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SAR EVALUATION REPORT

Applicant Name:
Apple, Inc.
One Apple Park Way
Cupertino, CA 95014

Date of Testing:
07/05/18 – 07/19/18
Test Site/Location:
PCTEST Lab, Morgan Hill, CA, USA
Document Serial No.:
1C1806040006-01-R1.BCG

FCC ID: **BCG-A1976**

APPLICANT: **APPLE, INC.**

DUT Type: Watch
Application Type: Certification
FCC Rule Part(s): CFR §2.1093
Model: A1976

Equipment Class	Band & Mode	Tx Frequency	SAR	
			1g Head (W/kg)	10g Extremity (W/kg)
PCT	UMTS 850	826.40 - 846.60 MHz	< 0.1	0.24
PCT	UMTS 1750	1712.4 - 1752.6 MHz	0.22	< 0.1
PCT	UMTS 1900	1852.4 - 1907.6 MHz	0.16	< 0.1
PCT	LTE Band 12	699.7 - 715.3 MHz	< 0.1	0.18
PCT	LTE Band 17	706.5 - 713.5 MHz	N/A	N/A
PCT	LTE Band 13	779.5 - 784.5 MHz	< 0.1	0.18
PCT	LTE Band 5 (Cell)	824.7 - 848.3 MHz	< 0.1	0.27
PCT	LTE Band 26 (Cell)	814.7 - 848.3 MHz	< 0.1	0.22
PCT	LTE Band 4 (AWS)	1710.7 - 1754.3 MHz	0.25	< 0.1
PCT	LTE Band 25 (PCS)	1850.7 - 1914.3 MHz	0.15	< 0.1
PCT	LTE Band 2 (PCS)	1850.7 - 1909.3 MHz	N/A	N/A
PCT	LTE Band 41	2498.5 - 2687.5 MHz	0.23	< 0.1
DTS	2.4 GHz WLAN	2412 - 2472 MHz	< 0.1	< 0.1
DSS/DTS	Bluetooth	2402 - 2480 MHz	0.10	< 0.1
Simultaneous SAR per KDB 690783 D01v01r03:			0.35	0.32

This revised Test Report (S/N: 1C1806040006-01-R1.BCG) 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 watch device has been shown to be capable of compliance for localized specific absorption rate (SAR) for uncontrolled environment/general population exposure limits specified in ANSI/IEEE C95.1-1992 and has been tested in accordance with the measurement procedures specified in Section 1.8 of this report; for North American frequency bands only.

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

Randy Ortanez
President

ACCREDITED
TESTING CERT#2041.02

The SAR Tick is an initiative of the Mobile & Wireless Forum (MWF). While a product may be considered eligible, use of the SAR Tick logo requires an agreement with the MWF. Further details can be obtained by emailing: sartick@mwfai.info.

TABLE OF CONTENTS

1 DEVICE UNDER TEST 3

2 LTE INFORMATION 8

3 INTRODUCTION 9

4 DOSIMETRIC ASSESSMENT 10

5 TEST CONFIGURATION POSITIONS 11

6 RF EXPOSURE LIMITS 12

7 FCC MEASUREMENT PROCEDURES 13

8 RF CONDUCTED POWERS 17

9 SYSTEM VERIFICATION 35

10 SAR DATA SUMMARY 37

11 FCC MULTI-TX AND ANTENNA SAR CONSIDERATIONS 49

12 SAR MEASUREMENT VARIABILITY 53

13 EQUIPMENT LIST 54

14 MEASUREMENT UNCERTAINTIES 55

15 CONCLUSION 56

16 REFERENCES 57

APPENDIX A: SAR TEST PLOTS

APPENDIX B: SAR DIPOLE VERIFICATION PLOTS

APPENDIX C: PROBE AND DIPOLE CALIBRATION CERTIFICATES

APPENDIX D: SAR TISSUE SPECIFICATIONS

APPENDIX E: SAR SYSTEM VALIDATION

APPENDIX F: DUT ANTENNA DIAGRAM & SAR TEST SETUP PHOTOGRAPHS

1 DEVICE UNDER TEST

1.1 Device Overview

Table 1-1
Summary EUT Bands/Modes

Band & Mode	Operating Modes	Tx Frequency
UMTS 850	Voice/Data	826.40 - 846.60 MHz
UMTS 1750	Voice/Data	1712.4 - 1752.6 MHz
UMTS 1900	Voice/Data	1852.4 - 1907.6 MHz
LTE Band 12	Voice/Data	699.7 - 715.3 MHz
LTE Band 17	Voice/Data	706.5 - 713.5 MHz
LTE Band 13	Voice/Data	779.5 - 784.5 MHz
LTE Band 5 (Cell)	Voice/Data	824.7 - 848.3 MHz
LTE Band 26 (Cell)	Voice/Data	814.7 - 848.3 MHz
LTE Band 4 (AWS)	Voice/Data	1710.7 - 1754.3 MHz
LTE Band 25 (PCS)	Voice/Data	1850.7 - 1914.3 MHz
LTE Band 2 (PCS)	Voice/Data	1850.7 - 1909.3 MHz
LTE Band 41	Voice/Data	2498.5 - 2687.5 MHz
2.4 GHz WLAN	Voice/Data	2412 - 2472 MHz
Bluetooth	Data	2402 - 2480 MHz
NFC	Data	13.56 MHz

1.2 Power Reduction for SAR

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

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.

Table 1.3.1
Summary Max Conducted Powers – UMTS Mode

Mode / Band		Modulated Average (dBm)		
		3GPP WCDMA	*3GPP HSDPA*	*3GPP HSUPA*
UMTS Band 5 (850 MHz)	Maximum	**25.0**	**25.0**	**24.0**
	Nominal	**24.0**	**24.0**	**23.0**
UMTS Band 4 (1750 MHz)	Maximum	**23.5**	**23.5**	**22.5**
	Nominal	**22.5**	**22.5**	**21.5**
UMTS Band 2 (1900 MHz)	Maximum	**23.5**	**23.5**	**22.5**
	Nominal	**22.5**	**22.5**	**21.5**

Table 1.3.2
Summary Max Conducted Powers – LTE FDD Mode

Mode / Band		Modulated Average (dBm)
LTE Band 12	Maximum	**25.0**
	Nominal	**24.0**
LTE Band 17	Maximum	**25.0**
	Nominal	**24.0**
LTE Band 13	Maximum	**25.0**
	Nominal	**24.0**
LTE Band 5 (Cell)	Maximum	**25.0**
	Nominal	**24.0**
LTE Band 26 (Cell)	Maximum	**25.0**
	Nominal	**24.0**
LTE Band 4 (AWS)	Maximum	**23.5**
	Nominal	**22.5**
LTE Band 25 (PCS)	Maximum	**23.5**
	Nominal	**22.5**
LTE Band 2 (PCS)	Maximum	**23.5**
	Nominal	**22.5**

Table 1.3.3
Summary Max Conducted Powers – LTE TDD Mode

Mode / Band		Modulated Average (dBm)
LTE B41 (2496-2530 MHz)	Maximum	**22.15**
	Nominal	**21.40**
LTE B41 (2530-2690 MHz)	Maximum	**22.75**
	Nominal	**22.00**

Table 1.3.4
Summary Max Conducted Powers – WIFI Mode

Mode / Band		Modulated Average (dBm)				
	Channel	1	2 - 10	11	12	13
IEEE 802.11b (2.4 GHz)	Maximum	**19.0**	**19.0**	**19.0**	**19.0**	**18.0**
IEEE 802.11g (2.4 GHz)	Maximum	**17.5**	**18.5**	**17.5**	**15.0**	**7.0**
IEEE 802.11n (2.4 GHz)	Maximum	**17.5**	**18.5**	**17.5**	**15.0**	**7.0**

Table 1.3.5
Summary Max Conducted Powers – Bluetooth Mode

Mode/Band		Modulated Average (dBm)
Bluetooth BDR (ePA)	Maximum	**18.0**
Bluetooth BDR (iPA)	Maximum	**13.0**
Bluetooth EDR (ePA)	Maximum	**14.0**
Bluetooth EDR (iPA)	Maximum	**10.0**
Bluetooth LE (ePA)	Maximum	**18.0**
Bluetooth LE (iPA)	Maximum	**13.0**
Bluetooth HDR (ePA)	Maximum	**10.5**
Bluetooth HDR (iPA)	Maximum	**10.0**

1.4 DUT Antenna Locations

A diagram showing the location of the device antennas can be found in Appendix F.

1.5 Near Field Communications (NFC) Antenna

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

1.6 Simultaneous Transmission Capabilities

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

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 1-1
Simultaneous Transmission Scenarios

No.	Capable Transmit Configuration	Head	Extremity
1	UMTS + 2.4 GHz WI-FI	Yes	Yes
2	UMTS + 2.4 GHz Bluetooth	Yes	Yes
3	LTE + 2.4 GHz WI-FI	Yes	Yes
4	LTE + 2.4 GHz Bluetooth	Yes	Yes

1. 2.4 GHz WLAN, and 2.4 GHz Bluetooth share the same antenna path and cannot transmit simultaneously.
2. All licensed modes share the same antenna path and cannot transmit simultaneously.
3. When the user utilizes multiple services in UMTS 3G mode it uses multi-Radio Access Bearer or multi-RAB. The power control is based on a physical control channel (Dedicated Physical Control Channel [DPCCH]) and power control will be adjusted to meet the needs of both services. Therefore, the UMTS+WLAN scenario also represents the UMTS Voice/DATA + WLAN scenario.
4. This device supports VoLTE and VoWIFI.

1.7 Miscellaneous SAR Test Considerations

(A) 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 is limited to 27 RB on the uplink for 16QAM modulation. Additional measurements were evaluated to support SAR test exclusion for 16QAM as described in Section 7.5.4.

This device supports both LTE Band 12 and LTE Band 17. Since the supported frequency span for LTE Band 17 falls completely within the supported frequency span for LTE Band 12, both LTE bands have the same target power, and both LTE bands share the same transmission path, SAR was only assessed for LTE Band 12.

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

(B) WIFI

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

1.8 Guidance Applied

- FCC KDB Publication 941225 D01v03r01, D05v02r05 (3G/4G)
- FCC KDB Publication 248227 D01v02r02 (SAR Considerations for 802.11 Devices)
- FCC KDB Publication 447498 D01v06 (General SAR Guidance, Wrist-worn Device Guidance)
- FCC KDB Publication 865664 D01v01r04, D02v01r02 (SAR Measurements up to 6 GHz)

1.9 Device Serial Numbers

Several samples with identical hardware were used to support SAR testing. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units. The serial numbers used for each test are indicated alongside the results in Section 10.

1.10 Device Housing Types and Wristband Types

This device has two housing types that were evaluated independently for SAR: Aluminum and Stainless Steel. The device can also be used with different wristband accessories. The non-metallic wrist accessory, sport band, was evaluated for all exposure conditions. The available metallic wrist accessories, metal links band and metal loop band, were additionally evaluated.

2 LTE INFORMATION

LTE Information					
FCC ID	**BCG-A1976**				
Form Factor	Watch				
Frequency Range of each LTE transmission band	LTE Band 12 (699.7 - 715.3 MHz)				
	LTE Band 17 (706.5 - 713.5 MHz)				
	LTE Band 13 (779.5 - 784.5 MHz)				
	LTE Band 5 (Cell) (824.7 - 848.3 MHz)				
	LTE Band 26 (Cell) (814.7 - 848.3 MHz)				
	LTE Band 4 (AWS) (1710.7 - 1754.3 MHz)				
	LTE Band 25 (PCS) (1850.7 - 1914.3 MHz)				
	LTE Band 2 (PCS) (1850.7 - 1909.3 MHz)				
	LTE Band 41 (2498.5 - 2687.5 MHz)				
Channel Bandwidths	LTE Band 12: 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 17: 5 MHz, 10 MHz				
	LTE Band 13: 5 MHz, 10 MHz				
	LTE Band 5 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 26 (Cell): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz				
	LTE Band 4 (AWS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 25 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 2 (PCS): 1.4 MHz, 3 MHz, 5 MHz, 10 MHz, 15 MHz, 20 MHz				
	LTE Band 41: 5 MHz, 10 MHz, 15 MHz, 20 MHz				
Channel Numbers and Frequencies (MHz)	Low	Low-Mid	Mid	Mid-High	High
LTE Band 12: 1.4 MHz	699.7 (23017)		707.5 (23095)	715.3 (23173)	
LTE Band 12: 3 MHz	700.5 (23025)		707.5 (23095)	714.5 (23165)	
LTE Band 12: 5 MHz	701.5 (23035)		707.5 (23095)	713.5 (23155)	
LTE Band 12: 10 MHz	704 (23060)		707.5 (23095)	711 (23130)	
LTE Band 17: 5 MHz	706.5 (23755)		710 (23790)	713.5 (23825)	
LTE Band 17: 10 MHz	709 (23780)		710 (23790)	711 (23800)	
LTE Band 13: 5 MHz	779.5 (23205)		782 (23230)	784.5 (23255)	
LTE Band 13: 10 MHz	N/A		782 (23230)	N/A	
LTE Band 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 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 4 (AWS): 1.4 MHz	1710.7 (19957)		1732.5 (20175)	1754.3 (20393)	
LTE Band 4 (AWS): 3 MHz	1711.5 (19965)		1732.5 (20175)	1753.5 (20385)	
LTE Band 4 (AWS): 5 MHz	1712.5 (19975)		1732.5 (20175)	1752.5 (20375)	
LTE Band 4 (AWS): 10 MHz	1715 (20000)		1732.5 (20175)	1750 (20350)	
LTE Band 4 (AWS): 15 MHz	1717.5 (20025)		1732.5 (20175)	1747.5 (20325)	
LTE Band 4 (AWS): 20 MHz	1720 (20050)		1732.5 (20175)	1745 (20300)	
LTE Band 25 (PCS): 1.4 MHz	1850.7 (26047)		1882.5 (26365)	1914.3 (26683)	
LTE Band 25 (PCS): 3 MHz	1851.5 (26055)		1882.5 (26365)	1913.5 (26675)	
LTE Band 25 (PCS): 5 MHz	1852.5 (26065)		1882.5 (26365)	1912.5 (26665)	
LTE Band 25 (PCS): 10 MHz	1855 (26090)		1882.5 (26365)	1910 (26640)	
LTE Band 25 (PCS): 15 MHz	1857.5 (26115)		1882.5 (26365)	1907.5 (26615)	
LTE Band 25 (PCS): 20 MHz	1860 (26140)		1882.5 (26365)	1905 (26590)	
LTE Band 2 (PCS): 1.4 MHz	1850.7 (18607)		1880 (18900)	1909.3 (19193)	
LTE Band 2 (PCS): 3 MHz	1851.5 (18615)		1880 (18900)	1908.5 (19185)	
LTE Band 2 (PCS): 5 MHz	1852.5 (18625)		1880 (18900)	1907.5 (19175)	
LTE Band 2 (PCS): 10 MHz	1855 (18650)		1880 (18900)	1905 (19150)	
LTE Band 2 (PCS): 15 MHz	1857.5 (18675)		1880 (18900)	1902.5 (19125)	
LTE Band 2 (PCS): 20 MHz	1860 (18700)		1880 (18900)	1900 (19100)	
LTE Band 41: 5 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 10 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 15 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
LTE Band 41: 20 MHz	2506 (39750)	2549.5 (40185)	2593 (40620)	2636.5 (41055)	2680 (41490)
UE Category	1				
Modulations Supported in UL	QPSK, 16QAM				
LTE MPR Permanently implemented per 3GPP TS 36.101 section 6.2.3~6.2.5? (manufacturer attestation to be provided)	YES				
A-MPR (Additional MPR) disabled for SAR Testing?	YES				
LTE Additional Information	This device does not support full CA features on 3GPP Release 12. All uplink communications are identical to the Release 8 Specifications. The following LTE Release 12 Features are not supported: Carrier Aggregation, Relay, HetNet, Enhanced MIMO, eICIC, WIFI Offloading, eMBMS, Cross-Carrier Scheduling, Enhanced SC-FDMA.				

3 INTRODUCTION

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

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

3.1 SAR Definition

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

Equation 3-1
SAR Mathematical Equation

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

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

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

where:

σ = conductivity of the tissue-simulating material (S/m)
ρ = mass density of the tissue-simulating material (kg/m^3)
E = Total RMS electric field strength (V/m)

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

4 DOSIMETRIC ASSESSMENT

4.1 Measurement Procedure

The evaluation was performed using the following procedure compliant to FCC KDB Publication 865664 D01v01r04:

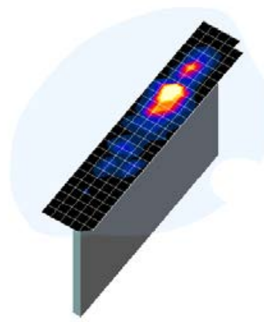

Figure 4-1
Sample SAR Area Scan

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

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

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

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 ε = 3 and loss tangent δ = 0.02. Additionally, a manufacturer provided low-loss foam was used to position the device for head SAR evaluations.

5.2 Positioning for Head

Devices that are designed to be worn on the wrist may operate in speaker mode for voice communication, with the device worn on the wrist and positioned next to the mouth. When next-to-mouth SAR evaluation is required, the device is positioned at 10 mm from a flat phantom filled with head tissue-equivalent medium. The device is evaluated with wrist bands strapped together to represent normal use conditions.

5.3 Extremity Exposure Configurations

Devices that are designed or intended for use on extremities or mainly operated in extremity only exposure conditions; i.e., hands, wrists, feet and ankles, may require extremity SAR evaluation. When the device also operates in close proximity to the user's body, SAR compliance for the body is also required. When extremity SAR evaluation is required, the device is evaluated with the back of the device touching the flat phantom, which is filled with body tissue-equivalent medium. The device was evaluated with Sport wristband unstrapped and touching the phantom. For Metal Loop and Metal Links wristbands, the device was evaluated with wristbands strapped and the distance between wristbands and the phantom was minimized to represent the spacing created by actual use conditions.

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

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

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.

7.4.2 Head SAR Measurements

SAR for head exposure configurations is measured using the 12.2 kbps RMC with TPC bits configured to all “1s”. SAR in AMR configurations is not required when the maximum average output of each RF channel for 12.2 kbps AMR is less than 0.25 dB higher than that measured in 12.2 kbps RMC. Otherwise, SAR is measured on the maximum output channel in 12.2 AMR with a 3.4 kbps SRB (signaling radio bearer) using the exposure configuration that resulted in the highest SAR for that RF channel in the 12.2 kbps RMC mode.

7.4.3 Body SAR Measurements

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

7.4.4 SAR Measurements with Rel 5 HSDPA

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

7.4.5 SAR Measurements with Rel 6 HSUPA

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

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

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.

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 for 1g SAR and ≤ 2.0 W/kg for 10g SAR, 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 for 1g SAR and >3.625 W/kg for 10g SAR, 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 for 1g SAR and < 2.0 W/kg for 10g SAR.
d. Per Section 5.2.4 and 5.3, SAR tests for higher order modulations and lower bandwidths configurations are not required when the conducted power of the required test configurations determined by Sections 5.2.1 through 5.2.3 is less than or equal to ½ dB higher than the equivalent configuration using QPSK modulation and when the QPSK SAR for those configurations is <1.45 W/kg for 1g SAR and <3.625 W/kg for 10g SAR.
e. This device can only operate with 16QAM on the uplink with less than or equal to 27 RB. For 16QAM configurations with 10 MHz, 15 MHz and 20 MHz bandwidths, LTE powers for RB size of 15 ("50% RB") and 27 ("100% RB") with offsets to upper edge, middle, and lower edge of the channel are additionally measured for both QPSK and 16QAM modulations to support comparison and SAR test exclusion per Section 5.2.4 and 5.3.

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.

7.6 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 2.4 GHz SAR Test Requirements

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

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

2) When the reported SAR is > 0.8 W/kg, SAR is required for that position using the next highest measured output power channel. When any reported SAR is > 1.2 W/kg, SAR is required for the third channel; i.e., all channels require testing.

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

8 RF CONDUCTED POWERS

8.1 UMTS Conducted Powers

3GPP Release Version	Mode	3GPP 34.121 Subtest	Cellular Band [dBm]			AWS Band [dBm]			PCS Band [dBm]			3GPP MPR [dB]
			4132	4183	4233	1312	1412	1513	9262	9400	9538	
99	WCDMA	12.2 kbps RMC	24.03	24.15	23.91	22.71	22.80	22.54	22.61	22.71	22.45	-
99		12.2 kbps AMR	24.01	24.08	23.89	22.68	22.74	22.48	22.59	22.64	22.39	-
6	HSDPA	Subtest 1	24.02	24.12	23.91	22.76	22.74	22.51	22.60	22.62	22.37	0
6		Subtest 2	23.06	23.06	23.01	21.64	21.77	21.54	21.59	21.62	21.53	0
6		Subtest 3	22.52	22.64	22.51	21.18	21.31	21.06	21.14	21.15	21.01	0.5
6		Subtest 4	22.74	22.52	22.51	21.01	21.07	21.00	21.03	21.04	21.01	0.5
6	HSUPA	Subtest 1	22.45	22.57	22.37	21.20	21.27	21.06	21.15	21.14	20.98	0
6		Subtest 2	20.86	20.94	20.74	19.28	19.39	19.15	19.25	19.30	19.29	2
6		Subtest 3	21.60	21.69	21.52	20.04	20.12	19.91	20.04	20.01	19.84	1
6		Subtest 4	21.17	21.26	21.03	19.61	19.63	19.44	19.53	19.55	19.34	2
6		Subtest 5	23.02	23.10	22.98	21.58	21.65	21.45	21.50	21.55	21.28	0

This device does not support DC-HSDPA.

The manufacturer has confirmed the HSPA Powers are operating within expected tolerances for the implementation in this model.

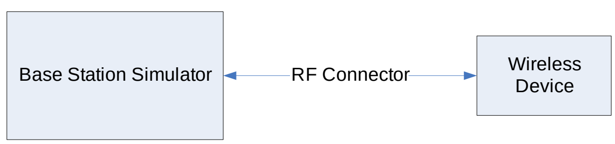

Figure 8-1
Power Measurement Setup

8.2 LTE Conducted Powers

8.2.1 LTE Band 12

Table 8-1
LTE Band 12 Conducted Powers - 10 MHz Bandwidth

LTE Band 12 10 MHz Bandwidth				
Modulation	RB Size	RB Offset	Mid Channel 23095 (707.5 MHz) Conducted Power [dBm]	Design MPR [dB]
QPSK	1	0	23.09	0
	1	25	23.10	0
	1	49	**23.11**	0
	25	0	22.57	1
	25	12	22.57	1
	25	25	**22.64**	1
	50	0	22.56	1
	15	0	22.75	1
	15	17	22.76	1
	15	35	22.66	1
	27	0	22.78	1
	27	12	22.74	1
	27	23	22.73	1
16QAM	1	0	22.63	1
	1	25	22.84	1
	1	49	22.81	1
	25	0	21.84	2
	25	12	21.56	2
	25	25	21.89	2
	15	0	21.92	2
	15	17	21.91	2
	15	35	21.86	2
	27	0	21.92	2
	27	12	21.89	2
	27	23	21.87	2

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

Table 8-2
LTE Band 12 Conducted Powers - 5 MHz Bandwidth

LTE Band 12 5 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 23035 (701.5 MHz)	Mid Channel 23095 (707.5 MHz)	High Channel 23155 (713.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.12	23.20	23.22	0
	1	12	23.04	23.17	23.13	0
	1	24	23.14	23.22	23.19	0
	12	0	22.57	22.71	22.65	1
	12	6	22.58	22.72	22.66	1
	12	13	22.63	22.76	22.70	1
	25	0	22.64	22.75	22.71	1
16QAM	1	0	22.79	22.95	22.86	1
	1	12	22.70	22.92	22.81	1
	1	24	22.77	22.98	22.82	1
	12	0	21.77	21.96	21.88	2
	12	6	21.74	21.94	21.86	2
	12	13	21.79	21.98	21.84	2
	25	0	21.85	21.96	21.90	2

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

LTE Band 12 3 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Design MPR [dB]
			23025 (700.5 MHz)	23095 (707.5 MHz)	23165 (714.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.07	23.17	23.12	0
	1	7	23.06	23.22	23.18	0
	1	14	23.06	23.21	23.19	0
	8	0	22.53	22.70	22.64	1
	8	4	22.50	22.69	22.66	1
	8	7	22.56	22.75	22.68	1
	15	0	22.53	22.71	22.69	1
16QAM	1	0	22.79	22.92	22.81	1
	1	7	22.72	22.94	22.82	1
	1	14	22.65	22.95	22.79	1
	8	0	21.76	21.92	21.85	2
	8	4	21.74	21.94	21.80	2
	8	7	21.77	21.97	21.85	2
	15	0	21.74	21.90	21.83	2

Table 8-4
LTE Band 12 Conducted Powers -1.4 MHz Bandwidth

LTE Band 12 1.4 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Design MPR [dB]
			23017 (699.7 MHz)	23095 (707.5 MHz)	23173 (715.3 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	23.09	23.23	23.16	0
	1	2	23.05	23.22	23.15	0
	1	5	23.01	23.23	23.22	0
	3	0	23.34	23.40	23.40	0
	3	2	23.33	23.38	23.39	0
	3	3	23.32	23.41	23.43	0
	6	0	22.54	22.70	22.71	1
16QAM	1	0	22.80	22.85	22.77	1
	1	2	22.76	22.86	22.78	1
	1	5	22.74	22.91	22.77	1
	3	0	22.59	22.76	22.69	1
	3	2	22.57	22.73	22.67	1
	3	3	22.54	22.74	22.72	1
	6	0	21.79	21.92	21.89	2

8.2.2 LTE Band 13

Table 8-5
LTE Band 13 Conducted Powers - 10 MHz Bandwidth

LTE Band 13 10 MHz Bandwidth				
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	Design MPR [dB]
QPSK	1	0	**23.25**	0
	1	25	23.09	0
	1	49	23.22	0
	25	0	**22.75**	1
	25	12	22.71	1
	25	25	22.73	1
	50	0	22.74	1
	15	0	22.66	1
	15	17	22.56	1
	15	35	22.64	1
	27	0	22.63	1
	27	12	22.53	1
	27	23	22.58	1
16QAM	1	0	23.00	1
	1	25	22.81	1
	1	49	22.97	1
	25	0	22.09	2
	25	12	22.02	2
	25	25	22.00	2
	15	0	21.95	2
	15	17	21.83	2
	15	35	21.87	2
	27	0	21.88	2
	27	12	21.77	2
	27	23	21.82	2

Table 8-6
LTE Band 13 Conducted Powers - 5 MHz Bandwidth

LTE Band 13 5 MHz Bandwidth				
Modulation	RB Size	RB Offset	Mid Channel 23230 (782.0 MHz) Conducted Power [dBm]	Design MPR [dB]
QPSK	1	0	23.37	0
	1	12	23.20	0
	1	24	23.35	0
	12	0	22.60	1
	12	6	22.63	1
	12	13	22.62	1
	25	0	22.64	1
16QAM	1	0	23.03	1
	1	12	22.88	1
	1	24	23.00	1
	12	0	21.88	2
	12	6	21.89	2
	12	13	21.90	2
	25	0	21.88	2

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.

8.2.3 LTE Band 5 (Cell)

Table 8-7
LTE Band 5 (Cell) Conducted Powers - 10 MHz Bandwidth

LTE Band 5 (Cell) 10 MHz Bandwidth				
Modulation	RB Size	RB Offset	Mid Channel 20525 (836.5 MHz) Conducted Power [dBm]	Design MPR [dB]
QPSK	1	0	23.21	0
	1	25	23.28	0
	1	49	**23.38**	0
	25	0	22.66	1
	25	12	22.68	1
	25	25	**22.73**	1
	50	0	22.72	1
	15	0	22.51	1
	15	17	22.70	1
	15	35	22.72	1
	27	0	22.62	1
	27	12	22.64	1
	27	23	22.68	1
16QAM	1	0	22.92	1
	1	25	22.96	1
	1	49	23.15	1
	25	0	22.00	2
	25	12	22.03	2
	25	25	22.04	2
	15	0	21.83	2
	15	17	21.90	2
	15	35	21.94	2
	27	0	21.86	2
	27	12	21.88	2
	27	23	21.92	2

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

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

LTE Band 5 (Cell) 5 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 20425 (826.5 MHz)	Mid Channel 20525 (836.5 MHz)	High Channel 20625 (846.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.42	23.19	23.20	0
	1	12	23.37	23.18	23.22	0
	1	24	23.36	23.26	23.21	0
	12	0	22.71	22.62	22.50	1
	12	6	22.66	22.63	22.45	1
	12	13	22.62	22.65	22.43	1
	25	0	22.65	22.66	22.48	1
16QAM	1	0	22.96	22.71	22.76	1
	1	12	22.91	22.74	22.60	1
	1	24	22.88	22.82	22.62	1
	12	0	22.01	21.98	21.87	2
	12	6	21.99	21.96	21.78	2
	12	13	21.94	21.97	21.74	2
	25	0	22.02	21.98	21.82	2

Table 8-9
LTE Band 5 (Cell) Conducted Powers - 3 MHz Bandwidth

LTE Band 5 (Cell) 3 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 20415 (825.5 MHz)	Mid Channel 20525 (836.5 MHz)	High Channel 20635 (847.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.26	23.29	23.20	0
	1	7	23.22	23.16	23.21	0
	1	14	23.16	23.14	23.22	0
	8	0	22.65	22.62	22.40	1
	8	4	22.62	22.60	22.38	1
	8	7	22.60	22.61	22.37	1
	15	0	22.63	22.62	22.37	1
16QAM	1	0	22.86	22.79	22.57	1
	1	7	22.88	22.78	22.54	1
	1	14	22.78	22.81	22.49	1
	8	0	22.02	21.94	21.74	2
	8	4	21.97	21.97	21.71	2
	8	7	21.97	21.97	21.71	2
	15	0	21.98	21.91	21.69	2

Table 8-10
LTE Band 5 (Cell) Conducted Powers – 1.4 MHz Bandwidth

LTE Band 5 (Cell) 1.4 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 20407 (824.7 MHz)	Mid Channel 20525 (836.5 MHz)	High Channel 20643 (848.3 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.31	23.24	23.00	0
	1	2	23.27	23.22	23.01	0
	1	5	23.27	23.27	23.05	0
	3	0	23.34	23.24	23.03	0
	3	2	23.33	23.25	23.04	0
	3	3	23.34	23.26	23.05	0
	6	0	22.65	22.57	22.42	1
16QAM	1	0	22.88	22.78	22.60	1
	1	2	22.89	22.77	22.64	1
	1	5	22.90	22.79	22.61	1
	3	0	22.76	22.68	22.47	1
	3	2	22.74	22.69	22.46	1
	3	3	22.76	22.71	22.43	1
	6	0	22.01	21.95	21.72	2

8.2.4 LTE Band 26 (Cell)

Table 8-11
LTE Band 26 (Cell) Conducted Powers - 10 MHz Bandwidth

LTE Band 26 (Cell) 10 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26740 (819.0 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 26990 (844.0 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.12	23.31	23.18	0
	1	25	23.30	23.19	23.01	0
	1	49	23.30	**23.34**	23.00	0
	25	0	22.76	22.55	22.63	1
	25	12	22.70	22.50	22.55	1
	25	25	22.76	22.77	22.46	1
	50	0	22.75	22.65	22.64	1
	15	0	22.57	22.62	22.70	1
	15	17	22.69	22.61	22.64	1
	15	35	22.72	22.66	22.45	1
	27	0	22.59	22.58	22.67	1
	27	12	22.67	22.60	22.56	1
	27	23	22.71	22.57	22.46	1
16QAM	1	0	22.85	23.19	22.99	1
	1	25	22.98	22.97	22.92	1
	1	49	23.04	23.02	22.69	1
	25	0	22.00	21.91	22.00	2
	25	12	22.03	21.95	21.94	2
	25	25	22.11	21.93	21.81	2
	15	0	21.81	21.85	21.98	2
	15	17	21.89	21.81	21.81	2
	15	35	21.97	21.86	21.68	2
	27	0	21.82	21.77	21.93	2
	27	12	21.92	21.79	21.83	2
	27	23	21.96	21.78	21.76	2

Table 8-12
LTE Band 26 (Cell) Conducted Powers - 5 MHz Bandwidth

LTE Band 26 (Cell) 5 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26715 (816.5 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 27015 (846.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.22	23.44	23.22	0
	1	12	23.23	23.34	23.07	0
	1	24	23.26	23.33	23.05	0
	12	0	22.54	22.61	22.50	1
	12	6	22.58	22.62	22.45	1
	12	13	22.62	22.64	22.44	1
	25	0	22.62	22.77	22.54	1
16QAM	1	0	23.00	22.97	22.93	1
	1	12	22.90	22.96	22.80	1
	1	24	22.94	22.94	22.78	1
	12	0	21.92	21.94	21.93	2
	12	6	21.97	21.96	21.88	2
	12	13	21.97	21.95	21.84	2
	25	0	21.95	21.95	21.91	2

Table 8-13
LTE Band 26 (Cell) Conducted Powers - 3 MHz Bandwidth

LTE Band 26 (Cell) 3 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26705 (815.5 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 27025 (847.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.20	23.15	23.01	0
	1	7	23.18	23.23	23.02	0
	1	14	23.17	23.17	23.00	0
	8	0	22.53	22.53	22.42	1
	8	4	22.51	22.57	22.40	1
	8	7	22.58	22.56	22.41	1
	15	0	22.54	22.61	22.49	1
16QAM	1	0	22.86	22.91	22.70	1
	1	7	22.79	22.95	22.80	1
	1	14	22.88	22.88	22.74	1
	8	0	21.83	21.85	21.77	2
	8	4	21.86	21.88	21.79	2
	8	7	21.90	21.90	21.75	2
	15	0	21.83	21.91	21.72	2

Table 8-14
LTE Band 26 (Cell) Conducted Powers -1.4 MHz Bandwidth

LTE Band 26 (Cell) 1.4 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26697 (814.7 MHz)	Mid Channel 26865 (831.5 MHz)	High Channel 27033 (848.3 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	23.51	23.29	23.04	0
	1	2	23.41	23.27	23.03	0
	1	5	23.43	23.29	23.07	0
	3	0	23.40	23.27	23.14	0
	3	2	23.33	23.25	23.14	0
	3	3	23.35	23.25	23.17	0
	6	0	22.64	22.58	22.51	1
16QAM	1	0	23.12	22.80	22.78	1
	1	2	22.92	22.83	22.75	1
	1	5	23.00	22.80	22.81	1
	3	0	22.71	22.76	22.58	1
	3	2	22.66	22.72	22.62	1
	3	3	22.68	22.70	22.61	1
	6	0	21.86	21.91	21.76	2

8.2.5 LTE Band 4 (AWS)

Table 8-15
LTE Band 4 (AWS) Conducted Powers - 20 MHz Bandwidth

LTE Band 4 (AWS) 20 MHz Bandwidth				
Modulation	RB Size	RB Offset	Mid Channel 20175 (1732.5 MHz) Conducted Power [dBm]	Design MPR [dB]
QPSK	1	0	22.15	0
	1	50	**22.35**	0
	1	99	22.24	0
	50	0	21.50	1
	50	25	21.49	1
	50	50	**21.53**	1
	100	0	21.52	1
	15	0	22.23	0
	15	42	22.38	0
	15	85	22.25	0
	27	0	21.40	1
	27	37	21.47	1
	27	73	21.41	1
16QAM	1	0	21.67	1
	1	50	21.89	1
	1	99	21.77	1
	15	0	21.55	1
	15	42	21.65	1
	15	85	21.58	1
	27	0	20.61	2
	27	37	20.71	2
	27	73	20.65	2

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

Table 8-16
LTE Band 4 (AWS) Conducted Powers - 15 MHz Bandwidth

LTE Band 4 (AWS) 15 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 20025 (1717.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20325 (1747.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	22.35	22.47	22.27	0
	1	36	22.30	22.57	22.16	0
	1	74	22.30	22.40	22.23	0
	36	0	21.73	21.76	21.48	1
	36	18	21.53	21.76	21.52	1
	36	37	21.55	21.69	21.55	1
	75	0	21.65	21.82	21.61	1
	15	0	22.19	22.41	22.18	0
	15	30	22.15	22.44	22.09	0
	15	60	22.14	22.42	22.12	0
	27	0	21.32	21.49	21.25	1
	27	24	21.30	21.48	21.23	1
	27	48	21.28	21.46	21.28	1
16QAM	1	0	21.58	21.50	21.71	1
	1	36	21.54	21.80	21.50	1
	1	74	21.54	21.64	21.41	1
	15	0	21.49	21.58	21.43	1
	15	30	21.42	21.59	21.36	1
	15	60	21.38	21.57	21.38	1
	27	0	20.51	20.68	20.50	2
	27	24	20.55	20.73	20.49	2
	27	48	20.52	20.71	20.51	2

Table 8-17
LTE Band 4 (AWS) Conducted Powers - 10 MHz Bandwidth

LTE Band 4 (AWS) 10 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Design MPR [dB]
			20000 (1715.0 MHz)	20175 (1732.5 MHz)	20350 (1750.0 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	22.24	22.48	22.10	0
	1	25	22.14	22.44	22.11	0
	1	49	22.19	22.44	22.18	0
	25	0	21.53	21.72	21.57	1
	25	12	21.50	21.75	21.60	1
	25	25	21.53	21.76	21.67	1
	50	0	21.55	21.75	21.58	1
	15	0	21.49	21.59	21.30	1
	15	17	21.43	21.61	21.36	1
	15	35	21.48	21.55	21.35	1
	27	0	21.44	21.53	21.27	1
	27	12	21.40	21.50	21.28	1
	27	23	21.41	21.56	21.33	1
16QAM	1	0	21.80	21.75	21.55	1
	1	25	21.64	21.67	21.56	1
	1	49	21.65	21.81	21.45	1
	25	0	20.90	21.17	20.86	2
	25	12	20.88	21.20	20.90	2
	25	25	20.86	21.20	20.97	2
	15	0	20.74	20.80	20.52	2
	15	17	20.68	20.83	20.57	2
	15	35	20.59	20.79	20.54	2
	27	0	20.65	20.74	20.50	2
	27	12	20.61	20.76	20.51	2
	27	23	20.63	20.79	20.55	2

Table 8-18
LTE Band 4 (AWS) Conducted Powers - 5 MHz Bandwidth

LTE Band 4 (AWS) 5 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel	Mid Channel	High Channel	Design MPR [dB]
			19975 (1712.5 MHz)	20175 (1732.5 MHz)	20375 (1752.5 MHz)	
			Conducted Power [dBm]			
QPSK	1	0	22.32	22.46	22.29	0
	1	12	22.26	22.40	22.35	0
	1	24	22.28	22.47	22.36	0
	12	0	21.49	21.77	21.60	1
	12	6	21.45	21.78	21.59	1
	12	13	21.44	21.75	21.55	1
	25	0	21.55	21.72	21.59	1
16QAM	1	0	21.65	21.74	21.60	1
	1	12	21.64	21.69	21.55	1
	1	24	21.67	21.82	21.52	1
	12	0	20.79	21.08	20.91	2
	12	6	20.76	21.10	20.92	2
	12	13	20.73	21.08	20.90	2
	25	0	20.76	21.03	20.89	2

Table 8-19
LTE Band 4 (AWS) Conducted Powers - 3 MHz Bandwidth

LTE Band 4 (AWS) 3 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 19965 (1711.5 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20385 (1753.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	22.21	22.42	22.18	0
	1	7	22.18	22.49	22.17	0
	1	14	22.12	22.47	22.16	0
	8	0	21.50	21.77	21.54	1
	8	4	21.48	21.71	21.46	1
	8	7	21.46	21.72	21.48	1
	15	0	21.49	21.70	21.52	1
16QAM	1	0	21.66	21.62	21.83	1
	1	7	21.74	21.77	21.78	1
	1	14	21.74	21.68	21.80	1
	8	0	20.81	21.05	20.84	2
	8	4	20.77	21.00	20.77	2
	8	7	20.80	21.04	20.76	2
	15	0	20.78	21.00	20.73	2

Table 8-20
LTE Band 4 (AWS) Conducted Powers -1.4 MHz Bandwidth

LTE Band 4 (AWS) 1.4 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 19957 (1710.7 MHz)	Mid Channel 20175 (1732.5 MHz)	High Channel 20393 (1754.3 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	22.23	22.52	22.30	0
	1	2	22.19	22.51	22.28	0
	1	5	22.19	22.48	22.23	0
	3	0	22.30	22.56	22.28	0
	3	2	22.27	22.49	22.26	0
	3	3	22.29	22.51	22.28	0
	6	0	21.52	21.79	21.55	1
16QAM	1	0	21.87	21.86	21.76	1
	1	2	21.80	21.74	21.74	1
	1	5	21.84	21.77	21.74	1
	3	0	21.73	21.94	21.68	1
	3	2	21.70	21.86	21.62	1
	3	3	21.70	21.87	21.68	1
	6	0	20.87	21.06	20.85	2

8.2.6 LTE Band 25 (PCS)

Table 8-21
LTE Band 25 (PCS) Conducted Powers - 20 MHz Bandwidth

LTE Band 25 (PCS) 20 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26140 (1860.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26590 (1905.0 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	**22.03**	21.88	21.63	0
	1	50	21.83	21.94	21.59	0
	1	99	21.89	21.90	21.85	0
	50	0	**21.27**	21.23	21.26	1
	50	25	21.11	21.22	21.14	1
	50	50	21.15	21.14	21.02	1
	100	0	21.23	21.25	21.20	1
	15	0	21.97	21.96	21.97	0
	15	42	21.89	21.99	21.90	0
	15	85	21.84	21.94	21.88	0
	27	0	21.14	21.17	21.08	1
	27	37	21.06	21.23	21.06	1
	27	73	21.05	21.12	21.02	1
16QAM	1	0	21.36	21.32	21.20	1
	1	50	21.19	21.47	21.11	1
	1	99	21.32	21.33	21.42	1
	15	0	21.28	21.27	21.21	1
	15	42	21.19	21.32	21.19	1
	15	85	21.17	21.23	21.15	1
	27	0	20.38	20.37	20.31	2
	27	37	20.22	20.40	20.27	2
	27	73	20.23	20.31	20.22	2

Table 8-22
LTE Band 25 (PCS) Conducted Powers - 15 MHz Bandwidth

LTE Band 25 (PCS) 15 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26115 (1857.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26615 (1907.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	22.12	22.12	21.98	0
	1	36	22.03	22.07	21.78	0
	1	74	21.94	22.04	22.01	0
	36	0	21.38	21.51	21.27	1
	36	18	21.28	21.49	21.21	1
	36	37	21.16	21.41	21.13	1
	75	0	21.32	21.62	21.46	1
	15	0	22.05	22.03	21.98	0
	15	30	21.96	22.09	21.96	0
	15	60	21.85	22.05	21.85	0
	27	0	21.20	21.18	21.19	1
	27	24	21.17	21.22	21.14	1
	27	48	21.00	21.10	20.99	1
16QAM	1	0	21.49	21.73	21.74	1
	1	36	21.39	21.74	21.59	1
	1	74	21.44	21.70	21.76	1
	15	0	21.23	21.27	21.25	1
	15	30	21.26	21.32	21.24	1
	15	60	21.17	21.21	21.14	1
	27	0	20.34	20.36	20.36	2
	27	24	20.26	20.40	20.30	2
	27	48	20.17	20.26	20.22	2

Table 8-23
LTE Band 25 (PCS) Conducted Powers - 10 MHz Bandwidth

LTE Band 25 (PCS) 10 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26090 (1855.0 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26640 (1910.0 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	21.88	22.04	21.75	0
	1	25	21.87	22.03	21.70	0
	1	49	21.77	21.95	21.90	0
	25	0	21.34	21.33	20.98	1
	25	12	21.28	21.34	21.04	1
	25	25	21.24	21.33	21.18	1
	50	0	21.25	21.32	21.10	1
	15	0	21.30	21.22	21.08	1
	15	17	21.28	21.21	20.97	1
	15	35	21.22	21.14	21.14	1
	27	0	21.15	21.15	20.99	1
	27	12	21.13	21.17	20.96	1
	27	23	21.10	21.19	21.05	1
16QAM	1	0	21.56	21.67	21.51	1
	1	25	21.54	21.65	21.38	1
	1	49	21.44	21.58	21.68	1
	25	0	20.63	20.63	20.43	2
	25	12	20.57	20.64	20.37	2
	25	25	20.56	20.65	20.50	2
	15	0	20.49	20.43	20.25	2
	15	17	20.47	20.51	20.16	2
	15	35	20.44	20.47	20.29	2
	27	0	20.45	20.44	20.17	2
	27	12	20.43	20.48	20.11	2
	27	23	20.41	20.49	20.19	2

Table 8-24
LTE Band 25 (PCS) Conducted Powers - 5 MHz Bandwidth

LTE Band 25 (PCS) 5 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26065 (1852.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26665 (1912.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	21.94	22.01	21.63	0
	1	12	21.93	22.02	21.73	0
	1	24	21.95	22.03	21.95	0
	12	0	21.23	21.22	21.00	1
	12	6	21.17	21.24	21.02	1
	12	13	21.21	21.25	21.19	1
	25	0	21.20	21.27	21.10	1
16QAM	1	0	21.49	21.58	21.24	1
	1	12	21.51	21.57	21.36	1
	1	24	21.56	21.61	21.58	1
	12	0	20.48	20.52	20.28	2
	12	6	20.46	20.51	20.32	2
	12	13	20.47	20.58	20.45	2
	25	0	20.46	20.57	20.35	2

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

LTE Band 25 (PCS) 3 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26055 (1851.5 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26675 (1913.5 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	21.80	21.88	21.72	0
	1	7	21.91	21.92	21.90	0
	1	14	21.83	21.89	21.89	0
	8	0	21.17	21.20	21.08	1
	8	4	21.19	21.19	21.16	1
	8	7	21.16	21.19	21.24	1
	15	0	21.19	21.20	21.18	1
16QAM	1	0	21.42	21.46	21.44	1
	1	7	21.49	21.55	21.56	1
	1	14	21.45	21.51	21.55	1
	8	0	20.55	20.46	20.36	2
	8	4	20.46	20.49	20.44	2
	8	7	20.43	20.52	20.60	2
	15	0	20.44	20.51	20.37	2

Table 8-26
LTE Band 25 (PCS) Conducted Powers -1.4 MHz Bandwidth

LTE Band 25 (PCS) 1.4 MHz Bandwidth						
Modulation	RB Size	RB Offset	Low Channel 26047 (1850.7 MHz)	Mid Channel 26365 (1882.5 MHz)	High Channel 26683 (1914.3 MHz)	Design MPR [dB]
			Conducted Power [dBm]			
QPSK	1	0	21.95	21.95	22.11	0
	1	2	21.94	21.92	22.04	0
	1	5	22.00	21.85	22.06	0
	3	0	21.96	22.01	21.92	0
	3	2	21.97	22.01	21.93	0
	3	3	21.99	22.02	21.88	0
	6	0	21.20	21.20	21.15	1
16QAM	1	0	21.53	21.51	21.40	1
	1	2	21.54	21.53	21.48	1
	1	5	21.57	21.47	21.43	1
	3	0	21.27	21.42	21.38	1
	3	2	21.29	21.38	21.41	1
	3	3	21.30	21.41	21.37	1
	6	0	20.47	20.53	20.54	2

8.2.7 LTE Band 41

Table 8-27
LTE Band 41 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	Design 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	21.35	21.22	21.42	21.30	**21.66**	0
	1	50	21.45	21.33	21.38	21.28	21.50	0
	1	99	21.20	21.37	21.39	21.37	21.45	0
	50	0	19.79	19.97	20.08	20.18	**20.19**	2
	50	25	19.77	20.00	20.10	20.17	20.17	2
	50	50	19.77	20.03	20.07	20.18	20.16	2
	100	0	19.78	20.03	20.09	20.18	20.17	2
	15	0	21.50	21.19	21.25	21.38	21.63	0
	15	42	21.52	21.18	21.21	21.30	21.64	0
	15	85	21.46	21.27	21.12	21.33	21.63	0
	27	0	19.94	19.67	19.91	19.85	20.18	2
	27	37	20.09	19.76	19.95	19.88	20.17	2
	27	73	20.08	19.82	19.87	19.86	20.17	2
16QAM	1	0	20.26	20.13	20.21	20.19	20.36	1
	1	50	20.31	20.23	20.11	20.18	20.26	1
	1	99	20.27	20.44	20.11	20.27	20.24	1
	15	0	20.49	20.22	20.54	20.46	20.74	1
	15	42	20.70	20.31	20.47	20.41	20.76	1
	15	85	20.59	20.42	20.33	20.45	20.77	1
	27	0	18.98	18.67	19.00	18.94	19.22	3
	27	37	19.09	18.79	18.99	18.87	19.21	3
	27	73	19.07	18.80	18.88	18.91	19.21	3

Table 8-28
LTE Band 41 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	Design 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	21.31	21.14	21.31	21.15	21.38	0
	1	36	21.40	21.22	21.30	21.23	21.41	0
	1	74	21.11	21.05	21.23	21.22	21.37	0
	36	0	19.90	19.73	19.78	19.84	20.04	2
	36	18	19.89	19.77	19.77	19.88	20.02	2
	36	37	19.69	19.75	19.76	19.87	20.03	2
	75	0	19.85	19.72	19.74	19.84	20.00	2
	15	0	21.55	21.15	21.26	21.19	21.40	0
	15	30	21.57	21.21	21.26	21.22	21.39	0
	15	60	21.47	21.21	21.11	21.19	21.38	0
	27	0	20.03	19.69	19.80	19.74	19.97	2
	27	24	20.09	19.77	19.76	19.80	20.03	2
	27	48	20.09	19.79	19.69	19.86	20.00	2
16QAM	1	0	20.60	20.05	20.10	20.05	20.37	1
	1	36	20.35	20.10	20.10	20.12	20.36	1
	1	74	20.10	20.21	20.06	20.20	20.29	1
	15	0	20.55	20.25	20.40	20.31	20.53	1
	15	30	20.69	20.38	20.36	20.35	20.45	1
	15	60	20.63	20.40	20.27	20.30	20.53	1
	27	0	18.97	18.69	18.85	18.79	19.03	3
	27	24	19.09	18.77	18.85	18.80	19.01	3
	27	48	19.07	18.89	18.70	18.83	19.01	3

Table 8-29
LTE Band 41 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	Design 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	21.45	21.05	21.20	21.18	21.41	0
	1	25	21.44	21.05	21.22	21.22	21.38	0
	1	49	21.19	21.11	21.24	21.25	21.41	0
	25	0	20.69	20.10	20.31	20.31	20.52	1
	25	12	20.58	20.08	20.35	20.35	20.49	1
	25	25	20.48	20.13	20.36	20.37	20.50	1
	50	0	20.50	20.08	20.30	20.30	**20.53**	1
	15	0	20.63	20.02	20.17	20.20	20.57	1
	15	17	20.72	20.13	20.17	20.21	20.53	1
	15	35	20.65	20.14	20.13	20.18	20.54	1
	27	0	20.66	20.02	20.37	20.14	20.49	1
	27	12	20.65	20.09	20.33	20.17	20.49	1
	27	23	20.64	20.01	20.32	20.18	20.50	1
16QAM	1	0	20.70	20.05	20.11	20.10	20.37	1
	1	25	20.42	20.12	20.13	20.16	20.31	1
	1	49	20.10	20.12	20.21	20.18	20.35	1
	15	0	19.63	19.12	19.34	19.25	19.65	2
	15	17	19.69	19.28	19.32	19.25	19.67	2
	15	35	19.77	19.24	19.27	19.24	19.64	2
	25	0	19.80	19.08	19.38	19.39	19.60	2
	25	12	19.73	19.12	19.42	19.40	19.57	2
	25	25	19.59	19.10	19.44	19.43	19.58	2
	27	0	19.64	19.18	19.34	19.17	19.59	2
	27	12	19.73	19.18	19.28	19.17	19.55	2
	27	23	19.69	19.21	19.31	19.22	19.57	2

Table 8-30
LTE Band 41 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	Design 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	21.45	21.05	21.10	21.19	21.30	0
	1	12	21.39	21.08	21.10	21.18	21.25	0
	1	24	21.24	21.10	21.12	21.14	21.29	0
	12	0	20.58	20.10	20.19	20.21	20.43	1
	12	6	20.51	20.05	20.18	20.26	20.41	1
	12	13	20.45	20.11	20.18	20.29	20.42	1
	25	0	20.49	20.09	20.17	20.28	20.41	1
16QAM	1	0	20.52	20.05	20.05	20.14	20.30	1
	1	12	20.32	20.06	20.06	20.17	20.35	1
	1	24	20.24	20.05	20.07	20.09	20.28	1
	12	0	19.62	19.05	19.17	19.27	19.49	2
	12	6	19.58	19.10	19.16	19.32	19.48	2
	12	13	19.53	19.11	19.18	19.31	19.49	2
	25	0	19.66	19.10	19.22	19.37	19.53	2

8.3 WLAN Conducted Powers

Table 8-31
2.4GHz WLAN Average RF Power

2.4GHz Conducted Power [dBm]				
Freq [MHz]	Channel	IEEE Transmission Mode		
		802.11b	802.11g	802.11n
		Average	Average	Average
2412	1	**18.97**	17.49	17.50
2417	2	18.95	18.50	18.48
2437	6	18.95	18.49	18.49
2457	10	18.94	18.48	18.50
2462	11	18.95	17.50	17.45

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.

