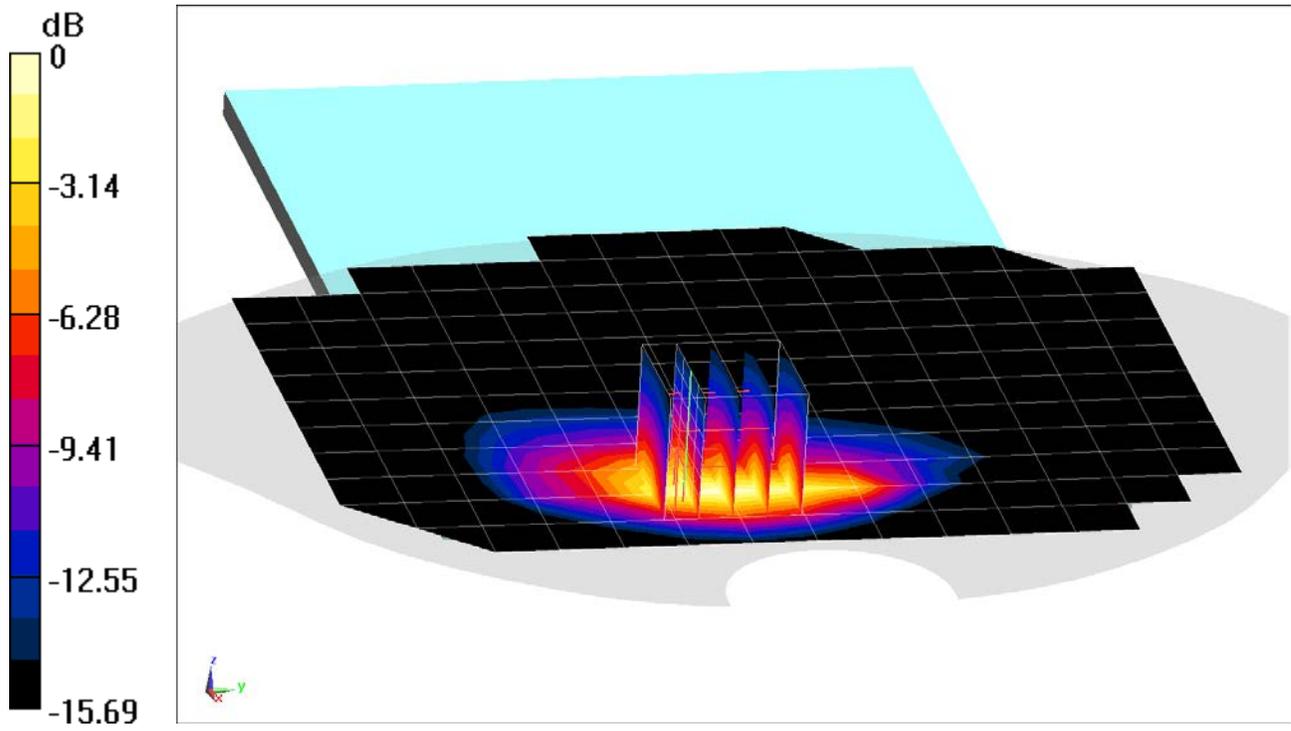
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
 $f = 707.5 \text{ MHz}$; $\sigma = 0.928 \text{ S/m}$; $\epsilon_r = 57.382$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-15-2019; Ambient Temp: 22.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3914; ConvF(9.73, 9.73, 9.73) @ 707.5 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1687
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 (13x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 25.96 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.607 W/kg



0 dB = 1.10 W/kg = 0.41 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657

Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Body Medium parameters used (interpolated):
 $f = 782 \text{ MHz}$; $\sigma = 0.962 \text{ S/m}$; $\epsilon_r = 56.585$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-20-2019; Ambient Temp: 23.5°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(10.05, 10.05, 10.05) @ 782 MHz; Calibrated: 5/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/8/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715
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**

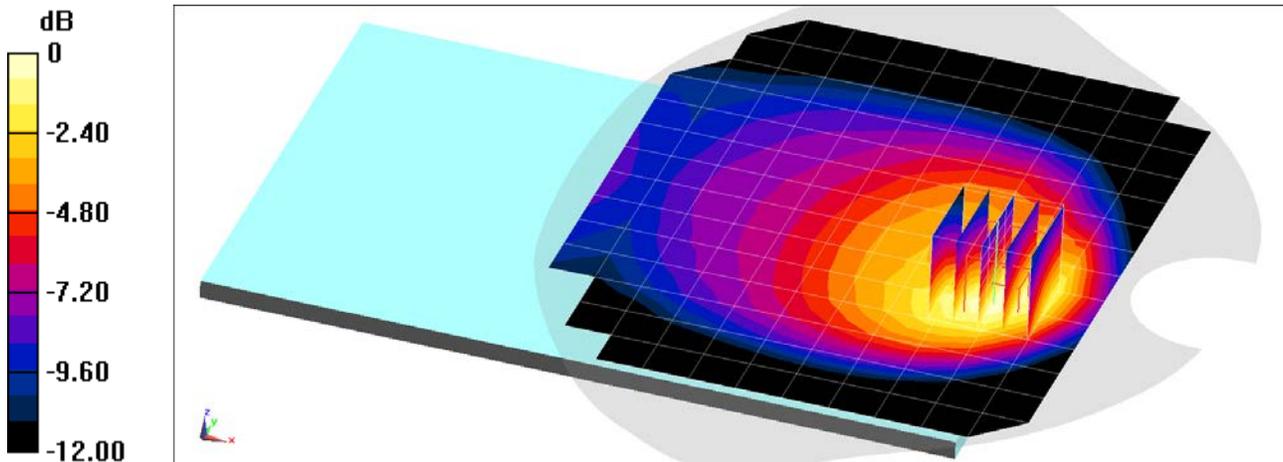
Area Scan (15x15x1): Measurement grid: dx=15mm, dy=15mm

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

Reference Value = 26.60 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 1.01 W/kg

SAR(1 g) = 0.649 W/kg



0 dB = 0.869 W/kg = -0.61 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657

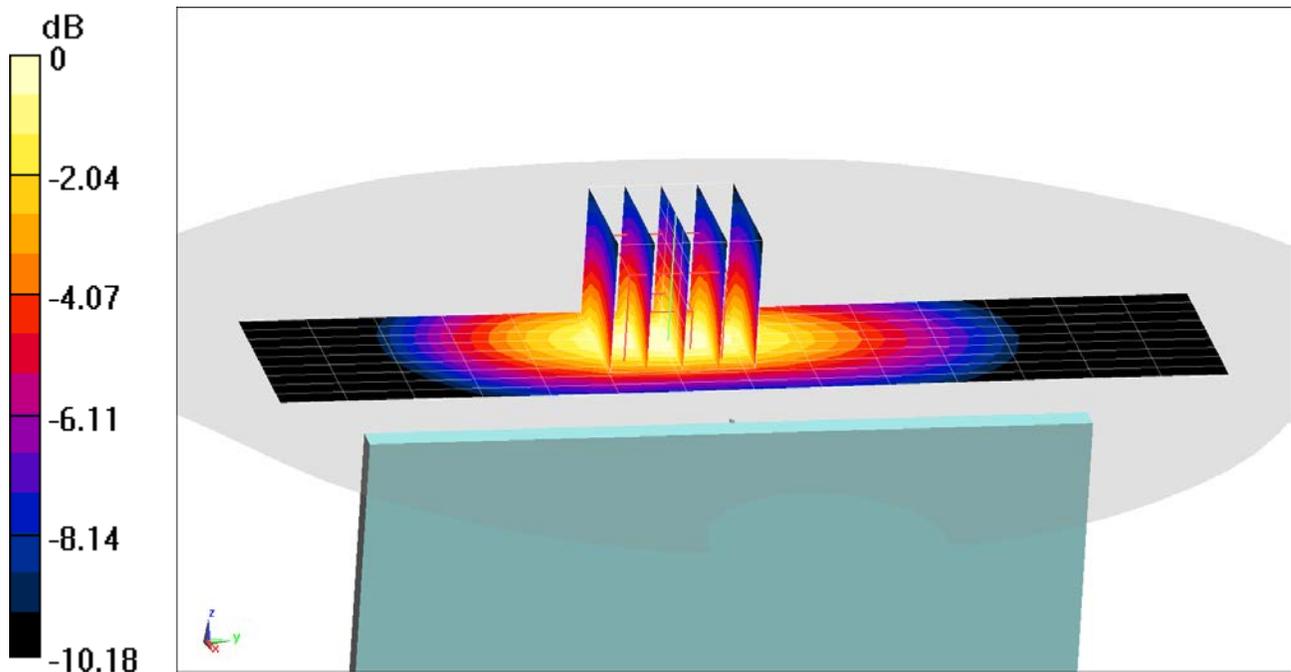
Communication System: UID 0, LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
 $f = 831.5 \text{ MHz}$; $\sigma = 0.944 \text{ S/m}$; $\epsilon_r = 57.104$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-19-2019; Ambient Temp: 21.0°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 831.5 MHz; Calibrated: 5/16/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn859; Calibrated: 5/8/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 26 (Cell.), Body SAR, Top Edge, Mid.ch, 15 MHz Bandwidth,
QPSK, 1 RB, 74 RB Offset**

Area Scan (10x15x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 28.65 V/m; Power Drift = -0.05 dB
Peak SAR (extrapolated) = 1.07 W/kg
SAR(1 g) = 0.724 W/kg



0 dB = 0.947 W/kg = -0.24 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657

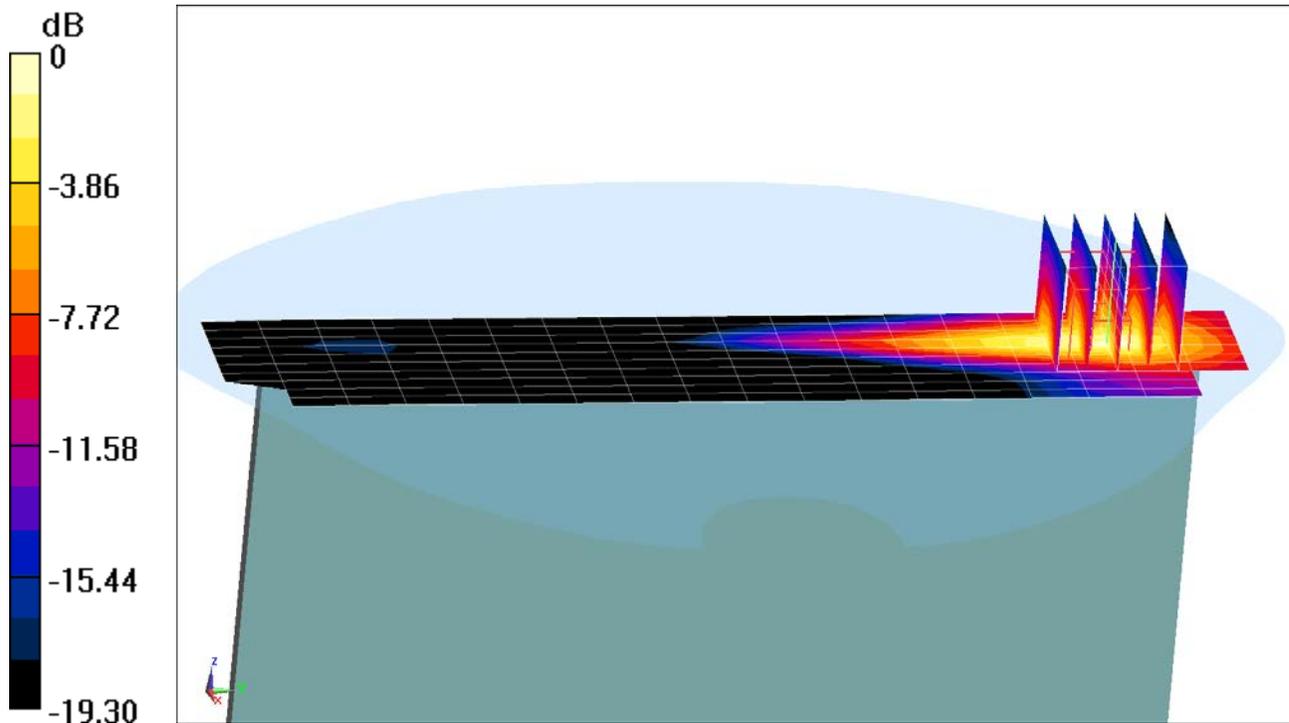
Communication System: UID 0, LTE Band 66 (AWS); Frequency: 1770 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
 $f = 1770 \text{ MHz}$; $\sigma = 1.478 \text{ S/m}$; $\epsilon_r = 53.941$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-17-2019; Ambient Temp: 22.6°C; Tissue Temp: 21.9°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: SAM Left; Type: QD000P40CA; Serial: TP:82355
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: LTE Band 66 (AWS), Body SAR, Left Edge, High.ch,
20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset**

Area Scan (11x21x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 20.69 V/m; Power Drift = 0.11 dB
Peak SAR (extrapolated) = 1.45 W/kg
SAR(1 g) = 0.586 W/kg



0 dB = 1.15 W/kg = 0.61 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657

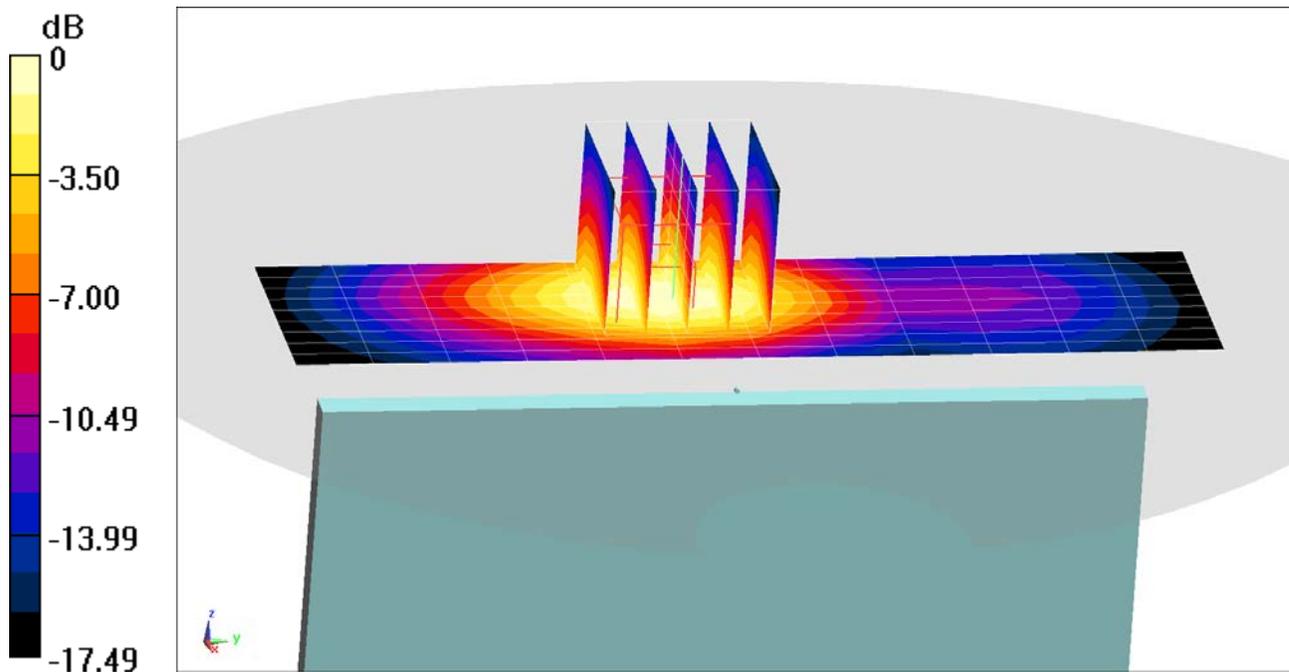
Communication System: UID 0, _LTE Band 25 (PCS); Frequency: 1905 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
 $f = 1905 \text{ MHz}$; $\sigma = 1.548 \text{ S/m}$; $\epsilon_r = 53.599$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-20-2019; Ambient Temp: 20.9°C; Tissue Temp: 23.0°C

Probe: EX3DV4 - SN7488; ConvF(8.37, 8.37, 8.37) @ 1905 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 25 (PCS), Body SAR, Top Edge, High.ch, 20 MHz Bandwidth,
QPSK, 1 RB, 0 RB Offset**

Area Scan (10x13x1): Measurement grid: dx=5mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 24.62 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 1.47 W/kg
SAR(1 g) = 0.863 W/kg



0 dB = 1.25 W/kg = 0.97 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657

Communication System: UID 0, LTE Band 7; Frequency: 2510 MHz; Duty Cycle: 1:1

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2510 \text{ MHz}$; $\sigma = 2.083 \text{ S/m}$; $\epsilon_r = 50.59$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0 cm

Test Date: 08-01-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2510 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 7, Body SAR, Left Edge, Low.ch, 20 MHz Bandwidth,
QPSK, 1 RB, 99 RB Offset**

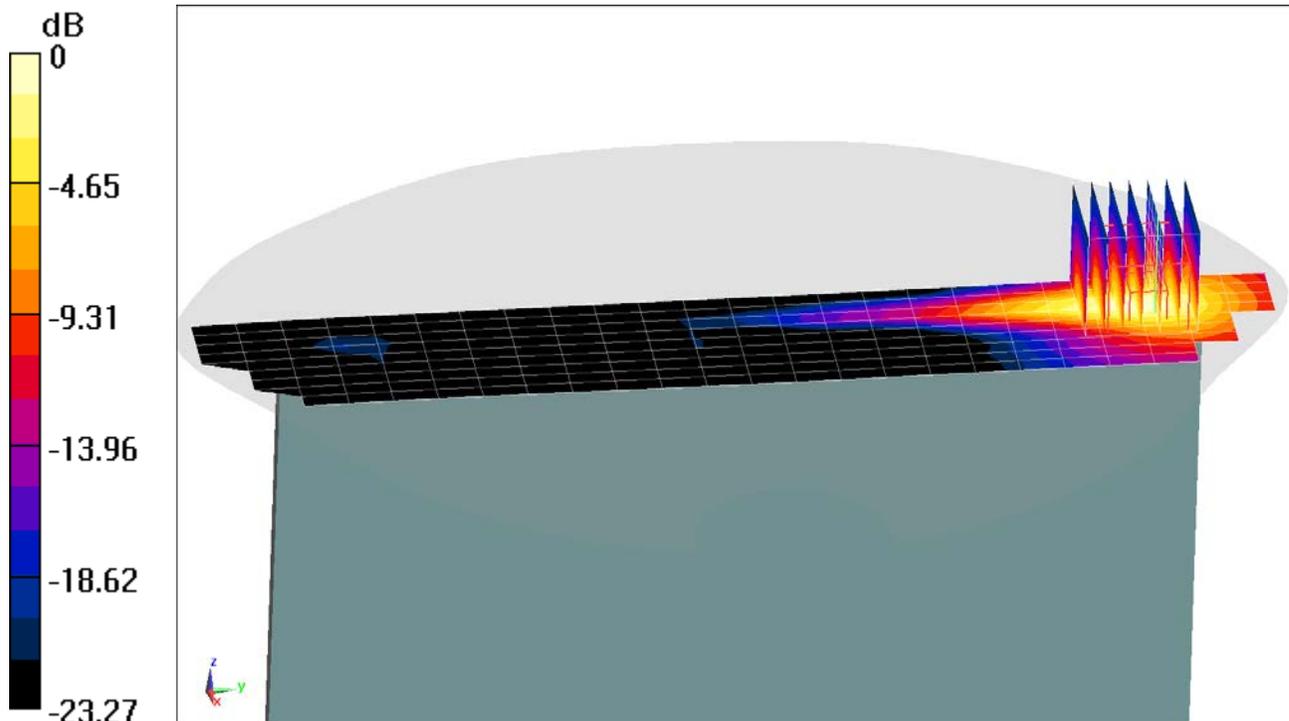
Area Scan (10x25x1): Measurement grid: dx=5mm, dy=12mm

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

Reference Value = 25.13 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 3.26 W/kg

SAR(1 g) = 1.17 W/kg



0 dB = 2.18 W/kg = 3.38 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00665

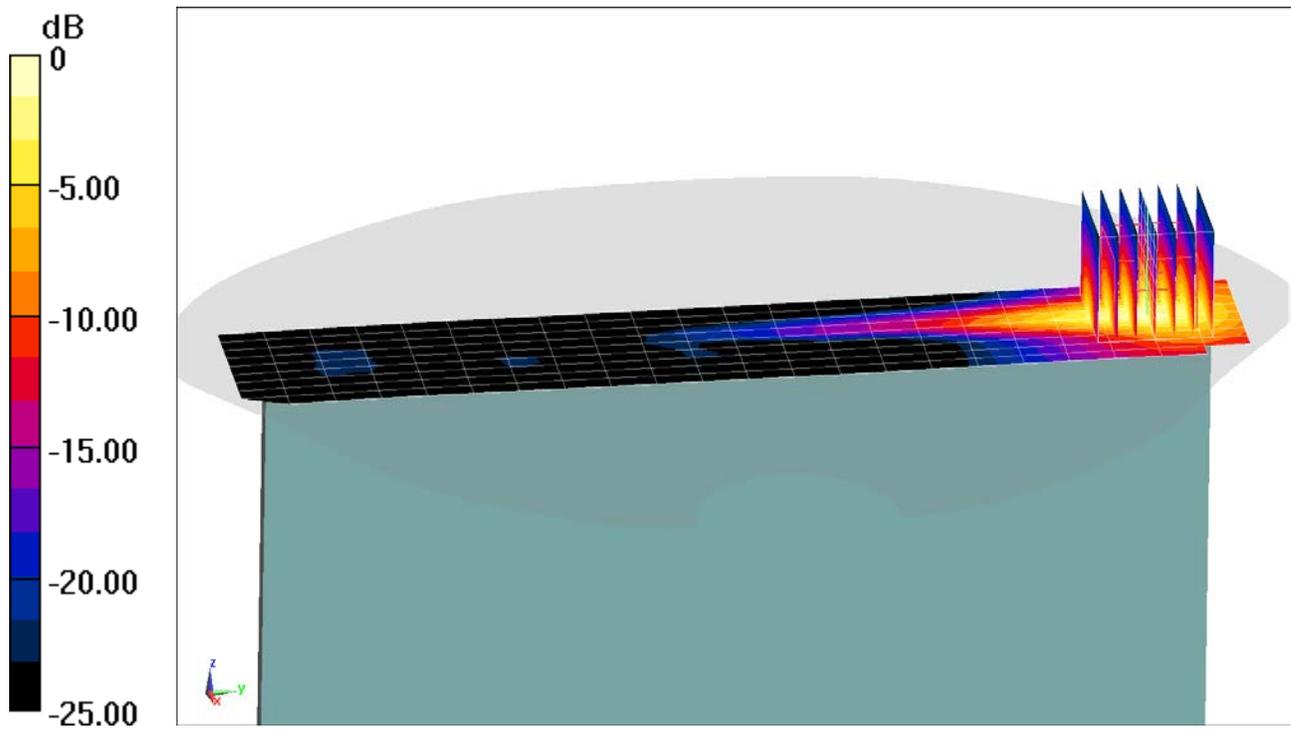
Communication System: UID 0, _LTE Band 41; Frequency: 2680 MHz; Duty Cycle: 1:1.58
Medium: 2450 Body Medium parameters used (interpolated):
 $f = 2680$ MHz; $\sigma = 2.282$ S/m; $\epsilon_r = 50.078$; $\rho = 1000$ kg/m³
Phantom section: Flat Section; Space: 0 cm

Test Date: 08-01-2019; Ambient Temp: 22.5°C; Tissue Temp: 22.0°C

Probe: EX3DV4 - SN7417; ConvF(7.37, 7.37, 7.37) @ 2680 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, Left Edge, High.ch, 20 MHz Bandwidth,
QPSK, 1 RB, 50 RB Offset**

Area Scan (10x19x1): Measurement grid: dx=5mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 24.72 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 3.81 W/kg
SAR(1 g) = 1.21 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00640