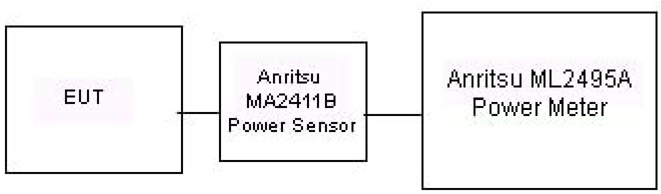

Figure 8-2
Power Measurement Setup

8.4 Bluetooth Conducted Powers

Table 8-32
Bluetooth Average RF Power

Frequency [MHz]	Modulation	Power Scheme	Channel No.	Avg Conducted Power	
				[dBm]	[mW]
2402	GFSK	ePA	0	16.14	41.115
2441	GFSK	ePA	39	**18.00**	63.096
2480	GFSK	ePA	78	15.60	36.308
2402	GFSK	iPA	0	12.54	17.947
2441	GFSK	iPA	39	**13.00**	19.953
2480	GFSK	iPA	78	11.21	13.213
2402	8PSK	ePA	0	14.00	25.119
2441	8PSK	ePA	39	13.70	23.442
2480	8PSK	ePA	78	12.77	18.923
2402	8PSK	iPA	0	9.39	8.690
2441	8PSK	iPA	39	9.87	9.705
2480	8PSK	iPA	78	8.21	6.622

Note: The bolded data rate and channel above were tested for SAR. Bluetooth was evaluated with a test mode with 100% transmission duty factor.

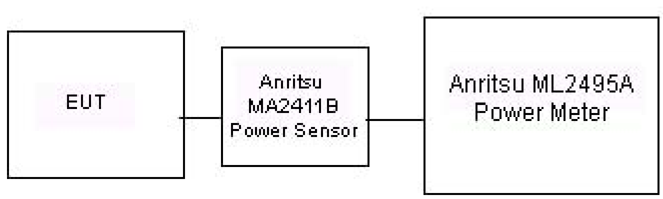

Figure 8-3
Power Measurement Setup

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
7/9/2018	750H	21.8	700	0.877	41.184	0.889	42.201	-1.35%	-2.41%
			710	0.880	41.169	0.890	42.149	-1.12%	-2.33%
			740	0.890	41.083	0.893	41.994	-0.34%	-2.17%
			755	0.895	41.055	0.894	41.916	0.11%	-2.05%
			770	0.900	41.011	0.895	41.838	0.56%	-1.98%
			785	0.906	40.974	0.896	41.760	1.12%	-1.88%
7/9/2018	835H	19.2	820	0.867	41.434	0.899	41.578	-3.56%	-0.35%
			835	0.882	41.222	0.900	41.500	-2.00%	-0.67%
			850	0.897	41.014	0.916	41.500	-2.07%	-1.17%
7/10/2018	835H	21.6	820	0.893	40.672	0.899	41.578	-0.67%	-2.18%
			835	0.899	40.636	0.900	41.500	-0.11%	-2.08%
			850	0.905	40.605	0.916	41.500	-1.20%	-2.16%
7/9/2018	1750H	20.7	1710	1.304	38.494	1.348	40.142	-3.26%	-4.11%
			1750	1.345	38.329	1.371	40.079	-1.90%	-4.37%
			1790	1.386	38.131	1.394	40.016	-0.57%	-4.71%
7/16/2018	1900H	21.0	1850	1.404	39.118	1.400	40.000	0.29%	-2.20%
			1880	1.432	38.992	1.400	40.000	2.29%	-2.52%
			1910	1.463	38.867	1.400	40.000	4.50%	-2.83%
7/5/2018	2450H	22.7	2400	1.835	38.536	1.756	39.289	4.50%	-1.92%
			2450	1.889	38.373	1.800	39.200	4.94%	-2.11%
			2500	1.944	38.185	1.855	39.136	4.80%	-2.43%
7/10/2018	2450H	21.9	2400	1.813	38.771	1.756	39.289	3.25%	-1.32%
			2450	1.872	38.585	1.800	39.200	4.00%	-1.57%
			2500	1.925	38.380	1.855	39.136	3.77%	-1.93%
7/12/2018	2450H	23.4	2400	1.811	38.328	1.756	39.289	3.13%	-2.45%
			2450	1.867	38.147	1.800	39.200	3.72%	-2.69%
			2500	1.919	37.962	1.855	39.136	3.45%	-3.00%
7/19/2018	2600H	22.4	2600	2.017	37.435	1.964	39.009	2.70%	-4.03%
			2650	2.073	37.272	2.018	38.945	2.73%	-4.30%
			2700	2.126	37.079	2.073	38.882	2.56%	-4.64%
7/16/2018	750B	20.4	700	0.929	56.204	0.959	55.726	-3.13%	0.86%
			710	0.939	56.082	0.960	55.687	-2.19%	0.71%
			740	0.966	55.733	0.963	55.570	0.31%	0.29%
			755	0.980	55.573	0.964	55.512	1.66%	0.11%
			770	0.995	55.422	0.965	55.453	3.11%	-0.06%
			785	1.010	55.289	0.966	55.395	4.55%	-0.19%
7/16/2018	835B	20.8	820	0.988	53.993	0.969	55.258	1.96%	-2.29%
			835	1.004	53.814	0.970	55.200	3.51%	-2.51%
			850	1.019	53.647	0.988	55.154	3.14%	-2.73%
7/16/2018	1750B	21.1	1710	1.446	52.292	1.463	53.537	-1.16%	-2.33%
			1750	1.484	52.180	1.488	53.432	-0.27%	-2.34%
			1790	1.522	52.079	1.514	53.326	0.53%	-2.34%
7/18/2018	1750B	21.1	1710	1.437	51.790	1.463	53.537	-1.78%	-3.26%
			1750	1.475	51.694	1.488	53.432	-0.87%	-3.25%
			1790	1.514	51.569	1.514	53.326	0.00%	-3.29%
7/13/2018	1900B	23.8	1850	1.527	51.717	1.520	53.300	0.46%	-2.97%
			1880	1.556	51.616	1.520	53.300	2.37%	-3.16%
			1910	1.584	51.535	1.520	53.300	4.21%	-3.31%
7/17/2018	1900B	22.2	1850	1.524	51.539	1.520	53.300	0.26%	-3.30%
			1880	1.550	51.447	1.520	53.300	1.97%	-3.48%
			1910	1.579	51.355	1.520	53.300	3.88%	-3.65%
7/10/2018	2450B	21.7	2400	1.954	51.578	1.902	52.767	2.73%	-2.25%
			2450	2.020	51.378	1.950	52.700	3.59%	-2.51%
			2500	2.091	51.157	2.021	52.636	3.46%	-2.81%
7/16/2018	2600B	23.0	2600	2.144	52.469	2.163	52.509	-0.88%	-0.08%
			2650	2.189	52.381	2.234	52.445	-2.01%	-0.12%
			2700	2.236	52.289	2.305	52.382	-2.99%	-0.18%

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). The tissue parameters listed in the SAR test plots may slightly differ from the table above due to significant digit rounding in the software.

9.2 Test System Verification

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

Table 9-2
System Verification Results - 1g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR_{1g} (W/kg)	1 W Target SAR_{1g} (W/kg)	1 W Normalized SAR_{1g} (W/kg)	$Deviation_{1g}$ (%)
AM7	750	HEAD	07/09/2018	22.0	21.8	0.200	1034	3329	1.540	8.320	7.700	-7.45%
AM8	835	HEAD	07/09/2018	21.0	19.8	0.200	4d180	3287	1.960	9.600	9.800	2.08%
AM7	835	HEAD	07/10/2018	22.2	21.6	0.200	4d180	3329	2.030	9.600	10.150	5.73%
AM2	1750	HEAD	07/09/2018	21.7	21.3	0.100	1104	3022	3.590	36.400	35.900	-1.37%
AM2	1900	HEAD	07/16/2018	21.5	21.3	0.100	5d181	3022	3.840	39.500	38.400	-2.78%
AM6	2450	HEAD	07/05/2018	22.9	20.8	0.100	921	3131	5.280	52.300	52.800	0.96%
AM5	2450	HEAD	07/10/2018	21.9	21.0	0.100	945	7490	5.030	51.000	50.300	-1.37%
AM6	2450	HEAD	07/12/2018	22.5	21.5	0.100	750	3131	5.460	53.300	54.600	2.44%
AM4	2600	HEAD	07/19/2018	24.0	21.2	0.100	1069	3119	5.440	56.900	54.400	-4.39%

Table 9-3
System Verification Results - 10g

System Verification TARGET & MEASURED												
SAR System #	Tissue Frequency (MHz)	Tissue Type	Date:	Amb. Temp (°C)	Liquid Temp (°C)	Input Power (W)	Source SN	Probe SN	Measured SAR_{10g} (W/kg)	1 W Target SAR_{10g} (W/kg)	1 W Normalized SAR_{10g} (W/kg)	$Deviation_{10g}$ (%)
AM6	750	BODY	07/16/2018	22.1	21.6	0.200	1034	3131	1.200	5.670	6.000	5.82%
AM8	835	BODY	07/16/2018	22.3	21.8	0.200	4d180	3287	1.350	6.310	6.750	6.97%
AM5	1750	BODY	07/16/2018	21.8	21.4	0.100	1104	7490	2.060	19.600	20.600	5.10%
AM5	1750	BODY	07/18/2018	22.9	20.5	0.100	1104	7490	2.050	19.600	20.500	4.59%
AM5	1900	BODY	07/13/2018	21.9	22.7	0.100	5d180	7490	2.150	20.900	21.500	2.87%
AM2	1900	BODY	07/17/2018	21.5	20.8	0.100	5d181	3022	2.150	20.900	21.500	2.87%
AM6	2450	BODY	07/10/2018	21.9	21.7	0.100	750	3131	2.480	24.200	24.800	2.48%
AM1	2600	BODY	07/16/2018	22.1	22.5	0.100	1009	3275	2.410	25.000	24.100	-3.60%

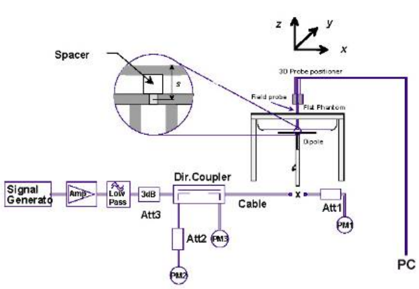

Figure 9-1
System Verification Setup Diagram

Figure 9-2
System Verification Setup Photo

10 SAR DATA SUMMARY

10.1 Standalone Head SAR Data

Table 10-1
UMTS Head SAR

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Housing Type	Wrist Band Type	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	25.0	24.15	0.17	10 mm	Aluminum	Sport	D92WV00RK47D	1:1	front	0.002	1.216	0.002	
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.12	10 mm	Aluminum	Metal Links	D92WV00EK47D	1:1	front	0.002	1.216	0.002	
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.18	10 mm	Aluminum	Metal Loop	D92WV00FK47D	1:1	front	0.004	1.216	0.005	A1
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.13	10 mm	Stainless Steel	Sport	D92WV00SK47H	1:1	front	0.002	1.216	0.002	
836.60	4183	UMTS 850	RMC	25.0	24.15	0.16	10 mm	Stainless Steel	Metal Links	D92WV00KK47H	1:1	front	0.001	1.216	0.001	
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.09	10 mm	Stainless Steel	Metal Loop	D92WV00QK47H	1:1	front	0.002	1.216	0.002	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	0.03	10 mm	Aluminum	Sport	D92WV00RK47D	1:1	front	0.119	1.175	0.140	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	0.02	10 mm	Aluminum	Metal Links	D92WV00FK47D	1:1	front	0.163	1.175	0.192	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	-0.18	10 mm	Aluminum	Metal Loop	D92WV00RK47D	1:1	front	0.188	1.175	0.221	A2
1732.40	1412	UMTS 1750	RMC	23.5	22.80	0.01	10 mm	Stainless Steel	Sport	D92WV00EK47H	1:1	front	0.090	1.175	0.106	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	0.16	10 mm	Stainless Steel	Metal Links	D92WV00SK47H	1:1	front	0.138	1.175	0.162	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	0.01	10 mm	Stainless Steel	Metal Loop	D92WV00EK47H	1:1	front	0.141	1.175	0.166	
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.04	10 mm	Aluminum	Sport	D92WV00RK47D	1:1	front	0.091	1.199	0.109	
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.13	10 mm	Aluminum	Metal Links	D92WV00EK47D	1:1	front	0.094	1.199	0.113	
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.13	10 mm	Aluminum	Metal Loop	D92WV00ZK47D	1:1	front	0.133	1.199	0.159	A3
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.10	10 mm	Stainless Steel	Sport	D92WV00EK47H	1:1	front	0.088	1.199	0.106	
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.01	10 mm	Stainless Steel	Metal Links	D92WV00SK47H	1:1	front	0.095	1.199	0.114	
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.12	10 mm	Stainless Steel	Metal Loop	D92WV00QK47H	1:1	front	0.099	1.199	0.119	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram									

Table 10-2
LTE Band 12 Head SAR

MEASUREMENT RESULTS																						
FREQUENCY			Mode	Bandwidth [MHz]	Wrist Band Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Housing Type	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	Sport	25.0	23.11	0.14	0	Aluminum	D92WV00RK47D	QPSK	1	49	10 mm	front	1:1	0.001	1.545	0.002	A4
707.50	23095	Mid	LTE Band 12	10	Sport	24.0	22.64	0.16	1	Aluminum	D92WV00RK47D	QPSK	25	25	10 mm	front	1:1	0.001	1.368	0.001	
707.50	23095	Mid	LTE Band 12	10	Metal Links	25.0	23.11	-0.19	0	Aluminum	D92WV00EK47D	QPSK	1	49	10 mm	front	1:1	0.000	1.545	0.000	
707.50	23095	Mid	LTE Band 12	10	Metal Links	24.0	22.64	-0.10	1	Aluminum	D92WV00EK47D	QPSK	25	25	10 mm	front	1:1	0.000	1.368	0.000	
707.50	23095	Mid	LTE Band 12	10	Metal Loop	25.0	23.11	0.18	0	Aluminum	D92WV00RK47D	QPSK	1	49	10 mm	front	1:1	0.001	1.545	0.002	
707.50	23095	Mid	LTE Band 12	10	Metal Loop	24.0	22.64	0.18	1	Aluminum	D92WV00EK47D	QPSK	25	25	10 mm	front	1:1	0.001	1.368	0.001	
707.50	23095	Mid	LTE Band 12	10	Sport	25.0	23.11	0.14	0	Stainless Steel	D92WV00EK47H	QPSK	1	49	10 mm	front	1:1	0.000	1.545	0.000	
707.50	23095	Mid	LTE Band 12	10	Sport	24.0	22.64	0.20	1	Stainless Steel	D92WV00EK47H	QPSK	25	25	10 mm	front	1:1	0.000	1.368	0.000	
707.50	23095	Mid	LTE Band 12	10	Metal Links	25.0	23.11	-0.14	0	Stainless Steel	D92WV00KK47H	QPSK	1	49	10 mm	front	1:1	0.001	1.545	0.002	
707.50	23095	Mid	LTE Band 12	10	Metal Links	24.0	22.64	0.14	1	Stainless Steel	D92WV00KK47H	QPSK	25	25	10 mm	front	1:1	0.001	1.368	0.001	
707.50	23095	Mid	LTE Band 12	10	Metal Loop	25.0	23.11	0.08	0	Stainless Steel	D92WV00EK47H	QPSK	1	49	10 mm	front	1:1	0.001	1.545	0.002	
707.50	23095	Mid	LTE Band 12	10	Metal Loop	24.0	22.64	0.13	1	Stainless Steel	D92WV00EK47H	QPSK	25	25	10 mm	front	1:1	0.001	1.368	0.001	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram												

Table 10-3
LTE Band 13 Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Wrist Band Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Housing Type	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	Sport	25.0	23.25	0.20	0	Aluminum	D92WV00FK47D	QPSK	1	0	10 mm	front	1:1	0.001	1.496	0.001	
782.00	23230	Mid	LTE Band 13	10	Sport	24.0	22.75	0.14	1	Aluminum	D92WV00RK47D	QPSK	25	0	10 mm	front	1:1	0.001	1.334	0.001	
782.00	23230	Mid	LTE Band 13	10	Metal Links	25.0	23.25	-0.16	0	Aluminum	D92WV00FK47D	QPSK	1	0	10 mm	front	1:1	0.001	1.496	0.001	
782.00	23230	Mid	LTE Band 13	10	Metal Links	24.0	22.75	0.17	1	Aluminum	D92WV00EK47D	QPSK	25	0	10 mm	front	1:1	0.000	1.334	0.000	
782.00	23230	Mid	LTE Band 13	10	Metal Loop	25.0	23.25	0.05	0	Aluminum	D92WV00GK47D	QPSK	1	0	10 mm	front	1:1	0.001	1.496	0.001	A5
782.00	23230	Mid	LTE Band 13	10	Metal Loop	24.0	22.75	0.16	1	Aluminum	D92WV00RK47D	QPSK	25	0	10 mm	front	1:1	0.001	1.334	0.001	
782.00	23230	Mid	LTE Band 13	10	Sport	25.0	23.25	-0.17	0	Stainless Steel	D92WV00KK47H	QPSK	1	0	10 mm	front	1:1	0.001	1.496	0.001	
782.00	23230	Mid	LTE Band 13	10	Sport	24.0	22.75	0.14	1	Stainless Steel	D92WV00RK47H	QPSK	25	0	10 mm	front	1:1	0.000	1.334	0.000	
782.00	23230	Mid	LTE Band 13	10	Metal Links	25.0	23.25	0.13	0	Stainless Steel	D92WV00SK47H	QPSK	1	0	10 mm	front	1:1	0.000	1.496	0.000	
782.00	23230	Mid	LTE Band 13	10	Metal Links	24.0	22.75	0.12	1	Stainless Steel	D92WV00QK47H	QPSK	25	0	10 mm	front	1:1	0.000	1.334	0.000	
782.00	23230	Mid	LTE Band 13	10	Metal Loop	25.0	23.25	0.13	0	Stainless Steel	D92WV00QK47H	QPSK	1	0	10 mm	front	1:1	0.001	1.496	0.001	
782.00	23230	Mid	LTE Band 13	10	Metal Loop	24.0	22.75	0.14	1	Stainless Steel	D92WV00RK47H	QPSK	25	0	10 mm	front	1:1	0.000	1.334	0.000	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram												

Table 10-4
LTE Band 5 (Cell) Head SAR

MEASUREMENT RESULTS																				
FREQUENCY			Mode	Bandwidth [MHz]	Wrist Band Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Housing Type	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Sport	25.0	23.38	0.13	0	Aluminum	D92WV00EK47D	QPSK	1	49	10 mm	front	1:1	0.003	1.452	0.004	A6
836.50	20525	Mid	LTE Band 5 (Cell)	10	Sport	24.0	22.73	0.08	1	Aluminum	D92WV00EK47D	QPSK	25	25	10 mm	front	1:1	0.003	1.340	0.004	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Metal Links	25.0	23.38	0.13	0	Aluminum	D92WV00RK47D	QPSK	1	49	10 mm	front	1:1	0.002	1.452	0.003	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Metal Links	24.0	22.73	0.13	1	Aluminum	D92WV00ZK47D	QPSK	25	25	10 mm	front	1:1	0.002	1.340	0.003	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Metal Loop	25.0	23.38	-0.03	0	Aluminum	D92WV00GK47D	QPSK	1	49	10 mm	front	1:1	0.003	1.452	0.004	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Metal Loop	24.0	22.73	0.13	1	Aluminum	D92WV00GK47D	QPSK	25	25	10 mm	front	1:1	0.002	1.340	0.003	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Sport	25.0	23.38	0.15	0	Stainless Steel	D92WV00KK47H	QPSK	1	49	10 mm	front	1:1	0.003	1.452	0.004	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Sport	24.0	22.73	0.15	1	Stainless Steel	D92WV00KK47H	QPSK	25	25	10 mm	front	1:1	0.002	1.340	0.003	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Metal Links	25.0	23.38	0.13	0	Stainless Steel	D92WV00EK47H	QPSK	1	49	10 mm	front	1:1	0.003	1.452	0.004	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Metal Links	24.0	22.73	0.13	1	Stainless Steel	D92WV00EK47H	QPSK	25	25	10 mm	front	1:1	0.002	1.340	0.003	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Metal Loop	25.0	23.38	0.15	0	Stainless Steel	D92WV00RK47H	QPSK	1	49	10 mm	front	1:1	0.003	1.452	0.004	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Metal Loop	24.0	22.73	0.18	1	Stainless Steel	D92WV00RK47H	QPSK	25	25	10 mm	front	1:1	0.003	1.340	0.004	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram												

Table 10-5
LTE Band 26 (Cell) Head SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Wrist Band Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Housing Type	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)	10	Sport	25.0	23.34	0.01	0	Aluminum	D92WV00FK47D	QPSK	1	49	10 mm	front	1:1	0.004	1.466	0.006	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Sport	24.0	22.77	0.16	1	Aluminum	D92WV00FK47D	QPSK	25	25	10 mm	front	1:1	0.003	1.327	0.004	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Metal Links	25.0	23.34	0.02	0	Aluminum	D92WV00RK47D	QPSK	1	49	10 mm	front	1:1	0.002	1.466	0.003	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Metal Links	24.0	22.77	-0.11	1	Aluminum	D92WV00RK47D	QPSK	25	25	10 mm	front	1:1	0.002	1.327	0.003	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Metal Loop	25.0	23.34	0.11	0	Aluminum	D92WV00GK47D	QPSK	1	49	10 mm	front	1:1	0.001	1.466	0.001	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Metal Loop	24.0	22.77	0.04	1	Aluminum	D92WV00GK47D	QPSK	25	25	10 mm	front	1:1	0.001	1.327	0.001	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Sport	25.0	23.34	-0.12	0	Stainless Steel	D92WV00QK47H	QPSK	1	49	10 mm	front	1:1	0.002	1.466	0.003	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Sport	24.0	22.77	-0.04	1	Stainless Steel	D92WV00QK47H	QPSK	25	25	10 mm	front	1:1	0.001	1.327	0.001	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Metal Links	25.0	23.34	0.18	0	Stainless Steel	D92WV00EK47H	QPSK	1	49	10 mm	front	1:1	0.004	1.466	0.006	A7
831.50	26865	Mid	LTE Band 26 (Cell)	10	Metal Links	24.0	22.77	0.18	1	Stainless Steel	D92WV00EK47H	QPSK	25	25	10 mm	front	1:1	0.003	1.327	0.004	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Metal Loop	25.0	23.34	0.13	0	Stainless Steel	D92WV00KK47H	QPSK	1	49	10 mm	front	1:1	0.002	1.466	0.003	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Metal Loop	24.0	22.77	0.13	1	Stainless Steel	D92WV00KK47H	QPSK	25	25	10 mm	front	1:1	0.002	1.327	0.003	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram												

Table 10-6
LTE Band 4 (AWS) Head SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Wrist Band Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Housing Type	Device Serial Number	Modulation	RB Size	RB Offset	Spacing	Side	Duty Cycle	SAR (1g)	Scaling Factor	Reported SAR (1g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Sport	23.5	22.35	-0.08	0	Aluminum	D92WV00RK47D	QPSK	1	50	10 mm	front	1:1	0.102	1.303	0.133	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Sport	22.5	21.53	0.12	1	Aluminum	D92WV00RK47D	QPSK	50	50	10 mm	front	1:1	0.085	1.250	0.106	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Metal Links	23.5	22.35	0.04	0	Aluminum	D92WV00EK47D	QPSK	1	50	10 mm	front	1:1	0.119	1.303	0.155	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Metal Links	22.5	21.53	-0.01	1	Aluminum	D92WV00EK47D	QPSK	50	50	10 mm	front	1:1	0.096	1.250	0.120	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Metal Loop	23.5	22.35	0.00	0	Aluminum	D92WV00RK47D	QPSK	1	50	10 mm	front	1:1	0.189	1.303	**0.246**	A8
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Metal Loop	22.5	21.53	0.11	1	Aluminum	D92WV00RK47D	QPSK	50	50	10 mm	front	1:1	0.159	1.250	0.199	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Sport	23.5	22.35	0.01	0	Stainless Steel	D92WV00SK47H	QPSK	1	50	10 mm	front	1:1	0.084	1.303	0.109	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Sport	22.5	21.53	0.01	1	Stainless Steel	D92WV00SK47H	QPSK	50	50	10 mm	front	1:1	0.071	1.250	0.089	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Metal Links	23.5	22.35	0.04	0	Stainless Steel	D92WV00EK47H	QPSK	1	50	10 mm	front	1:1	0.131	1.303	0.171	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Metal Links	22.5	21.53	0.13	1	Stainless Steel	D92WV00EK47H	QPSK	50	50	10 mm	front	1:1	0.107	1.250	0.134	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Metal Loop	23.5	22.35	0.00	0	Stainless Steel	D92WV00SK47H	QPSK	1	50	10 mm	front	1:1	0.140	1.303	0.182	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Metal Loop	22.5	21.53	-0.02	1	Stainless Steel	D92WV00SK47H	QPSK	50	50	10 mm	front	1:1	0.114	1.250	0.143	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram												

Table 10-7
LTE Band 25 (PCS) Head SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Wrist Band Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Housing Type	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	Sport	23.5	22.03	0.13	0	Aluminum	D92WV00NK47D	QPSK	1	0	10 mm	front	1:1	0.065	1.403	0.091	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Sport	22.5	21.27	0.10	1	Aluminum	D92WV00NK47D	QPSK	50	0	10 mm	front	1:1	0.058	1.327	0.077	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Metal Links	23.5	22.03	0.06	0	Aluminum	D92WV00EK47D	QPSK	1	0	10 mm	front	1:1	0.084	1.403	0.118	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Metal Links	22.5	21.27	0.06	1	Aluminum	D92WV00EK47D	QPSK	50	0	10 mm	front	1:1	0.071	1.327	0.094	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Metal Loop	23.5	22.03	0.02	0	Aluminum	D92WV00ZK47D	QPSK	1	0	10 mm	front	1:1	0.103	1.403	0.145	A9
1860.00	26140	Low	LTE Band 25 (PCS)	20	Metal Loop	22.5	21.27	-0.01	1	Aluminum	D92WV00ZK47D	QPSK	50	0	10 mm	front	1:1	0.088	1.327	0.117	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Sport	23.5	22.03	-0.11	0	Stainless Steel	D92WV00SK47H	QPSK	1	0	10 mm	front	1:1	0.065	1.403	0.091	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Sport	22.5	21.27	0.06	1	Stainless Steel	D92WV00SK47H	QPSK	50	0	10 mm	front	1:1	0.057	1.327	0.076	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Metal Links	23.5	22.03	0.11	0	Stainless Steel	D92WV00QK47H	QPSK	1	0	10 mm	front	1:1	0.065	1.403	0.091	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Metal Links	22.5	21.27	0.07	1	Stainless Steel	D92WV00QK47H	QPSK	50	0	10 mm	front	1:1	0.056	1.327	0.074	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Metal Loop	23.5	22.03	0.07	0	Stainless Steel	D92WV00KK47H	QPSK	1	0	10 mm	front	1:1	0.093	1.403	0.130	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Metal Loop	22.5	21.27	0.02	1	Stainless Steel	D92WV00KK47H	QPSK	50	0	10 mm	front	1:1	0.078	1.327	0.104	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram												

Table 10-8
LTE Band 41 Head SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Wrist Band Type	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	MPR [dB]	Housing Type	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)	
2680.00	41490	High	LTE Band 41	20	Sport	22.75	21.66	-0.07	0	Aluminum	D92WV00HK47D	QPSK	1	0	10 mm	front	1:1.58	0.153	1.285	0.197	
2680.00	41490	High	LTE Band 41	20	Sport	20.75	20.19	-0.01	2	Aluminum	D92WV00HK47D	QPSK	50	0	10 mm	front	1:1.58	0.115	1.138	0.131	
2680.00	41490	High	LTE Band 41	10	Sport	21.75	20.53	-0.02	1	Aluminum	D92WV00HK47D	QPSK	50	0	10 mm	front	1:1.58	0.132	1.324	0.175	
2680.00	41490	High	LTE Band 41	20	Metal Links	22.75	21.66	-0.08	0	Aluminum	D92WV00HK47D	QPSK	1	0	10 mm	front	1:1.58	0.131	1.285	0.168	
2680.00	41490	High	LTE Band 41	20	Metal Links	20.75	20.19	-0.06	2	Aluminum	D92WV00HK47D	QPSK	50	0	10 mm	front	1:1.58	0.089	1.138	0.101	
2680.00	41490	High	LTE Band 41	10	Metal Links	21.75	20.53	-0.05	1	Aluminum	D92WV00HK47D	QPSK	50	0	10 mm	front	1:1.58	0.120	1.324	0.159	
2680.00	41490	High	LTE Band 41	20	Metal Loop	22.75	21.66	-0.02	0	Aluminum	D92WV00HK47D	QPSK	1	0	10 mm	front	1:1.58	0.121	1.285	0.155	
2680.00	41490	High	LTE Band 41	20	Metal Loop	20.75	20.19	0.00	2	Aluminum	D92WV00HK47D	QPSK	50	0	10 mm	front	1:1.58	0.091	1.138	0.104	
2680.00	41490	High	LTE Band 41	10	Metal Loop	21.75	20.53	0.01	1	Aluminum	D92WV00HK47D	QPSK	50	0	10 mm	front	1:1.58	0.109	1.324	0.144	
2680.00	41490	High	LTE Band 41	20	Sport	22.75	21.66	-0.13	0	Stainless Steel	D92WV00HK47H	QPSK	1	0	10 mm	front	1:1.58	0.182	1.285	0.234	A10
2680.00	41490	High	LTE Band 41	20	Sport	20.75	20.19	0.00	2	Stainless Steel	D92WV00HK47H	QPSK	50	0	10 mm	front	1:1.58	0.131	1.138	0.149	
2680.00	41490	High	LTE Band 41	10	Sport	21.75	20.53	0.01	1	Stainless Steel	D92WV00HK47H	QPSK	50	0	10 mm	front	1:1.58	0.146	1.324	0.193	
2680.00	41490	High	LTE Band 41	20	Metal Links	22.75	21.66	-0.13	0	Stainless Steel	D92WV00HK47H	QPSK	1	0	10 mm	front	1:1.58	0.160	1.285	0.206	
2680.00	41490	High	LTE Band 41	20	Metal Links	20.75	20.19	0.17	2	Stainless Steel	D92WV00HK47H	QPSK	50	0	10 mm	front	1:1.58	0.096	1.138	0.109	
2680.00	41490	High	LTE Band 41	10	Metal Links	21.75	20.53	0.00	1	Stainless Steel	D92WV00HK47H	QPSK	50	0	10 mm	front	1:1.58	0.120	1.324	0.159	
2680.00	41490	High	LTE Band 41	20	Metal Loop	22.75	21.66	0.08	0	Stainless Steel	D92WV00HK47H	QPSK	1	0	10 mm	front	1:1.58	0.148	1.285	0.190	
2680.00	41490	High	LTE Band 41	20	Metal Loop	20.75	20.19	0.03	2	Stainless Steel	D92WV00HK47H	QPSK	50	0	10 mm	front	1:1.58	0.108	1.138	0.123	
2680.00	41490	High	LTE Band 41	10	Metal Loop	21.75	20.53	0.12	1	Stainless Steel	D92WV00HK47H	QPSK	50	0	10 mm	front	1:1.58	0.130	1.324	0.172	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population									Head 1.6 W/kg (mW/g) averaged over 1 gram												

Table 10-9
2.4 GHz WLAN Head SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Housing Type	Wrist Band Type	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)	
2412	1	802.11b	DSSS	22	19.0	18.97	0.14	10 mm	Aluminum	Sports	D92WV00CK47D	1	front	99.2	0.090	1.007	1.008	0.091	
2412	1	802.11b	DSSS	22	19.0	18.97	0.15	10 mm	Aluminum	Metal Links	D92WV00HK47D	1	front	99.2	0.073	1.007	1.008	0.074	
2412	1	802.11b	DSSS	22	19.0	18.97	-0.03	10 mm	Aluminum	Metal Loop	D92WV00HK47D	1	front	99.2	0.070	1.007	1.008	0.071	
2412	1	802.11b	DSSS	22	19.0	18.97	0.14	10 mm	Stainless Steel	Sports	D92WV00TK47H	1	front	99.2	0.093	1.007	1.008	0.094	A11
2412	1	802.11b	DSSS	22	19.0	18.97	0.20	10 mm	Stainless Steel	Metal Links	D92WV00WK47H	1	front	99.2	0.064	1.007	1.008	0.065	
2412	1	802.11b	DSSS	22	19.0	18.97	0.02	10 mm	Stainless Steel	Metal Loop	D92WV00TK47H	1	front	99.2	0.079	1.007	1.008	0.080	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Head 1.6 W/kg (mW/g) averaged over 1 gram											

Table 10-10
Bluetooth (ePA) Head SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Housing Type	Wrist Band Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor (Cond Power)	Reported SAR (1g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
2441	39	Bluetooth	FHSS	18.0	18.00	0.04	10 mm	Aluminum	Sport	D92WV00CK47D	1	front	1:1	0.099	1.000	0.099	
2441	39	Bluetooth	FHSS	18.0	18.00	0.09	10 mm	Aluminum	Metal Links	D92WV00CK47D	1	front	1:1	0.080	1.000	0.080	
2441	39	Bluetooth	FHSS	18.0	18.00	0.04	10 mm	Aluminum	Metal Loop	D92WV00CK47D	1	front	1:1	0.079	1.000	0.079	
2441	39	Bluetooth	FHSS	18.0	18.00	-0.02	10 mm	Stainless Steel	Sport	D92WV00TK47H	1	front	1:1	0.103	1.000	0.103	A12
2441	39	Bluetooth	FHSS	18.0	18.00	0.04	10 mm	Stainless Steel	Metal Links	D92WV00TK47H	1	front	1:1	0.075	1.000	0.075	
2441	39	Bluetooth	FHSS	18.0	18.00	0.04	10 mm	Stainless Steel	Metal Loop	D92WV00TK47H	1	front	1:1	0.082	1.000	0.082	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram										

Table 10-11
Bluetooth (iPA) Head SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Housing Type	Wrist Band Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (1g)	Scaling Factor (Cond Power)	Reported SAR (1g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
2441	39	Bluetooth	FHSS	13.0	13.00	-0.06	10 mm	Aluminum	Sport	D92WV00HK47D	1	front	1:1	0.031	1.000	0.031	A13
2441	39	Bluetooth	FHSS	13.0	13.00	0.09	10 mm	Aluminum	Metal Links	D92WV00HK47D	1	front	1:1	0.027	1.000	0.027	
2441	39	Bluetooth	FHSS	13.0	13.00	0.06	10 mm	Aluminum	Metal Loop	D92WV00HK47D	1	front	1:1	0.026	1.000	0.026	
2441	39	Bluetooth	FHSS	13.0	13.00	-0.06	10 mm	Stainless Steel	Sport	D92WV00WK47H	1	front	1:1	0.025	1.000	0.025	
2441	39	Bluetooth	FHSS	13.0	13.00	-0.07	10 mm	Stainless Steel	Metal Links	D92WV00WK47H	1	front	1:1	0.018	1.000	0.018	
2441	39	Bluetooth	FHSS	13.0	13.00	0.12	10 mm	Stainless Steel	Metal Loop	D92WV00WK47H	1	front	1:1	0.017	1.000	0.017	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Head 1.6 W/kg (mW/g) averaged over 1 gram										

10.2 Standalone Extremity SAR Data

Table 10-12
UMTS Extremity SAR Data

MEASUREMENT RESULTS																
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Housing Type	Wrist Band Type	Device Serial Number	Duty Cycle	Side	SAR (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.												(W/kg)		(W/kg)	
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.02	0 mm	Aluminum	Sport	D92WV00NK47D	1:1	back	0.132	1.216	0.161	
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.03	0 mm	Aluminum	Metal Links	D92WV00NK47D	1:1	back	0.200	1.216	0.243	A14
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.07	0 mm	Aluminum	Metal Loop	D92WV00EK47D	1:1	back	0.162	1.216	0.197	
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.03	0 mm	Stainless Steel	Sport	D92WV00SK47H	1:1	back	0.125	1.216	0.152	
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.01	0 mm	Stainless Steel	Metal Links	D92WV00SK47H	1:1	back	0.189	1.216	0.230	
836.60	4183	UMTS 850	RMC	25.0	24.15	-0.15	0 mm	Stainless Steel	Metal Loop	D92WV00KK47H	1:1	back	0.150	1.216	0.182	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	-0.05	0 mm	Aluminum	Sport	D92WV00RK47D	1:1	back	0.056	1.175	0.066	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	0.10	0 mm	Aluminum	Metal Links	D92WV00GK47D	1:1	back	0.044	1.175	0.052	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	0.04	0 mm	Aluminum	Metal Loop	D92WV00FK47D	1:1	back	0.016	1.175	0.019	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	-0.02	0 mm	Stainless Steel	Sport	D92WV00RK47H	1:1	back	0.046	1.175	0.054	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	-0.01	0 mm	Stainless Steel	Metal Links	D92WV00KK47H	1:1	back	0.041	1.175	0.048	
1732.40	1412	UMTS 1750	RMC	23.5	22.80	0.01	0 mm	Stainless Steel	Metal Loop	D92WV00SK47H	1:1	back	0.060	1.175	0.071	A15
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.12	0 mm	Aluminum	Sport	D92WV00RK47D	1:1	back	0.015	1.199	0.018	
1880.00	9400	UMTS 1900	RMC	23.5	22.71	-0.11	0 mm	Aluminum	Metal Links	D92WV00NK47D	1:1	back	0.007	1.199	0.008	
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.08	0 mm	Aluminum	Metal Loop	D92WV00RK47D	1:1	back	0.003	1.199	0.004	
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.02	0 mm	Stainless Steel	Sport	D92WV00RK47H	1:1	back	0.015	1.199	0.018	A16
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.11	0 mm	Stainless Steel	Metal Links	D92WV00QK47H	1:1	back	0.006	1.199	0.007	
1880.00	9400	UMTS 1900	RMC	23.5	22.71	0.18	0 mm	Stainless Steel	Metal Loop	D92WV00EK47H	1:1	back	0.005	1.199	0.006	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Extremity 4.0 W/kg (mW/g) averaged over 10 grams									

Table 10-13
LTE Band 12 Extremity SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Housing Type	Wrist Band Type	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 (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
707.50	23095	Mid	LTE Band 12	10	Aluminum	Sport	25.0	23.11	-0.04	0	D92WV00FK47D	QPSK	1	49	0 mm	back	1:1	0.098	1.545	0.151	
707.50	23095	Mid	LTE Band 12	10	Aluminum	Sport	24.0	22.64	-0.03	1	D92WV00FK47D	QPSK	25	25	0 mm	back	1:1	0.086	1.368	0.118	
707.50	23095	Mid	LTE Band 12	10	Aluminum	Metal Links	25.0	23.11	-0.16	0	D92WV00EK47D	QPSK	1	49	0 mm	back	1:1	0.117	1.545	0.181	A17
707.50	23095	Mid	LTE Band 12	10	Aluminum	Metal Links	24.0	22.64	-0.18	1	D92WV00EK47D	QPSK	25	25	0 mm	back	1:1	0.096	1.368	0.131	
707.50	23095	Mid	LTE Band 12	10	Aluminum	Metal Loop	25.0	23.11	-0.19	0	D92WV00FK47D	QPSK	1	49	0 mm	back	1:1	0.098	1.545	0.151	
707.50	23095	Mid	LTE Band 12	10	Aluminum	Metal Loop	24.0	22.64	-0.10	1	D92WV00FK47D	QPSK	25	25	0 mm	back	1:1	0.085	1.368	0.116	
707.50	23095	Mid	LTE Band 12	10	Stainless Steel	Sport	25.0	23.11	-0.07	0	D92WV00SK47H	QPSK	1	49	0 mm	back	1:1	0.075	1.545	0.116	
707.50	23095	Mid	LTE Band 12	10	Stainless Steel	Sport	24.0	22.64	0.02	1	D92WV00SK47H	QPSK	25	25	0 mm	back	1:1	0.063	1.368	0.086	
707.50	23095	Mid	LTE Band 12	10	Stainless Steel	Metal Links	25.0	23.11	-0.03	0	D92WV00KK47H	QPSK	1	49	0 mm	back	1:1	0.111	1.545	0.171	
707.50	23095	Mid	LTE Band 12	10	Stainless Steel	Metal Links	24.0	22.64	-0.05	1	D92WV00KK47H	QPSK	25	25	0 mm	back	1:1	0.092	1.368	0.126	
707.50	23095	Mid	LTE Band 12	10	Stainless Steel	Metal Loop	25.0	23.11	-0.18	0	D92WV00EK47H	QPSK	1	49	0 mm	back	1:1	0.104	1.545	0.161	
707.50	23095	Mid	LTE Band 12	10	Stainless Steel	Metal Loop	24.0	22.64	-0.06	1	D92WV00EK47H	QPSK	25	25	0 mm	back	1:1	0.085	1.368	0.116	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Extremity 4.0 W/kg (mW/g) averaged over 10 grams											

Table 10-14
LTE Band 13 Extremity SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Housing Type	Wrist Band Type	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 (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
782.00	23230	Mid	LTE Band 13	10	Aluminum	Sport	25.0	23.25	-0.09	0	D92WV00GK47D	QPSK	1	0	0 mm	back	1:1	0.081	1.496	0.121	
782.00	23230	Mid	LTE Band 13	10	Aluminum	Sport	24.0	22.75	0.00	1	D92WV00GK47D	QPSK	25	0	0 mm	back	1:1	0.078	1.334	0.104	
782.00	23230	Mid	LTE Band 13	10	Aluminum	Metal Links	25.0	23.25	-0.13	0	D92WV00FK47D	QPSK	1	0	0 mm	back	1:1	0.117	1.496	0.175	A18
782.00	23230	Mid	LTE Band 13	10	Aluminum	Metal Links	24.0	22.75	-0.12	1	D92WV00FK47D	QPSK	25	0	0 mm	back	1:1	0.102	1.334	0.136	
782.00	23230	Mid	LTE Band 13	10	Aluminum	Metal Loop	25.0	23.25	-0.12	0	D92WV00ZK47D	QPSK	1	0	0 mm	back	1:1	0.110	1.496	0.165	
782.00	23230	Mid	LTE Band 13	10	Aluminum	Metal Loop	24.0	22.75	-0.12	1	D92WV00ZK47D	QPSK	25	0	0 mm	back	1:1	0.097	1.334	0.129	
782.00	23230	Mid	LTE Band 13	10	Stainless Steel	Sport	25.0	23.25	-0.04	0	D92WV00QK47H	QPSK	1	0	0 mm	back	1:1	0.068	1.496	0.102	
782.00	23230	Mid	LTE Band 13	10	Stainless Steel	Sport	24.0	22.75	0.11	1	D92WV00QK47H	QPSK	25	0	0 mm	back	1:1	0.064	1.334	0.085	
782.00	23230	Mid	LTE Band 13	10	Stainless Steel	Metal Links	25.0	23.25	-0.02	0	D92WV00SK47H	QPSK	1	0	0 mm	back	1:1	0.111	1.496	0.166	
782.00	23230	Mid	LTE Band 13	10	Stainless Steel	Metal Links	24.0	22.75	0.07	1	D92WV00SK47H	QPSK	25	0	0 mm	back	1:1	0.096	1.334	0.128	
782.00	23230	Mid	LTE Band 13	10	Stainless Steel	Metal Loop	25.0	23.25	0.02	0	D92WV00EK47H	QPSK	1	0	0 mm	back	1:1	0.069	1.496	0.103	
782.00	23230	Mid	LTE Band 13	10	Stainless Steel	Metal Loop	24.0	22.75	0.08	1	D92WV00EK47H	QPSK	25	0	0 mm	back	1:1	0.061	1.334	0.081	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Extremity 4.0 W/kg (mW/g) averaged over 10 grams										

Table 10-15
LTE Band 5 (Cell) Extremity SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Housing Type	Wrist Band Type	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 (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Aluminum	Sport	25.0	23.38	-0.04	0	D92WV00NK47D	QPSK	1	49	0 mm	back	1:1	0.111	1.452	0.161	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Aluminum	Sport	24.0	22.73	0.02	1	D92WV00NK47D	QPSK	25	25	0 mm	back	1:1	0.095	1.340	0.127	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Aluminum	Metal Links	25.0	23.38	-0.10	0	D92WV00EK47D	QPSK	1	49	0 mm	back	1:1	0.187	1.452	**0.272**	A19
836.50	20525	Mid	LTE Band 5 (Cell)	10	Aluminum	Metal Links	24.0	22.73	-0.01	1	D92WV00EK47D	QPSK	25	25	0 mm	back	1:1	0.158	1.340	0.212	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Aluminum	Metal Loop	25.0	23.38	-0.09	0	D92WV00GK47D	QPSK	1	49	0 mm	back	1:1	0.134	1.452	0.195	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Aluminum	Metal Loop	24.0	22.73	0.12	1	D92WV00GK47D	QPSK	25	25	0 mm	back	1:1	0.113	1.340	0.151	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Stainless Steel	Sport	25.0	23.38	-0.01	0	D92WV00RK47H	QPSK	1	49	0 mm	back	1:1	0.105	1.452	0.152	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Stainless Steel	Sport	24.0	22.73	-0.04	1	D92WV00RK47H	QPSK	25	25	0 mm	back	1:1	0.088	1.340	0.118	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Stainless Steel	Metal Links	25.0	23.38	-0.03	0	D92WV00KK47H	QPSK	1	49	0 mm	back	1:1	0.173	1.452	0.251	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Stainless Steel	Metal Links	24.0	22.73	0.06	1	D92WV00KK47H	QPSK	25	25	0 mm	back	1:1	0.144	1.340	0.193	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Stainless Steel	Metal Loop	25.0	23.38	0.05	0	D92WV00KK47H	QPSK	1	49	0 mm	back	1:1	0.137	1.452	0.199	
836.50	20525	Mid	LTE Band 5 (Cell)	10	Stainless Steel	Metal Loop	24.0	22.73	-0.11	1	D92WV00KK47H	QPSK	25	25	0 mm	back	1:1	0.103	1.340	0.138	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population											Extremity 4.0 W/kg (mW/g) averaged over 10 grams										

Table 10-16
LTE Band 26 (Cell) Extremity SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Housing Type	Wrist Band Type	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 (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Aluminum	Sport	25.0	23.34	-0.01	0	D92WV00GK47D	QPSK	1	49	0 mm	back	1:1	0.093	1.466	0.136	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Aluminum	Sport	24.0	22.77	-0.01	1	D92WV00GK47D	QPSK	25	25	0 mm	back	1:1	0.079	1.327	0.105	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Aluminum	Metal Links	25.0	23.34	-0.04	0	D92WV00GK47D	QPSK	1	49	0 mm	back	1:1	0.152	1.466	0.223	A20
831.50	26865	Mid	LTE Band 26 (Cell)	10	Aluminum	Metal Links	24.0	22.77	0.05	1	D92WV00GK47D	QPSK	25	25	0 mm	back	1:1	0.129	1.327	0.171	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Aluminum	Metal Loop	25.0	23.34	0.01	0	D92WV00EK47D	QPSK	1	49	0 mm	back	1:1	0.121	1.466	0.177	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Aluminum	Metal Loop	24.0	22.77	-0.02	1	D92WV00EK47D	QPSK	25	25	0 mm	back	1:1	0.103	1.327	0.137	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Stainless Steel	Sport	25.0	23.34	-0.11	0	D92WV00SK47H	QPSK	1	49	0 mm	back	1:1	0.103	1.466	0.151	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Stainless Steel	Sport	24.0	22.77	-0.04	1	D92WV00SK47H	QPSK	25	25	0 mm	back	1:1	0.086	1.327	0.114	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Stainless Steel	Metal Links	25.0	23.34	0.05	0	D92WV00KK47H	QPSK	1	49	0 mm	back	1:1	0.139	1.466	0.204	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Stainless Steel	Metal Links	24.0	22.77	-0.07	1	D92WV00KK47H	QPSK	25	25	0 mm	back	1:1	0.117	1.327	0.155	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Stainless Steel	Metal Loop	25.0	23.34	0.02	0	D92WV00RK47H	QPSK	1	49	0 mm	back	1:1	0.107	1.466	0.157	
831.50	26865	Mid	LTE Band 26 (Cell)	10	Stainless Steel	Metal Loop	24.0	22.77	-0.02	1	D92WV00RK47H	QPSK	25	25	0 mm	back	1:1	0.089	1.327	0.118	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Extremity 4.0 W/kg (mW/g) averaged over 10 grams											

Table 10-17
LTE Band 4 (AWS) Extremity SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Housing Type	Wrist Band Type	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 (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Aluminum	Sport	23.5	22.35	-0.15	0	D92WV00ZK47D	QPSK	1	50	0 mm	back	1:1	0.056	1.303	0.073	A21
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Aluminum	Sport	22.5	21.53	0.08	1	D92WV00ZK47D	QPSK	50	50	0 mm	back	1:1	0.035	1.250	0.044	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Aluminum	Metal Links	23.5	22.35	0.02	0	D92WV00EK47D	QPSK	1	50	0 mm	back	1:1	0.022	1.303	0.029	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Aluminum	Metal Links	22.5	21.53	-0.12	1	D92WV00EK47D	QPSK	50	50	0 mm	back	1:1	0.016	1.250	0.020	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Aluminum	Metal Loop	23.5	22.35	0.19	0	D92WV00ZK47D	QPSK	1	50	0 mm	back	1:1	0.028	1.303	0.036	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Aluminum	Metal Loop	22.5	21.53	0.14	1	D92WV00ZK47D	QPSK	50	50	0 mm	back	1:1	0.019	1.250	0.024	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Stainless Steel	Sport	23.5	22.35	0.02	0	D92WV00EK47H	QPSK	1	50	0 mm	back	1:1	0.031	1.303	0.040	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Stainless Steel	Sport	22.5	21.53	0.06	1	D92WV00EK47H	QPSK	50	50	0 mm	back	1:1	0.023	1.250	0.029	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Stainless Steel	Metal Links	23.5	22.35	-0.14	0	D92WV00QK47H	QPSK	1	50	0 mm	back	1:1	0.026	1.303	0.034	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Stainless Steel	Metal Links	22.5	21.53	0.01	1	D92WV00QK47H	QPSK	50	50	0 mm	back	1:1	0.020	1.250	0.025	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Stainless Steel	Metal Loop	23.5	22.35	0.08	0	D92WV00SK47H	QPSK	1	50	0 mm	back	1:1	0.030	1.303	0.039	
1732.50	20175	Mid	LTE Band 4 (AWS)	20	Stainless Steel	Metal Loop	22.5	21.53	0.14	1	D92WV00SK47H	QPSK	50	50	0 mm	back	1:1	0.024	1.250	0.030	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Extremity 4.0 W/kg (mW/g) averaged over 10 grams											

Table 10-18
LTE Band 25 (PCS) Extremity SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Housing Type	Wrist Band Type	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 (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Aluminum	Sport	23.5	22.03	0.14	0	D92WV00ZK47D	QPSK	1	0	0 mm	back	1:1	0.018	1.403	0.025	A22
1860.00	26140	Low	LTE Band 25 (PCS)	20	Aluminum	Sport	22.5	21.27	0.16	1	D92WV00ZK47D	QPSK	50	0	0 mm	back	1:1	0.013	1.327	0.017	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Aluminum	Metal Links	23.5	22.03	-0.07	0	D92WV00EK47D	QPSK	1	0	0 mm	back	1:1	0.006	1.403	0.008	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Aluminum	Metal Links	22.5	21.27	0.12	1	D92WV00EK47D	QPSK	50	0	0 mm	back	1:1	0.005	1.327	0.007	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Aluminum	Metal Loop	23.5	22.03	-0.12	0	D92WV00RK47D	QPSK	1	0	0 mm	back	1:1	0.004	1.403	0.006	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Aluminum	Metal Loop	22.5	21.27	0.14	1	D92WV00RK47D	QPSK	50	0	0 mm	back	1:1	0.003	1.327	0.004	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Stainless Steel	Sport	23.5	22.03	-0.16	0	D92WV00EK47H	QPSK	1	0	0 mm	back	1:1	0.009	1.403	0.013	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Stainless Steel	Sport	22.5	21.27	0.13	1	D92WV00EK47H	QPSK	50	0	0 mm	back	1:1	0.007	1.327	0.009	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Stainless Steel	Metal Links	23.5	22.03	-0.07	0	D92WV00QK47H	QPSK	1	0	0 mm	back	1:1	0.006	1.403	0.008	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Stainless Steel	Metal Links	22.5	21.27	-0.19	1	D92WV00QK47H	QPSK	50	0	0 mm	back	1:1	0.006	1.327	0.008	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Stainless Steel	Metal Loop	23.5	22.03	0.15	0	D92WV00SK47H	QPSK	1	0	0 mm	back	1:1	0.004	1.403	0.006	
1860.00	26140	Low	LTE Band 25 (PCS)	20	Stainless Steel	Metal Loop	22.5	21.27	0.14	1	D92WV00SK47H	QPSK	50	0	0 mm	back	1:1	0.003	1.327	0.004	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Extremity 4.0 W/kg (mW/g) averaged over 10 grams											

Table 10-19
LTE Band 41 Extremity SAR

MEASUREMENT RESULTS																					
FREQUENCY			Mode	Bandwidth [MHz]	Housing Type	Wrist Band Type	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 (10g)	Scaling Factor	Reported SAR (10g)	Plot #
MHz	Ch.																	(W/kg)		(W/kg)	
2680.00	41490	High	LTE Band 41	20	Aluminum	Sport	22.75	21.66	-0.20	0	D92WV00HK47D	QPSK	1	0	0 mm	back	1:1.58	0.034	1.285	0.044	
2680.00	41490	High	LTE Band 41	20	Aluminum	Sport	20.75	20.19	0.12	2	D92WV00HK47D	QPSK	50	0	0 mm	back	1:1.58	0.020	1.138	0.023	
2680.00	41490	High	LTE Band 41	10	Aluminum	Sport	21.75	20.53	0.13	1	D92WV00CK47D	QPSK	50	0	0 mm	back	1:1.58	0.023	1.324	0.030	
2680.00	41490	High	LTE Band 41	20	Aluminum	Metal Links	22.75	21.66	0.13	0	D92WV00HK47D	QPSK	1	0	0 mm	back	1:1.58	0.023	1.285	0.030	
2680.00	41490	High	LTE Band 41	20	Aluminum	Metal Links	20.75	20.19	-0.18	2	D92WV00HK47D	QPSK	50	0	0 mm	back	1:1.58	0.017	1.138	0.019	
2680.00	41490	High	LTE Band 41	10	Aluminum	Metal Links	21.75	20.53	0.19	1	D92WV00CK47D	QPSK	50	0	0 mm	back	1:1.58	0.020	1.324	0.026	
2680.00	41490	High	LTE Band 41	20	Aluminum	Metal Loop	22.75	21.66	0.13	0	D92WV00CK47D	QPSK	1	0	0 mm	back	1:1.58	0.029	1.285	0.037	
2680.00	41490	High	LTE Band 41	20	Aluminum	Metal Loop	20.75	20.19	0.15	2	D92WV00CK47D	QPSK	50	0	0 mm	back	1:1.58	0.022	1.138	0.025	
2680.00	41490	High	LTE Band 41	10	Aluminum	Metal Loop	21.75	20.53	0.17	1	D92WV00HK47D	QPSK	50	0	0 mm	back	1:1.58	0.018	1.324	0.024	
2680.00	41490	High	LTE Band 41	20	Stainless Steel	Sport	22.75	21.66	-0.12	0	D92WV00TK47H	QPSK	1	0	0 mm	back	1:1.58	0.061	1.285	0.078	A23
2680.00	41490	High	LTE Band 41	20	Stainless Steel	Sport	20.75	20.19	-0.12	2	D92WV00TK47H	QPSK	50	0	0 mm	back	1:1.58	0.024	1.138	0.027	
2680.00	41490	High	LTE Band 41	10	Stainless Steel	Sport	21.75	20.53	-0.13	1	D92WV00TK47H	QPSK	50	0	0 mm	back	1:1.58	0.057	1.324	0.075	
2680.00	41490	High	LTE Band 41	20	Stainless Steel	Metal Links	22.75	21.66	0.10	0	D92WV00TK47H	QPSK	1	0	0 mm	back	1:1.58	0.031	1.285	0.040	
2680.00	41490	High	LTE Band 41	20	Stainless Steel	Metal Links	20.75	20.19	0.18	2	D92WV00TK47H	QPSK	50	0	0 mm	back	1:1.58	0.021	1.138	0.024	
2680.00	41490	High	LTE Band 41	10	Stainless Steel	Metal Links	21.75	20.53	0.08	1	D92WV00TK47H	QPSK	50	0	0 mm	back	1:1.58	0.022	1.324	0.029	
2680.00	41490	High	LTE Band 41	20	Stainless Steel	Metal Loop	22.75	21.66	-0.13	0	D92WV00HK47H	QPSK	1	0	0 mm	back	1:1.58	0.012	1.285	0.015	
2680.00	41490	High	LTE Band 41	20	Stainless Steel	Metal Loop	20.75	20.19	-0.01	2	D92WV00HK47H	QPSK	50	0	0 mm	back	1:1.58	0.008	1.138	0.009	
2680.00	41490	High	LTE Band 41	10	Stainless Steel	Metal Loop	21.75	20.53	0.13	1	D92WV00HK47H	QPSK	50	0	0 mm	back	1:1.58	0.009	1.324	0.012	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population										Extremity 4.0 W/kg (mW/g) averaged over 10 grams											

Table 10-20
2.4 GHz WLAN Extremity SAR

MEASUREMENT RESULTS																			
FREQUENCY		Mode	Service	Bandwidth [MHz]	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Housing Type	Wrist Band Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle (%)	SAR (10g)	Scaling Factor (Power)	Scaling Factor (Duty Cycle)	Reported SAR (10g)	Plot #
MHz	Ch.														(W/kg)			(W/kg)	
2412	1	802.11b	DSSS	22	19.0	18.97	0.14	0 mm	Aluminum	Sport	D92WV00HK47D	1	back	99.2	0.035	1.007	1.008	0.036	
2412	1	802.11b	DSSS	22	19.0	18.97	0.03	0 mm	Aluminum	Metal Links	D92WV00HK47D	1	back	99.2	0.041	1.007	1.008	0.042	
2412	1	802.11b	DSSS	22	19.0	18.97	0.16	0 mm	Aluminum	Metal Loop	D92WV00HK47D	1	back	99.2	0.038	1.007	1.008	0.039	
2412	1	802.11b	DSSS	22	19.0	18.97	-0.06	0 mm	Stainless Steel	Sport	D92WV00WK47H	1	back	99.2	0.034	1.007	1.008	0.035	
2412	1	802.11b	DSSS	22	19.0	18.97	0.04	0 mm	Stainless Steel	Metal Links	D92WV00WK47H	1	back	99.2	0.047	1.007	1.008	0.048	A24
2412	1	802.11b	DSSS	22	19.0	18.97	-0.02	0 mm	Stainless Steel	Metal Loop	D92WV00WK47H	1	back	99.2	0.035	1.007	1.008	0.036	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population								Extremity 4.0 W/kg (mW/g) averaged over 10 grams											

Table 10-21
Bluetooth (ePA) Extremity SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Housing Type	Wrist Band Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (10g)	Scaling Factor (Cond Power)	Reported SAR (10g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
2441	39	Bluetooth	FHSS	18.0	18.00	-0.12	0 mm	Aluminum	Sport	D92WV00CK47D	1	back	1:1	0.033	1.000	0.033	
2441	39	Bluetooth	FHSS	18.0	18.00	-0.09	0 mm	Aluminum	Metal Links	D92WV00CK47D	1	back	1:1	0.046	1.000	0.046	A25
2441	39	Bluetooth	FHSS	18.0	18.00	-0.05	0 mm	Aluminum	Metal Loop	D92WV00CK47D	1	back	1:1	0.034	1.000	0.034	
2441	39	Bluetooth	FHSS	18.0	18.00	0.07	0 mm	Stainless Steel	Sport	D92WV00WK47H	1	back	1:1	0.035	1.000	0.035	
2441	39	Bluetooth	FHSS	18.0	18.00	-0.10	0 mm	Stainless Steel	Metal Links	D92WV00WK47H	1	back	1:1	0.043	1.000	0.043	
2441	39	Bluetooth	FHSS	18.0	18.00	0.03	0 mm	Stainless Steel	Metal Loop	D92WV00WK47H	1	back	1:1	0.042	1.000	0.042	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Extremity 4.0 W/kg (mW/g) averaged over 10 grams										

Table 10-22
Bluetooth (iPA) Extremity SAR

MEASUREMENT RESULTS																	
FREQUENCY		Mode	Service	Maximum Allowed Power [dBm]	Conducted Power [dBm]	Power Drift [dB]	Spacing	Housing Type	Wrist Band Type	Device Serial Number	Data Rate (Mbps)	Side	Duty Cycle	SAR (10g)	Scaling Factor (Cond Power)	Reported SAR (10g)	Plot #
MHz	Ch.													(W/kg)		(W/kg)	
2441	39	Bluetooth	FHSS	13.0	13.00	0.15	0 mm	Aluminum	Sport	D92WV00HK47D	1	back	1:1	0.013	1.000	0.013	
2441	39	Bluetooth	FHSS	13.0	13.00	0.14	0 mm	Aluminum	Metal Links	D92WV00HK47D	1	back	1:1	0.017	1.000	0.017	A26
2441	39	Bluetooth	FHSS	13.0	13.00	0.13	0 mm	Aluminum	Metal Loop	D92WV00HK47D	1	back	1:1	0.014	1.000	0.014	
2441	39	Bluetooth	FHSS	13.0	13.00	-0.12	0 mm	Stainless Steel	Sport	D92WV00TK47H	1	back	1:1	0.007	1.000	0.007	
2441	39	Bluetooth	FHSS	13.0	13.00	-0.20	0 mm	Stainless Steel	Metal Links	D92WV00TK47H	1	back	1:1	0.012	1.000	0.012	
2441	39	Bluetooth	FHSS	13.0	13.00	0.10	0 mm	Stainless Steel	Metal Loop	D92WV00TK47H	1	back	1:1	0.009	1.000	0.009	
ANSI / IEEE C95.1 1992 - SAFETY LIMIT Spatial Peak Uncontrolled Exposure/General Population							Extremity 4.0 W/kg (mW/g) averaged over 10 grams										

10.3 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 447498 D01v06.
2. Batteries are fully charged at the beginning of the SAR measurements.
3. Liquid tissue depth was at least 15.0 cm for all frequencies.
4. The manufacturer has confirmed that the device(s) tested have the same physical, mechanical and thermal characteristics and are within operational tolerances expected for production units.
5. SAR results were scaled to the maximum allowed power to demonstrate compliance per FCC KDB Publication 447498 D01v06.
6. Per FCC KDB Publication 865664 D01v01r04, variability SAR tests were not required since measured SAR results for all frequency bands were less than 0.8 W/kg for 1g SAR and 2.0 W/kg for 10g SAR.

7. This device has two housing types: Aluminum and Stainless Steel. The non-metallic wrist accessory, sport band, was evaluated for all exposure conditions. The available metallic wrist accessories, metal links band and metal loop band, were additionally evaluated.
8. This device is a watch and does not support any other use conditions. Therefore the procedures in FCC KDB Publication 447498 D01v06 Section 6.2 have been applied for extremity and next to mouth (head) conditions.

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 SAR and ≤ 2.0 W/kg for 10g SAR then testing at the other channels is not required for such test configuration(s). When the maximum output power variation across the required test channels is > ½ dB, instead of the middle channel, the highest output power channel was used.

LTE Notes:

1. LTE Considerations: LTE test configurations are determined according to SAR Evaluation Considerations for LTE Devices in FCC KDB Publication 941225 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 (scaled) for LTE Band 41 SAR measured at the highest output power channel in a given a test configuration was > 0.6 W/kg for 1g SAR and > 1.5 W/kg for 10g SAR, 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. This device can only operate with 16QAM on the uplink with less than or equal to 27 RB. QPSK and 16QAM LTE powers for RB size of 15 ("50% RB") and 27 ("100% RB") were additionally measured to support comparison and SAR test exclusion per KDB 941225 D05v02r04 Section 5.2.4 and 5.3.

WLAN/Bluetooth Notes:

1. Justification for test configurations for WLAN per KDB Publication 248227 D01v02r02 for 2.4 GHz WIFI operations, the highest measured maximum output power channel for DSSS was selected for SAR measurement. SAR for OFDM modes (2.4 GHz 802.11g/n) was not required due to the maximum allowed powers and the highest reported DSSS SAR. See Section 7.6.2 for more information. When the maximum reported 1g averaged SAR is ≤0.8 W/kg, SAR testing on additional channels was not required. Otherwise, SAR for the next highest output power channel was required until the reported SAR result was ≤ 1.20 W/kg or all test channels were measured.
2. When 10-g SAR measurement is considered, a factor of 2.5 is applied to the thresholds above.
3. 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. The maximum achievable duty cycles for all modes were determined based on measurements performed on a spectrum analyzer in zero-span mode with RBW = 8 MHz, VBW = 50 MHz, and detector = peak per guidance of Section 6.0 b) of ANSI C63. 10-2013 and KDB 558074 D01 v04. The RBW and VBW were both greater than 50/T, where T is the minimum transmission duration, and the number of sweep points across T was

greater than 100.

4. To determine compliance, Bluetooth SAR was measured with internal power amplifier and external power amplifier. Bluetooth was evaluated with a test mode with 100% transmission duty factor.

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, simultaneous transmission SAR test exclusion may be applied when the sum of the 1-g SAR or 10-g SAR for all the simultaneous transmitting antennas in a specific a physical test configuration is ≤1.6 W/kg or ≤4.0 W/kg. The different test positions in an exposure condition may be considered collectively to determine SAR test exclusion according to the sum of 1-g or 10-g SAR.

11.3 Head SAR Simultaneous Transmission Analysis

For SAR summation, the highest reported SAR across all housing and wristband types was used as a conservative evaluation for the simultaneous transmission analysis.

Table 11-1
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Head at 1.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	UMTS 850	0.005	0.094	0.099
	UMTS 1750	0.221	0.094	0.315
	UMTS 1900	0.159	0.094	0.253
	LTE Band 12	0.002	0.094	0.096
	LTE Band 13	0.001	0.094	0.095
	LTE Band 5 (Cell)	0.004	0.094	0.098
	LTE Band 26 (Cell)	0.006	0.094	0.100
	LTE Band 4 (AWS)	0.246	0.094	**0.340**
	LTE Band 25 (PCS)	0.145	0.094	0.239
	LTE Band 41	0.234	0.094	0.328

Table 11-2
Simultaneous Transmission Scenario with Bluetooth (ePA) (Head at 1.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth (ePA) SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	UMTS 850	0.005	0.103	0.108
	UMTS 1750	0.221	0.103	0.324
	UMTS 1900	0.159	0.103	0.262
	LTE Band 12	0.002	0.103	0.105
	LTE Band 13	0.001	0.103	0.104
	LTE Band 5 (Cell)	0.004	0.103	0.107
	LTE Band 26 (Cell)	0.006	0.103	0.109
	LTE Band 4 (AWS)	0.246	0.103	**0.349**
	LTE Band 25 (PCS)	0.145	0.103	0.248
	LTE Band 41	0.234	0.103	0.337

Table 11-3
Simultaneous Transmission Scenario with Bluetooth (iPA) (Head at 1.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth (iPA) SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Head SAR	UMTS 850	0.005	0.031	0.036
	UMTS 1750	0.221	0.031	0.252
	UMTS 1900	0.159	0.031	0.190
	LTE Band 12	0.002	0.031	0.033
	LTE Band 13	0.001	0.031	0.032
	LTE Band 5 (Cell)	0.004	0.031	0.035
	LTE Band 26 (Cell)	0.006	0.031	0.037
	LTE Band 4 (AWS)	0.246	0.031	**0.277**
	LTE Band 25 (PCS)	0.145	0.031	0.176
	LTE Band 41	0.234	0.031	0.265

11.4 Extremity SAR Simultaneous Transmission Analysis

Table 11-4
Simultaneous Transmission Scenario with 2.4 GHz WLAN (Extremity at 0.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	2.4 GHz WLAN SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Extremity SAR	UMTS 850	0.243	0.048	0.291
	UMTS 1750	0.071	0.048	0.119
	UMTS 1900	0.018	0.048	0.066
	LTE Band 12	0.181	0.048	0.229
	LTE Band 13	0.175	0.048	0.223
	LTE Band 5 (Cell)	0.272	0.048	**0.320**
	LTE Band 26 (Cell)	0.223	0.048	0.271
	LTE Band 4 (AWS)	0.073	0.048	0.121
	LTE Band 25 (PCS)	0.025	0.048	0.073
	LTE Band 41	0.078	0.048	0.126

Table 11-5
Simultaneous Transmission Scenario with Bluetooth (ePA) (Extremity at 0.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth (ePA) SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Extremity SAR	UMTS 850	0.243	0.046	0.289
	UMTS 1750	0.071	0.046	0.117
	UMTS 1900	0.018	0.046	0.064
	LTE Band 12	0.181	0.046	0.227
	LTE Band 13	0.175	0.046	0.221
	LTE Band 5 (Cell)	0.272	0.046	**0.318**
	LTE Band 26 (Cell)	0.223	0.046	0.269
	LTE Band 4 (AWS)	0.073	0.046	0.119
	LTE Band 25 (PCS)	0.025	0.046	0.071
	LTE Band 41	0.078	0.046	0.124

Table 11-6
Simultaneous Transmission Scenario with Bluetooth (iPA) (Extremity at 0.0 cm)

Exposure Condition	Mode	3G/4G SAR (W/kg)	Bluetooth (iPA) SAR (W/kg)	Σ SAR (W/kg)
		1	2	1+2
Extremity SAR	UMTS 850	0.243	0.017	0.260
	UMTS 1750	0.071	0.017	0.088
	UMTS 1900	0.018	0.017	0.035
	LTE Band 12	0.181	0.017	0.198
	LTE Band 13	0.175	0.017	0.192
	LTE Band 5 (Cell)	0.272	0.017	**0.289**
	LTE Band 26 (Cell)	0.223	0.017	0.240
	LTE Band 4 (AWS)	0.073	0.017	0.090
	LTE Band 25 (PCS)	0.025	0.017	0.042
	LTE Band 41	0.078	0.017	0.095

11.5 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.

12 SAR MEASUREMENT VARIABILITY

12.1 Measurement Variability

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

12.2 Measurement Uncertainty

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

13 EQUIPMENT LIST

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Agilent	E4438C	ESG Vector Signal Generator	6/22/2018	Annual	6/22/2019	MY53401181
Agilent	E5515C	Wireless Communications Test Set	2/28/2018	Biennial	2/28/2020	GB41450275
Agilent	N5182A	MXG Vector Signal Generator	6/15/2018	Annual	6/15/2019	MY47420837
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343971
Anritsu	MA24106A	USB Power Sensor	1/19/2018	Annual	1/19/2019	1520503
Anritsu	MA24106A	USB Power Sensor	1/19/2018	Annual	1/19/2019	1520501
Anritsu	MA2411B	Pulse Power Sensor	11/15/2017	Annual	11/15/2018	1339007
Anritsu	ML2495A	Power Meter	10/22/2017	Annual	10/22/2018	941001
Anritsu	ML2496A	Power Meter	10/9/2017	Annual	10/9/2018	1138001
Anritsu	MT8820C	Radio Communication Analyzer	6/27/2018	Annual	6/27/2019	6201240328
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/14/2017	Biennial	2/14/2019	170112507
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
MCL	BW-N6W5+	6dB Attenuator	CBT	N/A	CBT	1139
Mini-Circuits	NLP-2950+	Low Pass Filter DC to 2700 MHz	CBT	N/A	CBT	N/A
Mitutoyo	CD-6"CSX	Digital Caliper	CBT	N/A	CBT	11670711
Narda	4772-3	Attenuator (3dB)	CBT	N/A	CBT	9406
Pasternack	PE2208-6	Bidirectional Coupler	CBT	N/A	CBT	N/A
Pasternack	PE5011-1	Torque Wrench	7/19/2017	Biennial	7/19/2019	N/A
Rohde & Schwarz	CMW500	Radio Communication Tester	4/20/2018	Annual	4/20/2019	128635
SPEAG	D750V3	750 MHz SAR Dipole	5/18/2018	Annual	5/18/2019	1034
SPEAG	D835V2	835 MHz SAR Dipole	5/18/2018	Annual	5/18/2019	4d180
SPEAG	D1750V2	1750 MHz SAR Dipole	9/7/2017	Annual	9/7/2018	1104
SPEAG	D1900V2	1900 MHz SAR Dipole	9/7/2017	Annual	9/7/2018	5d181
SPEAG	D1900V2	1900 MHz SAR Dipole	8/16/2017	Annual	8/16/2018	5d180
SPEAG	D2450V2	2450 MHz SAR Dipole	9/11/2017	Annual	9/11/2018	921
SPEAG	D2450V2	2450 MHz SAR Dipole	5/16/2018	Annual	5/16/2019	945
SPEAG	D2450V2	2450 MHz SAR Dipole	6/7/2017	Biennial	6/7/2019	750
SPEAG	D2600V2	2600 MHz SAR Dipole	9/11/2017	Annual	9/11/2018	1069
SPEAG	D2600V2	2600 MHz SAR Dipole	6/19/2018	Annual	6/19/2019	1009
SPEAG	DAE4	Dasy Data Acquisition Electronics	2/8/2018	Annual	2/8/2019	1403
SPEAG	DAE4	Data Acquisition Electronics	1/26/2018	Annual	1/26/2019	1533
SPEAG	DAE4	Dasy Data Acquisition Electronics	6/18/2018	Annual	6/18/2019	701
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/7/2018	Annual	3/7/2019	604
SPEAG	DAE4	Data Acquisition Electronics	1/26/2018	Annual	1/26/2019	1532
SPEAG	DAE4	Dasy Data Acquisition Electronics	5/17/2018	Annual	5/17/2019	728
SPEAG	DAE4	Dasy Data Acquisition Electronics	4/12/2018	Annual	4/12/2019	501
SPEAG	DAK-3.5	Dielectric Assessment Kit	5/15/2018	Annual	5/15/2019	1070
SPEAG	ES3DV3	SAR Probe	2/13/2018	Annual	2/13/2019	3329
SPEAG	ES3DV3	SAR Probe	9/18/2017	Annual	9/18/2018	3287
SPEAG	ES3DV2	SAR Probe	6/22/2018	Annual	6/22/2019	3022
SPEAG	ES3DV3	SAR Probe	3/13/2018	Annual	3/13/2019	3131
SPEAG	EX3DV4	SAR Probe	1/26/2018	Annual	1/26/2019	7490
SPEAG	ES3DV3	SAR Probe	5/18/2018	Annual	5/18/2019	3119
SPEAG	ES3DV3	SAR Probe	4/12/2018	Annual	4/12/2019	3275

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

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 Unceritainty	0.6	R	1.73	0.23	0.26	0.1	0.1	∞
Liquid Conductivity - deviation from target values	5.0	R	1.73	0.64	0.43	1.8	1.2	∞
Liquid Permittivity - deviation from target values	5.0	R	1.73	0.60	0.49	1.7	1.4	∞
Combined Standard Uncertainty (k=1)		RSS				11.5	11.3	60
Expanded Uncertainty (95% CONFIDENCE LEVEL)		k=2				23.0	22.6	

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: BCG-A1976; Type: Watch; Serial: D92WV00FK47D

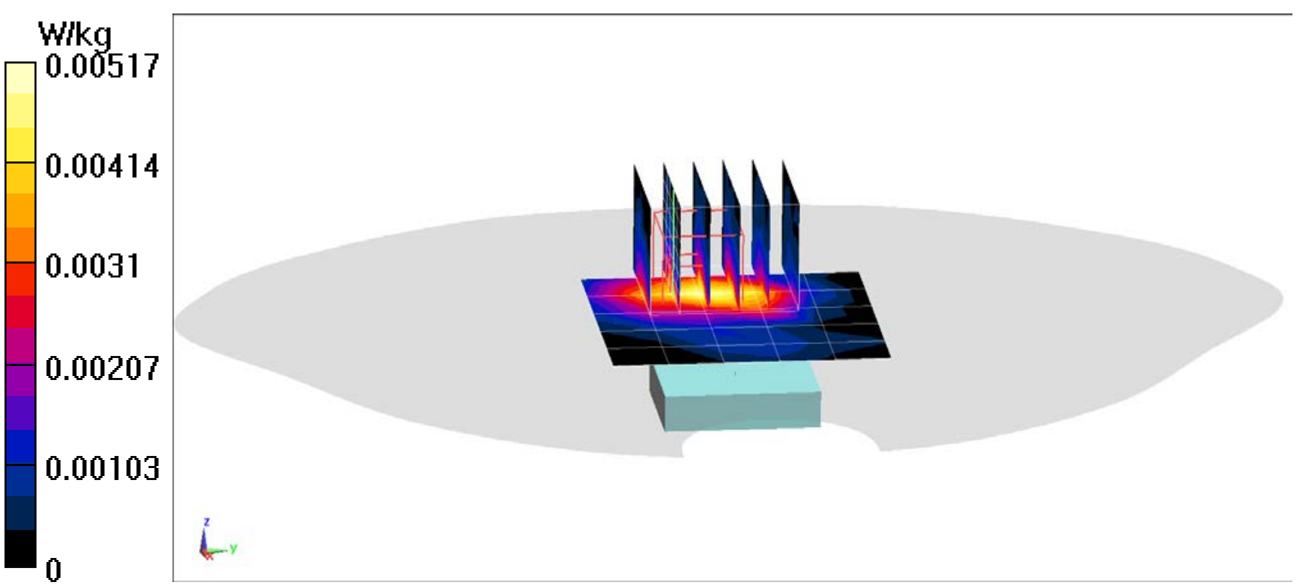
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
f = 836.6 MHz; σ = 0.884 S/m; ε_r = 41.2; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-09-2018; Ambient Temp: 21.0°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(6.7, 6.7, 6.7); Calibrated: 9/18/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1533; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1935
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: UMTS 850, Head SAR, Front side, Mid.ch
Aluminum, Metal Loop Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.242 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.00746 W/kg
SAR(1 g) = 0.004 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00RK47D

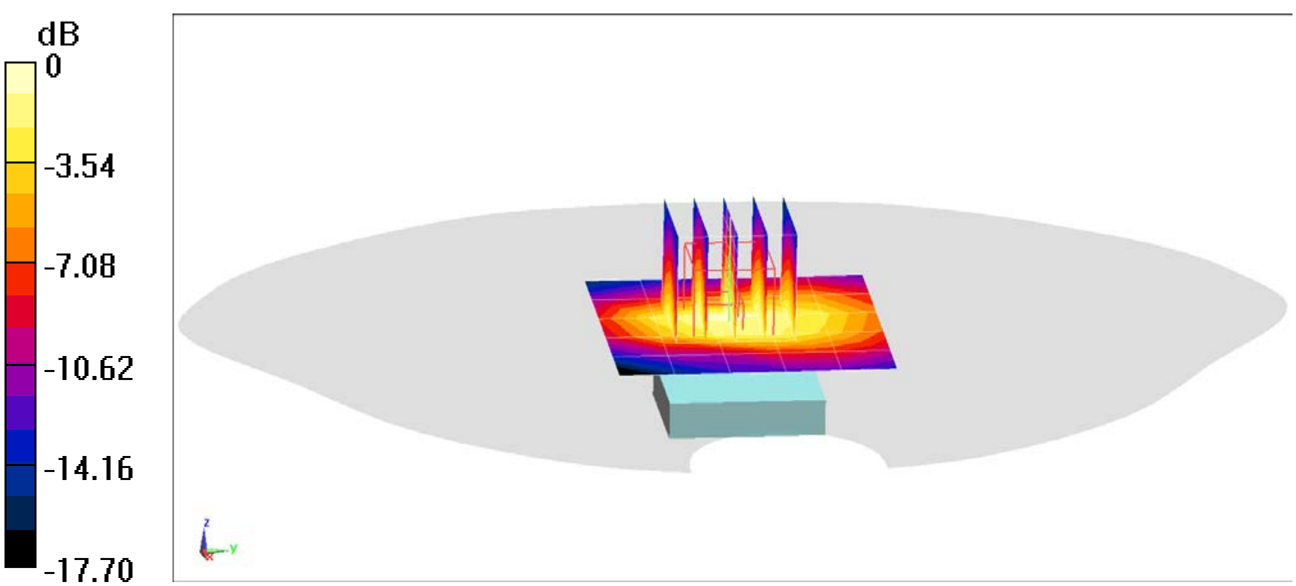
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.327 S/m; ε_r = 38.402; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-09-2018; Ambient Temp: 21.7°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(5.32, 5.32, 5.32); Calibrated: 6/22/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn701; Calibrated: 6/18/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CA; Serial: 1275
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: UMTS 1750, Head SAR, Front side, Mid.ch,
Aluminum, Metal Loop Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.21 V/m; Power Drift = -0.18 dB
Peak SAR (extrapolated) = 0.287 W/kg
SAR(1 g) = 0.188 W/kg



0 dB = 0.219 W/kg = -6.60 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00ZK47D

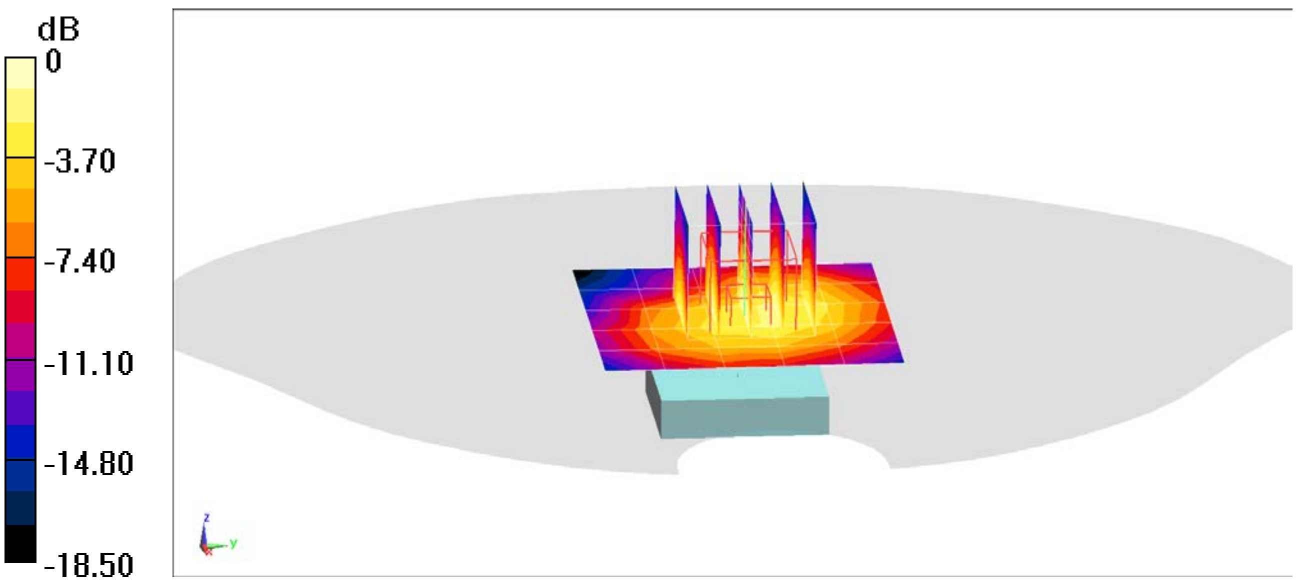
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used:
f = 1880 MHz; σ = 1.432 S/m; ε_r = 38.992; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-16-2018; Ambient Temp: 21.5°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(5.07, 5.07, 5.07); Calibrated: 6/22/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn701; Calibrated: 6/18/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CA; Serial: 1275
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

**Mode: UMTS 1900, Head SAR, Front side, Mid.ch,
Aluminum, Metal Loop Wrist Band**

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 10.12 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.205 W/kg
SAR(1 g) = 0.133 W/kg



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00RK47D

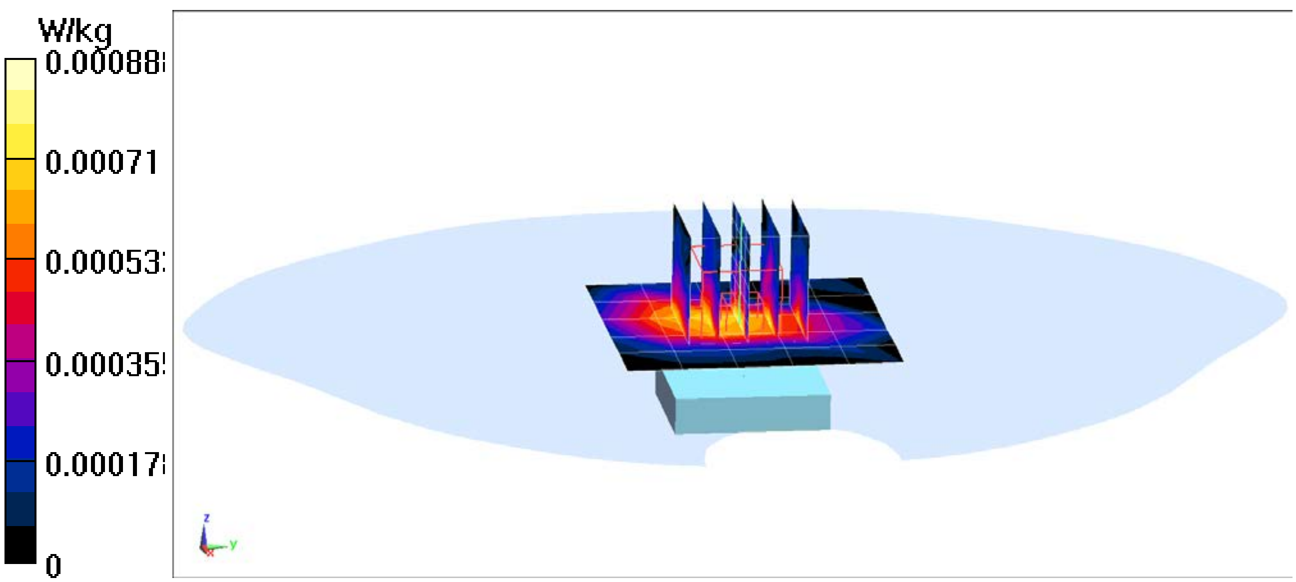
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.879 S/m; ε_r = 41.173; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 7-9-2018; Ambient Temp: 22.0°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3329; ConvF(6.79, 6.79, 6.79); Calibrated: 2/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1403; Calibrated: 2/8/2018
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 12, Head SAR, Front side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Aluminum, Sport Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.020 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.00161 W/kg
SAR(1 g) = 0.001 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00GK47D