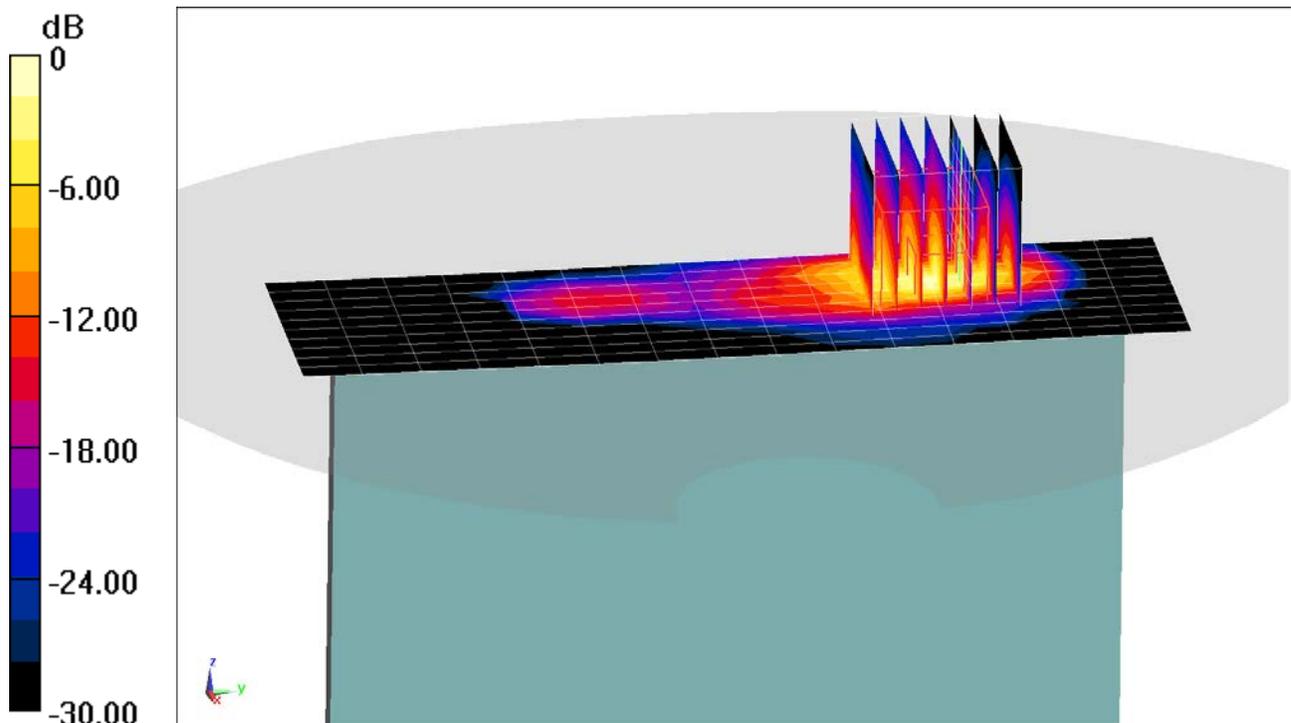
Communication System: UID 0, IEEE 802.11b; Frequency: 2437 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
 $f = 2437 \text{ MHz}$; $\sigma = 1.901 \text{ S/m}$; $\epsilon_r = 51.51$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-31-2019; Ambient Temp: 22.6°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7357; ConvF(7.59, 7.59, 7.59) @ 2437 MHz; Calibrated: 4/24/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1407; Calibrated: 4/18/2019
Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

**Mode: IEEE 802.11b, 22 MHz Bandwidth, Antenna 2, Body SAR,
Ch 6, 1 Mbps, Top Edge**

Area Scan (11x16x1): Measurement grid: dx=5mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 20.32 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 2.22 W/kg
SAR(1 g) = 0.590 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00665

Communication System: UID 0, _IEEE 802.11n; Frequency: 5510 MHz; Duty Cycle: 1:1
Medium: 5GHz Body Medium parameters used (interpolated):
 $f = 5510 \text{ MHz}$; $\sigma = 5.502 \text{ S/m}$; $\epsilon_r = 46.636$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 0 cm

Test Date: 07-31-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.4°C

Probe: EX3DV4 - SN7410; ConvF(4.42, 4.42, 4.42) @ 5510 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 802.11n, Antenna 2, U-NII-2C, 40 MHz Bandwidth, Body SAR,
Ch 102, 13.5 Mbps, Top Edge**

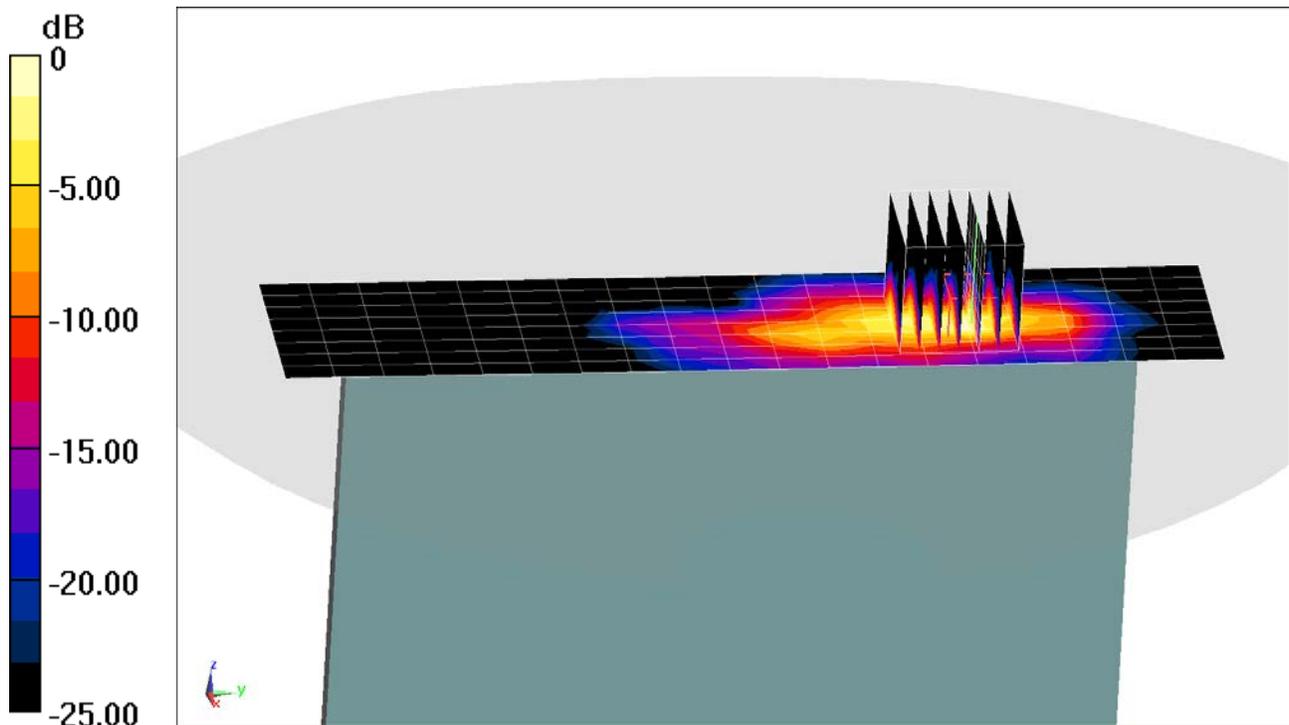
Area Scan (9x8x1): Measurement grid: dx=5mm, dy=10mm

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

Reference Value = 10.44 V/m; Power Drift = -0.17 dB

Peak SAR (extrapolated) = 2.82 W/kg

SAR(1 g) = 0.432 W/kg



0 dB = 1.42 W/kg = 1.52 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: ZNFT600US; Type: Portable Tablet; Serial: 00657

Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1.302

Medium: 2450 Body Medium parameters used (interpolated):

$f = 2441 \text{ MHz}$; $\sigma = 2.031 \text{ S/m}$; $\epsilon_r = 51.565$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 0 cm

Test Date: 08-04-2019; Ambient Temp: 22.2°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7417; ConvF(7.51, 7.51, 7.51) @ 2441 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: Bluetooth, Body SAR, Ch 39, 1 Mbps, Back Side

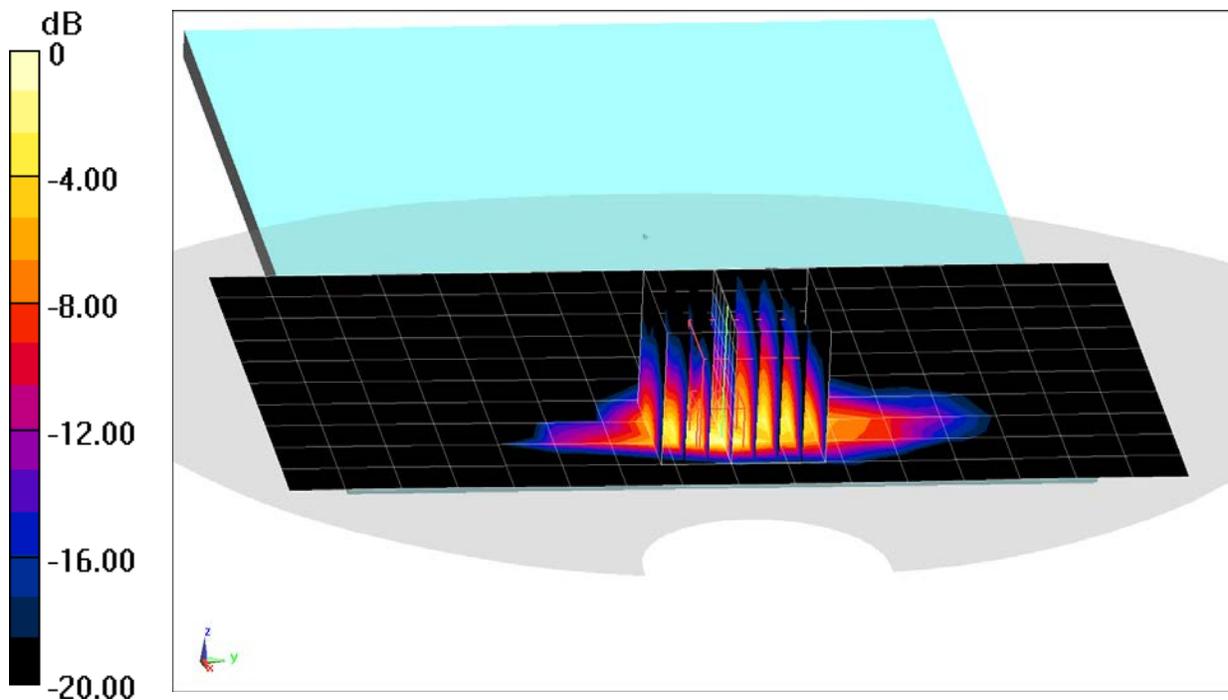
Area Scan (9x19x1): Measurement grid: dx=12mm, dy=12mm

Zoom Scan (7x9x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 9.206 V/m; Power Drift = 0.08 dB

Peak SAR (extrapolated) = 0.416 W/kg

SAR(1 g) = 0.164 W/kg



0 dB = 0.479 W/kg = -3.20 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 Body Medium parameters used (interpolated):
 $f = 750 \text{ MHz}$; $\sigma = 0.942 \text{ S/m}$; $\epsilon_r = 57.308$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-15-2019; Ambient Temp: 22.8°C; Tissue Temp: 22.6°C

Probe: EX3DV4 - SN3914; ConvF(9.73, 9.73, 9.73) @ 750 MHz; Calibrated: 2/19/2019
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1272; Calibrated: 2/14/2019
Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1687
Measurement SW: DASY52, Version 52.10 (2);SEMCAD X Version 14.6.12 (7470)

750 MHz System Verification at 23.0 dBm (200 mW)

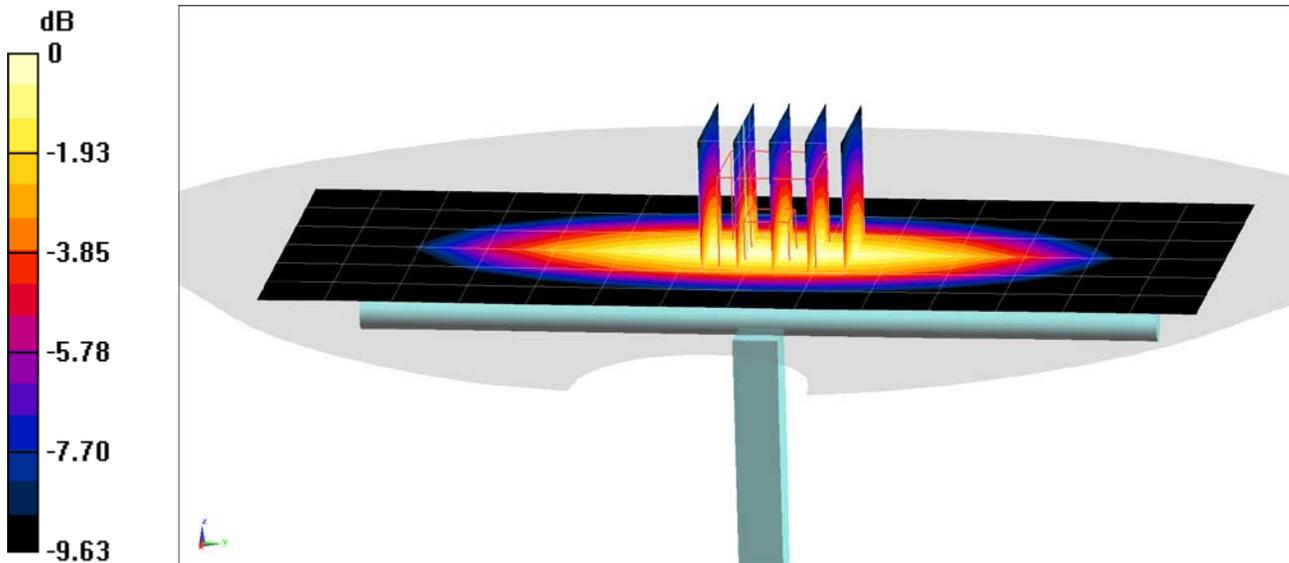
Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 2.49 W/kg

SAR(1 g) = 1.7 W/kg

Deviation(1 g) = -0.93%



0 dB = 2.22 W/kg = 3.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

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

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

$f = 750 \text{ MHz}$; $\sigma = 0.952 \text{ S/m}$; $\epsilon_r = 56.67$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-20-2019; Ambient Temp: 23.5°C; Tissue Temp: 21.5°C

Probe: EX3DV4 - SN7406; ConvF(10.05, 10.05, 10.05) @ 750 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715

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

750 MHz System Verification at 23.0 dBm (200 mW)

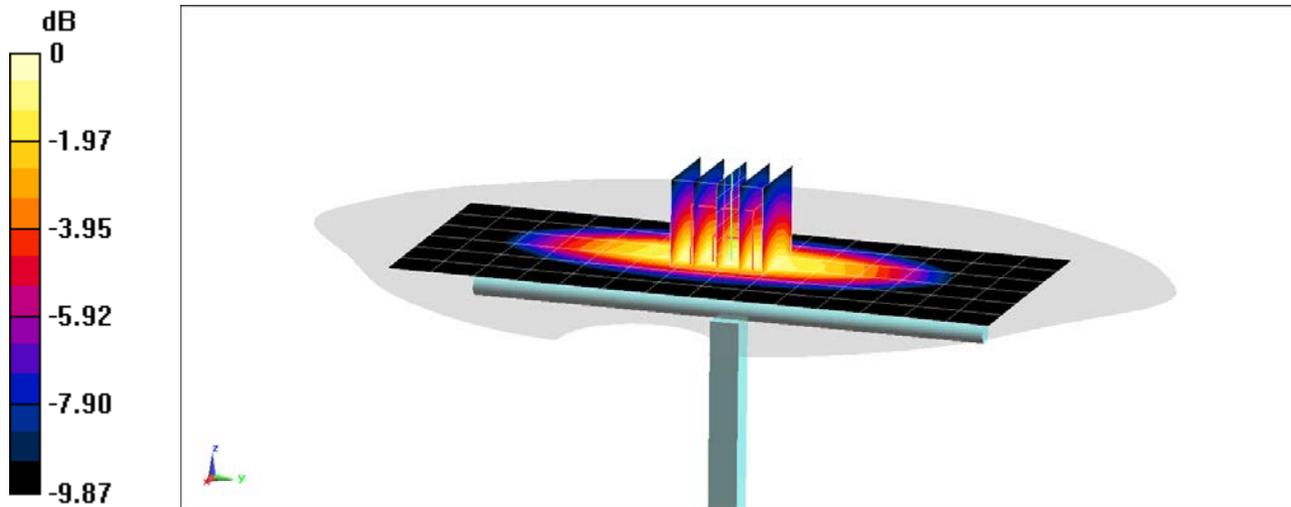
Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 2.66 W/kg

SAR(1 g) = 1.79 W/kg

Deviation(1 g) = 4.68%



0 dB = 2.37 W/kg = 3.75 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 Body; Medium parameters used:

$f = 835 \text{ MHz}$; $\sigma = 0.945 \text{ S/m}$; $\epsilon_r = 57.098$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.5 cm

Test Date: 08-19-2019; Ambient Temp: 21.0°C; Tissue Temp: 20.9°C

Probe: EX3DV4 - SN7406; ConvF(9.78, 9.78, 9.78) @ 835 MHz; Calibrated: 5/16/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

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

Phantom: Twin-SAM V5.0 Left 30; Type: QD 000 P40 CD; Serial: 1715

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

835 MHz System Verification at 23.0 dBm (200 mW)

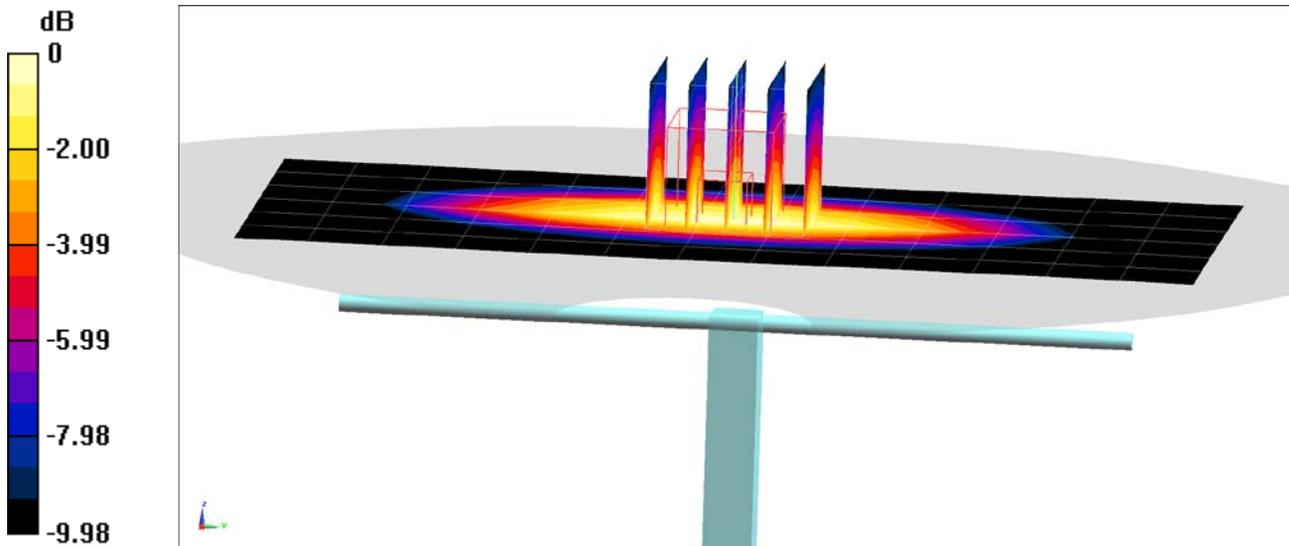
Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 3.00 W/kg

SAR(1 g) = 2.01 W/kg

Deviation(1 g) = 3.93%



0 dB = 2.67 W/kg = 4.27 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750 \text{ MHz}$; $\sigma = 1.464 \text{ S/m}$; $\epsilon_r = 53.969$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-17-2019; Ambient Temp: 22.6°C; Tissue Temp: 21.9°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: SAM Left; Type: QD000P40CA; Serial: TP:82355

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

1750 MHz System Verification at 20.0 dBm (100 mW)

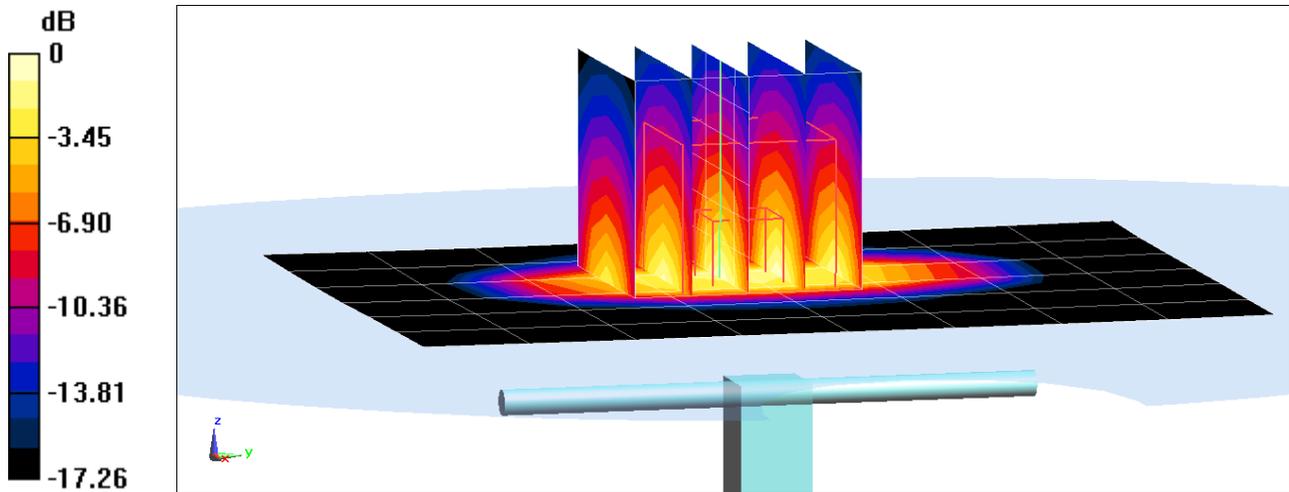
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 7.12 W/kg

SAR(1 g) = 3.88 W/kg

Deviation(1 g) = 6.01%



0 dB = 5.92 W/kg = 7.72 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1

Medium: 1750 Body Medium parameters used:

$f = 1750$ MHz; $\sigma = 1.437$ S/m; $\epsilon_r = 51.764$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-19-2019; Ambient Temp: 22.4°C; Tissue Temp: 21.4°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)

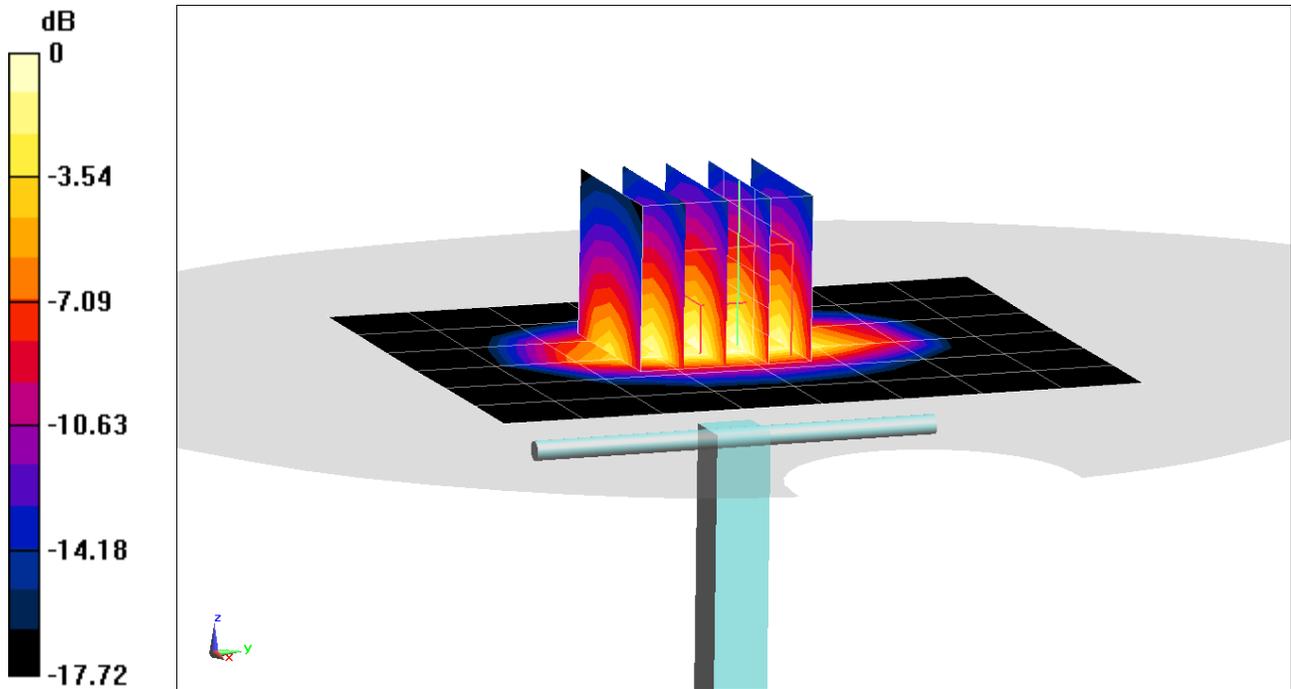
Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm

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

Peak SAR (extrapolated) = 6.73 W/kg

SAR(1 g) = 3.63 W/kg

Deviation(1 g) = -0.82%



0 dB = 5.54 W/kg = 7.44 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

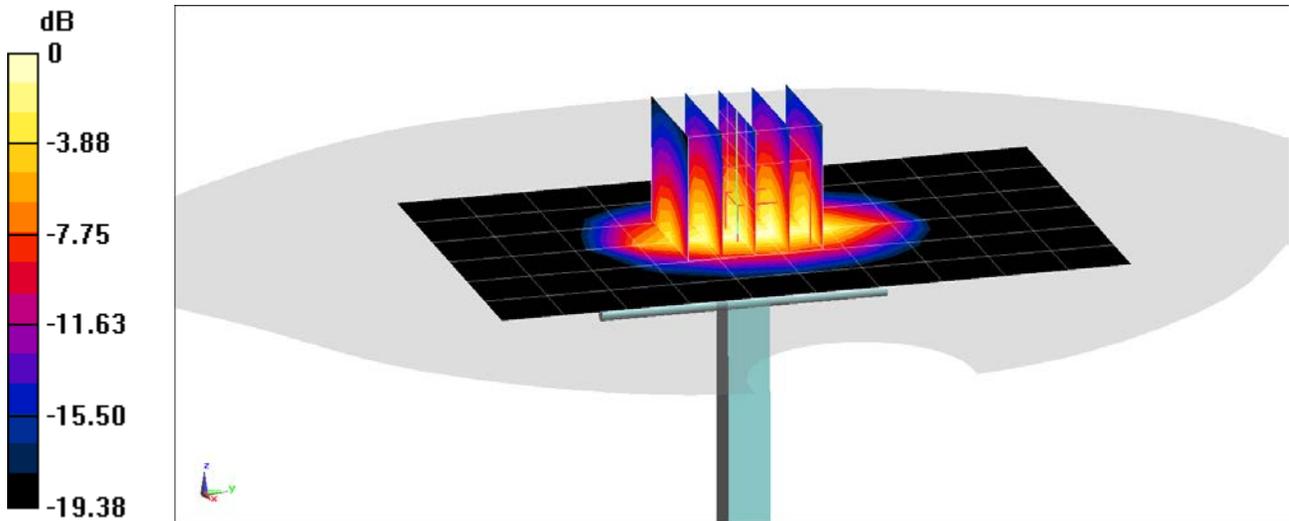
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
 $f = 1900 \text{ MHz}$; $\sigma = 1.581 \text{ S/m}$; $\epsilon_r = 54.585$; $\rho = 1000 \text{ kg/m}^3$
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-25-2019; Ambient Temp: 20.0°C; Tissue Temp: 20.1°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) = 7.76 W/kg
SAR(1 g) = 4.16 W/kg
Deviation(1 g) = 6.39%