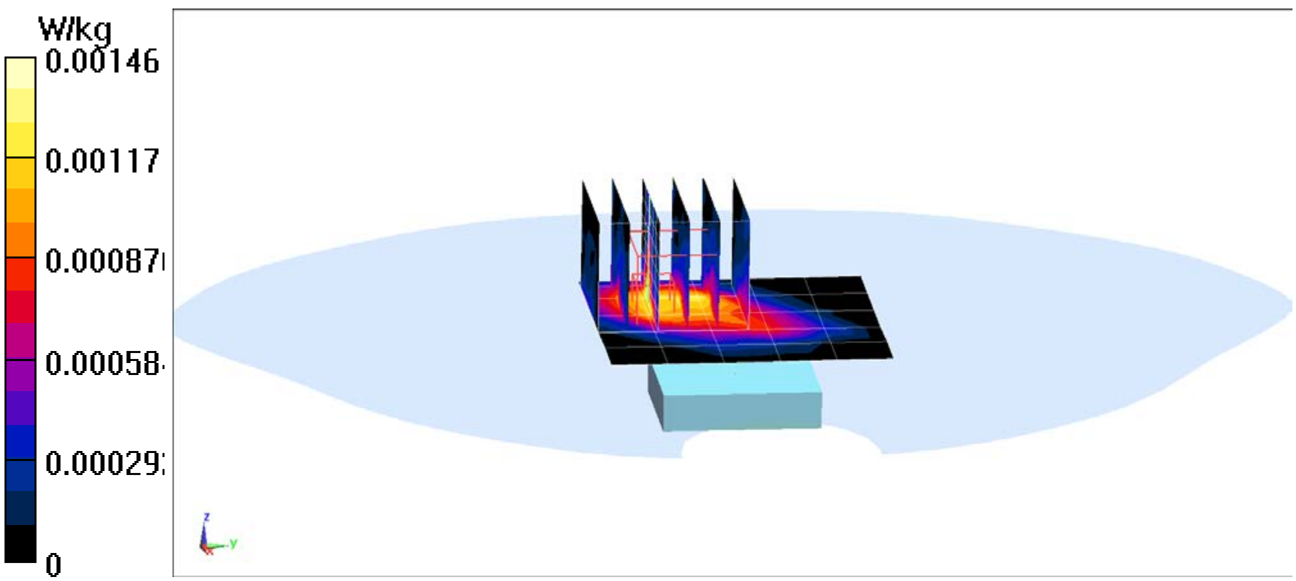
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 782 MHz; $\sigma = 0.905$ S/m; $\varepsilon_r = 40.981$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 7-9-2018; Ambient Temp: 22.0°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3329; ConvF(6.79, 6.79, 6.79); Calibrated: 2/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1403; Calibrated: 2/8/2018
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 13, Head SAR, Front side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, Aluminum, Metal Loop Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 1.213 V/m; Power Drift = 0.05 dB
Peak SAR (extrapolated) = 0.00337 W/kg
SAR(1 g) = 0.001 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00EK47D

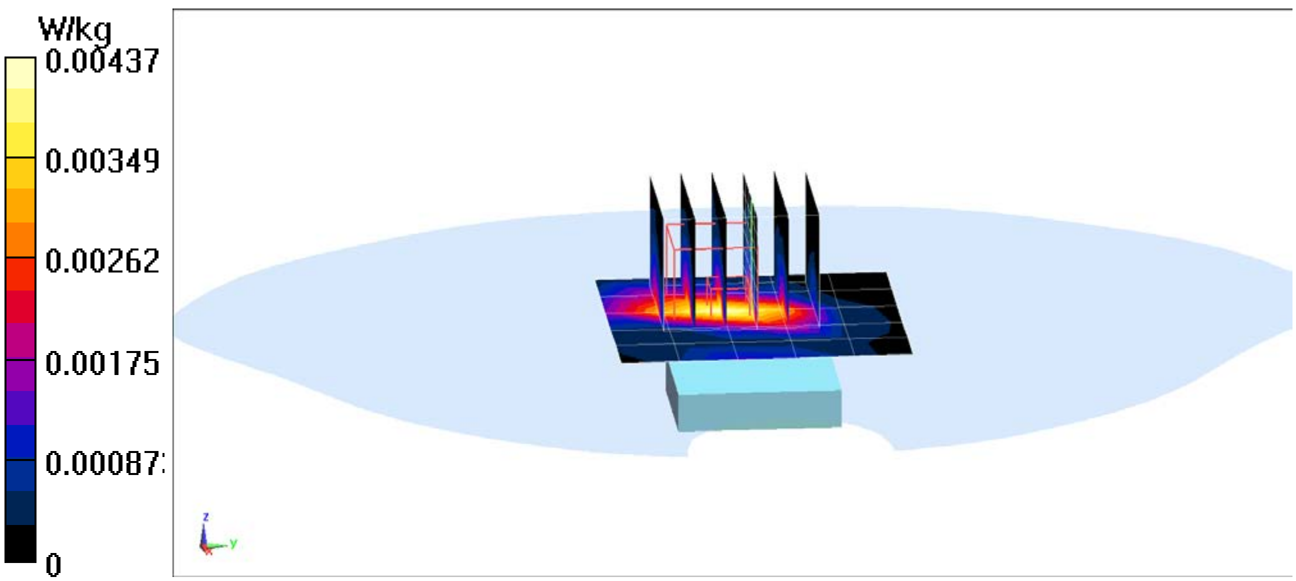
Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
$f = 836.5$ MHz; $\sigma = 0.9$ S/m; $\varepsilon_r = 40.633$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 7-10-2018; Ambient Temp: 22.2°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3329; ConvF(6.41, 6.41, 6.41); Calibrated: 2/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1403; Calibrated: 2/8/2018
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 5 (Cell.), Head SAR, Front side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Aluminum, Sport Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.054 V/m; Power Drift = 0.13 dB
Peak SAR (extrapolated) = 0.0110 W/kg
SAR(1 g) = 0.003 W/kg



DUT: BCG-A1976; Type: Watch; Serial: D92WV00EK47H

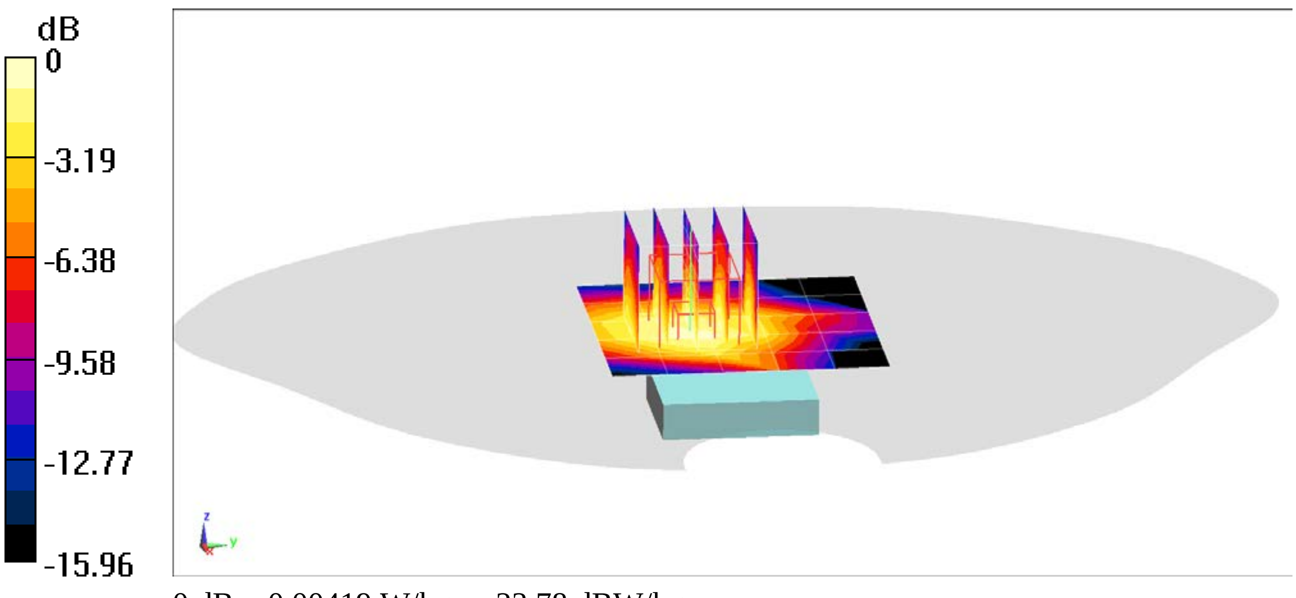
Communication System: UID 0, _LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used (interpolated):
$f = 831.5$ MHz; $\sigma = 0.879$ S/m; $\varepsilon_r = 41.271$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-09-2018; Ambient Temp: 21.0°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(6.7, 6.7, 6.7); Calibrated: 9/18/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1533; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1935
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 26 (Cell.), Head SAR, Front side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Stainless Steel, Metal Links Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 2.171 V/m; Power Drift = 0.18 dB
Peak SAR (extrapolated) = 0.00538 W/kg
SAR(1 g) = 0.004 W/kg



0 dB = 0.00419 W/kg = -23.78 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00RK47D

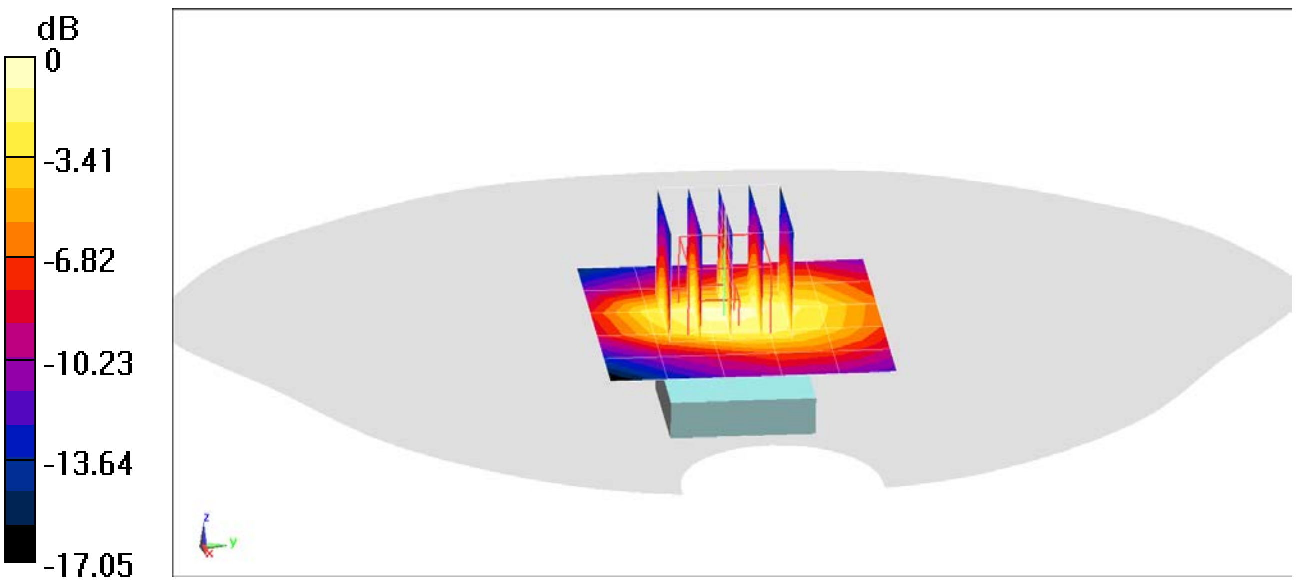
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.327 S/m; ε_r = 38.401; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-09-2018; Ambient Temp: 21.7°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(5.32, 5.32, 5.32); Calibrated: 6/22/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn701; Calibrated: 6/18/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CA; Serial: 1275
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 4 (AWS), Head SAR, Front side, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset, Aluminum, Metal Loop Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 12.60 V/m; Power Drift = 0.00 dB
Peak SAR (extrapolated) = 0.283 W/kg
SAR(1 g) = 0.189 W/kg



0 dB = 0.220 W/kg = -6.58 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00ZK47D

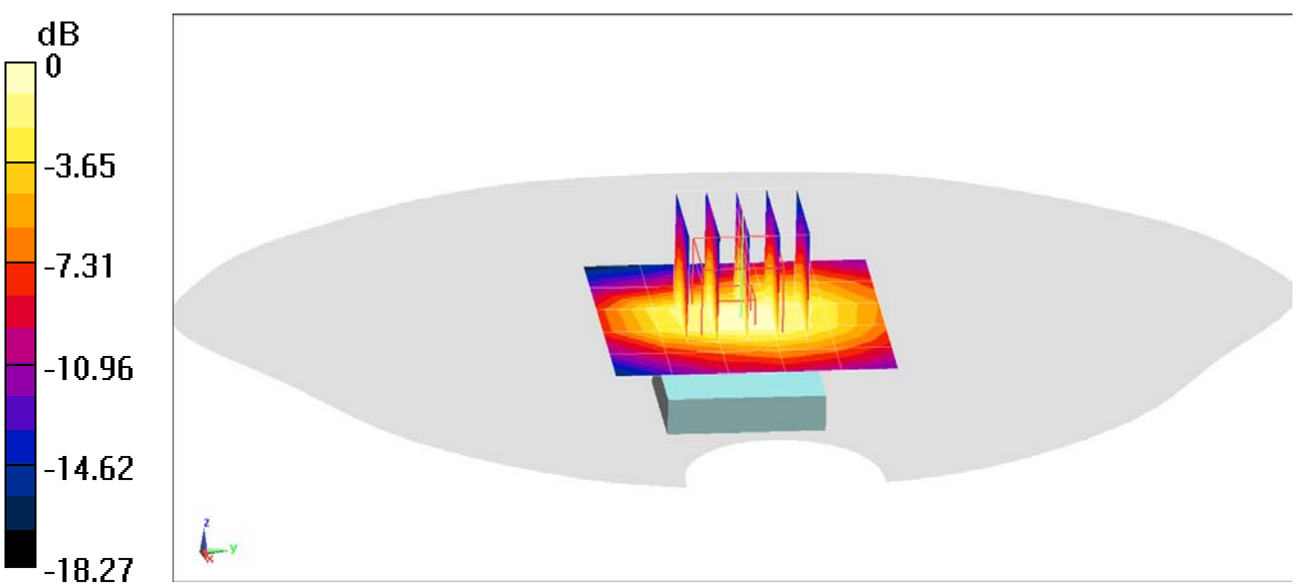
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.413 S/m; ε_r = 39.076; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-16-2018; Ambient Temp: 21.5°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(5.07, 5.07, 5.07); Calibrated: 6/22/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn701; Calibrated: 6/18/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CA; Serial: 1275
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 25 (PCS), Head SAR, Front side, Low.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, Aluminum, Metal Loop Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.060 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.157 W/kg
SAR(1 g) = 0.103 W/kg



0 dB = 0.121 W/kg = -9.17 dBW/kg

DUT: BCG-A1976; Type: Watch; Serial: D92WV00HK47H

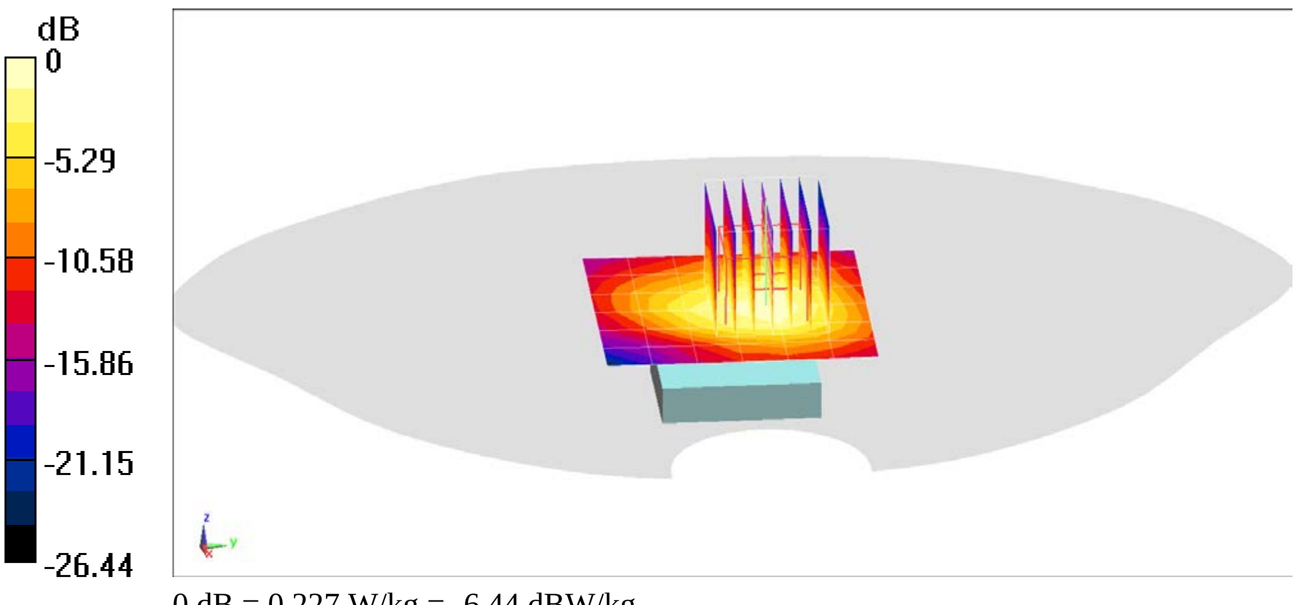
Communication System: UID 0, LTE Band 41; Frequency: 2680 MHz; Duty Cycle: 1:1.58
Medium: 2600 Head Medium parameters used (interpolated):
f = 2680 MHz; σ = 2.105 S/m; ε_r = 37.156; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-19-2018; Ambient Temp: 24.0°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3119; ConvF(4.47, 4.47, 4.47); Calibrated: 5/18/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn728; Calibrated: 5/17/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CC; Serial: 1179
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 41, Head SAR, Front side, High.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, Stainless Steel, Sport Wrist Band

Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 10.02 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.348 W/kg
SAR(1 g) = 0.182 W/kg



0 dB = 0.227 W/kg = -6.44 dBW/kg

DUT: BCG-A1976; Type: Watch; Serial: D92WV00TK47H

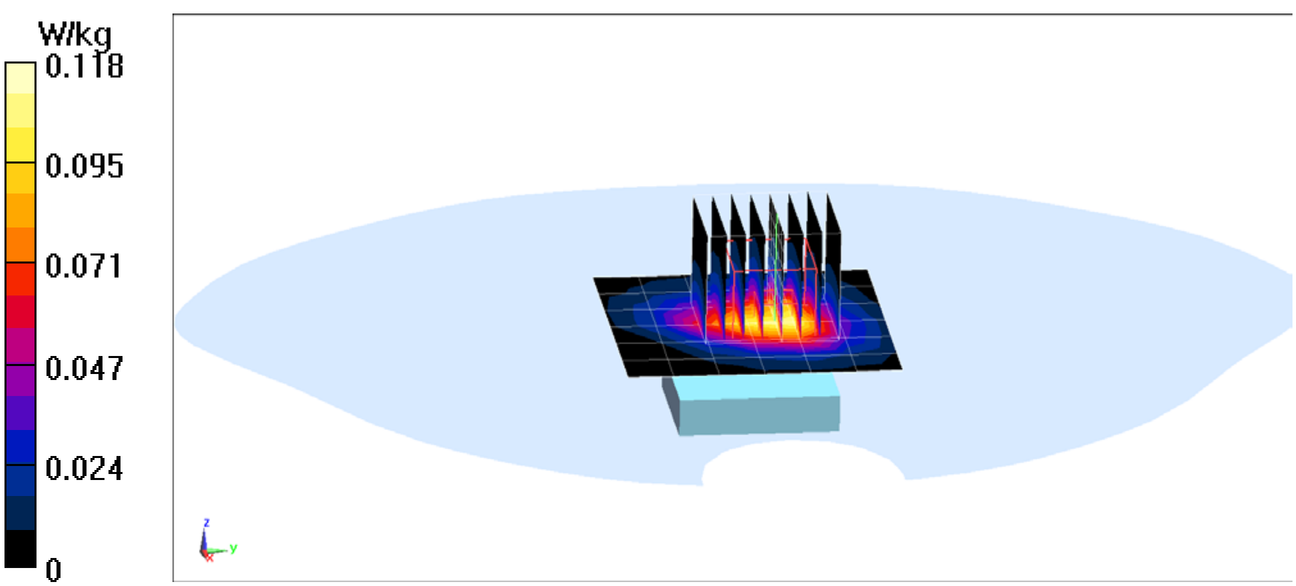
Communication System: UID 0, 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.848 S/m; ε_r = 38.497; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-05-2018; Ambient Temp: 22.9°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3131; ConvF(4.75, 4.75, 4.75); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11b, 22 MHz Bandwidth, Head SAR, Ch 1, 1 Mbps, Front Side, Stainless Steel, Sport Wrist Band

Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 0.9850 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.167 W/kg
SAR(1 g) = 0.093 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00TK47H

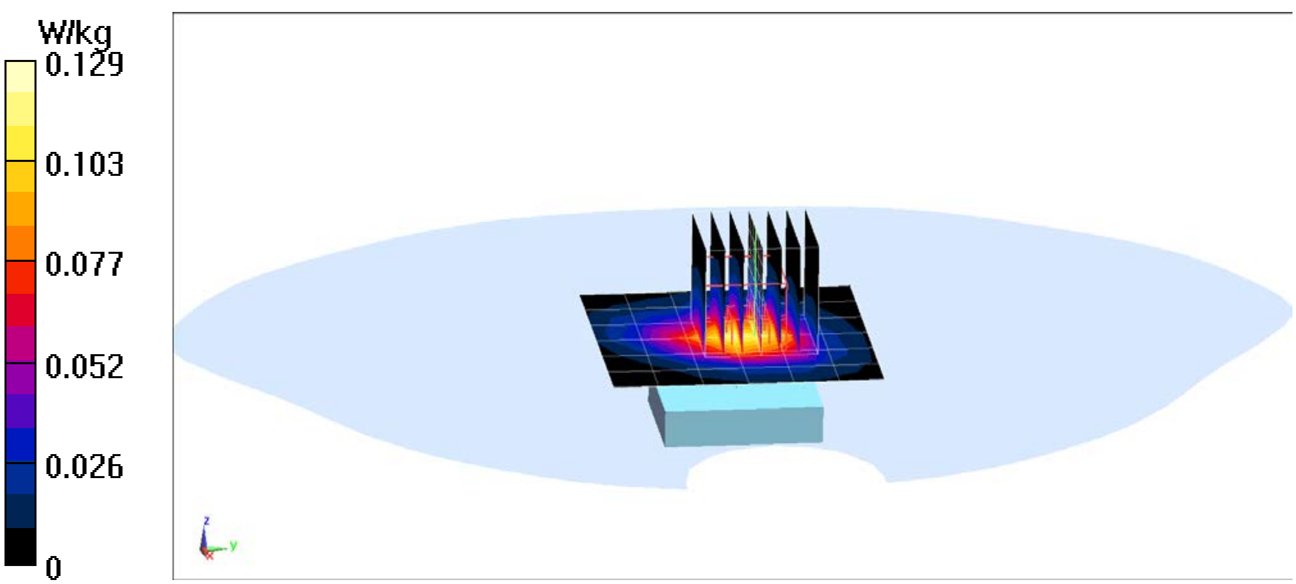
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2441 MHz; σ = 1.857 S/m; ε_r = 38.18; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-12-2018; Ambient Temp: 22.5°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3131; ConvF(4.75, 4.75, 4.75); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: Bluetooth ePA, Head SAR, Ch 39, 1 Mbps,
Front Side, Stainless Steel, Sport Wrist Band

Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.025 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 0.189 W/kg
SAR(1 g) = 0.103 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00HK47D

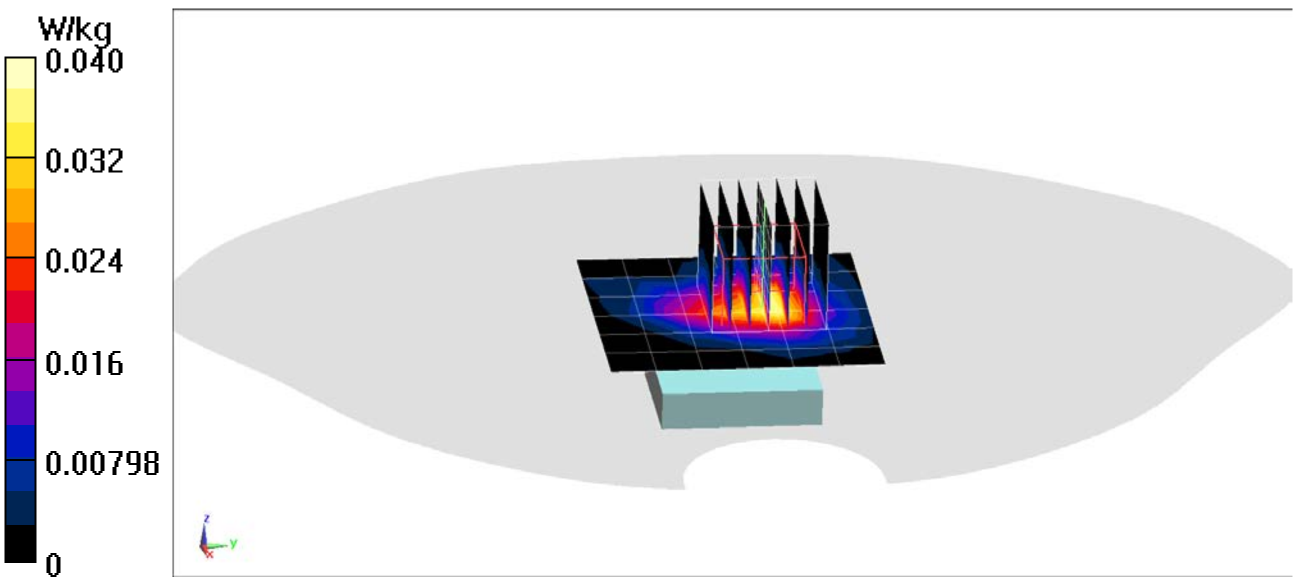
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used (interpolated):
f = 2441 MHz; σ = 1.861 S/m; ε_r = 38.618; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-10-2018; Ambient Temp: 21.9°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7490; ConvF(7.89, 7.89, 7.89); Calibrated: 1/26/2018;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1532; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1936
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: Bluetooth iPA, Head SAR, Ch 39, 1 Mbps, Front Side, Aluminum, Sport Wrist Band

Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.301 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 0.0600 W/kg
SAR(1 g) = 0.031 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00NK47D

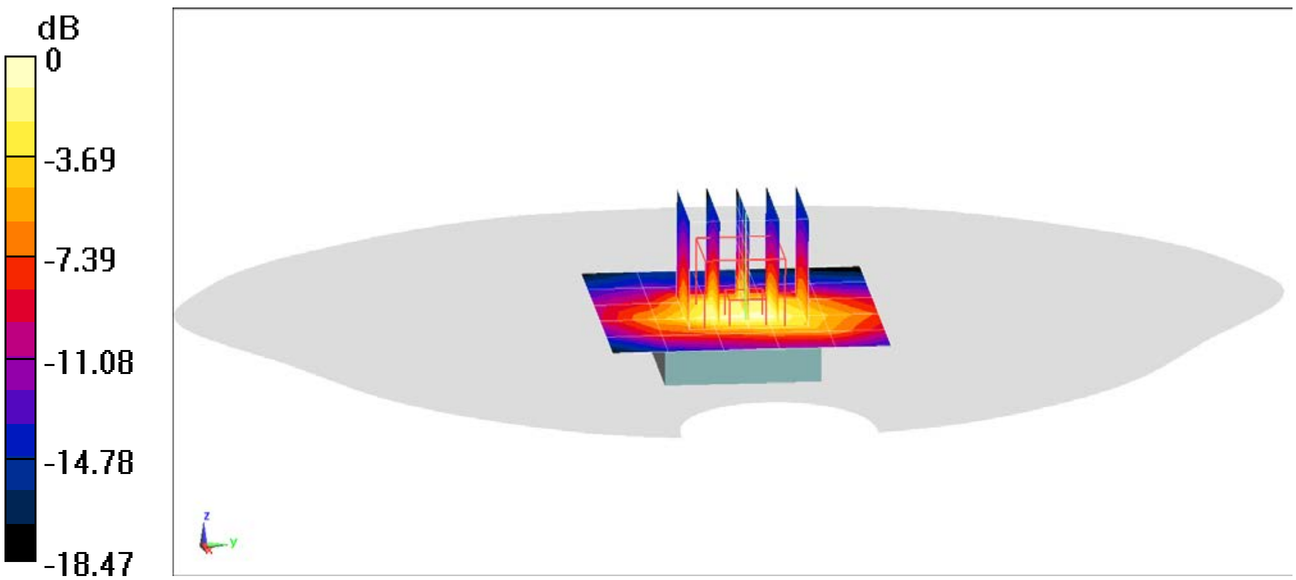
Communication System: UID 0, UMTS; Frequency: 836.6 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.6 MHz; σ = 1.006 S/m; ε_r = 53.796; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-16-2018; Ambient Temp: 22.3°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3287; ConvF(6.56, 6.56, 6.56); Calibrated: 9/18/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1533; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1935
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: UMTS 850, Extremity SAR, Back side, Mid.ch
Aluminum, Metal Links Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.08 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 0.915 W/kg
SAR(10 g) = 0.200 W/kg



0 dB = 0.567 W/kg = -2.46 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00SK47H

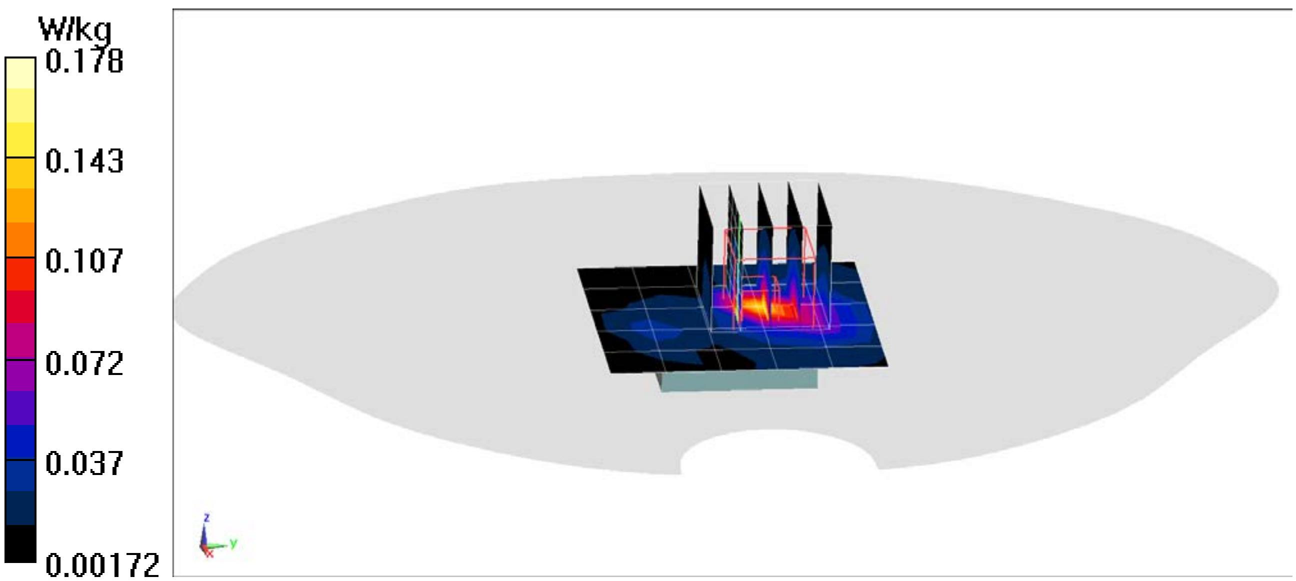
Communication System: UID 0, UMTS; Frequency: 1732.4 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.4 MHz; σ = 1.467 S/m; ε_r = 52.229; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-16-2018; Ambient Temp: 21.8°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN7490; ConvF(8.69, 8.69, 8.69); Calibrated: 1/26/2018;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1532; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1936
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: UMTS 1750, Extremity SAR, Back side, Mid.ch
Stainless Steel, Metal Loop Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.725 V/m; Power Drift = 0.01 dB
Peak SAR (extrapolated) = 0.244 W/kg
SAR(10 g) = 0.060 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00RK47H

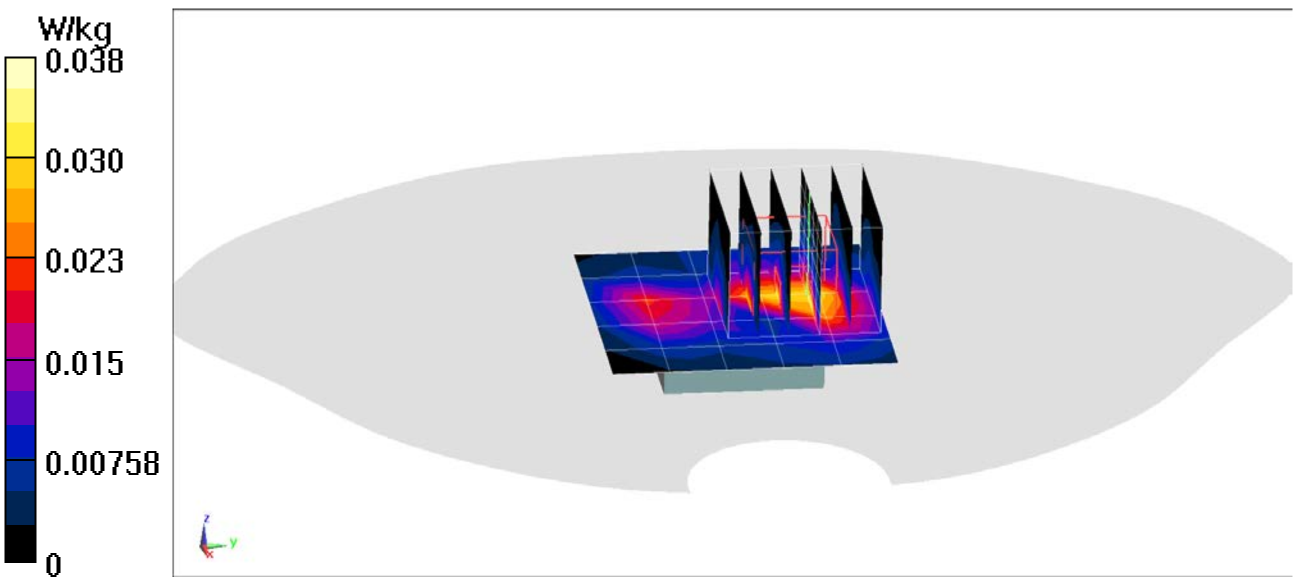
Communication System: UID 0, UMTS; Frequency: 1880 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used:
f = 1880 MHz; σ = 1.55 S/m; ε_r = 51.447; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-17-2018; Ambient Temp: 21.5°C; Tissue Temp: 20.8°C

Probe: ES3DV2 - SN3022; ConvF(4.67, 4.67, 4.67); Calibrated: 6/22/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn701; Calibrated: 6/18/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CA; Serial: 1275
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: UMTS 1900, Extremity SAR, Back side, Mid.ch
Stainless Steel, Sport Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (6x6x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 4.812 V/m; Power Drift = 0.02 dB
Peak SAR (extrapolated) = 0.108 W/kg
SAR(10 g) = 0.015 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00EK47D

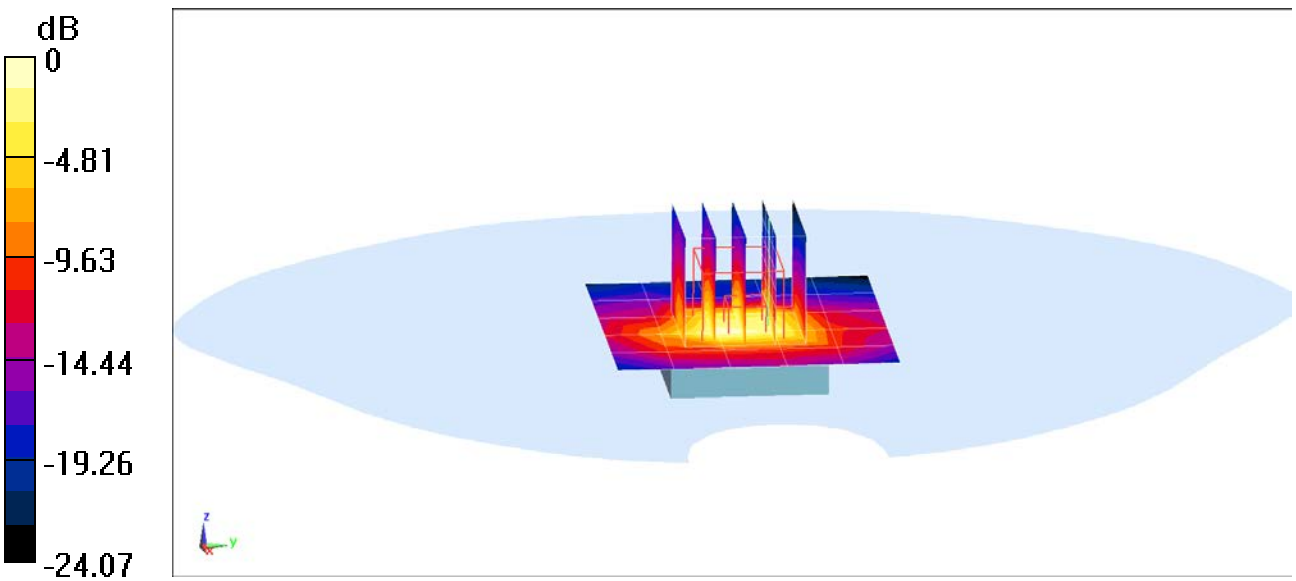
Communication System: UID 0, LTE Band 12; Frequency: 707.5 MHz; Duty Cycle: 1:1
Medium: 700-770MHz Body Medium parameters used (interpolated):
f = 707.5 MHz; σ = 0.937 S/m; ε_r = 56.112; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-16-2018; Ambient Temp: 22.1°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3131; ConvF(6.26, 6.26, 6.26); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 12, Extremity SAR, Back side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Aluminum, Metal Links Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.23 V/m; Power Drift = -0.16 dB
Peak SAR (extrapolated) = 1.16 W/kg
SAR(10 g) = 0.117 W/kg



0 dB = 0.363 W/kg = -4.40 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00FK47D

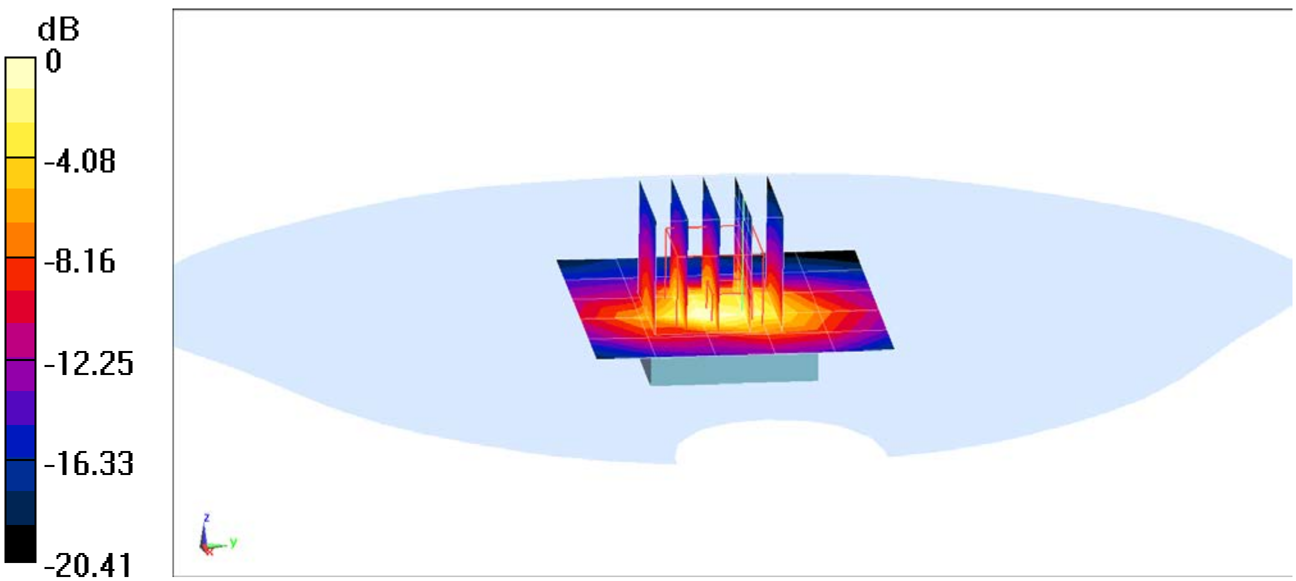
Communication System: UID 0, LTE Band 13; Frequency: 782 MHz; Duty Cycle: 1:1
Medium: 700-770MHz Body Medium parameters used (interpolated):
f = 782 MHz; σ = 1.007 S/m; ε_r = 55.316; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-16-2018; Ambient Temp: 22.1°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3131; ConvF(6.26, 6.26, 6.26); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 13, Extremity SAR, Back side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, Aluminum, Metal Links Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 15.22 V/m; Power Drift = -0.13 dB
Peak SAR (extrapolated) = 0.893 W/kg
SAR(10 g) = 0.117 W/kg



0 dB = 0.381 W/kg = -4.19 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00EK47D

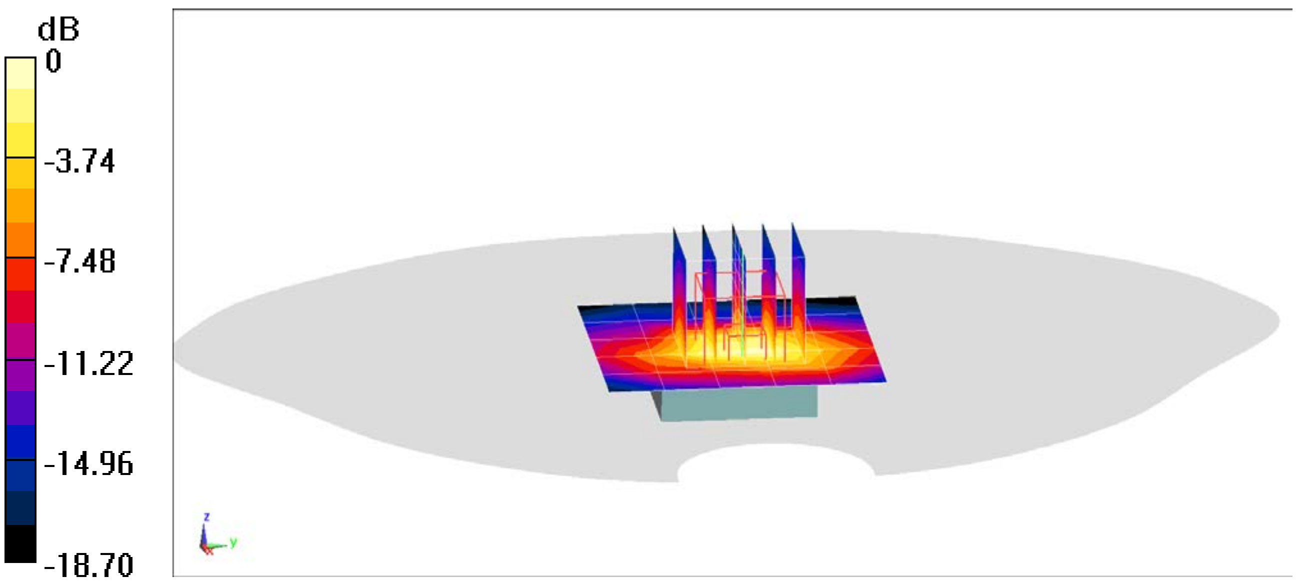
Communication System: UID 0, LTE Band 5; Frequency: 836.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 836.5 MHz; σ = 1.006 S/m; ε_r = 53.797; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-16-2018; Ambient Temp: 22.3°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3287; ConvF(6.56, 6.56, 6.56); Calibrated: 9/18/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1533; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1935
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 5 (Cell.), Extremity SAR, Back side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Aluminum, Metal Links Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 16.13 V/m; Power Drift = -0.10 dB
Peak SAR (extrapolated) = 0.953 W/kg
SAR(10 g) = 0.187 W/kg



0 dB = 0.583 W/kg = -2.34 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00GK47D

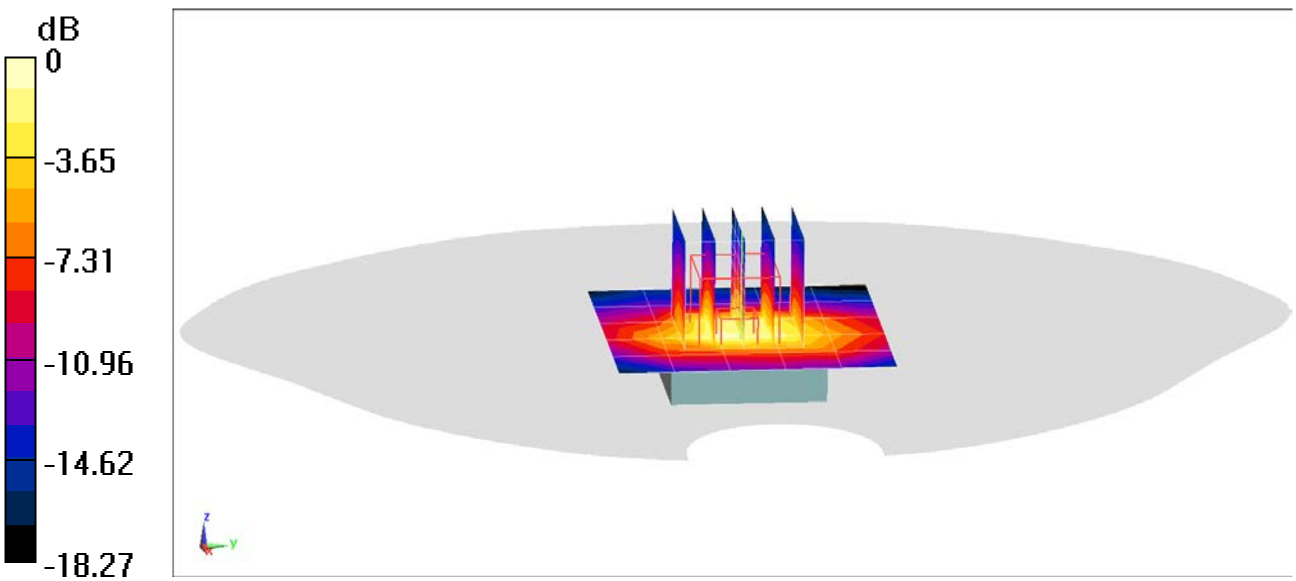
Communication System: UID 0, _LTE Band 26; Frequency: 831.5 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used (interpolated):
f = 831.5 MHz; σ = 1 S/m; ε_r = 53.856; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-16-2018; Ambient Temp: 22.3°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3287; ConvF(6.56, 6.56, 6.56); Calibrated: 9/18/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1533; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1935
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 26 (Cell.), Extremity SAR, Back side, Mid.ch, 10 MHz Bandwidth, QPSK, 1 RB, 49 RB Offset, Aluminum, Metal Links Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 14.00 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 0.681 W/kg
SAR(10 g) = 0.152 W/kg



0 dB = 0.440 W/kg = -3.57 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00ZK47D

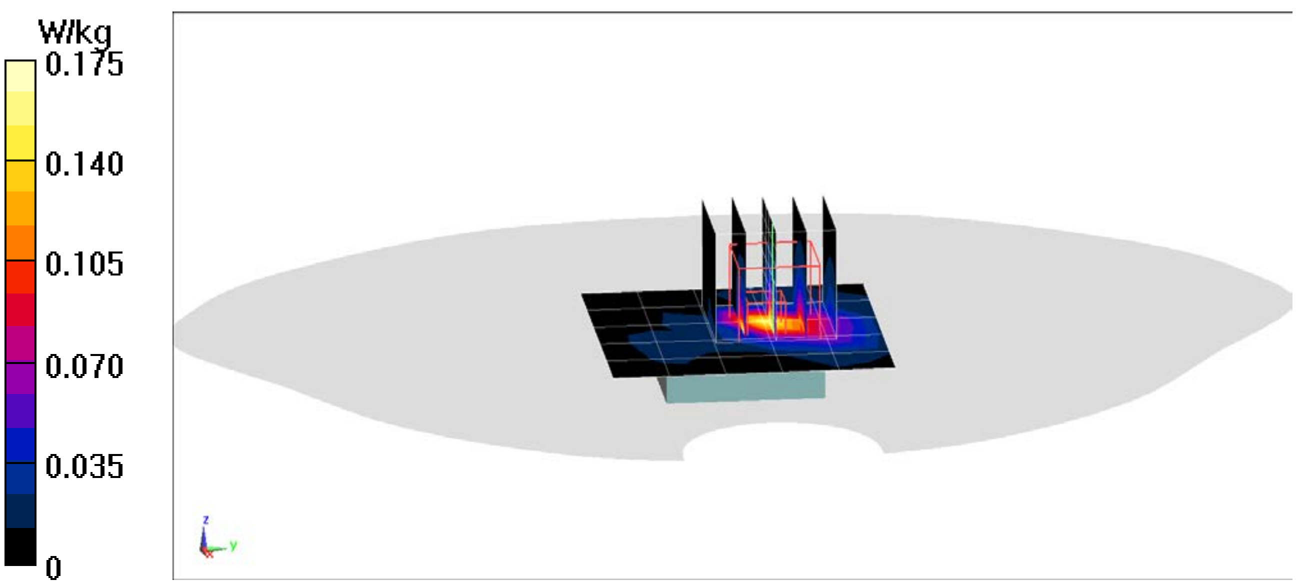
Communication System: UID 0, LTE Band 4 (AWS); Frequency: 1732.5 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used (interpolated):
f = 1732.5 MHz; σ = 1.458 S/m; ε_r = 51.736; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-18-2018; Ambient Temp: 22.9°C; Tissue Temp: 20.5°C

Probe: EX3DV4 - SN7490; ConvF(8.69, 8.69, 8.69); Calibrated: 1/26/2018;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1532; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1936
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 4 (AWS), Extremity SAR, Back side, Mid.ch, 20 MHz Bandwidth, QPSK, 1 RB, 50 RB Offset, Aluminum, Sport Wrist Band

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 9.938 V/m; Power Drift = -0.15 dB
Peak SAR (extrapolated) = 0.337 W/kg
SAR(10 g) = 0.056 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00ZK47D

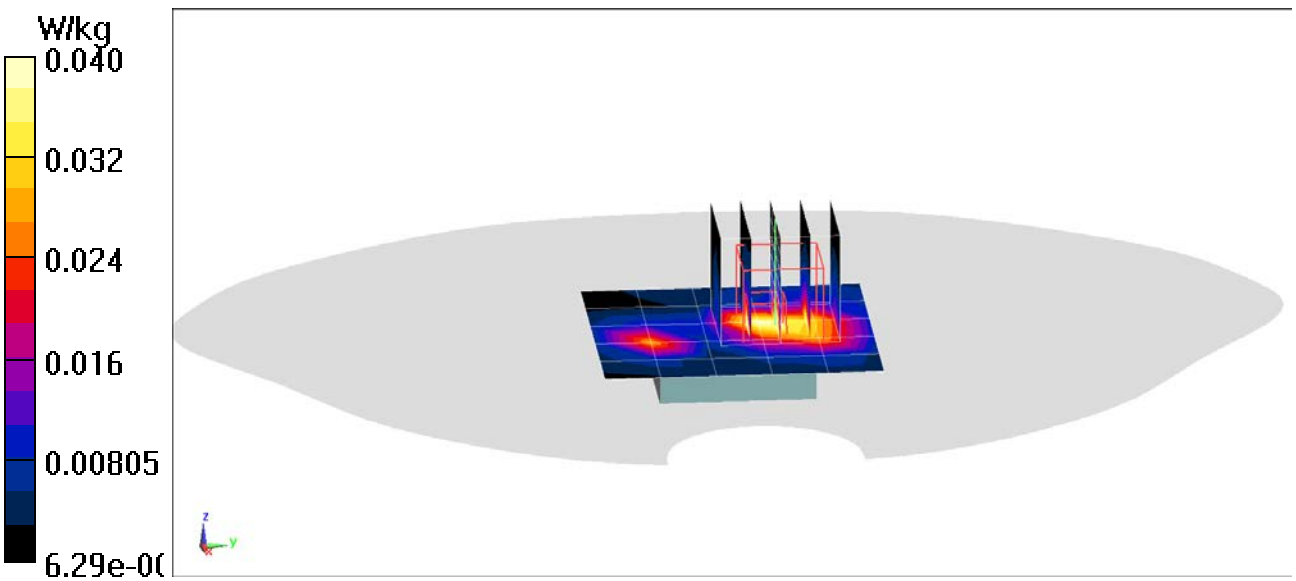
Communication System: UID 0, LTE Band 25 (PCS); Frequency: 1860 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1860 MHz; σ = 1.537 S/m; ε_r = 51.683; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-13-2018; Ambient Temp: 21.9°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN7490; ConvF(8.32, 8.32, 8.32); Calibrated: 1/26/2018;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1532; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1936
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

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

Area Scan (6x6x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Reference Value = 5.186 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.0910 W/kg
SAR(10 g) = 0.018 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00TK47H

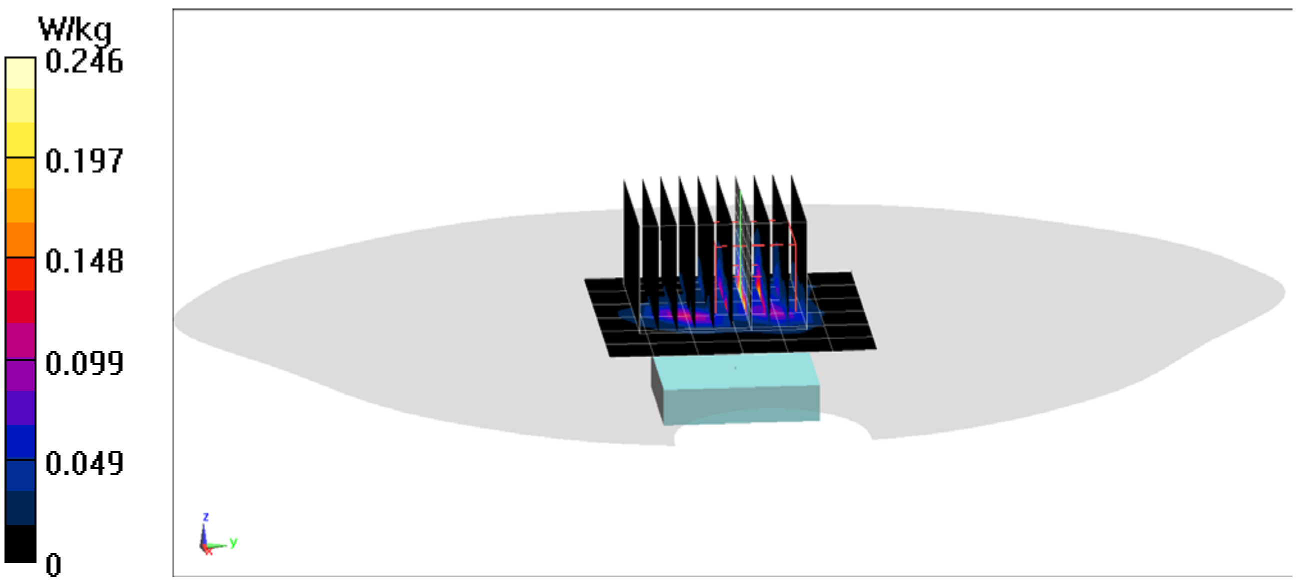
Communication System: UID 0, LTE Band 41; Frequency: 2680 MHz; Duty Cycle: 1:1.58
Medium: 2600 Body Medium parameters used (interpolated):
f = 2680 MHz; σ = 2.217 S/m; ε_r = 52.326; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-16-2018; Ambient Temp: 22.1°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3275; ConvF(4.47, 4.47, 4.47); Calibrated: 4/12/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn501; Calibrated: 4/12/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CD; Serial: 1736
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: LTE Band 41, Extremity SAR, Back side, High.ch, 20 MHz Bandwidth, QPSK, 1 RB, 0 RB Offset, Stainless Steel, Sport Wrist Band

Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (10x10x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 7.198 V/m; Power Drift = -0.12dB
Peak SAR (extrapolated) = 0.472 W/kg
SAR(10 g) = 0.061 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00WK47H

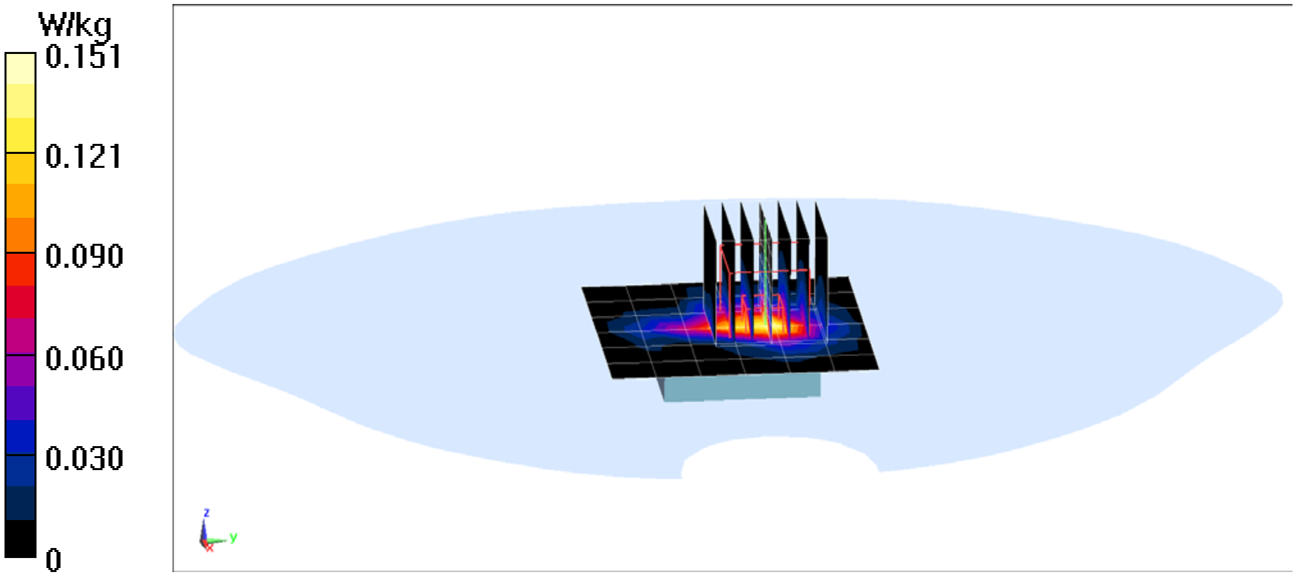
Communication System: UID 0, IEEE 802.11b; Frequency: 2412 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2412 MHz; σ = 1.97 S/m; ε_r = 51.53; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-10-2018; Ambient Temp: 21.9°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3131; ConvF(4.45, 4.45, 4.45); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: IEEE 802.11b, 22 MHz Bandwidth, Extremity SAR, Ch 1,
1 Mbps, Back Side, Stainless Steel, Metal Links Wrist Band

Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 8.223 V/m; Power Drift = 0.04 dB
Peak SAR (extrapolated) = 0.273 W/kg
SAR(10 g) = 0.047 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00CK47D

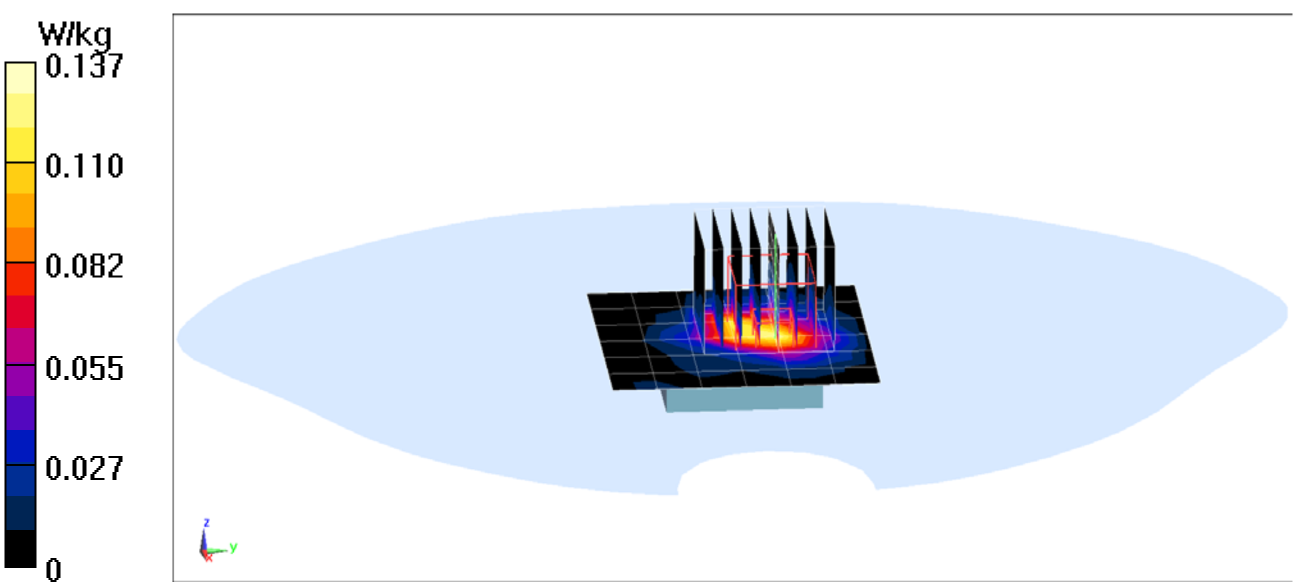
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2441 MHz; σ = 2.008 S/m; ε_r = 51.414; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-10-2018; Ambient Temp: 21.9°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3131; ConvF(4.45, 4.45, 4.45); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: Bluetooth ePA, Extremity SAR, Ch 39, 1 Mbps, Back Side, Aluminum, Metal Links Wrist Band

Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x8x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 6.031 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 0.255 W/kg
SAR(10 g) = 0.046 W/kg



PCTEST ENGINEERING LABORATORY, INC.

DUT: BCG-A1976; Type: Watch; Serial: D92WV00HK47D

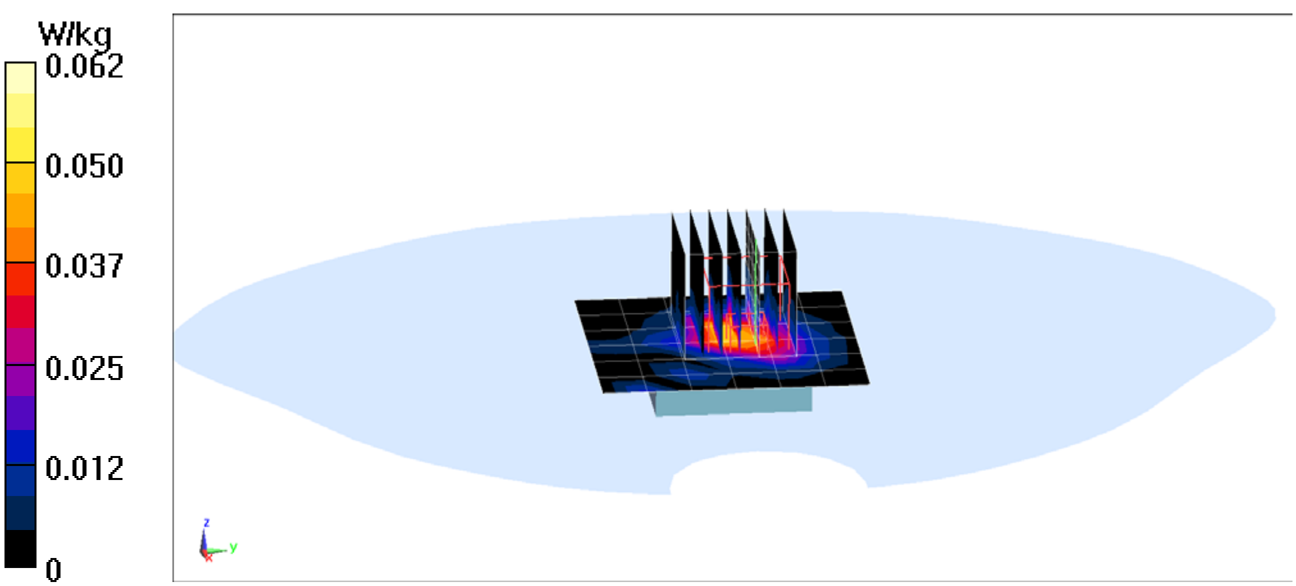
Communication System: UID 0, Bluetooth; Frequency: 2441 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used (interpolated):
f = 2441 MHz; σ = 2.008 S/m; ε_r = 51.414; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 0.0 cm

Test Date: 07-10-2018; Ambient Temp: 21.9°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3131; ConvF(4.45, 4.45, 4.45); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

Mode: Bluetooth iPA, Extremity SAR, Ch 39, 1 Mbps, Back Side, Aluminum, Metal Links Wrist Band

Area Scan (7x7x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (8x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 4.004 V/m; Power Drift = 0.14 dB
Peak SAR (extrapolated) = 0.128 W/kg
SAR(10 g) = 0.017 W/kg



APPENDIX B: SYSTEM VERIFICATION

PCTEST ENGINEERING LABORATORY, INC.

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

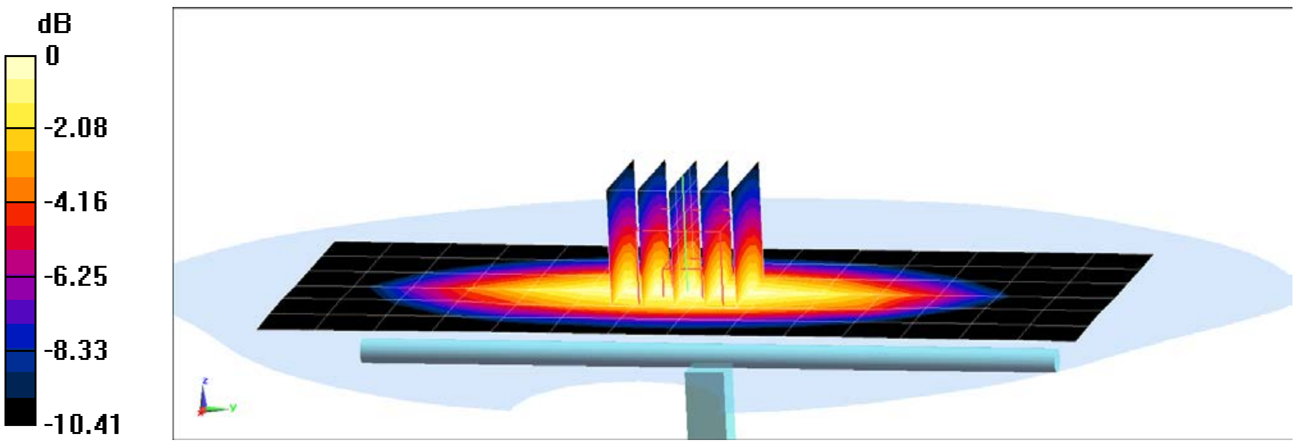
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 750 Head Medium parameters used (interpolated):
f = 750 MHz; σ = 0.893 S/m; ε_r = 41.064; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 7-9-2018; Ambient Temp: 22.0°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3329; ConvF(6.79, 6.79, 6.79); Calibrated: 2/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1403; Calibrated: 2/8/2018
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.29 W/kg
SAR(1 g) = 1.54 W/kg
Deviation(1 g) = -7.45%



0 dB = 1.80 W/kg = 2.55 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

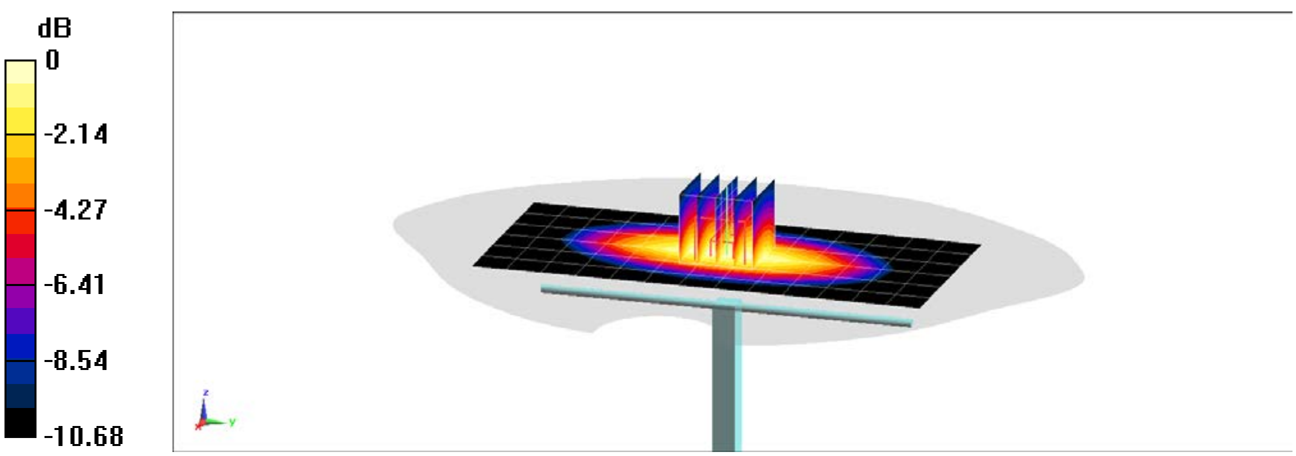
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.882 S/m; ε_r = 41.222; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-09-2018; Ambient Temp: 21.0°C; Tissue Temp: 19.8°C

Probe: ES3DV3 - SN3287; ConvF(6.7, 6.7, 6.7); Calibrated: 9/18/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1533; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1935
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.93 W/kg
SAR(1 g) = 1.96 W/kg
Deviation(1 g) = 2.08%



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

PCTEST ENGINEERING LABORATORY, INC.

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

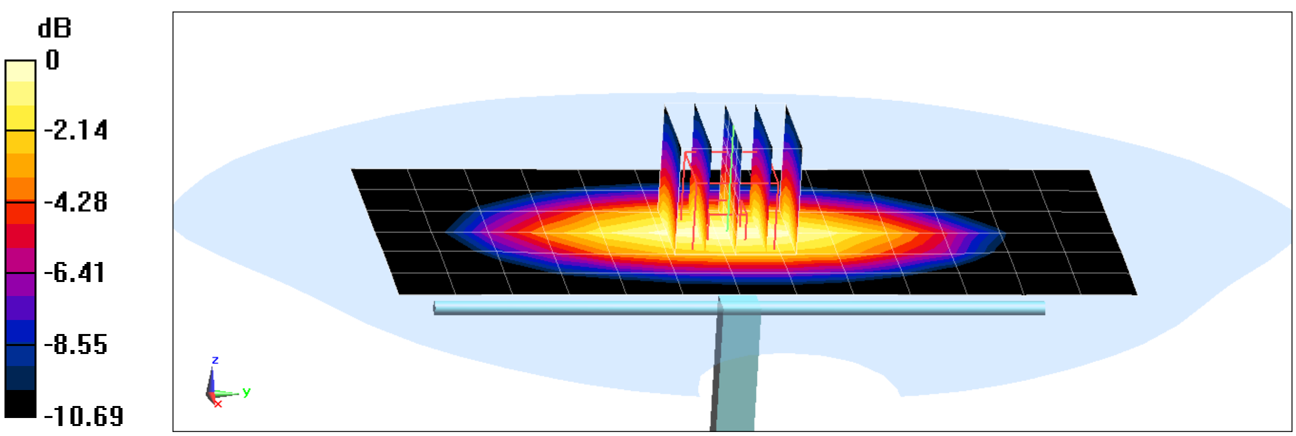
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Head Medium parameters used:
f = 835 MHz; σ = 0.899 S/m; ε_r = 40.636; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-10-2018; Ambient Temp: 22.2°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3329; ConvF(6.41, 6.41, 6.41); Calibrated: 2/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1403; Calibrated: 2/8/2018
Phantom: SAM Sub; Type: SAM 4.0; Serial: TP-1403
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 3.00 W/kg
SAR(1 g) = 2.03 W/kg
Deviation(1 g) = 5.73%



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1104

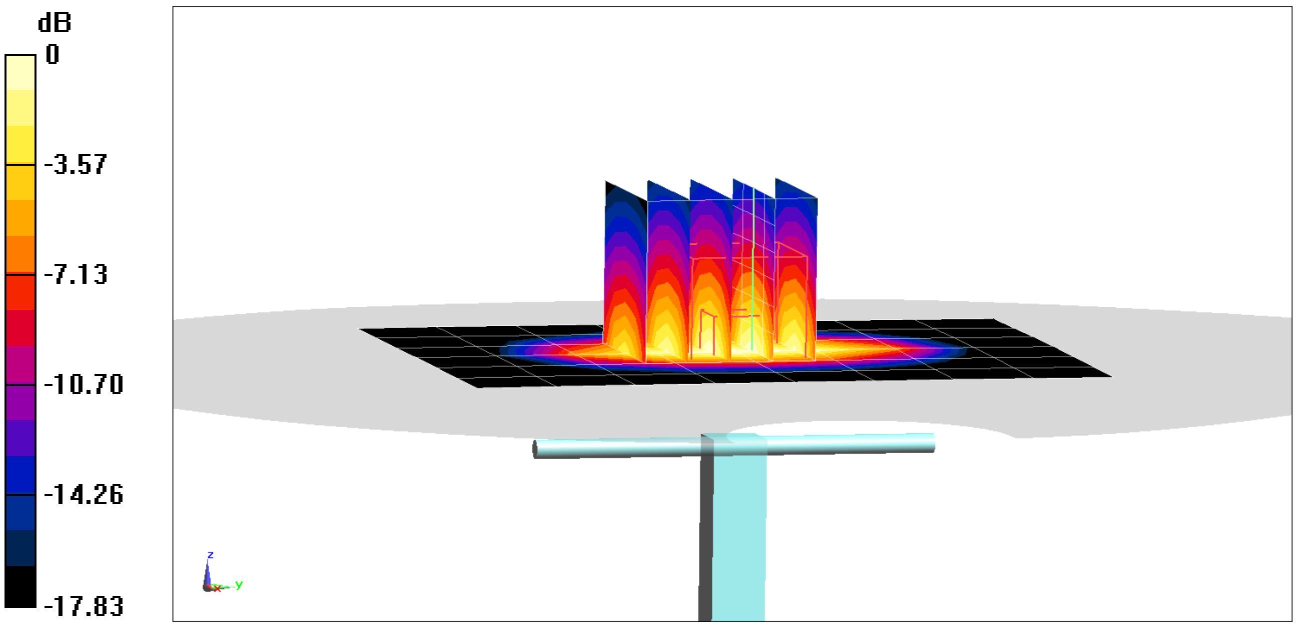
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Head Medium parameters used:
f = 1750 MHz; $\sigma = 1.345$ S/m; $\varepsilon_r = 38.329$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-09-2018; Ambient Temp: 21.7°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(5.32, 5.32, 5.32); Calibrated: 6/22/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn701; Calibrated: 6/18/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CA; Serial: 1275
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.35 W/kg
SAR(1 g) = 3.59 W/kg
Deviation(1 g) = -1.37%



0 dB = 4.46 W/kg = 6.49 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d181

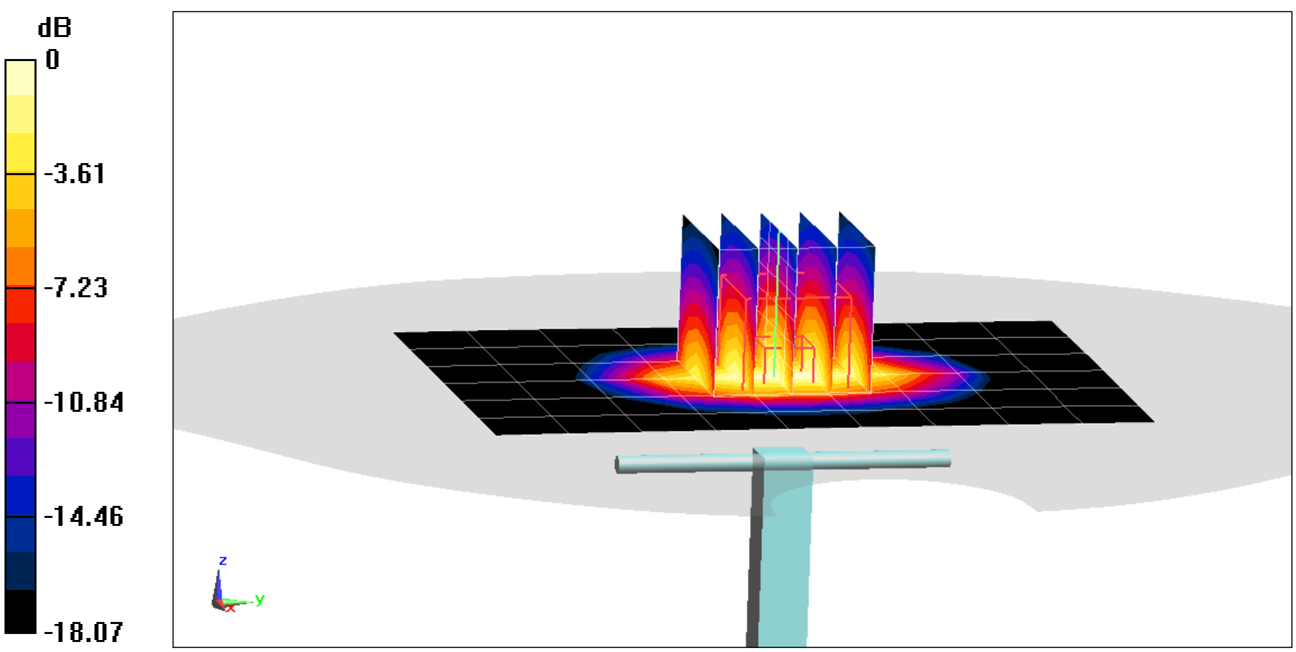
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Head Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.453 S/m; ε_r = 38.909; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-16-2018; Ambient Temp: 21.5°C; Tissue Temp: 21.3°C

Probe: ES3DV2 - SN3022; ConvF(5.07, 5.07, 5.07); Calibrated: 6/22/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn701; Calibrated: 6/18/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CA; Serial: 1275
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.92 W/kg
SAR(1 g) = 3.84 W/kg
Deviation(1 g) = -2.78%



0 dB = 4.84 W/kg = 6.85 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 921

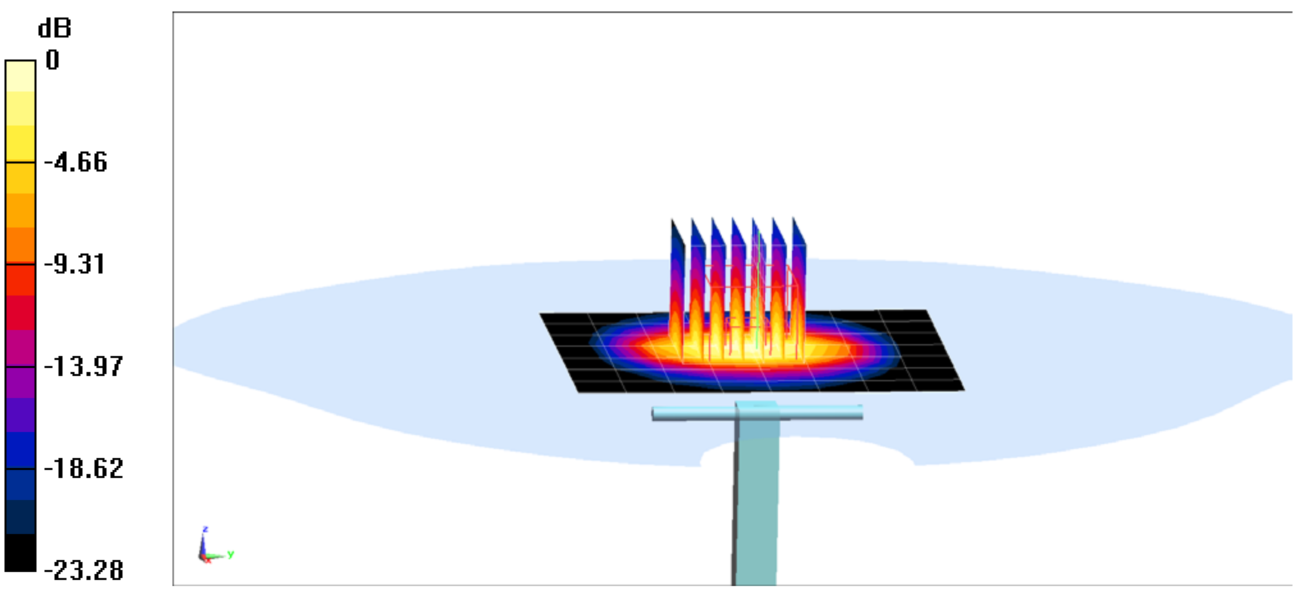
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.889 S/m; ε_r = 38.373; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-05-2018; Ambient Temp: 22.9°C; Tissue Temp: 20.8°C

Probe: ES3DV3 - SN3131; ConvF(4.75, 4.75, 4.75); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.0 W/kg
SAR(1 g) = 5.28 W/kg
Deviation(1 g) = 0.96%



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

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 945

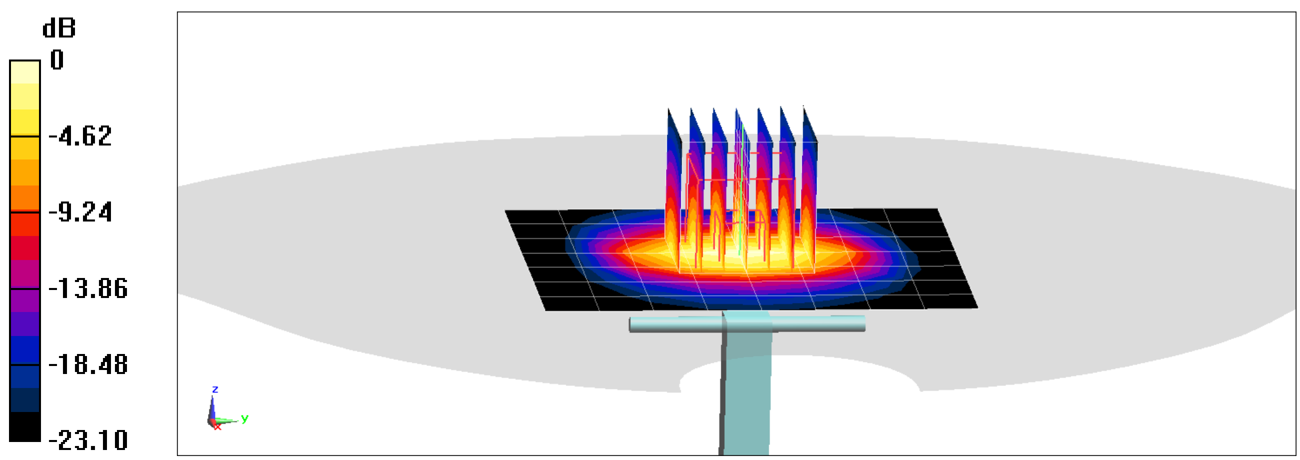
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.872 S/m; ε_r = 38.585; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-10-2018; Ambient Temp: 21.9°C; Tissue Temp: 21.0°C

Probe: EX3DV4 - SN7490; ConvF(7.89, 7.89, 7.89); Calibrated: 1/26/2018;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1532; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1936
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.1 W/kg
SAR(1 g) = 5.03 W/kg
Deviation(1 g) = -1.37%



0 dB = 8.70 W/kg = 9.40 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 750

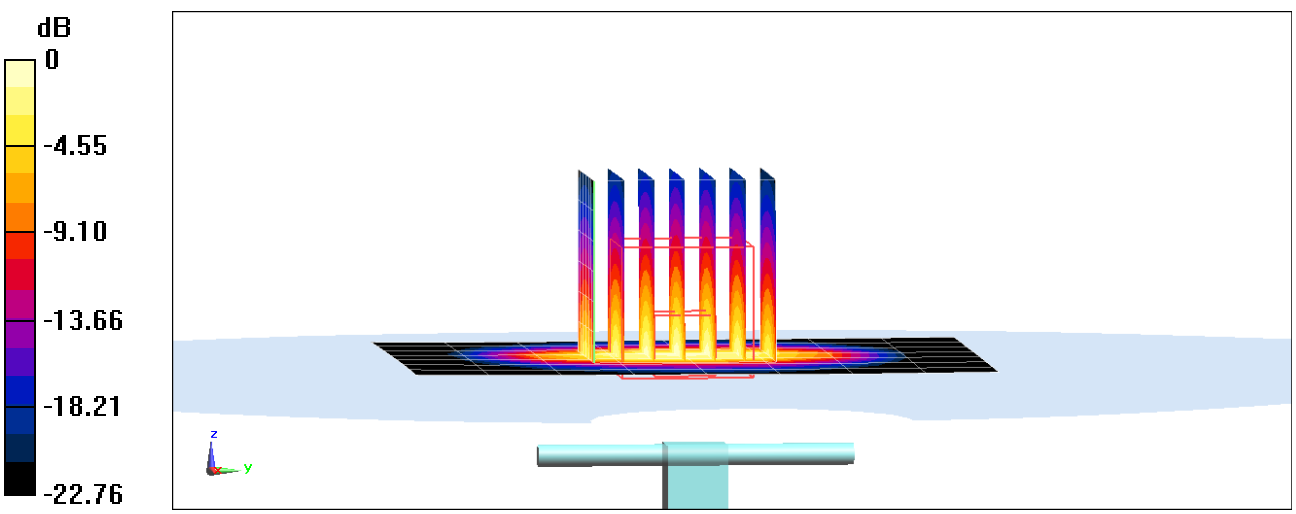
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Head Medium parameters used:
f = 2450 MHz; σ = 1.867 S/m; ε_r = 38.147; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-12-2018; Ambient Temp: 22.5°C; Tissue Temp: 21.5°C

Probe: ES3DV3 - SN3131; ConvF(4.75, 4.75, 4.75); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.4 W/kg
SAR(1 g) = 5.46 W/kg
Deviation(1 g) = 2.44%



0 dB = 7.23 W/kg = 8.59 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1069

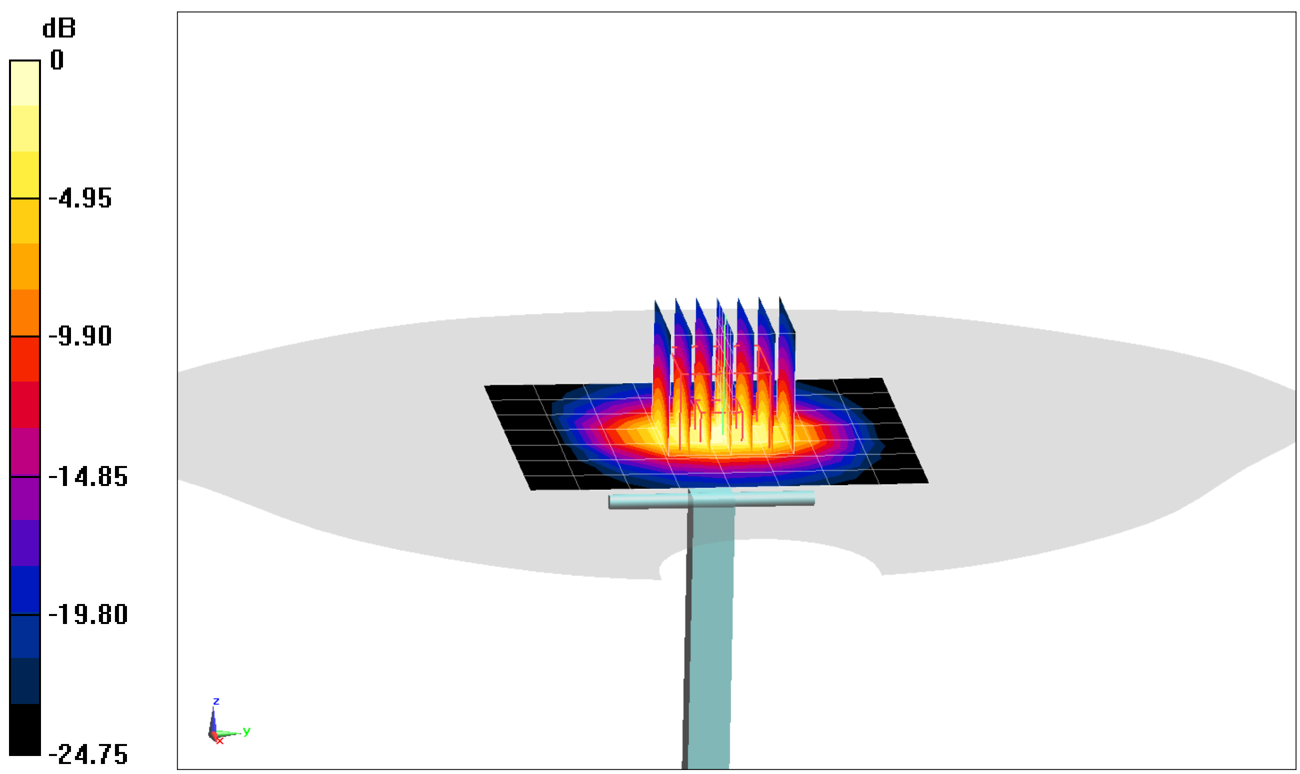
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 2300-2600 Head Medium parameters used:
f = 2600 MHz; σ = 2.017 S/m; ε_r = 37.435; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-19-2018; Ambient Temp: 24.0°C; Tissue Temp: 21.2°C

Probe: ES3DV3 - SN3119; ConvF(4.47, 4.47, 4.47); Calibrated: 5/18/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn728; Calibrated: 5/17/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CC; Serial: 1179
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2600 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 12.0 W/kg
SAR(1 g) = 5.44 W/kg
Deviation(1 g) = -4.39%



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

PCTEST ENGINEERING LABORATORY, INC.