0 dB = 6.39 W/kg = 8.06 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:

$f = 2450 \text{ MHz}$; $\sigma = 1.917 \text{ S/m}$; $\epsilon_r = 51.463$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2019; Ambient Temp: 22.6°C; Tissue Temp: 21.2°C

Probe: EX3DV4 - SN7357; ConvF(7.59, 7.59, 7.59) @ 2450 MHz; Calibrated: 4/24/2019

Sensor-Surface: 1.4mm (Mechanical Surface Detection)

Electronics: DAE4 Sn1407; Calibrated: 4/18/2019

Phantom: Twin-SAM V4.0 Front Right; Type: QD 000 P40 CC; Serial: 1167

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

2450 MHz System Verification at 20.0 dBm (100 mW)

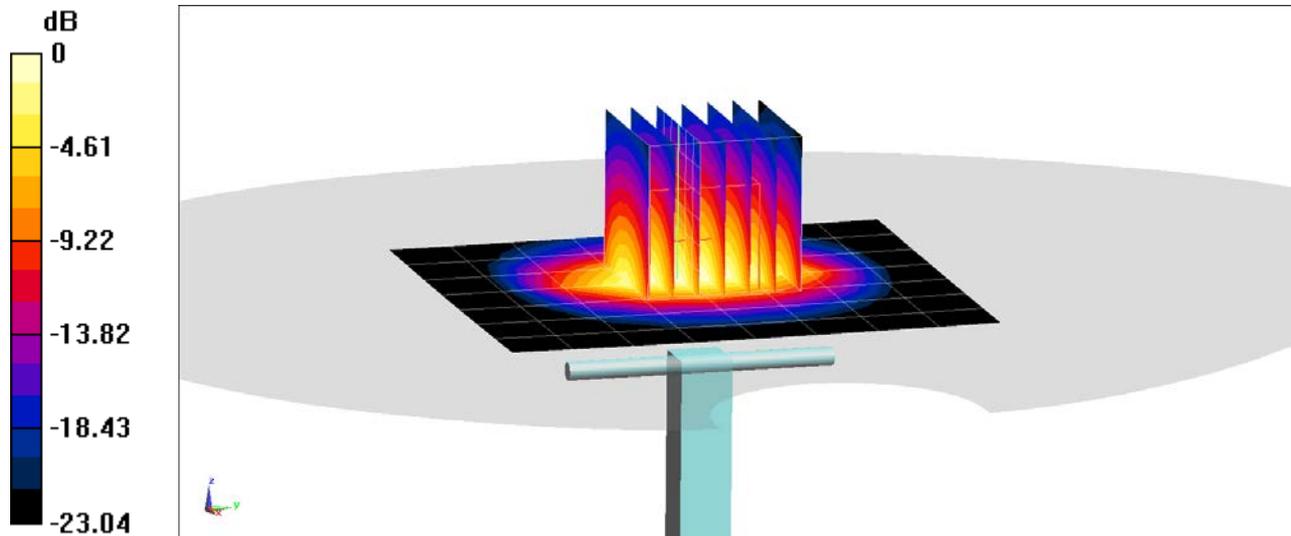
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 10.5 W/kg

SAR(1 g) = 4.95 W/kg

Deviation(1 g) = -3.13%



0 dB = 8.32 W/kg = 9.20 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1

Medium: 2450 Body; Medium parameters used:

$f = 2450 \text{ MHz}$; $\sigma = 2.042 \text{ S/m}$; $\epsilon_r = 51.536$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-04-2019; Ambient Temp: 22.2°C; Tissue Temp: 21.2°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)

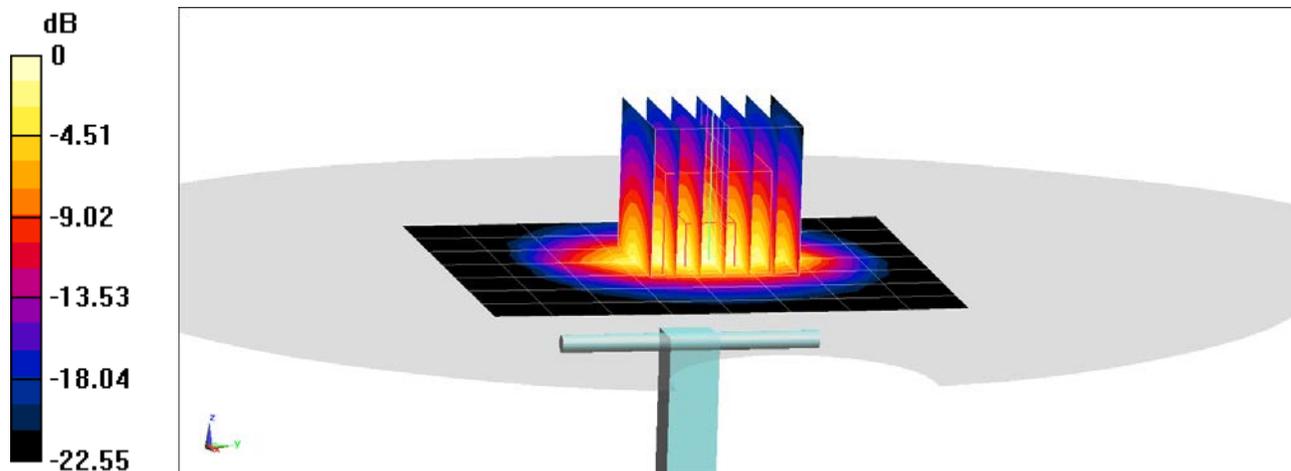
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 11.0 W/kg

SAR(1 g) = 5.31 W/kg

Deviation(1 g) = 5.99%



0 dB = 8.92 W/kg = 9.50 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:

$f = 2600$ MHz; $\sigma = 2.189$ S/m; $\epsilon_r = 50.331$; $\rho = 1000$ kg/m³

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 08-01-2019; Ambient Temp: 22.5°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)

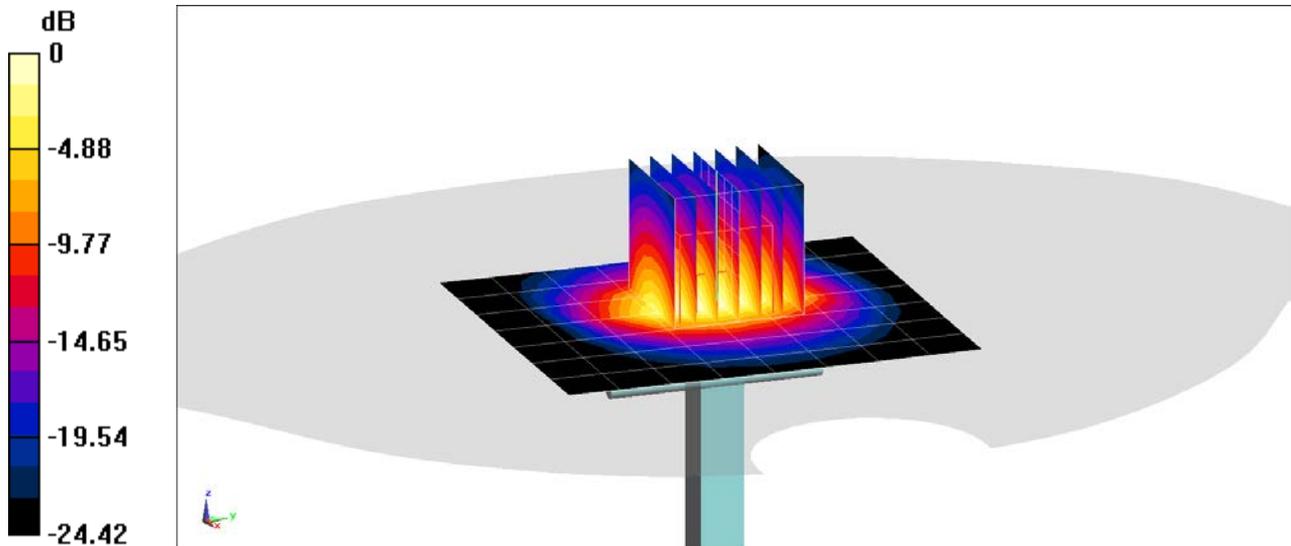
Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm

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

Peak SAR (extrapolated) = 12.2 W/kg

SAR(1 g) = 5.6 W/kg

Deviation(1 g) = 2.19%



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):

$f = 5250 \text{ MHz}$; $\sigma = 5.165 \text{ S/m}$; $\epsilon_r = 47.068$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.4°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)

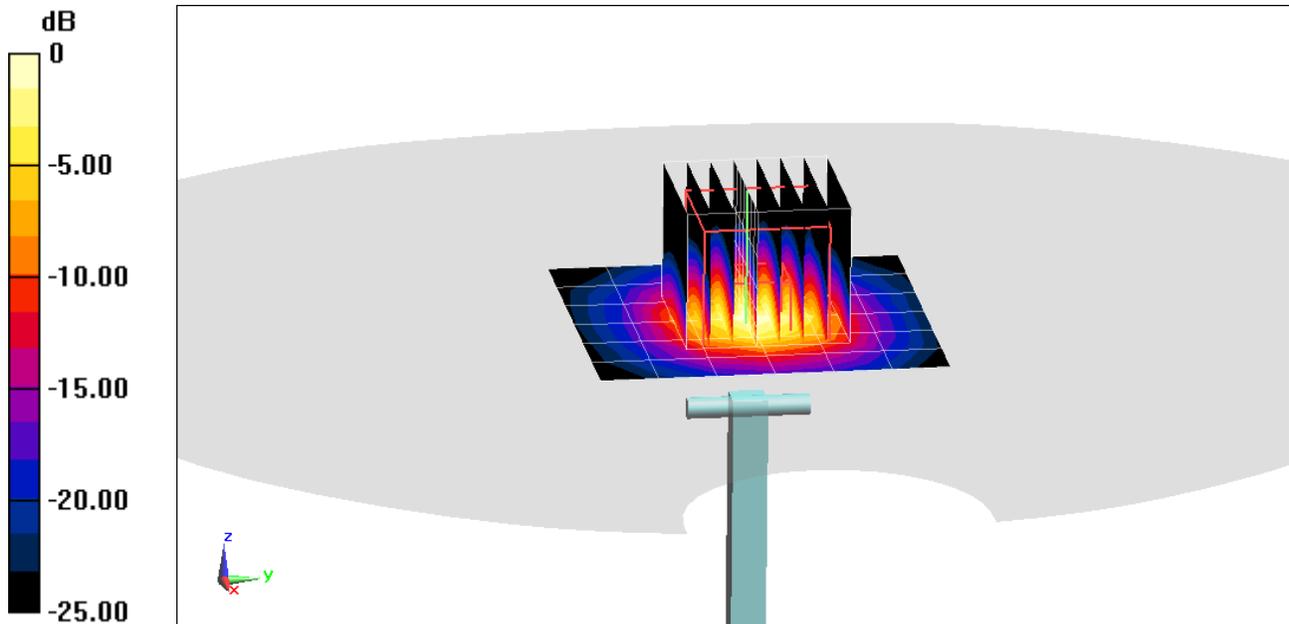
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

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

Peak SAR (extrapolated) = 13.5 W/kg

SAR(1 g) = 3.47 W/kg

Deviation(1 g) = -8.56%



0 dB = 8.16 W/kg = 9.12 dBW/kg

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:

$f = 5600 \text{ MHz}$; $\sigma = 5.629 \text{ S/m}$; $\epsilon_r = 46.485$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.4°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)

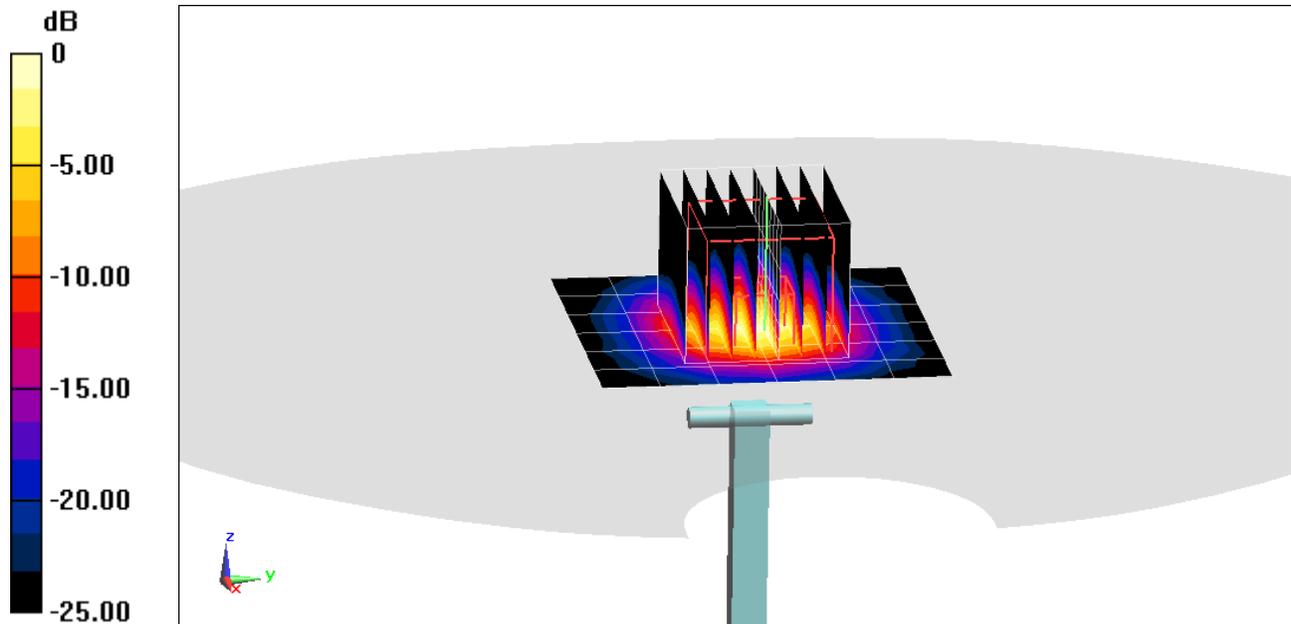
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

Zoom Scan (9x8x7)/Cube 0: Measurement grid: dx=4mm, dy=4mm, dz=1.4mm; Graded Ratio: 1.4

Peak SAR (extrapolated) = 16.4 W/kg

SAR(1 g) = 3.74 W/kg

Deviation(1 g) = -6.38%



0 dB = 9.37 W/kg = 9.72 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):

$f = 5750 \text{ MHz}$; $\sigma = 5.842 \text{ S/m}$; $\epsilon_r = 46.222$; $\rho = 1000 \text{ kg/m}^3$

Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-31-2019; Ambient Temp: 21.5°C; Tissue Temp: 20.4°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)

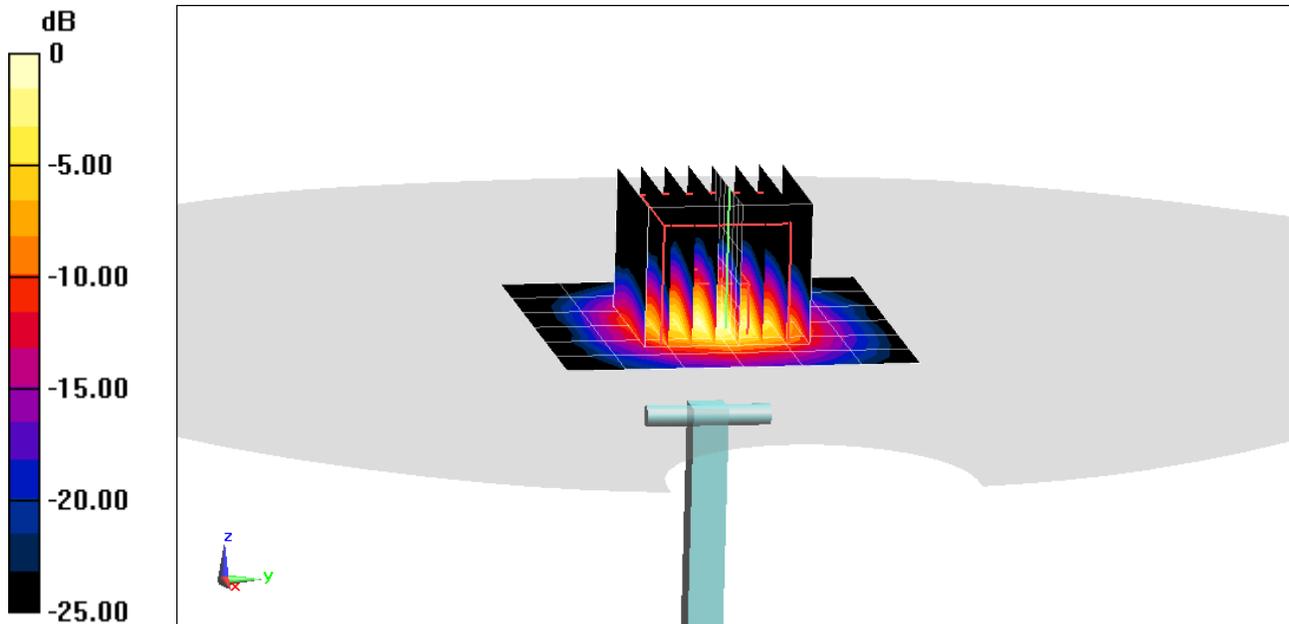
Area Scan (7x7x1): Measurement grid: dx=10mm, dy=10mm

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

Peak SAR (extrapolated) = 16.0 W/kg

SAR(1 g) = 3.57 W/kg

Deviation(1 g) = -6.91%



0 dB = 8.98 W/kg = 9.53 dBW/kg

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: **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: **Lefi Klysner** Laboratory Technician
Approved by: **Katja Pokovic** Technical Manager

Signature

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



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

Accredited by the Swiss Accreditation Service (SAS)

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

Accreditation No.: **SCS 0108**

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

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.37 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.42 W/kg \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 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.58 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.43 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.71 W/kg \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: $f = 750$ MHz; $\sigma = 0.9$ S/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 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:

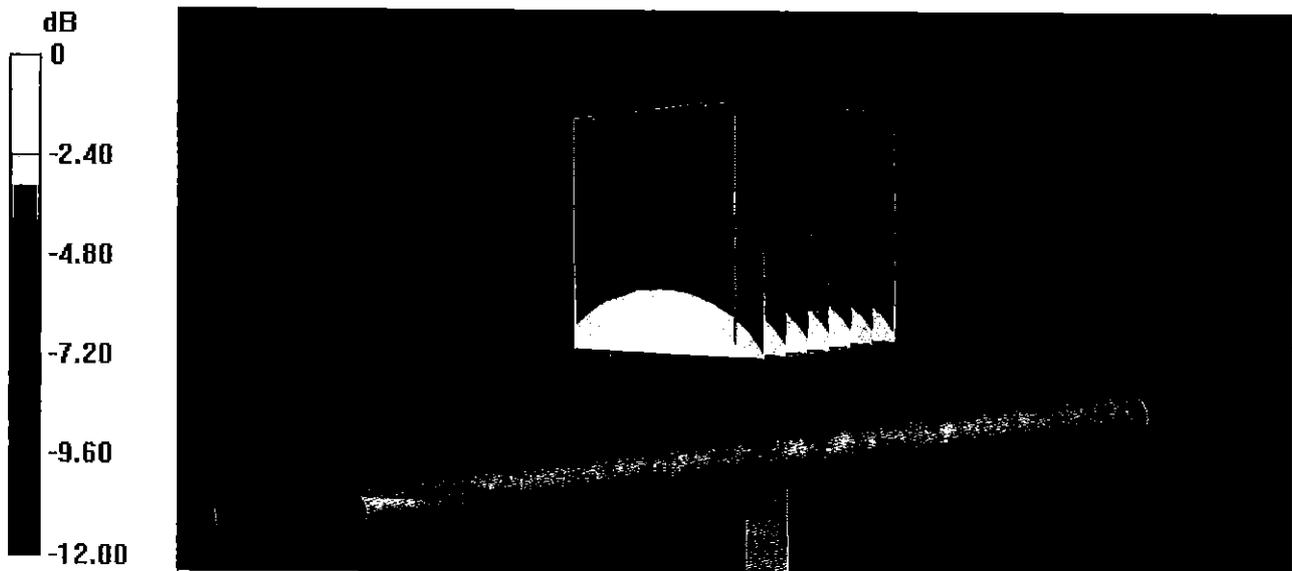
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

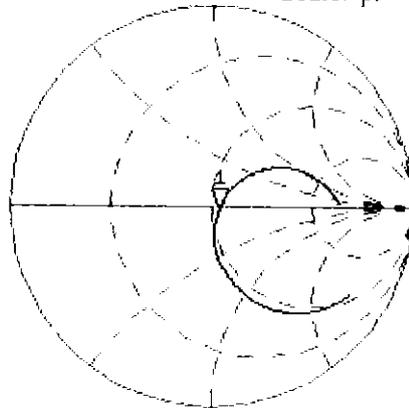


0 dB = 2.80 W/kg = 4.47 dBW/kg

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

*
Del
CA



Avg
16

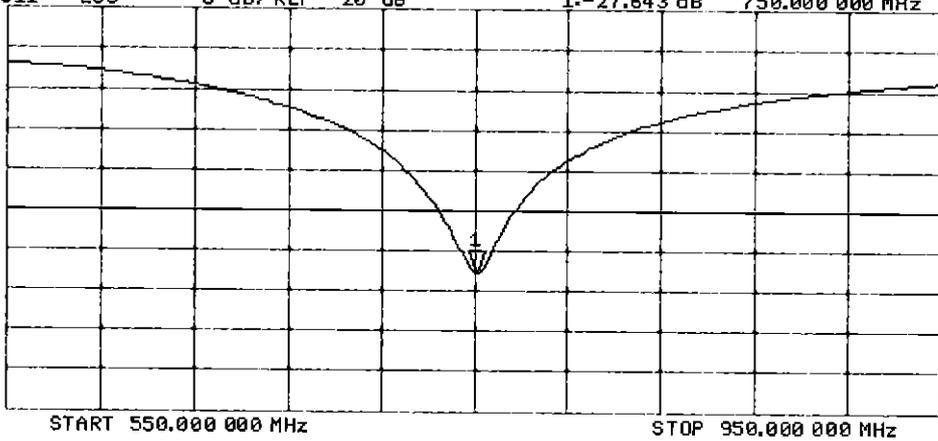
H1d

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: $f = 750$ MHz; $\sigma = 0.96$ S/m; $\epsilon_r = 55$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

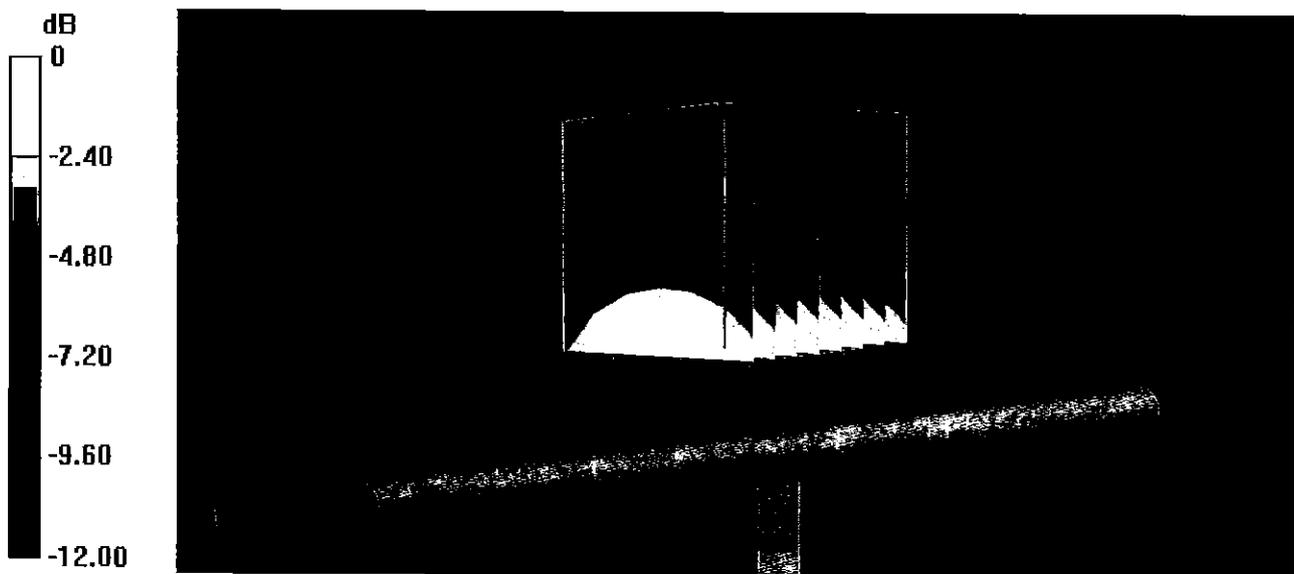
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.31 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.17 W/kg

SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.43 W/kg

Maximum value of SAR (measured) = 2.83 W/kg



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

Impedance Measurement Plot for Body TSL

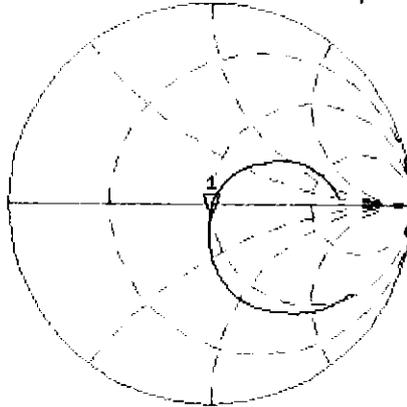
12 Jan 2018 13:13:21
CH1 S11 1 U FS 1: 49.234 Ω -6.1934 Ω 34.264 pF 750.000 000 MHz

*
 De1

CA

Avg
 16

H1d

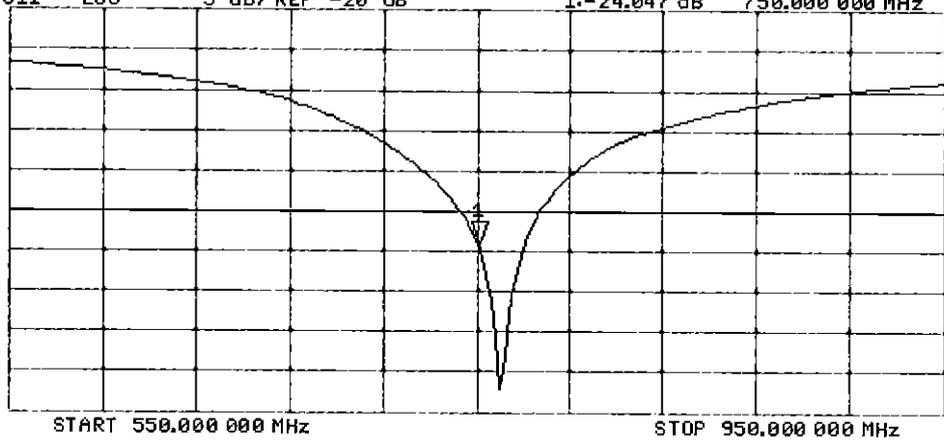


CH2 S11 LOG 5 dB/REF -20 dB 1:-24.047 dB 750.000 000 MHz

CA

Avg
 16

H1d



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: $f = 750$ MHz; $\sigma = 0.9$ S/m; $\epsilon_r = 44.2$; $\rho = 1000$ kg/m³

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

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

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

Reference Value = 56.79 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 2.89 W/kg

SAR(1 g) = 1.98 W/kg; SAR(10 g) = 1.33 W/kg

Maximum value of SAR (measured) = 2.58 W/kg

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

Reference Value = 56.85 V/m; Power Drift = -0.06 dB

Peak SAR (extrapolated) = 2.94 W/kg

SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (measured) = 2.62 W/kg

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

Reference Value = 56.29 V/m; Power Drift = 0.04 dB

Peak SAR (extrapolated) = 2.78 W/kg

SAR(1 g) = 2.01 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (measured) = 2.56 W/kg

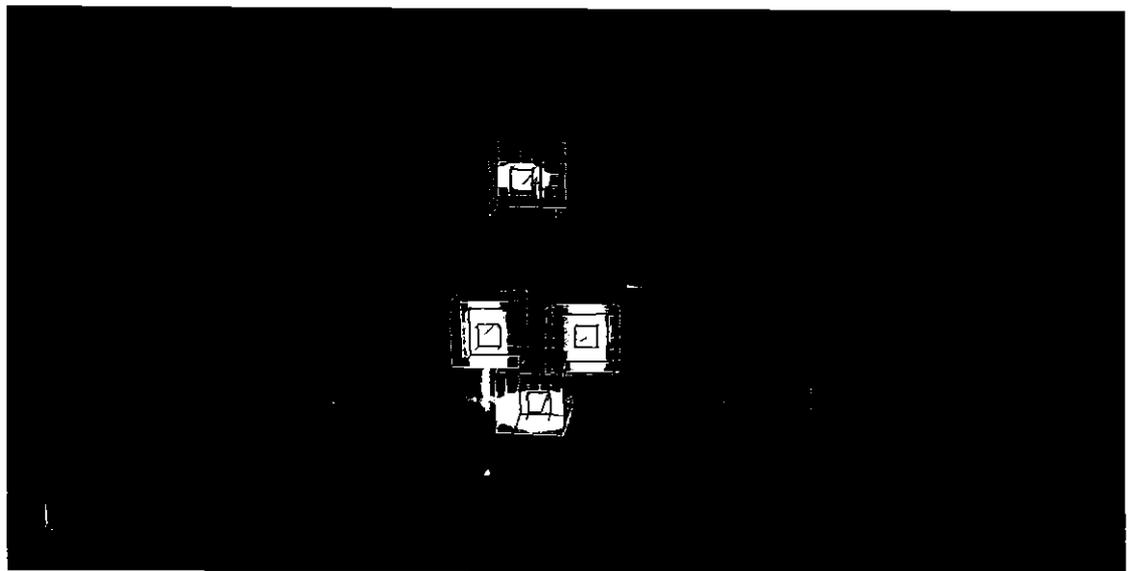
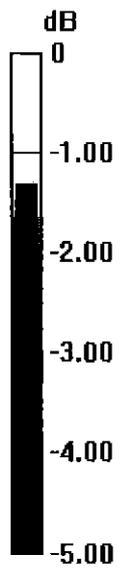
SAM Head/Ear/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 51.01 V/m; Power Drift = 0.02 dB

Peak SAR (extrapolated) = 2.31 W/kg

SAR(1 g) = 1.67 W/kg; SAR(10 g) = 1.15 W/kg

Maximum value of SAR (measured) = 2.11 W/kg



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

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

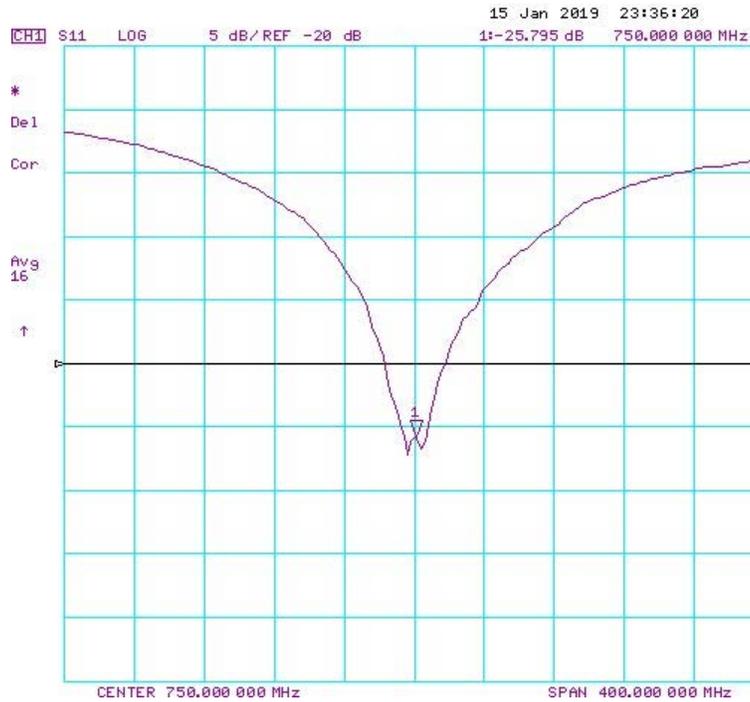
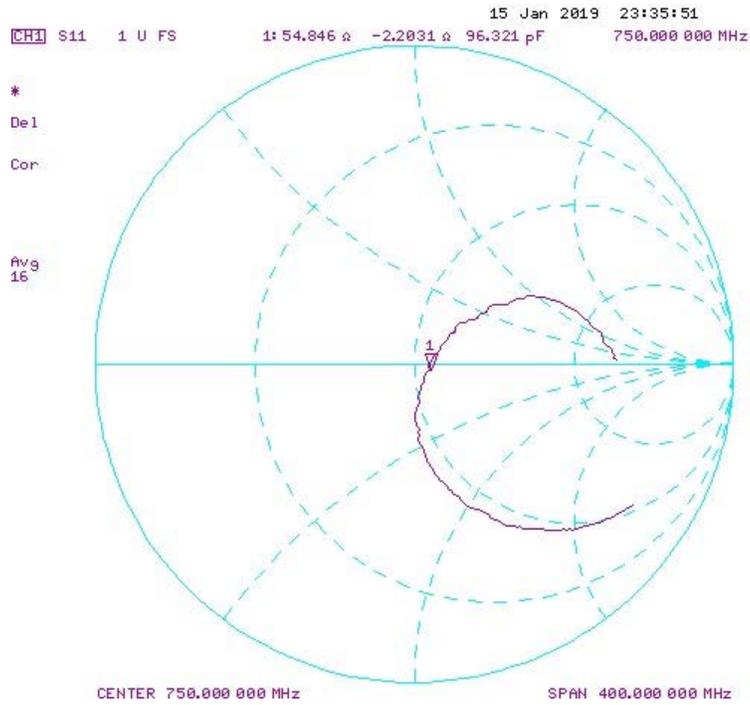
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

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.

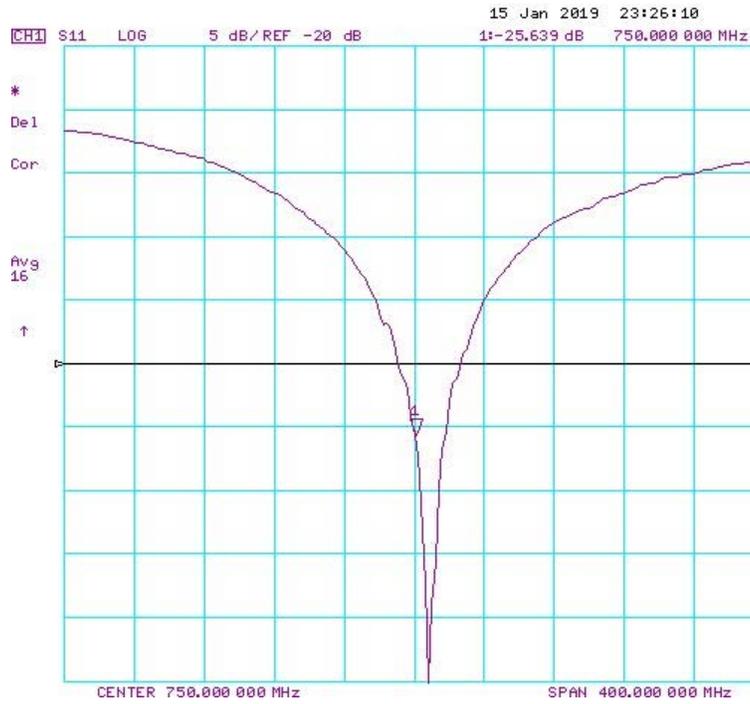
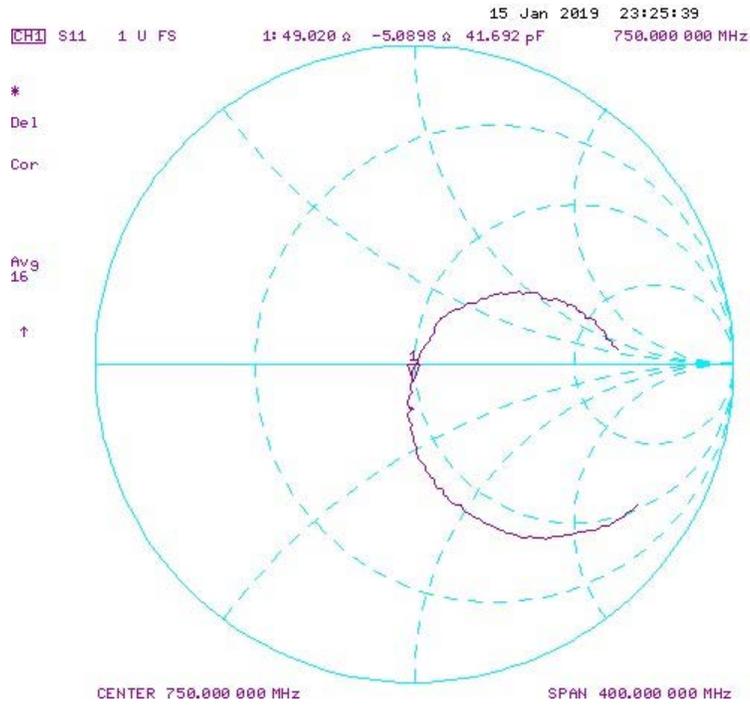
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

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)

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:

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

Additional Documentation:

- e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.2
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5.0 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	42.1 \pm 6 %	0.89 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	2.07 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.29 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	5.48 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	54.5 \pm 6 %	0.98 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	2.18 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	8.55 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	1.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	5.67 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	54.5 Ω - 0.3 j Ω
Return Loss	- 27.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.2 Ω - 3.0 j Ω
Return Loss	- 30.3 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.035 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	1.93 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	7.72 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.31 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.23 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	8.20 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.39 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	5.55 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	2.00 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	8.00 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	5.51 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	1.66 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	6.64 W/kg ± 17.5 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.14 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	4.55 W/kg ± 16.9 % (k=2)

DASY5 Validation Report for Head TSL

Date: 13.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750$ MHz; $\sigma = 0.89$ S/m; $\epsilon_r = 42.1$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.32, 10.32, 10.32) @ 750 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:

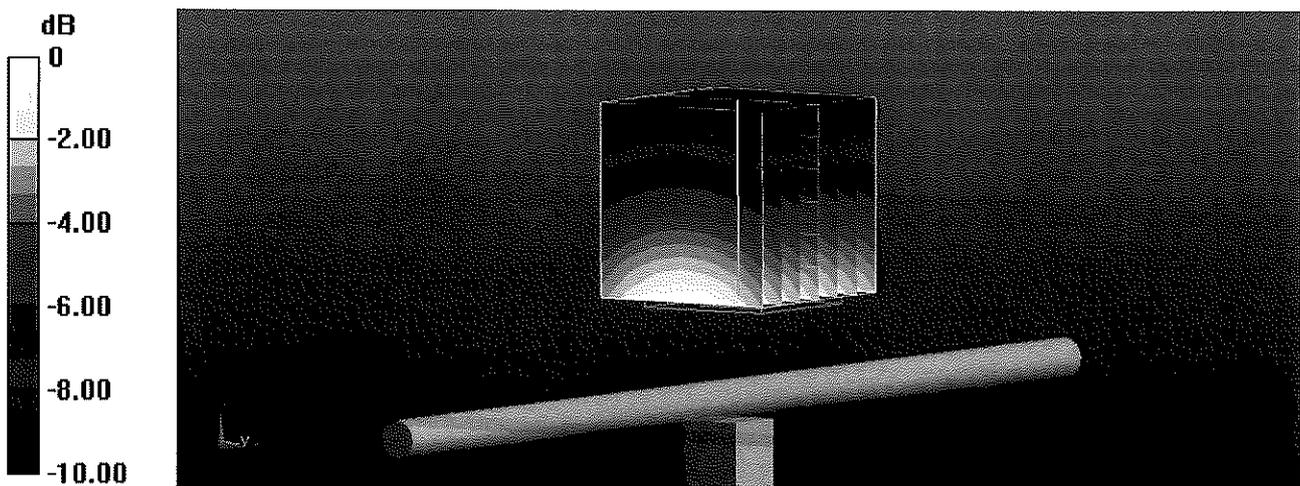
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 58.96 V/m; Power Drift = 0.00 dB

Peak SAR (extrapolated) = 3.06 W/kg

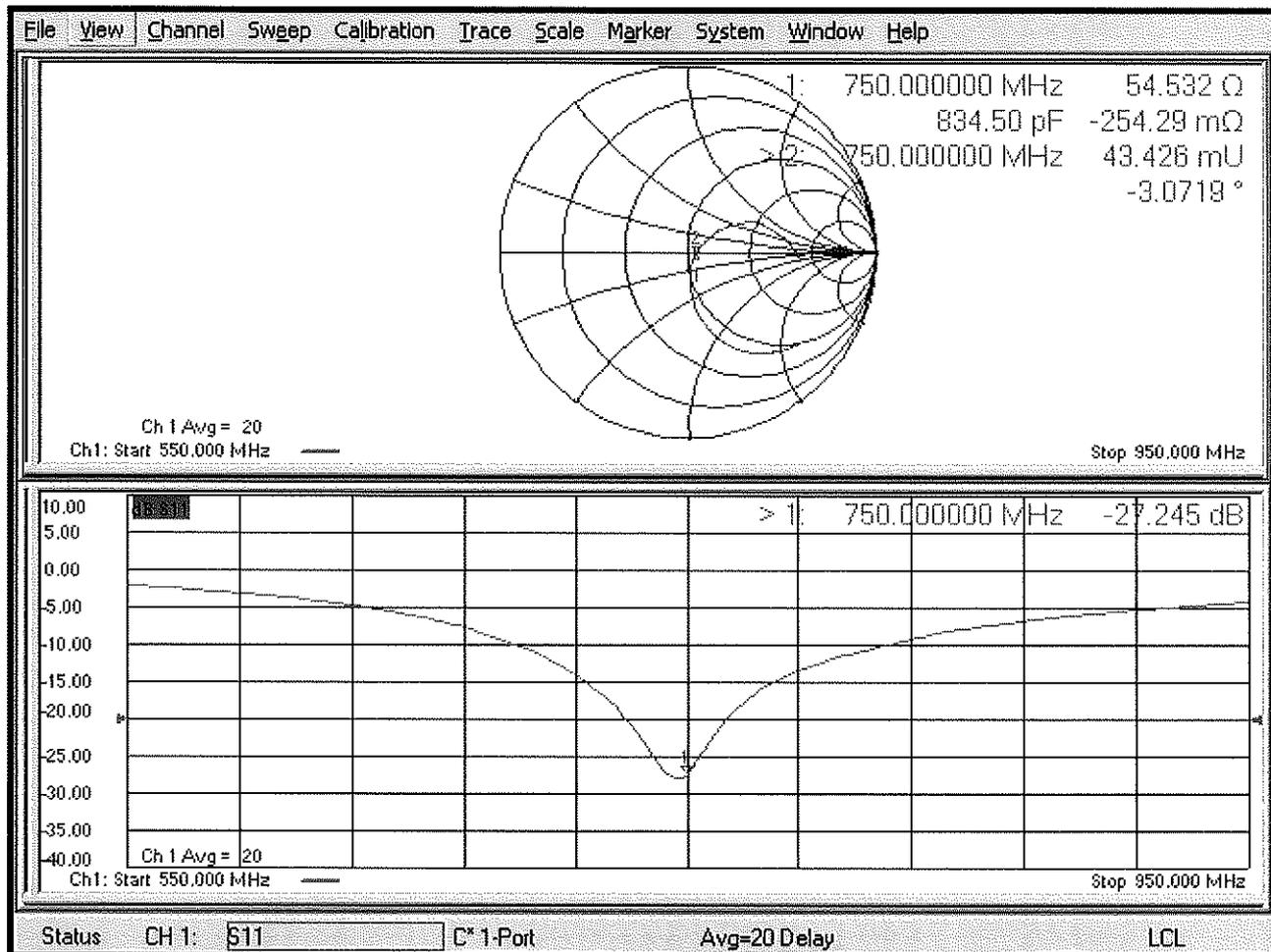
SAR(1 g) = 2.07 W/kg; SAR(10 g) = 1.37 W/kg

Maximum value of SAR (measured) = 2.73 W/kg



0 dB = 2.73 W/kg = 4.36 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 750 MHz; Type: D750V3; Serial: D750V3 - SN:1054

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750$ MHz; $\sigma = 0.98$ S/m; $\epsilon_r = 54.5$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.29, 10.29, 10.29) @ 750 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:

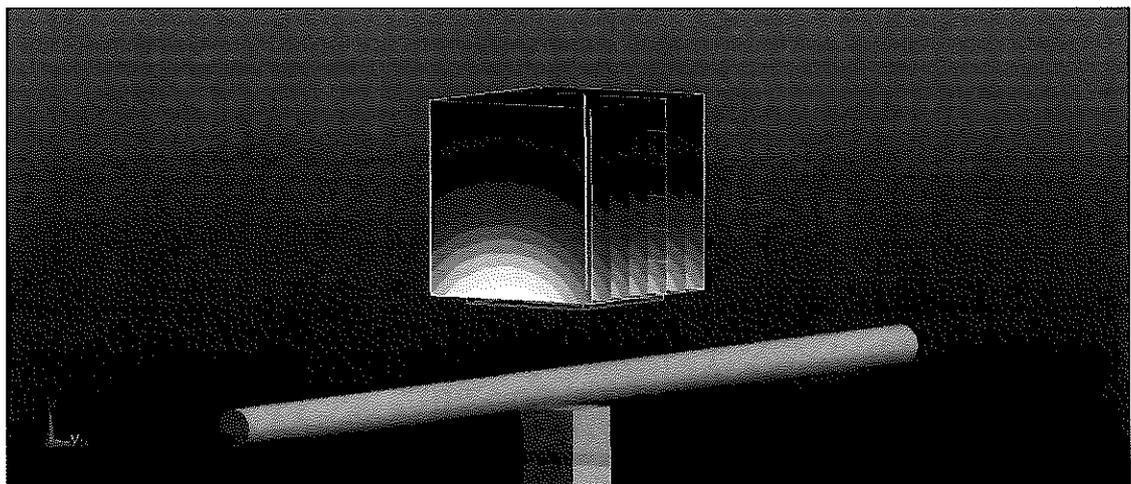
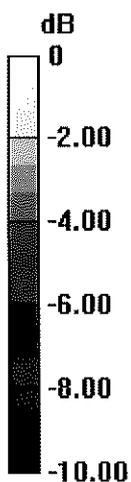
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 57.37 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 3.19 W/kg

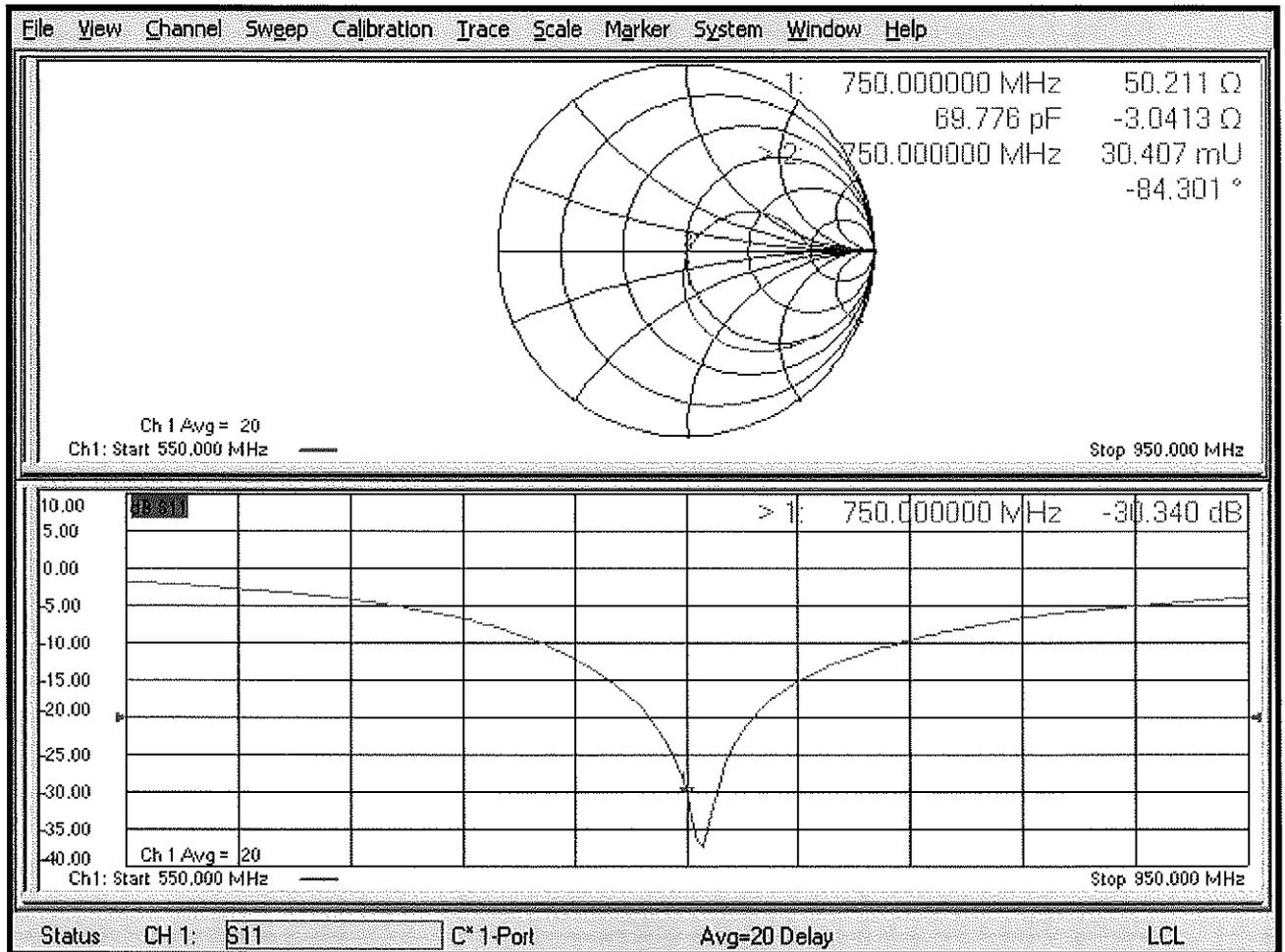
SAR(1 g) = 2.18 W/kg; SAR(10 g) = 1.44 W/kg