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

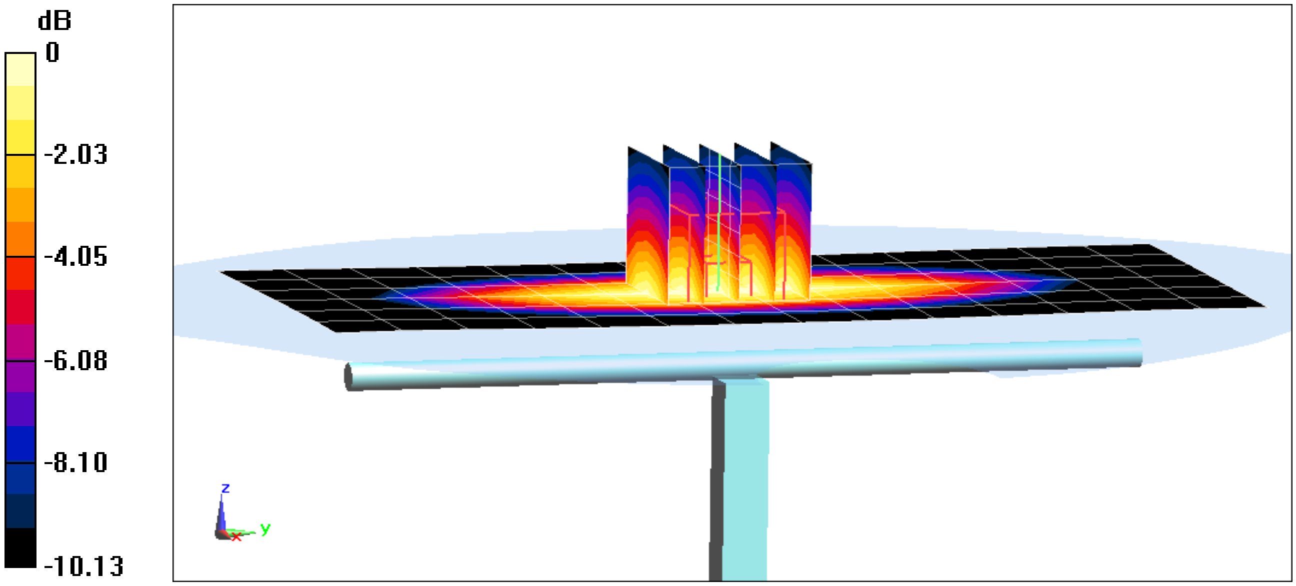
Communication System: UID 0, CW; Frequency: 750 MHz; Duty Cycle: 1:1
Medium: 700-750MHz Body Medium parameters used (interpolated):
f = 750 MHz; σ = 0.975 S/m; ε_r = 55.626; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-16-2018; Ambient Temp: 22.1°C; Tissue Temp: 21.6°C

Probe: ES3DV3 - SN3131; ConvF(6.26, 6.26, 6.26); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

750 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x15x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 2.71 W/kg
SAR(10 g) = 1.2 W/kg
Deviation(10 g) = 5.82%



0 dB = 2.13 W/kg = 3.28 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

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

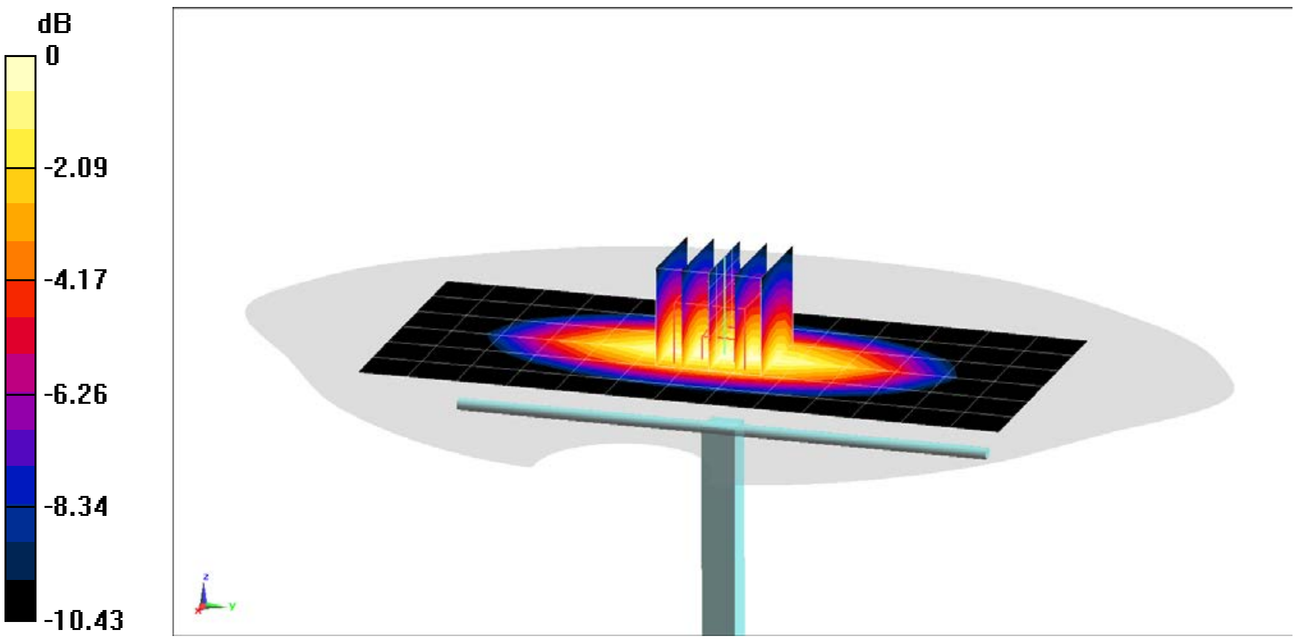
Communication System: UID 0, CW; Frequency: 835 MHz; Duty Cycle: 1:1
Medium: 835 Body Medium parameters used:
f = 835 MHz; σ = 1.004 S/m; ε_r = 53.814; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.5 cm

Test Date: 07-16-2018; Ambient Temp: 22.3°C; Tissue Temp: 21.8°C

Probe: ES3DV3 - SN3287; ConvF(6.56, 6.56, 6.56); Calibrated: 9/18/2017;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1533; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 AA; Serial: 1935
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

835 MHz System Verification at 23.0 dBm (200 mW)

Area Scan (7x14x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 3.05 W/kg
SAR(10 g) = 1.35 W/kg
Deviation(10 g) = 6.97%



0 dB = 2.39 W/kg = 3.78 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1104

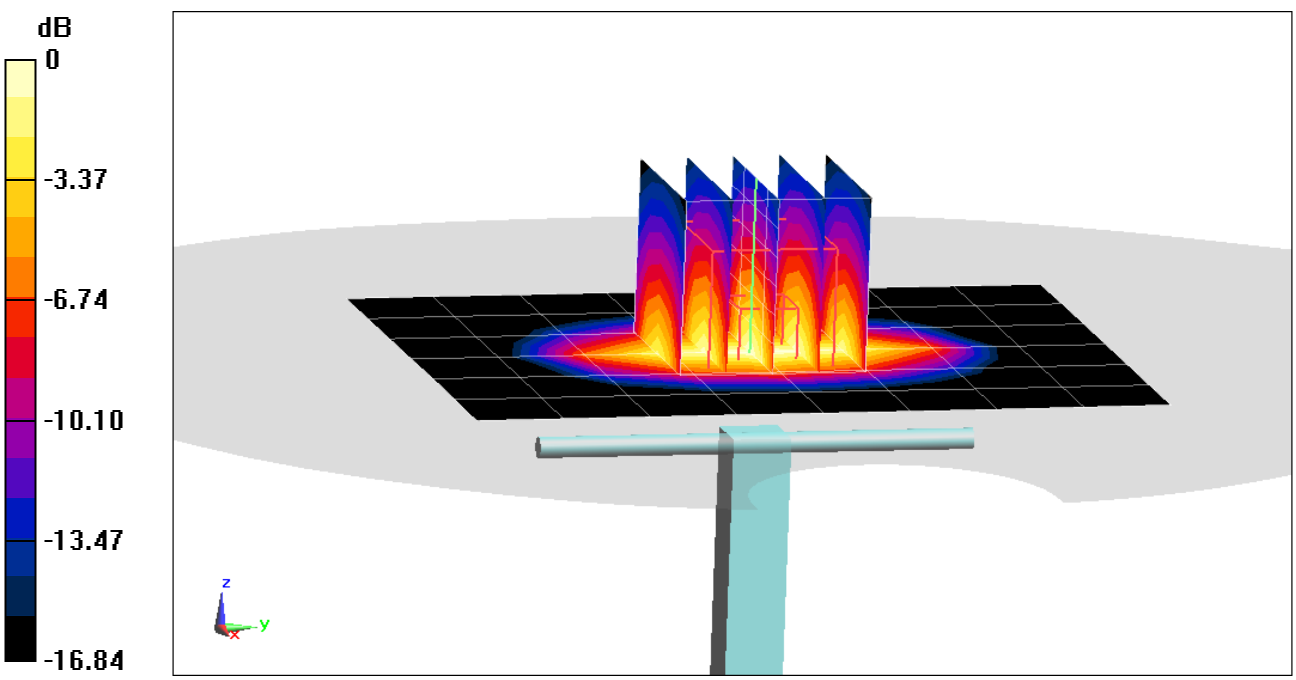
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
$f = 1750$ MHz; $\sigma = 1.484$ S/m; $\varepsilon_r = 52.18$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-16-2018; Ambient Temp: 21.8°C; Tissue Temp: 21.4°C

Probe: EX3DV4 - SN7490; ConvF(8.69, 8.69, 8.69); Calibrated: 1/26/2018;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1532; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1936
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.95 W/kg
SAR(10 g) = 2.06 W/kg
Deviation(10 g) = 5.10%



0 dB = 5.90 W/kg = 7.71 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: 1104

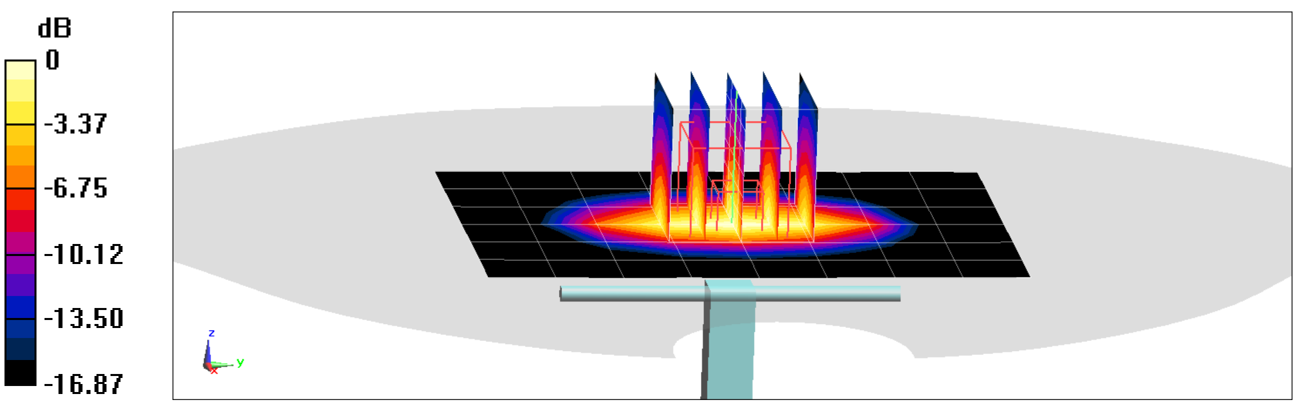
Communication System: UID 0, CW; Frequency: 1750 MHz; Duty Cycle: 1:1
Medium: 1750 Body Medium parameters used:
f = 1750 MHz; σ = 1.475 S/m; ε_r = 51.694; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-18-2018; Ambient Temp: 22.9°C; Tissue Temp: 20.5°C

Probe: EX3DV4 - SN7490; ConvF(8.69, 8.69, 8.69); Calibrated: 1/26/2018;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1532; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1936
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1750 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x9x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 6.92 W/kg
SAR(10 g) = 2.05 W/kg
Deviation(10 g) = 4.59%



0 dB = 5.88 W/kg = 7.69 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d180

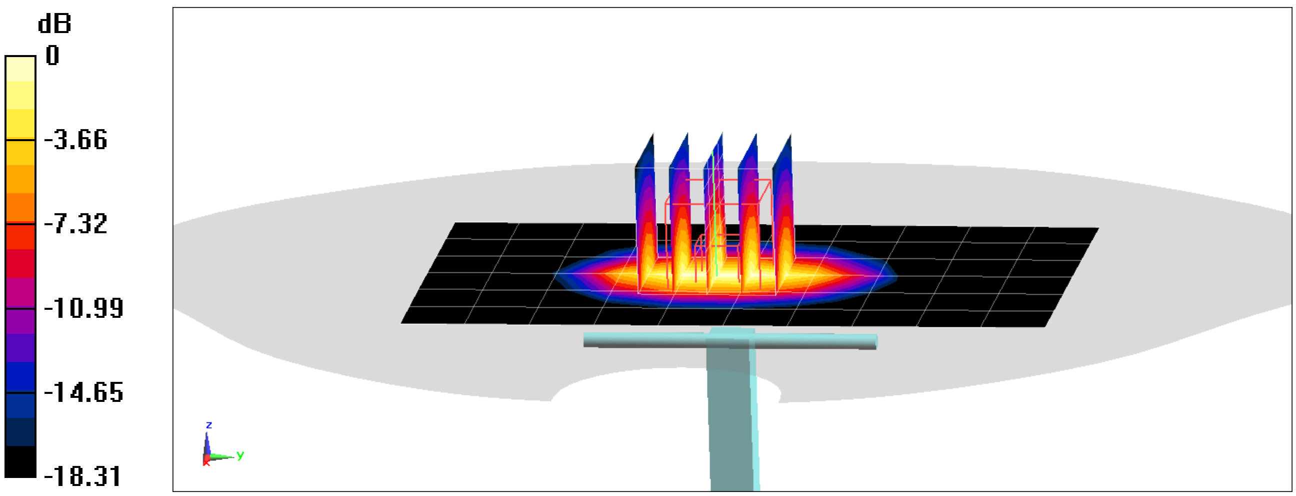
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.575 S/m; ε_r = 51.562; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-13-2018; Ambient Temp: 21.9°C; Tissue Temp: 22.7°C

Probe: EX3DV4 - SN7490; ConvF(8.32, 8.32, 8.32); Calibrated: 1/26/2018;
Sensor-Surface: 1.4mm (Mechanical Surface Detection)
Electronics: DAE4 Sn1532; Calibrated: 1/26/2018
Phantom: Twin-SAM V8.0; Type: QD 000 P41 Ax; Serial: 1936
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x11x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.70 W/kg
SAR(10 g) = 2.15 W/kg
Deviation(10 g) = 2.87%



0 dB = 6.48 W/kg = 8.12 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: 5d181

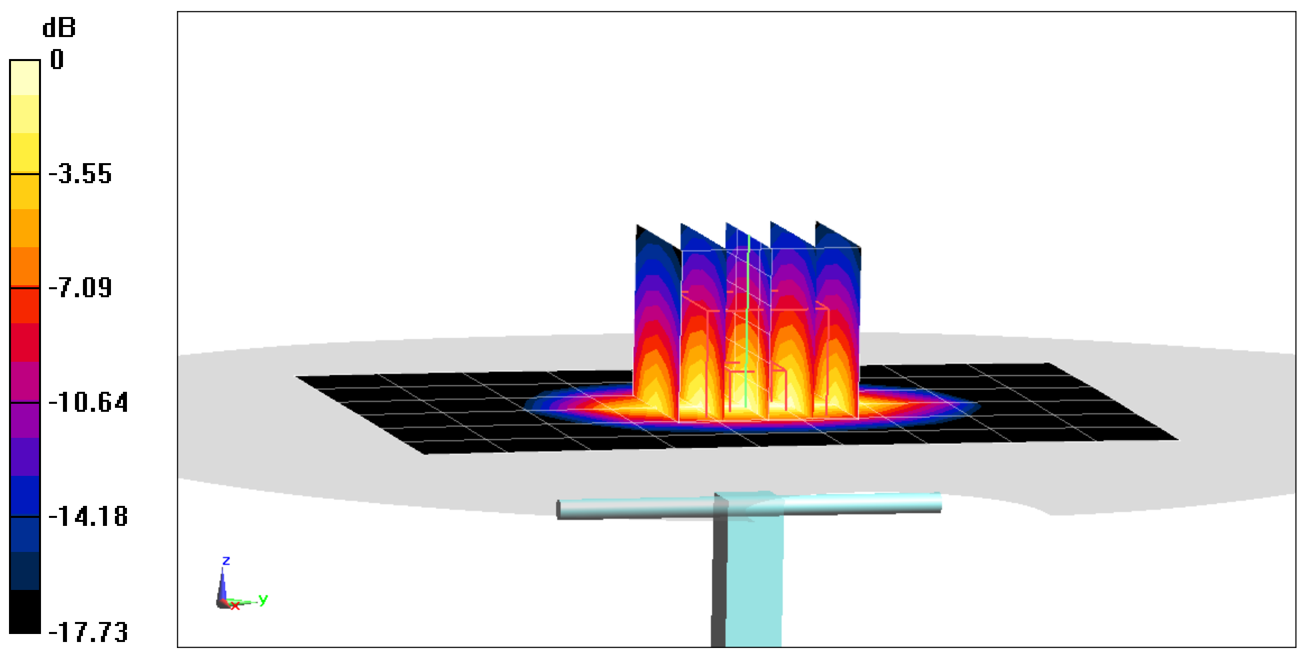
Communication System: UID 0, CW; Frequency: 1900 MHz; Duty Cycle: 1:1
Medium: 1900 Body Medium parameters used (interpolated):
f = 1900 MHz; σ = 1.569 S/m; ε_r = 51.386; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-17-2018; Ambient Temp: 21.5°C; Tissue Temp: 20.8°C

Probe: ES3DV2 - SN3022; ConvF(4.67, 4.67, 4.67); Calibrated: 6/22/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn701; Calibrated: 6/18/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CA; Serial: 1275
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

1900 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (7x10x1): Measurement grid: dx=15mm, dy=15mm
Zoom Scan (5x5x7)/Cube 0: Measurement grid: dx=8mm, dy=8mm, dz=5mm
Peak SAR (extrapolated) = 7.26 W/kg
SAR(10 g) = 2.15 W/kg
Deviation(10 g) = 2.87%



0 dB = 5.18 W/kg = 7.14 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: 750

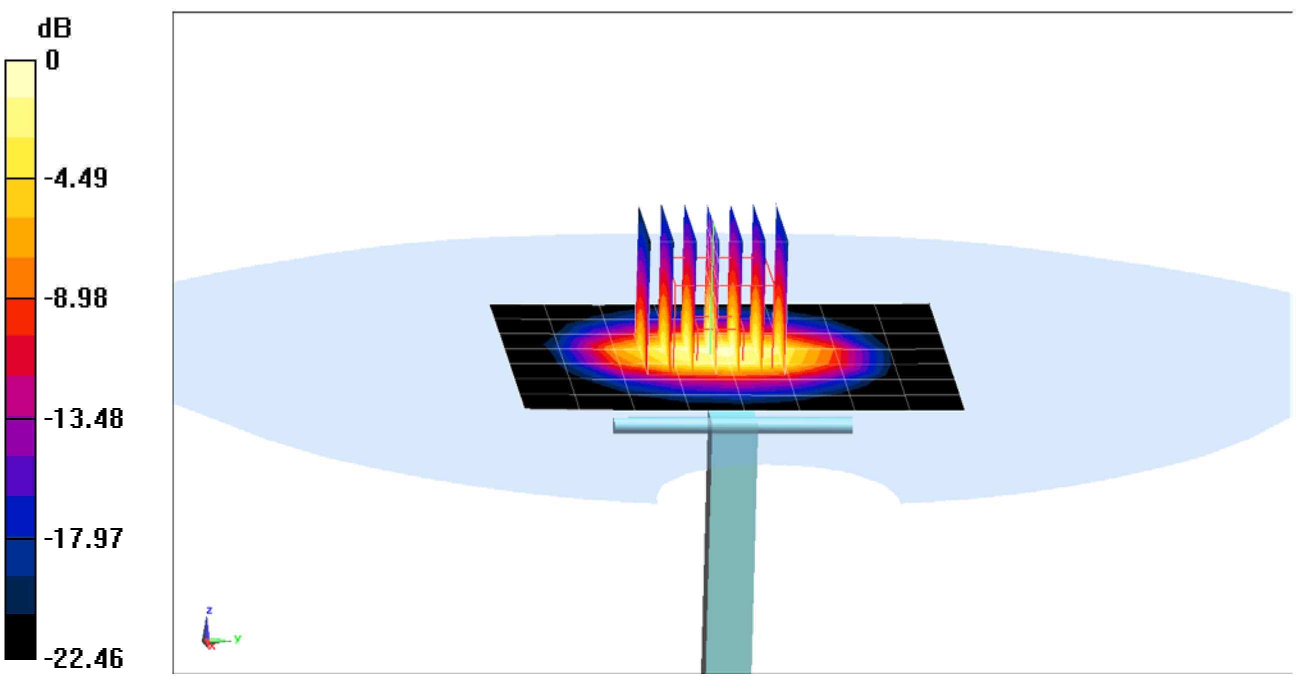
Communication System: UID 0, CW; Frequency: 2450 MHz; Duty Cycle: 1:1
Medium: 2450 Body Medium parameters used:
f = 2450 MHz; σ = 2.02 S/m; ε_r = 51.378; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-10-2018; Ambient Temp: 21.9°C; Tissue Temp: 21.7°C

Probe: ES3DV3 - SN3131; ConvF(4.45, 4.45, 4.45); Calibrated: 3/13/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn604; Calibrated: 3/7/2018
Phantom: SAM Main; Type: SAM 4.0; Serial: TP-1406
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2450 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.0 W/kg
SAR(10 g) = 2.48 W/kg
Deviation(10 g) = 2.48%



0 dB = 6.96 W/kg = 8.43 dBW/kg

PCTEST ENGINEERING LABORATORY, INC.

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: 1009

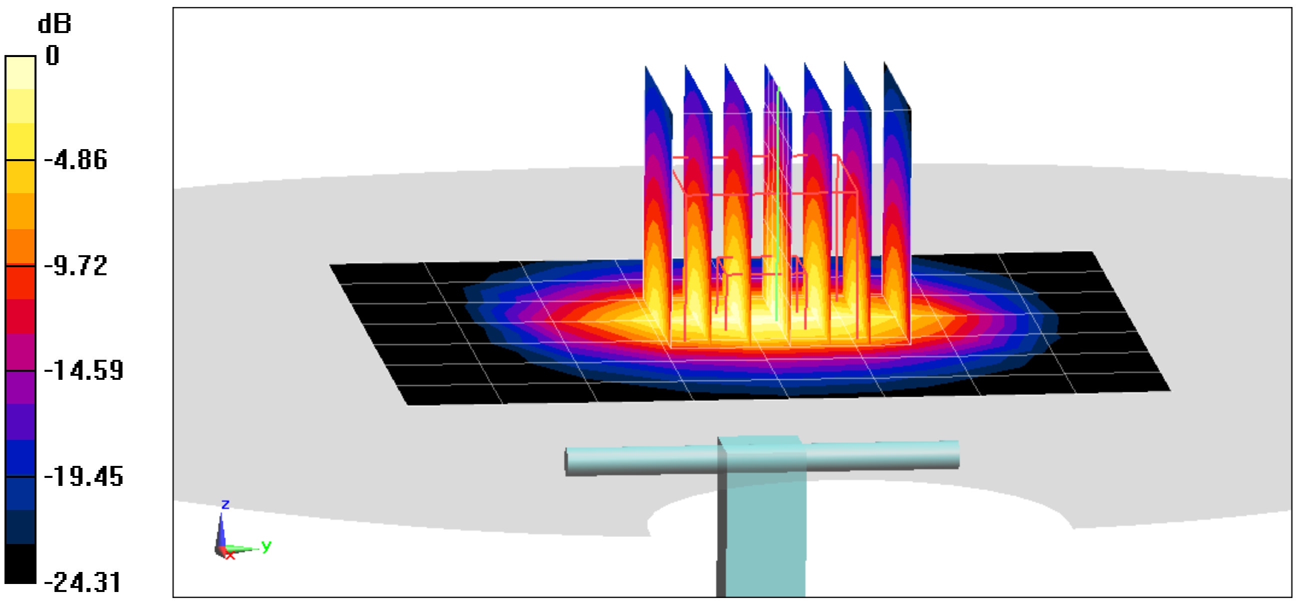
Communication System: UID 0, CW; Frequency: 2600 MHz; Duty Cycle: 1:1
Medium: 700-2700 Body Medium parameters used:
f = 2600 MHz; σ = 2.144 S/m; ε_r = 52.469; ρ = 1000 kg/m^3
Phantom section: Flat Section; Space: 1.0 cm

Test Date: 07-16-2018; Ambient Temp: 22.1°C; Tissue Temp: 22.5°C

Probe: ES3DV3 - SN3275; ConvF(4.47, 4.47, 4.47); Calibrated: 4/12/2018;
Sensor-Surface: 3mm (Mechanical Surface Detection)
Electronics: DAE4 Sn501; Calibrated: 4/12/2018
Phantom: Twin-SAM V4.0; Type: QD 000 P40 CD; Serial: 1736
Measurement SW: DASY52, Version 52.10;SEMCAD X Version 14.6.10 (7417)

2600 MHz System Verification at 20.0 dBm (100 mW)

Area Scan (8x9x1): Measurement grid: dx=12mm, dy=12mm
Zoom Scan (7x7x7)/Cube 0: Measurement grid: dx=5mm, dy=5mm, dz=5mm
Peak SAR (extrapolated) = 11.6 W/kg
SAR(10 g) = 2.41 W/kg
Deviation(10 g) = -3.60%



0 dB = 7.17 W/kg = 8.56 dBW/kg

APPENDIX C: PROBE CALIBRATION

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

S Schweizerischer Kalibrierdienst
C Service suisse d'étalonnage
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: D750V3-1034_May18

CALIBRATION CERTIFICATE

Object: D750V3 - SN:1034

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

SC ✓ 5/31/2018

Calibration date: May 18, 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	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

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: May 22, 2018

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	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Head TSL parameters	22.0 °C	41.9	0.89 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	41.0 ± 6 %	0.89 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**8.32 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.36 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**5.42 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	Permittivity	Conductivity
Nominal Body TSL parameters	22.0 °C	55.5	0.96 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.7 ± 6 %	0.96 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.15 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**8.57 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.42 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**5.67 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	55.3 Ω + 0.0 jΩ
Return Loss	- 26.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	50.0 Ω - 3.2 jΩ
Return Loss	- 29.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.034 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	July 06, 2011

DASY5 Validation Report for Head TSL

Date: 17.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

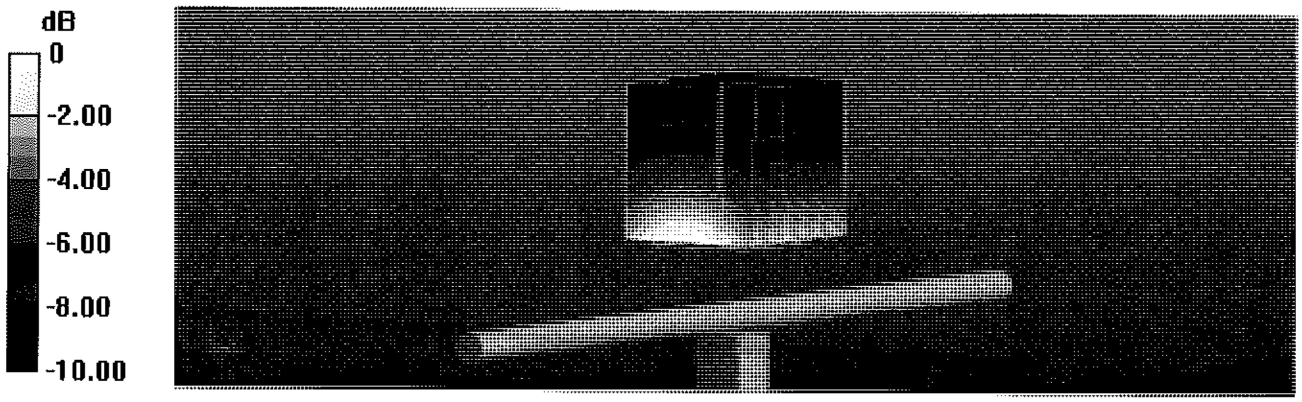
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; $\sigma = 0.89$ S/m; $\varepsilon_r = 41$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.22, 10.22, 10.22) @ 750 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

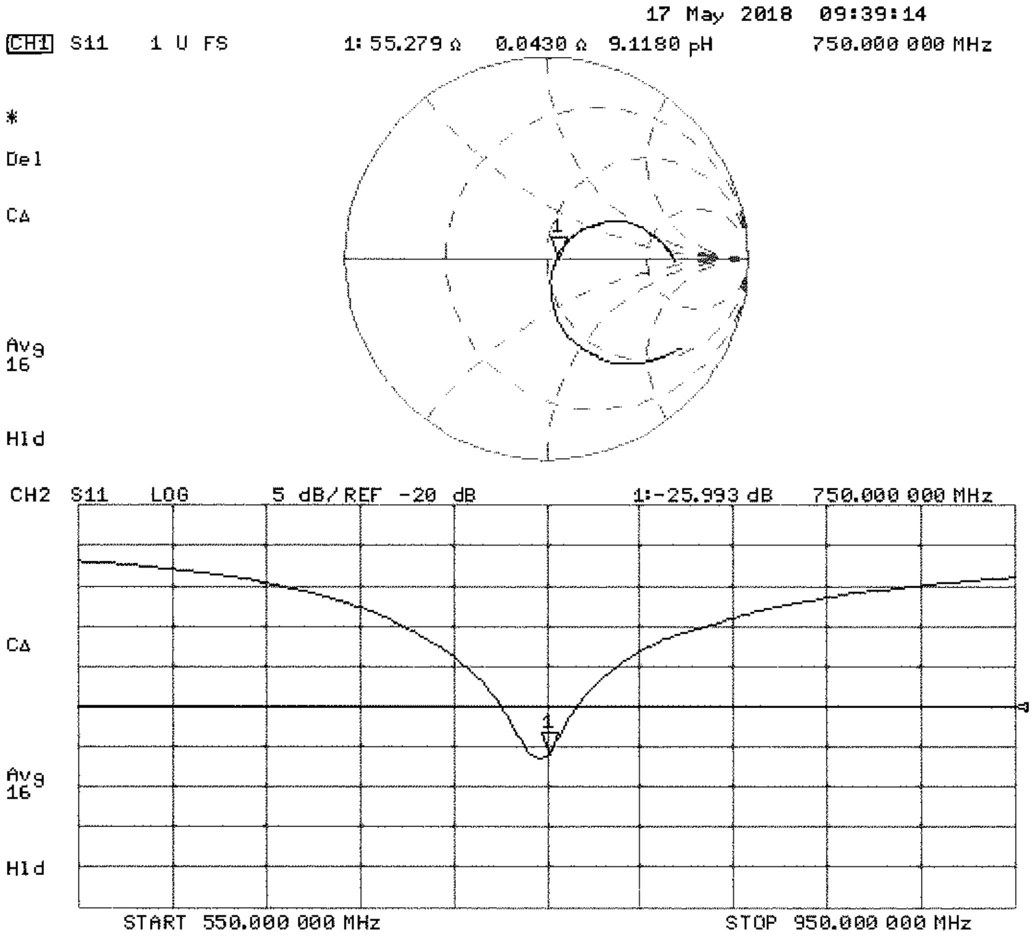
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 59.66 V/m; Power Drift = -0.03 dB
Peak SAR (extrapolated) = 3.18 W/kg
SAR(1 g) = 2.09 W/kg; SAR(10 g) = 1.36 W/kg
Maximum value of SAR (measured) = 2.82 W/kg



0 dB = 2.82 W/kg = 4.50 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 18.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

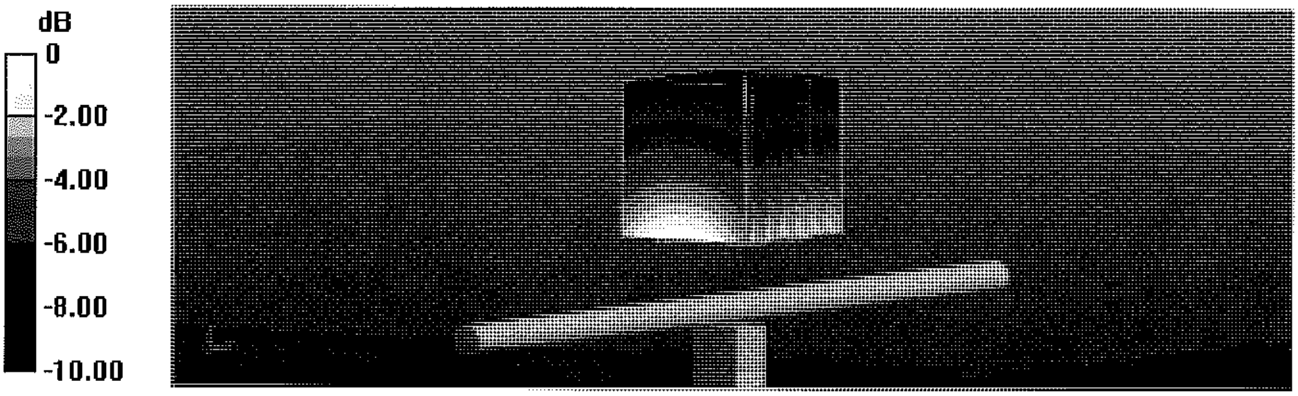
Communication System: UID 0 - CW; Frequency: 750 MHz
Medium parameters used: f = 750 MHz; σ = 0.96 S/m; ε_r = 54.7; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.19, 10.19, 10.19) @ 750 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

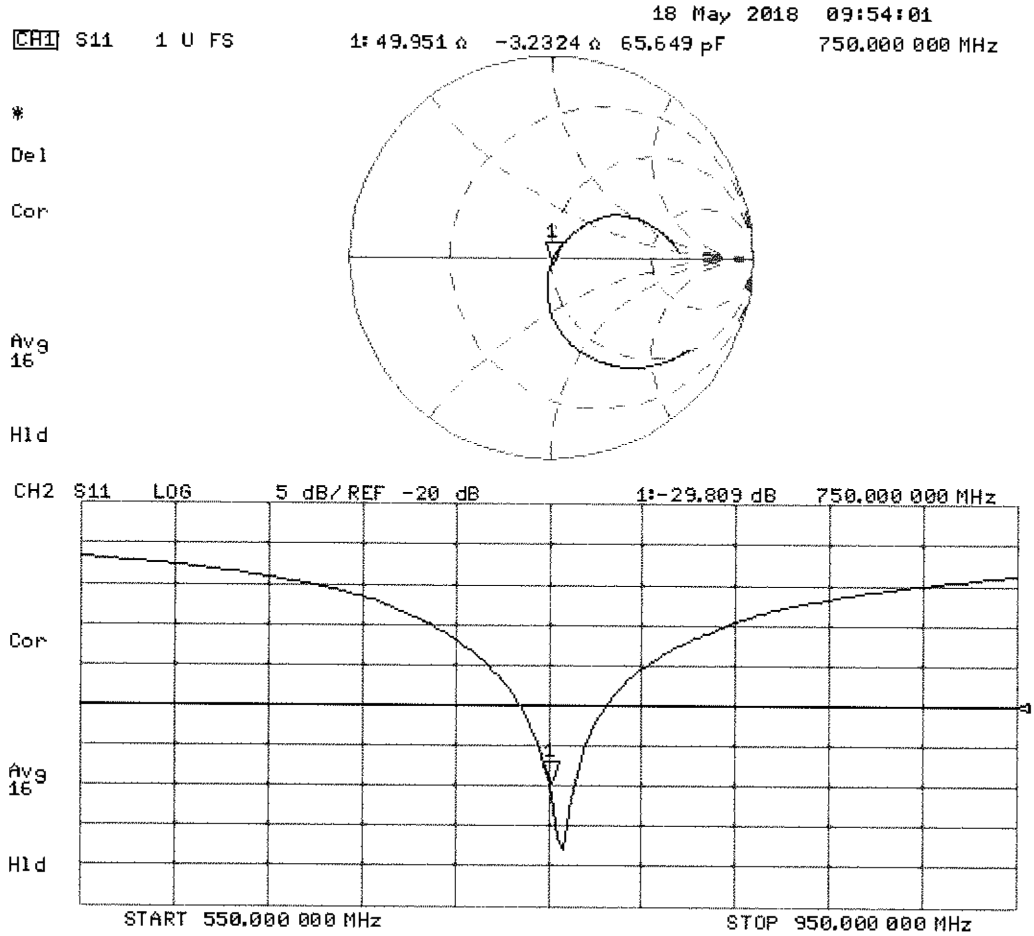
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 57.60 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 3.16 W/kg
SAR(1 g) = 2.15 W/kg; SAR(10 g) = 1.42 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



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Accreditation No.: SCS 0108

Client PC Test

Certificate No: D835V2-4d180_May18

CALIBRATION CERTIFICATE

Object	D835V2 - SN:4d180
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 18, 2018

SC ✓
5/31/2018

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	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

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 22, 2018

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	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	15 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	835 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	41.5	0.90 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.8 ± 6 %	0.92 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	2.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**9.60 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	1.58 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**6.22 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	55.2	0.97 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.6 ± 6 %	0.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	2.44 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**9.59 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	1.60 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**6.31 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.7 Ω - 5.1 jΩ
Return Loss	- 25.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	47.2 Ω - 8.2 jΩ
Return Loss	- 21.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.396 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 24, 2014

DASY5 Validation Report for Head TSL

Date: 17.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

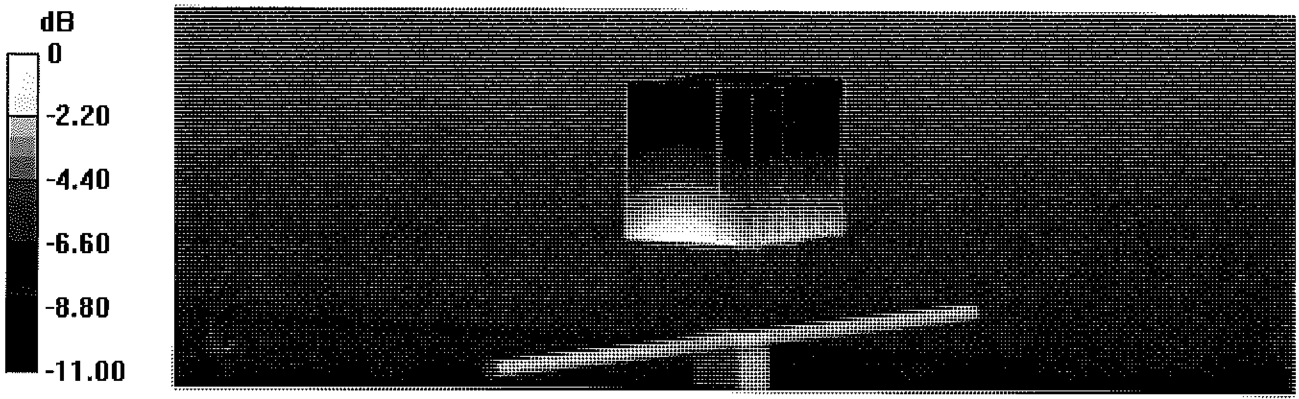
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; σ = 0.92 S/m; ε_r = 40.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(9.9, 9.9, 9.9) @ 835 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

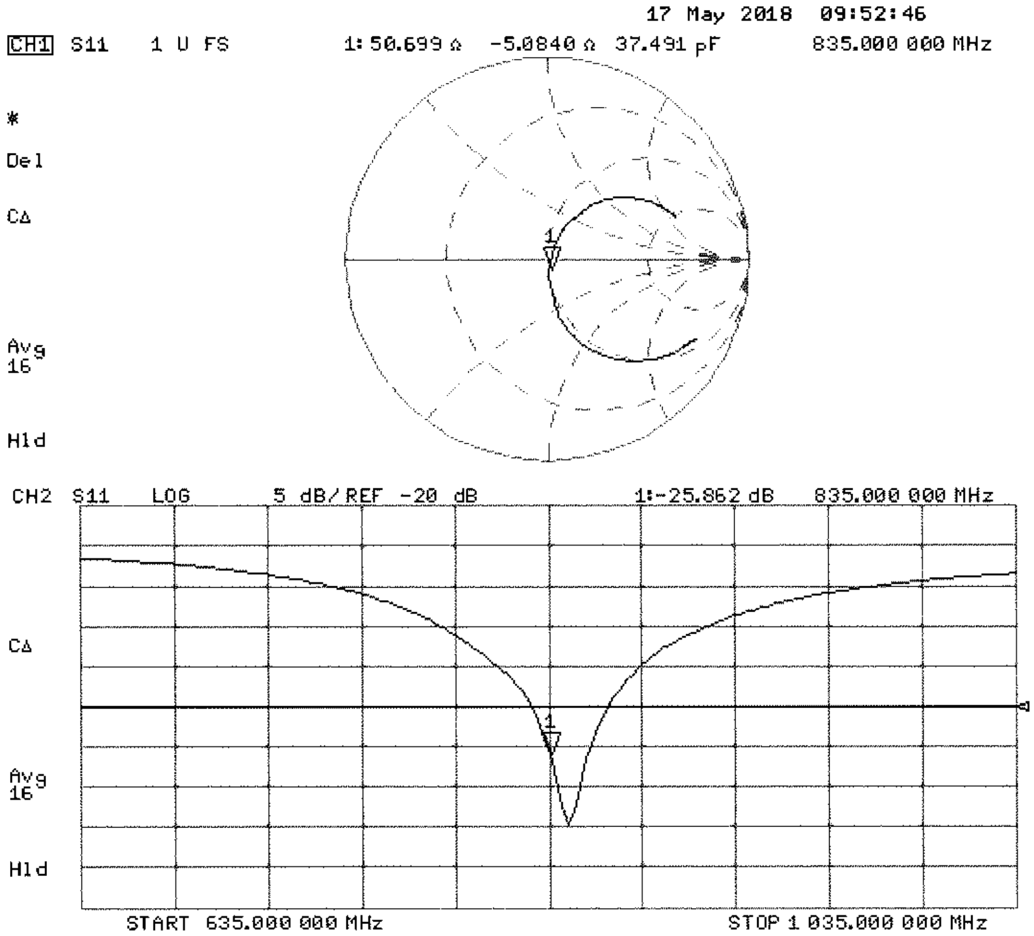
Dipole Calibration for Head Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 65.39 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 3.78 W/kg
SAR(1 g) = 2.45 W/kg; SAR(10 g) = 1.58 W/kg
Maximum value of SAR (measured) = 3.32 W/kg



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

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 18.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

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

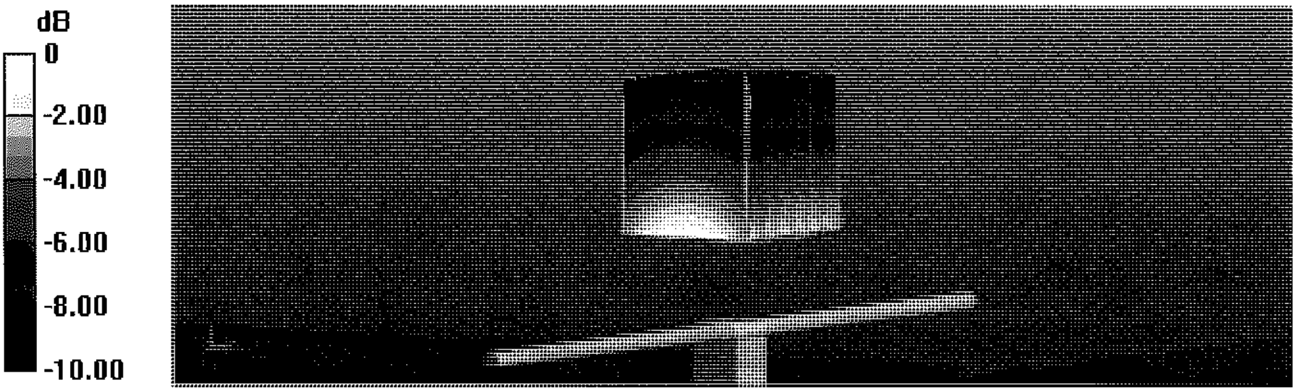
Communication System: UID 0 - CW; Frequency: 835 MHz
Medium parameters used: f = 835 MHz; $\sigma = 0.99$ S/m; $\varepsilon_r = 54.6$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(10.05, 10.05, 10.05) @ 835 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

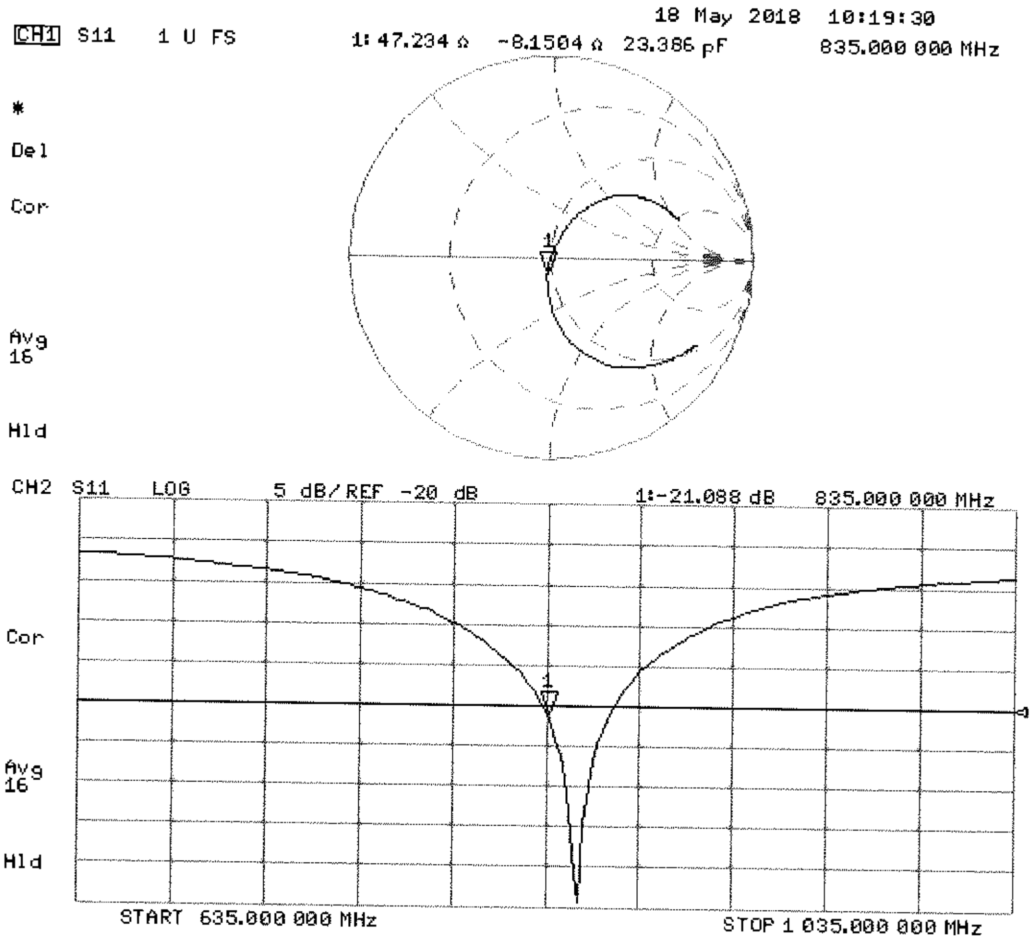
Dipole Calibration for Body Tissue/Pin=250 mW, d=15mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 60.80 V/m; Power Drift = -0.02 dB
Peak SAR (extrapolated) = 3.62 W/kg
SAR(1 g) = 2.44 W/kg; SAR(10 g) = 1.6 W/kg
Maximum value of SAR (measured) = 3.23 W/kg



0 dB = 3.23 W/kg = 5.09 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D1750V2-1104_Sep17