Maximum value of SAR (measured) = 2.87 W/kg



0 dB = 2.87 W/kg = 4.58 dBW/kg

Impedance Measurement Plot for Body TSL



DASY5 Validation Report for SAM Head

Date: 18.03.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 750 MHz

Medium parameters used: $f = 750$ MHz; $\sigma = 0.904$ S/m; $\epsilon_r = 44.22$; $\rho = 1000$ kg/m³

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.32, 10.32, 10.32) @ 750 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 Right/Head/Top/Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 55.66 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 2.80 W/kg

SAR(1 g) = 1.93 W/kg; SAR(10 g) = 1.31 W/kg

Maximum value of SAR (measured) = 2.52 W/kg

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

Reference Value = 57.68 V/m; Power Drift = 0.03 dB

Peak SAR (extrapolated) = 2.98 W/kg

SAR(1 g) = 2.05 W/kg; SAR(10 g) = 1.39 W/kg

Maximum value of SAR (measured) = 2.68 W/kg

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

Reference Value = 56.23 V/m; Power Drift = -0.04 dB

Peak SAR (extrapolated) = 2.82 W/kg

SAR(1 g) = 2 W/kg; SAR(10 g) = 1.38 W/kg

Maximum value of SAR (measured) = 2.56 W/kg

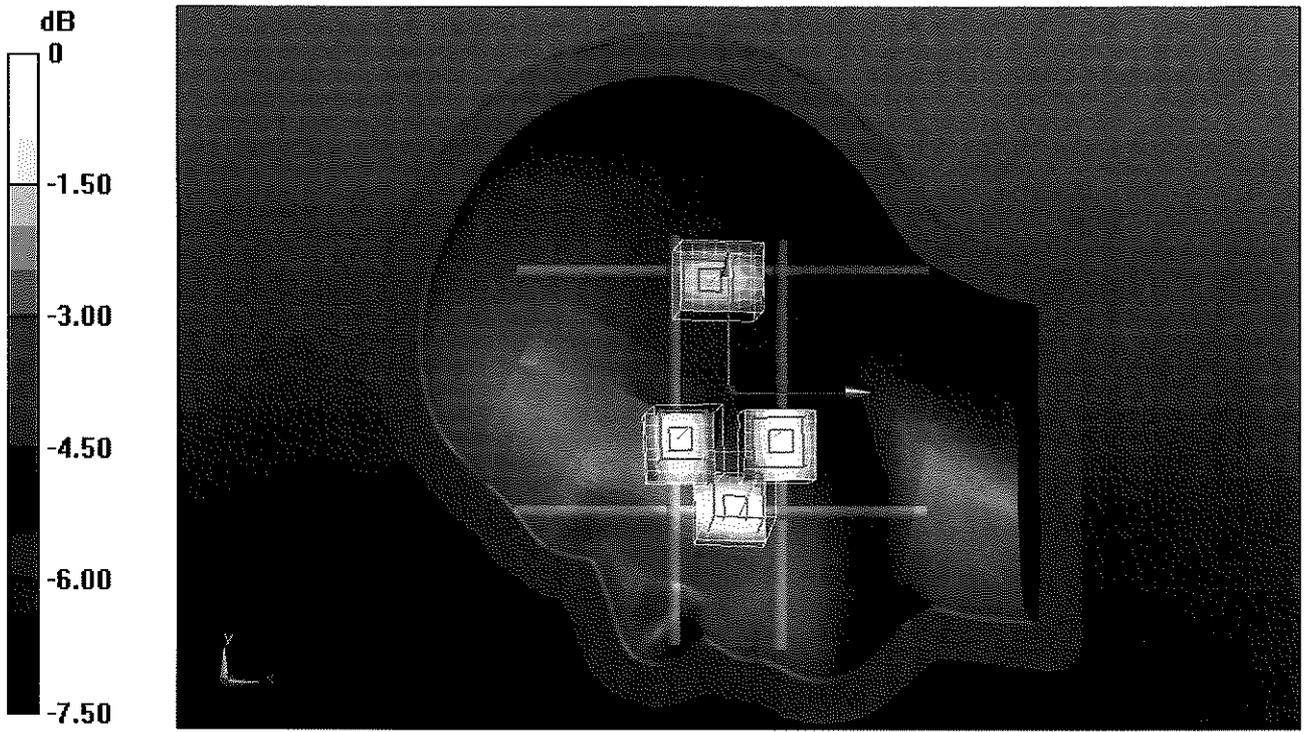
SAM Right/Head/Ear/Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 50.76 V/m; Power Drift = -0.02 dB

Peak SAR (extrapolated) = 2.32 W/kg

SAR(1 g) = 1.66 W/kg; SAR(10 g) = 1.14 W/kg

Maximum value of SAR (measured) = 2.11 W/kg



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



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

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 ± 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 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 Klynsner** Name: **Leif Klynsner** Function: **Laboratory Technician**

Signature

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager**

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 cm³ (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 cm³ (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 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.46 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	9.67 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.61 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	6.35 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: $f = 835$ MHz; $\sigma = 0.92$ S/m; $\epsilon_r = 41.3$; $\rho = 1000$ 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:

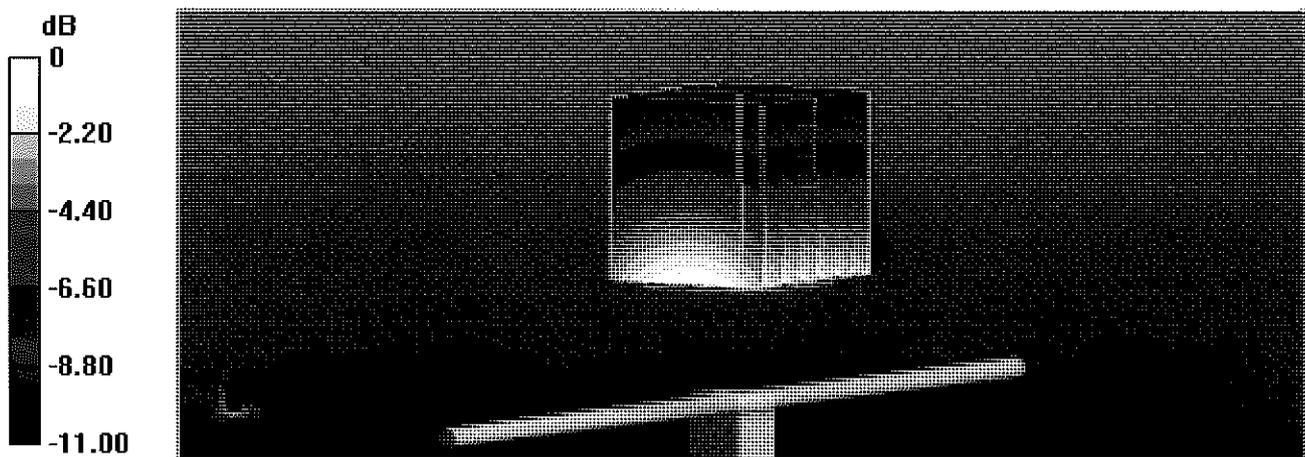
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 34.24 V/m; Power Drift = -0.00 dB

Peak SAR (extrapolated) = 3.73 W/kg

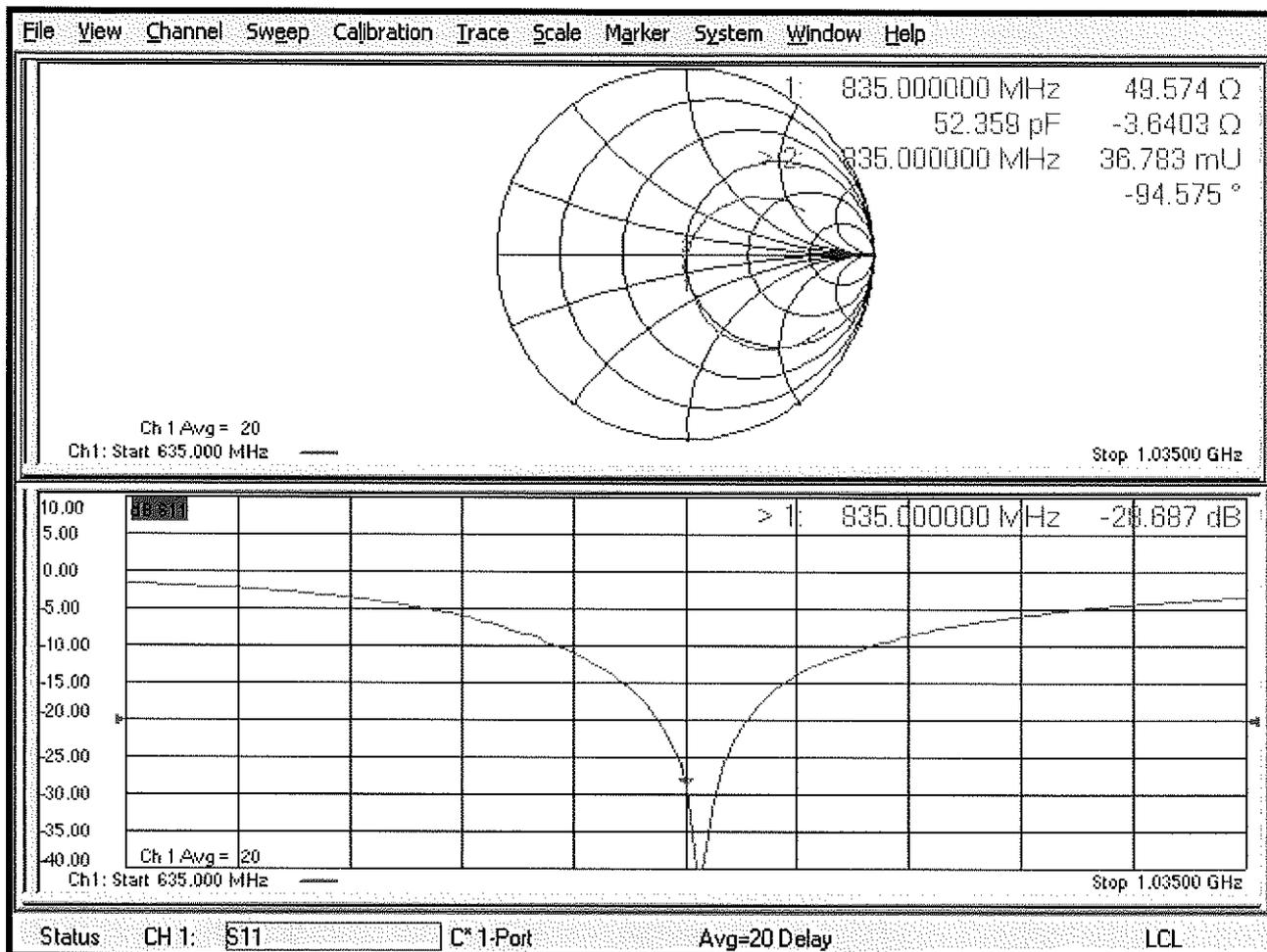
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.58 W/kg

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: $f = 835$ MHz; $\sigma = 0.99$ S/m; $\epsilon_r = 54.6$; $\rho = 1000$ kg/m³

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:

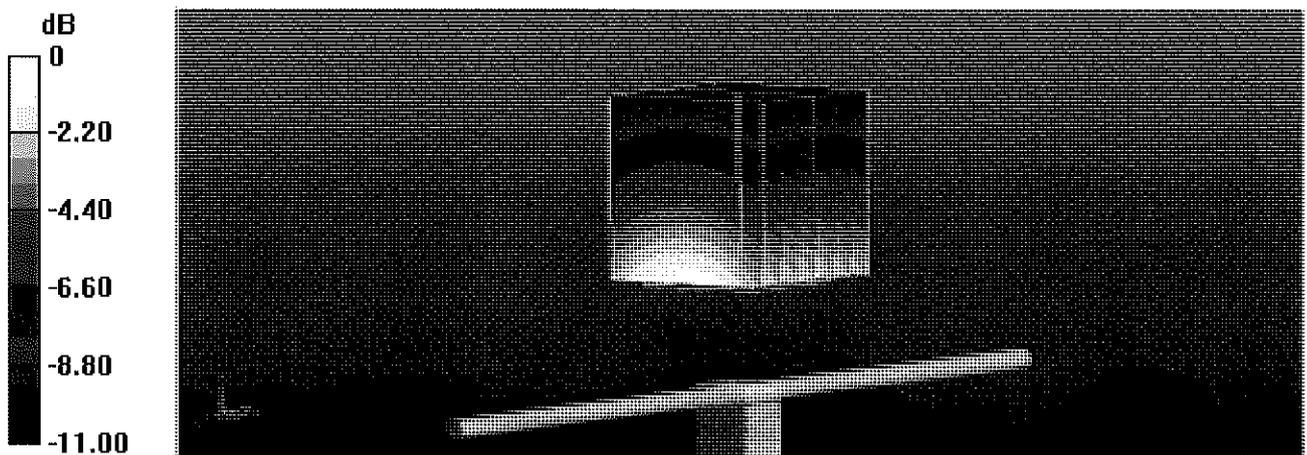
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 63.32 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 3.64 W/kg

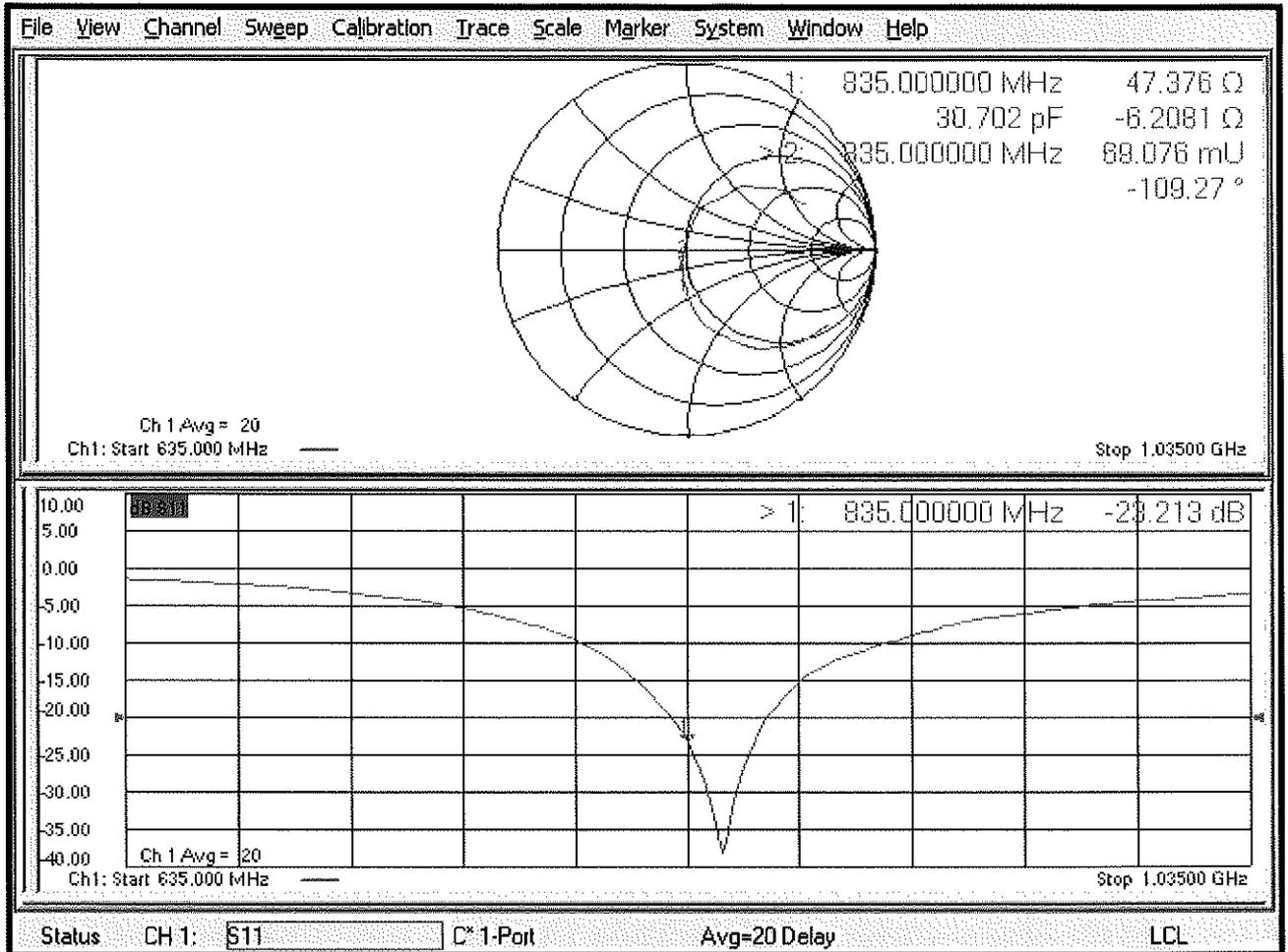
SAR(1 g) = 2.46 W/kg; SAR(10 g) = 1.61 W/kg

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: $f = 835$ MHz; $\sigma = 0.92$ S/m; $\epsilon_r = 44.4$; $\rho = 1000$ kg/m³

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=5mm, dy=5mm, dz=5mm

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=5mm, dy=5mm, dz=5mm

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=5mm, dy=5mm, dz=5mm

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

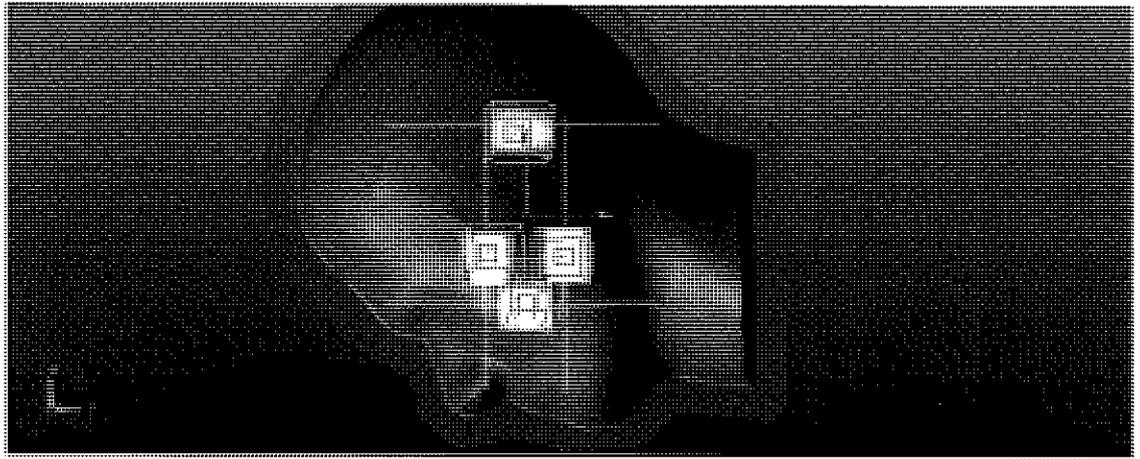
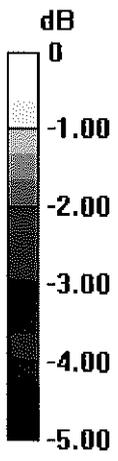
SAM/Head/Ear/Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm

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



0 dB = 2.62 W/kg = 4.18 dBW/kg



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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1750V2-1150_Oct18**

CALIBRATION CERTIFICATE

Object **D1750V2 - SN:1150**

Calibration procedure(s) **QA CAL-05.v10
Calibration procedure for dipole validation kits above 700 MHz**

Calibration date: **October 22, 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:	Name Michael Weber	Function Laboratory Technician	Signature <i>M. Weber</i>
Approved by:	Name Katja Pokovic	Function Technical Manager	Signature <i>K. Pokovic</i>

Issued: October 22, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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

Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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	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	38.8 \pm 6 %	1.33 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	9.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	36.5 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.76 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	19.2 W/kg \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 %	1.46 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	9.04 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	36.6 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.82 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	19.4 W/kg \pm 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.9 Ω - 0.4 j Ω
Return Loss	- 40.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.6 Ω - 0.1 j Ω
Return Loss	- 29.2 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.217 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	April 10, 2015

DASY5 Validation Report for Head TSL

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.33$ S/m; $\epsilon_r = 38.8$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.5, 8.5, 8.5) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

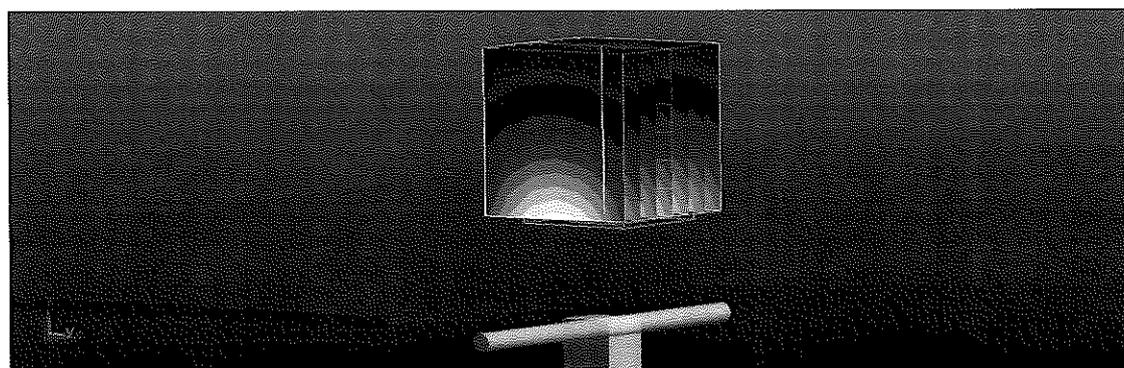
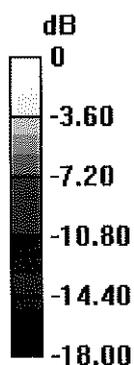
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 108.1 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 16.7 W/kg

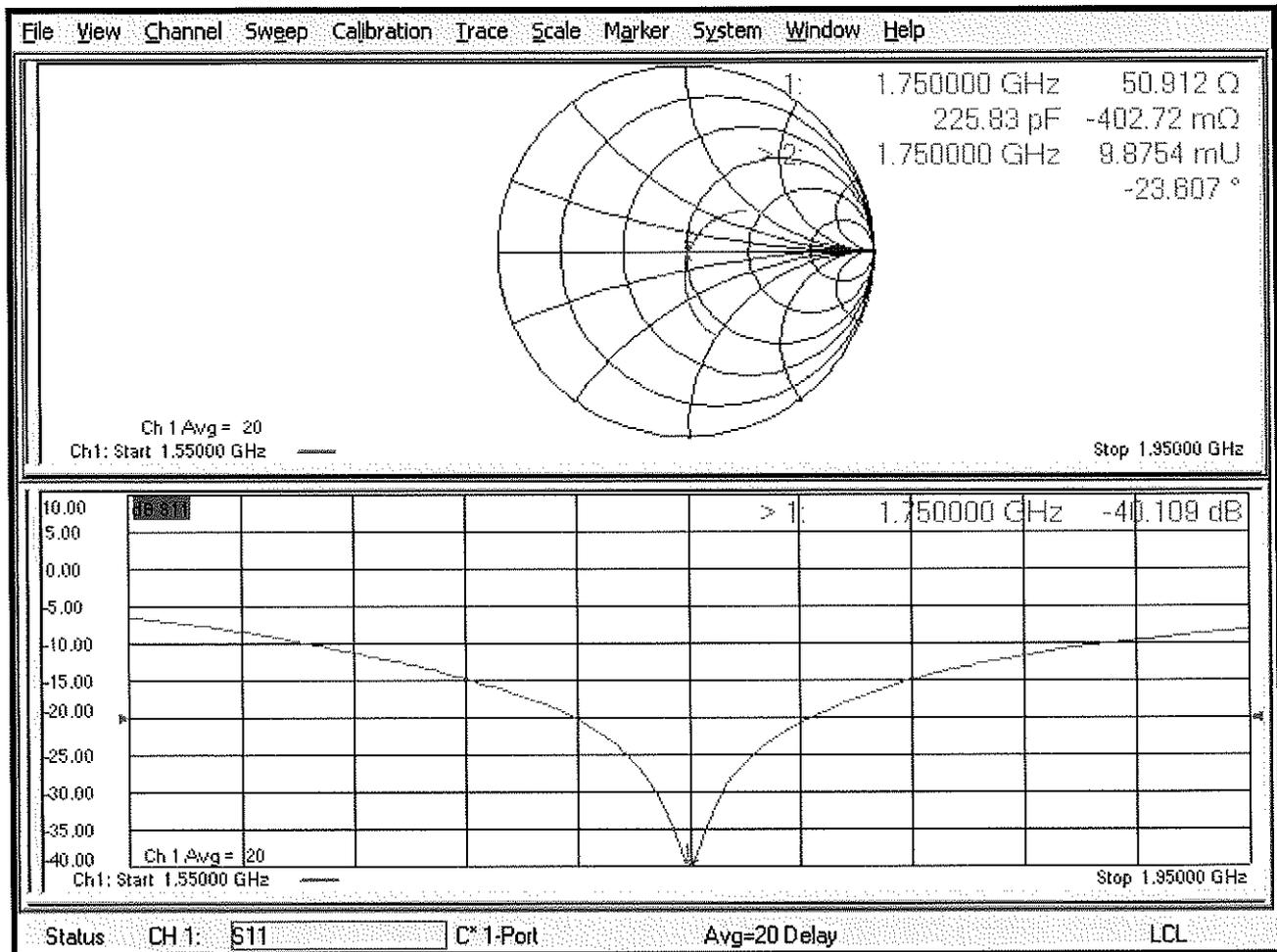
SAR(1 g) = 9.02 W/kg; SAR(10 g) = 4.76 W/kg

Maximum value of SAR (measured) = 14.0 W/kg



0 dB = 14.0 W/kg = 11.46 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 22.10.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1750 MHz

Medium parameters used: $f = 1750$ MHz; $\sigma = 1.46$ 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(8.35, 8.35, 8.35) @ 1750 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

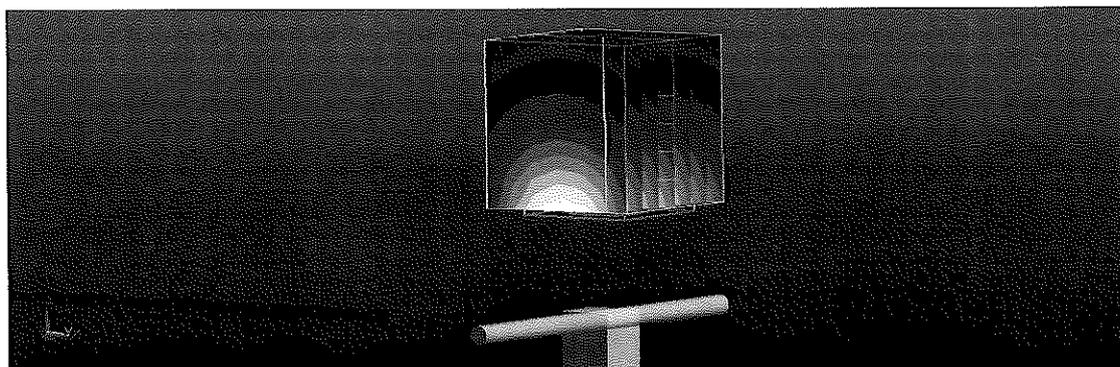
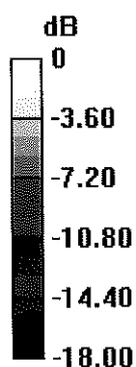
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 102.1 V/m; Power Drift = -0.09 dB

Peak SAR (extrapolated) = 16.0 W/kg

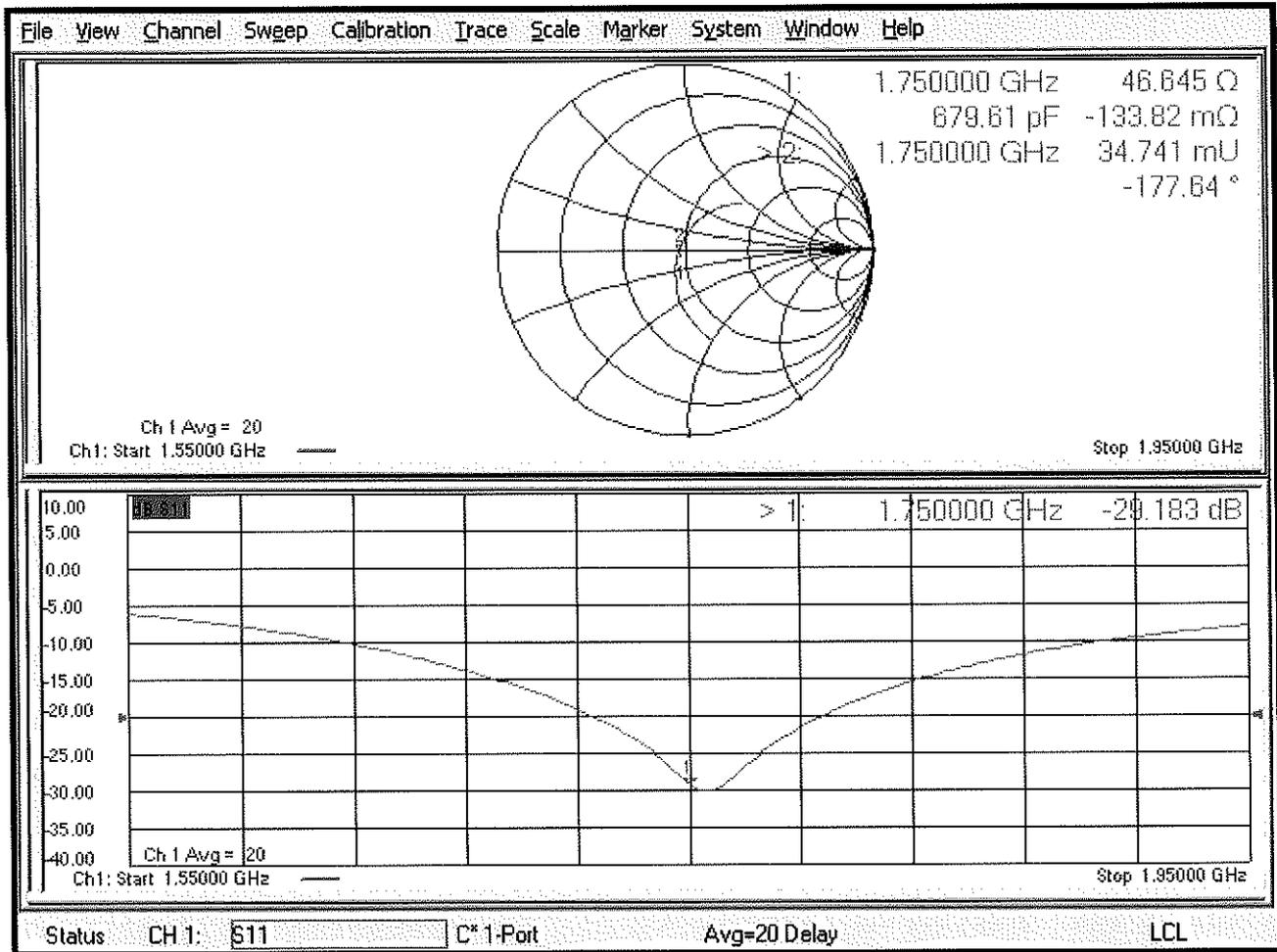
SAR(1 g) = 9.04 W/kg; SAR(10 g) = 4.82 W/kg

Maximum value of SAR (measured) = 13.6 W/kg



0 dB = 13.6 W/kg = 11.34 dBW/kg

Impedance Measurement Plot for Body TSL





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Multilateral Agreement for the recognition of calibration certificates

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D1900V2-5d148_Feb19**

CALIBRATION CERTIFICATE

Object **D1900V2 - SN:5d148**

Calibration procedure(s) **QA CAL-05.v11
Calibration Procedure for SAR Validation Sources between 0.7-3 GHz**

Calibration date: **February 21, 2019**

*BNV
05-01-19*

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: **Manu Seitz** Name: **Manu Seitz** Function: **Laboratory Technician** Signature:

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager** Signature:

Issued: February 21, 2019

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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	40.9 \pm 6 %	1.38 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	9.65 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	39.1 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	5.05 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	20.4 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	53.6 \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	9.56 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	39.1 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	5.05 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	20.5 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	51.8 Ω + 6.8 j Ω
Return Loss	- 23.2 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	48.4 Ω + 7.8 j Ω
Return Loss	- 21.9 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.170 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
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DASY5 Validation Report for Head TSL

Date: 21.02.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.38$ S/m; $\epsilon_r = 40.9$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.26, 8.26, 8.26) @ 1900 MHz; Calibrated: 31.12.2018
- 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:

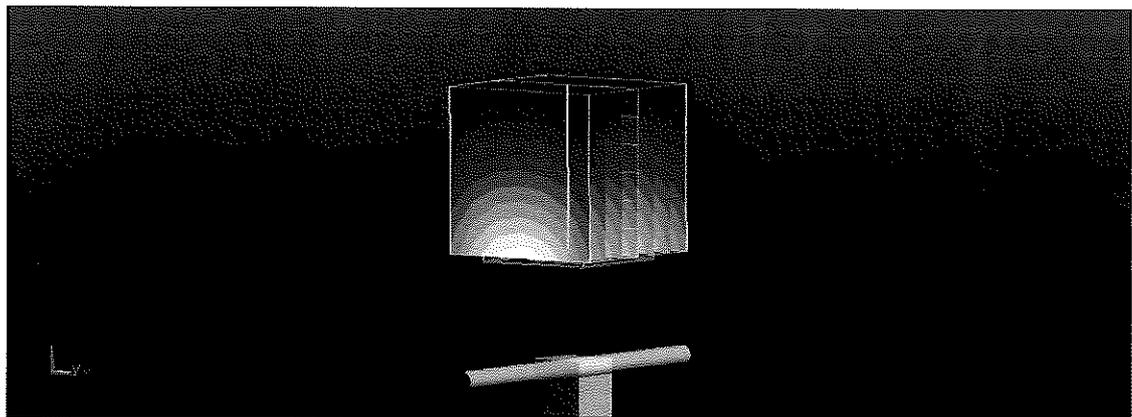
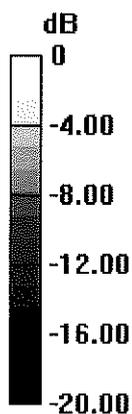
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 109.4 V/m; Power Drift = 0.01 dB

Peak SAR (extrapolated) = 17.8 W/kg

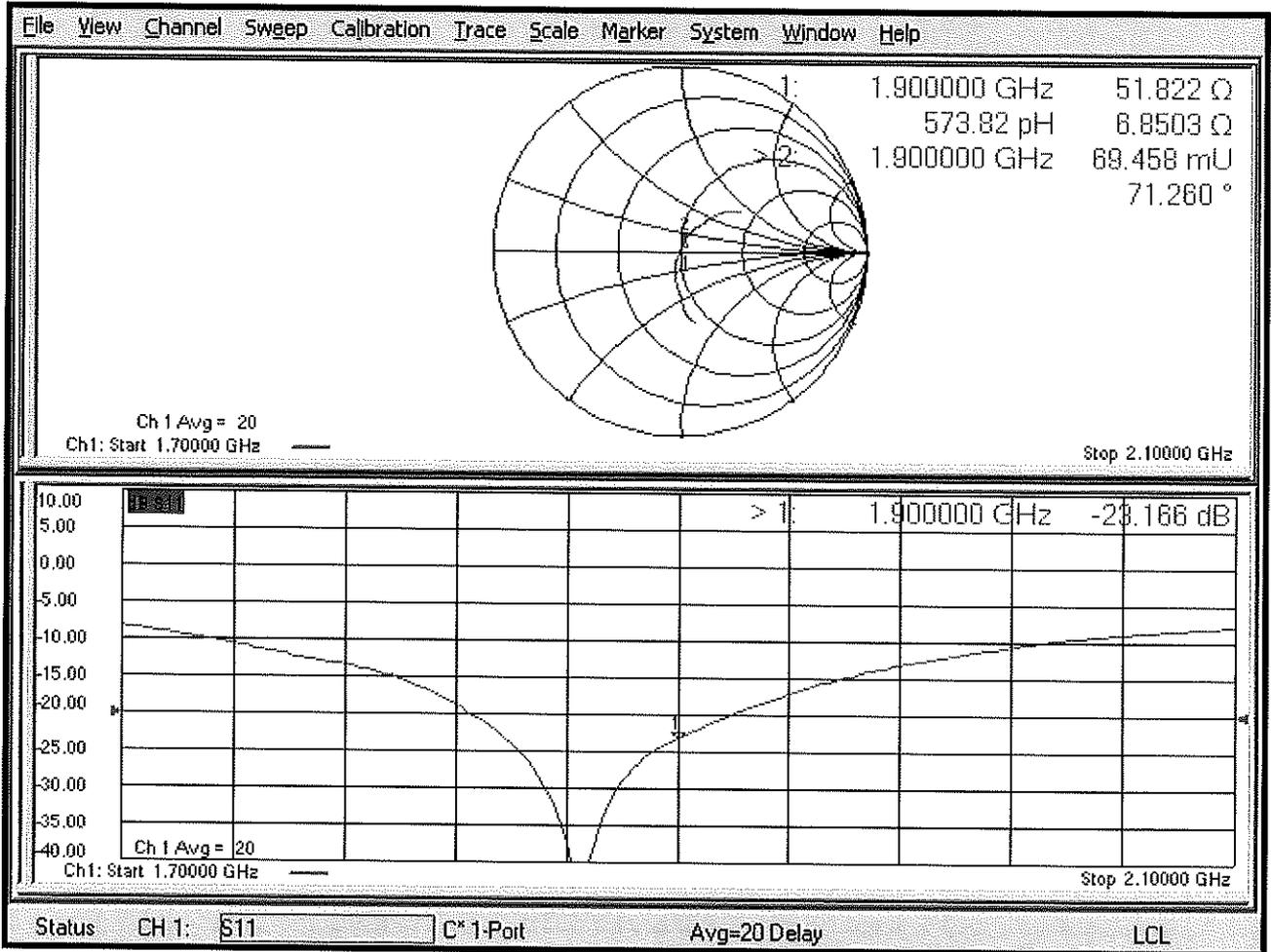
SAR(1 g) = 9.65 W/kg; SAR(10 g) = 5.05 W/kg

Maximum value of SAR (measured) = 15.0 W/kg



0 dB = 15.0 W/kg = 11.76 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 21.02.2019

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 1900 MHz

Medium parameters used: $f = 1900$ MHz; $\sigma = 1.47$ S/m; $\epsilon_r = 53.6$; $\rho = 1000$ kg/m³

Phantom section: Flat Section

Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.23, 8.23, 8.23) @ 1900 MHz; Calibrated: 31.12.2018
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 04.10.2018
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.2(1495); SEMCAD X 14.6.12(7450)

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

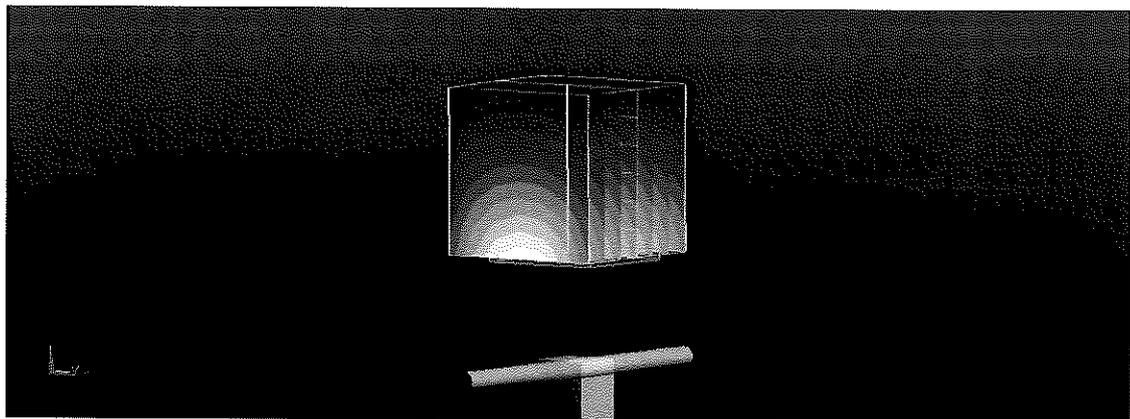
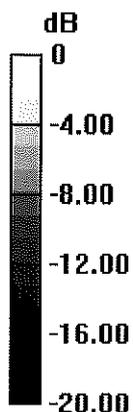
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.7 V/m; Power Drift = -0.03 dB

Peak SAR (extrapolated) = 17.0 W/kg

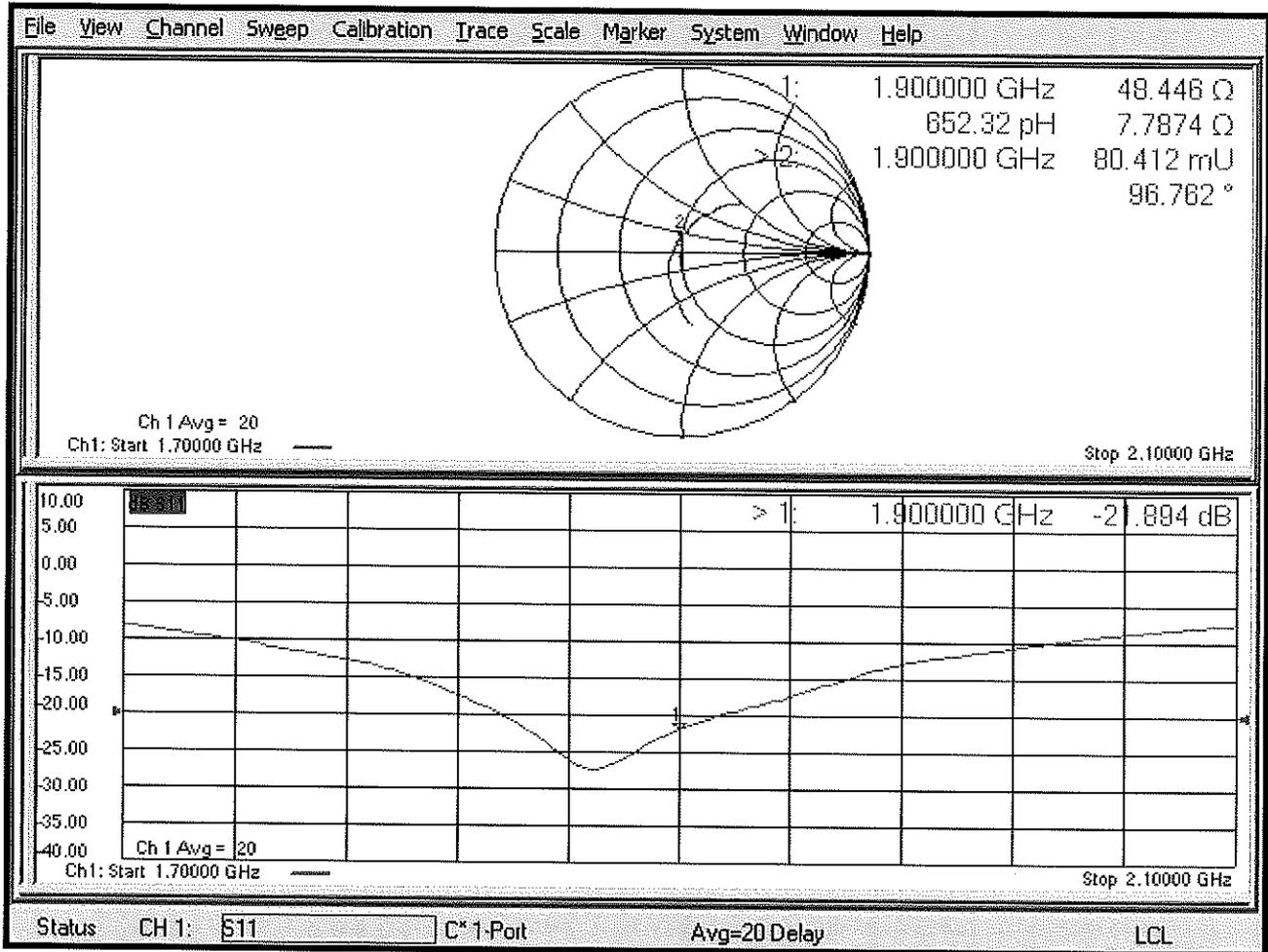
SAR(1 g) = 9.56 W/kg; SAR(10 g) = 5.05 W/kg

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



**Calibration Laboratory of
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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**

*SCS ✓
10/03/2017
Extended PM ✓
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
M. Weber
K. Pokovic

Issued: September 11, 2017

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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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 ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.8 ± 6 %	1.86 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	---	---

SAR result with Head TSL

SAR averaged over 1 cm ³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.5 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	52.7 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.8 W/kg ± 16.5 % (k=2)

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	52.7	1.95 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.9 ± 6 %	2.04 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	---	---

SAR result with Body TSL

SAR averaged over 1 cm ³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	51.1 W/kg ± 17.0 % (k=2)

SAR averaged over 10 cm ³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	24.2 W/kg ± 16.5 % (k=2)

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	$53.8 \Omega + 7.4 j\Omega$
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/ $P_{in}=250$ mW, $d=10$ mm/Zoom Scan (7x7x7)/Cube 0:

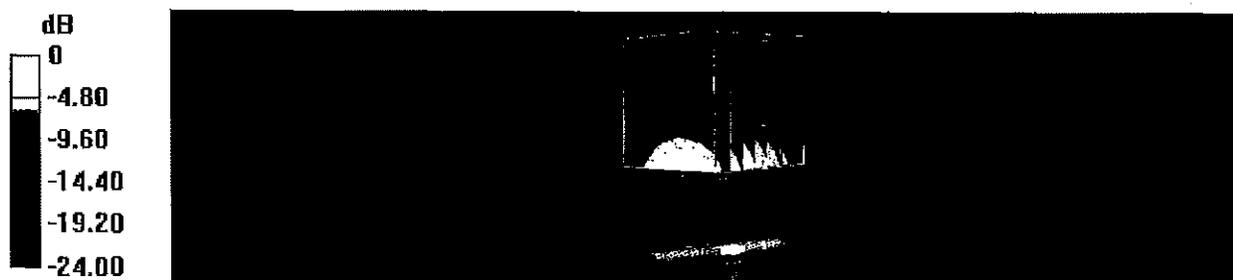
Measurement grid: $dx=5$ mm, $dy=5$ mm, $dz=5$ mm

Reference Value = 113.5 V/m; Power Drift = -0.08 dB

Peak SAR (extrapolated) = 26.9 W/kg

SAR(1 g) = 13.5 W/kg; SAR(10 g) = 6.28 W/kg

Maximum value of SAR (measured) = 21.6 W/kg



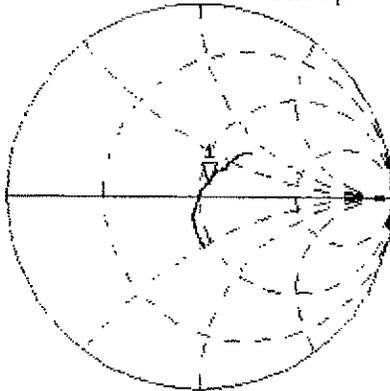
0 dB = 21.6 W/kg = 13.34 dBW/kg

Impedance Measurement Plot for Head TSL

11 Sep 2017 11:52:57

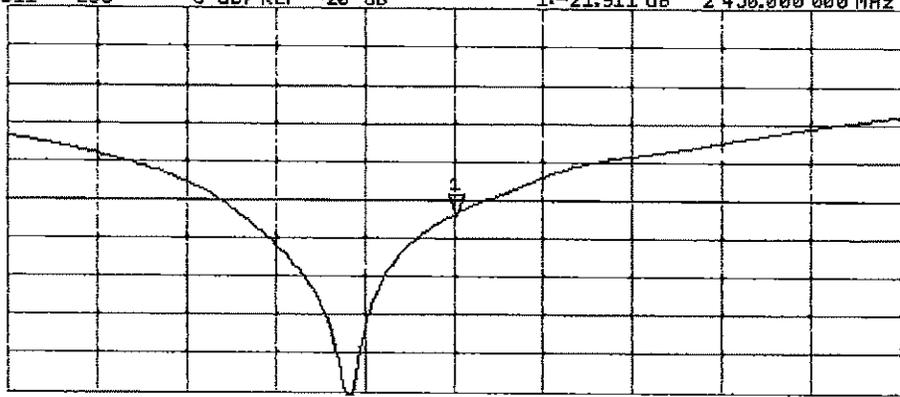
CH1 S11 1 U FS 1: 53.777 Ω 7.4395 Ω 483.28 μ H 2 450.000 000 MHz

*
DeI
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:

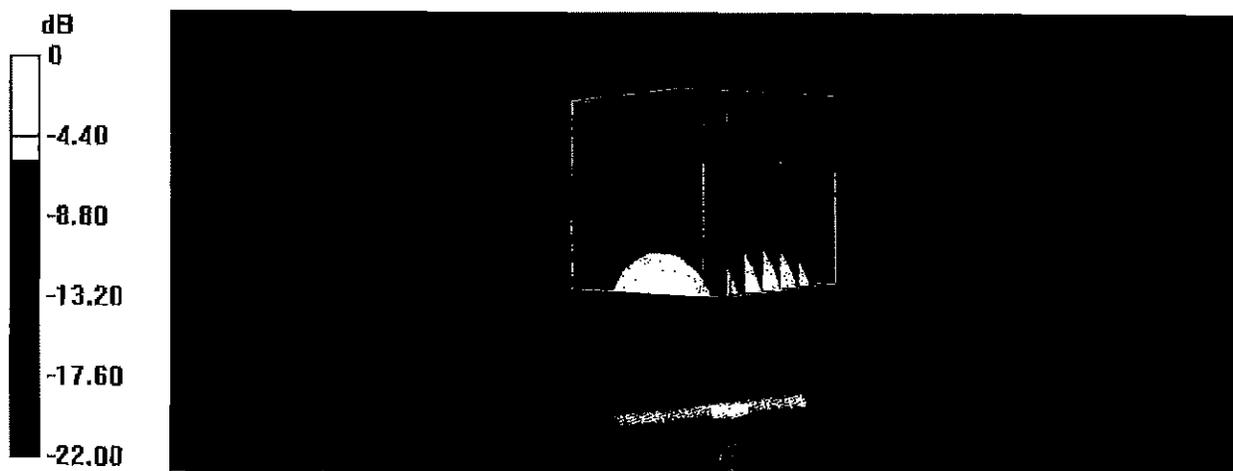
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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