CALIBRATION CERTIFICATE

Object	D1750V2 - SN:1104
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 07, 2017

SC ✓
10/03/2017

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

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

Calibration Equipment used (M&TE critical for calibration)

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

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: September 7, 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:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1750 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.1	1.37 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.1 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.11 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**36.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	4.81 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**19.2 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.4	1.49 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	53.8 ± 6 %	1.46 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.03 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**36.6 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	4.85 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**19.6 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	50.8 Ω - 0.2 jΩ
Return Loss	- 41.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.5 Ω - 0.7 jΩ
Return Loss	- 28.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.217 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	May 16, 2013

DASY5 Validation Report for Head TSL

Date: 07.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1104

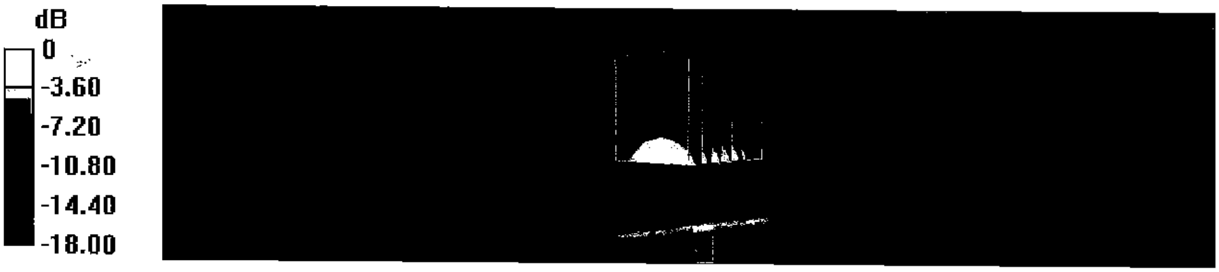
Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.36 S/m; ε_r = 39.1; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.73, 8.73, 8.73); 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)

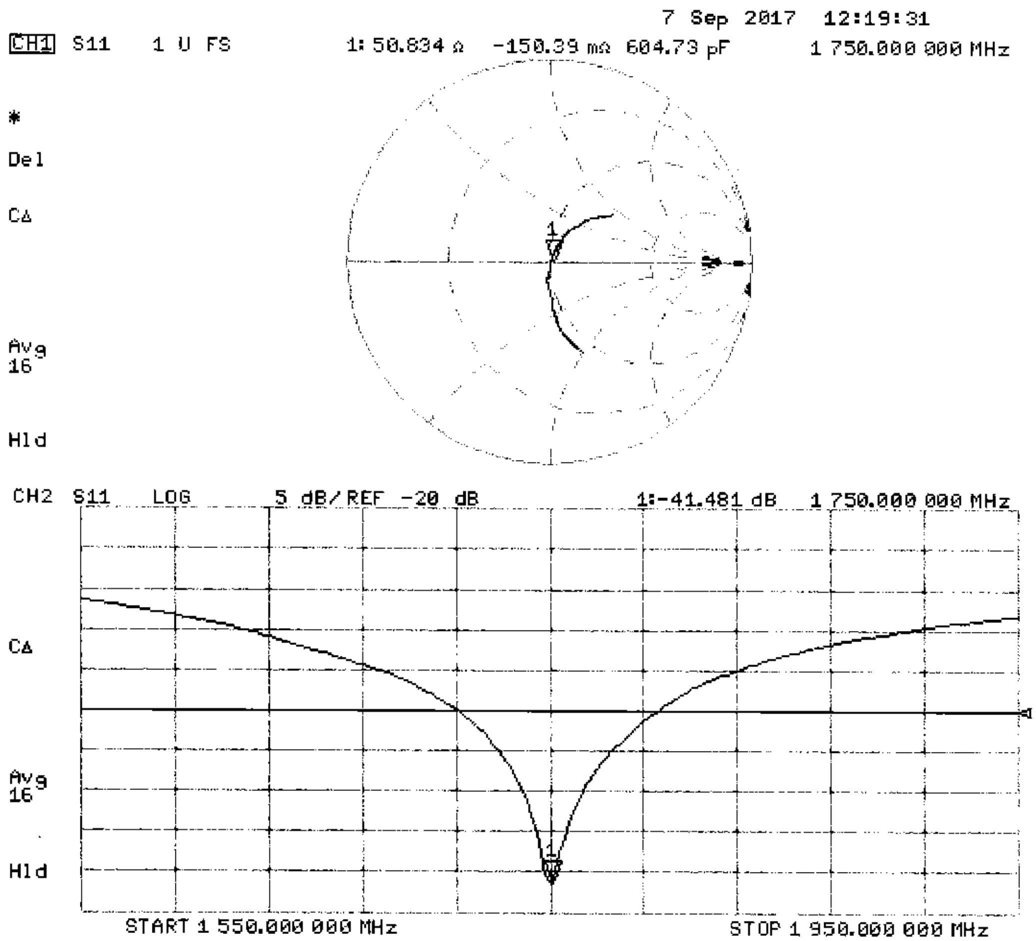
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 104.9 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 17.0 W/kg
SAR(1 g) = 9.11 W/kg; SAR(10 g) = 4.81 W/kg
Maximum value of SAR (measured) = 13.9 W/kg



0 dB = 13.9 W/kg = 11.43 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

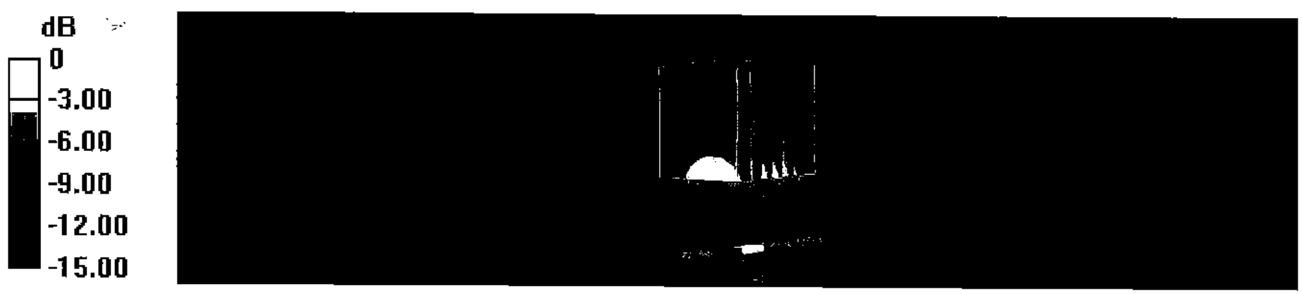
DUT: Dipole 1750 MHz; Type: D1750V2; Serial: D1750V2 - SN:1104

Communication System: UID 0 - CW; Frequency: 1750 MHz
Medium parameters used: f = 1750 MHz; σ = 1.46 S/m; ε_r = 53.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

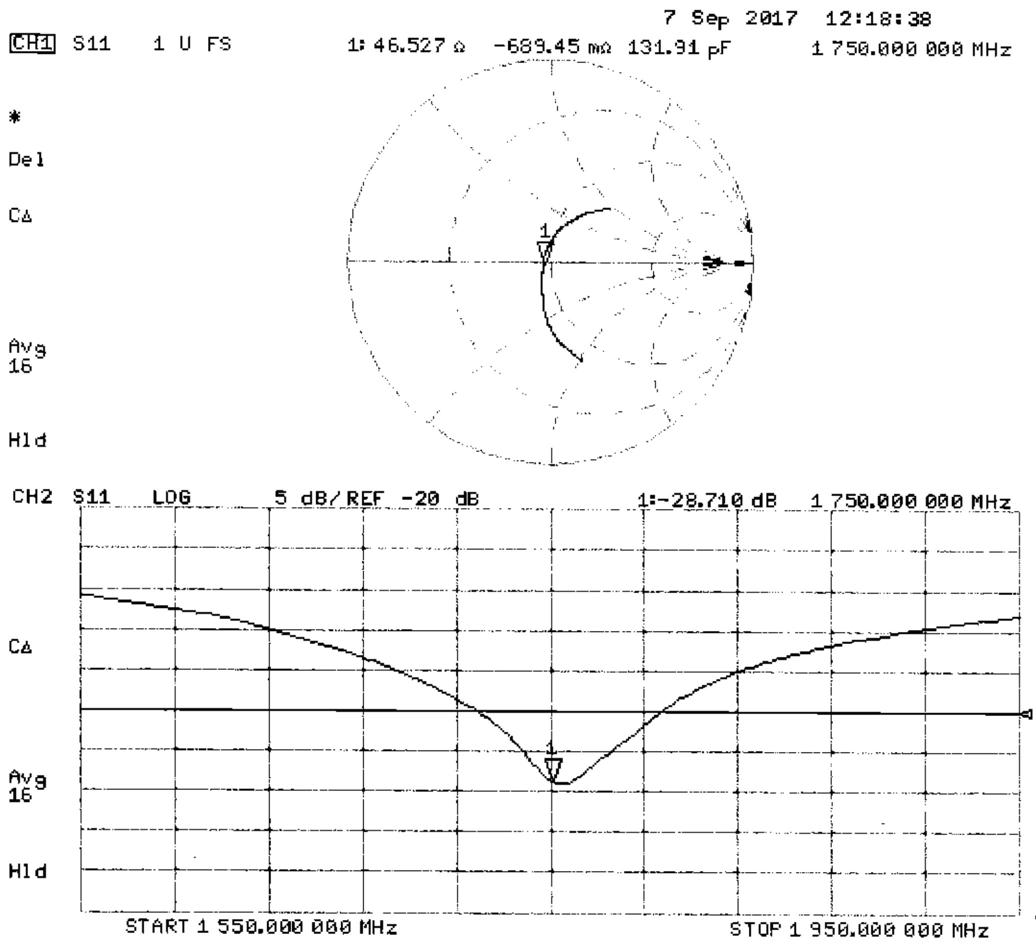
- Probe: EX3DV4 - SN7349; ConvF(8.46, 8.46, 8.46); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 99.30 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 15.6 W/kg
SAR(1 g) = 9.03 W/kg; SAR(10 g) = 4.85 W/kg
Maximum value of SAR (measured) = 12.9 W/kg



0 dB = 12.9 W/kg = 11.11 dBW/kg

Impedance Measurement Plot for Body TSL



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Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D1900V2-5d181_Sep17

CALIBRATION CERTIFICATE

Object	D1900V2 - SN:5d181
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 07, 2017

SC ✓
10/03/2017

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

Issued: September 7, 2017

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	39.0 ± 6 %	1.38 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.85 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.15 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.6 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.3 ± 6 %	1.47 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.65 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.14 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 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	53.7 Ω + 4.6 jΩ
Return Loss	- 24.9 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.2 Ω + 5.6 jΩ
Return Loss	- 24.8 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.200 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	August 23, 2013

DASY5 Validation Report for Head TSL

Date: 07.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d181

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.38 S/m; ε_r = 39; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

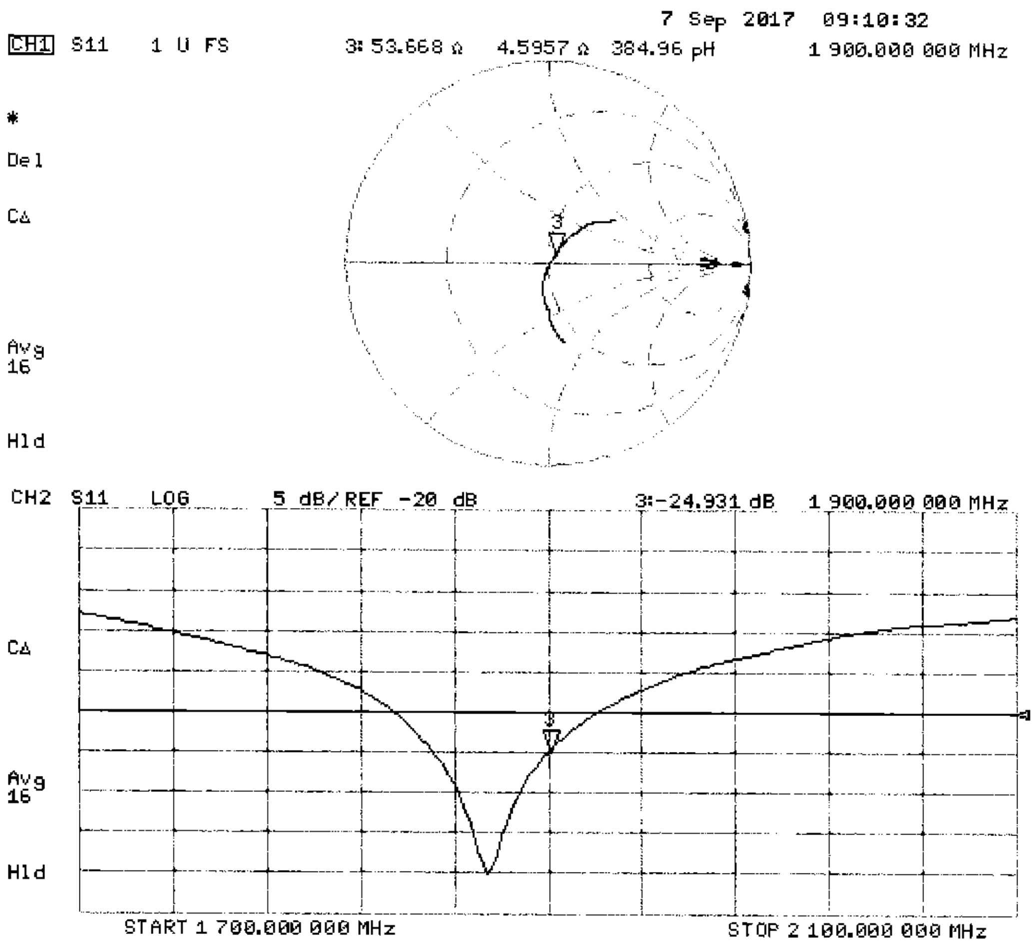
DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43); 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 = 106.8 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 18.5 W/kg
SAR(1 g) = 9.85 W/kg; SAR(10 g) = 5.15 W/kg
Maximum value of SAR (measured) = 14.8 W/kg

0 dB = 14.8 W/kg = 11.70 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

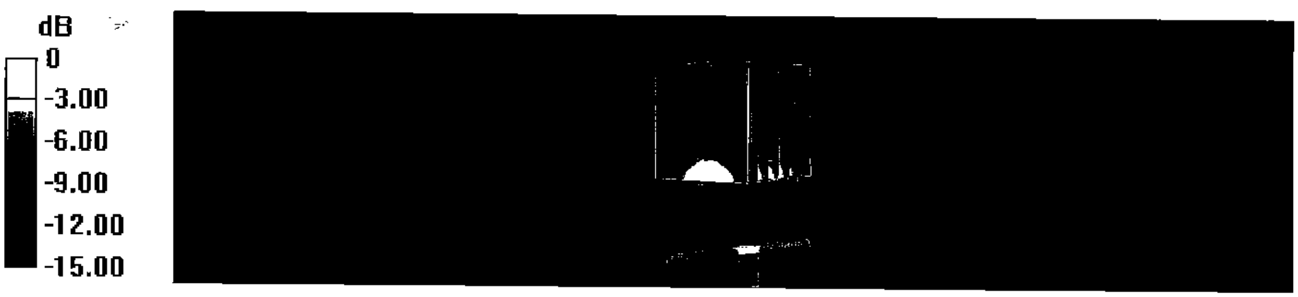
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d181

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma = 1.47$ S/m; $\varepsilon_r = 54.3$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

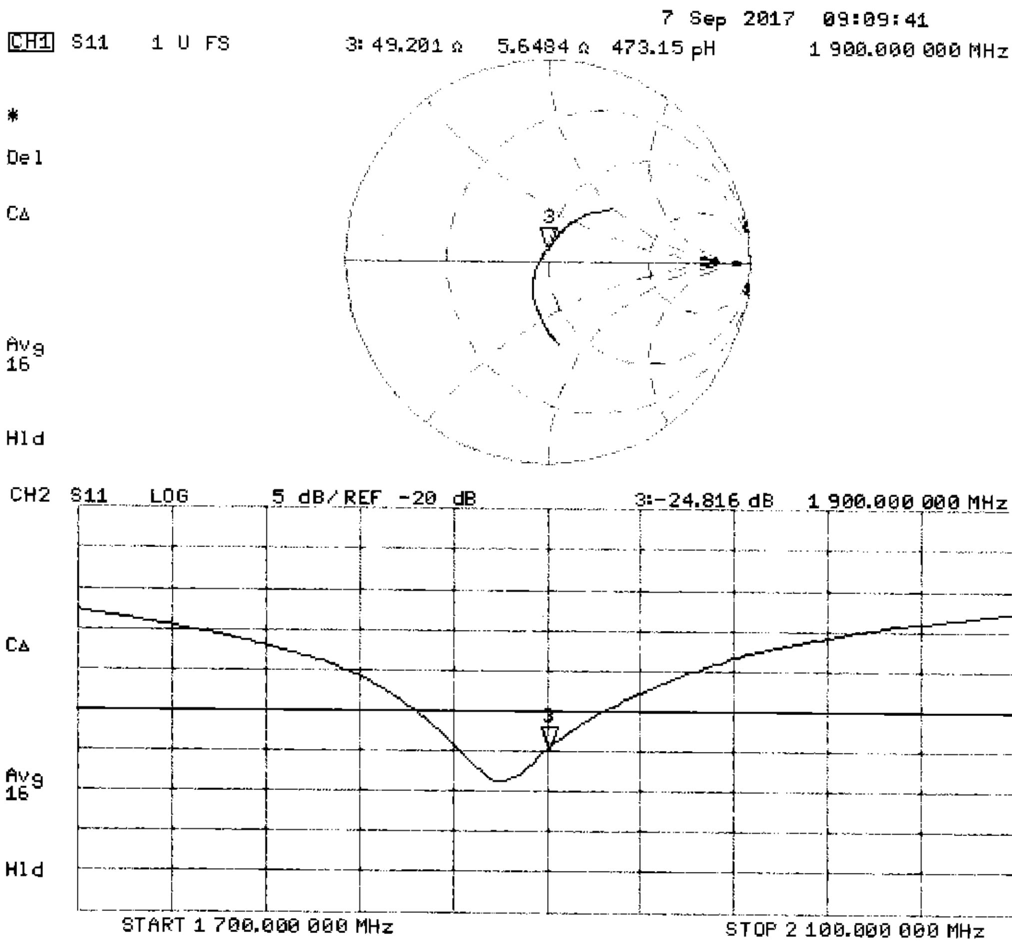
- Probe: EX3DV4 - SN7349; ConvF(8.2, 8.2, 8.2); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 101.4 V/m; Power Drift = -0.04 dB
Peak SAR (extrapolated) = 17.0 W/kg
SAR(1 g) = 9.65 W/kg; SAR(10 g) = 5.14 W/kg
Maximum value of SAR (measured) = 13.8 W/kg



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

Impedance Measurement Plot for Body TSL



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Zeughausstrasse 43, 8004 Zurich, Switzerland

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

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D1900V2-5d180_Aug17

CALIBRATION CERTIFICATE

Object	D1900V2 - SN:5d180
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	August 16, 2017

PM ✓ 8/27/17

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

	Name	Function	Signature
Calibrated by:	Johannes Kurikka	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: August 16, 2017

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	1900 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	40.0	1.40 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	40.6 ± 6 %	1.36 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	9.60 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**39.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	5.09 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**20.6 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	53.3	1.52 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	54.1 ± 6 %	1.48 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	9.68 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**39.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.17 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**20.9 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	54.0 Ω + 5.7 jΩ
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.6 Ω + 6.5 jΩ
Return Loss	- 23.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.203 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	August 23, 2013

DASY5 Validation Report for Head TSL

Date: 16.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

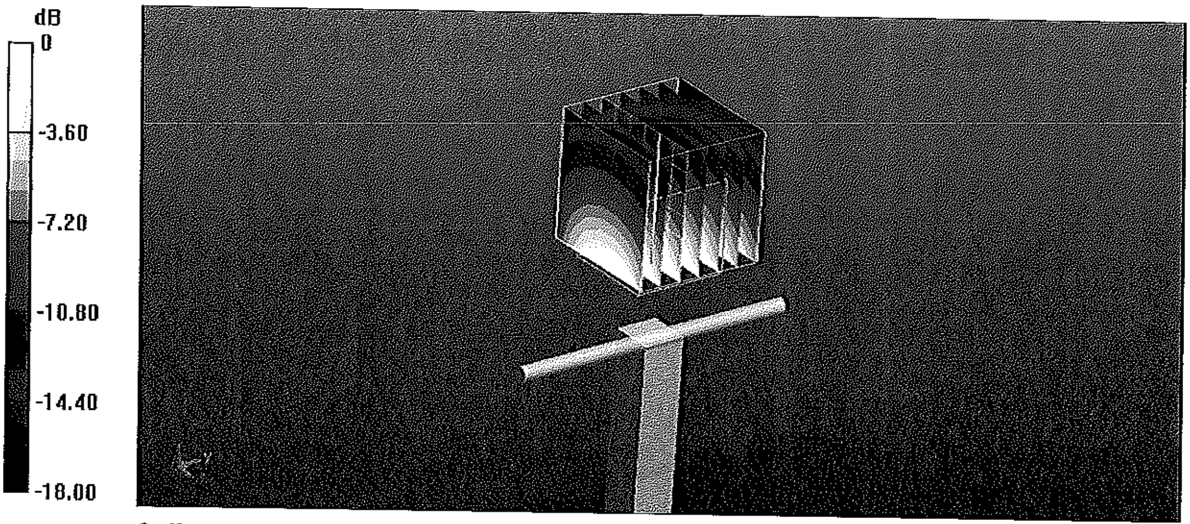
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d180

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; σ = 1.36 S/m; ε_r = 40.6; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

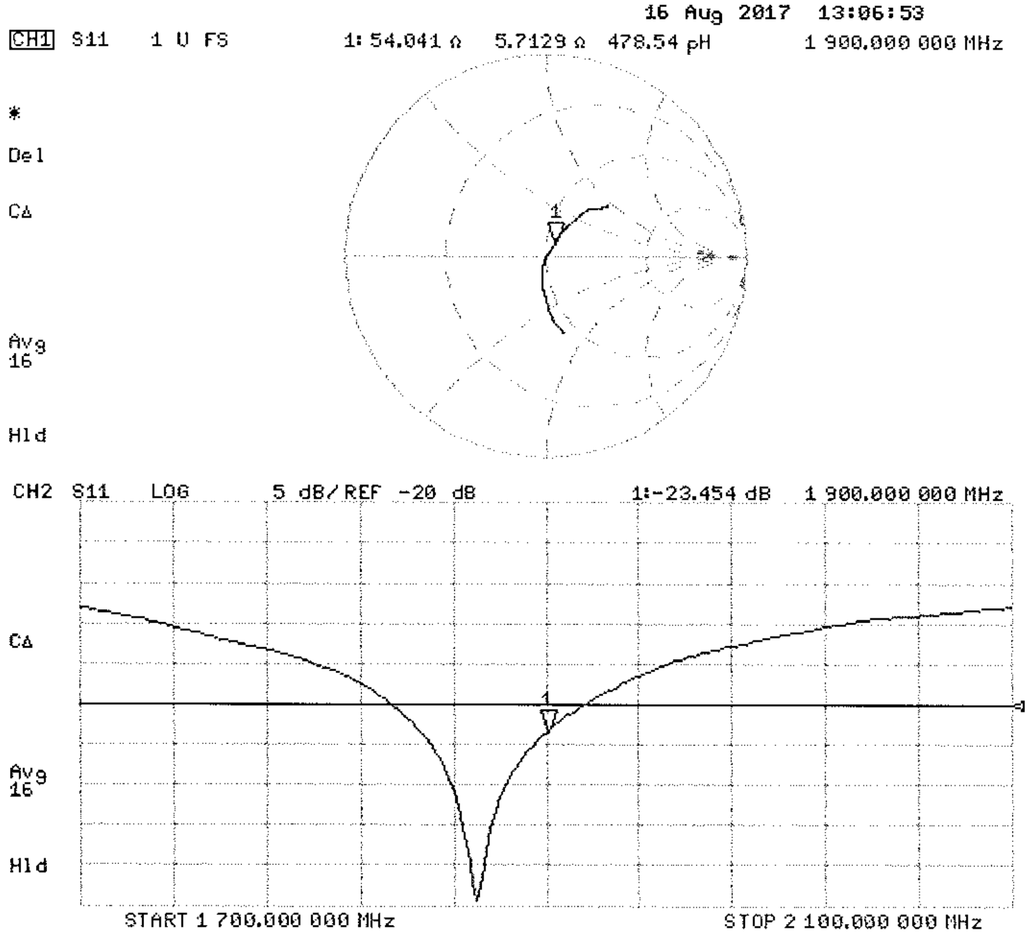
- Probe: EX3DV4 - SN7349; ConvF(8.43, 8.43, 8.43); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 103.7 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 17.6 W/kg
SAR(1 g) = 9.6 W/kg; SAR(10 g) = 5.09 W/kg
Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.08.2017

Test Laboratory: SPEAG, Zurich, Switzerland

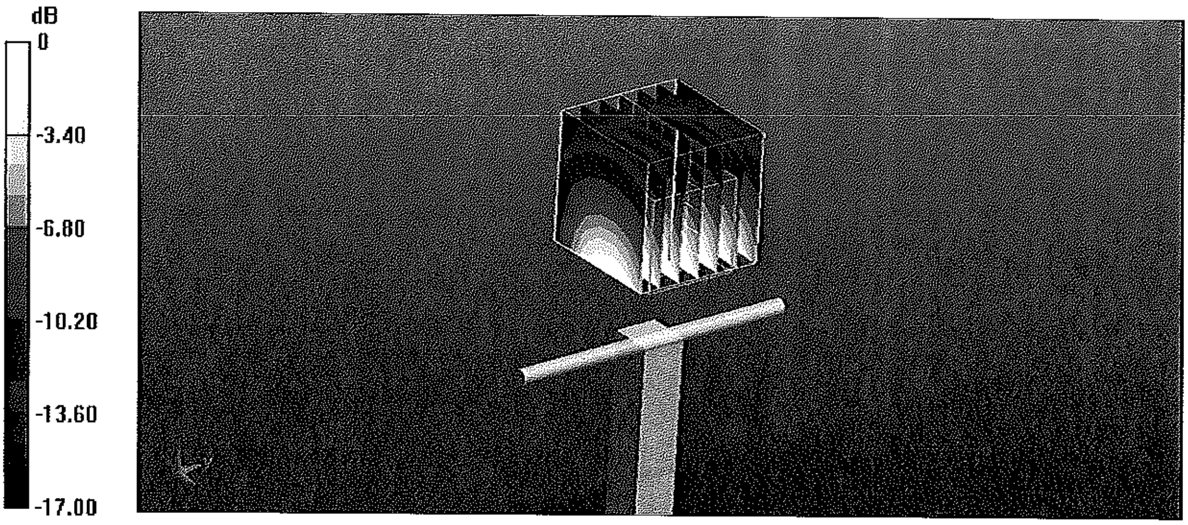
DUT: Dipole 1900 MHz; Type: D1900V2; Serial: D1900V2 - SN:5d180

Communication System: UID 0 - CW; Frequency: 1900 MHz
Medium parameters used: f = 1900 MHz; $\sigma = 1.48$ S/m; $\varepsilon_r = 54.1$; $\rho = 1000$ kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

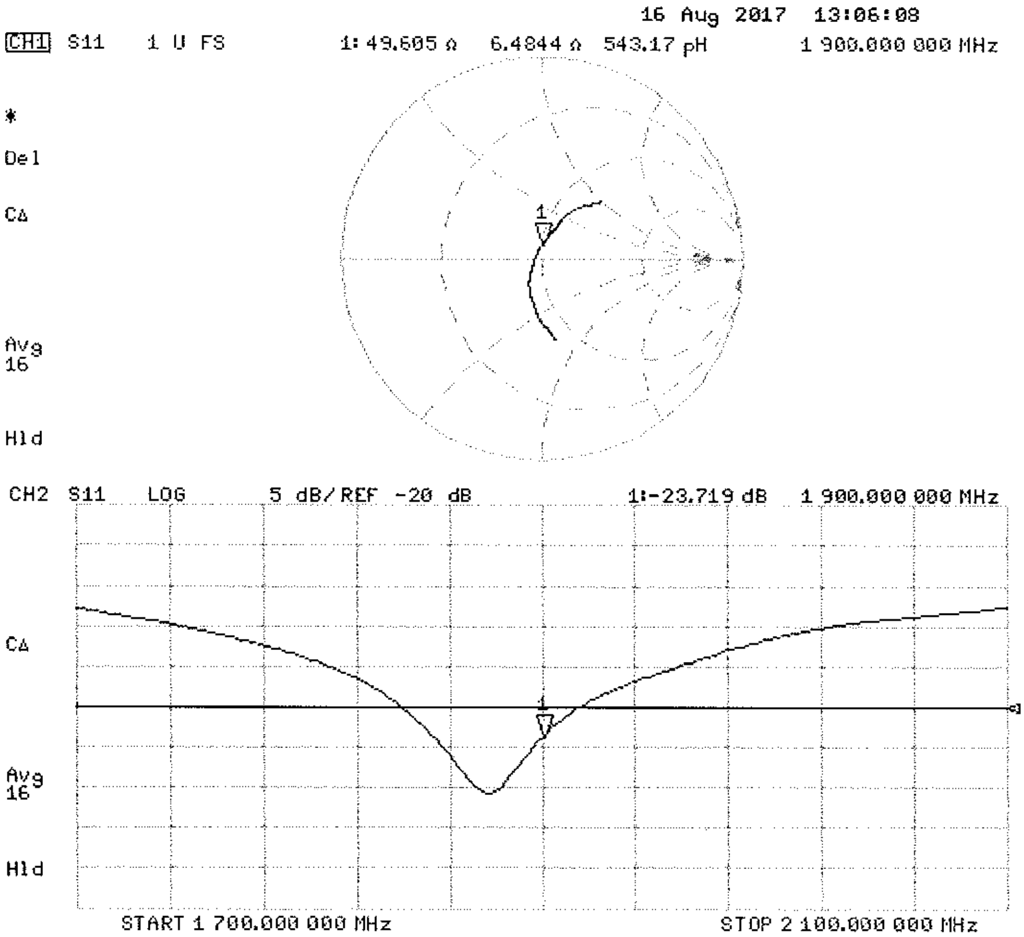
- Probe: EX3DV4 - SN7349; ConvF(8.2, 8.2, 8.2); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 99.33 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 16.9 W/kg
SAR(1 g) = 9.68 W/kg; SAR(10 g) = 5.17 W/kg
Maximum value of SAR (measured) = 14.1 W/kg



0 dB = 14.1 W/kg = 11.49 dBW/kg

Impedance Measurement Plot for Body TSL



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

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

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

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D2450V2-921_Sep17

CALIBRATION CERTIFICATE

Object: D2450V2 - SN:921

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

SC ✓ 10/03/2017

Calibration date: September 11, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

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

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: September 11, 2017

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
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 cm³ (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	13.4 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**52.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.22 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**24.5 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 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.0 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**50.7 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.07 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.9 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	53.3 Ω + 3.6 jΩ
Return Loss	- 26.6 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7 Ω + 5.9 jΩ
Return Loss	- 24.6 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.157 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	September 26, 2013

DASY5 Validation Report for Head TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

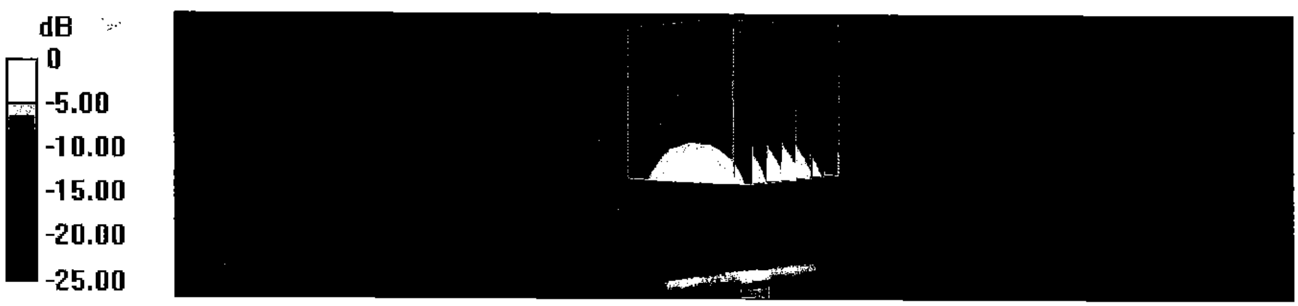
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 921

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.86 S/m; ε_r = 37.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

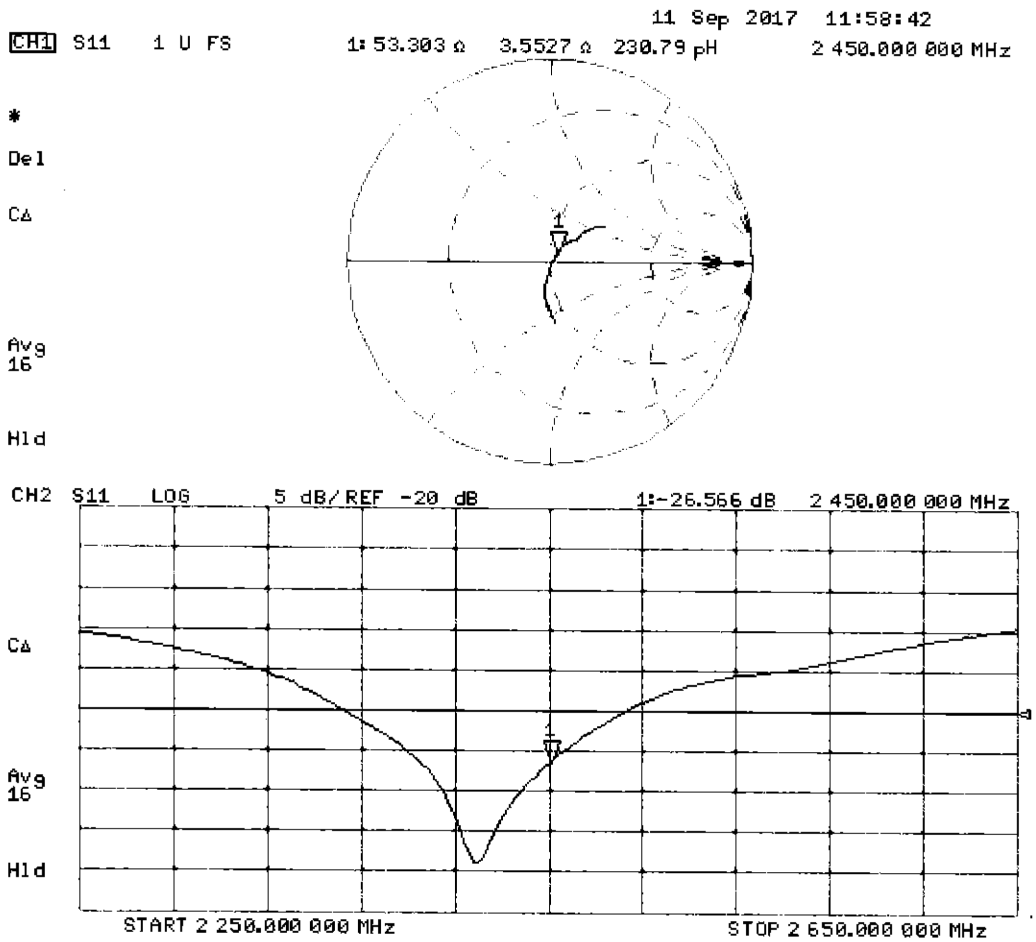
- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = -0.08 dB
Peak SAR (extrapolated) = 26.8 W/kg
SAR(1 g) = 13.4 W/kg; SAR(10 g) = 6.22 W/kg
Maximum value of SAR (measured) = 21.4 W/kg



0 dB = 21.4 W/kg = 13.30 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

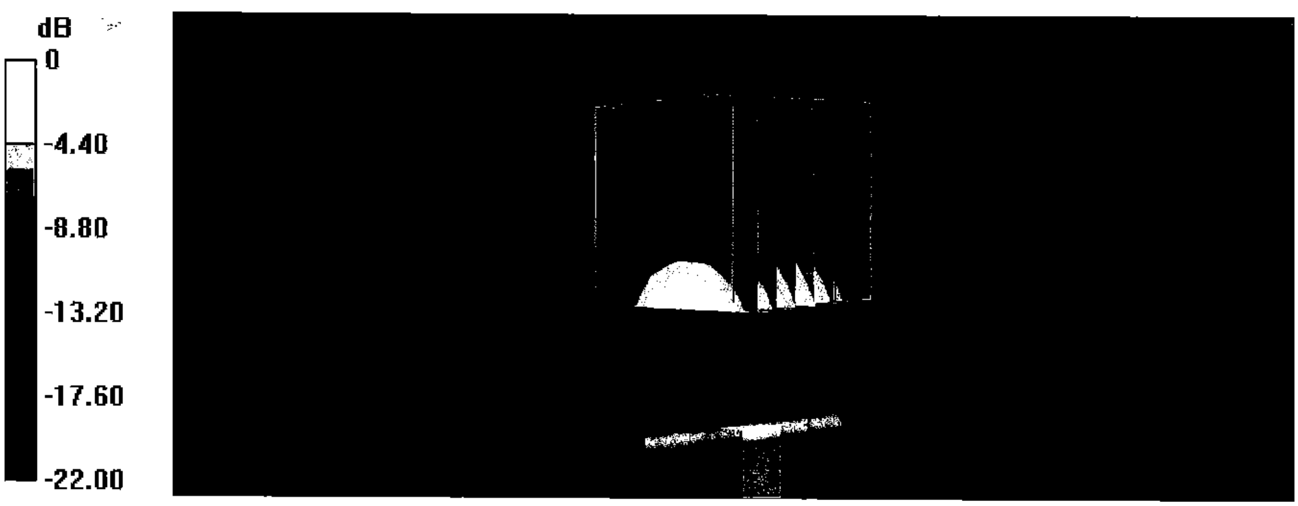
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN: 921

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.04 S/m; ε_r = 51.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

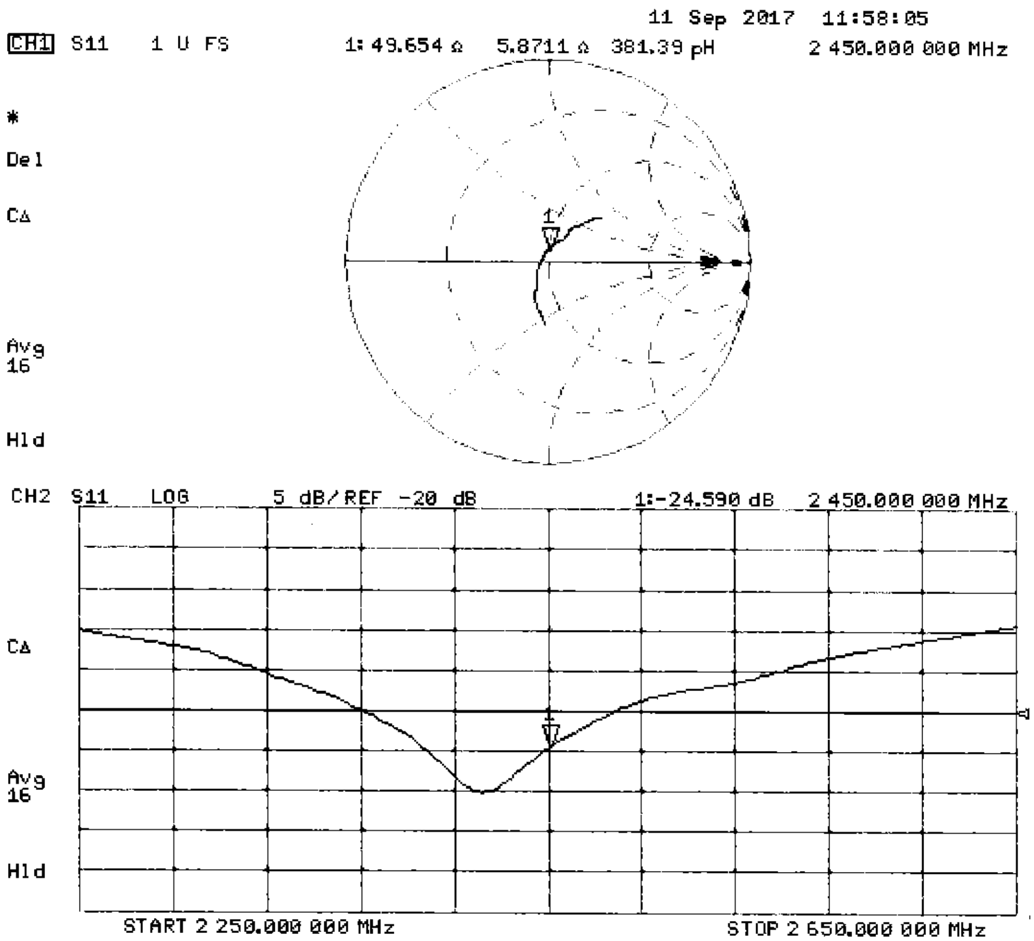
- Probe: EX3DV4 - SN7349; ConvF(8.1, 8.1, 8.1); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 103.9 V/m; Power Drift = -0.08 dB
Peak SAR (extrapolated) = 25.4 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.07 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



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

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

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D2450V2-945_May18

CALIBRATION CERTIFICATE

Object	D2450V2 - SN:945
Calibration procedure(s)	QA CAL-05.v10 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	May 16, 2018

SC ✓ 5/31/2018

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	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

	Name	Function	Signature
Calibrated by:	Manu Seitz	Laboratory Technician	
Approved by:	Katja Pokovic	Technical Manager	

Issued: May 17, 2018

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	V52.10.1
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	38.2 ± 6 %	1.85 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	13.0 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**51.0 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.02 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**23.8 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	52.3 ± 6 %	1.99 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	12.5 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**49.4 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	5.83 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**23.2 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	56.1 Ω + 3.7 jΩ
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	51.9 Ω + 5.0 jΩ
Return Loss	- 25.7 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.157 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	March 15, 2014

DASY5 Validation Report for Head TSL

Date: 16.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:945

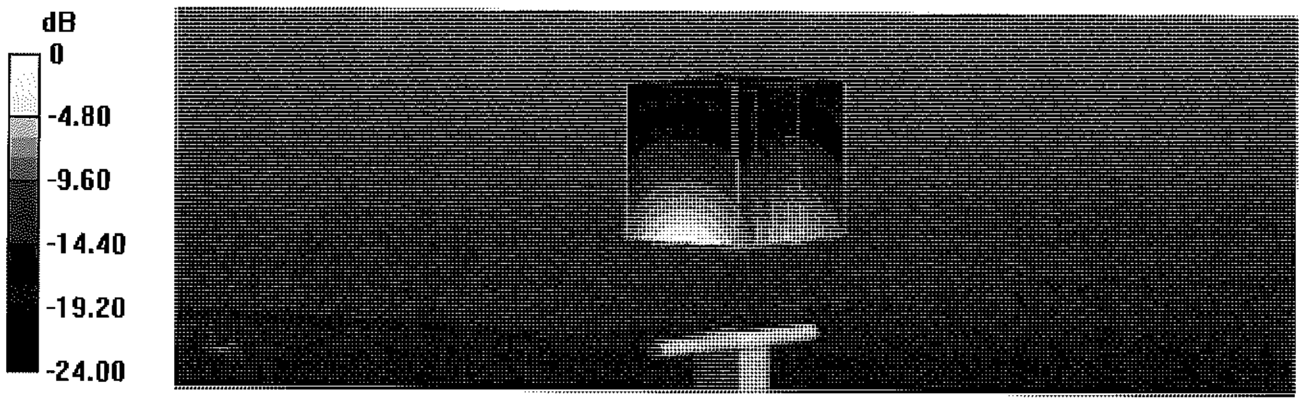
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 S/m; ε_r = 38.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.88, 7.88, 7.88) @ 2450 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

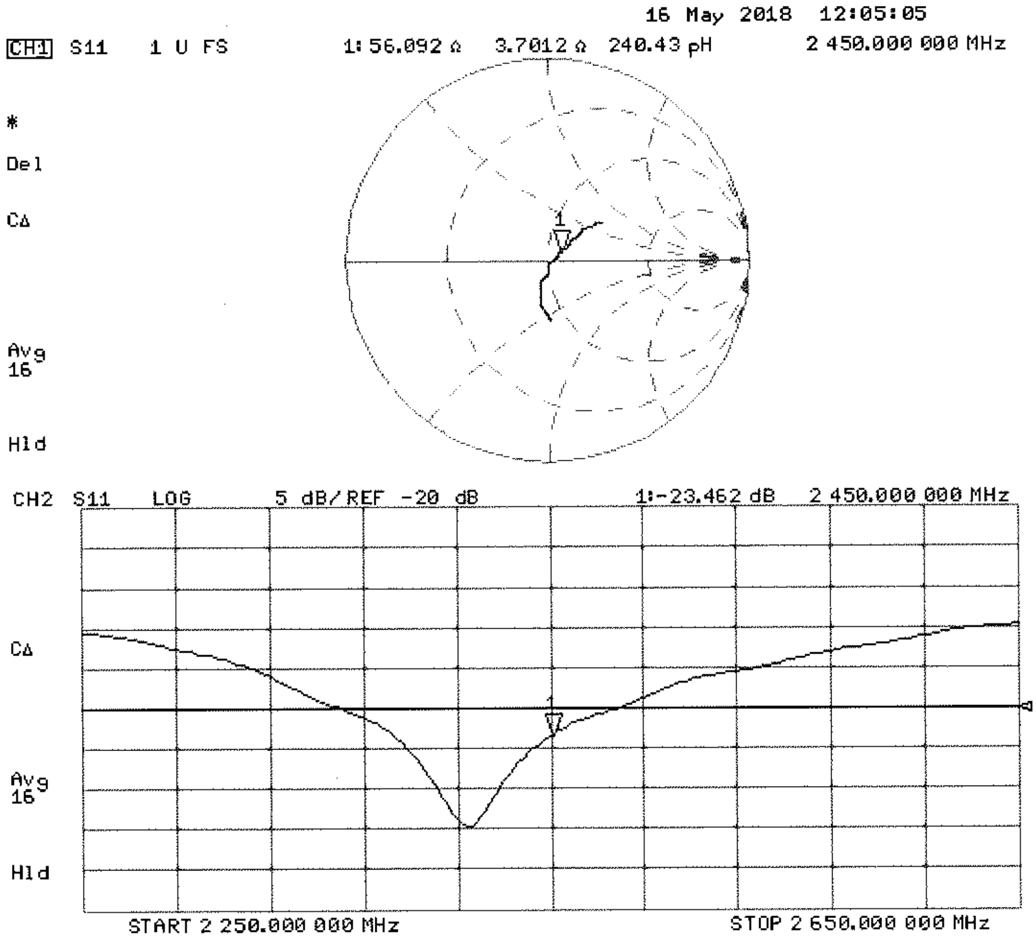
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 114.8 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 25.9 W/kg
SAR(1 g) = 13 W/kg; SAR(10 g) = 6.02 W/kg
Maximum value of SAR (measured) = 21.4 W/kg