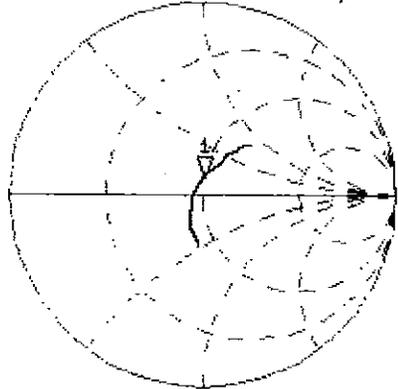
0 dB = 20.3 W/kg = 13.07 dBW/kg

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 pF 2 450.000 000 MHz

De1
CA



Avg
16

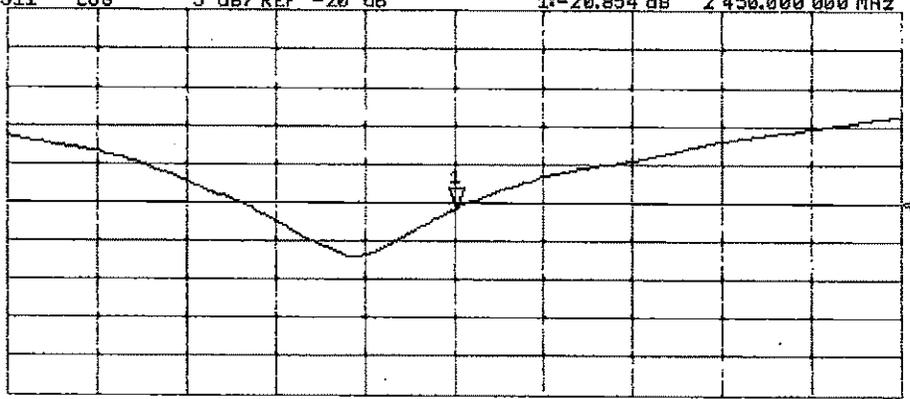
H1d

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:

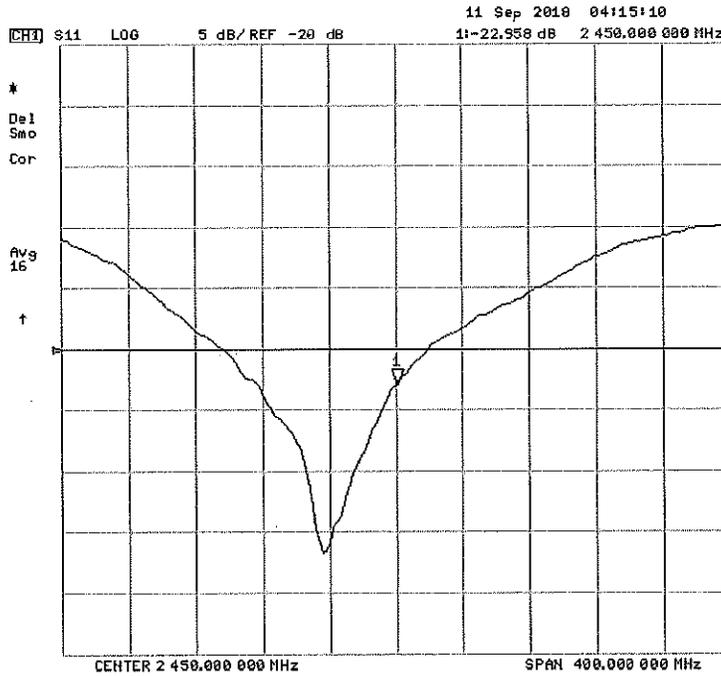
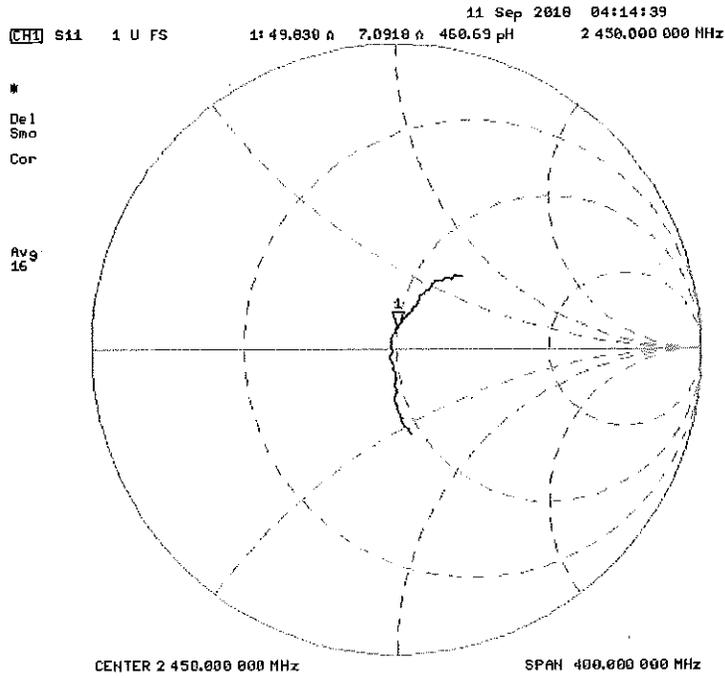
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does 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:

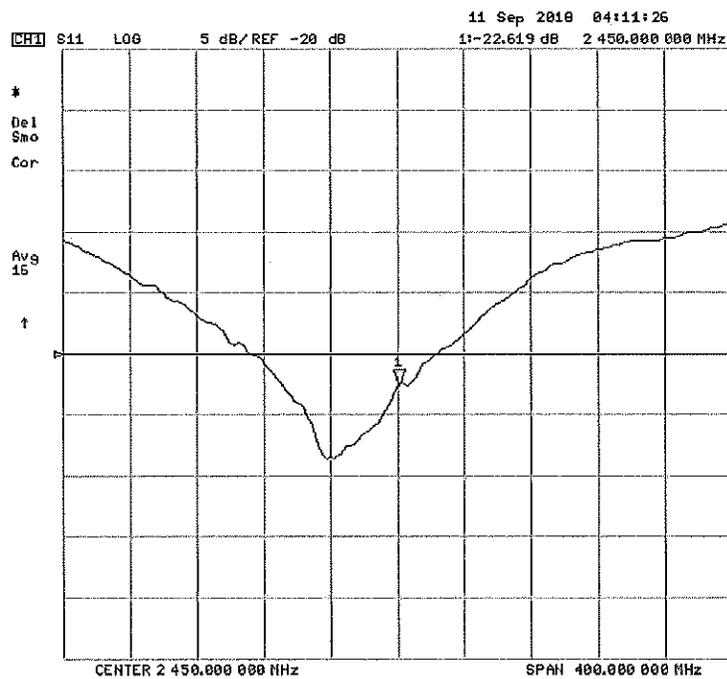
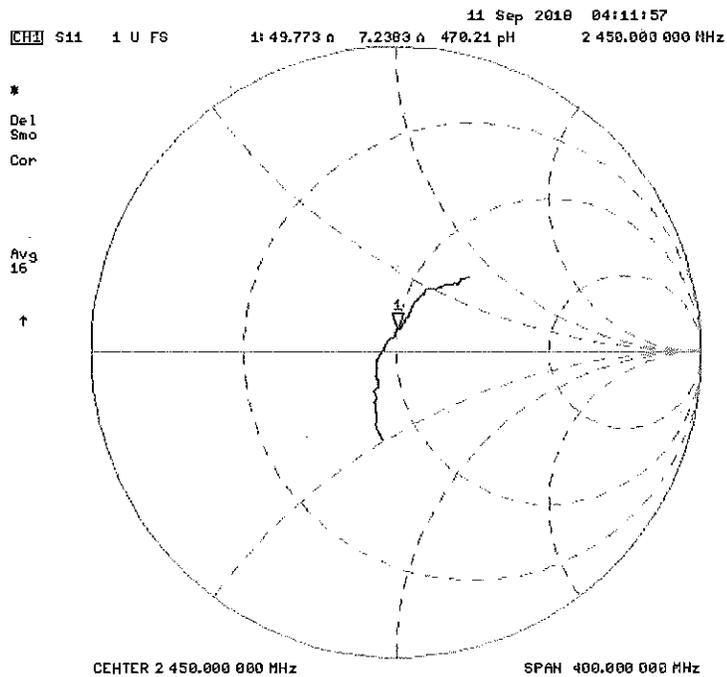
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Head (1g) W/kg @ 20.0 dBm	Measured Head SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Head (10g) W/kg @ 20.0 dBm	Measured Head SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance 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



Impedance & Return-Loss Measurement Plot for Body TSL



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



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

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

Accreditation No.: **SCS 0108**

Client **PC Test**

Certificate No: **D2450V2-719_Aug17**

CALIBRATION CERTIFICATE

Object **D2450V2 - SN:719**

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

Calibration date: **August 17, 2017**

PMV
8/27/17
Extended
BN
8/19/2018

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

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

Calibration Equipment used (M&TE critical for calibration)

Primary Standards	ID #	Cal Date (Certificate No.)	Scheduled Calibration
Power meter NRP	SN: 104778	04-Apr-17 (No. 217-02521/02522)	Apr-18
Power sensor NRP-Z91	SN: 103244	04-Apr-17 (No. 217-02521)	Apr-18
Power sensor NRP-Z91	SN: 103245	04-Apr-17 (No. 217-02522)	Apr-18
Reference 20 dB Attenuator	SN: 5058 (20k)	07-Apr-17 (No. 217-02528)	Apr-18
Type-N mismatch combination	SN: 5047.2 / 06327	07-Apr-17 (No. 217-02529)	Apr-18
Reference Probe EX3DV4	SN: 7349	31-May-17 (No. EX3-7349_May17)	May-18
DAE4	SN: 601	28-Mar-17 (No. DAE4-601_Mar17)	Mar-18
Secondary Standards	ID #	Check Date (in house)	Scheduled Check
Power meter EPM-442A	SN: GB37480704	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: US37292783	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
Power sensor HP 8481A	SN: MY41092317	07-Oct-15 (in house check Oct-16)	In house check: Oct-18
RF generator R&S SMT-06	SN: 100972	15-Jun-15 (in house check Oct-16)	In house check: Oct-18
Network Analyzer HP 8753E	SN: US37390585	18-Oct-01 (in house check Oct-16)	In house check: Oct-17

Calibrated by: **Michael Weber** Name **Laboratory Technician** Function

Approved by: **Katja Pokovic** Name **Technical Manager** Function

Signature

M. Weber

Katja Pokovic

Issued: August 17, 2017

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:

- 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	13.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	51.9 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	24.3 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 %	2.03 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	12.8 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	50.1 W/kg \pm 17.0 % (k=2)

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.00 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	23.7 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	55.7 Ω + 7.0 j Ω
Return Loss	- 21.4 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.4 Ω + 8.1 j Ω
Return Loss	- 21.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.150 ns
----------------------------------	----------

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

The dipole is made of standard semirigid coaxial cable. The center conductor of the feeding line is directly connected to the second arm of the dipole. The antenna is therefore short-circuited for DC-signals. On some of the dipoles, small end caps are added to the dipole arms in order to improve matching when loaded according to the position as explained in the "Measurement Conditions" paragraph. The SAR data are not affected by this change. The overall dipole length is still according to the Standard.

No excessive force must be applied to the dipole arms, because they might bend or the soldered connections near the feedpoint may be damaged.

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 10, 2002

DASY5 Validation Report for Head TSL

Date: 17.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 1.86$ 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:

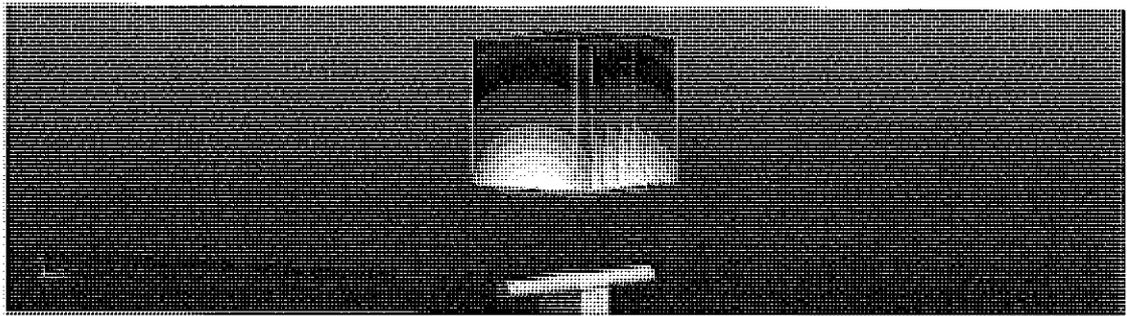
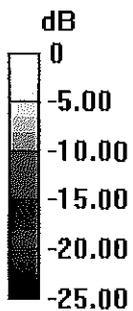
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 112.8 V/m; Power Drift = -0.01 dB

Peak SAR (extrapolated) = 26.9 W/kg

SAR(1 g) = 13.3 W/kg; SAR(10 g) = 6.15 W/kg

Maximum value of SAR (measured) = 21.6 W/kg

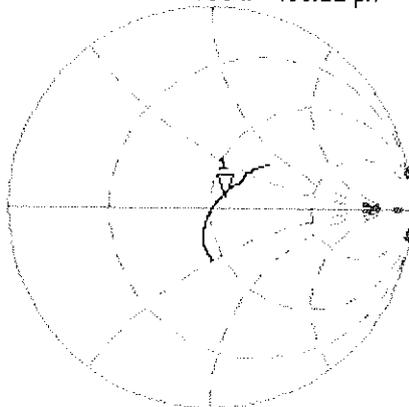


0 dB = 21.6 W/kg = 13.34 dBW/kg

Impedance Measurement Plot for Head TSL

17 Aug 2017 12:38:03
CH1 S11 1 U FS 1: 55.682 Ω 6.9766 Ω 453.21 μ H 2 450.000 000 MHz

*
Oe1
CA



Avg
16

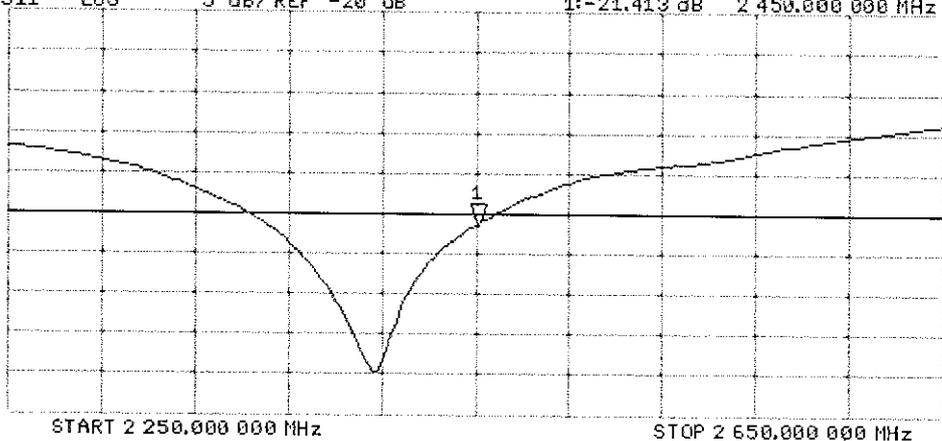
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.413 dB 2 450.000 000 MHz

CA

Avg
16

H1d



DASY5 Validation Report for Body TSL

Date: 17.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

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

Communication System: UID 0 - CW; Frequency: 2450 MHz

Medium parameters used: $f = 2450$ MHz; $\sigma = 2.03$ 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: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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

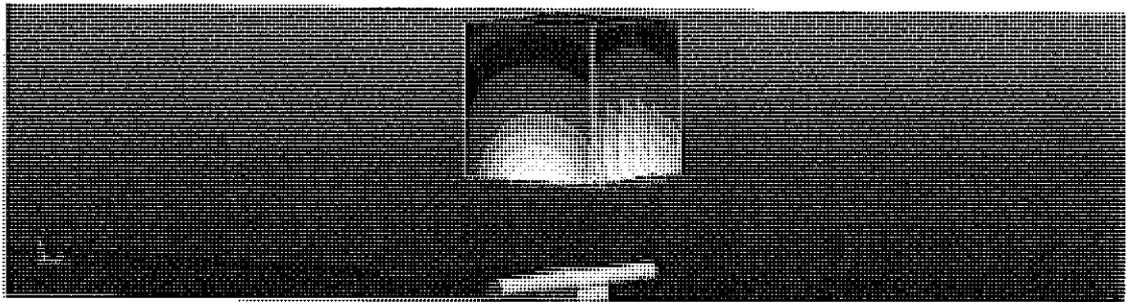
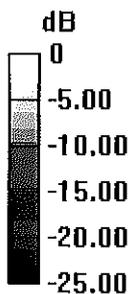
Measurement grid: dx=5mm, dy=5mm, dz=5mm

Reference Value = 103.0 V/m; Power Drift = -0.07 dB

Peak SAR (extrapolated) = 25.2 W/kg

SAR(1 g) = 12.8 W/kg; SAR(10 g) = 6 W/kg

Maximum value of SAR (measured) = 19.8 W/kg

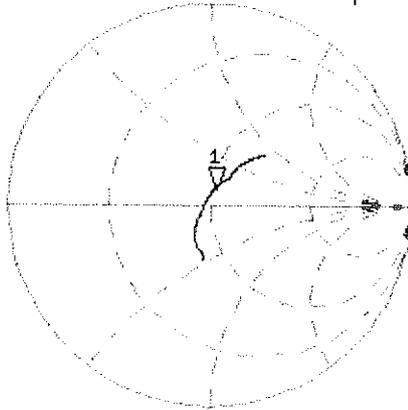


0 dB = 19.8 W/kg = 12.97 dBW/kg

Impedance Measurement Plot for Body TSL

17 Aug 2017 12:37:27
[CH1] S11 1 U FS 1: 51.379 Ω 8.1367 Ω 528.57 μ H 2 450.000 000 MHz

*
De1
C4



Avg
16

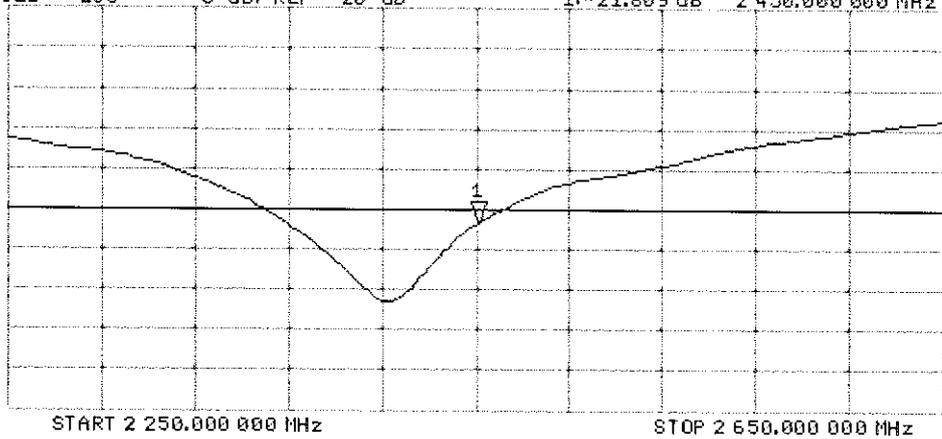
H1d

CH2 S11 LOG 5 dB/REF -20 dB 1: -21.809 dB 2 450.000 000 MHz

C4

Avg
16

H1d



START 2 250.000 000 MHz

STOP 2 650.000 000 MHz

Certification of Calibration

Object: D2450V2 – SN: 719

Calibration procedure(s): Procedure for Calibration Extension for SAR Dipoles.

Extended Calibration date: 08/09/2018

Description: SAR Validation Dipole at 2450 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	E4438C	ESG Vector Signal Generator	3/24/2017	Biennial	3/24/2019	MY42082385
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	433971
Anritsu	ML2495A	Power Meter	11/28/2017	Annual	11/28/2018	1039008
Anritsu	MA2411B	Pulse Power Sensor	3/2/2018	Annual	3/2/2019	1207364
Anritsu	MA2411B	Pulse Power Sensor	11/15/2017	Annual	11/15/2018	1339007
Control Company	4040	Therm./Clock/Humidity Monitor	3/31/2017	Biennial	3/31/2019	170232394
Control Company	4352	Ultra Long Stem Thermometer	5/2/2017	Biennial	5/2/2019	170330156
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/4/2018	Annual	6/4/2019	MY53401181
Mini-Circuits	BW-N20W5+	DC to 18 GHz Precision Fixed 20 dB Attenuator	CBT	N/A	CBT	N/A
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2209-10	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/7/2018	Annual	3/7/2019	1368
SPEAG	DAE4	Dasy Data Acquisition Electronics	8/9/2017	Annual	8/9/2018	1323
SPEAG	DAK-3.5	Dielectric Assessment Kit	9/12/2017	Annual	9/12/2018	1091
SPEAG	ES3DV3	SAR Probe	3/13/2018	Annual	3/13/2019	3319
SPEAG	ES3DV3	SAR Probe	8/14/2017	Annual	8/14/2018	3332

Measurement Uncertainty = $\pm 23\%$ (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

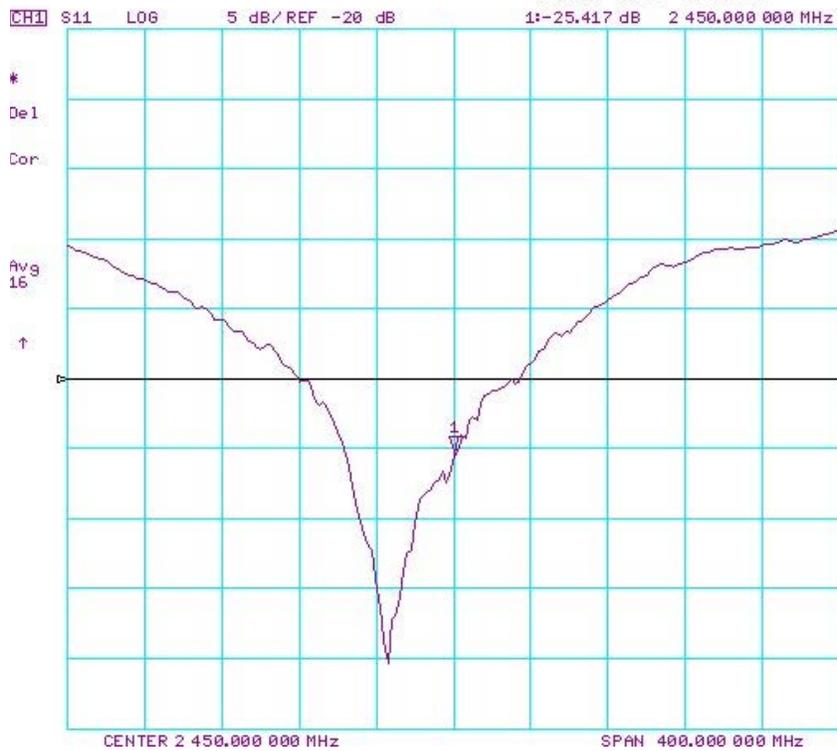
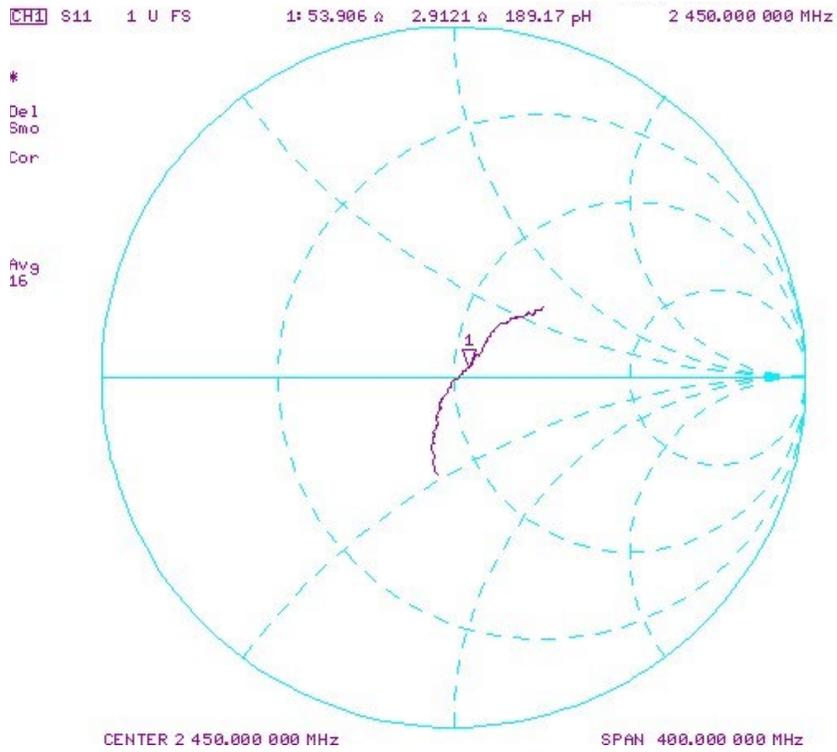
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

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.