0 dB = 21.4 W/kg = 13.30 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 16.05.2018

Test Laboratory: SPEAG, Zurich, Switzerland

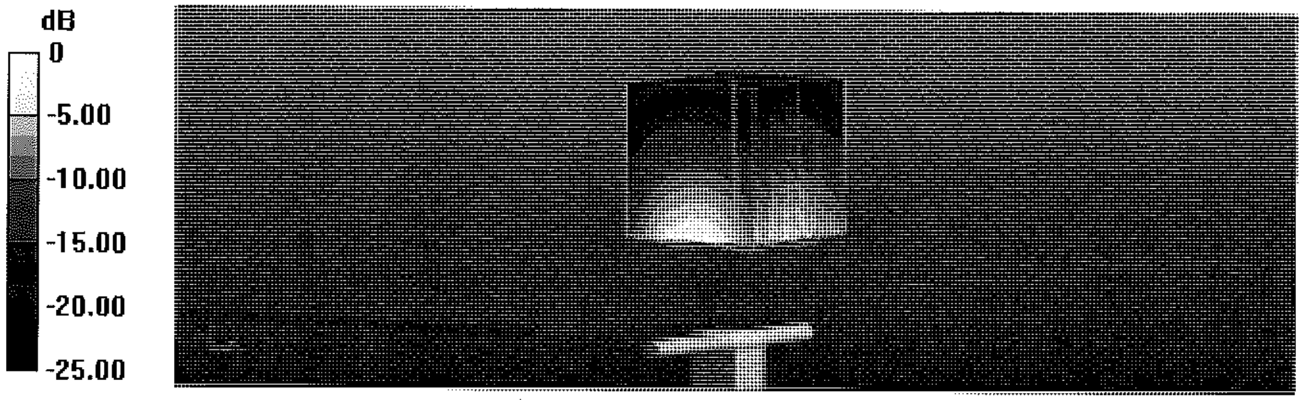
DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:945

Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.99 S/m; ε_r = 52.3; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

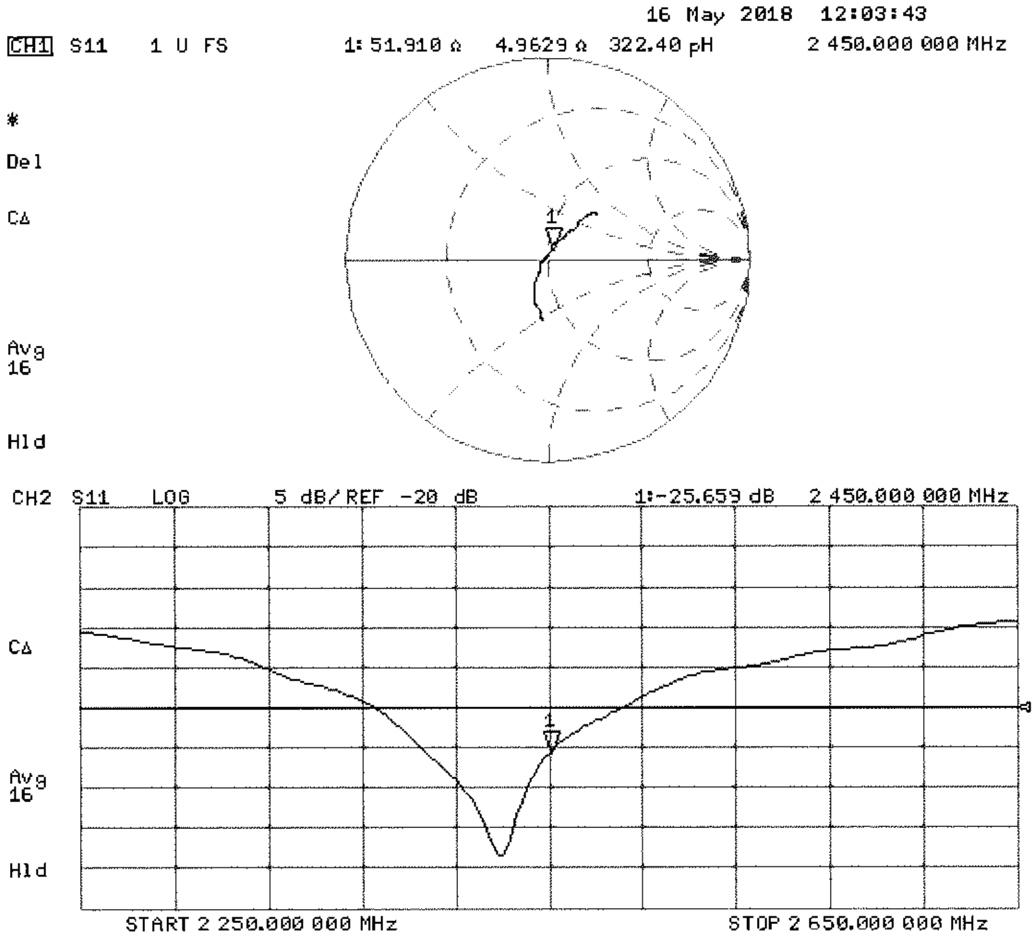
- Probe: EX3DV4 - SN7349; ConvF(8.01, 8.01, 8.01) @ 2450 MHz; Calibrated: 30.12.2017
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 26.10.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.1(1476); SEMCAD X 14.6.11(7439)

Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:
Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 106.8 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 25.0 W/kg
SAR(1 g) = 12.5 W/kg; SAR(10 g) = 5.83 W/kg
Maximum value of SAR (measured) = 20.2 W/kg



0 dB = 20.2 W/kg = 13.05 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: **D2450V2-750_Jun17**

CALIBRATION CERTIFICATE

Object D2450V2 - SN:750

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

BNV 8/3/2017
SC ✓ 6/1/2018

Calibration date: June 07, 2017

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

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

Calibration Equipment used (M&TE critical for calibration)

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

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

	Name	Function	Signature
Calibrated by:	Johannes Kurikka	Laboratory Technician	[signature]
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: June 9, 2017

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2450 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.2	1.80 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.9 ± 6 %	1.85 mho/m ± 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	13.6 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**53.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.29 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	52.2 ± 6 %	2.04 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm³ (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	13.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**51.2 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm³ (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.13 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.2 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	53.7 Ω + 5.8 jΩ
Return Loss	- 23.5 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	49.7 Ω + 6.7 jΩ
Return Loss	- 23.5 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.155 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 01, 2003

DASY5 Validation Report for Head TSL

Date: 07.06.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:750

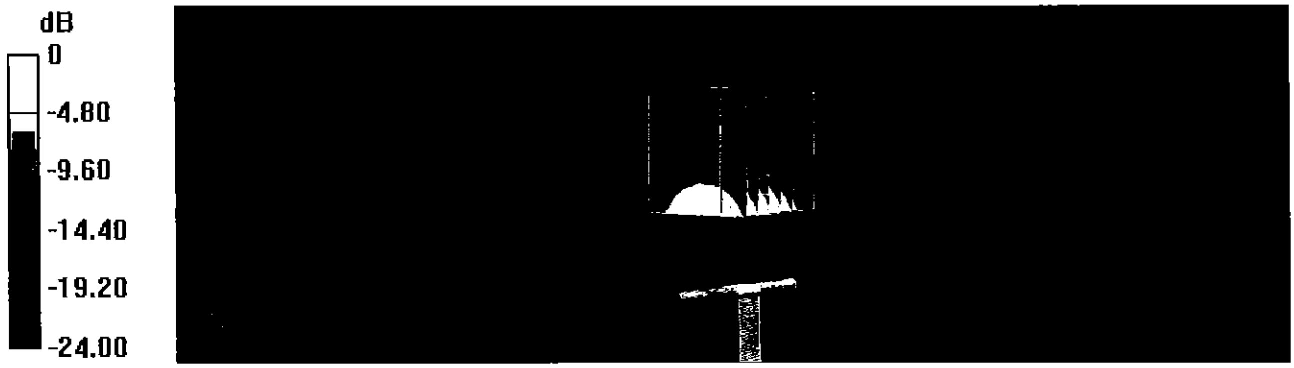
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 1.85 S/m; ε_r = 37.9; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.12, 8.12, 8.12); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

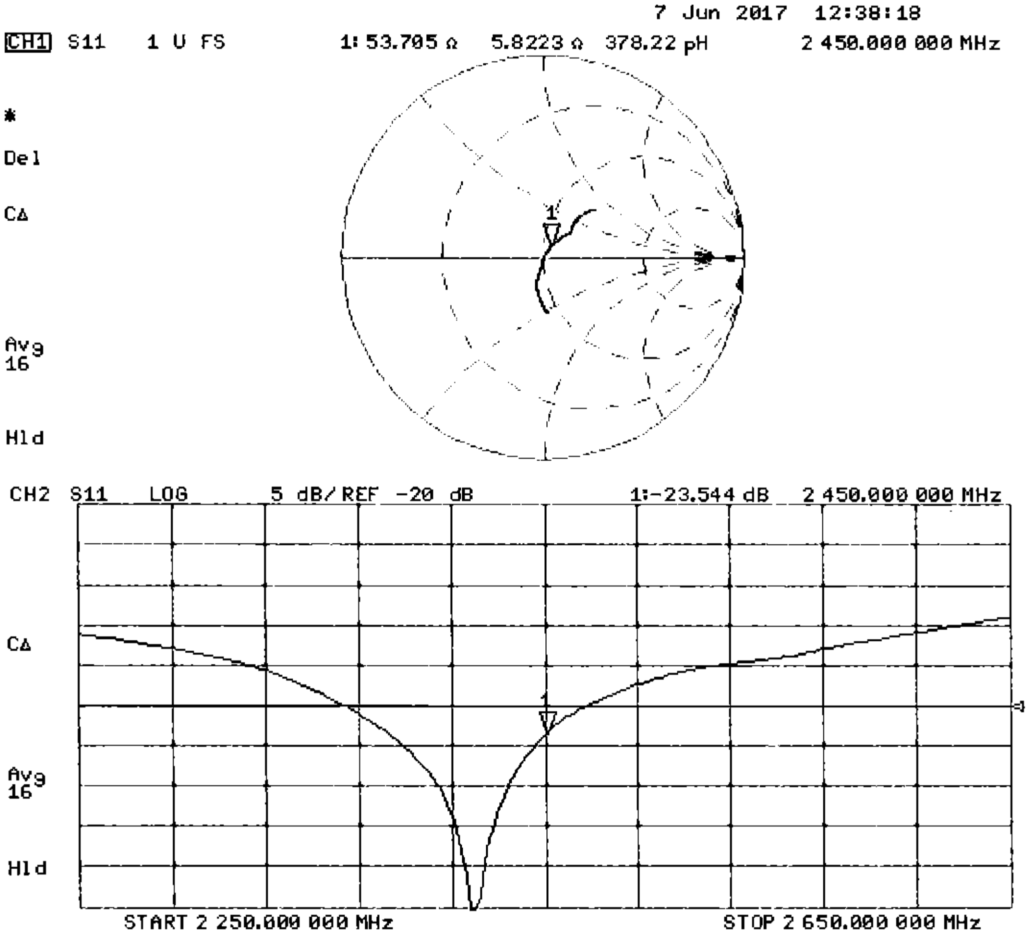
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 113.7 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 27.9 W/kg
SAR(1 g) = 13.6 W/kg; SAR(10 g) = 6.29 W/kg
Maximum value of SAR (measured) = 22.0 W/kg



0 dB = 22.0 W/kg = 13.42 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 07.06.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2450 MHz; Type: D2450V2; Serial: D2450V2 - SN:750

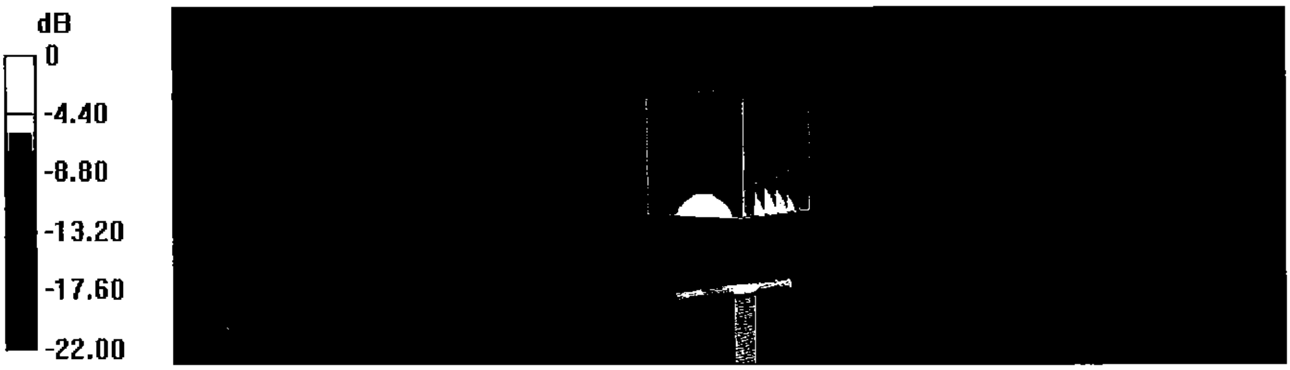
Communication System: UID 0 - CW; Frequency: 2450 MHz
Medium parameters used: f = 2450 MHz; σ = 2.04 S/m; ε_r = 52.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(8.1, 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)

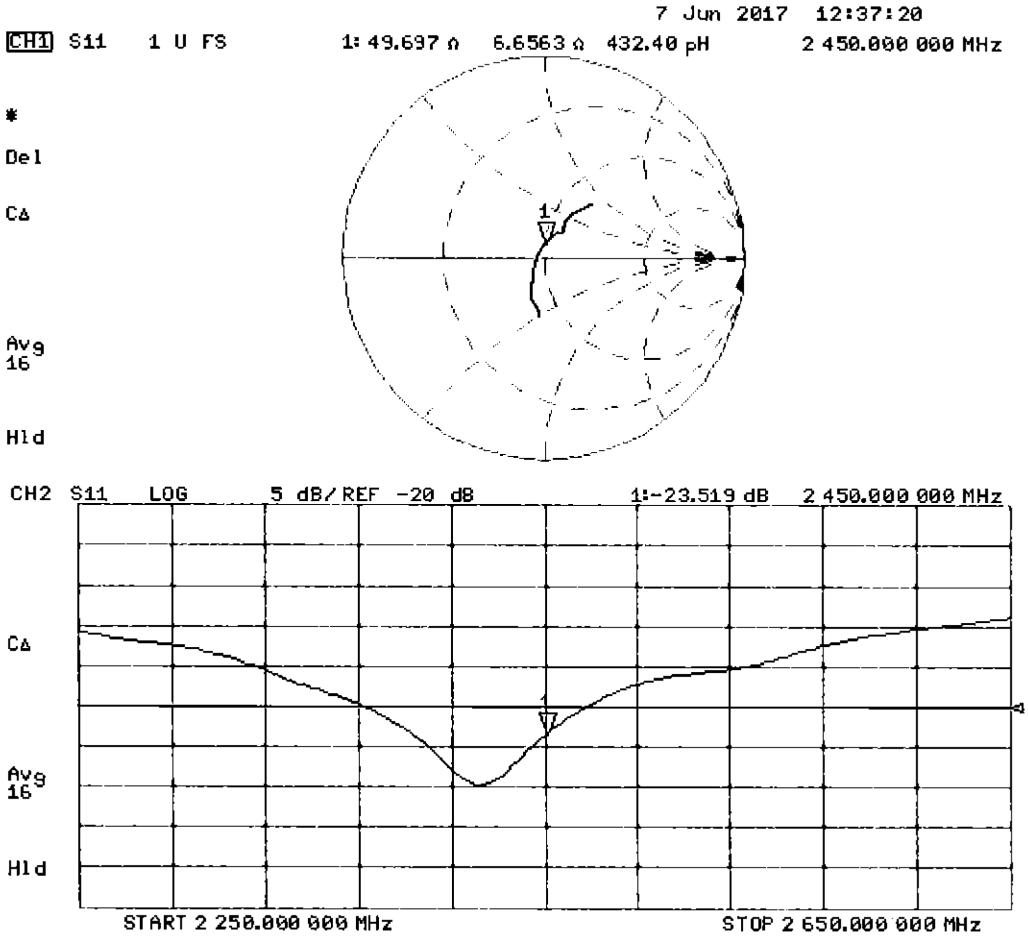
Dipole Calibration for Body Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 103.3 V/m; Power Drift = -0.01 dB
Peak SAR (extrapolated) = 26.0 W/kg
SAR(1 g) = 13.1 W/kg; SAR(10 g) = 6.13 W/kg
Maximum value of SAR (measured) = 20.5 W/kg



0 dB = 20.5 W/kg = 13.12 dBW/kg

Impedance Measurement Plot for Body TSL



Certification of Calibration

Object D2450V2 – SN: 750

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

Extended Calibration date: June 01, 2018

Description: SAR Validation Dipole at 2450 MHz.

Calibration Equipment used:

Manufacturer	Model	Description	Cal Date	Cal Interval	Cal Due	Serial Number
Agilent	8753ES	S-Parameter Network Analyzer	9/14/2017	Annual	9/14/2018	US39170118
Agilent	N5182A	MXG Vector Signal Generator	3/19/2018	Annual	3/19/2019	US46240505
Amplifier Research	15S1G6	Amplifier	CBT	N/A	CBT	343972
Anritsu	ML2496A	Power Meter	10/9/2017	Annual	10/9/2018	1138001
Anritsu	MA2411B	Pulse Power Sensor	11/15/2017	Annual	11/15/2018	1339007
Anritsu	MA2411B	Pulse Power Sensor	11/22/2017	Annual	11/22/2018	1339008
Control Company	4040	Temperature / Humidity Monitor	2/28/2018	Biennial	2/28/2020	150761911
Control Company	4352	Ultra Long Stem Thermometer	2/14/2017	Biennial	2/14/2019	170112507
Keysight	772D	Dual Directional Coupler	CBT	N/A	CBT	MY52180215
Keysight Technologies	85033E	Standard Mechanical Calibration Kit (DC to 9GHz, 3.5mm)	6/1/2017	Annual	6/1/2018	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	DAKS-3.5	Portable DAK	9/5/2017	Annual	9/5/2018	1045
SPEAG	ES3DV3	SAR Probe	3/13/2018	Annual	3/13/2019	3131
SPEAG	EX3DV4	SAR Probe	1/26/2018	Annual	1/26/2019	7490
SPEAG	DAE4	Dasy Data Acquisition Electronics	3/7/2018	Annual	3/7/2019	604
SPEAG	DAE4	Dasy Data Acquisition Electronics	1/26/2018	Annual	1/26/2019	1532

Measurement Uncertainty = ±23% (k=2)

	Name	Function	Signature
Calibrated By:	Sangmin Cha	Biomedical Engineer II	[signature]
Approved By:	Kaitlin O'Keefe	Senior Technical Manager	[signature]

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:

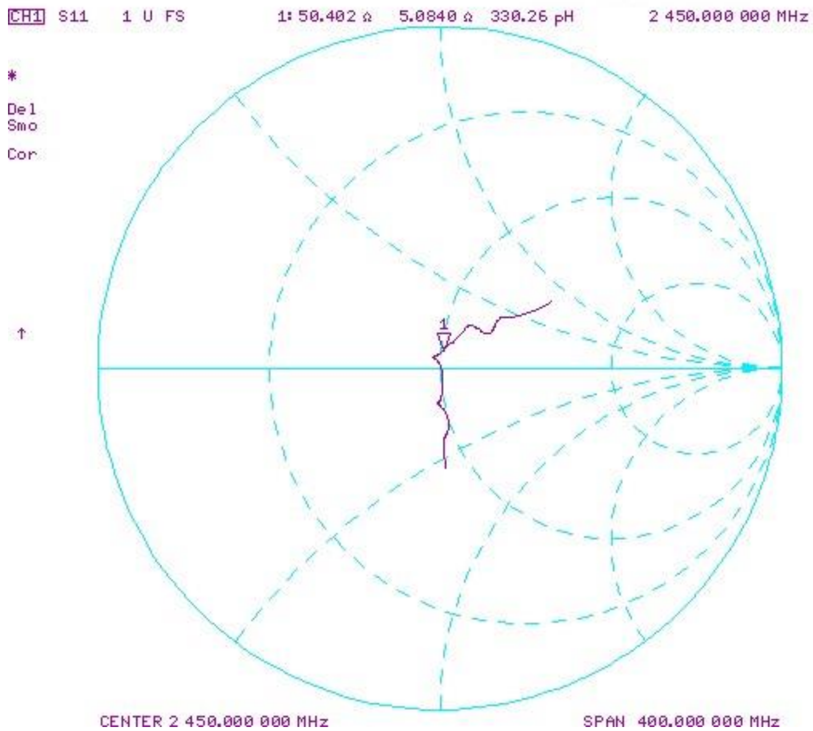
1. The measured SAR does not deviate more than 10% from the target on the calibration certificate.
2. The return-loss does not deviate more than 20% from the previous measurement and meets the required 20dB minimum return-loss requirement.
3. The measurement of real or imaginary parts of impedance does not deviate more than 5Ω from the previous measurement.

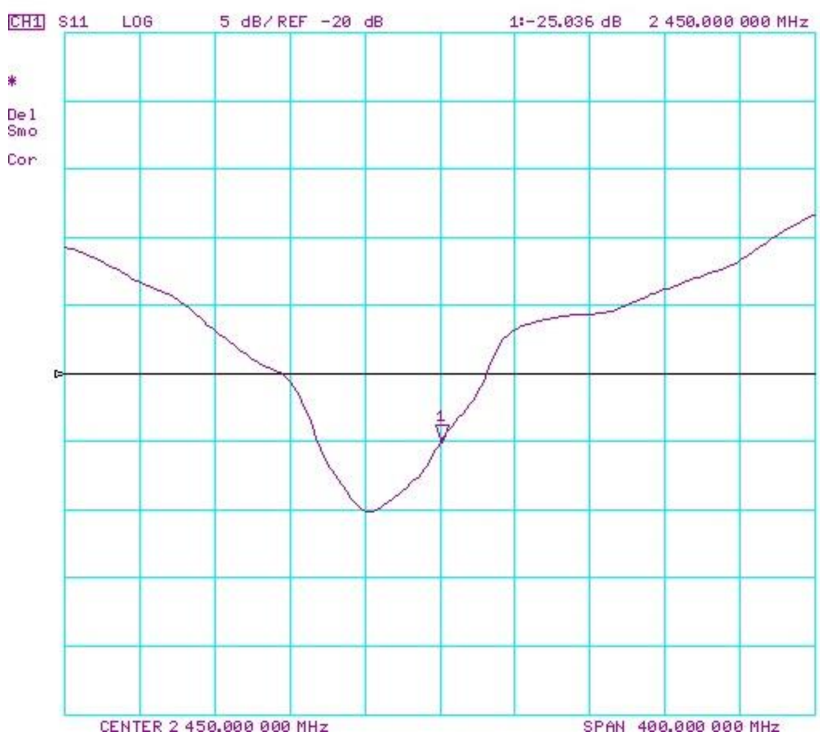
The following dipole was checked to pass the above 3 requirements to have 2-year calibration period from the calibration date:

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
6/7/2017	6/1/2018	1.155	5.33	5.54	3.94%	2.48	2.51	1.21%	53.7	50.4	3.3	5.8	5.1	0.7	-23.5	-25	-6.40%	PASS

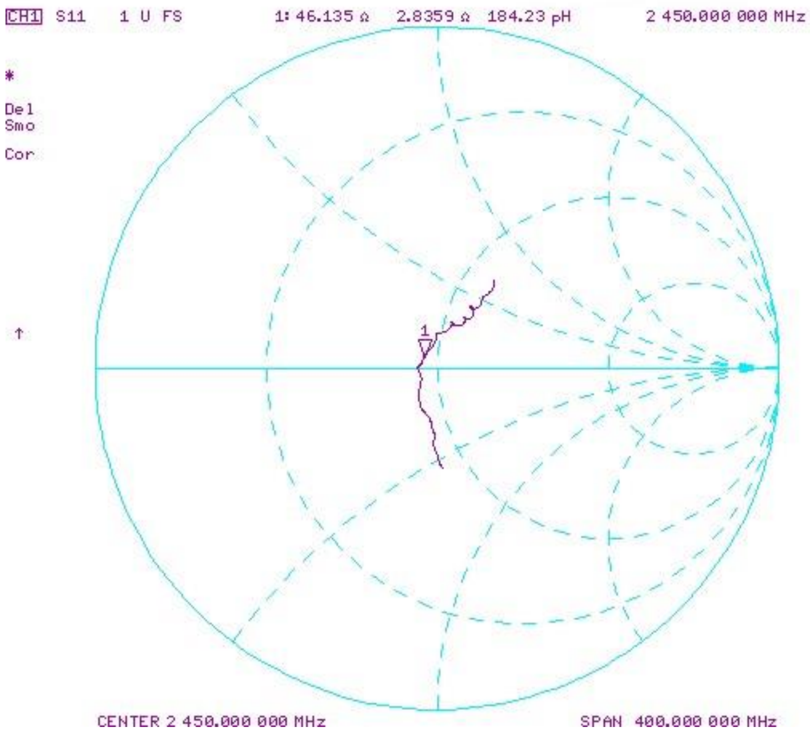
Calibration Date	Extension Date	Certificate Electrical Delay (ns)	Certificate SAR Target Body (1g) W/kg @ 20.0 dBm	Measured Body SAR (1g) W/kg @ 20.0 dBm	Deviation 1g (%)	Certificate SAR Target Body (10g) W/kg @ 20.0 dBm	Measured Body SAR (10g) W/kg @ 20.0 dBm	Deviation 10g (%)	Certificate Impedance 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
6/7/2017	6/1/2018	1.155	5.12	4.9	-4.30%	2.42	2.23	-7.85%	49.7	46.1	3.6	6.7	2.8	3.9	-23.5	-24.5	-4.30%	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**
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: D2600V2-1069_Sep17

CALIBRATION CERTIFICATE

Object	D2600V2 - SN:1069
Calibration procedure(s)	QA CAL-05.v9 Calibration procedure for dipole validation kits above 700 MHz
Calibration date:	September 11, 2017

SC ✓ 10/03/2017

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

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

Calibration Equipment used (M&TE critical for calibration)

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

	Name	Function	Signature
Calibrated by:	Michael Weber	Laboratory Technician	M.Weber
Approved by:	Katja Pokovic	Technical Manager	[signature]

Issued: September 11, 2017

Glossary:

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

Calibration is Performed According to the Following Standards:

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

Additional Documentation:

e) DASY4/5 System Handbook

Methods Applied and Interpretation of Parameters:

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

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

Measurement Conditions

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

DASY Version	DASY5	V52.10.0
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.2 ± 6 %	2.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.6 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**56.9 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.45 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.4 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.4 ± 6 %	2.23 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	14.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**55.3 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.26 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**24.8 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.1 Ω - 6.1 jΩ
Return Loss	- 24.1 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	46.2 Ω - 4.7 jΩ
Return Loss	- 24.1 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	July 17, 2013

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1069

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.03 S/m; ε_r = 37.2; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

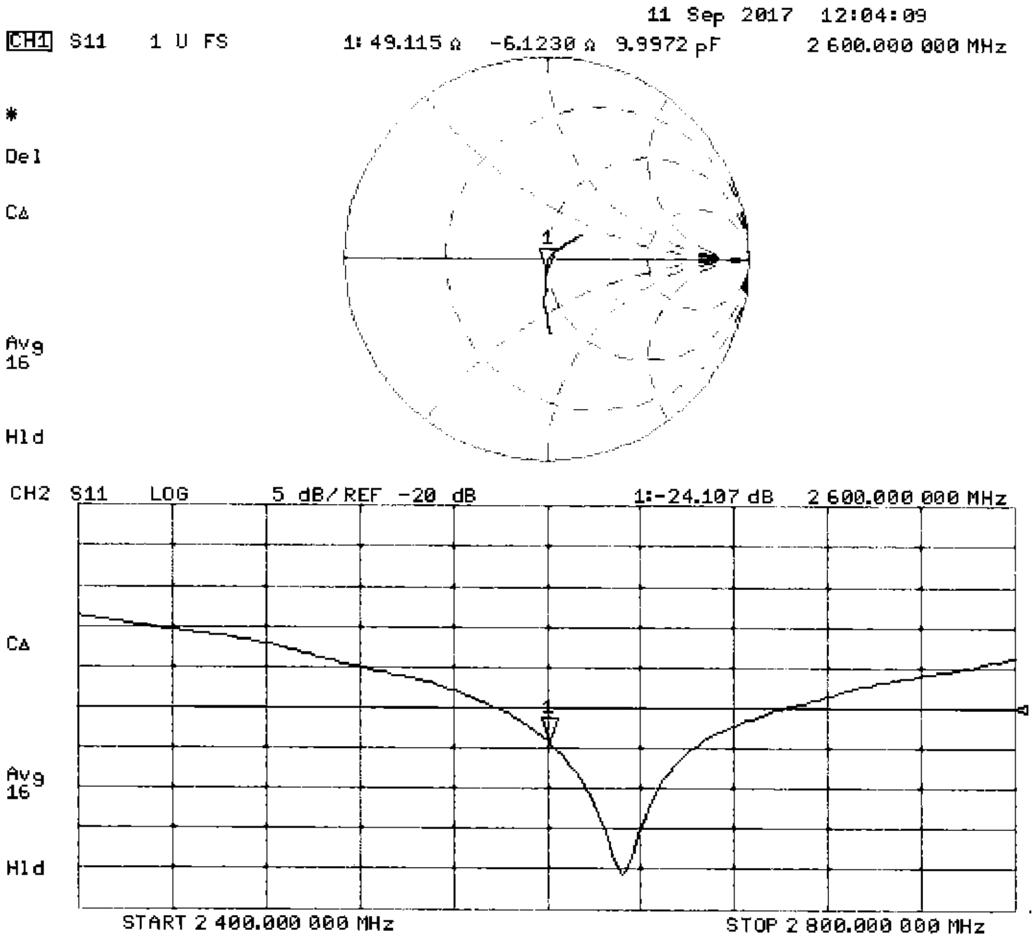
- Probe: EX3DV4 - SN7349; ConvF(7.96, 7.96, 7.96); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (front); Type: QD 000 P50 AA; Serial: 1001
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 115.4 V/m; Power Drift = -0.06 dB
Peak SAR (extrapolated) = 31.2 W/kg
SAR(1 g) = 14.6 W/kg; SAR(10 g) = 6.45 W/kg
Maximum value of SAR (measured) = 24.5 W/kg

0 dB = 24.5 W/kg = 13.89 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 11.09.2017

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN: 1069

Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.23 S/m; ε_r = 51.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

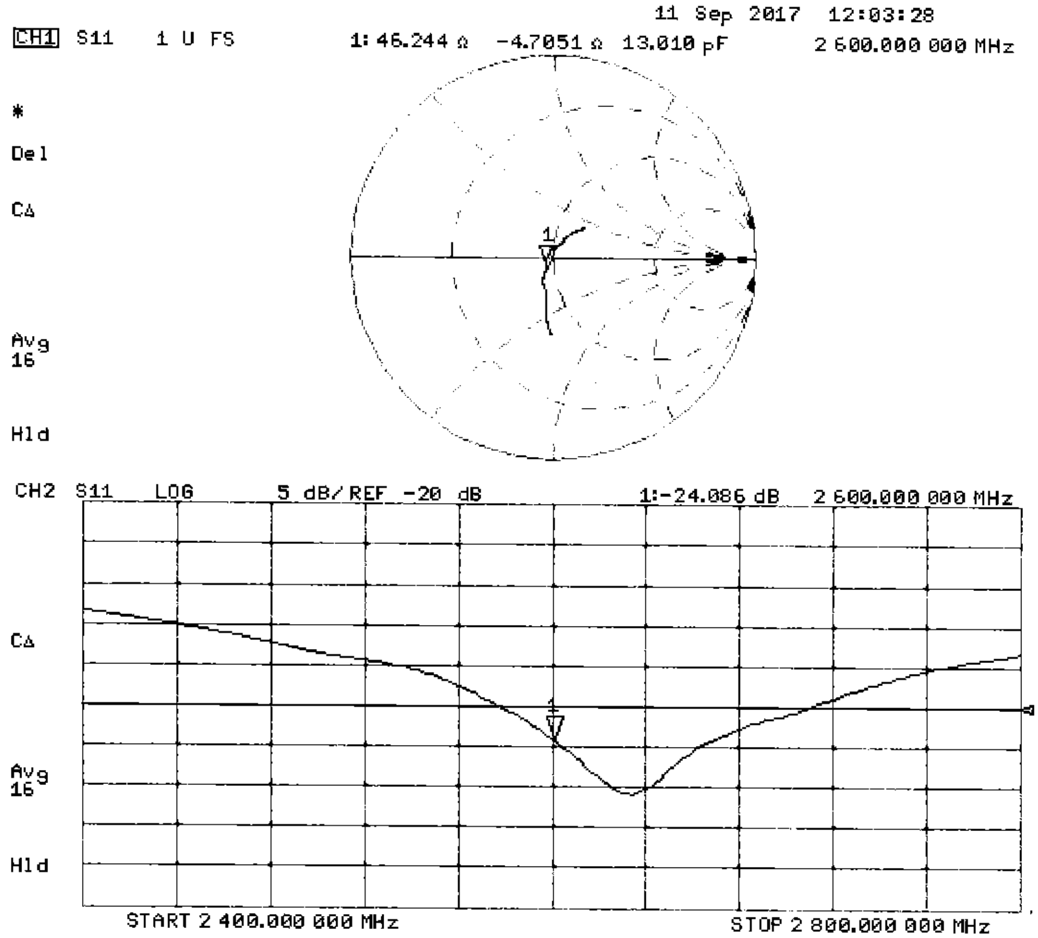
- Probe: EX3DV4 - SN7349; ConvF(7.94, 7.94, 7.94); Calibrated: 31.05.2017;
- Sensor-Surface: 1.4mm (Mechanical Surface Detection)
- Electronics: DAE4 Sn601; Calibrated: 28.03.2017
- Phantom: Flat Phantom 5.0 (back); Type: QD 000 P50 AA; Serial: 1002
- DASY52 52.10.0(1446); SEMCAD X 14.6.10(7417)

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 = 105.7 V/m; Power Drift = -0.09 dB
Peak SAR (extrapolated) = 29.9 W/kg
SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.26 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



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

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

Accreditation No.: SCS 0108

Client **PC Test**

Certificate No: D2600V2-1009_Jun18

CALIBRATION CERTIFICATE

Object: D2600V2 - SN:1009

SC ✓ 6/28/18

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

Calibration date: June 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-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

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

Issued: June 21, 2018

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	V52.10.1
Extrapolation	Advanced Extrapolation	
Phantom	Modular Flat Phantom	
Distance Dipole Center - TSL	10 mm	with Spacer
Zoom Scan Resolution	dx, dy, dz = 5 mm	
Frequency	2600 MHz ± 1 MHz	

Head TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Head TSL parameters	22.0 °C	39.0	1.96 mho/m
Measured Head TSL parameters	(22.0 ± 0.2) °C	37.4 ± 6 %	2.03 mho/m ± 6 %
Head TSL temperature change during test	< 0.5 °C	----	----

SAR result with Head TSL

SAR averaged over 1 cm^3 (1 g) of Head TSL	Condition	
SAR measured	250 mW input power	14.3 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**55.8 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Head TSL	condition	
SAR measured	250 mW input power	6.38 W/kg
SAR for nominal Head TSL parameters	normalized to 1W	**25.1 W/kg ± 16.5 % (k=2)**

Body TSL parameters

The following parameters and calculations were applied.

	Temperature	**Permittivity**	**Conductivity**
Nominal Body TSL parameters	22.0 °C	52.5	2.16 mho/m
Measured Body TSL parameters	(22.0 ± 0.2) °C	51.8 ± 6 %	2.22 mho/m ± 6 %
Body TSL temperature change during test	< 0.5 °C	----	----

SAR result with Body TSL

SAR averaged over 1 cm^3 (1 g) of Body TSL	Condition	
SAR measured	250 mW input power	14.1 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**55.5 W/kg ± 17.0 % (k=2)**

SAR averaged over 10 cm^3 (10 g) of Body TSL	condition	
SAR measured	250 mW input power	6.31 W/kg
SAR for nominal Body TSL parameters	normalized to 1W	**25.0 W/kg ± 16.5 % (k=2)**

Appendix (Additional assessments outside the scope of SCS 0108)

Antenna Parameters with Head TSL

Impedance, transformed to feed point	49.8 Ω - 5.0 jΩ
Return Loss	- 26.0 dB

Antenna Parameters with Body TSL

Impedance, transformed to feed point	44.3 Ω - 4.8 jΩ
Return Loss	- 22.1 dB

General Antenna Parameters and Design

Electrical Delay (one direction)	1.153 ns

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

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

Additional EUT Data

Manufactured by	SPEAG
Manufactured on	April 12, 2007

DASY5 Validation Report for Head TSL

Date: 13.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1009

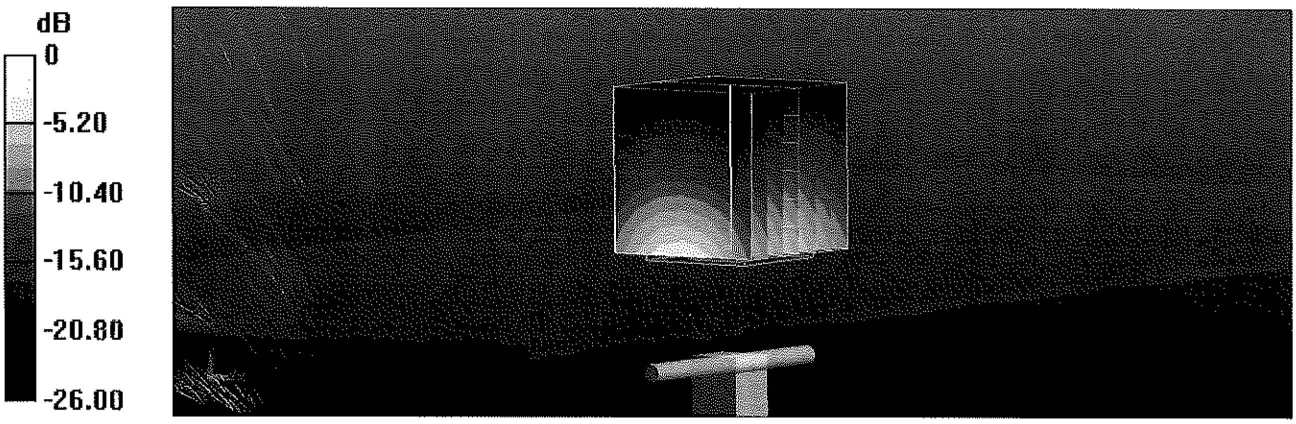
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.03 S/m; ε_r = 37.4; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.7, 7.7, 7.7) @ 2600 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

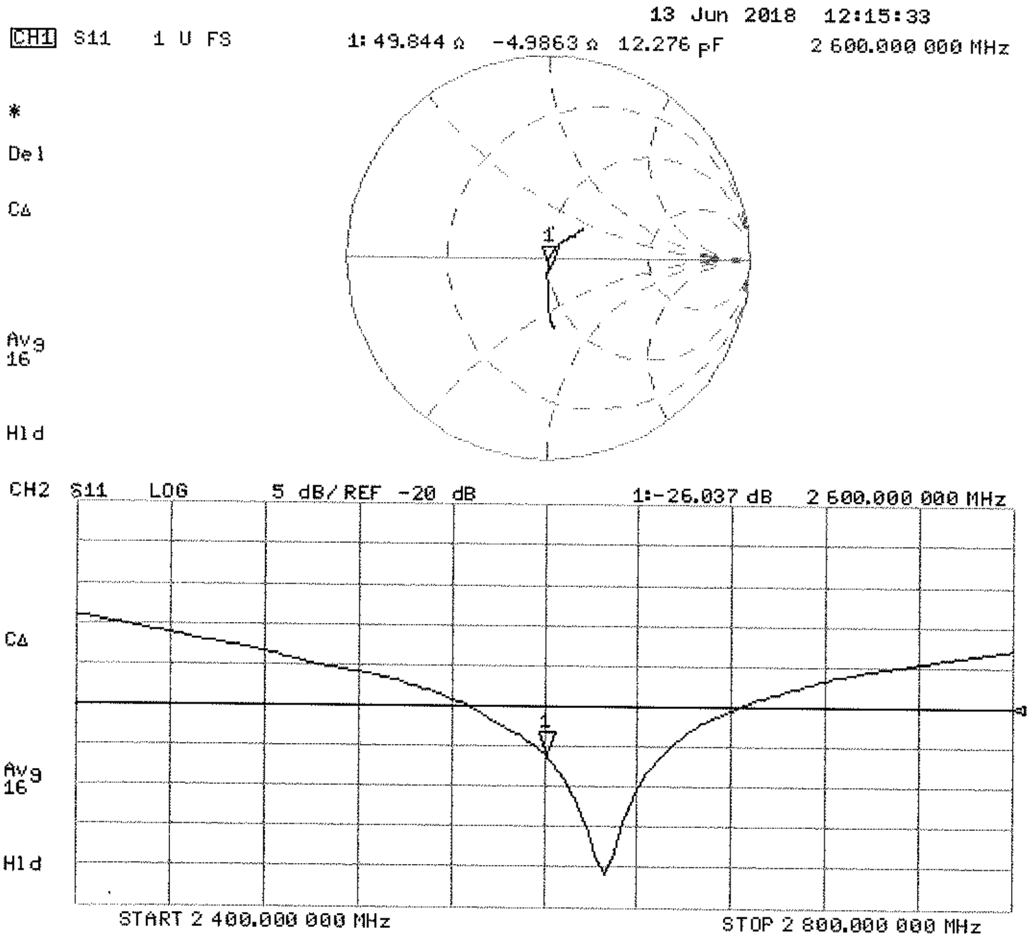
Dipole Calibration for Head Tissue/Pin=250 mW, d=10mm/Zoom Scan (7x7x7)/Cube 0:

Measurement grid: dx=5mm, dy=5mm, dz=5mm
Reference Value = 117.9 V/m; Power Drift = 0.03 dB
Peak SAR (extrapolated) = 28.4 W/kg
SAR(1 g) = 14.3 W/kg; SAR(10 g) = 6.38 W/kg
Maximum value of SAR (measured) = 23.7 W/kg



0 dB = 23.7 W/kg = 13.75 dBW/kg

Impedance Measurement Plot for Head TSL



DASY5 Validation Report for Body TSL

Date: 19.06.2018

Test Laboratory: SPEAG, Zurich, Switzerland

DUT: Dipole 2600 MHz; Type: D2600V2; Serial: D2600V2 - SN:1009

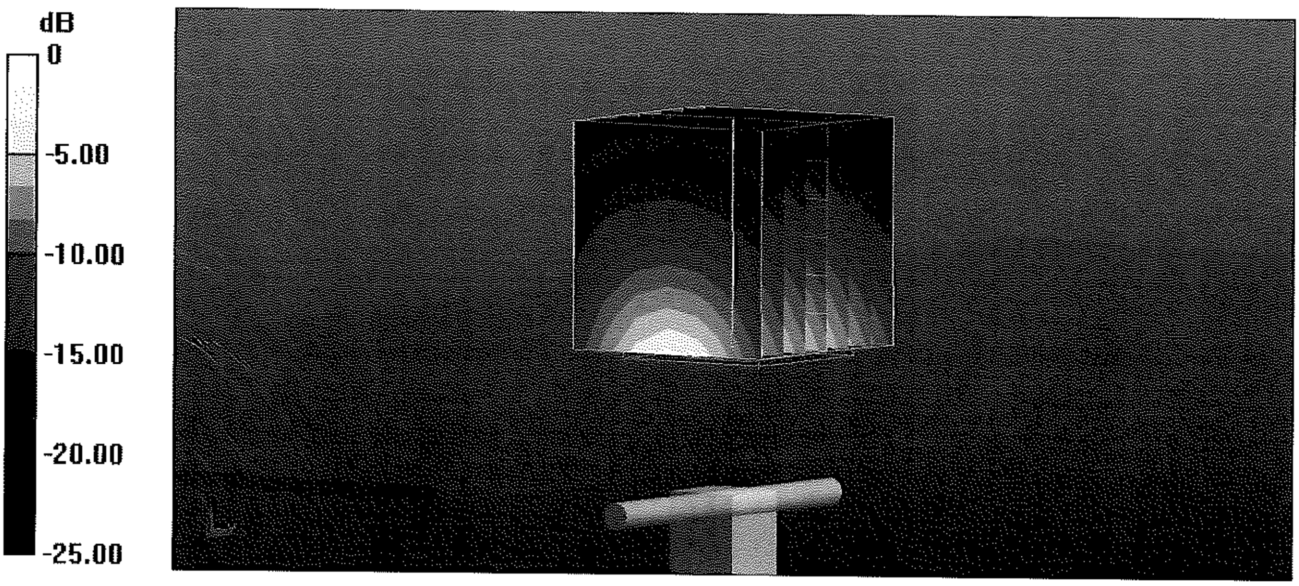
Communication System: UID 0 - CW; Frequency: 2600 MHz
Medium parameters used: f = 2600 MHz; σ = 2.22 S/m; ε_r = 51.8; ρ = 1000 kg/m^3
Phantom section: Flat Section
Measurement Standard: DASY5 (IEEE/IEC/ANSI C63.19-2011)

DASY52 Configuration:

- Probe: EX3DV4 - SN7349; ConvF(7.81, 7.81, 7.81) @ 2600 MHz; 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 52.10.1(1476); SEMCAD X 14.6.11(7439)

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 = 109.4 V/m; Power Drift = -0.07 dB
Peak SAR (extrapolated) = 28.7 W/kg
SAR(1 g) = 14.1 W/kg; SAR(10 g) = 6.31 W/kg
Maximum value of SAR (measured) = 23.7 W/kg



0 dB = 23.7 W/kg = 13.75 dBW/kg