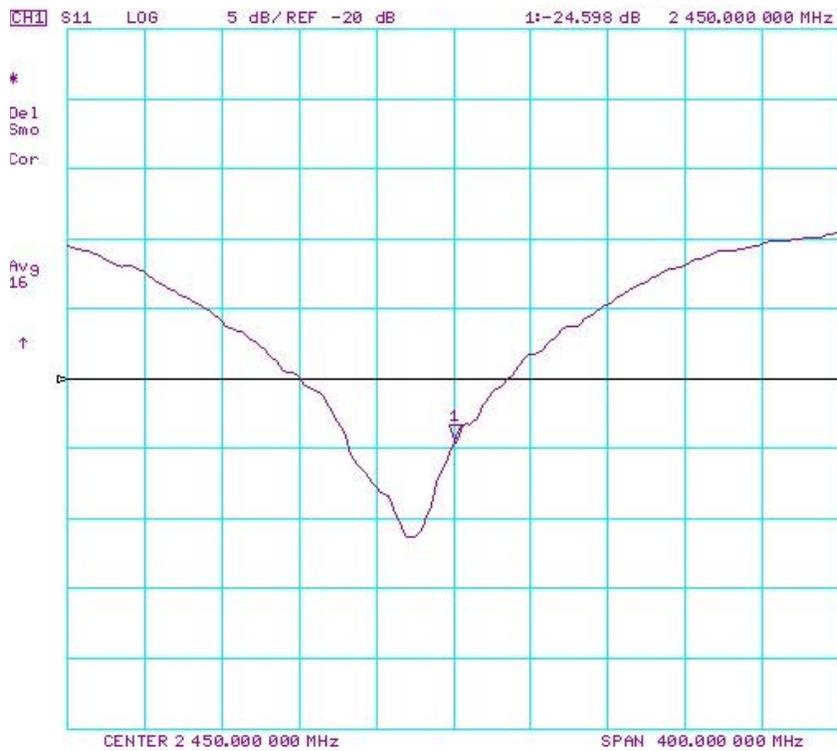
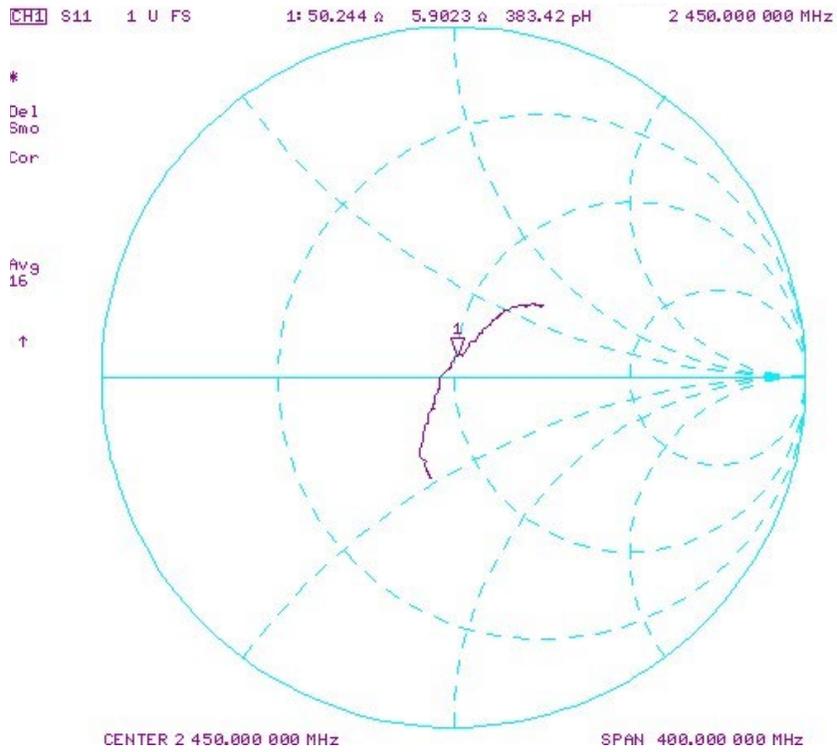
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

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 Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Head (Ohm) Real	Measured Impedance Head (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Head (Ohm) Imaginary	Measured Impedance Head (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Head (dB)	Measured Return Loss Head (dB)	Deviation (%)	PASS/FAIL
8/17/2017	8/9/2018	1.150	5.19	5.46	5.20%	2.43	2.51	3.29%	55.7	53.9	1.8	7.0	2.9	4.1	-21.4	-25.4	-18.70%	PASS
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance Body (Ohm) Real	Measured Impedance Body (Ohm) Real	Difference (Ohm) Real	Certificate Impedance Body (Ohm) Imaginary	Measured Impedance Body (Ohm) Imaginary	Difference (Ohm) Imaginary	Certificate Return Loss Body (dB)	Measured Return Loss Body (dB)	Deviation (%)	PASS/FAIL
8/17/2017	8/9/2018	1.150	5.01	5.19	3.59%	2.37	2.38	0.42%	51.4	50.2	1.2	8.1	5.9	2.2	-21.8	-24.6	-12.80%	PASS

Impedance & Return-Loss Measurement Plot for Head TSL



Impedance & Return-Loss Measurement Plot for Body TSL





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Multilateral Agreement for the recognition of calibration certificates

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 power evaluation with power 100 MHz**

Calibration date: **April 11, 2018**

*BN ✓
04-20-2018
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: **Michael Weber** (Name), **Laboratory Technician** (Function), *[Signature]* (Signature)

Approved by: **Katja Pokovic** (Name), **Technical Manager** (Function), *[Signature]* (Signature)

Issued: April 12, 2018

This calibration certificate shall not be reproduced except in full without written approval of the laboratory.



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Accreditation No.: **SCS 0108**

Glossary:

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

Calibration is Performed According to the Following Standards:

- 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:

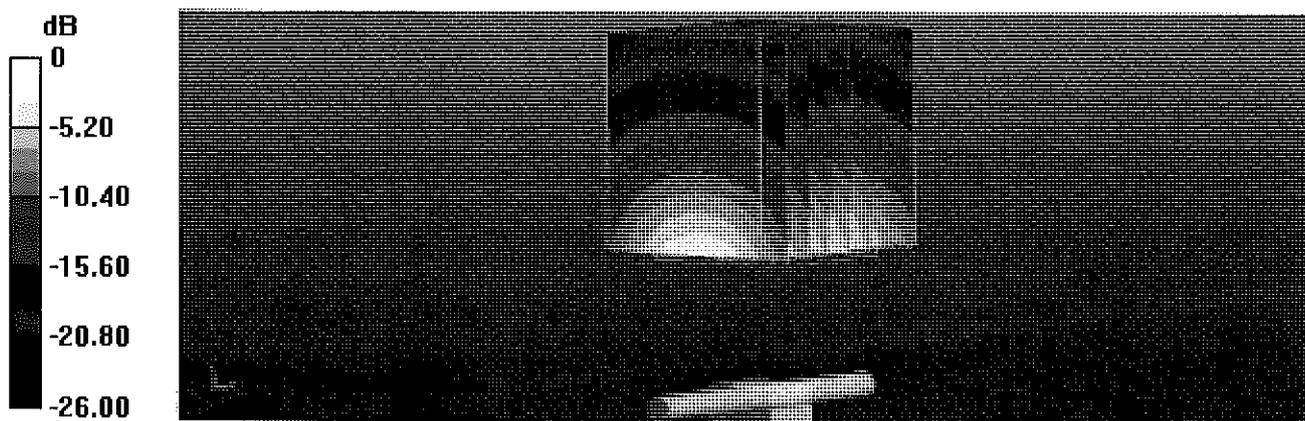
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

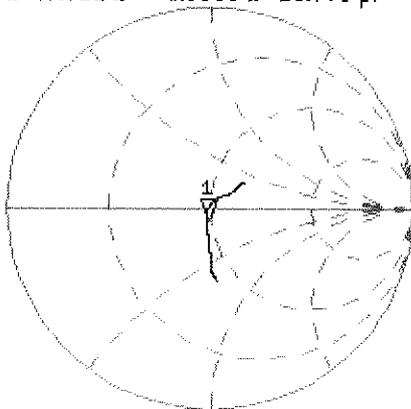
[CH1] S11 1 U FS 1: 47.721 Ω -5.6836 Ω 10.770 pF 2 500.000 000 MHz

*
De1

CA

Avg
16

H1 d

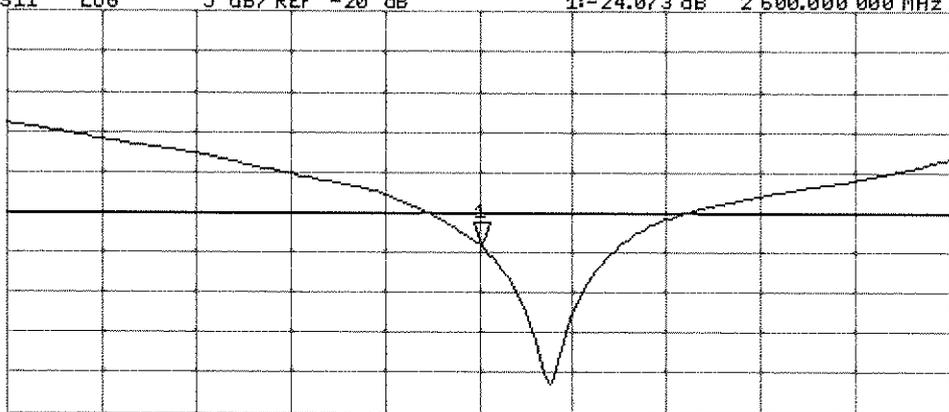


CH2 S11 LOG 5 dB/REF -20 dB 1:-24.073 dB 2 500.000 000 MHz

CA

Avg
16

H1 d



START 2 400.000 000 MHz

STOP 2 800.000 000 MHz

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:

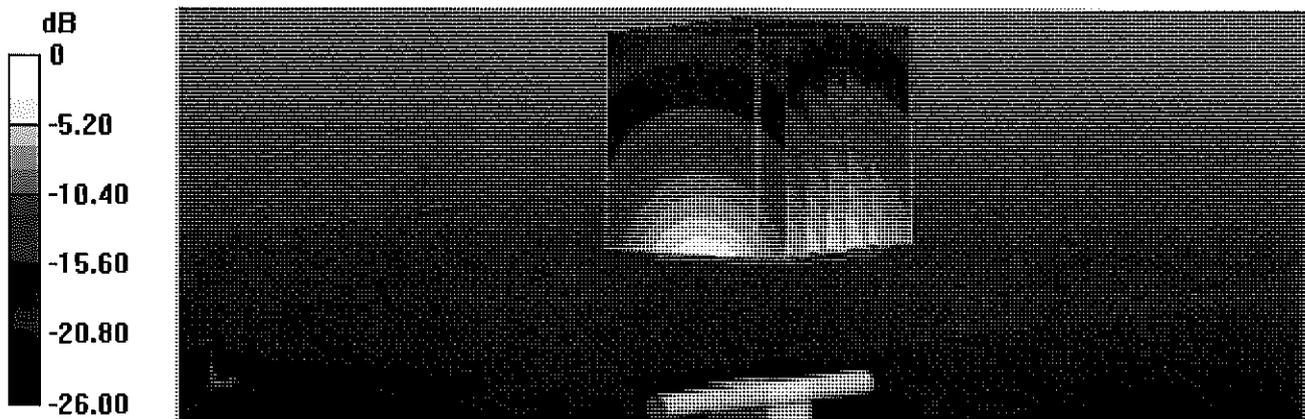
Measurement grid: dx=5mm, dy=5mm, dz=5mm

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

11 Apr 2018 11:24:36

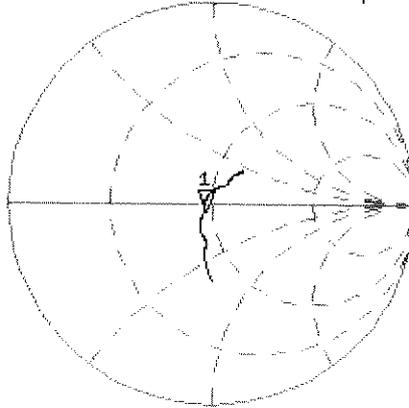
CH1 S11 1 U FS 1: 46.039 Ω -3.7520 Ω 16.315 pF 2 600.000 000 MHz

*
De1

CA

Avg
16

H1 d

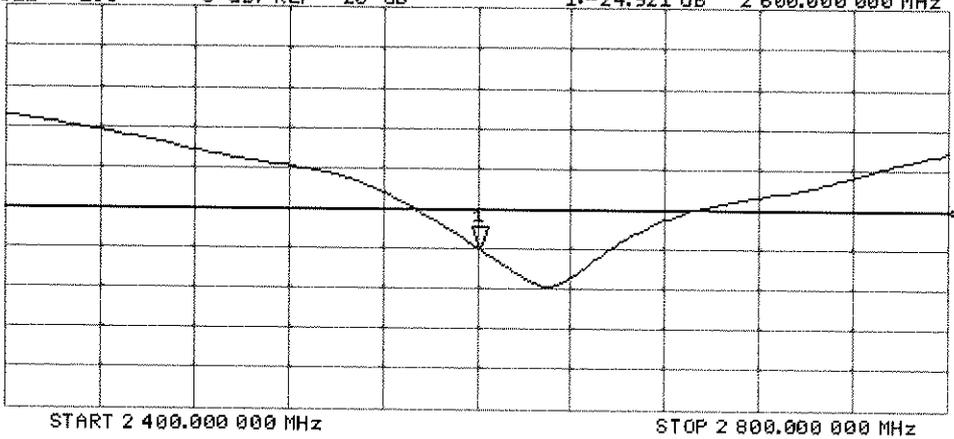


CH2 S11 LOG 5 dB/REF -20 dB 1:-24.921 dB 2 600.000 000 MHz

CA

Avg
16

H1 d



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

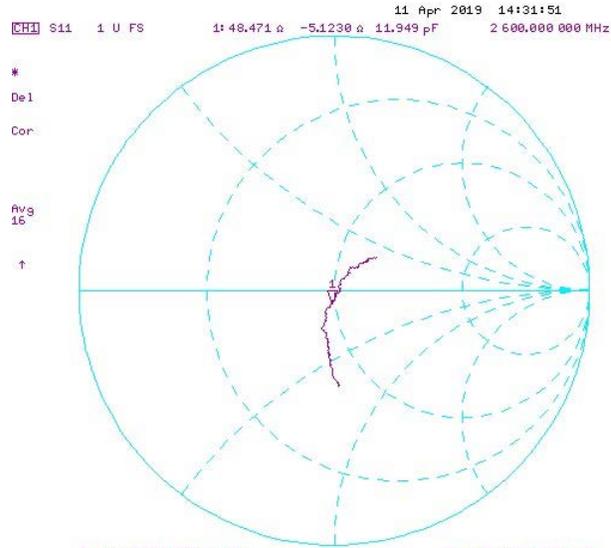
Per KDB 865664 D01, calibration intervals of up to three years may be considered for reference dipoles when it is demonstrated that the SAR target, impedance and return loss of a dipole have remained stable according to the following requirements:

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.

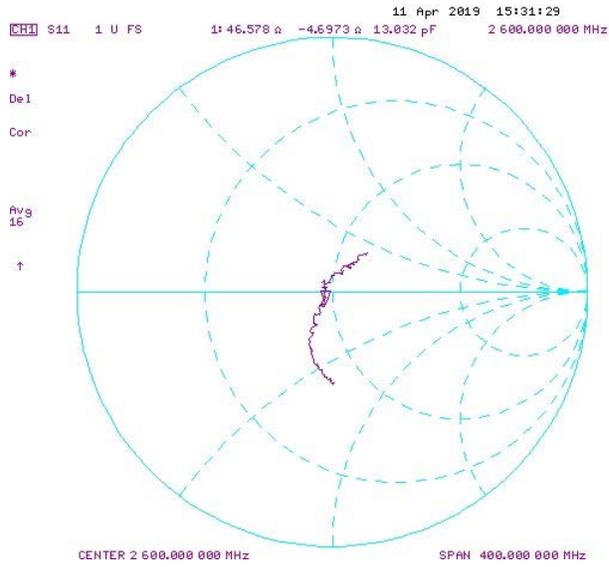
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

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	1.80%	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: **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**

*BN ✓
01-25-2018*

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

*BN ✓
02/06/2019*

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: 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: 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: **Leif Klysner** Name: **Leif Klysner** Function: **Laboratory Technician**

Signature
[Handwritten Signature]

Approved by: **Katja Pokovic** Name: **Katja Pokovic** Function: **Technical Manager**

[Handwritten Signature]

Issued: January 18, 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 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 ± 1 MHz 5250 MHz ± 1 MHz 5600 MHz ± 1 MHz 5750 MHz ± 1 MHz 5800 MHz ± 1 MHz	

Head TSL parameters at 5250 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.9	4.71 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	36.2 ± 6 %	4.55 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL at 5250 MHz

SAR averaged over 1 cm³ (1 g) of Head TSL	Condition	
SAR measured	100 mW input power	7.91 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	79.2 W/kg ± 19.9 % (k=2)

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	100 mW input power	2.28 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	22.8 W/kg ± 19.5 % (k=2)

Head TSL parameters at 5600 MHz

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	35.5	5.07 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	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)

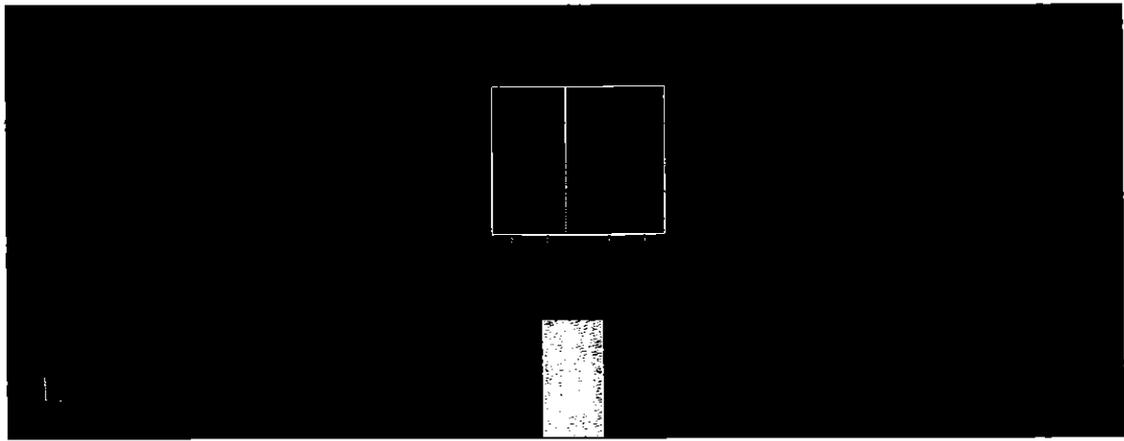
DASY52 Configuration:

- 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



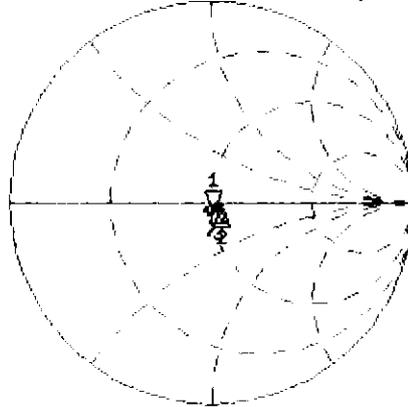
0 dB = 18.9 W/kg = 12.76 dBW/kg

Impedance Measurement Plot for Head TSL

11 Jan 2018 15:50:25

CH1 S11 1 U FS 1: 50.010 Ω -5.5215 Ω 5.4904 pF 5 250.000 000 MHz

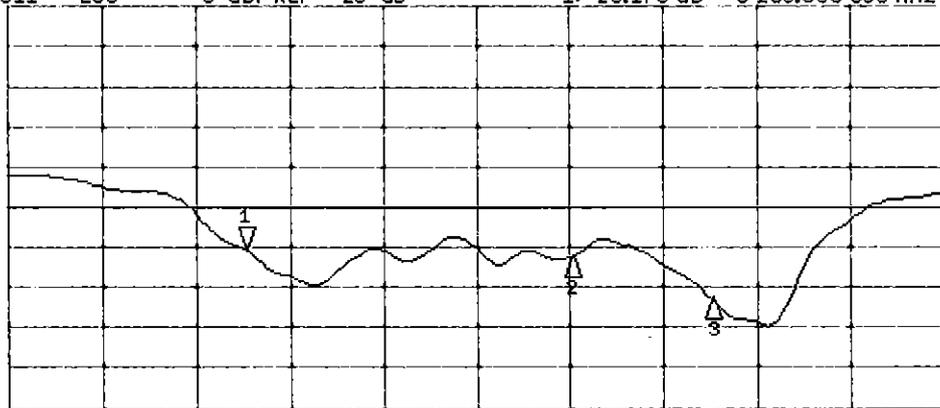
De1
Cor
Avg
15
H1d



CH1 Markers
2: 54.660 Ω
-2.1445 Ω
5.60000 GHz
3: 52.729 Ω
-44.922 m Ω
5.75000 GHz

CH2 S11 LOG 5 dB/ REF -20 dB 1: -25.170 dB 5 250.000 000 MHz

Cor
Avg
15
H1d



CH2 Markers
2: -26.187 dB
5.60000 GHz
3: -31.504 dB
5.75000 GHz

START 5 000.000 000 MHz

STOP 6 000.000 000 MHz

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

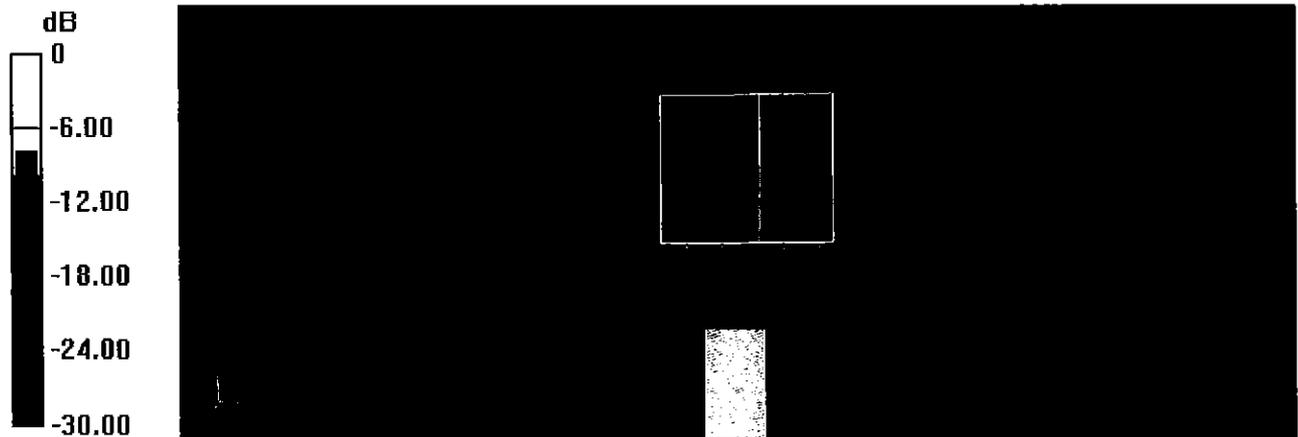
SAR(1 g) = 7.64 W/kg; SAR(10 g) = 2.13 W/kg

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

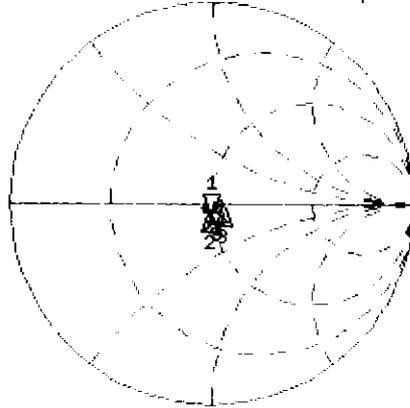


Impedance Measurement Plot for Body TSL

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

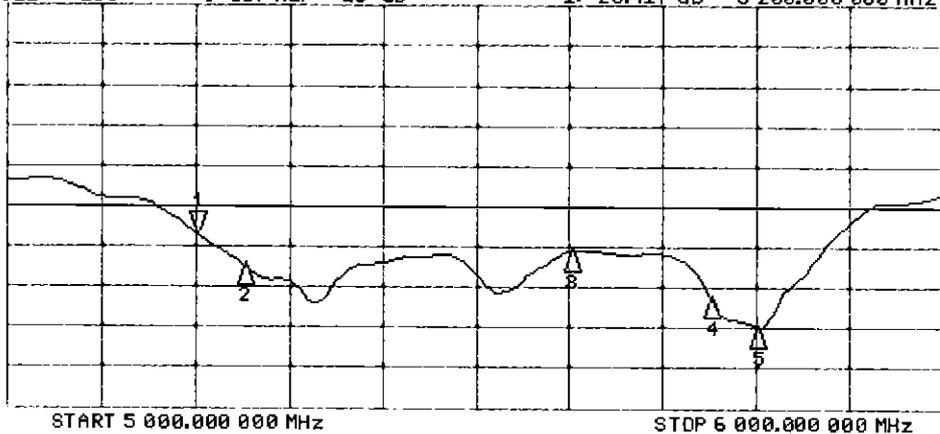


CH1 Markers

- 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

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=4mm, dy=4mm, dz=1.4mm

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=4mm, dy=4mm, dz=1.4mm

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=4mm, dy=4mm, dz=1.4mm

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